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Agricultural irrigation equipment — Check valves

Matériel agricole d'irrigation — Clapets antiretour

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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.

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 9952 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*.

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Agricultural irrigation equipment — Check valves

1 Scope

This International Standard specifies the construction and performance requirements, and test methods for check valves, intended for operation in agricultural irrigation systems with water at temperatures not exceeding 50 °C, which may contain fertilizers and chemicals of types and concentrations used in agriculture.

This reference to the use of fertilizers and chemicals applies solely to the tolerance of the check valves to these materials from the aspect of their possible corrosivity. It does not imply authorization of the use of check valves in systems where backflow preventers are obligatory for complete stoppage of reverse flow, nor does it apply to valves known as backflow preventers, which completely stop the reverse flow of water, nor to hydraulically activated and controlled check valves.

This International Standard applies to check valves of nominal sizes 15 mm (0,5 in) up to and including 300 mm (12 in).

NOTE 1 A separate International Standard will be prepared for backflow preventers at a later date.

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 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 7005-1:1992, *Metallic flanges — Part 1: Steel flanges.*

ISO 7005-2:1988, *Metallic flanges — Part 2: Cast iron flanges.*

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

ISO 9911:1993, *Agricultural irrigation equipment — Manually operated small plastics valves.*

3 Definitions

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

3.1 check valve: Valve which permits flow in one direction only and prevents reversal of flow by means of an automatic check mechanism. The valve opens by the flow of fluid and closes by the weight of the check mechanism or by mechanical force (e.g. spring) when the flow ceases.

3.2 check valve complete with stop: Check valve which incorporates an adjustable stop to restrict the lift of the check mechanism.

3.3 horizontal pattern check valve: Check valve for installation in a horizontal position, in which the axes of the inlet and outlet are in line with each other.

3.4 vertical pattern check valve: Check valve for installation in a vertical position, in which the axes of the inlet and outlet are in line with each other.

3.5 angle pattern check valve: Check valve for installation at a junction between vertical and horizontal positions, in which the axes of the inlet and outlet are at right angles to each other.

3.6 push [lift-type] check valve: Check valve in which the check mechanism incorporates a disc, pis-

ton or ball which is pushed off the body seat by flow in the normal direction.

3.7 swing-type check valve: Check valve in which the check mechanism incorporates a swinging disc or two half-discs which swing on a hinge.

3.8 nominal size: Conventional numerical designation used to indicate the size of an irrigation valve. This designation represents the nominal diameter or thread size of the pipe to which the valve can be connected without intermediate fittings.

NOTE 2 A single number designation is adequate if the inlet and outlet ports are the same size.

3.9 nominal pressure: Maximum static water pressure immediately upstream of the valve at which the valve is required to operate.

3.10 adjustable stop: Device used for adjusting the range of movement of the check mechanism up to full opening or full closing of the valve.

3.11 body seat: Machined ring-shaped surface with which the closing component (disc, piston, ball) makes contact for stopping the flow.

3.12 check mechanism: That part or assembly of moving parts which closes the water passage when flow ceases or flow is reversed.

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

3.14 full opening: Position reached by the check mechanism when the valve is either fully open or the check mechanism reaches the adjustable stop.

3.15 backflow preventer: Mechanical assembly designed to prevent unintended backflow of water into a non-irrigation section of the water supply system, in order to protect against entry of materials which may constitute a health hazard.

4 Classification

Check valves are classified according to type of check mechanism or of installation.

NOTE 3 Figures 1 to 7 show the basic design concept of the various types of check valves and are given in this International Standard solely to illustrate the structural concepts used in their manufacture. They should not be construed as dictating a design requirement.

4.1 Check mechanism

a) Swinging disc (see figure 1)

b) Push or lift disc (see figures 2 and 3)

c) Push or lift disc - Venturi profile (see figure 4)

d) Piston (see figure 5)

e) Ball (see figures 6 and 7)

4.2 Installation

a) Horizontal position only (see figures 1, 2, 5 and 6)

b) Vertical position only (see figure 7)

c) Any position (see figures 3 and 4)

5 Marking

Each check valve shall bear a readily visible, clear and durable marking giving the following information:

a) manufacturer's name and/or trademark;

b) nominal size;

c) nominal pressure;

d) arrow indicating direction of flow;

e) a marking "H" for horizontal or "V" for vertical on those check valves where horizontal or vertical orientation is necessary for their proper operation.

