Smart Laser Sensors

E3NC

Ideal for Applications That Cannot Be Handled with Fiber Sensors or Photoelectric Sensors

- The lineup includes E3NC-L Sensors, which are ideal for presence detection, and E3NC-S Sensors, which are ideal for discriminations.
  - The E3NC-S Sensors include CMOS and provide stable detection of workpieces with different colors and inclined installation.
- Smart Tuning to achieve stable detection with easy setup.
- White on black display characters for high visibility.
- Flexible robot cables are used for the Sensor Heads.

Features

Retro-reflective Models: E3NC-LH03
- Maximum sensing distance of 8 m.
- Stable detection of many types of workpieces.
- Stable detection of highly transparent films.

Diffuse-reflective Models: E3NC-LH02
- Long-distance detection at up to 1.2 m.
- Spot can be adjusted to the workpiece or application.

CMOS Laser, Reflective Models: E3NC-SH250H/SH250/SH100
- Stable detection even for different workpiece colors and materials.
- Stable detection for inclined Head installation and different workpiece shapes.

Amplifier Units
- Same shape as Fiber Amplifier Units plus easy operation.
- Smart Tuning with one button.

For the most recent information on models that have been certified for safety standards, refer to your OMRON website.

Refer to the Safety Precautions on page 14.
## Ordering Information

### Sensor Heads: E3NC-L Compact Laser Sensor Series (Dimensions ➜ page 17)

<table>
<thead>
<tr>
<th>Sensing method</th>
<th>Appearance</th>
<th>Beam shape</th>
<th>Sensing distance</th>
<th>Laser class</th>
<th>Cable length</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coaxial Retro-reflective with MSR function</td>
<td>![Image]</td>
<td>Spot</td>
<td>8 m *</td>
<td>Class 1</td>
<td>2 m</td>
<td>E3NC-LH03 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 m</td>
<td>E3NC-LH03 5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diffuse-reflective</td>
<td>![Image]</td>
<td>Variable spot</td>
<td>1.2 m</td>
<td>Class 1</td>
<td>2 m</td>
<td>E3NC-LH02 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 m</td>
<td>E3NC-LH02 5M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Limited-reflective</td>
<td>![Image]</td>
<td>Spot</td>
<td>70±15 mm</td>
<td></td>
<td>2 m</td>
<td>E3NC-LH01 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5 m</td>
<td>E3NC-LH01 5M</td>
</tr>
</tbody>
</table>

* 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 (Dimensions ➜ page 19)

<table>
<thead>
<tr>
<th>Connecting method</th>
<th>Appearance</th>
<th>Inputs/outputs</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-wired (2 m)</td>
<td>![Image]</td>
<td>2 outputs + 1 input</td>
<td>E3NC-LA21 2M E3NC-LA51 2M</td>
</tr>
<tr>
<td>Wire-saving Connector</td>
<td>![Image]</td>
<td>1 output + 1 input</td>
<td>E3NC-LA7 E3NC-LA9</td>
</tr>
<tr>
<td>M8 Connector</td>
<td>![Image]</td>
<td>1 output + 1 input</td>
<td>E3NC-LA24 E3NC-LA54</td>
</tr>
<tr>
<td>Connector for Sensor Communications Unit *</td>
<td>![Image]</td>
<td>...</td>
<td>E3NC-LA0</td>
</tr>
</tbody>
</table>

* 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 (Dimensions ➜ page 18)

<table>
<thead>
<tr>
<th>Sensing method</th>
<th>Appearance</th>
<th>Beam shape</th>
<th>Measurement range</th>
<th>Laser class</th>
<th>Cable length</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance-settable</td>
<td>![Image]</td>
<td>Spot</td>
<td>35 to 250 mm</td>
<td>Class 2</td>
<td>2 m</td>
<td>E3NC-SH250H 2M</td>
</tr>
<tr>
<td></td>
<td>![Image]</td>
<td></td>
<td>35 to 100 mm</td>
<td>Class 1</td>
<td>2 m</td>
<td>E3NC-SH100 2M</td>
</tr>
</tbody>
</table>

**Note:** Only an E3NC-SA Amplifier Unit can be connected.
Amplifier Units: E3NC-S Ultra-compact CMOS Laser Sensor Series (Dimensions ➜ page 19)

* 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 (Required for Retro-reflective Sensors) (Dimensions ➜ page 21)
A Reflector is not provided with the Sensor Head. It must be ordered separately.

<table>
<thead>
<tr>
<th>Applicable Sensor Head</th>
<th>Appearance</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LH03</td>
<td></td>
<td>E39-R21</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E39-R22</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E39-RS10</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>E39-RS11</td>
<td></td>
</tr>
</tbody>
</table>

Lens Attachments for Sensor Heads (Dimensions ➜ page 21)
A Lens Attachment is not provided with the Sensor Head. It must be ordered separately as required.

<table>
<thead>
<tr>
<th>Applicable Sensor Head</th>
<th>Appearance</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LH03</td>
<td></td>
<td>E39-P51</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-LH02</td>
<td></td>
<td>E39-P52</td>
<td>1</td>
</tr>
</tbody>
</table>

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

Sensor Head Mounting Brackets (Dimensions ➜ page 22)
A Mounting Bracket is not provided with the Sensor Head. It must be ordered separately as required.

<table>
<thead>
<tr>
<th>Applicable Sensor Head</th>
<th>Appearance</th>
<th>Model</th>
<th>Quantity</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LH03</td>
<td></td>
<td>E39-L190</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-LH02</td>
<td></td>
<td>E39-L185</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-LH01</td>
<td></td>
<td>E39-L186</td>
<td>1</td>
<td>Mounting Bracket: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nut plate: 1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Phillips screws (M3×18): 2</td>
</tr>
<tr>
<td>E3NC-SH250H</td>
<td></td>
<td>E39-L187</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SH250</td>
<td></td>
<td>E39-L188</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SH100</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Amplifier Unit Accessories

**Wire-saving Connectors (Required for models for Wire-saving Connectors.) (Dimensions → page 26)**

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

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Cable length</th>
<th>No. of conductors</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Master Connector</td>
<td></td>
<td>2 m</td>
<td>4</td>
<td>E3X-CN21</td>
</tr>
<tr>
<td>Slave Connector</td>
<td></td>
<td>2 m</td>
<td>2</td>
<td>E3X-CN22</td>
</tr>
</tbody>
</table>

**Sensor I/O Connectors (Required for models for M8 Connectors.) (Dimensions → page 26)**

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

<table>
<thead>
<tr>
<th>Size</th>
<th>Cable</th>
<th>Appearance</th>
<th>Cable type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>Standard</td>
<td>Straight</td>
<td>2 m</td>
<td>XS3F-M421-402-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L-shaped</td>
<td>5 m</td>
<td>XS3F-M421-405-A</td>
</tr>
</tbody>
</table>

Note: For details, refer to XS3 which can be accessed from your OMRON website.

**Amplifier Unit Mounting Bracket (Dimensions → page 27)**

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

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E39-L143</td>
<td>1</td>
</tr>
</tbody>
</table>

Note: For details, refer to Mounting Brackets on E39-L/E39-S/E39-R which can be accessed from your OMRON website.

**DIN Track (Dimensions → page 27)**

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

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Type</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Shallow type, total length: 1 m</td>
<td>PFP-100N</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Shallow type, total length: 0.5m</td>
<td>PFP-50N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deep type, total length: 1 m</td>
<td>PFP-100N2</td>
<td></td>
</tr>
</tbody>
</table>

**End Plate (Dimensions → page 27)**

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.

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PFP-M</td>
<td>1</td>
</tr>
</tbody>
</table>

**Cover**

Attach these Covers to Amplifier Units. Order a Cover when required, e.g., if you lose the covers.

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E39-G24 FOR E3NC-LA</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>E39-G21 FOR E3NC-SA</td>
<td></td>
</tr>
</tbody>
</table>

**Related Products**

**Sensor Communications Units**

<table>
<thead>
<tr>
<th>Type</th>
<th>Appearance</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Communications Unit for EtherCAT</td>
<td></td>
<td>E3NW-ECT</td>
</tr>
<tr>
<td>Sensor Communications Unit for CompoNet</td>
<td></td>
<td>E3NW-CRT</td>
</tr>
<tr>
<td>Sensor Communications Unit for CC-Link</td>
<td></td>
<td>E3NW-CCL</td>
</tr>
<tr>
<td>Distributed Sensor Unit *</td>
<td></td>
<td>E3NW-DS</td>
</tr>
</tbody>
</table>

Refer to your OMRON website for details.

