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**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*<sup>1)</sup>
- *Part 5: Power-driven soil-working machines*
- *Part 6: Sprayers and liquid fertilizer distributors*

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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

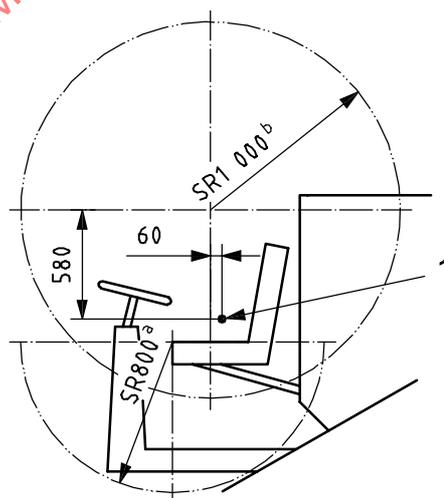
#### 3.5

##### **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.

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 (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.

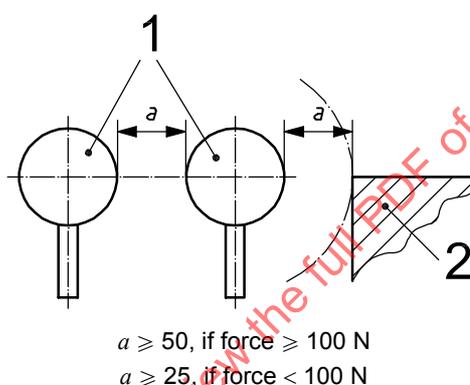
## 4.4 Controls

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  $\geq 100$  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.

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



### Key

- 1 hand-operated control
- 2 adjacent part

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.

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.

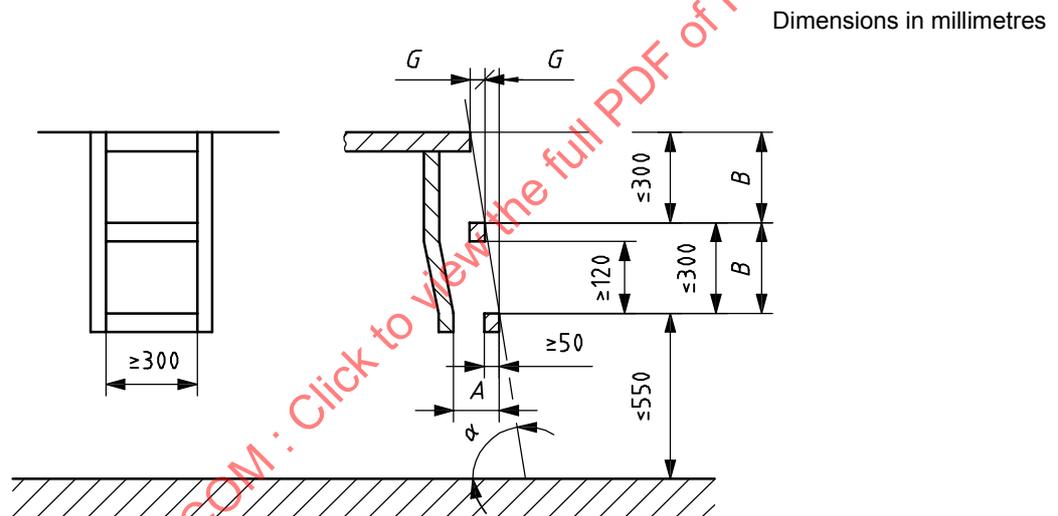
**4.5.1.2 Steps and ladders**

**4.5.1.2.1** 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 t)]. 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.

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

**4.5.1.2.3** 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**

**4.5.1.2.4** 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.

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

**4.5.1.2.6** 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.

#### 4.5.1.3 Handrails/handholds

**4.5.1.3.1** 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.

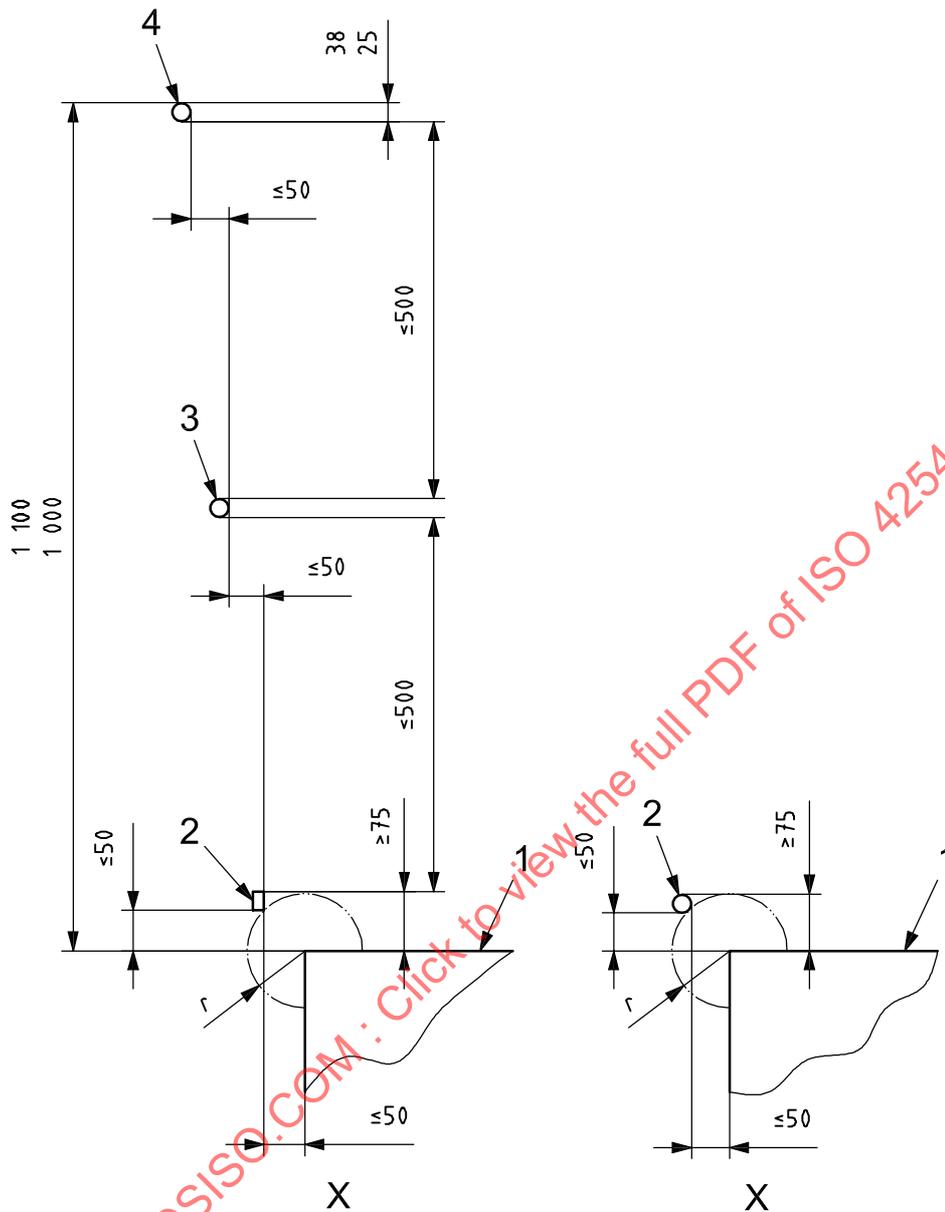
**4.5.1.3.2** A handrail/handhold grab shall be provided above the uppermost step/rung of the boarding means at a height between 850 mm and 1 100 mm. The handhold shall be at least 150 mm long.

