INTERNATIONAL STANDARD

ISO 24649

First edition
2022-02

Agricultural irrigation equipment — Manually and hydraulically operated plastics valves

Matériel agricole d'irrigation — Vannes en matière plastique à commande manuelle par des actionneurs hydrauliques

Reference number
ISO 24649:2022(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document 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 24649 cancels and replaces ISO 9911:2006, which has been technically revised.

The main changes are as follows:

— the scope was extended to include hydraulically operated plastics valves in addition to operated plastics valves.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Agricultural irrigation equipment — Manually and hydraulically operated plastics valves

1 Scope

This document specifies the general requirements and test methods for manually operated and hydraulically operated plastics valves intended for use in agricultural irrigation systems.

It is applicable to manually operated and hydraulically operated plastics valves (as indicated in Table A.2) of nominal sizes DN 8 (1/4") to DN 200 (8").

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 48-2, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 2: Hardness between 10 IRHD and 100 IRHD*

ISO 188, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 2859-1:1999, *Sampling procedures for inspection by attributes — Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection*

ISO 5752, *Metal valves for use in flanged pipe systems — Face-to-face and centre-to-face dimensions*

ISO 7005-1, *Pipe flanges — Part 1: Steel flanges for industrial and general service piping systems*

ISO 8233, *Thermoplastics valves — Torque — Test method*

ISO 9624, *Thermoplastics piping systems for fluids under pressure — Flange adapters and loose backing flanges — Mating dimensions*

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

3 Terms and definitions

For the purposes of this document, the following terms and definitions.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
body
main component of the valve which houses functioning components, provides the fluid flow passageways and the connection ends

3.2
seat
part of the *obturator* (3.10) which provides the obturator sealing surface that can be an integral or a separate component

3.3
nominal pressure
PN
numerical designation equal to the maximum working pressure specified by the manufacturer at which a device will continuously operate

3.4
nominal size
numerical designation used to refer to the size of the device end connections which is identical to the numerical nominal diameter of the pipe or pipes to which the device is to be connected directly

3.5
angle valve
valve with a generally cylindrical body for which the *body* (3.1) ends are in planes perpendicular to each other and having a *stem* (3.13) the axis of which is colinear with the axis passing through the centre of one of the body ends

3.6
ball valve
valve in which a ball can be turned to move its port, or ports, relative to the ports in the valve *body* (3.1), to control the flow of water

3.7
globe valve
valve with a generally cylindrical *body* (3.1) in which the axes of the body ends are co-linear and in which the axis of the *stem* (3.13) is perpendicular to the axes of the body ends

3.8
oblique valve
valve in which the axes of the *body* (3.1) ends are co-linear and in which the axis of the *stem* (3.13) is oblique to the axes of the body ends

3.9
closing disc
part of an *obturator* (3.10) of any shape on which the *disc face* (3.11) is formed and to which the *disc facing ring* (3.12), if used, is secured

3.10
obturator
moving member in a valve that operates to close the valve and, where applicable, contains a washer or similar sealing device

3.11
disc face
sealing surface of the *obturator* (3.10) in a valve which contacts the valve *seat* (3.2) when the valve is in the closed position

3.12
disc facing ring
ring, of material different from that of the *closing disc* (3.9), secured to the disc and used to ensure water tightness when the valve is closed

3.13
stem
component of an *obturator* (3.10) on which the actuating thread is formed and by which control of the closing component is affected

3.14
closing torque
minimum torque required to achieve full tightness of a manually operated device at *nominal pressure* (3.3)

3.15
shell test
test intended to check the design strength of a valve *body* (3.1) under internal hydrostatic pressure

3.16
ageing
chemical change to the rubber compound created by thermal and environmental conditions ultimately manifesting itself in a physical shift of mechanical properties

4 Technical characteristics

4.1 General

The valves are intended for installation in irrigation piping networks, using water at temperatures up to 60 °C. They can be fitted with handwheels or add-on automatic control mechanisms.

All valve components that come in 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.

Plastics materials shall be UV resistant.

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 could impair performance or cause injury.

All spare parts of valves shall be made available by the manufacturer within the guarantee period.

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.

NOTE Guidance on chemical resistance can be found in ISO/TR 10358 (for plastics) and ISO/TR 7620 (for rubbers).

Operating conditions, including pressures, are as specified by the manufacturer.

4.2 Dimensions

The face-to-face dimensions of valves for use in flanged pipe systems shall be selected from ISO 5752.

For all other types of end connections, the selection of the face-to-face dimensions shall be the responsibility of the manufacturer.

4.3 Connections to pipeline

The flanged connection dimensions of the valve to the pipeline shall be in accordance with ISO 7005-1 or ISO 9624.

In valves with threaded ends intended for direct connection to the pipeline, the threads shall be in accordance with ISO 7-1. However, other threads are allowed, provided that a suitable adaptor is supplied with each threaded connection such that it complies with ISO 7-1.

4.4 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.

NOTE The handwheel and mechanical stem in hydraulically operated plastics valves are not used for closing or opening the valve, but only for limiting the stroke of the obturator when the user wants to limit the flow.

