BS ISO 9912-2:2013

BSI Standards Publication

Agricultural irrigation equipment — Filters for microirrigation

Part 2: Strainer-type filters and disc filters

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee AGE/30, Irrigation and drainage equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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INTERNATIONAL STANDARD

ISO 9912-2

Second edition
2013-11-01

Agricultural irrigation equipment — Filters for microirrigation —

Part 2: Strainer-type filters and disc filters

Matériel agricole d'irrigation — Filtres —

Partie 2: Filtres à tamis

Reference number
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Foreword

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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. www.iso.org/directives

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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*.

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: http://www.iso.org/iso/home/standards_development/resources-for-technical-work/foreword.htm

This second edition cancels and replaces the first edition (ISO 9912-2:1992), of which it constitutes a minor revision.

ISO 9912 consists of the following parts, under the general title *Agricultural irrigation equipment — Filters for microirrigation*:

— *Part 1: Terms, definitions and classification*

— *Part 2: Strainer-type filters and disc filters*

— *Part 3: Automatic flushing strainer-type filters and disc filters*

A fourth part on granulated media filters is planned.

INTERNATIONAL STANDARD ISO 9912-2:2013(E)

Agricultural irrigation equipment — Filters for microirrigation —

Part 2: Strainer-type filters and disc filters

1 Scope

This part of ISO 9912 specifies general construction requirements and test methods for strainer filters and disc filters (hereinafter called filters) intended for operation in agricultural irrigation systems.

This part of ISO 9912 does not cover the aspects of filtration ability, efficiency, and capacity (like quality of filtered water or time of operation before a filter becomes entirely clogged), nor does it deal with structural requirements or tests of automatic flushing mechanism filters that are covered by ISO 9912-3.

NOTE The parameters of filtration ability, efficiency, and capacity, their definitions, and their test methods are to be included in a separate ISO Technical Report. The test methods for comparing various filters under identical operating conditions will be described in that Technical Report, using water as defined by the client, to characterize the filter properties during operation with this water, or with water defined by the tester or the client.

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

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

ISO 7005-2, *Metallic flanges — Part 2: Cast iron flanges*

ISO 9912-1:2004, *Agricultural irrigation equipment — Filters for micro-irrigation — Part 1: Terms, definitions and classification*

3 Terms and definitions

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

3.1
strainer filter
strainer
device containing one or more filter elements, such as a screen or a mesh, used for separating clogging material from water flowing through the device by collecting it on the surface of the filter element or elements

[SOURCE: ISO 9912-1:2004, 2.8]

3.2
disc filter
filter in which the filter element is a disc filter element

Note 1 to entry: See also 3.4.

3.3
strainer filter element
filter element
component of a strainer filter consisting of a perforated plate, a screen, a mesh, or a combination of these, intended to retain clogging materials larger than a specified size from the water flowing through the component

[SOURCE: ISO 9912-1:2004, 2.25]

3.4
disc filter element
filter element
component of a filter composed of discs with grooved or textured faces arranged adjacent to the other to form a stack

3.5
filter housing
component of a filter that houses or supports the filter element

[SOURCE: ISO 9912-1:2004, 2.34]

3.6
filter housing cover
removable cover permitting assembly, disassembly, inspection, and cleaning of the filter elements

3.7
drain valve
flush valve
valve normally installed at the bottom of a filter, intended for draining or flushing of contaminate from the filter housing

3.8
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

3.9
clean pressure drop
pressure drop in a clean filter, measured with a flow of clean water

3.10
safe maximum pressure drop
maximum allowable pressure difference, declared by the manufacturer, between inlet and outlet pressures across a filter, when the filter element has become clogged to the extent of requiring cleaning or replacement

3.11
critical pressure drop before failure
maximum allowable pressure difference, declared by the manufacturer, between inlet and outlet pressures across each filtering element of the filter, which will not cause failure of the filter element

3.12
range of recommended flow rates
range of flow rates, declared by the manufacturer, for proper operation of a filter

3.13
nominal size
numerical designation used to refer to the size of the device end connection which is identical to the numerical designation of the pipe or pipes to which the device is to be connected directly

3.14
aperture size
size, declared by the manufacturer, that expresses the ability of a filter to retain particles and suspended matter

Note 1 to entry: The aperture size is expressed in microns.

