



# Standard Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes<sup>1</sup>

This standard is issued under the fixed designation B179; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. 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 [E527](#).

NOTE 2—Supplementary data pertaining to the alloys covered by this specification when used in the form of castings are given in Specifications [B26/B26M](#), [B85/B85M](#), [B108/B108M](#), [B618/B618M](#), [B686/B686M](#), and [B955/B955M](#).

1.3 Unless the order specifies the “M” specification designation, the material shall be furnished to the inch-pound units.

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

1.5 The values stated in inch-pound units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *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:<sup>2</sup>

<sup>1</sup> 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.

Current edition approved Oct. 1, 2014. Published October 2014. Originally approved in 1946. Last previous edition approved in 2011 as B179 – 11<sup>ε1</sup>. DOI: 10.1520/B0179-14.

<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

[B26/B26M Specification for Aluminum-Alloy Sand Castings](#)

[B85/B85M Specification for Aluminum-Alloy Die Castings](#)

[B108/B108M Specification for Aluminum-Alloy Permanent Mold Castings](#)

[B618/B618M Specification for Aluminum-Alloy Investment Castings](#)

[B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products](#)

[B686/B686M Specification for Aluminum Alloy Castings, High-Strength](#)

[B985 Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis](#)

[B955/B955M Specification for Aluminum-Alloy Centrifugal Castings](#)

[B969 Specification for Aluminum-Alloy Castings Produced by the Squeeze Casting, Thixocast and Rheocast Semi-Solid Casting Processes](#)

[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

[E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys](#)

[E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)

[E607 Test Method for Atomic Emission Spectrometric Analysis Aluminum Alloys by the Point to Plane Technique Nitrogen Atmosphere \(Withdrawn 2011\)<sup>3</sup>](#)

[E716 Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spectrochemical Analysis](#)

[E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry](#)

### 2.2 ANSI Standard:

[H35.1/H35.1\(M\) American National Standard Alloy and Temper Designation Systems for Aluminum<sup>4</sup>](#)

<sup>3</sup> The last approved version of this historical standard is referenced on [www.astm.org](http://www.astm.org).

<sup>4</sup> 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<sup>A,B</sup>**  
**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 E29.

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

AA No.	Designation		Registered Date	Products <sup>C</sup>	Composition, %											Aluminum Minimum			
	Former				Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Others <sup>D</sup> Each		Total <sup>E</sup>		
100.1*	...	...	06/30/70	Ingot	0.15	0.6-0.8	0.10	...	...	...	...	...	...	...	...	...	0.03 <sup>F</sup>	0.10	99.00 <sup>G</sup>
130.1*	...	...	06/30/70	Ingot	...	...	0.10	...	...	...	...	...	...	...	...	...	0.03 <sup>F</sup>	0.10	99.30 <sup>G</sup>
150.1*	...	...	06/30/70	Ingot	...	...	0.05	...	...	...	...	...	...	...	...	...	0.03 <sup>F</sup>	0.10	99.50 <sup>G</sup>
160.1	...	...	01/28/76	Ingot	0.10 <sup>I</sup>	0.25 <sup>I</sup>	...	...	...	...	...	...	...	...	...	...	0.03 <sup>F</sup>	0.10	99.60 <sup>G</sup>
170.1*	...	...	06/30/70	Ingot	...	...	...	...	...	...	...	...	...	...	...	...	0.03 <sup>F</sup>	0.10	99.70 <sup>G</sup>
201.2	...	...	04/17/68	Ingot	0.10	0.10	4.0-5.2	0.20-0.50	0.20-0.55	...	...	...	...	...	...	...	0.05 <sup>K</sup>	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	...	...	...	...	...	...	...	0.03 <sup>K</sup>	0.10	Remainder
203.2	Aluminum 350		12/02/72	Ingot	0.20	0.35	4.8-5.2	0.20-0.30	0.10	...	1.3-1.7	...	...	...	...	...	0.05 <sup>L</sup>	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	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	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	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	0.15	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	...	...	...	...	...	0.05	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	...	...	...	...	...	0.05	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	...	...	...	...	...	0.05	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	...	...	...	...	...	0.05	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	...	...	...	...	...	0.05	0.15	Remainder
295.1	195		...	Ingot	0.7-1.5	0.8	4.0-5.0	0.35	0.03	...	...	...	...	...	...	...	0.05	0.15	Remainder
295.2	195		...	Ingot	0.7-1.2	0.8	4.0-5.0	0.30	0.03	...	...	...	...	...	...	...	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	...	...	...	...	...	...	0.35	Remainder
296.2	B295.2, B195		...	Ingot	2.0-3.0	0.8	4.0-5.0	0.30	0.03	...	...	...	...	...	...	...	0.05	0.15	Remainder
301.1 <sup>M</sup>	...		08/02/94	Ingot <sup>N</sup>	9.5-10.5	0.8-1.2	3.0-3.5	0.50-0.8	0.30-0.50	...	1.0-1.5	...	...	...	...	...	0.03	0.10	Remainder

