INTERNATIONAL STANDARD

ISO 4254-5

Second edition
2008-09-01

Agricultural machinery — Safety —

Part 5: Power-driven soil-working machines

Matériel agricole — Sécurité —

Partie 5: Machines de travail du sol à outils animés

Reference number
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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 4254-5 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 3, *Safety and comfort*.

This second edition cancels and replaces the first edition (ISO 4254-5:1992), which has been technically revised.

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*

— *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*, was cancelled and replaced by ISO 19472, *Machinery for forestry — Winches — Dimensions, performance and safety.*

1) To be cancelled and replaced by ISO 26322-1, *Tractors and machinery for agriculture and forestry — Safety — Part 1: Standard tractors*

Introduction

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

a) Type-A standards (basis standards) give basic concepts, principles for design, and general aspects that can be applied to machinery.

b) Type-B standards (generic safety standards) deal with one 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) deal 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 power-driven soil-working machines.

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

Agricultural machinery — Safety —

Part 5: Power-driven soil-working machines

1 Scope

This part of ISO 4254, intended to be used together with ISO 4254-1, specifies the safety requirements and their verification for the design and construction of mounted, semi-mounted and trailed power-driven soil-working 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 power-driven soil-working machines used as intended and under the conditions foreseen by the manufacturer (see Clause 4).

This part of ISO 4254 is not applicable to:

— spading machines;

— machines fitted with a retractable device making them capable of working between two successive plants in the same row.

This part of ISO 4254 is not applicable to environmental hazards or electromagnetic compatibility. It is not applicable to hazards related to moving parts for power transmission, except for strength requirements for guards and barriers, nor to maintenance or repairs carried out by professional service personnel.

NOTE 1 Specific requirements related to road traffic regulations are not taken into account in this part of ISO 4254.

NOTE 2 Vibrations are not regarded as a significant hazard in the case of mounted, semi-mounted or trailed machines.

This part of ISO 4254 is not applicable to power-driven soil-working machines which are manufactured before the date of its publication.

When requirements of this part of ISO 4254 are different from those which are stated in ISO 4254-1, the requirements of this part of ISO 4254 take precedence over the requirements of ISO 4254-1.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100-1 and ISO 4254-1 and the following apply.

3.1
power-driven soil-working machine
machine with powered tools designed for modifying soil structure or profile and/or for incorporating plant and crop residues or animal manure during tillage

NOTE See Annex B for examples of such machines.

3.2
attachment
equipment which can be fitted to a power-driven soil-working machine and which allows the function of the machine to be modified

3.2.1
attachment preventing access
attachment which restricts access onto the top of the power-driven soil-working machine and its driven tools at the rear

EXAMPLE Seed drills.

3.2.2
attachment not preventing access
equipment which allows access onto the top of the power-driven soil-working machine

EXAMPLE Frames, rollers or harrows.

4 Safety requirements and/or measures

4.1 General

Machinery shall comply with the safety requirements and/or protective measures of this clause. Unless otherwise specified in this part of ISO 4254, the machine shall comply with the requirements of ISO 4254-1.

The compliance with the safety requirements and/or measures shall be verified in accordance with Clause 5.

4.2 Noise reduction at the design stage

The main noise sources when operating power-driven mounted, semi-mounted and trailed soil-working machines are the tractor, the engagement of tools with the soil — neither of which is under the control of the machine manufacturer — and the gearbox of the machine. Appropriately designed gearwheels, drives and oil bath lubrication and cooling may be seen as measures for noise reduction at the design stage.

4.3 Protection against inadvertent contact with power-driven tools

4.3.1 Machines shall be designed or guarded in accordance with 4.3.1.1 to 4.3.1.5 in order to avoid inadvertent contact with the powered tools at the front, rear, sides and top of the machine during normal operation and service.

4.3.1.1 At the front, sides and rear of the accessible zone shown in Figure 1, a barrier shall extend from the outermost path of the tools to a distance, a, beyond the path of the tools as shown in Figure 2 a) and b).

4.3.1.2 On the top of the machine, the area between the barriers shall be guarded as follows.

a) The area covering the tools up to the outermost points of their path shall be guarded by a solid guard.

b) The area between the barriers and the edge of the top guard shall be covered in such a way that it is not possible to gain access to the tools. This guarding may be achieved by a guard, any suitable part of the machine or a combination of both.

4.3.1.3 On the sides and rear of the machine, when in the working position, for the guard covering the parts of the tools above the ground, distance a may extend to less than 200 mm (see Figure 3).

