

**Consultation Response from Philips Lighting**  
on  
**“E3 Lighting Update Policy Position of September 2017”**

October 11, 2017

This consultation response of Philips Lighting includes the requested feedback on the “E3 Lighting Update Policy Position of September 2017” proposal and is submitted to [EERLighting@environment.gov.au](mailto:EERLighting@environment.gov.au) for Australia and to [regs@eeca.govt.nz](mailto:regs@eeca.govt.nz) for New Zealand.

**Content:**

1. Answers on the 3 broad questions, which are raised in the introduction (page 6) of the E3 proposal.
2. Review results of Attachment J of the E3 proposal.

Note: The answers and review results of Philips Lighting are red marked.

**1. Answers on the 3 broad questions, which are raised in the introduction (page 6) of the E3 proposal.**

A. Are there any implementation barriers or possible unintended consequences of any of the policy positions or proposals under consideration?

Yes, the policy positions and proposals under consideration have significant implementation barriers and would, if implemented without sincere consideration of the many detailed comments provided in Chapter 2 of this consultation response, have unintended, negative consequences not only for the lighting industry, but also for consumers and the environment.

The proposal is based on several wrong assumptions, it is ambiguous and it lacks proper terms and definitions. It references wrong metrics and measurement methods. It proposes to impose too strict levels that are impossible to meet by state-of-the-art technologies in commercially viable fashion. Detailed examples of this are given in Chapter 2 of this consultation response and should be seen as an illustration of the flaws of the proposal, and not as an endorsement of the overall framework presented in this draft proposal.

The consequence of the proposed measure would be that state-of-the-art LED products cannot meet the proposed requirements. Prices of LED products would increase dramatically for consumers and the strictest forms of surveillance and corrective action would be required to enforce the new regulation, otherwise it would stimulate unfair competition, trade barriers, and a rogue channel of uncompliant products.

Moreover, proposed lifetime testing requirements are incompatible with ever faster product development cycles of innovative companies driving increased energy efficiency, and the proposed measures would continuously deprive Australian consumers of the latest innovations in lighting products, including more energy efficient products.

**B. Is the analysis of the policy proposals considered reasonable, including data and assumptions used?**

No, the analysis is not at all considered reasonable. The proposal seems to be largely based on the International Energy Agency (IEA) 4E Solid State Lighting Annex, a document that contains numerous flaws similar to those reported in Chapter 2, and that also was established without proper incorporation of industry insights on modern-day processes of sustainable, innovative product design and on market realities.

Moreover, the current document does not reflect adequate consideration of industry comments submitted in response to earlier drafts of the document. Most of the March 2017 comments that were submitted through Lighting Council Australia and the Lighting Council New Zealand, seem to have been ignored without any motivation or explanation, and without any attempt at dialogue or discussion.

The adverse effect of overly complex, overambitious and widely scoped regulations – which time and time again prove to be impossible to adequately enforce - on global sustainability goals is more and more recognized, not only by government representatives and the industry, but also by several NGO's that share our environmental goals. Setting the framework for effective regulation is not an academic exercise on “nominal CCTs consistent with the 7-step chromaticity quadrangles and Duv tolerances”.

We would like to recall that previously submitted comments propose a more balanced, more correct and more sustainable framework for effective legislation that benefits consumers, that more effectively achieves environmental goals and that also ensures a fair, level playing field for innovative companies that share sustainability goals.

Such an enhanced framework should include the following attributes that are standardized in the international ISO, IEC and CIE standards:

- energy efficiency and functional performance requirements, and;
- product information requirements, and;
- means of confirming compliance with these requirements.

For further details, we refer to previously submitted comments and Chapter 2 of this consultation response, and we are offering to clarify these further as needed.

**C. Will the proposals have any adverse effects that have not been considered?**

Indeed, the proposal will lead to

- (i) over-specified and too costly products for the end-users
- (ii) reduction of product choice and variety for Australian consumers
- (iii) delay of bringing innovative, energy saving products to the Australian market
- (iv) very costly time-consuming qualification efforts for the industry
- (v) unintended trade barriers
- (vi) unfair competition due to ambiguous and erroneous content
- (vii) unaffordable efforts for market surveillance and enforcement

## 2. Review results of Attachment J

Note: Because of the unclear scope and exemptions, and the incomplete terms and definitions, it was impossible to submit an integral response to the proposal at this stage. However, the major comments can be found below and should be seen as an illustration of the flaws of the proposal, and not as an endorsement of the overall framework presented in this draft proposal.

### Draft Minimum Energy Performance Standards (MEPS) for LED Lighting

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 and November 2016 (as part of [Consultation Regulation Impact Statement \(CRIS\)](#)). Further revisions have been made after consideration of comments on the CRIS. The [Supplementary consultation document - Lighting: Updated policy positions](#) should be read in conjunction with this document.

#### Scope

The scope (e.g. what about LED packages, LED modules, drivers, etc.) and exemptions (e.g. 200 pcs. sales volume) are unclear.

The terms and definitions are incomplete (e.g. what is the definition of LED lamp, Directional lamp, etc.).

Proposal: Clarify the scope and exemptions, and include unambiguous definitions for all terms that are used in the document.

Furthermore, it's strongly recommended to add a "Subject Matter" to the document / attachment.

Proposal: Add the following subject matter;

This attachment deals with:

- energy efficiency and functional performance requirements, and;
- product information requirements, and;
- means of confirming compliance with these requirements.

This attachment does not deal with requirements on safety, electromagnetic compatibility (EMC), hazardous substances, lifetime and warranty since these requirements are not primary related to energy efficiency and functional performance, and are therefore typically incorporated in other regulations.

Proposed to apply to the sale and commercial use of:

- LED Lamps: target to publish March 2018 to come into effect March 2019.

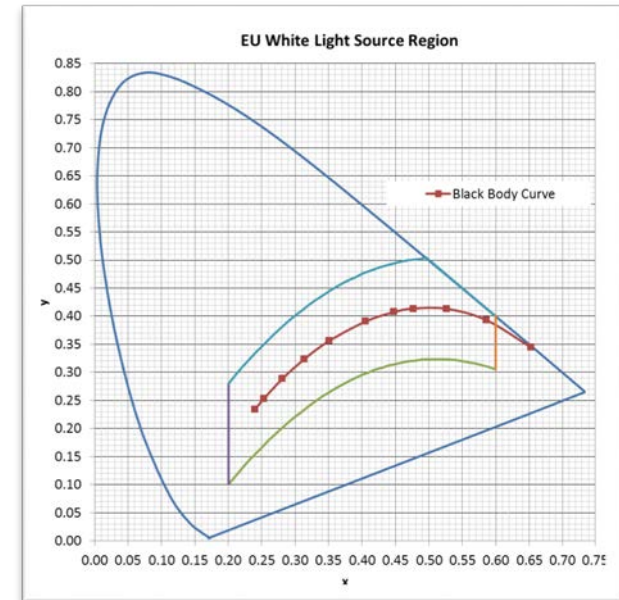
The proposed MEPS detailed in this document will form the basis of the Decision RIS for approval by governments (expected to be considered by Energy Ministers in November 2017). The E3 program requests stakeholders to consider the LED MEPS on lamps detailed below and provide specific feedback on

any amendments required including rationale for change and alternative approach, with supporting evidence. The exposure draft of the LED MEPS determination will be released following approval of the DRIS.

- **LED luminaires:** As referred in the Supplementary consultation document, the GEMS Act will be reviewed to facilitate MEPS on LED luminaires. A separate CRIS (and subsequent Decision RIS) will be released prior to implementation.

Because of the staged approach, this version of the draft MEPS focuses on LED Lamps. The table providing details on the parameters and requirements for integrated luminaires has been moved to the end of the document to allow the reader to focus on the more immediate proposal for lamps.

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&5). 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 were originally derived from the International Energy Agency 4E Solid State Lighting Annex Product Quality and Performance Tiers (<http://ssl.iea-4e.org/>) but have been updated with more recent market data. 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, LED package or driver test data is allowed, this must be from an accredited (but not necessarily third party) laboratory.



### *All LED Product 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 mode 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>

This is a too wide white region specification which includes lamps that do not have a general lighting function (IR (e.g. red or gold), UV (blue), grow light (purple), collagen (pink), or coloured lamps in general). Consequently, these lamps shall be explicitly exempted from the regulation.

Proposal: Change the above wide white region specification into following narrower specification:

- $0,270 < x < 0,530$  and
- $-2,3172 x^2 + 2,3653 x - 0,2199 < y < -2,3172 x^2 + 2,3653 x - 0,1595$ ;

In the case of tuneable lamps and luminaires, compliance for photometric parameters will be based on testing at maximum light output (in case the lamps are also dimmable). Testing of tuneable products (for luminous flux, power, CRI and CCT) will be done with the product's CCT adjusted through operation with software provided with products as sold and updated with latest available software versions. The testing shall include (A) the nominal CCT of 2700 K or the minimum CCT (whichever is higher) and (B) the nominal CCT of 4000K or the maximum CCT (whichever is lower) and for dimmable lamps, be conducted at maximum light output.

