

مشروع نهائي  
مواصفة قياسية عمانية

متطلبات كفاءة الطاقة والتشغيل ووضع البطاقات لمصابيح (LED) ذاتية الكبح

**Energy efficiency, functionality and labelling  
requirements for self-ballasted Light Emitting Diode  
(LED) lamps**

المديرية العامة للمواصفات والمقاييس  
وزارة التجارة والصناعة

هذه الوثيقة مشروع لمواصفة قياسية عمانية تم توزيعها لإبداء الرأي والملاحظات بشأنها، لذلك فإنها عرضة للتغيير والتبديل، ولايجوز الرجوع إليها كمواصفة قياسية عمانية معتمدة إلا بعد اعتمادها.

## تقديم

المديرية العامة للمواصفات والمقاييس جهاز التقييس الوطني بالسلطنة أنشئت بموجب المرسوم السلطاني رقم 1976/39، ومن مهامها إعداد المواصفات القياسية العمانية واللوائح الفنية استنادا للمرسوم السلطاني رقم 87/1.

وقد قامت دائرة المواصفات بالمديرية بإعداد هذه المواصفة القياسية العمانية " **متطلبات كفاءة الطاقة والتشغيل ووضع البطاقات لمصابيح ( LED ) ذاتية الكبح** "

وقد تم إعداد المشروع باللغة الإنجليزية بعد استعراض المواصفات القياسية الأوروبية والدولية .

وقد اعتمدت هذه المواصفة كمواصفة قياسية عمانية ملزمة، بتاريخ / / ، الموافق / / م

## Forward

General Directorate of Standardization and Metrology (DGSM) is the National standard body in Sultanate of Oman. It was established according to Royal Decree No. 39/1976. DGSM is responsible of issuing Omani standards and technical regulations.

Director of standards, in the DGSM has prepared this standard "Energy Efficiency, Functional and Labelling requirements for self-ballasted Light Emitting Diode (LED) Lamps".

The draft standard has been prepared in English language based on relevant European Standards.

This standard was approved as an Omani Technical Regulation on \_\_\_\_\_

# Contents

1. Scope.....	4
2. Normative references .....	4
3. Definitions .....	4
4. Functionality requirements and prequalification criteria .....	7
5. Energy efficiency rating .....	10
6. Label particulars .....	11
7. Information to be visibly displayed for end-consumers.....	17
8. Inspection /check testing guidelines.....	17
Annex-A: Relevant standards.....	18
Annex-B: Special purpose lamps .....	21
Annex-C: Information to be displayed for end-user awareness.....	22
Annex-D: Inspection /check testing for market surveillance .....	23
Annex E – Registration form.....	25

# Energy efficiency, functionality and labelling requirements for self-ballasted Light Emitting Diode (LED) lamps in the Sultanate of Oman

## 1. Scope

This standard specifies the energy efficiency, functionality, and product information requirements for self-ballasted LED lamps for general lighting services that works on single-phase alternating current supply up to and including 240V, 50Hz, being manufactured, imported or sold in Oman.

The standard covers the following types of self-ballasted LED lamps:

- a. Both the directional and non-directional lamps.
- b. Lamps having a luminous flux above 60 lumens and below 12,000 lumens.

This standard does not cover the following types of LED lamps:

- a. Lamps which are used in special purpose applications (Special purpose lamps are explained in '**Annex-B: Special purpose lamps**').
- b. Lamps not intended for general lighting purposes.

## 2. Normative references

For the purpose of verification and compliance with the requirements of this standard, the relevant standards listed in '**Annex-A: Relevant standards**' must be referred in conjunction with this document.

## 3. Definitions

- 3.1 '**Ballast**' means lamp control gear inserted between the supply and one or more discharge lamps which, by means of inductance, capacitance or a combination of inductance and capacitance, serves mainly to limit the current of the lamp(s) to the required value.
- 3.2 '**Beam Angle**' means the angle between two imaginary lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the lamp and through points at which the luminous intensity is 50 % of the centre beam intensity, where the centre beam intensity is the value of luminous intensity measured on the optical beam axis.
- 3.3 '**Chromaticity**' means the property of a colour stimulus defined by its chromaticity coordinates, or by its dominant or complementary wavelength and purity taken together.

- 3.4 **'Colour consistency'** means the maximum deviation of chromaticity coordinates (**x and y**) of a single lamp from a chromaticity center point ( $c_x$  and  $c_y$ ), expressed as the size (in steps) of the Macadam ellipse formed around the chromaticity center point ( $c_x$  and  $c_y$ ). MacAdam ellipses refer to the regions (in the form of an ellipse) on a chromaticity diagram which contain all Colours that are indistinguishable to the average human eye from the Colour at the center of the ellipse.
- 3.5 **'Colour rendering (Ra)'** means the effect of an illuminant on the Colour appearance of objects by conscious or subconscious comparison with their Colour appearance under a reference illuminant.
- 3.6 **'Control device'** means an electronic or mechanical device controlling or monitoring the luminous flux of the lamp by other means than power conversion for the lamp, such as timer switches, occupancy sensors and daylight standard devices. In addition, phase-cut dimmers shall also be considered as control devices.
- 3.7 **'Correlated Colour temperature (Tc [K])'** means the temperature of a Planckian (black body) radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions.
- 3.8 **'Directional Lamp'** a lamp having at least 80% light output within a solid angle of  $\pi$  steradians corresponding to a cone with an angle of  $120^\circ$ .
- 3.9 **'Initial luminous flux'** means the luminous flux of a lamp after a short operating period.
- 3.10 **Lamp:** means a unit emitting light, whose performance can be assessed independently, and which consists of one or more light sources. It may include additional components necessary for starting, power supply or stable operation of the unit or for distributing, filtering or transforming the optical radiation, in cases where those components cannot be removed without permanently damaging the unit.
- 3.11 **Lamp cap:** means that part of a lamp, which provides the connection to the electrical supply by means of a lamp holder or lamp connector, and may also serve to retain the lamp in the lamp holder.
- 3.12 **'Lamp control gear'** means a device located between the electrical supply and one or more lamps, which provides functionality related to the operation of the lamp(s), such as transforming the supply voltage, limiting the current of the lamp(s) to the required value, providing starting voltage and preheating current, preventing cold starting, correcting the power factor or reducing radio interference. The device may be designed to connect to other lamp control gear to perform these functions. The term does not include:
- Control devices

