INTERNATIONAL STANDARD

**ISO 9635-4**

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# Agricultural irrigation equipment — Irrigation valves —

## Part 4: Air valves

*Matériel agricole d'irrigation — Vannes d'irrigation —*

*Partie 4: Vannes de purge d'air*



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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.

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 9635-4 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 9635-4, together with ISO 9635-1, ISO 9635-2, ISO 9635-3 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 4:
# Air valves



## 1 Scope

This part of ISO 9635 specifies construction and performance requirements and test methods for air 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 air irrigation valves of DN 15 (1/2 inch) diameter or greater, designed to be directly operated, i.e. the force is applied to the obturator by the float, either directly or via a mechanical linkage. The valves can be operated by a force applied through an adjustable pilot valve.

## 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 9635-2:2006, *Agricultural irrigation equipment — Irrigation valves — Part 2: Isolating valves*

## 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**
**air valve**
**float-type purger**
self-operating float-type valve designed for the evacuation of air from, or the ingress of air into, water pipelines.

NOTE Such valves can be single-float or double-float and can fulfil one or more or the following functions: air release, air intake, air venting.

**3.2**
**air release function**
discharge of an air volume from a water pipeline

**3.3**
**air intake function**
**vacuum relief function**
admittance of an air volume into a water pipeline

**3.4**
**air venting function**
**continuous acting air vent function**
purging of entrapped air from a water pipeline in service under pressure

## 4 Design requirements

Air valves and float-type purgers shall be designed in accordance with ISO 9635-1:2006, Clause 4. In addition, these valves may be fitted with an integrated isolating device, which shall be in accordance with ISO 9635-2.

## 5 Performance requirements

All tests are to be performed on the valve as delivered to the test facility.

### 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. For double-float valves, the obturators may be tested simultaneously or separately.

#### 5.1.2 Resistance of obturator to differential pressure

Tested within 5.1.1.

#### 5.1.3 Resistance of valves to bending

Not applicable. However, bending resistance may be an optional requirement for air valves, if bending resistance is specified by the customer

#### 5.1.4 Resistance of valves to operating loads

Not applicable, except for any integrated isolating device, which shall be in accordance with ISO 9635-2:2006, 5.1.4.

### 5.2 Watertightness

#### 5.2.1 Watertightness of shell and all pressure-containing components

##### 5.2.1.1 Internal pressure

The requirement of watertightness to internal pressure is fulfilled by conformance to 5.1.1.

##### 5.2.1.2 External pressure

Not applicable, except for any integrated isolating device, which shall be in accordance with ISO 9635-2:2006, 5.2.1.2.

#### 5.2.2 Seat tightness

##### 5.2.2.1 Seat tightness at high pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.2.2.1.The test fluid shall be water. The leakage rate shall be rate A. For a type test, the test duration shall not be less than 10 min. For double-float valves, the obturators may be tested simultaneously or separately.

##### 5.2.2.2 Seat tightness at low pressure

Requirements and testing shall be in accordance with ISO 9635-1:2006, 5.2.2.2. The test fluid shall be water. The leakage rate shall be rate A. For a type test, the test duration shall not be less than 10 min. For double-float valves, the obturators may be tested simultaneously or separately.

#### 5.2.3 Maximum operating torque (MOT) for operation and tightness

Not applicable, except for air valves with an integrated isolating device, which shall be in accordance with ISO 9635-2:2006, 5.2.3.

### 5.3 Airflow characteristics

Requirements shall be in accordance with ISO 9635-1:2006, 5.3.

The characteristics given by the manufacturer in the form of a graph or table shall be the airflow as a function of inlet pressure. When this is measured according to the conditions defined hereafter in the relevant subclauses of this part of ISO 9635, the flow shall be not less than 90 % of the value indicated by the manufacturer at a minimum of three points on the curve, these points being indicative of the range and functions of the valve.

The performance data shall be shown at standard conditions of temperature and barometric pressure.

#### 5.3.1 Air release function

The type test shall be in accordance with Annex A.

#### 5.3.2 Air intake function

The type test shall be in accordance with Annex B.

