

INTERNATIONAL STANDARD

IEC 61140

Third edition
2001-10

BASIC SAFETY PUBLICATION

Protection against electric shock – Common aspects for installation and equipment

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROTECTION AGAINST ELECTRIC SHOCK – COMMON ASPECTS FOR INSTALLATION AND EQUIPMENT

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.
- 5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
- 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 61140 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

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
64/1191/FDIS	64/1202/RVD

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

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

It has the status of a basic safety publication in accordance with IEC Guide 104.

Annexes A, B and C are for information only.

The committee has decided that the contents of this publication will remain unchanged until 2006. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

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INTRODUCTION

This International Standard is a Basic Safety Publication intended for use by technical committees in the preparation of standards in accordance with the principles of IEC Guide 104 and ISO/IEC Guide 51.

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PROTECTION AGAINST ELECTRIC SHOCK – COMMON ASPECTS FOR INSTALLATION AND EQUIPMENT

1 Scope

This International Standard applies to the protection of persons and animals against electric shock. It is intended to give fundamental principles and requirements which are common to electrical installations, systems and equipment or necessary for their co-ordination.

This standard has been prepared for installations, systems and equipment without a voltage limit.

NOTE There are some clauses in this standard which refer to low-voltage and high-voltage systems, installations and equipment. For the purpose of this standard, low-voltage is any rated voltage up to and including 1 000 V a.c. or 1 500 V d.c. High voltage is any rated voltage exceeding 1 000 V a.c. or 1 500 V d.c.

The requirements of this standard apply only if they are incorporated, or are referred to, in the relevant standards. It is not intended to be used as a stand-alone standard.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard 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 60050(131): *International Electrotechnical Vocabulary (IEV) – Chapter 131: Electric and magnetic circuits*

IEC 60050(195): 1998, *International Electrotechnical Vocabulary (IEV) – Part 195: Earthing and protection against electric shock*
Amendment 1 (2001)

IEC 60050(351):1998, *International Electrotechnical Vocabulary – Part 351: Automatic control*

IEC 60050(826):1982, *International Electrotechnical Vocabulary – Chapter 826: Electrical installations of buildings*
Amendment 2 (1995)

IEC 60071-1:1993, *Insulation co-ordination – Part 1: Definitions, principles and rules*

IEC 60071-2:1996, *Insulation co-ordination – Part 2: Application guide*

IEC 60364-4-41, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 41: Protection against electric shock*

IEC 60364-4-443:1995, *Electrical installations of buildings – Part 4: Protection for safety – Chapter 44: Protection against overvoltages – Section 443: Protection against overvoltages of atmospheric origin or due to switching*

IEC 60364-5-54:1980, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 54: Earthing arrangements and protective conductors*

IEC 60364-6-61:1986, *Electrical installations of buildings – Part 6: Verification – Chapter 61: Initial verification*

IEC 60417-2, *Graphical symbols for use on equipment – Part 2: Symbol originals*

IEC 60446:1999, *Basic and safety principles for man-machine interface, marking and identification – Identification of conductors by colours or numerals*

IEC 60479-1:1994, *Effects of current on human beings and livestock – Part 1: General aspects*

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

IEC 60601 (all parts), *Medical electrical equipment*

IEC 60601-1:1988, *Medical electrical equipment – Part 1: General requirements for safety*

IEC 60664-1:1992, *Insulation co-ordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60721 (all parts), *Classification of environmental conditions*

IEC 60990:1999, *Methods of measurement of touch current and protective conductor current*

IEC 61201:1992, *Extra-low-voltage (ELV) – Limit values*

ISO/IEC Guide 51:1999, *Safety aspects – Guidelines for their inclusion in standards*

IEC Guide 104:1997, *The preparation of safety publications and the use of basic safety publications and group safety publications*

3 Definitions

NOTE An index of definitions is given in annex C.

For the purpose of this International Standard the following definitions apply:

3.1

electric shock

physiological effect resulting from an electric current through a human or animal body

[IEV 195-01-04]

3.1.1

basic protection

protection against electric shock under fault-free conditions

[IEV 195-06-01]

NOTE For low-voltage installations, systems and equipment, basic protection generally corresponds to protection against direct contact as used in IEC 60364-4-41.

3.1.2

fault protection

protection against electric shock under single-fault conditions

[IEV 195-06-02]

NOTE For low-voltage installations, systems and equipment, fault protection generally corresponds to protection against indirect contact as used in IEC 60364-4-41, mainly with regard to failure of basic insulation.

3.2

(electric) circuit

an arrangement of devices or media through which electric current can flow

[IEV 131-01-01]

NOTE See also IEC 826-05-01 for electrical installations of buildings.

3.3

(electrical) equipment

any item used for such purposes as generation, conversion, transmission, storage, distribution or utilization of electrical energy, such as machines, transformers, apparatus, measuring instruments, protective devices, accessories for wiring systems, appliances

[IEV 826-07-01, modified]

3.4

live part

conductor or conductive part intended to be energized in normal operation, including a neutral conductor, but by convention not a PEN conductor or PEM conductor or PEL conductor

[IEV 195-02-19]

NOTE 1 This concept does not necessarily imply a risk of electric shock.

NOTE 2 For definitions of PEM and PEL see IEC 195-02-13 and 195-02-14.

3.5

hazardous-live-part

live part which, under certain conditions, can give a harmful electric shock

[IEV 195-06-05]

NOTE In case of high voltage, a hazardous voltage may be present on the surface of solid insulation. In such a case the surface is considered to be a hazardous-live-part.

3.6

exposed-conductive-part

conductive part of equipment, which can be touched and which is not normally live, but which can become live when basic insulation fails

[IEV 195-06-10]

NOTE A conductive part of electrical equipment which can only become live through contact with an exposed-conductive-part which has become live, is not considered to be an exposed-conductive-part itself.

3.7

extraneous-conductive-part

conductive part not forming part of the electrical installation and liable to introduce an electric potential, generally the electric potential of a local earth

[IEV 195-06-11]

3.8 touch voltage

3.8.1 (effective) touch voltage

voltage between conductive parts when touched simultaneously by a person or an animal

NOTE The value of the effective touch voltage may be appreciably influenced by the impedance of the person or the animal in electric contact with these conductive parts.

[IEV 195-05-11]

3.8.2 prospective touch voltage

voltage between simultaneously accessible conductive parts when those conductive parts are not being touched, by a person or an animal

[IEV 195-05-09]

3.9 touch current

electric current passing through a human body or through an animal body when it touches one or more accessible parts of an installation or of equipment

[IEV 195-05-21]

3.10 insulation

NOTE Insulation can be a solid, a liquid or a gas (e.g. air), or any combination.

3.10.1 basic insulation

insulation of hazardous-live-parts which provides basic protection

NOTE This concept does not apply to insulation used exclusively for functional purposes.

[IEV 195-06-06]

3.10.2 supplementary insulation

independent insulation applied in addition to basic insulation, for fault protection

[IEV 195-06-07]

3.10.3 double insulation

insulation comprising both basic insulation and supplementary insulation

[IEV 195-06-08]

3.10.4 reinforced insulation

insulation of hazardous-live-parts which provides a degree of protection against electric shock equivalent to double insulation

NOTE Reinforced insulation may comprise several layers which cannot be tested singly as basic insulation or supplementary insulation.

[IEV 195-06-09]