



**Designation: B 179 – 96**

## **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 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 ( $\epsilon$ ) 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 Tables 1 and 2.

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. 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.

### **2. Referenced Documents**

#### *2.1 ASTM Standards:*

B 26/B26M Specification for Aluminum-Alloy Sand Castings<sup>2</sup>

B 85 Specification for Aluminum-Alloy Die Castings<sup>2</sup>

B 108 Specification for Aluminum-Alloy Permanent Mold Castings<sup>2</sup>

B 275 Practice for Codification of Certain Nonferrous Metals and Alloys, Cast and Wrought<sup>2</sup>

B 618 Specification for Aluminum-Alloy Investment Castings<sup>3</sup>

B 666/B 666M Practice for Identification Marking of Aluminum and Magnesium Products<sup>2</sup>

B 686 Specification for Aluminum Alloy Castings, High-Strength<sup>2</sup>

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>4</sup>

E 34 Test Methods for Chemical Analysis of Aluminum and Aluminum Base Alloys<sup>5</sup>

E 88 Practice for Sampling Nonferrous Metals and Alloys in Cast Form for Determination of Chemical Composition<sup>5</sup>

E 101 Test Method for Spectrographic Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique<sup>6</sup>

E 227 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique<sup>5</sup>

E 527 Practice for Numbering Metals and Alloys (UNS)<sup>7</sup>

E 607 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Point-to-Plane Technique, Nitrogen Atmosphere<sup>8</sup>

E 716 Practices for Sampling Aluminum and Aluminum Alloys for Spectrochemical Analysis<sup>8</sup>

E 1251 Test Method for Optical Emission Spectrometric Analysis of Aluminum and Aluminum Alloys by the Argon Atmosphere, Point-to-Plane, Unipolar Self-Initiating Capacitor Discharge<sup>8</sup>

#### *2.2 ANSI Standard:*

H35.1 Alloy and Temper Designation Systems for Aluminum<sup>2</sup>

### **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, Tables 1 and 2), and

3.1.3 The quantity in pieces or pounds.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B-7 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.01 on Aluminum Alloy Ingots and Castings.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.02.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.07.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.

<sup>5</sup> *Annual Book of ASTM Standards*, Vol 03.05.

<sup>6</sup> Discontinued. See *1995 Annual Book of ASTM Standards*, Vol 03.05.

<sup>7</sup> *Annual Book of ASTM Standards*, Vol 01.01.

<sup>8</sup> *Annual Book of ASTM Standards*, Vol 03.06.

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

**NOTICE: This standard has either been superseded and replaced by a new version or discontinued.**

**TABLE 1 Chemical Composition Limits for Alloys Normally Used in Sand and Permanent Mold Casting Processes**

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

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

NOTE 3—The following applies to all specified limits in this table: For purposes of determining conformance to these limits, an observed value or a calculated value obtained from analysis shall 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.

