Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee AGE/20, Powered Lawn and Garden Equipment, upon which the following bodies were represented:

AFRC Institute of Engineering Research
Agricultural Engineers' Association
Association for Consumer Research (ACRE)
British Agricultural and Garden Machinery Association Ltd.
British Lawnmower Manufacturers' Federation
BSI Staff
Consumer Policy Committee of BSI
Consumers' Association
Department of Trade and Industry (Consumer Safety Unit, CA Division)
Health and Safety Executive
Institute of Leisure and Amenity Management
Local Authority Organizations
National Turfgrass Council
Royal Society for the Prevention of Accidents
Silsoe Research Institute

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Contents

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NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 774 + A3
April 1996 March 2001
+ A1
February 1997
+ A2
June 1997

ICS 65.060.080

Descriptors: Horticultural machines, portable equipment, cutting tools, hedge trimmers, safety requirements, accident prevention, electric motors, internal combustion engines, handles, safety devices, hazards, tests, marking, maintenance

English version

Garden equipment — Hand held, integrally powered hedge trimmers — Safety

(includes amendments A1:1997, A2:1997 and A3:2001)

Matérial de jardinage — Tailles-haies portatifs à moteur incorporé — Securité
(inclut les amendements A1:1997, A2:1997 et A3:2001)

Gartengeräte — Tragbare motorbetriebene Heckenscheren — Sicherheit
(enthält Änderungen A1:1997, A2:1997 und A3:2001)

This European Standard was approved by CEN on 1996-03-05: Amendment A1 was approved by CEN on 1997-01-19. Amendment A2 was approved by CEN on 1997-05-24. Amendment A3 was approved by CEN on 2001-02-04. 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.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CEN

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

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

Ref. No. EN 774:1996 + A1:1997 + A2:1997+ A3:2001 E

Foreword

This European Standard was prepared by Technical Committee CEN/TC144, Tractors and machinery for agriculture and forestry, the Secretariat of which is held by AFNOR.

This European Standard shall be given the status of national standard, either by publication of an identical text or by endorsement, at least by October 1996, and conflicting national standards shall be withdrawn at the latest by October 1996.

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).

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

Foreword to amendment A1

This amendment EN 774:1996/A1:1997 to the EN 774:1996 has been prepared by Technical Committee CEN/TC 144, Tractors and machinery for agriculture and forestry, the Secretariat of which is held by AFNOR.

This amendment to the European Standard EN 774:1996 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 1997, and conflicting national standards shall be withdrawn at the latest by August 1997.

This amendment fulfils the "under study NOTE" which is located after the first paragraph of the present text of **4.2** and at the same time will ensure total compatibility with the equivalent CENELEC standard. Similar text is also proposed for the ISO and IEC standards for hedge trimmers.

This amendment to the European Standard EN 774:1996 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).

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

Foreword to amendment A2

This amendment EN 774:1996/A2:1997 to EN 774:1996 has been prepared by Technical Committee CEN/TC 144 Tractors and machinery for agriculture and forestry, the Secretariat of which is held by AFNOR.

This amendment to the European Standard EN 774:1996 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 amendment fulfils the "under study" NOTE which is located at the end of the present text of **4.1.5** Blade stopping time. As this amendment includes a figure existing subsequent Figure 10 is renumbered Figure 11.

This amendment to the European Standard EN 774:1996 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).

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Foreword to amendment A3

This amendment EN 774:1996/A3:2001 to EN 774:1996 has been prepared by Technical Committee CEN/TC 144, Tractors and machinery for agriculture and forestry, the Secretariat of which is held by AFNOR.

This amendment to the European Standard EN 774:1996 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2001, and conflicting national standards shall be withdrawn at the latest by September 2001.

This amendment to the European Standard EN 774:1996 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.

This amendment which specifically deals with vibration and noise, replaces the notes in the right hand column of Table A.1 against hazard items **4.1**, **4.2** and **5** listed in the left hand column.

Annex C and Annex D are normative, Annex E is informative.

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.

Contents

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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.

1 Scope

This European Standard specifies safety requirements and their verification for design and construction of hand held integrally driven powered hedge trimmers, which are designed for use by one operator, for trimming hedges and bushes utilizing one or more linear reciprocating cutter blades.

It describes methods for the elimination or reduction of hazards arising from their use. In addition, it specifies the type of information to be provided by the manufacturer on safe working practices.

This standard is not applicable to hedge trimmers with rotating blades or hedge trimmers powered by back-pack or other external power source.

The electrical safety aspects of mains powered electric hedge trimmers are covered by EN 50144-1 and prEN 50144-2-15.

The safety aspects of batteries and the electrical safety aspects of battery powered hedge trimmers are not covered by this standard.

The list of significant hazards dealt with in this standard 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 reference, 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 applies.

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, *Safety of machinery — Basic concepts, general principles for design — Part 2: Technical principles and specifications.*

EN 294:1992, *Safety of machinery — Safety distances to prevent danger zones being reached by the upper limbs.*

EN 563:1994, , *Safety of machinery — Temperatures of touchable surfaces — Ergonomics data to establish temperature limit values for hot surfaces.*

EN 28662-1:1992, *Hand-held portable power tools — Measurement of vibrations at the handle — Part 1: General* (ISO 8662-1:1988).

EN 50144-1:1995, *Safety of hand-held motor-operated electrical tools — Part 1: General requirements.*

prEN 50144-2-15:1994, *Safety of hand-held electric motor operated tools — Part 2-15: Particular requirements for hedge trimmers.*

EN ISO 354:1993, *Acoustics — Measurement of sound absorption in a reverberation room* (ISO 354:1985).

EN ISO 3744:1995, *Acoustics — Determination of sound power levels of noise sources using sound pressure — Engineering method in an essentially free field over a reflecting plane* (ISO 3744:1994).

EN ISO 11201:1995, *Acoustics — Noise emitted by machinery and equipment — Measurement of emission sound pressure levels at a work station and at other specified positions — Engineering method in an essentially free field over a reflecting plane* (ISO 11201:1995).

EN ISO 11688-1:1998, *Acoustics — Recommended practice for the design of low-noise machinery and equipment — Part 1: Planning* (ISO/TR 11688-1:1995).

ISO 3767-1:1991, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 1: Common symbols.*

ISO 3767-3:1995, *Tractors, machinery for agriculture and forestry, powered lawn and garden equipment — Symbols for operator controls and other displays — Part 3: Symbols for powered lawn and garden equipment.*

ISO 3864:1984, , *Safety colours and safety signs.*

ISO 7293:1997, *Forestry machinery — Portable chain saws — Engine performance and fuel consumption.*

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1
petrol hedge trimmer
hedge trimmer powered by petrol

NOTE Typical examples are shown in Figure 1a) and Figure 1b).

3.2
electric hedge trimmer
hedge trimmer powered by electricity

NOTE A typical example is shown in Figure 1c).

3.3
blade tooth
the part of the cutter blade which is sharpened to perform the shearing action (see Figure 2)

3.4
cutter blade
a part of the cutting device having blade teeth which cut by shearing action either against other blade teeth or against a shear plate (see Figure 2)

3.5
cutting device
that part of the assembly of cutter blade and shear plate, or the cutter blades together with any supporting part, which performs the cutting action

NOTE This device may be single or double sided (see Figure 2)

3.6
cutting length
the effective cutting length of the cutting device measured from the inside edge of the first blade tooth or shear plate tooth to the inside edge of the last blade tooth or shear plate tooth (see Figure 3)

NOTE Where both blades move the measurements should be taken when the first and last teeth are furthest apart.

3.7
front handle
handle located at or towards the cutting device. (See Figure 1)

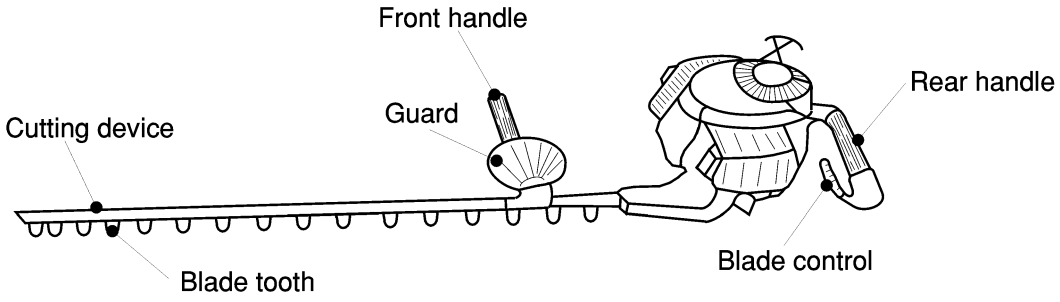
3.8
rear handle
handle located furthest from the cutting device. (See Figure 1)

3.9
throttle lock
device for temporarily setting the throttle in a partially open position to aid starting

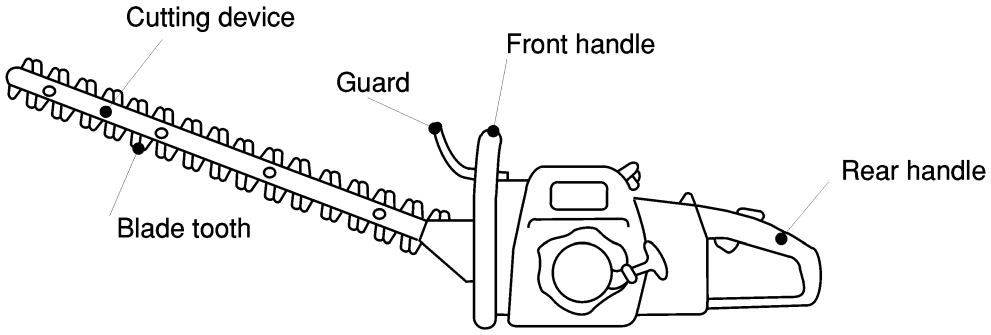
3.10
blade control
a device activated by the operator's hand or finger, for controlling the cutter blade movement. Depending on the application this may require single or two-stage operation

3.11
blunt extension
an extending blunt part of the cutting device or an extending part of an unsharpened plate fitted to the cutting device

3.12
maximum operating engine/motor speed
the highest engine/motor speed obtainable when adjusted in accordance with the hedge trimmer manufacturer's specifications and/or instructions with the cutting device engaged



a)