TABLE 1 Continued

Designation		Registered Date	Products <sup>C</sup>	Composition, %										Others <sup>D</sup>		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Each	Total <sup>E</sup>	
302.1 <sup>M</sup>	...	08/02/94	Ingot <sup>N</sup>	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 <sup>M</sup>	...	08/02/94	Ingot <sup>N</sup>	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 <sup>M</sup>	A108	...	Ingot	5.0-6.0	0.8	4.0-5.0	0.50	0.10	...	...	1.0	0.25	...	0.50	Remainder	
308.2 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	...	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 <sup>M</sup>	...	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	354	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 <sup>M</sup>	355	...	Ingot	4.5-5.5	0.50 <sup>O</sup>	1.0-1.5	0.50 <sup>O</sup>	0.45-0.6	0.25	...	0.35	0.25	0.05	0.15	Remainder	
355.2 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	...	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 <sup>M</sup>	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 <sup>M</sup>	356	...	Ingot	6.5-7.5	0.50 <sup>O</sup>	0.25	0.35 <sup>O</sup>	0.25-0.45	...	...	0.35	0.25	0.05	0.15	Remainder	
356.2 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	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	

TABLE 1 Continued

Designation		Registered Date	Products <sup>C</sup>	Composition, %										Others <sup>D</sup>		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Each	Total <sup>E</sup>	
B356.2 <sup>M</sup>	...	09/17/81	Ingot	6.5-7.5	0.06	0.03	0.30-0.45	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder	
C356.2 <sup>M</sup>	...	05/30/85	Ingot	6.5-7.5	0.04	0.03	0.30-0.45	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder	
F356.2 <sup>M</sup>	...	10/20/71	Ingot	6.5-7.5	0.12	0.05	0.17-0.25	...	...	0.05	0.04-0.20	...	0.05	0.15	Remainder	
357.1 <sup>M</sup>	357	...	Ingot	6.5-7.5	0.12	0.03	0.45-0.6	...	...	0.03	0.20	...	0.05	0.15	Remainder	
A357.2 <sup>M</sup>	A357	...	Ingot	6.5-7.5	0.12	0.05	0.45-0.7	...	...	0.05	0.04-0.20	...	0.03 <sup>P</sup>	0.10	Remainder	
B357.2 <sup>M</sup>	...	09/17/81	Ingot	6.5-7.5	0.06	0.03	0.45-0.6	...	...	0.03	0.04-0.20	...	0.03	0.10	Remainder	
C357.2 <sup>M</sup>	...	09/17/81	Ingot	6.5-7.5	0.06	0.03	0.50-0.7	...	...	0.03	0.04-0.20	...	0.03 <sup>P</sup>	0.10	Remainder	
