~~Designation:B366–04b~~ Designation: B 366 – 04b$^{\epsilon 1}$

Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Fittings[1]

This standard is issued under the fixed designation B 366; 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.

ε[1] NOTE—Editorial changes were made in Table 3 in November 2006.

1. Scope*

1.1 This specification covers wrought welding fittings for pressure piping, factory-made from nickel and nickel alloys. Threaded fittings as covered in ASME B16.11 are also covered by this specification. The term welding applies to butt-welding or socket-welding parts such as 45 and 90° elbows, 180° bends, caps, tees, reducers, lap-joint stub ends, and other types, as covered by ASME B16.9, ASME B16.11, MSS SP-43, MSS SP-95, and MSS SP-97.

1.1.1 Several grades of nickel and nickel alloys are included in this specification. Grades are designated with a prefix, WP or CR, based on the applicable ASME or MSS dimensional and rating standards.

1.1.2 Class WP fittings are those manufactured to the requirements of ASME B16.9, B16.11.

1.1.3 For each of the WP nickel and nickel alloy grades, several classes of fittings are covered to indicate whether seamless or welded construction was utilized. Class designations are also utilized to indicate the nondestructive test method and extent of nondestructive examination (NDE). Table 1 is general summary of the fitting classes applicable to all WP grades of nickel and nickel alloys covered by this specification. There are no classes for the CR grades. Specific requirements are covered elsewhere.

1.2 This specification does not apply to cast welding fittings.

TABLE 1 Fitting Classes for WP Grades

Class	Construction	Nondestructive Examination
S	Seamless	None
W	Welded	Radiography or Ultrasonic
WX	Welded	Radiography
WU	Welded	Ultrasonic

1.3 Optional supplementary requirements are provided for fittings where a greater degree of examination is desired. These supplementary requirements call for additional tests. When desired, one or more of these may be specified in the order.

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

1.5 *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 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 127 Specification for Nickel-Copper Alloy (UNS N04400) Plate, Sheet, and Strip
B 160 Specification for Nickel Rod and Bar
B 161 Specification for Nickel Seamless Pipe and Tube
B 162 Specification for Nickel Plate, Sheet, and Strip
B 163 Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes
B 164 Specification for Nickel-Copper Alloy Rod, Bar, and Wire

[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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[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.**

