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LED modules for general lighting – Safety specifications

Modules de DEL pour éclairage général – Spécifications de sécurité

IEC 62031:2008

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**LED MODULES FOR GENERAL LIGHTING –
SAFETY SPECIFICATIONS**

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The technical content is therefore identical to the base edition and its amendment and has been prepared for user convenience. A vertical line in the margin shows where the base publication has been modified by amendment 1. Additions and deletions are displayed in red, with deletions being struck through.

International Standard IEC 62031 has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

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

NOTE In this standard, the following print types are used:

- Requirements proper: in roman type.
- *Test specifications: in italic type.*
- Explanatory matter: in smaller roman type.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability 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

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WITHDRAWN

INTRODUCTION

The first edition of a safety standard for LED modules for general lighting applications acknowledges the need for relevant tests for this new source of electrical light, sometimes called “solid state lighting”.

The provisions in the standard represent the technical knowledge of experts from the fields of the semiconductor industry and those of the traditional electrical light sources.

Two types of LED modules are covered: with integral and external control gear.

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LED MODULES FOR GENERAL LIGHTING – SAFETY SPECIFICATIONS

1 Scope

This International Standard specifies general and safety requirements for light-emitting diode (LED) modules:

- * LED modules without integral control gear for operation under constant voltage, constant current or constant power;
- * self-ballasted LED modules for use on d.c. supplies up to 250 V or a.c. supplies up to 1 000 V at 50 Hz or 60 Hz.

NOTE 1 The safety requirements for separate control gear are specified in IEC 61347-2-13. The performance requirements for separate control gear are specified in IEC 62384.

NOTE 2 Requirements for LED modules with integrated control gear and equipped with a lamp cap (self-ballasted lamp), intended for mains voltage general lighting service retrofit applications (thereby replacing existing lamps with identical lamp caps) are specified in IEC 60968 (an amendment to the present edition or a new edition with extended scope is in preparation).

Requirements for LED modules with integrated control gear and equipped with a lamp cap (self-ballasted lamp), intended for non-mains voltage general lighting service retrofit applications (thereby replacing existing lamps with identical lamp caps) are under consideration.

NOTE 3 Where in the requirements of this standard both types of LED modules, with and without integral control gear, are addressed, the word “modules” is used instead. Where only the expression “LED module(s)” is used, it is understood to refer to the type without integral control gear.

2 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 60598-1:2003, *Luminaires – Part 1: General requirements and tests*⁴⁾
~~Amendment 1 (2006)~~

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

IEC 60838-2-2, *Miscellaneous lampholders – Part 2-2: Particular requirements – Connectors for LED modules*

IEC 61347-1:2007, *Lamp controlgear – Part 1: General and safety requirements*

IEC 61347-2-13:2006, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules*

IEC 62471:2006, *Photobiological safety of lamps and lamp systems*

ISO 4046-4:2002, *Paper, board, pulp and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

⁴⁾ A consolidated 6.1 (2006) exists, that includes IEC 60598-1 (2003) and its Amendment 1 (2006).

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

For expressions and terms in the field of LEDs and LED modules, refer to IEC TS 62504, which is currently in development.

3.1

light-emitting diode

LED

solid state device embodying a p-n junction, emitting optical radiation when excited by an electric current

[IEV 845-04-40]

3.2

LED module

unit supplied as a light source. In addition to one or more LEDs, it may contain further components, e.g. optical, mechanical, electrical and electronic, but excluding the control gear.

3.3

self-ballasted LED module

LED module, designed for connection to the supply voltage

NOTE If the self-ballasted LED module is equipped with a lamp cap, it is regarded to be a self-ballasted lamp.

3.4

integral LED module

LED module, generally designed to form a non-replaceable part of a luminaire

3.5

integral self-ballasted LED module

self-ballasted LED module, generally designed to form a non-replaceable part of a luminaire

3.6

built-in LED module

LED module, generally designed to form a replaceable part built into a luminaire, a box, an enclosure or the like and not intended to be mounted outside a luminaire, etc. without special precautions

3.7

built-in self-ballasted LED module

self-ballasted LED module, generally designed to form a replaceable part built into a luminaire, a box, an enclosure or the like and not intended to be mounted outside a luminaire, etc. without special precautions

3.8

independent LED module

LED module, so designed that it can be mounted or placed separately from a luminaire, an additional box or enclosure or the like. The independent LED module provides all the necessary protection with regard to safety according to its classification and marking.

NOTE The control gear must not necessarily be integrated in the module.

3.9**independent self-ballasted LED module**

self-ballasted LED module, so designed that it can be mounted or placed separately from a luminaire, an additional box or enclosure or the like. The independent LED module provides all the necessary protection with regard to safety according to its classification and marking.

NOTE The control gear may be integrated in the module.

3.10**rated maximum temperature** t_c

highest permissible temperature which may occur on the outer surface of the LED module (at the indicated position, if marked) under normal operating conditions and at the rated voltage/current/power or the maximum of the rated voltage/current/power range

3.11**heat transfer temperature** t_d

temperature occurring on a representative part of the LED module (or any heat-conducting foil or paste applied as for insertion if delivered with the LED module) (at the indicated position if marked) intended for the passing of heat to the lampholder or to other parts of the luminaire under normal operating conditions and at the rated voltage/current/power or the maximum of the rated voltage/current/power range

NOTE A measurement method is under consideration.

3.12**heat output to the luminaire** P_d

power to be transferred to the luminaire by means of heat-conduction in order to keep t_c

NOTE 1 P_d is below the rated power of an LED module.

NOTE 2 For LED modules which do not need heat-conduction to the luminaire for keeping t_c , P_d is equal to zero.

NOTE 3 A measurement method is under consideration.

4 General requirements

4.1 Modules shall be so designed and constructed that in normal use (see manufacturer's instruction) they operate without danger to the user or surroundings.

4.2 For LED modules, all electrical measurements, unless otherwise specified, shall be carried out at voltage limits (min/max), current limits (min/max) or power limits (min/max) and minimum frequency, in a draught-free room at the temperature limits of the allowed range specified by the manufacturer. Unless the manufacturer indicates the most critical combination, all combinations (min/max) of voltage/current/power and temperature shall be tested.

4.3 For self-ballasted LED modules, the electrical measurements shall be carried out at the tolerance limit values of the marked supply voltage.

4.4 Integral modules not having their own enclosure shall be treated as integral components of luminaires as defined in IEC 60598-1, Clause 0.5. They shall be tested assembled in the luminaire, and as far as applicable with the present standard.

4.5 In addition, independent modules shall comply, ~~in addition to this standard,~~ with the requirements of ~~relevant clauses of~~ IEC 60598-1, ~~where these requirements are not already covered in this standard~~ including marking requirements of that standard such as IP classification and mechanical stress.

4.6 If the module is a factory sealed unit, it shall not be opened for any tests. In the case of doubt based on the inspection of the module and the examination of the circuit diagram, and in agreement with the manufacturer or responsible vendor, such specially prepared modules shall be submitted for testing so that a fault condition can be simulated.

5 General test requirements

5.1 Tests according to this standard shall be type tests.

NOTE The requirements and tolerances permitted by this standard are related to testing of a type-test sample submitted by the manufacturer for that purpose. Compliance of the type-test sample does not ensure compliance of the whole production of a manufacturer with this safety standard.

Conformity of production is the responsibility of the manufacturer and may need routine tests and quality assurance in addition to type testing.

5.2 Unless otherwise specified, the tests shall be carried out at an ambient temperature of 10 °C to 30 °C.

5.3 Unless otherwise specified, the type test shall be carried out on one sample consisting of one or more items submitted for the purpose of the type test.

In general, all tests shall be carried out on each type of module or, where a range of similar modules is involved, for each wattage in the range or on a representative selection from the range, as agreed with the manufacturer.

5.4 If the light output has detectably changed, the module shall not be used for further tests.

NOTE Usually, a value of 50 % indicates irreversible changes in the module.

5.5 For SELV-operated LED modules, the requirements of IEC 61347-2-13, Annex I, apply additionally.

General conditions for tests are given in Annex A.

6 Classification

Modules are classified, according to the method of installation, as:

- built-in;
- independent;
- integral.

For integral modules, the NOTE to 1.2.1 in IEC 60598-1 applies.

7 Marking

7.1 Mandatory marking for built-in or independent modules

- a) Mark of origin (trade mark, manufacturer's name or name of the responsible vendor/supplier).
- b) Model number or type reference of the manufacturer.
- c) ~~Either the~~
 - ~~rated supply voltage(s), or voltage range, supply frequency or/and~~
 - ~~rated supply current(s) or current range, supply frequency (the supply current may be given in the manufacturer's literature) or/and~~

~~• rated input power, or power range.~~

- 1) If the LED module requires a stable voltage(s), the rated supply voltage or voltage range, both together with the supply frequency shall be marked. Marking of the rated supply current(s) is voluntary.
- 2) If the LED module requires a stable current, the rated supply current(s) or current range, both together with the supply frequency shall be marked. Marking of the rated supply voltage(s) is voluntary.

- d) Nominal power.
- e) Indication of position and purpose of the connections where it is necessary for safety. In case of connecting wires, a clear indication shall be given in a wiring diagram.
- f) Value of t_c . If this relates to a certain place on the LED module, this place shall be indicated or specified in the manufacturer's literature.
- g) For eye protection, see requirements of IEC 62471.
- h) Built-in modules shall be marked with the symbol according to Figure 1 in order to separate them from independent modules. The mark shall be located on the packaging or on the LED module itself.



Source: IEC 60417-6053 (2011-05)

Figure 1 – Symbol for built-in LED modules

- i) The heat transfer temperature t_d (if the LED module is provided with a cap enabling the insertion and the withdrawal without the use of tools and reliant on heat-conduction to the luminaire).
- j) The power for heat-conduction P_d (if the LED module is provided with a cap enabling the insertion and the withdrawal without the use of tools and reliant on heat-conduction to the luminaire). If P_d is not known exactly, the rated power of the LED module may be taken instead.
- k) Working voltage at which the insulation is designed.

~~NOTE—The symbol is under consideration.~~

7.2 Location of marking

Items a), b), c) and f) of 7.1 shall be marked on the module.

Items d), e), g) ~~and~~, h), i) and j) ~~of 7.1~~ shall be marked legible on the LED module or on the LED module data sheet. Item k) should be in the manufacturer's literature.

For integral modules, no marking is required, but the information given in 7.1 a) to g) shall be provided in the technical literature of the manufacturer.

7.3 Durability and legibility of marking

Marking shall be durable and legible.