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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.

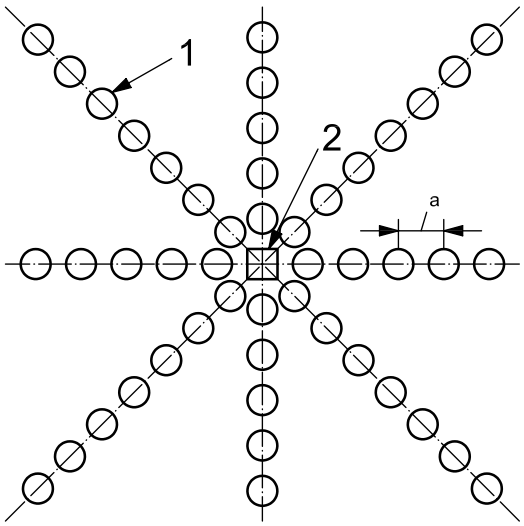
6.3.2 Diameter of coverage

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;

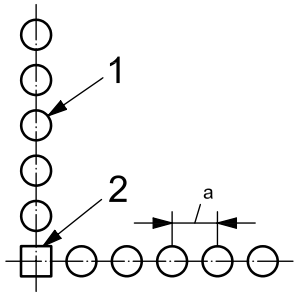
— the secondary diameter is the average of the two smallest distances multiplied by two.

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).



Key

1 collector

2 test sprayer

[a] Collectors spaced at 2,5 m or 0,5 m.

Figure 2 — Diameter of coverage test using Method 2

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 two 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.

The diameter of coverage is the average of the two distances multiplied by two.

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

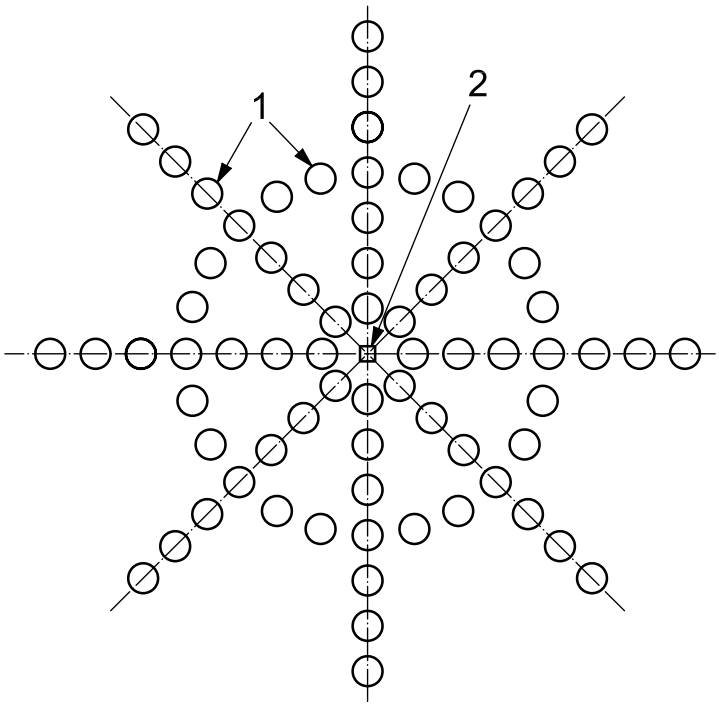
6.3.3 Spray coverage pattern

6.3.3.1 Method 1 — Radial collector arrays

The collectors shall be placed on a level surface along eight 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.

A circumference of collectors shall be placed around the sprayer at a distance of 50 % of the manufacturer defined radius of throw. Around the circumference, there shall be a minimum of two collectors between each two radii for sprayers with a radius of throw up to 2 m and a minimum of three collectors for sprayers with a radius of throw greater than 2 m (see Figure 3).

The sprayer is placed in the centre of the test area (see Figure 3).



Key

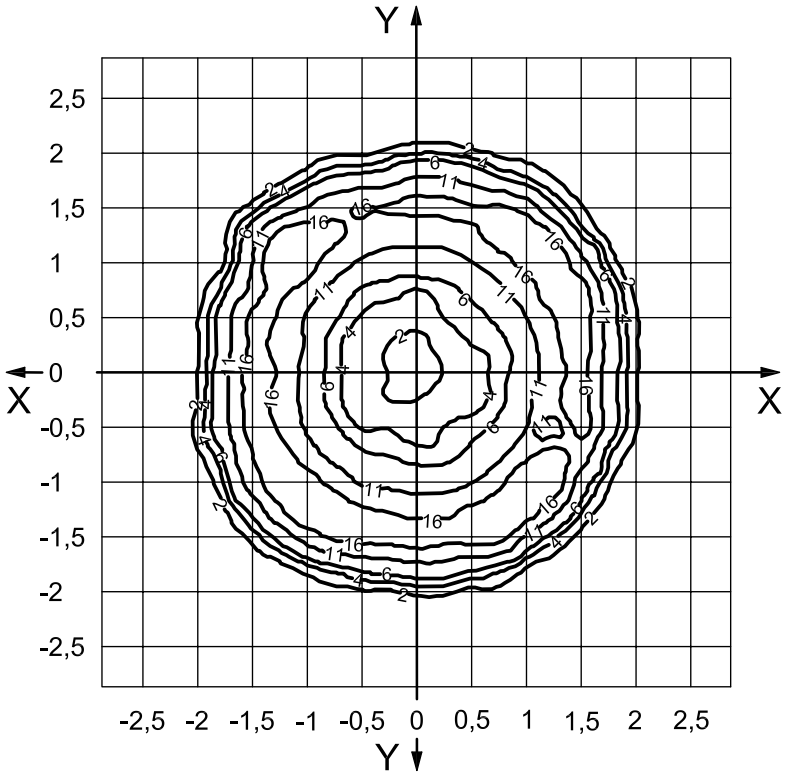
1 collector

2 test sprayer

Figure 3 — Spray coverage pattern test using Method 1

Operate the sprayer for a minimum period of 1 h, while maintaining the test pressure 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).

Immediately on conclusion of the test, measure the quantity of water in each of the collectors in the spray coverage area and record the values at each point. Adjust the volumes for evaporation (see 6.3). Plot the curves (isograms) by connecting the interpolated points of equal depth (see Figure 4).



X distance of the collector from the sprayer (m)

Y distance of the collector from the sprayer (m)

NOTE The values for the water application rate are measured in h (mm/h). The location of sprayer is 0,0.

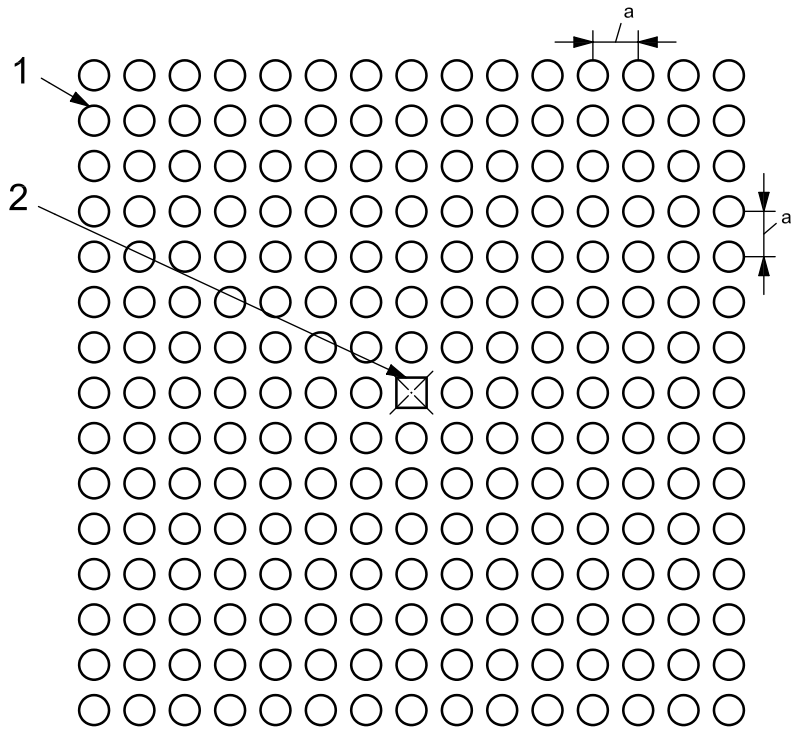
Figure 4 — Plot of the spray coverage pattern

The spray coverage pattern obtained from the test results shall conform generally to the pattern supplied by the manufacturer.

