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**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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## 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 4254-6 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 6, *Equipment for crop protection*.

This second edition cancels and replaces the first edition (ISO 4254-6:1995), which has been technically revised.

ISO 4254 consists of the following parts, under the general title *Agricultural machinery — Safety*:

- *Part 1: General requirements*
- *Part 5: Power-driven soil-working machines*
- *Part 6: Sprayers and liquid fertilizer distributors*
- *Part 7: Combine harvesters, forage harvesters and cotton harvesters*
- *Part 8: Solid fertilizer distributors*
- *Part 9: Seed drills*
- *Part 10: Rotary tedders and rakes*
- *Part 11: Pick-up balers*
- *Part 12: Rotary disc and drum mowers and flail mowers*

Part 2, *Anhydrous ammonia applicators*, has been withdrawn.

Part 3, *Tractors*, has been cancelled and replaced by ISO 26322, *Tractors for agriculture and forestry — Safety*

Part 4, *Forestry winches*, has been cancelled and replaced by ISO 19472, *Machinery for forestry — Winches — Dimensions, performance and safety*

## Introduction

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

- a) type-A standards (basic standards) giving basic concepts, principles for design, and general aspects that can be applied to machinery;
- b) type-B standards (generic safety standards) dealing 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 control devices, interlocking devices, pressure-sensitive devices, guards);
- c) type-C standards (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

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

When requirements of this type-C standard are different from those which are stated in type-A or 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.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this part of ISO 4254. These hazards are specific to sprayers and liquid fertilizer distributors.

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 part of ISO 4254, 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 pesticide products and liquid fertilizer application, designed for use by one operator only. In addition, it specifies the type of information on safe working practices (including residual risks) to be provided by the manufacturer.

This part of ISO 4254 is not applicable to:

- pedestrian-controlled sprayers;
- knapsack sprayers;
- aerial sprayers;
- handheld spraying devices (e.g. spray guns).

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

This part of ISO 4254, taken together with ISO 4254-1, deals with all the significant hazards, hazardous situations and events relevant to sprayers and liquid fertilizer distributors when they are used as intended and under the conditions foreseen by the manufacturer (see Clause 4), excepting the hazards arising from:

- automatically actuated height adjustment systems;
- electrostatic phenomena;
- electromagnetic compatibility;
- the environment, other than noise;
- inhalation of spraying chemical products due to a lack of effective methods to maintain breathing air quality inside the cab;
- roll-over and tip-over of self-propelled machines with a ride-on driver;
- vibration (except the declaration);
- dust emission;
- burns;

- moving parts for power transmission except strength requirements for guards and barriers;
- safety and reliability of control systems;
- travelling function of self-propelled machines.

NOTE ISO 14982 specifies test methods and acceptance criteria for evaluating the electromagnetic compatibility of all kind of mobile agricultural machinery.

This part of ISO 4254 is not applicable to sprayers and liquid fertilizer distributors which are manufactured before the date of publication of this document by ISO.

## 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 4254-1:2008, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 5353:1995, *Earth-moving machinery, and tractors and machinery for agriculture and forestry — Seat index point*

ISO 5681:1992, *Equipment for crop protection — Vocabulary*

ISO 12100-1:2003, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*

ISO 12100-2:2003, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles*

ISO 13857:2008, *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 5681 and ISO 12100-1, and the following apply.

### 3.1

#### **sprayer**

appliance for application of pesticide products and liquid fertilizer

### 3.2

#### **aerial sprayer**

sprayer designed to be mounted to a plane or helicopter

## 4 List of significant hazards

Table 1 gives the significant hazard(s), the significant hazardous situation(s) and hazardous event(s) covered by this part of ISO 4254 that have been identified by risk assessment as being significant for this type of machine, and which require specific action by the designer or manufacturer to eliminate or to reduce the risk.

Attention is drawn to the necessity to verify that the safety requirements specified in this part of ISO 4254 apply to each significant hazard presented by a given machine and to validate that the risk assessment is complete.



Table 1 — List of significant hazards associated with sprayers and liquid fertilizer distributors

No. <sup>a</sup>	Hazard, hazardous situation or hazardous event	Origin	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
<b>A.1</b>	<b>Mechanical hazards</b>			
A.1.1	Crushing hazard	Folding or unfolding of the boom, calibration, insufficient clearance zone when hitching, failure of control system	4.7, 4.14.5, 5.1.3.3, 5.2	5.1, 5.3, 5.3.3, 5.11, 7.1
A.1.2	Shearing hazard	Folding or unfolding of the boom, calibration, failure of control system	4.4, 4.8, 5.1.4	5.1, 5.3.2, 5.3.3, 7.1
A.1.3	Cutting or severing hazard	Folding or unfolding of the boom, calibration	4.1, 4.14.5, 6.4	5.1, 5.3.2
A.1.4	Entanglement hazard	Drawing-in by the fan, power take-off drive shaft	4.1, 4.14.5, 5.1.4, 5.2	5.1, 5.7
A.1.6	Impact hazard	Movement of the boom when it is folded in transport position, insufficient clearance zone when hitching	4.1, 4.14.3, 5.1.4, 5.2	5.1, 5.3.2, 5.11
A.1.9	High pressure fluid ejection hazard	Rupture of pressurized components (e.g. hoses)	4.10.2	5.6, 5.8
<b>A.2</b>	<b>Electrical hazards</b>			
A.2.2	Contact of persons with live parts (direct contact) or with parts which have become live under faulty conditions (indirect contact)	Contact of the boom with overhead power line	—	5.3.2, 7.1, 7.2
<b>A.4</b>	<b>Hazards generated by noise</b>		4.2, 8.1.q), Annex B	5.13
<b>A.5</b>	<b>Hazards generated by materials and substances</b>			
A.5.1	Hazards resulting from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	Contact with chemical products (when spraying with self-propelled machines with front booms, filling or draining the spray tank, handling)	4.10, 4.12, 5.4, 5.6, 8.1	5.1, 5.3.1, 5.4, , 5.8, 5.9, 5.10, 5.12
<b>A.6</b>	<b>Hazards generated by neglecting ergonomic principles in machinery design</b>			
A.6.1	Unhealthy postures or excessive efforts	High actuating forces for adjusting the height of the boom, inadequate location of the filling hole of the spray tank, insufficient clearance zone when hitching	4.4.3, 4.4.5, 4.5.1, 4.5.1.2.3, 4.14.3, 5.2	5.3.3, 5.4.1, 5.11
A.6.2	Inadequate consideration of hand-arm or foot-leg anatomy	Inadequate location of the filling hole of the spray tank, insufficient clearance zone when hitching	4.5.2.3, 4.6.1, 4.6.3, 5.1.1, 5.1.4, 5.1.5,	5.4.1, 5.11
A.6.7	Inadequate design, location or identification of manual controls	Inadequate location of the filling hole of the spray tank, contact of the boom	4.4, 4.6, 5.1.1, 6.1	5.3.2, 5.3.3, 5.9

