



Designation: ~~B483/B483M – 13~~^{e1} B483/B483M – 20

Standard Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications¹

This standard is issued under the fixed designation B483/B483M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

^{e1} NOTE—Table 1 was corrected editorially in June 2014.

1. Scope*

1.1 This specification covers aluminum and aluminum-alloy drawn tube and drawn pipe in straight lengths and tube in coils for general purpose applications and climate control (HVAC) in the alloys (Note 2), and tempers shown in Tables 1 and 1-23. Coiled tubes are generally available only as round tubes with a wall thickness not exceeding 0.083 in. [2.00 mm] and only in non-heat-treatable alloys.

NOTE 1—For drawn seamless tubes, see Specification B210/B210M, for drawn seamless tubes to be used in condensers and heat exchangers, Specifications B234 and B234M, and for seamless pipe and tube, Specification B241/B241M. For extruded structural tube and pipe, see Specification B429/B429M.

NOTE 2—This specification's use of the term *alloy* in the general sense includes aluminum as well as aluminum alloy.

NOTE 1—For drawn seamless tubes, see Specifications B210 and B210M, for tubes to be used in condensers and heat exchangers, Specifications B234 and B234M, and for seamless pipe, Specification B241/B241M. For extruded structural tube and pipe, see Specification B429.

NOTE 2—this specification use of the term *alloy* in the general sense includes aluminum as well as aluminum alloy.

1.2 Alloy and temper designations are in accordance with ANSI H35.1/H35.1(M)-H35.1/H35.1M. The equivalent Unified Number System alloy designations are those of Table 34 preceded by A9, for example A91060 for aluminum 1060 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 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. 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 nonconformance with the standard.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *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 order acceptance form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards:*²

~~B210~~B210/B210M Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric) B0210_B0210M

~~B210M~~ Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric) (Withdrawn 2019)³

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.

