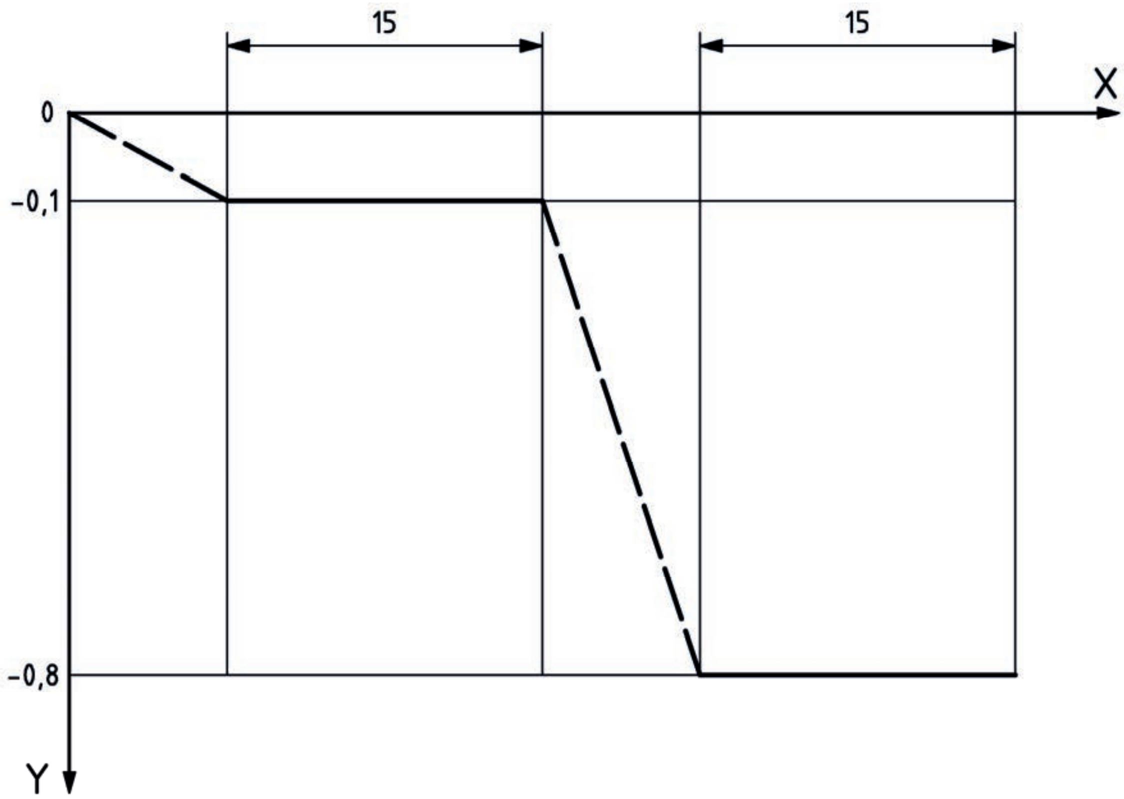
Table 14 — Angular deflection, α

Nominal outside diameter of connecting pipe d_n mm	**α at 10 × d_n from socket-end** mm
40	90
50	115
63	145
75	175
90	210
110	255
125	290
140	330
160	370
180	415
200	460
225	520
250	580
315	730
355	820
400	925



Key

X time, minutes

Y pressure, bar

NOTE The negative pressure changes need not be at linear rate.

