Designation: B 951 – 08

Standard Practice for Codification of Unalloyed Magnesium and Magnesium-Alloys, Cast and Wrought[1]

This standard is issued under the fixed designation B 951; 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 (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

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 E 527.

2. Referenced Documents

2.1 The following documents form a part of this practice to the extent referenced herein:

2.2 *ASTM Standards:* [2]

B 80 Specification for Magnesium-Alloy Sand Castings

B 90/B 90M Specification for Magnesium-Alloy Sheet and Plate

B 91 Specification for Magnesium-Alloy Forgings

B 92/B 92M Specification for Unalloyed Magnesium Ingot and Stick For Remelting

B 93/B 93M Specification for Magnesium Alloys in Ingot Form for Sand Castings, Permanent Mold Castings, and Die Castings

B 94 Specification for Magnesium-Alloy Die Castings

B 107/B 107M Specification for Magnesium-Alloy Extruded Bars, Rods, Profiles, Tubes, and Wire

B 199 Specification for Magnesium-Alloy Permanent Mold Castings

B 403 Specification for Magnesium-Alloy Investment Castings

B 843 Specification for Magnesium Alloy Anodes for Cathodic Protection

E 527 Practice for Numbering Metals and Alloys in the Unified Numbering System (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 %	
Unalloyed aluminum made by a refining process	0.0XX
Alloys and unalloyed aluminum or magnesium not made by a refining process	0.0X
0.10 through 0.55 %	0.XX
Over 0.55 %	0.X,X.X,XX.X

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.

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 (Notes 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.

[1] 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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[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.

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 greater of the two 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.

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	

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

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																			
Practice	UNS	See ASTM	Magnesium	Aluminum	Calcium	Copper	Gadolinium	Iron	Lithium	Manganese	Neodymium	Nickel	Rare Earths	Silicon	Silver	Strontium	Yttrium	Zinc	Zirconium	Other Elements		
																				Specific	Each	Total
9980A	M19980	B 92/B 92M	99.80 min			0.02				0.10		0.001								0.01 Sn 0.01 Pb 0.006 Na	0.05	
9980B	M19991	B 92/B 92M	99.80 min			0.02				0.10		0.005								0.01 Sn 0.01 Pb	0.05	
9990A	M19990	B 92/B 92M	99.90 min	0.003				0.04		0.004		0.001		0.005						[A]	0.01	
9995A	M19995	B 92/B 92M	99.95 min	0.01				0.003		0.004		0.001		0.005						0.01 Ti[A]	0.005	
9998A	M19998	B 92/B 92M	99.98 min	0.004		0.0005		0.002		0.002		0.0005		0.003						0.001 Ti[A] 0.00003 B 0.001 Pb	0.005	
AJ52A[B]	M17520	B 94	[C]	4.5-5.5		0.010		0.004[D]		0.24-0.6[D]		0.001		0.10		1.7-2.3		0.22			0.01	
AJ52A[BE]	M17521	B 93/B 93M	[C]	4.6-5.5		0.008		0.004		0.25-0.5		0.001		0.08		1.8-2.3		0.20			0.01	
AJ62A[B]	M17620	B 94	[C]	5.5-6.6		0.010		0.004[D]		0.24-0.6[D]		0.001		0.10		2.0-2.8		0.22			0.01	
AJ62A[BE]	M17621	B 93/B 93M	[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	B 94	[C]	4.4-5.4		0.010		0.004[D]		0.26-0.6[D]		0.002		0.10				0.22			0.02	
AM50A[E]	M10501	B 93/B 93M	[C]	4.5-5.3		0.008		0.004		0.28-0.50		0.001		0.08				0.22			0.01	
AM60A	M10600	B 94	[C]	5.5-6.5		0.35				0.13-0.6		0.03		0.50				0.22				
AM60A	M10601	B 93/B 93M	[C]	5.6-6.4		0.25				0.15-0.50		0.01		0.20				0.20				0.30
AM60B	M10602	B 94	[C]	5.5-6.5		0.010		0.005[D]		0.24-0.6[D]		0.002		0.10				0.22			0.02	
AM60B[E]	M10603	B 93/B 93M	[C]	5.6-6.4		0.008		0.004		0.26-0.50		0.001		0.10				0.20			0.01	
AM100A	M10100	B 80 B 199 B 403	[C]	9.3-10.7		0.10				0.10-0.35		0.01		0.30				0.30				0.30
AM100A	M10101	B 93/B 93M	[C]	9.4-10.6		0.08				0.13-0.35		0.010		0.20				0.2				0.30
AS21A	M10210	B 94	[C]	1.8-2.5		0.01		0.005		0.18-0.7		0.001		0.7-1.2				0.20			0.01	
AS21A[E]	M10211	B 93/B 93M	[C]	1.9-2.5		0.008		0.004		0.2-0.6		0.001		0.7-1.2				0.20			0.01	
AS21B[B]	M10212	B 94	[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[BE]	M10213	B 93/B 93M	[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	B 94	[C]	3.5-5.0		0.06				0.20-0.50		0.03		0.50-1.5				0.12				

