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INTERNATIONAL STANDARD

colour inside

Equipment for general lighting purposes – EMC immunity requirements

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CONTENTS

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EQUIPMENT FOR GENERAL LIGHTING PURPOSES – EMC IMMUNITY REQUIREMENTS

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.
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International Standard IEC 61547 has been prepared by IEC technical committee 34: Lamps and related equipment.

This third edition cancels and replaces the second edition, published in 2009. This edition constitutes a technical revision

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

a) extension of scope with end-user replaceable modules and the combination of end-user replaceable module and independent auxiliary;
b) clarification of module testing in a host system;
c) increased ESD and surge test levels for road and street lighting equipment;
d) the introduction of ESD testing under normal operation and handling conditions;
e) removal of line to ground surge test for self-ballasted lamps ≤ 25 W.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
34/676/FDIS	34/689/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This document is to be read in conjunction with the relevant basic and/or product standard(s).

A list of all parts in the IEC 61547 series, published under the general title *Equipment for general lighting purposes – EMC immunity requirements*, can be found on the IEC website.

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

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- withdrawn,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

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EQUIPMENT FOR GENERAL LIGHTING PURPOSES – EMC IMMUNITY REQUIREMENTS

1 Scope

This part of IEC 61547 which deals with electromagnetic immunity requirements, applies to lighting equipment which is within the scope of IEC technical committee 34, including apparatus such as lamps, ~~auxiliaries and luminaires, intended either for connecting to a low voltage electricity supply or for battery operation~~ luminaires and modules.

~~Excluded from the scope of this standard is equipment for which the immunity requirements are formulated in other IEC or CISPR standards such as:~~

~~– lighting equipment for use in transport vehicles;~~

~~– entertainment lighting control equipment for professional purposes;~~

~~– lighting devices built into other equipment such as:~~

- ~~scale illumination or indicators;~~
- ~~photocopiers;~~
- ~~slide and overhead projectors;~~
- ~~multimedia equipment.~~

Excluded from the scope of this document are:

– components or modules intended to be built into lighting equipment and which are not end-user replaceable;

– equipment for which the electromagnetic compatibility requirements in the radio-frequency range are explicitly formulated in other product immunity standards, even if they incorporate a built-in lighting function.

NOTE Examples of exclusions are:

– equipment with built-in lighting devices for display back lighting, scale illumination and signaling;

– SSL-displays;

– range hoods, refrigerators, freezers;

– photocopiers, projectors;

– electronic switches for fixed installations;

– lighting equipment for road vehicles (within the scope of CISPR 12);

– lighting equipment for aircraft and airfield facilities.

However, in multi-function equipment where the lighting ~~part~~ function operates independently from other ~~parts~~ functions, the electromagnetic immunity requirements of this document apply to the lighting ~~part~~ function only.

Lighting equipment with a wireless control function are also within the scope of this document. However, the test is limited to the control of the lighting function only. Radio properties like frequency stability or spurious emissions are not assessed.

EXAMPLE Colour/light level control via a wireless interface are meant to stay intact after an immunity test.

Also included in the scope of this document is lighting equipment that interfaces with systems or installations other than common power supply networks.

The requirements of this document are based on the requirements for domestic, commercial and light-industrial environments as given in IEC 61000-6-1:2016, but modified to lighting engineering practice.

It can be expected that lighting equipment complying with the requirements of this document will operate satisfactorily in other environments. In some special cases, measures ~~have to~~ can be taken to provide higher immunity. In this document it is impracticable to deal with all these possibilities. Such requirements ~~may~~ can be established by contractual agreement between supplier and purchaser.