4.3.1.4 At the rear of the machine when the guard is hinged, its lower edges shall be at a minimum distance, d, in any position, in accordance with the dimensions shown in Figure 4.

4.3.1.5 The top guard, barriers and those parts of the machine ensuring the guarding shall be able to withstand a vertical downward load of 1 200 N. In addition, the barriers shall be capable of withstanding the following horizontal loads:

a) 600 N for machines with a horizontal axis intended to be used with a tractor where the maximum power is $\leqslant$ 37 kW according to 6.1 h);

b) 1 000 N for all other machines.

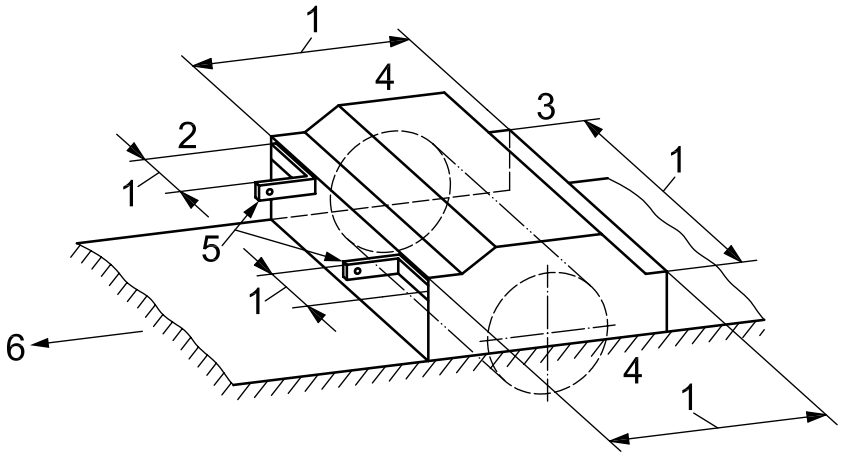
4.3.2 The guard at the rear may be moveable or removable in order to permit the fitting of attachments. Attachments that afford equivalent protection to that provided by the rear guard may be used in place of the guard, provided that the following provisions are met.

a) Such parts or such attachments shall not be power driven.

b) Access to the driven tools shall be prevented by a barrier at any point on line ZY as shown in Figure 2 c). The area between the barrier and the top of the machine shall be covered in accordance with 4.3.1.2 b).

c) When attachments preventing access (see 3.2.1) are fitted, it shall not be possible to gain access to the power-driven tools of the soil-working machine through the shaded area shown in Figure 5. This means that for attachments preventing access, the guarding at the rear according to 4.3.1.1 and 4.3.1.2 b) shall extend a minimum 550 mm from both sides of the machine.

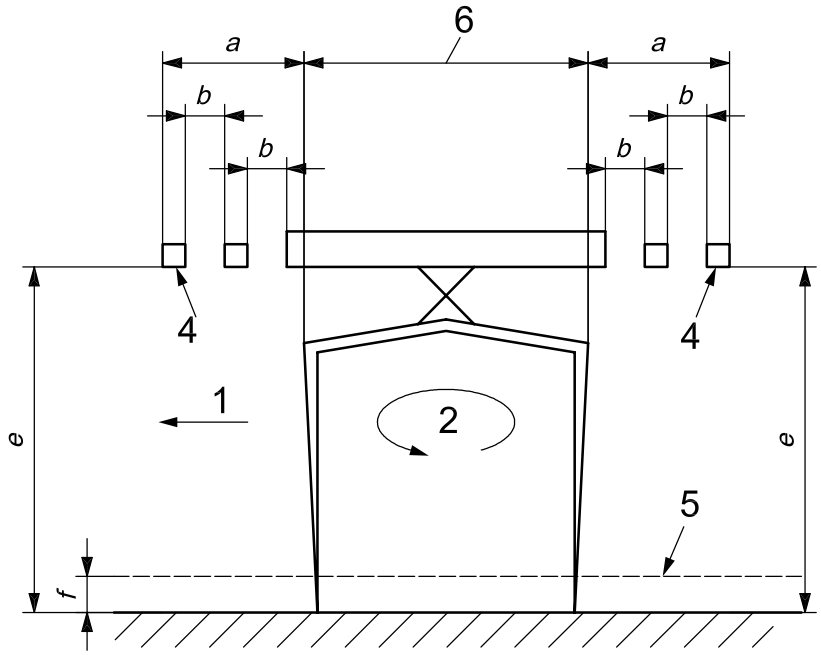
4.3.3 When a soil-working machine with powered tools can be used without machine components or tools normally serving as a guard according to 6.1 a) and b), the machine shall be designed in such a way that an alternative guard (supplied by the manufacturer) can be fitted.



