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Agricultural machinery — Safety —

Part 8: Solid fertilizer distributors

Matériel agricole — Sécurité —

Partie 8: Distributeurs d'engrais solides

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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 4254-8 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 3, *Safety and comfort*.

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

— *Part 1: General requirements*

— *Part 5: Power-driven soil-working machines*

— *Part 6: Sprayers and liquid fertilizer distributors*

— *Part 7: Combine harvesters, forage harvesters and cotton harvesters*

— *Part 8: Solid fertilizer distributors*

— *Part 9: Seed drills*

— *Part 10: Rotary tedders and rakes*

— *Part 11: Pick-up balers*

— *Part 12: Rotary disc and drum mowers and flail mowers*

Part 2, *Anhydrous ammonia applicators*, has been withdrawn, Part 3, *Tractors*, has been cancelled and is to be replaced by ISO 26322 (all parts), *Tractors for agriculture and forestry — Safety*, and Part 4, *Forestry winches*, has been cancelled and replaced by ISO 19472, *Machinery for forestry — Winches — Dimensions, performance and safety*.

Introduction

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

a) type-A standards (basic safety standards) giving basic concepts, principles for design, and general aspects that can be applied to all machinery;

b) type-B standards (generic safety standards) dealing with one safety aspect or one type of safeguard that can be used across a wide range of machinery:

   — type-B 1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);

   — type-B 2 standards on safeguards (e.g. two-hand control devices, interlocking devices, pressure-sensitive devices, guards);

c) type-C standards (machinery safety standards) dealing with detailed safety requirements for a particular machine or group of machines.

This part of ISO 4254 is a type-C standard as stated in ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations or hazardous events are covered are indicated in the Scope of this document. These hazards are specific to solid fertilizer distributors.

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

When requirements of this type-C standard are different from those which are stated in type-A or B standards, the requirements of this type-C standard take precedence over the requirements of the other standards for machines that have been designed and built according to the requirements of this type-C standard.

Agricultural machinery — Safety —

Part 8: Solid fertilizer distributors

1 Scope

This part of ISO 4254, used together with ISO 4254-1, specifies safety requirements and their verification for the design and construction of mounted, semi-mounted, trailed or self-propelled solid fertilizer distributors for solid fertilizer application, i.e. full-width solid fertilizer distributors, solid fertilizer broadcasters, distributors with oscillating tube and line-distributors, as well as solid fertilizer distributors driven by an auxiliary engine with one operator only, used in agriculture and horticulture. In addition, it specifies the type of information on safe working practices (including residual risks) to be provided by the manufacturer.

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.

This part of ISO 4254 deals with all the significant hazards (as listed in Annex A), hazardous situations and events relevant to solid fertilizer distributors used as intended and under the conditions foreseen by the manufacturer, except the hazards arising from:

— equipment for loading fertilizer into the machine, if fitted;

— an auxiliary engine, if fitted.

This part of ISO 4254 is not applicable to the following:

— combined seed and fertilizer drills;

— machines for distributing granulated pesticides;

— pedestrian-controlled distributors;

— knapsack distributors.

This part of ISO 4254 is not applicable to environmental hazards or electromagnetic compatibility; neither is it applicable to hazards related to maintenance or repairs carried out by professional service personnel.

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

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

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

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

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

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

3 Terms and definitions

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

3.1
solid fertilizer distributor
machine which spreads fertilizer in a continuous way on the soil surface and in the crop

3.2
full-width solid fertilizer distributor
solid fertilizer distributor which spreads fertilizer over the surface corresponding to a working width that is roughly the same as the machine width

3.3
solid fertilizer broadcaster
solid fertilizer distributor which spreads fertilizer over the surface corresponding to a working width that is essentially wider than the machine width

3.4
solid fertilizer line-distributor
solid fertilizer distributor which spreads fertilizer in bands separated by bands without fertilizer and which has a working width that is roughly the same as the machine width

4 Safety requirements and/or protective 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.

In addition, the machine shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this document.

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

4.2 Stability when parked and for manual handling

4.2.1 General

The machine shall be designed to be stable in accordance with ISO 4254-1:2008, 6.2.1. This shall be verified according to 5.1.1. See also 6.1 k) and 6.1 q).

4.2.2 Mounted machines fitted with rollers for manual handling when demounted

Machines equipped with transport rollers for manual handling shall be designed to minimize the risk of rollover. This shall be verified according to 5.1.2.

