**Designation: B709 – 22**

# Standard Specification for Iron-Nickel-Chromium-Molybdenum Alloy Plate, Sheet, and Strip[1]

This standard is issued under the fixed designation B709; 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 iron-nickel-chromium-molybdenum alloy (UNS N08028) 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 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:*[2]

B899 Terminology Relating to Non-ferrous Metals and Alloys

B906 Specification for General Requirements for Flat-Rolled Nickel and Nickel Alloys Plate, Sheet, and Strip

E8/E8M Test Methods for Tension Testing of Metallic Materials

## 3. Terminology

3.1 *Definitions:*

3.1.1 The terms and definitions of Terminology B899 apply.

## 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 those specified in Ordering Information Section in Specification B906.

## 5. General Requirements

5.1 Material furnished under this specification shall conform to the applicable requirements of Specification B906, unless otherwise specified herein.

## 6. Materials and Manufacture

6.1 *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 1975 °F (1080 °C) and cooling rapidly to room temperature.

## 7. Chemical Composition

7.1 The material sampled in accordance with 10.1 shall conform to the composition limits prescribed in Table 1.

7.2 If a product analysis is made by the purchaser, the material shall conform to the product (check) analysis requirements in Specification B906.

## 8. Mechanical Properties

8.1 The material shall conform to the requirements as to the mechanical property prescribed in Table 2.

## 9. Dimensions and Permissible Variations

9.1 *Sheet*—Material furnished under this specification shall conform to the applicable requirements of Specification B906, except as specified in Table 3 and Table 4.

9.2 *Cold-Rolled Strip*—Material furnished under this specification shall conform to the applicable requirements of Specification B906, except as specified in Tables 5-7.

9.3 *Plate*—Material furnished under this specification shall conform to the applicable requirements of Specification B906.

[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.

Current edition approved Oct. 1, 2022. Published October 2022. Originally approved in 1982. Last previous edition approved in 2017 as B709 – 17. DOI: 10.1520/B0709-22.

[2] 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**

## 10. Sampling

10.1 *Sampling for Chemical Analysis, Mechanical Testing, and Corrosion Testing shall be performed in accordance with Specification B906, except as specified herein:*

10.1.1 *Plate*—A lot of plate for testing and inspection purposes shall consist of the products resulting from the rolling of one heat of material in the same condition and specified thickness, solution annealed by the same practice, but in no case more than 25 000 lb (11 340 kg).

10.1.2 *Sheet and Strip*—A lot of sheet or strip for testing and inspection purposes shall consist of material from one heat in the same form (sheet or strip), condition, finish, and specified thickness, solution annealed by the same practice but in no case more than 25 000 lb (11 340 kg).

10.2 *Sampling for Mechanical Tests:*

10.2.1 When samples are to be taken after delivery, the purchaser of material ordered to cut lengths may request on the purchase order additional material of adequate size to provide sample coupons for inspection purposes.

## 11. Number of Tests and Retests

11.1 In the case of sheet or strip supplied in coil form, two or more tension tests (one from each end of each coil), and one or more hardness tests shall be made on specimens taken from each end of the coil. When material is supplied in flat sheet, flat strip, or plate, one tension and one or more hardness tests shall be made on each 100 or less sheets, strips, or plates of the same lot. When specified, one corrosion test shall be conducted for each lot.

11.2 If any specimens selected to represent any lot fail to meet any of the test requirements, the material represented by such specimens may be retested. If there is valid reason to believe the result is not representative, the material may be re-reannealed and retested.

## 12. Specimen Preparation

12.1 Tension test specimens from material under ½ in. (12.7 mm) in thickness shall be of the full thickness of the material and machined to the form and dimensions shown for the sheet-type specimen in Test Methods E8/E8M. Tension test specimens from material ½ in. (12.7 mm) and over shall be of the full thickness of the material, machined to the form and dimensions shown for the plate-type specimen in Test Methods E8/E8M.

## 13. Keywords

13.1 N08028; plate; sheet; strip

**TABLE 1 Chemical Requirements[A]**

| Element | Composition, % |
|---|---|
| Ni | 30.0 to 34.0 |
| Fe | remainder[B] |
| Cr | 26.0 to 28.0 |
| Mo | 3.0 to 4.0 |
| C | 0.030 |
| Si | 1.00 |
| Mn | 2.50 |
| P | 0.030 |
| S | 0.030 |
| Cu | 0.6 to 1.4 |

[A] Maximum, unless range is indicated.
[B] Determined arithmetically by difference.



**TABLE 2 Mechanical Property Requirements**



| Form | Tensile Strength, min, ksi (MPa) | Yield Strength (0.2 % off-set), min, ksi (MPa) | Elongation in 2 in. or 50 mm, or 4D, min, % | Rockwell Hardness (or equivalent)[A] |
|---|---|---|---|---|
| Sheet | 73 (500) | 31 (214) | 40 | 70–90 HRB |
| Strip | 73 (500) | 31 (214) | 40 | 70–90 HRB |
| Plate | 73 (500) | 31 (214) | 40 | 70–90 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.

**TABLE 3 Flatness Tolerances for Hot-Rolled and Cold-Rolled Sheets**

| Sheets not Specified to Stretcher Leveled Standard of Flatness | | |
|---|---|---|
| Specified Thickness, in. (mm) | Width, in. (mm) | Flatness Tolerance (max Deviation from a Horizontal Flat Surface), in. (mm) |
| 0.062 (1.57) and over | to 60 (1524), incl | ½ (12.7) |
| | over 60 to 72 (1524 to 1829), incl | ¾ (19.1) |
| | over 72 (1829) | 1 (25.4) |
| Under 0.062 (1.57) | to 36 (914), incl | ½ (12.7) |
| | over 36 to 60 (914 to 1524), incl | ¾ (19.1) |
| | over 60 (1524) | 1 (25.4) |

**TABLE 4 Weight Tolerances for Hot-Rolled and Cold-Rolled Sheets**

It is not practicable to produce hot-rolled and cold-rolled sheets to exact theoretical weight. Sheets of any one item of a specified thickness and size in any finish may be overweight to the following extent:

(*1*) An item of five sheets or less, or an item estimated to weigh 200 lb (90.7 kg) or less, may actually weigh as much as 10 % over the theoretical weight.

(*2*) An item of more than five sheets and estimated to weigh more than 200 lb (90.7 kg) may actually weigh as much as 7½ % over the theoretical weight.

(*3*) The underweight variations for sheets are limited by the under thickness tolerances shown in Specification B906.

For determining theoretical weight, the factor 42 lb/ft$^2$·in. (0.0008 kg/cm$^2$·mm) thickness may be used.