



Standard Specification for Metal Mechanical Cold Flare Compression Fittings with Disc Spring for Crosslinked Polyethylene (PEX) Tubing^{1,2}

This standard is issued under the fixed designation F 1961; 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 four sizes of PEX tubing that meets the requirements of Specifications F 876 and F 877. 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, burst pressure, sustained pressure, excessive temperature and pressure, temperature cycling tests, and markings to be used on the fittings.

1.2 The values stated in inch-pounds units are to be regarded as the standard. The SI values stated in parentheses are provided for information purposes.

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 and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:

- A 666 Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar³
- B 16 Specification for Free-Cutting Brass Rod, Bar, and Shapes for Use in Screw Machines⁴
- B 140/B 140M Specification for Copper-Zinc-Lead (Leaded Red Brass or Hardware Bronze) Rod, Bar and Shapes⁴
- B 283 Specification for Copper and Copper-Alloy Die Forgings (Hot Pressed)⁴
- D 618 Practice for Conditioning Plastics and Electrical

Insulation Materials for Testing⁵

- D 1598 Test Method for Time-To-Failure of Plastic Pipe Under Constant Internal Pressure⁶
- D 1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings⁶
- D 1600 Terminology for Abbreviated Terms Relating to Plastics⁵
- D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings⁶
- E 18 Test Methods for Rockwell Hardness and Rockwell Superficial Hardness of Metallic Materials⁷
- F 412 Terminology Relating to Plastic Piping Systems⁶
- F 876 Specification for Crosslinked Polyethylene (PEX) Tubing⁶
- F 877 Specification for Crosslinked Polyethylene (PEX) Plastic Hot- and Cold-Water Distribution Systems⁶
- 2.2 ASME Standards:⁸
 - 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:⁹
 - NSF 14 Plastic Piping Components and Related Materials
 - NSF 61 Drinking Water System Components-Health Effects
- 2.4 DIN Standard:¹⁰
 - DIN 1766.
- 2.5 Other Standard:¹¹
 - MSS SP-104, Wrought Copper Solder Joint Pressure Fittings

3. Terminology

3.1 *Definitions*—Definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600 unless otherwise indicated.

¹ This specification is under the jurisdiction of ASTM Committee F-17 on Plastic Piping Systems, and is the direct responsibility of Subcommittee F17.10 on Fittings. Current edition approved April 10, 1999. Published July 1999.

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 *Annual Book of ASTM Standards*, Vol 01.03.

⁴ *Annual Book of ASTM Standards*, Vol 02.01.

⁵ *Annual Book of ASTM Standards*, Vol 08.01.

⁶ *Annual Book of ASTM Standards*, Vol 08.04.

⁷ *Annual Book of ASTM Standards*, Vol 03.01.

⁸ Available from American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th St., New York, NY 10017.

⁹ Available from National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

¹⁰ Available from Deutsches Institut Fur Normung eV, Burggrafenstrasse 4 Berlin 30, West Germany D-1000.

¹¹ Available from Manufacturer's Standardization Society of the Valve and Fittings Industry, 5203 Leesburg Pike, Suite 502, Falls Church, VA 22041.

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 F 876 and F 877.

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 B 140 copper alloy UNS C31400, Specification B 16 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 B 283 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 A 666 stainless steel UNS S30100. The flat washer shall be 1/2 hard. The minimum hardness of the conical compression washer shall be HRC 40.

6. Performance Requirements

6.1 *General*—All performance tests shall be performed on 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 F 876 and F 877. Assembly of test specimens shall be in accordance with 8.2. 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.

6.3 *Hydrostatic Sustained Pressure Strength*—Assemblies shall meet the hydrostatic sustained pressure strength requirements shown in Table 2 when tested in accordance with 9.6.

6.4 *Thermocycling*—Assemblies shall not leak or separate when thermocycled 1000 times between the temperatures of 60 and 180°F (16 and 82°C) when tested in accordance with 9.7.

