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**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*





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## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 11680-1 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 17, *Manually portable forest machinery*.

This second edition cancels and replaces the first edition (ISO 11680-1:2000), which has been technically revised to reflect the state of the art.

ISO 11680 consists of the following parts, under the general title *Machinery for forestry — Safety requirements and testing for pole-mounted powered pruners*:

- *Part 1: Machines fitted with an integral combustion engine*
- *Part 2: Machines for use with back-pack power source*

## Introduction

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

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

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

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

## Part 1: Machines fitted with an integral combustion engine

### 1 Scope

This part of ISO 11680 gives safety requirements and measures for their verification for the design and construction of portable, hand-held, pole-mounted powered pruners having an integral combustion engine as their power unit and using a drive shaft to transmit power to a cutting attachment consisting of a saw chain or a reciprocating or 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 part of ISO 11680 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 instruction handbook), relevant to these machines when they are used as intended and under conditions of misuse which are reasonably foreseeable by the manufacturer.

NOTE See Annex A for a list of significant hazards.

This part of ISO 11680 is applicable to portable, hand-held, pole-mounted powered pruners manufactured after its date of publication.

### 2 Normative references

The following referenced documents are indispensable for the application 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, *Machinery for forestry — Portable chain saws — Vocabulary*

ISO 7112:2008, *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 8893, *Forestry machinery — Portable brush cutters and grass-trimmers — Engine performance and fuel consumption*

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

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

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

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

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

IEC 60745-1:2006, *Hand-held motor-operated electric tools — Safety — Part 1: General requirements*

### 3 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 6531, ISO 7112 and ISO 12100 and the following apply.

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

NOTE See Figure 1 for an example of a pole-mounted powered pruner with integral combustion engine and a saw-chain cutting attachment within the Scope of this part of ISO 11680.

### 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 for relevant but not significant hazards which are not dealt with by this part of ISO 11680.

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).

Except where otherwise specified in this part of ISO 11680, the safety distances specified in ISO 13857:2008, 4.2.4.1 and 4.2.4.3, shall be met.

#### 4.2 Hand-grips

##### 4.2.1 Requirements

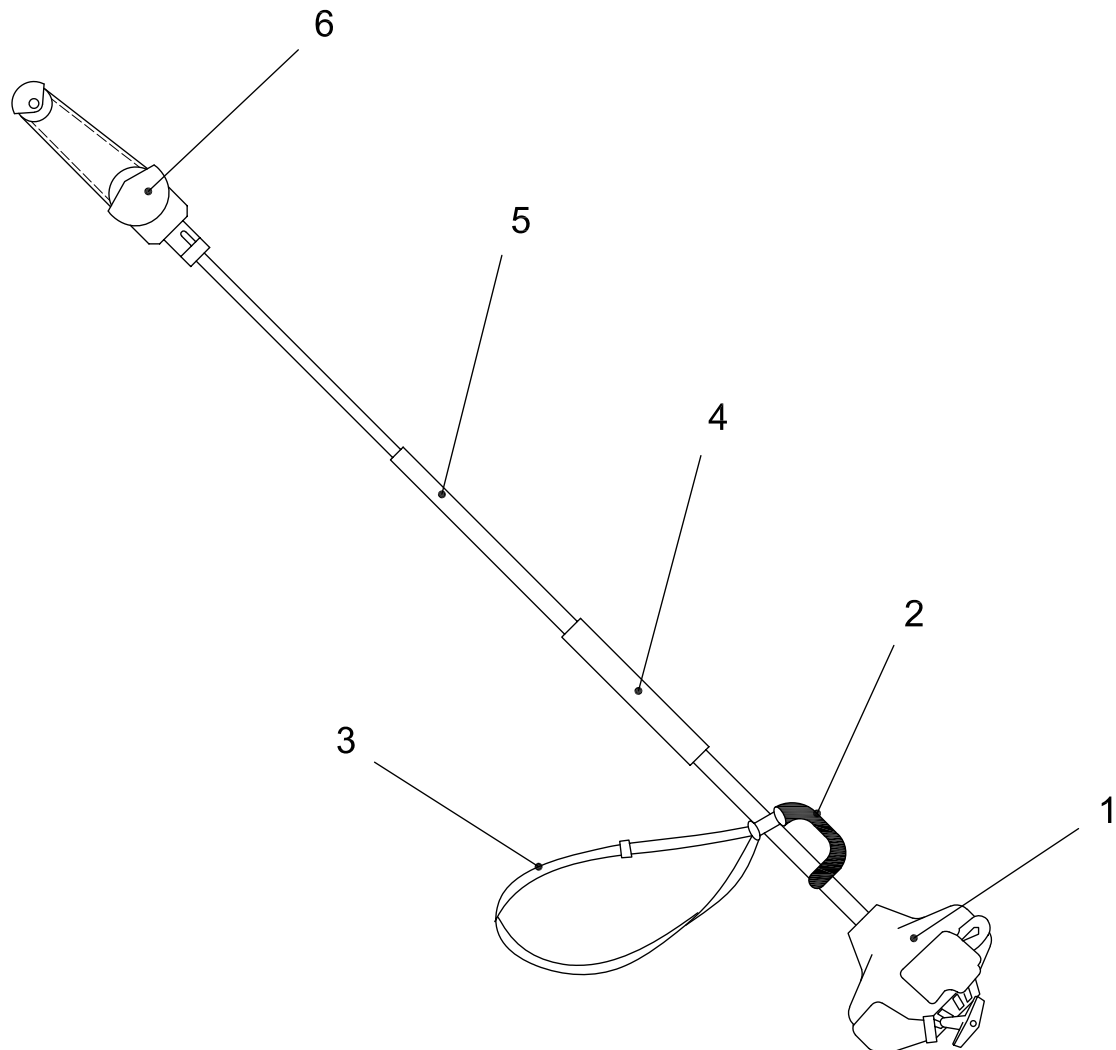
The machine shall have a hand-grip for each hand. The shape and surface of the hand-grip shall be designed so as to provide the necessary sureness of grip, regardless of whether or not the operator wears gloves. If the hand-grip nearest the cutting attachment is an integral part of the drive-shaft tube, the diameter shall be between 20 mm and 50 mm. The hand-grip length shall be at least 100 mm.

