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**LED modules for general lighting
service—Performance requirements**

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal for establishment of Japanese Industrial Standard submitted by Japan Electric Lamp Manufacturers Association (JELMA)/Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law.

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LED modules for general lighting service—Performance requirements

Introduction

This Japanese Industrial Standard specifies the various electric characteristics such as input voltage, input current and electric power consumption, the various optical characteristics such as quantity on total luminous flux and light source colour, and their marking methods of LED modules for general lighting service intended mainly for the lighting use.

This Standard specifies the performance which the manufacturer or responsible vendor has to ensure so that the direct users of LED modules for general lighting service or the intermediate users who design or construct a lighting system, etc. using LED modules for general lighting service can use and handle them properly.

No corresponding International Standard has been established at this point.

1 Scope

This Standard specifies the performance and marking of single white LEDs for general lighting service and LED modules for general lighting service. However, LED luminaires and self-ballasted LED-lamps integrated by incorporating LED modules for general lighting service that are not assumed to be exchanged and maintained by general users are not included.

The electric power supplied to the LED modules for general lighting service shall be as follows.

- a) Electric power obtained directly from a commercial power supply
- b) Electric power obtained through a copper iron type transformer or an electronic transformer from a commercial power supply
- c) Electric power of DC 250 V or less, or of AC 1 000 V or less at 50 Hz or 60 Hz in the range of supply voltage

The tests specified in this Standard are type tests excluding test methods that are to be performed on individual modules by the manufacturer in the manufacturing process.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS C 1102-2 *Direct acting indicating analogue electrical measuring instruments and their accessories Part 2: Special requirements for ammeters and voltmeters*

JIS C 1102-3 *Direct acting indicating analogue electrical measuring instruments and their accessories Part 3: Special requirements for wattmeters and varmeters*

- JIS C 1609-1 *Illuminance meters Part 1: General measuring instruments*
- JIS C 7527 *Tungsten halogen lamps (non-vehicle)—Performance specifications*
- JIS C 7604 *High-pressure mercury vapour lamps—Performance specifications*
- JIS C 7709-1 *Lamp caps and holders together with gauges for the control of interchangeability and safety Part 1: Lamp caps*
- JIS C 7709-2 *Lamp caps and holders together with gauges for the control of interchangeability and safety Part 2: Lampholders*
- JIS C 7709-3 *Lamp caps and holders together with gauges for the control of interchangeability and safety Part 3: Gauges*
- JIS C 7801 *Measuring methods of lamps for general lighting*
- JIS C 8121-2-2 *Miscellaneous lampholders—Part 2-2: Particular requirements—Connectors for printed circuit board based LED-modules*
- JIS C 8152 *Measuring methods of white light emitting diode for general lighting*
- JIS C 8153 *DC or AC supplied electronic control gear for LED modules—Performance requirements*
- JIS C 8154 *LED modules for general lighting—Safety specifications*
- JIS Z 8113 *Lighting vocabulary*
- JIS Z 8724 *Methods of colour measurement—Light-source colour*
- JIS Z 8725 *Methods for determining distribution temperature and color temperature or correlated color temperature of light sources*
- JIS Z 9112 *Classification of fluorescent lamps by chromaticity and colour rendering property*

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in **JIS Z 8113** and the following apply.

3.1 LED (Light Emitting Diode)

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

It is also called single LED.

3.2 white LED for lighting

LED of which the light colour corresponding to total luminous flux or CIE averaged LED intensity satisfies the following conditions:

- a spectral distribution spreads in the almost whole regions of a visible range and there is no missing part of a spectrum between them,
- correlated colour temperature is a temperature of 2 500 K to 10 000 K, and
- chromaticity at the correlated colour temperature given in **b)** is within 0.02 in deviation (d_{uv}) from a blackbody locus.

3.3 LED module

device composed by mounting single white LEDs for lighting on a substrate, etc. or arranging two or more LEDs in a plane or in three dimensions so that they can be treated as one unit, consisting of many mechanical and electrical control circuits or part of them and many optical elements, or its aggregate

NOTE : The term also refers to a device obtained by arranging single LEDs in an array configuration or in a cluster configuration.

3.4 LED luminaire

luminaire that uses an LED module as a main light source

NOTE 1 LED luminaire refers to an LED module with functions and decorations added, which is classified as “luminaire” by the manufacturer.

NOTE 2 Generally, “luminaire” is defined as “the device which has members necessary for distributing, transmitting or changing light from a lamp and for supporting, fixing and protecting the lamp, a means for connecting to a power supply and a lighting auxiliary circuit as necessary, which, however, excludes a lamp”. An “LED luminaire”, on the other hand, should include an LED module that is the equivalent of a lamp, and for those with an LED module of which the rated life is 30 000 h or less, that part should be made structurally exchangeable.

3.5 rated voltage

voltage applied to an LED module or voltage between both input terminals when the specified input current is applied to an LED module under the conditions specified by the manufacturer or responsible vendor (hereafter referred to as “the manufacturer, etc.”)

NOTE : “The manufacturer or responsible vendor” as stated in this Standard is equivalent to “Notifying Supplier” as given in the Electrical Appliances and Materials Safety Act, and is defined as the manufacturer of products in Japan and the vendor (wholesale, etc.) who performs import enterprises.

3.6 rated input current

current passing into an LED module when the specified input voltage is applied to the LED module, or current declared by the manufacturer, etc., which is made to pass into an LED module when the LED module is operated, under the conditions specified by the manufacturer, etc.

3.7 rated input electric power

electric power consumed by an LED module when rated voltage or rated input current is applied to the LED module, or electric power declared by the manufacturer, etc., which is applied to an LED module when a single LED or the LED module is operated, under the conditions specified by the manufacturer, etc.

