ASTM B366 / ASME SB366

Standard Specification for
Factory-Made Wrought Nickel and Nickel Alloy Fittings

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.

Grades are designated with a prefix, WP or CR, based on the applicable ASME or MSS dimensional and rating standards. 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.

Table 1

Class	Construction	Non-destructive Examination
S	Seamless	None
W	Welded	Radiography or Ultrasonic
WX	Welded	Radiography
WU	Welded	Ultrasonic

A. Manufacture :-

1. Grade WP fittings ordered as Class S shall be of seamless construction and shall meet all requirements of ASME B16.9 or B16.11.
2. Grade WP fittings ordered as Class W shall meet the requirements of ASME B16.9 and shall 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 point A.2.i, and point A.2.ii.
    i. The weld in the starting pipe, made to one of the pipe or tube product specifications listed in Table 3, shall not require radiography, provided that no filler metal is used in making the weld.
    ii. Instead of the radiographic examination, and at the option of the manufacturer, welds may be ultrasonically examined in accordance with the Code requirements stated in point A.4.
3. Grade WP fittings ordered as Class WX shall meet the requirements of ASME B16.9 and shall 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 point A.3.i.
    i. Instead of the radiographic examination, and at the option of the manufacturer, welds, may be ultrasonically examined in accordance with the Code requirements stated in point A.4.
4. Grade WP fittings ordered as Class WU shall meet the requirements of ASME B16.9 and shall ultrasonically examined throughout their entire length in accordance with Appendix 12 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code.
5. 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.

B. Heat Treatment :-

All fittings shall be furnished heat treated. See Table 2 for recommended heat treatments.

Table 2

Corrosion Resistant Fittings	ASME Pressure Fittings	Alloy	UNS Designation	Heat Treatment[A,B] DEG F (DEG C)	Quench

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
CRHX	WPHX	Ni-Cr-Mo-Fe	N06002	2150 (1177)[D]	Rapid Air/Water
CRHG	WPHG	Ni-Cr-Fe-Mo-Cu	N06007	2100-2150 (1150 to 1177)	Rapid Air/Water
CRHC22	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
CRHG30	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 (1121)	Rapid Air/Water
CRHC2000	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
CRHBC1	WPHBC1	Low C-Ni-Mo-CR	N10362	2100B (1147)	Rapid Air/Water
CRHC4	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 (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 (1121)	Rapid Air/Water
CRHG3	WPHG3	Ni-Cr-Fe-Mo-Cu	N06985	2100-2150 (1147 to 1177)	Rapid Air/Water
CR20CB	WP20CB	Cr-Ni-Fe-Mo-Cu-Cb	N08020	1700-1850 (927 to 1010)	Rapid Air/Water
		stabilized			
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 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 983)[F]	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
CRH242	WPH242	Ni-Mo-Cr-Fe	N10242	1925-2025 (1050-1105)	Rapid Air/Water
CRHC276	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
CRHB2	WPHB2	Ni-Mo	N10665	1950 (1065)[D]	Rapid Air/Water
CRHB3	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 25000 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.*

C. Chemical Composition :-

The material shall conform to the requirements as to chemical composition for the respective material prescribed in Table 3.

Table 3

Marking[A]				Product and ASTM Designation		
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	B161	B162	B160, B564
CRNL	WPNL	Ni, Low C	N02201	B161	B162	B160
CRNC[B]	WPNC[B]	Ni-Cu	N04400	B165	B127	B164, B564
CRHX	WPHX	Ni-Cr-Mo-Fe	N06002	B619, B622, B626	B435	B572
CRHG	WPHG	Ni-Cr-Fe-Mo-Cu	N06007	B619, B622, B626	B582	B581
CRHC22	WPHC22	Low C-Ni-Mo-Cr	N06022	B619, B622, B626	B575	B574, B564, B462, B472
CRV602	WPV602	Ni-Cr-Fe	N06025	B163, B167	B168	B166, B462, B472
CRHG30	WPHG30	Ni-Cr-Fe-Mo-Cu	N06030	B619, B622, B626	B582	B581, B462, B472
CRHG35	WPHG35	Ni-Cr-Mo	N06035	B619, B622, B626	B575	B574, B564, B462, B472
CRV45TM	WPV45TM	Ni-Cr-Fe	N06045	B163, B167	B168	B166, B462, B472
CR2120	WP2120	Ni-Cr-Mo Low C	N06058	B619, B622, B626	B575	B564, B574
CR5923	WP5923	Low C-Ni-Cr-Mo	N06059	B619, B622, B626	B575	B564, B574, B462, B472
CRHC2000	WPHC2000	Low C-Ni-Cr-Mo-Cu	N06200	B619, B622, B626	B575	B564, B574, B462, B472
CRM21	WPM21	Low C-Ni-Cr-Mo-Ta	N06210	B619, B622, B626	B575	B564, B574
CRH230	WPH230	Ni-Cr-W-Mo	N06230	B619, B622, B626	B435	B572, B564
CRHBC1	WPHBC1	Low C-Ni-Mo-Cr	N10362	B619, B622, B626	B575	B574, B564, B462, B472
CRHC4	WPHC4	Low C-Ni-Mo-Cr	N06455	B619, B622, B626	B575	B574
CRNCI	WPNCI	Ni-Cr-Fe	N06600	B167, B516, B517	B168	B166, B564
CR603GT	WP603GT	Ni-Cr-Fe-Al	N06603	B163, B167, B516, B517	B168	B166, B564
CRNCMC	WPNCMC	Ni-Cr-Mo-Cb	N06625	B444, B704, B705	B443	B446, B564
CRIN686	WPIN686	Low C-Ni-Cr-Mo	N06686	B163, B619, B622, B626	B575	B564, B574, B462, B472
CR626Si	WP626Si	Ni-Cr-Mo-Si	N06219	B444, B704, B705	B443	B446, B564

CRHG3	WPHG3	Ni-Cr-Fe-Mo-Cu	N06985	B619, B622, B626	B582	B581
CR20CB	WP20CB	Cr-Ni-Fe-Mo-Cu-Cb	N08020	B464, B468, B729	B463	B472, B473, B462
		Stabilized				
CR3127	WP3127	Low C-Ni-Fe-Cr-Mo-Cu	N08031	B619, B622, B626	B625	B564, B649, B462, B472
CRH120	WPH120	Ni-Cr-Fe	N08120	B407, B514, B515	B409	B408, B564
CR330	WP330	Ni-Fe-Cr-Si	N08330	B535, B710	B536	B511, B512
CR6XN	WP6XN	Fe-Ni-Cr-Mo-N	N08367	B675, B676, B690	B688	B472, B564, B691, B462
CRNiC	WPNiC	Ni-Fe-Cr	N08800	B407, B514, B515	B409	B408, B564
CRNiC10	WPNiC10	Ni-Fe-Cr	N08810	B407, B514, B515	B409	B408, B564
CRNiC11	WPNiC11	Ni-Fe-Cr	N08811	B407	B409	B408, B564
CRNiCMC	WPNiCMC	Ni-Fe-Cr-Mo-Cu	N08825	B423, B704, B705	B424	B425, B564
CR1925	WP1925	Low C-Ni-Fe-Cr-Mo-Cu	N08925	B673, B674, B677	B625	B649
CR1925N	WP1925N	Low C-Ni-Fe-Cr-Mo-Cu-N	N08926	B673, B674, B677	B625	B649
CRHB	WPHB	Ni-Mo	N10001	B619, B622, B626	B333	B335
CRHN	WPHN	Ni-Mo-Cr-Fe	N10003		B434	B573
CRH242	WPH242	Ni-Mo-Cr-Fe	N10242	B619, B622, B626	B434	B573, B564
CRHC276	WPHC276	Low C-Ni-Mo-Cr	N10276	B619, B622, B626	B575	B574, B564, B462, B472
CRB10	WPB10	Low C-Ni-Mo-Cr-Fe	N10624	B619, B622, B626	B333	B335, B564
CRVB4	WPVB4	Ni-Mo	N10629	B619, B622, B626	B333	B335, B564, B462, B472
CRHB2	WPHB2	Ni-Mo	N10665	B619, B622, B626	B333	B335, B564, B462, B472
CRHB3	WPHB3	Ni-Mo	N10675	B619, B622, B626	B333	B335, B564, B462, B472
CRH160	WPH160	Ni-Co-Cr-Si	N12160	B619, B622, B626	B435	B564, B572
CR3033	WP3033	Low C-Cr-Ni-Fe-N	R20033	B619, B622, B626	B625	B564, B649, B472, B462
CRH556	WPH556	Ni-Fe-Cr-Co	R30556	B619, B622, B626	B435	B572

[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* point *A.2.ii or A.3.i is used, the symbol shall be supplemented by WU or WXU as applicable.*

[B] *Yield strength shall be 25000 psi (172 MPa) min, for all hot-formed, annealed fittings made from WPNC material.*

D. <u>Mechanical Properties and Other Requirements :-</u>

1. Tensile Requirements (All Table 3 alloys except for UNS N06625 Grade 1 or Grade 2):
   Material used in the manufacture of the fittings shall conform to the requirements for tensile properties as prescribed for the respective product in Table 3.
   i. Tensile Requirements (For fittings made to meet the mechanical properties of UNS N06625 Grade 1): At the option of the manufacturer, the material used in the manufacture of UNS

N06625 Grade 1 fittings shall conform to the mechanical property requirements of either UNS N06625 Grade 1 or Grade 2 as prescribed for the respective product in Table 3.

ii. Tensile Requirements (For fittings made to meet the mechanical properties of UNS N06625 Grade 2): At the option of the manufacturer, the material used in the manufacture of UNS N06625 Grade 2 fittings shall conform to the mechanical property requirements of either UNS N06625 Grade 1 or Grade 2 as prescribed for the respective product in Table 3.

2. Hydrostatic Tests: Hydrostatic testing of wrought fittings is not required by this specification.

E. Dimensions :-

1. Fittings or components produced in accordance with this specification shall have sizes, shapes, and dimensions in accordance with those specified in ASME B16.9, ASME B16.11, MSS SP-43, MSS SP-95, MSS SP-97, ASME H34.1, ASME H34.2, or ASME H34.3.

F. Supplementary Test :-

1. Tension Test.
2. Liquid Penetrant Test:
   i. The method shall be in accordance with Practice E165. Acceptance limits shall be as specified by the purchaser.
3. Hydrostatic Test.
4. Positive Material Identification Examination:
   i. Product shall receive a Positive Material Identification examination by Guide E1916.

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