



Standard Specification for Metal Insert Fittings for Polyethylene/Aluminum/ Polyethylene and Crosslinked Polyethylene/Aluminum/ Crosslinked Polyethylene Composite Pressure Pipe¹

This standard is issued under the fixed designation F1974; 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 covers metal insert fittings with split ring and compression nut (compression joint) and metal insert fittings with copper crimp rings (crimp joint) for four sizes of composite pressure pipe. These fittings are intended for use in 125 psi (690 kPa) cold- and hot-water distribution systems operating at temperatures up to and including 180 °F (82 °C). (When used in polyethylene/aluminum/polyethylene systems the maximum operating temperature is limited by the pipe to 140 °F (60 °C) and where applicable 180 °F (82 °C)). Included are the requirements for materials, workmanship, burst pressure, sustained pressure, excessive temperature and pressure, temperature cycling tests, and markings to be used on the fittings and rings. The fittings covered by this specification are intended for use in potable water distribution systems for residential and commercial applications, water service, underground irrigation systems, and radiant panel heating systems, baseboard, snow- and ice-melt systems, and gases that are compatible with the composite pipe and fittings.

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.

NOTE 1—The tables show the “nominal size” in millimetres with the inch size in parentheses. This exception is made to harmonize the “nominal size” with the two pipe standards, Specifications F1281 and F1282.

1.3 The following precautionary caveat pertains only to the test method portion, Section 9, 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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.4 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

- B16/B16M Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
- B36/B36M Specification for Brass Plate, Sheet, Strip, And Rolled Bar
- B62 Specification for Composition Bronze or Ounce Metal Castings
- B75/B75M Specification for Seamless Copper Tube
- B134/B134M Specification for Brass Wire
- B140/B140M Specification for Copper-Zinc-Lead (Red Brass or Hardware Bronze) Rod, Bar, and Shapes
- B159/B159M Specification for Phosphor Bronze Wire
- B283/B283M Specification for Copper and Copper-Alloy Die Forgings (Hot-Pressed)
- B371/B371M Specification for Copper-Zinc-Silicon Alloy Rod
- B584 Specification for Copper Alloy Sand Castings for General Applications
- D618 Practice for Conditioning Plastics for Testing
- D1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure
- D1599 Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2240 Test Method for Rubber Property—Durometer Hardness

¹ This specification is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.10 on Fittings.

Current edition approved July 1, 2023. Published July 2023. Originally approved in 1999. Last previous edition approved in 2020 as F1974 - 09(2020). DOI: 10.1520/F1974-23.

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

E18 Test Methods for Rockwell Hardness of Metallic Materials

F412 Terminology Relating to Plastic Piping Systems

F1281 Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe

F1282 Specification for Polyethylene/Aluminum/Polyethylene (PE-AL-PE) Composite Pressure Pipe

2.2 *ANSI Standards:*³

B1.20.1 Pipe Threads General Purpose (Inch)

B16.18 Cast Copper Alloy Solder Joint Pressure Fittings

B16.22 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings

2.3 *Manufacturers Standardization Society Standard:*⁴

SP-104 Wrought Copper LW Solder Joint Pressure Fittings

2.4 *National Sanitation Foundation Standards:*⁵

Standard No. 14 for Plastic Piping Components and Related Materials

Standard No. 61 for Drinking Water System Components - Health Effects

3. Terminology

3.1 Definitions are in accordance with Terminology **F412** and abbreviations are in accordance with Terminology **D1600**, unless otherwise indicated.

4. Classification

4.1 This specification covers two classes of fittings, fittings with split ring and compression nut and fittings with a copper crimp ring, suitable for use with four sizes of PEX/AL/PEX or PE/AL/PE pipe that meets the requirements of Specifications **F1281** and **F1282** respectively.

5. Materials and Manufacture

5.1 *Fittings*—The fittings shall be made from one of the following metals.

