



Designation: **B423–11 (Reapproved 2021) B423 – 22**

# Standard Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloy (~~UNS N08825, N08221, and N06845~~) Seamless Pipe and Tube<sup>1</sup>

This standard is issued under the fixed designation B423; 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 ~~Scope\*~~

1.1 This specification<sup>2</sup> covers nickel-iron-chromium-molybdenum-copper alloys (~~UNS N08825, N08221, and N06845~~)<sup>3</sup> in the form of cold-worked and hot-finished seamless pipe and tube intended for general corrosive service. The general requirements for pipe and tube are covered in Specification **B829**.

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 The following precautionary caveat pertains only to the test methods portion, Section 9, of this specification: *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*:<sup>4</sup>

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

## 3. General Requirement

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

<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-423 in Section II of that code.

<sup>3</sup> New designation established in accordance with Practice E527 and SAE J 1086, Practice for Numbering Metals and Alloys (UNS).

<sup>4</sup> 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

## 4. Ordering Information

4.1 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:

4.1.1 Alloy name or UNS number,

4.1.2 ASTM designation,

4.1.3 Condition (see [Appendix X2X1](#)),

4.1.4 Finish (see [Appendix X2X1](#)),

4.1.5 *Dimensions*:

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

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

4.1.5.3 *Length*—Cut to length or random,

4.1.6 *Quantity*—Feet (or metres) or number of pieces,

4.1.7 *Hydrostatic Test or Nondestructive Electric Test*—Specify type of test (see [6.2](#)).

4.1.8 *Hydrostatic Pressure Requirements*—Specify test pressure if other than required by [9.1.1](#),

4.1.9 *Certification*—State if certification is required,

4.1.10 *Samples for Product (Check) Analysis*—State whether samples for product (check) analysis should be furnished (see [5.2](#)),

4.1.11 *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, and

4.1.12 *Small-Diameter Tube and Light-Wall Tube—Tube with Specified Wall Thickness 3 % or Less of the Specified Outside Diameter (Converter Sizes)*—See [Appendix X1Annex A1](#).

## 5. Chemical Composition

5.1 The material shall conform to the composition limits specified in [Table 1](#). One test is required for each lot as defined in Specification [B829](#).

**TABLE 1 Chemical Requirements<sup>A</sup>**

Element	UNS N08825	UNS N08221	UNS N06845
Nickel	38.0–46.0	39.0–46.0	44.0–50.0
Chromium	19.5–23.5	20.0–22.0	20.0–25.0
Iron	22.0 min <sup>B</sup>	22.0 min <sup>B</sup>	remainder <sup>B</sup>
Manganese	1.0	1.0	0.5
Carbon	0.05	0.025	0.05
Copper	1.5–3.0	1.5–3.0	2.0–4.0
Silicon	0.5	0.5	0.5
Sulfur	0.03	0.03	0.010
Aluminum	0.2	0.2	...
Titanium	0.6–1.2	0.6–1.0	...
Molybdenum	2.5–3.5	5.0–6.5	5.0–7.0
Tungsten	...	...	2.0–5.0

<sup>A</sup> Maximum unless range or minimum is given. Where ellipses (...) appear in this table, there is no requirement and analysis for the element need not be determined or reported.

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

**TABLE 2 Mechanical Properties of Pipe and Tube**

Alloy	Condition and Size	Tensile Strength, min, ksi (MPa)	Yield Strength 0.2 % Offset, min, ksi (MPa)	Elongation in 2 in. or 50 mm (4D), min, %
UNS N08825	hot-finished annealed	75 (517)	25 (172)	30
UNS N08825	cold-worked annealed	85 (586)	35 (241)	30
UNS N08825	hot-forming quality (hot-finished or cold-drawn annealed)	<sup>A</sup>	<sup>A</sup>	<sup>A</sup>
UNS N08221	cold-finished, annealed	79 (545)	34 (234)	30
UNS N06845	cold-finished, annealed	100 (690)	40 (276)	30

<sup>A</sup> Hot-forming quality is furnished to chemical requirements and surface inspection only. No mechanical properties are required.

