



Standard Specification for Aluminum-Alloy Permanent Mold Castings¹

This standard is issued under the fixed designation B108/B108M; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification² covers aluminum-alloy permanent mold castings designated as shown in [Table 1](#).

1.2 This specification is for aluminum-alloy permanent mold castings used in general purpose applications. It may not address the mechanical properties, integrity testing, and verification required for highly loaded or safety critical applications.

1.3 Alloy and temper designations are in accordance with ANSI H35.1/H35.1(M). The equivalent unified numbering system alloy designations are in accordance with Practice [E527](#).

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

1.5 For acceptance criteria for inclusion of new aluminum and aluminum alloys and their properties in this specification, see [Annex A1](#) and [Annex A2](#).

1.6 *Units*—The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.7 *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 The following documents of the issue in effect on the date of casting purchase form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:³

- [B179](#) Specification for Aluminum Alloys in Ingot and Molten Forms for Castings from All Casting Processes
- [B275](#) Practice for Codification of Certain Zinc, Tin and Lead Die Castings
- [B557](#) Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products
- [B557M](#) Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)
- [B660](#) Practices for Packaging/Packing of Aluminum and Magnesium Products
- [B881](#) Terminology Relating to Aluminum- and Magnesium-Alloy Products
- [B917/B917M](#) Practice for Heat Treatment of Aluminum-Alloy Castings from All Processes
- [B985](#) Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis
- [D3951](#) Practice for Commercial Packaging
- [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
- [E94](#) Guide for Radiographic Examination
- [E155](#) Reference Radiographs for Inspection of Aluminum and Magnesium Castings
- [E165](#) Practice for Liquid Penetrant Examination for General Industry
- [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)⁴
- [E716](#) Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spectrochemical Analysis

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 ASME Boiler and Pressure Code application see related SB-108.

³ 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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