3.15
filter connection length
overall length between the extremities of the connections of a filter, the face-to-face distance between the connections, or the distance between centre-lines of the parallel inlet and outlet ports

3.16
contaminate
debris, suspended particles of organic or inorganic origin, or other contaminants removed from water in the filtration process

[SOURCE: ISO 9912-1:2004, 2.9]

4 Marking

4.1 General

Each filter shall bear a readily visible, durable marking giving the particulars specified in 4.1.1 and 4.1.2.

4.1.1 Marking of filter housing

The marking of the filter housing shall include:

a) the name of manufacturer and/or registered trademark,

b) the model identification,

c) the nominal size,

d) the nominal pressure,

e) an arrow indicating the direction of water flow, and

f) the aperture size (optional marking, applicable when a filter is supplied with the filter element already assembled).

The aperture size may be marked on an adhesive label affixed to the filter housing in a prominent position.

4.1.2 Marking of filter element

The marking of the filter element shall include:

a) the name of manufacturer and/or registered trademark, and

b) the aperture size.

The aperture size may be indicated by a marking such as a specific colour that is defined in the manufacturer's catalogue.

5 Design and construction requirements

5.1 General

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

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

Plastics parts of a filter that are exposed to ultraviolet (UV) radiation under normal working conditions in which the filter operates 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 filter shall be designed so that, after the assembly of the filter element in the filter housing, all the water flowing through the filter flows through the filter element.

5.2 Filter housing

Where the size or the configuration of a thread-connected filter housing does not allow for easy handling of it while connecting or disconnecting pipework, a boss or other means for facilitating connection and disconnection of the filter housing to and from the network shall be provided.

The filter shall be designed so that contaminates accumulated on the filter element or in the filter housing do not enter the supply line when cleaning or replacing the filter element. In a manually cleaned filter, the construction of the filter element shall allow the disassembly, cleaning, and reassembly of the filter element without removal of the filter from the supply line.

The filter connection length shall not deviate from the length indicated in the manufacturer's catalogue by more than the tolerance specified in Table 1.

Table 1 — Filter length tolerance

Dimensions in millimetres

Length of filter	Permissible deviation[a]
≤400	±2
>400	±3

[a] The length tolerance is only applicable to filter housings where the axes of inlet and outlet ports are parallel.

5.3 Connections

5.3.1 Threads of a filter with threaded ends for direct connection to the supply line shall comply with ISO 7-1. Other types of threads are allowed provided that a suitable adaptor is supplied with each threaded connection, so that it complies with ISO 7-1.

5.3.2 Flanged connections shall comply with ISO 7005-1 or ISO 7005-2, depending on the material from which the filter housing connection is made.

5.3.3 For filters with other types of connections, the filter manufacturer shall supply or identify a commercially available adaptor to a standard thread as described in 5.3.1 or to a standard flange as described in 5.3.2.

5.3.4 A suitable connection, such as a thread or a mechanical grooved connection (Victaulic[1)], for example), shall be provided on the drain valve outlet to facilitate the connection of components to provide for drainage.

6 Mechanical and hydraulic tests

6.1 General

Perform the following tests with water at a temperature of 23 °C ± 3 °C, unless otherwise indicated in the specific test description.

Ensure that the instruments used for measuring the various parameters permit measurement to an accuracy of ± 2 % of actual values.

6.2 Resistance of the filter to internal hydrostatic pressure

6.2.1 Preparation

Perform the following tests on a filter with all its parts assembled for normal operation, according to the manufacturer's instructions.

Sample size should be determined by the tester or by the client.