4.5 Specific construction requirements for globe, oblique and angle valves

4.5.1 Threaded valve stems

The threads of the valve stems shall be as designed by the manufacturer to be 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.

4.5.2 Disc facing ring

4.5.2.1 General

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 given in 4.5.2.2 to 4.5.2.4.

4.5.2.2 Hardness

Test the hardness of the disc facing ring in accordance with ISO 48-2, using methods N or M, depending on the disc facing ring shape. The hardness value shall be defined by the manufacturer.

4.5.2.3 Compression set

Test the compression set of the disc facing ring in accordance with ISO 815-1 for 24 h at 70 °C. The compression set after test shall not exceed 20 %.

4.5.2.4 Ageing

Repeat the hardness test (see 4.5.2.2) after keeping the disc facing ring at 70 °C for 16 h, in accordance with ISO 188 (accelerated ageing in oxygen). The change in hardness due to ageing shall be in the range of −5 to + 8 Shore A.

4.6 Specific construction requirements for ball valves

4.6.1 The stem shall be provided with a seal to ensure tightness.

The seal shall be of elastomeric or other material of suitable mechanical properties.

4.6.2 If the seal is of O-ring shape, the hardness of the O-rings shall be determined using the test method specified in ISO 48-2 and shall be 60 to 80 Shore A ±5.

The compression set of the O-ring material shall be determined using the test method given in ISO 815-1 (22 h at 70 °C) and shall not be more than 20 %.

5 Mechanical and functional tests

5.1 General

Unless otherwise required, the tests shall be performed with water at a temperature of 23 ± 5 °C.

The permissible deviation of the measuring device readings from the actual values of the measured quantities shall be in accordance with Table 1.

Table 1 — Accuracy of measurement

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

NOTE Calibration of the measuring devices is according to national regulations.

5.2 Operating torque

5.2.1 General

This clause applies to manually and hydraulically operated valves with a mechanical closing device.

5.2.2 Closing torque

The test shall be performed in accordance with ISO 8233. When testing hydraulically operated valves with a mechanical closing device, the closure and opening of the stem can be assisted by pressurizing or depressurizing the upper diaphragm chamber. The torque required to change the valve position from fully open to fully closed at nominal pressure shall not exceed the closing torque according to Table 2.

Table 2 — Closing torque

Valve nominal diameter		Closing torque
mm	in	N · m
20	3/4	1,5
25	1	3
32	1 1/4	5
40	1 1/2	7,7
50	2	11
65	2 1/2	20
80	3	30
100	4	See footnote a
150	6	See footnote a
200	8	See footnote a
[a] As declared by manufacturer.		

5.2.3 Resistance to increased torque

The test shall be carried out in accordance with ISO 8233, applying a torque equal to the closing torque (see Table 2) multiplied by three: for 1 min while closing the valve and for 1 min while opening the valve.

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 tests given under 5.5.

5.3 Pressure loss

This clause applies to manually and hydraulically operated valves.

The pressure loss parameters shall be determined using the test according to ISO 9644.

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

5.4 Resistance of valve and valve material to internal hydrostatic pressure

This clause applies to manually and hydraulically operated valves.

The resistance of the valve and valve material to internal hydrostatic pressure shall be tested in accordance with Annex A and shall conform with its requirements.

5.5 Seat and stem sealing test

5.5.1 Seat test for manually operated valves

NOTE For hydraulically operated valves, see 5.5.2.

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 3, close the obturator to the specified test torque and apply the specified water pressure for the specified duration. Perform the test for both sets of test conditions.

Table 3 — Test conditions for manually operated valves

Test temperature	Test torque	Test conditions	
		Pressure	Duration
°C	N · m	kPa	h
23 ± 5	1,2 × closing torque [a]	1,5 × PN	1
	1,5 × closing torque [a]	1,1 × PN	10

[a] See Table 2.

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 in accordance with Table 3.

After the test, no permanent deformation shall be observed by visual examination in any part of the valve.

5.5.2 Seat test for hydraulically operated valves

Connect the valve inlet to a water supply pipeline and leave the valve outlet open to the atmosphere. Using the test conditions according to Table 4, close the obturator by means of the diaphragm and apply the specified water pressure for the specified duration. Perform the test for both sets of test conditions.

Table 4 — Test conditions for hydraulically operated valves

Test temperature	Test conditions	
	Pressure	Duration
°C	kPa	h
23 ± 5	1,5 × PN	1
	1,1 × PN	10

No signs of leakage shall appear through the valve seat.

5.5.3 Stem sealing test

This subclause applies to manually and hydraulically operated valves.

Connect the valve inlet to a water supply line with the obturator open and the valve outlet closed. Apply a water pressure of 1,2 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.

After the test, no permanent deformation shall be observed by visual examination in any part of the valve.

If the valve stem sealing consists of an O-ring, repeat the tightness test at a pressure of 20 kPa (0,2 bar[1)]) Compliance requirements are as specified above.

5.6 Valve performance at increased hydraulic pressure

This clause applies to manually and hydraulically operated valves.

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 that the valve outlet is open to the drain. Adjust the valve to maintain a flow velocity of 0,25 m/s in a pipe of nominal diameter equal to that of the inlet port.

