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FORMER ALLOY AND TEMPER DESIGNATIONS, ALUMINUM AND MAGNESIUM ALLOYS

1.0 INTRODUCTION

The purpose of this document is to provide a cross reference between current and former US alloy and temper designations for aluminum and magnesium alloys. The document is not an official FAA publication. Rather, it is a document intended as an information source, for use by those involved in the maintenance or incident investigation of vintage / antique aircraft and other industrial products, using decades old design data or drawings. The information provided herein is offered on a best effort basis and, as such, it should not be considered all inclusive. The reader is hereby urged to seek technical advice from metal producers and / or professional societies / associations. This document will eventually be posted at the following public web site: http://www.faa.gov/aircraft/air_cert/design_approvals/csta/publications

2.0 ALLOY DESIGNATIONS, ALUMINUM & ITS ALLOYS

Tables 1 and 2, respectively, list former and current alloy designations for wrought and cast aluminum alloys. Several designation systems were used in the past. The basis for some of these former systems are discussed below. [a]

2.1 Former Commercial Designation Systems

2.1.1 Wrought Products

2.1.1.1 "Aluminum Industry" Designation System

An "Aluminum Industry" designation system of sorts was used by Alcoa, Kaiser, Reynolds and other producers. This section presents the details of that system.

(a) Commercially Pure Aluminum: Commercially pure aluminum was designated in one of two ways:

1. Numeral only. For example, 99.5, 99.75, etc., with the number indicating a percentage representing the purity level.

2. A numeral, consisting of one digit, followed by the suffix "S." Frequently, the number was preceded by one or more prefixes. The prefixes, numbers and the suffix "S" were not separated.

(b) Aluminum Alloys: Aluminum alloys were designated by a numeral, consisting of one or two digits, followed by the suffix "S." Sometimes, the number was preceded by one or more prefixes. The prefixes, numbers, and the suffix "S" were not separated.

Key to Prefixes & Numbers With Suffix "S"

Prefixes:

"M": New alloy in development stage.
"X": New alloy advanced from the development to the experimental stage.
"A", "B" & all other prefixes: A modified version of the original chemical composition.

Numbers with Suffix "S":

1S, 2S: Commercially pure aluminum, 99.0% or better.
50S-69S: Magnesium is chief alloying element.
70S-79S: Zinc is chief alloying element.
3S-9S: Manganese is chief alloying element.
80S-84S: Element other than above is chief alloying element.
10S-29S: Copper is chief alloying element.
30S-49S: Silicon is chief alloying element.

The key to the prefixes and numbers with suffix "S" is presented in the sidebar titled Key to Prefixes & Numbers With Suffix "S," on this page.

[a] *Key to current designations may be found in Aluminum Association publications or ANSI H35.1.*

2.1.1.2 Designations for Products Produced only by Reynolds Metals

In addition to the "Aluminum Industry" designation system of 2.1.1.1, Reynolds Metals occasionally utilized "R" designations, which were used without other prefixes or the "S" suffix. The key to these designations is presented in the sidebar titled "Key to the Reynolds R Designations" on this page.

Key to the Reynolds "R" Designations

R995; R998; R308 (No. 1 Reflector sheet): Commercially pure aluminum.
R301; R317: Copper is chief alloying element.
R303: Zinc is chief alloying element. (2)
R305; R306: Magnesium is chief alloying element.
R353; R361: Magnesium and silicon are chief alloying elements.
R399: Element other than above is chief alloying element.

2.1.1.3 Other Designation Systems

Different producers occasionally used their own designation systems. One case recorded in Table 1 is HZM100, which was a Harvey Metals designation for 7001. Foreign designations were sometimes used in the USA. One case recorded in Table 1 is *RR 58*, a British designation for 2618. A designation system, consisting of the prefix "K" or "LK," followed by a three digit numeral, was also used in the past. In Table 1, these designations (e.g., K157 and LK183) are underlined. It was not possible, however, to find a key to this designation system.

2.1.2 Cast Products

Commercial designations for cast aluminum products fell into two categories. The first category utilized trade names; e.g., Allcast, Tenzaoy. The second category utilized a designation that consists of two or three digit numeral that may or may not be preceded by a prefix. The prefixes used are believed to follow the same rules outlined in the sidebar titled "Key to Prefixes & Numbers With Suffix S" on page 1. It was not possible, however, to find a key for the numeral protocol used.

