



Designation: **B574 – 18 B574 – 23**

Standard Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel- Molybdenum-Chromium-Tantalum, Low-Carbon Nickel- Chromium-Molybdenum-Copper, and Low-Carbon Nickel- Chromium-Molybdenum-Tungsten Alloy Rod and Bar¹

This standard is issued under the fixed designation B574; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification² covers rod and bar of low-carbon nickel-chromium-molybdenum alloys (UNS N10276, N06022, N06035, N06044, N06455, N06058, and N06059), low-carbon nickel-molybdenum-chromium (UNS N10362), 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~~ Rods and Bars $\frac{5}{16}$ in. to $\frac{3}{4}$ in. (7.94(7.94 mm to 19.05 mm), exclusive, in ~~in diameter,~~ dimension³ ~~hot or cold finished,~~ solution annealed and pickled, or mechanically descaled.

1.2.2 ~~Rods~~ Rods and Bars $\frac{3}{4}$ in. to $3\frac{1}{2}$ in. (19.05 to 88.9 mm), inclusive, in ~~diameter,~~ dimension³ ~~hot or cold finished,~~ solution annealed, ground or turned.

1.2.3 ~~Rods~~ Rods and $\frac{1}{4}$ Bars $\frac{1}{4}$ in. to $3\frac{1}{2}$ in. (6.35(6.35 mm to 88.9 mm), inclusive, in ~~diameter,~~ dimension³ solution annealed, cold finished, as cold finished, worked, ground or turned (N06059 and N06686 only, (N06022, N06059, N06686, and N10276, see Table 2 and Table 3).

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 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 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.

³ Dimension applies to diameter of rods, to distance between parallel surfaces of squares and hexagonals, and separately to width and thickness of rectangles.

*A Summary of Changes section appears at the end of this standard

TABLE 1 Chemical Requirements^{A,B}

Element	Composition Limits, %										
	Alloy N06035	Alloy N06044	Alloy N10276	Alloy N06022	Alloy N06455	Alloy N06059	Alloy N06058	Alloy N06200	Alloy N10362	Alloy N06210	Alloy N06686
Molybdenum	7.60–9.00	0.80-1.20	15.0–17.0	12.5–14.5	14.0–17.0	15.0–16.5	18.5–21.0	15.0–17.0	21.5-23.0	18.0–20.0	15.0-17.0
Chromium	32.25–34.25	43.5-45.3	14.5–16.5	20.0–22.5	14.0–18.0	22.0–24.0	20.0- 23.0	22.0–24.0	13.8-15.6	18.0–20.0	19.0-23.0
Iron	2.00 max	0.3 max	4.0–7.0	2.0–6.0	3.0 max	1.5, max	1.5, max	3.0 max	1.25 max	1.0 max	5.0 max
Iron	2.00	0.3	4.0–7.0	2.0–6.0	3.0	1.5	1.5	3.0	1.25	1.0	5.0
Tungsten	0.60 max	...	3.0–4.5	2.5–3.5	...	...	0.3 max	...	...	...	3.0-4.4
Tungsten	0.60	...	3.0–4.5	2.5–3.5	...	...	0.3	...	...	...	3.0-4.4
Cobalt, max	1.00	...	2.5	2.5	2.0	0.3	0.3 max	2.0 max	...	1.0	...
Cobalt	1.00	...	2.5	2.5	2.0	0.3	0.3	2.0	...	1.0	...
Carbon, max	0.050	0.02	0.040	0.015	0.015	0.010	0.010	0.010	0.010	0.015	0.010
Carbon	0.050	0.02	0.010	0.015	0.015	0.010	0.010	0.010	0.010	0.015	0.010
Silicon, max	0.60	0.20	0.08	0.08	0.08	0.10	0.10	0.08	0.08	0.08	0.08
Silicon	0.60	0.20	0.08	0.08	0.08	0.10	0.10	0.08	0.08	0.08	0.08
Manganese, max	0.50	0.07-0.30	1.0	0.50	1.0	0.5	0.5	0.5	0.60	0.5	0.75
Manganese	0.50	0.07-0.30	1.0	0.50	1.0	0.5	0.5	0.5	0.60	0.5	0.75
Vanadium, max	0.20	...	0.35	0.35	...	...	...	...	...	0.35	...
Vanadium	0.20	...	0.35	0.35	...	...	...	...	...	0.35	...
Phosphorus, max	0.030	0.020	0.04	0.02	0.04	0.015	0.015	0.025	0.025	0.02	0.04
Phosphorus	0.030	0.020	0.04	0.02	0.04	0.015	0.015	0.025	0.025	0.02	0.04
Sulfur, max	0.015	0.020	0.03	0.02	0.03	0.010	0.010	0.010	0.010	0.02	0.02
Sulfur	0.015	0.020	0.03	0.02	0.03	0.010	0.010	0.010	0.010	0.02	0.02
Titanium	...	0.10-0.30	...	...	0.7 max	...	...	...	...	...	0.02-0.25
Titanium	...	0.10-0.30	...	...	0.7	...	...	...	...	...	0.02-0.25
Nickel	remainder ^A	Bal	remainder ^A	remainder ^A	remainder ^A	Bal	Bal	remainder ^A	remainder ^A	remainder ^A	remainder ^A
Nickel ^C	remainder	remainder	remainder	remainder	remainder	remainder	remainder	remainder	remainder	remainder	remainder
Aluminum	0.40 max	0.30 max	...	...	...	0.1–0.4	0.40 max	0.50 max	0.50 max	...	...
Aluminum	0.40	0.30	...	...	...	0.1–0.4	0.40	0.50	0.50	...	...
Copper	0.30 max	...	...	...	...	0.50 max	0.50 max	1.3–1.9	...	...	...
Copper	0.30 max	...	...	...	...	0.50	0.50	1.3–1.9	...	...	...
Tantalum	...	...	...	...	...	...	...	...	...	1.5–2.2	...
Nitrogen	...	...	...	...	...	...	0.02–0.15	...	...	...	...

