INTERNATIONAL STANDARD

ISO 9912-4

First edition
2018-08

Agricultural irrigation equipment — Filters for microirrigation —

Part 4: Granulated media filters

Matériel agricole d'irrigation — Filtres pour micro-irrigation —

Reference number
ISO 9912-4:2018(E)

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
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 on 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 the following URL: 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*.

A list of all parts in the ISO 9912 series can be found on the ISO website.

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 — Filters for microirrigation —

Part 4: Granulated media filters

1 Scope

This document specifies construction requirements and test methods for pressurized granulated media filters, hereinafter referred to as media filters, intended for operation in agricultural irrigation systems.

It is applicable to both manual cleaning media filters and automatic self-cleaning media filters, used as single unit or in batteries (two or more units working in parallel).

This document covers the operation and performance of a media filter, together with all related valves, back flushing mechanism, underdrains, manifolds and other related accessories necessary for the operation of the filter.

This document is applicable to three configurations of a filter.

a) An empty filter vessel (tank) housing.

b) A filter vessel filled with media filter material(s), complete with valves, connections, air release and/or other accessories. This configuration, when connected to and controlled by a flushing control device, is a complete operating single filter unit, usually positioned as a part of a filtration station.

c) A filtration station, called “filter battery”.

Annex A provides information on types of irrigation media filters.

Annex B provides information on granulated media.

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

ISO 9912-1, *Agricultural irrigation equipment — Filters for micro-irrigation — Part 1: Terms, definitions and classification*

ISO 9912-2:2013, *Agricultural irrigation equipment — Filters for microirrigation — Part 2: Strainer-type filters and disc filters*

ISO 9912-3, *Agricultural irrigation equipment — Filters for microirrigation — Part 3: Automatic flushing strainer-type filters and disc filters*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 9912-1, ISO 9912-3 and the following apply.

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 http://www.electropedia.org/

3.1
granulated media filter
media filter
permeable granulated media, such as sand, gravel, crushed granite or synthetic material, with a specific gravity higher than water and used for filtration, provided the granules can be fluidized during back flushing

3.2
clogged filter element
filter element that has collected a quantity of residue such that it cannot maintain the highest flow rate recommended by the manufacturer without exceeding the *safe maximum pressure drop* (3.6)

3.3
flush valve
valve through which back flushing water is discharged from the filter

3.4
nominal pressure
p_{nom}
numerical designation equal to the maximum working pressure specified by the manufacturer at which a device will operate at a water temperature of 23 °C ± 3 °C

3.5
clean pressure drop
pressure drop in a clean filter measured with a flow of clean water

3.6
safe maximum pressure drop
maximum allowable difference between inlet and outlet pressures across a filter, when the filter element has become clogged to the extent of requiring cleaning or replacement, as specified by the filter manufacturer

3.7
range of recommended flow rates
q_{min} to q_{max}
range of flow rates declared by the manufacturer for proper operation of a filter

3.8
nominal size
conventional numerical designation, the same as the nominal diameter of the pipes to which the filter can be connected directly, indicating the size of the filter connections

4 Design and construction requirements

4.1 General

A complete media filter system includes the following connections:

a) an inlet: the point of entry for unfiltered supply water;

b) an outlet: the point of exit for filtered water going to the irrigation network;

c) a back flush outlet: the point of exit for water and residue that are flushed out during the back flushing stage;

d) a command power source: for the activation of an automatic back flushing operation, normally hydraulically-operated by filtered water (can also be pneumatically-operated or electrically-operated).

Components belonging to filters of the same nominal size, type and model, and produced by the same manufacturer, shall be interchangeable.

Filter parts that are in contact with water shall be made of non-toxic materials, and shall be resistant to, or protected against, degradation caused by existing working conditions and types of water used in agricultural irrigation. The filter housing shall be resistant to environmental conditions in the intended application.

Plastics parts of a filter that are exposed to ultraviolet radiation under normal working conditions in which the filter operates in the intended application shall include additives to improve their resistance to UV radiation. Plastics parts that enclose waterways shall be opaque or shall be provided with an opaque cover that blocks all light from reaching clear waterway enclosures.

