Designation: B691 – 02 (Reapproved 2013)

Standard Specification for Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire[1]

This standard is issued under the fixed designation B691; 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 alloys (UNS N08366 and UNS N08367)* in the form of hot-finished and cold-finished rounds, squares, hexagons, octagons, and rectangles.

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 The following safety hazards caveat pertains only to the test methods portion, Section 12, of this specification: *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]

B880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys

E8 Test Methods for Tension Testing of Metallic Materials

E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

E1473 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 The terms rod, bar, and wire, as used in this specification, are described as follows:

3.1.2 *bar, n*—hot-finished or cold-finished material of round, square, hexagon, octagon, or rectangular solid section in straight lengths.

3.1.3 *rod, n*—hot-finished material of round, square, hexagon, octagon, or rectangular solid section furnished in coils for subsequent cold drawing into finished products.

3.1.4 *wire, n*—cold-finished material of round, square, hexagon, octagon, or rectangle solid section furnished in coils.

4. Ordering Information

4.1 It is the responsibility of the purchaser to specify all requirements that are necessary for material ordered to this specification. Examples of such requirements include, but are not limited to, the following:

4.1.1 Quantity (feet, metres, or number of pieces),
4.1.2 Form (rod, bar, wire),
4.1.3 Name of material or UNS number,
4.1.4 Finish (see 8.2),
4.1.5 Dimensions, including length,
4.1.6 Certification, if required (Section 15),
4.1.7 Purchaser's inspection, if required (Section 13),
4.1.8 ASTM designation and year of issue, and
4.1.9 Samples for product analysis, if required.

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 made by the purchaser, the material shall conform to the permissible variations for product (check) analysis in Specification B880.

6. Mechanical Properties and Other Requirements

6.1 The material shall conform to the mechanical property requirements specified in Table 2.

7. Dimensions and Permissible Variations

7.1 *Size:*

[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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* New designation established in accordance with ASTM E527 and SAE J1086, Practice for Numbering Metals and Alloys.

[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.

TABLE 1 Chemical Requirements

Element	Composition Limits, %	
	N08366	N08367
Carbon	0.035 max	0.030 max
Manganese	2.00 max	2.00 max
Silicon	1.00 max	1.00 max
Phosphorus	0.040 max	0.040 max
Sulfur	0.030 max	0.030 max
Chromium	20.00 to 22.00	20.00 to 22.00
Nickel	23.50 to 25.50	23.50 to 25.50
Molybdenum	6.00 to 7.00	6.00 to 7.00
Nitrogen	...	0.18 to 0.25
Iron[A]	remainder	remainder
Copper	...	0.75 max

[A] Iron shall be determined arithmetically by difference.

TABLE 2 Mechanical Properties

	Cold-Finished-Annealed and Hot-Finished-Annealed (All Sizes)		Forging Quality (All Sizes)	
	N08366	N08367	N08366	N08367
Tensile strength, min, ksi (MPa)	75 (517)	95 (655)	[A]	[A]
Yield strength, 0.2 % offset, min, ksi (MPa)	30 (206)	45 (310)	[A]	[A]
Elongation in 2 in. or 50 mm, or 4*D*, min, %	30	30	[A]	[A]

[A] No tensile properties are required on forging quality.

7.1.1 *Rounds*—The permissible variations in size of cold-finished round shall be as given in Table 3. For hot-finished round bars and rod, they shall be as given in Table 4.

7.1.2 *Squares*—The permissible variations in size of cold-finished square bars shall be as given in Table 5. For hot-finished square bars and rods, they shall be as given in Table 4.

TABLE 3 Permissible Variations in Diameter Cold-Finished Round Bars and Wire

Specified Diameter, in. (mm)	Diameter tolerance, in. (mm)[A,B,C]
	Plus and Minus
0.0030 (0.076) to 0.0048 (0.122), excl	0.0001 (0.003)
0.0048 (0.122) to 0.0080 (0.203), excl	0.0002 (0.005)
0.0080 (0.203) to 0.0120 (0.305), excl	0.0003 (0.008)
0.0120 (0.305) to 0.0240 (0.610), excl	0.0004 (0.010)
0.0240 (0.610) to 0.0330 (0.838), excl	0.0005 (0.013)
0.0330 (0.838) to 0.0440 (1.118), excl	0.0008 (0.020)
0.0440 (1.118) to 0.3125 (7.938), excl	0.001 (0.03)
0.3125 (7.938) to 0.5000 (12.700), excl	0.0015 (0.038)
0.5000 (12.700) to 1.000 (25.4), excl	0.002 (0.05)
1.000 (25.40) to 1.500 (38.10), excl	0.0025 (0.06)
1.500 (38.10) to 4.000 (101.6), incl	0.003 (0.08)

