INTERNATIONAL STANDARD

ISO 9911

First edition
1993-02-15

Agricultural irrigation equipment — Manually operated small plastics valves

Matériel agricole d'irrigation — Petites vannes en matière plastique commandées manuellement

Reference number
ISO 9911:1993(E)

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.

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.

International Standard ISO 9911 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Sub-Committee SC 18, *Irrigation and drainage equipment and systems*.

Annex A forms an integral part of this International Standard.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Agricultural irrigation equipment — Manually operated small plastics valves

1 Scope

This International Standard specifies the general requirements and test methods for manually operated small plastics valves intended for operation in agricultural irrigation systems. It applies to manually operated plastics valves of nominal sizes up to and including 90 mm (3 in).

The valves are intended for installation in irrigation piping networks, using water at temperatures up to 50 °C. Nominal pressures of the valves are as designated by the manufacturer.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7-1:1982, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Designation, dimensions and tolerances.*

ISO 48:1979, *Vulcanized rubbers — Determination of hardness (Hardness between 30 and 85 IRHD).*

ISO 188:1982, *Rubber, vulcanized — Accelerated ageing or heat-resistance tests.*

ISO 815:1991, *Rubber, vulcanized or thermoplastic — Determination of compression set at ambient, elevated or low temperatures.*

ISO 1167:1973, *Plastics pipes for the transport of fluids — Determination of the resistance to internal pressure.*

ISO 2859-1:1989, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection.*

ISO 7349:1983, *Thermoplastics valves — Connection references.*

ISO 7508:1985, *Unplasticized polyvinyl chloride (PVC-U) valves for pipes under pressure — Basic dimensions — Metric series.*

ISO 8233:1988, *Thermoplastics valves — Torque — Test method.*

ISO 8242:1989, *Polypropylene (PP) valves for pipes under pressure — Basic dimensions — Metric series.*

ISO 8659:1989, *Thermoplastics valves — Fatigue strength — Test method.*

ISO 9393-1:—[1], *Thermoplastics valves — Pressure test methods and requirements — Part 1: General.*

ISO 9625:—[1], *Mechanical joint fittings for use with polyethylene pressure pipes for irrigation purposes.*

ISO 9644:1993, *Agricultural irrigation equipment — Pressure losses in irrigation valves — Test method.*

3 Definitions

For the purposes of this International Standard, the following definitions apply.

3.1 valve body: Main part of a valve through which the water flows, which houses the working parts of

1) To be published.

the valve and allows connection to the piping system.

3.2 valve seat: Smooth seat around the flow aperture in the body dividing wall with which the obturator makes contact when a valve is closed.

3.3 body dividing wall: Integral part of the body which separates the inlet and outlet ports and on which the valve body seat is formed.

3.4 nominal pressure, p_{nom}: Maximum static water pressure at which the valve is required to operate.

3.5 nominal size: Conventional numerical designation used to indicate the size of an irrigation system component. This designation represents the nominal diameter or thread size of the pipe which can be connected to the component without an intermediate fitting.

NOTE 1 A single number designation is adequate if the inlet and outlet ports are the same size.

3.6 angle valve: Valve with a generally cylindrical body in which the body ends are at right angles to each other and in which the axis of the stem is in line with that of one body end.

3.7 ball valve: Valve in which a ball can be turned to move its port, or ports, relative to the valve ports, to control the flow of fluid.

3.8 diaphragm valve: Valve in which a flexible diaphragm constitutes the closing and regulating mechanism to control the flow of fluid through the valve.

3.9 globe valve: Valve with a generally cylindrical body in which the body ends are in line with each other and in which the axis of the stem is at right angles to that of the body ends.

3.10 oblique valve; Y-globe valve: Valve in which the body ends are in line with each other, and in which the axis of the stem is oblique to that of the body ends.

3.11 closing disc: Part of an obturator, irrespective of its shape, on which the disc face is formed, and to which the disc facing ring, if used, is secured.

3.12 obturator: Moving member in a valve that operates to close the valve seat and, where applicable, contains a washer or similar sealing member.

3.13 disc face: Smooth face of the obturator which makes contact with the valve seat when the valve is closed.

3.14 disc facing ring: Ring or round plate, of material different from the closing disc, secured to the disc and used to ensure water-tightness when a valve is closed.

3.15 stem; spindle: Component by which control of the closing component is effected.

3.16 closing torque: Smallest torque required to achieve full tightness of a valve at nominal pressure.