6.3.3.2 Method 2 — Full-grid collector arrays

Level the test area and divide it into squares, with maximum spacing of 0,25 m for sprayers with a diameter of coverage up to 6 m or 0,5 m for sprayers with a diameter of coverage greater than 6 m. Place the collectors at the corners of each square (see Figure 5).

Remove the collector from the centre of the test area and install the test sprayer in its place (see Figure 5).



Key

1 collector

2 test sprayer

[a] Collectors spaced at 2,5 m or 0,5 m.

Figure 5 — Spray coverage pattern test using Method 2

Operate the sprayer for a minimum period of 1 h while maintaining the test pressure 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).

Immediately on conclusion of the test, measure the quantity of water in each of the collectors in the spray coverage area and record the values at each point. Adjust the volumes for evaporation (see 6.3). Plot the curves (isograms) by connecting the interpolated points of equal depth (see Figure 4).

The spray coverage pattern obtained from the test results shall conform generally to the pattern supplied by the manufacturer.

6.3.4 Water distribution curve

There are two methods to determine the water distribution curve, depending on the number of radii in the sprayer test.

6.3.4.1 Method 1

Lay out the collectors and sprayer as outlined in 6.3.2.1.

Operate the sprayer for a minimum period of 1 h, while maintaining the test pressure 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).

Immediately on conclusion of the test, measure the quantity of water in each of the collectors placed in the spray coverage area and record the values at each point. Adjust the volumes for evaporation (see 6.3).

Calculate the water application rate, h (mm/h), using Equation (1):

$$h = \frac{V}{A} \times \frac{1}{t} \tag{1}$$

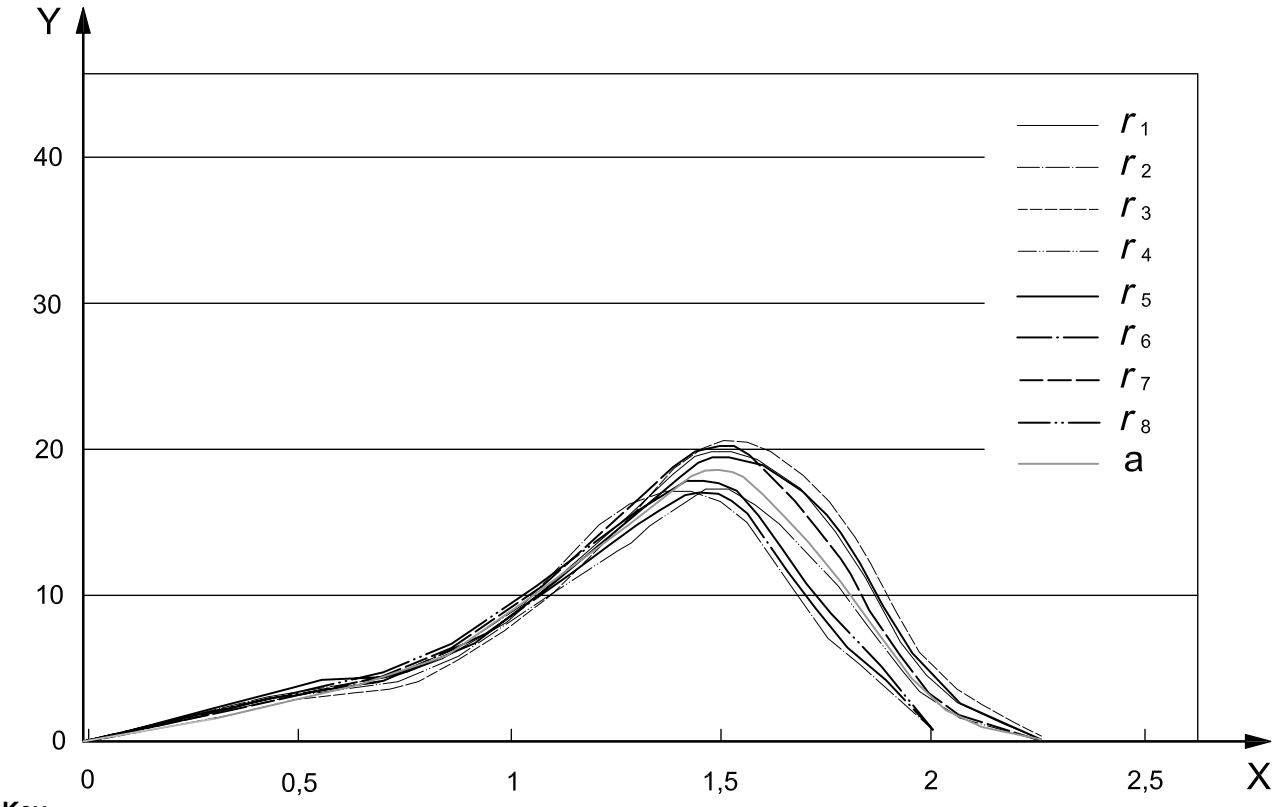
where

V is the volume, in litres, collected in each collector;

A is the area, in square metres, of the collector opening;

t is the test duration, in hours.