6.5 *Excessive Temperature and Pressure Capability:*

6.5.1 *General*—PEX tubing and fitting assemblies shall have adequate strength to accommodate short-term conditions, 30 days, of 210°F (99°C) and 150 psi (1034 kPa).

6.5.2 *Excessive Temperature Hydrostatic Sustained Pressure*—Tubing and fittings when tested as assemblies shall not fail as defined in Test Method D 1598 in less than 720 h when tested in accordance with 9.8 and the requirements shown in Table 3.

TABLE 1 Minimum Hydrostatic Burst Strength Requirements for Fitting and PEX Tubing Assemblies

Nominal Tubing Size in. (mm)	Minimum Burst Pressures at Different Temperatures ^A	
	psi at 73.4°F (kPa at 23°C)	psi at 180°F (kPa at 82.2°C)
3/8 (10)	620 (4275)	275 (1896)
1/2 (13)	480 (3309)	215 (1482)
3/4 and larger (16 and larger)	475 (3275)	210 (1448)

^AThe fiber stress to derive this test pressure is: 1900 psi (13.10 mPa) at 73.4°F (23.0°C), and 850 psi (5.86 mPa) at 180°F (82.2°C)

TABLE 2 Minimum Hydrostatic Sustained Pressure Requirements for Fitting and PEX Tubing Assemblies^A

Nominal Tubing Size, in. (mm) in. (mm)	Pressure Required for Test, psi (kPa) ^B 180 ± 4°F (82.2 ± 2°C)
3/8 (10)	250 (1724)
1/2 (13)	195 (1344)
3/4 and larger (16 and larger)	190 (1310)

^ATest duration is 1000 h.

^BThe fiber stress to derive this test pressure is 770 psi (5.31 mPa) at 180°F (82.2°C).

TABLE 3 Excessive Temperature and Pressure Requirements for Fitting and PEX Tubing Assemblies

Test Duration, h	Hydrostatic Test Pressure, psi (kPa) ^A	Air Bath Temperature, °F (°C)
720 min	150 min (1034)	210 ± 4 (99 ± 2)

^AThe fiber stress used to derive this test pressure is 595 psi (4.10 mPa) at 210°F (99°C)

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 9.4. Dimensions and properties of flat and conical compression washer components of disc springs shall be in accordance with Table 4.

7.1.1 *Alignment*—The maximum angular variation of any opening shall not exceed 1/2° 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 F 876 and F 877.