2 Normative references

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 60050-161, *International Electrotechnical Vocabulary – Part 161: Electromagnetic Compatibility* (available at http://www.electropedia.org)

IEC 60050-845, *International Electrotechnical Vocabulary – Part 845: Lighting* (available at http://www.electropedia.org)

IEC 60598-1:~~2008~~2014, *Luminaires – Part 1: General requirements and tests*

~~IEC 60598-2-22, *Luminaires – Part 2-22: Particular requirements – Luminaires for emergency lighting*~~

IEC 61000-4-2:2008, *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3:2006, *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio frequency, electromagnetic field immunity test*~~[1]~~
IEC 61000-4-3:2006/AMD1:2007
IEC 61000-4-3:2006/AMD2:2010

IEC 61000-4-4:~~2004~~2012, *Electromagnetic compatibility (EMC) – Part 4-4: Testing and measurement techniques – Electrical fast transient/burst immunity test*

IEC 61000-4-5:~~2005~~2014, *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*
IEC 61000-4-5:2014/AMD1:2017

IEC 61000-4-6:~~2008~~2013, *Electromagnetic compatibility (EMC) – Part 4-6: Testing and measurement techniques – Immunity to conducted disturbances, induced by radio-frequency fields*

IEC 61000-4-8:~~1993~~2009, *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*~~[2]~~
~~Amendment 1 (2000)~~

IEC 61000-4-11:2004, *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity*

~~[1] There exists a consolidated edition 3.1 (2008) that comprises IEC 61000-4-3 and its Amendment 1.~~

~~[2] There exists a consolidated edition 1.1 (2001) that comprises IEC 61000-4-8 and its Amendment 1.~~

tests
IEC 61000-4-11:2004/AMD1:2017

~~IEC 61000-6-1:2005, *Electromagnetic compatibility (EMC) – Part 6-1: Generic standards – Immunity for residential, commercial and light-industrial environments*~~

IEC CISPR 15:2018, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-161 and IEC 60050-845 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
enclosure port
physical boundary of the equipment through which electromagnetic fields may radiate or penetrate ~~(see Figure 1)~~

3.2
AC power port
port at which a conductor or cable, intended to supply AC power from a mains network to the equipment, is connected to the equipment

3.3
DC power port
port at which conductor or cable, intended to supply DC power from a network to the equipment, is connected to the equipment

3.4
load port
port at which the power cable of the load is connected to the equipment

3.5
end-user replaceable module
electronic or electrical part which serves a specific function or functions of a lighting application, which is intended for application in a luminaire or in an installation by an end-user and which is intended to be marketed and/or sold separately from a lighting equipment or system

EXAMPLE Starter, controlgear, ELV lamps, control unit, LEDni module, LEDsi module.

Note 1 to entry: End-user replaceable modules are replaceable modules excluding non-user replaceable modules.

3.6
port
~~particular electrical interface of the specified equipment with the external electromagnetic environment~~

category of an interface of an EUT which provides a coupling path for electromagnetic disturbances from the electromagnetic environment into the EUT

Note 1 to entry: Figure 1 shows examples of ports. The AC/DC power port may include the protective earth conductor.

