INTERNATIONAL STANDARD

ISO 1452-4

First edition
2009-12-01

Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) —

Part 4: **Valves**

Systèmes de canalisations en plastique pour l'alimentation en eau, pour branchements et collecteurs d'assainissement enterrés et aériens avec pression — Poly(chlorure de vinyle) non plastifié (PVC-U) —

Partie 4: Robinets

Reference number
ISO 1452-4:2009(E)

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Published in Switzerland

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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.

ISO 1452-4 was prepared by the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping 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 first edition cancels and replaces ISO 4422-4:1997, which has been technically revised.

ISO 1452 consists of the following parts, under the general title *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U)*:

— *Part 1: General*

— *Part 2: Pipes*

— *Part 3: Fittings*

— *Part 4: Valves*

— *Part 5: Fitness for purpose of the system*

Guidance for the assessment of conformity is to form the subject of a part 7.

Introduction

The System Standard, of which this is Part 4, specifies the requirements for a piping system and its components made from unplasticized poly(vinyl chloride) (PVC-U). The piping system is intended to be used for water supply and for buried and above-ground drainage and sewerage under pressure.

In respect of potential adverse effects on the quality of water intended for human consumption, caused by the products covered by this part of ISO 1452, the following are relevant.

a) This part of ISO 1452 provides no information as to whether or not the products can be used without restriction.

b) Existing national regulations concerning the use and/or the characteristics of these products remain in force.

Requirements and test methods material and components, other than valves, are specified in ISO 1452-1, ISO 1452-2 and ISO 1452-3. Characteristics for fitness for purpose (mainly for joints) are covered in ISO 1452-5.

This part of ISO 1452 covers the characteristics of valves.

Guidance for installation is given in ISO/TR 4191[1].

Guidance for assessment of conformity is provided in ENV 1452-7[2].

For the convenience of users of this part of ISO 1452, marking on valves according to withdrawn International Standards (e.g. ISO 4422-4:1997) may be considered valid for a period, e.g. up to three years from the date of publication of this part of ISO 1452.

Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) —

Part 4: Valves

1 Scope

This part of ISO 1452 specifies the characteristics of valves made from unplasticized poly(vinyl chloride) (PVC-U) for piping systems intended for water supply and for buried and above-ground drainage and sewerage under pressure.

It also specifies the test parameters for the test methods referred to in this part of ISO 1452.

In conjunction with ISO 1452-1, ISO 1452-2, ISO 1452-3 and ISO 1452-5 it is applicable to PVC-U valves with components of PVC-U, other plastics and non-plastics materials intended to be used for the following:

a) water mains and services buried in ground;

b) conveyance of water above ground for both outside and inside buildings;

c) buried and above-ground drainage and sewerage under pressure.

It is applicable to valves in piping systems intended for the supply of water under pressure up to and including 25 °C (cold water) intended for human consumption and for general purposes as well as for waste water under pressure.

This part of ISO 1452 is also applicable to valves for the conveyance of water and waste water up to and including 45 °C. For temperatures between 25 °C and 45 °C, Figure A.1 of ISO 1452-2:2009 applies.

NOTE 1 The producer and the end-user can come to agreement on the possibilities of use for temperatures above 45 °C on a case-by-case basis.

This part of ISO 1452 is applicable to valves of the following types:

— valves for solvent cementing;

— valves for elastomeric ring seal joints;

— valves for flanged joints.

NOTE 2 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.

2 Normative references

The following referenced documents are indispensable for the application 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 580, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating*

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 1183-1:2004, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pyknometer method and titration method*

ISO 1452-1:2009, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 1: General*

ISO 1452-2:2009, *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*

ISO 1452-3:2009, *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: Fittings*

ISO 1452-5, *Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure — Unplasticized poly(vinyl chloride) (PVC-U) — Part 5: Fitness for purpose of the system*

ISO 2507-1:1995, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method*

ISO 2507-2:1995, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 2: Test conditions for unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly(vinyl chloride) (PVC-HI) pipes*

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

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

ISO 16135, *Industrial valves — Ball valves of thermoplastics materials*

ISO 16136, *Industrial valves — Butterfly valves of thermoplastics materials*

ISO 16137, *Industrial valves — Check valves of thermoplastics materials*

ISO 16138, *Industrial valves — Diaphragm valves of thermoplastics materials*

ISO 16139, *Industrial valves — Gate valves of thermoplastics materials*

ISO 21787, *Industrial valves — Globe valves of thermoplastics materials*

EN 802, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings for pressure piping systems — Test method for maximum deformation by crushing*

3 Terms, definitions, symbols and abbreviated terms

For the purposes of this document, the terms, definitions, symbols and abbreviated terms given in ISO 1452-1 apply.

4 Material

4.1 Valve bodies

The valve body material used shall conform to ISO 1452-1 and to the requirements given in 4.2 and 4.3.

4.2 Density

The density, ρ, at 23 °C of the valve body, when measured in accordance with ISO 1183-1, shall be between the following limits:

$$1\,350\ \text{kg/m}^3 \leqslant \rho \leqslant 1\,460\ \text{kg/m}^3$$

4.3 MRS-value

The fitting material shall have a minimum required strength, MRS, as defined in ISO 1452-1:2009, 4.4.1.

The manufacturer of the compound or formulation shall confirm the MRS by testing as described in ISO 1452-1:2009, 4.4.1, 4.4.2 or 4.4.3, respectively.

The MRS value of the valve body material shall be declared by the fitting manufacturer in its technical file.

4.4 Additional components

Additional components made from other plastics and non-plastics materials, as necessary for the construction of the PVC-U valves, shall fulfil their specific functions without preventing conformity to ISO 1452-5.

5 General characteristics

5.1 Appearance

When viewed without magnification, the internal and external surfaces of valves shall be smooth, clean and free from scoring, cavities and other surface defects to an extent that would prevent conformity to this part of ISO 1452.

Each end shall be square to its axis.

5.2 Colour

The colour of injection-moulded valve bodies shall be grey throughout the wall.

5.3 Opacity

The wall of the valve shall be opaque and shall not transmit more than 0,2 % of visible light when measured in accordance with ISO 7686.

6 Geometrical characteristics

6.1 Measurement of dimensions

Dimensions shall be measured in accordance with ISO 3126.

6.2 Nominal diameters

The nominal diameter(s), d_n, of a valve shall correspond to, and be designated by, the nominal outside diameter(s) of the pipe(s) for which they are designed.

6.3 Valves dimensions

6.3.1 Joint dimensions

6.3.1.1 Dimensions of sockets and spigots for solvent cement type valves

The socket dimensions of the valve shall be the same as for sockets on pipes or fittings and shall conform to ISO 1452-2.

The spigot length(s) shall be at least equal to the corresponding socket length(s).

6.3.1.2 Dimensions of sockets and spigots for ring seal type valves

The socket dimensions of the valve shall be the same as for pipes or fittings and conform to ISO 1452-2.

The spigot diameters shall conform to ISO 1452-2 and the spigot length(s) shall be the same as for fittings conforming to ISO 1452-3.

6.3.1.3 Mating dimensions for flange type valves

The mating dimensions of the flanges used on valves shall conform to ISO 1452-3.

6.3.2 Laying lengths and face-to-face lengths

Laying lengths (Z-lengths), or for flanged valves the face-to-face length, shall conform in general to ISO 16135, ISO 16136, ISO 16137, ISO 16138, ISO 16139 or ISO 21787, as applicable.

7 Classification and operating conditions

7.1 Classification

Valves shall be classified according to their nominal pressure, PN, and the series S of the connecting pipe for which they are designed. The nominal pressure, PN, of the valves shall be related to their material design stress, σ_s, using as a basis, the relationship used for pipes, i.e.

$$PN = \frac{10\sigma_s}{S} \quad (1)$$

7.2 Determination of the allowable operating pressure for water up to 45 °C

The allowable operating pressure, PFA, of valves for temperatures up to and including 25 °C shall be equal to the nominal pressure.

To determine the allowable operating pressure of valves for temperatures between 25 °C and 45 °C, a supplementary derating factor, f_T, shall be applied to the nominal pressure as given in Equation (2):

$$PFA = f_T \times PN \quad (2)$$

This factor is given in the relevant clause of ISO 16135, ISO 16136, ISO 16137, ISO 16138, ISO 16139 and ISO 21787, as applicable.

8 Mechanical characteristics

8.1 Resistance of valve bodies to internal pressure

Valve bodies, where hydrostatic pressure can be applied, shall be tested in accordance with the procedure and the test parameters given in the relevant clause of ISO 16135, ISO 16136, ISO 16137, ISO 16138, ISO 16139 and ISO 21787, as applicable, using test equipment conforming to ISO 1167-1 and ISO 1167-3.

