



Designation: B 199 – 99

Standard Specification for Magnesium-Alloy Permanent Mold Castings¹

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1. Scope

1.1 This specification covers magnesium alloy permanent mold casting alloys designated as shown in Table 1.

1.2 The values stated in inch-pound units are to be regarded as the standard. The SI values given in parentheses are provided for information only.

2. Referenced Documents

2.1 The following documents of the issue in effect on date of order acceptance form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:

B 275 Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought²

B 296 Practice for Temper Designations of Magnesium Alloys, Cast and Wrought²

B 557 Test Methods of Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products²

B 660 Practices for Packaging/Packing of Aluminum and Magnesium Products²

B 661 Practice for Heat Treatment of Magnesium Alloys²

E 8 Test Methods of Tension Testing of Metallic Materials³

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specification⁴

E 35 Test Methods for Chemical Analysis of Magnesium and Magnesium Alloys⁵

E 88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition⁵

E 94 Guide for Radiographic Testing⁶

E 155 Reference Radiographs for Inspection of Aluminum and Magnesium Castings⁶

E 165 Test Methods for Liquid Penetrant Examination⁶

E 527 Practice for Numbering Metals and Alloys (UNS)⁷

2.3 Federal Standards:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁸

2.4 Military Specification:

MIL-M-6857 Heat Treatment of Magnesium Alloy Castings⁸

3. Terminology

3.1 Definitions:

3.1.1 *permanent mold casting*—a metal object produced by introducing molten metal by gravity or low pressure into a mold constructed of durable material, usually iron or steel, and allowing it to solidify.

3.1.2 *semipermanent mold casting*—a permanent mold casting which is made using an expendable core such as bonded sand.

4. Ordering Information

4.1 Orders for castings under this specification shall include the following information:

4.1.1 Quantity of each casting,

4.1.2 Alloy (Section 7 and Table 1),

4.1.3 Temper (Section 8 and Table 2),

4.1.4 Minimum properties of specimens cut from castings, if required (see section 9.3),

4.1.5 Drawing showing dimensions of the castings (the amount of stock left for machine finish should be indicated),

4.1.6 Surface treatment (see 10.1),

4.1.7 Whether inspection is required at the manufacturer's works (see section 11.1.1),

4.1.8 Special inspection requirements (see 11.2),

4.1.9 Whether certification is required (see 13.1), and

4.1.10 Whether marking for identification is required (see 14.1).

5. Manufacture

5.1 The responsibility of furnishing castings that can be laid out and machined to the finished dimensions within the permissible variations specified, as shown on the blueprints or drawings, shall rest with the supplier, except when molds are furnished by the purchaser. Sufficient stock shall be allowed for shrinkage, and where requested, for finishing; castings of excessive weight shall not be furnished.

¹ This specification is under the jurisdiction of ASTM Committee B-7 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.04 on Magnesium Alloy Cast and Wrought Products.

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² *Annual Book of ASTM Standards*, Vol 02.02.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ *Annual Book of ASTM Standards*, Vol 03.05.

⁶ *Annual Book of ASTM Standards*, Vol 03.03.

⁷ *Annual Book of ASTM Standards*, Vol 01.01.

⁸ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

TABLE 1 Chemical Composition Limits^A

NOTE 1—Analysis shall regularly be made only for the elements specifically mentioned in this table. If, however, the presence of other elements is suspected or indicated in amounts greater than the specified limits, further analysis shall be made to determine that these elements are not present in excess of the specified limits.

NOTE 2—The following applies to all specified limits in this table: For purposes of acceptance and rejection, an observed value or a calculated value obtained from analysis shall be rounded to the nearest unit in the last right-hand place of figures used in expressing the specified limit.

ASTM	UNS	Iron	Magnesium	Aluminum	Manganese	Zinc	Rare Earths	Zirconium	Silicon	Copper	Nickel	Composition, %	
												Alloy Number ^B	Total ^C Other Impuri- ties
AM100A	M10100	...	remainder	9.3 to 10.7	0.10–0.35	0.30	...	...	0.30	0.10	0.01	0.30	...
AZ81A	M11810	...	remainder	7.0 to 8.1	0.13–0.35	0.40 to 1.0	...	...	0.30	0.10	0.01	0.30	...
AZ91C	M11914	...	remainder	8.1 to 9.3	0.13–0.35	0.40 to 1.0	...	...	0.30	0.10	0.01	0.30	...
AZ91E	M11919	0.005 ^D	remainder	8.1 to 9.3	0.17–0.35	0.40 to 1.0	...	...	0.20	0.015	0.0010	0.30	0.01
AZ92A	M11920	...	remainder	8.3 to 9.7	0.10–0.35	1.6 to 2.4	...	...	0.30	0.25	0.01	0.30	...
EQ21A ^E	M18330	...	remainder	...	...	...	1.5 to 3.0 ^F	0.40 to 1.0	...	0.05–0.10	0.01	0.30	...
EZ33A	M12330	...	remainder	...	...	2.0 to 3.1	2.5 to 4.0	0.50 to 1.0	...	0.10	0.01	0.30	...
QE22A ^G	M18220 ^F	...	remainder	...	...	...	1.8 to 2.5 ^F	0.40 to 1.0	...	0.10	0.01	0.30	...

^A Limits are in weight percent max unless shown as a range or stated otherwise.

^B ASTM alloy designations were established in accordance with Practice B 275. UNS designations were established in accordance with Practice E 527.

^C Includes listed elements for which no specific limit is shown.

^D If iron exceeds 0.005 %, the iron to manganese ratio shall not exceed 0.032.

^E Silver content for Alloy EQ21A (M18330) shall be 1.3 to 1.7 %.

^F Rare earth elements are in the form of didymium.

^G Silver content for Alloy QE22A (M18220) shall be 2.0 to 3.0, inclusive.