#### 4.5.2 Platforms

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

**4.5.2.2** 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 4.5.1.3.1 and 4.5.1.3.2 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**

**4.5.2.3** 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.

## 4.6 Boarding means for other than operator stations

**4.6.1** Boarding means to locations other than the operator's station (e.g. leading to servicing or maintenance locations) shall be provided with foot supports (e.g. rungs or steps) and handholds.

In addition, if static machine components are used as foot supports and/or handholds, the requirements given in 4.5.1.3.1 and 4.5.1.3.2 and 4.5.1.2.1 shall be fulfilled.

**4.6.2** Such boarding means shall comprise a series of successive steps as shown in Figure 5 and shall be in accordance with a), b) or c), as follows.

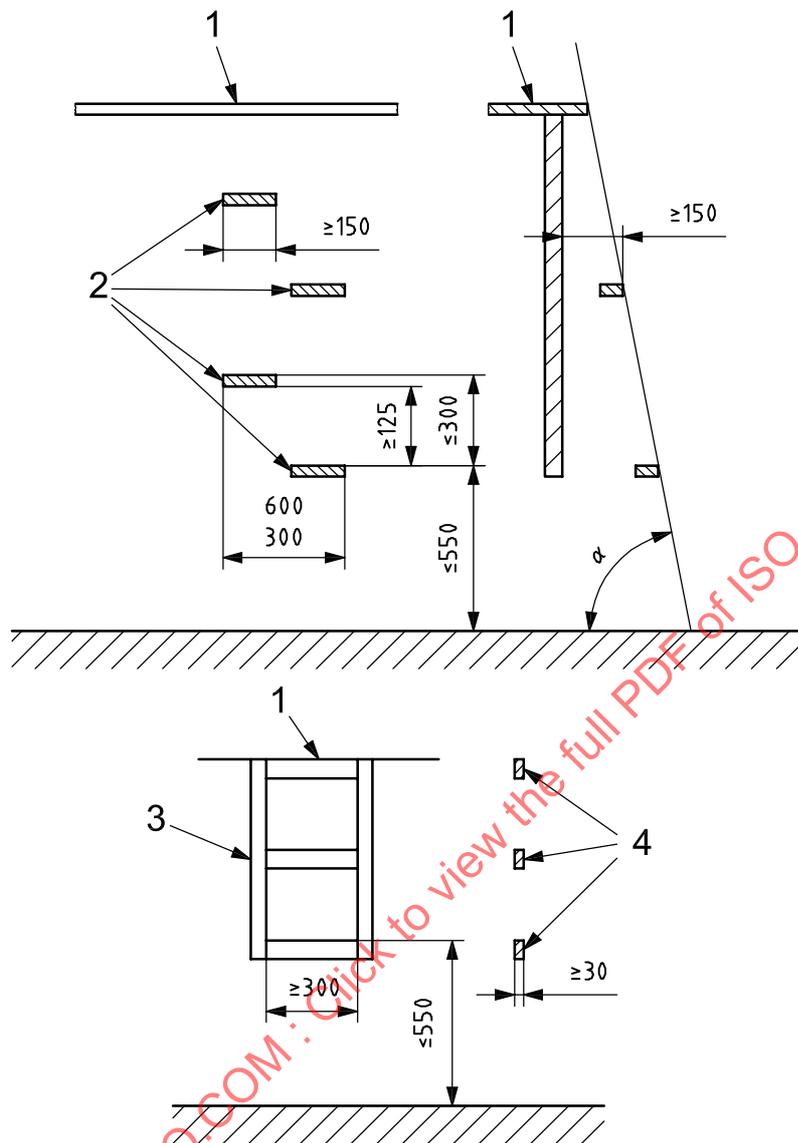
- a) The inclination  $\alpha$  shall be between  $70^\circ$  and  $90^\circ$  from the horizontal (see Figure 5). Each step shall have a slip-resistant surface, a lateral stop at each end and be so designed that any accumulation of mud and/or snow is minimized in the normal conditions of work. The vertical and horizontal distance between successive steps shall be within a tolerance of  $\pm 20$  mm.
- b) The boarding means shall be a ladder. The top side of each rung shall have a horizontal slip-resistant surface at least 30 mm from front to back. If rungs can be used as handholds, then rectangular section rungs shall have corner radii  $\geq 5$  mm.
- c) The boarding means shall be in accordance with 4.5.1.2.

**4.6.3** Servicing or maintenance locations shall have slip-resistant surfaces and suitable handholds.

**4.6.4** When access is needed above or next to the PTO (power take-off) drive shaft, an adequate platform and steps shall be provided in order to eliminate the need to use the PTO drive shaft or its guard as a step.

**4.6.5** If boarding means are located such that there is the hazard of inadvertent contact with the PTO drive shaft guard or PIC guard by reaching through the boarding means with foot or hand, provisions shall be made for shielding on the rear of the boarding means.

**4.6.6** By design, PTO drive shafts and their guards shall not be considered as steps.



- Key**
- 1 platform
  - 2 step
  - 3 ladder
  - 4 rung

Figure 5 — Dimensions of boarding means for other than operator stations

#### 4.7 Strength requirements for guards and barriers

4.7.1 Guards and barriers, and in particular barriers with a vertical height from the ground of up to 550 mm, whose use as access steps during normal use cannot be prevented, shall be designed so that they can withstand a vertical load of 1 200 N. Conformance with this requirement shall be checked using the test given in Annex C or an equivalent method which fulfils the same test acceptance criteria.

**4.7.2** Barriers used as protection against hazards related to moving working parts shall withstand the following horizontal loads:

- 1 000 N, up to 400 mm from the ground in the working position;
- 600 N, above 400 mm from the ground in the working position.

Conformance with these requirements shall be checked using the test given in Annex C or an equivalent method.

## **4.8 Supports for service and maintenance**

### **4.8.1 General**

**4.8.1.1** When it is necessary for the operator to work under raised parts of the machine in order to carry out maintenance or service, mechanical supports or hydraulic locking devices shall be provided to prevent inadvertent lowering.

Means other than mechanical or hydraulic devices are acceptable, provided an equal or greater level of safety is ensured.

**4.8.1.2** It shall be possible to control hydraulic locking devices and mechanical supports from outside the hazard zones.

**4.8.1.3** Mechanical supports and hydraulic locking devices shall be identified by use of a colour that contrasts with the overall machine colour or by a safety sign located either on, or in close proximity to, the device.

**4.8.1.4** When the supports or hydraulic devices are controlled manually, their method of operation shall be explained in the operator's manual [see 8.1.3 j)] and, if such operation is not intuitive, on the machine itself using either a safety or informational sign.

### **4.8.2 Mechanical supports**

**4.8.2.1** Mechanical supporting devices shall withstand a load of 1,5 times the maximum static load to be supported.

**4.8.2.2** Detachable mechanical supports shall have a dedicated and clearly visible and identifiable storage position on the machine.

### **4.8.3 Hydraulic locking devices**

Hydraulic locking devices shall be located on the hydraulic cylinder or connected to the hydraulic cylinder by rigid or flexible lines. In the latter case, the lines connecting the locking device to the hydraulic cylinder shall be designed to withstand a pressure at least four times the rated maximum hydraulic pressure. This rated maximum hydraulic pressure shall be specified in the operator's manual. The conditions for the replacement of such flexible lines shall also be given in the operator's manual [see 8.1.3 k)].

## **4.9 Electrical equipment**

**4.9.1** Electrical cables shall be protected if located in potentially abrasive contact with surfaces and shall be resistant to, or protected against, contact with lubricant or fuel. Electrical cables shall be located so that no portion is in contact with the exhaust system, moving parts or sharp edges.

**4.9.2** Fuses or other overload protection devices shall be installed in all electrical circuits except for the starter-motor circuit and the high-tension spark ignition system. Electrical distribution of these devices between circuits shall prevent the possibility of cutting-off all warning systems simultaneously.

## 4.10 Hydraulic components and fittings

4.10.1 Hydraulic systems shall comply with the safety requirements of ISO 4413.

4.10.2 Pressurized hoses, pipes and components shall be located or shielded so that in the event of rupture, the fluid cannot be discharged directly onto the operator when in the operating position.

## 4.11 Pneumatic systems

Pneumatic systems shall comply with the safety requirements of ISO 4414.

## 4.12 Operating fluids

Changing of operating fluids, including the safety aspects, shall be explained in the operator's manual [see 8.1.3 u)].

## 4.13 Manual operation of individual assemblies

If special tools are required for the manual operation of individual assemblies, these shall be supplied with the machine and their use explained in the operator's manual [see 8.1.3 l)].

## 4.14 Service, maintenance and handling

4.14.1 The routine lubrication and maintenance operations shall be capable of being carried out in a safe way, for example with the power source stopped.

4.14.2 Components which require frequent maintenance shall be accessible by means according to 4.6.

4.14.3 Hinged guards and doors shall be fitted with a means to retain them in the open position, if a hazard from uncontrolled closing exists.

4.14.4 Parts of the machine that will be handled by the operator:

- if their mass is  $\geq 40$  kg, they shall be designed or fitted with attachments so that the use of lifting equipment is possible;
- if their mass is  $< 40$  kg, they shall be fitted with handles or parts of the machine located so that safe handling is ensured and such that, during this operation, any contact with hazardous parts (cutting tools, hot surfaces, etc.) is prevented.

4.14.5 Folding elements designed to reduce transport width and/or height shall have a means of retaining themselves in the transport position, either mechanically or by other means (e.g. hydraulically, gravity). The change from transport position to working position and vice versa shall be possible without exposing the operator to crushing and pinching.

4.14.6 Barriers which exceed the transport width may be folded from the functional/protection position into a transport position.

## 5 Safety requirements and/or measures — Self-propelled ride-on machines

### 5.1 Operator station

#### 5.1.1 Access to operator's seat

For access to the operator's seat, the floor area shall have a minimum width of 300 mm. Devices such as rear-view mirrors shall not intrude into the access space in any of their engaged/disengaged positions, except in the case of devices intended to restrict the operator encountering hazards during operation.