Table 1 (continued)

No. <sup>a</sup>	Hazard, hazardous situation or hazardous event	Origin	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
<b>A.8</b>	<b>Unexpected start-up</b>			
A.8.2	Restoration of energy supply after an interruption		4.4, 6.1	—
<b>A.11</b>	<b>Failure of the power supply</b>	Fall of the boom	4.8, 6.5	5.3.3, 7.1
<b>A.14</b>	<b>Break-up during operation</b>		4.7, 4.8, 4.9, 4.10	5.1.2
<b>A.15</b>	<b>Falling or ejected objects or fluids</b>	Failure of pressurized hoses	4.10	5.6, 5.8
<b>A.16</b>	<b>Loss of stability/overtipping of machinery</b>	Lack of stability due to the unfolded booms, when parked or for manual handling	5.2, 6.2	5.2, 7.1
A.16.1	Insufficient ability of machinery to be slowed down, stopped and immobilized	Propulsion of machine	5.1.3.2	5.1.2
<b>A.17</b>	<b>Slip, trip and fall of persons (relating to machinery)</b>	Inadequate location of the filling hole of the spray tank, access to operator's station or other boarding means	4.6.1, 4.6.2.3, 4.6.3, 4.6.4, 4.14, 5.4	5.4.1
<b>Additional hazards, hazardous situations and hazardous events due to mobility</b>				
<b>A.18</b>	<b>Relating to the travelling function</b>			
A.18.1	Movement when starting the engine	Unlocking of the boom when the machine is in transport position	5.1.8	5.3.2
<b>A.19</b>	<b>Linked to the work position</b>			
A.19.1	Fall of persons during access to (or at/from) the work position	Inadequate location of the filling hole of the spray tank	4.6.1, 4.6.2 c)	5.4.1
A.19.5	Insufficient visibility from the work position		5.1.7	5.1.2
A.19.6	Inadequate lighting		5.1.7.3	5.1.2
<b>A.20</b>	<b>Due to the control system</b>			
A.20.1	Inadequate location of manual controls	Contact of the boom with the operator	6.1	5.3.3
A.20.2	Inadequate design and marking of manual controls and their mode of operation	Inadequate location of the filling hole of the spray tank, contact of the boom, actuation forces not adapted, contact of the boom with overhead power line	4.4, 6.1	5.3.2, 5.3.3, 5.9
<b>A.22</b>	<b>Due to the power source and to the transmission of power</b>			
A.22.1	Hazards from coupling	Insufficient clearance zone when hitching	5.2.1, 6.3	5.11, 7.1
		Power transmission	6.4	—

<sup>a</sup> With reference to ISO 4254-1:2008, Table A.1.

## 5 Safety requirements and/or protective measures

### 5.1 General

**5.1.1** 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 12100-1:2003, Clause 5, for hazards relevant, but not significant, which are not dealt with by this part of ISO 4254. For those hazards, ISO 12100-2 may be used for guidance.

The compliance with the safety requirements and/or measures shall be verified in accordance with Clause 6.

**5.1.2** Unless otherwise specified in this part of ISO 4254, the machine shall comply with the requirements of ISO 4254-1.

**5.1.3** The machine shall allow for handling and operating, including filling and maintenance, by an operator wearing adequate personal protective equipment as recommended in 7.1 f).

### 5.2 Stability

#### 5.2.1 General

The machine shall be designed to be stable as specified in ISO 4254-1:2008, 6.2.1. See also 7.1 k).

#### 5.2.2 Mounted machines fitted with rollers for manual handling when dismantled

Machines equipped with transport rollers for manual handling shall be designed so that they cannot tip over.

### 5.3 Spray booms

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#### 5.3.1 Front-mounted booms

In order to protect the driver from spray, self-propelled machines with front-mounted spray booms shall be fitted with either

- a cab, or
- a driver's seat having a seat index point (SIP) in accordance with ISO 5353:1995, Clause 3, positioned at least 1 000 mm above the maximum working height of the boom, or
- a boom provided with a device that minimizes the contact of the operator with spray (e.g. shroud).

**NOTE** Further requirements will be included at the next revision of this part of ISO 4254 depending on progress of knowledge, particularly with regard to air purification devices.

See also 7.1 g).

#### 5.3.2 Boom folding

**5.3.2.1** 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 7.1 d) and 7.1 j).

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.