

Standard of Test Method

EM701

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Ministry of Environment

In Situ Temperature Measurement Test for LED Luminaires

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Foreword

When LED luminaires (hereinafter called “luminaires”) are made of LED packages or modules (hereinafter called “light source”) certified in accordance with “EL211, LED Light Source Package and Module” and are used in normal conditions, this standard is about to check whether the appropriate light source operates within requirements by Eco-Label Certification.

It should be noted that parts of this standard may in conflict with patent rights having technical characteristics, patent applications after laying-open of application, utility model rights or application for the utility model registration after laying-open of application. The Minister of Environment shall have no responsibility for confirmation of matters related to patent rights having technical characteristics, patent applications after laying-open of application, utility model rights or application for the utility model registration after laying-open of application.



1 Scope

When LED luminaires (hereinafter called “luminaires”) are made of LED packages or modules (hereinafter called “light source”) certified in accordance with “EL211, LED Light Source Package and Module” and are used in normal conditions, this standard shall be applied to check whether the appropriate light source operates within requirements by Eco-Label Certification.

2 Normative references

The following documents, in whole or in part, are indispensable for application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EL211 , LED Light Source Package and Module
ANSI/UL 1598, Luminaires
ANSI/IES RP-16-10, Nomenclature and Definitions for Illuminating Engineering
IESNA LM-80-08, Approved Method: Measuring Lumen Maintenance of LED Light Sources
ASTM E230, Standard Specification and Temperature-Electromotive Force (emf)
Tables for Standardized Thermocouples

3 Terms and definitions

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

3.1

LED package

one or more LED dies that are electrically connected (ex. wires). This may include optical, thermal, mechanical and electric elements.

NOTE This cannot be connected directly to normal power because it does not include power and standard base.

3.2

LED module

two or more LED dies or packages that are electrically connected on a printed circuit board (PCB) or other. This may include additional thermal, mechanical and electric elements in order to connect it to optical elements and LED drivers.

NOTE This cannot be connected directly to normal power because it does not include power and standard base.

3.3

lumen maintenance

total luminous flux at a given time within the lifetime of the package or module divided by the initial flux and expressed on a percentage basis.

3.4

temperature measurement point (TMP_{LED})

in the condition of the applied product used normally, the point that the manufacturer specifies with the technical basis for enabling direction measurement of the temperature in the LED junction.

3.5

temperature at TMP_{LED} (T_s)

temperature measured at TMP_{LED} .

3.6

surface-mounted luminaires

luminaires whose housings are exposed to the air. These include products that are mounted on walls or ceilings or standing products that are independently installed.

3.7

built-in luminaires

luminaires that are installed in ceilings or walls, or that are installed in a dark place after being connected directly to insulating materials.

3.8

thermocouple

electric connection of one end of two types of conductors for the purpose of generating thermo-electromotive force.

4 Installation of luminaires

4.1 General installation conditions

The test shall be conducted by installing in the approximate method to the actual use condition according to the luminaire structure. If there is no rational method for the luminaire mounting device, the test method in ANSI/UL 1598 shall be followed.

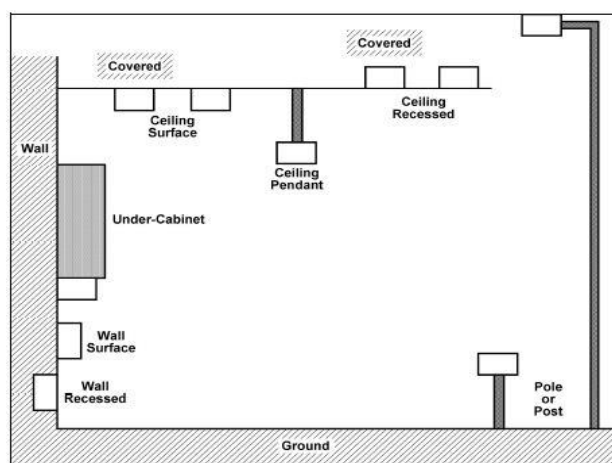


Figure 1 — Example of installation of luminaires in accordance with ANSI/UL 1598

4.2 Individual installation conditions in accordance with the structure of luminaires

Details of installation conditions in accordance with the structure of luminaires shall comply with the methods mentioned below. The detailed matters on the installation condition according to the luminaire structure shall comply with the method provided as follows. However, if the installation condition is not in the structure of clear limitation, the installation shall be enable in the state of operating in the poorest optic source condition.

4.2.1 Ceiling surface luminaires

This shall be in consideration of Section 19.10 and Section 19.11 of ANSI/UL 1598.

4.2.2 Under cabinet luminaires

This shall be in consideration of Section 19.12 of ANSI/UL 1598.

4.2.3 Ceiling pendant luminaires

Any products which are fixed apart more than 10 cm from walls or ceilings shall not need separate installation conditions. Any products which are fixed apart less than 10 cm from walls or ceilings shall be in consideration of Section **19.10** of ANSI/UL 1598.

4.2.4 Non-IC type built-in luminaires

This shall be in consideration of Section **19.13** of ANSI/UL 1598.

4.2.5 IC type built-in luminaires

This shall be in consideration of Section **19.15** of ANSI/UL 1598.

5 Measurement in installation conditions for luminaires

5.1 Preparations for measurement of many targets

If it is difficult to measure temperature of the entire light source because many light sources are used, the range of target light sources for measurement can be reduced by using a non-contact type temperature measuring device. For such purpose, an infrared imaging device that enables checking for temperature distribution is appropriate. In this case, the optic source subjected for measurement may be set with the range in the order of higher temperature.

5.2 Guidelines for attachment of thermocouples

Thermocouples shall be thin enough not to have an influence on the rise of temperature of a measurement target. The allowable limits of thermocouples shall satisfy Table 1 "Special Limits: $\leq 1.1\text{ }^{\circ}\text{C}$ or 0.4% " of ASTM E230.

Attach the thermocouple solidly to the temperature measurement point (TMP_{LED}) being presented by the light source manufacturer in the way not to disturb the rise of temperature. Attachment methods include soldering at high temperature, conductive adhesion (catalyst, UV or epoxy adhesion) or methods recommended by the light source manufacturer. However, thermocouple attachment using adhesive tape cannot be regarded as sufficient substantialization of thermal contact.

NOTE Solid attachment refers to the maintenance of a thermocouple adhered to the temperature

measurement point (TMP_{LED}) while this test proceeds, and includes a proper ancillary means to prevent separation of the thermocouple.

5.3 Measurement of temperature at TMP_{LED} (T_s)

After attaching the thermocouple to the TMP_{LED} in accordance with 5.2 and operating the luminaire in its normal state under installation conditions, measure the temperature at TMP_{LED} (T_s) and the temperature surrounding the light source when thermal equilibrium is reached. At that time, the voltage to be applied to the luminaire should be most unfavorable within $220 V \pm 10\%$. If there is no change in voltage and current to be applied to light source even though the rated voltage changes, however, the rated voltage can be applied.

5.4 Measurement of voltage and current

Measure the voltage and current to be applied to each light source in measurement conditions of 5.3.

6 Test result evaluation

If all the test results of measurement of temperature, voltage and current in accordance with 5.2 and 5.3 meet the following, it is evaluated that the appropriate luminaire can maintain certification conditions for light source:

- a) Both the temperature surrounding the light source and the temperature at TMP_{LED} (T_s) are equivalent to or below the certification conditions of the product complying with “EL211. LED Light Source Package and Module”
- b) Both the voltage and the current to be applied to the light source are equivalent to or below the certification conditions of the product complying with “EL211. LED Light Source Package and Module”

NOTE If the luminaire operates with the voltage and current not following certification conditions, technical data of the influence of the appropriate conditions on lumen maintenance should be submitted by the light source manufacturer for evaluation.

7 Test result report

A report on test results shall include the following information:

- a) Comments on the standard
- b) Matters necessary for checking test samples
 - Manufacturer's name, model name
 - Product manual of the applied light source, a test report of an accredited testing laboratory on IESNA LM-80-08 or equivalent criteria
- c) Installation conditions
- d) Test methods
- e) Test results
- f) Other conditions not provided but implemented additionally in this standard
- g) Details of all the situations that may have an influence on results

References

- [1] ENERGY STAR® Manufacturer's Guide for Qualifying Solid State Lighting Luminaires – Version 2.1
- [2] ASTM MNL 12, Manual on the Use of Thermocouples in Temperature Measurements
- [3] NIST ITS-90, Thermocouple Database

Common Criteria, Notice No. 2017-103, the Ministry of Environment

1. Those who have received the eco-label certification shall comply with the environment regulation standards during the certification period. In case of a breach of the environmental regulation standards, the details of such violation, an improvement measure, and a recurrence-preventive measure including data listed below shall be submitted to the Director of the Korea Environmental Industry & Technology Institute (hereinafter referred to as "the KEITI Director") within one month from the date of such violation. If the required set of documents and data is submitted and implemented as planned, it shall be deemed conforming.
 - A. A list of the environment regulation standards applicable to the area where the applicant is located
 - B. The company system to implement the environment regulation standards (including an organization chart describing roles and responsibilities)
 - C. The company regulation for archiving records and documents related to implementation of the environment regulation standards.
2. In relation to the "Consumer Information" label specified in the certification criteria for each product, the followings shall be complied with.
 - A. "Consumer Information" related to the product shall be marked on the surface of the product. However, in the case where the KEITI director acknowledges that it is not possible to mark it on the surface of the product or that the marking itself is undesirable, Consumer Information may be marked on other appropriate area(s) where can be easily recognized by consumers such as the product packages, product guides or user guides.
 - B. "Consumer Information" related to the service shall be displayed on the inside/outside of the premises of the service operation business. However, in the case where the KEITI director acknowledges that it cannot be displayed on the inside/outside of the premises, or that the marking itself is not desirable, Consumer Information may be displayed on other appropriate area(s) where can be easily recognized by consumers such as contracts, delivery statements, warranties, or promotion materials.
3. Those who wish to receive the eco-label certification or who have been eco-label certified shall comply with the Act on Fair Labeling and Advertising in order to establish fair trade order and protect consumers. In addition, unfair labels or advertisements that are related to the environmental aspects of the product are not allowed in accordance with Clause 10 of Article 16 of the Act.
4. In the case where there is a restriction related to the raw materials in use or the place of product use in accordance with other laws or regulations or in the case where the product needs to be certified prior to its production, all those applicable certification standards and regulations shall be complied with.
5. With respect to the various standards cited in the certification criteria for the target product, only the latest versions of the standards shall apply unless otherwise noted. If the applicable regulation criteria is strengthened compared to the certification criteria of each product due to a revision of relevant laws and regulations, the strengthened regulation criteria shall tentatively apply; if the regulation criteria is to be abolished, its current version shall tentatively apply until the applicable certification criteria is revised.
6. When it is judged that application of quality-related criteria in accordance with the certification criteria of each product is inappropriate, the KEITI Director may set and implement the needed quality criteria for relevant products.

[Verification method in accordance with the certification criteria]

1. The test certificate in accordance with the prescribed test methods shall mean a test report issued by one of the agencies (listed below) designated by the KEITI Director. When a person applying for the Eco-label certification seeks to be verified by a test/inspection institution not included in the list below, such verification shall be conducted in the presence of a professional designated by the KEITI Director.
 - A. Korea Environmental Industry & Technology Institute in accordance with 12 of Clause 4, Article 5 of the Act
 - B. Test/inspection institutions recognized in the accreditation system for test/inspection institutions in accordance with the Article 23 of the 「Framework Act on National Standards」 (e.g. test/inspection institutions accredited by KOLAS)
 - C. Test/inspection institutions designated and accredited by the president of central administrative agency in accordance with relevant laws
 - D. Foreign test/inspection bodies complying with the ISO/IEC 17025
 - E. Test/inspection institutions recognized by the KEITI Director in case that it is difficult to conduct tests in one of the institutions specified from A to D.
2. A test and inspection organization that issued a test certificate in accordance with Clause 1 herein shall comply with the KEITI Director's request for data related to the test unless there is a specific reason. If the institution rejects the request of KEITI Director without a justifiable reason, the test/inspection institution is subject to restrictions on their testing & inspection work.
3. The submitted documents shall be verified according to the test certificate, raw material supply/production statement, product related certificate(s), user manual, guidebook, or product provided by the person who wishes to receive the eco-label certification in order to prove that the product complies with relevant certification criteria. If it is a service, it may include performance data, documentary evidence and on-site photos. However, when such verification cannot be complete only with the submitted documents, more tests according to Clause 1 may be added.
4. In case that the person who has already received the certification seeks for additional certification on models using the same materials, parts or components as the certified product, the previous verification results of raw materials, parts or components may be used again; provided, however, that the additional certification shall be applied within 12 months from the date of initial certification.
5. In case of certification in accordance with 2 of Clause 3, Article 4, the KEITI Director shall randomly select a sample from models in the product line for verification.
6. In case of certification in accordance with 3 of Clause 3, Article 4, the KEITI Director shall randomly select a sample from models in the product line for verification. However, in the case where some of environmental and quality information is different from model to model and affects their verification results, each model shall be separately verified according to the environment-related or quality-related criteria.