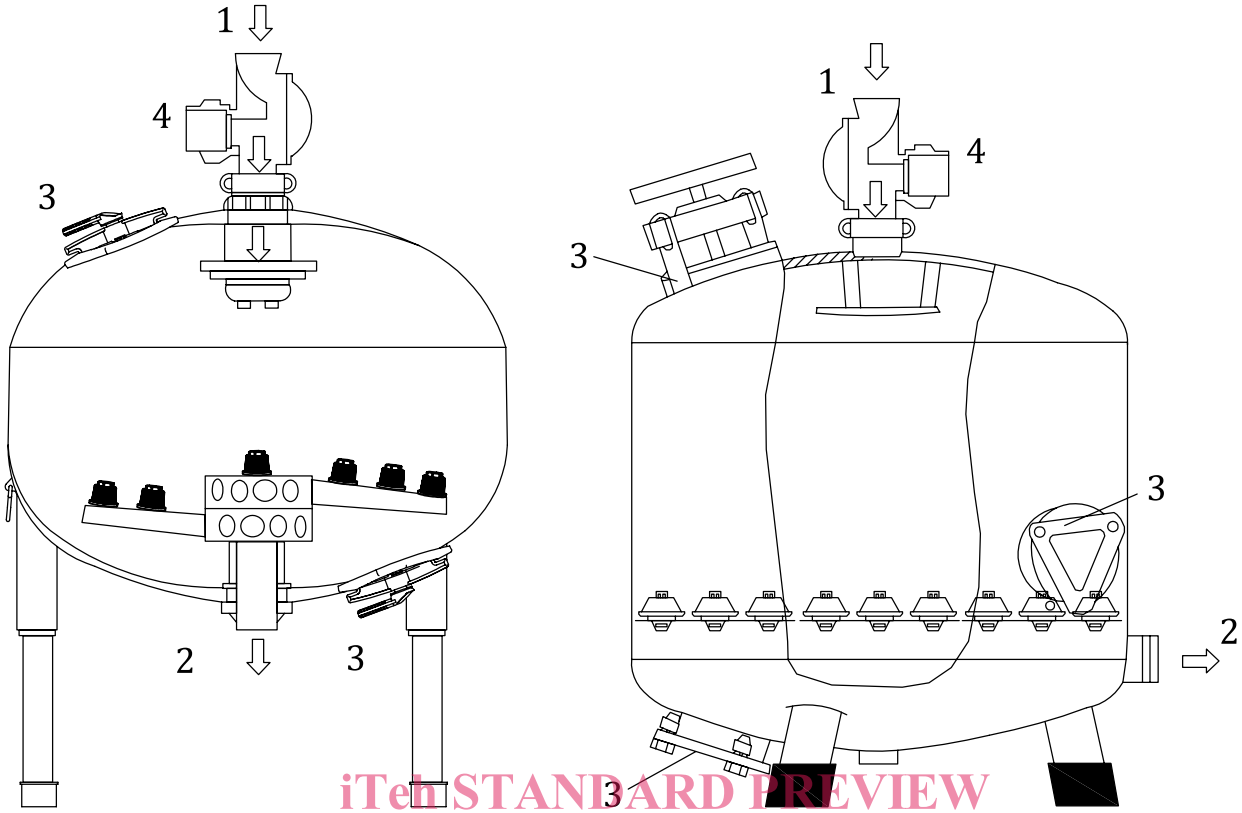
The construction of the filter shall facilitate its proper installation in its intended location and position.

The construction of the filter body shall permit dismantling for maintenance, according to manufacturer's instructions.

In most cases, a filtered flush stream is supplied by other filter units of the battery that are in the filtering stage. In case other options are used to supply flush water, the supplier shall guarantee that it is in accordance with this document.

The back flushing flow rate shall be high enough to vigorously fluidize and agitate the entire media, yet low enough so that only residue is washed from the tank and not the filter media itself.

