

N-Smart

Presence / Detection / Measurement

Smart Laser Sensors
E3NC-L/E3NC-S

Get the Ability to Handle Applications Beyond the Realm of Fiber Sensors



Compact
Laser Sensors
E3NC-L



Ultra-compact
CMOS Laser Sensors
E3NC-S



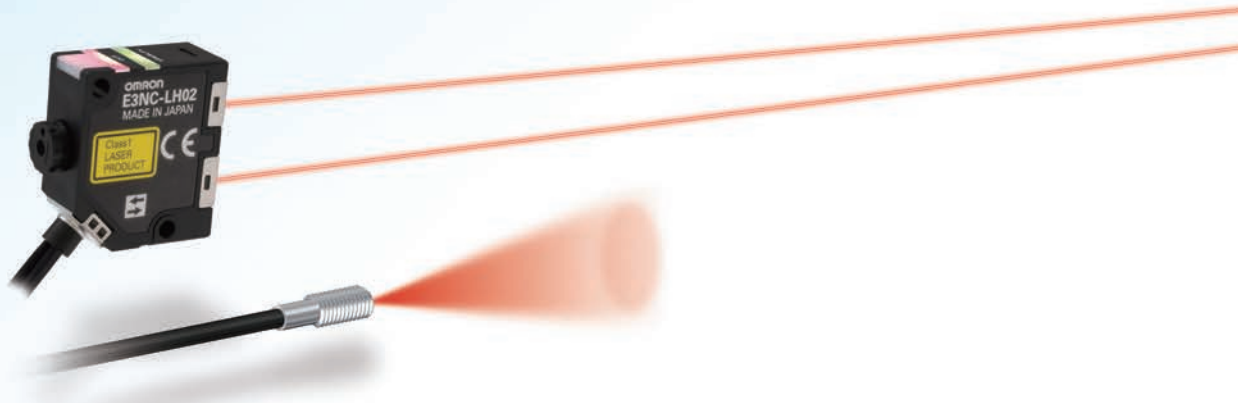
EtherCAT®

CompoNet

CC-Link V2

realizing

A Wide Variety of Laser Sensor Heads That Handle



Fiber Sensor Topics

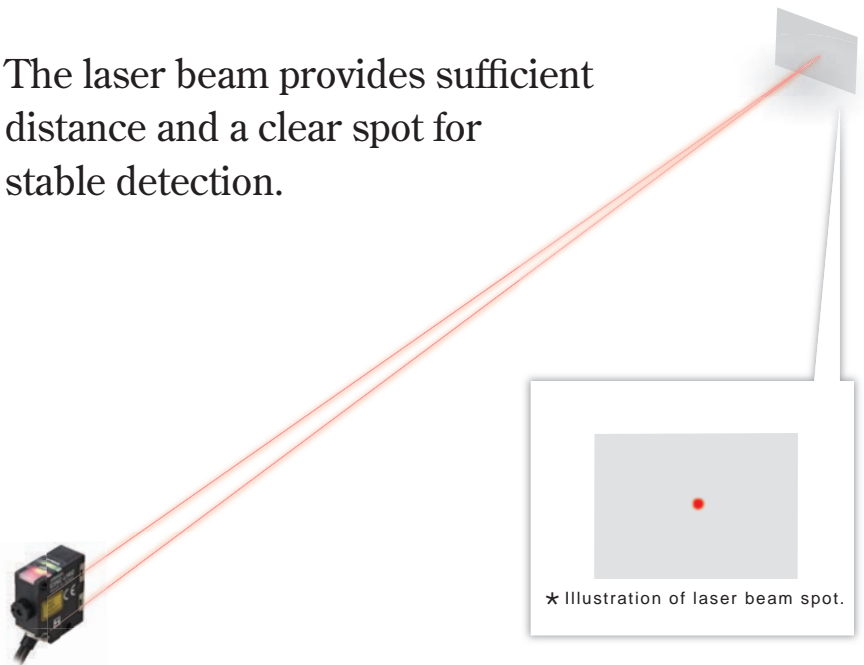
E3NC Laser Sensor Solutions

The sensing distance is short.

The beam spreads out.

The spot is not visible.

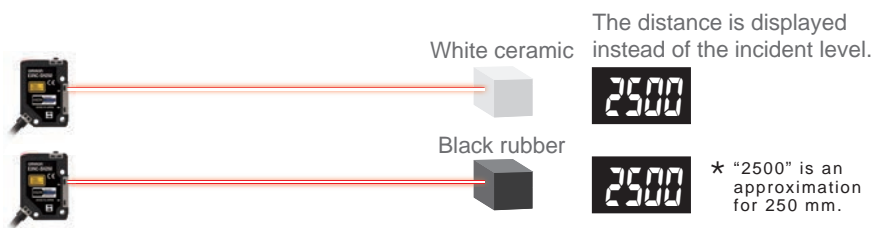
The laser beam provides sufficient distance and a clear spot for stable detection.



Colors influence detection.

Inclination influences detection.

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



Refer to page 8 for information on triangulation.

