SAE Aerospace
An SAE International Group

AEROSPACE MATERIAL SPECIFICATION

SAE AMS 4490H

Issued JAN 1940
Revised AUG 2005

Superseding AMS 4490G

Magnesium Alloy Castings, Die
9.0Al - 0.70Zn (AZ91D, Temper F)
As Cast

(Composition similar to UNS M11916)

1. SCOPE:

1.1 Form:

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

1.2 Application:

These castings have been used typically for applications where light weight, near netshape components are desired without a need for high strength, or soundness, 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, 400 Commonwealth Drive, Warrendale, PA 15096-0001 or www.sae.org.

AMS 2475	Protective Treatments, Magnesium Alloys
AMS 2694	Repair Welding of Aerospace Castings
AMS 2804	Identification, Castings

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

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2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 or 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 E 10	Brinell Hardness of Metallic Materials
ASTM E 21	Elevated Temperature Tension Tests of Metallic Materials
ASTM E 35	Chemical Analysis of Magnesium and Magnesium Alloys
ASTM E 505	Reference Radiographs for Inspection of Aluminum and Magnesium Die Castings
ASTM E 1417	Fluorescent Penetrant Inspection
ASTM E 1742	Radiograph Inspection

3. TECHNICAL REQUIREMENTS:

3.1 Composition:

Shall conform to the percentages by weight shown in Table 1, determined by wet chemical methods in accordance with ASTM E 35, by spectrochemical methods, or by other analytical methods acceptable to purchaser:

TABLE 1 - Composition

Element	min	max
Aluminum	8.3	9.7
Manganese (3.1.1)	0.15	0.50
Zinc	0.35	1.0
Silicon	--	0.10
Copper	--	0.030
Nickel	--	0.002
Iron (3.1.2)	--	0.005
Other Elements, each	--	0.02
Other Elements, total	--	0.30
Magnesium	remainder	

3.1.1 Manganese may be less than 0.15 if the iron to manganese ratio does not exceed 0.032.

3.1.2 Iron may exceed 0.005 if the iron to manganese ratio does not exceed 0.032.

3.2 Condition:

As cast.

3.3 Casting:

Castings shall be produced in lots 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 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.

3.4 Chemical Analysis Specimens:

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

3.5 Quality:

3.5.1 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.

3.5.1.1 Castings shall have smooth surfaces and shall be well cleaned.

3.5.2 When specified, castings shall be produced under radiographic control. This control shall consist of radiographic examination of castings in accordance with ASTM E 1742 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.

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

3.5.4 Radiographic, fluorescent penetrant, contrast dye penetrant, and other quality standards shall be as agreed upon by purchaser and vendor. ASTM E 505 may be used to define radiographic acceptance standards.

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

3.5.5.1 When authorized by purchaser, welding in accordance with AMS 2694 or other welding program approved by purchaser may be used.

3.5.5.2 Chemical treatment, coating, or other process to prevent leakage shall be performed as specified by drawing or as authorized by purchaser.

3.5.6 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 the specified requirements.

4.2 Classification of Tests:

All technical requirements of this specification are acceptance tests and as preproduction tests and shall be performed prior to or on the first-article shipment of a casting to a purchaser, on each lot, 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:

Shall be in accordance with the following:

4.3.1 At least one chemical analysis specimen in accordance with 3.4 from each melt or a casting from each lot.

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

4.4 Approval:

4.4.1 Sample castings from new or reworked patterns and the casting procedure shall be approved by purchaser before castings for production use are supplied, unless such approval be 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. Vendor shall also establish control factors for producing separately cast tensile specimens, but these control factors need not be identical to those used for production of 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 Control factors for producing castings include, but are not limited to, the following:

Type of furnace
Furnace atmosphere
Alloy additions, fluxing, deoxidation, and gas removal procedures
Location and number of gates
Location and number of knockout pins
Mold temperature and tolerances
Injection pressure and tolerances
Metal injection temperature; variation of ±50 °F (±28 °C) from the established limit is permissible
Solidification and cooling procedures
Straightening procedure, when applicable
Cleaning operations
Methods of inspection
Radiographic sampling plan, if used

4.4.2.1.1 Any of the 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.

4.4.2.1.2 Detail of the process control shall be available for purchaser's review/audit at the foundry facility.

4.5 Reports:

The vendor of castings shall furnish with each shipment a report showing the results of tests for composition of at least one casting or of separately-cast specimens from each melt and stating that the castings conform to the other technical requirements of this specification. This report shall include the purchase order number, lot number, AMS 4490H, part number, and quantity.