

# Draft Regulation on Requirements for Non-directional Household Lamps In Kingdom of Bahrain

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## Section 1. Scope

This Regulation establishes requirements for the placing on the market of non-directional household lamps, including when they are marketed for non-household use or when they are integrated into other products. It also establishes product information requirements for special purpose lamps.

The requirements set out in this Regulation shall not apply to the following household and special purpose lamps:

- a) lamps having the following chromaticity coordinates  $x$  and  $y$ :
  - $x < 0.200$  or  $x > 0.600$
  - $y < -2.3172x^2 + 2.3653x - 0.2800$  or  $y > -2.3172x^2 + 2.3653x - 0.1000$
- b) directional lamps
- c) lamps having a luminous flux below 60 lumens or above 12,000 lumens
- d) lamps having:
  - 6% or more of total radiation of the range 250-780nm in the range of 250-400nm
  - the peak of the radiation between 315-400nm (UVA) or 280-315nm (UVB)
- e) fluorescent lamps without integrated ballast
- f) high-intensity discharge lamps
- g) incandescent lamps with E14/E27/B22/B15 caps, with a rated voltage equal to or below 60 volts and without integrated transformer.

For special purpose lamps, the following information shall be clearly and prominently indicated on their packaging and in all forms of product information accompanying the lamp when it is placed on the market:

- (a) their intended purpose; and
- (b) that they are not suitable for household room illumination.

## Section 2. Definitions

### 2.1. General Definitions

General definitions are as follows:

1. 'household room illumination' means the full or partial illumination of a household room, by replacing or complementing natural light with artificial light, in order to enhance visibility within that space.
2. 'lamp' means a source made in order to produce an optical radiation, usually visible, including any additional components necessary for starting, power supply or stable operation of the lamp or for the distribution, filtering or transformation of the optical radiation, in case those components cannot be removed without permanently damaging the unit.

3. 'household lamp' means a lamp intended for household room illumination; it does not include special purpose lamps.
4. 'special purpose lamp' means a lamp not intended for household room illumination because of its technical parameters or because the related product information indicates that it is unsuitable for household room illumination.
5. 'directional lamp' means a lamp having at least 80 % light output within a solid angle of  $\pi$  steradians (corresponding to a cone with angle of  $120^\circ$ ).
6. 'non-directional lamp' means a lamp that is not a directional lamp.
7. 'filament lamp' means a lamp in which light is produced by means of a threadlike conductor which is heated to incandescence by the passage of an electric current. The lamp may or may not contain gases influencing the process of incandescence.
8. 'incandescent lamp' means a filament lamp in which the filament operates in an evacuated bulb or is surrounded by inert gas.
9. 'tungsten halogen lamp' means a filament lamp in which the filament is made of tungsten and is surrounded by gas containing halogens or halogen compounds. Tungsten halogen lamps are supplied either with or without integrated power supply;
10. 'discharge lamp' means a lamp in which the light is produced, directly or indirectly, by an electric discharge through a gas, a metal vapour or a mixture of several gases and vapours.
11. 'fluorescent lamp' means a discharge lamp of the low pressure mercury type in which most of the light is emitted by one or several layers of phosphors excited by the ultraviolet radiation from the discharge. Fluorescent lamps are supplied either with or without integrated ballasts.
12. 'ballast' means a device which serves to limit the current of the lamp(s) to the required value in case it is connected between the supply and one or more discharge lamps. It may also include means for transforming the supply voltage, dimming the lamp, correcting the power factor and, either alone or in combination with a starting device, providing the necessary conditions for starting the lamp(s). It can be integrated or external to the lamp.
13. 'power supply' means a device which is designed to convert alternating current (AC) power input from the mains power source input into direct current (DC) or another AC output.
14. 'compact fluorescent lamp' means a unit which cannot be dismantled without being permanently damaged, provided with a lamp cap and incorporating a fluorescent lamp and any additional components necessary for starting and stable operation of the lamp.
15. 'fluorescent lamp without integrated ballast' means a single and double capped fluorescent lamp without integrated ballast.
16. 'high intensity discharge lamp' means an electric discharge lamp in which the light producing arc is stabilized by wall temperature and the arc has a bulb wall loading in excess of 3 watts per square centimeter.
17. 'light emitting diode' or 'LED' means a solid state device embodying a p-n junction, emitting optical radiation when excited by an electric current.
18. 'LED lamp' means a lamp incorporating one or several LED.
19. 'MOIC' is an abbreviation for Ministry of Industry & Commerce

## 2.2. Technical Definitions

For the purposes of compliance and verification of compliance with the requirements of this Regulation, the parameters below shall be established by reliable, accurate and reproducible measurement procedures, which take into account the generally recognised state of the art measurement methods:

