

BRITISH STANDARD

**BS EN ISO
11806 : 1997**

Agricultural and forestry machinery — Portable hand-held combustion engine driven brush cutters and grass trimmers — Safety

The European Standard EN ISO 11806 : 1997 has the status of a
British Standard

ICS 65.060.80

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BS EN ISO 11806 : 1997

National foreword

This British Standard is the English language version of EN ISO 11806 : 1997. It is identical with ISO 11806 : 1997.

The UK participation in its preparation was entrusted to Technical Committee AGE/29, Forestry machinery, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

Attention is drawn to the fact that CEN and CENELEC standards normally include an annex which lists normative references to international publications with their corresponding or European publications. The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled 'International Standards Correspondence Index', or by using the 'Find' facility of the BSI Standards Electronic Catalogue.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO title page, pages 2 to 31, a blank page, an inside back cover and a back cover.

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EUROPEAN STANDARD

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Descriptors: agricultural machinery, forest equipment, brush trimmers, portable equipment, heat engines, safety of machinery, accident prevention, safety requirements, specifications, design, inspection, hazards, technical notices, utilization, marking

English version

**Agricultural and forestry machinery - Portable
hand-held combustion engine driven brush cutters
and grass trimmers - Safety (ISO 11806:1997)**

Matériel agricole et forestier -
Débroussailleuses et coupe-herbe portatifs à
moteur thermique - Sécurité (ISO 11806:1997)

Land- und Forstmaschinen - Tragbare
handgeführte Freischneider und Trimmer mit
Antrieb durch Verbrennungsmotor - Sicherheit
(ISO 11806:1997)

This European Standard was approved by CEN on 1997-02-16. CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

The text of EN ISO 11806:1997 has been prepared by Technical Committee CEN/TC 144 "Tractors and machinery for agriculture and forestry", the secretariat of which is held by AFNOR, in collaboration with Technical Committee ISO/TC 23 "Tractors and machinery for agriculture and forestry".

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 1997; and conflicting national standards shall be withdrawn at the latest by December 1997.

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

The annex A is normative and contains the "List of hazards".

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.



0 Introduction

The extent to which hazards are covered is indicated in the scope of this standard. In addition, machinery shall comply as appropriate with EN 292 for hazards which are not covered by this standard.

This European 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 standard.

1 Scope

This European Standard specifies safety requirements and their verification for design and construction of portable hand-held, combustion engine driven brush cutters and grass trimmers.

This standard is not applicable to backpack powered units, to lawn edge trimmers or to brush cutters equipped with metallic blades consisting of more than one part.

It describes methods for the elimination or reduction of risks 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 requirement to reduce noise and vibration hazards. Indeed the different means available to reduce these risks are a matter for the technical information to which the manufacturer may resort, through specialised books or specific bodies.

The list of significant hazards dealt with is given in Annex A. Annex A also indicates the hazards which have not been dealt with.

Environmental aspects have not been considered in this standard.

This European Standard applies primarily to machines which are manufactured after the date of issue of the standard.

2 Normative References

This European Standard incorporates by dated or undated references, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to apply.

EN 292-1	1991	Safety of machinery - Basic concepts, general principles for design - Part 1: Basic terminology, methodology
EN 292-2	1991	Safety of machinery - Basic concepts, general principles for design - Part 2: Technical principles and specifications
EN 292-2:1991/A1:1995		
EN 563	1994	Safety of machinery - Temperatures of touchable surfaces - Ergonomics data to establish temperature limit values for hot surfaces
EN 27917	1991	Acoustics - Measurement at the operator's position of airborne noise emitted by brush saws
ISO 7112	1982	Machinery for forestry - Portable brush saws - Vocabulary

ISO 7113	1991 Forestry machinery - Portable brush saws - Saw blades
ISO 7916	1989 Forestry machinery - Portable brush saws - Measurement of hand-transmitted vibration
ISO 7918	1995 Forestry machinery - Portable brush cutters and grass trimmers - Cutting attachment guard dimensions
ISO 8380	1993 Forestry machinery - Portable brush cutters and grass trimmers - Cutting attachment guard strength
ISO 8893	1989 Forestry machinery - Portable brush-saws - 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)

3 Definitions

For the purposes of this European Standard, the following definitions and figures 1 and 2 apply :

3.1 brush cutter

Unit fitted with a rotating blade made of metal or plastic intended to cut weed, brush, small trees and similar vegetation.

- 1 engine stopping device
- 2 throttle trigger lockout
- 3 suspension point
- 4 handle
- 5 throttle trigger
- 6 shaft tube
- 7 harness - quick release mechanism
- 8 harness - hip pad
- 9 cutting attachment guard
- 10 blade
- 11 silencer

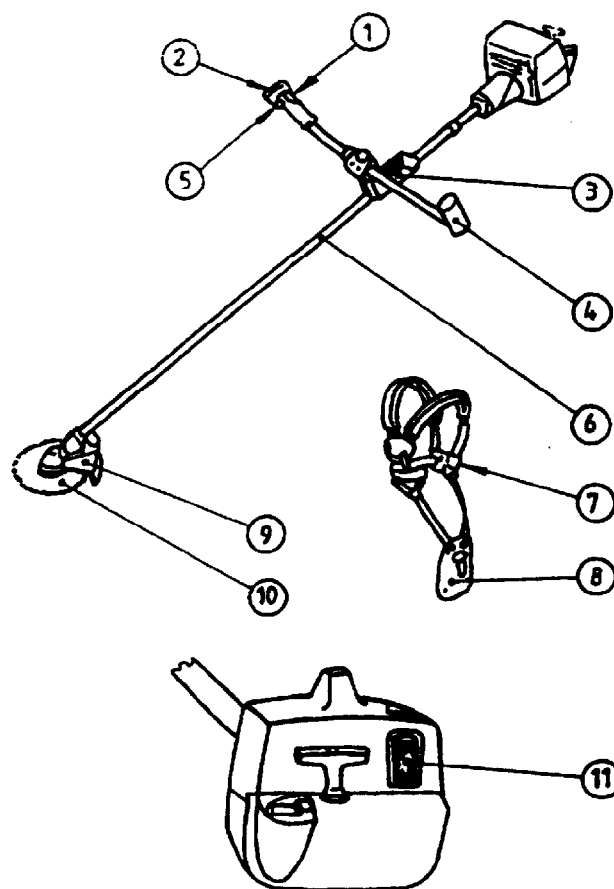


Figure 1 : Brush cutter

3.2 brush saw

Brush cutter fitted with a circular saw blade.

3.3 grass trimmer

Unit fitted with flexible line(s), string(s), or similar non-metallic flexible cutting elements, such as pivoting cutters, intended to be used to cut weed, grass or similar soft vegetation.