Key To ASTM-ASME Prefix Letters *

A- Aluminum	**M- Manganese**
B- Bismuth	**N- Nickel**
C- Copper	**P- Lead**
D- Cadmium	**Q- Silver**
E- Rare Earths	**R- Chromium**
F- Iron	**S- Silicon**
G- Magnesium	**T- Tin**
H- Thorium	**W- Yttrium**
K- Zirconium	**Y- Antimony**
L- Lithium **	**Z- Zinc**

** The letters I and O are excluded. The letters J, U, V and X have not been used to date.*
*** Some references (e.g., ref. 7) list beryllium not lithium as corresponding to the letter L. It is thought that lithium is the more accurate choice, since beryllium is not a normal alloying element in Al or Mg alloys.*

2.2 Former ASTM-ASME Designations for Wrought & Cast Products

In addition to commercial designations, Tables 1 and 2 also list former designations used by ASTM (American Society for Testing and Materials) and ASME (American Society of Mechanical Engineers) for specifying aluminum and its alloys. This system had been discontinued for wrought alloys in the 1950's and for cast alloys in 1974. The system, however, is still in use for magnesium and its alloys (see section 4 below). Below, the details of the ASTM-ASME designation system are presented.

(a) Commercially Pure Aluminum (wrought): The designation consists of a numeral showing the minimum purity, with the decimal point omitted. An arbitrarily chosen letter is added to differentiate grades. Example: 990 A for 99.0% minimum purity aluminum.

(b) Wrought & Cast Aluminum Alloys: The designation consists of not more than two letters representing the chief alloying elements, arranged in order of decreasing percentages (or in alphabetical order if equal percentages). For the purposes of this document, the subject letters

will be referred to as prefix letters. The key to these letters is presented in the side bar titled "Key To ASTM-ASME Prefix Letters" on page 2. The prefix letters are followed by the respective percentages of the elements rounded off to the nearest whole numbers. A final (suffix) letter is arbitrarily assigned to differentiate alloys that would otherwise have identical designations in spite of having different compositions. Some examples illustrating the use of this designation system are presented in the sidebar titled "Examples of the Former ASTM-ASME System; Al Alloys" on this page.

Examples of the Former ASTM-ASME System; Al Alloys

1. **The chief alloying elements of alloy SG11A (6151) and SG11B (6066) are silicon (S) and magnesium (G). For the former (6151), the nominal percentage for the elements are 0.80 % and 0.63 %, respectively. For the latter (6066), the corresponding values are 1.35 % and 1.1 %. All four values round up to 1 %; i.e., both alloys would have the designation SG11. The suffix letters A and B are assigned to distinguish between the two alloys.**
2. **The chief alloying elements of alloy ZG62A (7075) are zinc (5.6 % nominal, rounded to 6 %) and magnesium (2.5 % nominal, rounded to 2 %). The zinc is listed first because it has the higher**

2.3 SAE Designations

In the past, SAE (Society of Automotive Engineers) utilized its own designation system. Reference to this system could only be found in conjunction with cast alloys; see Table 2. It was not possible, however, to find a key to this designation system. In 1990, SAE adopted the AA designation system.

3.0 TEMPER DESIGNATIONS, ALUMINUM & ITS ALLOYS

Prior to October 1947, the tempers of commercial aluminum alloys have been designated by a system of numbers and letters; e.g., ½ H, -W, -T, -RT, etc. It was not possible to locate a key for that system, which was applicable to wrought and cast products. [b] Beyond October 1947, the comprehensive temper designation system in use today was adopted. [c] The current system, also applicable to wrought and cast products, is flexible, allowing for the incorporation of tempers to be developed in the future. Tables 3 and 4 depict cross reference between current and former temper designations for wrought aluminum products. [d]

4.0 ALLOY AND TEMPER DESIGNATIONS, MAGNESIUM & ITS ALLOYS

In 1948, a standard alloy and temper designation system was adopted for magnesium and its alloys, and that system is still in use today for both cast and wrought products. The adopted alloy designation system is the ASTM-ASME system, discussed in 2.2; an example of its use is presented in the sidebar titled "Example of the ASTM-ASME System; Mg Alloys" on this page. The adopted temper

Example of the ASTM-ASME System-Mg Alloys

The chief alloying elements of alloy AZ91C and AZ91D are aluminum (A) and Zn (Z). The nominal percentages for the elements are 8.7 % and 0.70 %, respectively. These are rounded off to 9 and 1, hence the designation AZ91. Aluminum is listed first because it has the higher percentage. The letters C and D are assigned to differentiate alloys that would otherwise have identical designations in spite of having different compositions.

[b] *Note that the –H tempers are applicable only to wrought products.*
[c] *Key to the current designation system may be found in Aluminum Association publications or ANSI H35.1.*
[d] *The subject tables are from reference 1, pp. 808-809.*

designation system is the same as that used for aluminum and its alloys. Prior to 1948, magnesium and its alloys were designated by trade names, of which Dowmetal was the most common one; an alloy would be referred to as Dowmetal followed by a number that designates the alloy. In addition to trade names, SAE and ASTM designation systems were also used. Table 5 lists former and current alloy designations for wrought and cast magnesium alloys. Table 6 lists some of the Dowmetal trade names not covered in Table 5. The temper designations for magnesium alloys followed the system outlined in the sidebar titled "Former Temper Designation System-Mg Alloys" on this page. The former temper designations were suffixed to alloy designation, without a hyphen.

