
**Snow throwers — Safety requirements
and test procedures —**

Part 3:
Ride-on snow throwers

*Chasse-neige — Exigences de sécurité et essais —
Partie 3: Chasse-neige à conducteur porté*

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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

This document was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 13, *powered lawn and garden equipment*.

This first edition of ISO 8437-3, together with ISO 8437-1, ISO 8437-2 and ISO 8437-4, cancels and replaces ISO 8437:1989, which has been technically revised. It also incorporates the Amendment ISO 8437:1989/Amd.1:1997.

A list of all parts in the ISO 8437 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

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

- a) Type-A standards (basic standards) give basic concepts, principles for design and general aspects that can be applied to machinery.
- b) Type-B standards (generic safety standards) deal with one or more safety aspects or safeguards that can be used across a wide range of machinery:
 - 1) type-B1 standards on particular safety aspects (e.g. safety distances, surface temperature, noise);
 - 2) type-B2 standards on safeguards (e.g. two-handed controls, interlocking devices, pressure sensitive devices, guards).
- c) Type-C standards (machinery safety standards) deal with detailed safety requirements for a particular machine or group of machines.

ISO 8437 is a type-C standard as stated in ISO 12100.

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

- machine manufacturers (small, medium and large enterprises);
- health and safety bodies (regulators, accident prevention organizations, market surveillance, etc.).

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

- machine users/employers (small, medium and large enterprises);
- machine users/employees (e.g. trade unions, organizations for people with special needs);
- service providers, e.g. for maintenance (small, medium and large enterprises);
- consumers (in case of machinery intended for use by consumers).

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

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

When provisions of this type-C standard are different from those which are stated in type-A or type-B standards, the provisions of this type-C standard shall 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.

Snow throwers — Safety requirements and test procedures —

Part 3: Ride-on snow throwers

1 Scope

This document specifies safety requirements applicable to combustion engine powered ride-on snow throwers. It is intended to be used with ISO 8437-1 and ISO 8437-4 to achieve the full requirements and means for ride-on snow throwers.

The ISO 8437 series deals with significant hazards, hazardous situations and events relevant to snow throwers used as intended and under the conditions reasonably foreseeable by the manufacturer.

It does not apply to the following:

- electrically powered and battery powered snow throwers;
- hand-held snow throwers;
- airport or highway snow removal machines and equipment;
- machines intended for use in potentially explosive atmospheres.

It does not deal with hazards related to the following:

- battery circuits exceeding 42 V;
- mains connected starting motor;
- magneto grounding circuits;
- working environment;
- electromagnetic compatibility.

The ISO 8437 series is not applicable to machines that were manufactured before the date of its publication.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3411, *Earth-moving machinery — Physical dimensions of operators and minimum operator space envelope*

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

ISO 8437-1:2019, *Snow throwers — Safety requirements and test procedures — Part 1: Terminology and common tests*

ISO 8437-4:2019, *Snow throwers — Safety requirements and test procedures — Part 4: Information on national and regional provisions*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO 8437-1 and ISO 12100 apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

4 Snow thrower safety requirements and test procedures

4.1 General

The machines shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed in accordance with the principles of ISO 12100 for hazards relevant but not significant that are not dealt with by this document (e.g. sharp edges on the outside of the machine).

A slip-resistant surface or other means shall be provided to minimize the possibility of an operator's foot slipping off the foot supports or platforms.

Machines with a snow thrower shall be equipped with two red-colour reflex reflectors. They shall face rearward and be mounted a minimum of 305 mm above the ground. A red tail light, visible at 91,4 m, may be substituted for reflectors. Reflectors or tail lights shall be provided with the snow thrower attachments if the propelling machine is not equipped with reflectors or tail lights.

For additional regional and national requirements, see ISO 8437-4:2019, Clause 6.

4.2 Controls

4.2.1 General

Operator controls shall be located within, and have a range of movement which remains within, the operator control position given in [Figure 1](#), except for

- engine controls,
- snow discharge chute and deflector control(s),
- manual lift,
- hydrostatic bypass valve, and
- parking brake.

Compliance shall be checked by inspection and measurement.

The controls shall be designed such that they can be operated by an operator with and without arctic mittens see [Figure 2](#).

Compliance shall be checked by functional test.

No controls shall be in any hazard zone (see [Figure 1](#)).

Compliance shall be checked by inspection and functional test.

Pedals shall have a slip-resistant surface or other means of minimizing the possibility of the operator's foot slipping off the pedals.

Compliance shall be checked by inspection and functional test.