3.17 opening torque: Smallest torque which, when continuously applied to the stem, will fully open the valve from a fully closed position.

3.18 shell test: Test to determine the pressure-containing capability of the complete valve assembly.

4 Marking

Each manually operated plastics valve that meets the requirements of this International Standard shall bear a readily visible, clear and durable marking, which shall give the particulars listed under a), b) and f) below; particulars listed under c), d) and e) may be given on an attached label or on the packaging:

a) name of manufacturer or registered trade-mark;

b) nominal size of inlet and outlet ports: for direct slip-on type connections to plastics pipe, the outside nominal diameter of the connecting pipe shall be given in millimetres: for threaded connections, the nominal thread size shall be given in accordance with ISO 7-1;

c) nominal pressure, in hundreds of kilopascals;

d) the abbreviation "IRRIG";

e) type of valve material (PE, PVC, PP, etc.);

f) direction of flow, if necessary.

5 Sampling and acceptance requirements

5.1 Type-tests

The sample of test specimens shall be taken at random by the test laboratory representative from a total of at least 100 valves. The number of test specimens required for each test shall be as specified in table 1.

Table 1 — Required number of test specimens and acceptance number

Clause	Name of test	No. of test specimens	Acceptance No.
Clause 6	Technical characteristics	2	0
7.2.1	Closing torque	3	1
7.2.2	Resistance to increased torque	3	0
7.3	Pressure loss	2	0
7.4	Resistance of valve and valve material to internal hydrostatic pressure		
A.1	Plastics moulded material	2	0
A.2	Shell test	3	0
7.5	Seat and stem sealing test	5	1
7.6	Valve performance at increased hydraulic pressure	2	0
7.7	Endurance test	2	0

If the number of defective specimens in the sample is equal to or less than the acceptance number given in table 1, the lot shall be considered acceptable. If the number of defective specimens found in the test is greater than the acceptance number, the lot shall be rejected.

5.2 Acceptance tests

When acceptance of manufacturing lots or of shipments of valves is required, the sampling shall be conducted in accordance with ISO 2859-1:1989 based on AQL 2,5 and Special Inspection Level S-4.

All test specimens in the sample, selected at random in accordance with table II-A in ISO 2859-1:1989, shall be tested for 1 h, as specified in 7.5.

The shipment or the lot complies with this International Standard if the number of defective specimens found in the test does not exceed the acceptance number specified in ISO 2859-1:1989.

For the other tests, the number of test specimens shall be selected at random from the sample in accordance with table 1. The shipment or the lot complies with this International Standard if the number of defective specimens found in the other tests does not exceed the acceptance number specified in table 1.

6 Technical characteristics

6.1 General

All valve components that come into contact with water shall be suitable for use with water, fertilizers and chemicals commonly used in irrigation, including treated sewage water.

The body material shall be opaque.

All parts of the valve shall be of good workmanship, whole and smooth, and shall contain no holes, air bubbles, flash, projections, or any other defects that may impair performance or cause injury.

All parts of valves that are of the same size, type and model and produced by the same manufacturer shall be interchangeable.

The manufacturer shall supply written certification that the materials used in the manufacture of the valve comply with this International Standard.

On request, the manufacturer shall supply any available information on the resistance of the valve to corrosive attack by fertilizers and chemicals used in agriculture.

6.2 Dimensions

According to the type of end connections of the valve, the basic dimensions of the valve shall comply with the International Standards listed in table 2.

Table 2 — Basic dimensions

Material	International Standard
Polypropylene (PP)	ISO 8242
Polyethylene (PE)	ISO 9625
Unplasticized polyvinyl chloride (PVC-U)	ISO 7508

6.3 Connections to pipeline

The connections of the valve to the pipeline shall be as specified in ISO 7349 and in International Standards listed in table 2.

NOTE 2 Flanged connections are not included.

In valves with threaded ends intended for direct connection to the pipeline, the threads shall comply with ISO 7-1. However, other threads are allowed provided that a suitable adaptor is supplied with each threaded connection making it comply with ISO 7-1. In valves intended for connection to polyethylene pipe by mechanical jointing fittings, the fittings shall comply with ISO 9625.

6.4 Handwheel or handle

The handwheel or handle shall be free from sharp projections, burrs or other defects that could cause injury.

The handwheel or handle shall be securely connected to the valve stem and shall be replaceable.

6.5 Specific construction requirements for globe, oblique and angle valves

6.5.1 Threaded valve stems or spindles

The threads of the valve stems or spindles shall be as designed by the manufacturer, provided they are self-locking.