B 165 Specification for Nickel-Copper Alloy (UNS N04400) Seamless Pipe and Tube
B 166 Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Rod, Bar, and Wire
B 167 Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Seamless Pipe and Tube
B 168 Specification for Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, and N06045) and Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Plate, Sheet, and Strip
B 333 Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip
B 335 Specification for Nickel-Molybdenum Alloy Rod
B 407 Specification for Nickel-Iron-Chromium Alloy Seamless Pipe and Tube
B 408 Specification for Nickel-Iron-Chromium Alloy Rod and Bar
B 409 Specification for Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
B 423 Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloy (UNS N08825 and N08221) Seamless Pipe and Tube
B 424 Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Plate, Sheet, and Strip
B 425 Specification for Ni-Fe-Cr-Mo-Cu Alloy (UNS N08825 and UNS N08221) Rod and Bar
B 434 Specification for Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, UNS N10242) Plate, Sheet, and Strip
B 435 Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Plate, Sheet, and Strip
B 443 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNSN06625) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Plate, Sheet, and Strip
B 444 Specification for Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625 and UNS N06852) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Pipe and Tube
B 446 Specification for Nickel-Chromium-Molybdenum-Columbium Alloy (UNS N06625), Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219), and Nickel-Chromium-Molybdenum-Tungsten Alloy (UNS N06650)* Rod and Bar
B 462 Specification for Forged or Rolled UNS N06030, UNS N06022, UNS N06035, UNS N06200, UNS N06059, UNS N06686, UNS N08020, UNS N08024, UNS N08026, UNS N08367, UNS N10276, UNS N10665, UNS N10675, UNS N10629, UNS N08031, UNS N06045, UNS N06025, and UNS R20033 ~~Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service~~ Al
B 463 Specification for UNS N08020, UNS N08026, and UNS N08024 Alloy Plate, Sheet, and Strip
B 464 Specification for Welded UNS N08020, N08024, and N08026 Alloy Pipe
B 468 Specification for Welded UNS N08020, N08024, and N08026 Alloy Tubes
B 472 Specification for Nickel Alloy Billets and Bars for Reforging
B 473 Specification for UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire
B 511 Specification for Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes
B 512 Specification for Nickel-Chromium-Silicon Alloy (UNS N08330) Billets and Bars
B 514 Specification for Welded Nickel-Iron-Chromium Alloy Pipe
B 515 Specification for Welded UNS N08120, UNS N08800, UNS N08810, and UNS N08811 Alloy Tubes
B 516 Specification for Welded Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Tubes
B 517 Specification for Welded Nickel-Chromium-Iron-Alloy (UNS N06600, UNS N06603, UNS N06025, and UNS N06045) Pipe
B 535 Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and ~~UNS~~ N08332) Seamless Pipe and Tube
B 536 Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Plate, Sheet, and Strip
B 564 Specification for Nickel Alloy Forgings
B 572 Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Rod
B 573 Specification for Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, ~~UNS~~ N10242) Rod
B 574 Specification for Low-Carbon ~~Nickel-Molybdenum-Chromium, Low-Carbon~~ Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod
B 575 Specification for Low-Carbon ~~Nickel-Molybdenum-Chromium, Low-Carbon~~ Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Plate, Sheet, and Strip
B 581 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
B 582 Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
B 619 Specification for Welded Nickel and Nickel-Cobalt Alloy Pipe
B 622 Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
B 625 Specification for UNS ~~N08904, UNS~~ N08925, UNS N08031, UNS N08932, UNS N08926, UNS N08354, and UNS R20033 Plate, Sheet, and Strip

B 626 Specification for Welded Nickel and Nickel-Cobalt Alloy Tube
B 649~~Specification for Ni-Fe-Cr-Mo-Cu Low-Carbon Alloy (UNS N08904), Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloys (UNS N08925, UNS N08031, and UNS N08926), and Cr-Ni-Fe-N Low Carbon Alloy (UNS R20033) Bar and Wire~~ Specification for Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloys (UNS N08925, UNS N08031, UNS N08354, and UNS N08926), and Cr-Ni-Fe-N Low-Carbon Alloy (UNS R20033) Bar and Wire, and Ni-Cr-Fe-Mo-N Alloy (UNS N08936) Wire
B 673 Specification for UNS ~~N08904,~~ N08925, UNS N08354, and UNS N08926 Welded Pipe
B 674 Specification for UNS ~~N08904,~~ N08925, UNS N08354, and UNS N08926 Welded Tube
B 675 Specification for UNS N08367 Welded Pipe
B 676 Specification for UNS N08367 Welded Tube
B 677 Specification for UNS ~~N08904,~~ N08925, UNS N08354, and UNS N08926 Seamless Pipe and Tube
B 688 Specification for Chromium-Nickel-Molybdenum-Iron (UNS N08366 and UNS N08367) Plate, Sheet, and Strip
B 690 Specification for Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Seamless Pipe and Tube
B 691 Specification for Iron-Nickel-Chromium-Molybdenum Alloys (UNS N08366 and UNS N08367) Rod, Bar, and Wire
B 704 Specification for Welded UNS N06625, ~~N06219,~~UNS N06219 and UNS N08825 Alloy Tubes
B 705 Specification for Nickel-Alloy (UNS N06625, ~~N06219,~~N06219 and N08825) Welded Pipe
B 710 Specification for Nickel-Iron-Chromium-Silicon Alloy Welded Pipe
B 729 Specification for Seamless UNS N08020, UNS N08026, and UNS N08024 Nickel-Alloy Pipe and Tube
B 880 Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys
B 899 Terminology Relating to Non-ferrous Metals and Alloys
E 165 Test Method for Liquid Penetrant Examination
E 1916 Guide for Identification and/or Segregation of Mixed Lots of Metals

