

# EL211. LED Light Source Package and Module

## [EL211-2013/1/2013-23]



### 1. Scope

The criteria shall apply to LED packages and modules supplied as white light sources for lighting. However, products made by using organic light-emitting diodes shall be excluded.

### 2. Definitions

#### 2.1

“LED die” means a luminous semi-conducting material piece mounted on an LED circuit.

#### 2.2

“LED package” refers to a series of one or more LED dies that includes other electric joints, such as wire. It may include optical devices and thermal/mechanical/electrical components. As it does not include power supply and standard base, it cannot be directly connected to commercial electricity.

#### 2.3

“LED module” refers to a series of 2 or more LED dies or packages on a printed circuit board or other circuit board. It may include optical devices or other additional thermal/mechanical/electrical components required to connect to LED driver. As it does not include power supply and standard base, it cannot be directly connected to commercial electricity.

#### 2.4

“Lumen maintenance” refers to a value of percentage calculated by dividing total luminous flux at a given time in the life of package or module by initial luminous flux.

#### 2.5

“Derivative products” refer to products with the same characteristics as the application product in terms of materials, manufacturing process and performance.

## 2.6

“Temperature measurement point ( $TMP_{LED}$ )” refers to the point specified by the manufacturer with technical grounds to indirectly measure the temperature of LED junctions under normal use conditions for the application product.

Note) Normal use conditions refer to the worst use conditions usually anticipated when the application product is installed in an LED lamp.

## 2.7

“Measurement point temperature ( $T_s$ )” refers to the temperature measured at the temperature measurement point ( $TMP_{LED}$ ).

Remarks) The terms used in this criteria shall follow the definitions in the following standards and regulations, unless separately defined.

- ANSI/IES RP-16-10 (Nomenclature and Definitions for Illuminating Engineering)
- IESNA LM 80-08 (Approved Method: Measuring Lumen Maintenance of LED Light Sources)
- ENERGY STAR<sup>®</sup> Program Requirements for Luminaires Version 1.1
- ENERGY STAR<sup>®</sup> Program Guidance Regarding LED Package, LED Array and LED Module Lumen Maintenance Performance Data Supporting Qualification of Lighting Products, Sep. 9, 2011

## 3. Certification Criteria

### 3.1 Environmental Criteria

#### 3.1.1

In respect to the use of chemical substances in manufacturing or the recyclability of parts in the stages of use or disuse, the following criteria shall be met.

Note) The criteria shall not apply to the subjects excluded from the restriction on the use of harmful substances specified in EU Directive 2002/95/EC. However, if EU Directive 2002/95/EC is revised, the revised EU Directive at the time of the application for certification shall be followed.

### 3.1.1.1

In respect to lead (Pb), cadmium (Cd), mercury (Hg) and hexavalent chromium (Cr<sup>6+</sup>) contained in a part comprising a product, one of the following criteria shall be met.

- a) For harmful elements contained in parts comprising a product to meet the following criteria, appropriate management system shall be established and operated.

Item	Lead (Pb)	Cadmium (Cd)	Mercury (Hg)	Hexavalent chromium (Cr <sup>6+</sup> )
Criteria [mg/kg]	1 000 or less	100 or less	1 000 or less	1 000 or less

- b) If appropriate management system has not been established and operated for the relevant harmful elements, the harmful elements contained in the parts of a product shall meet the following criteria.

Item	Lead (Pb)	Cadmium (Cd)	Mercury (Hg)	Hexavalent chromium (Cr <sup>6+</sup> )
Criteria [mg/kg]	1 000 or less	100 or less	1 000 or less	1 000 or less

Note) If the content of total chromium (Cr) is 1 000 mg/kg or less, it shall be regarded as meeting the criteria.

### 3.1.1.2

Polybrominated biphenyls (PBBs), polybrominated diphenylethers (PBDEs) and the short-chain chlorinated paraffins (C=10-13) with a chlorine concentration of 50% or higher shall not be used in a product.

### 3.1.1.3

Lead shall not be used as soldering or adhesion materials.

### 3.1.2

With respect to the life of products in use, the lumen maintenance after 6 000 hours shall be 90 % or higher. For an LED module comprising 2 or more LED packages, however, if the luminous flux of each package is 90 % or higher after 6 000 hours, the module shall be regarded as meeting the criteria.

Remarks 1) The result of the lumen maintenance test for the application product with the correlated color temperature of 2 700K, 3 000K or 3 500K may be used to verify the lumen maintenance of derivative products with the correlated color temperature of 2 700K or higher.

Remarks 2) The result of the lumen maintenance test for the application product with the correlated color temperature of 4 000K, 4 500K, 5 000K, 5 700K or 6 500K may be used to verify the lumen maintenance of derivative products with the correlated color temperature of 4000K or higher.

