



Designation: B 814 – 02

Standard Specification for Nickel-Chromium-Iron-Molybdenum-Tungsten Alloy (UNS N06920) Plate, Sheet, and Strip¹

This standard is issued under the fixed designation B 814; 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 covers nickel-chromium-iron-molybdenum-tungsten alloy UNS N06920 in the form of rolled plate, sheet, and strip for general corrosion service.

1.2 The following products are covered under this specification:

1.2.1 *Sheet and Strip*—Hot or cold rolled, annealed and descaled unless solution-annealing is performed in an atmosphere yielding a bright finish; and

1.2.2 *Plate*—Hot rolled, solution-annealed, and descaled.

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 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:*

B 880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys, and Cobalt Alloys²

E 8 Test Methods for Tension Testing of Metallic Materials³

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁴

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁵

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 Thier Alloys.

Current edition approved July 10, 2002. Published September 2002. Originally published as B 814 – 91. Last previous edition B 814 – 95.

² *Annual Book of ASTM Standards*, Vol 02.04.

³ *Annual Book of ASTM Standards*, Vol 03.01.

⁴ *Annual Book of ASTM Standards*, Vol 14.02.

⁵ *Annual Book of ASTM Standards*, Vol 03.05.

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys⁵

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *plate*—material $\frac{3}{16}$ in. (4.76 mm) and over in thickness.

3.1.2 *sheet and strip*—material under $\frac{3}{16}$ in. (4.76 mm) in thickness.

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered to this specification. Examples of such requirements include, but are not limited to, the following:

4.1.1 *Alloy*.

4.1.2 *Dimensions*—Thickness (in decimals of an inch), width, and length (inch or fraction of an inch).

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

4.1.4 *Optional Requirement*—Plate; state how the plate is to be cut (see 7.8.1 and Table 1).

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

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

5. Chemical Composition

5.1 The material shall conform to the chemical composition requirements prescribed in Table 2.

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 *Tensile Properties*—The material shall conform to the room temperature tensile properties prescribed in Table 3.

7. Dimensions, Mass, and Permissible Variations

7.1 For the purposes of calculating the weight of the material covered by this specification, a density of 0.303 lb/in.³ (8.39 g/cm³) shall be used.

TABLE 1 Permissible Variations in Width and Length of Sheared, Plasma-Torch-Cut, or Abrasive Cut Rectangular Plate

Specified Thickness	Permissible Variations in Widths and Lengths for Dimensions Given, in. (mm)			
	Up to 30 (760), incl		Over 30 (760)	
	+	-	+	-
	Inches			
<i>Sheared:</i>				
3/16 to 5/16	3/16	1/8	1/4	1/8
5/16 to 1/2, incl	1/4	1/8	3/8	1/8
<i>Abrasive Cut:</i>				
3/16 to 1 1/2, incl	1/16	1/16	1/16	1/16
Over 1 1/2 to 2 1/2, incl	1/8	1/8	1/8	1/8
<i>Plasma-Torch-Cut.^A</i>				
3/16 to 2, excl	1/2	0	1/2	0
2 to 3, incl	5/8	0	5/8	0
	Millimetres			
<i>Sheared:</i>				
4.76 to 7.94, excl	4.76	3.18	6.35	3.18
7.94 to 12.70, incl	6.35	3.18	9.52	3.18
<i>Abrasive Cut:</i>				
4.76 to 38.1, incl	1.59	1.59	1.59	1.59
Over 38.1 to 63.5, incl	3.18	3.18	3.18	3.18
<i>Plasma-Torch-Cut.^A</i>				
4.8 to 50.8, excl	12.7	0	12.7	0
50.8 to 76.2, incl	15.9	0	15.9	0

^AThe tolerance spread shown for plasma-torch-cutting may be obtained all on the minus side, or divided between the plus and the minus side if so specified by the purchaser.

TABLE 2 Chemical Requirements

Element	Composition Limits, %
Chromium	20.5–23.0
Iron	17.0–20.0
Molybdenum	8.0–10.0
Tungsten	1.0–3.0
Carbon, max	0.03
Cobalt, max	5.0
Manganese, max	1.0
Phosphorus, max	0.040
Sulfur, max	0.030
Silicon, max	1.0
Nickel	Remainder ^A

^ASee 12.1.1.