The valve stem shall be of sufficient length to permit full closure of the valve when the handwheel or handle is mounted on the stem and the disc facing ring is removed.

6.5.2 Disc facing ring

The disc facing ring, if used, shall remain securely attached to the disc when in operation, but shall be removable for replacement without requiring removal of the valve from the system, with or without the closing disc.

When the disc facing ring is of elastomeric material, the material shall meet the requirements in 6.5.2.1 to 6.5.2.3.

6.5.2.1 Hardness

Test the hardness of the disc facing ring as specified in ISO 48.

The hardness of the disc facing ring shall be 80 IRHD ± 5 IRHD.

6.5.2.2 Compression set

Test the compression set of the disc facing ring as specified in ISO 815 for 22 h at 70 °C.

The compression set after compression shall not exceed 20 %.

6.5.2.3 Ageing

Repeat the hardness test (6.5.2.1) after keeping the disc facing ring at 70 °C for seven days, as specified in ISO 188:1982, clause 3.

The change in hardness due to ageing shall be in the range of − 5 IRHD to + 8 IRHD.

6.6 Specific construction requirements for ball valves

6.6.1 The stem shall be provided with sealing means to ensure tightness. The sealing means shall be of elastomeric or other material of suitable mechanical properties and chemical resistance.

6.6.2 If the sealing means is of O-ring shape, the hardness of the O-rings shall be determined by the test method specified in ISO 48 and shall be not more than 75 IRHD.

The compression set of the O-ring material shall be determined by the test method specified in ISO 815 (22 h at 70 °C) and shall be not more than 20 %.

7 Mechanical and functional tests

7.1 General

Unless otherwise required, the tests shall be performed with water at ambient temperature (20 °C to 30 °C).

The permissible deviation of the measuring devices from the actual value shall be as specified in table 3.

Table 3 — Accuracy of measurement

Measured quantity	Allowable error
Flow-rate	± 2 %
Pressure	± 2 %
Torque	± 2 %

The measuring devices shall be calibrated according to the existing calibration rules of the member countries.

7.2 Operating torque

7.2.1 Closing torque

The test shall be performed as described in ISO 8233. The torque required to full opening, or closing to full tightness, at nominal pressure shall not exceed the closing torque specified in table 4.

Table 4 — Closing torque

Nominal diameter		Closing torque
mm	in	N·m
20	1/2	1,5
25	3/4	3
32	1	5
40	1 1/4	7,7
50	1 1/2	11
63	2	20
90	3	30

7.2.2 Resistance to increased torque

The test shall be carried out in accordance with ISO 8233, applying a torque equal to the closing torque specified in table 4 multiplied by three, for 1 min in the direction of closing, and for 1 min in the direction of opening.

The valve and its parts shall withstand the torque without suffering damage and without any part becoming loose or disengaged.

After applying the increased torque, the valve shall pass the seat and packing tightness test in 7.5.

7.3 Pressure loss

The pressure loss parameters shall be determined from the test described in ISO 9644.

The measured parameters shall not exceed the values declared by the manufacturer by more than 5 %.

7.4 Resistance of valve and valve material to internal hydrostatic pressure

The resistance of the valve and valve material to internal hydrostatic pressure shall be tested in accordance with annex A and shall comply with the requirements specified in annex A.

7.5 Seat and stem sealing test

7.5.1 Seat test

Connect the valve inlet to a water supply pipeline and leave the valve outlet open to the atmosphere. Using the test conditions specified in table 5, close the obturator by means of the specified test torque and apply the specified water pressure for the specified duration. Perform the test twice, once for a duration of 1 h and once again for 100 h.

Table 5 — Test conditions

Test temperature	Test torque	Test conditions	
		Pressure	Duration
°C	N·m		
23 ± 3	1,2 × closing torque[1)]	1,5 × p_{nom}	1 h
	1,5 × closing torque[1)]	1,1 × p_{nom}	100 h
1) See table 4.			

The test specimen complies with the test requirements if there is no leakage through the valve seat. If, during the test time, leakage appears through the valve seat, the sealing may be tightened once again by applying a test torque as specified in table 5.

The test shall not cause permanent deformation in any part of the valve.

7.5.2 Stem sealing test

Connect the valve inlet to a water supply line with the obturator open and the valve outlet closed. Apply a water pressure of 1,5 times the nominal pressure for a duration of 1 h. Open and close the obturator alternately three times (i.e. six movements).

