SLOVENSKI STANDARD
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Thermoplastics piping and ducting systems - Joints for buried non-pressure applications - Test method for the long-term sealing performance of joints with elastomeric seals by estimating the sealing pressure

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Rohrleitungs- und Schutzrohrsysteme aus Thermoplasten - Verbindungen für erdverlegte drucklose Anwendungen - Prüfverfahren für das Langzeit-Dichtverhalten von Verbindungen mit Elastomer-Dichtungen durch Abschätzung des Dichtdrucks

Systemes de canalisations et de gaines en thermoplastiques - Assemblages pour applications enterrées sans pression - Méthode d'essai pour la performance a long terme des assemblages avec garnitures d'étanchéité en élastomere par l'estimation de la pression d'étanchéité

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Thermoplastics piping and ducting systems - Joints for buried non-pressure applications - Test method for the long-term sealing performance of joints with elastomeric seals by estimating the sealing pressure

Systèmes de canalisations et de gaines en thermoplastiques - Assemblages pour applications enterrées sans pression - Méthode d'essai pour la performance à long terme des assemblages avec garnitures d'étanchéité en élastomère par l'estimation de la pression d'étanchéité

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This European Standard (EN 14741:2006) has been prepared by Technical Committee CEN/TC 155 “Plastics piping systems and ducting systems”, the secretariat of which is held by NEN.

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of an identical text or by endorsement, at the latest by August 2006, and conflicting national standards shall be withdrawn at the latest by August 2006.

This document supersedes EN 1989:2000.

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 that support System Standards for plastics piping systems and ducting systems.

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

1 Scope

This draft European Standard specifies a method for determination of the long-term sealing pressure of elastomeric seals in assembled joints for buried non-pressure sewerage plastics piping and ducting systems.

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.

EN 681-1, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 1: Vulcanized rubber*

EN 681-2, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 2: Thermoplastic elastomers*

EN 681-3, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 3: Cellular materials of vulcanized rubber*

EN 681-4, *Elastomeric seals — Materials requirements for pipe joint seals used in water and drainage applications — Part 4: Cast polyurethane sealing elements*

EN 837-1:1996, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN ISO 9967, *Plastics pipes - Determination of creep ratio (ISO 9967:1994)*

3 Symbols

B : the theoretical pressure in bar, in the PTFE tube at t = 1 h

D : drop factor of extrapolated pressure data at 24 h and 100 years

M : the gradient of the curve

p_t : pressure measured in the PTFE tube at a flow of 120 ml/min and the time t hours

p_0 : initial leakage pressure in bar, measured in the PTFE tube after completing the assembly

p_{ta}, p_{tb}, p_{tc} : pressure measured in the 3 PTFE tubes in the tested joint marked a, b or c respectively at the time t hours

p_x : extrapolated pressure in bar at 100 years

p_y : calculated pressure in bar at 24 h

p_{xa}, p_{xb}, p_{xc} : extrapolated pressure in bar at 100 years in the 3 PTFE tubes in the tested joint marked a, b or c respectively.

$p_{100\ y}$: the arithmetic mean value of the pressures obtained for each of the three extrapolated values p_x at 100 years

$p_{24\ h}$: the arithmetic mean value of the pressures obtained for each of the three calculated values p_y at 24 h

R : correlation coefficient

t : time in hours

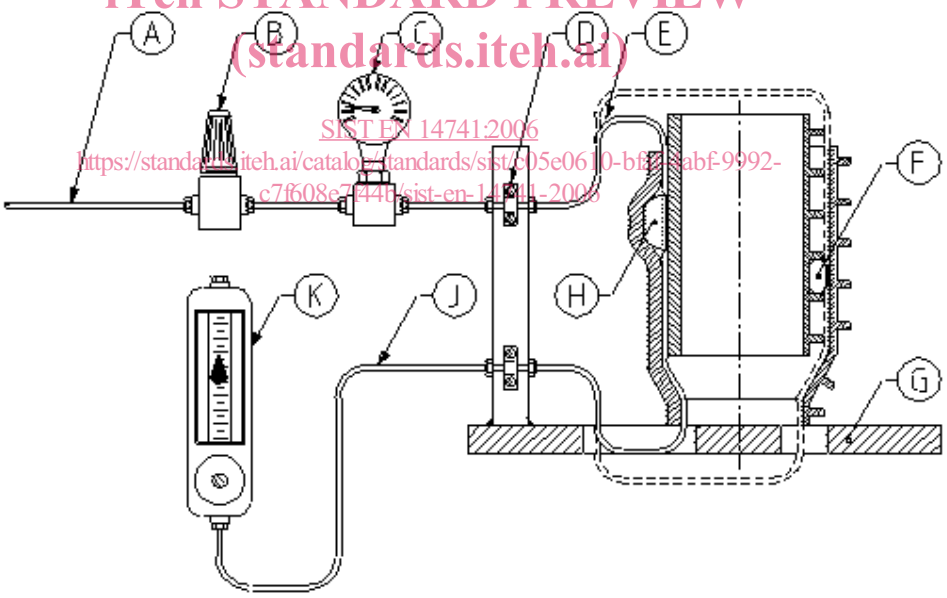
4 Principle

The sealing pressure in a joint is estimated by measuring the pressure, necessary to lift the seal, in each of 3 PTFE tubes equally distributed over the circumference of a joint located between the rubber seal and the spigot or socket as appropriate, see Figure 1.

In a temperature controlled environment and at increasing time intervals, a constant flow rate of 120 ml/min nitrogen or air is forced through 3 flexible PTFE tubes.

The nitrogen or air pressure *p*, necessary to achieve this flow, is measured. The pressure p_t is measured at increasing time intervals over a period of time. The extrapolated regression lines for p_t are used to calculate the estimated value p_x at 100 years and p_y at 24 h.

5 Apparatus



Key

A	Source of nitrogen or clean air	F	Position of the tube in a joint with the sealing ring positioned on the spigot
B	Regulator/pressure controller	G	Test assembly base
C	Pressure gauge	H	Position of the tube in a joint with sealing ring positioned in the socket
D	Fixed coupler	J	Connecting tube
E	PTFE tube	K	Flow meter

Figure 1 — Typical arrangement of the test assembly

5.1 A source of nitrogen, with a purity of at least 99,8%, or alternatively, cleaned air (oil free) both capable of supplying a flow of up to 200 ml/min and at a pressure of at least 10 bar [1].

5.2 Regulator/pressure controller, capable of regulating a stable pressure and flow increase up to 120 ml/min.

5.3 Pressure gauge, for measuring the pressure in the main line and capable of checking conformity to 7.2 (class 0,6 or better as specified in EN 837-1:1996).

5.4 Connecting tube, with an inside diameter of at least 4 mm.

5.5 PTFE tube, conforming to the following:

— capable of sustaining at least 10 bar pressure.

— the total thickness of the flattened PTFE tube shall be between 0,16 mm and 0,24 mm, measured in the middle of the sample and carried out in two positions perpendicular to each other.

— the total width of the flattened tube shall be between 6 mm and 10 mm.

NOTE The PTFE tube used for this test is a blown-up tube, normally applied as a shrinkage tube.
The original diameter and wall thickness after shrinkage are normally specified. The attention is drawn that the blown-up dimensions are normally not specified. Care should be taken that the wall thickness and the diameter of the tube as received are verified. The given tolerances should be seen as a guide for the supplier.

5.6 Flow meter, with a capacity of 200 ml/min and a tolerance of ± 5 ml/min

5.7 Means for storage of the test assembly, capable of fixing and storing the test assembly in such a way that no additional movements in the joint can occur. It shall be capable of fixing the PTFE tubes in such a way that during connecting or disconnecting to the pressure gauge and flow meter, no movement of the PTFE tube in the sealing area can occur.

5.8 Lubricant, an aerosol of silicon (Polydimethylsiloxanoil) with gas propellant (Propane/Butane).

6 Test pieces

6.1 General

Each test piece shall consist of a complete joint, together with its elastomeric seal and PTFE tube(s). Unless otherwise specified in the referring standard, the number of PTFE tubes shall be three, marked as a, b and c, equally spaced around the spigot.

6.2 Assembly

Prior to assembly, the test pieces shall be conditioned at the test temperature for at least 24 h.

Clean the rubber sealing ring, the socket and the spigot.

Prepare the PTFE tube by pressing it together several times until permanently flattened and place it along the smooth surface of the spigot or socket.

[1] 1 bar = 10^5 N/m^2

Lubricate the smooth wall in the joint (spigot or socket), the seal and PTFE tube(s). The lubricant as defined in 5.8 shall be used. Use sufficient lubricant to ensure that the PTFE shrinkage tube(s) and seal can be assembled without damage, and the seal can equalise its position within the groove circumference.

Assemble the socket and spigot, including the seal, in accordance with the manufacturer's instructions and the following requirements.

a) The joint shall be assembled in such a way that the PTFE tubes are mounted between the spigot or socket and the seal (see Figure 1); precaution shall be taken to avoid squeezing of the PTFE tube outside the sealing area.
   It is permitted to mill a grove, insert thin plastics strips along the tube, drill holes in the spigot or socket or any other method to give room for sufficient flow through the tube outside the sealing area. The method selected shall not significantly influence the creep behaviour of the joint in the sealing housing area.

b) Make sure that the PTFE tube can move freely in the axial direction and that the flattened section of the PTFE tube is located under the sealing ring and not distorted, when the joint is made.

6.3 Leaktightness of the test system

Make sure the pressurised side of the test equipment is leaktight after installation. Identify any leakage by soap solution. If necessary, reassemble the leaking joints. Avoid flow through the sealing zone during this operation.

7 Test procedure

7.1 General

The testing shall start between half an hour and 8 h after assembly and leaktightness testing in accordance with Clause 6.

For each of the installed PTFE tubes, carry out the procedure according to 7.2 with the test pieces kept in the temperature controlled environment at (23 ± 2) °C.

Measure and record the sealing pressure, p in bar, at times of 24 h, 168 h, 336 h, 504 h, 600 h, 696 h, 862 h, 1008 h, 1392 h and 2000 h.

Where it is not possible to read the pressure at the appropriate time between 500 h and 2000 h, it is permitted to deviate by up to 48 h, provided the actual measurement time is used in preparing the plots described in Clause 8.

7.2 Procedure for determining the pressure

7.2.1 Measure the leakage pressure, p_0, in each of the 3 tubes individually, using the following procedure.

a) Using the procedure described in 7.2.2 a) steadily increase pressure until a flow of 120 ml/min through the PTFE tube occurs;

b) Measure and record this initial leakage pressure p_0;

c) Reduce pressure to zero.

7.2.2 At each time interval as specified in 7.1, achieve a flow of 120 ml/min and measure and record the nitrogen (or air) pressure p_t in bar, using the following procedure for each of the 3 tubes individually.