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

### Part 3: Fittings

*Systèmes de canalisations en plastique pour l'adduction d'eau, pour le drainage enterré et en surface, et pour le réseau d'égout sous pression — Poly(chlorure de vinyle) non plastifié (PVC-U) —*

*Partie 3: Raccords et assemblages*

(Revision of ISO 4422-3:1996)

ICS 23.040.20; 23.040.45; 91.140.60; 93.025

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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 1452-3 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 2, and by Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems* in collaboration.

This first edition cancels and replaces ISO 4422-3:1996 [1], EN 1452-3:1999 [2], and partly EN 1456-1:2001 [3], which have been technically revised. It also includes and cancels ISO 264:1976 [4], ISO 2045:1988 [5], ISO 2048:1990 [6], ISO 3460:1975 [7], ISO 4434:1977 [8] and ISO 6455:1983 [9].

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*

NOTE For a further part, *Part 7: Guidance for the assessment of conformity*, CEN/TC 155 intends to revise ENV 1452-7:2000 [10], that might be published as CEN/TS 1452-7 [11]. It will include CEN/TS 1456-2:2003 [12].

## Introduction

The System Standard, of which this is Part 3, 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 standard:

- 1) this standard provides no information as to whether the products may be used without restriction;
- 2) it should be noted that existing national regulations concerning the use and/or the characteristics of these products remain in force.

Requirements and test methods for material and components, other than fittings, are specified in Part 1, Part 2 and Part 4 of ISO 1452. Characteristics for fitness for purpose (mainly for joints) are covered in Part 5.

This Part of ISO 1452 covers the characteristics of fittings.

Guidance for installation is given in ISO/TR 4191:1989 [13]. Its revision will include and could replace ENV 1452-6:2001 [14].

Guidance for assessment of conformity is provided in CEN/TS 1452-7 [11], the revision of which is intended to include CEN/TS 1456-2:2003 [12].

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

## Part 3: Fittings

### 1 Scope

This Part of ISO 1452 specifies the characteristics of fittings 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 standard.

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

- b) water mains and services buried in ground;
- c) conveyance of water above ground for both outside and inside buildings;
- d) buried and above ground drainage and sewerage under pressure.

It is applicable to fittings 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 standard is also applicable to components 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 given in Annex A of ISO/DIS 1452-2:2008 applies.

**NOTE** The possibilities of use for temperatures above 45° C should be defined between the producer and end-user case by case.

Depending on the jointing method, this standard is applicable to the following types of fittings:

- fittings for solvent cementing;
- elastomeric ring seal fittings.

PVC-U fittings can be manufactured by injection-moulding and/or be fabricated from pipe.

This standard is also applicable to PVC-U flange adapters and to the corresponding flanges made from various materials.

This standard covers a range of fitting sizes and pressure classes and gives requirements concerning colours.

**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 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 580, *Plastics piping and ducting systems — Injection-moulded thermoplastics fittings — Methods for visually assessing the effects of heating* (EN ISO 580:2005)

ISO 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method* (EN ISO 1167-1:2006)

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* (prEN ISO 1167-3:2007)

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

ISO/DIS 1452-1:2008, *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* (prEN ISO 1452-1:2008)

ISO/DIS 1452-2:2008, *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* (prEN ISO 1452-2:2008)

ISO/DIS 1452-5:2008, *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* (prEN ISO 1452-5:2008)

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

ISO 2507-2, *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* (EN ISO 3126:2005)

ISO 7686, *Plastics pipes and fittings — Determination of opacity* (EN ISO 7686:2005)

ISO 13783, *Plastics piping systems — Unplasticized poly(vinyl chloride) (PVC-U) end-load bearing double socket joints — Test method for leaktightness and strength while subjected to bending and internal pressure* (EN ISO 13783)

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

## 3 Terms and definitions, symbols and abbreviations

For the purposes of this standard, the terms and definitions, symbols and abbreviations given in ISO/DIS 1452-1:2008 apply, together with the following.



### 3.1 Definitions

#### 3.1.1

##### laying length ( $Z$ -length)

- a) laying length of fittings and valves with angled outlets:
- 1) for socketed outlet, the laying length is the distance from the inserted tube or spigot end to the intersection point of the fitting/valve axis (fitting or valve centre);
  - 2) for spigot outlet, the laying length is the distance from the outlet end to the intersection point of the fitting/valve axis (fitting or valve centre).
- b) laying length of fittings and valves with parallel outlets:
- 3) in the case of sockets, the laying length is the distance between the ends of the inserted tubes or spigots;
  - 4) in the case of one socket and one spigot, the laying length is the distance from the inserted tube or spigot end to the end of the spigot outlet.

#### 3.1.2

##### design length of bends ( $Z_d$ -length)

length of an outlet, excluding any socket length or insert length of spigot

### 3.2 Symbols

$Z$  : Laying length ( $Z$ -length)

$Z_d$  :  $Z$ -design length ( $Z_d$ -length)

$r$  : bend radius

## 4 Material

### 4.1 Fitting material

The fitting material to be used shall conform to ISO/DIS 1452-1:2008 and to the requirements given in 4.2 and 4.3.