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

Before conducting the tests on a filter equipped with a drain valve, open and close the valve 100 times while applying a water pressure at the filter inlet equal to 0,75 × p_{nom}. This step can be conducted on the valve alone, without the filter, by removing the valve.

Close the filter outlet. Fill the filter with water by gravity. Verify that the water reaches all areas of the filter that are under pressure in normal use and that there is no entrapped air.

6.2.2 Static pressure test

Apply hydraulic pressure at the filter inlet, raising it gradually to 1,5 × p_{nom}; maintain this pressure for 5 min.

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

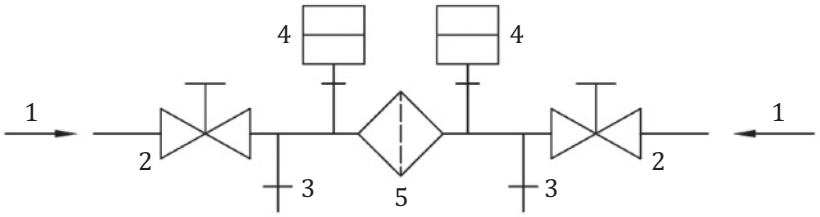
The filter shall withstand the test pressure without suffering any damage or any visible permanent deformation.

No signs of leakage shall appear through the filter housing, the filter housing cover seal, or the drain valve.

6.2.3 Cyclic pressure test

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

1) This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of this product.

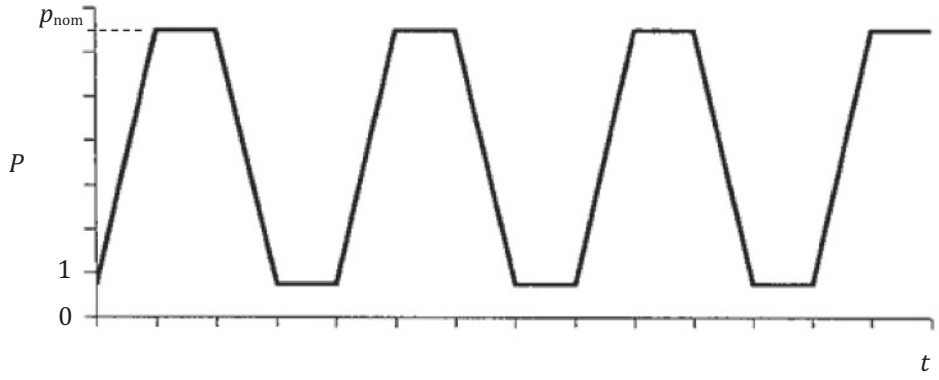


Key

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

Figure 1 — Cyclic pressure test bench

6.2.3.2 Apply a cyclic pressure at both the inlet and the outlet of the filter, increasing gradually from 1 bar to the nominal pressure (p_{nom}), holding up this pressure, then decreasing gradually to 1 bar, as shown in Figure 2.



Key

t time in seconds
P pressure in bar

Figure 2 — Cyclic pressure sequence

The duration of pressure increase, pressure decrease, and pressure hold periods shall be according to Table 2.

Table 2 — Duration of cyclic pressure steps

Filter's volume l	Duration of pressure increase/decrease s	Duration of pressure hold s
0 to 60	4 ± 1	4 ± 1
61 to 200	8 ± 2	8 ± 2
201 to 600	15 ± 3	15 ± 3
above 600	25 ± 5	25 ± 5

6.2.3.3 Continue applying the same cyclic pressure pattern for 20 000 cycles.

6.2.3.4 Then, continue applying a similar cyclic pressure pattern for 2 000 cycles, with pressure cycling between 1 bar and 1,5 × p_{nom}.

6.2.3.5 Increase the pressure to 1,5 × p_{nom} for filters with a metallic housing, or to 3 × p_{nom} for filters with a plastics (in whole or in part) housing, and maintain it for an additional period of 30 min.

6.2.3.6 The filter complies with the test requirements if there is no evidence of leakage from the filter shell and no fracture or other failure occurs during the test. Packing leakage shall not be a cause for rejection.

