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UNOFFICIAL ENGLISH TRANSLATION

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Hohe Beleuchtungsqualität für große Prüfobjekte



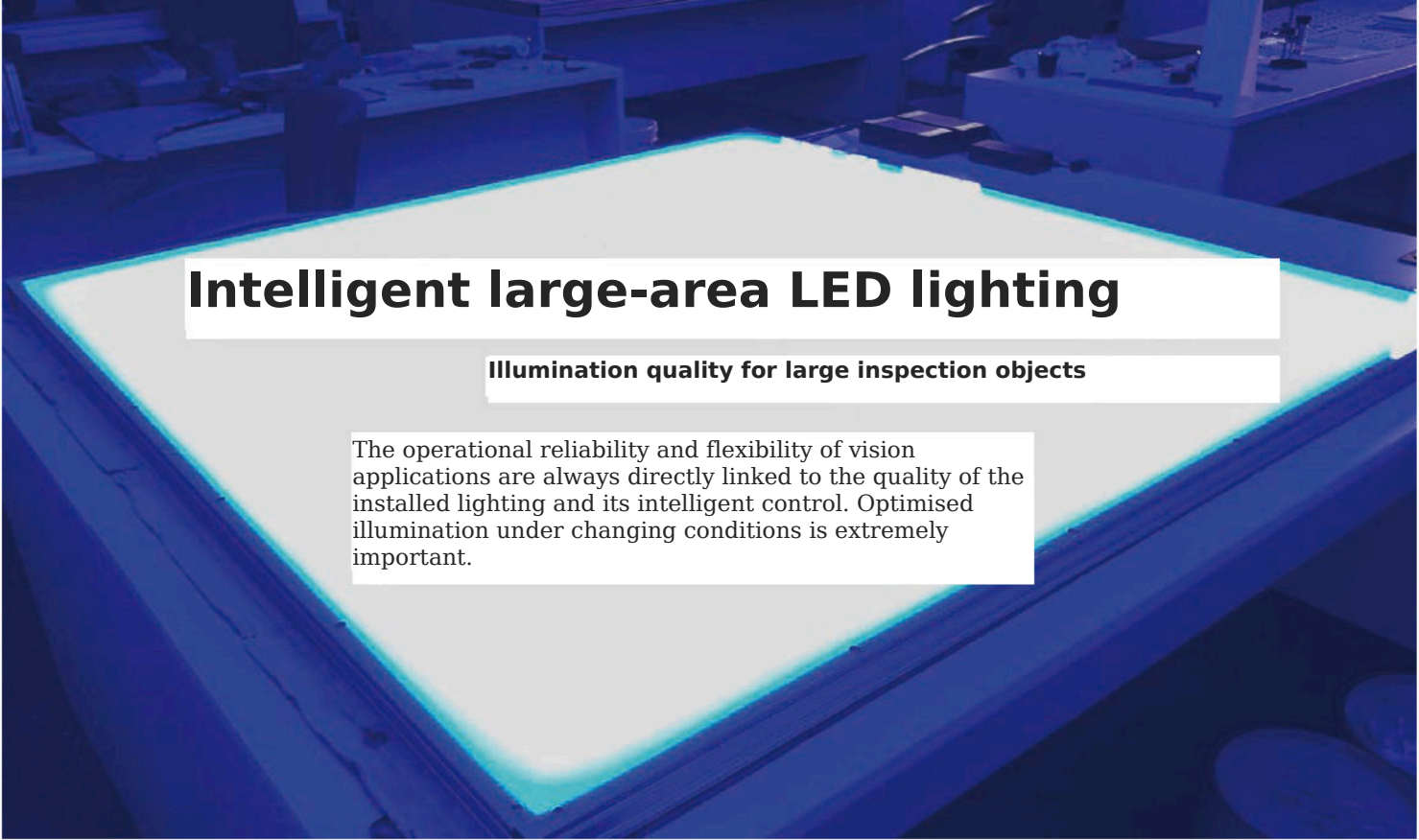
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Intelligent large-area LED lighting

Historical 2019 technical statements, the five-year warranty and electrical specifications are translated as published. The original aperture / sharpness wording and the claim of a rated current 300% higher are retained, not independently validated. Original publisher artwork, logos and advertisements are retained in their original language.



