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Varnost električnih ročnih orodij - 1. del: Splošne zahteve

Safety of hand-held electric motor operated tools -- Part 1: General requirements

Sicherheit handgeführter motorbetriebener Elektrowerkzeuge -- Teil 1: Allgemeine Anforderungen

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Sécurité des outils électroportatifs à moteur -- Partie 1: Règles générales

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EUROPEAN STANDARD

EN 50144-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

May 1998

ICS 25.140.20

Supersedes EN 50144-1:1995

Descriptors: Hand-held motor-operated electric tools, safety requirements, protection against electric shock, fire protection, protection against mechanical hazard

English version

Safety of hand-held electric motor operated tools Part 1: General requirements

Sécurité des outils électroportatifs à
moteur
Partie 1: Règles générales

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

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

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

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

Central Secretariat: rue de Stassart 35, B - 1050 Brussels

Foreword

This European Standard has been prepared by the Technical Committee CENELEC TC 61F, Hand-held and transportable motor operated electric tools.

The first edition of EN 50144-1 was published in March 1995. A draft for an amendment was submitted to the Unique Acceptance Procedure (UAP) in May 1996 and was approved by CENELEC on 1996-12-09.

A second draft for an amendment, required to gain acceptance as a harmonized standard under the Machinery Directive standard, was submitted to the formal vote in May 1997 and was approved by CENELEC on 1997-07-01, when it was decided to publish a new consolidated edition of EN 50144-1.

The following dates were fixed:

- | | | |
|---|-------|-------------------------|
| - latest date by the European Standard has to be implemented at national level by publication of an identical national standard or by endorsement | (dop) | 1998-12-01 |
| - latest date by which the national standards conflicting with the EN have to be withdrawn | (dow) | to be fixed (see below) |

This new edition of EN 50144-1 replaces EN 50144-1:1995 and HD 400.1 S1:1980 and its amendment A1:1991. However HD 400.1 remains valid until all the tools specifically covered by HD 400 are covered in a Part 2 of EN 50144.

Other standards referred to in this European standard are listed in annex F. The annex lists the valid edition of those documents at the time of issue of this EN. All references are however to be understood as references to the latest edition.

This standard is divided into two parts:

Part 1: General requirements which are common to most hand-held electric motor operated tools (for the purpose of this standard referred to simply as tools).

Part 2: Requirements for particular types of tool which either supplement or modify the requirements given in Part 1 to account for the particular hazards and characteristics of these specific tools.

This European Standard has been prepared under a mandate given to CEN and CENELEC by the European Commission and the European Free Trade Association and supports the essential safety requirements of the Low Voltage Directive and the Machinery Directive.

Compliance with the clauses of Part 1 together with a relevant Part 2 of this standard provides one means of conforming with the specified essential requirements of the Directives concerned.

A relevant Part 2 is one in which the type of the tool or an accessory which is to be used with the tool is within the scope of that Part 2.

When a relevant Part 2 does not exist, Part 1 can help to establish the requirements for the tool, but will not by itself provide a means of conforming with the relevant essential safety requirements of the Low Voltage Directive and the Machinery Directive.

Warning: Other requirements and other EC Directives can be applicable to the products falling within the scope of this standard.

CEN Technical Committees have produced a range of standards dealing with a similar range of non-electrically powered tools. Where necessary normative references are made to these standards in the relevant Part 2.

This standard follows the overall requirements of EN 292-1 and EN 292-2.

NOTE: In this standard the following print types are used:

- Requirements proper;
- Test specifications;
- Explanatory matter.

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1 Scope

This standard applies to hand-held motor operated or magnetically driven tools intended for indoor or outdoor use designed for use by one person. This standard applies to a.c. tools having any frequency and d.c. tools. It does not apply to:

- battery operated tools
- tools used for preparing or processing food
- tools used in explosive atmospheres.

This standard covers tools which can be used in a fixed support. Unless the requirement for such a support is given in a relevant Part 2, this standard alone will not be sufficient to ensure that the combination of tool and support is adequate.

