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# Draft Minimum Energy Performance Standards for LED Lighting

This draft MEPS has been developed as part of a range of options for addressing LED lighting efficiency and performance in Australia and New Zealand. Any application of a MEPS to LED lighting in Australia and New Zealand will be subject to approval by governments following consideration of a Regulation Impact Statement (after public consultation). The draft MEPS has been developed in consultation with a technical working group of stakeholders from lighting and control supply, government programs and test laboratories, and was issued for stakeholder comment in July 2016 as part of the development of these proposals. More information about the Equipment Energy Efficiency Program is available at: [www.energyrating.gov.au/](http://www.energyrating.gov.au/) with specific background on LED lighting available in the LED lighting Product Profile here: [www.energyrating.gov.au/consultation/led-lighting-product-profile-consultation](http://www.energyrating.gov.au/consultation/led-lighting-product-profile-consultation)

## Scope

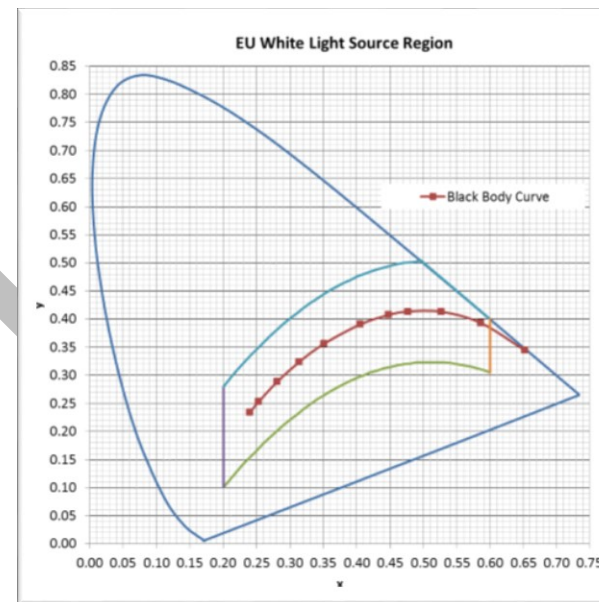
This Draft Minimum Energy Performance Standards (MEPS) for LED Lighting products is proposed to apply to the sale and commercial use of the range of LED products specified below. The MEPS is intended to specify minimum performance levels for lighting efficacy and a number of other performance parameters important in ensuring LED lighting products provide an effective and efficient alternative to other less efficient lighting technologies (tables 1&2). Table 3 lists proposed package marking requirements. Where possible, the test requirements reference relevant international standards by the International Commission on Illumination(CIE), International Electrotechnical Commission (IEC), and regional standards such as the Illuminating Engineering Society of North America. The MEPS levels are largely derived from the International Energy Agency 4E Solid State Lighting Annex Product Quality and Performance Tiers (<http://ssl.iea-4e.org/product-performance>). Note that while product test data will be required for product registration, it is proposed that third party accredited testing will not be required. Where the use of module or LED package test data is allowed, this must be from an accredited (but not necessarily third party) laboratory.

### All Lamp Categories

As well as the specific scope below, this MEPS applies to lamps and luminaires capable of being tuned to within the specified white region in any of their modes of operation. This includes fixed white light sources as well as tuneable sources which are capable of being tuned to within the white region specified by the chromaticity coordinates (x and y) range:

- $0,2 < x < 0,6$ ; and
- $-2,3172 x^2 + 2,3653 x - 0,28 < y < -2,3172 x^2 + 2,3653 x - 0,1$ .<sup>1</sup>

In the case of tuneable lamps and luminaires, compliance for photometric parameters will be based on testing at the lowest and highest CCTs achievable by the lamp plus the nominal CCT of 2700 K (non-directional and directional lamps and small luminaires), or 4000 K (linear LED lamps and large and planar luminaires, battens and troffers), if within the maximum and minimum CCTs. Also testing will be conducted at maximum light output (in case the lamps are also dimmable). Testing of tuneable products will be done with the product's CCT adjusted through operation with software provided with products as sold.



### Non-directional LED lamps (table 1)

Lamps with LED light sources of all shapes with lamp caps B15, B22, E14, E27, E39, E40, GU10, G9 and ELV lamp bi-pin caps G4, that emit  $\geq 100$  lm.

### Directional LED lamps (table 1)

Lamps with LED light sources of all shapes with lamp caps B15, B22, E14, E27, E39, E40, GU10, G9 and R7, and ELV lamp bipin caps GU5.3, GX5.3, G6.35, GX53, that emit  $\geq 100$  lm.

### Linear LED lamps (table 1)

Linear LED lamps double-capped LED lamps including G5 and G13 caps, intended for replacing fluorescent lamps (as defined in IEC 60081) with the same caps (as defined in IEC 60081) or caps specific for double-capped linear LED lamps (related to IEC 60838-2-3) with a nominal length of 550 mm to 1500 mm.

<sup>1</sup> Note: referenced from EU Regulation No244 (2009) and latest proposal for revised EU Regulation

### *Planar Luminaires, integrated battens & Troffers (table 2)*

Integrated LED fixtures (including panel form) intended as an alternative to tubular fluorescent based general purpose

- troffer/recessed luminaires (defined in AS/NZS 60598-2-2)
- batten/fixed general purpose luminaires, suspended or surface mount (defined in AS/NZS 60598-2-1)

### *Integrated LED Luminaires (small) (table 2)*

Integrated LED luminaires with a luminous flux of  $\geq 100$  lm and  $< 2,500$  lm. Note integrated includes a luminaire with remote control gear.

For decorative style integrated LED luminaires (see definition below) which have low volume sales of up to {a yet to be determined} annual units, or other limited production run luminaires which have low volume sales of up to 20 annual units a simplified registration may be submitted, including supply of manufacturer's datasheet, without demonstration of full compliance with MEPS. Import/production volumes to be provided annually for duration of registration. Where this upper sales limit is exceeded, the supplier may either withdraw the product from sale; or alternately both complete product testing and complete a full product registration (demonstrating compliance with MEPS). Note - where decorative luminaires are designed with lamp holders rather than an integrated light source, any supplied lamp will be subject to MEPS (in a standard registration process) rather than the entire luminaire.

### *Integrated LED Luminaires (large) (table 2)*

Integrated LED luminaires with a luminous flux of  $\geq 2,500$  lm and  $< 50,000$  lm. Note integrated includes a luminaire with remote control gear.

Includes integrated LED fixtures intended as an alternative to general purpose industrial style high bay, low bay and indoor area lighting luminaires

For decorative style integrated LED luminaires (see definition below) which have low volume sales of up to {a yet to be determined} annual units, or other limited production run luminaires which have low volume sales of up to 20 annual units, a simplified registration may be submitted, including supply of manufacturer's datasheet, without demonstration of full compliance with MEPS. Import/production volumes to be provided annually for duration of registration. Where this upper sales limit is exceeded, the supplier may either withdraw the product from sale; or alternately both complete product testing and complete a full product registration (demonstrating compliance with MEPS). Note - where decorative luminaires are designed with lamp holders rather than an integrated light source, any supplied lamp will be subject to MEPS (in a standard registration process) rather than the entire luminaire.

## Scope Exclusions for LED Lamps and Integrated LED luminaires

Integrated LED luminaires (Small and Large) exclude:

- Planar Luminaires, integrated battens & Troffers (including those defined in AS/NZS 60598.2.1 and AS/NZS 60598.2.2:2002)<sup>2</sup>
- Theatrical luminaires as defined in AS/NZS 60598.2.17:2006
- Lamps and luminaires compliant with cyanosis observation index and colour temperature requirements of AS/NZS 1680.2.5:1997 Interior lighting Part 2.5: Hospital and Medical tasks, with package marked 'For Medical Use Only'.
- Light source products that are battery operated in their fundamental operating state including
  - Portable luminaires for garden use: AS/NZS 60598.2.7:2005
  - Hand lamps as defined in AS/NZS 60598.2.8:2005
- Portable (non-fixed) luminaires (e.g. desk lamps, standard lamps, Portable general purpose luminaires as defined in AS/NZS 60598.2.4:2005, and portable luminaires for children defined in AS/NZS 60598-2-10)
- Rope lights and string lights (as defined in AS/NZS 60598.2.20:2002) or chain lights defined in IEC 60598-2-21
- Non-maintained emergency escape lighting luminaires and illuminated emergency exit signs (as defined in AS/NZS 60598.2.22)
- Outdoor luminaires with an ingress protection rating of IP65 and above
- Road and public space lighting luminaires (as defined in AS/NZS 1158).
- Wall luminaires with up/down lighting of beam angles less than 30 degrees and less than 500lm in either direction (ie up or down)
- Floor/step mounted luminaires with up lighting less than 200lm

### Definition

#### ***Integrated LED Luminaire***

Luminaire that:

- satisfies Type A or Type B LED luminaires specified in the scope of IEC 62722.2.1; or
- uses individual LED packages in place of a LED module
- and does not include IEC standardised lamp holders

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<sup>2</sup> As these are encompassed in the Planar Luminaires, integrated battens & Troffers category

### ***Decorative style integrated LED luminaire***

Integrated LED luminaires which are primarily designed for their lighted as well as their unlighted appearance and aesthetic contribution to the space. Such luminaires are typically intended for use where a decorative accent or an aesthetic appearance, not a specified amount of luminaire light output, is desired. The light output of decorative luminaires is typically not intended to independently illuminate a space or a task. (Based on NEMA Lighting Systems Division & American Lighting Association Joint Document: LSD 51-2009)

Note: a photometric quantification of this definition is under investigation for small (residential) decorative luminaires and large (non-residential) decorative luminaires.

### **Product Families for Registration**

(1) Two or more models from a single product class may be registered in the same family of models, when the models:

- (a) Are of a single brand;
- (b) Rely on the one test report (or the test report of the least efficient family member where (e) applies) that sets out the results of testing conducted in accordance with the Determination;
- (c) Have the same physical characteristics that are relevant to complying with the Determination, including, but not limited to, the following: overall size; optics, geometric form factor; and any other dimensions, components or component arrangements that may affect performance. However models within the same family may have different minor physical characteristics (that do not affect energy performance), for example:
  - different lamp caps/ cap sizes
  - shape of the outer glass or plastic lamp cover.
  - mounting brackets and other casing or luminaire surround variations that do not change the size, shape and reflectivity of the light emitting components of the product.
  - colour or other surface variations to casing areas other than changes to the reflectivity or diffusers of the light emitting components of the product
  - an application may include either clear lamps or frosted/pearl, but not both;

(d) Have the same performance characteristics that are relevant to complying with minimum performance specifications set out in the Determination, including, but not limited to, the following:

- (i) efficacy; and
- (ii) wattage.

(e) Despite paragraph (d), models in the same family may have different luminous flux or efficacy where the difference arises as a result of different colour temperatures, colour rendering index, diffuser, or beam angles. In such cases:

- (i) test results for registration purposes will only be required for the model with the lowest energy efficiency in the proposed family; and
- (ii) all models in the family must have the same performance characteristics relevant to complying with the specified minimum performance requirements other than efficacy, colour temperature, colour rendering index, diffuser, and beam angle.

The rated luminous flux of all models must be within 10% of the test results submitted for family registration.

(2) For subsection (1), a model cannot be a member of a family if its inclusion in that family would lead to the family consisting of more than 25? lamp models or {to be determined} luminaire models.

(i) Within this limit, additional models may be later added to families at a reduced cost. Where additional models are updates of previous models with updated module or drivers, provided the physical characteristics are the same (as required by paragraph (c)) these models may consume less power (due to more efficient components) however the rated luminous flux must be within 10% of the test results submitted for family registration.

## **COMMENTS FROM PHILIPS LIGHTING S&R (STANDARDS & REGULATIONS) TEAM**

### **GENERAL:**

1. The draft has multiple requirements and referencing different standards for various attributes. This current requirement is over-specified leading into a costly product to meet such requirements and an unhealthy balance between the requirements and monitoring. This would result in a complex MVE (Monitoring, Verification and Enforcement) efforts for market surveillance by the authorities. What is observed in draft is
  - 2 energy requirement – 3 tiers
  - 20 functional requirements
  - 14 marking requirements
  - Draft References to 5 US standards, 1 European standard, 9 International standards which leads to confusion, cost increase and delay in time to market for the manufacturers, a higher cost product for the customer/end user.
2. In the proposed test sample requirement which is 10 lamps, 4 small and 2 large luminaires Philips Lighting views that this is not the correct method of sampling to demonstrate compliance to the required efficacy. This might be only good for market surveillance. Philips Lighting feels that alternative sample sizes leading to a confusing demand for the manufacturer, resulting in delay for the product to be launched in the market.
3. Lighting industry emphasizes that effective legislation requires a healthy balance in ‘Number of requirements’ and ‘MVE efforts’. An unbalanced MVE efforts might encourage dishonest manufacturers to circumvent requirements at cost of genuine customers and compliant manufacturers/producers. Note that limiting the number of requirements as far as possible will in the end also simplify enforcement and verification.
4. In the draft standard, MEPS levels are largely drawn from the International Energy Agency 4E Solid State Lighting Annex Product Quality and Performance Tiers. Philips Lighting always supports and prefers reference to international CIE and/or IEC standards and does not recommend to refer to any regional IES standards.
5. One general objection is to the MEPS levels which are largely drawn from the International Energy Agency 4E Solid State Lighting Annex Product Quality and Performance Tiers (<http://ssl.iea-4e.org/>) because the Global Lighting Association (GLA) remains opposed to the levels of the 4E SSL Annex for lighting products on the grounds that they can stifle innovation, can deny consumers choice in the products they buy and can lead to certification programs which impose costs on lighting manufacturers.
6. In the list of exclusions, Include Luminaires with very narrow beam luminaires (<8 deg.)



7. The proposed 2016 IEA 4E SSL verification tests deviate from the method described in commonly used IEC standards. Philips Lighting prefers to stick to IEC methodology to determine  $lm/W$ . Refer as much as possible to IEC standards – the relevant ones are:

<b>LED product type</b>	<b>safety</b>	<b>performance</b>
<b>LED Lamp &gt; 50 V (230V) Integrated (Self-ballasted)</b>	<b>IEC 62560</b>	<b>IEC 62612</b>
<b>LED Lamp ≤ 50 V (12V) Integrated (Self-ballasted)</b>	<b>IEC 62569</b>	<i>In preparation at IEC</i>
<b>LED Double Capped Lamp (LED Tubes)</b>	<b>IEC 62776</b>	<i>Not available</i>
<b>LED Module</b>	<b>EN 62051</b>	<b>IEC 62717</b>
<b>LED Luminaire</b>	<b>IEC 60598-1 IEC 60598-2-xx</b>	<b>IEC 62722-1 IEC 62722-2-1</b>

8. Remove attributes mentioned in the draft that require 3K/6K hours of testing since 3K/6K hours measurements are costly and time consuming in terms of verification efforts for both market surveillance authorities and industry. There is no relation between performance at 3K/6K hours and performance towards end-of-life so performance at 3K/6K will not give any confidence in the product over time.
9. Remove all attributes for which a practical test method laid down in an international standard and a standardized test method is not available. (e.g. lifetime requirements). A practical test method laid down in international accepted standards will lead to unambiguous pass/fail criteria for both market surveillance authorities and industry. A practical test method laid down in international accepted standards enable mutual recognition of test results and so reducing the need for (re-)testing.
10. Remove all attributes for luminaires that are application depended and where requirements are laid down in CIE application standards used for lighting scheme design. (E.g. light distribution, colour rendering, colour maintenance). Philips Lighting always prefer IEC standards.

11. Philips Lighting recommends in the draft standard the following:
- 2 mandatory energy performance requirements (including unambiguous limits, no tiers)
  - lm/W as defined in IEC standards
  - standby power (W) as defined in IEC standards
  - 6 mandatory functional performance information obligations (without limits)
  - lumen output (lm) as defined in IEC standards
  - power (W) as defined in IEC standards
  - colour Quality: CCT + CRI as defined in CIE standards
  - Displacement Factor: as defined in IEC standards
  - dimmability Y/N
12. In scope, Philips Lighting recommends that all LED lighting for horticulture business is excluded from the scope.
13. As the MEPS are focused on energy performance, Philips Lighting recommends not to include Light Quality requirements in the standard as these are a different dimension than energy performance.
14. In the case of tuneable lamps and luminaires, compliance for photometric check parameters are too many in the draft standard. Philips Lighting recommends to choose default point and max. power CCT to measure the data.

## Performance requirements

### Table 1 – Lamps

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
Energy Efficiency & Photometric							
1	Efficacy	$\geq 65$ lm/W $\geq 85$ lm/W (2020) $\geq 100$ lm/W (2023)	$\geq 100$ lm/W $\geq 110$ lm/W (2020) $\geq 120$ lm/W (2023)		10	Average $\geq$ value specified	CIE S025 LM79 accepted until July 2019 EN 13032-4:2015
2	Replacement Lamp Equivalence	ONLY IF CLAIMING (1) Minimum Lumen output required when claiming equivalence to a specified GLS Tungsten Filament lamp <sup>3</sup>	ONLY IF CLAIMING (1) Minimum lumen output (as a percentage of GLS lamp equivalences of same wattage) required for claimed equivalent wattage reflector filament lamps of stated lamp shapes <sup>4</sup>	ONLY IF CLAIMING (1) Minimum lumen output required for claimed equivalence to linear fluorescent lamp. Bare lamp <sup>5</sup>	10  3 (Linear LED)	Average Luminous flux $\geq$ the specified minimum light output (lm) of the claimed Equivalent wattage	CIE S025 LM79 accepted until July 2019 EN 13032-4:2015

<sup>3</sup> All lumen values (except >125W) align with IEC62612 amd 1:2015 section 9.1 preferred rated luminous flux values

<sup>4</sup> Based on IEA 4 E SSL averaged values for directional lamps

<sup>5</sup> Based on Design Lights Consortium DLC requirements with \* extension

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method												
		Non-directional lamps	Directional lamps	Linear LED (tube)															
		10W = 100 lm 15W = 150 lm 25W = 250 lm 30W = 350 lm 40W = 500 lm 60W = 800 lm 75W = 1000 lm 100W = 1500 lm 125W = 2000 lm 150W = 2500 lm 175W = 3000 lm 200W = 3500 lm  (2) Dimensions of the lamp must comply with equivalent lamp's requirements in the relevant IEC lamp performance specification Standard	<table border="1"> <tr> <td>MR11</td> <td>80%</td> </tr> <tr> <td>MR16</td> <td>80%</td> </tr> <tr> <td>AR-111</td> <td>70%</td> </tr> <tr> <td>R</td> <td>45%</td> </tr> <tr> <td>PAR</td> <td>60%</td> </tr> <tr> <td>R7 (forward lumens)</td> <td>55%</td> </tr> </table> (use linear interpolation between GLS wattage values listed) (2) Dimensions of the lamp must comply with equivalent lamp's requirements in the relevant IEC lamp	MR11	80%	MR16	80%	AR-111	70%	R	45%	PAR	60%	R7 (forward lumens)	55%	L ≤ 600mm: 800 lm  *600 < L ≤ 900mm: 1200 lm  900 < L ≤ 1200mm: 1600 lm  *1200 < L ≤ 1500mm: 2000 lm  [Based on Design Lights Consortium DLC requirements with * extension] (2) Dimensions of the lamp must comply with equivalent lamp's requirements in the relevant IEC lamp performance specification Standard			
MR11	80%																		
MR16	80%																		
AR-111	70%																		
R	45%																		
PAR	60%																		
R7 (forward lumens)	55%																		

