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DEPARTMENT OF TRADE, INDUSTRY AND COMPETITION

NO. 160

1 March 2021

**NATIONAL REGULATOR FOR COMPULSORY SPECIFICATIONS ACT  
(Act No. 5 of 2008), AS AMENDED THROUGH LEGAL METROLOGY ACT (Act  
No. 9 of 2014)**

**COMPULSORY SPECIFICATION FOR ENERGY EFFICIENCY AND FUNCTIONAL  
PERFORMANCE REQUIREMENTS OF GENERAL SERVICE LAMPS (GSLs) -  
VC 9109**

I, Ebrahim Patel, the Minister of Trade, Industry and Competition, hereby under section 13(4)(a) of the National Regulator for Compulsory Specifications Act, 2008 (Act 5 of 2008), and, on the recommendation of the National Regulator for Compulsory Specifications (NRCS), publish the proposal to declare the compulsory specification set out in the attached schedule, as a compulsory specification for the safety performance of general service lamps.

Any person, who wishes to comment on this proposal to declare the Compulsory Specification concerned, shall submit their comments, in writing, to the Chief Executive Officer, National Regulator for Compulsory Specifications, Private Bag X 25, Brooklyn, 0075, on or before the date two (2) months after the publication of this notice.



**Ebrahim Patel,  
Minister of Trade, Industry and Competition**

## SCHEDULE

### COMPULSORY SPECIFICATION FOR ENERGY EFFICIENCY AND FUNCTIONAL PERFORMANCE REQUIREMENTS OF GENERAL SERVICE LAMPS (GSLs) - (VC 9109)

#### 1 SCOPE

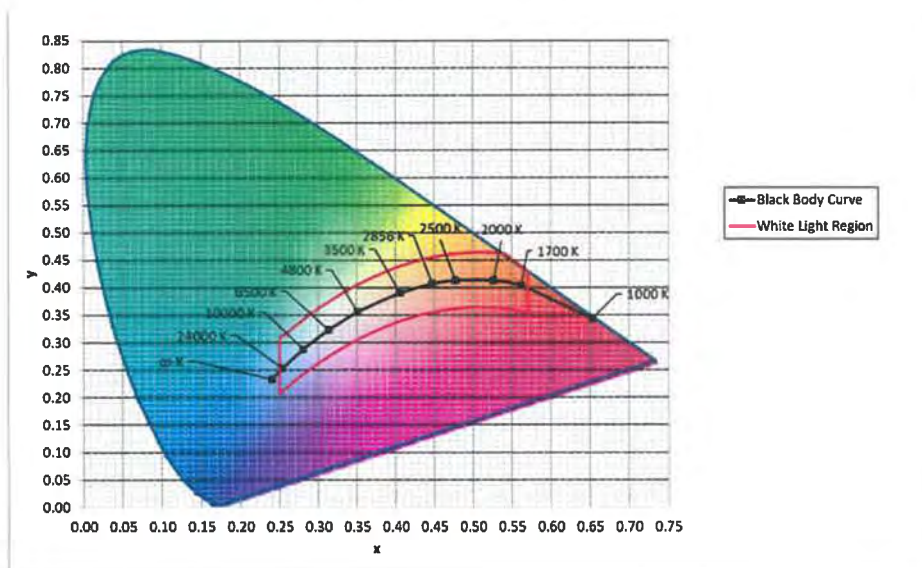
##### 1.1 Inclusions

This compulsory specification covers the energy efficiency and functional performance for general lighting directional and non-directional lamps of all shapes and finishes; using incandescent, halogen, fluorescent, light emitting diode (LED), and other light source technologies (not including high-intensity discharge lamps); that also satisfies a) to d):

- a) Capable of operating on a voltage up to 300V of either direct current or alternating current with a frequency of 50Hz;
- b) Emitting light with a total luminous flux of 60 to 3300 lumens;
- c) Light emission with the chromaticity coordinates (x, y) that are within the range (shown in Figure 1):

$$(i) \quad 0.250 < x < 0.570 \text{ and}$$

$$(ii) \quad -2.3172 x^2 + 2.3653 x - 0.2400 < y < -2.3172 x^2 + 2.3653 x - 0.1400;$$



