

International Designations and Chemical Composition Limits for Aluminum Hardeners

(North American and International Registration Record)



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Contents

	Page
FOREWORD	i
SIGNATORIES TO THE DECLARATION OF ACCORD	i
REGISTERED DESIGNATIONS AND CHEMICAL COMPOSITION	1-4
Footnotes	5
TABLE OF COLOR CODES FOR ALUMINUM HARDENERS	6
Color Codes by Designation	7
Color Codes by Alternate Designation	8-9
TABLE OF INACTIVE ALUMINUM HARDENER DESIGNATIONS	10
RECOMMENDATION TO THE DECLARATION OF ACCORD	11
Appendix A-Terms and Definitions	12
Appendix B-Use of Designations	12
Appendix C-General Guidelines for Determining Compliance with “Sale of Aluminum Hardener” and “Commercial Quantity” for purposes Of Registering Aluminum Hardeners	13
Appendix D-Aluminum Hardener Color Code Scheme	13-14
DECLARATION OF ACCORD	15

FOREWORD

Listed herein are designations and chemical composition limits for aluminum hardeners registered in accordance with the *Recommendation – International Designation System for Aluminum Hardeners*, which is printed on page 11. Additions may be made as required according to the rules outlined in the Declaration of Accord, printed on page 15, and aluminum hardeners will be deleted when no longer in commercial use (See table of Inactive Aluminum Hardeners).

Some of the registered aluminum hardeners may be the subject of a patent or patent application and their listing herein is not to be construed in any way as the granting of a license under such patent rights.

The following organizations are signatories to the Declaration of Accord on an International Alloy Designation System for Hardeners:

Australia

Australian Aluminium Council Limited

<https://aluminium.org.au>

Brazil

Associação Brasileira do Alumínio

<https://abal.org.br>

Canada

Aluminium Association of Canada

<https://aluminium.ca>

China

China Nonferrous Metals Techno-Economic Research
Institute

<http://www.cnsmq.com>

European Union

European Aluminium

<https://european-aluminium.eu/>

Germany

Gesamtverband der Aluminiumindustrie e.V.

<https://www.aluminiumdeutschland.de/>

Japan

Japan Aluminium Association

<https://aluminum.or.jp/>

Romania

ALSO S.A.

<https://alro.ro/>

United States of America

The Aluminum Association

<https://aluminum.org>

REGISTERED CHEMICAL COMPOSITION LIMITS ^{1, 2}

Only composition limits which are identical to those listed herein or are registered with
The Aluminum Association should be designated as "AA" aluminum hardeners.

Designation		Date Registered	Registered By	Si	Fe	Cu	Mn	Cr	Ni	Ti	B	V		Others ⁴		Al
Registered	Alternate													Each	Total ³	
H2000	20% Ca	1990-11-05	USA	0.20	0.30	....	....	....	....	....	....	0.05	Ca 18.0-22.0	0.03	0.10	Rem.
H2001	10% Ca	2005-08-18	EAA	0.30	0.30	....	....	....	....	....	0.01	....	Ca 9.0-11.0 Zn 0.04 max Pb 0.02 max Sn 0.02 max	0.04	0.10	Rem.
H2002	1% Be	2009-07-20	USA	0.20	0.40	0.05	0.02	0.02	0.02	0.02	....	....	Be 0.9-1.2 Mg 0.20 max Zn 0.10 max	0.05	0.15	Rem.
H2003	3% Bi	1975-01-01	USA	0.20	0.20	....	....	....	....	....	....	....	Bi 2.7-3.3	0.03	....	Rem.
H2004	2.5% Be	2009-07-20	USA	0.20	0.40	0.05	0.02	0.02	0.02	....	....	....	Be 2.2-3.0 Mg 0.50 max Zn 0.10 max	0.05	0.15	Rem.
H2005	5% Be	1977-02-10	USA	0.20	0.40	0.05	0.02	0.02	0.02	0.02	....	....	Be 4.5-6.0 Mg 0.50 max Zn 0.10 max	0.05	0.15	Rem.
H2007	10% Sr	1982-04-13	USA	0.20	0.30	....	....	....	....	....	....	....	Sr 9.0-11.0 Mg 0.05 max Ba 0.10 max Ca 0.03 max P 0.01 max	0.05	0.15	Rem.
H2010	25% Mg	1983-08-02	USA	0.10	0.15	....	....	....	....	....	....	....	Mg 23.0-27.0	0.03	0.10	Rem.
H2011	50% Mg	1983-08-02	USA	0.10	0.15	....	....	....	....	....	....	....	Mg 48-52	0.03	0.10	Rem.
H2012	3.5% Sr	1983-08-02	USA	0.20	0.30	....	....	....	....	....	....	....	Sr 3.2-3.8 Ca 0.03 max P 0.01 max	0.03	0.10	Rem.
H2016	8% Bi	1984-07-12	USA	0.20	0.30	....	....	....	....	....	....	....	Bi 7.5-8.5 Zn 0.10 max	0.05	0.20	Rem.
H2017	10%Sr-1%Ti-0.2%B	1986-02-21	USA	0.20	0.30	....	....	....	....	0.9-1.2	0.15-0.25	....	Sr 9.0-11.0 Ca 0.02 max	0.05	0.15	Rem.
H2018	5% Sr	2009-07-20	USA	0.20	0.30	....	....	....	....	....	....	....	Sr 4.5-5.5 Ba 0.05 max Ca 0.05 max	0.04	0.10	Rem.
H2019	15% Sr	2001-07-18	USA	0.20	0.30	....	....	....	....	....	....	....	Sr 14.0-16.0 P 0.01 max Ba 0.10 max Ca 0.05 max	0.05	0.15	Rem.
H2020	20% Sr	2009-07-20	USA	0.20	0.30	....	....	....	....	....	....	....	Sr 18.0-22.0 Ba 0.10 max	0.05	0.15	Rem.
H2021	5% Be	2019-08-19	USA	0.50	0.40	0.40	...	0.20	0.40	0.20	...	...	Be 4.5-5.5 Zn 0.20 Mg 0.50	0.05	0.15	Rem.
H2025	2% Sc	2009-07-20	USA	0.05	0.05								Sc 1.8-2.2	0.03	0.10	Rem.

