

TECHNICAL SPECIFICATION

General requirements for lighting systems – Safety

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IEC TS 63117:2021

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IEC Central Office
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

GENERAL REQUIREMENTS FOR LIGHTING SYSTEMS – SAFETY

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IEC TS 63117 has been prepared by IEC technical committee 34: Lighting. It is a Technical Specification.

The text of this Technical Specification is based on the following documents:

Draft	Report on voting
34/809/DTS	34/840/RVDTS

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

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

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INTRODUCTION

Lighting systems are becoming more common, not only to save energy but also to improve human well-being.

These systems are often comprised of many different products (luminaires, sensors, controllers, touch panels and other human interfaces, etc.) which are connected through communication cabling or wirelessly, where the light output can be varied based on the input from sensors or users.

This safety document is intended to cover those safety aspects that are specific to a lighting system and are not covered by existing standards. This document does not address safety aspects that are already covered in:

- product safety standards,
- installation safety standards.

IEC Guide 110 gives guidance on determining which electrical safety aspects of systems should be covered. Products that are considered safe, according to the relevant product safety standard, need to remain safe when connected to a network. The products need to remain safe under normal, abnormal and single fault conditions of any product connected to the lighting network.

For this purpose, the following electrical safety aspects are mentioned in IEC Guide 110:

- 1) protection from overvoltages on the network;
- 2) protection from hazards caused by connection of different types of circuits;
- 3) limitation of network interface leakage current;
- 4) protection from overheating of the communication network.

By correctly classifying a network, and by applying the required electrical insulation between different types of circuits, a manufacturer of products can design products to be safely connected to such a network.

Since it is not clear how many products will be connected to a network, due to the fact that lighting systems are often tailor-made, the designer of the lighting system is responsible for ensuring that the accumulated network interface leakage current from all products connected to the network does not exceed an acceptable limit. For the system designer it is therefore important that the product individual network touch current is specified in product documentation, and that system limits are given in a system publication. This document provides system network interface leakage current limits for different types of networks.

Communication networks can also be used for limited powering. The currents in these cables are not known to the installer, since they depend on the products used in the system as specified by the person designing the system. So, the person responsible for system design needs to take measures specified in system safety publications in order to avoid overheating of this cabling.

Functional safety is part of the overall safety that depends on functional and physical units operating correctly in response to their inputs. This document also covers functional safety aspects at the system level. For lighting systems, functional safety is normally related to communication errors, incorrect software (response), or foreseeable misuse. This document assists system designers in assessing the product characteristics for their inclusion in a system.

Lighting systems are not always considered to be associated with functional safety unless the light properties are relevant for the safety of the installation and surroundings. For example, in a tunnel, an inappropriate light level after power restoration can cause a safety issue.

GENERAL REQUIREMENTS FOR LIGHTING SYSTEMS – SAFETY

1 Scope

This document specifies the safety requirements of lighting systems at the system level, applicable when designing a lighting system.

A lighting system comprises a set of products. Safety requirements of the products are not covered in this document, but specified in product safety standards.

NOTE For emergency lighting systems, national or regional regulations provide relevant information that can be firstly consulted.

This document specifies safety requirements for lighting systems based on specific networks.

This document does not cover cyber-security and information security of lighting systems.

This document does not apply to lighting systems to be installed in potential explosive atmospheres which are under the scope of IEC TC 31.

For lighting systems based on an information and communication technology (ICT) network, refer to IEC 62949. For lighting systems based on a home and building electronic system and building automation and control system (HBES/BACS) network, refer to IEC 63044-3.

2 Normative references

[IEC TS 63117:2021](https://standards.iteh.ai/catalog/standards/sist/9dd0317a-6bc7-4eba-89a9-dfb8c130428b/iec-ts-63117-2021)

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The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 60364-4-44:2007, *Low-voltage electrical installations – Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances*

IEC 60364-4-44:2007/AMD1:2015

IEC 60364-4-44:2007/AMD2:2018

IEC 60664-1:2020, *Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests*

IEC 62504, *General lighting – Light emitting diode (LED) products and related equipment – Terms and definitions*

IEC 62949, *Particular safety requirements for equipment to be connected to information and communication technology networks*

IEC 63044-3, *Home and Building Electronic Systems (HBES) and Building Automation and Control Systems (BACS) – Part 3: Electrical safety requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60664-1 and IEC 62504 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1 lighting system

system designed to provide lighting

Note 1 to entry: The lighting system can be dedicated to

- a) the support of one or more specified visual tasks under specified conditions considering other requirements such as human comfort, safety, the appearance of the surrounding environment and energy consumption;
- b) the support of other than human tasks.

Note 2 to entry: The lighting system can include a set of light sources, other physical components, communication protocols, user interfaces, software and networks to provide control and monitoring functions.

Note 3 to entry: The light source(s) and the related equipment can be integrated in a single item, e. g. an LED module, a lamp or a luminaire.

Note 4 to entry: A lighting system can be networked to provide central or remote control and monitoring functions.

Note 5 to entry: A lighting system can be connected to or integrated with other systems or devices.

[SOURCE: IEC 60050-845:2020, 845-27-010]

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3.2 lighting system network

interconnection (wired or wireless) between lighting system products used for communication

Note 1 to entry: A lighting system network can carry digital data as well as analogue signals.

Note 2 to entry: Interconnection can also be used for powering.

3.3 low voltage LV

any rated voltage up to 1 000 V in alternative current with rated frequencies up to 30 kHz or 1 500 V in direct current

3.4 extra-low voltage ELV

voltage which does not exceed 50 V in alternative current or 120 V in direct current (ripple free) between conductors or between any conductor and earth

Note 1 to entry: "Ripple free" is conventionally defined for sinusoidal ripple voltage as a ripple content of not more than 10 % RMS: the maximum peak value does not exceed 140 V for a nominal 120 V ripple-free DC system.

Note 2 to entry: This voltage corresponds with the value given in IEC 61140:2016, Table 1.

Note 3 to entry: For interrupted direct current, for frequencies between 10 Hz and 200 Hz, the maximum peak voltage limit for ELV is 50 V, this limit includes a possible ripple. For frequencies outside this frequency range the limits of direct current apply.

3.5 SELV system

electric system in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions and
- under single fault conditions, including earth faults in other electric circuits

Note 1 to entry: SELV is the abbreviated term for "safety extra-low voltage".

[SOURCE: IEC 60050-826:2004, 826-12-31]

3.6

FELV system

electric system with ELV voltage for functional reasons and not fulfilling the requirements for SELV or PELV

Note 1 to entry: FELV has basic insulation from LV.

Note 2 to entry: Requirements for basic and fault protections of FELV circuits are given in IEC 60364-4-41:2005, 411.7.

Note 3 to entry: FELV is the abbreviated term for "functional extra-low voltage".

3.7

PELV system

electric system in which the voltage cannot exceed the value of extra-low voltage:

- under normal conditions and
- under single fault conditions, except earth faults in other electric circuits

Note 1 to entry: PELV is the abbreviated term for "protective extra-low voltage".

[SOURCE: IEC 60050-826:2004, 826-12-32]

3.8

functional safety

part of the overall safety that depends on functional and physical units operating correctly in response to their inputs

[SOURCE: IEC 60050-351:2013, 351-57-06, modified – The Note 1 to entry has been deleted.]

3.9

system designer

<of lighting systems> any individual or organization responsible for the design of the lighting system

3.10

network interface leakage current

electric current in an unwanted conductive path under normal operating conditions in the network interface

3.11

touch current

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

[SOURCE: IEC 60050-826:2004, 826-11-12]

4 General

A lighting system shall be designed, constructed and installed so that in normal use it operates safely for the user or surroundings. Safety is achieved by reducing risk to a tolerable level as specified in ISO/IEC Guide 51.

NOTE Standards for installation can be found in IEC 60364 (all parts), especially IEC 60364-4-41, IEC 60364-4-42, IEC 60364-4-43 and IEC 60364-5-53, as well as local installation regulations.

Lighting product interfaces to another system shall comply with the relevant interface standard. All product interfaces to the lighting system shall be classified and selected to comply with the insulation requirements of this document.

Where in this document the terms "product(s)", "equipment" and "device(s)" are used, it is understood to stand for "component(s) of a lighting system or its subsystem", except where it is obviously assigned to another meaning.

Compliance is checked by meeting the requirements of Clause 6 and Clause 7.

5 Classification of lighting system network

Lighting systems networks are classified as follows:

ICT network – Information and communication technology networks, for example, network based on Power over Ethernet (POE).

HBES/BACS network – Network and product interfaces specified in the IEC 63044 series.

Lighting system specific network – Lighting system specific networks include all networks applied to the lighting system that are not ICT or HBES/BACS networks. Types of networks of a lighting system specific network are LV, FELV, SELV and PELV.

Examples of LV

- power line communication (PLC) on mains wiring;
- "push dim", using mains voltage as a signal to change settings.

Examples of SELV

- DMX 512 for entertainment lighting system or landscape lighting.

Examples of FELV

- Digital addressable lighting interface according to the IEC 62386 series, 1 V to 10 V dimming protocol according to IEC 63128.

6 Electrical safety

6.1 Protection against hazards in the system products

All system components (products) of a lighting system shall comply with the relevant product safety standards, and shall be selected and constructed into the system according to manufacturer's instructions taking into consideration the environment in which they are installed and compatibility with the surrounding products.

Compliance is checked by verifying the product documentation.

6.2 Protection against network overvoltage and leakage current

6.2.1 Lighting system based on an ICT network

Where the system comprises products connected via an ICT network interface, interconnection circuits and cabling shall be selected by the system manufacturer and/or the system designer to provide continued conformance to the requirements of IEC 62949.