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REDLINE VERSION



BASIC SAFETY PUBLICATION

Protection against electric shock – Common aspects for installations and equipment

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

PROTECTION AGAINST ELECTRIC SHOCK – COMMON ASPECTS FOR INSTALLATION AND EQUIPMENT

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of 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, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). 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. 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 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 IEC National Committees.
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- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

DISCLAIMER

This Redline version is not an official IEC Standard and is intended only to provide the user with an indication of what changes have been made to the previous version. Only the current version of the standard is to be considered the official document.

This Redline version provides you with a quick and easy way to compare all the changes between this standard and its previous edition. A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text.

This is a preview of "S+ IEC 61140 Ed. 4.0...". [Click here to purchase the full version from the ANSI store.](#)

International Standard IEC 61140 has been prepared by IEC technical committee 64: Electrical installations and protection against electric shock.

This fourth edition cancels and replaces the third edition published in 2001 and Amendment 1:2004. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Introduction of the content of IEC 60449
- b) Better distinction between provisions and measures
- c) Consideration of effects other than ventricular fibrillation
- d) Additional protection was introduced
- e) ELV defined as part of LV
- f) Devices suitable for isolation required for automatic disconnection of supply (LV)
- g) Requirements relating to current in the protective conductor were moved to the main body of the standard

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

FDIS	Report on voting
64/2076/FDIS	64/2091/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 2.

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

The reader's attention is drawn to the fact that Annex C lists all of the "in-some-country" clauses on differing practices of a less permanent nature relating to the subject of this standard.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

INTRODUCTION

PROTECTION AGAINST ELECTRIC SHOCK – COMMON ASPECTS FOR INSTALLATIONS AND EQUIPMENT

1 Scope

This International Standard is a basic safety publication primarily intended for use by technical committees in the preparation of standards in accordance with the principles laid down in IEC Guide 104 and ISO/IEC Guide 51.

It is not intended to be used as a stand-alone standard.

According to IEC Guide 104, technical committees, when preparing, amending, or revising their publications, are required to make use of any basic safety publication such as IEC 61140.

This International Standard applies to the protection of persons and ~~animals~~ livestock against electric shock. The intent is to give fundamental principles and requirements which are common to electrical installations, systems and equipment or necessary for their coordination, without limitations with regard to the magnitude of the voltage or current, or the type of current, and for frequencies up to 1 000 Hz.

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

NOTE Some clauses in this standard refer to low-voltage and high-voltage systems, installations and equipment. For the purposes 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.~~

It should be noted that, for an efficient design and selection of protective measures, the type of voltage that may occur and its waveform needs to be considered, i.e. a.c. or d.c. voltage, sinusoidal, transient, phase controlled, superimposed d.c., as well as a possible mixture of these forms. The installations or equipment may influence the waveform of the voltage, e.g. by inverters or converters. The currents flowing under normal operating conditions and under fault conditions depend on the described voltage.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

~~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~~

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

IEC 60038, IEC standard voltages

IEC 60068 (all parts), Environmental testing

IEC 60071-1:~~1993~~, Insulation coordination – Part 1: Definitions, principles and rules

IEC 60071-2:~~1996~~, Insulation coordination – 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~~ 2011, Low-voltage electrical installations ~~of buildings~~ – Part 5-54: 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, Graphical symbols for use on equipment
(available at <http://www.graphical-symbols.info/equipment>)

~~IEC 60417-2, Graphical symbols for use on equipment — Part 2: Symbol originals~~

IEC 60445, Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors

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

IEC TS 60479-1:~~1994~~ 2005, Effects of current on human beings and livestock – Part 1: General aspects

IEC TR 60479-5, Effects of current on human beings and livestock – Part 5: Touch voltage threshold values for physiological effects

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 (all parts), Insulation coordination for equipment within low-voltage systems

IEC 60664-1:~~1992~~ 2007, Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests

IEC 60721 (all parts), Classification of environmental conditions

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

IEC TS 61201:~~1992~~ 2007, ~~*Extra-low-voltage (ELV) — Limit values*~~ *Use of conventional touch voltage limits — Application guide*

IEC 62271-102, *High-voltage switchgear and controlgear — Part 102: Alternating current disconnectors and earthing switches*

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

ISO/IEC Guide 51:~~1999~~ 2014, *Safety aspects — Guidelines for their inclusion in standards*