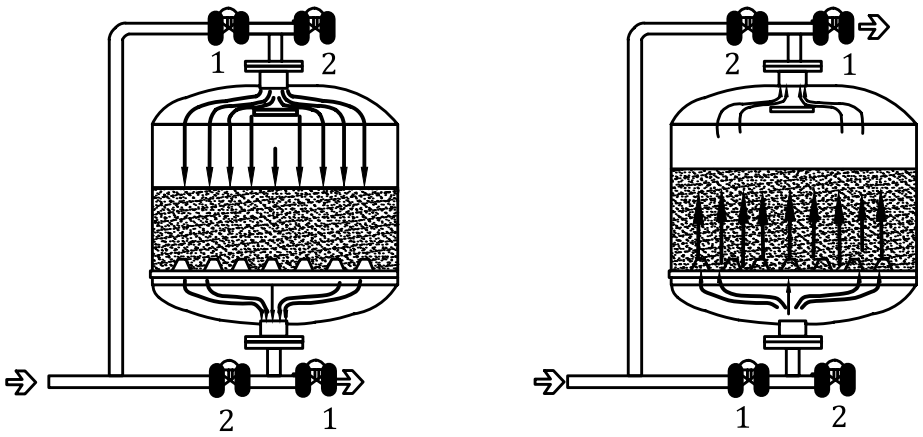
Typical media filter constructions are shown in Figure 1. Two operational modes of a media filter are shown in Figure 2.



Key

1 inlet
2 outlet
3 service port
4 backflush valve

Figure 1 — Typical media filter construction



a) Filtering mode **b) Flushing mode**

Key

1 opened
2 closed

Figure 2 — Two operational modes of a media filter

4.2 Inlet and expansion space chamber

The inlet and expansion space chamber shall be able to accommodate expansion of the media during back flushing. The expansion volume shall be at least one third of the media volume.

The chamber shall have a cover to enable media filling and visual inspection. Filter covers operating under pressure shall be supplied with a safety mechanism to protect the operator in case of a catastrophic failure. The filter vessel shall provide for the relief of internal pressure before opening any internal access ports. All access ports shall be secured to the filter vessel with suitable fasteners to prevent harm when attempting to loosen or remove covers or lids.

A hydraulic inlet distributor that evenly distributes incoming flow across media surface is recommended.

4.3 Media chamber

The media chamber is the main part of the filter.

Total volume, surface area and the depth of the filtering layer shall be clearly indicated on the filter body. If a rough media support layer is used, its dimensions shall be deducted from the active media parameters.

If the filter tank shape is not a cylinder, the surface area as a function of media level shall be indicated in the manufacturer's documentation.

Both ends of the filter media chamber shall have large, accessible service ports: at the top for checking and for media filling, and at the bottom for media replacement and underdrain service.

Parameters pertaining to specific granular media shall be supplied by the manufacturer.

4.4 Collection (underdrain) and back flushing unit

This component collects the filtered water, while not allowing media leakage. In the back flushing stage, it distributes reverse water flow used for back flushing.

There are several possible configurations for this unit:

a) a diffuser system assembled on a collection piping ("spider web");

b) a diffuser system mounted on top of a plate, which separates the filtering chamber from the collection chamber ("underdrain plate");

c) other variations of patterns.

Diffuser placement shall ensure even distribution of back flushing water over the whole granular media surface area.

The filter's underdrain shall be designed to retain the media sand and resist clogging by fine particle matter.

The size of the underdrain slot shall be no more than half the size of the smallest media grain.

4.5 Prefiltration element

a) The design of a prefiltration element, its filtering area, the size of water passages and their shape should be appropriate for the water quality for which the filter is intended.

NOTE 1 The prefiltration element is an optional component.

b) When a prefiltration element exists, the maximum pressure drop across it shall be less than the safe maximum pressure drop of the prefiltration element.

In case of no prefiltration pressure drop indication, the total pressure drop across it and the filter assembly shall be less than the safe maximum pressure drop.

c) The prefiltration element shall be an integral part of the filter while being tested. (This element is not intended to be tested separately.)

NOTE 2 The prefiltration element is not automatically flushed.

