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**Agricultural machinery — Safety —**  
**Part 1:**  
**General requirements**

*Matériel agricole — Sécurité —*

*Partie 1: Exigences générales*

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ISO 4254-1:2005

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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 4254-1 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 3, *Safety and comfort of the operator*.

This third edition cancels and replaces the second edition (ISO 4254-1:1989), which has been technically revised. It also incorporates the Amendment ISO 4254-1:1989/Amd.1:1998.

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

- *Part 1: General requirements*
- *Part 2: Anhydrous ammonia applicators*
- *Part 3: Tractors*
- *Part 5: Power-driven soil-working equipment*
- *Part 6: Equipment for crop protection*
- *Part 7: Combine harvesters, forage and cotton harvesters*
- *Part 9: Equipment for sowing, planting and distributing fertilizers*

Part 4, *Forestry winches*, is to be revised and published as ISO 19472, and part 6 is to be revised and published under the title *Sprayers and liquid fertilizer distributors*.

## Introduction

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

- a) Type-A standards (basis standards) give basic concepts, principle for design, and general aspects that can be applied to machinery;
- b) Type-B standards (generic safety standards) dealing with one or more safety aspect(s) or one or more type(s) 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-hands controls, 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 part of ISO 4254 is a type-C standard as stated in ISO 12100-1.

When provisions of this type-C standard are different from those which are stated in type-A or type-B standards, the provisions of this type-C standard take precedence over the provisions of the other standards for machines that have been designed and built according to the provisions 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 self-propelled ride-on, trailed, semi-mounted and mounted agricultural machines.

# Agricultural machinery — Safety —

## Part 1: General requirements

### 1 Scope

This part of ISO 4254 specifies the general safety requirements and their verification for the design and construction of self-propelled ride-on machines and mounted, semi-mounted or trailed machines used in agriculture. 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 deals with significant hazards (as listed in Annex A), hazardous situations and events relevant to this agricultural machinery used as intended and under the conditions foreseen by the manufacturer (see Clause 4). For compliance with European Directives, Annex C is additionally applicable.

This part of ISO 4254 is not applicable to

— tractors,

— aircraft,

— air-cushion vehicles, or

— lawn and garden equipment.

This part of ISO 4254 is not applicable to environmental hazards, road safety, electromagnetic compatibility, vibration or power take-off (PTO) and PTO drive shaft guarding between self-propelled machines/tractors and the first bearing of recipient machinery. It is not applicable to hazards related to maintenance or repairs to be carried out by professional service personnel.

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

This part of ISO 4254 is not applicable to machines which are manufactured before the date of its publication.

All of the hazards dealt with by this part of ISO 4254 will not necessarily be present on a particular machine. For any machine covered by this part of ISO 4254, the provisions of the part of ISO 4254 directly applicable to that type of machine, if available, take precedence over the provisions of this part of ISO 4254.

### 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 3600:1996, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and presentation*

## ISO 4254-1:2005(E)

ISO 3744:1994, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane*

ISO 3767-1, *Tractors and machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols*

ISO 3767-2, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 2: Symbols for agricultural tractors and machinery*

ISO 3776, *Tractors for agriculture — Seat belt anchorages*

ISO 3795:1989, *Road vehicles, and tractors and machinery for agriculture and forestry — Determination of burning behaviour of interior materials*

ISO 4413:1998, *Hydraulic fluid power — General rules relating to systems*

ISO 4414:1998, *Pneumatic fluid power — General rules relating to systems*

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

ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane*

ISO 11204:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Method requiring environmental corrections*

ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

ISO/TR 11688-1:1995, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning*

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 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs*

### 3 Terms and definitions

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

**3.1 normal operation and service**  
use of the machine for the purpose intended by the manufacturer by an operator familiar with the machine characteristics and complying with the information for operation, service and safe practices, as specified by the manufacturer in the operator's manual and by signs on the machine

**3.2 three-point contact support**  
system which permits a person to simultaneously use two hands and a foot or two feet and one hand when boarding, or dismounting from, a machine



**3.3****guarded by location**

guarding where a hazard is guarded by other parts or components of the machine that are not themselves guards, or when the hazard cannot be reached by the upper and lower limbs

