AERONAUTICAL
MATERIAL SPECIFICATIONS
SOCIETY OF AUTOMOTIVE ENGINEERS, Inc. 485 Lexington Ave., New York 17, N.Y.

AMS 4445
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Revised

MAGNESIUM ALLOY CASTINGS, SAND
3.3Th - 0.8Zr (HK31A-T6)
Solution and Precipitation Treated

1. ACKNOWLEDGMENT: A vendor shall mention this specification number in all quotations and when acknowledging purchase orders.

2. APPLICATION: Primarily for parts operating in the range of 350 - 550 F.

3. COMPOSITION:

Thorium	2.5 - 4.0
Zirconium, total	0.50 - 1.0
Zirconium, soluble	0.50 min
Zinc	0.30 max
Copper, if determined	0.10 max
Nickel, if determined	0.01 max
Other Impurities, total	0.20 max
Magnesium	remainder

3.1 Soluble zirconium is that portion of the zirconium which is soluble in 1:4 hydrochloric acid held below its boiling point. Routine determinations for soluble zirconium are not required.

4. CONDITION: Solution and precipitation heat treated.

5. TECHNICAL REQUIREMENTS:

5.1 Casting:

5.1.1 A melt shall be the metal withdrawn from a batch furnace charge of 2000 lb or less as melted for pouring castings or, when permitted by purchaser, a melt shall be 3000 lb or less of metal withdrawn from one continuous furnace in not more than 4 consecutive hours.

5.1.2 The molten metal may be subjected to super heating or other grain refining treatment.

5.2 Test Specimens: Tensile test specimens, and chemical analysis specimens when required, shall be cast with each melt of metal for castings and, when requested, shall be supplied with the castings.

5.2.1 Tensile Test Specimens: Shall be standard (0.5 in. diameter at the reduced parallel section) and shall be cast to size in molds made with the regular foundry mix of green sand, without using chills. Metal for the specimens shall be part of the melt which is used for the castings, and shall be subjected to the same super heating or other grain refining treatment given the metal for castings.

5.2.2 Chemical Analysis Specimens: When required by purchaser, shall be of size and shape agreed upon by purchaser and vendor.

5.3 Heat Treatment: Unless otherwise specified, all castings and tensile test specimens representing them shall be heat treated as follows:

5.3.1 Tensile test specimens from each melt, together with production castings, shall be solution heat treated by heating to 1050 F ± 10, holding at heat for not less than 2 hr, and air cooling, and precipitation heat treated by heating to 400 F ± 10, holding at heat for not less than 16 hr, and air cooling. At least one set of tensile test specimens shall be put into a batch furnace with each load of castings or into a continuous furnace at intervals of not longer than 3 hours.

5.4 Properties: Tensile test specimens and castings heat treated as in 5.3.1 shall conform to the following requirements:

5.4.1 Tensile Properties:

5.4.1.1 Tensile Test Specimens:

Tensile Strength, psi	27,000 min
Yield Strength at 0.2% Offset or at 0.0080 in. in 2 in. Extension Under Load (E = 6,500,000), psi	13,000 min
Elongation, % in 2 in.	4 min

5.4.1.2 Castings: When tensile properties of actual castings are determined for acceptance, not less than 4, and preferably 10, tensile test specimens shall be cut from thick and thin sections. The average value of all specimens selected shall conform to the following:

Tensile Strength, psi	20,000 min
Yield Strength at 0.2% Offset or at 0.0074 in. in 2 in. Extension Under Load (E = 6,500,000), psi	11,000 min
Elongation, % in 4D	2 min

5.4.2 Hardness of Castings: Except at sprues and risers, castings shall have hardness of Brinell 45 - 70 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or Brinell 50 - 75 using 1000 kg load and 10 mm ball.

5.4.3 Stress Rupture Test: Plain tensile test specimens shall be capable of meeting the following requirements:

5.4.3.1 A specimen maintained at 400 F ± 5 under a continuously applied axial stress of 20,000 psi shall not rupture in less than 100 hours.

5.4.3.2. A specimen maintained at 600 F ± 5 under a continuously applied axial stress of 7,000 psi shall not rupture in less than 100 hours.

6. QUALITY:

6.1 Castings shall be uniform in quality and condition, sound, and free from foreign materials and from internal and external imperfections detrimental to fabrication or to performance of parts. Castings shall have smooth surfaces and shall be well cleaned.

6.2 Radiographic and other quality standards shall be as agreed upon by purchaser and vendor.