^A See All 42.1.1 values are maximums unless specified as a minimum or a range is provided.

^B Where ellipses ([. . .]) appear in this table there is no requirement and the element need neither be analyzed for or reported.

^C Nickel shall be determined arithmetically by difference.

TABLE 2 Permissible Variations in Diameter/Dimension and Out-of-Roundness of As Cold Finished Rods/Cold-Worked and Bars

Specified Diameter/Dimension, in. (mm)	Permissible Variations, in. (mm)		
	Diameter/Dimension ^A		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)

^A Dimension applies to diameter of rods, to distance between parallel surfaces of squares and hexagonals, and separately to width and thickness of rectangles.

TABLE 3 Mechanical Property Requirements for As Cold Finished Rods/Cold-Worked Rods and Bars

Alloy	Grade	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % Offset), min, psi (MPa)	Elongation in 2 in. (50.8 mm) or 4D ^A 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
N06022 ^B	---	120 000 (825)	80 000 (550)	25
N10276 ^B	---	120 000 (825)	80 000 (550)	25

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

^B Up to 2.5 in. (63 mm) thickness.

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

Specified Diameter/Dimension, in. (mm)	Permissible Variations, in. (mm)		
	Diameter/Dimension ^A		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)

^A Dimension applies to diameter of rods, to distance between parallel surfaces of squares and hexagonals, and separately to width and thickness of rectangles.

TABLE 5 Mechanical Property Requirements for Hot or Cold Finished, Solution Annealed Rods/Rods and Bars

Alloy	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % Offset), min, psi (MPa)	Elongation in 2 in. (50.8 mm) or 4D ^A min, %
N10276	100 000 (690)	41 000 (283)	40
N06022	100 000 (690)	45 000 (310)	45
N06035	85 000 (586)	35 000 (241)	30
N06044	100 000 (690)	41 000 (280)	30
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)	45 000 (310)	45
N10362	105 000 (725)	45 000 (310)	40
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.

1.5 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:⁴

- [B880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys](#)
- [B899 Terminology Relating to Non-ferrous Metals and Alloys](#)
- [E8/E8M Test Methods for Tension Testing of Metallic Materials](#)
- [E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)
- [E55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition](#)
- [E527 Practice for Numbering Metals and Alloys in the Unified Numbering System \(UNS\)](#)
- [E1473 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.

3.1 Definitions:

3.1.1 For definitions of terms used in this specification, refer to Terminology [B899](#).

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](#). *Quantity (mass length, or number of pieces)*;

4.1.2 *Name of material*;

4.1.3 *ASTM specification designation and year date to which the product is to be furnished and be certified as meeting*;

4.1.4 *Condition, (hot rolled, cold drawn, annealed, heat treated)*;

4.1.5 *Grade designation*;

4.1.6 *Dimensions*—Nominal diameter and length. The shortest usable multiple length should be specified ([Table 4](#)).

4.1.7 *Shape and finish characteristics (surface finish, type of edge required)*.

4.1.8 *Certification*—State if certification or a report of test results is required ([Section 15](#)).

4.1.9 *Purchaser Inspection*—State which tests or inspections are to be witnessed ([Section 13](#)).

4.1.10 *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 [B880](#).

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](#) and [Table 5](#).

⁴ 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.