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Third edition
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Equipment for crop protection — Spraying equipment —

Part 1: Test methods for sprayer nozzles

Matériel de protection des cultures — Équipement de pulvérisation —

Partie 1: Méthodes d'essai des buses de pulvérisation

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Contents

Page

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 (see www.iso.org/directives).

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For an explanation on 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 the following URL: 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 6, *Equipment for crop protection*.

This third edition cancels and replaces the second edition (ISO 5682-1:1996), which has been technically revised as follows:

— clarity for the construction of the patternator;

— addition of a multiple nozzle setup to nozzle test methods;

— broadening of the scope of nozzle types covered;

— removal of drop size measurement using a Petri dish;

— clarification on the methods;

— clarification on sampling;

— update of instrumentation;

— several new informative annexes.

A list of all the parts in the ISO 5682 series can be found on the ISO website.

Equipment for crop protection — Spraying equipment —

Part 1: Test methods for sprayer nozzles

1 Scope

This document specifies test methods to assess the performance of sprayer nozzles with the exception of droplet characteristics. Applicable tests by nozzle type are described in an informative annex as a guide, but this is not required for use of this document.

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 5681, *Equipment for crop protection — Vocabulary*

ISO 8486-2:2007, *Bonded abrasives — Determination and designation of grain size distribution — Part 2: Microgrits F230 to F2000*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5681 apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at http://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

4 Measuring equipment

4.1 General

The working range of the measuring equipment shall be within the intended range of the measurements to be taken. The equipment used shall be recorded in the test report.

4.2 Horizontal patternator

4.2.1 General

The details for a horizontal patternator are described in 4.2. Annex B includes informative construction details, but is not required for equipment construction. For non-laboratory conditions, exceptions shall be noted on the report.

4.2.2 Groove characteristics

a) The distance between two consecutive groove walls (*E* in Figure 4) when measuring single nozzles shall be either 25 mm or 50 mm.

b) If the horizontal patternator is intended for the measurement of distribution evenness across multiple nozzles or complete spray booms, the distance between two consecutive groove walls (*E* in Figure 4) can be a distance of 25 mm, 50 mm, or 100 mm.

c) The deviation of the leading edges of the groove walls from horizontal shall not exceed a slope of ± 1 % (10 mm/m) across the width (*A* in Figure 1).

d) The variation in height of the grooves shall not exceed 2 mm as measured with a straight edge of at least 1 m length (*B* in Figure 2).

e) The inclination of the leading edge of the grooves shall not exceed a slope of 10 % from horizontal (*C* in Figure 3).

f) Grooves shall allow liquid to properly drain into the collection areas.

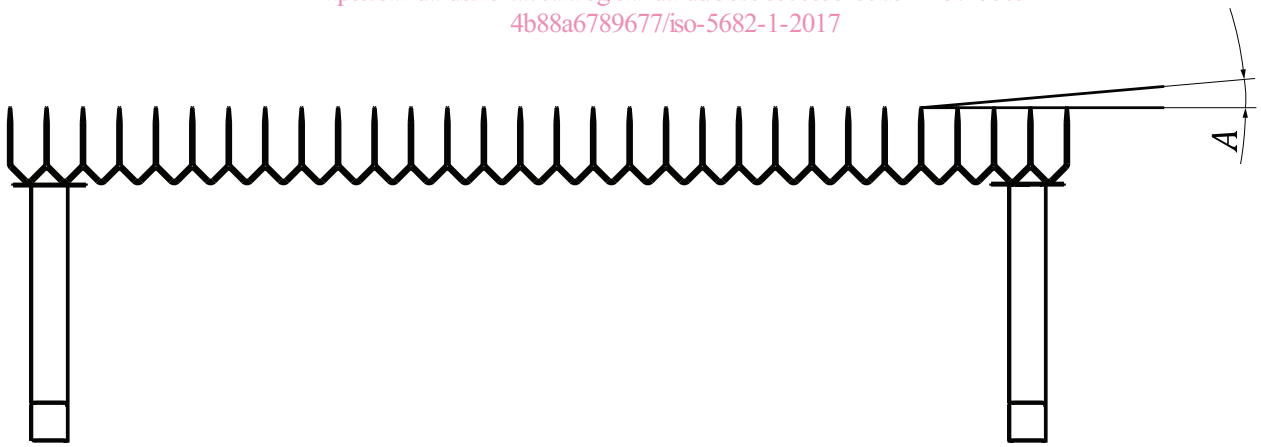
g) Groove depth (*F* in Figure 4) and groove width (*E* in Figure 4) shall be as specified in Table 1; this is to minimize the potential redistribution due to splashing. The depth and slope of the grooves may need to be adjusted in case of higher flows.