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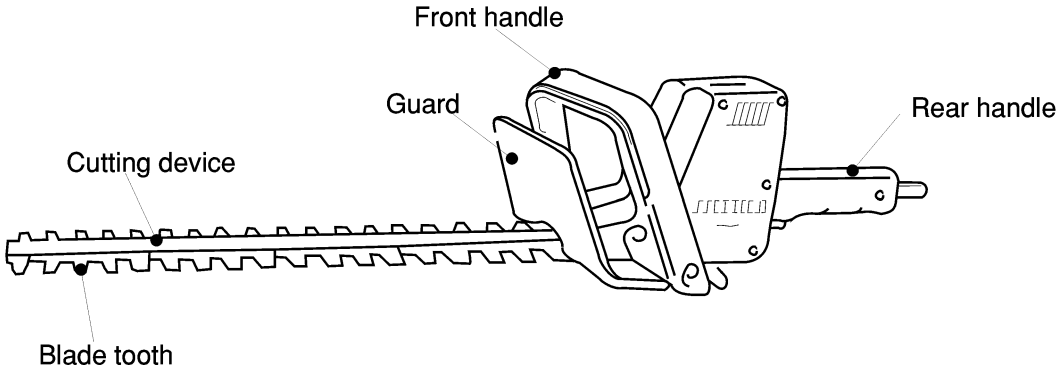


c)

Figure 1 — Examples of some different types of hedge trimmer

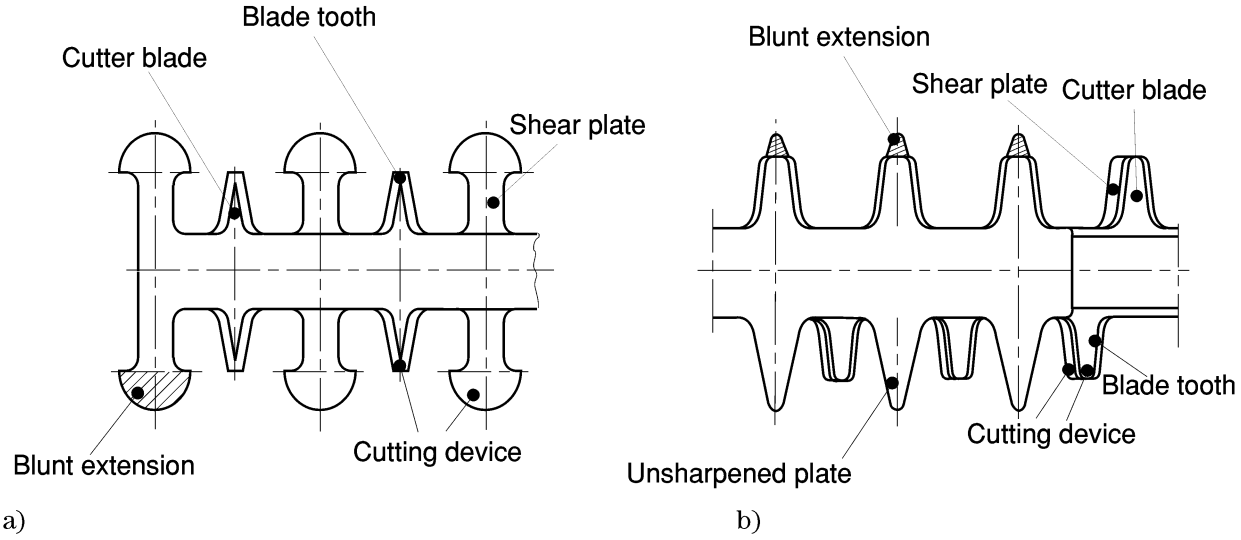


Figure 2 — Parts of a hedge trimmer cutting device

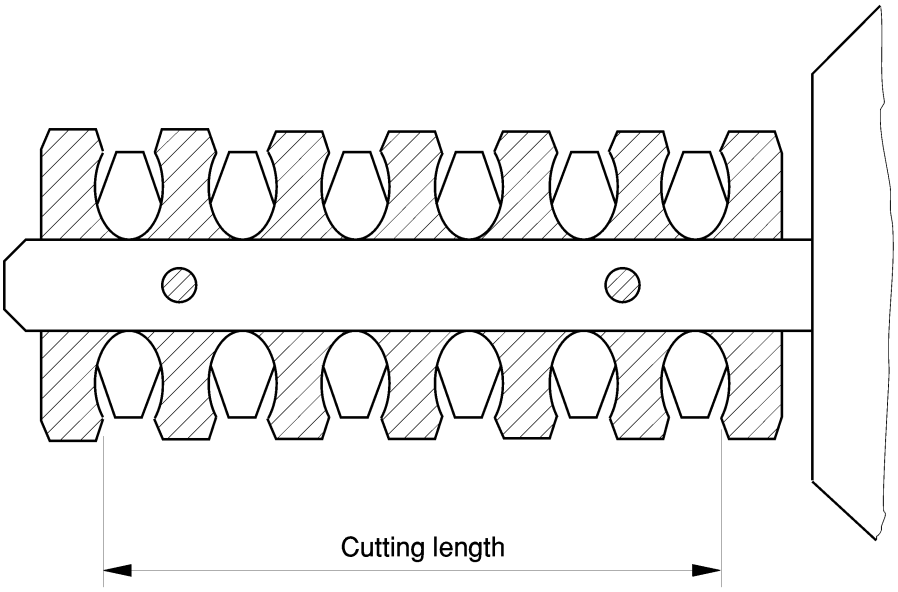


Figure 3 — Cutting length

4 Safety requirements and/or measures

4.1 Handles and cutting device

4.1.1 *Handles*

The number of handles shall be in accordance with Table 1.

The handles shall be designed in such a way that each one can be grasped with one hand.

The gripping surface of handles shall be at least 100 mm long. On bail or closed handles (U-shaped handles) this dimension is related to the inner width of the gripping surface. On straight handles it is the complete length between the housing and the end of the handle.

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

There shall be a minimum radial clearance of 25 mm around the gripping length.

If a part containing the motor complies with the dimensions above it may be considered as a handle.

If a straight handle is supported centrally (i.e. "T" type) the gripping length shall be calculated as follows:

a) for handles with a periphery (not including the support) less than 80 mm the gripping length is the sum of the two parts either side of the support;

b) for handles with a periphery (not including the support) of 80 mm or more the gripping length is the complete length from end to end.

Where appropriate the part of the handle containing the blade control actuator shall be counted as part of the handle gripping length. Finger grip or similar superimposed profiles shall not affect the method of calculating handle gripping length.

Handles shall be positively locked in position. If they are adjustable in different positions it shall not be possible to lock them in a position which contravenes other provisions of this standard.

For handles which are adjustable without the use of a tool it shall not be possible to alter the handle position when the cutting device is powered. When altering the handle position the blade control shall be disabled such that the cutting device can not be powered until the handle is locked into one of its designated operating positions (e.g. the control is automatically disengaged from the throttle of the engine if the handle is not locked into one of the positions of use).

Compliance shall be checked by inspection and measurement.

4.1.2 *Hand protection*

From any handle it shall not be possible to touch the moving cutter blade with fingers spread out.

All handles shall be so located that the test distance from the cutter blade to the side furthest from the cutter blade of any handle is not less than 120 mm. The distance shall be measured along the shortest path from the side of the handle furthest from the cutter blade to the nearest cutting edge of the cutter blade [see Figure 4 a)]. If there is a guard the distance shall be measured from the furthest side of the handle to the guard and from there to the nearest cutting edge of the cutter blade [see Figure 4b)].

Table 1 —

Category No.	1	2	3	4	5
[Electric (E)/Petrol (P)]	(E or P)	(E or P)	(E or P)	(E or P)	(P only)
Cutting length	≤200 mm	>200 mm	>200 mm	>200 mm	No requirement
Holding moment (**4.1.4**)	No requirement	No requirement	No requirement	No requirement	>20 N.m
Minimum number of handles	1	2	2	2	2
Number of handles with blade control	1	1	2	2	1 (in rear)
Maximum stopping time (See Note)	No requirement	No requirement	2 s	1 s	2 s
Cutting device	Figure 5	Figure 5	Figure 5 or Figure 6	Figure 7	Figure 5, Figure 6, Figure 7
NOTE Stopping times for categories 4 and 5 will be reviewed with a view to reduction by 50 % when this standard is revised. Stopping time for category 3 will be reduced to 1 s for hedge trimmers manufactured on or after 1 January 1998.					

4.1.3 *Cutting device*

To safeguard against contact with the cutter blade hedge trimmers shall be constructed to meet the requirements of one of the categories given in Table 1.

Blunt extensions shall extend over the full length of the cutting device for blade configurations according to Figure 5 and Figure 6. For cutting devices with blade configurations as shown in Figure 7, the blunt extensions shall reach a distance of at least 400 mm from any point of the rear face of the front handle [see Figure 8a) and Figure 8b)]. If the front handle is located part way along the cutting device the blunt extensions shall start at the first blade tooth and continue until the 400 mm minimum distance beyond the rear of the front handle is reached.

NOTE The 400 mm dimension will be reviewed with a view to increasing it to the full cutting length when this standard is revised.

Blunt extensions are not required for category 4 and 5 machines with blade spacing in excess of that allowed by the dimension d_1 in Figure 5 and Figure 6 if there are only 2 handles and the front handle is permanently fixed on the smooth side of a single sided cutting device [e.g. Figure 1a) and Figure 9a)].

4.1.4 *Holding moment*

The holding moment for petrol powered machines as required for category 5 of Table 1 shall be calculated as follows:

Holding moment = $F \times L$

where:

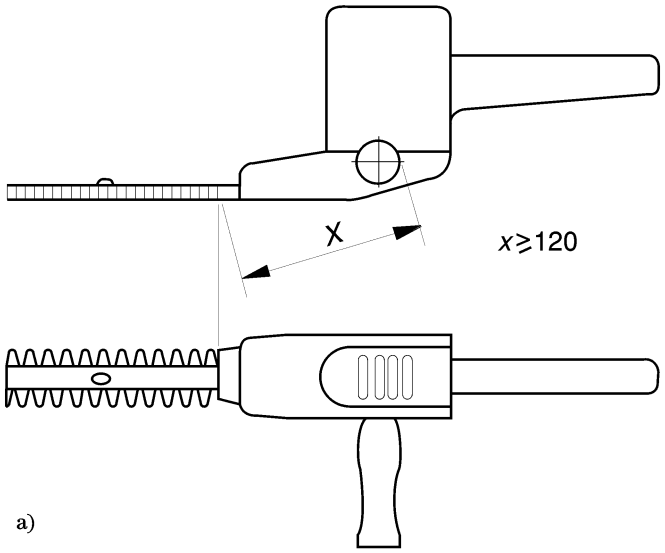
F is the force in newtons;

L is the length in metres.