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
			performance specification Standard				
3	Centre beam luminous intensity	N/A	<p>For MR or PAR lamps with a beam angle &lt;math&gt;65^\circ&lt;/math&gt;, centre beam intensity should meet equivalent levels using the online tool:  <a href="http://www.energystar.gov/ipa/products/lighting/iledl/IntLampCenterBeamTool.zip">http://www.energystar.gov/ipa/products/lighting/iledl/IntLampCenterBeamTool.zip</a></p> <p>For others lamps: ONLY IF CLAIMING</p> <p>Centre beam luminous intensity <math>\geq</math> declared value</p>	N/A	10	<p>For MR or PAR lamps:</p> <p>Average <math>\geq</math> equivalent level</p> <p>For other lamps:</p> <p>Average <math>\geq</math> declared value</p>	<p>CIE S025</p> <p>LM79 accepted until July 2019</p> <p>EN 13032-4:2015</p>
4	Light distribution	ONLY IF CLAIMING to be an 'omnidirectional' lamp or replacement for a General Lighting Service (GLS) lamp.	<p>Beam angle is <math>\pm 25\%</math> of declared beam angle</p> <p>And 50% of flux shall be in declared beam angle</p>	<p>Beam angle is <math>\pm 25\%</math> of declared beam angle</p> <p>And 50% of flux shall be in declared beam angle</p>	10	No less than 8 lamps (or 3 for linear LED lamps) meet	<p>CIE S025</p> <p>LM79 accepted</p>

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
		<p>Omnidirectional equivalence</p> <p>No less than 5% of total flux (zonal lumens) shall be emitted in the 130° to 180° zone.</p> <p>No less than 35% of total flux (zonal lumens) shall be emitted in the 90° to 180° zone.</p>			3 (Linear LED)	the specified requirements	<p>until July 2019</p> <p>EN 13032-4:2015</p>
Energy conservation							
6	Standby Power (For lamps with Standby mode only)		$P_{\text{STANDBY}}/P_{\text{ON}} \leq 5\%$ Capped at: < 0.5W < 0.3W (2023)		5  3 (Linear LED)	Average $\geq$ value specified  To be tested as supplied for sale (additional functionality may be supplied not activated). See also smart lamp criteria.	AS/NZS IEC 62301  (or IEA 4E SSL Task 7 2016 publication <a href="http://ssl.iea-4e.org/news/stand-by-of-smart-lamps">http://ssl.iea-4e.org/news/stand-by-of-smart-lamps</a> )

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
7	Smart Lighting: on-demand power consumption feature (smart lamps only)	Device to provide energy consumption reporting that is accessible by owner.  To be considered further following the outcomes of investigations by the IEA 4E SSL and G20 working groups.			1	Require device to provide energy consumption reporting that is accessible by owner	Energy Star Lamps v2 Section 12.9
Colour							
8	Colour Rendering	Ra ≥ 80			10	Average ≥ value specified	CIE S025 (refers to CIE 13.3  LM79 accepted until July 2019  EN 13032-4:2015

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method																																			
		Non-directional lamps	Directional lamps	Linear LED (tube)																																						
9	Colour Appearance	Lamp must have one of the following nominal CCTs consistent with the 7-step chromaticity quadrangles and Duv tolerances below. <sup>6</sup>			10	All samples shall have Chromaticity values that fall into the rated nominal CCT quadrangle	CIE S025 (refers to CIE S015)  LM79 accepted until July 2019  EN 13032-4:2015																																			
		<table border="1"> <thead> <tr> <th>Nominal CCT (K)</th> <th>Target CCT and Tolerance (K)</th> <th>Target Duv</th> <th>Duv Tolerance Range</th> </tr> </thead> <tbody> <tr> <td>2200</td> <td>2238 ± 102</td> <td>0.0000</td> <td rowspan="10"> <math>T_x</math>: CCT of the source            For <math>T_x &lt; 2870K</math>  <math>0.000 \pm 0.0060</math>            For <math>T_x \geq 2870K</math>  <math>D_{uv}(T_x) \pm 0.0060</math>            where  <math>D_{uv}(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854</math> </td> </tr> <tr> <td>2500</td> <td>2460 ± 120</td> <td>0.0000</td> </tr> <tr> <td>2700</td> <td>2725 ± 145</td> <td>0.0000</td> </tr> <tr> <td>3000</td> <td>3045 ± 175</td> <td>0.0001</td> </tr> <tr> <td>3500</td> <td>3465 ± 245</td> <td>0.0005</td> </tr> <tr> <td>4000</td> <td>3985 ± 275</td> <td>0.0010</td> </tr> <tr> <td>4500</td> <td>4503 ± 243</td> <td>0.0015</td> </tr> <tr> <td>5000</td> <td>5029 ± 283</td> <td>0.0020</td> </tr> <tr> <td>5700</td> <td>5667 ± 355</td> <td>0.0025</td> </tr> <tr> <td>6500</td> <td>6532 ± 510</td> <td>0.0031</td> </tr> </tbody> </table>				Nominal CCT (K)	Target CCT and Tolerance (K)	Target Duv	Duv Tolerance Range	2200	2238 ± 102	0.0000	$T_x$ : CCT of the source For $T_x < 2870K$ $0.000 \pm 0.0060$ For $T_x \geq 2870K$ $D_{uv}(T_x) \pm 0.0060$ where $D_{uv}(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854$	2500	2460 ± 120	0.0000	2700	2725 ± 145	0.0000	3000	3045 ± 175	0.0001	3500	3465 ± 245	0.0005	4000	3985 ± 275	0.0010	4500	4503 ± 243	0.0015	5000	5029 ± 283	0.0020	5700	5667 ± 355	0.0025	6500	6532 ± 510	0.0031		
Nominal CCT (K)	Target CCT and Tolerance (K)	Target Duv	Duv Tolerance Range																																							
2200	2238 ± 102	0.0000	$T_x$ : CCT of the source For $T_x < 2870K$ $0.000 \pm 0.0060$ For $T_x \geq 2870K$ $D_{uv}(T_x) \pm 0.0060$ where $D_{uv}(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854$																																							
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6500	6532 ± 510	0.0031																																								
10	Colour maintenance	<p>The shift in chromaticity co-ordinates after 6000 hours of operation, <math>\Delta u', v'</math> (6000 hours), <math>\leq 0.007</math></p> <p>LED Module or LED package test data (from an accredited lab) may be used, combined with ISTMT junction temperature test of lamp to be registered.</p>			3	All samples satisfy conditions of the test method.  Compliance testing may be an ISTMT	ISTMT ((IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14) & IESNA LM80 (test includes																																			

<sup>6</sup> As per ANSI C78.377: 2015 Specifications for the Chromaticity of Solid State Lighting Products



Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
						junction temperature test and relevant module/package test report or a full product test.	lens and phosphors) or IESNA LM84 <sup>7</sup>
	Life						
12	Endurance	<p>Must survive one switching cycle for every 2 hours of rated life</p> <p>Must survive temperature cycling test for 1,000 hours</p> <p>Must survive accelerated operational life test for 1,000 hours</p>			10	Satisfy conditions of the test method.	IEC 62612: 2013 Section 11.3.2-4
13	Lumen maintenance	<p>Lumen maintenance @ 6000 hrs</p> <p><math>L_{x,6k} \geq 86.7\%</math></p> <p>(based on <math>L_{70B50} \geq 15,000h</math>) LED Module or LED package test data (from an accredited lab) may be used, combined with ISTMT junction temperature test of lamp to be registered.</p>		<p>Lumen maintenance @ 6,000h</p> <p><math>L_{x,6k} \geq 91.8\%</math></p> <p>(based on <math>L_{70B50} \geq 25,000h</math>)</p>	10	<p>Average <math>L_{x,6k} \geq</math> value specified</p> <p>Compliance testing may be an ISTMT junction temperature</p>	<p>IESNA LM80/TM21 &amp; ISTMT (IEC 60598.1 Section 12.4.1 or UL</p>

<sup>7</sup> Note these test methods relate to luminaires. A test “housing” (ie representative luminaire) for lamps may be required. Consider allowing use of thermal imaging camera.

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
						test relating to module/package test report or a full product test.	1598 Clause 14) or IESNA LM84/TM28 <sup>8</sup>
14	Rated Life Declaration  (relates to packaging requirement)	Packaging declaration of a minimum lifetime of 15,000 hours		Packaging declaration of a minimum lifetime of 25,000 hours	N/A	Declaration Only	N/A
15	Minimum Rated Life, F <sub>50</sub>	< 50% at 15,000 hours  Not to be applied until a practical test method becomes available		< 50% at 25,000 hours  Not to be applied until a practical test method becomes available	To be determined	Average ≤ value specified	To be determined

<sup>8</sup> Note these test methods relate to luminaires. A test “housing” (ie representative luminaire) for lamps may be required. Consider allowing use of thermal imaging camera.