- External power supplies<sup>1</sup>
- 3.13 '**Lamp holder or socket**' means a device which holds the lamp in position, usually by having the cap inserted in it, in which case it also provides the means of connecting the lamp to the electric supply.
- 3.14 '**Lamp lifetime**' means the period of operating time after which the fraction of the total number of lamps which continue to operate corresponds to the lamp survival factor of the lamp under defined conditions and switching frequency. For LED lamps, lamp lifetime means the operating time between the start of their use and the moment when only 50 % of the total number of lamps survive or when the average lumen maintenance of the batch falls below 70 %, whichever occurs first.
- 3.15 '**Lamp lumen maintenance factor (LLMF)**' means the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial luminous flux.
- 3.16 '**Lamp start time**' means the time needed, after the supply voltage is switched on, for the lamp to start fully and remain alight.
- 3.17 '**Lamp survival factor (LSF)**' means the defined fraction of the total number of lamps that continue to operate at a given time under defined conditions and switching frequency.
- 3.18 '**Lamp warm-up time**' means the time needed after start-up for the lamp to emit a defined proportion of its stabilized luminous flux.
- 3.19 '**LED lamp**' means a lamp incorporating one or more LED modules. The lamp may be equipped with a cap.
- 3.20 '**LED module**' means an assembly having no cap and incorporating one or more LED packages on a printed circuit board. The assembly may have electrical, optical, mechanical and thermal components, interfaces and control gear.
- 3.21 '**LED package**' means an assembly having one or more LED(s). The assembly may include an optical element and thermal, mechanical and electrical interfaces.
- 3.22 '**Light-emitting diode (LED)**' means a light source, which consists of a solid-state device embodying a p-n junction. The junction emits optical radiation when excited by an electric current.
- 3.23 '**Lighting**' means the application of light to a scene, objects or their surroundings so that humans may see them.

<sup>1</sup>External power supplies are power adaptors used to convert household electric current into lower voltage (AC) current - or DC current - in order to operate a large variety of household and office products like electric toothbrushes and shavers, mobile and cordless phones, laptops and tablets, as well as printers, routers and modems.

- 3.24 **'Light source'** means a surface or object designed to emit mainly visible optical radiation produced by a transformation of energy. The term 'visible' refers to a wavelength of 380-780nm.
- 3.25 **'Luminous flux ( $\Phi$ )'** means the quantity derived from radiant flux (radiant power) by evaluating the radiation in accordance with the spectral sensitivity of the human eye. Without further specification, it refers to the initial luminous flux.
- 3.26 **'Luminous intensity (candela or cd)'** means the quotient of the luminous flux leaving the source and propagated in the element of solid angle containing the given direction, by the element of solid angle.
- 3.27 **'Nominal value'** means the value of a quantity used to designate and identify a product.
- 3.28 **'Non-directional lamp'** means a lamp that is not a directional lamp.
- 3.29 **'Power factor'** means the ratio of the absolute value of the active power to the apparent power under periodic conditions.
- 3.30 **'Premature failure'** means when a lamp reaches the end of its life after a period in operation, which is less than the rated lifetime stated in the technical documentation.
- 3.31 **'Rated value'** means the value of a quantity used for specification purposes, established for a specified set of operating conditions of a product. Unless stated otherwise, all requirements are set in rated values.
- 3.32 **'Self-ballasted lamp'** Unit which cannot be dismantled without being permanently damaged, provided with a lamp cap and incorporating a LED light source and any additional elements necessary for stable operation of the light source.
- 3.33 **'Special purpose lamps'** means a lamp that is intended for use in special applications. Special applications are those that require technical parameters not necessary for the purposes of lighting average scenes or objects in average circumstances. The types of special applications are listed in '

3.35 **Annex-B: Special** purpose lamps’.

3.36 **Switching cycle** means the sequence of switching the lamp on and off at set intervals.

3.37 **Useful luminous flux ( $\Phi_{use}$ )**: means the part of the luminous flux of a lamp falling within the beam angle used for calculating the lamp’s energy efficiency.

## 4. Functionality requirements and prequalification criteria

LED lamps covered in this standard must meet the requirements mentioned in following respective standards for safety and performance (the standards shall be read including amendments from time to time):

- a) IEC 62560 for Self-ballasted LED lamps by voltage > 50V – Safety specifications
- b) IEC 62612 for Self-ballasted LED lamps with supply voltages > 50V – Performance requirements
- c) IEC 61000-3-2 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current  $\leq$  16 A per phase)
- d) IEC 62471 for Photobiological Safety of Lamps and Lamp Systems

The lamp functionality requirements are outlined in Table 1 and it is applicable to both non-directional and directional LED lamps.

*Table 1: Functionality requirements*

Functionality parameter	Requirement
Lamp survival factor (LSF) at 6,000h	$\geq 0.90$
Lamp Lumen Maintenance factor (LLMF) at 6,000h	$\geq 0.80$
Number of switching cycles before failure	$\geq 15,000$ if rated lamp life $\geq 30,000$ h Otherwise: $\geq$ half the rated lamp life expressed in hours
Starting time	$< 0.5$ s
Lamp warm-up time to 95% of $\phi$	$< 2$ s
Premature failure rate	$\leq 5.0\%$ at 1,000h
Colour rendering (Ra)	$\geq 80$
Colour consistency	Variation of chromaticity coordinates within a



	six-step MacAdam ellipse or less.
Lamp power factor (PF) for lamps	<p><math>P \leq 2W</math>: No requirement</p> <p><math>2W &lt; P \leq 5W</math>: PF &gt; 0.4</p> <p><math>5W &lt; P \leq 25W</math>: PF &gt; 0.7</p> <p><math>P &gt; 25W</math>: PF &gt; 0.9</p>

The prequalification criteria for the purposes of energy efficiency labelling in Oman are outlined in Table 2.

