



AEROSPACE MATERIAL SPECIFICATION

AMS4427™**REV. D**

Issued 1992-07
Reaffirmed 2000-09
Revised 2019-08

Superseding AMS4427C

Magnesium Alloy, Sand Castings
4.0Y - 2.3Nd - 0.7Zr (WE43B - T6)
Solution and Precipitation Heat Treated
(Composition similar to UNS M18432)

RATIONALE

AMS4427D revises heat treatment (3.5), quality (3.7), reports (4.5.1), and packaging (5.2), prohibits unauthorized exceptions (3.8), 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 requiring a combination of light weight, high yield strength up to 570 °F (298 °C), and relatively high corrosion resistance, 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	Casting, Classification and Inspection of
AMS2360	Room Temperature Tensile Properties of Castings
AMS2361	Elevated Temperature Tensile Properties of Castings
AMS2475	Protective Treatments, Magnesium Alloys
AMS2694	In-Process Welding of Castings

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Documents
Document Sharing Hub

AMS2750	Pyrometry
AMS2768	Heat Treatment of Magnesium Alloy Castings
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 B117	Operating Salt Spray (Fog) Apparatus
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

Magnesium alloy castings 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
Yttrium	3.7	4.3
Neodymium	2.0	2.5
Zirconium	0.40	1.0
Other Rare Earths (3.1.1)	--	1.9
Zinc + Silver	--	0.20
Lithium	--	0.2
Manganese	--	0.03
Copper	--	0.02
Iron	--	0.010
Nickel	--	0.005
Other Elements, each (3.1.2)	--	0.01
Magnesium	remainder	

3.1.1 Other Rare Earths shall be principally Heavy Rare Earths (e.g., Gadolinium, Dysprosium, Erbium, Ytterbium) (see 8.2).

3.1.2 Determination not required for routine acceptance.

3.2 Condition

Solution and precipitation heat treated to the T6 temper.

3.3 Casting

Castings shall be produced from metal conforming to 3.1. Metal remelted from previously analyzed ingot may be poured directly into castings. 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 additions 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 solution and precipitation heat treated in the same heat treat batch.

3.4 Cast Test Specimens

Chemical analysis specimens and tensile specimens shall be cast as follows:

3.4.1 Chemical Analysis Specimens

Shall be cast from each melt and shall be of any suitable size, shape, or 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 (12.7 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 which is used for the castings and shall be subjected to the same grain refining or alloying treatment given the metal for the castings. The temperature of the metal during pouring of the specimens shall be not lower than that during pouring of the castings.

3.4.3 Integrally-Cast Coupons for Corrosion Specimens

When salt spray (fog) corrosion properties are to be determined using integrally-cast coupons (see 3.6.3), specimens shall be approximately 3 inches (75 mm) square by 0.25 inch (6.0 mm) thick.

3.4.3.1 One or more integrally-cast coupons should remain on castings where possible until just prior to protective treatment, specified in 5.2. If it is necessary to remove integrally-cast coupons prior to protective treatments (pickle), coupons shall accompany castings through any further processing such as, but not limited to, heat treatment, blasting, and etching.

3.5 Heat Treatment

Castings and representative tensile specimens shall be heat treated in accordance with AMS2768. At least one set of tensile specimens shall, during each stage of heat treatment, be put into a batch-type furnace with each load of castings or into a continuous furnace at intervals of no longer than 3 hours.