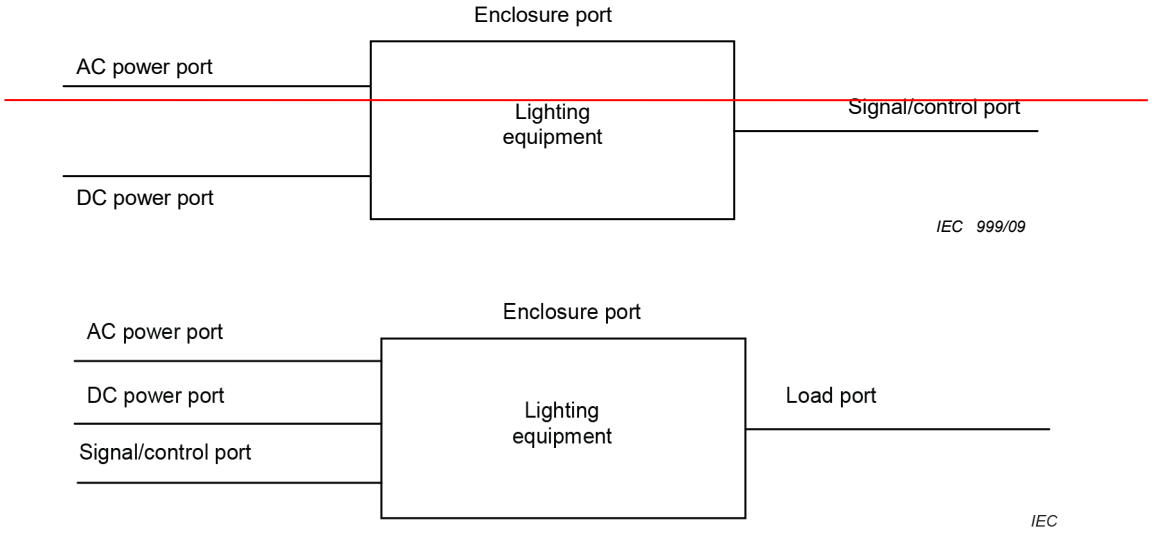

Figure 1 – Examples of ports

3.7
signal port
control port
port at which a signal cable is connected to the equipment

3.8
road and street lighting equipment
lighting equipment for illuminating roads, streets, tunnels and other public outdoor areas at a minimum total height above normal ground level of 2,5 m

3.9
lighting equipment
equipment with a primary function of generating and/or regulating and/or distributing optical radiation

EXAMPLE

- light sources and luminaires;
- the lighting part of multi-function equipment where one of the primary functions of this is illumination;
- modules like ELV lamps, self-ballasted lamps and controlgear;
- ultraviolet (UV) and infrared (IR) radiation equipment.

3.10
non-integrated LED lamp
LEDni lamp
LED lamp which needs a separate controlgear to operate

3.11
semi-integrated LED lamp
LEDsi lamp
LED lamp which carries the control unit of the controlgear, and is operated by the separated power supply of the controlgear

3.12
ELV
extra-low voltage
voltage not exceeding the relevant voltage limit of band I specified in IEC 60449

[SOURCE: IEC 60050-826:2004, 826-12-30]

3.13
self-ballasted lamp
integrated lamp
electric lamp that cannot be dismantled without being permanently damaged, incorporating controlgear, and all additional elements necessary for starting and stable operation of the light source, designed for direct connection of the supply voltage

[SOURCE: IEC 60050-845:—, 845-27-009, modified – Addition of "self-ballasted lamp" as a preferred term.]

3.14
standby mode
mode in which the light source is switched off while still connected to a power supply

[SOURCE: IEC 60050-845:—, 845-27-125]

4 Performance criteria

4.1 General

~~A functional description of performance criteria, during or as a consequence of the immunity testing, shall be provided by the manufacturer and noted in the test report.~~

~~The performance of lighting equipment shall be assessed by monitoring:~~

- ~~the luminous intensity of the luminaire or of the lamp(s);~~
- ~~the functioning of the control in the case of equipment which includes a regulating control or concerns the regulating control itself;~~
- ~~the functioning of the starting device, if any.~~

~~The performance criteria given hereafter apply to lighting equipment.~~

For the various immunity tests that apply, the performance of the following functions shall be assessed, as far as applicable or specified by the manufacturer:

- the luminous intensity of the luminaire or of the light source(s);
- the control function, for example on/off switching, light level setting, colour adjustment, wireless control.

For these functions, three different levels of performance criteria are specified in 4.2. The functions assessed and the performance criteria for each individual test shall be noted in the test report.

The effects of electromagnetic disturbances on the life of the equipment under test are excluded from this document.

4.2 Categorization of performance criteria

The following three categories of performance criteria apply.

a) Performance criterion A

During the test, no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

b) Performance criterion B

During the test, the luminous intensity may change to any value. After the test, the luminous intensity shall be restored to its initial value within 1 min (30 min for high pressure gas discharge lamps). Regulating controls need not function during the test, but after the test, the mode of the control shall be the same as before the test, provided that during the test no mode changing commands were given.

c) Performance criterion C

During and after the test, any change of the luminous intensity is allowed and the ~~lamp~~ light source(s) may be extinguished. After the test, within 30 min, all functions shall return to normal, if necessary by temporary interruption of the mains supply and/or operating the regulating control.

The following additional requirement ~~for~~ applies to lighting equipment incorporating a starting device: after the test, the lighting equipment is switched off~~. After half an hour, it is switched~~ for 30 min and back on again. The lighting equipment shall start and operate as intended.

The application of the different performance criteria for the various types of tests and for different lighting equipment are specified in Clause 6.

4.3 Objective assessment of luminous intensity performance

A change of luminous intensity ~~may~~ shall be checked by ~~visual observation but, in case of doubt, the following applies~~ either one of the following requirements:

- no change of luminous intensity by visual observation, or
- the luminous intensity of a lighting equipment by measurement.

When being measured, the luminous intensity of ~~a luminaire or of the lamp(s)~~ lighting equipment shall be measured by means of an illuminance (lux) meter which is positioned in an axis perpendicular to the main plane of the ~~luminaire or lamp(s)~~ lighting equipment, in its centre and at a distance for proper operation of the lux meter. The luminous intensity shall be deemed to be unchanged if the measured intensities during and after the test do not deviate by more than 15 %. In stand-by mode the change of the luminous intensity shall be less than 5 % of the maximum luminous intensity (100 % light output).

Care shall be taken to ensure the ambient light level does not influence the measurement results.

Precautions to achieve reproducible results given in the relevant ~~lamp~~ light source performance standards shall be observed.

~~**4.4 The effects of electromagnetic phenomena (as described in this standard) upon the life of the equipment under test are excluded from this standard.**~~

5 Test specifications

5.1 General

Immunity requirements for lighting equipment ~~defined within the scope concern~~ are specified in 5.2 to 5.8 on a port by port basis for the following disturbances:

– electrostatic discharges;
– continuous and transient disturbances;
– radiated and conducted disturbances;
– mains supply-related disturbances.

~~They are given in Subclauses 5.2 to 5.9 on a port by port basis.~~

Tests are applied to the relevant ports of the equipment as indicated in the respective clauses. For the purposes of this document, DC power ports for supplying regulating controls are considered to be signal ports. Tests shall be conducted in a well-defined and reproducible manner. Tests shall be carried out as single tests in sequence. The sequence of testing is optional.

It may be determined from consideration of the electrical characteristics and usage of particular equipment that some of the tests are inappropriate and therefore unnecessary. In such cases it is required that the decision not to test be recorded in the test report.

The description of the test, the test generator, the test methods and the test set-up are given in the basic standards, which are referred to in the relevant clauses.

~~Test levels are generally based on level 2 values as recommended in the basic standards.~~

In this document, in most cases, the selected test levels are based on level 2 values as given in the basic test and measurement immunity standards; these standards are referred to in the respective clauses.

Further explanation on the methodology and criteria why certain test phenomena, test levels and performance criteria are chosen for certain types of lighting equipment are given in Annex A.

Modules are tested as any other lighting equipment but shall be mounted in a representative host and the port(s) of the module being assessed shall be terminated accordingly. A representative host is a reference luminaire or reference system that enables proper functioning of the EUT. The functions of the host that are specific to the module being assessed shall be exercised during the tests. The host shall also incorporate essential EMI protection means or mitigation measures if these are explicitly specified by the manufacturer for application of such a module. A representative host shall also include the safety Class I or II features, whichever is applicable. If the module is tested in a host, the correct functioning of the combination shall be verified prior to the application of the disturbance. A detailed description of the host shall be given in the test report. Self-ballasted lamps shall be tested in hosts (reference luminaires) as specified in CISPR 15:2018, Annex A.

For modules, the length of the cables between the module and other devices that are part of the host shall be 3 m unless the manufacturer specifies another length.

NOTE 1 Depending on the type of lighting equipment, for ESD tests deviating requirements for using representative hosts can apply (see 5.2.2).

NOTE 2 The word module in this document refers to end-user replaceable modules as defined in 3.5.