- (a) 'Lamp efficacy' ( $\eta_{\text{lamp}}$ ), which is the quotient of the luminous flux emitted ( $\Phi$ ) by the power consumed by the lamp ( $P_{\text{lamp}}$ ).  $\eta_{\text{lamp}} = \Phi / P_{\text{lamp}}$  (unit: lm/W). The power dissipated by non-integrated auxiliary equipment, such as ballasts, transformers or power supplies, is not included in the power consumed by the lamp.
- (b) 'Lamp lumen maintenance factor' (LLMF), which is the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial (100 hour) luminous flux.
- (c) 'Lamp survival factor' (LSF), which is the defined fraction of the total number of lamps that continue to operate at a given time under defined conditions and switching frequency.
- (d) 'Lamp lifetime', which is the period of operation 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
- (e) 'Chromaticity', which is the property of a colour stimulus defined by its chromaticity coordinates, or by its dominant or complementary wavelength and purity taken together;
- (f) 'Luminous flux' ( $\Phi$ ), which is a quantity derived from radiant flux (radiant power) by evaluating the radiation according to the spectral sensitivity of the human eye, measured after 100 hours of lamp running time.
- (g) 'Correlated colour temperature' ( $T_c$  [K]), which is 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.
- (h) 'Colour rendering' ( $R_a$ ), which is the effect of an illuminant on the colour appearance of objects by conscious or subconscious comparison with their colour appearance under a reference illuminant.
- (i) 'Specific effective radiant ultraviolet power', which is the effective power of the ultraviolet radiation of a lamp weighted according to the spectral correction factors and related to its luminous flux (unit: mW/klm).
- (j) 'Lamp start time', the time needed, after the supply voltage is switched on, for the lamp to start fully and remain alight.
- (k) 'Lamp warm-up time', which is the time needed for the lamp after start-up to emit a defined proportion of its stabilized luminous flux.
- (l) 'Power factor', which is the ratio of the absolute value of the active power to the apparent power under periodic conditions.
- (m) 'Luminance', which is the amount of light, per unit of apparent surface, that is emitted by or reflected by a particular area within a given solid angle (unit: cd/m<sup>2</sup>).
- (n) 'Lamp mercury content', which is the mercury contained in the lamp and is measured according to the relevant IEC standards.

## 2.3. Other Definitions

Other definitions are as follows:

- (a) a 'rated value' is 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.
- (b) a 'nominal value' is the value of a quantity used to designate and identify a product.
- (c) 'Second lamp envelope' is a second outer lamp envelope which is not required for the production of light, such as an external sleeve for preventing mercury and glass release into the environment in case of lamp breakage, for protecting from ultraviolet radiation or for serving as a light diffuser.
- (d) 'Clear lamp' is a lamp (excluding compact fluorescent lamps) with a luminance above 25000 cd/m<sup>2</sup> for lamps having a luminous flux below 2000 lm and above 100000 cd/m<sup>2</sup> for lamps having more luminous flux, equipped with only transparent envelopes in which the light producing filament, LED or discharge tube is clearly visible.
- (e) 'Non-clear lamp' is a lamp that does not comply with the specifications under point (d) including compact fluorescent lamps.
- (f) 'Switching cycle' is the sequence of switching on and switching off the lamp with defined intervals.
- (g) 'Premature failure' is when a lamp reaches its end of life after a period in operation which is less than the rated lifetime stated in the technical documentation.
- (h) 'Lamp cap' means that part of a lamp which provides connection to the electrical supply by means of a socket or lamp connector and, in most cases, also serves to retain the lamp in the socket.
- (i) '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.

### Section 3. Lamp Efficacy Requirements

The maximum rated power ( $P_{max}$ ) for a given rated luminous flux ( $\Phi$ ) is as follows:

Clear lamps:  $P_{max} \leq 0.8 \times (0.88\sqrt{\Phi} + 0.049\Phi)$

Non-clear lamps:  $P_{max} \leq 0.24\sqrt{\Phi} + 0.0103\Phi$

The following correction factors are cumulative where appropriate:

- Filament lamp requiring external power supply:
  - Maximum rated power =  $P_{max} / 1.06$
- Discharge lamp with cap GX53:
  - Maximum rated power =  $P_{max} / 0.75$
- Non-clear lamp with colour rendering index  $\geq 90$  and  $P \leq 0.5 * (0.88\sqrt{\Phi} + 0.049 \Phi)$ :
  - Maximum rated power =  $P_{max} / 0.85$
- Discharge lamp with colour rendering index  $\geq 90$  and  $T_c \geq 5000K$ :
  - Maximum rated power =  $P_{max} / 0.76$
- Non-clear lamp with second envelope and  $P \leq 0.5 * (0.88\sqrt{\Phi} + 0.049 \Phi)$ :
  - Maximum rated power =  $P_{max} / 0.95$
- LED lamp requiring external power supply:
  - Maximum rated power =  $P_{max} / 1.1$

### Section 4. Lamp Functionality Requirements

For the purposes of testing the number of times the lamp can be switched on and off before failure, the switching cycle shall consist of periods comprising 1 minute on and 3 minutes off, while the other test conditions are defined according to Section 7. For the purposes of testing lamp lifetime, lamp survival factor, lumen maintenance and premature failure, the standard switching cycle according to Section 7 shall be used.