5.1.1 *Wrought Copper Fittings*—Wrought copper fittings shall be made from material meeting the requirements of Specification **B75/B75M** for one of the following coppers: copper UNS Nos. C10200, C10300, C10800, C12000, or C12200.

5.1.2 *Cast Copper Alloy Fittings*—Cast copper alloy fittings shall be made from material meeting the requirements of Specification **B584**, copper alloy UNS C84400, C85700, C85710, or Specification **B62**, copper alloy UNS C83600. When fittings are assembled with copper insert fittings, the insert fittings shall comply with **5.1.1**.

5.1.3 *Cast Copper Alloy Valves*—Cast copper alloy valves shall be made from material meeting the requirements of Specification **B62** copper alloy UNS No. C83600 or Specification **B584** copper alloy UNS Nos. C83800, C87850, or

C84400. When valves are assembled with copper insert fittings, the insert fittings shall comply with **5.1.1**.

5.1.4 *Machined Brass Fittings*—Machined brass fittings shall be made from material meeting the requirements of Specification **B140/B140M** Copper Alloy UNS No. C31400, or Specification **B16/B16M**, Copper Alloy UNS No. C36000, or Specification **B62**, Copper Alloy UNS No. C83600 or Specification **B36/B36M**, Copper Alloy UNS No. C23000, or Copper Alloy UNS No. C27450, or Specification **B371/B371M**, Copper Alloy UNS No. C69300.

5.1.5 *Forged Brass Fittings*—Forged brass fittings shall be made from material meeting the requirements of Specification **B283/B283M**, Copper Alloy UNS No. C37700 or Specification **B124**, Alloy UNS No. C37700, Copper Alloy UNS No. C27450.

5.2 *Crimp Rings*—Crimp rings shall be made from copper UNS Nos. C10200, C12000, or C12200. The crimp rings shall have a minimum allowable hardness of 35 and a maximum allowable hardness of 45 on the Rockwell 15T scale when measured according to Test Methods **E18**.

5.3 *Split Rings*—Split rings shall be made from material meeting the requirements of Specification **B140/B140M** Copper Alloy UNS No. C31400, or Specification **B16/B16M** copper alloy UNS No. C36000, or Specification **B159/B159M** Copper Alloy UNS No. C51000 or Specification **B134/B134M**, UNS No. C27000 or Copper Alloy UNS No. C27450.

5.4 The O-rings used on the brass fittings to make a static seal shall be manufactured from ethylene propylene rubber (EPDM) or silicone rubber (Si), with a Shore A durometer between 60 and 70 when tested in accordance with ASTM Test Method **D2240**.

6. Performance Requirements

6.1 *General*—All performance tests shall be performed on assemblies of fittings and PEX/AL/PEX pipe. Fittings, split rings and crimp rings shall meet the material and dimensional requirements of this standard. PEX/AL/PEX pipe shall meet the requirements of Specification **F1281**. Assembly of test specimens shall be in accordance with either **8.1** or **8.2**, as applicable. Each assembly shall contain at least one joint. Use separate sets of assemblies for each performance test requirement.

6.2 *Hydrostatic Burst*—Assemblies shall meet the minimum hydrostatic burst requirements shown in **Table 1** when tested in accordance with **9.5**.

TABLE 1 Minimum Hydrostatic Burst Strength Requirements for Fitting and PEX/AL/PEX Pipe Assemblies

Nominal Pipe Size, mm (in.)		Minimum Burst Pressures at Different Temperatures			
		psi at 73.4 °F	(kPa at 23 °C)	psi at 180 °F	(kPa at 82.2 °C)
1216	(1/2)	870	(6000)	580	(4000)
1620	(5/8)	725	(5000)	550	(3800)
2025	(3/4)	580	(4000)	465	(3200)
2532	(1)	580	(4000)	465	(3200)

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.org>.

⁵ Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48105, <http://www.nsf.org>.