The Engineering Society For Advancing Mobility Land Sea Air and Space®
INTERNATIONAL

AEROSPACE MATERIAL SPECIFICATION

Submitted for recognition as an American National Standard

REAFFIRMED
APR 94

AMS 4240F

Issued 11-1-41
Revised 10-1-89

Superseding AMS 4240E

CASTINGS, SAND
10Mg
Solution Heat Treated & Naturally Aged

This specification has been declared "NONCURRENT" by the Aerospace Materials Division, SAE, as of April 1989. It is recommended that this specification not be specified for new designs.

This cover sheet should be attached to the "E" Revision of the subject specification.

Noncurrent refers to those materials which have previously been widely used and which may be required on some existing designs in the future. The Aerospace Materials Division does not recommend these as standard materials for future use in new designs. Each of these "Noncurrent" specifications is available on request.

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This specification is under the jurisdiction of the AMS Committee "D".

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INTERNATIONAL

AEROSPACE MATERIAL SPECIFICATION

AMS 4240E
Superseding AMS 4240D

Issued 11-1-41
Revised 7-1-82

UNS A05200

ALUMINUM ALLOY CASTINGS, SAND
10Mg (520.0-T4)
Solution Heat Treated and Naturally Aged

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1. SCOPE:

1.1 Form: This specification covers an aluminum alloy in the form of sand castings.

1.2 Application: Primarily for components requiring a combination of maximum strength, elongation, and resistance to shock and where optimum resistance to stress-corrosion cracking is not required. Special foundry practices are necessary.

2. APPLICABLE DOCUMENTS: The following publications form a part of this specification to the extent specified herein. The latest issue of Aerospace Material Specifications (AMS) shall apply. The applicable issue of other documents shall be as specified in AMS 2350.

2.1 SAE Publications: Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096.

2.1.1 Aerospace Material Specifications:

AMS 2350 - Standards and Test Methods
AMS 2360 - Room Temperature Tensile Properties of Castings
AMS 2635 - Radiographic Inspection
AMS 2645 - Fluorescent Penetrant Inspection
AMS 2646 - Contrast Dye Penetrant Inspection
AMS 2694 - Repair Welding of Aerospace Castings
AMS 2804 - Identification, Castings

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2.2 ASTM Publications: Available from American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

ASTM B557 - Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products
ASTM E34 - Chemical Analysis of Aluminum and Aluminum Alloys
ASTM E155 - Reference Radiographs for Inspection of Aluminum and Magnesium Castings, Series III

2.3 U.S. Government Publications: Available from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

2.3.1 Federal Standards:

Federal Test Method Standard No. 151 - Metals; Test Methods

2.3.2 Military Specifications:

MIL-H-6088 - Heat Treatment of Aluminum Alloys

2.3.3 Military Standards:

MIL-STD-649 - Aluminum and Magnesium Products, Preparation for Shipment and Storage

3. TECHNICAL REQUIREMENTS:

3.1 Composition: Shall conform to the following percentages by weight, determined by wet chemical methods in accordance with ASTM E34, by spectrographic methods in accordance with Federal Test Method Standard No. 151, or by other analytical methods approved by purchaser:

	min	max
Magnesium	9.5	10.6
Iron	--	0.30
Titanium	--	0.25
Copper	--	0.25
Silicon	--	0.25
Manganese	--	0.15
Zinc	--	0.15
Other Impurities, each	--	0.05
Other Impurities, total	--	0.15
Aluminum	remainder	

3.2 Condition: Solution heat treated and naturally aged.
Ø

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3.3 Castings: 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. Unless otherwise agreed upon by purchaser and vendor, 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 has been found to conform to 3.1.

3.3.1 A melt shall be the metal withdrawn from a batch-furnace charge of 2000 lb (900 kg) or less as melted for pouring castings, or, when permitted by purchaser, a melt shall be 4000 lb (1800 kg) or less of metal withdrawn from one continuous furnace in not more than 8 consecutive hours.

3.3.2 A lot shall be all castings poured from a single melt in not more than 8 consecutive hours.

3.4 Cast Test Specimens: Chemical analysis specimens and tensile test 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 a size and shape agreed upon by purchaser and vendor.