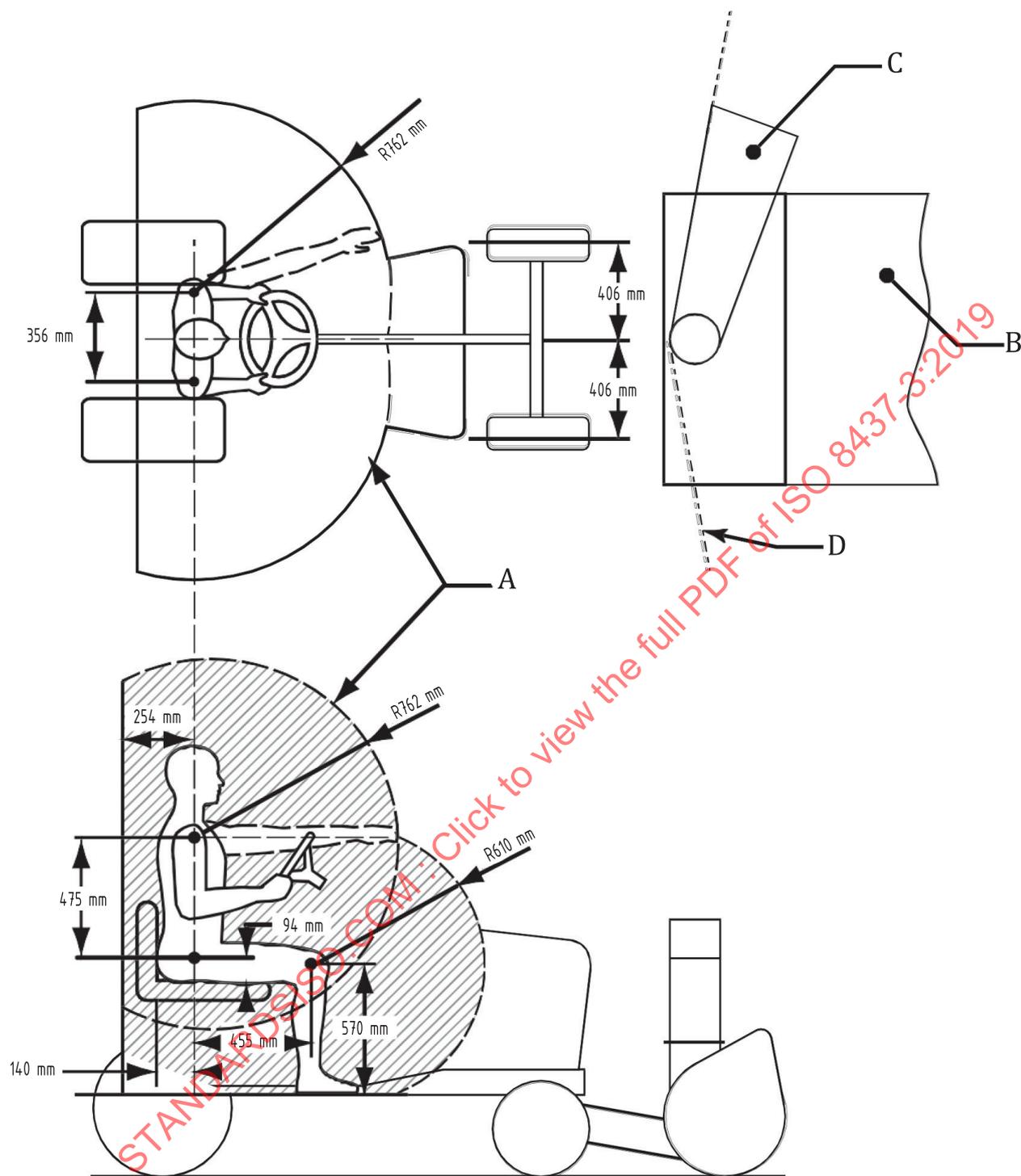
Controls where the purpose is not obvious to the user shall have the function, direction and/or method of operation clearly identified by a durable label or mark except for the steering wheel, manual lift controls, and snow discharge chute and deflector controls, which are optional.

Compliance shall be checked by inspection and labels shall be tested in accordance with ISO 8437-1:2019, 5.3.

Detailed instructions on the operation of all controls shall be provided in an instruction handbook (see [Annex A](#)).

Compliance shall be checked by inspection.

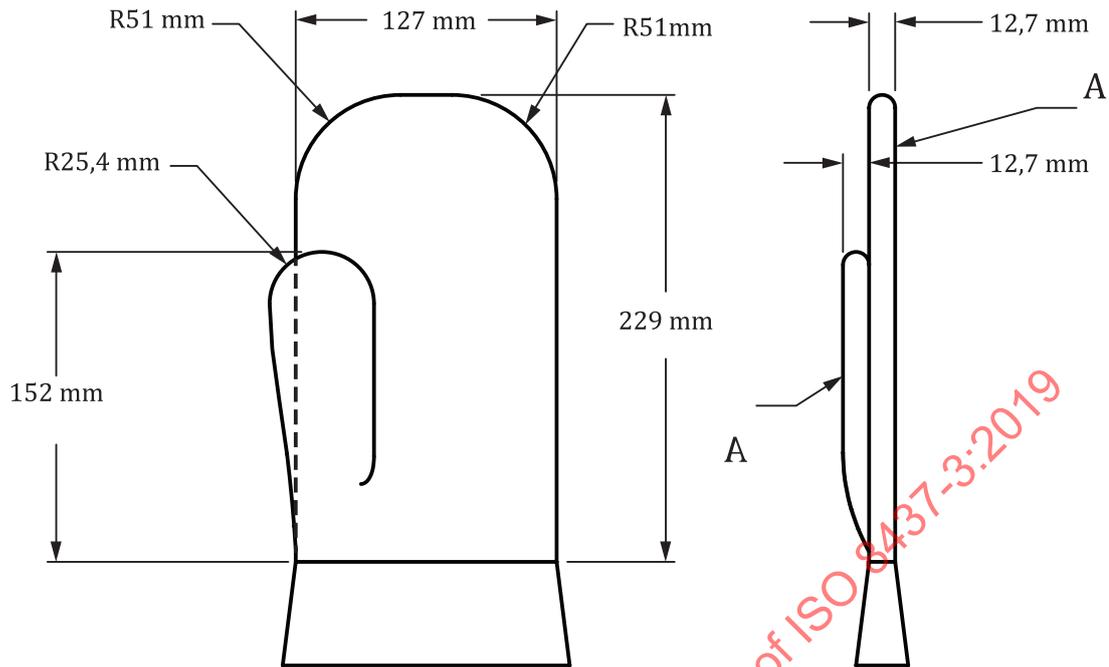
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Key