6 Technical requirements

6.1 General

The valve parts that are in contact with water shall be of non-toxic materials, and shall be resistant to, or protected against, corrosion in working conditions for which the valve is designed.

All parts belonging to check valves of the same size, type and model, and produced by the same manufacturer, shall be interchangeable.

Plastics parts of the check valve that are exposed to ultraviolet (UV) radiation shall contain additives to strengthen their resistance to deterioration by radiation under the normal working conditions in which the valves operate. Plastics parts that enclose water passages shall be opaque or shall be otherwise protected against penetration of light.

6.2 Valve body length

The length of the check valve shall not deviate from the length stated in the manufacturer's catalogue or literature by more than that specified in table 1.

Table 1 — Length tolerances

Dimensions in millimetres

Length of valve	Permissible deviation
⩽ 600	± 3
> 600	± 4

6.3 Connections

The manufacturer may use one of the following connection methods.

a) Threaded ends for direct connection to the supply line. Check valves with threaded ends shall be provided with a hexagonal boss or with other means for gripping. Threaded connections shall comply with ISO 7-1; however, other threads shall be allowed provided that a suitable adapter is supplied with each threaded connection, so that it complies with ISO 7-1.

b) Flanged connections shall comply with ISO 7005-1 or ISO 7005-2, according to the material from which the check valve housing is made.

c) Other types of connections.

6.4 Check mechanism

6.4.1 The check mechanism and its parts shall be so designed as to permit disassembly for maintenance and replacement.

When flow ceases, the obturator (disc, piston, ball) shall come into contact with the body seat and close the water passage in all positions of installation recommended by the manufacturer.

The check mechanism shall be constructed of materials that will prevent moving parts sticking to each other in operating conditions such as during prolonged periods of closure.

6.4.2 Check valves with a swinging disc check mechanism or one with two half-discs [see 4.1 a)] shall meet the following requirement.

— Discs that are detachable or of two-piece construction shall be so fitted as to prevent their becoming detached.

6.4.3 Check valves with a push or lift-type disc mechanism [see 4.1 b) and 4.1 c)] shall meet the following requirements.

— Discs bearing gaskets shall be so fitted as to prevent their becoming accidentally (or intentionally) detached.

— Discs of push or lift-type check valves shall be constructed so as to prevent their becoming accidentally (or intentionally) detached, shall ensure proper contact of the disc with the body seat, and shall provide a positive seal.

Valve tightness tests shall indicate whether these conditions have been met.

6.4.4 Check valves with a piston-type mechanism [see 4.1 d)] shall meet the following requirement.

— The piston shall employ a resilient material to ensure positive closure against the body seat when in the closed position.

6.4.5 Check valves with a ball-type mechanism [see 4.1 e)] shall meet the following requirement.

— The ball shall be constructed so as to ensure proper contact with the body seat when in the closed position and shall provide a positive seal.

6.5 Body seat

The body seat shall be an integral part of the valve body or a separate ring shall be fitted into the valve body as a replaceable part.

6.6 Adjustable stop

The manufacturer shall ensure that all stops (regardless of design) are adequately secured. The stops shall be easily adjustable, positive and not subject to loosening by vibration.

When assembled on the valve stem, the handle shall be mechanically secured.

The adjustable stop and its parts shall effectively resist an opening and closing torque in newton metres numerically equal to the nominal valve size in millimetres, or to 25 times the nominal valve size in inches.

7 Mechanical and functional tests

7.1 General

Unless otherwise specified, all tests shall be performed with fresh debris-free water at a water temperature of 10 °C to 30 °C. The water used should first be passed through a strainer filter with a 120 µm filter element.

The instruments used for measuring the various parameters shall permit measurements to an accuracy of within ± 2 % of the actual value.

7.2 Sampling and acceptance requirements

7.2.1 Type-tests

The sample of test specimens shall be taken at random by the testing laboratory representative from a lot of 20 to 50 check valves of the same nominal size. The number of test specimens required for each test shall be as specified in table 2.

If the number of defective test specimens is equal to or less than the acceptance number given in table 2, the lot shall be accepted. If the number of test specimens found in the test is greater than the acceptance number given in table 2, the lot shall be rejected.

Table 2 — Required number of test specimens and acceptance number

Clause	Name of test	No. of test specimens	Acceptance No.
7.3	Resistance of valve to internal hydrostatic pressure	5	1[1)]
7.4	Tightness	5	1
7.5	Valve opening after tightness test	3	0
7.6	Pressure loss	2	0
Clause 8	Endurance	2	0

1) Refers only to leakage through gaskets. Damage to valve body or impairment of valve operation are causes for rejection.

