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Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals

Tubes et raccords en plastiques thermodurcissables renforcés de verre (PRV) — Méthodes d'essai pour confirmer la conception des assemblages mâle-femelle verrouillés, y compris ceux à double emboîture avec joints d'étanchéité en élastomère

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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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For an explanation on 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 the following URL: 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 6, *Reinforced plastics pipes and fittings for all applications*.

This third edition cancels and replaces the second edition (ISO 7432:2018), which has been technically revised.

This edition includes the following significant changes compared to the previous edition:

— addition of the bending test (Method A), which was already included in ISO 7432:2002.

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.

Introduction

In a pipework system, pipes and fittings of different nominal pressures and nominal stiffnesses may be used. A joint may be made between pipes and/or fittings and should be designed such that its performance is equal to or better than the requirements for the pipeline, but not necessarily for the components being joined.

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

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

Glass-reinforced thermosetting plastics (GRP) pipes and fittings — Test methods to prove the design of locked socket-and-spigot joints, including double-socket joints, with elastomeric seals

1 Scope

This document specifies methods of test for joints with a locked socket and spigot, including double-socket joints, and with elastomeric seals, for buried and above-ground glass-reinforced thermosetting plastics (GRP) piping systems.

It covers methods of test for leaktightness and resistance to damage of the joint only, when subjected to specified combinations of angular movement, compression (deformation) perpendicular to the pipe axis and internal pressure. It assumes that the joint will be exposed to the effects of hydrostatic end thrust.

The tests detailed in 9.2, 9.3, 9.4 and 9.6 are applicable to joints with a locked socket and spigot, including double-socket joints, and with elastomeric seals intended to be used in buried or above-ground applications.

The bending tests detailed in 9.5 can be used to prove the design where joints are either intended to be used in buried applications or are intended to be used in particular above-ground situations where the tests may be considered appropriate.

With the exception of the procedure detailed in 9.5, these test procedures are applicable to joints for pipes and fittings of all nominal sizes. The tests detailed in 9.5 are applicable to joints for pipes and fittings up to and including DN 600. The tests are applicable for evaluating joints intended for applications conveying liquids at temperatures specified in the referring standards.

The test procedures in this document are damaging to the test piece, which will not be suitable for reuse after these tests. The test procedure is intended for type testing purposes.

This document is applicable only to the joint and specifies methods of test to prove its design.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

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

3.1
pressure
hydrostatic gauge pressure

Note 1 to entry: Expressed in bar.

3.2
bending
beam bending in the pipe and joint configuration as a result of a transverse force on the joint

3.3
deformation
pipe deformation in the coupling as a result of a vertical force on the pipe and a supported coupling causing a step between the two pipe spigots at the loading position

4 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 load conditions, including combinations of bending and deformation. In each specified combination the test piece is subjected to a series of test pressures for specified periods of time, including an internal sub-atmospheric test pressure. This also simulates an external positive pressure.

The procedure includes prolonged static tests at elevated pressures and cyclic testing to prove the structural design of the joint.

A joint is subjected to a specified internal negative pressure. This also simulates an external positive pressure.

Two methods are specified for the arrangement in 9.5, Method A and Method B. Method A is the default method. Method B may be agreed between the purchaser and manufacturer.

When under pressure, the joint is monitored for leakage. After each test condition (see Table 1) the joint is inspected for signs of damage.

In addition, a test at elevated positive static pressure is conducted to prove the structural design of the coupling (see Table 1 and 9.6).

NOTE 1 The only reason for testing the joint for resistance to negative pressure is to ensure adequate safety against infiltration of pollutants through the joint into the fluid carried in the piping system. Under the test conditions used, pipes with low stiffness can require support to prevent buckling.

NOTE 2 It is assumed that the following test parameters are set by the standard making reference to this document:

— the nominal size of the components to be connected by the joint;

— the pressure class of the components;

— the total effective length, L, of the test piece;

— the number of test pieces;

— if applicable, the conditioning to be applied;

— the test temperature;

— the sequence of testing, if appropriate;

— the test configuration;

— the deformation and bending forces F_A or F_B ;

— the permissible change in negative pressure.

In all these arrangements a joint of the same size and design shall be used. The same test piece may be used for more than one test procedure providing it is undamaged and of sufficient size to enable the test conditions to be achieved.

5 Apparatus

5.1 End-sealing devices

The end sealing devices shall be of sizes and type appropriate to the components under test. The end-sealing devices shall be securely fixed to the pipes to transmit the end thrust loads to the pipes.

