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Agricultural irrigation equipment — Sprayers — General requirements and test methods

Matériel agricole d'irrigation — Diffuseurs — 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 8026 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 third edition cancels and replaces the second edition (ISO 8026:1995), which has been technically revised. It also incorporates the Amendment ISO 8026:1995/Amd.1:2000.

Agricultural irrigation equipment — Sprayers — General requirements and test methods

1 Scope

This International Standard specifies the general requirements and test methods for irrigation sprayers.

It is applicable to sprayers intended for installation on a pipe lateral and for operation with irrigation water.

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 15886-3:2004, *Agricultural irrigation equipment — Sprinklers — Part 3: Characterization of distribution and test methods*

3 Terms and definitions

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

3.1
ambient temperature
temperature of the air surrounding a sprayer

3.2
collector
receptacle into which water is deposited during a water distribution test, a diameter of coverage test or a spray coverage pattern

3.3
diameter of coverage
distance between the most remote points at which a continuously operating sprayer deposits water at an effective application rate, measured along a straight line through the sprayer, equal numerically to twice the radius of throw

3.4
effective application rate
application rate greater than or equal to 0,26 mm/h for sprayers with flow rates exceeding 75 l/h and 0,13 mm/h for sprayers with flow rates equal to or less than 75 l/h

3.5
irrigation lateral
branch supply line in an irrigation system on which water distribution devices, such as sprayers, are mounted directly or by means of fittings, risers or tubes

3.6
irrigation sprayer
device that discharges water in the form of fine jets or in a fan shape without rotational movement of its parts

3.7
maximum working pressure
highest pressure immediately upstream from a sprayer, as specified by this International Standard or the manufacturer, to ensure continuous operation and functionality specific to the device

3.8
minimum working pressure
lowest pressure immediately upstream from a sprayer, as specified by this International Standard or the manufacturer, to ensure continuous operation and functionality specific to the device

3.9
nominal flow rate
volume of water discharged per unit of time from a sprayer under test pressure

3.10
non-regulated sprayer
non-pressure-compensating sprayer
sprayer with a variable flow rate at varying water pressures at the sprayer inlet

3.11
nozzle
aperture or adjutage of the sprayer through which water is discharged

3.12
pop-up sprayer
irrigation sprayer designed for installation such that the sprayer nozzle is below ground level when it is not pressurized and above ground when it is pressurized

3.13
radius of throw
wetted radius
distance measured from a continuously operating sprayer to the most remote point at which the sprayer deposits water at a minimum rate of 0,26 mm/h for a sprayer with a discharge exceeding 75 l/h and at a minimum rate of 0,13 mm/h, for a sprayer with a discharge equal to or less than 75 l/h, measured at any arc of coverage, except near the arc extremes for part-circle sprayers

3.14
range of regulation
all of the working pressures at the inlet of a regulated sprayer within which the sprayer is declared by the manufacturer to regulate flow within a specified accuracy

3.15
range of working pressures
all of the working pressures between the minimum working pressure and the maximum working pressure

3.16
regulated sprayer
sprayer that maintains a relatively constant flow rate at varying water pressures at the sprayer inlet within the limits specified by the manufacturer

3.17
spray coverage pattern
area wetted by the sprayer, which operates according to the conditions specified by the manufacturer

3.18
test pressure
pressure at the inlet of a sprayer declared by the manufacturer as the pressure to be used for test purposes

NOTE In the absence of such a declaration, 200 kPa is used.

3.19
trajectory angle
angle above the horizontal plane of the water spray discharged from a sprayer nozzle operating at test pressure

3.20
trajectory height
maximum height above a sprayer of the trajectory of the water spray discharged from the sprayer nozzle operating at test pressure

3.21
water distribution curve
distribution curve
graphical plot of water application depth as a function of distance from a sprayer along a specified radius

3.22
water outlet height
height above ground level of the water outlet of a sprayer when the sprayer is installed as specified by the manufacturer

