**Illuminance Meters**

**Introduction**

The developments in the use of LED technology have led to some misunderstanding about the appropriateness and accuracy of illuminance meters, including misleading claims that measurement readings should be increased to compensate for LED.

The purpose of this FactFile is to clarify the facts and dispel some of the myths that have circulated throughout the industry on the subject.

**Illuminance Meters: The Basics**

In simple terms, an illuminance meter measures spectral power and applies the eye-sensitivity, V(l) curve, conversion to generate a measurement reading in illuminance (lux). The human eye is technology-agnostic, so the meter measures in an identical way, irrespective of the light source under which measurements are taken.

There are a number of other factors that may give rise to uncertainty in the reading of an illuminance meter; these include cosine correction, infra-red and ultra-violet sensitivity and non-linearity of response. All of these factors are discussed in BS 667: 2005: *Illuminance meters*. Requirements and test methods (BSI, 2005); there is also a detailed summary of the factors in the SLL Code for Lighting (SLL, 2012). Manufacturers should provide a detailed breakdown of the accuracy of their meters.

The development of smartphones has led to a number of applications (‘apps’) being available that appear to act as illuminance meters, but would be very unlikely to conform to BS 667. These may be used for comparative purposes (such as by cricket umpires), but should not be used for any professional light measurement purpose as the camera has a narrow field of view and is not cosine-corrected.

**Accurate Instruments**

Professional F-type (‘field’) illuminance meters should be accurate to ±6%. Some accuracy has to be compromised for reasons of portability, ease of use etc. when compared to laboratory instruments, but this range of accuracy is acceptable for field instruments.

When considering purchasing an illuminance meter, this accuracy range should be checked to ensure that it falls within the acceptable range.

Within the manual for an illuminance meter, there will be a diagram showing the spectral sensitivity curve (F1’), which shows the accuracy of the photocell in comparison to the V(l) curve (Figure 1 below). It is to be expected that variances occur with saturated colours such as red or blue LEDs, but for installations using ‘white’ LEDs, instruments with an accuracy of ±6% are perfectly acceptable.

Typically, cheaper instruments, using less accurate photocells, will lead to higher variances from the V(l) curve and less accurate readings, particularly towards the blue end of the spectrum.

**Calibration**

The manufacturer should indicate the initial calibration period and, after that, all illuminance meters must be calibrated at least annually. Note that the calibration process calibrates both the meter and photocell in combination, so the instrument should not be used with an alternative photocell head or this will lead to errors in measurement.

Meters that are to be used for low-level lighting conditions, such as emergency lighting, street lighting etc. should be further calibrated for lowlight level conditions.

Additionally, if the meter is exposed to inclement weather or rough handling, it may need re-calibrating before its annual service, to ensure accuracy.
Summary

There is detailed guidance on how to carry out field measurements in the SLL Code for Lighting (SLL, 2012) and the SLL Lighting Handbook (SLL, 2018) but extra care should always be taken to avoid overshadowing and the photocell should ideally have a remote lead to facilitate this (Figure 2).

Professional, calibrated, F-type illuminance meters that fall within the accepted ±6% accuracy deviation can be used to accurately measure illuminance levels for installations of all light source types. Mobile telephone ‘apps’ are not appropriate.

References


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