INTERNATIONAL STANDARD

ISO 15876-3

Second edition
2017-01

Plastics piping systems for hot and cold water installations — Polybutene (PB) —

Part 3: **Fittings**

Systèmes de canalisations en plastique pour les installations d'eau chaude et froide — Polybutène (PB) —

Partie 3: Raccords

Reference number
ISO 15876-3:2017(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

ISO 15876-3 was prepared by the European Committee Standardization (CEN) Technical Committee CEN/TC 155, *Plastics pipings systems and ducting systems*, in collaboration with ISO Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, *Plastics pipes and fittings for water supplies*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition cancels and replaces the first edition (ISO 15876-3:2003), which has been technically revised with the following changes:

— introduction of polybutene random copolymer (PB-R) and renaming existing polybutene (PB) into polybutene homopolymer (PB-H);

— revision of specifications for conditioning of samples.

A list of all parts in the ISO 15876 series can be found on the ISO website.

Introduction

The System Standard ISO 15876, of which this document is Part 3, specifies the requirements for a piping system when made from polybutene (PB). The piping system is intended to be used for hot and cold water installations.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the product covered by ISO 15876 (all parts):

— ISO 15876 (all parts) provides no information as to whether the product may be used without restriction in any of the Member States of the EU or EFTA;

— it should be noted that, while awaiting the adoption of verifiable European criteria, existing national regulations concerning the use and/or the characteristics of this product remain in force.

Requirements and test methods for materials and components, other than fittings, are specified in ISO 15876-1 and ISO 15876-2. Characteristics for fitness for purpose (mainly for joints) are covered in ISO 15876-5. ISO/TS 15876-7 gives guidance for the assessment of conformity.

This document specifies the characteristics of the fittings.

At the date of publication of this standard, System Standards for piping systems of other plastics materials used for the same application include ISO 15874, ISO 15875, ISO 15876, ISO 15877, ISO 21003 and ISO 22391.

Plastics piping systems for hot and cold water installations — Polybutene (PB) —

Part 3: Fittings

1 Scope

This document specifies the characteristics of fittings for polybutene-1 (PB-1) piping systems intended to be used for hot and cold water installations within buildings for the conveyance of water, whether or not intended for human consumption (domestic systems) and for heating systems under design pressures and temperatures according to the class of application (see ISO 15876-1).

The designation polybutene is used together with the abbreviation PB throughout this document.

This document covers a range of service conditions (application classes) and design pressure classes. For values of T_D, T_{max} and T_{mal} in excess of those in ISO 15876-1:2016, Table 1, this document does not apply.

NOTE It is the responsibility of the purchaser or specifier to make the appropriate selections from these aspects, taking into account their particular requirements and any relevant national regulations and installation practices or codes.

It also specifies the parameters for the test methods referred to in this document.

In conjunction with the other parts of ISO 15876, this document is applicable to fittings made from PB and to fittings made from other materials which are intended to be fitted to pipes conforming to ISO 15876-2 for hot and cold water installations, whereby the joints conform to the requirements of ISO 15876-5.

This document is applicable to fittings of the following types:

— socket fusion fittings;

— electrofusion fittings;

— mechanical fittings;

— fittings with incorporated inserts.

It is also applicable to fittings made from alternative materials which, when fitted to pipes conforming to ISO 15876-2, conform to the requirements of ISO 15876-5.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 228-1, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 1133-1, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 1: Standard method*

ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 1167-3, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 3: Preparation of components*

ISO 1167-4, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 4: Preparation of assemblies*

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 7686, *Plastics pipes and fittings — Determination of opacity*

ISO 9080, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO 15876-1:2016, *Plastics piping system for hot and cold water installations — Polybutene (PB) — Part 1: General*

ISO 15876-2, *Plastics piping system for hot and cold water installations — Polybutene (PB) — Part 2: Pipes*

ISO 15876-5, *Plastics piping system for hot and cold water installations — Polybutene (PB) — Part 5: Fitness for purpose of the system*