Intelligent large-area LED lighting

Illumination quality for large inspection objects

The operational reliability and flexibility of vision applications are always directly linked to the quality of the installed lighting and its intelligent control. Optimised illumination under changing conditions is extremely important.

The lighting module is large and provides illumination extending to the edges, optimised for uniformity. This ensures reliable detection and a dependable vision solution.

Large inspection objects require much more extensive expertise in lighting hardware and software. For small test parts, mechanical measures such as covers or high light intensity can prevent external influences such as daylight relatively easily. For large parts or extensive inspection fields, a conventional approach would require considerable effort and severely restrict flexibility when inspecting different components. The solution for demanding industrial machine-vision applications combines powerful LED lighting systems with intelligent, versatile light control.

Homogeneous large-area illumination

For large test parts or extended inspection fields, Cretec GmbH offers a broad portfolio of large-area, modular, intelligently controlled LED lighting systems. These modules, in variable and customised sizes, provide economically and technologically efficient vision solutions, from backlighting extending to the edges through to front lighting, even for highly complex fully automated quality-control requirements. Alongside application-specific, optimised lighting, Cretec supplies the complete vision

solution, from feasibility studies to installation and support.

Test objects must be illuminated so that critical image features can be detected precisely with clear contrast. This requires lighting expertise and application experience in how light travels from its source to the object, is reflected or scattered, and is ultimately captured as an image through the lens on the camera sensor.

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.

Wide spectral range for feature extraction

Cretec lighting modules are designed for industrial use, including harsh environments and hygienic requirements, providing exactly the right light for every application. 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 $6,000 \times 6,000$ 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.

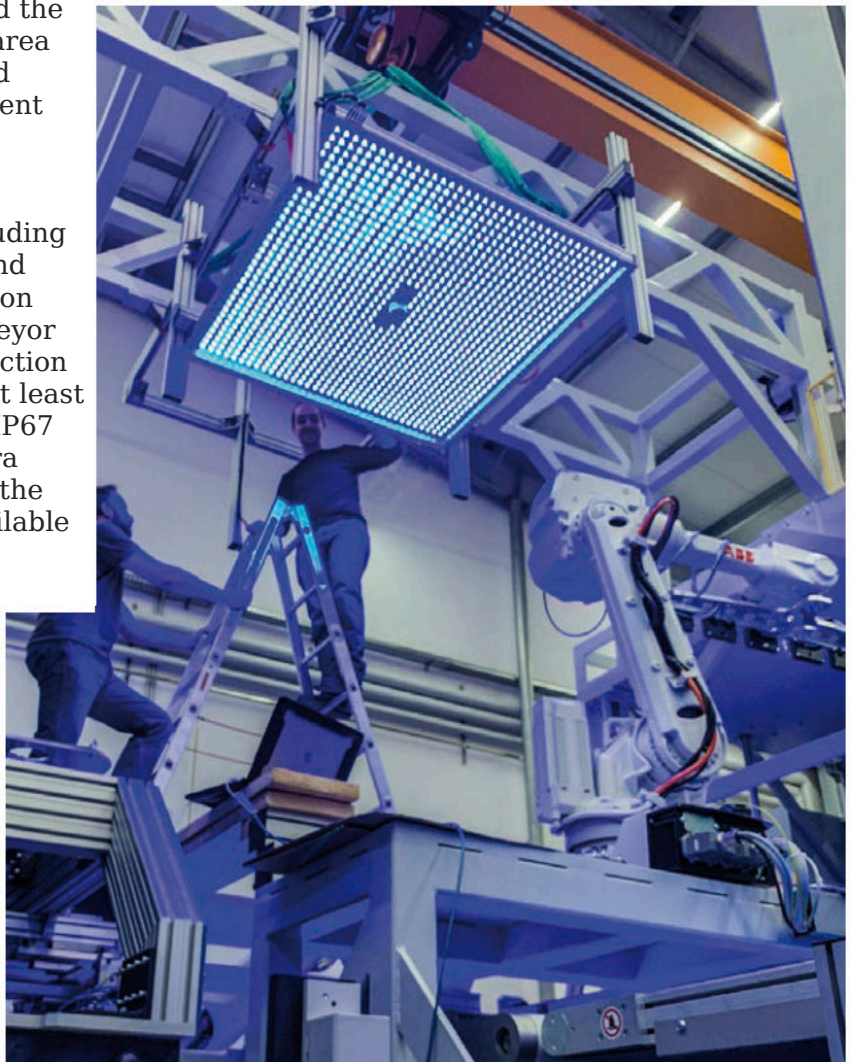
In the backlighting module, the spacing between the dimmable LEDs and their distance from the cover - a special diffuser - are selected to create an optimised, homogeneous illuminated field extending to the edges. Openings for optics can be incorporated where required, allowing a camera behind the light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