TABLE 2 *Continued*

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
AS41A	M10411	B 93/B 93M	[C]	3.7-4.8		0.04				0.22-0.48		0.01		0.60-1.4				0.10				0.30
AS41B	M10412	B 94	[C]	3.5-0.7[D]		0.02		0.0035[D]		0.35-0.7		0.002		0.50-1.5				0.12			0.02	
AS41B[E]	M10413	B 93/B 93M	[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	B 90/B 90M B 91 B 107/ B 107M B 843	[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
AZ31C	M11312	B 107/ B 107M	[C]	2.4-3.6		0.10				0.15-1.0[F]		0.03		0.10				0.50-1.5				0.30
AZ31D	M11313	B 843	[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	B 91 B 107/ B 107M	[C]	5.8-7.2		0.05		0.005		0.15-0.5		0.005		0.10				0.40-1.5				0.30
AZ63A	M11630	B 80	[C]	5.3-6.7		0.25				0.15-0.35		0.01		0.30				2.5-3.5				0.30
AZ63A	M11631	B 93/B 93M	[C]	5.5-6.5		0.20				0.15-0.35		0.010		0.20				2.7-3.3				0.30
AZ63B	M11632	B 843	[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	B 843	[C]	5.3-6.7		0.05		0.003		0.15-0.7		0.003		0.30				2.5-3.5				0.30
AZ63D	M11636	B 843	[C]	5.0-7.0		0.10		0.003		0.15-0.7		0.003		0.30				2.0-4.0				0.30
AZ80A	M11800	B 91 B 107/ B 107M	[C]	7.8-9.2		0.05		0.005		0.12-0.5		0.005		0.10				0.20-0.8				0.30
AZ81A	M11810	B 80 B 199 B 403	[C]	7.0-8.1		0.10				0.13-0.35		0.01		0.30				0.40-1.0				0.30
AZ81A	M11811	B 93/B 93M	[C]	7.2-8.0		0.08				0.15-0.35		0.010		0.20				0.5-0.9				0.30
AZ91A	M11910	B 94	[C]	8.3-9.7		0.10				0.13-0.50		0.03		0.50				0.35-1.0				
AZ91A	M11911	B 93/B 93M	[C]	8.5-9.5		0.08				0.15-0.40		0.01		0.20				0.45-0.9				0.30
AZ91B	M11912	B 94	[C]	8.3-9.7		0.35				0.13-0.50		0.03		0.50				0.35-1.0				
AZ91B	M11913	B 93/B 93M	[C]	8.5-9.5		0.25				0.15-0.40		0.01		0.20				0.45-0.9				0.30
AZ91C	M11914	B 80 B 199 B 403	[C]	8.1-9.3		0.10				0.13-0.35		0.01		0.30				0.40-1.0				0.30
AZ91C	M11915	B 93/B 93M	[C]	8.3-9.2		0.08				0.15-0.35		0.010		0.20				0.45-0.9				0.30
AZ91D	M11916	B 94	[C]	8.3-9.7		0.030		0.005[D]		0.15-0.50[D]		0.002		0.10				0.35-1.0			0.02	