EN 681-1, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 681-2, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

EN 1254-3, *Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes*

EN 1254-6, *Copper and copper alloys — Plumbing fittings — Part 6: Fittings with push-fit ends*

EN 1254-8, *Copper and copper alloys — Plumbing fittings — Part 8: Fittings with press ends for use with plastics and multilayer pipes*

EN 10088-1, *Stainless steels — Part 1: List of stainless steels*

EN 10226-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Taper external threads and parallel internal treads — Dimensions, tolerances and designation*

3 Terms and definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions, symbols and abbreviated terms given in ISO 15876-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1 General

3.1.1
fitting
component of a piping system, which connects two or more pipes and/or fittings together, without any further function

3.2 Mechanical fittings

3.2.1
compression fitting
fitting in which the joint is made by the compression of a ring or sleeve on the outside wall of the pipe with or without additional sealing elements and with internal support

3.2.2
crimped fitting
fitting in which the joint is made by crimping of the fitting and/or a ring on the outside wall of the pipe by means of a special tool

3.2.3
flanged fitting
fitting in which the pipe connection consists of two mating flanges which are mechanically pressed together and sealed by the compression of an elastomeric sealing element between them

3.2.4
flat seat union fitting
fitting in which the pipe connection consists primarily of two components, at least one of which normally incorporates a flat sealing surface, which are mechanically pressed together by means of screwed nut or similar and sealed by the compression of an elastomeric sealing element between them

3.3 Fittings for fusion

3.3.1
socket fusion fitting
fitting in which the joint with the pipe is made by melting together the outer part of the pipe with the inner part of the fitting by means of heat induced by a heated tool

3.3.2
electrofusion fitting
fitting in which the joint with the pipe is made by melting together the outer part of the pipe and the inner part of the fitting by means of heat induced by current flowing in an appropriate resistor inserted in the fitting body

3.4 Fitting with incorporated inserts

3.4.1
fitting with incorporated inserts
fitting in which the joint is made by means of connecting threads or other outlets, inserted in the plastics body combined with fusion ends for socket fusion or electrofusion

4 Material characteristics

4.1 Plastics fitting material

4.1.1 PB Fitting material identical to the PB pipe compound

The PB compound shall comply with material requirements specified in ISO 15876-1 and ISO 15876-2.

The material shall be tested in form of tubular test pieces.

When tested in accordance with the test methods specified in Table 1, using the indicated parameters, the test pieces shall withstand the hydrostatic test pressure, p_F, given in Table 6, Table 7 or Table 8 without bursting or leakage.

Table 1 — Mechanical characteristic of tubular test pieces made of PB by injection moulding

Characteristic	Requirement	Test parameters for the individual tests				Test method
Resistance to internal pressure	No bursting or leakage during the test period	**Hydrostatic (hoop) stress** MPa	**Test temperature** °C	**Test period** h	**Number of test pieces**	ISO 1167-1 and ISO 1167-3
	PB-H	15,5	20	1[a]	3	
		15,2	20	22	3	
		6,0	95	1 000	3	
	PB-R	15,3	20	1[a]	3	
		15,0	20	22	3	
		4,9	95	1 000	3	
		Test parameters for all tests				
		Sampling procedure	[b]			
		Type of end cap	Type a)			
		Orientation of test piece	Not specified			
		Type of test	Water-in-water			

[a] In case of dispute, tests shall be done at 20 °C/22 h.

[b] The sampling procedure is not specified. For guidance, see ISO/TS 15876-7[1].

4.1.2 PB fitting material not identical to the PB pipe compound

4.1.2.1 Evaluation of σ_{LPL}-values and control points

The fitting material in form of injection moulded or extruded tubular test pieces shall be evaluated by using the method given in ISO 9080 or equivalent where internal pressure tests are made in accordance with ISO 1167-1 and ISO 1167-3 to find the σ_{LPL}-values. The σ_{LPL}-values thus determined shall be used to determine the design stress, σ_{DF}, (see ISO 15876-2) and values of hydrostatic stress, σ_F, corresponding to the temperature and time control points given in Table 2.

