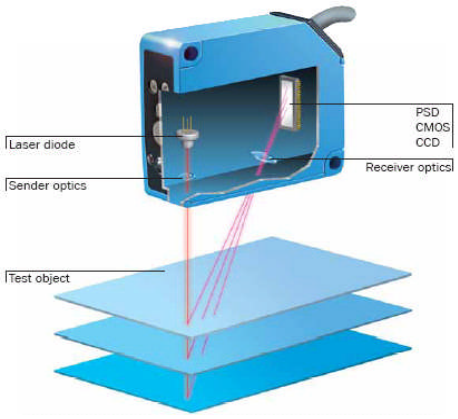
## Triangulation Receiver Technologies

Optical displacement sensors are part of SICK's distance measurement sensor family, but tend to concentrate on measurement at a short range (<1 meter) and feature resolution in the micron and sub-micron range. This can be compared to other longer-range distance measurement solutions, which measure up to 1200 meters with resolutions in the millimeter range.

All optical displacement sensors, regardless of the manufacturer, utilize similar receiving technologies that can be defined in the following ways and offer both application benefits and/or pitfalls that users of displacement products should understand.




**Principles of Triangulation**

A laser light spot is projected onto the target being measured. The light is reflected back to a light-sensitive receiver element. Based on the light position and the known geometry of the sensor optics, the distance is determined.

**PSD**- "Position Sensing Detectors"

This receiver technology is the simplest and lowest-cost solution. It can be defined as almost basic receiver technology that is used in baseline photoelectric products. Consideration must be given where different target remissions (light color vs. dark color) are present since the measurement values for the two remissions will differ. In addition, the PSD receiver cannot differ between the direct light source compared to reflected light, so targets with irregular and highly reflective surfaces can produce erroneous measurements. When high-gloss surfaces, such as polished metal are the targets, the PSD receiver can be "blinded" by the reflected light. This effect is called "blooming" and can be compared to digital photography when residual light being sent to the camera receiver causes the receiver to only see the light and blacks out all peripheral views.

**CCD**- "Charge-Coupled Device"

This version of receiver technology is common in digital cameras and video cameras. The technology has been available for years. In reference to optical displacement sensors, CCD receivers are a vast improvement over the baseline PSD style. Even though performance with dark/ light remission targets is better (compared to PSD), careful consideration must be applied since measurements at the black/white shifts can be significant. Many manufacturers compensate for this in their internal algorithms, but do not eliminate the effect of blooming where residual light being reflected off targets can still blind the CCD receiver.

**CMOS**- "Complementary Metal Oxide Semiconductor"

The upcoming star of optical performance, CMOS receivers offer several distinct advantages over the two previous designs. In fact, as the area of digital photography advances, CMOS receivers are rapidly becoming the preferred design by major camera manufacturers. CMOS receivers used in displacement sensors accurately measure distances of dark (6% remission) and light (90% remission) targets. This means that whether you are measuring tire tread or polished surfaces, the measurement values will remain consistent. CMOS receivers also have natural anti-blooming characteristics so high-gloss surfaces like polished metal can be measured with high accuracy and no blinding effect. This is the primary reason why digital photography is making the major move to CMOS receiver technology.

**Applications**

Optical displacement solutions are used in a variety of market segments primary when quality control, positioning and identification is required. Market segments include automotive, postal, electronics, packaging, robotics and general manufacturing markets.

For more information, contact SICK at info@sick.com or 800-325-7425.