

Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes¹

This standard is issued under the fixed designation B 179; 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.

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

1. Scope*

1.1 This specification covers commercial aluminum alloys in ingot form for remelting and molten form for the manufacture of castings. The specific gravity of these alloys does not exceed 3.0 and they are designated as shown in [Table 1](#).

NOTE 1—Throughout this specification the use of “ingot” in a general sense includes sow, T-bar, T-ingot, and pig.

1.2 Alloy designations are in accordance with ANSI [H35.1/H35.1\(M\)](#). The equivalent Unified Numbering System alloy designations are in accordance with Practice [E 527](#).

NOTE 2—Supplementary data pertaining to the alloys covered by this specification when used in the form of castings are given in Specifications [B 26/B 26M](#), [B 85](#), [B 108](#), [B 618](#), and [B 686](#).

1.3 For acceptance criteria for inclusion of new aluminum and aluminum alloys in this specification, see [Annex A1](#).

1.4 The values stated in inch-pound units are to be regarded as the standard.

1.5 *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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

[B 26/B 26M](#) Specification for Aluminum-Alloy Sand Castings

[B 85](#) Specification for Aluminum-Alloy Die Castings

[B 108](#) Specification for Aluminum-Alloy Permanent Mold Castings

¹ This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.01 on Aluminum Alloy Ingots and Castings.

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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.

[B 618](#) Specification for Aluminum-Alloy Investment Castings

[B 666/B 666M](#) Practice for Identification Marking of Aluminum and Magnesium Products

[B 686](#) Specification for Aluminum Alloy Castings, High-Strength

[E 29](#) Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

[E 34](#) Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys

[E 88](#) Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition

[E 527](#) Practice for Numbering Metals and Alloys (UNS)

[E 607](#) Test Method for Atomic Emission Spectrometric Analysis of Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere

[E 716](#) Practices for Sampling Aluminum and Aluminum Alloys for Spectrochemical Analysis

[E 1251](#) Test Method for Analysis of Aluminum and Aluminum Alloys by Atomic Emission Spectrometry

2.2 *ANSI Standard:*

[H35.1/H35.1\(M\)](#) American National Standard Alloy and Temper Designation Systems for Aluminum³

2.3 *Aluminum Associations Standard:*

Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot (The Pink Sheets)³

3. Ordering Information

3.1 Orders for material under this specification shall include the following information:

3.1.1 This specification designation (which includes the number, the year, and the revision letter, if applicable),

3.1.2 Alloy (Section [6](#), [Table 1](#)), and

3.1.3 The quantity in pieces or pounds.

³ Available from Aluminum Association, Inc., 1525 Wilson Blvd., Suite 600, Arlington, VA 22209, <http://www.aluminum.org>.

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

TABLE 1 Chemical Composition Limits of Aluminum Alloys in Ingot and Molten Forms for All Casting Processes^{1,2}

This Table has been reprinted by the permission of the Aluminum Association, Inc.

Only composition limits which are identical to those listed herein or are registered with the Aluminum Association should be designated as “AA” alloys.

NOTE 1—Where single units are shown, these indicate the maximum amounts permitted.

NOTE 2—Analysis shall be made for those elements for which limits are shown in this table.

NOTE 3—The following applies to all specified limits in the table: For purposes of acceptance or rejection an observed value or a calculated value obtained from analysis should be rounded to the nearest unit in the last right-hand place of figures used in expressing the specified limit in accordance with the rounding-off method of Practice E 29.

