Lifetime certificate

LED INSTITUT
DR. UWE SLABKE

Lifetime Certificate for LED Luminaires

Product: LED Luminaires with a COB Module made by Vossloh-Schwabe

The following analyses were carried out to determine the lifetime life of the product:

35,000-hour test – luminaire
20,000-hour project test and analysis

The test was independently carried out at the LED Institut Dr. Slabke in Bensheim. Certificate number: Z-2019-09-03-2018-85-0015

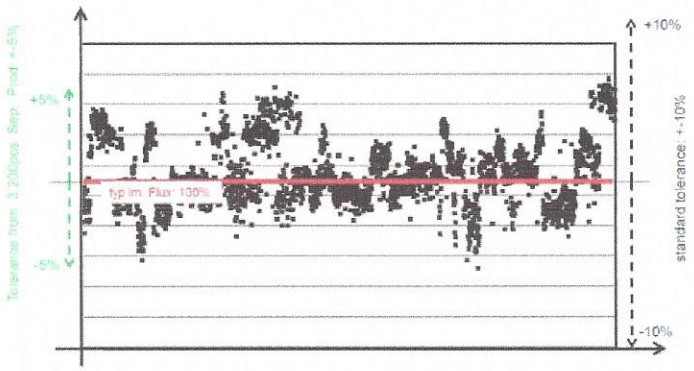
_ 0 Introduction

Due to the very rapid development time of LED luminaires as well as the usually very small number of random samples and the long duration of the test period with regard to the lifetime of 50,000 hours, project-related lifetime analyses are useful. The analysis is carried out on the basis of the lifetime of COBs and LED luminaires. Reliable values can only be obtained after 6,000 hours; such values can be ascertained and evaluated on the basis of small changes in parameters, variations in measured data and the limited degree of measuring accuracy. To this end, a random sample must be used that is suitable for delivering reliable evidence. Measured values must be subjected to statistical evaluation.

_ 1 Testing

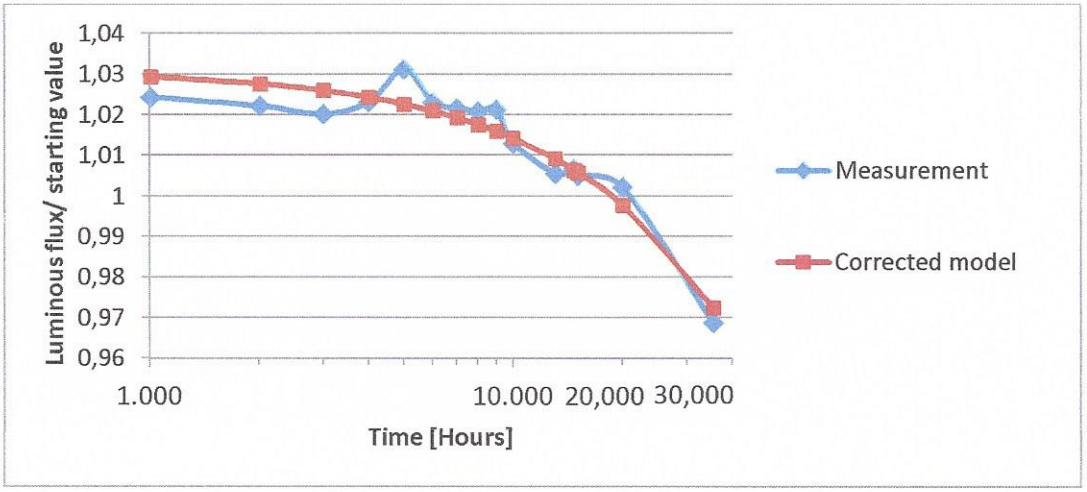
100 luminaires made by the company arclite Lichtvertrieb GmbH with COB modules made by the company Vossloh-Schwabe VS Lighting Solutions were installed at a branch of a clothing company in November 2013. These luminaires were operated up to the point in time of testing for a period of 20,000 hours. A total of 15 luminaires were taken from the branch in March 2018 and subsequently tested. The following image depicts such a specimen.

The distribution of luminous flux of the production of the COB modules (in the following diagram), the luminaires and the analysis of the distribution of luminous flux were used for the purpose of the analysis.



