

# INTERNATIONAL STANDARD

# NORME INTERNATIONALE

Low-voltage electrical installations –  
Part 1: Fundamental principles, assessment of general characteristics,  
definitions

Installations électriques à basse tension –  
Partie 1: Principes fondamentaux, détermination des caractéristiques générales,  
définitions



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IEC 60364-1

Edition 5.0 2005-11

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INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

COMMISSION  
ELECTROTECHNIQUE  
INTERNATIONALE

PRICE CODE  
CODE PRIX



ICS 91.140.50

ISBN 2-8318-8354-7

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## LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

**Part 1: Fundamental principles, assessment of  
general characteristics, definitions**

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International Standard IEC 60364-1 has been prepared by IEC Technical Committee 64: Electrical installations and protection against electric shock.

This fifth edition cancels and replaces the fourth edition, published in 2001. It constitutes a technical revision.

The main changes with respect to the previous edition are:

- in order to complete the scope, the new items external lighting and similar installations, medical locations, mobile or transportable units, photovoltaic power supply units and low-voltage generating sets are added;
- in Clause 131, "Fundamental principles", the list of hazards which may arise in electrical installations is completed; furthermore, a new subclause dealing with protection against voltage disturbances and measures against electromagnetic influences and a new subclause dealing with protection against power supply interruption are added;

- in Clause 132, "Design", the new subclause "Documentation for the electrical installation" is added;
- in Clause 134, "Erection and verification of electrical installations", the new subclause "periodic verification" is added;
- the former Clause 312, "Types of distribution system" is renamed "Conductor arrangement and system earthing" and, in the relevant subclauses, several new figures are included for better understanding of the different kind of a.c. and d.c. circuits and types of systems and their earthing being applied nowadays in IEC member countries;
- in 33.1, "Compatibility of characteristics", a new item for excessive PE conductor currents is added;
- a new Clause 36, "Continuity of service", is included;
- Annex B is aligned with the second edition of IEC 60050-826:2004.

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

FDIS	Report on voting
64/1488/FDIS	64/1499/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.

IEC 60364 consists of the following parts, under the general title *Low-voltage electrical installations*:

- Part 1: Fundamental principles, assessment of general characteristics, definitions
- Part 4: Protection for safety
- Part 5: Selection and erection of electrical equipment
- Part 6: Verification
- Part 7: Requirements for special installations or locations

The committee has decided that the contents of this publication will remain unchanged until the maintenance result date indicated on the IEC web site 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.

The contents of the corrigendum of August 2009 have been included in this copy.



## LOW-VOLTAGE ELECTRICAL INSTALLATIONS –

### Part 1: Fundamental principles, assessment of general characteristics, definitions

#### 11 Scope <sup>1</sup>

IEC 60364-1 gives the rules for the design, erection, and verification of electrical installations. The rules are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations and to provide for the proper functioning of those installations.

**11.1** IEC 60364-1 applies to the design, erection and verification of electrical installations such as those of

- a) residential premises;
- b) commercial premises;
- c) public premises;
- d) industrial premises;
- e) agricultural and horticultural premises;
- f) prefabricated buildings;
- g) caravans, caravan sites and similar sites;
- h) construction sites, exhibitions, fairs and other installations for temporary purposes;
- i) marinas;
- j) external lighting and similar installations (see, however, 11.3e));
- k) medical locations;
- l) mobile or transportable units;
- m) photovoltaic systems;
- n) low-voltage generating sets.

NOTE "Premises" covers the land and all facilities including buildings belonging to it.

**11.2** IEC 60364-1 covers

- a) circuits supplied at nominal voltages up to and including 1 000 V a.c. or 1 500 V d.c.;  
For a.c., the preferred frequencies which are taken into account in this standard are 50 Hz, 60 Hz and 400 Hz. The use of other frequencies for special purposes is not excluded.
- b) circuits, other than the internal wiring of apparatus, operating at voltages exceeding 1 000 V and derived from an installation having a voltage not exceeding 1 000 V a.c., for example, discharge lighting, electrostatic precipitators;

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<sup>1</sup> The numbering system is explained in Annex A.

- c) wiring systems and cables not specifically covered by the standards for appliances;
- d) all consumer installations external to buildings;
- e) fixed wiring for information and communication technology, signalling, control and the like (excluding internal wiring of apparatus);
- f) the extension or alteration of the installation and also parts of the existing installation affected by the extension or alteration.

NOTE The rules of IEC 60364-1 are intended to apply to electrical installations generally but, in certain cases, they may need to be supplemented by the requirements or recommendations of other IEC standards (for example, for installations in explosive gas atmospheres).

### 11.3 IEC 60364-1 does not apply to

- a) electric traction equipment, including rolling stock and signaling equipment;
- b) electrical equipment of motor vehicles, except those covered in Part 7;
- c) electrical installations on board ships and mobile and fixed offshore platforms;
- d) electrical installations in aircraft;
- e) public street-lighting installations which are part of the public power grid;
- f) installations in mines and quarries;
- g) radio interference suppression equipment, except where it affects the safety of the installation;
- h) electric fences;
- i) external lightning protection systems for buildings (LPS);

NOTE Atmospheric phenomena are covered in IEC 60364-1 but only insofar as effects on the electrical installations are concerned (for example, with respect to selection of surge protective devices).

- j) certain aspects of lift installations; [IEC 60364-1:2005](https://standards.iteh.ai/catalog/standards/sist/b16f6fac-570a-4494-820a-80957256102e/iec-60364-1-2005)
- k) electrical equipment of machines; <https://standards.iteh.ai/catalog/standards/sist/b16f6fac-570a-4494-820a-80957256102e/iec-60364-1-2005>

### 11.4 IEC 60364-1 is not intended to apply to

- systems for distribution of energy to the public, or
- power generation and transmission for such systems.

NOTE 1 Countries wishing to do so may, however, use this standard in whole or in part for that purpose.

NOTE 2 According to IEC 61936 which provides common rules for the design and the erection of electrical power installations in systems with nominal voltages above 1kV a.c. and nominal frequency up to and including 60 Hz, low-voltage a.c. and d.c. protection and monitoring systems should be in accordance with IEC 60364 series.

### 11.5 Electrical equipment is dealt with only so far as its selection and application in the installation are concerned.

This applies also to assemblies of electrical equipment complying with the relevant standards.

## 12 Normative references

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

IEC 60038, *IEC standard voltages*

IEC 60050(691), *International Electrotechnical Vocabulary (IEV) – Chapter 691: Tariffs for electricity*

IEC 60050-826, *International Electrotechnical Vocabulary (IEV) – Part 826: Electrical installations*

IEC 60364-4-41:2005, *Low-voltage electrical installations – Part 4-41: Protection for safety – Protection against electric shock*

IEC 60364-4-42, *Electrical installations of buildings – Part 4-42: Protection for safety – Protection against thermal effects*

IEC 60364-4-43, *Electrical installations of buildings – Part 4-43: Protection for safety – Protection against overcurrent*

IEC 60364-4-44, *Electrical installations of buildings – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-5-51, *Electrical installations of buildings – Part 5-51: Selection and erection of electrical equipment – Common rules*

IEC 60364-5-52, *Electrical installations of buildings – Part 5-52: Selection and erection of electrical equipment – Wiring systems*

IEC 60364-5-53:2001, *Electrical installations of buildings – Part 5-53: Selection and erection of electrical equipment – Isolation, switching and control*

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

IEC 60364-5-55:2001, *Electrical installations of buildings – Part 5-55: Selection and erection of electrical equipment – Other equipment*

IEC 60445, *Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and of terminations of certain designated conductors, including general rules for an alphanumeric system*

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

IEC 60617-DB:2001<sup>2</sup>, *Graphical symbols for diagrams*

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

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<sup>2</sup> "DB" refers to the IEC on-line database.

## 13 Fundamental principles

NOTE 1 Where countries not yet having national regulations for electrical installations deem it necessary to establish legal requirements for this purpose, it is recommended that such requirements be limited to fundamental principles which are not subject to frequent modification on account of technical development. The contents of Clause 13 may be used as a basis for such legislation.

NOTE 2 This clause contains basic requirements. In other parts of this standard (see Table A.2), more detailed requirements may be given.

### 131 Protection for safety

#### 131.1 General

The requirements stated in 131.2 to 131.7 are intended to provide for the safety of persons, livestock and property against dangers and damage which may arise in the reasonable use of electrical installations. The requirements to provide for the safety of livestock are applicable in locations intended for them.

NOTE In electrical installations, the following hazards may arise:

- shock currents;
- excessive temperatures likely to cause burns, fires and other injurious effects;
- ignition of a potentially explosive atmosphere;
- undervoltages, overvoltages and electromagnetic influences likely to cause or result in injury or damage;
- power supply interruptions and/or interruption of safety services;
- arcing, likely to cause blinding effects, excessive pressure, and/or toxic gases;
- mechanical movement of electrically activated equipment.

#### 131.2 Protection against electric shock

IEC 60364-1:2005  
<https://standards.iteh.ai/catalog/standards/sist/b16f6fac-570a-4494-820a->

##### 131.2.1 Basic protection (protection against direct contact)

NOTE For low-voltage installations, systems and equipment, basic protection generally corresponds to protection against direct contact.

Protection shall be provided against dangers that may arise from contact with live parts of the installation by persons or livestock.

This protection can be achieved by one of the following methods:

- preventing a current from passing through the body of any person or any livestock;
- limiting the current which can pass through a body to a non-hazardous value.

##### 131.2.2 Fault protection (protection against indirect contact)

NOTE For low-voltage installations, systems and equipment, fault protection generally corresponds to protection against indirect contact, mainly with regard to failure of basic insulation.

Protection shall be provided against dangers that may arise from contact with exposed-conductive-parts of the installation by persons or livestock.

This protection can be achieved by one of the following methods:

- preventing a current resulting from a fault from passing through the body of any person or any livestock;
- limiting the magnitude of a current resulting from a fault, which can pass through a body, to a non-hazardous value;
- limiting the duration of a current resulting from a fault, which can pass through a body, to a non-hazardous time period.

### 131.3 Protection against thermal effects

The electrical installation shall be so arranged to minimize the risk of damage or ignition of flammable materials due to high temperature or electric arc. In addition, during normal operation of the electrical equipment, there shall be no risk of persons or livestock suffering burns.

### 131.4 Protection against overcurrent

Persons and livestock shall be protected against injury and property shall be protected against damage due to excessive temperatures or electromechanical stresses caused by any overcurrents likely to arise in conductors.

Protection can be achieved by limiting the overcurrent to a safe value or duration.

### 131.5 Protection against fault currents

Conductors, other than live conductors, and any other parts intended to carry a fault current shall be capable of carrying that current without attaining an excessive temperature. Electrical equipment, including conductors shall be provided with mechanical protection against electromechanical stresses of fault currents as necessary to prevent injury or damage to persons, livestock or property.

Live conductors shall be protected against overcurrents arising from faults by the methods in 131.4.

NOTE Particular attention should be given to PE conductor and earthing conductor currents.

### 131.6 Protection against voltage disturbances and measures against electromagnetic influences

**131.6.1** Persons and livestock shall be protected against injury and property shall be protected against any harmful effects as a consequence of a fault between live parts of circuits supplied at different voltages.

**131.6.2** Persons and livestock shall be protected against injury and property shall be protected against damage as a consequence of overvoltages such as those originating from atmospheric events or from switching.

NOTE For protection against direct lightning strikes, see IEC 62305 series.

**131.6.3** Persons and livestock shall be protected against injury and property shall be protected against damage as a consequence of undervoltage and any subsequent voltage recovery.

**131.6.4** The installation shall have an adequate level of immunity against electromagnetic disturbances so as to function correctly in the specified environment. The installation design shall take into consideration the anticipated electromagnetic emissions, generated by the installation or the installed equipment, which shall be suitable for the current-using equipment used with, or connected to, the installation.

### **131.7 Protection against power supply interruption**

Where danger or damage is expected to arise due to an interruption of supply, suitable provisions shall be made in the installation or installed equipment.

## **132 Design**

### **132.1 General**

For the design of the electrical installation, the following factors shall be taken into account to provide

- the protection of persons, livestock and property in accordance with Clause 131;
- the proper functioning of the electrical installation for the intended use.

The information required as a basis for design is listed in 132.2 to 132.5. The requirements with which the design shall comply are stated in 132.6 to 132.12.

### **132.2 Characteristics of available supply or supplies**

When designing electrical installations in accordance with IEC 60364 series it is necessary to know the characteristics of the supply. Relevant information from the network operator is necessary to design a safe installation according to IEC 60364 series. The characteristics of the power supply should be included in the documentation to show conformity with IEC 60364 series. If the network operator changes the characteristics of the power supply this may affect the safety of the installation.

**132.2.1** Nature of current: a.c. and/or d.c.

**132.2.2** Function of conductors:

- for a.c.: line conductor(s);  
neutral conductor;  
protective conductor.
- for d.c.: line conductor(s);  
midpoint conductor;  
protective conductor.

NOTE The function of some conductors may be combined in a single conductor.

**132.2.3** Values and tolerances:

- voltage and voltage tolerances;
- voltage interruptions, voltage fluctuations and voltage dips;
- frequency and frequency tolerances;

- maximum current allowable;
- earth fault loop impedance upstream of the origin of the installation;
- prospective short-circuit currents.

For standard voltages and frequencies, see IEC 60038.

**132.2.4** Protective provisions inherent in the supply, for example, system earthing or mid-point earthing.

**132.2.5** Particular requirements of the supply undertaking.

### **132.3 Nature of demand**

The number and type of circuits required for lighting, heating, power, control, signalling, information and communication technology, etc. shall be determined by

- location of points of power demand;
- loads to be expected on the various circuits;
- daily and yearly variation of demand;
- any special conditions such as harmonics;
- requirements for control, signalling, information and communication technology, etc;
- anticipated future demand if specified.

### **132.4 Electric supply systems for safety services or standby electric supply systems**

- Source of supply (nature, characteristics);
- Circuits to be supplied by the electric source for safety services or the standby electrical source.

### **132.5 Environmental conditions**

The design of the electrical installation shall take into account the environmental conditions to which it will be subjected, see IEC 60364-5-51 and IEC 60721.

### **132.6 Cross-sectional area of conductors**

The cross-sectional area of conductors shall be determined for both normal operating conditions and for fault conditions according to

- a) their admissible maximum temperature;
- b) the admissible voltage drop;
- c) the electromechanical stresses likely to occur due to earth fault and short-circuit currents;
- d) other mechanical stresses to which the conductors can be subjected;
- e) the maximum impedance with respect to the functioning of the protection against fault currents;
- f) the method of installation.

NOTE The items listed above concern primarily the safety of electrical installations. Cross-sectional areas greater than those required for safety may be desirable for economic operation.