

Application Report

LEDs: Poison for photoelectric sensors?

Extraneous light is a common source of interference to light barriers and photoelectric sensors. Particularly popular LED lighting hampers reliable object detection. Are there any countermeasures to prevent the influence of ambient light?



Figure 1

Figure 1: Dream team in assembly technology: O200 (right) with O300/500 and OT300/500 of the comprehensive Baumer toolbox of light barriers and photoelectric sensors.

Object detection commonly deploys optical sensors. They provide precise non-contact detection at short response times. However, there is one drawback with light barriers and photoelectric sensors. They operate on visible light of the same spectral range as artificial light or sunlight. Consequently, such light may cause detection errors in photoelectric sensors. In particular LED lighting and bright sunlight are proven interfering factors – and often difficult to identify.

LED light is likely to generate detection errors

LED light becomes more and more popular at ceilings and machinery, both in new or retrofit installations. Thanks to the low power consumption at yet high luminous power, LEDs are much more economical than alternative light sources. Furthermore, in the future the use of fluorescent lamps will be banned by law in both the EU and Switzerland. This may have an effect on automated processes. The increasing use of LEDs is changing the ambient light conditions in shop floors and consequently adds on interference to optical sensors. This will increase the risk of detection errors. But why?

Tests have proved photoelectric sensors of different brands prone to interference by LED light of various frequencies. This will impair reliable object detection, and it's up to users to find out the cause. Yet, as long as the time-relevant switching behavior is maintained under extraneous light, troubleshooting is rather easy. The situation is completely different with optical sensors that according to individual interference frequencies will adapt their internal measuring cycles. This will confront users with extended response time or switching cycle time. This in turn may entail process cycle times being no longer adhered to, or system shutdown or, worst case, machine crash. Here, troubleshooting is extremely difficult since the root cause is not immediately evident, neither it can be seen whether the malfunction will be remedied automatically.

To make things even worse, not only LED ceiling light will have a negative effect on the operationability of photoelectric sensors and light barriers. Also sensors mounted close together or lighting systems for industrial cameras are potential interference factors.

Ambient light algorithm to eliminate error sources

The easiest way to avoid time-consuming error search is reliable object detection by optical sensors – reliably under any lighting condition including LED. Baumer identified ambient light and LED in particular as significant interference factor early on and established new standards for detection reliability by own research. The latest generation of Baumer optical sensors stand out by extremely high immunity to ambient light – thanks to an innovative algorithm.

In simple terms, this is how ambient light suppression works: At the beginning of every measurement cycle, the interference factors are identified by so-called dark signal measurements and compensated by control loops and innovative algorithms. Thanks to continuous evaluation of the interference factors, the sensor will automatically adapt to changing light conditions.

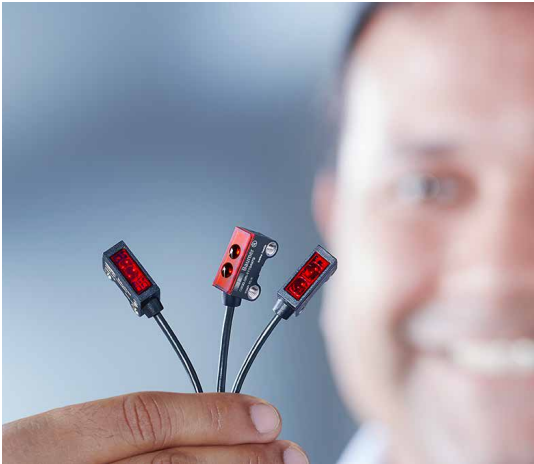


Figure 2

High-precision optics combined with powerful electronics ensure consistently high measuring speed at short response time of merely 0.5 ms. Speed combined with immunity to ambient light makes the Baumer photoelectric sensors and light barriers ideal for many automation tasks.

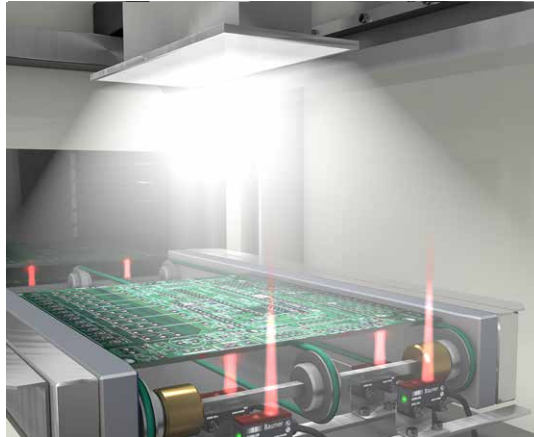


Figure 3

Also the O200 sensor family of the comprehensive Baumer portfolio of optical sensors excels with outstandingly high immunity to ambient light. These miniature sensors are likewise insensitive to LED interference and ignore ambient light as potential error source on the shop floor.

Conclusion

Switching errors by optical sensors prone to interference by ambient light impair process reliability. If the root cause is not obvious, troubleshooting is quite an expensive effort. Shutdown of the entire installation is often the consequence. At Baumer, we explored the weak points of optical sensors by extensive research to develop reliable solutions. The latest generation of optical sensors provides user benefit by unrivalled immunity to ambient light. This way, the Baumer light barriers and photoelectric sensors eliminate potential error sources in production. This ensures maximum process reliability even under changing light conditions and is prerequisite for safe 24/7 operation at maximum system uptime.

For more information visit
www.baumer.com/c/279

Figure 3: Even under direct LED light: The Baumer diffuse sensors with background suppression O200 ensure maximum reliability at ambient light.

Figure 2: The O200 series is not only extremely immune to ambient light but also provides maximum freedom in machine design thanks to their compact dimensions.



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