E357.1 <sup>M</sup>	...	06/06/01	Ingot	6.5-7.5	0.07	0.10	0.6-0.7	...	...	0.10	0.10-0.20	...	0.05 <sup>Q</sup>	0.15	Remainder	
E357.2 <sup>M</sup>	...	06/06/01	Ingot	6.5-7.5	0.07	0.10	0.6-0.7	...	...	0.10	0.10-0.20	...	0.05 <sup>R</sup>	0.15	Remainder	
F357.1 <sup>M</sup>	...	06/06/01	Ingot	6.5-7.5	0.07	0.10	0.45-0.7	...	...	0.10	0.04-0.20	...	0.05 <sup>Q</sup>	0.15	Remainder	
F357.2 <sup>M</sup>	...	06/06/01	Ingot	6.5-7.5	0.07	0.10	0.45-0.7	...	...	0.10	0.04-0.20	...	0.05 <sup>R</sup>	0.15	Remainder	
358.2 <sup>M</sup>	B358.2, Tens-50	...	Ingot	7.6-8.6	0.20	0.10	0.45-0.6	0.05	...	0.10	0.12-0.20	...	0.05 <sup>S</sup>	0.15	Remainder	
359.2 <sup>M</sup>	359	...	Ingot	8.5-9.5	0.12	0.10	0.55-0.7	...	...	0.10	0.20	...	0.05	0.15	Remainder	
A359.1 <sup>M</sup>	...	08/02/94	Ingot <sup>N</sup>	8.5-9.5	0.20	0.10	0.45-0.6	...	...	0.10	0.20	...	0.03	0.10	Remainder	
360.2 <sup>M</sup>	360	...	Ingot	9.0-10.0	0.7-1.1	0.10	0.45-0.6	...	...	0.10	...	0.10	...	0.20	Remainder	
A360.1 <sup>T,M</sup>	A360	...	Ingot	9.0-10.0	1.0	0.35	0.45-0.6	...	...	0.50	...	0.15	...	0.25	Remainder	
A360.2 <sup>M</sup>	A360	...	Ingot	9.0-10.0	0.6	0.05	0.45-0.6	...	...	...	...	...	0.05	0.15	Remainder	
361.1 <sup>M</sup>	...	06/30/78	Ingot	9.5-10.5	0.8	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 <sup>M</sup>	363	01/16/70	Ingot	4.5-6.0	0.8	...	0.20-0.40	...	...	...	0.25	0.25	...	0.30	Remainder	
364.2 <sup>M</sup>	364	...	Ingot	7.5-9.5	0.7-1.1	0.10	0.25-0.40	0.25-0.50	0.15	0.15	...	0.15	0.05 <sup>W</sup>	0.15	Remainder	
365.1 <sup>M</sup>	Silafont-36	01/05/96	Ingot	9.5-11.5	0.12	0.03	0.15-0.50	...	...	0.07	0.04-0.15	...	0.03 <sup>X</sup>	0.10	Remainder	
A365.1 <sup>M</sup>	Aural 2	10/17/08	Ingot	9.5-11.5	0.15-0.20	0.30-0.6	0.15-0.6	...	...	0.03	0.10	...	0.05 <sup>Y</sup>	0.15	Remainder	
366.1 <sup>M</sup>	...	03/27/03	Ingot <sup>Z</sup>	6.5-7.5	0.12	0.03	0.6-1.2	...	...	0.05	0.20	...	0.05	0.15	Remainder	
367.1 <sup>M</sup>	Mercalloy367	10/01/07	Ingot	8.5-9.5	0.20	0.25	0.35-0.50	...	...	0.10	0.20	...	0.05	0.15	Remainder	
368.1 <sup>M</sup>	Mercalloy366	10/01/07	Ingot	8.5-9.5	0.20	0.25	0.15-0.30	...	...	0.10	0.20	...	0.05	0.15	Remainder	
369.1 <sup>M</sup>	Special K-9	04/04/78	Ingot	11.0-12.0	1.0	0.50	0.30-0.45	0.30-0.40	0.05	0.9	...	0.10	0.05	0.15	Remainder	
380.2 <sup>M</sup>	380	...	Ingot	7.5-9.5	0.7-1.1	0.10	0.10	...	0.10	0.10	...	0.10	...	0.20	Remainder	

