
Agricultural sprayers — Recording of spray drift parameters

*Pulvérisateurs agricoles — Enregistrement des paramètres de la
dérive de pulvérisation*

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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.

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).

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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 6, *Equipment for crop protection*.

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.

Introduction

The risk of spray drift outside the area being sprayed is one of the potential risks to the environment occurring due to the application of plant protection products (PPPs). To protect sensitive non-target areas, such as water courses, the use of application techniques and equipment that can reduce the risk of spray drift has been promoted. Many new drift reduction technologies (DRTs) have been developed and introduced to reduce the risk of spray drift, with ISO Standards having been developed for drift measurement and classification of drift reduction potential for mobile field and bush and tree crop sprayers.

Some countries/authorities have introduced legislation/regulation regarding use of some DRTs for field and bush and tree crop sprayers. Typically, this includes approved operational parameters for the DRT (for example spray pressure, forward speed, boom height, level of air assistance, etc.) and/or acceptable conditions during the spraying operation (for example wind speed and direction) to achieve the intended drift reduction. If not operated within the correct parameters and/or in acceptable conditions during the spray operation, then this non-compliance can result in failure to achieve the intended drift reduction.

Some countries/authorities wish to have the ability to check, during spraying operations, for compliance with the approved operational parameters of the DRT to ensure that the expected spray drift reduction will be achieved. For real time in field checking of spray operations by inspectors, minimum requirements for electronic recording of certain spray parameters relevant to the risk of spray drift are required. Certain key operational parameters that can be recorded electronically can give an easy and immediate indication regarding compliance of the use of the DRT with the relevant approved operational parameters. The intention of this document is to deal with the recording of certain key operational parameters during the spraying operation, together with the requirements for display and storage of the data. Many other operational parameters, and of course the conditions during the spraying operation, can also affect the level of spray drift but are not covered in this document.

For countries/authorities wishing to undertake such in field inspection schemes, this document can offer the following benefits:

- a) it serves as a reference for regulators and legislators on data requirements;
- b) it provides more certainty for sprayer manufacturers with respect to sensors, software and data storage requirements; and
- c) it helps farmers/end users demonstrate to the public and other stakeholders, as well as authorities, that DRTs are being used properly to reduce the risk of spray drift.

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Agricultural sprayers — Recording of spray drift parameters

1 Scope

This document defines requirements on the electronic measurements (during spray operation) and recording of operator-controlled application parameters that influence spray drift, when specified for certain drift reduction technologies (DRT).

The values measured and recorded can be used to compare the setting of the sprayer with the provisions authorized for the specific DRT.

The document is applicable for sprayers for both field and tree and bush crops. It does not apply to hand held and portable sprayers.

The following parameters are covered in this document:

- a) spray pressure (pressure of the spray liquid and air in case of twin-fluid nozzles);
- b) nozzle height (field crop sprayers);
- c) fan rotational speed (for air assisted sprayers);
- d) sprayer forward speed.

This document does not specify:

- the exact length of the recording period;
- the verification of the measured and recorded parameters;
- the requirements for data format and exchange because they are covered by other ISO standards.

This document does not specify which of the four parameters needs to be monitored.

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 16119-2:2013, *Agricultural and forestry machinery — Environmental requirements for sprayers — Part 2: Horizontal boom sprayers*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 5681 and the following 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 <https://www.electropedia.org/>

3.1 parameter registration system PRS

system for measuring, storage and transfer of the relevant data from a sensor (or sensors) that measure the spray drift relevant parameters

3.2 air pressure

pressure of the air applied to twin-fluid nozzles

3.3 fan rotational speed

rotational speed of the fan on air assisted sprayers in rounds per minute (r/min)

4 Measuring of the relevant parameters

4.1 General

The following specifications apply for measurement and recording of parameters listed in the scope. For information, [Annex A](#) gives a translation table for these parameters to ISO 11783-11.

- The parameters shall be recorded as the actual measurement value every 10 s or as an average of all values measured during the last 10 s interval;
- Measuring of the absolute/actual time is not necessary.

Electronic measuring and recording devices provided on the sprayer for controlling the PPP application can also be used for the purpose of this document.

Recording of the parameters shall only take place during the time when the sprayer is actually spraying during spray operation in the field.

Many other operational parameters, as well as conditions during the spraying operation, can significantly affect the risk of spray drift from field and bush and tree crop sprayers – for information some of these parameters are listed in [Annex B](#).

