

JIS

JAPANESE INDUSTRIAL STANDARD

**Polyethylene Pipe-fittings
for the Supply of
Gaseous Fuels**

JIS K 6775—1989

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In the event of any doubt arising,
the original Standard in Japanese is to be final authority.

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Polyethylene Pipe-fittings for the
Supply of Gaseous Fuels

K 6775-1989

1. Scope

This Japanese Industrial Standard specifies the fittings used for fusion bonding, hereinafter referred to as the "fittings", of the polyethylene pipes, hereinafter referred to as the "pipes", specified in JIS K 6774.

Remarks 1. For the use of the fittings, direct ray of the sun and fine shall be taken into consideration.

Further, sufficient considerations shall be taken concerning fusion bonding condition, fusion bonding compatibility of fittings, etc.

Furthermore, where fusion bonding compatibility is necessarily evaluated, a fusion junction performance test specified in Appendix may be designated concerning evaluation of the performance of the fusion bonding part subject to the agreement between the parties concerned with delivery.

2. The units and numerical values given in { } in this Standard are in accordance with the conventional system of units, and are Standard values.

2. Classification

The fittings shall be classified by the melt flow rate of material used, the junction shape of fittings, and the molding method of the fittings as given in Tables 1 to 3.

Table 1. Classification by Melt Flow Rate of
Material of Fittings

Class	Melt flow rate
Class A	0.15 and over to 0.4 excl.
Class B	0.4 and over to 1.0 excl.
Class C	1.0 and over to 2.5 excl.

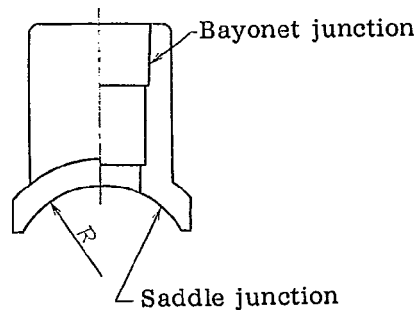
Applicable Standards and Corresponding International Standards:
See page 49.

Table 2. Classification by Junction Shape of Fittings

Class	Junction shape	Junction method	Class of pipe to be joined
Bayonet junction fittings	A junction shape having a tapered inner peripheral surface.	After fusing the junction of the fitting and the end outer surface of a pipe by heating, join the fitting and the pipe by insertion.	No. 1
Heating-wire containing-bayonet junction fittings	A junction shape having a cylindrical inner peripheral surface, heating elements such as heating wire or the like are integrated preliminarily into the junction.	After inserting a pipe into a fitting, fuse the junction and an end outer surface of the pipe by heating with a heating element incorporated in the junction of the fitting to be joined.	No. 1
Spigot type bayonet junction fittings	A junction shape of which the junction end has the same outside diameter as that of a pipe, and this bayonet junction fitting is combined with a heating-wire-containing junction fitting to be used.	After inserting a fitting into a heating-wire-containing bayonet junction fitting, fuse the junction and an end outer surface of the fitting by heating with a heating element incorporated into the junction of the heating-wire-containing bayonet junction fitting to be joined.	No. 1
Butt junction fittings	A junction shape of which a fitting end part has the same outside diameter and thickness as those of a pipe.	After fusing the junction of a fitting and the end part of the pipe by heating, join them by pressure fixing.	No. 1, No. 1U, No. 2, and No. 3
Saddle junction fittings	A junction shape having a saddle-backed junction surface having the same curvature as an outside diameter basic size of a pipe.	After fusing the junction of a fitting and an outer surface of the tube by heating, join by pressure fixing.	No. 1
Heating-wire containing-saddle junction fittings	A junction shape having a saddle-backed junction surface having the same curvature as an outside diameter basic size of a pipe, and heating elements such as heating wire or the like are preliminarily incorporated into the junction.	After pressurizing a junction of a pipe and an outer surface of a pipe, fuse the junction and the outer surface of the pipe by heating with a heating element incorporated into the junction of the fitting to be joined.	No. 1

Remark: A fitting can be assembled by combining not less than two kinds of junctions.