NOTE : The input electric power includes the electric power consumption of the control circuit integrated as a module or a part of it, and differs from the electric power consumption in an LED part.

3.8 power-factor

value obtained by dividing the input electric power (W) used under the condition that specifies the LED module of AC input by the product (VA) of input voltage (V) and input current (A) (both are AC effective values)

3.9 efficiency

value obtained by dividing the total luminous flux (lm) of an LED module by the input electric power (W)

It is expressed in lm/W.

3.10 CIE averaged LED intensity

luminous intensity obtained by averaging the luminous flux in a cone of which the centre line is the perpendicular obtained by dropping the photometric axis from the vertex, taking the LED tip as the vertex, with respect to the solid angle corresponding to the bottom surface of the cone

It is expressed in cd.

NOTE 1 This definition may be applied to a single LED and an LED module in the range in which the size of a light-emitting part does not exceed the size of a light-receiving surface.

NOTE 2 When the above-mentioned bottom surface area of the cone (i.e., the light-receiving surface area) is taken as 100 mm², the relation among solid angle, photometric axis and cone vertex angle is as follows.

- a) Solid angle becomes 0.001 sr when the distance on photometric axis is 316 mm and cone vertex angle is approximately 2°.
- b) Solid angle becomes 0.01 sr when the distance on photometric axis is 100 mm and cone vertex angle is approximately 6.5°.

In addition, in the technical report No. 127 of CIE (Commission Internationale de l'Éclairage), **a**) and **b**) are specified as “condition A” and “condition B”, respectively.

3.11 CIE partial LED flux

luminous flux emitted from an LED in the range of the solid angle determined by the distance in the direction of photometric axis and the aperture of 50 mm in diameter taking the LED tip as the vertex

It is expressed in lm.

3.12 total luminous flux of LED module

total sum of luminous flux which an LED module emits in all the directions

It is expressed in lm.

3.13 life of LED module

the total lighting time until the LED module no longer emits light or the total lighting time until the total luminous flux drops to 70 % of the value measured in the initial

stage of lighting when turned on under the conditions specified by the manufacturer, whichever is shorter

NOTE 1 Normally, “the initial stage of lighting” is defined as 0 h from turning on.

NOTE 2 The judgment of life may be performed based on variations Δx and Δy of chromaticity points x and y , respectively, between at 0 h and at the time of 25 % of the rated life (maximum of 6 000 h) specified by the manufacturer, etc., as well as on the total luminous flux, luminous intensity, etc.

3.14 rated life

time declared based on the average of time at which 50 % of the same type of LED modules, manufactured over a long period, have failed

Furthermore, the rated life is determined based on the test conducted by the manufacturer, etc., or may be the estimated value theoretically derived from the engineering data, etc. of single LED parts manufacturers that shows a relationship between the temperature and current indicating the operating conditions of an LED, and the time variation of maintenance of optical characteristics.

It is expressed in h.

3.15 rated maximum temperature, T_{cmax} or T_{c}

maximum allowable temperature of the surface of an LED module (the marked location when there is a marking that indicates a measurement location) at the rated voltage or at the maximum voltage when the rated voltage has a range, or at the rated current or at the maximum current when the rated current has a range, under the normal service condition

It is expressed in °C.

NOTE : T_{cmax} or T_{c} indicates the maximum allowable temperature, and t_{c} indicates the measured temperature when the location that specifies T_{c} is taken as the measurement point.

3.16 control gear

gear that drives the LED module of DC 250 V or less or AC 1 000 V or less at 50 Hz or 60 Hz by combining with an LED module

3.17 reference axis

virtual axis provided as the reference to an LED module when the light distribution of the LED module is measured

Normally, it is determined from the structure of the LED module and its mounting state.

3.18 rotational symmetrical luminous intensity distribution

light distribution in which the light distribution on all the planes passing through a reference axis is regarded as being symmetrical to the reference axis

3.19 luminous intensity distribution symmetrical about two planes

light distribution other than rotational symmetrical luminous intensity distribution in which the light distribution is regarded as being symmetrical to two planes that pass through a reference axis and intersect at right angles mutually

3.20 luminous intensity distribution symmetrical about one plane

light distribution other than rotational symmetrical luminous intensity distribution and luminous intensity distribution symmetrical about two planes, in which the light distribution is regarded as being symmetrical to one plane passing through a reference axis

3.21 asymmetrical luminous intensity distribution

light distribution that is not rotational symmetrical luminous intensity distribution, luminous intensity distribution symmetrical about two planes or luminous intensity distribution symmetrical about one plane

3.22 photometric centre

point that is assumed as the origin of the light that is on a reference axis and diverges from an LED module

In photometry, it is taken as a basis.

4 Classification

4.0 General

The LED module for general lighting service shall be classified according to the measurement method and types of products that are specified in **JIS C 7801** and **JIS C 8152** as follows.

4.1 Classification 1

Single LED or LED modules near the single LED in shape that are not attached to a substrate, a radiator, etc. by soldering or other means. Single LED or mainly small-sized LED modules not requiring the temperature control for preventing performance degradation due to temperature rise are classified into this category.

4.2 Classification 2

LED modules that are not directly used by general users and are manufactured mainly with the intention of using as parts such as of luminaires. LED modules of this classification are supplied in forms similar to existing types of luminaires such as those referred to as downlights, pendants or ceilings by being attached with mechanical components to its perimeters

The “built-in” and “integral” modules among the self-ballasted LED modules and LED modules without integrated control gear as described in Annex B of **JIS C 8154** fall under this classification.