8.2 Crushing test

Injection-moulded parts of valves, on which hydrostatic pressure cannot be applied, shall be tested in accordance with EN 802. The tested valve parts shall not shatter when they undergo a deformation of 20 %.

The period between manufacture and testing, t_1, and the conditioning period, t_2, shall be not less than 30 min. The closure speed of the press plates shall be (50 ± 5) mm/min.

8.3 Durability

The valve shall conform to the relevant clause of ISO 16135, ISO 16136, ISO 16137, ISO 16138, ISO 16139 and ISO 21787, as applicable.

NOTE The test method given in ISO 8659[3] specifies a fatigue strength test to confirm the ability of valves to withstand prolonged use in plastics piping systems for water supply, with repeated opening and closure.

8.4 Functional properties

8.4.1 Operating torque

The valve shall conform to the relevant clauses of ISO 16135, ISO 16136, ISO 16137, ISO 16138, ISO 16139 and ISO 21787, as applicable.

8.4.2 Seat and packing test

The valve shall conform to the relevant clause of ISO 16135, ISO 16136, ISO 16137, ISO 16138, ISO 16139 and ISO 21787, as applicable.

9 Physical characteristics

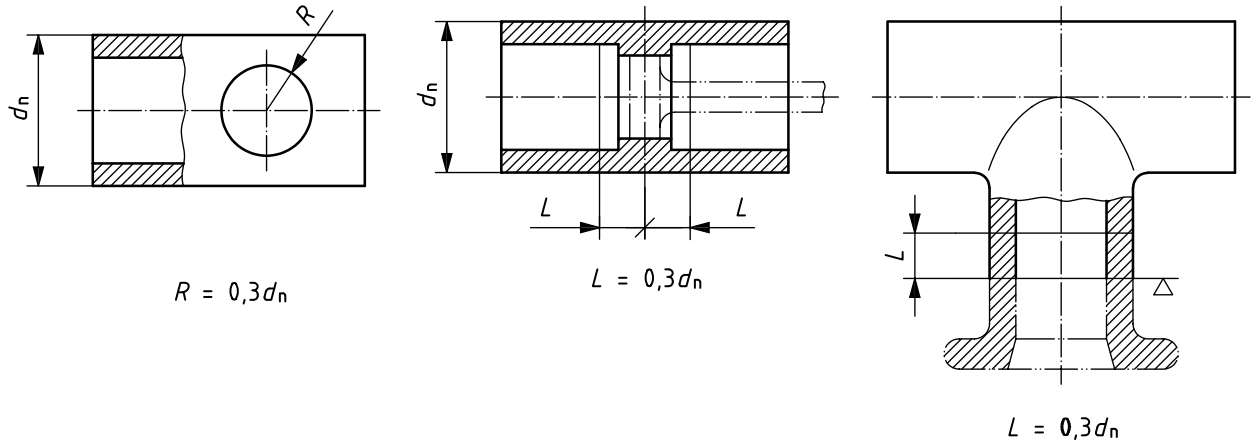
When tested in accordance with the test methods as specified in Table 1 using the indicated parameters, the injection-moulded PVC-U components, such as valve bodies, shall have physical characteristics conforming to the requirements given in Table 1.

Table 1 — Physical characteristics

Characteristic	Requirement	Test parameters		Test method
Vicat softening temperature (VST)	⩾ 74 °C	Shall conform to ISO 2507-2		ISO 2507-1
Effects of heating	The fittings shall not show any blisters or signs of weld-line splitting.[a] No surface damage in the area of any injection point shall penetrate deeper than 50 % of the wall thickness at that point. Outside the area of any injection point, no surface damage shall occur. [b]	Test temperature: Test period for: $e \leqslant 3$ $3 < e \leqslant 10$ $10 < e \leqslant 20$ $20 < e \leqslant 30$ $30 < e \leqslant 40$ $40 < e$ Number of test pieces:	(150 ± 2) °C 15 min 30 min 60 min 140 min 220 min 240 min 3	Method A of ISO 580 (Air oven)

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

[b] 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 1). Any cracks or delamination in the wall of the fitting within 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 1 — Injection gating areas

10 Chemical characteristics

The chemical characteristics shall conform to those required for pipes by ISO 1452-2.

11 Sealing rings

Sealing rings shall conform to ISO 1452-2.

12 Adhesives

Adhesives shall conform to ISO 1452-2.

13 Performance requirements

When valves conforming to this part of ISO 1452 are jointed to each other or to components conforming to other parts of ISO 1452, the valve assemblies and their joints shall conform to ISO 1452-5.

