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400 Commonwealth Drive, Warrendale, PA 15096-0001

# AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4248A

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Superseding AMS 4248

## Aluminum Alloy Hand Forgings and Rolled Rings
## 1.0Mg - 0.60Si - 0.28Cu - 0.20Cr (6061-T652)
## Solution Heat Treated, Stress Relief Compressed, and Precipitation Heat Treated

UNS A96061



1. SCOPE:

1.1 Form:

This specification covers an aluminum alloy in the form of hand forgings and rolled rings procured to inch/pound units.

1.1.1 MAM 4248 is the metric version of this AMS.

1.2 Application:

These products have been used typically for complex shaped parts requiring moderate strength and good forgeability of the alloy and where stability is required during machining, but usage is not limited to such applications. Corrosion resistance of this alloy is superior to that of aluminum alloys having copper as the principal alloying element.

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 2355 | Quality Assurance Sampling and Testing, Aluminum Alloys and Magnesium Alloys, Wrought Products, Except Forging Stock, and Rolled, Forged, or Flash Welded Rings |
| AMS 2645 | Fluorescent Penetrant Inspection |
| AMS 2808 | Identification, Forgings |



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2.2 ASTM Publications:

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

ASTM B 594 Ultrasonic Inspection of Aluminum-Alloy Products for Aerospace Applications
ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

2.3 U.S. Government Publications:

Available from Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-H-6088 Heat Treatment of Aluminum Alloys

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

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

TABLE 1 - Composition

| Element | min | max |
|---|---|---|
| Magnesium | 0.8 | 1.2 |
| Silicon | 0.40 | 0.8 |
| Copper | 0.15 | 0.40 |
| Chromium | 0.04 | 0.35 |
| Iron | -- | 0.7 |
| Zinc | -- | 0.25 |
| Manganese | -- | 0.15 |
| Titanium | -- | 0.15 |
| Other Impurities | -- | 0.05 |
| Other Impurities | -- | 0.15 |
| Aluminum | remainder | |



3.2 Condition:

Solution heat treated, stress relieved by compression to produce 1 to 5% permanent set, and precipitation heat treated. Heat treatments shall be performed in accordance with MIL-H-6088.

3.3 Properties:

The product shall conform to the following requirements, determined in accordance with AMS 2355:

3.3.1 Tensile Properties: Shall be as follows:

3.3.1.1 Hand Forgings: Specimens, machined from forgings having an essentially square or rectangular cross-section heat treated in the indicated thickness, shall have the properties shown in Table 2 provided the as-forged thickness does not exceed 8 inches and the cross-sectional area is not over 256 square inches.

TABLE 2 - Minimum Tensile Properties, Hand Forgings

| Nominal Thickness at Time of Heat Treatment Inches | Specimen Orientation | Tensile Strength ksi | Yield Strength at 0.2% Offset ksi | Elongation in or 4D % |
|---|---|---|---|---|
| Up to 2, incl | Longitudinal | 38.0 | 35.0 | 10 |
| | Long.-Trans. | 38.0 | 35.0 | 8 |
| Over 2 to 4, incl | Longitudinal | 38.0 | 35.0 | 10 |
| | Long.-Trans. | 38.0 | 35.0 | 8 |
| | Short-Trans. | 37.0 | 33.0 | 5 |
| Over 4 to 8, incl | Longitudinal | 37.0 | 34.0 | 8 |
| | Long.-Trans. | 37.0 | 34.0 | 6 |
| | Short-Trans. | 35.0 | 32.0 | 4 |

3.3.1.2 Rolled Rings: Specimens, machined in the indicated orientation from rings 3.5 inches and under in nominal thickness at time of heat treatment and having an OD-to-wall thickness ratio of 10:1 or greater, shall have the properties shown in Table 3 and Table 4.

3.3.1.2.1 Tangential: Axis of specimen tangential to the ring OD (axis parallel to the direction of rolling):

TABLE 3 - Minimum Tangential Tensile Properties, Rolled Rings

| Property | Value |
|---|---|
| Tensile Strength | 38.0 ksi |
| Yield Strength at 0.2% Offset | 35.0 ksi |
| Elongation in 4D | |
| Nominal Thickness, Inches | |
| Up to 2.5, incl | 10% |
| Over 2.5 to 3.5, incl | 8% |

3.3.1.2.2 Axial: Axis of specimen parallel to axis of ring (axis transverse to direction of rolling):

TABLE 4 - Minimum Axial Tensile Properties, Rolled Rings

| Property | Value |
|---|---|
| Tensile Strength | 38.0 ksi |
| Yield Strength at 0.2% Offset | 35.0 ksi |
| Elongation in 4D | |
| Nominal Thickness, Inches | |
| Up to 2.5, incl | 8% |
| Over 2.5 to 3.5, incl | 6% |

3.3.1.3 Special Purpose Forgings: Tensile property requirements for specimens cut from special purpose forgings or from forgings or rolled rings beyond the size and configuration limits of 3.3.1.1 or 3.3.1.2 shall be as specified on the drawing or as agreed upon purchaser and vendor.

3.3.2 Hardness: Shall be not lower than 80 HB/10/500 or 85 HB/10/1000.

3.4 Quality:

Forgings and rolled rings, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the forgings and rolled rings.

3.4.1 Forgings and rolled rings shall be subjected to a caustic etch followed by visual examination of the product surfaces for defect indications, such as seams, laps, bursts, and quench cracks. Surface imperfections which can be removed so that they do not reappear on etching and the required section thickness can be maintianed are acceptable.

3.4.2 When specified, all forgings and rolled rings shall be subjected to ultrasonic inspection in accordance with ASTM B 594 and shall meet ultrasonic Class A.

3.4.3 When specified, forgings and rolled rings shall be subjected to fluorescent penetrant inspection in accordance with AMS 2645. Standards for acceptance shall be established by the cognizant engineering organization.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for Inspection:

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.