

Measurement of the Luminous Flux More Accurate

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LEDs are more energy-efficient and environmentally friendly than incandescent lamps. In 2009 the EU adopted a regulation that called for a gradual ban on conventional light bulbs. This has increasingly brought LED lighting products to the fore. However, their luminous flux decreases over time, which may lead to problems in many areas, including the medical sector and horticultural lighting. Manufacturers must therefore provide detailed information about the expected lifetime of their LEDs as well as the development of their luminous flux over time. A fully automated measurement method developed by TÜV SÜD delivers highly reliable data. Delivering measurements, on a 24/7 basis, the method saves resources while significantly improving the accuracy of light output predictions.

LEDs have almost completely replaced traditional lighting products – incandescent lamps – in many areas because of their technical properties and EU requirements. LEDs consume significantly less energy than incandescent lamps and exceed their service life many times over. However, a downside is that the luminous flux of these modern lighting products decreases over time. This can prove problematic in some areas, such as the medical sector or in horticultural lighting, where a specific light output is required for precise surgical interventions or to accelerate plant growth.

Long-term Testing Right from the Prototype Stage

In most cases, the drop in light output, also known as degradation of luminous flux, is gradual. Users might not even notice that, for example, a lamp in the operating theatre no longer provides the required light output. The manufacturers' information on light output therefore provides users with vital guidance on degradation over time so that they need not perform regular measurements themselves – for which most users would lack the required technical equipment anyway. Reliable and accurate information is the result of detailed measurements commissioned by the manufacturers of lighting products and performed by qualified testing, inspection and certification (TIC) organizations. Even before the start of series productions, the manufacturers deliver a few prototypes from a planned series to testing laboratories, where they are then subjected to comprehensive testing over a long period. The process is designed to provide a statement about the service life of the lighting product that is as accurate as possible.

In the past, such tests took nine and a half months, whereby the testing laboratories measured the luminous flux only at the start and the end of that period. In accordance with the new Ecodesign Regulation for Light Sources (EU) 2019/2020, this period has now been cut to only five months. However, the regulation requires that the

lighting products tested are exposed to continuous switching cycles consisting of 150 minutes of the light source switched on, followed by 30 minutes of the light source switched off. This means, testing involves a considerable workload that is hardly manageable manually. Given this, for some time, TÜV SÜD Product Service has been using the robogoniometer for testing lighting products. This robot uses a photo- and spectroradiometer that comply with the requirements defined by the German Accreditation Body (Deutsche Akkreditierungsstelle, DAkkS). The device automatically tests the light sources, adapting the measurement time to various lighting situations – similarly to the automatic adjustment of exposure time by a modern camera.

More Data, Reliable Results

The robogoniometer has halved the number of working hours required for these tests. In the past, testers had to remove and re-install the lamps themselves in every cycle. By contrast, TÜV SÜD's cutting edge robot now performs this task completely independently. Providing continuous 24/7 measurements, it delivers much larger volumes of data than previous measurement methods, and to a higher level of reliability. The device uses a measurement arm equipped with high-performance sensors, that it can move to various points of measurement to collect data. The measured values are saved in a database and processed in line with the terms of reference.

To ensure conditions are identical for every measurement, TÜV SÜD identified the variables relevant for the results in the test setting, evaluated their impact on the results and thus set out the basis for the comparability, evaluation and further processing of the data. Variables relevant to the test result include the type of fastening of the LED lamps, the presence of other light sources in the vicinity, the intervals between switching on and switching off the lamps and the temperatures in the test room.

