IEC 60335-2-91

Edition 3.0 2008-02

INTERNATIONAL STANDARD

Household and similar electrical appliances – Safety – Part 2-91: Particular requirements for walk-behind and hand-held lawn trimmers and lawn edge trimmers



IEC 60335-2-91:2008(E)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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CONTENTS

FOREWORD 4
INTRODUCTION 6

1 Scope 7
2 Normative references 7
3 Definitions 8
4 General requirement 9
5 General conditions for the tests 9
6 Classification 9
7 Marking and instructions 10
8 Protection against access to live parts 11
9 Starting of motor-operated appliances 11
10 Power input and current 11
11 Heating 11
12 Void 11
13 Leakage current and electric strength at operating temperature 11
14 Transient overvoltages 11
15 Moisture resistance 11
16 Leakage current and electric strength 12
17 Overload protection of transformers and associated circuits 12
18 Endurance 12
19 Abnormal operation 12
20 Stability and mechanical hazards 12
21 Mechanical strength 14
22 Construction 15
23 Internal wiring 17
24 Components 17
25 Supply connection and external flexible cords 17
26 Terminals for external conductors 18
27 Provision for earthing 18
28 Screws and connections 18
29 Clearances, creepage distances and solid insulation 18
30 Resistance to heat and fire 18
31 Resistance to rusting 18
32 Radiation, toxicity and similar hazards 19

Annexes 24
Annex B (normative) Appliances powered by rechargeable batteries 24
Annex D (normative) Thermal motor protectors 26
Annex I (normative) Motors having basic insulation that is inadequate for the rated voltage of the appliance 26

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Annex AA (informative) Safety signs and symbols which may be used on lawn trimmers and lawn edge trimmers 27
Annex BB (informative) Vibration 29
Annex CC (informative) Noise test code – Engineering method (grade 2) 34
Annex DD (informative) Example of a material and construction fulfilling the requirements for an artificial surface 40
Annex EE (informative) Safety instructions 42

Bibliography 44

Figure 101 – Guard, lawn trimmer (see 20.101.1) 20
Figure 102 – Guard, lawn edge trimmer (see 20.101.2) 21
Figure 103 – Guard strength test (hand-held appliances) 22
Figure 104 – Cutting head strength test (see 21.102) 22
Figure 105 – Cutting means measurement (see 22.103) 23
Figure BB.1 – Examples of transducer location/orientation (hand-held trimmers) 32
Figure BB.2 – Examples of transducer location/orientation (walk-behind machines) 33
Figure CC.1 – Microphone positions on the hemisphere (see Table CC.1) 35
Figure DD.1 – Sketch of the measurement surface covered with an artificial surface (not to scale) 41

Table CC.1 – Co-ordinates of microphone positions 36
Table CC.2 – Absorption coefficients 37

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-91: Particular requirements for walk-behind and hand-held lawn trimmers and lawn edge trimmers

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International Standard IEC 60335-2-91 has been prepared by IEC subcommittee 61F: Safety of hand-held motor-operated electric tools, of IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition cancels and replaces the second edition published in 2002. It constitutes a technical revision. Main changes in this edition include the revised endurance test in Clause 18; Annex B, which allows for battery-powered trimmers; and addition of informative Annexes BB, CC and EE on vibration, noise and safety instructions.

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The text of this standard is based on the following documents:

FDIS	Report on voting
61F/710/FDIS	61F/713/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

This part 2 is to be used in conjunction with the latest edition of IEC 60335-1 and its amendments. It was established on the basis of the fourth edition (2001) of that standard.

NOTE 1 When “Part 1” is mentioned in this standard, it refers to IEC 60335-1.

This part 2 supplements or modifies the corresponding clauses in IEC 60335-1, so as to convert that publication into the IEC standard: Safety requirements for walk-behind and hand-held lawn trimmers and lawn edge trimmers.

When a particular subclause of Part 1 is not mentioned in this part 2, that subclause applies as far as is reasonable. When this standard states “addition”, “modification” or “replacement”, the relevant text in Part 1 is to be adapted accordingly.

NOTE 2 The following numbering system is used:

– subclauses, tables and figures that are numbered starting from 101 are additional to those in Part 1;

– unless notes are in a new subclause or involve notes in Part 1, they are numbered starting from 101, including those in a replaced clause or subclause;

– additional annexes are lettered AA, BB, etc.

NOTE 3 The following print types are used:

– requirements proper: in roman type;

– *test specifications: in italic type;*

– notes: in small roman type.

Words in **bold** in the text are defined in Clause 3. When a definition concerns an adjective, the adjective and the associated noun are also in bold.

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
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- replaced by a revised edition, or
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A bilingual version of this publication may be issued at a later date.

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INTRODUCTION

It has been assumed in the drafting of this international standard that the execution of its provisions is entrusted to appropriately qualified and experienced persons.

This standard recognizes the internationally accepted level of protection against hazards such as electrical, mechanical, thermal, fire and radiation of appliances when operated as in normal use taking into account the manufacturer's instructions. It also covers abnormal situations that can be expected in practice and takes into account the way in which electromagnetic phenomena can affect the safe operation of appliances.

This standard takes into account the requirements of IEC 60364 as far as possible so that there is compatibility with the wiring rules when the appliance is connected to the supply mains. However, national wiring rules may differ.

If an appliance within the scope of this standard also incorporates functions that are covered by another part 2 of IEC 60335, the relevant part 2 is applied to each function separately, as far as is reasonable. If applicable, the influence of one function on the other is taken into account.

This standard is a product family standard dealing with the safety of appliances and takes precedence over horizontal and generic standards covering the same subject.

An appliance that complies with the text of this standard will not necessarily be considered to comply with the safety principles of the standard if, when examined and tested, it is found to have other features that impair the level of safety covered by these requirements.

An appliance employing materials or having forms of construction differing from those detailed in the requirements of this standard may be examined and tested according to the intent of the requirements and, if found to be substantially equivalent, may be considered to comply with the standard.

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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-91: Particular requirements for walk-behind and hand-held lawn trimmers and lawn edge trimmers

1 Scope

This clause of Part 1 is replaced by the following.

This International Standard deals with the safety of electric powered **walk-behind** and **hand-held lawn trimmers** and **lawn edge trimmers**, with **cutting element(s)** of non-metallic filament line or freely pivoting non-metallic cutter(s), with a kinetic energy of not more than 10 J each, used by a standing operator for cutting grass, their **rated voltage** being not more than 250 V for a.c. or 50 V d.c..

In this standard, **hand-held** and **walk-behind lawn trimmers** and **lawn edge trimmers** are referred to collectively as trimmer(s).

So far as is practicable, this standard deals with the common hazards presented by trimmers which are encountered by all persons in the normal use and reasonably foreseeable misuse of the trimmers.

NOTE 101 Attention is drawn to the fact that in many countries additional requirements are specified by the national health authorities, the national authorities responsible for the protection of labour, the national water supply authorities and similar authorities.

This standard does not apply to

– scissor type or **lawn trimmers** and **lawn edge trimmers** with **cutting means** other than those described above;
– self-propelled **lawn trimmers** or **lawn edge trimmers**;
– **lawn trimmers** or **lawn edge trimmers** which do not have a distance of at least 600 mm between the **cutting means control** and the **cutting head**;
– battery-powered trimmers fitted with batteries that have to be removed for charging.

NOTE 102 Requirements for tools with this type of battery can be found in Annexes K and L of IEC 60745-1.

EMC and environmental aspects, except noise, have not been considered in this standard.

NOTE 103 The method of calculating the kinetic energy for the purposes of this standard is given in 22.103.

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60068-2-75, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

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IEC 60320-2-3, *Appliance couplers for household and similar general purposes – Part 2-3: Appliance couplers with a degree of protection higher than IPX0*

ISO 354:2003, *Acoustics – Measurement of sound absorption in a reverberation room*

ISO 3744:1994, *Acoustics – Determination of sound power levels of noise sources using sound pressure – Engineering method in an essentially free field over a reflecting plane*

ISO 3767-1:1998, *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 8662-1:1988, *Hand-held portable power tools – Measurement of vibrations at the handle – Part 1: General*

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 12100-1:2003, *Safety of machinery – Basic concepts, general principles for design – Part 1: Basic terminology, methodology*

ISO 11688-1:1995, *Acoustics – Recommended practice for the design of low-noise machinery and equipment – Part 1: Planning*

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

3 Definitions

This clause of Part 1 is applicable except as follows.

3.1.9
Replacement:
normal operation
operation of the appliance at rated voltage with the load necessary to attain rated power input

NOTE The trimmer is operated at no-load. Automatic line extenders must be disabled.