NOTE One equivalent way of evaluation is to calculate the σ_{LPL}-value for each temperature (for example, 20 °C, 70 °C and 95 °C) individually.

If evaluation using the method given in ISO 9080 or equivalent is available from long-term internal pressure tests relative to extruded pipes of the same compound as used for the fitting, the relevant test temperature shall be equal to or higher than the maximum design temperature, T_{max}, for the service condition class.

Table 2 — Control points for testing fitting materials with tubular test pieces relative to classification of service conditions

	All application classes	Application			
		Class 1	Class 2	Class 4	Class 5
Maximum design temperature, T_{max}, in °C	—	80	80	70	90
Test temperature, T_{test}, in °C	20	95[a]	95[a]	80	95
Test duration, in h	1	1 000	1 000	1 000	1 000

[a] Conducted at 95 °C to match existing test facilities.

It is recommended that the nominal diameter of the tubular test pieces should be in the range of the nominal diameters of fittings normally produced by the manufacturer.

4.1.2.2 Thermal stability

When testing the thermal stability by hydrostatic pressure testing in accordance with ISO 1167-1 at 110 °C for 8 760 h, using a test piece in pipe form or a fitting connected to pipes, the test piece shall withstand the test without bursting. The test shall be conducted in water-in-air at an internal pressure equivalent to the hydrostatic stress used in the pipe material thermal stability test.

If a fitting connected to pipes is used as a test piece and the pipe connection fails, then the thermal stability test shall be repeated using a test piece in pipe form.

4.1.3 Plastics fitting material other than PB

Plastics material, other than PB, for fittings intended to be used in PB piping systems for hot and cold water within buildings for the conveyance of water, whether or not for human consumption (domestic systems) and for heating systems, shall conform to 4.3.

4.2 Metallic fitting material

Metallic material for fittings intended to be used with components conforming to ISO 15876 shall conform to the requirements given in EN 1254-3, EN 1254-6, EN 1254-8 or EN 10088-1, as applicable.

4.3 Influence on water intended for human consumption

The material shall conform to ISO 15876-1.

5 General characteristics

5.1 Appearance

When viewed without magnification, the internal and external surfaces of fittings shall be smooth, clean and free from scoring, cavities and other surface defects to an extent that would prevent conformity to this document. The material shall not contain visible impurities. Slight variations in appearance of the colour shall be permitted. Each end of a fitting shall be square to its axis.

5.2 Opacity

Fittings that are declared to be opaque shall not transmit more than 0,2 % of visible light when tested in accordance with ISO 7686.

This test is not necessary when the fitting body is made from a compound already declared opaque for the production of pipes.

6 Geometrical characteristics

6.1 General

Dimensions shall be measured in accordance with ISO 3126.

6.1.1 Nominal diameter(s)

The nominal diameter(s), d_n, of a fitting shall correspond to and be designated by the nominal outside diameter(s) of the pipe(s) conforming to ISO 15876-2, for which they are designed.

6.1.2 Angles

The preferred nominal angles of non-straight fittings are 45° and 90°.

6.1.3 Threads

Threads used for jointing shall conform to EN 10226-1. Where a thread is used as a fastening thread for jointing an assembly (e.g. union nuts), it shall conform to ISO 228-1, except that these requirements need not apply to the threads used by the manufacturer to join component parts of a fitting together.

