INTERNATIONAL STANDARD

ISO 9393-1

Second edition
2004-07-01

Thermoplastics valves for industrial applications — Pressure test methods and requirements —

Part 1: General

Robinets en matières thermoplastiques pour les applications industrielles — Méthodes d'essai de pression et exigences —

Partie 1: Généralités

Reference number
ISO 9393-1:2004(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9393-1 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 7, *Valves and auxiliary equipment of plastics materials*.

This second edition cancels and replaces the first edition (ISO 9393-1:1994), which has been technically revised.

ISO 9393 consists of the following parts, under the general title *Thermoplastics valves for industrial applications — Pressure test methods and requirements*:

— *Part 1: General*

— *Part 2: Test conditions and basic requirements*

Thermoplastics valves for industrial applications — Pressure test methods and requirements —

Part 1: General

1 Scope

This part of ISO 9393 specifies the test methods for the resistance to internal pressure and the leaktightness of thermoplastics valves for use in industrial applications with cold water or with industrial fluids, but excluding gas applications covered by thermoplastics-valve product standards.

Part 2 of this International Standard specifies the test conditions and requirements.

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 1167-1, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 10931:—[1)], *Plastics piping systems for industrial applications — Poly(vinylidene fluoride) (PVDF) — Specifications for components and the system*

ISO 15493:2003, *Plastics piping systems for industrial applications — Acrylonitrile-butadiene-styrene (ABS), unplasticized poly(vinyl chloride) (PVC-U) and chlorinated poly(vinyl chloride) (PVC-C) — Specifications for components and the system — Metric series*

ISO 15494:2003, *Plastics piping systems for industrial applications — Polybutene (PB), polyethylene (PE) and polypropylene (PP) — Specifications for components and the system — Metric series*

3 Terms and definitions

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

3.1
nominal pressure
PN
alphanumerical designation of pressure, used for reference purposes, which is related to the mechanical strength of the valve

NOTE Usually it corresponds to the maximum allowable pressure of water at 20 °C, in bars, for which the valve is designed.

1) To be published. (Revision of ISO 10931-1:1997, ISO 10931-2:1997, ISO 10931-3:1996, ISO 10931-4:1997 and ISO 10931-5:1998)

3.2
test pressure
internal pressure to which a valve is subjected during a test

NOTE It is usually expressed in bars (1 bar = 0,1 MPa).

3.3
closing torque
torque required to close a valve to full tightness at the maximum allowable pressure

NOTE Closing torque is usually expressed in newton metres.

3.4
materials test
test intended to determine the long-term behaviour, under internal hydrostatic pressure, of thermoplastics materials in the form of injection-moulded pipe

3.5
shell test
test intended to check the design strength of a valve shell, under internal hydrostatic pressure, against known hydrostatic curves

3.6
long-term behaviour test of a complete valve
test intended to determine the pressure-resistance capability of a complete valve assembly

3.7
seat and packing test
test on a valve to determine

— the leaktightness of the valve seat when the valve is closed (in one direction for unidirectional valves, and in each of the directions for bi- or multidirectional valves);

— the leakproofness of the complete valve assembly when the valve is open

4 Classification of pressure tests

There are four categories of valve pressure test, as follows:

a) Tests intended to establish the long-term internal-pressure resistance of the thermoplastics materials from which the valve components were manufactured (materials tests).

b) Tests intended to verify the performance of the pressure-sustaining components of the valve (shell tests).

c) Tests intended to verify that the design of the valve and its connections does not adversely affect the long-term performance of the valve (long-term behaviour tests of complete valves).

d) Tests intended to verify the leaktightness of the completely assembled valve (seat and packing tests).

5 Test specimens

5.1 Test specimens for materials tests

Test specimens shall be prepared in accordance with Clause 5 of ISO 15493:2003, ISO 15494:2003 or ISO 10931:—, as applicable for the particular material concerned.

For connection of the test specimens to the test apparatus and for other features, see ISO 1167-1.

5.2 Test specimens for shell tests

For component pressure testing on a valve body (shell test), ISO 1167-1 can be used.