Applications Beyond the Realm of Fiber Sensors

Detection Requirement

Stable presence detection



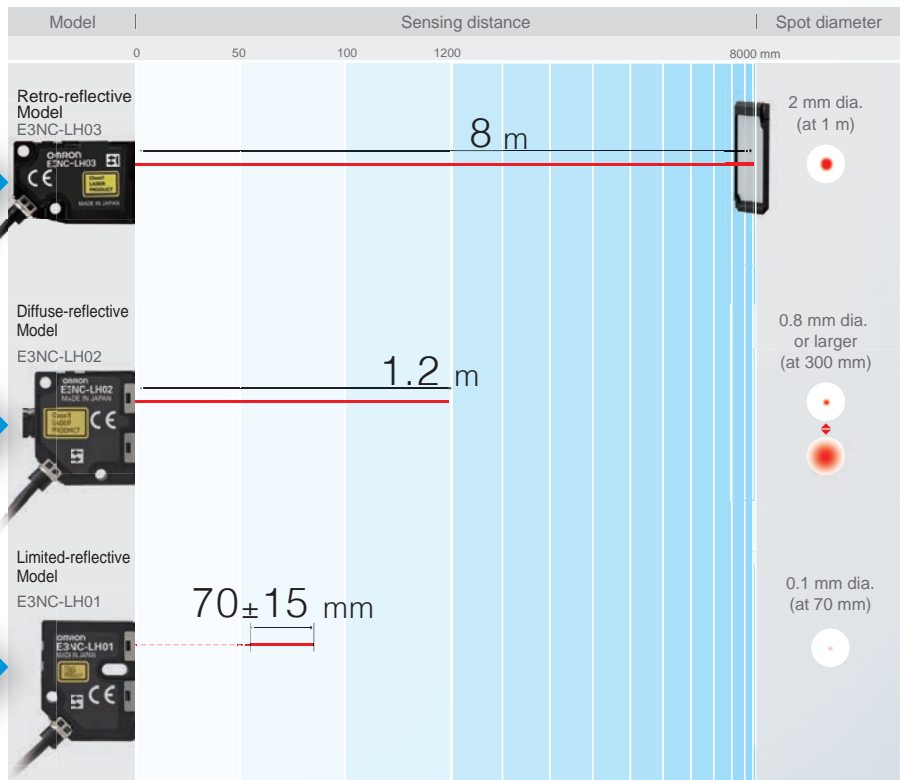
Long-distance detection with installation on only one side



High-precision positioning



Presence E3NC-L series of Compact Laser Sensors



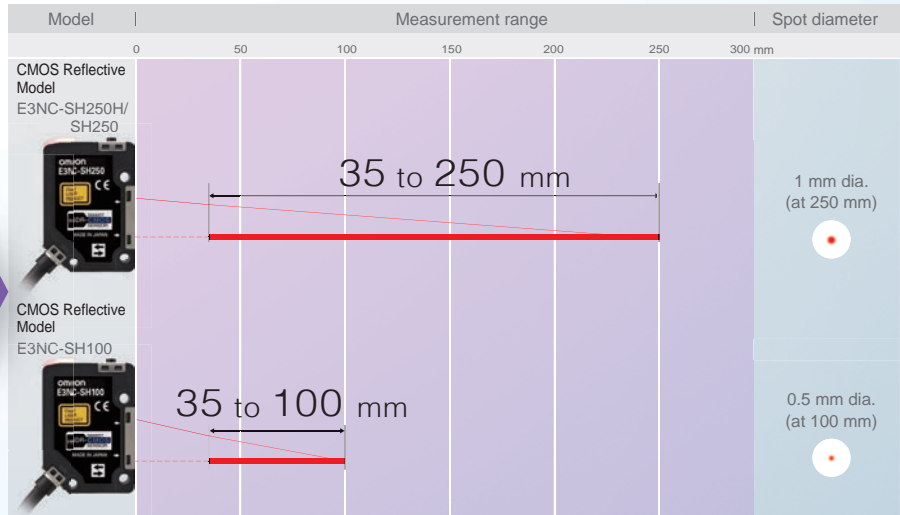
Stable detection even with workpieces of different colors



Stable detection even with the Sensor installed at an angle

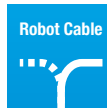
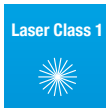


