Designation: B535 – 06 (Reapproved 2022)

Standard Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Seamless Pipe and Tube[1]

This standard is issued under the fixed designation B535; 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 specification[2] covers alloys UNS N08330 and N08332 in the form of hot-finished and cold-finished seamless pipe and tube intended for heat resisting applications and general corrosive service.

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 become familiar with all hazards including those identified in the appropriate Safety Data Sheet (SDS) for this product/material as provided by the manufacturer, 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:*[3]

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

B899 Terminology Relating to Non-ferrous Metals and Alloys

3. Terminology

3.1 *Definitions*—Definitions for terms defined in Terminology B899 shall apply unless otherwise defined by the requirements of this document.

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 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 *Dimensions:*

5.1.3.1 *Pipe*—Specify standard pipe size and schedule,

5.1.3.2 *Tube*—Specify outside diameter and nominal or minimum wall,

5.1.3.3 *Length* (specific or random),

5.1.4 *Finish:*

5.1.4.1 *Pipe*—Specify cold-worked or hot-worked,

5.1.4.2 *Tube*—Specify cold-worked or hot-finished,

5.1.5 *Quantity* (feet or meters or number of pieces),

5.1.6 *Hydrostatic Test or Nondestructive Electric Test*—Specify type of test (see 8.4),

5.1.7 *Certification*—State if certification is required,

5.1.8 *Samples for Product (Check) Analysis*—State whether samples for product analysis should be furnished, and

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

6. Materials and Manufacture

6.1 *Heat Treatment*—The material shall be furnished in the annealed condition. The final heat treatment of UNS N08330 shall be 1900 °F (1040 °C) minimum. The final heat treatment of UNS N08332 shall be 2100 °F (1150 °C) minimum.

[1] 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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[2] For ASME Boiler and Pressure Vessel Code applications see related Specification SB-535 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.

TABLE 1 Chemical Requirements

Element	Composition Limits, %
C	...[A]
Mn	2.00 max
P	0.03 max
S	0.03 max
Si	0.75–1.50
Cr	17.0–20.0
Ni	34.0–37.0
Cu	1.00 max
Pb	0.005 max
Sn	0.025 max
Fe	remainder[B]

[A] Alloy UNS N08330: 0.08 max.
Alloy UNS N08332: 0.05 to 0.10.
[B] Element shall be determined arithmetically by difference.

TABLE 2 Mechanical Properties

Alloy	Condition	Tensile Strength, min, psi (MPa)	Yield Strength, 0.2 % offset, min, psi (MPa)	Elongation in 2 in. or 50 mm, or 4*D*, min, %	Hardness[A]
UNS N08330	annealed	70 000 (483)	30 000 (207)	30	70 to 90 HRB
UNS N08332	annealed	67 000 (462)	27 000 (186)	30	65 to 88 HRB

[A] Hardness values are informative only and not to be construed as the basis for acceptance.

TABLE 3 Permissible Variations in Outside Diameter, Hot-Finished and Cold-Finished Pipe

Nominal Pipe Size, in.	Permissible Variations in Outside Diameter			
	Over		Under	
	in.	mm	in.	mm
⅛ to 1½, incl	1/64	0.4	1/32	0.8
Over 1½ to 4, incl	1/32	0.8	1/32	0.8
Over 4 to 8, incl	1/16	1.6	1/32	0.8
Over 8 to 18, incl	3/32	2.4	1/32	0.8

7. Chemical Composition

7.1 The material shall conform to the composition limits specified in Table 1.

7.1.1 A chemical analysis shall be made on each lot of material as described in Specification B829.

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

8. Mechanical and Other Properties

8.1 The material shall conform to the mechanical properties listed in Table 2.

8.1.1 One tension test shall be made on each lot of material.

8.2 *Grain Size*—Annealed alloy UNS N08332 shall conform to an average grain size of ASTM No. 5 or coarser. One test per lot is required.

8.3 *Flattening Test*—One section of pipe or tube per lot, not less than 2½ in. (63.5 mm) in length, shall be flattened cold between parallel plates in two steps. During the first step, which is test for ductility, no cracks or breaks on the inside, outside or end surfaces shall occur until the distance between the plates is less than the value *H* calculates as follows:

$$H = 1.09\,t/(0.09+t/D) \quad (1)$$

where:

H = distance between parallel plates, in.,
t = specified wall thickness, in., and
D = nominal outside diameter, in.

During the second step, which is a test for soundness, the flattening shall be continued until the specimen breaks or the opposite walls of the pipe or tube meet.

8.4 *Hydrostatic Test or Nondestructive Electric Test:*

8.4.1 Each pipe or tube shall be subjected to either the hydrostatic test or to a nondestructive electric test as per prescribed in Specification B829. The type of test to be used shall be at the option of the manufacturer, unless specified in the purchase order.

8.4.2 If any tube or pipe shows leak during hydrostatic testing, it shall be rejected.

9. Dimensions and Permissible Variations

9.1 The permissible variations in outside diameter for pipe, both cold-finished and hot-finished, are shown in Table 3. Other dimensions and permissible variations are provided in Specification B829.