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Plastic piping systems — Mechanical joints between fittings and pressure pipes — Test method for leak tightness under negative pressure

Systèmes de canalisations en matières plastiques — Assemblages mécaniques entre raccords et tubes sous pression — Méthode d'essai pour l'étanchéité sous pression négative

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 5, *General properties of pipes, fittings and valves of plastic materials and their accessories — Test methods and basic specifications,* in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 155, *Plastics piping systems and ducting systems,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 3459:2015), which has been technically revised.

The main changes are as follows:

— references to diameters > 63 mm have been deleted;

— a change in vacuum pressure that can be considered to be leak tight has been introduced.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastic piping systems — Mechanical joints between fittings and pressure pipes — Test method for leak tightness under negative pressure

WARNING — Persons using this document should be familiar with normal laboratory practice, if applicable. The use of this document can involve hazardous materials, operations and equipment. This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

1 Scope

This document specifies two methods of testing for checking the leak tightness of assembled joints between mechanical fittings and plastic pressure pipes with diameters up to and including 63 mm. The test applies regardless of the design and material of the fitting used for jointing plastics pipe.

This test method is not applicable to fusion-welded joints.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Principle

Checking of the leak tightness of an assembled joint when submitted to external pressure greater than the pressure within the pipe.

For measurements where the external hydraulic pressure is greater than the atmospheric pressure within the pipe, procedure A shall be used.

For measurements with a vacuum inside the pipe segment and an atmospheric pressure outside the pipe, procedure B shall be used.

5 Test parameters and requirements

The test parameters of the standard which refers to this document shall be used and the requirements shall be fulfilled. If one or more parameters are not given in the referring standard, the ones given in Annex A shall apply.

The following test parameters should be given by the standard which refers to this document:

a) test medium;

b) test pressure (bar or MPa);

c) test duration (h);

d) test temperature (°C);

e) free length (mm).

6 Apparatus

6.1 Apparatus for Procedure A

6.1.1 A suitable apparatus for Procedure A is shown in Figure 1.

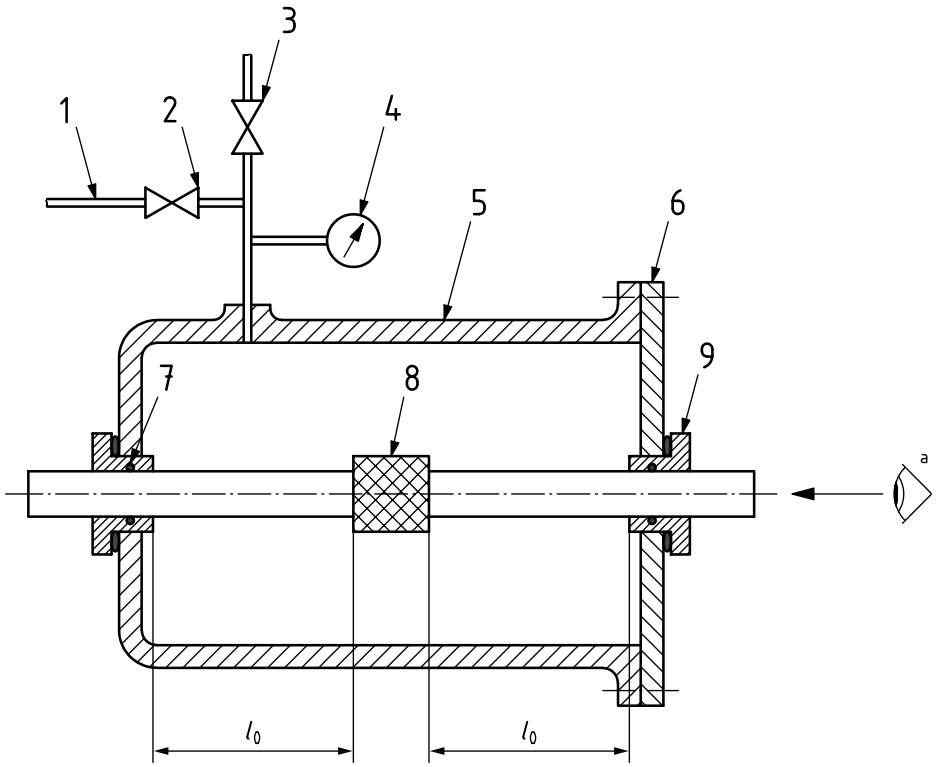
6.1.2 Enclosed tank, capable of being used at the appropriate test pressure and receiving the test specimen. The ends of the test specimen shall pass through the walls of the tank, so that the inside of the pipe is open to the atmosphere and the connecting pipes are in axial alignment. The assembly shall be arranged so as to enable any leakage to be detected within the test specimen.

6.1.3 Pressure source, connected to the tank and capable of raising and maintaining the specified water pressure to within ±0,05 bar[1)].

6.1.4 Pressure measuring device, capable of checking conformity of the test pressure.

6.1.5 Temperature control system, capable of maintaining the temperature of the pressurized water in the tank at the specified temperature, *T*, to within ±2 °C.

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



Key

1	connection to hydraulic pump	6	cover flange
2	valve	7	annular seal
3	air release valve	8	fitting to be tested
4	pressure measuring device	9	sealing collar
5	enclosed tank	l_0	pipe free length

a The apparatus shall permit a clear view through the test piece.

