



Standard Specification for Metal Insert Fittings Utilizing a Copper Crimp Ring for SDR9 Cross-linked Polyethylene (PEX) Tubing and SDR9 Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) Tubing¹

This standard is issued under the fixed designation F2434; 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 o-ring seals and copper crimp rings for use with Cross-linked Polyethylene (PEX) and Cross-linked Polyethylene/Aluminum/Cross-linked Polyethylene (PEX-AL-PEX) tubing in $\frac{1}{2}$, $\frac{3}{4}$ 1, and $1\frac{1}{4}$ in. nominal diameters that meet the requirements for Specifications F876 and F2262. These fittings are intended for use in 125 psi (861.9 kPa) (PEX-AL-PEX) and 100 psi (689.5 kPa) (PEX) cold- and hot-water distribution systems operating at temperatures up to and including 180°F (82°C). Included are the requirements for materials, workmanship, dimensions, performance, and markings to be used on the fittings and rings.

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 Compliance with this specification requires that these fittings be tested and certified to Specification F877 and F2262.

1.4 *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

- B16/B16M Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
- B62 Specification for Composition Bronze or Ounce Metal Castings

- B140/B140M Specification for Copper-Zinc-Lead (Red Brass or Hardware Bronze) Rod, Bar, and Shapes
- B283 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
- D1600 Terminology for Abbreviated Terms Relating to Plastics
- D2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
- E18 Test Methods for Rockwell Hardness of Metallic Materials
- 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
- F2262 Specification for Crosslinked Polyethylene/Aluminum/Crosslinked Polyethylene Tubing OD Controlled SDR9

2.2 ASME 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 Manufacturer's Standardization Society Standard: SP-104 Wrought Copper Solder Joint Pressure Fittings⁴

2.4 NSF International Standards:⁵

- NSF/ANSI 14 Plastic Piping Components and Related Materials

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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 Society of Mechanical Engineers (ASME), ASME International Headquarters, Three 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 NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48113-0140, http://www.nsf.org.

*A Summary of Changes section appears at the end of this standard

NSF/ANSI 61 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 one class of fittings and copper crimp rings suitable for use with tubing that meets the requirements of Specifications **F876** and **F2262**.

5. Materials and Manufacture

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

5.1.1 *Cast Copper Alloys*—Cast copper alloy fittings shall be made from material meeting the requirements of Specification **B584**, Copper Alloy UNS Nos. C84400, C83800, C87850 or C89844 or Specification **B62** Copper Alloy UNS No. C83600.

5.1.2 *Machined Brass*—Machined brass fittings shall be made from material meeting the requirements of Specification **B371/B371M**, Copper Alloy UNS No. C69300, Specification **B140/B140M** Copper Alloy UNS No. C31400, Specification **B283** Copper Alloy UNS No. C37700, or Specification **B16/B16M** Copper Alloy UNS No. C36000 or C69300 Copper Alloy UNS No. C27450.

5.1.3 *Forged Brass*—Forged brass fittings shall be made from material meeting the requirements of Specification **B283** Copper Alloy UNS Nos. C37700 or Copper Alloy UNS No. C27450.

5.2 *Crimp Rings*—Crimp rings shall be made from copper UNS Nos. C10200, or C12200, and shall be black in color or alternately be identified per **10.2.3.2** of this specification. 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 *O-rings*—O-rings used on the copper alloy 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 Specification **D2240**.

6. General Requirements

6.1 The following sections of Specifications **F877** and **F2262** constitute a part of this specification.

6.1.1 Use with PEX Tubing (**F877**):

6.1.1.1 Requirements,

6.1.1.2 Test Methods, and

6.1.2 Use with PEX-AL-PEX Tubing (**F2262**):

6.1.2.1 Performance Requirements of Connectors except product marking section.

6.1.3 Retest and Rejection.

6.2 In addition, when a section with a title identical to that referenced in **6.1**, appears in this specification, it contains additional requirements that supplement those appearing in Specifications **F877** and **F2262**.

6.3 *Dimensions*—Any randomly selected fitting or fittings, and crimp ring or crimp rings, shall be used to determine dimensions. Measurements shall be made in accordance with Test Method **D2122**, except determine diameters by making measurements at four locations spaced approximately 45° apart around the circumference. Inspection and gauging of solder joint ends shall be in accordance with ASME B16.18, ASME B16.22, or MSS SP-104.

6.4 *General*—All performance tests shall be performed on assemblies of fittings, crimp rings, PEX, and PEX-AL-PEX tubing. Fittings and crimp rings shall meet the material and dimensional requirements of this specification. PEX tubing shall meet the requirements of Specification **F876**. PEX-AL-PEX tubing shall meet the requirements of Specification **F2262**. Assembly of test specimens shall be in accordance with **9.1.1**. Use separate sets of assemblies for each performance test requirement. In addition, fittings shall be designed with sufficient overall dimensions to allow proper use of crimp tool without interference with previously completed crimps on the same fitting.

