
Machinery for forestry — Portable hand-held brush-cutters and grass-trimmers with backpack-mounted combustion-engine power source — Safety requirements and testing

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Matériel forestier — Débroussailleuses et coupe-herbe portatifs équipés d'une source motrice portée à dos à moteur à combustion interne — Exigences de sécurité et essais

ISO 14865:1998

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Contents

1 Scope	1
2 Normative references	1
3 Definitions	2
4 Safety requirements	2
4.1 General.....	2
4.2 Power unit.....	2
4.3 Noise and vibration.....	3
4.3.1 Noise emission.....	3
4.3.2 Vibrations at the handles	3
4.4 Handles	3
4.5 Barrier	4
4.6 Cutting attachment strength.....	4
4.6.1 General.....	4
4.6.2 Impact	4
4.6.3 Overspeed	4
4.6.4 Single piece metal blade material	5
4.7 Retention of cutting attachment.....	5
4.8 Guards for cutting attachment	5
4.9 Distance to cutting attachment	5
5 Verification of safety requirements.....	6
6 Information for use	7
6.1 General.....	7
6.2 Technical data	7
6.3 Instruction handbook	8
6.4 Marking	9
Annex A (normative) List of hazards.....	11
Annex B (normative) Cutting attachment impact test	14
Annex C (normative) Thrown object test	15

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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 14865 was prepared by Technical Committee ISO/TC 23, *Tractors and machinery for agriculture and forestry*, Subcommittee SC 17, *Manually portable forest machinery*.

Annexes A, B and C form an integral part of this International Standard.

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Introduction

This International Standard covers brush-cutters as well as grass-trimmers, because the design of both machines is basically identical. Frequently one and the same unit can be either a brush-cutter or a grass-trimmer, depending on what type of cutting attachment is used. As grass-trimmers are often used in forestry, the relevant requirements have been included in this International Standard.

The requirements for backpack-powered brush-cutters and grass-trimmers are equivalent to those for brush-cutters and grass-trimmers with an integrated power source as given in ISO 11806:1997, *Agricultural and forestry machinery — Portable hand-held combustion engine driven brush cutters and grass trimmers — Safety*.

In addition, machinery is to comply as appropriate with ISO/TR 12100 for hazards which are not covered by this International Standard.

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Machinery for forestry — Portable hand-held brush-cutters and grass-trimmers with backpack-mounted combustion-engine power source — Safety requirements and testing

1 Scope

This International Standard specifies safety requirements and their verification for design and construction of portable hand-held brush-cutters and grass-trimmers with a backpack-mounted combustion-engine power source.

It is not applicable to units with an integrated power source, to lawn edge-trimmers or to brush-cutters equipped with metallic blades consisting of several parts.

It describes methods for the elimination or reduction of hazards arising from their use. In addition, it specifies the type of information on safe working practices to be provided by the manufacturer. It does not however give any technical requirements to reduce noise and 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.

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

Environmental aspects have not been considered in this International Standard.

This International Standard is primarily applicable to machines which are manufactured after the date of issue of the 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 7112:—¹⁾, *Machinery for forestry — Portable hand-held brush-cutters and grass-trimmers — Vocabulary*.

ISO 7113:—²⁾, *Portable hand-held forestry machines — Brush-cutters — Cutting attachments*.

ISO 7916:1989, *Forestry machinery — Portable brush-saws — Measurement of hand-transmitted vibration*.

ISO 7917:1987, *Acoustics — Measurement at the operator's position of airborne noise emitted by brush saws*.³⁾

ISO 7918:1995, *Forestry machinery — Portable brush-cutters and grass-trimmers — Cutting attachment dimensions*.

¹⁾ To be published. (Revision of ISO 7112:1982)

²⁾ To be published. (Revision of ISO 7113:1991)

³⁾ Equivalent to EN 27917:1991.

ISO 8380:1993, *Forestry machinery — Portable brush-cutters and grass-trimmers — Cutting attachment guard strength*.