The proposed testing of tuneable lamps is a very complex and timely test procedure which requires test houses to seek for the lowest and highest CCT and max light output.

Proposal: Limit the testing of tuneable lamps to one setting. (e.g. the initial, out-of-the-box, or the most power consumption setting).

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

Lamps with LED light sources of all shapes with lamp caps B15, B22, E14, E27, E39, E40, GU5.3, GU10, GX10, GU24, GX53, 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 bi-pin caps GU5.3, GX5.3, G6.35, GX53, that emit  $\geq 100$  lm.

---

<sup>1</sup> Note: referenced from EU Regulation No244 (2009)

### *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.

For LED lamp models otherwise within scope which have low volume sales of up to (200) 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).

Low (200) sales volume exemptions create loopholes.

Proposal: Limit sales volume to 10 pieces.

### *Integrated LED Luminaires (table 5)*

Luminaire requirements should be set for the light source (LED module) rather than for the luminaire. Consequently, no definition and requirements are needed for decorative LED luminaires.

The scope for luminaires is yet to be finalised but is likely to include:

- Integrated LED luminaires with a luminous flux of  $\geq 250$  lm and  $< 1,500$  lm. Note integrated includes a luminaire with remote control gear.
- Planar Luminaires, integrated battens & Troffers
- Large Luminaires (including High / Low Bay integrated Luminaires)

Where an integrated LED luminaire within scope is supplied with either an:

- integrated driver; or
- separate driver provided in the same package; or
- driver supplied in a separate package that is specifically marked to be used with the luminaire;

The integrated LED luminaire will be tested with the specific driver for the purpose of demonstrating compliance.

Where an integrated LED luminaire within scope is not supplied with a driver in one of the configurations specified in the paragraph above, the luminaire will be tested with a nominated driver that is representative of intended drivers for use in Australia with the LED luminaire. (One of the intended drivers for use in Australia and/or New Zealand will also be nominated for compliance testing purposes).

Decorative style integrated LED luminaires otherwise within scope (see definition below) which have low volume sales of up to {250} annual units, or other limited production run luminaires which have low volume sales of up to 75 annual units are not within scope. Where this upper sales limit is exceeded, the supplier may either withdraw the product from sale; or complete product testing and be able to demonstrate 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.

Low (250) sales volume and decorative luminaires exemptions create loopholes.

Proposal: Limit sales volume to 10 pieces and delete the decorative luminaire exemption.

### Scope Exclusions for LED Lamps and Integrated LED luminaires

Exemptions are unclear and create loopholes (e.g. the exemption for outdoor, road and public space, wall luminaires with up/down lighting and integrated luminaires in furniture's).

Proposal: Clarify the exemptions and avoid / delete possible loopholes.

- 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 (R2016)
- 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 Rope lights as defined in DR AS/NZS 60598.2.21: (2017?)6 and lighting chains as defined in DR AS/NZS 60598.2.20: (2017?)6
- Non-maintained emergency escape lighting luminaires and illuminated emergency exit signs (as defined in AS/NZS 60598.2.22)
- Outdoor luminaires as defined in IEC 60598-2-5 with an ingress protection rating of IP65 and above
- Road and public space lighting luminaires (as defined in AS/NZS 1158.0).
- Wall luminaires with up/down lighting of beam angles less than 30 degrees and less than 500lm in either direction (i.e. up or down)
- Integrated luminaires incorporated into furniture as defined in IEC 60364-7-713 ED. 2.0 Low-voltage electrical installations Part 7-713: Requirements for special installations or locations - Furniture (but not exclude lamps imported with furniture)

## Definition

The terms and definitions are incomplete (e.g. what is the definition of LED lamp, Directional lamp, etc., etc.).

Proposal: Include unambiguous definitions for all terms that are used in the document.

**Light Emitting Diode (LED):** a PN junction semiconductor device that, by spontaneous emission, emits incoherent optical radiation by injecting electrons and/or holes across the PN junction.

### **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

### **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)<sup>2</sup>

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

The proposed family definition deviates from the one used in current IEC standards. Consequently, lighting industry will face new 'families of models' to be tested before registration. This will lead to additional testing and extra cost.

Proposal: Refer to international accepted IEC performance standards for family model definition.

---

<sup>2</sup> A picture-book guide may be produced to assist with scope determination



## LED Lamps

(1) Two or more models (up to 75) 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, 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 (lamp size variations attributable to lamp cap variation permitted)
  - shape of the outer glass or plastic lamp cover.
  - 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/diffusers and frosted/pearl;
- (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.
  - (iii) voltage
- (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, beam angles or ability to dim. 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.
  - (iii) Wattage variations are permitted within 50% variation from nominated least efficient model

(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 75 lamp models.

(a) 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 (1)(c)) these models may consume less power (due to more efficient components).

## Performance requirements

\*) It's strongly recommended that the test methods (last column in the below table) refer only to the applicable and globally accepted standards of the International Electrotechnical Commission (IEC) and / or the International Commission on Illumination (CIE). A reference to other alternative standards will create a lot of confusion at industry, test houses and surveillance authorities.

**Table 1: Lamps (note preferred test standards are highlighted)<sup>3</sup>**

| Ref                             | Attribute                 | Requirement  |                                |                           | Sample size | Compliance criteria | Test method *) |               |    |    |   |    |                           |   |
|---------------------------------|---------------------------|--|--------------------------------|---------------------------|-------------|---------------------|----------------|---------------|----|----|---|----|---------------------------|---|
|                                 |                           | Non-directional lamps  | Directional lamps              | Linear LED (tube)         |             |                     |                |               |    |    |   |    |                           |   |
| Energy Efficiency & Photometric |                           |  |                                |                           |             |                     |                |               |    |    |   |    |                           |   |
| 1                               | Efficacy<br><br>Improve   | ≥ 80 lm/W (2019)<br>≥ 90 lm/W (2021)<br>≥ 100 lm/W (2023)<br><br>These efficacy requirements are too strict, especially for low-lumen lamps.<br>Proposal: Implement an efficacy = f(luminous flux) relation.<br>E.g: <table border="1" style="margin-left: 20px;"> <thead> <tr> <th rowspan="2">Rated Luminous Flux<br/>Φ in lm</th> <th colspan="2">Luminous Efficacy in lm/W</th> </tr> <tr> <th>Non-Directional</th> <th>Directional</th> </tr> </thead> <tbody> <tr> <td>150 ≤ Φ &lt; 600</td> <td>60</td> <td>50</td> </tr> </tbody> </table> | Rated Luminous Flux<br>Φ in lm | Luminous Efficacy in lm/W |             | Non-Directional     | Directional    | 150 ≤ Φ < 600 | 60 | 50 | ≥ 100 lm/W (2019)<br>≥ 110 lm/W (2021)<br>≥ 120 lm/W (2023)<br><br>These efficacy requirements are too strict, especially for low-lumen lamps.<br>Proposal: Implement an efficacy = f(luminous flux) relation.<br><br>Don't regulate beyond 5 years from now. | 10 | Average ≥ value specified | CIE S025<br><br>or<br><br>LM79 accepted until July 2021<br><br>or |
| Rated Luminous Flux<br>Φ in lm  | Luminous Efficacy in lm/W |  |                                |                           |             |                     |                |               |    |    |   |    |                           |   |
|                                 | Non-Directional           | Directional  |                                |                           |             |                     |                |               |    |    |   |    |                           |   |
| 150 ≤ Φ < 600                   | 60                        | 50   |                                |                           |             |                     |                |               |    |    |   |    |                           |   |

<sup>3</sup> Colour codes – Purple: mandatory test for all products in scope. Green: Tests expected to be available already for most products.