Former Temper Designation System; Mg Alloys

a: Annealed sheet.
h: Hard rolled sheet.
AC: As cast.
ACS: As cast plus a stabilizing heat treatment.
HT: Heat treated.
HTA: Heat treated and aged.
HTS: Heat treated and stabilized.
A: Aged.

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References

Aluminum & Aluminum Alloys

1- Metals Handbook, 1948 Edition, ASM, 1948, p 793, pp 808-809.
2- Heat Treating Aluminum Alloys, Reynolds Metals Company, 1948, p 62.
3- "Alloy Designation System," American Standards Association ASA E35-1 (1957), issued by the Aluminum Association.
4- Metals Handbook, vol. 1, 8 th Ed., ASM, 1961, p. 892, 917.
5- Welding Kaiser Aluminum, Kaiser Aluminum & Chemical Sales, Inc., First Ed., 1967, pp. 2-13 to 2-28.

Magnesium & Magnesium Alloys

6- Metals Handbook, 1948 Edition, ASM, 1948, pp. 999-1000, pp. 1013-1024.
7- Metals Handbook, vol. 1, 8 th Ed., ASM, 1961, p. 1069, pp. 1095-1112.
8- Metals Handbook, vol. 2, 10 th Ed., ASM, 1990, pp. 455-457, pp. 480-516.
9- Dowmetal Magnesium Alloys, The Dow Chemical Company, 1940.
10- Dow Magnesium Alloys and Products, The Dow Chemical Company, Magnesium Department, 1950.

Table 1: Former & Current Designation, Wrought Aluminum & Its Alloys [1]

Former Designation		Current AA [2] Designation
commercial	ASTM-ASME	
EC		EC [3]
AE1S		1030
AD1S		1050
BD1S	996A	1060
AC1S		1070
JC1S		1075
BC1S, R998		1080
AB1S		1085
FB1S		1090
AAIS		1095
BA1S		1099
2S	990A	1100
R308		1130 [4]
BE1S		1145 [5]
ED1S		1150
99.6, CD1S		1160
FC1S		1170
99.75		1175 [6]
CC1S, 99.8		1180 [7]
CB1S		1185
99.87, E81S		1187 [7]
BB1S		1188
CA1S		1197 [7]
A2S		1200
99.3		1230 [8]
R995, 99.35		1235
DD1S		1260
HC1S		1270
DB1S		1285
DE1S		1330
		1360
11S, SAE 202	CB60A	2011 [9]
14S, R301 Core, SAE 246, 260	CS41A	2014
Clad 14S	CS41A	Alclad 2014 [10]
17S	CM41A	2017 [11]
R317		[12]
18S		2018
24S, SAE 24, 240	CG42A	2024
Clad 24S	CG42A	Alclad 2024 [13]
25S	CS41C	2025
A17S		2117
XA19S		X2119
B14S		2214
XB16S		X2216
B18S, SAE 203	CN42D	2218
		2219
B25S		2225
C16S		2316
F18S, *RR58* [14]		2618
3S, SAE 29, 245	M1A	3003
3S	M1A	Alclad 3003 [15]
4S	MG11A	3004
4S	MG11A	Alclad 3004 [15]
A5S		3005

Former Designation		Current AA [2] Designation
commercial	ASTM-ASME	
32S, SAE 290	SG121A	4032
43S, K145		4043
45S		4045
X47S		X4047
C43S, 44S, K143		4343
E43S		4543
K155, A50S, R305	G1B	5005
50S, SAE 207	G1A	5050
		Alclad 5050
52S, SAE 201	GR20A	5052
55S		5055
56S	GM50A	5056
	Clad GM50A	5056
LK183	GM41A	5083
K186	GM40A	5086
		5152
A54S, SAE 208	GR40A	5154
		Alclad 5155
		5252
B54S	GR40B	5254
		5257
C56S		5356
C57S, K157, SAE 209		5357
D50S		5405
	GM31A	5454
	GM51B	5456
		5457
		5557
F52S	GR20B	5652
		5657
R306, K162		6003 [16]
53S, R353	GS11B	6053 [17]
61S, R361, SAE 244, 281	GS11A	6061
61S	GS11A	Alclad 6061 [15]
62S		6062
63S, SAE 212	GS10A	6063
66S	SG11B	6066
	GS10B	6101
A51S, SAE 280	SG11A	6151
XB51S		X6251
B53S		6253
		6262
		X6263
B64S		6264
		6351
C53S		6353
XD53S		X6453
E53S		6553
J51S, K160		6951

Table 1, Cont'd: Former & Current Designations, Wrought Aluminum & Its Alloys [1]

