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Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods for leaktightness of flexible joints

Tubes et raccords en plastiques thermodurcissables renforcés de verre (PRV) — Méthodes d'essai d'étanchéité des assemblages flexibles

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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 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 the 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 8639 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 6, *Reinforced plastics pipes and fittings for all applications*.

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

Introduction

In a pipework system, pipes and fittings of different nominal pressures and stiffnesses may be used.

Any joint made between pipes and/or fittings should be designed such that its performance is equal to or better than the requirements of the pipeline, but not necessarily of the components being joined.

The requirements for assembly of the joint are not included in this International Standard, but they should be in accordance with the manufacturer's recommendations.

The material-dependent parameters and/or performance requirements are stated in the referring specification.

Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods for leaktightness of flexible joints

1 Scope

This International Standard specifies methods of test for flexible socket-and-spigot joints with elastomeric sealing elements for glass-reinforced thermosetting plastics (GRP) piping systems intended for buried and above-ground pipelines. It covers methods of test for the leaktightness of the joint only, when subjected to specified combinations of longitudinal extension (draw), angular movement (angular deflection), vertical compression (misalignment) and internal pressure. This International Standard is applicable to joints for either pressure or non-pressure applications.

NOTE The joints tested in accordance with this International Standard are subjected to conditions which measure their ability to function and thereby prove the design of the joint, especially for type-testing purposes.

These test procedures are applicable to joints for pipes and fittings of all nominal sizes. The tests are suitable for the evaluation of joints intended for applications in which liquids are conveyed at temperatures specified in the referring specifications (see clause 2).

2 Principle

A test piece comprising two pieces of pipe jointed together by incorporation of a socket or inclusion of a double-socket coupler is subjected to specified combinations of draw, angular deflection and misalignment. In each specified combination, the test piece is subjected to a sequence of three or more test pressures for specified periods of time, including an internal sub-atmospheric test pressure.

In addition, joints for pressure applications are subjected to a specified cyclic pressure test.

When under pressure, the joint is monitored for leakage.

Between each test (see Tables 1 and 2), the joint is inspected for signs of leakage.

NOTE 1 It is assumed that the following test parameters will be set by the specification making reference to this International Standard:

a) the nominal size of the components to be connected by the joint (see 4.1);

b) the pressure class of the components (see 4.1);

c) the total effective length L of the assembled test piece (see 4.1);

d) the number of test pieces to be used (see 4.2);

e) if applicable, any preconditioning other than that specified in clause 5;

f) the test temperature and the permissible deviations from the test temperature (see clause 6);

g) the nominal pressure relevant to the joint under test (see 4.1 and clause 7);

h) the joint positions (see Tables 1 and 2);

i) the draw (see 7.3.1, 7.4.3 and 7.5.2), the angular deflection (see 7.4.3) and the force F (see 7.5.5);

j) the acceptable increase in pressure over 1 h for the negative-pressure test (see 7.3).

NOTE 2 The only purpose in testing the resistance to negative pressure is to give adequate safety against infiltration of pollutants through the joint into the fluid carried in the piping system. Under these test conditions, pipes with a low stiffness may require support to prevent buckling.

If the joint is to be used in systems where the maximum operating temperature is higher than the value given in the referring specification, the test conditions may be modified accordingly.

Table 1 — Summary of tests for evaluating joints for pressure applications — Conditions and sequence

Test	Pressure sequence	Pressure level	Duration	Subclause number
Initial leakage	Initial pressure	1,5 × PN	15 min	7.2.4
Total draw	Negative pressure	– 0,8 bar	1 h	7.3.3 and 7.3.4
Angular deflection and draw	Preliminary pressure	1,5 × PN	15 min	7.4.5
	Maintained pressure	2,0 × PN	24 h	7.4.6
Misalignment and draw	Preliminary pressure	1,5 × PN	15 min	7.5.4
	Maintained pressure	2,0 × PN	24 h	7.5.7
Cyclic pressure	Positive cyclic pressure	Atmospheric to 1,5 × PN and back to atmospheric	10 cycles of 1,5 min to 3,0 min each	7.6.2 and 7.6.3
NOTE Nominal pressure (PN) is an alphanumeric designation of pressure related to the resistance of a component of a piping system to internal pressure.				