**Figure 1: GSL chromaticity limits**

- d) a lamp base which can be connected to one of the following general service lamp sockets:

- (i) Screw base types: E11, E12, E14, E17, E26 or E27, or
- (ii) Bayonet base types: B15d, BA15d, B22, B22d or BC22, or
- (iii) Pin base types: G4, GU4, G5.3, GU5.3, GX5.3, GY6.35, G9, GU10, GZ10 or GX53 base, or

- (iv) R7s, or
- (v) Alternative base types which can be connected to the above lamp base sockets by using commercially available passive adaptors.

## 1.2 Exclusions

The following lamps are excluded from the energy efficiency and functional performance requirements of this compulsory specification:

- a) the primary purpose of the light is not general illumination and the product packaging is prominently marked as such, e.g. but not limited to:
  - aa) emission of light as an agent in chemical or biological processes (other than human visual perception), e.g. but not limited to:
    - (i) polymerization,
    - (ii) ultraviolet light used for curing/drying/hardening,
    - (iii) photodynamic therapy,
    - (iv) horticulture,
    - (v) food service,
    - (vi) medical applications,
    - (vii) aquarium,
    - (viii) animal care, and
    - (ix) anti-insect products;
- b) image capture and image projection, e.g. but not limited to:
  - (i) camera flashlights,
  - (ii) photocopiers, and
  - (iii) video projectors;
- c) signalling, e.g. but not limited to:
  - (i) railway-signalling
  - (ii) marine-signalling,
  - (iii) road-signalling and traffic control, and
  - (iv) air traffic-signalling and airfield lamps;
- d) the spectral distribution of the light is adjusted to the specific needs of particular technical equipment, in addition to making the scene or object visible for humans, e.g. but not limited to:
  - (i) studio lighting,
  - (ii) performance special effects lighting, and
  - (iii) theatre lighting;
- e) the scene or object lit requires special protection from the negative effects of the light source, e.g. but not limited to:
  - (i) lighting with dedicated filtering for photosensitive patients, and
  - (ii) lighting with dedicated filtering for photosensitive museum exhibits;

- f) lighting is required only for emergency situations, e.g. but not limited to emergency lighting luminaires;
- g) requiring ambient temperatures above 120°C and this exemption only applies to incandescent and halogen lamps with the following characteristics:
  - (i) an overall length of maximum 60 mm,
  - (ii) a rated power of maximum 25 W,
  - (iii) a base type of E14 or B15, and
  - (iv) a rated luminous flux of maximum 225 lm.
- h) reference lamps used for national measurement standards;
- i) light sources for battery operated products, including but not limited to mobile phones, torches, camping lights, toys, armbands, solar powered garden lamps, bicycle lights and other non-motorized vehicle lights, etc.; and
- j) halogen light sources with R7s cap and luminous flux  $\leq 2,700$  lumens or  $> 12,000$  lumens.

## 2 DEFINITIONS

**2.1** For the purposes of this document, the definitions in standards referred in Section 4 of this compulsory specification, shall apply.

**2.2** In addition, the following definitions shall apply:

**2.2.1** **applicant:** the manufacturer or importer seeking approval for GSL(s). The applicant shall be an existing legal entity within the Republic of South Africa.

**2.2.2** **approval:** confirmation by the NRCS that a particular GSL(s) satisfies the requirements of this compulsory specification.

**2.2.3** **arithmetical mean:** the average of a set of numerical values, calculated by adding them together and dividing by the number of terms in the set.

**2.2.4** **beam angle** of a directional lamp: the angle between two imaginary lines in a plane through the optical beam axis, such that these lines pass through the centre of the front face of the 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. For lamps that have different beam angles in different planes, the largest beam angle shall be considered; Note 2. For lamps with user-controllable beam angle, the beam angle corresponding to the 'reference control setting' shall be considered.

**2.2.5** **chromaticity:** the property of a colour stimulus defined by its chromaticity coordinates (x and y).

**2.2.6** **colour rendering index (CRI):** the 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.

- 2.2.7 colour-tuneable lamp (CTL):** a connected lamp (CL) 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, and with which the lamp is in the scope of this Regulation. The 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. The term also 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.
- 2.2.8 connected lamp (CL):** a general service lamp 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.
- 2.2.9 correlated colour temperature (CCT):** the 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. 6500K, produce blueish-white light, whereas those with a low CCT of 2700K produce light that is more yellowish-white.
- 2.2.10 data-connection parts:** parts that perform one of the following functions:
- reception or transmission of wired or wireless data signals and the processing thereof (either used to control the light emission function or otherwise),
  - sensing and processing of the sensed signals (either used to control the light emission function or otherwise),
  - actuation by audio control (including voice control),
  - a combination of these.
- 2.2.11 declaration report:** a report that is issued by an accredited conformity assessment body, indicating the equivalence of standards.
- 2.2.12 directional lamp (DL):** a lamp which has a beam angle (as defined in IEC 61341:1994 and measured in accordance with CIE S025:2015) of no more than 90 degrees in at least one plane and that being in at least one plane for an asymmetric beam lamp. These lamps are also known as reflector lamps and are commonly installed in recessed cans or track lighting.
- 2.2.13 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. Displacement factor is a more detailed measure to quantify the displacement of the current and its effect on the power supply network.
- 2.2.14 endurance test:** (also called a supply switching test) is the switching on and off of a lamp 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.
- 2.2.15 family:** a 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.

- 2.2.16 flicker:** the 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.
- 2.2.17 fluorescence or fluorescent light source (FL):** the 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 Regulation, magnetic induction light sources are also considered as fluorescent light sources.
- 2.2.18 gas discharge:** 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.
- 2.2.19 general illumination purposes:** for the purposes of this compulsory specification, means any light source that meets the requirements of Section 1.1 and is not exempted under Section 1.2.
- 2.2.20 general service lamp (GSL):** includes a light source that meets the requirements of Section 1.1 but is not one of the exclusions in Section 1.2.
- 2.2.21 halogen lamp:** gas-filled lamp containing halogens or halogen compounds, the filament being of tungsten.
- 2.2.22 high-intensity discharge:** 'high intensity discharge' (HID) means an 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 Regulation, HID light sources are limited to metal halide, high-pressure sodium and mercury vapour types.
- 2.2.23 illumination:** the application of light to a scene, objects or their surroundings so that they may be seen.
- 2.2.24 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 creates heat.
- 2.2.25 lamp:** a light source made in order to produce an optical radiation, usually visible. Note: The term "lamps" is often referred to as a globe, bulb or light bulb.

- 2.2.26 lamp cap:** that part of a lamp which provides connection to the electrical supply by means of a lampholder or lamp connector and, in most cases, also serves to retain the lamp in the lampholder.
- Note 1:** The term base is also used in both the United Kingdom and the US to denote an integral part of a lamp envelope which has been so shaped that it fulfils the function of a cap. It may engage either a holder or a connector, depending on other design features of the lamp- and holder system.
- Note 2:** The cap of a lamp and its corresponding holder are generally identified by one or more letters followed by a number which indicates approximately the principal dimension (generally the diameter) of the cap in millimeters.
- 2.2.27 life (of a lamp):** the total time for which a lamp has been operated before it becomes useless or is considered to be so according to specified criteria. Note: Lamp life is usually expressed in hours.
- 2.2.28 light emitting diode (LED):** a 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.
- 2.2.29 lumen (lm):** an 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 light the lamp provides.
- 2.2.30 luminaire:** an 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.
- 2.2.31 luminous efficacy ( $\eta_v$  or  $\Phi_v$ ):** 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 bulb) is at producing visible light.
- 2.2.32 luminous flux or flux ( $\Phi$ ):** 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. If not specified differently, it refers to the rated, maximum initial luminous flux of a light source, after a short operating period, and to the total flux emitted in a solid angle of  $4\pi$  steradians (corresponding to a  $360^\circ$  sphere).
- 2.2.33 model:** refers to 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.
- 2.2.34 non-directional lamp (NDL):** a general service lamp that is not a directional lamp.

