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**Agricultural machinery — Safety —
Part 13:
Large rotary mowers**

Matériel agricole — Sécurité —

Partie 13: Grandes faucheuses rotatives

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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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is 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*¹⁾
- *Part 5: Power-driven soil-working machines*
- *Part 6: Sprayers and liquid fertilizer distributors*
- *Part 7: Combine harvesters, forage harvesters and cotton harvesters*
- *Part 8: Solid fertilizer distributors*
- *Part 9: Seed drills*
- *Part 10: Rotary tedders and rakes*
- *Part 11: Pick-up balers*
- *Part 12: Rotary disc and drum mowers and flail mowers*
- *Part 13: Large rotary mowers*
- *Part 14: Bale wrappers*

ISO 4254-2, *Tractors and machinery for agriculture and forestry — Technical means for providing safety — Part 2: Anhydrous ammonia applicators*, has been withdrawn; ISO 4254-3, *Tractors and machinery for*

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, *Agricultural machinery — Guards for moving parts of power transmission — Guard opening with tool*, and ISO/TS 28923, *Agricultural machinery — Guards for moving parts of power transmission — Guard opening without tool*.

agriculture and forestry — Technical means for providing safety — Part 3: Tractors, has been cancelled and is to be replaced by ISO 26322 (all parts), *Tractors for agriculture and forestry — Safety*; and ISO 4254-4, *Tractors and machinery for agriculture and forestry — Technical means for providing safety —Part 4: Forestry winches*, has been cancelled and replaced by ISO 19472, *Machinery for forestry — Winches — Dimensions, performance and safety*.

In this corrected version of ISO 4254-13:2012, the following corrections have been made:

- in [Table A.1](#), the column title has been corrected from ISO 4254-1:2008^a to ISO 4254-1:2013 and the Note^a removed from the last row.
- in [Table A.1](#), rows 1.7, 2.1, 2.2, 4.3 and 5.1, the cross-references in the fourth column (subclause of ISO 4254-1) have been corrected;
- in [Table A.1](#), rows 1.6, 1.8, 7.1, 7.2 and 9.2, the cross-references in the last column have been corrected;
- in [D.2.3](#), the mass has been corrected from 25 kg to 25 g.

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Introduction

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

- type-A standards (basis safety standards) giving basic concepts, principle for design, and general aspects that can be applied to machinery;
- type-B standards (generic safety standards) dealing with one safety aspect or one type 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 control devices, interlocking devices, pressure-sensitive devices, guards);
- 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 12100:2010.

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

The machinery concerned and the extent to which hazards, hazardous situations and events are covered are indicated in the scope of this part of ISO 4254. These hazards are specific to large rotary mowers.

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

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Agricultural machinery — Safety —

Part 13: Large rotary mowers

1 Scope

This part of ISO 4254, when used together with ISO 4254-1, specifies the safety requirements and their verification for the design and construction of towed, semi-mounted, or mounted large rotary mowers with single or multiple cutting elements which have a cutting diameter of 1 000 mm or greater for any single cutting element assembly, mounted on a propelling tractor or machine, intended for agricultural mowing equipment and designed for shredding crop residue, grass and small brush by impact. It describes methods for the elimination or reduction of hazards arising from the intended use and reasonable 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.

NOTE 1 These machines can be used for shredding grass. When used outside agriculture, additional requirements not specified in this part of ISO 4254 can be applicable.

This part of ISO 4254 is not applicable to:

- rotary disc mowers, rotary drum mowers, and flail mowers designed for forage crop harvesting as covered by ISO 4254-12;
- arm-type large rotary mowers;
- pedestrian-controlled motor mowers;
- lawn mowers covered by ISO 5395.

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 provisions of ISO 4254-1 for machines that have been designed and built according to the provisions of this part of ISO 4254.

This part of ISO 4254, taken together with ISO 4254-1, deals with all the significant hazards, hazardous situations and events relevant to large rotary mowers used as intended and under the conditions foreseen by the manufacturer. (A list of significant hazards is provided in [Annex A](#).)

NOTE 2 Example illustrations of two mowers (a rigid-deck large rotary mower and a trail-type multi-section foldable-wing large rotary mower) dealt with in this part of ISO 4254 are shown in [C.1](#).

NOTE 3 Example illustrations of mowers not dealt with in this part of ISO 4254 are shown in [C.2](#).

This part of ISO 4254 is not applicable to environmental hazards, road safety, electromagnetic compatibility, vibration and hazards related to moving parts for power transmission. It is also not applicable to hazards related to maintenance or repairs to be carried out by professional service personnel.