Table 2 — Summary of tests for evaluating joints for non-pressure applications — Conditions and sequence

Test	Pressure sequence	Pressure level	Duration	Subclause number
Initial leakage	Initial pressure	1,5 bar	15 min	7.2.4
Total draw	Negative pressure	– 0,8 bar	1 h	7.3.3 and 7.3.4
Angular deflection and draw	Preliminary pressure	1,5 bar	15 min	7.4.5
	Maintained pressure	2,0 bar	24 h	7.4.6
Misalignment and draw	Preliminary pressure	1,5 bar	15 min	7.5.4
	Maintained pressure	2,0 bar	24 h	7.5.7
NOTE Nominal pressure (PN) is an alphanumeric designation of pressure related to the resistance of a component of a piping system to internal pressure.				

3 Apparatus

3.1 End-sealing devices, of a size and type appropriate to the joint system under test, anchored to take the axial end thrust but permitting free longitudinal movement.

3.2 Supports

3.2.1 Test rig supports, capable of supporting the end thrust induced by the internal pressure but not otherwise supporting the joint (see Figures 1, 2 and 3).

3.2.2 Straps or **cradles,** (100 ± 5) mm wide, capable of supporting the socket barrel over an 180° arc (see Figure 3), for use as follows:

a) a cradle, to support the socket on a fixed base, as required for misalignment testing (see 7.5);

b) a strap or cradle positioned adjacent to the end of the joint being tested [see Figure 3)], through which the force F necessary for misalignment testing (see 7.5) can be applied.

The straps or cradles shall not have a detrimental effect on the test piece, for example point loads.

3.2.3 Pipe supports, capable of supporting an arc of approximately 120° of the pipe barrel (see Figures 1, 2 and 3) for use as follows:

a) support R (see Figure 3) positioned at least 500 mm from the spigot end of the pipe and at the point of balance to provide support during testing with misalignment;

b) supports (see 7.2, 7.3, 7.4 and 7.5) for the pipe components of the test piece (see 4.1 and Figures 1, 2 and 3). These can be used to apply angular deflection (see 7.4 and Figure 2). They shall allow misalignment to occur.

3.2.4 Special supports:

a) if necessary to prevent buckling of the pipe barrel during negative-pressure testing (see 7.3);

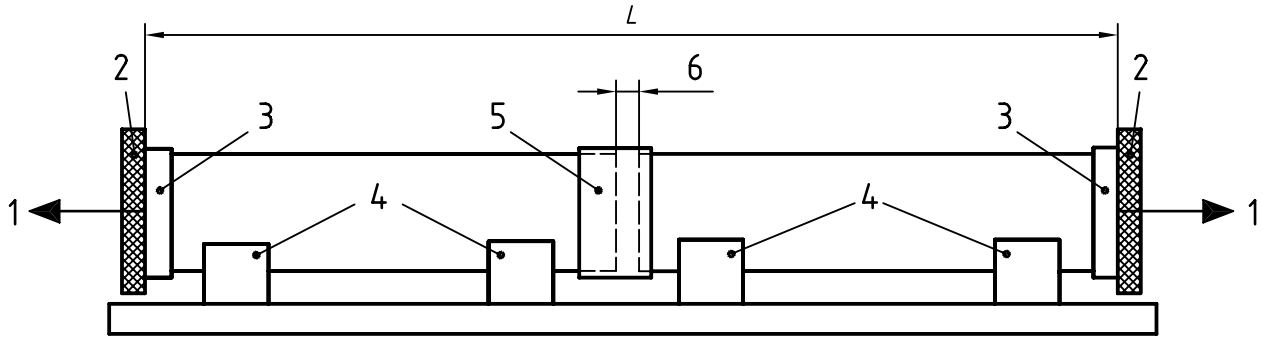
b) if necessary to prevent the total draw from reducing during negative-pressure testing (see 7.3).

3.3 Source of hydrostatic pressure, to meet the needs of the test, including, as necessary, pressure-cycling controls (see Table 1).

3.4 Means for measuring the gauge pressure at the top of the pipe to an accuracy within ±2 % and checking conformity to the specified pressures (see 7.2.4, 7.3.3, 7.3.5, 7.4.5, 7.4.6, 7.5.4, 7.5.7 and 7.6.2).