| Ref | Attribute | Requirement  |                   |                   | Sample size  | Compliance criteria | Test method *)  |
|-----|-----------|--|-------------------|-------------------|--|---------------------|---|
|     |           | Non-directional lamps  | Directional lamps | Linear LED (tube) |  |                     |   |
|     |           | $600 \leq \Phi \leq 1200$<br>$1200 \leq \Phi \leq 3300$  | 70<br>80          | 60<br>70          |  |                     | EN 13032-4:2015<br><br>Where a lamp model is provided with interchangeable/adjustable reflectors or lenses, the test will use the configuration that delivers the narrowest beam angle<br><br>Power to be tested as supplied for sale (additional functionality may be supplied not activated). |
|     |           | <p>Don't not regulate beyond 5 years from now.<br/>           Proposal: Delete the 2023 step.</p> <p>Reductions for</p> <p>(a) Directional (10%)<br/>           Directional reduction is too low<br/>           Proposal: Increase to 15%</p> <p>(b) Beam Angle &lt; 30° (10%)<br/>           Beam-angle &lt; 30° reduction is too low<br/>           Proposal: Increase to 15%</p> <p>(c) 90 ≤ CRI &lt; 100 (10%)<br/>           CRI reduction is too low<br/>           Proposal: Increase to 15%</p> <p>(d) CCT ≤ 3000K (10%)</p> <p>The reductions will be cumulative.</p> <p>The following (15%) reductions are missing and should be added:</p> <ul style="list-style-type: none"> <li>• Tuneable white lamps</li> <li>• Connected (IoT) lamps</li> <li>• Tuneable RGB lamps</li> <li>• Anti-glare lamps</li> <li>• Dimmable lamps</li> <li>• Low voltage lamps</li> </ul> |                   |                   | Proposal: Delete the 2023 step.<br><br>Reductions are missing and should be added. |                     |   |

| Ref | Attribute   | Requirement  |   |   | Sample size                     | Compliance criteria   | Test method *)  |
|-----|---|--|---|---|---------------------------------|---|---|
|     |   | Non-directional lamps  | Directional lamps   | Linear LED (tube)   |                                 |   |   |
| 4   | <p>Light distribution</p> <p>Delete</p> <p>These are not requirements but definitions.</p> <p>Proposal: Delete these requirements and apply proper definitions instead.</p> | <p>ONLY IF CLAIMING to be an 'omnidirectional' lamp or replacement for a General Lighting Service (GLS) lamp.</p> <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> | <p>Beam angle is ± 25% of declared beam angle</p> <p>and</p> <p>50% of flux shall be in declared beam angle</p>   | <p>Beam angle is ± 25% of declared beam angle</p> <p>and</p> <p>50% of flux shall be in declared beam angle</p> | <p>10</p> <p>3 (Linear LED)</p> | <p>No less than 8 lamps (or 3 for linear LED lamps) meet the specified requirements</p>                               | <p>CIE S025</p> <p>or</p> <p>LM79 accepted until July 2021</p> <p>or</p> <p>EN 13032-4:2015</p> |
| 3   | <p>Centre beam luminous intensity</p> <p>Delete</p>   | N/A  | <p>For MR or PAR lamps with a beam angle &lt;65°, centre beam intensity should meet equivalent levels using the online tool:</p> <p><a href="http://www.energystar.gov/ia/products/lighting/iledl/IntlampCenterBeamTool.zip">http://www.energystar.gov/ia/products/lighting/iledl/IntlampCenterBeamTool.zip</a></p> <p>There are no other equivalency requirements.</p> <p>Proposal: Change this requirement into an optional</p> | N/A   | 10                              | <p>For MR or PAR lamps:</p> <p>Average ≥ equivalent level</p> <p>For other lamps:</p> <p>Average ≥ declared value</p> | <p>CIE S025</p> <p>or</p> <p>LM79 accepted until July 2021</p> <p>or</p> <p>EN 13032-4:2015</p> |

| Ref    | Attribute   | Requirement           |   |  | Sample size | Compliance criteria            | Test method *)  |
|--------|---|-----------------------|---|--|-------------|--------------------------------|---|
|        |   | Non-directional lamps | Directional lamps   | Linear LED (tube)  |             |                                |   |
|        |   |                       | <p>voluntary information requirement.</p> <p>For others lamps: ONLY IF CLAIMING<br/>Centre beam luminous intensity <math>\geq</math> declared value</p> |  |             |                                |   |
| 20     | <p>Maximum high angle Luminance</p> <p>Delete</p> | N/A                   |   | <p>When the gamma (<math>\gamma</math>) 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</p> <p>This is one of the many technical design specifications. It does not belong to a regulation.</p> <p>Delete this requirement.</p> | 3           | All lamps satisfy requirements | <p>CIE S025</p> <p>or</p> <p>LM79 accepted until July 2021</p> <p>or</p> <p>EN 13032-4:2015</p> |
| Colour |   |                       |   |  |             |                                |   |
| 7      | <p>Colour Rendering</p> <p>Agreed</p>             | Ra $\geq$ 80          |   |  | 10          | Average $\geq$ value specified | <p>CIE S025 (refers to CIE 13.3)</p> <p>or</p> <p>LM79 accepted</p>                             |

| Ref | Attribute                        | Requirement   |                   |                   | Sample size | Compliance criteria  | Test method *)  |
|-----|----------------------------------|---|-------------------|-------------------|-------------|--|---|
|     |                                  | Non-directional lamps   | Directional lamps | Linear LED (tube) |             |  |   |
|     |                                  |   |                   |                   |             |  | until July 2021<br>or<br>EN 13032-4:2015  |
| 8   | Colour Appearance<br><br>Improve | Lamp must have one of the following nominal CCTs consistent with the 7-step chromaticity quadrangles and Duv tolerances below. <sup>4</sup> |                   |                   | 10          | All samples shall have Chromaticity values that fall into the rated nominal CCT quadrangle | CIE S025 (refers to CIE S015)<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4:2015 |

| Nominal CCT (K) | Target CCT and Tolerance (K) | Target Duv | Duv Tolerance Range   |
|-----------------|------------------------------|------------|---|
| 2200            | 2238 ± 102                   | 0.0000     | $T_x$ : CCT of the source<br>For $T_x < 2870\text{K}$<br>$0.000 \pm 0.0060$<br>For $T_x \geq 2870\text{K}$<br>$D_{uv}(T_x) \pm 0.0060$<br>where<br>$D_{uv}(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854$ |
| 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     |   |

CCT is an information requirement. It must not be accompanied with limits.

<sup>4</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) |  |   |                                  |
|     |                                 | Proposal: Change this requirement into an information requirement and delete the levels.   |  |                   |  |   |                                  |
|     | Life                            |  |  |                   |  |   |                                  |
| 10  | Endurance<br><br>Improve        | <p>Must survive one switching cycle for every 2 hours of rated life<br/>           Must survive temperature cycling test for 1,000 hours<br/>           Must survive accelerated operational life test for 1,000 hours<br/>           Endurance tests are related to lifetime and warranty. This does not belong in the scope of a regulation on EE and Functional performance.<br/>           Proposal: Replace these tests by a simple 500h duration test to detect premature failures.</p>  |  |                   | 10   | Satisfy conditions of the test method.  | IEC 62612: 2013 Section 11.3.2-4 |
| 11  | Lumen maintenance<br><br>Delete | <p>Lumen maintenance @ 6000 hrs<br/> <math>L_{x,6k} \geq 86.7\%</math><br/>           (based on <math>L_{70}B_{50} \geq 15,000h</math>)<br/>           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.<sup>5</sup><br/>           Lumen maintenance tests are related to lifetime and warranty. This does not belong in the scope of a regulation on EE and Functional performance.<br/>           Proposal: Delete this requirement</p> | <p>Lumen maintenance @ 6,000h<br/> <math>L_{x,6k} \geq 91.8\%</math><br/>           (based on <math>L_{70}B_{50} \geq 25,000h</math>)<br/>           Lumen maintenance tests are related to lifetime and warranty. This does not belong in the scope of a regulation on EE and Functional performance.</p> | 10                | <p>Average <math>L_{x,6k} \geq</math> value specified<br/>           Compliance testing may be an ISTMT junction temperature test relating to 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) or IESNA LM84/TM28 Note these test methods relate to luminaires. A</p> |                                  |

<sup>5</sup> Refer to Lumen Maintenance Testing Explained paper.

| Ref                                    | Attribute                               | Requirement   |                   |                                   | Sample size | Compliance criteria | Test method *)  |                |          |  |          |       |       |       |                      |  |  |
|--|---|---|-------------------|-----------------------------------|-------------|---------------------|---|----------------|----------|--|----------|-------|-------|-------|----------------------|--|--|
|  |   | Non-directional lamps   | Directional lamps | Linear LED (tube)                 |             |                     |   |                |          |  |          |       |       |       |                      |  |  |
|  |   |   |                   | Proposal: Delete this requirement |             |                     | test "housing" (i.e. representative luminaire) for lamps may be required. Consider allowing use of thermal imaging camera for determining the hotspot for thermocouple attachment points. |                |          |  |          |       |       |       |                      |  |  |
| Electrical                             |   |   |                   |                                   |             |                     |   |                |          |  |          |       |       |       |                      |  |  |
| 14                                     | Fundamental Power Factor<br><br>Improve | <p align="center"><b>Table F.1 – Recommended values for displacement factor</b></p> <table border="1"> <thead> <tr> <th>Metric</th> <th>P ≤ 2 W</th> <th>2 W &lt; P ≤ 5 W</th> <th>5 W &lt; P ≤ 25 W</th> <th>P &gt; 25 W</th> </tr> </thead> <tbody> <tr> <td><math>k_{\text{displacement}} (\cos\phi_1)</math></td> <td>No limit</td> <td>≥ 0,4</td> <td>≥ 0,7</td> <td>≥ 0,9</td> </tr> </tbody> </table> <p>PF &gt; 0.90</p> <p>Power factor- should not be specified 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 &gt; 50V performance requirements Annex D. This also specifies limiting values.</p> |                   |                                   | Metric      | P ≤ 2 W             | 2 W < P ≤ 5 W   | 5 W < P ≤ 25 W | P > 25 W | $k_{\text{displacement}} (\cos\phi_1)$ | No limit | ≥ 0,4 | ≥ 0,7 | ≥ 0,9 | 10<br>3 (Linear LED) | Average power factor ≥ value specified | IEC 61000-3-2 (2014)<br><br>Test data may be sourced from control gear manufacturer if available |
| Metric                                 | P ≤ 2 W                                 | 2 W < P ≤ 5 W   | 5 W < P ≤ 25 W    | P > 25 W                          |             |                     |   |                |          |  |          |       |       |       |                      |  |  |
| $k_{\text{displacement}} (\cos\phi_1)$ | No limit                                | ≥ 0,4   | ≥ 0,7             | ≥ 0,9                             |             |                     |   |                |          |  |          |       |       |       |                      |  |  |