Registered Alloys in the Form of XXX.1 Ingot and XXX.2 Ingot

Designation		Registered Date	Products ⁵	Composition, %												Others ²⁶		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn					
														Each	Total ³			
100.1*	...	06/30/70	Ingot	0.15	0.6-0.8	0.10	... ¹⁹	...	... ¹⁹	...	0.05	... ¹⁹	...	0.03 ¹⁹	0.10	99.00 ⁴		
130.1*	...	06/30/70	Ingot	... ¹⁸	... ¹⁸	0.10	... ¹⁹	...	... ¹⁹	...	0.05	... ¹⁹	...	0.03 ¹⁹	0.10	99.30 ⁴		
150.1*	...	06/30/70	Ingot	... ²⁰	... ²⁰	0.05	... ¹⁹	...	... ¹⁹	...	0.05	... ¹⁹	...	0.03 ¹⁹	0.10	99.50 ⁴		
160.1	...	01/28/76	Ingot	0.10 ²⁰	0.25 ²⁰	...	... ¹⁹	...	... ¹⁹	...	0.05	... ¹⁹	...	0.03 ¹⁹	0.10	99.60 ⁴		
170.1*	...	06/30/70	Ingot	... ²¹	... ²¹	...	... ¹⁹	...	... ¹⁹	...	0.05	... ¹⁹	...	0.03 ¹⁹	0.10	99.70 ⁴		
201.2	...	04/17/68	Ingot	0.10	0.10	4.0-5.2	0.20-0.50	0.20-0.55	...	...	...	0.15-0.35	...	0.05 ⁷	0.10	Remainder		
A201.1	A201.2	10/09/70	Ingot	0.05	0.07	4.0-5.0	0.20-0.40	0.20-0.35	...	...	...	0.15-0.35	...	0.03 ⁷	0.10	Remainder		
203.2	Hiduminium 350	12/02/72	Ingot	0.20	0.35	4.8-5.2	0.20-0.30	0.10	...	1.3-1.7	0.10	0.15-0.25	...	0.05 ²²	0.20	Remainder		
204.2	A-U5GT	10/01/74	Ingot	0.15	0.10-0.20	4.2-4.9	0.05	0.20-0.35	...	0.03	0.05	0.15-0.25	0.05	0.05	0.15	Remainder		
206.2	...	04/23/76	Ingot	0.10	0.10	4.2-5.0	0.20-0.50	0.20-0.35	...	0.03	0.05	0.15-0.25	0.05	0.05	0.15	Remainder		
A206.2	...	04/23/76	Ingot	0.05	0.07	4.2-5.0	0.20-0.50	0.20-0.35	...	0.03	0.05	0.15-0.25	0.05	0.05	0.15	Remainder		
B206.2	...	07/07/03	Ingot	0.05	0.07	4.2-5.0	0.20-0.50	0.20-0.35	...	0.03	0.05	0.05	0.05	0.05	0.15	Remainder		
240.1	A240.1, A140	...	Ingot	0.50	0.40	7.0-9.0	0.30-0.7	5.6-6.5	...	0.30-0.7	0.10	0.20	...	0.05	0.15	Remainder		
242.1	142	...	Ingot	0.7	0.8	3.5-4.5	0.35	1.3-1.8	0.25	1.7-2.3	0.35	0.25	...	0.05	0.15	Remainder		
242.2	142	...	Ingot	0.6	0.6	3.5-4.5	0.10	1.3-1.8	...	1.7-2.3	0.10	0.20	...	0.05	0.15	Remainder		
A242.1	A142	...	Ingot	0.6	0.6	3.7-4.5	0.10	1.3-1.7	0.15-0.25	1.8-2.3	0.10	0.07-0.20	...	0.05	0.15	Remainder		
A242.2	A142	...	Ingot	0.35	0.6	3.7-4.5	0.10	1.3-1.7	0.15-0.25	1.8-2.3	0.10	0.07-0.20	...	0.05	0.15	Remainder		
295.1	195	...	Ingot	0.7-1.5	0.8	4.0-5.0	0.35	0.03	...	...	0.35	0.25	...	0.05	0.15	Remainder		
295.2	195	...	Ingot	0.7-1.2	0.8	4.0-5.0	0.30	0.03	...	...	0.30	0.20	...	0.05	0.15	Remainder		
296.1	B295.1, B195	...	Ingot	2.0-3.0	0.9	4.0-5.0	0.35	0.05	...	0.35	0.50	0.25	...	...	0.35	Remainder		
296.2	B295.2, B195	...	Ingot	2.0-3.0	0.8	4.0-5.0	0.30	0.03	...	...	0.30	0.20	...	0.05	0.15	Remainder		
301.1 ²⁸	...	08/02/94	Ingot ²⁷	9.5-10.5	0.8-1.2	3.0-3.5	0.50-0.8	0.30-0.50	...	1.0-1.5	0.05	0.20	...	0.03	0.10	Remainder		
302.1 ²⁸	...	08/02/94	Ingot ²⁷	9.5-10.5	0.20	2.8-3.2	...	0.8-1.2	...	1.0-1.5	0.05	0.20	...	0.03	0.10	Remainder		
303.1 ²⁸	...	08/02/94	Ingot ²⁷	9.5-10.5	0.8-1.2	0.20	0.50-0.8	0.50-0.7	...	...	0.05	0.20	...	0.03	0.10	Remainder		
308.1 ²⁸	A108	...	Ingot	5.0-6.0	0.8	4.0-5.0	0.50	0.10	...	...	1.0	0.25	...	...	0.50	Remainder		

