Smart Laser Sensor
E3NC Series

• Precise Laser spot of min. 0.8 mm
• Independency of color or surface structure
• Adjustable focus and line beam
• EtherCAT connectivity
A Wide Variety of Laser Sensor Heads That Handle

Fiber Sensor Topics

- The sensing distance is short.
- The beam spreads out.
- The spot is not visible.

E3NC Laser Sensor Solutions

The laser beam provides sufficient distance and a clear spot for stable detection.

The use of triangulation and CMOS provides stable detection for workpieces with different colors or with an inclination of the Sensor.

Colors influence detection.

Inclination influences detection.
Applications Beyond the Realm of Fiber Sensors

Detection Requirement

Stable presence detection

Long-distance detection with installation on only one side

High-precision positioning

Stable detection even with workpieces of different colors

Stable detection even with the Sensor installed at an angle

**E3NC-L series of Compact Laser Sensors**

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensing distance</th>
<th>Spot diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>2 mm dia. (at 1 m)</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>0.8 mm dia. or larger (at 300 mm)</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>0.1 mm dia. (at 70 mm)</td>
</tr>
<tr>
<td>8 m</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**E3NC-S series of Ultra-compact CMOS Laser Sensors**

<table>
<thead>
<tr>
<th>Model</th>
<th>Measurement range</th>
<th>Spot diameter</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1 mm dia. (at 250 mm)</td>
</tr>
<tr>
<td></td>
<td>50</td>
<td>0.5 mm dia. (at 100 mm)</td>
</tr>
<tr>
<td></td>
<td>100</td>
<td>35 to 250 mm</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>35 to 100 mm</td>
</tr>
<tr>
<td></td>
<td>200</td>
<td></td>
</tr>
<tr>
<td></td>
<td>250</td>
<td></td>
</tr>
<tr>
<td></td>
<td>300</td>
<td></td>
</tr>
</tbody>
</table>

CMOS Reflective Model: E3NC-SH100/SH250
Stable Detection of Many Types of Workpieces, Even Transparent Ones

Visible spot even at long distances.

Maximum sensing distance of 8 m

Application

<table>
<thead>
<tr>
<th>Detection of Remaining Sheet Metal</th>
<th>Detection of Two PCBs</th>
<th>Detection of Overlapping Lids</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Detection of Remaining Sheet Metal" /></td>
<td><img src="image2" alt="Detection of Two PCBs" /></td>
<td><img src="image3" alt="Detection of Overlapping Lids" /></td>
</tr>
</tbody>
</table>

The small, long-distance spot can stably detect large pieces of sheet metal that remain on a press.
The small beam spot can detect two PCBs inserted together.
The small beam spot stably detects overlapping lids on cups.
**Dectects Film That’s 95% Transparent**

High-frequency Modulation for Stable Detection of Even Minor Variations in the Thickness or Position of Transparent Objects

**High-frequency Modulation**
Conventional emitted laser beams have a single wavelength. With high-frequency Modulation, the emitted laser beam is controlled so that it contains multiple wavelengths.

**Conventional Transparent Object Detection**
Previously, the laser beam passed through the transparent object due to slight changes in the thickness or position, and that often interfered with stable detection.

**Transparent Object Detection with High-frequency Modulation**
Even if the thickness or position of the transparent object changes slightly, the presence of the transparent object is confirmed by attenuation of the wavelengths that are not affected to achieve stable detection.

**Application**

**Detecting Glass Wafer Protrusion**
The high ability to detect transparent objects enables stable detection of highly transparent glass wafers.

**Detecting the Height of Shrink Packaging Film**
The large difference in light levels even for transparent films enables stable detection of thin packaging films.

**Detecting Two Sheets of Transparent Film**
Even small differences in incident light level are captured to enable detection of two sheets of transparent film.
Long-distance and Variable Spot to Stably Detect the Target Workpiece

Visible spot even at long distances.

**Maximum Sensing Distance:**

1.2 m

**Adjust the Spot to the Workpiece or Application for Stable Detection.**

**Variable Spot**

You can adjust the spot size to the workpiece size or sensing surface conditions for even more-stable detection. The use of a crown lock eliminates the need for tools to lock the spot adjuster. Just press in the adjuster to lock it to prevent the setting from changing.