Care shall be taken to ensure that the pressure during the closing phase does not exceed the test pressure specified above.

The test specimen complies with the test requirements if no leakage occurs through the packing. If, during the test time, leakage appears through the packing, the packing may be tightened once again by means of the packing nut.

The test shall not cause permanent deformation in any part of the valve.

If the sealing of the valve stem consists of an O-ring, repeat the tightness test at a pressure of 20 kPa (0,2 bar).

Compliance requirements are as specified above.

7.6 Valve performance at increased hydraulic pressure

Connect the valve to a hydraulic pressure supply line in which a flow meter is installed. Check that the upstream hydraulic pressure (at flow) is 1,5 times the nominal pressure and the valve outlet is open to the atmosphere. Adjust the valve to a flow velocity of 0,1 m/s in a pipe of nominal diameter equal to that of the inlet port.

Maintain the pressure and flow velocity for about 30 s.

The closing mechanism shall operate satisfactorily, the sealing parts shall not be displaced, and no vibration noise shall be detected.

7.7 Endurance test

In principle, this test shall be performed as described in ISO 8659, but with the additions in 7.7.1 to 7.7.3.

7.7.1 Before conducting the endurance test, test the tightness of the valve as follows.

With the valve closed, apply a hydraulic pressure at the valve inlet equal to the nominal pressure for 1 min. The valve outlet shall be open to the atmosphere.

There shall be no visually detectable leakage.

7.7.2 The following cycling procedure shall then be performed.

7.7.2.1 The valve shall be left open for 10 s. The flow velocity shall not exceed 1,5 m/s.

7.7.2.2 After closing the valve, apply an internal hydrostatic pressure equal to the nominal pressure; maintain this pressure for 5 s in valves of up to 32 mm (1 in), and for 10 s in valves of 40 mm (1 1/4 in).

7.7.2.3 The number of test cycles to be performed shall total 5 000, of which 2 500 cycles shall be performed with water at 45 °C, and 2 500 at ambient temperature.

During opening and closing, there shall be no visually detectable leakage at the seal.

7.7.3 After completion of the cycles in 7.7.2, repeat the 1 h seat test as specified in 7.5.1 and the stem sealing test as specified in 7.5.2.

There shall be no visually detectable leakage.

Annex A
(normative)

Resistance of valve and valve material to hydrostatic pressure

A.1 Plastics moulded material of valve body

NOTE 3 This test may be omitted if the valve manufacturer supplies the test laboratory with a satisfactory test report on the strength requirements specified in table A.1.

The pressure test shall be performed on an injection-moulded tube specimen made of the same material as the valve body.

The dimensions of the specimen shall be as shown in figure A.1.

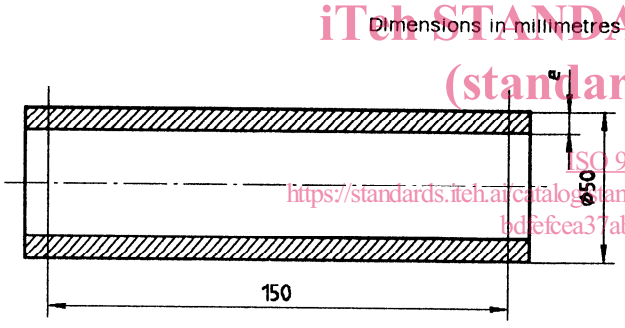

Figure A.1 — Free test length

The specimen shall be tested in accordance with ISO 1167 and shall meet the strength requirements specified in table A.1.

The specimen tested shall not suffer fracture or other damage.

Table A.1 — Test conditions and requirements

Material	Temperature °C	Circumferential stress N/mm²	Minimum duration h
PVC-U	60	10	1 000
HDPE, Type I	80	3	170
HDPE, Type II	80	4	170
PP, Type I	95	3,5	1 000
PP, Type II	95	2,5	1 000
POM	60	10	1 000
ABS	70	4	1 000

A.2 Shell test

The test shall be performed as described in ISO 9393-1, except for the test conditions and requirements which shall be as specified in A.2.1 and A.2.2 respectively.

A.2.1 The test conditions shall be as specified in table A.2. Both tests, i.e. for durations of 1 h and 1 000 h as specified in table A.2, shall be performed for each material.

NOTE 4 Test materials for plastics materials other than those specified in table A.2 are under study.

Two tests shall be carried out, each performed on a different valve.

During the test period, the closing mechanism shall be open.

All tests shall be performed at a temperature of 23 °C ± 3 °C.