2.2 *ASME Standards:*
B16.9 Wrought Steel Butt Welding Fittings[3]
B16.11 Forged Steel Fittings, Socket-Welding and Threaded[3]
H34.1 Nickel Seamless Pipe and Tubing[3]
H34.2 Nickel-Copper Alloy Seamless Pipe and Tubing[3]
H34.3 Nickel-Chromium-Iron Alloy Seamless Pipe and Tubing[3]

2.3 *Manufacturers Standardization Society of the Valve and Fittings Industry Standards:*
MSS SP-25 Standard Marking Systems for Valves, Fittings, Flanges, and Unions[4]
MSS SP-43 Standard Practice for Light Weight Stainless Steel Butt Welding Fittings[4]
MSS SP-95 Sewage (D) Nipples and Bull Plugs[4]
MSS SP-97 Forged Carbon Steel Branch Outlet Fittings–Socket Welding, Threaded and Butt Welding Ends[4]
Boiler and Pressure Vessel Code, Section VIII, Division 1, Pressure Vessels and Section IX, Welding Qualifications[3]

2.5 *AWS Standards:*
A5.11 Specification for Nickel and Nickel Alloy Covered Welding Electrodes[5]
A5.14 Specification for Nickel and Nickel-Alloy Bare Welding Rods and Electrodes[5]

3. Terminology

3.1 Terms defined in Terminology B 899shall apply unless otherwise defined in this standard.

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 Quantity, number of fittings of each kind,

4.1.2 Description of Fitting and Nominal Dimensions (standard or special),

4.1.3 Alloy Composition,

4.1.4 Condition (temper) if applicable.

4.1.5 If neither grade of N06625 is specified, Grade 1 will be supplied.

4.1.6 For each Grade of WP fittings ordered, a Class should also be indicated.

4.1.6.1 Grade **CR** fittings shall not be substituted for fittings ordered to Grade **WP** , but Grade **WP** may be substituted for Grade **CR**.

4.1.6.2 For all Classes of WP fittings, unless S, W, WX, or WU is specified by the purchaser, any class may be furnished at the option of the supplier.

4.1.7 *Purchaser Inspection*—State which tests or inspections are to be witnessed (Section 10),

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[3] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990.

[4] Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602.

[5] Available from The American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126.

4.1.8 *Samples for Product* (*Check*) *Analysis*—State whether samples should be furnished (6.3),
4.1.9 Test reports (Section 12), and
4.1.10 Supplementary requirements, if any.

5. Materials and Manufacture

5.1 *Material*—The material for wrought welding fittings may consist of forgings, rods, bars, plates, sheets, and seamless or welded pipe that conform to all the requirements of the ASTM specifications for the particular product and alloy referred to in Table 2.

5.2 *Manufacture*:

5.2.1 Forging or shaping operations may be performed by hammering, pressing, piercing, extruding, upsetting, rolling, bending, or fusion welding, or by a combination of two or more of these operations. The forming procedure shall be so applied that it will not produce injurious defects in the fittings.

5.2.2 Grade WP fittings ordered as Class S shall be of seamless construction and shall meet all requirements of ASME B16.9 or B16.11.

5.2.3 All classes of fittings shall have the welders, welding operators, and welding procedures qualified under the provisions of Section IX of the ASME Boiler and Pressure Vessel Code.

5.2.4 Grade WP fittings ordered as Class W shall meet the requirements of ASME B16.9 and shall have all pipe welds made by the starting material manufacturer or the fitting manufacturer with the addition of filler radiographically examined throughout the entire length in accordance with Paragraph UW-51 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code, except as exempt by 5.2.4.1, and 5.2.4.2.