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

TABLE 1 Chemical Composition Limits^{A,B,C}

Alloy		Composition, %												Other Elements ^E	
ANSI ^D	UNS	Aluminum	Silicon	Iron	Copper	Manga- nese	Magne- sium	Chromium	Nickel	Zinc	Titanium	Tin	Each	Total ^F	
204.0	A02040	remainder	0.20	0.35	4.2–5.0	0.10	0.15–0.35	...	0.05	0.10	0.15–0.30	0.05	0.05	0.15	
242.0	A02420	remainder	0.7	1.0	3.5–4.5	0.35	1.2–1.8	0.25	1.7–2.3	0.35	0.25	...	0.05	0.15	
296.0		remainder	2.0–3.0	1.2	4.0–5.0	0.35	0.05	...	0.35	0.50	0.25	...	...	0.35
308.0		remainder	5.0–6.0	1.0	4.0–5.0	0.50	0.10	...	...	1.0	0.25	...	...	0.50
319.0	A03190	remainder	5.5–6.5	1.0	3.0–4.0	0.50	0.10	...	0.35	1.0	0.25	...	...	0.50
332.0 ^G	A03320	remainder	8.5–10.5	1.2	2.0–4.0	0.50	0.50–1.5	...	0.50	1.0	0.25	...	...	0.50
333.0	A03330	remainder	8.0–10.0	1.0	3.0–4.0	0.50	0.05–0.50	...	0.50	1.0	0.25	...	...	0.50
336.0 ^G	A03360	remainder	11.0–13.0	1.2	0.50–1.5	0.35	0.7–1.3	...	2.0–3.0	0.35	0.25	...	0.05	...	
354.0	A03540	remainder	8.6–9.4	0.20	1.6–2.0	0.10	0.40–0.6	...	...	0.10	0.20	...	0.05	0.15
355.0	A03550	remainder	4.5–5.5	0.6 ^H	1.0–1.5	0.50 ^H	0.40–0.6	0.25	...	0.35	0.25	...	0.05	0.15	
C355.0	A33550	remainder	4.5–5.5	0.20	1.0–1.5	0.10	0.40–0.6	...	...	0.10	0.20	...	0.05	0.15
356.0	A03560	remainder	6.5–7.5	0.6 ^H	0.25	0.35 ^H	0.20–0.45	...	...	0.35	0.25	...	0.05	0.15
A356.0	A13560	remainder	6.5–7.5	0.20	0.20	0.10	0.25–0.45	...	...	0.10	0.20	...	0.05	0.15
357.0		remainder	6.5–7.5	0.15	0.05	0.03	0.45–0.6	...	...	0.05	0.20	...	0.05	0.15
A357.0	A13570	remainder	6.5–7.5	0.20	0.20	0.10	0.40–0.7	...	...	0.10	0.04–0.20	...	0.05 ^J	0.15
E357.0		remainder	6.5–7.5	0.10	0.10	0.10	0.55–0.6	...	...	...	0.10–0.20	...	0.05 ^J	0.15
F357.0		remainder	6.5–7.5	0.10	0.20	0.10	0.40–0.7	...	...	0.10	0.04–0.20	...	0.05 ^J	0.15
359.0	A03590	remainder	8.5–9.5	0.20	0.20	0.10	0.50–0.7	...	...	0.10	0.20	...	0.05	0.15
443.0	A04430	remainder	4.5–6.0	0.8	0.6	0.50	0.05	0.25	...	0.50	0.25	...	...	0.35
B443.0	A24430	remainder	4.5–6.0	0.8	0.15	0.35	0.05	...	...	0.35	0.25	...	0.05	0.15
A444.0	A14440	remainder	6.5–7.5	0.20	0.10	0.10	0.05	...	...	0.10	0.20	...	0.05	0.15
513.0 ^G	A05130	remainder	0.30	0.40	0.10	0.30	3.5–4.5	...	...	1.4–2.2	0.20	...	0.05	0.15
535.0	A05350	remainder	0.15	0.15	0.05	0.10–0.25	6.2–7.5	...	...	...	0.10–0.25	...	0.05 ^K	0.15
705.0	A07050	remainder	0.20	0.8	0.20	0.40–0.6	1.4–1.8	0.20–0.40	...	2.7–3.3	0.25	...	0.05	0.15	
707.0	A07070	remainder	0.20	0.8	0.20	0.40–0.6	1.8–2.4	0.20–0.40	...	4.0–4.5	0.25	...	0.05	0.15	
711.0 ^G	A07110	remainder	0.30	0.7–1.4	0.35–0.65	0.05	0.25–0.45	...	...	6.0–7.0	0.20	...	0.05	0.15
713.0	A07130	remainder	0.25	1.1	0.40–1.0	0.6	0.20–0.50	0.35	0.15	7.0–8.0	0.25	...	0.10	0.25	
850.0	A08500	remainder	0.7	0.7	0.7–1.3	0.10	0.10	...	0.7–1.3	...	0.20	5.5–7.0	...	0.30	
851.0 ^G	A08510	remainder	2.0–3.0	0.7	0.7–1.3	0.10	0.10	...	0.3–0.7	...	0.20	5.5–7.0	...	0.30	
852.0 ^G	A08520	remainder	0.40	0.7	1.7–2.3	0.10	0.6–0.9	...	0.9–1.5	...	0.20	5.5–7.0	...	0.30	

^A When single units are shown, these indicate the maximum amounts permitted.

^B Analysis shall be made for the elements for which limits are shown in this table.

^C 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 method of Practice E29.

^D ASTM alloy designations are recorded in Practice B275.

^E *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.

^F *Other Elements*—Total shall be the sum of unspecified metallic elements 0.010 % or more, rounded to the second decimal before determining the sum.

^G 336.0 formerly A332.0, 332.0 formerly F332.0, 513.0 formerly A514.0, 711.0 formerly C712.0, 851.0 formerly A850.0, 852.0 formerly B850.0.

^H If the iron content exceeds 0.45 %, manganese content shall not be less than one half of the iron.

^I Beryllium 0.04–0.07.

^J Beryllium 0.002 max

^K Beryllium 0.003–0.007, boron 0.005 max.

E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry

E2422 Digital Reference Images for Inspection of Aluminum Castings

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System

2.3 ANSI Standard:⁵

H35.1/H35.1(M) Alloy and Temper Designation Systems for Aluminum

2.4 Military Standards:⁶

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-276 Impregnation of Porous Nonferrous Metal Castings

NAVSEA S9074-AR-GIB-010/278 Requirements for Fabrication Welding and Inspection, and Casting Inspection and Repair for Machinery, Piping, and Pressure Vessels

⁵ Available from Aluminum Association, Inc., 1525 Wilson Blvd., Suite 600, Arlington, VA 22209, <http://www.aluminum.org>.

