



Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes¹

This standard is issued under the fixed designation B210/B210M; 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.

1. Scope*

1.1 This specification² covers aluminum and aluminum-alloy drawn seamless tubes in straight lengths and coils for general purpose and pressure applications in alloys (Note 2), tempers, and thicknesses shown in Table 2 [Table 3]. 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.

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

NOTE 1—See Specification B483/B483M for aluminum-alloy drawn tubes for general purpose applications; Specification B234 for aluminum-alloy drawn seamless tubes for condensers and heat exchangers; and Specification B241/B241M for aluminum-alloy seamless pipe and seamless extruded tube.

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

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

1.4 *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.*

1.5 *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.*

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-210 in Section II of that Code.

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

- B234 Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes for Surface Condensers, Evaporators, and Heat Exchangers
- B241/B241M Specification for Aluminum and Aluminum-Alloy Seamless Pipe and Seamless Extruded Tube
- B483/B483M Specification for Aluminum and Aluminum-Alloy Drawn Tube and Drawn Pipe for General Purpose Applications
- 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)
- 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
- 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
- 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)

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	Zn	Ti	Bi	Sn	Pb	Other Elements ^E		Al, min
												Each	Total ^F	
1060	0.25	0.35	0.05	0.03	0.03	...	0.05	0.03				0.03 ^G	...	99.60 min ^H
1100	-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	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
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
3003	0.6	0.7	0.05–0.20	1.0–1.5	...	...	0.10	...				0.05	0.15	rem
Alclad 3003 ^I														
3102	0.40	0.7	0.10	0.05–0.40	...	...	0.30	0.10				0.05	0.15	rem
Alclad 3102 ^I														
5005	0.30	0.7	0.20	0.20	0.50–1.1	0.10	0.25	...				0.05	0.15	rem
5050	0.40	0.7	0.20	0.10	1.1–1.8	0.10	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
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
5086	0.40	0.50	0.10	0.20–0.7	3.5–4.5	0.05–0.25	0.25	0.15				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
5456	0.25	0.40	0.10	0.50–1.0	4.7–5.5	0.05–0.20	0.25	0.20				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
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	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
7072 cladding ^J	0.7 Si + Fe		0.10	0.10	0.10	...	0.8–1.3	...				0.05	0.15	rem
7075 ^K	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 Limits are in weight percent maximum unless shown as a range or otherwise stated.

^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 of 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 *Other Elements Total*, the material shall be considered non-conforming.

^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 Vanadium 0.05 % max.

^H 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.

^I Alloy clad with Alloy 7072.

^J Composition of cladding alloy as applied during the course of manufacture. The samples from finished tube shall not be required to conform to these limits.

^K A Zr + Ti limit of 0.25 percent maximum may be used with this alloy designation for extruded and forged products only, but only when the supplier or producer and the purchaser have mutually so agreed. Agreement may be indicated, for example, by reference to a standard, by letter, by order note, or other means which allow the Zr + Ti limit.

ASTM B210/B210M-19

<https://standards.iteh.ai/catalog/standards/sist/8d48efc-fbf4d-4f13-83a0-b97392ee17b5/astm-b210-b210m-19>

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

2.3 *ANSI Standards*:⁵

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

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

2.4 *Military Standard*:⁶

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

2.5 *AMS Specification*:⁷

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

2.6 *Federal Standard*:⁶

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

2.7 *Other Standards*:⁸

[CEN EN 14242 Aluminum and Aluminum Alloys – Chemical Analysis – Inductively Coupled Optical Emission Spectral Analysis](#)

3. Terminology

3.1 Definitions:

⁶ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

⁷ Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096-0001.

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

⁴ The last approved version of this historical standard is referenced on www.astm.org.

