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Thermoplastics piping systems for non-pressure underground drainage and sewerage — 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 thermoplastiques pour branchements et collecteurs d'assainissement enterrés sans pression — Assemblages pour applications enterrées sans pression — Méthode d'essai de 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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Foreword

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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.

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ISO 13265 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 1, *Plastics pipes and fittings for soil, waste and drainage (including land drainage)*.

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

1 Scope

This International Standard specifies a method for determining 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.

ISO 9967, *Thermoplastics pipes — Determination of creep ratio*

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

3 Symbols

B	theoretical pressure, in bar[1)], in the PTFE tube at t = 1 h
D	drop factor of extrapolated pressure data at 24 h and 100 years
M	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 three PTFE tubes in the tested joint, marked a, b and c, respectively, at 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 three PTFE tubes in the tested joint, marked a, b and c, respectively
p_{100y}	arithmetic mean value of the pressures obtained for each of the three extrapolated values, p_x, at 100 years
p_{24h}	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

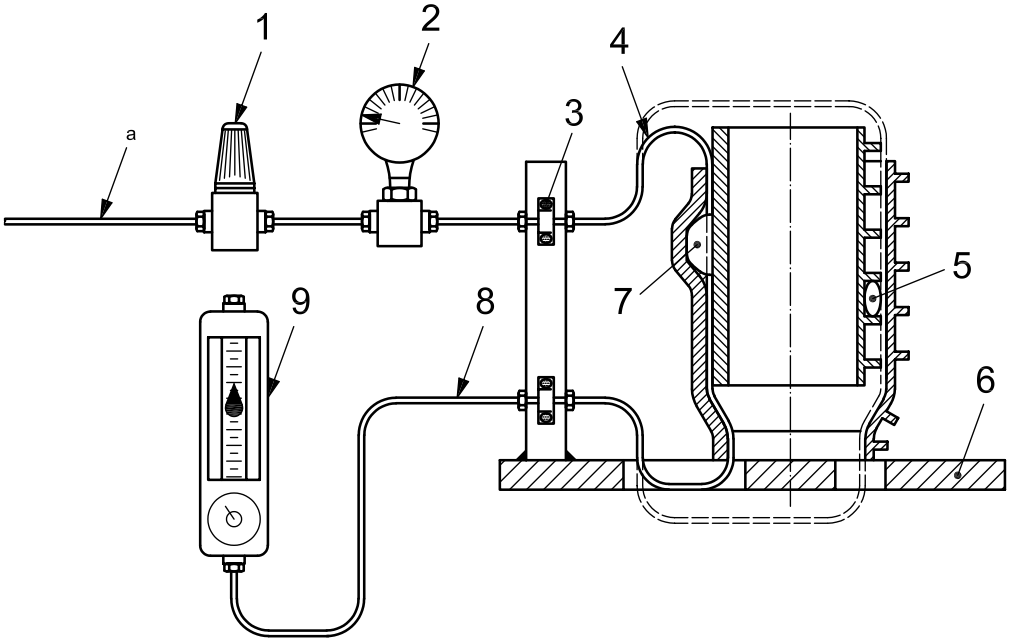
4 Principle

The sealing pressure in a joint is estimated by measuring the pressure necessary to lift the seal, in each of three 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 of nitrogen or air is forced through three 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.

1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.



Key

1 regulator/pressure controller
2 pressure gauge
3 fixed coupler
4 PTFE tube
5 position of the tube in a joint with the sealing ring positioned on the spigot
a Source of nitrogen or clean air.
6 test assembly base
7 position of the tube in a joint with sealing ring positioned in the socket
8 connecting tube
9 flow meter

Figure 1 — Typical arrangement of the test assembly

5 Apparatus

5.1 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.

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).

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

5.5 PTFE tube, conforming to the following:

a) capable of sustaining at least 10 bar pressure;

b) 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;

c) 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. Blown-up dimensions are normally not specified.

The given tolerances should be seen as a guide for the supplier.

Care should be taken that the wall thickness and the diameter of the tube as received are verified.

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

5.7 Means for storing 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, when 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 (polydimethylsiloxane) 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.

Lubricate the smooth wall in the joint (spigot or socket), the seal and PTFE tube(s). The lubricant 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 equalize 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); precautions shall be taken to avoid squeezing the PTFE tube outside the sealing area.

b) 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 that gives 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.

c) 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 pressurized 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 a leaktightness test performed 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 24 h, 168 h, 336 h, 504 h, 600 h, 696 h, 862 h, 1 008 h, 1 392 h and 2 000 h.

Where it is not possible to read the pressure at the appropriate time between 500 h and 2 000 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 three 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 three tubes individually.

a) Increase pressure in increments of 0,5 bar until the level is 0,5 bar below p_0 or the previous measurement. Then continue to increase the pressure gradually and slowly. Occasionally, allow time for the pressure and flow to stabilize. Continue this process until the flow rate has been (120 ± 5) ml/min for 60 s at the same pressure. Record the pressure as p_{ta} in bar.

   If the pressure reaches 10 bar, stop pressurizing and record the pressure as 10 bar.

   If the pressure in all three tubes is recorded as 10 bar after the reading at 504 h, the assembly shall be deemed to have passed the requirements.

   If one or two of the tubes show a pressure less than 10 bar at the 504 h reading, the test shall be continued and the calculation shall be done based on the pressure readings below 10 bar.

b) Reduce pressure to zero.

c) If, during testing, the actual flow reaches a level 10 % higher than 120 ml/min, stop the test and repeat the whole procedure after waiting for at least 30 min.