4 Classification

4.1 Classification according to uniformity of coverage

4.1.1 Uniform spray coverage pattern

4.1.2 Non-uniform spray coverage pattern

4.2 Classification according to water-spray characteristic(s)

4.2.1 Area of coverage

4.2.1.1 Circular

4.2.1.1.1 Full-circle

4.2.1.1.2 Part-circle

4.2.1.1.2.1 Fixed-pattern

4.2.1.1.2.2 Adjustable pattern

4.2.1.2 Non-circular (polygonal, rounded non-circular)

4.2.2 Type of spray

4.2.2.1 Sheet spray

4.2.2.2 Jet spray

4.3 Classification according to performance characteristics (flow rate regulation)

4.3.1 Regulated sprayers

4.3.2 Non-regulated sprayers

4.4 Classification according to type of connection

4.4.1 Threaded

4.4.2 Insert barb

4.4.3 Bayonet

4.4.4 Other

4.5 Classification according to additional functions

4.5.1 Pop-up/fixed

4.5.2 Valve in head

5 General requirements

5.1 Materials

The plastics parts of the sprayers, which conduct water and which are exposed to sunlight, shall be opaque and shall contain an additive to protect against UV radiation.

Sprayers may be made from a copper alloy or from other materials, whose mechanical properties and resistance to corrosion when used with irrigation water are similar to those of copper alloys.

On request, the manufacturer shall provide information about the resistance of the sprayer to chemicals used in agriculture.

5.2 Manufacture and assembly

The sprayers shall have no manufacturing defects which might be detrimental to their operation.

The sprayers shall incorporate features for easy fitting and assembly. All sprayers equipped with removable parts shall be easy to assemble manually or by using common tools. Should any special tool be required, the manufacturer shall be able to furnish them on request. The removable parts of one sprayer shall be interchangeable with those of other units of the same make and type.

5.3 Connections

The sprayer connections shall be specified according to the connection type and the corresponding International Standard.

5.3.1 Threaded connection

For sprayers designed for threaded connection to irrigation laterals, the screw threads shall comply with ISO 7-1. Alternatively, other threads may be allowed provided that a suitable adaptor is supplied with each threaded connection, making it comply with ISO 7-1.

5.3.2 On line connection

The manufacturer shall specify the type and size of flexible tube for which the connections are suitable.

All complementary information shall be supplied by the manufacturer.

6 Test methods

6.1 Measurements

The accuracy required for all measurements not specifically addressed in this International Standard shall be ± 3 %.

Application depths within collectors shall be measured to an accuracy of ± 1 %.

The test pressure shall not vary by more than ± 2 % during the test period. The pressure shall be measured to an accuracy of ± 1 %.

The flow rate through the sprayer shall be measured to an accuracy of ± 1 %.

The temperature shall be measured to an accuracy of ± 0,5 °C. For indoor testing, the water temperature shall be (23 ± 3) °C.

Time shall be measured with stopwatches accurate to ± 0,1 s.

6.2 General test conditions

Perform the test on sprayers which have previously been examined visually (without disassembly) for satisfactory workmanship and quality.

Attach test sprayers to the supply line according to the field assembly recommendations of the manufacturer.

Maintain the sprayer within ± 2° of vertical.

There shall be no visually detectable external leakage during the test.

Sprayers of the same type, but with different nozzles or different means of attachment, shall be tested separately for each combination of sprayer and nozzle or sprayer and means of attachment.

Collectors shall be designed in accordance with ISO 15886-3:2004, 4.1, and shall incorporate the following features.

a) They shall be identical.

b) The vertical dimension of each collector shall be at least twice the maximum depth of the water collected during the test, but not less than 150 mm.

c) The circular opening with sharp edges shall be free of deformities.

d) The diameter shall be from one half to one times the height, but shall not be less than 85 mm.

The opening of all collectors shall be in a common horizontal plane, with a slope not exceeding 2 % in any direction.

Sprayer nozzle height above the openings of the collectors shall be 0,20 m or at a height as specified by the manufacturer.

6.3 Hydraulic tests

Perform the tests indoors, in drift-free conditions or in an outdoor area under no wind conditions (maximum allowable wind speed less than 0,5 m/s).

Relative humidity and ambient temperature shall be measured at the start, midpoint and end of the test. For indoor testing, changes in temperature and humidity during the test shall not exceed ± 5 % of the pre-test ambient.

In order to take evaporation into account, put three control collectors into the test area, but outside the sprayer range. Place the target depth of water in each collector just prior to the start of the test. At the conclusion of the test, measure the final water depth and compute the evaporation by subtracting the final from the initial water depth and averaging the three results.

Prior to conducting the functional and operational tests, operate each test sprayer for 1 h at test pressure, in order to establish stable conditions.

6.3.1 Hydraulic test to be performed for each type of sprayer

The minimum tests to be performed for each type of sprayer are shown in Table 1.