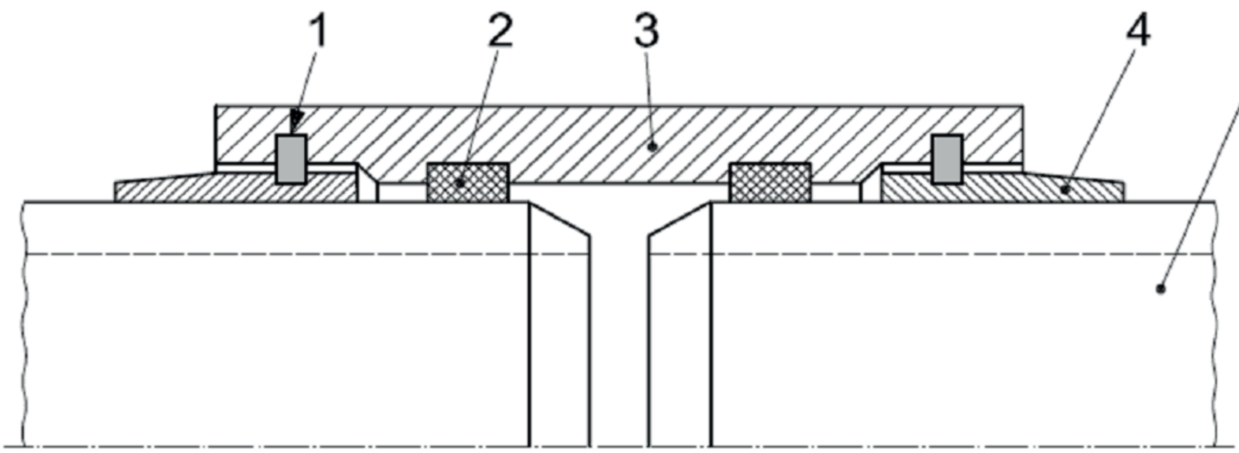
Figure 2 — Negative pressure test regime

9.3.3.10 Leak tightness and strength while subjected to bending and internal pressure (W, P, I, IS)

When a fitting assembly with PVC-U or PVC-O pipes and end-load-bearing double sockets, which are provided with elastomeric seals and a locking device (see Figure 3 for a typical example), assembled in accordance with 9.3.1, is tested in accordance with ISO 13783, the assembly shall conform to the requirement given in Table 15.

Table 15 — Parameters leak tightness and strength while subjected to bending and internal pressure

Application	Test medium	Test parameters	Requirement
W, P, I, IS	Water	Test temperature: 20 °C ± 5 °C Variation in temperature: ±2 °C	Leak tight



Key

1 locking device

2 sealing ring

3 PVC-U or PVC-O coupling

4 solvent cemented PVC-U sleeve

5 PVC-U or PVC-O pipe

Figure 3 — Typical example of an end-load-bearing double-socket

9.3.3.11 Flow rate pressure drop relationship (GAS)

The air flow rate at ambient temperature corresponding to a pressure drop across the fitting, as measured when the fitting assembly is tested in accordance with ISO 17778, shall conform to the requirement given in Table 16.

Table 16 — Parameters flow rate pressure drop relationship

Application	Test medium	Test pressure	Pressure drop	Requirement
GAS	Air	25 mbar	for $d_n \leq 63$ mm: 0,5 mbar for $d_n > 63$ mm: 0,1 mbar	Air flow rate (value indicated by the manufacturer)

9.3.3.12 Stress corrosion test (GAS, W, P, I, IS)

When a fitting assembly, assembled in accordance with 9.3.1, is tested in accordance with ISO 6957, it shall conform to the requirement given in Table 17.

Table 17 — Parameters stress corrosion

Application	Number of test pieces	pH value of test solution	Requirement
GAS	1	10,0	No cracks
W, P, I, IS	1	9,5	No cracks

NOTE If the test of GAS is fulfilled, this test covers the requirements of W, P, I and IS.

10 Marking

The minimum data for marking is given in Table 18.

Table 18 — Minimum data for marking

Aspects	Marking
Manufacturer's name or trade mark	Name or code
Nominal diameter (in mm)	e.g. 110
Production information	[a,b]
Body material	e.g. PP-R[c]
Standard number	ISO 17885[c]
Design pressure	e.g. PN 16[b]
Intended use	e.g. W[b]

[a] In clear figures or in code providing traceability to production period within year and month and the production site if manufacturer is producing at different sites nationally and/or internationally.

[b] This information may be on the product, on a label attached to the product or on the individual bag.

[c] This information may be on the packaging.

11 Packaging

The fitting and the associated components required for its assembly shall be packaged in bulk or individually protected where necessary in order to prevent deterioration and contamination.

The packaging shall have at least information with the manufacturer's name, type and the nominal diameter of the pipe(s), number of units and special storage conditions, if any.

Annex A
(informative)

List of standards

A list of standards for plastic pipes for which mechanical fittings is given in Table A.1.