Detection E3NC-S series of Ultra-compact CMOS Laser Sensors



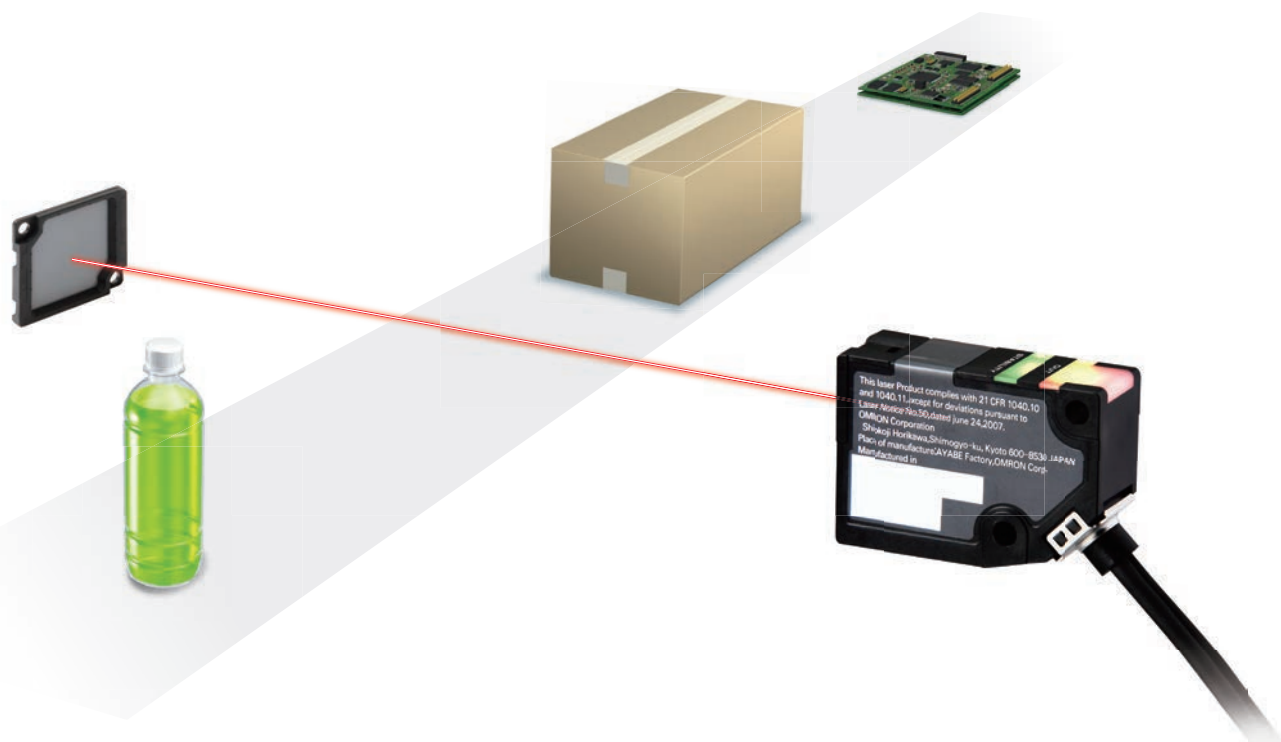


Retro-reflective Model
E3NC-LH03



* The E39-R21 and E39-R22 Reflectors are also IP67.

Stable Detection of Many Types of Workpieces, Even Transparent Ones

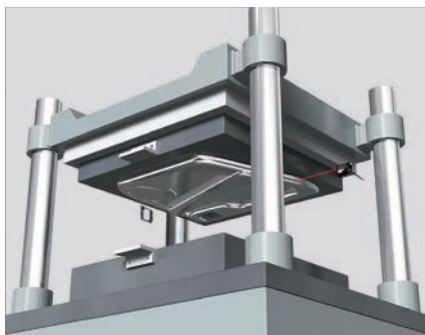


Visible spot even at long distances.

Maximum sensing distance of **8 m**

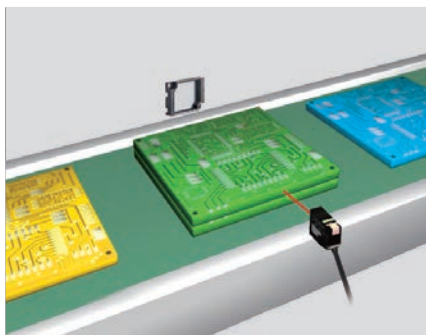
Application

Detection of Remaining Sheet Metal



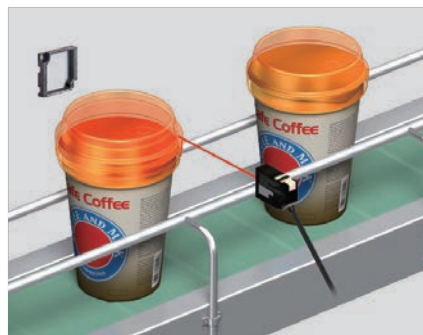
The small, long-distance spot can stably detect large pieces of sheet metal that remain on a press.

Detection of Two PCBs



The small beam spot can detect two PCBs inserted together.

Detection of Overlapping Lids



The small beam spot stably detects overlapping lids on cups.

And, Convenient!



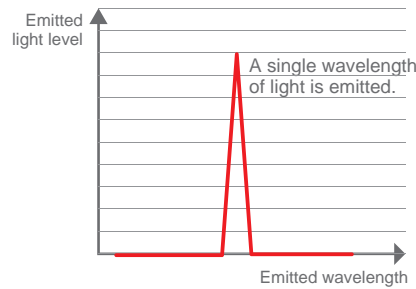
Detects Film That's 95% Transparent

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

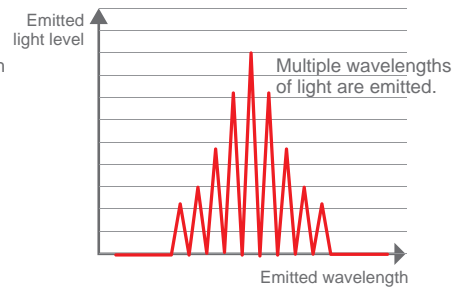
High-frequency Modulation

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

Wavelength Distribution of Conventional Emission



Wavelength Distribution of High-frequency Modulation



Conventional Transparent Object Detection

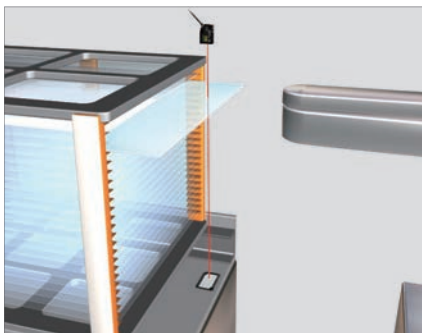
Previously, the laser beam passed through the transparent object due to slight changes in the thickness or position, and that often interfered with stable detection.

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



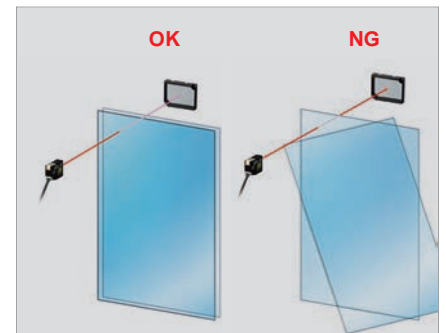
The high ability to detect transparent objects enables stable detection of highly transparent glass wafers.

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.



Diffuse-reflective Model

E3NC-LH02

Laser Class 1



IP65 *



Robot Cable



* Only when adjuster is locked.

