



Standard Specification for Precipitation-Hardening and Cold Worked Nickel Alloy Bars, Forgings, and Forging Stock for Moderate or High Temperature Service¹

This standard is issued under the fixed designation B637; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

^{ε1} NOTE—Vanadium content for UNS N07752 in Table 1 was corrected editorially in November 2012.

1. Scope

1.1 This specification² covers hot- and cold-worked precipitation-hardenable nickel alloy rod, bar, forgings, and forging stock for moderate or high temperature service ([Table 1](#)).

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:³

[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](#)

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 May 1, 2012. Published May 2012. Originally approved in 1970. Last previous edition addition approved in 2011 as B637 – 06 (2011). DOI: 10.1520/B0637-12E01.

² For ASME Boiler and Pressure Vessel Code applications, see related Specification SB-637 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.

[E139 Test Methods for Conducting Creep, Creep-Rupture, and Stress-Rupture Tests of Metallic Materials](#)

[E1473 Test Methods for Chemical Analysis of Nickel, Cobalt, and High-Temperature Alloys](#)

3. Terminology

3.1 Definitions:

3.1.1 *bar, n*—material of rectangular (flats), hexagonal, octagonal, or square solid section in straight lengths.

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 material ordered under this specification. Examples of such requirements include, but are not limited to, the following:

4.1.1 Alloy ([Table 1](#)).

4.1.2 Condition (temper or cold worked) ([Tables 2 and 3](#) and [6.1](#)).

4.1.3 *Shape*—Rod or bar (round, rectangle, square, hexagon, octagon).

4.1.3.1 Forging (sketch or drawing).

4.1.4 *Dimensions*, including length.

4.1.5 Quantity (mass or number of pieces).

4.1.6 *Forging Stock*—Specify if material is stock for reforging.

4.1.7 Finish.

4.1.8 *Certification*—State if certification is required ([Section 15](#)).

4.1.9 *Samples for Product (Check) Analysis*—Whether samples for product (check) analysis shall be furnished ([9.2](#)).

