

# SHD-4000 Sensor System

## for Small Hole Detection in metals, rubber & other materials

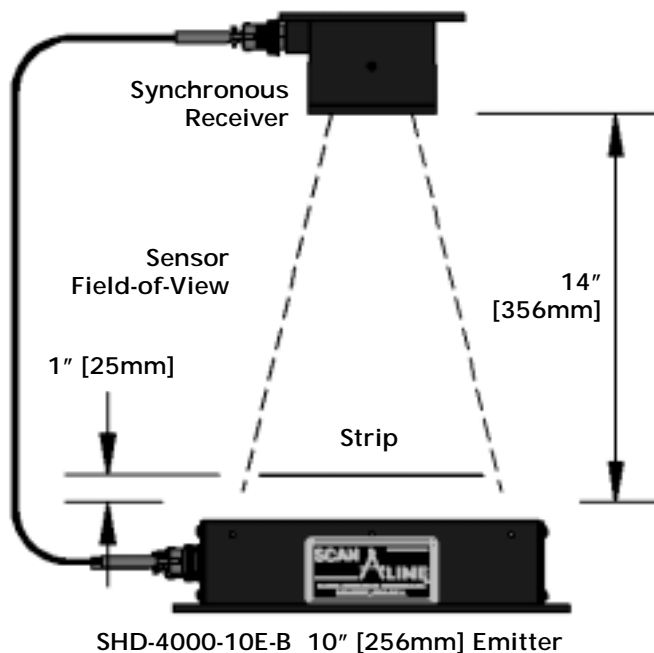
### Overview

The SCAN-A-LINE™ Model SHD-4000-Series Small Hole Detectors provide reliable inspection of web materials for small holes at line speeds of 1000' [304m] per minute and higher. They meet requirements in the Rubber, Plastics, Paper and Metals industries, where conventional "Pin Hole" detectors are cost prohibitive, but where hole defects of 0.062" [1.6mm] and larger can pose serious quality or production problems.

The SHD-4000-Series Small Hole Detectors use Harris Instrument Corporation's patented Scanned-LED Technology combined with a 400 kHz. sample rate. Integrated with an advanced synchronous detector, the Model SHD-4000 provides reliable small hole detection with extraordinary rejection of ambient light interference.

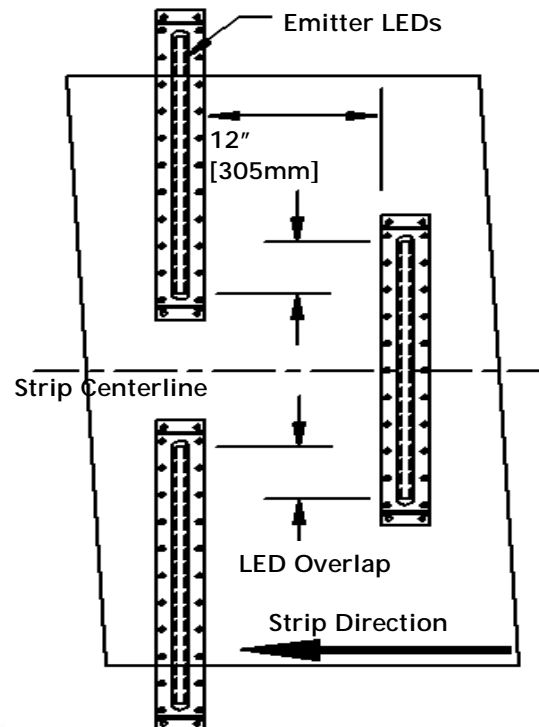
Hole defects can be detected to within 0.5" [13mm]\* of the strip edges without the use of mechanical shutters. Operation without moving mechanical shutters eliminates the need for most mechanical maintenance. The sensor system operates by edge counting to overcome difficulties with changing web positions and irregular strip widths.

One or two sensors can be connected to the SHD-4000 Processing Unit and multiple systems can be combined for wide materials.



