



Designation: B80 – 23

Standard Specification for Magnesium-Alloy Sand Castings¹

This standard is issued under the fixed designation B80; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers magnesium-alloy sand castings 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 in parentheses are provided for information only.

1.3 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

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:²

[B93/B93M](#) Specification for Magnesium Alloys in Ingot Form for Sand Castings, Permanent Mold Castings, and Die Castings

[B296](#) Practice for Temper Designations of Magnesium Alloys, Cast and Wrought

[B557](#) Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products

[B660](#) Practices for Packaging/Packing of Aluminum and Magnesium Products

[B661](#) Practice for Heat Treatment of Magnesium Alloys

[B951](#) Practice for Codification of Unalloyed Magnesium and Magnesium-Alloys, Cast and Wrought

[E29](#) Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

[E35](#) Test Methods for Chemical Analysis of Magnesium and Magnesium Alloys (Withdrawn 2008)³

[E88](#) Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

[E94](#) Guide for Radiographic Examination Using Industrial Radiographic Film

[E155](#) Reference Radiographs for Inspection of Aluminum and Magnesium Castings

[E165](#) Practice for Liquid Penetrant Testing for General Industry

[E527](#) Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

[E716](#) Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spark Atomic Emission Spectrometry

2.3 Federal Standards:⁴

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

Fed. Std. No. 184 Identification Marking of Aluminum, Magnesium and Titanium

2.4 Military Standards:⁴

MIL-STD-129 Marking for Shipment and Storage (Military Agencies)

MIL-STD-276 Impregnation of Porous Non-ferrous Metal Castings

MIL-I-13857 Impregnation of Metal Castings

MIL-M-46062 Magnesium Alloy Castings, High Strength

MIL-M-6857 Heat Treatment of Magnesium Alloy Castings

2.5 ANSI Standard:⁵

ANSI Z1.4 Sampling Procedures and Tables for Inspection by Attributes

¹ This specification is under the jurisdiction of ASTM Committee B07 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 For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

⁵ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

TABLE 1 Chemical Requirements^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.

Alloy Number ^B		Chemical Composition Limits for Registered Magnesium Alloys																
ASTM	UNS	Magne- sium	Alu- minum	Copper	Gado- linium	Iron	Lithium	Man- ganese	Neo- dymium	Nickel	Rare Earths	Silicon	Silver	Yttrium	Zinc	Zirconium	Others (Metallic Impurities) Each	Total ^C Impu- rities
AM100A	M10100	remainder	9.3–10.7	0.10	...	...	...	0.10–0.35	...	0.01	...	0.30	...	...	0.30	...	...	0.30
AZ63A	M11630	remainder	5.3–6.7	0.25	...	...	...	0.15–0.35	...	0.01	...	0.30	...	...	2.5–3.5	...	...	0.30
AZ81A	M11810	remainder	7.0–8.1	0.10	...	...	...	0.13–0.35	...	0.01	...	0.30	...	...	0.40–1.0	...	...	0.30
AZ91C	M11914	remainder	8.1–9.3	0.10	...	...	...	0.13–0.35	...	0.01	...	0.30	...	...	0.40–1.0	...	...	0.30
AZ91E	M11919	remainder	8.1–9.3	0.015	...	0.005 ^D	...	0.17–0.35	...	0.0010	...	0.20	...	...	0.40–1.0	...	0.01	0.30
AZ92A	M11920	remainder	8.3–9.7	0.25	...	...	...	0.10–0.35	...	0.01	...	0.30	...	...	1.6–2.4	...	...	0.30
EQ21A	M18330	remainder	...	0.05–0.10	...	...	...	...	...	0.01	1.5–3.0 ^E	...	1.3–1.7	...	...	0.40–1.0	...	0.30
EV31A ^F	M12310	remainder	...	0.01	1.0–1.7	0.010	...	...	2.6–3.1	0.0020	0.4 ^G	...	0.05	...	0.20–0.50	0.40–1.0	0.01	...
EZ33A	M12330	remainder	...	0.10	...	...	...	...	...	0.01	2.5–4.0 ^H	...	...	...	2.0–3.1	0.50–1.0	...	0.30
K1A	M18010	remainder	...	...	...	...	...	...	...	...	...	...	...	...	...	0.40–1.0	...	0.30
QE22A	M18220	remainder	...	0.10	...	...	...	...	...	0.01	1.8–2.5 ^E	...	2.0–3.0	...	...	0.40–1.0	...	0.30
WE43A	M18430	remainder	...	0.03	...	0.01	0.2	0.15	2.0–2.5	0.005	1.9 ^I	0.01	...	...	...	0.40–1.0	0.2	...
WE43B	M18432	remainder	...	0.02	...	0.010	0.2	0.03	2.0–2.5	0.005	1.9 ^I	...	J	3.7–4.3	J	0.40–1.0	0.01	...
WE54A	M18410	remainder	...	0.03	...	...	0.2	0.03	1.5–2.0	0.005	2.0 ^I	0.01	...	4.75–5.5	0.20	0.40–1.0	0.20	...
ZC63A	M16331	remainder	...	2.4–3.0	...	...	...	0.25–0.75	...	0.01	...	0.20	...	...	5.5–6.5	...	...	0.30
ZE41A	M16410	remainder	...	0.10	...	...	...	0.15	...	0.01	0.75–1.75 ^H	...	...	...	3.5–5.0	0.40–1.0	...	0.30
ZK51A	M16510	remainder	...	0.10	...	...	...	...	...	0.01	...	...	...	...	3.6–5.5	0.50–1.0	...	0.30
ZK61A	M16610	remainder	...	0.10	...	...	...	...	...	0.01	...	...	...	...	5.5–6.5	0.6–1.0	...	0.30

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

^B ASTM alloy designations were established in accordance with Practice B951. UNS designations were established in accordance with Practice E527.

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

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

^E Rare earth elements are in the form of Didymium, with not less than 70 % Neodymium, and the remainder substantially Praseodymium.

^F Alloy EV31A is a patented composition, suitable for elevated temperature applications. Interested parties are invited to submit information regarding the identification of alternatives to these compositions to ASTM International. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this specification. Users of this specification are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

^G Other Rare Earths may also be present to a total maximum of 0.4 %. These Rare Earths shall principally be Cerium, Lanthanum, and Praseodymium.

^H Total Rare Earths (TRE) are principally a mixture of Cerium, Lanthanum, Neodymium and Praseodymium. The Cerium content should not be less than 45% of TRE.

^I Other Rare Earths shall be principally heavy rare earths, such as, Gadolinium, Dysprosium, Erbium, and Ytterbium. Other Rare Earths are derived from the Yttrium, typically 80 % Yttrium, and 20 % heavy rare earths.

^J Zinc + Silver shall not exceed 0.20 % in WE43B.