- 2.2.35 NRCS:** National Regulator for Compulsory Specifications as established by the National Regulator for Compulsory Specifications Act, 2008 (Act No. 5 of 2008).
- 2.2.36 *passive adaptor*:** (also called lampholder adaptor) a connecting device capable of being inserted into a lampholder and has outlet facilities for connection to a flexible cord or integral flexible cord or fitted with lampholders. The adaptor may incorporate electronic circuits to control the output.
- 2.2.37 *proof of approval*:** a Letter of Authority (LoA) issued by the NRCS, which confirms that a particular GSL(s) satisfies the requirements of this compulsory specification.
- 2.2.38 *rated life, L70B50*:** for LED and OLED light sources means the 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 L70B50 lifetime.
- 2.2.39 *rated luminous flux (of a model of lamp)*:** the value of the initial luminous flux of a given model of lamp declared by the manufacturer or the responsible vendor, the lamp being operated under specified conditions. Unit: lm. Note 1: The initial luminous flux may be the luminous flux of a lamp after a short ageing period, as specified in the relevant lamp standard. Note 2: The rated luminous flux is sometimes marked on the lamp. (IEC).
- 2.2.40 *rated power (of a model of lamp)*:** the value of the consumed electrical power by a given model of lamp declared by the manufacturer or the responsible vendor, the lamp being operated under specified conditions. Unit: W. Note: The rated power is usually marked on the lamp. (IEC).
- 2.2.41 *rated voltage or rated voltage range*:** the nominal voltage/range of voltage at which a piece of electrical equipment is designed to operate.
- 2.2.42 *reference control setting*:** a control setting or combination of control settings that is used to verify compliance of a light source with this regulation. 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.

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:

- a) The light source is in scope of this compulsory specification according to 1.1 and none of the conditions for exemption of 1.2 applies (if this is not possible, the light source is out-of-scope or exempted);
- b) The adjustable/selectable beam angle is the narrowest available;



- c) The power consumption of lighting control parts and non-lighting parts is minimal (if these parts cannot be disconnected or switched-off);
- d) The full-load condition is obtained (maximum initial luminous flux given the other chosen settings); and
- e) When the end-user opts to reset factory defaults, the reference control settings are obtained.

**2.2.43 short term flicker indicator (*PstLM*):** a measure of flicker evaluated over a duration of at least 180 seconds in accordance with IEC 61547-1.

**2.2.44 *stroboscopic effect*:** a 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.

**2.2.45 *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.

**2.2.46 *valid test report*:** a copy of an original test report.

### 3 GENERAL REQUIREMENTS

- 3.1 The applicant shall ensure that each model of GSL(s) has been approved and successfully registered by the NRCS before offering it for sale, or import, or supply in accordance with the requirements of Annex A.
- 3.2 The applicant shall inform the NRCS of any change in design or materials affecting any mandatory requirement in terms of this compulsory specification. In the event of such change(s) the NRCS may, at its discretion, demand that the applicant submits a new application for approval.
- 3.3 The applicant shall, on request, provide the NRCS, within 5 working days, with satisfactory proof of compliance in respect of any model of GSL(s) included in the scope of this compulsory specification.
- 3.4 Failure to provide such proof shall constitute reasonable grounds for suspicion of non-compliance with the requirements of this compulsory specification.
- 3.5 All GSL(s) shall comply with the requirements of this compulsory specification with respect to energy efficiency, functional performance and product information as set out in Sections 3.2, 3.3 and 3.4 when tested in accordance with the test standards in Section 4.

### 4 EFFICIENCY REQUIREMENTS

#### 4.1 Luminous Efficacy Requirement

- a) GSLs shall comply with the luminous efficacy requirements in Table 1 or Table 2, as relevant:

**Table 1: Minimum luminous efficacy, phase 1**

Product Type	Phase 1 Minimum luminous efficacy (lm/W)
General Service Lamp	90

**Table 2: Minimum luminous efficacy, phase 2**

Product Type	Phase 2 Minimum luminous efficacy (lm/W)
General Service Lamp	105

- b) Depending on the lamp characteristics, the minimum luminous efficacy values may be decreased by the following correction factors (C):

**Table 3: Correction factors**

Lamp Characteristics	C
Luminous flux $\Phi$ (lm) below 400 lm	-10%
Directional lamps	-15%
Colour-tuneable lamps (CTL)	-10%
Connected LED Lamps – rated luminous flux $\Phi$ (lm):	
$60 \text{ lm} \leq \Phi \leq 300 \text{ lm}$	-15%
$300 \text{ lm} < \Phi \leq 650 \text{ lm}$	-10%
$650 \text{ lm} < \Phi \leq 1200 \text{ lm}$	-7.5%
$1200 \text{ lm} < \Phi \leq 2000 \text{ lm}$	-5.0%
$2000 \text{ lm} < \Phi \leq 3300 \text{ lm}$	-2.5%

- c) With respect the correction factors in Table 3, the following should be noted:
- (i) Where applicable, the correction factors are additive up to a maximum of 25%.
  - (ii) For colour-tuneable lamps (defined in Section 2) that are also connected lamps, the correction factors are additive.
  - (iii) Lamps 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 ( $T_c$ ), and/or changing their directional lamp or non-directional lamp status, shall be evaluated using the reference control settings.

#### 4.2 Displacement Factor ( $\text{Cos } \phi_1$ )

All GSLs shall have a displacement factor as stipulated in **Error! Reference source not found.**

**Table 4: Displacement factor**

Rated in Watts (W) for the lamp	Input Power	Displacement Factor
$P \leq 2W$		Not applicable
$2W < P \leq 5W$		$\geq 0.4$
$5W < P \leq 10W$		$\geq 0.7$
$P > 10W$		$\geq 0.9$

**4.2.1 Standby Power for connected lamps**

- a) Standby power for lamps shall not exceed 0.5 W.
- b) Networked standby power for Connected LED Lamps shall not exceed 0.5 W.
- c) The allowable values for Standby power and Networked standby power shall not be added together.

**4.3 Functional Performance Requirements**

All GSL shall comply with the functional requirements in Table 5:

**Table 5: Functional requirements**

Metric	Mandatory Requirements
Colour Rendering Index (CRI)	$Ra \geq 80$
Lumen maintenance factor	<p>The lumen maintenance factor <math>X_{LMF}\%</math> after endurance testing according to Annex B shall be not less than <math>X_{LMF,MIN}\%</math>, calculated as follows:</p> $X_{LMF,MIN}\% = 100 \times e^{\frac{(3000 \times \ln(0.7))}{L_{70}}}$ <p>where <math>L_{70}</math> is the declared <math>L_{70}B_{50}</math> lifetime (in hours)                      Upper limit for <math>X_{LMF,MIN}\%</math>: the calculated required lumen maintenance of the sample shall not exceed 96.0% (i.e., <math>X_{LMF,MIN}\% \leq 96.0\%</math>).                      Where no lifetime is declared, 15,000 hours will be assumed.</p>
Survival factor	No less than 90% of sample units should be operational following endurance testing according to Annex B.
EMC emissions	Compliance with CISPR15 or SANS 215
EMC immunity	Compliance with SANS 61547 or IEC 61547
Harmonics	Compliance with SANS 61000-3-2 or IEC 61000-3-2

Metric	Mandatory Requirements
Short term flicker indicator ( $P_{stLM}$ )	$\leq 1.0^1$ at full load and a sinusoidal input voltage (i.e. intrinsic performance). Note: compliance with SANS 61547-1 or IEC 61547-1
Stroboscopic effect visibility measure (SVM)	$\leq 0.4$ at full load and a sinusoidal input voltage (i.e. intrinsic performance). Note: compliance with SANS/IEC TR 63158
Colour consistency	Variation of x,y chromaticity coordinates within a five-step Standard Deviation of Colour Matching (SDCM) or less.

#### 4.4 Product Information Requirements

##### 4.4.1 Lamp information

The following information shall be clearly and indelibly printed on the product:

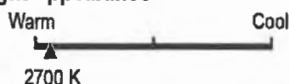
- a) Rated power in Watts (mandatory).
- b) Rated operating voltage (mandatory).
- c) Trade name or brand name (mandatory).
- d) Rated initial luminous flux in lumens (mandatory).
- e) Rated correlated colour temperature (CCT) in Kelvin (K) (mandatory).
- f) Beam angle (mandatory for directional lamps).

##### 4.4.2 Packaging information

The following information shall be clearly and prominently indicated on the packaging and in all other forms of product information:

- a) Rated power in Watts (mandatory).
- b) Rated operating voltage (mandatory).
- c) Rated initial luminous flux in lumens (mandatory).
- d) Rated efficacy in lumens per Watt (lm/W) (mandatory).
- e) Rated lifetime in hours and  $L_{70B50}$  if longer (mandatory).
- f) Rated correlated colour temperature (CCT) in Kelvin (K) combined with a sliding scale: (mandatory).

##### Light Appearance



- g) Beam angle (mandatory for directional lamps).

<sup>1</sup> Where 1 means 50% of the population will be affected by the flicker.

- h)** Statement on Dimmability. Clearly state whether dimmable or not dimmable. If yes, then information on dimmer compatibility, or web link to this information. (mandatory).
- i)** For general service lamps which are, according to paragraph 1.2, exempted from the requirements of paragraph 3, the intended purpose shall be stated on all forms of packaging, product information and advertisement, together with a clear indication in large font on the front of the package that the **Lamp is NOT Intended for General Illumination Purposes**. (mandatory).
- j)** Base type (mandatory).
- k)** Efficiency label compliant with the current version of the Department of Energy guideline for energy efficiency label compliance in South Africa: *A Guide for Energy Efficiency Labelling* (mandatory).
- l)** Incandescent equivalency claim (optional).
- m)** Manufacturers are not required to provide an incandescent equivalency claim (i.e. "This lamp is as bright as a 60W incandescent" or "10W = 60W"). However, if they do, then the equivalency shall be based on the table below which depicts the minimum initial luminous flux that is required to claim a specific incandescent lamp wattage equivalency:

**Table 6: Incandescent wattage equivalencies for LED lamps**

Incandescent Equivalency [W]	Wattage	Minimum Initial Luminous Flux [lm]
		Non-directional Lamps
15		150
25		250
40		500
60		800
75		1000
100		1500
150		2500
200		3500

Note: The listed incandescent wattage equivalencies may be interpolated (e.g. 50 Watts) and extrapolated (e.g. 7 Watts) using the values in the given table.

- l)** Voltage surge and dip immunity claim (optional).

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 for conditions in South Africa.

## 5 REFERENCED TEST STANDARDS AND COMPLIANCE CERTIFICATION

The metrics, referenced standards and compliance certification criteria are set out in this Section, with consideration of:

- a) The latest edition of the referenced standards (including any amendments) applies.
- b) The same sample of lamps may be used for certain metrics as set out in the test sequence in Annex B
- c) The required levels, sample sizes and compliance criteria for compliance certification by suppliers shall be the same as requirements in the referenced standards.

**Table 7: Relevant test standards and compliance certification**

Phenomena	Lamp Type	Standard	Compliance Certification (for suppliers)	Surveillance Testing (for government)
Luminous Efficacy [lm/W]	All	Calculated See below for (measured luminous flux / measured power)	Sample of 10 units. The arithmetical mean of the calculated luminous efficacy of the 10 units shall not be less than required level.	Sample of 10 units. The arithmetical mean of the calculated luminous efficacy of the 10 units shall not be less than required level.
Luminous flux in [lm]	Incandescent / Halogen	IEC / SANS 60064 CIE 84 / IEC 60357	Sample of 10 units. The arithmetical mean of the measured luminous flux of the 10 units shall not be less than 92.5% 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 10 units. The arithmetical mean of the measured luminous flux of the 10 units shall not be less than 90% of the rated luminous flux
	CFL	IEC / SANS 60969 CIE 84		
	LED	IEC / SANS 62612 CIE S025		
Power in [W]	Incandescent / Halogen	IEC / SANS 60064 CIE 84	Sample of 10 units. The arithmetical mean of the measured power of the 10 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 10 units. The arithmetical mean of the measured power of the 10 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.
	CFL	IEC / SANS 60969 CIE 84		
	LED	IEC / SANS 62612 CIE S025		