See footnotes on page 5.

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Designation		Date Registered	Registered By	Si	Fe	Cu	Mn	Cr	Ni	Ti	B	V		Others ⁴		Al
Registered	Alternate													Each	Total ³	
H2030	68% Mg	2009-07-20	USA	0.10	0.15	....	0.10	....	....	....	....	....	Mg 65-71	0.05	0.15	Rem.
H2035	10% Bi	2009-07-20	USA	0.20	0.30	....	....	....	....	....	....	....	Bi 9.0-11.0	0.05	0.20	Rem.
H2132	32% Cu	1975-01-01	USA	0.20	0.30	32-34	....	....	....	....	....	....	....	0.05	0.15	Rem.
H2148	50% Cu	2005-08-18	EAA	0.30	0.30	47-53	....	....	....	....	0.01	....	Zn 0.05 max Pb 0.02 max Sn 0.02 max	0.04	0.10	Rem.
H2149	50% Cu	2005-08-18	EAA	0.50	0.7	47-53	0.40	0.10	0.20	0.10	....	....	Mg 0.50 max Zn 0.20 max	0.05	0.15	Rem.
H2150	50% Cu	1989-01-30	USA	0.10	0.15	48-52	....	....	....	....	....	....	....	0.05	0.15	Rem.
H2154	54% Cu	1975-01-01	USA	0.10	0.10	51-57	....	....	....	....	....	....	....	0.05	....	Rem.
H2201	5% Ti-0.1% B	1975-01-01	USA	0.30	0.35	....	....	....	....	4.5-5.5	0.10-0.20	0.25	....	0.03	0.10	Rem.
H2202	5% Ti-0.6% B	1975-01-01	USA	0.20	0.30	....	....	....	....	4.5-5.5	0.50-0.7	0.20	....	0.03	0.10	Rem.
H2203	3% B	1975-01-01	USA	0.20	0.30	....	....	....	....	....	2.5-3.5	....	K 1.0 max Na 0.50 max	0.03	0.10	Rem.
H2204	4% B	1975-01-01	USA	0.20	0.30	....	....	....	....	....	3.5-4.5	....	K 1.0 max Na 0.50 max	0.03	0.10	Rem.
H2206	6% Ti	1975-01-01	USA	0.30	0.35	....	....	....	....	5.5-6.5	0.004	0.30	....	0.03	0.10	Rem.
H2207	5% Ti-0.2% B	1977-01-19	USA	0.30	0.35	....	....	....	....	4.5-5.5	0.15-0.25	0.25	....	0.03	0.10	Rem.
H2209	10% Ti	2005-08-18	EAA	0.30	0.7	0.20	0.45	0.10	0.20	9.0-11.0	....	0.50	Mg 0.50 max Zn 0.20 max	0.05	0.15	Rem.
H2210	10% Ti	1975-01-01	USA	0.30	0.35	....	....	....	0.05	9.0-11.0	0.004	0.50	....	0.03	0.10	Rem.
H2211	10% Ti-1% B	1977-01-19	USA	0.30	0.35	....	....	....	0.05	9.0-11.0	0.9-1.5	0.50	....	0.03	0.15	Rem.
H2213	10% Ti-0.4% B	1983-12-28	USA	0.20	0.30	....	....	....	....	9.0-11.0	0.30-0.50	0.10	....	0.03	0.10	Rem.
H2214	3%Ti-1% B	1984-12-06	USA	0.20	0.30	....	....	....	....	2.8-3.4	0.7-1.1	0.05	....	0.03	0.10	Rem.
H2217	5% B	1986-05-19	USA	0.20	0.30	....	....	....	....	0.05	4.5-5.5	....	K 1.0 max Na 0.50 max	0.03	0.10	Rem.
H2218	6% Ti-0.4% B	1987-09-28	USA	0.20	0.30	....	....	....	....	5.5-6.5	0.30-0.50	0.15	....	0.03	0.10	Rem.
H2219	3% Ti-0.4% B	1987-09-28	USA	0.20	0.30	....	....	....	....	2.7-3.3	0.30-0.50	0.15	....	0.03	0.10	Rem.
H2220	3% Ti-0.2% B	1987-09-28	USA	0.20	0.30	....	....	....	....	2.7-3.3	0.15-0.25	0.15	....	0.03	0.10	Rem.
H2221	10% B	2001-05-10	USA	0.25	0.30	...	...	...	...	...	9.0-11.0	...	K 1.0 max Na 0.50 max	0.03	0.10	Rem.
H2222	8% B	2001-07-18	USA	0.25	0.30	...	...	...	...	0.05	7.5-9.0	...	K 1.0 max Na 0.50 max	0.03	0.10	Rem.
H2223	1.7% Ti-1.4% B	2009-07-20	USA	0.20	0.30	...	...	...	...	1.3-2.2	1.1-1.7	0.05	...	0.03	0.10	Rem.
H2231	3% Ti-0.15% C	1997-02-27	USA	0.30	1.5					2.6-3.4	0.004	0.30	C 0.08-0.22	0.03	0.10	Rem.

See footnotes on page 5.