5.2.4.1 The weld in the starting pipe, made to one of the pipe or tube product specifications listed in Table 2, shall not require radiography, provided that no filler metal is used in making the weld.

5.2.4.2 Instead of the radiographic examination, and at the option of the manufacturer, welds made by the fitting manufacturer may be ultrasonically examined in accordance with the Code requirements stated in 5.2.6.

5.2.5 Grade WP fittings ordered as Class WX shall meet the requirements of ASME B16.9 and shall have all welds, whether made by the fitting manufacturer or the starting material manufacturer, radiographically examined throughout their entire length in accordance with Paragraph UW-51 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code, except as exempt by 5.2.5.1. The radiography for this class of fittings may be done either prior to or after forming at the option of the manufacturer.

5.2.5.1 Instead of the radiographic examination, and at the option of the manufacturer, welds, whether made by the fitting manufacturer or the starting material manufacturer, may be ultrasonically examined in accordance with the Code requirements stated in 5.2.6.

5.2.6 Grade WP fittings ordered as Class WU shall meet the requirements of ASME B16.9 and shall have all welds, whether made by the fitting manufacturer of the starting material manufacturer, ultrasonically examined throughout their entire length in accordance with Appendix 12 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code. The ultrasonic examination of welds for this class may be performed either prior to or after forming at the option of the manufacturer.

5.2.7 Personnel performing NDE examinations shall be qualified in accordance with SNT-TC-1A.

5.2.8 Fittings covered in MSS SP-43, MSS SP-95, or MSS SP-97 and ordered as **CR*** ** shall meet the requirements of MSS SP-43, MSS SP-95, or MSS SP-97, respectively, and do not require non-destructive examination.

5.2.9 All joints welded with filler metal shall be finished in accordance with the requirements of Paragraph UW-35 (a) of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code.

5.2.10 Radiographic examination of the weld buildup on cold-formed stub ends shall not be required provided that all the following steps are adhered to:

5.2.10.1 The weld procedure and welders or welding operators meet the requirements of 5.2.3.

5.2.10.2 All weld surfaces are liquid penetrant examined in accordance with Appendix 8 of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

5.2.10.3 Repair of areas in the weld is permitted, but 5.2.10.1 and 5.2.10.2 must be repeated.

5.2.10.4 Fittings shall be marked with the symbol WBU following the alloy designation (for example: WPN-WBU).

5.2.11 Stubends may be produced with the entire lap added as weld metal to a straight pipe section provided the welding satisfies the requirements of 5.2.3 for qualifications and 5.3 for heat treatment.

5.2.11.1 Grade **WP****Class W** – Radiographic examination of the welds, made with the addition of filler metal, is required. See 5.2.4.

5.2.11.2 Grade **WP****Class WX** – Radiographic examination of all welds, made with or without the addition of filler metal is required. See 5.2.5.

5.2.11.3 Grade **WP****Class WU** – Ultrasonic examination of all welds, made with or without the addition of filler metal, is required. See 5.2.6.

5.2.11.4 Grade **CR** – Nondestructive examination is not required. See 5.2.8.

5.2.12 Stubends may be produced with the entire lap added by the welding of a ring, made from plate or flat bar of the same alloy grade and composition, to the outside of a straight section of pipe, provided the weld is a double welded full penetration joint and satisfies the requirements of 5.2.3 for qualifications and 5.3 for heat treatment.