ISO 8893:1997, *Forestry machinery — Portable brush-cutters and grass-trimmers — Engine performance and fuel consumption*.

ISO 10884:1995, *Manually portable brush-cutters and grass-trimmers with internal combustion engine — Determination of sound power levels — Engineering method (Grade 2)*.

ISO/TR 12100-1:1992, *Safety of machinery — Basic concepts, general principles for design — Part 1: Basic terminology, methodology*.⁴⁾

ISO/TR 12100-2:1992, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications*.⁵⁾

ISO 14740:—⁶⁾, *Machinery for forestry — Backpack power unit for brush-cutters and grass-trimmers, pole-cutters, hedge-trimmers and similar appliances — Safety requirements and testing*.

3 Definitions

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

3.1 dry mass

total unit mass without fuel, cutting attachment or guard

3.2 unit

complete brush-cutter or grass-trimmer including backpack power unit equipped with harness, power transmission shaft, cutting attachment and guard, but excluding the harness

NOTE — Certain commonly used terms relating to the unit are given in figure 1.

4 Safety requirements

4.1 General

Each brush-cutter or grass-trimmer with a backpack power unit shall conform with the requirements below. If a grass-trimmer can be converted to a brush-cutter, then the converted unit shall comply with requirements for a brush-cutter and vice versa.

4.2 Power unit

The backpack power unit, including the controls and harness shall comply with the requirements given in ISO 14740.

⁴⁾ Equivalent to EN 292-1:1991.

⁵⁾ Equivalent to EN 292-2:1991.

⁶⁾ To be published.

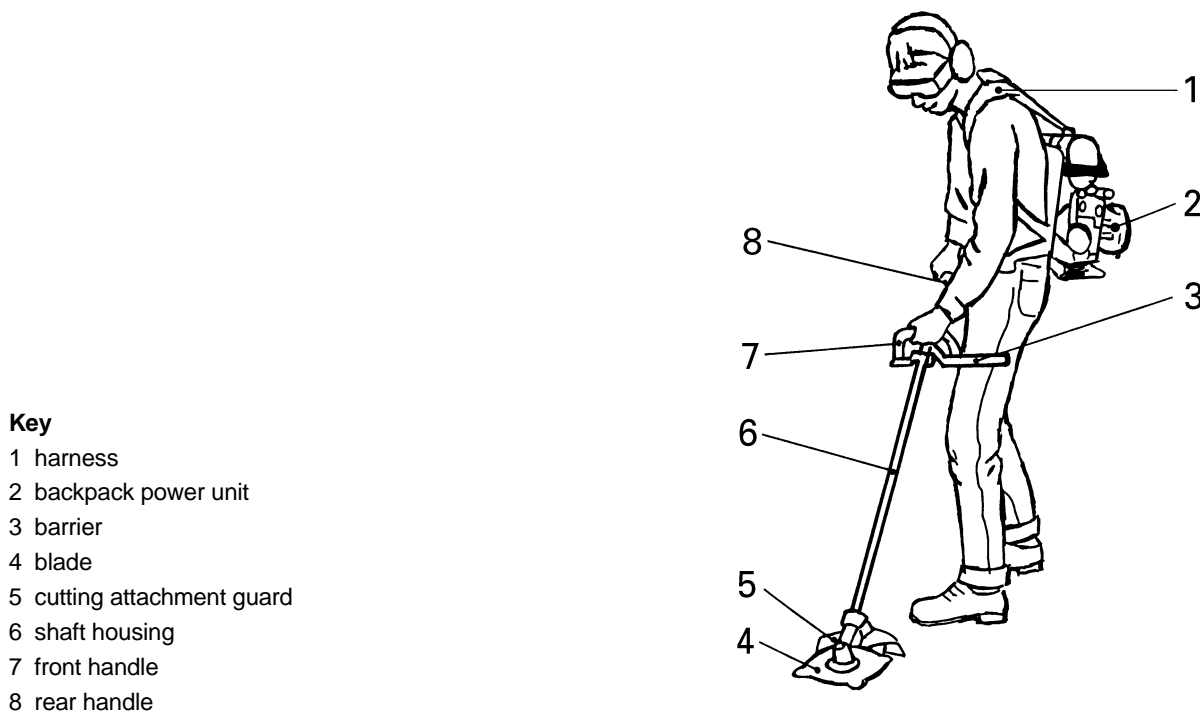


Figure 1 — Example of a brush-cutter with a backpack power unit

4.3 Noise and vibration

4.3.1 Noise emission

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The time-averaged sound pressure levels at the operator's ear shall be measured in accordance with ISO 7917, with the backpack power unit mounted on the operator according to the manufacturer's instructions.

For brush-cutters, sound pressure levels shall be measured at idling and racing.

For grass-trimmers, sound pressure levels shall be measured at idling and with wide open throttle and maximum length in case of flexible line, and the guard in place according to manufacturer's recommendations.

The sound power levels shall be measured according to ISO 10884 with all cutting attachments recommended by the manufacturer and at the same operating conditions as given in 4.3.1.

4.3.2 Vibrations at the handles

The weighted acceleration sum shall be measured according to ISO 7916 for all cutting attachments recommended by the manufacturer.

For brush-cutters, the weighted acceleration sum shall be measured at idling and racing.

For grass-trimmers, the weighted acceleration sum shall be measured at idling and with wide open throttle and maximum length in case of flexible line, and the guard in place according to manufacturer's recommendations.

4.4 Handles

4.4.1 Two handles, one for each hand, shall be provided for all units.

4.4.2 The handles shall be designed so that the distance L between the centre of the handles is at least 500 mm for those units which are intended to be equipped with metal saw blades, and 250 mm for all other units (see figure 2).

The handles shall be adjustable so that a suitable ergonomic working position can be achieved. An adjustment below the minimum dimensions shall be prevented by design.

NOTE — The position of the operator towards the cutting attachment is defined by the suspension point (see 4.9) and the barrier (see 4.5).

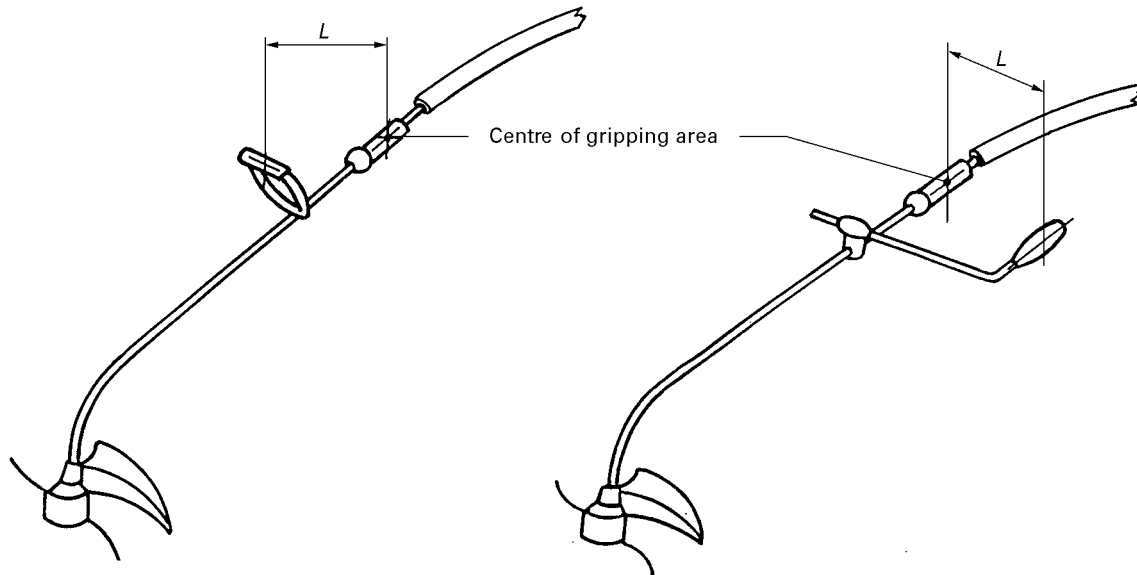


Figure 2 — Handle distance
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4.4.3 Handles shall be designed so that they can be fully gripped by an operator when wearing different types of gloves, provide the necessary sureness of grip by their shape and surface and have a length of at least 100 mm.

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4.5 Barrier

Brush-cutters shall be equipped with a barrier to prevent an unintentional contact with the cutting attachment. The barrier shall project at least 200 mm horizontally, perpendicular to the centreline of the shaft tube. The handle assembly may serve as a barrier. See also figure 2.

Adjustable barriers shall be in accordance with 4.4.2

4.6 Cutting attachment strength

4.6.1 General

The cutting attachment as specified by the manufacturer shall first be tested and meet the requirements according to 4.6.2. The same cutting attachment shall then, without any changes, be tested and meet the requirements according to 4.6.3. An exception is made for cutting attachment of single piece metal blade for which no overspeed test (4.6.3) is made. Such blades shall instead meet the material requirements in 4.6.4.

4.6.2 Impact

Cutting attachment, excluding flexible cutting lines, shall not break or crack when impacted once against a 25 mm diameter steel rod, according to annex B.

NOTE — Minor damage at the point of contact is not a cause for test failure.

4.6.3 Overspeed

The cutting attachment shall not break or crack when operated for 5 min, either at maximum speed or at 133 % of the maximum power speed, according to ISO 8893, whichever is less.

4.6.4 Single piece metal blade material

Single piece metal blades shall be made of materials which comply with ISO 7113.

4.7 Retention of cutting attachment

4.7.1 The mounting of a metallic cutting attachment shall not show any relative motion between the cutting attachment and the retainer when tested as follows:

- a) install the cutting attachment according to the manufacturer's instructions;
- b) lock the power transmission shaft;
- c) apply a rotational torque, M , to the cutting attachment, the value of which is

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

where

M is the torque, in newton metres;

V is the engine displacement, in cubic centimetres;

k is the gear ratio, or the engine rotational frequency divided by the cutting attachment rotational frequency.

The test shall be conducted five times in the normal direction, then five times in the opposite direction.

4.7.2 If tools are necessary to replace the cutting attachments, they shall be supplied with the machine.

4.8 Guards for cutting attachment

4.8.1 Metallic cutting attachments shall be equipped with a transport guard.

4.8.2 Guards for the cutting attachment shall fulfil the minimum dimensions according to ISO 7918.

4.8.3 It shall not be possible to adjust the guard so that it does not comply with the dimensions and location shown in ISO 7918:1995, figures 2 and 3.

4.8.4 Guard strength shall be in accordance with ISO 8380 for all guards. The test at $-25\text{ }^{\circ}\text{C}$ does not apply to the cutting attachment of grass-trimmers.

4.8.5 In a thrown object test for all guards according to annex C, no more than three penetrations in the area from 0,3 m to 2 m height is allowed. If more than three penetrations occur, the test has to be repeated five times with no more than three penetrations in each test. The guard shall not crack or break.

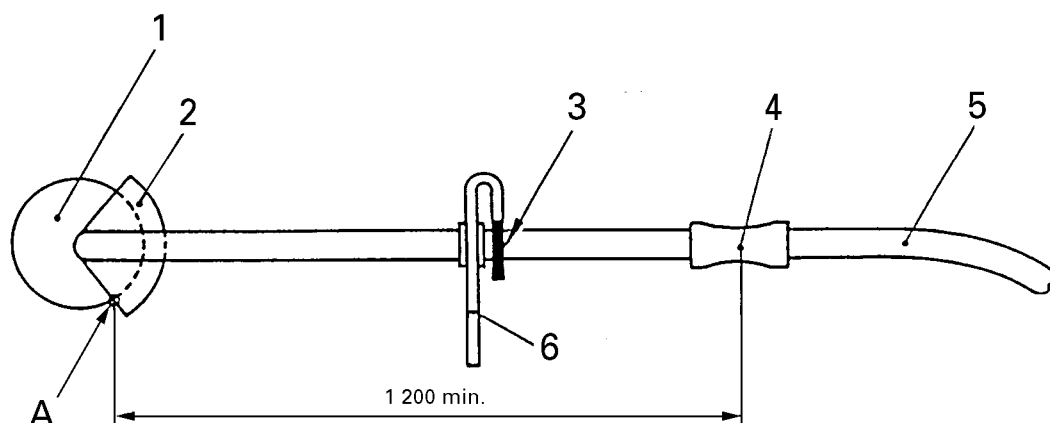
4.8.6 Grass-trimmers with flexible cutting lines shall have a line limiting device or other means of line length control.

4.9 Distance to cutting attachment

The unit shall have a minimum distance of 1 200 mm from the mid-point of the rear handle to the nearest unguarded point of the cutting attachment (point A, see figure 3).

Point A is the intersection between the plane perpendicular to the cutting path and the side-edge of the cutting attachment guard.

Dimensions in millimetres

**Key**

- | | | | |
|---|--------------------------------|---|-----------------------------|
| 1 | Cutting attachment | 4 | Handle grip |
| 2 | Guard | 5 | Flexible power transmission |
| 3 | Centre at rear of front handle | 6 | Barrier |

Figure 3 — Minimum distance from rear handle to the cutting attachment**5 Verification of safety requirements**

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

Table 1 — Safety requirements and testing method

Sub-clause	Safety requirements	Testing method			
		Inspection ¹⁾	Function test ²⁾	Measurement ³⁾	Reference
4.2	Power unit	×	×	×	ISO 14740
4.3.1	Noise emission			×	ISO 7917
4.3.2	Vibrations at the handles			×	ISO 7916
4.4	Handles	×	×	×	
4.5	Barrier	×	×	×	
4.6	Cutting attachment strength	×	×	×	ISO 7113, ISO 8893, annex B of this International Standard
4.7	Retention of cutting attachment	×	×		
4.8	Guards for cutting attachment	×	×	×	ISO 7918, ISO 8380, annex C of this International Standard
4.9	Distance to cutting attachment			×	

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 Information for use

6.1 General

Every brush-cutter and grass-trimmer shall be supplied with information about the use for which it is designed or has been tested and about conditions necessary to ensure that it will be safe and without risk to health at all times when it is being adjusted, used, cleaned or maintained.

6.2 Technical data

The following technical information shall, including those for the chosen power source, be made available for each model and/or mark where significant differences occur:

a) Dry mass:

- unit: kg
- backpack power unit: kg

b) Volume:

- fuel tank: cm³
- oil tank, if applicable: cm³

c) Engine:

- displacement: cm³
- speed at idling: min⁻¹
- maximum performance: kW
- speed at recommended max. spindle speed: min⁻¹
- maximum corresponding spindle speed: min⁻¹
- fuel consumption in accordance with ISO 8893,
at maximum engine performance (on request): kg/h
- specific fuel consumption in accordance with ISO 8893,
at maximum engine performance: g/kWh

d) Cutting tools:

- type:
- diameter for blades: mm

e) Sound pressure level (according to ISO 7917):

$$L_{pA \text{ av}} = 10 \lg \left[0,5 \left(10^{0,1L_{pA \text{ Id}}} + 10^{0,1L_{pA \text{ R or Fl}}} \right) \right]$$

where

$L_{pA \text{ Id}}$ is the A-weighted time-averaged emission sound pressure level at idling, in decibels;