



Designation: B247 – 25

Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings¹

This standard is issued under the fixed designation B247; 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 die forgings, hand forgings, and rolled ring forgings in the alloys (Note 1) and tempers as shown in Table 2, Table 3, and Table 5. The maximum thicknesses for forgings within the scope of this specification are as indicated in those tables.

NOTE 1—Throughout this specification use of the term *alloy* in the general sense includes aluminum as well as aluminum alloy.

NOTE 2—For forging stock supplied as rolled, cold-finished bar, extruded bar, or rod see Specification B211/B211M.

1.2 Alloy and temper designations are in accordance with ANSI H35.1/H35.1(M). The equivalent Unified Numbering System alloy designations are those of Table 1 preceded by A9, for example, A91100 for aluminum 1100 in accordance with Practice E527.

1.3 For acceptance criteria for inclusion of new aluminum and aluminum alloys in this specification, see Annex A2.

1.4 This specification is the inch-pound companion to Specification B247M; therefore, no SI equivalents are presented in the specification.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

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

2.2 ASTM Standards:³

- B211/B211M Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire
- B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)
- B557 Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products
- B594 Practice for Ultrasonic Inspection of Aluminum-Alloy Wrought Products
- B660 Practices for Packaging/Packing of Aluminum and Magnesium Products
- B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products
- B918/B918M Practice for Heat Treatment of Wrought Aluminum Alloys
- B985 Practice for Sampling Aluminum Ingots, Billets, Castings and Finished or Semi-Finished Wrought Aluminum Products for Compositional Analysis
- E10 Test Method for Brinell Hardness of Metallic Materials
- E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E165/E165M Practice for Liquid Penetrant Testing for General Industry
- E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)
- E716 Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spark Atomic Emission Spectrometry
- E1004 Test Method for Determining Electrical Conductivity Using the Electromagnetic (Eddy Current) Method
- E1251 Test Method for Analysis of Aluminum and Aluminum Alloys by Spark Atomic Emission Spectrometry

¹ This specification is under the jurisdiction of ASTM Committee B07 on Light Metals and Alloys and is the direct responsibility of Subcommittee B07.03 on Aluminum Alloy Wrought Products.

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² For ASME Boiler and Pressure Vessel Code applications see related Specification SB-247 in Section II of that Code.

³ For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

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

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

Alloy	Silicon	Iron	Copper	Man- ganese	Mag- nesium	Chro- mium	Nickel	Zinc	Titanium	Zir- conium	Other Elements ^E		Alumi- num
											Each	Total ^F	
1100	0.95 Si + Fe		0.05–0.20	0.05	...	...	...	0.10	...	...	0.05	0.15	99.00 min ^G
2014	0.50–1.2	0.7	3.9–5.0	0.40–1.2	0.20–0.8	0.10	...	0.25	0.15	... ^H	0.05	0.15	rem
2018	0.9	1.0	3.5–4.5	0.20	0.45–0.9	0.10	1.7–2.3	0.25	...	...	0.05	0.15	rem
2025	0.50–1.2	1.0	3.9–5.0	0.40–1.2	0.05	0.10	...	0.25	0.15	...	0.05	0.15	rem
2218	0.9	1.0	3.5–4.5	0.20	1.2–1.8	0.10	1.7–2.3	0.25	...	...	0.05	0.15	rem
2219 ^I	0.20	0.30	5.8–6.8	0.20–0.40	0.02	...	...	0.10	0.02–0.10	0.10–0.25	0.05	0.15	rem
2618	0.10–0.25	0.9–1.3	1.9–2.7	...	1.3–1.8	...	0.9–1.2	0.10	0.04–0.10	...	0.05	0.15	rem
3003	0.6	0.7	0.05–0.20	1.0–1.5	...	...	...	0.10	...	...	0.05	0.15	rem
4032	11.0–13.5	1.0	0.50–1.3	...	0.8–1.3	0.10	0.50–1.3	0.25	...	...	0.05	0.15	rem
5083	0.40	0.40	0.10	0.40–1.0	4.0–4.9	0.05–0.25	...	0.25	0.15	...	0.05	0.15	rem
6061	0.40–0.8	0.7	0.15–0.40	0.15	0.8–1.2	0.04–0.35	...	0.25	0.15	...	0.05	0.15	rem
6066	0.9–1.8	0.50	0.7–1.2	0.6–1.1	0.8–1.4	0.40	...	0.25	0.20	...	0.05	0.15	rem
6151	0.6–1.2	1.0	0.35	0.20	0.45–0.8	0.15–0.35	...	0.25	0.15	...	0.05	0.15	rem
7049	0.25	0.35	1.2–1.9	0.20	2.0–2.9	0.10–0.22	...	7.2–8.2	0.10	...	0.05	0.15	rem
7050	0.12	0.15	2.0–2.6	0.10	1.9–2.6	0.04	...	5.7–6.7	0.06	0.08–0.15	0.05	0.15	rem
7075	0.40	0.50	1.2–2.0	0.30	2.1–2.9	0.18–0.28	...	5.1–6.1	0.20 ^J	...	0.05	0.15	rem
7076	0.40	0.6	0.30–1.0	0.30–0.8	1.2–2.0	...	...	7.0–8.0	0.20	...	0.05	0.15	rem
7175	0.15	0.20	1.2–2.0	0.10	2.1–2.9	0.18–0.28	...	5.1–6.1	0.10	...	0.05	0.15	rem