[A] Diameter tolerances are over and under as shown in the above table. Also, rounds can be produced to tolerances all over and nothing under, or all under and nothing over, or any combination of over and under, if the total spread in diameter tolerance for a specified diameter is not less than the total spread shown in the table.
[B] The maximum out-of-round tolerance for round wire is one-half of the total size tolerance shown in the above table.
[C] When it is necessary to heat treat or heat treat and pickle after cold finishing, size tolerances are double those shown in the table for sizes 0.0240 in. (0.610 mm) and over.

7.1.3 *Hexagons and Octagons*—The permissible variations in size of cold-finished hexagons and octagons shall be as given in Table 5. For hot-finished bar and rod hexagons and octagons they shall be as given in Table 6.

7.1.4 *Flats* (Rectangles) —The permissible variations in width and thickness of cold-finished flats shall be as given in Table 7 for bars and for wire in Table 8. For hot-finished flat bars and rods, the tolerances for width and thickness shall be as given in Table 9.

7.2 *Out-of-Round*—Hot-finished rounds and cold-finished rounds (except forging quality), all sizes, in straight lengths, shall not be out-of-round by more than shown in Table 4 and Table 3.

7.3 *Corners*—Cold-finished squares, rectangles, hexagons and octagons will have equal angles and sharp corners.

7.4 *Machining Allowances*—When the surfaces of hot-finished material are to be machined, the allowances given in Table 10 are recommended for normal machining operations.

7.5 *Length:*

7.5.1 Unless multiple, nominal, or cut lengths are specified, random mill lengths shall be furnished.

7.5.2 When bars are ordered in multiple lengths, ¼ in. (6.4 mm) will be allowed for each multiple cut, unless otherwise specified.

7.5.3 The permissible variations in length of hot or cold-finished bars shall be as specified in Table 11 or Table 12 depending upon whether or not the material is specified to be machine-cut after straightening.

7.6 *Ends:*

7.6.1 Bars ordered to random or nominal lengths will be furnished with either cropped or saw-cut ends.

7.6.2 Bars ordered to cut lengths will be furnished with square saw-cut or machine cut ends.

7.7 *Straightness:*

7.7.1 The permissible variations in straightness of cold-finished bars shall be as specified in Table 13.

7.7.2 The permissible variations in straightness of hot-finished bars shall be as specified in Table 13.

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.

8.2 Finishes available include hot-rolled, hot rolled-annealed-descaled, cold-drawn, ground, turned, and machined.

9. Sampling

9.1 *Lot Definition:*

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

9.1.2 Lots for mechanical testing shall consist of the material from one heat, in the same condition (temper), and of the same specified size (excepting length) and cross-section.

9.2 *Test Material Selection:*

9.2.1 *Sampling for Chemical Analysis:*

TABLE 4 Permissible Variations in Size of Hot-Finished Round and Square Bars and Rods