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



TABLE 1 Tensile Property Limits, Tube (US Customary)^{A,B}

ALLOY Alloy AND and TEMPER Temper	SPECIFIED WALL Specified Wall THICKNESS in. [mm] Thickness, in.	TENSILE STRENGTH – ksi [MPa] Tensile Strength, ksi				Elongation in 2 in. [50 mm] or 4x Diameter, ^{C,E,I} in. [25.4 mm] or 5x Diameter, ^{C,E,I} in. [127 mm] Cut-out Specimen ^E		
		ULTIMATE Ultimate		YIELD Yield ^D (0.2% Offset), (0.2 % ksi [MPa] Offset)		In 50 mm Full Section Specimen ^E (2 in.) ^E	In 5x-Cut-out Specimen ^E Diameter (5.65√A) 4x Diameter ^{A,C}	FULL SECTION SPECIMEN ^E
		min:min	max:max	min:min	max:max			
1060^{E,I}								
1060^{F,H}								
1060-O	0.010-0.500 [0.25-12.50]	8.5 [60]	13.5 [95]	2.5 [16]	.. [-]	..	..	..
1060-O	0.010-0.500	8.5	13.5	2.5	..	..	..	..
1060-H12	0.010-0.500 [0.25-12.50]	10.0 [70]	.. [-]	4.0 [30]	.. [-]	..	..	..
1060-H12	0.010-0.500	10.0	..	4.0	..	..	..	..
1060-H14	0.010-0.500 [0.25-12.50]	12.0 [85]	.. [-]	10.0 [70]	.. [-]	..	..	..
1060-H14	0.010-0.500	12.0	..	10.0	..	..	..	..
1060-H18	0.010-0.500 [0.25-12.50]	16.0 [110]	.. [-]	13.0 [90]	.. [-]	..	..	..
1060-H18	0.010-0.500	16.0	..	13.0	..	..	..	..
1060-H113 ^K	0.010-0.500 [0.25-12.50]	8.5 [60]	.. [-]	2.5 [16]	.. [-]	..	..	..
1060-H113 ^J	0.010-0.500	8.5	..	2.5	..	..	..	..
1100^{E,I}								
1100^{F,H}								
1100-O	0.014-0.500 [0.36-12.50]	11.0 [75]	15.5 [105]	3.5 [25]	.. [-]	..	..	..
1100-O	0.014-0.500	11.0	15.5	3.5	..	..	..	..
1100-H12	0.014-0.500 [0.36-12.50]	14.0 [95]	.. [-]	11.0 [75]	.. [-]	..	..	..
1100-H12	0.014-0.500	14.0	..	11.0	..	..	..	..
1100-H14	0.014-0.500 [0.36-12.50]	16.0 [110]	.. [-]	14.0 [95]	.. [-]	..	..	..
1100-H14	0.014-0.500	16.0	..	14.0	..	..	..	..
1100-H16	0.014-0.500 [0.36-12.50]	19.0 [130]	.. [-]	17.0 [115]	.. [-]	..	..	..
1100-H16	0.014-0.500	19.0	..	17.0	..	..	..	..
1100-H18	0.014-0.500 [0.36-12.50]	22.0 [150]	.. [-]	20.0 [140]	.. [-]	..	..	..
1100-H18	0.014-0.500	22.0	..	20.0	..	..	..	..
1100-H113 ^K	0.014-0.500 [0.36-12.50]	11.0 [75]	.. [-]	3.5 [25]	.. [-]	..	..	..
1100-H113 ^J	0.014-0.500	11.0	..	3.5	..	..	..	..
3003^{E,I}								
3003^{F,H}								
3003-O	0.010-0.024 [0.25-0.63]	14.0 [95]	19.0 [130]	5.0 [35]	.. [-]	..	..	..
3003-O	0.010-0.024	14.0	19.0	5.0	..	..	..	..
0.025-0.049 [0.63-1.20]	14.0 [95]	19.0 [130]	5.0 [35]	.. [-]	30	20	..	..
0.050-0.259 [1.20-6.30]	14.0 [95]	19.0 [130]	5.0 [35]	.. [-]	35	25	..	..
0.260-0.500 [6.30-12.50]	0.025-0.049	14.0	19.0	5.0	..	30	20	..
	14.0 [95]	19.0 [130]	5.0 [35]	.. [-]	..	30	27	..
0.260-0.500 [6.30-12.50]	0.050-0.259	14.0	19.0	5.0	..	35	25	..
	14.0 [95]	19.0 [130]	5.0 [35]	.. [-]	..	30	27	..
3003-H12	0.010-0.500 [0.25-12.50]	17.0 [115]	.. [-]	12.0 [85]	.. [-]	..	..	..
3003-H12	0.010-0.500	17.0	..	12.0	..	..	..	..
3003-H14	0.010-0.024 [0.25-0.63]	20.0 [140]	.. [-]	17.0 [115]	.. [-]	3	..	..
3003-H14	0.010-0.024	20.0	..	17.0	..	3	..	..
0.025-0.049 [0.63-1.20]	20.0 [140]	.. [-]	17.0 [115]	.. [-]	5	3	..	..
0.050-0.259 [1.20-6.30]	0.025-0.049	20.0	..	17.0	..	5	3	..
	20.0 [140]	.. [-]	17.0 [115]	.. [-]	8	4	..	..
0.260-0.500 [6.30-12.50]	0.050-0.259	20.0	..	17.0	..	8	4	..
	20.0 [140]	.. [-]	17.0 [115]	.. [-]	..	..	..	..
3003-H16	0.260-0.500	20.0	..	17.0	..	..	..	..
3003-H16	0.010-0.024 [0.25-0.63]	24.0 [165]	.. [-]	21.0 [145]	.. [-]
3003-H16	0.010-0.024	24.0	..	21.0
0.025-0.049 [0.63-1.20]	24.0 [165]	.. [-]	21.0 [145]	.. [-]	3	2



