



# B161-25

## Standard Specification for Nickel Seamless Pipe and Tube

This standard is issued under the fixed designation B161; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope\*

1.1 This specification<sup>2</sup> covers nickel (UNS N02200)<sup>3</sup> and low-carbon nickel (UNS N02201)<sup>3</sup> in the form of cold-worked seamless pipe and tube in the conditions shown in Table 1 and Table A1.1.

1.1.1 Hot-worked material is available. Properties are to be agreed upon between the manufacturer and purchaser.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 *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.*

1.4 *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 ASTM Standards:<sup>4</sup>

B829 Specification for General Requirements for Nickel and Nickel Alloys Seamless Pipe and Tube

B899 Terminology Relating to Non-ferrous Metals and Alloys

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Their Alloys.

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<sup>2</sup> For ASME Boiler and Pressure Vessel Code applications see related Specification SB-161 in Section II of that Code.

<sup>3</sup> New designation established in accordance with Practice E527 and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

<sup>4</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [www.astm.org/contact](http://www.astm.org/contact). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

### 3. Terminology

3.1 For definitions of terms used in this specification, refer to Terminology B899.

### 4. General Requirement

4.1 Material furnished under this specification shall conform to the applicable requirements of Specification B829 unless otherwise provided herein.

### 5. Ordering Information

5.1 It is the responsibility of the purchaser to specify all requirements that are necessary for the safe and satisfactory performance of material ordered under this specification. Examples of such requirements include, but are not limited to, the following:

5.1.1 Alloy name or UNS number.

5.1.2 ASTM designation and year of issue.

5.1.3 *Condition* (see Annex A1).

5.1.4 *Finish* (see Annex A1).

5.1.5 *Dimensions*:

5.1.5.1 *Tube*—Specify outside diameter and nominal or minimum wall.

5.1.5.2 *Pipe*—Specify standard pipe size and schedule.

5.1.5.3 *Length*—Cut to length or random.

5.1.6 *Quantity*—Feet or number of pieces.

5.1.7 *Hydrostatic Test or Nondestructive Electric Test*—Specify test (see 7.2).

5.1.8 *Hydrostatic Pressure Requirements*—Specify test pressure if other than required by Specification B829.

5.1.9 *Samples for Product (Check) Analysis*—State whether samples for product (check) analysis should be furnished (see 6.2).

5.1.10 *Purchaser Inspection*—If purchaser wishes to witness tests or inspection of material at place of manufacture, the purchase order must so state indicating which tests or inspections are to be witnessed.

5.1.11 *Small-Diameter and Thin-Wall Tube (Converter Sizes)*—See Annex A1.

### 6. Chemical Composition

6.1 The material shall conform to the composition limits specified in Table 2.

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



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**TABLE 1 Mechanical Properties**

Condition and Size	Tensile Strength, min, psi (MPa)		Yield Strength (0.2 % offset), min, psi (MPa)		Elongation in 2 in. or 50 mm (or 4 D), min, %	
	Nickel (UNS N02200)	Low-Carbon Nickel (UNS N02201)	Nickel (UNS N02200)	Low-Carbon Nickel (UNS N02201)	Nickel (UNS N02200)	Low-Carbon Nickel (UNS N02201)
Annealed:						
5 in. (127 mm) and under outside diameter	55 000 (380)	50 000 (345)	15 000 (105)	12 000 (80)	35	35
Over 5 in. (127 mm) in outside diameter	55 000 (380)	50 000 (345)	12 000 (80)	10 000 (70)	40	40
Stress-Relieved:						
All sizes	65 000 (450)	60 000 (415)	40 000 (275)	30 000 (205)	15	15

**TABLE 2 Chemical Requirements**

Element	Composition, % <sup>A</sup>	
	Nickel (UNS N02200)	Low-Carbon Nickel (UNS N02201)
Ni, <sup>A,B</sup> min	99.0	99.0
Cu	0.25	0.25
Fe	0.40	0.40
Mn	0.35	0.35
C	0.15	0.02
Si	0.35	0.35
S	0.01	0.01

<sup>A</sup> All values are maximums unless marked as a minimum.

<sup>B</sup> Element shall be determined arithmetically by difference.

6.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations in Specification B829.

## 7. Mechanical and Other Properties

7.1 *Tension Test*—The material shall conform to the tensile properties specified in Table 1. The sampling and specimen preparation are as covered in Specification B829.

7.1.1 Tensile properties for material specified as small-diameter and thin-wall tube (converter sizes) shall be as prescribed in Table A1.2.

7.2 *Hydrostatic Test or Nondestructive Electric Test*—Each pipe or tube shall be subjected to the Nondestructive Electric Test or the Hydrostatic Test. Unless specified by the purchaser, either test may be used at the option of the producer.

## 8. Dimensions and Permissible Variations

8.1 Permissible variations for tube specified as small-diameter and thin-wall tube (converter size) shall conform to the permissible variations prescribed in Table A1.2.

## 9. Number of Tests

9.1 *Chemical Analysis*—One test per lot.

9.2 *Tension*—One test per lot.

9.3 *Hydrostatic or Nondestructive Electric Test*—Each piece in each lot.

## 10. Test Methods

10.1 *Hydrostatic Test*—Each pipe or tube with an outside diameter 1/8 in. (3 mm) and larger and with wall thickness of 0.015 in. (0.38 mm) and over shall be tested in accordance with Specification B829. The allowable fiber stress, for material in the condition furnished, is as follows:

	UNS N02200	UNS N02201
Annealed:		
5 in. (127 mm) outside diameter and under	10 000 psi (70 MPa)	8000 psi (55 MPa)
Over 5 in. outside diameter	8000 psi (55 MPa)	6700 psi (45 MPa)
Stress-Relieved:		
All sizes	16 200 psi (110 MPa)	15 000 psi (105 MPa)

10.1.1 When so agreed upon by the manufacturer and purchaser, pipe or tube may be tested to 1 1/2 times the allowable fiber stress given above.

10.1.2 If any pipe or tube shows leaks during hydrostatic testing, it shall be rejected.

10.2 *Nondestructive Electric Test*—Each pipe or tube shall be examined with a nondestructive electric test as prescribed in Specification B829.

## 11. Certification

11.1 A manufacturer's certification shall be furnished to the purchaser stating that material has been manufactured, tested, and inspected in accordance with this specification, and that the test results on representative samples meet specification requirements and a report of the test results shall be furnished.

## 12. Keywords

12.1 seamless pipe; seamless tube; thin-wall tube; N02200; N02201



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ANNEX

(Mandatory Information)

A1. CONVERTER SIZES

A1.1 Small-diameter tube and thin-wall tube in outside diameters 1 ¼ in. (31.8 mm) and under may be furnished in the conditions listed in Table A1.1 when so specified. The material is furnished in a limited range of sizes and the manufacturer should be consulted as to the various outside diameters and wall thicknesses that may be furnished. Material will have a bright finish. Such material shall conform to the applicable requirements in Table A1.1 and Table A1.2.

A1. CONDITIONS AND FINISHES NORMALLY SUPPLIED

A1.3 Scope

A1.3.1 This appendix lists the conditions and finishes in which pipe and tube (other than converter sizes) are normally supplied. These are subject to change, and the manufacturer should be consulted for the latest information available.

A1.4 Nickel (UNS N02200)

A1.4.1 *Annealed*—Soft, with a dull, matte finish.

A1.4.2 *Stress-Relieved*—Thermally treated below the annealing temperature to relieve the major portion of the internal stresses, with a thin, light to medium-dark surface.

A1.5 Low-Carbon Nickel (UNS N02201)

A1.5.1 *Annealed*—Similar to A1.4.1.

A1.5.2 *Stress-Relieved*—Similar to A1.4.2.

TABLE A1.1 Mechanical Properties<sup>A</sup> of Small-Diameter and Thin-Wall Tube (Converter Sizes)

Condition	Tensile Strength, psi (MPa)	Yield Strength (0.2 % offset), min, psi (MPa)	Elongation in 2 in. or 50 mm, min, %
Nickel UNS N02200			
Annealed <sup>B</sup>	75 000 (515) max	15 000 (105)	33
Half-hard <sup>C</sup>	80 000 (550) min	40 000 (275)	12
Full hard <sup>D</sup>	95 000 (655) min	75 000 (515)	4
Low-Carbon Nickel UNS N02201			
Annealed <sup>B</sup>	70 000 (480) max	12 000 (85)	35
Half-hard <sup>C</sup>	70 000 (480) min	30 000 (205)	12
Full hard <sup>D</sup>	85 000 (585) min	65 000 (450)	4

<sup>A</sup> Not applicable to outside diameters under ⅝ in. (3.2 mm) and wall thicknesses under 0.015 in. (0.38 mm).