**3.4****inadvertent contact**

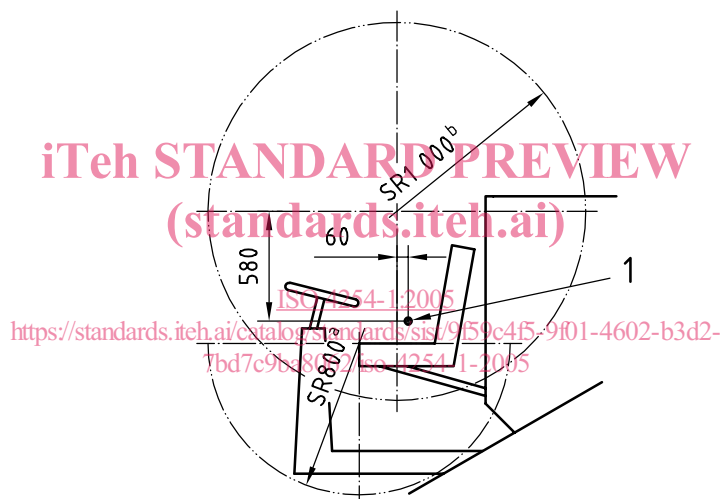
unplanned exposure of a person to a hazard resulting from the person's action during normal operation and service of the machine

**3.5****hand and foot reach**

(machines without cab) reach defined for hands by a sphere of 1 000 mm radius, centred on the seat centreline, 60 mm in front of and 580 mm above the seat index point (SIP) as defined in ISO 5353 and for feet by a hemisphere of 800 mm radius centred on the seat centreline at the front edge of the cushion and extending downwards, with the seat in its central position

See Figure 1.

Dimensions in millimetres

**Key**

- 1 SIP (seat index point)
- <sup>a</sup> Hemisphere radius (feet).
- <sup>b</sup> Sphere radius (hands).

**Figure 1 — Hand and foot reach**

**3.6****hand and foot reach**

(machines with cab) reach defined for hands by those portions, lying within the cab, of a sphere of 1 000 mm radius, centred on the seat centreline, 60 mm in front of and 580 mm above the seat index point (SIP) as defined in ISO 5353, and for feet by those portions, lying within the cab, of a hemisphere of 800 mm radius centred on the seat centreline at the front edge of the cushion and extending downwards, with the seat in its central position

**3.7****normal access**

access for operators for process control and adjusting, service or maintenance tasks during normal operation according to the intended use of the machine

## 4 Safety requirements and/or measures applicable to all machines

### 4.1 Fundamental principles, design guidance

4.1.1 The machine shall be designed according to the principles of risk reduction specified in ISO 12100-1:2003, Clause 5, for hazards relevant but not significant.

4.1.2 Unless otherwise specified in this part of ISO 4254, safety distances shall comply with the requirements given in ISO 13852:1996, Tables 1, 3, 4 or 6.

4.1.3 Functional components which need to be exposed for proper function, drainage or cleaning shall be guarded without causing other hazards, for example risk of fire due to the accumulation of organic material during the intended operation or use.

### 4.2 Noise

4.2.1 The technical information given in ISO/TR 11688-1 shall be used as means to design low-noise machinery.

NOTE 1 ISO/TR 11688-2 also gives useful information on noise-generation mechanisms in machinery.

NOTE 2 Noise generation may vary considerably between machinery types. Noise reduction measures are therefore dealt with in product specific standards.

4.2.2 Noise emission values, if required to be declared, shall be determined in accordance with Annex B [see also 8.1.3 r)].

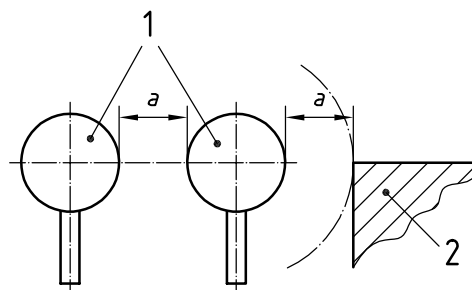
### 4.3 Controls

4.3.1 The controls and their different positions shall be identified and shall be explained in the operator's manual [see 8.1.3 c)]. Symbols shall be in accordance with ISO 3767-1 and ISO 3767-2.

4.3.2 Pedals shall have a slip-resistant surface and be easy to clean.

4.3.3 Hand-operated controls requiring an actuating force  $\geq 100$  N shall have a minimum clearance,  $a$ , of 50 mm between the outer contours or from adjacent parts of the machine (see Figure 2). Controls requiring an actuating force  $< 100$  N shall have a minimum clearance of 25 mm. This requirement does not apply to fingertip operation controls, e.g. push-buttons, electric switches.

4.3.4 For requirements pertaining to machine-specific controls, see the relevant part(s) of ISO 4254.



$a \geq 50$ , if force  $\geq 100$  N  
 $a \geq 25$ , if force  $< 100$  N

#### Key

- 1 hand-operated control
- 2 adjacent part

Figure 2 — Clearance around hand-operated controls

**4.3.5** Handle(s) located at least 300 mm from the nearest articulation shall be provided for manually folded elements. The handle(s) can be integral parts of the machine provided they are suitably designed and clearly identified. The force required for the manual folding operation shall not exceed 250 N as an average value when moving from the start to the stop position. The peak(s) shall not exceed 400 N. There shall be no shearing, pinching or uncontrollable movement hazards to the operator when folded.