- (1) An example of a fitting assembled by combining bayonet junction and saddle junction



- (2) An example of a fitting assembled by combining spigot type bayonet junction and saddle junction containing heating wire.

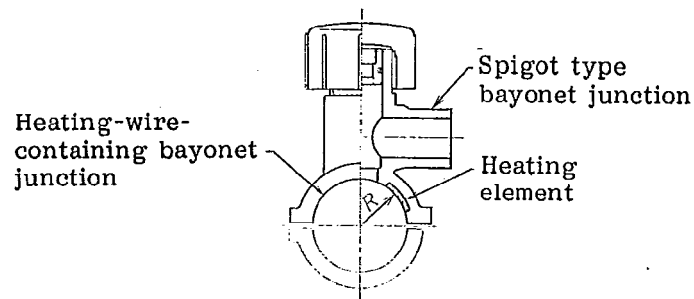


Table 3. Classification by Molding Method of Junction Fittings

Class	Molding method of butt junction fitting
K $\bar{O}$ (Japanese) type	A junction fitting manufactured by unified molding with an injection molder or the like.
OTSU (Japanese) type	A junction fitting of which the body is molded in a body with an injection molder or the like and of which a butt junction is a pipe bonded by fusion.

3. Quality

3.1 Performance The performance of fittings shall be subjected to the test of 6. and the results shall conform to the requirements specified in Tables 4. and 5.

Table 4. Short Term Performance of Fittings

Test item	Performance			Applicable clause
Ring tensile test	Tensile yield strength 14.7MPa {150kgf/cm ² } min.			6.8
Burst hydraulic test	No. 1	Maximum pressure	3.43MPa {35kgf/cm ² } min.	6.9
	No. 1U	Maximum pressure	2.75MPa {28kgf/cm ² } min.	
	No. 2	Maximum pressure	2.16MPa {22kgf/cm ² } min.	
	No. 3	Maximum pressure	1.67MPa {17kgf/cm ² } min.	
Elongation test at elevated temperature	Variation rate in outside diameter and length		±5%	6.10
	Variation in angle		±5°	
Hot internal pressure creep test	Not to show cracks and other defects.			6.11
Compression peeling test (1)	Peeling length rate of fusion junction is 15% max., and other defect shall not be generated.			6.12

Note (1) The compression peeling test applies only to a fitting into which heating elements such as heating wire are incorporated.

Table 5. Long Term Performance of Fittings

Test item	Performance	Applicable clause
Long term hot internal pressure creep test	Not to show cracks and other defects.	6.16

3.2 Appearance and Shape The appearance and shape of fittings shall be as follows:

- (1) Inside and outside surfaces of fittings shall be smooth, and, free from flaws, cracks, distortion and other defects which are impedimental to use.
- (2) Section of the fitting shall be practically true circle, and both end faces thereof shall be at right angles with the axis of the fitting.

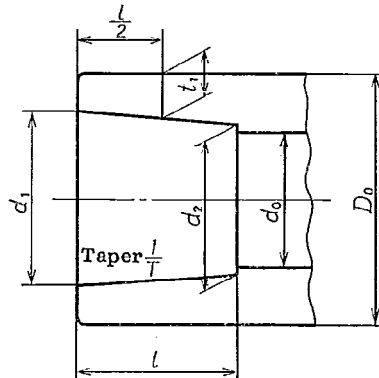
3.3 Color of Fittings The color of fittings shall be green. However, colors other than green may be taken subject to the agreement between the parties concerned with delivery.

4. Dimensions of Junction

4.1 Dimensions of Junction of Bayonet Junction Fittings Dimensions of the junction of a bayonet junction fitting and permissible deviations thereon shall be as given in Table 6.

Further, d_2 and D_0 given in Table 6. are appended for informative reference and are not a part of this Standard.