Alloy <sup>A</sup>		Use <sup>B</sup>	Composition, %											Others <sup>C</sup>		Aluminum
ANSI <sup>A</sup>	UNS		Silicon	Iron	Copper	Manganese	Magnesium	Chromium	Nickel	Zinc	Tin	Titanium	Each	Total <sup>D</sup>		
201.2	A02012	S	0.10	0.10	4.0–5.2	0.20–0.50	0.20–0.55	...	...	...	0.15–0.35	0.05 <sup>E</sup>	0.10	remainder		
204.2	A02042	S,P	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	0.15	remainder		
208.1	A02081	S,P	2.5–3.5	0.9	3.5–4.5	0.50	0.10	...	0.35	1.0	0.25	...	0.50	remainder		
208.2	A02082	S,P	2.5–3.5	0.8	3.5–4.5	0.30	0.03	...	...	0.20	0.20	...	0.30	remainder		
222.1	A02221	S,P	2.0	1.2	9.2–10.7	0.50	0.20–0.35	...	0.50	0.8	0.25	...	0.35	remainder		
242.1	A02421	S,P	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	A02422	S,P	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	A12421	S	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	A12422	S	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	A02951	S	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	A02952	S	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	...	P	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	...	P	2.0–3.0	0.8	4.0–5.0	0.30	0.03	...	...	0.30	0.20	0.05	0.15	remainder		
308.1	A03081	P	5.0–6.0	0.8	4.0–5.0	0.50	0.10	...	...	1.0	0.25	...	0.50	remainder		
308.2	A03082	P	5.0–6.0	0.8	4.0–5.0	0.30	0.10	...	...	0.50	0.20	...	0.50	remainder		
319.1	A03191	S,P	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	A03192	S,P	5.5–6.5	0.6	3.0–4.0	0.10	0.10	...	0.10	0.10	0.20	...	0.20	remainder		
328.1	A03281	S	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>F</sup>	A03321	P	8.5–10.5	0.9	2.0–4.0	0.50	0.6–1.5	...	0.50	1.0	0.25	...	...	remainder		
332.2 <sup>F</sup>	A03322	P	8.5–10.0	0.6	2.0–4.0	0.10	0.9–1.3	...	0.10	0.10	0.20	...	0.15	remainder		
333.1	A03331	P	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		
336.1 <sup>F</sup>	A03361	P	11.0–13.0	0.9	0.50–1.5	0.35	0.8–1.3	...	2.0–3.0	0.35	...	...	0.30	remainder		
336.2 <sup>F</sup>	A03362	P	11.0–13.0	0.9	0.50–1.5	0.10	0.9–1.3	...	2.0–3.0	0.10	...	...	0.50	remainder		
354.1	A03541	P	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		
355.1	A03551	S,P	4.5–5.5	0.50 <sup>G</sup>	1.0–1.5	0.50 <sup>G</sup>	0.45–0.6	0.25	...	0.35	0.25	0.05	0.15	remainder		
355.2	A03552	S,P	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		
C355.2	A33552	S,P	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	A03561	S,P	6.5–7.5	0.50 <sup>G</sup>	0.25	0.35 <sup>G</sup>	0.25–0.45	...	...	0.35	0.25	0.05	0.15	remainder		
356.2	A03562	S,P	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		
A356.2	A13562	S,P	6.5–7.5	0.12	0.10	0.05	0.30–0.45	...	...	0.05	0.20	0.05	0.15	remainder		
357.1	A03571	P	6.5–7.5	0.12	0.05	0.03	0.45–0.6	...	...	0.05	0.20	0.05	0.15	remainder		
A357.2	A13570	P	6.5–7.5	0.12	0.10	0.05	0.45–0.7	...	...	0.05	0.04–0.20	0.03 <sup>H</sup>	0.10	remainder		
359.2	A03592	P	8.5–9.5	0.12	0.10	0.10	0.55–0.7	...	...	0.10	0.20	0.05	0.15	remainder		
443.1	A04431	S,P	4.5–6.0	0.6	0.6	0.50	0.05	0.25	...	0.50	0.25	...	0.35	remainder		
443.2	A04432	S,P	4.5–6.0	0.6	0.10	0.10	0.05	...	...	0.10	0.20	0.05	0.15	remainder		
B443.1	A24431	S,P	4.5–6.0	0.6	0.15	0.35	0.05	...	...	0.35	0.25	0.05	0.15	remainder		
A444.2	A14442	P	6.5–7.5	0.12	0.05	0.05	0.05	...	...	0.05	0.20	0.05	0.15	remainder		
513.2 <sup>F</sup>	A05132	P	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	A05141	S	0.35	0.40	0.15	0.35	3.6–4.5	...	...	0.15	0.25	0.05	0.15	remainder		
514.2	A05142	S	0.30	0.30	0.10	0.10	3.6–4.5	...	...	0.10	0.20	0.05	0.15	remainder		
520.2	A05202	S	0.15	0.20	0.20	0.10	9.6–10.6	...	...	0.10	0.20	0.05	0.15	remainder		
535.2	A05352	S,P	0.10	0.10	0.05	0.10–0.25	6.6–7.5	...	...	...	0.10–0.25	0.05 <sup>I</sup>	0.15	remainder		
705.1	A07051	S,P	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	A07071	S,P	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		
710.1 <sup>F</sup>	A07101	S	0.15	0.40	0.35–0.65	0.05	0.65–0.8	...	...	6.0–7.0	0.25	0.05	0.15	remainder		
711.1 <sup>F</sup>	A07111	P	0.30	0.7–1.1	0.35–0.65	0.05	0.30–0.45	...	...	6.0–7.0	0.20	0.05	0.15	remainder		
712.2 <sup>F</sup>	A07122	S	0.15	0.40	0.25	0.10	0.50–0.65	0.40–0.6	...	5.0–6.5	0.15–0.25	0.05	0.20	remainder		
713.1	A07131	S,P	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		



