INTERNATIONAL STANDARD

ISO 8437

First edition
1989-11-15

Snowthrowers — Safety requirements and test procedures

Chasse-neige — Exigences de sécurité et essais

Reference number
ISO 8437 : 1989 (E)

Contents

International Organization for Standardization
Case postale 56 • CH-1211 Genève 20 • Switzerland
Printed in Switzerland

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.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 8437 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry.*

Annex A forms an integral part of this International Standard. Annex B is given for information only.

Snowthrowers — Safety requirements and test procedures

Section 1: General

1.1 Scope

This International Standard specifies safety requirements and test procedures applicable to walk-behind power snowthrowers, riding power snowthrowers, lawn riding tractors or lawn and garden tractors (as defined in ISO 5395-1) used with snowthrower attachments, and to snowthrower attachments themselves.

It does not apply to airport, highway and agricultural types of snow removal machines and equipment.

1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 3304:1985, *Plain and seamless precision steel tubes — Technical conditions for delivery.*

ISO 3305:1985, *Plain and welded precision steel tubes — Technical conditions for delivery.*

ISO 3306:1985, *Plain and as-welded and sized precision steel tubes — Technical conditions for delivery.*

ISO 4200:1985, *Plain and steel tubes, welded and seamless — General tables of dimensions and masses per unit length.*

ISO 5395: —[1], *Power lawn mowers, lawn tractors, and lawn and garden tractors, professional mowers, and lawn and garden tractors with attachments — Definitions, safety requirements and test procedures.*

1.3 Definitions

For the purposes of this International Standard, the following definitions apply.

1.3.1 arctic mitten: Large insulated mitten meeting the dimensions in figure 1.

1.3.2 barrier: Vertical plane determined by an obstruction, such as a handle or steering-wheel, that restrains the operator. (See figure 2.)

1.3.3 collector: Auger or similar device used to gather snow.

1.3.4 collector housing: Structure, framework, or integral shields that limit access to and egress of material from the collector.

1.3.5 durable label: Label that is considered to be virtually permanent.

1.3.6 hazard zone: Three-dimensional area that might be hazardous for a person to occupy. (See figure 2.)

1.3.7 impeller: Power-driven device that imparts energy to discharge the snow. For the purposes of this International Standard, when the collecting function is combined with the impelling function, the device is called an impeller.

1.3.8 impeller housing: Structure, framework, or integral shield that limits access to and egress of material from the impeller.

1.3.9 legible lettering: Lettering having a minimum height of one unit for every 500 units of viewing distance, or 3 mm, whichever is greater.

1.3.10 operator control position: Area (space) within which all controls requiring operation from the operator position are located. (See figure 2.)

1.3.11 operator position: Area occupied by the operator during operation of the machine. (See figure 2.)

1) To be published.

1.3.12 projected exhaust outlet area: Projection of the exhaust outlet openings perpendicular to the perimeter of the openings. For multiple openings, such as perforated outlets, the perimeter is determined by connecting the adjacent outermost holes with a series of tangent lines to circumscribe the area of the outlet holes pattern. (A 360° hole pattern on the outer perimeter of the exhaust system will require connecting lines at each end of the hole pattern.) For tubular or ducted outlet(s), the projection is determined by an extension from the walls of each outlet.

1.3.13 snow discharge deflector: Movable component used to direct snow discharging from a snow discharge guide.

1.3.14 snow discharge guide: Movable or fixed component that directs snow discharging from the impeller housing.

1.3.15 ride-on snowthrower: Self-propelled ride-on machine that is designed for throwing snow.

1.3.16 self-propelled snowthrower: Snowthrower equipped with a means for powered propulsion, other that the collector or impeller, such as wheels or tracks.

1.3.17 walk-behind snowthrower: Snowthrowing machine, either pushed or self-propelled, normally controlled by the operator walking behind the unit.

Section 2: Walk-behind snowthrower

2.1 Controls

2.1.1 General requirements

2.1.1.1 Control identification

Durable labels shall be used to identify and show the direction of operation of all operating controls except the snow discharge guides, for which identification is optional. Labels shall be located near or on the control.

2.1.1.2 Control location

2.1.1.2.1 Engine controls shall not be located in the hazard zone [see figure 2 a)].

2.1.1.2.2 All other operating controls shall be located in the operator control position [see figure 2 a)] convenient to the 5th to 95th percentile adult male dressed appropriately for the climate conditions.

2.1.1.3 Operability

All operating controls shall be operable by an operator wearing arctic mittens (see figure 1).

2.1.1.4 Control design

Controls shall be designed to prevent hazardous conditions, such as pinching or cutting the operator, during normal operation of the control with or without arctic mittens.