Former Designations		Current AA [2] Designation
commercial	ASTM-ASME	
HZM100 [18]		7001
		7039
70S		7070
72S		7072 [19]
X73S		X7073
75S, SAE 215, 241	ZG62A	7075
Clad 75S	ZG62A	Alclad 7075 [15]
76S		7076
79S		7079 [20]
A78S		7178
A78S		Alclad 7178 [21]
XB72S		X7272
B77S		7277
R303 [22]		
R399		8099
K112		8112
XB80S		X8280
XC80S		X8380
XD80S		X8480

Footnotes to Table 1:

(1) The terms Clad and Alclad are used interchangeably.
(2) Aluminum Association. The AA designation system became effective in 1954.
(3) The designation (EC) for electrical conductor wire has not changed.
(4) No. 1 Reflector Sheet.
(5) Foil.
(6) Cladding on No. 2 Reflector Sheet.
(7) Electrolytic condenser foil.
(8) Cladding on Alclad 24S (2024).
(9) Also containing 0.20-0.60 % each of Pb and Bi.
(10) Cladding, R306 / K162 (6003), see footnote 16. Reynolds product was R301 Core with R306 cladding. The 1948 edition of ASM's Metals Handbook also lists a 53S (6053) cladding, possibly used by Alcoa and other producers. ASM Handbook, vol.2, 10 th edition lists 6006 as the current cladding.
(11) ASM Handbook, 1948 edition lists an Alclad version with pure aluminum cladding.
(12) Nominal composition of R317 is: 4% Cu, 0.6% Mn, 0.6% Mg. It also contains 0.5% Bi and 0.5% Pb nominal, for free machining qualities. The closest alloy is 2017, which contains neither Bi or Pb.
(13) Cladding, pure aluminum (see footnote 8).
(14) RR 58 is a British designation.
(15) Cladding, 72S (7072), see note 19.
(16) Cladding for 14S and Reynolds' R301 Core (2014).
(17) Cladding for 14S.
(18) Harvey Metals designation.
(19) Used as a cladding for many alloys, including 2219, 3004, 3004, 6061, 7075, 7475 and 7475.
(20) Alloy 7079 and its clad version are not listed in recent publications of the AA, the Aerospace Structural Metals Handbook or Mil-HDBK-5 (MMPDS). The alloy is listed in ASM Handbooks.
(21) Current cladding 7011. Former cladding used could not be ascertained.
(22) Nominal composition of R303 is: 6.4% Zn, 2.5% Mg, 1.2% Cu. It is close to 7178.

Table 2: Former & Current Designations, Cast Aluminum Alloys

Former Designations			Current AA [2] Designation
commercial	ASTM-ASME	SAE [1]	
108	CS43A		208.0
A108	CS64A	330	308.0
C113	CS74A	33	213.0
122	CG100A	34	222.0
142	CN42A	39	242.0
195	C4A	38	295.0
295.0, B195 [3]	CS42A	380	296.0
319	SC64C, D	329, 326	319.0
Allcast [4]			
Red X-8	SC82A	327	328.0
F332.0, F132 [3]	SC103A	332	332.0
333		333.0	
A332.0, A132 [3]	SN122A	321	336.0
354			354.0
355	SC51A	322	355.0
C355	SC51B	355	C355.0
356	SG70A	323	356.0
A356	SG70B	336	A356.0
357			357.0
A357			A357.0
359	SG91A		359.0
360	SG100B	309	360.0
A360	SG100A		A360.0
380	SC84B		380.0
A380	SC84A	306	A380.0
	SC102A		383.0
384	SC114A		384.0 , A384.0
390			390.0
A390			A390.0
13	S12B		413.0
A13	S12A	305	A413.0
43	S5B		443.0
43			A443.0
43	S5A		B443.0
A43	S5C		C443.0
B514.0, B214 [5]	GS42A		512.0 [6]
A514.0, A214 [3]	GZ42A		513.0
214	G4A	320	514.0
218	G8A		518.0
220	G10A	324	520.0
Almag 35	GM70B		535.0
A218			A535.0
B218			B535.0
603, Ternalloy 5	ZG32A	311	705.0
607, Ternalloy 7	ZG42A	312	707.0
A712.0, A612 [5]	ZG61B	313	710.0
D712.0, D612, [7] 40E [5], [76]	ZG61A	310	712.0

Former Designations			Curre A Desig
commercial	ASTM-ASME	SAE [1]	
613, Tenzaloy	ZC81A, B	315	
Precedent 71A	ZG71B		
750			
A850.0, A750 [5]			
B850, B750 [5]			
Red X-11, [8]			
B132 [3]	SC122A		
Red X-13 [8]			
A142 [9]			
XA140 [10]			
85X [11]			
85 [12]			
113 [7]			
138 [8]	CS104A		
152 [8]			
C612 [8], [13]	ZC60A		
D132 [14]			

Footnotes to Table 2:

(1) SAE: Society of Automotive Engineers. These designations were used in SAE J452 and J453. In 1990, SAE adopted the AA syste
(2) Aluminum Association. The AA designation sy became effective in 1954.
(3) Underlined designations are listed in federal specification QQ-A-596 (permanent mold castin
(4) Mean composition for Allcast is 3% Cu, 5% Si. Referenced in ASTM B26, B108. Often consid equivalent to 319.
(5) Underlined designations are listed in federal specification QQ-A-601 (sand castings).
(6) Alloy 512.0 is no longer active.
(7) Underlined designation listed in ASTM B26.
(8) Listed in ASTM B108.
(9) Listed in AMS 4220.
(10) Listed in SAE specification AMS 4227.
(11) Listed in SAE specification AMS 4291.
(12) Listed in QQ-A-591 and ASTM B85.
(13) Alloy designation was changed from C612 to C712 and then apparently discontinued.
(14) Alloy nominal composition: 9% Si, 3.5% Cu, 0.8% Mg, 0.8% Ni.

Table 3: Key to Former Temper Designations, Wrought Heat-Treatable Aluminum Alloys

Alloy	Former Temper Designation	Current Temper Designation (1), (2)											
		Sheet & Plate (3)				Extrusions (3)		Wire, Rod & Bar (3)	Tubing (3),(4)		Forgings (5)	Rivets	
		Flat Sheet	Coiled Sheet	Plate	All								
		HTP	HTP	HTP	HTU	HTP	HTU	HTP	HTP	HTU	HTP	HTP	D
11S	-W -T3 -T8							-T4 -T3 -T8					
14S & Alclad 14S (6)	-W -T -T	-T3 -T6	-T4 -T6	-T4 -T6	-T4 -T6	-T4 -T6	-T42 -T62	-T4 -T6			-T4 -T6 -T61 (6)		
17S	-T -T Any Temper							-T4				-T4	-T3 (7) -T31 (8) -T41 (9)
A17S	-T											-T4	-T3 (7)
18S	-T										-T61 (6)		
24S & Alclad 24S (10)	-T -RT -T80 -T81 -T86	-T3 -T36 -T81 -T86	-T4 -T6	-T4 -T36 -T86	-T4 -T6	-T4	-T42	-T4 -T36	-T3	-T4		-T4	-T31 (8)
25S & 32S	-T										-T6		
A51S	-W -T										-T4 -T6		
53S	-W Any Temper -T -T5 -T61					-T4 -T6 -T5	-T4 -T6				-T4 -T6	-T4 -T6 -T61	-T4 -T41 (9) -T6 -T61

Table 3, Cont'd: Key to Former Temper Designations, Wrought Heat-Treatable Aluminum Alloys

Alloy	Former Temper Designation	Current Temper Designation (1), (2)											
		Sheet & Plate (3)				Extrusions (3)		Wire, Rod & Bar (3)	Tubing (3),(4)		Forgings (5)	Rivets	
		Flat Sheet	Coiled Sheet	Plate	All								
		HTP	HTP	HTP	HTU	HTP	HTU	HTP	HTP	HTU	HTP	HTP	D
61S (6061)	-W -T -T5 -T62 -T81	-T4 -T6	-T4 -T6	-T4 -T6	-T4 -T6	-T4 -T6 -T5 -T62	-T4 -T6	-T4 -T6 -T81	-T4 -T6	-T4 -T6		-T6	-T6
63S (6063)	-T -T5					-T6	-T6						
75S & Alclad 75S (10) (7075)	-W -T	-W (11) -T6	-W (11) -T6	-W (11) -T6	-W (11) -T6	-W (11) -T6	-W (11) -T6	-T6					

Footnotes to Table 3:

(1) Key to current designations may be found in Aluminum Association Publications or ANSI H35.1.
(2) HTP: Heat Treated by Producer. HTU: Heat Treated by User (I.e., manufacturer of finished product. D: Driven Rivets.
(3) Products listed are available in -O nd -F tempers.
(4) For extruded tubing, see columns for extrusions.
(5) Forgings are also available in the -F temper.
(6) Boiling water quench.
(7) Driven cold after full natural aging.
(8) Driven cold immediately after solution heat treatment, or when refrigerated to defer natural aging.
(9) Driven hot, at the solution heat treating temperature.
(10) Alclad available only for sheet and plate products.
(11) To be specific, the time of aging must be specific; e.g., 75S (7075)-W (2 hr), 75S (7075)-W (2 months).

Table 4: Temper Designations, Strain Hardened Wrought Non Heat-Treatable Aluminum Alloys [1]

Former Temper Designation	Current Temper Designation		
	Strain Hardened Only	Strain Hardened & Partially Annealed	Strain Hardened & Stabilized
1/4 H	-H12	-H22	-H32
1/2 H	-H14	-H24	-H34
3/4 H	-H16	-H26	-H36
H	-H18	-H28	-H38
Extra Hard [2]			-H39

Footnotes to Table 4:

(1) Alloys are normally produced and stocked in some, not all, tempers.
(2) Not a standard temper.