3.5 Vacuum pump or equivalent, capable of applying the required negative gauge pressure (see 7.3 and Table 1).

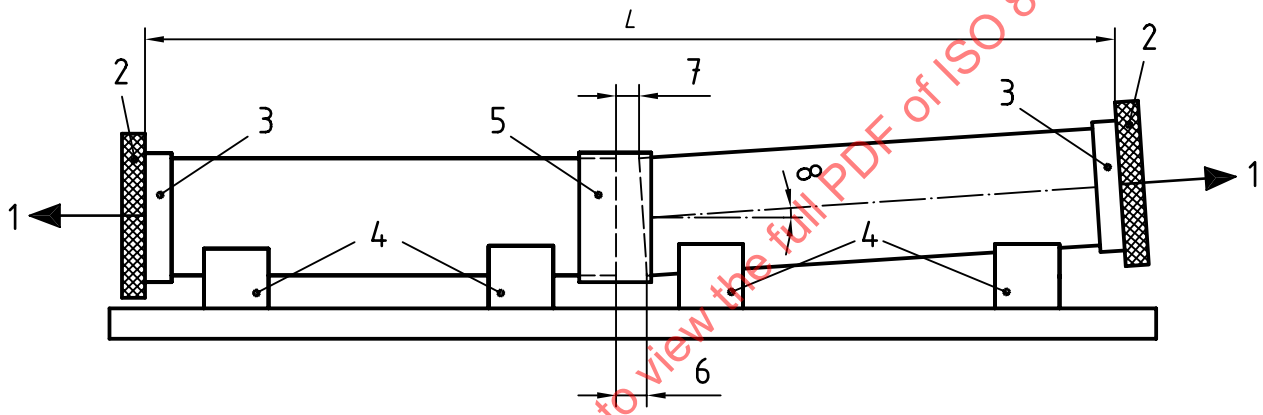
3.6 Means of applying the required force F (see 7.5.5), and means for measuring the applied force to an accuracy within ±5 %.



Key

1	Thrust resisted by test rig	4	Supports
2	Test rig	5	Test joint
3	End cap	6	Total draw

Figure 1 — Test arrangement for total draw

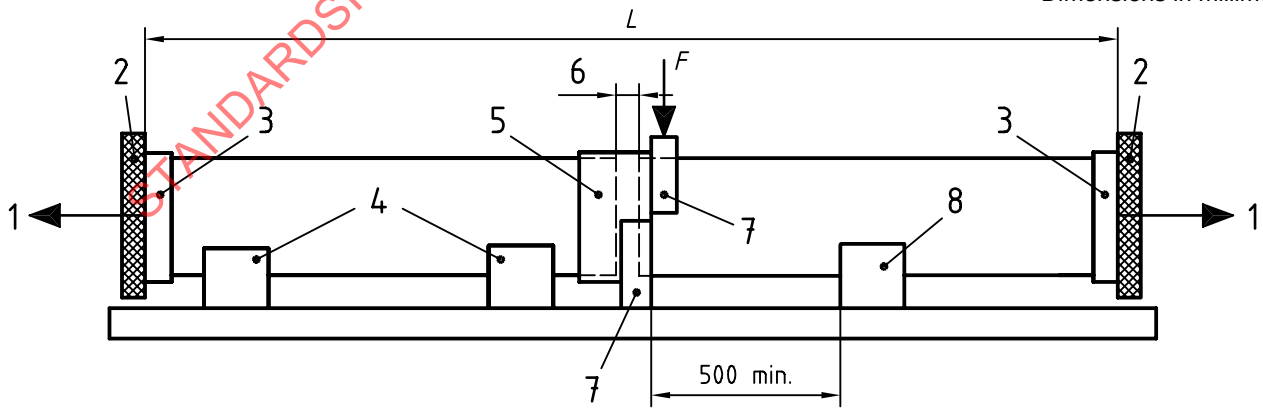


Key

1	Thrust resisted by test rig	5	Test joint
2	Test rig	6	Total draw
3	End cap	7	Draw
4	Supports	8	Angular deflection

Figure 2 — Test arrangement for angular deflection and draw

Dimensions in millimetres



Key

1	Thrust resisted by test rig	5	Test joint
2	Test rig	6	Total draw
3	End cap	7	Cradle
4	Supports	8	Support R

Figure 3 — Test arrangement for misalignment and draw

4 Test pieces

4.1 Test arrangement

Each test piece shall comprise an assembly of two pieces of pipe of compatible nominal size and pressure class, as specified in the referring standard, jointed by the socket/spigot, or double-socket, joint to be tested.

The total effective length L (see Figures 1, 2 and 3) of the assembly shall be not less than that specified in the referring specification and shall allow, if required, the joint under test to be located in the middle of the test arrangement.