Table 6. Dimensions of Junction of Bayonet Junction Fittings and Permissible Deviations Thereon



Unit: mm

Symbol Designation	$d_0^{(2)}$	d_1	Permissible deviation on d_1 ⁽³⁾	t_1	permissible deviation on t_1 ⁽⁴⁾	l	permissible deviation on l	$\frac{1}{T}$	Informative reference	
									d_2	D_0
20	20	26.10	± 0.20	5.4	-0.15	22	± 2	$\frac{1}{57}$	25.7	37
25	26	33.00		6.2	-0.20	24			32.6	46
30	33	41.00	± 0.25	7.1	-0.20	25			40.6	56
40	38	46.90		8.0	-0.25	28			46.4	63
50	48	58.80	± 0.30	9.9	-0.30	30			58.3	79
75	71	87.60	± 0.35	14.6	-0.45	36			87.0	118
100	91	112.50		18.8	-0.55	41			111.8	152

Notes (²) d_0 is the minimum value and its maximum value shall not exceed d_2 .

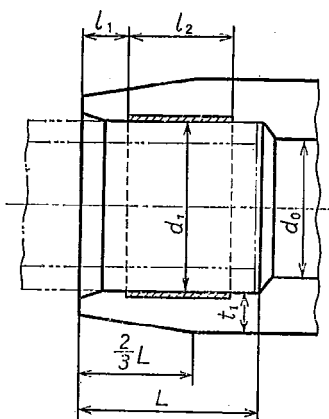
(³) Permissible deviation on dimension d_1 means a difference between dimension d_1 measured by 6.2 and dimension d_1 given in Table 6.

(⁴) A plus side of permissible deviations on dimension t_1 is not limited.

4.2 Dimension of Junction of Heating-Wire-Containing Bayonet Junction Fittings Dimensions of the junction of a heating wire containing bayonet junction fitting and permissible deviations thereon shall be as given in Table 7.

Further, L and d_0 given in Table 7. are appended for informative reference and are not a part of this Standard.

Table 7. Dimensions of Junction of Heating-Wire-Containing Bayonet Junction Fittings and Permissible Deviations Thereon



Unit: mm

Symbol Designation	d_1	Permissible deviations on d_1 ⁽⁵⁾	l_1 ⁽⁶⁾	l_2 ⁽⁶⁾⁽⁷⁾	t_1 ⁽⁶⁾⁽⁸⁾	Informative reference	
						L	d_0
20	27.35	± 0.15	5	18	4.0	33	20
25	34.40	± 0.20		20	4.5	35	26
30	42.40	± 0.20		23	5.1	38	33
40	48.40	± 0.20		24	5.8	41	38
50	60.50	± 0.20		28	7.1	46	48
75	89.70	± 0.20		37	10.3	58	71
100	114.85	± 0.25		44	13.1	71	91
150	166.10	± 0.30		50	18.8	78	132
200	217.45	± 0.35		75	24.5	103	172

Notes ⁽⁵⁾ Tolerance on dimension d_1 applies to a range where heating elements such as heating wire are incorporated.

⁽⁶⁾ l_1 , l_2 and t_1 are the minimum values.

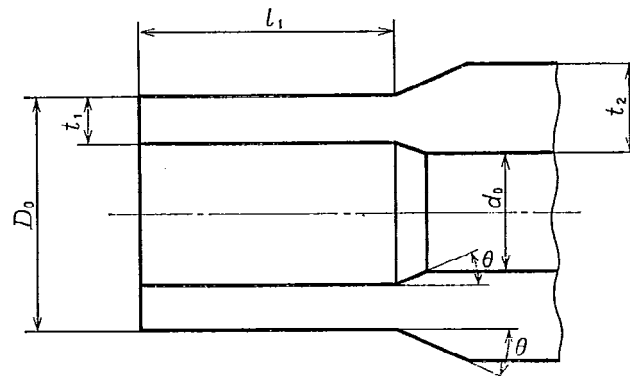
⁽⁷⁾ Dimension l_2 is the dimension of a range where heating elements such as heating wire are incorporated.

⁽⁸⁾ Dimension t_1 applies to all range excluding the range of $\frac{2}{3}L$ from a junction end part.