3.5.2
Replacement:
hand-held appliance
appliance which is supported by hand, possibly assisted by wheel(s), skids or harness etc. and constructed such that it cannot maintain its operating position without being held by an operator

3.101
walk-behind appliance
appliance which is ground supported, controlled by an operator walking behind and constructed such that it maintains its operating position without being held by an operator

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3.102
lawn trimmer
grass trimming machine where the **cutting means** operates in a plane approximately parallel to the ground

3.103
lawn edge trimmer
grass trimming machine where the **cutting means** operates in a plane approximately perpendicular to the ground

3.104
cutting means
mechanism used to provide the cutting action in which one or more **cutting elements**, cutting by impact, rotate about an axis normal to the cutting plane

3.105
cutting element
single non-metallic filament line or freely pivoting non-metallic cutter

3.106
cutting head
support system for the **cutting element**

3.107
cutting means control
device activated by the operator's hand or finger, for controlling the cutting mean's movement

3.108
power switch
switch that controls the primary operating means of the trimmer

3.109
no-load
operation of the appliance at rated voltage with new **cutting means**, extendable monofilament line being trimmed to the maximum cutting length less 5 mm

4 General requirement

This clause of Part 1 is applicable.

5 General conditions for the tests

This clause of Part 1 is applicable.

6 Classification

This clause of Part 1 is applicable except as follows.

6.1 *Replacement:*

Appliances shall be of **class II** or **class III**.

Compliance is checked by inspection and by the relevant tests.

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6.2 *Addition:*

Walk-behind trimmers of **class II** or with **class II** parts shall be classified at least as IPX4.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 A*ddition:*

Add the following new indents:

– manufacturer's address or country of origin;
– year of manufacture, in 4 digits.

Add the following new paragraphs:

The following warnings shall be located in easily visible positions, indicating:

WARNING:
– Read instruction manual.
– Keep bystanders away.

Except for **walk-behind lawn trimmers** with 360 degree guarding, the machine shall also be marked with the following:

– Wear eye protection.

Mains-operated appliances shall also be marked with the substance of the following:

– Disconnect the mains plug if the cord is damaged or entangled.

Additionally, **hand-held lawn trimmers** and **hand-held lawn edge trimmers** shall be marked with the following:

– Do not expose to moisture.

Marking giving cautionary information shall be located as close as practicable to the relevant hazard. Such marking shall either be in one of the official languages of the country in which the appliance is to be sold or the safety signs and symbols according to Annex AA shall be used. Colours shall be in accordance with ISO 3767-1 and ISO 3767-3 and/or ISO 11684 as appropriate unless the symbols are cast, embossed or stamped when colours are not required. If symbols and/or safety signs are used, their significance shall be described in the instruction manual.

7.12 *Addition:*

An operator's manual shall be supplied with the machine. This shall include

a) a repeat of those warnings required to be marked on the appliance together with further explanation, where appropriate. Where symbols or safety signs are used in the marking on the appliance, their function shall be explained;
b) instructions for the proper assembly of the appliance for use, if the appliance is not supplied in a completely assembled form;
c) instructions for proper adjustment and maintenance of the appliance;
d) where parts are consumable, the part number of the replacement shall be specified;
e) instructions on the operation of all controls;

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f) advice on the use and type of extension cords to be used (not lighter than required by 25.7);

g) instructions for the safe operation, preparation, maintenance and storage of the appliance such as those given as an example in Annex EE.

8 Protection against access to live parts

This clause of Part 1 is applicable.

9 Starting of motor-operated appliances

This clause of Part 1 is not applicable.

10 Power input and current

This clause of Part 1 is not applicable.

11 Heating

This clause of Part 1 is applicable except as follows.

11.4 Not applicable.

11.5 *Replacement:*

The trimmer is operated in still air under normal load operation until a steady state is reached, the torque being applied is measured. While the torque is maintained, the voltage is then adjusted to 0,94 times the rated voltage or 1,06 times the rated voltage, whichever is the most unfavourable.

11.6 Not applicable.

11.7 *Replacement:*

Appliances are operated until steady conditions are established.

12 Void

13 Leakage current and electric strength at operating temperature

This clause of Part 1 is applicable.

14 Transient overvoltages

This clause of Part 1 is applicable.

15 Moisture resistance

This clause of Part 1 is applicable.

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16 Leakage current and electric strength

This clause of Part 1 is applicable.

17 Overload protection of transformers and associated circuits

This clause of Part 1 is applicable.

18 Endurance

This clause of Part 1 is replaced as follows.

18.101 Trimmers shall be so constructed that, in normal use, there will be no electrical or mechanical failure that might impair compliance with this standard. The insulation shall not be damaged and contacts and connections shall not work loose as a result of heating, vibrations, etc.

Moreover, overload protection devices shall not operate under normal running conditions.

Compliance is checked by the test of 18.102.

Immediately after the test, the tool shall withstand an electric strength test as specified in Clause 15. Connections shall not have worked loose, and there shall be no deterioration impairing safety in normal use.

18.102 The tool is operated at **no-load** for 15 h of operation at a voltage equal to 1,1 times rated voltage, and then for 15 h at a supply voltage equal to 0,9 times rated voltage. The trimmer may be operated for a number of periods, each period being not less than 7 h.

During this test, the trimmer is maintained according to the instruction manual and replacement of the carbon brushes is allowed.

During these tests, overload protection devices shall not operate.

19 Abnormal operation

This clause of Part 1 is applicable except as follows.

19.7 Not applicable.

20 Stability and mechanical hazards

This clause of Part 1 is applicable except as follows.

20.2 *Replacement:*

All power driven transmission parts (other than the **cutting means**) shall be guarded to prevent the operator's contact with these parts.

The principles set out in ISO 12100-1 shall be followed when developing a guarding system.

All guards shall be either permanently attached, or secured to prevent removal without the use of tools in accordance with 3.25.1 of ISO 12100-1, or the construction of the appliance

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shall be such that it cannot be used without the guard in its guarding position in accordance with 3.25.4 of ISO 12100-1.

Compliance is checked by inspection.

20.101 Guarding of cutting means

20.101.1 Lawn trimmers

Lawn trimmers shall be guarded on the operator's side, as a minimum, to the extent shown in Figure 101.

The radius X of the guard shall not be smaller than the major swept radius of the **cutting head** and the guard shall extend beyond the plane of the **cutting element** by at least 3 mm for **walk-behind lawn trimmers** and 10 mm for **hand-held lawn trimmers**. The guard shall extend at least 45° from the axis of the handle on the side where the **cutting element** is moving away from the operator and at least 90° from the axis of the handle on the side where the **cutting element** is moving towards the operator. The vertices of these angles lie on the axis of the **cutting head** spindle.

If the guarding is less than a total of 360°, the direction of rotation of the **cutting element**(**s**) shall be marked on the **lawn trimmer**.

Compliance is checked by inspection and measurement.

20.101.2 Lawn edge trimmers

Lawn edge trimmers shall be guarded, as a minimum, to the extent shown in Figure 102. The radius X of the guard shall not be smaller than the major swept radius of the **cutting head**. The guard shall extend beyond the plane of the **cutting element** by at least 10 mm. With the **lawn edge trimmer** in its normal position of use, the guard shall extend a minimum of 90° from the vertical towards the ground on the side where the **cutting element** is moving upwards and a minimum of 45° from the vertical towards the ground on the side where the **cutting element** is moving downwards. The vertices of these angles lie on the axis of the **cutting head** spindle.

If the guarding is less than a total of 360°, the direction of rotation of the **cutting elements** shall be marked on the **lawn edge trimmer**.

Compliance is checked by inspection and measurement.

20.101.3 Guarding of cutting means

All guards shall be imperforate and shall be either permanently attached or secured to prevent removal without the use of tools in accordance with 3.25.1 of ISO 12100-1, or the construction of the appliance shall be such that it cannot be used without the guard in its guarding position in accordance with 3.25.4 of ISO 12100-1.

Compliance is checked by inspection.

20.102 Controls

Controls, where the purpose is not obvious to the user, shall have the function, direction and method of operation clearly identified by a durable marking.

Detailed instructions on the operation of all controls shall be provided in the instruction handbook.

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21 Mechanical strength

This clause of Part 1 is applicable except as follows.

21.1 *Replace the second paragraph by the following:*

The compliance of **cutting means** guards is checked by the tests of 21.101 and the compliance of **cutting heads** is checked by the tests of 21.102. Other parts of the appliance are checked by applying blows to the appliance by means of the spring-operated impact test apparatus described in IEC 60068-2-75.

Replace value of impact in the third paragraph with 1,0 J ± 0,05 J.

21.101 Strength and rigidity of cutting means guard

The mechanical strength and rigidity of the **cutting means** guard shall be adequate for normal use.

Before the test, the temperature of the parts to be tested are stabilized to an ambient temperature of 20 °C ± 3 °C.

