Designation: B 425 – 99 (Reapproved 2005)

Standard Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221)* Rod and Bar[1]

This standard is issued under the fixed designation B 425; 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[2] covers nickel-iron-chromium-molybdenum-copper alloy (UNS N08825 and UNS N08221)* in the form of hot-finished and cold-drawn rounds, squares, hexagons, and rectangles.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

1.3 The following precautionary caveat pertains only to the test methods portion, Section 12, of this specification: *This standard does not purport to address all of the safety problems, 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 and health practices, and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:* [3]

B 424 Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221)* Plate, Sheet, and Strip

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

E 8 Test Methods for Tension Testing of Metallic Materials

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

E 1473 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 *bar*, *n*—material of rectangular (flats), hexagonal, or square solid section up to and including 10 in. (254 mm) in width and ⅛ in. (3.2 mm) and over in thickness in straight lengths.

3.1.1.1 *Discussion*—Hot-worked rectangular bar in widths 10 in. (254 mm) and under may be furnished as hot-rolled plate with sheared or cut edges in accordance with Specification B 424, provided the mechanical property requirements of this specification are met.

3.1.2 *rod*, *n*—material of round solid section furnished in straight lengths.

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 ASTM designation and date of issue,

4.1.2 UNS number,

4.1.3 *Section*—Rod (round) or bar (square, hexagonal, or rectangular),

4.1.4 *Dimensions*, including length,

4.1.5 Condition (see Appendix X1),

4.1.6 Finish (see Appendix X1),

4.1.7 *Quantity*—Feet (or metres) or number of pieces,

4.1.8 *Certification*—State if certification is required (Section 15),

4.1.9 *Samples for Product (Check) Analysis*—State whether samples for product (check) analysis should be furnished (see 5.2), and

4.1.10 *Purchaser Inspection*—If purchaser wishes to witness tests or inspection of material at place of manufacture, the purchase order must so state, indicating which test or inspections are to be witnessed (Section 13).

[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 Nov. 1, 2005. Published February 2006. Originally approved in 1964. Last previous edition approved in 1999 as B 425 – 99.

* New designation established in accordance with Practice E 527 and SAE J 1086, Practice for Numbering Metals and Alloys (UNS).

[2] For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-425 in Section II of that code.

[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.

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 performed by the purchaser, it shall be done in accordance with Specification B 880 and the material shall conform to the product (check) analysis variations defined in Table 1 of Specification B 880.

6. Mechanical Properties and Other Requirements

6.1 *Mechanical Properties*—The material shall conform to the mechanical properties specified in Table 2.

7. Dimensions and Permissible Variations

7.1 *Diameter, Thickness, or Width*—The permissible variations from the specified dimensions as measured on the diameter or between parallel surfaces of cold-worked rod and bar shall be as prescribed in Table 3, and of hot-worked rod and bar as prescribed in Table 4.

7.2 *Out-of-Round*—Hot-worked rods and cold-worked rods (except "forging quality") all sizes, in straight lengths, shall not be out-of-round by more than one half the total permissible variations in diameter shown in Table 3 and Table 4, except for hot-worked rods ½ in. (12.7 mm) in diameter and under, which may be out-of-round by the total permissible variations in diameter shown in Table 4.

7.3 *Corners*—Cold-worked bars will have practically exact angles and sharp corners.

7.4 *Machining Allowances for Hot-Worked Materials*—When the surfaces of hot-worked products are to be machined, the allowances prescribed in Table 5 are recommended for normal machining operations.

7.5 *Length*—The permissible variations in length of cold-worked and hot-worked rod and bar shall be as prescribed in Table 6.

7.5.1 Rods and bars ordered to random or nominal lengths will be furnished with either cropped or saw-cut ends; material ordered to cut lengths will be furnished with square saw-cut or machined ends.

7.6 *Straightness*:

7.6.1 The permissible variations in straightness of cold-worked rod and bar as determined by the departure from straightness shall be as prescribed in Table 7.

7.6.2 The permissible variations in straightness of hot-worked rod and bar as determined by the departure from straightness shall be as specified in Table 8.

TABLE 1 Chemical Requirements

Element	UNS N08825	UNS N08221
Nickel	38.0–46.0	39.0–46.0
Chromium	19.5–23.5	20.0–22.0
Iron[A]	22.0 min	balance
Manganese	1.0 max	1.0 max
Carbon	0.05 max	0.025 max
Copper	1.5–3.0	1.5–3.0
Silicon	0.5 max	0.5 max
Sulfur	0.03 max	0.03 max
Aluminum	0.2 max	0.2 max
Titanium	0.6–1.2	0.6–1.0
Molybdenum	2.5–3.5	5.0–6.5

[A] Element shall be determined arithmetically by difference.

8. Workmanship, Finish, and Appearance

8.1 The material shall be uniform in quality and condition, smooth, commercially straight or flat, and free of injurious imperfections.

9. Sampling

9.1 *Lot—Definition*:

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

9.1.2 A lot for mechanical properties testing shall consist of all material from the same heat, nominal diameter or thickness, and condition.

9.1.2.1 Where material cannot be identified by heat, a lot shall consist of not more than 500 lb (227 kg) of material in the same size and condition. A single piece weighing over 500 lb shall be considered as one lot.

9.2 *Test Material Selection*:

9.2.1 *Chemical Analysis*—Representative samples from each lot shall be taken during pouring or subsequent processing.

9.2.1.1 Product (check) analysis shall be wholly the responsibility of the purchaser.

9.2.2 *Mechanical Properties*—Samples of the material to provide test specimens for mechanical properties shall be taken from such locations in each lot as to be representative of that lot.

10. Number of Tests

10.1 *Chemical Analysis*—One test per lot.

10.2 *Tension*—One test per lot.

11. Specimen Preparation

11.1 Tension test specimens shall be taken from material in the final condition and tested in the direction of fabrication.

11.1.1 All rod and bar shall be tested in full cross-section size when possible. When a full cross-section size test cannot be performed, the largest possible round specimen shown in Test Methods E 8 shall be used. Longitudinal strip specimens shall be prepared in accordance with Test Methods E 8 for rectangular bar up to ½ in. (12.7 mm), inclusive, in thicknesses which are too wide to be pulled full size.

12. Test Methods

12.1 The chemical composition and mechanical and other properties of the material as enumerated in this specification shall be determined, in case of disagreement, in accordance with the following ASTM standards:

Test	ASTM Designation
Chemical analysis	E 1473
Tension	E 8
Rounding procedure	E 29

12.2 For purposes of determining compliance with the specified limits for requirements of the properties listed in the following table, an observed or calculated value shall be rounded as indicated below, in accordance with the rounding method of Practice E 29: