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**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**

*Systèmes de canalisations en plastiques — Emboîtures avec bagues  
d'étanchéité en élastomères en poly(chlorure de vinyle) non plastifié  
(PVC-U) pour les tubes PVC-U — Méthode d'essai d'étanchéité sous  
pression négative*



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## Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 13844 was prepared by the European Committee for Standardization (CEN) in collaboration with ISO Technical Committee 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).

Throughout the text of this standard, read "...this European Standard..." to mean "...this International Standard...".

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## Foreword

The text of EN ISO 13844:2000 has been prepared by Technical Committee CEN/TC 155 "Plastics piping systems and ducting systems", the secretariat of which is held by NNI, in collaboration with Technical Committee ISO/TC 138 "Plastics pipes, fittings and valves for the transport of fluids".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2000, and conflicting national standards shall be withdrawn at the latest by October 2000.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

This standard is based on a working draft, prepared by the International Organization for Standardization (ISO). It is an editorial revision of the text concerned (ISO/TC138/SC2 N 672 revised) without modification of the technical content.

The material-dependent parameters and/or performance requirements are incorporated in the System Standard(s) concerned.

This standard is one of a series of standards on test methods which support System Standards for plastics piping systems and ducting systems.

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## 1 Scope

This standard specifies a method for testing the leaktightness of:

- single sockets of unplasticized poly(vinyl chloride) (PVC-U);
  - double sockets of PVC-U;
    - sockets of PVC-U fittings,
- with elastomeric sealing rings.

It is applicable to elastomeric-sealing-ring-type socket joints conforming to EN 1452-2 or ISO 4422-2, intended for use with PVC-U pressure pipes.

## 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 revision 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.

EN 1452-2, *Plastics piping systems for water supply — Unplasticized poly(vinyl chloride) (PVC-U) — Part 2: Pipes* or

ISO 4422-2, *Pipes and fittings made of unplasticized poly(vinyl chloride) (PVC-U) for water supply — Specifications — Part 2: Pipes (with or without integral sockets)*,

as applicable (see the note in clause 5).

## 3 Principle

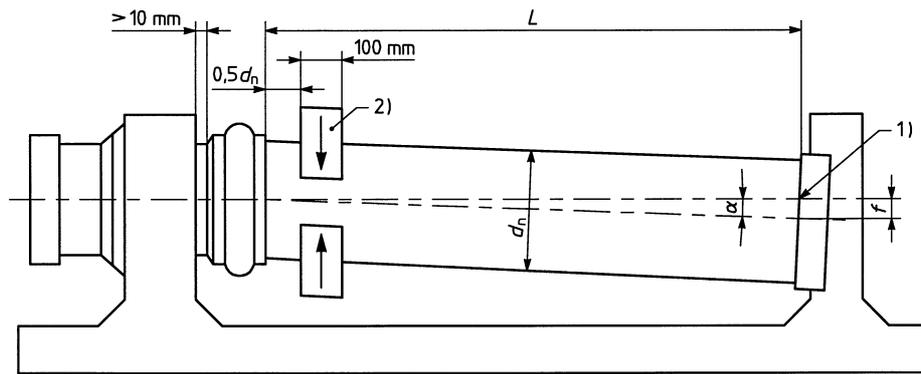
A test piece consisting of a PVC-U pipe mounted into a PVC-U socket is exposed within a specified temperature range to two specified negative internal pressures for a specified test period, while the pipe is being subjected to an angular deflection in the socket and to deformation. During the test the test piece is monitored for signs of leakage.

## 4 Apparatus

**4.1 Apparatus**, comprising at least two fixing devices, one of which is movable, to allow angular deflection to be applied to the test joint, while a negative air pressure (partial vacuum) is being applied.

**4.2 Vacuum gauge**, having an accuracy of  $\pm 1\%$  at the measured values.

**4.3 Equipment**, designed to produce a deforming force on the pipe spigot at a specified distance from the mouth of the socket. A typical arrangement is shown in Figure 1.



$L$  is the free length of the pipe between the socket mouth and the end-seal ( $L = 5d_n$ , with  $L_{min} = 500$  mm and  $L_{max} = 1500$  mm)  
 $d_n$  is the nominal outside diameter of the pipe

- 1) Starting point for measuring and adjusting the angle of deflection  $\alpha$  ( $\geq 2^\circ$ )
- 2) For pipes of series S 16 and greater, a pair of clamps to deform the pipe (see 6.2)

NOTE The deflection,  $f$ , and the angle of deflection,  $\alpha$ , are related by the equation  $f = L \sin \alpha$ . For  $\alpha = 2^\circ$ , the deflection is  $f = 0,035L$ .

**Figure 1 — Typical test arrangement**

**4.4 Vacuum pump**, capable of maintaining the two required levels of negative pressure (see 6.6).

**4.5 Isolation valve**, between the test piece and the vacuum pump (see 6.6).

## 5 Test piece

The test piece shall comprise an assembly of a PVC-U pipe section conforming to either EN 1452-2 or ISO 4422-2, as applicable, and mounted into the PVC-U socket to be tested.

NOTE When the test is conducted in accordance with EN ISO 13844, EN 1452-2 is applicable, whereas ISO 4422-2 is applicable when the test is conducted in accordance with ISO 13844.

The assembly shall be carried out in accordance with the socket manufacturer's instructions.

Pipes of the same nominal pressure (PN) or the same pipe series S as that of the socket shall be used for the test.

For the applicable size, the mean outside diameter of the pipe shall be the smallest available within the tolerance band and the socket dimensions (mean inside diameter and the diameter of the groove for housing the sealing ring) shall be the largest available conforming to the maximum values stated by the manufacturer.

The length of the pipe section shall be such that the free length,  $L$ , between the socket mouth and the end-seal is equal to five times the nominal outside diameter of the pipe with a minimum of 500 mm and a maximum of 1500 mm.

## 6 Procedure

**6.1** Secure the socket, without any deformation, to the immovable fixing device of the apparatus so that the socket axis is horizontal and adjust the pipe section in line with the axis of the socket.

**6.2** For pipes of series S 16 and greater (i.e. thinner walls), deform the pipe in the vertical plane by 5 % of the  $d_n$  using a pair of 100 mm wide clamps placed at a distance of  $0,5d_n$  from the mouth of the test socket. Measure the deformation at the face of the clamp adjacent to the mouth of the socket.

**6.3** For pipes of series less than S 16 (i.e. thicker walls), carry out procedures given in 6.4 to 6.6 without applying the deforming force.

**6.4** By inclining the pipe in the test apparatus, determine the free angle of deflection,  $\alpha$ , which the joint can tolerate without forcing.

If  $\alpha \geq 2^\circ$ , firmly anchor the pipe to maintain the deflected pipe in this position for the remainder of the test.

If  $\alpha < 2^\circ$ , carry out the test at a deflection of  $2^\circ$  measured at the starting point (see Figure 1), by forcing the pipe to that position.

**6.5** Carry out the procedure of 6.6 under the following conditions:

- with the angular deflection applied in the vertical plane while constantly inspecting for and recording any signs of leakage;
- with the ambient temperature constant to within  $\pm 2^\circ\text{C}$  and within the range of  $15^\circ\text{C}$  to  $25^\circ\text{C}$ .

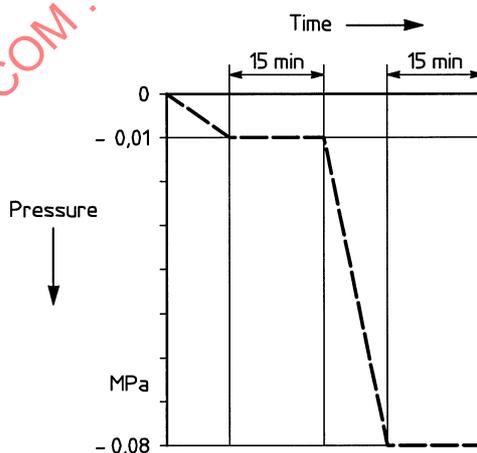
**6.6** Apply a negative pressure to the test piece until a constant gauge pressure of  $-(0,1 \pm 0,02)$  bar [ $-(0,01 \pm 0,002)$  MPa] is achieved (see Figure 2).

Isolate the vacuum pump from the test piece, monitor the pressure for 15 min and record any change in the negative pressure. If the change in negative pressure exceeds 0,05 bar (0,005 MPa), stop the test.

Unless the change in negative pressure was not more than 0,05 bar [0,005 MPa], apply a further negative pressure to the test piece until a constant gauge pressure of  $-(0,8 \pm 0,02)$  bar [ $-(0,08 \pm 0,002)$  MPa] is achieved.

Again, isolate the vacuum pump from the test piece, monitor the pressure for a further 15 min and record any change in negative pressure.

NOTE The first negative pressure is approximately 0,9 bar absolute. The second negative pressure is approximately 0,2 bar absolute.



NOTE The negative pressure changes need not be at linear rate.  
1 bar =  $10^5$  N/m<sup>2</sup> = 0,1 MPa.

**Figure 2 — Negative pressure test regime**

## 7 Test report

The test report shall include the following information:

- a) a reference to this standard and to the referring standard;
- b) the nominal pressure (PN) and/or the pipe series S of the PVC-U pipe and socket used for the test;
- c) the mean outside diameter of the pipe section;
- d) the mean inside diameter of the socket;
- e) the diameter of the groove for housing the sealing ring;
- f) the angle of deflection,  $\alpha$ , used for the test;
- g) the ambient temperature during the test, in degrees Celsius;
- h) whether or not the pipe was deformed (see 6.2 and 6.3);
- i) information on the leaktightness of the joint, including any changes observed in the negative pressure (see 6.6);
- j) any factors which may have affected the results, such as any incidents or any operating details not specified in this standard;
- k) the testing body and tester;
- l) the date of test.

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