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TABLE 1 Continued

TABLE 1 Continued

ALLOY AND TEMPER	SPECIFIED WALL THICKNESS	TENSILE STRENGTH - ksi [MPa] Tensile Strength, ksi				Elongation in 2-in. [50 mm] or 4x Diameter, or In 5x-Cut-out SECTION		
		ULTIMATE		YIELD		In 50 mm Full Section Specimen (2 in.) ^F	In 5x-Cut-out Diameter (5.65√A) 4x Diameter ^{G,C}	FULL SECTION SPECIMENS ^F
		min	max	min	max			
0.050-0.259 [1.20-6.30]	24.0 [165]	...	21.0 [145]	...	5	4	...	...
	0.025-0.049	24.0	...	21.0	...	3	2	...
0.260-0.500 [6.30-12.50]	24.0 [165]	...	21.0 [145]	...	...	...	...	...
	0.050-0.259	24.0	...	21.0	...	5	4	...
	0.260-0.500	24.0	...	21.0	...	...	...	...
3003-H18	0.010-0.024 [0.25-0.63]	27.0 [185]	...	24.0 [165]	...	2	...	...
3003-H18	0.010-0.024	27.0	...	24.0	...	2	...	...
0.025-0.049 [0.63-1.20]	27.0 [185]	...	24.0 [165]	...	3	2	...	...
	0.025-0.049	27.0	...	24.0	...	3	2	...
0.050-0.259† [1.20-6.30]	27.0 [185]	...	24.0 [165]	...	5	3	...	...
	0.050-0.259	27.0	...	24.0	...	5	3	...
0.260-0.500 [6.30-12.50]	27.0 [185]	...	24.0 [165]	...	...	...	...	...
	0.260-0.500	27.0	...	24.0	...	...	...	...
3003-H113 ^K	0.010-0.500 [0.25-12.50]	14.0 [95]	...	5.0 [35]	...	...	...	...
3003-H113 ^J	0.010-0.500	14.0	...	5.0	...	...	...	...
5050 ^{F,I}								
5050 ^{F,H}								
5050-O	0.010-0.500 [0.25-12.70]	18.0 [125]	24.0 [165]	6.0 [40]	...	...	...	...
5050-O	0.010-0.500	18.0	24	6.0	...	...	...	...
5050-H32	0.010-0.500 [0.25-12.70]	22.0 [150]	...	16.0 [110]	...	...	...	...
5050-H32	0.010-0.500	22.0	...	16.0	...	...	...	...
5050-H34	0.010-0.500 [0.25-12.70]	25.0 [170]	...	20.0 [140]	...	...	...	...
5050-H34	0.010-0.500	25.0	...	20.0	...	...	...	...
5050-H36	0.010-0.500 [0.25-12.70]	27.0 [185]	...	22.0 [150]	...	...	...	...
5050-H36	0.010-0.500	27.0	...	22.0	...	...	...	...
5050-H38	0.010-0.500 [0.25-12.70]	29.0 [200]	...	24.0 [165]	...	...	...	...
5050-H38	0.010-0.500	29.0	...	24.0	...	...	...	...
5052 ^{F,I}								
5052 ^{F,H}								
5052-O	0.010-0.450 [0.25-11.50]	25.0 [170]	35.0 [240]	10.0 [70]	...	...	...	...
5052-O	0.010-0.450	25.0	35.0	10.0	...	...	...	...
5052-H32†	0.010-0.450 [0.25-11.50]	31.0 [215]	...	23.0 [160]	...	...	...	...
5052-H32	0.010-0.450	31.0	...	23.0	...	...	...	...
5052-H34	0.010-0.450 [0.25-11.50]	34.0 [235]	...	26.0 [180]	...	...	...	...
5052-H34	0.010-0.450	34.0	...	26.0	...	...	...	...
5052-H36	0.010-0.450 [0.25-11.50]	37.0 [255]	...	29.0 [200]	...	...	...	...
5052-H36	0.010-0.450	37.0	...	29.0	...	...	...	...
5052-H38	0.010-0.450 [0.25-11.50]	39.0 [270]	...	31.0 [215]	...	...	...	...
5052-H38	0.010-0.450	39.0	...	31.0	...	...	...	...
6061								
6061-O	0.018-0.500 [0.45-12.50]	...	22.0 [150]	...	14.0 [95]	15	15	13
6061-O	0.018-0.500	...	22.0	...	14.0	15	15	...
6061-T4	0.025-0.049 [0.63-1.20]	30.0 [200]	...	16.0 [110]	...	16	14	...
6061-T4	0.025-0.049	30.0	...	16.0	...	16	14	...
0.050-0.259 [1.20-6.30]	30.0 [200]	...	16.0 [110]	...	18	16	...	...
0.260-0.500 [6.30-12.50]	30.0 [200]	...	16.0 [110]	...	20	18	16	...
	0.050-0.259	30.0	...	16.0	...	18	16	...
6061-T42 ^{G,H}	0.025-0.049 [0.63-1.20]	30.0 [200]	...	14.0 [110]	...	16	14	...



TABLE 1 Continued
TABLE 1 Continued

ALLOY AND TEMPER	SPECIFIED WALL THICKNESS	TENSILE STRENGTH – ksi [MPa] Tensile Strength, ksi				Elongation in 2-in. [50 mm] or 4x Diameter, %		FULL SECTION SPECIMENS
		ULTIMATE		YIELD ^D		In 50 mm Full Specimen ^F (2 in.) ^E	In 5x Cut-out Diameter ^G (5.65√A) 4x Diameter ^{G,C}	
		min	max	min	max			
	0.260–0.500	30.0	...	16.0	...	20	18	
0.050–0.259 [1.20–6.30]	30.0 [200]	...	14.0 [110]	...	18	16	14	
6061-T42 ^G	0.025–0.049	30.0	...	14.0	...	16	14	
	0.050–0.259	30.0	...	14.0	...	18	16	
0.260–0.500 [6.30–12.50]	30.0 [200]	...	14.0 [110]	...	20	18	16	
	0.260–0.500	30.0	...	14.0	...	20	18	
6061-T6 and T62 ^{G,H}	0.025–0.049 [0.63–1.20]	42.0 [290]	...	35.0 [240]	...	10	8	...
6061-T6 and T62 ^G	0.025–0.049	42.0	...	35.0	...	10	8	
0.050–0.259 [1.20–6.30]	42.0 [290]	...	35.0 [240]	...	12	10	10	
	0.050–0.259	42.0	...	35.0	...	12	10	
	0.260–0.500	42.0	...	35.0	...	14	12	
0.260–0.500 [6.30–12.50]	42.0 [290]	...	35.0 [240]	...	14	12	10	
6061-T8	0.035–0.350	45.0	...	40.0	...	8	...	
6063								
6063-O	0.018–0.500 [0.45–12.50]	...	19.0 [130]	...	...	...	...	...
6063-O	0.018–0.500	...	19.0	...	...	...	...	...
6063-T4 and T42 ^{G,H}	0.025–0.049 [0.63–1.20]	22.0 [150]	...	10.0 [70]	...	16	14	...
6063-T4 and T42 ^G	0.025–0.049	22.0	...	10.0	...	16	14	
0.050–0.259 [1.20–6.30]	22.0 [150]	...	10.0 [70]	...	18	16	16	
	0.050–0.259	22.0	...	10.0	...	18	16	
0.260–0.500 [6.30–12.50]	22.0 [150]	...	10.0 [70]	...	20	18	16	
	0.260–0.500	22.0	...	10.0	...	20	18	
6063-T6 and T62 ^{G,H}	0.025–0.049 [0.63–1.20]	33.0 [230]	...	28.0 [195]	...	12	8	...
6063-T6 and T62 ^G	0.025–0.049	33.0	...	28.0	...	12	8	
0.050–0.259 [1.20–6.30]	33.0 [230]	...	28.0 [195]	...	14	10	10	
	0.050–0.259	33.0	...	28.0	...	14	10	
0.260–0.500 [6.30–12.50]	33.0 [230]	...	28.0 [195]	...	16	12	10	
	0.260–0.500	33.0	...	28.0	...	16	12	
6063-T83	0.025–0.259 [0.63–6.30]	33.0 [230]	...	30.0 [205]	...	5	...	...
6063-T83	0.025–0.049	33.0	...	30.0	...	5	...	
6063-T83+	0.025–0.259 [0.63–6.30]	28.0 [195]	...	25.0 [170]	...	5	...	...
6063-T831	0.025–0.049	28.0	...	25.0	...	5	...	
6063-T832	0.025–0.049 [0.63–1.20]	41.0 [285]	...	36.0 [250]	...	8	5	...
6063-T832	0.025–0.049	41.0	...	36.0	...	8	5	
0.050–0.259 [1.20–6.30]	40.0 [275]	...	35.0 [240]	...	8	5	...	
	0.025–0.049	40.0	...	35.0	...	8	5	
6262								
6262-T6 and T62 ^{G,H}	0.025–0.049 [0.63–1.20]	42.0 [290]	...	35.0 [240]	...	10	8	...
6262-T6 and T62 ^G	0.025–0.049	42.0	...	35.0	...	10	8	
0.050–0.259 [1.20–6.30]	42.0 [290]	...	35.0 [240]	...	12	10	10	
0.260–0.500 [6.30–12.50]	42.0 [290]	...	35.0 [240]	...	14	12	10	
	0.050–0.259	42.0	...	35.0	...	12	10	
6262-T9	0.025–0.375 [0.63–10.00]	48.0 [330]	...	44.0 [305]	...	5	4	3
6262-T9	0.260–0.500	42.0	...	35.0	...	14	12	
	0.025–0.375	48.0	...	4.0	...	5	4	