Plot the water distribution curves for all the collectors which were measured as a function of the distance of each collector from the sprayer along the eight radii. Calculate and plot the average water distribution curve (see Figure 6).



Key

X distance of each collector from the sprayer (m)

Y water application rate (mm/h)

a average

r_1 radius 1

r_2 radius 2

r_3 radius 3

r_4 radius 4

r_5 radius 5

r_6 radius 6

r_7 radius 7

r_8 radius 8

Figure 6 — Water distribution curve using Method 1

The average water distribution curve shall conform to the curve supplied by the manufacturer within a permissible deviation of ± 15 %.

6.3.4.2 Method 2

Lay out the collectors and sprayer as outlined in 6.3.2.2.

Operate the sprayer for a minimum period of 1 h, while maintaining the test pressure 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).

Immediately on conclusion of the test, measure the quantity of water in each of the collectors in the spray coverage area and record the values at each point. Adjust the volumes for evaporation (see 6.3).

Calculate the water application rate, h (mm/h), using Equation (2):

$$h = \frac{V}{A} \times \frac{1}{t} \tag{2}$$

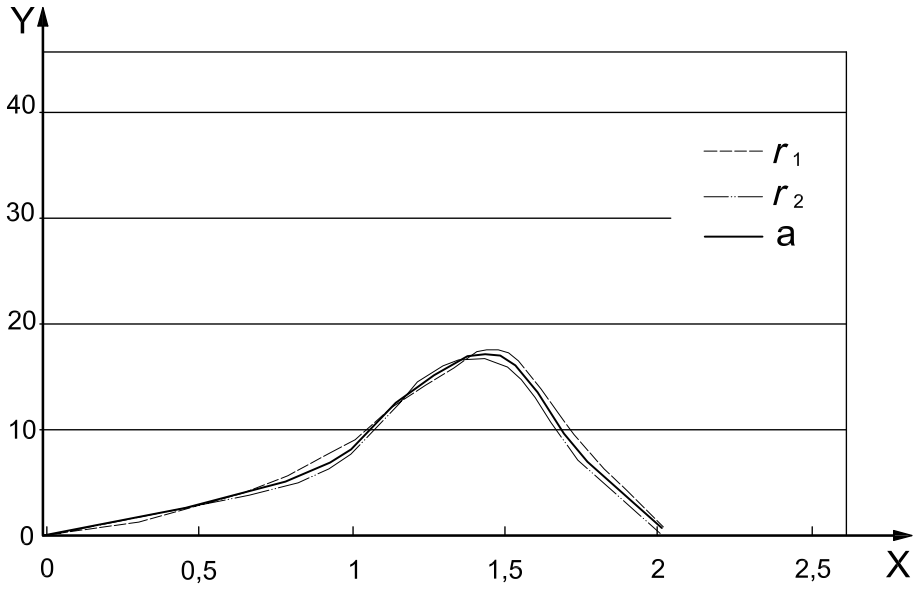
where

V is the volume, in litres, collected in each collector;

A is the area, in square metres, of the collector opening;

t is the test duration, in hours.

Plot the water distribution curves for all the collectors which were measured as a function of the distance of each collector from the sprayer along the two radii. Calculate and plot the average water distribution (see Figure 7).



Key

X distance of each collector from the sprayer (m)

Y water application rate (mm/h)

r_1 radius 1

r_2 radius 2

a average

Figure 7 — Water distribution curve using Method 2

The average water distribution curve shall conform to the curve supplied by the manufacturer within a permissible deviation of ± 15 %.

6.3.5 Uniformity of flow rate

6.3.5.1 General

This test applies to regulated and non-regulated sprayers. The test sample shall include 10 sprayer units.

6.3.5.2 Non-regulated sprayer

Measure the flow rates of each sprayer unit with the inlet water pressure at the test pressure. Record the measured flow rate of each sprayer separately.

