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DRAFT EAST AFRICAN STANDARD

**Lighting products — Minimum energy performance standard — Part 2 –
Luminaires**

EAST AFRICAN COMMUNITY

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Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC 051 Electrical Installation and Lighting.

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

Lighting products — Minimum energy performance standard — Part 2 – Luminaires

1 Scope

This Draft East African standard covers the energy efficiency and functional performance requirements, sampling and test methods for luminaires described in Clause 4 which include the following:

- a) indoor ambient luminaires; and
- b) outdoor / streetlight luminaires.

This standard does not apply to indoor ambient luminaires or outdoor/streetlight luminaires specifically tested and approved to operate:

- a) in potentially explosive atmospheres;
- b) for emergency use; and
- c) in or on aircraft.

This standard does not cover safety requirements of lighting products.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI C78.377, *Electric Lamps — Specifications for the Chromaticity of Solid-State Lighting Products*

ANSI C136.2, *Dielectric Withstand and Electrical Transient — Immunity Requirements*

CIE 015, *Colorimetry*

CIE 84, *Measurement of Luminous Flux*

CIE 121, *The Photometry and Goniophotometry of Luminaires*

CIE S025, *Test method for led lamps, led luminaires and led modules*

CISPR 15, *Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment*

IEC 61000-3-2, *Electromagnetic compatibility (EMC) — Part 3-2: Limits — Limits for harmonic current emissions (equipment input current ≤ 16 A per phase)*

IEC 61000-4-5, *Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test*

IEC 61000-4-7, *Electromagnetic compatibility (EMC) — Part 4-7: Testing and measurement techniques - General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*

IEC 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase*

IEC 61643-11, *Low-voltage surge protective devices — Part 11: Surge protective devices connected to low-voltage power systems - Requirements and test methods*

IEC 62301, *Household electrical appliances — Measurement of standby power*

IEC 62612, *Self-ballasted LED lamps for general lighting services with supply voltages > 50 V — Performance requirements*

IEC 62722-2-1, *Luminaire performance — Part 2-1: Particular requirements for LED luminaires*

IEC TR 61341, *Method of measurement of centre beam intensity and beam angle(s) of reflector lamps*

IEC TR 61547-1, *Equipment for general lighting purposes — EMC immunity requirements — Part 1: Objective light flickermeter and voltage fluctuation immunity test method*

IEC TR 63158, *Equipment for general lighting purposes — Objective test method for stroboscopic effects of lighting equipment*

IEEE 1789, *IEEE Recommended Practices for Modulating Current in High-Brightness LEDs for Mitigating Health Risks to Viewers*

IES LM 80, *IES Approved Method for Measuring Lumen Maintenance of LED Light Sources*

IES LM 84, *IES Approved Method for Measuring Lumen and Colour Maintenance LED Lamps, Lighting engines, and Luminaires*

IES LM-79, *Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products*

IES TM-21, *Projecting long term lumen maintenance of LED light sources*

IEC 60061-1 Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 1: Lamp caps

IEC 60061-2 Lamp caps and holders together with gauges for the control of interchangeability and safety - Part 2: Lamp holders)

IEC 60529, Degrees of protection provided by enclosures (IP Code)

IEC 60598-2-1 Luminaires - Part 2-1: Particular requirements - Fixed general purpose luminaires

IEC 60598-2-2 Luminaires - Part 2-2: Particular requirements - Recessed luminaires

IEC 60598-2-3 Luminaires – Part 2-3: Particular requirements

Luminaires for road and street lighting

IEC 60598-2-5 Luminaires - Part 2-5: Particular requirements – Floodlights

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1

applicant

manufacturer or importer seeking approval for lighting product(s). The applicant shall be an existing legal entity

3.2

approval

confirmation by the appropriate government agency that a particular lighting product(s) satisfies all the requirements of this mandatory standard

3.3

arithmetical mean

average of a set of numerical values, calculated by adding them together and dividing by the number of terms in the set

3.4

beam angle of a directional light source

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 light source 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.

Note 1 to entry: For light sources that have different beam angles in different planes, the largest beam angle shall be considered

Note 2 to entry: For light sources with user-controllable beam angle, the beam angle corresponding to the 'reference control setting' shall be considered.

3.5

chromaticity

property of a colour stimulus defined by its chromaticity coordinates (in either x,y or u',v' coordinate system)

3.6

colour consistency

maximum deviation of the chromaticity coordinates of samples of a product from the chromaticity coordinates of the nominal CCT value

3.7

colour rendering index (CRI)

measure of the degree to which the psychophysical colour of an object illuminated by the test illuminant conforms to that of the same object illuminated by the reference illuminant, suitable allowance having been made for the state of chromatic adaptation. CRI is a measure of the ability of a light source to accurately reveal the colours of various objects in comparison with an incandescent source of the same colour temperature

3.8

colour-tuneable light source (CTL)

connected lamp or luminaire using LED or OLED technology, that can be set to emit light with a large variation of colours outside the range defined in the scope, but can also be set to emit white light inside the colour range defined in the scope (clause 5.1)

Note 1 to entry: This term does not include tuneable-white lamps that can only be set to emit white light, with different colour temperatures, within the range defined in the scope.

Note 2 to entry: This term does not include dim-to-warm lamps, that shift their white light output to lower colour temperature when dimmed, simulating the behaviour of incandescent light sources.

3.9

connected lighting product (CL)

lighting product including data-connection parts that are physically integrated with the light emitting parts in a single inseparable housing, and where the data-connection parts cannot be disconnected, switched-off or their power consumption minimised.

3.10

correlated colour temperature (CCT)

temperature of the Planckian radiator whose perceived colour most closely resembles that of a given stimulus at the same brightness and under specified viewing conditions. Units: K. Lamps with a high CCT, e.g. 6500 K, produce blueish-white light, whereas those with a low CCT of 2700 K produce light that is more yellowish-white.

3.11

data-connection parts

parts that perform one of the following functions:

- a) reception or transmission of wired or wireless data signals and the processing thereof (either used to control the light emission function or otherwise),
- b) sensing and processing of the sensed signals (either used to control the light emission function or otherwise),
- c) actuation by audio control (including voice control),
- d) a combination of these.

3.12

declaration report

report that is issued by an accredited conformity assessment body, indicating the equivalence of standards.

3.13

displacement factor: (also called fundamental power factor)

quantifies the displacement (phase-shift) between the fundamental current and voltage waveforms by calculating the cosine of the phase-shift angle ($\cos \phi_1$). Displacement factor is a more detailed measure to quantify the displacement of the current and its effect on the power supply network.