Table 5: Former & Current Designations, Wrought & Cast Magnesium Alloys
(Casting alloys in bold; wrought alloys in *italics*)

Form [1]	Chemical Designations [2]	Former Designations						Most Current ASTM-ASME Designations
		Trade Names		Industry Designations				
		Dowmetal [3]	Other	SAE [6]		ASTM Alloy# [9]	ASTM- ASME [10]	
				AMS [7]	Alloy# [8]			
I, Pr	**Pure Mg, 99.8**	[4]	**Mazlo AM2S**	[4]	[4]	[4]	[4]	[5]
S, ES	*Mg-3AL*	[4]	[4]	[4]	[4]	[4]	[4]	*A3A* [5]
DC	**Mg-1.25Al-1Mn**	[4]	**Eclipsaloy 130**	[4]	[4]	[4]	**AM11**	[5]
SC	**Mg-4Al-0.2Mn**	[4]	**Mazlo AM244**	[4]	[4]	[4]	[4]	[5]
DC	**Mg-6Al--.013Mn**	[4]	[4]	[4]	[4]	[4]	[4]	**AM60A**
DC	**Mg-6Al-0.25Mn**	[4]	[4]	[4]	[4]	[4]	[4]	**AM60B**
SC	**Mg-8Al-0.2 Mn**	**A** [11]	**Mazlo AM241**	[4]	[4]	**1**	**A8**	**AM80A** [5]
F, ES	*Mg-8Al-0.2Mn*	*A* [12]	[4]	[4]	[4]	**1**	[4]	[5]
SC, PMC	**Mg-10Al-0.1 Mn**	**G**	**Mazlo AM240**	[4]	**502**	**2**	**A10**	**AM100A**
W	*Mg-10Al-0.1 Mn*	*G*	*Mazlo AM-C59S*	[4]	[4]	[4]	[4]	[5]
DC	**Mg-4.3Al-1Si-0.2Mn**	[4]	[4]	[4]	[4]	[4]	[4]	**AS41A**
DC	**Mg-4.3Al-1Si-0.35Mn**	[4]	[4]	[4]	[4]	[4]	[4]	**AS41B**
ES	*Mg-1.25Al-0.4Zn-0.1Mn*	[4]	[4]	[4]	[4]	[4]	[4]	*AZ10A*
ES	*Mg-2Al-1.2Zn-0.18Ca*	[4]	[4]	[4]	[4]	[4]	[4]	*AZ21X1*
ES *S* *S* *F*	*Mg-3Al-1Zn-0.3Mg*	*FS-1*	*Mazlo AM-C52S*	[4]	*52* *510* [4] [4]	[4]	*AZ31X*	*AZ31B* *AZ31B* *AZ31C* *AZ31B*

Table 5, Cont'd: Former & Current Designations, Wrought & Cast Magnesium Alloys
(Casting alloys in bold; wrought alloys in *italics*)

Form [1]	Chemical Designations [2]	Former Designations						Most Current ASTM-ASME Designations
		Trade Names		Industry Designations				
				SAE [6]				
		Dowmetal [3]	Other	AMS [7]	Alloy# [8]	ASTM Alloy# [9]	ASTM- ASME [10]	
W	*Mg-3.25-1.2Zn*	[4]	[4]	[4]	[4]	[4]	[4]	*PE [13]*
S	*Mg-5Al-1Zn-0.25Mg*	*JS-1*	[4]	[4]	*512*	[4]	*AZ51X*	[5]
ES *F*	*Mg-6Al-1Zn-0.2Mg*	*J-1*	*Mazlo AM-C57S*	*4350* *4350*	*520* *531*	[4]	*AZ61X*	*AZ61A*
SC	**Mg-6Al-3Zn-0.2 Mn**	**H**	**Mazlo AM265**	[4]	**50**	**4**	**AZ63**	**AZ63A**
ES *F*	*Mg-8.5Al-0.5Zn-0.15Mg*	*O-1*	*Mazlo AM-C58S*	[4] *4360*	*523* *532*	[4]	*AZ80X*	*AZ80A*
SC, PMC, IC	**Mg-7.5Al-0.7Zn-0.15 Mn**	[4]	[4]	[4]	**505**	[4]	[4]	**AZ81A**
DC **I** **SC, PMC** **DC** **SC, PMC** **DC**	**Mg-9Al-2Zn-0.1 Mn**	**R** **RC**	**Mazlo AM263**	[4]	**501** [4] **504** [4] [4] **501A**	**13** [4] [4] [4] [4] [4]	**AZ91**	**AZ91A** **AZ91B** **AZ91C** **AZ91D** **AZ91E** **AZ91B**
SC **PMC** **IC** **I**	**Mg-9Al-2Zn-0.1 Mn**	**C**	**Mazlo AM260**	**4434** **4484** **4453** [4]	**500** **503** [4] [4]	[4]	**AZ92**	**AZ92A**
SC	**Mg-3RE [14]-0.2 Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**EK30A [5]**
F	*Mg-3Di [14]-0.5Zr*	[4]	[4]	[4]	[4]	[4]	[4]	*EK31XA [5]*