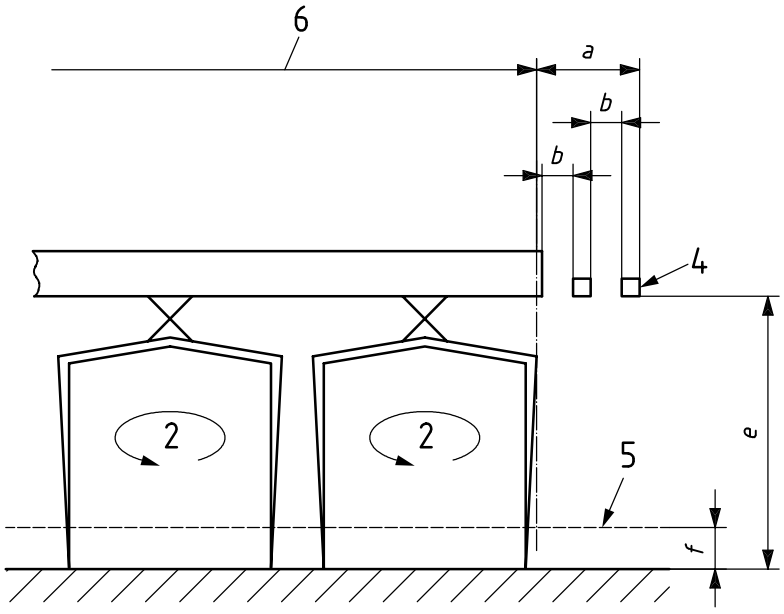
Key

1	accessible zone	4	sides
2	front	5	lower hitch points
3	rear	6	forward direction (rear-mounted machine)

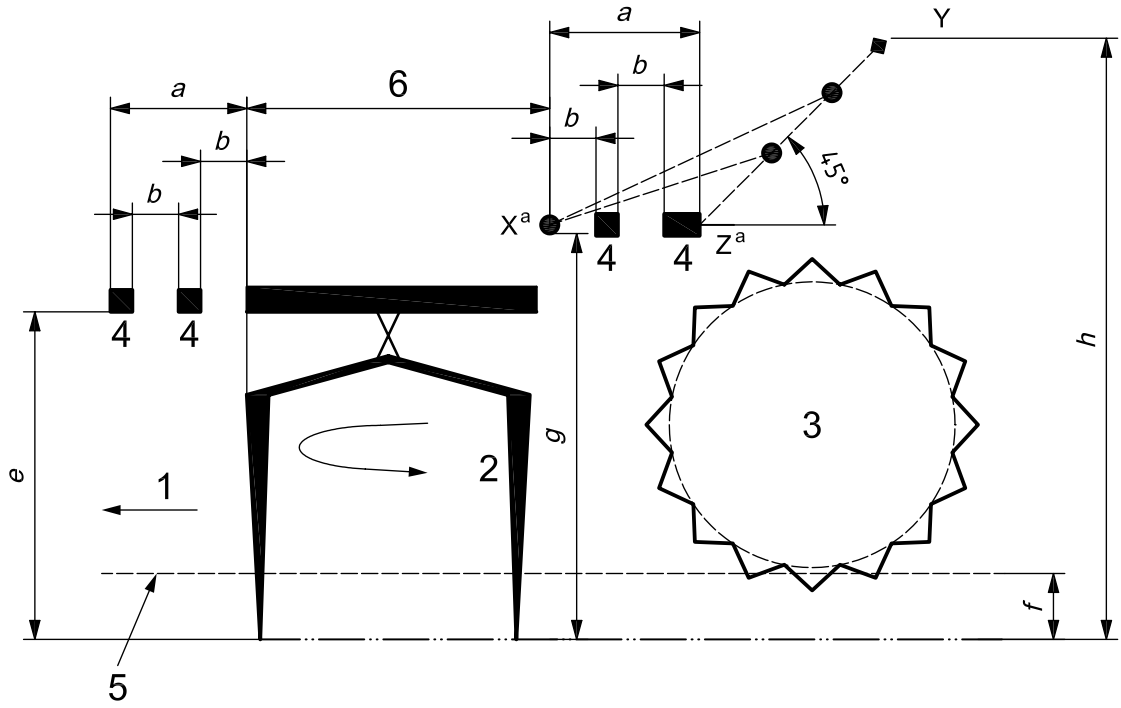
Figure 1 — Accessible zones (see 4.3.1)



a) Front and rear barriers (see 4.3.1)



b) Side barriers (see 4.3.1)



c) Rear guarding (see 4.3.2)

