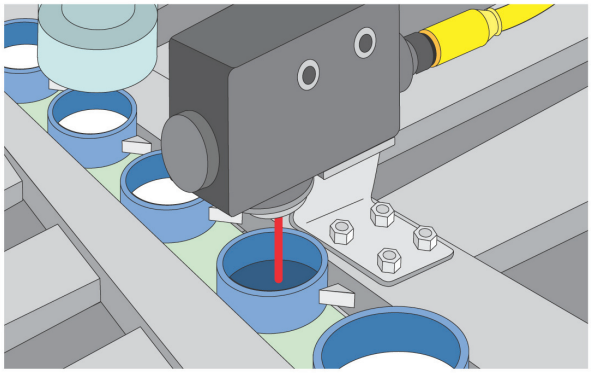
Material Handling: Sensing Challenges and Solutions

TECHNOLOGY BRIEF

In today's material handling market, OEMs are faced with a number of concerns when choosing a sensor manufacturer and specifying sensors. What makes one sensor manufacturer more attractive than another? What sensor features are the most important to me? How do I protect my company from specifying a sensor that will be obsolete in the next 12 months bringing my production to it knees? What are the current trends in the sensor market? With the growing trend to reduce inventory, how can I limit the number of unique models my machine needs? What electrical standards and optical features are important?



For many OEMs, choosing the right sensor manufacturer is concern number one. OEMs want a manufacturer with a trusted name in the material handling industry. They also want a manufacturer who is not only reliable and experienced, but one who can provide them with quick solutions anywhere in the world. Ensuring that your sensor manufacturer is a global player not only helps with local stock and product support, a global manufacturer can also offer assistance with local approvals and wiring regulations. For instance, a US-based machine builder selling to an end customer in Europe may not be familiar with the requirements of CE. Sending a machine overseas that does not meet the local directives can be a costly mistake.

Sensor features are another area of concern for OEMs. As new sensor models are introduced and new technology becomes available, so too do their features. Knowing which sensor features are important can be a challenging task. The trade-off is always cost versus performance. Therefore, it is necessary that engineers are able to distinguish between required technical points and the "nice to have" features. Most sensor manufacturers divide sensor families into classes, consisting of low-end and high-end models. The models differ from each other in respect to housing material, LED indications, optical performance and general attributes.

Low-end models offer cost-effective solutions to general applications where good optical performance is required. Because cost is essential, low-end models typically have housings made with lower-grade plastics or metals. Also to keep cost low, features such as indicating LEDs and external adjustments are usually not available or are limited to a single indicator and potentiometer. Optical performance on low-end models is average, and high-tech features that would add significant costs are normally not offered.

High-end models, on the other hand, are packed with high-performance features tailored more toward specialty applications. Housings include high-grade plastics and metals such as stainless steel and aluminum. Furthermore, high-end models commonly include multiple indicators, automatic push button or remote teach-in, light on/dark on selection, rotating electrical connectors and multiple mounting possibilities. Optically, high-end models have improved sensing characteristics including sharper light spots, laser light sources, high ambient light resistance and automatic cross-talk protection, all of which yield better overall performance.

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While the majority of applications can be solved with low-end models, more complex applications require the need for specialty high-end sensors. Generally considered application specific, these high-end sensor models have features that include clear object detection, color, contrast, luminescence, ultra-small target detection, light grids and so on. For this reason, it is important for OEMs that their sensor supplier is able to provide both low- and high-end models.

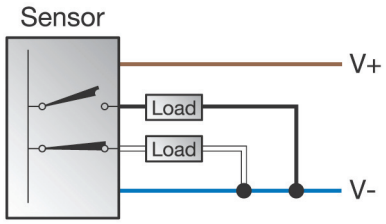
Indicating LEDs found on many low- and high-end models are a basic feature that provides visual information about the sensor's status. Most commonly used with photoelectric sensors, an amber LED is used to indicate that light from the sensor is being received. On models that include two LEDs, a green indicates the sensor is powered. LEDs make it easy to test the functionality of a sensor at the sensor itself. If the green power LED is lit, than it can be determined that the sensor is receiving voltage from the power supply or transformer. If the yellow LED is not responding as objects pass by the sensor, further examination may be required to determine if the sensor is misaligned or may have its gain (also called sensitivity) adjusted too low. Due to the limited size of the housing, most sensor manufactures do not include additional LEDs beyond the standard green and amber.