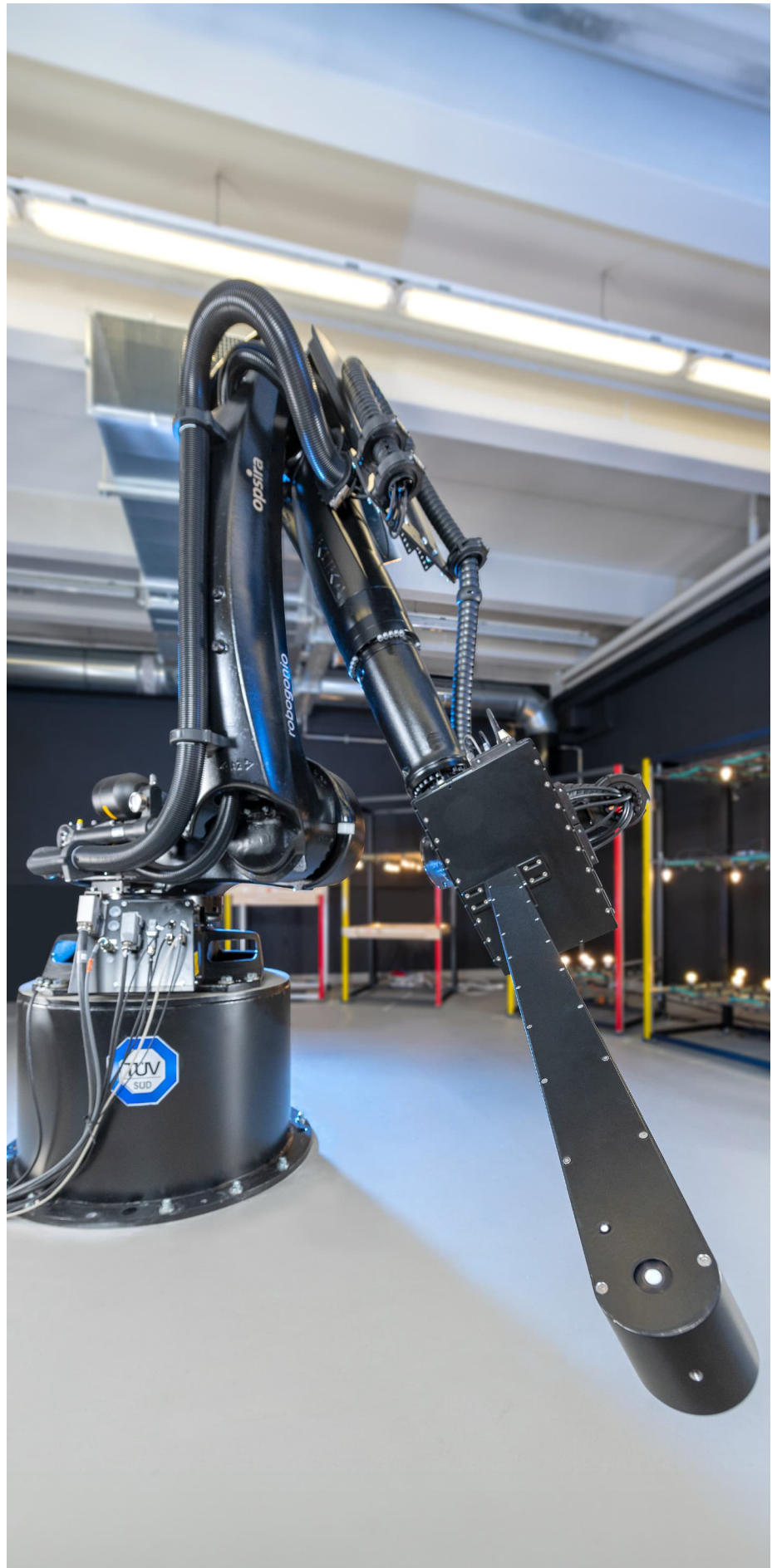
Faster and More Reliable

TÜV SÜD's test setup, currently the only one of its kind, enables up to 8,000 light sources to be tested simultaneously in up to 300 projects in its Garching-based testing laboratory. The enormous advantage in terms of cost and speed is a quantum leap in the scalability of lighting product testing compared to conditions in even the recent past. Manufacturers obtain a far larger volume of data on their prototypes, and also gain direct access to the TIC organization's online database. They can thus access their test results at any time, enabling them to draw first conclusions before measurements have even been completed. This monitoring is unique compared to other automatic measurement methods, offering manufacturers the chance to integrate initial results into their product design and development from an early stage.

The robogoniometer makes predictions of the service life of LED lighting products more reliable. The modern test method is thus hoped to improve customer satisfaction, as it ensures delivery of the promised performance in most cases alongside compliance with the applicable legal requirements. ■



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The robogoniometer at TÜV SÜD in Garching provides fully automatic 24/7 measurements of LED light output.