Dimensions in millimetres

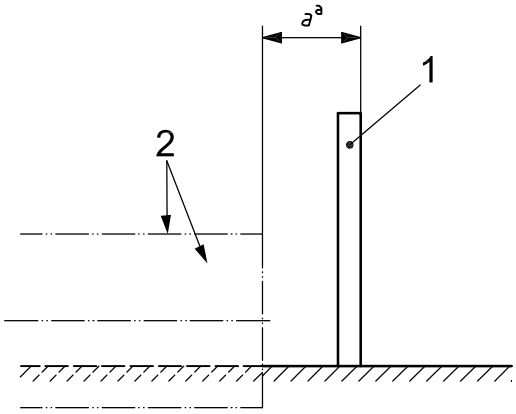
a	*b*	*e–f*	*g–f*	*h–f*
⩾ 200	⩽ 60 at front ⩽ 80 at rear and sides	⩽ 400	⩽ 500	⩽ 700
f working depth according to information given by manufacturer in operator's manual				

Key

1 direction of travel
2 power-driven tool
3 depth control roller
4 barrier
5 ground surface
6 tool path

a See 4.3.2 b).

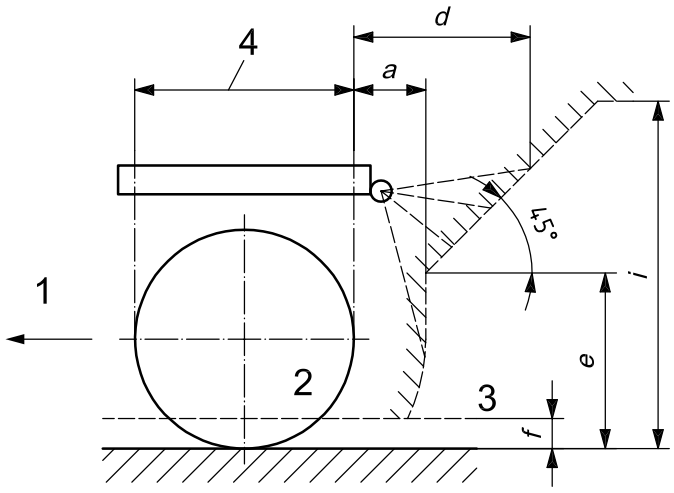
Figure 2 — Guarding and barriers — Dimensions



Key

1 guard
2 path of power-driven tool
a Extent of barrier in accordance with 4.3.1.3.

Figure 3 — Lateral guard (see 4.3.1.3)



Dimensions in millimetres

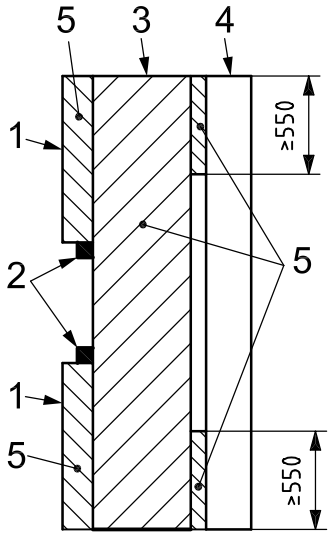
a	*e–f*	*i–f*
⩾ 200	⩽ 400	⩽ 800
d minimum distance according to 4.3.1.4 *f* working depth according to information given by manufacturer in operator's manual		

Key

1 direction of travel
2 power-driven tools
3 ground surface
4 tool path

Figure 4 — Rear protection — Hinged guard dimensions (see 4.3.1.4)

Dimensions in millimetres



Key

1 front barrier
2 lower hitch points
3 power driven machine (tool path)
4 attachment preventing access
5 area to be verified in accordance with Clause 5

Figure 5 — Rear protection by attachments in lieu of guard (see 4.3.2)

4.4 Adjustment of working depth

4.4.1 General

These requirements apply to hand-operated control(s) which need to be actuated when modifying the working depth according to 6.1 j).