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Designation		Date Registered	Registered By	Si	Fe	Cu	Mn	Cr	Ni	Ti	B	V		Others ⁴		Al
Registered	Alternate													Each	Total ³	
H2252	5% Ti-1% B	1996-10-08	USA	0.20	0.30	....	....	....	....	4.5-5.5	0.8-1.2	0.20	....	0.03	0.10	Rem.
H2258	5% Ti-0.18% C	1999-05-20	USA	0.30	0.35	....	....	....	....	4.5-5.5	0.005	0.30	C 0.13-0.23	0.03	0.10	Rem.
H2264	6% Ti-0.04% C	1996-03-12	USA	0.20	0.35	....	....	....	....	5.5-6.5	0.004	0.05	C 0.03-0.05	0.03	0.10	Rem.
H2302	36% Si	1983-08-02	USA	34-39	0.50	....	....	....	....	0.07	0.01	0.06	P 0.01 max	0.05	0.15	Rem.
H2312	12% Si	1975-01-01	USA	11.0-13.0	0.35	0.10	....	....	....	....	....	....	....	0.05	0.15	Rem.
H2320	20% Si	2005-08-18	EAA	18.0-22.0	0.30	....	....	....	....	....	0.01	....	Pb 0.02 max Sn 0.02 max Zn 0.04 max Ca 0.06 max	0.04	0.10	Rem.
H2321	20% Si	2005-08-18	EAA	18.0-22.0	0.7	0.20	0.40	0.10	0.20	0.10	....	....	Mg 0.50 max Ca 0.06 max	0.05	0.15	Rem.
H2350	50% Si	1975-01-01	USA	47-54	0.50	....	....	....	....	0.07	0.01	0.06	....	0.05	....	Rem.
H2410	10% Mn	2005-08-18	EAA	0.30	0.30	....	9.0-11.0	....	....	....	0.01	....	Pb 0.02 max Sn 0.02 max Zn 0.04 max	0.04	0.10	Rem.
H2411	10% Mn	2005-08-18	EAA	0.50	0.7	0.20	9.0-11.0	0.10	0.20	0.10	....	....	Mg 0.50 max Zn 0.20 max	0.05	0.15	Rem.
H2425	25% Mn	1975-01-01	USA	0.20	0.25	....	24.0-26.0	....	....	....	....	....	....	0.03	0.15	Rem.
H2461	61% Mn	1975-01-01	USA	0.15	0.25	....	58-64	....	....	....	....	....	....	0.03	0.10	Rem.
H2475	75% Mn	1975-01-01	USA	0.10	0.20	....	74-76	0.10	....	....	....	....	....	0.05	0.15	Rem.
H2485	85% Mn	1995-01-04	USA	0.10	0.20	....	84-86	0.10	....	....	....	....	....	0.05	0.15	Rem.
H2500	10% Ni	1975-01-01	USA	0.15	0.20	....	....	....	9.0-11.0	....	....	....	....	0.03	0.10	Rem.
H2501	20% Ni	1983-08-02	USA	0.15	0.20	....	....	....	18.0-22.0	....	....	....	....	0.03	0.10	Rem.
H2575	75% Ni	1975-10-10	USA	....	0.10	....	....	0.05	74-76	....	....	....	Co 0.10 max	0.05	0.15	Rem.
H2600	10% Zr	1983-08-02	USA	0.20	0.25	....	....	....	....	0.05	....	....	Zr 9.0-11.0	0.03	0.15	Rem.
H2602	2.5% V	1977-01-19	USA	0.20	0.25	....	....	....	....	0.03	0.01	2.0-3.0	....	0.03	0.10	Rem.
H2603	3% Zr	1977-02-07	USA	0.20	0.25	....	....	....	....	0.05	....	....	Zr 2.7-3.3	0.03	0.10	Rem.
H2605	5% V	1977-01-19	USA	0.20	0.25	....	....	....	....	0.03	0.01	4.5-5.5	....	0.03	0.10	Rem.
H2606	6% Zr	1975-01-01	USA	0.20	0.25	....	....	....	....	0.05	....	....	Zr 5.5-6.5	0.03	0.10	Rem.
H2607	5% Zr	2005-08-18	EAA	0.30	0.30	....	....	....	....	....	0.01	....	Zr 4.5-5.5 Ca 0.010 max Na 0.005 max Pb 0.010 max Sn 0.010 max Zn 0.04 max	0.04	0.10	Rem.

See footnotes on page 5.

REGISTERED CHEMICAL COMPOSITION LIMITS ^{1, 2}

**Only composition limits which are identical to those listed herein or are registered with
The Aluminum Association should be designated as "AA" aluminum hardeners.**

Designation		Date Registered	Registered By	Si	Fe	Cu	Mn	Cr	Ni	Ti	B	V		Others ⁴		Al
Registered	Alternate													Each	Total ³	
H2610	10% V	2005-08-18	EAA	0.30	0.30	....	....	....	....	....	0.01	9.0-11.0	Pb 0.02 max Sn 0.02 max Zn 0.04 max	0.04	0.10	Rem.
H2612	10% Zr	2005-08-18	EAA	0.30	0.45	0.20	....	....	0.20	0.20	....	....	Zr 9.0-11.0 Sn 0.20	0.05	0.15	Rem.
H2615	15% Zr	1986-02-21	USA	0.35	0.35	....	....	....	....	....	....	....	Zr 13.5-16.0	0.05	0.15	Rem.
H2632	3% Zr-2% V	1975-01-01	USA	0.20	0.25	....	....	....	....	....	....	1.8-2.2	Zr 2.7-3.3	0.03	0.10	Rem.
H2633	6% Zr - 4% V	2001-05-10	USA	0.35	0.35	...	...	...	...	...	...	3.5-4.5	Zr 5.5-6.5	0.05	0.15	Rem.
H2700	10% Sr-14% Si	1977-02-10	USA	12.0-16.0	1.5	0.05	0.10	0.05	0.05	0.10	....	0.05	Sr 9.0-11.0 Ba 0.50 max Ca 0.50 max P 0.01 max Zr 0.10 max	0.05	0.15	Rem.
H2810	10% Fe	2005-08-18	EAA	0.30	9.0-11.0	....	....	....	....	....	0.01	....	Pb 0.02 max Sn 0.02 max Zn 0.04 max	0.04	0.10	Rem.
H2811	10% Fe	2005-08-18	EAA	0.50	9.0-11.0	0.20	0.40	0.10	0.20	0.10	....	....	Mg 0.50 max Zn 0.20 max	0.05	0.15	Rem.
H2825	25% Fe	1975-01-01	USA	0.30	23.0-27.0	0.05	0.20	....	....	....	....	....	....	0.05	....	Rem.
H2845	45% Fe	2005-08-18	EAA	0.30	43-47	....	0.30	....	....	....	0.01	....	Pb 0.02 max Sn 0.02 max Zn 0.04 max C 0.10 max	0.04	0.10	Rem.
H2875	75% Fe	1975-10-10	USA	....	74-76	0.15	0.25	0.10	0.10	....	....	....	....	0.05	0.15	Rem.
H2880	80% Fe	1994-03-31	USA	....	79-81	0.15	0.30	0.10	0.10	....	....	....	....	0.05	0.15	Rem.
H2918	10% Cr	2005-08-18	EAA	0.30	0.30	....	....	9.0-11.0	....	....	0.01	....	Pb 0.02 max Sn 0.02 max Zn 0.04 max	0.04	0.10	Rem.
H2919	20% Cr	2005-08-18	EAA	0.30	0.30	....	....	18.0-22.0	....	....	0.01	....	Pb 0.02 max Sn 0.02 max Zn 0.04 max	0.04	0.10	Rem.
H2920	20% Cr	1975-01-01	USA	0.30	0.55	0.10	....	19.0-21.0	....	....	....	....	....	0.05	0.15	Rem.
H2921	20% Cr	2005-08-18	EAA	0.50	0.7	0.20	0.40	18.0-22.0	0.20	0.10	....	....	Mg 0.50 max Zn 0.20 max	0.05	0.15	Rem.
H2975	75% Cr	1975-10-10	USA	0.30	0.50	....	0.10	74-76	....	....	....	....	....	0.05	0.15	Rem.

