



Designation: B599 – 20

Standard Specification for Nickel-Iron-Chromium-Molybdenum-Niobium Stabilized Alloy Plate, Sheet, and Strip¹

This standard is issued under the fixed designation B599; 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-iron-chromium-molybdenum-niobium stabilized alloy (UNS N08700)² plate, sheet, and strip in the solution-annealed condition.

1.2 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.

1.3 *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, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.4 *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:*³

A262 Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steels

E8/E8M Test Methods for Tension Testing of Metallic Materials

E10 Test Method for Brinell Hardness of Metallic Materials

E18 Test Methods for Rockwell Hardness 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

E140 Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, Scleroscope Hardness, and Leeb Hardness

E350 Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

E353 Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 The terms plate, sheet, and strip as used in this specification are described as follows:

3.1.2 *plate*, *n*—material 0.1875 in. (4.76 mm) and over in thickness and over 10 in. (254 mm) in width.

3.1.3 *sheet*, *n*—material under 0.1875 in. (4.76 mm) in thickness and over 24 in. (610 mm) in width.

3.1.4 *strip*, *n*—material under 0.1875 in. (4.76 mm) in thickness and under 24 in. (610 mm) in width.

4. Ordering Information

4.1 Orders for material under this specification should include the following information:

4.1.1 Quantity (weight or number of pieces).

4.1.2 Name of material or UNS N08700.

4.1.3 Form (plate, sheet, or strip).

4.1.4 Dimensions.

4.1.5 Type of edge required (for strip only, see 9.4).

4.1.6 *Finish* (Section 10)—For sheet ordered with No. 4 finish, specify whether one or both sides are to be polished.

4.1.7 ASTM designation and year of issue.

4.1.8 *Corrosion Test*—State if intergranular corrosion test is required (Section 8).

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

³ 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.

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

TABLE 1 Chemical Requirements

Element	Composition, %
Nickel	24.0–26.0
Iron	remainder ^A
Chromium	19.0–23.0
Molybdenum	4.3–5.0
Niobium ^B	8 × carbon to 0.40
Carbon, max	0.04
Silicon, max	1.00
Manganese, max	2.00
Phosphorus, max	0.040
Sulfur, max	0.030
Copper, max	0.50

^A Determined arithmetically by difference.

^B The terms Niobium (Nb) and Columbium (Cb) are alternate names for the same element.

TABLE 2 Product (Check) Analysis

Element	Tolerances Over the Maximum Limit or Under the Minimum Limit, %
Nickel	0.20
Chromium	0.20
Molybdenum	0.10
Niobium ^A	0.05
Carbon	0.01
Silicon	0.05
Manganese	0.04
Phosphorus	0.005
Sulfur	0.005
Copper	0.03

^A The terms Niobium (Nb) and Columbium (Cb) are alternate names for the same element.

4.1.9 *Marking*—State if metal die identification is required on plate ¼ in. (6.35 mm) or thicker (Section 17).

5. Materials and Manufacture

5.1 *Heat Treatment*—The final heat treatment shall be a solution anneal. Minor cold working such as flattening or temper rolling may be performed after the final solution annealing treatment.

NOTE 1—This recommended solution anneal consists of heating to a minimum temperature of 2000°F (1090°C) and cooling rapidly to room temperature.

6. Chemical Composition

6.1 The material sampled, in accordance with 11.2, shall conform to the composition limits prescribed in Table 1.

6.2 If a product analysis is subsequently made, the material shall conform to the composition limits with the product analysis variation prescribed in Table 2.

7. Mechanical Requirements

7.1 The material shall conform to the requirements as to the mechanical property prescribed in Table 3.

8. Intergranular Corrosion Test

8.1 All material supplied to this specification shall be capable of passing the intergranular corrosion test, but the test need not be performed on any given lot unless it is specified on the purchase order. If the test is specified, it shall be performed by the manufacturer on specimens taken in the as-shipped condition. Specimens shall be tested in the sensitized condition (1 h at 1250°F (677°C)), and tested in accordance with Practice C of Practices A262. The corrosion rate shall not exceed 2.5 mils/month (165 mg/dm²·day).

9. Dimensions and Permissible Variations

9.1 *Sheet*—The material referred to as sheet shall conform to the variations in dimensions prescribed in Tables 4-9, inclusive.

9.2 *Cold-Rolled Strip*—The material referred to as cold-rolled strip shall conform to the permissible variations in dimensions prescribed in Tables 10-13, inclusive.

9.3 *Plate*—The material referred to as plate shall conform to the permissible variations in dimensions prescribed in Tables 14-20, inclusive.

9.4 Edges for Cold-Rolled Strip:

9.4.1 The various types of edges procurable shall be as follows:

9.4.1.1 *No. 1 Edge*—Rolled edge, contour as specified.

9.4.1.2 *No. 3 Edge*—An edge produced by slitting.

9.4.1.3 *No. 5 Edge*—Approximately square edge produced by rolling or filing, or both, after slitting.

10. Workmanship, Finish, and Appearance

10.1 The material shall be free of injurious imperfections and shall correspond to the designated finish as described as follows:

10.1.1 *Sheet*—The various types of finish procurable on sheet products shall be as follows:

10.1.1.1 *No. 1 Finish*—Hot rolled, annealed, and descaled; produced by hot rolling to specified thicknesses followed by annealing and descaling (see 10.2).

10.1.1.2 *No. 2D Finish*—Dull, cold-rolled finish; produced by cold rolling to the specified thickness, annealing, and descaling. The dull finish results from the descaling and pickling operations.

TABLE 3 Mechanical Property Requirements

Form	Tensile Strength, min, ksi (MPa)	Yield Strength (0.2 % offset), min, ksi (MPa)	Elongation in 2 in. or 50 mm, or 4D, min, %	Rockwell Hardness (or equivalent) ^A
Sheet	80 (550)	35 (240)	30	75–90 HRB
Strip	80 (550)	35 (240)	30	75–90 HRB
Plate	80 (550)	35 (240)	30	75–90 HRB

^A Hardness values are shown for information only and shall not constitute a basis for acceptance or rejection as long as the other mechanical properties are met.