Table 1 — Hydraulic tests

Sprayer type	Hydraulic test					
	Diameter of coverage	Spray coverage pattern	Water distribution curve	Uniformity of flow rate	Flow rate as a function of inlet pressure	Trajectory height
Uniform spray coverage pattern plus full circle	6.3.2 Method 2	6.3.3 Method 1	6.3.4 Method 2	6.3.5	6.3.6	6.3.7
Uniform spray coverage pattern plus part-circle	6.3.2 Method 1	6.3.3 Method 1	6.3.4 Method 1	6.3.5	6.3.6	6.3.7
Non-uniform spray coverage pattern plus full circle	6.3.2 Method 1	6.3.3 Method 2	6.3.4 Method 1	6.3.5	6.3.6	6.3.7
Non-circular/part-circle	6.3.2 Method 1[a]	6.3.3 Method 2	6.3.4 Method 1[a]	6.3.5	6.3.6	6.3.7
Other	—	—	—	6.3.5	6.3.6	—

[a] The diameter of coverage and the water distribution curve shall be calculated using the spray coverage pattern.

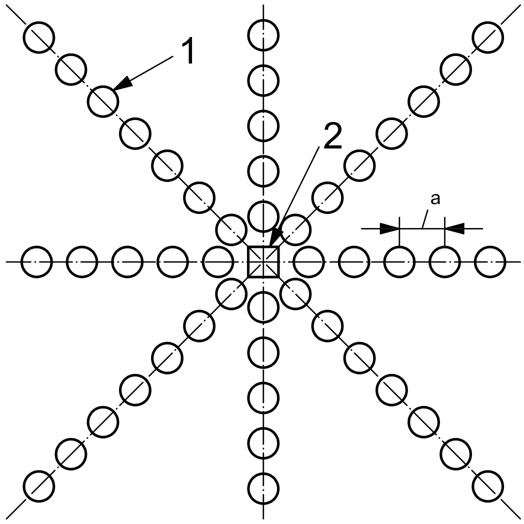
6.3.2 Diameter of coverage

The test specimen to perform this test shall be taken at random from the test sample used to determine the uniformity of flow rate and the flow rate as a function of inlet pressure.

6.3.2.1 Method 1

The collectors shall be placed on a level surface along 8 radii which are determined by lines extending from the sprayer at 45° angles. In the radii, the collectors shall be spaced at 0,25 m for sprayers with a diameter of coverage of up to 6 m, or 0,5 m for sprayers with a diameter of coverage greater than 6 m. The end of each line shall extend beyond the surface sprayed.

The sprayer shall be placed at the centre of these radii (see Figure 1).



Key

1 collector

2 test sprayer

a Collectors spaced at 0,25 m or 0,5 m.

Figure 1 — Diameter of coverage test using Method 1

Operate the sprayer for a minimum period of 1 h at the test pressure as measured at the inlet of the sprayer. The test duration shall be long enough to allow the requirements for reading accuracy of the collectors (see 6.1) to be met for a minimum of 50 % of the collectors after being adjusted for the evaporation error (see 6.3).

Measure the quantity of water in the collectors along eight radii from the sprayer to the most remote point at which the sprayer deposited water at one of the following minimum rates:

a) 0,26 mm/h for a sprayer with a flow rate that exceeds 75 l/h;

b) 0,13 mm/h for a sprayer with a flow rate equal to or less than 75 l/h.

Calculate the diameter of coverage as the average of the eight distances multiplied by two.

For non-circular sprayers, there are two diameters of coverage:

— the main diameter is the average of the two greatest distances multiplied by two;

— the secondary diameter is the average of the two smallest distances multiplied by two.

The diameter of coverage shall conform to the values supplied by the manufacturer within a permissible deviation of ± 10 %.

6.3.2.2 Method 2

The collectors shall be placed on a level surface along 2 radii, which are determined by two lines extending from the sprayer at 90° angles, which are measured at any arc of coverage except at the arc extremes for part-circle sprayers. In the radii, the collectors are spaced at 0,25 m for sprayers with an effective diameter of coverage of up to 6 m, or 0,5 m for sprayers with an effective diameter of coverage greater than 6 m. The end of each line shall extend beyond the surface sprayed (see Figure 2).

The sprayer shall be placed at the centre of these radii and shall be orientated to coincide with one of the radii (see Figure 2).