Figure 1 — Typical apparatus

6.2 Apparatus for Procedure B

6.2.1 A typical test arrangement for Procedure B is shown in Figure 2.

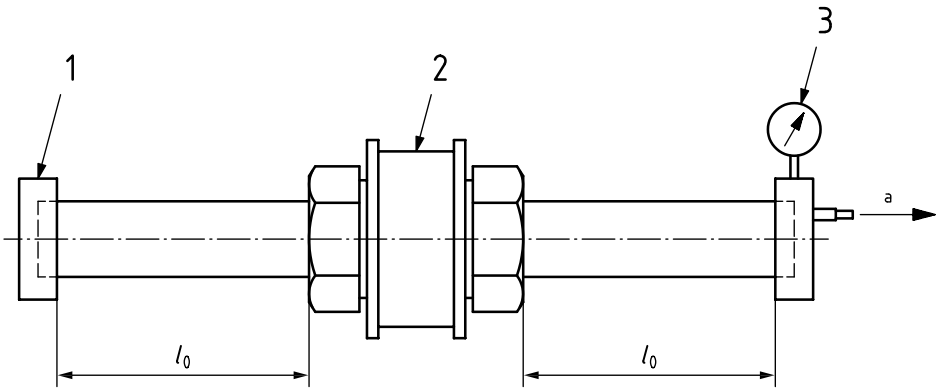
6.2.2 Vacuum source (pump), capable of producing in the test piece the partial vacuum specified in the referring standard.

6.2.3 Vacuum pressure measurement device, capable of measuring the pressure in the test piece to within ±0,01 bar.

6.2.4 Shut-off valve, to isolate the test piece from the vacuum source.

6.2.5 Thermometer(s), capable of checking conformity to the specified test temperature.

6.2.6 End-sealing device, of appropriate size and sealing method for sealing the non-jointed end of the test piece. The device shall be restrained in a manner that does not exert longitudinal forces on the joints.



Key

1 end seal

2 joint under test

3 pressure measurement device

a To vacuum pump.

l_0 pipe free length

Figure 2 — Typical test arrangement

7 Test pieces

The test specimen shall consist of one or more fittings and two or more pieces of plastic pressure pipe of the size and quality for which the fitting is designed. The fittings and pipes shall not be tested until 24 h after their production. For practical reasons, the manufacturer may wait for a shorter period of time before testing. In case of dispute, a duration of 24 h shall apply.

In case of using Procedure B, the test piece shall be connected to the vacuum source (pump) via a line with a shut-off valve. The vacuum pressure measurement device shall be connected between the shut-off valve and the test piece.

The assembly of the joint should be carried out in accordance with the manufacturer's instructions.

The mean outside diameter, d_{em}, of the pipe should preferably conform to the minimum specified value, and the fitting dimensions (mean inside diameter, d_{im}) should preferably conform to the maximum values stated by the manufacturer, in order to have dimensions as close as possible to the extreme limits of their relevant tolerances.

8 Procedure A: Pressure outside

8.1 Secure the test specimen in the water tank. Fill the tank with water at the specified temperature and so that variations in the test temperature do not exceed ±2 °C. Condition the test specimen for at least 20 min.

8.2 Remove any condensation from the inside of the test specimen. Wait for 10 min and ensure that the inside of the test specimen is completely dry.

8.3 After conditioning, progressively and smoothly apply a first test pressure, p_1, in the shortest time practicable for at least 1 h and then smoothly increase the pressure without shock to the second level, p_2. Maintain the test pressure, p_2, for a further period of at least 1 h. The test starts upon achieving the required test pressures.

8.4 Maintain a constant reading on the pressure-measuring device. Inspect the inside surface of the test piece for leakage and record any signs of leakage observed, and the pressure (p_1 or p_2) at which leakage occurs, while the joint is subjected to external pressure.

9 Procedure B: Vacuum inside

9.1 Condition the test specimen at the test temperature for at least 20 min.

9.2 Ensure that during the procedure, the test temperature is maintained at the specified temperature and that variations in the test temperature do not exceed ±2 °C.

9.3 Evacuate the test piece to the test pressure specified in the referring standard. Record the time when the test pressure is achieved and close the shut-off valve.

9.4 Record the increase of pressure, if any, in the test piece until either the test period specified in the referring standard has elapsed or prior failure of the test piece as indicated by an increase of internal pressure. Unless otherwise specified by the referring standard, the assembly shall be considered to be leak tight if the change in vacuum pressure is ≤ 50 mbar.

10 Test report

The test report shall include the following information:

a) a reference to this document (ISO 3459:2021) and the referring standard (including its year of publication);

b) the nominal pressure class or S series of the components [e.g. fitting(s), pipe] comprising the joint(s) under test;

c) all details necessary for identification of the test pieces, including the nominal size of the pipes and fittings used to produce the test pieces, the type of material and the manufacturer's code;

d) the test procedure;

e) the test period;

f) the test pressure;

g) the test temperature;

h) information on the leak tightness of the joint including the pressure at which a leakage occurred (if any);

i) any factors which can have affected the results, such as any incidents or any operating details not specified in this document, or any deviations from the procedure;

j) any unusual features observed;

k) the date of test.

Annex A
(normative)

Test parameters

The test parameters in Table A.1 shall be used, if applicable.

Table A.1 — Test parameters

Test medium		Test duration	Test temperature	Test pressure difference (p_1 and p_2)
Procedure A	**Procedure B**			
Water outside and air (atmospheric pressure) inside	Air	1 h low pressure difference (p_1) followed by 1 h high pressure difference (p_2)	20 °C ± 5 °C	100^{+50}_{0} mbar (p_1) followed by (800 ± 50) mbar (p_2)
NOTE 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.				

The free length, l_0, of each pipe shall be at least 250 mm.