



Designation: F 1733 – 96

Standard Specification for Butt Heat Fusion Polyamide(PA) Plastic Fitting for Polyamide(PA) Plastic Pipe and Tubing¹

This standard is issued under the fixed designation F 1733; 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 polyamide (PA) butt fusion fittings for use with polyamide pipe (IPS and ISO) and tubing (CTS). Included are requirements for materials, workmanship, dimensions, marking, sustained pressure, and burst pressure.

1.2 The values given in parentheses are provided for information only.

2. Referenced Documents

2.1 ASTM Standards:

D 1598 Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure²

D 1599 Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings²

D 1600 Terminology for Abbreviated Terms Relating to Plastics³

D 2122 Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings²

D 2513 Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings²

D 4066 Specification for Nylon Injection and Extrusion Materials⁴

F 412 Terminology Relating to Plastic Piping Systems²

2.2 Federal Standard:

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)⁵

2.3 Military Standard:

MIL-STD-129 Marking for Shipment and Storage⁵

2.4 *National Sanitation Foundation Standard:*
Standard No. 14 for Plastic Piping Components and Related Materials⁶

3. Terminology

3.1 Definitions are in accordance with Terminology F 412 and abbreviations are in accordance with Terminology D 1600,

unless otherwise specified.

3.2 *dimension ratio (DR) for thermoplastic pipe*—the ratio of diameter to wall thickness. For this specification it is calculated by dividing the specified outside diameter by the specified wall thickness of the fitting at its area of fusion. DRs are rounded and do not calculate exactly.

4. Classification

4.1 *General*—This specification covers butt fusion fittings intended for use with polyamide pipe and tubing.

4.1.1 Fittings covered by this specification are normally molded. Fittings may be machined from extruded or molded stock.

4.1.2 Fittings fabricated by thermal welding are not included in this specification.

4.1.3 Fittings intended for use in the distribution of natural gas or petroleum fuels shall also meet the requirements of Specification D 2513.

5. Ordering Information

5.1 When ordering fittings under this specification, the following should be specified:

5.1.1 Polyamide compound (material designation or trade name)

5.1.2 Style of fitting (tee, 90° ell, and the like)

5.1.3 Size:

5.1.3.1 Nominal diameter.

5.1.3.2 CTS, IPS, or schedule.

5.1.3.3 Dimension ratio number or schedule number.

6. Materials

6.1 *Basic Materials*—This specification covers fittings made from polyamide plastics as defined in Specification D 4066.

NOTE 1—The PA plastic fittings intended for use in the transport of potable water should be evaluated and certified as safe for this purpose by a testing agency acceptable to the local health authority. The evaluation should be in accordance with requirements for chemical extraction, taste, and odor, that are no less restrictive than those included in National Sanitation Foundation (NSF) Standard 14. The seal or mark of the laboratory making the evaluation should be included on the pipe and tubing.

6.2 *Compounds*—The polyamide fittings compounds shall

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² *Annual Book of ASTM Standards*, Vol 08.04.

³ *Annual Book of ASTM Standards*, Vol 08.01.

⁴ *Annual Book of ASTM Standards*, Vol 08.02.

⁵ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁶ Available from the National Sanitation Foundation, P.O. Box 1468, Ann Arbor, MI 48106.

meet the requirements for Group 3, Class 2, and Grade 3, as prescribed in Specification D 4066.

6.3 *Rework Material*—Clean rework material generated from the manufacturer’s own production may be used by the same manufacturer as long as the fittings produced conform to the requirements of this specification.

7. Requirements

7.1 Dimensions and Tolerances:

7.1.1 *Outside Diameter*—Nominal outside diameters of butt fusion fittings shall conform to the nominal iron pipe size (IPS) or copper tubing size (CTS) dimensions at area of fusion. These dimensions and tolerances shall be as shown in Table 1, Table 2, and Table 3 of this specification.

7.1.2 *Inside Diameter (CTS Fittings Only)*—Inside diameters of butt fusion fittings for tubing at area of fusion shall conform to the dimensions of the tubing being joined. The dimensions and tolerances for the fittings are shown in Table 3.

