



Designation: B 620 – 98a

Standard Specification for Nickel-Iron-Chromium-Molybdenum Alloy (UNS N08320) Plate, Sheet, and Strip¹

This standard is issued under the fixed designation B 620; 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 specification² covers rolled nickel-iron-chromium-molybdenum alloy (UNS N08320)* plate, sheet, and strip, for use in general corrosive service.

1.2 The following products are covered under this specification:

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

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.

2. Referenced Documents

2.1 *ASTM Standards*:

B 880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys³

E 8 Test Methods for Tension Testing of Metallic Materials⁴

E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁴

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications⁵

E 55 Practice for Sampling Wrought Nonferrous Metals and Alloys for Determination of Chemical Composition⁶

E 140 Hardness Conversion Tables for Metals (Relationship Between Brinell Hardness, Vickers Hardness, Rockwell Hardness, Rockwell Superficial Hardness, and Knoop Hardness)⁴

¹ This specification is under the jurisdiction of ASTM Committee B-2 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-620 in Section II of that Code.

* New designation established in accordance with ASTM E527 and SAE J1086, Recommended 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.

E 1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys⁷

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

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

4.1.3 *Optional Requirement*:

4.1.3.1 *Plate*—State how plate is to be cut (see 7.8.1 and Table 1).

4.1.4 *Purchase 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 2.

5.2 If a product (check) analysis is made by the purchaser, the material shall conform to the requirements specified in Table 2 subject to the permissible tolerances per 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 *Annual Book of ASTM Standards*, Vol 03.06.



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), incl	
	+	-	+	-
Inches				
<i>Sheared:</i>				
3/16 to 5/16, excl	3/16	1/8	1/4	1/8
Over 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:</i> ^A				
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, incl	4.76	3.18	6.35	3.18
Over 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:</i> ^A				
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, %
Nickel	25.0–27.0
Iron	remainder ^A
Chromium	21.0–23.0
Molybdenum	4.0–6.0
Manganese, max	2.5
Carbon, max	0.05
Titanium, min	4 × carbon
Silicon, max	1.00
Phosphorus, max	0.04
Sulfur, max	0.03

^ASee 12.1.1.

TABLE 3 Mechanical Property Requirements

Tensile Strength min, psi (MPa)	Yield Strength (0.2 % Offset) min, psi (MPa)	Elongation in 2 in. (50.8 mm) or 4D ^A min, %	Rockwell Hardness, ^B max
75 000 (517)	28 000 (193)	35	95 HRB

^AD refers to the diameter of the tension specimen.

^BHardness values are shown for information purposes only and are not to be used as a basis for rejection or acceptance. For approximate hardness conversions, see Hardness Conversion Tables E 140.

6.2 *Hardness*—The hardness values given in Table 3 are informative only.

7. Dimensions, Mass, and Permissible Variations

7.1 *Weight*—The material covered by this specification shall be assumed to weigh 0.291 lb/in.³(8.05 g/cm³).

7.2 *Thickness* :

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

7.2.2 *Sheet and Strip*—The permissible variations in thickness of sheet and strip shall be as prescribed in Table 5. The thickness shall be measured with the micrometer spindle 3/8 in. (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. 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 6.

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 zero minus tolerance

7.5 *Straightness:*

7.5.1 The edgewise curvature (depth of cord) of flat sheet, strip, and plate shall not exceed 0.05 in. multiplied by the length in feet or 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 deg (1/16 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 Plate shall have sheared or abrasive cut or plasma-torch-cut edges as specified.

7.8.2 Sheet and strip shall have sheared or slit edges.

TABLE 4 Permissible Variations in Thickness of Plate^A

Specified Thickness, in. (mm)	Permissible Variations in Thickness, in. (mm) ^{BC}	
	+	- ^{7/32}
(4.76 to 5.56), incl	0.021 (0.53)	0.010 (0.25)
Over 5/32 to 1/4 (5.56 to 6.35), incl	0.024 (0.61)	0.010 (0.25)
Over 1/4 to 3/8 (6.35 to 9.52), incl	0.027 (0.69)	0.010 (0.25)
Over 3/8 to 1/2 (9.52 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 22.22), 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. (1.22 m) and under in width.

^BMeasured 3/8 in. (9.52 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 percentage of thickness.