



Designation: B983 – 12

Standard Specification for Precipitation Hardened or Cold Worked, Seamless Nickel Alloy Pipe and Tube¹

This standard is issued under the fixed designation B983; 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 covers high strength, seamless pipe and tube of nickel alloys (UNS N07022, UNS N07725, and UNS N07740)² as shown in **Table 1**.

1.2 Pipe and tube shall be supplied in the cold worked or cold worked and precipitations hardened or solution annealed plus precipitation hardened and descaled conditions. When atmosphere control is used, descaling is not necessary.

1.3 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.

1.4 *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 become familiar with all hazards including those identified in the appropriate Material Safety Data Sheet (MSDS) for this product/material as provided by the manufacturer, to establish appropriate safety and health practices, and determine the applicability of regulatory limitations prior to use.*

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

E8 Test Methods for Tension Testing of Metallic Materials

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

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 New designation established in accordance with Practice E527 and SAE J1086, Practice for Numbering Metals and Alloys (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.

3. Terminology

3.1 Terms shall be defined in accordance with Terminology **B899**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *average diameter, n*—See Terminology **B899**.

3.2.2 *pipe, n*—See Terminology **B899** and Specification **B829**.

3.2.3 *tube, n*—See Terminology **B899**.

4. General Requirements

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 material ordered under this specification. Examples of such requirements include, but are not limited to the following:

5.1.1 *Alloy*—**Table 1**.

5.1.1.1 *Heat Treatment or Cold Work or Type* (**Table 2** and **Table 3**.)

5.1.2 *Dimensions:*

5.1.2.1 *Tube*—Outside diameter, minimum or average wall thickness, and length.

5.1.2.2 *Pipe*—Standard pipe size and schedule (Specification **B829**).

5.1.3 *Ends*—Plain ends cut and deburred will be furnished.

5.1.4 *Certification*—State if certification or a report of test results is required (Section 15).

5.1.5 *Samples for Check Analysis*—State whether samples for check analysis should be furnished.

5.1.6 *Purchaser Inspection*—If the purchaser wishes to witness tests or inspection of material at the place of manufacture, the purchase order must so state, indicating which tests or inspections are to be witnessed (Section 14).

6. Chemical Composition

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

TABLE 1 Chemical Requirements

Element	UNS N07022	UNS N07725	UNS N07740
Carbon	0.010 max	0.03 max	0.005–0.08
Manganese	0.5 max	0.35 max	1.0 max
Silicon	0.08 max	0.20 max	1.0 max
Phosphorous	0.025 max	0.015 max	0.03 max
Sulfur	0.015 max	0.010 max	0.03 max
Chromium	20.0–21.4	19.0–22.5	23.5–25.5
Cobalt	1.0 max	...	15.0–22.0
Molybdenum	15.5–17.4	7.00–9.50	2.0 max
Columbium	...	2.75–4.00	...
Titanium	...	1.00–1.70	0.5–2.5
Aluminum	0.5 max	0.35 max	0.2–2.0
Zirconium	...	...	...
Boron	0.006 max	...	0.0006–0.006
Iron	1.8 max	Remainder ^A	3.0 max
Copper	0.5 max	...	0.50 max
Nickel	Remainder ^A	55.0–59.0	Remainder ^A
Tantalum	0.2 max	...	...
Tungsten	0.8 max	...	...
Columbium + Tantalum	...	...	0.50–2.5

^A The element may be determined arithmetically by difference.

TABLE 2 Heat Treatments

Alloy	Condition	Recommended Solution Annealing Treatment	Recommended Precipitation Hardening Treatment
UNS N07022 Type 1	Solution Ann + cw	1800–2050°F (982–1121°C), hold ½ hr/in., 5 min min., rapid air cool or water quench	
UNS N07022 Type 2	Solution Ann + cw + prec hard	1800–2050°F (982–1121°C), hold ½ hr/in., 5 min min., rapid air cool or water quench	1075–1150°F (579–621°C), hold 10 h, air cool
UNS N07725 Type 1	Solution Ann + prec hard	1900 ± 25°F (1040 ± 14°C), hold 1 h per in. of thickness, air cool	1350 ± 25°F (730 ± 14°C), hold 8 h, furnace cool at 100°F (56°C) per min to 1150°C ± 25°F (620 ± 14°C), hold for 8 h, air cool
UNS N07725 Type 2	Solution Ann + cw + prec hard	1900 ± 25°F (1040 ± 14°C), hold 1 h per in. of thickness, air cool	1350 ± 25°F (730 ± 14°C), hold 8 h, furnace cool at 100°F (56°C) per min to 1150°C ± 25°F (620 ± 14°C), hold for 8 h, air cool
UNS N07740	Solution Ann + prec hard	Minimum 2012 ± 25°F (1100 ± 14°C), hold 1 h per in. of thickness, water quench	1472 ± 25°F (800 ± 14°C), hold min. 4 h for up to 2 in. thickness + additional ½ h per each additional in. of thickness, air cool

TABLE 3 Mechanical Properties

Alloy	Condition ^A	Tensile Strength, min., ksi (MPa)	Yield Strength min., ksi (MPa)	Elongation in 2 in., (50 mm) or 4D ^B , min, %	Hardness Rc max
UNS N07022 Type 1	Solution Ann + cw	178 (1227)	160 (1103)	13	45
UNS N07022 Type 2	Solution Ann + cw + prec hard	178 (1227)	160 (1103)	15	50
UNS N07725 Type 1	Solution Ann + prec hard	150 (1035)	120 (827)	20	...
UNS N07725 Type 2	Solution Ann + cw + prec hard	150 (1035)	120 (827)	20	...
UNS N07740	Solution Ann + prec hard	150 (1035)	90 (620)	20	...

^A See Table 2.

^B D refers to the diameter of the tension specimen.

6.2 If a product (check) analysis is made by the purchaser, the material shall conform to the requirements specified in **Table 1** subject to the permissible tolerances per Specification **B829**.