7.2.2 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 according to table II-A of ISO 2859-1:1989, shall be tested in accordance with 7.3 and 7.4.

The shipment or manufacturing 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 test specimens shall be selected at random to conform with the number specified in table 2. The shipment or manufacturing lot is considered to comply with this International Standard if the number of defective specimens found in the other tests does not exceed the acceptance number specified in table 2.

7.3 Resistance of valve to internal hydrostatic pressure

7.3.1 Preparation

Perform this test with the valve inlet connected to the test assembly and the valve outlet connected to a closed section of pipe of the same nominal valve size. Subject the valve to water pressure equal to the nominal pressure, with water reaching all parts of the valve. In check valves equipped with an adjustable stop, set the adjustable stop at its extreme position so that the water passage in the valve is fully open.

7.3.2 Check valves with metal body

With the valve inlet connected to the test assembly, as described in 7.3.1, apply a gradually increasing pressure up to 1,5 times the nominal pressure declared by the manufacturer. Maintain this pressure for 5 min.

There shall be no visible signs of leakage.

7.3.3 Check valves with plastics body

The resistance of the valve and valve materials to hydrostatic pressure shall be tested according to ISO 9911:1993, subclause 7.4.

7.4 Tightness tests

7.4.1 Tightness of check mechanism

When testing the tightness of the check mechanism, install the valve horizontally, unless the check valve is of type 4.2 b), in which case the valve shall be installed vertically.

The test procedure is as follows.

a) Apply a hydraulic pressure of 30 kPa at the valve outlet, and maintain this pressure for 2 min for valves with a metal body and for 5 min for valves with a plastics body.

b) Raise the pressure gradually to 1,5 times the nominal pressure and maintain this pressure for 5 min in the case of valves with a metal body and for 1 h in the case of valves with a plastics body.

For valves with a nominal size up to and including 50 mm (2 in), no signs of leakage shall occur.

For valves with a nominal size of 63 mm (2,5 in) and greater, slight leakage at the inlet is permissible during 7.4.1 a) above (low pressure), provided that the leakage does not exceed 30 ml/h for each 25 mm nominal size of the valve.

In the test conducted according to 7.4.1 b) above, no leakage from the valve shall be visible, nor shall the valve or any of its parts suffer any damage.

7.4.2 Tightness of check valve with adjustable stop

This test applies to check valves with an adjustable stop which may cause complete stoppage of the flow.

The test procedure is as follows.

a) Tighten the adjustable stop with a torque in newton metres equal numerically to one-fifth of the nominal size of the check valve in millimetres (or five times the nominal size in inches).

b) Repeat the test as above but also in accordance with 7.4.1 with the pressure applied at the valve inlet, and the valve outlet open to the atmosphere.

7.5 Test of valve opening after tightness test

After completion of the tightness test specified in 7.4.1 b), open the valve outlet to the atmosphere and apply a hydraulic pressure of 30 kPa at the valve inlet. The valve shall open and permit water flow.

7.6 Pressure loss test

This test shall be conducted as prescribed in ISO 9644.

The pressure loss measured at a particular flow-rate shall not exceed the pressure loss declared by the manufacturer at that same flow-rate.

8 Endurance tests

8.1 Mechanical endurance

Connect the valve to a suitable source of water in accordance with the instructions of the manufacturer.

Operate valves of a nominal size up to and including 80 mm (3 in) for a duration of 20 000 cycles, and valves of a nominal size of 100 mm (4 in) and greater for a duration of 10 000 cycles. Each cycle shall be run as follows.

a) Run water through the valve in the direction of flow as indicated by the arrow on the valve body at a velocity of 0,25 m/s for a period of time in seconds equal to one-fifth of the nominal size of the valve in millimetres (or equal to five times the nominal size of the valve in inches). In no circumstances shall this period of time exceed 30 s.

b) Stop the water flow and immediately apply a back pressure equal to the nominal pressure for a period of time in seconds equal numerically to one-fifth of the nominal size of the valve in millimetres (or equal numerically to five times the nominal size of the valve in inches). Check to determine that the valve is actually closed. In no circumstances shall this period of time exceed 30 s.

The valve shall show no signs of damage during and after completion of the mechanical endurance test.

8.2 Tightness after mechanical endurance test

After completion of the mechanical endurance test in 8.1, repeat the tightness test specified in 7.4.1.

a) In the test in 7.4.1 a), a leakage of up to 60 ml/h for each 25 mm nominal size of the valve is permissible.

b) In the test in 7.4.1 b), slight leakage is permissible, provided it does not exceed 30 ml/h for each 25 mm nominal size of the valve.