^A See Annex A1.

^B To determine conformance to this specification each value for tensile strength and for yield strength shall be rounded to the nearest 0.1 ksi [MPa] and each value for elongation to the nearest 0.5 %, both in accordance with the rounding method of Practice E29.

^C Elongation of full-section and cut-out sheet-type specimens is measured in 2 in.; of cut-out round specimens, in 4x specimen diameter.

^D Yield strength to be determined only on straight tube.



- ^E ~~Round~~ Round tube 2 inches or less in outside diameter and square tube 1½ ~~inches~~ in. or less on a side are tested in full section unless the limitations of the testing machine precludes the use of such a specimen.
- ^F For round tube over 2 ~~inches~~ in. in diameter, for square tube over 1½ ~~inches~~ in. on a side, for all sizes of tube other than round and square, or in those cases when a full section specimen cannot be used, a cut-out specimen is used.
- ^G ~~Elongations in 50 mm apply for tube tested in full section, for sheet type specimens for tubes having a flat wall, and for similar curved specimens for tubes having a curved wall up to a maximum wall thickness of 12.50 mm. Elongations in 5D (5.65√A), where D and A are diameter and cross-sectional area specimens, respectively, apply to round test specimens machined from wall thickness over 6.30 mm.~~
- ^G Material in the T42 or T62 tempers is not available from the material producers.
- ^H In this alloy tube other than round is produced only in the F (as drawn) and O tempers. Properties for F temper are not specified or guaranteed.
- ^I For specified wall thickness under 0.025 in. ~~[0.63 mm]~~ elongation is not required.
- ^J The H113 temper applies to other than round tube which is fabricated from annealed round tube.
- † Corrected editorially.

