Society of Automotive Engineers, Inc.
400 COMMONWEALTH DRIVE, WARRENDALE, PA. 15096

AEROSPACE MATERIAL SPECIFICATION

AMS 4390F
Superseding AMS 4390E
Issued 1-15-60
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MAGNESIUM ALLOY SHEET AND PLATE
2.0Th - 0.78Mn (HM21A-T8)

1. SCOPE:

1.1 Form: This specification covers a magnesium alloy in the form of sheet and plate.

1.2 Application: Primarily for components requiring weldability and good strength-to-weight ratio up to 700°F (370°C). Material covered by this specification is radioactive. All applicable rules and regulations, including those of the Nuclear Regulatory Agency pertaining to handling of radioactive material and all licensing provisions for use of such material should be observed.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2202 - Tolerances, Aluminum-Base and Magnesium-Base Alloy Sheet and Plate
AMS 2350 - Standards and Test Methods
AMS 2355 - Quality Assurance Sampling and Testing of Aluminum-Base and Magnesium-Base Alloys, Wrought Products (Except Forgings and Forging Stock) and Flash Welded Rings

2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM E9 - Compression Testing of Metallic Materials at Room Temperature
ASTM E21 - Elevated Temperature Tension Tests of Metallic Materials

2.3 Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined in accordance with Ø AMS 2355:

	min	max
Thorium	1.5	2.5
Manganese	0.45	1.1
Other Impurities, each	--	0.10
Other Impurities, total	--	0.30
Magnesium	remainder	

3.2 Condition: The product shall be supplied in the following condition:

3.2.1 Product 0.500 In. (12.70 mm) and Under in Nominal Thickness: Solution heat treated, cold worked, precipitation heat treated, and pickled.

3.2.2 Product Over 0.500 In. (12.70 mm) in Nominal Thickness: Solution heat treated, cold worked, and precipitation heat treated.

Ø 3.3 Properties: The product shall conform to the following requirements:

3.3.1 Longitudinal and Long-Transverse Tensile Properties:

3.3.1.1 At Room Temperature: Shall be as specified in Table I, 3.3.1.1.1, 3.3.1.2, and 3.3.1.2.1, determined in accordance with AMS 2355.

TABLE I

Nominal Thickness Inches	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min	Elongation in 2 in. or 4D %, min
0.016 to 0.250, incl	33,000	18,000	6
Over 0.250 to 0.500, incl	32,000	21,000	6
Over 0.500 to 3.000, incl	30,000	21,000	6

TABLE I (SI)

Nominal Thickness Millimetres	Tensile Strength MPa, min	Yield Strength at 0.2% Offset MPa, min	Elongation in 50.8 mm or 4D %, min
0.41 to 6.35, incl	228	124	6
Over 6.35 to 12.70, incl	221	145	6
Over 12.70 to 76.20, incl	207	145	6

3.1.1.1.1 Tensile property requirements for product under 0.016 in. (0.41 mm) or over 3.000 in. (76.20 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.1.2 At 600°F (316°C): Shall be as follows, for product 0.016 to 0.250 in. (0.41 to 6.35 mm), excl, in nominal thickness, determined in accordance with ASTM E21 on specimens heated to 600°F ± 5 (316°C ± 3), held at heat for 10 min. before testing, and tested at 600°F ± 5 (316°C ± 3) at a rate not greater than 0.05 in. per in. per min. (0.05 mm/mm/min.) through the 0.2% offset and at a rate of 0.11 - 0.14 in. per in. per min. (0.11 - 0.14 mm/mm/min.) above the 0.2% offset:

Tensile Strength, min	11,000 psi (75.8 MPa)
Elongation in 2 in. (50.8 mm) or 4D, min	8%

3.3.1.2.1 Tensile property requirements for product under 0.016 in. (0.41 mm) or 0.250 in (6.35 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.3.2 Longitudinal and Long-Transverse Compressive Properties: Shall be as specified in Table II and Ø 3.3.2.1, determined in accordance with ASTM E9.

