المملكـــة العربيـــة السعوديـــة

KINGDOM OF SAUDIA ARABIA

الـهيئـــة الســعوديـــة للمواصفـــات والمقاييـــس والجـــودة

Saudi Standards, Metrology and Quality Org.(SASO)

Technical Regulation		لائحـة فـنية
Standard No.	SASO-2870	رقم المواصفة
Reference No.	SASO-2870	مرجع المواصفة
Issue Year	2015	سنة الاصدار
Adoption Year	2015	سنة الاعتماد
Numeric Coding	903-2870	الترميز الرقمي

متطلبات كفاءة الطاقة ومتطلبات التشغيل ووضع البطاقات لمنتجات الانارة – الجزء الاول .

ENERGY EFFICIENCY, FUNCTIONALITY AND LABELING REQUIREMENTS FOR LIGHTING PRODUCTS PART 1

المواصفات القياسية السعودية

Saudi Standards

تقديم وطني

قامـت الهيئـة السعوديـة للمواصفـات والمقاييـس والجـودة بإعداد اللائحـة الفنيـة التـالية

SASO-2870	اصدار	2015

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NATIONAL FOREWORD

The Saudi Standards, Metrology and Quality (SASO) has prepared the Following Technical Regulation:

SASO-2870	**Issue Year**	2015

ENERGY EFFICIENCY, FUNCTIONALITY AND LABELING REQUIREMENTS FOR LIGHTING PRODUCTS PART 1

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Date of SASO Board of Directors' Approval	:	
Date of Publication in the Official Gazette	:	
Date of Enforcement of this Standard	:	

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1. Scope

This Standard covers products listed in Annex A (also summarized in the table below):

Regulatory parameters	Indirect lamps	Direct lamps	Luminaires	Control gear
Safety	✓	✓	✘	✘
Electromagnetic compatibility	✓	✓	✘	✘
Performance	✓	✓	✘	✘
Functionality requirements	✓	✓	✘	✘
Marking requirements	✓	✓	✘	✘
Energy efficiency requirements	✓	✓	✘	✘
Hazardous chemicals requirements	✓	✓	✘	✘

✓ Included in this Standard
✘ Excluded from this Standard

Lamps of the same technologies listed in Annex A follow the requirements of this standard. Lamps used in special applications or not intended for general lighting purposes are excluded from parts of this Standard as detailed in Annex B.

2. Terms and definitions

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

2.1 General

General Lighting: the full or partial illumination of an area, by replacing or complementing natural light with artificial light in order to enhance visibility in that area.

Homogeneous materials: means one material of uniform composition throughout, or a material consisting of a combination of materials that cannot be disjointed or separated into different materials by mechanical actions such as unscrewing, cutting, crushing, grinding and abrasive processes.

Manufacturer: means the natural or legal person who manufactures products covered by this Standard and is responsible for their conformity with this Standard in view of their being placed on the market and/or put into service under the manufacturer's own name or trademark or for the manufacturer's own use. In the absence of a manufacturer as defined in the first sentence of this point or of an importer, any natural or legal person who places on the market and/or puts into service products covered by this Standard shall be considered a manufacturer.

Product: an equipment, system or part which is included in the list of regulated products under this Standard.

Standard: refers directly to this Standard - "Saudi Arabian Standard for Lighting Products Part 1".

2.2 Technical

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. They may be supplied with an integrated power supply.

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.

Beam angle: means the angle between two imaginary lines in a plane through the optical beam axis, such that these lines pass through the center of the front face of the lamp and through points at which the luminous intensity is 50 % of the center beam intensity, where the center beam intensity is the value of luminous intensity measured on the optical beam axis.

Chromaticity: means the property of a color stimulus defined by its chromaticity coordinates, or by its dominant or complementary wavelength and purity taken together.

Color consistency: means the maximum deviation of chromaticity coordinates (x and y) of a single lamp from a chromaticity center point (cx and cy), expressed as the size (in steps) of the MacAdam ellipse formed around the chromaticity center point (cx and cy). MacAdam ellipses refer to the regions (in the form of an ellipse) on a chromaticity diagram which contain all colors that are indistinguishable to the average human eye from the color at the center of the ellipse.

Color rendering (Ra): means the effect of an illuminant on the color appearance of objects by conscious or subconscious comparison with their color appearance under a reference illuminant.

Compact fluorescent lamp with integrated ballast (CFLi): means a fluorescent lamp that includes all components necessary for starting and stable operation of the lamp.

Components and sub-assemblies: means parts intended to be incorporated into products which are not placed on the market and/or put into service as individual parts for end- users or the environmental performance of which cannot be assessed independently.

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.

Correction factor: any mathematical adjustment made to a calculation to account for deviations in either the sample or the method of measurement. Specifically for this Standard, the correction is needed to be able to apply one formula for different lamp types. The efficacy (lumens per watt) of a certain lamp type can be described by a certain formula. There are however systematic differences that require a correction. As an example, some customers have a strong preference for lamps with an outer bulb as these resemble covered incandescent lamps best. Such lamps are made with an additional outer bulb which is placed over the light generating part. The shape of the efficacy curve is not changed by this outer bulb, but because it absorbs part of the emitted light, the formula needs to be corrected for the additional light loss.

Correlated color temperature (Tc [K]): a specification of the color appearance of the light emitted by a lamp, relating its color to the color of light from a reference source when heated to a particular temperature, measured in degrees Kelvin (K). More specifically, it is the absolute temperature of a blackbody whose chromaticity most nearly resembles that of the light source. A black body is an idealized physical body that absorbs all incident electromagnetic radiation, regardless of frequency or angle of incidence.

Direct Lamp: a lamp having at least 80% light output within a solid angle of πsr corresponding to a cone with an angle of 120˚.

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 vapors.

External lamp control-gear: means non-integrated lamp control gear designed to be installed outside the enclosure of a lamp or luminaire, or to be removed from the enclosure without permanently damaging the lamp or the luminaire.

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 contain gases influencing the process of incandescence.

Halogen lamp control gear: means lamp control gear that transforms mains voltage to extra low voltage for halogen lamps.

Incandescent lamp: means a filament lamp in which the filament operates in an evacuated bulb or is surrounded by inert gas.

Initial luminous flux: means the luminous flux of a lamp after a short operating period according to the applicable standard.

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.

Lamp cap: means that part of a lamp which provides 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.

Lamp control gear: means a device located between the electrical supply and one or more lamps, which provides a 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 a 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.

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.

Lamp lifetime: 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. For all other lamps, 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.

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.

Lamp mercury content: means the mercury contained in the lamp (weight usually specified in mg).

Lamp start time: means the time needed, after the supply voltage is switched on, for the lamp to start fully and remain alight.

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.

Lamp warm-up time: means the time needed after start-up for the lamp to emit a defined proportion of its stabilized luminous flux.

LED lamp: means a lamp incorporating one or more LED modules. The lamp may be equipped with a cap.

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.

LED package: means an assembly having one or more LED(s). The assembly may include an optical element and thermal, mechanical and electrical interfaces.

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.

Lighting: means the application of light to a scene, objects or their surroundings so that they may be seen by humans.

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 380-780 nm.

Luminaire: means an apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes all the parts necessary for supporting, fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply.

Luminous flux (Φ): 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. Radiant flux is the measure of the total power of electromagnetic radiation (including infrared, ultraviolet, and visible light).

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.

Materials: means all materials used during the life cycle of a product.

Nominal value: means the value of a quantity used to designate and identify a product.

Indirect lamp: means a lamp that is not a direct lamp.

Power factor: means the ratio of the absolute value of the real power (also known as active power) to the apparent power under periodic conditions.

Premature failure: means when a lamp reaches the end of its life after a period in operation which is less than the rated life time stated in the technical documentation.

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.

Self-ballasted lamp: a unit which cannot be dismantled without being permanently damaged, provided with a lamp cap and incorporating a light source and any additional elements necessary for starting and stable operation of the light source i.e. CFL with integrated ballast (CFLi) or LED retrofit lamp with integrated ballast.

Special purpose lamps: are lamps covered by Annex A and defined in Annex B3 of this Standard.

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

Useful luminous flux (Φ_{use}): means the part of the luminous flux of a lamp falling within the beam angle used for calculating the lamp's energy efficiency.

White light source: means a light source having chromaticity coordinates that satisfy the following requirement:

- $0.270 < x < 0.530$
- $-2.3172\ x^2 + 2.3653\ x - 0.2199 < y < -2.3172\ x^2 + 2.3653\ x - 0.1595$

3. Reference standards

The following list of reference standards applies. However, this Standard supersedes the below reference standards in case of conflicting requirements.

- SASO IEC 60061-1 Specification for lamp caps and holders together with gauges for the control of interchangeability and safety - Lamp caps
- SASO GSO IEC 60064 Tungsten Performance Standard
- SASO 2571(IEC 60357)T-H Performance Standard
- SASO 2226(IEC 60360)Method of measurement of lamp cap temperature rise
- SASO GSO IEC 60432-1 Tungsten Safety Standard
- SASO 1983 (IEC 60432-2) T-H Safety Standard.
- SASO 2570 (IEC 60432-3) T-H Safety Standard
- SASO 2367 (IEC 60630) Maximum lamp outlines
- SASO IEC 60634 Heat test source (HTS) lamps for carrying out heating tests on luminaires
- SASO IEC 60682 Method of measuring pinch temperatures
- SASO 2224 (IEC TR 60887) Glass bulb designation system for lamps
- SASO GSO IEC 60901 Single-capped fluorescent lamps - Performance Standard
- SASO GSO IEC 60968 CFLi Safety Standard
- SASO GSO IEC 60969 CFLi Performance requirements
- SASO IEC TR 60972 Classification and interpretation of new lighting products
- SASO GSO IEC 61000-3-2 Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)
- SASO IEC 61126 Procedure for constructing maximum outlines
- SASO 2720 (IEC 61199) Single-capped fluorescent lamps Safety Standard
- SASO IEC TR 61341 Method of measurement of center beam intensity and beam angle
- SASO IEC 61549 Miscellaneous lamp Standard
- SASO IEC TR 62732 Three-digit code for designation of color rendering and correlated color temperature
- SASO IEC 62471 Photo biological Safety of Lamps and Lamp Systems
- SASO IEC 62471-2 Photobiological safety of lamps and lamp systems - Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety
- SASO IEC/TS 62504 General lighting – LEDs and LED modules – Terms and definitions
- SASO IEC 62554 Sample preparation for measurement of mercury level in fluorescent lamps
- SASO IEC 62560 Self ballasted LED lamps > 50V Safety Standard
- SASO IEC 62612 Self ballasted LED lamps > 50V Performance Requirements
- SASO standard to be adopted based on (Project IEC 62663-1) Non-ballasted LED lamps - Safety requirements
- SASO standard to be adopted based on (Project IEC 62663-2) Non-ballasted LED lamps – Performance Requirements
- SASO IEC/PAS 62707-1 LED Binning
- SASO IEC/PAS 62717 LED Modules Performance specifications
- SASO standard to be adopted based on (Project IEC/PAS 62838) Safety of LED lamps with supply voltages smaller equal 50V
- SASO IEC/PAS 62868 Safety of OLED
- SASO IEC TR 62778 Application of 62471 to light sources and luminaires (blue light) SASO EN 13032-4 Light and lighting - Measurement and presentation of photometric data of lamps and luminaires Part 4: LED light sources and luminaires

4. Requirements for indirect and direct lamps

4.1 Energy efficiency requirements

Lamps listed in Annex A of this Standard shall comply with the energy efficiency requirements specified in Annex C (indirect lamps) according to Table 2, and Annex F (direct lamps) according to Table 8.

Energy efficiency classes and the methods of calculating the EEI for lamps are detailed in Annex C (indirect lamps) and Annex F (direct lamps).

4.2 Functionality requirements

Lamps listed in Annex A of this Standard shall comply with the functionality requirements specified in Annex D (indirect lamps) and Annex G (direct lamps).

4.3 Marking requirements

Instruction manuals supplied with products shall be in the Arabic and English language. Cautionary and/or any safety warnings for the direct user or consumer shall be in the Arabic and English language. The use of internationally accepted pictograms is permitted instead of verbally expressed language.

Lamps listed in Annex A of this Standard shall comply with the marking requirements specified in Annex E (indirect lamps) and Annex H (direct lamps).

“Special purpose” lamps (Annex B-3) do not need to comply with the marking requirements specified in Annex E and Annex H. Instead, 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
b. That they are not suitable for household room illumination

4.4 Hazardous chemicals: Substance restrictions for lamps

Products specified in Annex A and Annex B shall comply with the maximum hazardous substance limits according to Annex I, Tables 16, 17 and 18.

4.5 Energy efficiency label

Products requiring compliance to energy efficiency requirements shall bear the energy efficiency label as per Annex J.

5. Testing requirements

Lamps listed in this Standard shall be tested under the requirements mentioned in Annex K.

ANNEX A - Regulated products

This Standard covers indirect and direct general light sources having a luminous flux above 60 lumens or below 12 000 lumens of the following technologies:

- Incandescent lamps
- Compact fluorescent lamps with integrated ballast (CFLi)
- Halogen lamps
- Light-emitting diode (LED) lamps (Incandescent retrofit types)
- Light-emitting diode (LED) lamps (Halogen retrofit types)

ANNEX B - Exempted products

B1 - The following are exempted from the requirements of the Standard except for hazardous materials as specified in Annex I:

- Traffic/signal lamps, such as:
  - Signal lamps
  - Aviation/Aircraft lighting – for runways and planes, all exterior applications
  - Train lighting, including signal lighting
  - Water craft lighting, including signal lighting
  - Automotive lighting/lamps
- Heating lamps (infrared), such as:
  - Infrared heat lamps – comfort heating (outdoor and indoor)
  - Infrared heat lamps – industrial
  - Infrared heat lamps – animal rearing
  - Infrared heat lamps – health care

B2 - The following lamps are only exempted from the energy labelling requirements of this Standard:

- Lamps marketed for operation with batteries
- Lamps marketed as part of a luminaire and not intended to be removed by the end-user, except when they are offered for sale, hire or hire purchase or displayed separately to the end user, for example as spare parts
- Lamps marketed as part of a product whose primary purpose is not lighting. However, if they are offered for sale, hire or hire purchase or displayed separately, for example as spare parts, they shall be included within the scope of this Standard

These afore-mentioned lamps are not excluded from this Standard when they are marketed for general lighting purposes.

B3 - The following lamps are considered as "special purpose" and therefore exempt from the energy efficiency, functionality and marking requirements (except marking requirements specified in Section 4.3 of this Standard for "special purpose" lamps):

- Lamps for swimming pools
- Lamps for emitting light as an agent in chemical or biological processes, such as:
  - Pet care (aquarium, terrarium, etc.)
  - Anti-insect lamps
  - Disinfection
  - Tanning
  - Polymerization
  - Photodynamic therapy
  - Horticulture
- Display optic lamps (< 12 000 lumens), such as:
  - Stage and studio lamps
  - Theatre lamps
  - Television (TV) lamps
  - Studio lamps
  - Photo lamps – Flashlights or lamps for the development of pictures
  - Projection lamps
- Light sources that do not comply with the definition of white light sources
- Household appliances, such as:
  - Oven lamps
  - Refrigerator lamps
  - Sewing machine lamps
  - Temperature lamps
  - Mirror lamps

ANNEX C - Energy efficiency requirements for indirect lamps

The following requirements apply to the following ***indirect*** lamp types:

- Incandescent lamps
- Halogen lamps
- Compact fluorescent lamps with integrated ballast (CFLi)
- Light-emitting diode (LED) lamps (Incandescent retrofit types)
- Light-emitting diode (LED) lamps (Halogen retrofit types)

C1 - Calculation of energy efficiency index

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 models *without* external control gear, 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 listed below:

Lamps operating on external halogen lamp control gear:
Power corrected for control gear losses (P_{cor}) = P_{rated} × 1.06

Lamps operating on external LED lamp control gear:
Power corrected for control gear losses (P_{cor}) = P_{rated} × 1.10

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 (Φ_{use}) by the following formulae:

For models with Φ_{use} < 1 300 lumen: $P_{ref} = 0.88\sqrt{\Phi_{use}} + 0.049\Phi_{use}$

For models with Φ_{use} ≥ 1 300 lumen: $P_{ref} = 0.07341\Phi_{use}$

The useful luminous flux (Φ_{use}) is defined in accordance with Table 1.

Table 1: Definition of useful luminous flux

Type	Useful luminous flux (Φ_{use})
Indirect lamps	Total rated luminous flux (Φ)

C2 - Maximum allowable EEI for indirect lamps

The maximum allowable EEI for indirect lamps are outlined in Table 2.

Table 2: Maximum energy efficiency index (EEI)

Range	Stage 1 (1 May 2016)				Stage 2 (1 May 2017)				Stage 3 (1 Jan 2019)			
	Incandescent	High voltage halogen	Low voltage halogen	CFLi & LED	Incandescent	High voltage halogen	Low voltage halogen	CFLi & LED	Incandescent	High voltage halogen[1]	Low voltage halogen	CFLi & LED
All lamps with power < 60W	n/a	n/a	n/a	n/a	0.95	0.95	0.5	0.24	0.95	0.5	0.5	0.24
All lamps with power ≥ 60W	0.95	0.95	0.5	0.24	0.95	0.95	0.5	0.24	0.95	0.5	0.5	0.24

C3 - Energy efficiency classes

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

Table 3: Energy efficiency classes for indirect lamps

Energy efficiency index (EEI)	Energy efficiency class (Arabic)	Equivalent energy efficiency class (English)
EEI ≤ 0.11	أ	A
0.11 < EEI ≤ 0.13	ب	B
0.13 < EEI ≤ 0.18	ج	C
0.18 < EEI ≤ 0.24	د	D
0.24 < EEI ≤ 0.50	هـ	E
0.50 < EEI ≤ 0.95	و	F
0.95 < EEI ≤ 1.75	ز	G
Note: For labeling purposes, the Arabic letters should be used. The equivalent English version is only provided for informational purposes		

[1] G9 and R7 caps will have a MEPS of 0.95

ANNEX D - Functionality requirements for indirect lamps

The lamp functionality requirements are outlined in Table 4 for indirect compact fluorescent lamps with integrated ballast (CFLi) lamps, Table 5 for indirect LED lamps, and Table 6 for all other indirect lamp types.

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.

For the purposes of testing lamp lifetime, lamp survival factor, lumen maintenance and premature failure, the standard switching cycle shall be used.

Table 4: Functionality requirements for indirect compact fluorescent lamps with integrated ballast

Functionality parameter	Requirements
Lamp survival factor at 6 000h	≥ 0.70
Lumen maintenance	At 2 000 h: ≥ 88 % (≥ 83 % for lamps with second lamp envelope) At 6 000 h: ≥ 70%
Number of switching cycles before failure	≥ half the lamp lifetime expressed in hours ≥ 30 000 if lamp starting time > 0.3 s
Starting time	< 1.5s if P < 10W < 1.0s if P ≥ 10W
Lamp warm-up time to 60% total rated luminous flux (Φ)	< 40 s or < 100 s for lamps containing mercury in amalgam form
Premature failure rate	≤ 2.0 % at 400 h
UVA + UVB radiation	≤ 2.0 mW/klm
UVC radiation	≤ 0.01 mW/klm
Lamp power factor	≥ 0.55 if P < 25 W ≥ 0.90 if P ≥ 25 W
Color rendering (R_a)	≥ 80

Table 5: Functionality requirements for indirect LED lamps

Functionality parameter	Requirement
Lamp survival factor at 6 000h	≥ 0.90
Lumen Maintenance at 6 000h	≥ 0.80
Number of switching cycles before failure	≥ 15 000 if rated lamp life ≥ 30 000h otherwise: ≥ half the rated lamp life expressed in hours
Starting time	< 0.5s
Premature failure rate	≤ 5.0% at 1 000h
Color rendering (Ra)	≥ 80
Color consistency	Variation of chromaticity coordinates within a six-step MacAdam ellipse or less.
Lamp power factor (PF) for lamps with integrated control gear	P ≤ 2W : no requirement 2W < P ≤ 5W : PF > 0.4 5W < P ≤ 25W : PF > 0.5 P > 25W : PF > 0.9

Table 6: Functionality requirements for all other indirect lamps (Excluding compact fluorescent lamps with integrated ballast and LED lamps)

Functionality parameter	Requirement
Rated lamp lifetime	≥ 2 000h
Lumen maintenance	≥ 85% at 75% of rated average lifetime
Number of switching cycles	≥ four times the rated lamp life expressed in hours
Starting time	< 0.2s
Lamp warm-up time to 60% total rated luminous flux (Φ)	≤ 1.0s
Premature failure rate	≤ 5.0% at 200h
Lamp power factor	≥ 0.95

ANNEX E - Marking requirements for indirect lamps

The following should be printed on the bulb with non-removable ink:

- Brand name
- Input voltage
- Nominal power
- Country of origin

Information shall be visibly displayed prior to purchase to end-users on the packaging[2] and/or on an accompanying catalogue, in addition the information should be displayed on free access websites (English and/or Arabic).

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:

- Brand name
- Model number
- Input voltage
- Lamp type (Indirect)
- Country of origin
- Lamp technology (Incandescent/Halogen/CFLi/LED)
- Cap type
- Nominal lamp power (in watt)
- Nominal luminous flux (in lumens)
- Nominal efficacy (in lumens per watt)
- Nominal life time (in hours)
- Number of switching cycles before up to B50 lifetime
- Color temperature
- Lamp mercury content as ***X.X mg*** (applicable only to lamps that contains mercury)
- Indication on which website to consult in case of accidental lamp breakage, in order to find instructions on how to clean up the lamp debris

[2] Using a print which is not easily removable

ANNEX F - Energy efficiency requirements for direct lamps

The following requirements apply to the following ***direct*** lamp types:

- Incandescent lamps
- Halogen lamps
- Compact fluorescent lamps with integrated ballast (CFLi)
- Light-emitting diode (LED) lamps (Incandescent retrofit types)
- Light-emitting diode (LED) lamps (Halogen retrofit types)

F1 - Calculation of energy efficiency index

The energy efficiency index (EEI) of the lamp is calculated as follows and rounded to two decimal places:

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

P_{cor} is defined as:

P_{cor} is the rated power (P_{rated}) measured at nominal input voltage and corrected where appropriate in accordance with Table 7. The correction factors are cumulative where appropriate.

Table 7: Correction factors for direct lamps

Scope of the correction	Corrected power (P_{cor})
Lamps operating on external halogen lamp control gear	P_{rated} × 1.06
Lamps operating on external LED lamp control gear	P_{rated} × 1.10
Compact fluorescent lamps with color rendering index ≥ 90	P_{rated} × 0.85
Lamps with anti-glare shield	P_{rated} × 0.80

P_{ref} is defined as:

P_{ref} is the reference power obtained from the useful luminous flux of the lamp (Φ_{use}) by using the following formula:

For models with Φ_{use} < 1 300 lumen: $P_{ref} = 0.88\sqrt{\Phi_{use}} + 0.049\Phi_{use}$

For models with Φ_{use} ≥ 1 300 lumen: $P_{ref} = 0.07341\Phi_{use}$

Φ_{use} is defined as:

- Rated luminous flux present in a 120° cone ($\Phi_{120°}$) for direct lamps meeting all the following conditions:
  - Having a beam angle ≥ 90°
  - Being of type different than a filament lamp
  - Carrying a warning on their packaging in accordance with point (j) of Annex H (Information requirements on packaging and free access websites)
- Rated luminous flux present in a 90° cone ($\Phi_{90°}$) for all other direct lamps

F2 - Maximum allowable EEI for direct lamps

The maximum allowable EEI for direct lamps are outlined in Table 8.

Table 8: Maximum energy efficiency index (EEI)

Range	Stage 1 (1 May 2016)				Stage 2 (1 May 2017)				Stage 3 (1 Jan 2019)			
	Incandescent	High voltage halogen	Low voltage halogen	CFLi & LED	Incandescent	High voltage halogen	Low voltage halogen	CFLi & LED	Incandescent	High voltage halogen	Low voltage halogen	CFLi & LED
All lamps with power < 60W	n/a	n/a	n/a	n/a	0.95	1.75	0.95	0.24	0.95	0.95	0.95	0.24
All lamps with power ≥ 60W	0.95	1.75	0.95	0.24	0.95	1.75	0.95	0.24	0.95	0.95	0.95	0.24

F3 - Energy efficiency classes

The energy efficiency rating of lamps shall be determined on the basis of their energy efficiency index (EEI) as outlined in Table 9.

Table 9: Energy efficiency classes for direct lamps

Energy efficiency index (EEI)	Energy efficiency class (Arabic)	Equivalent energy efficiency class (English)
EEI ≤ 0.11	أ	A
0.11 < EEI ≤ 0.13	ب	B
0.13 < EEI ≤ 0.18	ج	C
0.18 < EEI ≤ 0.24	د	D
0.24 < EEI ≤ 0.50	هـ	E
0.50 < EEI ≤ 0.95	و	F
0.95 < EEI ≤ 1.75	ز	G
Note: For labeling purposes, the Arabic letters should be used. The equivalent English version is only provided for informational purposes		

ANNEX G - Functionality requirements for direct lamps

The lamp functionality requirements are outlined in Table 10 for direct compact fluorescent lamps with integrated ballast, Table 11 for direct LED lamps, and Table 12 for incandescent, halogen, and other direct lamps.

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 or 5 minutes on and 5 minutes off.

For the purposes of testing lamp lifetime, lamp survival factor, lumen maintenance and premature failure, the standard switching cycle shall be used.

Table 10: Functionality requirements for direct compact fluorescent lamps with integrated ballast (CFLi)

Functionality parameter	Requirements
Lamp survival factor at 6 000 h	≥ 0.70
Lumen maintenance	At 2 000 h: ≥ 83 % At 6 000 h: ≥ 70%
Number of switching cycles before failure	≥ half the lamp lifetime expressed in hours ≥ 30 000 if lamp starting time > 0.3 s
Starting time	< 1.5 s if P < 10 W < 1.0 s if P ≥ 10 W
Lamp warm-up time to 60 % total rated luminous flux (Φ)	< 40 s or < 100 s for lamps containing mercury in amalgam form
Premature failure rate	≤ 5.0 % at 1 000 h
Lamp power factor for lamps with integrated control gear	≥ 0.55 if P < 25 W ≥ 0.90 if P ≥ 25 W
Color rendering (Ra)	≥ 80

Table 11: Functionality requirements for direct LED lamps

Functionality parameter	Requirements
Lamp survival factor at 6 000 h	≥ 0.90
Lumen Maintenance at 6 000 h	≥ 0.80
Number of switching cycles before failure	≥ 15 000 if rated lamp life ≥ 30 000 h otherwise: ≥ half the rated lamp life expressed in hours
Starting time	< 0.5 s

Premature failure rate	≤ 5.0 % at 1 000 h
Color rendering (Ra)	≥ 80
Color consistency	Variation of chromaticity coordinates within a six-step MacAdam ellipse or less.
Lamp power factor (PF) for lamps with integrated control gear	P ≤ 2 W: no requirement 2 W < P ≤ 5 W: PF > 0.4 5 W < P ≤ 25 W: PF > 0.5 P > 25 W: PF > 0.9

Table 12: Functionality requirements for all other direct lamps (excluding compact fluorescent lamps with integrated ballast and LED)

Functionality parameter	Requirements
Rated lamp lifetime at 50 % lamp survival	≥ 2 000 h for mains voltage types ≥ 4 000 h for extra low voltage lamps
Lumen maintenance	≥ 80 % at 75 % of rated average lifetime
Number of switching cycles	≥ four times the rated lamp life expressed in hours
Starting time	< 0.2 s
Lamp warm-up time to 60 % total rated luminous flux (Φ)	≤ 1.0 s
Premature failure rate	≤ 5.0 % at 200 h
Lamp power factor for lamps with integrated control gear	Power > 25 W: ≥ 0.9 Power ≤ 25 W: ≥ 0.5

ANNEX H - Marking requirements for direct lamps

The following should be printed on the bulb with non-remvable ink:

- Brand name
- Input voltage
- Nominal power
- Country of origin

Information shall be visibly displayed prior to purchase to end-users on the packaging and/or on an accompanying catalogue, in addition the information should be displayed on free access websites (English and/or Arabic).

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:

- Brand name
- Model number
- Input voltage
- Lamp type (Direct)
- Country of origin
- Lamp technology (Incandescent/Halogen/CFLi/LED)
- Cap type
- Nominal useful luminous flux displayed in a font at least twice as large as any display of the nominal lamp power.
- Nominal life time of the lamp in hours (should not longer than the rated life time).
- Color temperature, as a value in Kelvins and also expressed graphically or in words.
- Number of switching cycles before premature failure.
- Warm-up time up to 60 % of the full light output (may be indicated as ‘instant full light’ if less than 1 second).
- 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.
- If designed for optimum use in non-standard conditions (such as ambient temperature Ta ≠ 25 °C or specific thermal management is necessary), provide information on those conditions.
- Lamp dimensions in millimeters (length and largest diameter).
- Nominal beam angle in degrees.
- If the lamp’s beam angle is ≥ 90° and its useful luminous flux as defined in Annex F is to be measured in a 120° cone, a warning that the lamp is not suitable for accent lighting.
- If the lamp cap is a standardized type also used with filament lamps, but the lamp’s dimensions are different from the dimensions of the filament lamp(s) that the lamp is meant to replace, provide a drawing comparing the lamp’s dimensions to the dimensions of the filament lamp(s) it replaces.
- An indication that the lamp is of a type listed in the first column of Table 13 may be displayed only if the luminous flux of the lamp in a 90° cone ($\Phi_{90°}$) is not lower than the reference luminous flux indicated in Table 13 for the smallest wattage among the lamps of the type concerned. The reference luminous flux shall be multiplied by the correction factor in Table 14. For LED lamps, it shall be in addition multiplied by the correction factor in Table 15.
- An equivalence claim involving the power of a replaced lamp type may be displayed only if the lamp type is listed in Table 13 and if the luminous flux of the lamp in a 90° cone ($\Phi_{90°}$) is not lower than the corresponding reference luminous flux in Table 13. The reference luminous flux shall be multiplied by the correction factor in Table 14. For LED lamps, it shall be in addition multiplied by the correction factor in Table 15. The intermediate values of both the luminous flux and the claimed equivalent lamp

power (rounded to the nearest 1 W) shall be calculated by linear interpolation between the two adjacent values.

Table 13: Reference luminous flux for equivalence claims

Type	Power (W)	Reference Φ_{90° (lm)
Extra-low voltage reflector type		
MR11 GU4	20	160
	35	300
MR16 GU 5.3	20	180
	35	300
	50	540
AR111	35	250
	50	390
	75	640
	100	785
Mains-voltage blown glass reflector type		
R50/NR50	25	90
	40	170
R63/NR63	40	180
	60	300
R80/NR80	60	300
	75	350
	100	580
R95/NR95	75	350
	100	540
R125	100	580
	150	1 000
Mains-voltage pressed glass reflector type		
PAR16	20	90
	25	125
	35	200
	50	300
PAR20	35	200
	50	300
	75	500
PAR25	50	350
	75	550
PAR30S	50	350
	75	550
	100	750
PAR36	50	350
	75	550
	100	720
PAR38	60	400
	75	555
	80	600
	100	760

	120	900

Table 14: Multiplication factors for lumen maintenance

Lamp type	Luminous flux multiplication factor
Halogen lamps	1.00
Compact fluorescent lamps	1.08
LED lamps	1.15

Table 15: Multiplication factors for LED lamps

LED lamp beam angle	Luminous flux multiplication factor
20° ≤ beam angle	1.00
15° ≤ beam angle < 20°	0.90
10° ≤ beam angle < 15°	0.85
beam angle < 10°	0.80

If the lamp contains mercury:

(a) Lamp mercury content as X.X mg.

(o) Indication of which website to consult in case of accidental lamp breakage to find instructions on how to clean up the lamp debris.

ANNEX I - Hazardous substances limits

The following limits for hazardous substances apply.

Table 16: Maximum content limits of hazardous substances for lamps in the scope of this Standard

Descriptions	Tolerated maximum concentrated values of substance by weight in homogeneous materials
Lead(Pb)	0.1%
Cadmium (Cd)	0.01%
Hexavalent chromium (Cr6+)	0.1%
Polybrominated biphenyls (PBB)	0.1%
Polybrominated diphenyl ether (PBDE)	0.1%

Table 17 outlines the limit on mercury content per light bulb, which applies to single capped compact fluorescent lamps (integrated ballast) for general lighting purposes. All other lamp types in this Standard shall not have mercury limits.

Table 17: Maximum mercury content limits for lamps in the scope of this Standard (applies to single capped compact fluorescent lamps with integrated ballast for general lighting purposes only)

Lamp type	Limit
≥30 W and <150 W	5.0 mg
<30 W	2.5 mg
<30 W with long lifetime (> 15 000 h)	3.5 mg
With circular or square structural shape or other non-linear with tube diameter ≤ 17 mm	7.0 mg

Table 18 outlines exemptions to the hazardous substance limits set in this annex. Eligible products or components have no limit on the levels of the relevant hazardous substance.

Table 18: Exemptions for lamps in the scope of this Standard

Description	Requirements
Electrical and electronic components containing lead in a glass or ceramic other than dielectric ceramic in capacitors, e.g. piezoelectronic devices, or in a glass or ceramic matrix compound	No limit
Lead in dielectric ceramic in capacitors for a rated voltage of 125 V AC or 250 V DC or higher	No limit
Cadmium and its compounds in electrical contacts	No limit
Lead as an alloying element in aluminum containing up to 0,4 % lead by weight	No limit
Copper alloy containing up to 4 % lead by weight	No limit
Lead in high melting temperature type solders (i.e. lead- based alloys containing 85 % by weight or more lead)	No limit
Lead and cadmium in printing inks for the application of enamels on glasses, such as borosilicate and soda lime glasses	No limit
Lead in glass of fluorescent tubes not exceeding 0.2% by weight	No limit

ANNEX J - Energy efficiency label

J-1 - Determining the energy efficiency class

The energy efficiency class for each product shall be determined as outlined in Table 3 in Annex C-3 (indirect lamps) and as outlined in Table 9 in Annex F-3 (direct lamps).

J-2 - Design and placement of the label

The label shall be printed as illustrated in Figure 1 and should be fixed and non-removable.

The energy efficiency classes shall each be represented as follows: with a fixed number of color-coded bars as outlined in Table 19 and illustrated in Figure 1.

Table 19: Energy efficiency class representation

Bar color	Energy efficiency class (Arabic)	Equivalent energy efficiency class (English)
Dark green	أ	A
Green	ب	B
Light green	ج	C
Yellow	د	D
Orange	هـ	E
Red	و	F
Dark red	ز	G
Note: For labeling purposes, the Arabic letters should be used. The equivalent English version is only provided for informational purposes.		

The label must be at least 43 mm wide and 75 mm high. If no side of the packaging is large enough to contain the label and its blank border or if this would cover more than 50 % of the surface area of the largest side, the label and border may be reduced, but by no more than is required to meet both these conditions. However, in no case may the label be reduced to less than 40 % (by height) of its standard size. If the packaging is too small to take such a reduced label, a 43 mm wide and 75 mm high label must be attached to the lamp or the packaging.

Should the label be printed in a larger format, its contents must remain proportionate to the dimensions illustrated in Figure 2.

The label shall be on the most prominent part of the product packaging to be easily visible to the consumer.

J-3 - Information and values contained on the label

The fields (a), (b), and (c) outlined in Figure 3 shall comply with the following requirements:

- **Field (a):** This field shall display the logo of the Saudi Standards, Metrology and Quality Organization (SASO).

- **Field (b):** 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 L):
  - Manufacturer name
  - Model number

- Country of origin
- Luminous flux (lumens)
- Lifetime (h)
- Rated power (W)
- Equivalent power (W)
- EEI (unit-less)
- Efficacy (lumens/W)
- Annual electricity consumption (kWh/year)

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

Figure 1

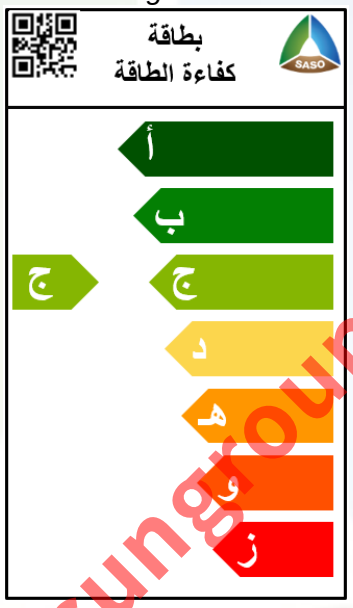


Figure 2

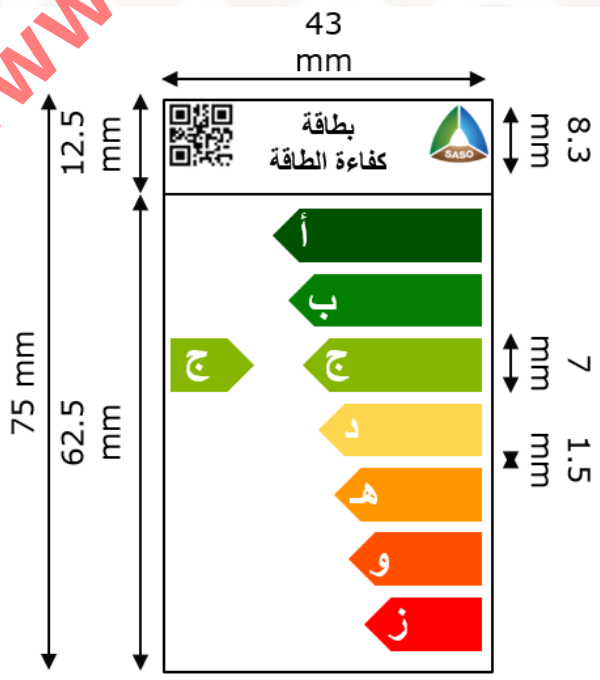
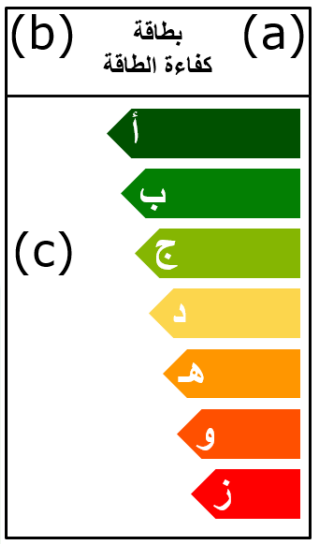


Figure 3



ANNEX K – Testing methodologies

K-1 – General testing methodologies

The following is the list of reference standards for testing energy efficiency, functionality, and safety requirements.

Table 20: Reference standards for indirect incandescent light bulbs

Parameter	Reference	Remarks
EEI	IEC 60064, 3.4.1 and Annex A for power; CIE 84 for basics of luminous flux measurement; IEC 60064, 3.4.2 for luminous flux	The average EEI value shall be calculated from the arithmetic mean of each product's individual EEI.
Lamp caps	IEC 60064 in conjunction with IEC 60061-1	
Lamp survival factor	CIE 97	
Rated lifetime, lamp lifetime	IEC 60064, Annex A and B	
Lumen maintenance, lamp lumen maintenance factor	IEC 60064, 3.5 and Annex A	
Number of switching cycles	—	Reliable, accurate and reproducible measurement procedures shall be used.
Starting time	—	Not relevant for incandescent lamps.
Lamp warm-up time	—	Not relevant for incandescent lamps.
Premature failure rate	IEC 60064, 3.5	
Lamp power factor	—	Not relevant for incandescent lamps (power factor equals 1).
Chromaticity coordinates	CIE S 010 (or ISO 23539) for basics on photometry, CIE 15 for basics on colorimetry, CIE 63 for spectroradio-metric measurement	
CCT	CIE 15	
CRI	—	Not relevant for incandescent lamps (CRI is 100).
Luminance	CIE 18.2	
Specific effective UV radiant power	IEC 62471	
Dimensions	IEC 60064	

Table 21: Reference standards for indirect halogen light bulbs

Parameter	Reference	Remarks
Lamp efficacy, luminous efficacy	IEC 60357, 1.4.5 and Annex A for luminous flux; CIE 84 for basics of luminous flux; EN 60357, 1.4.4 for power	The average efficacy value shall be calculated from the arithmetic mean of each product's individual efficacy.
Lamp caps	IEC 60432-2, 1.1 for halogen for domestic and general lighting; EN 60432-3, 2.3 for halogen (not for vehicles); in conjunction with EN 60061-1	
Lamp survival factor	CIE 97	
Rated lifetime, lamp lifetime	IEC 60357, 1.4 and Annex A	
Lumen maintenance, lamp lumen maintenance factor	IEC 60357, 1.4 and Annex A	
Number of switching cycles	—	Reliable, accurate and reproducible measurement procedures shall be used.
Starting time	—	Not relevant for halogen incandescent lamps.
Lamp warm-up time	—	Not relevant for halogen incandescent lamps.
Premature failure rate	IEC 60357, Annex A	
Lamp power factor (only for lamps with integrated controlgear)	IEC 61000-3-2	
Chromaticity coordinates	CIE S 010 (= ISO 23539) for basics on photometry, CIE 15 for basics on colorimetry, CIE 63 for spectroradio-metric measurement	
CCT	CIE 15	
CRI	—	Not relevant for halogen incandescent lamps (CRI is 100).
Luminance	CIE 18.2	
Specific effective UV radiant power	IEC 62471	
Lamp dimensions	IEC 60357	

Table 22: Reference standards for indirect Compact Fluorescent Light bulbs with integrated control gear

Parameter	Reference	Remarks
Lamp efficacy, luminous efficacy	IEC 60969, at present 34A/1701/CDV Annex A for luminous flux; CIE 84 for basics of luminous flux; 34A/1701/CDV Annex A for power	The average efficacy value shall be calculated from the arithmetic mean of each product's individual efficacy.
Lamp caps	IEC 60968 in conjunction with IEC 60061-1	
Lamp survival factor	CIE 97	
Rated lifetime, lamp lifetime	IEC 60969, at present 34A/1701/CDV Annex G	
Lumen maintenance, lamp lumen maintenance factor	IEC 60969, at present 34A/1701/CDV Annex D	
Number of switching cycles	IEC 60969, at present 34A/1701/CDV Annex F	
Starting time	IEC 60969, at present 34A/1701/CDV Annex B	
Lamp warm-up time	IEC 60969, at present 34A/1701/CDV Annex C	The run-up time shall be used instead.
Premature failure rate	IEC 60969, at present 34A/1701/CDV Annex G	
Lamp power factor (only for lamps with integrated controlgear)	IEC 61000-3-2	
Chromaticity coordinates	CIE 15	
CCT	CIE 15	
CRI	CIE 13.3	
Luminance	CIE 18.2	
Specific effective UV radiant power	IEC 62471	
Lamp dimensions	IEC 60969, at present 34A/1701/CDV Table 3	
Dimmability	—	Reliable, accurate and reproducible measurement procedures shall be used.

Table 23: Reference standards for indirect Light Emitting Diode light bulbs

Parameter	Reference	Remarks
Lamp efficacy	IEC 62612, 9.3 efficacy. To be corrected according to IM 244 with correction factor.	The average efficacy value shall be calculated from the arithmetic mean of each product's individual efficacy.
Rated lifetime, lamp lifetime	—	Reliable, accurate and reproducible measurement procedures shall be used. For LED lamps, 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.
Lamp warm-up time	—	Reliable, accurate and reproducible measurement procedures shall be used.
Premature failure rate	IEC 62612, 11.2	An additional read point at 1 000 h and the compliance criteria according to the regulations 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	
UVA+UVB	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 24: Reference standards for direct incandescent light bulbs

Parameter	Reference	Remarks
EEI	CIE 84 for general conditions of luminous flux measurement. L2(AP)005 for cone luminous flux. IEC 60064, 3.4.1 for power.	The average EEI value shall be calculated from the arithmetic mean of each product's individual EEI.
Rated lifetime	IEC 60064, Annex A and B	
Lumen maintenance	IEC 60064, 3.5 and Annex A	
Number of switching cycles	—	Reliable, accurate and reproducible measurement procedures shall be used.
Starting time	—	Not relevant for incandescent lamps.
Lamp warm-up time	—	Not relevant for incandescent lamps.
Premature failure rate	IEC 60064, 3.5 and Annex A	
Lamp power factor	—	Not relevant for incandescent lamps (power factor equals 1).
Chromaticity coordinates	CIE S 010 (= ISO 23539) for basics on photometry, CIE 15 for basics on colorimetry, CIE 63 for spectroradio-metric measurement	
CRI	—	Not relevant for incandescent lamps (CRI is 100).
Equivalence claim for retrofit lamps	—	Not relevant for incandescent lamps.
Beam angle	IEC/TR 61341	
Peak intensity	IEC/TR 61341	

Table 25: Reference standards for direct halogen light bulbs

Parameter	Reference	Remarks
EEI	CIE 84 for general conditions of luminous flux measurement. L2(AP)005 for cone luminous flux. EN 60357, 1.4.4 for power.	The average EEI value shall be d from the arithmetic mean of each individual EEI.
Rated lifetime	EN 60357, 1.4 and Annex A	
Lumen maintenance	EN 60357, 1.4 and Annex A	
Number of switching cycles	—	Reliable, accurate and reproducible measurement procedures shall be used. EN 60357, A.3 duty cycle, may partially be used.
Starting time	—	Not relevant for halogen incandescent lamps.
Lamp warm-up time	—	Not relevant for halogen incandescent lamps.
Premature failure rate	EN 60357, Annex A	
Lamp power factor	—	Not relevant for halogen incandescent lamps (power factor equals 1).
Chromaticity coordinates	CIE S 010 (= ISO 23539) for basics on photometry, CIE 15 for basics on colorimetry, CIE 63 for spectroradio-metric measurement	
CRI	—	Not relevant for halogen incandescent lamps (CRI is 100).
Equivalence claim for retrofit lamps	—	See measurement of luminous flux and power under parameter EEI.
Beam angle	IEC/TR 61341, further conditions EN 60357, Annex A	
Peak intensity	IEC/TR 61341, further conditions EN 60357, Annex A	
Lamp type (MR11, GU4, etc.	EN 60357	

Table 26: Reference standards for direct Compact Fluorescent Light bulbs with integrated control gear

Parameter	Reference	Remarks
EEI	CIE 84 for general conditions of luminous flux measurement; L2(AP)005 for cone luminous flux; IEC 60969, at present 34A/1701/CDV Annex A for power.	The average EEI value shall be calculated from the arithmetic mean of each product's individual EEI.
Rated lifetime	IEC 60969, at present 34A/1701/CDV Annex G	
Lamp survival factor	IEC 60969, at present 34A/1701/CDV Annex G	
Lumen maintenance	IEC 60969, at present 34A/1701/CDV Annex D	
Number of switching cycles	IEC 60969, at present 34A/1701/CDV Annex F	
Starting time	IEC60969, at present 34A/1701/CDV Annex B	
Lamp warm-up time	IEC 60969, at present 34A/1701/CDV Annex C	The run-up time shall be used instead.
Premature failure rate	IEC 60969, at present 34A/1701/CDV Annex G	
Lamp power factor	IEC 61000-3-2	
Chromaticity coordinates	CIE 15	
CCT	CIE 15	
CRI	CIE 13.3	
Spectral power distribution	CIE 63	
Lamp dimensions	IEC 60969, at present 34A/1701/CDV Table 3	
Beam angle	IEC/TR 61341	
Peak intensity	IEC/TR 61341	
Lamp type (MR11, GU4, etc.	IEC 60968 at present 34A/1624/CD - caps	
Cone luminous flux	L2(AP)005	
Cap	IEC 60968	

Table 27: Reference standards for direct Light Emitting Diode light bulbs

Parameter	Reference	Remarks
EEI	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 EEI value shall be calculated from the arithmetic mean of each product's individual EEI.
Rated lifetime, lamp lifetime	—	Reliable, accurate and reproducible measurement procedures shall be used.
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 described in 34A/1701/CDV (for CFLi) may be adapted.
Lamp warm-up time	—	Reliable, accurate and reproducible measurement procedures shall be used. The method described in 34A/1701/CDV (for CFLi) 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 regulations shall be applied.
Lamp power factor (only for lamps with integrated controlgear)	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.
Lamp type (MR11, GU4, etc.)	See parameter “cap”.	
Cone luminous flux	L2(AP)005	
Cap	IEC 62560	

Measurement of mercury content for CFLi:

The applicant shall provide a test report stating that the mercury content has been measured using the method described below. The report shall state the average mercury content, calculated by analyzing ten lamps, and then deleting the highest and lowest values before calculating the arithmetic mean of the remaining eight values.

The test method for the mercury content is as follows. The arc tube is first separated from its plastic surrounds and associated electronics. The associated lead wires are cut as close to the glass seal as possible. The arc tube is taken to a fume cupboard and is cut into segments. The segments are placed in a suitably sized robust screw-capped plastic bottle to which is added a 1 inch diameter porcelain ball and 25 ml of high purity concentrated nitric acid (70 %). The bottle is sealed and shaken for a few minutes to reduce the arc tube to fine particle size, the stopper is periodically loosened to eliminate any possibility of pressure build-up. The contents of the bottle are allowed to react for 30 minutes during which time the contents are periodically agitated. The contents of the bottle are then filtered through an acid resistant filter paper and collected in a 100 ml graduated volumetric flask. Potassium dichromate is then added to the flask so that the final concentration is 1 000 ppm with respect to chromium. The flask is then made up to volume with pure water. Matched standards are made up on a concentration range up to 200 ppm mercury. The solutions are analyzed using flame atomic absorption at a wavelength of 253,7 nm with background correction on. From the results obtained and knowledge of the solution volume, the original mercury content of the light bulb can be computed. The competent body may agree adaptations to the details of this test method if they are necessary for technical reasons, and these shall be applied in a consistent manner.

As alternative methods, measurements according to IEC 62554 "Sample preparation for measurement of mercury level in fluorescent lamps" and/or IEC 62321 "Determination of certain substances in electrotechnical products" series are accepted.

K-2 – Enforcer additional testing methodologies

The enforcer may draw a sample of 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 28.
The 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, and
- All parameters listed in Table 28 are met

Table 28: Testing methodologies

Parameter	Procedure
Lamp survival factor at 6 000 h (for LED lamps only)	The test shall end • when the required number of hours is met, or • when more than two lamps fail, whichever occurs first Compliance: a maximum of two out of every 20 lamps in the test batch may fail before the required number of hours Non-compliance: otherwise
Number of switching cycles before failure	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 Compliance: at least 19 of every 20 lamps in the batch have no failure after the required number of switching cycles is reached Non-compliance: otherwise
Starting time	Compliance: 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 Non-compliance: otherwise
Lamp warm-up time to 60 % Φ	Compliance: the average warm-up time of the lamps in the test batch is not higher than the required warm-up time plus 10%, and no lamp in the sample batch has a warm-up time that exceeds the required warm-up time multiplied by 1.5 Non-compliance: otherwise
Premature failure rate	The test shall end • when the required number of hours is met, or • when more than one lamp fails, whichever occurs first. Compliance: a maximum of one out of every 20 lamps in the test batch fails before the required number of hours Non-compliance: otherwise
Color rendering (Ra)	Compliance: 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 Non-compliance: otherwise
Lumen maintenance at end of life and rated lifetime	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 Compliance: the lumen maintenance at end of life and the

(for LED lamps only)	lifetime values obtained by extrapolation 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 % Non-compliance: otherwise
Equivalence claims for retrofit lamps according to points (l) and (m) of Annex H	If only the equivalence claim is verified for compliance, it is sufficient to test 10 lamps, where possible obtained approximately in equal proportion from four randomly selected sources Compliance: the average results of the lamps in the test batch do not vary from the limit, threshold or declared values by more than 10 % Non-compliance: otherwise
Beam angle	Compliance: 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 Non-compliance: otherwise
Peak intensity	Compliance: the peak intensity of each individual lamp in the test batch is not less than 75 % of the rated intensity of the model Non-compliance: otherwise
Energy efficiency index[3]	Compliance: The Energy Efficiency Index (EEI) value for lamps in the scope of this Standard shall be less than or equal to the specified values in Tables 2 and 8, when calculated at both rated and average tested power and luminous flux. Furthermore, the average EEI of the sample tested should be within 10% of the rated EEI, and each bulb in the sample should have an EEI value within 10% of the sample's average EEI. Non-compliance: otherwise
Other parameters	Compliance: the average results of the lamps in the test batch do not vary from the limit, threshold or declared values by more than 10 %. Non-compliance: otherwise.

[3] The tolerances for variation indicated above relate only to the verification of the measured parameters by the authorities and shall not be used by the supplier as an allowed tolerance on the values in the technical documentation to achieve a more efficient energy class. The declared values shall not be more favorable for the supplier than the values reported in the technical documentation.

ANNEX L – Registration form

APPLICATION FOR REGISTRATION OR RENEWAL OF REGISTRATION OF LIGHTING PRODUCTS FOR ENERGY EFFICIENCY LABEL

SECTION (1)
APPLICATION DETAILS

I hereby apply for registration of lighting product (s) for the purpose of energy efficiency registration.
In the country of ……
(*specify the country in which this application is made*)

Date of import ……

SECTION (2)
APPLICANT DETAILS

Name of applicant ……
Business address ……
P.O Box ……
Post code ……
Contact person ……
Position/title ……
Tel (……)……..
Fax (……)……..
Email ……

SECTION (3)
DESCRIPTION OF THE LIGHTING PRODUCT

Name of manufacturer	.....
Brand name	.....
Model number	.....
Country of manufacturing	.....
Model year	.....
Lighting type	☐ Direct ☐ Indirect
Technology	☐ Incandescent ☐ High voltage hallogen ☐ Low voltage hallogen ☐ CFLi ☐ LED
Control gear	☐ Internal ☐ External ☐ None
Type and size of cap	.....
Lamp dimensions (mm)	.....
Reference standard	.....
Nominal/rated voltage (V)	.....
Rated frequency (Hz)	.....
Nominal/rated power (W)	.....
Lifetime (h)	.....
Rated luminous flux (lm)	.....
Color temperature (K)	.....

SECTION (4)
TESTING AND TEST REPORT

Name of lab	.....
Test date	.....
Corrected power P_{cor} (W)	.....
Useful luminous flux Φ_{use} (lm)	.....
Reference power P_{ref} (W)	.....
Lamp survival factor at 6000h (%)	.....
Lumen maintenance at 2000h (%)	.....
Lumen maintenance at 6000h (%)	.....
Number of switching cycles before failure	.....
Starting time(s)	.....
Lamp warm-up time to 60 % total rated luminous flux Φ (s)	.....
Premature failure rate at xxxxh (%)	.....
Lamp power factor	.....
Color rednering (Ra)	.....
Efficacy (lm/W)	.....
Annual energy consumption (kWh/yr)	.....
Energy Efficiency Inex (EEI)	.....
Energy efficiency rating	☐ أ/A ☐ ب/B ☐ ج/C ☐ د/D ☐ هـ/E ☐ و/F ☐ ز/G
UVA+UVB radiation (mW/klm) ***For CFL only***	.....
UVC radiation (mW/klm) ***For CFL only***	.....
Mercury content (mg)	.....
Concentration value by weight of Lead (%)	.....
Concentration value by weight of Cadmium (%)	.....
Concentration value by weight of Hexavalent chromium (%)	.....
Concentration value by weight of Polybrominated biphenyls (%)	.....
Concentration value by weight of Polybrominated diphenyl ether (%)	.....