4.2 Spray pressure

4.2.1 Accuracy of the measurement

If the sprayer is equipped with a pressure sensor that meets the requirements of ISO 16119 series, to measure the spray pressure that is shown on the display in the cabin, this sensor can be used for the measuring of the spray pressure for this purpose.

If not, the spray liquid pressure shall be measured with a maximum error of $\pm 0,1$ bar. For field-crop sprayers in the range of (0 to 10) bar, for sprayers for bush and tree crops in the range (0 to 16) bar.

In the case of twin-fluid nozzles, the air pressure shall be measured with a maximum error of $\pm 0,1$ bar. The measuring range is (0 to 5) bar.

4.2.2 Location of the measurement

The sensor(s) for measuring the pressure of spray liquid and air (in case of twin fluid nozzles) shall be located close to the measurement positions on the sprayer for these pressure(s) to be displayed to the operator or used for the regulation of the pressure(s).

4.2.3 Connection test instruments

For the purpose of checking the accuracy of the pressure measuring sensors(s), the sensor(s) shall be easily accessible and removable using common tools or a testing connection shall be present on the sprayer to connect a reference pressure indicator near the location of the pressure sensor(s).

4.3 Nozzle height

4.3.1 Sprayers with automatic spray boom height control

On sprayers equipped with an automatic spray boom height control, the set point of the nozzle height in the control, set up by the operator, shall be recorded.

4.3.2 Sprayers with manual spray boom height control

4.3.2.1 Accuracy of the measurement

The nozzle height shall be measured within a maximum error of $\pm 5\%$ of the true value, in accordance with ISO 16119-2:2013, 5.1.6. This accuracy shall be checked in a static situation above flat surface.

NOTE Test method to be defined.

4.3.2.2 Location of the measurement

The nozzle height shall be measured on at least one location on the spray boom, which gives a representative measurement of the nozzle height not influenced by spray boom movements and the tractor/sprayer on the crop (e.g. as close to the centre of the spray boom as possible).

4.3.2.3 Multiple measuring points

In the case of the measurement of nozzle height at multiple measuring points, the average of the measurements shall be recorded.

4.4 Fan rotational speed

4.4.1 Accuracy of the measurement

The fan rotational speed shall be measured in revolutions per minute (r/min) within a maximum error of $\pm 5\%$ of the true value, in accordance with ISO 16119-2:2013, 5.1.6. (For sprayers for bush and tree crops at least up to 3 000 r/min of the fan speed).

NOTE At sprayers with mechanical driven fans, the fan rotational speed is the result of the rotational speed of the PTO and gear-ratio of an eventually present gear-box.

4.4.2 Location of the measurement

The fan rotational speed shall be measured at the drive shaft on which the fan is mounted.

4.4.3 Multiple fans

In case of multiple individually driven fans, the rotational speed of each fan in revolutions per minute (r/min) shall be measured and recorded.

4.5 Sprayer forward speed

4.5.1 Accuracy of the measurement

The actual sprayer forward speed shall be measured within a maximum error of $\pm 5\%$ of the true value, in accordance with ISO 16119-2:2013, 5.1.6.

Forward speed information may be provided by the tractor/implement [e.g. Global Navigation Satellite System (GNSS)] or wheel sensor mounted on the self-propelled sprayer, tractor or towed implement.

5 Display, storage and transfer of the data

5.1 Operation parameter registration system (PRS)

If provided, the PRS shall:

- indicate the correct functioning of the system;
- start automatically when the spray operation is started and;
- be incapable to being manually switched on or off.

5.2 Display and storage of the data

After ending of the spray operation, the recorded values shall be available for at least 60 min.

The measured values shall be readable on the display of the PRS or the spray controller.

The measured values shall be readable with a precision of at least 1 digit (after decimal point/dot).

At a minimum, the previous 60 minutes of data of the sprayer operation shall be stored.

It shall be possible to display the recorded values.

Annex A (informative)

Translation table to ISO 11783-11

Table A.1 — Translation table to ISO 11783-11

ISO 4444	ISO 11783-11 Data dictionary entry
Spray pressure	#194 - Actual product pressure
Nozzle height	#62 - Actual working height
Set point nozzle height	#61 - Set point working height
Fan rotational speed	
Sprayer forward speed	#397 - Actual speed