### 3.1.3

With regard to the recyclability of products in the stage of recycling or disuse, packing material of products in the process of manufacturing shall meet the following criteria.

#### 3.1.3.1

For synthetic resins used as packing material (weight of 25 g or higher and the area of flat parts of 200 mm<sup>2</sup> or higher), each part which is separated shall have the indication of the classification of quality of the material so that separation and collection can be easily conducted in disusing the product.

#### 3.1.3.2

Packing material of a product shall not contain halogen synthetic resins such as PVC.

#### 3.1.3.3

Separate packing buffer material of a product shall meet one of the following criteria, and shall be composed of a single quality of material.

- a) Recycled paper and pulp material, such as pulp mold
- b) Packing buffer material with the ecolabel certification as “EL606. Packing Material” of the certification criteria by ecolabel subject product.
- c) Packing buffer material made by using waste synthetic resin of 50 % by weight or higher.
- d) Foamed synthetic resins (EPS, EPE, EPP) packing buffer material manufactured by using substance with ODP of 0 as a foaming agent
- e) Air-cell packing buffer material made by injecting air into synthetic resin material

## **3.2 Quality Criteria**

### 3.2.1

If the national standards for the relevant product include Korean Standard, it shall meet the criteria for quality or performance of the relevant standard. However, the items related to “3.1 Environmental Criteria” shall be excluded.

### 3.2.2

If the national standards for the relevant product do not include Korean Standard, the product shall meet the criteria for quality and performance of the standard according to the following order. However, the items related to “3.1 Environmental Criteria” shall be excluded, and if Ecolabel Criteria Establishment Committee decides the criteria to be applied are not reasonable for the characteristics of the product, the product shall meet the criteria (test items, test method, reference values, etc.) modified to suit the characteristics of the product by the committee.

#### 3.2.2.1

National standards other than Korean Standard

#### 3.2.2.2

Foreign standards or international standards for the quality of the relevant product

#### 3.2.2.3

Domestic and foreign groups' standards quoted by the current ecolabel subject products and certification criteria

#### 3.2.2.4

Private-sector standards equivalent to or higher than, national standards in the industrial area of the relevant product

## **3.3 Consumer Information**

### 3.3.1

Indication of country of origin (manufacturer and supplier)

### 3.3.2

Manufacturer's model name and product type (package or module)

### 3.3.3

Indication of the information on the characteristics of the product

a) Light efficiency and light source color

b) The result of the lumen maintenance test measured according to "4.1.3 Test Method" and the test conditions (rated voltage ( $V_f$ ), rated current ( $I_f$ ), temperature measurement point ( $TMP_{LED}$ ), temperature at measurement point ( $T_s$ ), etc.)

### 3.3.4

Indication of the information on the design and use conditions for verification of lumen maintenance

## 4. Test Method

Criteria Item		Test and Verification Method
Envir. Criteria	3.1.1	3.1.1.1~2 Documents submitted according to "4.1.2 Verification and Test Method"
		3.1.1.3 Verification of submitted documents and the site
	3.1.2	Test report of authorized institute or verification of submitted documents according to "4.1 and 4.3 Test Method"
	3.1.3	Verification of submitted documents and the site
Quality Criteria	3.2.1~2	Verification of submitted documents
Consumer Information		Verification of submitted documents

### 4.1 General Matters

#### 4.1.1

In principle, the number of test samples of packages shall be more than 20 and the number of test samples of modules shall be more than 10 per product.

#### 4.1.2

In principle, for test samples, consigned ecolabel certification institute shall conduct a random sampling of products on the market or ones stored in production fields. If such random sampling is unavailable, however, samples suggested by the manufacturer may be used as a test sample.

#### 4.1.3

Rounding-off of test results shall be conducted according to KS Q 5002 (Statistical interpretation of data – Part. 1: Statistical presentation of data).

### **4.2 Method for the verification and test of the criteria for the restriction on the use of harmful elements**

#### **4.2.1 Method for the verification of the establishment and operation of the appropriate harmful element management system**

Note) This method aims to verify the appropriateness of the criteria for the restriction of the use of lead, cadmium and mercury and their compounds and hexavalent chromium compounds in parts comprising a product. This method may also be used as a method to verify whether the applicant manages PBBs, PBDEs and short-chain chlorinated paraffin (C=10-13) appropriately.

##### 4.2.1.1

Such appropriateness shall be verified by examining one or more of the following a)-d) documents or test results.

- a) Any manual or related documents regarding the management system used to manage harmful elements appropriately when the manufacturer is supplied with parts from parts supplier.
- b) Results of test conducted by manufacturer used to manage harmful elements appropriately when the manufacturer is supplied with parts from parts supplier. (In this case, specific test methods including pretreatment method applied to such tests shall be included.)
- c) Certificates by third-party authorized institute required to verify that the parts comprising a product meet the relevant certification criteria [Ex: Ecolabel certificate for EL763. Parts for Electric and Electronic Products] of the certification criteria by eco-label subject product.