Tools with an electric heating element are within the scope of this standard. They should also comply with relevant Parts of EN 60335.

Tools incorporating electronics components are within the scope of this standard and covered by annex B.

2 Definitions

2.1 Where the terms voltage and current are used, they imply the r.m.s. values, unless otherwise specified.

2.2 The following definitions apply for the purpose of this standard.

2.2.1 **hand-held tool:** An electric motor-operated or magnetically driven machine intended to do mechanical work and so designed that the motor and the machine form an assembly which can easily be brought to its place of operation and which is held by hand or suspended during operation.

NOTE: Hand-held tools may be provided with a flexible shaft, the motor being fixed or portable.

2.2.2 **rated voltage:** The voltage (for three-phase supply, the voltage between phases) assigned to the tool by the manufacturer.

2.2.3 **rated voltage range:** The voltage range assigned to the tool by the manufacturer expressed by its lower and upper limits.

2.2.4 **rated input:** The input in watts, assigned to the tool by the manufacturer.

2.2.5 **rated current:** The current at rated voltage or at the lower limit of the rated voltage range, assigned to the tool by the manufacturer.

NOTE: If no current is assigned to the tool, the rated current for the purpose of this standard is the current measured when the tool is operating under normal load, at rated voltage or at the lower limit of the rated voltage range.

2.2.6 **rated frequency:** The frequency assigned to the tool by the manufacturer.

2.2.7 **rated frequency range:** The frequency range assigned to the tool by the manufacturer, expressed by its lower and upper limits.

2.2.8 **rated no-load speed:** No-load speed at rated voltage or at the upper limit of the rated voltage range, assigned to the tool by the manufacturer.

2.2.9 **non-detachable flexible cable or cord:** Flexible cable or cord which can only be removed from the tool with the aid of a tool.

2.2.10 **basic insulation:** Denotes the insulation applied to live parts to provide basic protection against electric shock.

NOTE: Basic insulation does not necessarily include insulation used exclusively for functional purposes.

2.2.11 **supplementary insulation (protective insulation):** An independent insulation provided in addition to the basic insulation, in order to ensure protection against electric shock in the event of a failure of the basic insulation.

2.2.12 **double insulation:** An insulation comprising both basic insulation and supplementary insulation.

2.2.13 **reinforced insulation:** An improved basic insulation with such mechanical and electrical qualities that it provides the same degree of protection against electric shock as double insulation.

2.2.14 Class I tool: A tool having at least basic insulation throughout and provided with either an appliance inlet with earthing contact, or a non-detachable flexible cable or cord with earthing conductor.

NOTE: Class I tools may have parts with double insulation, or reinforced insulation; or parts operating at safety extra-low voltage.

2.2.15 Class II tool: A tool with double insulation and/or reinforced insulation throughout and without provision for earthing.

Such a tool may be of one the following types:

- i) A tool having a durable and substantially continuous enclosure of insulating material which envelopes all metal parts, with the exception of small parts, such as nameplates, screws and rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation; such a tool is called an insulation-encased Class II tool;
- ii) A tool having a substantially continuous metal enclosure, in which double insulation is used throughout, except for those parts where reinforced insulation is used, because the application of double insulation is manifestly impracticable; such a tool is called a metal-encased Class II tool;
- iii) A tool, which is a combination of types (i) and (ii).

NOTE 1: The enclosure of an insulation-encased Class II tool may form a part or the whole of the supplementary insulation or the reinforced insulation.

NOTE 2: If a tool with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be of Class I construction.

NOTE 3: Class II tools may have parts operating at safety extra-low voltage.

2.2.16 Class III tool: A tool designed for operation at safety extra-low voltage, and which has no circuits, either internal or external, which operate at a voltage other than safety extra-low voltage.

2.2.17 safety extra-low voltage: A nominal voltage not exceeding 42 V between conductors and between conductors and earth or, for three-phase supply, not exceeding 24 V between conductors and neutral, the no-load voltage not exceeding 50 V and 29 V respectively.