[B234 Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators, and Heat Exchangers](#)

[B234M Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators, and Heat Exchangers \(Metric\)](#)

[B241/B241M Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube](#)

[B429B429/B429M Specification for Aluminum-Alloy Extruded Structural Pipe and Tube \(Withdrawn 2019\)³](#)

[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 \(Metric\)](#)

[B597 Practice for Heat Treatment of Aluminum Alloys \(Withdrawn 2002\)³](#)

[B660 Practices for Packaging/Packing of Aluminum and Magnesium Products](#)

[B666/B666M Practice for Identification Marking of Aluminum and Magnesium Products](#)

[B807/B807M Practice for Extrusion Press Solution Heat Treatment for Aluminum Alloys](#)

[B881 Terminology Relating to Aluminum- and Magnesium-Alloy Products](#)

[B918B918/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](#)

[E34 Test Methods for Chemical Analysis of Aluminum and Aluminum-Base Alloys \(Withdrawn 2017\)³](#)

[E215 Practice for Standardizing Equipment and Electromagnetic Examination of Seamless Aluminum-Alloy Tube](#)

[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 Spark Atomic Emission Spectrometry](#)

[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 \(Performance Based Method\)](#)

2.3 *ANSI Standards:*⁴

[H35.1/H35.1\(M\)H35.1/H35.1M Alloy and Temper Designation Systems](#)

[H35.2 Dimensional Tolerances for Aluminum Mill Products](#)

[H35.2M Dimensional Tolerances for Aluminum Mill Products \[Metric\]](#)

2.4 *Military Standard:*⁵

[MIL-STD-129 Marking for Shipment and Storage](#)

2.5 *Federal Standard:*⁵

[Fed. Std. No. 123 Marking for Shipment \(Civil Agencies\)](#)

2.6 *Military Specifications:SAE Standard:*⁶

[AMS 2770 Heat Treatment of Wrought Aluminum Alloy Parts](#)

[AMS 2772 Heat Treatment of Aluminum Alloy Raw Materials](#)

2.7 *FederalOther Standard:*⁷

[Fed. Std. No. 123 Marking for Shipment \(Civil Agencies\)CEN EN 14242 Aluminum and Aluminum Alloys – Chemical Analysis – Inductively Coupled Optical Emissions Spectral Analysis](#)

³ The last approved version of this historical standard is referenced on www.astm.org.

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, DODSSP, Bldg. 4, Section D, DLA Document Services, Building 4/D, 700 Robbins Ave., Philadelphia, PA 19111-5098, <http://dodssp.daps.dla.mil>; 19111-5094, <http://quicksearch.dla.mil>.~~

⁶ Available from SAE International (SAE), 400 Commonwealth Dr., Warrendale, PA 15096, <http://www.sae.org>.

⁷ Available from European Committee for Standardization (CEN), Avenue Marnix 17, B-1000, Brussels, Belgium, <http://www.cen.eu>.



TABLE 2 Tensile Property Limits, Drawn Pipe^{A,B,C}

Temper	Pipe Size, Designation	Tensile Strength, ksi [MPa]				Yield Strength ^C (0.2% Offset), ksi [MPa]; min Elongation, min, %	In 5x Diameter (5.65 √A) ^E
		min	max	Elongation in 2 in. or 4x Diameter; ^D min, %	In 50 mm		
Alloy 3003							
H18	Under 1	27.0 [185]	...	24.0 [165]	4	[4]	...
H112	1 and over	14.0 [95]	...	5.0 [35]	25	[25]	[22]

