INTERNATIONAL STANDARD

ISO 5395-2

Second edition
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Garden equipment — Safety requirements for combustion-engine-powered lawnmowers —

Part 2: Pedestrian-controlled lawnmowers

Matériel de jardinage — Exigences de sécurité pour les tondeuses à gazon à moteur à combustion interne —

Partie 2: Tondeuses à gazon à conducteur à pied

Reference number
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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 5395-2 was prepared by the European Committee for Standarization (CEN) Technical Committee CEN/TC 144, *Tractors and machinery for agriculture and forestry* in collaboration with ISO Technical Committee TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 13, *Powered lawn and garden equipment*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This second edition of ISO 5395-2, together with ISO 5395-1 and ISO 5395-3, cancels and replaces ISO 5395:1990, which has been technically revised. These three parts also incorporate the Amendment ISO 5395:1990/Amd.1:1992.

ISO 5395 consists of the following parts, under the general title *Garden equipment — Safety requirements for combustion-engine-powered lawnmowers*:

— *Part 1: Terminology and common tests*

— *Part 2: Pedestrian-controlled lawnmowers*

— *Part 3: Ride-on lawnmowers with seated operator*

Introduction

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

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

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 requirements of this type-C standard.

Garden equipment — Safety requirements for combustion-engine-powered lawnmowers —

Part 2: Pedestrian-controlled lawnmowers

1 Scope

1.1 This part of ISO 5395 specifies safety requirements and their verification for combustion-engine-powered pedestrian-controlled rotary lawnmowers and cylinder lawnmowers, including pedestrian-controlled mowers with a sulky having a seated operator (hereafter named "lawnmower"), and equipped with:

— metallic cutting means; and/or

— non-metallic cutting means with one or more cutting elements pivotally mounted on a generally circular drive unit, where these cutting elements rely on centrifugal force to achieve cutting, and have a kinetic energy for each single cutting element of 10 J or more.

This part of ISO 5395 does not apply to:

— robotic and remote-controlled lawnmowers, flail mowers, grassland mowers, sickle bar mowers, towed/semi-mounted grass-cutting machines, and scrub-clearing machines;

— electrically powered and battery-powered lawnmowers;

— pedestrian-controlled lawnmowers with a swing-over handle.

NOTE IEC 60335-1[2] together with IEC 60335-2-77,[3] give requirements for pedestrian-controlled walk-behind electrically powered lawnmowers.

1.2 This part of ISO 5395 deals with all significant hazards, hazardous situations or events (see Annex A) relevant to lawnmowers when used as intended and under the conditions of misuse which are reasonably foreseeable by the manufacturer.

1.3 It is not applicable to lawnmowers which are manufactured before the date of publication of this document.

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.

IEC 61032:1997, *Protection of persons and equipment by enclosures — Probes for verification*

ISO 5395-1:2013, *Garden equipment — Safety requirements for combustion-engine-powered lawnmowers — Part 1: Terminology and common tests*

ISO 5395-3:2013, *Garden equipment — Safety requirements for combustion-engine-powered lawnmowers — Part 3: Ride-on lawnmowers with seated operator*

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

ISO 13849-1:2006, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design*

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

ISO 14119:1998, *Safety of machinery — Interlocking devices associated with guards — Principles for design and selection*

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

ISO 17398:2004, *Safety colours and safety signs — Classification, performance and durability of safety signs*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 12100 and ISO 5395-1 apply.

4 Requirements for pedestrian-controlled lawnmowers

4.1 General

The lawnmower shall comply with the safety requirements and/or protective measures of this clause. The lawnmower shall be marked and carry warnings according to 7.2 and shall be provided with an instruction handbook which complies with 7.1.

In addition, the lawnmower shall be designed according to the principles of ISO 12100 for relevant but not significant hazards which are not dealt with by this document. An audible warning device (for example, horn) is not required. Unless otherwise stated, all tests shall be carried out at an ambient temperature between 15 °C and 35 °C.

If not otherwise specified within this part of ISO 5395, the tests may be carried out in any order and on separate machines, cutting-means enclosures, and cutting-means components.

When the order in which tests should be carried out and the number of permitted machines are not defined in this part of ISO 5395, these conditions should be determined by agreement between the persons carrying out the tests and the manufacturer.

Where it is specified that the engine shall run during the test, it shall be operated at the maximum operating engine speed (see definition in ISO 5395-1). If the measured engine speed is not within the limits specified in the instruction handbook, the engine speed shall be adjusted in accordance with the manufacturer's instructions.

4.2 Controls

4.2.1 Location

The location of operator controls which require sustained activation shall be within the gripping area of the handle(s).

The location of operator controls that do not require sustained activation but that might be operated during grass cutting shall be within the zones shown in Figure 1.

The operator control zone defined in Figure 1 includes the maximum movement range of the controls but is not intended to represent preferred operator control positions.

NOTE 1 ISO/TS 15079[12] gives useful information about the location and operation of operator controls.

For lawnmowers with a sulky, see the additional requirements in 4.17.2.

For the purpose of this subclause, the following shall not be considered as controls that are operated during grass cutting:

— height-of-cut setting;

— fixed cutting-means setting or adjustment;

— grass discharge opening to the grass catcher;

— hydrostatic bypass valve;

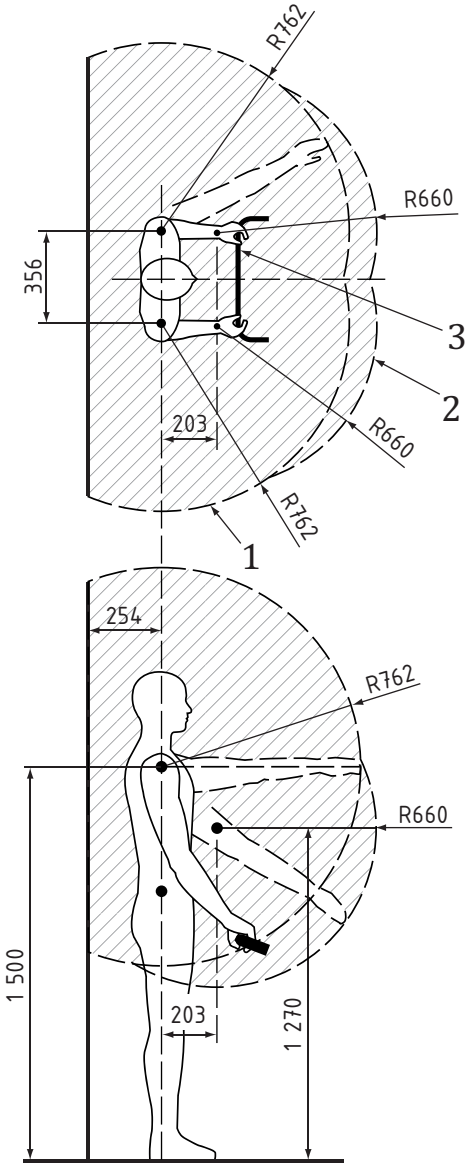
— engine-starting controls which meet 4.2.3 requirements;

— engine-stopping controls, if separate from cutting-means stopping.

A manually operated parking brake shall be operable from the operator position.

Compliance shall be checked by inspection and measurements.

Dimensions in millimetres, tolerance ± 3 mm



Key

1 operator control zone

2 operator control zone when leaning against handle barrier

3 handle barrier

Figure 1 — Operator control zone

NOTE 2 The operator control zone, illustrated in Figure 1, is the area into which the extremities of a 95th percentile male can reach from the normal operator position. The lowest forward zone is the area into which a 5th percentile male or a 50th percentile female can reach when against the handle barrier. This zone can also be reached by a 95th percentile male leaning forward against the handle barrier.

4.2.2 Engine speed

The lawnmower shall be designed so that it is not possible to sustain an engine speed greater than the maximum operating engine speed (see definition in ISO 5395-1) by the use of any control or by adjustments made without breaking a manufacturer's seal, if so provided, or without replacing or reconfiguring engine speed control components.

Compliance shall be checked by inspection and measurement.

4.2.3 Engine starting

Any engine-starting device (e.g. start switch, recoil rope starter) shall require intentional activation in order to start the engine.

A starter operated by means of a loose rope shall not be allowed.

For battery-started lawnmowers, the start switch shall be of the type operated by a removable key or a similar device, to prevent unauthorized starting of the engine.

An engine-starting device located outside the operator control zone (see 4.2.1) shall only allow starting with the cutting-means drive disengaged or if the lawnmower satisfies the foot protection requirements of 5.3.2.2 d) at the starting position.

Compliance shall be checked by inspection.

4.2.4 Engine stopping

An engine-stopping device shall be provided. The device shall not depend on sustained manual pressure for its continued operation. The stopping device can be included in the operator presence control (OPC).

NOTE An emergency stop device is not required.

Compliance shall be checked by functional test and inspection.

4.2.5 Brake steering or clutch steering

The brake-steering or clutch-steering controls shall be arranged so that:

— if actuated by dual controls, the control farthest to the right shall induce a movement of the machine to the right and the control farthest to the left shall induce a movement of the machine to the left; or,

— if actuated by a single control, a clockwise movement of the control about its axis shall effect a clockwise turn of the machine about its axis, and a counter-clockwise movement shall effect a counter-clockwise turn.

Compliance shall be checked by functional test and inspection.

4.2.6 Traction drive

Both the forward and reverse functions of the traction-drive control, if present, shall require an OPC.

Compliance shall be checked by functional test and inspection.

4.3 Operator presence control (OPC)

The lawnmower shall be fitted with operator presence control device(s) which:

— meets the requirements in ISO 13849-1:2006, for Category 1; and

— requires activation by the operator before the lawnmower's traction (if so equipped) and cutting-means drive systems can be started; these functions shall be separate; and

— requires sustained activation by the operator to allow continued operation; and

— automatically activates the stopping of the cutting-means rotation and/or traction-drive system if so equipped, when the operator releases the control device.

The sustained activation and release functions of the traction-drive OPC can be combined with the cutting means OPC.

NOTE The hazards from failure of the OPC system as well as use of performance level (PL) are under review.

From a complete stop position, restart of the cutting-means rotation shall require two separate and distinct actions. Activation of the OPC shall be one of the actions. If these actions are to be carried out using the same hand, then the actions shall be separate and dissimilar to prevent accidental restarting of the cutting means.

If the OPC is reactivated before the cutting means have stopped, the cutting means can resume operation if there is sufficient kinetic energy to restart the engine.

Automatic or single-action stopping and starting of the cutting means shall be allowed during continuous operation of the OPC.

Compliance shall be checked by functional test and inspection.

4.4 Handle

4.4.1 Distance

There shall be a horizontal distance of at least 450 mm from the rear part of the handle, which serves as a barrier between the operator and the nearest point of the cutting means, and the nearest point of the cutting means (dimension 1 in Figure 2).

There shall also be positive means (e.g. latch or upper stop) which cannot be unintentionally disengaged during normal operation of the lawnmower, to prevent dimension 1 in Figure 2 from becoming less than 450 mm.

Additionally, there shall be a rear wall of the cutting-means enclosure and a barrier that shall extend at least 120 mm to the rear from the nearest point of the cutting-means tip circle on the operator's side and rise by an angle of not more than 5° from horizontal (see Figure 2);

For a handle distance of 750 mm or more, this rear wall can be replaced by a trailing shield which shall be provided at the rear of the lawnmower and shall extend to not more than 6 mm above a level supporting surface at all cutting heights. For cutting widths less than 762 mm, the trailing shield shall have a composite width, including wheels, within the width of the cut area, of at least 90 % of the width of cut. For cutting widths greater than or equal to 762 mm, the trailing shield shall have a minimum composite width of 90 % of the distance between the wheels.

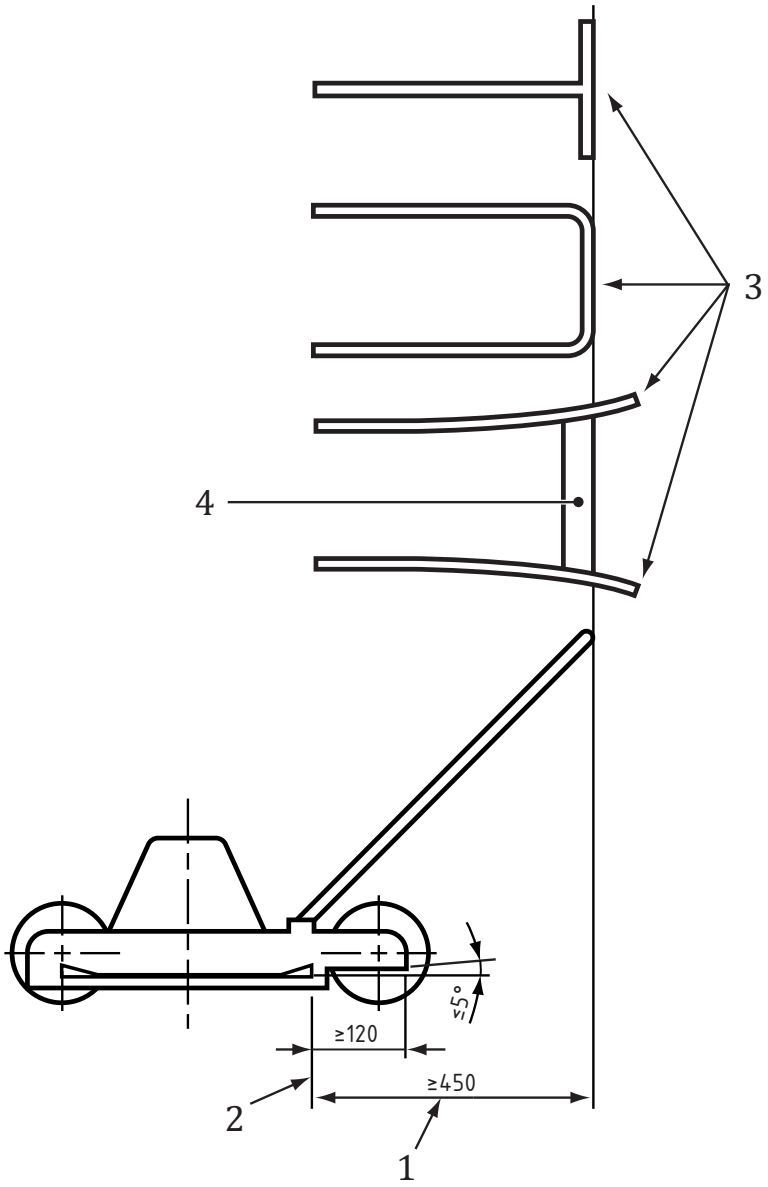
Compliance shall be checked by inspection..

4.4.2 Pivoting

A pivoting handle which has a temporary storage position (park position), usually just forward of the vertical, shall be equipped with a means to either manually or automatically lock the handle back into an operating position.

Compliance shall be checked by inspection.

Dimensions in millimetres



Key

1 horizontal handle distance between the cutting-means tip circle and the rear edge of the handle
2 rearmost point of cutting-means tip circle
3 examples of handle configuration
4 barrier

Figure 2 — Handle distance and rear cutting-means enclosure

4.5 Guards

4.5.1 General

All power-driven components, except the cutting-means and ground-contacting parts, shall be guarded to prevent contact with these components during normal operation. (See 5.3 or 6.2 as appropriate for requirements for the enclosure of the cutting means.)

Openings in guards which would otherwise provide access to moving parts shall comply with the requirements of ISO 13857:2008, 4.2.4.1 and 4.2.4.3.

Fixed guards shall be fixed by systems that can be opened or removed only with tools. A fixed guard, that has to be removed as a part of maintenance procedures as described in the instruction handbook, shall be retained by a fixing system that shall remain attached to the guard or to the machinery when the guard is removed. Where possible, a fixed guard shall be incapable of remaining in place without its fixing system.

Compliance shall be checked by inspection and measurement.

4.5.2 Detaching or opening of guards

The opening or detaching of guards shall require the use of a tool except for:

a) interlocked guards, in accordance with ISO 14119, which prevent access before the moving parts have come to a complete stop. While the hazardous part is exposed it shall not be possible to apply power to it;

b) the opening of automatically closing guards for grass discharge chutes. Such a guard shall remain in its operating position when:

   — the lawnmower is operated on the coconut matting of E.6 in ISO 5395-1:2013; and

   — the cutting means are engaged and operated at maximum operating engine speed; and

   — the cutting means are adjusted to the lowest and highest cutting positions.

Compliance shall be checked by functional test and inspection.

4.6 Brakes

4.6.1 Service-brake performance

4.6.1.1 Requirements

A lawnmower exceeding a mass of 78 kg in its heaviest design configuration with full fuel tanks and empty grass catcher (if installed) shall be equipped with a service brake. A lawnmower to which a sulky can be attached (see 4.17.1) shall be equipped with a service brake.

The service brake shall meet the following requirements:

— the service-brake performance shall only rely on the effectiveness of the braking system; and

— the service-brake control shall be hand-operated; and

— the service-brake control device shall be located within the operator control zone (see Figure 1) and its position shall not interfere with the position of other controls; and

— if the lawnmower is equipped with combined traction clutch and brake controls, the service brake engagement shall simultaneously disengage the traction clutch; and

— the service brake shall be capable of stopping the lawnmower's motion so that the average measured stopping distance does not exceed 0,19 m for each 1 km/h of the maximum forward speed and maximum reverse speed, if a reverse traction drive is provided.

The service-brake system can be provided by a hydrostatic, electric or mechanical drive.

Compliance shall be checked by inspection and tested according to 4.6.1.2.

4.6.1.2 Service brake test

a) The tests shall be conducted on a lawnmower:

   — in its heaviest standard design configuration as available from the manufacturer, with any grass catcher (if installed) filled to its maximum volumetric capacity with material of density 150 kg/m^3 ± 10 kg/m^3; and

   — with full fuel tanks; and

   — with pneumatic tyres inflated to the maximum recommended pressures for the lawnmower; and

   — with brakes adjusted in accordance with the manufacturer's instructions.

b) The tests shall be conducted on a dry, smooth, hard concrete (or equivalent) surface with a maximum slope of 1 %.

c) First condition the service-brake system by running the lawnmower for 10 min during which 10 stops shall be performed from the maximum forward speed.

d) If a reverse traction drive is provided, this break-in period shall be extended to 20 min during which the service brakes shall be applied to stop the machine 10 times from maximum forward speed, and 10 times from maximum reverse speed.

e) If the lawnmower is equipped with separate traction clutch and service-brake controls, the traction clutch shall be simultaneously disengaged with the service brake engagement.

f) After the conditioning procedure has been completed, the service brake test shall be conducted three times in the forward direction of travel and, for the lawnmower with a reverse traction drive, repeated three times in the reverse direction of travel.

g) Operate the lawnmower at its maximum ground speed and release the traction-drive control and apply a maximum force of 220 N to the centre of the grip area of the hand control for the service-brake system. The stopping distances shall be measured for each brake test and the average value calculated for each direction tested.

4.6.2 Parking brake

4.6.2.1 Requirements

The lawnmower equipped with a service brake shall also be equipped with a parking brake. The parking brake shall be capable of holding the lawnmower facing both uphill and downhill on a slope up to and including 16,7° (30 %).

To allow the removal of initial slack in the system, a distance of 50 mm movement is allowed during the first 30 s after the parking brake has been applied. There shall be no further movement after the 30 s.

The parking brake can be combined with the service brake.

The maximum force to actuate the parking brake shall not exceed:

— 220 N for a hand-grip parking brake, actuated by hand gripping motion only; or

— 330 N for a hand-lever parking brake, actuated by arm motion with a hand on a lever; or

— 450 N for a foot-operated parking brake.

The unlocking force shall not exceed the maximum specified actuating force.

NOTE The forces 220 N, 330 N and 450 N are considered as maximum forces that can be applied to meet the test requirements of 4.6.2.2. The operating forces during normal use would in general be less.

If the lawnmower is equipped with an automatic parking brake, it shall be activated when the operator presence control is released.

Compliance shall be checked by inspection and measurement and tested according to 4.6.2.2.

4.6.2.2 Parking brake test

a) The tests shall be conducted on the same lawnmower and under the same conditions as in the service brake test. The transmission shall be in neutral and the engine shall be stopped. If so equipped, the hydrostatic bypass valve shall be in the normal position for cutting grass.

b) The tests shall be conducted on a smooth flat surface with 16,7° (30 %) slope, and a coefficient of friction such that the lawnmower does not slide down the slope.

c) The parking brake shall be applied.

d) The test shall be conducted for a period of 5 min, or if the parking brake is hydrostatic, the test period shall be 60 min.

4.7 Transport position of the cutting-means assembly

4.7.1 Disengagement of the cutting means

If movement of the cutting means to the transport position changes the position of any part of the cutting-means tip circle, or of the contact line of a cylinder cutting means, to a position above 400 mm from the ground, then the cutting-means drive shall be automatically disengaged or require manual disengagement before the cutting means can be raised above 400 mm.

When there is a designated transport position below 400 mm and where the height of any part of the cutting-means tip circle, or the contact line of a cylinder cutting means, is less than 400 mm, there shall be a means of disengaging the cutting means drive while the traction drive is engaged.

Compliance shall be checked by inspection and measurement.

4.7.2 Manual movement to the transport position

Handles shall be provided if the cutting-means assembly is to be moved manually to the transport position. The force required for manual movement from working position to the transport position shall not exceed 250 N.

Compliance shall be checked by inspection and measurement.

4.7.3 Securing in the transport position

The cutting-means assembly shall be capable of being held in the transport position by secure means such as latches.

Compliance shall be checked by inspection.

4.7.4 Movement from the transport position

When moving the cutting means from the transport position to the working position, it shall not be possible to engage the drive to the cutting means unless:

— the operator is in the operator position; and

— the cutting-means tip circle or the contact line of a cylinder cutting means is within 400 mm of the ground; and

— there is a deliberate activation of the drive to the cutting means by the operator.

Compliance shall be checked by inspection and measurement.

4.8 Separate fan for grass collection

If a lawnmower is equipped with a fan to assist grass collection, it shall be provided with:

— a device that will automatically stop fan rotation when the operator's hands are removed from the lawnmower handle. This device can be the same as the one provided for the stopping of the cutting means by the operator presence control (OPC) (see 4.3); or

— interlocked guards on the collection device which prevent access to the fan during the removal or opening of the grass catcher, before it has come to a complete stop.

Compliance shall be checked by functional test and inspection.

4.9 Hot surfaces

Engine exhaust components and their guards with a surface temperature greater than 90 °C for non-metallic materials or 80 °C for metallic materials, and that are accessible during normal operation shall be guarded from inadvertent contact so that the tip or conical surface of cone A or B shall not contact any area of 10 cm^2 or more of the hot surface.

Compliance shall be checked by the test given in ISO 5395-1:2013, Annex H *where the requirement is that the tip or conical surface of cone A or B does not contact any area of 10 cm^2 or more of the hot surface.*

4.10 Exhaust fumes

Engine exhaust fumes shall be directed away from the operator when in the operator position during grass cutting.

Compliance shall be checked by functional test and inspection.

4.11 Pressurized components of hydraulic systems

Hoses, pipes, couplings, pressure relief valves and other pressurized components that operate at a maximum working pressure greater than 5 000 kPa and that are located within less than 1 000 mm of the operator control zone shall be located or shielded so that, in the event of a rupture, the fluid cannot be discharged directly onto the operator when in the operator's position.

The same requirements apply to pressurized components with a working pressure of 500 kPa to 5 000 kPa and within 1 000 mm of the operator control zone and where the temperature of the pressurized fluid exceeds 50 °C when operated at an ambient temperature of 20 °C ± 5 °C.

Compliance shall be checked by inspection and measurement.

4.12 Liquid spillage

4.12.1 Requirements

Liquid containers, batteries, fuel systems, oil reservoirs, and coolant systems shall be designed and constructed so as to prevent spillage when the lawnmower is in a tilted position during normal operation. There shall be no leakage from the filling openings.

Compliance shall be checked by inspection and tested according to 4.12.2.

4.12.2 Spillage test

The liquid container, battery, fuel system, oil reservoir or coolant system shall be filled to its maximum as specified by the manufacturer in the instruction handbook.

The lawnmower shall be tilted for 1 min at 20° lateral with the right side downhill and again with the left side downhill.

Repeat the test when tilted for 1 min at 20° longitudinal with the front downhill and again with the rear downhill.

Weeping at vent systems is not considered as spillage.

4.13 Electrical system

4.13.1 Electrical cables and wiring (including high tension cables)

Electrical cables shall be protected if located in a position of potentially abrasive contact with metal surfaces, or lubricants or fuel. The lawnmower wiring assembly shall, where possible, be grouped together, and shall be supported and located so that no portion is in contact, except for electrical connectors, with the carburettor, fuel injector(s), fuel lines, exhaust system or moving parts. High tension cables shall be supported and located so that no portion is in contact, except for electrical connectors, with the carburettor, fuel lines, exhaust system or moving parts. Any edges of metal parts or components with the potential to contact the electrical cables or wiring shall be rounded or shielded to prevent possible abrasion or cutting damage to the cables or wiring.

Compliance shall be checked by inspection.

4.13.2 Starting battery installation

The compartment for a vented storage battery shall have openings to provide ventilation. If drainage is provided, acid from the battery in any of the normal operator positions shall not contact parts that will be affected to the extent that a hazard will be created. The compartment need not be a complete enclosure, but shall be designed so that the described drainage hazards are avoided. It shall be possible to disconnect the battery electrical circuit, for example with common tools, a switch, or tool-less quick connect systems.

Compliance shall be checked by inspection.

4.13.3 Overload protection

All circuits, except the starter motor and high-tension ignition circuits, shall be provided with an overload protection device in the ungrounded line of a single wire system near the battery terminal, or in either wire of a two-wire system.

Compliance shall be checked by inspection.

4.13.4 Terminals and electrical parts

Terminals and un-insulated electrical parts and two-wire non-grounded systems shall be protected against short-circuiting.

Compliance shall be checked by inspection.

4.13.5 Ignition circuits (spark ignition engines)

A control to stop the spark ignition engine by interruption of the ignition or grounding of the magneto shall be provided and shall be fitted on the low-voltage side.

Compliance shall be checked by inspection.

All high-voltage parts of the circuit, including spark-plug terminals, shall be electrically protected in such a manner that the operator cannot make accidental contact with them.

Compliance shall be checked by the finger probe test (probe B) of IEC 61032:1997*.*

4.14 Electromagnetic immunity

All electronic components used in the systems to control the machine shall meet the acceptance criteria of ISO 14982:1998, 6.3 and 6.6, concerning electromagnetic immunity.

Compliance shall be checked by testing according to ISO 14982:1998*,* 6.3 and 6.6*.*

4.15 Noise

4.15.1 Reduction by design, at source and by protective measures

Noise reduction shall be an integral part of the design process thus specifically taking into account measures at the source. The success of the applied noise reduction measures is assessed on the basis of the actual noise emission values.

The main sources causing and influencing noise are generally the air intake system, engine cooling system, engine exhaust system, cutting system, and vibrating surfaces. See ISO/TR 11688-1[7] for general technical information and guidance for the design of low-noise machines. Special care shall be taken in the acoustical design of machines.

NOTE ISO/TR 11688-2[8] gives useful information on noise generating mechanisms in machinery and ISO 14163[11] gives guidelines for noise control by silencers. ISO 11691[9] and ISO 11820[10] can be used for testing of the silencer.

4.15.2 Noise measurements

Where required to be declared, emission sound pressure levels and sound power levels including the uncertainties shall be determined in accordance with ISO 5395-1:2013, Annex F.

NOTE The provision of this information is mandatory only when required by regional regulations.

4.16 Vibration

4.16.1 Reduction by design, at source and by protective measures

Vibration reduction shall be an integral part of the design process thus specifically taking into account measures at the source. The success of the applied vibration reduction measures is assessed on the basis of the actual vibration values.

The main sources causing and influencing vibration are generally the dynamic forces from the engine, cutting means, unbalanced moving parts, impact in gear sprockets, bearings and other mechanisms, travelling surface, speed, tyre pressure and the interaction between operator, machine and material being worked.

NOTE CR 1030-1[1] gives general technical information and guidance for the reduction of hand-arm vibration on machines.

4.16.2 Vibration measurements

Where required to be declared:

— declare the vibration total value to which the hand-arm system is subjected; the uncertainty of measurement shall be determined in accordance with ISO 5395-1:2013, Annex G; and

— for a lawnmower with a sulky, declare the highest root mean square value of frequency-weighted acceleration to which the whole body is subjected and the uncertainties of measurements; these shall be determined in accordance with ISO 5395-1:2013, Annex G.

NOTE The provision of this information is mandatory only when required by regional regulations

4.17 Additional requirements for a lawnmower with a sulky with a seat

NOTE The requirements of this part of ISO 5395 are based on the assumption that a sulky will have a seat for the operator.

4.17.1 Braking

4.17.1.1 Requirements

A lawnmower designed to be equipped with a sulky shall have a service brake and a parking brake, which meet the requirements of 4.6.1 and 4.6.2, respectively.

For pedestrian-controlled lawnmowers, a foot-operated service brake is allowed if interlinked with a hand-operated control. It shall be positioned so that it can be used with either foot and shall not affect steering.

Compliance shall be checked by inspection and tested according to 4.17.1.2.

4.17.1.2 Brake test

Operation of the service brake and parking brake for the combination of the lawnmower and sulky shall be verified by tests according to 4.6.1 and 4.6.2, respectively, with the following modifications:

A mass of 90 kg ± 0,5 kg shall be securely fastened to the seat to simulate an operator. The centre of gravity of the mass shall be 150 mm ± 5 mm above the lowest point of the operator supporting surface of the seat and 250 mm ± 5 mm forward of the seat back. If a seat back is not used, the forward measurement of 250 mm ± 5 mm shall be measured from the back of an actual seated operator.

4.17.2 Controls

All operator controls shall remain within the zones as defined in ISO 5395-3:2013, Figure 1. In addition, the operator shall be able to reach the controls from the sulky throughout the limits of motion between the sulky and the lawnmower when:

— pitched to the limits or ± 30°, whichever is less (Figure 3); and

— rolled to the limits or ± 20°, whichever is less (Figure 4); and

— yawed to the limits or ± 90°, whichever is less (Figure 5).

The lawnmower and sulky combination shall incorporate restrictor(s) to limit yaw, pitch and roll, respectively, to be within the maximum angles stated above.

Compliance shall be checked by inspection and measurement.

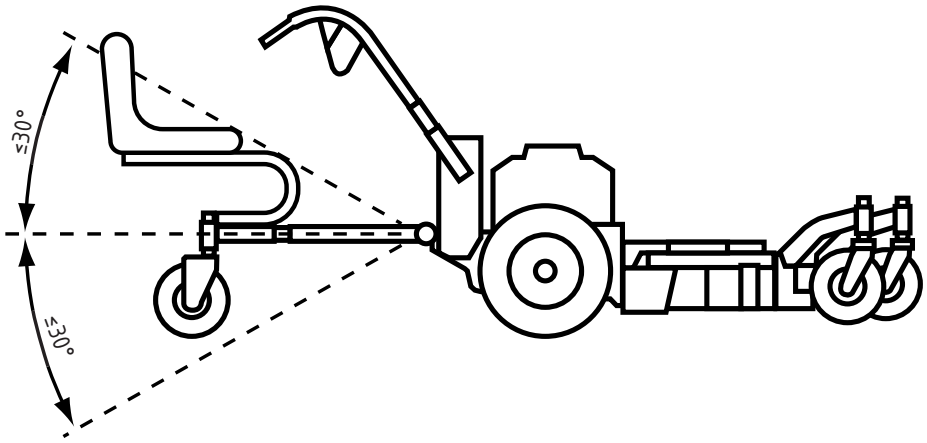


Figure 3 — Pitch

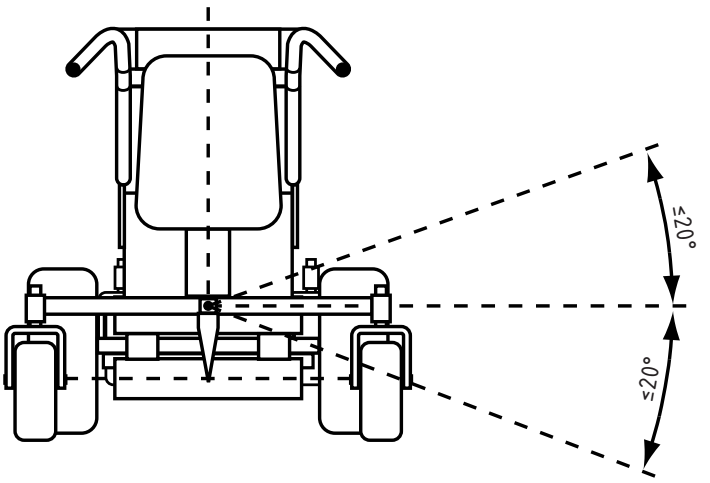


Figure 4 — Roll

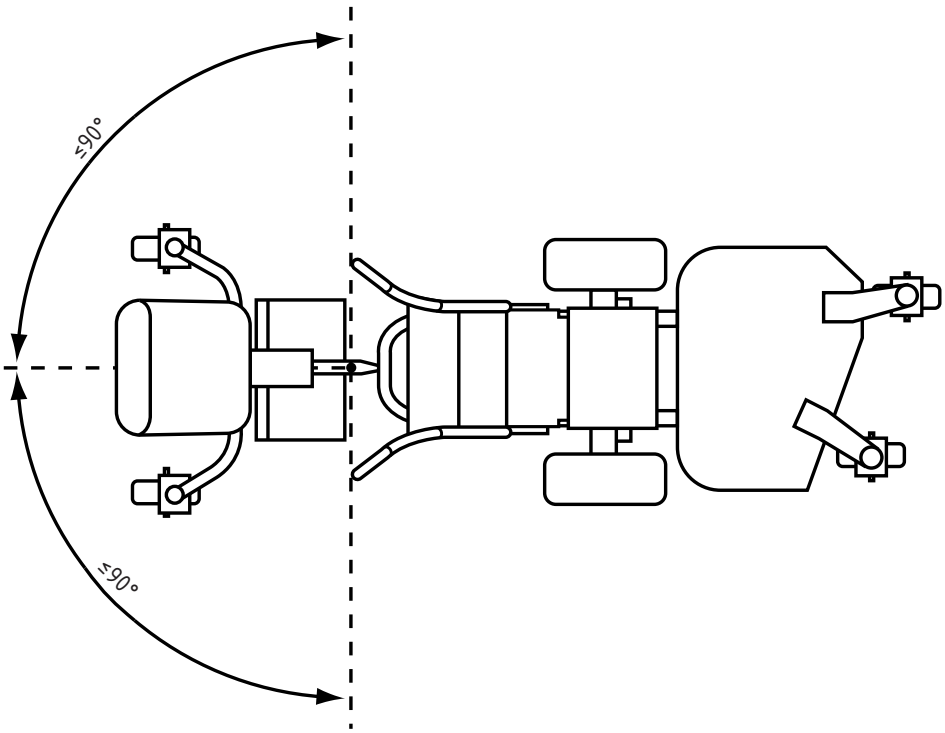


Figure 5 — Yaw

4.17.3 Platform and foot rest

Foot resting areas shall have slip-resistant surfaces or other means of minimizing the risk of the operator slipping off the sulky.

4.17.4 Stability

The lawnmower and sulky combination shall comply with ISO 5395-3:2013, 4.6.1 with the exception that the longitudinal test acceptance with the sulky end positioned downhill shall be a minimum of 20°.

5 Particular requirements for pedestrian-controlled rotary lawnmowers

5.1 Stopping time of the cutting means

5.1.1 Stopping time and durability

Cutting-means rotation shall stop within the maximum time specified in Table 1.

Table 1 — Cutting-means stopping time

Lawnmower cutting width mm	Max stopping time s
≤ 762	3
>762	5

Compliance shall be checked in accordance with ISO 5395-1:2013, Annex A.

5.1.2 Imbalance

5.1.2.1 Requirements

The lawnmower shall withstand an imbalanced cutting means. No part of the lawnmower shall loosen, break up or be ejected if it is necessary for compliance with the requirements of this standard, nor shall any other component or part of the lawnmower pass through all layers of a target panel when tested according to 5.1.2.2.