Calculate the coefficient of variation, C_V, using Equation (3):

$$C_V = \frac{s_q}{\bar{q}} \times 100 \tag{3}$$

where

s_q is the standard deviation of the flow rates for the sample, in litres per hour;

$\bar{q}$ is the mean flow rate of the sample, in litres per hour.

The mean flow rate of the test sample $\bar{q}$ shall not deviate from the nominal flow rate by more than 7 %.

The coefficient of variation, C_V, of the flow rate of the test sample shall not exceed 7 %.

6.3.5.3 Regulated sprayer

Condition the sprayer units in the test sample by operating them for a total of 1 h. The conditioning procedure shall consist of the following steps:

a) Set the minimum working pressure, p_{min}, and maintain it for 3 min.

b) Set the maximum working pressure, p_{max}, and maintain it for 3 min.

c) Set the minimum working pressure, p_{min}, and maintain it for 3 min.

d) Set the maximum working pressure, p_{max}, and maintain it for 3 min.

e) Set the minimum working pressure, p_{min}, and maintain it for 3 min.

f) Set the maximum working pressure, p_{max}, and maintain it for 3 min.

g) Set the pressure at the midpoint of the range of regulation and maintain it until the total time of the conditioning procedure (1 h) is completed.

Immediately after conditioning and while maintaining the inlet pressure at the midpoint of the range of regulation, test the sprayers in accordance with 6.3.5.2.

6.3.6 Flow rate as a function of inlet pressure

6.3.6.1 Test method

Test each sprayer in increments not greater than 50 kPa, from zero pressure up to $1{,}2 \cdot p_{max}$, such that at least four values at four different pressures are obtained. Measure the flow rate at least 3 min after reaching the test pressure.

For regulated sprayers, continue the test by decreasing the pressure from $1{,}2 \cdot p_{max}$ to 0 in the same increments used during testing at increasing pressures.

If the actual inlet pressure exceeds the desired inlet pressure by more than 10 kPa during its rise and fall, return to zero pressure and repeat the test.

6.3.6.2 Non-regulated sprayers

Calculate the average flow rate, $\bar{q}$, for each pressure level, in litres per hour, obtained by measuring the flow rate of the sprayer at increasing pressure.

Plot the curve, $\bar{q}$, as a function of the inlet pressure. The curve of $\bar{q}$ shall conform to the manufacturer's published curve within an allowable deviation of not more than ± 7 %.

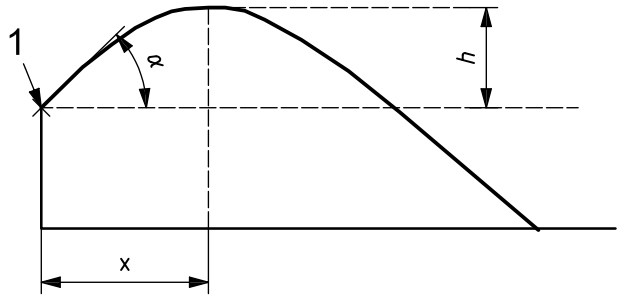
6.3.6.3 Regulated sprayers

Calculate the average flow rate, $\bar{q}$, for each inlet pressure, in litres per hour, obtained by measuring the flow rates of the sprayers at increasing and decreasing pressures (the average of eight flow rate measurements).

Plot the curve, $\bar{q}$, as a function of the inlet pressure. The curve of $\bar{q}$, shall not deviate from the nominal flow rate by more than ± 7 %.

6.3.7 Trajectory height

The measurement is taken from a horizontal plane through the main nozzle. As with the radius of throw, occasional drops that achieve a greater height shall be ignored in favour of some general representation of the top surface of the main jet. Care shall be taken to insure that the sprayer riser meets the 2° vertical tolerance. The radial distance to the location of maximum trajectory height shall be noted. Both height and radius measurements require an accuracy of ± 5 %.



Key

α trajectory angle
1 sprayer nozzle
h trajectory height

Figure 8 — Trajectory height

Trajectory height shall conform to the manufacturer's declared height within an allowable deviation of not more than ± 5 %.

6.4 Durability test

Operate the sprayer for 2 000 h at the maximum working pressure. Operate the sprayer continuously for four days to five days, then stop it for one day to two days, in alternating sequences, until a total of 2 000 h of operation has been reached.