Specified size, in. (mm)	Permissible Variations from Specified Size, in. (mm)		Out-of-Round[A] or Out-of-Square,[B] in. (mm)
	Plus	Minus	
¼ (6.4) to 5/16 (7.9), incl	0.005 (0.13)	0.005 (0.13)	0.008 (0.20)
Over 5/16 (7.9) to 7/16 (11.1), incl	0.006 (0.15)	0.006 (0.15)	0.009 (0.23)
Over 7/16 (11.1) to 5/8 (15.9), incl	0.007 (0.18)	0.007 (0.18)	0.010 (0.25)
Over 5/8 (15.9) to 7/8 (22.2), incl	0.008 (0.20)	0.008 (0.20)	0.012 (0.30)
Over 7/8 (22.2) to 1 (25.4), incl	0.009 (0.23)	0.009 (0.23)	0.013 (0.33)
Over 1 (25.4) to 1⅛ (28.6), incl	0.010 (0.25)	0.010 (0.25)	0.015 (0.38)
Over 1⅛ (28.6) to 1¼ (31.8), incl	0.011 (0.28)	0.011 (0.28)	0.016 (0.41)
Over 1¼ (31.8) to 1⅜ (34.9), incl	0.012 (0.30)	0.012 (0.30)	0.018 (0.46)
Over 1⅜ (34.9) to 1½ (38.1), incl	0.014 (0.36)	0.014 (0.36)	0.021 (0.53)
Over 1½ (38.1) to 2 (50.8), incl	1/64 (0.4)	1/64 (0.4)	0.023 (0.58)
Over 2 (50.8) to 2½ (63.5), incl	1/32 (0.8)	0	0.023 (0.58)
Over 2½ (63.5) to 3½ (88.9), incl	3/64 (1.2)	0	0.035 (0.89)
Over 3½ (88.9) to 4½ (114.3), incl	1/16 (1.6)	0	0.046 (1.17)
Over 4½ (114.3) to 5½ (139.7), incl	5/64 (2.0)	0	0.058 (1.47)
Over 5½ (139.7) to 6½ (165.1), incl	⅛ (3.2)	0	0.070 (1.78)
Over 6½ (165.1) to 8 (203.2), incl	5/32 (4.0)	0	0.085 (2.16)

[A] Out-of-round is the difference between the maximum and minimum diameters of the bar, measured at the same cross section.
[B] 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.

TABLE 5 Permissible Variations in Distance Between Parallel Surfaces of Cold Finished Hexagonal, Octagonal, and Square Bars and Wire

Specified Size, in. (mm)	Permissible Variations from Specified Size, in. (mm)[A]	
	Plus	Minus
0.125 (3.18) to 0.3125 (7.938), excl	0	0.002 (0.05)
0.3125 (7.938) to 0.500 (12.70), excl	0	0.003 (0.08)
0.500 (12.70) to 1.000 (25.40), incl	0	0.004 (0.10)
Over 1 (25.40) to 2 (50.80), incl	0	0.006 (0.15)
Over 2 (50.80) to 3 (76.20), incl	0	0.008 (0.20)
Over 3 (76.20)	0	0.010 (0.25)

[A] When it is necessary to heat treat or heat treat and pickle after cold finishing, size tolerances are double those shown in the table.

TABLE 6 Permissible Variations in Size of Hot-Finished Hexagonal and Octagonal Bars and Rods

Specified Sizes Measured Between Opposite Sides, in. (mm)	Permissible Variations from Specified Size, in. (mm)		Maximum Difference, in. (mm), 3 Measurements for Hexagons Only
	Plus	Minus	
¼ to ½ (6.4 to 12.7), incl	0.007 (0.18)	0.007 (0.18)	0.011 (0.28)
Over ½ to 1 (12.7) to (25.4), incl	0.010 (0.25)	0.010 (0.25)	0.015 (0.38)
Over 1 (25.4) to 1½ (38.1), incl	0.021 (0.53)	0.021 (0.53)	0.025 (0.64)
Over 1½ (38.1) to 2 (50.8), incl	1/32 (0.8)	1/32 (0.8)	1/32 (0.8)
Over 2 (50.8) to 2½ (63.5), incl	3/64 (1.2)	3/64 (1.2)	3/64 (1.2)
Over 2½ (63.5) to 3½ (88.9), incl	1/16 (1.6)	1/16 (1.6)	1/16 (1.6)

9.2.1.1 An analysis of each lot shall be made by the manufacturer from a representative sample obtained during the pouring of the heat or subsequent processing.

9.2.1.2 If samples for product (check) analysis are specified, a representative sample shall be taken from each lot of finished material.

9.2.2 *Sampling for Mechanical Testing*—Samples of the material to provide test specimens for mechanical testing shall be taken from such locations in each lot (see 9.1.2) as to be representative of that lot.

10. Number of Tests and Retests

10.1 *Chemical Analysis*—One test per lot.

10.2 *Mechanical Tests and Tension Tests*—One test per lot.

10.3 *Retests*—If the specimen used in the mechanical test of any lot fails to meet the specified requirements, an additional specimen shall be taken from a different sample piece and tested. The results of this test specimen shall meet the specified requirements.

