Designation: ~~B211 – 12ε1~~ B211/B211M – 19

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;~~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.

~~ε[1] NOTE—Table 1 was corrected editorially in June 2012.~~

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.~~H35.1/H35.1M. The equivalent UNS alloy designations are those of Table 1 preceded by A9, for example, A91100 for aluminum 1100 in accordance with Practice E527.

~~1.3 A complete metric companion to Specification B211 has been developed—B211M; therefore, no metric equivalents are presented in this specification.~~

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~~B918/B918M Practice for Heat Treatment of Wrought Aluminum Alloys

[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[E]	Aluminum
1100	0.95 Si + Fe		0.05–0.20	0.05	...	...	...	0.10	...	...	...	...	0.05	0.15	99.00 min[G]
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[H]	0.15[H]	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[I]	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.

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
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.

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

E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys (Withdrawn 2017)[4]

E290 Test Methods for Bend Testing of Material for Ductility

E527 Practice for Numbering Metals and Alloys in the Unified Numbering System (UNS)

TABLE 2 Mechanical Property Limits[A] (US Customary)

Temper	Specified Diameter or Thickness, in.	Tensile Strength, ksi		Yield Strength[B] (0.2 % offset), min, ksi	Elongation[B] in 2 in. or 4× Diameter, min %
		min	max		
		Aluminum 1100			
O	0.124 and under	11.0	15.5	...	...
	0.125 and over	11.0	15.5	3.0	25
H12	0.374 and under	14.0	...	...	...
H14	0.374 and under	16.0	...	...	...
H16	0.374 and under	19.0	...	...	...
H18	0.374 and under	22.0	...	...	...
H112	all	11.0	...	3.0	...
F	all	–[D]	...	–[D]	...
		Alloy 2011			
T3	0.125–1.500	45.0	...	38.0	10
	1.501–2.000	43.0	...	34.0	12
	2.001–3.500	42.0	...	30.0	12
T4 and T451[E]	0.125–8.000	40.0	...	18.0	16
T6 and T651[E]	0.375–6.500	54.0	...	40.0	10
T8	0.125–3.250	54.0	...	40.0	10
		Alloy 2111			
T8	0.500–3.500	52.0	...	38.0	10
		Alloy 2014[F]			
O	0.124 and under	...	35.0	...	...
	0.125–8.000	...	35.0	...	12
T4, T42[G] , & T451[E]	0.124 and under	55.0	...	...	...
	0.125–8.000[H]	55.0	...	32.0	16
T6, T62[G] , & T651[E]	0.124 and under	65.0	...	...	...
	0.125–8.000[H]	65.0	...	55.0	8
		Alloy 2017[F]			
O	0.124 and under	...	35.0	...	...
	0.125–8.000	...	35.0	...	16
T4, T42[G] , & T451[E]	0.124 and under	55.0	...	...	...
	0.125–8.000[I]	55.0	...	32.0	12
		Alloy 2024[F]			
O	0.124 and under	...	35.0	...	...
	0.125–8.000	...	35.0	...	16
T36	0.124 and under	69.0	...	...	...
	0.125–0.375	69.0	...	52.0	10
T4[J]	0.124 and under	62.0	...	...	...
	0.125–0.499	62.0	...	45.0[J]	10
	0.500–4.500[H]	62.0	...	42.0[J]	10
	4.501–6.500[K]	62.0	...	40.0	10
	6.501–8.000[K]	58.0	...	38.0	10
T42[G]	0.124 and under	62.0	...	...	...
T42[G]	0.125–1.000	62.0	...	40.0	10
	1.001–6.500[H]	62.0	...	40.0	10
T351[E]	0.500–6.500[H]	62.0	...	45.0	10
	6.501–8.000	62.0	...	45.0	9
T6	0.124 and under	62.0	...	...	...
	0.125–6.500[H]	62.0	...	50.0	5
T62[G]	0.124 and under	60.0	...	...	...
	0.125–6.500[H]	60.0	...	46.0	5
T851[E]	0.500–6.500[H]	66.0	...	58.0	5
		Alloy 2219			
T851[E]	0.500–2.000	58.0	...	40.0	4
	2.001–4.000	57.0	...	39.0	4
		Alloy 3003			
O	all	14.0	19.0	5.0	25
H12	0.374 and under	17.0	...	...	...
H14	0.374 and under	20.0	...	...	...
H16	0.374 and under	24.0	...	...	...
H18	0.374 and under	27.0	...	...	...
H112	all	14.0	...	5.0	...
F	all	–[D]	...	–[D]	...
		Alloy 4032			
T86	0.375–0.750	51.0	...	46.0	4
		Alloy 5052			
O	0.124 and under	...	32.0	...	...
	0.125 and over	25.0	32.0	9.5	25
H32	0.124 and under	31.0	...	...	...
	0.125–0.374	31.0	...	23.0	...
H34	0.374 and under	34.0	...	26.0	...
H36	0.124 and under	37.0	...	...	...
	0.125–0.374	37.0	...	29.0	...
H38	0.374 and under	39.0	...	...	...
F	all	–[D]	...	–[D]	...

