PHILIPS

Technical Brief

Overview of Photometric Testing

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Abstract: This document describes why Type A goniometers were chosen to measure lumen output of narrow beam luminaires instead of Type C goniometers, in conflict with LM-79-08 standards.

LM-79-08 is an approved standard for measuring electrical and photometric data of Solid-State Lighting (SSL) products. The Illuminating Engineering Society (IES) developed the LM-79-08 standard specifically for luminaires that utilize LEDs as their light source. The traditional method of photometric measurement of SSL products used relative photometry, where the luminaire and the bare lamp are measured separately. This method of testing is not ideal for LED luminaires as LEDs are not designed to be used outside of a luminaire. To account for this, the IES developed LM-79-08 using absolute photometry, where the LEDs and luminaire are tested together under specific temperature and environmental conditions.

LM-79-08 measures several data points: Total Luminous Flux (lumens), Luminous Efficacy (lumens/ watts), Luminous Intensity Distribution (candelas), Chromaticity (quality of light), CCT (correlated color temperature), and CRI (color rendering index). To adhere to LM-79-08, luminaires must be tested under the following conditions:

- Orientation – Intended operating position
- Input Voltage – Within 0.2% of rated value
- Ambient Temperature – Within 1 °C of 25 °C (1 °F of 77 °F)

Before any measurements can be deemed official the luminaire needs to meet stability guidelines. A luminaire is considered stable only after the variation of three readings of its input power and light output taken 15 minutes apart of one another are less than 0.5%.

There are two methods for measuring the Total Luminous Flux or lumens of a luminaire under LM-79-08: An Integrating Sphere System or a Goniometer. The main difference between methods is the size of the luminaire being measured, an Integrating Sphere System is better for smaller luminaires while a Goniometer is better suited to measure larger luminaires. Goniometers also measure Luminous Intensity Distribution or what direction the light disperses from the luminaire.

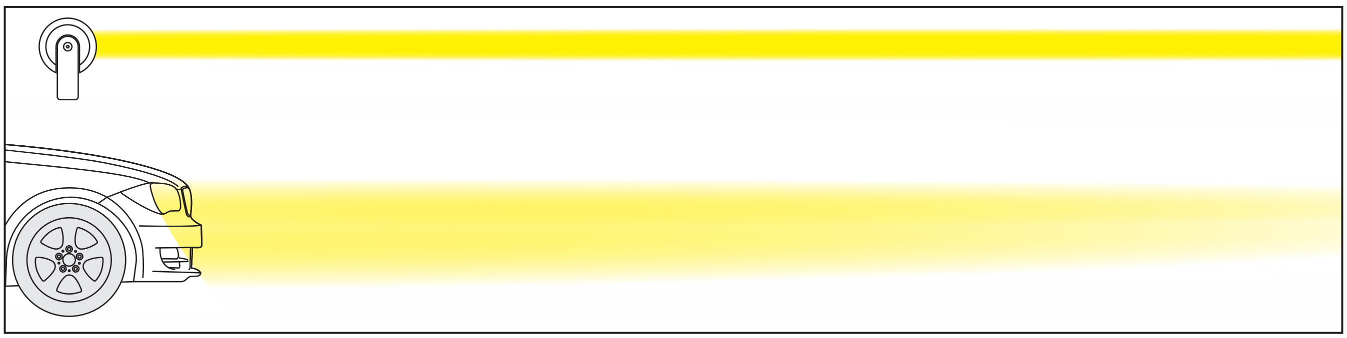
There are three goniometer types:

- Type A – Luminaire rotates on the horizontal axis while fixed on the vertical axis (used for automotive lighting).
- Type B – Luminaire rotates on the vertical axis while fixed on the horizontal axis (used for display and flood lighting).
- Type C – Same as Type B, except that the luminaire burning position remains unchanged (recommended for general lighting systems).

Although ideal for most luminaires, Type C goniometers are not designed to measure large luminaires with narrow beam angles 5° and under. Whereas most luminaires project light across a larger area up to a certain distance, luminaires with narrow beam angles send light to a smaller, more concentrated area further away. Type C goniometers can make photometric measurements of narrow beam luminaires, but the readings will only show a portion of the luminaire's Luminous Intensity Distribution as Type C goniometers only measure up to 18.3 m (60 ft). For luminaires with narrow beam angles that throw light out to distances of up to 30.5 m (100 ft) and beyond, Type C goniometers do not illustrate and capture the luminaire's full capabilities.

Commonly used on automobile head lights, Type A goniometers are designed to measure long, narrow beams of light up to 30.5 m (100 ft) away, making them ideal for large LED luminaires with narrow beam angles. A luminaire with a beam angle under 5° is designed to send light to a precise target area at substantial distance, so a Type A goniometer is better suited to illustrate this than a Type C goniometer. A by-product of the distance required for Type A goniometer testing is the increased resolution of the light beam. A measurement over a longer distance is able to capture all of the granular increments of a light beam.

As the LED lighting industry enters a new and exciting "shaping of light" phase, luminaires are being designed to perform in ways thought impossible only a few years prior. With innovation comes new applications but also the need for updated testing methods. Historically the lighting industry has not seen luminaires with such significantly narrow beam angles, but as they gain acceptance it is important to establish photometric testing methods that provide complete, accurate, and reliable information.



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