
**Agricultural sprayers — Boom
steadiness — Test methods**

Pulvérisateurs agricoles — Stabilité des rampes — 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 14131 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 6, *Equipment for crop protection*.

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Agricultural sprayers — Boom steadiness — Test methods

1 Scope

This International Standard specifies test methods for measuring boom steadiness in agricultural field crop sprayers, with the objective of evaluating the stability of the boom and the quality of its suspension, and determining its movements.

NOTE Safety methods for agricultural sprayers are specified in ISO 4254-6.

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 5008, *Agricultural wheeled tractors and field machinery — Measurement of whole-body vibration of the operator*

3 Terms and definitions

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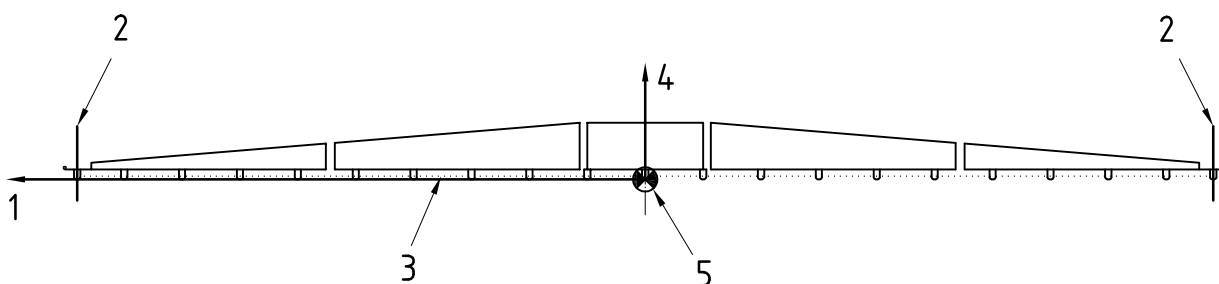
For the purposes of this document, the following terms and definitions apply.

3.1

boom centre

point located in the vertical plane of the boom and at the median of the segment joining the output of the nozzles in this plane

See Figure 1.



Key

- 1 Y-axis
- 2 axis of end nozzle
- 3 segment joining output of nozzles
- 4 Z-axis
- 5 boom centre

Figure 1 — Defined locations on a boom

3.2 boom section end

distal point of each boom section

3.3 boom tip

distal point of the boom

3.4 reference axle

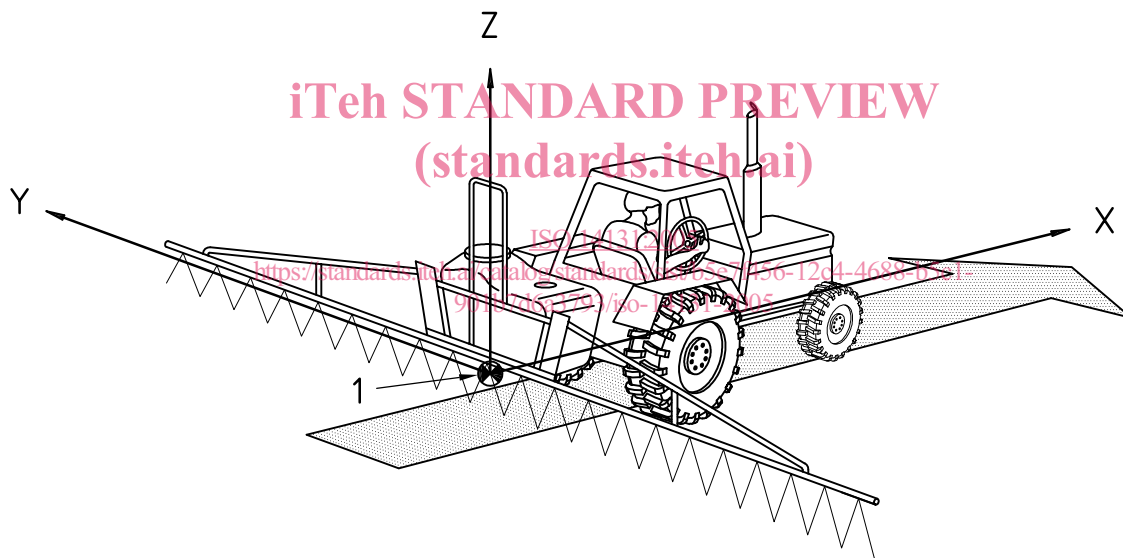
axle nearest the boom

NOTE In the case of a trailed sprayer, it is the axle of the sprayer.

3.5 vertical displacement

distance between the position at rest of a boom section end at moment t_0 of the beginning of the test and its position at the moment given, measured along the vertical axis, in a vertical plane perpendicular to the axis of the boom

See Figure 2.



Key

- X X-axis (in driving direction)
- Y Y-axis (along boom)
- Z Z-axis (in vertical plane)
- 1 origin (boom centre)

Figure 2 — Origin and direction references

3.6 horizontal displacement

distance between the position at rest of a boom section end, at moment t_0 of the beginning of the test, and its position at the moment given, measured along the horizontal axis, in a vertical plane perpendicular to the axis of the boom

See Figure 2.

