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Agricultural irrigation equipment — Volumetric valves — General requirements and test methods

Matériel agricole d'irrigation — Vannes volumétriques — Exigences générales et méthodes d'essai

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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 7714 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 fourth edition cancels and replaces the third edition (ISO 7714:2000), which has been technically revised.

Agricultural irrigation equipment — Volumetric valves — General requirements and test methods

1 Scope

This International Standard specifies general requirements and test methods for volumetric valves able to automatically deliver preset quantities of water. It is applicable to valves actuated by pipeline pressure and flow alone, and which do not need any other, external, source of energy.

NOTE Volumetric valves are typically required to operate correctly with different qualities of irrigation water at a variety of flow rates and at temperatures between 5 °C and 50 °C.

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 7-1, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

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 apply.

3.1
volumetric valve
valve capable of automatically delivering preset volumes of irrigation water at various flow rates, by measuring the volume of water flowing through the valve

3.2
serial volumetric valve
volumetric valve designed to operate in a sequence of volumetric valves

3.2.1
single outlet serial volumetric valve
serial volumetric valve with one inlet and one outlet, intended for connection in parallel in a system of volumetric valves designed to be opened by means of a hydraulic command when preset to the open position and which, on closing after delivering a preset volume of water, transmits a hydraulic command to the next volumetric valve in the system to bring it into operation

3.2.2
single outlet "skip over" serial volumetric valve
serial volumetric valve with one inlet and one outlet, intended for connection in parallel in a system of volumetric valves designed to be opened by means of a hydraulic command when preset to the open position and which, on closing after delivering a preset volume of water, skips over the next volumetric valve in the system and transmits a hydraulic command to the second next volumetric valve to bring it into operation

3.2.3
dual outlet serial volumetric valve
serial volumetric valve with one inlet and two outlets, normally open when the pressure at the inlet is the atmospheric pressure and designed so that, when a preset volume of water has passed through the first outlet, this outlet closes automatically, the second outlet opens automatically and all the flow is passed through the second outlet to the next volumetric valve in the series

3.3
non-serial volumetric valve
volumetric valve designed to operate alone

3.4
permanent flow rate
q_{V3}
highest flow rate under normal service conditions at which the volumetric valve can be operated in a satisfactory manner within the maximum permissible error

3.5
overload flow rate
q_{V4}
highest flow rate at which the volumetric valve does not exceed the maximum permissible pressure loss and can be operated for a short period of time within its maximum permissible error, whilst maintaining its metrological performance when it is subsequently operated under normal service conditions

3.6
minimum flow rate
q_{V1}
lowest flow rate at which the volumetric valve can be operated within the maximum permissible error

3.7
range of flow rates
flow rates ranging from the minimum flow rate to the overload flow rate, inclusive of limits

3.8
range of working flow rates
flow rates ranging from the minimum flow rate to the permanent flow rate, inclusive of limits

3.9
relative error
ε
error, expressed as a percentage, defined by the equation:

$$\varepsilon = \frac{V_i - V_a}{V_a} \times 100$$

where

V_i is the indicated volume;

V_a is the actual volume.

[ISO 4064-3:2005, definition 3.3]

3.10
maximum working pressure
highest water pressure at the inlet to a volumetric valve at which it performs satisfactorily the functions specified by the manufacturer

3.11
minimum working pressure
lowest water pressure at the inlet to a volumetric valve at which it operates satisfactorily and performs the mechanical and hydraulic functions as specified by the manufacturer

3.12
range of working pressures
all pressures ranging from the minimum working pressure to the maximum working pressure, inclusive of limits

3.13
nominal pressure
highest pressure at the inlet to a volumetric valve at which the volumetric valve should be operated under normal service conditions, as specified by the manufacturer

3.14
accuracy
the quality which characterizes the ability of a measuring instrument to give indications approximating to the true value of the quantity measured

3.15
uncertainty of measurement
parameter associated with the result of a measurement, obtained using an appropriate mathematical formula which takes into account all sources of error, that characterizes the dispersion of values that could reasonably be attributed to the measurement result

3.16
pattern approval
certification bestowed by an authorized and accepted body, recognizing that the pattern of a measuring instrument conforms to the requirements of accepted International Standards

3.17
granulometry
measure of the particle (grain) content of irrigation water, as characterized by size dispersion and total amount of solids

4 Classification

4.1 According to accuracy of cumulative volume counter

Class 1: volumetric valve containing a control mechanism with a cumulative volume counter and having an accuracy of volume measurement of ± 2 %, within the range of flow rates.