TABLE 2 Tensile Property Limits, Tube (SI Units)^{A,B}

Alloy and Temper	Specified Wall Thickness, mm (Over-Thru)	Tensile Strength, MPa				Full Section Specimen (50 mm) ^D	Elongation ^{D,I} min, %	
		Ultimate		Yield ^C (0.2 % Offset)			50 mm	In 5x Diameter (5.65 √A) ^E
		min	max	min	max			
1060^{E,H}								
1060-O	0.25-12.5	60	95	15	...	...	...	...
1060-H12	0.25-12.5	70	...	30	...	...	...	...
1060-H14	0.25-12.5	85	...	70	...	...	...	...
1060-H18	0.25-12.5	110	...	90	...	...	...	...
1060-H113 ^J	0.25-12.5	60	...	15	...	...	...	...
1100^{E,H}								
1100-O	0.32-12.50	75	105	25	...	...	...	...
1100-H12	0.32-12.50	95	...	75	...	...	...	...
1100-H14	0.32-12.50	110	...	95	...	...	...	...
1100-H16	0.32-12.50	130	...	115	...	...	...	...
1100-H18	0.32-12.50	150	...	140	...	...	...	...
1100-H113 ^J	0.32-12.50	75	...	25	...	...	...	...
3003^{E,H}								
3003-O	0.25-0.63	95	130	35	...	...	...	...
	0.63-1.20	95	130	35	...	30	20	...
	1.20-6.30	95	130	35	...	35	25	...
	6.30-12.50	95	130	35	...	...	30	27
3003-H12	0.25-12.50	120	...	85	...	...	...	...
3003-H14	0.25-0.63	140	...	115	...	3	...	...
	0.63-1.20	140	...	115	...	5	3	...
	1.20-6.30	140	...	115	...	8	4	...
	6.30-12.50	140	...	115	...	...	...	...
3003-H16	0.25-0.63	165	...	145	...	...	...	...
	0.63-1.20	165	...	145	...	3	2	...
	1.20-6.30	165	...	145	...	5	4	...
	6.30-12.50	165	...	145	...	...	...	...
3003-H18	0.25-0.63	185	...	165	...	2	...	...
	0.63-1.20	185	...	165	...	3	2	...
	1.20-6.30	185	...	165	...	5	3	...
	6.30-12.50	185	...	165	...	...	...	...
3003-H113 ^J	0.25-12.50	95	...	35	...	...	...	...
5050^{E,H}								
5050-O	0.25-12.50	125	165	40	...	...	...	...
5050-H32	0.25-12.50	150	...	110	...	...	...	...
5050-H34	0.25-12.50	170	...	140	...	...	...	...
5050-H36	0.25-12.50	185	...	150	...	...	...	...
5050-H38	0.25-12.50	200	...	165	...	...	...	...
5052^{E,H}								
5052-O	0.25-11.50	170	240	70	...	...	...	...
5052-H32	0.25-11.50	215	...	160	...	...	...	...
5052-H34	0.25-11.50	235	...	180	...	...	...	...
5052-H36	0.25-11.50	255	...	200	...	...	...	...
5052-H38	0.25-11.50	270	...	215	...	...	...	...
6061								
6061-O	0.45-12.50	...	150	...	95	15	15	13
6061-T4	0.63-1.20	205	...	110	...	16	14	...
	1.20-6.30	205	...	110	...	18	16	...
	6.30-12.50	205	...	110	...	20	18	16
6061-T42 ^{F,G}	0.63-1.20	205	...	95	...	16	14	...
	1.20-6.30	205	...	95	...	18	16	...
	6.30-12.50	205	...	95	...	20	18	16
6061-T6 & T62 ^{F,G}	0.63-1.20	290	...	240	...	10	8	...
	1.20-6.30	290	...	240	...	12	10	...
	6.30-12.50	290	...	240	...	14	12	10
6061-T8	1.00-0.800	310	...	275	...	8	6	...
6063								
6063-O	0.45-12.50	...	130	...	...	...	...	...
6063-T4 & T42 ^{F,G}	0.63-1.20	150	...	70	...	16	14	...
	1.20-6.30	150	...	70	...	18	16	...