TABLE 7 Permissible Variations in Width and Thickness of Cold-Finished Flat Bars

Width, in. (mm)	Width Tolerance, in. (mm), Plus and Minus[A]	
	For Thicknesses 0.250 in. (6.35) and Under	For Thicknesses Over 0.250 in. (6.35)
0.375 (9.53) to 1 (25.40), incl	0.004 (0.10)	0.002 (0.05)
Over 1 (25.40) to 2 (50.80), incl	0.006 (0.15)	0.003 (0.08)
Over 2 (50.80) to 3 (76.20), incl	0.008 (0.20)	0.004 (0.10)
Over 3 (76.20) to 4.500 (114.30), incl[B]	0.010 (0.25)	0.005 (0.13)
Thickness, in. (mm)	**Thickness Tolerance, in. (mm), Plus and Minus[A]**	
0.125 (3.18) to 1 (25.40), incl	0.002 (0.05)	
Over 1 (25.40) to 2 (50.80), incl	0.003 (0.08)	
Over 2 (50.80) to 3 (76.20), incl	0.004 (0.10)	
Over 3 (76.20) to 4.500 (114.30), incl[B]	0.005 (0.13)	

[A] When it is necessary to heat treat or heat treat and pickle after cold finishing, tolerances are double those shown in the table.
[B] Cold-finished flat bars over 4.500 in. (114.3 mm) wide or thick are produced: width and thickness tolerances for such bars are not included herein.

TABLE 8 Permissible Variations in Width and Thickness of Cold-Finished Flat Coils[A]

Specified Width, in. (mm)	Permissible Variations in Thickness, in. (mm), Plus and Minus, for Given Thicknesses, in. (mm)			Permissible Variations in Width, in. (mm), for Given Width, in. (mm)	
	Under 0.029 (0.74)	0.029 (0.74) to 0.035 (0.89), excl	0.035 (0.89) to 0.1875 (4.76), excl	Plus	Minus
0.0625 (1.588) to 0.375 (9.52), excl	0.001 (0.03)	0.0015 (0.038)	0.002 (0.05)	0.005 (0.13)	0.005 (0.13)

[A] Where it is necessary to heat treat or heat treat and pickle after cold finishing, size variations are double those shown in the table.

TABLE 9 Permissible Variations in Thickness and Width for Hot-Finished Flat Bars and Rods

Specified Widths, in.	Thickness Tolerances, in., for Thicknesses Given									Width Tolerance, in.	
	⅛ to ½ incl	Over ½ to 1 incl	Over 1 to 2 incl	Over 2 to 4 incl		Over 4 to 6 incl		Over 6 to 8 incl			
	Plus and Minus			Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
Up to 1, incl	0.008	0.010	...	...	...	...	...	...	...	0.015	0.015
Over 1 to 2, incl	0.012	0.015	0.031	...	...	...	...	...	...	0.031	0.031
Over 2 to 4, incl	0.015	0.020	0.031	0.062	0.031	...	...	...	...	0.062	0.031
Over 4 to 6, incl	0.015	0.020	0.031	0.062	0.031	0.093	0.062	...	...	0.093	0.062
Over 6 to 8, incl	0.016	0.025	0.031	0.062	0.031	0.093	0.062	0.125	0.156	0.125	0.156
Over 8 to 10, incl	0.021	0.031	0.031	0.062	0.031	0.093	0.062	0.125	0.156	0.156	0.187
SI Equivalents											
Specified Widths, mm	Thickness Tolerances, mm, for Thicknesses Given										
	3.18 to 12.70 Incl	Over 12.70 to 25.40 Incl	Over 25.40 to 50.80 Incl	Over 50.80 to 101.6 Incl		Over 101.6 to 152.4 Incl		Over 152.4 to 203.2 Incl		Width Tolerance, Incl	
	Plus and Minus			Plus	Minus	Plus	Minus	Plus	Minus	Plus	Minus
Up to 25.40, incl	0.20	0.25	...	...	...	...	...	...	...	0.38	0.38
Over 25.40 to 50.80, incl	0.30	0.38	0.79	...	...	...	...	...	...	0.79	0.79
Over 50.80 to 101.60, incl	0.38	0.51	0.79	1.57	0.79	...	...	...	...	1.57	0.79
Over 101.60 to 152.40, incl	0.38	0.51	0.79	1.57	0.79	2.36	1.57	...	...	2.36	1.57
Over 152.40 to 203.20, incl	0.41	0.64	0.79	1.57	0.79	2.36	1.57	3.18	3.96	3.18	3.96
Over 203.20 to 254.00, incl	0.53	0.79	0.79	1.57	0.79	2.36	1.57	3.18	3.96	3.96	4.75