TABLE 1 Continued

Designation		Registered Date	Products ⁵	Composition, %												Others ²⁶		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn					
															Each	Total ³		
308.2 ²⁸	A108	...	Ingot	5.0-6.0	0.8	4.0-5.0	0.30	0.10	...	...	0.50	0.20	...	...	0.50	Remainder		
318.1 ²⁸	...	01/29/91	Ingot	5.5-6.5	0.8	3.0-4.0	0.50	0.15-0.6	...	0.35	0.9	0.25	...	...	0.50	Remainder		
319.1 ²⁸	319, All Cast	...	Ingot	5.5-6.5	0.8	3.0-4.0	0.50	0.10	...	0.35	1.0	0.25	...	...	0.50	Remainder		
319.2 ²⁸	319, All Cast	...	Ingot	5.5-6.5	0.6	3.0-4.0	0.10	0.10	...	0.10	0.10	0.20	...	...	0.20	Remainder		
A319.1 ²⁸	...	08/28/70	Ingot	5.5-6.5	0.8	3.0-4.0	0.50	0.10	...	0.35	3.0	0.25	...	...	0.50	Remainder		
B319.1 ²⁸	...	10/30/81	Ingot	5.5-6.5	0.9	3.0-4.0	0.8	0.15-0.50	...	0.50	1.0	0.25	...	...	0.50	Remainder		
320.1 ²⁸	...	04/08/82	Ingot	5.0-8.0	0.9	2.0-4.0	0.8	0.10-0.6	...	0.35	3.0	0.25	...	...	0.50	Remainder		
328.1 ²⁸	Red X-8	...	Ingot	7.5-8.5	0.8	1.0-2.0	0.20-0.6	0.25-0.6	0.35	0.25	1.5	0.25	...	...	0.50	Remainder		
332.1 ²⁸	F332.1, F132	...	Ingot	8.5-10.5	0.9	2.0-4.0	0.50	0.6-1.5	...	0.50	1.0	0.25	...	...	0.50	Remainder		
332.2 ²⁸	F332.2, F132	...	Ingot	8.5-10.0	0.6	2.0-4.0	0.10	0.9-1.3	...	0.10	0.10	0.20	...	...	0.30	Remainder		
333.1 ²⁸	333	...	Ingot	8.0-10.0	0.8	3.0-4.0	0.50	0.10-0.50	...	0.50	1.0	0.25	...	...	0.50	Remainder		
A333.1 ²⁸	...	08/28/70	Ingot	8.0-10.0	0.8	3.0-4.0	0.50	0.10-0.50	...	0.50	3.0	0.25	...	...	0.50	Remainder		
336.1 ²⁸	A332.1, A132		Ingot	11.0-13.0	0.9	0.50-1.5	0.35	0.8-1.3	...	2.0-3.0	0.35	0.25	...	0.05	...	Remainder		
336.2 ²⁸	A332.2, A132		Ingot	11.0-13.0	0.9	0.50-1.5	0.10	0.9-1.3	...	2.0-3.0	0.10	0.20	...	0.05	0.15	Remainder		
339.1 ²⁸	Z332.1, Z132	...	Ingot	11.0-13.0	0.9	1.5-3.0	0.50	0.6-1.5	...	0.50-1.5	1.0	0.25	...	...	0.50	Remainder		
354.1 ²⁸	354	...	Ingot	8.6-9.4	0.15	1.6-2.0	0.10	0.45-0.6	...	...	0.10	0.20	...	0.05	0.15	Remainder		
354.2 ²⁸		07/21/97	Ingot	8.6-9.4	0.06	1.6-2.0	0.10	0.45-0.6	...	...	0.10	0.20	...	0.05	0.15	Remainder		
355.1 ²⁸	355	...	Ingot	4.5-5.5	0.50 ¹⁰	1.0-1.5	0.50 ¹⁰	0.45-0.6	0.25	...	0.35	0.25	...	0.05	0.15	Remainder		
355.2 ²⁸	355	...	Ingot	4.5-5.5	0.14-0.25	1.0-1.5	0.05	0.50-0.6	...	...	0.05	0.20	...	0.05	0.15	Remainder		
A355.2 ²⁸	...	09/17/81	Ingot	4.5-5.5	0.06	1.0-1.5	0.03	0.50-0.6	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder		
C355.1 ²⁸	...	06/04/74	Ingot	4.5-5.5	0.15	1.0-1.5	0.10	0.45-0.6	...	...	0.10	0.20	...	0.05	0.15	Remainder		
C355.2 ²⁸	C355	...	Ingot	4.5-5.5	0.13	1.0-1.5	0.05	0.50-0.6	...	...	0.05	0.20	...	0.05	0.15	Remainder		
356.1 ²⁸	356	...	Ingot	6.5-7.5	0.50 ¹⁰	0.25	0.35 ¹⁰	0.25-0.45	...	...	0.35	0.25	...	0.05	0.15	Remainder		
356.2 ²⁸	356	...	Ingot	6.5-7.5	0.13-0.25	0.10	0.05	0.30-0.45	...	...	0.05	0.20	...	0.05	0.15	Remainder		
A356.1 ²⁸	...	06/04/74	Ingot	6.5-7.5	0.15	0.20	0.10	0.30-0.45	...	...	0.10	0.20	...	0.05	0.15	Remainder		
A356.2 ²⁸	A356	...	Ingot	6.5-7.5	0.12	0.10	0.05	0.30-0.45	...	...	0.05	0.20	...	0.05	0.15	Remainder		
B356.2 ²⁸	...	09/17/81	Ingot	6.5-7.5	0.06	0.03	0.03	0.30-0.45	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder		
C356.2 ²⁸	...	05/30/85	Ingot	6.5-7.5	0.04	0.03	0.03	0.30-0.45	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder		
F356.2 ²⁸	...	10/20/71	Ingot	6.5-7.5	0.12	0.10	0.05	0.17-0.25	...	...	0.05	0.04-0.20	...	0.05	0.15	Remainder		
357.1 ²⁸	357	...	Ingot	6.5-7.5	0.12	0.05	0.03	0.45-0.6	...	...	0.05	0.20	...	0.05	0.15	Remainder		