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
Electrical							
17	Power Factor	< 25W: PF > 0.50 ≥ 25W: PF > 0.90		PF > 0.90	10 3 (Linear LED)	Average power factor ≥ value specified	IEC 61000-3-2 (2014)  Test data may be sourced from control gear manufacturer if available
18	Harmonics	<p>For products <math>5W &lt; P \leq 25W</math>: <i>{text here is pending final approval of amendment to 61000-3-2}</i></p> <p>One of the following three requirements:</p> <ol style="list-style-type: none"> <li>the harmonic currents shall not exceed the power-related limits of Table 3, column 2,</li> </ol>			1	Comply with the requirements of IEC61000-3-2	IEC 61000-4-7  Test data may be sourced from control gear manufacturer if available

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method																								
		Non-directional lamps	Directional lamps	Linear LED (tube)																											
		<b>Table 3 – Limits for Class D equipment</b> <table border="1" style="margin: auto;"> <thead> <tr> <th>Harmonic order</th> <th>Maximum permissible harmonic current per watt</th> <th>Maximum permissible harmonic current</th> </tr> <tr> <th><i>n</i></th> <th>mA/W</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>3,4</td> <td>2,30</td> </tr> <tr> <td>5</td> <td>1,9</td> <td>1,14</td> </tr> <tr> <td>7</td> <td>1,0</td> <td>0,77</td> </tr> <tr> <td>9</td> <td>0,5</td> <td>0,40</td> </tr> <tr> <td>11</td> <td>0,35</td> <td>0,33</td> </tr> <tr> <td><math>13 \leq n \leq 39</math> (odd harmonics only)</td> <td><math>\frac{3,85}{n}</math></td> <td>See Table 1</td> </tr> </tbody> </table>			Harmonic order	Maximum permissible harmonic current per watt	Maximum permissible harmonic current	<i>n</i>	mA/W	A	3	3,4	2,30	5	1,9	1,14	7	1,0	0,77	9	0,5	0,40	11	0,35	0,33	$13 \leq n \leq 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1			
Harmonic order	Maximum permissible harmonic current per watt	Maximum permissible harmonic current																													
<i>n</i>	mA/W	A																													
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7	1,0	0,77																													
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11	0,35	0,33																													
$13 \leq n \leq 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1																													
		<p>or:</p> <p>2. the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth harmonic current shall not exceed 61 %. Also, the waveform of the input current shall be such that it reaches the 5 % current threshold before or at 60°, has its peak value before or at 65° and does not fall below the 5 % current threshold before 90°, referenced to any zero crossing of the fundamental supply voltage. The current threshold is 5 % of the highest absolute peak value that occurs in the measurement window, and the phase angle measurements are made on the cycle that includes this absolute peak value (see Figure 2). Components of current with frequencies above 9 kHz shall not influence this evaluation. or:</p> <p>3. the THD shall not exceed 70%. The third order harmonic, expressed as a percentage of the fundamental current, shall not exceed 35%, the fifth order shall not exceed 25%, the seventh order shall not exceed 30%, the ninth and eleventh order shall not exceed 20% and the second order shall not exceed 5%.</p>																													

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method																
		Non-directional lamps	Directional lamps	Linear LED (tube)																			
		<p>If the lighting equipment includes means for control (e.g. dimming, colour), or is specified to drive multiple loads, then the measurement is made only at the control setting and the load of lamps that gives the maximum active input power.</p> <p>NOTE The preceding requirement is based on the assumption that, for lighting equipment using control other than phase control, the THC decreases when the input power is reduced.</p> <p>For lighting equipment containing a control module with an active input power <math>\leq 2</math> W, the contribution of the control module to the harmonic current of the lighting equipment is disregarded e.g. by testing the equipment with control module fed by a separate mains supply.</p> <p>For products <math>&gt;25</math>W<sup>9</sup>:</p> <table border="1" data-bbox="757 767 1303 1098"> <thead> <tr> <th>Harmonic Order</th> <th>Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)</th> </tr> </thead> <tbody> <tr> <td>n</td> <td>(%)</td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>30 - CPF *</td> </tr> <tr> <td>5</td> <td>10</td> </tr> <tr> <td>7</td> <td>7</td> </tr> <tr> <td>9</td> <td>5</td> </tr> <tr> <td>11 ≤ n ≤ 39 (odd harmonics only)</td> <td>3</td> </tr> </tbody> </table> <p>* CPF is the circuit power factor</p> <p><i>{text below is pending final approval of amendment to 61000-3-2}</i></p> <p>For the other types of lighting equipment that includes means for control (e.g. dimming, colour), the following conditions apply:</p> <ol style="list-style-type: none"> <li>the harmonic current values for the maximum active input power condition derived from the percentage limits given in Table 2 shall not be exceeded;</li> </ol>			Harmonic Order	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)	n	(%)	2	2	3	30 - CPF *	5	10	7	7	9	5	11 ≤ n ≤ 39 (odd harmonics only)	3			
Harmonic Order	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)																						
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<sup>9</sup> IEC 61000-3-2, Table 2, Limits for Class C equipment

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
		2. at control settings leading to an active input power less than the maximum input power condition, the harmonic currents shall not exceed the limits based on the maximum active input power of: <ul style="list-style-type: none"> <li>○ below 50W: no limits below 5 W;</li> <li>○ 50 W - 250 W: no limits below 10% of maximum active input power;</li> <li>○ above 250 W: no limits below 25 W.</li> </ul>					
Operation							
19	Dimmer compatibility	Lamp dims smoothly to 30% of light output with no observable flicker and no audible noise. When dimmer is set to 100%, light output $\geq$ 90% of lamp without dimmer. For dimmable products, the lamp manufacturer shall: <ul style="list-style-type: none"> <li>(a) declare the conditions under which the lamp will dim</li> <li>(b) provide a webpage address that lists compatible dimmer makes and models including (for ELV lamps) compatible makes and models of ELVCs available in the local market; and</li> <li>(c) for each compatible dimmer, the number of lamps that can be dimmed and the range of luminous flux levels a given dimmer-lamp combination can achieve.</li> </ul> Note. Condition applies to Lamp		N/A	3 lamps  2 dimmers  (1 ELVC model if required)	All lamp/dimmer/ (ELVC, if required) combinations where compatibility claimed satisfy conditions of the test method.	To be developed <sup>10</sup>  To include tests for inrush current, maximum cycle current, 30% dim and flicker (IEEE 1789 or other).  Suppliers do not need to

<sup>10</sup> IEC Joint Working Committee TC 34 & 23B on the interoperability of dimmers and LED products 34/305/DTR may provide reference Also IEC TC document 34C/1187/DC on in-rush current may provide reference

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
							submit tests for registration. Compliance may test
20	ELV converter compatibility  (For ELV Lamps only)	<p>In combination with ELV converter shall operate in a stable manner without observable flicker, light fluctuation or audible noise</p> <p>Also the manufacturer shall:</p> <p>(a) declare which ELV conditions (e.g. minimum/maximum number of lamps connected to ELVC) under which the lamp will operate</p> <p>(b) provide a webpage address that lists compatible ELV converter makes and models including ELVCs available in the local market.</p>		N/A	3 lamps  3 ELVCs	All lamp/ELVC combinations where compatibility claimed satisfy conditions of the test method.	<p>To be developed</p> <p>To include tests for flicker (IEEE 1789 or other) and audible noise.</p> <p>Suppliers do not need to submit tests for registration. Compliance may test.</p>

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method								
		Non-directional lamps	Directional lamps	Linear LED (tube)											
Health															
21	Photo-biological Safety	For ELV Lamps only (other lamps subject to similar safety regulation) Blue Light & UV hazards shall be either RG0 or RG1 unlimited <sup>11</sup>  (This is based on advice that Australian electrical safety regulators will regulate Photo-biological Safety for all but ELV lamps - awaiting advice on New Zealand)			1	Satisfy conditions of the test method.	IEC 62471 / CIE S009								
22	Dominant light modulation frequency (f) Modulation percent at this frequency (Mod%) <sup>12</sup>  includes Flicker effects)	Maximum flicker modulation (based on the flicker frequency) <sup>13</sup> <table border="1" data-bbox="616 699 1171 1050"> <thead> <tr> <th>Dominant modulation frequency (f)</th> <th>Modulation percent at f</th> </tr> </thead> <tbody> <tr> <td><math>f \leq 90\text{Hz}</math></td> <td><math>FM \leq (0.025 \times f)</math></td> </tr> <tr> <td><math>90\text{Hz} \leq f \leq 1250\text{Hz}</math></td> <td><math>FM \leq (0.08 \times f)</math></td> </tr> <tr> <td><math>f &gt; 1250\text{Hz}</math></td> <td>No Mod% requirement</td> </tr> </tbody> </table>			Dominant modulation frequency (f)	Modulation percent at f	$f \leq 90\text{Hz}$	$FM \leq (0.025 \times f)$	$90\text{Hz} \leq f \leq 1250\text{Hz}$	$FM \leq (0.08 \times f)$	$f > 1250\text{Hz}$	No Mod% requirement	1	Satisfy conditions of the test method.	IEEE 1789 or other if specified in Determination.
Dominant modulation frequency (f)	Modulation percent at f														
$f \leq 90\text{Hz}$	$FM \leq (0.025 \times f)$														
$90\text{Hz} \leq f \leq 1250\text{Hz}$	$FM \leq (0.08 \times f)$														
$f > 1250\text{Hz}$	No Mod% requirement														

<sup>11</sup> Based on IEC 62471/CIE S009. Guidance is provided in IEC/TR 62778:2014: Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires

<sup>12</sup> The requirements are based on IEEE 1789-2015. The priority here is on restricting the visible modulation of light (including flicker) at frequencies  $\leq 90$  Hz, as more research is required on the effects of light modulation frequencies beyond 90 Hz (i.e. non-visible effects). NOTE1: In some particular instances, there is a strong sub-harmonic or inter-harmonic frequency in the luminance modulation waveform. In this case, the dominant light modulation frequency may not be clearly defined. The requirements should then be met for both the Fourier fundamental frequency and the sub/inter harmonic frequency. NOTE2: Due to the lack of a standard for the photometric measurement of modulated light, the SSL Annex are continuing to work on this issue, consult with stakeholders including CIE TC 1-83 (authors of CIE TN 006:2016), and will issue an update when new guidance becomes available.