TABLE 1 Continued

Alloy <sup>A</sup>		Use <sup>B</sup>	Composition, %												
ANSI <sup>A</sup>	UNS		Silicon	Iron	Copper	Manganese	Magnesium	Chromium	Nickel	Zinc	Tin	Titanium	Others <sup>C</sup>		Aluminum
												Each	Total <sup>D</sup>		
771.2	A07712	S	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
850.1	A08501	S,P	0.7	0.50	0.7–1.3	0.10	0.10	...	0.7–1.3	5.5–7.0	0.20	...	...	0.30	remainder
851.1 <sup>F</sup>	A08511	S,P	2.0–3.0	0.50	0.7–1.3	0.10	0.10	...	0.30–0.7	5.5–7.0	0.20	...	...	0.30	remainder
852.1 <sup>F</sup>	A08521	S,P	0.40	0.50	1.7–2.3	0.10	0.7–0.9	...	0.9–1.5	5.5–7.0	0.20	...	...	0.30	remainder

<sup>A</sup> ASTM alloy designations are recorded in Practice B 275.

<sup>B</sup> S = sand cast. P = permanent mold cast.

<sup>C</sup> "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 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 nonconforming.

<sup>D</sup> Other Elements—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.

<sup>E</sup> Silver 0.40–1.0 %.

<sup>F</sup> 336.1 formerly A332.1, 336.2 formerly A332.2, 332.1 formerly F332.1, 332.2 formerly F332.2, 513.2 formerly A514.2, 710.1 formerly A712.1, 711.1 formerly C712.1, 712.2 formerly D712.2, 851.1 formerly A850.1, 852.1 formerly B850.1.

<sup>G</sup> If iron exceeds 0.45 %, manganese shall not be less than one half of the iron content.

<sup>H</sup> Beryllium 0.04–0.07 %.

<sup>I</sup> Beryllium 0.003–0.007 %, boron 0.002 % max.

**TABLE 2 Chemical Composition Limits for Alloys Normally Used in the Die Casting Process**

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

NOTE 2—Analysis shall be made for the 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.