Functionality requirements for compact fluorescent lamps are given in the following table.

**Table 1 - Functionality requirements for compact fluorescent lamps**

Functionality Parameter	Requirement
Lamp survival factor at 6000h	$\geq 0.70$
Lumen maintenance	At 2000h: $\geq 88\%$ ( $\geq 83\%$ for lamps with second lamp envelope) At 6000h: $\geq 70\%$
Number of switching cycles before failure	$\geq$ lamp lifetime expressed in hours $\geq 30,000$ if lamp starting time $> 0.3s$
Starting time	$< 1.5s$ if $P < 10 W$ $< 1.0s$ if $P \geq 10 W$
Lamp warm-up time to 60% $\Phi$	$< 40s$ or $< 100s$ for lamps containing mercury in amalgam form

Functionality Parameter	Requirement
Premature failure rate	$\leq 2.0\%$ at 400h
UVA + UVB radiation	$\leq 2.0$ mW/klm
UVC radiation	$\leq 0.01$ mW/klm
Lamp power factor	$\geq 0.55$ if $P < 25$ W $\geq 0.90$ if $P \geq 25$ W
Colour rendering (Ra)	$\geq 80$

Functionality requirements for lamps excluding compact fluorescent lamps and LED lamps are given in the following table.

**Table 2 - Functionality requirements for lamps excluding compact fluorescent lamps and LED lamps**

Functionality Parameter	Requirement
Rated lamp lifetime	$\geq 2000$ h
Lumen maintenance	$\geq 85\%$ at 75% of rated average lifetime
Number of switching cycles before failure	$\geq$ four times the rated lamp lifetime expressed in hours
Starting time	$< 0.2$ s
Lamp warm-up time to 60% $\Phi$	$< 1.0$ s
Premature failure rate	$\leq 5.0\%$ at 200h
UVA + UVB radiation	$\leq 2.0$ mW/klm
UVC radiation	$\leq 0.01$ mW/klm
Lamp power factor	$\geq 0.95$

Functionality requirements for non-directional LED lamps are given in the following table. Note that this requirement has been taken from the European directional and LED regulation 1194 as LED functionality requirements do not appear in European regulation 244.



**Table 3 - Functionality requirements for non-directional LED lamps**

Functionality Parameter	Requirement
Lamp survival factor at 6000 h	$\geq 0.90$
Lumen maintenance at 6000 h	$\geq 0.80$
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% $\Phi$	$< 2.0$ s
Premature failure rate	$\leq 5.0\%$ at 1000h
Colour rendering (Ra)	$\geq 80$ $\geq 65$ if the lamp is intended for outdoor or industrial applications
Colour consistency	Variation of chromaticity coordinates within a six-step MacAdam ellipse or less.
Lamp power factor for lamps with integrated control gear	$P \leq 2$ W: no requirement $2$ W $< P \leq 5$ W: PF $> 0.4$ $5$ W $< P \leq 25$ W: PF $> 0.5$ $P > 25$ W: PF $> 0.9$

## Section 5. Mercury Limits

The mercury limits for compact fluorescent lamps are given in the table below

**Table 4 - Mercury limits**

Lamp Type	Limit
$\geq 30$ W and $< 150$ W	5 mg
$< 30$ W	2.5 mg
$< 30$ W with long lifetime ( $> 15$ khrs)	3.5 mg

Any mercury contained in compact fluorescent lamps shall be in amalgam form.

## Section 6. Product Information Requirements

For special purpose lamps, the following information shall be clearly and prominently indicated on their packaging and in all forms of product information accompanying the lamp when it is placed on the market:

- (a) their intended purpose; and
- (b) that they are not suitable for household room illumination.