### 4.2 Density

The density,  $\rho$ , at 23 °C of the fitting, when measured in accordance with ISO 1183-1:2004, shall be between the following limits:

$$1350 \text{ kg/m}^3 \leq \rho \leq 1460 \text{ kg/m}^3$$

### 4.3 MRS-value

The fitting material shall have a minimum required strength, MRS, as defined in 4.4.1 of ISO/DIS 1452-1:2008.

The manufacturer of the compound/formulation shall confirm the MRS by testing as described in 4.4.1 or 4.4.2 of ISO/DIS 1452-1:2008 respectively.

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

## 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.

Each end of a fitting shall be square to its axis.

### 5.2 Colour

The colour of injection-moulded fittings shall be grey throughout the wall for water supply, and grey or brown for drainage and sewerage under pressure.

The colour of fittings made from pipes shall be grey, blue or cream throughout the wall for water supply, and grey or brown for drainage and sewerage under pressure.

### 5.3 Opacity of fittings intended for the above ground conveyance of water

The wall of the fittings 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 inside diameter(s),  $d_n$ , of a fitting shall correspond to, and be designated by, the nominal outside diameter(s) of the pipe(s) for which the fitting is designed.

### 6.3 Fittings for solvent cementing

#### 6.3.1 Socket and spigot dimensions

The socket dimensions of the fittings shall be the same as for sockets on pipes and shall conform to ISO/DIS 1452-2:2008.

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

The tolerance on the diameter of the spigot ends,  $d_2$ , of reducing bushing (see Table 7) shall always be positive and be as follows:

- maximum 0,2 mm for diameters equal to or less than 90 mm;
- maximum 0,3 mm for diameters 110 to 160 mm;
- maximum 0,4 mm for diameters 180 to 225 mm;
- maximum 0,5 mm for diameters 250 to 315 mm.

### 6.3.2 Diameters, laying lengths, bend radii and angles

**6.3.2.1** For the following types of injection-moulded fittings the  $Z$ -lengths shall be calculated using one of the following equations as applicable, where  $\alpha$  is the angle of the elbow and  $r$  is the radius of the bend.

- a) 90° elbows, 90° tees (see Table 1):  $Z = \frac{d_n}{2} + 1$
- b) 45° elbows (see Table 1):  $Z = \frac{d_n}{2} \tan \frac{\alpha}{2} + 1$
- c) 45° tee (see Table 1):  $Z = \frac{d_n}{2} \cot \frac{\alpha}{2} + t$
- with
- | $d_n$ | $t$ |
|-------|-----|
| ≤ 90  | 3   |
| 110   | 4   |
| 125   | 6   |
| 140   | 6   |
| 160   | 7   |
- d) Bends (see Table 2)  $Z = r = 2d_n$
- e) Short bends (see Table 5)  $Z = r = 0,75d_n$
- f) Reducing bushes long (see Table 6)  $Z = 0,75 d_2 + 6$
- g) Reducing bushes short (see Table 7)  $Z = \left(\frac{d_2}{2} + 6\right) - \left(\frac{d_1}{2} + 6\right)$

The calculated values are given in Table 1 to Table 7. The calculated values may be adapted by the manufacturer.

The manufacturer's information (e.g. catalogues) shall state the exact value(s) of the  $Z$ -length(s).

NOTE The deviation from the calculated values are recommended to be not greater than the values given in the Table 1, Table 2, Table 5, Table 6 and Table 7 as applicable.

**6.3.2.2** For bends made from pipe the  $Z$ -design-lengths,  $Z_d$ , and the bend radii shall be equal to or greater than the values given in Table 3 and Table 4, as applicable.

NOTE 1 The  $Z_d$ -lengths are always greater than the corresponding socket lengths.

The wall thickness in the bend area of bends made from pipe shall be not less than the specified minimum wall thickness for the corresponding pipe given in ISO/DIS 1452-2:2008.

NOTE 2 If needed the next pipe series with the smaller S-number can be used. See also 7.2.

**6.3.2.3** Figures and Tables for fittings for solvent cementing.

Types of fittings are shown in Figure 1.

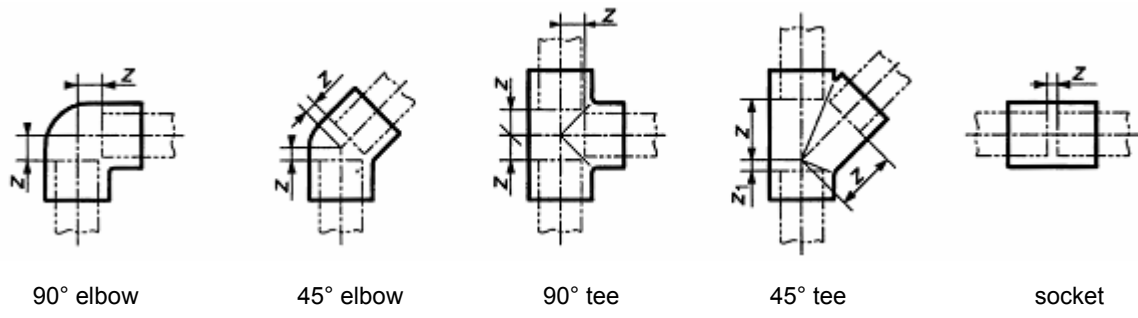


Figure 1 — Types of fittings: Typical elbows, tees and double-socket

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