<sup>13</sup> Based on IEEE 1789:2015, Confirmed that Australian electrical safety regulators will not be covering flicker



Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Non-directional lamps	Directional lamps	Linear LED (tube)			
23	Maximum high angle Luminance	N/A		When the gamma ( $\gamma$ ) angle exceeds 60 degrees, the light source luminance is no more than 10,000 candela/m <sup>2</sup> in C <sub>0</sub> , C <sub>45</sub> and C <sub>90</sub> planes	3	All lamps satisfy requirements	CIE S025 LM79 accepted until July 2019 EN 13032-4:2015

### COMMENTS FROM PHILIPS LIGHTING S&R (STANDARDS & REGULATIONS) TEAM

#### Performance requirements-Table 1 – Lamps

- Lighting industry needs to be aware that this MEPs document is distinguishing a) Non-directional; b) Directional and c) Linear lamps, whereas the IEC performance standards for lamps are split over technology: a) Retrofit LED lamps >50V (230V); b) Retrofit LED lamps <50V (12V); c) TLED. Philips Lighting suggests to adopt universal IEC method of distinguishing different types of lamps.
- Lamp efficacy- Philips Lighting recommends not put time limit, 2020 and 2023. Since LED technology is still evolving, it is difficult to predict what shall be the Lighting situation in next 2 to 6 years from now. Philips Lighting proposes to use only two stages: 2018 and 2020 with a review in 2022.
  - For non-directional lamps, proposed is 65lm/W
  - For directional lamps, proposed is 60lm/W due to optical loss from special beam design.
  - For connected LED lamp, proposed is 15% decrease of efficacy due to driver loss for involvement of special features.

3. Replacement Lamp Equivalence-Propose to refer to Europe regulations as below:
  - 244/2009/EC (non-directional LED lamp)
  - 1174/2012/EC (directional LED lamp).
  - Propose to delete equivalence requirement for TLED
  - Propose to delete the dimension of lamps and mark MOL/MOD
4. Since equivalence claim is based on light output in item 2, the claim based on center beam intensity shall be deleted. Otherwise, there is contradiction. In case we have to put the value over there, the limit than should refer IEC 62612.
5. Light Distribution - For TLED, do we have to put beam angle on it? Philips Lighting suggest to delete the TLED Beam angle requirement.
6. Ratio of Standby Power to On power (For lamps with Standby mode only)  $P_{STANDBY}/P_{ON} \leq 5\%$ . Rated power should be one of the consideration factor, eg., if the rated power is 3W, then the requirement for 3W standby power is  $\leq 0.15W$ , but even in year 2023 the requirement is  $\leq 0.3W$ . Philips Lighting recommends to have Stand by Power cap at 0.5 W. Since standby losses are hardly effected by lamp wattage, it means that this requirement will make it difficult to create low wattage lamps with standby functionality, potentially hampering further energy saving. Proposal to remove this ratio requirement.
7. Colour Rendering  $R_a \geq 80$ . Should only be valid for LED lamps for consumer market. Not relevant for professional LED products as the application requirements / standards will prevail.
8. Colour Appearance- Philips Lighting recommends that such requirement should not be included in the MEPS, hence to be deleted.
9. Colour Maintenance- Philips Lighting recommends that such requirement should not be included in the MEPS, hence to be deleted.
10. Lumen maintenance--Minimum lifetime is not regulated since so far no reliable method available to verify whole Lifetime. The overall of this 'lumen maintenance' is very questionable. If the Lx, 6k value was deduced from claimed lifetime based on TM21 or product exponential features, why not use the value of the Lx, 2K or even Lx, 1K? 6k hours test is a big loading and is not reasonable to be required in MEPS standard. What's the requirement for 15K hrs for non-directional and directional lamps? More clarification is required here.
11. Rated Life declaration – Philips Lighting recommends not to be applied until a practical proven test method is available. What is the added value of this declaration since there is no standard to explain how to measure/calculate in such a way that apple-to-apple comparison in case of verification is possible.

12. Warranty- proposed to change the duration to minimum 1 year.
13. Power factor- Philips Lighting suggests not to specify power factor at lamp level. IEC 61000-3-2 is not the right standard to refer to for power factor. For Power Factor please refer to IEC 62612 LED lamps > 50V performance requirements Annex D. This also specifies limiting values. For LED lamps < 50V performance requirements are under development (IEC 63063) so there is today no performance standard available that specifies how to measure the Power Factor. Also for TLED there is no performance standard available that specifies how to measure the Power factor. In case of retrofit TLED (used in existing luminaires) the power factor has to be seen at luminaire level with the combination of TLED and control gear.
14. Harmonics – Philips Lighting proposes to adopt the current IEC61000-3-2 and not wait for any coming IEC which is still under discussions.
15. Dimmer Compatibility – Philips Lighting recommends not to include in MEPS. Since this attribute cannot be a Lamps only requirement, it takes 2 to tango (lamp and dimmer). As IEC test method is under development, it cannot be included already in these MEPS.
16. Photobiological safety. Philips Lighting agrees with requirements.
17. Flicker- Philips Lighting suggests to adopt IEC TR 61547-1's requirement in visible flickering. The draft refers to IEEE 1789 which has too stricter requirements and not widely recognized in global lighting industry. IEEE has decided to review and revise IEEE 1789-2015.
18. Maximum high angle luminance - Glare requirement is relevant to luminaire, so Philips Lighting proposes to delete this requirement for LED lamps. Also the limits are application dependent and laid down in different CIE norms. Not recommended to specify at product level.

**Table 2 – Integrated LED luminaires<sup>14</sup>**

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
Energy Efficiency & Photometric							
1	Efficacy	<u>Directional</u> ≥ 65 lm/W ≥ 85 lm/W (2020) ≥100 lm/W (2023)  <u>Non-directional</u> ≥ 65 lm/W (2019) ≥ 85 lm/W (2021) ≥100 lm/W (2023)	≥ 110 lm/W (2020) ≥ 120 lm/W (2023)	≥ 90 lm/W (2019) ≥ 110 lm/W (2021) ≥ 120 lm/W (2023)	4 (Small)  2 (Large & P/B/T)	Average ≥ value specified	CIE S025  LM79 accepted until July 2019  EN 13032-4:2015
2	Replacement Lamp Equivalence	ONLY IF CLAIMING. Where claiming replacement equivalence to a specific lamp based fixture the luminaire must meet minimum lumen output provided for lamps in table 1.	None provided	ONLY IF CLAIMING. Luminaire lumens (per lamp) for claimed number of tubular fluorescent lamp equivalents must meet minimum lumen output provided in the lamp table 1.	3 (Small)  1 (P/B/T)	Average Luminous flux ≥ Claimed Equivalent wattage specified minimum light output (lm)	CIE S025  LM79 accepted until July 2019

<sup>14</sup> Note that for maintained emergency lighting luminaires compliance with the performance requirements shall be met when the emergency components are disconnected.

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
		(eg for halogen downlights replacements, use equivalence of MR16 directional lamp)					EN 13032-4:2015
3	Centre beam luminous intensity	<p>ONLY IF CLAIMING. For luminaires claiming equivalence to MR or PAR lamps with a beam angle &lt;65°, centre beam intensity should meet equivalent levels using the online tool: <a href="http://www.energystar.gov/ipa/products/lighting/iled/IntlampCenterBeamTool.zip">http://www.energystar.gov/ipa/products/lighting/iled/IntlampCenterBeamTool.zip</a></p> <p>ONLY IF CLAIMING</p> <p>Centre beam luminous intensity ≥ declared value</p>	<p>ONLY IF CLAIMING</p> <p>Centre beam luminous intensity ≥ declared value</p>	N/A	<p>3 (Small)</p> <p>1 (Large)</p>	<p>For MR or PAR lamp claimed equivalence:</p> <p>Average ≥ of equivalent level</p> <p>For other lamps:</p> <p>Average ≥ of declared value</p>	<p>CIE S025</p> <p>LM79 accepted until July 2019</p> <p>EN 13032-4:2015</p>

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
4	Light distribution	<p>ONLY for Directional luminaires:</p> <p>Beam angle is <math>\pm 25\%</math> of declared beam angle</p> <p>and</p> <p>50% of flux shall be in declared beam angle</p>	None provided		3	All samples meet the specified requirements	<p>CIE S025</p> <p>LM79 accepted until July 2019</p> <p>EN 13032-4:2015</p>
Energy conservation							
5	Standby Power (For luminaires with Standby mode only)	$P_{\text{STANDBY}}/P_{\text{ON}} \leq 5\%$ capped at: < 0.5W < 0.3W (2023)	$< 0.1.1\text{W}$ $< 0.0.5\text{W}$ (2023)		3 (Small)  1 (Large & P/B/T)	All samples $\leq$ value specified  To be tested as supplied for sale (additional functionality may be supplied not	AS/NZS IEC 62301  (or IEA 4E SSL Task 7 2016 publication)