#### 5.1.2 Operator's seat

**5.1.2.1** On machines on which the operator is required to sit, a seat shall be provided which will adequately support the operator in all working and operating modes. Information on the seat adjustment shall be provided in the operator's manual [see 8.1.3 d)].

**5.1.2.2** The driver's seat dimensions and adjustment shall meet the requirements of ISO 4253, except that the seat index point (SIP) dimension above the platform shall be 500 mm minimum and 650 mm maximum (see Figure 6). The driver's seat adjustment mechanism(s) shall prevent unintended seat movement and shall have stops at the ends of the adjustment range. The suspension system shall be adjustable to accommodate the weight of the driver.

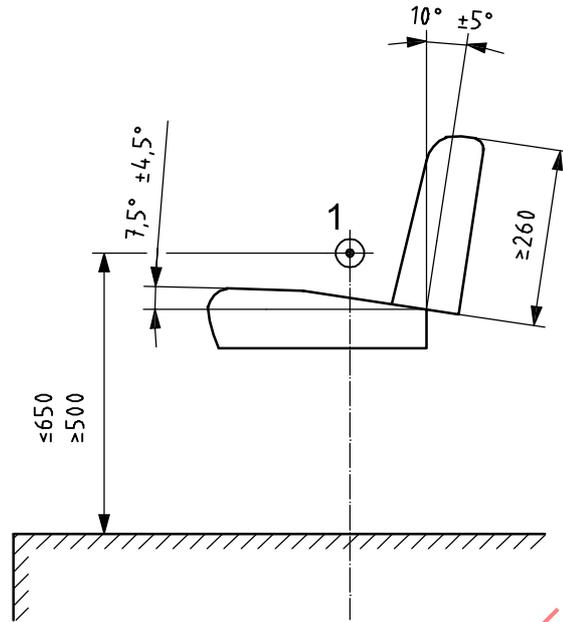
**5.1.2.3** In cases where the machine is equipped with a roll-over protection structure (ROPS), the seat shall be equipped with anchorage points for a restraint system complying with the requirements of ISO 3776-1 and ISO 3776-2 and with the restraint system itself.

#### 5.1.3 Propulsion and steering

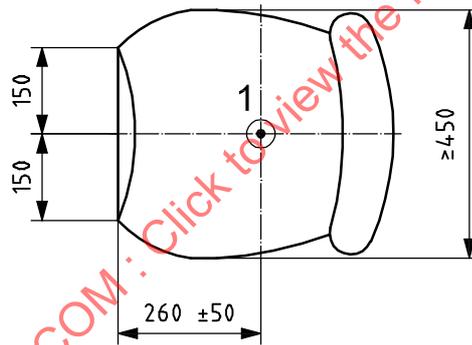
**5.1.3.1** The controls used to activate machine propulsion shall be located or designed so that they can only be operated from the operator's station.

**5.1.3.2** The steering mechanism shall be so designed as to reduce the transmission of force to the operator's hand in the event of any sudden movement of the steering-wheel or -lever(s) in reaction to the steered wheel(s).

**5.1.3.3** When the steering mechanism is in the operating position, the clearance between the fixed parts and the steering wheel shall be as shown in Figure 7.



a) Intermediate seat adjustment

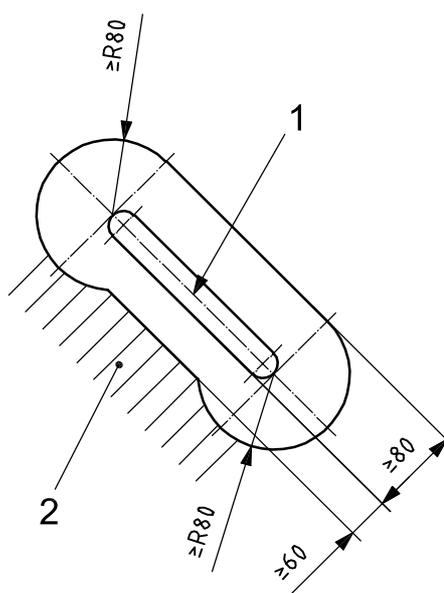


b) Coordinate for measuring width of seat

Key

- 1 SIP

Figure 6 — Seat dimensions and height

**Key**

- 1 steering wheel
- 2 fixed parts

**Figure 7 — Clearance between the steering wheel and fixed parts**

#### 5.1.4 Shearing and pinching points

In the operator's workplace, there shall be no shearing or pinching points within hand or foot reach of the operator when seated in the seat provided.

#### 5.1.5 Emergency exit

**5.1.5.1** When the operator's station is equipped with a cab, provisions shall be made for an emergency exit. In addition to the primary door, at least one other exit shall be provided as an emergency exit. A second door, windshield(s), roof panel or window(s) not on the same side wall as the primary door is to be considered as an emergency exit, provided that it can be opened or removed quickly from inside the cab. If a special tool is required, this tool shall be attached to the cab and provided for this purpose near the exit.

#### 5.1.5.2 Emergency exits shall

- have minimum dimensions constituting either an ellipse with principal axes of 640 mm and 440 mm, a square with 600 mm sides, a rectangular shape of 470 mm by 650 mm, or a round area having a diameter of 650 mm;
- be labelled with the user instructions if the intended emergency exit is not routinely used or if location and use is not obvious.

If labelling is used, information on location and use shall be provided in the operator's manual [see 8.1.3 f)]. Such exits include, but are not limited to, a single latch window or a second egress door with a handle and latch.

#### 5.1.6 Cab material burning rate

The burning rate of cab interior material such as seat covering, wall, floor and headliner coverings when provided shall not exceed the maximum rate of 150 mm/min when tested in accordance with ISO 3795.

### 5.1.7 Visibility

5.1.7.1 The design and position of the operator's workplace shall be such that the operator has adequate visibility to drive the machine and view the work area of the machine. Aids such as mirrors or TV devices shall be provided to remedy inadequate direct view.

