INTERNATIONAL STANDARD

ISO 11680-1

Third edition
2021-10

Machinery for forestry — Safety requirements and testing for pole-mounted powered pruners —

Part 1: Machines fitted with an integral combustion engine

Matériel forestier — Exigences de sécurité et essais pour les perches élagueuses à moteur —

Partie 1: Machines équipées d'un moteur à combustion interne intégré

Reference number
ISO 11680-1:2021(E)

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

Published in Switzerland

Contents

Page

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 of 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 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 17, *Manually portable (hand-held) powered lawn and garden equipment and forest machinery*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 144, *Tractors and machinery for agriculture and forestry,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 11680-1:2011), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Clause 1, the scope has been broadened to include extended and telescopic machines;

— Clause 3, definitions for “cutting attachment”, “dry weight”, “extendable”, “hand-held” and “telescopic” have been added;

— Figure 1 has been amended to show different types of pole mounted powered pruners;

— Clause 4:

  — a new subclause, 4.2 “Protection against contact with power driven components”, has been added;

  — in 4.4, harness requirements have been reworded and amended;

  — in 4.5.2, the requirements for circular saw blade securing have been clarified;

  — in 4.7, the distance to the cutting attachment have been clarified;

  — in 4.10.2, the requirement to test the throttle trigger lockout function has been added;

  — in 4.12, the verification method for fuel tank ventilation system has been added;

  — in 4.14, the requirements for protection against hot surfaces have been reworded and amended;

- in 4.19, fuel feed line strength and accessibility requirements have been added;
- in 4.20, fuel tank structural integrity requirements have been added;

— Clause 5:

- in 5.1, the requirements for instructions have been revised;
- in 5.2, the marking and warning requirements have been rearranged.

A list of all parts in the ISO 11680 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

This document is a type-C standard as stated in ISO 12100:2010.

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 organisations, 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 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.

Machinery for forestry — Safety requirements and testing for pole-mounted powered pruners —

Part 1: Machines fitted with an integral combustion engine

1 Scope

This document specifies safety requirements and measures for their verification for the design and construction of portable, hand-held, pole-mounted powered pruners (hereafter named "machine"), including extendable and telescopic machines, having an integral combustion engine as their power source. These machines use a power transmission shaft to transmit power to a cutting attachment consisting of a saw-chain and guide bar, a reciprocating saw blade or a single-piece circular saw blade with a 205 mm maximum outside diameter. Methods for the elimination or reduction of hazards arising from the use of these machines and the type of information on safe working practices to be provided by the manufacturer are specified.

This document deals with all significant hazards, hazardous situations or hazardous events with the exception of electric shock from contact with overhead electric lines (apart from warnings and advice for inclusion in the instructions), relevant to these machines when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer (see Annex A).

This document is applicable to portable, hand-held, pole-mounted powered pruners manufactured after its date of publication.

Brush cutters with a circular saw blade are not included in the scope of this document.

NOTE Brush cutter requirements are outlined in ISO 11806-1:2021.

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 6531:2017, *Machinery for forestry — Portable chain-saws — Vocabulary*

ISO 7112:2018, *Machinery for forestry — Portable brush-cutters and grass-trimmers — Vocabulary*

ISO 7113:1999, *Portable hand-held forestry machines — Cutting attachments for brush cutters — Single-piece metal blades*

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

ISO 13857:2019, *Safety of machinery — Safety distances to prevent hazard zones being reached by upper and lower limbs*

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

ISO 22867:2021, *Forestry and gardening machinery — Vibration test code for portable hand-held machines with internal combustion engine — Vibration at the handles*

ISO 22868:2021, *Forestry and gardening machinery — Noise test code for portable hand-held machines with internal combustion engine — Engineering method (Grade 2 accuracy)*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 6531:2017, ISO 7112:2018, ISO 12100:2010 and the following apply.

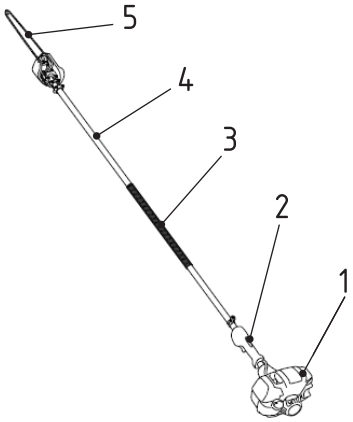
ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

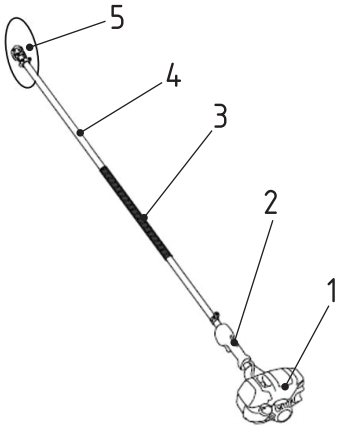
— IEC Electropedia: available at http://www.electropedia.org/

3.1
pole-mounted powered pruner
machine whose power source is attached via a long shaft tube (pole) to a cutting attachment, designed to enable an operator to cut branches from a distance

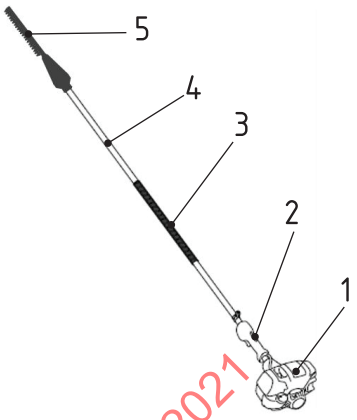
Note 1 to entry: See Figure 1 for examples of pole-mounted powered pruners with integral combustion engine within the scope of this document.



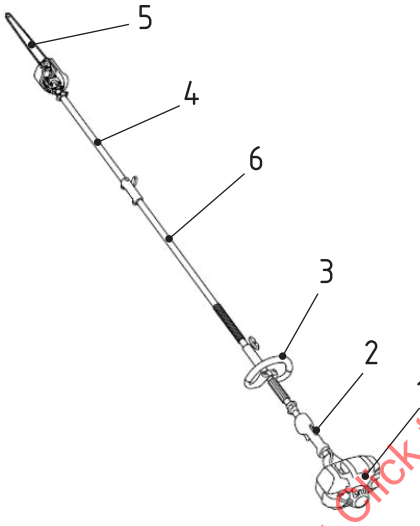
a) Machine with saw-chain cutting attachment



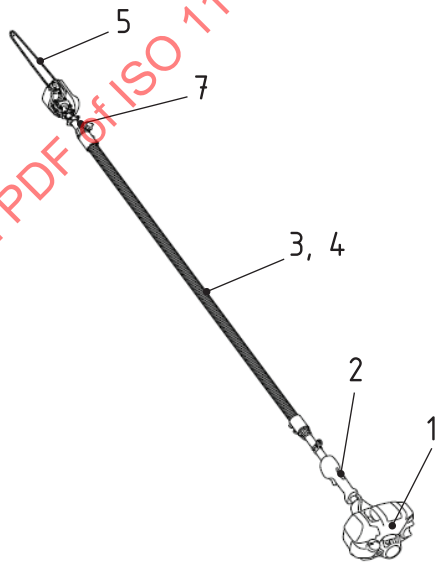
b) Machine with circular saw blade cutting attachment



c) Machine with reciprocating saw blade cutting attachment



d) Extendable machine



e) Telescopic machine

Key

1 power unit
2 rear handle
3 front handle
4 shaft tube
5 cutting attachment
6 extension
7 telescopic shaft tube

Figure 1 — Examples of pole-mounted powered pruners with integral combustion engine

3.2
cutting attachment
combination of a saw-chain and guide bar, a reciprocating saw blade or a single-piece circular saw blade, used to cut branches from a standing tree

3.3
dry weight
weight of the machine with empty fuel/oil tank(s) and without *cutting attachment* (3.2)

3.4
extendable
able to extend operational length of the machine by adding shaft extensions

3.5
hand-held
supported and controlled by the operator

Note 1 to entry: A harness can aid in providing support.

3.6
telescopic
able to extend operational length of the machine by means of a sliding inner shaft and outer shaft

4 Safety requirements and/or protective measures

4.1 General

Machines shall comply with the safety requirements and/or protective measures of this clause. In addition, the machine shall be designed according to the principles of ISO 12100:2010 for relevant but not significant hazards which are not dealt with by this document.

The safe operation of a pole-mounted powered pruner also depends on the safe environment associated with the use of personal protective equipment (PPE), such as gloves, slip-resistant footwear, and eye, hearing and head protective equipment, as well as safe working procedures (see 5.1).

4.2 Protection against contact with power driven components

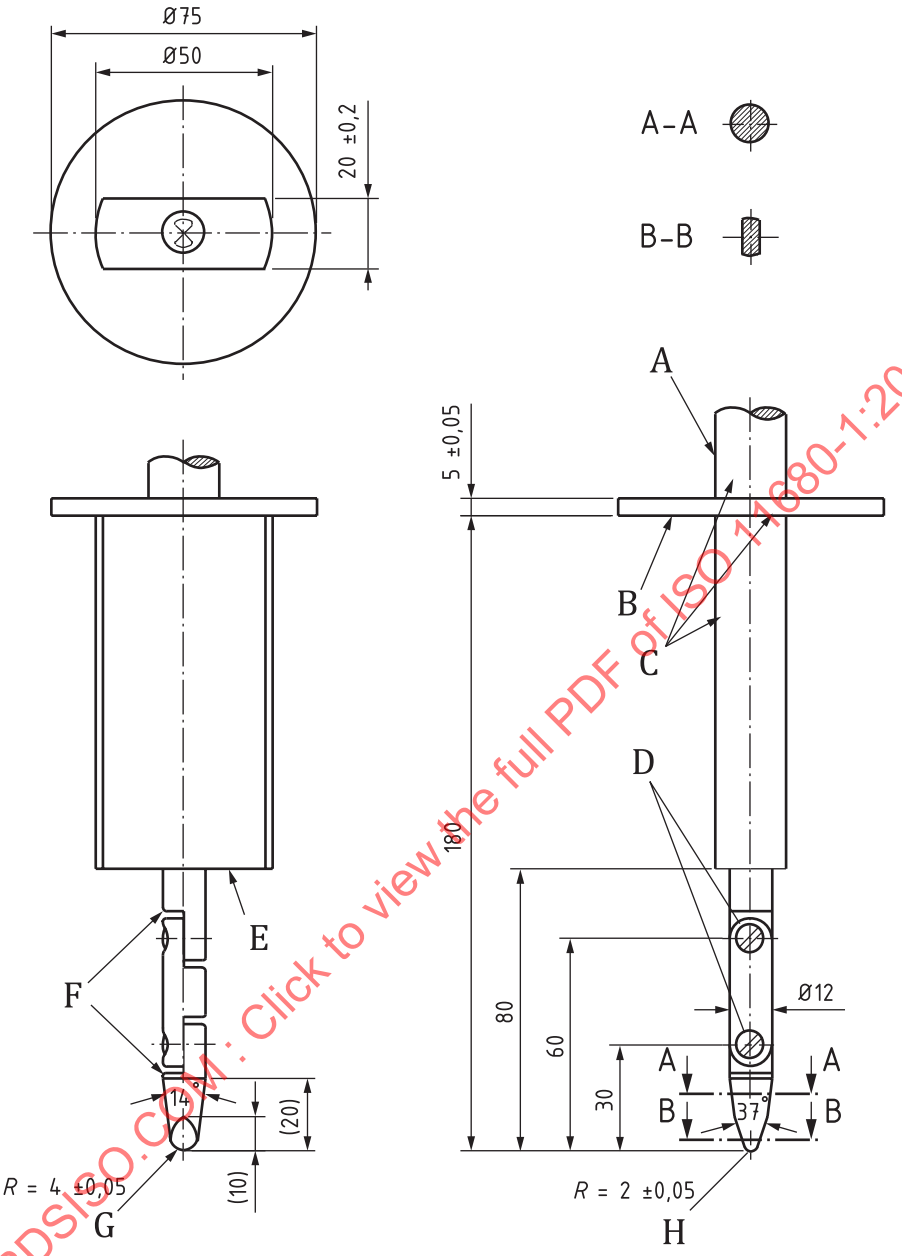
4.2.1 Requirements

All power driven components with the exception of the cutting attachment, shall be located or guarded so that the operator will not inadvertently contact them when starting or during normal operation of the machine as described in the instructions.

4.2.2 Verification

The location and accessibility of power driven components shall be verified by inspection. For straight line access, the safety distances specified in ISO 13857:2019, 4.2.4.1 and 4.2.4.3 shall be met. For other access points, use probe B of IEC 61032:1997, shown in Figure 2. The probe shall be applied to any opening protecting a power-driven part using a force of (10 ± 2) N. Contact with any power driven component is not allowed.

Dimensions in millimetres



Key

A handle
B guard
C insulating material
D joints
E stop face
F chamfer all edges
G spherical
H cylindrical

Figure 2 — Probe for accessibility of power-driven components

4.3 Handles

4.3.1 Requirements

The machine shall have a handle for each hand. The shape and surface of the handle shall be designed so as to provide the necessary sureness of grip, regardless of whether or not the operator wears gloves. If the handle nearest the cutting attachment is an integral part of the drive-shaft tube, the perimeter of the handle cross-section along the gripping length shall be between 65 mm and 170 mm. The gripping length shall be at least 100 mm.

The gripping length of a bail or closed handle shall comprise any length that is straight or curved at a radius greater than 100 mm together with any blend radius, but not more than 10 mm, at one or both ends of the gripping surface.

4.3.2 Verification

The design and dimensions shall be verified by inspection and measurement.

4.4 Harness

4.4.1 Requirements

All machines with a dry weight of more than 6 kg shall be equipped with a harness to be worn by the operator. The harness is primarily for supporting the machine during movement between cutting tasks and for reducing the risk of unintentional contact with the cutting attachment. The harness shall be adjustable to the size of the operator.

Shoulder harnesses shall be:

— designed in a way for easy removal; or

— equipped with a quick release mechanism that ensures that the machine can be removed or released quickly from the operator.

A single shoulder harness is considered to be designed in a way for easy removal.

A double shoulder harness is considered to be designed in a way for easy removal, if the left and right shoulder straps are not connected to each other in front of the operator's body.

If straps to connect the left and right shoulder straps are provided, it is also considered to be designed in a way for easy removal when the straps connecting the left and right shoulder straps can be released under the load of the machine by using one hand and have no more than two release points.

NOTE An example of a release point is a buckle that requires squeezing between the thumb and finger before releasing, for example a side release buckle.

A quick-release mechanism, if provided, shall be positioned either at the connection between the machine and the harness or between the harness and the operator. The quick-release mechanism shall only function by deliberate action of the operator.

It shall be possible to open the quick-release mechanism while under load using only one hand and it shall have no more than two release points.

4.4.2 Verification

The harness, its functionality and its adjustment shall be verified by inspection. The quick-release mechanism shall be verified by a functional test carried out by a person wearing the harness and with a vertical load of three times the dry weight of the machine acting on the suspension point.

4.5 Cutting attachment

4.5.1 Saw-chain cutting attachment

4.5.1.1 Requirements

Saw-chain cutting attachments shall be provided with a means of adjustment to achieve saw-chain tension in accordance with the instructions. The method of ensuring saw-chain tension shall be described in the instructions.

Means shall also be provided to lubricate the saw-chain, either automatically or manually. If a manual oiler is provided, it shall be located so that it can be operated while the machine is held by both handles

4.5.1.2 Verification

Means for adjustment and lubrication of the saw-chain shall be verified by inspection and functional testing.

4.5.2 Circular saw blade cutting attachment

4.5.2.1 Requirements

These requirements are applicable to circular saw blade cutting attachments equipped with all circular saw blades recommended for use by the manufacturer.

The circular saw blade shall be a single-piece blade in accordance with the specifications for blade surface quality and blade material given in ISO 7113:1999.

Circular saw blades shall be secured by an attachment method preventing relative motion between the circular saw blade and the retainer, or between the circular saw blade and the shaft on which it is mounted, when the rotational torque defined in 4.5.2.2 is applied to the circular saw blade.

The method for securing the circular saw blade shall also prevent loosening of the circular saw blade during use by:

— having a fastening system that is tightened by the driving torque of the machine, or

— having a fastening system secured by a method not acted upon by rotational forces.

4.5.2.2 Verification

Surface quality and material of the circular saw blade shall be verified in accordance with ISO 7113:1999, Clause 4 and 5.2.

The function of the attachment method shall be verified by the following test procedure.

a) Install the cutting attachment in accordance with the instructions.

b) Lock the power transmission shaft.

c) Apply to the circular saw blade a rotational torque, M, in newton metres (N·m). See Formula (1):

$$M = 0{,}4 \times V \times k \quad (1)$$

where

V is the engine displacement, in cubic centimetres (cm^3);

k is the gear ratio (engine/blade rotational frequency).

The torque M shall be applied over (5 ± 2) s and held for (2 ± 1) s.

d) Conduct the test five times in the direction opposite to normal rotation, then five times in the direction of normal operation.

The method for securing the circular saw blade shall be verified by inspection.

4.5.3 Cutting attachment strength

4.5.3.1 Requirements

Recommended cutting attachments and their fixing systems and guards shall not break or crack after impact with a hard surface when subjected to the functional test specified in 4.5.3.2.

4.5.3.2 Verification

The ambient temperature shall be (20 ± 5) °C.

The test shall be performed with the engine stopped. The machine shall be at the fully extended position (if extendable), as this represents the worst-case scenario. The fuel tank and saw-chain lubrication tank, if applicable, shall be filled to 50 % of maximum fill level. The engine oil tank, if applicable, shall be filled according to the manufacturer's instructions.

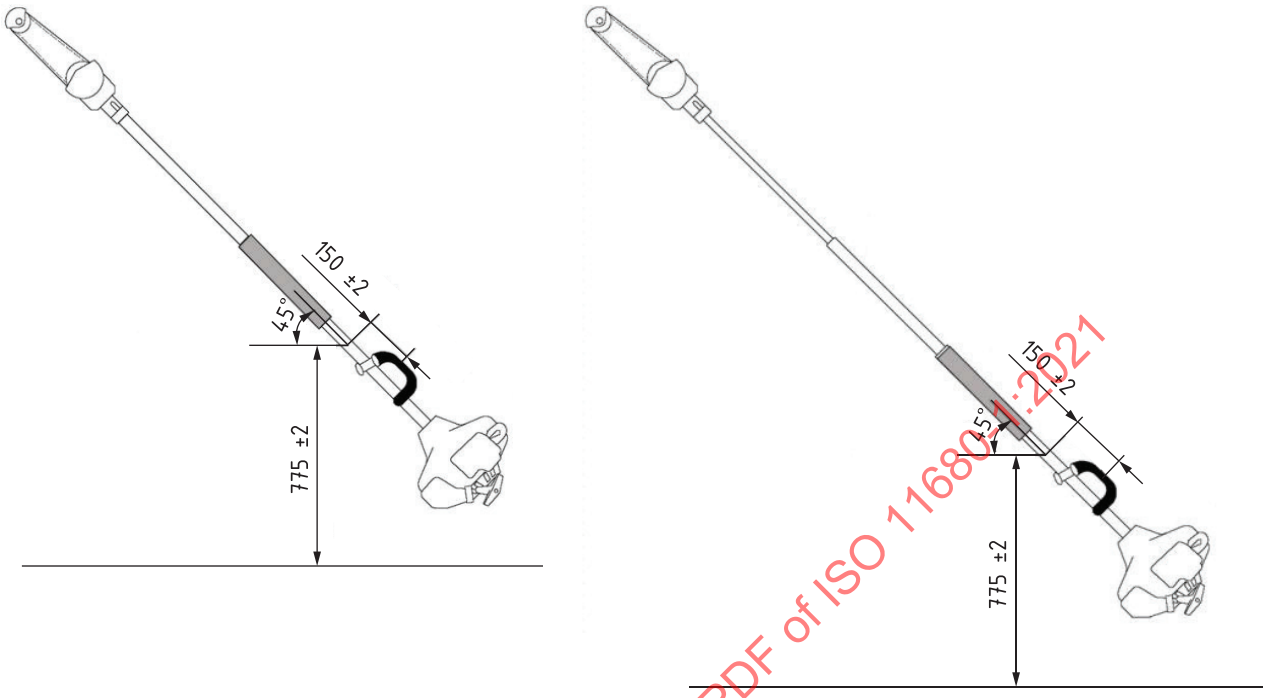
Suspend the machine freely from a position (150 ± 2) mm in front of the middle of the rear handle and at a height of (775 ± 2) mm above the test surface (see Figure 3).

Allow the machine to swing freely once around the point of suspension from a start position in which the machine is at an angle of (45 ± 2) ° to the horizontal. The test surface with which the machine impacts shall be flat and of concrete or similar hard material.

If, after impact, no breakage or cracks can be detected in the cutting attachment or its fixing system or guard by means of visual inspection, verify the structural integrity of the fixing system and guard by operating the machine as follows. If the saw blade or guide bar is so bent as to be unusable, replace it before the test. Start the engine and run at racing speed for (60 ± 2) s. Control the engine speed using the throttle trigger.

Structural integrity of the fixing system and guard is considered to have been successfully verified if no parts of the cutting attachment have been ejected and no cracks can be detected during visual inspection. Failure in the drive mechanism is not considered as being failure of the test.

Dimensions in millimetres



a) Non-extendable machine **b) Telescopic or extendable machine**

Figure 3 — Test set-up cutting attachment strength

4.6 Transport cover for cutting attachment

4.6.1 Requirements

The machine shall be provided with a transport cover for the cutting attachment.

The transport cover for the cutting attachment shall cover the saw-chain on the part of guide bar intended for cutting, or the cutting edges of circular or reciprocating saw blades, as appropriate, during transportation or when the machine is stored. The transport cover shall stay in its protective position when the machine is held in any direction.

4.6.2 Verification

The attachment of the transport cover to the cutting attachment shall be verified by inspection when holding the machine in any direction.

4.7 Distance to cutting attachment

4.7.1 Requirements

The distance, L, from the rear of the throttle trigger to the nearest unguarded point of the cutting attachment shall be at least 1 250 mm, if applicable measured as a chain measurement (L1 + L2), with the cutting attachment adjusted to its position nearest to the operator (see Figure 4).

If the location of the throttle trigger is adjustable, any adjustment below the distance of 1 250 mm shall be prevented by design.

This minimum distance from the rear of the throttle trigger to the nearest unguarded point of the cutting attachment shall apply to all cutting attachments recommended by the manufacturer.

A fixed obstacle (e.g. the gear case or a collar on the shaft tube) shall be provided close to the cutting attachment to indicate to the operator that his hand is getting close to the cutting attachment. The distance from the rear of the fixed obstacle to the nearest unguarded point of the cutting attachment (L3) shall be at least 120 mm, measured as a chain measurement.

Dimensions in millimetres

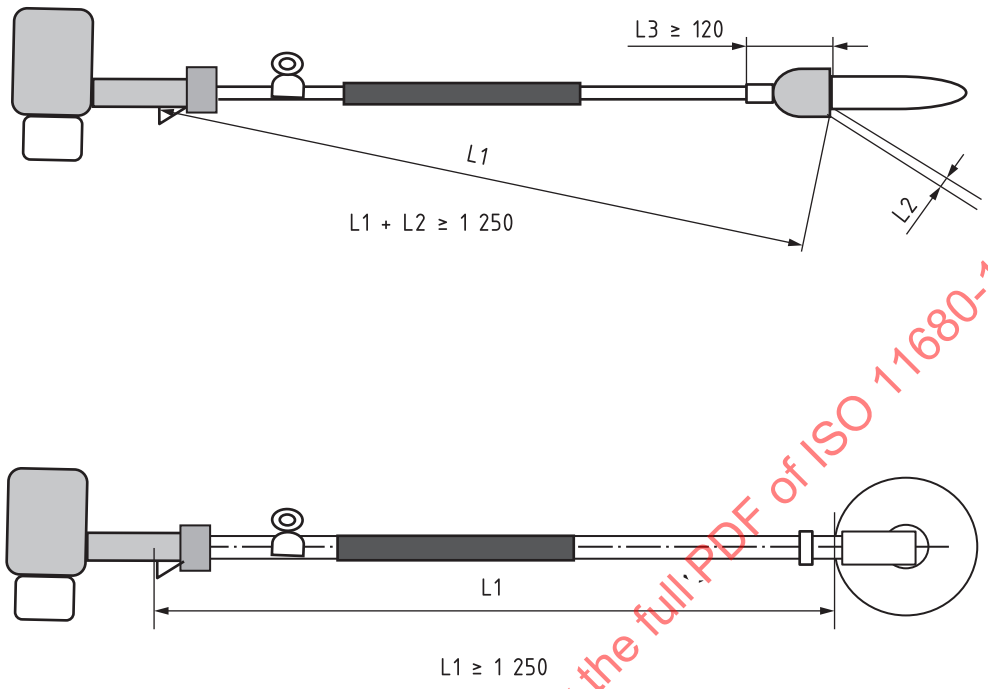


Figure 4 — Distance to the cutting attachment

4.7.2 Verification

Means for adjustment, the presence of the fixed obstacle and the distances from the throttle trigger and fixed obstacle to the cutting attachment shall be verified by inspection and measurement.

4.8 Engine starting device

4.8.1 Requirements

An engine starting device shall be provided. If a manual starter is provided, it shall be permanently attached to the machine, and if using a rope, shall have a recoil device. If an electric starter is provided, it shall require two or more separate and dissimilar actions to activate. A combination manual/electric starter shall fulfil all requirements.

4.8.2 Verification

The means of starting the engine shall be verified by inspection and functional testing.

4.9 Engine stopping device

4.9.1 Requirements

The machine shall be fitted with an engine stopping device by which the engine can be brought to a final stop and which does not depend on sustained manual effort for its operation. The control for this device shall be so positioned that it can be operated while the machine is held with both hands by an operator wearing gloves. The colour of the control shall clearly contrast with the background.

4.9.2 Verification

The correct functioning of the engine stopping device shall be verified by inspection while the machine is being operated. The location of the control shall also be verified by inspection.

4.10 Throttle control

4.10.1 Throttle trigger

4.10.1.1 Requirements

The throttle trigger shall be positioned so that it can be pressed and released with a gloved hand while both handles are being held.

4.10.1.2 Verification

The position shall be verified by inspection and functional testing.

4.10.2 Operation

4.10.2.1 Requirements

The machine shall be provided with a throttle trigger that, when released, automatically reverts to the idling position unless a throttle control latch to aid starting is engaged (see 4.10.3). The throttle trigger shall be retained in the idling position by the automatic engagement of a throttle trigger lockout.

After the starting procedure has been completed, activation of the throttle trigger to increase the engine speed to a point at which the cutting attachment will start to move shall only be possible with the throttle trigger lockout disengaged.

The starting procedure is considered to have been completed when the operator disengages the throttle control latch and the engine returns to idling speed.

Unintentional movement of the cutting attachment shall be minimized by a throttle control so designed that, when a force is applied to the throttle control handle while the throttle trigger lockout is engaged, engine speed will not increase to a point where the clutch engages and cutting attachment movement begins.

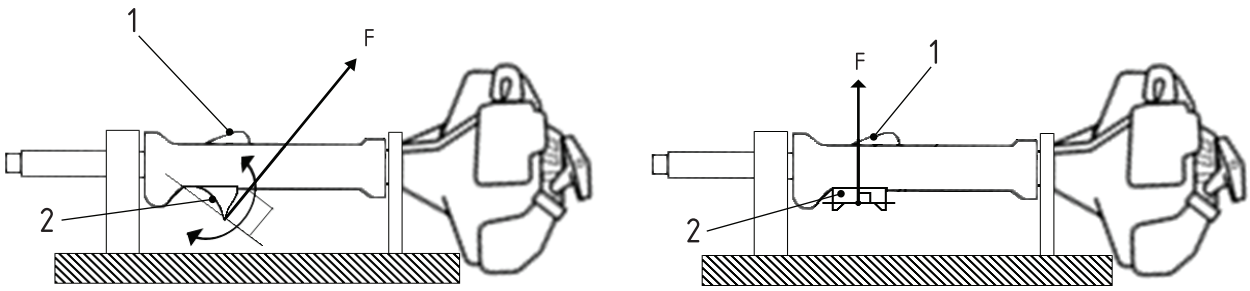
When a force is applied to the throttle trigger, while the throttle trigger lockout is engaged, engine speed shall not increase to a point where the clutch engages and cutting attachment movement begins.

4.10.2.2 Verification

The functionality shall be verified by inspection while operating the machine. The throttle control linkage design shall be verified by applying a force equal to three times the dry weight of the machine in the most unfavourable direction on the middle of the handle with the throttle control, with the machine rigidly fixed on the shaft tube in front of the handle with the throttle control. The force shall be applied with a tolerance of ±5 N.

The throttle trigger lockout function shall be verified by applying a force equal to (50 ± 2) N on the throttle trigger with the throttle trigger lockout engaged. During the test, the hand grip shall be fixed, without contacting the throttle trigger lockout.

The specified force shall be applied gradually to the throttle trigger in the direction of travel and held for (5 ± 1) s. For pivoting throttle triggers the force shall be applied at the point furthest from the pivot and for linear operating throttle triggers the force shall be applied at the midpoint of the throttle trigger. See Figure 5.



a) Pivoting throttle trigger **b) Linear operating throttle trigger**

Key

1 throttle trigger lockout
2 throttle trigger
F force application direction

Figure 5 — Throttle trigger lockout performance test

4.10.3 Throttle control latch

4.10.3.1 Requirements

If a throttle control latch is provided to aid starting and its engagement results in movement of the cutting attachment during starting, the throttle control latch shall have to be engaged manually and shall be automatically released when the throttle trigger is operated. In such cases, the activation device used to set the throttle control latch shall be located outside the gripping area of the handle and it shall require at least two independent motions to engage the throttle control latch.

The gripping area is defined as extending from 25 mm in front of, to 75 mm behind, the rear part of the throttle trigger.

The operational force on the throttle trigger for releasing the throttle control latch shall not exceed 25 N.

4.10.3.2 Verification

The functionality of the throttle control latch shall be verified by inspection and measurement while operating the machine. The specified force for releasing the throttle control latch shall be applied within 1 s at a position (5 ± 1) mm in front of the rear part of the throttle trigger and in the direction of throttle trigger movement (perpendicular to the rotation radius of the throttle trigger).

4.11 Clutch

4.11.1 Requirements

The machine's clutch shall be so designed that the cutting attachment does not move when the engine rotates at any speed less than or equal to 1,25 times the idling speed.

4.11.2 Verification

Correct operation of the clutch shall be verified by inspection when the engine speed is increased from idling speed to 1,25 times the highest idling speed, in accordance with the instructions.

4.12 Tanks

4.12.1 Requirements

Fuel tank and saw-chain lubrication tank caps shall have retainers to prevent separation from the machine.

The fuel tank opening shall be at least 20 mm in diameter. Saw-chain lubrication tank and engine oil tank openings, if applicable, shall be at least 15 mm in diameter. The tank openings or caps shall be clearly marked to indicate the function of the tank; if only the caps are marked, they shall not be interchangeable between tanks.

The filler openings shall be located so that the action of filling the tanks is not obstructed by other components. It shall be possible to use a funnel.

The design of the caps and the fuel tank ventilation system (if equipped) shall be such that no apparent leakage occurs while the machine is at its normal stable operating temperature, during working and while being transported.

4.12.2 Verification

Cap retainers and opening dimensions shall be verified by measurement and inspection.

Caps and fuel tank ventilaton system shall be verified as follows.

The test shall be conducted without the influence of sunlight with an ambient air speed of max. 3 m/s and at (20 ± 3) °C ambient temperature.

Fill the tanks to the manufacturer's recommended fill level. Secure caps per the manufacturer's recommendations.

Prepare the machine for testing by cycling the engine for 5 s at idling speed and 5 s at racing speed until the surface temperature stabilizes within 5 °C. Once the surface temperature has stabilized, shutdown the machine.

Immediately following shutdown, inspect the caps and fuel tank ventilation system for leakage while holding the machine for 30 s in each of the six orthogonal directions. Seepage from fuel tank ventilation systems is not regarded as leakage.

4.13 Protection against contact with parts of the machine under high voltage

4.13.1 Requirements

All high-voltage parts of the machine circuitry, including spark-plug terminals, shall be located, insulated or guarded so that the operator cannot come into accidental contact with them.

Ignition interruption or short-circuiting shall be provided and shall be fitted on the low-voltage side.

4.13.2 Verification

The location and insulation of the parts under high voltage shall be verified by inspection, using a standard test finger, in accordance with probe B of IEC 61032:1997 shown in Figure 2. The ignition interruption or short-circuiting shall be verified by inspection.

4.14 Protection against contact with hot parts

4.14.1 Requirements

The temperature of handles and continuously held controls shall not exceed 43 °C when measured at an ambient temperature of (20 ± 3) °C. Other controls and surfaces contacted to perform normal operation in accordance with the manufacturer's recommendations shall not exceed 55 °C when measured at an ambient temperature of (20 ± 3) °C.

Other metallic surfaces of the machine (excluding the cutting attachment), that have a temperature of over 80 °C, or other plastic parts that have a temperature of over 94 °C, when measured at an ambient temperature of (20 ± 3) °C, are considered a hot surface.

Normal operation of the machine in accordance with the manufacturer's recommendations shall not cause the operator to come into unintentional contact with an area of greater than 10 cm^2 of any contiguous hot surface. The contiguous hot surface area can be curved or irregular. Such a hot surface shall be guarded from unintentional contact if the tip or the conical surface of the test cone, shown in Figure 6, can contact more than 10 cm^2 of the contiguous hot surface area.

Maintenance and adjustment procedures as described in the manufacturer's instructions are considered intentional acts and are excluded from the provisions of this subclause.

The exhaust pipe (outlet) is not considered a surface that is intentionally or inadvertently contacted during normal operation.

4.14.2 Verification

The test shall be conducted without the influence of sunlight, with an ambient air speed of max. 3 m/s, and at (20 ± 3) °C ambient temperature.

Prepare the machine for testing by cycling the engine for 5 s at idling speed and 5 s at racing speed until the surface temperature stabilizes within 5 °C.

Measure the surface temperatures and apply the test cone shown in Figure 6 as described in Annex C.

Dimensions in millimetres

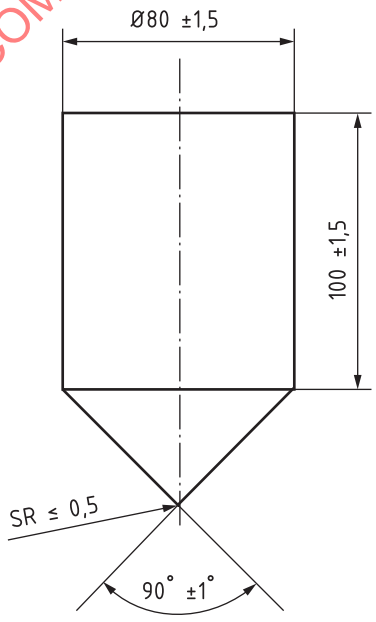


Figure 6 — Test cone

4.15 Exhaust gases

4.15.1 Requirements

The exhaust outlet shall be located such that it directs emissions away from the operator in normal working positions as described in the manufacturer's instructions.

4.15.2 Verification

The location and direction of the exhaust outlet shall be verified by inspection.

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 source. The success of the applied vibration reduction measures is assessed on the basis of the actual vibration total values for each handle. The main sources causing and influencing vibration are generally the dynamic forces from the engine, cutting means, unbalanced moving parts, impact in gears, bearings and other mechanisms and the interaction between operator, machine and material being worked.

NOTE CR 1030-1[12] gives general technical information on widely recognized technical rules and means and provides guidelines for the design of reduced hand-arm vibration machines.

4.16.2 Vibration measurement

The vibration shall be measured and the equivalent vibration total value calculated for each handle in accordance with ISO 22867:2021.

4.17 Noise

4.17.1 Reduction by design at source and protective measures

Noise reduction shall be an integral part of the design process, thus specifically taking into account measures at 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 the air intake system, engine-cooling system, engine exhaust system, cutting system and vibrating surfaces.

NOTE 1 ISO/TR 11688-1 gives general technical information and guidance for the design of low-noise machines.

Special care shall be taken in the acoustical design of the machine.

NOTE 2 ISO/TR 11688-2 gives useful information on noise generation mechanisms in machinery and ISO 14163 provides guidelines for noise control by silencers. ISO 11691 and ISO 11820 address the testing of the silencer.

4.17.2 Noise measurement

The equivalent A-weighted emission sound pressure level at the operator's position and the A-weighted sound power level shall be measured and calculated in accordance with ISO 22868:2021.

4.18 Electromagnetic immunity

4.18.1 Requirements

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

4.18.2 Verification

Electromagnetic immunity shall be verified by testing in accordance with ISO 14982:1998.

4.19 Fuel feed line strength and accessibility

4.19.1 Requirements

Fuel feed lines shall be routed so that they are not subject to direct abrasion when located outside of the tank.

Fuel feed lines shall not break, crack, leak or become detached from their fittings if they are accessible by and tested with the test probe shown in Figure B.1.

4.19.2 Verification

Fuel feed line strength and accessibility shall be evaluated according to Annex B.

4.20 Fuel tank structural integrity

4.20.1 Requirements

The fuel tank shall be integrated in the machine so that it withstands, without any visible leakage, the shock occurring when dropped onto a concrete surface or surface of similar hard material. Seepage from the fuel tank ventilation system is not regarded as leakage.

4.20.2 Verification

Fuel tank structural integrity shall be evaluated as follows.

Fill the machine's fuel tank half full with a mix of 50 % glycol and 50 % water. Condition the machine at (-5 ± 5) °C for a minimum of 6 h.

Within one minute from coming out from the conditioning environment, drop the machine twice onto a concrete surface or surface of similar hard material. If both impacts cannot be performed within one minute, the machine shall be reconditioned to the test temperature before the second drop.

The test shall be performed with the machine in the most compact position.

The machine shall be dropped with centerline of the shaft (775 ± 5) mm above the concrete surface or surface of similar hard material and the shaft balanced in the horizontal position (parallel to the impact surface). If the tank is exposed, the machine shall be dropped in such a manner most likely to cause the exposed tank surface to contact the ground at impact. It is not required that the tank contacts the ground at impact if the natural tendency of the machine design reorients the machine after it is released.

Defective parts, excluding the fuel tank, may be replaced.

Inspect the machine for leakage while holding it for 30 s in each of the 6 orthogonal directions.

NOTE To collect any liquid that can leak out as a result of the test, concrete slabs placed in a metal tray, in turn placed on the concrete surface, can be used.

5 Information for use

5.1 Instructions

5.1.1 General

Safety, operating and maintenance instructions and technical data as listed shall be made available for every machine.

If any portion of this information is not provided with the machine, the website or company contact information with instruction on how this information can be obtained shall be provided with the machine.

For the information to be provided to the user, the following applies.

5.1.2 Technical data

The instructions shall give at least the following information for each model and/or shall mark where significant differences occur:

— machine mass (with empty tanks, without cutting attachment and harness), in kg;

— cutting attachments (chain type, bar length in cm or cm and inch, diameter for blades in mm or mm and inch, as applicable);

— maximum rotational frequency of the spindle for the circular saw blade (if applicable), in min^{-1} or r/min;

— engine idling speed range, in min^{-1};

— values for equivalent vibration total value (for each handle), determined in accordance with ISO 22867:2021, together with the uncertainty of stated values, both in m/s^2;

— value for the equivalent A-weighted emission sound pressure level at the operator position, determined in accordance with ISO 22868:2021, together with the uncertainty of the stated values, in dB;

— value for the equivalent A-weighted sound power level, determined in accordance with ISO 22868:2021 (if required), together with the uncertainty of the stated values, in dB.

5.1.3 Other information

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

The importance of reading the instructions thoroughly before using the machine shall be stressed on the front of the instructions.

The terms used in all documentation shall be in accordance with ISO 6531:2017 and ISO 7112:2018. Alternative wording may be used provided it is explained according to ISO 6531:2017 and ISO 7112:2018.

The instructions shall at least cover information relating to the following:

a) transport, handling and storage of the machine, including

   — the use of the transport cover for the cutting attachment during transport and storage;

   — cleaning and maintenance before storage;

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

b) commissioning of the machine, including

— assembly instructions, initial adjustments and checks, and including a description of the method to install the cutting attachment;

— instructions for adjusting the idle speed so that the cutting attachment stops turning when the engine idles;

— a list of recommended cutting attachments and appropriate guards and their location (where applicable), including a warning of possible consequences from using non-approved cutting attachments;

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

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

c) the machine itself, including

— a description, identification and the nomenclature of principal parts, including the safety devices and harness, and the use of the quick-release mechanism (when provided), explanations of their functions and necessary PPE to be used, including correct clothing;

— an explanation of symbols and safety signs;

— regular maintenance tasks, pre-operational measures and daily maintenance, including the checking for loose fasteners, fuel leaks and damaged parts (e.g. cracks in the saw blade);

— instructions for guide bar and saw-chain adjustments, with the engine stopped (where applicable);

— saw-chain tensioning and sharpening techniques (where applicable);

— declared values of the A-weighted emission sound pressure level at the operator position and of the A-weighted sound power level, including a warning of the risks and the measures to be taken to minimize those risks;

— a description of safe working techniques;

— equivalent vibration, including a warning of the risks and measures to be taken to minimize those risks (including an explanation of white finger risks and the means available to the users for protecting themselves);

d) the use of the machine, including

— a note alerting the user to the fact that national regulation can restrict the use of the machine;

— the need for daily inspection before use and after dropping or other impacts in order to identify any significant damage or defects;

— instructions on general operation and in common cutting tasks, including warnings against unintended use;

— a warning about the danger of using the machine near overhead electric power lines;

— instructions on the use of PPE, including recommendations for the type of hearing protection, eye protection (visor or glasses) and head protection and clothing;

— instructions regarding exposure to vibration, with an explanation of white finger risks and to seek medical attention if symptoms occur, and, if appropriate, recommendations for limiting the duration of operation;

- instructions including information on the use of slip-resistant foot protection as well as close-fitting clothes;
- instructions on the proper use of the harness and the quick-release mechanism (if applicable);
- a warning against the use of the machine when the operator is tired, ill or under the influence of alcohol or other drugs;
- information on correct working posture, the need for rest periods and changing working positions;
- a warning of risk for bystanders and the need to keep them at a safe distance from the machine during its operation;
- a warning about the risk of being struck by falling branches;
- a warning about dangerous operating positions;
- starting and stopping techniques with particular reference to safety;
- a warning about the emission of exhaust gases;
- instructions to keep firm footing and balance during operation, including the need to use the harness provided;

e) maintenance instructions, including

- a description of servicing and replacement tasks for the user, including a reminder about the need to keep the machine in good working condition, as well as the cutting attachment and the cutting attachment guard (if applicable);
- specifications of the spare parts to be used, when these affect the health and safety of the operator;
- drawings or diagrams to allow user maintenance and fault finding;
- the provision of sufficient information to enable the user to maintain the safety system throughout the life of the product and an explanation of the consequences of improper maintenance, use of non-conforming replacement components, or the removal or modification of safety components;

f) declaration of conformity

- any locally required conformity declarations (e.g. EC Declaration of Conformity).

5.2 Markings and warnings

5.2.1 General requirements

All machines shall be clearly and durably labelled or marked with wording or suitably paraphrased wording as described in 5.2.2 and 5.2.3. Symbols can be used to provide the information required and shall be explained in the instructions.

Safety signs and symbols shall be distinctive on the products. Embossed features can be used to achieve distinctiveness and 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 a person with normal vision, including corrected vision, from a distance of not less than 500 mm.

All markings and warnings shall be located in a readily visible position on the machine and shall resist the anticipated service conditions, such as the effect of temperature, moisture, fuel, oil, abrasion and weathering exposure.

If labels are used, they shall be tested in accordance with 5.3.2, after which they shall undergo a visual inspection and be compared against an untested, new control specimen. No significant indications of indentation, separation, splitting, chalking, swelling, peeling, blistering, flaking, large scratches or cracking of the material, and/or no significant deterioration of print, shall be detected.

The labels shall also be tested in accordance with 5.3.3, after which the non-adhesion distance shall be a maximum of 1 mm from the specimen edge and the adhesive properties shall be at least 0,09w, in newtons, where w is the test specimen width, in millimetres.

NOTE Labels tested and approved according to ANSI/UL 969:2018 supplemented by a gasoline exposure test can be used and are considered to fulfil the requirements of 5.3.

5.2.2 Marking requirements

All machines shall be marked with the following minimum information:

— business name and full address of the manufacturer or, where applicable, the authorized representative;

  The address may be simplified, provided the manufacturer (or, where applicable, his authorized representative) can be identified, but in any event the address on the plaque shall be sufficient for mail to reach the company;

— designation of series or type;

  Allowing the technical identification of the product. This can be achieved by a combination of letters and/or numbers and may be combined with the designation of the machinery.

— designation of machinery;

  The designation of machinery allows the technical identification of the product. This can be achieved by a combination of letters and/or numbers and combined with the designation of the series or type.

  NOTE 1 An example of such a code is “A123-B”.

— year of construction, i.e. the year in which the manufacturing process was completed;

— serial number, if any;

— any marking that indicates compliance (e.g. the CE- mark).

The machine shall be marked with the identification and method of operation of the control for the engine stopping device, oiler control (if provided), choke control and heated handle switch (if provided).

NOTE 2 Marking according to ISO 3767-1 and ISO 3767-5 is considered to satisfy this provision.

Machines equipped with a circular saw blade cutting attachment shall be marked with the following minimum information:

— maximum rated rotational frequency of the spindle, in min^{-1} or r/min;

— rotational direction for the cutting attachment on a component near the cutting attachment.

Circular saw blades shall be marked with the following information:

— maximum rated rotational frequency, in min^{-1} or r/min;

— rotational direction.

5.2.3 Warning requirements

All machines shall be marked with the following warnings.

— Read the instructions and follow all warnings and safety instructions.

— Wear head, eye and hearing protection and protective footwear and gloves.

— Keep the pole mounted powered pruner a sufficient distance away from electrical power lines.

NOTE ISO 3864-2/ISO 3864-3 can be considered for the design of warning labels.

5.3 Test of labels

5.3.1 Preparation of test specimens and control specimens

5.3.1.1 General

New test specimens shall be prepared for each of the tests given in 5.3.2 and 5.3.3. New control specimens shall also be prepared for any test that involves a visual inspection.

5.3.1.2 Test panels

Test panels shall be made with a surface equal to that on which the label shall be mounted.

The test panels shall be carefully cleaned with an appropriate solvent in order to remove all traces of adhesive, grease, oil and water, and then dried for at least 2 h.

5.3.1.3 Test specimens

The number of test specimens and control specimens prepared for each test shall be a minimum of three.

The test specimen/control specimen shall be the complete label wherever possible, except where the physical limitations of the test equipment do not allow for testing of an entire label or when the graphical content of the label has no effect on the results of the test. The minimum dimensions of the test specimen shall be 13 mm in width and 25 mm in length.

The backing layer protecting the adhesive side shall be completely removed for the wipe resistance test (see 5.3.2) and for the adhesion test (see 5.3.3) to a length of at least 15 mm, but leaving the protected end long enough to be attached to the pulling machine. The specimens shall then be applied to the test panel symmetrically. The applied specimens shall be rolled over five times using a steel roller with a rubber coating, having a diameter of 30 mm to 60 mm and a width at least 2 mm wider than the test specimen. Apply the roller with a force of (50 ± 2) N and a rolling speed of approximately (200 ± 20) mm/s.

After being applied to the test panels, the test specimens shall be conditioned at a temperature of (23 ± 5) °C with a relative humidity of (50 ± 20) % for at least 24 h prior to testing.

5.3.2 Wipe resistance test

Three test specimens shall be mounted on test panels in accordance with 5.3.1 and then immersed in the test liquid for (300 ± 3) s.

After having removed it from the test liquid, wipe the test specimen with a force of (10 ± 1) N and 1 cycle/s, using an unbleached cotton cloth soaked in the test liquid for (30 ± 3) s. After the wiping test has been completed, a visual inspection of the test specimen shall be carried out.

The test liquids shall be

a) water, and

b) a mixture by volume of 50 % isooctane and 50 % toluene.

5.3.3 Adhesion test

Three test specimens shall be mounted on test panels in accordance with 5.3.1 and immersed in the test liquid (50 % isooctane and 50 % toluene) for (30 ± 1) min.

After removing the test specimen from the test liquid, inspect and measure any non-adhesion distances from the specimen edge.

Then attach the test panel to a holder and the free end of the test specimens, still covered by a backing layer protecting the adhesive side, to a pulling machine. Apply a pulling force upwards at an angle of (90 ± 5) ° to the test panel and at a speed of (60 ± 6) mm/min. Measure the tensile force required for this over a distance of at least 15 mm. The average value of the tensile force, expressed in newtons, shall be calculated and recorded. If the test distance of 15 mm is not achievable because the test specimens tear, the test specimens shall be reinforced with a second layer of the label being tested.