## 4.4 Operator stations

### 4.4.1 Boarding means

#### 4.4.1.1 General

**4.4.1.1.1** If the vertical height of the operator station floor above ground level exceeds 550 mm, measured on level ground and with the specified tyres with the maximum diameter at specified inflation pressure [see 8.1.3 u)], a boarding means shall be provided. The dimensions shall be as shown in Figure 3.

**4.4.1.1.2** Whenever the boarding means is located directly in line and forward of a wheel (i.e. within the track of the machine), provision shall be made for a railing to be located on the wheel side. This does not apply for the transport position.

Shielding shall be provided on the back of steps or ladders whenever a protruding hand or foot may contact a hazardous part of the machine, e.g. wheel.

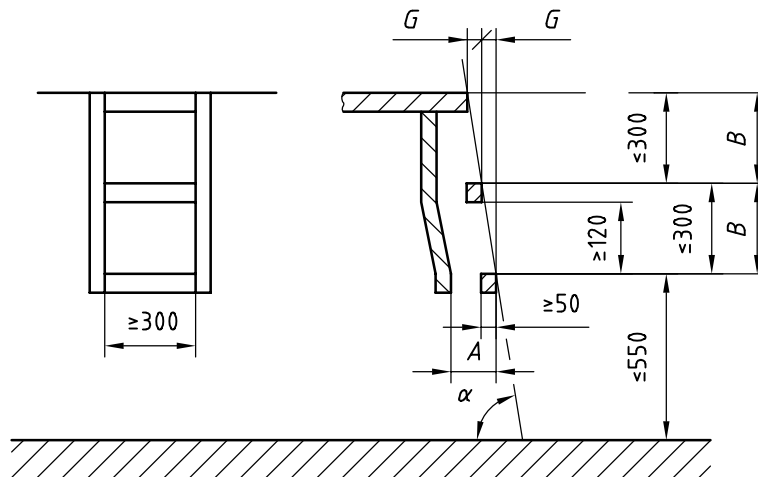
#### 4.4.1.2 Steps and ladders

**4.4.1.2.1** The height of the first step shall be achieved with the specified tyres and with the maximum diameter at specified inflation pressure [see 8.1.3 u)]. The vertical distance between successive steps shall be equal within a tolerance of  $\pm 20$  mm. Each step shall have a slip-resistant surface, a lateral stop at each end and be so designed (e.g. mudguards, perforated steps) that an accumulation of mud and/or snow is minimized under normal work conditions.

A flexible connection(s) between the first and second steps is permitted.

**4.4.1.2.2** If ladders are used, their inclination,  $\alpha$ , shall be between  $70^\circ$  and  $90^\circ$  from the horizontal (see Figure 3).

**4.4.1.2.3** Other operator stations with such boarding means having an inclination  $\alpha$  from the horizontal of less than  $70^\circ$  shall be in accordance with Figure 3 and the sum of  $2B + G$  shall be  $\leq 700$  mm, where  $B$  is the vertical distance and  $G$  the horizontal distance between steps.



**Key**

- A toe clearance, where  $A = 150$  mm
- B vertical distance between successive steps
- G horizontal distance between successive steps
- $\alpha$  angle of inclination from the horizontal

**Figure 3 — Dimensions of boarding means for operator stations**

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4.4.1.2.4 If parts of the boarding means are moveable, the operating force shall not exceed 200 N as the average value when moving from the start to the stop position. The peak(s) shall not exceed 400 N.

4.4.1.2.5 When moving the boarding means, there shall be no shearing, pinching or uncontrollable movement hazards to the operator.

4.4.1.2.6 Where, on tracked machines, the track shoes and track pad surfaces are intended to be used as access steps, three-point contact support shall be provided to ensure safe boarding for the operator.

**4.4.1.3 Handrails/handholds**

4.4.1.3.1 Handrails or handholds shall be provided on both sides of the boarding means and shall be so designed that the operator can maintain three-point contact support at all times. The width of the handrail/handhold cross section shall be between 25 mm and 38 mm. The lower end of the handrail/handhold shall be located no higher than 1 500 mm from the ground surface. A minimum clearance of 50 mm shall be provided for hand clearance between the handrail/handhold and the adjacent parts except at attaching points.