| Ref   | Attribute                                     | Requirement   |                   |                   | Sample size    | Compliance criteria                           | Test method *)                       |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
|---|---|---|-------------------|-------------------|----------------|---|--------------------------------------|----------|------|---|---|-----|------|---|-----|------|---|-----|------|---|-----|------|----|------|------|---|------------------|-------------|---|--|--|
|   |   | Non-directional lamps   | Directional lamps | Linear LED (tube) |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
|   |   | <p>For LED lamps &lt; 50V performance requirements are under development (IEC 63063) so there is currently no performance standard available that specifies how to measure the Power Factor.</p> <p>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.</p> <p>It is best to delete the PF requirement as the displacement factor is already a good parameter to judge the lamp impact on power grid</p> <p>Use unambiguous terms: Either displacement factor or fundamental power factor<br/>Proposal:<br/>Use: Fundamental power factor (which is also known as displacement factor or <math>\text{Cos}\phi_1</math>)</p>   |                   |                   |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
| 15  | <p>Harmonics</p> <p>Delete</p>                | <p>For products <math>5W &lt; P \leq 25W</math>: {text here is pending final approval of amendment to 61000-3-2}</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> <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><br/>(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> <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</li> </ol> |                   |                   | 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 | $13 \leq n \leq 39$<br>(odd harmonics only) | $\frac{3,85}{n}$ | See Table 1 | 1 | Comply with the requirements of IEC61000-3-2 | <p>IEC 61000-4-7</p> <p>Test data may be sourced from control gear manufacturer if available</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  |                   |                   |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
| $13 \leq n \leq 39$<br>(odd harmonics only) | $\frac{3,85}{n}$                              | See Table 1   |                   |                   |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |

| Ref | Attribute | Requirement   |                   |                   | Sample size | Compliance criteria | Test method *) |
|-----|-----------|---|-------------------|-------------------|-------------|---------------------|----------------|
|     |           | Non-directional lamps   | Directional lamps | Linear LED (tube) |             |                     |                |
|     |           | <p>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> <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 &gt;25W<sup>6</sup>:</p> |                   |                   |             |                     |                |

<sup>6</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) |  |                     |                |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |
|                                     |  |   | <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<br/>(odd harmonics only)</td> <td>3</td> </tr> </tbody> </table> <p>* CPF is the circuit power factor</p> | 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<br>(odd harmonics only) | 3 |  |  |  |
| 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<br>(odd harmonics only) | 3  |   |  |                   |  |                     |                |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |
|                                     |  | <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> <p>Mains harmonic current requirements are related to EMC regulations. This does not belong in the scope of a regulation on EE and Functional performance.</p> <p>Proposal: Delete this requirement</p> |  |                   |  |                     |                |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |
|                                     | Health   |   |  |                   |  |                     |                |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |

| Ref | Attribute   | Requirement  |                   |                   | Sample size | Compliance criteria                    | Test method *)                                    |
|-----|---|--|-------------------|-------------------|-------------|--|---|
|     |   | Non-directional lamps  | Directional lamps | Linear LED (tube) |             |  |   |
| 18  | Photo-biological Safety<br><br>Delete   | Blue Light & UV hazards shall be either RG0 or RG1 unlimited <sup>78</sup><br><br>(UV hazard test not required if the light source does not contain a UV LED chip)<br><br>Photo-biological safety requirements are related to product safety regulations. This does not belong in the scope of a regulation on EE and Functional performance. And is already covered in safety regulations.<br><br>Proposal: Delete this requirement |                   |                   | 1           | Satisfy conditions of the test method. | IEC 62471 / CIE S009                              |
| 19  | Dominant light modulation frequency (f)<br>Modulation percent at this frequency (Mod%) <sup>9</sup> | Maximum flicker modulation at the dominant modulation frequency <sup>10</sup> < 30%<br><br>Maximum flicker modulation is not recognized as the correct metric for the attribute "Flicker"<br>Proposal: Change the requirement as follows: $P_{st}^{LM} \leq 1,0$ at maximum (full) light output, and measured according IEC TR 61547-1.  |                   |                   | 1           | Satisfy conditions of the test method. | IEEE 1789 or other if specified in Determination. |

<sup>7</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>8</sup> Feedback during stakeholder consultation indicated a preference for this requirement to be retained for all lamps subject to MEPS

<sup>9</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>10</sup> Based on IEEE 1789:2015 test method part only – and not the threshold values as concerns about stringency noted and may require adjustments to thresholds. See flicker discussion paper.

| Ref                                    | Attribute  | Requirement   |                   |                   | Sample size             | Compliance criteria   | Test method *)   |
|--|--|---|-------------------|-------------------|-------------------------|---|--|
|  |  | Non-directional lamps   | Directional lamps | Linear LED (tube) |                         |   |  |
|  | (Includes Flicker effects)<br><br>Improve<br><br>Change Attribute in "Flicker" |   |                   |                   |                         |   |  |
| Smart Lamps ONLY - Energy conservation |  |   |                   |                   |                         |   |  |
| 5                                      | Standby Power (For lamps with Standby mode only)<br><br>Improve                | $P_{\text{STANDBY}}/P_{\text{ON}} \leq 5\%$<br>Capped at: < 0.5W<br>< 0.3W (2023)<br><br>(When tested with the latest firmware updates)<br><br>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. These requirements are not feasible furthermore it's unclear what is meant with Standby Power.<br>These requirements are not feasible furthermore it's unclear what is meant with Standby Power.<br>Proposal: Keep the requirement at $\leq 0.5W$ and define what's meant with Standby Power. |                   |                   | 5<br><br>3 (Linear LED) | Average $\geq$ value specified<br>To be tested as supplied for sale (additional functionality may be supplied not activated). See also smart lamp criteria. | AS/NZS IEC 62301<br><br>(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> ) <sup>11</sup> |
| 6                                      | Smart Lighting: on-demand power  | Device to provide energy consumption reporting that is accessible by owner.<br><br>Further revisions may follow outcomes of investigations by the IEA 4E SSL and G20 working groups.  |                   |                   | 1                       | Require device to provide energy consumption reporting that   | Energy Star Lamps v2 Section 12.9  |

<sup>11</sup> Modified test method to be developed.

| Ref         | Attribute   | Requirement   |   |                   | Sample size      | Compliance criteria    | Test method *) |
|-------------|---|---|---|-------------------|------------------|------------------------|----------------|
|             |   | Non-directional lamps   | Directional lamps   | Linear LED (tube) |                  |                        |                |
|             | consumption feature (smart lamps only)<br><br>Delete                    | <p>This is not yet a mature requirement.<br/>Proposal: Delete this requirement.</p>   |   |                   |                  | is accessible by owner |                |
| Declaration |   |   |   |                   |                  |                        |                |
| 12          | Rated Life Declaration (relates to packaging requirement)<br><br>Delete | <p>Packaging declaration of a minimum lifetime of 15,000 hours</p> <p>Rated life declarations are related to lifetime and warranty. This does not belong in the scope of a regulation on EE and Functional performance. Furthermore, there are no other consumer products with these kind of (20 years) warranty requirements and MVE is not possible.</p> <p>Proposal: Delete this requirement</p> | <p>Packaging declaration of a minimum lifetime of 25,000 hours</p> <p>Rated life declarations are related to lifetime and warranty. This does not belong in the scope of a regulation on EE and Functional performance. Furthermore, there are no other consumer products with these kind of (20 years) warranty requirements and MVE is not possible.</p> <p>Proposal: Delete this requirement</p> | N/A               | Declaration Only | N/A                    |                |

| Ref | Attribute  | Requirement  |                   |                   | Sample size        | Compliance criteria   | Test method *)   |
|-----|--|--|-------------------|-------------------|--------------------|---|--|
|     |  | Non-directional lamps  | Directional lamps | Linear LED (tube) |                    |   |  |
| 17  | ELV converter compatibility<br>(For ELV Lamps only)<br>Improve | In combination with ELV converter shall operate in a stable manner without observable flicker or light fluctuation. Suppliers do not need to submit tests for registration. <sup>12</sup><br>Also the manufacturer shall: <ul style="list-style-type: none"> <li>(a) declare which ELV conditions (e.g. minimum/maximum number of lamps connected to ELVC) under which the lamp will operate</li> <li>(b) provide a webpage address that lists compatible ELV converter makes and models including ELVCs available in the local market.</li> </ul> Upcoming test method should refer to IEC TR 61547-1 not IEEE 1789 |                   | N/A               | 3 lamps<br>3 ELVCs | All lamp/ELVC combinations where compatibility claimed satisfy conditions of the test method. | To be developed<br>To include tests for flicker (IEEE 1789 or other). Suppliers do not need to submit tests for registration <sup>13</sup><br>. Compliance may test. |