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 in. (12.50 mm) diameter at the reduced parallel gage section, and shall be cast to size in molds made of the regular foundry mix of green sand without using chills. Metal for the specimens shall be part of the melt which is used Ø for the castings. If the metal for castings is given any treatment, such as fluxing or cooling and reheating, the metal for the specimens shall be a portion of the metal so treated and, during such treatment, shall be heated to the same maximum temperature and held for approximately the same time as the molten 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.

3.5 Heat Treatment: All castings and representative tensile specimens shall be solution heat treated and naturally aged in accordance with Ø MIL-H-6088; at least one set of 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.

3.6 Properties: Castings and representative tensile specimens produced in accordance with 3.4.2 shall conform to the following requirements:

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3.6.1 Tensile Properties: Shall be as follows, determined in accordance with Ø ASTM B557; conformance to the requirements of 3.6.1.1 shall be used as the 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:

Tensile Strength, min	42,000 psi (290 MPa)
Yield Strength at 0.2% Offset, min	22,000 psi (150 MPa)
Elongation in 4D, min	12%

3.6.1.2 Specimens Cut From Castings:

3.6.1.2.1 When tensile properties of actual castings are determined for acceptance, the average of not less than four, and preferably 10, specimens cut from thick and thin sections shall be as follows:

Tensile Strength, min	31,500 psi (215 MPa)
Yield Strength at 0.2% Offset, min	16,500 psi (115 MPa)
Elongation in 4D, min	3%

3.6.1.2.2 When properties other than those of 3.6.1.2.1 are required, tensile specimens as in 4.3.4 taken in locations indicated on the drawing, Ø from a casting chosen at random to represent the lot, shall have the properties indicated on the drawing for such specimens. Property requirements may be designated in accordance with AMS 2360.

3.7 Quality:

3.7.1 Castings, as received by purchaser, shall be uniform in quality and Ø condition, sound, and free from foreign materials and from internal and external imperfections detrimental to usage of the castings.

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

3.7.2 Castings shall be produced under radiographic control, unless otherwise specified. This control shall consist of radiographic examination of Ø castings in accordance with AMS 2635 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 Ø inspection in accordance with AMS 2645 or to contrast dye penetrant inspection in accordance with AMS 2646.

3.7.4 Radiographic, fluorescent penetrant, contrast dye penetrant, and other Ø quality standards shall be as agreed upon by purchaser and vendor. ASTM E155 may be used to define radiographic acceptance standards.

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

3.7.5.1 When permitted in writing by purchaser, defects in castings may be removed and the castings repaired by welding in accordance with AMS 2694.

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 performing all Ø required tests. Results of such tests shall be reported to the purchaser as required by 4.5. Purchaser reserves the right to sample and to perform any confirmatory testing deemed necessary to ensure that the castings conform to the requirements of this specification.

4.2 Classification of Tests:

4.2.1 Acceptance Tests: Tests to determine conformance to requirements for composition (3.1), tensile properties of separately-cast specimens (3.6.1.1), and quality (3.7) are classified as 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 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 are determined.

4.2.2 Preproduction Tests: Tests to determine conformance to all technical requirements of this specification are classified as preproduction tests and shall be performed 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.

4.2.2.1 For direct U.S. Military procurement, substantiating test data and, when requested, preproduction test material shall be submitted to the cognizant agency as directed by the procuring activity, the contracting officer, or the request for procurement.

4.3 Sampling: Shall be in accordance with the following:

4.3.1 Two chemical analysis specimens in accordance with 3.4.1 from each melt and/or a casting from each lot.

4.3.2 Three tensile specimens in accordance with 3.4.2 from each lot.

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

4.3.4 One or more castings from each lot when properties are required from specimens machined from castings. Specimens shall conform to ASTM B557 and shall be either 0.500 in. (12.50 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 3.6.1.2.2, if specimen locations are not shown on the drawing, not less than four tensile specimens, two from the thickest section and two from the thinnest section, shall be cut from a casting or castings from each lot.

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 control factors of processing which 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 control factors of processing, vendor shall submit for reapproval a statement of the proposed changes in processing and, when requested, sample test specimens, 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
Fluxing or oxide removal procedures
Gating and risering practices
Pouring temperature (variation of ±50°F (±30°C) from the established limit is permissible)
Solidification and cooling procedures
Solution heat treatment cycle
Cleaning operations
Methods of inspection

4.4.2.1.1 Parameters for any of the above control factors of processing considered proprietary by the vendor may be assigned a code designation. Each variation in such parameters shall be assigned a modified code designation.

4.5 Reports:

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