<sup>B</sup> This condition is sometimes designated as "No. 1 Temper."

<sup>C</sup> This condition is sometimes designated as "No. 2 Temper."

<sup>D</sup> This condition is sometimes designated as "No. 3 Temper."

TABLE A1.2 Permissible Variations for Small-Diameter and Thin-Wall Tube (Converter Sizes)<sup>A,B,C,D,E,F</sup>

Specified Outside Diameter, in. (mm)	Outside Diameter		Inside Diameter		Wall Thickness, %	
	Plus	Minus	Plus	Minus	Plus	Minus
Under ¾ (2.4)	0.002 (0.05)	0	0	0.002 (0.05)	10	10
¾ to ⅝ (2.4 to 4.8), excl	0.003 (0.08)	0	0	0.003 (0.08)	10	10
⅝ to ½ (4.8 to 12.7), excl	0.004 (0.10)	0	0	0.004 (0.10)	10	10
½ to 1¼ (12.7 to 31.8), incl	0.005 (0.13)	0	0	0.005 (0.13)	10	10

<sup>A</sup> *Ovality, Normal Wall Tube—As-Drawn (No. 2 and 3) Tempers*—Ovality will be held within the outside diameter tolerances shown in the table.

*Annealed (No. 1) Temper*—Ovality will be held within 2 % of the theoretical average outside diameter.

<sup>B</sup> *Ovality, Thin-Wall Tube—As-Drawn (No. 2 and 3) Tempers*—Up to but not including 1¼ in. (31.8 mm) in outside diameter, ovality will be held within 2 % of the theoretical average outside diameter.

*Annealed (No. 1) Temper*—Ovality will be held within 3 % of the theoretical average outside diameter.

<sup>C</sup> *Wall Tolerances, Thin-Wall Tube*—The plus and minus wall tolerance shown in the table shall apply down to and including 0.005 in. (0.13 mm) in wall thickness. For wall thicknesses less than 0.005 in. (0.13 mm), the tolerance shall be ±0.0005 in. (0.013 mm).

<sup>D</sup> *Random Lengths*:

Where nominal random lengths on tubing ⅝ in. (3.2 mm) and larger in outside diameter are specified, a length tolerance of ±3½ ft (1.06 m) applies to the nominal length. This is a total spread of 7 ft (2.10 m).

Random lengths in sizes ⅝ in. (3.2 mm) and larger in outside diameter shall be subject to a length range of 5 ft to 24 ft (1.50 m to 7.30 m). Long random lengths are subject to a range of 15 ft to 22 ft (4.57 m to 6.70 m).

Random lengths in sizes up to, but not including ⅝ in. (3.2 mm) in outside diameter, and fragile thin-wall tube over this outside diameter are subject to the length range of 1 ft to 15 ft (0.30 m to 4.57 m).

<sup>E</sup> *Straightness*—Round tubing is subject to a straightness tolerance of one part in 600 [equivalent to a depth of arc of 0.030 in. (0.76 mm) in any 3 ft (0.91 m) of length].

<sup>F</sup> When specified, the tolerance spreads of this table may be applied as desired. However, when not specified, the tolerances in this table will apply. It should be noted that inside diameter tolerances are based upon the outside diameter range.



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### SUMMARY OF CHANGES

Committee B02 has identified the location of selected changes to this standard since the last issue (B162 – 99 (2019)) that may impact the use of this standard. (Approved April 1, 2025.)

- (1) Added reference to Terminology **B899**.
- (2) Certifications made mandatory.
- (3) Revised **Table 2** formatting.
- (4) Replaced light wall tubes with thin-wall tube as per definition in Terminology **B899**.
- (5) Converter sizes moved to a mandatory annex to align with other B02.07 specifications.

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