2.1.1.5 Resistance to movement

Controls shall have sufficient resistance to movement to meet the requirements of 2.6.2.1 and 2.6.3. Tilt of the machine shall not affect movement of controls as determined by 2.6.9.

2.1.2 Specific requirements

2.1.2.1 Shutoff control device

A shutoff control device shall be provided to stop operations of the engine. This device shall require manual and intentional activation in order to start the engine. A key switch, or similar device, shall be provided to prevent unauthorized starting of the engine, unless manual starting is the only means of starting. The shutoff control device and the key switch or similar device may be combined in one control.

2.1.2.2 Engine speed control

The direction of motion for an engine speed hand-lever control shall be generally forward or upward, or both, to increase speed, and generally rearward or downward, or both, to decrease speed.

2.1.2.3 Drive interlock

A means shall be provided to prevent the starting of the engine when either the traction drive or impeller drive is engaged. Such means shall not be required on a traction drive or impeller drive that is equipped with operator-presence (normally off) controls. If the engine can only be started from behind the barrier [see figure 2 a)], the impeller drive need not be disengaged.

2.1.2.4 Impeller control

2.1.2.4.1 A means shall be provided that will automatically stop the impeller in 5 s when the operator leaves the operator position. It shall require intentional reactivation after stopping, and shall comply with the torque requirements of 2.1.2.4.2.

2.1.2.4.2 The impeller shall stop in 5 s, and remain stopped, when the drive is disengaged. With the engine stopped, the impeller shall resist a torque of at least 1,13 N·m at completion of tests given in 2.6.2.1 and 2.6.3, measured at the impeller shaft in the direction of normal rotation. If an engine kill control is the only control used, the impeller shall stop in 5 s, and the torque requirement shall not apply.

2.1.2.5 Self-propelled walk-behind snowthrowers

2.1.2.5.1 A traction drive engagement control shall be provided. If the control is not a squeeze-grip control, it shall move in the direction of intended travel for engagement. A means shall be provided to permit the machine to be transported under its own power without impeller engagement.

2.1.2.5.2 The reverse-traction-engagement control shall be an operator-presence (normally off) control.

2.1.2.5.3 A means shall be provided to permit engagement of the impeller without engagement of traction drive.

2.2 Guards, shields, guides, deflectors and housings

2.2.1 General

All guards, shields, guides, deflectors, and housings shall comply with all applicable test requirements of 2.6.

2.2.2 Installation

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

2.2.3 Snow guides and deflectors

2.2.3.1 A snow discharge guide(s) shall be provided to control the direction of discharge. The control for adjustment of the guide(s), if provided, shall be located in the operator control position (see figure 2).

NOTE — Snow discharge guides are under study.

2.2.3.2 A snow discharge deflector(s) shall be provided to direct the flow of discharge leaving the discharge guide(s). The deflector may be part of the discharge guide.

2.2.3.3 The discharge limit shall not intersect the operator position, as illustrated in figure 2.

2.2.3.4 A durable label (safety sign) containing the signal work "DANGER" shall be located near the snow discharge opening. It should be accompanied by a message such as "Shut off engine before unclogging discharge chute." (See 2.5 and 2.7.)

2.2.4 Collector and/or impeller housing

The sides shall cover the diametral extremities of the housing as shown in figure 3. The housing opening limits shall not intersect the operator position (see figures 2 and 3).

A durable label shall be located on the housing containing the signal word "DANGER". It should be accompanied by a message such as "Avoid injury from rotating auger — keep hands, feet and clothing away." (See 2.5 and 2.7.)

NOTE — Excluded from this requirement are single-stage units that are hand-held and have flexible rubber-type paddles which throw the snow and contact the ground to assist in self-propelling.

2.2.5 Engine exhaust

Engine exhaust emissions shall not be directed towards the operator.

2.2.6 Fuel overflow

Fuel overflow shall not pass through the projected exhaust outlet area, contact high-tension ignition cables or any non-insulated electrical component, or collect on the machine. Compliance with these requirements shall be determined by the fuel tank overfill test given in 2.6.7.

2.3 Servicing

2.3.1 Specific written instructions with appropriate safety warnings shall be provided with the equipment for those servicing operations recommended by the manufacturer that must be performed with the engine running.

2.3.2 General service written instructions shall be provided with the equipment for servicing operations recommended by the manufacturer to maintain the equipment in safe operating condition.

2.4 Electrical requirements

Electrical requirements shall comply with the requirements of ISO 5395-2:1981, clause 3.5.

2.5 Durable label requirements

Required labels shall comply with ISO 5395-2:1981, clause 3.3.

2.6 Tests for power snowthrowers

2.6.1 Test conditions

Unless otherwise stated, the test conditions given in 2.6.1.1 to 2.6.1.6 shall apply to 2.6.2.1, 2.6.2.2, 2.6.3, 2.6.4 and 2.6.6.

2.6.1.1 Assembly

The snowthrower shall be completely assembled.

2.6.1.2 Test position

The assembly of 2.6.1.1 shall rest on a horizontal surface.

2.6.1.3 Test speed

The engine shall be set at the equipment manufacturer's maximum specified speed. Then all mechanisms necessary for the equipment to perform its intended functions shall be engaged, where applicable. The control shall be fixed to maintain the maximum speed.

2.6.1.4 Restraints

Resilient restraints may be used to keep the snowthrower in position during the tests given in 2.6.2 and 2.6.3.

2.6.1.5 Number of units to be tested and sequence of tests

For the tests given in this International Standard, the following conditions shall apply.

— The manufacturer has the option of running one or any number of machines for tests (1) to (6).

— For tests (7) and (8), only one machine shall be used.

— Test (7) shall be followed by test (8).

Tests are as follows:

(1) Temperatures of exposed surfaces (see 2.6.4).

(2) Probe (see 2.6.5).

(3) Fuel tank overfill (see 2.6.7).

(4) Fuel line (see 2.6.8).

(5) Stability (see 2.6.6).

(6) Tilt for controls (see 2.6.9).

(7) Controls (see 2.6.3).

(8) Structural integrity (see 2.6.2).

2.6.2 Structural integrity tests

2.6.2.1 Imbalance test

2.6.2.1.1 Test procedure

The impeller imbalance in gram metres shall be determined by the formula:

$$700\ D^3$$

where D is the outside diameter of the impeller, in metres.

The calculated imbalance shall be created by removing or adding material until the required imbalance is obtained. The snowthrower shall be run in this imbalanced condition for 1 h.

2.6.2.1.2 Test acceptance

The machine shall have failed this test if either of the following occurs:

— Loss or failure of any part or component that results in non-compliance with applicable parts of this International Standard.

— Movement of the controls from the position selected at the beginning of test or shifting of the snow discharge guide more than 15° from the selected position.

2.6.2.2 Impact test

2.6.2.2.1 Test equipment and conditions

An impact text fixture such as one shown in figure 4 shall be used.

The snowthrower shall be positioned over the fixture as illustrated in figure 4.

The impact rod shall be injected into the impeller as indicated in figure 4.

2.6.2.2.2 Test acceptance

The machine shall have failed this test if either of the following occurs:

— Breaking off of any part of the impeller. (Shearing of devices provided to protect these parts shall not constitute test failure.)

— Fracture or distortion of the impeller housing which will allow the probe (see figure 5) to contact a hazardous component or surface. (Failure in the areas of the 51 mm diameter test hole shall not constitute failure of this test.)

2.6.2.3 Guards

2.6.2.3.1 Test procedure

A smooth steel sphere having a diameter of 51 mm and weighing 0,54 kg shall be used.

If guards can be struck from above, the sphere shall be dropped vertically; if not, the sphere shall be suspended by a cord and allowed to fall from rest as a pendulum to strike the guards. In either case, the vertical travel of the sphere shall be 1,3 m.

One drop shall be made on each guard being tested.

For guards made of nonmetallic material the test shall be repeated on both a) and b):

a) A different sample(s) that has been in an air-oven for 7 h at a uniform temperature not less than 10 °C higher than the maximum operating temperature of the material measured under normal operating conditions, but not less than 70 °C. The sample(s) shall not be tested until it has returned to room temperature.

b) A sample(s) that has been conditioned at −20 °C for 7 h.

2.6.2.3.2 Test acceptance

The guard shall have failed this test if either of the following occurs:

— Cracking that affects the functional strength of the part.

— Any conditions that result in non-compliance with applicable parts of this International Standard.

Acceptance shall not be affected if a guard deformed during the test can be readily restored to its original shape.

2.6.3 Controls test

2.6.3.1 Test procedure

The engine shall be run for 15 min without interruption, with the controls in the disengaged position. This test is not required on a machine with an engine kill switch. This test is to verify that the controls stay in the disengaged position during the 15 min test.

2.6.3.2 Test acceptance

The criteria for failure shall be the same as in 2.6.2.1.2. In addition, the machine shall have failed this test if the impeller rotates more than 3 revolutions in the 15 min test period.

2.6.4 Temperature of exposed surfaces

2.6.4.1 Limitations

All hot surfaces which exceed 66 °C and which might be contacted by the operator during normal starting, operating, or refuelling shall be indicated by a durable safety label (see 2.5 and 2.7) located adjacent to the surface, and be thermally insulated or shielded (if necessary) so that such surfaces will not exceed a temperature of 149 °C at 4,4 °C ambient. Surfaces that must comply are to be determined by the probe test given in 2.6.5.

2.6.4.2 Test method

Surface temperatures shall be taken after the engine has operated under no-load for 1 h or until a steady-state temperature has been obtained. The temperature-measuring system shall enable the surface temperature to be determined within 2 %. Temperature measurements shall be made at any temperature and corrected to 4,4 °C ambient.

The corrected surface temperature, in degrees Celsius, is equal to the measured surface temperature, in degrees Celsius +4,4 °C (ambient temperature, in degrees Celsius).

2.6.5 Probe test

2.6.5.1 Test procedure

CAUTION: The test is used to check moving parts and the following procedures should be conducted with the engine not running.

Simulate the operator during normal starting and operation of the machine and insert the probe shown in figure 5 into all openings to its maximum depth of 105 mm or until a force of 4,4 N is attained. As the probe is inserted, rotate and position it in all possible angles with the opening, attempting to contact the part or parts under test. The probe shall not be inserted beyond its length of 105 mm.

2.6.5.2 Test acceptance

The machine shall be considered properly guarded if one of the following applies:

a) The hazard cannot be contacted with the probe shown in figure 5 manoeuvred in any manner.

b) The hazard is under and within the perimeter of the chassis elements, such as the frame or fender, and the hazard cannot be reached with the probe shown in figure 5 manoeuvred 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.

c) The hazard is controlled by a operator-presence control such that when functioning in accordance with a) and b), the probe cannot reach the hazard while simultaneously actuating the operator-presence control in its normal manner.

2.6.6 Stability

2.6.6.1 General requirements

Compliance with the provisions of 2.6.6 shall not be required on machines weighing less than 45 kg. Stability determination shall be under static conditions with the test requirements given in 2.6.6.1.1 to 2.6.6.1.3.

2.6.6.1.1 Pneumatic tyres shall be inflated to the pressure recommended in the operator's manual for normal operation.

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

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

2.6.6.2 Test procedure

The stability of the snowthrower shall be determined as follows.

Place the machine on a variable-slope single plate (tilt table) with a friction surface under the wheels equivalent to a 16- to 36-grit abrasive material. The table shall be tilted until

a) lift-off of the upper wheel or wheels occurs; or

b) the minimum angle for acceptance as specified in 2.6.6.3 is attained.

Position the machine on the tilt table with its longitudinal centreline parallel to the intersection line of the lowest edge of the table and a horizontal plane. Position the machine first with its right side on the downhill side and then with its left side on the downhill side.

2.6.6.3 Test acceptance

2.6.6.3.1 Lift-off is considered to have occurred when a strip of 20 gauge steel, 51 mm wide, can be pulled from or moved under any tyre with a force of 9 N or less.

2.6.6.3.2 Lateral test acceptance is determined when the angle of the tilt table with the machine positioned as in 2.6.6.2 can reach a 10° (17,7 %) slope, with either side downhill, before lift-off occurs.

2.6.7 Fuel tank overfill test

2.6.7.1 Test procedure

With the machine on a level plane, the fuel tank inlet shall be overfilled by 100 ml of liquid within 5 s.

2.6.7.2 Test liquid

The test liquid shall be nonflammable and approximately the same viscosity as the fuel intended for use. (Trichlorethane or the equivalent can be used.)

2.6.7.3 Test acceptance

The machine shall have failed this test if any of the following occurs:

— The test liquid passes through the projected exhaust outlet area.

— The test liquid collects on the machine.

— The test liquid comes into contact with high-tension ignition cables or any non-insulated electrical component.

2.6.8 Fuel line axial pull test

Fuel lines shall not pull off fittings or fail when subjected to a 44 N axial pull test. The test is to be performed with the test liquid in the line. This test is not required of short fuel lines held in position by compression.

2.6.9 Tilt test for controls

The control position shall not be affected by tilting of the machine, snowthrower, or combination of machine and snowthrower.

2.6.9.1 Test procedure

This test shall be conducted in accordance with the stability test procedure in 2.6.5.2.

2.6.9.2 Inactivation of controls

Controls shall be placed in the stop, disengaged, or lift position (or other inactive position).

2.6.9.3 Test acceptance

Controls shall not move to the run, engaged, lowered, or other activating position at the extreme tilt specified for stability acceptance in 2.6.6.3.

2.7 Safety instructions

A durable label shall be provided to inform the user of the potential hazards that may be encountered in the normal operation and servicing of the snowthrower and power-driven attachments.

Similar instructions shall also be included in the operator's manual, supplied by the manufacturer as pertinent instructions for safe operation, such as shown in annex A.