Compliance shall be checked by the tests given in 21.101.1, 21.101.2 and 21.101.3.

21.101.1 The rigidity of the cutting means guard is checked by applying a force, at any point, equivalent to the weight of the lawn trimmer in the most unfavourable direction for 30 s.

During and after the test, the guard shall not distort or have become detached, nor shall it show any visible cracks. The screws and retaining clips shall still be secure and the requirements of 21.101.1 and 21.101.2 shall still be met.

21.101.2 The strength of cutting means guards of **walk-behind lawn trimmers** and **walk-behind lawn edge trimmers** is tested by means of a ball impact test.

Each of three samples of the complete appliance is subjected to an impact of 6,5 J ± 0,2 J on a part of the guard likely to be the weakest, with the trimmer resting on a smooth, rigid, level surface.

The tests are conducted so that, in each test, the sample receives an impact in a location different from the other two tests.

The impact is produced with a smooth steel sphere (as used for ball bearings) having a diameter of 50 mm ± 0,8 mm. If the part to be tested is at an angle of up to 45° to the horizontal, the sphere is allowed to fall vertically from rest to strike the part. Otherwise, the sphere is suspended by a cord and is allowed to fall from rest as a pendulum to strike the part. In either case, the vertical travel of the sphere is to be 1 300 mm ± 3 mm.

After the tests, the guard shall not have become detached nor shall it show any visible cracks. The screws and retaining clips shall still be secure and the requirements of 20.101.1 and 20.101.2 shall still be met.

21.101.3 The strength of the cutting means guards of **hand-held lawn trimmers** and **hand-held lawn edge trimmers** is tested by means of the following drop test.

One sample of the complete appliance without the supply cord is dropped three times so that the guard falls through a vertical distance of 900 mm ± 2 mm onto a smooth horizontal concrete surface in such a manner as to test the guard most severely. A string shall be used

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to suspend the appliance so that the desired orientation of the appliance is achieved. Cutting the string will allow the appliance to fall in the correct orientation to test the guard of the **cutting head** (see Figure 103).

After the tests, the guard shall not have become detached nor shall it show any visible cracks. The screws and retaining clips shall still be secure and the requirements of 20.101.1 and 20.101.2 shall still be met.

21.102 Strength of the cutting head

The mechanical strength of the **cutting head** shall be adequate for normal use. Before the test, the temperature of the parts to be tested shall be stabilized to an ambient temperature of 20 °C ± 3 °C.

Compliance shall be checked by the test given below.

*One sample of the complete appliance is dropped so that the **cutting head**, in a horizontal plane, falls through a vertical distance to make contact with a rigidly supported horizontal steel block. The drop height is 900 mm ± 2 mm for **hand-held lawn trimmers** and **hand-held lawn edge trimmers,** and 250 mm ± 2 mm for **walk-behind lawn trimmers** and **walk-behind lawn edge trimmers**. A string shall be used to suspend the appliance so that the desired orientation of the appliance is achieved. Cutting the string will allow the appliance to fall in the correct orientation to test the **cutting head** (see Figure 104).*

Damage to other parts during this test shall be ignored.

It is not necessary for the appliance to be operable after the test.

If the appliance is operable, then, immediately following the test, the appliance shall be run at its maximum speed for 30 s both with and without **cutting elements**.

If the appliance is not operable and the **cutting head** is not visibly damaged, all parts of the **cutting head** that are replaceable by the user and which can be transferred are fitted to a new appliance. This new appliance is then run at its maximum speed for 30 s both with and without **cutting elements**.

No parts shall become detached and no visible cracks shall have developed.

22 Construction

This clause of Part 1 is applicable except as follows.

22.36 *Addition:*

Hand-held lawn trimmers and **hand-held lawn edge trimmers** shall have at least one handle.

All **hand-held lawn trimmers** and **hand-held lawn edge trimmers** with a mass of more than 3,5 kg shall have two handles and the distance between the centres of the two handles shall be at least 250 mm.

This measurement of 250 mm does not apply to two handled **lawn trimmers** or **lawn edge trimmers** with a mass of 3,5 kg or less.

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Additionally, all **hand-held lawn trimmers** and **hand-held lawn edge trimmers** with a mass of more than 6 kg shall also have at least a single shoulder harness and those with a mass of more than 7,5 kg shall have a double shoulder harness.

The mass of the appliance shall be determined in its heaviest condition of normal use as specified in the instruction manual and without cable or harness.

The gripping surface of any handle required by this standard shall be at least 100 mm long.

If the part containing the motor complies with the 100 mm dimension, it may be considered as a handle.

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

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

– for handles with a periphery (not including the support) of less than 80 mm, the gripping length shall be the sum of the two parts either side of the support;
– for handles with a periphery (not including the support) of 80 mm or more, the gripping length shall be the complete length from end to end.

Where appropriate, the part of the handle containing the **cutting means 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 the handle gripping length.

Compliance is checked by inspection and measurement.

22.40 *Replacement:*

A **cutting means control** shall be provided and this shall require two separate and dissimilar actions before the **cutting elements** can be driven, or the control shall be guarded to prevent inadvertent operation. There shall be no means of locking this control in the "on" position and the movement of the **cutting element** shall come to rest after the control is released.

Compliance shall be checked by inspection and, for a guarded **cutting means control**, it shall not be possible to operate the control by means of a 100 mm ± 1 mm diameter sphere.

22.101 A cutting means shall consist of one or more non-metallic cutting elements mounted on or emerging from a generally circular cutting head.

Compliance is checked by inspection.

22.102 A cutting element shall consist of one of the following:

a) a non-metallic filament line or,
b) a non-metallic freely pivoting cutter.

Appliances having **cutting means** using one or more **cutting elements** of continuous filament line (e.g. wound on a spool contained either in the **cutting head** or other attachment) shall incorporate a means to automatically limit the line to its correct operating length after the line has been extended and/or the appliance is operated.

The manufacturer shall not supply metallic **cutting elements** which can replace the non-metallic ones.

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Compliance is checked by inspection.

22.103 A cutting element shall have a kinetic energy of not more than 10 J.

Compliance is checked by inspection, measurement and test. Polyamide **cutting elements** are stored for at least seven days in a humidity cabinet under the same conditions as those required for the test of 15.3 before carrying out the test and measurement.

For the purposes of this standard, the kinetic energy shall be determined by means of the following formula:

$$kinetic\ energy = ½\ mv^2\ (J)$$

where

m is the mass of the length L of the **cutting element**, in kilograms (see Figure 105);

v is the maximum attainable velocity of point Z which is half-way along the length L of the **cutting element**, in metres per second.

Therefore: $v = 0{,}1047\ n\ (r – (L/2))$

where

n is the maximum rotational speed with a full length of line or a new cutter fitted, in revolutions per minute;

r is the distance from the axis of rotation of the **cutting head** to the outer tip of the **cutting means**, in metres;

L is the measured length of the **cutting element**, in metres.

23 Internal wiring

This clause of Part 1 is applicable.

24 Components

This clause of Part 1 is applicable except as follows.

24.1.3 *Addition:*

Switches operated by the **cutting means control** to energise the motor shall have a total contact separation of at least 3 mm. This shall be achieved either by single or double pole disconnection. Switches shall have been satisfactorily tested for at least 50 000 operations.

25 Supply connection and external flexible cords

This clause of Part 1 is applicable except as follows.

25.1 *Addition:*

Appliance inlets shall not allow the introduction of a connector complying with the standard sheets of IEC 60320 except for IEC 60320-2-3.

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25.5 *Replacement:*

Appliances shall be provided with one of the following:

– a supply cord not less than 6 m in length with type X attachment, or
– a supply cord of length not exceeding 0,5 m with type X or Y attachment and terminating in a cable coupler, or
– an appliance inlet.

25.7 *Replace the first paragraph by the following:*

Supply cords shall be not lighter than:

– if rubber insulated, ordinary tough rubber sheathed flexible cord (code designation 60245 IEC 53);
– if polyvinyl chloride insulated, ordinary polyvinyl chloride sheathed flexible cord (code designation 60227 IEC 53).

26 Terminals for external conductors

This clause of Part 1 is applicable.

27 Provision for earthing

This clause of Part 1 is applicable.

28 Screws and connections

This clause of Part 1 is applicable.

29 Clearances, creepage distances and solid insulation

This clause of Part 1 is applicable.

29.2 *Addition:*

Pollution degree 3 applies for this machine.

30 Resistance to heat and fire

This clause of Part 1 is applicable except as follows.

30.2.3 Not applicable.

31 Resistance to rusting

This clause of Part 1 is replaced by the following.

Ferrous parts, the rusting of which might cause the tool to fail to comply with this standard, shall be adequately protected against rusting.

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Compliance is checked by the following test:

All grease is removed from the parts to be tested by immersing them in a suitable degreasing agent for 10 min.

The parts are then immersed for 10 min in a 10 % solution of ammonium chloride in water at a temperature of (20 ± 5) °C.

Without drying, but after shaking off any drops, the parts are placed for 10 min in a box containing air saturated with moisture at a temperature of (20 ± 5) °C.

After the parts have been dried for 10 min in a heating cabinet at a temperature of (100 ± 5) °C, their surfaces shall show no signs of rust.

When using the liquids specified for the test, adequate precautions must be taken to prevent the inhalation of their vapours.

Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.

For small helical springs and the like, and for parts exposed to abrasion, a layer of grease may provide sufficient protection against rusting. Such parts are only subjected to the test if there is doubt about the effectiveness of the grease film, and the test is then made without previous removal of the grease.

32 Radiation, toxicity and similar hazards

This clause of Part 1 is applicable.

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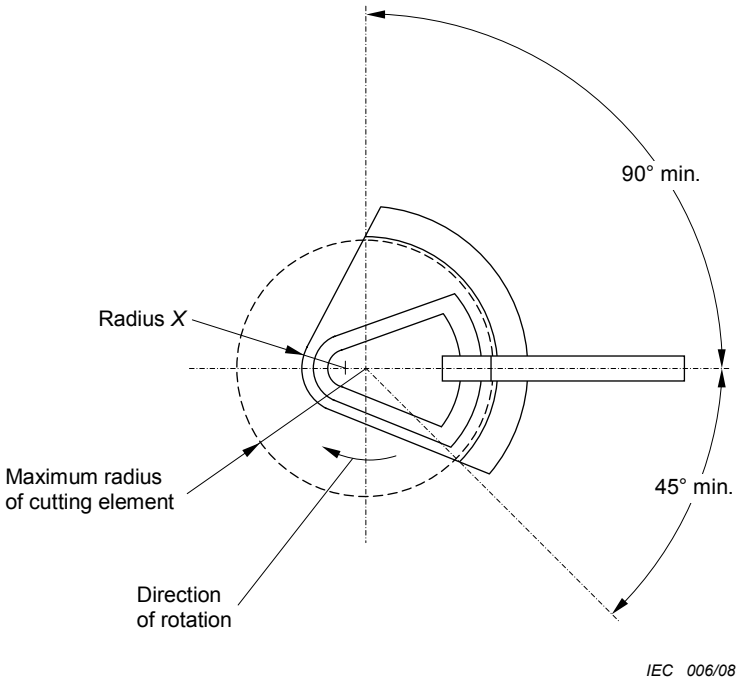


Figure 101a – Plan view

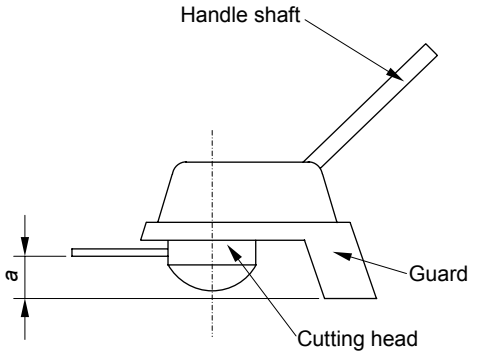


Figure 101b – Side view

NOTE 1 For reasons of clarity, any skids or wheels are not shown on the figure. The figure is not intended to govern design except as regards the dimensions and specific requirements shown.

NOTE 2 Figures are not to scale.

NOTE 3 If the direction of rotation is reversed, the 45° and 90° guard extensions must be transposed.

Figure 101 – Guard, lawn trimmer (see 20.101.1)

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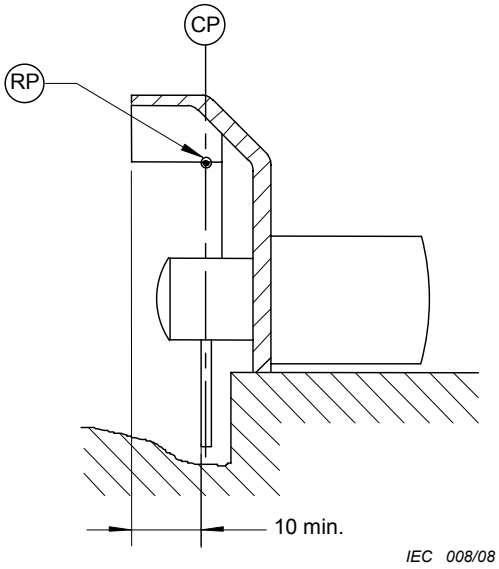


Figure 102a – Part section at AA (guard only)

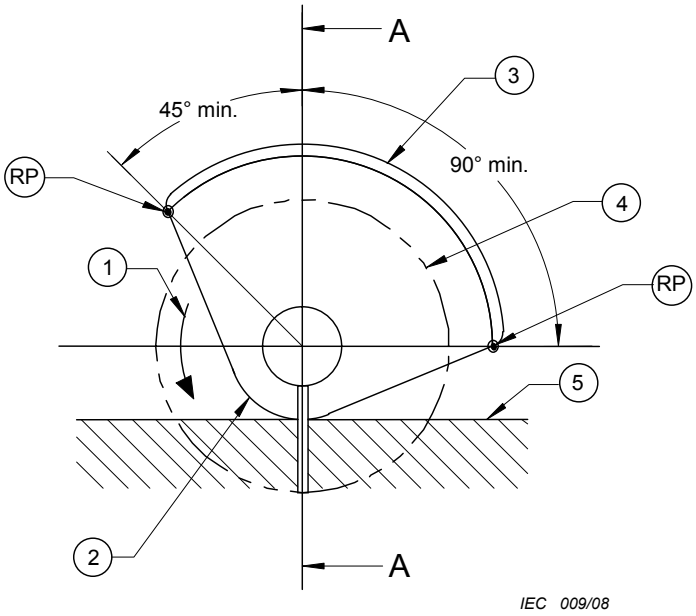


Figure 102b – View towards cutting means

Key

1 direction of rotation

2 radius "*Y*"

3 guard

4 maximum radius of cutting element

5 plane of lawn edge

NOTE 1 For reasons of simplification, the handle and any skids or wheels are not shown in the figures. The figures are not intended to govern the design except as regards the dimensions and the specific requirements shown.

NOTE 2 Figures are not to scale.

NOTE 3 If the direction of rotation is reversed, the 45° and 90° guarding requirements are transposed.

NOTE 4 The reference point "RP" is where the centre plane of **cutting element** "CP" intersects the outer guard edge

Figure 102 – Guard, lawn edge trimmer (see 20.101.2)

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Dimensions in metres

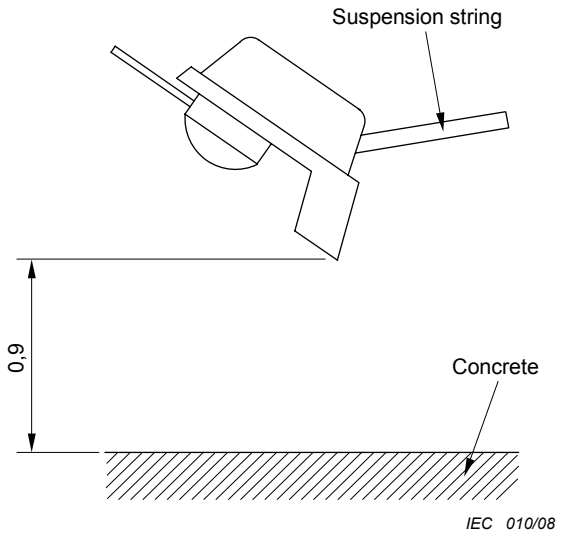


Figure 103 – Guard strength test (hand-held appliances)

Dimensions in metres

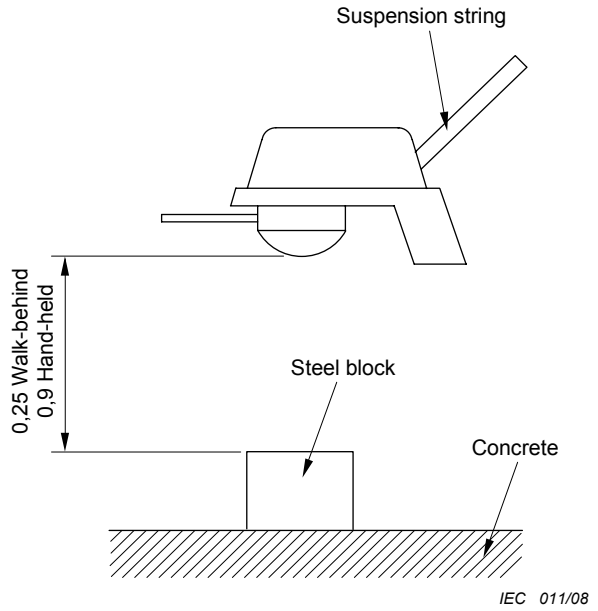


Figure 104 – Cutting head strength test (see 21.102)

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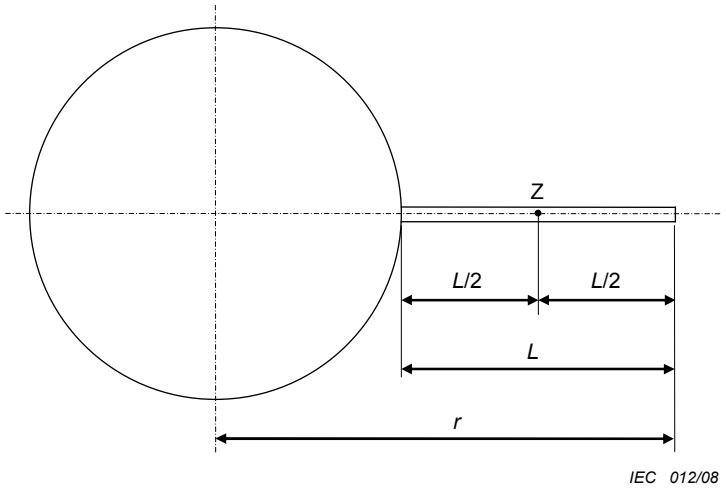


Figure 105a – Filament line

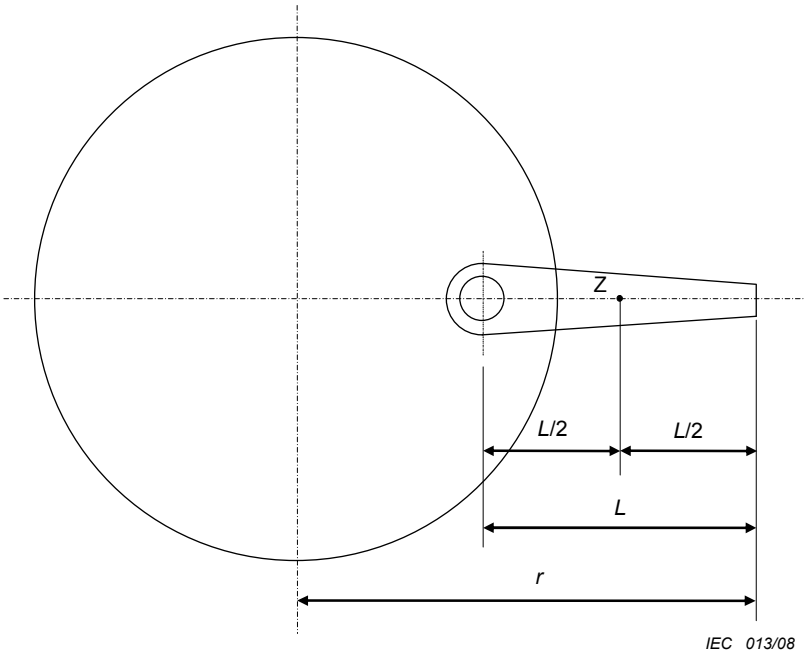


Figure 105b – Pivoting cutter

Figure 105 – Cutting means measurement (see 22.103)

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Annexes

The annexes of Part 1 are applicable except as follows:

Annex B
(normative)

Appliances powered by rechargeable batteries

Part 1 applies, as indicated in this part 2, with the following modifications.

3.1.9
normal operation

operation of the appliance under the following conditions:

– the trimmer, supplied by its fully charged battery, is operated at no load. Automatic line extenders shall be disabled;
– the battery is charged, the battery being initially discharged to such an extent that the appliance cannot operate;
– if possible, the appliance is supplied from the supply mains through its battery charger, the battery being initially discharged to such an extent that the appliance cannot operate. The trimmer is operated at no load. Automatic line extenders shall be disabled;
– if the appliance incorporates inductive coupling between two parts that are detachable from each other, the appliance is supplied from the supply mains with the **detachable part** removed.

7.1 *Modification:*

Delete 3rd indent.

11 Heating

This clause of Part 1 is not applicable.

18 Endurance

This clause of Part 1 is not applicable.

22.40 *Addition:*

Battery-powered trimmers shall either have a disabling device, or the **cutting means control** shall require two separate and dissimilar actions before the **cutting means** can be powered. For the purposes of this standard, a battery that can be removed without the use of tools is considered to be a disabling device.

Compliance is checked by inspection.

It shall not be possible for the trimmer to operate whilst the battery is being charged. This condition is considered to be met if the charger is so low powered that it can not operate a trimmer when the battery is discharged.

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Compliance shall be checked by the following test.

Starting with a fully charged battery, run the trimmer continuously until the trimmer will no longer operate the cutting means. While still holding the switch in the "on" position, connect the charger. The cutting means shall not move within 5 s of connecting the charger.

24 Components

24.1.3 This subclause of Part 1 is not applicable.

24.101 Power switches

24.101.1 Power switches shall have adequate breaking capacity.

Compliance is checked by subjecting a switch to 50 operations of making and breaking the locked output mechanism current of the fully charged battery-operated tool, each "on" period having a duration of not more than 0,5 s and each "off" period having a duration of at least 10 s.

After this test, the power switch shall have no electrical or mechanical failure. If the switch operates properly in the on and off positions at the end of the test, it is considered to have no mechanical or electrical failures.

24.101.2 Power switches shall withstand, without excessive wear or other harmful effect, the mechanical, electrical, and thermal stresses occurring in normal use.

Compliance is checked by subjecting a switch to 6 000 cycles of operation making and breaking the current encountered in the fully charged battery tool operated at ***no-load****. The switch is operated at a uniform rate of 30 operations per minute. During the test, the switch shall operate correctly. After the test, inspection of the switch shall show no undue wear, no discrepancy between the position of the operating means and that of the moving contacts, no loosening of electrical or mechanical connections, no seepage of sealing compound.*

25.1 This subclause of Part 1 applies without the addition of this part 2.

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Annex D
(normative)

Thermal motor protectors

This annex of Part 1 is not applicable.

Annex I
(normative)

Motors having basic insulation that is inadequate for the rated voltage of the appliance

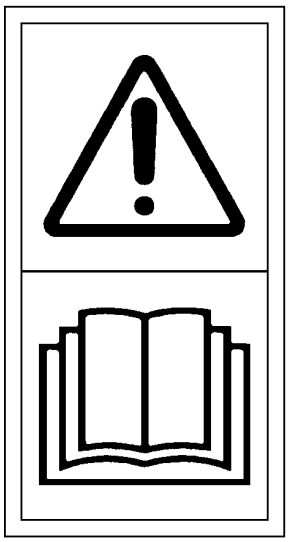
This annex of Part 1 is not applicable.

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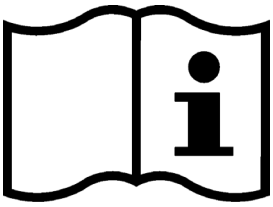
Annex AA
(informative)

Safety signs and symbols which may be used on lawn trimmers and lawn edge trimmers

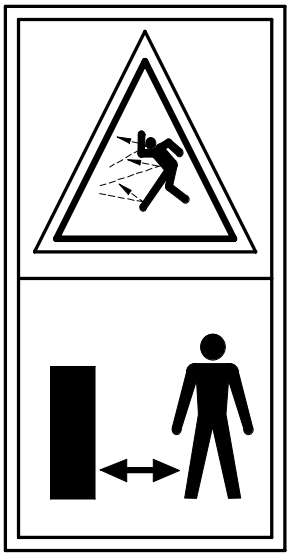
AA.1 Read operator's manual



NOTE The symbol in the lower half of this pictogram may be replaced by the symbol shown in 7.6 (symbol 1641 of ISO 7000)



AA.2 Keep bystanders away



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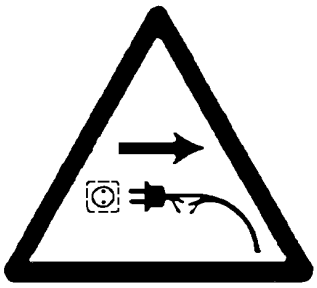
AA.3 Wear eye protection



AA.4 Do not expose to moisture



AA.5 Disconnect the mains plug if the cord is damaged or entangled



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Annex BB
(informative)

Vibration

BB.1 Quantities to be measured

The values measured shall be:

– acceleration according to 3.1 of ISO 8662-1:1988, presented as weighted acceleration a_{hW} according to 3.3 of ISO 8662-1:1988;

– rotational speed of the engine.

BB.2 Instrumentation

BB.2.1 General

For specification of instrumentation, see 4.1 of ISO 8662-1:1988.

BB.2.2 Transducer

For specifications of transducer, see 4.1 of ISO 8662-1:1988.

BB.2.3 Fastening of transducer

Fastening of transducer shall be in accordance with 4.2 of ISO 8662-1:1988.

BB.2.4 Calibration

Calibration shall be made in accordance with 4.8 of ISO 8662-1:1988.

BB.3 Measurement direction and measurement location

BB.3.1 Measurement direction

Measurements shall be made on each handle for the three directions *x*, *y* and *z* (see Figure BB.1 for **hand-held** trimmers and Figure BB.2 **for walk-behind** trimmers).

BB.3.2 Measurement location

Typical locations of the transducer assemblies and directions of measurement are shown in Figure BB.1 for **hand-held** trimmers and Figure BB.2 for **walk-behind** trimmers.

BB.4 Test procedure

BB.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. If the **cutting means** is a monofilament that fed from a coil held by the **cutting head**, the length of the rotating **cutting means** shall be adjusted to be approximately 5 mm less than the maximum length.

The machine shall be run until stable conditions are reached before the test is commenced. All speed-setting devices shall be adjusted to the highest figure.

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The rated voltage or the upper limit of the rated voltage range and/or frequency shall be maintained during the test at 0,98 to 1,02 times the stated values. The supply voltage of mains-powered machines is measured at the plug of the cable or cord supplied, not at the plug of any extension cable or cord. Battery-powered machines shall be powered by an external power source maintained at the nominal voltage of the battery.

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

Automatic line extenders shall be disabled.

BB.4.2 Measurement procedure

For each handle, a series of five tests shall be carried out using one operator.

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

Measurement for the three directions (see Clause BB.3) shall be made simultaneously.

BB.4.2.1 Hand-held trimmers

Adjustable handle(s) shall be set to the mid-position. If a harness is provided, it shall be used during the test. The machine handle(s) shall be held in the normal operating position with the plane of the **cutting means** parallel or perpendicular to the ground, as appropriate, and within 50 mm of the ground. The **cutting means** shall be free of all obstructions.

BB.4.2.2 Walk-behind trimmers

Adjustable handles shall be set to suit the operator. The cutting height shall be set to 30 mm or the next higher cutting position when set on a hard level surface. Machines with a maximum cutting height setting of 30 mm or less shall be set at their maximum height setting.

Measurements shall be carried out on 19 mm plywood covered with coconut matting nailed to the plywood. The coconut matting shall have approximately 20 mm high fibres embedded in a PVC base weighing approximately 7 000 g/m^2.

The measurements shall be carried out with an operator who shall be 1,75 m ± 0,05 m tall.

BB.5 Determination of the measurement result

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

BB.6 Reduction as a safety requirement

BB.6.1 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;

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– 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.

BB.6.2 Reduction by information

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

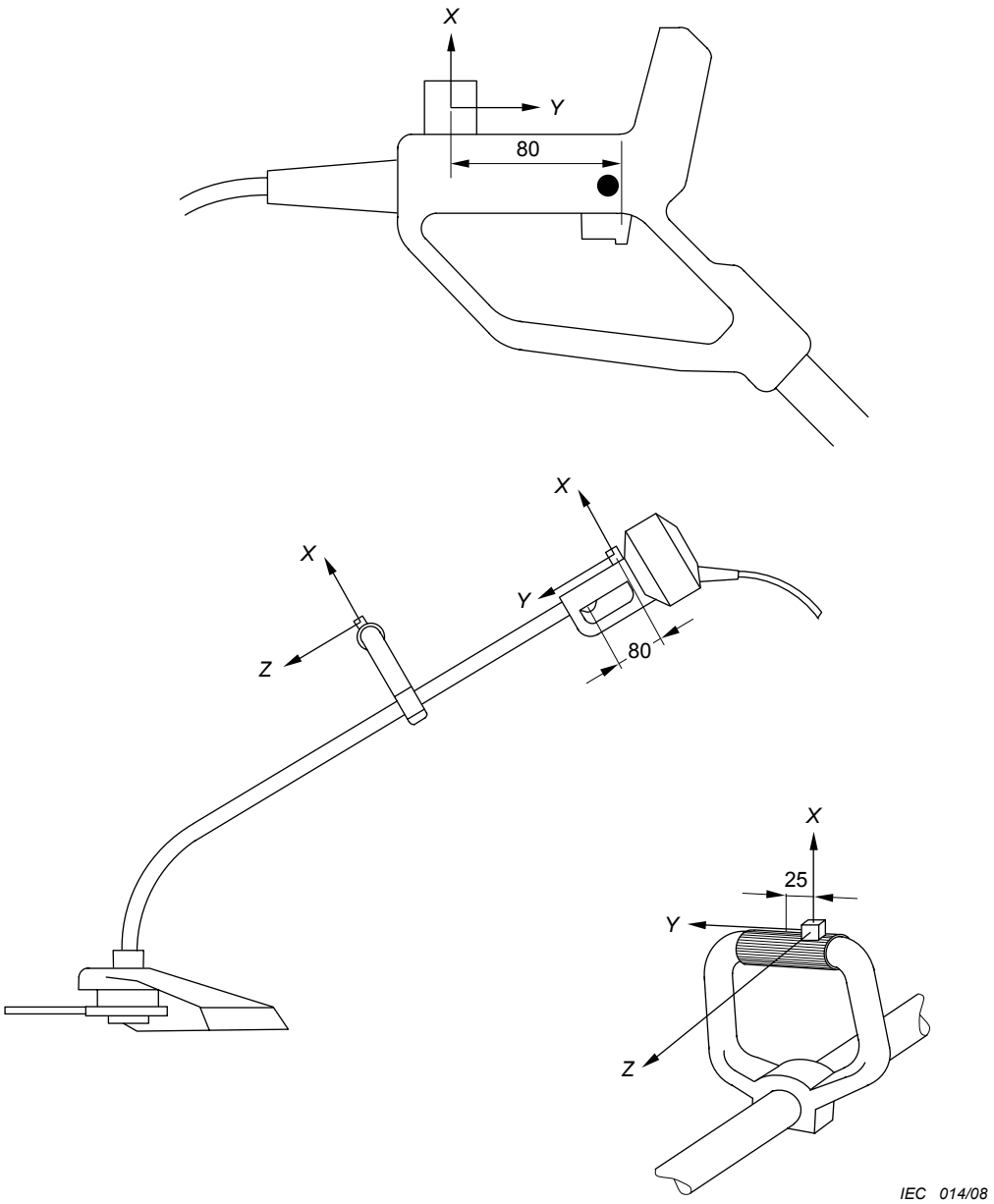
– the use of low-vibration operating modes, and/or limited time of operation;
– the wearing of personal protection equipment (PPE).

BB.6.3 Vibration measurement

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

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Dimensions in millimetres

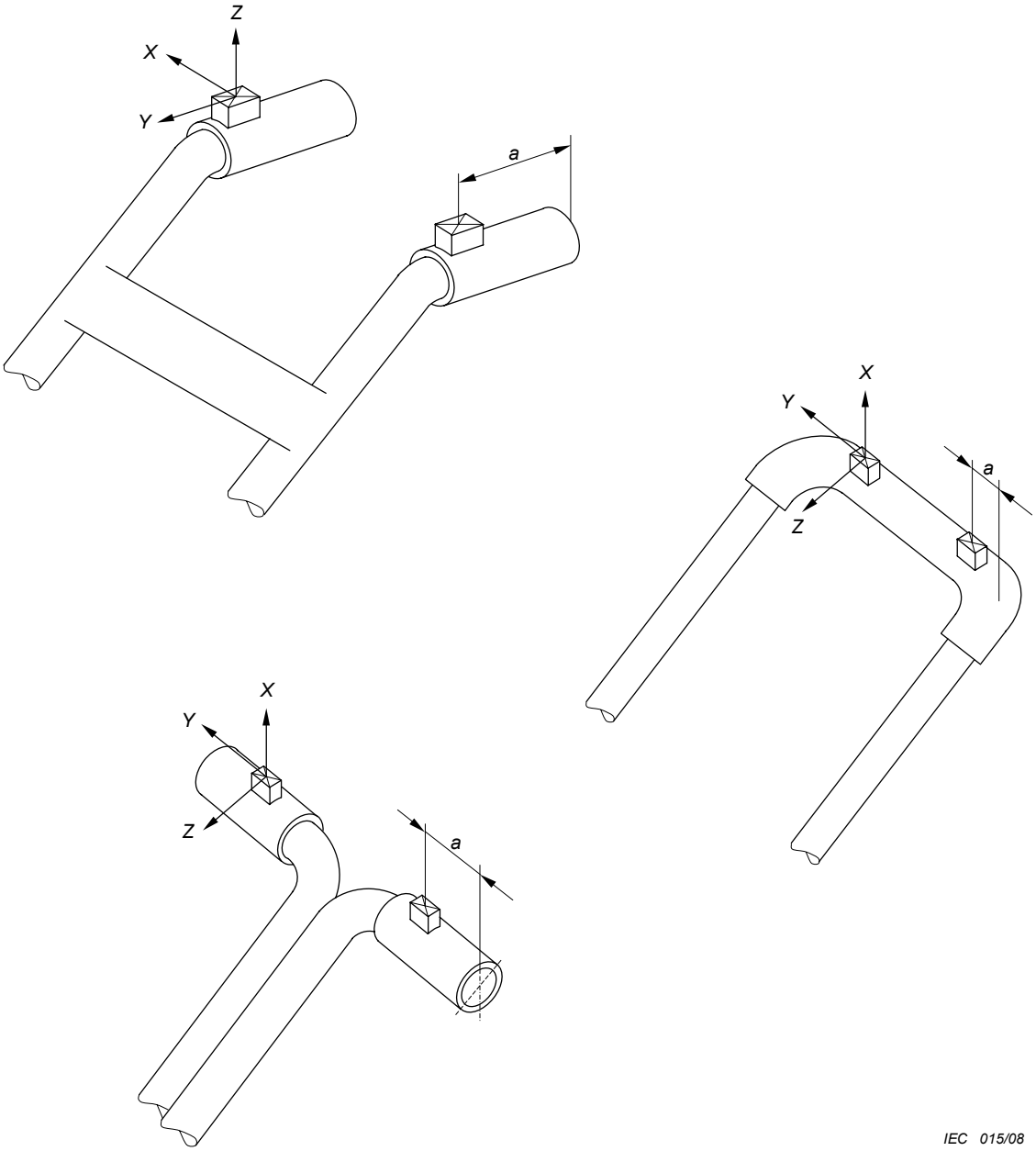


NOTE If the measurements of 80 mm cannot be obtained, the transducer is placed at the rear end of that portion of the handle intended to be grasped. If the measurement of 25 mm cannot be obtained, the transducer must be placed as close as possible to this position, avoiding contact with the hand.

Figure BB.1 – Examples of transducer location/orientation (hand-held trimmers)

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Dimensions in millimetres



Key

a = 100

Figure BB.2 – Examples of transducer location/orientation (walk-behind machines)

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Annex CC
(informative)

Noise test code – Engineering method (grade 2)

CC.1 Scope

This noise test code specifies the information necessary to carry out efficiently and under standardised conditions the determination of the noise emission characteristics of hand-held and **walk-behind lawn trimmers** and **lawn edge 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.

CC.2 A-weighted sound power level determination

For the determination of the A-weighted sound power level, ISO 3744:1994 shall be used subject to the following modifications or additional requirements:

– the reflecting surface shall be replaced by an artificial surface which complies with CC.4.1 or by natural grass which complies with CC.4.2. 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, which depends on the width of cut of the machine under test and which shall be:

  r = 4 m for machines with a width of cut up to 1,2 m;

  r = 10 m for machines with a width of cut exceeding 1,2 m;

– the microphone array shall be six microphone positions as defined in Figure CC.1 and Table CC.1;

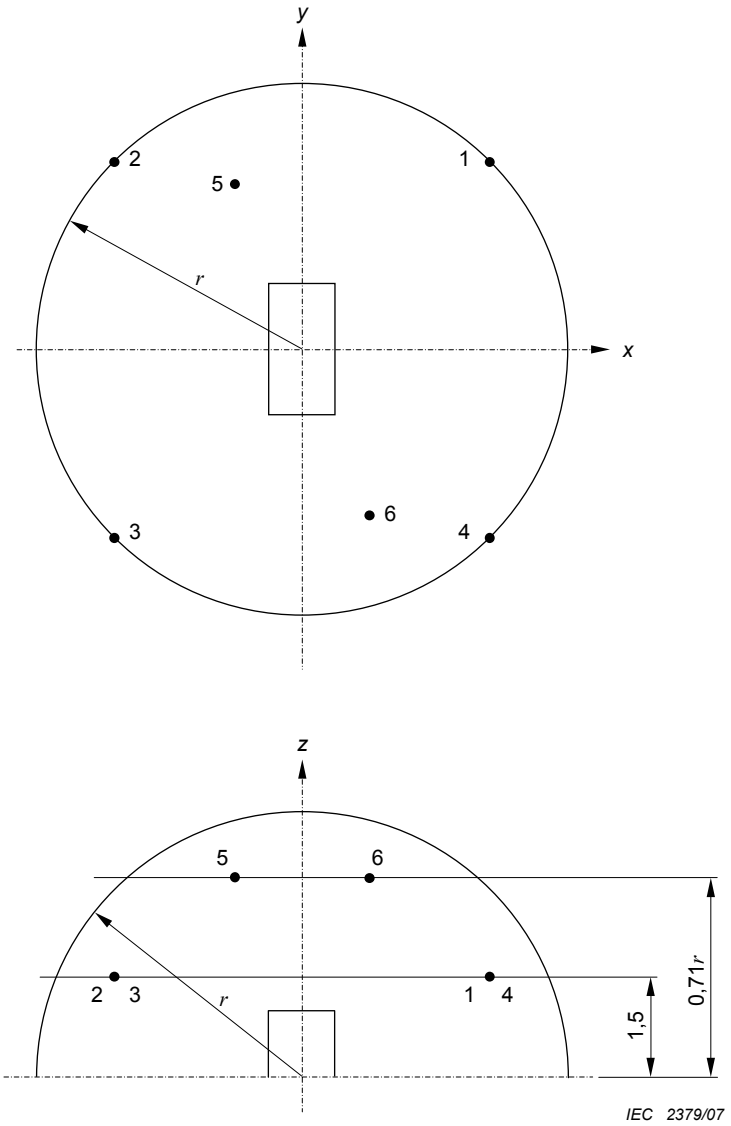
– environmental conditions shall be within the limits specified by the manufacturers of the measuring equipment. The ambient air temperature shall be in the range from 5 °C to 30 °C and the wind speed shall be less than 8 m/s and preferably less than 5 m/s;

– for measurements in the open air, K_{2A} shall be taken as 0;

– for measurements indoors, the value of K_{2A}, determined without artificial surface and in accordance with Annex A of ISO 3744:1994, shall be ≤ 2 dB, in which case K_{2A} shall be taken as 0.

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Dimensions in metres



Key

r radius of hemisphere

Figure CC.1 – Microphone positions on the hemisphere (see Table CC.1)

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Table CC.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*

Microphones numbered 1 to 4 are not exactly on the hemisphere but a little bit outside. For the determination of the measured sound power level:

– microphones shall be set at the positions specified in the table;

– the area of the measurement surface to take into account is that of a hemisphere with a radius of 4 m, so assuming that all microphones are on this hemisphere.

CC.3 A-weighted emission sound pressure level measurement

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

– The reflecting surface shall be replaced by an artificial surface which complies with CC.4.1 or by natural grass which complies with CC.4.2. 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 operator stands upright and looks straight ahead. 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.

  - For **walk-behind** trimmers, the microphone shall be aimed with its axis of maximally flat response (as specified by the manufacturer) pointing forwards and at an angle of 45° downwards from the horizontal.
  - For **hand-held** trimmers, the microphone shall be aimed with its axis of maximally flat response (as specified by the manufacturer) pointing at the front handle of the trimmer.

CC.4 Requirements for test floor

CC.4.1 Artificial surface

The artificial surface shall have absorption coefficients as given in Table CC.2, measured in accordance with ISO 354:2003.

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Table CC.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 DD for an example of a material and construction which can be expected to fulfil these requirements.

CC.4.2 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.

CC.5 Installation, mounting and operating conditions

Measurements shall be carried out on a new, normal production machine featuring standard equipment as provided with the machine. If the **cutting means** is a monofilament that is fed from a coil held by the **cutting head**, the length of the rotating **cutting means** shall be adjusted to be approximately 5 mm less than the maximum length".

Automatic line extenders shall be disabled.

The machine shall be run until stable conditions are reached before the test is commenced. All speed-setting devices shall be adjusted to the highest figure.

For electric motors supplied from mains:

– the rated voltage of the upper limit of the rated voltage range and/or frequency shall be maintained during the test at 0,98 to 1,02 times the stated values;

– the supply voltage of mains-powered trimmer or lawn edge trimmer is measured at the plug of the cable or cord supplied, not at the plug of any extension cable or cord.

For electric motors supplied from batteries:

– noise measurements shall be started with fully charged batteries as specified by the user instructions but shall not be continued when the battery voltage under load drops to lower than 0,9 times the battery voltage under load at the beginning of the measurements for lead-acid batteries, or to lower than 0,8 times for other batteries;

– the battery voltage shall be measured at the battery terminals.

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

Measurements shall be made with maximum motor speed. If the trimmer has a governor which is below that speed, the measurement shall be made at the maximum revolution speed stipulated by the user instructions with the **cutting means** engaged.

Adjustable handle(s) shall be set to the mid-position. If a harness is provided, it shall be used during the test. The machine handle(s) shall be held in the normal operating position with the plane of the **cutting means** parallel or perpendicular to the ground, as appropriate, and within 50 mm of the ground. The **cutting means** shall be free of all obstructions.

A motor speed indicator shall be used to check the speed of the motor. It shall have an accuracy of ±2,5 % of the reading. The indicator and its engagement with the 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.

CC.6 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 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).

CC.7 Information to be recorded and reported

The information to be recorded and reported is that required by ISO 3744:1994 and ISO 11201:1995.

CC.8 Reduction as a safety requirement

CC.8.1 Reduction at source by design and protective measures

The machine shall generate a noise level as low as practicable. The main sources causing noise are:

– air intake system;
– cutting system;
– vibrating surfaces.

ISO 11688-1:1995 gives general technical information on widely recognized technical rules and means to be followed in the design of low-noise machines.

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CC.8.2 Reduction by information

If, after taking all possible technical 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.

CC.8.3 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 CC.

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Annex DD
(informative)

Example of a material and construction fulfilling the requirements for an artificial surface

DD.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.

DD.2 Construction

As is shown in Figure DD.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 (a) of the construction as shown in Figure DD.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 bordered by a two-legged aluminium section (d), 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 (c) 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 insulating felt material (b) cut to size.

The felt flooring of the joint planes which are neither stood on nor driven over (type A surface in Figure DD.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 felt material should it become soiled. As a wire mesh, a so-called aviary wire (e) with a mesh width of 10 mm and a wire diameter of 0,8 mm has proved to be suitable. This wire appears to protect 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 DD.1). For these surfaces, the use of wire grating of corrugated steel wire (f) 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.

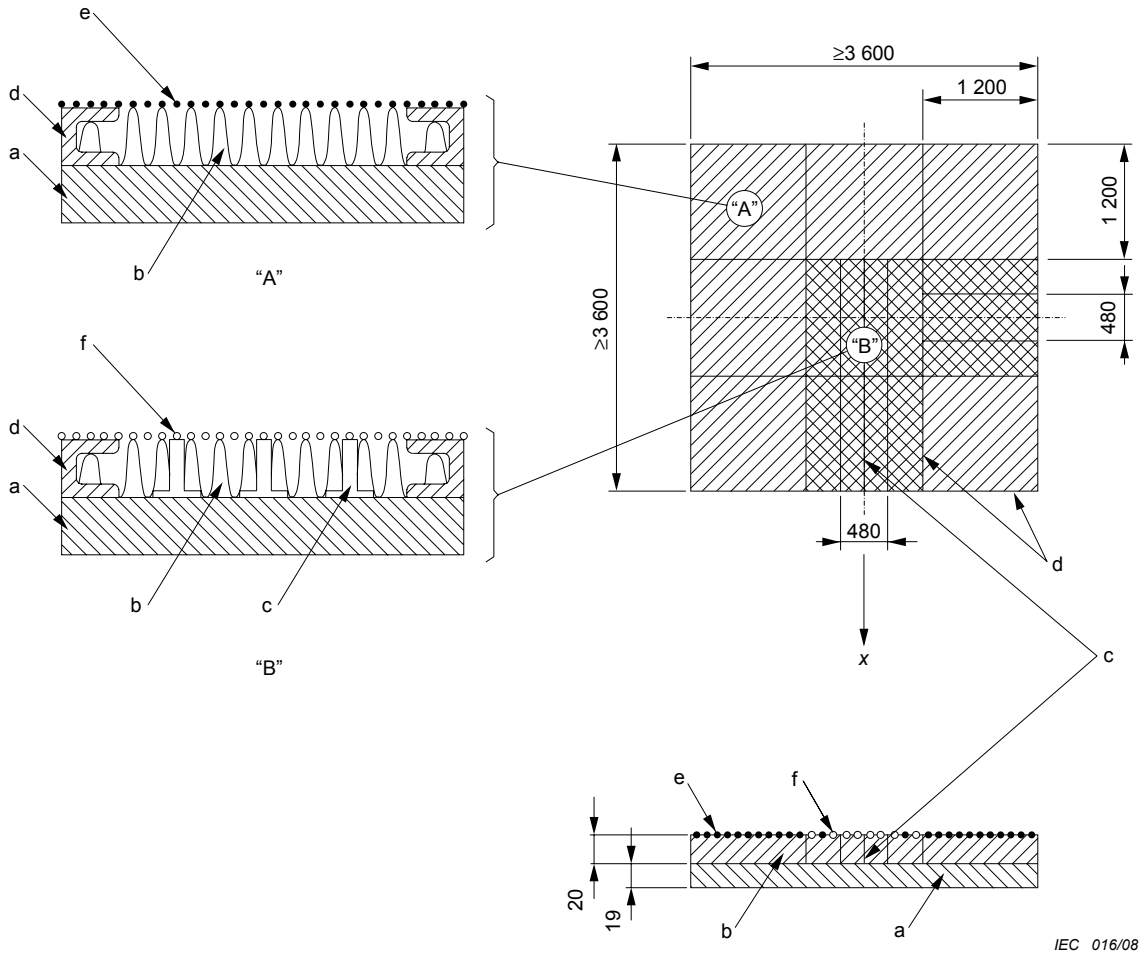
The fact that the microphone positions are not situated directly above the flooring of the measurement site allows the microphones to be easily mounted on stands, assuming that the ground is even and hard as, for example, an asphalt or concrete site.

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.

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Dimensions in millimetres
(unless otherwise stated all dimensions are approximate)



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 thick)

b mineral wool fibre layer (nominally 20 thick)

c aluminium T-sections (nominally 3 thick × 20 high)

d aluminium U-sections (nominally 3 thick × 20 high)

e wire mesh (nominally 10 × 10 mesh made of 0,8 diameter steel wire)

f wire grating (nominally 30 × 30 mesh made of 3,1 diameter steel wire)

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

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Annex EE
(informative)

Safety instructions

EE.1 General

This annex presents an example of safe operating practices for all machine types covered by this standard. The instruction handbook should include, where appropriate, the substance of the following clauses of this annex.

It should also include information concerning noise and vibration levels and any necessary warnings, together with the following:

IMPORTANT
READ CAREFULLY BEFORE USE
KEEP FOR FUTURE REFERENCE

EE.2 Safe operating practices

EE.2.1 Training

a) Read the instructions carefully. Be familiar with the controls and the proper use of the machine.

b) Never allow people unfamiliar with these instructions or children to use the machine. Local regulations can restrict the age of the operator.

c) Keep in mind that the operator or user is responsible for accidents or hazards occurring to other people or their property.

EE.2.2 Preparation

a) Before use, check the supply and extension cord for signs of damage or aging. If the cord becomes damaged during use, disconnect the cord from the supply immediately. DO NOT TOUCH THE CORD BEFORE DISCONNECTING THE SUPPLY. Do not use the appliance if the cord is damaged or worn.

b) Never operate the machine while people, especially children, or pets are nearby.

c) Wear eye protection and stout shoes at all times while operating the machine.

EE.2.3 Operation

a) Keep supply and extension cords away from **cutting means**.

b) Use the machine only in daylight or good artificial light.

c) Never operate the machine with damaged guards or shields or without guards or shields in place.

d) Switch on the motor only when the hands and feet are away from the **cutting means**.

e) Always disconnect the machine from the power supply (i.e. remove the plug from the mains or remove the disabling device)

- whenever leaving the machine unattended;
- before clearing a blockage;
- before checking, cleaning or working on the machine;

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- after striking a foreign object;
- whenever the machine starts vibrating abnormally.

f) Take care against injury to feet and hands from the **cutting means**.

g) Always ensure that the ventilation openings are kept clear of debris.

EE.2.4 Maintenance and storage

a) Disconnect the machine from the power supply (i.e. remove the plug from the mains or remove the disabling device) before carrying out maintenance or cleaning work.

b) Use only the manufacturer's recommended replacement parts and accessories.

c) Inspect and maintain the machine regularly. Have the machine repaired only by an authorized repairer.

d) When not in use, store the machine out of the reach of children.

EE.2.5 Recommendation

a) The appliance should be supplied via a residual current device (RCD) with a tripping current of not more than 30 mA.

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Bibliography

The bibliography of Part 1 is applicable except as follows:

Addition:

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

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

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