NOTE 1: When safety extra-low voltage is obtained from the supply mains, it must be through a safety isolating transformer or a convertor with separate windings.

NOTE 2: The voltage limits specified are based on the assumption that the safety isolating transformer is operated at its rated supply voltage.

2.2.18 normal load: The load to be applied to the tool so that the stress imposed corresponds to that occurring under normal conditions of use, any marking of short-time or intermittent operation being observed and heating elements, if any being operated as in normal use.

The conditions of normal load are specified in Part 2; if not, the tool shall be loaded according to the manufacturer instructions; in the absence of such instructions the tool shall be operated continuously at a load such that rated input is attained.

NOTE: The normal load is based on the rated voltage or on the upper limit of the rated voltage range.

2.2.19 accessible part: Any part which can be touched by the standard test finger shown in figure 1; for accessible metal parts, it includes any other metal part which is an electrical contact with such parts.

2.2.20 detachable part: A part which can be removed without the aid of a tool.

2.2.21 rated operating time: The operating time assigned to the tool by the manufacturer.

2.2.22 continuous operation: Operation under normal load for an unlimited period.

2.2.23 short-time operation: Operation under normal load for a specified period, starting from cold, the intervals between successive periods of operation being sufficiently long to allow the tool to cool down to approximately room temperature.

2.2.24 intermittent operation: Operation in a series of specified identical cycles, each cycle being composed of a period of operation under normal load, followed by a rest period with the tool running idle or switched off.

2.2.25 thermal cut-out: A device which, during abnormal operation, limits the temperature of a tool, or of parts of it, by automatically opening the circuit or by reducing the current, and which is so constructed that its setting cannot be altered by the user.

2.2.26 non self-resetting thermal cut-out: A thermal cut-out which requires resetting by hand, or replacement of a part, in order to restore the current.

2.2.27 creepage distance: The shortest path between two conductive parts, or between a conductive part and the bounding surface of the tool, measured along the surface of the insulating material.

NOTE: The bounding surface of the tool is the outer surface of the enclosure, considered as though metal foil were pressed into contact with accessible surfaces of insulating material.

2.2.28 clearance: The shortest distance between two conductive parts, or between a conductive part and the bounding surface of the tool, measured through air.

2.2.29 “aid of a tool”, “use of a tool”: Where such expressions occur the word tool means a hand tool, for example a screwdriver, which may be used to operate a screw or other means of fixing.

2.2.30 body: The term body includes all accessible metal parts, shafts or handles, knobs, grips and the like and metal foil in contact with all accessible surfaces of insulating material; it does not include inaccessible metal parts.

2.2.31 safety isolating transformer: Transformer, the input winding of which is electrically separated from the output winding by an insulation at least equivalent to double insulation or reinforced insulation and which is designed to supply a tool or circuit of safety extra low voltage.

2.2.32 ordinary tool: A tool which does not comply with the requirement given in this standard for either splash proof tools or watertight tools.

2.2.33 splash proof tool: A tool which complies with the requirement given in this standard for both ordinary and splash proof tools.

2.2.34 watertight tool: A tool which complies with the requirement given in this standard for both ordinary and watertight tools.

3 General requirements

Tools shall be so designed and constructed that in normal use they function safely and cause no danger to persons or surroundings, even in the event of such careless use as may occur in normal service.

The materials used for the construction of the tool shall not introduce additional hazards during the use or disposal of the tool.

In general, compliance is checked by carrying out all the relevant tests.

4 General conditions for the tests

4.1 *Tests according to this standard are type tests.*

4.2 *Unless otherwise specified, the tests are made on a single sample as supplied; which shall withstand all the relevant tests.*

4.2.1 *If the tool is designed for different supply voltages, for both a.c. and d.c. or for different speeds, etc., more than one sample may be required.*

4.2.2 *If the test of 11.2 has to be made three or possibly six additional samples are required.*

4.2.3 *If it is necessary to dismantle a Class II tool for the tests of clauses 12 and 15, one additional sample may be required.*

4.2.4 *The testing of components may necessitate the submission of additional samples of these components. When the submission of such samples is necessary, they should be submitted together with the tool.*

4.3 *Unless otherwise specified, the tests are carried out in the order of the clauses of this standard.*

Before testing is started, the tool is operated at rated voltage or at the lower limit of the rated voltage range, in order to verify that it is in working order.

