INTERNATIONAL STANDARD

ISO 15886-4

First edition
2019-06

Irrigation equipment — Irrigation sprinklers —

Part 4: Test methods for durability

Matériel d'irrigation — Sprinklers d'irrigation —

Partie 4: Méthodes d'essai concernant la durabilité

Reference number
ISO 15886-4:2019(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 of 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 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 15886 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.

Irrigation equipment — Irrigation sprinklers —

Part 4: Test methods for durability

1 Scope

This document specifies the conditions and methods for testing the durability of rotating sprinklers for irrigation.

The term sprinkler is used here in a broad generic sense and is meant to cover a wide variety of products as classified in ISO 15886-1, which applies to all irrigation sprinkler classifications having both static parts and moving parts during operation, as defined by the manufacturer.

For any given sprinkler, a wide range of nozzle configurations, operating conditions, and adjustments generates at least a theoretical need for a correspondingly large number of tests. Testing agencies and manufacturers can use interpolation techniques to reduce the number of actual test runs, provided accuracy standards are still being met.

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 15886-3:2012, *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.

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
ambient temperature
temperature of the air surrounding a sprinkler

3.2
area of coverage
area within the wetted boundary from a sprinkler operated within the range of effective application rates specified in the manufacturer's literature

3.3
clean water
water processed, if necessary, so as to contain suspended particles no larger than 74 microns (200 mesh) equivalent and to contain no dissolved chemicals known to have short-term effects on sprinklers materials

3.4
distribution curve
graphical plot of water application depth as a function of distance from a sprinkler along a specified radius

3.5
distribution uniformity
DU
coefficient using the lowest 25 % of water application depths to characterize the uniformity of field-measured or simulated water application from a grid of sprinklers

3.6
flow rate
volume of water passing through a device per unit of time

3.7
full grid collector arrays
collectors located at the intersections of a two-dimensional geometric grid pattern sufficient in number to give a desired statistical basis for determining water *distribution uniformity* (3.5)

3.8
inlet connection size
nominal pipe size designation for commercial purposes or for manufacturer's declaration defined by reference to a recognized standard

3.9
maximum working pressure
P_{max}
highest water pressure at the inlet to a sprinkler recommended by the manufacturer to ensure proper operation

3.10
minimum working pressure
P_{min}
lowest pressure at the inlet to a sprinkler recommended by the manufacturer to ensure proper operation

3.11
nozzle
aperture of a sprinkler through which the water is discharged

3.12
nozzle pressure
pressure measured immediately upstream from a *nozzle* (3.11) or as inferred by a Pitot tube measurement at the nozzle orifice

3.13
nozzle size
numerical size designation used for commercial purposes with no specific relationship to the actual dimensions of a nozzle

3.14
part-circle sprinkler
sprinkler with an adjustable feature that enables it to irrigate a sector of a circular area, either with or without an attachment which enables it to be adjusted to irrigate another sector or the entire circular area

3.15
regulated sprinkler
sprinkler that maintains a relatively constant flow rate at varying water pressures at the sprinkler inlet within the limits specified by the manufacturer

3.16
radius of throw
distance measured from a centreline of a continuously operating sprinkler to the most remote point at which the sprinkler deposits water at the minimum effective application rate, measured at any arc of coverage except near the arc extremes for *part-circle sprinklers* (3.14), also called wetted radius

3.17
rotating sprinkler
water distribution device which, as a result of rotating motion around its axis, distributes water over a circular area, part of a circular area or a non-circular area

3.18
statistical uniformity coefficient
UCS
coefficient using standard deviation as a measure of dispersion in statistical theory to characterize the uniformity of field-measured water application from a full grid of sprinklers

3.19
test pressure
pressure at the inlet of a sprinkler declared by the manufacturer as the pressure to be used for test purposes

3.20
working pressure
water pressure recommended by the manufacturer to ensure proper operation of a sprinkler

4 Installation of sprinklers under test

The sprinkler selected for testing shall be representative of general production capabilities particularly as it relates to speed of rotation.

Mount the test sprinkler in accordance with the manufacturer's installation instructions for normal operation in the field including the manner of installation, tightening torque, maximum/minimum force required to assemble.

Mount the sprinkler on a riser with nominal size designation the same as the sprinkler inlet connection. Ensure that the riser is fixed rigidly vertically and that it does not vibrate enough to cause a visual effect on the sprinkler operation, bend or deviate from the vertical position during the test. The maximum allowable deviation from the vertical position during the test is 2°.

