



Standard Specification for Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing¹²

This standard is issued under the fixed designation F1961; 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 mechanical cold flare compression fittings with integral disc spring suitable for use with cross-linked polyethylene PEX plastic tubing in $\frac{3}{8}$, $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{3}{4}$ nominal diameters, that meets the requirements of Specifications F876 and F877. These fittings are intended for use in 100 psi (689.5 kPa) cold and hot water distributions systems and hydronic heating systems operating at temperatures up to and including 180°F (82°C). Included are the requirements for materials, workmanship, dimensions, and markings to be used on the fittings.

1.2 *Units*—The values stated in inch-pounds units are to be regarded as the standard. The values given in parentheses are mathematical conversions to SI units which 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:³

- A666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar
- B16/B16M Specification for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines
- 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)

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 The cold flare compression fitting with integral disc spring is covered by a patent. Interested parties are invited to submit information regarding the identification of an alternative to this patented item to ASTM headquarters. Your comments will receive careful consideration at a meeting of F17, which you may attend.

³ 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.

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) Plastic Hot- and Cold-Water Distribution Systems

2.2 *ASME Standards:*⁴

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 *NSF Standards:*⁵

NSF 14 Plastic Piping Components and Related Materials

NSF 61 Drinking Water System Components-Health Effects

2.4 *DIN Standard:*⁶

DIN 1766.

2.5 *Other Standard:*⁷

MSS SP-104, Wrought Copper Solder Joint Pressure Fittings

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 covers one class of mechanical cold flare compression fittings suitable for use with four sizes of PEX tubing that meets the requirements of Specifications F876 and F877.

⁴ Available from American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th St., New York, NY 10017.

⁵ Available from National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

⁶ Available from Deutsches Institut Fur Normung eV, Burggrafenstrasse 4 Berlin 30, West Germany D-1000.

⁷ Available from Manufacturer's Standardization Society of the Valve and Fittings Industry, 5203 Leesburg Pike, Suite 502, Falls Church, VA 22041.

5. Materials and Manufacture

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

5.1.1 *Machined Brass Fittings*—Machined brass fittings shall be made from material meeting the requirements of Specification **B140/B140M** copper alloy UNS C31400, Specification **B16/B16M** Copper alloy UNS C38500, or DIN 17660 – CuZn39Pb3.

5.1.2 *Forged Brass Fittings*—Forged brass fittings shall be made from material meeting the requirements of Specification **B283** Copper alloy UNS C37700, or DIN 17660-CuZn40Pb2.

5.1.3 *Disc Spring*—The disc spring assembly consists of one conical compression washer and one flat washer. Both washers shall be made from material meeting the requirements of Specification **A666** stainless steel UNS S30100. The flat washer shall be ½ hard. The minimum hardness of the conical compression washer shall be HRC 40.

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 Performance Requirements:

6.3.1 *General*—All performance test shall be preformed in assemblies of fittings and PEX tubing as defined in 8.3. Fittings and compression sleeves shall meet the material and dimensional requirements of this standard. PEX tubing shall meet the requirements of Specifications **F876** and **F877**. Assembly of test specimens shall be in accordance with 9.2. Use separate set of assemblies for each performance test requirement.

6.3.2 *Dimensions*— Randomly selected fitting or fittings and PEX reinforcing rings shall be used to determine dimensions. Measurements shall be made in accordance with Test Method **D2122**. Determine the diameters by making measurements at four points spaced at approximately 45° apart around the circumference. Inspection and gauging of taper joint ends shall be in accordance with ANSI **B16.18**, or ANSI **B16.22**, or MSS SP-104. Inspection and gaging of taper pipe threads shall be in accordance with ANSI **B1.20.1**. All fittings that will be subjected to secondary processes of mechanical marking, which affect their dimensional tolerances, shall be tested in their final marked configuration.

7. Dimensions

7.1 *Dimensions and Tolerances*—The dimensions and tolerances of fitting components shall be as shown in **Figs. 1-3** when measured in accordance with **6.3.2**. Dimensions and properties of flat and conical compression washer components of disc springs shall be in accordance with **Table 1**.

7.1.1 *Alignment*—The maximum angular variation of any opening shall not exceed ½ ° off the true centerline axis.

7.1.2 *Fittings with Solder Joint Ends*—External dimensions of solder joint ends shall be in accordance with ANSI B.16.22, **B16.18**, or MSS SP-104.

