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An American National Standard

Standard Specification for Fluid Conditioner Fittings in Piping Applications Above 0°F[1]

This standard is issued under the fixed designation F1201; 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 provides the minimum requirements for pressure-retaining components of fluid conditioner fittings. It addresses the pressure-retaining component design, fabrication, rating, marking, and testing.

1.2 This specification is not intended to override any of the present fluid conditioner fitting specifications specific to devices such as strainers, filters, and traps but should be used for devices for which a specific specification does not apply.

1.3 This specification provides sufficient requirements to allow a fluid conditioner fitting to be used in the marine environment.

1.4 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.

1.5 The following precautionary caveat pertains only to the test methods portion, Section 7, 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 establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D93 Test Methods for Flash Point by Pensky-Martens Closed Cup Tester

F722 Specification for Welded Joints for Shipboard Piping Systems

2.2 *ANSI Standards:*[3]

ANSI B2.1 Pipe Threads

ANSI B16.1 Cast Iron Pipe Flanges and Flanged Fittings

ANSI B16.3 Malleable Iron Threaded Fittings

ANSI B16.4 Cast Iron Threaded Fittings

ANSI B16.5 Pipe Flanges and Flanged Fittings

ANSI B16.11 Forged Steel Fittings, Socket-Welding and Threaded

ANSI B16.15 Cast Bronze Threaded Fittings

ANSI B16.24 Bronze Pipe Flanges and Flanged Fittings

ANSI B16.25 Buttwelding Ends

ANSI B31.1 Power Piping

2.3 *MSS Standards:*[4]

SP-44 Steel Pipe Flanges

SP-51 150 lb Corrosion Resistant Cast Flanges and Flanged Fittings

SP-61 Pressure Testing of Steel Valves

SP-67 Butterfly Valves

2.4 *ASME Standards:*[5]

ASME Boiler and Pressure Vessel Code, Section VIII

ASME Boiler and Pressure Vessel Code, Section IX

3. Terminology

3.1 *Definitions:*

3.1.1 *fluid conditioner fitting*—a device, other than a valve or pipe or pipe joining fitting, installed in a pressure piping system, that monitors or provides for the monitoring of the fluid, or otherwise operates on or alters the condition of the fluid.

3.1.2 *maximum allowable working pressure (MAWP)*—the highest internal pressure at the maximum design temperature that the fluid conditioner fitting can be safely subjected to in service.

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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.

[3] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.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 Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

3.1.3 *maximum design temperature*—the maximum temperature for which the fluid conditioner fitting is rated by the manufacturer.

3.1.4 *multiplex fluid conditioner fitting*—a fluid conditioner fitting that is made up of multiples of a single unit connected by either manifolding, piping, tubes, or valves.

4. Classification

4.1 *Class I*—Fluid conditioner fitting meeting the following requirements:

Service	Pressure, psig (MPa) Temperature, °F (°C)
Liquefied flammable gas	above 150 (1.03) . . . and . . . above 0 (–18)
Fuels	above 150 (1.03) . . . or . . . above 150 (66)
Liquids with a flash point[A] 150 °F (66 °C) or below	above 225 (1.55) . . . or . . . above 150 (66)
Liquids with a flash point above 150 °F (66 °C)[B]	above 225 (1.55) . . . or . . . above 400 (204)
Steam, gases, and vapors	above 150 (1.03) . . . or . . . above 650 (343)
Water	above 225 (1.55) . . . or . . . above 350 (177)

[A] Flash point measured in accordance with Test Methods D93.
[B] Includes lubricating oils, hydraulic fluids, and heat transfer oils.

4.2 *Class II*—All other fluid conditioner fittings.

5. Materials and Manufacture

5.1 Pressure-retaining parts shall be constructed of materials listed in Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code (hereafter called the ASME Code) or ANSI B31.1. Nonmetallic materials may be used for pressure-retaining parts provided the material is suitable for the intended service and is compatible with the fluid to be conducted.