See footnotes on page 5.

FOOTNOTES

1. Composition in weight percent maximum unless shown as a range or a minimum.

Standard limits for alloying elements and impurities are expressed to the following places:

Less than 0.001 %	0.000X
0.001 through 0.01 %	0.00X
0.01 through 0.10 %:	
Unalloyed aluminum made by	
a refining process	0.0XX
Alloys and unalloyed aluminum	
not made by a refining process	0.0X
0.10 through 0.55 %	0.XX
(It is customary to express limits	
0.30 % through 0.55 %	
as 0.X0 or 0.X5)	
0.55 through 29.9 %:	0.X, X.X, or XX.X
Over 29.9 %	XX

2. Except for "Aluminum" and "Others", analysis is required for elements for which specific limits are shown. For purposes of determining conformance to these limits, an observed value or calculated value obtained from analysis is rounded off to the nearest unit in the last right hand place of figures used in expressing the specified limit, based on ASTM Standard Practice E29, as follows:

When the figure next beyond the last figure or place to be retained is less than 5, the figure in the last place retained should be kept unchanged.

When the figure next beyond the last figure or place to be retained is greater than 5, the figures in the last place should be increased by 1.

When the figure next beyond the last figure or place to be retained is 5 and

- a. there are no figures or only zeroes beyond this 5, if the figure in the last place to be retained is odd, it should be increased by 1; if even, it should be kept unchanged;
 - b. if the 5 next beyond the figure in the last place to be retained is followed by any figures other than zero, the figure in the last place retained should be increased by 1 whether odd or even.
3. The sum of those "Others" metallic elements 0.010 % or more each, expressed to the second decimal before determining the sum.
 4. "Others" includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the registration or specification. However, such analysis is not required and may not cover all metallic "Other" elements. Should any analysis by the producer or the purchaser establish that an "Others" element exceeds the limit of "Each" or that the aggregate of several "Others" elements exceeds the limit of "Total", the material shall be considered nonconforming.

+ Designation registered since previous issue.

COLOR CODE FOR ALUMINUM HARDENERS*

	ORANGE	GRAY	PURPLE	BROWN	GREEN	DARK BLUE	LIGHT BLUE	YELLOW	RED	BLACK	WHITE
WHITE					H2211 ²				H2000 ² H2001 ² H2264 ²	H2302 ² H2312 ² H2320 ² H2321 ² H2350 ²	
BLACK	H2602 ² H2605 ² H2610 ²	H2500 ² H2501 ² H2575 ²	H2003 ² H2016 ² H2035 ²		H2207 ²	H2632 ³ H2633 ³	H2010 ² H2011 ² H2030 ²	H2002 ² H2004 ² H2005 ² H2021 ²		H2810 ¹ H2811 ¹ H2825 ¹ H2845 ¹ H2875 ¹ H2880 ¹	
RED			H2231 ²	H2258 ²	H2201 ²	H2025 ²	H2017 ³	H2203 ² H2204 ² H2217 ² H2221 ² H2222 ²	H2206 ¹ H2209 ¹ H2210 ¹		
YELLOW					H2202 ²			H2132 ¹ H2148 ¹ H2149 ¹ H2150 ¹ H2154 ¹			
LIGHT BLUE					H2223 ²		H2007 ¹ H2012 ¹ H2018 ¹ H2019 ¹ H2020 ¹ H2700 ¹				
DARK BLUE					H2213 ²	H2600 ¹ H2603 ¹ H2606 ¹ H2607 ¹ H2612 ¹ H2615 ¹					
GREEN	H2218 ²	H2219 ²	H2220 ²	H2214 ²	H2252 ¹						
BROWN											
PURPLE			H2410 ¹ H2411 ¹ H2425 ¹ H2461 ¹ H2475 ¹ H2485 ¹								
GRAY											
ORANGE	H2918 ¹ H2919 ¹ H2920 ¹ H2921 ¹ H2975 ¹										

1. One stripe - single color For example: Yellow for 2132
2. Two stripes - Different colors For example: Black/Light Blue for H2010.
3. Three stripes - Various colors For example: Light Blue/Red/Yellow for H2017

* For specific color codes by designation, see table "Color Code by Aluminum Hardener Designation" on the next page.

