



Standard Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps for SDR9 Crosslinked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing¹

This standard is issued under the fixed designation F2159; 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 establishes requirements for sulfone plastic insert fittings and copper crimp rings, or alternate stainless steel clamps for four sizes Nominal Tubing Sizes (NTS) ($\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$, and 1) of cross-linked polyethylene (PEX) tubing that meet the requirements for Specification F876 or Specification F3253, or polyethylene of raised temperature (PE-RT) tubing that meet the requirements of Specification F2623 or Specification F2769. These fittings are intended for use in 100 psi (690 kPa) cold- and hot-water distribution systems operating at temperatures up to and including 180 °F (82 °C). Included are the requirements for material, molded part properties, performance, workmanship, dimensions, and markings to be used on the fittings and rings.

1.1.1 When used with PEX tubing in accordance with Specification F876, the fittings covered by this specification are intended for use in, but not limited to, residential and commercial, hot- and cold-potable water distribution systems, reclaimed water, fire protection, municipal water service lines, building supply lines, radiant heating and cooling systems, hydronic distribution systems, snow and ice melting systems, geothermal ground loops, district heating, turf conditioning, compressed air distribution, and building services pipe.

1.1.2 When used with PEX tubing in accordance with Specification F3253, the fittings covered by this specification are intended for use in residential and commercial hydronic heating and cooling systems.

1.1.3 When used with PE-RT tubing in accordance with Specification F2769, the fittings covered by this specification are intended for use in residential and commercial, hot- and cold-potable water distribution systems, and building supply lines.

1.1.4 When used with PE-RT tubing in accordance with Specification F2623, the fittings covered by this specification

are intended for use in general fluid transport, including hydronics and irrigations systems.

1.2 Included are the requirements for material, molded part properties, performance, workmanship, dimensions, and markings to be used on the fittings and rings.

1.3 The following is an index of the appendix in this specification:

GO/NO-GO Crimp Gauges

Appendix X1

1.4 *Units*—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 method portions, Sections 11 and 12, 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.*

1.6 *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

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

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.

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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

- D1600** Terminology for Abbreviated Terms Relating to Plastics
- D2122** Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- D2837** Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
- D6394** Classification System for and Basis for Specification for Sulfone Plastics (SP)
- F412** Terminology Relating to Plastic Piping Systems
- F876** Specification for Crosslinked Polyethylene (PEX) Tubing
- F1498** Specification for Taper Pipe Threads 60° for Thermoplastic Pipe and Fittings
- F1807** Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring, or Alternate Stainless Steel Clamps, for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing
- F2098** Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) to Metal Insert and Plastic Insert Fittings
- F2623** Specification for Polyethylene of Raised Temperature (PE-RT) Systems for Non-Potable Water Applications
- F2769** Specification for Polyethylene of Raised Temperature (PE-RT) Plastic Hot and Cold-Water Tubing and Distribution Systems
- F3253** Specification for Crosslinked Polyethylene (PEX) Tubing with Oxygen Barrier for Hot- and Cold-Water Hydronic Distribution Systems

2.2 ASME Standard:

B 1.20.1 Pipe Threads General Purpose Inch³

2.3 NSF International Standard:

ANSI/NSF Standard No. 14 for Plastic Piping Components and Related Materials⁴

ANSI/NSF Standard No. 61 for Drinking Water System Components-Health Effects⁴

2.4 ISO Standards:⁵

ISO 9080 Plastics piping and ducting systems -- Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation

ISO 12162 Thermoplastics materials for pipes and fittings for pressure applications –Classification, designation and design coefficient

3. Terminology

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

4. Classification

4.1 This specification governs one class of fittings and copper crimp rings or alternate stainless steel clamps suitable for use with nominal size $\frac{3}{8}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1 size PEX tubing that meets the requirements of Specification **F876** or Specification **F3253** and PE-RT tubing that meets the requirements of Specification **F2623** or Specification **F2769**.

5. Materials and Manufacture

5.1 *Material*—Fittings shall be molded from sulfone plastic (SP) as specified in Specification **D6394**. The material shall be unreinforced polysulfone (group 01, class 1, grades 1 or 2) or polyphenylsulfone (group 03, class 1, grade 1 or 2) or unreinforced polyphenylsulfone/polysulfone blends (group 04, Class 1, grade 2) or reworked plastic in accordance with **5.1.1**.

NOTE 1—Since fittings specified by this standard will be used in hot-and-cold water plumbing systems, a material used to manufacture fittings in accordance with this specification must demonstrate qualities consistent with that application in addition to the performance requirements of this specification. Those qualifying characteristics include, but are not limited to, an established hydrostatic design basis (HDB) in accordance with Test Method **D2837** or ISO 9080/ ISO 12162 minimum required strength (MRS) and a demonstration of resistance to the long-term effects of those chemicals normally found in potable water at the maximum temperature stated in this specification.

5.1.1 *Rework Material*—Clean rework material of the same commercial designation, generated from the manufacturer's own production may be used by the same manufacturer, provided the fittings meet all of the requirements of this specification. Reworked material shall not be introduced at a ratio exceeding 25 %.

5.2 *Potable Water Requirements*—Products intended for the transport of potable water shall be evaluated, tested and certified for conformance with ANSI/NSF Standard No. 61 or the health effects portion of ANSI/NSF Standard No. 14 by an acceptable certifying organization when required by the regulatory authority having jurisdiction.

5.3 *Crimp Rings*—Crimp rings shall be manufactured and marked in accordance with the requirements of Specification **F1807**.

5.4 *Alternate Stainless Steel Clamps*—Clamps shall be made from stainless steel in conformance with all requirements of Specification **F2098**.

6. Molded Part Properties

6.1 *Insert Crush*—The fitting insert shall not crack, split, or shatter when tested in accordance with **12.1**.

6.2 *Splay*—The molded part shall be free of visible splay excepting some slight blushing at the gate location.

7. Performance Requirements

7.1 *General*—All performance tests shall be performed on assemblies of fittings, crimp rings, or alternate stainless steel clamps, and PEX tubing or PE-RT tubing, or both. Fittings and crimp rings shall meet the material and dimensional requirements of this standard. PEX tubing shall meet the requirements of Specification **F876** or Specification **F3253**. PE-RT tubing

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 NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, <http://www.nsf.org>.

⁵ Available from International Organization for Standardization (ISO), ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland, <http://www.iso.org>.