4.3 Dimensions of Junction of Spigot Type Bayonet Junction Fittings
Dimensions of the junction of a spigot type bayonet junction fitting and permissible deviations thereon shall be as given in Table 8.

Further, d_0 , t_2 and θ given in Table 8 are appended for informative reference, and are not a part of this Standard.

Table 8. Dimensions of Junction of Spigot Type Bayonet Junction Fittings and Permissible Deviations Thereon



Unit: mm

Designation	D_0	Permissible deviations on D_0 (⁹)(¹⁰)	l_1 (¹⁰)(¹¹)	l_1 (¹¹)	Informative reference		
					d_0	t_2	θ (°)
20	27.0	± 0.15	3.0	33	19	5.4	30 max.
25	34.0		3.4	35	25	6.2	
30	42.0		3.9	38	31	7.1	
40	48.0		4.4	41	36	8.0	
50	60.0	± 0.20	5.5	46	45	9.9	
75	89.0	± 0.30	8.1	58	68	14.6	

Notes (⁹) Permissible deviation on dimension D_0 means a difference between dimension D_0 measured according to 6.2 and dimension D_0 given in Table.

(¹⁰) Permissible deviation on dimension D_0 and dimension l_1 apply to the range within l_1 from an end face of a fitting body.

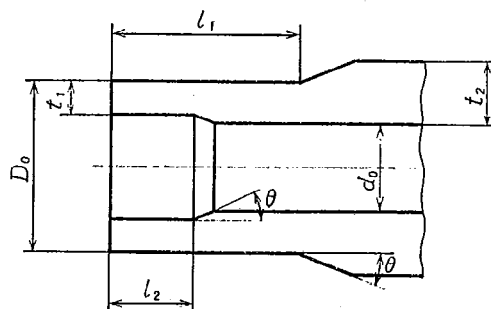
(¹¹) l_1 and l_1 are the minimum values.

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4.4 Dimensions of Junction of Butt Junction Fittings Dimensions of the junction of a butt junction fitting and permissible deviations thereon shall be as given in Table 9 and Table 10.

Further, l_2 and θ given in Table 9 and Table 10 are appended for informative reference, and are not a part of this Standard.

Table 9. Dimensions of Junction of K $\bar{O}$ (Japanese)
Type Butt Junction Fittings and Permissible
Deviations Thereon



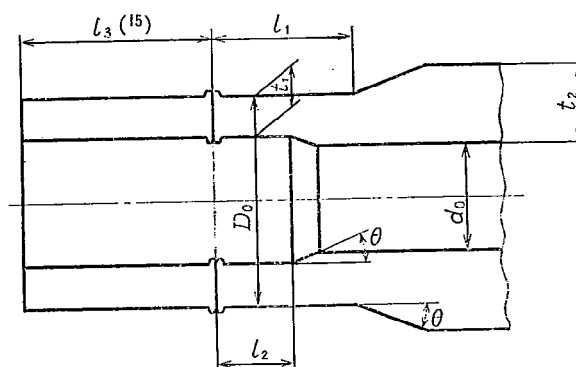
Unit: mm

Class of pipe to be joined	Designation	D_0	Permissible deviations (¹²) on D_0 (³)	l_1	Permissible deviations on l_1 (¹²)	d_0 (¹³)	l_1 (¹¹)	l_2 (¹³)	Informative reference	
									t_2	$\theta(^{\circ})$
No. 1	50	60.0	± 0.20	5.5	$+0.8$ 0	46	85	25	9.9	30 max.
	75	89.0	± 0.30	8.1	$+1.1$ 0	68		28	14.6	
	100	114.0	± 0.35	10.4	$+1.3$ 0	87		33	18.8	
	150	165.0	± 0.50	15.0	$+1.7$ 0	127		43	27.0	
	200	216.0	± 0.65	19.7	$+2.2$ 0	166		54	35.5	
No. 1U	100U	114.0	± 0.35	8.5	$+1.1$ 0	87		33	18.8	
	150U	165.0	± 0.50	12.3	$+1.5$ 0	127		43	27.0	
	200U	216.0	± 0.65	16.0	$+1.8$ 0	166		54	35.5	
No. 2	100	114.0	± 0.35	6.8	$+0.9$ 0	87		33	18.8	
	125	140.0	± 0.45	8.3	$+1.1$ 0	108		35	23.0	
	150	165.0	± 0.50	9.8	$+1.2$ 0	127		43	27.0	
	200	216.0	± 0.65	12.8	$+1.5$ 0	166		54	35.5	
No. 3	150	165.0	± 0.50	7.9	$+1.0$ 0	127		43	27.0	
	200	216.0	± 0.65	10.3	$+1.3$ 0	166		54	35.5	