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
			product/parameter, e.g. DALI and sensor, luminaire is to be measured.			activated). See also smart lamp criteria.	
7	Smart Lighting – controlled variations in power consumption (smart luminaires only)	To be considered following the outcomes of investigations by the IEA 4E SSL and G20 working groups			1	Require device to provide energy consumption reporting that is accessible by owner	Energy Star Lamps v2 Section 12.9
Colour							
8	Colour Rendering		Ra ≥80		3 (Small)  1 (Large & P/B/T)	Average ≥ value specified	CIE S025 (refers to CIE 13.3)
9							

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method																																									
		Small	Large	Planar, Battens & Troffers (P/B/T)																																												
	Colour Appearance	Lamp must have one of the following nominal CCTs consistent with the 7-step chromaticity quadrangles and Duv tolerances below. <sup>15</sup>			3 (Small)  1 (Large & P/B/T)	All samples shall have chromaticity values that fall into the rated nominal CCT quadrangle	CIE S025 (refers to CIE S015)																																									
		<table border="1"> <thead> <tr> <th>Nominal CCT (K)</th> <th>Target CCT and Tolerance (K)</th> <th>Target Duv</th> <th>Duv Tolerance Range</th> </tr> </thead> <tbody> <tr> <td>2200</td> <td>2238 ± 102</td> <td>0.0000</td> <td rowspan="3"><math>T_x</math>: CCT of the source For <math>T_x &lt; 2870\text{K}</math> <math>0.000 \pm 0.0060</math></td> </tr> <tr> <td>2500</td> <td>2460 ± 120</td> <td>0.0000</td> </tr> <tr> <td>2700</td> <td>2725 ± 145</td> <td>0.0000</td> </tr> <tr> <td>3000</td> <td>3045 ± 175</td> <td>0.0001</td> <td rowspan="2">For <math>T_x \geq 2870\text{K}</math> <math>D_{uv}(T_x) \pm 0.0060</math> where <math>D_{uv}(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854</math></td> </tr> <tr> <td>3500</td> <td>3465 ± 245</td> <td>0.0005</td> </tr> <tr> <td>4000</td> <td>3985 ± 275</td> <td>0.0010</td> <td></td> </tr> <tr> <td>4500</td> <td>4503 ± 243</td> <td>0.0015</td> <td></td> </tr> <tr> <td>5000</td> <td>5029 ± 283</td> <td>0.0020</td> <td></td> </tr> <tr> <td>5700</td> <td>5667 ± 355</td> <td>0.0025</td> <td></td> </tr> <tr> <td>6500</td> <td>6532 ± 510</td> <td>0.0031</td> <td></td> </tr> </tbody> </table>			Nominal CCT (K)	Target CCT and Tolerance (K)	Target Duv	Duv Tolerance Range	2200	2238 ± 102	0.0000	$T_x$ : CCT of the source For $T_x < 2870\text{K}$ $0.000 \pm 0.0060$	2500	2460 ± 120	0.0000	2700	2725 ± 145	0.0000	3000	3045 ± 175	0.0001	For $T_x \geq 2870\text{K}$ $D_{uv}(T_x) \pm 0.0060$ where $D_{uv}(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854$	3500	3465 ± 245	0.0005	4000	3985 ± 275	0.0010		4500	4503 ± 243	0.0015		5000	5029 ± 283	0.0020		5700	5667 ± 355	0.0025		6500	6532 ± 510	0.0031				
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4000	3985 ± 275	0.0010																																														
4500	4503 ± 243	0.0015																																														
5000	5029 ± 283	0.0020																																														
5700	5667 ± 355	0.0025																																														
6500	6532 ± 510	0.0031																																														
10	Colour maintenance	The shift in chromaticity co-ordinates after 6000 hours of operation, $\Delta u',v'$ (6000 hours), $\leq 0.007$			3	All samples satisfy conditions of the test method.	ISTMT (IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14) & IESNA LM80																																									

<sup>15</sup> As per ANSI C78.377: 2015 Specifications for the Chromaticity of Solid State Lighting Products



Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
		Module or LED package test data (from an accredited lab) may be used, combined with ISTMT junction temperature test of lamp to be registered.				Compliance testing may be a ISTMT junction temperature test and relevant module/package test report or a full product test.	(acceptable where module tested includes lens and phosphors) or IESNA LM84 <sup>16</sup>
Life							
12	Endurance	<p>Must survive one switching cycle for every 1 hours of rated life<sup>17</sup></p> <p>Must survive temperature cycling test for 1,000 hours</p> <p>Must survive accelerated operational life test for 1,000 hours</p>			<p>3 (Small)</p> <p>1 (Large &amp; P/B/T)</p>	Satisfy conditions of the test method.	<p>IEC 62722.2.1: 2011 Section 10.3.2-4</p> <p>Test data from module and driver accepted</p>

<sup>16</sup> Note testing of small luminaires may require consideration of insulation requirement. Consider allowing use of thermal imaging camera

<sup>17</sup> Note: twice requirement of IEC 62722.2.1

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
							(IEC 62717 Section 10.3)
13	Lumen maintenance	<p>Lumen maintenance @ 6,000h</p> <p><math>L_{x,6k} \geq 93.1\%</math></p> <p>(based on <math>L_{70}B_{50} \geq 30,000h</math>)</p> <p>Module or LED package test data (from an accredited lab) may be used, combined with ISTMT junction temperature test of lamp to be registered.</p>	<p>Lumen maintenance @ 6,000h (<math>L_{x,6k}</math>)</p> <p><math>\geq 95.4\%</math> of initial</p> <p>(based on <math>L_{70}B_{50} \geq 45,000h</math>)</p> <p>Module or LED package test data (from an accredited lab) may be used, combined with ISTMT junction temperature test of lamp to be registered.</p>		3	<p>Average <math>L_{x,6k} \geq</math> value specified</p> <p>Compliance testing may be a ISTMT junction temperature test and relevant module/package test report or a full product test.</p>	<p>IESNA LM80/TM21 &amp; ISTMT (IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14)</p> <p>or</p> <p>IESNA LM84/TM28</p> <p>Consider allowing use of thermal imaging camera<sup>18</sup></p>
14	Rated Life Declaration	Packaging declaration of a minimum of 30,000 hours	Packaging declaration of a minimum of 45,000 hours		N/A	Declaration Only	N/A

<sup>18</sup> Note testing of small luminaires may require consideration of insulation requirement.

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
	(relates to packaging requirement)						
15	Minimum Rated Life, F <sub>50</sub>	< 50% at 30,000 hours  Not to be applied until a practical test method becomes available	< 50% at 45,000 hours  Not to be applied until a practical test method becomes available		To be determined	Average ≤ value specified	To be determined
Electrical							
17	Power Factor		> 0.90		1 (Small)  1 (Large & P/B/T)	Average power factor ≥ value specified	IEC 61000-3-2 (2014)  Test data may be sourced from control gear manufacturer

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method																			
		Small	Large	Planar, Battens & Troffers (P/B/T)																						
18	Harmonics	<p>For products <math>5W &lt; P \leq 25W</math>: <i>{text here is pending final approval of amendment to 61000-3-2}</i></p> <p>One of the following three requirements:</p> <ol style="list-style-type: none"> <li>the harmonic currents shall not exceed the power-related limits of Table 3, column 2, </li> </ol>			1	Comply with the requirements of IEC61000-3-2	IEC 61000-4-7  Test data may be sourced from control gear manufacturer																			
<p style="text-align: center;"><b>Table 3 – Limits for Class D equipment</b></p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Harmonic order</th> <th>Maximum permissible harmonic current per watt</th> <th>Maximum permissible harmonic current</th> </tr> <tr> <th><i>n</i></th> <th>mA/W</th> <th>A</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>3,4</td> <td>2,30</td> </tr> <tr> <td>5</td> <td>1,9</td> <td>1,14</td> </tr> <tr> <td>7</td> <td>1,0</td> <td>0,77</td> </tr> <tr> <td>9</td> <td>0,5</td> <td>0,40</td> </tr> <tr> <td>11</td> <td>0,35</td> <td>0,33</td> </tr> <tr> <td><math>13 \leq n \leq 39</math> (odd harmonics only)</td> <td><math>\frac{3,85}{n}</math></td> <td>See Table 1</td> </tr> </tbody> </table> <p style="text-align: right;">or:</p>			Harmonic order	Maximum permissible harmonic current per watt				Maximum permissible harmonic current	<i>n</i>	mA/W	A	3	3,4	2,30	5	1,9	1,14	7	1,0	0,77	9	0,5	0,40	11	0,35	0,33
Harmonic order	Maximum permissible harmonic current per watt	Maximum permissible harmonic current																								
<i>n</i>	mA/W	A																								
3	3,4	2,30																								
5	1,9	1,14																								
7	1,0	0,77																								
9	0,5	0,40																								
11	0,35	0,33																								
$13 \leq n \leq 39$ (odd harmonics only)	$\frac{3,85}{n}$	See Table 1																								
<ol style="list-style-type: none"> <li>the third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth harmonic current shall not exceed 61 %. Also, the waveform of the input current shall be such that it reaches the 5 % current threshold before or at 60°, has its peak value before or at 65° and does not fall below the 5 % current threshold before 90°, referenced to any zero crossing of the fundamental supply voltage. The current threshold is 5 % of the highest absolute peak value that occurs in the measurement window, and the phase angle measurements are made on the cycle that includes this absolute peak value (see Figure 2). Components of current with frequencies above 9 kHz shall not influence this evaluation. or:</li> </ol>																										

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
		<p>3. the THD shall not exceed 70%. The third order harmonic, expressed as a percentage of the fundamental current, shall not exceed 35%, the fifth order shall not exceed 25%, the seventh order shall not exceed 30%, the ninth and eleventh order shall not exceed 20% and the second order shall not exceed 5%.</p> <p>If the lighting equipment includes means for control (e.g. dimming, colour), or is specified to drive multiple loads, then the measurement is made only at the control setting and the load of lamps that gives the maximum active input power.</p> <p>NOTE The preceding requirement is based on the assumption that, for lighting equipment using control other than phase control, the THC decreases when the input power is reduced.</p> <p>For lighting equipment containing a control module with an active input power <math>\leq 2</math> W, the contribution of the control module to the harmonic current of the lighting equipment is disregarded e.g. by testing the equipment with control module fed by a separate mains supply.</p> <p>For products <math>&gt;25</math>W<sup>19</sup>:</p>					

<sup>19</sup> IEC 61000-3-2, Table 2, Limits for Class C equipment

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method																		
		Small	Large	Planar, Battens & Troffers (P/B/T)																					
		<table border="1"> <thead> <tr> <th>Harmonic Order</th> <th>Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)</th> </tr> </thead> <tbody> <tr> <td>n</td> <td></td> </tr> <tr> <td>2</td> <td>2</td> </tr> <tr> <td>3</td> <td>30 - CPF *</td> </tr> <tr> <td>5</td> <td>10</td> </tr> <tr> <td>7</td> <td>7</td> </tr> <tr> <td>9</td> <td>5</td> </tr> <tr> <td>11 ≤ n ≤ 39 (odd harmonics only)</td> <td>3</td> </tr> <tr> <td colspan="2">* CPF is the circuit power factor</td> </tr> </tbody> </table> <p><i>{text below is pending final approval of amendment to 61000-3-2}</i></p> <p>For the other types of lighting equipment that includes means for control (e.g. dimming, colour), the following conditions apply:</p> <ol style="list-style-type: none"> <li>the harmonic current values for the maximum active input power condition derived from the percentage limits given in Table 2 shall not be exceeded;</li> <li>at control settings leading to an active input power less than the maximum input power condition, the harmonic currents shall not exceed the limits based on the maximum active input power of: <ul style="list-style-type: none"> <li>below 50W: no limits below 5 W;</li> <li>50 W - 250 W: no limits below 10% of maximum active input power;</li> <li>above 250 W: no limits below 25 W.</li> </ul> </li> </ol>			Harmonic Order	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)	n		2	2	3	30 - CPF *	5	10	7	7	9	5	11 ≤ n ≤ 39 (odd harmonics only)	3	* CPF is the circuit power factor				
Harmonic Order	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency (%)																								
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2	2																								
3	30 - CPF *																								
5	10																								
7	7																								
9	5																								
11 ≤ n ≤ 39 (odd harmonics only)	3																								
* CPF is the circuit power factor																									
Operation																									
19		Luminaire Dims smoothly to 30% of light output with no observable flicker and no	N/A																						

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
	Dimmer compatibility	audible noise. When dimmer is set to 100%, light output $\geq$ 90% of luminaire without dimmer. For dimmable products, the manufacturer shall:  (a) declare the conditions under which the luminaire will dim (b) provide a webpage address that lists compatible dimmer makes and models; and (c) for each compatible dimmer, the number of luminaires that can be dimmed and the range of luminous flux levels a given dimmer-luminaire combination can achieve.			1 luminaire  1 dimmer	Satisfy conditions of the test method.	To be developed <sup>20</sup>  To include tests for inrush current, maximum cycle current, 30% dim and flicker (IEEE 1789 or other).  Suppliers do not need to submit tests for registration. Compliance may test.
Health							

<sup>20</sup> IEC Joint Working Committee TC 34 & 23B on the interoperability of dimmers and LED products 34/305/DTR may provide reference Also IEC TC document 34C/1187/DC on in-rush current may provide reference

Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method								
		Small	Large	Planar, Battens & Troffers (P/B/T)											
20	Photo-biological Safety	(To be deleted subject to confirmation that New Zealand Electrical Safety regulations cover) Blue Light & UV hazards shall be either RG0 or RG1 unlimited <sup>21</sup>			1	Satisfy conditions of the test method.	IEC 62471 / CIE S009								
21	Dominant light modulation frequency (f) Modulation percent at this frequency (Mod%) <sup>22</sup>  (includes Flicker effects)	Maximum flicker modulation (based on the flicker frequency) <sup>23</sup>  <table border="1" data-bbox="577 667 1133 1018"> <thead> <tr> <th>Dominant modulation frequency (f)</th> <th>Modulation percent at f</th> </tr> </thead> <tbody> <tr> <td>f ≤ 90Hz</td> <td>FM ≤ (0.025 × f)</td> </tr> <tr> <td>90Hz ≤ f ≤ 1250Hz</td> <td>FM ≤ (0.08 × f)</td> </tr> <tr> <td>f &gt; 1250Hz</td> <td>No Mod% requirement</td> </tr> </tbody> </table>			Dominant modulation frequency (f)	Modulation percent at f	f ≤ 90Hz	FM ≤ (0.025 × f)	90Hz ≤ f ≤ 1250Hz	FM ≤ (0.08 × f)	f > 1250Hz	No Mod% requirement	1	Satisfy conditions of the test method.	IEEE 1789 (or other specified in Determination)
Dominant modulation frequency (f)	Modulation percent at f														
f ≤ 90Hz	FM ≤ (0.025 × f)														
90Hz ≤ f ≤ 1250Hz	FM ≤ (0.08 × f)														
f > 1250Hz	No Mod% requirement														

<sup>21</sup> Based on IEC 62471/CIE S009. Guidance is provided in IEC/TR 62778:2014: Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires

<sup>22</sup> The requirements are based on IEEE 1789-2015. The priority here is on restricting the visible modulation of light (including flicker) at frequencies ≤ 90 Hz, as more research is required on the effects of light modulation frequencies beyond 90 Hz (i.e. non-visible effects). NOTE1: In some particular instances, there is a strong sub-harmonic or inter-harmonic frequency in the luminance modulation waveform. In this case, the dominant light modulation frequency may not be clearly defined. The requirements should then be met for both the Fourier fundamental frequency and the sub/inter harmonic frequency. NOTE2: Due to the lack of a standard for the photometric measurement of modulated light, the SSL Annex are continuing to work on this issue, consult with stakeholders including CIE TC 1-83 (authors of CIE TN 006:2016), and will issue an update when new guidance becomes available.

<sup>23</sup> Based on IEEE 1789:2015



Ref	Attribute	Requirement			Sample size	Compliance criteria	Test method
		Small	Large	Planar, Battens & Troffers (P/B/T)			
22	Maximum high angle Luminance	When the gamma ( $\gamma$ ) angle exceeds 60 degrees, the light source luminance is no more than 10,000 candela/m <sup>2</sup> in C <sub>0</sub> , C <sub>45</sub> and C <sub>90</sub> planes			3	All lamps satisfy requirements	CIE S025 LM79 accepted until July 2019 EN 13032-4:2015

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## **COMMENTS FROM PHILIPS LIGHTING S&R (STANDARDS & REGULATIONS) TEAM**

### **Table 2 - Integrated LED Luminaires**

1. Philips Lighting believes the proposed product category definitions are not clear e.g. what is large/small? Definition to be clear what is planar, batten, troffers, recessed, suspended and surface type. This causes confusion and requires further clarification.
2. Also the proposed scope is not clear:
  - a) The exercise is about LED MEPs for both lamps and luminaires. There is a split in MEPS for 'Integrated LED luminaires' (page 55) and 'Non-integrated commercial luminaires' (page 60) whereas Annex H only specifies 'Integrated LED luminaires MEPS' related criteria (table 2).
  - b) There seems a contradiction in Annex H scope + scope exclusions: Scope: Planar Luminaires, integrated battens & Troffers (table 2)
    - troffer/recessed luminaires (defined in AS/NZS 60598-2-2)
    - batten/fixed general purpose luminaires (defined in AS/NZS 60598-2-1)
  - c) Scope exclusion: Integrated LED luminaires (Small and Large) exclude - Planar Luminaires, integrated battens & Troffers (including those defined in AS/NZS 60598.2.1 and AS/NZS 60598.2.2:2002)
  - d) In Small: Scope Exclusions for Integrated LED luminaires—first clause: "Planar Luminaires, integrated battens & Troffers (including those defined in AS/NZS 60598.2.1 and AS/NZS 60598.2.2:2002) " need to more specific. Since previously chapter lists planar, integrated batten and Troffers include in the scope, so here need to clarify under what condition those products can be excluded.
3. Efficacy – Philips Lighting proposes 45 lm/W or lower to be safe for Small Integrated Luminaires, due to optical efficiency and LED overdrive constraints. Efficacy measurement is difficult for Consumer Luminaire (Small) in case of decorative style luminaire.
4. Efficacy - Introducing a lm/W threshold for professional luminaires does not make much sense. For energy saving potential of non-residential buildings, better introduce energy requirements for lighting systems and limit the energy use (kWh/m<sup>2</sup>/year) for these lighting systems in different applications. Many decorative luminaires are not designed for optimal efficiency. Light output ratio (LOR) is often low. his requirements does not make sense for many decorative luminaires used in Home application.
5. Standby Power - Proposal to remove section on standby requirements for luminaires, since it will hamper energy efficient solutions to enter the market. Also it is not clear what is meant with "luminaire with Standby mode only",
6. Smart Lighting- Philips Lighting recommends not to be applied until a practical test method becomes available. IEC standards is the preference as Philips Lighting does not support IEA 4E SSL publications.
7. Colour Rendering – Philips Lighting suggests that Ra ≥ 80 should only be valid for LED luminaires for consumer market. Not relevant for professional LED luminaires as the application requirements / standards will prevail.
8. Colour Appearance. Proposed to delete requirement from the MEPS.
9. Colour Maintenance. Proposed to delete requirement from the MEPS.