TABLE II

Nominal Thickness Inches	Yield Strength at 0.2% Offset psi, min
0.063 to 0.250, incl	15,000
Over 0.250 to 0.500, incl	20,000
Over 0.500 to 1.000, incl	17,000
Over 1.000 to 2.000, incl	15,000
Over 2.000 to 3.000, incl	14,000

TABLE III

Nominal Thickness Millimetres	Yield Strength at 0.2% Offset MPa, min
1.60 to 6.35, incl	103
Over 6.35 to 12.70, incl	138
Over 12.70 to 25.40, incl	117
Over 25.40 to 50.80, incl	103
Over 50.80 to 76.20, incl	97

3.3.2.1 Compressive property requirements for product under 0.063 in. (1.60 mm) or over 3.000 in. (76.20 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

3.4 Quality: The product, as received by the purchaser, shall be uniform in quality and condition, sound, Ø and free from segregation and foreign materials and from internal and external imperfections detrimental to usage of the product.

3.5 Tolerances: Unless otherwise specified, tolerances shall conform to all applicable requirements of AMS 2202.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection: The vendor of the product shall supply all samples and shall be Ø responsible for performing all required tests. Results of such tests shall be reported to the purchaser as required by 4.4. Purchaser reserves the right to perform such confirmatory testing as he deems necessary to ensure that the product conforms to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to composition (3.1), room-temperature tensile Ø property (3.3.1.1), and tolerance (3.5) requirements are classified as acceptance tests.

4.2.2 Periodic Tests: Tests to determine conformance to elevated-temperature tensile property Ø (3.3.1.2) and compressive property (3.3.2) requirements are classified as periodic tests.

4.3 Sampling: Shall be in accordance with AMS 2355.

4.4 Reports:

4.4.1 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 other acceptance test requirements of this specification. This report shall include the purchase order number, material specification number and its revision letter, size, and quantity.

4.4.2 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 and its revision letter, 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.

Ø 4.5 Resampling and Retesting: Shall be in accordance with AMS 2355.

5. PREPARATION FOR DELIVERY:

5.1 Identification: Each sheet and plate shall be marked on one face, in the respective location indicated below, with the alloy number and temper, AMS 4390 or applicable Federal or Military specification designation, inspection lot number, manufacturer's identification, and nominal thickness. The characters shall be of such size as to be clearly legible, shall be applied using a suitable marking fluid, and shall be sufficiently stable to withstand normal handling. The markings shall have no deleterious effect on the product or its performance.

5.1.1 Flat Sheet and Plate Under 6 In. (152 mm) Wide: Shall be marked in one or more lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm). The inspection lot number may appear in the row marking or may appear at only one location on each piece.

5.1.2 Flat Sheet and Plate 0.375 In. (9.52 mm) and Under Thick, 6 - 60 In. (152 - 1524 mm), Incl, Wide, and 36 - 200 In. (914 - 5080 mm), Incl, Long: Shall be marked in lengthwise rows of characters recurring at intervals not greater than 3 ft (914 mm), the rows being spaced approximately 6 in. (152 mm) on centers across the width and staggered. Every third row shall show the manufacturer's identification and nominal thickness. The other rows shall show the alloy number and temper and AMS4390 or applicable Federal or Military specification designation. The inspection lot number may be included in the rows with the alloy, temper, and specification designations or may appear at only one location on each piece.

5.1.3 Flat Sheet and Plate Over 0.375 In. (9.52 mm) Thick, or Over 60 In. (1524 mm) Wide, or Over 200 In. (5080 mm) Long: Shall be marked as in 5.1.2 or, at vendor's discretion, shall be marked in one or two rows of characters recurring at intervals not greater than 3 ft (914 mm) and running around the periphery of the piece. If one row is used, it shall show all information of 5.1 except that the inspection lot number may be omitted. If two rows are used, one row shall show the alloy number and temper and AMS 4390 or applicable Federal or Military specification designation; the second row shall show the manufacturer's identification and nominal thickness. The inspection lot number may be included in the line with the manufacturer's identification and nominal thickness or may appear at only one location on each piece.

5.1.3.1 If peripheral 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 direction of rolling.

5.1.4 Coiled Sheet: Shall be marked near both the outside and inside ends of the coil; the markings shall be Ø applied as in 5.1 or shall appear on a durable tag or label attached to the coil and marked with the information of 5.1. When the inside end of the coil is inaccessible, as when the sheet is wound on cores, the tag or label may be attached to the core.

5.1.5 Circles: Shall be marked with the information of 5.1 if the circle is 24 in. (610 mm) or more in nominal diameter. Circles less than 24 in. (610 mm) in nominal diameter shall be identified as agreed upon by purchaser and vendor.

5.2 Protective Treatment: The product shall be oiled with a light corrosion-inhibiting oil and shall be further protected, during shipment and storage, by interleaving with suitable paper sheets.

5.3 Packaging: