



Designation: B366/B366M – 23

Standard Specification for Factory-Made Wrought Nickel and Nickel Alloy Fittings¹

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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.

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 either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

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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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 Safety Data Sheet (SDS) for this product/material as provided by the manufacturer; to establish appropriate safety, health, and environmental practices, and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

- B127 Specification for Nickel-Copper Alloy Plate, Sheet, and Strip
- B160 Specification for Nickel Rod and Bar
- B161 Specification for Nickel Seamless Pipe and Tube
- B162 Specification for Nickel Plate, Sheet, and Strip
- B163 Specification for Seamless Nickel and Nickel Alloy Condenser and Heat-Exchanger Tubes
- B164 Specification for Nickel-Copper Alloy Rod, Bar, and Wire
- B165 Specification for Nickel-Copper Alloy Seamless Pipe and Tube
- B166 Specification for Nickel-Chromium-Aluminum Alloy, Nickel-Chromium-Iron Alloys, Nickel-Chromium-Cobalt-Molybdenum Alloy, Nickel-Iron-Chromium-Tungsten Alloy, and Nickel-Chromium-Molybdenum-Copper Alloy Rod, Bar, and Wire
- B167 Specification for Standard Specification for Nickel-Chromium-Aluminum Alloys (UNS N06699) Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696) Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617) Nickel-Iron-Chromium-Tungsten Alloy (UNS N06674)

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



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

and Nickel-Chromium-Molybdenum-Copper Alloy (UNS N06235) Seamless Pipe and Tube

- B168** Specification for Nickel-Chromium-Aluminum Alloys (UNS N06699), Nickel-Chromium-Iron Alloys (UNS N06600, N06601, N06603, N06690, N06693, N06025, N06045, and N06696), Nickel-Chromium-Cobalt-Molybdenum Alloy (UNS N06617), Nickel-Iron-Chromium-Tungsten Alloy (UNS N06674), and
- B333** Specification for Nickel-Molybdenum Alloy Plate, Sheet, and Strip
- B335** Specification for Nickel-Molybdenum Alloy Rod
- B407** Specification for Nickel-Iron-Chromium Alloy Seamless Pipe and Tube
- B408** Specification for Nickel-Iron-Chromium Alloy Rod and Bar
- B409** Specification for Nickel-Iron-Chromium Alloy Plate, Sheet, and Strip
- B423** Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloy Seamless Pipe and Tube
- B424** Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloys Plate, Sheet, and Strip
- B425** Specification for Nickel-Iron-Chromium-Molybdenum-Copper Alloys Rod and Bar
- B434** Specification for Nickel-Molybdenum-Chromium-Iron Alloys Plate, Sheet, and Strip
- B435** Specification for Heat and Corrosion Resistant High Temperature Alloy Plate, Sheet, and Strip
- B443** Specification for Nickel-Chromium-Molybdenum-Columbium Alloy and Nickel-Chromium-Molybdenum-Silicon Alloy Plate, Sheet, and Strip
- B444** Specification for Nickel-Chromium-Molybdenum-Columbium Alloys (UNS N06625 and UNS N06852) and Nickel-Chromium-Molybdenum-Silicon Alloy (UNS N06219) Pipe and Tube
- B446** 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
- B462** Specification for Forged or Rolled Nickel Alloy Pipe Flanges, Forged Fittings, and Valves and Parts for Corrosive High-Temperature Service
- B463** Specification for UNS N08020 Alloy Plate, Sheet, and Strip
- B464/B464M** Specification for Welded UNS N08020 Alloy Pipe
- B468** Specification for Welded UNS N08020 Alloy Tubes
- B472** Specification for Nickel Alloy Billets and Bars for Reforging
- B473** Specification for UNS N08020, UNS N08024, and UNS N08026 Nickel Alloy Bar and Wire

- B511** Specification for Nickel-Iron-Chromium-Silicon Alloy Bars and Shapes
- B512** Specification for Nickel-Chromium-Silicon Alloy Billets and Bars
- B514** Specification for Welded Nickel-Iron-Chromium Alloy Pipe
- B515** Specification for Welded Nickel-Iron-Chromium Alloy Tubes
- B516** Specification for Welded Nickel-Chromium-Aluminum Alloy (UNS N06699) and Nickel-Chromium-Iron Alloy (UNS N06600, UNS N06601, UNS N06603, UNS N06025, UNS N06045, UNS N06690, and UNS N06693) Tubes
- B517** Specification for Welded Nickel-Chromium-Iron Alloy Pipe
- B535** Specification for Nickel-Iron-Chromium-Silicon Alloys (UNS N08330 and N08332) Seamless Pipe and Tube
- B536** Specification for Nickel-Iron-Chromium-Silicon Alloys Plate, Sheet, and Strip
- B564** Specification for Nickel Alloy Forgings
- B572** Specification for UNS N06002, UNS N06230, UNS N12160, and UNS R30556 Rod
- B573** Specification for Nickel-Molybdenum-Chromium-Iron Alloys (UNS N10003, N10242) Rod
- B574** Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Molybdenum-Chromium, Low-Carbon Nickel-Molybdenum-Chromium-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, and Low-Carbon Nickel-Chromium-Molybdenum-Tungsten Alloy Rod
- B575** Specification for Low-Carbon Nickel-Chromium-Molybdenum, Low-Carbon Nickel-Chromium-Molybdenum-Copper, Low-Carbon Nickel-Chromium-Molybdenum-Tantalum, Low-Carbon Nickel-Chromium-Molybdenum-Tungsten, and Low-Carbon Nickel-Molybdenum-Chromium Alloy Plate, Sheet, and Strip
- B581** Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Rod
- B582** Specification for Nickel-Chromium-Iron-Molybdenum-Copper Alloy Plate, Sheet, and Strip
- B619/B619M** Specification for Welded Nickel and Nickel-Cobalt Alloy Pipe
- B622** Specification for Seamless Nickel and Nickel-Cobalt Alloy Pipe and Tube
- B625** Specification for Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloy, Ni-Fe-Cr-Si Alloy, Cr-Ni-Fe-N Low-Carbon Alloy, Fe-Ni-Cr-Mo-Cu-N Alloy, and Ni-Fe-Cr-Mo-N Alloy Plate, Sheet, and Strip
- B626** Specification for Welded Nickel and Nickel-Cobalt Alloy Tube
- B649** Specification for Ni-Fe-Cr-Mo-Cu-N Low-Carbon Alloy and Cr-Ni-Fe-N Low-Carbon Alloy Bar and Wire, Ni-Cr-Fe-Mo-N Alloy Wire, and Ni-Fe-Cr-Mo-N Alloy Bar
- B673** Specification for Nickel-Iron-Chromium-Molybdenum and Iron-Nickel-Chromium-Molybdenum-Copper Welded Pipe



- B674** Specification for Nickel-Iron-Chromium-Molybdenum and Iron-Nickel-Chromium-Molybdenum-Copper Welded Tube
- B675** Specification for Iron-Nickel-Chromium-Molybdenum Alloy Welded Pipe
- B676** Specification for UNS N08367 Welded Tube
- B677** Specification for Nickel-Iron-Chromium-Molybdenum and Iron-Nickel-Chromium-Molybdenum-Copper Seamless Pipe and Tube
- B688** Specification for Chromium-Nickel-Molybdenum-Iron Plate, Sheet, and Strip
- B690** Specification for Iron-Nickel-Chromium-Molybdenum Alloy Seamless Pipe and Tube
- B691** Specification for Iron-Nickel-Chromium-Molybdenum Alloy (UNS N08367) Rod, Bar, and Wire
- B704** Specification for Welded Nickel Alloy Tubes
- B705** Specification for Nickel-Alloy (UNS N06625, N06219 and N08825) Welded Pipe
- B710** Specification for Nickel-Iron-Chromium-Silicon Alloy Welded Pipe
- B729** Specification for Seamless Nickel-Iron-Chromium-Molybdenum-Copper Nickel Alloy Pipe and Tube
- B880** Specification for General Requirements for Chemical Check Analysis Limits for Nickel, Nickel Alloys and Cobalt Alloys
- B899** Terminology Relating to Non-ferrous Metals and Alloys
- E165** Practice for Liquid Penetrant Testing for General Industry
- E1916** Guide for Identification of Mixed Lots of Metals
- 2.2 *ASME Standards:*³
- B16.9** Wrought Steel Butt Welding Fittings
- B16.11** Forged Steel Fittings, Socket-Welding and Threaded
- 2.3 *Manufacturers Standardization Society of the Valve and Fittings Industry Standards:*
- MSS SP-25** Standard Marking Systems for Valves, Fittings, Flanges, and Unions⁴
- MSS SP-43** Standard Practice for Light Weight Stainless Steel Butt Welding Fittings⁴
- MSS SP-95** Sewage (D) Nipples and Bull Plugs⁴
- MSS SP-97** Forged Carbon Steel Branch Outlet Fittings—Socket Welding, Threaded and Butt Welding Ends⁴
- Boiler and Pressure Vessel Code, Section VIII, Division 1** Pressure Vessels and Section IX, Welding Qualifications³
- 2.4 *AWS Standards:*⁵
- A5.11** Specification for Nickel and Nickel Alloy Covered Welding Electrodes
- A5.14** Specification for Nickel and Nickel-Alloy Bare Welding Rods and Electrodes

2.5 *ASNT:*⁶

SNT-TC-1A Recommended Practice for Nondestructive Testing Personnel Qualification and Certification

3. Terminology

3.1 Terms defined in Terminology **B899** shall 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),
- 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.

⁶ Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518, <http://www.asnt.org>.

³ Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, <http://www.asme.org>.

⁴ Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602, <http://www.mss-hq.com>.

⁵ Available from American Welding Society (AWS), 550 NW LeJeune Rd., Miami, FL 33126, <http://www.aws.org>.