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

## 6. Mechanical Properties and Other Requirements

6.1 *Tension Test*—The material shall conform to the tensile properties specified in **Table 2**. The sampling and specimen preparation are as covered in Specification **B829**.

6.1.1 ~~Tensile~~—When specified by the purchaser, tensile properties for material specified as small-diameter tube and light-wall tube with specified wall thickness 3 % or less of the specified outside diameter (converter sizes) shall be as prescribed in **Table X1-1A1.1**.

6.2 *Hydrostatic or Nondestructive Electric Test*—Each pipe or tube shall be subjected to either the hydrostatic test or the nondestructive electric test. The type of test to be used shall be at the option of the manufacturer, unless otherwise specified in the purchase order.

## 7. Dimensions and Permissible Variations

7.1 *Diameter and Wall Thickness*—The permissible variations in the outside diameter and wall thickness shall conform to the permissible variations prescribed in Tables 3, 4, and 5 of Specification **B829**.

7.2 ~~Permissible~~—When specified by the purchaser, permissible variations for material specified as small-diameter tube and light-wall tube with specified wall thickness 3 % or less of the specified outside diameter (converter size) shall conform to the permissible variations prescribed in **Table X1-2A1.2**.

## 8. Number of Tests

8.1 *Chemical Analysis*—One test per lot.

8.2 *Tension*—One test per lot.

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

## 9. Test Methods

9.1 *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 N08825 hot finished, annealed:	16 600 psi (114 MPa)
UNS N08825 cold-worked, annealed:	21 200 psi (146 MPa)
UNS N08221 cold finished, annealed:	19 700 psi (138 MPa)

9.1.1 When so agreed upon between the manufacturer and purchaser, pipe or tube may be tested to 1½ times the allowable fiber stress given in 9.1.

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

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

## 10. Keywords

10.1 converter sizes; N08221; N08825; N06845; seamless pipe; seamless tube

### APPENDIXES

(Nonmandatory Information)

#### X1. CONVERTER SIZES

X1.1 Small-diameter and light-wall tube in outside diameters 1¼ in. (31.8 mm) and under may be furnished in the conditions listed in Table X1.1 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 right finish. Such material shall conform to the applicable requirements in Table X1.1 and Table X1.2.

  
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### ANNEX

ASTM B423-22

(Mandatory Information) <https://standards.iteh.ai/catalog/standard/ASTM-B423-22/5f9be3-b47a0e18abd5/astm-b423-22>

#### A1. CONVERTER SIZES

A1.1 Small-diameter tube and tube with specified wall thickness 3 % or less of the specified outside diameter, in outside diameters 1¼ 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 right finish. Such material shall conform to the applicable requirements in Table A1.1 and Table A1.2.

**TABLE X1-1/A1.1 Mechanical Properties<sup>A</sup> of Small-Diameter Tube and Light-Wall Tubing with Specified Wall Thickness 3 % Or Less of the Specified Outside Diameter (Converter Sizes)**

Condition	Tensile Strength, ksi (MPa)	Yield Strength (0.2 % offset) min, ksi (MPa)	Elongation in 2 in. or 50 mm, min, %
Annealed <sup>B,C</sup>	85–115 (586–793)	35 (241)	30
Half-hard <sup>D</sup>	105 (724) min	75 (517)	15
Full-hard <sup>E</sup>	125 (862) min	100 (689)	5

<sup>A</sup> Not applicable to outside diameters under ½ in. (3.2 mm) and wall thickness under 0.015 in. (0.381 mm).

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

<sup>C</sup> The minimum tensile strength value applies only to tubing in straight lengths.

<sup>D</sup> This condition is sometimes designated as “No. 2 Temper.”

<sup>E</sup> This condition is sometimes designated as “No. 3 Temper.”