3.14

endurance test: (also called a supply switching test)

switching on and off of a lamp or luminaire to simulate how the product will perform over its lifetime. The test is carried out to stress the lamp over a period of time to help determine the failure rates and luminous flux maintenance of that product.

3.15

family

group of lamps, luminaires, light modules or drivers with the same brand name that has essentially identical: (1) physical characteristics and construction, (2) system design and performance, and (3) quality and safety characteristics. Any variation within a family of models shall have little or no effect on the efficacy and performance of those models.

3.16

flicker

perception of visual unsteadiness induced by a light stimulus the luminance or spectral distribution of which fluctuates with time, for a static observer in a static environment. The fluctuations can be periodic and non-periodic and may be induced by the light source itself, the power source or other influencing factors.

3.17

fluorescence or fluorescent light source

phenomenon or a light source using an electric gas discharge of the low-pressure mercury type in which most of the light is emitted by one or more layers of phosphors excited by the ultraviolet radiation from the discharge. Fluorescent light sources may have one ('single-capped') or two ('double-capped') connections ('caps') to their electricity supply. For the purposes of this standard, magnetic induction light sources are also considered as fluorescent light sources.

3.18

gas discharge

phenomenon where light is produced, directly or indirectly, by an electric discharge through a gas, plasma, metal vapour or mixture of gases and vapours

3.19

general illumination purposes

any light source that fulfils the requirements of products listed in Clause 5 of this standard

3.20

halogen lamp

gas-filled lamp containing halogens or halogen compounds, the light-emitting filament being made of tungsten

3.21

high-intensity discharge, (HID)

electric gas discharge in which the light-producing arc is stabilised by wall temperature and the arc chamber has a bulb wall loading in excess of 3 Watts per square centimetre. 'Gas discharge' means a phenomenon where light is produced, directly or indirectly, by an electric discharge through a gas, plasma, metal vapour or mixture of gases and vapours. For the purpose of this Standard, HID light sources are limited to metal halide, high-pressure sodium and mercury vapour types.

3.22

illumination

application of light to a scene, objects or their surroundings so that they may be seen

3.23

incandescence

emission of optical radiation by the process of thermal radiation. In light sources incandescence is typically produced by the passage of an electric current through a threadlike resistive conductor ('filament') which generates heat.

3.24

indoor ambient luminaire

See Section 5.2

3.25

ingress protection (IP) rating

numerical classification preceded by the symbol IP applied to the enclosure of equipment to provide:

- a) protection of persons against contact with, or approach to, live parts and against contact with moving parts (other than smooth rotating shafts and the like) inside the enclosure,
- b) protection of the equipment against ingress of solid foreign objects, and
- c) where indicated by the classification, protection of the equipment against harmful ingress of water

Note 1 to entry: The conditions for other than rotating machines are specified in IEC 60529, Degrees of protection provided by enclosures (IP Code).

Note 2 to entry: The detailed test requirements for rotating electric machines are in IEC 60034-5, Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification.

Note 3 to entry: The enclosure which provides the degree of protection IP is not necessarily the same as the equipment enclosure providing the Type of Protection.

Note 4 to entry: An enclosure which provides the degree of protection required by one of the Types of Protection will have been subjected to other tests prior to the tests for degree of protection.

3.26

life (of a lamp or luminaire)

total time for which a lamp or luminaire has been operated before it becomes useless or is considered to be so according to specified criteria. Note: life is usually expressed in hours and as an average time at which point half of the light sources concerned are expected to have failed or become noncompliant according to specified criteria. (e.g. 70% of light output).

3.27

light emitting diode (LED)

technology in which light is produced from a solid-state device embodying a p-n junction of inorganic material or organic material. This latter case is also known as 'organic light emitting diode' (OLED). In both cases the junction emits optical radiation when excited by an electric current.

3.28

linear fluorescent light source (LFL)

cylindrical tube with two ('double-capped') connections ('caps') one at each end of the tube. These connect to the electricity supply via control gear and the tube can have different diameters, commonly T5 ø16 mm, T8 ø26 mm and T12 ø38 mm.

3.29

linear LED light source

equivalent LED based light source to an LFL, physically fitting the same luminaire. It can be a direct retrofit running on the same control gear (i.e., electronic ballast or high frequency ballast) or on a direct mains power connection.

3.30

lumen (lm)

SI unit of luminous flux which is emitted in unit solid angle (steradian) by a uniform point source having a luminous intensity of 1 candela. It indicates the amount of visible light the lamp provides.

3.31

luminaire

apparatus which distributes, filters or transforms the light transmitted from one or more lamps and which includes, except the lamps themselves, all the parts necessary for fixing and protecting the lamps and, where necessary, circuit auxiliaries together with the means for connecting them to the electric supply. Also referred to as a light fixture or light fitting.

3.32

luminous efficacy (η_v)

expressed in lm/W, quotient of the luminous flux emitted by the electric power consumed by the light source. It is an expression of how energy efficient a lamp or luminaire is at producing visible light.

3.33

luminous flux or flux (Φ or Φ_v)

expressed in lumen (lm), means the quantity derived from radiant flux (radiant power) by evaluating the electromagnetic radiation in accordance with the spectral sensitivity of the human eye.

3.34

model

all the units in a product line from the same manufacturer, sold under the same brand name, and which are identical except for a serial number or other identifying mark. Any variation within a product line of models shall have no effect on the efficacy and performance of those models and shall only be due to natural manufacturing variation observed within otherwise identical units.

3.35

outdoor / streetlight luminaire

see Section 5.3

3.36

passive adaptor (also called lamp holder adaptor)

connecting device capable of being inserted into a lamp holder and has outlet facilities for connection to a flexible cord or integral flexible cord or fitted with lamp holders. The adaptor may incorporate electronic circuits to control the output.

3.37

rated life, $L_{70}B_{50}$: for LED and OLED light sources

time in hours between the start of their use and the moment when for 50 % of a population of light sources the light output has gradually degraded to a value below 70 % of the initial luminous flux. This is also referred to as the $L_{70}B_{50}$ lifetime;

3.38

rated luminous flux

value of the initial luminous flux of a given model of lamp/luminaire declared by the manufacturer or the responsible vendor, the lamp being operated under specified conditions. Unit: lumen (lm)

Note 1 to entry: The initial luminous flux may be the luminous flux of a lamp/luminaire after a short ageing period, as specified in the relevant lamp standard.

Note 2 to entry: The rated luminous flux is sometimes marked on the lamp/luminaire.

3.39

rated input power

value of the consumed electrical power by a given model of lamp/luminaire declared by the manufacturer or the responsible vendor, the lamp/luminaire being operated under specified conditions. Unit: watt (W). Note: The rated power is usually marked on the lamp/luminaire.

3.40

rated voltage or rated voltage range

nominal voltage/range of voltage at which a piece of electrical equipment is designed to operate. The rated voltage is usually required to be marked on the light source.

3.41

reference control setting

control setting or combination of control settings that is used to verify compliance of a light source with this standard. These settings are relevant for light sources that allow the end-user to control, manually or automatically, directly or remotely, the luminous intensity, colour, colour temperature, spectrum, and/or beam angle of the emitted light.

3.42

sensor

device permanently connected to the electricity supply and integrated in a lamp or luminaire to sense environmental conditions and control the lamp or luminaire in some way. For example, a daylight sensor that switches the light source on at dusk or a motion detector that turns the light source off when nobody is there.

3.43

short term flicker indicator (PstLM)

perception of visual unsteadiness induced by a static light stimulus the luminance or spectral distribution of which fluctuates with time, for a static observer in a static environment. The fluctuations can be periodic and non-periodic and may be induced by the light source itself, the power source or other influencing factors. The metric for flicker used in this Standard is the 'PstLM', where 'st' stands for short term and 'LM' for light flicker meter method, as defined in standards. A value of PstLM=1 means that the average observer has a 50% probability of detecting flicker, a measure of flicker evaluated over a duration of at least 180 seconds in accordance with IEC 61547-1.

3.44

stroboscopic effect

change in motion perception induced by a light stimulus the luminance or spectral distribution of which fluctuates with time, for a static observer in a non-static environment. The fluctuations can be periodic and non-periodic and may be induced by the light source itself, the power source or other influencing factors. The metric for the stroboscopic effect used in this Standard is the 'SVM' (Stroboscopic Visibility Measure), as defined in standards. SVM=1 represents the visibility threshold for an average observer to have a 50% probability of detecting stroboscopic effects.

3.45

stroboscopic effect visibility measure (SVM)

stroboscopic effect evaluated over a specified time interval of a relatively short duration. The duration is at least 1 second, in accordance with CIE TN 006 and IEC TR 63158.

3.46

valid test report

copy of an original test report issued for a regulated (covered) product by a laboratory accredited by an internationally recognised body, which is also recognised under a given country's conformity assessment policy. The internationally recognised body should be a member of the IAF/ILAC/IECEE mutual recognition scheme.

4 Symbols and/or abbreviated terms

ANSI American National Standards Institute

CCT Correlated Colour Temperature

CFL Compact Fluorescent Lamp

CIE Commission Internationale de l'Eclairage

CISPR Comité International Spécial des Perturbations Radioélectriques

CL Connected Lighting

CLD Control of Light Distribution

CRI Colour Rendering Index

CTL Colour Tuneable Light

EAC East African Community

EASC East African Standards Committee

EMC Electromagnetic Compatibility

EN European Norm

EU European Union

GSL General Service Lamp

HID High Intensity Discharge

HT Harmonised Text

Hz Hertz

IAF International Accreditation Forum

IEA International Energy Agency

IEC International Electrotechnical Commission

IECEE IEC Conformity Assessment for Electrotechnical Equipment and Components

IES Illuminating Engineering Society (North America)

ILAC International Laboratory Accreditation Cooperation

IP Ingress Protection

ISO International Standards Organisation

ISTMT In-situ Temperature Measurement Test

K Kelvin

klm kilolumen

LED Light Emitting Diode

LFL Linear Fluorescent Lamp

lm Lumen

mm millimetre

mW milliwatt

NEMA National Electrical Manufacturers Association

nm nanometer

OLED Organic Light Emitting Diode

PstLM Short term flicker indicator

SDCM Standard Deviation Colour Matching

SI Système International

SVM Stroboscopic Visibility Measure

TBT Technical Barriers to Trade

TN Technical Note (CIE)

TR Technical Report (IEC)

U4E United for Efficiency (United Nations Environment)

UV Ultraviolet

V Voltage

W Watts

5 Product description

5.1 General

Products within the scope have light emission with the chromaticity coordinates (x, y) that are within the range defined by the equations below (and shown in Figure 1):

- a) $0,250 < x < 0,570$ and
- b) $-2,3172 x^2 + 2,3653 x - 0,2400 < y < -2,3172 x^2 + 2,3653 x - 0,1400$

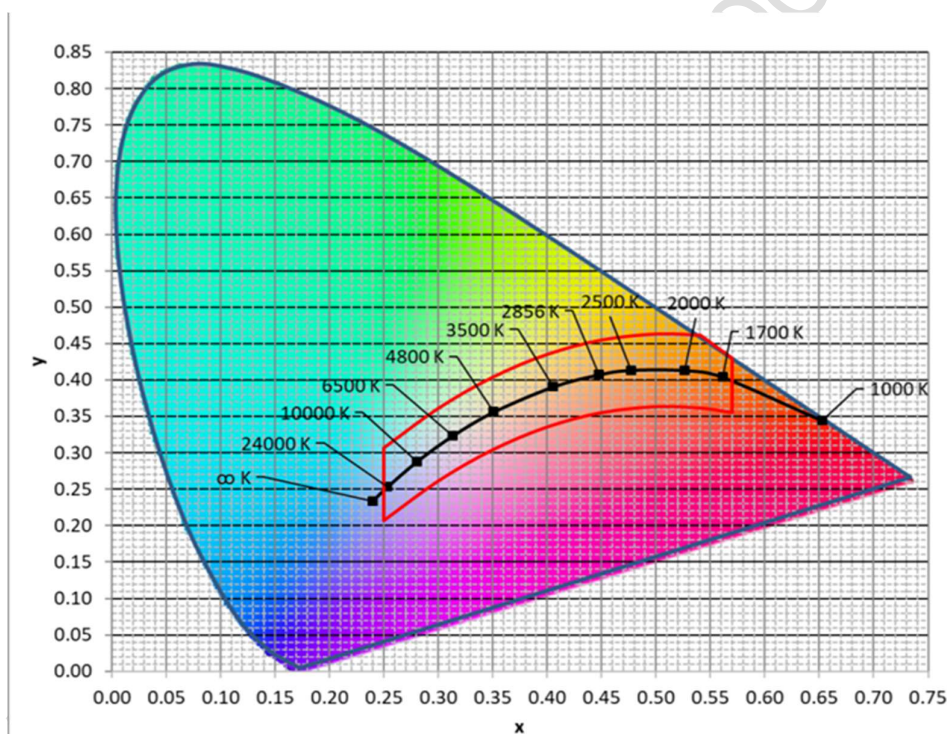


Figure 1 — Plot of the chromaticity equations defining the light emission region

5.2 Indoor ambient luminaires

5.2.1 Indoor ambient luminaires — Inclusions

Indoor ambient luminaires, comprising both fluorescent and LED light sources and driver equipment, which have chromaticity coordinates defined in clause 5.1, include the following:

5.2.1.1 Linear batten luminaire

A long luminaire designed to provide direct lighting to indoor spaces which is usually surface-mounted, has a thickness (product height) greater than 30 mm, is in scope of IEC 60598-2-1; and which satisfies one of the following conditions:

- a) Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or uses individual LED packages in place of a LED module, or
- b) Includes IEC standardised lamp holder(s) as specified in IEC 60061.

5.2.1.2 Linear troffer luminaire

A long luminaire designed to provide lighting to indoor spaces which is usually installed flush with the ceiling (IEC IEV Ref 845-10-13), has a thickness (product height) greater than 30mm, is in scope of either IEC 60598-2-1 or IEC 60598-2-2, and which satisfies one of the following conditions:

- a) Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or uses individual LED packages in place of a LED module, or
- b) Includes IEC standardised lamp holder(s) as specified in IEC 60061.

5.2.1.3 Downlight luminaire

A small luminaire where light is directed downward, usually recessed into the ceiling (IEC IEV Ref 845-10-15), is in the scope of IEC 60598-2-2, and which satisfies one of the following conditions:

- a) Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or uses individual LED packages in place of a LED module, or
- b) Includes IEC standardised lamp holder(s) as specified in IEC 60061.

5.2.1.4 High-bay luminaires

An indoor luminaire often constructed as a pendant style suspended circular luminaire with a large reflector designed to illuminate large areas with high ceilings from 6 to 16 metre heights and which satisfies one of the following conditions:

- a) Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or uses individual LED packages in place of a LED module, or
- b) Includes IEC standardised lamp holder(s) as specified in IEC 60061.

5.2.1.5 Low-bay luminaires

An indoor often constructed as a ceiling-mounted box-type construction designed to illuminate areas with ceilings typically from 4 to 6 metre ceiling heights and which satisfies one of the following conditions:

- a) Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or uses individual LED packages in place of a LED module, or
- b) Includes IEC standardised lamp holder(s) as specified in IEC 60061.

5.2.1.6 Planar (or panel) luminaire

An indoor luminaire usually recess-mounted and often nominally 300 mm x 1200 mm, 600 mm x 600 mm, and 600 mm x 1200 mm and a frosted waveguide material as the emitting surface. These luminaires have a thickness (product height) less than 30 mm, and satisfy one of the following conditions:

- a) is either a Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or
- b) uses individual LED packages in place of a LED module and does not include IEC standardised lamp holders as specified in IEC 60061.

5.2.2 Indoor ambient luminaires – Exclusions

This standard shall not apply to indoor ambient luminaires specifically, tested, marketed and approved to operate as listed below:

- a) in potentially explosive atmospheres;
- b) medical applications;
- c) horticulture;
- d) animal care;
- e) for emergency use; and
- f) in or on aircraft.

5.3 Outdoor / streetlight luminaires

Outdoor/streetlight luminaires shall meet the following criteria:

- a) produce light with chromaticity coordinates defined part 1 of this standard.
- b) designed for use in road, street and tunnel lighting and other public outdoor lighting applications (such as parking lots, pedestrian walkways and bicycle paths);
- c) Is in the scope of either IEC 60598-2-3 or IEC 60598-2-5; and
- d) satisfies one of the following conditions:
 - a) Type A or Type B LED luminaire as specified in the scope of IEC 62722.2.1, or uses individual LED packages in place of a LED module, or
 - b) Includes IEC standardised lamp holder(s) as specified in IEC 60061.

6 Requirements

6.1 Energy efficiency requirements

6.1.1 General

6.1.1.1 All covered luminaires shall comply with the minimum luminous efficacy requirements for the entire light source (i.e., luminaire) set out in two phases in Table 1:

Table 1 — Minimum luminous efficacy of luminaires

Type of covered product*	Minimum luminous efficacy (lm/W)	
	Phase 1 (1 April 2022)	Phase 2 (1 April 2024)
Linear batten and troffer luminaires	105	115
Downlight luminaires	85	95
High and low-bay luminaires	120	130
Planar (or panel) luminaires	85	95
Outdoor / streetlight luminaires	105	115
*The scope of coverage of these luminaires is given in clause 5 of this Standard		

6.1.1.2 Depending on the characteristics of the luminaires, the minimum luminous efficacy values required in Table 1 may be decreased by the following efficacy allowances given in Table 2. For example, a Downlight Luminaire that emits 350 lumens could adjust the Phase 1 requirement by subtracting 10 lm/W, such that the minimum required 85 lm/W is adjusted down to 75 lm/W.

Table 1 — Efficacy allowances for specific luminaires with special characteristics

Special characteristics of luminaires	Efficacy allowances lm/W
Luminous flux Φ (lm) below 400 lm	- 10
CCT < 2500 K	- 10 lm/W
High CRI (Ra >90)	- 10 lm/W

6.1.1.3 With respect the efficacy allowances listed in Table 2, the following notes also apply:

NOTE 1: Where applicable, efficacy allowances are additive

NOTE 2: Light sources that allow the end-user to adapt the spectrum and/or the beam angle of the emitted light, thus changing the values for luminous flux, CRI-Ra and/or colour temperature (Tc), and/or changing their directional lamp or non-directional lamp status, shall be evaluated using the reference control settings (defined in clause 3).

6.1.2 Standby power (applicable to connected lamps and luminaires)

Standby power (P_{sb}) luminaires shall not exceed 0.5 W. Networked standby power (P_{net}) for connected lamps and luminaires shall not exceed 0.5 W. The allowable values for standby power and networked standby power shall not be added together.

6.1.3 Fundamental power factor (also called displacement factor or Cos ϕ 1)

All luminaires shall have a displacement factor as set out in Table 3.

Table 3 — Fundamental power factor

Rated Input power, P (W)	Displacement factor
$P \leq 2 \text{ W}$	No limit
$2 \text{ W} < P \leq 5 \text{ W}$	≥ 0.4
$5 \text{ W} < P \leq 10 \text{ W}$	≥ 0.7
$P > 10 \text{ W}$	≥ 0.9

6.2 Functional performance requirements

6.2.1 Colour Rendering Index (CRI)

When tested in accordance with IEC 62722-2-1, the CRI shall be as follows:

- a) For interior ambient luminaires: $R_a \geq 80$; and
- b) For outdoor / streetlighting luminaires: $R_a \geq 70$.

6.2.2 Harmonics

The harmonics shall comply with IEC 61000-3-2.

6.2.3 Nominal CCT

CCT shall be $\geq 2200 \text{ K}$ and $\leq 6500 \text{ K}$ and be within the 7-step quadrangles as set out in ANSI 78.377.

6.2.4 Lumen maintenance factor

6.2.4.1 Outdoor luminaires

The lumen maintenance factor shall not be less than that stated in, and after testing according to Annex B.

6.2.4.2 All other luminaires

The lumen maintenance factor $X_{LMF}\%$ after testing according to Annex A shall be not less than $X_{LMF,MIN}\%$, calculated as follows:

$$X_{LMF,MIN}\% = 100 \times e^{\frac{(3000 \times \ln(0.7))}{L_{70}}}$$

Where

L_{70} is the declared L_{70B50} lifetime (in hours)

Upper limit for $X_{LMF,MIN}\%$ is the calculated required lumen maintenance of the sample shall not exceed 96.0 % (i.e., $X_{LMF,MIN} \leq 96.0 \%$).

6.2.5 Survival factor

No less than 90 % of sample units shall be operational following endurance testing according to Annex A.

6.2.6 EMC emissions

Electromagnetic emissions shall comply with CISPR 15.

6.2.7 EMC immunity

Electromagnetic immunity (including voltage surge and dip) – the luminaire shall comply with IEC TR 61547-1.

6.2.8 Short term flicker indicator (PstLM)

Short term flicker indicator shall be ≤ 1.0 at full load and a sinusoidal input voltage (i.e. intrinsic performance) in accordance with IEC TR 61547-1

6.2.9 Stroboscopic effect visibility measure (SVM)

Stroboscopic effect visibility measure shall be ≤ 0.4 at full load and a sinusoidal input voltage (i.e. intrinsic performance) in accordance with IEC TR 63158.

6.2.10 Colour consistency

Products shall comply with either the requirements in the x,y chromaticity coordinates column or the u',v' chromaticity coordinates column, based on the nominal CCT:

Table 4 — Colour consistency

Product type	x,y Chromaticity coordinates	u',v' Chromaticity coordinates
Indoor ambient luminaires	≤ 3 SDCM	≤ 3 step u'v' circle
Outdoor/streetlight luminaires	≤ 5 SDCM	≤ 5 step u'v' circle

6.2.11 Additional functional requirements for indoor ambient luminaires and outdoor/streetlight luminaires

6.2.11.1 Warranty

A legally binding warranty statement shall be supplied with the product which guarantees against manufacturing or design faults for an extended period from the date of purchase during which free exchange or repair of the defective product shall be offered as below:

- Indoor luminaire: Minimum 3 years
- Outdoor/streetlight luminaire: Minimum 5 years

6.2.11.2 Serviceability / repairability

The luminaire shall be accessible and serviceable by maintenance personnel and have light source and driver replaceable to extend service life.

6.2.11.3 IP rating

When tested in accordance with IEC 60529, the IP rating shall be as follows;

- a) Indoor luminaire: —Minimum of IP20
- b) Outdoor/streetlight luminaire: —Minimum of IP65.

6.2.12 Additional functional requirements for outdoor/streetlight luminaires

6.2.12.1 Luminaire lifetime

L_{70B50} for shall be as follows

- a) outdoor luminaires, minimum 30,000 h; and
- b) streetlight and tunnel luminaires minimum, 50,000 h

6.2.12.2 Total circuit power

Total circuit power of the luminaire shall be $\pm 10\%$ of the rated power declared by the manufacturer.

6.2.12.3 Operating voltage

Outdoor lighting and streetlight luminaires shall start and continue to operate at 70% of the nominal mains voltage (220 – 240 V a.c.) and shall comply with IEC TR 61547 for voltage surges.

6.2.12.4 Surge protection devices

The luminaire shall have a surge protection device external to the controller which meets the requirements of IEC 61643-11.

6.2.12.5 Nominal CCT

CCT shall be $\geq 2700\text{ K}$ and $\leq 5000\text{ K}$ and be within the 7-step quadrangles as set out in ANSI

78.377.6.2.12.6 Smart lighting compatible

The luminaire shall incorporate a NEMA 7-pin compatible socket (NEMA/ANSI C136.41).

6.2.12.7 Control of light distribution

Luminaires shall conform to the Control of Light Distribution (CLD) requirements set out in the table below, where:

$$\text{CLD}(\%) = (\text{Zonal flux} \times 100) / \text{Total luminous flux}$$

Table 5 — Requirements for CLD limits

Type of Luminaire		CLD (%)
Full cut-off	Above 90°	0%
	Above 80° and up to 90°	≤ 10%
Cut-off	Above 90°	≤ 2.5%
	Above 80° and up to 90°	≤ 10%

6.2.13 Control settings

The reference control settings shall be those predefined by the manufacturer as factory default values and encountered by the user at first installation (out-of-the-box values). If the installation procedure foresees an automatic software update during first installation, or if the user has the option to perform such an update, the resulting change in settings (if any) shall be taken into account.

The light source manufacturer shall define the reference control settings such that:

- The light source is in scope of this standard according to 5.2.1 and none of the conditions for exemption of 5.2.2 applies (if this is not possible, the light source is out-of-scope or exempted);
- The adjustable/selectable beam angle is the narrowest available;
- The power consumption of lighting control parts and non-lighting parts is minimal (if these parts cannot be disconnected or switched-off);
- The full-load condition is obtained (maximum initial luminous flux given the other chosen settings);

When the end-user opts to reset factory defaults, the reference control settings are obtained.

6.3 Labelling

6.3.1 General

The information listed in 6.3.2 and 6.3.3 apply to the products listed clauses 5.2 and 5.3.

6.3.2 Labelling on product

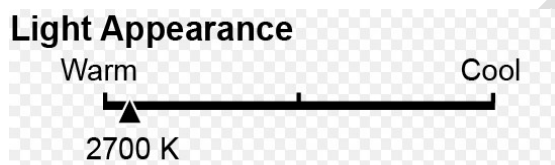
The following information shall be legibly and indelibly printed on indoor/outdoor and streetlight luminaires

- rated power in Watts;
- rated operating voltage
- rated frequency;
- trade name or brand name;
- rated initial luminous flux in lumens;
- rated correlated colour temperature (CCT) in Kelvin (K); and
- for directional luminaires only, beam angle in degrees.

6.3.3 Labelling on packaging

The following information shall be legibly and indelibly indicated on the packaging, wrapping, container or on installation instruction

- a) rated power in Watts;
- b) rated operating voltage including the minimum voltage specified (i.e., the voltage range) and frequency;
- c) trade name or brand name and physical address;
- d) displacement factor;
- e) rated initial luminous flux in lumens;
- f) rated efficacy in lumens per Watt (lm/W) for the complete lamp / luminaire device;
- g) rated lifetime in hours and $L_{70}B_{50}$ if longer;
- h) rated correlated colour temperature (CCT) in Kelvin (K) combined with a sliding scale;



- i) statement on dimmability. Clearly state whether dimmable or not dimmable. If dimmable, then information on dimmer compatibility, or web link to this information;
- j) efficiency label compliant with the EAC regional energy label or a recognised equivalent;
- k) safety certifications and statement.
 - l) IP ratingm) CRI; and
 - n) rated current

6.3.4 Labelling requirements applicable to specific types of luminaires

The following information on the packaging and in all forms of product information is mandatory only for the luminaire types specified below:

- a) Indoor luminaires that are directional: Beam angle;
- b) For indoor luminaires and outdoor / streetlight luminaires: Ingress Protection (IP) rating;
- c) Any covered lighting product where standby power is not zero: Rated standby power (P_{sb}), expressed in W and rounded to the second decimal;
- d) Any covered lighting product where networked standby power is not zero: Rated networked standby power (P_{net}) for the connected light source, expressed in W and rounded to the second decimal; and

- e) Any covered lighting product that incorporates a voltage surge and dip immunity claim: Manufacturers are not required to provide a voltage surge and dip immunity claim (e.g. "Withstands Power Surge", "Power Surge Protected"). However, if they do, then the claim shall meet the EMC immunity requirements for equipment for general lighting purposes as set out in IEC 61547.

7 Sampling and testing

7.1 General

7.1.1 The metrics, referenced standards, conformity assessment and surveillance testing for all the covered products are set out in this section.

7.1.2 Standards issued by different standardization bodies such as ISO, IEC and ARSO will only be accepted if it is proven, in the form of a declaration report from an accredited conformity assessment body, that they are technically equivalent to the relevant standards listed in Table 6 in this clause. The applicant shall be responsible for obtaining such a declaration report.

7.2 Referenced test standards and assessment for indoor ambient luminaires and outdoor / streetlight luminaires

7.2.1 Table 6 sets out the metrics, lamp type, standards and sample size and pass criteria for conformity assessment (for suppliers) and surveillance testing (for governments).

7.2.2 Table 6 shall be assessed taking into account the following notes:

- a) • Valid Test reports or certificates. Test reports or certificates based on previous editions of reference standards are valid if the product has not undergone technical revisions/updates
- b) The same sample of luminaires may be used for certain metrics as set out in the test sequence in Annex A;
- c) : The first compliance check to be luminous efficacy after initial ageing to avoid unnecessary testing of non-compliant product;
- d) For suppliers (i.e., importers and manufacturers), the required sample sizes and criteria for conformity assessment shall be the same as those set-out in the requirements of the referenced measurement standards;
- e) For governments (i.e., market surveillance authorities) the surveillance testing criteria for verification testing are less stringent than the criteria in the Measurement Standards to allow for measurement uncertainties and manufacturing tolerances; and
- f) The surveillance testing criteria shall not be used by suppliers for conformity assessment with this standard (see d) above);

Table 6 — Relevant test standards, conformity assessment and surveillance testing for Indoor ambient luminaires and outdoor / streetlight luminaires

Phenomena	Luminaire type	Standard	Conformity assessment (for suppliers)	Surveillance testing (for government)
Luminous Efficacy [lm/W]	All	Calculated. See below for (measured luminous flux / measured power)	Sample of 3 units. The arithmetical mean of the calculated luminous efficacy of the 3 units shall not be less than required level.	Sample of 3 units. The arithmetical mean of the calculated luminous efficacy of the 3 units shall not be less than required level.
Initial luminous flux [lumens]	LED	IEC 62722-2-1 CIE S 025	Sample of 3 units. The arithmetical mean of the measured luminous flux of the 3 units shall not be less than 95 % of the rated luminous flux and the measured luminous flux of each individual lamp of the sample shall not be less than 90 % of the rated luminous flux	Sample of 3 units. The arithmetical mean of the measured luminous flux of the 3 units shall not be less than 95 % of the rated luminous flux
	Non-LED Luminaires	IEC 62722-2 series CIE 84 CIE 121		
Colour Rendering Index (CRI), Ra	LED	IEC 62722-2-1 CIE S 025 CIE 13.3	Sample of 3 units. The measured CRI of each individual lamp of the sample shall not be less than the required CRI-R _a level minus 3	Sample of 3 units. The arithmetical mean of the measured CRI of the 3 units shall not be less than the required CRI-R _a level minus 3
Colour Consistency	LED	IEC 62722-2-1 CIE S 025 CIE 015	Sample of 3 units. For each individual lamp of the sample, the measured CCT shall conform to the industry standard tolerances contained in the IEC standards used for testing.	Sample of 3 units. The arithmetical mean of the measured CCT shall conform to the industry standard tolerances contained in the standards used for testing.
Correlated colour temperature (CCT)	LED	IEC 62722-2-1 CIE S 025 CIE 015 ANSI C78.377	Sample of 3 units. For each individual lamp of the sample, the measured chromaticity coordinates shall conform to the tolerances contained in ANSI C78.377 for the nominal CCT.	Sample of 3 units. For each individual lamp of the sample, the measured chromaticity coordinates shall conform to the tolerances contained in ANSI C78.377 for the nominal CCT.
Total Circuit Power [Watts]	LED	IEC 62722-2-1 CIE S 025	Sample of 3 units. The arithmetical mean of the measured power of the 3 units shall not exceed 107.5 % of the rated power, and the measured power of each individual lamp of the sample shall not exceed 110% of the rated power.	Sample of 3 units. The arithmetical mean of the measured power of the 3 units shall not exceed 110 % of the rated power, and the measured power of each individual lamp of the sample shall not exceed 115% of the rated power.
	Non-LED	IEC 62722-2 series CIE 84 CIE 121		

Phenomena	Luminaire type	Standard	Conformity assessment (for suppliers)	Surveillance testing (for government)
Displacement Factor	LED	IEC 62722-2-1	Sample of 3 units. The measured displacement factor of each individual lamp of the sample shall not be less than the required level minus 0.05.	Sample of 3 units. The arithmetical mean of the measured displacement factor of the 3 units shall not be less than the required level minus 0.05.
Voltage Variation	LED	IEC 61000-4-11 IEC 61000-4-5	Sample of 3 units. All units in the sample shall start and continue to operate at 70 % of the country's nominal installation voltage. All units shall meet the requirements of IEC 61547 for voltage surges.	Sample of 3 units. All units in the sample shall start and continue to operate at 70% of the country's nominal installation voltage. All units shall meet the requirements of IEC 61547 for voltage surges.
Harmonics	LED	IEC 61000-4-7 IEC 61000-3-2	Sample of 3 units. All units in the sample shall conform to IEC 61000-3-2.	Sample of 3 units. All units in the sample shall conform to IEC 61000-3-2.
Luminaire Lifetime	LED	IES LM 80 / TM 21 IES LM 84 / TM 28	Sample of 3 units. See Annex A.	Sample of 3 units. See Annex A.
Surge Protection Devices	LED	ANSI C136.2 IEC 61643-11	Sample of 3 units. All units in the sample shall incorporate a surge protection device that conforms to ANSI C136.2 or IEC 61643-11.	Sample of 3 units. All units in the sample shall incorporate a surge protection device that conforms to ANSI C136.2 or IEC 61643-11.
Control of Light Distribution	LED	IES LM-79 CIE S 025	At 0° upcast the luminaire meets the CLD requirements for the nominated type of luminaire.	At 0° upcast the luminaire meets the CLD requirements for the nominated type of luminaire.
Short-term Flicker indicator (P _{st} LM)	LED	IEC TR 61547-1	Sample of 3 units. For each individual lamp of the sample, the measured P _{st} LM of the 3 units shall not be more than the required level plus 5%.	Sample of 3 units. For each individual lamp of the sample, the measured P _{st} LM of the 3 units shall not be more than the required level plus 5%.
Stroboscopic effect Visibility Measure (SVM)	LED	IEC TR 63158	Sample of 3 units. For each individual lamp of the sample, the measured SVM of the 3 units shall not be more than the required level plus 5%.	Sample of 3 units. The arithmetical mean of the measured SVM of the 3 units shall not be more than the required level plus 5%.

Phenomena	Luminaire type	Standard	Conformity assessment (for suppliers)	Surveillance testing (for government)
EMC emissions	All	CISPR 15	Sample of 1 unit. Shall meet the requirements of the standard.	Sample of 1 unit. Shall meet the requirements of the standard.
EMC immunity (including voltage surge and dip)	All	IEC 61547	Sample of 1 unit. Shall meet the requirements of the standard.	Sample of 1 unit. Shall meet the requirements of the standard.

8 Requirements for applicant

8.1 With respect to the performance requirements (Clause 6), the following evidence shall be submitted to the national regulatory authority as proof of conformity with the requirements of this standard:

- a) a completed application form as specified in Annex B or a similar form as required by the national regulatory authority;
- b) evidence of conformity to requirements set out in Clause 6 - A valid test report issued by a laboratory appropriately accredited by an internationally recognised body being a member of an IAF/ILAC/IECEE mutual recognition scheme in accordance with the country's conformity assessment policy; and
- c) other documents as required by the national regulatory authority.

8.2 The applicant shall ensure that each model of the lighting product has been approved and successfully registered by the relevant regional or national regulatory authority before offering it for sale, or import, or supply in accordance with the requirements set out in the relevant regulations.

8.3 Evidence of conformity which is deemed unacceptable includes, for example, self-certification reports, declaration of one product being applied to another, data sheets without valid test reports and so on. Only valid test reports will be accepted as evidence of compliance to the requirements of covered products.

8.4 The applicant shall inform the regulatory authority of any change in design or materials affecting any mandatory requirement in terms of this standard for any product, even within a family of products. In the event of such change(s) the regulatory authority may, at its discretion, demand that the applicant submits a new application for approval.

8.5 The applicant shall, on request, provide the regulatory authority with proof of compliance in respect of any model of lighting product included in the scope of this standard. Failure to provide such proof shall constitute reasonable grounds for suspicion of non-compliance with the requirements of this mandatory regulation of the product.

Annex A

(normative)

Lifetime and endurance test

A.1 General

Light sources shall undergo a switching cycle endurance testing to verify their luminous flux maintenance factor and survival factor. This endurance testing consists of the test method outlined below for LED and OLED light sources

A.2 Ambient conditions and test setup

A.2.1 The switching cycles are to be conducted in a room with an ambient temperature of $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ and an average air velocity of less than 0.2 m/s.

A.2.2 The switching cycles on the sample shall be conducted in free air in a vertical base-up position. However, if a supplier has declared the light source is suitable for use in a specific orientation only, then the sample shall be mounted in that orientation.

A.2.3 The applied voltage during the switching cycles shall have a tolerance within 2 %. The total harmonic content of the supply voltage shall not exceed 3 %. Standards provide guidance on the supply voltage source.

A.3 Provisional endurance test method

A.3.1 Initial flux measurement; measure the luminous flux of the light source prior to starting the endurance test switching cycle.

A.3.2 Switching cycles; operate the light source for 1200 cycles of repeated, continuous switching cycles without interruption. One complete switching cycle consists of 150 min of the light source switched on at full power followed by 30 min of the light source switched off. The hours of operation recorded (i.e., 3000 h) include only the periods of the switching cycle when the light source was switched on, i.e. the total test time is 3600 h.

A.3.3 Final flux measurement; at the end of the 1200 switching cycles, note if any lamps have failed (see 'Survival Factor' requirements in clauses 6.3 Table 5) and measure the luminous flux of the light sources that have not failed.

A.3.4 For each of the units in the sample which have not failed, divide the measured final flux by the measured initial flux. The arithmetical mean of the resulting values of all the units that did not fail provides the determined value for the luminous flux maintenance factor $X_{LMF}\%$.

Annex B

(informative)

Outdoor / streetlight luminaire lifetime test

B.1 General

There are two options for suppliers to demonstrate conformity to the luminous flux maintenance requirement for outdoor / streetlight luminaires,

- a) Option B.1: Component performance; or
- b) Option B.2: Luminaire performance.

B.1.1 Option B.1: Performance of the LED Component

B.1.1.1 The LED component Performance option allows the manufacturer to demonstrate compliance with the luminous flux maintenance requirements by providing the in-situ temperature measurement test (ISTMT) (as written in IES LM-84, Annex A), the report on the luminous flux maintenance tests according to the IES LM-80 for the LED module used in the luminaire and the calculation of the luminous flux maintenance designed according to IES TM-21.