TABLE 2 Permissible Raw Materials

Marking[A]				Product and ASTM Designation[B]		
Corrosion-Resistant Fittings	ASME Pressure Fittings	Alloy	UNS Designation	Pipe or Tube	Plate, Sheet, or Strip	Bar Forging and Forging Stock
CRN	WPN	Ni	N02200	B 161	B 162	B 160, B 564
CRNL	WPNL	Ni, Low C	N02201	B 161	B 162	B 160
CRNC[C]	WPNC[C]	Ni-Cu	N04400	B 165	B 127	B 164, B 564
CR HX	WPHX	Ni-Cr-Mo-Fe	N06002	B 619, B 622, B 626	B 435	B 572
CR HG	WPHG	Ni-Cr-Fe-Mo-Cu	N06007	B 619, B 622, B 626	B 582	B 581
CR HC 22	WPHC22	Low C-Ni-Mo-Cr	N06022	B 619, B 622, B 626	B 575	B 574, B 564, B 462, B 472
CRV602	WPV602	Ni-Cr-Fe	N06025	B 163, B 167	B 168	B 166, B 462, B 472
CR HG 30	WPHG30	Ni-Cr-Fe-Mo-Cu	N06030	B 619, B 622, B 626	B 582	B 581, B 462, B 472
CRHG35	WPHG35	Ni-Cr-Mo	N06035	B 619, B 622, B 626	B 575	B 574, B 564, B 462, B 472
CRV45TM	WPV45TM	Ni-Cr-Fe	N06045	B 163, B 167	B 168	B 166, B 462, B 472
CR2120	WP2120	Ni-Cr-Mo low C	N06058	B 619, B 622, B 626	B 575	B 564, B 574
CR5923	WP5923	Low C-Ni-Cr-Mo	N06059	B 619, B 622, B 626	B 575	B 564, B 574, B 462, B 472
CR HC 2000	WPHC2000	Low C-Ni-Cr-Mo-Cu	N06200	B 619, B 622, B 626	B 575	B 564, B 574, B 462, B 472
CRM21	WPM21	Low C-Ni-Cr-Mo-Ta	N06210	B 619, B 622, B 626	B 575	B 564, B 574
CRH230	WPH230	Ni-Cr-W-Mo	N06230	B 619, B 622, B 626	B 435	B 572, B 564
CR HC 4	WPHC4	Low C-Ni-Mo-Cr	N06455	B 619, B 622, B 626	B 575	B 574
CRNCI	WPNCI	Ni-Cr-Fe	N06600	B 167, B 516, B 517	B 168	B 166, B 564
CR603GT	WP603GT	Ni-Cr-Fe-Al	N06603	B 163, B 167, B 516, B 517	B 168	B 166, B 564
CRNCMC	WPNCMC	Ni-Cr-Mo-Cb	N06625	B 444, B 704, B 705	B 443	B 446, B 564
CRIN686	WPIN686	Low C-Ni-Cr-Mo	N06686	B 163, B 619, B 622, B 626	B 575	B 564, B 574, B 462, B 472
CR626Si	WP626Si	Ni-Cr-Mo-Si	N06219	B 444, B 704, B 705	B 443	B 446, B 564
CR HG3	WPHG3	Ni-Cr-Fe-Mo-Cu	N06985	B 619, B 622, B 626	B 582	B 581
CR20CB	WP20CB	Cr-Ni-Fe-Mo-Cu-Cb stabilized	N08020	B 464, B 468, B 729	B 463	B 472, B 473, B 462
CR3127	WP3127	Low C-Ni-Fe-Cr-Mo-Cu	N08031	B 619, B 622, B 626	B 625	B 564, B 649, B 462, B 472
CRH120	WPH120	Ni-Cr-Fe	N08120	B 407, B 514, B 515	B 409	B 408, B 564
CR330	WP330	Ni-Fe-Cr-Si	N08330	B 535, B 710	B 536	B 511, B 512
CR6XN	WP6XN	Fe-Ni-Cr-Mo-N	N08367	B 675, B 676, B 690	B 688	B 472, B 564, B 691, B 462
CRNIC	WPNIC	Ni-Fe-Cr	N08800	B 407, B 514, B 515	B 409	B 408, B 564
CRNIC10	WPNIC10	Ni-Fe-Cr	N08810	B 407, B 514, B 515	B 409	B 408, B 564
CRNIC11	WPNIC11	Ni-Fe-Cr	N08811	B 407	B 409	B 408, B 564
CRNICMC	WPNICMC	Ni-Fe-Cr-Mo-Cu	N08825	B 423, B 704, B 705	B 424	B 425, B 564
CR904L	WP904L	Low C-Ni-Fe-Cr-Mo-Cu	N08904	B 673, B 674, B 677	B 625	B 649
CR1925	WP1925	Low C-Ni-Fe-Cr-Mo-Cu	N08925	B 673, B 674, B 677	B 625	B 649
CR1925N	WP1925N	Low C-Ni-Fe-Cr-Mo-Cu-N	N08926	B 673, B 674, B 677	B 625	B 649
CR HB	WPHB	Ni-Mo	N10001	B 619, B 622, B 626	B 333	B 335
CR HN	WPHN	Ni-Mo-Cr-Fe	N10003		B 434	B 573
CR H242	WPH242	Ni-Mo-Cr-Fe	N10242	B 619, B 622, B 626	B 434	B 573, B 564
CR HC 276	WPHC276	Low C-Ni-Mo-Cr	N10276	B 619, B 622, B 626	B 575	B 574, B 564, B 462, B 472
CRB10	WPB10	Low C-Ni-Mo-Cr-Fe	N10624	B 619, B 622, B 626	B 333	B 335, B 564
CRVB4	WPVB4	Ni-Mo	N10629	B 619, B 622, B 626	B 333	B 335, B 564, B 462, B 472
CR HB2	WPHB-2	Ni-Mo	N10665	B 619, B 622, B 626	B 333	B 335, B 564, B 462, B 472
CR HB3	WPHB–3	Ni-Mo	N10675	B 619, B 622, B 626	B 333	B 335, B 564, B 462, B 472
CRH160	WPH160	Ni-Co-Cr-Si	N12160	B 619, B 622, B 626	B 435	B 564, B 572
CR3033	WP3033	Low C-Cr-Ni-Fe-N	R20033	B 619, B 622, B 626	B 625	B 564, B 649, B 472, B 462
CRH556	WPH556	Ni-Fe-Cr-Co	R30556	B 619, B 622, B 626	B 435	B 572