4.4 *Unless otherwise specified, the tests are carried out at an ambient temperature of (20 ± 5) °C, the tool being placed in the most unfavourable position which may occur in normal use.*

4.5 *Tools for a.c. only are tested with a.c., at rated frequency, if marked. Tools for d.c. only are tested with d.c.*

Tools not marked with rated frequency are tested at 50 Hz.

Tools designed for more than one rated voltage, or for both a.c. and d.c., are tested at the most unfavourable voltage and nature of supply.

When it is specified that the supply voltage is equal to the rated voltage multiplied by a factor, the supply voltage for tools marked with a rated voltage range is equal to:

- *the upper limit of the rated voltage range multiplied by this factor, if greater than 1;*
- *the lower limit of the rated voltage range multiplied by this factor, if smaller than 1.*

When testing tools designed for d.c. only, the possible influence of polarity on the operation of the tool is taken into consideration.

Tools marked with a rated frequency range are tested at 50 Hz, if this frequency is within the range; otherwise, they are tested at the most unfavourable frequency within the range.

For tools designed for more than one rated voltage or rated voltage range, the rated voltage to be used for the tests is the most unfavourable voltage.

NOTE: It may be necessary to make some of the tests more than once, in order to establish the most unfavourable voltage.

4.6 *Heating elements incorporated in the tool are connected to a separate supply, unless otherwise specified, and are tested according to the relevant EN 60335.*

If, in normal use, the heating element cannot be operated unless the motor is running, the element is tested with the motor running. If the heating element can be operated without the motor running, the element is tested with or without the motor running, whichever is the more unfavourable.

4.7 *Tools provided with a regulating device or a similar control, shall be tested with these controls adjusted to their most unfavourable setting within the range specified by the manufacturer for the particular application, if the setting can be altered by the user.*

If the adjusting means of the control is accessible without the aid of a tool, this subclause applies whether the setting can be altered by hand or with the aid of a tool; if the adjusting means is not accessible without the aid of a tool, this subclause applies only if the setting can be altered by hand.

NOTE: Adequate sealing is regarded as preventing alteration of the setting by the user.

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4.8 *Electronic speed control devices shall be set for the highest speed.*

4.9 *Tools intended to be used with a non-detachable flexible cable or cord shall be tested with the flexible cable or cord connected to the tool.*

4.10 *The tool shall be loaded according to the specification in the relevant Part 2. Tools for which alternative accessories are available, shall be tested with each accessory.*

4.11 *If a torque is to be applied, the method of loading shall be chosen so as to avoid additional stresses, such as those caused by side thrust. Additional loads necessary for the correct operation of the tool shall be, however, taken into consideration.*

4.12 *Tools intended to be operated at safety extra-low voltage supplied by a transformer delivered together with the tool, shall be tested together with the transformer.*

4.13 *If the Class I tools have parts with double insulation or reinforced insulation, such parts shall also be checked for compliance with the appropriate requirements specified for Class II tools.*

Similarly, if Class I or Class II tools have parts operating at safety extra-low voltage, such parts shall also be checked for compliance with the appropriate requirements specified for Class III tools.

4.14 *Tools with overload protection devices incorporated in the plug shall be tested without regard being paid to such protection device.*

4.15 *For tools incorporating electronic circuits see annex B.*

5 Rating

The maximum rated voltage is:

- 250 V for d.c. tools,
- 440 V for other tools.

Compliance is checked by inspection of the marking.

NOTE: The requirements of this standard are based on the assumption that in normal use the voltage between the supply lines and earth does not exceed 250 V.

6 Classification

Tools are classified:

- 1 According to protection against electric shock:
 - Class I tools,
 - Class II tools,
 - Class III tools.
- 2 According to degree of protection against moisture:
 - Ordinary tools,
 - Splash-proof tools,
 - Watertight tools.

7 Marking and information for use

7.1 Tools shall be marked with:

- Rated voltage(s) or rated voltage range(s) in Volts,
- Symbol for nature of supply, if applicable,
- Rated frequency or rated frequency range in Hertz, unless the tool is designed for d.c. only, or for a.c. of any frequency not exceeding 60 Hz.
- Rated input in Watts or Kilowatts, if greater than 25 W,
- Rated current in Amperes, if greater than 10 A,
- Manufacturer's name or trade mark,
- Manufacturer's address or country of origin,
- Manufacturer's model or type reference and serial number (if any),
- Any mandatory mark showing compliance with legislation by reference to this standard,
- Rated operating time, or rated operating time and rated resting time, in hours, minutes or seconds, if applicable,
- Symbol for Class II construction, for Class II tools only,
- Symbol for degree of protection against moisture, if applicable,
- Rated no-load speed in revolutions per minute, if exceeding 10 000.
- Additional markings are allowed, provided they do not give rise to misunderstanding
- If the motor of a tool is marked separately, the marking of the tool and that of the motor shall be such that there can be no doubt with regard to the rating and manufacturer of the tool itself.

7.2 For tools with heating elements incorporated, the complete marking for heating elements required in EN 60335-1 shall, in addition, be given on the marking plate of the tool.

For such tools the rated input is considered equal to the maximum rated input of the motor and of the heating elements that can be in operation simultaneously.

7.3 Tools for short-time operation or intermittent operation shall be marked with rated operating time or rated operating time and rated resting time respectively, unless the operating time is either limited by the construction or corresponds to the description of normal load given in Part 2.

The marking of short-time operation or intermittent operation shall correspond to normal use.

The marking of intermittent operation shall be such that the rated operating time precedes the rated resting time, the marking being separated by an oblique stroke.

7.4 If the tool can be adjusted to suit different rated voltages or different rated inputs, the voltage or input to which the tool is adjusted shall be easily and clearly discernible. This requirement does not apply to tools for star-delta connection.

For tools where frequent changes in voltage setting are not required, this requirement is considered to be met if the rated voltage or the rated input to which the tool is adjusted, can be determined from a wiring diagram fixed to the tool; the wiring diagram may be on the inside of a cover which has to be removed to connect the supply conductors. This diagram may be on a card which is riveted to the cover, or on a paper or similar label secured to the cover by an adhesive, but it must not be on a label loosely attached to the tool.

7.5 For tools marked with more than one rated voltage or rated voltage range, the rated input for each of these voltages or ranges shall be marked, if greater than 25 W.

The upper and lower limits of the rated input shall be marked on the tool so that the relation between input and voltage appears distinctly, unless the difference between the limits of a rated voltage range does not exceed 10% of the mean value of the range, in which case the marking for rated input may be related to the mean value of this range.

Tools for star-delta connection must be clearly marked with the two rated voltages (e.g. 230 V \triangle \sphericalangle 400 V).

7.6 The following symbols shall be used as appropriate.⁽¹⁾


n	.....	Speed of normal load
n_0	.....	Rated no load speed
V	.....	Volts
A	.....	Amperes
Hz	.....	Hertz
W	.....	Watts
kW	.....	Kilowatts
h	.....	Hours
min	.....	Minutes
s	.....	Seconds
min^{-1} or .../min	.....	Revolutions or reciprocations per minute
\sim	.....	Alternating current
3 \sim	.....	Three-phase alternating current
3N \sim	.....	Three-phase alternating current with neutral
\equiv	.....	Direct current
\square	.....	Class II construction
\triangle (One drop in a triangle)	.....	Splash-proof construction
$\bullet\bullet$ (Two drops)	.....	Watertight construction

The symbol for nature of supply shall be placed next to the marking for rated voltage. The dimensions of the symbol for Class II construction shall be such that the length of the sides of the outer square is about twice the length of the sides of the inner square. The length of the sides of the outer square shall not be less than 5 mm, unless the largest dimension of the tool does not exceed 15 cm, in which case the dimensions of the symbol may be reduced, but the length of the sides of the outer square shall not be less than 3 mm.

The symbol for Class II construction shall be so placed that it will be obvious that it is a part of the technical information and is unlikely to be confused with the manufacturer's name or trade mark.

⁽¹⁾ This does not exclude the use of other symbols for other purposes

7.7 Terminals intended exclusively for the neutral conductor shall be indicated by the letter N.

Earthing terminals shall be indicated by the symbol .

These indications shall not be placed on screws, removable washers or other parts which might be removed when conductors are being connected.

7.8 Tools to be connected to more than two supply conductors shall be provided with a wiring diagram, unless the correct mode of connection is obvious.

The earthing conductor is not a supply conductor.

For tools for star-delta connection, the wiring diagram must show how the windings are to be connected.

The wiring diagram may be that referred to in 7.4.

7.9 A push-button shall be coloured red only if it serves to open the circuit to be controlled and has no other function.

This requirement does not apply to push-buttons used for locking the mains switch.

7.10 For tools that might cause danger when started unexpectedly, the "off" position of the mains switch shall be indicated, unless this position is obvious to the user; the indication, if required, shall be the figure 0.

The figure 0 shall not be used for any other indication.

7.11 Regulating devices and the like, intended to be adjusted during operation of the tool, shall be provided with an indication for the direction of adjustment to increase or to decrease the value of the characteristic being adjusted.

This requirement does not apply to regulating devices provided with reciprocating adjusting means, if its "fully-on" position is opposite to its "off" position.

If figures are used for indicating the different positions, the "off" position shall be indicated by the figure 0 and the position of a greater output, input, speed, etc. shall be indicated by a higher figure.

An indication of + and - is considered to be sufficient.

The indications for the different positions of the operating means of a control device need not be placed on the device itself.

7.12 Tools provided with electronic regulating devices shall either have a special marking or be accompanied by an instruction sheet giving the necessary instructions for the use of the tool.

7.13 The tool shall be accompanied by an instruction sheet, relevant to the tool concerned, in one of the official languages of the country in which it is to be sold.

7.13.1 The instruction sheet shall include at least the following:

- the name and address of the manufacturer or the country of origin;
- a repeat of the safety markings (e.g. maximum speed, capacity, etc.) that are to be marked on the tool;
- an explanation of any symbols or pictograms marked on the tool relevant to safe use;
- instruction related to safe use including normal operating conditions, assembly, adjustment, maintenance, etc. and draw attention to ways in which the tool shall not be used (which shall include the warning "Remove the plug from the socket before carrying out any adjustment, servicing or maintenance");
- list of accessories to be used with the tool;
- the noise emission (measured in accordance with 13.2)
- the vibration level, if applicable (measured in accordance with 13.3);
- information concerning dust extraction effectiveness (optional) as measured in accordance with 13.1;
- if necessary, instructions concerning the use of personal protective equipment.

7.13.2 The general safety instructions shall include the substance of the following text, as appropriate.

WARNING! When using electric tools, basic safety precautions, including the following, should always be followed to reduce the risk of fire, electric shock and personal injury.

Read all these instructions before operating this product and save these instructions.

For safe operations:

- 1 Keep work area clean
 - Cluttered areas and benches invite injuries.
- 2 Consider work area environment
 - Do not expose power tools to rain. Do not use power tools in damp or wet locations. Keep work area well lit. Do not use power tools where there is risk to cause fire or explosion.
- 3 Guard against electric shock
 - Avoid body contact with earthed or grounded surfaces (e.g. pipes, radiators, ranges, refrigerators).
- 4 Keep children away
 - Do not let visitors touch the tool or extension cord. All visitors should be kept away from area.
- 5 Store idle tools
 - When not in use, tools should be stored in a dry, high or locked up place, out of reach of children.
- 6 Do not force the tool
 - It will do the job better and safer at the rate for which it was intended.
- 7 Use the right tool
 - Do not force small tools or attachments to do the job of a heavy duty tool. Do not use tools for purposes not intended; for example, do not use circular saws to cut tree limbs or logs.
- 8 Dress properly
 - Do not wear loose clothing or jewellery, they can be caught in moving parts. Rubber gloves and non-skid footwear are recommended when working outdoors. Wear protecting hair covering to contain long hair.
- 9 Use safety glasses
 - Also use face or dust mask if the cutting operation is dusty.
- 10 Connect dust extraction equipment
 - If devices are provided for the connection of dust extraction and collection facilities ensure these are connected and properly used.
- 11 Do not abuse the cord
 - Never carry the tool by the cord or yank it to disconnect it from the socket. Keep the cord away from heat, oil and sharp edges.
- 12 Secure work
 - Use clamps or a vice to hold the work. It is safer than using your hand and it frees both hands to operate the tool.
- 13 Do not overreach
 - Keep proper footing and balance at all times.
- 14 Maintain tool with care
 - Keep cutting tools sharp and clean for better and safer performance. Follow instructions for lubrication and changing accessories. Inspect tool cord periodically and if damaged have it repaired by an authorized service facility. Inspect extension cords periodically and replace, if damaged. Keep handles dry, clean and free from oil and grease.
- 15 Disconnect tools
 - When not in use, before servicing and when changing accessories such as blades, bits and cutters.
- 16 Remove adjusting keys and wrenches
 - Form the habit of checking to see that keys and adjusting wrenches are removed from the tool before turning it on.
- 17 Avoid unintentional starting
 - Do not carry a plugged-in tool with a finger on the switch. Ensure switch is off when plugging in.
- 18 Use outdoor extension leads
 - When tool is used outdoors, use only extension cords intended for outdoor use.
- 19 Stay alert
 - Watch what you are doing. Use common sense. Do not operate tool when you are tired.

20 Check damaged parts

- Before further use of the tool, a guard or other part that is damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment of moving parts, free running of moving parts, breakage of parts, mounting and any other conditions that may affect its operation. A guard or other part that is damaged should be properly repaired or replaced by an authorized service centre unless otherwise indicated in this instruction manual. Have defective switches replaced by an authorized service facility. Do not use the tool if the switch does not turn it on and off.

21 Warning

- The use of any accessory or attachment, other than those recommended in this instruction manual, may present a risk of personal injury.

22 Have your tool repaired by a qualified person

- This electric tool is in accordance with the relevant safety requirements. Repairs should only be carried out by qualified persons using original spare parts, otherwise this may result in considerable danger to the user.

7.14 Marking specified in 7.1 to 7.5 shall be placed on the main part of the tool in such a way that it is clearly discernible when the tool is ready for use.

Marking on, indications for switches, thermal cut-outs and similar control devices, shall be placed in the vicinity of these components; they shall not be placed on removable parts if these parts can be replaced in such a way that the marking is misleading.

Compliance with the requirements of 7.1 to 7.14 is checked by inspection.

7.15 Marking shall be easily legible and durable.

Self adhesive labels glued in recesses in the enclosure of the tool, are allowed for ordinary tools.

Compliance is checked by inspection and by rubbing the marking by hand for 15 s with a piece of cloth soaked with water and again for 15 s with a piece of cloth soaked with petroleum spirit.

After all the tests of this specification, the marking shall be easily legible; it shall not be easily possible to remove marking plates and they shall show no curling.

The petroleum spirit to be used for the test is aliphatic solvent hexane having a maximum aromatics content of 0,1% by volume, a kauri-butanol value of 29, an initial boiling point of approximately 65 °C, a dry point of approximately 69 °C and a specific mass of approximately 0,66 kg/l.

8 Protection against electric shock

8.1 Tools shall be so constructed and enclosed that there is adequate protection against accidental contact with live parts and, for Class II tools, with metal parts separated from live parts by basic insulation only, even after removal of detachable parts. There shall be in addition adequate protection against risk of contact with basic insulation.

Enclosures shall have no openings giving access to live parts other than openings necessary for the use and working of the tool.

The insulating properties of lacquer, enamel, cotton, paper, oxide film on metal parts, beads, sealing compound and similar coverings shall not be relied upon to give the required degree of protection against accidental contact with live parts.

Unless otherwise specified, uninsulated parts operating at safety extra-low voltage are considered to be live parts.

Compliance is checked by inspection and, if necessary, by a test with the standard test finger shown in figure 1.

In addition, apertures in Class II tools and apertures in Class I tools, other than those in metal parts connected to an earthing terminal or earthing contact, are tested with the test pin shown in figure 2.

After removal of detachable parts, the test finger and the test pin are applied in every possible position, the test finger being applied without appreciable force and the test pin with a force of 10 N. Apertures preventing the entry of the test finger are further tested by means of a straight unjointed test finger of the same dimensions, which is applied with a force of 50 N; if this finger enters, the test with the test finger shown in figure 1 is repeated, except that the force necessary to push the finger through the aperture is exerted. An electrical contact indicator is used to show contact.

It shall not be possible to touch bare live parts or live parts protected by lacquer, enamel, paper, cotton, oxide film, beads, sealing compound or similar coverings only, with the test finger or, for Class II tools, with the test pin.

It shall not be possible to touch with the test finger basic insulation of unearthed metal parts separated from live parts by basic insulation only.

For Class II tool, it shall not be possible to touch metal parts separated from live parts by basic insulation only, with the test finger.

The standard test finger must be so designed that each of the jointed sections can be turned through an angle of 90° with respect to the axis of the finger in the same direction only.

NOTE: It is recommended that a lamp be used for the indication of contact and that the voltage be not less than 40 V.

8.2 Parts providing protection against shock shall have adequate mechanical strength and shall not work loose in normal use. It shall not be possible to remove them without the aid of a tool.

Compliance is checked by inspection, by manual test and by the tests of clauses 16 and 19.

8.3 Shafts of operating knobs, handles, levers and the like shall not be live.

Compliance is checked by inspection.

8.4 For Class II tools, capacitors shall not be connected to accessible metal parts, and their casings, if of metal, shall be separated from accessible metal parts by supplementary insulation.

Compliance is checked by inspection and by the test specified for supplementary insulation.

8.5 Tools shall be so designed that in normal use there is no risk of electric shock from charged capacitors. Capacitors having a rated capacitance not exceeding 0,1 µF are not considered as liable to entail a risk of electric shock.

Compliance is checked by the following test, which is made ten times.

The tool is operated at rated voltage or at the upper limit of rated voltage range.

The mains switch, if any, is then removed to the "off" position and the tool is disconnected from the supply by means of the plug.

One second after disconnection, the voltage between the pins of the plug shall not exceed 34 V.

NOTE: Care is taken that the voltage is measured with an instrument which does not appreciably affect the value to be measured.

9 Starting

Motors shall start under all normal voltage conditions which may occur in use.

Centrifugal and other automatic starting switches shall operate reliably and without contact chattering.

Compliance is checked by operating the tool, with no load, ten times in succession at a voltage equal to 0,85 times rated voltage, regulating devices, if any, being set as in normal use.

Tools provided with a centrifugal or other automatic starting switch are, in addition, operated ten times in succession at a voltage equal to 1,1 times rated voltage.

In all cases, the tool shall function correctly.

10 Input and current

10.1 The input of the tool, at rated voltage and under normal load, shall not exceed the rated input by more than the deviation shown in table 1.

Table 1

Rated input (W)	Deviation
Up to and including 33,3	10 W
Over 33,3 up to and including 150	30%
Over 150 up to and including 300	45 W
Over 300	15%

Compliance is checked by measuring the input of the tool operating at rated voltage and under normal load, when the input has stabilised.

A lower limit of the input is not required.