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

TABLE 2 Tensile Property Limits (US Customary)^{A,B}

Temper	Specified Wall Thickness, ^C in.	Tensile Strength, ksi		Yield Strength ^D (0.2 % offset), min, ksi	Elongation in 2 in. or 4x Diameter, ^E min, %	
		min	max		Full-Section Specimen	Cut-Out Specimen
Aluminum 1060^F						
O	0.014–0.500	8.5	13.5	2.5	...	...
H12		10.0	...	4.0	...	...
H14		12.0	...	10.0	...	...
H18		16.0	...	13.0	...	...
H113 ^G		8.5	...	2.5	...	...
Aluminum 1100^F						
O	0.010–0.500	11.0	15.5	3.5	...	...
H12		14.0	...	11.0	...	...
H14		16.0	...	14.0	...	...
H16		19.0	...	17.0	...	...
H18		22.0	...	20.0	...	...
H113 ^G		11.0	...	3.5	...	...
Alloy 2011						
T3	0.018–0.049	47.0	...	40.0	...	...
	0.050–0.500	47.0	...	40.0	10	8
T4511	0.018–0.049	44.0	...	25.0	...	...
	0.050–0.259	44.0	...	25.0	20	18
	0.260–0.500	44.0	...	25.0	20	20
T8	0.018–0.500	58.0	...	46.0	10	8
Alloy 2014						
O	0.018–0.500	...	32.0	16.0 max	...	...
T4, T42 ^H	0.018–0.024	54.0	...	30.0	10	...
	0.025–0.049	54.0	...	30.0	12	10
	0.050–0.259	54.0	...	30.0	14	10
	0.260–0.500	54.0	...	30.0	16	12
T6, T62 ^H	0.018–0.024	65.0	...	55.0	7	...
	0.025–0.049	65.0	...	55.0	7	6
	0.050–0.259	65.0	...	55.0	8	7
	0.260–0.500	65.0	...	55.0	9	8
Alloy 2024						
O	0.018–0.500	...	32.0	15.0 max	...	...
T3	0.018–0.024	64.0	...	42.0	10	...
	0.025–0.049	64.0	...	42.0	12	10
	0.050–0.259	64.0	...	42.0	14	10
	0.260–0.500	64.0	...	42.0	16	12
T42 ^H	0.018–0.024	64.0	...	40.0	10	...
	0.025–0.049	64.0	...	40.0	12	10
	0.050–0.259	64.0	...	40.0	14	10
	0.260–0.500	64.0	...	40.0	16	12
Alloy 3003^F						
O	0.010–0.024	14.0	19.0	5.0	...	...
	0.025–0.049	14.0	19.0	5.0	30	20
	0.050–0.259	14.0	19.0	5.0	35	25
	0.260–0.500	14.0	19.0	5.0	...	30
H12	0.010–0.500	17.0	...	12.0	...	...
H14	0.010–0.024	20.0	...	17.0	3	...
	0.025–0.049	20.0	...	17.0	5	3
	0.050–0.259	20.0	...	17.0	8	4
	0.260–0.500	20.0	...	17.0	...	...
H16	0.010–0.024	24.0	...	21.0	...	...
	0.025–0.049	24.0	...	21.0	3	2
	0.050–0.259	24.0	...	21.0	5	4
	0.260–0.500	24.0	...	21.0	...	...
H18	0.010–0.024	27.0	...	24.0	2	...
	0.025–0.049	27.0	...	24.0	3	2
	0.050–0.259	27.0	...	24.0	5	3
	0.260–0.500	27.0	...	24.0	...	...
H113 ^G	0.010–0.500	14.0	...	5.0	...	...
Alloy Alclad 3003^F						
O	0.010–0.024	13.0	19.0	4.5	...	...
	0.025–0.049	13.0	19.0	4.5	30	20
	0.050–0.259	13.0	19.0	4.5	35	25
	0.260–0.500	13.0	19.0	4.5	...	30
H14	0.010–0.024	19.0	...	16.0	...	...
	0.025–0.049	19.0	...	16.0	5	3
	0.050–0.259	19.0	...	16.0	8	4
	0.260–0.500	19.0	...	16.0	...	...
H18	0.010–0.500	26.0	...	23.0	...	...
H113 ^G	0.010–0.500	13.0	...	4.5	...	...
Alloy 3102^F						
O	0.018–0.049	12.0	17.0	4.0	30 ^I	20 ^I
	0.050–0.065	12.0	17.0	4.0	35	25

