

INTERNATIONAL STANDARD

IEC
60745-1

Third edition
2001-12

Hand-held motor-operated electric tools – Safety –

Part 1: General requirements

*Outils électroportatifs à moteur –
Sécurité –*

*Partie 1:
Règles générales*

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CONTENTS

FOREWORD.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references.....	7
3 Definitions.....	9
4 General requirements.....	15
5 General conditions for the tests.....	15
6 Void.....	17
7 Classification.....	17
8 Marking and instructions.....	17
9 Protection against access to live parts.....	24
10 Starting.....	26
11 Input and current.....	26
12 Heating.....	26
13 Leakage current.....	30
14 Moisture resistance.....	31
15 Electric strength.....	33
16 Overload protection of transformers and associated circuits.....	35
17 Endurance.....	35
18 Abnormal operation.....	36
19 Mechanical hazards.....	39
20 Mechanical strength.....	40
21 Construction.....	41
22 Internal wiring.....	48
23 Components.....	49
24 Supply connection and external flexible cords.....	52
25 Terminals for external conductors.....	58
26 Provision for earthing.....	61
27 Screws and connections.....	63
28 Creepage distances, clearances and distances through insulation.....	65
29 Resistance to heat, fire and tracking.....	69
30 Resistance to rusting.....	70
31 Radiation, toxicity and similar hazards.....	71

Annex A (normative) Measurement of creepage distances and clearances.....	79
Annex B (normative) Motors not isolated from the supply mains and having basic insulation not designed for the rated voltage of the tool.....	84
Annex C (normative) Circuit for measuring leakage currents.....	86
Annex D (normative) Burning test.....	88
Annex E (normative) Glow-wire test.....	89
Annex F (normative) Needle-flame test.....	90
Annex G (normative) Proof tracking test.....	91
Annex H Void.....	92
Annex I (normative) Switches.....	93
Annex J (informative) Selection and sequence of the tests of clause 29.....	94
Bibliography.....	95
Figure 1 – Standard test finger.....	72
Figure 2 – Test pin.....	73
Figure 3 – Diagram for leakage current measurement at operating temperature for single-phase connection and three-phase tools suitable for single-phase supply of class II tools.....	73
Figure 4 – Diagram for leakage current measurement at operating temperature for three-phase connection.....	74
Figure 5 – Ball-pressure test apparatus.....	74
Figure 6 – Schematic representation of cord anchorages.....	75
Figure 7 – Test fingernail.....	76
Figure 8 – Examples of parts of earthing terminals.....	77
Figure 9 – Flexing test apparatus.....	78
Figure A.1a – Clearance gap for parallel sided and V-shaped groove.....	80
Figure A.1b – Clearance gap for rib and uncemented joint with groove.....	81
Figure A.1c – Clearance gap for uncemented joint and diverging-sided groove.....	82
Figure A.1d – Clearance gap between wall and screw.....	83
Figure B.1 – Simulation of defects.....	85
Figure C.1 – Circuit for measuring leakage currents.....	87
Table 1 – Maximum normal temperature rises.....	28
Table 2 – Test voltages.....	33
Table 3 – Maximum winding temperature.....	38
Table 4 – Impact energies.....	40
Table 5 – Test torques.....	41
Table 6 – Minimum cross-sectional area of supply cord.....	53
Table 7 – Pull and torque value.....	55
Table 8 – Nominal cross-sectional area of conductors.....	59
Table 9 – Torque for testing screws and nuts.....	64
Table 10 – Minimum creepage distances and clearances (in millimetres).....	66

INTERNATIONAL ELECTROTECHNICAL COMMISSION

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY –

Part 1: General requirements

FOREWORD

- 1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
- 3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical specifications, technical reports or guides and they are accepted by the National Committees in that sense.
- 4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
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- 6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60745-1 has been prepared by sub-committee 61F: Safety of hand-held motor-operated electric tools, of IEC technical committee 61: Safety of household and similar electrical appliances.

