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Luminaire performance – iTeh Standards
Part 2-1: Particular requirements – LED luminaires
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Part 2-1: Particular requirements – LED luminaires

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

LUMINAIRE PERFORMANCE –

Part 2-1: Particular requirements – LED luminaires

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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This commented version (CMV) of the official standard IEC 62722-2-1:2023 edition 2.0 allows the user to identify the changes made to the previous IEC 62722-2-1:2014 edition 1.0. Furthermore, comments from IEC SC 34D experts are provided to explain the reasons of the most relevant changes, or to clarify any part of the content.

A vertical bar appears in the margin wherever a change has been made. Additions are in green text, deletions are in strikethrough red text. Experts' comments are identified by a blue-background number. Mouse over a number to display a pop-up note with the comment.

This publication contains the CMV and the official standard. The full list of comments is available at the end of the CMV.

IEC 62722-2-1 has been prepared by subcommittee 34D: Luminaires, of IEC technical committee 34: Lighting. It is an International Standard.

This second edition cancels and replaces the first edition published in 2014. This edition constitutes a technical revision.

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

- a) alignment with IEC 62717:2014, IEC 62717:2014/AMD1:2015 and IEC 62717:2014/AMD2:2019;
- b) clarification of temperature requirements for the maintenance test, in 10.2 and Annex A;
- c) introduction of a new Annex C on methods for calculation and measurements of parameters for extension of electric and photometric data.

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

Draft	Report on voting
34D/1680/FDIS	34D/1687/RVD

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 International Standard 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.

A list of all parts in the IEC 62722 series, published under the general title *Luminaire performance* 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 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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INTRODUCTION

~~This standard is the conversion of IEC PAS 62722-2-1 into a full IEC performance standard for LED luminaires for general lighting applications.~~ This document acknowledges the need for relevant tests for luminaires using ~~this new source of~~ LED as an electrical light source **1**. This document is seen in close context with the publication of simultaneously developed performance standards for luminaires in general and for LED modules. This document does not consider luminaires designed for LED lamps, which are covered in IEC 62722-1. Changes in LED luminaires standards have an impact on LED module standards and vice versa, due to the behaviour of LED. Therefore, for the development of this document, the mutual consultancy of experts of both products has taken place.

The provisions in this document represent the technical knowledge of experts from the fields of the semiconductor (LED chip) industry and of the traditional electrical light sources and luminaires.

As this document has been simultaneously developed and edited with the standard for LED modules (IEC 62717), where appropriate, the compliance of the LED modules with the provisions of IEC 62717 can be transferred to the whole luminaire.

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LUMINAIRE PERFORMANCE –

Part 2-1: Particular requirements – LED luminaires

1 Scope

This part of IEC 62722 specifies the performance requirements for LED luminaires, together with the test methods and conditions, ~~required to show compliance with this standard~~. It applies to LED luminaires for general lighting purposes.

Semi-luminaires are not covered under the scope of this document.

For some types of luminaires (e.g. decorative or household) the provision of performance data under the scope of this document is not appropriate. **2**

In this document, the following types of LED luminaires are distinguished.

- Type A – Luminaires using LED modules where compliance with IEC 62717⁴ ~~has been proven~~ is given.
- Type B – Luminaires using LED modules where compliance with IEC 62717⁴ ~~has not been proven~~ is not given.
- ~~– Type C – Luminaires using a LED lamp and covered in IEC 62722-1.~~

Luminaires using an LED lamp are covered in IEC 62722-1 and are not within the scope of this document. **3**

The requirements of this document ~~only~~ relate to type testing.

~~This standard does not cover Type C luminaires.~~

~~This standard does not cover LED luminaires that intentionally produce coloured light, neither does it cover luminaires using OLEDs (organic LEDs).~~

~~These performance requirements are additional to the requirements in IEC 62722-1, Clauses 1 to 9, except where in this Part 2-1 alternative methods of measurement or limits are specified.~~ **4**

~~As this standard has been simultaneously developed and edited with the standard for LED modules, where appropriate the compliance of the LED modules to the provisions of IEC 62717 may be transferred to the whole luminaire.~~

This document covers LED luminaires using LED modules, based on inorganic LED technology that produces white light. It does not cover luminaires using light sources based on OLED technology (organic LED technology). **5**

The lifetime of LED luminaires is in most cases much longer than the practical test times. Consequently, the verification of manufacturer's lifetime claims ~~cannot be made in a sufficiently confident way. For that reason the acceptance or rejection of a manufacturer's life time claim, past 25 % of rated life (with a maximum of 6 000 h),~~ **6** is out of the scope of this document.

⁴ ~~To be published.~~

Instead of lifetime validation, this document has opted for lumen maintenance categories at a defined finite test time. Therefore, the category number does not imply a prediction of achievable lifetime. The categories are lumen-depreciation character categories showing behaviour in agreement with the manufacturer's information which is provided before the test is started.