NOTE 4 ISO 14982 specifies test methods and acceptance criteria for evaluating the electromagnetic compatibility of all kinds of mobile agricultural machinery.

This part of ISO 4254 is not applicable to large rotary mowers which are manufactured before the date of publication of this document by ISO.

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 148-1:2009, *Metallic materials — Charpy pendulum impact test — Part 1: Test method*

ISO 730:2009, *Agricultural wheeled tractors — Rear-mounted three-point linkage — Categories 1N, 1, 2N, 2, 3N, 3, 4N and 4*

ISO 3600:1996, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Operator's manuals — Content and presentation*

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

ISO 4254-12:2012, *Agricultural machinery — Safety — Part 12: Rotary disc and drum mowers and flail mowers*

ISO 5673-1:2005, *Agricultural tractors and machinery — Power take-off drive shafts and power-input connection — Part 1: General manufacturing and safety requirements*

ISO 6508-1:2005, *Metallic materials — Rockwell hardness test — Part 1: Test method (scales A, B, C, D, E, F, G, H, K, N, T)*

ISO 11684:1995, *Tractors, machinery for agriculture 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*

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3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4254-1, ISO 4254-12, ISO 12100, and the following apply.

3.1 Rotary mowers

3.1.1

large rotary mower

mower, which may include mulching, with single or multiple cutting-element assemblies which have a cutting diameter of 1 000 mm or greater powered by a propelling machine in which one or more functional components rotate(s) about a vertical axis to cut or shear crop residue, grass and small brush by impact

3.1.1.1

rigid-deck large rotary mowers

large rotary mowers with single or multiple cutting-element assemblies on a common rigid deck

3.1.1.2

multi-section, foldable-wing large rotary mowers

large rotary mowers with multiple cutting-element assemblies and with a single wing or multiple wings that are capable of following the terrain

Note 1 to entry: The wings are foldable for transport and to clear obstacles, but are intended to operate only with all sections in close proximity to the ground surface when mowing.

3.2 Cutting elements

3.2.1

cutting element

mower tool designed to cut or shear crop residue, grass and small brush by impact

Note 1 to entry: This can include mulching.

Note 2 to entry: Knives, blades and sickles are common cutting elements.

3.2.2

cutting-element lot

determined by the cutting-element manufacturer, traceable to the mill heat and manufacturing process

Note 1 to entry: A new cutting-element lot is established when there is a change in the heat of steel.

3.2.3

heat of steel

metal produced by a single cycle of a batch-melting process

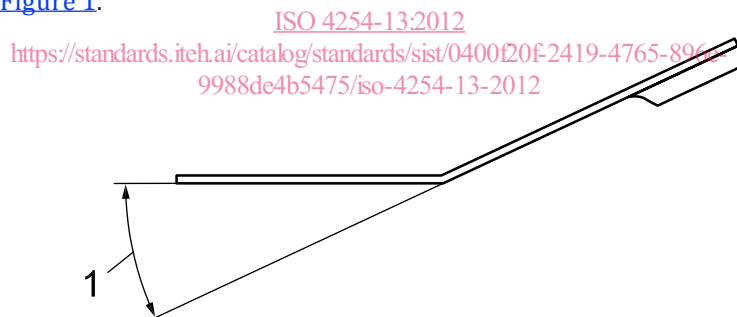
Note 1 to entry: The heat analysis is obtained from a small sample of molten metal from the ladle or furnace. The sample is allowed to solidify, then, a spectrochemical analysis is performed. If the chemical analysis is within specification, the balance of molten metal can be cast as one heat treat number. Typically, heats are over 50 t with many mills running heats about 300 t.

3.2.4

permanent set angle

angle formed by the back of the cutting element or test coupon in the area of the bend after removal from the cutting-element bend-test fixture

Note 1 to entry: See [Figure 1](#).



Key

1 permanent set angle

Figure 1 — Permanent set angle of cutting element after the bend test

3.2.5

total deflection angle

sum of the permanent set angle and the estimated spring back

Note 1 to entry: This angle is for ease of fixture design and not acceptance criteria. (See [5.8](#), [Table 1](#).)

3.2.6

test coupon

flat specimen with the same cross-section and of the same cutting-element lot as the cutting elements it represents

3.3 Thrown-object testing

3.3.1

normal operating position

space within the operator zone occupied by the operator while operating the mower

Note 1 to entry: The operator is sitting on the seat of the propelling machine with hands on the steering controls and feet on controls or areas provided for foot placement.

Note 2 to entry: For examples of target configurations, see [Figures 7](#) and [8](#).

3.3.2

projectile impact

rupture of the front layer but not the back layer of the target material by a test projectile

3.3.3

projectile hit

rupture of all layers of the target material by a test projectile

3.3.4

target material

material used for the thrown-object test

Note 1 to entry: See [Annex D](#).

3.3.5

test projectile

common steel nail or steel wire with the approximate dimensions shown in [Figure 2](#)

Note 1 to entry: The wire projectile should be capable of bending 180° with no cracks or breaks.

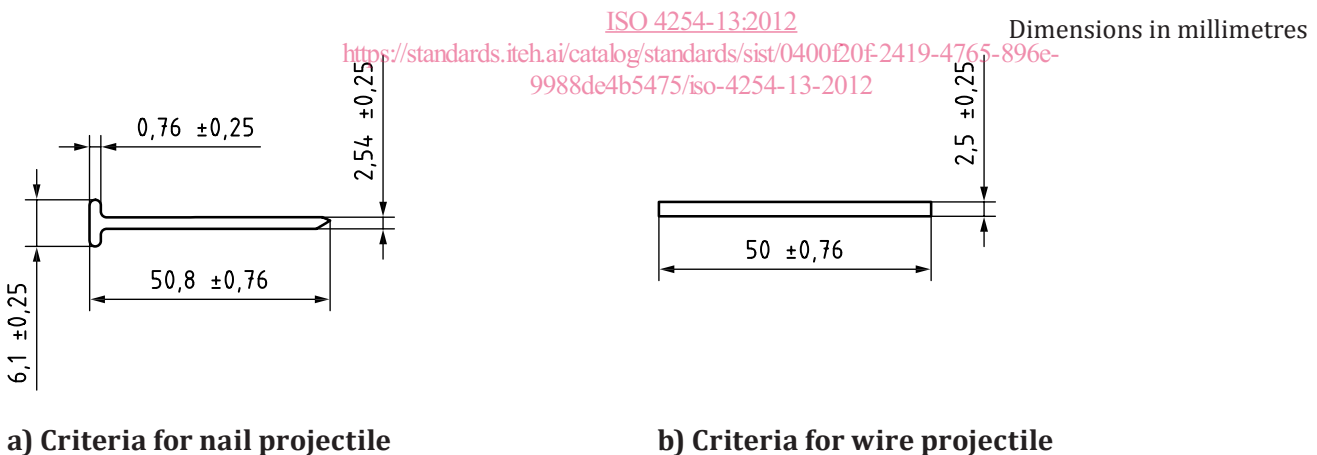


Figure 2 — Test projectile

3.3.6

operator zone

space within the target area in which operator is seated in the normal operating position on the propelling machine while operating the mower

Note 1 to entry: See [Figures 7](#) and [8](#).

3.3.7

target walls

arrangement of target material and supports

Note 1 to entry: See the cross-section in [Figure 9](#) with the configuration shown in [Figures 7](#) and [8](#).

4 Safety requirements and/or protective measures

4.1 General

4.1.1 Machinery shall comply with the safety requirements and/or protective measures of [Clauses 4](#) and [5](#). Machinery shall meet the test requirements and acceptance criteria as specified in [5.3](#), [5.4](#) and [5.5](#). In addition, the machine shall be designed according to the principles of ISO 12100:2010 for relevant but not significant hazards which are not dealt with by this document.

4.1.2 Unless 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.

4.1.3 The maximum tip speed for the cutting elements shall not exceed 96,5 m/s.

4.2 Protection against thrown objects

The mower shall be designed to minimize thrown objects so that tests defined in [5.6](#) are satisfied.

Protective devices (e.g. protective skirts, chains or rubber strips) may be used.

4.3 Protection against inadvertent contact with the cutting elements

4.3.1 The mower shall be designed or guarded in such a way that any inadvertent contact with the cutting elements at the sides and on the top is prevented when the mower is operated according to the manufacturer's instructions in the operator's manual.

4.3.2 The mower shall be designed or guarded in such a way that any inadvertent contact with the cutting elements at the front (normally the intake) and at the rear (normally the exhaust) is minimized when the mower is operated according to the manufacturer's instructions in the operator's manual.

4.3.3 The top protection shall be achieved by a rigid guard or by the device used to prevent thrown-objects.

4.3.4 At the sides, at the front (intake area) and at the rear (exhaust area), there shall be protection by rigid or flexible guard; the device used to minimize projections; or a combination of these devices so when tested according to [5.2](#), there will be no contact between the test probe and the cutting element or the cutting-element assembly.

4.4 Rotating power component guarding and shielding

4.4.1 The mower shall be designed or guarded in such a way that any inadvertent contact with the rotating power component is minimized when the mower is operated according to the manufacturer's instructions in the operator's manual.

4.4.2 Drive shafts and their connecting points shall be guarded in accordance with ISO 5673-1:2005. Other moving parts for power transmission shall be guarded against contact to comply with the safety distances of Tables 1, 3, 4 and 6 of ISO 13857:2008.

4.5 Overrunning clutch or freewheel device

4.5.1 Mowers equipped with an overrunning clutch or a free-wheel device shall be guarded as described in [4.4](#).

4.5.2 Rotating elements that can be inadvertently contacted shall have evidence of rotation and a suitable safety sign to warn of the hazard.

4.5.3 There shall be instructions in the instruction handbook stating to wait until all movement is stopped before servicing.

4.6 Attachment means for trailed mowers

Any trailed unit shall be designed in such a manner that there is a remaining downward load of 3 % of the total weight, or at least 500 N on the hitch point, in order to avoid an uncontrolled upward movement when it is disconnected.

4.7 Attachment means for mounted and semi-mounted mowers

Three-point hitch-mounted and semi-mounted mowers shall be attached to the propelling machine by means of one or a combination of the standardized attachment methods as defined in ISO 730:2009.

4.8 Cutting elements

4.8.1 Cutting-element identification and marking

Every cutting element shall include the following information, stamped or otherwise permanently affixed, in a non-critical-stress area that will be readable on a used cutting element:

- cutting-element manufacturer identification;
- date of manufacture or lot number or production run number.

4.8.2 Hardness

The Rockwell hardness value shall be at least 38 HRC in accordance with ISO 6508-1:2005.

4.8.3 Charpy impact strength

The cutting element shall have an average Charpy value of at least 20,3 J when tested according to [5.7](#).

4.8.4 Bending

The cutting element shall not have any cracks visible to the naked eye after being submitted to the bend test in [5.8](#).

4.9 Impact of the cutting means assemblies

4.9.1 The mower shall withstand a sudden impact to the cutting means.

4.9.2 Compliance is checked by conducting the test in [5.3](#) without loss of any part of the mower or failure of any mower component, excluding portions of the cutting element with a mass of 30 g or less, in a manner that can be hazardous to the operator or bystanders. There shall be no punctures made in the target walls by any part of the mower or cutting elements.

4.10 Unbalance

The mower shall withstand unbalanced cutting means. No part of the mower shall loosen, break up or be ejected, if they are necessary for compliance with the requirements of this part of ISO 4254, nor shall any other component or part of the mower, puncture all the target walls, when tested in accordance with [5.4](#).

4.11 Structural integrity

4.11.1 The cutting means assemblies shall withstand the impact stresses to which they are subjected when used.

4.11.2 The top or side deck shall be designed with a mild carbon steel material of 3 mm thickness or more.

4.11.3 For other materials, and for materials < 3 mm thick, compliance is checked by conducting the test in 5.5. There shall be no break-through of test rods through the cutting-element housing or cutting-element enclosure and there shall be no failure of other shielding.

5 Verification of safety requirements and/or measures

5.1 Test conditions — General

5.1.1 Assembly

5.1.1.1 The mower shall be completely assembled and mounted on, or attached to, its propelling machine except for tests where mounting on a suitable test fixture is designated; or, where necessary, the mower unit may be tested while separated from the power unit and power be provided by some other means. However, the speeds shall be the same as those attained when on, or attached to, the propelling machine, and the fixed parts of the mower which extend into the trajectory area shall also be duplicated as nearly as practicable.

5.1.1.2 Adjustable guards shall be set in the most open position for the test.

5.1.2 Mower position

The mower shall rest on a horizontal surface that is flat within 2°.

Means to restrain the mower in position during the test should be employed, if necessary. Resilient restraints (e.g. chains) may be used.

5.1.3 Test speed

Except for static tests, the mower shall be operated at the highest operating speed recommended in the operator's manual.

5.1.4 Number of tests

All tests shall be run once for each cutting-element assembly of the mower, except where otherwise herein designated. A new mower can be used for each test, except for the structural integrity test and the thrown-object test.

5.2 Foot-probe test

5.2.1 Foot-probe test equipment

Foot-probe test equipment shall be constructed in accordance with [Figure 3](#).