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INTERNATIONAL STANDARD

Household and similar electrical appliances – Safety – Part 2-94: Particular requirements for scissors type grass shears



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HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES – SAFETY –

Part 2-94: Particular requirements for scissors type grass shears

FOREWORD

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International Standard IEC 60335-2-94 has been prepared by subcommittee 61F: Safety of hand-held motor-operated electric tools, of IEC technical committee 61: Safety of household and similar electrical appliances.

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

FDIS	Report on voting
61F/704/FDIS	61F/712/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 third edition cancels and replaces the second edition, published in 2002. Is constitutes a technical revision. The main updates concern mechanical hazards, construction, endurance and resistance to rusting.

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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 scissors type grass shears.

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: 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,
- withdrawn,
- replaced by a revised edition, or
- amended.

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.

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 2-94: Particular requirements for scissors type grass shears

1 Scope

This clause of Part 1 is replaced by the following.

This standard deals with the safety of electric powered **hand-held scissors type grass shears** with a maximum cutting width of 200 mm designed primarily for cutting grass, their **rated voltage** being not more than 250 V for a.c. or 50 V d.c.

The term “grass shear” within this standard means “electric powered scissors type grass shear”.

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

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.

Requirements for chargers are covered by IEC 60335-2-29.

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

2 Normative references

This clause of Part 1 is applicable except as follows.

Addition:

IEC 60320, *Appliance couplers for household and similar general purposes*

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*

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

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

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

ISO 13852:1996, *Safety of machinery – Safety distances to prevent danger zones being reached by the upper limbs*

EN 12449:1999, *Copper and copper alloys – Seamless, round tubes for general purposes*

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 obtain rated power input

3.5.2 *Replacement:*
hand-held appliance
portable appliance intended to be held in the hand during normal use, including appliances which will not maintain their operating position unless supported, possibly with an extension shaft and/or assisted by wheel(s), skid(s) or similar

3.101
width of cut
the effective cutting width 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, whichever is the greater (see Figure 101)

3.102
scissors type grass shears
grass-cutting machine with two blades where the one cutter blade reciprocates along a straight or curved path (see Figure 102)

3.103
blade tooth
part of the **cutter blade** which is sharpened to perform the shearing action (see Figure 101)

3.104
cutter blade
part of the **cutting means** having blade teeth which cut by shearing action against the teeth of the shear plate (see Figure 101)

3.105
cutting means
cutter blade and shear plate together with any supporting part(s), which together perform the cutting action

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3.106
cutting means control
device, activated by the operator's hand or finger, for controlling the operation of the **cutting means**

3.107
no load
operation of the appliance at rated voltage with the cutting means attached

3.108
extension shaft
optional shaft which is designed to be fitted to a hand-held grass shear to enable the operator to cut grass while in a standing position

3.109
power switch
device that turns on and off the electric power and/or electronically activates and deactivates the function(s) of the tool

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:*

Scissors type grass shears shall be of **class II** or **class III**.

Compliance is checked by inspection and by the relevant tests.

7 Marking and instructions

This clause of Part 1 is applicable except as follows.

7.1 *Addition:*

Add the following 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.

Warning: Do not expose to moisture.

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Warning: **Cutting means** continues to run after the motor is switched off.

Warning: Keep bystanders away.

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

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

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 appliance is to be sold or safety signs and symbols according to Annex AA may be used. Symbols according to ISO 3767-1, ISO 3767-3 and ISO 11684 may also be used, as appropriate. Colours shall be in accordance with ISO 3767-1 and/or ISO 11684 as appropriate, unless the symbols are cast, embossed or stamped when colours are not required. If symbols 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;

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 grass shear is operated in still air under **normal operation** conditions until a steady state is reached, the torque being applied is measured. While the torque is maintained, the voltage

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is then adjusted to 0,94 times the rated voltage or 1,06 times the rated voltage, or the mean of the rated voltage range, 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.

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 Grass shears 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 16, the test voltages being, however, reduced to 75 % of the specified values. Connections shall not have worked loose, and there shall be no deterioration impairing safety in normal use.

18.102 *The grass shear is operated with the plane of the **cutting means** horizontal and at no load for 15 h of operation at a voltage equal to 1,1 times rated voltage, and then for 15 h at*

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a supply voltage equal to 0,9 times rated voltage. The grass shear may be operated for a number of periods, each period being not less than 7 h.

During this test, the grass shear 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.

20.101 General

Grass shears shall comply with the safety requirements and/or protective measures of this Clause. In addition, the **grass shears** shall be designed according to the principles of ISO 12100-1 for hazards relevant but not significant, which are not dealt with by this document (e.g. sharp edges on the outside of the **grass shears**).

20.102 Power-driven components (other than the cutting means)

All power-driven transmission components shall be guarded to prevent the operator's contact with these parts during **normal operation**.

Except where otherwise stated in this standard, all openings and safety distances shall conform to 4.5.1 and 4.5.3 of ISO 13852.

Compliance shall be checked by inspection and measurement.

20.103 Cutting means configuration

Cutting means shall be so constructed, that the **shear plate** teeth extend at least 2 mm beyond the moving cutter teeth. The extension shall be measured for each **cutter blade/shear plate tooth** combination (see Figure 103).

20.104 Hand protection

The housing shall be so constructed, that inadvertent contact of the hand holding the grass shear with the **cutter blade**(s) shall be prevented.

