

Shed a Light

The Importance of Strobe Lighting Operation and LED Strobe Controllers for Machine Vision

LED strobe controllers allow machine vision engineers to achieve consistent light levels which are paramount to guarantee repeatable results.

Lighting is one of the most critical elements of a machine vision system and is key to achieve stable and repeatable results. Incorrect illumination and non-constant image brightness may result in extensive and time-consuming image processing or, in the worst case, in a crucial loss of information. There is no software algorithm capable of revealing features that are not correctly illuminated.

Most of the machine vision lighting products available nowadays are LED based. LEDs are in fact the ideal light source for machine vision applications: they can be switched on and off in sequence, turning them on only when necessary. Additionally, LEDs can be overdriven, i. e. they can emit more light only for a limited amount of time, which is usually necessary whenever the application requires an increased amount of light to image fast moving objects without motion blur. Furthermore, overdriving has many advantages, including the following:

- eliminate the influence of ambient light;
- preserve the LED lifetime;

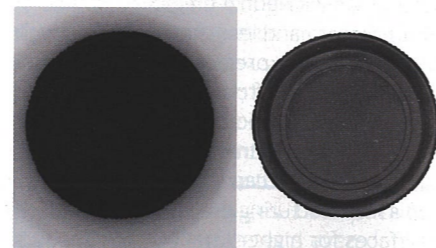
- synchronize the on time of the light with the camera and the item to be inspected;
- reduce the power consumption of the whole vision system;
- decrease heat dissipation (no heatsinks or fans required).

When inspecting fast moving parts, typical conditions include cameras set at short exposure times (to avoid motion blur) and optics set at high F/N. However, such conditions may lead to images that are too dark to be processed by machine vision algorithms. To get more light it is possible to either increase the camera gain or to lower the lens F/N. The first option will result in higher noise levels while the second will decrease the depth of field: both ways, therefore, will result in an image where fewer details can be distinguished.

In many cases it is possible to avoid this issue by increasing the amount of light. For this reason, Opto Engineering offers a wide range of LED lights designed to work in overdrive mode, specifically suitable for high speed applications, including high uniformity

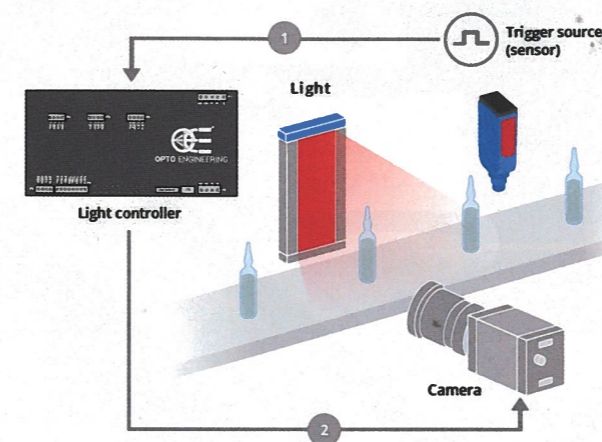
LED backlights available in many formats and wavelengths (LTBP series), dome illuminators (LTDM series), low angle ringlights (LTLA series) and powerful LED pattern projectors (LTPRUP series).

When pulsing LEDs in high demanding applications it is, of course, essential to synchronize the on time of the light with the cameras and manage the timing in the most precise and repeatable way by controlling the pulse

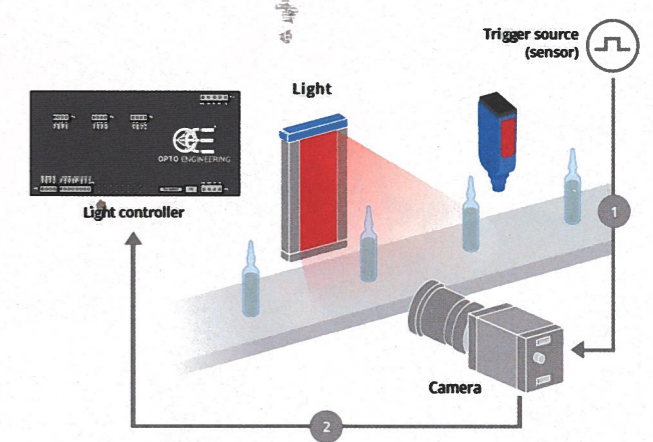


Images of black plastic caps illuminated with dome lights. The image on the left cannot be processed by machine vision algorithms: the dome light used is not powerful enough. The image on the right with strobe illumination can be used for surface inspection.

A • Controller triggers camera



B • Camera triggers controller



A) Option A shows a triggering arrangement where the light controller is triggered by trigger source(s) (sensor positioned on the manufacturing line) and the lighting controller then triggers the camera(s). B) Option B shows an arrangement where each camera is triggered by a trigger source (sensor), the camera then triggers the light controller and starts its exposure.



With flashed LEDs in high demanding applications, it is paramount that the lighting is synchronized with the camera and the control is highly accurate and repeatable.»

duration, frequency and amount of current supplied to the LED: a LED strobe controller is required to do this, allowing machine vision engineers to achieve consistent light levels which are paramount to guarantee repeatable results.

Opto Engineering offers LED controllers with up to eight channels either with Ethernet and/or RS485 interfaces designed to accurately set current intensity, pulse duration and delay of LED illuminators (in steps as slow as 1 μ s). The communication protocol is Modbus. In addition to a number of opto-isolated synchronization inputs, Opto Engineering high-performance controllers

feature several synchronization outputs that allow the controller to be used as a master to the camera or to directly control an actuator on the line. ■

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