- A operator position
- B collector hazard zone
- C discharge hazard zone
- D discharge limit

Figure 1 — Operator position and hazard zones: ride-on snow throwers

**Key**

A pressed flat

NOTE 1 All dimensions approximate, without hand in glove.

NOTE 2 Material: buckskin outer shell with knit liner.

Figure 2 — Arctic mitten

4.2.2 Engine stopping and starting

4.2.2.1 Starting device

A switch operated by a removable key, or a similar device, shall be provided to prevent unauthorized starting of the engine unless a manual starter (such as an integral starter rope) is the only means of starting the engine. Any engine starting device shall require intentional activation in order to start the engine. Snow throwers shall not be provided with a starter operated by means of a loose rope.

Compliance shall be checked by inspection and functional test.

4.2.2.2 Stopping device

An engine stopping device shall be provided. The device shall not depend on sustained manual pressure for its continued operation. An emergency stop device is not required.

Compliance shall be checked by inspection and functional test.

4.2.2.3 Hand-operated

The direction of motion for a handle-mounted engine speed hand-lever control shall be

- a) generally forward or upward, or both, to increase speed, and
- b) generally rearward or downward, or both, to decrease speed.

Compliance shall be checked by inspection and functional test.

4.2.2.4 Foot-operated

When a foot-operated engine speed control pedal is provided, it shall be operated by the right foot with the direction of motion generally forward or downward, or both, to increase speed. It shall be located within the operator control position.

Compliance shall be checked by inspection and functional test.

4.2.2.5 Drive interlock for starting

A means shall be provided to prevent starting of the engine unless

- a) the collector and impeller drive are disengaged, and
- b) the traction drive is disengaged or in a neutral position.

Compliance shall be checked by inspection and functional test.

4.2.2.6 Engine speed

For regional and national requirements on engine speed, see ISO 8437-4:2019, Clause 6.

4.2.3 Collector and impeller control

4.2.3.1 Operator-presence control

A means shall be provided to automatically stop the impeller and/or collector or kill the engine when the operator leaves the operator position. The collector and/or impeller may resume operation upon reactivation of the operator-presence control, provided the collector and impeller did not stop. Additional requirements are given at [4.2.8](#).

Compliance shall be checked by inspection and functional test.

4.2.3.2 Stopping time

The impeller and/or collector shall stop within 5 s, and comply with [4.2.3.4](#) when the control is disengaged.

The engine shall be set at the equipment manufacturer's maximum specified speed. The control shall be fixed to maintain the maximum speed.

Compliance shall be checked by inspection, measurement, and test in accordance with [4.2.3.4](#).

4.2.3.3 Impeller or traction engagement control

A means shall be provided to permit the machine to be transported under its own power without the impeller engaged. A means shall also be provided to permit engagement of the impeller without engagement of the traction drive.

Compliance shall be checked by inspection and functional test.

4.2.3.4 Impeller controls tests

4.2.3.4.1 Test procedure

Stopping time shall be measured from the initiation of a stop command from the maximum speed achievable by means of the operator's engine speed control.

When collector and impeller stopping is achieved by means of a power disconnecting device (e.g. clutch) the engine shall be run for 15 min uninterrupted, with controls in the disengaged position. The engine shall be operated at the maximum operating speed obtained by the operator control.

This test is not required if a means is provided that will automatically stop the engine when the operator leaves the operator position.

4.2.3.4.2 Test acceptance

The criteria for failure shall be as follows.

- For all machines, the measured stopping time for the collector and/or impeller exceeds 5 s.
- For machines with a power disconnection device (e.g. clutch), the impeller and/or collector revolve more than 3 revolutions during the 15 min test period with the control in the disengaged position.

Compliance shall be checked by inspection and functional test.

4.2.4 Directional control

Except for lever-steer snow throwers, forward/reverse directional controls shall require at least one of the following.

- A distinct change in direction of the control actuation (for example, right angle to general path of control motion) at a point before a change in direction occurs.
- A distinct change in force level at the point of entry into the selected direction.
- A positive means of retarding machine acceleration, for example hydrostatic control with valves operated by rigid linkages.

Compliance shall be checked by inspection and functional test.

4.2.5 Clutch control requirements for traction clutch or neutral, or both

4.2.5.1 General

A ride-on lawnmower equipped with a clutch control system meeting the requirements of ISO 5395-3 for the clutch control shall be considered compliant with this subclause when using the same traction control system with a snow thrower attachment.