<sup>12</sup> In the absence of an agreed test method, at the moment we would not require up-front test reports – this is currently designed to ensure that adequate information on transformer compatibility claims is provided.

<sup>13</sup> Audible noise is from excessive peak current during supply cycle. Can a limit be set which would stop noise from being generated? (Similar to the new phase cut dimmer compatibility tech Report 63037)

| Ref | Attribute  | Requirement  |                   |                   | Sample size  | Compliance criteria  | Test method *)  |
|-----|--|--|-------------------|-------------------|--|--|---|
|     |  | Non-directional lamps  | Directional lamps | Linear LED (tube) |  |  |   |
| 16  | Dimmer compatibility (Phase cut dimmers only) <sup>14</sup><br><br>Improve | Lamp dims smoothly to 30% of light output with no observable flicker. When dimmer is set to 100%, light output ≥ 90% of lamp without dimmer. For dimmable products, the lamp manufacturer shall:<br><br>(a) declare the conditions under which the lamp will dim<br>(b) declare which conditions (e.g. minimum/maximum number of lamps connected to dimmer) under which the lamp will operate;<br>(c) 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<br>(d) 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.<br>(e) The webpage may also specify where the Lamp has been tested and meets the requirements of IEC/TR 63037 Ed. 1.0<br><br>Note. Condition applies to Lamp<br><br>Upcoming test method should refer to IEC TR 61547-1 not IEEE 1789 |                   | N/A               | 3 lamps<br><br>2 dimmers<br><br>(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>15</sup><br>To include tests for inrush current <sup>16</sup> , maximum cycle current, 30% dim and flicker (IEEE 1789 or other).<br>Suppliers do not need to submit tests for registration. Compliance may test. |
|     | Claims   |  |                   |                   |  |  |   |

<sup>14</sup> In the absence of an agreed test method, at the moment we would not require up-front test reports – this is more designed to ensure that adequate information on dimming claims is provided.

<sup>15</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

<sup>16</sup> Limits on in-rush current could prevent audible noise and negate concern for trying to test the audible noise directly.



| Ref                           | Attribute                                   | Requirement   |                               |                     | Sample size                | Compliance criteria | Test method *) |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
|-------------------------------|---|---|-------------------------------|---------------------|----------------------------|---------------------|----------------|--------|------|------|--------|------|------|--------|------|------|--------|------|------|--------|------|------|--------|------|------|---------|-------|------|---------|-------|------|---------|-------|-------|---------|-------|-------|---------|-------|-------|---------|--|------|-----|------|-----|--------|-----|---|-----|-----|-----|---------------------|-----|---|--------------------------|---|---|
|                               |   | Non-directional lamps   | Directional lamps             | Linear LED (tube)   |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 2                             | Replacement Lamp Equivalence<br><br>Improve | <p>ONLY IF CLAIMING</p> <p>(1) Minimum Lumen output required when claiming equivalence to a specified GLS Tungsten Filament or halogen lamp<sup>17</sup></p> <table border="1"> <thead> <tr> <th>Replace GLS Tungsten Filament</th> <th>Replace GLS Halogen</th> <th>Required GLS LED in lumens</th> </tr> </thead> <tbody> <tr><td>10 W</td><td>7 W</td><td>100 lm</td></tr> <tr><td>15 W</td><td>10 W</td><td>150 lm</td></tr> <tr><td>25 W</td><td>18 W</td><td>250 lm</td></tr> <tr><td>30 W</td><td>21 W</td><td>350 lm</td></tr> <tr><td>40 W</td><td>28 W</td><td>500 lm</td></tr> <tr><td>60 W</td><td>42 W</td><td>800 lm</td></tr> <tr><td>75 W</td><td>52 W</td><td>1000 lm</td></tr> <tr><td>100 W</td><td>70 W</td><td>1500 lm</td></tr> <tr><td>125 W</td><td>88 W</td><td>2000 lm</td></tr> <tr><td>150 W</td><td>105 W</td><td>2500 lm</td></tr> <tr><td>175 W</td><td>123 W</td><td>3000 lm</td></tr> <tr><td>200 W</td><td>140 W</td><td>3500 lm</td></tr> </tbody> </table> <p>(2) Dimensions of the lamp must comply with equivalent lamp's requirements in the</p> | Replace GLS Tungsten Filament | Replace GLS Halogen | Required GLS LED in lumens | 10 W                | 7 W            | 100 lm | 15 W | 10 W | 150 lm | 25 W | 18 W | 250 lm | 30 W | 21 W | 350 lm | 40 W | 28 W | 500 lm | 60 W | 42 W | 800 lm | 75 W | 52 W | 1000 lm | 100 W | 70 W | 1500 lm | 125 W | 88 W | 2000 lm | 150 W | 105 W | 2500 lm | 175 W | 123 W | 3000 lm | 200 W | 140 W | 3500 lm | <p>ONLY IF CLAIMING</p> <p>(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>18</sup></p> <table border="1"> <tbody> <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> </tbody> </table> | MR11 | 80% | MR16 | 80% | AR-111 | 70% | R | 45% | PAR | 60% | R7 (forward lumens) | 55% | <p>ONLY IF CLAIMING</p> <p>(1) Minimum lumen output required for claimed equivalence to linear fluorescent lamp.</p> <p>Bare lamp<sup>19</sup></p> <p>L ≤ 600mm: 800 lm</p> <p>*600 &lt; L ≤ 900mm: 1200 lm</p> <p>900 &lt; L ≤ 1200mm:1600 lm</p> <p>*1200 &lt; L ≤ 1500mm:2000 lm</p> <p>[Based on Design Lights Consortium DLC requirements with * extension]</p> <p>(2) Dimensions of the lamp must comply with equivalent lamp's requirements in the relevant IEC lamp</p> | 10<br><br>3 (Linear LED) | <p>(1) Average Luminous flux ≥ the specified minimum light output (lm) of the claimed Equivalent wattage</p> <p>(2) Dimensions comply with Clause 6 of: IEC 60630 Ed. 2.5 b:2005 "Maximum lamp outlines for incandescent lamps"</p> <p>Dimensions comply with Clause 1.5.3 of: IEC 60081 Ed. 5.1 b:2002</p> | <p>CIE S025</p> <p>or</p> <p>LM79 accepted until July 2021</p> <p>or</p> <p>EN 13032-4:2015</p> |
| Replace GLS Tungsten Filament | Replace GLS Halogen                         | Required GLS LED in lumens  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 10 W                          | 7 W   | 100 lm  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 15 W                          | 10 W  | 150 lm  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 25 W                          | 18 W  | 250 lm  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 30 W                          | 21 W  | 350 lm  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 40 W                          | 28 W  | 500 lm  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 60 W                          | 42 W  | 800 lm  |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 75 W                          | 52 W  | 1000 lm   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 100 W                         | 70 W  | 1500 lm   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 125 W                         | 88 W  | 2000 lm   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 150 W                         | 105 W                                       | 2500 lm   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 175 W                         | 123 W                                       | 3000 lm   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| 200 W                         | 140 W                                       | 3500 lm   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| MR11                          | 80%   |   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| MR16                          | 80%   |   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| AR-111                        | 70%   |   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| R                             | 45%   |   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| PAR                           | 60%   |   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |
| R7 (forward lumens)           | 55%   |   |                               |                     |                            |                     |                |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |        |      |      |         |       |      |         |       |      |         |       |       |         |       |       |         |       |       |         |  |      |     |      |     |        |     |   |     |     |     |                     |     |   |                          |   |   |

<sup>17</sup> GLS halogen replacement wattages are indicative. All lumen values (except >125W) align with IEC62612 and 1:2015 section 9.1 preferred rated luminous flux values