4.4.2 Location of controls

It shall be possible for the operator to adjust the working depth by means of hand-operated control(s) that shall be located

a) on the tractor and accessible only from the driving position, or

b) on the machine and accessible by the operator standing on the ground, and

c) outside the shaded area as shown in Figures 6 a) and b), and

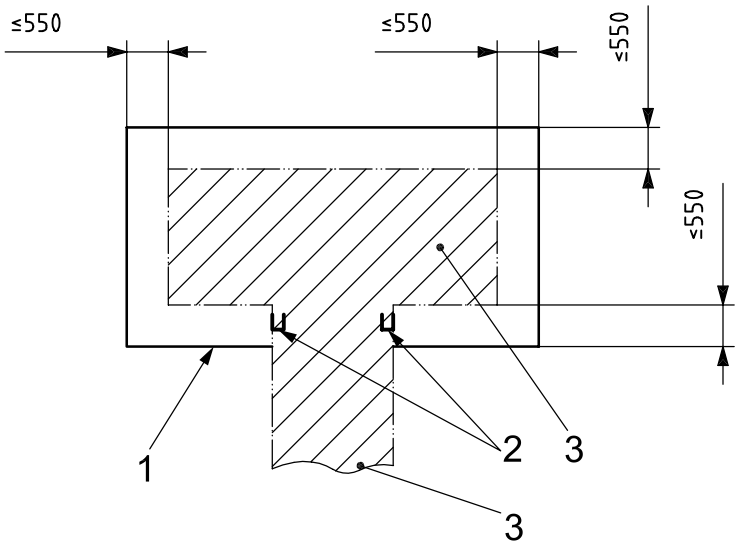
d) on the top, sides, front or rear of the machine, at a maximum distance of 550 mm from its outermost extremity, with this distance being measured at right angles from the accessible zone (see Figure 1) parallel to the forward direction for hand-operated controls accessible from the front or rear of the machine, and at right angles to the forward direction for those controls accessible from the sides.

If the machine is designed so that rollers or other similar equipment can be used as an integral part of the machine during cultivation, the 550 mm distance specified in d), above, shall be measured from the outermost edge of this machine.

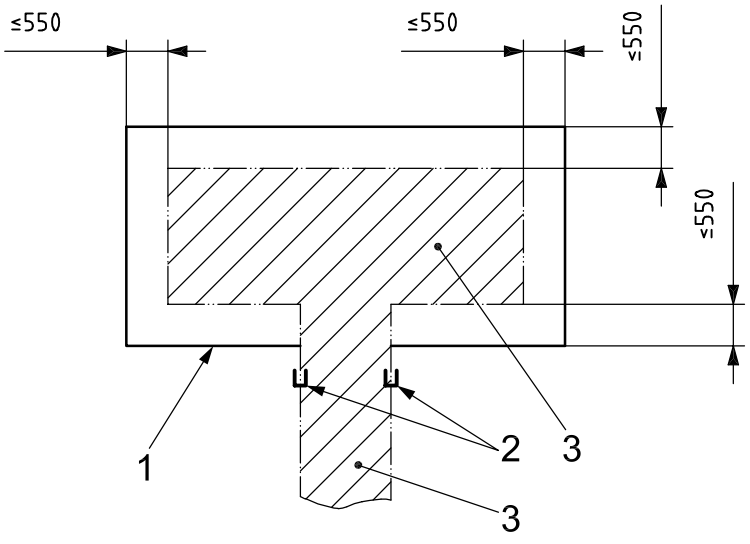
4.4.3 Operation of controls

The adjustment of hand-operated controls shall be possible with the working tools stopped.

Dimensions in millimetres



a)



b)

Key

1 outer limits of machine
2 lower hitch points
3 hand-operated control exclusion area

Figure 6 — Exclusion area for hand-operated controls for adjusting working depth (top view)

5 Verification of safety requirements or protective measures

See Table 1.

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

Clause/subclause	Verification		
	Inspection	Measurement	Procedure/reference
4.1	X	X	Shall be verified in accordance with ISO 4254-1.
4.3	X	X	Passing through the area between the barriers, machine components and the edge of the top guard shall be verified using a 61 ± 1 mm and 81 ± 1 mm diameter spherical test gauge, respectively. This test gauge shall be of mild steel and shall be applied by hand. The machine and its guards shall be set in any of the guard's or machine's positions. The strength of the guards and barriers shall be tested in accordance with ISO 4254-1:2008, Annex C.
4.4	X	X	Shall be verified in accordance with 6.1.