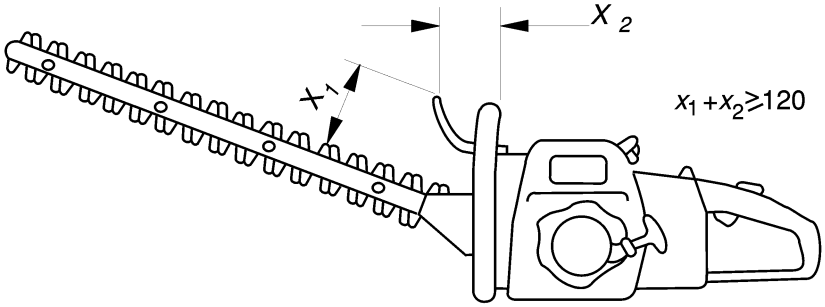
For machines with a lateral rear handle the holding moment shall be calculated according to Figure 9a).

For machines with a longitudinal rear handle the holding moment shall be calculated as shown in Figure 9b).

The holding moment for a machine with tanks shall be determined with them half full.



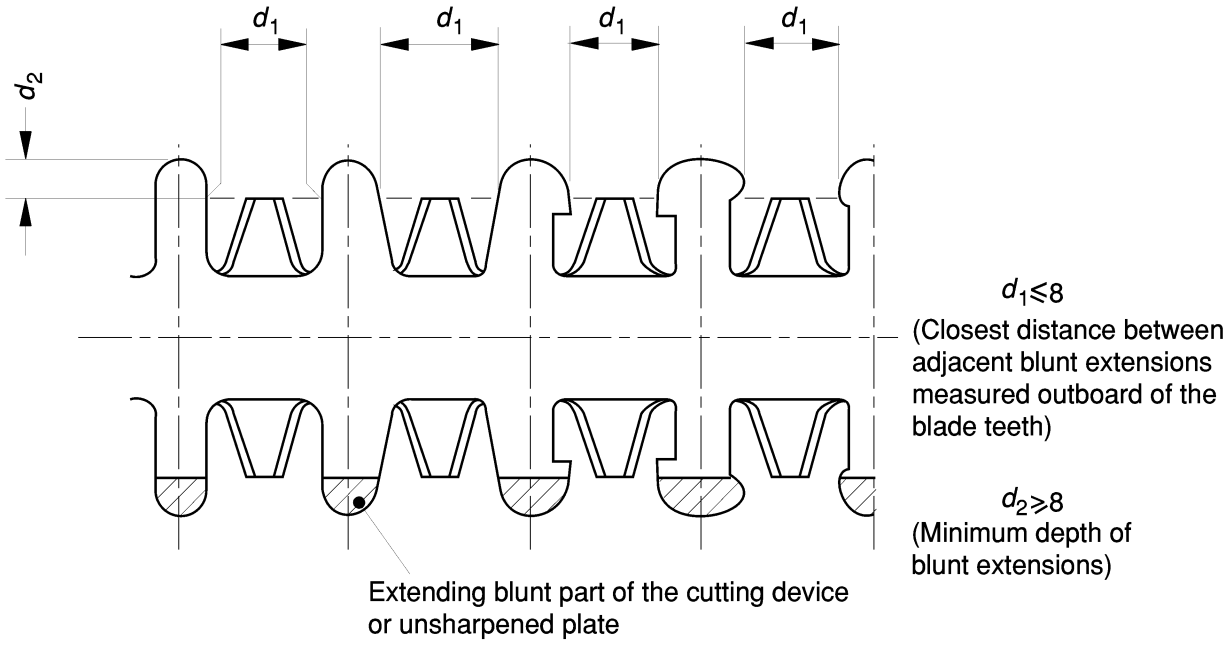
a)



b)

Dimensions in millimetres

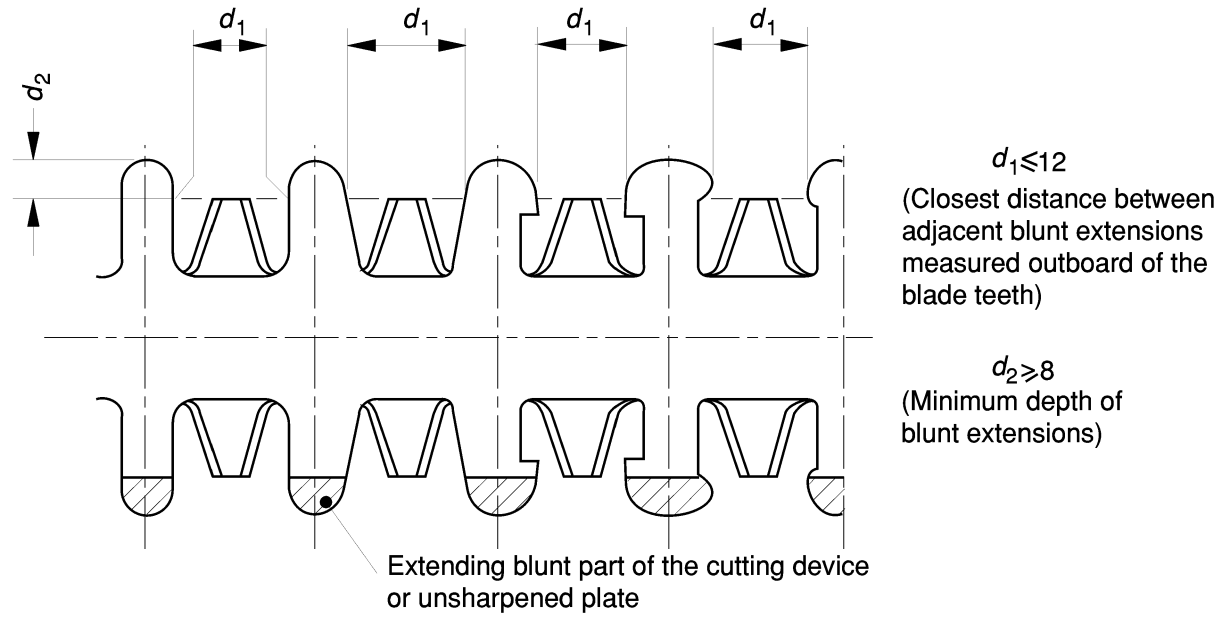
Figure 4 — Examples of measurement method for test distance for hand protection in accordance with 4.1.2



Dimensions in millimetres

NOTE May be single or double sided (see Table 1).

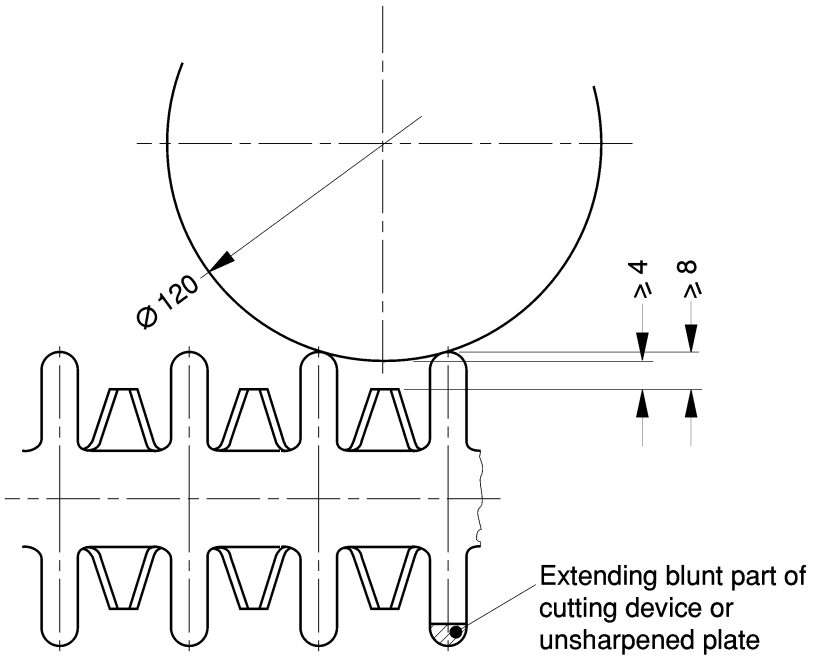
Figure 5 — Examples of cutting device configuration option for categories 1, 2, 3 and 5



Dimensions in millimetres

NOTE May be single or double sided (see Table 1).

Figure 6 — Examples of cutting device configuration option for categories 3 and 5



Dimensions in millimetres

NOTE May be single or double sided (see Table 1).

Figure 7 — Cutting device configuration option for categories 4 and 5

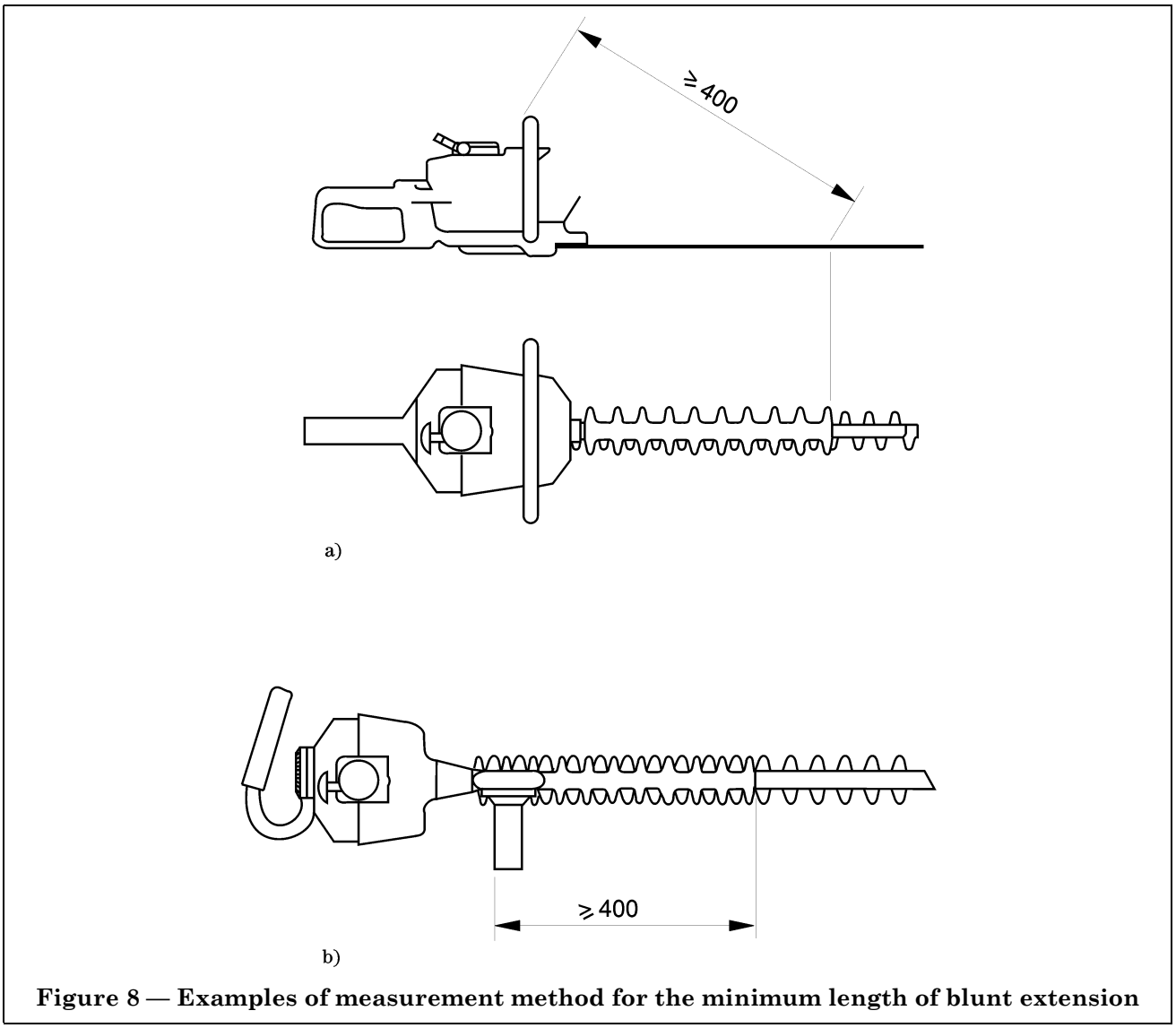
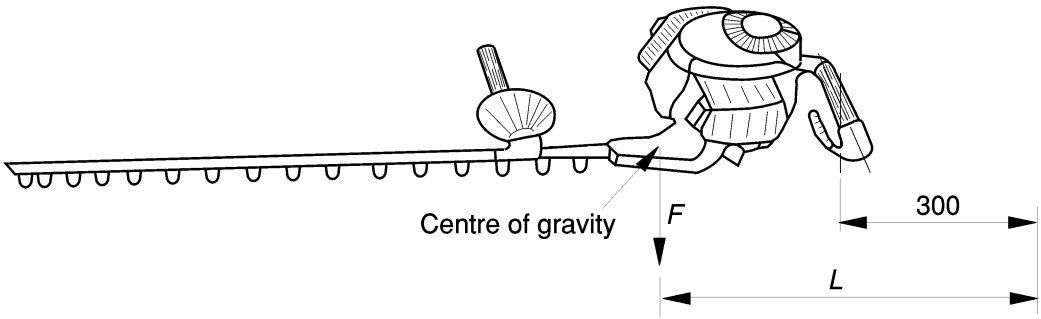
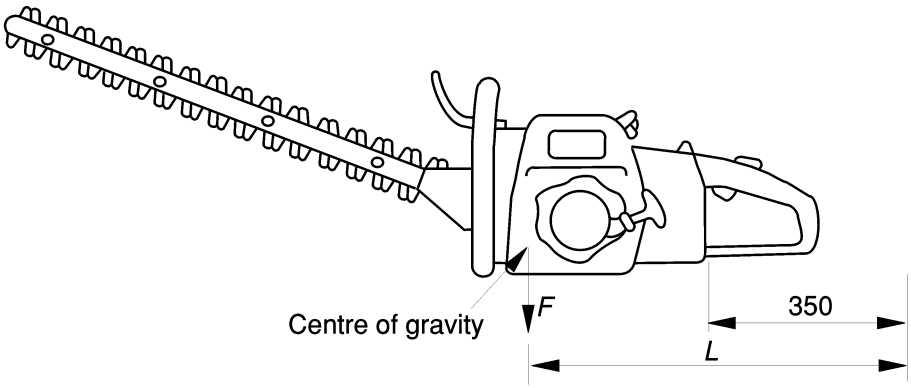


Figure 8 — Examples of measurement method for the minimum length of blunt extension



a) NOTE. 300 dimension is from the centre of the rear handle



b) NOTE. 350 dimension is from the front of the rear handle

Dimensions in millimetres

Figure 9 — Method of calculating holding moment given in Table 1

4.1.5 ***Blade stopping time***

4.1.5.1 The cutting device stopping mechanism shall meet the stop time requirement given in Table 1.

Compliance is checked by the test of **4.1.5.3** carried out in accordance with **4.1.5.2**.

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

The hedge trimmer shall be mounted and instrumented in such a manner that the results of the test are not affected. If an external starting device is used it shall not influence the results.

The means for operating the hedge trimmer during the test shall be such that the blade control is released abruptly from the full "on" position and it returns to the idle or off position by itself. A device to detect the moment of release of the blade control shall be provided.

The running speed ("m") of the hedge trimmer during the test shall be either:

a) for electric powered hedge trimmers the maximum speed; or

b) for ungoverned and governed petrol powered hedge trimmers, 133 % of the manufacturers rated speed for maximum power, or the maximum speed, which ever is less.

Tachometers shall have an accuracy of ±2,5 % and the time recording measurement system shall have a total accuracy of ±25 ms.

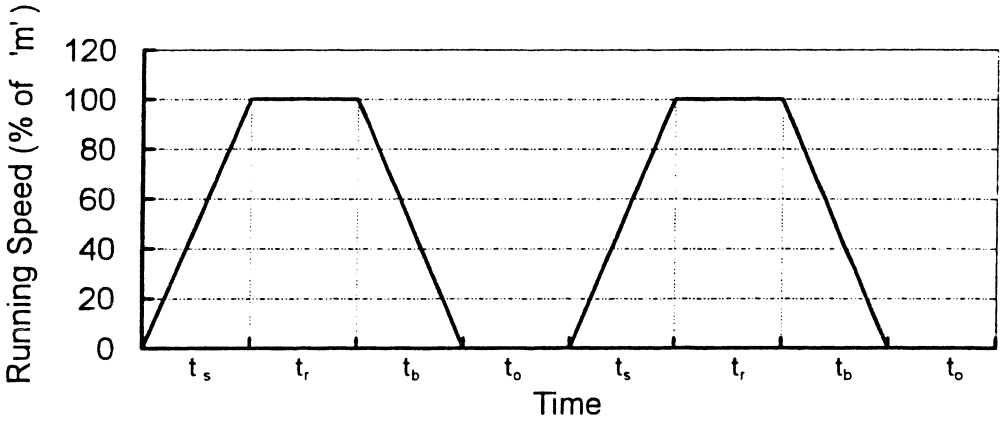


Figure 10 — Example of test cycles

Figure 10 gives a schematic representation of two cycles. Each cycle shall consist of the following sequence:

— accelerate the blade from rest to the maximum speed — (time = t_s);

— hold it at this speed for a short time to ensure that it is stable — (time = t_r);

— release the blade control and allow the blade to come to rest — (time = t_b);

— allow a short time at rest before commencing the next cycle — (time = t_o).

If the total for one cycle is t_c then $t_c = t_s + t_r + t_b + t_o$. The test cycle times for "on" ($t_s + t_r$) and "off" ($t_b + t_o$) shall be decided by the manufacturer but shall not exceed 100 s "on" and 20 s "off".

NOTE This test is not representative of normal use and therefore the cycle times are to be specified by the manufacturer to avoid unnecessary wear or damage to the machine.

Petrol powered hedge trimmers shall be run-in for 15 min prior to the test in accordance with manufacturer's instructions, the cutting device, stopping mechanism, carburettor and ignition being adjusted and lubricated as appropriate in accordance with the manufacturer's instructions. Battery powered hedge trimmers shall be powered from an external power source to simulate a fully charged battery.

Ten on/off operations of the blade control shall be carried out prior to the test, the cutting device and stopping mechanism being adjusted in accordance with the manufacturers instructions.

Stopping time is measured from the moment of release of the blade control until the cutter blade has reached the end of the last full stroke. Where there are two blade controls half the test cycles and stop time measurements shall be carried out on each.

4.1.5.3 For hedge trimmers where the stopping mechanism can be adjusted and maintained and the manufacturer instructs the user to have this carried out at regular intervals, the test sequence shall consist of a total of 306 cycles, measurements of the stopping time of the cutting blades shall be made for the first six cycles of each 50 cycles of operation and the final six cycles of the test sequence. During the test no adjustments shall be made.

For hedge trimmers where the stopping mechanism is not adjustable the test sequence shall consist of a total of 2 506 cycles, measurement of the stopping time of the cutting blade shall be made for the first six cycles of each 500 cycles of operation and the final six cycles of the test sequence. The hedge trimmer shall be lubricated in accordance with the manufacturers instructions.

No other stopping times shall be recorded

Each of the measured stopping times shall comply with the requirements of Table 1. If the sample fails to complete the full number of cycles but otherwise meets the requirements of this test either the machinery may be repaired if the stopping mechanism is not affected and the test continued or if the machine cannot be repaired one further sample may be tested which must then comply fully with the requirements.

The test sequence need not be continuous, however any period or periods of operation shall only be stopped after any of the required sets of six measured cycles.

4.1.6 *Cutting device guard*

A guard for the cutting device shall be provided. It shall be designed to cover the cutting device during transportation or when the hedge trimmer is stored.

The guard shall stay in its protective position when holding the hedge trimmer with the covered cutting device pointing vertically downwards.

4.2 Starting and idling

There shall be no arrangement to lock the blade control in the "on" position and the cutting device shall stop when a blade control is released.

Hedge trimmers shall be fitted with one or two blade controls (see Table 1) and be so designed that the hazards due to inadvertent starting are reduced to a minimum. This shall be deemed to be met if either:

a) the blade control, or one of the blade controls for category 3 and 4 (see Table 1), requires two separate and dissimilar actions before the cutting device operates, or;

b) the hedge trimmer has a blade control in each handle, neither of which requires two separate and dissimilar actions before the cutting device operates and the blunt extensions, if required by **4.1.3**, extend the full length of the cutting blade.

Starting the engine shall not be considered as one of these actions unless the engine stops when the control is released.

When starting the engine of petrol powered hedge trimmers the throttle trigger may be locked in a starting position (throttle lock). This position shall be unlocked automatically when the throttle trigger is operated.

On petrol powered hedge trimmers there shall be a means which separates the driving mechanism from the cutter blades. When starting and when the engine is idling the cutting device shall not have any cutting actions. If a centrifugal clutch is provided it shall disconnect the power to the cutter blades when the engine is idling. The cutting device shall disengage at not less than 1,25 times the idling speed.

Compliance shall be checked by inspection.

4.3 Controls

4.3.1 *Marking*

Controls other than those whose purpose is obvious shall have the function, direction and/or method of operation clearly identified by a durable mark or label. Detailed instructions on the operation of all controls shall be provided in an instruction manual (see **5.2**). Colours shall be in contrast to the background unless the symbols are cast, embossed or stamped when colours are not required.

NOTE Symbols according to ISO 3767-1 and ISO 3767-3 may be used as appropriate.

4.3.2 *Blade control*

With the hand(s) on the handle(s) the control(s) shall be operable from all normal positions of the hand(s), without having to move the position of either hand.

Compliance shall be checked by inspection.

4.4 Engine stop

Petrol driven hedge trimmers shall have a control for stopping the engine which can be operated without releasing the hold of either of the handles. The engine stopping device shall not depend on sustained manual pressure for its operation. The stop position shall be clearly marked. The control shall have a contrasting colour against its background.

Compliance shall be checked by inspection.

4.5 Power drive parts protection

All moving parts other than the cutting device shall be guarded to prevent the operator's contact with these components.

All reach distances and apertures shall conform to **4.5.1** and **4.5.3** of EN 294:1992.

Compliance shall be checked by inspection.

4.6 Heat protection

4.6.1 *Requirements*

A guard or shield shall be provided to prevent inadvertent contact with any exposed exhaust component, greater than 10 cm^2 and with hot surface greater than 80 °C measured at 20 °C ± 3 °C ambient temperature, during normal starting and operation of the machine as described in the operating instructions. Handles and permanently held controls shall not exceed 43 °C measured at 20 °C ± 3 °C ambient temperature. Other controls and surfaces contacted during normal operation shall not exceed 55 °C measured at 20 °C ± 3 °C ambient temperature.

4.6.2 *Test method*

The test shall be conducted in the shade. The engine shall be operated at its maximum no load speed until the temperatures stabilize. The cutting device shall be lubricated as recommended by the manufacturer.

Temperatures shall be determined by correcting the observed temperature by the difference between the specified ambient and the test ambient temperature where necessary.

4.6.3 *Test acceptance for exhaust surfaces*

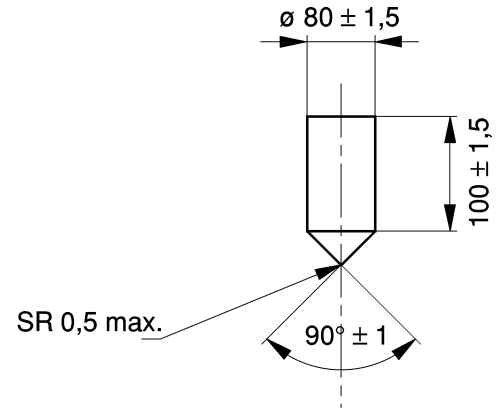
The tip or the conical surfaces of the cone (see Figure 11) shall not make contact with surfaces greater than 10 cm^2 and with a temperature greater than 80 °C.

NOTE The temperatures in this clause will be reviewed at the next revision of this standard taking into account any relevant values given in EN 563 and experience gained with the values as specified above.

4.7 Fuel tank

For petrol powered hedge trimmers the fuel cap shall have a retainer. The fuel tank opening shall be at least 22 mm in diameter and it shall be located so that the filling of the tank by means of a suitable funnel is not obstructed by other components.

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



Dimensions in millimetres

Figure 11 — Dimensions of cone

4.8 Engine exhaust

For petrol powered hedge trimmers the engine exhaust shall be directed away from the operator.

4.9 Electrical requirements

4.9.1 *General*

Mains powered hedge trimmers shall comply with EN 50144-1 and prEN 50144-2-15.

The electrical requirements of this clause apply only to the ignition circuits on petrol powered hedge trimmers.

Electrical cables shall be protected if located in potentially abrasive contact with metal surfaces and shall be resistant to, or protected against, contact with lubricant or fuel.

4.9.2 *Ignition circuit*

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

4.9.3 *Test method*

The requirements shall be checked by inspection and using the finger probe as specified in EN 50144-1.

4.10 Vibration

4.10.1 *Reduction by design and protective measures*

The machine shall be designed to generate a vibration level as low as practicable. The main sources causing vibration are the:

— oscillating forces from the motor;
— cutting means;
— unbalanced moving parts;
— impact in gears, bearings and other mechanisms;
— interaction between operator, machine and material being worked.

NOTE 1 CR 1030-1:1995 gives general technical information on widely recognized technical rules and means to be followed in the design of machines for low hand-arm vibration solutions.

NOTE 2 Besides the vibration reduction of the source, technical measures to isolate the vibration source from the handle may be used, when appropriate, such as isolators and resonating masses.

4.10.2 *Reduction by information*

After taking possible technical measures for vibration reduction, it is still recommended that, when appropriate, the instruction handbook recommends:

— the use of low-vibration operating modes, and/or limited time of operation;
— the wearing of personal protection equipment (PPE).

4.10.3 *Vibration measurement*

For the measurement of hand-arm vibration the methods given in Annex C shall be used.

4.11 Noise

4.11.1 *Reduction as a safety requirement*

4.11.1.1 *Reduction at source by design and protective measures*

The machine shall generate a noise level as low as practicable. The main sources causing noise for combustion engine driven machines are:

— air intake system;
— engine cooling system;
— engine exhaust system;
— cutting system;
— vibrating surfaces.

EN ISO 11688-1:1998 gives general technical information on widely recognized technical rules and means to be followed in the design of low-noise machines. For combustion engine driven machines special care shall be taken in the design of the exhaust system and the selection of the silencer.

NOTE EN ISO 11691:1995 and EN ISO 11820:1996 can be used for the testing of the silencer.

4.11.1.2 *Reduction by information*

If after taking all possible measures for reducing noise at the design stage a manufacturer considers that further protection of the operator is necessary, then the instruction handbook shall:

— recommend the use of low-noise operating modes, and/or limited time of operation;

— give a warning of the noise level and recommend the use of ear protection.

4.11.2 ***Noise emission measurement***

The determination of the sound power level and of the emission sound pressure level at the operator's position shall be carried out using the measurement methods given in Annex D.

5 Information for use

5.1 Machine identification and marking

5.1.1 Each hedge trimmer shall be legibly and indelibly marked with at least the following information:

— name and address of the manufacturer;

— year of construction;

— designation of series or type;

— serial number if any.

In addition every machine shall be prominently marked with the following warning(s) or appropriate symbol(s) in accordance with ISO 3864.

a) Warning. Read the instruction handbook;

b) Use ear protection (where appropriate).

NOTE Examples of suitable symbols are given in Annex B.

5.1.2 Marking provided for identification and directional or cautionary information shall have a reasonable life for the anticipated machine operating environment, when tested in accordance with **5.1.3**, and satisfy the following:

— a label shall have a durable bond with the base material surface or the marking shall be cast, embossed or stamped;

— a label shall be water resistant and designed to be permanently legible;

— a label shall not curl at edges and legibility shall not be affected by spilled fuel or lubricant.

Marking giving cautionary information shall be located as close as practicable to the relevant hazard. Such marking shall be in one of the official languages of the country in which the hedge trimmer is sold, or use applicable pictograms/symbols in contrasting colours. If the marking is cast, embossed or stamped, colours are not required.

5.1.3 The marking shall be rubbed by hand for 15 s with a piece of cloth soaked in water and again for 15 s with a piece of cloth soaked in petrol.

After the test the marking shall still be easily legible. Labels shall not be readily removable nor shall they show any sign of curling.

5.2 Instruction handbook

Each hedge trimmer shall be provided with an instruction handbook written in one of the official languages of the country of sale, giving operating, servicing, and maintenance instructions and an explanation of pictogram/symbols used. The instruction handbook shall include those operations which can normally be performed by the operator. It shall comply with **5.5** of EN 292-2:1992.

The electrical safety aspects of mains powered electric hedge trimmers are covered by EN 50144-1 and prEN 50144-2-15.

If the machine is not supplied fully assembled the instruction handbook shall describe proper assembly.

The instruction handbook and the technical documentation describing the machine shall:

— give the declared noise emission values of the machinery in accordance with **1.7.4**f) of Annex A of EN 292-2:1991/A1:1995;

— give reference to the noise test code specified in Annex D;

— give the declared vibration values of the machinery in accordance with **3.6.3** of Annex A of EN 292-2:1991/A1:1995;

— give reference to the vibration test code specified in Annex C.

The instruction handbook shall include where appropriate the substance of the following:

a) THIS MACHINE CAN CAUSE SERIOUS INJURIES. Read the instructions carefully for the correct handling, preparation, maintenance, starting and stopping of the machine. Be familiar with all controls and the proper use of the machine;

b) never allow children to use the machine;

c) avoid operating while people, especially children are nearby;

d) dress properly! Do not wear loose clothing or jewellery which can be caught in moving parts. Use of sturdy gloves, non-skid footwear, and safety glasses is recommended;

e) stop the engine or disconnect from mains before:

— cleaning or when clearing a blockage;

— checking, maintenance or working on the machine.

f) while operating the machine always be sure of a safe and secure operating position especially when using steps or a ladder;

g) handle fuel with care; it is highly flammable. Never add fuel to a machine with a running or hot engine. Do not inhale fuel fumes as they are toxic;

h) do not attempt to repair the machine unless you are qualified to do so;

i) do not operate the machine with a damaged or excessively worn cutting device;

j) to reduce fire hazard keep engine and silencer free of debris, leaves, or excessive lubricant;

k) a warning of noise level and the need for ear protection;

l) always ensure all handles and guards are fitted when using the machine. Never attempt to use an incomplete machine or one fitted with an unauthorized modification;

m) where a hedge trimmer is provided with more than one handle always use two hands to operate it;

n) when transporting or storing the machine always fit the cutting device guard;

o) instructions for correct use and an indication that the machine should not be used for any other purpose;

p) know how to stop the machine quickly in an emergency;

q) the dry mass of the machine in kilograms or for electric machines with 1 m of cable (including coupler or connector if appropriate);

r) always be aware of your surroundings and stay alert for possible hazards that you may not hear due to the noise of the machine.

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.

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

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

— "dealt with": the hazard is significant. The measures given in the clauses indicated 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**	Dealt with in **4.1.2**, **4.1.3**, **4.1.5**
1.3	Cutting or severing hazard	**4.2.1**, **4.2.2**	**3.2**	Dealt with in **4.1.2**, **4.1.3**, **4.1.5**, **4.1.6**
1.4	Entanglement hazard	**4.2.1**, **4.2.2**	—	Not relevant
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**	—	Not relevant
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

Table A.1 — List of hazards *(continued)*

Hazards		Relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
1.10	Ejection of Parts (of machinery and processed materials/workpieces)	**4.2.2**	**3.8**	Dealt with in **5.2**d)
1.11	Loss of stability (of machinery and machine parts)	**4.2.2**	**6.2.5**, **3.3**	Not relevant
1.12	Slip, trip and fall hazards in relationship with machinery (because of their mechanical nature)	**4.2.3**	**6.2.4**	Dealt with in **5.2**f), **5.2**a)
2	Electrical hazards, caused for example by:	**4.3**	**3.9**	—
2.1	electrical contact (direct or indirect);	**4.3**	—	Dealt with in **1**, **4.9.1**, **5.2**
2.2	electrostatic phenomena;	**4.3**	—	Not relevant
2.3	thermal radiation of 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 **4.6**, **5.2**g), **5.2**j)
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**	Annex A, **1.5.8**, **1.7.4**f)	Dealt with in **4.9**, **5.2**
4.2	interferences with speech communication, acoustic signals, etc;	**4.5**	Annex A, **1.5.8**, **1.7.4**f)	Dealt with in **4.9**, **5.2**
5	Hazards generated by vibration (resulting in a variety of neurological and vascular disorders);	**4.6**	Annex A, **1.5.9**, **3.6.3**	Dealt with in **4.8**
6	Hazards generated by radiation, especially by:	**4.7**	—	—
6.1	electrical arcs;	—	—	Not relevant
6.2	lasers;	—	—	Not relevant
6.3	ironizing radiation sources;	**4.7**	—	Not relevant
6.4	machines making use of high frequency electromagnetic fields.	—	—	Not relevant

Table A.1 — List of hazards *(continued)*

Hazards		Relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
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 **4.8**, **5.2**g)
7.2	fire or explosion hazard;	**4.8**	—	Dealt with in **4.7**
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 **4.1.3**, **5.2**
8.2	inadequate consideration of human hand-arm or foot-leg anatomy;	**4.9**	**3.6.2**	Dealt with in **4.1.1**, **4.1.2**, **4.4**
8.3	neglected use of personal protection equipment;	**5.5**	—	Dealt with in **5.2**d)
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 **5.2**m), **5.2**o)
9	Hazard combinations	**4.10**	—	Dealt with in **5.2**l)
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**	Not relevant
10.3	failure, malfunction of control system (unexpected start up, unexpected overrun);	**3.15**, **3.16**, **3.17**	**3.7**	Dealt with in **5.2**f)
10.4	errors of fitting;	—	—	Dealt with in **4.1**, **5.2**l)
10.5	overturn, unexpected loss of machine stability;	**4.2.2**	**6.2.5**	Not relevant
11	Hazards caused by (temporary) missing and/or incorrectly positioned safety related measures/means, for example:	—	**4**	—
11.1	all kinds of guard;	**3.22**	**4.2**	Dealt with in **5.2**f)

Table A.1 — List of hazards *(concluded)*

Hazards		Relevant clauses (informative)		Solutions given by this standard
		EN 292-1	EN 292-2	
11.2	all kinds of safety related (protection) devices;	**3.23**	**4.2**	Dealt with in **5.2**a)
11.3	starting and stopping devices;	—	**3.7**	Dealt with in **5.2**p)
11.4	safety signs and signals;	—	**3.6.7**, **5.2**, **5.3**, **5.4**	Deal with in **5.2**a)
11.5	all kinds of information or warning devices;	—	**5.4**	Dealt with in **5.2**
11.6	energy supply disconnecting devices;	—	**6.2.2**	Dealt with **5.2**a)
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**	**6.2.1**, **3.12**, **6.2.3**, **6.2.6**	Dealt with in **5.2**l)
11.10	equipment evacuating gases, etc.	—	—	Not relevant

Annex B (informative)
Acceptable symbols for machine working

1 — Warning

2 — Before use read instruction handbook

3 — Do not use in rain or wet conditions

4 — If cable is damaged pull the plug from the mains before examining

5 — Wear eye protection

6 — Wear ear protection

7 — Wear eye and ear protection

Annex C (normative)
Vibration

C.1 Quantities to be measured

The values measured shall be:

— acceleration according to **3.1** of EN 28662-1:1992, presented as weighted acceleration $a_{h,w}$ according to **3.3** of EN 28662-1:1992;

— rotational speed of the engine.

C.2 Instrumentation

C.2.1 *General*

For specification of instrumentation see **4.1** of EN 28662-1:1992.

C.2.2 *Transducer*

For specifications of transducer see **4.1** of EN 28662-1:1992.

C.2.3 *Fastening of transducer*

Fastening of transducer shall be in accordance with **4.2** of EN 28662-1:1992.

C.2.4 *Calibration*

Calibration shall be made in accordance with **4.8** of EN 28662-1:1992

C.3 Measurement direction and measurement location

C.3.1 *Measurement direction*

Measurements shall be made on each handle for the 3 directions x, y and z (see Figure C.1 and Figure C.2).

C.3.2 *Measurement location*

Typical locations of the transducer assemblies and directions of measurement are shown in Figure C.1 and Figure C.2.

C.4 Test procedure

C.4.1 *Determination of working procedure*

Tests shall be carried out on a new, normal production machine featuring standard equipment with the machine provided by the manufacturer.

The machine shall be run-in and warmed up until stable conditions are reached before the test is commenced. The carburettor and ignition shall be set and the cutting device(s) lubricated according to the instructions of the manufacturer.

Measurements shall be made with full tanks at an engine speed which is 133 % of the speed at maximum engine power as determined in accordance with ISO 7293:1997. If the engine has a governor which is below that speed the measurement shall be made at the maximum revolution speed stipulated by the manufacturer with the cutting means engaged.

During the test the cutting means shall be driven. Contact between the hand and the transducer shall be avoided.

C.4.2 *Measurement procedure*

For each handle a series of five tests shall be carried out using one operator. The hedge trimmer shall be held with the axis of the cutting device orientated as in the normal rest position on a horizontal surface.

NOTE 1 Issues such as the validity of the tests and the number of test operators are to be considered for future revision in the light of experience gained using the present test method.

Each reading shall be obtained from the signal time suitable for the test equipment being used. Duration of the test shall not be less than 8 s.

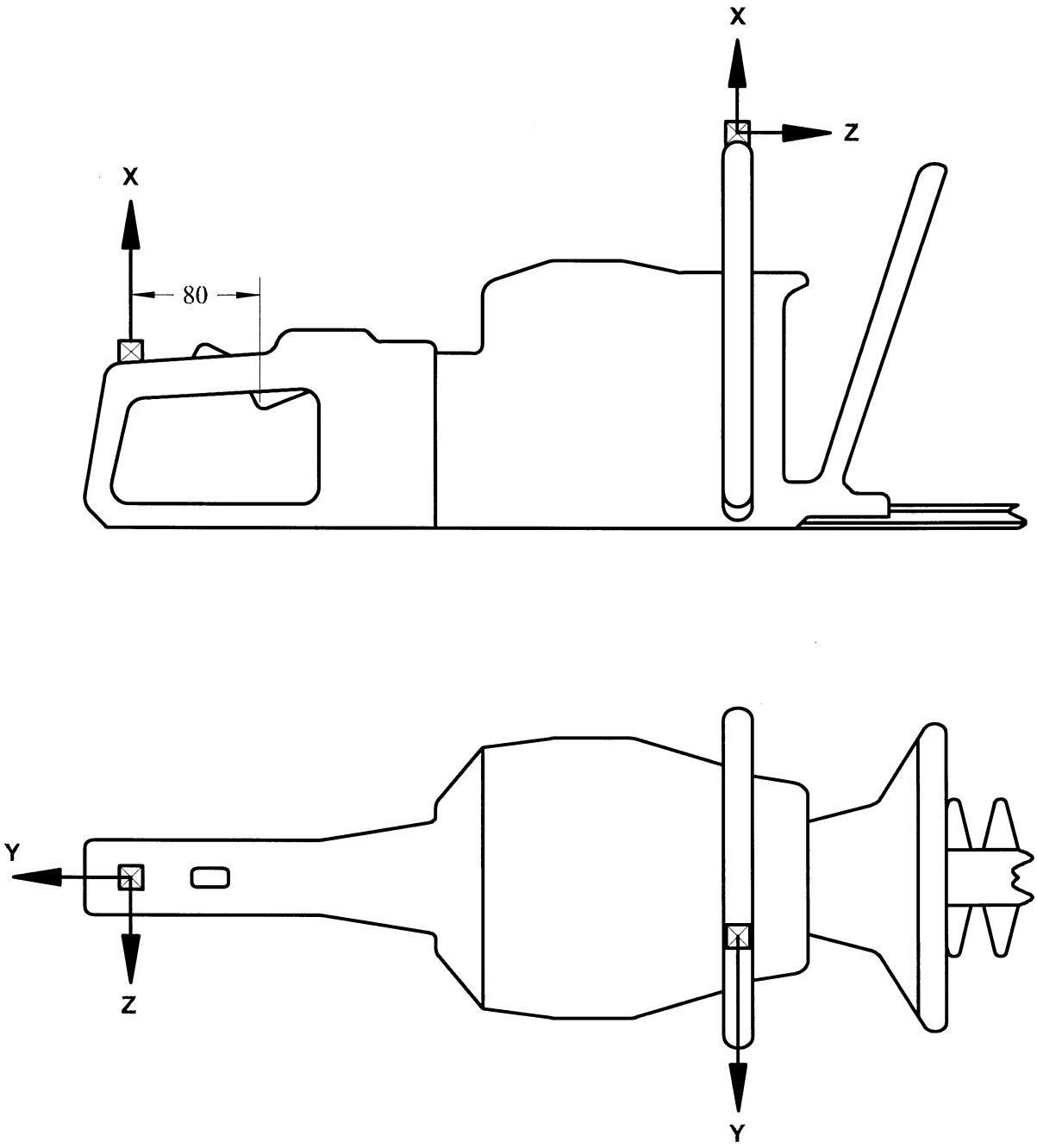
NOTE 2 An equivalent level of accuracy may be achieved by using a shorter duration than 8 s. In this case the equivalence of the results should be justifiable.

Measurement for the three directions (see **C.3.1**) shall be made simultaneously.

C.5 Determination of the measurement result

The measurement result of each handle shall be determined as the arithmetic mean over the $a_{h,w}$ value of each test. If a single figure is quoted it shall be the higher of the two.

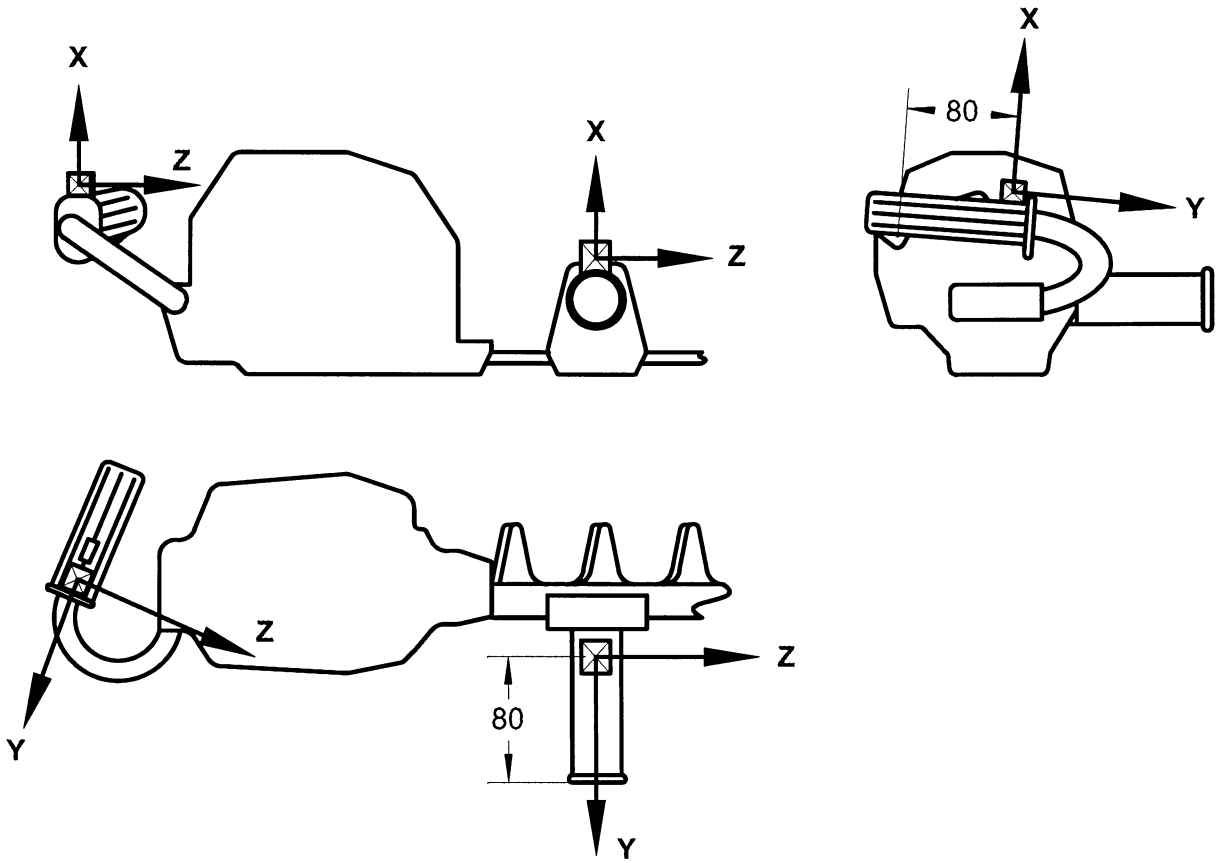
Dimensions in millimetres



NOTE If the measurement of 80 mm cannot be obtained, the transducer is placed at the rear end of that portion of the handle intended to be grasped.

Figure C.1 — Examples of transducer location/orientation (longitudinal rear handle)

Dimensions in millimetres



NOTE If the measurement of 80 mm cannot be obtained, the transducer is placed as close as possible to this position, avoiding contact with the hand.

Figure C.2 — Examples of transducer location/orientation (lateral rear handle)

Annex D (normative)
Noise test code — Engineering method (Grade 2)

NOTE This Annex only applies to combustion engine powered hedge trimmers. The method for electric machines is given in EN 50144-2-15:1997.

D.0 Scope

The noise test code specifies the information necessary to carry out efficiently and under standardized conditions the determination of the noise emission characteristics of hand-held, integrally powered hedge trimmers.

Noise emission characteristics include the emission sound pressure level at the operator position and the sound power level. The determination of these quantities is necessary for:

— manufacturers to declare the noise emitted;

— comparing the noise emitted by machines in the family concerned;

— purposes of noise control at the source at the design stage.

The use of this noise test code ensures reproducibility of the determination of the noise emission characteristics within specified limits determined by the grade of accuracy of the basic noise measurement method used. Noise measurement methods allowed by this standard give results with Grade 2 of accuracy.

D.1 Sound power level determination

For the determination of sound power level, EN ISO 3744:1995 shall be used subject to the following modifications:

— the reflecting surface shall be replaced by an artificial surface or by natural grass which complies with **D.3**. Reproducibility of results using natural grass is likely to be lower than that required for Grade 2 of accuracy. In the case of dispute, measurements shall be carried out in the open air and on the artificial surface;

— the measurement surface shall be a hemisphere with a radius, r, of 4 m;

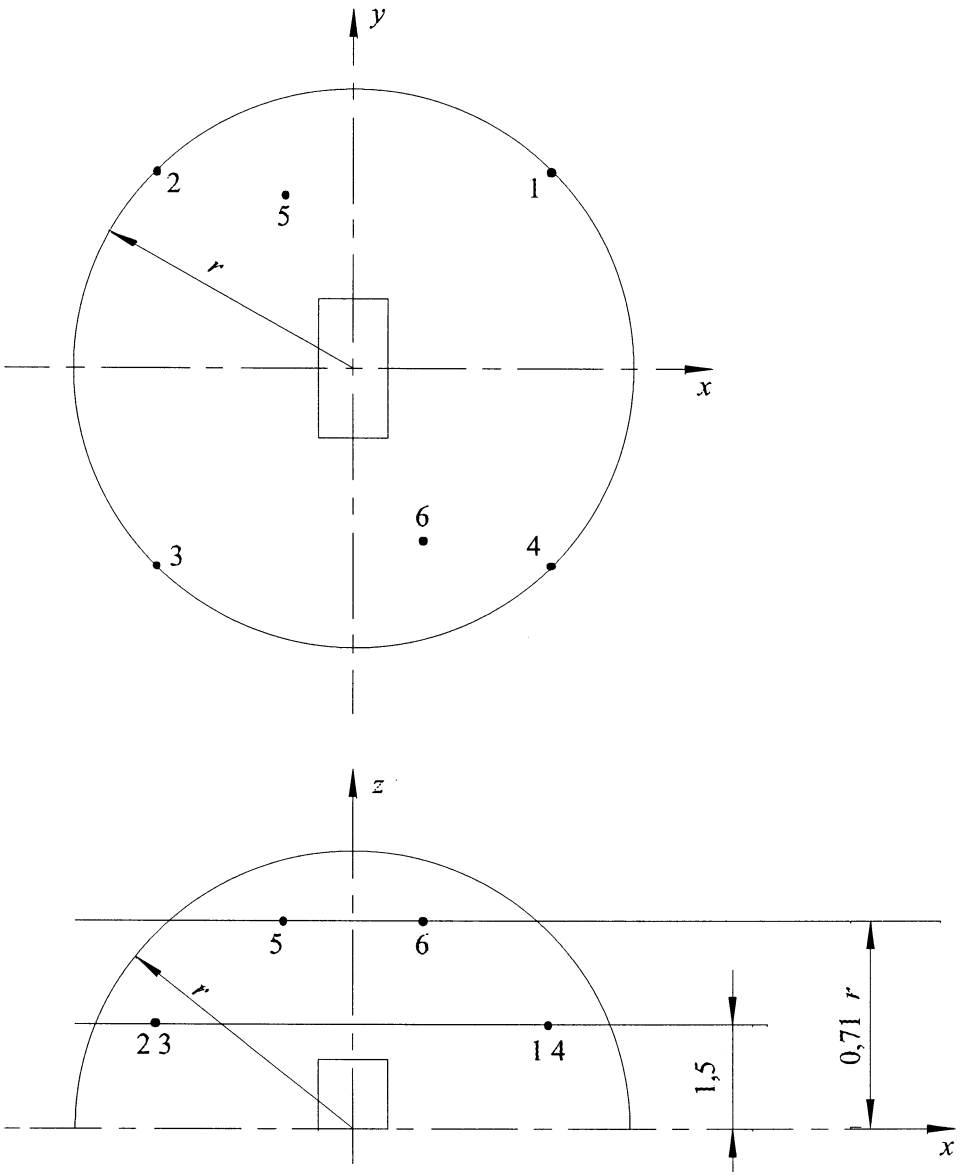
— the microphone array shall be composed of six microphone positions as defined in Figure D.1 and Table D.1;

— environmental conditions shall be within the limits specified by the manufacturers of the measuring equipment. The ambient air temperature shall be in the range from 5 °C to 30 °C and the wind speed shall be less than 8 m/s and preferably less than 5 m/s;

— for measurements in the open air $K_{2A} = 0$;

— for measurements indoors the value of K_{2A}, determined without artificial surface and in accordance with Annex A of EN ISO 3744:1995, shall be ≤ 2 dB, in which case K_{2A} shall be disregarded.

Dimensions in metres



KEY

r radius of hemisphere

Figure D.1 — Microphone positions on the hemisphere (see Table D.1)

Table D.1 — Co-ordinates of microphone positions

Position No.	x r	y r	z
1	+0,7	+0,7	1,5 m
2	−0,7	+0,7	1,5 m
3	−0,7	−0,7	1,5 m
4	+0,7	−0,7	1,5 m
5	−0,27	+0,65	0,71 r
6	+0,27	−0,65	0,71 r

D.2 A-weighted emission sound pressure level measurement

For the measurement of the A-weighted emission sound pressure level, EN ISO 11201:1995 shall be used subject to the following modifications:

— the reflecting surface shall be replaced by an artificial surface or by natural grass which complies with **D.3**. Reproducibility of results using natural grass is likely to be lower than that required for Grade 2 of accuracy. In the case of dispute, measurements shall be carried out in the open air and on the artificial surface;

— environmental conditions shall be within the limits specified by the manufacturers of the measuring equipment. The ambient air temperature shall be in the range from 5 °C to 30 °C, and the wind speed shall be less than 8 m/s and preferably less than 5 m/s;

— the microphone shall be head mounted 200 mm ± 20 mm from the median plane of the head on the louder side and in line with the eyes. The microphone shall be aimed with its axis of maximally flat response (as specified by the manufacturer) pointing at the front handle of the hedge trimmer. The operator shall wear a helmet on which the microphone may be attached. The helmet shall be of a shape so that its outer edge is at least 30 mm closer to the head than the microphone. The operator shall be 1,75 m ± 0,05 m tall.

D.3 Requirements for test floor

D.3.1 *Artificial surface*

The artificial surface shall have absorption coefficients as given in Table D.2, measured in accordance with EN ISO 354:1993.

Table D.2 — Absorption coefficients

Frequencies Hz	Absorption Coefficients	Tolerance
125	0,1	±0,1
250	0,3	±0,1
500	0,5	±0,1
1 000	0,7	±0,1
2 000	0,8	±0,1
4 000	0,9	±0,1

The artificial surface shall be placed on a hard, reflecting surface and have a size of at least 3,6 m × 3,6 m placed at the centre of the test environment. The construction of the supporting structure shall be such that the requirements for the acoustic properties are also met with the absorptive material in place. The structure shall support the operator to avoid compression of the absorbing material.

NOTE See Annex E for an example of a material and construction which can be expected to fulfil these requirements.

D.3.2 ***Natural grass***

The test environment shall be covered, at least for the horizontal projection of the measurement surface used, with high-quality natural grass. Before the measurements are taken, the grass shall be cut with a mower to a height of cut as near as possible to 30 mm. The surface shall be clean of grass clippings and debris and shall be visibly free of moisture, frost or snow.

D.4 Installation, mounting and operating conditions

Measurements shall be carried out on a new, normal production machine featuring standard equipment as provided by the manufacturer. The engine shall be run-in and warmed up until stable conditions are reached before the test is commenced. The carburettor and ignition shall be set and the cutting devices lubricated according to the instructions of the manufacturer.

During the test the cutting means shall be engaged and unloaded.

The hedge trimmer shall be held with the axis of the cutting device orientated as in the normal rest position on a horizontal surface. The engine speed shall be 133 % of the speed at maximum engine power as determined in accordance with ISO 7293:1997. If the engine has a revolution limit which is below that speed, the measurement shall be made at the maximum revolution speed stipulated by the manufacturer.

An engine speed indicator shall be used to check the speed of the engine. It shall have an accuracy of ±2,5 % of the reading. The indicator and its engagement with the hedge trimmer shall not affect the operation during the test.

For the sound pressure level measurement the shortest distance from an imaginary line drawn through the upper horizontal part of the front handle to the head mounted microphone shall be as close to 0,7 m as practicable.

For the sound power level determination, the cutting device shall be above the centre of the hemisphere.

D.5 Measurement uncertainties and declaration of noise emission values

When measuring the emission sound pressure level at the operator position, tests shall be repeated to attain the required grade of accuracy, and until three consecutive A-weighted results give values within not more than 2 dB. The arithmetic average of these shall be the measured A-weighted emission sound pressure level of the machine.

The uncertainties associated with the measurements shall be taken into account when deciding on the declared noise emission values.

NOTE The methodology used for taking uncertainties into account should be based on the use of measured values and measurement uncertainties. The latter are the uncertainty associated to the measurement procedure (which is determined by the grade of accuracy of the measurement method used) and the production uncertainty (variation of noise emission from one machine to another of the same type made by the same manufacturer).

D.6 Information to be recorded and reported

The information to be recorded and reported is that required by EN ISO 3744:1995 and EN ISO 11201:1995.

Annex E (informative)
Example of a material and construction fulfilling the requirements for an artificial surface

E.1 Material

Mineral fibre, 20 mm thick, having an airflow resistance of 11 kN·s/m^4 and a density of 25 kg/m^3.

E.2 Construction

As is shown in Figure E.1, the artificial flooring of the measurement site is sub-divided into nine joint planes, each of approximately 1,20 m × 1,20 m. The backing layer of the construction as shown in Figure E.1 consists of chipboard, 19 mm thick, coated with a plastics material on both sides. Such boards are used, for example, for the construction of kitchen furniture. The cut edges of the chipboards should be protected against moisture by applying a coat of plastic paint. The outsides of the flooring are boarded by a two-legged aluminium section, its leg height being 20 mm. Sections of this profile material are also screwed to the edges of the joint planes where they serve as spacers and attachment points.

On the middle joint plane on which the machine is placed during measurement as well as any other place on which the operator can get to stand on, aluminium T-sections with a leg length of 20 mm are mounted as spacers. These sections also provide exact markings which facilitate the alignment of the machine in the middle of the measurement site. The prepared boards are then covered with the mineral wool fibre material cut to size.

The felt flooring of the joint planes which are neither stood on nor driven over (type A surface in Figure E.1) are covered with a simple wire mesh fastened to the edge strips and to the attachment points; for this purpose, the sections should be provided with holes. Thus, the material is adequately attached, but it remains possible to replace the mineral wool fibre material should it become soiled. As a wire mesh, a so-called aviary wire with a mesh width of 10 mm and a wire diameter of 0,8 mm has proved to be suitable. This wire appears to project the surface adequately without affecting the acoustic conditions.

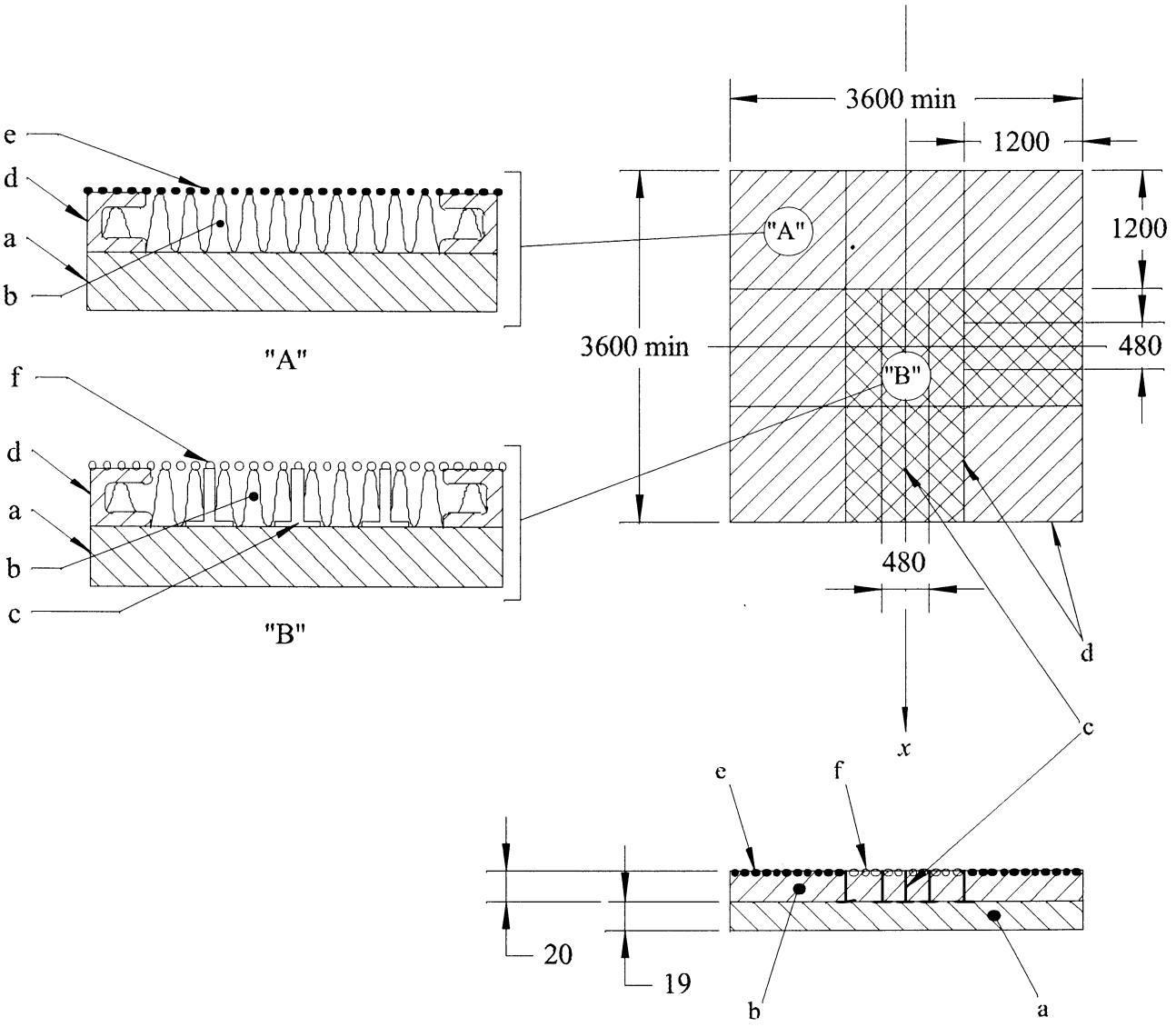
Protection by simple wire mesh is not, however, sufficient in the area subjected to traffic (type B surface in Figure E.1). For these surfaces, the use of wire grating of corrugated steel wire with a diameter of 3,1 mm and a mesh width of 30 mm has proved to be suitable.

The construction of the measurement site as described above offers two advantages: it can be prepared without much time and effort, and all the materials are easily obtainable.

The fact that the microphone positions are not situated directly above the flooring of the measurement site allows the microphones to be easily mounted on stands, assuming that the ground is even and hard as, for example, an asphalt or concrete site.

When arranging the microphones, account has to be taken of the fact that the height of the microphones has to be determined in relation to the surface of the flooring of the measurement site. It shall, therefore, be 40 mm higher when measuring from the ground under the microphone.

Dimensions in millimetres



KEY

"A"	This surface is not suitable to carry weight. Do not stand on or drive over
"B"	This surface is suitable to carry weight. May be stood on or driven over
a	Backing layer of plastics coated chipboard (nominally 19 mm thick)
b	Mineral wool fibre layer (nominally 20 mm thick)
c	Aluminimum T-sections (nominally 3 mm thick × 20 mm high)
d	Aluminimum U-sections (nominally 3 mm thick × 20 mm high)
e	Wire mesh (nominally 10 mm × 10 mm mesh made of 0,8 mm diameter steel wire)
f	Wire grating (nominally 30 mm × 30 mm mesh made of 3,1 mm diameter steel wire)

NOTE Unless otherwise stated, all dimensions are approximate.

Figure E.1 — Sketch of the measurement surface covered with an artificial surface
(not to scale)

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 Trade Association and supports essential requirements of "Machinery" Directive 98/37/EC, amended by Directive 98/79/EC.

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

The clauses of this standard are likely to support requirements of "Machinery" Directive.

Compliance with the clauses of this European Standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

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[1] CR 1030-1:1995, *Hand-arm vibration — Guidelines for vibration hazards reduction — Part 1: Engineering methods by design of machinery*.

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[3] EN ISO 11691:1995, *Acoustics — Measurement of insertion loss of ducted silencers without flow — Laboratory survey method* (ISO 11691:1995).

[4] EN ISO 11820:1996, *Acoustics — Measurements on silencers in situ* (ISO 11820:1996).

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