Table A.1 — List of standards

Pipe material	Standard (GAS)	Standard (W, P)	Standard (I)	Standard (IS)
ABS	—	—	—	ISO 15493[7]
PA[a]	ISO 16486-2[8]	—	—	—
PB	—	—	—	ISO 15494[9]
PE 32	—	ISO 4427-2:1996[10]	ISO 8779[12]	—
PE 40	—	ISO 4427-2[11]	ISO 8779[12]	—
PE 63	—	ISO 4427-2[11]	—	ISO 15494[9]
PE 80 PE 100	ISO 4437-2[13]	ISO 4427-2[11]	—	ISO 15494[9]
PE-RT[b]	—	—	—	ISO 15494[9]
PE-X	ISO 14531-1[14]	—	—	ISO 15494[9]
PVC-C	—	—	—	ISO 15493[7]
PVC-HI	ISO 6993-1	—	—	—
PVC-O	—	ISO 16422[15]	ISO 16422[15]	—
PVC-U	—	ISO 1452-2[16]	—	ISO 15493[7]
PP[c]	—	—	—	ISO 15494[9]
PVDF	—	—	—	ISO 10931[17]
Multi-layer	ISO 18225[d][18]	ISO 21004[19]	—	—

a PA = PA 11 160, PA 11 180, PA 12 160 or PA 12 180.

b PE-RT = PE-RT type 1 or PE-RT type 2.

c PP = PP-H, PP-B, PP-R or PP-RCT.

d The corresponding International Standard is a system standard.

Annex B
(normative)

Stiffener requirements

Stiffener shall comply with the following:

a) The stiffener shall be rigid and provide support over the entire compression area.

b) There shall be no longitudinal displacement of the stiffener after assembly.

c) A fitting shall have only one stiffener insert for each combination of diameter and SDR series of the pipe with which it is assembled.

d) The insertion of the stiffener shall be done according to the manufacturer instructions.

e) After stiffener installation, the pipe shall show no signs of damage, scratches or cracks to an extend that would prevent conformity to the requirements of this International Standard.

f) The stiffener material shall be fit for purpose.

Annex C
(normative)

Test pressure of materials and fitting bodies

The test pressures of materials and fitting bodies are given in Table C.1

Table C.1 — Test pressure of materials and fittings bodies

Material	Test temperature	Test duration	σ_{tF}	MRS	σ_S
	°C	h	MPa	MPa	MPa
ABS	20	1	25,0	12,5	8,0
	70	1 000	3,1	12,5	8,0
ECTFE	20	40	26,0	18,4	14,3
	80	170	8,0	18,4	14,3
PA 11 160	20	1 000	19,0	16	8,0
	80	165	10,0	16	8,0
PA 11 180	20	1 000	20,0	18	9,0
	80	165	11,5	18	9,0
PA 12 160	20	1 000	19,0	16	8,0
	80	165	10,0	16	8,0
PA 12 180	20	1 000	20,0	18	9,0
	80	165	11,5	18	9,0
PA 12-GF30	20	1	50,0	20	12,5
	60	1 000	20,0	20	12,5
PA 12-GF50	20	1	50,0	20	12,5
	60	1 000	20,0	20	12,5
PA 12-GF65	20	1	50,0	20	12,5
	60	1 000	20,0	20	12,5
PB	20	1	15,5	12,5	10,0
	95	1 000	6,0	12,5	10,0
PE 80	20	1	11,3	8	6,3
	80	1 000	4,0	8	6,3
PE 100	20	1	13,3	10	8,0
	80	1 000	5,0	10	8,0
PE-RT – Type 1	20	1	9,9	8	6,3
	95	1 000	3,4	8	6,3
PE-RT – Type 2	20	1	10,8	8	6,3
	95	1 000	3,6	8	6,3

[a] Valid for design coefficient C = 1,6. For other design coefficients, a different design stress σ_S is used. See ISO 16422.[15]