<sup>18</sup> Based on IEA 4 E SSL averaged values for directional lamps

<sup>19</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)                  |                          |  |   |
|     |   | relevant IEC lamp performance specification Standard<br><br><b>Apply the Im-levels of the relevant Incandescent and Halogen IEC performance standards</b>  | (use linear interpolation between GLS wattage values listed)<br><br>(2) Dimensions of the lamp must comply with equivalent lamp's requirements in the relevant IEC lamp performance specification Standard<br><br><b>Apply the Im-levels of the relevant Incandescent and Halogen IEC performance standards</b> | performance specification Standard |                          | "Double-capped fluorescent lamps - Performance specifications                    |   |
| 4   | Light distribution<br><br><b>Delete</b><br><br><b>These are not requirements but definitions.</b><br><br><b>Proposal: Delete these requirements and apply proper definitions instead.</b> | <b>ONLY IF CLAIMING</b> to be an 'omnidirectional' lamp or replacement for a General Lighting Service (GLS) lamp.<br><br>Omnidirectional equivalence<br><br>No less than 5% of total flux (zonal lumens) shall be emitted in the 130° to 180° zone.<br><br>No less than 35% of total flux (zonal lumens) shall be emitted in the 90° to 180° zone. | N/A   | N/A                                | 10<br><br>3 (Linear LED) | No less than 8 lamps (or 3 for linear LED lamps) meet the specified requirements | <b>CIE S025</b><br><br>or<br><br>LM79 accepted until July 2021<br><br>or<br><br>EN 13032-4:2015 |

**Table 2: Proposed test methods and nominated parameters**

| Ref | Test method  | Attribute   |
|-----|--|---|
| 1   | CIE S025<br><br>(or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4:2015)<br><br>(All refer to CIE S015 & CIE 13.3 for colour measurements)                           | <ul style="list-style-type: none"> <li>• Luminous flux</li> <li>• Power</li> <li>• Efficacy</li> <li>• Colour Appearance (CCT, x, y)</li> <li>• Colour Rendering (CRI)</li> <li>• Centre beam luminous intensity (directional lamps only)</li> <li>• Beam Angle (directional lamps only)</li> </ul> |
| 2   | A. IEC 62612: 2013, Section 11.3:           Lamps<br><br>B. IEC 62717: 2014, Section 10.3:           Modules<br><br>C. IEC 62722.2.1: 2011, Section 10.3.2-4:   Luminaires | Endurance <ul style="list-style-type: none"> <li>• Switching cycles test</li> <li>• Temperature cycling test</li> <li>• Accelerated operational life test</li> </ul>  |
| 3   | IESNA LM80/TM21<br>&<br>ISTMT (to IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14)<br><br>(or IESNA LM84/TM28)   | <ul style="list-style-type: none"> <li>• Lumen maintenance</li> <li>•</li> </ul>  |
| 4   | IEC 61000-3-2 (2014)   | <ul style="list-style-type: none"> <li>• Power Factor</li> </ul>  |
| 5   | IEC 61000-4-7  | <ul style="list-style-type: none"> <li>• Harmonics</li> </ul>   |
| 6   | IEC 62471/CIE S009   | <ul style="list-style-type: none"> <li>• Photo biological Safety</li> </ul>   |
| 7   | IEEE 1789  | <ul style="list-style-type: none"> <li>• Flicker</li> </ul>   |
| 8   | AS/NZS IEC 62301<br><br>(or IEA 4E SSL Task 7 2016 publication)  | <ul style="list-style-type: none"> <li>• Standby Power (smart lamps only)</li> </ul>  |

| Ref | Test method                        | Attribute  |
|-----|------------------------------------|--|
| 9   | Energy Star Lamps v2, Section 12.9 | <ul style="list-style-type: none"> <li>Smart Lighting – controlled variations in power consumption (smart lamps only)</li> </ul> |
| 10  | To be developed                    | <ul style="list-style-type: none"> <li>Dimmer compatibility</li> </ul>   |
| 11  | To be developed                    | <ul style="list-style-type: none"> <li>ELV converter compatibility</li> </ul>  |

**Table 3: Proposed product package marking requirements<sup>2021</sup>**

Table 3 is not reviewed in detail. In principal, the earlier generic and specific table 1 comments apply as well.

| Ref | Attribute                | Product | Package | Spec Sheet /website | Marked Value Criterion   |
|-----|--------------------------|---------|---------|---------------------|--|
| 1   | Lumens<br><b>Improve</b> | X       | X       | X                   | <u>Non-directional LED lamps:</u><br>The rated luminous flux should preferably <sup>22</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>23</sup> |

<sup>20</sup> Note that the allowed variations between tested and rated values specified below do not apply to compliance with minimum performance requirements.

<sup>21</sup> Noting feedback that many types of professional and wholesale luminaires are supplied in plain packaging, the proposed package marking requirements for luminaires will be reviewed. We will examine options to allow package marking requirements to instead be shown on website and/or product data sheet where luminaires are not sold in retail outlets.

<sup>22</sup> Stakeholder input sought on whether these values should be mandatory or only encouraged.

<sup>23</sup> Note these lumen values (except for the 150W which doesn't exist) align with the IEC62612 and 1:2015 section 9.1 preferred rated luminous flux values

| Ref | Attribute | Product | Package | Spec Sheet /website | Marked Value Criterion   |
|-----|-----------|---------|---------|---------------------|--|
|     |           |         |         |                     | <p>The initial luminous flux of each individual LED lamp in the measured sample shall not be <del>less than the rated luminous flux by more than 10 %, and not be</del> <sup>24</sup>more than the rated luminous flux by more than 10% unless, if the rated value is one of the preferred values listed above, then 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><br/>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> <p><b>Apply IEC 62612 (performance requirement for LED lamp):</b><br/>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 %.<br/>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>Luminaires:</u></p> |

---

<sup>24</sup> We understand that a variation of the rated value below the tested value would not be allowed in EU. To discuss with TWG

| Ref | Attribute  | Product | Package | Spec Sheet /website | Marked Value Criterion  |
|-----|--|---------|---------|---------------------|---|
|     |  |         |         |                     | <p>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> <p><b>Do not determine bins but allow all flux values.<br/>Allow more room than 10-20% the bound or delete them.</b></p>   |
| 2   | <p>Efficacy (lumens per Watt)</p> <p><b>Improve</b></p>              |         | 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> <p><b>Apply IEC 62612.<br/>For all tested units in a sample, the LED lamp efficacy shall not be less than 80 % of the rated LED lamp efficacy as declared by the manufacturer or responsible vendor.</b></p> |
| 3   | Watts (must be in a smaller font than lumens 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 10 %.   |
| 4   | Replacement Lamp Equivalence (directional and non-directional lamps) |         | X       | X                   | Statement of equivalence to a filament lamp (if claim made). 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. May include a qualification for lifetime if used in enclosed luminaires.   |
| 6   | Correlated colour temperature  | X       | X       | X                   |   |
| 7   | CRI  |         |         | X                   | Must be greater than rated CRI - 3.   |

| Ref | Attribute   | Product | Package | Spec Sheet /website | Marked Value Criterion  |
|-----|---|---------|---------|---------------------|---|
| 8   | Beam Angle (for directional lamps & small luminaires)                 | X       | X       | X                   |   |
| 9   | Dimmable  | X       | X       | X                   |   |
| 10  | Dimmer compatibility information and web link                         |         | X       | X                   | If claim made that product is dimmable  |
| 11  | ELVC converter compatibility information and web link                 |         | X       | X                   | For ELV products only   |
| 12  | Ballast compatibility information and web link (for Linear LED lamps) |         | X       | X                   |   |
| 13  | Website link for disposal information                                 |         | X       | X                   |   |
| 14  | Standby energy use  |         | X       | X                   | Only for products with a standby mode   |
| 15  | Photo biological Safety   |         |         | X                   | Blue light and UV risk categories. Spec sheet/website only required if above RG0. |
| 16  | Product identification number/code as used for product registration   |         | X       | X                   |   |

#### Table 4: Proposed test conditions

Table 4 is not reviewed in detail. In principal, the earlier generic and specific table 1 comments apply as well.