The use of a steel pipe or a rigid plastic riser is recommended to provide the required mechanical strength and facilitate the installation of a standard pressure tap.

If the manufacturer specifies any special operating conditions on items that are provided as standard equipment with the sprinkler, they shall be used.

For a sprinkler which is not riser-mounted as described above, the test mounting shall be as specified by the manufacturer.

5 Measurements

5.1 Accuracy of measurements

Pressure shall be measured with an accuracy of ±1,0 %.

Flow rate through the sprinkler shall be measured with an accuracy of ±2,0 %.

Temperature shall be measured with an accuracy of ±0,5 °C.

Time shall be measured with a stop watch.

The accuracy required for other measurements not specifically specified in this document is ±3,0 %.

5.2 Pressure measurement

The test pressure shall be measured at the height of the main nozzle. Refer to ISO 15886-3 for pressure tap construction. There shall be no flow obstructions between the pressure tap and the sprinkler base.

6 Test conditions

Clean water shall be used for the test and be filtered through a 130 micron (120 mesh) filter.

The test pressure shall not change by more than 5 %. The water temperature during the test shall be 5 °C to 35 °C.

Chemicals may be added to the water to prevent the precipitation of scale in the test sprinkler provided they do no harm to the sprinkler construction, water passages, nozzle or to the operating properties of the sprinkler. If, at the end of the durability test, scale was deposited on the sprinkler parts, it may be removed chemically or mechanically provided that no damage, as mentioned above, will happen to the sprinkler.

The test shall be performed in an installation fulfilling the following conditions.

— There shall be no effect of atmospheric conditions (rain, wind, solar radiation) on the operation of the sprinkler.

— There shall be no algae or other microorganism growth in the water and on the test sprinkler.

— The water flow from the sprinkler shall not affect its operation, e.g. return spray from the test facility walls on the operating mechanism of the sprinkler.

For part circle sprinklers, see ISO 15886-3:2012, Annex B.

7 Tests to be performed before durability test

7.1 Resistance to hydrostatic pressure at ambient temperature

7.1.1 General

Connect the sprinkler to the test bench and plug the outlet of the nozzles in such a manner that no leakage occurs at the connection during the test. For nozzles that cannot be plugged, perform the test in the operating position of the sprinkler. The sprinkler may be prevented from rotating during the test by mechanical means. The connection of the sprinkler to the supply line shall be made according to recommendations of the manufacturer for field assembly.

Check that no air remains in the system then gradually increase the water pressure beginning with one quarter of the nominal working pressure in stages of 100 kPa holding the system pressure for 5 s at each pressure stage.

7.1.2 Metal sprinklers

Raise the water pressure to 2 times the maximum working pressure, P_{max}, and maintain that level for 10 min at ambient temperature.

7.1.3 Plastic sprinklers

Raise the water pressure to 2,4 times the maximum working pressure, P_{max}, and maintain that level for 1 h at ambient temperature.

7.1.4 Requirements

To comply with this document, no defects in the sprinkler body shall appear during the test and no leakage shall occur through the sprinkler body or its gaskets. Leakage through the sliding bearings of the rotating sprinklers is permitted.

7.2 Water tightness

The test shall be performed as follows:

Connect the sprinkler with its nozzles to the supply pipeline according to the service conditions recommended by the manufacturer.

Increase the water pressure from P_{min} to P_{max} in steps of 100 kPa and maintain the pressure at each step for 1 min. Throughout the test, the total leakage of the sprinkler shall be collected by suitable means.

The tightness test shall be performed after 24 h of sprinkler operation at the maximum test pressure.

To comply with this document:

a) the total leakage rate shall not exceed 2 % of the sprinkler flow rate at the test pressure;

b) for sprinkler nominal flowrate ≤250 l/h the leakage rate shall not exceed 5 l/h; and

c) there shall be no leakage through the threaded connection to the supply line.

7.3 Flow rate as a function of inlet pressure

7.3.1 General

The test shall be performed on a sample of five sprinklers of the same model and of the same nominal flow rate.

7.3.2 Test method

Test each sprinkler in pressure increments not greater than 50 kPa, from 0 to 1,2 P_{max}, such that at least four values at four different pressures are obtained. Wait at least 3 min after reaching the test pressure to measure the flow rate.

For regulated sprinklers, continue the test by decreasing the pressure from 1,2 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.

7.3.3 Non-regulated sprinklers

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

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