7.1.3 *Wall Thickness*—The wall thicknesses of butt fusion fittings shall not be less than the minimum specified for the pipe or tubing. The wall thicknesses and tolerances at the area of fusion shall be as shown in Table 3, Table 4, and Table 5 of this specification.

7.1.4 *Measurements*—These shall be made in accordance with Test Method D 2122 for roundable pipe.

7.1.5 *Design Dimensions*—Overall fitting dimensions may be as preferred from a design standpoint by the manufacturer and accepted by the purchaser consistent with 7.1.3.

7.2 Pressure Test Requirements:

7.2.1 *Short-Term Rupture Strength for Fittings ½ to 12 in. and 90 to 315 mm, Nominal Diameter*—The minimum short-term rupture strength of the fitting and fused pipe or tubing shall not be less than the minimum short-term rupture strength of the pipe or tubing in the system when tested in accordance with 10.5.3. These minimum pressures shall be as shown in

TABLE 2 ISO Sizing System (ISO 161/1) Outside Diameters and Tolerances for Fit for Use with Polyamide Pipe, mm

Nominal Pipe Size	Average Outside Diameter at Area of Fusion	
	Min	Max ^A
90	90.0	90.8
110	110.0	111.0
160	160.0	161.4
200	200.0	201.8
250	250.0	252.3
280	280.0	282.5
315	315.0	317.8
355	355.0	358.2
400	400.0	403.6
450	450.0	454.1
500	500.0	504.5
560	560.0	565.0
630	630.0	635.7
710	710.0	716.4
800	800.0	807.2
900	900.0	908.1
1000	1000.0	1009.0
1200	1200.0	1210.8
1400	1400.0	1412.6
1600	1600.0	1614.4

^ASpecified in ISO 3607.

Table 6 of this specification. Test specimens shall be prepared for testing in the manner described in 10.5.1 of this specification. The test equipment, procedures, and failures definitions shall be as specified in Test Method D 1599.

7.2.2 *Short-Term Strength for Fittings 14 to 48 in. and 355 to 1600 mm, Nominal Diameter*—Fittings shall not fail when tested in accordance with 10.5.3. The minimum pressure shall be as shown in Table 6 of this specification. Test specimens shall be prepared for testing in the manner described in 10.2 of this specification. The test equipment and procedures shall be as specified in Test Method D 1599.

7.2.3 *Sustained Pressure*—The fitting and fused pipe or tubing shall not fail, as defined in Test Method D 1598, when tested at the time, pressures, and test temperatures selected from test options offered in Table 7. The test specimens shall be prepared for testing in the manner prescribed in 10.5.1.

8. Workmanship, Finish, and Appearance

8.1 The manufacture of these fittings shall be in accordance with good commercial practice so as to produce fittings meeting the requirements of this specification. Fittings shall be homogeneous throughout and free of cracks, holes, foreign inclusions, or other injurious defects. The fittings shall be as uniform as commercially practicable in color, opacity, density, and other physical properties.

9. Sampling

9.1 Parts made for sale under this specification should be sampled at a frequency appropriate for the end use intended. When the fittings are to be installed under a system specification (such as Specification D 2513 for gas), the minimum requirements of that specification must be satisfied.

10. Test Methods

10.1 *General*—The test methods in this specification cover fittings to be used with pipe and tubing for gas, water, and other engineered piping systems. Test methods that are applicable

TABLE 1 IPS Sizing System Outside Diameters and Tolerances for Fittings for Use with Polyamide Pipe, in.

Nominal Pipe Size	Average Outside Diameter at Area of Fusion ^A	Tolerance
½	0.840	±0.008
¾	1.050	±0.008
1	1.315	±0.010
1¼	1.660	±0.010
1½	1.900	±0.010
2	2.375	±0.010
3	3.500	±0.012
4	4.500	±0.015
6	6.625	±0.018
8	8.625	±0.025
10	10.750	±0.027
12	12.750	±0.036
14	14.000	±0.063
16	16.000	±0.072
18	18.000	±0.081
20	20.000	±0.090
21.5	21.500	±0.097
22	22.000	±0.099
24	24.000	±0.108
28	28.000	±0.126
32	32.000	±0.144
36	36.000	±0.162
42	42.000	±0.189
48	48.000	±0.216

^ADefined as measured ¼ in. (6.4 mm) from fitting outlet extremity.