| Ref | Attribute  | Test method  |
|-----|--|--|
| 1   | Efficacy   | CIE S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4: 2015                            |
| 2   | Replacement Lamp Equivalence   | CIE S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4: 2015                            |
| 3   | Standby Power (smart lamps only)   | AS/NZS IEC 62301<br><br>(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 S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4: 2015<br>(All refer to CIE S015) |
| 6   | Colour Rendering   | CIE S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4: 2015<br>(All refer to CIE 13.3) |



| Ref | Attribute  | Test method  |
|-----|--|--|
| 7   | Lumen maintenance  | IESNA LM80/TM21<br>&<br>ISTMT (IEC 60598.1 Section 12.4.1 or UL 1598 Clause 14)<br>Or<br>IESNA LM84/TM28 |
| 8   | Power Factor   | IEC 61000-3-2 (2014)   |
| 9   | Harmonics  | IEC 61000-4-7  |
| 10  | Dimmer compatibility   | To be developed  |
| 11  | ELV converter compatibility                                      | To be developed  |
| 12  | Photo biological Safety  | IEC 62471/CIE S009   |
| 13  | Endurance<br><br>Lamps<br><br>Modules/packages<br><br>Luminaires | IEC 62612: 2013<br>or<br>IEC 62717: 2014<br>or<br>IEC 62722.2.1: 2011                                    |
| 14  | Flicker  | IEEE 1789  |
| 15  | Centre beam luminous intensity (directional lamps only)          | CIE S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4:2015                                 |
| 16  | Beam Angle   | CIE S025<br>or   |

| Ref | Attribute | Test method  |
|-----|-----------|--|
|     |           | LM79 accepted until July 2021<br>or<br>EN 13032-4:2015 |

## Table 5: Integrated LED luminaires<sup>2526</sup>

Table 5 is not reviewed in detail. In principal, the earlier generic and specific table 1 comments apply as well.

| Ref                             | Attribute              | Requirement  |   |  | Sample size     | Compliance criteria | Test method   |
|---------------------------------|------------------------|--|---|--|-----------------|---------------------|---|
|                                 |                        | Small  | Large   | Planar, Battens & Troffers (P/B/T)     |                 |                     |   |
| Energy Efficiency & Photometric |                        |  |   |  |                 |                     |   |
| 1                               | Efficacy <sup>27</sup> | Directional<br>≥ 85 lm/W (2020)<br>≥100 lm/W (2023)<br><br>Non-Directional<br>≥ 85 lm/W (2021)<br>≥100 lm/W (2023)<br><br>Reductions for<br>(a) 90 ≤ CRI < 100 (10%)<br>(b) CCT ≤ 3000K (10%)<br>(c) Beam angles ≤ 30° (10%)<br>(d) Glare control (Antiglare) 20%<br><br>Note: Antiglare is where the luminous intensity 60 degrees and above in gamma | ≥ 110 lm/W (2020)<br>≥ 120 lm/W (2023)<br><br>Increase for<br>(a) 70 ≤ CRI < 80 (10%) | ≥ 110 lm/W (2021)<br>≥ 120 lm/W (2023) | 1 <sup>28</sup> | ≥ value specified   | CIE S025<br><br>or<br><br>LM79 accepted until July 2021<br><br>or<br><br>EN 13032-4: 2015<br><br>Where a small luminaire model is provided with interchangeable /adjustable reflectors or |

<sup>25</sup> Note that for maintained emergency lighting luminaires compliance with the performance requirements shall be met when the emergency components are disconnected.

<sup>26</sup> Colour codes – Purple: mandatory test for all products in scope. Green: Tests expected to be available already for most products

<sup>27</sup> Efficacy levels subject to market review closer to date

<sup>28</sup> Sample size for small luminaires to be discussed with TWG

| Ref | Attribute          | Requirement   |               |                                    | Sample size | Compliance criteria                         | Test method   |
|-----|--------------------|---|---------------|------------------------------------|-------------|---|---|
|     |                    | Small   | Large         | Planar, Battens & Troffers (P/B/T) |             |   |   |
|     |                    | <p>angle is less than 5% of the peak intensity of the luminaire</p> <p>The reductions will be cumulative.</p>   |               |                                    |             |   | <p>lenses, the test will use the configuration that delivers the narrowest beam angle.</p> <p>Tool-less removable shrouds will not be included in test</p> <p>Power to be tested as supplied for sale (additional functionality may be supplied not activated).</p> |
| 4   | Light distribution | <p>ONLY for Directional luminaires:<br/>Beam angle is:<br/>± 25% of declared beam angle</p> <p>and</p> <p>50% of flux shall be in declared beam angle</p> | None provided |                                    | 1           | All samples meet the specified requirements | <p><b>CIE S025</b></p> <p>or</p> <p>LM79 accepted until July 2021</p> <p>or</p> <p>EN 13032-4:2015</p>  |

| Ref    | Attribute         | Requirement  |        |                                    | Sample size | Compliance criteria  | Test method                   |
|--------|-------------------|--|--------|------------------------------------|-------------|--|-------------------------------|
|        |                   | Small  | Large  | Planar, Battens & Troffers (P/B/T) |             |  |                               |
|        |                   |  |        |                                    |             |  |                               |
| Colour |                   |  |        |                                    |             |  |                               |
| 7      | Colour Rendering  | Ra ≥80   | Ra ≥70 | Ra ≥80                             | 1           | ≥ value specified  | CIE S025 (refers to CIE 13.3) |
| 8      | Colour Appearance | Lamp must have one of the following nominal CCTs consistent with the 7-step chromaticity quadrangles and Duv tolerances below. <sup>29</sup> |        |                                    | 1           | Chromaticity co-ordinates fall into the rated nominal CCT quadrangle | CIE S025 (refers to CIE S015) |

<sup>29</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) |                                    |  |  |                     |      |            |        |   |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |  |  |  |
|                 |                              | <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<br/> For <math>T_x &lt; 2870K</math><br/> <math>0.000 \pm 0.0060</math><br/> For <math>T_x \geq 2870K</math><br/> <math>D_w(T_x) \pm 0.0060</math><br/> where<br/> <math>D_w(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<br>For $T_x < 2870K$<br>$0.000 \pm 0.0060$<br>For $T_x \geq 2870K$<br>$D_w(T_x) \pm 0.0060$<br>where<br>$D_w(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854$ | 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<br>For $T_x < 2870K$<br>$0.000 \pm 0.0060$<br>For $T_x \geq 2870K$<br>$D_w(T_x) \pm 0.0060$<br>where<br>$D_w(T_x) = 57700 \times (1/T_x)^2 - 44.6 \times (1/T_x) + 0.00854$ |                                    |                                    |  |  |                     |      |            |        |   |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |  |  |  |
| 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   |   |                                    |                                    |  |  |                     |      |            |        |   |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |  |  |  |
|                 | Life                         |  |   |                                    |                                    |  |  |                     |      |            |        |   |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |  |  |  |
| 10              | Endurance                    | <p>Must survive one switching cycle for every 1 hours of rated life<sup>30</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>  |   |                                    | 3 (Small)<br><br>1 (Large & P/B/T) | Satisfy conditions of the test method. | IEC 62722.2.1: 2011 Section 10.3.2-4<br>Test data from module and driver accepted (IEC 62717 Section 10.3) |                     |      |            |        |   |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |      |            |        |  |  |  |

<sup>30</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) |   |   |   |                |          |   |          |       |       |       |   |                   |   |
| 11  | Lumen maintenance        | <p>Lumen maintenance @ 6,000h</p> <p><math>L_{x,6k} \geq 93.1\%</math></p> <p>(based on <math>L_{70B50} \geq 30,000h</math>)<br/>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>) <math>\geq 95.4\%</math> of initial</p> <p>(based on <math>L_{70B50} \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> |                                    | <p>3 (small)</p> <p>1 (Large &amp; P/B/T)</p> | <p>Average <math>L_{x,6k} \geq</math> value specified</p> <p>Compliance testing may be an 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) or IESNA LM84/TM28 Note testing of small luminaires may require consideration of insulation requirement. Consider allowing use of thermal imaging camera to ascertain hottest point.</p> |                |          |   |          |       |       |       |   |                   |   |
| Electrical                                  |                          |  |  |                                    |   |   |   |                |          |   |          |       |       |       |   |                   |   |
| 14  | Fundamental Power Factor | <p><b>Table F.1 – Recommended values for displacement factor</b></p> <table border="1"> <thead> <tr> <th>Metric</th> <th>P ≤ 2 W</th> <th>2 W &lt; P ≤ 5 W</th> <th>5 W &lt; P ≤ 25 W</th> <th>P &gt; 25 W</th> </tr> </thead> <tbody> <tr> <td><math>\kappa_{\text{displacement}} (\cos\phi_1)</math></td> <td>No limit</td> <td>≥ 0,4</td> <td>≥ 0,7</td> <td>≥ 0,9</td> </tr> </tbody> </table> |  |                                    | Metric  | P ≤ 2 W   | 2 W < P ≤ 5 W   | 5 W < P ≤ 25 W | P > 25 W | $\kappa_{\text{displacement}} (\cos\phi_1)$ | No limit | ≥ 0,4 | ≥ 0,7 | ≥ 0,9 | 1 | ≥ value specified | <p><b>IEC 61000-3-2 (2014)</b></p> <p>Test data may be sourced from control gear manufacturer</p> |
| Metric                                      | P ≤ 2 W                  | 2 W < P ≤ 5 W  | 5 W < P ≤ 25 W   | P > 25 W                           |   |   |   |                |          |   |          |       |       |       |   |                   |   |
| $\kappa_{\text{displacement}} (\cos\phi_1)$ | No limit                 | ≥ 0,4  | ≥ 0,7  | ≥ 0,9                              |   |   |   |                |          |   |          |       |       |       |   |                   |   |