5.1.7.2 When the operator's station is equipped with a cab, a windscreen wiper shall be provided.

5.1.7.3 Provisions for installing working lights shall be available.

### 5.1.8 Starting and stopping the engine

5.1.8.1 Information on starting and stopping shall be provided in the operator's manual [see 8.1.3 e)].

5.1.8.2 Where an electric starter is used, unauthorized activation of the starter shall be avoided, by use of means such as

- key operated ignition or starting switch,
- lockable cab,
- lockable cover for the ignition or starting switch,
- security ignition or starting lock,
- lockable battery disconnecting switch.

5.1.8.3 Starting the engine shall not be possible with the engine's power transmission drive system engaged.

5.1.8.4 Stopping the engine shall be achieved by a device constructed so that

- the engine's stop device does not require sustained manual operation, and
- when the device is set at the "off" or "stop" position the engine cannot be re-started, unless the device has been reset.

## 5.2 Moving the machine

### 5.2.1 Attachments for towing

Attachment points for retrieving and towing (hooks, rings, ears, etc.) shall be provided at the front and/or rear of the machine. If these attachment points are not obvious, they shall be clearly indicated on the machine and in the operator's manual [see 8.1.3 m) and 8.3].

### 5.2.2 Moveable attachments

Movable attachments shall be maintained in their transport position.

### 5.2.3 Use of lifting jacks

5.2.3.1 Application points for use with jacks when raising the machine shall be clearly marked, if not obvious, and their location and the procedure for using jacks shall be described in the operator's manual [see 8.1.3 m) and 8.3.2].

5.2.3.2 The jack-up points shall have the appropriate strength and be constructed so that a laden machine can be lifted from the ground (e.g. to change the wheels).

### 5.3 Electric

**5.3.1** Batteries shall be located so they can be properly maintained and exchanged, from the ground or a platform, and shall be secured to remain in position and located or constructed and sealed so as to reduce the possibility of spillage in the event of a machine overturn. The electrical, non-earth terminals of batteries shall be protected to prevent unintentional contact and shorting to earth.

**5.3.2** It shall be possible to easily disconnect the battery electrical circuit (e.g. with common tools or a switch).

**5.3.3** Information on service and replacement of the battery shall be provided in the operator's manual [see 8.1.3 p)].

### 5.4 Fuel tank

**5.4.1** Any tank filler shall be located outside the cab, not more than 1 500 mm above the ground or a platform.

**5.4.2** Fuel tanks shall be corrosion-resistant and shall satisfy leakage tests at a pressure equal to double the working pressure, but in any event not less than 30 kPa.

**5.4.3** The design of the fuel cap shall be such that no apparent leakage occurs whilst the engine is at the normal operating temperature and in all machine working positions. Seepage from any fuel tank ventilation system shall not be considered as leakage.

**5.4.4** Information on filling of the fuel tank shall be provided in the operator's manual [see 8.1.3 p)].

### 5.5 Hot surfaces

Hot surfaces which can be reached unintentionally by the operator during normal operation of the machine shall be covered or insulated. This applies to hot surfaces which are near steps, handrails, handholds and integral machine parts used as boarding means and which may be inadvertently touched.

### 5.6 Exhaust gases

The outlet of the exhaust pipe shall be located and directed in such a way that the driver or any other operator obliged to stand on the machine will not normally be exposed to harmful concentrations of noxious gases or fumes.

EXAMPLE Location of the outlet away from the head level of the operator or the intake of the cab.

## 6 Safety requirements and/or measures — Mounted, semi-mounted and trailed machines

### 6.1 Controls

**6.1.1** The control on the tractor or self-propelled machine of the energy supply to trailed or mounted machines shall be considered the normal device for stopping the machine, unless

- it is specified otherwise in particular machine standards, or
- there is an operator station on the machine, or
- an operator position is necessary beside the machine designed for use with the machine operating in a stationary position.

**6.1.2** Any manual control which has to be operated by the operator standing on the ground while the PTO drive shaft is running shall be situated at a minimum horizontal distance of 550 mm from the PTO drive shaft.

## **6.2 Stability**

### **6.2.1 General**

**6.2.1.1** Machines shall be designed to be stable when parked on firm ground, with an inclination up to 8,5° in any direction. This requirement shall be met with any tanks or hoppers empty, then with the tanks or hoppers filled with the product handled by the machine, and in both cases with and without optional fitted equipment or containers for which the machine has been designed.

**6.2.1.2** Supporting devices, other than wheels (e.g. stands, outriggers) shall have a bearing surface designed to limit the ground pressure to a maximum of 400 kPa. Outriggers or similar devices shall also be lockable in their transport position. It shall be possible for the driver/operator to verify visually that the outriggers are in the transport position.

**6.2.1.3** If the required stability when in operation or stationary can only be achieved by employing special measures or by using the machine in a particular way, this fact shall be pointed out on the machine itself (see 8.3.3), and/or in the operator's manual [see 8.1.3 h)].

### **6.2.2 Mounted and semi-mounted machines**

**6.2.2.1** If a supporting device is necessary for storing the machine, this device shall remain attached to the machine.

**6.2.2.2** The height of the lower hitch points of three-point mounted machines shall be compatible with the lower hitch point height of the intended three-point linkage.

NOTE 1 The ISO 11001 (see Reference [4]) series provides information on three-point hitch couplers.

NOTE 2 ISO 2332 (see Reference [1]) provides information on the clearance zone between tractor and implement.

### **6.2.3 Trailed machines with vertical load on draw bar hitch > 500 N**

**6.2.3.1** Trailers or machines with draw bars designed to be picked up mechanically by the towing vehicle shall be fitted with a stand capable of supporting the draw bar with the hitch point at least 150 mm above the ground (for the maximum ground pressure, see also 6.2.1.2).

**6.2.3.2** Trailers or machines with draw bars designed to be coupled to a fixed-height clevis shall be fitted with a supporting device or jack whose height is adjustable and which may be of one or the other of the following types:

- non-folding, in which case the design shall be such that inadvertent movement of the position is not possible;
- folding, in which case the supporting device shall have a manual control located on the left of the machine in relation to the direction of motion such that, when the device is fitted and moved, hinged or folded into the transport or supporting position, it shall be provided with a means preventing it from being used to support or adjust the height of the drawbar unless secured in the supporting position.

