INTERNATIONAL STANDARD

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Agricultural irrigation equipment — Irrigation valves —

Part 2: Isolating valves

Matériel agricole d'irrigation — Vannes d'irrigation —

Partie 2: Vannes d'isolation

Reference number
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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

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 18, *Irrigation and drainage equipment and systems*.

This second edition cancels and replaces the first edition (ISO 9635-2:2006), which has been technically revised.

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 2: Isolating valves

1 Scope

This part of ISO 9635 specifies construction and performance requirements and test methods for isolating 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 isolating irrigation valves of DN 8 in 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 documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9635-1:2014, *Agricultural irrigation equipment — Irrigation valves — Part 1: General requirements*

ISO 9644, *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 9635-1:2014 and the following apply.

3.1
clear way valve
valve designed to have an unobstructed flow path which allows the passage of a theoretical sphere with a diameter which is not less than the inside diameter of the body end port

[SOURCE: EN 736-3]

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

Note 1 to entry: $Q = K_V \sqrt{\Delta p}$, where Q is the flow rate in cubic metres per hour (m^3/h), and Δp is the pressure drop across the valve, in bar or kilopond/kilogram-force per square centimetre (kp/cm^2, kgf/cm^2).

Note 2 to entry: 1 bar = 0,1 MPa = 105 Pa; 1 MPa = 1 N/mm^2.

Note 3 to entry: Adapted from EN 736-3.

3.3
full bore valve
valve with a seat diameter of not less than 90 % of the internal diameter of the body end port

[SOURCE: EN 736-3]

3.4
isolating valve
valve intended for use only in the fully closed or fully open position

[SOURCE: EN 736-1]

4 Design requirements

Isolating valves shall be designed in accordance with the requirements given in Clause 4 of ISO 9635-1:2014.

5 Performance requirements

5.1 General

Perform all tests on the valve as it was delivered to the test facility.

5.2 Mechanical strength

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

Carry out testing in accordance with ISO 9635-1:2014, 5.2.1. Test results shall comply with the requirements of ISO 9635-1:2014, 5.2.1.

5.2.2 Resistance of obturator to differential pressure

Carry out testing in accordance with ISO 9635-1:2014, 5.2.2. Test results shall comply with the requirements of ISO 9635-1:2014, 5.2.2.

Except for valves to be used for a single flow direction, perform the test successively in each flow direction.

5.2.3 Resistance of valve to bending

Carry out testing in accordance with ISO 9635-1:2014, 5.2.3, applying a bending moment, *M,* during the test appropriate to the DN value of the valve in accordance with Table 1. Test results shall comply with the requirements of ISO 9635-1:2014, 5.2.3.

Table 1 — Bending moments

DN	Bending moment *M* N · m
8	610
10	615
20	640
25	670
NOTE For plastic-bodied valves, the applied bending moment should be equal to the bending moment exerted by a 6 m long plastic tube of the same diameter (DN).	

Table 1 *(continued)*

DN	Bending moment *M* N · m
32	730
40	825
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
NOTE For plastic-bodied valves, the applied bending moment should be equal to the bending moment exerted by a 6 m long plastic tube of the same diameter (DN).	

5.2.4 Resistance of valves to operating loads

Test results shall comply with the requirements of ISO 9635-1:2014, 5.2.4.

In order to verify this requirement, test the valve in accordance with Annex A, with the application of a closing torque and an opening torque equal to the minimum strength torque (mST), following which it shall satisfy the requirements of the operating tests in accordance with 5.3.3, and the seat tightness tests in accordance with 5.3.2.1 and 5.3.2.2.

The minimum strength torque shall be equal to twice the maximum operating torque given in 5.3.3. In testing gate valves as specified in 5.3.3 c), apply a minimum strength torque (mST) as set out in Annex A equal to 5 × the maximum operating torque (MOT). In the case of valves as specified in 5.3.3 d), the test is applicable only when there is an additional manual operating element.

5.3 Watertightness and airtightness

5.3.1 Watertightness and airtightness of shell and all pressure-containing components

5.3.1.1 Internal pressure

Conduct testing in accordance with ISO 9635-1:2014, 5.3.1.1.

Test results shall comply with the requirements of ISO 9635-1:2014, 5.3.1.1.

5.3.1.2 External pressure

Conduct testing in accordance with ISO 9635-1:2014, 5.3.1.2.

Test results shall comply with the requirements of ISO 9635-1:2014, 5.3.1.2.

5.3.2 Seat tightness

5.3.2.1 Seat tightness at high differential pressure

Conduct testing in accordance with ISO 9635-1:2014, 5.3.2.1.

After closing the valve by application of the maximum operating torque (see 5.3.3), the leakage rate shall not exceed rate A for resilient seated valves and shall not exceed rate B for metallic-seated valves. Maintain the test pressure for 10 min.

Except for valves to be used in a single flow direction, perform the test successively in each flow direction.

5.3.2.2 Seat tightness at low differential pressure

Conduct testing in accordance with ISO 9635-1:2014, 5.3.2.2

After closing the valve by application of the maximum operating torque (see 5.3.3), the leakage rate shall not exceed rate A for resilient seated valves and shall not exceed rate B for metallic seated valves. Maintain the test pressure for 10 min.