Table 2: Prequalification criteria

Type of Lamp	Prequalification Criteria
<b>Non-directional LED lamps</b>	$P_{lamp} \leq 0.24\sqrt{\Phi} + 0.0103\Phi.$ <p>Where,</p> <ul style="list-style-type: none"> <li><math>P_{lamp}</math> is maximum allowable power consumption</li> <li><math>\Phi</math> is the rated luminous flux (<math>\Phi</math>)</li> </ul>
<b>Directional LED lamps</b>	<p><b>EEl &lt; 0.5</b></p> <p>Where EEl is energy efficiency index (EEl) of the lamp</p> <p>Refer section –</p> <p>Energy efficiency rating Energy efficiency rating for calculating the EEl of the lamp</p>

## 5. Energy efficiency rating

The energy efficiency rating of LED lamps shall be determined based on the energy efficiency index (EEI) as outlined in Table 3.

Table 3: Energy efficiency classes for LED lamps

Energy Efficiency Index (EEI)		Energy efficiency class (Arabic)	Equivalent energy efficiency class (English)
EEI for non-directional lamps	EEI for directional lamps		
EEI ≤ 0.11	EEI ≤ 0.13	أ	A
0.11 < EEI ≤ 0.17	0.13 < EEI ≤ 0.18	ب	B
0.17 < EEI ≤ 0.24	0.18 < EEI ≤ 0.40	ج	C
0.24 < EEI ≤ 0.60	0.40 < EEI ≤ 0.95	د	D
0.60 < EEI ≤ 0.80	0.95 < EEI ≤ 1.20	هـ	E
0.80 < EEI ≤ 0.95	1.20 < EEI ≤ 1.75	و	F
EEI > 0.95	EEI > 1.75	ز	G

Note: For labelling purposes, the Arabic letters shall be used. The equivalent English version is only provided for informational purposes

For the calculation of the energy efficiency index (EEI) of a model, its corrected rated power for any control gear losses is compared with its reference power. The EEI is calculated as follows and rounded to two decimal places:

$$EEI = \frac{P_{cor}}{P_{ref}}$$

$P_{cor}$  is defined as:

For self-ballasted lamps,  $P_{cor}$  is the rated power ( $P_{rated}$ ). For models *with* external control gear,  $P_{cor}$  is the rated power ( $P_{rated}$ ) corrected in accordance with the corrections factors. As this standard is only applicable to self-ballasted type LED lamps, the power is not corrected for any control gear losses. The rated power  $P_{rated}$  of the lamps is measured at their nominal input voltage.

$P_{ref}$  is defined as:

$P_{ref}$  is the reference power obtained from the useful luminous flux of the model ( $\Phi_{use}$ ) by the following formulae mentioned in Table 4.

Table 4: Formulae for calculating reference power

Useful luminous flux	Relevant formulae for calculating reference power
For models with $\Phi_{use} < 1,300$ lumen	$P_{ref} = 0.88\sqrt{\Phi_{use}} + 0.049 \times \Phi_{use}$
For models with $\Phi_{use} \geq 1,300$ lumen	$P_{ref} = 0.07341 \times \Phi_{use}$

The useful luminous flux ( $\Phi_{use}$ ) is defined in accordance with Table 5.

Table 5: Definition of useful luminous flux

Type	Useful luminous flux ( $\Phi_{use}$ )
Non-directional lamps	Total rated luminous flux ( $\Phi$ )
Directional lamps with a beam angle $\geq 90^\circ$ other than filament lamps and carrying a textual or graphical warning on their packaging that they are not suitable for accent lighting	Rated luminous flux present in a $120^\circ$ cone ( $\Phi_{120^\circ}$ )
Other directional lamps	Rated luminous flux present in a $90^\circ$ cone ( $\Phi_{90^\circ}$ )

## 6. Label particulars

### Label design

The label shall be printed as illustrated in

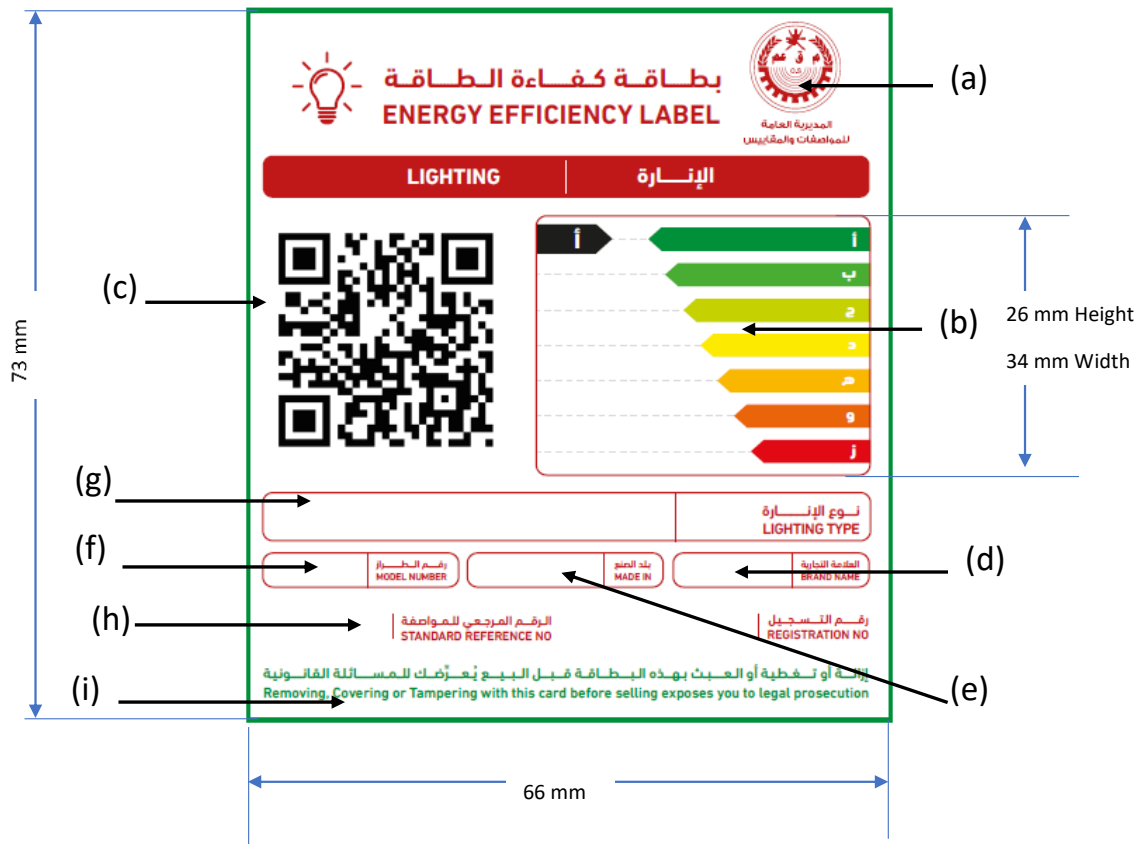


Figure 1 and should be fixed and non-removable. The energy efficiency class shall each be represented: with a fixed number of Colour-coded bars as outlined in **Table 3** and illustrated in