**6.2.3.3** If crushing and shearing points are unavoidable when operating the supporting device, then instructions giving advice on how to avoid such hazards shall be given in the operator's manual [see 8.1.3 r)].

**6.2.3.4** Supporting devices and their securing elements shall normally be fixed to the machine. If, however, such supporting devices do not permit the proper use of the machine, and providing that their removal does not affect the stability of the machine, then these supporting devices may be made detachable

without the use of tools. In this case, suitable instructions shall be given in the operator's manual [see 8.1.3 r)]. If supporting devices are detachable, provision shall be made for storing them on the machine.

### 6.3 Hitches for towing

**6.3.1** Appropriate information about the hitching system, including maintenance and checks, shall be included in the operator's manual [see 8.1.3 b)].

**6.3.2** Hitching points for towing the machines shall be clearly shown in the operator's manual which shall also include the maximum static vertical force exerted on the towing vehicle [see 8.1.3 b)].

### 6.4 Transmission of mechanical power between self-propelled machines/tractors and recipient machinery

#### 6.4.1 General

The straight line overlap of the power take-off (PTO) drive shaft guard with the power input connection (PIC) guard shall be not less than 50 mm. This minimum overlap shall also apply to protection devices of wide-angle PTO drive shafts and when using clutches or other elements.

If the machine can be equipped with a PTO drive shaft with a guard, the restraining device of which requires a fixing point on the machine, suitable fixing point(s) shall be provided.

NOTE This requirement is to be the subject of review.

The machine shall be supplied with a support for the transmission shaft when the machine is uncoupled, but this support shall not be the device used to prevent rotation of the transmission shaft guard.

The PIC guard shall be so constructed and attached to the implement that, in conjunction with the PTO drive shaft guard, it encloses the shaft on all sides up to the first fixed bearing housing of the machine, while allowing for fitting and articulation of the PTO drive shaft.

#### 6.4.2 Stationary operation

PTO-driven equipment designed to operate in a stationary position shall be provided with means to prevent separation of the PTO drive shaft, e.g. by keeping it coupled to the three-point linkage during operation. Information on the use of such means shall be provided in the operator's manual [see 8.1.3 s)].

### 6.5 Hydraulic, pneumatic and electrical connections with a self-propelled machine

Suitable devices for supporting disconnected hydraulic and pneumatic hoses and electric cables when the machine is not coupled to a self-propelled vehicle or when the connections are not in use shall be provided on the machine itself.

**7 Verification of safety requirements or protective measures**

See Table 1.

**Table 1 — List of safety requirements and/or protective measurements and their verification**

Clause/subclause	Verification		
	Inspection	Measurement	Procedure/reference
4.2.2	X	X	Shall be verified in accordance with Annex B.
4.4.			Shall be verified by folding the elements in according to instructions in the operator's manual and while using the handles or integral parts identified for that purpose.
4.5.1.2.4	X	X	Shall be verified by operating the boarding means according to the instructions in the operator's manual.
4.5.1.2.5	X	—	Shall be verified by operating the boarding means according to the instructions in the operator's manual.
4.7.1	X	X	Shall be verified in accordance with Annex C.
4.7.2	X	X	Shall be verified in accordance with Annex C.
4.8.1.1	X	—	Shall be verified by carrying out maintenance or service operations described in the operator's manual.
4.14.1	X	—	Shall be verified carrying out routine lubrication and maintenance operations described in the operator's manual.
5.1.2.3	X	—	Shall be verified in accordance with ISO 3776-1 and ISO 3776-2.
5.1.6	X	—	Shall be verified in accordance with ISO 3795.
5.4.2	X	—	Shall be verified by using the manufacturer's specification (30 kPa).
6.2.1.1	X	X	Shall be verified by using the blocking devices, if provided, (e.g. chocks) in place or actuated, and by parking the machine in the manner described in the operator's manual.

**8 Information for use**

**8.1 Operator's manual**

**8.1.1** An operator's manual shall be supplied with each machine.

**8.1.2** Easily accessible storage place for the operator's manual shall be provided on self-propelled machines.

**8.1.3** The operator's manual shall provide safety instructions for normal operation and servicing of the machine, including the use of personal protective equipment as appropriate and shall correspond to ISO 3600.

In particular, the following information and points shall be included, if relevant:

- a) the correct methods of mounting and dismounting (see 6.3.1, 6.3.2);
- b) compatibility with the tractors, e.g. hitching system, vertical load at the hitching point, engine power, stability (see 6.3.1, 6.3.2);
- c) description and function of all controls including an explanation of the symbols used (see 4.4.1);

- d) how to adjust the position of the seat to provide an ergonomic relationship with the controls (see 5.1.2.1);
- e) method of starting and stopping the engine (see 5.1.8, 6.1);
- f) location and method of opening emergency exits (see 5.1.5.2);
- g) precautions to be taken with moving parts involved in the working process (see 4.14.1);
- h) use of supports to ensure stability when parked (see 6.2.1.3);
- i) general requirements for servicing and maintaining the machine and usage of special tools (see 4.13, 4.14.1);
- j) use of devices for maintaining machine parts in a raised position during maintenance and servicing (see 4.8.1.4);
- k) provision of information concerning the renewal of hoses used in hydraulic locking systems (see 4.8.3);
- l) manual operation of individual parts (see 4.13);
- m) information on the correct method for towing and lifting the machine (see 5.2.1, 5.2.2, 5.2.3.1);
- n) information on how to verify that the outriggers are safely in the transport position (see 6.2.1.2);
- o) hazards associated with overhead power lines, including giving the maximum working height of the machine if over 4,0 m;
- p) hazards associated with the use of batteries (see 5.3.3) and filling of fuel tanks (see 5.4.4);
- q) noise emission values, if required to be declared (see 4.2.2);
- r) how and where to apply lifting jacks, including the use of jacks and supporting devices on the draw bar (see 6.2.3.3, 6.2.3.4);
- s) a requirement that static externally powered machines shall be coupled mechanically to the power source to prevent disengagement of the drive line (see 6.4.2);
- t) tyre size(s) and inflation pressure(s) (see 4.5.1.1.1, 4.5.1.2.1);
- u) instruction how to change safely operating fluids (see 4.12);
- v) vibration emission values, if required to be declared (see 4.3);
- w) additional information:
  - foreseen uses of the machine;
  - initial set-up of the machinery (unless this will be carried out by the dealer);
  - fire precautions;
  - clearing of blockages linked to material flows/working processes.