[A] When WP fittings are of welded construction or made from welded pipe, the symbol shall be supplemented with W or WX as applicable. If ultrasonic examination in accordance with 5.2.4.2 or 5.2.5.1 is used, the symbol shall be supplemented by WU or WXU as applicable.

[B] See 2.1 and 5.1.

[C] Yield strength shall be 25 000 psi (172 MPa) min, for all hot-formed, annealed fittings made from WPNC material.

5.2.12.1 Grade **WP****Class W** – Radiographic examination of all welds, made with the addition of filler metal, is required. See 5.2.4.

5.2.12.2 Grade **WP****Class WX** – Radiographic examination of all welds, made with or without the addition of filler metal, is required. See 5.2.5.

5.2.12.3 Grade **WP****Class WU** – Ultrasonic examination of all welds, made with or without the addition of filler metal, is required. See 5.2.6.

5.2.12.4 Grade **CR** – Nondestructive examination is not required. See 5.2.8.

5.3 *Heat Treatment*—All fittings shall be furnished heat treated. See Table 3 for recommended heat treatments. All forming or welding shall be done and completed prior to any final heat treatment. For seamless fittings made without forming, heat treatment,

TABLE 3 Heat Treatment

Corrosion Resistant Fittings	ASME Pressure Fittings	Alloy	UNS Designation	Heat Treatment[A,B] DEG F (DEG C)	Quench
~~CRN~~	~~WPN~~	~~Ni~~	~~N02200~~	~~1650-1700 (1900 to 928)~~	~~Rapid Air/Water~~
CRN	WPN	Ni	N02200	1650-1700 (900 to 928)†	Rapid Air/Water
CRNL	WPNL	Ni, Low C	N02201	1650-1700 (900 to 928)	Rapid Air/Water
CRNC[C]	WPNC[C]	Ni-Cu	N04400	1650-1700 (900 to 928)	Rapid Air/Water
CR HX	WPHX	Ni-Cr-Mo-Fe	N06002	2150 (1177)[D]	Rapid Air/Water
CR HG	WPHG	Ni-Cr-Fe-Mo-Cu	N06007	2100-2150 (1150 to 1177)	Rapid Air/Water
~~CR HC 22~~	~~WPHC22~~	~~Low C-Ni-Mo-Cr~~	~~N06022~~	~~2050 (1120)[D]~~	~~Rapid Air/Water~~
CR HC 22	WPHC22	Low C-Ni-Mo-Cr	N06022	2050 (1121)[D]†	Rapid Air/Water
CRV602	WPV602	Ni-Cr-Fe	N06025	2200 (1204)[E]	Rapid Air/Water
CR HG 30	WPHG30	Ni-Cr-Fe-Mo-Cu	N06030	2150 (1177)[D]	Rapid Air/Water
CRHG35	WPHG35	Ni-Cr-Mo	N06035	2050 (1121)	Rapid Air/Water
CRV45TM	WPV45TM	Ni-Cr-Fe	N06045	2150 (1177)	Rapid Air/Water
~~CR5923~~	~~WP5923~~	~~Low C-Ni-Cr-Mo~~	~~N06059~~	~~2050 (1120)~~	~~Rapid Air/Water~~
CR5923	WP5923	Low C-Ni-Cr-Mo	N06059	2050 (1121)	Rapid Air/Water
CR HC 2000	WPHC2000	Low C-Ni-Cr-Mo-Cu	N06200	2075-2125 (1135-1163)	Rapid Air/Water
CRM21	WPM21	Low C-Ni-Cr-Mo-Ta	N06210	[E]	[E]
CRH230	WPH230	Ni-Cr-W-Mo	N06230	2150-2250 (1177-1232)	Rapid Air/Water
CR HC 4	WPHC4	Low C-Ni-Mo-Cr	N06455	1950 (1065)[D]	Rapid Air/Water
CRNCI	WPNCI	Ni-Cr-Fe	N06600	1800-1850 (983 to 1010)	Rapid Air/Water
CR603GT	WP603GT	Ni-Cr-Fe-Al	N06603	2175 (1189)	Rapid Air/Water
CRNCMC	WPNCMC	Ni-Cr-Mo-Cb	N06625 Gr 1	1600 (871)	Rapid Air/Water
~~CRNCMC~~	~~WPNCMC~~	~~Ni-Cr-Mo-Cb~~	~~N06625 Gr 2~~	~~2000 (10934)[D]~~	~~Rapid Air/Water~~
