



Designation: B983 – 13

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

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1. Scope

1.1 This specification covers high strength, seamless pipe and tube of nickel alloys (UNS N07022, UNS N07725, UNS N07740, UNS N09945, UNS N09925, UNS N07718, UNS N10276, UNS N06985)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](#)

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.

Unified Numbering System (UNS)

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	UNS N09945	UNS N09925	UNS N07718	UNS N10276	UNS N06985
Carbon	0.010 max	0.03 max	0.005-0.08	0.005-0.04	0.03 max	0.08 max	0.02 max	0.015 max
Manganese	0.5 max	0.35 max	1.0 max	1.0 max	1.00 max	0.35 max	1.0 max	1.0 max
Silicon	0.08 max	0.20 max	1.0 max	0.5 max	0.50 max	0.35 max	0.08 max	1.0 max
Phosphorous	0.025 max	0.015 max	0.03 max	0.03 max	...	0.015 max	0.030 max	0.04 max
Sulfur	0.015 max	0.010 max	0.03 max	0.03 max	0.030 max	0.015 max	0.030 max	0.03 max
Chromium	20.0-21.4	19.0-22.5	23.5-25.5	19.5-23.0	19.5-23.5	17.0-21.0	14.5-16.5	21.0-23.5
Cobalt	1.0 max	...	15.0-22.0	...	...	1.0 max	2.5 max	5.0 max
Molybdenum	15.5-17.4	7.00-9.50	2.0 max	3.0-4.0	2.50-3.50	2.80-3.30	15.0-17.0	6.0-8.0
Columbium	...	2.75-4.00	...	2.4-4.5	0.50 max	4.75-5.50	...	...
Titanium	...	1.00-1.70	0.5-2.5	0.5-2.5	1.90-2.40	0.65-1.15	...	...
Aluminum	0.5 max	0.35 max	0.2-2.0	0.01-0.7	0.10-0.50	2.20-0.80	...	...
Zirconium	...	...	...	...	...	...	...	...
Boron	0.006 max	...	0.0006-0.006	...	...	0.006 max	...	...
Iron	1.8 max	Remainder ^B	3.0 max	Remainder ^B	22.0 min ^A	Remainder ^B	4.0-7.0	18.0-21.0
Copper	0.5 max	...	0.50 max	1.5-3.0	1.50-3.00	0.30 max	...	1.5-2.5
Nickel	Remainder ^B	55.0-59.0	Remainder ^B	45.0-55.0	38.0-46.0	50.0-55.0	Remainder ^B	Remainder ^B
Tantalum	0.2 max	...	...	...	...	...	...	...
Tungsten	0.8 max	...	...	...	...	...	3.0-4.5	1.5 max
Columbium + Tantalum	...	...	0.50-2.5	...	...	...	...	0.50 max
Vanadium	...	...	...	...	...	...	0.35 max	...

^A Minimum: The element may be determined arithmetically by difference.
^B Remainder: The element may be determined arithmetically by difference.

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**.

7. Mechanical Properties

7.1 Unless otherwise specified, the material shall be supplied in the cold worked (cw), or cold worked and precipitation hardened (prec hard), or solution annealed plus precipitation hardened condition as described in **Table 2** and **Table 3**.

7.2 The mechanical properties of the material at room temperature shall conform to those shown in **Table 3**.

8. Hydrostatic Test or Non-Destructive Electric Test

8.1 Each pipe or tube shall be tested by the manufacturer by either hydrostatic or a non-destructive electric test in accordance with Specification **B829**. Hydrostatic testing at a pressure greater than 1000 psi may be performed upon agreement between the purchaser and manufacturer or at the option of the manufacturer provided that the allowable fiber stress per Specification **B829** is not exceeded.

9. Weight

9.1 For calculation of mass or weight, the following densities shall be tested:

Alloy	Density	
	lb/in. ³	g/cm ³
UNS N07022	0.311	8.60
UNS N07725	0.300	8.31
UNS N07740	0.291	8.05
UNS N09945	0.296	8.2
UNS N09925	0.292	8.08
UNS N07718	0.296	8.19
UNS N10276	0.321	8.89
UNS N06985	0.294	8.14

10. Sampling

10.1 Lots for Chemical Analysis and Mechanical Testing are as defined in Specification **B829**.

10.2 Sampling of Chemical Analysis:

10.2.1 A representative sample shall be taken from each lot during pouring or subsequent processing.

10.2.2 Product (check) analysis shall be wholly the responsibility of the purchaser.

10.3 Sampling for Mechanical Testing:

10.3.1 A representative sample shall be taken from each lot of finished material.

11. Number of Tests and Retests

11.1 Chemical Analysis—One test per lot.

11.2 Tension Test—One test per lot.

11.3 Retests—If the specimen used in the mechanical test of any lot fails to meet the specified requirements, two additional specimens shall be taken from different sample pieces and tested. The results of the tests on both of these specimens shall meet the specified requirements.

12. Specimen Preparation

12.1 Tension test specimens shall be taken from material after final heat treatment and tested in the direction of fabrication.

12.2 Whenever possible, all pipe and tube shall be tested in full tubular size. When testing in full tubular size is not possible, longitudinal strip specimens, or the largest possible round specimen prepared in accordance with Test Methods **E8**, shall be used.