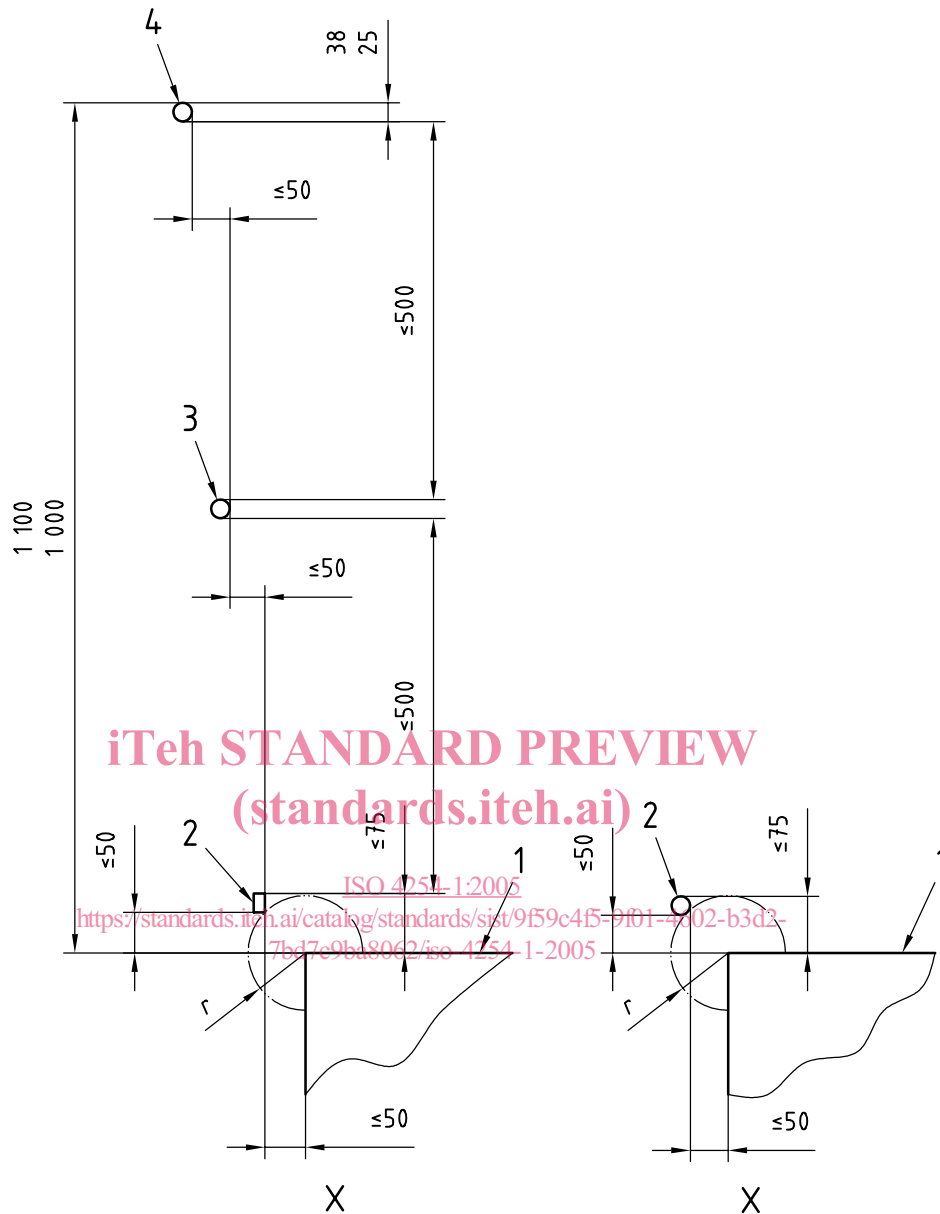
4.4.1.3.2 A handrail/handhold grab shall be provided above the uppermost step/rung of the boarding means at a height between 850 mm and 1 100 mm. The handhold shall be at least 150 mm long.

**4.4.2 Platforms**

4.4.2.1 Platforms shall be flat and have a slip-resistant surface and, if necessary, provision for drainage.

4.4.2.2 Platforms — except those only used when the machine is stationary and which are less than 1 000 mm above the ground — shall be equipped with a foot guard, hand rail and intermediate rail around the edge of the platform with the dimensions shown in Figure 4. No foot guard shall be provided at the entrance of the platform.

In addition, if static machine components are used as a foot guard, handrail and/or intermediate rail, the requirements given in 4.4.1.3.1 and 4.4.1.3.2 shall be fulfilled.



**Key**

*r* radius 50 mm max.

- 1 platform
- 2 foot guard
- 3 intermediate rail
- 4 hand rail

**Figure 4 — Platform foot guard and hand rail**

**4.4.2.3** If the boarding means of platforms and cabs are made movable for transport purposes, provision shall be made for railing off access to the platform or cab. For cabs equipped with a door, the cab door satisfies this requirement.