Designation: B211/B211M – 23

Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire[1]

This standard is issued under the fixed designation B211/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.

1. Scope*

1.1 This specification[2] covers rolled or cold-finished bar, rod, and wire in alloys (Note 1) and tempers as shown in Table 2 [Table 3].

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 B221 [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 H35.1/H35.1M. The equivalent UNS alloy designations shall be 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 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]

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)

B316/B316M Specification for Aluminum and Aluminum-Alloy Rivet and Cold-Heading Wire and Rods

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)

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/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

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E290 Test Methods for Bend Testing of Material for Ductility

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

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

[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-211 in Section II of that Code.

[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.

***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] Each	Other Elements[E] Total[F]	Al, min
1100[G]	0.95 Si + Fe		0.05–0.20	0.05	. . .	. . .	. . .	0.10	. . .	. . .	. . .	. . .	0.05	0.15	99.00[G]
2011	0.40	0.7	5.0–6.0	. . .	. . .	. . .	. . .	0.30	. . .	0.20–0.6	0.20–0.6	. . .	0.05	0.15	rem
2111	0.40	0.7	5.0–6.0	. . .	. . .	. . .	. . .	0.30	. . .	0.20–0.8	. . .	0.10–0.50	0.05	0.15	rem
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	rem
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	rem
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	rem
2219	0.20	0.30	5.8–6.8	0.20–0.40	0.02	. . .	. . .	0.10	0.02–0.10	. . .	. . .	. . .	0.05[H]	0.15[H]	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	0.5–1.3	0.25	. . .	. . .	. . .	. . .	0.05	0.15	rem
5052	0.25	0.40	0.10	0.10	2.2–2.8	0.15–0.35	. . .	0.10	. . .	. . .	. . .	. . .	0.05	0.15	rem
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	rem
5154	0.25	0.40	0.10	0.10	3.1–3.9	0.15–0.35	. . .	0.20	0.20	. . .	. . .	. . .	0.05	0.15	rem
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	rem
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	rem
6026	0.6–1.4	0.7	0.20–0.50	0.20–1.0	0.6–1.2	0.30	. . .	0.30	0.20	0.50–1.5	0.40	0.05	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
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	rem
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	rem
6262A	0.40–0.8	0.7	0.15–0.40	0.15	0.8–1.2	0.04–0.14	. . .	0.25	0.10	0.40–0.9	. . .	0.40–1.0	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	. . .	. . .	. . .	0.05	0.15	rem

[A] In case of any discrepancy in the values listed in this table 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. The "Teal Sheets" are available at http://www.aluminum.org/tealsheets.
[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] The aluminum content is the difference between 100.00 % and the sum of all other metallic elements and silicon present in amounts of 0.010 % or more each, rounded to the second decimal before determining the sum.
[H] Vanadium 0.05–0.15 % zirconium 0.10–0.25 %. The total for other elements does not include vanadium and zirconium.

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

2.3 *ANSI Standards:*[4]

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

H35.2 [H35.2M] Dimensional Tolerances for Aluminum Mill Products

2.4 *Federal Standard:*[5]

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

2.5 *Military Standard:*

MIL-STD-129 Marking for Shipment and Storage[5]

2.6 *Aerospace Material Specification:*[6]

AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials

2.7 *The Aluminum Association:*[7]

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

Aluminum Standards & Data (AS&D)

Tempers for Aluminum and Aluminum Alloy Products (Yellow Sheets)

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

2.8 *Other Standards:*

CEN EN 14242 Aluminium and Aluminium Alloys–Chemical Analysis–Inductively Coupled Plasma Optical Emission Spectral Analysis[8]

3. Terminology

3.1 *Definitions:*

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

3.1.2 *flattened and slit wire, n*—flattened wire which has been slit to obtain square edges.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *capable of, adj*—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] 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 Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.
[7] Available from The Aluminum Association, Inc. 1400 Crystal Drive, Suite 430, Arlington, VA 22202, www.aluminum.org.
[8] Available from European Committee for Standardization, Central Secretariat (CEN), rue de Stassart 36, B1050 Brussels, Belgium. http://www.cen.eu/esearch