AEROSPACE MATERIAL SPECIFICATION

AMS4484™	REV. L

Issued 1944-08
Revised 2013-09
Reaffirmed 2020-10

Superseding AMS4484K

Magnesium Alloy Castings, Permanent Mold
9.0Al - 2.0Zn (AZ92A-T6)
Solution and Precipitation Heat Treated
(Composition similar to UNS M11920)

RATIONALE

AMS4484L revises analysis for composition (3.1), clarifies when chemical analysis specimens are taken (3.4.1), revises Sampling and Testing (4.3.1) and Protective Treatment (5.2) and is a Five Year Review and update of this specification.

1. SCOPE

1.1 Form

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

1.2 Application

These castings have been used typically for parts operating up to 300 °F (149 °C), 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 724-776-4970 (outside USA), www.sae.org.

AMS2175 Castings, Classification and Inspection

AMS2360 Room Temperature Tensile Properties of Castings

AMS2475 Protective Treatments, Magnesium Alloys

AMS2694 In Process Welding of Castings

TO PLACE A DOCUMENT ORDER: **Tel: 877-606-7323 (inside USA and Canada)**
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
SAE WEB ADDRESS: **http://www.sae.org**

For more information on this standard, visit
https://www.sae.org/standards/content/AMS4484L

AMS2768 Heat Treatment of Magnesium Alloy Casting

AMS2804 Identification, Castings

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 B 557 Tension Testing Wrought and Cast Aluminum and Magnesium-Alloy Products

ASTM B 660 Packaging/Packing of Aluminum and Magnesium Products

ASTM B 953 Sampling Magnesium and Magnesium Alloys for Spectrochemical Analysis

ASTM B 954 Analysis of Magnesium and Magnesium Alloys by Atomic Emission Spectrometry

ASTM E 1417/ E 1417M Liquid Penetrant Testing

ASTM E 1742/ E 1742M 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 B 954, or by other analytical methods acceptable to purchaser.

TABLE 1 - COMPOSITION

Element	min	max
Aluminum	8.3	9.7
Zinc	1.6	2.4
Manganese	0.10	--
Silicon	--	0.30
Copper	--	0.10
Nickel	--	0.01
Other Elements, each (3.1.1)	--	0.10
Other Elements, total (3.1.1)	--	0.30
Magnesium	remainder	

3.1.1 Determination not required for routine acceptance.

3.2 Condition

Solution and 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 are permissible. 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, solution 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 required, shall be supplied with the castings:

3.4.1 Chemical Analysis Specimens

Shall be cast from each melt after the last melt addition and shall be tested to qualify the melt lot as in 3.1.

3.4.2 Tensile Specimens

Shall be cast with each lot of castings, shall be of standard proportions conforming to ASTM B 557 with 0.500 inch (12.70 mm) diameter at the reduced parallel gage section, and shall be cast to size in permanent molds. 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 separately-cast tensile specimens shall be solution and precipitation 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 not longer than three hours.

3.6 Properties

Castings and separately-cast tensile specimens produced in accordance with 3.4.2 shall conform to the following requirements:

3.6.1 Tensile Properties

Shall be as follows, determined in accordance with ASTM B 557; conformance to the requirements of 3.6.1.1 shall be used as basis for acceptance of castings except when purchaser specifies that the requirements of 3.6.1.2 apply.

3.6.1.1 Separately-Cast Specimens

Shall meet the requirements shown in Table 2.

TABLE 2 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	34.0 ksi (234 MPa)
Yield Strength at 0.2% Offset	18.0 ksi (124 MPa)
Elongation in 2 inches or 4D	1.0%

3.6.1.2 Specimens Cut from Castings or from Integrally-Cast Coupons

Specimens as in 4.3.4 shall meet the requirements of Table 3.

TABLE 3 - MINIMUM TENSILE PROPERTIES

Property	Value
Tensile Strength	17.0 ksi (117 MPa)
Yield Strength at 0.2% Offset	13.5 ksi (93 MPa)

3.6.1.3 When properties other than those specified in Table 3 are required, tensile specimens as in 4.3.4 taken from locations indicated on the drawing, from a casting or castings chosen at random to represent the lot, shall have the properties indicated on the drawing for such specimens. Property requirements for such specimens may be designated in accordance with AMS2360.

3.7 Quality

3.7.1 Castings, 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 castings.

3.7.1.1 Castings shall have smooth surfaces and shall be sufficiently cleaned to permit fluorescent penetrant inspection.