TABLE 2 *Continued*

Temper	Specified Wall Thickness, ^C in.	Tensile Strength, ksi		Yield Strength ^D (0.2 % offset), min, ksi	Elongation in 2 in. or 4x Diameter, ^E min, %	
		min	max		Full-Section Specimen	Cut-Out Specimen
Alloy Alclad 3102^F						
O	0.018–0.049	10.0	17.0	3.5	30 ^f	20 ^f
	0.050–0.065	10.0	17.0	3.5	35	25
Alloy 5005^F						
O	0.018–0.500	15.0	21.0	5.0	...	...
Alloy 5050^F						
O	0.010–0.500	18.0	24.0	6.0	...	...
H32	0.010–0.500	22.0	...	16.0	...	...
H34	0.010–0.500	25.0	...	20.0	...	...
H36	0.010–0.500	27.0	...	22.0	...	...
H38	0.010–0.500	29.0	...	24.0	...	...
Alloy 5052^F						
O	0.010–0.450	25.0	35.0	10.0	...	...
H32	0.010–0.450	31.0	...	23.0	...	...
H34	0.010–0.450	34.0	...	26.0	...	...
H36	0.010–0.450	37.0	...	29.0	...	...
H38	0.010–0.450	39.0	...	24.0	...	...
Alloy 5083^F						
O	0.018–0.450	39.0	51.0	16.0	...	14
Alloy 5086^F						
O	0.010–0.450	35.0	46.0	14.0	...	...
H32	0.010–0.450	40.0	...	28.0	...	...
H34	0.010–0.450	44.0	...	34.0	...	...
H36	0.010–0.450	47.0	...	38.0	...	...
Alloy 5154^F						
O	0.010–0.500	30.0	41.0	11.0	10	10
H34	0.010–0.500	39.0	...	29.0	5	5
H38	0.010–0.250	45.0	...	34.0	...	...
Alloy 5456^F						
O	0.018–0.450	41.0	53.0	19.0	...	14
Alloy 6061						
O	0.018–0.500	...	22.0	14.0 max	15	15
T4	0.025–0.049	30.0	...	16.0	16	14
	0.050–0.259	30.0	...	16.0	18	16
	0.260–0.500	30.0	...	16.0	20	18
T42 ^H	0.025–0.049	30.0	...	14.0	16	14
	0.050–0.259	30.0	...	14.0	18	16
	0.260–0.500	30.0	...	14.0	20	18
T6, T62 ^H	0.025–0.049	42.0	...	35.0	10	8
	0.050–0.259	42.0	...	35.0	12	10
	0.260–0.500	42.0	...	35.0	14	12
T8	0.035–0.350	45.0	...	40.0	8	...
Alloy 6063						
O	0.018–0.500	...	19.0	...	...	...
T4, T42 ^H	0.025–0.049	22.0	...	10.0	16	14
	0.050–0.259	22.0	...	10.0	18	16
	0.260–0.500	22.0	...	10.0	20	18
T6, T62 ^H	0.025–0.049	33.0	...	28.0	12	8
	0.050–0.259	33.0	...	28.0	14	10
	0.260–0.500	33.0	...	28.0	16	12
T83	0.025–0.259	33.0	...	30.0	5	...
T831	0.025–0.259	28.0	...	25.0	5	...
T832	0.025–0.049	41.0	...	36.0	8	5
	0.050–0.259	40.0	...	35.0	8	5
Alloy 6262						
T6, T62 ^H	0.025–0.049	42.0	...	35.0	10	8
	0.050–0.259	42.0	...	35.0	12	10
	0.260–0.500	42.0	...	35.0	14	12
T9	0.025–0.375	48.0	...	44.0	5	4
Alloy 7075						
O	0.025–0.049	...	40.0	21.0 max ^J	10	8
	0.050–0.500	...	40.0	21.0 max ^J	12	10
T6, T62 ^H	0.025–0.259	77.0	...	66.0	8	7
	0.260–0.500	77.0	...	66.0	9	8
T73 ^K	0.025–0.259	66.0	...	56.0	10	8
	0.260–0.500	66.0	...	56.0	12	10

^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 and each value for elongation to the nearest 0.5 % both in accordance with the rounding-off method of Practice E29.

^C Coiled tube is generally available with a maximum wall thickness of 0.083 in. and only in non-heat-treatable alloys.