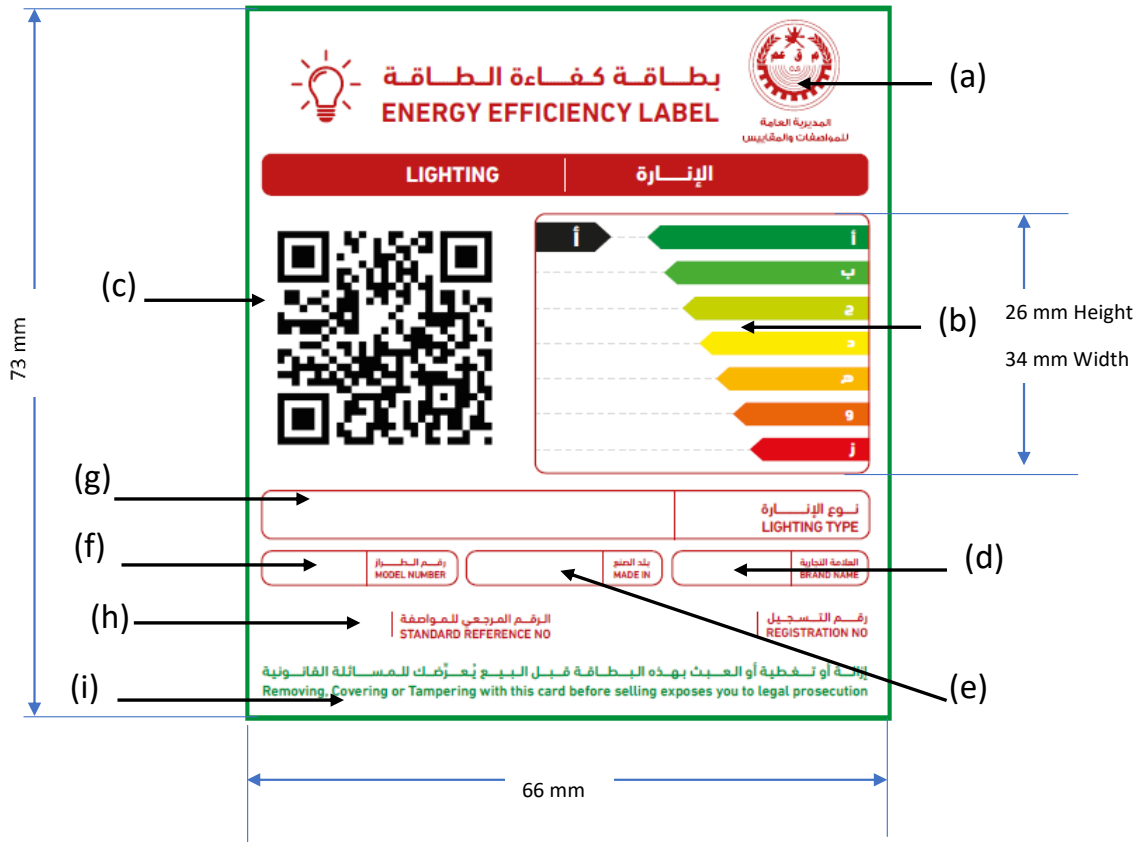


Figure 1 The label shall be printed directly on one side of the individual packaging of the product. The label shall be (66 mm wide and 73 mm high) as in

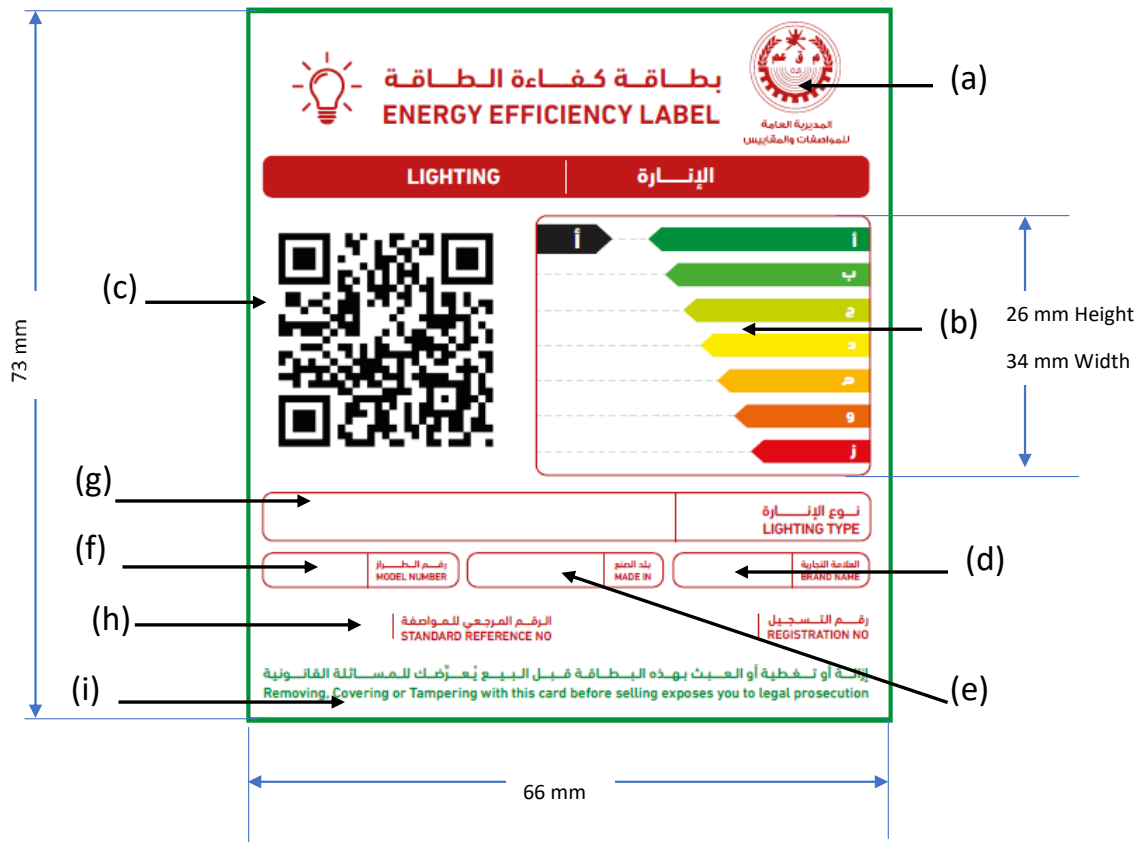


Figure 1 without alteration.