This shall be achieved if the handle is so constructed that it is attached to the grass shear at the front of the handle grip and the shortest distance between the front of the handle grip and the nearest root of a cutter blade tooth is at least 120 mm (see Figure 104).

The distances shall be measured along the shortest path from the front of the handle grip to the nearest cutting edge of a **cutter blade**.

Compliance shall be checked by inspection and measurement.

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21 Mechanical strength

This clause of Part 1 is applicable except as follows.

Replacement of the third paragraph:

The appliance is rigidly supported and three blows are applied to every point of the enclosure that is likely to be weak.

The impact energy will be 1,0 ± 0,05 J and blows shall also be applied to handles, levers, knobs, handle shafts and cutting elements.

21.101 General

The mechanical strength of the grass shear shall be adequate for normal use.

Compliance shall be checked by the tests given in 21.101.1 and 21.102.

21.101.1 Strength and rigidity

One sample of the complete grass shear shall be dropped three times so that it falls through a vertical distance of (900 ± 10) mm onto a smooth horizontal concrete surface in such a manner as to test the strength of the grass shear most severely (see Figure 105). Each of the three drops shall be so conducted that the grass shear receives an impact in a location different from the other two.

A string can be used to suspend the grass shear so that the desired orientation of the grass shear can be achieved. Cutting the string will allow the grass shear to fall in the correct orientation to test the relevant part.

No parts of the grass shear that are necessary for safe operation shall become detached and no visible cracks shall have developed.

It is not necessary for the grass shear to be operable after the test but, if it is operable, then immediately following this test, it shall be run at its maximum speed for 30 s and again, no parts of the grass shear that are necessary for safe operation shall become detached and no visible cracks shall have developed.

21.102 Cutting means strength and rigidity

The rigidity and mounting of the **cutting means** of the grass shear shall be capable of safely withstanding impact with a hard object. This shall be tested by fixing the grass shear on a steel plate or a smooth concrete surface in such a manner that a test piece can be easily introduced into the **cutting means**.

The test piece shall be a nominal 15 mm diameter copper tube, having a nominal wall thickness of 1 mm as specified in EN 12449:1999 (see Figure 106) or of other material with comparable characteristics. The tube shall be fixed into a suitable carrying device.

The grass shear shall be run at maximum speed, then the tube shall be introduced into the **cutting means** at a speed of 1 m/s. The grass shear shall continue to be run for 15 s or until the blades stop or the tube is cut.

No part of a **cutter blade** or the **cutting means** shall become detached. Any breakage of a **cutter blade** shall be considered failure of the test. Breakage of a drive shearing device or chipping of the blade cutting edge shall not be deemed to be a test failure.

NOTE The test does not require that the grass shear has to be suitable for use after test.

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22 Construction

This clause of Part 1 is applicable except as follows.

22.12 *Addition:*

Grass shears shall have at least one handle. The handle(s) shall be designed in such a way that each one can be grasped with one hand.

The gripping length 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.

NOTE 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 two parts on 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 **cutting means control** 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.

22.30 *Addition:*

Scissor type grass shears shall be constructed so as to prevent bridging of **supplementary insulation** and **reinforced insulation** by grass cuttings or other debris.

22.35 *Addition:*

For **class II appliances,** handles and operator controls which are held when operating the appliance shall either be of insulating material or covered by insulating material having a thickness of at least 1 mm, or separated by insulation equivalent to **supplementary insulation** from other accessible metal parts.

Compliance is checked by inspection, by measurement and for the insulating material covering on handles, operator controls and handle shafts, by the following tests.

A sample of the covered part is conditioned at a temperature of 70 °C ± 2 °C for seven days (168 h). After conditioning, the sample is allowed to attain approximately room temperature.

Inspection shall show that the covering has not shrunk to such an extent that the required length or the required insulation is no longer provided or that the covering has not peeled off, so that it can move longitudinally.

After this, the sample is maintained for 4 h at a temperature of –10 °C ± 2 °C.

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While still at this temperature, the sample is then subjected to impact by means of the apparatus shown in Figure 107. The weight A having a mass of 300 g is dropped from a height of 350 mm onto the chisel B of hardened steel, the tip of which is placed on the sample.

One impact is applied to each place where the covering is likely to be weak or damaged in intended use, the distance between the points of impact being at least 10 mm.

After this test, inspection shall show that the covering has not peeled off and an electric strength test is made between metal parts and metal foil wrapped around the covering in the area required to be insulated.

The test voltage of 2 500 V is applied for 1 min.

During this test, no flashover or breakdown shall occur.

22.40 *Addition:*

A **cutting means control** shall be provided and either this shall require two separate and dissimilar actions before the **cutting means** 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. The **cutting means** 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 ± 1) mm diameter sphere.

22.101 Control on extension shaft

If an extension shaft is used, the control on the extension shaft shall override or duplicate the original switch.

Compliance is checked by inspection and by practical test.

22.102 Cutting means protective cover

A protective cover for the **cutting means** shall be provided. It shall be suitable for covering the **cutting means** during transportation or when the grass shear is stored.

The cover shall stay in its protective position when holding the grass shear with the covered **cutting means** pointing vertically downwards.

Compliance is checked by inspection and by practical test.

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.

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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.

Compliance is checked by inspection.

25.5 *Replacement:*

Appliances shall be provided with one of the following:

– a supply cord not less than 6 m in length with the type X attachment, or

– a supply cord of length not exceeding 0,3 m with type X or Y attachment and terminating in a cable coupler, or

– an appliance inlet.

25.7 *Replacement of the first paragraph:*

Power supply cords shall not be 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).

25.7.101

The mains cord shall exit at or towards the rear of the enclosure and be in a direction away from the cutter blades.

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 except as follows.

29.2 *Addition:*

Pollution degree 3 applies for this machine.

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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.

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.

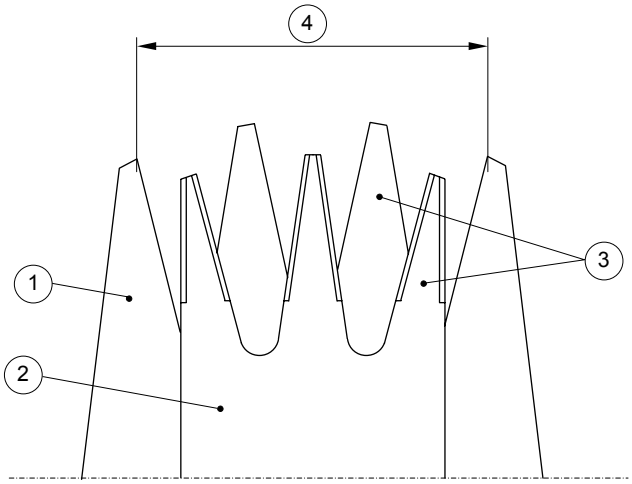
Traces of rust on sharp edges and any yellowish film removable by rubbing are ignored.

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 not applicable.

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Key

1 **Cutter blade** (bottom)
2 **Cutter blade** (top)
3 Blade teeth
4 Cutting width

Figure 101 – Parts of cutting means (see 3.103, 3.104) – Cutting width (see 3.101)

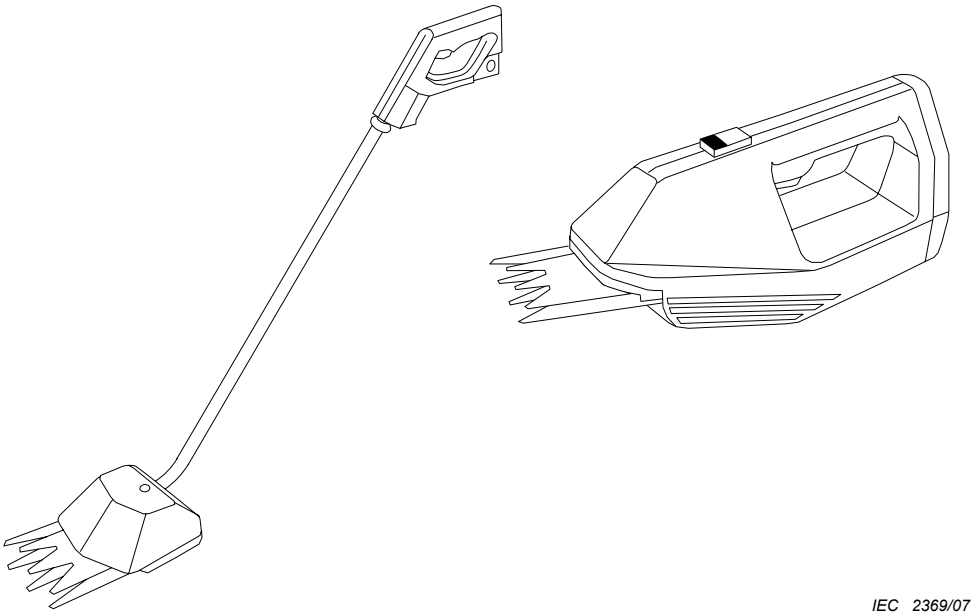
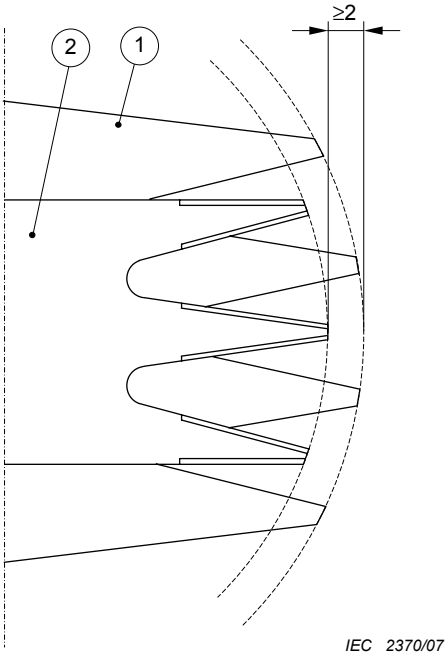


Figure 102 – Examples of grass shears (see 3.102)

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Dimension in millimetres



Key

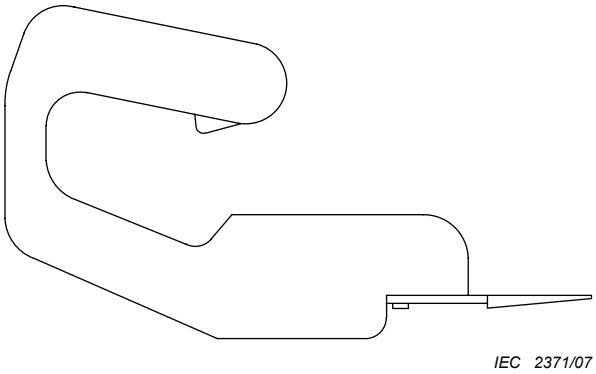
1 Shear plate

2 Cutter blade

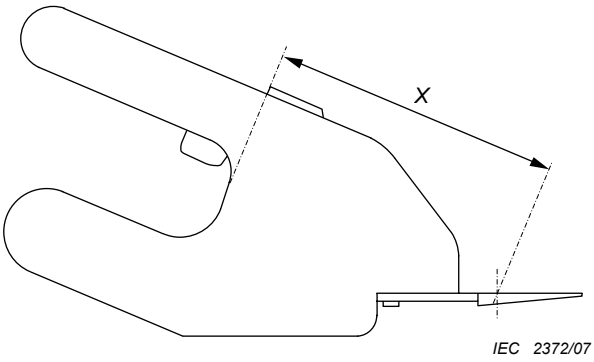
Figure 103 – Cutter blade extension (see 20.103)

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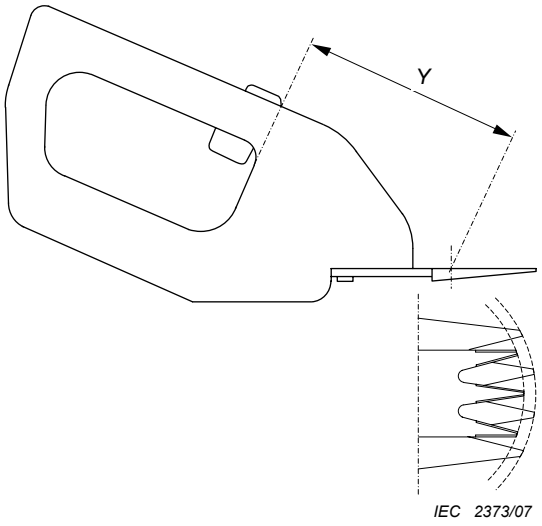
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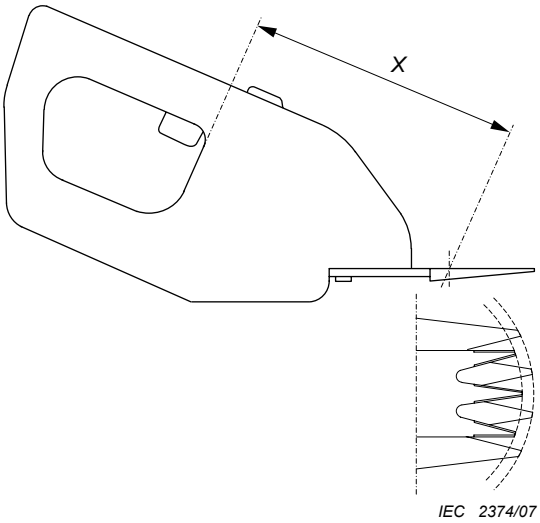
a) Handle not attached at front (does not comply with 20.104)



b) Handle attached at front (complies with 20.104)



c) Handle attached at front and rear (does not comply with 20.104)



d) Handle attached at front and rear (complies with 20.104)

Key

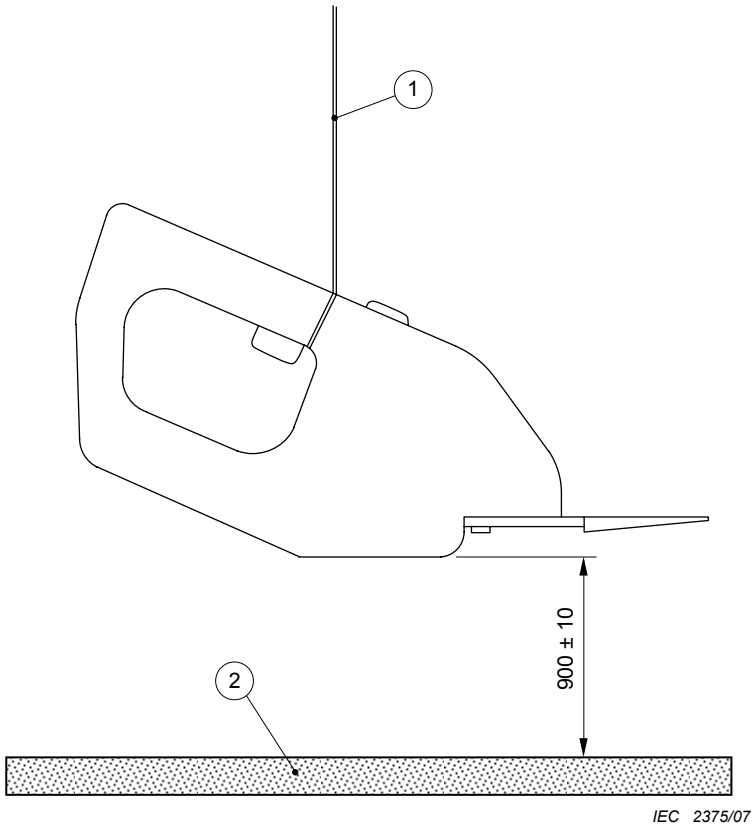
X ≥ 120 mm

Y < 120 mm

Figure 104 – Examples of compliance/non-compliance and measurement method for hand protection (see 20.104)

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Dimension in millimetres



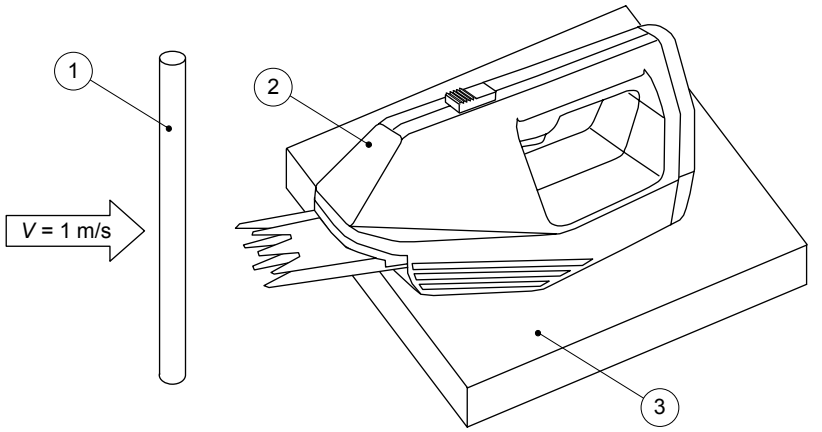
Key

1 String

2 Smooth horizontal concrete

Figure 105 – Example showing the layout for the strength test and a possible orientation for the grass shear (see 21.101.1)

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Key

1 Copper tube

2 Grass shear fixed on a steel or concrete base

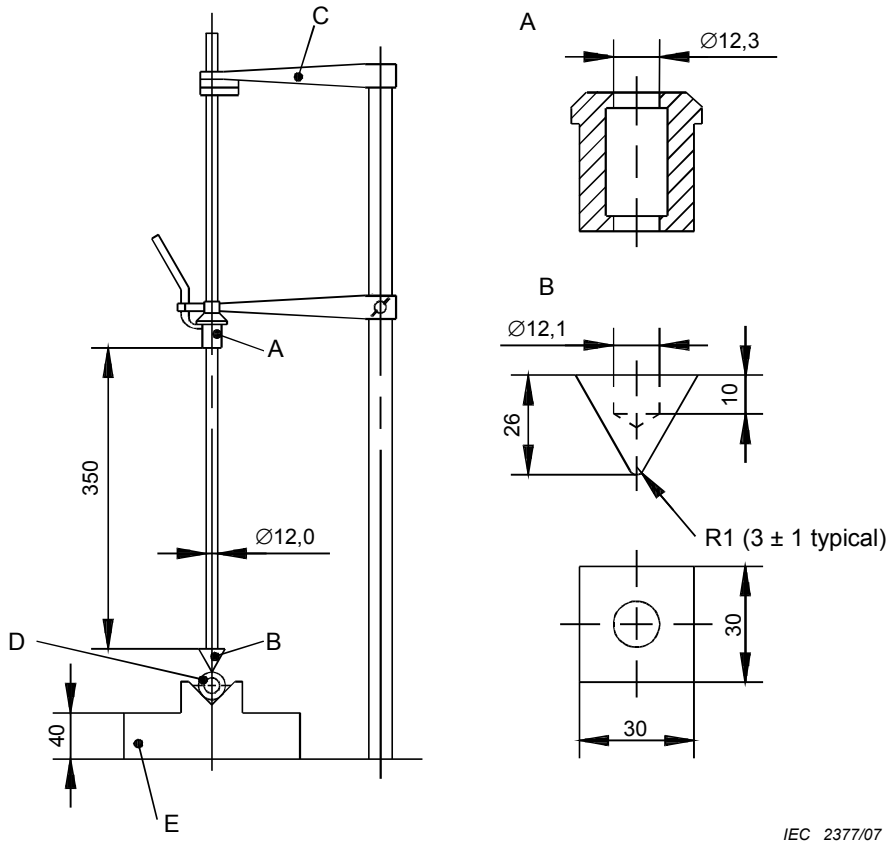
3 Steel or concrete base

V Speed and direction of movement of copper tube

Figure 106 – Cutting means strength test (see 21.102)

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Dimensions in millimetres



Key

A Weight

B Harden steel chisel

C Fixing arm

D Sample

E Base having a mass of 10 kg

Figure 107 – Device for impact test (see 22.35)

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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.

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 **grass shears** 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. If the control on the machine uses the two dissimilar actions option and the control on the extension handle uses the guarding option, the instruction manual shall require the user to remove the extension handle before maintenance, storage or leaving the machine unattended.

For the purposes of this standard, a battery that can be removed without the use of tools is considered to be a disabling device.

It shall not be possible for the grass shear 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 grass shear after the battery(ies) have been discharged by running the shear until the unit no longer operates.

Requirements for tools with this type of battery can be found in Annexes K and L of IEC 60745-1. Annexes K and L of IEC 60745-1 are only applicable for battery tests.

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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.

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.

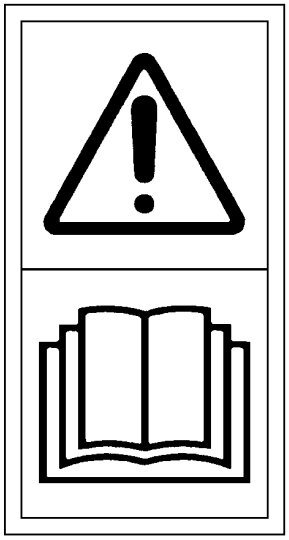
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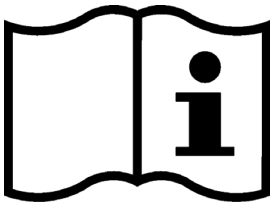
Annex AA
(informative)

Symbols which may be used on scissors type grass shears

AA.1 Warning: 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).



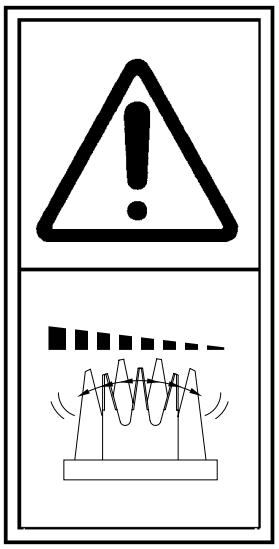
AA.2 Do not expose to moisture



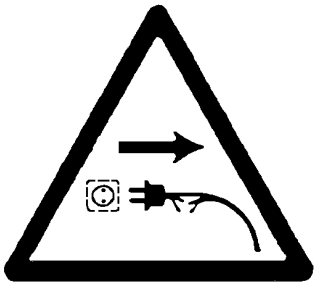
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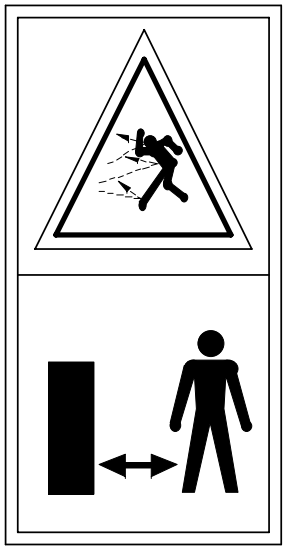
AA.3 Warning: cutting means continues to run after the motor is switched off



AA.4 Disconnect the mains plug if the cord is damaged or entangled



AA.5 Keep bystanders away



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Annex BB
(informative)

Vibration

BB.1 Quantities to be measured

The quantities to be measured are as follows:

– 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;

– frequency of reciprocation of the grass shear.

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 3 directions *x*, *y* and *z* (see Figure BB.1).

BB.3.2 Measurement location

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

BB.4 Test procedure

BB.4.1 Determination of working procedure

Tests shall be carried out on a new, normal production grass shear featuring standard equipment, with the grass shear provided by the manufacturer. Where a grass shear can be fitted with an optional handle extension, the measurement shall be made for both conditions.

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The grass shear shall be run-in and warmed up until stable conditions are reached before the test is commenced. The **cutting means** shall be lubricated according to the instruction manual.

Measurements shall be made with the grass shear running at maximum speed. If the grass shear has a governor which is below that speed, the measurement shall be made at the maximum speed stipulated by the instruction manual with the **cutting means** engaged.

During the test, the grass shear shall be held by a human hand as in **normal operation** and the **cutting means** shall be driven. Contact between the hand and the transducer shall be avoided.

BB.4.2 Measurement procedure

For each handle, a series of five tests shall be carried out using one operator. The grass shear shall be held out of contact with any surface and with the plane of the **cutting means** horizontal.

The same procedure shall be done by using an extension shaft. The grass shear shall be held at the handle of the extension shaft by a human hand while the other hand holds the shaft.

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 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 Figure BB.1) shall be made simultaneously.

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 General

BB.6.1 Reduction by design and protective measures

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

- **cutting means**;
- unbalanced moving parts;
- impact in gears, bearings and other mechanisms;
- interaction between operator, **grass shears** 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.

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BB.6.2 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).

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

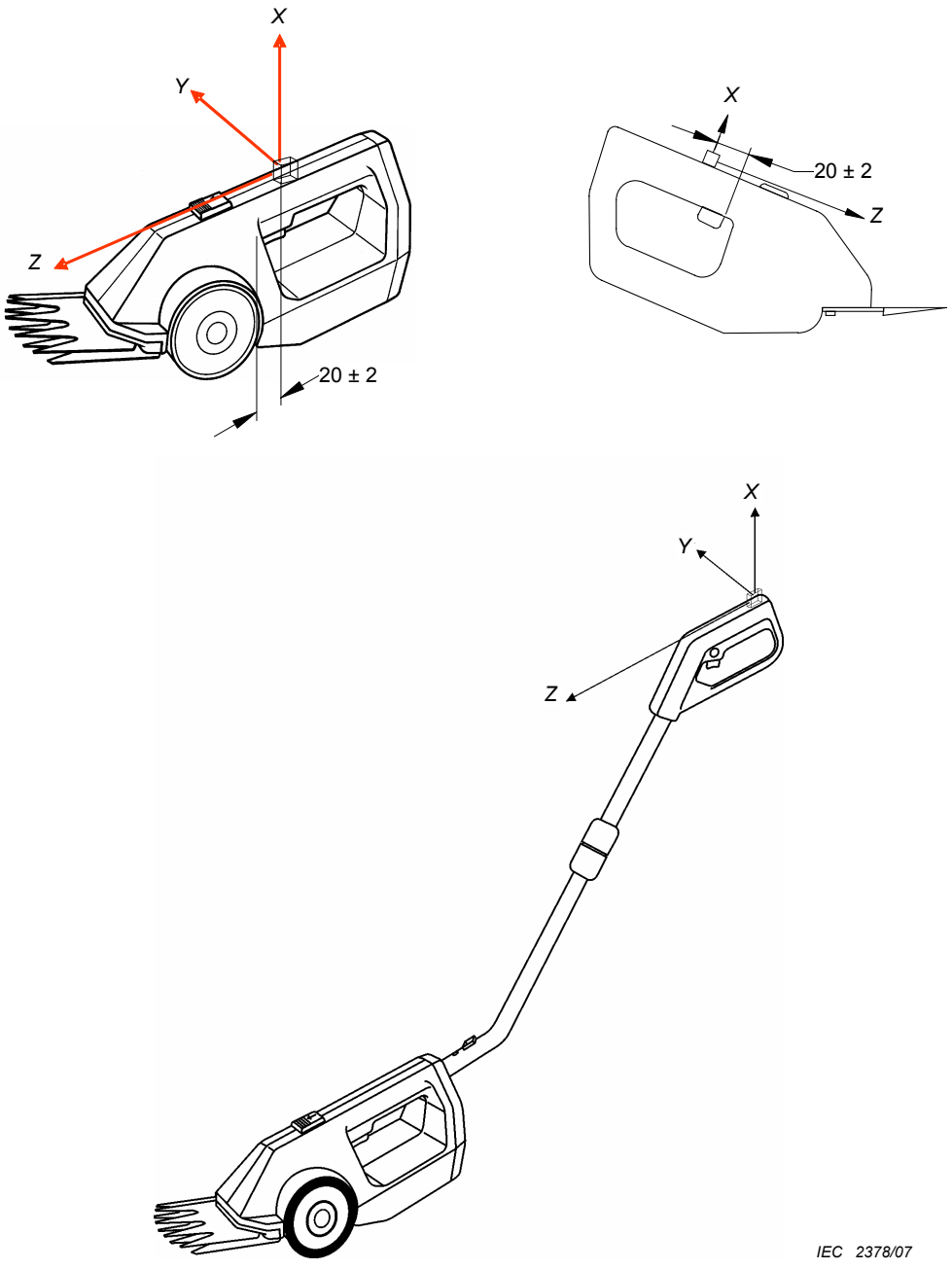


Figure BB.1 – Examples of transducer location/orientation (handle)

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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 scissor type grass shears.

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.

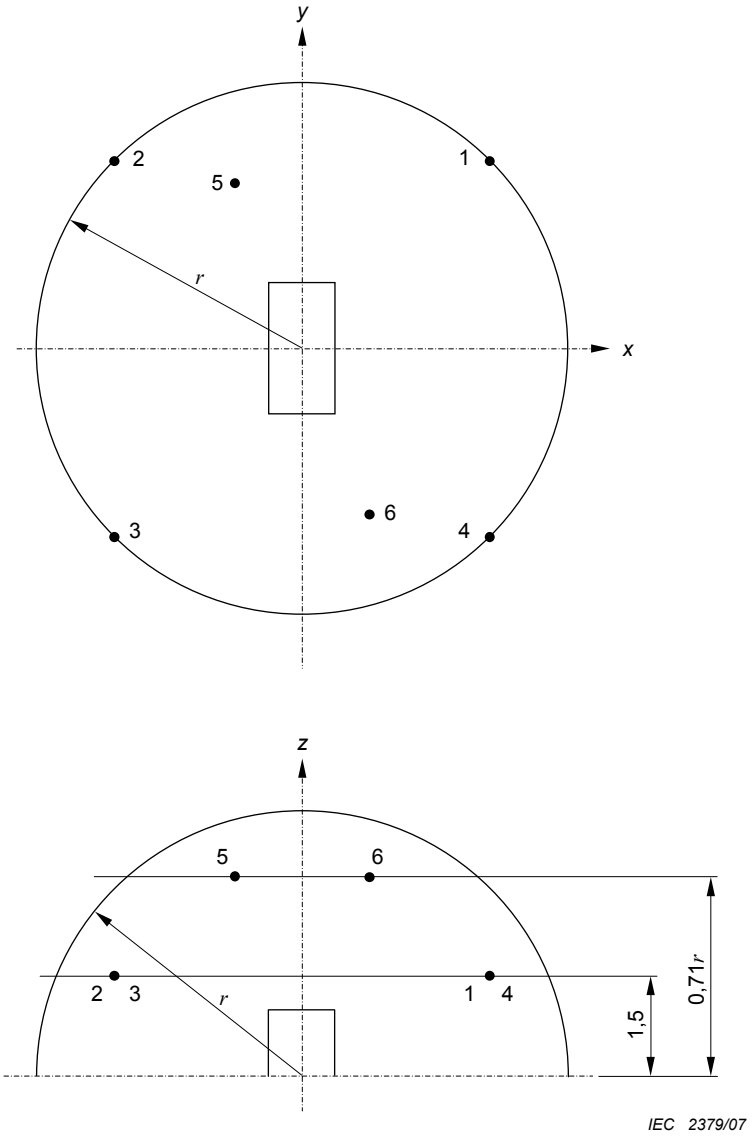
CC.2 A-weighted sound power level determination

For the determination of 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 (See 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, of 4 m.
– The microphone array shall be composed of six microphone positions as defined in Table CC.1. (See Figure CC.1 for microphone positions on the hemisphere.)
– 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 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 = 4 m (radius of hemisphere)

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

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Table CC.1 – Coordinates 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, thus assuming that all microphones are on this hemisphere.

CC.3 A-weighted emission sound pressure level measurement

For the determination 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 or by natural grass which complies with Clause CC.4. Reproducibility of results using natural grass is likely to be lower than that required for Grade 2. 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 **cutting means** of the grass shear. 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.

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

Frequency 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 grass shear featuring standard equipment as provided with the machine. The **cutting means** shall be lubricated according to the instruction handbook.

The grass shear 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 **grass shears** 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 instruction manual 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.

During the test, the **cutting means** shall be driven but without load.

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

The grass shear handle(s) shall be held by the operator in the normal operating position with the plane of the **cutting means** parallel to the ground and within 50 mm of the ground. The **cutting means** shall be free of all obstructions.

A 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 grass shear 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 **cutting means** to the head mounted microphone shall be as close to 0,7 m as practicable. For **grass shears** with a permanently fitted extended handle, this distance shall be measured to the handle grip.

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

CC.6 Measurement uncertainties

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 grass shear.

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

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 **grass shears** 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 (see CC.4.1)

DD.1 Material

The material is a mineral fibre, 20 mm thick, having an airflow resistance of 11 kN.s/m^4 and a density of 25 kg/m³.

DD.2 Construction

As is shown in Figure DD.1, the artificial flooring of the measurement site is subdivided 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 grass shear 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 grass shear 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.

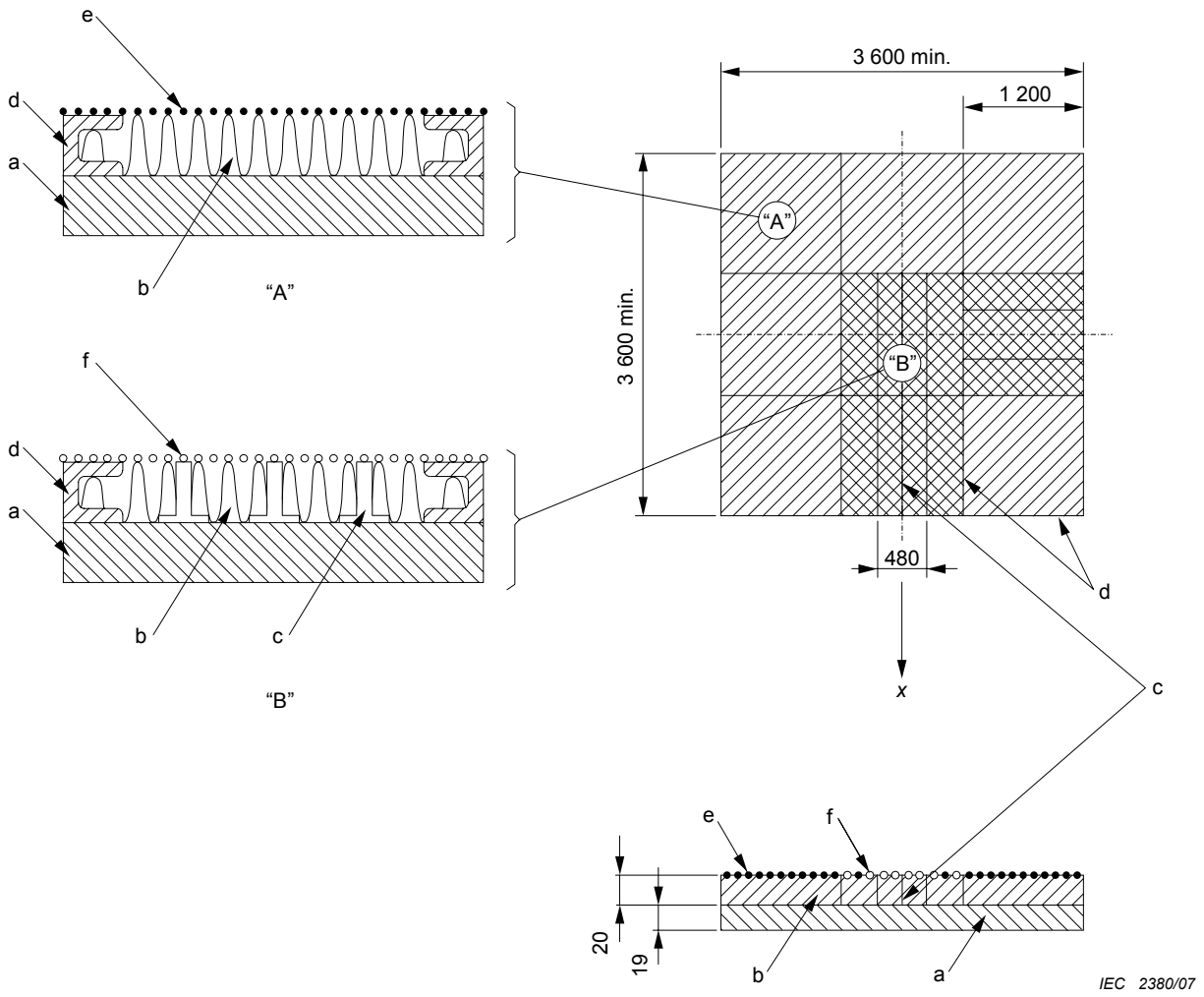
The construction of the measurement site as described above offers two advantages: it can be prepared without much time and effort, and all the materials are easily obtainable.

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



KEY

"A" This area is ineligible for weight. Not for step and not for passable

"B" This area is eligible for weight. For step and passable

a Backing layer (19 mm)

b Insulating felt material

c Aluminium T-sections (3 mm thick × 20 mm tall)

d Aluminium U-sections (3 mm thick × 20 mm tall)

e Wire mesh (10 mm fence wire; wire-thickness 0,8 mm)

f Wire grating (30 mm × 20 mm fence wire; wire-thickness 3,1 mm)

NOTE Unless otherwise stated, all dimensions are approximate.

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 operation 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;
- 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.

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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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