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Protection against electric shock - Common aspects for
installation and equipment. CONSOLIDATED TEXT

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

Käesolev Eesti standard EVS-EN 61140:2006 sisaldab Euroopa standardi EN 61140:2002+A1:2006 ingliskeelset teksti.

Standard on kinnitatud Eesti Standardikeskuse 18.12.2002 käskkirjaga ja jõustub sellekohase teate avaldamisel EVS Teatajas.

Euroopa standardimisorganisatsioonide poolt rahvuslikele liikmetele Euroopa standardi teksti kättesaadavaks tegemise kuupäev on 20.03.2002.

Standard on kättesaadav Eesti standardiorganisatsioonist.

This Estonian standard EVS-EN 61140:2006 consists of the English text of the European standard EN 61140:2002+A1:2006.

This standard is ratified with the order of Estonian Centre for Standardisation dated 18.12.2002 and is endorsed with the notification published in the official bulletin of the Estonian national standardisation organisation.

Date of Availability of the European standard text 20.03.2002.

The standard is available from Estonian standardisation organisation.

ICS 13.260, 29.020, 91.140.50

Võtmesõnad: kaitse, paigaldus, seadmed

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EUROPEAN STANDARD

EN 61140

NORME EUROPÉENNE

EUROPÄISCHE NORM

March 2002

ICS 13.260;29.020;91.140.50

Supersedes EN 61140:2001

English version

**Protection against electric shock –
Common aspects for installation and equipment
(IEC 61140:2001)**

Protection contre les chocs électriques -
Aspects communs aux installations et
aux matériels
(CEI 61140:2001)

Schutz gegen elektrischen Schlag -
Gemeinsame Anforderungen
für Anlagen und Betriebsmittel
(IEC 61140:2001)

This European Standard was approved by CENELEC on 2001-12-04. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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, Malta, 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

The text of document 64/1191/FDIS, future edition 3 of IEC 61140, prepared by IEC TC 64, Electrical installations and protection against electric shock, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61140 on 2001-12-04.

This European Standard supersedes EN 61140:2001.

The following dates were fixed:

- latest date by which the EN has to be implemented
at national level by publication of an identical
national standard or by endorsement (dop) 2003-08-01
- latest date by which the national standards conflicting
with the EN have to be withdrawn (dow) 2004-12-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annex ZA is normative and annexes A, B, C and ZB are informative.

Annexes ZA and ZB have been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61140:2001 was approved by CENELEC as a European Standard without any modification.

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60050-131	- ¹⁾	International Electrotechnical Vocabulary (IEV) Chapter 131: Electric and magnetic circuits	-	-
IEC 60050-195	1998	Chapter 195: Earthing and protection against electric shock	-	-
A1	2001		-	-
IEC 60050-351	1998	Part 351: Automatic control	-	-
IEC 60050-826	1982	Chapter 826: Electrical installations of buildings	-	-
A2	1995		HD 384.2 S2	2001 ²⁾
IEC 60071-1	1993	Insulation co-ordination Part 1: Definitions, principles and rules	EN 60071-1	1995
IEC 60071-2	1996	Part 2: Application guide	EN 60071-2	1997
IEC 60364-4-41 (mod)	- ¹⁾	Electrical installations of buildings Part 4: Protection for safety - Chapter 41: Protection against electric shock	HD 384.4.41 S2	1996 ³⁾
IEC 60364-4-443 (mod)	1995	Part 4: Protection for safety - Chapter 44: Protection against overvoltages - Section 443: Protection against overvoltages of atmospheric origin or due to switching	HD 384.4.443 S1	2000

1) Undated reference.

2) HD 384.2 S2 includes A1:1990 + A2:1995 + A3:1999 to IEC 60050-826.

3) Valid edition at date of issue.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60364-5-54 (mod)	1980	Part 5: Selection and erection of electrical equipment - Chapter 54: Earthing arrangements and protective conductors	HD 384.5.54 S1	1988
IEC 60364-6-61 (mod)	1986	Part 6: Verification - Chapter 61: Initial verification	HD 384.6.61 S1	1992
IEC 60417-2	- ¹⁾	Graphical symbols for use on equipment Part 2: Symbol originals	EN 60417-2	1999 ³⁾
IEC 60446	1999	Basic and safety principles for man-machine interface, marking and identification - Identification of conductors by colours or numerals	EN 60446	1999
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)	EN 60529 + corr. May	1991 1993
IEC 60601	Series	Medical electrical equipment	EN 60601	Series
IEC 60601-1	1988	Medical electrical equipment Part 1: General requirements for safety	EN 60601-1 + corr. July	1990 1994
IEC 60664-1 (mod)	1992	Insulation coordination for equipment within low-voltage systems Part 1: Principles, requirements and tests	HD 625.1 S1 + corr. November	1996 1996
IEC 60721	Series	Classification of environmental conditions	EN 60721	Series
IEC 60990	1999	Methods of measurement of touch current and protective conductor current	EN 60990	1999
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	-	-

Annex ZB
(informative)

A-deviations

A-deviation: National deviation due to regulations, the alteration of which is for the time being outside the competence of the CEN/CENELEC member.

This European Standard falls under Directive 73/23/EEC.

NOTE (from CEN/CENELEC IR Part 2, 3.1.9): Where standards fall under EC Directives, it is the view of the Commission of the European Communities (OJ No C 59; 1982-03-09) that the effect of the decision of the Court of Justice in case 815/79 Cremonini/Vrankovich (European Court Reports 1980, p. 3583) is that compliance with A-deviations is no longer mandatory and that the free movement of products complying with such a standard should not be restricted except under the safeguard procedure provided for in the relevant Directive.

A-deviations in an EFTA-country are **valid instead** of the relevant provisions of the European Standard in that country until they have been removed.

<u>Clause</u>	<u>Deviation</u>
3.17.3	Belgium (Wiring rules: Règlement Général sur les Installations Electriques (RGIE) / Algemeen Reglement op de Elektrische Installaties (AREI) art. 28.02)

A conductive part embedded in concrete is not allowed as an earth electrode.

**Protection against electric shock -
Common aspects for installation and equipment
(IEC 61140:2001/A1:2004, modified)**

Protection contre les chocs électriques -
Aspects communs aux installations
et aux matériels
(CEI 61140:2001/A1:2004, modifiée)

Schutz gegen elektrischen Schlag -
Gemeinsame Anforderungen für
Anlagen und Betriebsmittel
(IEC 61140:2001/A1:2004, modifiziert)

This amendment A1 modifies the European Standard EN 61140:2002; it was approved by CENELEC on 2006-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this amendment the status of a national standard without any alteration.

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 amendment 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, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the 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

The text of amendment 1:2004 to the International Standard IEC 61140:2001, prepared by IEC TC 64, Electrical installations and protection against electric shock, together with the common modifications prepared by the Technical Committee CENELEC TC 64, Electrical installations and protection against electric shock, was submitted to the formal vote and was approved by CENELEC as amendment A1 to EN 61140:2002 on 2006-05-01.

The following dates were fixed:

- latest date by which the amendment has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2007-05-01
- latest date by which the national standards conflicting with the amendment have to be withdrawn (dow) 2009-05-01

In this document the common modifications to the International Standard are indicated by a vertical line in the left margin of the text.

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1 Scope

Add the following NOTE:

NOTE Z1 Requirements of this standard may be used by technical committees as a basis for their publications.

2 Normative references

Insert the following two new references:

IEC 60038:1983 + A1:1994 + A2:1997, *IEC standard voltages*

EN 62271-102:2002 + corr. March 2005, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches* (IEC 62271-102:2001 + corr. April 2002 + corr. May 2003)

3 Definitions

Add the following two new definitions:

3.41

isolation

function intended to make dead for reasons of safety all or a discrete section of the electrical installation by separating the electrical installation or section from every source of electric energy

[IEV 826-17-01]

3.42

impulse withstand voltage

highest peak value of impulse voltage of prescribed form and polarity which does not cause breakdown of insulation under specified conditions

8 Special operating and servicing conditions

Add, after 8.2, the following new subclause:

8.3 Devices for isolation

8.3.1 General

Devices suitable for isolation shall effectively isolate the circuit concerned from all live supply conductors.

NOTE 1 With regard to low voltage, see also 8.3.2.

The position of the contacts or other means of isolation shall, in the isolated position, be either externally visible or clearly and reliably indicated.

NOTE 2 The indication may be achieved by suitable marking to indicate the isolated and closed positions respectively.

Devices suitable for isolation shall be designed and/or erected to prevent unintentional or unauthorized operation.

NOTE 3 Such operation might be caused for example by shocks and vibrations.

8.3.2 Devices for isolation for low voltage

Devices suitable for isolation shall effectively isolate the circuit concerned from all live supply conductors including the neutral. However in TN-S systems where the supply system conditions are

such that the neutral conductor can be regarded as being reliably at earth potential, the neutral conductor need not to be isolated.

Devices for isolation shall comply with the following two conditions:

- a) When in the new, clean and dry condition, with the contacts in the position for isolation, the device shall withstand between the line and load terminals, the impulse withstand voltage given in Table 2.

Table 2 – Minimum impulse withstand voltage of devices for isolation related to the nominal voltage

Nominal voltage of the supply system ^a		Minimum impulse withstand voltage ^b	
V		kV	
Three-phase systems	Single-phase systems with middle point	Overvoltage category III	Overvoltage category IV
	120 – 240	3	5
230/400, 277/480		5	8
400/690		8	10
1 000		10	15

^a According to IEC 60038.

^b Equipment of overvoltage category II and I are not applicable for isolation.

NOTE 1 For an explanation of the overvoltage categories, see 2.2.2.1.1 of EN 60664-1:2003.

NOTE 2 The impulse withstand voltages are referred to an altitude of 2 000 m.

- b) The leakage current across open poles shall under no circumstances exceed:

- 0,5 mA per pole in the new, clean and dry condition, and
- 6 mA per pole, at the end of the conventional service life of the device,

when tested across the terminals of each pole with a voltage value equal to 110 % of the voltage between line to neutral corresponding to the rated voltage of equipment, when the starpoint or midpoint of the supply is connected to earth. In all other cases the voltage value shall be equal to 110 % of the line-to-line voltage of the supply system.

In the case of d.c. testing, the value of the d.c. voltage shall be the same as the r.m.s. value of the a.c. test voltage.

NOTE Tests to verify this requirement may be specified by the relevant technical committee.

8.3.3 Devices for isolation for high voltage

8.3.3.1 General

Every isolating device shall be suitable for the assigned purpose.

All general requirements, e.g. earthing arrangements and if necessary the special requirements of the location, e.g. altitude, shall be stated and taken into consideration.

All isolated parts of the main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This requirement does not necessarily apply to removable parts that become accessible after being separated from the installation.

The corresponding specifications for the assigned equipment shall be designed taking into account the network configuration, the local particular conditions and the experiences of operation and maintenance.

It shall be considered that the expected electrical stresses are not only the stresses found in normal operation, but also additional stresses, for example in case of a short-circuit fault.

Lightning and switching overvoltages shall be also taken into consideration.

Mechanical, climatic and other special stresses which belong to external influences at the site of installation shall be considered during the design process of the equipment.

NOTE 1 Besides these stresses, it is important to pay attention to EN 60071-1, Insulation co-ordination, by the selection of a suitable switching device.

To avoid unintentional operation, means of preventing the operation of the isolating device shall be available in the "on" and "off" position.

NOTE 2 For the construction or installation of devices for isolation it should be taken into consideration, that electric arcs or hot ionizing gases may be generated when switching off. Therefore equipment should be designed or installed in such a way that ionized gas released during switching does not result in damage to the equipment or in danger to operating personnel. This is valid also if there is a secondary flashover by ionization to parts which are not live parts.

8.3.3.2 Characteristics of devices for isolation

The rated impulse withstand voltage levels across the isolating distance shall be higher than the rated impulse withstand voltage level for line-to-line or line-to-earth insulation (see EN 62271-102).

For safety reasons, devices for isolation shall be designed so that any earth leakage current which may flow from one contact to the terminal on the other side of the isolator is limited to an acceptable level. This safety requirement is fulfilled, if this leakage current is reliably dissipated to earth via a special connector.

NOTE 1 For devices for isolation which contain a dielectric different from air with atmospheric pressure, the dielectric conditions for the isolating distance may be agreed between manufacturer and user.

NOTE 2 Tests for verification of the effectiveness of the protection against pollution and the performance of the insulation materials with regard to leakage current should be considered.

NOTE 3 For high voltage rated impulse withstand voltages, see EN 60071-1.

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INTERNATIONAL STANDARD

IEC
61140

Third edition
2001-10

BASIC SAFETY PUBLICATION

Protection against electric shock – Common aspects for installation and equipment

*This **English-language** version is derived from the original **bilingual** publication by leaving out all French-language pages. Missing page numbers correspond to the French-language pages.*



Reference number
IEC 61140:2001(E)

Publication numbering

As from 1 January 1997 all IEC publications are issued with a designation in the 60000 series. For example, IEC 34-1 is now referred to as IEC 60034-1.

Consolidated editions

The IEC is now publishing consolidated versions of its publications. For example, edition numbers 1.0, 1.1 and 1.2 refer, respectively, to the base publication, the base publication incorporating amendment 1 and the base publication incorporating amendments 1 and 2.

Further information on IEC publications

The technical content of IEC publications is kept under constant review by the IEC, thus ensuring that the content reflects current technology. Information relating to this publication, including its validity, is available in the IEC Catalogue of publications (see below) in addition to new editions, amendments and corrigenda. Information on the subjects under consideration and work in progress undertaken by the technical committee which has prepared this publication, as well as the list of publications issued, is also available from the following:

- **IEC Web Site** (www.iec.ch)

- **Catalogue of IEC publications**

The on-line catalogue on the IEC web site (www.iec.ch/searchpub) enables you to search by a variety of criteria including text searches, technical committees and date of publication. On-line information is also available on recently issued publications, withdrawn and replaced publications, as well as corrigenda.

- **IEC Just Published**

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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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Commission Electrotechnique Internationale
International Electrotechnical Commission
Международная Электротехническая Комиссия

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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.
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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 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.