Maintain the pressure and flow velocity for 30 s.

The closing mechanism at the nominal pressure shall operate satisfactorily, the sealing parts shall not be displaced, and no vibration noise over 85 dB shall be observed.

5.7 Endurance testing

This clause applies to manually and hydraulically operated valves.

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.

1) 1 bar = 100 kPa

6 Sampling and acceptance requirements

6.1 Type-tests

Ensure that the laboratory in charge of the test extract a sample of test specimens randomly from a total of at least 100 valves. See Table 5 for acceptance number.

Table 5 — Required number of test specimens and acceptance number

Clause	Test	Number of test specimens	Acceptance number
Clause 4	Technical characteristics	2	0
5.2.2	Closing torque	3	1 [a]
5.2.3	Resistance to increased torque	3	0
5.3	Pressure loss	2	0
5.4	Resistance of valve and valve material to internal hydrostatic pressure	4	0
5.5	Seat and stem sealing test	5	1 [b]
5.6	Valve performance at increased hydraulic pressure	2	0
5.7	Endurance testing	2	0
A.1	Static pressure test	2	0
A.3	Shell test	3	0

[a] If the closing torque of the defective specimens is greater than 10 % of the value given in Table 2, the acceptance number is 0.

[b] If the leakage of the defective specimens is greater than 5 drops per minute, the acceptance number is 0.

If the number of defective specimens in the sample is equal to or less than the acceptance number given in Table 5, 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. All parts of the valve shall be of good workmanship, whole and smooth, and shall contain no holes.

6.2 Acceptance tests

When acceptance of manufacturing lots or of shipments of valves is required, conduct the sampling in accordance with ISO 2859-1:1999, based on AQL 2,5 and special inspection level S-4.

Test all specimens in the sample selected at random in accordance with ISO 2859-1:1999, Table II-A, for 1 h, as specified in 5.5.

The shipment or the lot complies with this document if the number of defective specimens found in the test does not exceed the acceptance number according to ISO 2859-1.

For the other tests, the number of test specimens shall be selected at random from the sample in accordance with Table 5.

The shipment or the lot complies with this document if the number of defective specimens found in the other tests does not exceed the acceptance number specified in Table 5.

7 Marking

Each manually operated plastics valve that meets the requirements of this document shall have the following particulars available to users through clear markings on the product, on the packaging, or on the product website.

The name of the manufacturer or registered trademark, nominal size, and direction of flow shall be readily visible on the product.

Nominal size of inlet and outlet ports shall be marked on the product, on the packaging, or on the product website: for direct slip-on type connections to plastics pipe, the outside nominal diameter of the connecting pipe shall be given; for threaded connections, the nominal thread size shall be given in accordance with ISO 7-1.

a) Nominal pressure in bars and kPa (e.g. 10 bar = 1 000 kPa).

b) Valve size in inch and mm (e.g. 2" -DN50).

c) Direction of flow should be shown on the valve body.

d) Type of valve material: PE, PVC, PP, PA-GF, etc.

e) Valve model.

Annex A
(normative)

Resistance of valve and valve material to hydrostatic pressure

A.1 Static pressure test

This clause applies to manually and hydraulically operated valves.

For conditioning of valves with shell-body made of PA-GF, immerse the whole valve, while its inlet and outlet are open, in hot water bath at 60 °C for 24 h. Then let the sample cool down to room temperature before testing.

NOTE For valves with shell-body made of other materials, no conditioning is required.

Apply hydraulic pressure at the valve inlet, raising it gradually to 1,5 × PN; maintain this pressure for 5 min.

If the seal of the valve cover swells or is dislodged, it may be re-installed and the closing torque increased to achieve a positive sealing. Following that, reapply the required pressure for an additional 15 min and recheck the seal's condition.

The valve shall withstand the test pressure without any damage and no permanent deformation shall be observed by visual examination.

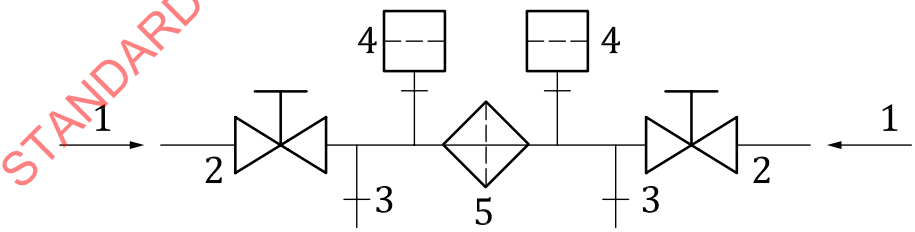
No signs of leakage shall appear through the valve housing and the valve cover seal.

A.2 Cyclic pressure test

This clause applies to manually and hydraulically operated valves.

Continue the test with the same sample used for the static pressure test.

Position the valve in a test bench as shown in Figure A.1. Fill the test system with water and raise its pressure up to 100 kPa[1].



Key

1 pressurizing device
2 stop valve/ solenoid valve
3 drain valve
4 pressure gauge
5 valve under test

Figure A.1 — Cyclic pressure test bench