The following information is to be visibly displayed prior to purchase to end-users on the packaging and on free access websites (the information does not need to be specified using the

exact wording of the list below - it may be displayed using graphs, figures or symbols rather than text):

- a) Nominal lamp power
- b) Nominal luminous flux
- c) Nominal life time of the lamp in hours (not higher than the rated life time)
- d) Number of switching cycles before premature lamp failure
- e) Colour temperature (also expressed as a value in Kelvins)
- f) Warm-up time up to 60 % of the full light output (may be indicated as ‘instant full light’ if less than 1 second)
- g) A warning if the lamp cannot be dimmed or can be dimmed only on specific dimmers
- h) If designed for optimal use in non-standard conditions (such as ambient temperature  $T_a \neq 25 \text{ }^\circ\text{C}$ ) information on those conditions
- i) Lamp dimensions in millimeters (length and diameter)
- j) If equivalence with an incandescent lamp is claimed on the packaging, the claimed equivalent incandescent lamp power (rounded to 1 W) shall be that corresponding in the table below to the luminous flux of the lamp contained in the packaging. The intermediate values of both the luminous flux and the claimed incandescent lamp power (rounded to 1W) shall be calculated by linear interpolation between the two adjacent values.

**Table 5 - equivalence values**

Rated lamp luminous flux (lm) $\Phi$			Claimed equivalent incandescent lamp power (W)
CFL	Halogen	LED and other lamps	
125	119	136	15
229	217	249	25
432	410	470	40
741	702	806	60
970	920	1055	75
1398	1326	1521	100
2253	2137	2452	150
3172	3009	3452	200

- k) The term ‘energy saving lamp’ or any similar product related promotional statement about lamp efficacy may only be used if the lamp complies with the efficacy requirements applicable to non-clear lamps.
- l) If the lamp contains mercury:
  - a. Lamp mercury content as X,X mg
  - b. Indication of website to consult in case of accidental lamp breakage to find instructions on how to clean up the lamp debris.

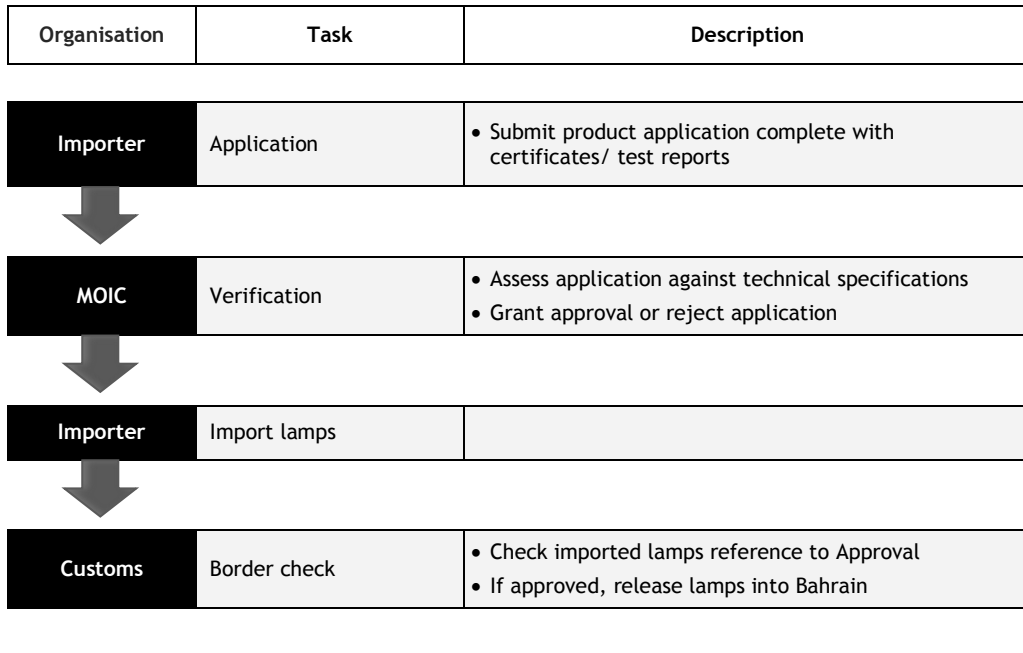
The following information is to be made publicly available on free-access websites (as a minimum, the following information shall be expressed at least as values):

- a) The packaging information specified above
- b) Rated wattage (0.1 W precision)
- c) Rated luminous flux
- d) Rated lamp life time
- e) Lamp power factor
- f) Lumen maintenance factor at the end of the nominal life
- g) Starting time (as X,X seconds)
- h) Colour rendering.
- i) If the lamp contains mercury:
  - a. Instructions on how to clean up the lamp debris in case of accidental lamp breakage.
  - b. Recommendations on how to dispose of the lamp at its end of life.

## Section 7. Monitoring, Verification and Evaluation (MVE)

### 7.1. Pre-approval Process

The proposed MVE process is presented below.



### 7.2. Check Testing

Authorities shall have the right to sample and test products to verify their compliance to the requirements stated in this regulation

### 7.3. Penalties

Companies or individuals who are found to be importing or selling non-compliant products would be liable in accordance with the provision of the laws and regulations of the kingdom of Bahrain.