7. Dimensions

7.1 *Dimensions and Tolerances*—The dimensions and tolerances of fittings and crimp rings shall be as shown in **Fig. 1**, **Fig. 3**, **Fig. 4**, and **Table 1**, when measured in accordance with **6.3**.

7.1.1 *Alignment*—The maximum angular variation of any opening shall not exceed 1° off the true centerline axis.

7.1.2 *Fittings with Solder Joint Ends*—Solder joint ends shall be in accordance with ASME B16.22, ASME B16.18, or MSS SP-104.

7.1.3 *Tapered Threaded Ends*—Fitting threads shall be right-hand conforming to ASME B1.20.1. They shall be taper threads (NPT).

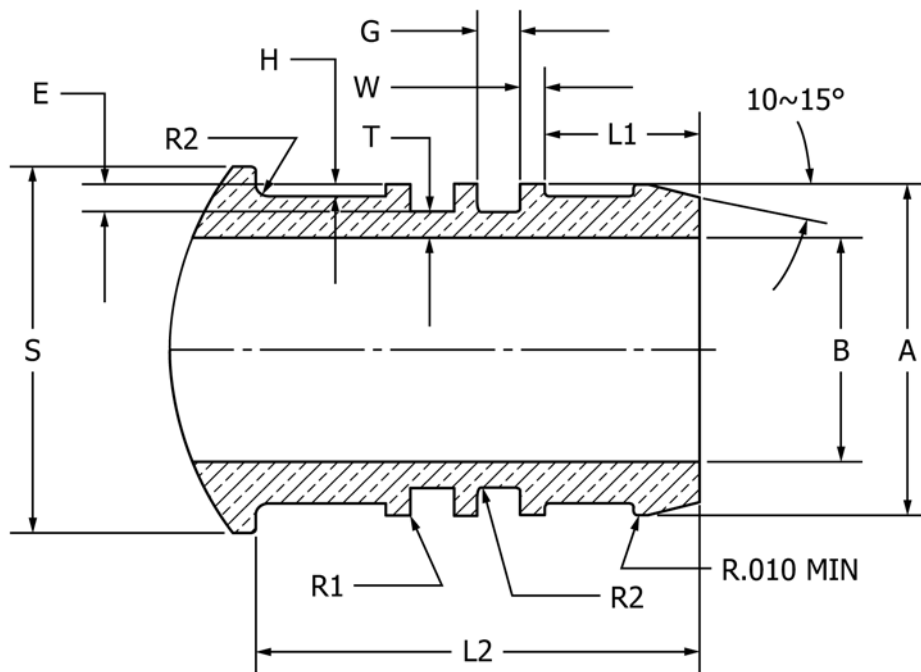
8. Workmanship, Finish, and Appearance

8.1 The sealing surfaces of the insert shall be smooth and free of foreign material. Fitting walls shall be free of cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the unaided eye, that affect the wall integrity.

9. Assembly

9.1 *Crimp Joints*—Insert fittings shall be joined to PEX, or PEX-AL-PEX, tubing by the compression of a copper crimp ring around the outer circumference of the tubing, forcing the tubing material into annular spaces formed by ribs on the fitting. Insert fittings and crimp rings shall meet the dimensional and material requirements of this standard. The dimensions and out-of-roundness of the crimp ring, after it has been crimped, shall be in accordance with **Table 1**.

9.1.1 *Crimping Procedure*—The crimping procedure shall be as follows: slide the crimp ring 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 crimp ring shall then be positioned on the tubing so the edge of the crimp ring is 1/8 to 1/4 in. (3.2 to 6.4 mm) from the end of the tube. The jaws of the crimping tool shall be centered over the crimp ring and the tool shall be held so that the crimping



Size	A Outside Diameter of Rib	B Mini- mum ID	L1 Distance to First Rib	L2 Min Insert Length ^A	H Min Rib Height	Num- ber of Ribs ^B	W Rib ^C Width	G Rib Spacing Typical	T Mini- mum Wall ^D	R1 Mini- mum Rib Ra- dius	R2 Mini- mum Ra- dius	S Isolator Diameter ^E	E Groove Depth
½ in.	0.471 ± 0.004	0.310	0.214-0.224	0.625	0.013	3	0.03-0.04	0.058-0.066	0.028	0.006	0.015	0.518 ± 0.002	0.040± 0.001
¾ in.	0.667 ± 0.004	0.500	0.214-0.224	0.625	0.013	3	0.03-0.04	0.058-0.066	0.037	0.006	0.015	0.738 ± 0.005	0.040± 0.001
1 in.	0.856 ± 0.004	0.667	0.214-0.224	0.795	0.013	4	0.03-0.04	0.058-0.066	0.041	0.006	0.015	0.963 ± 0.005	0.040± 0.001
1¼ in.	1.045 ± 0.004	0.860	0.214-0.224	0.795	0.013	4	0.03-0.04	0.058-0.066	0.045	0.006	0.015	1.150 ± 0.005	0.040± 0.001

^A Measured from shoulder of rib to end of fitting.

