



Designation: ~~B719-83(Reapproved1994)^{ε1}~~ Designation: B 719 - 00 (Reapproved 2009)

Standard Specification for Nickel-Chromium-Molybdenum-Cobalt-Tungsten- Iron-Silicon Alloy (UNS N06333) Bar¹

This standard is issued under the fixed designation B 719; 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.

~~^{ε1}Note—Table 3 was editorially corrected in January 1994.~~

1. Scope

1.1 This specification covers wrought alloy UNS N06333 in the form of hot-finished and cold-finished bars and flats intended for heat resisting applications and general corrosive service.

~~1.2 The values stated in inch-pound units are to be regarded as the standard.~~

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

2. Referenced Documents

2.1 *ASTM Standards:*²

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 10 [Test Method for Brinell Hardness of Metallic Materials](#)

E 18 [Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials](#)²

[Test Methods for Rockwell Hardness of Metallic Materials](#)

E 29 [Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

E 140 [Hardness Conversion Tables for Metals](#)²

[Hardness Conversion Tables for Metals Relationship Among Brinell Hardness, Vickers Hardness, Rockwell Hardness, Superficial Hardness, Knoop Hardness, and Scleroscope Hardness](#)

E354 [Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys](#) 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 ~~bars~~ bars, *n*—material of round, hexagonal, octagonal, or square solid section, furnished in straight lengths, 1/4 in. {~~6.35 mm~~}(6.35 mm) and over in diameter or size.

3.1.2 ~~flats~~ flats, *n*—material 1/4 to 10 in. {~~6.35~~}(6.35 to 254 mm){mm}, inclusive, in width and 120 in. {~~3.05 mm~~}(3.05 mm) and over in thickness.

4. Ordering Information

~~4.1 Orders for material to this specification shall include information with respect to the following:~~

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:

¹ This specification is under the jurisdiction of ASTM Committee B-2-B02 on Nonferrous Metals and Alloys and is the direct responsibility of Subcommittee B02.07 on Refined Nickel and Cobalt and Alloys Containing Nickel or Cobalt or Both as Principal Constituents.

Current edition approved March 25, 1983. Published September 1983 on Refined Nickel and Cobalt and Their Alloys.

Current edition approved Oct. 1, 2009. Published 2009. Originally approved in 1983. Last previous edition approved in 2005 as B 719 - 00 (2005).

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* Vol 03.01 volume information, refer to the standard's Document Summary page on the ASTM website.

- 4.1.1 Alloy name or UNS number.
- 4.1.2 Quantity.
- 4.1.3 ASTM Designation and year of issue.
- 4.1.4 Section (round, square, hexagonal, and so forth).
- 4.1.5 Dimensions, including length.
- 4.1.6 Finish, hot or cold.
- 4.1.7 *Certification*—state if certification is required (Section 16).
- 4.1.8 *Samples for Product (Check) Analysis*—State whether samples shall be furnished.
- 4.1.9 *Purchaser Inspection*—If a purchaser wishes to witness tests or inspections of material at the place of manufacture, the purchase order must so state indicating which tests or inspections are to be witnessed.

5. Material and Manufacture

5.1 All material shall be furnished in the annealed condition, except that cold-drawn hexagons may be given a cold draw sizing pass subsequent to the final anneal.

NOTE 1—Hot-finished rectangular bar in widths 10 in. ~~[254 mm]~~(254 mm) and under may be furnished as hot-finished plate with sheared or cut edges.

6. Chemical Requirements ~~Chemical Requirements~~

- 6.1 The material shall conform to the requirements as to chemical composition specified in Table 1.
- 6.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations in ~~Table 1~~per Specification B 880.

7. Mechanical and Other Requirements

7.1 The mechanical properties of the material at room temperature shall conform to those shown in Table 2.

8. Permissible Variations in Dimensions

8.1 All bars shall conform to the permissible variations in dimensions specified in Tables 3-8, inclusive.

9. Workmanship, Finish, and Appearance

9.1 The material shall be uniform in quality and condition, smooth, commercially straight, and free from injurious imperfections.

10. Sampling

10.1 *Lot Definitions*:

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

10.1.2 A lot for mechanical properties shall consist of material from one heat of the same condition and cross section, and no more than 40 000 lb ~~[18 100 kg]~~(18 100 kg) in mass.

10.2 *Test Material Selection*:

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

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

10.2.2 *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.