11. Specimen Preparation

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

11.2 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 E8 shall be used. Longitudinal strip specimens shall

TABLE 10 Normal Machining Allowances for Hot-Finished Material

Finished-Machined Dimensions for Conditions as Indicated Below, in. (mm)[A]	On Diameter for Rounds	Distance Between Parallel Surfaces, for Hexagons, Squares	For Rectangles	
			On Thickness	On Width
Hot-finished:[B]				
Up to 7/8 (22.2), incl	1/8 (3.2)	1/8 (3.2)	1/8 (3.2)	3/16 (4.8)
Over 7/8 to 1 7/8 (22.2 to 47.6), incl	1/8 (3.2)	3/16 (4.8)	1/8 (3.2)	3/16 (4.8)
Over 1 7/8 to 2 7/8 (47.6 to 73.0), incl	3/16 (4.8)	1/4 (6.4)	...	3/16 (4.8)
Over 2 7/8 to 3 13/16 (73.0 to 96.8), incl	1/4 (6.4)	...	...	3/16 (4.8)
Over 3 13/16 (96.8)	1/4 (6.4)	...	...	3/8 (9.5)
Hot-finished rounds:				
Rough-turned:[C]				
15/16 to 4 (23.8 to 101.6), incl in diameter	1/16 (1.6)	...	...	...
Over 4 to 12 (101.6 to 304.8). incl in diameter	1/8 (3.2)	...	...	...
Semi-smooth machined:				
Over 2½ to 4 (63.5 to 101.6), incl	1/16 [D] (1.6)	...	...	...
Over 2½ to 4 (63.5 to 101.6), incl	1/8 [E] (3.2)	...	...	...
Over 4 to 10 (101.6 to 254.0), incl	1/8 [F] (3.2)	...	...	...

[A] Dimensions apply to diameter of rounds, to distance between parallel surfaces of hexagons and squares, and separately to width and thickness of rectangles.
[B] The allowances in Table 9 for hot-finished material are recommended for rounds machined in lengths of 3 ft (0.9 m) or less and for squares, hexagons, and rectangles machined in lengths of 2 ft (0.6 m) or less. Hot-finished material to be machined in longer lengths should be specified showing the finished cross-sectional dimension and the length in which the material will be machined in order that the manufacturer may supply material with sufficient oversize, including allowance for out-of-straightness.
[C] Applicable to 3 ft (0.9 m) max length.
[D] Applicable to 10 ft (3.0 m) max length.
[E] Applicable to lengths over 10 to 20 ft (3.0 to 6.1 m), incl.
[F] Applicable to 30 ft (9.1 m) max lengths.

TABLE 11 Permissible Variations in Length of Hot-Finished or Cold-Finished Bars

NOTE 1—These tolerances are not applicable when bars are ordered random length.

Specified Size of Rounds, Squares, Hexagons, Octagons, and Widths of Flats, in. (mm)	Permissible Variations in Length, in. (mm)			
	To 12 ft (3658 mm)		Over 12 ft (3658 mm) to 25 ft (7620 mm)	
	Plus	Minus	Plus	Minus
Up to 2 (50.80), incl	½ (12.70)	0	¾ (19.05)	0
Over 2 (50.80) to 4 (101.60), incl	¾ (19.05)	0	1 (25.40)	0
Over 4 (101.6) to 6 (152.4), incl	1 (25.40)	0	1¼ (31.75)	0
Over 6 (152.4) to 9 (228.6), incl	1¼ (31.75)	0	1½ (38.10)	0
Over 9 (228.6) to 12 (304.8)	1½ (38.10)	0	2 (50.80)	0

TABLE 12 Permissible Variations in Length of Hot-Finished or Cold-Finished Bars Machine Cut After Machine Straightening

NOTE 1—These tolerances are not applicable when bars are ordered random length.