TABLE 1 Continued

Designation		Registered Date	Products ⁵	Composition, %												
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Others ²⁶		Aluminum Minimum
														Each	Total ³	
A357.2 ²⁸	A357	...	Ingot	6.5-7.5	0.12	0.10	0.05	0.45-0.7	...	...	0.05	0.04-0.20	...	0.03 ⁶	0.10	Remainder
B357.2 ²⁸	...	09/17/81	Ingot	6.5-7.5	0.06	0.03	0.03	0.45-0.6	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder
C357.2 ²⁸	...	09/17/81	Ingot	6.5-7.5	0.06	0.03	0.03	0.50-0.7	...	...	0.03	0.04-0.20	...	0.03 ⁶	0.10	Remainder
E357.1 ²⁸	...	06/06/01	Ingot	6.5-7.5	0.07	...	0.10	0.6-0.7	...	...	...	0.10-0.20	...	0.05 ²⁹	0.15	Remainder
E357.2 ²⁸	...	06/06/01	Ingot	6.5-7.5	0.07	...	0.10	0.6-0.7	...	...	...	0.10-0.20	...	0.05 ³⁰	0.15	Remainder
F357.1 ²⁸	...	06/06/01	Ingot	6.5-7.5	0.07	0.20	0.10	0.45-0.7	...	...	0.10	0.04-0.20	...	0.05 ²⁹	0.15	Remainder
F357.2 ²⁸	...	06/06/01	Ingot	6.5-7.5	0.07	0.20	0.10	0.45-0.7	...	...	0.10	0.04-0.20	...	0.05 ³⁰	0.15	Remainder
358.2 ²⁸	B358.2, Tens-50	...	Ingot	7.6-8.6	0.20	0.10	0.10	0.45-0.6	0.05	...	0.10	0.12-0.20	...	0.05 ¹⁵	0.15	Remainder
359.2 ²⁸	359	...	Ingot	8.5-9.5	0.12	0.10	0.10	0.55-0.7	...	...	0.10	0.20	...	0.05	0.15	Remainder
A359.1 ²⁸		08/02/94	Ingot ²⁷	8.5-9.5	0.20	0.20	0.10	0.45-0.6	...	...	0.05	0.20	...	0.03	0.10	Remainder
360.2 ²⁸	360	...	Ingot	9.0-10.0	0.7-1.1	0.10	0.10	0.45-0.6	...	0.10	0.10	...	0.10	...	0.20	Remainder
A360.1 ^{11,28}	A360	...	Ingot	9.0-10.0	1.0	0.6	0.35	0.45-0.6	...	0.50	0.40	...	0.15	...	0.25	Remainder
A360.2 ²⁸	A360	...	Ingot	9.0-10.0	0.6	0.10	0.05	0.45-0.6	...	...	0.05	...	...	0.05	0.15	Remainder
361.1 ²⁸	...	06/30/78	Ingot	9.5-10.5	0.8	0.50	0.25	0.45-0.6	0.20-0.30	0.20-0.30	0.40	0.20	0.10	0.05	0.15	Remainder
363.1 ²⁸	363	01/16/70	Ingot	4.5-6.0	0.8	2.5-3.5	... ¹⁶	0.20-0.40	... ¹⁶	0.25	3.0-4.5	0.20	0.25	... ¹⁷	0.30	Remainder
364.2 ²⁸	364	...	Ingot	7.5-9.5	0.7-1.1	0.20	0.10	0.25-0.40	0.25-0.50	0.15	0.15	...	0.15	0.05 ¹²	0.15	Remainder
365.1 ²⁸	Silafont-36	01/05/96	Ingot	9.5-11.5	0.12	0.03	0.50-0.8	0.15-0.50	...	...	0.07	0.04-0.15	...	0.03 ¹³	0.10	Remainder
366.1 ²⁸	...-	03/27/03	Ingot ³¹	6.5-7.5	0.12	0.05	0.03	0.6-1.2	...	...	0.05	0.20	...	0.05	0.15	Remainder
369.1 ²⁸	Special K-9	04/04/78	Ingot	11.0-12.0	1.0	0.50	0.35	0.30-0.45	0.30-0.40	0.05	0.9	...	0.10	0.05	0.15	Remainder
380.2 ²⁸	380	...	Ingot	7.5-9.5	0.7-1.1	3.0-4.0	0.10	0.10	...	0.10	0.10	...	0.10	...	0.20	Remainder
A380.1 ^{11,28}	A380	...	Ingot	7.5-9.5	1.0	3.0-4.0	0.50	0.10	...	0.50	2.9	...	0.35	...	0.50	Remainder
A380.2 ²⁸	A380	...	Ingot	7.5-9.5	0.6	3.0-4.0	0.10	0.10	...	0.10	0.10	...	...	0.05	0.15	Remainder
B380.1 ²⁸	A380	...	Ingot	7.5-9.5	1.0	3.0-4.0	0.50	0.10	...	0.50	0.9	...	0.35	...	0.50	Remainder
C380.1 ²⁸	...	01/29/91	Ingot	7.5-9.5	1.0	3.0-4.0	0.50	0.15-0.30	...	0.50	2.9	...	0.35	...	0.50	Remainder
D380.1 ²⁸	...	01/29/91	Ingot	7.5-9.5	1.0	3.0-4.0	0.50	0.15-0.30	...	0.50	0.9	...	0.35	...	0.50	Remainder
381.2 ²⁸	...	06/12/97	Ingot	9.0-10.0	0.7-1.0	3.0-4.0	0.50	0.13	0.15	0.50	2.9	0.20	0.15	... ²⁴	0.50	Remainder
383.1 ²⁸	...	...	Ingot	9.5-11.5	1.0	2.0-3.0	0.50	0.10	...	0.30	2.9	...	0.15	...	0.50	Remainder

TABLE 1 Continued

Designation		Registered Date	Products ⁵	Composition, %												
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Others ²⁶		Aluminum Minimum
														Each	Total ³	
383.2 ²⁸	...	...	Ingot	9.5-11.5	0.6-1.0	2.0-3.0	0.10	0.10	...	0.10	0.10	...	0.10	...	0.20	Remainder
A383.1 ²⁸	...	01/29/91	Ingot	9.5-11.5	1.0	2.0-3.0	0.50	0.15-0.30	...	0.30	2.9	...	0.15	...	0.50	Remainder
384.1 ²⁸	384	...	Ingot	10.5-12.0	1.0	3.0-4.5	0.50	0.10	...	0.50	2.9	...	0.35	...	0.50	Remainder
384.2 ²⁸	384	...	Ingot	10.5-12.0	0.6-1.0	3.0-4.5	0.10	0.10	...	0.10	0.10	...	0.10	...	0.20	Remainder
A384.1 ²⁸	384	...	Ingot	10.5-12.0	1.0	3.0-4.5	0.50	0.10	...	0.50	0.9	...	0.35	...	0.50	Remainder
B384.1 ²⁸	...	01/29/91	Ingot	10.5-12.0	1.0	3.0-4.5	0.50	0.15-0.30	...	0.50	0.9	...	0.35	...	0.50	Remainder
C384.1 ²⁸	...	01/29/91	Ingot	10.5-12.0	1.0	3.0-4.5	0.50	0.15-0.30	...	0.50	2.9	...	0.35	...	0.50	Remainder
390.2 ²⁸	390	...	Ingot	16.0-18.0	0.6-1.0	4.0-5.0	0.10	0.50-0.65 ⁹	...	...	0.10	0.20	...	0.10	0.20	Remainder
A390.1 ²⁸	A390	...	Ingot	16.0-18.0	0.40	4.0-5.0	0.10	0.50-0.65 ⁹	...	...	0.10	0.20	...	0.10	0.20	Remainder
B390.1 ²⁸	...	03/29/79	Ingot	16.0-18.0	1.0	4.0-5.0	0.50	0.50-0.65 ⁹	...	0.10	1.4	0.20	...	0.10	0.20	Remainder
391.1 ²⁸	Mercosil	01303/01	Ingot	18.0-20.0	0.9	0.20	0.30	0.45-0.70	...	...	0.10	0.20	...	0.10	0.20	Remainder
A391.1 ²⁸	Mercosil	01/30/01	Ingot	18.0-20.0	0.50 ¹⁰	0.20	0.30 ¹⁰	0.45-0.70	...	...	0.10	0.20	...	0.10	0.20	Remainder
B391.1 ²⁸	Mercosil	01/30/01	Ingot	18.0-20.0	0.15	0.20	0.30	0.45-0.70	...	...	0.10	0.20	...	0.10	0.20	Remainder
392.1 ²⁸	392	...	Ingot	18.0-20.0	1.1	0.40-0.8	0.20-0.6	0.9-1.2	...	0.50	0.40	0.20	0.30	0.15	0.50	Remainder
393.1 ²⁸	Vanasil	...	Ingot	21.0-23.0	1.0	0.7-1.1	0.10	0.8-1.3	...	2.0-2.5	0.10	0.10-0.20	...	0.05 ¹⁴	0.15	Remainder
393.2 ²⁸	Vanasil	...	Ingot	21.0-23.0	0.8	0.7-1.1	0.10	0.8-1.3	...	2.0-2.5	0.10	0.10-0.20	...	0.05 ¹⁴	0.15	Remainder
413.2 ²⁸	13	...	Ingot	11.0-13.0	0.7-1.1	0.10	0.10	0.07	...	0.10	0.10	...	0.10	...	0.20	Remainder
A413.1 ^{11,28}	A13	...	Ingot	11.0-13.0	1.0	1.0	0.35	0.10	...	0.50	0.40	...	0.15	...	0.25	Remainder
A413.2 ²⁸	A13	...	Ingot	11.0-13.0	0.6	0.10	0.05	0.05	...	0.05	0.05	...	0.05	...	0.10	Remainder
B413.1 ²⁸	...	11/06/84	Ingot	11.0-13.0	0.40	0.10	0.35	0.05	...	0.05	0.10	0.25	...	0.05	0.20	Remainder