TABLE 2 *Continued*

Temper	Specified Diameter or Thickness, in.	Tensile Strength, ksi		Yield Strength[B] (0.2 % offset), min, ksi	Elongation[B] in 2 in. or 4x Diameter, min %
		min	max		
		Alloy 5056			
O	0.124 and under	...	46.0	...	...
	0.125 and over	...	46.0	...	20
H111	0.374 and under	44.0	...	...	...
H12	0.374 and under	46.0	...	...	...
H32	0.374 and under	44.0	...	...	...
H14	0.374 and under	52.0	...	...	...
H34	0.374 and under	50.0	...	...	...
H18	0.374 and under	58.0	...	...	...
H38	0.374 and under	55.0	...	...	...
H192	0.374 and under	60.0	...	...	...
H392	0.374 and under	58.0	...	...	...
		Alloy 5154			
O	all	30.0	41.0	11.0	25
H32	0.374 and under	36.0	...	...	...
H34	0.374 and under	39.0	...	...	...
H36	0.374 and under	42.0	...	...	...
H38	0.374 and under	45.0	...	...	...
H112	all	30.0	...	11.0	...
		Alloy 6013			
T651[E]	0.500–4.000	56.0	...	52.0	7
T8	0.750–1.500	58.0	...	56.0	8
	1.501–5.500	57.0	...	55.0	7
		Alloy 6020			
T8	0.187–0.375	43.0	...	40.0	12
	0.376–1.999	42.0	...	39.0	12
	2.000–3.250	39.0	...	36.0	12
		Alloy 6026			
T6	0.200–3.000	54.0	...	44.0	6
T8	0.200–3.000	50.0	...	46.0	3
T9	0.200–3.000	52.0	...	48.0	3
		Alloy 6061[F]			
O	0.124 and under	...	22.0	...	...
	0.125–8.000	...	22.0	...	18
T4 & T451[E]	0.124 and under	30.0	...	...	...
	0.125–8.000[I]	30.0	...	16.0	18
T42[G]	0.125–8.000[I]	30.0	...	14.0	18
T6, T62[G] , & T651[E]	0.124 and under	42.0	...	...	...
	0.125–8.000[I]	42.0	...	35.0	10
T89 & T94	0.374 and under	54.0	...	47.0	...
		Alloy 6110			
T9	0.374 and under	65.0	...	63.0	2
		Alloy 6262			
T6 & T651[E]	0.125–8.000[H]	42.0	...	35.0	10
T8	0.750–2.000	45.0	...	43.0	12
T9	0.125–2.000	52.0	...	48.0	5
	2.001–3.000	50.0	...	46.0	5
		Alloy 7075[F]			
O	0.124 and under	...	40.0	...	...
	0.125–8.000	...	40.0	...	10
T6, T62[G]	0.124 and under	77.0	...	66.0	...
	0.125–4.000[L]	77.0	...	66.0	7
T651[E]	0.124 and under	77.0	...	66.0	...
	0.125–4.000[L]	77.0	...	66.0	7
	4.001–6.000	75.0	...	64.0	7
	6.001–7.000	73.0	...	62.0	7
T73 & T7351[E]	0.124 and under	68.0	...	...	...
	0.125–4.000	68.0	...	56.0	10
	4.001–5.000	66.0	...	55.0	8
	5.001–6.000	64.0	...	52.0	8

Temper	Specified Diameter or Thickness, in	Bend Diameter Factor, N
	Alloy 2017	
T4, T42, & T451	0.124 and under	3[M]
	0.125–8.000[I]	6[M]
	Alloy 2024	
O	0.124 and under	1
T351, T4, T42	0.124 and under	3
	0.125–6.500	6
	Alloy 3003	
O	all	0
H12	0.374 and under	2
H14	0.374 and under	2
H16	0.374 and under	8

[A] To determine conformance to this specification, each value for tensile strength and for yield strength shall be rounded to the nearest 0.1 ksi [1 MPa] and each value for elongation to the nearest 0.5 %, both in accordance with the rounding-off method of Practice E29. The basis for establishment of tensile property limits is shown in Annex A1.
[B] The measurement of yield strength and elongation is not required for wire less than 0.125 in. [3.20 mm] in thickness or diameter.
[C] Elongations in 50 mm applies to rectangular bar up through 12.5 mm thickness from which a standard rectangular tension test specimen is machined. The 5× diameter $(5.65\sqrt{A})$ requirements, where *D* and *A* are diameter and cross-sectional area of the specimen, respectively, apply to round specimens tested in fullsection or to standard or proportional, round-machined, tension test specimens.
[D] There are no tensile requirements for material in the F temper but it usually can be expected that material 1½ in. [40 mm] or less in thickness or diameter (except sections over 4 in. [100 mm] in width) will have a strength about equivalent to the H14 or H34 temper. As size increases the strength decreases to nearly that of the O temper.
[E] For stress-relieved tempers, characteristics and properties other than those specified may differ somewhat from the corresponding characteristics and properties of material in the basic tempers.
[F] Also available in the F temper for which no properties are specified or test results provided. Producers shall perform tension tests to confirm response to heat treatment as required by Section 10.
[G] Material in the T42 or T62 tempers is not available from the materials producers. These properties can usually be obtained by the user when material is properly solution heat treated or solution and precipitation heat treated from the O or F temper. These properties also apply to samples of material in the O or F temper that are solution heat treated or solution and precipitation heat treated by the producer to determine that the material will respond to proper heat treatment. Properties attained by the user, however, may be lower than those listed if the material has been formed or otherwise cold or hot worked, particularly in the O temper, prior to solution heat treatment.
[H] Properties listed for this full size increment are applicable to rod. Properties listed are also applicable to square, rectangular, hexagonal, or octagonal bar having a maximum thickness of 4 in. [100 mm] and a maximum cross-sectional area of 36 $in.^2$ [23 000 mm^2].
[I] For bar, maximum cross-sectional area is 50 $in.^2$ [32 000 mm^2].
[J] ~~Beryllium 0.0003 maximum for welding electrode and welding rod only.~~ Minimum yield strength for 2024-T4 wire and rod 0.125 in. [3.20 mm] and larger in thickness or diameter, produced in coil form for both straight length and coiled products, is 40.0 ksi [275 MPa].
[K] Properties listed for this size increment are applicable to rod only.
[L] For rounds, maximum diameter is 4 in. [100 mm]; for square, hexagonal, or octagonal bar, maximum thickness is 3½ in. [90 mm]; for rectangular bar, maximum thickness is 3 in. [80 mm] with corresponding maximum width of 6 in. [150 mm]; for rectangular bar less than 3 in. [80 mm] in thickness, maximum width is 10 in. [250 mm].
[M] Bend diameter factor values stated for this full size increment apply to T4 product only. Values listed also apply to T451 product in the 0.500–8.000 in. [12.20–200 mm] size range.

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

2.3 *ANSI Standards:*
~~H35.1~~H35.1/H35.1M Alloy and Temper Designation Systems for Aluminum[5]
H35.2 [H35.2M] Dimensional Tolerances for Aluminum Mill Products[5]

2.4 *Federal Standard:*
Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[6]

2.5 *Military Standard:*
MIL-STD-129 Marking for Shipment and Storage[6]

2.6 *Aerospace Material Specification:*
AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials[7]

2.7 *The Aluminum Association:*
~~International Alloy Designations and Chemical Composition Limits~~ International Alloy Designations and Chemical Composition Limits for Wrought Aluminum and Wrought Aluminum Alloys ("Teal Sheets")[8]

2.8 *Other Standards:*
CEN EN 14242 Aluminium and Aluminium Alloys–Chemical Analysis–Inductively Coupled Plasma Optical Emission Spectral Analysis[9]

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*—Flattened wire which has been slit to obtain square edges.