⁶ Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://www.dodssp.daps.mil>.

2.5 *AMS Specification:*

AMS 2771 Heat Treatment of Aluminum Alloy Castings⁷

2.6 *Federal Standard:*⁶

Fed Std. No. 123 Marking for Shipment (Civil Agencies)

2.7 *Other Standards:*⁸

CEN EN 14242 Aluminum and Aluminum Alloys, Chemical Analysis, Inductively Coupled Plasma Optical Emission Spectral Analysis

3. Terminology

3.1 *Definitions*—Refer to Terminology **B881** for definitions of product terms used in this specification.

4. Ordering Information

4.1 Orders for material under this specification shall include the following information (see **1.4** and **1.5**):

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

NOTE 1—For inch-pound application, specify Specification B108 and for metric application specify Specification B108M. Do not mix units.

4.1.2 Alloy (see Section **7** and **Table 1**),

4.1.3 Temper (see Section **10** and **Table 2** [**Table 3**]),

TABLE 2 Tensile Requirements^A (Inch-Pound Units)

NOTE 1—For purposes of determining conformance with this specification, each value for tensile strength and yield strength shall be rounded to the nearest 0.1 ksi, and each value for elongation shall be rounded to the nearest 0.5 %, both in accordance with the rounding method of Practice **E29**.

Alloy		Temper ^B	Tensile Strength, min, ksi	Yield Strength ^C (0.2 % offset), min, ksi	Elongation in 2 in. or 4 × Diameter, min, %	Typical Brinell Hardness ^D 500-kgf load, 10-mm ball
ANSI ^E	UNS					
204.0	A02040	T4 separately cast specimens	48.0	29.0	8.0	...
242.0	A02420	T571	34.0	...	F	105
		T61	40.0	...	F	110
296.0	A02960	T4	33.0	15.0	4.5	75
		T6	35.0	...	2.0	90
		T7	33.0	16.0	3.0	...
308.0	A03080	F	24.0	...	...	70
319.0	A03190	F	27.0	14.0	2.5	95
332.0 ^G	A03320	T5	31.0	...	F	105
333.0	A03330	F	28.0	...	F	90
		T5	30.0	...	F	100
		T6	35.0	...	F	105
		T7	31.0	...	F	90
336.0 ^G	A03360	T551	31.0	...	F	105
		T65	40.0	...	F	125
354.0	A03540	T61				
		separately cast specimens	48.0	37.0	3.0	
		casting, designated area ^H	47.0	36.0	3.0	
		castings, no location designated ^H	43.0	33.0	2.0	
		T62				
		separately cast specimens	52.0	42.0	2.0	
		castings, designated area ^H	50.0	42.0	2.0	
		castings, no location designated ^H	43.0	33.0	2.0	
355.0	A03550	T51	27.0	...	F	75
		T62	42.0	...	F	105
		T7	36.0	...	F	90
		T71	34.0	27.0	F	80
C355.0	A33550	T61				
		separately cast specimens	40.0	30.0	3.0	85–90
		castings, designated area ^H	40.0	30.0	3.0	
		castings, no location designated ^H	37.0	30.0	1.0	85
356.0	A03560	F	21.0	10.0	3.0	
		T6	33.0	22.0	3.0	85
		T71	25.0	...	3.0	70
A356.0	A13560	T61				
		separately cast specimens	38.0	26.0	5.0	80–90
		castings, designated area ^H	33.0	26.0	5.0	
		castings, no location designated ^H	28.0	26.0	3.0	
357.0		T6	45.0	...	3.0	...
A357.0	A13570	T61				
		separately cast specimens	45.0	36.0	3.0	100
		castings, designated area ^H	46.0	36.0	3.0	...
		castings, no location designated ^H	41.0	31.0	3.0	...
E357.0 ^I		T61				
		separately cast specimens	45.0	36.0	3.0	100
		castings, designated area ^H	46.0	36.0	3.0	
		castings, no location designated ^H	41.0	31.0	3.0	
F357.0 ^J		T6	45.0	...	3.0	
359.0	A03590	T61				
		separately cast specimens	45.0	34.0	4.0	90