6 Information for use

6.1 Operator's manual

The information and items given in ISO 4254-1 apply were relevant.

In particular, the following information shall be included, as applicable:

a) hazards resulting from the fitting of attachments (see 4.3.2 and 4.3.3);

b) the need to mount the alternative guard supplied with the machine (if applicable, see 4.3.3);

c) instructions for the adjustment of rear-hinged protective devices (see 4.3.1.4);

d) the fact that the stability and steering of the tractor can be affected by mounted machines when they are raised for transport;

e) hazards caused by power-driven tools;

f) hazards caused by the rearward ejection of materials;

g) the prohibition to climb onto the machine when it is in operation;

h) the maximum power of the tractor (see 4.3.1.5);

i) information on the minimum working depth

j) instructions on adjusting the controls needed to modify the working depth (see 4.4).

6.2 Safety and instructional signs

In particular, warnings shall be provided on the machine in all appropriate places drawing the attention to

a) hazards caused by moving parts (e.g. soil engaging tools),

b) hazards caused by the ejection of materials, and

c) the hazard of climbing onto the machine when it is in operation.

Annex A
(informative)

List of significant hazards

Table A.1 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.

Table A.1 — List of significant hazards

No. [a]	Hazard	Hazardous situation and event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.1	**Mechanical hazards**			
A.1.1	Crushing	— Controls	4.4.3; 6.1	4.4
		— Boarding means	4.5; 4.6	—
		— Platforms	4.5; 4.6	—
		— Working tools	4.7	4.3; 4.4; 6
		— Service, maintenance, handling	4.8; 4.14.1; 4.14.3; 4.14.5; 4.14.6	6
		— Stability	6.2	—
		— Mounting of machines	6.2.2; 6.2.3; 6.3	—
		— Folding elements	4.4.5; 4.14.5	—
A.1.2	Shearing	— Controls	4.4.3; 6.1	4.4
		— Boarding means	4.5; 4.6	—
		— Platforms	4.5; 4.6	—
		— Working tools	4.7	4.3; 4.4; 6
		— Service, maintenance, handling	4.8; 4.14.1; 4.14.3; 4.14.5; 4.14.6	6
		— Stability	6.2	—
		— Mounting of machines	6.2.2; 6.2.3; 6.3	6
		— Folding elements	4.4.5; 4.14.5	—
A.1.3	Cutting or severing	— Working tools	4.7	4.3; 4.4; 6
A.1.4	Entanglement	— Working tools	4.7	4.3; 4.4; 6
A.1.5	Drawing-in or trapping	— Working tools	4.7	4.3; 4.4; 6
A.1.6	Impact	— Boarding means	4.5; 4.6	—
		— Folding elements	4.4.5; 4.14.5	—
A.1.7	Stabbing or puncture	— Working tools	4.7	4.3; 4.4; 6
A.1.8	Friction or abrasion	— Controls	4.4.3	4.3; 4.4; 6
		— Electrical equipment	4.9.1	—
		— Boarding means	4.5; 4.6	—

Table A.1 (*continued*)

No. [a]	Hazard	Hazardous situation and event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.1.9	High pressure fluid injection or ejection	— Hydraulic components	4.10; 6.5	—
A.2	**Electrical hazards**			
A.2.1	Contact of persons with live parts (direct contact)	— Electrical equipment	4.9; 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.2.5	Thermal radiation or other phenomena such as the projection of molten particles and chemical effects from short circuits, overloads, etc.	— Electrical equipment	4.9	—
A.3	**Thermal hazards**			
	Burns, scalds and other injuries by a 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 — Hot surfaces	4.12 5.5	— 6
A.4	**Hazards generated by noise**			
	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	— Noise	4.2; 8.1.3	4.2
A.5	**Hazards generated by materials and substances**			
A.5.1	Hazards from contact with, or inhalation of, harmful fluids, gases, mists, fumes and dusts	— Operating fluids	4.10; 4.12	—
A.6	**Hazards generated by neglecting ergonomic principles in machinery design**			
A.6.1	Unhealthy postures or excessive effort	— Controls — Boarding means — Service, maintenance, handling	4.4 4.5; 4.6 4.14.2; 4.14.4	— — —
A.6.2	Missing consideration of hand-arm or foot-leg anatomy	— Controls — Boarding means	4.4 4.5; 4.6	4.4 —
A.6.3	Missing consideration of use of personal protective equipment	— Information for use	8	—
A.6.5	Mental overload and under load, stress	— Controls	4.4	—
A.6.6	Human error, human behaviour	— Controls — Information for use — Signs	4.4 8.1 8.2	— 6 6
A.6.7	Wrong operation due to inadequate design, location or identification manual controls	— Controls	4.4; 6.1	4.4