COLOR CODE FOR ALUMINUM HARDENERS - Continued

BY ALUMINUM HARDENER DESIGNATION

H2000	Red/White
H2001	Red/White
H2002	Black/Yellow
H2003	Black/Purple
H2004	Black/Yellow
H2005	Black/Yellow
H2007	Light Blue
H2010	Black/Lt. Blue
H2011	Black/Lt. Blue
H2012	Light Blue
H2016	Black/Purple
H2017	Light Blue/Red/Yellow
H2018	Light Blue
H2019	Light Blue
H2020	Light Blue
H2021	Black/Yellow
H2025	Red/Dark Blue
H2030	Black/Lt. Blue
H2035	Black/Purple
H2132	Yellow
H2148	Yellow
H2149	Yellow
H2150	Yellow
H2154	Yellow
H2201	Green/Red
H2202	Green/Yellow
H2203	Red/Yellow
H2204	Red/Yellow
H2206	Red
H2207	Green/Black
H2209	Red
H2210	Red
H2211	Green/White
H2213	Green/Dark Blue
H2214	Green/Brown
H2217	Red/Yellow
H2218	Green/Orange
H2219	Green/Gray
H2220	Green/Purple
H2221	Red/Yellow
H2222	Red /Yellow
H2223	Green/Lt. Blue
H2231	Red/Purple
H2252	Green
H2258	Red/Brown
H2264	Red/White
H2302	Black/White
H2312	Black/White
H2320	Black/White
H2321	Black/White
H2350	Black/White
H2410	Purple
H2411	Purple
H2425	Purple
H2461	Purple
H2475	Purple
H2485	Purple
H2500	Black/Gray
H2501	Black/Gray
H2575	Black/Gray

H2600	Dark Blue
H2602	Black/Orange
H2603	Dark Blue
H2605	Black/Orange
H2606	Dark Blue
H2607	Dark Blue
H2610	Black/Orange
H2612	Dark Blue
H2615	Dark Blue
H2632	Black/Dark Blue/Black
H2633	Black/Dark Blue/Black
H2700	Light Blue
H2810	Black
H2811	Black
H2825	Black
H2845	Black
H2875	Black
H2880	Black
H2918	Orange
H2919	Orange
H2920	Orange
H2921	Orange
H2975	Orange

See footnotes on page 5.

COLOR CODE FOR ALUMINUM HARDENERS - Continued

BY ALTERNATE DESIGNATION

	Beryllium 1%	H2002	Black/Yellow
	Beryllium 2.5%	H2004	Black/Yellow
	Beryllium 5%	H2005	Black/Yellow
+	Beryllium 5%	H2021	Black/Yellow
	Bismuth 3%	H2003	Black/Purple
	Bismuth 8%	H2016	Black/Purple
	Bismuth 10%	H2035	Black/Purple
	Boron 3%	H2203	Red/Yellow
	Boron 4%	H2204	Red/Yellow
	Boron 5%	H2217	Red/Yellow
	Boron 8%	H2222	Red/Yellow
	Boron 10%	H2221	Red/Yellow
	Calcium 10%	H2001	Red/White
	Calcium 20%	H2000	Red/White
	Chromium 10%	H2918	Orange
	Chromium 20%	H2919	Orange
	Chromium 20%	H2920	Orange
	Chromium 20%	H2921	Orange
	Chromium 75 %	H2975	Orange
	Copper 32%	H2132	Yellow
	Copper 50%	H2148	Yellow
	Copper 50%	H2149	Yellow
	Copper 50%	H2150	Yellow
	Copper 54%	H2154	Yellow
	Iron 10%	H2810	Black
	Iron 10%	H2811	Black
	Iron 25%	H2825	Black
	Iron 45%	H2845	Black
	Iron 75%	H2875	Black
	Iron 80%	H2880	Black
	Magnesium 25%	H2010	Black/Lt. Blue
	Magnesium 50%	H2011	Black/Lt. Blue
	Magnesium 68%	H2030	Black/Lt. Blue
	Manganese 10%	H2410	Purple
	Manganese 10%	H2411	Purple
	Manganese 25%	H2425	Purple
	Manganese 61%	H2461	Purple
	Manganese 75%	H2475	Purple
	Manganese 85%	H2485	Purple
	Nickel 10%	H2500	Black/Gray
	Nickel 20%	H2501	Black/Gray
	Nickel 75%	H2575	Black/Gray
	Scandium 2%	H2025	Red/Dark Blue
	Silicon 12%	H2302	Black/White
	Silicon 20%	H2320	Black/White
	Silicon 20%	H2321	Black/White
	Silicon 36%	H2312	Black/White
	Silicon 50%	H2350	Black/White
	Strontium 3.5%	H2012	Light Blue
	Strontium 5%	H2018	Light Blue
	Strontium 10%	H2007	Light Blue
	Strontium 10%, Silicon 14%	H2700	Light Blue
	Strontium 10%, Titanium 1%, Boron 0.2%	H2017	Lt. Blue/Red/Yellow
	Strontium 15%	H2019	Light Blue
	Strontium 20%	H2020	Light Blue

See footnotes on page 5.

COLOR CODE FOR ALUMINUM HARDENERS - Continued

BY ALTERNATE DESIGNATION

Titanium 6%	H2206	Red
Titanium 10%	H2209	Red
Titanium 10%	H2210	Red
Titanium 3%, Carbon 0.15%	H2231	Red/Purple
Titanium 5%, Carbon 0.18%	H2258	Red/Brown
Titanium 6%, Carbon 0.04%	H2264	Red/White
Titanium 1.7% Boron 1.4%	H2223	Green/Lt. Blue
Titanium 3%, Boron 0.2%	H2220	Green/Purple
Titanium 3%, Boron 0.4%	H2219	Green/Gray
Titanium 3%, Boron 1%	H2214	Green/Brown
Titanium 5%, Boron 0.1%	H2201	Green/Red
Titanium 5%, Boron 0.2%	H2207	Green/Black
Titanium 5%, Boron 0.6%	H2202	Green/Yellow
Titanium 5%, Boron 1%	H2252	Green
Titanium 6%, Boron 0.4%	H2218	Green/Orange
Titanium 10%, Boron 0.4 %	H2213	Green/ Dark Blue
Titanium 10%, Boron 1%	H2211	Green/White
Vanadium 2.5%	H2602	Black/Orange
Vanadium 5%	H2605	Black/Orange
Vanadium 10%	H2610	Black/Orange
Zirconium 3%	H2603	Dark Blue
Zirconium 5%	H2607	Dark Blue
Zirconium 6%	H2606	Dark Blue
Zirconium 10%	H2600	Dark Blue
Zirconium 10%	H2612	Dark Blue
Zirconium 15%	H2615	Dark Blue
Zirconium 3%, Vanadium 2%	H2632	Black/Dark Blue/Black
Zirconium 6%, Vanadium 4%	H2633	Black/Dark Blue/Black

See footnotes on page 5.

INACTIVE ALUMINUM HARDENERS

	<u>DESIGNATION</u>	<u>DATE RECLASSIFIED</u>
	H2006	1989-06-28
	H2008	1986-07-08
	H2009	1990-11-05
	H2013	1986-07-08
	H2014	2003-09-25
	H2015	1986-07-08
	H2115	1989-06-28
	H2118	1989-06-28
	H2120	2003-09-25
	H2140	1989-06-28
	H2205	1986-07-08
	H2208	1986-07-08
†	H2209	1986-07-08
	H2212	1998-12-01
	H2215	1989-06-28
	H2216	2000-03-08
	H2251	1999-10-24
	H2300	1989-06-28
	H2301	1986-07-08
	H2307	2003-09-25
†	H2320	1989-06-28
	H2351	1986-07-08
	H2401	1994-03-31
	H2403	1986-07-08
	H2405	1986-07-08
	H2407	1986-07-08
†	H2410	1989-06-28
	H2420	1986-07-08
	H2430	1986-07-08
	H2510	1986-07-08
	H2550	1986-07-08
	H2801	1986-07-08
	H2804	1986-07-08
†	H2810	1986-07-08
	H2820	2003-09-25
	H2900	1986-07-08
	H2910	1989-06-28

† Designation Reassigned

See footnotes on page 5.

RECOMMENDATION INTERNATIONAL DESIGNATION SYSTEM FOR ALUMINUM HARDENERS

This Recommendation is based on the numerical designation system for aluminum hardeners which was adopted in the U.S.A. in 1973, and which became its national standard in 1975. Designations, registered in accordance with this Recommendation, may be used by any country. For use, see Appendix A, B, C and D.

1. Scope

1.1 This recommendation describes a system for designating aluminum hardeners used primarily for the addition of alloying or grain refining elements or modifiers to aluminum alloy melts.

2. Aluminum Hardener Designation System ⁽¹⁾

2.1 This system consists of four digit numerical designations prefixed by the letter H. The first two digits identify the aluminum hardener group by major alloying element(s)⁽²⁾⁽³⁾ as shown in Table 1. The last two digits indicate the sequential registration of aluminum hardeners beginning with the number H2X00 and have no other significance.

TABLE 1
Designations for Aluminum Hardener Groups ⁽⁴⁾

	<i>Major Alloying Elements</i>	<i>Designation No.</i>
Aluminum Hardeners	Other Elements ^(a)	H20XX
	Cu	H21XX
	Ti, B	H22XX
	Si	H23XX
	Mn	H24XX
	Ni	H25XX
	Zr, V	H26XX
	Two or more elements, each over 9.5%	H27XX
	Fe	H28XX
	Cr	H29XX
Grouped by Major Added Elements Other Than Aluminum		

(a) Major elements other than those listed.

FOOTNOTE

(1) Chemical composition limits and designations conforming to this recommendation may be registered with The Aluminum Association provided

(a) The aluminum hardener is offered for sale;

(b) The aluminum hardener contains more aluminum than attributable to impurity and the aluminum serves a useful function other than qualifying the aluminum hardener for inclusion in the system;

(c) The aluminum hardener must be produced specifically for and regularly used as an alloying material in the production of aluminum and aluminum alloys;

(d) The complete chemical composition limits are registered; and

(e) The composition is significantly different from that of any other aluminum hardeners for which a numerical designation already has been assigned, where "significant" is defined as:

(i) A change of the following amounts or more in arithmetic mean of the limits for each individual alloying element:

<i>Arithmetic Mean of Limits for Alloying Elements in Registered Aluminum Hardener</i>	<i>Minimum Arithmetic Changes Need for New Aluminum Hardener Issuance*</i>
--	--

Up thru 0.30%	0.10
Over 0.30 thru 1.0%	0.15
Over 1.0 thru 2.0%	0.20
Over 2.0 thru 3.0%	0.30
Over 3.0 thru 4.0%	0.40
Over 4.0 thru 5.0%	0.50
Over 5.0 thru 6.0%	0.70
Over 6.0	1.00

*Lesser amounts are considered too small to issue new aluminum hardener designation.

(ii) Addition or deletion of one or more alloying elements with limits having an arithmetic mean of 0.20% or more.

(iii) Change in limits for impurities for which the difference between arithmetic means (existing and proposed) is at least 0.10%.

(2) For codification purposes an alloying element is any element which is intentionally added.

(3) A major element is that element other than aluminum having the greatest nominal concentration. Should two or more major elements have equal nominal concentrations, that element appearing first in the element limit sequence shall be used to determine designation grouping. When nominal concentration of two or more elements are each greater than 9.5%, such aluminum hardeners are assigned to the 27XX group.

(4) Standard limits for alloying elements and impurities are expressed in the following sequence: Silicon; Iron; Copper; Manganese; Chromium; Nickel; Titanium; Boron; Vanadium (See Note 1); Other (See Note 2) elements, Each; Other (See Note 2) elements, Total; Aluminum (See Note 3).

Note 1- Additional specified elements having limits are inserted in alphabetical order by their chemical symbols between Vanadium and Other Elements, Each, or are specified in footnotes.