Table 1 — Groove depth

Groove width (*E*)	25 mm	50 mm/100 mm
Groove depth (*F*)	≥ 50 mm	≥ 75 mm

h) The straightness of each groove wall at the leading edge (*J* in Figure 5) shall be within ± 1,5 mm/m of the intended location (*H* in Figure 5) for horizontal patternators where the groove width (*E* in Figure 4) is 25 mm or 50 mm; the straightness of each groove wall at the leading edge shall be within ± 2,0 mm/m where the groove width is 100 mm.

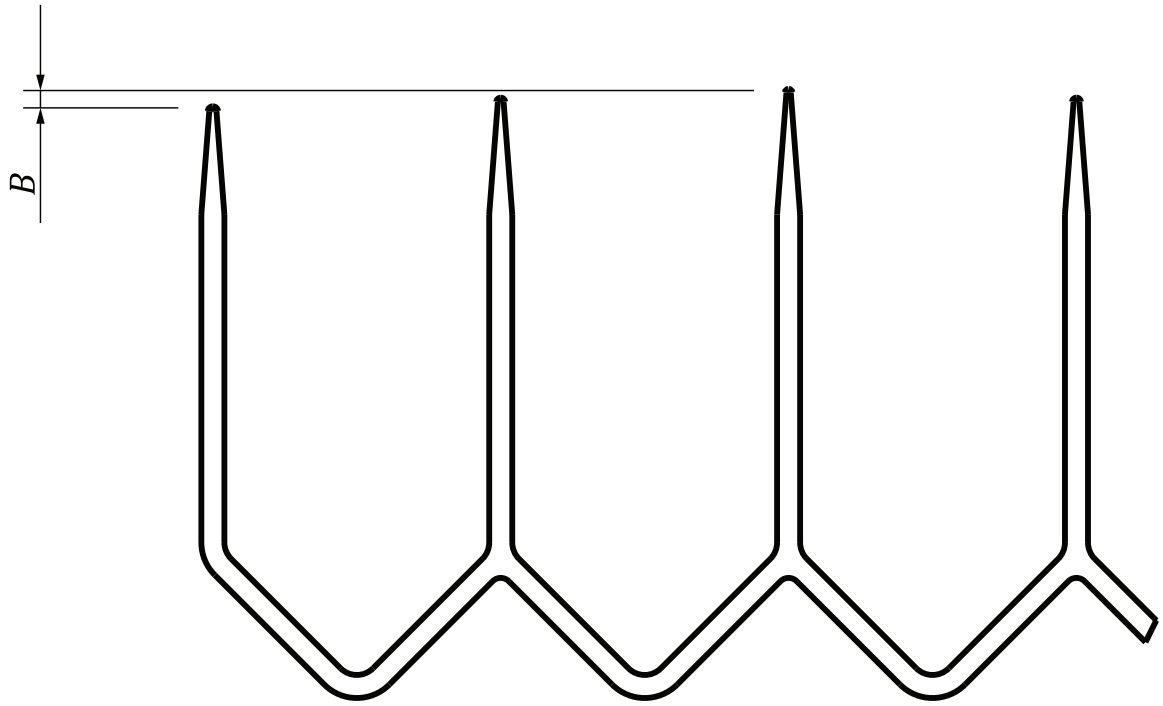
i) The deviation of the distance between the leading edges of two consecutive groove walls (*E* in Figure 4) shall be within ± 1,5 mm for 25 mm and 50 mm grooves and ± 2 mm for 100 mm grooves.



