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Forest machinery — Backpack power units for brush-cutters, grass-trimmers, pole-cutters and similar appliances — Safety requirements and testing

Matériel forestier — Sources motrices portées à dos utilisées pour entraîner les débroussailleuses, les coupe-herbe, les scies à perche et autres appareils similaires — Exigences de sécurité et essais

Reference number
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Foreword

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

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.

International Standard ISO 14740 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 17, *Manually portable forest machinery*.

Requirements for hazards not covered in this International Standard are given in ISO/TR 12100.

Annex A forms an integral part of this International Standard.

Forest machinery — Backpack power units for brush-cutters, grass-trimmers, pole-cutters and similar appliances — Safety requirements and testing

1 Scope

This International Standard specifies the safety requirements and their verification for the design and construction of backpack power units incorporating a combustion engine as a power source to power brush-cutters, grass-trimmers, pole-cutters and similar appliances.

It describes methods for the elimination or reduction of hazards arising from the use of the backpack power units, but does not cover hazards resulting from the use of the attached appliance. Therefore this International Standard cannot be used alone for the assessment of the machine safety aspects for a machine with a backpack power unit, and must only serve as a reference for specifications concerning the backpack power unit itself. It does not specify any technical requirements to reduce noise and whole body vibration hazards. Indeed the different means available to reduce these hazards are a matter for the technical aids to which the manufacturer may resort, through specialized books or specific bodies.

NOTE — An agreed method to measure whole body vibration from the backpack power unit is presently not available.

The list of significant hazards requiring action to reduce the risk is given in annex A.

Environmental aspects have not been considered in this International Standard.

2 Normative references

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

ISO 3767-5:1992, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 5: Symbols for manual portable forestry machinery.*

ISO 6531:—[1)], *Machinery for forestry — Portable hand-held chain-saws — Vocabulary.*

ISO 7112:—[2)], *Machinery for forestry — Portable hand-held brush-cutters and grass-trimmers — Vocabulary.*

ISO 11684:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Safety signs and hazards pictorials — General principles.*

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1) To be published. (Revision of ISO 6531:1982)

2) To be published. (Revision of ISO 7112:1982)

ISO/TR 12100-1:1992, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology.*[3)]

ISO/TR 12100-2:1992, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*[4)]

ISO 13852:1996, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*[5)]

IEC 60335-1:1991, *Safety of household and similar electrical appliances — Part 1: General requirements.*

3 Definitions

For the purposes of this International Standard, the definitions given in ISO 6531 and ISO 7112 and the following apply.

3.1 backpack power unit
power source which is designed to be carried on the operator's body by means of a supporting device

3.2 brush-cutter
unit with a rotating blade made of metal or plastic, intended for cutting weeds, brush, small trees and similar vegetation

3.3 handgrip
surface or structure specifically designed for the operator's hand to grasp to enable manoeuvring of the backpack power unit

3.4 powered pole-cutter
portable unit designed to allow an operator to use a cutting device to cut branches of trees whilst remaining at a distance from the cutting zone

3.5 appliance
tool which includes a transmission shaft, cutting attachment, guard and handles

3.6 unit
complete machine including backpack power unit with harness and an appliance

4 Safety requirements

Each backpack power unit shall be in accordance with the requirements below.

4.1 Exhaust system

The exhaust outlet shall be located so as to direct exhaust emissions away from the operator when placed on his back or hips.

4.2 Controls

All controls shall be designed to be operable by an operator wearing gloves.

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3) Equivalent to EN 292-1:1991.

4) Equivalent to EN 292-2:1991.

5) Equivalent to EN 294:1992.

4.2.1 Throttle trigger

4.2.1.1 The backpack power unit shall either have a throttle trigger lockout or be designed so that a straight and rigid gauge of 10 mm diameter and 200 mm length shall not activate the throttle trigger to such an extent that the engine speed is raised above the idling speed.

4.2.1.2 The throttle trigger shall be possible to attach on the appliance so that it can be pressed and released with one hand holding the handle of the appliance on which the throttle trigger is mounted.

4.2.1.3 The throttle trigger shall, when released, automatically revert to the idling position and be retained in that position by the automatic engagement of a throttle trigger lockout.

4.2.1.4 If a throttle lock is provided for starting, it shall be automatically released when the throttle trigger is operated. The throttle lock shall be so designed that two or more independent motions are required to engage the throttle lock.

4.2.1.5 In the starting mode power can be transmitted to the appliance.

4.2.2 Engine-stopping device

The backpack power unit shall be fitted with an engine-stopping device by which the engine can be brought to a full stop and does not depend on sustained manual effort for its operation. The control for this device shall be attached adjacent to the throttle control so that it can be operated while the appliance is being held by an operator with both hands. The purpose and method of operation of the device shall be clearly and durably marked. The colour of the control shall clearly contrast with the background.

4.3 Handgrip

A handgrip shall be available. It can be a part of the frame, and shall allow an operator alone to grasp the backpack power unit to place it on the back or hip.

4.4 Engine support

The engine shall be supported on a backpack frame designed to distribute the load evenly on the operator's back, shoulders, waist and/or hips.

4.5 Harness

4.5.1 A suitable harness shall be provided to carry the backpack frame. It shall be adjustable to the size of the operator.

4.5.2 A double shoulder harness shall be provided for all backpack power units exceeding a dry mass of 7,5 kg.

4.5.3 The harness shall be designed to prevent slipping and so that pressure can be evenly distributed on the operator's back, shoulders and/or waist.

4.5.4 The harness design, or the quick release mechanism shall enable the backpack power unit to be released quickly from the operator in case of emergency. The design of the connection between the harness and those parts of the backpack power unit suspended from it shall be such that separation will only occur by deliberate action of the operator.

4.6 Power driven components

The backpack power unit shall be constructed to ensure that when used as intended, the operator is protected from power driven components such as sprockets, flexible drive lines, pulleys, shafts, gears, flywheels, fan blades and also drive belts and chains.

For openings, the requirements of ISO 13852:1996, 4.5.2 and 4.5.3, shall be met.

4.7 Hydraulic and pneumatic pipes and hoses

Hydraulic and pneumatic pipes and hoses subject to internal pressures greater than 500 kPa shall be shielded to prevent operator injury in the event of leakage.

4.8 Protection against contact with hot parts

The cylinder and exhaust or parts being in direct contact with the cylinder and exhaust shall be guarded so that they are not accessible by unintentional contact during normal operation. If hot parts are accessible, they shall not have a contacted area greater than 10 cm^2. They shall be considered accessible if they can be reached by the test cone, as shown in figure 1.

The temperature for the accessible parts shall not cause a hazard to the operator. For further information, see EN 563:1994[6], and especially its annex C.

Dimensions in millimetres

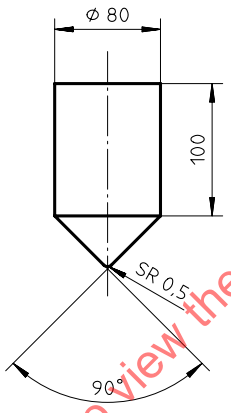

Figure 1 — Test cone

4.9 Protection against contact with parts under high voltage

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

All high voltage parts of the circuit, including spark plug terminals, shall be electrically protected in such a manner that the operator cannot make accidental contact with them. The requirements shall be checked by inspection and using a finger probe, as described in IEC 60335-1:1991, figure 1.

4.10 Tank openings

4.10.1 The fuel cap shall have a retainer. The diameter of the fuel tank opening shall be at least 20 mm.

4.10.2 The opening or cap shall be clearly marked.

4.10.3 The design of the cap shall be such that no apparent leakage occurs whilst the engine is at the normal operating temperature, in all working positions and while being transported. Seepage from any fuel tank ventilation system shall not constitute a leakage.

4.10.4 The filler openings shall be located so that the filling of the tanks with a suitable funnel is not obstructed by other components.

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6) *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces.*

4.11 Starting device

A starting device shall be provided to allow the engine to be started without using separate independent auxiliary assistance (for example belts or cables).

When the backpack power unit is fitted with an electric starting device, two or more independent motions shall be required to engage the device.

4.12 Clutch

The backpack power unit shall have a clutch which ensures that no power is transmitted to the appliance powered by the unit when the engine rotation speed is less than or equal to 1,25 times the manufacturer's recommended idling speed.

5 Verification of safety requirements

The compliance with safety requirements shall be verified according to table 1.

Table 1 — Safety requirements and testing method

		Testing method		
Subclause	**Safety requirements**	**Inspection[1)]**	**Function test[2)]**	**Measurement[3)]**
4.1	Exhaust system	×	×	
4.2	Controls	×	×	
4.2.1	Throttle trigger	×	×	×
4.2.2	Engine-stopping device	×	×	
4.3	Handgrip	×	×	
4.4	Engine support	×		
4.5	Harness	×	×	
4.6	Power driven components	×		
4.7	Hydraulic and pneumatic pipes and hoses	×	×	
4.8	Protection against contact with hot parts		×	×
4.9	Protection against contact with parts under high voltage	×	×	×
4.10	Tank openings	×	×	×
4.11	Starting device	×	×	
4.12	Clutch		×	×

1) Consists of verifying that the machine has the relevant part.
2) Consists of verifying that the machine or component operates normally.
3) Consists of determining a value by using some form of device or instrument.

6 Markings

The markings shall be permanent, legible and located in a readily visible position on the backpack power unit and shall resist the anticipated service conditions, such as the effects of temperature, moisture, petrol, oil, abrasion and weathering exposure. Symbols should be in accordance with applicable ISO standards and shall be explained in the instruction handbook. All controls shall be marked with an appropriate symbol in accordance with ISO 3767-5, if applicable. Symbols relating to safety shall be in accordance with the requirements of ISO 11684.

Symbols shall have good contrast with their background. Embossed features shall be at least 0,5 mm in height.

The information and/or instructions provided by the symbols shall be clearly legible when viewed from a distance of at least 500 mm.

When it is intended for a symbol to identify the location of a control in addition to its function, the symbol shall be placed conveniently adjacent to that control.

Every backpack power unit shall be marked with at least the following information:

a) name of manufacturer and country of origin;

b) designation of types or series;

c) the manufacturer's identification, e.g. the serial number;

d) identification of the engine-stopping device, choke and the fuel and/or oil caps or their openings;

e) a symbol indicating that hearing protection is necessary;

f) the following statement, prominently marked: "WARNING! — See instruction handbook".

7 Instruction handbook

The backpack power unit shall be accompanied by an instruction handbook.

The instruction handbook shall include comprehensive instructions and information on all aspects of operator/user maintenance and the safe use of the backpack power unit, including personal protective equipment requirements and the need for training in all operations. They shall comply with ISO/TR 12100-2:1992, 5.5. The instructions shall take into account that the backpack power unit may be used by a first time inexperienced operator. Terms used in all documentation shall be in accordance with ISO 6531 and ISO 7112.

NOTE — Extensive use should be made of photographs and/or diagrams. The information can be a part of a handbook covering the complete machine (3.6).

The importance of reading the instruction handbook thoroughly before using the backpack power unit shall be stressed on the front page of the instruction handbook.

The instruction handbook shall at least cover information relating to

a) transport, handling and storage of the backpack power unit, such as

   — cleaning and maintenance before storage, including the use of guards on cutting attachments with metal blades,

   — securing the backpack power unit during transport to prevent loss of fuel, damage or injury;

b) commissioning of the backpack power unit, such as

   — assembling instructions, initial adjustments and checks,

   — for units with a clutch, the routine for checking that the power transmission axle of the appliance stops turning when the engine idles,

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

   — explanation of symbols and safety signs;

c) the backpack power unit itself, such as

   — description, identification and nomenclature of principal parts including the safety devices and harness, explanations of their functions and necessary personal protection equipment to be used, including correct clothing,

— regular maintenance task, pre-operating measures and daily maintenance techniques, including the check for loose fasteners, fuel leaks and damaged parts,

— application of the unit and how it is intended to be used, including prohibited applications,

— data about sound pressure and power levels and vibration levels, including a warning about the risks and measures to be taken to minimize those risks,

— a description, with illustrations of recommended safe techniques recommended by the manufacturer;

d) the use of the backpack power unit, such as

— operating instructions, including the use of PPE and the need for adequate training, and warning against the use of the unit while being tired, ill or under influence of alcohol or other drugs. PPE instructions shall include recommendations concerning the type of hearing protectors to be worn,

— warnings about dangerous operating positions, hazards which may be encountered whilst using the unit and how to avoid them whilst doing typical tasks,

— starting and stopping, with particular reference to safety,

— warning about the emission of exhaust gases and the danger of starting or running the engine in a closed room,

— the need to use the harness provided;

e) maintenance instructions, such as

— servicing and replacement tasks for the user, keeping safety devices in place,

— drawings or diagrams to allow user maintenance and for fault-finding tasks,

— consequences of improper maintenance and removal of safety devices.

Annex A
(normative)

List of hazards

Table A.1 gives the list of hazards based on ISO/TR 12100-1 and annex A of ISO/TR 12100-2:1992.

The meaning of the different indications given in the last column (solutions given by this International Standard) of this table is as follows:

— "not relevant": the hazard is not significant for the machine;

— "dealt with": the hazard is significant. The measures given in the indicated clauses provide guidance for dealing with the hazard in accordance with the principles of safety integration of ISO/TR 12100, that is:

  — elimination or reduction of the risk by design, as far as possible,

  — protection measures,

  — information on the residual risks;

— "partly dealt with": the hazard is significant for several parts of the machine. The measures given in the indicated subclauses deal with this hazard for some of these parts. For the other parts, other measures, not included in this International Standard, will have to be applied;

— "not dealt with": the hazard is significant for the machine but has not been taken into account during the preparation of this International Standard.

Table A.1 — List of hazards

Hazards		Relevant subclauses (informative)		Solutions given by this International Standard
		ISO/TR 12100-1:1992	ISO/TR 12100-2:1992	
A.1	**Mechanical hazards** [caused for example by shape and relative location, mass and stability (potential energy of elements), mass and velocity (kinetic energy of elements), inadequacy of the mechanical strength, accumulation of potential energy by elastic elements (springs), or liquids or gases under pressure, or vacuum, or of the machine parts or workpieces]	4.2	—	—
A.1.1	Crushing hazard	4.2.1, 4.2.2	3.2	not relevant
A.1.2	Shearing hazard	4.2.1, 4.2.2	3.2, 4.1.1	not relevant
A.1.3	Cutting or severing hazard	4.2.1, 4.2.2	3.2	not relevant
A.1.4	Entanglement hazard	4.2.1, 4.2.2	—	dealt with in 4.5, 4.11
A.1.5	Drawing-in or trapping hazard	4.2.1	3.11, 4.1.1, 6.1.2	dealt with in 4.5, 4.11
A.1.6	Impact hazard	4.2.1	—	not relevant
A.1.7	Stabbing or puncture hazard	4.2.1	—	not relevant
A.1.8	Friction or abrasion hazard	4.2.1	3.3 b)	not relevant
A.1.9	High-pressure fluid injection hazard	4.2.1	—	not relevant