CRNCMC	WPNCMC	Ni-Cr-Mo-Cb	N06625 Gr 2	2000 (1093)[D]†	Rapid Air/Water
CRIN686	WPIN686	Low C-Cr-Ni-Mo	N06686	2150 (1177)	Rapid Air/Water
~~CR626Si~~	~~WP626Si~~	~~Ni-Cr-Mo-Si~~	~~N06219~~	~~2050 (1120)~~	~~Rapid Air/Water~~
CR626Si	WP626Si	Ni-Cr-Mo-Si	N06219	2050 (1121)†	Rapid Air/Water
CR HG3	WPHG3	Ni-Cr-Fe-Mo-Cu	N06985	2100-2150 (1147 to 1177)	Rapid Air/Water
CR20CB	WP20CB	Cr-Ni-Fe-Mo-Cu-Cb stabilized	N08020	1700-1850 (927 to 1010)	Rapid Air/Water
CR904L	WP904L	Low C-Ni-Fe-Cr-Mo-Cu	N08904	1985-2100 (1085 to 1150)	Rapid Air/Water
CR3127	WP3127	Low C-Ni-Fe-Cr-Mo-Cu	N08031	2175 (1189)	Rapid Air/Water
CRH120	WPH120	Ni-Cr-Fe	N08120	2175-2225 (1189-1220)	Rapid Air/Water
CR330	WP330	Ni-Fe-Cr-Si	N08330	1900 (1038)	Rapid Air/Water
CR6XN	WP6XN	Fe-Ni-Cr-Mo-N	N08367	2025 (1107)	Rapid Air/Water
~~CRNIC~~	~~WPNIC~~	~~Ni-Fe-Cr~~	~~N08800~~	~~1800-1900 (983 to 1037)[F]~~	~~Rapid Air/Water~~
CRNIC	WPNIC	Ni-Fe-Cr	N08800	1800-1900 (983 to 1038)[F]†	Rapid Air/Water
CRNIC10	WPNIC10	Ni-Fe-Cr	N08810	2100-2150 (1147 to 1177)[F]	Rapid Air/Water
CRNIC11	WPNIC11	Ni-Fe-Cr	N08811	2100-2150 (1147 to 1177)[F]	Rapid Air/Water
~~CRNICMC~~	~~WPNICMC~~	~~Ni-Fe-Cr-Mo-Cu~~	~~N08825~~	~~1700-1800 (930 to 980)[F]~~	~~Rapid Air/Water~~
CRNICMC	WPNICMC	Ni-Fe-Cr-Mo-Cu	N08825	1700-1800 (930 to 983)[F]†	Rapid Air/Water
~~CR1925~~	~~WP1925~~	~~Low C-Ni-Fe-Cr-Mo-Cu~~	~~N08925~~	~~1800-1900 (983 to 1037)~~	~~Rapid Air/Water~~
CR1925	WP1925	Low C-Ni-Fe-Cr-Mo-Cu	N08925	1800-1900 (983 to 1038)†	Rapid Air/Water
CR2120	WP2120	Low C-Ni-Cr-Mo	N06058	2075 (1135)	Rapid Air/Water
CR1925N	WP1925N	Low C-Ni-Fe-Cr-Mo-Cu-N	N08926	2150 (1177)	Rapid Air/Water
CRHB	WPHB	Ni-Mo	N10001	1950 (1065)[D]	Rapid Air/Water
CRHN	WPHN	Ni-Mo-Cr-Fe	N10003	2150 (1177)[D]	Rapid Air/Water
CR H242	WPH242	Ni-Mo-Cr-Fe	N10242	1925-2025 (1050-1105)	Rapid Air/Water
CR HC 276	WPHC276	Low C-Ni-Mo-Cr	N10276	2050 (1121)[D]	Rapid Air/Water
CRB10	WPB10	Low C-Ni-Mo-Cr-Fe	N10624	2050 (1121)	Rapid Air/Water
CRVB4	WPVB4	Ni-Mo	N10629	1975 (1080)	Rapid Air/Water
CR HB2	WPHB2	Ni-Mo	N10665	1950 (1065)[D]	Rapid Air/Water
CR HB3	WPHB3	Ni-Mo	N10675	1950 (1065)[D]	Rapid Air/Water
CRH160	WPH160	Ni-Co-Cr-Si	N12160	2025 (1107)[D]	Rapid Air/Water
CR3033	WP3033	Low C-Cr-Ni-Fe-N	R20033	2050 (1121)	Rapid Air/Water
CRH556	WPH556	Ni-Fe-Cr-Co	R30556	2150 (1177)[D]	Rapid Air/Water

[A] Recommended set temperatures – Different termperatures may be selected by either the purchaser or the manufacturer.
[B] Set temperature, ±25°F.
[C] Yield strength shall be 25 000 psi (172 MPa) min, for all hot-formed, annealed fittings made from WPNC material.
[D] Minimum temperature.
[E] Annealing temperature and quench shall be agreed upon between purchaser and manufacturer.
[F] Heat treatment is highly dependent on intended service temperature – consult material manufacturer for specific heat treatments for end use temperature.

† Corrected editorially.