TABLE 2 Continued

Alloy and Temper	Specified Wall Thickness, mm (Over-Thru)	Tensile Strength, MPa				Elongation ^{D,I} min, %		
		Ultimate		Yield ^C (0.2 % Offset)		Full Section Specimen (50 mm) ^D	Cut-out Specimen ^F	
		min	max	min	max		50 mm	In 5x Diameter (5.65 √A) ^E
6063-T6 and T62 ^{F,G}	6.30–12.50	150	...	70	...	20	18	16
	0.63–1.20	230	...	195	...	12	8	...
	1.20–6.30	230	...	195	...	14	10	...
	6.30–12.50	230	...	195	...	16	12	10
6063-T83	0.63–6.30	230	...	205	...	5	...	...
6063-T831	0.63–6.30	195	...	170	...	5	...	...
6063-T832	0.63–1.20	285	...	250	...	8	5	...
	1.20–6.30	275	...	240	...	8	5	...
6262								
6262-T6 & T62 ^{F,G}	0.63–1.20	290	...	240	...	10	8	...
	1.20–6.30	290	...	240	...	12	10	...
	6.30–12.50	290	...	240	...	14	12	10
6262-T9	0.63–10.0	330	...	305	...	5	4	3

^AThe basis for establishment of tensile property limits is shown in See Annex A1.

^BFor purposes of determining conformance with this specification, 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 shall be rounded to the nearest 0.5 %, both in accordance with the rounding-off method of Practice E29.

^CElongation of full-section and cut-out sheet-type specimens is measured in 2-in.; of round specimens, in 4x specimen diameter. Yield strength to be determined only on straight tube.

^DFor purposes of determining conformance with this specification, each value for ultimate strength and yield strength shall be rounded to the nearest 1 MPa, and each value for elongation shall be rounded to the nearest 0.5%, both in accordance with the rounding-off method of Practice Round tube 50 mm or less in outside diameter and square tube 35 mm or less on a side are tested in full section unless the limitations of the E29 testing machine precludes the use of such a specimen.

^EFor round tube over 50 mm in diameter, for square tube over 35 mm on a side, for all sizes of tube other than round and square, or in those cases when a full section specimen cannot be used, a cut-out specimen is used.

^FElongation—Elongations in 50 mm apply for pipetube tested in full-section and to full-section, for sheet type specimens taken from pipes having a for tubes having a flat wall, and for similar curved specimens for tubes having a curved wall up to 12.50 mm thick. Elongation—a maximum wall thickness of 12.50 mm. Elongations in 5D (5.65 √A)√A, where D and A are diameter and cross-sectional area of the specimens—specimens, respectively, apply to round test specimens machined from wall thickness over 6.30 mm.

TABLE 3 Chemical Composition Limits^{A,B,C,I}

Alloy	Composition, %										
	Silicon	Iron	Copper	Manganese	Magnesium	Chromium	Zinc	Titanium	Other Elements ^D		Aluminum
									Each	Total ^E	
1060	0.25	0.35	0.05	0.03	0.03	...	0.05	0.03	0.03 ^F	...	99.60 min ^G
1100	0.95 Si + Fe	...	0.05–0.20	0.05	...	...	0.10	...	0.05	0.15	99.00 min ^G
3003	0.6	0.7	0.05–0.20	1.0–1.5	...	...	0.10	...	0.05	0.15	remainder
5005	0.30	0.7	0.20	0.20	0.50–1.1	0.10	0.25	...	0.05	0.15	remainder
5050	0.40	0.7	0.20	0.10	1.1–1.8	0.10	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
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
6063	0.20–0.6	0.35	0.10	0.10	0.45–0.9	0.10	0.10	0.10	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	0.05 ^H	0.15	remainder

^ALimits are in percent maximum unless shown as a range or otherwise stated.

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

^CFor purposes of determining conformance to these limits, an observed value or a calculated value attained 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.

^DOthers 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 this specification. However, such analysis is not required and may not cover all metallic Material in the T42 or T62 tempers is not available from Others elements. Should any analysis by the producer or the purchaser establish that an the 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 material producers.

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

^FVanadium 0.05 %, maximum.

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

^HBismuth and lead each 0.40–0.7 %.

^IIn case there is a discrepancy in the values listed in In this alloy tube other than round is produced only in the F (as drawn) 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> and O tempers. Properties for F temper are not specified or guaranteed.

^JFor specified wall thickness under 0.63 mm elongation is not required.

^KThe H113 temper applies to other than round tube which is fabricated from annealed round tube.