Key

A slope deviation from horizontal

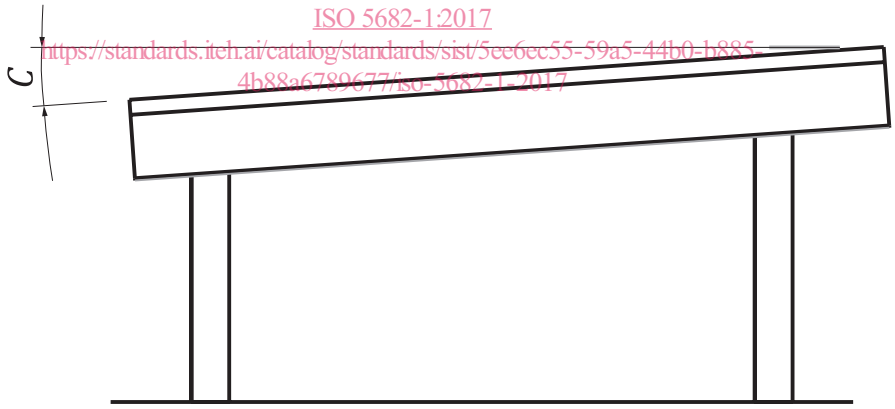
Figure 1 — Transverse angle of leading edges of grooves



Key

B deviation of groove leading edges height

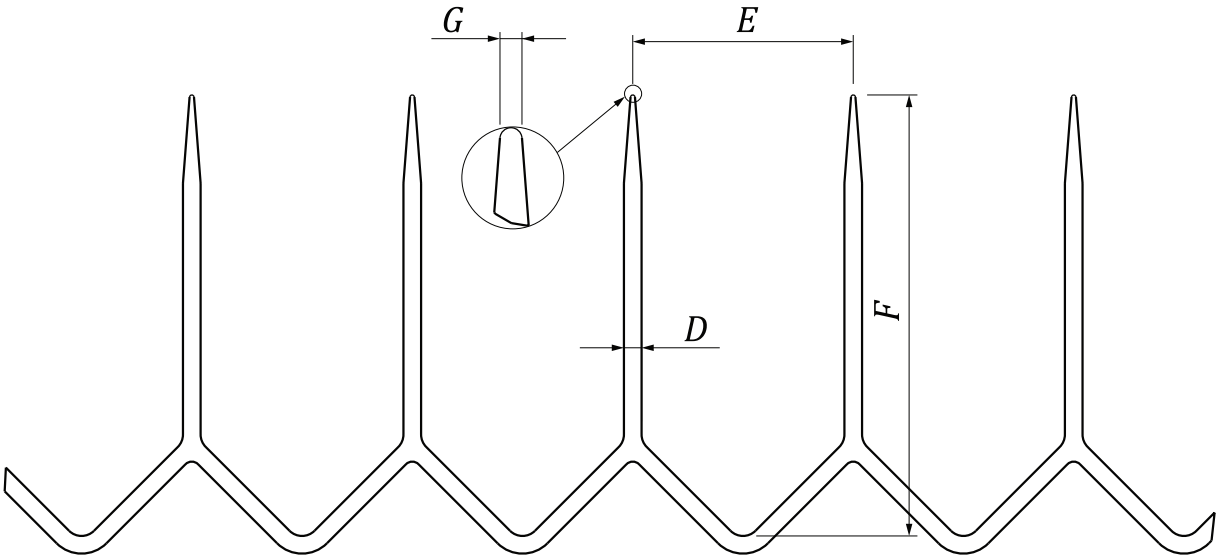
Figure 2 — Variation of groove leading edges heights