E3NC-L series

Long-distance and Variable Spot to Stably Detect the Target Workpiece

Visible spot even at long distances.
Maximum Sensing Distance:

1.2 m

0.8 mm dia. or larger
(Approx. 0.8 mm dia. at 300 mm)



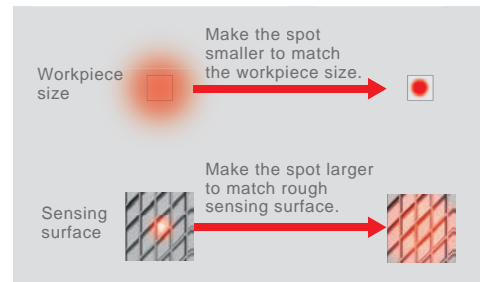
And, Convenient!



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

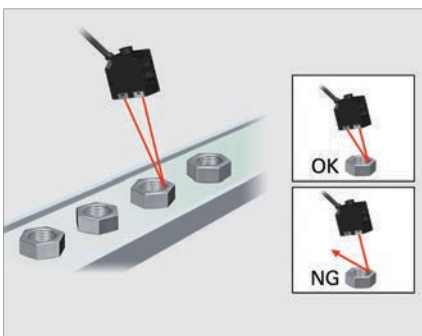
Variable Spot

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.



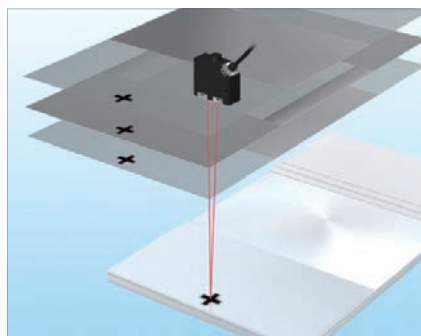
Application

Thread Presence Detection



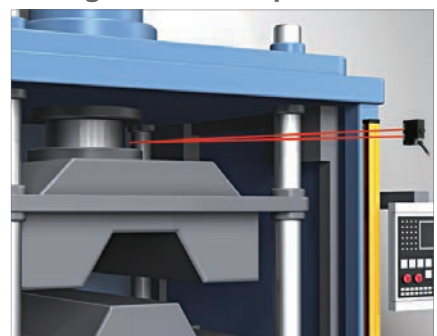
The spot is made wider so that the presence of threading in the nuts can be detected.

Glass Substrate Mark Detection



With a maximum sensing distance of 1.2 m, long-distance mark detection is stable.

Workpiece Presence Detection through Narrow Gaps



Even detailed locations that are recessed in machines can be stably detected from a distance.



Limited-reflective Model

E3NC-LH01

Laser Class 1



IP65



Robot Cable



Minute Spot for High-precision Detection

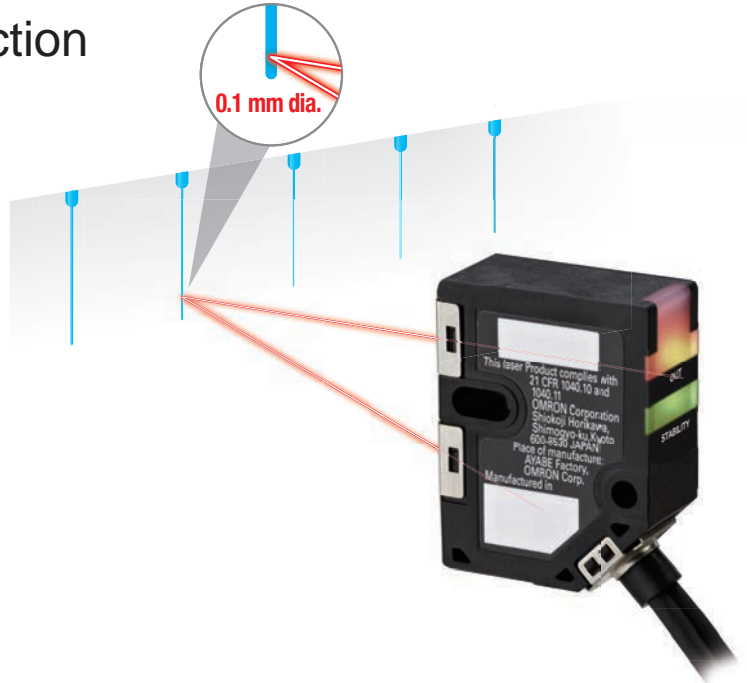
High-precision Positioning

Minute spot with

0.1 mm dia.

Pin-point precision positioning to $\pm 10 \mu\text{m}$. *

* With Smart Tuning. Depends on the workpiece.



No Detection Closer or Farther Away

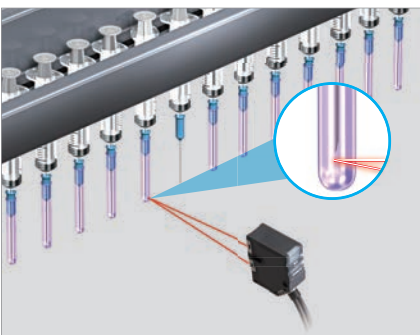
Limited detection with a sensing distance of

70 ± 15 mm

Limited reflection means that objects are detected only within a sensing distance of 70 mm \pm 15 mm even if there are workpieces or reflective objects closer or farther away. This helps prevent false detection.

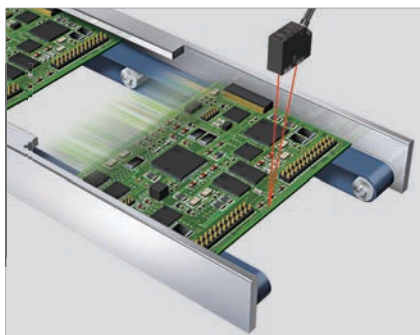
Application

Detecting the Presence of Needle Caps



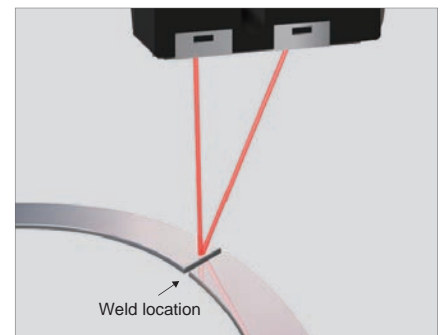
The minute 0.1-mm spot is targeted only at the end of the cap for stable detection.

PCB Arrival Confirmation



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

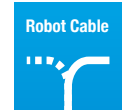
Ring Joint Location Detection



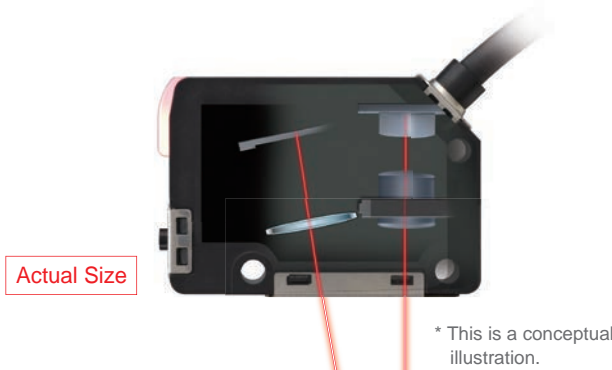
The minute, sharp laser beam stably detects 0.1 mm seams.



E3NC-SH250H/SH250
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

Measuring Dark Workpieces

White ceramic



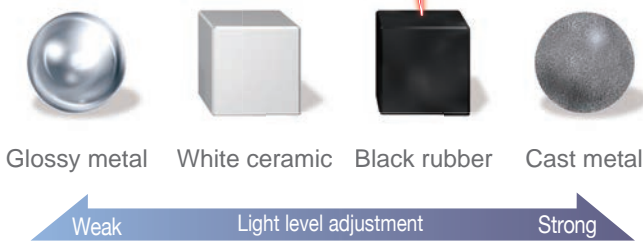
Black rubber



Short CMOS shutter time Long

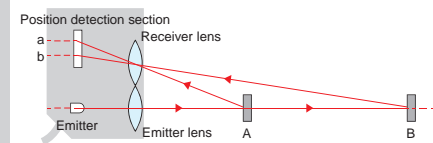


Weak Laser emission power Strong



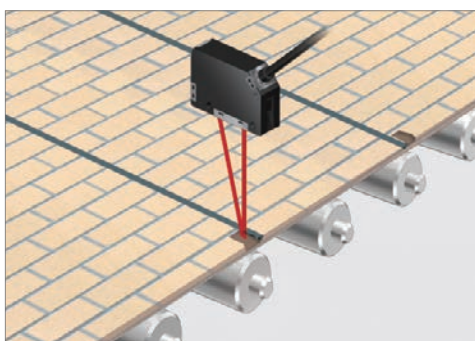
Stable Detection with Triangulation

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



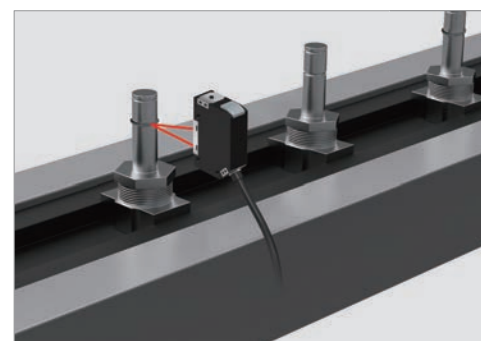
Application

Detecting the Presence of Exterior Wall Material



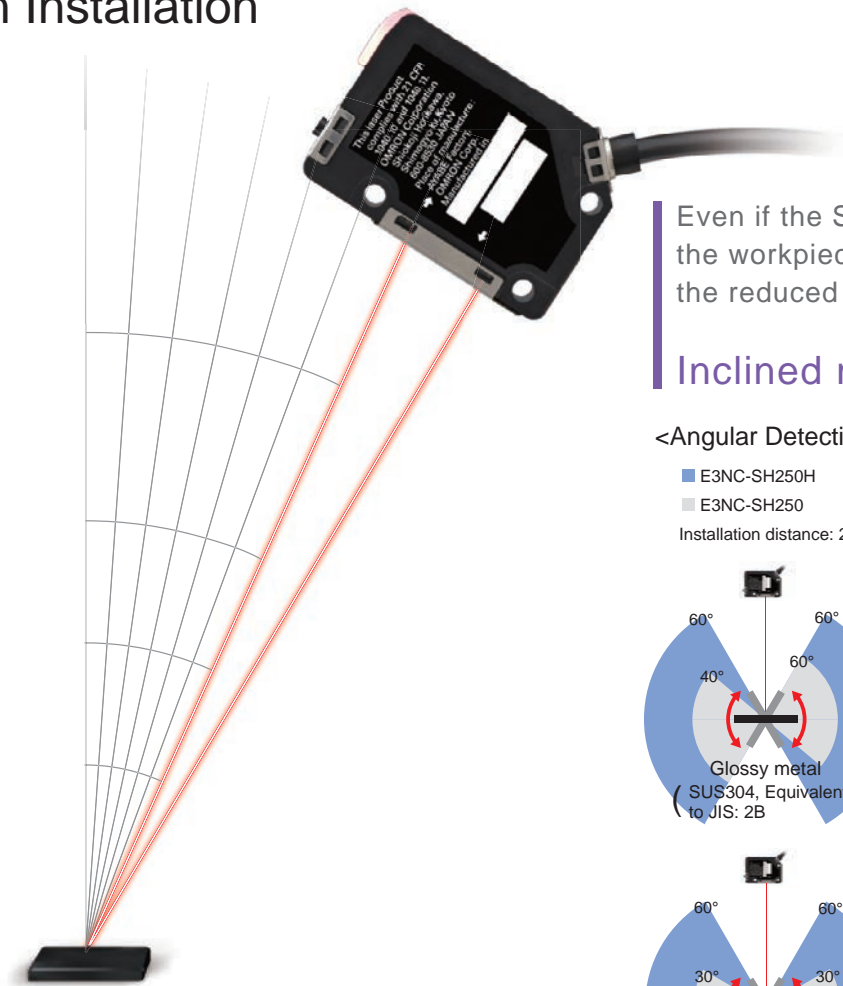
With the CMOS Sensor, stable detection is possible even if the workpiece's color or surface conditions are not consistent.