TABLE 1 Continued

Designation		Registered Date	Products ⁵	Composition, %												Others ²⁶		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn					
														Each	Total ³			
443.1 ²⁸	43	...	Ingot	4.5-6.0	0.6	0.6	0.50	0.05	0.25	...	0.50	0.25	...	...	0.35	Remainder		
443.2 ²⁸	43	...	Ingot	4.5-6.0	0.6	0.10	0.10	0.05	...	...	0.10	0.20	...	0.05	0.15	Remainder		
A443.1 ²⁸	43 (0.30 max Cu)	...	Ingot	4.5-6.0	0.6	0.30	0.50	0.05	0.25	...	0.50	0.25	...	...	0.35	Remainder		
B443.1 ²⁸	43 (0.15 max Cu)	...	Ingot	4.5-6.0	0.6	0.15	0.35	0.05	...	...	0.35	0.25	...	0.05	0.15	Remainder		
C443.1 ²⁸	A43	...	Ingot	4.5-6.0	1.1	0.6	0.35	0.10	...	0.50	0.40	...	0.15	...	0.25	Remainder		
C443.2 ²⁸	A43	...	Ingot	4.5-6.0	0.7-1.1	0.10	0.10	0.05	...	...	0.10	...	...	0.05	0.15	Remainder		
444.2 ²⁸	...	09/24/73	Ingot	6.5-7.5	0.13-0.25	0.10	0.05	0.05	...	...	0.05	0.20	...	0.05	0.15	Remainder		
A444.1 ²⁸	...	06/04/74	Ingot	6.5-7.5	0.15	0.10	0.10	0.05	...	...	0.10	0.20	...	0.05	0.15	Remainder		
A444.2 ²⁸	A344	...	Ingot	6.5-7.5	0.12	0.05	0.05	0.05	...	...	0.05	0.20	...	0.05	0.15	Remainder		
505.1	...	04/12/004	Ingot ³²	0.40-0.8	0.50	0.15-0.40	0.15	0.9-1.2	0.04-0.35	...	0.25	0.15	...	0.05	0.15	Remainder		
511.1	F514.1, F214	...	Ingot	0.30-0.7	0.40	0.15	0.35	3.6-4.5	...	...	0.15	0.25	...	0.05	0.15	Remainder		
511.2	F514.2, F214	...	Ingot	0.30-0.7	0.30	0.10	0.10	3.6-4.5	...	...	0.10	0.20	...	0.05	0.15	Remainder		
512.2	B514.2, B214	...	Ingot	1.4-2.2	0.30	0.10	0.10	3.6-4.5	...	...	0.10	0.20	...	0.05	0.15	Remainder		
513.2	A514.2, A214	...	Ingot	0.30	0.30	0.10	0.10	3.6-4.5	...	...	1.4-2.2	0.20	...	0.05	0.15	Remainder		
514.1	214	...	Ingot	0.35	0.40	0.15	0.35	3.6-4.5	...	...	0.15	0.25	...	0.05	0.15	Remainder		
514.2	214	...	Ingot	0.30	0.30	0.10	0.10	3.6-4.5	...	...	0.10	0.20	...	0.05	0.15	Remainder		
515.2	L514.2, L214	01/02/70	Ingot	0.50-1.0	0.6-1.0	0.10	0.40-0.6	2.7-4.0	...	...	0.05	...	...	0.05	0.15	Remainder		
516.1	...	09/30/83	Ingot	0.30-1.5	0.35-0.7	0.30	0.15-0.40	2.6-4.5	...	0.25-0.40	0.20	0.10-0.20	0.10	0.05 ²⁵	...	Remainder		
518.1	218	...	Ingot	0.35	1.1	0.25	0.35	7.6-8.5	...	0.15	0.15	...	0.15	...	0.25	Remainder		
518.2	218	...	Ingot	0.25	0.7	0.10	0.10	7.6-8.5	...	0.05	...	...	0.05	...	0.10	Remainder		
520.2	220	...	Ingot	0.15	0.20	0.20	0.10	9.6-10.6	...	...	0.10	0.20	...	0.05	0.15	Remainder		
535.2	Almag 35	...	Ingot	0.10	0.10	0.05	0.10-0.25	6.6-7.5	...	...	...	0.10-0.25	...	0.05 ⁸	0.15	Remainder		
A535.1	A218	...	Ingot	0.20	0.15	0.10	0.10-0.25	6.6-7.5	...	...	...	0.25	...	0.05	0.15	Remainder		
B535.2	B218	...	Ingot	0.10	0.12	0.05	0.05	6.6-7.5	...	...	...	0.10-0.25	...	0.05	0.15	Remainder		
705.1	603, Ternalloy 5	...	Ingot	0.20	0.6	0.20	0.40-0.6	1.5-1.8	0.20-0.40	...	2.7-3.3	0.25	...	0.05	0.15	Remainder		
707.1	607, Ternalloy 7	...	Ingot	0.20	0.6	0.20	0.40-0.6	1.9-2.4	0.20-0.40	...	4.0-4.5	0.25	...	0.05	0.15	Remainder		