Phenomena	Lamp Type	Standard	Compliance Certification (for suppliers)	Surveillance Testing (for government)
Standby Power	Connected LED lamp	IEC 63103	Sample of 10 units. The measured standby power of each individual lamp of the 10 units shall not exceed the required level by more than 100 mW.	Sample of 10 units. The arithmetical mean of the measured standby power of the 10 units shall not exceed the required level by more than 100 mW.
Displacement Factor	LED	IEC / SANS 62612	Sample of 10 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 10 units. The arithmetical mean of the measured displacement factor of the 10 units shall not be less than the required level minus 0.05.
Colour Rendering Index (CRI)	LED	IEC / SANS 62612 CIE S 025 CIE 13.3	Sample of 10 units. The measured CRI of each individual lamp of the sample shall not be less than the required CRI-R <sub>a</sub> level minus 3	Sample of 10 units. The arithmetical mean of the measured CRI of the 10 units shall not be less than the required CRI-R <sub>a</sub> level minus 3
Correlated colour temperature (CCT)	LED	IEC / SANS 62612 CIE S025 CIE S015	Sample of 10 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 10 units. The arithmetical mean of the measured CCT shall conform to the industry standard tolerances contained in the standards used for testing.
Luminous flux maintenance factor	LED	See Annex B	The determined X <sub>LMF</sub> % of the sample following the test in Annex B shall not be less than X <sub>LMF, MIN</sub> %. <sup>2</sup>	The determined X <sub>LMF</sub> % of the sample following the test in Annex B shall not be less than X <sub>LMF, MIN</sub> %.
Survival Factor	LED	See Annex B	Sample of 10 units. At least 9 light units of the test sample must be operational after completing the endurance test in Annex B.	Sample of 10 units. At least 9 light sources of the test sample must be operational after completing the endurance test in Annex B.

<sup>2</sup> There is no tolerance associated with this metric as it is a fixed requirement and it is up to the manufacturer to declare an L70B50 value to meet it.

Phenomena	Lamp Type	Standard	Compliance Certification (for suppliers)	Surveillance Testing (for government)
Short-term Flicker indicator (PstLM)	LED	IEC / SANS TR 61547-1	Sample of 10 units. For each individual lamp of the sample, the measured intrinsic <sup>3</sup> P <sub>st</sub> <sup>LM</sup> of the 10 units shall not be more than the required level plus 5%.	Sample of 10 units. For each individual lamp of the sample, the measured intrinsic P <sub>st</sub> <sup>LM</sup> of the 10 units shall not be more than the required level plus 5%.
Stroboscopic effect Visibility Measure (SVM)	LED	IEC / SANS TR 63158	Sample of 10 units. For each individual lamp of the sample, the measured intrinsic SVM of the 10 units shall not be more than the required level plus 5%.	Sample of 10 units. The arithmetical mean of the measured intrinsic SVM of the 10 units shall not be more than the required level plus 5%.
EMC emissions	All	CISPR15 or SANS 215		
EMC immunity (including voltage surge and dip)	All	SANS 61547 or IEC 61547		
Harmonics	All	IEC 61000-3-2		

## 6 EQUIVALENCE OF STANDARDS

- 6.1** Standards issued by different standardization bodies such as ISO and EN, 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 South African National Standard or other relevant standard as provided in Section 4.
- 6.2** The applicant shall be responsible for obtaining such a declaration report. Proof of conformity with such a standard shall be accepted as conformity with the corresponding South African National Standard or other relevant standard as provided in Section 4.

## 7 CONFORMITY TO NEW EDITIONS OF REFERENCED STANDARDS

- 7.1** For the purposes of this compulsory specification, a new edition of a referenced standard shall become effective twelve (12) months from the date of publication as a South African National Standard.

<sup>3</sup> Intrinsic performance is where test is conducted with a stable mains voltage without fluctuations



- 7.2 New products, or products resubmitted for approval because of a change in design or materials, shall in all cases be evaluated against the requirements of the latest edition of any referenced standard.
- 7.3 When a new edition of a referenced standard is published, products originally approved in accordance with the previous edition of that standard may have their approval extended for up to five (5) years from the effective date of the new standard, subject to the requirements of Annex A, unless declared otherwise by the Minister.