The label shall be printed on the most prominent part of the individual product packaging to be easily visible to the end-user.

The label design in the Figure 2 and Figure 3 which is comparatively larger in size can be adapted if the space on the packaging can accommodate this. Also this bigger label can be printed in the product brochures.

### Information on the label

The fields from (a) to (i) outlined in Figure 1 shall comply with the following requirements:

**Field (a):** This field shall display the logo of the Directorate General for Standards and Metrology (DGSM).

**Field (b):** This field shall reflect the energy efficiency class, which the product attained, based on its energy efficiency index (EEI).

**Field (c):** This field shall have a QR code representing the main characteristics of the lamp, this may include the following items based on the data provided in the registration form (**Annex E**):

- Manufacturer name
- Model number
- Country of origin
- Luminous flux (lumens)
- Lifetime (h)
- Rated power (W)
- Correlated Colour temperature (K)
- EEL (unit-less)
- Efficacy (lumens/W)

**Field (d):** this field identifies the brand name of the product

**Field (e):** this field identifies the country of origin

**Field (f):** this field identifies the model number

**Field (g):** this field identifies the lighting type (Self Ballasted LED Lamps)

**Field (h):** this field identifies the registration and standard reference numbers (Note: It is proposed that the Omani label should provide information on both Safety and Performance standards nos. adhered)

**Field (i):** this field identifies the legal statement

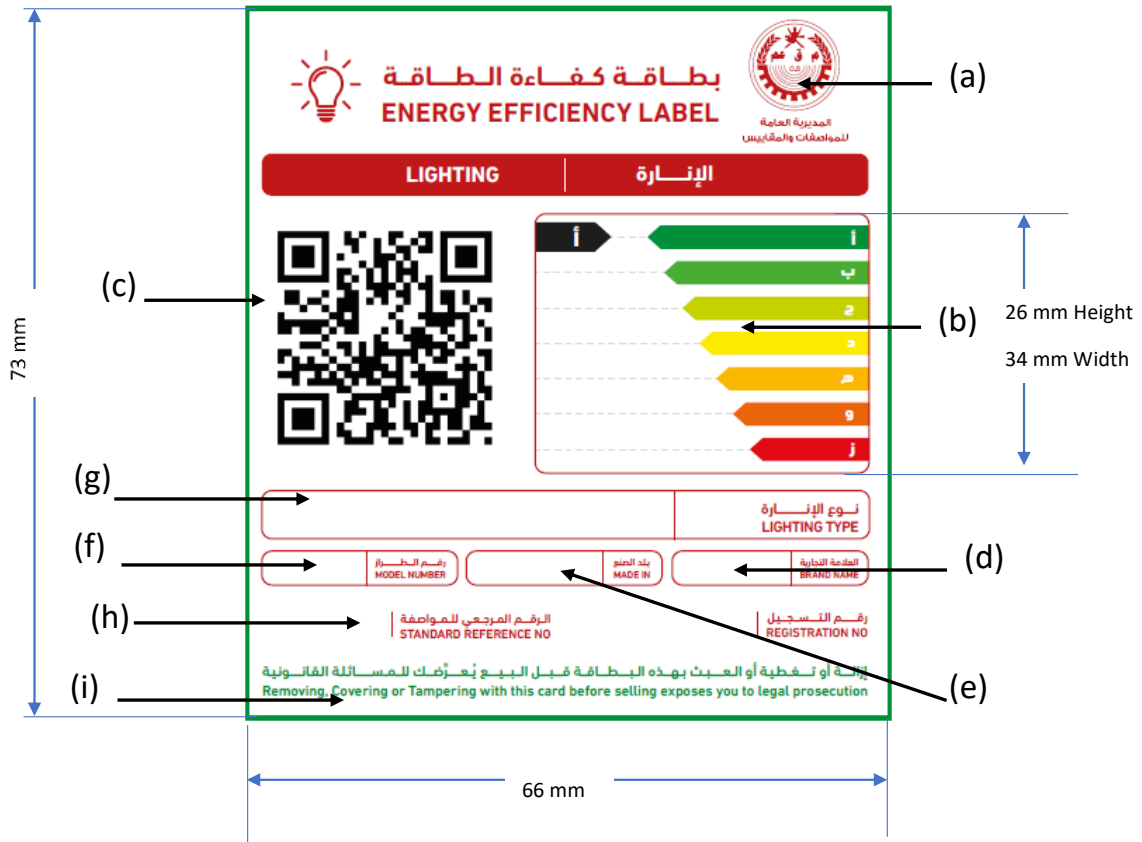
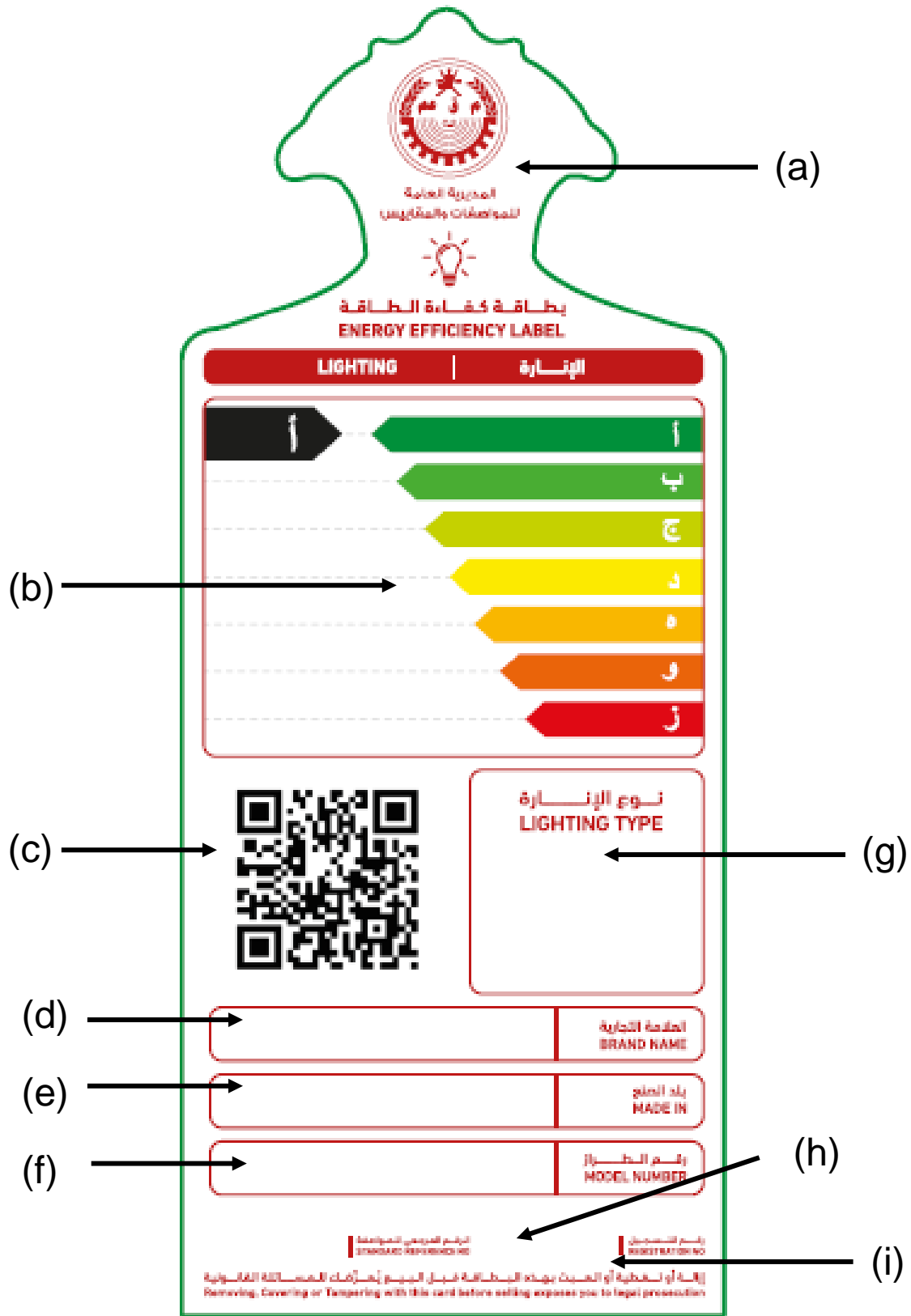


