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400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

**SAE**

**AMS 4385H**

Issued 1 AUG 1957  
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Superseding AMS 4385G

Submitted for recognition as an American National Standard

SHEET AND PLATE, MAGNESIUM ALLOY  
3.2Th - 0.70Zr (HK31A-H24)  
Cold Rolled and Partially Annealed

UNS M13310

## 1. SCOPE:

### 1.1 Form:

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

### 1.2 Application:

These products have been used typically for parts requiring good weldability and good strength-to-weight-ratio up to 550 °F (288 °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.

## 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.

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user."

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## 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:

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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	2.45	4.0
Zirconium	0.45	1.0
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.

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## 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: Cold rolled, partially annealed, and pickled.

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3.2.2 Product Over 0.500 inch (12.70 mm) in Nominal Thickness: Cold rolled and partially annealed.

### 3.3 Properties:

The product shall conform to the following requirements:

#### 3.3.1 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 - Minimum Tensile Properties, Inch/Pound Units

Nominal Thickness Inches	Tensile Strength ksi	Yield Strength at 0.2% Offset ksi	Elongation in 2 Inches or 4D %
0.016 to 0.125, incl	34.0	26.0	4
Over 0.125 to 0.250, incl	34.0	24.0	4
Over 0.250 to 1.000, incl	34.0	25.0	4
Over 1.000 to 3.000, incl	33.0	25.0	4

TABLE 2B - Minimum Tensile Properties, SI Units

Nominal Thickness Millimeters	Tensile Strength MPa	Yield Strength at 0.2% Offset MPa	Elongation in 50.8 mm or 4D %
0.41 to 3.18, incl	234	179	4
Over 3.18 to 6.35, incl	234	165	4
Over 6.35 to 25.40, incl	234	172	4
Over 25.40 to 76.20, incl	228	172	4

3.3.1.1.1 Room temperature 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.

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- 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) in nominal thickness, determined in accordance with ASTM E 21 on specimens heated to 600°F ± 5 (316°C ± 3), held at heat for 10 to 20 minutes before testing, and tested at 600°F ± 5 (316°C ± 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 10.0 ksi (69 MPa)  
Elongation in 2 Inches (50.8 mm) or 4D, minimum 20%

- 3.3.1.2.1 Tensile property requirements at 600 °F (316 °C) for product under 0.016 inch (0.41 mm) or over 0.250 inch (6.35 mm) in nominal thickness shall be as agreed upon by purchaser and vendor.

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

TABLE 3A - Minimum Compressive Properties, Inch/Pound Units

Nominal Thickness Inches	Yield Strength at 0.2% Offset ksi
0.063 to 0.125, incl	20.0
Over 0.125 to 0.250, incl	22.0
Over 0.250 to 1.000, incl	20.0
Over 1.000 to 3.000, incl	17.0

TABLE 3B - Minimum Compressive Properties, SI Units

Nominal Thickness Millimeters	Yield Strength at 0.2% Offset MPa
1.60 to 3.18, incl	138
Over 3.18 to 6.35, incl	152
Over 6.35 to 25.40, incl	138
Over 25.40 to 76.20, incl	117

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

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## 3.4 Quality:

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

3.4.1 Acceptance limits for imperfections shall be as agreed upon by purchaser and vendor.

## 3.5 Tolerances:

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

## 4. QUALITY ASSURANCE PROVISIONS:

## 4.1 Responsibility for Inspection:

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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:

Tests for all technical requirements are acceptance tests and shall be performed on each lot.

## 4.3 Sampling and Testing:

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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 4385H, 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:

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Shall be in accordance with AMS 2811.

## 5.2 Protective Treatment:

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