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Agricultural irrigation equipment — Rotating sprinklers —

Part 1: Design and operational requirements

*Matériel agricole d'irrigation — Asperseurs rotatifs —
Partie 1: Exigences de conception et de fonctionnement*



Reference number
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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.

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.

International Standard ISO 7749-1 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 second edition cancels and replaces the first edition (ISO 7749-1:1986), of which it constitutes a technical revision.

ISO 7749 consists of the following parts, under the general title *Agricultural irrigation equipment — Rotating sprinklers*:

- *Part 1: Design and operational requirements*
- *Part 2: Uniformity of distribution and test methods*

NOTE — Future parts will also cover part-circle sprinklers and pop-up sprinklers.

Annex A forms an integral part of this part of ISO 7749.

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Agricultural irrigation equipment — Rotating sprinklers —

Part 1: Design and operational requirements

1 Scope

This part of ISO 7749 specifies the design and operational requirements of rotating sprinklers and sprinkler nozzles for agricultural irrigation equipment and their test methods. It applies to sprinklers intended for assembly in pipeline networks for irrigation and operation at the pressures recommended by the manufacturer.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7749. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7749 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*.

ISO 2859-1:1989, *Sampling procedures for inspection by attributes — Part 1: Sampling plans indexed by acceptable quality level (AQL) for lot-by-lot inspection*.

ISO 3951:1989, *Sampling procedures and charts for inspection by variables for percent nonconforming*.

ISO 7749-2:1990, *Irrigation equipment — Rotating sprinklers — Part 2: Uniformity of distribution and test methods*.

3 Definitions

For the purposes of this part of ISO 7749, the following definitions apply.

3.1 rotating sprinkler: Device which by its rotating motion around its vertical axis distributes water over a circular area or part of a circular area.

3.2 nozzle: Aperture or adjutage of the sprinkler through which the water is discharged.

NOTE 1 A sprinkler may contain one or several cylindrical nozzles, or nozzles of other shapes. It may refer to either a single nozzle, or to a combination of nozzles in a multi-nozzled sprinkler.

3.3 equivalent nozzle diameter: Theoretical nozzle outlet diameter, calculated on the basis of nozzle pressure and flowrate.

NOTE 2 The calculation is described in annex A.

3.4 minimum effective pressure, $p_{\min}$: Lowest working pressure declared by the manufacturer, measured near the base of the sprinkler, at a point situated about 0,2 m below the main nozzle of the sprinkler, but with the pressure gauge situated in the same plane as the main nozzle. (See figure 1.)

3.5 maximum effective pressure $p_{\max}$: Highest working pressure declared by the manufacturer, measured near the base of the sprinkler, at a point

situated about 0,2 m below the main nozzle of the sprinkler, but with the pressure gauge situated in the same plane as the main nozzle. (See figure 1.)

3.6 range of effective pressure: Pressure range between the minimum effective pressure, p_{min} , and the maximum effective pressure, p_{max} , declared by the manufacturer as the pressure range in which the sprinklers operate effectively. (See figure 2.)

3.7 test pressure: Water pressure within the range of the effective pressure (3.6) used for testing the sprinkler.

3.8 nominal flowrate: Quantity of water per unit of time discharged by a sprinkler with a specific nozzle at ambient temperature at the test pressure declared by the manufacturer in the manufacturer's data sheets.

3.9 radius of throw: Farthest distance measured, while the sprinkler is rotating normally, from the sprinkler centreline to the point at which the sprinkler deposits water at the minimum rate of 0,25 mm/h for a sprinkler whose discharge exceeds 75 l/h, and 0,13 mm/h for a sprinkler whose discharge is equal to or less than 75 l/h, typically measured at any arc of coverage except at the arc extremes for part-circle sprinklers.

NOTE 3 The respective values relate only to sprinklers in continuous operation.

3.10 effective diameter of coverage: Twice the radius of throw (3.9).

3.11 trajectory height: Maximum height of the trajectory of the water stream above the sprinkler nozzle when operating at the test pressure.

3.12 trajectory angle: Angle of the water stream above a horizontal plane, as discharged from the sprinkler nozzle operating at the test pressure.

3.13 normal trajectory angle: Trajectory angle of 20° and greater.

3.14 low trajectory angle: Trajectory angle smaller than 20°.

3.15 sprinkler spacings: Distance between sprinklers along the irrigation laterals and distance between laterals.

3.16 coefficient of distribution uniformity, CDU: Uniformity of water application rate, depth or amount, at a given pressure and at a particular spacing, expressed as a percentage.

NOTE 4 The CDU is determined by the Christiansen method described in ISO 7749-2.

3.17 wind speed: Average wind speed at the test site during the test of distribution uniformity of the sprinkler.

NOTE 5 The calculation is described in ISO 7749-2.

3.18 irrigation lateral: Branch supply line on which water distribution devices (sprinklers, emitters, drippers) are mounted directly or by means of fittings, risers or tubes.