Table C.1 *(continued)*

Material	Test temperature	Test duration	σ_{tF}	MRS	σ_S
	°C	h	MPa	MPa	MPa
PE-X	20	1	11,0	8	6,3
	95	1 000	4,4	8	6,3
POM-C	20	1	59,0	10	6,3
	95	1 000	6,0	10	6,3
POM-H	20	1	63,0	10	6,3
	60	1 000	10,0	10	6,3
PP-B	20	1	16,0	8	6,3
	95	1 000	2,6	8	6,3
PP-H	20	1	21,0	10	6,3
	95	1 000	3,6	10	6,3
PP-R	20	1	16,0	8	6,3
	95	1 000	3,5	8	6,3
PP-RCT	20	1	15,0	11,2	9,0
	95	1 000	3,8	11,2	9,0
PPSU	20	1	57,1	32	22,4
	95	1 000	21,3	32	22,4
PSU	20	1	66,0	16	11,2
	95	1 000	9,7	16	11,2
PVC-C	20	1	43,0	20	10,0
	60	1 000	16,5	20	10,0
PVC-HI	20	1	30,0	25	10,0
	60	1 000	9,0	25	10,0
PVC-O 315	20	10	40,8	31,5	20,0[a]
	60	1 000	19,2	31,5	20,0[a]
PVC-O 355	20	10	46,0	35,5	22,0[a]
	60	1 000	22,0	35,5	22,0[a]
PVC-O 400	20	10	52,0	40,0	25,0[a]
	60	1 000	25,0	40,0	25,0[a]
PVC-O 450	20	10	60,0	45,0	28,0[a]
	60	1 000	29,0	45,0	28,0[a]
PVC-O 500	20	10	65,0	50,0	32,0[a]
	60	1 000	32,0	50,0	32,0[a]
PVC-U	20	1	42,0	25	10,0
	60	1 000	10,0	25	10,0
PVDF	20	1	32,6	25	16,0
	95	1 000	11,5	25	16,0

[a] Valid for design coefficient C = 1,6. For other design coefficients, a different design stress σ_S is used. See ISO 16422.[15]

Annex D
(normative)

Physical characteristics of fitting materials

When determined in accordance with the test method specified in Table 5, using the parameters indicated, the physical characteristics of parts the fittings made of materials shall conform to the requirements given in Table D.1.

Table D.1 — Physical characteristics of parts made of fitting materials

Material	Characteristic	Requirement	Test parameters		Test method
ABS	Vicat softening temperature (VST/B/50 N)	≥90 °C	Conditioning	6 h in air at 80 °C	ISO 306
		And			
		≥70 °C	Conditioning	16 h in water at 90 °C	ISO 306
ECTFE	Melt mass-flow rate (MFR)	0,8 to 1,3	Temperature Load	275 °C 2,16 kg	ISO 1133-1
	Heat deflection temperature	≥90 °C	Load	0,46 MPa	ISO 75-2
PA 11 160 PA 11 180 PA 12 160 PA 12 180	Viscosity number	≥180 ml/g	Solvent	m-Cresol	ISO 307
PA12-GF30 PA12-GF50 PA12-GF65	Viscosity number	≥180 ml/g	Solvent	m-Cresol	ISO 307
PA12-GF30	Ash content	30 ± 2 %	Calcination temperature	850 ± 50 °C[a]	ISO 3451-4
PA12-GF50	Ash content	50 ± 2 %	Calcination temperature	850 ± 50 °C[a]	ISO 3451-4
PA12-GF65	Ash content	65 ± 2 %	Calcination temperature	850 ± 50 °C[a]	ISO 3451-4

[a] If at that temperature glass fibres present become molten and thus prevent further calcinations of the polymer, lower the temperature of calcinations to (600 ± 25) °C and repeat the procedure with a fresh test portion.

[b] Not applicable for outerlayer material introduced to facilitate fusion jointing.

[c] A tolerance of ±5 % shall apply to manufacturer's nominated value at any point in the body of the fitting.

[d] Samples of radial thickness 0,1 mm to be used for measurement of gel content. Samples to be taken at least from the outer and inner surfaces of the PE-X fitting and the mid-wall position.

[e] To be carried out on feedstock fitting material or on reverted fitting.

[f] The weld-line is likely to become more pronounced, but this should not be taken as a sign of weld-line splitting.

[g] For sprue-gating, the area of the injection point shall be calculated using a radius $R = 0{,}3d_n$ with a maximum value of 50 mm. For fittings moulded by end-gating techniques, e.g. ring or diaphragm methods, the gating area shall be a cylindrical portion with a length of $L = 0{,}3d_n$ with a maximum value of 50 mm (see Figure D.1). Any cracks or delamination in the wall of the fitting within to the injection area, parallel to the axis of the fitting, shall not penetrate in the axial direction more than 20 % of the length L defined in this note.

