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

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Revised

MAGNESIUM ALLOY CASTINGS, SAND
3.3Ce - 2.5Zn - 1Zr (EZ32A-T5)
Aged

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

2. APPLICATION: Primarily for parts operating at 300 - 500 F.

3. COMPOSITION:

Cerium (Total Rare Earths)	2.5 - 4.0
Zinc	2.0 - 3.0
Zirconium, total	0.40 - 1.5
Zirconium, soluble	0.40 min
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: Aged.

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5.1.1 A melt shall be the metal withdrawn from a batch furnace charge of 2000 lb or less as melted for pouring castings or, when permitted by purchaser, a melt shall be 3000 lb or less of metal withdrawn from one continuous furnace in not more than 4 consecutive hours.

5.2 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.

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: 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 heated to a temperature not higher than 475 F, unless otherwise specified, for the proper time for aging and cooled in air. At least one set of tensile test specimens shall be put into a batch-type furnace with each load of castings or into a continuous furnace at intervals of not longer than 3 hours.

5.4 Tensile Properties:

5.4.1 Tensile Test Specimens:

Tensile Strength, psi	20,000 min
Yield Strength at 0.2% Offset or at 0.0083 in. in 2 in. Extension Under Load (E = 6,500,000), psi	14,000 min
Elongation, % in 2 in.	2 min

5.4.2 Tensile Properties of Castings: When tensile properties of actual castings are determined for acceptance, not less than 4, and preferable 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	16,000 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 4D	1.0 min

5.4.2.1 The yield strength of any specimen cut from a casting shall conform to the following:

Yield Strength at 0.2% Offset or at 0.0077 in. in 2 in. Extension Under Load (E = 6,500,000), psi	12,000 min

5.4.2.2 Conformance to these requirements may be used as a basis for acceptance of castings.

5.4.3 Tensile Properties at 500 F: Material shall be capable of meeting the following requirements as applicable to the type of specimen tested. Tensile test specimens shall be heated to 500 F + 5, held at 500 F + 5 for 10 min. before testing, and tested at 500 F + 5 at a rate not greater than 0.05 in. per in. per min. up to the yield strength and at a rate of 0.11 - 0.14 in. per in. per min. above the yield strength.

Test Specimen	Tensile Strength psi, min	Yield Strength at 0.2% Offset psi, min
Separately Cast	13,000	8,000
Cut from Casting	10,000	6,000

5.5 Hardness of Castings: Except at sprues and risers, the castings shall have hardness of Brinell 48 - 60 using 500 kg load and 10 mm ball or 1000 kg load and 9/16 in. ball, or Brinell 57 - 72 using 1000 kg load and 10 mm ball.

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.

6.3 Unless otherwise specified, castings shall be produced under radiographic control. This shall consist of radiographic examination of castings until proper foundry technique, which will produce castings free from harmful internal imperfections, is established for each part number, and of production castings as necessary to ensure maintenance of satisfactory quality.

6.4 Castings shall not be repaired by plugging, welding, or other methods, without written permission from purchaser.

6.5 Castings shall not be impregnated, chemically treated, or coated to prevent leaking, unless specified or allowed by written permission which states the method to be used. Impregnated castings shall be marked IMP.

7. REPORTS:

7.1 Unless otherwise specified, the vendor of castings shall furnish with each shipment three copies of a report of the results of tests to determine conformance of the castings to the requirements of this specification. This report shall show the chemical composition of the castings, properties of the tensile test specimens, melt numbers, material specification number, purchase order number, part number, and quantity. If the accuracy of control is adequate each melt need not be analyzed, but the frequency of analysis shall be as agreed upon by purchaser and vendor.

7.2 Unless otherwise specified, the vendor of finished or semi-finished parts shall furnish with each shipment three copies of a report showing the purchase order number, material specification number, contractor or other direct supplier of castings, part number, and quantity. When castings for making parts are produced or purchased by the parts vendor, that vendor shall inspect each shipment or melt of castings to determine conformance to the requirements of this specification, and shall include in the report a statement that the castings conform, or shall include copies of laboratory reports showing the results of tests to determine conformance.