5.3 Test specimens for long-term behaviour of a complete valve

Test specimens for long-term behaviour testing of a complete valve shall comprise a complete valve with all connecting elements assembled in accordance with the valve manufacturer's instructions, as follows:

a) Valves with flanges or unions

Test specimens shall be connected by means of flanges or unions to the test apparatus.

b) Valves with threaded ends (male and/or female)

Test specimens shall be connected by means of threaded fittings to the test apparatus.

c) Valves with ends for fusion or solvent-cement jointing

Test specimens shall consist of a valve jointed by fusion or solvent-cementing to one or more thermoplastics-pipe sections. The free length of the pipe section connected to the valve shall be at least equal to the outside diameter of the pipe.

The pipe shall be cut at right angles to its longitudinal axis.

For fusion-jointed or cemented components, the curing or setting time specified by the manufacturer shall be completed before commencing conditioning in accordance with 5.5.

d) Valves with compression-fitting ends

Test specimens shall be jointed to one or more pipe sections. The free length of each pipe section connected to the valve shall be at least equal to the outside diameter of the pipe.

e) Valves with elastomeric sealing ring type socket joints

Test specimens shall be jointed to one or more pipe sections. The free length of each pipe section connected to the valve shall be at least equal to the outside diameter of the pipe.

5.4 Test specimens for seat and packing tests

Test specimens shall comprise a complete valve assembly having the open ends of the valve closed off by, for example, covers, plugs and flexible seals.

For moulded, fusion-jointed or cemented components, the curing or setting time specified by the manufacturer shall be completed before commencing conditioning in accordance with 5.5.

5.5 Conditioning

5.5.1 Conditioning for tests with water inside the test specimen

Before or after positioning it in the test apparatus, fill the test specimen with water and condition it for at least 1 h at a temperature not deviating more than $\pm$ 2 °C from the specified test temperature.

5.5.2 Conditioning for tests with a gas inside the test specimen

Condition the test specimen for at least 1 h at a temperature not deviating more than ± 8 °C from the specified test temperature.

6 Test apparatus

6.1 Pressurizing device, as specified in ISO 1167-1, capable of being connected to the specimen and capable of progressively applying the water pressure specified in the appropriate product standard and maintaining the pressure constant to within $^{+2}_{-1}$ % for the length of time specified in ISO 9393-2[2)], while maintaining the temperature at that specified in the product standard.

For seat and packing tests, if air or nitrogen is used as the test fluid (either may be used), the device shall be capable of applying a constant gas pressure of 0,6 MPa (6 bar) and shall include a temperature-controlled water bath large enough for the specimen to be immersed in it.

If air or nitrogen is used as the test fluid, it is necessary to take appropriate safety precautions for the use of compressed gases.

For long-term behaviour testing of complete valves and for shell tests, the specimen shall be suspended or placed so that the results are not influenced by the forces necessary to tighten the test specimen, nor shall the test device provide additional reinforcement or support to the valve.

6.2 Pressure measurement devices, capable of checking conformity to the specified test pressure.

In the case of gauges or similar calibrated pressure measurement devices, the required pressure setting shall lie within the calibrated range of the device used.

The pressure measurement device(s) shall not contaminate the test fluid.

NOTE The use of master gauges for calibration of the apparatus is recommended.

6.3 Thermometers or equivalent, capable of checking conformity to the specified test temperature.

6.4 Timer, capable of recording the duration of application of pressure up to the moment of failure of the test specimen, as specified by the referring standard, or capable of measuring the specified time of test for the seat and packing test.

7 Procedure

7.1 Materials test

Carry out testing in accordance with Clause 5 of ISO 15493:2003, ISO 15494:2003 or ISO 10931:—, as applicable for the particular material concerned.

7.2 Shell test

Prepare the test specimen, condition it in accordance with 5.5 and proceed as follows:

Connect the test specimen to the pressurizing device.

---

2) ISO 9393-2, *Thermoplastics valves for industrial applications — Pressure test methods and requirements — Part 2: Test conditions and basic requirements*, is in course of preparation. Until such time as it is available, the test conditions may be agreed between the interested parties.

Position the test specimen so that the entire valve shell will be subjected to the test pressure.

Ensure that the temperature of the water in the test specimen conforms to the specified test temperature.

Release any trapped air from the test specimen.

Raise the pressure progressively and smoothly in such a way that the test pressure specified in ISO 9393-2[2)] is attained as rapidly as possible, but not in less than 30 s. Maintain the pressure and temperature for the length of time specified in ISO 9393-2[2)].

Decrease the pressure to atmospheric pressure.

