# Contrast Sensors

## THEORY OF OPERATION

The KT/NT can be used in a variety of applications, including positioning data processing forms, positioning labels, cans or tubes, and recognizing codes. The KT/NT signals the machine control to cut, fold, or fuse material or to stop material feed.

The KT/NT detects registration marks by monitoring changes in the light reflected by the background and the mark. The mark is the symbol on the object that the KT/NT must detect; the background is the area around the registration mark and must be in contrast to the mark.

The KT/NT recognizes colors as gray scale values. Therefore, two colors such as red and green that have approximately the same gray scale value may be difficult for the KT/NT to distinguish. When a sensor lens is chosen to increase the operating range, the contrast between the mark and the background may need to be increased. An ideal contrast is black and white.

The receiver in the KT/NT detects the reflected light and converts it into an analog voltage. This voltage is dependent on the color or reflectivity of the scanned material, thus allowing the registration mark to be detected. As part of the setup procedure, the voltage level for the lighter color is stored in memory. The switching threshold is then set in relation to the stored level.

Each time the analog voltage from the received light exceeds or drops below the switching threshold, an output from the sensor is triggered.

## SENSING DISTANCE

The sensing distance is the distance between the front edge of the lens and the scanned material. This distance is a function of the selected optics. The sensitivity of the KT/NT increases as the sensor-to-object distance decreases, as shown in Fig. 1.

The sensing distance tolerance is approximately ± 3 mm (± 0.12 in), depending on the contrast level. This is the range within which the distance from sensor to material can vary and the sensor will still reliably detect marks. An example is shown in Fig. 2.

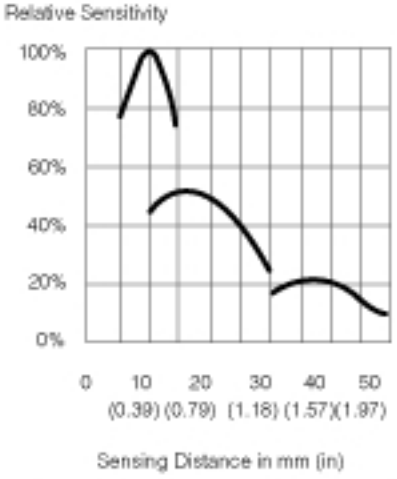


**Fig. 1** The sensitivity of the sensor increases as the sensor-to-object distance decreases.

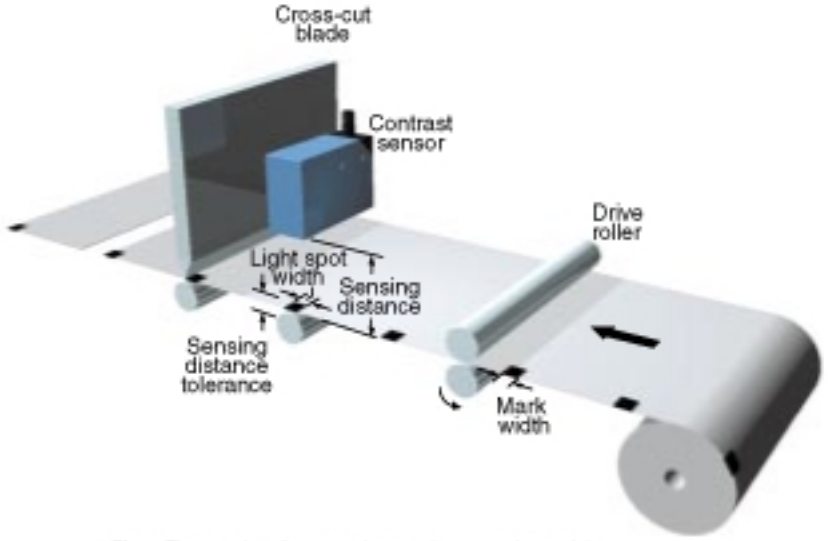


**Fig. 2** The sensing distance tolerance is ±3 mm (±0.12 in).