Table A.1 (*continued*)

No. [a]	Hazard	Hazardous situation and event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.7	**Combination of hazards**	— Individual assemblies	4.13	4.3
		— Information for use	8.1	6
A.8	**Unexpected start-up, unexpected overrun/overspeed**			
A.8.1	Failure/disorder of the control system	— Service, maintenance, handling	4.8	—
		— Electrical equipment	4.9	—
		— Connections	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	—
A.8.5	Errors made by the operator (due to mismatch of machinery with human characteristics and abilities)	— Controls	4.4; 6.1.2	4.4
		— Boarding means	4.5; 4.6	—
		— Mounting of machines	6.2; 6.3	6
		— Service, maintenance, handling	4.14	4.4
		— Information for use	8.1	6
A.9	**Impossibility of stopping the machine in the best possible conditions**	— Controls	4.4; 6.1	—
A.10	**Variations in the rotational speed of tools**	— PTO drive shaft	6.4; 8.1	—
A.11	**Failure of power supply**	— Supports	4.8	—
		— Electrical equipment	4.9	—
		— Connections	6.5	—
		— Folding elements	4.4.5; 4.14.5	—
A.12	**Failure of the control circuit**	— Electrical equipment	4.9	—
A.13	**Errors of fitting**	— Mounting of machines	6.2; 6.3	6
		— Operator's manual	8.1.3	6
A.14	**Break-up during operation**	— Guards and barriers	4.7	4.3.1.5
		— Supports	4.8	—
		— Hydraulic components	4.10	—
		— Pneumatic components	4.11	—
		— Working tools	—	6
A.15	**Falling or ejected objects or fluids**	— Supports	4.8	—
		— Hydraulic components	4.10	—
		— Folding elements	4.14.5	—
		— Working tools	—	6

Table A.1 (*continued*)

No. [a]	Hazard	Hazardous situation and event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.16	**Loss of stability/overturning of machinery**	— Stability	6.2	—
A.17	**Slip, trap and fall of persons (related to machinery)**	— Boarding means	4.5; 4.6	—
Additional hazards, hazardous situations and hazardous events due to mobility				
A.18	**Related to the travelling function**			
A.18.3	Movement without all parts in a safe position	— Folding elements	4.14.5	—
A.19	**Link to the work position**			
A.19.1	Fall of persons during access to (or at/from) the work position	— Boarding means	4.5; 4.6	—
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 — Guards — Supports	4.4.3; 4.5 4.5.1.2 4.6.4 4.7 4.8	— — — — —
A.19.8	Noise at work position	— Operator's work station	4.2	4.2
A.20	**Due to the control systems**			
A.20.1	Unhealthy posture due to inadequate location of manual controls	— Controls	4.4; 4.8.1.2 6.1	4.4
A.20.2	Unhealthy posture due to inadequate design of manual controls and their mode of operation	— Controls	4.4	—
A.21	**From handling the machine (lack of stability)**	— Stability	6.2	—
A.22	**Due to the power source and to the transmission of power**			
A.22.2	Crushing, shearing or entanglement by power transmission between machines	— Power transmission	6.4; 6.5	—
A.22.3	Crushing and shearing when coupling and towing	— Mounting of machines	6.2.2; 6.2.3; 6.3	—
A.24	**Insufficient instructions for the driver/operator**	— Information for use	8.1	6

[a] With reference to ISO 4254-1:2008, Table A.1.

Annex B
(informative)

Examples of power-driven soil working machines

See Figures B.1 and B.2.