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.

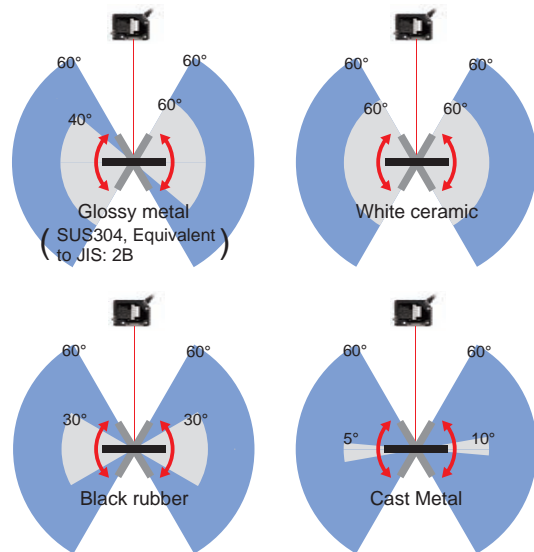
Inclined mounting at up to **60°**

<Angular Detection Range>

■ E3NC-SH250H

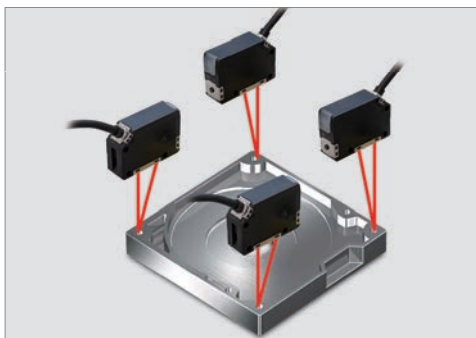
■ E3NC-SH250

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.



Lens Attachments

E39-P51 (For E3NC-LH03 Retro-reflective Models)

E39-P52 (For E3NC-LH02 Diffuse-reflective Models)



Handle Even More Applications with a Line Beam



And, Convenient!



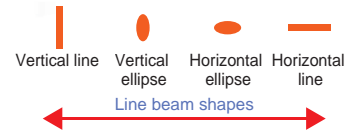
Select the Line Beam Shape

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.



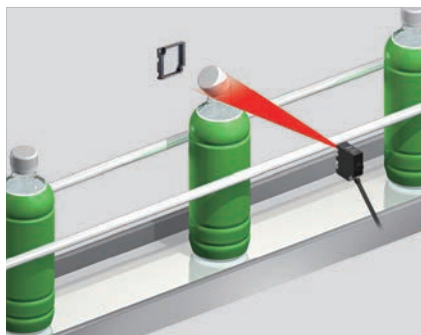
Application

Presence Detection of Powders or Liquids



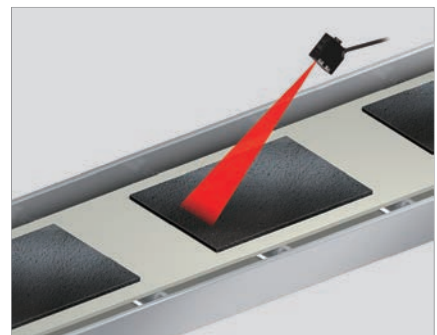
With a wider beam, you can stably detect powders and liquids because they are less likely to fall outside of the beam.

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.

Laser Amplifier Units

E3NC-LA

Laser Amplifier Units (CMOS Type)

E3NC-SA



Consistent Operating Methods for All N-Smart Amplifier Units. White Display Characters for High Visibility.

Select the Best Tuning Method
According to the Application

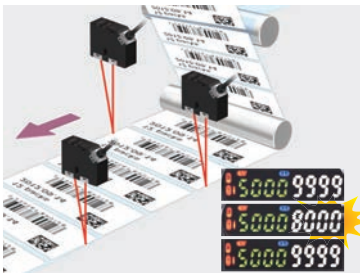


Smart Tuning

Common*
Functions

Basic Tuning Two-point Tuning

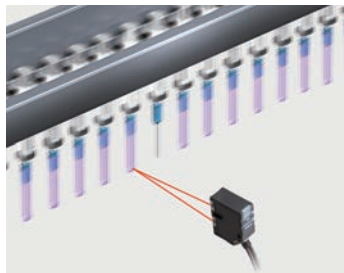
The larger incident level between measurements with and without a workpiece is set to 9,999.



Common*
Functions

High-speed Workpieces Full Auto Tuning

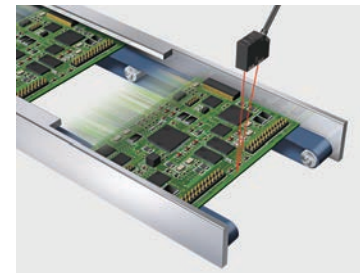
You can adjust to moving workpieces without stopping the line.



Additional
E3NC-LA
Functions

High-precision Positioning Position Tuning

High-precision, pinpoint workpiece positioning is possible.



