
Agricultural machinery — Safety —
Part 6:
Sprayers and liquid fertilizer
distributors

Matériel agricole — Sécurité —

Partie 6: Pulvérisateurs et distributeurs d'engrais liquides

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Published in Switzerland

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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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 (standards.iteh.ai)

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 6, *Equipment for crop protection*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 144, *Tractors and machinery for agriculture and forestry*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 4254-6:2009), which has been technically revised and contains the following changes:

- some excluded hazards have been deleted from the scope as they are covered by ISO 4254-1 or this revised edition;
- the general (stability) requirements have been deleted as they are covered by ISO 4254-1;
- the protection of the operator against hazardous substances in case of front mounted booms has been removed as this risk is relevant to all types of sprayers but appropriate requirements (in form of an international reference standard) are not yet available;
- in [4.5.2](#), the requirements for chemical inductions bowls have been amended to cover foldable devices;
- in [4.7](#), requirements for protecting the operator in case of leakages have been added;
- a new subclause ([4.12](#)) to deal with the storage of personal protective equipment has been added;
- [Clause 6](#) has been aligned with ISO 4254-1.

A list of all parts in the ISO 4254 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.

Introduction

The structure of safety standards in the field of machinery is as follows:

- a) type-A standards (basic standards) give basic concepts, principles for design, and general aspects that can be applied to machinery;
- b) type-B standards (generic safety standards) deal with one safety aspect or one type of safeguards that can be used across a wide range of machinery:
 - type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise),
 - type-B2 standards on safeguards (e.g. two-hand controls, interlocking devices, pressure sensitive devices, guards);
- c) type-C standards (machinery safety standards) deal with detailed safety requirements for a particular machine or group of machines.

This document is a type-C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (e.g. regulators, accident prevention organizations, market surveillance)

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document. These hazards are specific to sprayers and liquid fertilizer distributors.

When requirements of this type-C standard are different from those which are stated in type-A or type-B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Significant hazards that are common to all the agricultural machines (self-propelled, mounted, semi-mounted and trailed) are dealt with in ISO 4254-1.

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Agricultural machinery — Safety —

Part 6: Sprayers and liquid fertilizer distributors

1 Scope

This document, to be used together with ISO 4254-1, specifies the safety requirements and their verification for the design and construction of mounted, semi-mounted, trailed and self-propelled agricultural sprayers for use with plant protection products (PPP) and liquid fertilizer application, as placed on the market by the manufacturer and designed for a single operator only. In addition, it specifies the type of information on safe working practices (including residual risks) to be provided by the manufacturer.

When requirements of this document are different from those which are stated in ISO 4254-1, the requirements of this document take precedence over the requirements of ISO 4254-1 for machines that have been designed and built according to the provisions of this document.

This document, taken together with ISO 4254-1, deals with significant hazards, hazardous situations and events relevant to sprayers and liquid fertilizer distributors when they are used as intended and under the conditions foreseeable by the manufacturer (see Annex A), excepting the hazards arising from:

- protection of the driver against spray when spraying (see Foreword);
- automatically actuated height adjustment systems;
- the environment, other than noise;
- moving parts for power transmission except strength requirements for guards and barriers.

This document is not applicable to sprayers and liquid fertilizer distributors which are manufactured before the date of publication 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 4254-1:2013, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 5681, *Equipment for crop protection — Vocabulary*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4254-1, ISO 5681 and ISO 12100 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/>

4 Safety requirements and/or protective measures

4.1 General

4.1.1 Machinery shall comply with the safety requirements and/or protective measures of this clause.

In addition, the machine shall be designed according to the principles of ISO 12100 for hazards that are relevant, but not significant, which are not dealt with by this document.

The compliance with the safety requirements and/or measures shall be verified in accordance with [Clause 5](#).

4.1.2 Unless otherwise specified in this document, the machine shall comply with the requirements of ISO 4254-1.

4.1.3 The machine shall allow for handling and operating, including filling and maintenance, by an operator wearing adequate personal protective equipment in accordance with [6.1 g](#)).

4.2 Stability of machines fitted with rollers for manual handling when dismantled

Machines equipped with transport rollers for manual handling when dismantled shall be designed to minimize the risk of tipping over (see [Clause 5](#)) or unintended rolling down an incline.

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4.3 Spray boom folding

4.3.1 To limit the risk associated with overhead power lines during work, the booms shall be capable of folding and unfolding without exceeding a height of 4 m. See also [6.1 d](#)) and [6.1 e](#)).

This requirement does not apply during release of the folded boom from the transport position, nor during positioning of the folded boom into the transport position.

4.3.2 In the case of powered folding/unfolding operation, manual controls shall be of the hold-to-run type and located outside the swivelling zone.

4.4 Adjustment of spray boom height

4.4.1 Manual height adjustment

The manual force necessary to adjust the height of the boom shall not exceed 250 N.

The height adjustment device shall be:

- self-arresting and able to deal with a nominal load equal to at least 1,3 times the weight of the boom, and
- operable from the ground or from a platform as specified in ISO 4254-1:2013, 4.7.2.

4.4.2 Powered height adjustment

In the case of powered height adjustment systems that are manually actuated, it shall be possible to actuate the manual control from the driver's position and the control shall be of the hold-to-run type.

In the case of powered height adjustment systems that are automatically actuated, it shall be possible to override the system from the driver's position.

To ensure the protection of the operator against crushing and shearing hazards related to a failure of the control circuit of the height adjustment of the boom, the machine shall be fitted for those purposes with either:

- a) a device which limits the maximum downward speed of the boom to $10 \text{ mm}\cdot\text{s}^{-1}$ (measured at the centreline of the machine) during a hydraulic failure, or
- b) a device capable of stopping the boom lowering at a minimum height of 500 mm between the boom and the ground.

For b), in those cases where the height needs to be reduced to less than 500 mm, a safety device shall prevent any lowering beneath 500 mm without an intentional and separate action of a safety device.

If these safety devices are hydraulic valves not directly fitted to the cylinder, the lines connecting the valve to the cylinder shall be designed to withstand a pressure of at least four times the rated maximum hydraulic pressure.

4.5 Spray tank

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4.5.1 Prevention of whole-body access to the tank

To limit the risk of access into the tank, any tank opening greater than 400 mm in diameter — or, if it is rectangular, of more than $400 \text{ mm} \times 300 \text{ mm}$ — shall be provided with a grating which can only be removed by the use of tools. The openings in the grating shall not exceed the above-mentioned dimensions. See also 6.1 g) and h) and 6.2.2.

4.5.2 Limitation of contact with chemicals

4.5.2.1 To minimize the risk of exposure to chemicals during filling/cleaning operations 4.5.2.2, 4.5.2.3 or 4.5.2.4 shall be applied.

4.5.2.2 Chemical induction bowls which are folded/unfolded manually shall be provided with a handle and locking mechanism for folding/unfolding that can be actuated without presenting a risk to the operator during operation. The handle can be an integral part of the chemical induction bowl provided it is suitably designed and clearly identified.

Power-assisted chemical induction bowls shall be able to be operated from a position that prevents the operator contacting the folding induction bowl while operating the folding control. The folding control shall be a hold-to-run control. The unintended unfolding of the chemical induction bowl during transport shall be prevented by a suitable means.

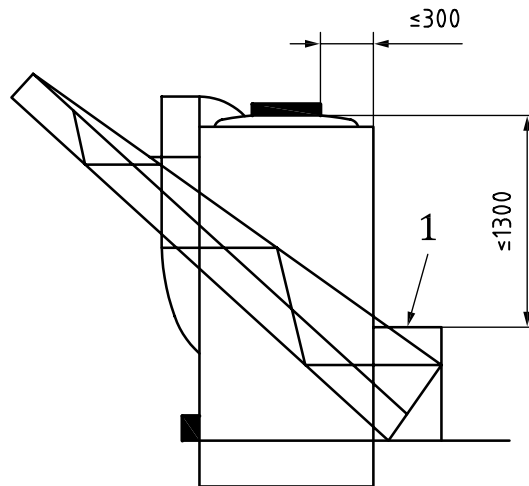
The plant protection product container rinsing device shall be operated by a hold-to-run control. The rinsing device shall operate after a container is correctly positioned on the rinsing device in a way that prevents the discharge of liquid onto the operator. The rinsed liquid shall be directed to release into the induction system so that no liquid shall be ejected outside of the induction system.