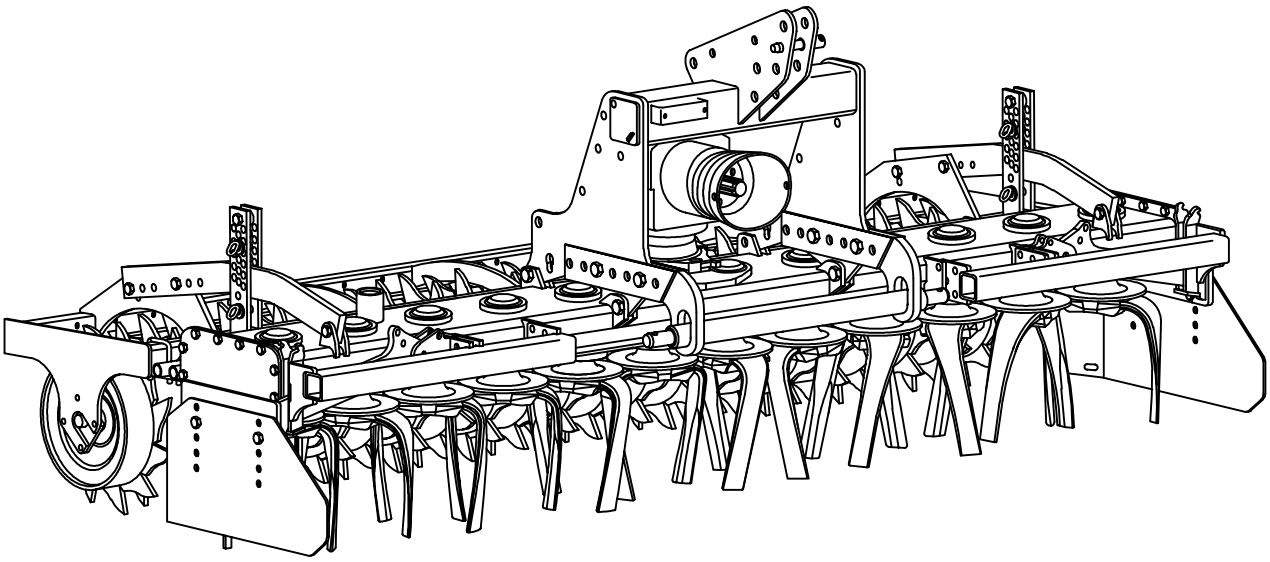


Figure B.1 — Rotary harrow

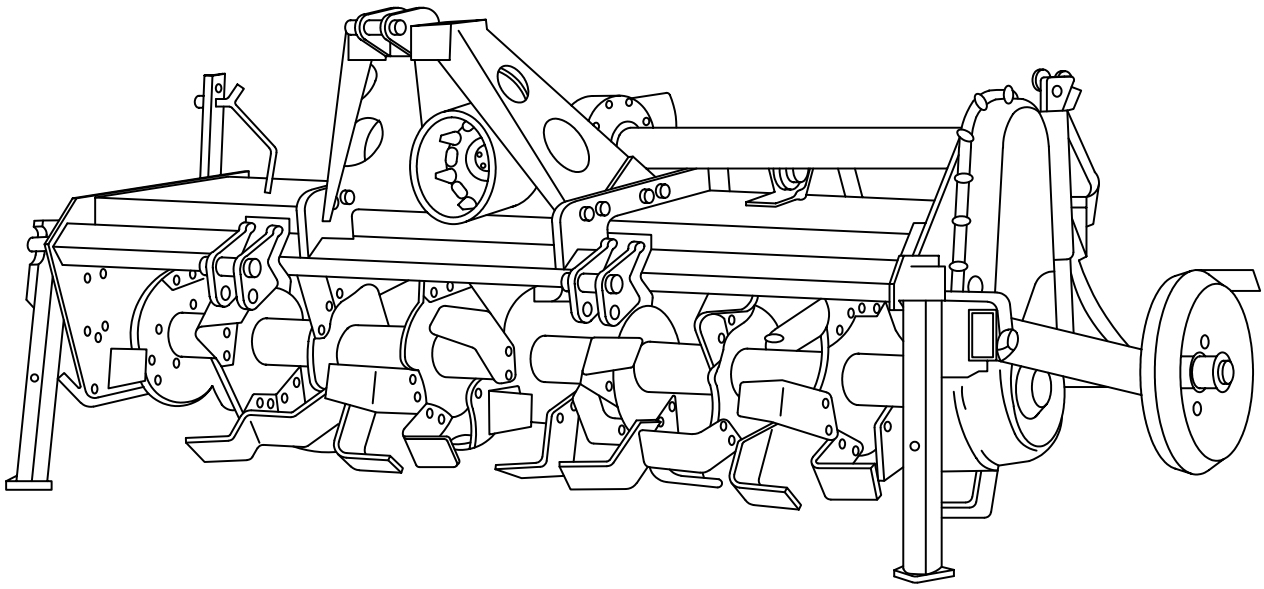


Figure B.2 — Rotary cultivator

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