



SLOVENSKI STANDARD

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

iTeh STANDARD PREVIEW

Errichten von Niederspannungsanlagen - Teil 1: Allgemeine Grundsätze, Bestimmungen allgemeiner Merkmale, Begriffe

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

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HD 60364-1

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Supersedes HD 384.1 S2:2001 and HD 384.3 S2:1995

English version

**Low-voltage electrical installations -
Part 1: Fundamental principles,
assessment of general characteristics, definitions**
(IEC 60364-1:2005, modified)

Installations électriques à basse tension -
Partie 1: Principes fondamentaux,
détermination des caractéristiques
générales, définitions
(CEI 60364-1:2005, modifiée)

Errichten von Niederspannungsanlagen -
Teil 1: Allgemeine Grundsätze,
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Begriffe
(IEC 60364-1:2005, modifiziert)

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This Harmonization Document was approved by CENELEC on 2008-05-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for implementation of this Harmonization Document at national level.

Up-to-date lists and bibliographical references concerning such national implementations may be obtained on application to the Central Secretariat or to any CENELEC member.

This Harmonization Document exists in three official versions (English, French, German).

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, 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 the International Standard IEC 60364-1:2005, 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 HD 60364-1 on 2008-05-01.

This Harmonization Document supersedes HD 384.1 S2:2001 + HD 384.3 S2:1995.

The following dates were fixed:

- latest date by which the existence of the HD has to be announced at national level (doa) 2008-11-01
- latest date by which the HD has to be implemented at national level by publication of a harmonized national standard or by endorsement (dop) 2009-05-01
- latest date by which the national standards conflicting with the HD have to be withdrawn (dow) 2011-05-01

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

Annex ZA has been added by CENELEC.

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Contents

11	Scope	5
12	Normative references	7
13	Fundamental principles	8
131	Protection for safety	8
131.1	General	8
131.2	Protection against electric shock	8
131.3	Protection against thermal effects	9
131.4	Protection against overcurrent	9
131.5	Protection against fault currents	9
131.6	Protection against voltage disturbances and measures against electromagnetic influences	9
131.7	Protection against power supply interruption	9
132	Design	10
132.1	General	10
132.2	Characteristics of available supply or supplies	10
132.3	Nature of demand	11
132.4	Electric supply systems for safety services or standby electric supply systems	11
132.5	Environmental conditions	11
132.6	Cross-sectional area of conductors	11
132.7	Type of wiring and methods of installation	11
132.8	Protective equipment	12
132.9	Emergency control	12
132.10	Disconnecting devices	12
132.11	Prevention of mutual detrimental influence	12
132.12	Accessibility of electrical equipment	12
132.13	Documentation for the electrical installation	12
133	Selection of electrical equipment	12
133.1	General	12
133.2	Characteristics	13
133.3	Conditions of installation	13
133.4	Prevention of harmful effects	13
134	Erection and verification of electrical installations	14
134.1	Erection	14
134.2	Initial verification	14
134.3	Periodic verification	14
20	Terms and definitions	14
30	Assessment of general characteristics	15
31	Purposes, supplies and structure	15
311	Maximum demand and diversity	15
312	Conductor arrangement and system earthing	15
312.1	Current-carrying conductors depending on kind of current	15
312.2	Types of system earthing	17

313	Supplies	30
313.1	General	30
313.2	Supplies for safety services and standby systems	30
314	Division of installation	30
32	Classification of external influences	31
33	Compatibility	31
33.1	Compatibility of characteristics	31
33.2	Electromagnetic compatibility	31
34	Maintainability	31
35	Safety services	32
35.1	General	32
35.2	Classification	32
36	Continuity of service	32
Annex A (informative)	Examples of system earthing	33
A.1	TN Systems (AC)	33
A.2	TT-Systems (AC)	37
A.3	IT-Systems (AC)	38
A.4	TN-Systems (DC)	41
A.5	TT-Systems (DC)	43
A.6	IT-Systems (DC)	44
Annex B (informative)	Definitions – Application guide and explanations to selected terms of IEC 60050–826 (IEV 826 – Electrical installations)	45
Annex ZA (informative)	A-deviations https://standards.iteh.ai/catalog/standards/sist/9c7e1ab1-dcee-41b6-b1bf-71da3121b76d/sist-hd-60364-1-2008	48
Bibliography	https://standards.iteh.ai/catalog/standards/sist/9c7e1ab1-dcee-41b6-b1bf-71da3121b76d/sist-hd-60364-1-2008	49

11 Scope ¹⁾

HD 60364-1 gives the rules for the design, erection, and verification of low-voltage 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 HD 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, 11.3 e));
- 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 HD 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;
- 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 HD 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 CENELEC standards (for example, for installations in explosive gas atmospheres).

¹⁾ The numbering system is explained in Annex A of IEC 60364-1:2005.

11.3 HD 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 HD 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;
- k) electrical equipment of machines.

11.4 HD 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 document in whole or in part for that purpose.

NOTE 2 According to HD 637 which provides common rules for the design and the erection of electrical power installations in systems with nominal voltages above 1 kV 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 HD 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.

<u>EN/HD</u>	<u>Year</u>	<u>Title</u>	<u>IEC</u>	<u>Year</u>
HD 472 S1	1989	Nominal voltages for low voltage public electricity supply systems ²⁾	IEC 60038 (mod)	1983
-	-	International Electrotechnical Vocabulary (IEV) Chapter 691: Tariffs for electricity	IEC 60050-691	
-	-	International Electrotechnical Vocabulary (IEV) Part 826: Electrical installations	IEC 60050-826	
HD 384 / HD 60364	Series	Electrical installations of buildings	IEC 60364 (mod)	Series
EN 60445		Basic and safety principles for man-machine interface, marking and identification - Identification of equipment terminals and conductor terminations	IEC 60445 (mod)	
EN 60446		Basic and safety principles for man-machine interface, marking and identification - Identification of conductors by colours or numerals	IEC 60446	
-	-	Graphical symbols for diagrams	IEC 60617	Database
EN 60721	Series	Classification of environmental conditions	IEC 60721	Series

²⁾ The title of IEC 60038 is: "IEC standard voltages".

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, 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

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 overcurrent 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 EN 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 HD 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 HD 60364 series. The characteristics of the power supply should be included in the documentation to show conformity with HD 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 HD 472.

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 HD 60364-5-51 and EN 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.

132.7 Type of wiring and methods of installation

For the choice of the type of wiring and the methods of installation the following shall be taken into account:

- the nature of the locations;
- the nature of the walls or other parts of the building supporting the wiring;
- accessibility of wiring to persons and livestock;
- voltage;
- the electromagnetic stresses likely to occur due to earth fault and short-circuit currents;
- electromagnetic interference;
- other stresses to which the wiring can be subjected during the erection of the electrical installation or in service.

132.8 Protective equipment

The characteristics of protective equipment shall be determined with respect to their function which may be, for example, protection against the effects of

- overcurrent (overload, short-circuit);
- earth fault current;
- overvoltage;
- undervoltage and no voltage.

The protective devices shall operate at values of current, voltage and time which are suitably related to the characteristics of the circuits and to the possibilities of danger.

132.9 Emergency control

Where, in case of danger, there is the necessity for the immediate interruption of supply, an interrupting device shall be installed in such a way that it can be easily recognized and effectively and rapidly operated.

132.10 Disconnecting devices

Disconnecting devices shall be provided so as to permit switching and/or isolation of the electrical installation, circuits or individual items of apparatus as required for operation, inspection and fault detection, testing, maintenance and repair.

132.11 Prevention of mutual detrimental influence

The electrical installation shall be arranged in such a way that no mutual detrimental influence will occur between electrical installations and non-electrical installations.

132.12 Accessibility of electrical equipment

The electrical equipment shall be arranged so as to afford as may be necessary:

- sufficient space for the initial installation and later replacement of individual items of electrical equipment;
- accessibility for operation, inspection and fault detection, testing, maintenance and repair.

132.13 Documentation for the electrical installation

Every electrical installation shall be provided with appropriate documentation.

133 Selection of electrical equipment

133.1 General

Every item of equipment shall comply with the appropriate European Standards (EN) or Harmonization Documents (HD) or national standard implementing the HD. In absence of an appropriate EN or HD, the equipment shall comply with the appropriate national standard. In other cases, based on the decisions of the National Committee, reference may be made either to IEC standards which are not approved in CENELEC or to national standards of another country. Where there are no applicable standards the item of equipment concerned shall be selected by special agreement between the person specifying the installation and the installer.

133.2 Characteristics

Every item of electrical equipment selected shall have suitable characteristics appropriate to the values and conditions on which the design of the electrical installation (see Clause 132) is based and shall, in particular, fulfil the following requirements.

133.2.1 Voltage

Electrical equipment shall be suitable with respect to the maximum steady-state voltage (r.m.s. value for a.c.) likely to be applied, as well as overvoltages likely to occur.

NOTE For certain equipment, it may be necessary to take account of the lowest voltage likely to occur.

133.2.2 Current

All electrical equipment shall be selected with respect to the maximum steady-state current (r.m.s. value for a.c.) which it has to carry in normal service, and with respect to the current likely to be carried in abnormal conditions and the period (for example, operating time of protective devices, if any) during which it may be expected to flow.

133.2.3 Frequency

If frequency has an influence on the characteristics of electrical equipment, the rated frequency of the equipment shall correspond to the frequency likely to occur in the circuit.

133.2.4 Load factor

All electrical equipment which is selected on the basis of its power characteristics shall be suitable for the duty demanded of the equipment taking into account the design service conditions, see IEC 60364-1-02.

133.3 Conditions of installation

All electrical equipment shall be selected so as to withstand safely the stresses and the environmental conditions (see 132.5) characteristic of its location and to which it may be subjected. If, however, an item of equipment does not have by design the properties corresponding to its location, it may be used on condition that adequate additional protection is provided as part of the completed electrical installation.

133.4 Prevention of harmful effects

All electrical equipment shall be selected so that it will not cause harmful effects on other equipment or impair the supply during normal service including switching operations. In this context, the factors which can have an influence include, for example:

- power factor;
- inrush current;
- asymmetrical load;
- harmonics;
- transient overvoltages generated by equipment in the installation.