

KS

KOREAN INDUSTRIAL STANDARD

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

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**Plastics piping systems for hot and cold water
installations —Polybutylene (PB) Fittings**

Foreword

This standard is written on the basis of **ISO/FDIS 15876-3** *Plastics piping systems for hot and cold water installation - Polybutylene (PB) - Part 3 : Fittings* with a little change of standard structure and technical modifications. The technical differences and the contents which are not originated from international standard are underlined.

1. Scope

1.1 This standard specifies the characteristics of fittings for polybutylene (PB) for 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 appropriate to the class of application (see **Table 1** of **KS M ISO 15876-1**).

This standard covers a range of service conditions (application classes), design pressures and pipe dimension classes.

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 test parameters for the test methods referred to in this standard.

In conjunction with the other Parts of **KS M ISO 15876-1** it is applicable to fittings made from PB and to fittings made from other materials which are intended to be fitted to pipes conforming to **KS M ISO 15876-2** for hot and cold water installations and whereby the joints conform to the requirements of **KS M ISO 15876-5**.

It is applicable to fittings made from alternative materials which when fitted to pipes conforming to Part 2, conform to the requirements of Part 5 of **KS M ISO 15876**

This standard is applicable to fittings of the following types:

- socket weld fittings
- electrofusion fittings
- mechanical fittings
- fitting with incorporated inserts

1.2 Annex A(Normative) shall be effective with the Body of this standard until Dec 31, 2006, but it shall be deleted after that.

2. Normative references

This Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed

hereafter. For dated references, subsequent amendments to, or revisions of any of these publications apply to this Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

- KS M ISO 3363** : 2002, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 2: Pipes (ISO/FDIS 15876-5:2002)*
- KS M ISO 1133** : 2002, *Plastic - Measurement of melt mass-flow rate(MFR) of thermoplastic Plastic and melt volume-flow rate(MVR)*
- KS M ISO 1167** : 2003, *Thermoplastics pipes for the conveyance of fluids - Resistance to internal pressure - Test method*
- KS M ISO 3126** : 2003, *Plastics piping systems - Plastics piping component - Measurement and determination of dimensions*
- KS M ISO 4065** : 2003, *Thermoplastics pipes - Universal wall thickness table*
- KS M ISO 7686** : 2003, *Plastics pipes and fittings - Opacity - Test method*
- KS M ISO TR 9080** : 2003, *Plastics piping and ducting system - Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*
- KS M ISO 11922-1** : 2003, *Thermoplastics pipes for the conveyance of fluids - Dimensions and tolerances - Part 1 : Metric series*
- KS M ISO 15876-1** : 2003, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 1: General (ISO/FDIS 15876-1)*
- ISO 228-1** : 2000, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation*
- ISO 12092** : 2000, *Fittings, valves and other piping system components made of unplasticized poly(vinyl chloride) (PVC-U), chlorinated poly(vinyl chloride) (PVC-C), acrylonitrile-butadiene-styrene (ABS) and acrylonitrile-styrene-acrylate (ASA) for pipes under pressure - Resistance to internal pressure - Test method*
- ISO/FDIS 15876-5** : 2002, *Plastics piping systems for hot and cold water installations — Polybutylene (PB) — Part 5: Fitness for purpose of the system (ISO/FDIS 15876-5:2002)*
- ISO 23711** : 2003, *Elastomer seals - Requirement for material for pipe joint seals used in water and drainage application - Thermoplastic elastomers*
- EN 681-1**, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*
- EN 1254-3**, *Copper and copper alloys — Plumbing fittings — Part 3: Fittings with compression ends for use with plastics pipes*
- EN 1088-1**, *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 internal threads — Dimensions, tolerances and designation*
- EN 12107**, *Plastics piping systems — Injection-moulded thermoplastics fittings, valves and ancillary equipment — Determination of long-term hydrostatic strength of thermoplastics materials for injection moulding of piping*

3. Terms and definitions, symbols and abbreviated terms

For the purposes of this standard the terms and definitions, symbols and abbreviated terms given in **KS M ISO 15876-1** apply together with the following terms and definitions:

3.1 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 welding

3.3.1 Socket weld 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 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

Fitting in which the joint is made by means of connecting threads or other outlets, inserted in the plastics body combined with weld ends for socket welding or electrofusion.