#### 5.3.3 Air venting function

The air venting function shall be verified by measuring the section of the small orifice of the valve, calculating the flow through it at below-sonic conditions and comparing the result with the value given in the manufacturer's catalogue. The difference shall be no greater than ± 10 %.

Measure the actual air venting capability in a manner similar to the air release function (see 5.3.1).

### 5.4 Resistance to chemicals and fertilizers

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

## 5.5 Endurance

### 5.5.1 Endurance of valves with air intake and/or air release functions

The endurance of a valve with air intake and/or air release functions shall be evaluated by subjecting the valve to 250 consecutive cycles of filling and draining in accordance with Annex C, with the pressure varying from atmospheric to PFA. The valve shall open and close fully during the test and shall pass the watertightness tests in accordance with 5.2.1 and 5.2.2 after the 250 cycles.

### 5.5.2 Endurance of valves with air venting function

The endurance of a valve with air venting function shall be evaluated by subjecting the valve to 2 500 consecutive cycles of air venting. This may be achieved by continuous injection of air into the system, allowing the valve to cycle automatically, or by cyclic injection of air, depending on the type of valve. The valve shall open and close fully at each cycle of the test and shall pass the watertightness tests in accordance with 5.2.1 and 5.2.2 after the 2 500 cycles.

Perform the test at a pressure equal to PFA.

### 5.5.3 Long-term unseating test

This is an accelerated test to ensure that the obturator will release after being under pressure for a long duration.

The test shall be carried out on a valve, mounted vertically, at a temperature of 50 °C (+5 °C), kept under an hydraulic pressure of at least PFA for five days.

Following this, release the pressure and check that the valve opens normally.

The valve shall then pass the watertightness tests in accordance with 5.2.1 and 5.2.2.

Valves with several functions shall be tested without isolating the parts ensuring the different functions.

# 6 Conformity assessment

## 6.1 General

Requirements shall be in accordance with ISO 9635-2:2006, 6.1.

## 6.2 Type tests

Requirements shall be in accordance with ISO 9635-2:2006, 6.2. The type tests performed shall be those according to Table 1.

## 6.3 Control of production process and quality system

Requirements shall be in accordance with ISO 9635-2:2006, 6.3.

NOTE The production control tests given in Table 1 are for information only.

**Table 1 — 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 and float | 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 air velocity | See Clause 4 | — |
| 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 all pressure-containing components to internal pressure | See 5.1.1 | See 5.1.1 |
| 5.1.2 | Resistance of float to differential pressure | See 5.1.2 | — |
| 5.1.4 | Resistance of valves to operating loads | See 5.1.4 | — |
| 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 | Seat tightness | See 5.2.2 | See 5.2.2 |
| 5.2.3 | Maximum operating torque (MOT) for operation and leak-tightness | See 5.2.2 and 5.2.3 | See 5.2.3 |
| 5.3.1 | Air release function | See 5.3.1 | — |
| 5.3.2 | Air intake function | See 5.3.2 | — |
| 5.4 | Resistance to chemicals and fertilizers | See 5.4 | — |
| 5.5 | Endurance | 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 9635-2:2006, Clause 7.

## 8 Packaging

Requirements shall be in accordance with ISO 9635-2:2006, Clause 8.

# Annex A
(normative)

# Test method for airflow characteristics of valves with air release function

## A.1 General

See 5.3 and 5.3.1.

The test medium shall be air. Air pressure testing shall be in accordance with all related safety regulations. Additional safety measures shall be taken when necessary.

The test shall be carried out on a valve mounted vertically. The test shall begin with the valve and the air at ambient temperature.

At the point where the air flow is measured, the air temperature shall remain between 5 °C and 45 °C throughout the test.

Valves with several functions (air release, air intake and air venting) shall be tested without isolating the parts ensuring the different functions.

## A.2 Test installation

Figure A.1 is given as an example.

## A.3 Test procedure

The test procedure is the following.

a) Open the isolating valve to reach the flow of the first point of measurement. The value of the flow shall be within the range of ± 4 % for the test duration.

   The minimum recommended test duration is 30 s.

   The value of the pressure shall be within the range of ± 5 % for the test duration.