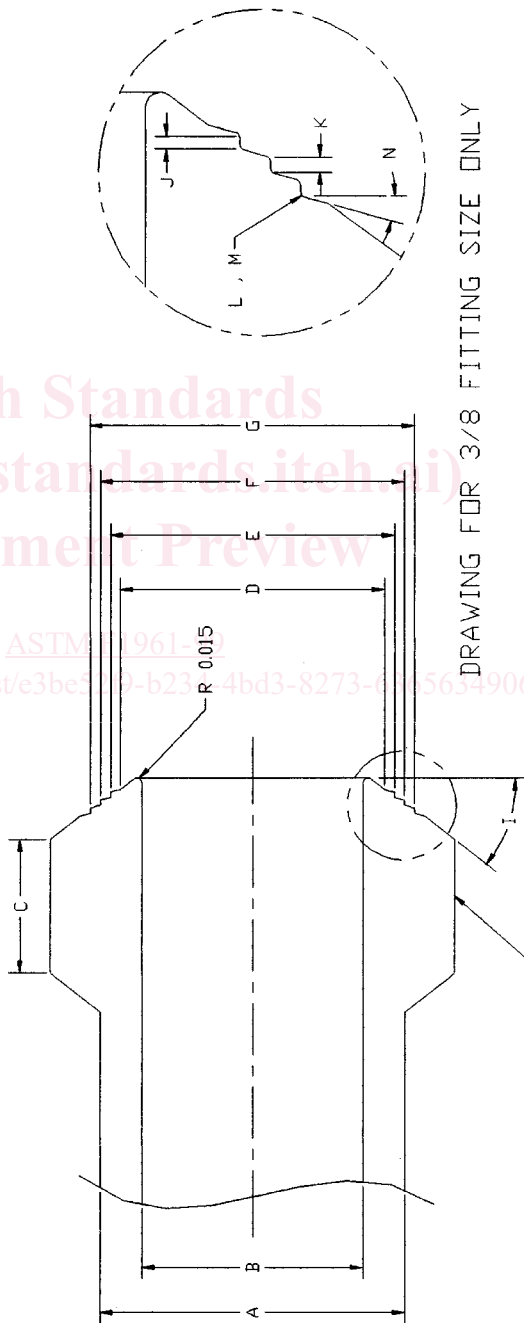
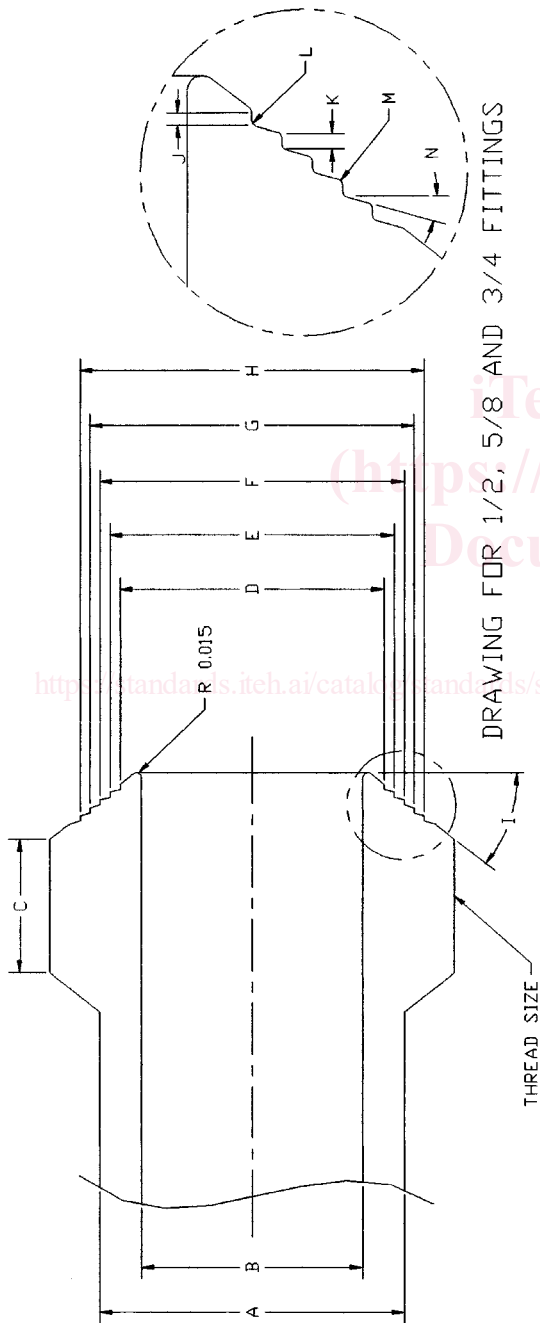
9.1.1 *Solder Joints*—Soldering of fitting joints shall be completed prior to installation of the PEX tubing. Excessive heat from the soldering operation will damage the PEX tubing.