Except for valves to be used in a single flow direction, perform the test successively in each flow direction.

5.3.3 Maximum operating torque (MOT) for operation and watertightness and airtightness

In order to verify this requirement, test the isolating valve as set out in Annex C. The measured torque shall not exceed the MOT as specified in a) to d) below.

a) **Valves delivered with their operating element**

1) In the case of a hand wheel, use Formula (1):

$$\text{MOT}=0{,}5\times F\times D \tag{1}$$

NOTE This is expressed in newton metres (N · m).

where

F is the maximum operating manual force (F refers to operating the valve, F_{max}, to seating and unseating the valve, see Annex E), expressed in newtons (N);

D is the diameter of the hand wheel, in metres (m).

2) In the case of a lever, use Formula (2):

$$\text{MOT}=F\times L \tag{2}$$

NOTE This is expressed in newton metres (N · m).

where

F is the maximum operating manual force (F refers to operating the valve, F_{max}, to seating and unseating the valve, see Annex E), expressed in newtons (N);

L is the length of the lever, in metres (m).

b) **Valves delivered without operating element and intended to be operated by T-shaped key**

1) For butterfly valves, use Formula (3):

$$MOT=125\ N\cdot m \tag{3}$$

2) For gate valves, use Formula (4):

$$MOT=1\times DN \tag{4}$$

NOTE This is expressed in newton metres (N · m).

3) For other types of valves, use Formula (5):

$$MOT=\text{value given by the manufacturer} \tag{5}$$

c) **Gate valves delivered without operating element and intended to be operated by ring key and bar**

See Annex B.

d) **Valves operated electrically, hydraulically, or pneumatically**

MOT=value given by the manufacturer

5.3.4 Watertightness and airtightness of gearboxes to external pressure

Conduct testing in accordance with ISO 9635-1:2014, 5.3.1.2.

Test results shall comply with the requirements of ISO 9635-1:2014, 5.3.1.2.

5.4 Hydraulic characteristics

Test results shall comply with ISO 9635-1:2014, 5.4. The characteristic given by the manufacturer shall be the flow coefficient, K_V.

It is recommended that the manufacturer show the head loss of valves in the form of a table or graph.

When measured in accordance with ISO 9644, K_V resulting from the head loss curve shall be within ±5 % of the value declared by the manufacturer.

5.5 Resistance to chemicals and fertilizers

Conduct testing in accordance with ISO 9635-1:2014, 5.5.

Test results shall comply with the requirements of ISO 9635-1:2014, 5.5.

5.6 Endurance

The endurance of isolating valves is evaluated as follows:

a) Subject the isolating valve to an endurance test as set out in Annex D at a differential pressure equal to the allowable operating pressure across the obturator.

b) Test the isolating valve in accordance with 5.3.1, 5.3.2, and 5.3.3, with the application of a torque not exceeding either

— 1,2 × the maximum operating torque (with the same leakage rate), or

— the maximum operating torque (with leakage allowed to increase by one rate level).

See ISO 9635-1:2014, Table G.2, for leakage rates.

Complete the following number of opening/closing cycles during the endurance test:

— for manually-operated valves, 250 cycles;

— for electrically-operated, hydraulically-operated, or pneumatically-operated valves, 2 500 cycles.

Apply this test to isolating valves of DN 8 up to and including DN 500.

6 Conformity assessment

6.1 General

Test results shall comply with the requirements of ISO 9635-1:2014, 6.1.

6.2 Type tests

Perform the type tests set out in Table 2.

Test results shall comply with the requirements of ISO 9635-1:2014, 6.2.

6.3 Control of production process and quality system

Test results shall comply with the requirements of ISO 9635-1:2014, 6.3.

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

7 Marking

Requirements shall comply with ISO 9635-1:2014, Clause 7.

8 Packaging

Requirements shall be in accordance with ISO 9635-1:2014, Clause 8.

Table 2 — Requirements and tests

Subclause of ISO 9635-1:2014	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 and 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 wetted valve part materials, including lubricants, in contact with water intended for human consumption	See test reports in accordance with national regulations	—

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

Table 2 *(continued)*

Subclause of ISO 9635-1:2014	Corresponding requirement	Type tests[a]	Production tests (informative)
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
5.2.1	Resistance of shell and all pressure containing components to internal pressure	See 5.2.1	See 5.2.1
5.2.2	Resistance of obturator to differential pressure	See 5.2.2	—
5.2.3	Resistance of valves to bending	See 5.2.3	—
5.2.4	Resistance of valves to operating loads	See 5.2.4	—
5.3.1.1	Leak-tightness to internal pressure	See 5.3.1.1	See 5.3.1.1
5.3.1.2	Leak-tightness to external pressure	See 5.3.1.2	—
5.3.2.1	Seat tightness at high differential pressure	See 5.3.2.1 and 5.3.3	See 5.3.2.1 and 5.3.3
5.3.2.2	Seat tightness at low differential pressure	See 5.3.2.2 and 5.3.3	—
5.3.1.2	Leak-tightness of gearboxes to external pressure	See 5.3.4	—
5.4	Hydraulic or airflow characteristics	See 5.4	—
5.5	Resistance to chemicals and fertilizers	See 5.5	—
5.6	Endurance	See 5.6	—

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