_2 Test Results

The following diagram shows the behavior of the luminaire's luminous flux on the basis of the lifetime test over a period of 35,000 hours. (The blue curve depicts the actually measured development of the luminous flux. The red curve (curve fitting) denotes a mathematical correction curve, on which the analyses are based, among others.



These measured data permit the following values regarding the degradation of the luminaire to be ascertained: a degradation of 3.2% can be determined after 20,000 hours. A degradation of 5.7% can be determined after a total of 35,000 hours.

The following diagram portrays two frequency distributions of luminous flux that are based, among others, on measurements carried out at the branch in 2018. In this regard, the red curve represents a Gaussian distribution of luminous flux, as was found to be the case with luminaires in a factory condition as delivered by the manufacturer and in accordance with production statistics. In addition, three measured data such as the reference spotlight and two spotlights from the batch delivered in 2013 are also shown in the diagram.

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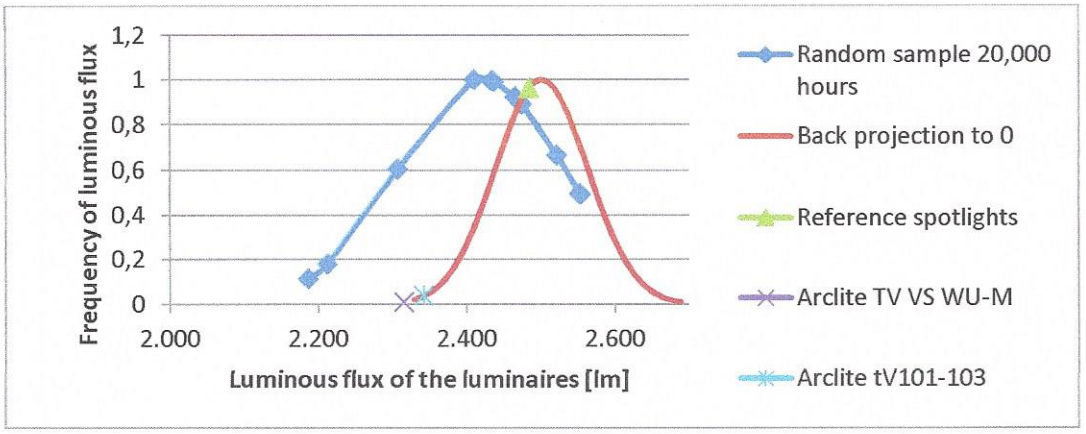

The blue curve shows how luminous flux were distributed after an operating time of 20,000 hours, which were evaluated in the course of the field measurements taken (random sample of 15 luminaires). In this regard, the Gaussian distribution is statistically significant.

After 20,000 hours, the luminous flux of the 15 measured luminaires were found to have reduced by a statistical mean from an initial 2,500 lm to 2,420 lm. This difference of 80 lm corresponds to 3.2% of the original value. Currently, a value of L70B50 is communicated on the market. Based on the measured results of the specimens and the lifetime tests, we consider an outstanding value at 50,000 hours to be reliable for the luminaire and the COB modules. Furthermore, the 100 luminaires installed at the branch were subjected to visual inspection. Neither a chip or cluster failure was found with any of the luminaires.

_ 3 Evaluation

The trackVISION 101 luminaires with the COB modules made by Vossloh-Schwabe display constant measured values and a narrow distribution of the luminous flux represented above in the branch project after 20,000 hours operation. A project-related statistical 3.2% degradation of luminous flux is determinable. The maintenance of luminous flux is, however, evaluated as very high. Datasheet values are considered to be reliable.
The measured photogoniometric values of 15 luminaires confirm the LM-80 tests of the Vossloh-Schwabe LUGA Shop modules and lifetime measurements over 35,000 hours.
Neither individual nor cluster failures could be determined on the LED modules after 20,000 hours in the project. To this end, 100 LED modules were visually inspected.

Given typical operation conditions (25 °C ambient temperature, ESD-compliant environment and clean environment) a lifetime of **> 50,000 hours** with outstanding values are to be expected for the luminaires and the COB modules.

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