TABLE 1 Continued

Designation		Registered Date	Products <sup>C</sup>	Composition, %										Others <sup>D</sup>		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Each	Total <sup>E</sup>	
A380.1 <sup>T,M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	...	01/29/91	Ingot	7.5-9.5	1.0	3.0-4.0	0.50	0.15-0.30	...	0.50	0.90	...	0.35	...	0.50	Remainder
E380.1 <sup>M</sup>	...	10/12/06	Ingot	7.5-9.5	1.0	3.0-4.0	0.50	0.30	...	0.50	2.9	...	0.35	...	0.50	Remainder
381.2 <sup>M</sup>	...	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	...	0.50	Remainder
383.1 <sup>M</sup>	...	...	Ingot	9.5-11.5	1.0	2.0-3.0	0.50	0.10	...	0.30	2.9	...	0.15	...	0.50	Remainder
383.2 <sup>M</sup>	...	...	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 <sup>M</sup>	...	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
B383.1 <sup>M</sup>	...	10/12/06	Ingot	9.5-11.5	1.0	2.0-3.0	0.50	0.30	...	0.30	2.9	...	0.15	...	0.50	Remainder
384.1 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	...	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 <sup>M</sup>	...	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 <sup>M</sup>	390	...	Ingot	16.0-18.0	0.6-1.0	4.0-5.0	0.10	0.50-0.65 <sup>AC</sup>	...	...	0.10	0.20	...	0.10	0.20	Remainder
A390.1 <sup>M</sup>	A390	...	Ingot	16.0-18.0	0.40	4.0-5.0	0.10	0.50-0.65 <sup>AC</sup>	...	...	0.10	0.20	...	0.10	0.20	Remainder
B390.1 <sup>M</sup>	...	03/29/79	Ingot	16.0-18.0	1.0	4.0-5.0	0.50	0.50-0.65 <sup>AC</sup>	...	0.10	1.4	...	...	0.10	0.20	Remainder
391.1 <sup>M</sup>	Mercosil	01/30/01	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 <sup>M</sup>	Mercosil	01/30/01	Ingot	18.0-20.0	0.50 <sup>O</sup>	0.20	0.30 <sup>O</sup>	0.45-0.70	...	...	0.10	0.20	...	0.10	0.20	Remainder
B391.1 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	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 <sup>AD</sup>	0.15	Remainder
393.2 <sup>M</sup>	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 <sup>AD</sup>	0.15	Remainder
413.2 <sup>M</sup>	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