TABLE 3 Mechanical Property Requirements

Tensile Strength, min, ksi (MPa)	95 (655)
Yield Strength, min, ksi (MPa)	35 (240)
Elongation in 2 in. (50.8 mm) or 4D ^A , min, %	35

^AD refers to the diameter of the tension specimen.

7.2 Thickness:

7.2.1 Plate—The permissible variations in thickness of plate shall be as prescribed in Table 4 and Table 5.

7.2.2 Sheet and Strip—The permissible variations in thickness of sheet and strip shall be as prescribed in Table 6. The thickness shall be measured with the micrometer spindle 3/8 in.

TABLE 4 Permissible Variations in Thickness of Plate^A

Specific Thickness, in. (mm)	Permissible Variations in Thickness, in. (mm) ^{B,C}	
	+	-
3/16 to 7/32 (4.762 to 5.556), incl	0.021 (0.53)	0.010 (0.25)
Over 7/32 to 1/4 (5.556 to 6.350), incl	0.024 (0.61)	0.010 (0.25)
Over 1/4 to 3/8 (6.350 to 9.525), incl	0.027 (0.69)	0.010 (0.25)
Over 3/8 to 1/2 (9.525 to 12.70), incl	0.030 (0.76)	0.010 (0.25)
Over 1/2 to 5/8 (12.70 to 15.88), incl	0.035 (0.89)	0.010 (0.25)
Over 5/8 to 3/4 (15.88 to 19.05), incl	0.040 (1.02)	0.010 (0.25)
Over 3/4 to 7/8 (19.05 to 22.25), incl	0.045 (1.14)	0.010 (0.25)
Over 7/8 to 1 (22.22 to 25.4), incl	0.050 (1.27)	0.010 (0.25)
Over 1 to 2 1/2 (25.4 to 63.5), incl	5 ^D	0.010 (0.25)

^AApplicable to plate 48 in. (1219 mm) and under in width.

^BMeasured 3/8 in. (9.525 mm) or more from any edge.

^CBuffing or grinding for removal of light surface imperfections shall be permitted. The depth of such buffed or ground areas shall not exceed the minimum tolerance thickness.

^DExpressed as percent of thickness.

(9.525 mm) or more from any edge for material 1 in. (25.4 mm) or over in width and at any place on material under 1 in. (25.4 mm) in width.

7.3 Width:

7.3.1 Plate—The permissible variations in width of rectangular plates shall be as prescribed in Table 1.

7.3.2 Sheet and Strip—The permissible variations in width for sheet and strip shall be as prescribed in Table 7.

7.4 Length:

7.4.1 Plate—Permissible variations in the length of rectangular plate shall be as prescribed in Table 1.

7.4.2 Sheet and Strip—Sheet and strip may be ordered to cut lengths, in which case a variation of 1/8 in. (3.175 mm) over the specified length shall be permitted, with a 0 minus tolerance.

7.5 Straightness:

7.5.1 The edgewise curvature (depth of chord) of flat sheet, strip, and plate shall not exceed the product of 0.05 in. multiplied by the length in feet (0.04 mm multiplied by the length in centimetres).

7.5.2 Straightness for coiled strip is subject to agreement between the manufacturer and the purchaser.

7.6 Squareness (Sheet)—For sheets of all thicknesses and widths of 6 in. (152.4 mm) or more, the angle between adjacent sides shall be 90 ± 0.15° (1/16 in. in 24 in. or 2.6 mm/m).

7.7 Flatness—Plate, sheet, and strip shall be commercially flat.

7.8 Edges:

7.8.1 Plates shall have sheared, abrasive cut, or plasma-torch-cut edges as specified.

7.8.2 Sheet and strip shall have sheared or slit edges.

8. Workmanship, Finish, and Appearance

8.1 The material shall be uniform in quality and condition, smooth, and free of injurious defects.

9. Sampling

9.1 Lots for Chemical Analysis and Mechanical Testing:

9.1.1 A lot for chemical analysis shall consist of one heat.