

Austromatisierung

26 March 2020

UNOFFICIAL ENGLISH TRANSLATION

The original article was published in German in Austromatisierung, a trade magazine published in Austria. Prepared for CRETEC. The German original remains the reference.

Austromatisierung Ausgabe 03.2020 Großes ins rechte Licht rücken



CRETEC Pressemappe

Stand: 05.2020

Seite 14 / 116

Putting large objects in the right light

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Putting large objects in the right light

It is well known that the success and quality of a machine-vision application depend, among other things, on the right lighting and its intelligent control. While external influences such as daylight or reflections are relatively easy to manage for small test parts, the effort increases enormously for larger objects. For these applications, the German company Cretec offers a broad range of large-area, modular, intelligently controlled LED lighting systems. It also implements complete vision solutions, from feasibility studies and installation through to ongoing support.

By Dipl.-Ing. Kamillo Weiß

As in professional photography, Cretec bases illumination on the definition of luminance, which describes the brightness of light from emitting surfaces. This approach precisely describes homogeneous light emission across the entire illuminated area. It is particularly important for difficult measurement objects whose shape and reflective properties present special challenges, for example rapidly moving objects in production lines that require intense illumination without overexposing the centre. Maximum homogeneity right to the edges is essential for consistent results in a vision application.

Intelligent LED lighting for bulky machine-vision inspection objects

Wide spectral range for feature extraction

The modules are designed for industrial use, including harsh environments and hygienic requirements. The basic LED modules can be combined into any geometric format, as bar lights for conveyor applications or as large-area lights. Available illuminated areas range from 50 × 50 mm to 6,000 × 6,000 mm. All light colours are available in continuous or strobe mode. The LED boards are developed in-house and fitted with white, red, green, blue, infrared, ultraviolet, RGB or RGBW LEDs.

In the backlighting module, the

spacing between the dimmable LEDs and their distance from the cover - a special diffuser - are selected to create an optimised, homogeneous illuminated field extending to the edges. Openings for optics can be incorporated where required, allowing a camera behind the light to look through it. The large-area LED lights are factory-adjusted and require no further manual adjustment when the application changes.

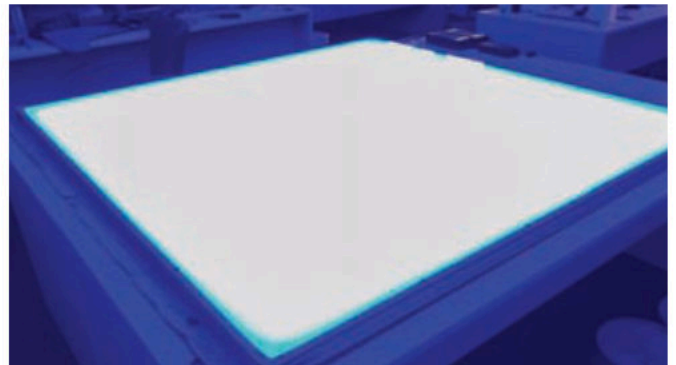
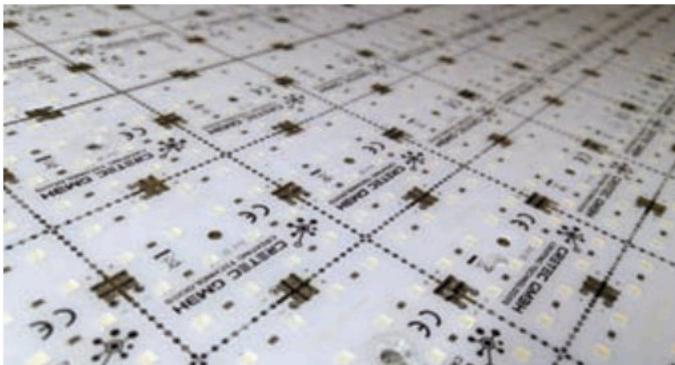
The protection rating of the lights and connectors is at least IP65, optionally

stored as ready-to-use recipes in the vision software. White light with a controllable colour temperature opens up further application areas.

Operating LEDs in strobe mode offers many advantages for demanding vision tasks. Synchronised in the microsecond range, the light effectively freezes test objects and captures them with high image sharpness. Compared with continuous light at larger aperture values, potentially accompanied by image noise, strobe lighting can use smaller aperture values with greater

vehicle interiors, measuring from 250 × 250 mm to 1,400 × 1,300 mm, and precise vision-based inspection of transparent adhesive application. Robots handle the large components, and the large field of view requires the vision camera to be positioned 2.75 m away. Cretec solved this task with a complete system.

A large-area, homogeneous blue LED lighting system with a short wavelength of 470 nm was crucial. It separates the visibility of white, black, grey and brown component colours and



up to IP67. The camera opening is in the centre of the light. A hygienic design is also available as an option.

Broad-based intelligence

For each application, users can make a broad range of individual adjustments through external control of the LED modules. Multicoloured test objects can be imaged with greater contrast by separating brightness values in the greyscale image. Intelligent control of coloured LED light (RGB/RGBW), combined with image processing using tone mapping, can considerably improve reliable recognition of structures. Four-colour LEDs allow successive exposures of a product in different colours, precisely detecting complex product features with just one camera.

Homogeneous large-area light also helps minimise the adverse effects of reflective surfaces. All lighting parameters for product variants are

Optimised homogeneity extending to the edges of a large-area lighting module makes a decisive contribution to reliable detection and dependable vision solutions.

sharpness. An extremely short flash duration permits operation at a rated current 300% higher, enormously increasing the available illuminance. External influences such as ambient light are also largely eliminated. Changes in LED light intensity over the service life or with temperature can be taken into account and compensated by the control system.

Application example: automotive industry

One application required reliable handling of flat needle-punched nonwoven materials and carpets for

minimises environmental influences such as daylight and factory lighting. These LEDs also offer high efficiency, and short-wavelength light enables greater sharpness in camera resolution. The lighting module is only 45 mm high and measures 1,500 × 1,500 mm, with a 25-megapixel camera installed in its centre. External control directly addresses all basic LED modules by segment. The system precisely detects whether the partly transparent adhesive has been applied uniformly across the entire component, at a resolution of 0.3 mm. (TR)

About the author: Dipl.-Ing. Kamillo Weiß is a freelance technical journalist and wrote this article on behalf of Cretec.

INFORMATION: www.cretec.gmbh

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