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

TABLE 1 Chemical Requirements

Element	Composition Limits, %						
	UNS N07022	UNS N07208	UNS N07252 (Formerly Grade 689)	UNS N07001 (Formerly Grade 685)	UNS N07500 (Formerly Grade 684)	UNS N07750 (Formerly Grade 688)	UNS N07718 (Formerly Grade 718)
Carbon	0.010 max	0.04–0.08	0.10–0.20	0.03–0.10	0.15 max	0.08 max	0.08 max
Manganese	0.5 max	0.3 max	0.50 max	1.00 max	0.75 max	1.00 max	0.35 max
Silicon	0.08 max	0.15 max	0.50 max	0.75 max	0.75 max	0.50 max	0.35 max
Phosphorus	0.025 max	0.015 max	0.015 max	0.030 max	0.015 max	...	0.015 max
Sulfur	0.015 max	0.015 max	0.015 max	0.030 max	0.015 max	0.01 max	0.015 max
Chromium	20.0–21.4	18.5–20.5	18.00–20.00	18.00–21.00	15.00–20.00	14.00–17.00	17.0–21.0
Cobalt	1.0 max	9.0–11.0	9.00–11.00	12.00–15.00	13.00–20.00	1.00 max ^A	1.0 max ^A
Molybdenum	15.5–17.4	8.0–9.0	9.00–10.50	3.50–5.00	3.00–5.00	...	2.80–3.30
Columbium (Nb) + tantalum	...	...	...	...	...	0.70–1.20	4.75–5.50
Titanium	...	1.90–2.30	2.25–2.75	2.75–3.25	2.50–3.25	2.25–2.75	0.65–1.15
Aluminum	0.5 max	1.38–1.65	0.75–1.25	1.20–1.60	2.50–3.25	0.40–1.00	0.20–0.80
Zirconium	...	0.020 max	...	0.02–0.12	...	...	...
Boron	0.006 max	0.003–0.010	0.003–0.01	0.003–0.01	0.003–0.01	...	0.006 max
Iron	1.8 max	1.5 max	5.00 max	2.00 max	4.00 max	5.00–9.00	remainder ^B
Copper	0.5 max	0.1 max	...	0.50 max	0.15 max	0.50 max	0.30 max
Nickel	remainder ^B	remainder ^B	remainder ^B	remainder ^B	remainder ^B	70.00 min	50.0–55.0
Tantalum	0.2 max	0.1 max	...	...	...	...	...
Columbium (Niobium)	...	0.2 max	...	...	...	...	...
Tungsten	0.8 max	0.5 max	...	...	...	...	...
	UNS N07080 (Formerly Grade 80A)	UNS N07752	UNS N09925	UNS N07725			
Carbon	0.10 max	0.020–0.060	0.03 max	0.03 max			
Manganese	1.00 max	1.00 max	1.0 max	0.35 max			
Silicon	1.00 max	0.50 max	0.5 max	0.20 max			
Phosphorus	...	0.008 max	0.03 max	0.015 max			
Sulfur	0.015 max	0.003 max	0.03 max	0.010 max			
Chromium	18.00–21.00	14.50–17.00	19.5–22.5†	19.00–22.50†			
Cobalt	...	0.050 max	...	...			
Molybdenum	...	...	2.5–3.5	7.00–9.50			
Columbium (Nb) + tantalum	...	0.70–1.20	0.5 max (Nb only)	2.75–4.00			
Titanium	1.80–2.70	2.25–2.75	1.9–2.40	1.00–1.70			
Aluminum	0.50–1.80	0.40–1.00	0.1–0.5	0.35 max			
Boron	...	0.007 max	...	...			
Iron	3.00 max	5.00–9.00	22.0 min	remainder ^B			
Copper	...	0.50 max	1.5–3.0	...			
Zirconium	...	0.050 max	...	...			
Vanadium	...	0.10 max†	...	...			
Nickel	remainder ^B	70.0 min	42.0–46.0	55.0–59.0			

^A If determined.

^B The element shall be determined arithmetically by difference.

† Chromium content was corrected editorially.

† Vanadium content was corrected editorially

5. Chemical Composition

5.1 The material shall conform to the requirements as to chemical composition prescribed in **Table 1**.

5.2 If a product (check) analysis is performed by the purchaser, the material shall conform to the product (check) analysis variations prescribed in Specification **B880**.

6. Mechanical Properties

6.1 Unless otherwise specified, the material shall be supplied in the cold worked or solution treated condition, suitable for subsequent age hardening.

6.2 The cold worked or solution treated material shall be capable of meeting the mechanical property requirements of **Table 3**, and the stress rupture requirements of **Table 4** (except alloys UNS N07022, N09925 and N07725), following the precipitation hardening treatment described in **Table 2**.

6.3 When the material is to be supplied in the cold worked or solution treated plus aged condition, the requirements of **Table 3** and **Table 4** (except alloys UNS N07022 N09925 and N07725) shall apply, with the precipitation hardening treatment of **Table 2**, or as agreed upon between the purchaser and the manufacturer as part of the purchase contract.

7. Dimensions and Permissible Variations

7.1 *Diameter, Thickness, or Width*—The permissible variations from the specified dimensions of cold-worked rod and bar shall be as prescribed in **Table 5**, and of hot-worked rod and bar as prescribed in **Table 6**.