4 Test conditions

4.1 General

The sprayer should be operated according to good practice, and should be referenced in the manufacturer's manual unless it is the subject of the test.

4.2 Tyres

All characteristics of the tyres shall be recorded in the test report (see 5.5), including their inflation pressure.

4.3 Adjustment of boom

The boom shall be tested opened, with a height relative to the targets adjusted according to the specifications of the nozzle under test: for 110°/120° nozzles it is usually 50 cm and for 80°/90° nozzles, 75 cm. Adjustments specified in the manufacturer's manual shall be used and specified in the test report.

4.4 Distance between wheels

Track width and wheel bases shall be specified in the report.

4.5 Dimensional specifications

The dimensional specifications for the sprayer, its boom and its suspension (see Annex A), at rest, shall be determined and recorded in the test report.

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5 Test methods and requirements

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5.1 General

Three categories of test are specified, depending on excitation and measurement situation: field (5.2), track (5.3) and simulator (5.4).

5.2 Tests on fields

5.2.1 General conditions

Good agricultural practices for spraying shall be respected.

Record the meteorological conditions, including wind speed and wind direction related to track direction (see 5.2.2), in the test report. The wind speed, measured at a height of 2 m, shall be not more than 5 m/s.

5.2.2 Track

In case of wind speed higher than 4 m/s, the track direction should be in the crosswind direction.

The sprayer under test shall be driven down the track three times.

The minimum length of the track shall be equivalent to at least 30 s of driving.

The minimum starting length to minimize the start-up effect of the boom movements shall be 1 m/ per 0,1 m/s driving speed with a minimum of 20 m.

5.2.3 Driving speed

Unless speed variation is continuously monitored, the driving speed shall be constant during the test.

5.2.4 Motion measurement

5.2.4.1 General

The frequencies measured shall be at least between 0,1 Hz and 5 Hz.

The sample rate shall be a minimum of 10 Hz.

5.2.4.2 Displacement

If directly measured or obtained by proper integration/double integration of velocity/acceleration, then the accuracy shall be minimum 0,1 cm per 1 m of boom length.

Measure both the vertical displacement and the horizontal displacement.

5.2.4.3 Velocity

If directly measured or obtained by integration of accelerations, then the accuracy shall be the same as that obtained by derivation of displacement.

5.2.4.4 Acceleration

If directly measured, then the accuracy shall be the same as that obtained by double derivation of displacement.

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5.2.5 Procedure

5.2.5.1 Specific condition

Measure the travel speed.

5.2.5.2 Minimum requirements

Conduct any test at least five times (the usual number of repetitions is 10 times).

a) Global evaluation of general behaviour of boom

Select a reference point in at least the vertical direction. Depending on the purpose of the test, the reference point may be the sprayer frame, ground surface, crop surface or an absolute point or plane. Carry out measurements at a minimum of one measurement point (e.g. at the boom tip).

b) Evaluation of boom motion

Select reference points in both the horizontal and vertical directions. Depending on the purpose of the test, a reference point may be the sprayer frame, ground surface, crop surface or an absolute point or plane. Carry out measurements, which shall be related to the boom centre, at a minimum of two measurement points — boom centre and boom tip — preferably at each boom section end.

5.3 Tests on tracks

5.3.1 General

The objective is to use bumps and/or holes to generate impulses, the intent being to approximate working conditions in the field in a reproducible way, and to analyse the movements of the boom under these conditions.

Unless tank filling level is the subject of the test, the tank of the sprayer shall be empty.

5.3.2 Track

The track shall be built using a material that does not lose its shape. Movable obstacles may be added if they are fixed on the track such that the tractor cannot displace them.

The minimum length of the track shall be 50 m or such that at least 25 s of driving can be monitored.

The minimum starting length to minimize the start-up effect of the boom movements shall be 1 m per 0,1 m/s driving speed with a minimum of 20 m.

A suitable track is as specified in ISO 5008:2002, 11.2.1 b) ("smoother track").

5.3.3 Driving speed

Unless speed variation is continuously monitored, the driving speed shall be constant during the test.

5.3.4 Motion measurement

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5.3.4.1 General

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Measure and record the vertical and horizontal motion. 14131-2005

The frequencies measured shall be at least between 0,1 Hz and 5 Hz.

The sample rate shall be a minimum of 10 Hz.

5.3.4.2 Displacement

If directly measured or obtained by proper integration/double integration of velocity/acceleration, then the accuracy shall be minimum 0,1 cm per 1 m of boom length.

Measure both the vertical displacement and the horizontal displacement.

5.3.4.3 Velocity

If directly measured or obtained by integration of accelerations, then the accuracy shall be the same as that obtained by derivation of displacement.

5.3.4.4 Acceleration

If directly measured, then the accuracy shall be the same as that obtained by double derivation of displacement.