4.2.3 Machines with adjustable supporting devices

It shall be possible to adjust supporting devices, if provided, without going beneath the machine.

This shall be verified by inspection.

4.3 Distributing components

4.3.1 Swivelling and movable components

4.3.1.1 In order to limit the risk associated with overhead power lines, in cases where the implement exceeds 4 m in elevation either during operation or transportation, or at any time when folded elements are being raised to, or lowered from, the transport position, a safety sign shall be provided to inform and warn of the hazard of power line entanglement.

4.3.1.2 A suitable safety message warning of the hazard of contact with overhead power lines shall be included in the operator's manual.

See 4.3.1.5 for verification.

4.3.1.3 In the case of powered operation, the control shall be of the hold-to-run type and the manual control shall be located outside of the swivelling and/or folding zones.

4.3.1.4 A device shall be provided to prevent swivelling or folding elements from moving when they are in transport position. If this locking device is a hydraulic valve not directly fitted to the cylinder, the bursting pressure of the circuit's components from the valve to the cylinder shall be four times its maximum working pressure. Retaining in the transport position may also be achieved by a mechanical device, by gravity in folding/swivelling over centre or by other suitable means.

The unlocking and the unfolding of the elements shall be controlled by separate actions on the part of the operator.

4.3.1.5 The device shall be in accordance with ISO 4254-1:2008, 4.8.

This shall be verified by inspection. See also 6.1 l).

4.3.2 Spreading plates and oscillating tubes

4.3.2.1 Protection against unintentional contact with distributing components

Machines shall be designed or guarded in such a way that any unintentional contact with the distributing components at the front, rear and sides is avoided (e.g. a barrier or a part of the machine). This shall not apply to solid fertilizer distributors with ground-wheel-driven distributing components.

This shall be verified by inspection. See also 6.1 e) and 6.1 m).

4.3.2.1.1 For machines where working heights, h, according to the operator's manual are less than 1 500 mm from the ground, the guarding shall be achieved by the following:

a) a barrier located above the distributing components so that the dimensions shown in Figure 1 and given in Table 1 are respected;

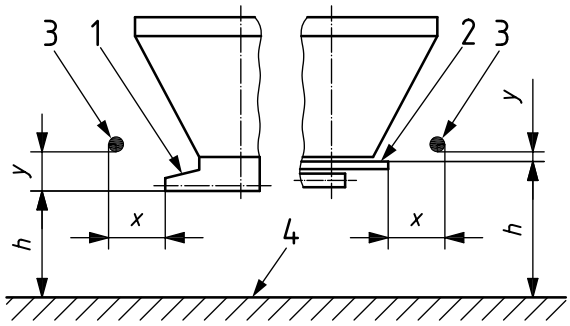
b) when there is a horizontal overlap, at a height of 1 500 mm, between the side of the hopper or structural framework of the machine and the path of motion of the tip of the distributing components (see Figure 2), of

— 200 mm minimum in the case of rotary distributors, or

— 50 mm minimum in the case of oscillating distributors,

a barrier located above the distributing components so that the dimensions given in Figure 2 and Table 2 are respected.

In the case where the barrier is located at least 100 mm inside the external contour of the hopper, then this barrier shall withstand a vertical and a horizontal load of 600 N.



Key

X horizontal distance between tip of distributing components and barrier

Y vertical distance between tip of distributing components and barrier

1 distributing component (oscillating distributor)

2 distributing component (rotary distributor)

3 barrier

4 ground

h maximum working height

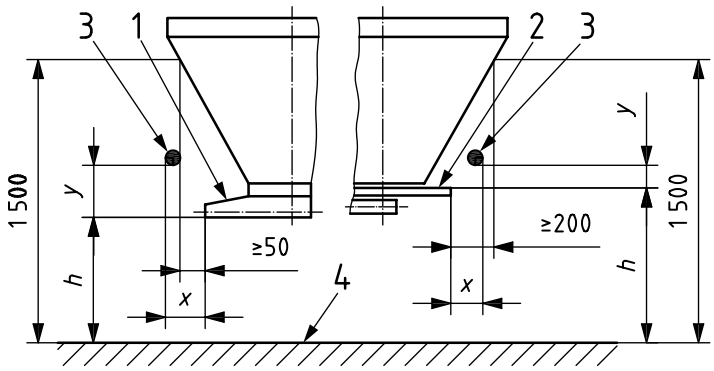
NOTE h, as shown, is given here only as an example.