5.2 Fluid conditioner fittings intended for flammable service with nonmetallic materials or metallic materials having a solidus to liquidus temperature below 1700 °F (927 °C) shall pass the prototype fire test in 7.2.

5.3 Bolting materials shall be at least equal to those listed in Table 1 of ANSI B16.5 or Table 126.1 of ANSI B31.1. Bolts, screws, and fasteners in contact with interior fluid shall be compatible with the fluid. Carbon steel bolting shall not be used in services rated above 500 °F (260 °C).

5.4 Gaskets and seals shall be of materials suitable for the intended service.

5.5 The pressure ratings established under this specification are based on materials of high quality produced under regular control of chemical and mechanical properties by a recognized process. The manufacturer shall be prepared to submit a certificate of compliance verifying that his product has been so produced and that it has been manufactured from material whose chemical and mechanical properties are at least equal to the requirements of the appropriate specification.

5.6 For materials not having values of allowable stress tabulated in Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, allowable stresses shall be determined in accordance with the procedures outlined in Subsection C and Appendix P of that section. Where it can be shown that the values of allowable stress listed for a particular material in one product form (because of similar chemistry, physical properties, heat treatment, and so forth) are applicable to the same material in an unlisted product form, the listed values of allowable stress may be used.

5.7 Cast iron shall be limited to services below 450 °F (232 °C). Cast iron fittings conforming to ANSI B2.1 and ANSI B16.4 are limited to Class 125 and 250.

5.8 Users are cautioned to exercise care in the selection of materials, as some fluids may react chemically with some materials used in these products.

6. Other Requirements

6.1 The maximum allowable working pressure (MAWP) of fluid conditioner fittings covered under this specification shall be established by at least one of the following methods:

6.1.1 Proof test in accordance with the requirements prescribed in paragraph UG-101 of Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code. If burst-type tests as outlined in paragraph UG-101(m) are used, it is not necessary to rupture the component. In this case, the value of *B* to be used in determining the MAWP shall be the maximum pressure to which the component was subjected without rupture.

6.1.2 Design calculations in accordance with the requirements prescribed in Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code.

6.2 Where welded construction is used, weld joint design details shall be in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code except as noted in 6.3. Supplemental radiography requirements are presented in 7.3. Welders and weld procedures shall be qualified in accordance with Section IX of the ASME Boiler and Pressure Vessel Code. Except for fillet welds, all welds shall be full penetration welds extending through the entire thickness of the shell.

6.3 Welds on fluid conditioner fittings greater than 6-in. (152-mm) internal diameter or 1.5-ft^3 (0.042-m^3) net internal volume and rated above 600 psi (4.14 MPa) or 400 °F (204 °C) shall be of the following types as listed in Table UW-12 of the ASME Boiler and Pressure Vessel Code: Type (1) for Category A joints; Types (1) or (2) for Category B joints; and all Category C and D joints shall be full penetration welds extending through the entire thickness of the vessel wall or nozzle wall. Welded joint categories are defined under UW-3 of the ASME Boiler and Pressure Vessel Code.

6.4 Post-weld heat treatment shall be in accordance with Section VIII, Division 1 of the ASME Boiler and Pressure Vessel Code, except that fluid conditioner fittings greater than 6-in. (152-mm) internal diameter or 1.5-ft^3 (0.042-m^3) net internal volume, rated above 600 psi (4.14 MPa) or 400 °F (204 °C), and fabricated of carbon or low alloy steel, shall be post-weld, heat-treated regardless of thickness.

6.5 Inlet and outlet connections consisting of welded flange end fittings shall be in accordance with Specification F722. Pipe end connections for fluid conditioner fittings shall be in accordance with one of the specifications listed in 2.2 or 2.3. Where radiography is required by 7.3.2, all welded inlet and outlet connections shall be butt-weld joints as required by Specification F722 for Class 1 piping systems. Threaded inlet and outlet connections shall be in accordance with 6.6.