Notes (¹²) Dimensional permissible deviations on D_0 and l_1 apply within 25 mm from an end face.

(¹³) d_0 and l_2 are the minimum values.

Table 10. Dimensions of Junction of OTSU
(Japanese) Type Butt Junction
Fittings and Permissible Deviations Thereon



Unit: mm

Class of pipe to be joined	Designation	D_0	Permissible deviation (¹⁴) on D_0 (°)	t_1	Permissible deviation on t_1 (¹⁴)	$d_0^{(13)}$	$l_1^{(11)}$	$l_2^{(13)}$	Informative reference	
									t_2	$\theta(^{\circ})$
No. 1	150	165.0	± 0.50	15.0	$+1.7_0$	127	15	10	27.0	30 max.
	200	216.0	± 0.65	19.7	$+2.2_0$	166			35.5	
No. 1U	150U	165.0	± 0.50	12.3	$+1.5_0$	127			27.0	
	200U	216.0	± 0.65	16.0	$+1.8_0$	166			35.5	
No. 2	150	165.0	± 0.50	9.8	$+1.2_0$	127			27.0	
	200	216.0	± 0.65	12.8	$+1.5_0$	166			35.5	
No. 3	150	165.0	± 0.50	7.9	$+1.0_0$	127			27.0	
	200	216.0	± 0.65	10.3	$+1.3_0$	166			35.5	

Notes (¹⁴) Dimensional permissible deviations on D_0 and t_1 apply within 10 mm from an end face of a junction body. However, butt junction parts are excepted.

(¹⁵) For l_3 , pipes of No. 1 to 3 specified in JIS K 6774 are used. The length may be optionally determined subject to the agreement between the parties concerned with delivery.

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5. Materials and Manufacturing Method

5.1 Materials of a fitting shall be copolymer of polyethylene or ethylene as main component for principal raw materials. They shall be subjected the test of 6, and the results shall conform to the requirements specified in Tables 11 and 12.

Table 11. Short Term Performance of Materials

Test item	Performance	Applicable clause
Melt flow rate test	Class A 0.15 and over to 0.4 excl. Class B 0.4 and over to 1.0 excl. Class C 1.0 and over to 2.5 excl.	6.4
Density test	0.933 g/cm ³ and over up to 0.939 g/cm ³ excl.	6.5
Tensile test	Tensile yield strength 17.7MPa {180kgf/cm ² } min.	6.6
	Tensile elongation at break 300 % min.	
Charpy impact test	9.8kJ/m ² {10kgf·cm/cm ² } min.	6.7

Table 12. Long Term Performance of Materials

Test item	Performance	Applicable clause
Environmental stress cracking test for material	Period required for generation of 50 % crackings 240 h min.	6.13
Immersion test	Percent variation of tensile yield strength ± 12 %	6.14
	Mass variation when immersed in fluid paraffin, mixture of tential butyl mercaptan and fluid paraffin, methanol, isopropanol and ethylene glycol ± 1 mg/cm ²	
	Mass variation when immersed in mixture of benzene and methanol ± 2 mg/cm ²	
Weathering test	Percentage reduction of elongation 20 % max.	6.15

5.2 Coloring agent and stabilizing agent used in manufacture of fittings shall be of excellent quality, and they shall be evenly dispersed in the material.