TABLE 1 Continued

Designation		Registered Date	Products ⁵	Composition, %												Others ²⁶		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn					
														Each	Total ³			
709.1	...	04/12/04	Ingot ³²	0.40	0.40	1.2-2.0	0.30	2.2-2.9	0.18-0.28	...	5.1-6.1	0.20	...	0.05	0.15	Remainder		
709.2		04/12/04	Ingot ³²	0.15	0.20	1.2-2.0	0.15	2.2-2.9	0.18-0.28	...	5.1-6.0	0.20	...	0.05	0.15	Remainder		
710.1	A712.1, A612	...	Ingot	0.15	0.40	0.35-0.6	0.05	0.65-0.8	...	...	6.0-7.0	0.25	...	0.05	0.15	Remainder		
711.1	C712.1, C612	...	Ingot	0.30	0.7-1.1	0.35-0.6	0.05	0.30-0.45	...	...	6.0-7.0	0.20	...	0.05	0.15	Remainder		
712.2	D712.2, D612, 40E	...	Ingot	0.15	0.40	0.25	0.10	0.50-0.659	0.40-0.6	...	5.0-6.5	0.15-0.25	...	0.05	0.20	Remainder		
713.1	613, Tenzaloy	...	Ingot	0.25	0.8	0.40-1.0	0.6	0.25-0.50	0.35	0.15	7.0-8.0	0.25	...	0.10	0.25	Remainder		
771.2	Precedent 71A	...	Ingot	0.10	0.10	0.10	0.10	0.85-1.0	0.06-0.20	...	6.5-7.5	0.10-0.20	...	0.05	0.15	Remainder		
772.2	B771.2, Precedent 71B	...	Ingot	0.10	0.10	0.10	0.10	0.65-0.8	0.06-0.20	...	6.0-7.0	0.10-0.20	...	0.05	0.15	Remainder		
850.1	750	...	Ingot	0.7	0.50	0.7-1.3	0.10	0.10	...	0.7-1.3	...	0.20	5.5-7.0	...	0.30	Remainder		
851.1	A850.1, A750	...	Ingot	2.0-3.0	0.50	0.7-1.3	0.10	0.10	...	0.30-0.7	...	0.20	5.5-7.0	...	0.30	Remainder		
852.1	B850.1, B750	...	Ingot	0.40	0.50	1.7-2.3	0.10	0.7-0.9	...	0.9-1.5	...	0.20	5.5-7.0	...	0.30	Remainder		
853.2	XC850.2, XC750	...	Ingot	5.5-6.5	0.50	3.0-4.0	0.10	...	...	...	...	0.20	5.5-7.0	...	0.30	Remainder		

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 percent: 0.000X

0.001 but less than 0.01 percent: 0.00X

0.01 but less than 0.10 percent:

Unalloyed aluminum made by a refining process: 0.0XX

Alloys and unalloyed aluminum not made by a refining process: 0.0X

0.10-0.55 percent: 0.XX

(It is customary to express limits of 0.30 percent through 0.55 percent as 0.X0 or 0.X5)

Over 0.55 percent: 0.X, X.X, etc.

(Note—Mg percent for some long standing alloys is an exception to this rule.)

² Except for "Aluminum" and "Others," analysis normally is made 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, in accordance with the following:

—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 figure in the last place retained 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 zeros, 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 percent or more each, expressed to the second decimal before determining the sum.

- ⁴ The aluminum content for unalloyed aluminum not made by a refining process is the difference between 100.00 percent and the sum of all other analyzed metallic elements and silicon present in amounts of 0.010 percent or more each, expressed to the second decimal before determining the sum. When an element's specified maximum limit is 0.XX, an observed value or a calculated value greater than 0.005 but less than 0.010 % is rounded off and shown as "less than 0.01."
- ⁵ Ingot is the normal form in which the material is purchased or delivered, but it may also be in the molten form.
- ⁶ Beryllium 0.04-0.07.
- ⁷ Silver 0.40-1.0.
- ⁸ Beryllium 0.003-0.007; boron 0.002 maximum.
- ⁹ The number of decimal places to which Mg percent is expressed is exempted by the Note stated in Footnote 1.
- ¹⁰ If iron exceeds 0.45, manganese content shall not be less than one-half iron content.
- ¹¹ A360.1, 380.2, A380.1 and A413.1 ingot is used to produce 360.0 and A360.0; 380.0 and A380.0; 413.0 and A413.0 castings, respectively.
- ¹² Beryllium 0.02-0.04.
- ¹³ Phosphorus 0.001 maximum; strontium 0.010-0.020.
- ¹⁴ Vanadium 0.08-0.15.
- ¹⁵ Beryllium 0.15-0.30.
- ¹⁶ Manganese + chromium 0.8 maximum.
- ¹⁷ Lead 0.25 maximum.
- ¹⁸ Iron/silicon ratio 2.5 minimum.
- ¹⁹ Manganese + chromium + titanium + vanadium 0.025 maximum.
- ²⁰ Iron/silicon ratio 2.0 minimum.
- ²¹ Iron/silicon ratio 1.5 minimum.
- ²² Antimony 0.20-0.30; cobalt 0.20-0.30; zirconium 0.10-0.30, Titanium + zirconium 0.50 max.
- ²³ Deleted—combined with footnote 22.
- ²⁴ Antimony 0.15 maximum; lead 0.15 maximum.
- ²⁵ Lead 0.10 maximum.
- ²⁶ "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 non-conforming.
- ²⁷ Primarily used for making metal matrix composite.
- ²⁸ Identifiers for 3xx.x and 4xx.x Foundry Ingot Containing Structure Modifiers:
- | Alloy Designation | Structure Modifying Element | Chemical Composition Limits |
|-------------------|-----------------------------|-----------------------------|
| Suffix | Element | Min (%) Max (%) |
| N | Na | 0.003 0.08 |
| S | Sr | 0.005 0.08 |
| C | Ca | 0.005 0.15 |
| P | P | — 0.06 |
- The letter suffix follows and is separated from the registered foundry ingot designations by a hyphen (i.e., "A356.1-S").
- In cases where more than one modifier is intentionally added, only the modifier of greater concentration shall be identified by suffix letter affixed to the registered alloy designation.
- When a foundry alloy is sold with a suffix added to its alloy designation, the modifying element's concentration is not to be included in the "Others, Each" "Others, Total."
- It is not intended that these structure modifier identities be treated as new alloy designation, nor should these designations be listed in the Registration Record.
- ²⁹ 0.002 max Be.
- ³⁰ 0.0003 max Be.
- ³¹ Used for semi-solid formed products.
- ³² Used for centrifugally formed products.
- * Rated minimum conductivities for rotor ingot (electrical Motor armatures) and other high conductivity applications:
- | Ingot | Percent IACS |
|-------|--------------|
| 100.2 | 54 |
| 130.2 | 55 |
| 150.2 | 57 |
| 170.1 | 59 |
- The rating of ingot metal for minimum conductivity characteristic is based on established relations between electrical conductivity and metal composition.