6.6 Threaded pipe connections shall be limited to the following services:

NPS ¾ in. (20 mm) and below . . . 1500 psig (10.3 MPa) max
NPS 1 in. (25 mm) and below . . . 1200 psig (8.27 MPa) max
NPS 2 in. (50 mm) and below . . . 600 psig (4.14 MPa) max
NPS 3 in. (80 mm) and below . . . 400 psig (2.76 MPa) max

6.7 Threaded pipe joints above nominal pipe size (NPS) 2 (50 mm) shall not be used in systems that require radiographic examination in 7.3.2.

6.8 For multiplex fluid conditioner fittings:

6.8.1 Piping and valves shall be in accordance with ANSI B31.1. Welded joints used in the interconnected piping shall be in accordance with Specification F722 for equivalent class of pipe.

6.8.2 The maximum valve seat leakage shall not be greater than that allowed by MSS SP-61 or SP-67.

6.8.3 There shall be continuous fluid flow during change-over of the elements.

6.9 For a fluid conditioner fitting requiring cleaning or servicing, its construction shall facilitate cleaning and minimize fluid spillage.

6.10 All performance ratings assigned to a fluid conditioner fitting shall be confirmed by calculations or testing (see 7.4), or both, and certified by the manufacturer.

6.11 If an external protective device is required for the fluid conditioner fitting to pass the fire test in 7.2, the device shall sufficiently encase the fluid conditioner fitting to protect the fitting from a fire when it is installed in its normal position(s).

7. Test Methods

7.1 All fluid conditioner fittings shall be pressure tested by one of the following methods:

7.1.1 Conduct a hydrostatic test at 1½ times the 100 °F (37 °C) rated MAWP of the fluid conditioner fitting. Perform the test with water or other liquid having a maximum viscosity of 40 SSU at 125 °F (52 °C) with a maximum pressure test temperature of 125 °F (52 °C). The minimum duration of the test shall be 15 s for fluid conditioner fittings less than NPS 2 (50 mm), 1 min for fluid conditioner fittings NPS 2½ (63 mm) through 8 (203 mm), and 3 min for larger sizes. The purpose of this test is to detect leaks and structural imperfections. No visible leakage is permitted.

7.1.2 Class II fluid conditioner fittings of NPS 2 (50 mm) and smaller with other than flanged connections may, at the option of the manufacturer, be air tested to the lesser of 1.2 times the MAWP or 80 psig (0.55 MPa). The minimum duration of the test shall be 15 s. Visually detectable leakage is not acceptable.

7.1.2.1 Manufacturers exercising this option shall also certify that a prototype from each production lot of the same size fluid conditioner fitting was subjected to a hydrostatic test in accordance with 7.1.1.

7.2 Test a prototype of a fluid conditioner fitting design that requires a fire test in accordance with 5.2 as follows:

7.2.1 Position the fluid conditioner fitting 9 in. (230 mm) above the top edge of an open pan of heptane large enough to engulf the fluid conditioner fitting completely in the fire. The pan shall conform to the following minimum dimensions:

7.2.1.1 *Depth,* 1½ in. (38 mm).

7.2.1.2 *Width,* twice the width of the fluid conditioner fitting but no less than 8½ in. (220 mm).

7.2.1.3 *Length,* twice the length of the fluid conditioner fitting but no less than 14 in. (360 mm).

7.2.2 Add to the pan sufficient heptane to provide for a 2½-min burn.

7.2.3 Mount thermocouples so as to sense the flame temperature in the same plane and elevation as the fluid conditioner fitting assembly. Pressurize with water the fluid conditioner fitting to its MAWP during the burning portion of the test. Following ignition of the heptane, begin timing and monitor the temperature. The temperature shall reach a minimum of 1200 °F (649 °C) but shall not exceed 1350 °F (732 °C). If 1200 °F (649 °C) is not reached, repeat the test using a new specimen. If 1350 °F (732 °C) is exceeded, discard the results and repeat the test.