6.2 Dimensions of sockets for socket weld and electro-fusion fittings

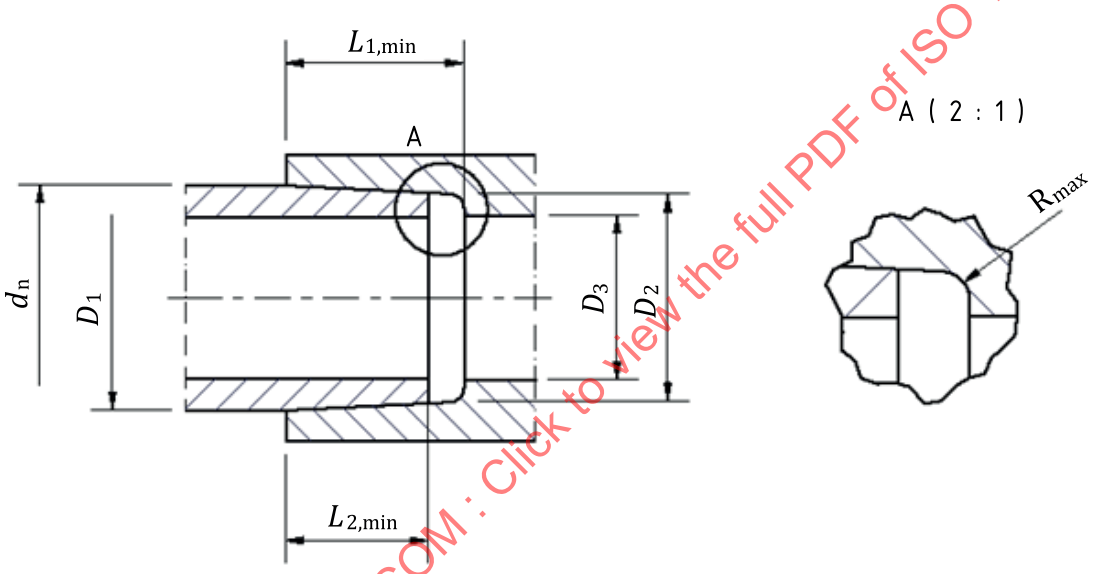
6.2.1 Dimensions of socket fusion fittings (see Figure 1)

Socket fusion fittings shall be classified in two types as follows:

— type A: fittings intended to be used with pipes, where no external machining of the pipe is required;

— type B: fittings intended to be used with pipes, where machining of the outside surface of the pipe is necessary in accordance with the instructions of the manufacturer.

The nominal diameters of the socket fusion fittings shall conform to Table 3 or Table 4.



Key

d_n nominal outside diameter

D_1 inside diameter of the socket mouth which comprises the mean diameter of the circle at the inner section of the extension of the socket with the plane of the socket mouth

D_2 mean inside diameter of the socket root which comprises the mean diameter of the circle in a plane parallel to the plane of the socket mouth and separated from it by a distance of $L_{1,min}$

D_3 minimum diameter of the flow channel (bore) through the body of a fitting

$L_{1,min}$ minimum socket length, which comprises the distance from the socket mouth to the shoulder

$L_{2,min}$ minimum insertion length which comprises the depth of penetration of the heated pipe end into the socket

R_{max} allowed maximum root radius

Figure 1 — Socket and spigot dimensions for socket fusion fittings

Table 3 — Diameters and lengths of sockets for socket fusion fittings of type A

Dimensions in millimetres

Nominal diameter of the fitting	Mean inside diameter of socket				Maximum out-of-roundness	Minimum bore[a]	Radius at socket root	Socket length	Penetration of pipe into socket
	Root D_1		Root D_2						
d_n	$D_{1,min}$	$D_{1,max}$	$D_{2,min}$	$D_{2,max}$		$D_{3,min}$	R_{max}	$L_{1,min}$	$L_{2,min}$
16	15,00	15,45	14,74	15,10	0,55	11,2	2,5	16,5	15,0
20	19,00	19,45	18,74	19,19	0,55	15,2	2,5	16,5	15,0
25	23,85	24,40	23,54	24,09	0,55	19,4	2,5	19,5	18,0
32	30,75	31,20	30,40	30,95	0,65	25,0	3,0	21,5	20,0
40	38,75	39,30	38,37	38,92	0,65	31,4	3,0	24,0	22,0
50	48,75	49,30	48,31	48,86	0,75	39,4	3,0	27,0	25,0
63	61,65	62,20	61,16	61,71	0,75	49,8	4,0	30,0	28,0
75	73,20	74,00	72,90	73,70	1,00	69,0	4,0	33,0	33,0
90	87,70	88,70	87,40	88,40	1,20	84,0	4,0	37,0	37,0
110	107,30	108,40	106,90	108,00	1,30	87,6	4,0	43,0	43,0
125	122,40	124,60	121,50	123,00	1,20	99,7	4,0	40,0	35,0
140	137,20	139,50	135,60	137,50	1,20	111,4	4,0	43,0	38,0
160	156,80	159,50	155,40	157,20	1,40	127,3	5,0	47,0	42,0

