Designation: F2098 – 15

Standard Specification for Stainless Steel Clamps for Securing SDR9 Cross-linked Polyethylene (PEX) Tubing to Metal Insert and Plastic Insert Fittings[1]

This standard is issued under the fixed designation F2098; 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 stainless steel clamps for use with five sizes of insert fittings that comply with F1807 or F2159, and cross-linked polyethylene (PEX) plastic tubing that complies with F876. These clamps are intended as an alternative to the copper-alloy crimp-rings of Specifications F1807 for use in 100 psi (689.5 kPa) cold- and hot-water distribution systems operating at temperatures up to and including 180°F (82°C). Included are requirements for materials, workmanship, dimensions and marking of the stainless steel clamps; requirements for deforming the clamps; which apply to assemblies of PEX tubing and Specifications F1807 and F2159, insert fittings secured with deformed clamps per this specification.

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.

1.3 *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]

A240/A240M Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications

D1600 Terminology for Abbreviated Terms Relating to Plastics

F412 Terminology Relating to Plastic Piping Systems

F876 Specification for Crosslinked Polyethylene (PEX) Tubing

F877 Specification for Crosslinked Polyethylene (PEX) Hot- and Cold-Water Distribution Systems

F1807 Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

F2159 Specification for Plastic Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Polyethylene of Raised Temperature (PE-RT) Tubing

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 one class of stainless steel clamps in five sizes suitable for securing PEX tubing that meets the requirements of Specifications F876 to insert fittings that meet the requirements of Specifications F1807 and F2159.

5. Materials and Manufacture

5.1 *Clamps*—Clamps shall be made from material meeting the requirements of Specification A240/A240M stainless steel UNS S304000.

6. General Requirements

6.1 The following sections of Specification F877 constitute a part of this specification.

6.1.1 Requirements,

6.1.2 Test Methods, and

6.1.3 Retest and Rejection.

6.2 In addition, when a section with a title identical to that referenced in 6.1 above, appears in this specification, it contains additional requirements that supplement those appearing in Specification F877.

6.3 *General*—All performance tests shall be performed on assemblies of fittings, clamps and PEX tubing. Clamps shall

[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 Nov. 1, 2015. Published February 2016. Originally approved 2001. Last previous edition approved in 2008 as F2098–08. DOI: 10.1520/F2098-15.

[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.

meet the material and dimensional requirements of this specification. Metal insert fittings shall meet the material and dimensional requirements of Specification F1807. Plastic insert fittings shall meet the material and dimensional requirements of Specification F2159. PEX tubing shall meet the requirements of Specification F876. Assembly of test specimens shall be in accordance with 9.1.1. Each assembly shall contain at least two (2) joints. Use separate sets of assemblies for each performance test requirement.

7. Dimensions

7.1 *Dimensions and Tolerances*—The dimensions and tolerances of clamps shall be as shown in Figs. 1-4 and Table 1 and Table 2.

8. Workmanship, Finish, and Appearance

8.1 The surfaces of the clamps shall be smooth and free of foreign material. Clamps shall be free of cracks, holes, corrosion, voids, foreign inclusions, or other defects that are visible to the unaided eye that have potential to affect the clamp integrity.

8.1.1 The manufacturer shall verify that any residual manufacturing substances on clamps are compatible with PEX System components such as PEX tube or insert fittings.

9. Assembly

9.1 *Clamp Joints*—Insert fittings shall be joined to PEX tubing by deforming and locking a stainless steel clamp around the outer circumference of the tubing, forcing the tubing material into annular spaces formed by the ribs on the fitting. Metal insert fittings shall meet the material and dimensional requirements of Specification F1807. Plastic insert fittings shall meet the material and dimensional requirements of Specification F2159. PEX tubing shall meet the requirements of Specifications F876. Clamps shall meet the dimensional and material requirements of this specification.

9.1.1 *Clamping Procedure*—The clamping procedure shall be as follows: slide the clamp onto the tubing, insert the ribbed end of the fitting into the end of the tubing until the tubing contacts the shoulder of the fitting or tube stop. The clamp shall then be positioned on the tubing so the edge of the clamp is ⅛ to ¼ in. (3.2 to 6.4 mm) from the end of the tube. The ratcheting clamping tool shall be used to close the clamp. The tool will not release until the clamp is properly closed. Ratcheting hand tools shall conform to the dimensional requirements of Fig. 3.

9.1.2 *Clamping Tools*—Clamps and ratcheting hand tools from different manufacturers have similar appearances. Clamps shall be installed using the tools and calibration methods recommended by the clamp manufacturer.

10. Retest

10.1 If any failure occurs, a retest shall be conducted only if agreed upon between the purchaser and the seller. Failure in the retest indicates the quantity of clamps represented by the sample does not conform to the requirements of this specification.

11. Product Marking

11.1 *Quality of Marking*—The marking shall be applied to the clamps in such a manner that it remains legible after installation and inspection.

11.2 *Content of Marking:*

11.2.1 Marking on clamps shall include manufacturer's name or trademark, or some other identifying mark, and if size permits, the designation, "F2098."

11.2.1.1 Where recessed marking is used on clamps, care shall be taken to see that the marking shall not cause cracks or reduce the wall thickness below the minimum specified.

11.2.2 Marking on packaging shall include manufacturer's name; date of manufacture or manufacturing lot code, or both; clamp size; and "ASTM F2098 for use with ASTM F1807 and F2159 insert fittings and ASTM F876 PEX Tubing."