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

8. Workmanship, Finish and Appearance

8.1 The sealing surfaces of the fitting(s) shall be smooth and free of foreign material. The fitting walls shall be free of cracks, holes, blisters, voids, foreign inclusions or other defects that are visible to the eye without magnification and that have potential to affect the wall integrity.

9. Assembly

9.1 *Joints*—Mechanical cold flare compression fittings shall be joined to PEX tubing by the procedure of 8.2. Fittings shall meet the dimensional tolerances of this standard. PEX tubing shall meet the requirements of Specifications **F876** and **F877**.

9.1.1 *Solder Joints*—Soldering of fitting joints shall be completed prior to installation of the PEX tubing. Excessive heat from the soldering operation will damage the PEX tubing.

9.2 *Assembly Procedure*—Refer to **Fig. 4** for a cross-section of a fully-assembled cone union with PEX tubing and male fitting end. To affix the mechanical cold flare compression fitting to PEX tubing, the procedure shall be as follows:

9.2.1 Cut the tubing square using a cutter designed for plastic tubing. Inspect the end for burrs or foreign debris. Place the proper-size cone union assembly (female fitting) onto the assembly tool. Place the PEX tubing into the tool, so that the cut end abuts the cone union. Grip the PEX tubing by closing the locking handle of the tool until the tool locks. Fully close the compression lever. This action both presses the grip ring of the cone union assembly onto the PEX tubing, and flares the end of the PEX tubing to an angle of 22°. Open the compression lever to release the PEX tubing and the fitting. Tighten the cone union nut onto the mating (male) end of the desired fitting, until the torque shown in **Table 2** has been applied. Custom torque wrenches that are adjusted to slip at these torque values are available and appropriate.

9.3 One assembly for testing purposes is one fitting with PEX tubing assembled onto each leg of the fitting.

10. Quality Assurance

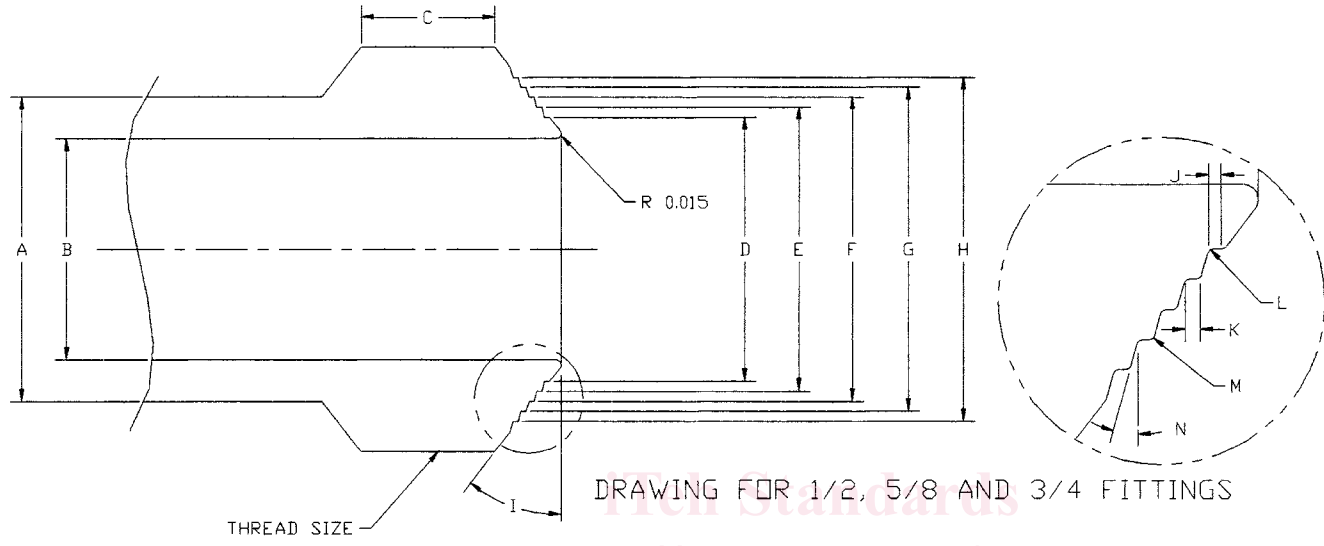
10.1 When the product or product packaging is marked with the ASTM designation F1961, the manufacturer affirms that the product was manufactured, inspected, sampled, and tested in accordance with this specification, and has been found to meet the requirements of this specification.