[a] Only applicable, if a shoulder exists.

Table 4 — Diameters and lengths of sockets for socket fusion fittings of type B

Dimensions in millimetres

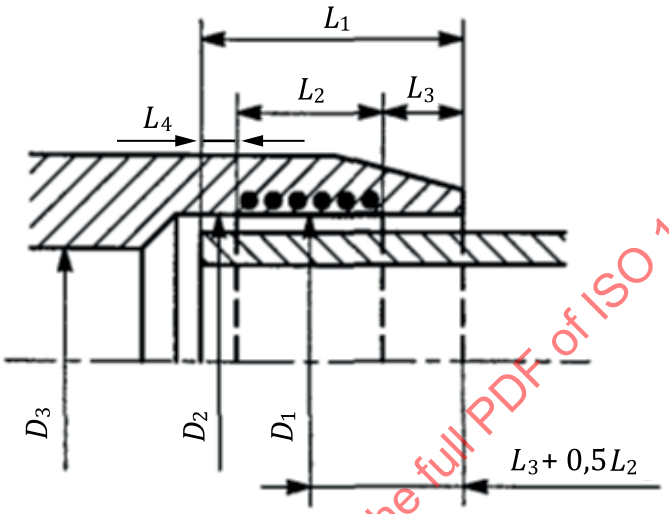
Nominal diameter of the fitting	Mean inside diameter of socket				Maximum out-of-roundness	Minimum bore[a]	Radius at socket root	Socket length	Penetration of pipe into socket
	Root D_1		Root D_2						
d_n	$D_{1,min}$	$D_{1,max}$	$D_{2,min}$	$D_{2,max}$		$D_{3,min}$	R_{max}	$L_{1,min}$	$L_{2,min}$
16	15,2	15,5	15,1	15,4	0,4	11,2	2,5	13,0	9,5
20	19,2	19,5	19,0	19,3	0,4	15,2	2,5	14,5	11,0
25	24,2	24,5	23,9	24,3	0,4	19,4	2,5	16,0	12,5
32	31,1	31,5	30,9	31,3	0,5	25,0	3,0	18,0	14,5
40	39,0	39,4	38,8	39,2	0,5	31,4	3,0	20,5	17,0
50	48,9	49,4	48,7	49,2	0,6	39,4	3,0	23,5	20,0
63	61,9	62,5	61,6	62,1	0,6	49,8	4,0	27,5	24,0
75	73,7	74,2	73,4	73,9	1,0	59,4	4,0	31,0	27,5
90	88,6	89,2	88,2	88,8	1,0	71,6	4,0	35,5	32,0
110	108,4	109,0	108,0	108,6	1,0	87,6	4,0	41,5	38,0
125	122,7	123,9	122,3	123,5	1,2	99,7	4,0	46,0	42,5
140	137,6	138,8	137,2	138,4	1,2	111,4	4,0	50,5	47,0
160	157,2	158,6	156,7	158,1	1,4	127,3	5,0	56,5	53,0

[a] Only applicable, if a shoulder exists.

6.2.2 Dimensions of sockets for electrofusion fittings

The principal dimensions of sockets for electrofusion fittings as shown in Figure 2 shall be in accordance with Table 5.