Table 5, Cont'd: Former & Current Designations, Wrought & Cast Magnesium Alloys
(Casting alloys in bold; wrought alloys in *italics*)

Form [1]	Chemical Designations [2]	Former Designations						Most Current ASTM-ASME Designations
		Trade Names		Industry Designations				
		Dowmetal [3]	Other	SAE [6]		ASTM Alloy# [9]	ASTM- ASME [10]	
				AMS [7]	Alloy# [8]			
SC, PMC	**Mg-4RE [14]-0.6 Zr**	[4]	[4]	**4440, 4441**	[4]	[4]	[4]	**EK41A [5]**
SC, PMC, IC	**Mg-2.1Di [14]-1.5Ag-0.7Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**EQ21A**
SC, PMC, IC	**Mg-3RE [14]-2.7 Zn-0.5 Zr**	[4]	[4]	**4442**	**506**		**EZ 33**	**EZ33A**
SC *S, P*	**Mg-3.25Th [14]-0.7 Zr** Mg-3.25Th [14]-0.7 Zr	[4] [4]	[4] [4]	**4445** *4384*	**507** *507*	[4] [4]	**HK31XA** *HK31XA*	**HK31A** *HK31A*
S, P, F	*Mg-2Th [14]-0.5Mn*	[4]	[4]	[4]	[4]	[4]	[4]	*HM21A*
ES	*Mg-3Th [14]-1.2Mn*	[4]	[4]	[4]	[4]	[4]	*HM31XA*	*HM31A*
SC	**Mg-3.25Th [14]-2Zn-0.75Zr**	[4]	[4]	**4447**	[4]	[4]	**HZ32XA**	**HZ32A**
SC	**Mg-0.7Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**K1A**
SC	**Mg-1.5/1.2 Mn**	**M**	**Mazlo AM 403**	[4]	[4]	[4]	**M1**	[5]
ES *S, P* *F*	*Mg-1.5/1.2 Mn*	*M*	*Mazlo AM 3S*	[4] *4370* [4]	*522* *51* *533*	*11* *11* [4]	*M1*	*M1A*
SC, PMC, IC	**Mg-2.5Ag-2.1Nd [14]-0.7Zn**	[4]	[4]	[4]	[4]	[4]	**QE22**	**QE22A**
GC	**Mg-2.5Ag-1.1Th [14]-1.1RE [14]**	[4]	[4]	[4]	[4]	[4]	[4]	**QH21A**
SC, PMC, IC	**Mg-4Y [14]-3.4RE [14] -0.7Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**WE43**
SC, PMC, IC	**Mg-5.1Y [14]-3RE [14] -0.7Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**WE54**
SC, PMC, IC	**Mg-6Zn-2.7Cu-0.5Mn**	[4]	[4]	[4]	[4]	[4]	[4]	**ZC63**

Table 5, Cont'd: Former & Current Designations, Wrought & Cast Magnesium Alloys
(Casting alloys in bold; wrought alloys in *italics*)

Form [1]	Chemical Designations [2]	Former Designations						Most Current ASTM-ASME Designations
		Trade Names		Industry Designations				
		Dowmetal [3]	Other	SAE [6] AMS [7]	SAE [6] Alloy# [8]	ASTM Alloy# [9]	ASTM- ASME [10]	
ES	*Mg-6.5Zn-1.25CU-0.75Mn*	[4]	[4]	[4]	[4]	[4]	[4]	*ZC71*
F	*Mg-5Sn-3Al-0.5Mn*	*D*	*Mazlo AM65S, Alloy AT35* [15]	[4]	*53*	[4]	*TA54*	[5]
S, P	*Mg-1.25Zn-0.17RE* [14]	[4]	[4]	[4]	[4]	[4]	[4]	*ZE10A* [5]
SC	**Mg-4.25Zn-1.25RE** [14]**-0.5Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**ZE41A**
SC	**Mg-5.7Zn-2.5RE** [14]**-0.7 Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**ZE63A**
SC	**Mg-4Zn-2Th** [14]**-0.5 Zr**	[4]	[4]	[4]	[4]	[4]	[4]	**ZH42** [5]
SC	**Mg-5.7Zn-1.8Th** [14]**-0.7 Zr**	[4]	[4]	[4]	**508**	[4]	**ZH62XA**	**ZH62A**
ES	*Mg-2.3Zn-0.55Zr*	[4]	[4]	[4]	[4]	[4]	[4]	*ZK20A* [5]
ES	*Mg-2.3Zn-0.65Zr*	[4]	[4]	[4]	[4]	[4]	[4]	*ZK21A*
ES	*Mg-4Zn-0.45 Zr*	[4]	[4]	[4]	[4]	[4]	[4]	*ZK40A*
SC	**Mg-4.5Zn-0.7 Zr**	[4]	[4]	**4443**	**509**	[4]	[4]	**ZK51A**
ES *F*	*Mg-5.5Zn-0.5Zr 524*	[4]	[4]	*4352* *4362*	[4]	[4]	*ZK60*	*ZK60A* [16]
SC	**Mg-6Zn-0.8 Zr 513**	[4]	[4]	[4]	[4]	[4]	**ZK61**	**ZK61A**