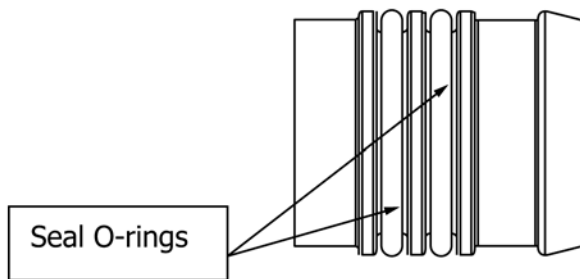
^B Lead chamfer area is not considered a rib.

^C Rib sides may be angled.

^D Applies to entire fitting, not just insert area.

^E This diameter serves as a tube stop to isolate Aluminum layer, in PEX-AL-PEX tubing, preventing contact with the brass.

FIG. 1 Fitting Insert Dimensions and Tolerances



NOTE 1—The Barb/O-ring design is covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative(s) to this patent item to the ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend.

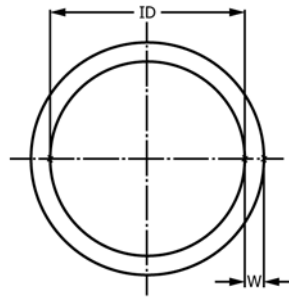
FIG. 2 Sealing O-ring Placement

jaws are approximately perpendicular to the axis of the barb. The jaws of the crimping tool shall be closed around the crimp ring, compressing the crimp ring onto the tubing. The crimp ring shall not be crimped more than once. Each crimp shall be checked to determine conformance to the after-crimped dimensional requirements of Table 1.

10. Product Marking

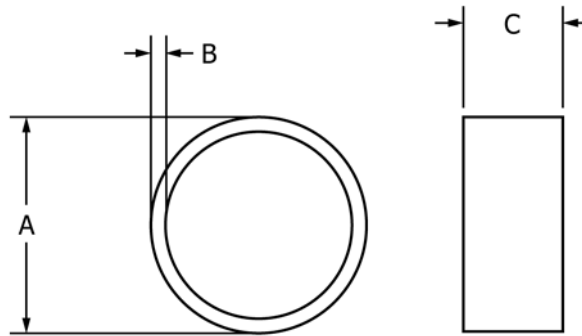
10.1 *Quality of Marking*—The marking shall be applied to the fittings in such a manner that it remains legible after installation and inspection.

10.2 *Content of Marking*:



Size	ID Inside Diameter	W O-ring Cross Section
1/2 in.	0.394 ± 0.005	0.039 ± 0.003
3/4 in.	0.591 ± 0.005	0.039 ± 0.003
1 in.	0.768 ± 0.009	0.039 ± 0.003
1 1/4 in.	0.945 ± 0.009	0.039 ± 0.003

FIG. 3 Fitting O-ring Dimensions and Tolerances



Size	A Avg Outside Diameter ^{A,B}	B		C Width
		Wall Thickness ^B	Average Wall ^{C,D}	
1/2 in.	0.750 ± 0.003	0.056 ± 0.0035	± 0.002	0.325 ± 0.020
3/4 in.	1.000 ± 0.003	0.056 ± 0.0035	± 0.002	0.325 ± 0.020
1 in.	1.250 ± 0.003	0.049 ± 0.0035	± 0.002	0.450 ± 0.020
1 1/4 in.	1.500 ± 0.003	0.055 ± 0.0035	± 0.002	0.550 ± 0.020

^A All dimensions shall be measured with appropriate micrometers, such as pin or ball micrometers for wall and outside diameter micrometers with flat anvils or vernier calipers shall be used to measure outside diameters and width of rings.

^B The average measurement is obtained from measurements taken in at least two different circumferential positions which are equally spaced around the circumference.

^C The average wall measurement is obtained from measurements taken in eight different positions which are equally spaced around the circumference.

^D The maximum out-of-roundness of the crimp ring shall not inhibit assembly with the fitting and tubing. The crimp ring dimensions after crimping shall comply with

Table 1.

FIG. 4 Copper Crimp Ring Dimensions Before Crimping

10.2.1 Marking on fittings shall include manufacturer's name or trademark, or some other identifying mark, and the ASTM standard number.