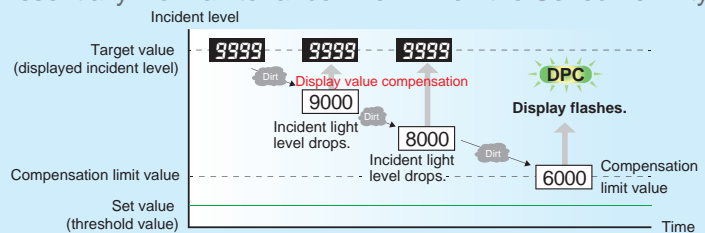
* The common functions are provided by both the E3NC-LA and the E3NC-SA.

Additional
E3NC-LA
Functions

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

DPC (Dynamic Power Control)

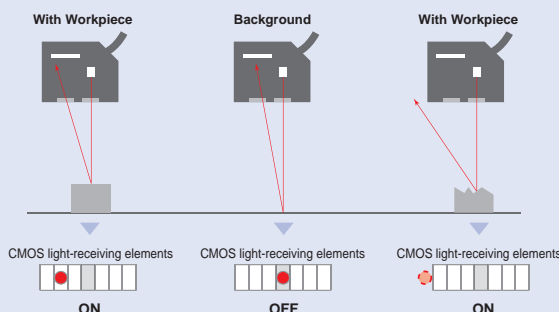
Even if dirt or machine vibration reduces the amount of light received, OMRON's unique DPC automatically compensates the displayed incident level to achieve stable, high-precision detection.



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.



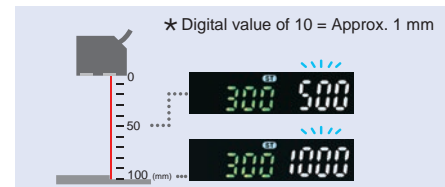
And, Convenient!



Easy Adjustment after Head Installation

Easy-to-understand Distance Display (★Approximation)

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.



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.

N-Smart
Presence / Detection / Measurement

E3NX-FA Fiber Amplifier Units
Cat. No. E426

E3NX-CA Color Fiber Amplifier Unit
Cat. No. Y216

E3NC Smart Laser Sensors

E9NC-T Contact-Type Smart Sensor
Cat. No. E433

E3NW Sensor Communications Units
Cat. No. E428

Stable Detection with the No. 1 Performance

Easy application with consistent operating procedures.

High Color Discrimination Capability

From Minute Workpieces to Long-distance Detection

Handles Advanced Measurement Applications

Applications with Many Sensors:
More convenience and even lower costs with a network.

EtherCAT
CompoNet
CC-Link V2

Common Features and Models in the N-Smart Series

Common Buttons

Intuitive Operation and Easy Setup.



White Characters on a Black Background

High-contrast displays for easy visibility from a distance.

Models with Wire-saving Connectors **Popular**

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.

Optical communications (mutual interference prevention)

Slave Connector Output line only.

Power supplied.

Master Connector Power line + Output line

Model for Sensor Communications Unit

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**







Controller

EtherCAT
CompoNet
CC-Link V2

E3NW Cat.No.E428

Ordering Information





Sensor Heads: E3NC-L Compact Laser Sensor Series

Sensing method	Appearance	Beam shape	Sensing distance	Laser class	Cable length	Model
Coaxial Retro-reflective with MSR function		Spot	 8 m *	Class 1	2 m	E3NC-LH03 2M
					5 m	E3NC-LH03 5M
Diffuse-reflective		Variable spot	 1.2 m		2 m	E3NC-LH02 2M
					5 m	E3NC-LH02 5M
Limited-reflective		Spot	 70±15 mm		2 m	E3NC-LH01 2M
					5 m	E3NC-LH01 5M

* These values apply when an E39-R21, E39-R22, E39-RS10, or E39-RS11 Reflector is used. A Reflector is not included. Purchase a Reflector separately to match the intended use of the Sensor.

Note: Only an E3NC-LA□□ Amplifier Unit can be connected.




Amplifier Units: E3NC-L Compact Laser Sensor Series

Connecting method	Appearance	Inputs/outputs	Model	
			NPN output	PNP output
Pre-wired (2 m)		2 outputs + 1 input	E3NC-LA21 2M	E3NC-LA51 2M
Wire-saving Connector		1 output + 1 input	E3NC-LA7	E3NC-LA9
M8 Connector		1 output + 1 input	E3NC-LA24	E3NC-LA54
Connector for Sensor Communications Unit *		---	E3NC-LA0	

* A Sensor Communications Unit is required if you want to use the Amplifier Unit on a network.





Note: Only an E3NC-LH□□ Sensor Head can be connected.

Sensor Heads: E3NC-S Ultra-compact CMOS Laser Sensor Series

Sensing method	Appearance	Beam shape	Measurement range	Laser class	Cable length	Model
Distance-settable		Spot	 35 to 250 mm	Class 1	2 m	E3NC-SH250H 2M
					2 m	E3NC-SH250 2M
						2 m
2 m	E3NC-SH100 2M					

Note: Only an E3NC-SA□□ Amplifier Unit can be connected.

Amplifier Units: E3NC-S Ultra-compact CMOS Laser Sensor Series

Connecting method	Appearance	Inputs/outputs	Model	
			NPN output	PNP output
Pre-wired (2 m)		2 outputs + 1 input	E3NC-SA21 2M	E3NC-SA51 2M
Wire-saving Connector		1 output + 1 input	E3NC-SA7	E3NC-SA9
M8 Connector		1 output + 1 input	E3NC-SA24	E3NC-SA54
Connector for Sensor Communications Unit *		---	E3NC-SA0	


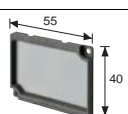

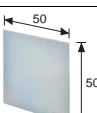
* A Sensor Communications Unit is required if you want to use the Amplifier Unit on a network.
Note: Only an E3NC-SH□□ or E3NC-SH□□H Sensor Head can be connected.