4.5.2.3 The filling hole of the spray tank shall be so positioned that the height from the ground or platform is not more than 1 300 mm, with the horizontal reach between the rim of the hole and the outer edge of any part of the sprayer which could hinder the operator being not more than 300 mm at the operator filling position (see Figure 1).

4.5.2.4 In case of liquid plant protection products, the sprayer shall be equipped with a means for introducing plant protection products that controls the risk of chemical contact and inhalation when introducing plant protection products and when cleaning the plant protection products container.

NOTE A closed transfer systems standard is under development.

Dimensions in millimetres



Key

1 operator filling position

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Figure 1 — Maximum reach for manually filling chemicals

4.5.3 Prevention of spillage and overflow

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The actual overall volume of the spray liquid tank shall exceed the nominal volume by at least 5 %.

The lid shall be:

- attached to the machine, e.g. by means of a chain;
- fitted with a holding device ensuring a closed position either by means of a positive mechanical action or lids fixed by screwing;
- fitted so as to prevent leakage of the spray mixture, e.g. by means of a seal.

The level of liquid shall be indicated to the operator during filling and emptying. The nominal volume of the tank shall be marked.

A pressure-compensation device shall be fitted on tanks that are not designed to be put under pressure, in order to keep them at atmospheric pressure when emptying and filling [see also 6.1 b)].

4.5.4 Protection from contact with spray mixture when draining

The operator shall be prevented from coming into contact with the spray mixture when emptying the tank. This requirement is met if

- the draining outlet can be opened without a tool (for example by means of a tap), and
- the flow is directed away from the operator.

An emptying device shall allow the complete emptying of the residue in the tank when the sprayer is in a horizontal position.

It shall be possible to collect the liquid at the outlet without contaminating the operator or equipment parts.

The tank outlet shall be guarded against accidental opening (see ISO 16119-2:2013, 5.1.1.3.2).

See also 6.1 g) and 6.1 l).

4.6 Pressure indicator (manometer)

The sprayer shall have a spray liquid pressure indicator. The design of the pressure indicator shall be such that in case of a leakage there is no unreasonable hazard for the operator. This requirement is deemed to be fulfilled if either:

- spray liquid carrying hoses are not located in the operator cabin, or
- additional protection shall be provided, e.g. by imperforate covers completely covering the hoses and their connecting devices so that exposure of leakage to the operator shall be avoided.

The working pressure(s) shall be clearly readable from the driver's position. Turning of the head and the upper body is acceptable.

For analogue pressure gauges, the minimum diameter of pressure gauge dial plate shall be:

- 63 mm where the gauge is positioned within the hand reach of the operator or between the tractor and the transverse vertical plane formed by the hitch points of the three-point linkage;
- 100 mm in all other cases.

The gauge case shall be isolated from the spray mixture.

Pressure exceeding the maximum working pressure shall be indicated — for example, on the analogue pressure gauge by a red marking and on a digital instrument by an (audible or optical) indication initiated when the pressure reaches the maximum working pressure. See also 6.1 n).

4.7 Protection against overpressure

The sprayer shall be provided with a safety device that prevents the pressure from exceeding the maximum working pressure of the circuit by more than 20 %.

The adjustment of this safety device shall be protected against unauthorized or accidental modification. Its actuation shall not cause any spillage or leakage of liquid from the circuit.

4.8 Fan for air-assistance

If a sprayer is equipped with a fan for air-assistance, the following requirements apply.

- The fan shall be placed or protected so that when the sprayer is operating it shall not be able to draw in or discharge foreign matter which could injure the operator.
- Access to the fan shall be prevented by fixed guards, which may be a combination of imperforate and mesh guards whose apertures are in accordance with the requirements of ISO 13857:2019, Tables 1, 3, 4 and 6.
- When the fan drive is not controlled independently from the pump drive, it shall be possible to disengage the fan drive from the pump drive from the ground or from a platform.

See also 6.1 i).