3.7.1.2 Castings cleaned by blasting shall be pickled in a sulfuric or sulfuric-nitric acid solution to remove not less than 0.002 inch (0.05 mm) of metal prior to protective treatment as in 5.2.

3.7.2 Castings shall be produced under radiographic control. This control shall consist of radiographic examination of castings in accordance with ASTM E 1742/E 1742M, or other radiographic procedure acceptable to purchaser, 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.

3.7.3 When specified, castings shall be subjected to fluorescent penetrant inspection in accordance with ASTM E 1417/E 1417M.

3.7.4 Fluorescent penetrant and other quality standards shall be as established by purchaser. Unless otherwise specified, radiographic acceptance standards shall meet the requirements of AMS2175, Grade D.

3.7.5 Castings shall not be peened, plugged, impregnated, or welded unless authorized by the purchaser.

3.7.5.1 When authorized by purchaser, welding in accordance with AMS2694 or other welding program approved by the purchaser may be used.

3.7.6 Castings shall not be impregnated, chemically treated, or coated to prevent leakage unless specified or allowed by written permission of purchaser designating the method to be used.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

The vendor of castings shall supply all samples for vendor's tests and shall be responsible for the performance of all required tests. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the castings conform to specified requirements.

4.2 Classification of Tests

4.2.1 Acceptance Tests

Except as specified in 4.2.1.1, tests for composition (3.1), tensile properties (3.6.1), and quality (3.7) are acceptance tests and shall be performed to represent each melt or lot as applicable.

4.2.1.1 Tensile properties of specimens cut from castings or from integrally-cast coupons shall be determined only when specified by purchaser or when separately-cast specimens are not available. Tensile properties of separately-cast specimens need not be determined when tensile properties of specimens cut from castings or from integrally-cast coupons are determined.

4.2.2 Preproduction Tests

4.2.3 Tests for all technical requirements are preproduction tests and shall be performed prior to or on the first-article shipment of a casting to a purchaser, when a change in material and/or processing requires reapproval as in 4.4.2, and when purchaser deems confirmatory testing to be required.

4.3 Sampling and Testing

Shall be in accordance with the following:

4.3.1 At least one chemical analysis specimen in accordance with 3.4.1 and ASTM B 953 from each melt for conformance to 3.1.

4.3.2 One or more separately-cast tensile specimen in accordance with 3.4.2 representing each lot, except when properties of specimens cut from castings or from integrally cast coupons are required.

4.3.3 Two preproduction castings in accordance with 4.4.1 of each part number.

4.3.4 Except as permitted by 4.3.4.1, one or more castings from each lot when properties of specimens machined from castings are required. Specimens shall conform to ASTM B 557 and shall be either 0.500 inch (12.70 mm) diameter at the reduced parallel gage section, subsize specimens proportional to the standard, or standard sheet-type specimens. For determining conformance to the requirements of 3.6.1.2, if specimen locations are not shown on the drawing, not less than two tensile specimens, one from the thickest section and one from the thinnest section, shall be cut from a casting or castings from each lot.

4.3.4.1 When permitted by purchaser, tensile specimens conforming to ASTM B 557, excised from integrally cast coupons may be used in lieu of separately-cast specimens (4.3.2) or specimens cut from a casting or castings (4.3.4). Size, number, and location of integrally cast coupons shall be as specified by purchaser.

4.4 Approval

4.4.1 Sample castings from new or reworked molds and the casting procedure shall be approved by purchaser before castings for production use are supplied, unless such approval is waived by purchaser.

4.4.2 Vendor shall establish, for production of sample castings of each part number, parameters for the process control factors that will produce acceptable castings; these shall constitute the approved casting procedure and shall be used for producing production castings. If necessary to make any change in parameters for the process control factors, vendor shall submit for reapproval a statement of the proposed changes in processing and, when requested, test specimens, sample castings, or both. Production castings incorporating the revised operations shall not be shipped prior to receipt of reapproval.

4.4.2.1 Process control factors for producing castings include, but are not limited to, the following:

Type of furnace
Furnace atmosphere
Ladle addition or grain refining practice
Fluxing or oxide removal procedure
Gating and risering practices
Metal pouring temperature; variation of ±50 °F (±28 °C) from established limit is permissible
Solidification and cooling procedures
Solution and precipitation heat treatment cycles
Cleaning operations
Methods of inspection

4.4.2.1.1 Any of the above process control factors for which parameters are considered proprietary by the vendor may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation.