



AEROSPACE MATERIAL SPECIFICATION

AMS4442™**REV. H**

Issued 1956-07
Reaffirmed 2000-09
Revised 2019-01

Superseding AMS4442G

Magnesium Alloy, Sand Castings
3.2 Rare Earths - 2.5Zn - 0.70Zr (EZ33A-T5)
Precipitation Heat Treated

(Composition similar to UNS M12330)

RATIONALE

AMS4442H prohibits unauthorized exceptions (3.8), revises quality (3.7.2.1), reports (4.5.1) and packaging (5.2), and results from a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a magnesium alloy in the form of sand castings.

1.2 Application

These castings have been used typically for parts operating up to 500 °F (260 °C), and having good pressure tightness, but usage is not limited to such applications.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AMS2175	Castings, Classification and Inspection of
AMS2360	Room Temperature Tensile Properties of Castings
AMS2361	Elevated Temperature Tensile Properties of Castings

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Documents
Document Sharing Hub

AMS2475	Protective Treatments, Magnesium Alloys
AMS2694	In-Process Welding of Castings
AMS2750	Pyrometry
AMS2804	Identification, Castings
ARP1917	Clarification of Terms Used in Aerospace Metals Specifications

2.2 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B557	Tension Testing Wrought and Cast Aluminum and Magnesium-Alloy Products
ASTM B660	Packaging/Packing of Aluminum and Magnesium Products
ASTM B953	Sampling Magnesium and Magnesium Alloys for Spectrochemical Analysis
ASTM B954	Analysis of Magnesium and Magnesium Alloys by Atomic Emission Spectrometry
ASTM E10	Brinell Hardness of Metallic Materials
ASTM E21	Elevated Temperature Tension Tests of Metallic Materials
ASTM E155	Reference Radiographs for Inspection of Aluminum and Magnesium Castings
ASTM E1417/E1417M	Liquid Penetrant Testing
ASTM E1742/E1742M	Radiographic Examination

3. TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1, determined by spectrochemical methods in accordance with ASTM B954, or by other analytical methods acceptable to purchaser.

Table 1 - Composition

Element	Min	Max
Total Rare Earths (3.1.1)	2.5	4.0
Zinc	2.0	3.1
Zirconium, total	0.40	1.0
Copper (3.1.2)	--	0.10
Nickel (3.1.2)	--	0.01
Other Elements, each	--	0.10
Other Elements, total	--	0.30
Magnesium	remainder	

3.1.1 Total Rare Earths (TRE) are principally a mixture of Cerium, Lanthanum, Neodymium and Praseodymium. The Cerium content shall not be less than 45% of TRE.

3.1.2 Determination not required for routine acceptance.

3.2 Condition

Precipitation heat treated.

3.3 Casting

Castings shall be produced from metal conforming to 3.1. Furnace or ladle additions of grain-refining elements or alloys shall be added to the melt. Molten metal taken from alloying furnaces, with or without addition of foundry operating scrap (gates, sprues, risers, and rejected castings), shall not be poured into castings unless first converted to ingot, analyzed, and remelted or unless the composition of a sample taken after the last addition to the melt conforms to 3.1.

3.3.1 A melt shall be the metal withdrawn from a batch-furnace charge of 2000 pounds (907 kg) or less as melted for pouring castings or, when permitted by purchaser, a melt shall be 4000 pounds (1814 kg) or less of metal withdrawn from one continuous furnace in not more than eight consecutive hours.

3.3.2 A lot shall be all castings poured from a single melt in not more than eight consecutive hours and precipitation heat treated in the same heat treatment batch.

3.4 Cast Test Specimens

Chemical analysis specimens and tensile specimens shall be cast as follows and, when requested, shall be supplied with the castings:

3.4.1 Chemical Analysis Specimens

Shall be cast from each melt and shall be of any suitable size, shape, and form.

3.4.2 Tensile Specimens

Shall be cast with each lot of castings, shall be of standard proportions conforming to ASTM B557 with 0.500 inch (12.70 mm) diameter at the reduced parallel gage section, and shall be cast to size in molds made with the regular foundry mix of sand without using chills. Metal for the specimens shall be part of the melt that is used for the castings and shall be subjected to the same grain refining or alloying treatment given the metal for casting. The temperature of the metal during pouring of the specimens shall be not lower than that during pouring of the castings.

3.5 Heat Treatment

Castings and representative tensile specimens shall be precipitation heat treated by heating to a temperature not higher than 475 °F (246 °C), except as specified in 3.5.1, holding at the selected temperature within ± 15 °F (± 8 °C) for the proper time for precipitation heat treatment, and cooling in air. At least one set of tensile 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. Pyrometry shall be in accordance with AMS2750.

3.5.1 When specified by purchaser for applications where high-temperature creep properties are not important, castings and representative tensile specimens shall be precipitation heat treated by heating to a temperature not higher than 650 °F (346 °C), holding at the selected temperature within ± 15 °F (± 8 °C) for not longer than 2 hours, and cooling in air.