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Agricultural machinery — Safety —

Part 9: Seed drills

Matériel agricole — Sécurité —

Partie 9: Semoirs

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 23, *Tractors and agricultural and forestry machinery*, Subcommittee SC 3, *Safety and comfort*.

This third edition cancels and replaces the second edition (ISO 4254-9:2008), which has been technically revised.

The main changes compared to the previous edition are as follows:

— revision of the 2008 edition under the Vienna Agreement (whole document);

— alignment with ISO 4254-1:2013 and ISO 4254-8:2018;

— addition of terms and definitions (3.5, 3.6 and 3.7);

— modification of control requirements (4.2.2);

— modification of hopper requirements (4.4);

— modification of single seed drills requirements (4.6);

— addition of noise reduction requirements (4.10);

— alignment of the list of significant hazards (Annex A).

A list of all parts in the ISO 4254 series can be found on the ISO website.

Introduction

This document is a type-C standard as stated in ISO 12100.

This document is of relevance, in particular, for the following stakeholder groups representing the market players with regard to machinery safety:

— machine manufacturers (small, medium and large enterprises);

— health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

Others can be affected by the level of machinery safety achieved with the means of the document by the above-mentioned stakeholder groups:

— machine users/employers (small, medium and large enterprises);

— machine users/employees (e.g. trade unions, organizations for people with special needs);

— service providers, e.g. for maintenance (small, medium and large enterprises);

— consumers (in case of machinery intended for use by consumers).

The above-mentioned stakeholder groups have been given the possibility to participate at the drafting process of this document.

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this document. These hazards are specific to seed drills.

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.

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 9:
Seed drills

1 Scope

This document, intended to be used together with ISO 4254-1, specifies the safety requirements, and their verification for design and construction of mounted, semi-mounted, trailed or self-propelled seed drills, including the seeding function of combined seed and fertilizer drills, and seed drills with integrated and inseparable powered soil-working tools 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 document is also applicable to seeding systems where components for seed deposition in the soil, for seed metering and for seed storage are distributed between two or more linked vehicles.

This document deals with all significant hazards (as listed in Annex A), hazardous situations and events relevant to seed drills, when they are used as intended and under the conditions of misuse foreseeable by the manufacturer, excepting the hazards arising from

— electrostatic phenomena,

— external influences on electrical equipment,

— failure of energy supply,

— failure and/or malfunction of the control system,

— inadequate visibility from drivers'/operators' position,

— travelling functions (drive, braking, etc.),

— break down of parts rotating at high speed,

— equipment for loading seeds (and fertilizer), and

— moving parts for power transmission except for strength requirements for guards.

This document is not applicable to

— fertilizer distributors designed only for solid fertilizer application (covered in ISO 4254-8),

— maintenance or repairs carried out by professional service personnel, or

— to environmental hazards (except noise), and

— to seed drills which are manufactured before the date of its publication.

When requirements of this document are different from those which are stated in ISO 4254-1, the requirements of this document take precedence over the requirements of ISO 4254-1 for machines that have been designed and built according to the provisions of this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 4254-1:2013, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 4254-5, *Agricultural machinery — Safety — Part 5: Power-driven soil-working equipment*

ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction*

ISO 13857:2008, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

ISO 14120:2015, *Safety of machinery — Guards — General requirements for the design and construction of fixed and movable guards*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1
seed drill
machine for sowing seeds (e.g. cereals) in a continuous manner

Note 1 to entry: Examples of such machines are given in Annex B.

3.2
seed drill with integrated and inseparable powered soil-working tools
single machine including the functions of seeding and of soil-working powered tools of which neither the *seed drill* (3.1) nor the powered soil working tools can be used separately

Note 1 to entry: Examples of such machines are given in Annex B.

3.3
single seed drill
machine for sowing one seed (e.g. sugar beet) at a time

Note 1 to entry: Examples of such machines are given in Annex B.

3.4
combined seed and fertilizer drill
machine which simultaneously applies seed and fertilizer

3.5
application rate
mass of seed applied per unit area, or number of seeds applied per unit area

3.6
access with load
mounting the machine and carrying, for example, a bag in order to fill the hopper with material

Note 1 to entry: Access with load normally does not allow three point contact.

3.7
access without load
mounting the machine without carrying material as additional equipment used for filling the hopper, for example, filling auger

Note 1 to entry: Access without load normally allows three point contact.

4 Safety requirements, risk reduction and protective measures

4.1 General

Machinery shall comply with the safety requirements, risk reduction, and protective measures of this clause. Unless otherwise specified in this document, 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.

In case of seed drills with integrated and inseparable powered soil-working tools, these tools shall be protected in accordance with ISO 4254-5.

4.2 Controls

4.2.1 For seed drills mounted at the rear of integrated and inseparable powered soil-working machines, manual controls for the adjustment of the seed drills shall meet the following requirements:

a) adjustments shall be possible at standstill (travel speed 0 km/h);

b) manual controls shall be located so that the operator does not need to be at the front of the machine or in a hazard zone to activate them, which is met if

   — manual controls are accessible to the operator standing on the ground and not located in the shaded area as shown in Figure 1, or

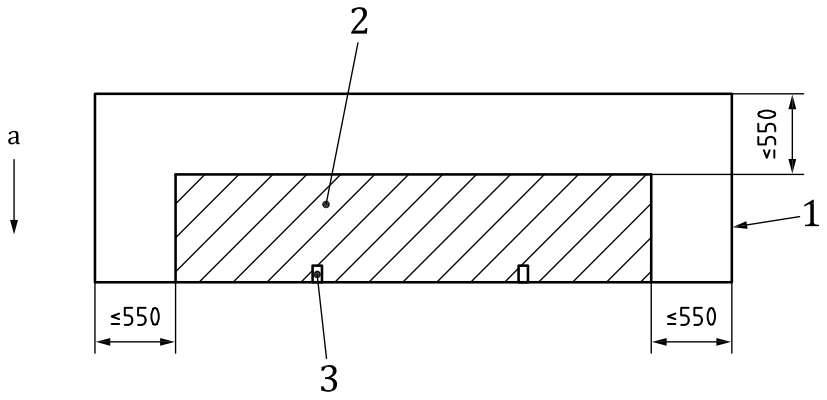
   — manual controls are accessible to the operator standing on a place fulfilling the requirements of ISO 4254-1:2013, 4.8.2.

This shall be verified by measurement and inspection.

Markers are excluded when determining the outer limits of the seed drill.

See also 6.1 a).

Dimensions in millimetres



Key

1 outer limits of the seed drill

2 area in which the manual controls for the adjustments shall not be located

3 lower coupling points of the machine, if provided

a Forward direction.

Figure 1 — Area where the manual controls for the adjustments shall not be located (in case of seed drills to be mounted at the rear of integrated and inseparable soil-working machines)

4.2.2 When 4.2.1 does not apply, manual controls for the adjustments located on the machine shall meet the following requirements:

a) adjustments shall be possible at standstill (travel speed 0 km/h);

b) manual controls affecting the machine as a whole and accessible to the operator standing on the ground shall not be located in the shaded area as shown in Figure 2 or the manual controls are accessible to the operator standing on a place to stand in accordance with ISO 4254-1:2013, 4.8.2;

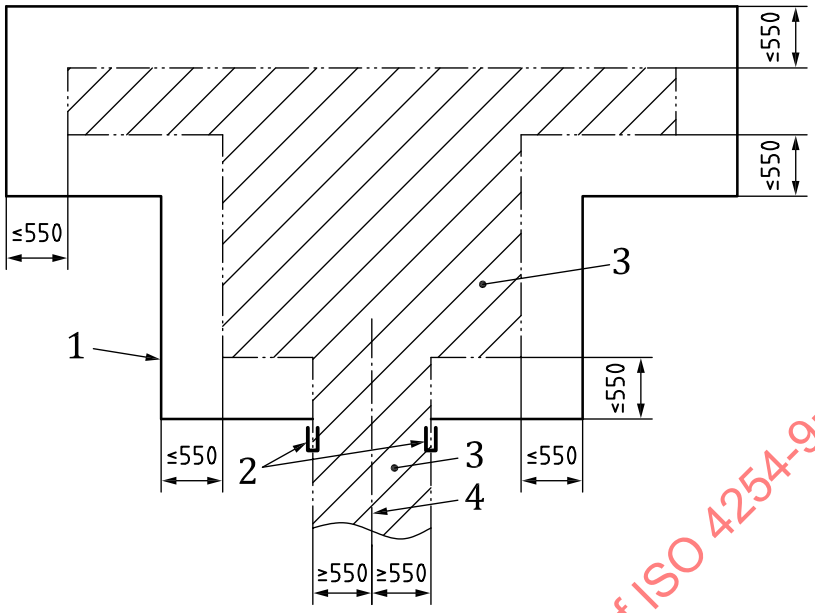
c) when required by machine configuration, adjustment controls for individual row units specified in the operator's manual may be located in the shaded zone.

This shall be verified by measurement and inspection.

Markers are excluded when determining the outer limits of the seed drill.

See also 6.1 a), b) and c).

Dimensions in millimetres



Key

1 outer limits of the machine
2 lower coupling points (shown only for information)
3 area where the manual controls for the adjustments shall not be located
4 axis of PTO drive shaft

Figure 2 — Area where the manual controls for adjustments shall not be located (in case of stand-alone seed drills)

4.3 Swivelling and folding components

To limit the risk associated with overhead power lines, swivelling and folding components shall be in accordance with ISO 4254-1:2013, 8.2.3 p) and 8.3.4.

See also 6.1 d) and e).

4.4 Hoppers

4.4.1 Cover

Shearing and pinching hazards in case of unintentional closing (for example due to wind) shall be avoided.

If a hopper cover is provided and if the mass of the cover is greater than 10 kg, means shall be provided to retain the cover to the hopper and the cover shall be provided with one or more handles. The handles may be integral parts of the cover, provided the handles are suitable designed and clearly identified (e.g. by shape or colour).

4.4.2 Moving components

4.4.2.1 For machines with moving components inside the hopper such as rotating agitators or feed augers which show an entanglement, drawing-in, crushing or shearing hazard, access to these components shall be prevented by

— fixed guard according to ISO 12100:2010, 6.3.3.2.2 and ISO 14120, or

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

— a combination of fixed and movable guards (in case a grid is used as guard, the grid apertures and location shall comply with the safety distances given in ISO 13857:2008, Tables 3, 4 and 6 in closed position), or

— guard that causes the drive of the moving components to stop when opened or removed and prevents starting with the guard open, or

— designing the access to the hopper in such a way that access to hazardous components is prevented when in motion and the movement of the hazardous components is prevented when access means are in the position for use.

For specific operations (e.g. calibration of the flow rate, emptying of residues, cleaning) starting the moving components shall be possible only if additional safety measures are applied, e.g. limitation of speed, hold-to-run control.

These requirements shall be verified by inspection and measurement. See also 6.1 f), g), h), i) and j).

When in the closed position, this guard (grid) shall meet the strength requirement for the vertical load as specified in ISO 4254-1:2013, 4.10.

If the manufacturer recommends the use of a special device (e.g. a hand rake) in the operator's manual in order to facilitate the filling or to remove blockages, this device and a location on the machine for storage in the filling area shall be provided. See also 6.1 k).

4.5 Loading

4.5.1 Operator access to loading locations without load

The access to the loading location around the hopper shall comply with ISO 4254-1:2013, 4.8.

4.5.2 Operator access to loading location with load

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

The height for loading 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, in the position defined in the operator's manual, shall not exceed 1 250 mm (see Figure 3).

4.5.2.2 If a platform is provided the vertical height of which above the ground exceeds 300 mm, a boarding means with an inclination (α) from the horizontal of less than 70° shall be provided (see Figure 4).

The vertical distance between the lowest step and the ground shall not exceed 300 mm and shall be freely accessible. The steps shall have at least a depth of 200 mm and at least a width of 300 mm (see Figure 3). For single seed drills, the width of the steps shall be at least 240 mm.

The boarding means to 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 approaching side.

4.5.2.3 If a loading platform is provided, this platform shall comply with ISO 4254-1:2013, 4.7.2 and shall meet the following requirements (see Figures 3 and 5).

— The platform shall be continuous, unless prevented by construction of the seed drill; in this case, the platform may consist of several parts; if the platform is narrower than the hopper, provisions to indicate the end of a platform to the operator shall be provided.

— Moveable elements of the platform or boarding means shall be so arranged that they cannot come in contact with the power take-off or any other powered element.

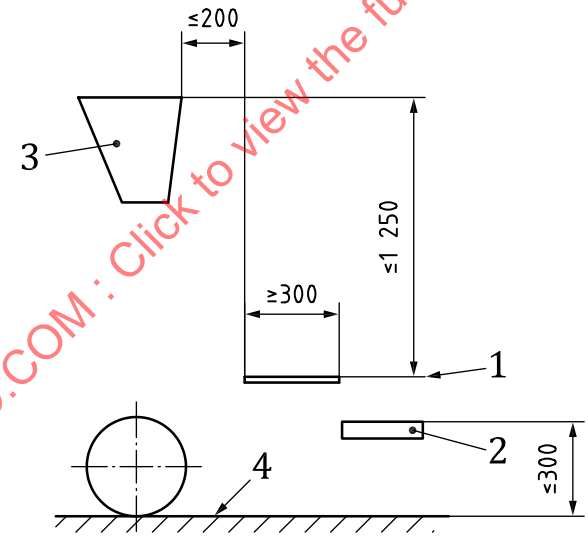
— The minimum width of the platform shall be 450 mm, the minimum depth from back to front shall be 300 mm and the minimum area shall be 0,18 m^2 [see Figures 5 a) and b)], except for seed drills with central hopper and components which restrict possible platform width (see Figure 5 c). For those machines, the minimum width shall be 240 mm and the minimum depth shall be 600 mm. There shall be at least one central platform when the width of the hopper is ≤1 500 mm and there shall be at least two platforms when the width of the hopper opening is over 1 500 mm.

— The distance between the edge of the hopper or the edge of the cover and the vertical plane through the edge of the platform shall be ≤200 mm (see Figure 4).

— A handrail or handholds shall be provided. The handrail or handholds may be integral parts of the hopper provided the handrail or handholds are suitably designed.

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

Dimensions in millimetres

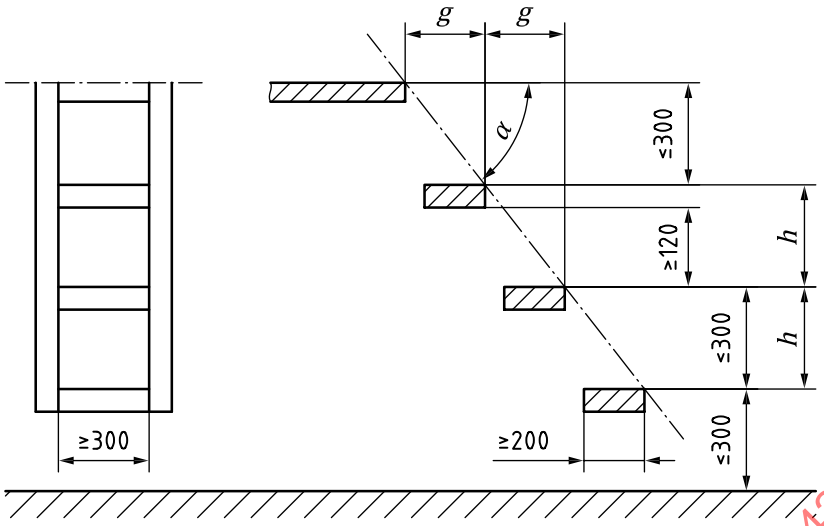


Key

1 platform
2 step
3 hopper
4 ground

Figure 3 — Loading location

Dimensions in millimetres



Key

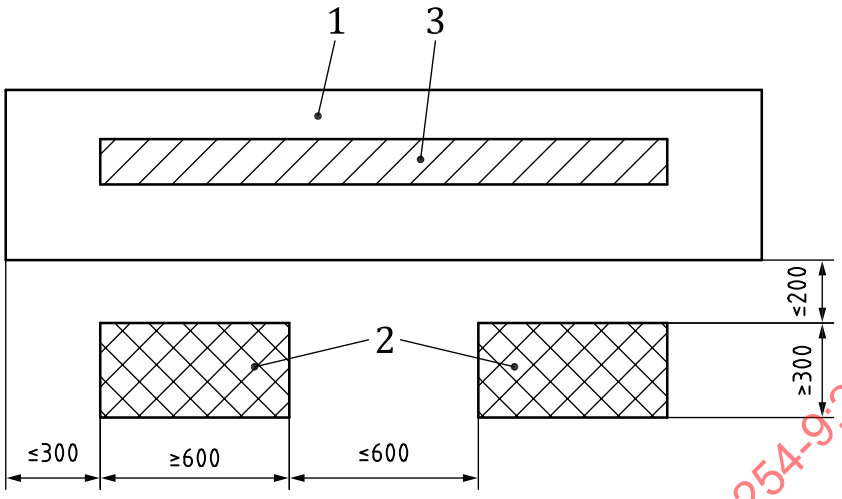
α angle of inclination

h height between two successive steps

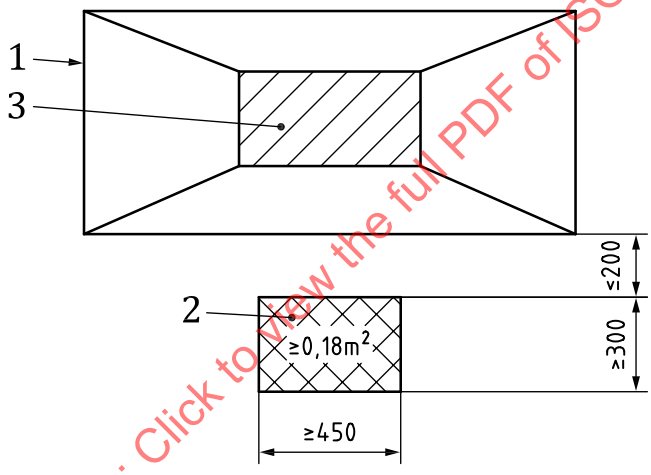
g depth between two successive step nosing

Figure 4 — Dimensions of boarding means for loading location when a platform is provided

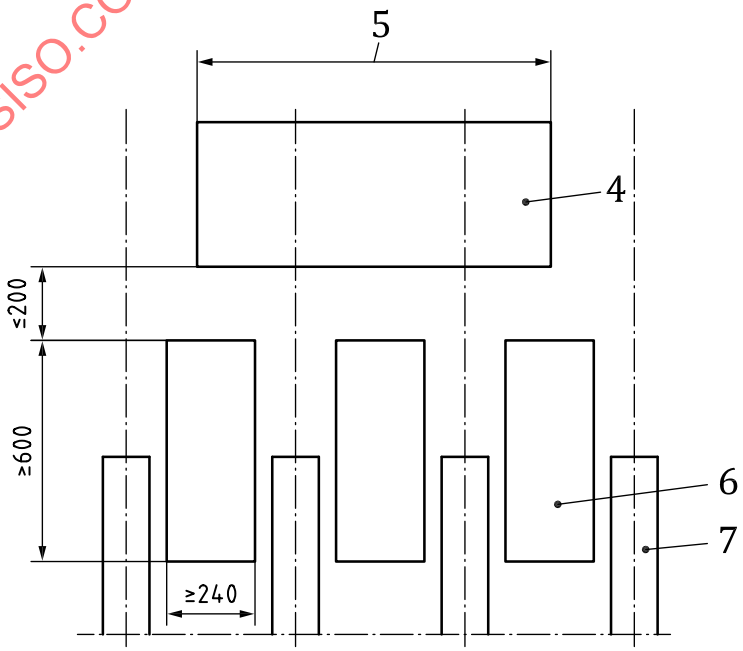
Dimensions in millimetres



a) Seed drills with hopper for loading and levelling over the whole width



b) Seed drills with hopper for centralised loading



c) Seed drill with a central hopper

Key

1	hopper	5	width of the hopper
2	platform	6	platform
3	area of dosage device	7	seeding unit
4	contour of hopper opening		

NOTE For single seed drills with a central hopper, the minimum number of platforms is linked to the width of the hopper. See 4.5.2.3.

Figure 5 — Dimensions of platforms

4.5.3 Other boarding means

Other boarding means, if available, shall meet the requirements of ISO 4254-1:2013, 4.8.3.

4.6 Single seed drills

In addition to the requirements already given in 4.4.2, the following requirements apply only to single seed drills:

— ground-wheel-driven power transmission parts shall be guarded at the outer side of the outer seeding units;

— non-ground-wheel driven power transmission parts which are located at a distance less than 850 mm from the outside edges of the machine or from the outside edges of the platform shall be guarded against drawing-in, trapping or entanglement hazards.

If seeding units are interchangeable, the operator's manual shall specify that only those units with covered power transmission parts shall be fitted on the outside of the seed drill.

This requirement shall be verified by inspection and measurement. See also 6.1 m) and n).

4.7 Blower

When a seed drill is fitted with a blower, the blower shall be placed or protected in such a way that when the machine is operating, it shall not be able to draw in or discharge foreign matter which could injure the operator. This shall be verified by inspection.

Access to rotating parts of blowers through outlet or intake areas shall be prevented by fixed guards. In addition, safety distances for openings shall be in accordance with ISO 13857:2008, Tables 1, 3, 4 and 6. This requirement shall be verified by measurement.

4.8 Flow rate calibration system

When a seed drill 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 and while the seed is falling, or the machine is working.

This shall be verified by inspection and function test.

4.9 Hitching and clearance zone

For mounted machines, a sufficient clearance between the machine and the tractor (or the machine and the integrated and inseparable powered soil-working machine) shall be ensured for the connection of

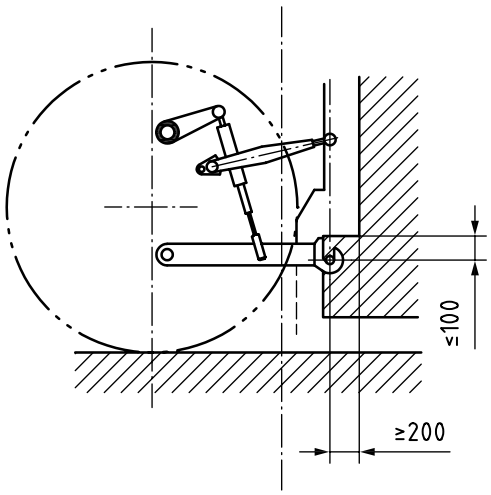
the driving elements (e.g. transmission), if provided, or the steering elements (e.g. electric/hydraulic remote control). This shall be achieved by:

— an increase of the clearance zone between the lower hitching points and the outer contour of the machine of minimum 200 mm, as shown in Figure 6, at least on one side so that it is possible to connect the driving or steering elements after having coupled the seed drill, or

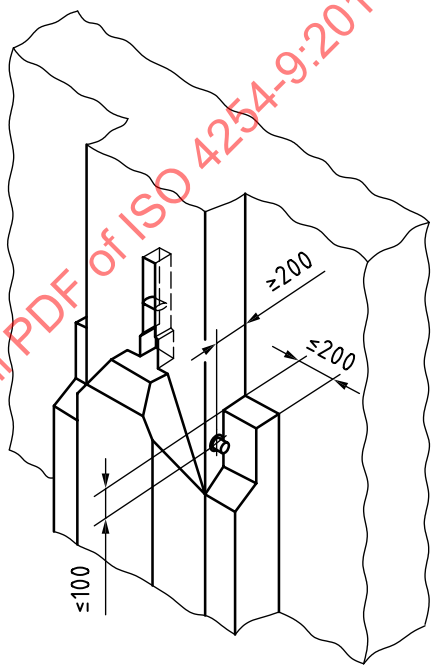
— design of the driving and steering elements so that their connection is possible before coupling the seed drill in a comparable clearance zone according to Figure 6.

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

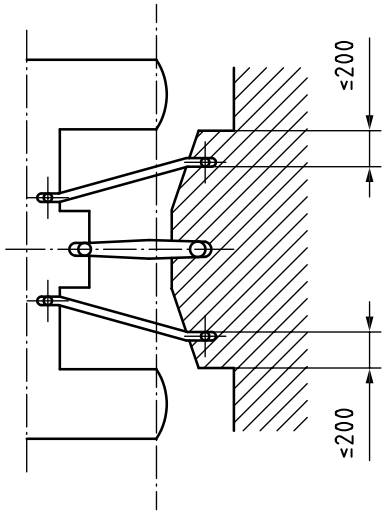
Dimensions in millimetres



a) Side view



b) Global view



c) Top view

Figure 6 — Clearance zone

4.10 Noise reduction as a safety requirement

The machine shall comply with ISO 4254-1:2013, 4.3. The main sources causing noise are

— the blower (applicable only for pneumatic machines),

— the drilling device, and

— the vibrating surfaces.

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

5 Verification of the safety requirements and protective/risk reduction measures

For means of verification, see individual clauses of this document.

6 Information for use

6.1 Instruction handbook

In addition to ISO 4254-1, the following information shall be included in the operator's manual:

a) hazards resulting from a combination, association or coupling of equipment, in particular with integrated and inseparable powered soil-working machine (see 4.2);

b) location and operation of controls for individual row units (see 4.2);

c) nobody shall stand nearby the machine when it is moving (in particular the hazards related to the contact with markers shall be pointed out) (see 4.2 and 4.3);

d) the risk of unintentional contact with overhead power lines where this is possible during application operations, e.g. due to uneven ground or use of swivelling and movable components, requires a risk assessment to be completed before any seeding operation commences in the area to be operated by the machine (see 4.3);

e) the folding of folded components from and into the transport position shall be performed only in areas without overhead power lines (see 4.3);

f) hazards caused by moving components in the hopper (see 4.4);

g) the safe procedures for the adjustments, calibration and loading (see 4.5.1 and 4.8);

h) the operator shall avoid wearing loosely fitting clothes which could become entangled with moving parts (see 4.4);

i) the conditions of use to prevent blockages occurring, e.g. to avoid the use of damp seed (see 4.4);

j) the hazards relating to clearing blockages, e.g. blockages in the coulters due to incorrect lowering of the machine to the ground, and the procedures to be followed (see 4.4);

k) use of special devices, e.g. hand rake (see 4.4);

l) the need to follow advice concerning manual handling of heavy loads and the need to follow correct procedures for sack handling and lifting (see 4.5);

m) the hazards during removal and refitting of the seed units and the instructions to be followed for their handling (see 4.6);

n) which seed units should be fitted on the outside of the machine in case of interchangeable seeding units (see 4.6);

o) instructions concerning the use of automatic and semi-automatic hitching, when provided (see 4.9);

p) that people shall not ascend onto the machine while operating (see 6.2);

q) the need to wear personal protective equipment (PPE) when necessary (see 4.8 and 4.10).

6.2 Safety and instructional signs

The following warnings shall be affixed on the machine, drawing attention to:

— the hazard of riding on a moving machine, which, as appropriate, should be affixed near the means of access, if any [see also 6.1 p)];

— the hazards caused by moving parts, including rotating feed augers and agitators within the hopper, as appropriate.

Annex A
(informative)

List of significant hazards

Table A.1 lists the hazards and hazardous situations and events, as far as they are dealt with in this document, identified by risk assessment as significant for the type of machinery which require action to eliminate or to reduce the risk.

Table A.1 — List of significant hazards associated with seed drills

No.[a]	Hazard	Location or event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this document
A.1	**Mechanical hazards**			
A.1.1	Crushing hazard	— swivelling and movable components — cover of the hopper — calibration system — hitching	4.7.1.2, 4.17, 5.1.4, 6.4.1	4.3, Clause 6 4.4, Clause 6 4.8, Clause 6 4.9, Clause 6
A.1.2	Shearing hazard	— swivelling and movable components — cover of the hopper	4.11, 5.1.4	4.3, Clause 6 4.4, Clause 6
A.1.3	Cutting or severing hazard	— swivelling and movable components — cover of the hopper	4.1, 4.17, 6.4.1	4.3, Clause 6 4.4, Clause 6
A.1.4	Entanglement hazard	— cover of the hopper — drive part — blower	4.1, 4.17, 6.4.1	4.4, 4.5, Clause 6 4.4, 4.6, Clause 6 4.7, Clause 6
A.1.5	Drawing-in or trapping hazard	— drive part — blower	—	4.4, 4.6, 4.9, Clause 6 4.7, 4.9, Clause 6
A.1.6	Impact hazard	— cover of the hopper — hitching	4.1, 4.11, 4.17, 6.4.1	4.4, Clause 6 4.9, Clause 6
A.1.9	High pressure fluid injection or ejection hazard	— rupture of pressurized hoses	4.13	—
A.2	**Electrical hazards**			
A.2.2	Contact of persons with parts which have become live under faulty conditions (direct and indirect contact)	— overhead power line	—	4.3, Clause 6
A.4	**Hazards generated by noise**			

[a] With reference to ISO 4254-1:2013, Table A.1.

Table A.1 *(continued)*

No.[a]	Hazard	Location or event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this document
A.4.1	Hearing loss (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	— noise	4.3, Annex B	4.10, Clause 6
A.5	**Hazards generated by vibration**			
A.5.2	Whole body vibration, particularly when combined with non-ergonomic postures	— platform	4.4	—
A.7	**Hazards generated by materials and substances**			
A.7.1	Hazards from contact with or inhalation of harmful fluids, gases, mists, fumes, and dusts	— seeds		Clause 6
A.8	**Hazards generated by neglecting ergonomic principles in machinery design**			
A.8.1	Unhealthy postures or excessive efforts	— controls — access to loading and hopper — hitching	4.5.3, 4.7.1, 4.8, 4.17	4.2, 4.3, Clause 6 4.5, Clause 6 4.9, Clause 6
A.8.2	Inadequate consideration of hand-arm or foot-leg anatomy	— controls — access to loading and hopper — hitching	4.7.1, 4.7.1.3, 4.8, 5.1.1, 5.1.3.4, 5.1.4	4.2, Clause 6 4.5, Clause 6 4.9, Clause 6
A.8.7	Inadequate design, location or identification of manual controls	— controls	4.5, 6.1	4.2, Clause 6
A.15	Errors of fitting	— seeding units	—	4.6, Clause 6
A.17	Ejected objects	— blower	4.13	4.7, Clause 6
A.18	Loss of stability/overturning of machinery	— lack of stability	5.2.1, 6.2.1	—
A.19	Slip, trip and fall of persons from machinery or during access to (or at/from) the work position	— access to loading	4.7.1, 4.7.1.3, 4.7.2, 4.8, 4.15, 5.4	4.5, Clause 6
Additional hazards, hazardous situations and hazardous events due to mobility				
A.20	**Related to the travelling function**			
A.20.1	Movement when starting the engine	— swivelling and movable components	5.1.8	—
A.20.3	Movement without all parts in a safe position	— swivelling and movable components	—	4.3, Clause 6
A.22	**Due to the control system**			

[a] With reference to ISO 4254-1:2013, Table A.1.

Table A.1 *(continued)*

No.[a]	Hazard	Location or event	Clause/subclause of ISO 4254-1:2013	Clause/subclause of this document
A.22.1	Inadequate location and mode of operation of manual controls	— controls — swivelling and movable components	4.5, 6.1	4.2, Clause 6 4.3, Clause 6
A.24	**Due to the power source and to the transmission of power**			
A.24.2	Hazards from transmission of power	— drive	6.4.1	—
A.24.3	Hazards from hitching	— hitching	5.2.1, 6.3	4.9, Clause 6
[a] With reference to ISO 4254-1:2013, Table A.1.				