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INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

AMENDMENT 1
AMENDEMENT 1

LED modules for general lighting – Safety specifications

Modules de DEL pour éclairage général – Spécifications de sécurité

IEC 62031:2008/A1:2012

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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FOREWORD

This amendment has been prepared by subcommittee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

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

FDIS	Report on voting
34A/1608/FDIS	34A/1628/RVD

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

The committee has decided that the contents of this publication 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

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- withdrawn,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

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2 Normative references

Replace the reference to IEC 60598-1:2003 with the following:

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

Add the following new reference:

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

3 Terms and definitions

Add the following new definitions:

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

Replace 4.5 by the following:

4.5 In addition, independent modules shall comply with the requirements of IEC 60598-1, including marking requirements of that standard such as IP classification and mechanical stress.

7 Marking

7.1 Mandatory marking for built-in or independent modules

Replace existing item c) by the following:

c)

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.

Replace existing item h) with the following new item h) and new Figure 1:

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

Add, after new item h) and the new Figure 1, the following new items i), j) and k):

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.

Delete the NOTE.

7.2 Location of marking

Replace the 2nd paragraph with the following:

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

7.3 Durability and legibility of marking

Replace the 4th paragraph with the following:

For items d) to j) of 7.1, compliance is checked by inspection.

13 Fault conditions

13.2 Overpower condition

Replace the 2nd paragraph with the following:

The LED module shall be switched on and the power monitored (at the input side). The voltage or the current shall be increased until 150 % of the rated power is reached. The test shall be continued until the LED module is thermally stabilised. A stable condition is reached, if the temperature does not change by more than 5 K in 1 h. The temperature shall be measured in the t_c point. The LED module shall withstand the overpower condition for at least 15 min, the time period of which can lie within the stabilisation period if the temperature change is ≤ 5K.

19 Resistance to corrosion

Add, after Clause 19, the following new Clauses 20 and 21:

20 Information for luminaire design

Information is given in Annex D.

21 Heat management

21.1 General

Clause 21 is applicable for exchangeable modules. It is not applicable for non-exchangeable modules. Exchangeability is safeguarded by means of a cap or base and a lampholder. Precondition is that a heat conducting thermal interface to the luminaire is needed for keeping the temperature below the rated maximum temperature t_c.

21.2 Heat-conducting foil and paste

For the purpose of heat-transfer from the LED module to the luminaire, the use of a heat-conducting foil can be necessary. Any heat-conducting foil shall be delivered within the LED module packaging.

Heat-conducting paste shall not be used (under consideration).

21.3 Heat protection (under consideration)

LED modules shall be equipped with a device that cuts the power off or reduces it when t_c is exceeded.

21.4 Construction

The heat-conduction from the LED module to the luminaire, the electrical connection and the mechanical holding in the cap/holder system should be separate unless the contrary is proven safe (under consideration).

Add, after the existing Annex C, the following new Annex D:

Annex D
(informative)

Information for luminaire design

D.1 General

This annex applies for LED modules that:

- have a cap/base enabling the insertion and the withdrawal of the LED module with or without the use of tools,
- do not have a heat management on board and rather rely on heat-conduction to the luminaire for safe operation.

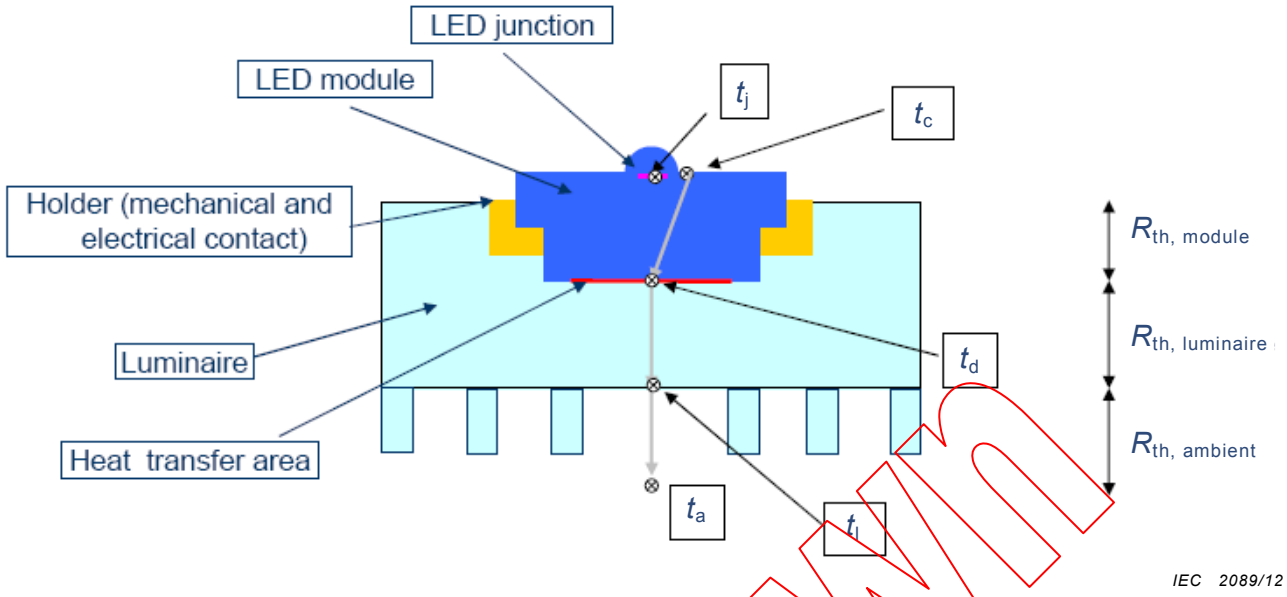
This annex covers only those provisions that are related to the thermal needs specific for these LED modules.

NOTE Because of their non-interchangeability, integral LED modules are excluded. Because independent LED modules are luminaire-like, not needing protection or else from a luminaire neither using a lampholder, they provide for their own heat management and are excluded. Only built-in LED modules remain within the scope of this annex.

For safe operation of these LED modules, it is essential to observe the recommendations of this annex.

D.2 Design freedom

A diagrammatic cross section of an LED module fixed by means of a lampholder to a luminaire with the locations for temperature measurements (t_a, t_c, t_d, t_j and t_l) and thermal resistances ($R_{th,\ module}$, $R_{th,\ luminaire}$ and $R_{th,\ ambient}$) is given with Figure D.1.



Key:

t_a rated maximum ambient temperature of the luminaire as defined in IEC 60598-1

t_c rated maximum temperature

t_d minimum heat transfer temperature

t_j junction temperature (shown for illustration only)

t_l temperature on the surface of the luminaire (shown for illustration only)

$R_{th,\ module}$ thermal resistance between t_c point and t_d point

$R_{th,\ luminaire}$ thermal resistance between t_d point and t_l point

$R_{th,\ ambient}$ thermal resistance between t_l and ambient

Figure D.1 – Diagrammatic cross section of an LED module (blue) fixed by means of a lampholder (yellow) to a luminaire (light blue, with symbolised cooling fins)

The thermal resistances shown in Figure D.1 can be added to a thermal resistance of the system:

$$R_{th,\ module} + R_{th,\ luminaire} + R_{th,\ ambient} = R_{th,\ system} \quad (D.1)$$

Any thermal resistance can be calculated from the temperature difference and the heat flow, e. g.:

$$R_{th,\ system} = (t_c - t_a) / P_d \quad (D.2)$$

$$R_{th,\ module} = (t_c - t_d) / P_d \quad (D.3)$$

The design freedom of the luminaire is given by the sum of $R_{th,\ luminaire} + R_{th,\ ambient}$. It can be calculated as follows:

$$R_{th,\ luminaire} + R_{th,\ ambient} = (t_d - t_a) / P_d \quad (D.4)$$

D.3 Testing in the luminaire

The knowledge of t_d and P_d as provided by the LED module manufacturer, of the geometry and the surface properties of the cap and of the t_a of the luminaire to be designed, will allow for designing a luminaire that will most probably keep the t_c of the LED module. However, testing in the luminaire if the luminaires does so will still be necessary.

Details of the test procedure are under consideration.

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