GL OPTIC

Light quality control

Quality testing of displays and backlit units using ILMD

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Backlit elements, controls, switches or entire displays are universal in electronics used in the defense industry. They often have irregular shapes and are increasingly larger and more complex to provide the user with convenient access to information and control options. Manufacturers and suppliers of lighting technology for the defense industry need accurate and fast systems for quality verification.

Ease and speed of measurement is key

Manufacturers often face the challenge of testing dozens of products. Then the ease and speed of the entire process becomes crucial. Our devices are designed according to the 'plug and measure' concept, allowing for a quick start. They are all individually calibrated to make work as easy as possible. They can be freely combined with each other to obtain a measurement system tailored to specific needs. Extensive analysis software is also provided, guaranteeing quick access to all relevant information.

Imaging luminance meter makes it easier and faster to verify the quality of displays and backlit components

To ensure the quality of backlit components, a visual assessment is not enough. To verify the luminance level, i.e. the brightness effect of backlit components, luminance measuring instruments are used. Today's electronic devices with luminescent elements of various shapes and sizes require more sophisticated analysis than just measuring luminance at a single point. ILMD (Imaging Luminance Measuring Device) matrix luminance meters, such as the **GL OPTICAM 2.0**, using a lens and a high-resolution CMOS sensor with a V-Lambda filter, are perfect for such measurements. These devices, in combination with specialized image analysis software, offer enormous potential for R&D and production quality control.

The **GL OPTICAM 2.0 4K TEC** imaging luminance meter was designed and manufactured in Poland and is used to verify luminescent components for compliance with standards and to assess their quality. The **GL OPTICAM 2.0 4K TEC** is a high-resolution, high-sensitivity camera-based system featuring a 9M-pixel CMOS image sensor with a dedicated V-lambda filter, providing luminance measurements that match the sensitivity of the human eye. An innovative automatic lens recognition system with RFID, allows quick reconfiguration of the system. Thermal stabilization of the sensor array compensates for measurement errors resulting from changing temperature conditions. Each **GL OPTICAM 2.0** system is factory calibrated in a multi-stage calibration procedure, ensuring repeatable measurements and laboratory accuracy.

GL OPTICAM 2.0

See more

How do I measure the luminance of backlit components?

Based on the image taken with the **GL OPTICAM 2.0**, an accurate image analysis can be performed and measurement data can be obtained for elements of different sizes and shapes. The measurement should take place in a darkroom, in order to avoid the influence of scattered light on the results obtained. For small elements, it is advisable to use a lens with the longest possible focal length in order to obtain the highest image resolution.

The analysis software allows selected areas to be marked for detailed analysis of rectangular regions. As the shape of the controls is irregular, a special tool allows a lower luminance threshold to be set to remove the background. The grey color indicates the pixels excluded from the analysis. In this way, only the actual luminous surface of the icon is analyzed.

FIG.1. STEERING WHEEL CONTROL LUMINANCE IMAGE

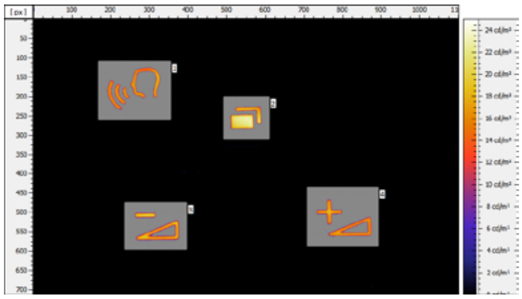

FIG.2. HIGHLIGHTED CONTROLS MARKED WITH A RECTANGULAR REGION AND BACKGROUND REMOVED

For each region, basic statistical luminance values such as mean value, minimum and maximum value and luminance range are displayed. In addition, a measure of uniformity, calculated as the ratio of the minimum value to the average luminance value, is added. In the example, area 2 has the lowest uniformity. This is also visible in the pseudo-color scale in the image.

The statistical values also make it possible to determine whether the average luminance values for all illuminated controls are similar or whether there are differences. Here, in region 2, it can be seen that the mean and maximum luminance values are significantly higher than the others.

Regiony zainteresowania

ID	Kolor	Nazwa	Średnia	Min	Maks	Zakres	Równomierność min do średniej
1		Rect 1	13,3 cd/m^2	5 cd/m^2	18,5 cd/m^2	13,5 cd/m^2	0,375
2		Rect 2	17,6 cd/m^2	5,01 cd/m^2	23,2 cd/m^2	18,2 cd/m^2	0,285
3		Rect 3	13,6 cd/m^2	5,02 cd/m^2	20 cd/m^2	15 cd/m^2	0,369
4		Rect 4	13,1 cd/m^2	5,01 cd/m^2	18,6 cd/m^2	13,6 cd/m^2	0,383

FIG. 3. STATISTICAL VALUES OF LUMINANCE

The histogram, a graphical visualization of a cross-section of the distribution of luminance values, allows visualization of the results obtained. Here, too, you can see the area of control 2 clearly different from the others.