11. Product Marking

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

11.2 Content of Marking:

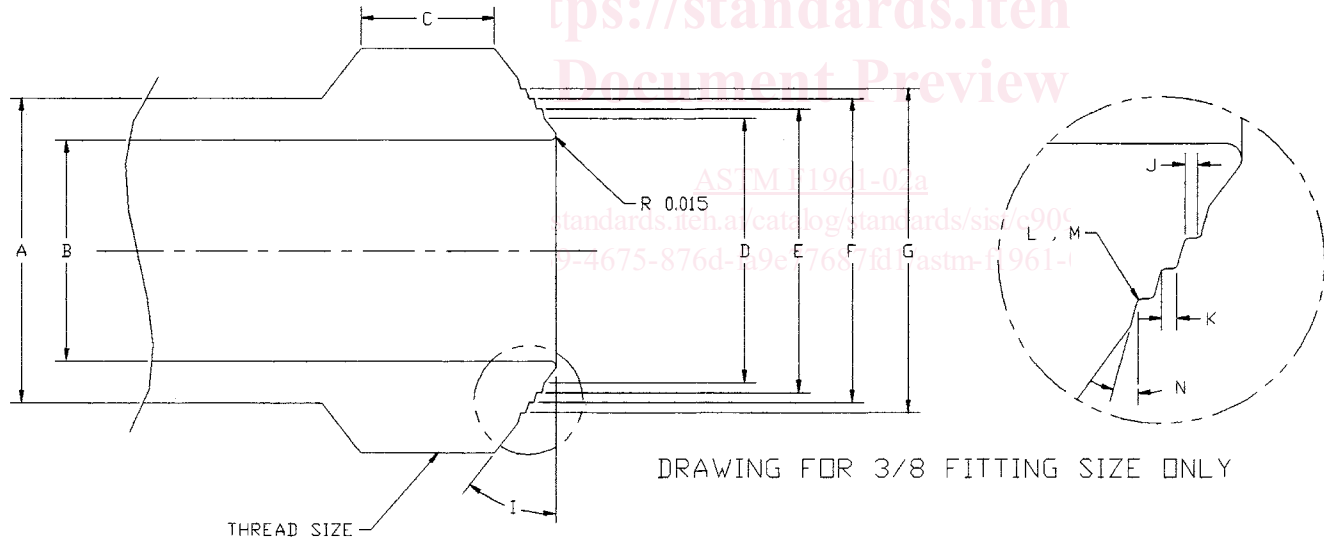
11.2.1 Marking on fittings shall include manufacturer's name or trademark, or some other identifying mark. Additional marking shall include ASTM standard number and PEX, if size permits.



DRAWING FOR 1/2, 5/8 AND 3/4 FITTINGS

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
BREAK ALL EDGES .005 - .010.
INTERNAL RADIUS .000 - .010.
ALL DIAMETERS CONCENTRIC
TO .005.

.X +/- .020
.XX +/- .010
.XXX +/- .005
ANGLES +/- 1/2 DEGREE



DRAWING FOR 3/8 FITTING SIZE ONLY

FITTING SIZE	DIM 'A'	DIM 'B'	DIM 'C'	DIM 'D'	DIM 'E'	DIM 'F'	DIM 'G'	DIM 'H'	DIM 'I'	DIM 'J'	DIM 'K'	DIM 'L'	DIM 'M'	DIM 'N'	THREAD SIZE
3/8	ø .58	ø .330	.22	ø .408	ø .453	ø .501	ø .548	N/A	38°	.0106	.0106	R .006	R .006	15°	M17 X 1.25
1/2	ø .766	ø .492	.28	ø .555	ø .603	ø .650	ø .698	ø .745	38°	.0111	.0122	R .006	R .006	15°	M22 X 1.5
5/8	ø .82	ø .572	.35	ø .700	ø .760	ø .820	ø .880	ø .940	38°	.0137	.0154	R .006	R .006	15°	M27 X 1.5
3/4	ø .91	ø .660	.40	ø .788	ø .848	ø .908	ø .968	ø 1.028	38°	.0137	.0154	R .006	R .006	15°	M30 X 2.0

FIG. 1 Male Fitting Dimensions