Key

C inclination of the leading edge of the grooves from horizontal

Figure 3 — Inclination of leading edges



Key

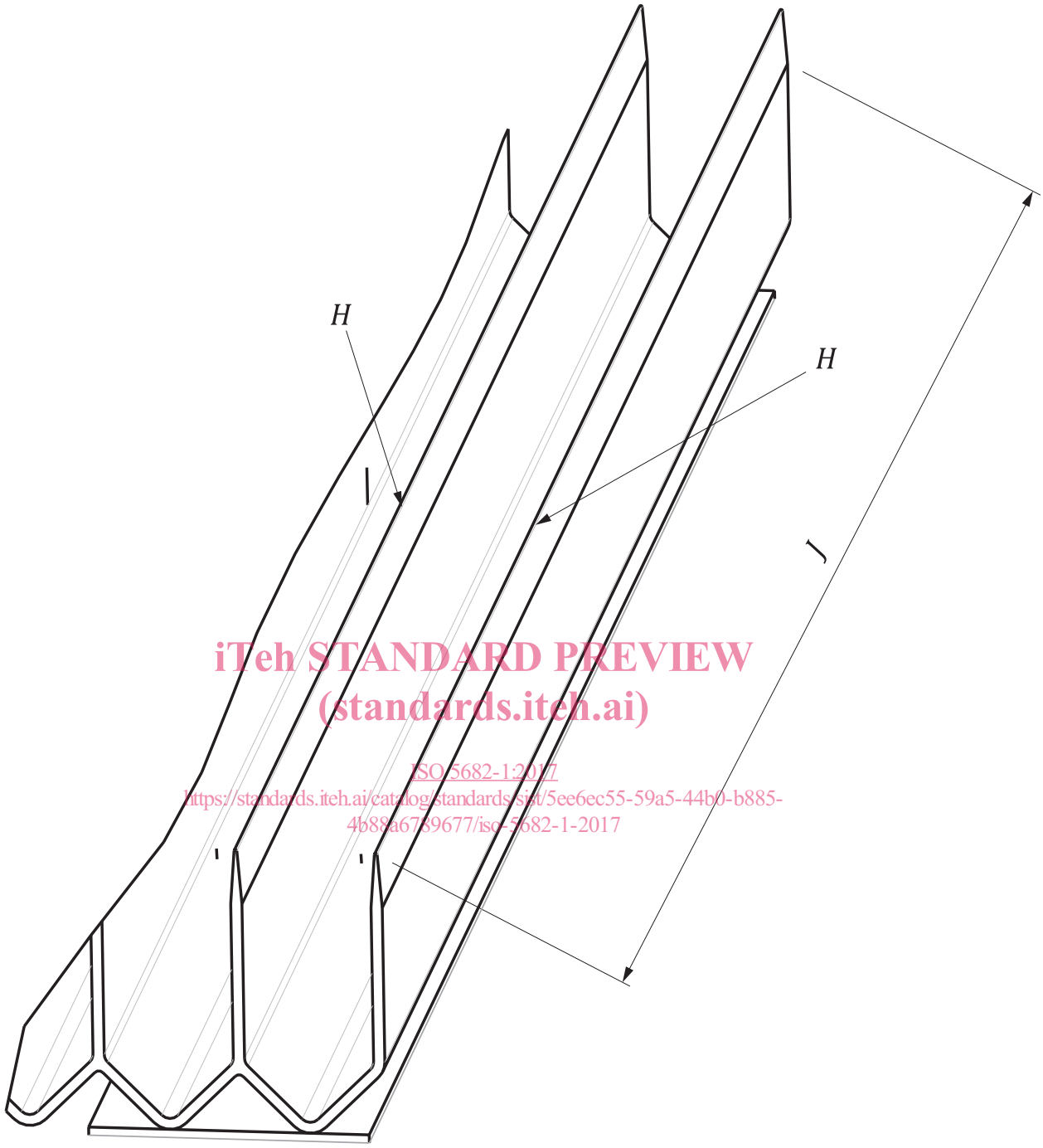
D lower groove wall thickness

E distance between two consecutive groove walls (groove width)

F groove depth

G upper groove wall thickness

Figure 4 — Groove section



Key

H intended location of wall leading edge

J full length of wall

Figure 5 — Straightness of groove walls

4.2.3 Upper part of the groove walls

a) The upper part of the groove walls (*G* in Figure 4) shall be less than 1,6 mm in width.

b) The lower part of the groove walls (*D* in Figure 4) may vary in thickness.