7.1.1 *Out of Round*—Cold-worked and hot-worked rod, 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 5** and **Table 6**, except for hot-worked rod ½ in. (12.7

TABLE 2 Heat Treatment^A

Alloy	Recommended Annealing Treatment	Recommended Solution Treatment	Recommended Stabilizing Treatment	Precipitation Hardening Treatment
N07022 ^B Type 1	...	1800 to 2000°F (982 to 1093°C), hold ½ h/in., 5 minutes minimum, rapid air cool or water quench	...	
N07022 ^C Type 2	...	1800 to 2000°F (982 to 1093°C), hold ½ h/in., 5 minutes minimum, rapid air cool or water quench	...	1125 ± 25°F (605 ± 14°C), hold 10 h, air cool ^B
N07022 Type 3	...	1800 to 2000°F (982 to 1093°C), hold ½ h/in., 5 minutes minimum, rapid air cool or water quench	...	1300 ± 25°F (705 ± 14°C), hold 16 h, furnace cool to 1125 ± 25°F (605 ± 14°C), hold 32 h, air cool
N07208	...	2000 to 2125°F (1093 to 1163°C), hold ½ h/in., 5 to 10 minutes minimum, water quench or rapid air cool	...	1850 ± 25°F (1010 ± 14°C), hold 2 h, air cool, followed by 1450 ± 25°F (788 ± 14°C), hold 8 h, air cool
N07252	...	1950 ± 25°F (1066 ± 14°C), hold 4 h, air cool	...	1400 ± 25°F (760 ± 14°C), hold 15 h, air cool or furnace cool
N07001	...	1825 to 1900°F (996 to 1038°C), hold 4 h, oil or water quench	1550 ± 25°F (843 ± 14°C), hold 4 h, air cool	1400 ± 25°F (760 ± 14°C), hold 16 h, air cool or furnace cool
N07500	2150 ± 25°F (1177 ± 14°C), hold 2 h, air cool (bars only)	1975 ± 25°F (1080 ± 14°C), hold 4 h, air cool	1550 ± 25°F (843 ± 14°C), hold 24 h, air cool	1400 ± 25°F (760 ± 14°C), hold 16 h, air cool or furnace cool
N07750 Type 1 (Service above 1100°F) (593°C)	...	2100 ± 25°F (1149 ± 14°C), hold 2 to 4 h, air cool	1550 ± 25°F (843 ± 14°C), hold 24 h, air cool	1300 ± 25°F (704 ± 14°C), hold 20 h, air cool or furnace cool
N07750 Type 2 (Service up to 1100°F) (593°C)	...	1800 ± 25°F (982 ± 14°C), hold ½ h min, cool at rate equivalent to air cool or faster	...	1350 ± 25°F (732 ± 14°C), hold 8 h, furnace cool to 1150 ± 25°F (621 ± 14°C), hold until total precipitation heat treatment has reached 18 h, air cool
N07750 Type 3	...	1975 – 2050°F (1079 – 1121°C), hold 1 to 2 h, air cool	...	1300 ± 25°F (704 ± 14°C), hold 20 h, +4 – 0 h, air cool
N07752 Type 1	...	1975 ± 25°F (1080 ± 14°C), hold 1 to 2 h, cool by water or oil quenching	...	1320 ± 25°F (715 ± 14°C), hold 20 h, +2, –0 h, air cool
N07752 Type 2	...	1975 ± 25°F (1080 ± 14°C), hold 1 to 2 h, cool by water or oil quenching	...	1400 ± 25°F (760 ± 14°C), hold 100 h, +4, –0 h, air cool
N07718	...	1700 to 1850°F (924 to 1010°C), hold ½ h min, cool at rate equivalent to air cool or faster	...	1325 ± 25°F (718 ± 14°C), hold at temperature for 8 h, furnace cool to 1150 ± 25°F (621 ± 14°C), hold until total precipitation heat treatment time has reached 18 h, air cool
N07080	...	1950 ± 25°F (1066 ± 14°C), hold 8 h, air cool	1560 ± 25°F (849 ± 14°C), hold 24 h, air cool	1290 ± 25°F (699 ± 14°C), hold 16 h, air cool

mm) and under, which may be out-of-round by the total permissible variations in diameter shown in **Table 6**.