Table D.1 *(continued)*

Material	Characteristic	Requirement	Test parameters		Test method
PB	Melt mass-flow rate (MFR)	After processing maximum deviation of ±20 % of the value measured on the batch used to manufacture the fitting	Temperature Load	190 °C 5 kg or 2,16 kg	ISO 1133-1
PE 80 PE 100 PE-RT type 1 PE-RT type 2	Melt mass-flow rate (MFR)	After processing maximum deviation of ±20 % of the value measured on the batch used to manufacture the fitting	Temperature Load	190 °C 5 kg or 21,6 kg	ISO 1133-1
PE-X[b]	Degree of crosslinking	Crosslinking process: Peroxide ≥70 %[c] Silane ≥65 %[c] Electron beam ≥60 %[c]	Media Time	Boiling xylene 8 h ± 30 min.	ISO 10147[d]
POM	Melt mass-flow rate (MFR)	≤4 g/10 min	Temperature Load	190 °C 2,16 kg	ISO 1133-1
PP-B PP-H PP-R PP-RCT	Melt mass-flow rate (MFR)	After processing maximum deviation of ±30 % of the value measured on the batch used to manufacture the fitting	Temperature Load Temperature Load	230 °C 2,16 kg Alternative condition: 190 °C 5 kg	ISO 1133-1
PPSU	Melt mass-flow rate (MFR)	After processing maximum deviation of ±30 % of the value measured on the batch used to manufacture the fitting	Temperature Load Temperature Load	365 °C 5 kg Alternative condition: 360 °C 10 kg	ISO 1133-1

a If at that temperature glass fibres present become molten and thus prevent further calcinations of the polymer, lower the temperature of calcinations to (600 ± 25) °C and repeat the procedure with a fresh test portion.

b Not applicable for outerlayer material introduced to facilitate fusion jointing.

c A tolerance of ±5 % shall apply to manufacturer's nominated value at any point in the body of the fitting.

d Samples of radial thickness 0,1 mm to be used for measurement of gel content. Samples to be taken at least from the outer and inner surfaces of the PE-X fitting and the mid-wall position.

e To be carried out on feedstock fitting material or on reverted fitting.

f The weld-line is likely to become more pronounced, but this should not be taken as a sign of weld-line splitting.

g For sprue-gating, the area of the injection point shall be calculated using a radius $R = 0{,}3d_n$ with a maximum value of 50 mm. For fittings moulded by end-gating techniques, e.g. ring or diaphragm methods, the gating area shall be a cylindrical portion with a length of $L = 0{,}3d_n$ with a maximum value of 50 mm (see Figure D.1). Any cracks or delamination in the wall of the fitting within to the injection area, parallel to the axis of the fitting, shall not penetrate in the axial direction more than 20 % of the length L defined in this note.

Table D.1 *(continued)*

Material	Characteristic	Requirement	Test parameters		Test method
PSU	Melt mass-flow rate (MFR)	After processing maximum deviation of ±30 % of the value measured on the batch used to manufacture the fitting	Temperature Load Temperature Load	343 °C 2,16 kg Alternative condition: 360 °C 2,16 kg	ISO 1133-1
PVC-C	Vicat softening temperature	≥103 °C	Shall conform to ISO 2507-2		ISO 2507-1
PVC-HI PVC-U	Vicat softening temperature	≥74 °C	Shall conform to ISO 2507-2		ISO 2507-1
PVC-O	Vicat softening temperature	≥80 °C	Shall conform to ISO 2507-2		ISO 2507-1
PVC-C PVC-O[e] PVC-U	Effects of heating	The fittings shall not show any blisters or signs of weld-line splitting.[f] No surface damage in the area of any injection point shall penetrate deeper than 30 % of e at that point for d_n < 75 mm and 50 % for d_n > 63 mm. Outside the area of any injection point no surface damage shall occur.[g]	Test temperature Test period for: $e \leq 3$ $3 < e \leq 10$ $10 < e \leq 20$ $20 < e \leq 30$ $30 < e \leq 40$ $40 < e$ Number of test pieces	(150 ± 2) °C 15 min 30 min 60 min 140 min 220 min 240 min 3	ISO 580:2005 Method A
PVC-HI	Effects of heating	See ISO 6993-2 and ISO 6993-3	Test temperature Test period for: $e \leq 3$ $3 < e \leq 10$ $10 < e \leq 20$ $20 < e \leq 30$ $30 < e \leq 40$ $40 < e$ Number of test pieces	(150 ± 2) °C 15 min 30 min 60 min 140 min 220 min 240 min 3	ISO 580:2005 Method A

a If at that temperature glass fibres present become molten and thus prevent further calcinations of the polymer, lower the temperature of calcinations to (600 ± 25) °C and repeat the procedure with a fresh test portion.

