



## Designation: B951—10 Designation: B951 — 11

# Standard Practice for Codification of Unalloyed Magnesium and Magnesium- Alloys, Cast and Wrought<sup>1</sup>

This standard is issued under the fixed designation B951; 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 reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

~~Note—Table 2 and section 4.2 were corrected editorially and the year date changed on Jan. 29, 2010.~~

### 1. Scope<sup>#</sup>

- 1.1 This practice provides a system for designating unalloyed magnesium and magnesium-alloys that have been used commercially since 1952, and thus is intended to be the registration source for unalloyed magnesium and magnesium-alloys. A record of designations along with the established compositions is given in Table 2.
- 1.2 The equivalent Unified Numbering System (UNS) alloy designations shown in the appendixes are in accordance with Practice E527.

### 2. Referenced Documents

- 2.1 The following documents form a part of this practice to the extent referenced herein:
  - 2.2 *ASTM Standards*:<sup>2</sup>
    - B80 Specification for Magnesium-Alloy Sand Castings
    - B90/B90M Specification for Magnesium-Alloy Sheet and Plate
    - B91 Specification for Magnesium-Alloy Forgings
    - B92/B92M Specification for Unalloyed Magnesium Ingot and Stick For Remelting
    - B93/B93M Specification for Magnesium Alloys in Ingot Form for Sand Castings, Permanent Mold Castings, and Die Castings
    - B94 Specification for Magnesium-Alloy Die Castings
    - B107/B107M Specification for Magnesium-Alloy Extruded Bars, Rods, Profiles, Tubes, and Wire
    - B199 Specification for Magnesium-Alloy Permanent Mold Castings
    - B403 Specification for Magnesium-Alloy Investment Castings
    - B843 Specification for Magnesium Alloy Anodes for Cathodic Protection
    - E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)(UNS)(UNS)

### 3. Basis of Codification

- 3.1 The designations for alloys and unalloyed metals are based on their chemical composition limits.

NOTE 1—For unalloyed magnesium, magnesium-alloys, cast and wrought, standard limits for alloying elements and impurities are expressed to the following places:

Less than 0.0001 % (used only for magnesium alloys)	0.0000X
0.0001 to 0.001 %	0.000X
0.001 to 0.01 %	0.00X
0.01 to 0.10 %	0.0XX
Unalloyed aluminum made by a refining process	0.0X
Alloys and unalloyed aluminum or magnesium not made by a refining process	0.XX
0.10 through 0.55 %	0.XX
Over 0.55 %	0.XX.XXX

- 3.2 Designations shall be assigned, revised, and cancelled by Subcommittee B07.04 of ASTM Committee B07 on Light Metals and Alloys on written requests to its chairman. Complete chemical composition limits shall be submitted with request for assignment or revision of designations. Arbitrary assignments by other subcommittees or committees will not be recognized.

<sup>1</sup> This practice 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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<sup>2</sup> 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.

\*A Summary of Changes section appears at the end of this standard.

#### 4. Alloys

4.1 Designation for alloys shall consist of not more than two letters representing the alloying elements (Note 2) specified in the greatest amount, arranged in order of decreasing percentages, or in alphabetical order if of equal percentages, followed by the respective percentages rounded off to whole numbers and a serial letter (Note 3). The full name of the base metal precedes the designation, but it is omitted for brevity when the base metal being referred to is obvious.

NOTE 2—For codification, an alloying element is defined as an element (other than the base metal) having a minimum content greater than zero either directly specified or computed in accordance with the percentages specified.

NOTE 3—The serial letter is arbitrarily assigned in alphabetical sequence starting with “A” (omitting “I” and “O”) and serves to differentiate otherwise identical designations. A serial letter is necessary to complete each designation.

4.2 The letters used to represent the two greatest amounts of the alloying elements shall be those in Table 1.

4.3 In rounding percentages, the nearest whole number shall be used. If two choices are possible as when the decimal is followed by a 5 only, or a 5 followed only by zeros, the nearest even whole number shall be used.

4.4 When a range is specified for the alloying element, the rounded mean shall be used in the designation.

4.5 When only a minimum percentage is specified for the alloying element, the rounded minimum percentage shall be used in the designation.

#### 5. Unalloyed Metals

5.1 Designations for unalloyed metals consist of the specified minimum purity, all digits retained but dropping the decimal point, followed by a serial letter (Note 3). The full name of the base metal precedes the designation, but it is omitted for brevity when the base metal being referred to is obvious.

#### 6. Keywords

6.1 magnesium; UNS designations

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**TABLE 1 Letters Representing Alloying Elements**

A—Aluminum	Q—Silver
C—Copper	S—Silicon
E—Rare earths	T—Tin*
H—Thorium*	V—Gadolinium
J—Strontium	W—Yttrium
K—Zirconium	Z—Zinc
L—Lithium*	*For historical reference
M—Manganese	

**TABLE 2 Unalloyed Magnesium and Magnesium-Alloy Registration  
(A Registration Record of Magnesium Alloys with Established Designations and Chemical Composition)**

NOTE—Cast or wrought product compositions may differ from casting ingot compositions.

