



Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric)¹

This standard is issued under the fixed designation B211M; 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.

^{ε1} NOTE—Table 1 was corrected editorially in June 2012.

1. Scope*

1.1 This specification covers rolled or cold-finished bar, rod, and wire in alloys (Note 1) and tempers as shown in Table 2.

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

NOTE 2—The term *cold finished* is used to indicate the type of surface finish, sharpness of angles, and dimensional tolerances produced by drawing through a die.

NOTE 3—See Specification B221M for aluminum and aluminum-alloy extruded bars, rods, wire, shapes, and tubes; and Specification B316/B316M for aluminum and aluminum-alloy rivet and cold-heading wire and rods.

1.2 Alloy and temper designations are in accordance with ANSI H35.1M. 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 This specification is the metric counterpart of Specification B211.

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

2. Referenced Documents

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

2.2 *ASTM Standards*:²

B221M Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric)

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 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.

B316/B316M Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods
B557M Test Methods for Tension Testing Wrought and Cast Aluminum- and Magnesium-Alloy Products (Metric)
B594 Practice for Ultrasonic Inspection of Aluminum-Alloy Wrought Products
B660 Practices for Packaging/Packing of Aluminum and Magnesium Products
B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products
B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products
B918 Practice for Heat Treatment of Wrought Aluminum Alloys
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
E290 Test Methods for Bend Testing of Material for Ductility
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)³
E716 Practices for Sampling and Sample Preparation of Aluminum and Aluminum Alloys for Determination of Chemical Composition by Spectrochemical Analysis
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
G47 Test Method for Determining Susceptibility to Stress-Corrosion Cracking of 2XXX and 7XXX Aluminum Alloy Products

³ 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,D}

Alloy	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti [†]	Bi	Pb	Sn [†]	Other Elements ^E		Aluminum
													Each	Total ^F	
1100 ^G	0.95 Si + Fe		0.05–0.20	0.05	...	...	...	0.10	...	...	...	...	0.05	0.15	99.00 min ^H
2011	0.40	0.7	5.0–6.0	...	...	...	...	0.30	...	0.20–0.6	0.20–0.6	...	0.05	0.15	remainder
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	...	...	...	0.05	0.15	remainder
2017	0.20–0.8	0.7	3.5–4.5	0.40–1.0	0.40–0.8	0.10	...	0.25	0.15	...	...	...	0.05	0.15	remainder
2024	0.50	0.50	3.8–4.9	0.30–0.9	1.2–1.8	0.10	...	0.25	0.15	...	...	...	0.05	0.15	remainder
2219	0.20	0.30	5.8–6.8	0.20–0.40	0.02	...	...	0.10	0.02–0.10	...	...	...	0.05 ^I	0.15 ^I	remainder
3003	0.6	0.7	0.05–0.20	1.0–1.5	...	...	...	0.10	...	...	...	...	0.05	0.15	remainder
4032	11.0–13.5	1.0	0.50–1.3	...	0.8–1.3	0.10	0.5–1.3	0.25	...	...	...	...	0.05	0.15	remainder
5052	0.25	0.40	0.10	0.10	2.2–2.8	0.15–0.35	...	0.10	...	...	...	...	0.05	0.15	remainder
5056	0.30	0.40	0.10	0.05–0.20	4.5–5.6	0.05–0.20	...	0.10	...	...	...	...	0.05	0.15	remainder
5154 ^G	0.25	0.40	0.10	0.10	3.1–3.9	0.15–0.35	...	0.20	0.20	...	...	...	0.05	0.15	remainder
6013	0.6–1.0	0.50	0.6–1.1	0.20–0.8	0.8–1.2	0.10	...	0.25	0.10	...	...	...	0.05	0.15	remainder
6020	0.40–0.9	0.50	0.30–0.9	0.35	0.6–1.2	0.15	...	0.20	0.15	...	0.05	0.9–1.5	0.05	0.15	remainder
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	remainder
6110	0.7–1.5	0.8	0.20–0.7	0.20–0.7	0.50–1.1	0.04–0.25	...	0.30	0.15	...	...	...	0.05	0.15	remainder
6262	0.40–0.8	0.7	0.15–0.40	0.15	0.8–1.2	0.04–0.14	...	0.25	0.15	0.40–0.7	0.40–0.7	...	0.05	0.15	remainder
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	...	...	...	0.05	0.15	remainder

[†] Values corrected editorially in June 2012.

^A In case of any discrepancy in the values listed in Table 1 when compared with those listed in the “Teal Sheets” (International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys), the composition limits registered with The Aluminum Association and published in the “Teal Sheets” shall be considered the controlling composition.

^B Limits are in mass percent maximum unless otherwise shown.

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

^D 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.

^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 non-conforming.

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

^G Beryllium 0.0003 maximum for welding electrode and welding rod only.

^H The aluminum content is the difference between 100.00 % and the sum of all the other metallic elements and silicon present in amounts of 0.010 % or more each, rounded to the second decimal before determining the sum.

^I Vanadium 0.05–0.15 % zirconium 0.10–0.25 %. The total for other elements does not include vanadium and zirconium.

2.3 ANSI Standards:

H35.1M Alloy and Temper Designation Systems for Aluminum⁴

H35.2M Dimensional Tolerances for Aluminum Mill Products⁴

2.4 Federal Standard:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁵

2.5 Military Standard:

MIL-STD-129 Marking for Shipment and Storage⁵

2.6 Aerospace Material Specification:

AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials⁶

2.7 The Aluminum Association:

International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys⁷

2.8 Other Standards:

CEN EN 14242 Aluminium and Aluminium Alloys—Chemical Analysis—Inductively Coupled Plasma Optical Emission Spectral Analysis⁸

3. Terminology

3.1 Definitions:

3.1.1 Refer to Terminology B881 for definitions of product terms used in this specification.

3.1.2 *flatten and slit wire*—flatten wire which has been slit to obtain square edges.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *capable of*—The term *capable of* as used in this specification means that the test need not be performed by the producer of the material. However, should subsequent testing by the purchaser establish that the material does not meet these requirements, the material shall be subject to rejection.

4. Ordering Information

4.1 Orders for material to this specification shall include the following information:

4.1.1 This specification number,

⁴ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, <http://www.ansi.org>.

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁶ Available from the Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001.

⁷ Available from The Aluminum Association, Inc. 1525 Wilson Boulevard, Arlington, VA 22209, www.aluminum.org.

⁸ Available from European Committee for Standardization, Central Secretariat (CEN), rue de Stassart 36, B1050 Brussels, Belgium. <http://www.cen.eu/eseach>