TABLE 1 Continued

Designation		Registered Date	Products <sup>C</sup>	Composition, %										Others <sup>D</sup>		Aluminum Minimum
AA No.	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Each	Total <sup>E</sup>	
A413.1 <sup>T,M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	...	11/06/84	Ingot	11.0-13.0	0.40	0.10	0.35	0.05	...	0.05	0.10	...	...	0.20	Remainder	
443.1 <sup>M</sup>	43	...	Ingot	4.5-6.0	0.6	0.6	0.50	0.05	0.25	...	0.50	...	...	0.35	Remainder	
443.2 <sup>M</sup>	43	...	Ingot	4.5-6.0	0.6	0.10	0.10	0.05	...	...	0.10	...	...	0.15	Remainder	
A443.1 <sup>M</sup>	43 (0.30 max Cu)	...	Ingot	4.5-6.0	0.6	0.30	0.50	0.05	0.25	...	0.50	...	...	0.35	Remainder	
B443.1 <sup>M</sup>	43 (0.15 max Cu)	...	Ingot	4.5-6.0	0.6	0.15	0.35	0.05	...	...	0.35	...	0.05	0.15	Remainder	
C443.1 <sup>M</sup>	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 <sup>M</sup>	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 <sup>M</sup>	...	09/24/73	Ingot	6.5-7.5	0.13-0.25	0.10	0.05	0.05	...	...	0.05	...	0.05	0.15	Remainder	
A444.1 <sup>M</sup>	...	06/04/74	Ingot	6.5-7.5	0.15	0.10	0.10	0.05	...	...	0.10	...	0.05	0.15	Remainder	
A444.2 <sup>M</sup>	A344	...	Ingot	6.5-7.5	0.12	0.05	0.05	0.05	...	...	0.05	...	0.05	0.15	Remainder	
505.1	...	04/12/004	Ingot <sup>A,E</sup>	0.40-0.8	0.50	0.15-0.40	0.15	0.9-1.2	0.04-0.35	...	0.25	...	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	...	0.05	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	...	0.05	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	...	0.05	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	...	0.05	0.15	Remainder	
514.1	214	...	Ingot	0.35	0.40	0.15	0.35	3.6-4.5	...	...	0.15	...	0.05	0.15	Remainder	
514.2	214	...	Ingot	0.30	0.30	0.10	0.10	3.6-4.5	...	...	0.10	...	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	0.05 <sup>A,F</sup>	...	Remainder	
518.1	218	...	Ingot	0.35	1.1	0.25	0.35	7.6-8.5	...	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	...	...	...	0.10	Remainder	
520.2	220	...	Ingot	0.15	0.20	0.20	0.10	9.6-10.6	...	...	0.10	...	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 <sup>A,G</sup>	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, Temalloy 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	

TABLE 1 Continued

AA No.	Designation		Registered Date	Products <sup>C</sup>	Composition, %											Aluminum Minimum	
	Former	Former			Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Sn	Others <sup>D</sup> Each		Others <sup>D</sup> Total <sup>F</sup>
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
709.1	...		04/12/04	Ingot <sup>A/E</sup>	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 <sup>A/E</sup>	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, Tenzalloy		...	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

\* 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.

† Corrected editorially in August 2013.

<sup>A</sup> 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.XXX

0.10-0.55 percent: 0.10-0.55 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.)

<sup>B</sup> 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.

<sup>C</sup> Ingot is the normal form in which the material is purchased or delivered, but it may also be in the molten form.



D "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.

E The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum.

F Manganese + chromium + titanium + vanadium 0.025 maximum.

G 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."

H Iron/silicon ratio 2.5 minimum.

I Iron/silicon ratio 2.0 minimum.

J Iron/silicon ratio 1.5 minimum.

K Silver 0.40-1.0.

L Antimony 0.20-0.30; cobalt 0.20-0.30; zirconium 0.10-0.30; Titanium + zirconium 0.50 max.

M Identifiers for 3xx.x and 4xx.x Foundry Ingot Containing Structure Modifiers:

Alloy Designation Suffix	Structure Chemical Composition Modifying Element Limits		
	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 designations, nor should these designations be listed in the Registration Record.

N Primarily used for making metal matrix composite.

O If iron exceeds 0.45, manganese content shall not be less than one-half iron content.

P Beryllium 0.04-0.07.

Q 0.002 max Be.

R 0.0003 max Be.

S Beryllium 0.15-0.30.

T 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.

U Manganese + chromium 0.8 maximum.

V Lead 0.25 maximum.

W Beryllium 0.02-0.04.

X Phosphorus 0.001 maximum; strontium 0.010-0.020.

Y 0.001 max P.

Z Used for semi-solid formed products.

A<sup>A</sup> Casting: 0.001 % max. P; 0.05-0.07 % Sr.