5.2 Supports

5.2.1 **Straps or cradles**, for use as follows:

a) a **support R** of sufficient width, typically 150 mm, (item 6 in Figure 2) positioned at least 500 mm from the spigot end of the pipe at the point of balance to provide support during testing with deformation (see 9.3 and 9.4);

b) a **strap or cradle** (100 ± 5) mm wide (item 7 in Figure 2) supporting at least a 120° arc of the socket, as required for deformation testing (see 9.3 and 9.4);

c) a **strap or cradle** (100 ± 5) mm wide supporting an arc up to 180° of the pipe barrel, positioned adjacent to the end of the joint being tested (item 5 in Figure 2) and through which the force F1 necessary for deformation testing (see 9.3 and 9.4) can be applied;

d) a **strap or cradle** (100 ± 5) mm wide supporting an arc up to 180° of the pipe barrel, positioned in the middle of the joint being tested (item 6 in Figure 3, item 5 in Figure 4) and through which the force FA or FB necessary for the bending test (see 9.5) can be applied;

e) **supports** of sufficient width, typically 150 mm, to carry the pipe components of the test piece (item 3 in Figure 2) and designed in such a way that they allow deformation to occur.

The straps or cradles shall not have a detrimental effect on the test piece, e.g. by applying point loads.

5.2.2 Special supports

Special supports shall be used if necessary to prevent buckling of the pipe barrel during deformation (see 9.3 and 9.4) or negative pressure (9.2) testing. Such supports shall be positioned in such a way that they do not affect the force F_1 applied to the joint or the joint's response to such a load.

5.3 Source of hydrostatic pressure

The source of hydrostatic pressure shall be capable of applying the required pressures including, as necessary, pressure cycle controls.

5.4 Pressure gauges

Pressure gauges shall be capable of measuring the positive and negative pressures. The gauges shall be calibrated to an accuracy of ±2 % of the value to be measured. The pressure shall be measured at the top of the pipe.

5.5 Vacuum pump

The vacuum pump shall be capable of producing the required negative gauge pressure (see 9.2).

5.6 Means of applying and measuring the required deformation and bending forces

The means of applying the required deformation forces F_1 (see 9.3, 9.4) and bending forces F_A (see 9.5.1, Annex A) or F_B (see 9.5.2, Annex B) shall be calibrated to an accuracy of ±5 % of the value to be measured.