Figure 1 — Guarding by use of barrier for machines where working height < 1 500 mm — Without horizontal overlap

Table 1 — Distance between tip of distribution components and barrier — Without horizontal overlap

Horizontal distance mm	Vertical distance mm
$100 \leqslant X < 200$	$Y \leqslant 200$
$X \geqslant 200$	$Y \leqslant 300$

Dimensions in millimetres



Key

X horizontal distance between tip of distributing components and barrier

Y vertical distance between tip of distributing components and barrier

1 distributing component (oscillating distributor)

2 distributing component (rotary distributor)

3 barrier

4 ground

h maximum working height

NOTE h, as shown, is given here only as an example.

Figure 2 — Guarding by use of barrier for machines where working height < 1 500 mm — With horizontal overlap

Table 2 — Distance between tip of distributing components and barrier — With horizontal overlap

Horizontal distance mm	Vertical distance mm
$50 \leqslant X < 100$	$Y \leqslant 100$
$X \geqslant 100$	$Y \leqslant 150$

In either case a) or b) above, the dimension $(h + y)$ shall not exceed 1 500 mm.

This shall be verified by measurement and inspection.

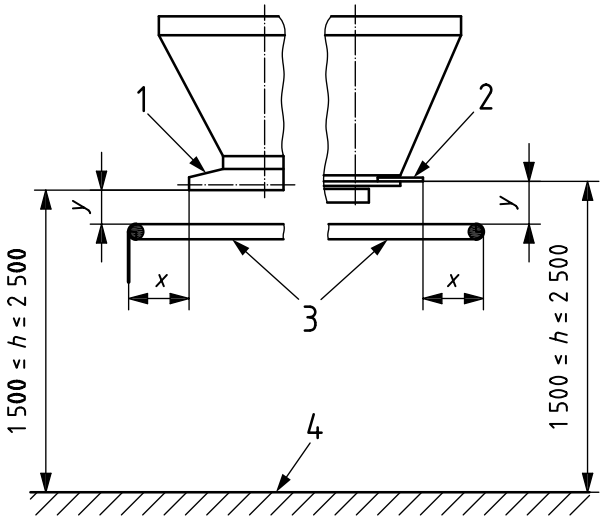
4.3.2.1.2 For machines where the minimum working heights, h, according to the operator's manual are greater than or equal to 1 500 mm, but less than or equal to 2 500 mm, from the ground, the guarding shall be achieved by a barrier located below the distributing components so that the dimensions shown in Figure 3 and given in Table 1 are respected.

This shall be verified by measurement and inspection.

4.3.2.1.3 For machines where working heights, h, according to the operator's manual can be less or greater than 1 500 mm from the ground, the dimensions given in 4.3.2.1.1 and 4.3.2.1.2 apply.

This shall be verified by measurement and inspection.

Dimensions in millimetres



Key

X horizontal distance between outer side of barrier and outer end of distributing component (plate or oscillating tube)

Y vertical distance between axis of barrier and lower level of plate or axis of oscillating tube

1 distributing component (oscillating distributor)

2 distributing component (rotary distributor)

3 barrier

4 ground

h minimum working height(s) according to operator's manual

NOTE *h* is the value calculated from the ground to the distributing components taken on the lower level of the plate or the axis of the oscillating tube.

Figure 3 — Guarding for machines where working height > 1 500 mm

4.3.2.2 Protection against ejection of parts of machine

Parts of distributing components of solid fertilizer broadcasters, such as blades, shall be reliably fixed, e.g. by a fixing bolt with lock-nut.

This shall be verified by inspection.

NOTE A test method on the strength of this device is to be developed.

4.4 Feeding components guarding

4.4.1 Feeding components, agitators, distributing conveyors and flow control regulators that create a drawing-in or trapping hazard shall be guarded or located so as to minimize the risk of unintentional contact.

4.4.2 Hoppers containing feeding components, agitators, distributing conveyors or flow control regulators that do not depend on ground travel of the machine for operation shall be fitted with a grid in accordance with the safety distances given in ISO 13852:1996 Tables 1, 3, 4 and 6, which shall either

— be fixed, as defined in ISO 12100-1:2003, 3.25.1, or

— remain attached to the machine when opened (e.g. by means of hinges) and automatically lock in the closed position without the use of a tool, and needing a tool to be opened, or

— a combination of these alternative grids.

