INTERNATIONAL STANDARD

ISO 9635-3

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Agricultural irrigation equipment — Irrigation valves —

Part 3: Check valves

Matériel agricole d'irrigation — Vannes d'irrigation —

Partie 3: Clapets antiretour

Reference number
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Foreword

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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 9635-3 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 18, *Irrigation and drainage equipment and systems*.

This first edition of ISO 9635-3, together with ISO 9635-1, ISO 9635-2, ISO 9635-4 and ISO 9635-5, cancels and replaces ISO 9635:1990, of which it constitutes a technical revision.

ISO 9635 consists of the following parts, under the general title *Agricultural irrigation equipment — Irrigation valves*:

— *Part 1: General requirements*

— *Part 2: Isolating valves*

— *Part 3: Check valves*

— *Part 4: Air valves*

— *Part 5: Control valves*

Agricultural irrigation equipment — Irrigation valves —

Part 3: Check valves

1 Scope

This part of ISO 9635 specifies construction and performance requirements and test methods for check valves, intended for operation in irrigation systems with water at temperatures not exceeding 60 °C, which can contain fertilizers and other chemicals of the types and concentrations used in agriculture.

It is applicable to hydraulically operated check irrigation valves of DN 15 (1/2 inch) diameter or greater, designed to operate in the fully open and fully closed positions, but which can also operate for extended time periods in any intermediate position.

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 9635-1:2006, *Agricultural irrigation equipment — Irrigation valves — Part 1: General requirements*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9635-1 and the following apply.

3.1
check valve
valve which automatically opens by fluid flow in a defined direction and which automatically closes to prevent fluid flow in the reverse direction

[EN 1267]

3.2
flow coefficient
K_V
coefficient equal to the flow rate, in cubic metres per hour, of water at a temperature between 5 °C and 50 °C, passing through the valve and causing a loss of static head of 1 bar

NOTE 1 $Q = K_V\sqrt{\Delta p}$, where Q is the flow rate in cubic metres per hour (m^3/h), and p is the pressure in kilopascals per square centimetre (kPa/cm^2).

NOTE 2 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2.

NOTE 3 Adapted from EN 736-3.

4 Design requirements

Check valves shall be designed in accordance with ISO 9635-1:2006, Clause 4.

Check valves may be equipped with a device to assist closure or balance the weight of the obturator. However, such valves are not considered to have a mechanically operated obturator.

The manufacturer shall indicate in the relevant technical documentation the orientations in which the check valves fulfil the requirements of this standard.

It is recommended that the valves be designed to permit integral repair and maintenance without removing the valve body from the line.

5 Performance requirements

5.1 Mechanical strength

5.1.1 Resistance of shell and all pressure-containing components to internal pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.1.1.

5.1.2 Resistance of obturator to differential pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.1.2.

The test shall be performed with the pressure applied to the downstream side of the obturator.

After testing, the obturator shall not be jammed nor wedged. After completion of the test, the differential pressure and flow rate necessary to fully open the obturator shall not exceed the initial values by more than 10 %.

5.1.3 Resistance of valve to bending

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.1.3.

The test shall be performed with the pressure applied to the downstream side of the obturator.

The bending moment, M, to be applied during the test shall be in accordance with Table 1, as a function of DN.

Table 1 — Bending moments

DN	Bending moment M N · m
50	1 050
65	1 400
80	1 500
100	2 200
125	3 200
150	4 800
200	7 200
250	11 000
300	15 000
350	19 000
400	24 000
450	28 000
500	33 000

5.2 Watertightness and air-tightness

5.2.1 Watertightness and air-tightness of shell and all pressure-containing components

5.2.1.1 Internal pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.2.1.1.

5.2.1.2 External pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.2.1.2.

5.2.2 Seat tightness

5.2.2.1 Seat tightness at high differential pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.2.2.1. For a type test, the test duration shall not be less than 10 min.

The test shall be performed with the pressure applied to the downstream side of the obturator.

5.2.2.2 Seat tightness at low differential pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.2.2.2. For a type test, the test duration shall not be less than 10 min.

The test shall be performed with the pressure applied to the downstream side of the obturator.

5.3 Hydraulic characteristics

Requirements shall be in accordance with ISO 9635-1:2006, 5.3. The characteristic given by the manufacturer shall be the head loss as a function of flow or the K_V value.

When measured in accordance with ISO 9644:1993, Clause 4, the head loss shall not be more than 1,1 times the value indicated by the manufacturer.

5.4 Resistance to chemicals and fertilizers

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.4.