The values of lengths L_1 and L_2 (see Figure 2) shall be in accordance with Table 5. The manufacturer shall declare the actual length.



Key

D_1 mean inside diameter of the fusion zone which comprises the mean inside diameter when measured in a plane parallel to the plane of the mouth at a distance $L_3 + 0{,}5L_2$ from that face

D_2 minimum inside diameter of the socket measured in any plane parallel to the plane of the mouth at a distance not greater than L_1 from that plane

D_3 minimum bore which comprises the minimum diameter of the flow channel through the body of the fitting. In the case of a coupling without a stop, it is not greater than half the total length of the fitting.

L_1 depth of penetration of the pipe or male end of a spigot fitting

L_2 nominal length of the fusion zone, which comprises the heated length as declared by the manufacturer

L_3 nominal unheated entrance length of the fitting, which comprises the distance between the mouth of the fitting and the start of the fusion zone as declared by the manufacturer

L_4 nominal unheated length of the fitting, which comprises the distance between the end of the fusion zone and the end of the pipe as declared by the manufacturer

Figure 2 — Principal dimensions for electrofusion fittings

Table 5 — Socket dimensions for electrofusion fittings

Dimensions in millimetres

Nominal diameter of the fitting d_n	Minimum mean inside diameter[a] of fusion zone $D_{1,min}$	Nominal length of fusion zone $L_{2,min}$
16	16,1	10
20	20,1	10
25	25,1	10
32	32,1	10
40	40,1	10
50	50,1	10
63	63,2	11
75	75,2	12
90	90,2	13
110	110,3	15
125	125,3	16
140	140,3	18
160	160,4	20

[a] In piping systems that involve spigot trimming, smaller values for D_1 are permitted if conforming to the manufacturer's specification.

6.3 Dimensions of metallic fittings

Metallic fittings shall conform to EN 1254-3.

7 Mechanical characteristics of plastics fittings

7.1 General

When tested in accordance with ISO 1167-1, ISO 1167-3 and ISO 1167-4 using the test parameters given in Table 6 and Table 7 where the test pressure is given in relation to the class of fitting and design pressure, the component shall withstand the test pressure, p_F, without bursting or leakage during the test period.

Prior to the delivery, the fittings shall meet the mechanical characteristics.

The testing shall be conducted in water-in-air.

The test pressure shall be calculated using Formula (1):

$$p_F = p_D \times \frac{\sigma_F}{\sigma_{DF}} \quad (1)$$

where

p_F is the hydrostatic test pressure, in bars, to be applied to the fitting body during the test period;

σ_F is the value of the hydrostatic stress, in megapascals, of the fitting body material corresponding to the test duration and test temperature conditions in Table 6 and Table 7;

σ_{DF} is the design stress value, in megapascals, of the fitting body material as determined for the appropriate service condition class from data produced in accordance with ISO 15876-1 and ISO 15876-2;

p_D is the design pressure of 4 bar, 6 bar, 8 bar or 10 bar, as applicable.

NOTE 1 bar = 10^5 N/m^2 = 0,1 MPa.

Fittings may be connected to the pipes for which they are intended to be used. Other methods may be used to seal the ends of the fitting body in order that the required pressure can be applied.

7.2 Fitting material identical to the PB pipe compound

In this case, σ_{DF} has the same value as σ_{DP} and the fitting shall conform to the requirements given in Table 6 or Table 7 using the test pressures, p_F, given, as applicable to the class of fitting and the design pressure.

7.3 Fitting made from PB not identical to the PB pipe compound

The fitting shall conform to the requirements given in Table 6 and Table 7 relating to test temperature and minimum time to failure as applicable to the class of fitting and design pressure, using Formula (1) and relevant values for hydrostatic stress, σ_F, and design stress, σ_{DF}, derived as in 4.1.2, to determine the test pressure, p_F.