7.2.4 At the end of the 2½-min of fire exposure, extinguish the flame, relieve the pressure, and allow the water to flow through the assembly. With free flow established, pressurize the fluid conditioner fitting to its MAWP and hold for 30 s. Failure to establish a free flow, or any fluid leakage during fire exposure or the subsequent pressure test, shall constitute failure.

7.2.5 Mount in their normally installed position those fluid conditioner fittings that require external protective devices installed to pass the above fire test. Test in each position those fluid conditioner fittings that can be mounted in more than one position. A different fluid conditioner fitting may be used for each test. If it is possible for this protection to be separated from the fluid conditioner fitting body by purchasers or users, mark the body to indicate that this protection is required (see 9.2).

7.2.6 Test only the smallest and largest sizes of a particular fluid conditioner fitting design to certify the design as having passed the above fire test.

NOTE 1—Manufacturers are cautioned that the application of this test can be hazardous. It is recommended that it be performed by a qualified laboratory familiar with the conduct of this type test.

7.3 Inspect all welds as follows:

7.3.1 Visually examine all welds in accordance with ANSI B31.1.

7.3.2 Welded inlet and outlet connections of Class I fluid conditioner fittings, equal to or greater than 4-in. (100-mm) nominal diameter or 0.375-in. (9.5-mm) nominal wall thickness, shall be 100 % radiographically examined in accordance with UW-51 of the ASME Boiler and Pressure Vessel Code.

7.3.3 For Class I multiplex fluid conditioner fittings, all butt-welds in interconnected piping greater than 4-in. (100-mm) nominal diameter or 0.375-in. (9.5-mm) nominal wall thickness shall be 100 % radiographically examined in accordance with UW-51 of the ASME Boiler and Pressure Vessel Code.

7.3.4 Fluid conditioner fittings greater than 6-in. (152-mm) internal diameter or 1.5-ft^3 (0.042-m^3) net internal volume and

rated above 600 psi (4.14 MPa) or 400 °F (204 °C) shall have all butt-welds fully radiographed in accordance with UW-51 of the ASME Boiler and Pressure Vessel Code.

7.4 A prototype of each fluid conditioner fitting having designated performance ratings not confirmed by calculations shall be tested to verify the ratings. The test shall be of the manufacturer's specification practice and shall be suitable for the type, size, and capacity of the fluid conditioner fitting.

7.4.1 Test only that combination of sizes, capacities, and so forth, of a particular fluid conditioner fitting design to certify the ratings of a complete family of a fluid conditioner fitting of the design.

8. Certification

8.1 When specified in the purchase order or contract, the manufacturer's certification shall be furnished to the purchaser stating that samples representing each lot or prototypes have been manufactured, tested, and inspected in accordance with this specification and the requirements have been met. When specified in the purchase order or contract, a report of the test results shall be furnished.

9. Product Marking

9.1 Each fluid conditioner fitting shall have a securely attached name plate or other permanent marking indicating the following:

9.1.1 Manufacturer's name or trademark.

9.1.2 Maximum allowable working pressure and temperature as designed and tested (for example, 150 psi at 150°F).

9.1.3 Size (end connection NPS).

9.1.4 ASTM designation number of this specification.

9.1.5 Direction of flow (by an arrow or the word "inlet,'' "outlet,'' or both).

9.1.6 If radiographed in accordance with 7.3, an "X'' shall be placed after the ASTM designation number.

9.2 If a removable protective device is installed to pass the fire test of 7.2.5, an "S'' shall be placed after the ASTM designation number.

10. Quality Assurance

10.1 The fluid conditioner fitting manufacturer shall maintain the quality of the fluid conditioner fittings that are designed, tested, and marked in accordance with this specification. At no time shall a fluid conditioner fitting be sold indicating that it meets the requirements of this specification if it does not meet the requirements herein.

11. Keywords

11.1 fluid conditioner fittings; piping applications; pressure-retaining components