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

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

^F 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, guaranteed, tested, or provided.

^G Beginning with the 1982 issue the requirements for the H112 tempers were replaced by the H113 temper, applicable to other than round tube, which is fabricated by cold-forming annealed round tube and acquires some temper in this forming operation.

^H Material in the T42 or T62 tempers is not available from the material producers.

^I For specified wall thickness under 0.025 in., elongation is not required.

^J Applicable only to round tube. The maximum yield strength for other-than-round tube shall be negotiated.

^K Material in this temper exhibits improved resistance to stress corrosion compared to that of the T6 temper. The stress-corrosion resistance capability of individual lots is determined by testing the previously selected tension-test samples in accordance with the applicable electrical conductivity acceptance criteria of Table 4.

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

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *capable of*—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.

3.2.2 *drawn seamless tube/pipe*—tube/pipe which does not contain any junction lines or welds of any type resulting from method of manufacture, that is subjected to drawing after extrusion having certain standardized sizes of outside diameter and wall thicknesses commonly designated by “Nominal Pipe Sizes” and American National Standards Institutes (ANSI) Schedule Numbers. Note that while this is a combined US Customary and Metric Units specification, there are no standard equivalent metric sizes for Pipe. Metric sizes are converted and shown only for user convenience.

4. Ordering Information

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

4.1.1 This specification designation (which includes the number, the year, and the revision letter, if applicable),

4.1.2 Quantity in pieces or pounds [kilograms],

4.1.3 Alloy (Section 7),

4.1.4 Temper (Section 8),

4.1.5 Cross-sectional dimensions (outside diameter and wall thickness, or inside diameter and wall thickness for round tube; for tube other than round, square, rectangular, hexagonal, or octagonal with sharp corners, a drawing is required),

4.1.6 Length (straight or coiled),

4.1.7 Nominal inside diameter of coils and weight [mass] or maximum outside diameter, if applicable,

4.1.8 For alloy Alclad 3003 or Alclad 3102 state clad inside or outside (17.1).

4.2 Additionally, orders for material to this specification shall include the following information when required by the purchaser:

4.2.1 For alloys 6061, 6063, and 6262, specify if Extrusion Press Solution Heat Treatment in accordance with Practice **B807/B807M** is not acceptable (11.2).

4.2.2 Whether heat treatment in accordance with Practice **B918/B918M** is required (11.3),

4.2.3 Whether flattening tests are required (Section 9 and Table 5 [Table 6]),

4.2.4 Whether flare testing is required (Section 10),

4.2.5 Whether 7075-O material is required to develop requirements for T73 temper (12.3),

4.2.6 Whether testing for leaks is required and, when leaks are allowed, the number of leaks allowed and the manner of marking leaks (15.1.3.2),

4.2.7 Whether inside cleanness test is required on coiled tubes (16.2) and frequency of testing required,

4.2.8 Whether inspection or witness of inspection and tests by the purchaser’s representative is required prior to material shipment (Section 20),

4.2.9 Whether certification is required (Section 22),

4.2.10 Whether marking for identification is required or there are exceptions to identification marking as provided in Practice **B666/B666M** (Section 23), and

4.2.11 Whether Practices **B660** applies, and if so, the levels of preservation, packaging, and packing required (Section 24).

4.2.12 Whether 7075 alloy Zr+Ti limit applies (Table 1, Footnote K).

5. Materials and Manufacture

5.1 The tube shall be produced by drawing an extruded tube made from hollow extrusion ingot (cast in hollow form or pierced) and extruded by the use of the die and mandrel method.

5.2 The ends of coiled tube shall be crimped or otherwise sealed to avoid contamination during shipment.

6. Responsibility for Quality Assurance

6.1 *Responsibility for Inspection and Tests*—Unless otherwise specified in the contract or purchase order, the producer is responsible for the performance of all inspection and test requirements specified herein. The producer may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser in the order or at the time of signing the contract. The purchaser shall have the right to perform any of the inspections and tests set forth in this specification where such inspections are deemed necessary to ensure that material conforms to prescribed requirements.

6.2 *Lot Definition*—An inspection lot shall be defined as follows:

6.2.1 For heat-treated tempers an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, and nominal dimensions traceable to a heat-treat lot or lots, and subjected to inspection at one time.