A<sup>B</sup> Ingot: 0.001 % max. P; Sr range to be determined between producer and purchaser to allow for potential burn out at the caster's facility.

A<sup>C</sup> Antimony 0.15 maximum; lead 0.15 maximum.

A<sup>D</sup> The number of decimal places to which Mg percent is expressed is exempted by the Note stated in Footnote A.

A<sup>E</sup> Vanadium 0.08-0.15.

A<sup>F</sup> Used for centrifugally formed products.

A<sup>G</sup> Lead 0.10 maximum.

A<sup>H</sup> Beryllium 0.003-0.007; boron 0.002 maximum.



### 2.3 Aluminum Associations Standard:

**Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingot (The Pink Sheets)**<sup>4</sup>

### 2.4 Other Standards:<sup>5</sup>

**EN 14242 Aluminum and Aluminum Alloys — Chemical Analysis — Inductively Coupled Plasma Optical Emission Spectral Analysis**

## 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 [kilograms].

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 ingot if required (see Sections 11 and 12.2),

3.2.3 Whether inspection is required at the manufacturer's works (see 8.2),

3.2.4 Whether certification or analysis is required (see Section 11), and

3.2.5 Whether SPC data is required (see Section 10.2).

## 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 producer by taking samples at the time the ingots are poured into molds or as the molten alloy is poured into the crucible(s) prior to shipment in accordance with Practice E716 and analyzed in accordance with Test Methods E34, E607, or E1251, or EN 14242. 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 the delivered crucible of molten metal after delivery.

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

6.1.2 When samples are taken at the time the ingots are poured, at least one sample shall be taken from the first, middle and last third of each lot of ingots poured from the same source of molten metal. The analytical results of each sample taken during the pouring of the ingots shall conform to the composition limits shown in Table 1. The analytical results of all samples taken during pouring of the ingots shall be averaged and that average reported as the composition of that lot of alloy.

6.1.3 *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 [15 000 kg] or fraction thereof.

6.2 If it becomes necessary to analyze ingot for conformance to chemical composition limits, the method used to sample for the determination of chemical composition shall be in accordance with Practice B985. Analysis shall be performed in accordance with Practice E716, Test Methods E34, E607, or E1251, or EN 14242 (ICP method).

## 7. Electrical Conductivity

7.1 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.

## 8. Inspection

8.1 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.

8.2 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.

8.3 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.

## 9. Rejection

9.1 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.

<sup>5</sup> Available from European Committee for Standardization (CEN), 36 rue de Stassart, B-1050, Brussels, Belgium, <http://www.cenorm.be>.

## 10. Certification

10.1 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.

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

## 11. Marking for Identification

11.1 When identification marking of ingots is specified on the order, ingots shall be marked in accordance with Practice **B666/B666M**.

## 12. Packaging, Marking, and Shipping

12.1 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.

12.2 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.

12.3 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.

## 13. Keywords

13.1 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/H35.1(M). The Aluminum Association holds the Secretariat of ANSI H35 Committee<sup>4</sup> 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 %	
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 of 0.30 through 0.55 % as 0.X0 or 0.X5.)	
Over 0.55 %	0.X, X.X, etc.
(except that combined Si + Fe limits for 99.00 % minimum aluminum must be expressed as 0.XX or 1.XX)	

A1.2.7 Standard limits for alloying elements and impurities are expressed in the following sequence: Silicon; Iron; Copper; Manganese; Magnesium; Chromium; Nickel; Zinc; Titanium, (**Note A1.1**); 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 Titanium, and Other Elements, Each, 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 the location of selected changes to this standard since the last issue (B179 – 11<sup>E1</sup>) that may impact the use of this standard. (Approved Oct. 1, 2014.)

- (1) References to Practice **B985** were added to subsections **2.1** and **6.2**.  
(2) Subsection 6.3 was deleted.  
(3) Subsections 7.1, 7.1.1, and 7.1.2 were moved into **6.1**.

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