4.2.4 Overall dimensions

The overall dimensions of the bench can vary depending on the need (i.e. number of nozzles, boom size). The length and width of the bench shall be sufficient to capture the intended spray area.

In cases where a bench cannot be constructed to capture the entire spray pattern of all of the nozzles intended to be measured, a means such as traversing step by step in the direction of the boom is allowed.

The tolerance of the overall width of the bench shall be as specified in Table 2.

Table 2 — Tolerance of the width

Table width (W)	$W \leq 1$ m	$1 < W \leq 3$ m	$3 < W \leq 5$ m	$5 < W \leq 10$ m	$10 < W$
Tolerance as percentage of nominal width	±1 %	±0,75 %	±0,6 %	±0,4 %	±0,3 %

4.2.5 Traversing systems

If the transverse distribution is measured by means of successive transverse measurements (e.g. a scanner using a patternator cart on rails), the tolerance of the movement from one position to the next shall be held within ± 10 mm per meter.

4.3 Distance

Distance measurement equipment up to 1 m in length shall have a maximum error of ± 1 mm. For measurement equipment that measures greater than 1 m, the maximum error shall be 0,1 % of the measured value.

4.4 Pressure

Minimum requirements on liquid pressure measurements are given in Table 3. The pressure indicator may be either analogue or digital. Analogue pressure indicators with a needle readout shall have a minimum diameter of 100 mm and shall be damped.

Table 3 — Characteristics of pressure indicators used for testing

Pressure to measure (ΔP) bar	Scale unit max. bar	Accuracy bar	Class required (% accuracy of full scale value)	Full scale value bar
$0 < \Delta P \leq 6$	0,1	±0,1	1,6	6
			1,0	10
			0,6	16
$6 < \Delta P \leq 16$	0,2	±0,25	1,6	16
			1,0	25
$\Delta P > 16$	1,0	±1,0	2,5	40
			1,6	60
			1,0	100
NOTE 1 bar equals 100 kPa for conversions of Table 3. Table derived from EN 837-1				

4.5 Time

Time measurement equipment shall have a maximum error of 0,5 % of the duration of the measurement.

4.6 Flow rate

Flow rate measurement equipment shall have a maximum error of ± 1,5 % of the full range of the device. Alternatively, use equipment specified in 4.5 and 4.9 to determine the flow rate.

4.7 Angle

Angle measurement through a protractor, angle meter, or digital instrument shall have a maximum error of ± 0,5°.

4.8 Temperature and humidity

Temperature measurement equipment shall have a maximum error of ± 1 °C. Relative humidity measurement equipment shall have a maximum error of ± 5 percentage units.

4.9 Volume and mass

Volume and mass measurement equipment shall have a maximum error of ± 1 % of the nominal value.

4.10 Air pressure

For systems that use pressurized air as part of the atomization process, the pressure indicator shall have a maximum error of ± 5 % of the measured value.

4.11 Standard laboratory horizontal spray boom

The standard horizontal spray boom setup for a horizontal patternator in the laboratory is described below. Annex G also includes informative details, but is not required for the setup.

The lateral position of the nozzles shall be over the top of the groove wall within ± 5 mm.

A pressure indicator according to 4.4 shall be arranged at a suitable position in the liquid supply system. The nozzle flow rate shall not vary more than ± 1,0 % at each nozzle position on the boom.

If an anti-drip device is present, the pressure shall be measured at a point downstream of the anti-drip device. The measurement shall be performed without the nozzle filter unless the nozzle filter is considered to be integral to the nozzle.

Figure 6 shows an example of a pressure indicator used immediately before the nozzle tip to avoid pressure drop from anti-drip devices or passageways in the nozzle holder. The test instrument shall not create a restriction between the nozzle holder and nozzle tip that would alter the flow or pressure.