10. Lumen Maintenance - Philips Lighting recommends that based on L70/B50, these values to be changed to 15 000 hrs (but not 30000 hrs or 45000 hrs) and also recommends to use IEC 62722-2-1 Performance requirements for LED based luminaires and IEC 62717 Performance requirements for LED modules.
11. Rated Life Declaration - Philips Lighting recommends the rated life declaration changed to 15,000 hrs (as most our products is designed for 15,000 hrs to 20, 000 hrs) and presently not to be applied till a practical test method becomes available.
12. Warranty - The warranty requirement does not make sense because it tries to link warranty to Lifetime claim (L70). But here the most important factor is early failure rate. Philips Lighting proposed to have warranty duration of only 1 year. If warranty declarations become mandatory, Philips Lighting recommends to skip the attributes related to maintained (3K/6K) values and lifetime declarations.
13. Power factor- Philips Lighting proposes for small luminaire (<25W) to comply with ERP (>0.5).
14. Harmonics – Currently luminaire products for rated power less than 25W, harmonic test is not required. In addition, {text below is pending final approval of amendment to 61000-3-2} also impact  $P \geq 25W$  products, Philips Lighting suggests not to adopt harmonics requirements till final IEC standard is finalized.
15. Flicker – Philips Lighting suggest to recommend TLA measurement method of Philips for flicker. Philips Lighting recommends to refer to IEC TR 61547 as IEEE 1789 is not universally accepted.
16. Maximum high value Luminance – Not required as Glare does not make much sense as it is difficult to link Glare to visual comfort. For professional luminaires used in non-residential buildings this will be application specific. And is normally specified in CIE application norms that are used for lighting scheme designs, hence no need to specify this at product level.
17. Dimmer Compatibility – Philips Lighting believes this is not clear. Does the trunkable batten or similar DIY need to be considered? Clarification is required on how to measure, for LED batten or SELV LED strip and in such cases will the test be based on the each individual small package or based on Max connection?

**Table 3: Proposed product package marking requirements<sup>24</sup>**

Ref	Attribute	Product	Package	Spec Sheet /website	Marked Value Criterion
1	Lumens	X	X	X	<p><u>Non-directional LED lamps:</u>                      The rated luminous flux should preferably<sup>25</sup> be one of the following values: 100 lm, 150 lm, 250 lm, 350 lm, 500 lm, 800 lm, 1000 lm, 1500 lm, 2000 lm, 3000 lm.<sup>26</sup></p> <p>The initial luminous flux of each individual LED lamp in the measured sample shall not be less than the rated luminous flux by more than 10 %, and not be more than the rated luminous flux by more than <del>10% unless, if the rated value is one of the preferred values listed above, then</del><sup>27</sup>20%.</p> <p>The average initial luminous flux of the LED lamps in the measured sample shall not be less than the rated luminous flux by more than 7.5 %.</p> <p><u>Directional lamps:</u>                      The initial luminous flux of each individual LED lamp/luminaire in the measured sample shall not be less than the rated luminous flux by more than 10 % and not be more than the rated luminous flux by more than 10%. The average initial luminous flux of the LED lamps in the measured sample shall not be less than the rated luminous flux by more than 7.5 %.</p>

<sup>24</sup> Note that the allowed variations between tested and rated values specified below do not apply to compliance with minimum performance requirements.

<sup>25</sup> Stakeholder input sought on whether these values should be mandatory or only encouraged. If only encouraged, the strike-through text would be retained.

<sup>26</sup> Note these lumen values (except for the 150W which doesn't exist) align with the IEC62612 amd 1:2015 section 9.1 preferred rated luminous flux values

<sup>27</sup> The strike-through text here would be included if the preferred luminous flux values were not mandatory.

Ref	Attribute	Product	Package	Spec Sheet /website	Marked Value Criterion
					<p><u>Luminaires:</u> The initial luminous flux of each individual LED luminaire sample shall not be less than the rated luminous flux by more than 10 % and not be more than the rated luminous flux by more than 10%.</p>
2	Efficacy (lumens per Watt)		X	X	<p>The initial efficacy of each individual LED lamp or luminaire in the measured sample shall be no less than the rated efficacy by more than 10 %.</p> <p>The average efficacy of the LED lamps in the measured sample shall be no less than the rated efficacy by more than 7.5 %.</p>
3	Watts (must be in a smaller font than efficacy on package)	X	X	X	The initial power consumed by each individual LED lamp in the measured sample shall not exceed the rated power by more than 5 %.
4	Replacement Lamp Equivalence (directional and non-directional lamps)		X	X	Statement of equivalence to a filament lamp. Minimum lumen output required when claiming as specified in Table 1 above.
5	Rated Lifetime		X	X	Must be equal or above the specified minimum rated life
6	Correlated colour temperature	X	X	X	
	CRI			X	Must be equal or above the specified CRI
7	Beam Angle (for directional lamps & small luminaires)	X	X	X	
8	Dimmable	X	X	X	

Ref	Attribute	Product	Package	Spec Sheet /website	Marked Value Criterion
9	Dimmer compatibility information and weblink		X	X	
10	ELVC converter compatibility information and weblink		X	X	
11	Ballast compatibility information and weblink (for Linear LED lamps)	X	X	X	
12	Website link for disposal information		X	X	
13	Standby energy use		X	X	
	Photo biological Safety	X	X	X	Blue light and UV risk categories. Product marking only required if above RG0.
14	Product identification number as used for product registration		X	X	

## **COMMENTS FROM PHILIPS LIGHTING S&R (STANDARDS & REGULATIONS) TEAM**

### **Table 3 - Proposed product package marking requirements**

Philips Lighting recommends the following product package marking:

- 1) Non-directional LED lamps- Lumen claim can't be fixed, hence to remove it.
- 2) The initial luminous flux of each individual LED lamp in the measured sample shall not be less than the rated luminous flux by more than 20%.
- 3) Efficacy- The initial efficacy of each individual LED lamp or luminaire in the measured sample shall be no less than the rated efficacy by more than 20 %.
- 4) Watts- The initial power consumed by each individual LED lamp in the measured sample shall not exceed the rated power by more than 10 %.
- 5) Warranty – 1 year
- 6) Next to CCT, Ra to be visible on at least the packaging and in the specification sheet.
- 7) Ballast compatibility information – As these would be often a range of ballasts, therefore too extensive list to put on the product marking.
- 8) Wattage need to change from 5% to 10%
- 9) CRI need to change from “Above” to “-3 ”

**Table 4: Proposed test conditions**

Ref	Attribute	Test method
1	Efficacy	CIE S025  or  LM79 accepted until July 2019  or  EN 13032-4:2015
2	Replacement Lamp Equivalence	CIE S025  or  LM79 accepted until July 2019  or  EN 13032-4:2015
3	Standby Power (smart lamps only)	AS/NZS IEC 62301  (or IEA 4E SSL Task 7 2016 publication)
4	Smart Lighting – controlled variations in power consumption (smart lamps only)	Energy Star Lamps v2 Section 12.9
5	Colour Appearance	CIE S025or  LM79 accepted until July 2019



Ref	Attribute	Test method
		or EN 13032-4:2015 (All refer to CIE S015)
6	Colour Rendering	CIE S025 or LM79 accepted until July 2019 or EN 13032-4:2015 (All refer to CIE 13.3)
7	Lumen maintenance	IESNA LM80/TM21 & ISTMT (IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14) Or IESNA LM84/TM28
9	Power Factor	IEC 61000-3-2 (2014)
10	Harmonics	IEC 61000-4-7
11	Dimmer compatibility	To be developed

Ref	Attribute	Test method
12	ELV converter compatibility	To be developed
13	Photo biological Safety	IEC 62471/CIE S009
14	<p>Endurance</p> <p>Lamps</p> <p>or</p> <p>Modules/packages</p> <p>Luminaires</p>	<p>IEC 62612: 2013</p> <p>or</p> <p>IEC 62717: 2014 or</p> <p>IEC 62722.2.1: 2011</p>
15	Flicker	IEEE 1789
16	Centre beam luminous intensity (directional lamps only)	<p>CIE S025</p> <p>or</p> <p>LM79 accepted until July 2019</p> <p>or</p> <p>EN 13032-4:2015</p>
17	Beam Angle	<p>CIE S025 nor</p> <p>LM79 accepted until July 2019</p>

Ref	Attribute	Test method
		or EN 13032-4:2015
18	Colour maintenance	ISTMT (IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14) & IESNA LM80 (acceptable where module tested includes lens and phosphors) Or IESNA LM84

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## COMMENTS FROM PHILIPS LIGHTING S&R (STANDARDS & REGULATIONS)

### Table 4: Proposed test conditions

- 1) Replacement lamp equivalence – Not relevant for luminaires
- 2) For non-residential luminaires there is currently no standard available on how to measure the stand-by power
- 3) Colour rendering is normally specified in CIE application norms that are used for lighting scheme designs. Therefore no need to specify this at product level.