[4] The last approved version of this historical standard is referenced on www.astm.org.
[5] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.
[6] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.
[7] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.
[8] Available from The Aluminum Association, Inc. ~~1525 Wilson Boulevard,~~ 1400 Crystal Drive, Suite 430, Arlington, VA ~~22209, www.aluminum.org~~22202, www.aluminum.org.
[9] Available from European Committee for Standardization, Central Secretariat (CEN), rue de Stassart 36, B1050 Brussels, Belgium. http://www.cen.eu/esearch

TABLE 3 Mechanical Property Limits (Metric SI)[A]
(See Table 2 for footnotes.)

Temper	Specified Diameter or Thickness, mm		Tensile Strength, MPa		Yield Strength[B] (0.2 % offset), MPa		Elongation,[B,C] min, %	
	over	through	min	max	min	max	in 50 mm	in 5× Diameter $(5.65\sqrt{A})$
Aluminum 1100								
O	...	3.20	75	105	...	...	...	...
	3.20	...	75	105	20	...	25	22
H12	...	10.00	95	...	...	...	...	...
H14	...	10.00	110	...	...	...	...	...
H16	...	10.00	130	...	...	...	...	...
H18	...	10.00	150	...	...	...	...	...
H112	all		75	...	20	...	...	...
F	all		[D]	...	[D]	...	...	...
Alloy 2011								
T3	3.20	40.00	310	...	260	...	10	9
	40.00	50.00	295	...	235	...	...	10
	50.00	90.00	290	...	205	...	...	12
T4 and T451[E]	3.20	200.00	275	...	125	...	16	14
T6 and T651	10.00	160.00	370	...	275	...	10	9
T8	3.20	80.00	370	...	275	...	10	9
Alloy 2111								
T8	12.70	88.90	360	...	260	...	...	9
Alloy 2014[F]								
O	...	3.20	...	240	...	...	...	...
	3.20	200.00	...	240	...	...	12	10
T4, T42[G] , & T451[E]	...	3.20	380	...	...	...	...	...
	3.20	200.00[H]	380	...	220	...	16	14
T6, T62[G] , & T651[E]	...	3.20	450	...	...	...	...	...
	3.20	200.00[H]	450	...	380	...	8	7
Alloy 2017[F]								
O	...	3.20	...	240	...	...	...	...
	3.20	200.00	...	240	...	...	16	14
T4, T42[G] , & T451[E]	...	3.20	380	...	...	...	...	...
	3.20	200.00[H,I]	380	...	220	...	12	10
Alloy 2024[F]								
O	...	3.20	...	240	...	...	...	...
	3.20	200.00	...	240	...	...	16	14
T36	...	3.20	475	...	...	...	...	...
	3.20	10.00	475	...	360	...	10	...
T4[J]	...	3.20	425	...	...	...	...	...
	3.20	12.50	425	...	310[J]	...	10	...
	12.50	120.00[H]	425	...	290[J]	...	...	9
	120.00	160.00[K]	425	...	275	...	...	9
	160.00	200.00[K]	425	...	260	...	...	9
T42[G]	...	3.20	400	...	...	...	...	...
	3.20	25.00	425	...	275	...	10	9
	25.00	160.00[H]	425	...	275	...	...	9
T351[E]	12.50	160.00[H]	425	...	310	...	...	9
	160.00	200.00	425	...	310	...	...	8
T6	...	3.20	425	...	...	...	...	...
	3.20	160.00[H]	425	...	345	...	5	4
T62[G]	...	3.20	415	...	...	...	...	...
	3.20	160.00[H]	415	...	315	...	5	4
T851[E]	12.50	160.00[H]	455	...	400	...	...	4
Alloy 2219								
T851[E]	12.50	50.00	400	...	275	...	...	3
	50.00	100.00	395	...	270	...	...	3
Alloy 3003								
O	...	3.20	95	130	...	...	...	...
	3.20	...	95	130	35	...	25	22
H12	...	10.00	115	...	...	...	...	...
H14	...	10.00	140	...	...	...	...	...
H16	...	10.00	165	...	...	...	...	...
H18	...	10.00	185	...	...	...	...	...
H112	all		95	...	35	...	...	...
F	all		[D]	...	[D]	...	...	...
Alloy 4032								
T86	10.00	20.00	350	...	315	...	4	3
Alloy 5052								
O	...	3.20	170	220	...	...	...	...
	3.20	...	170	220	65	...	25	22
H32	...	3.20	215	...	...	...	...	...
	3.20	10.00	215	...	160	...	...	...
H34	...	3.20	235	...	...	...	...	...
	3.20	10.00	235	...	180	...	...	...