TABLE 1 Chemical Requirements

Element	Composition Limits, %Product (Check) Analysis Variations; Under Min or Over Max of the Specified Limit of Element	
Carbon	0.10 max	0.01
Manganese	2.0 max	0.04
Phosphorus	0.03	0.005
Sulfur	0.03	0.005
Silicon	1.5 max	0.10
Chromium	24.0–27.0	0.25
Nickel	44.0–48.0	0.30
Molybdenum	2.5–4.0	0.10
Cobalt	2.5–4.0	0.05
Tungsten	2.5–4.0	0.07
Iron ^A	remainder	...

^A Element may be determined arithmetically by difference.

TABLE 2 Mechanical Properties

Tensile Strength, min psi-† (MPa)†	Yield Strength, 0.2 % offset, min. psi-† (MPa)†	Elongation in 2 in. or 50 mm, or 4D, min%	Hardness ^A
80 000 [551]	35 000 [241]	30	75 to 95 HRB
80 000 (551)	35 000 (241)	30	75 to 95 HRB

^A Hardness values are informative only and not to be construed as the basis for acceptance.

TABLE 3 Permissible Variations in Size of Hot-Rolled Round and Square Bars

NOTE 1—Out of round is the difference between the maximum and minimum diameters of the bar, measured at the same cross section.

NOTE 2—Out of square section is the difference in the two dimensions at the same cross section of a square bar, each dimension being the distance between opposite faces.

NOTE 3—Size tolerances for rounds in the size range from ¼ in. † (6.4 mm) † to approximately 5/8 in. † (15.9 mm) †, which are produced on rod mills in coils, are not shown herein.

NOTE 4—Variations in size of coiled product made on rod mills are greater than size tolerances for product made on bar mills.

Specified Size		Size Tolerance				Out of Round (Note 1) or Out of Square Section (Note 2)	
in.	mm	Over		Under		in.	mm
		in.	mm	in.	mm		
¼ to 5/16	6.4 to 7.9	0.005	0.13†	0.005	0.13	0.008	0.20
Over 5/16 to 7/16	7.9 to 11.1	0.006	0.15	0.006	0.15	0.009	0.23
Over 7/16 to 5/8	11.1 to 15.9	0.007	0.18	0.007	0.18	0.010	0.25
Over 5/8 to 7/8	15.9 to 22.2	0.008	0.20	0.008	0.20	0.012	0.30†
Over 7/8 to 1	22.2 to 25.4	0.009	0.23	0.009	0.23	0.013	0.33†
Over 1 to 1 1/8	25.4 to 28.6	0.010	0.25	0.010	0.25	0.015	0.38
Over 1 1/8 to 1 1/4	28.6 to 31.8	0.011	0.28	0.011	0.28	0.016	0.41
Over 1 1/4 to 1 3/8	31.8 to 34.9	0.012	0.30†	0.012	0.30†	0.018	0.46
Over 1 3/8 to 1 1/2	34.9 to 38.1	0.014	0.36	0.014	0.36	0.021	0.53
Over 1 1/2 to 2	38.1 to 50.8	1/64	0.4	1/64	0.4	0.023	0.58
Over 2 to 2 1/2	50.8 to 63.5	1/32	0.8	0		0.023	0.58
Over 2 1/2 to 3 1/2	63.5 to 88.9	3/64	1.2	0		0.035	0.89
Over 3 1/2 to 4 1/2	88.9 to 114.3	1/16	1.6	0		0.046	1.17
Over 4 1/2 to 5 1/2	114.3 to 139.7	5/64	2.0	0		0.058	1.46
Over 5 1/2 to 6 1/2	139.7 to 165.1	1/8	3.2	0		0.070	1.78
Over 6 1/2 to 8	165.1 to 203.2	5/32	4.0	0		0.085	2.16

† Editorially corrected.

11. Number of Tests

- 11.1 *Chemical Analysis*—One test per lot.
- 11.2 *Mechanical Properties*—One test per lot.

12. Specimen Preparation

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

12.1.1 All material 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 in ASTM Test Methods E 8 shall be used.

13. Test Methods

- ~~13.1 Chemical Composition—Test Methods E354.~~
- ~~13.2 Tension Test—Test Methods E8.~~
- ~~13.3 Rockwell Hardness—Test Methods E18.~~
- ~~13.4 Brinell Hardness—Test Method E10.~~
- ~~13.5 Hardness Conversion—Hardness Conversion Tables E140.~~

~~13.6 Rounding Method—For purposes of determining compliance with the limits in this specification, an observed value or a calculated value shall be rounded off as indicated below, in accordance with the rounding-off method of Practice E29.~~

13.1 Determine the chemical composition, mechanical, and other properties of the material as enumerated in this specification, in case of disagreement, in accordance with the following methods: