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Agricultural machinery — Thrown-object test and acceptance criteria —

Part 2: Flail mowers

Matériel agricole — Essai de projection d'objets et critères d'acceptation —
Partie 2: 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 17101-2 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 7, *Equipment for harvesting and conservation*.

This first edition of ISO 17101-2, together with ISO 17101-1, cancels and replaces ISO 17101:2004, which has been technically revised.

ISO 17101 consists of the following parts, under the general title *Agricultural machinery — Thrown-object test and acceptance criteria*:

— *Part 1: Rotary mowers*

— *Part 2: Flail mowers*

Agricultural machinery — Thrown-object test and acceptance criteria —

Part 2: Flail mowers

1 Scope

This part of ISO 17101 gives specifications and acceptance criteria for the thrown-object testing of flail mowers used in agriculture. Examples of machines are shown in Annex A.

It is not applicable to the following:

— large rotary mowers;

— rotary mowers;

— mowers with an articulated arm;

— mowers with one or more vertical axis designed for mulching;

— pedestrian controlled motor mowers;

— lawn mowers or machines designed as lawn mowers;

— inter-row mowing units;

— machines designed for highway and road maintenance only;

— flail mowers that have the rear part which can be opened for particular field use operations (e.g. row-crop mowers).

NOTE 1 If a machine is also designed for use outside agriculture, in addition to the thrown-object test given in this part of ISO 17101, other thrown object tests might apply.

NOTE 2 Thrown-object tests and acceptance criteria for rotary mowers are dealt with in ISO 17101-1.

2 Normative references

The following documents, in whole are 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 536:—[1)], *Paper and board — Determination of grammage*

ISO 789-1:1990, *Agricultural tractors — Test procedures — Part 1: Power tests for power take-off*

ISO 1974:2012, *Paper — Determination of tearing resistance — Elmendorf method*

ISO 2758:—[2)], *Paper — Determination of bursting strength*

ISO 3416:1986, *Textile floor coverings — Determination of thickness loss after prolonged, heavy static loading*

1) To be published. (Revision of ISO 536:1995)

2) To be published. (Revision of ISO 2758:2001)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

[SOURCE: ISO 4254-12:2012, definition 3.1]

3.2
flail mower
mower with a multiplicity of free-swinging cutting elements that rotates about a horizontal axis, cuts the crop by impact and mulches it with the same working elements

[SOURCE: ISO 4254-12:2012, definition 3.2]

3.3
conditioning device
mechanical device allowing the acceleration of the crop-drying process

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

3.4
swath board
adjustable device for controlling the swath width

3.5
Kraft paper
paper produced from pure unbleached sulfate Kraft pulp with machine finished surface

NOTE 1 Kraft paper is mainly used for the manufacture of paper sacks and for lining and laminating.

NOTE 2 See 4.2.1.1 for specific details.

3.6
test
operation consisting of two runs

3.7
run
single pass through the thrown-object material

3.8
impact
hole in the Kraft paper caused by a stone through which a cylindrical stick with a 6 mm diameter semi-spherical end passes without noticeable effort on the hand of the operator

4 Thrown object test

4.1 Testing conditions

4.1.1 Mower used for test

Tests shall be performed using the same flail mower, and the same protective devices. If the flail mower can be operated in different working positions (right side, centre or left side of the tractor, see 4.2.7), the test shall be performed with the flail mower in the rightmost and leftmost working positions behind the tractor as specified by the manufacturer in the operator's manual.

4.1.1.1 Thrown-object guard adjustment

Adjustable devices, which may influence the efficiency of the protective device to prevent projections, shall be located in the least favourable position.

4.1.1.2 Cutting height

The cutting height shall be adjusted at 50 mm. If this is not possible due to the design of the flail mower, the cutting height shall be adjusted as near as possible to 50 mm.

4.1.2 Test surface area

4.1.2.1 Ground conditions

Tests shall be performed on firm and horizontal, hard ground.

EXAMPLES Concrete, asphalt.

4.1.2.2 Coconut matting

The test surface area shall be lined with coconut matting with fibres measuring approximately 20 mm in height, embedded in a support material. The determination of compression behaviour shall be carried out in compliance with ISO 3416.

4.1.2.3 Sand layer (natural, crushed or uncrushed)

The coconut matting shall be covered with a layer of sand and shall be distributed in such a way as to leave visible the top of the coconut matting fibres. This condition shall be restored after each run.

4.1.2.4 Moisture

The test surface area shall be humidified to reach saturation point and be kept moist during the test.

4.2 Target

A target is used to record the impact of stones projected from the protected zone of the flail mower.

4.2.1 Target construction

4.2.1.1 Target material

The panels shall be constructed of a rigid frame. The dimensions of Panels 1 to 4 are shown in Figure 1; the dimensions of Panels 5 and 7 are shown in Figure 3; and the dimensions of Panel 6 are shown in Figure 2 a).

The Kraft paper shall be of 120 g/m^2 ± 10 g/m^2 construction, determined in accordance with ISO 536. The bursting strength shall be 500 kPa minimum, determined by using the method specified in ISO 2758. The tearing resistance shall be 1 200 mN minimum, in the machine direction, determined in accordance with the test method specified in ISO 1974.

4.2.1.2 Target material attachment

There shall be no reinforcing slat within 20 mm from the Kraft paper. There shall be no overlapping of Kraft paper, and, in order to have no overlaps, the Kraft paper should be stretched from the roll in the horizontal direction on the frames.

In order to have no overlaps per panel, it is recommended that the Kraft paper from the roll be stretched in a horizontal direction.

4.2.1.3 Target panels' frame

Panels 1 to 4 shall be made of a rigid frame, 2 000 mm in height, plus the thickness of the top supporting slat (see Figures 2 to 6).

4.2.1.4 Panel reference lines

Three horizontal reference lines, traced along the target at 200 mm, 600 mm and 2 000 mm from the ground level, shall show three zones:

— a lower zone (between 0 mm and 200 mm);

— a middle zone (between 200 mm and 600 mm); and

— an upper zone (between 600 mm and 2 000 mm) (see Figure 1).

If the flail-mower configuration requires the panels shown in Figures 5 to 11 to be moved further from the flail mower, the reference lines shall be moved proportionally upwards [see Figure 2 a)].

The horizontal reference lines of Panel 6, which is used for front-mounted flail mowers [see Figure 2 b)], shall be located 500 mm and 1 000 mm from the ground level and show three zones:

— a lower zone (between 200 mm and 500 mm);

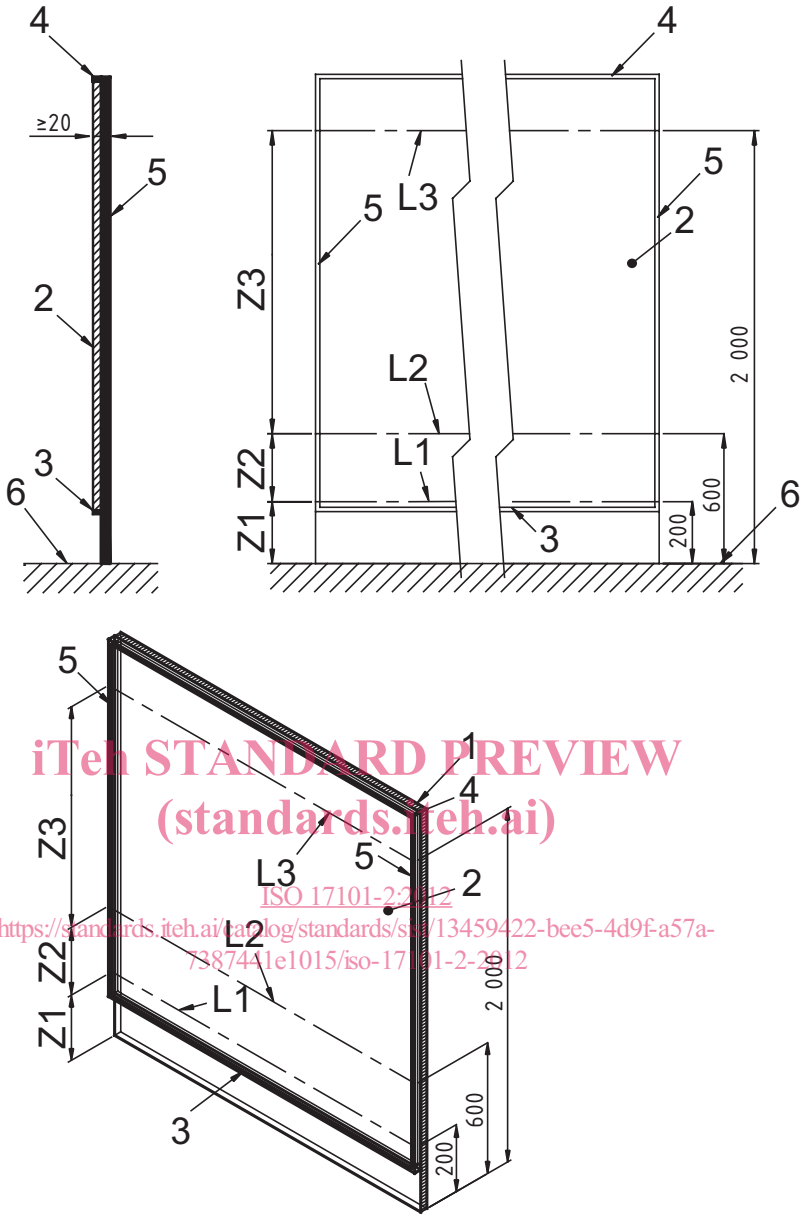
— a middle zone (between 500 mm and 1 000 mm); and

— an upper zone (between 1 000 mm and 1 200 mm).

If Panel 6 needs to be moved towards the rear due to the flail-mower dimensions, reference lines shall be moved proportionally upwards. [see Figure 2 c)].

Panels 1 to 4 shall be divided into vertical sections 1 000 mm wide, starting from one of the edges of the enclosure formed by the target panels. Panel 6, if present, shall also be divided into vertical sections 1 000 mm wide, starting from one of its edges. The sections shall be numbered.

Dimensions in millimetres

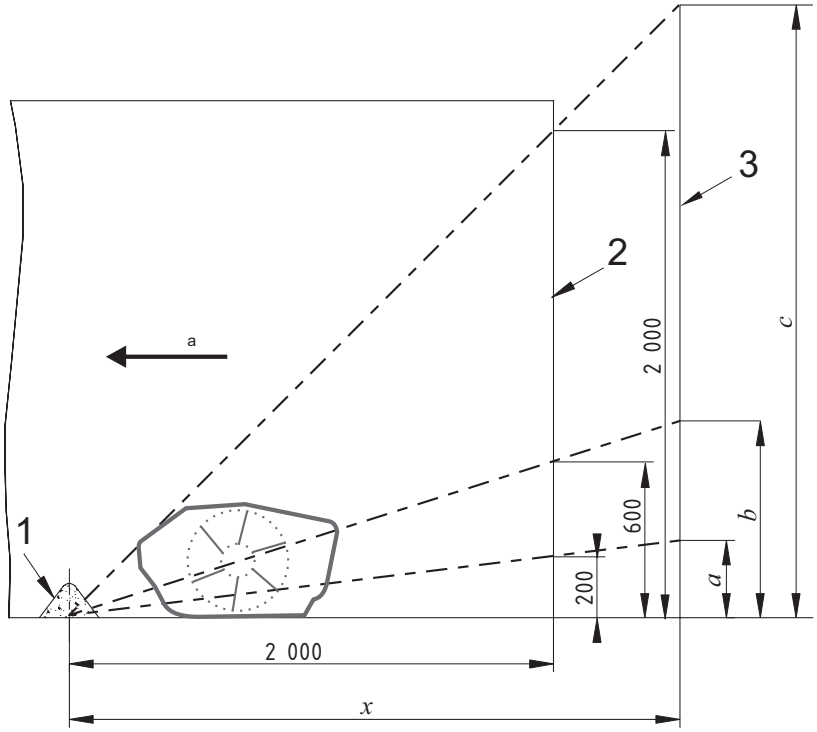


Key

L1	200 mm reference line	1	panel
L2	600 mm reference line	2	Kraft paper
L3	2 000 mm reference line	3	lower reinforcing slat
Z1	lower zone	4	upper reinforcing slat
Z2	middle zone	5	side reinforcing slat
Z3	upper zone	6	ground

Figure 1 — Target panel

Dimensions in millimetres



Key

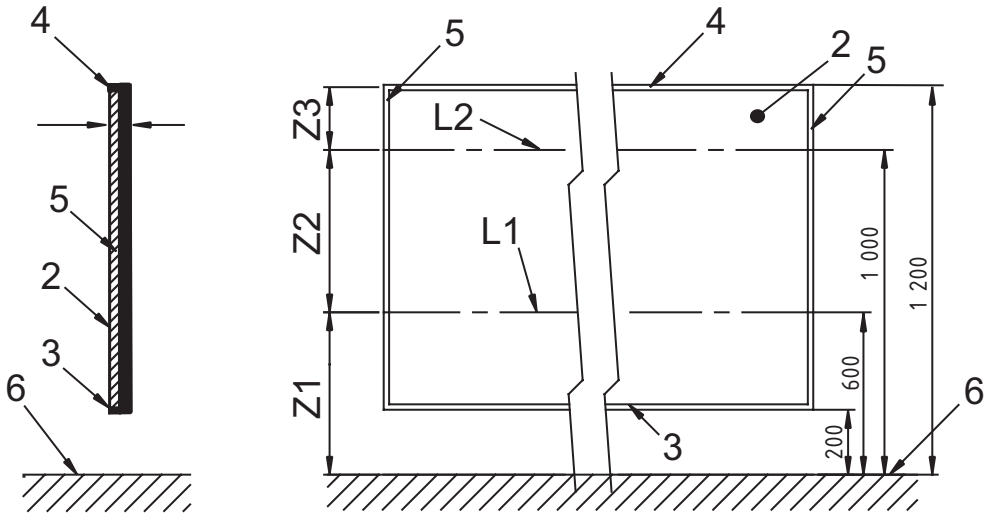
1 test material
2 panel (as specified)
3 panel for adjusted reference lines
$a = (200x)/(2\ 000)$
$b = (600x)/(2\ 000)$
$c = x$
x equal to panel height c

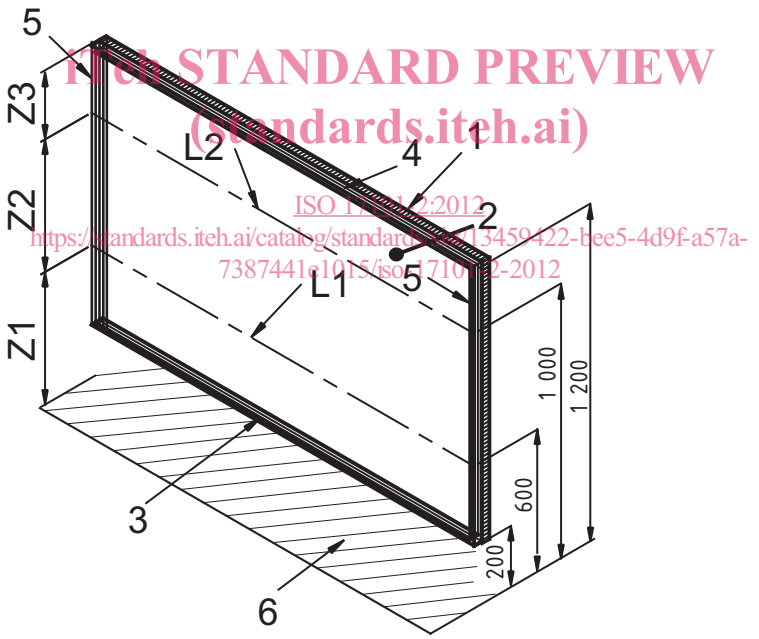
a Forward direction.

a) Example of proportional reference line adjustment for Panel 6

Figure 2 (*continued on the next page*)

Dimensions in millimetres





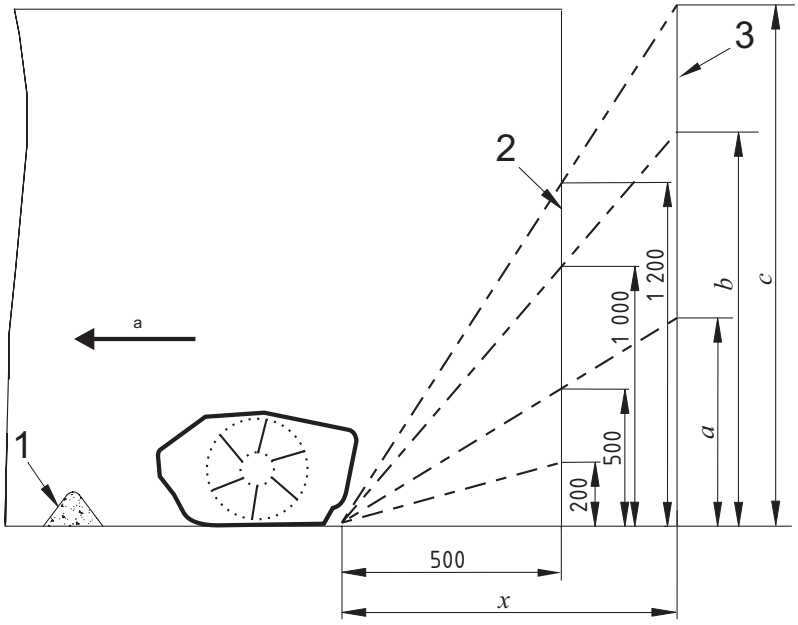
Key

L1	500 mm reference line	1	panel
L2	1 000 mm reference line	2	Kraft paper
		3	lower reinforcing slat
Z1	lower zone	4	upper reinforcing slat
Z2	middle zone	5	side reinforcing slat
Z3	upper zone	6	ground

b) Reference lines for Panel 6 front-mounted flail mowers

Figure 2 (*continued on the next page*)

Dimensions in millimetres



Key

1 test material
2 panel (as specified)
3 panel 6 for adjusted reference lines
$a = x$
$b = (1\,000x)/(500)$
$c = (1\,200x)/(500)$
x equal to panel height c
a Forward direction.

c) Proportional adjustment for Panel 6

Figure 2 — Panel 6

4.2.2 Panels in the operator's zone for flail mowers attached at the rear three-point tractor linkage

Panels 5, 7a, and 7b act as a target in the operator's zone (see Figure 3). They shall be made of a rigid frame and shall comply with the specifications given in Table 1 and Table 2.

At the rear angle of Panels 7a and 7b, there can be a slat in contact with paper and with a maximum thickness of 3 mm.

Panel 5, which shall be in a vertical plane, connects Panels 7a and 7b and shall be perpendicular to them. Panels 7a and 7b shall be parallel to the longitudinal axis of the tractor.

For three-point tractor linkage mowers, Panel 5 shall be located in a horizontal distance of (800 ± 50) mm in front of the axis of the lower hitch points of the mower.

NOTE 1 In order to comply with the required dimensions, it might be necessary to use an intermediate frame on which Panel 5 can be mounted and which is mounted between the hitch points of the tractor and the hitch points of the mower.

Figure 5 shows an example of the location of Panel 5.

For trailed and semi-mounted flail mowers, the following requirements apply.

a) For lower linkage coupled flail mowers, Panel 5 shall be located in a horizontal distance of (800 ± 50) mm in front of the axis of the hitch points of the flail mower.