- d) Other data used to verify that the manufacturer manages harmful elements appropriately when the manufacturer is supplied with parts from parts supplier.

#### 4.2.1.2

If it is difficult to decide whether the management system for harmful elements has been established and operated appropriately or the Ecolabel Certification Deliberation Committee requires test results for specific parts, the following “4.2.2 Test Method for the Content of Harmful Elements” shall be used to verify the parts selected through random sampling by consigned ecolabel certification institute.

### **4.2.2 Test Method for the Content of Harmful Elements**

Note) This method is an example of test methods used to verify the content of lead (Pb), cadmium (Cd), mercury (Hg) and hexavalent chromium ( $\text{Cr}^{6+}$ ) contained in parts comprising a product. In addition to this method, objective international test methods may be used to verify the content. In this case, specific test methods, including pretreatment method, shall be specified, and the appropriateness of specified test methods shall be determined through the review of Ecolabel Certification Deliberation Committee.

#### 4.2.2.1

In principle, samples for content analysis shall be prepared as even substances gained through manipulation such as grinding by basic unit of a part.

#### 4.2.2.2

Analysis method for lead (Pb), cadmium (Cd), mercury (Hg), hexavalent chromium ( $\text{Cr}^{6+}$ ), and total chromium (Cr)

- a) Lead (Pb) and cadmium (Cd): KS M 0016 (General Rules for Atomic Absorption Spectrochemical Analysis), KS M 0032 (General Rules for ICP Emission Spectrochemical Analysis) and ICP-MS (Inductively Coupled Plasma Mass Spectrometry)
- b) Mercury (Hg): Vaporization gold amalgamation atomic absorption spectrometry and KS M 0016 (General Rules for Atomic Absorption Spectrochemical Analysis)



- c) Hexavalent Chromium ( $\text{Cr}^{6+}$ ): The UV spectrophotometry by diphenylcarbazide method and the UV spectrophotometry by the lead acetate trihydrate method
- d) Total chromium (Cr): KS M 0016 (General Rules for Atomic Absorption Spectrochemical Analysis), KS M 0032 (General Rules for ICP Emission Spectrochemical Analysis) and ICP-MS (Inductively Coupled Plasma Mass Spectrometry)

#### **4.3 Method for Luminous Flux Maintenance Factor Test**

##### **4.3.1**

The test method shall follow the IESNA-LM-80-08 (Measuring Lumen Maintenance of LED Light Sources) quoted by International Energy Star program or equivalent or higher criteria to verify the lumen maintenance of LED-equipped lamps or lights.

##### **4.3.2**

Test results shall include the measurement conditions, such as ambient temperature, operating current, and measurement point temperature ( $T_s$ ), and for products comprising two or more dies or packages, the current intensity of each die or package within a discernable scope shall be indicated.

#### **5. Certification Reasons :**

“Reduction in Harmful Substances and Long Life”

## **Common Criteria**

1. Ecolabelled products must follow the following provisions with regard to the proper treatment of environmental pollution substances such as air and water wastes and noxious chemical substances emitted during the process of manufacturing or service operation.
  - A. When first applying for certification, the product manufacturer should observe the environment related laws and agreements pertaining to the region where the production factory or the place of service operation is located for a period of one year prior to the date of application. Any case of violation of the penalty clause will be verified by confirming documents involved during a period of one year to the date of application. Regarding any violation not related to the penalty clause, confirmation will be made on the completion of appropriate measures.
  - B. A person who has received a certification of ecolabelling shall observe the environment related laws and agreements pertaining to the region where the production factory or the place of service operation is located during the period of certification. However, regarding any violation besides a penalty, confirmation will be made on the completion of appropriate measures.
2. As a general rule, information for consumers shall be indicated on the surface of the product in such a way not to be easily erased. However, in case that indication on the surface of the product is impossible or undesirable, it can be indicated on appropriate parts such as product packaging, product guidebook and user's manual that consumers can recognize. However, the service information should be indicated inside and outside of the place of service operation. In case that indication inside and outside of the place of service operation is impossible or undesirable, it can be indicated on appropriate parts such as an agreement, letter of delivery, letter of guarantee, and PR materials that consumers can recognize.
3. In order to establish fair trade and protect consumer, the applicant for ecolabel and the holder of ecolabel license shall observe the Act on the Fairness of Indication and Advertisement with respect to the environmental aspects of the product.
4. For various standards referred to in the certification criteria by target product, the latest revised edition applies at the date of application, if not specified otherwise.
5. In applying the quality related criteria for each target product, if no standard is available that can be applied as the quality criteria, the president of Korea Environmental Industry & Technology Institute (KEITI) (hereafter referred to as "president of KEITI") may establish and operate the quality criteria for the product involved after review by a competent committee.