Specified Sizes of Rounds, Squares, Hexagons, Octagons, and Widths of Flats, in. (mm)	Length, ft (mm)	Tolerance, in. (mm)	
		Plus	Minus
0.125 (3.18) and under	up to 12 (3658), incl	1/16 (1.6)	0
0.125 (3.18) and under	over 12 (3658)	1/8 (3.2)	0
Over 0.125 (3.18) to 0.500 (12.70), incl	under 3 (914)	1/32 (0.8)	0
Over 0.125 (3.18) to 0.500 (12.70), incl	3 (914) to 12 (3658), incl	1/16 (1.6)	0
Over 0.125 (3.18) to 0.500 (12.70), incl	over 12 (3658)	1/8 (3.2)	0
Over 0.500 (12.70) to 3 (76.20), incl	up to 12 (3658), incl	1/8 (3.2)	0
Over 0.500 (12.70) to 3 (76.20), incl	over 12 (3658)	3/16 (4.8)	0
Over 3 (76.20) to 6 (152.40), incl	up to 12 (3658), incl	3/16 (4.8)	0
Over 3 (76.20) to 6 (152.40), incl	over 12 (3658)	1/4 (6.4)	0
Over 6 (152.40) to 9 (228.60), incl	up to 12 (3658), incl	1/4 (6.4)	0
Over 6 (152.40) to 9 (228.60), incl	over 12 (3658)	5/16 (7.9)	0
Over 9 (228.60) to 12 (304.80), incl	up to 12 (3658), incl	½ (12.7)	0
Over 9 (228.60) to 12 (304.80), incl	over 12 (3658)	½ (12.7)	0

be prepared in accordance with Test Methods E8 for flats up to ½ in. (12.7 mm), incl, in thickness that are too wide to be pulled full size.

TABLE 13 Permissible Variations in Straightness of Machine Straightened of Machine Straightened Hot-Finished or Cold-Finished Bars

Measurement is taken on the concave side of the bar with a straightedge. Unless otherwise specified, hot-finished or cold-finished bars for machining purposes are furnished machine straightened to the following tolerances:
Hot-finished:
⅛ in. in any 5 ft; but may not exceed ⅛ in. × (length in ft/5)
or
3.2 mm in any 1.5 m; but may not exceed 3.2 × (length in m/1.5)
Cold-finished:
1/16 in. in any 5 ft; but may not exceed 1/16 in. × (length in ft/5)
or
1.6 mm in any 1.5 m; but may not exceed 1.6 × (length in m/1.5)

12. Test Methods

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

12.1.1 *Chemical Analysis*—Test Methods E1473.

12.2 *Tension test*—Test Methods E8.

12.3 *Determination of significant places*—For purposes of determining compliance with the specified limits for the requirements of the properties listed in the following table, round an observed or a calculated value as indicated, in accordance with the rounding methods of Practice E29.

Requirement	Rounded unit for observed or calculated value
Chemical composition	nearest unit in the last right-hand place of figures of the specified limit
Tensile strength and yield strength	nearest 1000 psi (7 MPa)
Elongation	nearest 1 %

13. Inspection

13.1 Inspection of the material shall be agreed upon between the purchaser and the producer or supplier as part of the purchase contract.

14. Rejection and Rehearing

14.1 Material that fails to conform to the requirements of this specification may be rejected. Rejection shall be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier may make claim for a rehearing.

15. Certification

15.1 When specified in the purchase order or contract, a producer's or supplier's certification shall be furnished to the purchaser that the material was manufactured, sampled, tested, and inspected in accordance with this specification and has been found to meet the requirements. When specified in the purchase order or contract, a report of the test results shall be furnished.

16. Product Marking

16.1 Each bundle or shipping container shall be marked with the name of the material, UNS number, heat number, condition (temper), the specification number, the size, gross, tare, and net weights, consignor and consignee address, contract or order number, or such other information as may be defined in the contract or purchase order.

16.2 When so specified on the contract or purchase order, larger size bars shall be marked individually with the name of the material, heat number, condition (temper), the specification number, size, and producer's name or mark.

17. Keywords

17.1 bar; N08366; N08367; rod; wire