The gripping length of a bail or closed hand-grip 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.

##### 4.2.2 Verification

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





### Key

- 1 power unit
- 2 rear hand-grip
- 3 harness
- 4 front hand-grip
- 5 shaft tube
- 6 cutting attachment

**Figure 1 — Example of pole-mounted powered pruner with integral combustion engine and saw-chain cutting attachment**

## 4.3 Harness

### 4.3.1 Requirements

All machines 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.

A harness shall either be provided with a quick-release mechanism or the design shall be such that the harness can be removed quickly in the event of an emergency. Any such quick-release mechanism for emergency release shall enable rapid release of the machine from the harness or harness from operator.

If a quick-release mechanism is provided, it shall be possible to open it under load and release the machine using only one hand.

#### 4.3.2 Verification

The harness, its functionality and its adjustment shall be verified by inspection. The quick-release mechanism shall be checked 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.

### 4.4 Cutting attachment

#### 4.4.1 Saw-chain cutting attachment

##### 4.4.1.1 Requirements

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

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 hand-grips.

##### 4.4.1.2 Verification

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

#### 4.4.2 Circular saw-blade cutting attachment

##### 4.4.2.1 Requirements

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.

The circular saw blade shall be secured so as to prevent relative motion between it and the retainer or the shaft on which it is mounted. The method for securing the saw blade shall also prevent its loosening during use.

These requirements are applicable to all saw blades recommended by the instruction handbook.

##### 4.4.2.2 Verification

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

- a) Install the cutting attachment in accordance with the instruction handbook.
- b) Lock the power transmission shaft.
- c) Apply to the blade a rotational torque,  $M$ , in newton metres (N · m):

$$M = 0,4 \times V \times k$$

where

$V$  is the engine displacement, in cubic centimetres (cm<sup>3</sup>);

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

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

Blade surface quality and blade material shall be verified in accordance with ISO 7113.

### 4.4.3 Cutting attachment strength

#### 4.4.3.1 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 4.4.3.2.

#### 4.4.3.2 Verification

Suspend the machine freely from a position  $150 \text{ mm} \pm 2 \text{ mm}$  in front of the middle of the rear handle and at a height of  $775 \text{ mm} \pm 2 \text{ mm}$  above the test surface.

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  $45^\circ \pm 2^\circ$  to the horizontal. The test surface with which the machine impacts shall be flat and of concrete or similar.

If, after impact, no cracks can be detected in the cutting attachment or its fixing or guard by means of visual inspection, start the engine and run at an over-speed of 133 % of the maximum power speed or maximum engine speed — whichever is the lesser — for  $60 \text{ s} \pm 2 \text{ s}$ . Control the engine speed using the throttle trigger. If the saw blade or guide bar is so bent as to be unusable, replace it before the over-speed run.

Impact strength 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.

Single-piece metal blades shall also be verified by testing in accordance with ISO 7113:1999, Clause 5.

### 4.5 Transport cover for cutting attachment

#### 4.5.1 Requirements

The machine shall be provided with a transport cover, so designed that it remains attached to the cutting attachment during transport and storage.

#### 4.5.2 Verification

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

### 4.6 Distance to cutting attachment

#### 4.6.1 Requirements

The distance from the rear of the throttle trigger to the nearest unguarded point of the cutting attachment shall be at least 1 250 mm, with the cutting attachment adjusted to its position nearest the operator.

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. collar on the shaft tube) shall be provided close to the cutting attachment to warn the operator that his hand is getting close to the cutting device. The distance from the rear of the fixed obstacle to the nearest unguarded point of the cutting attachment shall be at least 120 mm, measured as a chain measurement.

#### 4.6.2 Verification

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

### 4.7 Engine starting device

#### 4.7.1 Requirements

The engine starting device shall be a self-contained, battery-powered electric starter and/or a manual starter where the actuator is permanently attached to the machine.

Pole-mounted powered pruners with a manual starter shall have a recoil device for the rope.

Two or more separate and dissimilar actions shall be required to activate the electrical starting device.

#### 4.7.2 Verification

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

### 4.8 Engine stopping device

#### 4.8.1 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.

#### 4.8.2 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.

### 4.9 Throttle control

#### 4.9.1 Position

##### 4.9.1.1 Requirements

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

##### 4.9.1.2 Verification

The position shall be verified by inspection and functional testing.

#### 4.9.2 Operation

##### 4.9.2.1 Requirements

The machine shall be provided with a throttle trigger that, when released, automatically reverts to the idling position unless a throttle lock to aid starting is engaged (see 4.9.3). The throttle trigger shall be retained in the idling position by the automatic engagement of a throttle trigger lock-out.

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 lock-out disengaged.

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

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

#### **4.9.2.2 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 weight of the machine, without cutting attachment and with tanks empty, in the most unfavourable direction on the handle with the throttle control.

#### **4.9.3 Throttle lock**

##### **4.9.3.1 Requirements**

If a throttle lock is provided to aid starting and its engagement will result in movement of the cutting attachment during starting, the throttle lock 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 lock shall be located outside the gripping area of the handle and it shall require at least two independent motions to engage the throttle lock.

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 lock shall not exceed 25 N.

##### **4.9.3.2 Verification**

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

#### **4.10 Clutch**

##### **4.10.1 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 1,25 times the idling speed.

##### **4.10.2 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 instruction handbook.

#### **4.11 Tanks**

##### **4.11.1 Requirements**

Tank caps shall have retainers.

The fuel tank opening shall be at least 20 mm in diameter and the oil tank opening, if existent, 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 design of the fuel tank assembly shall be such that no apparent leakage occurs while the machine is at its normal operating temperature, in all working positions and while being transported.

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.

#### **4.11.2 Verification**

The cap retainers, opening dimensions and location shall be verified by measurement and inspection. The tightness of the caps shall be verified by inspection while turning the machine in any direction. Seepage from fuel tank ventilation systems is not regarded as leakage.

### **4.12 Protection against contact with parts under high voltage**

#### **4.12.1 Requirements**

All high-voltage parts of the circuit, 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.

#### **4.12.2 Verification**

The location and insulation of the parts under high voltage shall be verified by inspection, using a standard test finger, in accordance with IEC 60745-1:2006, Figure 1. The ignition interruption or short-circuiting shall be verified by inspection.

### **4.13 Protection against contact with hot parts**

#### **4.13.1 Requirements**

The cylinder and parts in direct contact with the cylinder or the muffler shall be protected against unintentional contact during normal operation of the machine.

Such hot surfaces shall be considered accessible if the contactable area exceeds 10 cm<sup>2</sup> when probed by the test cone, as shown in Figure 2.

The temperature for these accessible parts of the machine, and guards or shields provided to prevent access to such hot surfaces, shall not be more than 80 °C for metallic surfaces or 94 °C for plastic surfaces.

NOTE For further information, see ISO 13732-1:2006, Annex E.

#### **4.13.2 Verification**

Verification shall be by determining the accessibility of identified hot surfaces using the test cone shown in Figure 2 and as follows.

Conduct the temperature test in the shade and at a maximum wind speed of 3 m/s. Operate the engine by cycling for 5 s at idling speed and 5 s at racing speed until the surface temperatures stabilize.

Identify the hot surface area or areas. Determine temperatures using temperature-measuring equipment with an accuracy of  $\pm 2$  °C.

If the test is conducted at an ambient temperature outside of the nominal  $20\text{ °C} \pm 3\text{ °C}$ , the recorded temperatures shall be corrected using the formula

$$T_C = T_O - T_A + 20\text{ °C}$$

where

$T_C$  is the corrected temperature, in degrees Celsius (°C);

$T_O$  is the observed temperature, in degrees Celsius (°C);

$T_A$  is the ambient temperature, in degrees Celsius (°C).

Allow the power source to cool before using the cone. It is not necessary to test the accessibility of hot parts while they are hot.

Apply the test cone shown in Figure 2 in any direction and with a maximum force of  $(10_{-1}^0)$  N. When moving the cone, determine whether there is any contact between the hot surface area or areas and the cone's tip or the conical surface. Neither tip nor conical surface shall come into contact with any hot surface area greater than  $10\text{ cm}^2$ .

Dimensions in millimetres

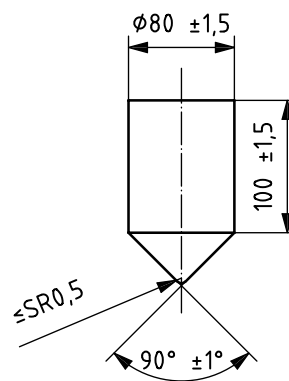


Figure 2 — Test cone

## 4.14 Exhaust gases

### 4.14.1 Requirement

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

### 4.14.2 Verification

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

## 4.15 Vibration

### 4.15.1 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 gives general technical information on widely recognized technical rules and means and provides guidelines for the design of reduced hand-arm vibration machines.

#### **4.15.2 Vibration measurement**

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

#### **4.16 Noise**

##### **4.16.1 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.

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 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. See the Bibliography.

##### **4.16.2 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.

#### **4.17 Electromagnetic immunity**

##### **4.17.1 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.

##### **4.17.2 Verification**

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

### **5 Information for use**

#### **5.1 Instruction handbook**

##### **5.1.1 General**

For the information to be provided to the user, the following applies, together with ISO 12100:2010, 6.4.

##### **5.1.2 Technical data**

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

- machine mass (without fuel, cutting attachment and harness), in kg;



- volume (fuel tank), in cm<sup>3</sup>;
- volume (oil tank, if any), in cm<sup>3</sup>;
- cutting attachments (type, diameter for blades), in mm;
- engine displacement, in cm<sup>3</sup>;
- maximum engine power, in accordance with ISO 8893, in kW;
- maximum rotational frequency of the spindle for the circular saw blade (if applicable), in min<sup>-1</sup>;
- engine idling speed range, in min<sup>-1</sup>;
- values for equivalent vibration total value (for each handle), determined in accordance with ISO 22867, together with the uncertainty of stated values, both in m/s<sup>2</sup>;
- values for the equivalent A-weighted emission sound pressure level at the operator position, determined in accordance with ISO 22868, together with the uncertainty of the stated values, both in A-weighted dB;
- values for the A-weighted sound power level, determined in accordance with ISO 22868 (if required), together with the uncertainty of the stated values, both in A-weighted dB.

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

### 5.1.3 Other information

The instruction handbook shall contain, in accordance with ISO 12100:2010, 6.4.5, comprehensive instructions and information on all aspects of maintenance, safe use of the machine, including types and use of clothing and 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.

Extensive use should be made of pictograms and/or diagrams.

The importance of reading the instruction handbook thoroughly before using the pruner shall be stressed on the front of the instruction handbook.

The terms used in all documentation shall be in accordance with ISO 6531 and ISO 7112.

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

- a) transport, handling and storage of the machine, including
  - the use of a transport guard during transport and storage,
  - cleaning and maintenance before storage, and
  - 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,
  - routines for checking that the cutting attachment stops turning when the engine idles,
  - a list of recommended cutting attachments and appropriate guards and their location, 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, and

- 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 chain adjustments, with the engine stopped (where applicable),
  - 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, and
  - 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 pruner,
  - 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 and, additionally, 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 including information on the use of slip-resistant foot protection as well as close-fitting clothes,
  - instructions on the use of the quick-release mechanism and adjustment of the harness,
  - 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,
  - hazards which could be encountered while using the machine and how to avoid them while performing typical tasks (e.g. removal of blockage),
  - warning of risk for bystanders and the need to keep them at a safe distance from the machine during its operation,
  - advice to remove branches in sections and a warning about dangerous operating positions, as well as the risk of being struck by falling branches or branches that, having hit the ground, rebound,
  - starting and stopping techniques with particular reference to safety,
  - a warning about the emission of exhaust gases,

- advice 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,
  - specifications of the spare parts to be used, when these affect the health and safety of operators,
  - 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-conformant replacement components, or the removal or modification of safety components.

## 5.2 Marking

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;
- designation of machinery;
- year of construction, i.e. the year in which the manufacturing process was completed;
- serial number, if any;
- maximum rotational frequency of the spindle, when applicable;
- rotational direction for the cutting attachment on a component near the cutting attachment, when applicable.

NOTE 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.

In addition, the cutting attachment shall be marked with the following information:

- maximum rated rotational frequency, in  $\text{min}^{-1}$ ;
- rotational direction, when applicable;
- name or trade mark of the manufacturer.

The machine shall also bear the following information:

- identification and method of operation — preferably according to ISO 3767 — of the control for the engine stopping device, oiler control (if provided), choke control and heated handle switch (if provided);
- identification of carburettor and oil adjustments (if applicable);
- identification of fuel and oil (if applicable) tank openings and/or caps.

If symbols are used, they shall be explained in the instruction handbook, and, except if cast, embossed or stamped, shall be in contrast to their background. Embossed features shall be at least 0,3 mm in height above the surrounding surface. The information and/or instructions provided by the symbols shall be clearly legible when viewed from a distance of not less than 500 mm.

The markings shall be located in a readily visible position and shall resist the anticipated service conditions, e.g. the effects of temperature, moisture, petrol, oil, abrasion and weathering exposure.

If labels are used, they shall be tested in accordance with 5.4.2, 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 5.4.3, 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.

### 5.3 Warnings

All machines shall be marked with the following warnings using text or pictograms:

- **Read the instruction handbook and follow all warnings and safety instructions.**
- **Wear head, eye and hearing protection and protective footwear and gloves.**
- **Keep the pole pruner a sufficient distance away from electrical power lines.**

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

NOTE Guidance for the design of pictorials is given in ISO 17080 and ISO 11684.

The warnings shall be located in a readily visible position on the machine and shall resist the anticipated service conditions, e.g. the effects of temperature, moisture, petrol, oil, abrasion and weather exposure.

When symbols are used, they shall, except if they are cast, embossed or stamped, be in contrast to their background. Embossed features shall be at least 0,3 mm in height above the surrounding surface. The information and/or instructions provided by the symbols shall be clearly legible when viewed from a distance of not less than 500 mm.

If labels are used, they shall be tested in accordance with 5.4.2, 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 5.4.3, 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.

### 5.4 Test of labels

#### 5.4.1 Preparation of test specimens and control specimens

##### 5.4.1.1 General

New test specimens shall be prepared for each of the tests given in 5.4.2 and 5.4.3. New control specimens shall also be prepared for any test that involves a visual inspection.

##### 5.4.1.2 Test panels

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

### 5.4.1.3 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 sign wherever possible, except where the physical limitations of the test equipment do not allow for testing of an entire sign or when the graphical content of the sign 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 protective layer shall be completely removed for the wipe resistance test (see 5.4.2) and for the adhesion test (see 5.4.3) 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, and of a width at least 2 mm wider than the test specimen and a diameter of 30 mm to 60 mm; a force of 50 N shall be applied to the roller and a rolling speed of approximately 200 mm/s shall be maintained.

After being applied to the test panels, the test specimens shall be conditioned at a temperature of  $23\text{ °C} \pm 5\text{ °C}$  with a relative humidity of  $50\% \pm 20\%$  for at least 24 h prior to testing.

### 5.4.2 Wipe resistance test

Three test specimens shall be mounted on test panels in accordance with 5.4.1 and then immersed in the test liquid for  $300\text{ s} \pm 3\text{ s}$ .

After having removed it from the test liquid, wipe the test specimen with a force of 10 N and 1 cycle/s, using an unbleached cotton cloth soaked in the test liquid for  $30\text{ s} \pm 3\text{ s}$ . 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.

### 5.4.3 Adhesion test

Three test specimens shall be mounted on test panels in accordance with 5.4.1 and immersed in the test liquid (50 % isooctane and 50 % toluene) for  $30\text{ min} \pm 1\text{ min}$ .

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 protective layer, to a pulling machine. Apply a pulling force upwards at an angle of  $90^\circ$  to the test panel and at a speed of  $(60 \pm 6)\text{ mm/min}$ . 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 layer being tested.

## Annex A (informative)

### List of significant hazards

This annex specifies the significant hazards, hazardous situations and significant hazardous events that have been identified as being significant for the pole-mounted powered pruners within the Scope of this part of ISO 11680 and which require specific action by the designer or manufacturer to eliminate or reduce the risk.

**Table A.1 — List of significant hazards associated with pole-mounted powered pruners**

Ref. No.	Hazard		Subclause of this part of ISO 11680
	Origin (source)	Potential consequences	
1	<b>Mechanical hazards</b>		
	Rotary cutting attachment	Cutting or severing of upper and lower extremities	4.4, 4.6, 4.9, 4.10
	Thrown objects from machine	Injury from impact of ejected objects	4.4
	Break-up of cutting attachment	Injury from ejected parts of cutting attachment	4.4, 5.1
	Engine control system malfunction or controls resulting in unexpected start-up with cutting attachment engaged, unexpected over-run/over-speed	Shearing, cutting, severing or entanglement of upper and lower extremities	4.2, 4.7, 4.8, 4.9, 4.10, 4.17, 5.1, 5.2
2	<b>Electrical hazards</b>		
	Live parts of electrical system (direct contact) or parts which have become under high voltage under faulty conditions (indirect contact)	Injuries from electric shock to the body	4.12
3	<b>Thermal hazards</b>		
	Hot engine parts, including parts which have become hot caused by heat radiation	Injury from burns and scalds from accidental contact	4.13
4	<b>Noise hazards</b>		
	Engine, transmission and cutting system, including resonance of fixed machine parts	Discomfort, partial hearing loss, deafness, loss of balance, loss of awareness, stress	4.16, 5.1, 5.3
5	<b>Vibration hazards</b>		
	Engine, handles	Discomfort, neurological, osteo-articular and vascular disorders	4.15, 5.1
6	<b>Material/substance hazards</b>		
	Engine exhaust gases, gasoline	Respiration problems through inhalation of harmful gases and injuries to the skin from contact with harmful liquids	4.14
7	<b>Ergonomic hazards</b>		
	Location and design of controls, handles, etc.	Discomfort, fatigue, injuries to locomotor apparatus, loss of control	4.2, 4.3, 4.7, 4.8, 4.9, 5.1

Table A.1 (continued)

Ref. No.	Hazard		Subclause of this part of ISO 11680
	Origin (source)	Potential consequences	
8	<b>Combination of hazards</b>		
	Poor posture or excessive effort in combination with inadequate design or location of manual controls, including inadequate consideration of human hand–arm anatomy, related to handle design and machine balance.	Discomfort, fatigue, injuries to locomotor apparatus, loss of control	4.2, 4.3, 4.7, 4.8, 4.9, 5.1, 5.2
	Hot engine parts/electrical short-circuiting in combination with leaking gasoline tank/gasoline spilling	Burns and scalds by resulting fire	4.11, 4.13, 5.1

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