b Not applicable for outerlayer material introduced to facilitate fusion jointing.

c A tolerance of ±5 % shall apply to manufacturer's nominated value at any point in the body of the fitting.

d Samples of radial thickness 0,1 mm to be used for measurement of gel content. Samples to be taken at least from the outer and inner surfaces of the PE-X fitting and the mid-wall position.

e To be carried out on feedstock fitting material or on reverted fitting.

f The weld-line is likely to become more pronounced, but this should not be taken as a sign of weld-line splitting.

g For sprue-gating, the area of the injection point shall be calculated using a radius $R = 0{,}3d_n$ with a maximum value of 50 mm. For fittings moulded by end-gating techniques, e.g. ring or diaphragm methods, the gating area shall be a cylindrical portion with a length of $L = 0{,}3d_n$ with a maximum value of 50 mm (see Figure D.1). Any cracks or delamination in the wall of the fitting within to the injection area, parallel to the axis of the fitting, shall not penetrate in the axial direction more than 20 % of the length L defined in this note.

Table D.1 *(continued)*

Material	Characteristic	Requirement	Test parameters		Test method
PVDF	Melt mass-flow rate (MFR)	After processing maximum deviation of ±20 % of the value measured on the batch used to manufacturer the fitting	Temperature Load	230 °C 5 kg	ISO 1133-1
	Vicat softening temperature	≥125 °C	Load	1 kg	ISO 306
Cu alloys	Dezincification resistance	The maximum measured dezincification accepted is 100 µm in the tangential direction. The maximum measured dezincification accepted is 200 µm in the axial direction.	Exposed area Test temperature Test duration	~100 mm^2 (75 ± 5)°C 24 h	ISO 6509

[a] If at that temperature glass fibres present become molten and thus prevent further calcinations of the polymer, lower the temperature of calcinations to (600 ± 25) °C and repeat the procedure with a fresh test portion.

[b] Not applicable for outerlayer material introduced to facilitate fusion jointing.

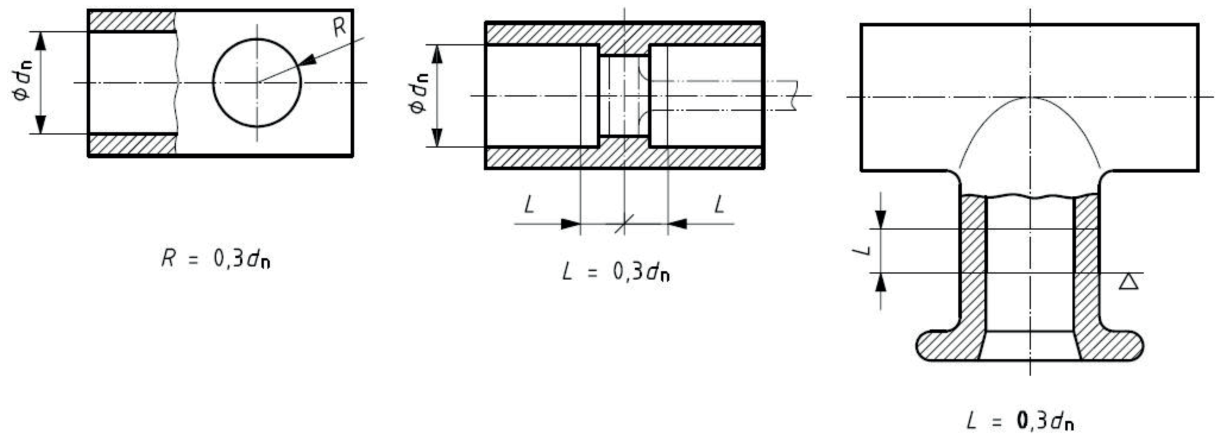
[c] A tolerance of ±5 % shall apply to manufacturer's nominated value at any point in the body of the fitting.