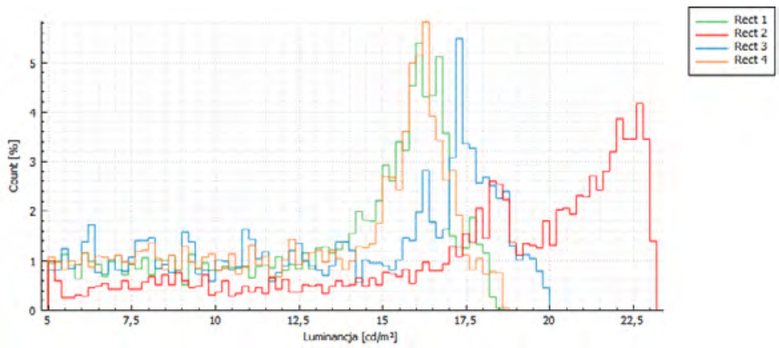

FIG. 4. HISTOGRAM OF THE LUMINANCE DISTRIBUTION

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The three-dimensional visualization of the luminance values is a spectacular, but also an easy-to-interpret tool to show the luminance distribution. It also allows potential inequalities to be quickly picked up.

Visualization by isocandelas graphically depicts the uniformity of the backlighting of the control. Isocandels are lines connecting points with the same luminance value. The shape of the isocandelas on the controls clearly indicates the brightest areas closest to the backlighting diode.

Color measurement

With elements illuminated by different-colored LEDs, the need to measure the colorimetric characteristics arises.

In order to analyze the color characteristics of the illuminated symbols, a spectral measurement of each symbol was made using a **GL OPTICAM SPECTIS 1.0 Touch** spectroradiometer. The measurements made use of a pen-type probe enabling very precise measurements. The results were assigned to each region, allowing their colorimetric coordinates to be plotted in color space.

In addition, by measuring the spectral distribution of the individual diodes, it was possible to correct the luminance values for the individual symbols based on error estimates resulting from the mismatch of the V(λ) filter (so-called Missmatch Correction). The range of luminance correction was from 2.5% to more than 5%.

Measurements of the luminance of backlit elements and displays are an indispensable part of quality control in the production process. It is worth relying on modern measurement solutions to speed up the entire process of component verification and to help bring new products to market more efficiently.

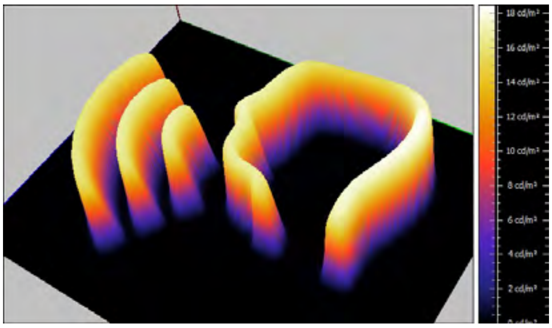

FIG. 5. THREE-DIMENSIONAL VISUALIZATION OF THE LUMINANCE OF A HIGHLIGHTED CONTROL

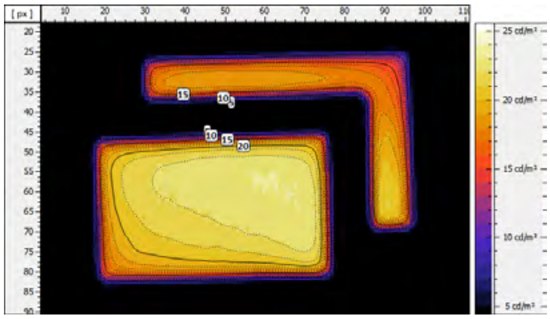

FIG. 6. VIEW OF ISOCANDELAS IN THE LUMINANCE IMAGE OF A BACKLIT CONTROL

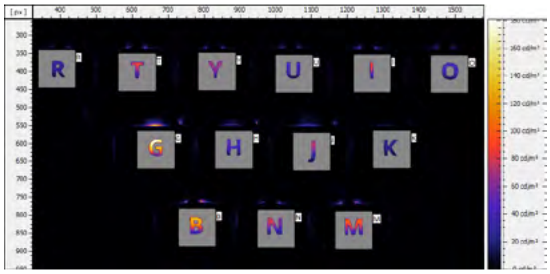

FIG. 7. RGB KEYPAD ANALYSIS

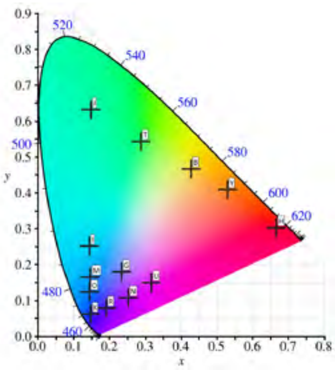

FIG. 8. CIE 1931 COLOR SPACE WITH THE COORDINATES OF THE INDIVIDUAL SYMBOLS PLOTTED

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