Figure 1: Small label for LED lamps (informative)





*Figure 2 Standard label for LED lamps*

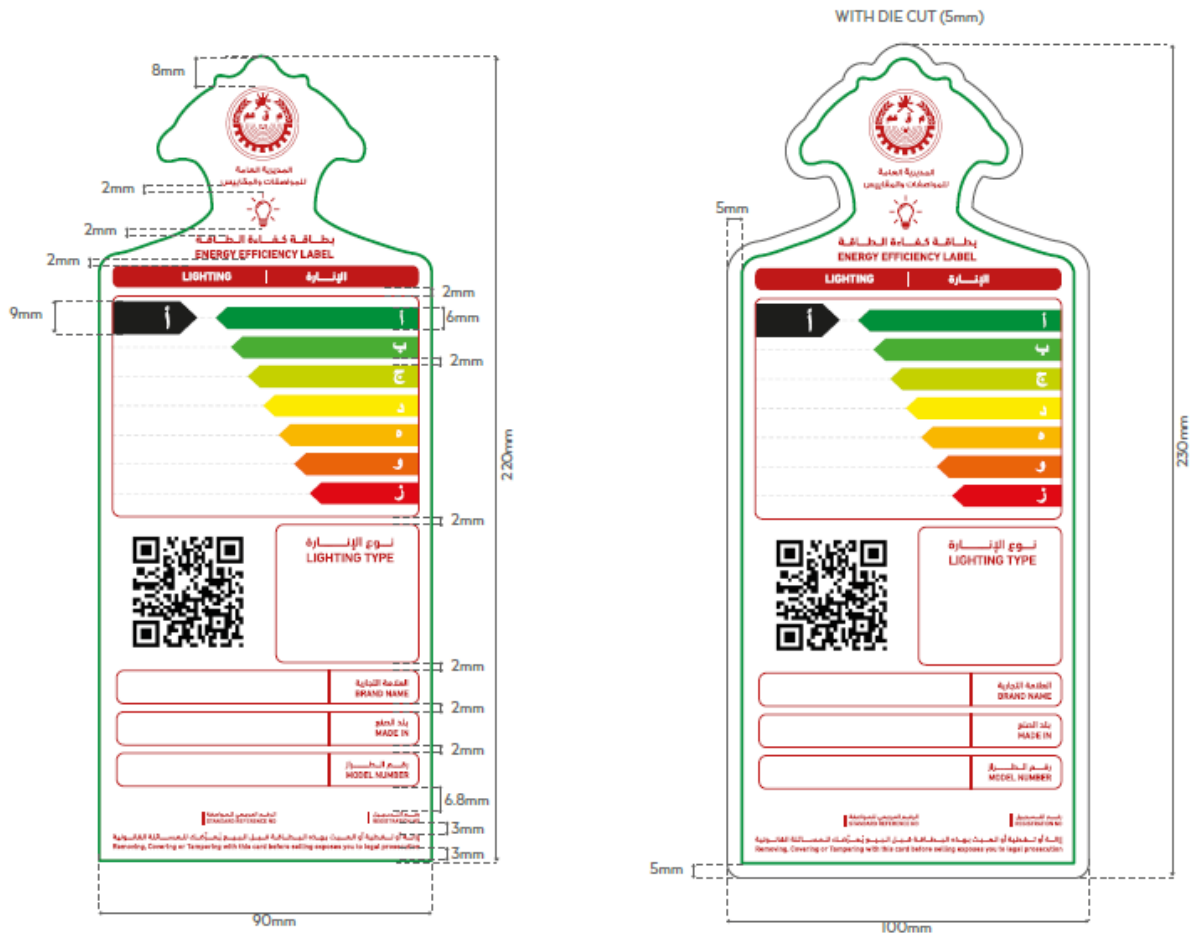


Figure 3 Dimensions of the label

## 7. Information to be visibly displayed for end-consumers

Information to be displayed for end-user awareness shall be in-line with the requirements mentioned in **Annex C**.