[d] Samples of radial thickness 0,1 mm to be used for measurement of gel content. Samples to be taken at least from the outer and inner surfaces of the PE-X fitting and the mid-wall position.

[e] To be carried out on feedstock fitting material or on reverted fitting.

[f] The weld-line is likely to become more pronounced, but this should not be taken as a sign of weld-line splitting.

[g] For sprue-gating, the area of the injection point shall be calculated using a radius $R = 0{,}3d_n$ with a maximum value of 50 mm. For fittings moulded by end-gating techniques, e.g. ring or diaphragm methods, the gating area shall be a cylindrical portion with a length of $L = 0{,}3d_n$ with a maximum value of 50 mm (see Figure D.1). Any cracks or delamination in the wall of the fitting within to the injection area, parallel to the axis of the fitting, shall not penetrate in the axial direction more than 20 % of the length L defined in this note.



a) Sprue-gate b) Diaphragm-gate c) Ring-gate

Figure D.1 — Injection gating areas

Annex E
(normative)

Resistance to gas constituents

This test method applies to PE and PE-X materials and can be used as guideline for other materials. The test shall be carried out on 32 mm SDR 11 pipe. The test may be carried out on other sizes, provided that there is a clear correlation to the results on the 32 mm SDR 11 pipe.

Prepare a synthetic condensate comprising a mixture of a 50 % mass fraction of *n*-decane (99 %) and a 50 % mass fraction of 1-3-5-trimethylbenzene.

Condition the pipe by filling it with condensate and allowing it to stand in air for 1 500 h at (23 ± 2) °C. Carry out the test in accordance with ISO 1167-1 and ISO 1167-2, but using the synthetic condensate inside the pipe at elevated temperature.

Annex F
(normative)

Test stresses

The test stresses depending on the pipe materials and intended application are given in Table F.1; see 9.3.3.3 and 9.3.3.4.

Table F.1 — Test stresses depending on pipe materials

Pipe material	Application		Test stress
	GAS	W, P, IS, I	MPa
ABS	—	X	12,5[a]
ECTFE	—	X	13,0[b]
PA 11 160	X	—	9,5[c]
PA 11 180	X	—	10,0[c]
PA 12 160	X	—	9,5[c]
PA 12 180	X	—	10,0[c]
PB	—	X	7,7[a]
PE32	—	X	2,8[a]
PE40	—	X	3,3[a]
PE63	—	X	4,5[a]
PE80	X	X	5,7[a]
PE100	X	X	6,6[a]
PE-RT – Type 1	—	X	4,9[a]
PE-RT – Type 2	—	X	5,4[a]
PE-X	X	X	5,5[a]
PP-B	—	X	8,0[a]
PP-H	—	X	10,5[a]

X = applicable,

— = not applicable.

[a] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 1 h at 20 °C.

[b] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 40 h at 20 °C.

[c] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 1000 h at 20 °C.

[d] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 10 h at 20 °C.

[e] Where:

p_t is the calculated pressure and is half of the value of the pressure (bar) at 1 h at 20 °C. This can be calculated by the following:

a) using the formula from ISO 17456:2006, Annex A, if the long-term pressure strength is calculated with Procedure I: “Calculation method” (multilayer P pipes);

b) from reference curve from ISO 17456:2006, if the long-term pressure strength is determined with Procedure II: “Pressure test” (multilayer M and P pipes).

Table F.1 *(continued)*

Pipe material	Application		Test stress MPa
	GAS	W, P, IS, I	
PP-R	—	X	8,0[a]
PP-RCT	—	X	7,5[a]
PVC-C	—	X	21,5[a]
PVC-HI	X	X	15,0[a]
PVC-O 315	—	X	20,4[d]
PVC-O 355	—	X	23,0[d]
PVC-O 400	—	X	26,0[d]
PVC-O 450	—	X	30,0[d]
PVC-O 500	—	X	32,5[d]
PVC-U	—	X	21,0[a]
PVDF	—	X	16,3[a]
Multi-layer	X	X	$\sigma_T = \frac{p_t \times (d_n - e_n)}{20 \times e_n}$ [e]

X = applicable,

— = not applicable.

[a] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 1 h at 20 °C.

[b] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 40 h at 20 °C.

[c] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 1000 h at 20 °C.