Accessories (Sold Separately)

Sensor Head Accessories

Reflectors for Retro-reflective Sensors

A Reflector is not provided with the Sensor Head. It must be ordered separately as required.

Applicable Sensor Head	Appearance	Model	Quantity
E3NC-LH03	 30x35	E39-R21	1
	 55x40	E39-R22	
	 25x25	E39-RS10	
	 50x50	E39-RS11	

Lens Attachments for Sensor Heads






A Lens Attachment is not provided with the Sensor Head. It must be ordered separately as required.

Applicable Sensor Head	Appearance	Model	Quantity
E3NC-LH03		E39-P51	1
E3NC-LH02		E39-P52	

Note: You can combine the Lens Attachment with an applicable Sensor Head to create a line beam.

Sensor Head Mounting Brackets



A Mounting Bracket is not provided with the Sensor Head. It must be ordered separately as required.

Applicable Sensor Head	Appearance	Model	Quantity	Contents
E3NC-LH03		E39-L190	1	Mounting Bracket: 1 Nut plate: 1 Phillips screws (M3x18): 2
E3NC-LH02		E39-L185		
E3NC-LH01		E39-L186		
E3NC-SH250H E3NC-SH250 E3NC-SH100		E39-L187		
		E39-L188		

Amplifier Unit Accessories



Wire-saving Connectors (Required for models for Wire-saving Connectors.)

Connectors are not provided with the Amplifier Unit and must be ordered separately. *Protective stickers are provided.

Type	Appearance	Cable length	No. of conductors	Model
Master Connector		2 m	4	E3X-CN21
Slave Connector			2	E3X-CN22

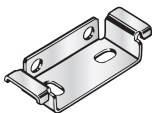
Sensor I/O Connectors (Required for models for M8 Connectors.)

Connectors are not provided with the Amplifier Unit and must be ordered separately.

Size	Cable	Appearance	Cable type	Model	
M8	Standard cable	Straight 	2 m	4-wire	XS3F-M421-402-A
			5 m		XS3F-M421-405-A
		L-shaped 	2 m		XS3F-M422-402-A
			5 m		XS3F-M422-405-A

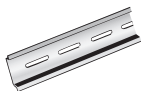
Amplifier Unit Mounting Bracket

A Mounting Bracket is not provided with the Amplifier Unit. It must be ordered separately as required.

Appearance	Model	Quantity
	E39-L143	1


DIN Track

A DIN Track is not provided with the Amplifier Unit. It must be ordered separately as required.

Appearance	Type	Model	Quantity
	Shallow type, total length: 1 m	PFP-100N	1
	Shallow type, total length: 0.5m	PFP-50N	
	Deep type, total length: 1 m	PFP-100N2	

End Plate

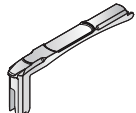
Two End Plates are provided with the Sensor Communications Unit. End Plates are not provided with the Amplifier Unit. They must be ordered separately as required.

Appearance	Model	Quantity
	PFP-M	1

Cover





Attach these Covers to Amplifier Units.

Order a Cover when required, e.g., if you lose the covers.

Appearance	Model	Quantity
	E39-G24 FOR E3NC-LA	1
	E39-G21 FOR E3NC-SA	

Related Products

Sensor Communications Units

Type	Appearance	Model
Sensor Communications Unit for EtherCAT		E3NW-ECT
Sensor Communications Unit for CompoNet *1		E3NW-CRT
Sensor Communications Unit for CC-Link *1		E3NW-CCL
Distributed Sensor Unit *2		E3NW-DS

*1. Refer to your OMRON website for details.


*2. The Distributed Sensor Unit can be connected to any of the Sensor Communications Units.

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CompoNet is a registered trademark of the ODVA.
CC-Link is a registered trademark of Mitsubishi Electric Corporation. The trademark is managed by the CC-Link Partner Association.

OMRON's CMOS Laser Sensor Lineup

Select the best match to your site and topics from our wide lineup.

		Installation distance	Detectable level difference	Resolution
Measurement	<p>Stable measurements in the order of 10 μm at a reasonable cost with essentially manual-free operation.</p> <p>ZX2</p> <p>Cat. No. E406</p> 	100 mm ^{*1}	—	5 μm
	<p>Ideal for simple measurements.</p> <p>ZX1</p> <p>Cat. No. E416</p> 	300 mm ^{*1}	—	30 μm
Detection		100 mm ^{*1}	—	7 μm
	<p>Stable detection of level differences in the order of 0.1 mm.</p> <p>ZX0</p> 	300 mm ^{*1}	3.0 mm ^{*2}	350 μm
		100 mm ^{*1}	0.7 mm ^{*2}	80 μm
	<p>Dependable detection in a compact body.</p> <p>E3NC-S</p> <p>Cat. No. E427</p> 	250 mm	9.0 mm ^{*2}	—
		100 mm	1.5 mm ^{*2}	—

*1. Sensors are also available for other installation distances.

*2. The value depends on conditions. Refer to product datasheets or refer to product information on your OMRON website.

EtherCAT® is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH, Germany.

CompoNet is a registered trademark of the ODVA.

CC-Link is a registered trademark of Mitsubishi Electric Corporation. The trademark is managed by the CC-Link Partner Association.

Be sure to read the Instruction Sheet for usage precautions prior to using the product.

The product photographs and figures that are used in this catalog may vary somewhat from the actual products.

Note: Do not use this document to operate the Unit.

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Cat. No. E427-E1-03 0525 (0214)