Furthermore, information about the use of appropriate personal protective equipment might be useful and should be included, if relevant.

## 8.2 Safety and instructional signs

**8.2.1** Safety signs shall be appropriately displayed when necessary to alert the operator and others of the risk of personal injury during normal operation and servicing.

**8.2.2** Safety signs shall conform to the requirements of ISO 11684.

**8.2.3** Instructional signs relating to equipment operation, servicing and care shall have an appearance, especially in respect of colour, different from that of the safety signs on the equipment.

### **8.3 Marking**

**8.3.1** All machines shall be marked legibly and indelibly with at least the following minimum information:

- name and address of manufacturer;
- designation of series or type;
- serial number, if any.

**8.3.2** Application points for use with jacks shall be clearly marked on the machine, if not obvious (see 5.2.3.1), and additional information shall be provided in the manual [see 8.1.3 m)].

**8.3.3** A sign on the machine shall be provided showing which special measures are to be taken or how the machine is to be used to ensure stability, if applicable (see 6.2.1.3).

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## Annex A (informative)

### List of significant hazards

This table specifies the significant hazards, significant hazardous situations and significant hazardous events that have been identified as being significant to the types of machines covered by this part of ISO 4254 and which require specific action by the designer or manufacturer to eliminate or reduce the risk.

	Hazard	Hazardous situation/event	Subclause of this part of ISO 4254
<b>A.1</b>	<b>Mechanical hazards</b>		
A.1.1	Crushing hazard	<ul style="list-style-type: none"> <li>— Controls</li> <li>— Boarding means</li> <li>— Platforms</li> <li>— Power transmission</li> <li>— Working tools</li> <li>— Service/maintenance</li> <li>— Roll-over</li> <li>— Shearing/pinching points</li> <li>— Moving the machine</li> <li>— Stability</li> <li>— Mounting of machines</li> </ul>	4.4.3; 5.1.3.2; 5.1.8; 6.1 4.5.1.1.2; 4.5.1.2.5; 4.5.2; 4.6 4.5.2.2 6.4 4.7 4.8; 4.14.1; 4.14.3; 4.14.5; 4.14.6 5.1.2.3 5.1.4 5.2 6.2 6.2.2; 6.2.3; 6.3
A.1.2	Shearing hazard	<ul style="list-style-type: none"> <li>— Controls</li> <li>— Boarding means</li> <li>— Platforms</li> <li>— Power transmission</li> <li>— Working tools</li> <li>— Service/maintenance</li> <li>— Roll-over</li> <li>— Shearing/pinching points</li> <li>— Moving the machine</li> <li>— Stability</li> <li>— Mounting of machines</li> </ul>	4.4.3; 5.1.3.2; 5.1.8; 6.1 4.5.1.1.2; 4.5.1.2.5; 4.5.2; 4.6 4.5.2.2 6.4 4.7 4.8; 4.14.1; 4.14.3; 4.14.5; 4.14.6 5.1.2.3 5.1.4 5.2 6.2 6.2.2; 6.2.3; 6.3
A.1.3	Cutting or severing hazard	<ul style="list-style-type: none"> <li>— Working tools</li> </ul>	4.7
A.1.4	Entanglement hazard	<ul style="list-style-type: none"> <li>— Power transmission parts</li> <li>— Working tools</li> <li>— Starting/stopping the engine</li> </ul>	6.4 4.7 5.1.8
A.1.5	Drawing-in or trapping hazard	<ul style="list-style-type: none"> <li>— Power transmission parts</li> <li>— Working tools</li> <li>— Starting/stopping the engine</li> </ul>	6.4 4.7 5.1.8

	Hazard	Hazardous situation/event	Subclause of this part of ISO 4254
A.1.6	Impact hazard	— Boarding means — Folding elements — Steering	4.5.1.2.5 4.14.5; 4.14.6 5.1.3.1
A.1.7	Stabbing or puncture hazard	— Working tools	4.7
A.1.8	Friction or abrasion hazard	— Controls — Electrical equipment — Boarding means	4.4.3; 5.1.3.2 4.9.1 4.5.1.1.2
A.1.9	High-pressure fluid injection or ejection hazard	— Hydraulic components	4.10; 6.5
<b>A.2</b>	<b>Electrical hazards</b>		
A.2.1	Contact of persons with live parts (direct contact)	— Electrical equipment	4.9; 5.3; 6.5
A.2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	— Electrical equipment	4.9.1
A.2.3	Approach to live parts under high voltage	— Overhead power lines	8.1.3
A.2.4	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc.	— Electrical equipment	4.9.2; 5.3.1
<b>A.3</b>	<b>Thermal hazards</b>		
	Burns, scalds and other injuries by possible contact of persons with objects or materials with an extreme high or low temperature, by flames or explosions and also by the radiation of heat sources	— Operating fluids — Cab material — Hot surfaces	4.12 5.1.6 5.5
<b>A.4</b>	<b>Hazards generated by noise</b>		
	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)  Accidents due to interference with speech communication and acoustic warning signals	— Noise	4.2
<b>A.5</b>	<b>Hazards generated by materials and substances</b>		
A.5.1	Hazards from contact with, or inhalation, of harmful fluids, gases, mists, fumes and dusts	— Operating fluids — Cab material — Battery — Exhaust gases	4.10; 5.4 5.1.6 5.3.1 5.6
A.5.2	Fire or explosion hazard	— Cab material	5.1.6