Class 2: volumetric valve containing a control mechanism with a cumulative volume counter and having an accuracy of volume measurement of ± 4 %, within the range of flow rates.

Classes 1 and 2 are recommended for water measurement in agricultural irrigation applications.

Class 3: volumetric valve containing a preset volume mechanism but without a cumulative volume counter.

4.2 According to method of operation as a system of volumetric valves

4.2.1 Non-serial volumetric valve.

4.2.2 Serial volumetric valve:

— single outlet serial volumetric valve;

— single outlet “skip over” serial volumetric valve;

— dual outlet serial volumetric valve.

NOTE The opening and closing commands of the water in the inlet of the first valve in the system can be either manual or automatic.

5 Markings

Each volumetric valve shall bear clear and permanent markings including the following information:

— name of manufacturer or the manufacturer’s registered trademark;

— permanent flow rate, q_{V3};

— ratio q_{V3}/q_{V1};

— serial number;

— arrow indicating the direction of flow;

— arrow indicating the direction of setting of the control device, if necessary;

— nominal pressure;

— for serial volumetric valves, a mark identifying the points of connection for serial operation, which shall be explained in the manufacturer’s catalogue;

— accuracy class (1, 2 or 3).

6 Technical requirements

6.1 General

All parts of volumetric valves of the same size, type and model intended for disassembly, maintenance and repair produced by the same manufacturer shall be interchangeable.

All parts of the volumetric valve shall be resistant to chemicals normally used in agriculture in their conventional concentrations, and shall operate smoothly for the water quality defined in 7.1.

Upon request, the manufacturer shall supply information pertaining to the operation and safety of the valve with water of purity levels not conventionally found in agriculture, such as corrosive water.

All non-metallic parts of the volumetric valves which are exposed to sunlight shall be protected against degradation from ultraviolet (UV) radiation under the normal operating conditions of the valve.

Non-metallic parts of the valve which serve as water passages shall be opaque or shall be protected in some other manner (for instance, by a closed cover) against penetration of light to the water passages.

The flow-control mechanism of the volumetric valve shall allow a means of manual override to stop the flow at any time, such as returning the setting device to zero.

6.2 Threaded and flanged connections

In volumetric valves with threaded ends intended for direct connection to the pipeline, the thread shall comply with ISO 7-1. Alternatively, other threads may be allowed, provided that a suitable adapter in accordance with ISO 7-1 is supplied with each threaded connection.

Volumetric valves with threaded ends shall be equipped with a hexagonal section, or at least a section with two parallel surfaces on the valve body, suitable for gripping with a standard open wrench, in order to prevent rotation of the volumetric valve during connection or disconnection. The manufacturer shall supply special tools if needed.

6.3 Metrological requirements

6.3.1 General

Volumetric valves are designated according to the permanent flow rate, q_{V3}, in cubic metres per hour, and by the ratio q_{V3}/q_{V1}, which represents the range of working flow rates.

6.3.2 Class 1, Class 2 and Class 3 — Sizes DN16, DN20 and DN25

The minimum value of the permanent flow rate, q_{V3}, with respect to volumetric meter size (nominal diameter, DN, in millimetres) shall be in accordance with Table 1.

Table 1 — Minimum value of permanent flow rate — Sizes DN16, DN20 and DN25

Volumetric meter size mm	Minimum q_{V3} m^3/h
DN16	1,6
DN20	2,5
DN25	4,0

Higher values of the permanent flow rate, q_{V3}, in cubic metres per hour, may be chosen from the following list: 2,5; 4,0; 6,3; 10.

The value of q_{V3}/q_{V1}, in cubic metres per hour, shall be chosen from the following list: 8; 10; 12,5; 16; 20; 25; 31,5.

6.3.3 Class 1 and Class 2 — Sizes DN40 to DN300

The minimum value of the permanent flow rate, q_{V3}, with respect to volumetric meter size shall be in accordance with Table 2.

Higher values of the permanent flow rate, q_{V3}, in cubic metres per hour, may be chosen from the following list: 25; 40; 63; 100; 160; 250; 400; 630; 1 000; 1 600.

The value of q_{V3}/q_{V1}, in cubic metres per hour, shall be chosen from the following list: 10; 12,5; 16; 20; 25; 31,5; 40; 50; 63; 80; 100.