

# AEROSPACE MATERIAL SPECIFICATION

**SAE**

**AMS 4390H**

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Superseding AMS 4390G

Submitted for recognition as an American National Standard

## SHEET AND PLATE, MAGNESIUM ALLOY

2.0Th - 0.78Mn (HM21A-T8)

Solution Heat Treated, Cold Worked, and Precipitation Heat Treated

UNS M13210

### 1. SCOPE:

#### 1.1 Form:

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

#### 1.2 Application:

This product has been used typically for components requiring good weldability and good strength-to-weight ratio up to 700 °F (371 °C), but usage is not limited to such applications.

#### 1.3 Precautions:

Product covered by this specification is radioactive. All applicable rules and regulations pertaining to handling of radioactive material and all licensing provisions for use of such material should be observed.

#### 1.4 Safety - Hazardous Materials:

While the materials, methods, applications, and processes described or referenced in this specification may involve the use of hazardous materials, this specification does not address the hazards which may be involved in such use. It is the sole responsibility of the user to ensure familiarity with the safe and proper use of any hazardous materials and to take necessary precautionary measures to ensure the health and safety of all personnel involved.

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**REAFFIRMED**  
5/95

## 2. APPLICABLE DOCUMENTS:

The following publications form a part of this specification to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order.

### 2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2202 Tolerances, Aluminum Alloy and Magnesium Alloy Sheet and Plate  
MAM 2202 Tolerances, Metric, Aluminum Alloy and Magnesium Alloy Sheet and Plate

AMS 2355 Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings

MAM 2355 Quality Assurance Sampling and Testing of Aluminum Alloys and Magnesium Alloys, Wrought Products (Except Forging Stock) and Flash Welded Rings, Metric (SI) Units

AMS 2811 Identification, Aluminum and Magnesium Alloy Wrought Products

### 2.2 ASTM Publications:

Available from ASTM, 1916 Race Street, Philadelphia, PA 19103-1187.

ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

ASTM E 9 Compression Testing of Metallic Materials at Room Temperature

ASTM E 21 Elevated Temperature Tension Tests of Metallic Materials

## 3. TECHNICAL REQUIREMENTS:

### 3.1 Composition: (R)

Shall conform to the percentages by weight shown in Table 1, determined in accordance with AMS 2355 or MAM 2355.

TABLE 1 - Composition

Element	min	max
Thorium	1.5	2.5
Manganese	0.45	1.1
Other Impurities, each (3.1.1)	--	0.10
Other Impurities, total (3.1.1)	--	0.30
Magnesium	remainder	

#### 3.1.1 Determination not required for routine acceptance.

## 3.2 Condition:

The product shall be supplied in the following condition:

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

## 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 2 and 3.3.1.1.1, determined in accordance with AMS 2355 or MAM 2355.

TABLE 2A - Tensile Properties

Nominal Thickness Inches	Tensile Strength ksi, min	Yield Strength at 0.2% Offset ksi, min	Elongation in 2 Inches or 4D %, min
0.016 to 0.250, incl	33.0	18.0	6
Over 0.250 to 0.500, incl	32.0	21.0	6
Over 0.500 to 3.000, incl	30.0	21.0	6

TABLE 2B - Tensile Properties (SI)

Nominal Thickness Millimeters	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

- 3.3.1.1.1 Tensile property requirements for product under 0.016 inch (0.41 mm) or over 3.000 inches (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 inch (0.41 to 6.35 mm), exclusive, in nominal thickness, determined in accordance with ASTM E 21 on specimens heated at 600 °F  $\pm$  5 (316 °C  $\pm$  3), held at heat for 10 to 20 minutes before testing, and tested at 600 °F  $\pm$  5 (316 °C  $\pm$  3) at a rate not greater than 0.05 inch/inch/minute (0.05 mm/mm/minute) through the 0.2% offset and at a rate of 0.11 – 0.14 inch/inch/minute (0.11 – 0.14 mm/mm/minute) above the 0.2% offset:

Tensile Strength, minimum 11.0 ksi (76 MPa)  
 Elongation in 2 Inches (50.8 mm) or 4D, minimum 8%

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

- 3.3.2 Longitudinal and Long-Transverse Compressive Properties: Shall be as specified in Table 3 and 3.3.2.1, determined in accordance with ASTM E 9.

TABLE 3A – Compressive Properties

Nominal Thickness Inches	Yield Strength at 0.2% Offset ksi, min
0.063 to 0.250, incl	15.0
Over 0.250 to 0.500, incl	20.0
Over 0.500 to 1.000, incl	17.0
Over 1.000 to 2.000, incl	15.0
Over 2.000 to 3.000, incl	14.0

TABLE 3B – Compressive Properties, (SI)

Nominal Thickness Millimeters	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 inch (1.60 mm) or over 3.000 inches (76.20 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

### 3.4 Quality:

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

### 3.5 Tolerances:

Shall conform to all applicable requirements of AMS 2202 or MAM 2202.

## 4. QUALITY ASSURANCE PROVISIONS:

### 4.1 Responsibility for Inspection:

(R)

The vendor of the product shall supply all samples for vendor's tests and shall be responsible for performing all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the product conforms to the requirements of this specification.

### 4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests for composition (3.1), room-temperature tensile properties (3.3.1.1), and tolerances (3.5) are acceptance tests and shall be performed on each lot.

4.2.2 Periodic Tests: Tests for elevated-temperature tensile properties (3.3.1.2) and compressive properties (3.3.2) are periodic tests and shall be performed at a frequency selected by the vendor unless frequency of testing is specified by purchaser.

### 4.3 Sampling and Testing:

(R)

Shall be in accordance with AMS 2355 or MAM 2355.

### 4.4 Reports:

The vendor of the product shall furnish with each shipment a report stating that the product conforms to the chemical composition and other technical requirements. The report shall include the purchase order number, lot number, AMS 4390H, size, and quantity.

### 4.5 Resampling and Retesting:

Shall be in accordance with AMS 2355 or MAM 2355.

## 5. PREPARATION FOR DELIVERY:

### 5.1 Identification:

(R)

Shall be in accordance with AMS 2811.