
**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**

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*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 5: Aptitude à l'emploi du système

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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 1452-5 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 4422-5:1997, 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 5, 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 the products may 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 for components requirements and test methods are specified in ISO 1452-2, ISO 1452-3 and ISO 1452-4.

This part of ISO 1452 establishes the characteristics of fitness for purpose of the plastics piping system composed of pipes, fittings, valves, ancillaries and their joints.

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

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

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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 5: Fitness for purpose of the system

1 Scope

This part of ISO 1452 specifies the characteristics for the fitness for purpose of unplasticized poly(vinyl chloride) (PVC-U) 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 1452-4, it is applicable to joints and assemblies 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; <https://standards.iteh.ai/catalog/standards/sist/921a2ae0-551f-4185-aa78-555555555555/iso-1452-5-2009>
- 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 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 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 of ISO 1452-2:2009 applies.

NOTE 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.

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 1452-1, *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 3: Fittings*

ISO 1452-4, *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*

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*

ISO 13844, *Plastics piping systems — Elastomeric-sealing-ring-type socket joints of unplasticized poly(vinyl chloride) (PVC-U) for use with PVC-U pipes — Test method for leaktightness under negative pressure*

ISO 13845, *Plastics piping systems — Elastomeric-sealing-ring-type socket joints for use with unplasticized poly(vinyl chloride) (PVC-U) pipes — Test method for leaktightness under internal pressure and with angular deflection*

ISO 13846, *Plastics piping systems — End-load-bearing and non-end-load-bearing assemblies and joints for thermoplastics pressure piping — Test method for long-term leaktightness under internal water pressure*

3 Terms and definitions, symbols and abbreviations

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

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4 Fitness for purpose of joints and the system

4.1 Assemblies with non-end-load-bearing joints

The following types of assemblies with non-end-load-bearing joints shall fulfil the fitness for purpose requirements given in 4.3 to 4.5 and Tables 1 and 2, as applicable:

- a) integrally socketed PVC-U pipe to pipe assemblies with elastomeric ring seal joints conforming to ISO 1452-2;
- b) PVC-U fitting and pipe assemblies with elastomeric ring seal joints conforming to ISO 1452-3 and ISO 1452-2, respectively;
- c) PVC-U valve and pipe assemblies with elastomeric ring seal joints conforming to ISO 1452-4 and ISO 1452-2, respectively;
- d) metal fitting and PVC-U pipe assemblies with elastomeric ring seal joints;
- e) metal valve and PVC-U pipe assemblies with elastomeric ring seal joints;
- f) PVC-U, GRP or metal adaptor assemblies with elastomeric ring seal joints for PVC-U pipes and with flanged, threaded or other connections to pipes of different materials or to ancillary equipment, such as tapping saddles;
- g) mechanical joint assemblies with PVC-U pipes.

The components of the assemblies of types b) to g) shall be assembled with PVC-U pipes of the corresponding nominal pressure, PN, or pipe series S conforming to ISO 1452-2. The assembly instructions of the component manufacturer shall be followed.

4.2 Assemblies with end-load-bearing joints

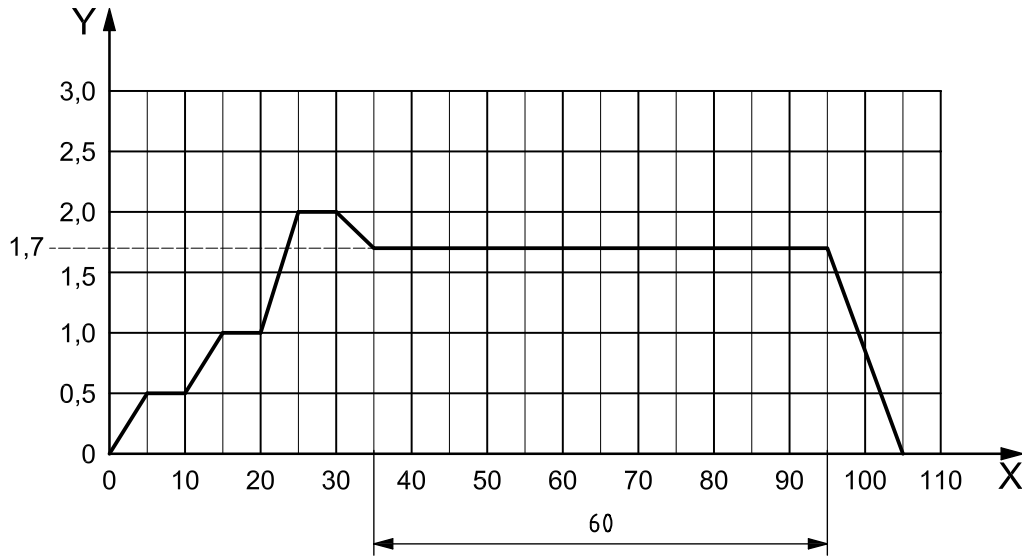
The following types of assemblies with end-load-bearing joints shall fulfil the fitness for purpose requirements given in 4.3 to 4.5 and Table 1 and Table 2, as applicable:

- a) integral socketed PVC-U pipe to pipe assemblies with solvent cement joints conforming to ISO 1452-2;
- b) PVC-U fitting and pipe assemblies with solvent cement joints conforming to ISO 1452-3 and ISO 1452-2, respectively;
- c) flange assemblies with PVC-U pipes, using PVC-U flange adaptors and flanges conforming to ISO 1452-3 or using GRP or metal flanges;
- d) PVC-U valve and pipe assemblies with solvent cement joints conforming to ISO 1452-4 and ISO 1452-2, respectively;
- e) PVC-U or metal valve and PVC-U pipe assemblies with flanged joints conforming to ISO 1452-4 and ISO 1452-2, respectively;
- f) PVC-U or metal tapping saddles and PVC-U pipe assemblies with solvent cement or mechanical joints conforming to ISO 1452-3 and ISO 1452-2, respectively;
- g) PVC-U, GRP or metal adaptor assemblies with solvent cement joints for PVC-U pipes and with threaded or other connections to pipes of different materials conforming to ISO 1452-3;
- h) PVC-U or metal union and special coupling assemblies;
- i) end-load-bearing double socket and PVC-U pipe assemblies with elastomeric ring seal joints (see ISO 1452-3:2009, Figure 25).