Note 2- "Others" includes listed elements for which no specific limit is shown as well as unlisted metallic elements. The producer may analyze samples for trace elements not specified in the registration or specification; however, such analysis is not required and may not cover all metallic "Others" elements. Should any analysis by the producer or the purchaser establish that an "Others" element exceeds the limit of "Each" or that the aggregate of several "Others" elements exceeds the limit of "Total", the material shall be considered non-conforming.

Note 3- Aluminum is specified as a remainder for aluminum hardeners.

APPENDIX A

TERMS AND DEFINITIONS

A.1 Aluminum Hardener:

Alloy containing aluminum and one or more other elements added to molten aluminum to alter the chemical composition.

Note 1: The term “aluminum hardener” is often used generically to include grain refiners, modifiers, performance hardeners, performance products, and master alloys.

Note 2: The term “master alloy” is used for different concepts in different parts of the world. In Europe the term refers to binary alloys obtained from melting, and in the US the term refers to an alloying additive combining several elements in a fixed ratio, which is added to molten aluminum to provide a finished alloy composition.

Note 3: Aluminum hardeners can have various forms including cast products (such as waffles), compacted products (such as briquettes), granules and rod.

A.1.1 Grain Refiner:

Alloy intended to reduce the grain size of cast aluminum.

A.1.2 Modifier:

Alloy intended to modify the microstructure of the cast aluminum.

A.1.3 Performance Hardener; Performance Product:

Alloy intended to improve product characteristics (such as oxidation control, electrical conductivity, etc.) that are different from those achieved by grain refiners or modifiers.

APPENDIX B

USE OF DESIGNATIONS

- B.1 All countries using designations in accordance with this Recommendation should use the same numerical designation for aluminum hardeners having identical or closely similar chemical composition limits. They should register the limits and the designations used with all other countries using these designations.
- B.2 A new numerical designation should be assigned only for aluminum hardeners having chemical composition limits significantly different from other aluminum hardeners for which designations have previously been assigned.
- B.3 Designations should be allotted in the following order of precedence:
 - B.3.1 The registered designation should be used if composition limits are identical to those previously registered by another country.
 - B.3.2 A new numerical designation should be assigned only for a significantly different composition not meeting the requirements of B.3.1. In this case, a number must be assigned which has not been used and which will not be assigned by any other country using numerical designations conforming to this Recommendation.
- B.4 Any new numerical designation should have an accompanying color code assignment, based on the color code scheme defined in Appendix D.

APPENDIX C

GUIDELINES FOR DETERMINING COMPLIANCE WITH DECLARATION OF ACCORD, ITEM 1.a., "SALE OF ALUMINUM HARDENER" AND "COMMERCIAL QUANTITY"

C.1 Sale of Aluminum Hardener

Sale of an aluminum hardener shall have been made to external users/customers (i.e., internal use and/or transfer of an aluminum hardener within a company does not meet the stated criteria).

C.2 Commercial Quantity

C.2.1 The aluminum hardener has undergone bona fide mill production and is NOT a "laboratory" scale volume.

C.2.2 The aluminum hardener is cast and fabricated in standard production facilities and is NOT a one-time production.

C.2.3 There is an expected and ongoing commercial demand and/or need for the aluminum hardener.

C.2.4 The aluminum hardener must be purchased and sold in a standard business context, which indicates that the aluminum hardener is actually "sold" and not "given away" for uses such as promotional evaluations.

APPENDIX D

COLOR SCHEME FOR DETERMINING COLOR CODES FOR ALUMINUM HARDENERS

All countries using designations in accordance with the Recommendation shall use the color scheme outlined below in determining color codes for new registrations. These color codes apply to all aluminum hardener forms (e.g. waffle, briquettes, etc.). See the Table on the next page for the color code assigned to aluminum hardeners. If the product is supplied in containers, the container shall be identified in the assigned color with both the aluminum hardener designation and the alternate designation (Iron 20% for example).

D.1 High Volume products are coded with one stripe which indicates the major alloying element(s).

D.2 High Volume products exceptions:

- Strontium products are coded with one light blue stripe except H2017, i.e. 10 Sr-1Ti-0.2 B, which is color coded with three stripes having the colors light blue, red, and yellow.
- Zirconium products are coded with one dark blue stripe with the exceptions of H2632, i.e. 3 Zr-2 V and H2633, i.e. 6 Zr-4 V, which are color coded with three stripes having the colors black, dark blue, and black.

D.3 Medium Volume/Low Volume products are coded with 2 stripes, the first stripe is always black and second stripe indicates the major alloying element(s).

D.4 Performance Products are coded with 2 stripes, the first stripe is always red and second stripe indicates the major alloying element(s).

D.5 Grain Refiner products

- Titanium Boron products are coded with 2 stripes, the first stripe is green and the second stripe is variable.
- Titanium Carbon products are coded with 2 stripes, the first stripe is red and the second stripe is variable.

Table of Color Code Schemes

Major Alloying Element(s)	Category	Color Code
Fe	High Volume	Black
Mn	High Volume	Purple
Cr	High Volume	Orange
Cu	High Volume	Yellow
Ti	High Volume	Red
Sr	High Volume	Light Blue
Zr	High Volume	Dark Blue
Mg	Medium/Low Volume	Black-Light Blue
Ni	Medium/Low Volume	Black-Gray
Si	Medium/Low Volume	Black-White
V	Medium/Low Volume	Black-Orange
Be	Medium/Low Volume	Black-Yellow
Bi	Medium/Low Volume	Black -Purple
Pb	Medium/Low Volume	Black-Green
B	Performance	Red-Yellow
Ca	Performance	Red-White
Sc	Performance	Red-Dark Blue
Zr - V	Exception	Black-Dark Blue-Black
Sr - Ti -B	Exception	Light Blue-Red-Yellow
Sr - Si	Exception	Light Blue
Ti - B	Grain Refiners	Green-Other Color
Ti - C	Grain Refiners	Red-Other Color

DECLARATION OF ACCORD ON AN INTERNATIONAL DESIGNATION SYSTEM FOR ALUMINUM HARDENERS

It is agreed by the parties hereto that the following rules shall apply in assigning aluminum hardener designations in accordance with the Recommendation dated 2001 September 20 and last revised March 2014 for an International Designation System for Aluminum Hardeners:

- To be eligible for registration:
 - The aluminum hardener shall be offered for sale currently and shall have been supplied in the previous twelve months, in both cases in commercial quantities;
 - The complete chemical composition limits shall be registered and the former designation, if any, shall be shown;
 - The composition shall be different from that of any aluminum hardener for which a numerical designation has already been assigned;
 - The aluminum hardener shall contain more aluminum than attributable to impurity and the aluminum shall serve a useful function other than qualifying the aluminum hardener for inclusion in the system;
 - The aluminum hardener shall be specifically produced for and regularly used as an alloying material in the production of aluminum and aluminum alloys.
- All requests for international registrations shall be submitted to The Aluminum Association by a signatory of the Declaration of Accord. The signatory, in carrying out this function, shall endeavor to restrict registrations to those required for international, regional or national standards or standards of equivalent importance in the commercial field. In view of its historic usage of these designations, more latitude is ceded to The Aluminum Association in this regard.
- It shall be the duty of each signatory to copy all other signatories on any correspondence during the registration process. The aluminum hardener designation shall be assigned by The Aluminum Association when negotiations on composition limits are complete among all signatories to the Declaration of Accord.
- No designation or chemical composition limits shall become final until at least 60 days after announcement to all signatories. During this 60-day period, all questions and objections regarding the designation or chemical composition limits shall be submitted; or an extension of the period shall be requested. Technical objections shall be substantially resolved prior to final registration.
- After the 60-day period, or any extension thereof, The Aluminum Association shall confirm the registered designation and the composition limits to all signatories.
- No changes in the composition limits are allowed after the registration is final.
- This Declaration of Accord may be executed in several counterparts and all so executed shall constitute one agreement.

Organization
Representative
Address
Date
Signature

DÉCLARATION D'ACCORD SUR UN SYSTÈME DE DÉSIGNATION INTERNATIONALE POUR LES DURCISSEURS D'ALUMINIUM

Il est convenu par les participants que les règles suivantes s'appliqueront pour la désignations de durcisseurs d'aluminium en concordance avec la recommandation datée du 20 septembre 2001 dernièrement révisée en mars 2014 pour un système de désignation internationale pour les durcisseurs d'aluminium.

- Pour être admis à l'enregistrement:
 - Le durcisseur d'aluminium devra être offert à la vente et avoir été fourni au cours des douze derniers mois, en quantités commerciales dans les deux cas;
 - Les limites de composition chimique complètes doivent être enregistrées ainsi que la désignation précédente, s'il y a lieu, doit paraître;
 - La composition devra différer de celle de tout durcisseur d'aluminium pour lequel une désignation numérique a déjà été assignée;
 - Le durcisseur d'aluminium devra contenir plus d'aluminium qu'attribuable à l'impureté et l'aluminium devra avoir une utilité autre que la qualification du durcisseur d'aluminium pour inclusion dans le système;
 - Le durcisseur d'aluminium doit être produit spécifiquement pour, et doit être utilisé régulièrement comme un matériau d'alliage dans la production d'aluminium et d'alliages d'aluminium.
- Toute demande d'enregistrement international doit être soumise à l'Aluminum Association par un signataire de la Déclaration d'Accord. Ledit signataire, dans l'exercice de cette fonction, s'appliquera à limiter les enregistrements à ceux requis pour les normes internationales, nationales ou régionales, ou autres normes d'importance équivalente dans le secteur commercial. Compte tenu de l'utilisation historique de ces désignations, l'Aluminum Association dispose d'une plus grande latitude à cet égard.
- Il appartiendra à chaque signataire d'informer toutes les organisations des pays participants de toutes correspondances pendant le processus d'enregistrement. Les attributions de numéros le durcisseur d'aluminium seront effectuées par l'Aluminum Association dès l'achèvement des négociations sur les limites de composition par tous les signataires de la Déclaration d'Accord.
- Aucune désignation ou limites de composition chimique ne sera définitive avant au moins 60 jours à compter de la date d'annonce donnée aux organisations participantes. Durant ces 60 jours toutes questions et objections concernant cette désignation ou les limites de composition chimique devront être soumises; sinon, une extension de la période devra être demandée à l'Aluminium Association. Toutes objections techniques devront être résolues de façon substantielle avant l'enregistrement final.
- Après la période de 60 jours, ou de l'extension de période demandée, l'Aluminium Association devra confirmer la désignation enregistrée et les limites de composition chimique à chaque organisation participante.
- Aucun changement dans les limites de composition chimique est autorisé après l'enregistrement final.
- Cette Déclaration d'Accord pourra être reproduite en plusieurs exemplaires tout en constituant un seul agrément.

Organisation
Représentant
Adresse
Date
Signature

OTHER ALUMINUM ASSOCIATION REGISTRATION RECORDS AND REFERENCES

- **INTERNATIONAL DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR UNALLOYED ALUMINUM** (Gold Sheets).
- **INTERNATIONAL ALLOY DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR WROUGHT ALUMINUM AND WROUGHT ALUMINUM ALLOYS** (Teal Sheets). Contains a complete list of all registered designations for wrought alloys including those produced in North America.
- **DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR ALUMINUM ALLOYS IN THE FORM OF CASTINGS AND INGOT** (Pink Sheets).
- **DESIGNATIONS AND CHEMICAL COMPOSITION LIMITS FOR ALUMINUM POWDERS AND ALUMINUM ALLOY POWDERS** (Purple Sheets).
- **TEMPERS FOR ALUMINUM AND ALUMINUM ALLOY PRODUCTS** (Yellow Sheets).
- **TEMPERS FOR ALUMINUM AND ALUMINUM ALLOY PRODUCTS—METRIC EDITION** (Tan Sheets).
- **COMPONENTS OF CLAD ALUMINUM ALLOY PRODUCTS** (Lt. Green Sheets).

On-line ordering of The Aluminum Association publications is available through our website: www.aluminum.org.