B.1.1.2 To evaluate the performance compliance of the LED component, the following conditions shall be met:

- a) the highest temperature measured in the ISTMT should be below the highest temperature value of the component measured in the IES LM-80;
- b) the location of the temperature measurement point (TMP) is defined by the manufacturer for both the IES LM-80 and the ISTMT tests;
- c) the LED module current, supplied by the LED controller in the luminaire, should be less than or equal to the LED module current measured for the IES LM-80 test report;
- d) the luminous flux maintenance duration in hours (h), estimated according to the IES TM-21, shall be greater than or equal to the percentage of the luminous flux maintenance corresponding to the projected end point, listed in Table B.1. The projected end point corresponds to the maximum value allowed by the extrapolation of the IES TM21, i.e. 6 times the test time value of the IES LM-80 data.

Table B.1 — Option 1: TM-21 projected luminous flux maintenance requirements

Test time operating hours	Projected end point (based on 20 sample units)	Required luminous flux maintenance at projected end point (For $\geq 50\,000$ h products)
6000 h	36 000 h	$\geq 77.4\%$
6500 h	39 000 h	$\geq 75.7\%$
7000 h	42 000 h	$\geq 74.1\%$
7500 h	45 000 h	$\geq 72.5\%$
8000 h	48 000 h	$\geq 71.0\%$
8333 h	50 000 h	$\geq 70.0\%$

B.1.2 Option B.2: Luminaire performance

B.1.2.1 In cases where Option 1: Component performance cannot be applied, such as products using secondary optics with remote phosphor or when IES LM-80 data is not available, vendors can demonstrate luminous flux maintenance compliance through the performance requirements of the luminaire.

B.1.2.2 The conformity of the luminaire performance for the maintenance of the luminous flux is verified by submitting the complete luminaire to the photometric tests of the IES LM-79, comparing the initial luminous flux (time = 0 hours) with the luminous flux after 6000 hours of operation (time ≥ 6000 h).

B.1.2.3 The test report should demonstrate a minimum percentage of the maintenance of the luminous flux, as shown in Table B.1.

Annex C
(informative)

Lighting products conformity assessment reporting form

APPLICANT DETAILS			
Applicant's Name:			
Applicant's Address:			
Applicant's Address (if applicable):			
Applicant's Email Address:			
Applicant's Telephone number:			
Applicant's Website:			
Applicant's Country:			
Applicant's contact person:			
PRODUCT DETAILS			
Lighting Product Type (Tick as appropriate)	<input type="checkbox"/> Indoor ambient luminaire <input type="checkbox"/> Outdoor / Streetlight luminaire		
Product Information	Model	For Single Models	
		For Family of Models	
		Model number	Family name of the models covered by this application
		Details of each model	
		Model Number	Brand
Manufacturer Details	Manufacturer Name:		

	Manufacturer Address:	
	Manufacturer Email Address:	
	Manufacturer Telephone Number:	
	Manufacturer Website:	
	Country of Manufacture:	
	Manufacturer Contact Person:	
TEST LABORATORY AND REPORT		
Test Laboratory Details	Laboratory name	
	Laboratory address	
	Is the laboratory accredited to test according to the applicable test methods relevant to the lighting product? (Y/N) Provide details.	
Test report details	Test report number:	
	Report signatory:	
	Test Date:	
	Test units serial numbers:	
	Test Report Findings	"Compliant to abc Standard", partial acceptance, exclusions, etc Just a summary
CONFORMITY ASSESSMENT CHECKLIST		
Does the product meet the mandatory requirements as set out in Section 6 of this standard? <i>(Please tick as appropriate)</i>		
Mandatory requirement	Lighting product Type	
	Indoor Ambient Luminaires	Outdoor/Streetlight Ambient Luminaires
Luminous Efficacy	<input type="checkbox"/>	<input type="checkbox"/>

Displacement Factor (Cos ϕ 1)	<input type="checkbox"/>	<input type="checkbox"/>
Harmonics	<input type="checkbox"/>	<input type="checkbox"/>
Standby Power (applicable to connected lamps and luminaires)	<input type="checkbox"/>	<input type="checkbox"/>
Colour Rendering Index (CRI)	<input type="checkbox"/>	<input type="checkbox"/>
Lumen maintenance factor	<input type="checkbox"/>	<input type="checkbox"/>
Survival factor	<input type="checkbox"/>	<input type="checkbox"/>
EMC emissions	<input type="checkbox"/>	<input type="checkbox"/>
EMC immunity	<input type="checkbox"/>	<input type="checkbox"/>
Short term flicker indicator (P_{stLM})	<input type="checkbox"/>	<input type="checkbox"/>
Stroboscopic effect visibility measure (SVM)	<input type="checkbox"/>	<input type="checkbox"/>
Colour consistency	<input type="checkbox"/>	<input type="checkbox"/>
Warranty	<input type="checkbox"/>	<input type="checkbox"/>
Serviceability / Repairability	<input type="checkbox"/>	<input type="checkbox"/>

Luminaire Lifetime	<input type="checkbox"/>	<input type="checkbox"/>
Total Circuit Power	<input type="checkbox"/>	<input type="checkbox"/>
Voltage Variation	<input type="checkbox"/>	<input type="checkbox"/>
Surge Protection Devices	<input type="checkbox"/>	<input type="checkbox"/>
Nominal CCT	<input type="checkbox"/>	<input type="checkbox"/>
Control Gear Operating Temperature	<input type="checkbox"/>	<input type="checkbox"/>
Smart Lighting Compatible	<input type="checkbox"/>	<input type="checkbox"/>
Control of Light Distribution	<input type="checkbox"/>	<input type="checkbox"/>
IP Rating	<input type="checkbox"/>	<input type="checkbox"/>
Lamp or Luminaire Information on the Product	<input type="checkbox"/>	<input type="checkbox"/>
Lamp and Luminaire Information on the Packaging and Other Forms of Product Information	<input type="checkbox"/>	<input type="checkbox"/>
PREVIOUS APPLICATIONS		
Have you applied for product registration in the past? <input type="checkbox"/> Yes <input type="checkbox"/> No		
If yes, provide the registration number(s): _____		
Has any previous application for a registration been rejected under the relevant national regulations? <input type="checkbox"/> Yes <input type="checkbox"/> No		
If yes, provide details.		

Bibliography

- [1] United Nations Environment's United for Efficiency (U4E) model regulations (<https://united4efficiency.org/lightingguidelines/>)
- [2] IEA 4E Solid State Lighting Annex's Quality and Performance Tiers (<https://ssl.iea-4e.org/product-performance>)
- [3] South Africa's draft national regulation on general service lamps
- [4] European Commission's Lighting Regulation (EU) 2019/2020 of 1 October 2019 (<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R2020&from=EN>)

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