Designation			Chemical Composition, % max unless shown as a range or as a min																		Other Elements		
Practice	UNS	See ASTM	Magnesium	Aluminum	Calcium	Copper	Gadolinium	Iron	Lithium	Manganese	Neodymium	Nickel	Rare Earths	Silicon	Silver	Strontium	Yttrium	Zinc	Zirconium	Specific	Each	Total	
9980A	M19980	B92/B92M	99.80 min			0.02				0.10		0.001								0.01 Sn	0.05		
9980B	M19991	B92/B92M	99.80 min			0.02				0.10		0.005								0.01 Pb			
9990A <sup>A</sup>	M19990	B92/B92M	99.90 min	0.003				0.04		0.004		0.001		0.005						0.006 Na			
9995A <sup>A</sup>	M19995	B92/B92M	99.95 min	0.01				0.003		0.004		0.001		0.005						0.01 Sn	0.05		
9998A <sup>A</sup>	M19998	B92/B92M	99.98 min	0.004		0.0005		0.002		0.002		0.0005		0.003						0.01 Pb			
9998A <sup>A</sup>	M19998	B92/B92M	99.98 min	0.004		0.0005		0.002		0.002		0.0005		0.003						0.01 Ti	0.005		
AJ52A <sup>BE</sup>	M17520	B94	c	4.5-5.5		0.010		0.004 <sup>D</sup>		0.24-0.6 <sup>D</sup>		0.001		0.10		1.7-2.3		0.22		0.001 Ti†	0.005		
AJ52A <sup>BE</sup>	M17521	B93/B93M	c	4.6-5.5		0.008		0.004		0.26†-0.5		0.001		0.08		1.8-2.3		0.20		0.001 Pb		0.01	
AJ52A <sup>BE</sup>	M17521	B93/B93M	c	4.6-5.5		0.008		0.004		0.26 - 0.5		0.001		0.08		1.8-2.3		0.20		0.001 Ti	0.005		
AJ62A <sup>BE</sup>	M17620	B94	c	5.5-6.6		0.010		0.004 <sup>D</sup>		0.24-0.6 <sup>D</sup>		0.001		0.10		2.0-2.8		0.22		0.001 Pb		0.01	
AJ62A <sup>BE</sup>	M17621	B93/B93M	c	5.6-6.6		0.008		0.004		0.26-0.05		0.001		0.08		2.1-2.8		0.20				0.01	
AM50A	M10500	B94	c	4.4-5.4		0.010		0.004 <sup>D</sup>		0.26-0.6 <sup>D</sup>		0.002		0.10				0.22				0.02	
AM50A <sup>E</sup>	M10501	B93/B93M	c	4.5-5.3		0.008		0.004		0.28-0.50		0.001		0.08				0.20†				0.01	
AM60A	M10600	B94	c	5.5-6.5		0.35				0.13-0.6		0.03		0.50				0.22					
AM60A	M10601	B93/B93M	c	5.6-6.4		0.25				0.15-0.50		0.01		0.20				0.20				0.30	
AM60B	M10602	B94	c	5.5-6.5		0.010		0.005 <sup>D</sup>		0.24-0.6 <sup>D</sup>		0.002		0.10				0.22				0.02	
AM60B <sup>E</sup>	M10603	B93/B93M	c	5.6-6.4		0.008		0.004		0.26-0.50		0.001		0.08†				0.20				0.01	
AM100A	M10100	B80	c	9.3-10.7		0.10				0.10-0.35		0.01		0.30				0.30				0.30	
		B199																					
		B403																					
AM100A	M10101	B93/B93M	c	9.4-10.6		0.08				0.13-0.35		0.010		0.20				0.2				0.30	
AS21A	M10210	B94	c	1.8-2.5		0.01		0.005		0.18-0.7		0.001		0.7-1.2				0.20				0.01	
AS21A <sup>E</sup>	M10211	B93/B93M	c	1.9-2.5		0.008		0.004		0.2-0.6		0.001		0.7-1.2				0.20				0.01	
AS21B <sup>B</sup>	M10212	B94	c	1.8-2.5		0.008		0.0035		0.05-0.15		0.001	0.06-0.25	0.7-1.2				0.25				0.01	
AS21B <sup>BE</sup>	M10213	B93/B93M	c	1.9-2.5		0.008		0.0035		0.05-0.15		0.001	0.06-0.25	0.7-1.2				0.25				0.01	
AS41A	M10410	B94	c	3.5-5.0		0.06				0.20-0.50		0.03		0.50-1.5				0.12					
AS41A	M10411	B93/B93M	c	3.7-4.8		0.04				0.22-0.48		0.01		0.60-1.4				0.10				0.30	
AS41B	M10412	B94	c	3.5-0.7 <sup>D</sup>		0.02		0.0035 <sup>D</sup>		0.35-0.7		0.002		0.50-1.5				0.12				0.02	
AS41B <sup>E</sup>	M10413	B93/B93M	c	3.7-4.8		0.015		0.0035		0.35-0.6		0.001		0.60-1.4				0.10				0.01	
AZ31B	M11311	B90/B90M	c	2.5-3.5	0.04	0.05		0.005		0.20-1.0		0.005		0.10				0.6-1.4				0.30	
		B91																					
		B107/B107M																					
		B843																					
AZ31C	M11312	B107/B107M	c	2.4-3.6		0.10				0.15-1.0 <sup>F</sup>		0.03		0.10				0.50-1.5				0.30	
AZ31D	M11313	B843	c	2.5-3.5	0.04	0.04		0.002		0.20-1.0		0.0010		0.05				0.6-1.4			0.01	0.30	
AZ61A	M11610	B91	c	5.8-7.2		0.05		0.005		0.15-0.5		0.005		0.10				0.40-1.5				0.30	
		B107/B107M																					
AZ63A	M11630	B80	c	5.3-6.7		0.25				0.15-0.35		0.01		0.30				2.5-3.5				0.30	
AZ63A	M11631	B93/B93M	c	5.5-6.5		0.20				0.15-0.35		0.010		0.20				2.7-3.3				0.30	
AZ63B	M11632	B843	c	5.3-6.7		0.02		0.003		0.15-0.7		0.002		0.10				2.5-3.5				0.30	
AZ63C	M11634	B843	c	5.3-6.7		0.05		0.003		0.15-0.7		0.003		0.30				2.5-3.5				0.30	