4. Material characteristics

4.1 Plastics fitting material

4.1.1 Fitting material identical to the PB pipe compound

The material from which fittings are made shall conform to the requirements as specified for pipes in **KS M 3363**.

When tested in accordance with the test method as specified in **Table 1** using the indicated parameters, injection moulded tubular test pieces shall withstand the hydrostatic (hoop) stress without bursting or leakage.

4.1.2 PB Fitting material not identical to the PB pipe compound

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

The fitting material in form of injection moulded tubular test pieces shall be evaluated by using the

method given in **KS M ISO 9080** or equivalent where internal pressure tests are made in accordance with **KS M ISO 1167** to find the σ_{LCL} -values. The σ_{LCL} -values thus determined shall be used to determine the design stress, σ_{LF} , (see **Annex A** of **KS M 3363**) and values of hydrostatic stress, σ_F , corresponding to the temperature and time control points given in **Table 2**.

NOTE 1 One equivalent way of evaluation is to calculate the σ_{LCL} -value for each temperature (for example 20°C, 60°C and 95°C) individually.

If evaluation using the method given in **KS M 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 injection-moulded tubular test pieces shall conform to the times for failure at the hydrostatic stress levels for the materials corresponding to the test temperature and the control points given in **Table 2**.

The relevant test temperature shall be equal to or higher than the maximum design temperature, T_{max} , for the service condition class.

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 temp. °C	Test period h	Number of test pieces	KS M ISO 1167 (together with EN 12107)
		15,5	20	1	3	
		6,0	95	1000	3	
		Test parameters for all tests				
		Sampling procedure		1)		
		Type of end cap		Type a)		
		Orientation of test piece		Not specified		
		Type of test		Water-in-water		

1) The sampling procedure is not specified. For guidance see **ISO/TS 15876-7**.

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 4	Class 5
Maximum design temperature, T_{max} (°C)		80	70	90
Test temperature, T_{Test} (°C)	20	95 ¹⁾	80	95
Test duration (h)	1	1000	1000	1000

1) Conducted at 95°C to match existing test facilities

NOTE 2 It is recommended that the nominal diameter of the injection-moulded 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 **KS M ISO 1167** at 110°C for 8760 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 fitting 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 **4.1.2**.

4.2 Metallic fitting material

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

4.3 Influence on water intended for human consumption

The material shall conform to **KS M 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 standard. 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 **KS M ISO 7686**

NOTE This test is not necessary when the fitting body material is of the same opaque PB compound as the pipe.

6. Geometrical characteristics

6.1 General

Dimensions shall be measured in accordance with **KS M ISO 3126**.

6.1.1 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 **KS M ISO 3363** 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

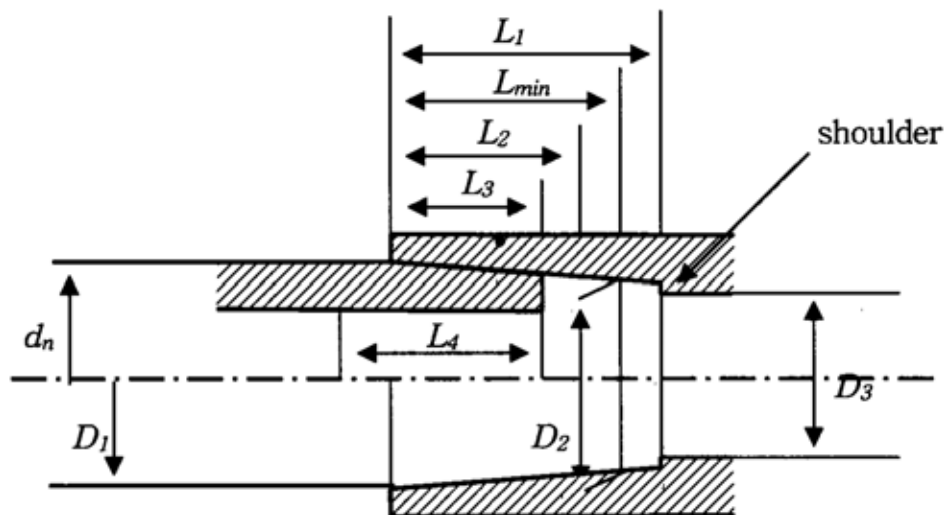
Threads used for jointing shall conform to **prEN 10226-1**. Where a thread is used as a fastening thread for jointing an assembly (e.g. union nuts) it shall conform to **ISO 228-1** except that these