## 8. Inspection /check testing guidelines

For evaluating the performance of LED lamps, the standards developing authority is empowered to conduct inspection /check testing of lamps. The broad guidelines for inspection /check testing for market surveillance is mentioned in **Annex D**.

## Annex-A: Relevant standards

The relevant testing standards and compliance criteria for non-directional and directional lamps are listed in **Table 6** and **Table 7** respectively.

*Table 6: Reference standards for non-directional LED lamps*

Parameter	Reference	Remarks
Lamp efficacy	IEC 62612, 9.3 efficacy.	The average efficacy values shall be calculated from the arithmetic mean of each product's individual efficacy.
Rated lifetime, lamp lifetime	EN 62612	Provides procedures for 6,000 h testing time.
Lamp survival factor	IEC 62612, 11.2	The compliance criteria of the regulations shall be applied.
Lumen maintenance, lamp lumen maintenance factor	IEC 62612, 11.2	The compliance criteria of the regulations shall be applied.
Number of switching cycles	IEC 62612, 11.3.3	-
Starting time	-	Reliable, accurate and reproducible measurement procedures shall be used. The method prescribed in IEC 60969, at present 34A/1701/CDV Annex B for CFL may be adapted.
Premature failure rate	IEC 62612, 11.2	An additional read point at 1,000 h and the compliance criteria according to the standard shall be applied.
Lamp power factor	IEC 61000-3-2	-
Chromaticity coordinates	prEN 13032-4	-
CCT	prEN 13032-4	-
CRI	prEN 13032-4	-
Luminance	CIE 18.2	-

Specific effective UV radiant power	IEC 62471	-
Lamp dimensions	IEC 62612, 6	-
Dimmability	IEC 62560, 5.2	The presence of a symbol or warning shall be checked.
Lamp caps	IEC 62560	-

*Table 7: Reference standards for directional LED lamps*

Parameter	Reference	Remarks
EEL	CIE 84 for general conditions of luminous flux measurement; L2(AP)005 for cone luminous flux; IEC 62612, 9.3 for efficacy; IEC 62612, 9.1 and Annex A for luminous flux, IEC 62612, 8.1 and Annex A for power	The average EEL value shall be calculated from the arithmetic mean of each product's individual EEL.
Rated lifetime, lamp lifetime	EN 62612	
Lamp survival factor	IEC 62612, 11.2	The compliance criteria of the regulations shall be applied.
Lumen maintenance	IEC 62612, 11.2	The compliance criteria of the regulations shall be applied.
Number of switching cycles	IEC 62612, 11.3.3	-
Starting time	-	Reliable, accurate and reproducible measurement procedures shall be used. The method prescribed in IEC 60969, at present 34A/1701/CDV Annex B for CFL may be adapted.

Premature failure rate	IEC 62612, 11.2	An additional read point at 1,000h and the compliance criteria according to the regulations shall be applied.
Lamp power factor (only for lamps with integrated control gear)	IEC 61000-3-2	-
CCT	prEN 13032-4	-
CRI	prEN 13032-4	-
Colour consistency	EN 62612, 10.1	-
Spectral power distribution	CIE 63	-
Lamp dimensions	IEC 62612, 6	-
Beam angle	IEC 62612, 9.2	-
Peak intensity	IEC 62612, 9.2	-
Dimmability	IEC 62560, 5.2	The presence of a symbol or warning shall be checked.
Cone luminous flux	L2(AP)005	-
Cap	IEC 62560	-

## Annex-B: Special purpose lamps

Lamps that are intended for use in special applications that require technical parameters not necessary for the purposes of general lighting in average circumstances. They are of the following types:

1. Applications where the primary purpose of the light is not lighting, such as:
  - (i) Emission of light as an agent in chemical or biological processes (such as polymerisation, ultraviolet light used for curing/drying/hardening, photodynamic therapy, horticulture, pet-care, anti- insect products).
  - (ii) Image capture and image projection (such as camera flashlights, photocopiers, video projectors).
  - (iii) Heating (such as infrared lamps).
  - (iv) Signalling (such as traffic control or airfield lamps).
  
2. Lighting applications where:
  - (i) The spectral distribution of the light is intended to change the appearance of the scene or object lit, in addition to making it visible (such as food lighting or coloured lamps); or
  - (ii) The spectral distribution of the light is adjusted to the specific needs of technical equipment, in addition to making the scene or object visible for humans (such as studio lighting, show effect lighting, theatre lighting); or
  - (iii) The scene or object lit requires special protection from the negative effects of the light source (such as lighting with dedicated filtering for photosensitive patients or photosensitive museum exhibits); or
  - (iv) Lighting is required only for emergency situations (such as emergency lighting luminaires or control gears for emergency lighting); or
  - (v) The lighting products must withstand extreme physical conditions (such as vibrations or temperatures below – 20 °C or above 50 °C).
  
3. Products incorporating lighting products, where the primary purpose is not lighting and the product is dependent on energy input in fulfilling its primary purpose during use (such as refrigerators, sewing machines, endoscopes, blood analysers).



## Annex-C: Information to be displayed for end-user awareness

### Information to be displayed on the lamp itself

The value of the nominal useful luminous flux ('lm'), of the colour temperature ('K') and of the nominal beam angle ('°') shall be displayed in a legible font on the surface of the lamp if, after the inclusion of safety-related information such as power and voltage, there is sufficient space available for it on the lamp without unduly obstructing the light coming from the lamp.

If there is room for only one of the three values, the nominal useful luminous flux shall be provided. If there is room for two values, the nominal useful luminous flux and the colour temperature shall be provided.

### Information to be visibly displayed to end-users, on the packaging and on freely accessible public domains (websites)

The information in listed from (a) to (i) in this section below shall be displayed on free access websites and in any other form the manufacturer deems appropriate.

If the product is placed on the market in a packaging containing information to be visibly displayed to the end- users, prior to their purchase, the information shall also be clearly and prominently indicated on the packaging.