## 8 EVIDENCE OF CONFORMITY TO REQUIREMENTS

With respect to the safety requirements (section 3), a valid test report issued by an appropriately accredited and internationally recognized body being a member of an IAF/ILAC/IECEE mutual recognition scheme in accordance with the NRCS's conformity assessment policy, shall be submitted to the NRCS as proof of conformity with the safety requirements of this compulsory specification.

## 9 IMPLEMENTATION PHASES

The compulsory specification shall be effective in accordance with the following phases:

### a) Phase 1:

Twelve (12) months after the publication of the final notice for duration of three (3) years. Products that are already in the market and approved by the NRCS for safety requirements are to comply with this compulsory specification twelve (12) months after the publication of the final notice.

### b) Phase 2:

Thirty-six (36) months after the publication of the final notice. Products that are already in the market and approved by the NRCS for safety requirements are to comply with this compulsory specification thirty-six (36) months after the publication of the final notice.

## ANNEX A - APPROVAL OF GENERAL SERVICE LAMP (GSL)

(Normative)

### A1. APPLICATION FOR APPROVAL

An application for approval of each model of GSL (or family of GSLs) intended for sale shall include A.1.1 to A.1.5 inclusive:

- A1.1** Details of the model(s) of GSL(s) for which approval is sought and the standard(s) to which it is claimed to conform;
- A1.2** Details of the manufacturing plant(s) in which the GSL model is produced;
- A1.3** Identification markings and other information appearing on the product;
- A1.4** Any reasonable additional information in order to clarify the above that may be requested by the NRCS;
- A1.5** For new applications:
  - a)** Proof of conformity as described in Section **Error! Reference source not found.** of this compulsory specification, with all the energy efficiency and functional performance requirements of this compulsory specification set out in Section 3, issued less than 36 months before the date of submission to the NRCS; and
  - b)** Declaration that all submitted information relates to the model of GSL detailed in this application for energy efficiency and functional performance approval.

**A1.6** For renewal applications

Three months prior to expiry of the Letter of Authority (LOA), an application for a new LOA may be granted, provided that a declaration that all the current conditions of the product energy efficiency and functional performance certification are met for the model of GSL detailed in this application for energy efficiency and functional performance approval.

## **A2 APPROVAL**

- A2.1** The NRCS shall assess the evidence of conformity supplied by the applicant and shall decide to grant approval or not, at its sole discretion.
- A2.2** The NRCS shall assign a unique number to each approval.
- A2.3** The NRCS shall issue a Letter of Authority (LOA) certificate for each successful application, to the applicant, when all the requirements have been met.
- A2.4** The approval granted with respect to each model of GSL that is pursuant to this compulsory specification may be withdrawn at any time, after the manufacturer has been notified in writing, if the requirements have not been met or maintained.

## **ANNEX B – ENDURANCE TEST METHOD AND SEQUENCE**

Light sources shall undergo 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:

## **B1 AMBIENT CONDITIONS AND TEST SETUP**

- B1.1** 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.
- B1.2** 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.
- B1.3** 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.

## **B2 PROVISIONAL ENDURANCE TEST METHOD**

- B2.1** Initial flux measurement: measure the luminous flux of the light source prior to starting the endurance test switching cycle.
- B2.2** Switching cycles: operate the light source for 1200 cycles of repeated, continuous switching cycles without interruption. One complete switching cycle consists of 150 minutes of the light source switched ON at full power followed by 30 minutes of the light source switched OFF. The hours of operation recorded (i.e., 3000 hours) include only the periods of the switching cycle when the light source was switched ON, i.e. the total test time is 3600 hours.
- B3.3** Final flux measurement: at the end of the 1200 switching cycles, note if any lamps have failed (see 'Survival Factor' requirements in Section 3.3 Table 5) and measure the luminous flux of the light sources that have not failed.
- B4.4** 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  $X_{\text{LMF}}\%$ .

**Legend**