12. Quality Assurance

12.1 When the clamp or clamp packing is marked with the ASTM designation "F2098" the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this specification and has been found to meet the requirements of this specification. The manufacturer further affirms that when clamps so marked are used in accordance with this specification to secure PEX tubing conforming to F876 or F877 to insert fittings conforming to Specifications

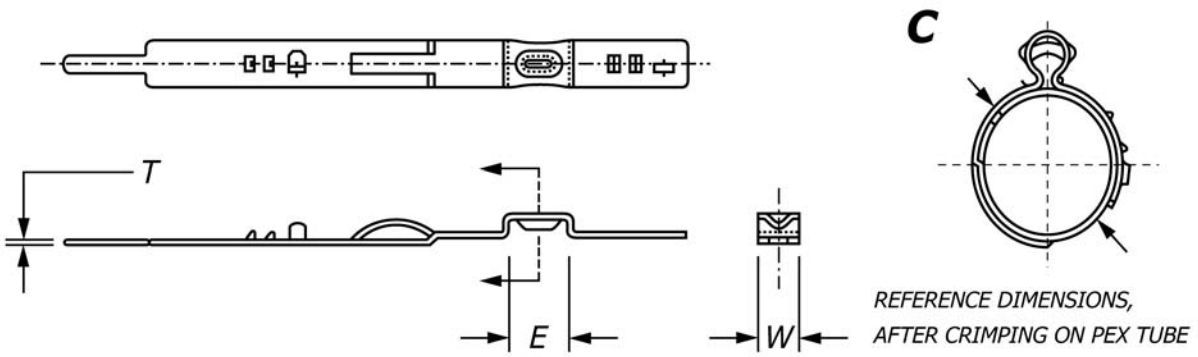


FIG. 1 Design and Layout

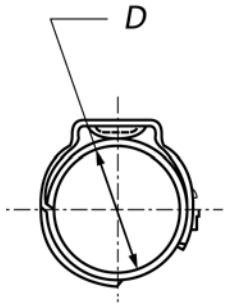
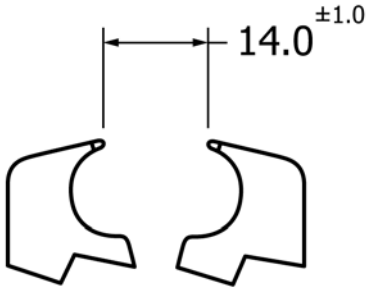


FIG. 2 Critical Dimensions



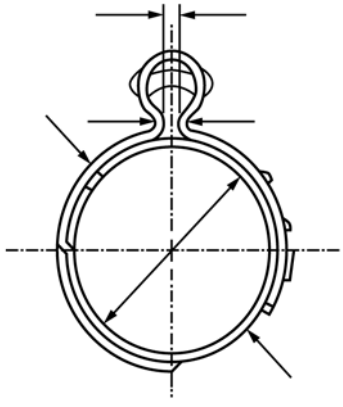
OPEN
HAND TOOL

Open

	max	min
in.	0.591	0.511
mm	(15.0)	(13.0)

Closed dimensions, for ratcheting hand tool, to be calibrated in accordance with the clamp manufacturer's specified dimensional recommendations and practices.

FIG. 3 Ratcheting Hand Tool Critical Dimensions



REFERENCE DRAWING,
AFTER CRIMPING

Arrows indicate various areas that can be checked or gauged, after crimping, to validate an effective final assembly. This validation should be conducted in accordance with the clamp manufacturer's specified dimensional recommendations and practices.

FIG. 4 Dimensional Checks to Validate Effective Final Assembly

F1807 or F2159, the assembled joints will conform to the performance requirements of this specification.

TABLE 1 Design and Layout Dimensions

Size	*C*	*E*	*T*	*W*
⅜ in.	0.472 + 3T (12.0 + 3T)	0.314 (8.0)	0.033 (0.84) 0.023 (0.58)	0.276 (7.0)
½ in.	0.598 + 3T (15.2 + 3T)	0.394 (10.0) 0.034 (0.86)	0.030 (0.76)	0.276 and 0.315 (7.0 and 8.0)
⅝ in.	0.717 + 3T (18.2 + 3T)	0.394 (10.0)	0.034 (0.86) 0.030 (0.76)	0.276 (7.0)
¾ in.	0.842 + 3T (21.4 + 3T)	0.394 (10.0)	0.038 (0.97) 0.030 (0.76)	0.354 & 0.394 (9.0 and 10.0)
1 in.	1.083 + 3T (27.5 + 3T)	0.394 (10.0)	0.052 (1.32) 0.030 (0.76)	0.394 (10.0)

TABLE 2 Critical Dimensions

Size	*D*
⅜ in.	0.524 (13.3)
½ in.	0.689 (17.5)
⅝ in.	0.819 (20.8)
¾ in.	0.917 (23.3)
1 in.	1.165 (29.6)

13. Dimensions

13.1 Design and Layout, as noted in Fig. 1 and Table 1 are for "reference" only. Specific dimensions and clamp features, other than what is noted in Fig. 2 and Table 2 as "Critical Dimensions" are to be left at the discretion of the individual manufacturer to accommodate varying manufacturing processes.

14. Tolerances

14.1 Tolerances on all critical dimensions (*D*) are ±0.010 in. (±0.25 mm). "Thickness" (*T*) tolerances ± 0.001 in. (± 0.025 mm).

15. Keywords

15.1 cold and hot water distribution; cross-linked polyethylene; metal insert fittings; PEX; stainless steel clamps