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 electrofusion fittings

6.2.1 Dimensions of socket weld fittings

The principal dimensions for socket weld fittings as shown in **Figure 1** shall be in accordance with **Table 3** and **Table 4** as applicable.



Key

- d_n : is the nominal outside diameter.
- D_1 : is the mean inside mouth diameter of the socket, 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 : is the mean inside root diameter of the socket, which comprises the mean diameter of the circle in a plane parallel to the plane of the mouth and separated from it by a distance of L_{min} (the reference socket length).
- D_3 : is the minimum bore which comprises the minimum diameter of the flow channel through the body of a fitting.
- L_{min} : is the reference socket length, which comprises the theoretical minimum socket length used for the purpose of calculations. The minimum value of L_{min} shall be equal to $(0,3 d_n + 8,5)$ mm.
- L_1 : is the actual length of the socket, which comprises the distance from the mouth to the shoulder (if any). The minimum value of L_1 shall be L_{min} .
- L_2 : is the heated length of the fitting, which comprises the length of penetration of the heated tool into the socket. The minimum value of L_2 is $(L_{min} - 2,5)$ mm. The maximum value of L_2 shall be L_{min} .

L_3 : is the insertion length, which comprises the depth of penetration of the heated pipe end or spigot end of a fitting into the socket. The minimum value of L_3 is ($L_{min} - 3,5$)mm. The maximum value of L_3 shall be L_{min} .

L_4 : is the heated length of pipe, which comprises the depth of penetration of the pipe end or spigot end of a fitting into the heated tool. The minimum value of L_3 shall be ($L_{min} - 3,5$)mm.

Figure 1 Socket and spigot dimensions for socket weld fittings

Table 3 Socket dimensions relative to length of socket weld fittings

Dimensions in millimeters

Nominal diameter of the fitting	Socket reference length, L	Actual length of socket, L_1	Heated socket length,		Penetration of pipe into socket, L_3		Heated length of pipe, L_4
d_n	L_{min}	$L_{1,min}$	$L_{2,min}$	$L_{2,max}$	$L_{3,min}$	$L_{3,max}$	$L_{4,min}$
16	13,3	13,3	10,8	13,3	9,8	13,3	9,8
20	14,5	14,5	12,0	14,5	11,0	14,5	11,0
25	16,0	16,0	13,5	16,0	12,5	16,0	12,5
32	18,1	18,1	15,6	18,1	14,6	18,1	14,6
40	20,5	20,5	18,0	20,5	17,0	20,5	17,0
50	23,5	23,5	21,0	23,5	20,0	23,5	20,0
63	27,4	27,4	24,9	27,4	23,9	27,4	23,9
75	31,0	31,0	28,5	31,0	27,5	31,0	27,5
90	35,5	35,5	33,0	35,5	32,0	35,5	32,0
110	41,5	41,5	39,0	41,5	38,0	41,5	38,0

NOTE $L_{min} = 0.3d_n + 8.5$, $L_{1,min} = L_{min}$, $L_{2,min} = L_{min} - 2.5$, $L_{2,max} = L_{min}$, $L_{3,min} = L_{min} - 3.5$, $L_{3,max} = L_{min}$, $L_{4,min} = L_{min} - 3.5$