The components of the assemblies of types b) to i) shall be assembled with PVC-U pipes of the corresponding nominal pressure, PN, or pipe series S conforming to ISO 1452-2. The assembly instructions of the component manufacturer shall be followed.

4.3 Short-term pressure test for leaktightness of assemblies

When assemblies with elastomeric ring seal type joints are tested with hydrostatic pressure and angular deflection in accordance with ISO 13845, using the test parameters given in Table 1 and a hydrostatic pressure test regime in accordance with Figure 1, where the test pressure, p_T , is given by the nominal pressure, PN, multiplied by the factor f , ($p_T = f \times PN$), they shall conform to the applicable requirements given in Table 1.



Key

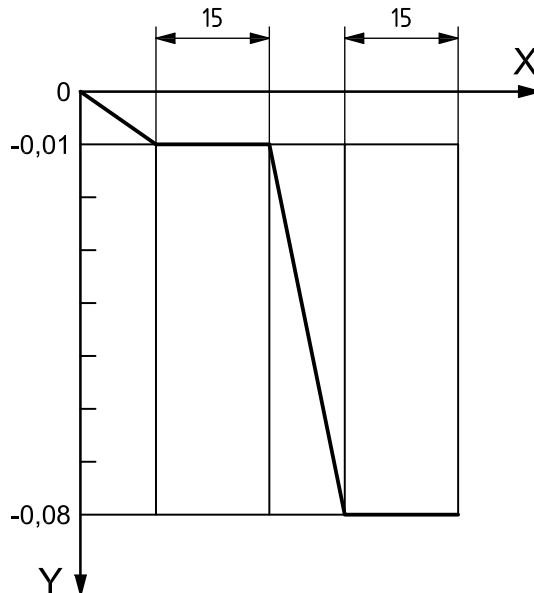
- X time, in minutes
- Y multiplication factor, f , used for the calculation of the test pressure

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

Figure 1 — Hydrostatic pressure test regime

4.4 Short-term negative pressure test for leaktightness of assemblies

When assemblies with elastomeric sealing ring seal type joints are tested with negative pressure and angular deflection plus deformation in accordance with ISO 13844, using the test parameters given in Table 1 and a negative pressure test regime in accordance with Figure 2, they shall conform to the applicable requirements given in Table 1.



Key

- X time, in minutes
- Y negative pressure, in megapascals

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

Figure 2 — Negative pressure test regime

4.5 Long-term pressure test for leaktightness of assemblies

When assemblies with solvent cement type joints, with elastomeric sealing ring type joints and with other end-load-bearing and non-end-load-bearing joints are tested in accordance with ISO 13846 using pipe sections with a free length equal to d_n , however not less than 150 mm, and the test parameters given in Table 1 and Table 2, as applicable, they shall conform to the applicable requirement given in these tables.

For long-term tests, the test parameters shall be related to the creep resulting from the permissible operating pressures and temperatures after 50 years for PVC-U as determined according to the method described in Annex B.

NOTE Hydrostatic pressures applied during short- and long-term testing on single components in accordance with ISO 1452-2, ISO 1452-3 and ISO 1452-4 are higher than the permissible operating pressure of the piping system and cannot be used for assembly testing as they would produce inadmissible stresses in joint areas and eight times more creep in the sockets that can actually occur after 50 years under working conditions.

Table 1 — Requirements for assemblies with non-end-load-bearing joints

Characteristic	Requirement	Test parameters				Test method	
		Parameter	Value				
Leaktightness at short-term hydrostatic internal pressure	No leakage at any point of the jointing areas during the test period	Test pressure ^a Ambient temp. Variation in temp. Deflection Test period Number of test samples ^b	Shall conform to Figure 1 15 °C to 25 °C ± 5 K 2° 100 min 1			ISO 13845	
Leaktightness at short-term negative air pressure	Negative pressure change shall be ≤ 0,05 bar for the first and for the second 15 min	Test pressure Ambient temperature Variation in temp. Deflection Deformation ^c Test period Number of test samples ^b	Shall conform to Figure 2 15 °C to 25 °C ± 2 K 2° 5 % Shall conform to Figure 2 1			ISO 13844	
Leaktightness at long-term hydrostatic internal pressure	No leakage at any point of the jointing areas during the test period		Pipe diameter			ISO 13846	
			for $d_n \leq 90$ mm:		for $d_n > 90$ mm:		
		Water temperature	20 °C	40 °C	20 °C		40 °C
		Test pressure ^a	1,7PN	1,3PN	1,65PN		1,3PN
		Test period		1 000 h			
		Number of test samples ^b		1			

^a The PN value is that of the nominal pressure rating of the fitting, or if an integral socket joint is used, the nominal pressure rating of the pipe.

^b The number of test pieces given indicates the number required to establish a value for the characteristic described in this table. The number of test pieces required for factory production control and process control should be listed in the manufacturer's quality plan.

^c Required only for pipe series S 16 and above (i.e. thinner walls).