7.1.2 Corners—Cold-worked bar shall have practically exact angles and sharp corners.

TABLE 2 *Continued*

Alloy	Recommended Annealing Treatment	Recommended Solution Treatment	Recommended Stabilizing Treatment	Precipitation Hardening Treatment
N07725	...	1900 ± 25°F (1038 ± 14°C), hold ½ min, and 4 h max, cool at rate equivalent to air cool	...	1350 ± 25°F (732 ± 14°C), hold at temperature for 5 to 8½ h, furnace cool to 1150 ± 25°F (621 ± 14°C), hold at temperature for 5 to 8½ h, air cool or faster
N09925	...	1825 to 1875°F (996 to 1024°C), hold ½ min, and 4 h max, cool at rate equivalent to air cool or faster	...	1365 ± 25°F (740 ± 14°C), hold at temperature for 6 to 9 hr, furnace cool to 1150 ± 25°F (621 ± 14°C), hold until total precipitation heat treatment time has reached 18 h, air cool or faster

^A The purchaser shall designate on the purchase order or inquiry any partial stage of heat treatment required on material to be shipped.

^B For solution treated + cold worked material only, when specified.

^C For solution treated + cold worked + precipitation hardened material only, when specified.

7.1.3 Cut Lengths—A specified length to which all rod and bar will be cut with a permissible variation of + ⅛ in. (3.18 mm), –0 for sizes 8 in. (203 mm) and less in diameter or the distance between parallel surfaces. For larger sizes, the permissible variation shall be + ¼ in. (6.35 mm), –0.

7.1.4 Straightness for Cold-Worked and Hot-Worked Rod and Bar—The maximum curvature (depth of chord) shall not exceed 0.050 in. multiplied by the length in feet (0.04 mm multiplied by the length in centimetres). Material under ½ in. (12.7 mm) in diameter or the distance between parallel surfaces shall be reasonably straight and free of sharp bends and kinks.

7.1.5 For forgings, dimensions and tolerances shall be as specified on the order, sketch, or drawing.

7.1.6 Dimensions and tolerances for forging stock shall be as agreed upon between the purchaser and the manufacturer.

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 Mechanical Properties—A lot for tension, hardness, and stress-rupture testing shall consist of all material from the same heat, nominal diameter or thickness, or forging size, and condition (temper).

9.1.2.1 For forging stock, a lot shall consist of one heat.

9.1.2.2 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 (temper).

9.2 Test Material Selection:

9.2.1 Chemical Analysis—Representative samples 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.

10.3 Hardness—One test per lot.

10.4 Stress-Rupture—One test per lot.

11. Specimen Preparation

11.1 Rod and Bar:

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

11.1.2 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 be prepared in accordance with Test Methods E8 for rectangular bar up to ½ in. (12.7 mm), inclusive, in thickness, which are too wide to be pulled full size.

11.1.3 Forging stock test specimens shall be taken from a forged-down coupon or a sample taken directly from stock.

11.2 Forgings:

11.2.1 The tension test specimen representing each lot shall be taken from a forging or from a test prolongation.

11.2.2 The axis of the specimen shall be located at any point midway between the center and the surface of solid forgings and at any point midway between the inner and outer surfaces of the wall of hollow forgings, and shall be parallel to the direction of greatest metal flow.