Growing demand for large lighting systems affects many sectors, including automotive, surface engineering and coating technology, larger inspection areas in packaging, and wide conveyor belts in food production. The protection rating of lights and connectors is at least IP65 (water jets), optionally up to IP67 (temporary immersion). The camera opening is located in the centre of the light. A hygienic design is also available as an option.

The homogeneous light of a $1,500 \times 1,500$ mm LED light enables precise inspection of adhesive application on an automotive parcel shelf, with reliable detection at a resolution of 0.3 mm.

Broad-based intelligence

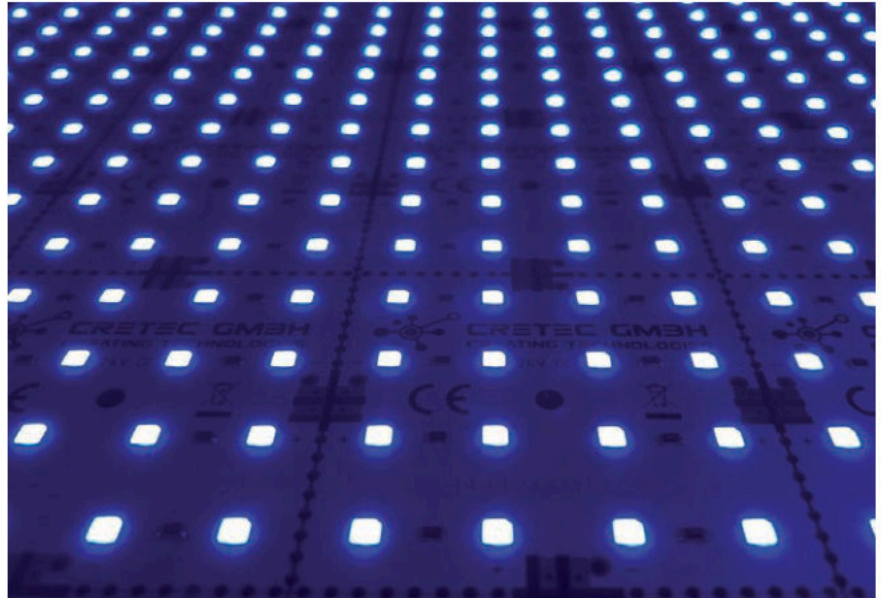
For each application, users can make a broad range of individual adjustments through external control of the LED modules. Multicoloured test objects can be imaged with greater contrast by separating brightness values in the greyscale image. Intelligent control of coloured LED light (RGB/RGBW), combined 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.