This third edition cancels and replaces the second edition published in 1997 and constitutes a technical revision.

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

FDIS	Report on voting
61F/422/FDIS	61F/427/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.

Annexes A, B, C, D, E, F, G and I form an integral part of this standard.

Annex J is for information only.

The committee has decided that the contents of this publication will remain unchanged until 2003. 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

The contents of the corrigendum of August 2003 have been included in this copy.

Withdrawing

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INTRODUCTION

This part 1 is to be used in conjunction with the appropriate part 2, which contains clauses to supplement or modify the corresponding clauses in part 1 to provide the relevant requirements for each type of product.

Individual countries may wish to consider its application, so far as is reasonable, to tools not mentioned in part 2, and to tools designed on new principles.

If the functions of a tool are covered by the different parts 2 of IEC 60745, the relevant part 2 is applied to each function separately, so far as is reasonable. If applicable, the influence of one function on the other is taken into account.

Normative references to other IEC and ISO standards are given in clause 2.

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

- Requirements: in roman type
- *Test specification: in italic type*
- Notes: in smaller roman type

It has been assumed in the drafting of this International Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

A product 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 intention of the requirements and, if found to be substantially equivalent, may be judged to comply with the standard.

Standards dealing with non-safety aspects of hand-held tools are:

- IEC standards published by TC 59 on methods of measuring performance;
- CISPR 11 and 14 on radio interference suppression;
- IEC 61000-3-2 and IEC 61000-3-3 on electromagnetic compatibility.

HAND-HELD MOTOR-OPERATED ELECTRIC TOOLS – SAFETY –

Part 1: General requirements

1 Scope

1.1 This International Standard deals with the safety of hand-held motor-operated or magnetically driven electric tools, the rated voltage of the tools being not more than 250 V for single-phase a.c. or d.c. tools, and 440 V for three-phase a.c. tools.

So far as is practicable, this standard deals with the common hazards presented by hand-held tools, which are encountered by all persons in the common use of the tools.

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

Hand-held electric tools, hereinafter referred to as tools, which can be mounted on a support for use as fixed tools without any alteration of the tool itself, are within the scope of this standard. Unless the requirement for such 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.

Requirements for motors not isolated from the supply, and having basic insulation not designed for the rated voltage of the tools, are given in Annex B.

This standard does not apply to:

- hand-held tools intended to be used in the presence of explosive atmosphere (dust, vapour or gas);
- hand-held tools used for preparing and processing food;
- hand-held tools for medical purposes (IEC 60601);
- heating tools which are covered by IEC 60335-2-45.

For hand-held tools intended to be used in vehicles or on board ships or aircraft, additional requirements may be necessary.

For hand-held tools intended to be used in tropical countries, special requirements may be necessary.

NOTE 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, etc.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 60745. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of IEC 60745 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60061-1:1969, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps*
Supplement A (1969) to amendment 26 (2001)

IEC 60068-2-75:1997, *Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests*

IEC 60083:1997, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60085:1984, *Thermal evaluation and classification of electrical insulation*

IEC 60112:1979, *Method for determining the comparative and the proof tracking indices of solid insulating materials under moist conditions*

IEC 60127 (all parts), *Miniature fuses*

IEC 60227 (all parts), *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V*

IEC 60245 (all parts), *Rubber insulated cables – Rated voltages up to and including 450/750*

IEC 60309 (all parts), *Plugs, socket-outlets and couplers for industrial purposes*

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

IEC 60335-1:2001, *Safety of household and similar electrical appliances – Part 1: General requirements*

IEC 60384-14:1993, *Fixed capacitors for use in electronic equipment – Part 14: Sectional specification: Fixed capacitors for electromagnetic interference suppression and connection to the supply mains*

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60695-2-2:1991, *Fire hazard testing – Part 2: Test methods – Section 2: Needle-flame test*

IEC 60695-2-10:2000, *Fire hazard testing – Part 2-10: Glowing/hot-wire based test methods – Glow-wire apparatus and common test procedure*

IEC 60695-2-11:2000, *Fire hazard testing – Part 2-11: Glowing/hot-wire based test methods – Glow-wire flammability test method for end-products*

IEC 60695-2-12:2000, *Fire hazard testing – Part 2-12: Glowing/hot-wire based test methods – Glow-wire flammability test method for materials*

IEC 60695-2-13:2000, *Fire hazard testing – Part 2-13: Glowing/hot-wire based test methods – Glow-wire ignitability test method for materials*

IEC 60707:1999, *Flammability of solid non-metallic materials when exposed to flame sources – List of test methods*

IEC 60730-1:1999, *Automatic electrical controls for household and similar use – Part 1: General requirements*

IEC 60998-2-2:1991, *Connecting devices for low-voltage circuits for household and similar purposes – Part 2-2: Particular requirements for connecting devices as separate entities with screwless-type clamping units*

IEC 60999-1:1999, *Connecting devices – Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units – Part 1: General requirements and particular requirements for clamping units for conductors from 0,2 mm² up to 35 mm² (included)*

IEC 61058-1:2000, *Switches for appliances – Part 1: General requirements*

IEC 61558-1:1997, *Safety of power transformers, power supply units and similar – Part 1: General requirements and tests*

ISO 1463:1982, *Metallic and oxide coatings – Measurement of coating thickness – Microscopical method*

ISO 2178:1982, *Non-magnetic coatings on magnetic substrates – Measurement of coating thickness – Magnetic method*

3 Definitions

For the purpose of this International Standard, the following definitions apply.

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

3.1.2 Where in this standard the expressions "with the aid of a tool", "without the aid of a tool", and "requires the use of a tool", the word "tool" means a screwdriver or any other object, which may be used to operate a screw or other fixing means.

3.2.1

rated voltage

voltage assigned to the tool by the manufacturer. For three-phase supply, it is the voltage between phases

3.2.2

rated voltage range

voltage range assigned to the tools by the manufacturer, expressed by its lower and upper limits

3.2.3

working voltage

maximum voltage to which the part under consideration is subjected when the tool is supplied at its rated voltage and operating under normal load. When deducing the working voltage, the effect of transient voltages is ignored

3.2.4

rated input

input in watts assigned to the tool by the manufacturer

3.2.5

rated input range

input range in watts assigned to the tool by the manufacturer, expressed by its lower and upper limits

3.2.6

rated current

current assigned to the tool by the manufacturer. 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 under normal load at rated voltage

3.2.7

rated frequency

frequency assigned to the tool by the manufacturer

3.2.8

rated frequency range

frequency range assigned to the tool by the manufacturer, expressed by its lower and upper limits

3.2.9

normal load

load to be applied to a tool, to obtain rated input or rated current, any marking of short-time or intermittent operation being observed and, unless otherwise specified, heating elements, if any, being operated as in normal use. The normal load is based on the rated voltage or on the upper limit of the rated voltage range

3.2.9.1

no load input / current

highest input or current obtained when a tool is operated at rated voltage and frequency with no external load (work) applied to the accessories packaged with the tool by the manufacturer and adjusted according to manufacturer's instructions, ready for use

3.2.10

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

3.3.1

detachable cord

flexible cord, for supply, intended to be connected to the tool by means of a suitable appliance coupler

3.3.2

supply cord

flexible cord, for supply purposes, which is fixed to the tool

3.3.3

type X attachment

method of attachment of the supply cord so that it can easily be replaced without the aid of a special purpose tool provided by the manufacturer. The supply cord may be a specially prepared cord and only available from the manufacturer or its service agent. A specially prepared cord can also include a part of the tool.

3.3.4

type Y attachment

method of attachment of the supply cord such that any replacement is intended to be made by the manufacturer, its service agent or similar qualified person. Type Y attachment may be used either with an ordinary flexible cord or with a special cord

3.3.5

type Z attachment

method of attachment of the supply cord so that it cannot be replaced without breaking or destroying the tool

3.4.1

basic insulation

insulation applied to live parts to provide basic protection against electric shock. Basic insulation does not necessarily include insulation used exclusively for functional purposes

3.4.2

supplementary insulation

independent insulation applied in addition to the basic insulation, in order to provide protection against electric shock in the event of a failure of the basic insulation

3.4.3

double insulation

insulation system comprising both basic insulation and supplementary insulation

3.4.4

reinforced insulation

single insulation system applied to live parts, which provides a degree of protection against electric shock equivalent to double insulation under the conditions specified in this standard. The term "single insulation system" does not imply that the insulation is one homogeneous piece. It may comprise several layers which cannot be tested singly as supplementary or basic insulation

3.4.5

class I tool

tool in which protection against electric shock does not rely on basic insulation only, but which includes an additional safety precaution in that conductive accessible parts are connected to the protective earthing conductor in the fixed wiring of the installation in such a way that conductive accessible parts cannot become live in the event of a failure of the basic insulation. For tools intended for use with a flexible cord, this provision includes a protective conductor as part of the flexible cord

3.4.6

class II tool

tool in which protection against electric shock does not rely on basic insulation only, but in which additional safety precautions, such as double insulation or reinforced insulation, are provided, there being no provision for protective earthing or reliance upon installation conditions.

Such a tool may be of one of the following types:

- a) a tool having a durable and substantially continuous enclosure of insulating material which envelops 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;
- b) 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;
- c) a tool which is a combination of the types a) and b).

The enclosure of an insulation-encased class II tool may form a part or the whole of the supplementary insulation or of the reinforced insulation.

If a tool with double insulation and/or reinforced insulation throughout has an earthing terminal or earthing contact, it is considered to be a class I tool

3.4.7

class II construction

part of a tool for which protection against electric shock relies upon double insulation or reinforced insulation

3.4.8

class III tool

tool in which protection against electric shock relies on supply at safety extra-low voltage, and in which voltages higher than those of safety extra-low voltages are not generated. Tools intended to be operated at safety extra-low voltage, and having internal circuits which operate at a voltage other than safety extra-low voltage, are not included in the classification, and are subject to additional requirement

3.4.9

class III construction

part of a tool for which protection against electric shock relies upon safety extra-low voltage, and in which voltages higher than those of safety extra-low voltages are not generated

3.4.10

creepage distance

shortest path between two conductive parts, or between a conductive part and the boundary surface of the tool, measured along the surface of the insulating material

3.4.11

clearance

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

3.4.12

normal duty conditions of insulating material

where there is virtually no deposition of conductive material and a long period of electrical stress; or a light deposition of conductive material and a short period of electrical stress

3.4.13

severe duty conditions of insulating material

where there is a light deposition of conductive material and a long period of electrical stress; or a heavy deposition of conductive material and a short period of electrical stress

3.4.14

extra-severe duty conditions of insulating material

where there is heavy deposition of conductive material and a long period of electrical stress; or an extra heavy deposition of conductive material and a short period of electrical stress

3.5.1

extra-low voltage

voltage supplied from a source within the tool and, which, when the tool is supplied at rated voltage, does not exceed 50 V between conductors and between conductors and earth

3.5.2

safety extra-low voltage

nominal voltage not exceeding 42 V between conductors and between conductors and earth, the no-load voltage not exceeding 50 V. When safety extra-low voltage is obtained from the supply mains, it is to be through a safety isolating transformer or a convertor with separate windings, the insulation of which complies with double or reinforced insulation requirements

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

3.5.3

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 intended to supply a distribution circuit, a tool or other equipment at safety extra-low voltage

3.6.1

hand-held tool (in this standard abbreviated to "tool")

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 the 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 either fixed or portable. Hand-held tools may also have provisions for mounting on a support. Hand-held tools include also hand-supported tools (such as paving breakers).

3.6.2

exchange type tool

tool which is intended not to be repaired at all, or to be repaired by the manufacturer's service organization only