For machines with a clutch control system that does not meet the requirements of ISO 5395-3, the requirements in [4.2.5.2](#) to [4.2.5.6](#) shall apply.

4.2.5.2 Foot pedal control

When provided, a foot pedal control shall be actuated by the operator's left foot, with the direction of motion generally forward or downward, or both, for disengagement. Operator-presence controls shall not be included in this requirement.

Compliance shall be checked by inspection.

4.2.5.3 Hand-operated control

When provided, a hand-operated clutch control shall be moved generally rearward or toward the operator for disengagement. This requirement shall not be applied to an operator-presence control in [4.2.5.4](#).

Compliance shall be checked by inspection and functional test.

4.2.5.4 Operator-presence control

In addition to the requirements of [4.2.8](#), a generally forward or downward motion on the foot-actuated operator-presence control, when provided, shall produce clutch engagement. A right-foot operator-presence control shall be outboard of the service brake pedal.

Compliance shall be checked by inspection.

4.2.5.5 Traction clutch

When a foot-operated (either foot) combination machine clutch or neutral return, or both, and a brake control is used, the direction of actuation shall be generally forward or downward, or both, to cause traction disengagement and brake application. Provision shall be made to retain control of the machine during the transition zone of brake disengagement to traction engagement.

Compliance shall be checked by inspection and functional test.

4.2.5.6 Lever-steer

On lever-steer machines, the engagement or disengagement of the clutch is accomplished by displacement of the lever(s). Movement of the lever(s) generally forward shall result in forward motion. Movement of the lever(s) generally rearward shall result in rearward motion.

Compliance shall be checked by inspection and functional test.

4.2.6 Traction speed control

A ride-on lawnmower equipped with a traction control system meeting the requirements of ISO 5395-3 for the speed control shall be considered compliant with [4.2.6](#) when using the same traction control system with a snow thrower attachment.

Fixed-ratio transmission speed selector controls, when provided, shall be located within the operator control position and the shifting patterns shall be clearly identified with a durable label.

A hand-operated direction control for non-variable speed snow throwers, when provided, shall be moved generally forward for forward machine motion, and generally rearward for rearward machine motion. A neutral position shall be provided and provisions shall be made to retard movement of the control into the forward and rearward directions from the neutral position.

When provided, a hand-operated variable speed traction control shall be moved generally forward or upward, or both, to increase speed.

A single-lever hand-operated combination directional and variable speed control, when provided, shall have a definite neutral zone with some means of retarding the control or its effect when moving into the forward or rearward direction. The control shall be moved generally forward for forward travel and increasing forward speed and shall be moved generally rearward for rearward travel and increasing rearward speed. The control shall remain in the selected position or move to a slower speed position unless repositioned by operator action.

A foot-actuated combination directional and variable speed control shall be operated as follows.

- a) If a single pedal is used for the combination directional and variable speed control, it shall be operated by the right foot. It shall produce forward motion with a generally forward or downward toe motion on the pedal and rearward motion with a generally rearward or downward heel motion. Increased displacement of the pedal shall produce increased speed in either direction. Provisions shall be made for a definite neutral zone with some means of retarding the control or its effect when moving into the generally forward or rearward directions.
- b) If two pedals are used for the combination directional and variable speed control, they shall both be operated by the right foot. Generally forward or downward motion on the outer pedal

shall produce reverse motion and increase rearward speed of the machine. Generally forward or downward motion on the inner pedal shall produce forward motion and increase forward speed of the machine.

For lever-steer machines, movement of the lever(s) shall be generally forward for forward motion, and generally rearward for rearward motion. Increased displacement of the lever(s) shall produce increased traction speed. A neutral zone or position shall be provided.

Compliance shall be checked by inspection and functional test.

4.2.7 Steering control

4.2.7.1 General

The steering mechanism shall not lock in any position.

Tiller bar steering shall not be permitted.

The machine shall turn right when the steering controls are turned in a clockwise motion. The machine shall turn left when the steering controls are turned in a counter clockwise motion (except for lever-steering systems).

Compliance shall be checked by inspection and functional test.

4.2.7.2 Steering lever(s) on lever-steer machines

Steering control(s) motion shall not be hindered.

Compliance shall be checked by inspection and functional test.

4.2.7.3 Lever-steer machines with two control levers

Movement of the right lever shall control the right drive wheel. Movement of the left lever shall control the left drive wheel. The machine shall turn right when the left lever is displaced further in the direction of the machine travel than the right lever. The machine shall turn left when the right lever is displaced further in the direction of the machine travel than the left lever.

Compliance shall be checked by inspection and functional test.

4.2.7.4 Lever-steer machines with a single control lever with lateral displacement for steering control

The machine shall turn right when the lever is moved generally to the right. The machine shall turn left when the lever is moved generally to the left.

Compliance shall be checked by inspection and functional test.

4.2.7.5 Lever-steer machines with a single control lever with rotational displacement for steering control

The machine shall turn right when the left extremity of the control is rotated in the direction of intended machine travel. The machine shall turn left when the right extremity of the control is rotated in the direction of intended machine travel.

Compliance shall be checked by inspection and functional test.

4.2.8 Operator-presence control (OPC)

4.2.8.1 General

The snow thrower shall be fitted with an operator presence control device that complies with the following:

- conforms to well-tried principles and applies well-tried components;
- requires activation by the operator before its collector, impeller and traction drive can be started;
- requires continuous activation by the operator to allow rotation of the collector and impeller, and the activation of the traction drive;
- automatically activates the stopping of collector and impeller rotation and the traction drive when the operator leaves the operating position used when clearing snow.

The operator-presence control shall conform to well-tried principles and applies well-tried components. A “well-tried component” for a safety-related application is a component which has been either

- a) widely used in the past with successful results in similar applications, or
- b) made and verified using principles which demonstrate its suitability and reliability for safety-related applications.

Newly developed components and safety principles may be considered as equivalent to “well-tried” if they fulfil the conditions of b).

Compliance shall be checked by inspection and functional test.

A ride-on lawnmower equipped with an OPC system meeting the OPC requirements of ISO 5395-3 for cutting means shall be considered compliant when using the same OPC system with a snow thrower attachment.

4.2.8.2 Restart of the collector and impeller

From a complete stop position, restart of the collector and impeller shall require two separate and distinct actions including, as one of the actions, the activation of the OPC. If these actions are carried out using the same hand, the actions shall be separate and dissimilar to prevent accidental restarting of the collector and impeller.

4.2.8.3 Restart of the collector and impeller before complete stop

If the OPC is reactivated without the operator leaving the operator’s position and before the collector and impeller and/or traction drive have stopped, the collector and impeller and/or traction drive can resume operation if there is sufficient kinetic energy to restart the engine.

4.2.8.4 Automatic or single action stopping and starting of the collector and impeller

Automatic or single action stopping and starting of the collector and impeller shall be allowed during continuous operation of the OPC.

4.3 Guards, shields, chutes, deflectors and housings

4.3.1 General

All guards, shields, chutes, deflectors and housings shall be designed to prevent removal from the machine without tools.

An adjustable snow discharge chute shall be provided to control the direction of discharge. Non-metallic discharge chutes shall pass the test in ISO 8437-1:2019, 4.2.

Adjustable snow discharge deflectors shall be provided to direct the flow of snow discharge leaving the discharge guides. Non-metallic discharge deflectors shall pass the test in ISO 8437-1:2019, 4.2. The deflector may be part of the discharge chute.

The discharge shall not encroach into the operator position, as indicated in [Figure 1](#).

An unperforated collector/impeller housing shall cover the top, rear, and sides of the collector/impeller as a minimum within the limits given in [Figure 3](#). At the sides, the housing shall cover the diametrical extremities of the collector/impeller except as shown in [Figure 3](#).

The housing opening limits as shown in [Figure 3](#) shall not intersect the operator position shown in [Figure 1](#). Intersection, as applied here, is defined as allowing line-of-sight between the collector and/or impeller and the operator position.

As an alternative to continuous unperforated sides to the collector/impeller housing, access to the rotating collector/impeller can be prevented by an unperforated reject ring fixed to the collector/impeller as shown in [Figure 4](#).

The housing opening limits as shown in [Figure 4](#) shall not intersect the operator position shown in [Figure 1](#). Intersection, as applied here, is defined as allowing line-of-sight between the collector and/or impeller and the operator position.

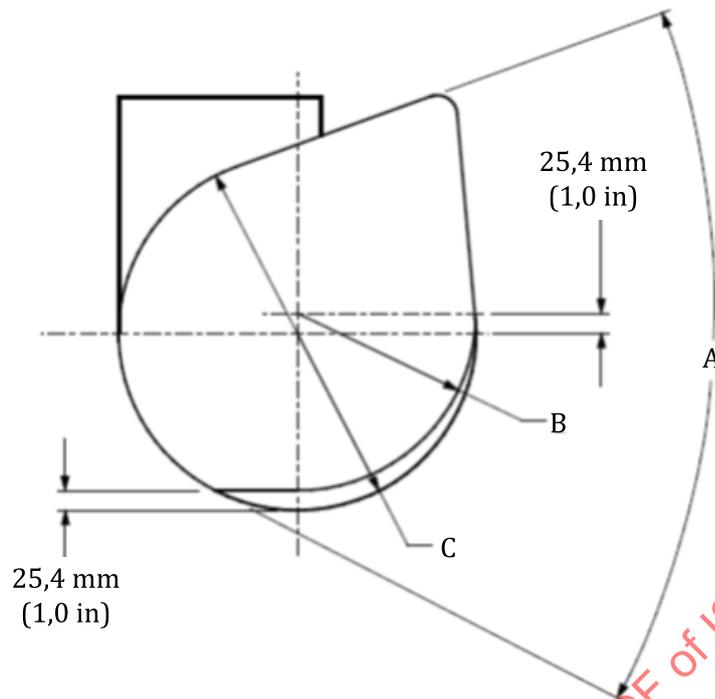
The reject ring shall:

- have a smooth surface without projections;
- have a maximum clearance with the rear circumferential guard of 50 mm;
- have a radius no less than 25,4 mm than the maximum radius of the collector/impeller;
- not extend axially more than 10 mm beyond the rear circumferential guard.

Ancillary openings, such as those required to facilitate manufacture or mount accessories, shall not intersect the operator control position. Intersection, as applied here, is defined as allowing line-of-sight between the collector and/or impeller, and the operator control position.

For additional regional and national requirements, see ISO 8437-4:2019, Clause 6.

Compliance shall be checked by inspection, measurement, and tested in accordance with ISO 8437-1.

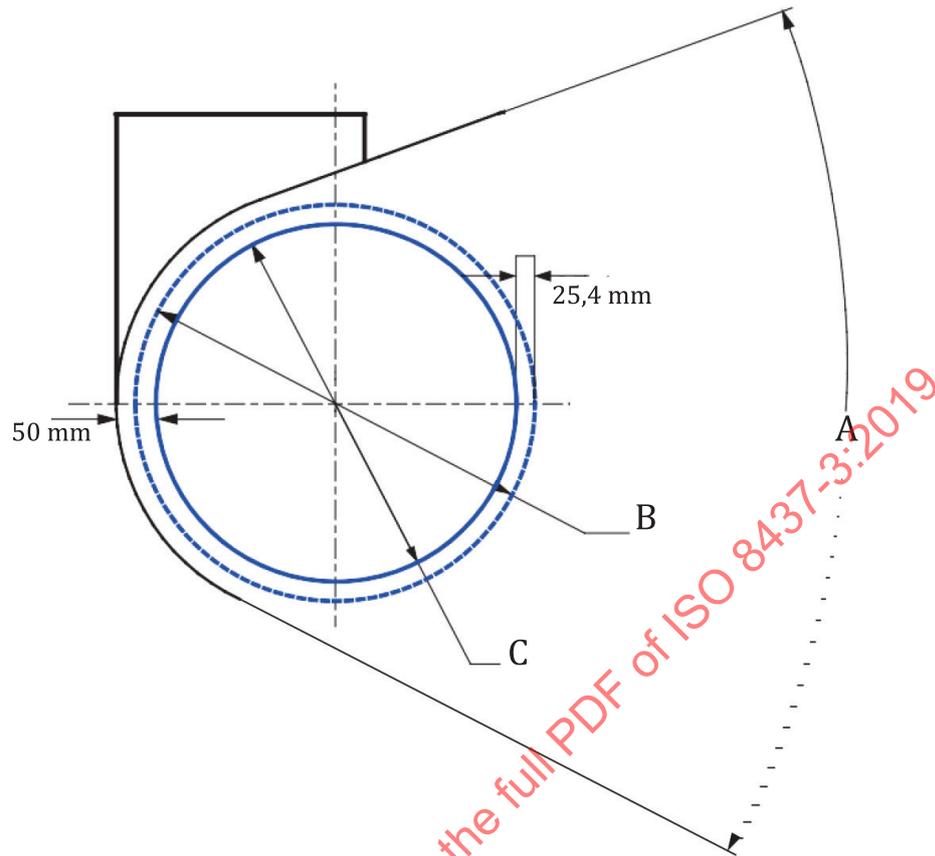


Key

- A opening limits
- B minimum side of collector housing
- C maximum diametrical extremity of collector/impeller

Figure 3 — Snow thrower housing

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Key

- A opening limits
- B maximum diametrical extremity of collector/impeller
- C reject ring

Figure 4 — Snow thrower housing with a reject ring

4.3.2 Hot surfaces

Compliance shall be checked by inspection and tested in accordance with ISO 8437-1.

4.3.3 Engine exhaust

Engine exhaust emission shall be directed away from the operator for normal mounting, starting and operating of the machine.

Compliance shall be checked by inspection.

4.4 Fuel

4.4.1 Fuel tank overfill test

Compliance shall be checked by inspection and tested in accordance with ISO 8437-1.

4.4.2 Fuel line axial pull test

Compliance shall be checked by inspection and tested in accordance with ISO 8437-1.

4.5 Electrical equipment: battery-powered circuits (not including magneto grounding circuits)

4.5.1 Insulated cables

Insulated cables comprising wiring circuits should be protected by rubber, plastic, non-metallic tape or non-metallic braid covering capable of withstanding severe abrasion, except where otherwise protected or not in potentially abrasive contact with metal surfaces. This wiring assembly shall, where possible, be grouped together, be properly supported and be located so that no portion is in contact with the carburettor, metallic fuel lines, the exhaust system, moving parts or sharp edges. Any edges of metal members subject to contact with the cables shall be rounded or protected to prevent possible damage to the cables by cutting or abrasion.

Compliance shall be checked by inspection.

4.5.2 Battery installation

The compartment for a vented storage battery shall be vented and shall provide for drainage of acid from the compartment. Drainage of acid from the battery in the operating position shall not come in contact with parts that will be critically affected in such a manner as to create a hazard.

Compliance shall be checked by inspection.

4.5.3 Overload protection

All circuits, except starting motor and ignition circuits, shall have overload protective devices on the battery-feed side of switches, and except for two-wire, non-grounded systems where the overload protection shall be located in either line.

Compliance shall be checked by inspection.

4.5.4 Terminals and non-insulated electrical parts

Terminals and non-insulated electrical parts shall be protected to prevent short circuiting by the fuel can or tools during normal refuelling and lubrication maintenance.

Compliance shall be checked by inspection.

4.6 Power drive

Nip and pinch points as well as outside faces of pulleys, sheaves, sprockets and gears shall be guarded by location or otherwise guarded to prevent inadvertent contact by the operator during normal starting and operation of the machine.

These guarding requirements shall not apply

- a) during maintenance activities,
- b) to rotating shafts protruding less than half of their outside diameter, and
- c) to ground-contacting parts.

Compliance with these requirements shall be determined by the probe test given in [4.7](#).

4.7 Probe test

4.7.1 Test procedure

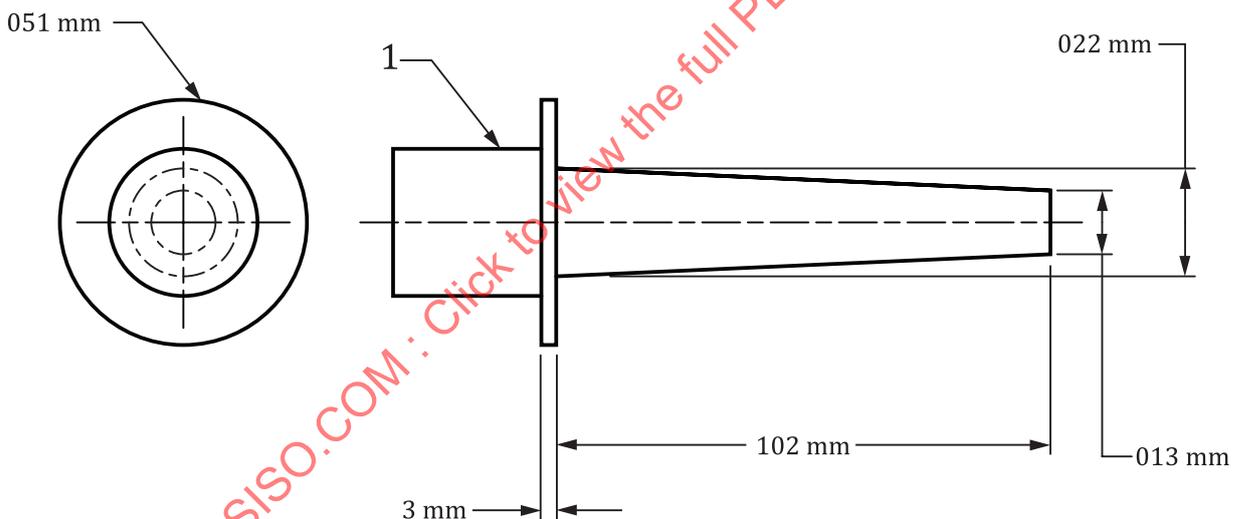
CAUTION — The following procedures should be conducted with the engine not running.

Simulate the operator during normal operation of the machine and insert the finger probe shown in [Figure 5](#) into all openings to its maximum depth (102 mm) or until a force of 4,4 N is attained. As the finger probe is inserted, rotate and position it in all possible angles with the opening, attempting to contact the part or parts under test. The finger probe shall not be inserted beyond the length of the finger probe (102 mm).

4.7.2 Test acceptance

The machine shall be considered properly guarded when with the operator-presence control operated in its normal manner with the test operator in the normal operating position conformity with the following is achieved:

- a) The hazard cannot be contacted with the finger probe shown in [Figure 5](#) when held by a large test operator (as specified in ISO 3411), manoeuvring the probe in any manner.
- b) For hazards under and within the perimeter of the chassis elements, such as the frame or fender, and the hazard cannot be reached with the finger probe shown in [Figure 5](#) when held by a large test operator (as specified in ISO 3411), manoeuvring the finger probe as follows:
 - 1) from above the chassis elements, downward through openings in or between the elements;
 - 2) underneath the chassis elements allowing only horizontal or downward probe movement, or both; upward probe movement shall not be permitted.



Key

- 1 suitable handle, optional

Figure 5 — Finger probe

4.8 Electromagnetic immunity

For regional and national requirements on electromagnetic immunity, see ISO 8437-4:2019, Clause 6.

4.9 Noise

For regional and national requirements on noise, see ISO 8437-4:2019, Clause 6.

4.10 Vibration

For regional and national requirements on vibration, see ISO 8437-4:2019, Clause 6.

5 Instructions for use

5.1 Instruction handbook

An instruction handbook shall be provided with the snow thrower and shall comply with [Annex A](#).

5.2 Markings

The machine shall be marked according to ISO 8437-1:2019, 5.1 and ISO 8437-4.

5.3 Warnings

The machine shall be marked with warnings according to ISO 8437-1:2019, 5.2.

6 Ride-on machines with snow thrower attachment: specific requirements

6.1 Service brake

6.1.1 Requirements

The machine shall be equipped with a service brake. Braking system requirements shall apply to the machine and snow thrower combination.

The service brake shall meet the following requirements:

- the service brake performance shall only rely on the effectiveness of the braking system;
- the service brake control device shall be located within the operator position (see [Figure 1](#)) and its use shall not interfere with the function of other controls;
- if the machine is equipped with combined traction clutch and brake controls, the service brake engagement shall simultaneously disengage the traction clutch;
- for machines with a maximum speed up to and including 13 km/h, the service brake shall be capable of stopping the machine'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;
- for machines with a maximum speed greater than 13 km/h, the service brake shall be capable of stopping the machine's motion so that the average measured stopping distance in metres does not exceed $0,015 \cdot v^2$ where v is the maximum speed in km/h 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.

6.1.2 Test procedure

The tests shall be conducted on a machine that complies with the following:

- at its heaviest design configuration as available from the manufacturer with the snow thrower attachment in the highest transport position;
- with full fuel tanks;
- with pneumatic tyres inflated to the maximum recommended pressures for the machine and without snow chains;
- with brakes adjusted in accordance with the manufacturer's instructions;

- with a $90 \text{ kg} \pm 0,5 \text{ kg}$ operator, or an equivalent weight. The operator, if present, shall sit upright without any intentional leaning in any direction during the test.

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

First, condition the service brake system by running the snow thrower for 10 min during which 10 stops shall be performed from the maximum forward speed.

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.

If the snow thrower is equipped with separate traction clutch and service brake controls, the traction clutch shall be simultaneously disengaged with the service brake engagement.

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

Operate the snow thrower at its maximum ground speed and apply a maximum force of

- 220 N to the centre of the grip area of the hand control,
- 450 N for a foot-operated service brake on a snow thrower not having a backrest on the seat, or
- 600 N for a foot-operated service brake on a snow thrower with a backrest on the seat.

Measure the stopping distances for each brake test and calculate the average value for each direction tested. The average measured stopping distance shall be in accordance with 6.11.

6.1.3 Service brake strength requirements

Except for hydrostatic or electric drive systems, the service brake system shall, without loss of function, withstand an overload of applied force that shall be

- $1\,670 \text{ N} \pm 50 \text{ N}$ for foot-operated brakes, or
- $625 \text{ N} \pm 25 \text{ N}$ for hand-operated brakes.

Compliance is verified by applying the force for 5 s on each brake control in the direction of brake actuation. After release of the applied force on the brake control, the service brake system shall meet the requirements of [6.1.1](#).

6.2 Parking brake

6.2.1 Requirements

A parking brake shall be provided and the control shall be located convenient to the operator. The direction of engagement shall be clearly identified with a durable label.

A hand-operated parking brake control, when provided, shall be moved generally rearward or upward to engage or set.

A foot-operated parking brake control, when provided, shall be moved generally forward or downward to engage or set.

The parking brake shall be capable of holding the snow thrower on a slope up to and including $16,7^\circ$ (30 %) facing both uphill and downhill.

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 on a snow thrower not having a backrest on the seat, or
- 600 N for a foot-operated parking brake on a snow thrower with a backrest on the seat.

6.2.2 Test procedure

The tests shall be conducted on the same machine and under the same conditions as in the service brake test but with the snow thrower in the lowered position. The transmission shall be in neutral and the engine shall be stopped. If so equipped, the hydrostatic bypass valve shall be in the normal working position of the machine.

The tests shall be conducted on a smooth flat surface with $16,7^\circ$ (30 %) slope and a coefficient of friction such that the snow thrower does not slide down the slope.

A $90 \text{ kg} \pm 0,5 \text{ kg}$ operator, or equivalent weight, shall be positioned on the machine seat. If an equivalent weight is used, it shall be securely fastened to the seat to simulate an operator. The centre of gravity of the mass shall be $150 \text{ mm} \pm 5 \text{ mm}$ above the lowest point of the operator supporting surface of the seat and $250 \text{ mm} \pm 5 \text{ mm}$ forward of the seat back. If a seat back is not used, the forward measurement of $250 \text{ mm} \pm 5 \text{ mm}$ shall be measured from the back of an actual seated operator.

The parking brake shall be applied.

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.

6.3 Stability

6.3.1 Requirements

Stability determination and measurement shall be performed under static conditions.

A $90 \text{ kg} \pm 0,5 \text{ kg}$ weight secured to the seat shall be used to simulate an operator. The centre of gravity of the weight shall be $150 \text{ mm} \pm 5 \text{ mm}$ above the lowest point of the operator supporting surface of the seat and $250 \text{ mm} \pm 5 \text{ mm}$ forward of the seat back. The forward measurement of $250 \text{ mm} \pm 5 \text{ mm}$ shall be made from the back of an actual operator when seated normally on the unit. If the seat is adjustable it shall be positioned at the most forward position when checking forward stability and in the most rearward position when checking rearward stability.

For machine stability determination, ballast shall be added only when the manufacturer designates that its use is required on the machine.

The machine shall be equipped with the tyre size and wheel track-width setting that gives the most unfavourable test condition. Pneumatic tyres shall be inflated to the maximum pressure recommended in the instruction handbook for normal operation. Stability requirements shall apply for all tyre combinations at all wheel track-width settings recommended in the instruction handbook.

Pneumatic tyres shall be inflated to the pressure recommended in the instruction handbook for normal operation.

All wheels may be locked to prevent rotation about the axle.

The stability requirements shall apply for all tyre combinations on all wheel tread settings approved by the machine manufacturer.