4.6 Back flushing control

4.6.1 Mandatory requirements

The construction of an automatic self-cleaning filter shall conform to the following requirements.

a) The flushing control system shall either be part of the filter assembly, supplied by the manufacturer together with the filter, or shall be a separate part produced by the filter manufacturer and supplied according to special request of the customer. Alternatively, the flushing control system may be manufactured by a third party, provided that it is approved by the filter manufacturer and is included in the information supplied by the manufacturer (see Clause 9).

b) The construction of the filter shall allow manual actuation of the flushing in the event of failure of the automatic flushing control mechanism.

c) The flushing control mechanism shall allow manual flushing at any time, independent of the conditions that apply to automatic flushing.

d) The coordination of the flushing operation and the opening of the flushing valve shall prevent water flowing out of this valve, unless the filter is being cleaned. During flushing, it shall be open for at least one full flushing operation.

e) The initiation and termination of flushing shall be activated either by pressure differential, by duration of filtration, by volume of water filtered, by another physical quantity, or by a combination of these.

4.6.2 Optional features

In addition, the following construction features are commonly used.

a) The filter may be fitted with a device that enables adjustment of the pre-set value of the flushing control mechanism for initiation of the flushing cycle and/or for controlling the duration and termination of the flushing cycle.

b) The filter may be equipped with a protective mechanism that prevents repeated flushings.

c) All hydraulically operated accessories of the filter should be operated using filtered water, with the exception of the inlet pressure signal which may come from non-filtered water.

5 Resistance of the filter to internal hydrostatic pressure

5.1 General

The tests shall be performed on a filter assembled for normal operation according to manufacturer's instructions. Internal parts and granular media may be excluded. All tests shall be performed with water at a temperature between 10 °C and 30 °C, unless otherwise indicated in the specific test description. The instruments used for measuring the various parameters shall permit measurement to an accuracy of ±1 % of the actual values.

5.2 Preparation

Close the filter housing service ports according to the manufacturer's instructions, including the required closure force or moment. If a specific tool is required, it shall be supplied by the manufacturer. Measure the force or moment required for this operation.

Before conducting the test on filters equipped with a drain valve, open and close the valve 100 times while applying a water pressure at the valve inlet equal to the nominal operating pressure multiplied by 0,75.

Close the filter outlet by suitable means. Fill the filter with water and check that no air remains trapped in the system and that the water reaches all places that may be under pressure during filter operation. Apply the hydraulic pressure required for the test at the filter inlet.

5.3 Static pressure test

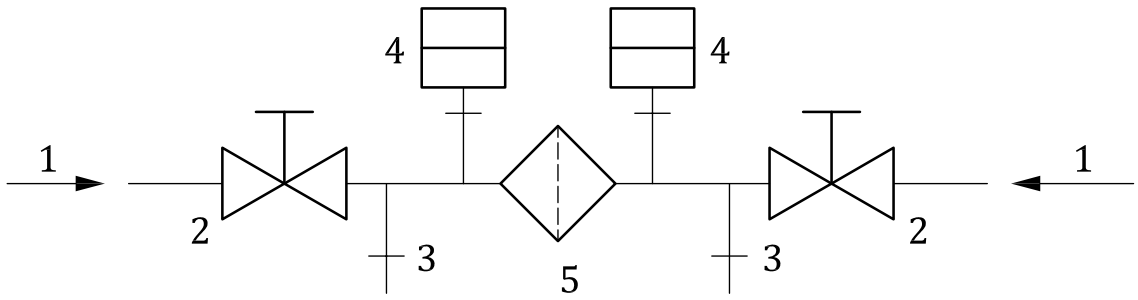
Raise the pressure gradually to the nominal pressure multiplied by 1,5, then close the valve to isolate from the pump and maintain this pressure for at least 5 min.

If the seal of the filter housing service ports swells or is dislodged, it may be returned to its location and the closing torque increased to achieve a positive seal. Following that, reapply the required pressure for an additional 15 min and recheck the seal's condition.

The filter shall withstand the test pressure without suffering any damage or any visible permanent deformation. No signs of leakage shall appear through the filter housing, the filter service ports seals or the drain valve.

5.4 Cyclic pressure test

5.4.1 Position the filter in a test bench as shown in Figure 3. Fill the test system with water and raise the pressure to 1 bar.



Key

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

Figure 3 — Cyclic pressure test bench