



Designation: B 574 – 06

# Standard Specification for 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<sup>1</sup>

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 reappraisal. A superscript epsilon (ε) indicates an editorial change since the last revision or reappraisal.

## 1. Scope

1.1 This specification<sup>2</sup> covers rod of low-carbon nickel-chromium-molybdenum alloys (UNS N10276, N06022, N06035, N06455, N06058, and 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  $\frac{5}{16}$  to  $\frac{3}{4}$  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  $\frac{3}{4}$  to  $3\frac{1}{2}$  in. (19.05 to 88.9 mm), inclusive, in diameter, hot or cold finished, solution annealed, ground or turned.

1.2.3 Rods  $\frac{1}{4}$  to  $3\frac{1}{2}$  in. (6.35 to 88.9 mm), inclusive, in diameter, solution annealed, cold finished, as cold finished, ground or turned (N06059 and N06686 only, see **Table 2** and **Table 3**).

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.

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:*<sup>3</sup>

**E 880** Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys

**E 8** Test Methods for Tension Testing of Metallic Materials

**E 29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

**E 55** Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition

**E 527** Practice for Numbering Metals and Alloys (UNS)

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

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *rod, n*—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 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 4**).

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**).

<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-574 in Section II of that Code.

\* New designation established in accordance with Practice **E 527** and SAE J1086, Practice for Numbering Metals and Alloys (UNS).

<sup>3</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.

**TABLE 1 Chemical Requirements**

Element	Composition Limits, %								
	Alloy N06035	Alloy N10276	Alloy N06022	Alloy N06455	Alloy N06059	Alloy N06058	Alloy N06200	Alloy N06210	Alloy N06686
Molybdenum	7.60–9.00	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	32.25–34.25	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	2.00 max	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	0.60 max	3.0–4.5	2.5–3.5	...	...	0.3 max	...	...	3.0–4.4
Cobalt, max	1.00	2.5	2.5	2.0	0.3	0.3 max	2.0 max	1.0	...
Carbon, max	0.050	0.010	0.015	0.015	0.010	0.010	0.010	0.015	0.010
Silicon, max	0.60	0.08	0.08	0.08	0.10	0.10	0.08	0.08	0.08
Manganese, max	0.50	1.0	0.50	1.0	0.5	0.5	0.5	0.5	0.75
Vanadium, max	0.20	0.35	0.35	...	...	...	...	0.35	...
Phosphorus, max	0.030	0.04	0.02	0.04	0.015	0.015	0.025	0.02	0.04
Sulfur, max	0.015	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 <sup>A</sup>	remainder <sup>A</sup>	remainder <sup>A</sup>	remainder <sup>A</sup>	Bal	Bal	remainder <sup>A</sup>	remainder <sup>A</sup>	remainder <sup>A</sup>
Aluminum	0.40 max	...	...	...	0.1–0.4	0.40 max	0.50 max	...	...
Copper	0.30 max	...	...	...	0.50 max	0.50 max	1.3–1.9	...	...
Tantalum	...	...	...	...	...	...	...	1.5–2.2	...

<sup>A</sup>See 12.1.1.

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

Specified Diameter, in. (mm)	Permissible Variations, in. (mm)		
	Diameter		Out of Roundness, max
	+	-	
1/4 –7/16 (6.35–11.11), 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)
3/4 –3 1/2 (19.05–88.9), incl	0.010 (0.25)	0.010 (0.25)	0.010 (0.25)

**TABLE 3 Mechanical Property Requirements for As Cold Finished Rods**

Alloy	Grade	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % Offset), min, psi (MPa)	Elongation in 2 in. (50.8 mm) or 4D <sup>A</sup> min, %
N06059	1	120 (827)	85 (586)	20
	2	135 (931)	125 (862)	20
	3	160 (1103)	150 (1034)	15
N06686	1	120 (827)	85 (586)	20
	2	135 (931)	125 (862)	20
	3	160 (1103)	150 (1034)	20

<sup>A</sup> D refers to the diameter of the tension specimen.

**TABLE 4 Permissible Variations in Diameter and Out-of-Roundness of Hot or Cold Finished, Solution Annealed Rods**

Specified Diameter, in. (mm)	Permissible Variations, in. (mm)		
	Diameter		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)

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.

5.2 If a product (check) analysis is made by the purchaser, the material shall conform to the product (check) analysis variations per Specification 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 5.

### 7. Dimensions and Permissible Variations

7.1 *Diameter*—The permissible variations from the specified diameter shall be as prescribed in Table 4.

7.2 *Out of Roundness*—The permissible variation in roundness shall be as prescribed in Table 4.