^A Limits are in weight percent maximum unless shown as a range or stated otherwise.

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

^C 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 E29.

^D In case there is a discrepancy in the values listed in Table 1 with those listed in the "International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys" (known as the "Teal Sheets"), the composition limits registered with the Aluminum Association and published in the "Teal Sheets" shall be considered the controlling composition. The "Teal Sheets" are available at <http://www.aluminum.org/tealsheets>.

^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 The aluminum content shall be calculated by subtracting from 100.00 % the sum of all metallic elements present in amounts of 0.010 % or more each, rounded to the second decimal before determining the sum.

^H Upon agreement between purchaser and producer or supplier, a zirconium-plus-titanium limit of 0.20 % maximum is permitted.

^I Vanadium, 0.05–0.15 %. The total for other elements does not include Vanadium.

^J Upon agreement between purchaser and producer or supplier, a zirconium-plus-titanium limit of 0.25 % maximum is permitted.

E3061 Test Method for Analysis of Aluminum and Aluminum Alloys by Inductively Coupled Plasma Atomic Emission Spectrometry (Performance Based)

G47 Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products

2.3 Aluminum Association Standards:⁴

AS&D Aluminum Standards & Data

AS&D Metric Aluminum Standards and Data Metric SI Designations and Chemical Composition Limits for Aluminum Alloys in the Form of Castings and Ingots (Pink Sheets)

Tempers for Aluminum and Aluminum Alloy Products Metric Edition (Tan Sheets)

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys (Teal Sheets)

Tempers for Aluminum and Aluminum Alloy Products (Yellow Sheets)

2.4 ANSI Standard:⁵

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

2.5 ASNT Standard:⁶

ASNT SNT-TC-1A ASNT Recommended Practice No. SNT-TC-1A

2.6 Military Standard:⁷

MIL-STD-129 Marking for Shipment and Storage (referenced in MIL-STD-649 and applies only to direct shipments to Department of Defense agencies).

2.7 SAE Standard:⁸

AMS 2772 Heat Treatment of Aluminum Alloys Raw Materials

2.8 Federal Standard:⁷

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

⁵ Available from Aluminum Association, Inc., 1400 Crystal Dr. Blvd., Suite 430, Arlington, VA 22202, <http://www.aluminum.org>.

⁶ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

⁷ Available from DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5094, <http://quicksearch.dla.mil>.

⁸ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

⁴ Available from Aluminum Association, 1400 Crystal Dr., Suite 430, Arlington, VA 22202, <http://www.aluminum.org>.