APPLES & PEARS: WHY STANDARDISATION OF PERFORMANCE REQUIREMENTS FOR LED LUMINAIRES IS IMPORTANT

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To get confidence in performance claims from different manufacturers it is important to use a standardised set of quality criteria for comparison and only apply products that are measured in compliance with the appropriate standard.

In this view standardisation of performance requirements is an important first step towards like-for-like comparison of luminaire manufacturer claims. Therefore the lighting industry is driving the process for standardisation of performance requirements for LED products.

1. Initial performance (following IEC/PAS)

Recently two important IEC documents have been published:

- IEC/PAS 62717 Performance requirements for LED modules
- IEC/PAS 62722 Performance requirements for LED luminaires

Both documents contain a set of initial performance criteria and describe how the criteria have to be measured. This can be used for verification of manufacturer performance claims.

Once the standards are in place, it becomes important that:

1. Manufacturers of LED modules and LED luminaires start using the IEC/PAS documents when measuring the initial specifications of their products;
2. Users of LED luminaires start to understand that they currently compare apples & pears and where they have to look for when evaluating LED luminaire performance claims.

For this purpose CELMA (the European trade association for luminaire manufacturers) produced a paper to give guidance to users of LED luminaires. The quality criteria used in the IEC/PAS documents have been translated into understandable quality criteria for specifiers, lighting designers, technical engineers and policy makers.

Applying these quality criteria in a proper way will enable users to compare performance claims of different manufacturers and walk away from Apples & Pears.

Typical initial quality criteria a user should look for:

1. Rated input power (in W);
2. Rated luminous flux (in lm);
3. LED luminaire efficacy (in lm/W);
4. Luminous intensity distribution;
5. Correlated Colour Temperature (CCT in K);
6. Rated Colour Rendering Index (CRI);
7. Rated chromaticity co-ordinate values (initial and maintained);
8. Maintained luminous flux.

2. Performance over life (beyond IEC/PAS)

Acceptance or rejection of quality over life is out of the scope of IEC/PAS because there are too many things we don't know. However the IEC/PAS contains an informative Annex explaining the current line of thinking on lifetime metrics.

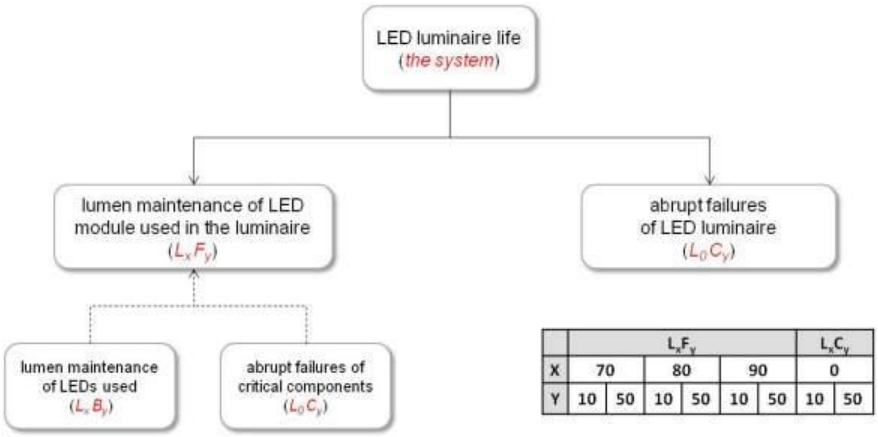
Most LED luminaire manufacturers take the LM-80/TM-21 data (expressed as L_xB_y) provided by the LED light source manufacturer and assume that this will be similar to the lumen maintenance of their LED luminaire.

There are two constrains in doing so:

1. In LM-80/TM-21 catastrophic failures of individual LEDs contributing to the light output are not taken into account;
2. There is no validated way to translate the LED light source results into the LED luminaire performance.

LED luminaires are sophisticated products consisting of many critical components where the technical luminaires design is of great influence to the actual performance. With the expected long lifetime it is worth to consider worth considering next to the 'lumen maintenance' also the 'system reliability'.

The metric L_xB_y related to the LED light source therefore seems less appropriate to assess the LED luminaire performance. For that purpose the IEC/PAS introduces 'luminaire life' as a combination of 'gradual' and 'abrupt' light degradation. This will be further developed as a possible future lifetime metric for LED luminaires.



	L_xF_y						L_xC_y	
X	70		80		90		0	
Y	10	50	10	50	10	50	10	50

Figure 1: LED luminaire life according to IEC

Lumen maintenance (L_xF_y)

- Gradual light degradation of all relevant components;
- Abrupt failures of individual LED's & critical components.

As an example $L_{70}F_{50}$: life time (hrs) where light output ≥ 70 % for 50 % of the population.

Abrupt failures (L_0C_y)

- Of the complete luminaire.

As an example L_0C_{10}: life time (hrs) where light output is 0 % for 10 % of the population.

For the purpose of distinctness and comparability, it is recommended to limit the use of possible values for x and y in L_xF_y and L_0C_y as indicated in the table shown in figure 1.

3. Summary

Standardisation of initial performance requirements is an important first step towards like-for-like comparison of luminaire manufacturer claims. Performance over life is currently not in the scope of the IEC/PAS because of the still many uncertainties in this relatively new LED technology. For that purpose the suggested lifetime metric ‘luminaire life’ will be further developed.

For fair comparison of initial performance always ask for product specifications measured against an appropriate standard. When considering performance over time please forget about LM-80/ TM-21 lumen maintenance data of LED’s used in a luminaire and look for ‘luminaire life’ values expressed in ‘lumen maintenance’ and ‘abrupt failures’ of the complete system.

It is important to remember not to mix up Apples & Pears since this will significantly improve the quality of your decision when evaluating claims from different LED luminaires.