5.5 Endurance

Check valves shall keep their functional capacity after a significant number of operations (opening/closing cycles).

The flow rate should be high enough to deflect the obturator to a fully open position.

In order to verify this requirement, the check valve shall be tested in accordance with Annex A, comprising 2 500 opening/closing cycles. Following this, it shall still pass the leak-tightness tests in accordance with 5.2.1 and 5.2.2, and no breakage of any part shall be detected by visual inspection after dismantling of the valve. Testing is not required for check valves greater than DN 300.

6 Conformity assessment

6.1 General

Requirements shall be in accordance with ISO 9635-1:2006, 6.1.

6.2 Type tests

Requirements shall be in accordance with ISO 9635-1:2006, 6.2. The type tests to be performed shall be those according to Table 2. They shall be carried out with the valve in the horizontal position, or in the position indicated by the manufacturer, depending on the possibilities of use of the check valve.

6.3 Control of production process and quality system

Requirements shall be in accordance with ISO 9635-1:2006, 6.3.

NOTE The production control tests given in Table 2 are for information only.

Table 2 — Requirements and testing

Subclause of ISO 9635-1:2006	Corresponding requirement	Type tests[a]	Production tests (informative)
4.1	Materials	See drawings and part lists	—
4.2	DN	See drawings	—
4.3	Pressures	See technical documentation	—
4.4	Temperatures	See materials	—
4.5	Design of shell obturator	See test report or calculation report	—
4.6	End types and interchangeability	See drawings and marking	—
4.7	Operating direction	See drawings	—
4.8	Maximum water velocity	See Clause 4	—
4.9	All materials, including lubricants, in contact with water intended for human consumption	See test reports in accordance with national regulations	—
4.10	Internal corrosion and ageing resistance	See drawings, part lists and technical documentation	Visual inspection of coatings
4.11	External corrosion and ageing resistance	See drawings, part lists and technical documentation	Visual inspection of coatings
5.1.1	Resistance of shell and of all pressure-containing components to internal pressure	See 5.1.1	See 5.1.1
5.1.2	Resistance of obturator to differential pressure	See 5.1.2	—
5.1.3	Resistance of valves to bending	See 5.1.3	—
5.2.1.1	Leak-tightness to internal pressure	See 5.2.1.1	See 5.2.1.1
5.2.1.2	Leak-tightness to external pressure	See 5.2.1.2	—
5.2.2.1	Seat tightness at high differential pressure	See 5.2.2.1	See 5.2.2.1
5.2.2.2	Seat tightness at low differential pressure	See 5.2.2.2	—
5.3	Hydraulic or airflow characteristics	See 5.3	—
5.4	Resistance to chemicals and fertilizers	See 5.4	—
5.5	Endurance	See 5.5	—

[a] References to subclauses in this column are to this part of ISO 9635.

7 Marking

Requirements shall be in accordance with ISO 9635-1:2006, Clause 7. In addition, the direction of flow shall be marked.

8 Packaging

Requirements shall be in accordance with ISO 9635-1:2006, Clause 8.

Annex A
(normative)

Test method for endurance of check valves

A.1 General

The test shall be performed with water at ambient temperature, initially in a no-flow situation with a downstream pressure equal to PMA.

A.2 Test procedure

The test procedure is the following.

a) Place the check valve on the test bench in the horizontal position, or in the position indicated by the manufacturer, depending on the possible uses of the valve.

b) Establish a water flow through the valve and maintain the flow for a duration sufficient to reach a minimum velocity of 1 m/s.

c) Stop the flow, decrease the upstream pressure and raise the downstream pressure (thus closing the obturator) until the differential pressure on the obturator is equal to PMA up to PMA $\pm$ 10 %.

   Maintain closed at this pressure for a minimum of 30 s.

d) Release the downstream pressure and begin a new cycle by re-establishing a water flow. Repeat the procedure for 2 500 cycles.

e) Remove the valve from the test bench and perform the watertighness and air-tightness tests in accordance with 5.2.1 and 5.2.2.

f) After termination of all tests, dismantle the valve and check by visual inspection for breakage of any part.

g) Terminate the test, record the test conditions and test results, noting the calibration status of all measuring devices.

Bibliography

[1] EN 736-1, *Valves — Terminology — Part 1: Definition of types of valves*

[2] EN 736-3, *Valves — Terminology — Part 3: Definition of terms*

[3] EN 805, *Water supply — Requirements for systems and components outside buildings*

[4] EN 1267, *Valves — Test of flow resistance using water as test fluid*

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