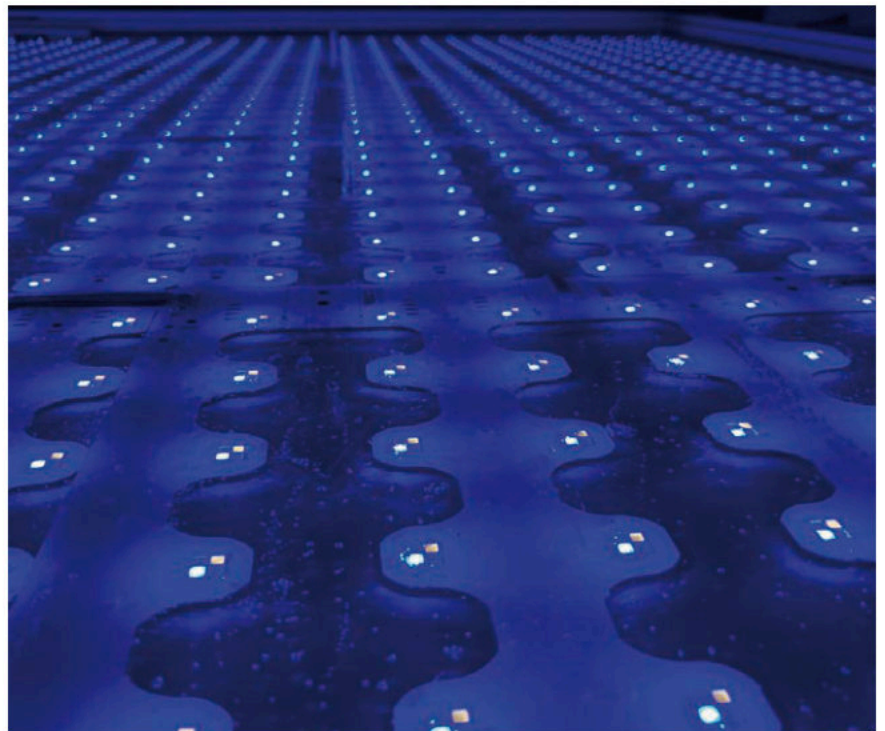
All lighting parameters for product variants are stored as ready-to-use recipes in the vision software. White light with a controllable colour temperature opens up further application areas.

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 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.

As a feature that stands out from competitors, Cretec offers a five-year warranty on the lighting modules - an important aspect of the payback period for system solutions.



The spacing between the dimmable LEDs and their distance from the cover - a special diffuser - are selected to ensure an optimised, homogeneous illuminated field.



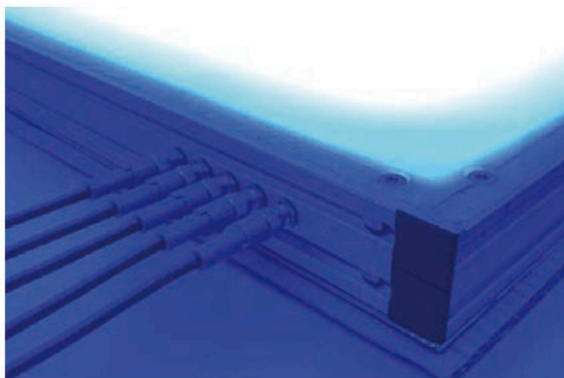
Large-area lighting modules with four-colour LEDs in strobe, colour-change or daylight mode enable an enormous range of industrial machine-vision applications.

A perfect adhesive bond

The automotive industry increasingly requires precise, automated machine-vision inspection of the many differently sized trim and fitted components used in vehicle interiors. Only then can subsequent assembly be error-free. This application required reliable handling and precise vision-based inspection of flat needle-punched nonwoven materials and carpets measuring from 250 × 250 mm to 1,400 × 1,300 mm. This had to take into account difficult surface properties and the various component colours: white, black, grey and brown.

The component dimensions and material properties place very high demands on both machine vision and the lighting system. Robots handle the large components, and the large field of view requires a camera working distance of 2.75 m. For example, a rear parcel shelf must be inspected fully automatically in three-shift operation for completeness and precise adhesive application, ensuring accurate subsequent assembly. The component's position is also measured precisely and the data passed to a second robot. A carrier part is then picked up, positioned on the parcel shelf and joined.

Cretec solved this complex task with a complete vision system. A large-area blue LED lighting system, only 45 mm high and



Depending on module size, power supply and external light control use several four-pin M8 connectors with IP65 to IP67 protection.



The camera of the vision system captures defective adhesive application in great detail.

measuring 1,500 × 1,500 mm, with a 25-megapixel camera installed in its centre, was crucial. External control directly addresses all basic LED modules by segment, achieving optimum illumination homogeneity and intensity.

A robot positions the adhesive-coated parcel shelves precisely in the camera's field of view. Uniform adhesive application across the entire component is detected at a resolution of 0.3 mm.

The blue LED light optimised for this application measures 1,500 × 1,500 mm and is 45 mm high. Its specifications are: 24 V DC supply voltage, 60 A current consumption, 1,440 W power consumption, 470 nm LED wavelength (blue), 12,480 LEDs, and power supply and external control through several watertight M8 connectors. This provides an impressive luminous flux of approximately 32,000 lumens at the test object.

- Kamillo Weiß -

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