	Hazard	Hazardous situation/event	Subclause of this part of ISO 4254
<b>A.6</b>	<b>Hazards generated by neglecting ergonomic principles in machinery design</b>		
A.6.1	Unhealthy postures or excessive effort	— Controls — Boarding means — Service and maintenance — Operator station	4.4 4.5; 4.6 4.14.2; 4.14.4 5.1.1; 5.1.3; 5.1.5.2
A.6.2	Inadequate consideration of hand-arm or foot-leg anatomy	— Controls — Boarding means — Operator station	4.4 4.5; 4.6 5.1
A.6.3	Neglected use of personal protective equipment	— Operator's manual	8.1.3
A.6.4	Inadequate local lighting	— Visibility	5.1.7.3
A.6.5	Mental overload and under load, stress	— Controls	4.4
A.6.6	Human error, human behaviour	— Controls — Operator's manual — Signs	4.4 8.1 8.2
A.6.7	Inadequate design, location or identification manual controls	— Controls	4.4; 5.1.3; 6.1
<b>A.7</b>	<b>Combination of hazards</b>	— Individual assemblies — Operator's manual	4.13 8.1
<b>A.8</b>	<b>Unexpected start-up, unexpected overrun/overspeed</b>		
A.8.1	Failure/disorder of the control system	— Service and maintenance — Electrical equipment — Connections	4.8 4.9 6.5
A.8.2	Restoration of energy supply after an interruption	— Controls	4.4; 6.1
A.8.3	External influences on electrical equipment	— Cables	4.9.1
A.8.4	Other external influences (gravity, wind, etc.)	— Stability	6.2.1.1; 6.2.1.2
A.8.5	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities)	— Controls — Boarding means — Operator station — Moving the machine — Mounting of machines — Service and maintenance — Operator's manual	4.4; 6.1.2 4.5; 4.6 5.1 5.2 6.2; 6.3 4.14 8.1.3
<b>A.9</b>	<b>Impossibility of stopping the machine in the best possible conditions</b>	— Controls — Starting/stopping the engine	4.4; 6.1 5.1.8
<b>A.10</b>	<b>Variations in the rotational speed of tools</b>	— PTO drive shaft	6.4; 8.1.3

	Hazard	Hazardous situation/event	Subclause of this part of ISO 4254
A.11	Failure of power supply	— Supports — Electrical equipment — Connections	4.8 4.9 6.5
A.12	Failure of the control circuit	— Electrical equipment	4.9
A.13	Errors of fitting	— Mounting of machines — Operator's manual	6.2; 6.3 8.1.3
A.14	Break-up during operation	— Guards and barriers — Supports — Hydraulic components — Pneumatic components	4.7 4.8 4.10 4.11
A.15	Falling or ejected objects or fluids	— Supports — Hydraulic components — Folding elements	4.8 4.10 4.14.5
A.16	Loss of stability/overturning of machinery	— Stability — Roll-over	6.2 5.1.2.3
A.17	Slip, trap and fall of persons (related to machinery)	— Boarding means	4.5; 4.6
<b>Additional hazards, hazardous situations and hazardous events due to mobility</b>			
A.18	<b>Related to the travelling function</b>		
A.18.1	Movement when starting the engine	— Propulsion of machine — Starting/stopping the engine	5.1.2.3 5.1.8
A.18.2	Moving without a driver at the driving position	— Propulsion of machine — Starting/stopping the engine	5.1.2.3 5.1.8
A.18.3	Movement without all parts in a safe position	— Folding elements	4.14.5
A.18.4	Insufficient ability of machinery to be slowed down, stopped and immobilized	— Propulsion of machine	5.1.3.2
A.19	<b>Link to the work position</b>		
A.19.1	Fall of persons during access to (or at/from) the work position	— Boarding means	4.5; 4.6
A.19.2	Exhaust gases/lack of oxygen at the work position	— Gases	5.4.1; 5.6
A.19.3	Fire (flammability of the cab, lack of extinguishing means)	— Cab material	5.1.6
A.19.4	Mechanical hazards at the working position: a) contact with wheels; b) rollover; c) fall of objects, penetration by objects;	— Shearing/pinching points — Wheels — PTO drive shaft — Supports — Roll-over	4.4.3; 4.5.1.2.5; 5.1.4 4.5.1.1.2 4.6.4 4.8 5.1.2.3
A.19.5	Insufficient visibility from the work positions	— Visibility	5.1.7

	Hazard	Hazardous situation/event	Subclause of this part of ISO 4254
A.19.6	Inadequate lighting	— Visibility	5.1.7.3
A.19.7	Inadequate seating	— Operator's seat	5.1.2
A.19.8	Noise at work position	— Operator's work station	4.2
A.19.9	Insufficient means for evacuation/emergency exit	— Emergency exit	5.1.5
<b>A.20</b>	<b>Due to the control system</b>		
A.20.1	Inadequate location of manual controls	— Controls	4.4; 4.8.1.2; 5.1.2.1; 6.1.1; 6.1.2
A.20.2	Inadequate design of manual controls and their mode of operation	— Controls	4.4; 5.1.3; 5.1.8
<b>A.21</b>	<b>From handling the machine (lack of stability)</b>		
		— Stability	6.2
		— Roll-over	5.1.2.3
<b>A.22</b>	<b>Due to the power source and to the transmission of power</b>		
A.22.1	Hazards from the engine and the batteries	— Starting/stopping the engine	5.1.8
		— Battery	5.3
A.22.2	Hazards from transmission power between machines	— Power transmission	6.4; 6.5
A.22.3	Hazards from coupling and towing	— Mounting of machines	6.2.2; 6.2.3; 6.3
<b>A.23</b>	<b>From/to third persons</b>		
A.23.1	Unauthorized start-up and use	— Starting/stopping the engine	5.1.8
A.23.2	Lack or inadequacy of visual or acoustic warning means	— Visibility	5.1.7
<b>A.24</b>	<b>Insufficient instructions for the driver/operator</b>		
		— Operator's manual	8.1