7.3 Long-term behaviour test of complete valves

Prepare the test specimen, condition it in accordance with 5.5 and proceed as follows:

Connect the test specimen to the pressurizing device.

Position the test specimen so that the entire valve shell will be subjected to the pressure.

Ensure that the temperature of the water in the test specimen conforms to the specified test temperature.

Release any trapped air from the test specimen.

Raise the pressure progressively and smoothly in such a way that the test pressure specified in ISO 9393-2[2)] is attained as rapidly as possible, but not in less than 30 s. Maintain the pressure and temperature for the length of time specified in ISO 9393-2[2)].

Decrease the pressure to atmospheric pressure.

7.4 Seat and packing test

7.4.1 Preparation

Prepare the test specimen, condition it in accordance with 5.5 and proceed as follows:

7.4.2 **Fully closed valve test** (for each direction — see 3.7)

Connect one end of the test specimen to the pressure line and the other end(s) to a device capable of detecting leakage.

Fill the closed test specimen with the test fluid at the specified temperature.

Release any trapped air from the test specimen.

Close the valve with the closing torque specified in the relevant product standard.

Raise the pressure progressively and smoothly in such a way that the test pressure specified in ISO 9393-2[2)] is attained as rapidly as possible, but not in less than 30 s. Maintain the pressure and temperature for the length of time specified in ISO 9393-2[2)].

Check the seat leaktightness.

Decrease the pressure to atmospheric pressure.

7.4.3 Open or part-open valve test

Open the valve to an extent such that all the cavities and related packing will be subjected to the test pressure.

Connect one end of the test specimen to the pressure supply and close the other end(s) with suitable end connectors or plugs.

Fill the test specimen with the test fluid at the specified temperature, and then shut off the water flow downstream of the test specimen.

Release any trapped air from the test specimen.

Raise the pressure progressively and smoothly in such a way that the test pressure specified in ISO 9393-2[2)] is attained as rapidly as possible, but not in less than 30 s. Maintain the pressure and temperature for the length of time specified in ISO 9393-2[2)].

Check the leaktightness of the shell and packing.

Decrease the pressure to atmospheric pressure.

8 Interpretation of results

8.1 Materials tests

The test results for the particular material shall be considered satisfactory if they conform to the requirements specified in ISO 15493:2003, ISO 15494:2003 or ISO 10931:—, as applicable.

If the connection to the test equipment fails, the test shall be considered null and void and shall be repeated on a different specimen.

If a test specimen ruptures and the rupture is at a distance less than $0{,}1l_0$ from the body end (where l_0 is the free length of the specimen), the test shall be repeated on a different specimen.

8.2 Shell tests

The test specimen shall be considered satisfactory if no rupture or other visible failure occurs during the test period.

The test specimen shall be regarded as unsatisfactory if the valve body bursts before the end of the test period.

If a pipe or a connection fails, the test shall be considered null and void and shall be repeated on a different specimen.

8.3 Long-term behaviour tests of complete valves

The test specimen shall be considered satisfactory if no leakage from the valve is noted, and no rupture or other visible failure occurs during the test period.

The test specimen shall be regarded as unsatisfactory if the valve assembly bursts before the end of the test period.

If a pipe or a connection fails, the test shall be considered null and void and shall be repeated on a different specimen.

8.4 Seat and packing tests

The test specimen shall be considered satisfactory if no leakage occurs through the valve seat and packing during the test period.

9 Test report

The test report shall include the following information:

a) a reference to this part of ISO 9393 and the type of test carried out (material, long-term behaviour, shell, seat and packing);

b) all details necessary for the complete identification of the specimen, including:

   1) the type of valve, its nominal size and the type of end-connections,

   2) the materials of the body and of its end-connections,

   3) the nominal pressure (PN) of the valve,

   4) the manufacturer's name or trade mark,

   5) if appropriate, the flow direction,

   6) if appropriate for the pipe section used, the nominal size and the wall thickness;

c) the test conditions;

d) the number of specimens tested;

e) whether the valve complied with the test requirements — if the valve failed (leakage or rupture), specify under what test conditions and the size and position of the rupture (if present);

f) details of any operations not specified in this part of ISO 9393, as well as details of any incidents which may have affected the results;

g) the date of the test;

h) the name and signature of the person responsible for carrying out the test.

ICS 23.060.01; 83.140.30

Price based on 7 pages