6.3 Filter element tightness and resistance to buckling or tearing

6.3.1 Use a thin film of impermeable plastics, for example polyethylene or PVC, to seal the filter element against flow of water through it.

In a filter where the water normally flows from the outside to the inside of the filter element, wrap the film around the outside of the filter element. In a filter where the water normally flows from the inside to the outside of the filter element, line the inside of the filter element with the plastics film.

The filter element may be sealed in any other manner, provided that the seal does not increase or decrease the resistance of the filter element to buckling or tearing.

Assemble the sealed filter element in the filter housing and close the filter housing cover as described in 6.2.1.

Keeping the filter outlet open, apply a hydraulic pressure at the inlet of the filter and raise it gradually up to the nominal pressure. Maintain this pressure for 15 min.

The leakage allowed at the filter outlet shall not exceed 0,1 % of the maximum recommended flow rate for the filter under test. This leakage shall remain steady or decrease during the test.

In a filter containing several filter elements in series, perform the test on each filter element separately.

6.3.2 Open the filter housing cover according to the manufacturer's instructions and measure the force or moment required for this operation.

The force or moment required to open the cover shall not exceed 150 % of the closing force or moment previously measured in 6.2.1.

Examine the filter visually. The filter element shall show no signs of permanent deformation, cracks, or tears.

6.3.3 A filter which, according to the manufacturer's declaration, can be cleaned during operation by means of full flow reverse flushing shall be tested again as described in 6.3.1 and 6.3.2, but with the following modifications.

a) In a filter in which the normal water flow is from the outside to the inside of the filter element, line the inside of the filter element with a plastics film.

b) In a filter in which the normal water flow is from the inside to the outside of the filter element, wrap the plastics film around the outside of the filter element.

c) Keeping the filter inlet open, apply hydraulic pressure at the outlet of the filter and raise it gradually to a pressure equal to the critical pressure drop before failure as specified by the manufacturer.

6.3.4 The test described in this subclause (6.3.4) shall only be performed on a filter in which a leakage, which exceeds the specified limits, has been observed in the test performed according to 6.3.1.

Instead of the regular filter element, install in the filter a solid impermeable element identical in size and in surface smoothness to the regular filter element. Close the cover of the housing as described in 6.2.1.

Repeat the test described in 6.3.1.

The leakage allowed at the filter outlet shall not exceed 0,05 % of the maximum recommended flow rate. This leakage shall remain steady or decrease during the test.

In a filter containing several filter elements, perform the test on each filter element separately.

6.4 Clean pressure drop

Measure the clean pressure drop of the filter for at least five different flow rates, equally distributed across the range declared by the manufacturer where one flow rate is within 10 % of the upper limit and one flow rate is within 10 % of the lower limit.

Use clean water (with less than 20 ppm of particles larger than 50 % of the filter aperture size) or prefilter by passing the water through a filter element with an aperture size at least 50 % smaller than that of the filter element being tested.

The measured pressure drop shall not be more than 10 % greater than the pressure drop declared by the filter manufacturer.

7 Information to be supplied by the manufacturer

The following information shall be supplied by the manufacturer:

a) the name of manufacturer and address of manufacturer or supplier;

b) the model and catalogue number of filter;

c) the filter data:

   1) nominal size (a single number designation is adequate if the inlet and outlet ports are the same size);

   2) nominal pressure;

   3) critical pressure drop before failure, for each type of filter element;

   4) range of recommended flow rates;

   5) overall dimensions of filter;

   6) type of connections to piping network;

   7) filter connection length;

   8) aperture size;

   9) curve of clean pressure drop in the range of recommended flow rates;

10) safe maximum pressure drop;

d) the housing cover closing instructions;

e) the instructions for assembly, operation, cleaning, and maintenance, including the limitations and prohibitions;

f) the list of spare parts;

g) the resistance to chemicals commonly used in agricultural irrigation.

Bibliography

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

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