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

Matériel agricole — Sécurité —

Partie 1: Exigences générales

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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*.

This fourth edition cancels and replaces the third edition (ISO 4254-1:2005), which has been technically revised. It also incorporates the Final Draft Amendment ISO 4254-1:2005/FDAM 1:2007.

The following major changes were introduced:

- requirements related to vibration have been added in a new subclause 4.3,
- requirements related to ergonomics have been added in new subclauses 4.4.6 and 5.1.2.2;
- requirements related to the transmission of mechanical power between self-propelled machines/tractors and recipient machinery have been added in a new subclause 6.4.1;
- the requirements related to the guarding of moving parts for power transmission given in 4.6 and Annex C have been deleted.

For the purposes of global relevance, the requirements related to the guarding of moving parts for power transmission have been transferred and published as two separate Technical Specifications: ISO/TS 28923:2007, which includes the guard requirements taken from both 4.6 and Annex C of ISO 4254-1:2005, and ISO/TS 28924:2007, which includes only the requirements from 4.6.

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

- *Part 1: General requirements*
- *Part 3: Tractors*¹⁾
- *Part 5: Power-driven soil-working machines*
- *Part 6: Sprayers and liquid fertilizer distributors*

1) Under revision. To be replaced by ISO 26322 (see Reference [8]).

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- *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 mowers and flail-mowers*

Part 4, *Forestry winches*, has been revised and replaced by ISO 19472 [7].

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Introduction

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

- a) Type-A standards (basic 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-hand 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.

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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).

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, or to the power take-off (PTO) drive shaft; neither is it applicable to moving parts for power transmission except for strength requirements for guards and barriers (see 4.7), nor to vibration except in respect of declarations. It is not applicable to hazards related to maintenance or repairs to be carried out by professional service personnel.

NOTE ISO 14982 (see Reference [6]) 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 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, 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 3776-1:2006, *Tractors and machinery for agriculture — Seat belts — Part 1: Anchorage location requirements*

ISO 3776-2:2007, *Tractors and machinery for agriculture — Seat belts — Part 2: Anchorage strength requirements*

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

ISO 4253:1993, *Agricultural tractors — Operator's seating accommodation — Dimensions*

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

ISO 15077:2008, *Tractors and self-propelled machinery for agriculture — Operator controls — Actuating forces, displacement, location and method of operation*

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

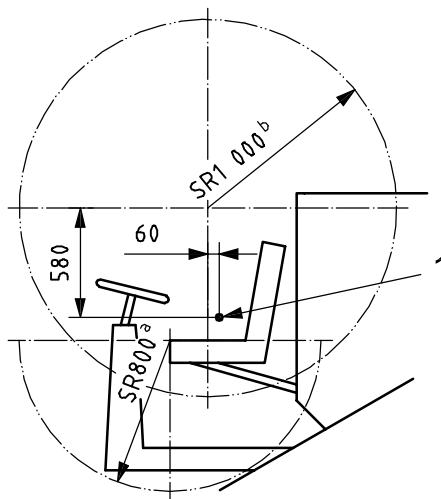
See Figure 1.

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Dimensions in millimetres



Key

- 1 SIP (seat index point)
- ^a Hemisphere radius (feet).
- ^b 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.

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NOTE 1 ISO/TR 11688-2 (see Reference [5]) 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 q)].

4.3 Vibration

If vibration emission values are required to be declared, then the weighted root mean square acceleration value and the measuring method shall be determined according to

- ISO 5008 [2],
- machine-specific standards, or
- the measuring method described in the operator's manual.

Vibration measurements are unnecessary for machines that do not require a ride-on operator.

NOTE 1 Mechanical vibrations are caused by the unevenness of the travelling surface and the movement of machine-related components such as engine, gearbox, drives and working tools. Technical measures for the reduction of vibrations can be, for example, isolators, dampening or suspension systems.

NOTE 2 As the origin of vibrations depends on the machine type and the individual design, detailed specifications for vibration reduction measures cannot be given in this part of ISO 4254.

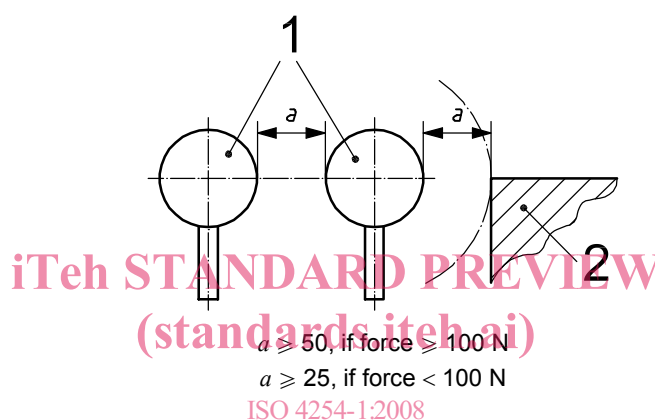
4.4 Controls

4.4.1 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.

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

4.4.3 Hand-operated controls requiring an actuating force ≥ 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.

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



Key

- 1 hand-operated control
 2 adjacent part

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Figure 2 — Clearance around hand-operated controls

4.4.5 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.

4.4.6 Unless specified otherwise in 4.4.3 and 4.4.5, actuating forces, displacement, location and the method of operation shall be in accordance with ISO 15077.

4.5 Operator stations

4.5.1 Boarding means

4.5.1.1 General

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

4.5.1.1.2 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.