**Application**

<table>
<thead>
<tr>
<th>Thread Presence Detection</th>
<th>Glass Substrate Mark Detection</th>
<th>Workpiece Presence Detection through Narrow Gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image of thread detection" /></td>
<td><img src="image2.png" alt="Image of glass substrate detection" /></td>
<td><img src="image3.png" alt="Image of workpiece detection" /></td>
</tr>
</tbody>
</table>

- The spot is made wider so that the presence of threading in the nuts can be detected.
- With a maximum sensing distance of 1.2 m, long-distance mark detection is stable.
- Even detailed locations that are recessed in machines can be stably detected from a distance.
Limited-reflective Model
E3NC-LH01

Minute Spot for High-precision Detection

High-precision Positioning
Minute spot with 0.1 mm dia.
Pin-point precision positioning to ±10 µm. ★
★ With Smart Tuning. Depends on the workplace.

No Detection Closer or Farther Away
Limited detection with a sensing distance of 70±15 mm
Limited reflection means that objects are detected only within a sensing distance of 70 mm ±15 mm even if there are workpieces or reflective objects closer or farther away. This helps prevent false detection.

Application

Detecting the Presence of Needle Caps
The minute 0.1-mm spot is targeted only at the end of the cap for stable detection.

PCB Arrival Confirmation
The laser beam forms a minute spot to detect arrival with high precision.

Ring Joint Location Detection
The minute, sharp laser beam stably detects 0.1 mm seams.
Detection E3NC-S series of Ultra-compact CMOS Laser Sensors

E3NC-SH250H/S250 E3NC-SH100

Stable Detection Even for Glossy Metals or Cast Metals Regardless of Workpiece Color, Material, or Surface Conditions

OMRON’s Unique HSDR-CMOS (High Speed and Dynamic Range)
Dynamic Range of Up to 500,000 Times

The shutter time of the CMOS is adjusted to the workpiece. And then the emission power is adjusted to optimize the amount of dispersed light that is received.

Measuring Bright Workpieces
- White ceramic
- Short CMOS shutter time
- Strong Laser emission power

Measuring Dark Workpieces
- Black rubber
- Long CMOS shutter time
- Weak Laser emission power

Stable Detection with Triangulation
With triangulation, the workpiece is measured by measuring the detection position on the position detection sector, which receives the light. Therefore, the influence of changes in the incident level is limited.

Application

Detecting the Presence of Exterior Wall Material

With the CMOS Sensor, stable detection is possible even if the workpiece’s color or surface conditions are not consistent.

O-ring Presence Detection

With the CMOS Sensor, stable detection is possible even with low-reflectance workpieces.
Limited Influence of Inclination in Sensor Installation. More Ability to Handle Workpieces and Greater Flexibility in Installation

Even if the Sensor is mounted at an angle, the workpiece can still be detected due to the reduced mounting restrictions.

Inclined mounting at up to 60°

<Angular Detection Range>
- Class 2 (E3NC-SH250H)
- Class 1 (E3NC-SH250)
Installation distance: 250 mm

Application

Detecting Holes Made in Metal Parts

The Sensors are influenced very little by the surface conditions of the workpiece, so level differences on metal surfaces can be stably detected.

Detection of Cut Position on Rubber Hose

Even if the Sensor is mounted at an angle, stable detection is possible for workpieces with low reflection.
**Stable Detection of Everything But the Background**

Tuning without a Workpiece

The background is used as a reference to detect everything but the reference. The surface conditions or inclination of the workpiece do not influence detection, so stable detection is maintained without changing the settings even if the workpiece is changed.

**With Workpiece**

CMOS light-receiving elements

**ON**

**OFF**

**Background**

With Workpiece

You can see the distance at a glance, which simplifies adjustment. After head installation, you can reduce adjustment time after line switchovers and reduce line stoppage time.

**Digital value of 10 = Approx. 1 mm**

(\(\text{mm}\))

And, Convenient!

**Easy Adjustment after Head Installation**

Easy-to-understand Distance Display

**Additional E3NC-LA Functions**

The common functions are provided by both the E3NC-LA and the E3NC-SA.

**Select the Line Beam Shape**

You can mount a Lens Attachment to the E3NC-LH02 and adjust the spot to create various shapes of line beams. Adjusting the beam shape to the workpiece enables even more-stable detection.

**Rubber Packing**

The Lens Attachments have internal rubber packings to reduce the entry of dirt between the Sensor Head and Lens Attachment.

