

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard



AMS 4390J

Issued JAN 1960
Revised FEB 1996

Superseding AMS 4390H

SHEET AND PLATE, MAGNESIUM ALLOY
2.0Th - 0.78Mn (HM21A-T8)
Solution Heat Treated, Cold Worked, and Precipitation Heat Treated
UNS M13210

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of February 1996. It is recommended, therefore, that this specification not be specified for new designs.

This cover sheet should be attached to the "H" revision of the subject specification.

"NONCURRENT" refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division, however, does not recommend these as standard materials for future use in new designs. Each of these "NONCURRENT" specifications is available from SAE upon request.

PREPARED UNDER THE JURISDICTION OF AMS COMMITTEE "D"

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AEROSPACE MATERIAL SPECIFICATION



AMS 4390H

Submitted for recognition as an American National Standard

Issued 15 JAN 1960
Revised 1 OCT 1991
Superseding AMS 4390G

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.

REAFFIRMED

MAY '95

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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.

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.

5.3 Packaging:

5.3.1 (R) The product shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the product to ensure carrier acceptance and safe delivery.

5.3.2 (R) For direct U.S. Military procurement, packaging shall be in accordance with ASTM B 660, Commercial Level, unless Level A is specified in the request for procurement.

6. ACKNOWLEDGMENT:

A vendor shall mention this specification number and its revision letter in all quotations and when acknowledging purchase orders.

7. REJECTIONS:

Product not conforming to this specification, or to modifications authorized by purchaser, will be subject to rejection.

8. NOTES:

8.1 Marginal Indicia:

The (R) symbol is used to indicate technical changes from the previous issue of this specification.

8.2 Dimensions and properties in inch/pound units and the Fahrenheit temperatures are primary; dimensions and properties in SI units and the Celsius temperatures are shown as the approximate equivalents of the primary units and are presented only for information.

8.3 For direct U.S. Military procurement, purchase documents should specify not less than the following:

Title, number, and date of this specification
Form and size of product desired
Quantity of product desired
Level A packaging, if required (See 5.3.2).

8.4 Similar Specifications:

MIL-M-8917 is listed for information only and shall not be construed as an acceptable alternate unless all requirements of this AMS are met.