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**Agricultural machinery — Safety —**

Part 12:

**Rotary disc and drum mowers and flail  
mowers**

*Matériel agricole — Sécurité —*

*Partie 12: Faucheuses rotatives à disques, faucheuses rotatives à  
tambours et faucheuses-broyeuses*





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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 4254-12 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 7, *Equipment for harvesting and conservation*.

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

- *Part 1: General requirements*<sup>1)</sup>
- *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 13: Large rotary mowers*<sup>2)</sup>

The following part is under preparation:

- *Part 14: Mounted, semi-mounted and trailed bale wrappers*

Part 2, *Anhydrous ammonia applicators*, has been withdrawn; Part 3, *Tractors*, has been cancelled and is replaced by ISO 26322 (all parts), *Tractors for agriculture and forestry — Safety*; and Part 4, *Forestry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*.

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1) 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 (*Guard opening with tool*) and ISO/TS 28924:2007 (*Guard opening without tool*).

2) To be published.

## Introduction

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

- a) Type-A standards (basic standards) giving basic concepts, principles 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 document is a type-C standard as stated in ISO 12100.

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 rotary disc mowers, rotary drum mowers, as used for forage crop harvesting in agriculture only, and flail mowers with horizontal axis for agriculture only, that are mounted, semi-mounted, trailed or self-propelled.

Significant hazards that are common to all the agricultural machines (self-propelled ride-on, 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 type-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 provisions of this type-C standard.



# Agricultural machinery — Safety —

## Part 12:

# Rotary disc and drum mowers and flail mowers

## 1 Scope

This part of ISO 4254, where used with ISO 4254-1, specifies the safety requirements and their verification for the design and construction of rotary disc mowers, rotary drum mowers, as used for forage crop harvesting in agriculture only, and flail mowers with a horizontal axis for use in agriculture only, that are mounted, semi-mounted, trailed or self-propelled. It describes methods for the elimination or reduction of hazards arising from the intended use and reasonably foreseeable misuse of these machines by one person (the operator) in the course of normal operation and service. In addition, it specifies the type of information on safe working practices to be provided by the manufacturer.

Flail mowers with a horizontal axis that can be opened at the rear only for maintenance reasons are included.

This part of ISO 4254 is also applicable to mowers equipped with a conditioning device.

This part of ISO 4254 is applicable only to mowers intended to work at ground level, examples of which are given in A.1.

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 for machines that have been designed and built according to the requirements of this part of ISO 4254.

This part of ISO 4254, taken together with ISO 4254-1, deals with all the significant hazards (as listed in Table 1), hazardous situations and events (with the exception of noise and vibrations) relevant to rotary disc mowers, rotary drum mowers and flail mowers, when they are used as intended and under the conditions of misuse that are reasonably foreseeable by the manufacturer (see Clause 4).

It is not applicable to (see examples in A.2)

- flail mowers that have the rear part which can be opened for particular field use operations,
- mowers with an articulated arm,
- mowers with one or more vertical axes designed for mulching,
- pedestrian-controlled motor mowers,
- lawn mowers,
- inter-row mowing units, or
- machines specifically designed for highway and road maintenance.

This part of ISO 4254 does not deal with environmental hazards, road safety and hazards related to moving parts for power transmission. It does not deal with hazards related to maintenance or repairs to be 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 machines manufactured before the date of its publication.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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 4254-1:2008, *Agricultural machinery — Safety — Part 1: General requirements*

ISO 5718:2002, *Harvesting equipment — Blades for agricultural rotary mowers — Requirements*

ISO 11684:1995, *Tractors, machinery for agricultural and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

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 14982:1998, *Agricultural and forestry machinery — Electromagnetic compatibility — Test methods and acceptance criteria*

ISO 17101-1:—<sup>3)</sup>, *Agricultural machinery — Thrown-object test and acceptance criteria — Part 1: Rotary mowers*

ISO 17101-2:—<sup>3)</sup>, *Agricultural machinery — Thrown-object test and acceptance criteria — Part 2: Flail mowers*

ISO 17103:2009, *Agricultural machinery — Rotary disc mowers, rotary drum mowers and flail mowers — Test methods and acceptance criteria for protective skirts*

## 3 Terms and definitions

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

NOTE For illustrations of mowers and components, see A.1.

**3.1 rotary mower**  
mower in which one or more functional components cut or shear forage crop by impact without mulching and rotate about a vertical axis

**3.1.1 rotary disc mower**  
**rotary mower** (3.1) where the drive line is below the path of the cutting elements

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3) To be published. (Revision of ISO 17101:2004)



**3.1.2****drum mower**

**rotary mower** (3.1) where the drive line is above the path of the cutting elements

**3.1.3****cutting height**

(disc and drum mowers) distance from the ground to the active cutting edge of the cutting element when the cutting element is in the forward-most position of rotation

**3.2****flail mower**

mower with a multiplicity of free-swinging cutting elements that rotate about a horizontal axis, which cuts the crop by impact and mulches it with the same working elements

**3.3****conditioning device**

mechanical device allowing the acceleration of the crop-drying process

NOTE Examples of acceleration of the crop-drying process are crushing, impact, abrasion and lamination.

**3.3.1****roll type conditioner**

**conditioning device** (3.3) that enhances the crop-drying process by passing crop material between, at least, two rollers

**3.3.2****impeller type conditioner**

**conditioning device** (3.3) that enhances the crop-drying process by utilizing tines or spokes to scrub off the wax coating from the crop or bend the stems

**3.4****mulching**

operation intended to chop the crop and leave the material on the ground to naturally decompose

**3.5****protective skirt**

skirt used on the machine to provide protection from thrown objects

**4 List of significant hazards**

Table 1 specifies the significant hazards, the significant hazardous situations and significant hazardous event(s) covered by this part of ISO 4254, that have been identified by risk assessment as being relevant to this type of machine, and which require specific action by the designer or manufacturer to eliminate or to reduce the risk.

Attention is drawn to the necessity to verify that the safety requirements specified in this part of ISO 4254 apply to each significant hazard presented by a given machine and to validate that the risk assessment is complete.

**Table 1 — List of significant hazards associated with rotary disc mowers, rotary drum mowers and flail mowers**

No. <sup>a</sup>	Hazard	Hazardous situation and event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
<b>A.1 Mechanical hazards</b>				
A.1.1	Crushing	Persons in danger zone; Coupling area of machines	4.4.3; 4.5.1.1.2; 4.5.1.2.5; 4.5.2; 4.5.2.2; 4.6; 4.7; 4.8; 4.14.1; 4.14.3; 4.14.5; 4.14.6; 5.1.2.3; 5.1.3.2; 5.1.4; 5.1.8; 5.2; 6.1; 6.2; 6.2.2; 6.2.3; 6.3; 6.4	5.1; 5.4; 5.5; 5.6; 7.1; 7.2
A.1.2	Shearing	Operating area of rotating/oscillating tools; Moving elements; Slewing area of machines and machine parts	4.4.3; 4.5.1.1.2; 4.5.1.2.5; 4.5.2; 4.5.2.2; 4.6; 4.7; 4.8; 4.14.1; 4.14.3; 4.14.5; 4.14.6; 5.1.2.3; 5.1.3.2; 5.1.4; 5.1.8; 5.2; 6.1; 6.2; 6.2.2; 6.2.3; 6.3; 6.4	5.1; 5.2; 5.5; 5.6; 5.7; 7.1; 7.2
A.1.3	Cutting or severing	Operating area of cutting machinery	4.7	5.2; 5.3; 5.5; 5.6; 5.7; 5.8; 5.9
A.1.4	Entanglement	Operating area of rotating machinery; Rotating or oscillating machine parts	4.7; 5.1.8; 6.4	5.1; 5.2; 5.5; 5.6; 7.1
A.1.5	Drawing-in or trapping	Operating area of rotating machinery; Rotary or oscillating machine parts	4.7; 5.1.8; 6.4	5.4; 5.5; 5.8; 5.9; 7.1; 7.2
A.1.6	Impact	Operating area of rotating machinery;	4.5.1.2.5; 4.14.5; 4.14.6; 5.1.3.1	5.2; 5.3; 5.4; 5.5; 5.6; 7.1; 7.2
A.1.10	Ejection of parts		4.7; 4.8	5.3; 5.5; 5.7; 7.1; 7.2
<b>A.6</b>	<b>Hazards generated by neglecting ergonomic principles in machinery design</b>			
A.6.1	Unhealthy postures or excessive efforts	Manual control of the machine	4.4; 4.4.5; 4.5; 4.6; 4.14.2; 4.14.4; 5.1.1; 5.1.2.1; 5.1.3; 5.1.5.2	5.4; 6.1
A.6.6	Human error	Operating area of the machines	4.4; 8.1; 8.2	7.1; 7.2
<b>A.8</b>	<b>Unexpected start-up, unexpected overrun/overspeed</b>			
A.8.1	Failure/disorder of the control system		4.4; 6.1	—
<b>A.11</b>	<b>Failure of power supply</b>	Operating area of the machines; Starting and stopping devices	4.8; 4.8.2; 4.9; 5.1.8; 6.1.1; 6.5 4.4; 5.1.8; 6.1	5.4; 5.5; 5.6
<b>A.13</b>	<b>Errors of fitting</b>		6.2; 6.3; 8.1; 8.1.3; 8.2	7.1
A.13.1	All kinds of guard		4.7	5.1; 5.5; 5.6; 7.1; 7.2
A.13.2	All kinds of safety-related (protection) devices		4.7; 4.14.5; 4.14.6; 5.1.2.3; 6.4	5.1; 5.5; 5.6; 7.1; 7.2
A.13.3	Safety signs and signals		8.2	7.1; 7.3

Table 1 (continued)

No. <sup>a</sup>	Hazard	Hazardous situation and event	Clause/subclause of ISO 4254-1:2008	Clause/subclause of this part of ISO 4254
A.13.4	Essential equipment and accessories for safe adjusting and maintenance		4.8; 4.14	7.1; 7.2
<b>A.16</b>	<b>Loss of stability</b>	Prohibited combinations; Supporting equipment	5.1.2.3; 6.2	7.1
A.16.1	Hazards due to sudden movement, instability, etc.		5.1.2.3; 6.2	5.1, 5.4, 5.5, 7.1, 7.2
<b>A.23</b>	<b>From/to third persons</b>			
A.23.3	Hazards to exposed persons due to uncontrolled movement		5.1.2.3; 5.1.8; 6.2	5.4; 5.5; 5.8; 7.1; 7.2

<sup>a</sup> With reference to ISO 4254-1:2008, Table A.1.

## 5 Safety requirements and/or protective measures

### 5.1 General

**5.1.1** Machinery shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of ISO 12100 for hazards relevant but not significant, which are not dealt with by this part of ISO 4254. The instruction handbook to be provided with the machine shall comply with 7.1. The machine shall also be marked and carry safety signs according to 7.2

**5.1.2** Except where otherwise specified in this part of ISO 4254, the machine shall comply with the requirements of ISO 4254-1 and with Tables 1, 3, 4 and 6 of ISO 13857:2008 as appropriate.

**5.1.3** Machinery shall comply with ISO 14982 for evaluating the electromagnetic compatibility.

### 5.2 Protection against inadvertent contact with the cutting elements

#### 5.2.1 General

The mower shall be designed or guarded in such a way that inadvertent contact during normal operation with the cutting elements from the front, and at the rear, the sides and the top is prevented.

##### 5.2.1.1 Rotary disc mowers and rotary drum mowers

Contact with the cutting elements from the top shall be prevented by an imperforate guard or by the device used to prevent thrown objects (see 5.3), providing it maintains at least an equivalent level of protection .

At any location along the cutting element path that is not either a crop inlet or a crop discharge area, typically the sides and a portion of the rear, the protection shall be achieved by either one or both of the following:

- a) a barrier located in such a way that the distances defined in Figure 1 and Figure 2 are respected. These distances are measured from the cutting element path and with the mower in working position, the cutting height,  $h$ , being adjusted at 50 mm or as near as possible to 50 mm.

NOTE 1 See Figure 2 (Detail A) for the correct method of measuring the cutting height.

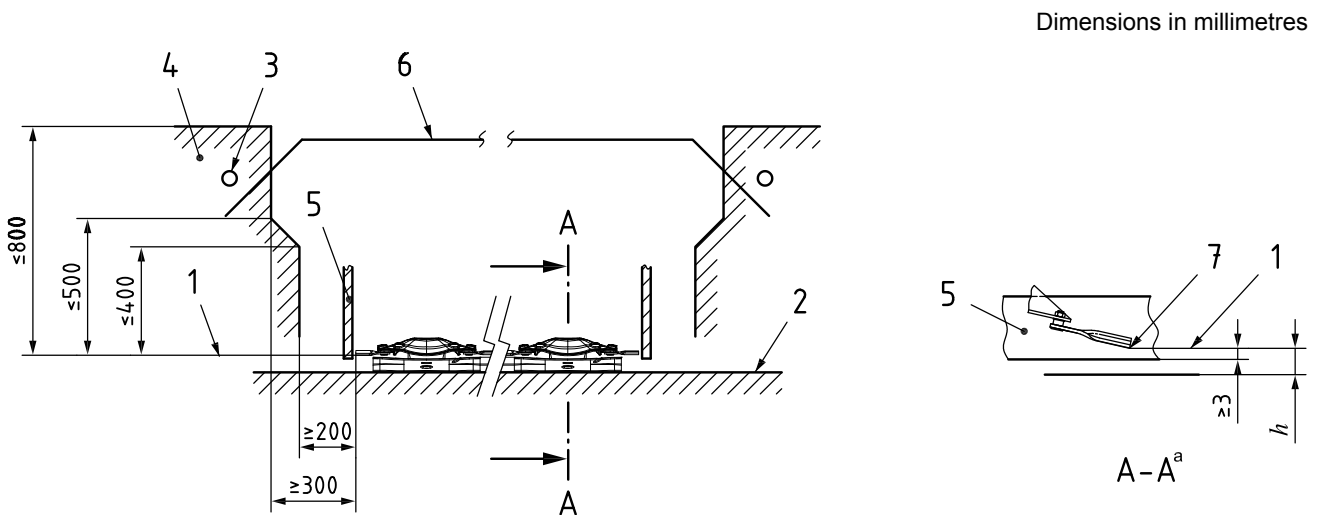
This barrier can be movable (e.g. removable, foldable) for transport or maintenance purposes. The removal of the barrier shall only be possible by the use of a tool. Movable barriers shall be kept in the fixed working position by means of a device. Unlocking this device shall only be the result of an intentional action;

- b) a rigid imperforate guard, located near the cutting elements and in such a way that its lower edge extends below the working elements path by a minimum of 3 mm (see Figure 1 and Figure 2). This measurement shall be carried out in static conditions, keeping the cutting elements parallel to the plane of the disc or drum.

At the crop inlet area and the crop discharge area, the protection shall be achieved by a barrier located in such a way that the minimum distances as defined in Figure 2 are respected, with the mower in the working position and the cutting height, *h*, being adjusted at 50 mm or as near as possible to 50 mm.

This barrier can be movable (e.g. removable, foldable) for transport or maintenance purposes. The removal of the barrier shall only be possible by the use of a tool. Movable barriers shall be kept in the fixed working position by means of a device. Unlocking this device shall only be the result of an intentional action.

NOTE 2 See Figure 2 (Detail A) for the correct method of measuring the cutting height.

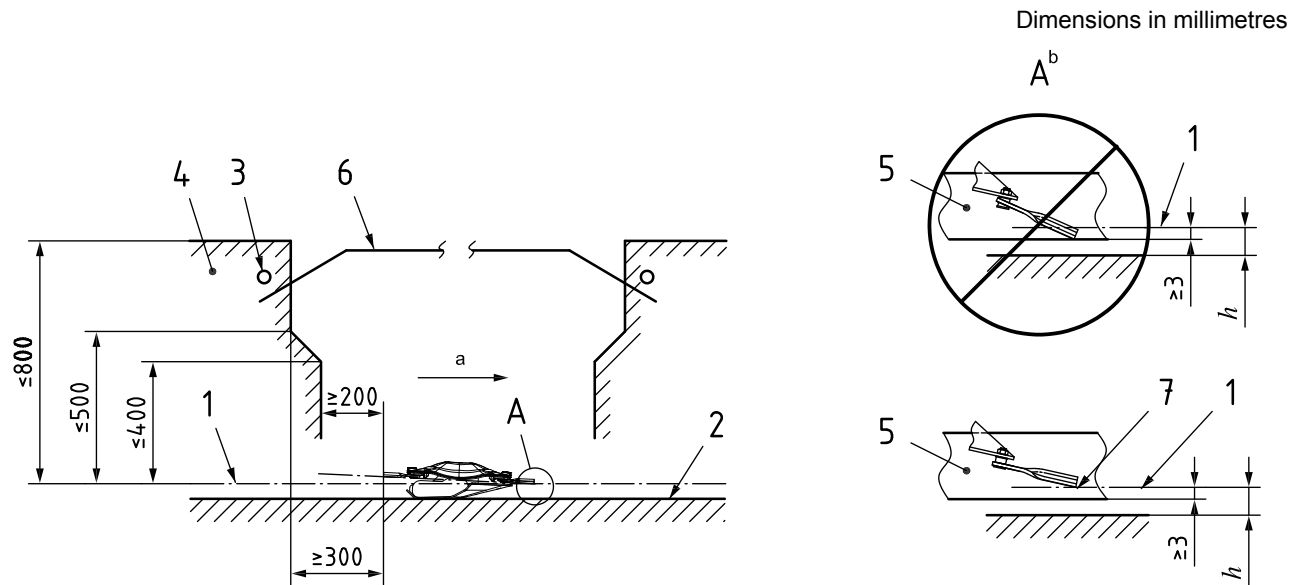


- Key**
- |  |                           |
|--|---------------------------|
| 1 cutting height                               | 5 rigid imperforate guard |
| 2 ground                                       | 6 top imperforate guard   |
| 3 barrier                                      | 7 cutting element path    |
| 4 area in which the barriers shall be located  |                           |
| <i>h</i> 50 mm or as near as possible to 50 mm |                           |

NOTE This figure is dimensionally symmetrical.

a Cutting height detail.

**Figure 1 — Rotary disc mowers and rotary drum mowers — Location of the barrier and rigid imperforate guard — Front and rear views**



**Key**

- |   |                           |
|---|---------------------------|
| 1 cutting height                              | 5 rigid imperforate guard |
| 2 ground                                      | 6 top imperforate guard   |
| 3 barrier                                     | 7 cutting element path    |
| 4 area in which the barriers shall be located |                           |

*h* 50 mm or as near as possible to 50 mm

NOTE This figure is dimensionally symmetrical.

*a* Direction of travel.

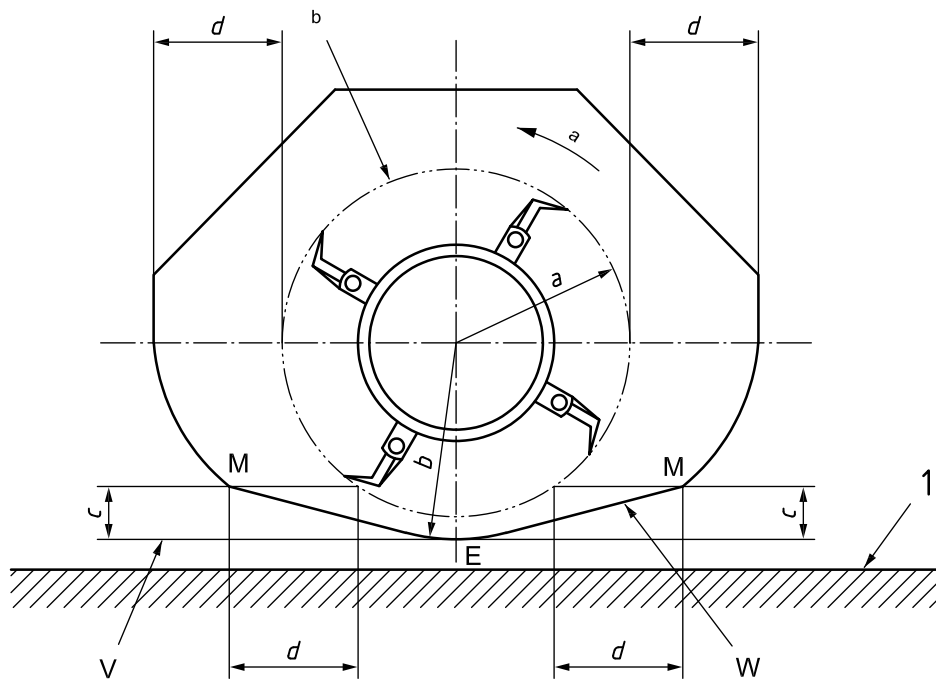
*b* Cutting height detail.

**Figure 2 — Rotary disc mowers and rotary drum mowers — Location of the barrier and rigid imperforate guard — Side view**

**5.2.1.2 Flail mowers**

The following requirements shall be fulfilled:

- the top protection shall be achieved by a rigid imperforate guard;
- at the sides, the protection shall be achieved by a rigid imperforate guard, located near the cutting elements and in such a way that the lower edge extends below the working element path by a minimum of 3 mm. Above point M, the guard shall extend at least 200 mm beyond the cutting element path. Below point M, the guard shall not be above line W, as defined in Figure 3;
- on the front and at the rear, the protection shall be achieved by a barrier located in such a way that the minimum distances as defined in Figure 4 are respected or by a barrier meeting the requirements of the foot probe test as described in 5.2.1.3.

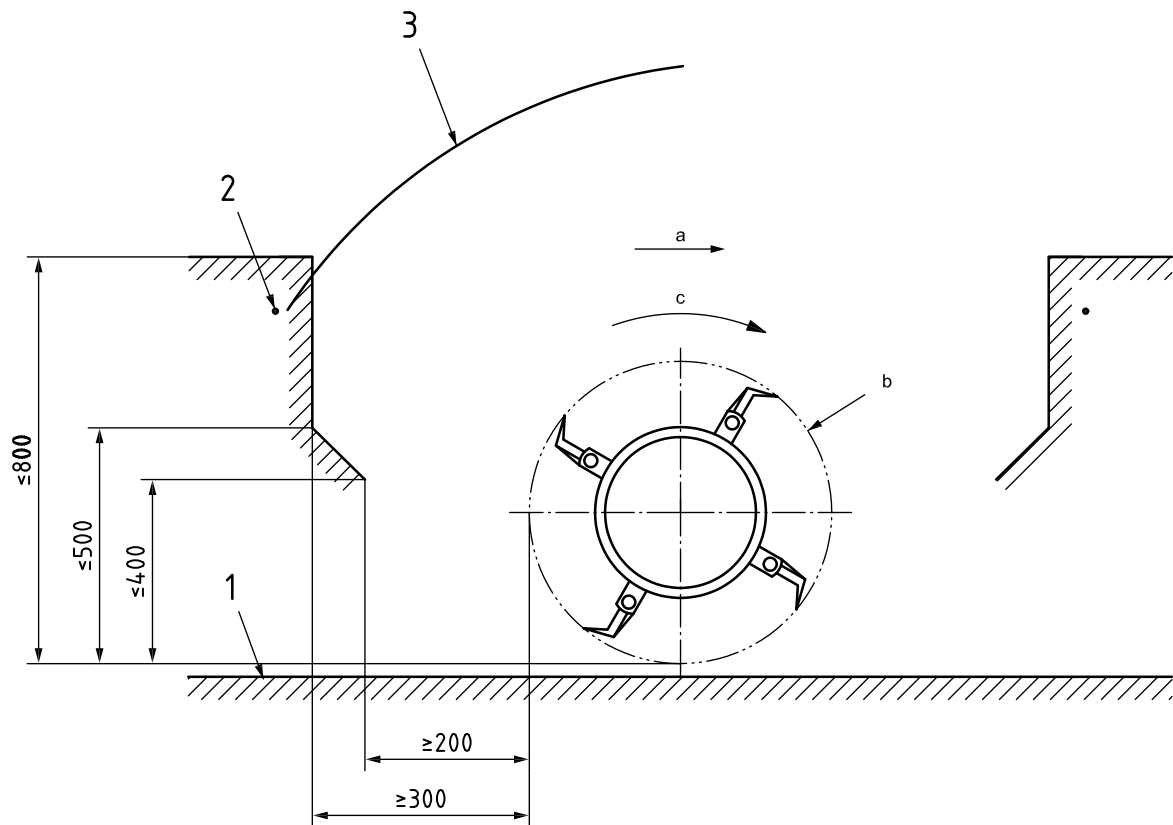


**Key**

- 1 ground
- a* cutting element path radius
- b* cutting element path radius +3 mm minimum
- c* distance between point M and V (maximum 120 mm)
- d* horizontal safety distance of 200 mm minimum from cutting element path
- E point on the circle with radius *b* on the vertical plane including the rotating axle
- M mid-point intersection relative to *c* and *d*
- V horizontal line passing through point E
- W straight line passing through point M and tangential to a circle with radius *b*
- a* Direction of rotation of cutting element.
- b* Cutting element path.

**Figure 3 — Flail mowers — Lateral location of the guard**

Dimensions in millimetres

**Key**

- 1 ground
- 2 area in which the barrier shall be located
- 3 upper rigid imperforate guard

NOTE This figure is dimensionally symmetrical.

- a Direction of travel.
- b Cutting element path.
- c Direction of rotation of cutting element.

**Figure 4 — Flail mowers — Rear and front locations of the barrier**

5.2.1.3 Foot probe test for flail mowers

5.2.1.3.1 Test equipment

The foot probe shall comply with the dimensions as given in Figure 5.

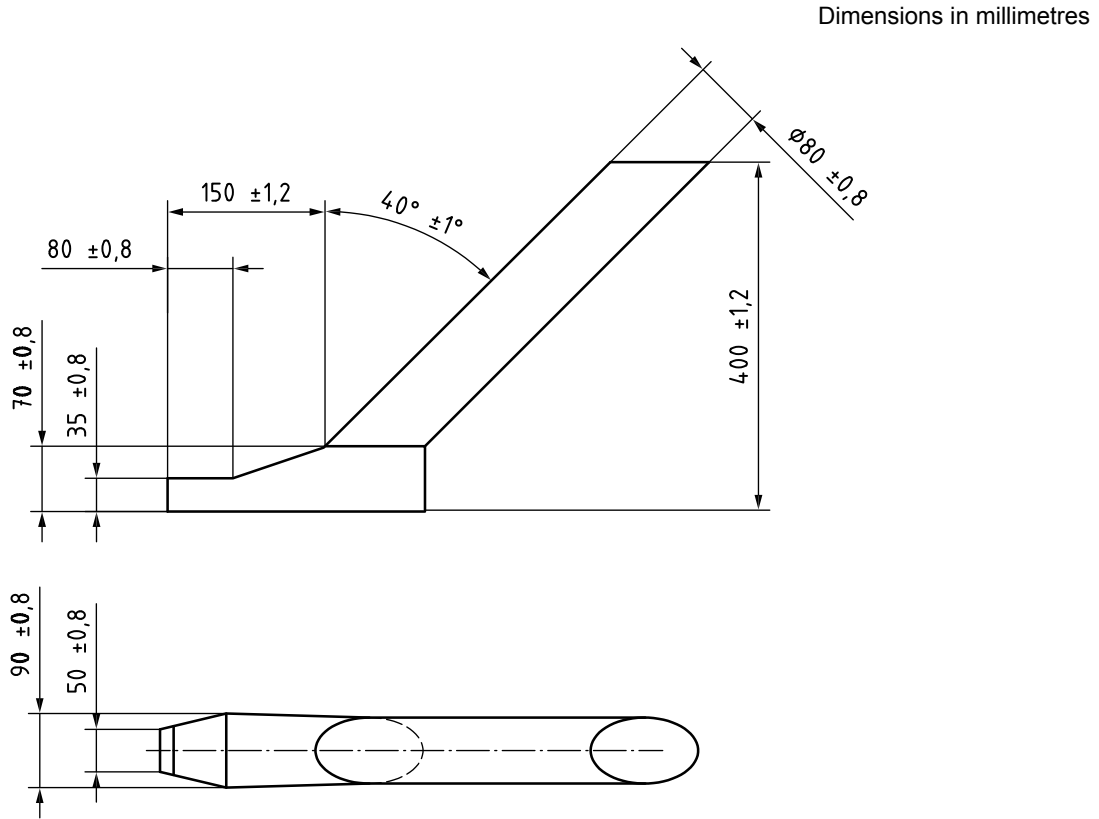


Figure 5 — Foot probe

5.2.1.3.2 Test conditions

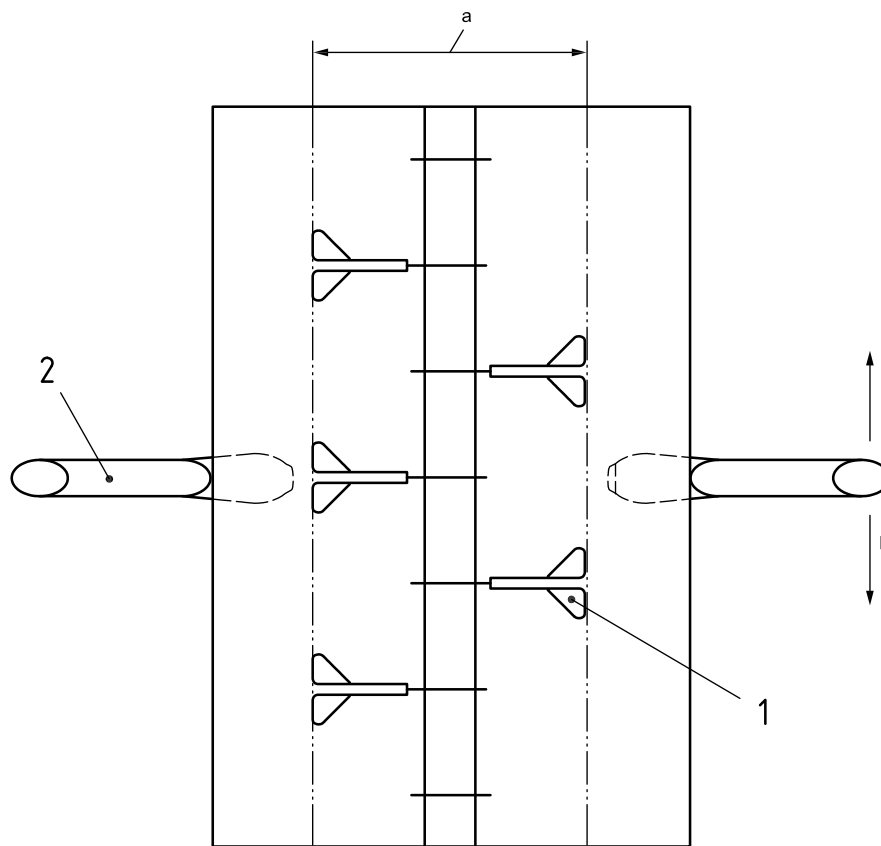
The test shall be conducted under static conditions on a flat surface.

5.2.1.3.3 Test procedure

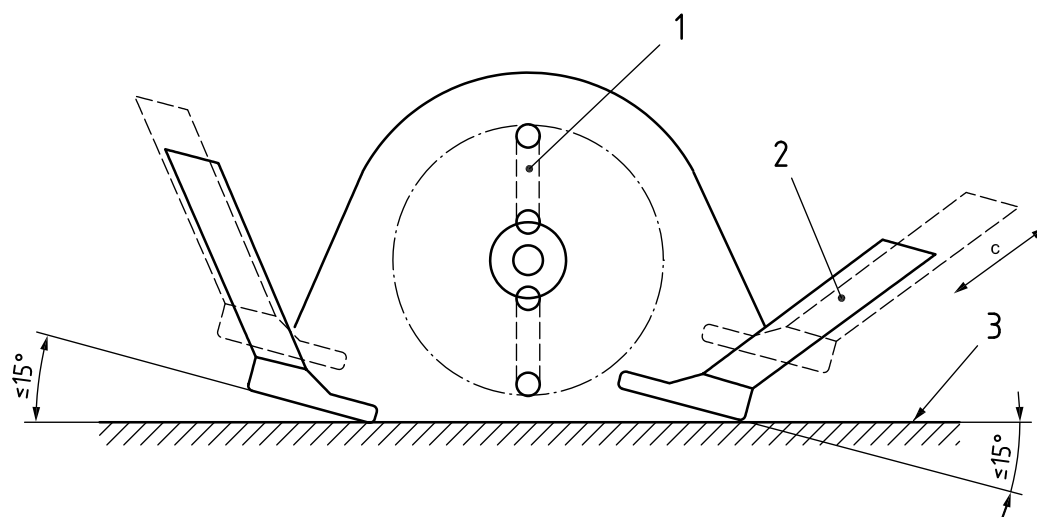
The foot probe shall be presented to the mower in a vertical plane, as shown at Figure 5, and in a horizontal movement. The foot probe shall be inserted as far as possible at the material intake and discharge areas of the mower cutting element enclosure with a minimum force of 110 ± 11 N before it is rotated horizontally and vertically by 15° to either side of the centreline, or to a lesser degree if restricted by the enclosure, while simultaneously being raised and lowered, as shown in Figure 6. This procedure shall be followed with the cutting elements in the highest and the lowest static cutting positions. If the maximum cutting position exceeds 200 mm, the test shall be carried out at the lowest static position and at 200 mm. If the cutting element path height is different for different cutting element speeds or cutting element options, the test shall include the two cutting element height extremes.

Components of the mowers or machine, or both, such as frames, etc., shall be considered part of the cutting element enclosure for the purpose of this test.





a) Plan view



b) Side view

**Key**

- 1 cutting element
- 2 foot probe
- 3 level ground

- a Diameter of cutting element tip circle.
- b Traverse periphery of flail housing, except where machine structure would keep person's foot or upright leg away.
- c Rock vertically a maximum of 15° up and down from level, while simultaneously raising and lowering the foot probe.

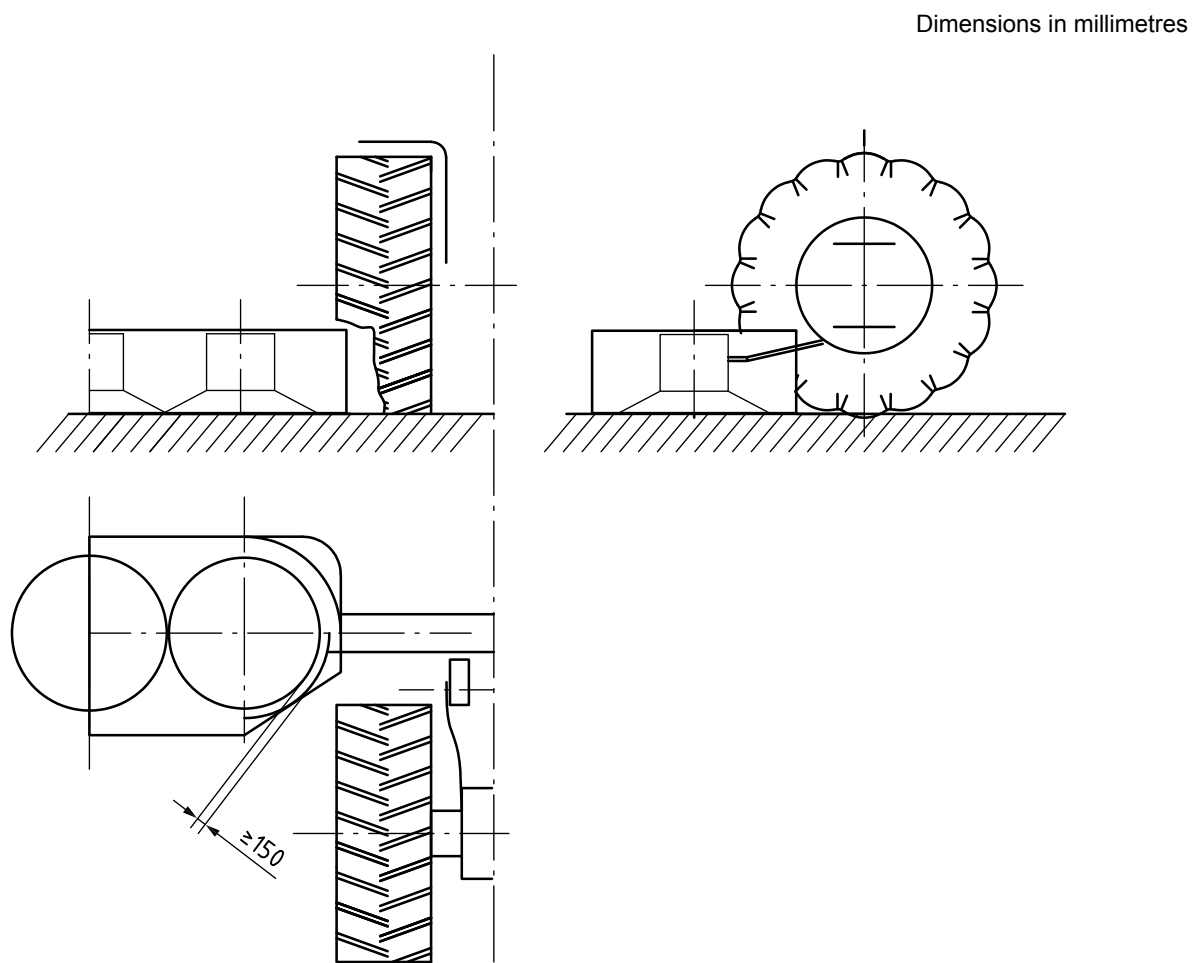
**Figure 6 — Foot probe test**

**5.2.1.3.4 Test acceptance**

The foot probe shall not enter the path of the blade or blade assemblies as verified by slow manual rotation of the blades with all power off. The foot probe test is not required at locations where the prime mover (tractor) structure or its tyres are within 100 mm of the mower barrier.

**5.2.2 Specific requirement for offset vertical axes mowers attached at the rear three-point tractor linkage**

To avoid interference with the tractor wheel, the distance between the front barrier and the cutting element path may be reduced, but shall be at least 150 mm, within a 90° sector, as shown in Figure 7.



**Figure 7 — Specific requirement for offset mowers**

### 5.3 Protection against thrown objects that are not part of the machine

The mower shall be fitted with a protective device to prevent thrown objects that are not part of the machine, and the tests specified in 6.2 shall be satisfied.

NOTE This protective device can be, for example, a protective skirt, rigid imperforate guard, chains or rubber strips.

In the case where this device consists of a protective skirt, this protective skirt shall comply with the requirements of 6.3. In addition, the attachment(s) of the protective skirt to the mower shall meet the following requirements:

- if the protective skirt is clamped between two elements over its entire length, these elements shall not have sharp edges where they come into contact with the protective skirt;
- if the protective skirt is attached directly to the mower by fasteners (e.g. screws and rivets), they shall be used with corresponding washers having a minimum diameter of four times the nominal diameter of the fasteners. These washers shall not have any sharp edges. The distance between two fasteners shall not exceed 250 mm;
- if the protective skirt is attached indirectly (e.g. by sliding over a tube) attachment elements shall not have any sharp edges.

### 5.4 Protection during handling and transport

For machines with folding elements, the provisions of ISO 4254-1:2008, 4.4.5, 4.14.5 and 5.2.2, apply.

In addition to the requirements of ISO 4254-1 and in the case of powered operation, control shall be by means of a hold-to-run device located outside the swivelling zone.

### 5.5 Additional safety requirements for conditioning devices as an attachment or an integral part of the rotary disc or drum mower

#### 5.5.1 General

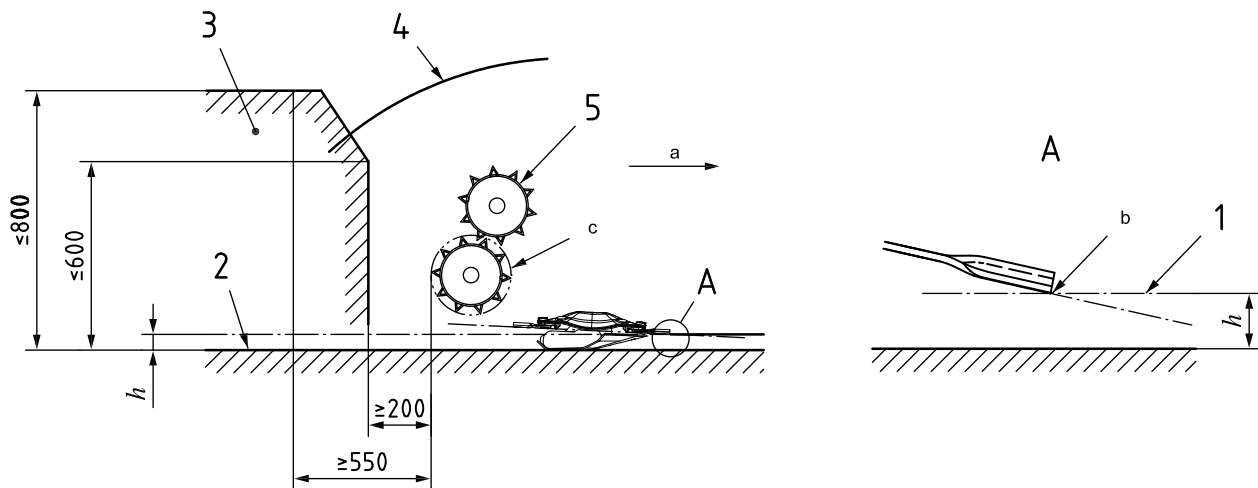
Conditioning devices shall be designed or guarded in such a way that, when combined with rotary disc or rotary drum mowers, inadvertent contact with the conditioning elements at the rear, at the sides and on the top is prevented. All dimensions shall be measured with the machine in working position, the cutting height being adjusted at 50 mm or as near as possible to 50 mm.

#### 5.5.2 Integral type conditioner

##### 5.5.2.1 Roll type conditioner

**5.5.2.1.1** The top protection shall be achieved by a rigid imperforate guard. The rear edge of this upper guard shall terminate in area as shown in Figure 8. At the rear, the protection is achieved by the extension of the rigid imperforate guard for the top protection to the rear in combination with the protection against thrown objects.

Dimensions in millimetres



**Key**

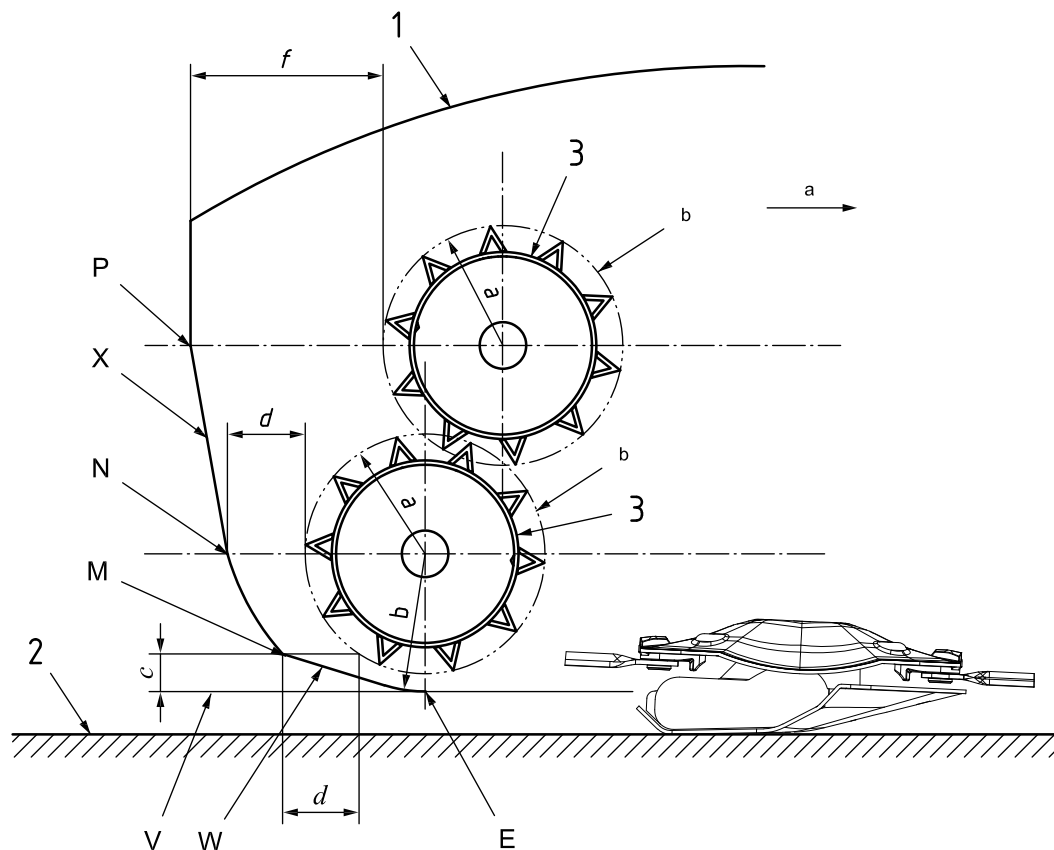
- |          |   |          |                                       |
|----------|---|----------|---------------------------------------|
| 1        | cutting height  | 4        | upper rigid imperforate guard         |
| 2        | ground  | 5        | conditioning roll                     |
| 3        | area in which the rear edge of the upper guard shall be located | <i>h</i> | 50 mm or as near as possible to 50 mm |
| <i>a</i> | Direction of travel.  |          |                                       |
| <i>b</i> | Cutting element path.   |          |                                       |
| <i>c</i> | Path of conditioning roll.                                      |          |                                       |

**Figure 8 — Roll type conditioner — Top protection to the rear — Side view**

**5.5.2.1.2** At the sides, a rigid imperforate guard shall be located near the conditioning elements and in such a way that its lower edge extends below the conditioning element path by a minimum of 3 mm. Above point M, the guard shall extend at least 200 mm beyond the conditioning element path. Below point M, the guard shall not be above line W. At point N, the horizontal distance between the lower roll and the edge of the lateral guard shall be at least 200 mm. At point P, the horizontal distance between the upper roll and the edge of the lateral guard shall be at least 550 mm. In the area between point N and point P, the guard shall extend at least to line X. Above point P, the guard shall continue in a vertical direction and be continuous with the top rigid imperforate guard (see Figure 9). Continuous means that there shall be no gaps or openings between the top and the lateral protection which are larger than the dimensions defined in 4.5.1 of ISO 13857:2008.

Lateral guarding may also include other parts of the machine (i.e. main frame and tyres) to prevent inadvertent contact with the conditioning element in accordance with the requirements of ISO 13857.

Dimensions in millimetres

**Key**

- 1 upper rigid imperforate guard
- 2 ground
- 3 conditioning rolls

*a* conditioning roll path radius

*b* conditioning roll path radius plus 3 mm

*c* distance between point M and the horizontal line passing through point E (maximum 120 mm)

*d* horizontal safety distance of 200 mm minimum from the path of the lower conditioning roll

*f* horizontal safety distance of 550 mm minimum from the path of the upper conditioning roll

E point on the circle with radius *b* on the vertical plane including the rotating axle

M mid-point intersection relative to *c* and *d*

N point on the circle with conditioning roll path radius of the lower conditioning roll plus *d* on the horizontal plane including the rotating axle

P point on the circle with conditioning roll path radius of the upper conditioning roll plus *f* on the horizontal plane including the rotating axle

V horizontal line passing through point E

W straight line passing through point M and tangential to a circle with radius *b*

X straight line passing through points N and P

*a* Forward direction.

*b* Path of conditioning rolls.

**Figure 9 — Roll type conditioner — Lateral protection to the rear — Side view**

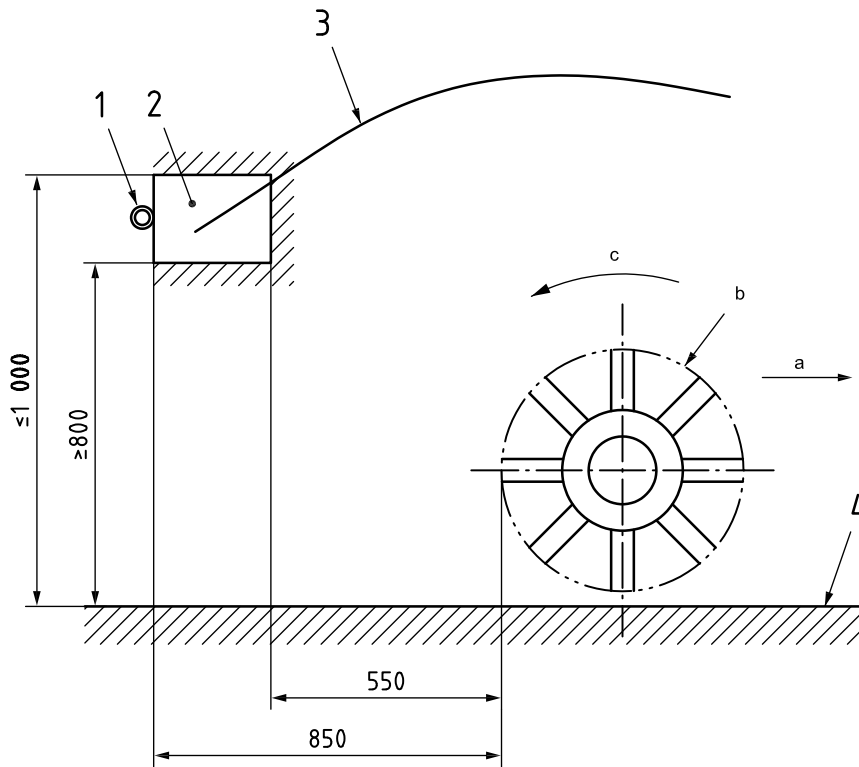
5.5.2.2 Impeller type conditioner

5.5.2.2.1 The top protection shall be achieved by a rigid imperforate guard. The rear edge of this upper guard shall terminate in either of the two options shown in Figure 10:

- option 1: the rear edge of this guard in combination with a barrier is located as shown in Figure 10 a), or
- option 2: the rear edge of this guard is located as shown in Figure 10 b).

At the rear, the protection is achieved by the extension of the rear edge of the upper rigid imperforate guard to the rear in combination with the protection against thrown objects.

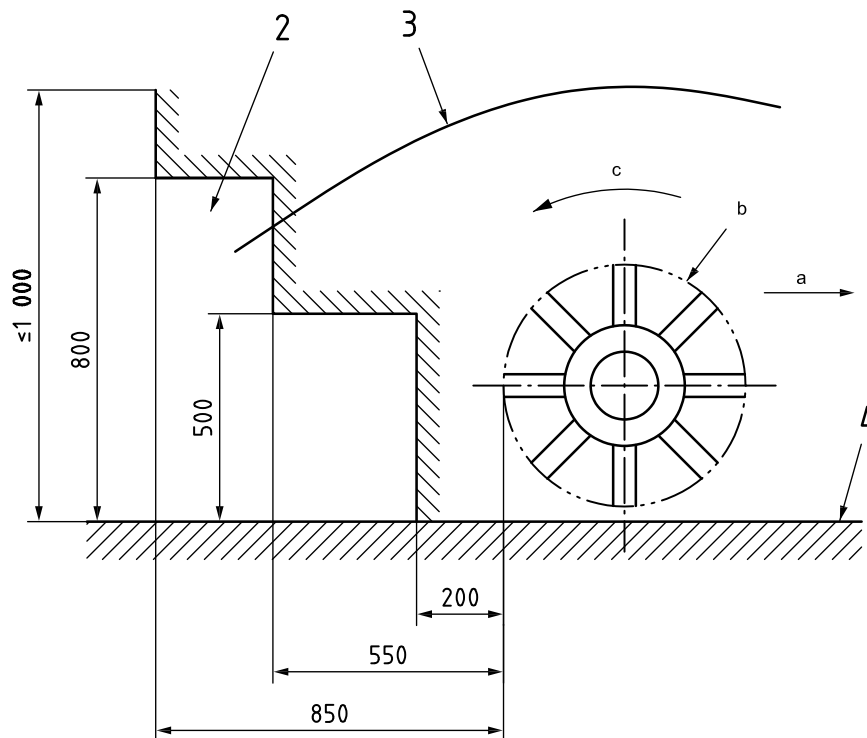
Dimensions in millimetres



a) Impeller type conditioner rigid imperforate guard associated with a barrier

Figure 10 (continued)

Dimensions in millimetres

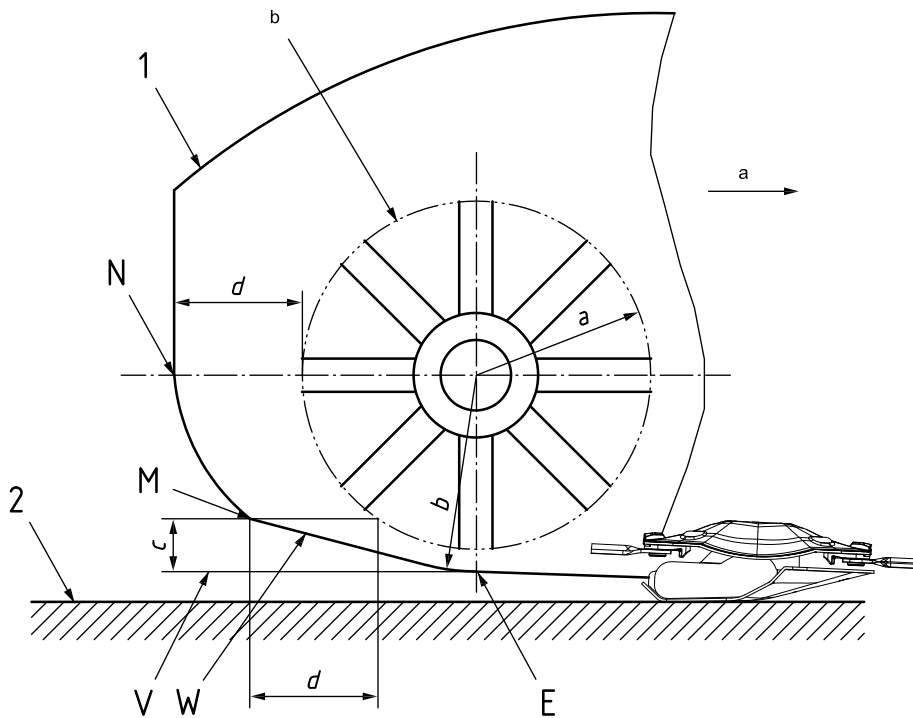
**Key**

- 1 barrier
- 2 area in which the rear edge of the upper guard shall be located
- 3 upper rigid imperforate guard
- 4 ground
- a Forward direction.
- b Conditioner tool path.
- c Direction of rotation of the conditioning element.

**b) Impeller type conditioner rigid imperforate guard without a barrier****Figure 10 — Impeller type conditioner — Top protection to the rear — Side view**

**5.5.2.2.2** At the sides, a rigid imperforate guard shall be located near the conditioning elements and in such a way that its lower edge extends below the conditioning element path by a minimum of 3 mm. Above point M, the guard shall extend at least 200 mm beyond the conditioning element path. Below point M, the guard shall not be above line W. At point N, the horizontal distance between the path of the flail/impeller and the edge of the lateral guard shall be at least 200 mm. Above point N, the guard shall continue in a vertical direction and be continuous with the top rigid imperforate guard (see Figure 11). Continuous means that there shall be no gaps or openings between the top and the lateral protection which are larger than the dimensions defined in 4.5.1 of ISO 13857:2008.

Lateral guarding may also include other parts of the machine (i.e. main frame and tyres) to prevent inadvertent contact with the conditioning element in accordance with the requirements of ISO 13857.



**Key**

- 1 upper rigid imperforate guard
- 2 ground
- a* conditioner tool path radius
- b* conditioner tool path radius plus 3 mm
- c* distance between point M and the horizontal line passing through point E (maximum 120 mm)
- d* horizontal safety distance of 200 mm minimum from the conditioner tool path
- E point on the circle with radius *b* on the vertical plane including the rotating axle
- M midpoint intersection relative to *c* and *d*
- N point on the circle with conditioner tool path radius plus *d* on the horizontal plane including the rotating axle
- V horizontal line passing through point E
- W straight line passing through point M and tangential to a circle with radius *b*
- a* Forward direction.
- b* Conditioner tool path.

**Figure 11 — Impeller type conditioner — Lateral protection to the rear — Side view**

**5.5.3 Conditioner attachments**

The requirements of 5.5.1 and 5.5.2 apply. In addition, 4.14.4 of ISO 4254-1:2008 shall be fulfilled. With the conditioning device removed the mower shall comply with 5.2 or an alternative guard complying with 5.2 shall be provided.

**5.5.4 Front-mounted mower with conditioner**

In the case of a conditioner fitted on a mower attached at the front of the tractor, between the lower hitch points the guard needs only to extend as far back as the rear edge of the conditioning element path.

At the sides, the requirements for lateral protection in 5.5.2 apply.



The area between the conditioning device and the mower shall be guarded in such a way that inadvertent contact during normal operation with the cutting elements from the front, and at the rear, the sides and the top is prevented.

## 5.6 Controls for adjustments

Adjustments (e.g. adjustment of the cutting height and adjustment of the conditioning device) shall be possible where the operator is in the operator's station, standing on the ground or standing on a platform conforming to ISO 4254-1.

If the adjustments can be carried out from the ground or the platform:

- this shall be possible with the conditioning and cutting elements stopped;
- the controls for adjustment shall be located on the top, or at the sides, front or rear of the mowing machine, at a maximum horizontal distance of 550 mm within the overall outer limits of the machine and, in addition, in case of mounted mowers, the operator shall not be required to stand between the lower link points to operate controls.

## 5.7 Blades

The blades shall comply with the requirements of ISO 5718:2002, except for 4.1.

NOTE ISO 5718 covers blades for rotary disc and rotary drum mowers only, and not flail mowers.

## 5.8 Overrunning clutch or freewheel device

If the mower is fitted with an overrunning clutch or a freewheel device, it shall be guarded as specified in 5.1.

If exposure is possible to elements that continue to rotate or move after the power is disengaged, there shall be evidence of rotation or an audible indication of rotation or a suitable safety sign. There shall be instruction in the operator's manual stating the need to wait until all movement is stopped before servicing or swinging components into transport position.

## 5.9 Implement hitch or carrier frame

Where the implement hitch or carrier frame has a different lateral position for transport and working or a different vertical position, whose failure may lead to an uncontrolled change of direction, it shall be fitted with a mechanical or hydraulic locking device (e.g. a pin, a latch or a hydraulic valve), which requires an intentional action when changing from the transport position to the working position. When a hydraulic device is used, the implement hitch shall remain in position in case of a failure of the hydraulic circuit (e.g. check valve and lowering control valve).

# 6 Verification of safety requirements and/or protective measures

## 6.1 General

Verification of the requirements specified in Clause 5 shall be carried out by means of inspection, calculation or testing. Dimensions, where given, shall be verified by measurements. Controls shall be verified by a functional test and positional measurements. Guards shall be verified by a functional test and positional measurements.

## 6.2 Thrown object test

The machines shall comply with the requirements of ISO 17101-1 for rotary disc and rotary drum mowers and ISO 17101-2 for flail mowers.

### 6.3 Protective skirts test

The protective skirt on the machines shall be tested and shall comply with the requirements of ISO 17103.

## 7 Information for use

### 7.1 Operator's manual

7.1.1 The content and presentation shall be in accordance with ISO 3600.

7.1.2 Comprehensive instructions and information on all aspects of the safe use of the machine, including suitable clothing and personal protective equipment requirements and the need for training, if necessary, shall be provided by the manufacturer in the operator's manual.

7.1.3 The operator's manual shall be in accordance with ISO 4254-1:2008, 8.1.3. See also ISO 12100:2010, 6.4.4.

7.1.4 In particular, the following information shall be provided:

- a) that all persons not involved with the mower operation shall be kept away;
- b) that a PTO drive shaft assembly equipped with a guard in good condition shall be used;
- c) the potential hazards involved when bringing a part of the mower into working or transport position;
- d) for mowers equipped with a removable conditioning device, advice shall be given to the operator on the need to fit the alternative guard provided with the machine, when the conditioning device is removed;
- e) that the engine shall be stopped before any intervention, such as blockage removal, servicing or adjusting;
- f) that variation in field conditions (such as the type and the density of the material being cut) may result in blockages and the action the operator can take to remove blockages;
- g) the working elements (provided with the mower) to be used and the instructions to be followed for clearing blockages (including a reminder of the need to stop the engine);
- h) the need to apply locking devices for the raised parts before carrying out maintenance or adjustment underneath the mower;
- i) the hazard caused by the working elements and/or conditioning device continuing to rotate for some time after the power source has been disconnected;
- j) the need to check for damage of the protective structures, protective skirts, chains and/or rubber strips and to replace damaged parts as necessary;
- k) that there is a hazard that worn or damaged cutting elements can be ejected, consequently detailed information on when and how to replace the cutting elements shall be given;
- l) that no persons are allowed to climb on or ride on the mower;
- m) the correct way of storing the mower to ensure stability;
- n) that worn and damaged blade attachment means are a hazard, therefore detailed information on when and how to replace the means of attachment;

- o) the risks of the connection between tractor and the machine and, if necessary, installation instructions for an overrunning clutch or a freewheel device according to 5.8;
- p) the need to use replacement blades, blade attachment means, protective skirts and wear parts, as recommended by the manufacturer.

## 7.2 Marking

### 7.2.1 General

All machines shall be marked in accordance with 8.3 of ISO 4254-1:2008; in addition the marking shall give the mass of the mower and/or conditioning device, if removable.

### 7.2.2 Instructional signs

Instructional signs relating to equipment operation, servicing and care shall have an appearance, especially colour, different from the safety signs on the equipment.

Nominal rotational frequency and, for front-mounted machines, direction of rotation of the power input connection (marked by an arrow) shall be provided on the machine.

### 7.2.3 Safety signs

**7.2.3.1** 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.

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

**7.2.3.3** In particular, safety signs shall be provided on the machine drawing attention to:

- a) hazards caused by tool rotation during operating and due to their inertia after the power source has been disconnected;
- b) hazards caused by objects ejected from the protected zone of the mower;
- c) hazards caused by bringing a part of the mower into the transport or working position;
- d) hazards associated with mounting or riding the machine while it is moving.

**7.2.3.4** For service, a safety sign can be installed to warn about inadvertent contact, if any exists, as determined by the manufacturer.

## Annex A (informative)

### Illustrations of mowers

#### A.1 Illustrations of mowers dealt with in this part of ISO 4254

Figures A.1 to A.8 are functional representations; they do not give an illustration of the safety measures required by this part of ISO 4254.



Figure A.1 — Self-propelled mower

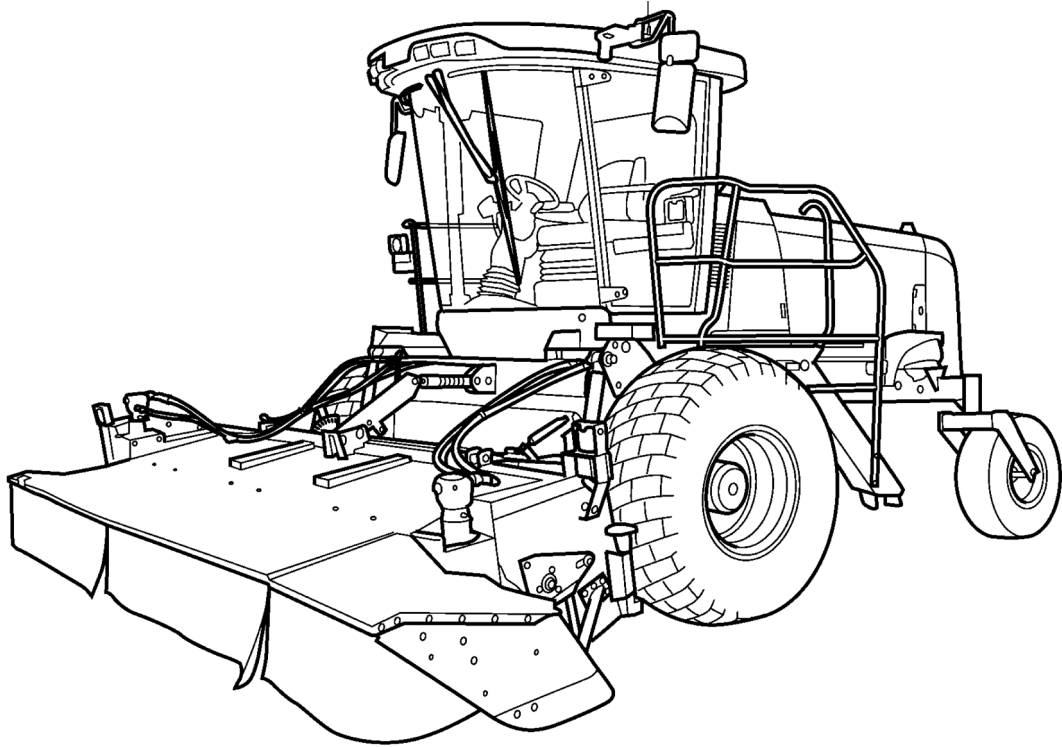
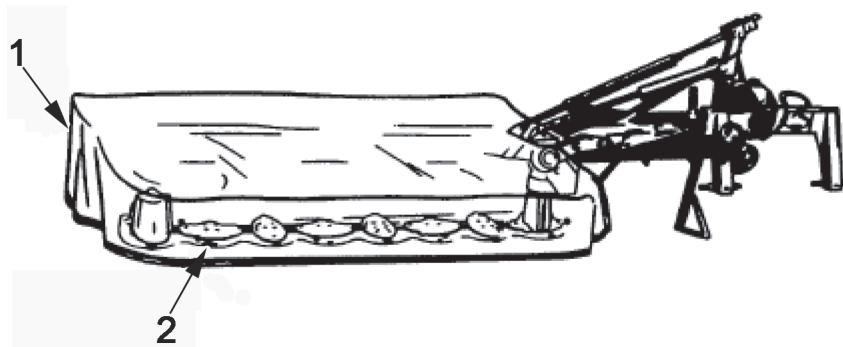


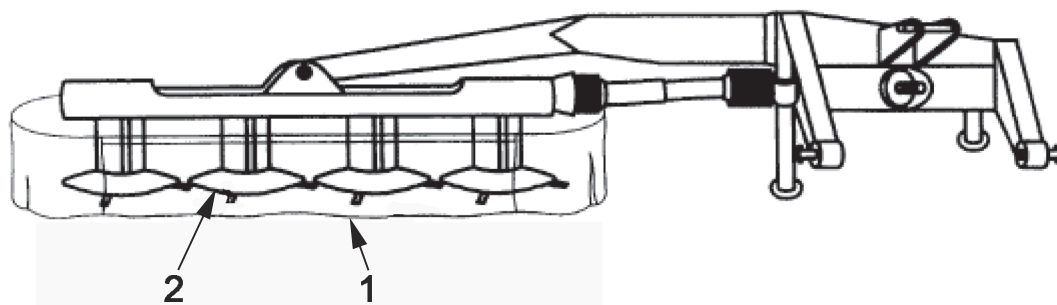
Figure A.2 — Self-propelled disc mower conditioner



**Key**

- 1 protective skirt
- 2 cutting head

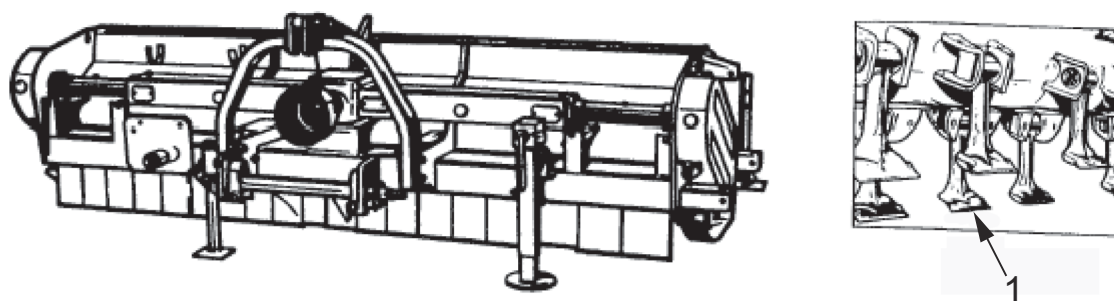
Figure A.3 — Basic rotary disc mower



**Key**

- 1 protective skirt
- 2 cutting head

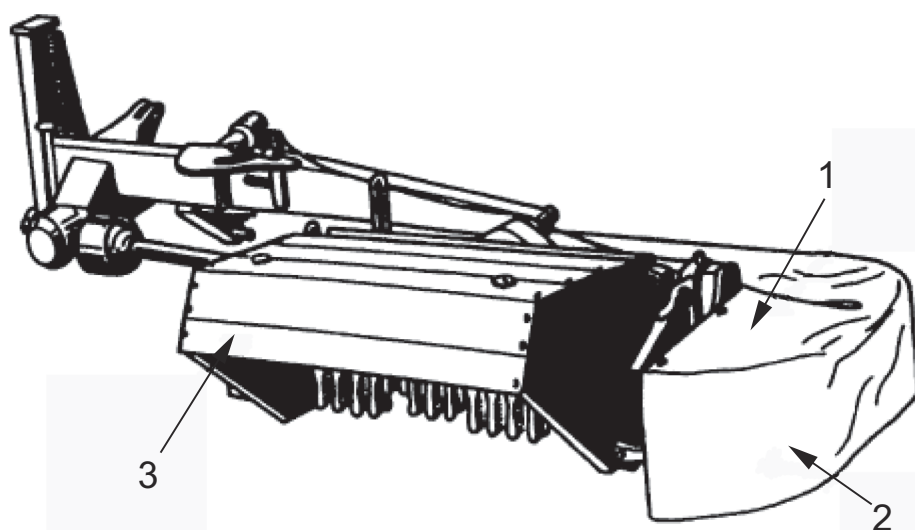
**Figure A.4 — Basic rotary drum mower**



**Key**

- 1 tool

**Figure A.5 — Flail mower**



**Key**

- 1 mower
- 2 protective skirt
- 3 conditioning device

**Figure A.6 — Mower with a conditioning device**

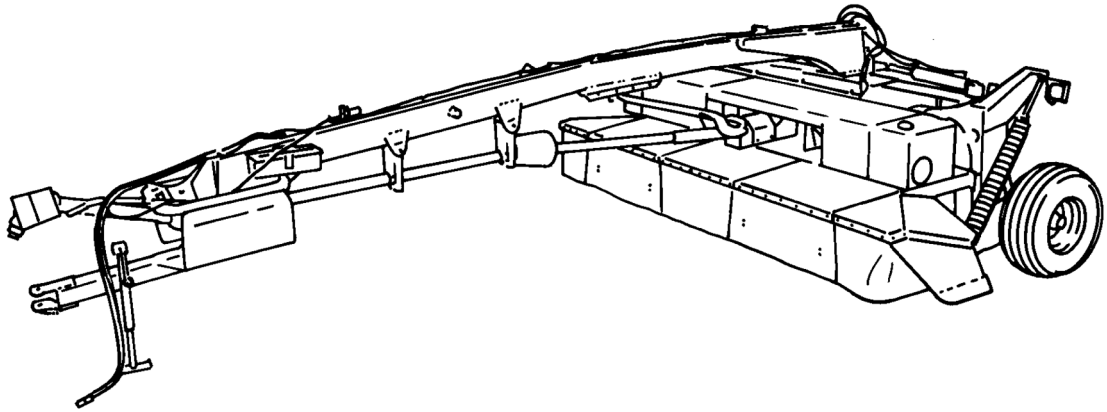


Figure A.7 — Centre pivot rotary disc mower conditioner

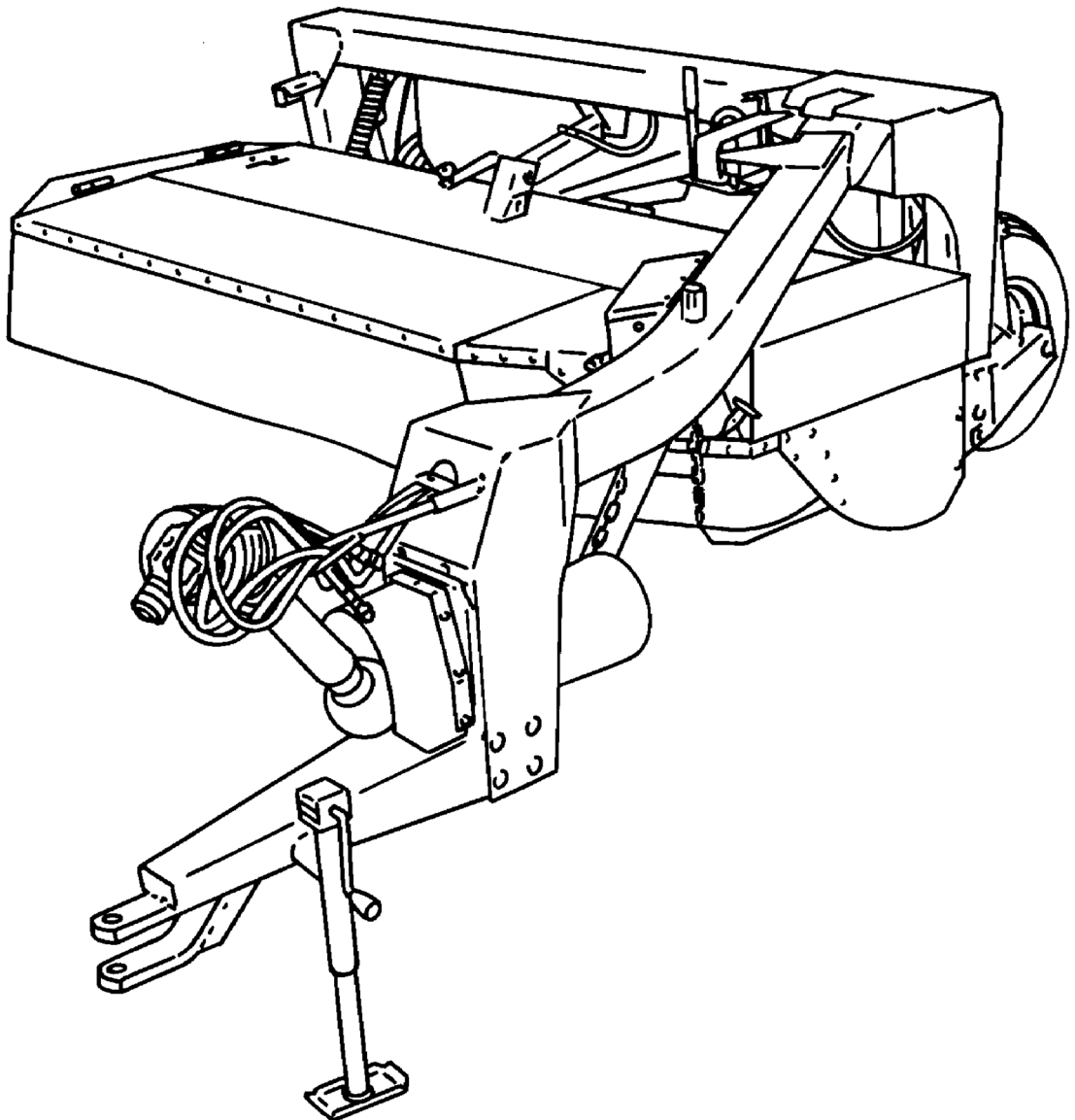
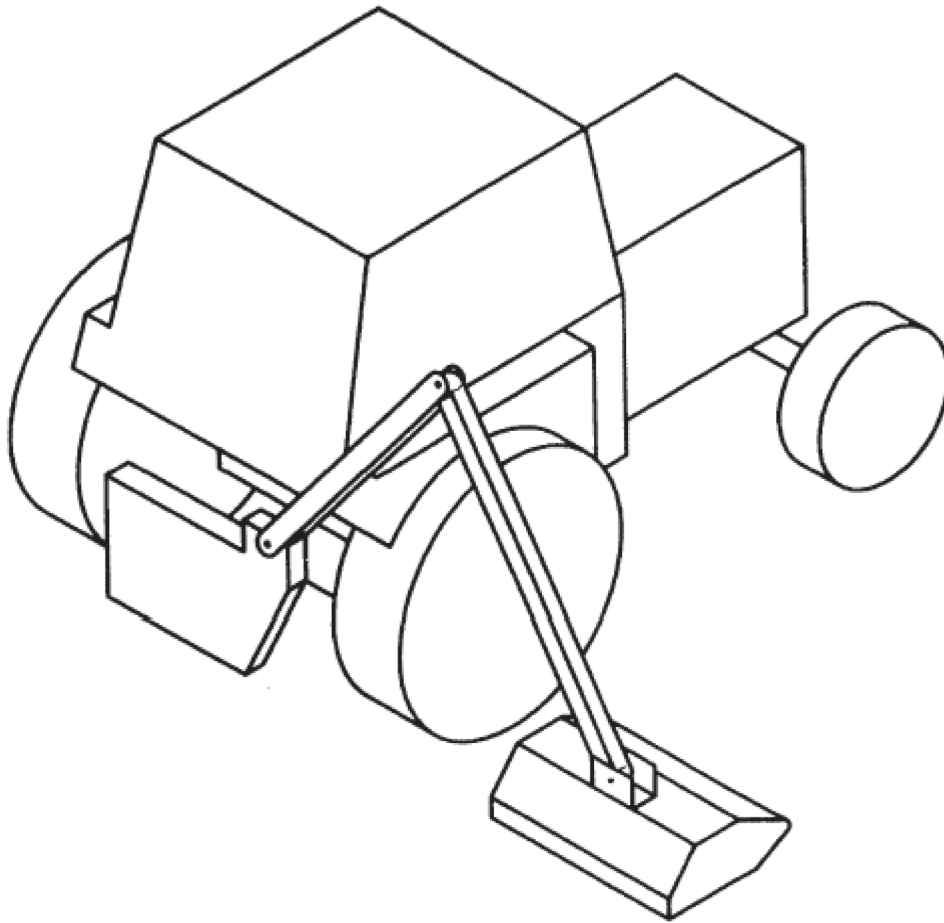


Figure A.8 — Side pull rotary disc mower conditioner

**A.2 Examples of mowers not dealt with in this part of ISO 4254**

See Figures A.9 to A.11.



**Figure A.9 — Mower with an articulated arm**



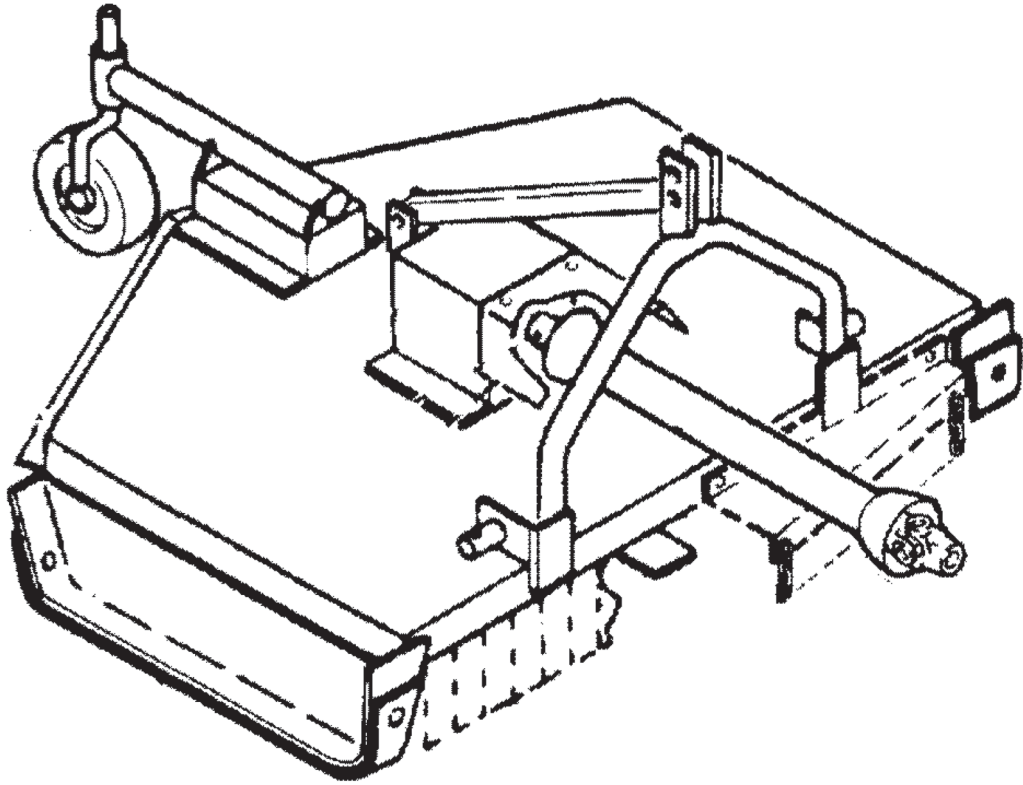


Figure A.10 — Single spindle rotary mower

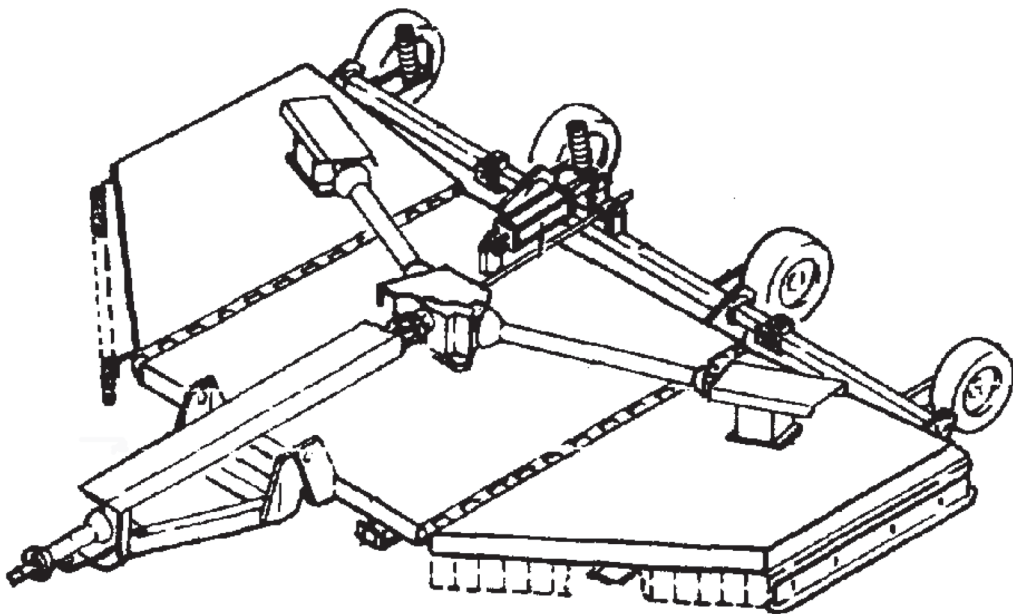


Figure A.11 — Multi-spindle rotary mower

## Bibliography

- [1] ISO 19472, *Machinery for forestry — Winches — Dimensions, performance and safety*
- [2] ISO 26322 (all parts), *Tractors for agriculture and forestry — Safety*
- [3] ISO/TS 28923:2007, *Agricultural machinery — Guards for moving parts of power transmission — Guard opening with tool*
- [4] ISO/TS 28924:2007, *Agricultural machinery — Guards for moving parts of power transmission — Guard opening without tool*