The above requirements shall be verified by inspection and measurement. See also 6.1 r).

When in the closed position, the grid shall meet the strength requirements for vertical load as specified in ISO 4254-1:2008, 4.7.

4.5 Loading

4.5.1 Access for loading

The operator's manual shall specify the loading procedure.

If this procedure includes manual loading, then the height for loading, either manually or with large bags, measured as the vertical distance between the upper edge of the hopper at the loading location and the surface of the ground or the operator platform, and in the position defined in the operator's manual, shall not exceed 1 250 mm (see Figure 4). In case the platform is narrower than the hopper, provisions for indicating the end of a platform to the operator shall be provided. These provisions shall not constitute an obstacle of access. See also 6.1 h) and 6.1 q).

If a loading platform is provided, this platform shall meet the following requirements:

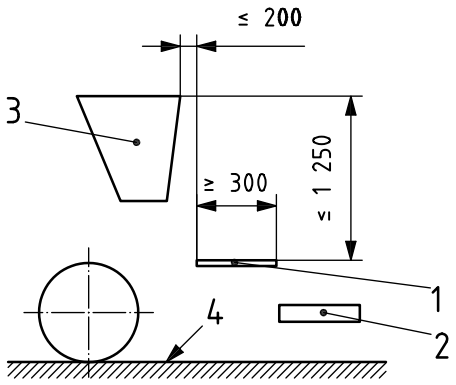
— the minimum width of the platform shall be 600 mm and the minimum depth from back to front shall be 300 mm;

— the distance between the edge of the hopper or the edge of the opened cover and the vertical plane through the edge of the platform shall be 200 mm maximum (see Figure 4);

— a handrail or handhold(s) shall be provided, located either between the hopper and the platform or on the outside of the platform. Platform(s) and steps, if provided, shall meet the requirements of ISO 4254-1.

This shall be verified by measurement and inspection.

Dimensions in millimetres



Key

1 platform
2 step
3 hopper
4 ground

Figure 4 — Loading location

4.5.2 Boarding means to manual loading location

The access to the loading location shall be freely accessible so that the operator does not need to climb over or onto machine components in order to reach the boarding means.

The boarding means shall be in accordance with ISO 4254-1:2008, 4.5.1 or 4.6, and with the requirements given below.

If a platform is provided whose vertical height above the ground exceeds 300 mm, a boarding means with an inclination from the horizontal of less than 70° shall be provided (see Figure 5).

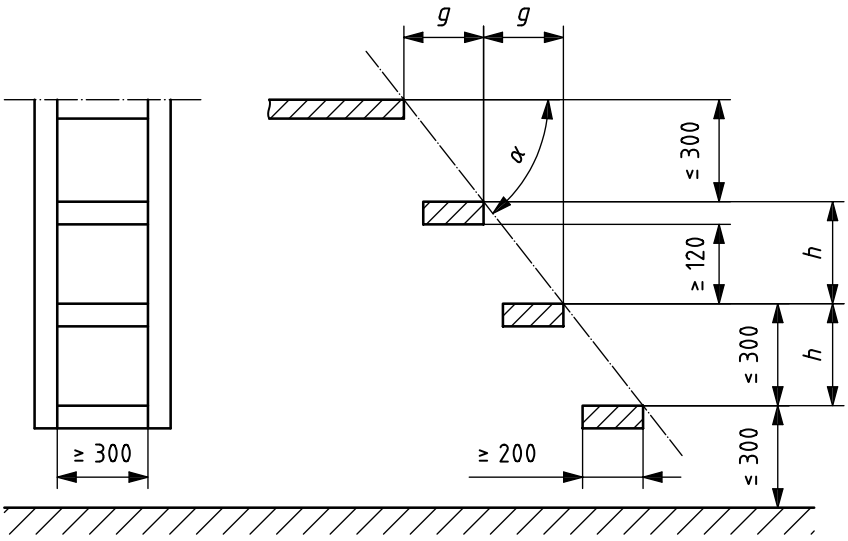
The vertical distance between the lowest step and the ground shall not exceed 300 mm. The steps shall have a depth of at least 200 mm and a width of at least 300 mm (see Figure 5).