3.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser:

3.2.1 Form—the approximate form and weight of each ingot may be specified by agreement between the purchaser and the manufacturer, and for molten metal the weight may be specified.

3.2.2 Whether marking for identification is required, including marking pattern if required (Section 13), and

3.2.3 Whether inspection is required at the manufacturer's works (see 10.2).

3.2.4 Whether certification or analysis is required (see Section 12).

3.2.5 Whether SPC data is required (see Section 12).

4. Process

4.1 The alloys may be made by any approved process.

5. Quality

5.1 The material covered by this specification shall be of uniform quality and shall be free from dross, slag, and other harmful contamination.

6. Chemical Composition

6.1 The ingots or molten metal shall conform to the chemical composition limits prescribed in **Table 1**. Conformance shall be determined by the manufacturer by analyzing samples taken at the time the ingots are poured into molds or as the molten alloy is poured into the crucible(s) prior to shipment. Conformance may also be determined by the manufacturer by taking samples from the ingots. If the chemical composition of the material has been determined during the course of manufacture, the manufacturer shall not be required to additionally sample and analyze the ingots or molten metal.

7. Sampling for Determination of Chemical Composition

7.1 The number of samples taken for determination of chemical composition shall be as follows:

7.1.1 When samples are taken at the time the ingots are poured, at least one sample shall be taken for each group of ingots poured from the same source of molten metal.

7.1.2 If the ingots are shipped in carload lots of the same alloy, not less than five ingots shall be taken at random from the carload for sampling. If the shipment is in less than carload lots, one sample ingot shall be taken for each 6000 lb (2700 kg) or fraction thereof. When it is deemed necessary, a sample may be taken from each melt of 500 lb (227 kg) or more of the alloy.

7.1.3 *Molten Metal*—Samples are taken at the time the molten metal is poured into the crucible(s) and at least one sample shall be taken for each group of crucible(s) continuously poured from the same source of molten metal, but unless otherwise specified in the contract or purchase order at least one sample shall be taken for every 30 000 lb (13 608 kg) or fraction thereof.

7.1.4 Samples for determination of chemical composition shall be taken in accordance with one of the following methods:

7.1.4.1 *Samples for Chemical Analysis*—Samples for chemical analysis shall be taken by sawing, drilling, or milling

ingots or test specimens in such a manner as to be representative of the material. The weight of a prepared sample shall be not less than 75 g (see Practice E 88).

7.1.4.2 *Samples for Spectrochemical and Other Methods of Analysis*—Sampling for spectrochemical analysis shall be in accordance with Practices E 716. Samples for other methods of analysis shall be suitable for the form of material being analyzed and the type of analytical method used.

8. Methods for Determination of Chemical Composition

8.1 The determination of chemical composition shall be made in accordance with suitable chemical (Test Methods E 34) or spectrochemical (Test Methods E 607 and E 1251) test methods. Other test methods may be used only when no published ASTM test method is available. In case of dispute, the methods of analysis shall be agreed upon between the producer and the purchaser.

9. Electrical Conductivity

9.1 The control of chemical requirements in **Table 1** ensures the capability of Alloys 100.1, 130.1, 150.1, and 170.1 to meet rated but not measured minimum conductivity in ingot form. The rated minimum conductivities for rotor ingot (electric motor armatures) and other high conductivity applications are listed in the footnote (*) of **Table 1**.

10. Inspection

10.1 Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. Except as otherwise specified in the contract or order, the producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

10.2 If the purchaser desires that inspection be made at the manufacturer's works where the material is made, it shall be so stated in the contract or purchase order.

10.3 If the purchaser elects to have inspection made at the manufacturer's works, the manufacturer shall afford the inspector representing the purchaser all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

11. Rejection

11.1 Material that does not conform to the requirements of this specification may be rejected and, if rejected, shall be replaced by the manufacturer. The full weight of the rejected material shall be returned to the manufacturer.

12. Certification

12.1 The manufacturer shall upon request, furnish to the purchaser either a certificate stating that each lot has been

sampled, tested, and inspected in accordance with this specification and has met the requirements or an analysis for each lot of material.

12.2 If the purchaser elects to receive SPC data for each lot of material being delivered, it shall be so stated in the purchase order.

13. Marking for Identification

13.1 When identification marking of ingots is specified on the order, ingots shall be marked in accordance with Practice **B 666/B 666M**.