11.2.3 The specimens shall be the largest possible round-type shown in Test Methods E8.

TABLE 3 Tensile and Hardness Requirements^A

Alloy	Heat Treatment	Tensile Strength, min, psi (MPa)	Yield Strength (0.2 % offset), min, psi (MPa)	Elongation in 2 in. (50 mm) or 4D, min, %	Reduction of Area, min, %	Brinell Hardness
N07022 Type 1	solution + cold worked	178 000 (1227)	160 000 (1103)	17	35	414 max
N07022 Type 2	solution + cold worked + precipitation harden	178 000 (1227)	160 000 (1103)	15	24	479 max
N07022 Type 3	solution + precipitation harden	145 000 (1000)	80 000 (552)	15	14	228 min
N07208	solution + precipitation harden	150 000 (1034)	90 000 (620)	20	14	250 min
N07252	solution + precipitation harden	160 000 (1100)	90 000 (620)	20	18	310 min
N07001	solution + stabilize + precipitation harden	160 000 (1100)	110 000 (760)	15 ^B	18 ^B	310 min
N07500 (rod and bar)	anneal + solution + stabilize + precipitation harden	175 000 (120)	105 000 (725)	15	15	310 min
N07500 (forgings)	solution + stabilize + precipitation harden	170 000 (1170)	100 000 (690)	20	18	310 min
N07750 Type 1	solution at 2100°F (1149°C) + stabilize + precipitation harden	140 000 (965)	90 000 (620)	8	...	262 min
N07750 Type 2 ^C	solution at 1800°F (982°C) + precipitation harden	170 000 (1170)	115 000 (790)	18	18	302 to 363
N07750 Type 2 ^D	solution at 1800°F (982°C) + precipitation harden	170 000 (1170)	115 000 (790)	15 (10) ^E	15 (12) ^E	302 to 363
N07750 Type 3	solution anneal at 2000°F (1093°C) + precipitation harden	160 000 (1103), min 185 000 (1276), max	100 000 (689), min 130 000 (896), max	20	20	267–363, Bm 27–40, Rc
N07752 Type 1	solution anneal at 1975°F (1080°C) + precipitation harden	160 000 (1103), min 185 000 (1276), max	100 000 (689), min 130 000 (896), max	20	20	267 to 363, Ba 27 to 40, Rc
N07752 Type 2	solution anneal at 1975°F (1080°C) + precipitation harden	140 000 (965)	85 000 (585)	20	20	...
N07718	solution + precipitation harden	185 000 (1275)	150 000 (1034)	12 (6) ^E	15 (8) ^E	331 min
N07080	solution + stabilize + precipitation harden	135 000 (930)	90 000 (620)	20	...	...
N07725	solution + precipitation harden	150 000 (1034)	120 000 (827)	20	35	43, Rc max
N09925 ^F	solution + precipitation harden	140 000 (965)	105 000 (724)	18	25	38, Rc max
N09925 ^G	solution + precipitation harden	140 000 (965)	110 000 (758)	18	25	38, Rc max

^A The supplier shall demonstrate that the material will meet fully heat-treated properties after full heat treatment in accordance with Table 2.

^B Forgings.

^C Up to 2.50 in. (63.5 mm), exclusive.

^D 2.50 to 4.00 in. (63.5 to 101.6 mm), exclusive.

^E These values apply for tension specimens machined tangentially from near the center of large disk forgings over 50 in.² (3225.8 mm²) in cross section or radially from rings 3 in. (76.2 mm) or more in thickness.

^F Cold worked, solution annealed and aged, 0.625 in. (15.9 mm) to 3 in. (76.2 mm), inclusive.

^G Hot worked, solution annealed and aged, 1 in. (25.4 mm) or over.

11.3 Stress-rupture specimens shall be the same as tension specimens except modified as necessary for stress-rupture testing in accordance with Test Methods E139.

12. Test Methods

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

Test	ASTM Designation
Chemical analysis	E1473
Tension	E8
Rounding procedure	E29
Stress-rupture	E139

TABLE 4 Stress-Rupture Requirements^A

Alloy	Heat Treatment	Test Temperature, °F (°C)	Stress, psi (MPa) ^B	Minimum Hours	Elongation in 2 in. or 50 mm (or 4D), min, %
N07208	solution + precipitation harden	1700 (927)	13 000 (89)	50	10
N07252	solution + precipitation harden	1500 (816)	30 000 (205)	100	10
N07001	solution + stabilize + precipitation harden	1500 (816)	33 000 (230)	100	5
N07500 (rod and bar)	anneal + solution + stabilize + precipitation harden	1500 (816)	38 000 (260)	100	5
N07500 (forgings)	solution + stabilize + precipitation harden	1500 (816)	38 000 (260)	100	5
N07750 Type 1	solution at 2100°F (1149°C) + stabilize + precipitation harden	1350 (732)	45 000 (310)	100	5 (3 if hours exceed 136)
N07718	solution + precipitation harden	1200 (649)	100 000 (690)	23	5
N07080	solution + stabilize + precipitation harden	1400 (760)	47 000 (325)	23	3.5
N09925 ^A	solution + precipitation harden	...	...	...	...
N07725 ^A	solution + precipitation harden	...	...	...	...