6.2.2 For non-heat-treated tempers, an inspection lot shall consist of an identifiable quantity of material of the same mill form, alloy, temper, and nominal dimensions subjected to inspection at one time.

7. Chemical Composition

7.1 *Limits*—The tubes shall conform to the chemical composition limits specified in Table 1. Conformance shall be determined by the producer, by taking samples in accordance with Practices **E716**, when the ingots are poured, and analyzing

TABLE 3 Tensile Property Limits^{A,B} (Metric SI)

Temper	Specified Wall Thickness ^C		Tensile Strength, MPa		Yield Strength ^D (0.2 % offset), MPa		Elongation, ^E min, %		
	Over	Through	Min	Max	Min	Max	Full-Section Specimen in 50 mm	Cut-Out Specimen in 50 mm	Cut-Out Specimen in 5x diameter (5.65 √A)
Aluminum 1060^F									
O	0.25	12.50	60	95	15	...	...	...	...
H12	0.25	12.50	70	...	30	...	...	...	...
H14	0.25	12.50	85	...	70	...	...	...	...
H18	0.25	12.50	110	...	90	...	...	...	...
H113 ^G	0.25	12.50	60	...	15	...	...	...	...
Aluminum 1100^F									
O	0.32	12.50	75	105	25	...	...	...	...
H12	0.32	12.50	95	...	75	...	...	...	...
H14	0.32	12.50	110	...	95	...	...	...	...
H16	0.32	12.50	130	...	115	...	...	...	...
H18	0.32	12.50	150	...	140	...	...	...	...
H113 ^G	0.32	12.50	75	...	25	...	...	...	...
Alloy 2011									
T3	0.45	1.20	325	...	275	...	...	...	...
	1.20	12.50	325	...	275	...	10	8	7
T4511	0.45	1.20	305	...	170	...	...	...	...
	1.20	6.30	305	...	170	...	20	18	16
	6.30	12.50	305	...	170	...	20	20	18
T8	0.45	12.50	400	...	315	...	10	8	7
Alloy 2014									
O	0.45	12.50	...	220	...	110	...	...	...
T4, T42 ^H	0.45	0.63	370	...	205	...	10	...	...
	0.63	1.20	370	...	205	...	12	10	...
	1.20	6.30	370	...	205	...	14	10	...
	6.30	12.50	370	...	205	...	16	12	10
T6, T62 ^H	0.45	0.63	450	...	380	...	7	...	...
	0.63	1.20	450	...	380	...	7	6	...
	1.20	6.30	450	...	380	...	8	7	...
	6.30	12.50	450	...	380	...	9	8	7
Alloy 2024									
O	0.45	12.50	...	220	...	100	...	...	...
T3	0.45	0.63	440	...	290	...	10	...	...
	0.63	1.20	440	...	290	...	12	10	...
	1.20	6.30	440	...	290	...	14	10	...
	6.30	12.50	440	...	290	...	16	12	10
T42 ^H	0.45	0.63	440	...	275	...	10	...	...
	0.63	1.20	440	...	275	...	12	10	...
	1.20	6.30	440	...	275	...	14	10	...
	6.30	12.50	440	...	275	...	16	12	10
Alloy 3003^F									
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
H12	0.25	12.50	120	...	85	...	...	...	...
H14	...	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	...	...	...	...
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	...	...	...	...
H18	...	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	...	...	...	...
H113 ^G	0.25	12.50	95	...	35	...	...	...	...
Alloy Alclad 3003^F									
O	0.25	0.63	90	125	30	...	...	...	...
	0.63	1.20	90	125	30	...	30	20	...
	1.20	6.30	90	125	30	...	35	25	...
	6.30	12.50	90	125	30	...	...	30	27
H14	0.25	0.63	135	...	110	...	...	...	...
	0.63	1.20	135	...	110	...	5	3	...
	1.20	6.30	135	...	110	...	8	4	...
	6.30	12.50	135	...	110	...	...	...	...
H18	0.25	12.50	180	...	160	...	...	...	...
H113 ^G	0.25	12.50	90	...	30	...	...	...	...