3.19 water distribution curve: Curve of application rates of the water accumulated in collectors laid out along a wetted radius, as a function of the distances of the collectors from the sprinkler.

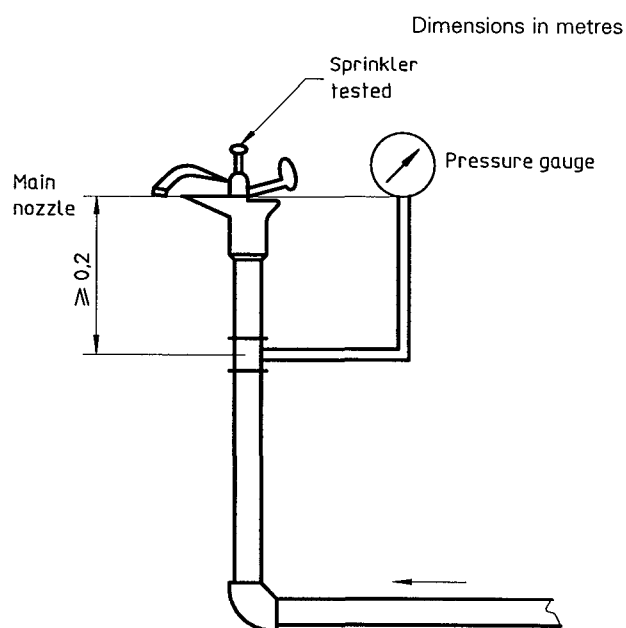


Figure 1 — Location of pressure gauge for measurement of sprinkler pressure

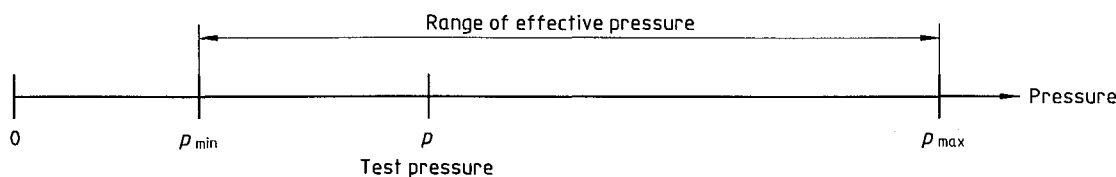


Figure 2 — Range of effective pressure

3.20 part-circle sprinkler: Rotating sprinkler designed to irrigate a sector of a circular area, either with or without an attachment which enables it to be adjusted to irrigate the entire circular area.

3.21 pop-up sprinkler: Irrigation sprinkler which is designed for installation so that the nozzle is below ground level when not operating.

NOTE 6 When the sprinkler is pressurized, the part containing the nozzle is raised so that the nozzle is above ground level for irrigation. When the pressure is shut off, the part containing the nozzle returns to its original position.

3.22 collector: Receptacle into which the water discharged by the sprinkler is deposited during the test for radius of throw.

3.23 ambient temperature: Temperature of the surroundings in the range of 15 °C to 30 °C.

4 General requirements

4.1 Materials

Sprinklers shall be made of metals or plastics. Metal sprinklers shall be made from a copper alloy or of other metals whose mechanical properties and resistance to corrosion when used with irrigation water are not less suitable than those of copper alloys.

Plastics parts of the sprinklers which conduct water and which are exposed to sunlight shall be opaque. Plastics parts of sprinklers exposed to ultraviolet (UV) radiation shall contain an additive resistant to UV radiation.

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

4.2 Construction and workmanship

4.2.1 Sprinkler parts, including nozzles, of the same type and manufacture shall be interchangeable.

If the construction of the sprinkler permits replace-

ment of parts, it shall be possible to replace the parts with standard tools; if special tools are required, the manufacturer shall be able to supply these tools.

4.2.2 The sprinkler shall be connected to the riser by means of threads or other means that ensure proper strength of the connection.

Sprinklers intended for threaded connection (see 4.3) to the pipeline or to risers shall be equipped with spanner flats or some other configuration, suitable for gripping with a standard open or adjustable wrench. Sprinklers having a plastics part for connection to risers may have other configurations (projections, slots, etc.) to facilitate manual assembly and removal.

4.2.3 Replaceable nozzles shall be attached to the sprinkler by threading, push-in or any other method that permits rapid and effective replacement under service conditions.

4.3 Threaded connections

In the case of sprinklers intended for threaded connection to a pipeline or to a riser, the threads shall comply with ISO 7-1. Alternatively, other threads may be allowed provided that a suitable adaptor shall be supplied with each threaded connection, making it comply with ISO 7-1.

4.4 Performance requirements

The following performance requirements apply to sprinklers having one or more nozzles.

4.4.1 Effective pressures

The sprinkler shall rotate continuously and regularly in its designed direction within its entire range of effective pressure from the minimum effective pressure, p_{min} , up to the maximum effective pressure, p_{max} .

4.4.2 Actuating mechanism

The actuating mechanism of the sprinkler shall operate in accordance with 7.6 at any inclination of the riser up to 10° from the vertical.