### Features

- Detect holes as small as 0.062" (1.6mm)<sup>1</sup>
- No Mechanical Shutters Required
- Sensors available in 10", 20" & 30" length
- Multiple sensors can be overlapped for wide materials
- Detect holes within 0.5" (13mm)<sup>1</sup> of the strip edge
- Minimum Hole Size and Hole Location (\*Optional )
- Exceptional Ambient Light Rejection
- Vibration Resistant
- Smoke, Mist & Dust Resistant
- Two-year Parts & Labor Warranty



Overlapped Sensors for Wide Materials

<sup>1</sup> Minimum hole size and sensing distance from the edge are dependent upon line speed, material thickness and system configuration.

Sensor Model/Size	Emitter Scan Time	Emitter-to-Receiver Separation
SHD-4000-10E-B / 10"	125 $\mu$ Sec	14" [356mm]
SHD-4000-20E-B / 20"	250 $\mu$ Sec	24" [610mm]
SHD-4000-30E-B / 30"	375 $\mu$ Sec	34" [864mm]

## Description

The SHD-4000-Series Sensors consist of a Scanned-LED Emitter and a Synchronous Detector Receiver. A 15' [4.4 m] cable is supplied for connecting the receiver to the emitter. A 20' [6.1 m] cable is provided for connecting the emitter to the **Hole Detection Processing Unit – Model SHD4000**. Emitters are supplied in three lengths, 10" [254 mm], 20" [508 mm], and 30" [762 mm]. The Model SHD-4000-10 emitter has a scan time of 125 microseconds. Since the LED IR source scans at 80,000"/sec, longer emitters require greater scan times and in some cases multiple short emitters may be required to achieve required system performance on higher speed lines or lines with thicker materials.

The emitters are housed in an extruded aluminum enclosure with a Lexan™ polycarbonate window. In normal operation, the synchronous receiver is placed in a position above the emitter where there is an unobstructed view of all of the emitter LEDs. The optimum separation distance for the emitter and receiver varies with the emitter size as shown in the previous table. The optimum product to emitter spacing (product passline), however, is fixed at 1" [25mm]. Passline changes will effect minimum hole size and other performance variables.

Line Speed <sup>1</sup>	Typical Minimum Hole Size <sup>2</sup>		
	SHD-4000-10	SHD-4000-20	SHD-4000-30
50 –600	0.062" [1.6mm]	0.062" [1.6mm]	0.062" [1.6mm]
750	0.062" [1.6mm]	0.062" [1.6mm]	0.064" [1.6mm]
1000	0.062" [1.6mm]	0.062" [1.6mm]	0.075" [1.9mm]
1250 <sup>3</sup>	0.062" [1.6mm]	0.063" [1.6mm]	0.094" [2.4mm]
1500 <sup>3</sup>	0.062" [1.6mm]	0.075" [1.9mm]	0.113" [2.9mm]
1750 <sup>3</sup>	0.062" [1.6mm]	0.088" [2.2mm]	0.131" [3.3mm]

<sup>1</sup> Line Speed in Feet per Minute.

<sup>2</sup> Small hole sensitivity can be degraded at the ends of the scan by the thickness of the material. As the inspected product thickness increases, the minimum detectable hole size increases.

<sup>3</sup> Shown for reference only. Line speeds faster than 1000/min must be verified by Harris Instrument Corporation.

## Operation

The SHD-4000-Series Sensors use Harris Instrument Corporation's patented Scanned-LED technology to detect holes by counting product edges. This unique approach permits the inspection of web materials without the use of mechanical shutters or movable blinders, often necessary with other hole detector systems. As each scan is begun, a sync pulse is used to reset the edge counters in the SHD4000.Hole Detection Processing Unit.

When a strip is passing over the center of the Emitter, and leaves the LEDs on both ends un-obstructed, only two edges will be detected. By setting the Model HDPU to alarm with more than two edges, the strip can be inspected for the presence of holes. When a wider web must be inspected, two or more sensors can be used to cover the complete width. In this configuration, the Model



SHD-4000 Processing Unit with hole location option

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