~~In order to validate a life time claim, an extrapolation of test data is needed. A general method of projecting measurement data beyond limited test time is under consideration.~~

~~For explanation of recommended life time metrics see IEC 62717, Annex C.~~

~~It may be expected that LED luminaires which comply with this standard will start and operate satisfactorily at voltages between 92 % and 106 % of rated supply voltage and at an ambient air temperature within the declared range of the manufacturer.~~

~~Evaluation of LOR (light output ratio) for LED luminaire is under consideration.~~

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 60598-1:2020, *Luminaires – Part 1: General requirements and tests*

IEC 60598-2-3:2002, *Luminaires – Part 2-3: Particular requirements – Luminaires for road and street lighting*

IEC 60598-2-5:2015, *Luminaires – Part 2-5: Particular requirements – Floodlights*

IEC 62031:2018, *LED modules for general lighting – Safety specifications*

~~IEC 62504, *General lighting – LEDs and LED modules – Terms and definitions*~~

IEC 62717:2014, *LED modules for general lighting – Performance requirements*

IEC 62717:2014/AMD1:2015

IEC 62717:2014/AMD2:2019

IEC 62722-1, *Luminaire performance – Part 1: General requirements*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 62717 and ~~IEC 62504, as well as~~ the following apply.

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

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

3.1**LED luminaire**

luminaire designed to incorporate at least one ~~or more~~ LED light source(s)

Note 1 to entry: The LED light source(s) can be an integral part of an LED luminaire.

[SOURCE: IEC 60050-845:2020, 845-30-056]

3.2**family of LED luminaires**

~~group of LED luminaires that have~~

- ~~— LED modules with the same method of control and operation (semi-integrated, integrated);~~
- ~~— LED modules with the same classification according to the method of installation (reference is made to IEC 62031, Clause 6) and using LED module of same family as specified in 6.2 of IEC 62717 and the same class of protection against electrical shock;~~
- ~~— the same design characteristics distinguished by common features of materials, components, and/or method of processing and heat management. 7~~

3.2**rated ambient performance temperature value**

t_q

highest ambient temperature around the luminaire related to a rated performance of the luminaire under normal operating conditions, ~~both~~ as declared by the manufacturer or responsible vendor

Note 1 to entry: Rated ambient performance temperature value is expressed in °C.

~~Note 2 to entry: For a given life time, the t_q temperature is a fixed value, not a variable.~~

Note 2 to entry: There can be more than one t_q temperature, depending on the lifetime claim, see 3.3.

3.3**useful life 8**

$L_x B_y$

<of LED luminaires> length of time until at maximum a percentage y of a population of operating LED luminaires of the same type have degraded to the initial luminous flux emitted multiplied by the luminous flux maintenance factor x

Note 1 to entry: The useful life includes operating LED luminaires only.

Note 2 to entry: The term "useful life" does not account for the replaceability of the LED luminaire.

Note 3 to entry: The useful life has unit h.

3.4**rated median useful life 9**

L_x

<of LED luminaires> length of operating time during which a total of 50 % (B_{50}) of a population of operating LED luminaires of the same type have ~~parametrically failed, under standard test conditions as declared by the manufacturer or responsible vendor~~ flux degraded to the initial luminous flux emitted multiplied by the luminous flux maintenance factor x

Note 1 to entry: The median useful life includes operating LED luminaires only.

Note 2 to entry: By convention, the expression "life of LED luminaires" without any modifiers is understood to mean the median useful life.

Note 3 to entry: The median useful life has unit h.

3.5

LED luminaire luminous efficacy

quotient of the luminous flux emitted by the power consumed by the LED luminaire

3.6

abrupt failure value **10**

AFV

<of LED luminaires> percentile of LED luminaires having failed to operate at median useful life, L_x

Note 1 to entry: The abrupt failure value has unit one and is expressed in %.

4 Product information

Information on the parameters shown in Table 1 shall be provided by the manufacturer or responsible vendor on the product datasheets, leaflets or website.

Compliance is checked by inspection.

Table 1 – Product information

Reference	Parameter
a	Rated input power (in W)
b	Photometric code ^a
c	Rated luminous flux (in lm)
d	Rated median useful life L_x (h) and the associated rated lumen maintenance factor (x) the related luminous flux maintenance x^e 11
e	Rated abrupt failure value (rated AFV) (%)
f	Lumen Luminous flux maintenance code ^b
g	Rated chromaticity coordinate values both initial and maintained ^c
h	Rated correlated colour temperature (CCT in K)
i	Rated colour rendering index (CRI)
j	Rated ambient performance temperature value (t_q) related to performance for a luminaire ^d (°C)
k	Rated LED luminaire luminous efficacy (in lm/W)
l	Ageing time, if different from 0 h
NOTE Regional legal requirements may can apply and overrule .	
a	See IEC 62717:2014, Annex D and IEC 62717:2014/AMD2:2019, Annex D.
b	See IEC 62717:2014, Table 6 and IEC 62717:2014/AMD2:2019, Table 6.
c	See IEC 62717:2014, Table 5.
d	See 6.2.
e	The rated useful life $L_x B_y$ (in hours) and the associated luminous flux maintenance factor x and percentage y can optionally be on the product datasheets, leaflets or website.

5 ~~Not used~~ General requirements **12**

Performance requirements given in this document are additional to the requirements in IEC 62722-1, except where, in this document, alternative methods of measurement or limits are specified.

Luminaires are considered within the same family if they have:

- LED modules with the same method of control and operation (semi-integrated, integrated);
- LED modules with the same classification according to the method of installation (reference is made to IEC 62031:2018, Clause 4) and using an LED module of the same family as specified in IEC 62717:2014, 6.2 and the same class of protection against electrical shock;
- the same design characteristics distinguished either by common features of materials and components, or by a method of processing and heat management or both.

Annex B provides an explanation of recommended lifetime metrics.

6 Test conditions

6.1 General test conditions

Test conditions for testing electrical and photometric characteristics, lumen maintenance and life are given in Annex A. For a luminaire in a family of luminaires as described in Clause 5, the electrical and photometric data can be calculated. When calculations are used or when alternative colorimetric data is derived, the methods and conditions given in Annex C shall be used. Annex C is only valid in the case of luminaires where a single LED module is used or where all the LED modules are identical. **13**

NOTE The applicability of Annex C to light sources where the light colour is obtained by mixing different spectra emitted by different light sources can require more consideration than those provided by Annex C.

All tests are measured on "*n*" LED luminaires of the same type. The number "*n*" shall be a minimum of products as given in Table 3. LED luminaires used in the endurance tests shall not be used in other tests.

Each sample luminaire shall comply with all the relevant tests except for the tests of 10.3 where one sample is required for each of the three separate tests mentioned in Table 2 and Table 3. In order to reduce the time of testing, the manufacturer or responsible vendor ~~may~~ can submit additional luminaires or parts of luminaires provided that these are of the same materials and design as the original luminaire and that the results of the test are the same as if carried out on an identical luminaire.

LED luminaires with dimming control shall be adjusted to maximum output for all tests.

LED luminaires with adjustable CCT shall be adjusted ~~or~~ set to one fixed value, as indicated by the manufacturer or responsible vendor.

LED luminaires of linear geometry and variable length shall be tested at a length at which the parameters are given (e.g. performance per *x* cm).

6.2 Luminaires using LED modules where compliance with IEC 62717 ~~has been proven~~ is given (Type A)

Only the tests for measurement of initial performance ~~are to~~ as detailed in 6.4 shall **14** be conducted, when the LED module is operated within its temperature limit t_p .

The information for luminaire design given in IEC 62717:2014, Clause B.1, requires LED modules to be operated within their t_p temperature limit. The t_p temperature shall be measured in accordance with the thermal test procedure defined in IEC 60598-1:2020, 12.4, (normal operation). When the luminaire is operating at its own maximum rated ambient performance temperature value (t_q), the t_p limit (for the declared performance – IEC 62717:2014, Table 2 and IEC 62717:2014/AMD2:2019, Table 2) of LED modules operating inside the luminaire shall not be exceeded. The test voltage for the luminaire shall be 1,00 times the rated voltage of the luminaire. In luminaires intended to be supplied with constant current, the test current shall be 1,00 times the rated current of the luminaire.

For luminaires for road and street lighting and floodlights intended for outdoor use only, the reduction of the measured temperature according to IEC 60598-2-3:2002, 3.12.1, and IEC 60598-2-5:2015, 5.12.1, respectively, shall not be applied for the t_p temperature of the LED module.

The ambient performance temperature t_q is measured in a draught-proof enclosure, as the air temperature, at a position near one of the perforated walls on a level with the centre of the luminaire, see IEC 60598-1, Clause K.1, item e).

6.3 Luminaires using LED modules where compliance with IEC 62717 ~~has not been proven~~ is not given (Type B)

6.3.1 General

~~The manufacturer shall conduct testing for 25 % of rated life up to a maximum of 6 000 h.~~ **15**

In principle all requirements for the LED light source apply for the luminaire as detailed in 6.4. **16**

6.3.2 Creation of module families to reduce test effort

6.3.2.1 General

The provisions of IEC 62717:2014, 6.2.1 apply to the LED luminaire.

6.3.2.2 Variations within family

The provisions of IEC 62717:2014, 6.2.2 apply to the LED luminaire.

6.3.2.3 Compliance testing of family members

The provisions of IEC 62717:2014, 6.2.3 apply to the LED luminaire.

6.4 Performance requirements

The performance criteria given in Table 2 apply to LED luminaires of Types A and B. All of the tested n LED luminaires shall have passed the performance requirements. The parameter given in Table 2 represents a replacement of the corresponding parameter given in IEC 62722-1. **17**

NOTE As indicated in Clause 5 of this document, the performance requirements given in this Subclause 6.4 are additional to the requirements in IEC 62722-1. Additional parameters or requirements not listed in Table 2 but given in IEC 62722-1 are still applicable (e.g. the power measured in non active mode).