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

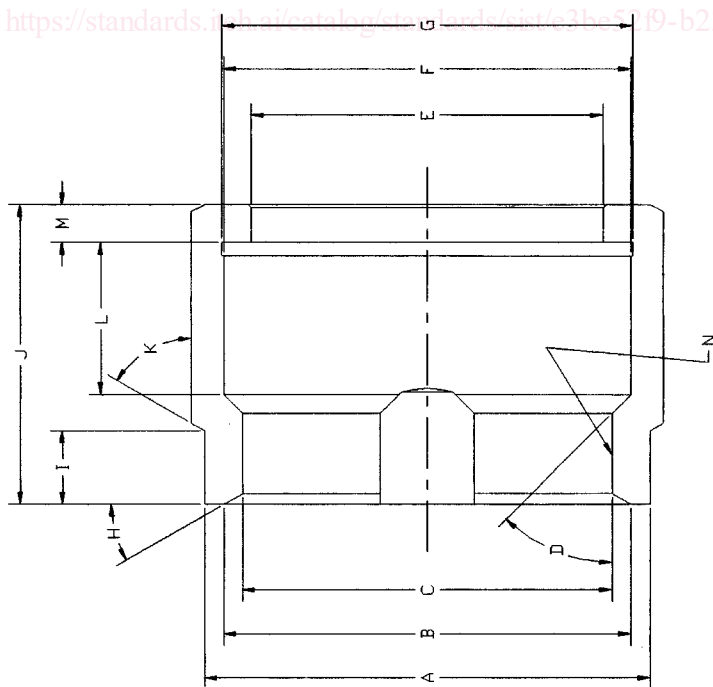
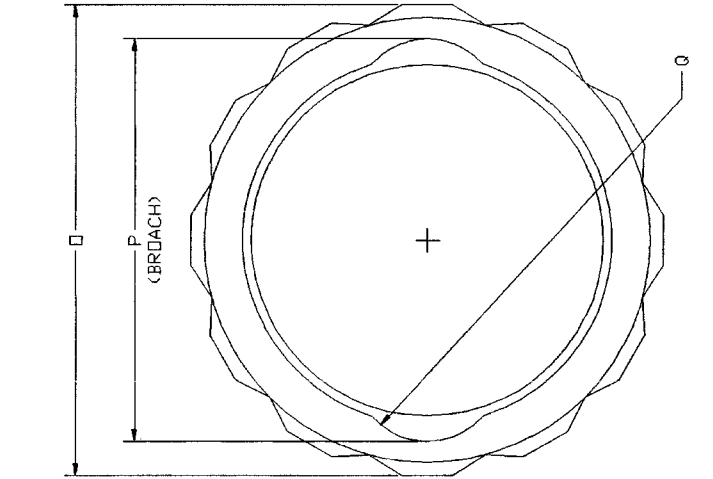
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES.
BREAK ALL EDGES .005 - .010.
INTERNAL RADIUS .000 - .010.
ALL DIAMETERS CONCENTRIC
TO .005.

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



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



iTeh Standards
 (https://standards.iteh.ai)
 Document Preview

ASTM F1961-99

https://standards.iteh.ai/catalog/standards/sist/e3be5119-b234-4bd3-8273-6313191615

FITTING SIZE	DIM 'A'	DIM 'B'	DIM 'C'	DIM 'D'	DIM 'E'	DIM 'F'	DIM 'G'	DIM 'H'	DIM 'I'	DIM 'J'
3/8	ø.765	ø.700	ø.623-617	22°	ø.610-606	ø.685	ø.701	30°	ø.685	.125
1/2	ø.967	ø.890	ø.807-803	22°	ø.787-783	ø.880	ø.896	30°	ø.880	.156
5/8	ø.1205	ø.1125	ø.1005	22°	ø.923	ø.1095-1110	ø.1111-1126	30°	ø.1095-1110	.156
3/4	ø.1330	ø.1215	ø.1103-1097	45°	ø.1050-1045	ø.1200-1215	ø.1221-1236	30°	ø.1200-1215	.220

FITTING SIZE	DIM 'K'	DIM 'L'	DIM 'M'	DIM 'N'	DIM 'O'	DIM 'P'
3/8	.495	.235	.062	M17X1.25-6H P.D.16373/6444	.828	.695-690
1/2	.610	.283	.078	M27X1.5-6H P.D.8278/8353	1.043	.885
5/8	.812	.375	.100	M27X1.5-6H P.D.10247/10325	1.300	1.120
3/4	.895	.455	.112	M30X2.0-6H P.D.11300/11388	1.408	1.205

FIG. 2 Union Nut Dimensions

UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES.
 BREAK ALL EDGES .005 - .015.
 ALL TOLERANCES ARE +/- .005
 BRDACH MUST BREAK INTO RECESS.