Compliance shall be checked by inspection and tested in accordance with 5.1.2.2.

5.1.2.2 Imbalance test

The lawnmower shall be tested with the target panel arrangement described in ISO 5395-1:2013, E.7.2. Ground-supported lawnmowers shall be tested on a smooth hard horizontal level surface. Air-cushion lawnmowers shall be tested on grass or a synthetic material equivalent to grass.

The cutting-means imbalance, in kilogram-metres, shall be 0,024 d^3, where d is the diameter of the cutting-means tip circle, in metres. The calculated imbalance shall be created by removing material from, and/or adding it to, the cutting means until the desired imbalance is obtained.

The lawnmower shall be run at the maximum operating engine speed for 60 min for each cutting means. All cutting-means assemblies of a multi-spindle lawnmower shall be tested individually unless the manufacturer chooses to test them all simultaneously, which shall be allowed. When testing the cutting-means assemblies on a multi-spindle lawnmower, a new lawnmower can be used for each test.

If the lawnmower fails to complete the 60 min run without stoppage because of failures not related to loss of structural integrity caused by imbalance of rotating parts, but otherwise meets the requirements of this clause (e.g. spark plug lead failure), the lawnmower can be repaired to complete the test.

It is not required that the lawnmower be suitable for use after this imbalance test is completed.

5.2 Impact of the cutting means

The lawnmower shall withstand a sudden impact to the cutting means in accordance with ISO 5395-1:2013, Annex B and any of the following outcomes of the tests shall be regarded as a failure to meet this requirement:

— target penetration by any part of the lawnmower; or

— breakage of the cutting means or the cutting-means retaining device; or

— detachment from the lawnmower of the cutting means, or of the cutting-means arm or disc on which it is mounted.

Breakage of a drive shearing device or chipping of the cutting-means cutting edge shall not be considered as test failures.

It is not required that the machine be suitable for use after the test.

Compliance shall be checked by inspection and tested in accordance with ISO 5395-1:2013, Annex B.

5.3 Cutting-means enclosure

5.3.1 Enclosure

The cutting-means enclosure shall extend at least 3 mm below the plane of the cutting-means tip circle at its lowest position, except as allowed for front openings and discharge openings. If portions of the cutting means securing parts extend below the cutting-means enclosure, these shall be located within the inner 50 % of the cutting-means tip circle diameter. Any extension of the wall(s) of the cutting-means

enclosure adjacent to the discharge opening, including the walls of the discharge chute, not meeting the 3 mm distance requirement, shall be considered as part of the discharge opening. These extensions shall be tested by the foot-protection test (see ISO 5395-1:2013, Annex C) and meet all the other discharge opening requirements of this standard.

If openings in the cutting-means enclosure are required, they shall be in the top surface within 150 mm radius of the cutting-means rotational axis. These openings shall meet the requirements of ISO 13857:2008, 4.2.4.1 and 4.2.4.3. If other openings in the cutting-means enclosure are provided (for example, drain holes, tooling holes, attachment mounting holes), the openings shall:

— not exceed a total number of 10; and

— be less than 6 mm in diameter or with sides less than 6 mm; and

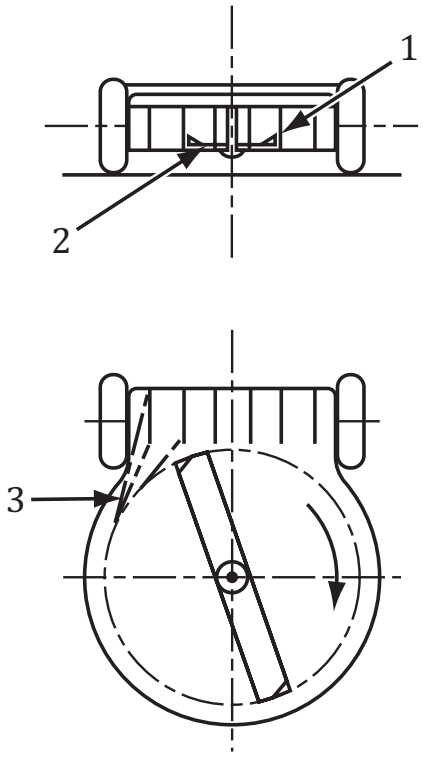
— meet the requirements of ISO 13857:2008, 4.2.4.1 and 4.2.4.3; and

— not allow direct line of sight between the operator zone (Figure 1) and the cutting means.

Machines with a front opening shall satisfy the foot protection requirement of 5.3.2. In addition, all tangential lines from the cutting-means tip circle, in or above the plane of the cutting-means tip circle and in the direction of rotation of the cutting means, shall intersect the cutting-means enclosure.

NOTE Figure 6 shows an example of a structure meeting this requirement.

Compliance shall be checked by inspection and measurement.



Key

1 vertical baffles

2 visible cutting means

3 tangential lines from cutting-means tip circle to intersect vertical baffles

Figure 6 — Example of design for front opening

5.3.2 Foot protection

5.3.2.1 Requirements

There shall be a protection from unintentional foot contact with the cutting means at the following areas of the cutting-means enclosure:

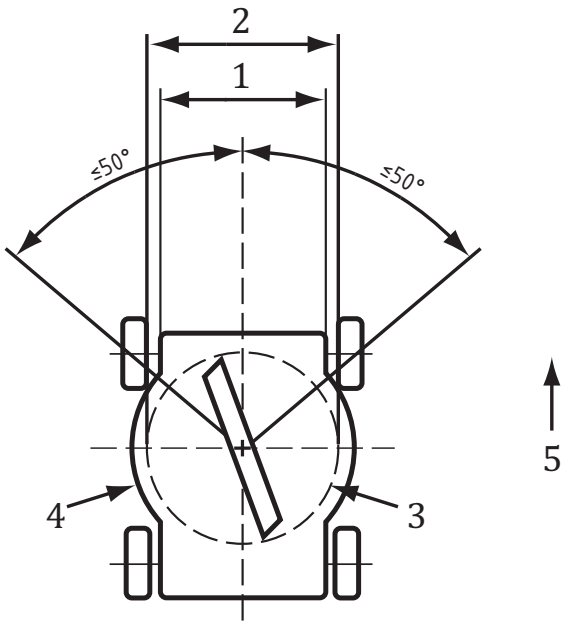
a) dimensions of the front opening in the cutting-means enclosure shall not exceed the smaller of either the cutting width, or the width generated by two radial lines (extending from the cutting-means spindle(s) centre(s) at an angle of 50° either side of the direction of travel) at the points where these lines intersect the enclosure, as shown in Figures 7 a) and 7 b);

b) discharge openings and the sides of any discharge opening or chute if these are less than 3 mm below the cutting-means tip circle;

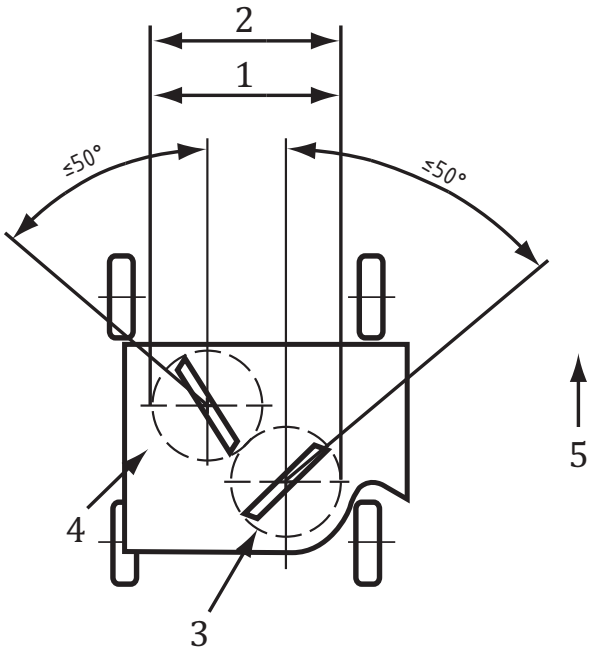
c) the rear of the lawnmowers;

d) within 60° on either side of any starting position, described in the instruction handbook, which is not in the operator control zone for lawnmowers where the cutting means is not disengaged from the engine by a clutch.

The compliance is checked by inspection, measurement and by applying the test of 5.3.2.2 where the probe shall not enter the path of the cutting-means tip circle.



a) Example of front opening limited by 50° angle



b) Example of front opening limited by width of cut

Key

1 maximum front opening
2 width of cut
3 cutting-means tip circle
4 cutting-means enclosure
5 direction of travel

Figure 7 — Examples of front opening allowance

5.3.2.2 Foot protection test

Protection from contact with cutting means shall be verified by applying the foot protection test in accordance with ISO 5395-1:2013, Annex C to:

a) the front opening, if any;

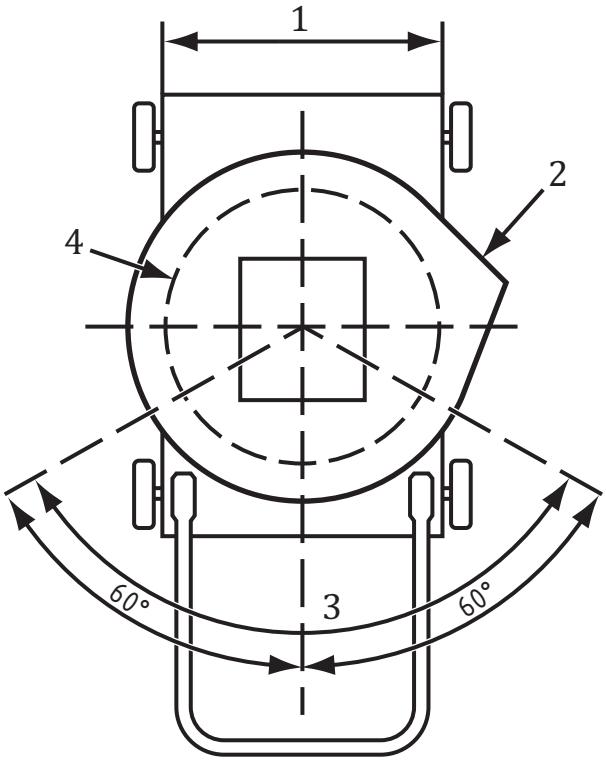
b) the discharge opening, if any, including:

— the area below the discharge opening, if the cutting-means enclosure is less than 3 mm below the cutting-means tip circle as measured to the tip circle at the point of insertion;

— the sides of any discharge opening or chute if these are less than 3 mm below the cutting-means tip circle.

c) the rear of pedestrian-controlled lawnmowers between the wheels to the area both 60° to the right and 60° to the left at the rear of the fore-aft centreline of the cutting width as shown in Figure 8. For lawnmowers with a single cutting means as shown in Figure 8, these angles shall be measured from a point on this fore-aft centreline which is at the centre of the cutting-means tip circle. For lawnmowers with multiple cutting means greater than 762 mm, only the area between the rear drive wheels is probed, as shown in Figure 9.

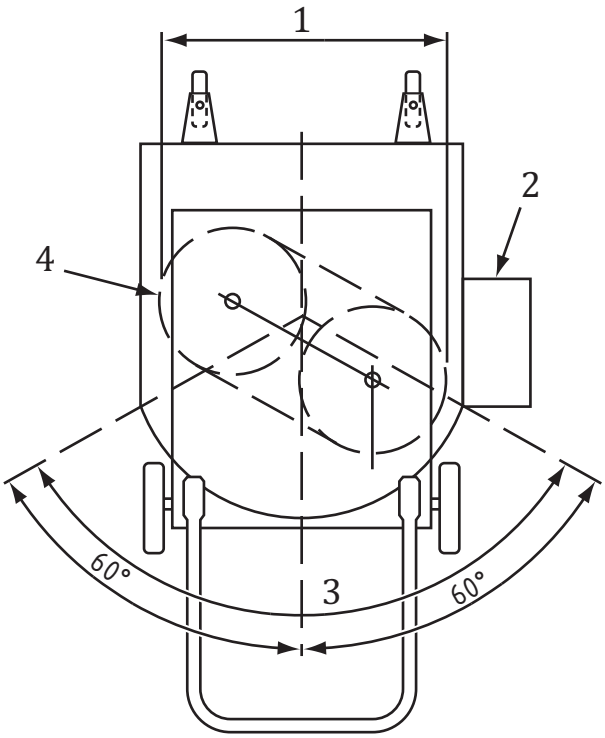
d) areas within 60° on either side of any starting position which is not in the operator control zone for lawnmower where the cutting means is not disengaged from the engine by a clutch.



Key

1 cutting width
2 discharge chute
3 area to be probed
4 cutting-means tip circle

Figure 8 — Area at the rear of the lawnmower to be probed – Single cutting means



Key

1 cutting width
2 discharge chute
3 area to be probed
4 cutting-means tip circle

Figure 9 — Area at the rear of the lawnmower to be probed – Multiple cutting means

5.4 Structural integrity

The cutting-means enclosure, guards and grass catcher shall withstand the impact stresses to which they are subjected when used.

Compliance is checked by the test of ISO 5395-1:2013, Annex D and any of the following outcomes of the test shall be regarded as failure to meet this requirement:

— a hole produced in the cutting-means enclosure, guards or grass catcher which has allowed a ball to pass through; or

— deformation of any part of the cutting-means enclosure, guards or grass catchers such that the cutting means comes in contact with the enclosure, guards or grass catcher; or

— dislodging of the grass catcher or guard; or

— any opening of a zipper or seam of the grass catcher.

A hole or opening in a secondary enclosure, if not a guard, such as an internal baffle, shall not be considered as a failure.

In the event of a test failure, two additional lawnmowers of the same configuration may be tested in an attempt to demonstrate compliance. Both additional lawnmowers shall be tested, and if either of these fails, the lawnmower shall be considered not to be in compliance with the structural integrity requirement of this standard.

It is not required that the lawnmower be suitable for use after this structural integrity test is completed.

5.5 Thrown objects

The cutting-means enclosure, guards and grass catchers shall be designed and constructed in such a way as to minimize the risk of thrown objects in normal use.

Compliance shall be verified according to the test of ISO 5395-1:2013, Annex E.

The number of hits in any zone shall not exceed the value shown in Table 2 for each spindle.

Only balls passing completely through all the layers of the panel material shall be considered as hits.

Table 2 — Permissible hits from thrown object test

Target zone as defined in ISO 5395-1:2013, Annex E	**Max allowed number of hits**
From 0 mm to 450 mm	30[a]
of which from 300 mm to 450 mm	6
From 450 mm to 900 mm	0
Below 450 mm in the operator target area for pedestrian-controlled lawnmowers	2
Above 450 mm in the operator target area for pedestrian-controlled lawnmowers	0
[a] For lawnmowers with a width of cut greater than 1 200 mm, 40 hits are allowed.	

In the event of a test failure, two additional lawnmowers of the same model and configuration can be tested in an attempt to demonstrate compliance. If so, both additional lawnmowers shall be tested, and if either of these fails, the lawnmower shall be considered not to be in compliance with the thrown objects requirement of this standard.

It is not required that the lawnmower be suitable for use after this thrown objects test is completed.

5.6 Grass catcher

If a lawnmower is fitted with a grass catcher, it shall be designed so that either:

— an interlocked grass catcher or guard which prevents access to the cutting means before it has come to a complete stop according to 5.1.1; or

— access to the discharge opening, after removing the grass catcher, is prevented by a self-closing guard that shall return to its normal operating position when the grass catcher is removed.

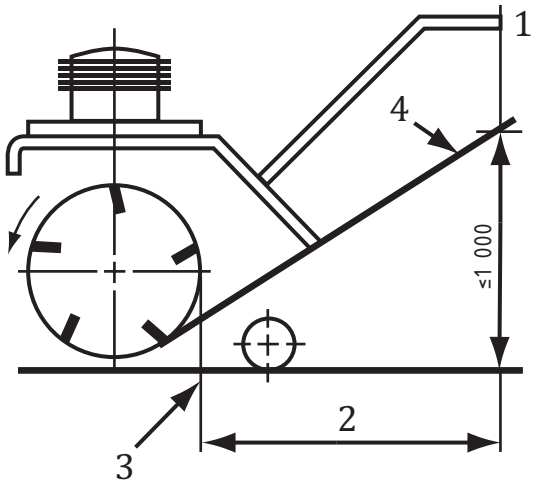
Compliance shall be checked by functional test and inspection.

6 Particular requirements for pedestrian-controlled cylinder lawnmowers

6.1 Throw line

A lawnmower, with other than front discharge, shall be fitted with a fixed guard which limits the throw line to a maximum height of 1 000 mm in the vertical plane defined by the ends of the handle grips (see Figure 10). Measurements shall be taken at the most unfavourable cutting height setting.

Compliance shall be checked by inspection.



Key

1 handle end at highest position
2 handle distance
3 vertical projection of cutting cylinder
4 throw line

Figure 10 — Throw line and handle distance

6.2 Cutting-means enclosure

6.2.1 Requirements

Cutting means shall be guarded.

It shall not be possible for any part of the rod (6.2.2) to approach closer than 10 mm to any point on the cutting means, with or without the grass catcher attached (see Figure 11). Cutting means shall be covered at the sides with guards which extend to a maximum height of 25 mm from the lowest limit of the cutting means from the centreline, rearward. From the centreline forward, the guard may be reduced up to 15° (see Figure 12).

Cutting-means assembly where the grass clippings are thrown without guiding or collecting and cutting-means assembly where the grass clippings are discharged to the rear shall be covered from above by a guard. The vertical projection of the guard onto the supporting surface shall be at least as large, in all directions, as the vertical projection of the cutting means, when any grass catcher has been removed (see Figure 13).

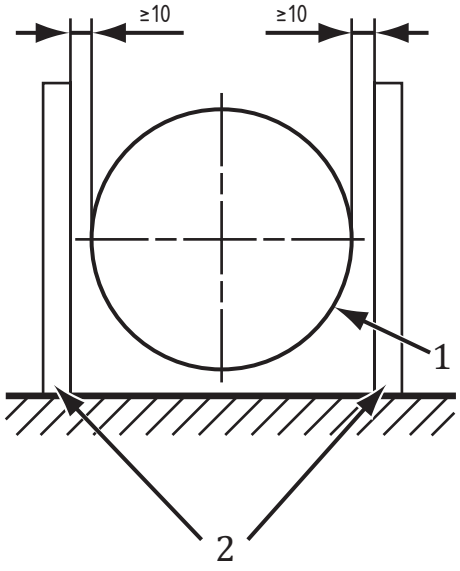
Cutting-means assembly where the grass clippings are discharged at the front shall be covered from the rear with a guard that extends so that its projection on the vertical plane covers from the top of the cutting means to not more than 25 mm from the bottom of the cutting means (see Figure 14).

Compliance shall be checked by inspection and tested in accordance with 6.2.2.

6.2.2 Verification

A rod, 50 mm ± 1 mm diameter and 500 mm long minimum, shall be placed on the supporting surface with its axis vertical and shall be moved towards the cutting means until stopped by a part of the lawnmower or the cutting means.

Dimensions in millimetres

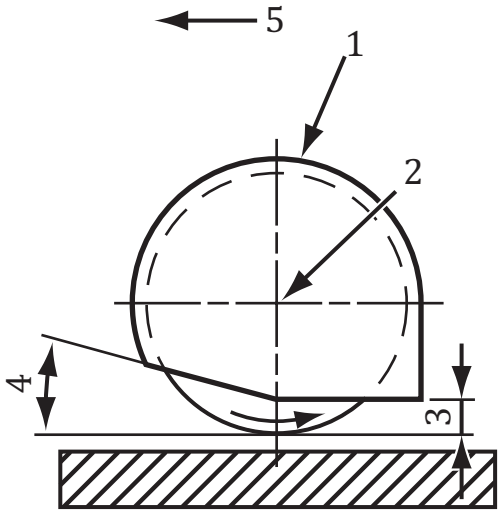


Key

1 cutting means

2 test rod

Figure 11 — Guarding for cutting means, general



Key

1 minimum guard contour

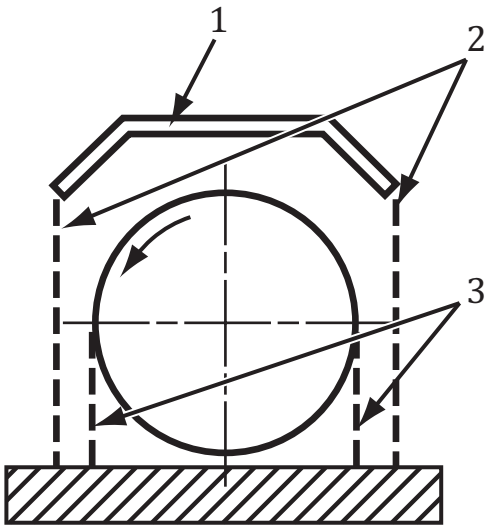
2 centre of rotation of the cutting means

3 height of the guard, rear of centreline (≤25 mm)

4 angle of guard, forward of centreline (≤15°)

5 direction of travel

Figure 12 — Guarding for cutting means, side coverage



Key

1 guard

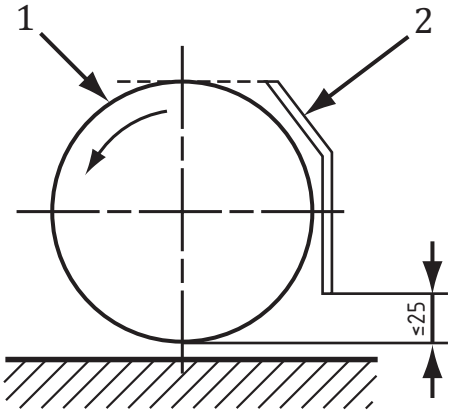
2 vertical projection of guard

3 vertical projection of cutting means

NOTE Distance between 2 and 3 > 0

Figure 13 — Guarding for cutting means, free and rear discharge

Dimensions in millimetres



Key

1 cutting means

2 guard

Figure 14 — Guarding for cutting means, front discharge

6.3 Stopping time of the cutting means

Cutting-means rotation shall stop within 7 s.

Compliance shall be verified according to the test of ISO 5395-1:2013, Annex A.

The stopping time shall be measured from the moment of release of the cutting means operator presence control or disengagement of the cutting-means manual control until the cutting-means rotation has stopped.

7 Information for use

7.1 Instruction handbook

7.1.1 General

For the information to be provided to the user, apply as applicable the content of this clause together with that given in ISO 12100:2010, 6.4.

7.1.2 Technical data

The instruction handbook shall give at least the following technical information for each lawnmower model, where required to be declared.

NOTE The provision of this information is mandatory only when required by regional regulations.

Nominal power	kW
Maximum operating engine speed (rotational frequency)	min^{-1}
Machine mass with empty tanks and in normal operating configuration	kg
Cutting width	cm
Equivalent A-weighted emission sound pressure level at the operator position, determined in accordance with ISO 5395-1:2013, Annex F	dB (A)
— together with the measurement uncertainty	dB (A)
A-weighted sound power level, determined in accordance with ISO 5395-1:2013, Annex F	dB (A)
— together with the measurement uncertainty	dB (A)
For hand-arm vibrations, the highest equivalent vibration total value for the handles or hand positions determined in accordance with ISO 5395-1:2013, Annex G	m/s^2
— together with uncertainty of stated value	m/s^2
For an operator on a sulky (if applicable), whole body vibrations the highest root mean square value of weighted acceleration determined in accordance with ISO 5395-1:2013, Annex G	m/s^2
— together with uncertainty of stated values	m/s^2

Sales literature describing the machinery should not contradict the instructions regarding health and safety aspects. Sales literature describing the performance characteristics of machinery should not contradict the same information on noise emissions and vibration values as are contained in the instruction handbook.

7.1.3 Other information

The instruction handbook shall contain, in accordance with ISO 12100:2010, 6.4.5, comprehensive instructions and information on all aspects of operator/user maintenance and the safe use of the lawnmower, including type and use of personal protective equipment (PPE), suitable clothing and the need for training in all manual operations. The instructions shall take into account use of a lawnmower by a first-time and/or inexperienced operator.

Extensive use should be made of safety signs and/or diagrams. ISO 3600[4] gives guidance on the structure of the handbook.

The importance of reading the instruction handbook thoroughly before using the lawnmower shall be stressed in the instruction handbook.

Terms used in all documentation shall be in accordance with this standard.

The instruction handbook shall at least cover information relating to the following:

a) assembly instructions, initial adjustments and checks, including description of method to install the blade assembly;

b) transport, handling and storage of the lawnmower, including:

— instruction for parking and storage including cleaning and maintenance before storage;

— instructions for securing during transport to prevent loss of fuel, damage or injury;

c) preparation of the lawnmower, including:

— information about the maximum levels for all liquid containers and battery;

— information about filling of fuel and oil, especially concerning fire precautions;

— recommended tyres and pressures and approved tyre combinations for different wheel track-widths;

— information regarding regular maintenance, pre-operating procedures and daily maintenance routines and consequences of improper maintenance;

d) information regarding the lawnmower, including:

— description, identification and nomenclature of principal parts including the safety devices and explanation of their function;

— explanation of symbols and safety signs;

— a list of recommended blades, including a warning of possible consequences from using non-genuine parts;

— where required to be declared, noise levels in accordance with 7.1.2 including warning about the risks and measures to be taken to minimize those risks;

NOTE 1 The provision of this information is mandatory only when required by regional regulations.

— where required to be declared, vibration values in accordance with 7.1.2 including warning about the risks and measures to be taken to minimize those risks;

NOTE 2 The provision of this information is mandatory only when required by regional regulations.

e) the use of the lawnmower, including:

— instructions regarding inspection of the mowing area and the need to remove foreign objects such as stones, toys, sticks and wires;

— instructions to mow only when there is good visibility and the need to keep bystanders away;

— warning about operating the lawnmower in slopes and near drop-offs, ditches or embankments;

— instructions regarding starting procedure and the operation of all controls;

— instructions for ensuring that all starting interlocks and operator presence controls are properly functioning including necessary regular checking;

— instructions that the lawnmower safety systems or features shall not be tampered with or disabled;

— instructions that the operator should not alter or tamper with any sealed adjustments for the engine speed control;

— the procedure(s) for properly adjusting the lawnmower with a warning about the danger of moving blade assemblies;

— instruction about required ballast, if applicable;

— the need for adequate training, including prohibited operations and warning against the use of the unit while being tired, ill or under influence of alcohol or other drugs;

— instructions about stopping and parking procedures before leaving the operator's position;

— where appropriate, cautions for such items as: "the lawnmower shall not be operated without either the entire grass catcher or self-closing discharge opening guard in place";

— information to use slip-resistant foot protection as well as suitable clothing;

— instructions regarding exposure to noise, selection and use of hearing protection, including recommendations for limiting the duration of operation, if appropriate,

— instructions regarding exposure to vibration, including recommendations for limiting the duration of operation, if appropriate;

— hazards which may be encountered while using the lawnmower and how to avoid them while doing typical tasks, e.g. blockage;

— warning about the emission of exhaust gases;

— warning about the use of the lawnmower when there is a risk for lightning;

f) maintenance of the lawnmower, including:

— appropriate user maintenance information;

— instructions to do servicing and replacement tasks with the engine shut off, including the need to keep the lawnmower in good working condition;

— the provision of sufficient information to enable the user to maintain all safety systems throughout the life of the product and to explain the consequences of improper maintenance, use of non-conforming replacement components, or the removal or modification of safety components;

— instructions for de-energizing stored energy devices, if applicable, (for example, spring-loaded mechanisms) and maintenance of engine cooling hydraulic systems;

— information on hydraulic components (if applicable); more specifically, that hydraulic fluid escaping under pressure can penetrate and seriously damage the skin, requiring immediate medical assistance;

— instructions to check and replace worn or damaged parts;

— instruction on how to verify the blade stopping device(s) are functioning as intended;

— identification of the spare parts to be used when these affect the health and safety of the operator, in particularly the cutting means.

Compliance shall be checked by inspection.

7.2 Markings and warnings

7.2.1 Marking requirements

The lawnmower shall be marked with the following minimum information:

a) business name and address of the manufacturer or where appropriate, his authorized representative;

b) the address can be simplified as long as the manufacturer (and where applicable, his authorized representative) can be identified. In any event, the address on the plaque shall be sufficient for mail to reach the company;

c) designation of the machine;

d) the designation of the machinery can be achieved by a combination of letters and/or numbers.

e) where required to be marked, year of construction that is the year in which the manufacturing process is completed;

f) designation of the series or type;

g) the designation of the series or type is to allow the technical identification of the product and this can be achieved by a combination of letters and/or numbers and can be combined with the designation of the machinery;

h) where required to be marked, the mass in kilograms of the lawnmower with empty tanks;

i) where required to be marked, the nominal power in kilowatts;

NOTE The provision of this information is mandatory only when required by regional regulations.

j) the serial number.

In addition, the lawnmower shall bear the following information:

— controls which can give rise to a hazard when operated shall be marked or so placed as to indicate clearly which part of the machine they control;

— for rotary lawnmowers, the cutting means shall be marked for identification with the part number and manufacturer, importer or supplier.

If symbols are used, they shall be explained in the instruction handbook.

When symbols are used, they shall, except if they are cast, embossed or stamped, be in contrast to their background. Embossed features shall be at least 0,3 mm in height. The information and/or instructions provided by the symbols shall be clearly legible when viewed by from a distance of (500 ± 10) mm.

The markings shall be located in a readily visible position and shall resist the anticipated service conditions, e.g. the effects of moisture and weathering exposure. Labels after testing in accordance with no less than one of the test methods of 7.2.3 shall show no significant indications of indentation, separation, splitting, chalking, swelling, peeling, edge curling, blistering, flaking, large scratches or cracking of the material and/or its graphical components.

Compliance shall be checked by inspection and functional test in accordance with 7.2.3.

7.2.2 Warning requirements

All lawnmowers shall be marked with warnings with the substance of the following:

— WARNING: READ INSTRUCTION HANDBOOK!

— WARNING: KEEP BYSTANDERS AWAY!

— WARNING: KEEP HANDS AND FEET AWAY FROM THE BLADES!

The text can be replaced by safety signs, see examples in ISO 11684.[6] If safety signs are used, they shall be explained in the instruction handbook.

The warnings shall be located in a readily visible position close to the hazard and shall resist the anticipated service conditions, e.g. the effects of moisture and weathering exposure.

When symbols are used, they shall, except if they are cast, embossed or stamped, be in contrast to their background. Embossed features shall be at least 0,3 mm in height. The information and/or instructions provided by the symbols shall be clearly legible when viewed by from a distance of (500 ± 10) mm.

The markings shall be located in a readily visible position and shall resist the anticipated service conditions, e.g. the effects of moisture and weathering exposure. Labels after testing in accordance with no less than one of the test methods of 7.2.3 shall show no significant indications of indentation, separation, splitting, chalking, swelling, peeling, edge curling, blistering, flaking, large scratches or cracking of the material and/or its graphical components.

Compliance shall be checked by inspection and functional test in accordance with 7.2.3.

7.2.3 Artificial weathering test

All markings and warnings according to 7.2 (except if they are embossed, cast, moulded) shall be tested according to:

— the open-flame carbon lamp accelerated weathering test of ISO 17398:2004, 7.3.2; or

— the xenon-arc artificial weathering resistance test of ISO 17398:2004, 7.3.4.

Other test methods can be used, providing the method ensures at least equivalent label durability.

Annex A
(informative)

List of significant hazards

Table A.1 specifies the significant hazards, significant hazardous situations and significant hazardous events that have been identified as being significant to the types of machines covered by this standard and which require specific action by the designer or manufacturer to eliminate or reduce the risk.

Table A.1 — List of significant hazards associated with pedestrian-controlled lawnmowers

Ref. No.	Hazard		Subclause of this part of ISO 5395
	Origin (source)	Potential consequences	
	Mechanical hazards		
1	Moving cutting-means assembly (e.g. lawnmower deck)	Crushing of upper and lower extremities	4.4, 4.7, 5.1, 5.3, 5.4, 6
2	Rotary cutting means	Cutting or severing of upper and lower extremities	4.4, 4.7, 5.1, 5.2, 5.3, 5.4, 5.6, 7.2.1, 7.2.2
3	Cylinder cutting means	Shearing of upper and lower extremities	4.4, 4.7, 6, 7.2.2
4	Separate fan for grass collection	Cutting or severing of upper extremities	4.8
5	Moving transmission parts	Entanglement, drawing-in, crushing, cutting, severing of upper extremities	4.4, 4.5
6	Thrown objects from cutting means	Injury from impact of ejected objects	5.1.2, 5.2, 5.4, 5.5, 6.1, 6.2, 7.2.2
7	Instability/overturning of machine	Injuries due to crushing by or collision with uncontrolled machine	4.2.5, 4.6
8	Traction control system failure resulting in impossibility of stopping the machine in the best possible conditions	Injuries due to crushing by or collision with uncontrolled machine	4.2.1, 4.2.5, 4.2.6, 4.3, 4.6
9	Engine control system malfunction or controls resulting in unexpected start-up with cutting means engaged, unexpected over-run/over-speed	Shearing, cutting, severing or entanglement of upper and lower extremities	4.2.1, 4.2.2, 4.2.3, 4.2.4, 4.2.6, 4.3, 4.7.1, 4.7.4, 4.13.5, 4.14
10	Hydraulic system	Injury from high pressure fluid injection	4.11, 7.1.3
	Electrical hazards		
11	Live parts of electrical system	Injuries from electric shock to the body	4.13, 7.1.3
12	Lightning	Injuries from electric shock to the body	7.1.3
	Thermal hazards		
13	Hot engine parts	Injury from burns and scalds from accidental contact	4.9, 7.1.3
	Noise hazards		

Table A.1 *(continued)*

Ref. No.	Hazard		Subclause of this part of ISO 5395
	Origin (source)	**Potential consequences**	
14	Engine, transmission and cutting means including resonance of fixed machine parts	Discomfort, partial hearing loss, deafness, loss of balance, loss of awareness, stress	4.15, 7.1.3, 7.2.2
	Vibration hazards		
15	Engine, handles, steering wheels and seats	Discomfort, low-back morbidity, neurological, osteo-articular and vascular disorders, trauma of the spine	4.16, 7.1.3
	Material/substance hazards		
16	Dust	Injuries to eyes	7.2.2
17	Engine exhaust gases, gasoline, brake and battery liquids	Respiratory problems through inhalation of harmful gases and injuries to the skin from contact with harmful liquids	4.10, 4.12, 7.1.3
	Ergonomic hazards		
18	Location and design of controls, handles, sulky attachments, etc.	Discomfort, fatigue, injuries to locomotor apparatus	4.2, 4.3, 4.4, 4.7.2, 4.17, 7.1.3, 7.2.1
	Combination of hazards		
19	Poor postures or excessive effort in combination with inadequate design or location of manual controls	Fatigue, injuries to locomotor apparatus	4.2.1, 4.4, 4.6, 4.7.2
20	Long operation, particularly in combination with poor posture	Fatigue, injuries to locomotor apparatus, loss of control	7.1.3
21	Hot engine parts/electrical short-circuiting in combination with leaking gasoline tank/gasoline spilling	Burns and scalds by resulting fire/explosion	4.12, 4.13, 7.1.3

Bibliography

[1] CR 1030-1, *Hand-arm vibration — Guidelines for vibration hazards reduction — Part 1: Engineering methods by design of machinery*

[2] IEC 60335-1, *Household and similar electrical appliances — Safety. General requirements*

[3] IEC 60355-2-77, *Household and similar electrical appliances — Safety — Part 2-77: Particular requirements for pedestrian controlled mains-operated lawnmowers*

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

[5] ISO 3767 (all parts), *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays*

[6] ISO 11684, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazard pictorials — General principles*

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

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

[9] ISO 11691, *Acoustics — Measurement of insertion loss of ducted silencers without flow — Laboratory survey method*

[10] ISO 11820, *Acoustics — Measurements on silencers in situ*

[11] ISO 14163, *Acoustics — Guidelines for noise control by silencers*

[12] ISO/TS 15079, *Powered lawn, garden and horticultural equipment — Operator controls — Guidance on actuating forces, displacement, location and methods of operation*

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