Designation: B 574 – 99a

Standard Specification for Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod[1]

This standard is issued under the fixed designation B 574; 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 rod of low-carbon nickel-molybdenum-chromium alloys (UNS N10276, N06022, and N06455)*, low-carbon nickel-chromium-molybdenum alloy (UNS N06058, UNS N06059), low-carbon nickel-molybdenum-chromium-tantalum (UNS N06210), low-carbon nickel-chromium-molybdenum-copper alloy (UNS N06200), and low-carbon nickel-chromium-molybdenum-tungsten (UNS N06686) as shown in Table 1, for use in general corrosive service.

1.2 The following products are covered under this specification:

1.2.1 Rods 5⁄16 to ¾ in. (7.94 to 19.05 mm), exclusive, in diameter, hot or cold finished, solution annealed and pickled, or mechanically descaled.

1.2.2 Rods ¾ to 3½ in. (19.05 to 88.9 mm), inclusive, in diameter, hot or cold finished, solution annealed, ground or turned.

1.3 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

B 880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys[3]

E 8 Test Methods for Tension Testing of Metallic Materials[4]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[5]

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition[6]

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys[7]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *rod*—a product of round solid section furnished in straight lengths.

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*—Table 1.

4.1.2 *Dimensions*—Nominal diameter and length. The shortest useable multiple length should be specified (Table 2).

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

4.1.4 *Purchaser Inspection*—State which tests or inspections are to be witnessed (Section 13).

4.1.5 *Samples for Product (Check) Analysis*—State whether samples should be furnished (9.2.2).

5. Chemical Composition

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

[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-574 in Section II of that Code.

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

[3] *Annual Book of ASTM Standards*, Vol 02.04.

[4] *Annual Book of ASTM Standards*, Vol 03.01.

[5] *Annual Book of ASTM Standards*, Vol 14.02.

[6] *Annual Book of ASTM Standards*, Vol 03.05.

[7] *Annual Book of ASTM Standards*, Vol 03.06.

TABLE 1 Chemical Requirements

Element	Composition Limits, %							
	Alloy N10276	Alloy N06022	Alloy N06455	Alloy N06059	Alloy N06058	Alloy N06200	Alloy N06210	Alloy N06686
Molybdenum	15.0–17.0	12.5–14.5	14.0–17.0	15.0–16.5	19.0 - 21.0	15.0–17.0	18.0–20.0	15.0-17.0
Chromium	14.5–16.5	20.0–22.5	14.0–18.0	22.0–24.0	20.0- 23.0	22.0–24.0	18.0–20.0	19.0-23.0
Iron	4.0–7.0	2.0–6.0	3.0 max	1.5, max	1.5, max	3.0 max	1.0 max	5.0 max
Tungsten	3.0–4.5	2.5–3.5	...	...	0.3 max	...	...	3.0-4.4
Cobalt, max	2.5	2.5	2.0	0.3	0.3 max	2.0 max	1.0	...
Carbon, max	0.010	0.015	0.015	0.010	0.010	0.010	0.015	0.010
Silicon, max	0.08	0.08	0.08	0.10	0.10	0.08	0.08	0.08
Manganese, max	1.0	0.50	1.0	0.5	0.5	0.5	0.5	0.75
Vanadium, max	0.35	0.35	...	...	...	...	0.35	...
Phosphorus, max	0.04	0.02	0.04	0.015	0.015	0.025	0.02	0.04
Sulfur, max	0.03	0.02	0.03	0.010	0.010	0.010	0.02	0.02
Titanium	...	...	0.7 max	...	...	...	...	0.02-0.25
Nickel	remainder[A]	remainder[A]	remainder[A]	Bal	Bal	remainder[A]	remainder[A]	remainder[A]
Aluminum	...	...	...	0.1–0.4	0.40 max	0.50 max	...	...
Copper	...	...	...	0.50 max	0.50 max	1.3–1.9	...	...
Tantalum	...	...	...	...	...	...	1.5–2.2	...

[A] See 12.1.1.

TABLE 2 Permissible Variations in Diameter and Out-of-Roundness of Finished Rods

Specified Diameter, in. (mm)	Permissible Variations, in. (mm)		
	Diameder		Out of Roundness, max
	+	–	
5/16 Hot-Finished, Annealed, and Descaled Rods			
5/16–7/16 (7.94–11.11), incl	0.012 (0.30)	0.012 (0.30)	0.018 (0.46)
Over 7/16 –5/8 (11.11–15.87), incl	0.014 (0.36)	0.014 (0.36)	0.020 (0.51)
Over 5/8–3/4 (15.87–19.05), excl	0.016 (0.41)	0.016 (0.41)	0.024 (0.61)
Hot-Finished, Annealed, and Ground or Turned Rods			
3/4–3 1/2 (19.05–88.9), incl	0.010 (0.25)	0	0.008 (0.20)

5.2 If a product (check) analysis is made by the purchaser, the material shall conform to the product (check) analysis variations per B 880.

6. Mechanical Properties and Other Requirements

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

7. Dimensions and Permissible Variations

7.1 *Diameter*—The permissible variations from the specified diameter shall be as prescribed in Table 2.

7.2 *Out of Roundness*— The permissible variation in roundness shall be as prescribed in Table 2.

7.3 *Machining Allowances*—When the surfaces of finished material are to be machined, the following allowances are suggested for normal machining operations.

7.3.1 *As-finished (Annealed and Descaled)*—For diameters of 5/16 to 1 1/16 in. (7.94 to 17.46 mm) inclusive, an allowance of 1/16 in. (1.59 mm) on the diameter should be made for finish machining.

7.4 *Length*:

7.4.1 Unless multiple, nominal, or cut lengths are specified, random mill lengths shall be furnished.

7.4.2 The permissible variations in length of multiple, nominal, or cut length rod shall be as prescribed in Table 4. Where rods are ordered in multiple lengths, a 1/4-in. (6.35-mm) length addition shall be allowed for each uncut multiple length.

7.5 *Ends*:

7.5.1 Rods ordered to random or nominal lengths shall be furnished with either cropped or sawed ends.

7.5.2 Rods ordered to cut lengths shall be furnished with square sawcut or machined ends.

TABLE 3 Mechanical Property Requirements

Alloy	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % Offset), min, psi (MPa)	Elongation in 2 in. (50.8 mm) or 4*D*[A] min, %
N10276	100 000 (690)	41 000 (283)	40
N06022	100 000 (690)	45 000 (310)	45
N06455	100 000 (690)	40 000 (276)	40
N06058	110 000 (760)	52 000 (360)	40
N06059	100 000 (690)	45 000 (310)	45
N06200	100 000 (690)	41 000 (283)	45
N06686	100 000 (690)	45 000 (310)	45
N06210	100 000 (690)	45 000 (310)	45

[A] *D* refers to the diameter of the tension specimen.