After operating the sprayer for 2 000 h, check and test the sprayer according to:

— test construction and parts;

— test resistance to hydrostatic pressure;

— test watertightness;

— the flow rate of the sprayer at the test pressure, where it shall not vary by more than ± 8 % from the nominal flow rate of the sprayer before performing the durability test;

— test distribution characteristics, as specified under the same conditions as before the durability test; the following deviations are permissible: ± 10 %.

6.5 Mechanical test

Test sprayers while attached to an irrigation lateral of the types and dimensions noted by the manufacturer for normal use in the field. Test sprayers of the same type, but with different means of attachment, separately for each combination for sprayer and means of attachment.

6.5.1 Test of resistance of threaded connections

Perform this test on sprayers intended for a threaded connection, attaching to a lateral using a standard wrench.

For sprayers made of metal, the threaded connection shall withstand a torque of 20 N·m without showing signs of damage. For sprayers made of plastics, the threaded connection shall withstand a torque of 7 N·m, applied for 1 h, without showing signs of damage.

6.5.2 Test of resistance to hydrostatic pressure at ambient temperature

6.5.2.1 Connect the sprayer to the lateral according to the recommendation of the manufacturer for field assembly and plug the nozzle such that no leakage occurs at the connection during the test.

For sealing the sprayer, a nozzle without a hole supplied by the manufacturer can be used. Alternatively, a nozzle whose connection to the sprayer is identical to its connection to the nozzle and does not affect the test results can be used. This can also be achieved by physically closing the nozzle by means of a soft material such as fabric, plastic, etc.

Check that no air remains in the system, then gradually increase the water pressure in stages of 50 kPa, holding the system pressure for 5 s at each pressure stage.

Increase the water pressure gradually from zero up to twice the maximum working pressure, p_{max}. Maintain this pressure for a period of 1 h.

6.5.2.2 The sprayer and its parts shall withstand the test pressure without being damaged, no leakage shall occur through the sprayer body and the sprayer shall not separate from the assembly.

6.5.3 Test of resistance to hydrostatic pressure at high temperature

6.5.3.1 Connect the sprayer to the lateral in accordance with the recommendations of the manufacturer for field assembly and plug the nozzle (see 6.5.2.1). Ensure that all connections are tight so that no leakage occurs during the test.

While the sprayer is immersed in water at (60 ± 5) °C, allow it to fill with water and check that no air remains in the system.

Connect the test assembly to a source of hydraulic pressure and increase the water pressure from zero up to the maximum working pressure, p_{max}, within a period of about 15 s.

Maintain the maximum working pressure for a period of 8 h.

6.5.3.2 The sprayer and its parts shall withstand the test pressure without being damaged, no leakage shall occur through the sprayer body or its connections and the sprayer shall not separate from the assembly.

7 Identification and marking

Each sprayer shall be clearly and permanently marked with the following information:

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

— catalogue identification symbol;

— nozzle size or nominal flow rate;

— indication of the correct operating position, if necessary;

— type of connection.

Replaceable parts, affecting sprayer performance, shall be marked separately. Colours may be used as identifying marks.

If the space on the sprayer is insufficient for all the required markings, identification of the manufacturer and the catalogue identification symbol are acceptable, provided that the unmarked specifications are available from the manufacturer.

8 Data to be supplied by the manufacturer

The manufacturer shall make appropriate information available to the user on irrigation sprayers in the form of catalogues, instructions or data sheets, which include, as a function of the classification (see Clause 4), the following data.

a) General data:

   1) catalogue number of irrigation sprayer;

   2) class of sprayer according to Clause 4;

   3) materials used for the manufacture of the sprayer;

   4) instructions for installation and operation;

   5) type of sprayer connection;

6) connection tube characteristics [diameter, maximum permitted length and hydraulic characteristics (e.g. flow rate, pressure and pressure losses)];

7) limitations of sprayer use (fertilizers, chemicals, etc.);

8) instructions for maintenance, storage and repair;

9) list of spare parts, including illustrations;

10) recommendations for filtration requirements.

b) Operating data:

1) flow rate;

2) test pressure;

3) maximum working pressure;

4) minimum working pressure;

5) coefficient of variation, C_V;

6) spray coverage pattern;

7) water distribution curve;

8) diameter/radius of coverage;

9) trajectory height and trajectory angle;

10) type and coverage of the sprayer nozzle.

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