The joint shall be assembled in accordance with the manufacturer's recommendations and, if applicable, the requirements of the referring specification.

4.2 Number of test pieces

The number of test pieces shall be as specified in the referring specification.

5 Conditioning

For any interval between assembly of the test piece in accordance with clause 4 and testing, store the test piece at temperatures which do not exceed the test temperature (see clause 6).

6 Test temperature

Carry out the following procedures at the temperature specified in the referring specification.

7 Procedure

7.1 Sequence for testing

Subject each test piece (see clause 4) to those of the following tests specified in the referring specification, in the sequence as given in Table 1 or 2 as applicable, and in 7.2 to 7.6.

If a test is interrupted, record the details in the test report and repeat the particular test before carrying on to the next in the series of tests, if applicable. Failure at the end caps or the pipe shall not constitute failure of the joint, but, if the test conditions are invalidated thereby, repeat the particular test thus affected, after replacing the failed component.

NOTE Each reference to hydrostatic pressure specifies a positive internal gauge pressure (i.e. relative to atmospheric pressure) expressed as a multiple of the nominal pressure (PN) that is relevant to the joint under test.

WARNING — When carrying out the procedures detailed in this clause, care should be taken to provide suitable protection from flying objects resulting from catastrophic failure.

7.2 Initial leakage

7.2.1 Using a conditioned test piece conforming to clauses 4 and 5, assemble the test arrangement as shown in Figure 1, using supports (3.2) as appropriate.

7.2.2 Connect the end caps to the pipes in such a way that the loads induced by the internal pressure will not be transmitted along the pipes to the joint under test.

7.2.3 Connect the test piece (see 4.1) to the source of hydrostatic pressure (3.3) and fill with water, venting as necessary to remove any air.

7.2.4 Apply an internal pressure of 1,5 times the nominal pressure of the joint, expressed in bars[1)], for 15 min (see Table 1 or Table 2).

7.2.5 Inspect the joint for signs of leakage. If there are none, proceed in accordance with 7.3. Otherwise, stop the test and record the observations.

7.3 Resistance to negative pressure

7.3.1 Empty the test piece and assemble the test arrangement as shown in Figure 1, using supports (3.2) as appropriate. Connect to the vacuum pump (3.5).

7.3.2 Apply the total draw specified in the referring specification.

7.3.3 Reduce the pressure to at least 0,8 bar below atmospheric pressure (approximately 0,2 bar absolute). Record the pressure reached.

7.3.4 Close the valve between the test piece and the vacuum pump and leave for 1 h.

7.3.5 After 1 h, record any increase in pressure.

7.3.6 If an increase in pressure in excess of the acceptable level specified in the referring specification [see item j) in note 1 to clause 2] has not occurred, then restore atmospheric pressure and proceed in accordance with 7.4.

7.3.7 If an increase in pressure in excess of the acceptable level specified in the referring specification has occurred, then inspect for sources of leakage other than the joint. If any such sources are found, then return the test piece to atmospheric pressure, seal the leaks and repeat the test described in 7.3.1 to 7.3.6. Otherwise, stop the test and record the observations.

7.4 Simultaneous angular deflection and draw

7.4.1 Assemble the test arrangement as shown in Figure 2.

7.4.2 Reconnect the test piece in accordance with 7.2.2, if necessary (see 4.1).

7.4.3 Apply the draw plus the angular deflection, as specified in the referring specification, to obtain the total draw as shown in Figure 2.

7.4.4 Connect the test piece (see 4.1) to the source of hydrostatic pressure (3.3) and fill with water, venting as necessary to remove any air.

7.4.5 Apply and maintain within ±2 % for 15 min the preliminary pressure specified in Table 1 or Table 2, as applicable. Inspect the joint for signs of leakage. If there are none, continue in accordance with 7.4.6. Otherwise, depressurize the test piece and record the observations in accordance with clause 8.

7.4.6 Increase the pressure to the maintained pressure specified in Table 1 or Table 2, as applicable, and maintain that pressure for 24 h.

7.4.7 Inspect the joint for signs of leakage and record the observations.

7.4.8 Reduce the pressure to atmospheric and empty the test piece. If there are no signs of leakage, continue in accordance with 7.5. Otherwise, record the observations in accordance with clause 8.

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1) 1 bar = 10^5 N/m^2 = 0,1 MPa