Alloy <sup>A</sup>			Composition, %												Aluminum
			Silicon	Iron	Copper	Man- ganese	Magne- sium	Chro- mium	Nickel	Zinc	Tin	Tita- nium	Other Elements <sup>B</sup>		
Each	Total <sup>C</sup>														
100.1	...	A01001	0.15	0.6–0.8	0.10	<sup>D</sup>	...	<sup>D</sup>	...	0.05	...	<sup>D</sup>	0.03 <sup>D</sup>	0.10	99.00 <sup>E</sup>
130.1	...	A01301	<sup>F</sup>	<sup>F</sup>	0.10	<sup>D</sup>	...	<sup>D</sup>	...	0.05	...	<sup>D</sup>	0.03 <sup>D</sup>	0.10	99.30 <sup>E</sup>
150.1	99.5A	A01501	<sup>G</sup>	<sup>G</sup>	0.05	<sup>D</sup>	...	<sup>D</sup>	...	0.05	...	<sup>D</sup>	0.03 <sup>D</sup>	0.10	99.50 <sup>E</sup>
170.1	...	A01701	<sup>H</sup>	<sup>H</sup>	...	<sup>D</sup>	...	<sup>D</sup>	...	0.05	...	<sup>D</sup>	0.03 <sup>D</sup>	0.10	99.70 <sup>E</sup>
360.2	SG100C	A03602	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	SG100A-B	A13601	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	...	A13602	9.0–10.0	0.6	0.10	0.05	0.45–0.6	...	...	0.05	...	...	0.05	0.15	remainder
380.2	SC84C	A03802	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	SC84A-B	A13801	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	...	A13802	7.5–9.5	0.6	3.0–4.0	0.10	0.10	...	0.10	0.10	...	...	0.05	0.15	remainder
383.1	SC102A	A03831	9.5–11.5	0.6–1.0	2.0–3.0	0.50	0.10	...	0.30	2.9	0.15	...	...	0.50	remainder
383.2	...	A03832	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
384.1	SC114A	A03841	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	...	A03842	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
390.2	SC174A	A03902	16.0–18.0	0.6–1.0	4.0–5.0	0.10	0.50–0.65	...	...	0.10	...	0.20	0.10	0.20	remainder
B390.1	SC174B	A23901	16.0–18.0	1.0	4.0–5.0	0.50	0.50–0.65	...	0.10	1.4	...	0.20	0.10	0.20	remainder
392.1	S19	A03921	18.0–20.0	1.1	0.40–0.8	0.20–0.6	0.9–1.2	...	0.50	0.40	0.30	0.20	0.15	0.50	remainder
413.2	S12C	A04132	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	S12A-B	A14131	11.0–13.0	1.0	1.0	0.35	0.10	...	0.50	0.40	0.15	...	...	0.25	remainder
A413.2	...	A14132	11.0–13.0	0.6	0.10	0.05	0.05	...	0.05	0.05	0.05	...	...	0.10	remainder
C443.1	S5C	A34431	4.5–6.0	1.0	0.6	0.35	0.10	...	0.50	0.40	0.15	...	...	0.25	remainder
C443.2	...	A34432	4.5–6.0	0.7–1.1	0.10	0.10	0.05	...	...	0.10	...	...	0.05	0.15	remainder
518.1	G8A	A05181	0.35	1.0	0.25	0.35	7.6–8.5	...	0.15	0.15	0.15	...	...	0.25	remainder
518.2	...	A05182	0.25	0.7	0.10	0.10	7.6–8.5	...	0.05	...	0.05	...	...	0.10	remainder

<sup>A</sup> ASTM designations were established in accordance with Practice B 275. ANSI designations were established in accordance with ANSI H35.1. UNS designations were established in accordance with Practice E 527.

<sup>B</sup> "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 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 nonconforming.

<sup>C</sup> Other Elements—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.

<sup>D</sup> Mn + Cr + Ti + V 0.025 % max.

<sup>E</sup> Aluminum content is the difference between 100.00 % and the sum of all other metallic elements present in amounts of 0.010 % or more each, expressed to the second decimal.

<sup>F</sup> Fe/Si ratio 2.5, min.

<sup>G</sup> Fe/Si ratio 2.0, min.

<sup>H</sup> Fe/Si ratio 1.5, min.



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 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 or Table 2. 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 101, E 227, 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 are as follows:

Alloy	% IACS
100.1	54
130.1	55
150.1	57
170.1	59

#### 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 on request, furnish to the purchaser a certificate stating that each lot has been sampled, tested, and inspected in accordance with this specification and has met the requirements.



### 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. The Aluminum Association holds the Secretariat of ANSI H35 Committee<sup>9</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 (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.

<sup>9</sup> The Aluminum Association, 900 19th Street, NW, Washington, DC 20006.



**B 179**

## **SUMMARY OF CHANGES**

This section identifies the principal changes to this standard that have been incorporated since the last issue.

(I) Specification revised to include sow and molten metal forms of aluminum alloy.

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