[d] These are longitudinal stresses, and their values are therefore half those of the circumferential stresses given as hoop stresses for 10 h at 20 °C.

[e] Where:

p_t is the calculated pressure and is half of the value of the pressure (bar) at 1 h at 20 °C. This can be calculated by the following:

a) using the formula from ISO 17456:2006, Annex A, if the long-term pressure strength is calculated with Procedure I: "Calculation method" (multilayer P pipes);

b) from reference curve from ISO 17456:2006, if the long-term pressure strength is determined with Procedure II: "Pressure test" (multilayer M and P pipes).

Annex G
(normative)

Cyclic test procedure

Table G.1 gives the cyclic test procedure for leak tightness after temperature cycling (outside temperature; see 9.3.3.6).

Table G.1 — Cyclic test procedure

Test method	Cyclic test procedure
Method A	i. place the fitting assembly in the first chamber at T_{min} [a] ±2 °C and leave it there for at least 2,5 h; ii. transfer the fitting assembly to the second chamber at T_{max} [a] ±2 °C; the minimum transfer time shall be 0,5 h and the maximum 1 h; iii. leave the fitting assembly in the second chamber at T_{max} [a] ±2 °C for at least 2,5 h; iv. transfer the fitting assembly to the first chamber at T_{min} [a] ±2 °C; the minimum transfer time shall be 0,5 h and the maximum 1 h; v. return to i).
Method B	i. increase the temperature of the chamber to T_{max} [a] ±2 °C at a minimum rate of 1 °C/min; ii. maintain at T_{max} [a] ±2 °C for at least 2 h; iii. reduce the temperature to T_{min} [a] ±2 °C at a minimum rate of 1 °C/min; iv. maintain at T_{min} [a] ±2 °C for at least 2 h; v. return to i).
[a] T_{max} and T_{min} are installation temperatures as declared by the manufacturer; see Clause 4.	

Bibliography

[1] ISO 3, *Preferred numbers — Series of preferred numbers*

[2] ISO 497, *Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers*

[3] CEN/TR 15438, *Plastics piping systems — Guidance for coding of products and their intended uses*

[4] EN 377, *Lubricants for applications in appliances and associated controls using combustible gases except those designed for use in industrial processes*

[5] ISO/TR 10358, *Plastics pipes and fittings — Combined chemical-resistance classification table*

[6] ISO/TR 7620, *Rubber materials — Chemical resistance*

[7] ISO 15493, *Plastics piping systems for industrial applications — Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) — Specifications for components and the system — Metric series*

[8] ISO 16486-2, *Plastics piping systems for the supply of gaseous fuels - Unplasticized polyamide (PA-U) piping systems with fusion jointing and mechanical jointing — Part 2: Pipes*

[9] ISO 15494, *Plastics piping systems for industrial applications – Polybutene (PB), polyethylene (PE) and polypropylene (PP) – Specifications for components and the system – Metric series*

[10] ISO 4427-2:1996, *Plastics piping systems – Polyethylene (PE) pipes and fittings for water supply – Part 2: Pipes*

[11] ISO 4427-2, *Plastics piping systems — Polyethylene (PE) pipes and fittings for water supply — Part 2: Pipes*

[12] ISO 8779, *Plastics piping systems — Polyethylene (PE) pipes for irrigation — Specifications*

[13] ISO 4437-2, *Plastics piping systems for the supply of gaseous fuels - Polyethylene (PE) — Part 2: Pipes*

[14] ISO 14531-1, *Plastics pipes and fittings — Crosslinked polyethylene (PE-X) pipe systems for the conveyance of gaseous fuels — Metric series — Specifications — Part 1: Pipes*

[15] ISO 16422, *Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure — Specifications*

[16] ISO 1452-2, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 2: Pipes*

[17] ISO 10931, *Plastics piping systems for industrial applications — Poly(vinylidene fluoride) (PVDF) — Specifications for components and the system*

[18] ISO 18225, *Plastics piping systems — Multilayer piping systems for outdoor gas installations — Specifications for systems*

[19] ISO 21004, *Plastics piping systems — Multilayer pipes and their joints, based on thermoplastics, for water supply*

[20] ISO 1083, *Spheroidal graphite cast irons — Classification*

[21] ISO 5922:2005, *Malleable cast iron*

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