INTERNATIONAL STANDARD

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Protection against electric shock – Common aspects for installations and equipment

Protection contre les chocs électriques – Aspects communs aux installations et aux matériels



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- f) Devices suitable for isolation required for automatic disconnection of supply (LV)

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PROTECTION AGAINST ELECTRIC SHOCK – COMMON ASPECTS FOR INSTALLATIONS AND EQUIPMENT

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This International Standard applies to the protection of persons and livestock against electric shock. The intent is to give fundamental principles and requirements which are common to electrical installations, systems and equipment or necessary for their coordination, without limitations with regard to the magnitude of the voltage or current, or the type of current, and for frequencies up to 1 000 Hz.

Some clauses in this standard refer to low-voltage and high-voltage systems, installations and equipment. For the purposes 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..

It should be noted that, for an efficient design and selection of protective measures, the type of voltage that may occur and its waveform needs to be considered, i.e. a.c. or d.c. voltage, sinusoidal, transient, phase controlled, superimposed d.c., as well as a possible mixture of these forms. The installations or equipment may influence the waveform of the voltage, e.g. by inverters or converters. The currents flowing under normal operating conditions and under fault conditions depend on the described voltage.

2 Normative references

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IEC 60038, *IEC standard voltages*

IEC 60068 (all parts), *Environmental testing*

IEC 60071-1, *Insulation coordination – Part 1: Definitions, principles and rules*

IEC 60071-2, *Insulation coordination – Part 2: Application guide*

IEC 60364-5-54:2011, *Low-voltage electrical installations – Part 5-54: Selection and erection of electrical equipment – Earthing arrangements and protective conductors*

IEC 60417, *Graphical symbols for use on equipment*
(available at <http://www.graphical-symbols.info/equipment>)

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IEC 60445, *Basic and safety principles for man-machine interface, marking and identification – Identification of equipment terminals, conductor terminations and conductors*

IEC TS 60479-1:2005, *Effects of current on human beings and livestock – Part 1: General aspects*

IEC TR 60479-5, *Effects of current on human beings and livestock – Part 5: Touch voltage threshold values for physiological effects*

IEC 60529, *Degrees of protection provided by enclosure (IP Code)*

IEC 60664 (all parts), *Insulation coordination for equipment within low-voltage systems*

IEC 60664-1:2007, *Insulation coordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

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

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

IEC TS 61201:2007, *Use of conventional touch voltage limits – Application guide*

IEC 62271-102, *High-voltage switchgear and controlgear – Part 102: Alternating current disconnectors and earthing switches*

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

ISO/IEC Guide 51:2014, *Safety aspects – Guidelines for their inclusion in standards*

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COMMISSION ELECTROTECHNIQUE INTERNATIONALE

PROTECTION CONTRE LES CHOCES ÉLECTRIQUES – ASPECTS COMMUNS AUX INSTALLATIONS ET AUX MATÉRIELS

AVANT-PROPOS

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La Norme internationale IEC 61140 a été établie par le comité d'études 64 de l'IEC: Installations électriques et protection contre les chocs électriques.

Cette quatrième édition annule et remplace la troisième édition parue en 2001 et l'Amendement 1:2004. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

- a) Introduction du contenu de l'IEC 60449
- b) Meilleure distinction entre les dispositions et les mesures
- c) Prise en compte des effets autres que la fibrillation ventriculaire
- d) Introduction d'une protection complémentaire
- e) TBT définie comme partie intégrante de BT

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- f) Dispositifs adaptés au sectionnement exigés pour la coupure automatique de l'alimentation (BT)
- g) Les exigences relatives au courant circulant dans le conducteur de protection ont été déplacées dans le corps du texte de la norme

Le texte de cette norme est issu des documents suivants:

FDIS	Rapport de vote
64/2076/FDIS	64/2091/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette norme.

Cette publication a été rédigée selon les Directives ISO/IEC, Partie 2.

Elle a le statut d'une publication fondamentale de sécurité conformément au Guide IEC 104.

L'attention du lecteur est attirée sur le fait que l'Annexe C énumère tous les articles traitant des différences à caractère moins permanent inhérentes à certains pays, concernant le sujet de la présente norme.

Le comité a décidé que le contenu de cette publication ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "<http://webstore.iec.ch>" dans les données relatives à la publication recherchée. À cette date, la publication sera

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- supprimée,
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- amendée.

PROTECTION CONTRE LES CHOCS ELECTRIQUES – ASPECTS COMMUNS AUX INSTALLATIONS ET AUX MATÉRIELS

1 Domaine d'application

La présente Norme internationale est une publication fondamentale de sécurité avant tout destinée à être utilisée par les comités d'études lors de l'élaboration de normes conformément aux principes établis dans le Guide IEC 104 et le Guide ISO/IEC 51.

Elle n'est pas destinée à être utilisée seule.

Conformément au Guide 104, il est demandé aux comités d'études, lors de l'élaboration, de l'amendement ou de la révision de leurs publications, d'utiliser toute publication fondamentale de sécurité applicable, telle que l'IEC 61140.

La présente Norme internationale est applicable à la protection des personnes et des animaux d'élevage contre les chocs électriques. Elle est destinée à donner des principes fondamentaux et des exigences communes aux installations, aux systèmes et aux matériels électriques, ou nécessaires à leur coordination sans limitation en ce qui concerne l'amplitude de tension ou de courant, ou le type de courant, et pour des fréquences jusqu'à 1 000 Hz.

Certains articles dans la présente norme se réfèrent à des systèmes, installations et matériels à basse tension et à haute tension. Pour les besoins de la présente norme, la basse tension correspond à toute tension assignée jusqu'à et y compris 1 000 V en courant alternatif ou 1 500 V en courant continu. La haute tension correspond à toute tension assignée supérieure à 1 000 V en courant alternatif ou 1 500 V en courant continu.

Il convient de noter que, pour une conception et une sélection efficaces des mesures de prévention, il est nécessaire de considérer le type de tension qui peut survenir et sa forme d'onde, c'est-à-dire la tension en courant alternatif ou en courant continu, sinusoïdale, transitoire, à commande de phase, en courant continu superposé, ainsi qu'un éventuel mélange de ces formes. Les installations ou matériels peuvent influencer la forme d'onde de la tension, par exemple, au moyen d'onduleurs ou de convertisseurs. Les courants circulant dans des conditions normales de fonctionnement et dans des conditions de défaut dépendent de la tension décrite.

2 Références normatives

Les documents suivants sont cités en référence de manière normative, en intégralité ou en partie, dans le présent document et sont indispensables pour son application. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60038, *Tensions normales de la CEI*

IEC 60068 (toutes les parties), *Essais d'environnement*

IEC 60071-1, *Coordination de l'isolement – Partie 1: Définitions, principes et règles*

IEC 60071-2, *Coordination de l'isolement – Partie 2: Guide d'application*

IEC 60364-5-54:2011, *Installations électriques basse-tension – Partie 5-54: Choix et mise en œuvre des matériels électriques – Installations de mise à la terre et conducteurs de protection*

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IEC 60417, *Symboles graphiques utilisables sur le matériel* (disponible à l'adresse <http://www.graphical-symbols.info/equipment>)

IEC 60445, *Principes fondamentaux et de sécurité pour les interfaces homme-machines, le marquage et l'identification – Identification des bornes de matériels, des extrémités de conducteurs et des conducteurs*

IEC TS 60479-1:2005, *Effets du courant sur l'homme et les animaux domestiques – Partie 1: Aspects généraux*

IEC TR 60479-5, *Effets du courant sur l'homme et les animaux domestiques – Partie 5: Valeurs des seuils de tension de contact pour les effets physiologiques*

IEC 60529, *Degrés de protection procurés par les enveloppes (Code IP)*

IEC 60664 (toutes les parties), *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension*

IEC 60664-1:2007, *Coordination de l'isolement des matériels dans les systèmes (réseaux) à basse tension – Partie 1: Principes, exigences et essais*

IEC 60721 (toutes les parties), *Classification des conditions d'environnement*

IEC 60990, *Méthodes de mesure du courant de contact et du courant dans le conducteur de protection*

IEC TS 61201:2007, *Utilisation des tensions limites conventionnelles de contact – Guide d'application*

IEC 62271-102, *Appareillage à haute tension – Partie 102: Sectionneurs et sectionneurs de terre à courant alternatif*

IEC Guide 104, *The preparation of safety publications and the use of basic safety publications and group safety publications* (disponible en anglais seulement)

ISO/IEC Guide 51:2014, *Aspects liés à la sécurité – Principes directeurs pour les inclure dans les normes*