^A The supplier shall demonstrate that the material will meet fully heat-treated properties after full heat treatment in accordance with Table 2. Stress rupture is not required for alloys N09925 and N07725.

^B Test specimens meeting minimum requirements may be overloaded to produce rupture in a reasonable and practical time period.

TABLE 5 Permissible Variations in Diameter or Distance Between Parallel Surfaces of Cold-Worked Rods and Bars

Specified Dimension, in. (mm) ^A	Permissible Variations from Specified Dimension, in. (mm)	
	Plus	Minus
Rods:		
1/16 to 3/16 (1.59 to 4.76), excl	0	0.002 (0.051)
3/16 to 1/2 (4.76 to 12.70), excl	0	0.003 (0.076)
1/2 to 15/16 (12.70 to 23.81), incl	0.001 (0.025)	0.002 (0.051)
Over 15/16 to 1 15/16 (23.81 to 49.2), incl	0.0015 (0.038)	0.003 (0.076)
Over 1 15/16 to 2 1/2 (49.2 to 63.5), incl	0.002 (0.051)	0.004 (0.102)
Bars:		
1/16 to 3/16 (1.59 to 4.76), excl	0	0.002 (0.051)
3/16 to 1/2 (4.76 to 12.7), excl	0	0.003 (0.076)

^A Dimensions apply to the diameter of rods, to the distance between parallel surfaces of hexagonal, octagonal, and square bar, and separately to width and thickness of rectangular bar.

TABLE 6 Permissible Variations in Diameter or Distance Between Parallel Surfaces of Hot-Worked Rods and Bars

Specified Dimension, in. (mm) ^A	Permissible Variations from Specified Dimension, in. (mm)	
	+	–
Rod and bar, hot-finished:		
1 (25.4) and under	0.016 (0.406)	0.016 (0.406)
Over 1 to 2 (25.4 to 50.8), incl	0.031 (0.787)	0.016 (0.406)
Over 2 to 4 (50.8 to 101.6), incl	0.047 (1.19)	0.031 (0.787)
Over 4 (101.6)	0.125 (3.18)	0.063 (1.60)
Rod, hot-finished and rough-turned or ground:		
Under 1 (25)	0.005 (0.13)	0.005 (0.13)
1 (25) and over	0.031 (0.79)	0

^A Dimensions apply to the diameter of rods, to the distance between parallel surfaces of hexagonal, octagonal, and square bar, and separately to width and thickness of rectangular bar.

following table, an observed value or a calculated value shall be rounded in accordance with the rounding method of Practice E29.

Test	Rounded Unit for Observed Or Calculated Value
Chemical composition, tolerances (when expressed in decimals), and hardness	Nearest unit in the last right-hand place of figures of the specified limit. If two choices are possible, as when the digits dropped are exactly a 5 or a 5 followed only by zeros, choose the one ending in an even digit, with zero defined as an even digit.
Tensile strength and yield strength	Nearest 1000 psi (6.9 MPa)
Elongation	Nearest 1 %
Rupture life	1 h

13. Inspection

13.1 Inspection of the material shall be made as agreed upon between the manufacturer and the purchaser as part of the purchase contract.

14. Rejection and Rehearing

14.1 Material, tested by the purchaser, that fails to conform to the requirements of this specification may be rejected. Rejection should 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.

12.2 For purposes of determining compliance with the specified limits for requirements of the properties listed in the

16. Product Marking

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

17. Keywords

17.1 bar; billet; forging; N07001; N07022; N07208; N07080; N07252; N07500; N07718; N07725; N07750; N07752; N09925

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org). Permission rights to photocopy the standard may also be secured from the ASTM website (www.astm.org/COPYRIGHT/).