14. Packaging, Marking, and Shipping

14.1 The material shall be packaged in such a manner as to prevent damage in ordinary handling and transportation. The type of packaging and gross weight of individual containers

shall be left to the discretion of the manufacturer unless otherwise agreed upon. Packaging methods and containers shall be so selected as to permit maximum utility of mechanical equipment in unloading and subsequent handling. Each package or container shall contain only one size or alloy of material when packed for shipment unless otherwise agreed upon.

14.2 Each package or container shall be marked with the purchase order number; quantity; specification number; alloy, gross, and net weights; and the name of the manufacturer.

14.3 Packages or containers shall be such as to ensure acceptance by common or other carriers for safe transportation at the lowest rate to the point of delivery.

15. Keywords

15.1 aluminum; ingot; molten metal

ANNEX

(Mandatory Information)

A1. ACCEPTANCE CRITERIA FOR INCLUSION OF NEW ALUMINUM AND ALUMINUM ALLOYS IN THIS SPECIFICATION

A1.1 Prior to acceptance for inclusion in this specification, the composition of wrought or cast aluminum or aluminum alloy shall be registered in accordance with ANSI **H35.1/H35.1M**. The Aluminum Association holds the Secretariat of ANSI H35 Committee³ and administers the criteria and procedures for registration.

A1.2 If it is documented that the Aluminum Association could not or would not register a given composition, an alternative procedure and the criteria for acceptance shall be as follows:

A1.2.1 The designation submitted for inclusion does not utilize the same designation system as described in ANSI H35.1. A designation not in conflict with other designation systems or a trade name is acceptable.

A1.2.2 The aluminum or aluminum alloy has been offered for sale in commercial quantities within the prior twelve months to at least three identifiable users.

A1.2.3 The complete chemical composition limits are submitted.

A1.2.4 The composition is, in the judgment of the responsible subcommittee, significantly different from that of any other aluminum or aluminum alloy already in this specification.

A1.2.5 For codification purposes, an alloying element is any element intentionally added for any purpose other than grain refinement and for which minimum and maximum limits are specified. Unalloyed aluminum contains a minimum of 99.00 % aluminum.

A1.2.6 Standard limits for alloying elements and impurities are expressed to the following decimal places:

Less than 0.001 %	0.000X
0.001 to but less than 0.01 %	0.00X
0.01 to but less than 0.10 %	0.0XX
Unalloyed aluminum made by a refining process	0.0X
Alloys and unalloyed aluminum not made by a refining process	0.XX
0.10 through 0.55 % (it is customary to express limits of 0.30 through 0.55 % as 0.X0 or 0.X5.)	
Over 0.55 % (except that combined Si + Fe limits for 99.00 % minimum aluminum must be expressed as 0.XX or 1.XX)	0.X, X.X, etc.

A1.2.7 Standard limits for alloying elements and impurities are expressed in the following sequence: Silicon; Iron; Copper; Manganese; Magnesium; Chromium; Nickel; Zinc (**Note A1.1**); Titanium; Other Elements, Each; Other Elements, Total; Aluminum (**Note A1.2**).

NOTE A1.1—Additional specified elements having limits are inserted in alphabetical order of their chemical symbols between zinc and titanium, or are specified in footnotes.

NOTE A1.2—Aluminum is specified as *minimum* for unalloyed aluminum and as a *remainder* for aluminum alloys.

SUMMARY OF CHANGES

Committee B07 has identified selected changes to this standard since the last issue (B 179 – 03) that may impact its use. (Approved Sept. 1, 2006)

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| <p>(1) Tables 1 and 2 were combined into a single new Table 1; “Chemical Composition Limits of Aluminum Alloys in Ingot and Molten Form for All Casting Processes” using the “Pink Sheets” format, republished herein with the permission of The Aluminum Association Inc. (Casting alloys 380.2, 385.1, 408.2 and 411.2 have been deactivated by the Aluminum Association and do not appear in Table 1.)</p> <p>(2) Section 1.2, 2.2 and A1.1: Corrected ANSI reference to H35.1/H35.1(M).</p> <p>(3) Section 1.5: Added new paragraph dealing with safety.</p> <p>(4) Section 2.1: Deleted reference to ASTM B 275.</p> <p>(5) Section 2.1: Deleted reference to the cancelled ASTM E 101.</p> <p>(6) Section 2.3: Added a reference to The Aluminum Association Inc.’s “Pink Sheets.”</p> <p>(7) Section 3.1.2: Deleted reference to Table 2.</p> <p>(8) Section 3.2.4: Revised to question whether chemical analysis and certificates of conformance are required.</p> <p>(9) Section 3.2.5: Added section to allow SPC to be specified.</p> <p>(10) Section 6.1: Deleted reference to Table 2.</p> <p>(11) Section 8: Deleted reference to ASTM E 101.</p> | <p>(12) Section 9: Reworded paragraph 9.1 to reference rotor ingot.</p> <p>(13) Section 12: Revised to allow request for analysis and SPC data.</p> <p>(14) New Table 1: Deleted all xxx.0 composition limits for castings from the pink sheets, deleted alloys used for coating steel, deleted footnotes related to castings and renumbered footnotes as necessary.</p> <p>(15) New Table 1, we added statement to the heading, regarding The Aluminum Association Inc.’s permission to republish.</p> <p>(16) Table 1 new alloys appearing in the standard: 160.1, A201.1, 203.2, 206.2, A206.2, 301.1, 302.1, 303.1, 318.1, A319.1, B319.1, 320.1, A333.1, 339.1, 354.2, A355.2, A356.1, B356.2, C356.2, F356.2, B357.2, C357.2, E357.1, F357.1, F357.2, 358.2, A359.1, 361.1, 363.1, 364.2, 365.1, 369.1, B380.1, C380.1, D380.1, 381.2, A383.1, A384.1, B384.1, C384.1, A390.1, 391.1A391.1, B391.1, 392.1, 393.1, 393.2, B413.1, A443.1, A444.1, 511.1, 511.2, 512.2, 513.2, 515.2, 516.1, A535.1, B535.2, 709.1, 709.2 with all appropriate footnotes.</p> |
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