6 Test pieces

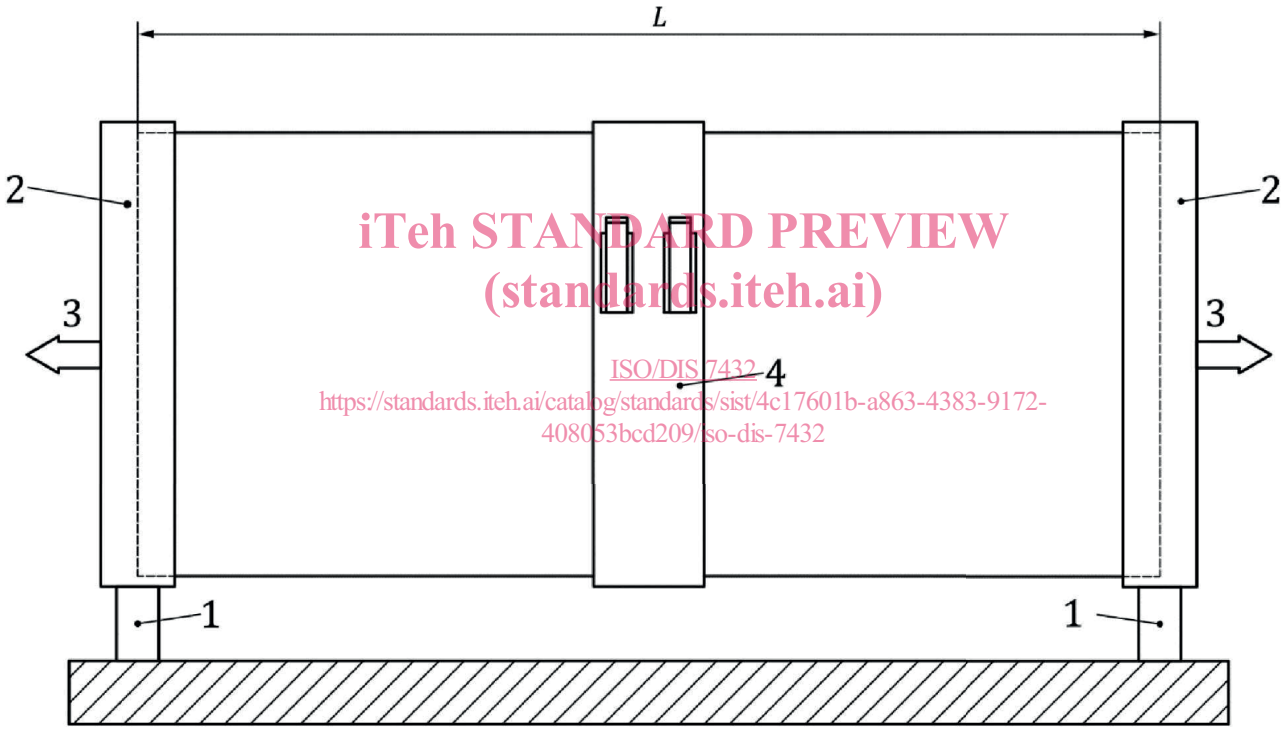
6.1 General

The test piece shall comprise an assembly of two pieces of pipe of the correct size and pressure class, as specified in the referring standard, between which the joint to be tested is located. In some cases, it can be desired to test a transition coupling capable of jointing two different nominal pipe sizes. In such a case both sides of the transition coupling shall satisfy the test requirements.

6.2 Test arrangement for tests detailed in 9.2 and 9.6

For the tests detailed in 9.2 and 9.6, the arrangement shall be as shown in Figure 1.

The total effective length L of the assembly shall be not less than specified in the referring specification for pressure test pieces and shall allow, if required, the joint under test to be located in the middle of the test arrangement.



Key

1 support (if required)
2 end-sealing device fixed to test piece
3 thrust transmitted to test piece (will be negative in leaktightness test specified in 9.2)
4 test joint
L total effective length

NOTE The arrangement can be used either horizontally (as shown) or vertically.

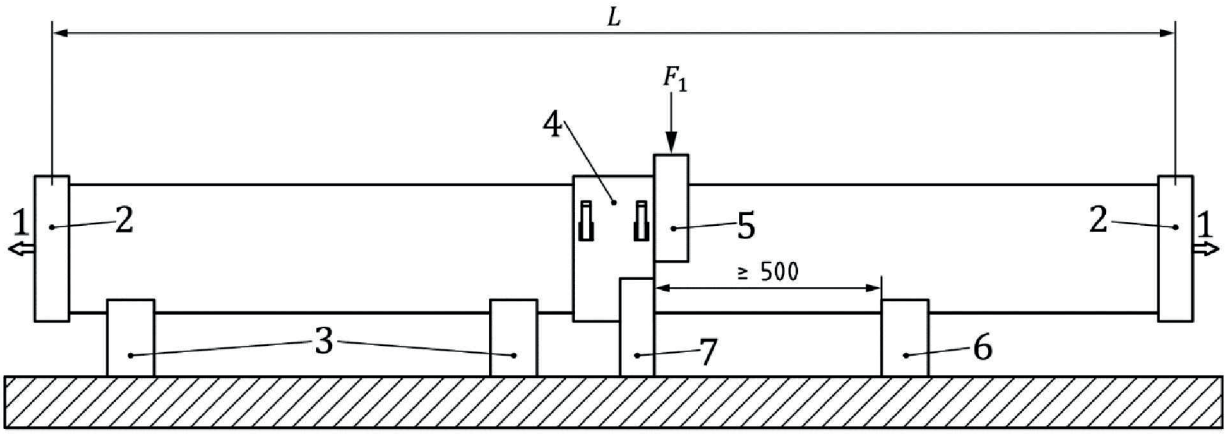
Figure 1 — Test arrangement for the tests detailed in 9.2 and 9.6

6.3 Test arrangement for tests detailed in 9.3 and 9.4

For the tests detailed in 9.3 and 9.4, the arrangement shall be as shown in Figure 2.

The total effective length L of the assembly shall be not less than specified in the referring specification for pressure test pieces and shall allow, if required, the joint under test to be located in the middle of the test arrangement.

Measurements in Millimetres



Key

1	thrust transmitted to test piece	5	strap or cradle [see item c) in 5.2.1]
2	end-sealing device fixed to test piece	6	support R [see item a) in 5.2.1]
3	support [see item e) in 5.2.1]	7	strap or cradle [see item b) in 5.2.1]
4	test joint		
F_1	force to be applied		
L	total effective length		

Figure 2 — Test arrangement for tests detailed in 9.3 and 9.4

6.4 Test arrangement for tests detailed in 9.5

Two methods are provided for the arrangement in 9.5, Method A and Method B.

NOTE Method A is the default method (see Clause 4).

The test arrangement for Method A and Method B are shown in Figure 3 and Figure 4 respectively. Details for Method A are given in Annex A, details for Method B are given in Annex B.

The joint shall be assembled in accordance with the manufacturer's recommendations.

For the bending tests shown in Figure 3 and Figure 4, the length of pipe between the end closure and the joint, which is positioned in the middle, shall be maximum 8 m, but at least 3 times DN, with a minimum of 0,5 m.