7.4 Fitting made from plastics other than PB

Fittings intended to be used in PB piping systems for hot and cold water within buildings for the conveyance of water, whether or not for human consumption (domestic systems), and for heating systems shall conform to 7.3.

Table 6 — Determination of test pressure, p_F, for PB-H

	Application class											
	Class 1			Class 2			Class 4			Class 5		
Maximum design temperature, T_{max}, in °C	80			80			70			90		
Design stress of fitting material, σ_{DF}, in MPa	5,72			5,04			5,46			4,30		
Test temperature[a], T_{test}, in °C	20[b]		95	20[b]		95	20[b]		80	20[b]		95
Test duration, t, in h	1	22	1 000	1	22	1 000	1	22	1 000	1	22	1 000
Hydrostatic stress of fitting material, σ_F, in MPa	15,5	15,2	6,0	15,5	15,2	6,0	15,5	15,2	8,3	15,5	15,2	6,0
Test pressure, p_F, in bar, for a design pressure, p_D, of:												
4 bar	14,3[c]	13,9[c]	5,5[c]	14,3[c]	13,9[c]	5,5[c]	14,3[c]	13,9[c]	7,7[c]	14,5	14,2	5,6
6 bar	16,3	15,9	6,3	18,5	18,1	7,2	17,1	16,6	9,2	21,7	21,3	8,4
8 bar	21,7	21,2	8,4	24,7	24,2	9,6	22,8	22,2	12,2	28,9	28,3	11,2
10 bar	27,1	26,5	10,5	30,8	30,2	12,0	28,4	27,7	15,3	36,1	35,4	14,0
Number of test pieces	3			3			3			3		

[a] Generally, the highest test temperature is taken to be (T_{max} + 10) °C with an upper limit of 95 °C. However, to match existing test facilities, the highest test temperature for classes 1 and 2 is also set at 95 °C. The hydrostatic stresses given correspond to the given test temperatures.

[b] 20 °C/22 h test to be done in case of failure at 20 °C/1 h or in case of dispute.

[c] The 20 °C, 10 bar, 50 years, cold water requirement, being higher, determines this value (see ISO 15876-1).

Table 7 — Determination of test pressure, p_F, for PB-R

	Application class											
	Class 1			Class 2			Class 4			Class 5		
Maximum design temperature, T_{max}, in °C	80			80			70			90		
Design stress of fitting material, σ_{DF}, in MPa	5,16			5,12			4,33			4,13		
Test temperature[a], T_{test}, in °C	20[b]		95	20[b]		95	20[b]		80	20[b]		95
Test duration, t, in h	1	22	1 000	1	22	1 000	1	22	1 000	1	22	1 000
Hydrostatic stress of fitting material, σ_F, in MPa	15,3	15,0	4,9	15,3	15,0	4,9	15,3	15,0	7,3	15,3	15,0	4,9
Test pressure, p_F, in bar, for a design pressure, p_D, of:												
4 bar	14,1[c]	13,8[c]	4,5[c]	14,1[c]	13,8[c]	4,5[c]	14,2	13,9	6,8	14,9	14,6	4,8
6 bar	17,8	17,5	5,7	18,0	17,6	5,8	21,3	20,8	10,2	22,3	21,8	7,2
8 bar	23,8	23,3	7,6	24,0	23,5	7,7	28,3	27,8	13,5	29,7	29,1	9,5
10 bar	29,7	29,1	9,5	29,9	29,3	9,6	35,4	34,7	16,9	37,1	36,4	11,9
Number of test pieces	3			3			3			3		

[a] Generally, the highest test temperature is taken to be (T_{max} + 10) °C with an upper limit of 95 °C. However, to match existing test facilities, the highest test temperature for classes 1 and 2 is also set at 95 °C. The hydrostatic stresses given correspond to the given test temperatures.

[b] 20 °C/22 h test to be done in case of failure at 20 °C/1 h or in case of dispute.

[c] The 20 °C, 10 bar, 50 years, cold water requirement, being higher, determines this value (see ISO 15876-1).