The information does not need to use the exact wording on the list below. It may be displayed in the form of graphs, drawings or symbols rather than text.

- a. Nominal useful luminous flux displayed in a font at least twice as large as any display of the nominal lamp power.
- b. Nominal lifetime of the lamp in hours (no longer than the rated lifetime).
- c. Colour temperature, as a value in Kelvins and expressed graphically or in words.
- d. Number of switching cycles before premature failure.
- e. Warm-up time up to 60 % of the full light output (may be indicated as 'instant full light' if less than 1 second).
- f. A warning if the lamp cannot be dimmed or can be dimmed only on specific dimmers; in the latter case a list of compatible dimmers shall be also provided on the manufacturer's website.
- g. If designed for optimum use in non-standard conditions (such as ambient temperature  $T_a \neq 25 \text{ }^\circ\text{C}$  or specific thermal management is necessary), information on those conditions.
- h. Lamp dimensions in millimetres (length and largest diameter)

- i. Nominal beam angle in degrees

## Annex-D: Inspection /check testing for market surveillance

The inspecting authority shall draw a sample batch of a minimum of **twenty lamps** of the same model from the same manufacturer, where possible obtained in equal proportion from four randomly selected sources, unless specified otherwise in Table 8.

The lamp model shall be considered to comply with the requirements laid down in this standard if:

- The lamps in the batch are accompanied by the required and correct product information, as mentioned in '**Annex-C: Information to be displayed for end-user awareness**'.
- The parameters of the lamps in the batch listed in Table 8 shows no non-compliance for any of the parameters.

*Table 8: Inspection and check testing requirements*

Parameter	Remarks /Procedure
Lamp survival factor at 6,000 h (for LED lamps only)	<p>The test shall end</p> <ul style="list-style-type: none"> <li>• when the required number of hours is met, or</li> <li>• when more than two lamps fail,</li> </ul> <p>whichever occurs first</p> <p><u>Compliance:</u> A maximum of two out of every 20 lamps in the test batch may fail before the required number of hours.</p> <p><u>Non-compliance:</u> Otherwise</p>
Number of switching cycles before failure	<p>The test shall end when the required number of switching cycles is reached, or when more than one out of every 20 lamps in the test batch have reached the end of their life, whichever occurs first.</p> <p><u>Compliance:</u> At least 19 of every 20 lamps in the batch have no failure after the required number of switching cycles is reached.</p>
Starting time	<p><u>Compliance:</u> The average starting time of the lamps in the test batch is not higher than the required starting time plus 10 %, and no lamp in the sample batch has a starting time longer than two times the required starting time.</p>

Premature failure rate	<p>The test shall end</p> <ul style="list-style-type: none"> <li>• when the required number of hours is met, or</li> <li>• when more than one lamp fails, whichever occurs first.</li> </ul> <p><u>Compliance:</u> Not more than one out of every 20 lamps in the test batch may fails before the required number of hours.</p>
Colour rendering (Ra)	<p><u>Compliance:</u> The average Ra of the lamps in the test batch is not lower than three points below the required value, and no lamp in the test batch has a Ra value that is more than 3,9 points below the required value.</p>
Lumen maintenance at end of life and rated lifetime	<p>For these purposes, 'end of life' shall mean the point in time when only 50 % of the lamps are projected to survive or when the average lumen maintenance of the batch is projected to fall below 70 %, whichever is projected to occur first.</p> <p><u>Compliance:</u> The lumen maintenance at end of life and the lifetime values obtained by extrapolation<sup>2</sup> from the lamp survival factor and from the average lumen maintenance of the lamps in the test batch at 6,000 h are not lower than respectively the lumen maintenance and the rated lifetime values declared in the product information minus 10 %</p>
Beam angle	<p><u>Compliance:</u> The average results of the lamps in the test batch do not vary from the declared beam angle by more than 25 % and the beam angle value of each individual lamp in the test batch does not deviate by more than 25 % of the rated value.</p>
Peak intensity	<p><u>Compliance:</u> The peak intensity of each individual lamp in the test batch is not less than 75 % of the rated intensity of the model</p> <p><u>Non-compliance:</u> Otherwise</p>
Other parameters (Energy efficiency index)	<p><u>Compliance:</u> The average results of the lamps in the test batch do not vary from the limit, threshold or declared values by more than 10 %.</p> <p><u>Non-compliance:</u> Otherwise.</p>

<sup>2</sup> Extrapolation shall be as per reference standard (TM 21 standard may be a reference)

## Annex E – Registration form

### APPLICATION FOR REGISTRATION OR RENEWAL OF REGISTRATION OF LED LAMPS FOR ENERGY EFFICIENCY LABEL IN OMAN

#### SECTION 1: APPLICATION DETAILS

I hereby apply for registration of LED Lamps for the purpose of energy efficiency labelling in the Sultanate of Oman

Date of import : \_\_\_\_\_

Registration no. : \_\_\_\_\_

#### SECTION 2: APPLICANT DETAILS

Name of applicant	
Position/Title	
Business address	
Telephone	
E-mail	

#### SECTION 3: PARTICULARS OF PRODUCT (LED LAMPS)

Name of the manufacturer	
Brand name	
Model number	
Country of manufacturing	
Date of manufacturing	
Type of LED lamp	Tick (✓) as appropriate: Directional Non-directional
Type and size of lamp cap	
Lamp dimensions	

Rated voltage(V)	
Rated frequency (Hz)	
Rated power(W)	
Lifetime	
Rated luminous flux (lumen)	
Correlated Colour Temperature (K)	

#### SECTION 4: TESTING AND TEST REPORT

Name of the lab	
Test lab accreditation details	Accredited from: Validity of Accreditation:
Lab address	
Test date	
Useful luminous flux $\phi_{use}$ (lm)	
Reference power Pref (W)	
Lamp survival factor at 6,000h (%)	
Lumen maintenance at 6,000h (%)	
Number of switching cycles before failure	
Starting time(s)	
Lamp power factor	
Colour rendering (Ra)	
Correlated Colour Temperatures (K)	
Efficacy (lm/W)	
Energy Efficiency Index (EEI)	
Energy efficiency class achieved as per Omani Standard (OS/_____) (Rating)	A/أ B/ب C/ج

	D/د E/ه F/و G/ز
--	--------------------------