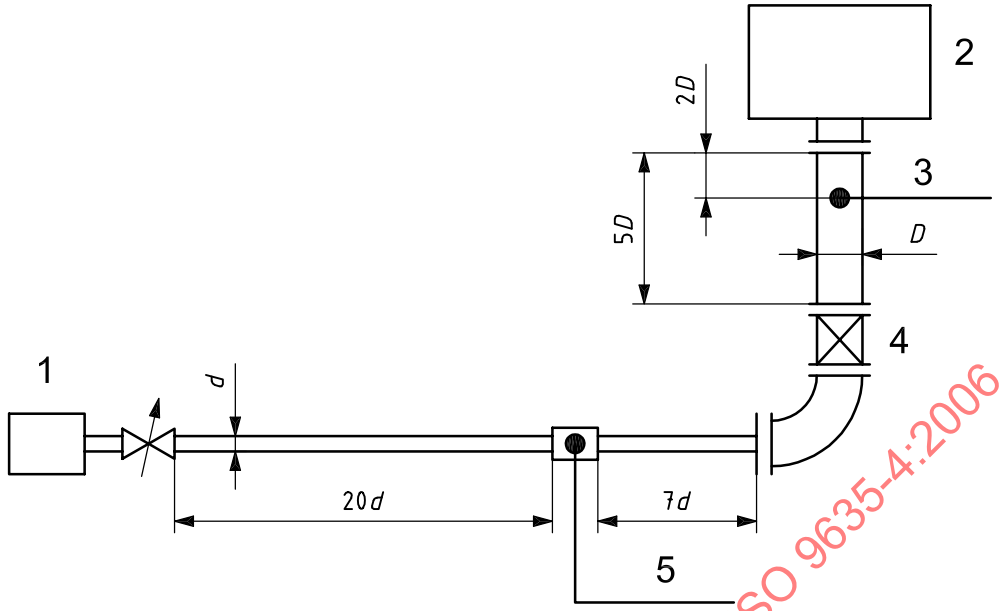
   The value of the temperature shall be within the range of ± 2 °C for the test duration.

b) Calculate the average flow, expressed in cubic metres per hour ($m^3/h$) (at standard temperature and pressure).

c) Record the test conditions and test results (average pressure, average temperature, average flow).

d) Repeat the procedure by opening the isolating valve to reach the flow of the second and third points of measurement.

   It is recommended that the three points be spread out symmetrically on the graph.




**Key**

$d$ nominal pipe diameter
$D$ nominal riser diameter
1 pressure source
2 air valve under test
3 pressure and temperature measurement devices
4 flow stabilizer
5 flow meter

**Figure A.1 — Test installation**

# Annex B
(normative)

# Test method for airflow characteristics of valves with air intake function

## B.1 General

See 5.3 and 5.3.2.

The test medium shall be air. Air pressure testing shall be in accordance with all related safety regulations. Additional safety measures shall be taken when necessary.

The test shall be carried out on a valve mounted vertically. The test shall begin with the valve and the air at ambient temperature.

At the point where the air flow is measured, the air temperature shall remain between 5 °C and 45 °C throughout the test.

Valves with several functions (air release, air intake and air venting) shall be tested without isolating the parts ensuring the different functions.

## B.2 Test installation

The test installation shall be capable of creating airflow in the air intake direction, either by negative pressure below the valve or by positive pressure around or into the valve. Figure B.1 shows examples.

The test installation shall be equipped with devices allowing the measurement of air flow, pressure and temperature.

## B.3 Test procedure

The test procedure is the following.

a) Open the isolating valve to reach the flow of the first point of measurement.

   The value of the flow shall be within the range of ± 4 % for the test duration.

   The value of the pressure shall be within the range of ± 5 % for the test duration.

   The value of the temperature shall be within the range of ± 2 °C for the test duration.

b) Calculate the average flow, expressed in cubic metres per hour ($m^3/h$) (at standard temperature and pressure), converting it to normal outside atmospheric conditions.

c) Record the test conditions and test results (average pressure, average temperature, average flow).

d) Repeat the procedure by opening the isolating valve to reach the flow of the second and third points of measurement.