- 1 choke
- 2 handle
- 3 engine stopping device
- 4 throttle trigger
- 5 barrier
- 6 shaft tube
- 7 cutting attachment guard
- 8 silencer

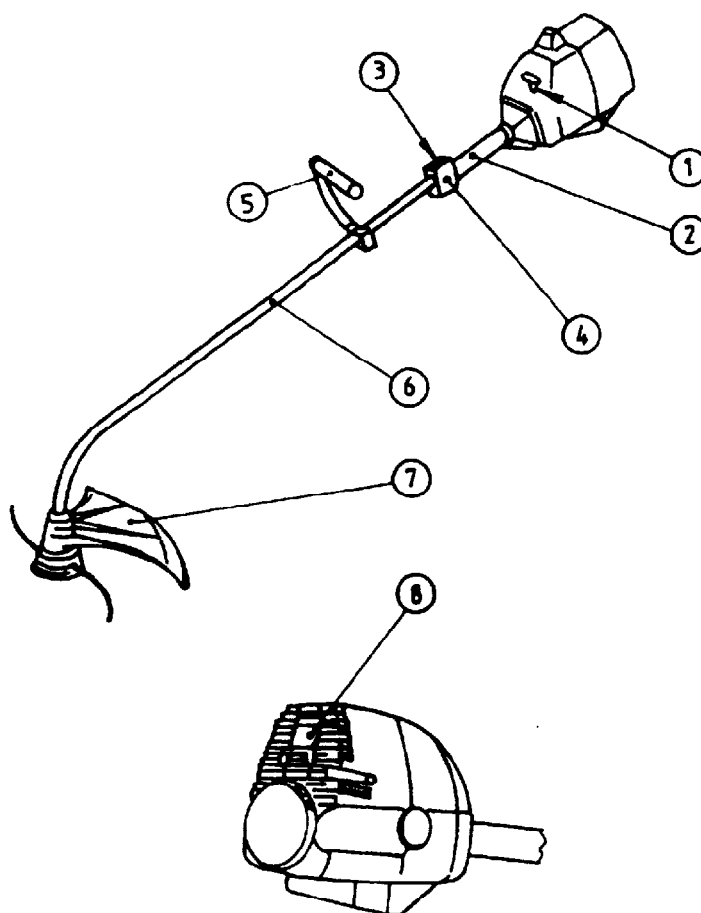


Figure 2: Grass trimmer

3.4 lawn edge trimmer

Grass trimming machine where the cutting means operate in a plane approximately perpendicular to the ground.

3.5 backpack power unit

Power source designed to be mounted on the operator's back by means of a support frame.

3.6 barrier

Device attached to the unit, to ensure that the operator maintains a minimum distance from the cutting attachment when the unit is being operated.

3.7 blade

Rotating device with cutting edges, made of rigid material.

3.8 saw blade

Circular metal blade with peripheral cutting teeth.

3.9 blade retainer

Mechanism which holds the brush cutter blade to the driving member.

3.10 cutting attachment

Cutting device such as a blade with its retainer, a cutting head etc.

3.11 dry mass

Total unit mass without fuel, cutting attachment and guard.

3.12 cutting attachment guard

Device for the purpose of protecting the operator from unintentional contact with the cutting attachment and from thrown objects.

3.13 transport guard

Device covering the cutting edges of the blade while the machine is transported or stored in a non operational mode.

3.14 handle

Device fitted to the unit to enable the operator to hold and manoeuvre the unit.

3.15 harness

Adjustable strap(s) used to suspend the unit from the operator.

3.16 hip pad

Strap or pad of flexible material attached either to the unit or the harness to cushion the operator from impacts from the unit and to reduce transmission of vibration.

3.17 power transmission shaft

Shaft inside the shaft tube for transmitting the power from the engine to the cutting attachment.

3.18 shaft tube

Part of the unit that provides a casing for the power transmission shaft.

3.19 silencer

Device for reducing engine exhaust noise and directing the exhaust gases.



3.20 engine stopping device

Control fitted to the unit which electrically stops the engine.

3.21 suspension point

Device on the unit to which the harness can be attached.

3.22 throttle trigger, throttle control

Device, usually a lever, activated by the operator's hand or finger, for controlling the engine speed.

3.23 throttle lock

Device for temporarily setting the throttle in a partially open position, to aid starting.

3.24 throttle trigger lockout

Device that prevents unintentional activation of the throttle trigger until manually released.

3.25 unit

Complete brush cutter (or grass trimmer) including power head, power transmission shaft, cutting attachment and guard, but excluding the harness.

4 Safety requirements**4.1 General**

Each brush cutter or grass trimmer 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 Vibration**4.2.1 General**

The weighted acceleration sum shall be measured according to 4.2.2 and 4.2.3 and with all cutting attachments recommended by the manufacturer. The achievable values at each handle is normally below 15 m/s^2 for machines with an engine displacement of 35 cm^3 or less and $7,5 \text{ m/s}^2$ for machines with an engine displacement of more than 35 cm^3 (see table 1).

Table 1 : Achievable vibration values

Engine displacement	
$\leq 35 \text{ cm}^3$	$> 35 \text{ cm}^3$
15 m/s^2	$7,5 \text{ m/s}^2$

These achievable values do not constitute personal exposure limits, but the emission values from a machine under defined test conditions (for example speed, load, material to be used ...) and according to the measurement method of the corresponding vibration levels.

NOTE: The achievable vibration values given in table 1 are not a barrier to innovation, and they should not prevent the achievement of better values. With this in view, they will have to be revised when the state of the art evolves.

4.2.2 *Brush cutter*

The weighted acceleration sum shall be measured in the idling and racing modes in accordance with ISO 7916.

4.2.3 *Grass trimmer*

The weighted acceleration sum shall be measured at idling and with wide open throttle and maximum length in case of flexible line with the guard in place. Other measuring conditions shall be in accordance with ISO 7916.

4.3 *Noise emission*

4.3.1 *Sound pressure level*

4.3.1.1 *General*

The sound pressure level shall be measured in accordance with 4.3.1.2 and 4.3.1.3 at the operator's ear.

Table 2 : Achievable sound pressure values

Engine displacement	
$\leq 35 \text{ cm}^3$	$> 35 \text{ cm}^3$
102 dB(A)	105 dB(A)

These achievable values do not constitute personal exposure limits, but the emission values from a machine under defined test conditions (for example speed, load, material to be used ...) and according to the measurement method of the corresponding noise levels.

NOTE : The achievable sound pressure values given in table 2 are not a barrier to innovation, and they should not prevent the achievement of better values. With this in view, they will have to be revised when the state of the art evolves.

4.3.1.2 *Brush cutter*

The sound pressure level shall be measured at idling and racing in accordance with EN 27917.

4.3.1.3 *Grass trimmer*

The sound pressure level shall be measured at idling and with wide open throttle and maximum length in case of flexible line with the guard in place. Other measuring conditions shall be in accordance with EN 27917.

4.3.2 *Sound power level*

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

4.4 Exhaust system

The exhaust outlet shall be so located as to direct exhaust emissions away from the operator in normal operating position indicated in figure D.3.

4.5 Handles

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

4.5.2 The handles shall be designed so that the distance L (see figure D.2) 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 others. For other details see figures D.1 and D.3.

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 relative to the cutting attachment is defined by the suspension point (see 4.11 and 4.15) and the barrier (see 4.6)

4.5.3 All 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 shaping and surface and have a length of at least 100 mm.

4.6 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 perpendicularly from the centre-line of the shaft tube. The handle assembly may serve as a barrier. See also figure D.2. Adjustable barriers shall be in accordance with 4.5.2.

4.7 Throttle control

4.7.1 The throttle control linkage shall be so constructed that a force equal to three times the weight of the unit (without cutting attachment and with empty tanks), applied in any direction to the handle with the throttle trigger, shall not increase the engine speed to a point where the clutch engages and cutting attachment engages.

4.7.2 A unit shall be provided with a constant pressure throttle trigger that automatically reverts to the idling position. Brush cutters shall either have a throttle trigger lockout or be so designed that a gauge of 10 mm diameter and 200 mm length shall not move the throttle trigger to an extent that the cutting attachment becomes engaged.

4.7.3 The throttle trigger shall be positioned so that it can be pressed and released with a gloved hand when holding the handle to which the throttle trigger is mounted.

4.7.4 If a throttle lock is provided for starting, it shall be self-releasing when the throttle trigger is depressed. In the starting mode the cutting attachment may be engaged. The throttle lock shall be so designed that two or more independent motions are required to engage the throttle lock.

4.8 Clutch

All units to which a blade can be attached shall have a clutch which ensures that no power is transmitted to the cutting attachment until the engine speed exceeds 1,25 times the manufacturers' recommended idling speed.

4.9 Engine stopping device

The machine shall be fitted with an engine stopping device which brings it to a final stop and 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 being held with both hands by an operator wearing gloves. 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.

4.10 Harness

4.10.1 General

A double shoulder harness shall be provided for all units exceeding a dry weight of 7,5 kg and for all brush saws. The double shoulder harness shall be designed so that pressure is evenly distributed on both shoulders of the operator. The design of the double shoulder harness shall prevent slipping in any direction.

All double shoulder harnesses shall be equipped with a quick release mechanism positioned either at the connection between the unit and harness or between the harness and operator. Either the design of the harness or the use of the quick release mechanism shall ensure that the unit can be released quickly from the operator in the event of emergency.

The harness shall be adjustable to the size of the operator.

For units having a double shoulder harness a hip pad shall be supplied.

4.10.2 Brush cutter

For units other than brush saws having a dry weight of 7,5 kg or less, at least a single shoulder harness shall be supplied.

4.10.3 Grass trimmer

4.10.3.1 For units having a dry weight below 6 kg, no harness is required.

4.10.3.2 For units having a dry weight of 6 kg to 7,5 kg, at least a single shoulder harness shall be supplied.

4.11 Balance

4.11.1 For all units requiring a harness except those designed to be supported by the ground (see 4.11.2), the suspension point (see figure D.1) shall be so adjustable that the machine is balanced when it is suspended on this point. Such a balanced brush cutter shall have a distance from the ground to the nearest point of the blade of $200 \text{ mm} \pm 100 \text{ mm}$. For balanced grass trimmers the distance from the ground to the nearest point of the cutting attachment shall be $200^{+100}_{-200} \text{ mm}$.

4.11.2 For brush cutters and grass trimmers suspended with a harness and designed to be supported by the ground, the suspension point shall be adjustable so that the ground contact force is not greater than 20 N.

4.11.3 The requirements shall be met :

- with the suspension point a minimum of 750 mm above the ground;
- with the tanks half filled by the volume with a liquid according to the manufacturer's recommendation for normal use; and
- for all cutting attachments recommended by the manufacturer.

4.12 Cutting attachment strength

4.12.1 General

The cutting attachment as specified by the manufacturer shall first be tested and meet the requirements according to 4.12.2. The same cutting attachment shall then, without any changes, be tested and meet the requirements according to 4.12.3. An exception is made for cutting attachment of single piece metal blade for which no overspeed test (see 4.12.3) is made. Such blades shall instead meet the material requirements in 4.12.4.

4.12.2 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.

4.12.3 Overspeed

The cutting attachment shall not break or crack when operated for 5 minutes either at 133% of the maximum speed or 177 % of the maximum power speed, according to ISO 8893, whichever is the less.

4.12.4 Single piece metal blade

Single piece metal blades shall be made of material which complies with ISO 7113.

4.13 Retention of cutting attachment

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

- install the cutting attachment according to the manufacturers' instructions ;
- lock the power transmission shaft ;

- apply to the cutting attachment a rotational torque the value of which is
 $M = 0,4 \times V \times k$

where :

V is the engine displacement, in cubic centimetres ;

M is the torque, in Newton metres ;

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

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

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

4.14 Guards for cutting attachment

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

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

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

4.14.4 Guard strength shall be in accordance with ISO 8380 for all guards. The test at -25°C does not apply to the cutting attachment guard of grass trimmers.

4.14.5 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. No cracks or breakages of the guards are allowed.

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

4.15 Distance to cutting attachment

Brush cutters balanced according to 4.11 shall have a minimum horizontal distance of 750 mm from a vertical line through the suspension point to the nearest unguarded point of the cutting attachment. This minimum distance shall apply to all cutting attachments used (see figure D.1).

4.16 Tank openings

The fuel cap shall have a retainer.

The fuel tank opening shall be at least 20 mm in diameter and the oil tank opening if any at least 15 mm in diameter.

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

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

4.17 Protection against contact with hot parts

The cylinder and parts in direct contact with the cylinder or the silencer, shall be guarded so that they are not accessible to unintentional contact during normal operation of the machine.

The temperatures for the accessible parts of these guards shall not cause a hazard to the operator. For further informations see EN 563, especially annex C.

Accessible parts are those that can be reached by the test cone as shown in figure 3 and the area contacted is more than 10 cm^2 .

Dimensions in mm

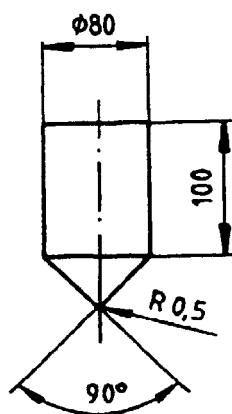


Figure 3 : Test cone

4.18 Starting device

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

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

4.19 Protection against contact with parts under high voltage

All parts of the motor which are under high voltage shall be insulated so that the material under high voltage cannot be touched.

5 Verification of safety requirements

The compliance with safety requirements shall be verified in accordance with table 3

Table 3 : Safety requirements and testing method

Safety requirements according to subclause		Testing method			
		Inspection	Function Test	Measure-ment	Reference
4.2	Vibration			X	ISO 7916
4.3	Noise emission			X	EN 27917 ISO 10884
4.4	Exhaust system	X			
4.5	Handles	X	X	X	
4.6	Barrier	X	X	X	
4.7	Throttle control	X	X	X	
4.8	Clutch			X	
4.9	Engine stopping device	X	X		
4.10	Harness	X	X		
4.11	Balance		X	X	
4.12	Cutting attachment strength	X	X	X	ISO 7113 ISO 8893 Annex B of this standard
4.13	Retention of cutting attachment	X	X		
4.14	Guards for cutting attachment	X	X	X	ISO 7918 ISO 8380 Annex C of this standard
4.15	Distance to cutting attachment			X	Annex D of this standard
4.16	Tank openings	X	X	X	
4.17	Protection against contact with hot parts		X	X	
4.18	Starting device	X			
4.19	Protection against contact with parts under high voltage	X	X	X	

NOTE :

Inspection = looking at the machine to see it is all there

Function test = a check on the normal operation of the machine /component to see that it performs as specified

Measurement = determining a value by using some form of device or instrument

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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 be made available for each model and/or mark where significant differences occur :

- | | |
|---------------------------------------------------------------------------------------------------------|-------------------|
| a) - Mass (without fuel, cutting attachment and guard) | kg |
| - Volume (fuel tank) | cm ³ |
| - Volume (oil tank, if any) | cm ³ |
| - Cutting attachments (type, diameter for blades) | mm |
| - Engine displacement | cm ³ |
| - Maximum engine performance (in accordance with ISO 8893) | kW |
| - Maximum rotational frequency of the spindle | min ⁻¹ |
| - Engine speed (rotational frequency) at recommended max. spindle rotational frequency | min ⁻¹ |
| - Engine speed (rotational frequency) at idling | min ⁻¹ |
| - Fuel consumption (in accordance with ISO 8893) at max. engine performance
(on request) | kg/h |
| - Specific fuel consumption (in accordance with to ISO 8893) at max. engine performance
(on request) | g/kWh |
- b) Vibration levels for idling and racing (for idling and with wide open throttle for grasstrimmers) when measured in accordance with 4.2 ;
- c) Sound pressure level (in accordance with EN 27917) :

$$L_{p_{Av}} = 10 \lg 0,5 (10^{0,1L_{p_{AId}}} + 10^{0,1L_{p_{AR \text{ or } WOT}}})$$

where :

$L_{p_{AId}}$ is the A-weighted time-averaged emission sound pressure level at idling,
in decibels ;

$L_{p_{AR}}$ is the A-weighted time-averaged emission sound pressure level at racing
(for brush cutters), in decibels ;

$L_{p_{AWOT}}$ is the A-weighted time-averaged emission sound pressure level with wide open throttle (for
grass trimmers), in decibels ;

$L_{p_{Av}}$ is the mean of the two applicable previous quantities.

d) Octave band analysis (on request) ;

e) Sound power level (in accordance with ISO 10884) :

$$L_{W_{Av}} = 10 \lg 0,5 (10^{0,1L_{W_{Id}}} + 10^{0,1L_{W_{R \text{ or } WOT}}})$$

where :

$L_{W_{Id}}$ is the A-weighted sound power level at idling, in decibels ;

$L_{W_{R}}$ is the A-weighted sound power level at racing (for brush cutters), in decibels;

$L_{W_{WOT}}$ is the A-weighted sound power level with wide open throttle (for grass trimmers), in decibels ;

$L_{W_{Av}}$ is the mean of the two applicable previous quantities.

6.3 Instruction handbook

Comprehensive instructions and information on all aspects of operator/user maintenance and the safe use for the unit, including safety clothing and personal protective equipment (PPE) requirements and the need for training in all operations shall be provided in the instruction handbook. They shall comply with 5.5 of EN 292-2:1991. The instructions shall take into account that the unit can be used by a first time inexperienced operator.

NOTE : Extensive use should be made of photographs and/or diagrams.

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

Terms used in all documentation shall be in accordance with ISO 7112.

The instruction handbook shall cover information relating to :

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

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

b) commissioning of the unit, such as :

- assembling instructions, initial adjustments and checks ;
- for units with a clutch, 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 ;
- consequences of improper maintenance, use of nonconforming components and removal of safety devices;
- filling of fuel and oil, especially concerning fire precautions ;
- explanation of symbols and safety signs.

c) the unit itself, such as :

- description, identification and nomenclature of principal parts including the safety devices and harness (when provided), explanations of their functions and necessary personal protection equipment (PPE) to be used, including correct clothing ;
- regular maintenance task, pre-operating measures and daily maintenance techniques, including checking for loose fasteners, fuel leaks and damaged parts such as cracks in the cutting attachment;
- application of the unit and how it is intended to be used, including prohibited uses. For brush cutters information shall also be given about the risks of kick back and blade thrust ;
- data about sound pressure and power levels and vibration levels (see 6.2), including warning about the risks and measures to be taken to minimise those risks.

d) the use of the unit, such as :

- operating instructions and instructions for common cutting tasks, including the use of personal protection equipment (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 for the type of hearing protectors and eye protectors, as well as appropriate clothing. For brush cutters the clothing instructions shall include information to use foot protection as well as protective clothing. In case of risk of falling objects, head protection shall be recommended ;
- hazards which may be encountered whilst using the unit and how to avoid them whilst doing typical tasks, including warnings of risks for bystanders and the need to keep them away during operation. A minimum 15 m distance is recommended between the machine and bystanders ;
- starting and stopping, with particular reference to safety ;
- warning about the emission of exhaust gases.

e) maintenance instructions, such as :

- servicing and replacement tasks for the user ;
- drawings or diagrams to allow user maintenance and for fault finding tasks.

6.4 Marking

All brush cutters and grass trimmers shall be marked legibly and indelibly with the following minimum information :

- name and address of the manufacturer ;
- year of construction ;
- designation of series or type ;
- serial number, if any.

In addition, the brush cutters and grass trimmers shall bear the following information :

- a) read the instruction handbook and follow all warnings and safety instructions ;
- b) wear head protection, where there is a risk of falling objects ;
- c) wear eye protection (goggles or face shield) ;
- d) wear ear protection ;
- e) wear foot protection and gloves (on brush cutters) ;
- f) the distance between the machine and bystanders shall be at least 15 m ;
- g) do not use metal blades (if applicable) ;
- h) beware of thrown objects ;
- i) identification of on/off control, fuel cap, choke control, heated handle switch (if provided) ;
- j) the maximum rotational frequency of the shaft for the cutting attachment in min^{-1} as specified by the manufacturer ;
- k) rotational direction of the saw blade on a component near the saw blade.

The cutting attachment shall be marked with the following information :

- l) maximum rated rotational frequency in min^{-1} ;
- m) rotational direction when applicable ;
- n) name or trade mark of the manufacturer.

Symbols should be in accordance with applicable ISO symbols and shall be explained in the instruction handbook.



Annex A (normative)**List of hazards**

Table A.1 gives the list of hazards based on EN 292-1:1991 and EN 292-2:1991 and Annex A of EN 292-2:1991/A1:1995.

The meaning of the different statements given in the last column (solutions given by this standard) of this table is :

- "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 EN 292; that means :
 - elimination or reduction of the risk by design, as far as possible ;
 - protection measures ;
 - information for the residual risks.
- "partly dealt with" : the hazard is significant for several parts of the machine. The measures given in the indicated clauses deal with this hazard for some of these parts. In the other parts where the hazard is significant, other measures, not included in this standard, will have to be applied in order to deal with this hazard.
- "not dealt with" : the hazard is significant for the machine but has not been taken into account during the preparation of this European Standard.

Table A.1 : List of hazards

Hazards		relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
1	Mechanical hazards (caused for example by : shape, 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 of the machine parts or workpieces)	4.2	-	-
1.1	crushing hazard	4.2.1, 4.2.2	3.2	not relevant
1.2	shearing hazard	4.2.1, 4.2.2	3.2, 4.1.1	not relevant
1.3	cutting or severing hazard	4.2.1, 4.2.2	3.2	dealt with in 4.1, 4.6 4.14, 4.15
1.4	entanglement hazard	4.2.1, 4.2.2	-	dealt with in 4.6
1.5	drawing-in or trapping hazard	4.2.1	3.11, 4.1.1, 6.1.2	not relevant
1.6	impact hazard	4.2.1	-	dealt with in 4.1, 4.14
1.7	stabbing or puncture hazard	4.2.1	-	not relevant
1.8	friction or abrasion hazard	4.2.1	3.3 b)	not relevant
1.9	high pressure fluid injection hazard	4.2.1	-	not relevant
1.10	ejection of parts (of machinery and processed material/workpieces)	4.2.2	3.8	dealt with in 4.1, 4.14, 6.3
1.11	loss of stability (of machinery and machine parts)	4.2.2	3.3, 6.2.5	dealt with in 4.1, 4.5, 4.11
1.12	slip, trip and fall hazards in relationship with machinery (because of their mechanical nature)	4.2.3	6.2.4	not relevant

(continued)

Table A.1 (continued)

Hazards		relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
2	Electrical hazards, caused for example by :	4.3	3.9	-
2.1	electrical contact (direct or indirect)	4.3	-	dealt with in 4.19
2.2	electrostatic phenomena	4.3	-	not relevant
2.3	thermal radiation or other phenomena such as ejection of molten particles, and chemical effects from short-circuits, overloads etc.	4.3	-	not relevant
2.4	external influences on electrical equipment	4.3	3.4	not relevant
3	Thermal hazards resulting in :	4.4	3.6.3	-
3.1	burns and scalds, by a possible contact of persons, by flames or explosions and also by the radiation of heat sources	4.4	-	dealt with in 4.16, 4.17, 6.3
3.2	health-damaging effects by hot or cold work environment	4.4	-	not relevant
4	Hazards generated by noise, resulting in :	4.5	3.6.3	-
4.1	hearing losses (deafness), other physiological disorders (e.g. loss of balance, loss of awareness)	4.5	-	dealt with in 4.3, 6.2, 6.3
4.2	interference with speech communication, acoustic signals, etc.	4.5	-	not dealt with
5	Hazards generated by vibration (resulting in a variety of neurological and vascular disorders)	4.6	3.6.3	dealt with in 4.2, 6.2, 6.3
6	Hazards generated by radiation, especially by :	4.7	-	-
6.1	electrical arcs	-	-	not relevant
6.2	lasers	-	-	not relevant
6.3	ionizing radiation sources	4.7	-	not relevant
6.4	machines making use of high frequency electromagnetic fields		-	not relevant
7	Hazards generated by materials and substances processed, used or exhausted by machinery for example :	4.8	3.3 b)	-
7.1	hazards resulting from contact with or inhalation of harmful fluids, gases, mists, fumes and dusts	4.8	-	dealt with in 4.4, 6.3
7.2	fire or explosion hazard	4.8	-	dealt with in 4.16, 6.3
7.3	biological and microbiological (viral or bacterial) hazards	4.8	-	not relevant
8	Hazards generated by neglecting ergonomic principles in machine design (mismatch of machinery with human characteristics and abilities) caused for example by :	4.9	3.6	-
8.1	unhealthy postures or excessive efforts	4.9	3.6.1, 3.6.4	dealt with in 4.5, 4.10
8.2	inadequate consideration of human hand-arm or foot-leg anatomy	4.9	3.6.2	dealt with in 4.5
8.3	neglected use of personal protection equipment	5.5	-	dealt with in 6.3, 6.4
8.4	inadequate area lighting	-	3.6.5	not relevant
8.5	mental overload or underload, stress, etc.	4.9	3.6.4	not relevant
8.6	human error	4.9	3.6	dealt with in 6.3

(continued)

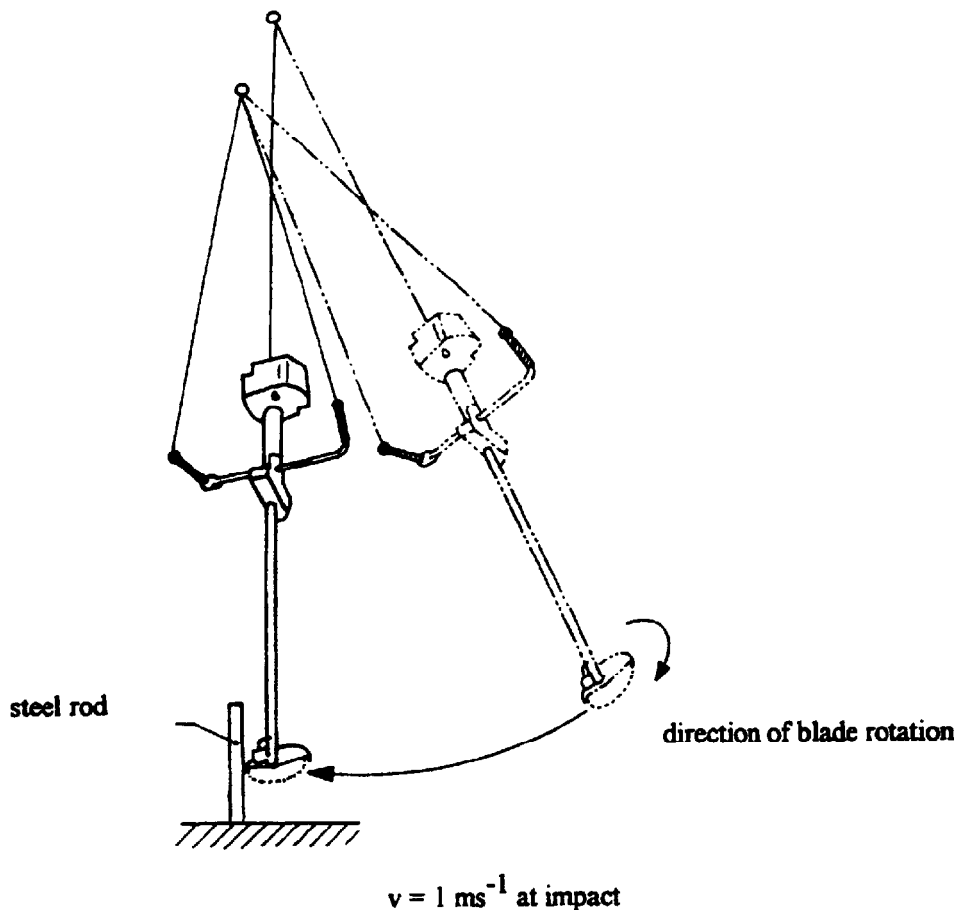
Table A.1 (concluded)

Hazards		relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
9	Hazard combinations	4.10	-	not relevant
10	Hazards caused by failure of energy supply, breaking down of machinery parts and other functional disorders, for example :	5.2.2	3	-
10.1	failure of energy supply (of energy and/or control circuits)	3.16	3.7	not relevant
10.2	unexpected ejection of machine parts or fluids	-	3.8, 4	partly dealt with in 4.12, 4.13, 4.14, 6.3
10.3	failure, malfunction of control system (unexpected start up, unexpected overrun)	3.15, 3.16, 3.17	3.7	dealt with in 4.7, 4.9
10.4	errors of fitting	-	-	dealt with in 6.3
10.5	overturn, unexpected loss of machine stability	4.2.2	6.2.5	dealt with in 4.5, 4.11
11	Hazards caused by (temporary) missing and/or incorrect positioned safety related measures/means, for example :	-	4	-
11.1	all kinds of guard	3.22	4.2	dealt with in 6.3
11.2	all kinds of safety related (protection) devices	3.23	4.2	partly dealt with in 6.3
11.3	starting and stopping devices	-	3.7	dealt with in 6.3
11.4	safety signs and signals	-	3.6.7, 5.2, 5.3, 5.4	dealt with in 6.3
11.5	all kinds of information or warning devices	-	5.4	dealt with in 6.3
11.6	energy supply disconnecting devices	-	6.2.2	not relevant
11.7	emergency devices	-	6.1	not relevant
11.8	feeding/removal means of workpieces	-	3.11	not relevant
11.9	essential equipment and accessories for safe adjusting and/or maintaining	3.3, 3.11	3.1.2, 6.2.1, 6.2.3, 6.2.6	dealt with in 6.3
11.10	equipment evacuating gases, etc.	-	-	not relevant

Annex B (normative)**Cutting attachment impact test**

- B.1** The unit shall be suspended freely in an operating position (see figure B.1).
- B.2** A fixed cold rolled steel rod of 25 mm diameter shall be impacted by the cutting attachment at a speed (v) of $1 \text{ ms}^{-1} \pm 0,1 \text{ ms}^{-1}$ (see figure B.1).
- B.3** The test shall be conducted once at racing speed (see ISO 7916) with the cutting attachment in a horizontal position.
- B.4** The engine/motor shall be switched off 1 s after the impact.

Dimensions in mm



NOTE : If the blade rotates in the opposite direction the cutting attachment shall impact the steel rod from the other side.

Figure B.1 : Impact test

Annex C (normative)**Thrown objects test****C.1 Test principle**

C.1.1 The test shall be conducted on a test stand described in figure C.1 and figure C.2.

C.1.2 The base shall be a flat board.

C.1.3 The base shall be covered with artificial grass-mat with a maximum height of 15 mm and a fibre length of 6 mm to 8 mm.

C.1.4 The fibre shall not have any specific orientation.

C.2 Test conditions

C.2.1 The unit shall be mounted rigidly above the base, and oriented in such a way that the device which inserts the test probes is at a distance (l) which is half the depth of the cutting teeth or 13 mm inside the outer path line of the cutting attachment, whichever is less (see figures C.1 and C.2). The flexible lines of the grass trimmer shall be adjusted to their maximum length.

C.2.2 The insertion of the test probes shall be made in a vertical direction at one of two positions shown in figure C.1.

C.2.3 If the cutting attachment rotates counter clockwise, position A for the test as specified in figure C.1 shall be used.

C.2.4 If the cutting attachment rotates clockwise, position B as specified in figure C.1 shall be used.

C.2.5 The lower surface of the cutting elements shall be parallel to and $30 \text{ mm} \pm 3 \text{ mm}$ above the top of the fibre surface (see figure C.2). In cases where the cutting head (see figure C.2) extends more than 30 mm below the cutting elements, a clearance of 1 mm to 5 mm between the cutting head and the fibre surface shall be maintained.

C.2.6 Calibrate the probe throw height to be 20 mm to 30 mm above the cutting plane.

C.3 Penetration wall

C.3.1 At the operator's position, a wall with a minimum height of 2 000 mm shall be established.

C.3.2 The wall shall be made of kraft paper (weight per unit area 80 g/m^2).

C.3.3 The paper shall be flatly attached without folds on a framework whose minimum inside dimensions are shown in figure C.1.

C.4 Test probes

C.4.1 The test probes shall be ceramic prisms with triangular sides and a prism height of $6,5 \text{ mm} \pm 0,8 \text{ mm}$ (see figure C.3). The mass of one prism shall be $0,43 \text{ g} \pm 0,02 \text{ g}$.

C.5 Procedure

C.5.1 At the selected probe insertion position (A or B), 25 probes shall be inserted individually into the circular path of the rotating cutting attachment.

C.5.2 The engine speed shall be at wide open throttle, using carburettor settings according to the manufacturer's recommendation or 133 % of the maximum power speed, whichever is less.

C.5.3 The base of the test stand shall be cleaned after the insertion of five probes.

C.6 Inspection of the cutting attachment

C.6.1 If the blade has been damaged during the test, it shall be replaced with a new blade.

C.6.2 For grass trimmers with a damaged line, pull out a fresh piece of line and cut it off to the original length.

C.7 Result

After test the paper wall shall be examined to determine if there has been any penetration.

Penetration is confirmed if a ball of 5 mm diameter can be pressed through the tear with a force of 3 N.

Dimensions in mm

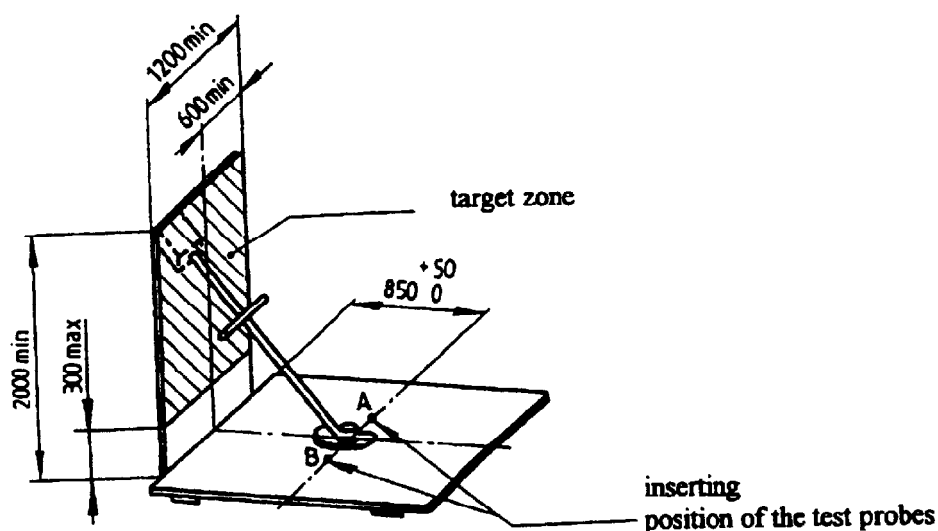
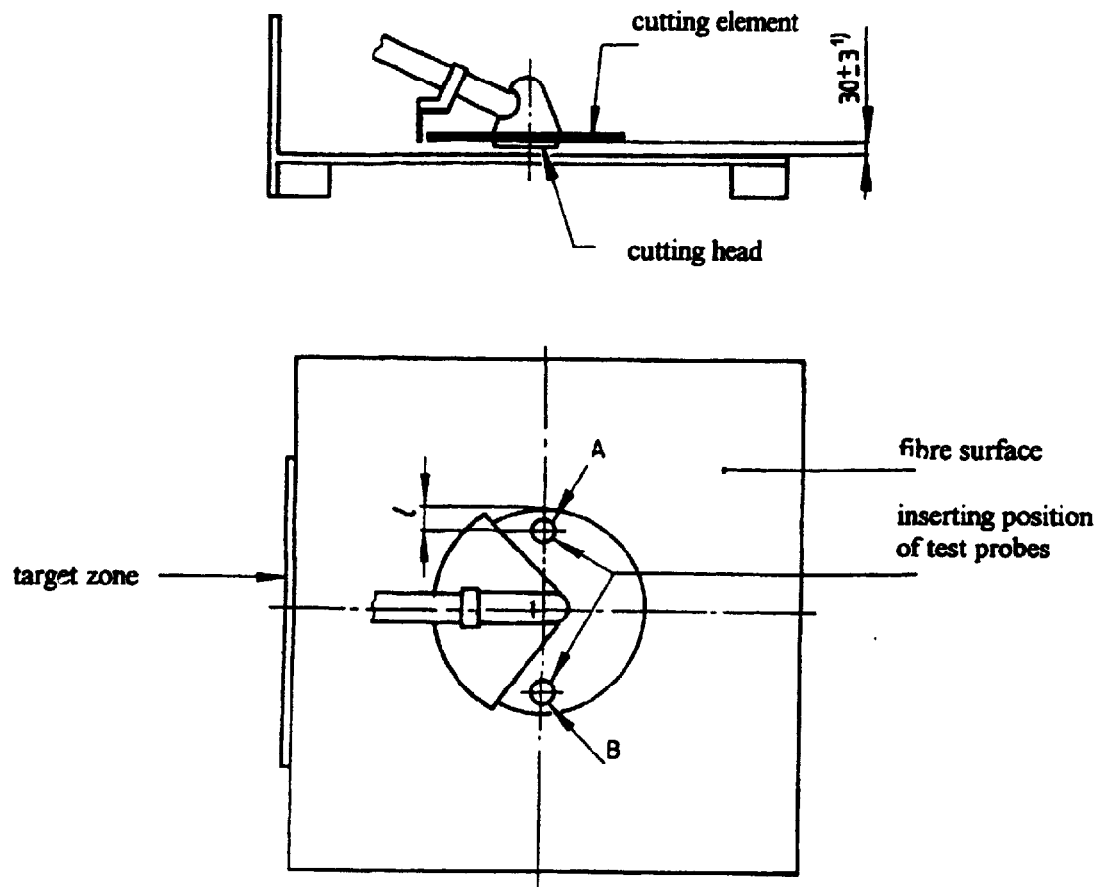


Figure C.1 : Test stand

Dimensions in mm



1) In case where the cutting head extends more than 30 mm below the cutting element this dimension is not valid. Instead 1 mm to 5 mm clearance between the cutting head and the fibre surface shall be maintained.

Figure C.2 : Location of brush cutter

Dimensions in mm

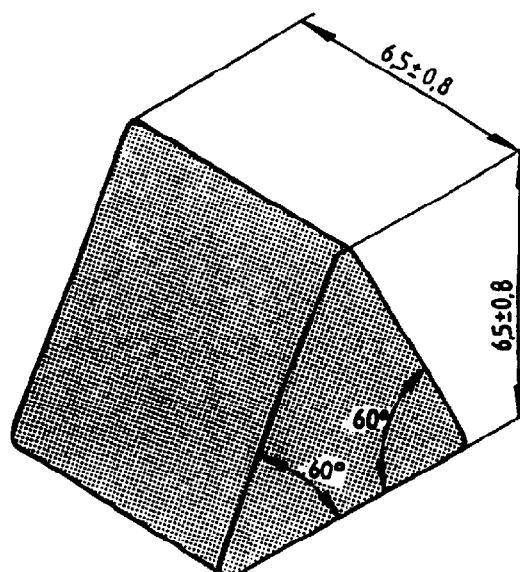
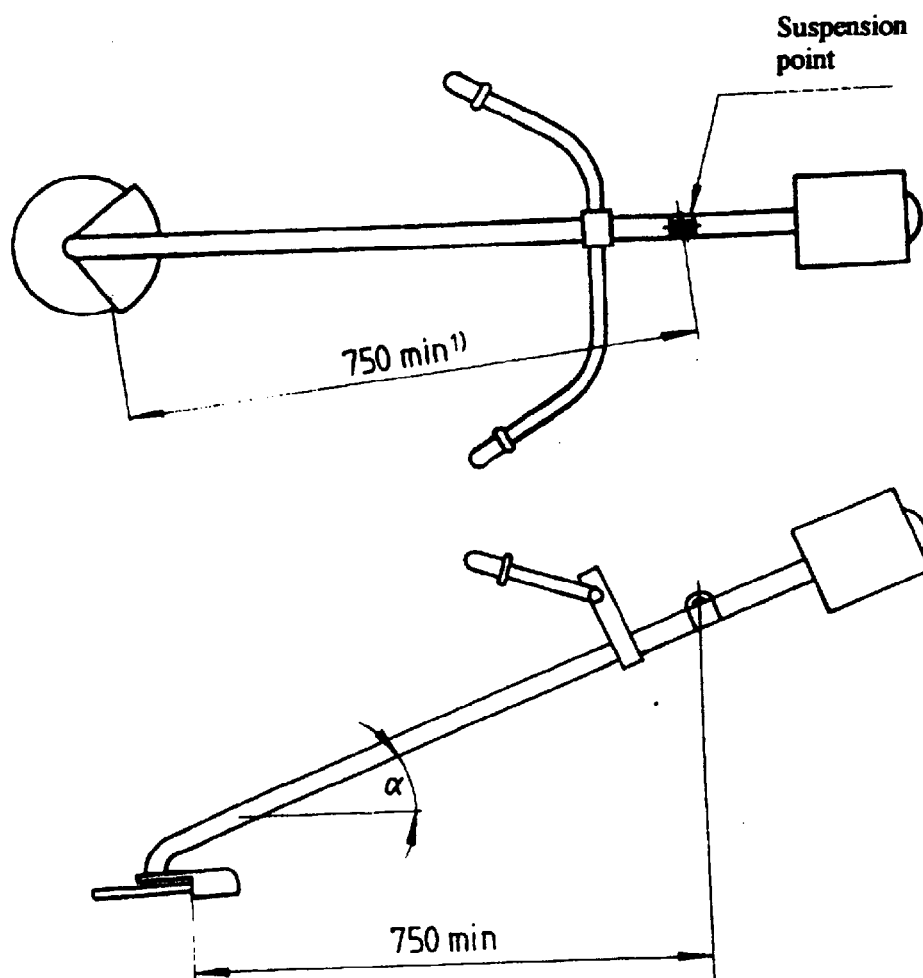


Figure C.3 : Test probe

Annex D (normative)

Dimensions

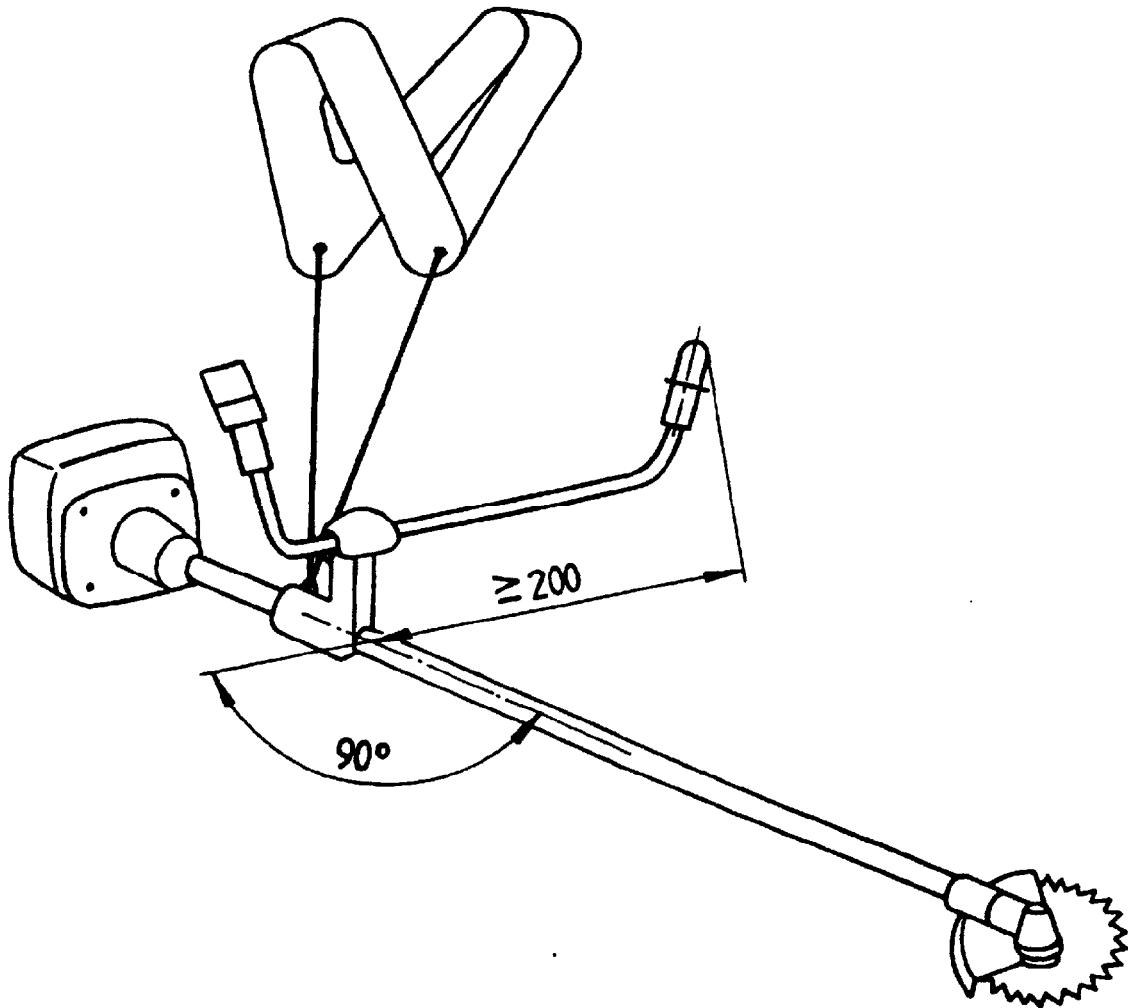
Dimensions in mm



1) horizontal dimension

Figure D.1 : Minimum horizontal distance from suspension point to cutting attachment

Dimensions in mm



NOTE : Handle serves as barrier.

Figure D.2 : Brush saw, where the handle assembly serves as the barrier and barrier minimum projection to the operator side from the shaft tube

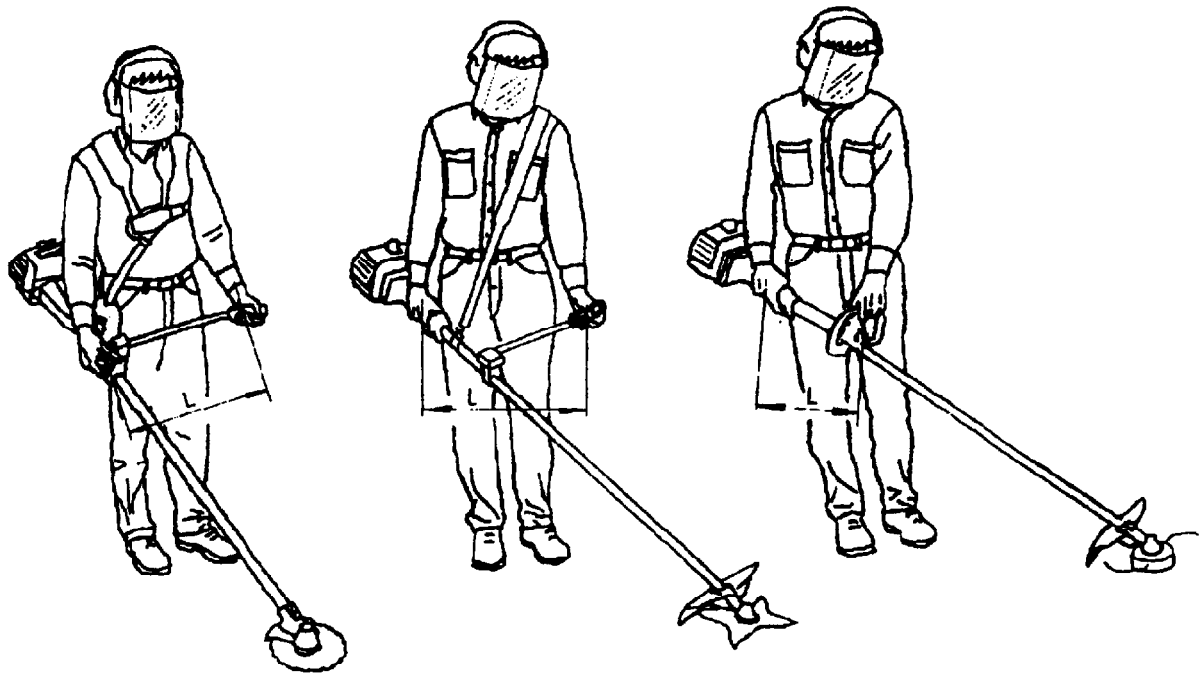


Figure D.3 : Handle distance L

Annex ZA (informative)**Clauses of this European Standard addressing essential requirements or other provisions of EU Directives**

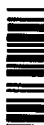
This European standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive[s] :

- . machinery Directive 89/392/EEC ;
- . its amendements 91/368/EEC and 93/44/EEC .

WARNING : Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The clauses of this standard are likely to support requirements of Directives.

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**BS EN ISO
11806 : 1997**

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