9 Information to be supplied by manufacturer

The following information shall be supplied by the manufacturer.

9.1 General information

a) name and address of manufacturer;

b) installation and operating instructions;

c) classification of the valve according to clause 4;

d) information on the metals and plastics used in manufacturing the valve and the resistance of these materials to the fertilizers and chemicals conventionally used in agriculture and irrigation;

e) information as to the type of valve body thread. If the valve is supplied with an adapter for the purpose of connection (see 6.3), the manufacturer shall give the necessary information relating to the adapter.

9.2 Operational data

a) nominal pressure, in kilopascals;

b) pressure loss data presented in accordance with ISO 9644;

c) known limitations of use (e.g. water quality, temperature);

d) recommended range of flow-rates;

e) technical data (mass, dimensions, assembly drawings, etc.).

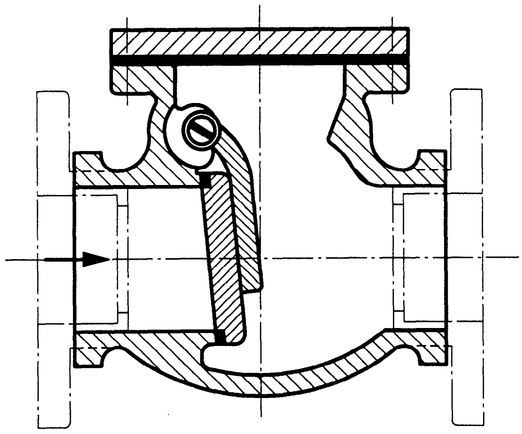

Figure 1 — Swing type

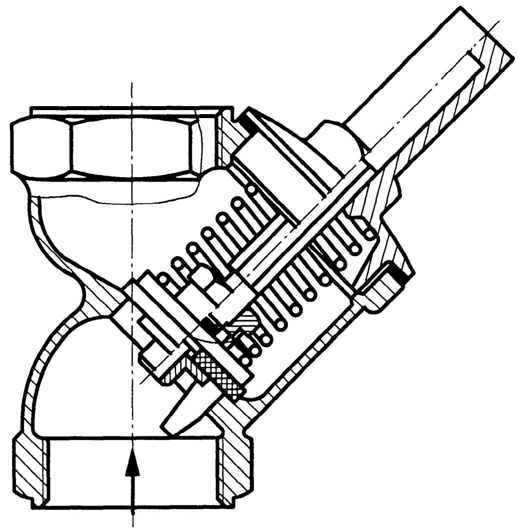

Figure 3 — Oblique check valve with lift type disc

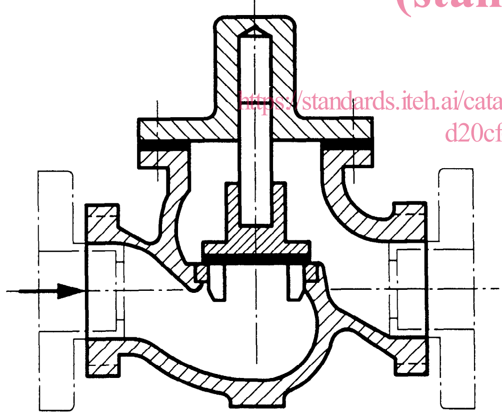

Figure 2 — Lift type with disc

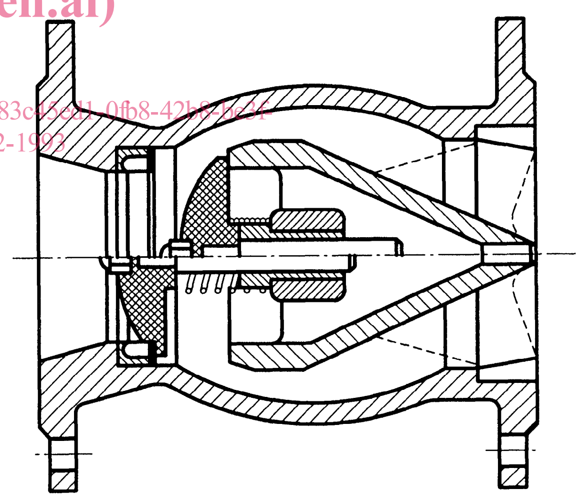

Figure 4 — Venturi profile