| Ref   | Attribute                                     | Requirement  |       |                                    | Sample size    | Compliance criteria                           | Test method                          |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
|---|---|--|-------|------------------------------------|----------------|---|--------------------------------------|----------|------|---|---|-----|------|---|-----|------|---|-----|------|---|-----|------|----|------|------|---|------------------|-------------|---|--|--|
|   |   | Small  | Large | Planar, Battens & Troffers (P/B/T) |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
| 15  | Harmonics                                     | <p>For products <math>5W &lt; P \leq 25W</math>:</p> <p><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> <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><br/>(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> <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: <ul style="list-style-type: none"> <li></li> </ul> </li> <li>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%.</li> </ol> |       |                                    | 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 | $13 \leq n \leq 39$<br>(odd harmonics only) | $\frac{3,85}{n}$ | See Table 1 | 1 | Comply with the requirements of IEC61000-3-2 | <p><b>IEC 61000-4-7</b></p> <p>Test data may be sourced from control gear manufacturer</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   |       |                                    |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |
| $13 \leq n \leq 39$<br>(odd harmonics only) | $\frac{3,85}{n}$                              | See Table 1  |       |                                    |                |   |                                      |          |      |   |   |     |      |   |     |      |   |     |      |   |     |      |    |      |      |   |                  |             |   |  |  |



| Ref                                 | Attribute  | Requirement  |       |                                    | Sample size    | Compliance criteria  | Test method |     |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |
|-------------------------------------|--|--|-------|------------------------------------|----------------|--|-------------|-----|---|---|---|------------|---|----|---|---|---|---|-------------------------------------|---|--|--|--|
|                                     |  | Small  | Large | Planar, Battens & Troffers (P/B/T) |                |  |             |     |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |
|                                     |  | <ul style="list-style-type: none"> <li>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.</li> </ul> <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>31</sup>:</p> <table border="1" data-bbox="712 746 1261 1077"> <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> <tr> <th>n</th> <th>(%)</th> </tr> </thead> <tbody> <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<br/>(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> |       |                                    | 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<br>(odd harmonics only) | 3 |  |  |  |
| 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<br>(odd harmonics only) | 3  |  |       |                                    |                |  |             |     |   |   |   |            |   |    |   |   |   |   |                                     |   |  |  |  |

<sup>31</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) |             |  |   |
|        |   | For the other types of lighting equipment that includes means for control (e.g. dimming, colour), the following conditions apply: <ol style="list-style-type: none"> <li>1. 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>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>o below 50W: no limits below 5 W;</li> <li>o 50 W - 250 W: no limits below 10% of maximum active input power;</li> <li>o above 250 W: no limits below 25 W.</li> </ul> </li> </ol> |       |                                    |             |  |   |
| Health |   |   |       |                                    |             |  |   |
| 17     | Photo biological Safety   | Blue Light & UV hazards shall be either RG0 or RG1 unlimited<br>(UV hazard test not required if the light source does not contain a UV LED chip)  |       |                                    | 1           | Satisfy conditions of the test method. | IEC 62471 / CIE S009  |
| 18     | Dominant light modulation frequency (f)<br>Modulation percent at this | Maximum flicker modulation at the dominant modulation frequency <sup>33</sup> < 30%   |       |                                    | 1           | Satisfy conditions of the test method. | <b>IEEE 1789</b><br><br>(or other specified in Determination) |

<sup>33</sup> Based on IEEE 1789:2015 test method part only – and not the threshold values as concerns about stringency noted and may require adjustments to thresholds

| Ref   | Attribute  | Requirement   |   |                                    | Sample size  | Compliance criteria   | Test method |
|---|--|---|---|------------------------------------|--|---|-------------|
|   |  | Small   | Large   | Planar, Battens & Troffers (P/B/T) |  |   |             |
|   | frequency (Mod%) <sup>32</sup><br><br>(Includes Flicker effects) |   |   |                                    |  |   |             |
| Smart Luminaires ONLY - Energy conservation |  |   |   |                                    |  |   |             |
| 5   | Standby Power<br><br>(For luminaires with Standby mode only)     | $P_{\text{STANDBY}}/P_{\text{ON}} \leq 5\%$ capped at:<br>< 0.5W<br>< 0.3W (2023) | < 0.1.1W<br>< 0.0.5W (2023)<br><br>Note: Where only 1 standby product/parameter is applicable, e.g. DALI, then test data from control gear/module may be used. Where a luminaire incorporates more than standby product/parameter, e.g. DALI and sensor, luminaire is to be measured. | 1                                  | $\leq$ value specified<br><br>To be tested as supplied for sale (additional functionality may be supplied not activated) with latest firmware updates. See also smart lamp criteria. | AS/NZS IEC 62301<br><br>(or IEA 4E SSL Task 7 2016 publication) <sup>34</sup> |             |

<sup>32</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>34</sup> Modified test method to be prepared.

| Ref          | Attribute  | Requirement   |  |                                    | Sample size             | Compliance criteria  | Test method   |
|--------------|--|---|--|------------------------------------|-------------------------|--|---|
|              |  | Small   | Large  | Planar, Battens & Troffers (P/B/T) |                         |  |   |
| 6            | Smart Lighting – controlled variations in power consumption<br><br>(smart luminaires only) | Device to provide energy consumption reporting that is accessible by owner.<br><br>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   |
| Declarations |  |   |  |                                    |                         |  |   |
| 12           | Rated Life Declaration (relates to packaging requirement)                                  | Packaging declaration of a minimum of 30,000 hours  | Packaging declaration of a minimum of 45,000 hours |                                    | N/A                     | Declaration Only   | N/A   |
| 16           | Dimmer compatibility (Phase cut dimmers only) <sup>35</sup>                                | Luminaire Dims smoothly to 30% of light output with no observable flicker. When dimmer is set to 100%, light output ≥ 90% of luminaire without dimmer. For                            | N/A  |                                    | 1 luminaire<br>1 dimmer | Satisfy conditions of the test method.   | To be developed <sup>36</sup><br>To include tests for inrush current, maximum cycle |

<sup>35</sup> In the absence of an agreed test method, at the moment we would not require up-front test reports – this is more designed to ensure that adequate information on dimming claims is provided.

<sup>36</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) |             |  |             |
|     |           | <p>dimnable products, the manufacturer shall:</p> <ul style="list-style-type: none"> <li>(a) declare the conditions under which the luminaire will dim</li> <li>(b) declare which conditions (e.g. minimum/maximum number of luminaires connected to dimmer) under which the luminaire will operate</li> <li>(c) provide a webpage address that lists compatible dimmer makes and models; and</li> <li>(d) 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.</li> </ul> |       |                                    |             | <p>current, 30% dim and flicker (IEEE 1789 or other).</p> <p>Suppliers do not need to submit tests for registration.</p> <p>Compliance may test.</p> |             |

| Ref    | Attribute                      | Requirement   |  |   | Sample size | Compliance criteria   | Test method  |
|--------|--------------------------------|---|--|---|-------------|---|--|
|        |                                | Small   | Large  | Planar, Battens & Troffers (P/B/T)  |             |   |  |
| Claims |                                |   |  |   |             |   |  |
| 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. (e.g. for halogen downlights replacements, use equivalence of MR16 directional lamp)   | 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. | 1           | Luminous flux $\geq$ Claimed Equivalent wattage specified minimum light output (lm)   | CIE S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4:2015 |
| 3      | Centre beam luminous intensity | ONLY IF CLAIMING. For luminaires claiming equivalence to MR or PAR lamps with a beam angle $<65^\circ$ , centre beam intensity should meet equivalent levels using the online tool: <a href="http://www.energystar.gov/ip/products/lighting/iledl/IntlampCenterBeamTool.zip">http://www.energystar.gov/ip/products/lighting/iledl/IntlampCenterBeamTool.zip</a><br><br>ONLY IF CLAIMING<br>Centre beam luminous intensity $\geq$ declared value | ONLY IF CLAIMING<br><br>Centre beam luminous intensity $\geq$ declared value | N/A   | 1           | For MR or PAR lamp claimed equivalence:<br><br>$\geq$ of equivalent level<br><br>For other lamp type claimed equivalence:<br><br>$\geq$ of declared value | CIE S025<br>or<br>LM79 accepted until July 2021<br>or<br>EN 13032-4:2015 |





**Lighting: updated policy positions**

**[www.energyrating.gov.au](http://www.energyrating.gov.au)**

**A joint initiative of Australian, State and Territory and New Zealand Governments**