**Application**

**Presence Detection of Powders or Liquids**

With a wider beam, you can stably detect powders and liquids because they are less likely to fall outside of the beam.

**Detection of Faulty Cap Assembly**

Using a line beam allows you to detect caps that are not attached correctly with only one Sensor.

**Presence Detection of Rubber Sheets**

The wide sensing area helps eliminate the influences of color differences in the rubber sheet to enable stable detection.
**Stable Detection of Everything But the Background**

**Tuning without a Workpiece**

The background is used as a reference to detect everything but the background. The surface conditions or inclination of the workpiece do not influence detection, so stable detection is maintained without changing the settings even if the workpiece is changed.

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**With Workpiece**

CMOS light-receiving elements

**Background**

CMOS light-receiving elements

**With Workpiece**

CMOS light-receiving elements

---

**With Workpiece**

ON

**ON**

OFF

**ON**

---

**50**

**100**

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**Easy Adjustment after Head Installation**

**Easy-to-understand Distance Display**

You can see the distance at a glance, which simplifies adjustment. After head installation, you can reduce adjustment time after line switchovers and reduce line stoppage time.

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**With Workpiece**

CMOS light-receiving elements

**Background**

CMOS light-receiving elements

**With Workpiece**

CMOS light-receiving elements

---

**ON**

**OFF**

**ON**

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**Digital value of 10 = Approx. 1 mm**

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**Long-term Stable Detection with Essentially No Maintenance Even When the Sensor Is Dirty**

**DPC** (Dynamic Power Control)

Even if dirt or machine vibration reduces the amount of light received, OMRON's unique DPC automatically compensates the displayed incident level to achieve stable, high-precision detection.

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**Stable Detection of Everything But the Background**

**Tuning without a Workpiece**

The background is used as a reference to detect everything but the reference. The surface conditions or inclination of the workpiece do not influence detection, so stable detection is maintained without changing the settings even if the workpiece is changed.

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**Select the Best Tuning Method According to the Application**

**Smart Tuning**

**Common Functions**

**Basic Tuning**

**Two-point Tuning**

The larger incident level between measurements with and without a workpiece is set to 9,999.

**Common Functions**

**High-speed Workpieces**

**Full Auto Tuning**

You can adjust to moving workpieces without stopping the line.

**Additional Functions**

**High-precision Positioning**

**Position Tuning**

High-precision, pinpoint workpiece positioning is possible.

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**Additional E3NC-LA Functions**

**Long-term Stable Detection with Essentially No Maintenance Even When the Sensor Is Dirty**

**DPC** (Dynamic Power Control)

Even if dirt or machine vibration reduces the amount of light received, OMRON's unique DPC automatically compensates the displayed incident level to achieve stable, high-precision detection.

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**Additional E3NC-SA Functions**

**Stable Detection of Everything But the Background**

**Tuning without a Workpiece**

The background is used as a reference to detect everything but the reference. The surface conditions or inclination of the workpiece do not influence detection, so stable detection is maintained without changing the settings even if the workpiece is changed.

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**With Workpiece**

CMOS light-receiving elements

**Background**

CMOS light-receiving elements

**With Workpiece**

CMOS light-receiving elements

---

**ON**

**OFF**

**ON**

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**E3NC-LA**

**E3NC-SA**

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**Consistent Operating Methods for All N-Smart Amplifier Units.**

**White Display Characters for High Visibility.**
Simpler and More Dependable

The N-Smart Lineup of Next-generation Fiber Sensors and Laser Sensors will quickly solve your problems and therefore increase equipment operation rates and minimize downtime with optimum cost performance.

Common Features and Models in the N-Smart Series

Common Buttons
Intuitive Operation and Easy Setup.

Models with Wire-saving Connectors
No Master/Slave Distinctions in Amplifier Units

- Reduce model numbers in stock
  You do not need to stock both master and slave amplifier units.

- Greatly reduced wiring work
  Power is supplied from the Master Connector, Slave Connectors have only output lines.

- Expansion is easy and reliable
  Mutual interference prevention works even if you use a Master Connector instead of a Slave Connector or combine them with pre-wired models.

Data Management and Time Reduction with Network Communications

- Three communications methods are supported
- Use Distributed Sensor Units to reduce equipment production costs and commissioning time
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