5.3 Fittings shall be manufactured with an injection molding press or the like.

6. Test Methods

6.1 Test Piece The preparation method and conditioning of a test piece shall be made as described below:

- (1) A specimen fitting and a specimen material, hereinafter, referred to as a sample, shall be respectively sampled by a reasonable process from a lot of fittings and a lot of materials of which the quality is considered the same one.
- (2) For a specimen plate, the sample is formed in a plate shape by a method specified in 3.(1) of JIS K 6760. A thickness of the specimen plate shall be 2 ± 0.2 mm. However, a thickness of the specimen plate for Charpy impact test shall be 4 ± 0.2 mm.
- (3) The preparation method and conditioning of the test pieces used for the test of fittings and the test of materials shall be made as specified in Tables 13 and 14. Granular samples shall be used for the melt flow rate test of the materials.

The test pieces to be used for the melt flow rate test and density test of the materials shall contain no coloring agent.

Table 13. Test Pieces for Short Term Performance Tests

Test item	Test pieces					Applicable test	
	Shape	Preparation method	Number of pieces	Conditioning		Test of fitting	Test of material
				Temperature °C	Time h		
Melt flow rate test	Granular	Use approximately about 4 g of granular sample.	3	-	-	-	○
Density test	Plate form	Cut out to a piece of 1 to 5 g capable of being measured from a specimen plate.		23 ± 2		-	○
Tensile test	Fig. 1	Cut out to the shape shown in Fig. 1 from a specimen plate.				-	○
Charpy impact test	Fig. 2	Cut out to the shape shown in Fig. 2 from a specimen plate.	7			-	○
Ring tensile test	Fig. 3	Cut out to the shape shown in Fig. 3 from a specimen fitting. However, cut out from the fitting body for OTSU (Japanese) type. Further, scrape off the heating-wire part on an inner face for a heating-wire-containing bayonet junction fitting.				○	-

Table 13 (Continued)

Test item	Test pieces					Applicable test	
	Shape	Preparation method	Number of pieces	Conditioning Temperature °C	Time h	Test of fitting	Test of material
Burst hydraulic test	Fitting	Join a length of not less than 500 mm of a pipe to be applied to a fitting body for butt junction fittings and a length of not less than 500 mm of No. 1 pipe for bayonet junction fittings, heating-wire-containing bayonet junction fittings, and spigot type bayonet junction fittings by fusion to a specimen fitting. Further, for saddle junction fittings and heating-wire-containing saddle junction fittings, join the specimen fitting to a central part of a length of not less than 1000 mm of No. 1 pipe.		+5 23 -2		○	-
Elongation test at elevated temperature		Specimen fitting		23 ± 2		○	-

Table 13 (Continued)

Test item	Test pieces					Applicable test	
	Shape	Preparation method	Number of pieces	Conditioning		Test of fitting	Test of material
				Temperature °C	Time h		
Hot internal pressure creep test	Fitting	Join a length of not less than 250 mm for 100 max. in designation, and a length of not less than 375 mm for 150 min. in designation of a pipe to be applied to a fitting body for butt junction fittings, and of No. 1 pipe for bayonet junction fittings, heating-wire-containing bayonet junction fittings, and spigot type bayonet junction fittings by fusion to a specimen fitting. Further, join a length of not less than 500 mm for 100 max. in designation and a length of not less than 750 mm for 150 min. in designation of No. 1 pipe by fusion to a central part of the pipe for saddle junction fittings and heating-wire-containing saddle junction fittings.	3	80 ± 1	1 min. However, a test piece to be joined by fusion shall be left at ordinary temperature for not less than 24 h after fusion bonding.	○	-
				23 ± 2			
Compression peel test	Fig. 4	Join a specimen fitting and No. 1 pipe by fusion, and cut out to the shape given in Fig. 4.				○	-

Remark: For heating-wire-containing bayonet junction fittings and heating-wire-containing saddle junction fittings, fusion junction shall be performed by fusion bonding conditions specified by the manufacturer.