14 Marking

14.1 General

Unless otherwise specified in Table 2, the marking elements shall be either

— printed or formed directly on the product, or

— put on a plate/label attached to the body of the assembled product

in such a way that after storage, weathering, handling and installation, legibility is maintained during the use of the products.

NOTE The manufacturer is not responsible for marking being illegible due to actions caused by installation and use such as painting, scratching, covering of the components or the use of detergents, etc. on the product.

Marking shall not initiate cracks or other types of defects which would impair conformity to the requirements of this part of ISO 1452.

If printing is used, the colour of the printed information shall differ from the basic colour of the product.

The size of the marking shall be such that the marking is legible without magnification.

14.2 Minimum required marking

The minimum required marking shall conform to Table 2.

Table 2 — Minimum required marking on valves

Aspects	Mark or symbol
– Number of the International Standard[a]	ISO 1452
– Manufacturer's name and/or trade mark	xyz
– Nominal diameter d_n	e.g. 63
– Material	e.g. PVC-U
– Nominal pressure PN[bc]	e.g. PN 16
– Nominal diameter of flange DN[d]	e.g. DN 80
– Manufacturer's information[be]	e.g. 93.66
– Intended use[af]	e.g. W/P

[a] This information may either be marked directly on the product or on a plate/label attached to the product or on the packaging.

[b] For nominal diameters $d_n \leqslant 32$ mm table footnote «a» applies.

[c] The marking of the pipe series S may be included, e.g. PN 16/S 8.

[d] For flanged valves only.

[e] To provide traceability, the following details shall be given:

— the production period, the year, in figures or in code;

— a name or code for the production site, if the manufacturer is producing in different sites, nationally and/or internationally.

[f] Information on abbreviations can be found in CEN/TR 15438[4] and/or in national rules.

NOTE For valves having the former standard reference (i.e. ISO 4422-4:1996) directly engraved in the mould, see Introduction.

14.3 Additional marking

Valves conforming to this part of ISO 1452, which conform also to other standard(s), may be additionally marked with the minimum required marking in accordance with this/these other standard(s) in which case table footnote «a» of Table 2 applies.

Valves conforming to this part of ISO 1452, which are third party certified may be marked accordingly. For practical reasons, this should be done on a label or on the packaging.

Annex A
(normative)

Imperial(inch)-sized valves

A.1 General

All clauses of this part of ISO 1452 shall apply, together with the following clauses. The specifications given in this annex are for the requirements which differ from those given in Clauses 1 to 14.

A.2 Nominal sizes and pressure classes

A.2.1 Nominal sizes

In place of 6.2, the following shall apply. The nominal size(s) of a valve shall correspond to and be designated by the nominal size(s) of the pipe(s) for which they are designed.

A.2.2 Pressure classes

Valves shall be classified according to the following nominal pressures, as applicable:

PN 9, PN 12 and PN 15.

A.3 Geometrical characteristics

For the purposes of 6.3, the following shall apply.

A.3.1 Dimensions of sockets and spigots for solvent cement type valves

The socket dimensions of the valve shall be the same as for pipes and fittings conforming to ISO 1452-2:2009, Annex B.

A.3.2 Dimensions of sockets and spigots for sealing ring type valves

The socket dimensions of the valve shall be the same as for pipes and fittings conforming to ISO 1452-2:2009, Annex B.

A.3.3 Mating dimensions for flange type valves

The mating dimensions of flanges used on valves shall conform to ISO 1452-3:2009, Annex A.

A.3.4 Laying lengths

For imperial-sized valves, 6.3.2 does not apply.

A.4 Mechanical characteristics

For the purposes of 8.1, Table A.1 shall apply.

Table A.1 — Resistance of valve bodies to internal pressure

Charac-teristic	Require-ment	Type of test piece	Test parameters				Test method
			Temp. °C	Pressure bars	Test period h	Type of test	
Internal pressure	No failure during the test period	Injection-moulded valve bodies	20	3,36 × PN	1	Water-in-water	ISO 1167-1 and ISO 1167-3
				2,56 × PN	1 000		

Bibliography

[1] ISO/TR 4191, *Unplasticized polyvinyl chloride (PVC-U) pipes for water supply — Recommended practices for laying*

[2] ENV 1452-7, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 7: Guidance for the assessment of conformity*

[3] ISO 8659, *Thermoplastics valves — Fatigue strength — Test method*

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

ICS 23.040.20; 23.040.45; 91.140.60; 93.025

Price based on 11 pages