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

10.2.2 Marking on packaging shall include manufacturers' name, fitting size, and ASTM F2434.

10.2.3 Crimp rings:

10.2.3.1 Marking on crimp rings shall include manufacturers' trademark or some other identifying mark and ASTM F2434.

10.2.3.2 Manufacturer of crimp rings may use an alternate identifying marking in place of the "black in color" provided the ring is generally natural copper color with 1/8 in. minimum black font lettering stating "PEX" or "PEX-AL-PEX," or both

TABLE 1 Crimp Ring Dimensions After Crimping on Tube/Fitting Assembly

Nominal Tube Size Insert End	Final Crimped Outside Diameter ^{A,B}	
	Minimum, in. (mm)	Maximum, in. (mm)
1/2	0.700 (17.8)	0.715 (18.2)
3/4	0.945 (24.0)	0.960 (24.4)
1	1.175 (29.8)	1.190 (30.2)
1 1/4	1.431 (36.3)	1.445 (36.7)

^A For all diameters except for the area of scoring caused by the crimping tool.

^B The maximum out-of-roundness as measured by the difference between the minimum crimped outside diameter and the maximum crimped outside diameter shall not exceed 0.006 in. (0.150 mm).

legibly printed in two (2) locations spaced equally, approximately 180° on the ring's outer circumference. For sizes

smaller than 3/4 in. where both "PEX" and "PEX-AL-PEX" marks are applied, it is permissible to only print "PEX" and "PEX-AL-PEX" in one location on the circumference.

11. Quality Assurance

11.1 When the product or product packing is marked with the ASTM designation F2434, 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.

12. Keywords

12.1 cold and hot water distribution; copper crimp rings; cross-linked polyethylene; metal insert fittings; PEX; PEX-AL-PEX

SUPPLEMENTARY REQUIREMENTS

This requirement applies whenever a regulatory authority or user calls for product to be used to convey or be in contact with potable water.

S1. Potable Water Requirements

S1.1 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

NSF Standard No. 14, by an acceptable certifying organization, when required by the regulatory authority having jurisdiction.

APPENDIX

(Nonmandatory Information)

X1. GO/NO-GO CRIMP GAGE

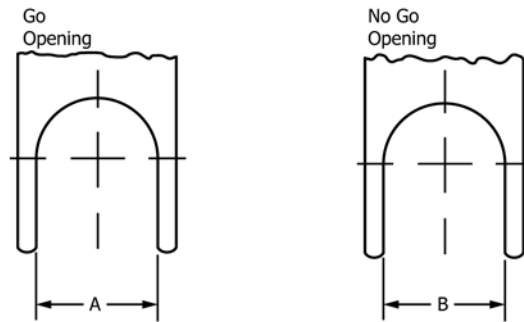
X1.1 This appendix provides dimensions for gages to check the after-crimped dimensions of the four sizes of crimp connections covered by this specification. This information has been taken from gages in current production at the time of the writing of this specification. Gages shown here provide only a reference for the maximum and minimum diameters of the crimped ring and do not provide a check for the out-of-round dimension. Additionally, calipers or micrometers may be used.

X1.2 Crimp gages manufactured according to the dimensions shown in Fig. X1.1 will ensure that crimps checked with these gages will not be larger or smaller than those allowed by this specification.

X1.3 *Use of the Crimp GO/NO-GO Gage*—Slide the correct size GO section of the gage over the crimped ring in at least

two places and attempt to slide the NO-GO section of the gage over the crimped ring in at least two places (see Note X1.1). The GO section of the gage should slide over the crimped ring easily and the NO-GO section should not slide over the crimped ring. If the GO section does not slide over the ring, or the NO-GO section slides over the ring, the crimped joint must be replaced. Additionally, the crimp tool may need adjustment; follow the recommendations of the tool manufacturer.

NOTE X1.1—Most of the commercially available crimp tools will produce a scoring mark on the ring where the jaws of the tool overlap. Gaging the crimped ring on this scoring mark will generally give a false reading. Gage the crimped ring away from the scoring mark for best accuracy.



Gage Opening		
Nominal Tube Size Insert End	Go (A)	No Go (B)
1/2	0.715 +0.000/- 0.002	0.700 +0.002/- 0.000
3/4	0.960 +0.000/- 0.002	0.945 +0.000/- 0.002
1	1.190 +0.000/- 0.002	1.175 +0.000/- 0.002
1 1/4	1.445 +0.000/- 0.002	1.431 +0.000/-0.002

FIG. X1.1 Go/No-Go Gages

SUMMARY OF CHANGES

Committee F17 has identified the location of selected changes to this standard since the last issue (D2434–09) that may impact the use of this standard. (Approved August 1, 2014)

- (1) Revised 5.2 to add an alternate identification marking of the crimp ring as an option to the material requirement that states the crimp ring “shall be black in color”.
- (2) Added 10.2.3 specific to “crimp rings”, renumbered 10.2.3.1, and added 10.2.3.2 as a new alternate marking

requirement to identify crimp ring type as being specific for use with PEX, and, or PEX-AL-PEX.

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