1.4 Dark field lighting

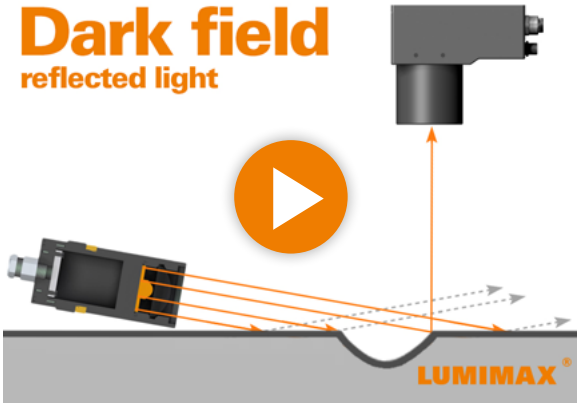
Left: diffuse reflected light

Right: Dark field

In direct contrast to bright field lighting, a dark field lighting setup is arranged so that light reflected by the surface of the test object is directed away from the camera. Accordingly, the object in the image appears dark. If the beam of light falls on an irregularity, however, then its edges will deflect the light rays. Accordingly, defects, contours or edges will appear as bright features on a dark background.

Dark field lighting is therefore especially suitable for:

- Surface finish inspection, even for strongly reflective objects
- Inspection of dot-peened or laser-cut codes
- Inspection of engraving, embossing, stamped numbers and raised structures
- Edge inspection



Video can be viewed at https://www.iim-ag.com/en/lumimax/useful-facts/videos/video-dark-field-light-reflected-light.html

To achieve a dark field arrangement, special ring lighting systems can be used. These use a radial light source that produces light at a flat angle. Another variant is creating a dark field with spot or bar lighting systems arranged at low angles of incidence.
The variant used depends not only on the test object itself, but also on the local installation conditions. Since a light source with a low angle of incidence means that dark field lighting utilises a very short working distance, using a closed ring light source is not always possible. In such cases, a combination of bar lights is typically used for lighting instead.

LUMIMAX® LSB series bar lights in the mounting bracket

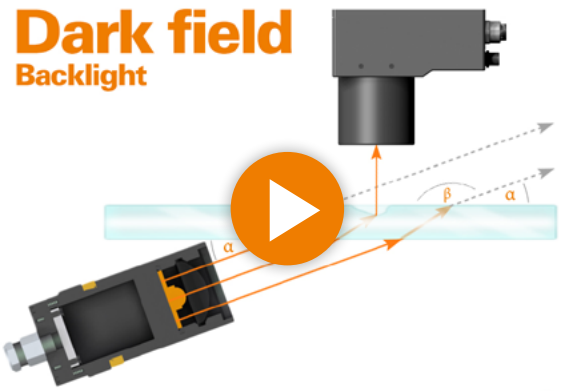
The LUMIMAX® Miniature Bar Lights in the LSB series are the perfect choice for this specific use case. Thanks to a special lens fitted in front of the LEDs, which is carefully matched to dark field requirements, these lights are able to achieve a homogeneous yet directed bar of light. Another special feature is the innovative mounting solution, which can incorporate one to four bar lights arranged in a square formation. The incident angle of the bar lights to the object plane can be altered between 0° and 90° in steps of 7.5°. The lights lock into place in each position, creating a precise, reproducible configuration, and ensuring that the lighting can be adjusted flexibly to a wide range of requirements.

1.4 Dark field lighting

In special cases, the lighting is also placed as a dark field behind the object. This approach is used to highlight defects in semi-transparent or transparent test objects. As with the reflected light version of dark field lighting, the light here is also normally reflected away from the camera. If the light falls on a scratch or edge, however, the beam is deflected into the camera.
In practice, however, backlight dark field lighting is a less commonly used arrangement.

Scratch on acrylic glass – diffuse backlight

Scratch on acrylic glass – dark field backlight



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