The boarding means of a platform located more than 1 200 mm above the ground shall be fitted with at least one handrail or handholds suitably located.

The lower end of the handrail/handhold shall be located at a maximum horizontal distance of 400 mm from the edge of the first step.

Other boarding means, if available, shall meet the requirements of ISO 4254-1:2008, 4.6.

Dimensions in millimetres



Key

α angle of inclination

h height between two successive steps

g depth between two successive steps

Figure 5 — Dimensions of boarding means for loading location when platform provided

4.5.3 Boarding means to mechanically loading locations

Boarding means to service locations shall meet the requirements of ISO 4254-1:2008, 4.6.

4.6 Checking of the hopper contents

It shall be possible to check the contents of the hopper, e.g. the residual volume. In cases where the upper edge of the hopper in its lowest position is more than 1 600 mm from the ground, this shall be accomplished by provision of one or another of a), b) or c), as follows:

a) a platform positioned between 1 200 mm and 1 600 mm from the upper edge of the hopper, whose boarding means complies with ISO 4254-1:2008, 4.6; in cases where the platform is required by body structure to be positioned less than 1 200 mm from the hopper edge,

   — a safety sign shall be provided warning against entering the hopper,

   — the operator's manual shall include an appropriate message instructing the operator not to enter the hopper, and

   — there shall be suitable handholds and foot supports arranged such that three-point contact can be maintained;

b) an inspection window in the hopper wall;

c) other means of checking the level while minimizing the risk to the operator, e.g. level indicator, video camera.

This shall be verified by measurement and inspection.

4.7 Protection against ejection of fertilizer

Solid fertilizer distributors shall be designed so that there is no ejection of fertilizer towards the operator on a 2 m width in a vertical plane, perpendicular to the driving direction of the machine and going through the lower hitching points or towing point.

This shall be verified by measurement and inspection. See also 6.1 f).

NOTE A test method is to be developed for inclusion in a future revision of this part of ISO 4254.

4.8 Flow rate calibration system

When a solid fertilizer distributor is supplied with a flow rate calibration system, it shall be possible for the operator to use it without going beneath the machine during the calibration test while the fertilizer is falling or the machine is working.

This shall be verified by inspection.

4.9 Hitching and clearance zone

For mounted machines, a sufficient clearance between the fertilizer distributor and the tractor shall be ensured for the connection of the driving elements (e.g. transmission), if provided, and/or the steering elements (e.g. electric/hydraulic remote control). This shall be achieved either by

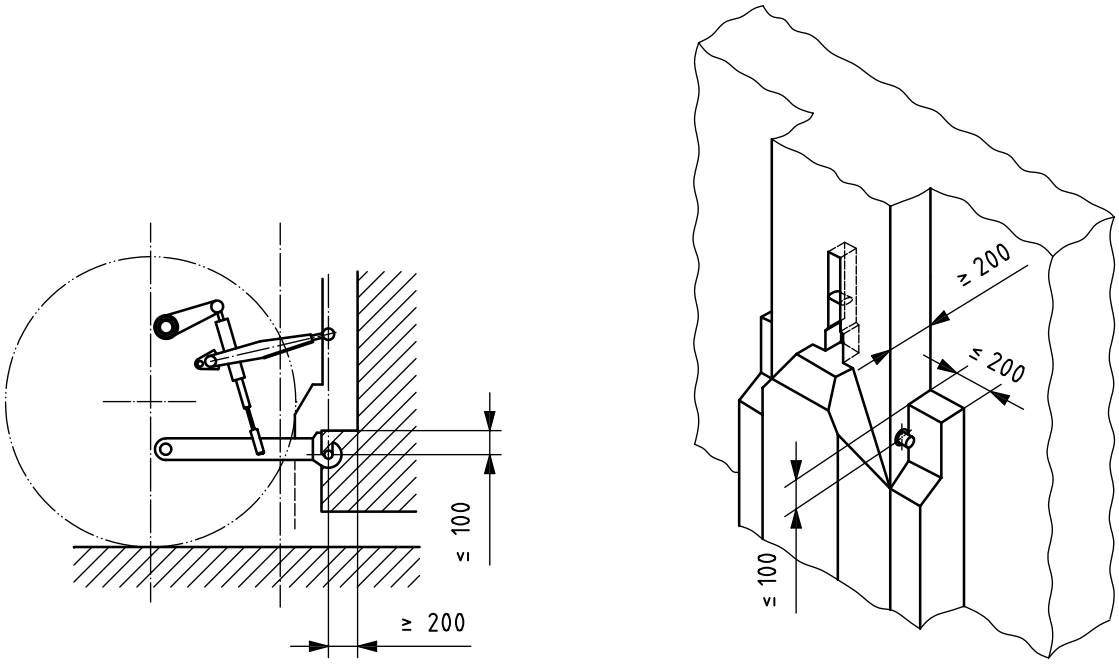
— an increase of the clearance zone shown in Figure 6 on at least one side, so that it is possible to connect the driving and/or steering elements after having coupled the fertilizer distributor, or

— design of the driving and/or steering elements so that their connection is possible before coupling the fertilizer distributor in a comparable clearance zone according to Figure 6.

This shall be verified by measurement and inspection. See also 6.1 j).

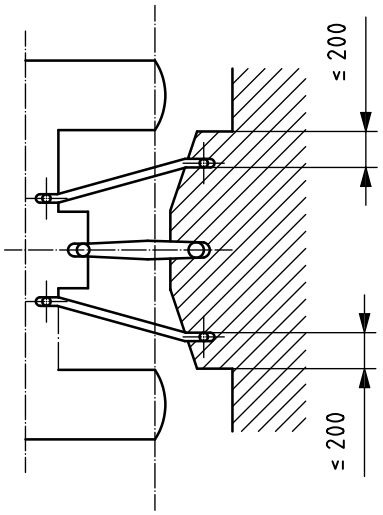
NOTE For PTO (power takeoff)-driven machines and the position and clearance, see ISO 5673-2.

Dimensions in millimetres



a) Side view

b) Global view



c) Top view

Figure 6 — Clearance zone

4.10 Noise

4.10.1 Noise reduction by design

The machine shall be designed to generate a noise level as low as practicable. The main sources of noise are spreading devices and vibrating surfaces.

Machines shall be designed and constructed taking into account the available information and technical measures to control noise at source in the design stage, in accordance with ISO/TR 11688-1.

NOTE In addition, ISO/TR 11688-2 gives useful information on noise generation mechanisms in machinery.

4.10.2 Reduction by information

If, after taking all possible technical measures for reducing noise at the design stage, a manufacturer considers that further protection of the operator is necessary, then adequate information shall be given in the operator's manual.

4.10.3 Noise emission values

Noise emission values, if required to be declared, shall be determined in accordance with ISO 4254-1:2008, Annex B.

5 Verification of the safety requirements and/or protective measures

5.1 Stability when parked and for manual handling

5.1.1 General

The requirement of 4.2.1 shall be verified according to ISO 4254-1:2008, 6.2.1, with the basic hopper(s) filled to half their capacity with test material of a density of 1 t/m^3.

5.1.2 Mounted machines fitted with rollers for manual handling when demounted

The requirement of 4.2.2 shall be checked as follows. Place the machine, parked with the hopper(s) empty according to the manufacturer's instructions, on a horizontal and even plane. Then push it at a speed of 1 $m \cdot s^{-1}$ against a fixed rectangular obstacle 50 mm high with a length at least equal to the distance between the external transport rollers and located on the ground at a right angle to the direction of movement of the machine.

This test shall be carried out moving both forwards and backwards.

The machine shall remain upright.

5.2 Swivelling and movable components

The requirement of 4.3.1.1 shall be verified by measurement as follows: the height of 4 m shall be measured with the machine on horizontal level ground.

6 Information for use

6.1 Operator's manual

The operator's manual shall be in accordance with ISO 4254-1:2008, 8.1.3. See also ISO 12100-2:2003, Clause 6. The following information shall be included, if relevant:

a) that the engine be stopped during maintenance;

b) that all persons not concerned with the machine be kept away;

c) that the load in mounted distributors can influence tractor manoeuvrability and that if the balance of the spreader is affected when partially unloaded, care be taken (see Annex B, which gives recommendations for calculations to be used to ensure stability of the tractor/distributor combination);

d) that persons not enter the machine when the spreading device is running;

e) that the operator avoid wearing loosely fitting clothes that could become entangled with moving parts;

f) that the operator wear personal protective equipment (PPE) when necessary or when required by the manufacturer of the fertilizer (e.g. when handling chemicals);

g) on the hazards involved during removal and refitting of the spreading device, and the instructions to be followed for its handling;

h) the procedures to be followed for the calibration and loading;

i) the need to use a PTO drive shaft equipped with a guard in good condition;

j) instructions concerning the use of automatic and semi-automatic hitching, when provided;

k) a recommendation that the distributor be parked on a horizontal, solid ground with the hopper(s) empty;

l) the risk of unintentional contact with overhead power lines where possible during application operations, e.g. due to uneven ground or use of swivelling and movable components;

m) the need to check that the unlocking procedure does not cause the swivelling and movable components to fall down in an uncontrolled way;

n) the different working heights for which the machine is intended;

o) for ATV (all terrain vehicle)-operated machines, the need to refer to the ATV operator's manual in particular for the stability and maximum loads;

p) the conditions of use to prevent blockages occurring (e.g. in the hopper) and the hazards related to clearing blockages;

q) the need to follow advice concerning manual handling of heavy loads and/or correct procedures for sack handling and lifting;

r) precautions that need to be taken when mounting and demounting extensions on the hopper.

6.2 Safety and instructional signs

Safety and instructional signs shall be in accordance with ISO 4254-1:2008, 8.2. In particular, safety sign(s) shall be provided drawing attention to hazards associated with

— mounting or riding on the machine while it is moving;

— moving and distributing parts;

— ejection of materials;

— climbing on protective structures not designed for boarding purposes.

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 may require specific action by the designer or manufacturer to eliminate or to reduce the risk. See ISO 4254-1:2008, Annex A.

No.[a]	Hazard	Hazardous situation/event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.1	**Mechanical hazards**			
A.1.1	Crushing hazard	— Lack of stability — Swivelling and movable components — Distributing components — Calibration system — Hitching	4.5.1, 4.6, 4.14, 5.1.4	4.2; 6 4.3.1; 6 4.3.2; 6 4.8; 6 4.9; 6
A.1.2	Shearing hazard	— Distributing components — Swivelling and movable components — Feeding components	4.8, 5.1.4	4.3.2; 6 4.3.1; 6 4.4; 6
A.1.3	Cutting or severing hazard	— Swivelling and movable components — Distributing components — Feeding components	4.1, 4.6, 4.14	4.3.1; 6 4.3.2; 6 4.4; 6
A.1.4	Entanglement hazard	— Distributing components — Feeding components	4.1, 4.6, 4.14	4.3.2; 6 4.4; 6
A.1.5	Drawing-in or trapping hazard	— Distributing components — Feeding components	—	4.3.2; 6 4.4; 6
A.1.6	Impact hazard	— Lack of stability — Hitching	4.1, 4.6, 4.8, 4.14	4.2; 6 4.9; 6
A.1.9	High pressure fluid injection or ejection hazard	— Rupture of pressurized hoses	4.10	—
A.2	**Electrical hazards**			
A.2.2	Contact of persons with parts which have become live under faulty conditions (indirect contact)	— Swivelling and movable components	8	4.3.1.1; 4.3.1.2; 6
A.2.3	Approach to live parts under high voltage	— Swivelling and movable components	—	4.3.1.1; 4.3.1.2; 6
A.4	**Hazard generated by noise**			
A.4.1	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	— Noise	4.2, Annex B	4.10; 6

No.[a]	Hazard	Hazardous situation/event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.5	**Hazards generated by materials and substances**			
A.5.1	Hazards resulting from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	— Fuel — Operating fluid — Solid fertilizer	4.12, 5.4, 8.1	4.7; 6
A.6	**Hazards generated by neglecting ergonomic principles in machinery design**			
A.6.1	Unhealthy postures or excessive efforts	— Loading — Hopper — Distributing components — Hitching	4.4.3, 4.5.1, 4.6, 4.14	4.5; 6 4.5; 4.6; 6 4.3.2.1; 6 4.9; 6
A.6.2	Inadequate consideration of hand-arm or foot-leg anatomy	— Access to hopper — Hitching	4.5.1, 4.5.1.3, 4.6, 5.1.1, 5.1.3.3, 5.1.4	4.5; 4.6; 6 4.9; 6
A.13	**Errors of fitting**		6.5, 8.1	6
A.15	**Falling or ejected objects or fluids**	— Distributing components — Solid fertilizer	4.10	4.3.2.2; 6 4.7; 6
A.16	**Loss of stability/overturning of machinery**	— Lack of stability	5.2.1, 6.2.1	4.2; 6
A.17	**Slip, trip and fall of persons (relating to machinery)**	— Access to hopper	4.5.1, 4.5.1.3, 4.4.2, 4.6, 4.12, 5.4	4.5; 4.6; 6
A.19	**Hazards limited to the work position**			
A.19.1	Fall of persons during access to (or at/from) the work position	— Access to hopper	4.5.1, 4.6	4.5; 4.6; 6
A.20	**Hazards due to the control system**			
A.20.1	Inadequate location of manual controls	— Supporting devices — Swivelling and movable components	6.1	4.2.3; 6 4.3.1.2; 4.3.1.3; 6
A.20.2	Inadequate design of manual controls and their mode of operation	— Supporting devices — Swivelling and movable components — High voltage power line	4.4.1, 4.4.2, 4.4.4, 6.1	4.2.3; 6 4.3.1.3; 6 4.3.1.1; 4.3.1.3; 6
A.22	**Hazards due to the power source and to the transmission of power**			
A.22.2	Hazards from transmission of power between machines	— Power transmission	—	—
A.22.3	Hazards from coupling	— Hitching	6.5, 8.1	4.9; 6

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

Annex B
(informative)

Stability of tractor solid fertilizer distributor combination

This annex is related to 6.1 c), which contains a requirement to give information concerning the possible loss of stability of the tractor due to the connection with the solid fertilizer distributor.

The following is recommended to the manufacturer to enable him to provide adequate and complete information.

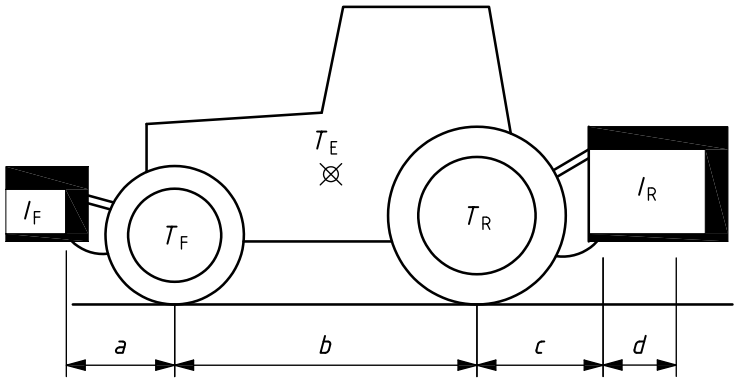
The example given refers to a solid fertilizer distributor mounted on a tractor.

Due to the mass of the machine itself and of the materials present in the hopper, the tractor solid fertilizer distributor combination can become unstable. In order to verify the total stability, the following expression can be applied for the calculation of the minimum ballasting at the front, $I_{F,min}$, which permits a load on the front axle equal to 20 % of the unladen mass of the tractor:

$$I_{F,min} = \frac{\left[I_R \times (c+d)\right] - (T_F \times b) + (0{,}2 \times T_E \times b)}{a+b}$$

NOTE Rear-mounted implement and front/rear combinations are considered for this calculation.

See Figure B.1.



Key

T_E mass of unladen tractor, kg [a]
T_F front axle load of unladen tractor, kg [a]
T_R rear axle load of unladen tractor, kg [a]
I_R combined mass of rear mounted implement/rear ballast, kg [b]
I_F combined mass of front mounted implement/front ballast, kg [b]
a distance from centre of gravity for combined front-mounted implement/front ballast to front axle centre, m [b c]
b tractor wheelbase, m [a c]
c distance from rear axle centre to centre of lower link balls, m [a c]
d distance from centre of lower link balls to centre of gravity for combined rear mounted implement/rear ballast, m [b]

[a] See the tractor instruction handbook.
[b] See price list and/or instruction handbook of the implement.
[c] To be measured.

Figure B.1 — Stability of the tractor distributor combination

Bibliography

[1] ISO/TR 11688-2:1998, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 2: Introduction to the physics of low-noise design*

[2] ISO 5673-2, *Agricultural tractors and machinery — Power take-off drive shafts and power-input connection — Part 2: Specification for use of PTO drive shafts, and position and clearance of PTO drive line and PIC for various attachments*

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