Some high-end sensor families have LEDs with enhanced functionality that can be very beneficial for identifying problems when they occur in the field. These LEDs serve as a diagnostic tool by showing, for example, if the output is shorted or the light being received is at a level so low that the sensor is having problems reliably detecting the target. This built in tool simplifies the troubleshooting process for technicians by eliminating the amount of testing required to determine the cause of the sensors fault. The fault conditions are displayed by flashing the green or amber LEDs at preset frequencies to indicate the error.

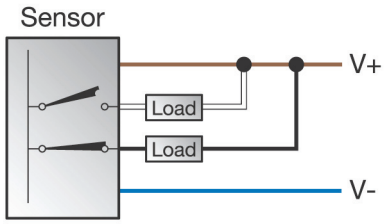
Still another advancement on high-end models is the use of highly visible LEDs. Highly visible LEDs add the benefit of being visible from greater distances and even from poor vantage points. These types of LEDs greatly improve the distance and even the angle at which the sensors status can be seen.

OEMs often suggest features they would like to see incorporated into production sensor models. One common suggestion is tamperproof housings. Tamperproof models have a fixed range that is set to the sensors maximum by default, with nothing to adjust. Because a misadjusted sensor could inadequately detect the target or could detect objects beyond the target area, OEMs often specify tamperproof models to prevent unauthorized adjustments to the sensor. Tamperproof models also enable quick replacement if a sensor is damaged. Because the replacement sensor doesn't need to be adjusted, less time is spent with setup and installation, thus reducing downtime and costs.

Typical 4-in-1™ Wiring



4-in-1™ output acting as PNP (sourcing)



4-in-1™ output acting as NPN (sinking)

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Although fixed-range models are a common request, adjustable models have their place as well. Models with sensitivity or gain adjustments allow the range to be quickly and easily fine-tuned, often by simply turning a potentiometer. This adjustability equates to flexibility because a single adjustable model could potentially replace several fixed range models of varying ranges, thus reducing stock.

With the current trend toward stock and cost reduction, OEMs must find a way to reduce the number of unique sensor models in their inventory. Limiting models not only reduces stock and paperwork for each unit, it ensures they will have the part on the shelf when the customer needs it. Stock reduction can also help to increase the usage of other models, which will ultimately reduce overall cost.

Selecting sensors with a 4-in-1 output can effectively reduce stock by eliminating the need for four different sensor models, because each sensor contains a normally open and normally closed output, which detects the type of load connected, and will sink or source accordingly. With 4-in-1, a single sensor can operate NPN normally open, NPN normally closed, PNP normally open or PNP normally closed. Because the sensor automatically detects the load, 4-in-1 sensors require no external wiring for mode selection and no potentiometers adjustment for light on or dark on.

An additional trend and universal request from OEMs involves photoelectric sensors with smaller housings. These miniature housings are desirable because they easily blend into their surrounding and utilize less space, which is often at a premium. Only recently have these smaller sensors offered performance to match their larger siblings. In the past, smaller size typically meant shorter sensing ranges. This is not true today. Thanks to continuing advancements in technology, it is not uncommon for a miniature or sub-miniature photoelectric sensor to have ranges equal to or greater than those of larger models.

To protect themselves from specifying a sensor that may eventually become obsolete, OEMs can choose sensors in industry-standard housings. Sensor families with industry-standard housings conform to an industry-accepted style and mounting pattern. These models include threaded cylindrical, surface mount and rectangular designs. An industry standard housing not only simplifies sensor replacement, it also guarantees the sensor will mount either in the same sized hole or will match up to the same bolt spacing. OEMs can also be assured with an industry standard housing that they are not locked into a single sensor manufacturer because most sensor manufacturers offer industry-standard styles.

OEMs can further protect themselves by choosing models that have flexible mounting configurations. These sensors have the versatility to mount by a threaded snout, or by thru-holes for a surface mount. Mounting with the threaded snout can be achieved quickly by using the included lock nut to secure these models to any correctly sized hole or opening. Thru-holes add the option of affixing the sensor to a machine surface in a manner similar to standard rectangular models. Optional brackets can also be used for more mounting configurations.

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