Footnotes to Table 5

(1) DC: Die castings. ES: Extruded shapes. F: Forgings. GC: General castings (no specific casting process listed in the references cited). I: Ingot. IC: Investment castings. P: Plate. PMC: Permanent mold castings. Pr: Powder. S: sheet. SC: Sand castings. W: Wrought (no specific products listed in the references cited).
(2) The numbers shown indicate the nominal percentages of the elements. In some cases, the minimum or maximum percentages are indicated. No effort is made here to distinguish and clarify the intent.
(3) Dowmetal was a trade name used by the Dow Chemical Company to designate Mg and Mg alloys.
(4) No former designations of this type are reported in the references cited.
(5) Not listed in the current ASM (American Society for Materials) Handbook (ref. 8).
(6) Society of Automotive Engineers.
(7) Aerospace Material Specification. AMS specifications are issued by SAE (see footnote 6).
(8) SAE alloy numbers are always mentioned in conjunction with SAE J 465 or J 466.
(9) The ASTM (American Society for Testing and Materials) numbers listed are from the following specifications for the products listed in footnote 1. DC: ASTM B 94. ES: ASTM B 107. F: ASTM B 91. I: ASTM B 93. IC: ASTM B 403. PMC: ASTM B 199. S, P: ASTM B 90. SC: ASTM B 80.
(10) These are formerly used ASTM-ASME designations.
(11) Replaced by Dowmetal H.
(12) Replaced by Dowmetal O.
(13) PE is not an ASTM-ASME designation; the correct ASTM designation would be of the AZ31 type. PE is an abbreviation for photo engraving. ASM Handbooks, however, use the PE designation as if it were an ASTM-ASME one.
(14) The metals known as the rare earths (RE) comprise three members of Group IIIB of the Periodic Table (Sc, Y, and La), and the 14 lanthanides (Ce, Pr, Nd, Pm, Sm, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, and Lu). Th, while not a rare earth, is associated with them in several respects.
(15) TA seems to be the reverse designation (TA) of the alloy.
(16) Reference 10 lists ZK60A as a Dowmetal designation.

Table 6: Dowmetal Designations not in Table 5
(Casting alloys in bold; wrought alloys in *italics*)

Form [1]	Chemical Designations [2]	Dowmetal	ASTM Alloy # [3]	Notes
SC	**Mg-12Al-0.1Mn**	**B**	[4]	**Replaced by Dowmetal P**
S, P	*Mg-6.5Al0.2Mn*	*E*	*7*	*Replaced by Dowmetal F*
DC	**Mg-6.5L-0.25Si-0.2Mn**	**EX**	[4]	
S, P, ES	*Mg-4Al—03Mn*	*F*	*6*	*Replaced by Dowmetal E (S, P) and Dowmetal J (ES)*
ES	*Mg-3Al-1Zn-0.3Mg*	*FS*	[4]	*A less controlled purity version of Dowmetal FS-1*
F, ES	*Mg-6.5Al-0.7Zn-0.2Mn*	*J*	*8*	
SC	**Mg-10Al-0.5Si-0.1Mn**	**K**	**12**	
F	*Mg-2.5Al-3.5Cd-0.3Mn*	*L*	[4]	
F, ES	*Mg-8.5Al-0.5Zn-0.2Mn*	*O*	*9*	
SC	**Mg-10Al-0.1Zn-0.1Mn**	**P**	[4]	
F, ES	*Mg-3Al-3Zn-0.2Mn*	*X* *X-1*	*15* [4]	*High purity Dowmetal X*

Footnotes to Table 6:

(1) DC: Die castings. ES: Extruded shapes. F: Forgings. P: Plate. SC: Sand castings.
(2) The numbers shown indicate the nominal percentages of the elements. In some cases, the minimum or maximum percentages are indicated. No effort is made here to distinguish and clarify the intent.
(3) The ASTM (American Society for Testing and Materials) numbers listed are from the following specifications for the products listed in footnote 1. DC: ASTM B 94. ES: ASTM B 107. F: ASTM B 91. S, P: ASTM B 90. SC: ASTM B 80.
(4) No former designations of this type are reported in the references cited.