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

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.
# Ratings and Specifications

## Compact Laser Sensors: E3NC-L

### Sensor Heads

<table>
<thead>
<tr>
<th>Item</th>
<th>Model</th>
<th>Coaxial Retro-reflective with MSR function</th>
<th>Diffuse-reflective</th>
<th>Limited-reflective</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>E3NC-LH03</td>
<td>E3NC-LH03+ E39-P51</td>
<td>E3NC-LH02</td>
<td>E3NC-LH02+ E39-P52</td>
</tr>
<tr>
<td>Light source (wavelength)*1</td>
<td>Visible semiconductor laser diode (660 nm), 1.35 mW (average output: 315 μW) (JIS Class 1, IEC/EN Class 1, and FDA Class 1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensing distance*2</td>
<td>Giga-power mode (GIGA)</td>
<td>8 m</td>
<td>0.5 m</td>
<td>1,200 mm</td>
</tr>
<tr>
<td></td>
<td>Standard mode (Std)</td>
<td>6 m</td>
<td>0.5 m</td>
<td>1,000 mm</td>
</tr>
<tr>
<td></td>
<td>High-speed mode (HS)</td>
<td>3.5 m</td>
<td>0.5 m</td>
<td>750 mm</td>
</tr>
<tr>
<td></td>
<td>Super-high-speed mode (SHS)</td>
<td>2 m</td>
<td>0.5 m</td>
<td>250 mm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>150 mm</td>
</tr>
<tr>
<td>Beam shape</td>
<td></td>
<td>Spot</td>
<td>Spot</td>
<td>Spot</td>
</tr>
<tr>
<td>Beam size*3</td>
<td>Approx. 2 mm dia. at 1 m</td>
<td>Line length: Approx. 25 mm at 250 mm Line length: Approx. 50 mm at 500 mm</td>
<td>Line length: Approx. 0.8 mm at 300 mm Line length: Approx. 45 mm at 500 mm Line length: Approx. 100 mm at 1,000 mm</td>
<td>Approx. 0.1 mm dia. at 70 mm</td>
</tr>
<tr>
<td>Differential distance*4</td>
<td></td>
<td>---</td>
<td>10% of sensing distance max.</td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td></td>
<td>OUT indicator (orange) and STABILITY indicator (green)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient illumination (Receiver side)</td>
<td>Incandescent lamp: 10,000 lx max., Sunlight: 20,000 lx max.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>Operating: −10 to 55°C; Storage: −25 to 70°C (with no icing or condensation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Altitude</td>
<td></td>
<td>2,000 m max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation environment</td>
<td></td>
<td>Pollution degree 3 (as per IEC 60947-1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td></td>
<td>20 MΩ min. (at 500 VDC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td></td>
<td>1,000 VAC at 50/60 Hz for 1 min</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 55 Hz with a 1.5-mm double amplitude or 100 m/s² for 2 hours each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td></td>
<td>500 m/s² for 3 times each in X, Y, and Z directions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td></td>
<td>IEC IP67*5 (E3NC-LH02: Applies only when adjuster is locked.)*5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td></td>
<td>Pre-wired connector (standard length: 2 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td></td>
<td>Pre-wired connector (standard length: 2 m)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td></td>
<td>Pre-wired connector (standard length: 2 m)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Materials

<table>
<thead>
<tr>
<th>Laptop Head</th>
<th>Sensor Head</th>
<th>Case</th>
<th>Lens</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Polybutylene terephthalate (PBT)</td>
<td>Methacrylic resin (PMMA)</td>
<td>Vinyl chloride (PVC)</td>
<td></td>
</tr>
<tr>
<td>Lens Attachment</td>
<td>Case</td>
<td>---</td>
<td>ABS</td>
<td>---</td>
</tr>
<tr>
<td>Lens</td>
<td>---</td>
<td>Methacrylic resin (PMMA)</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>

### Weight (packed state/Sensor Head only)

<table>
<thead>
<tr>
<th>Models with 2-m cable</th>
<th>Approx. 120 g/approx. 70 g</th>
<th>Approx. 115 g/approx. 65 g</th>
</tr>
</thead>
<tbody>
<tr>
<td>Models with 5-m cable</td>
<td>Approx. 180 g/approx. 130 g</td>
<td>Approx. 175 g/approx. 125 g</td>
</tr>
<tr>
<td>Lens Attachment</td>
<td>Approx. 25 g/approx. 2 g</td>
<td>Approx. 25 g/approx. 2 g</td>
</tr>
</tbody>
</table>

### Accessories

<table>
<thead>
<tr>
<th>Items</th>
<th>Instruction Manual</th>
</tr>
</thead>
</table>

---

*1. These Sensors are classified as Class 1 laser devices under IEC 60825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH (Center for Devices and Radiological Health) registration has been completed. E3NC-LH01, E3NC-LH02 (Accession Number: 1220690) E3NC-LH03 (Accession Number: 1320739)

*2. The values were measured using the OMRON standard sensing object (white paper) for the E3NC-LH01, E3NC-LH02, and E3NC-LH02 + E39-P52. The values for the E3NC-LH03, and E3NC-LH03 + E39-P51 apply when an E39-R21, E39-R22, E39-RS10, or E39-RS11 Reflector is used. Other Reflectors are not recommended.

*3. Defined at the 1/e² (13.5%) of the central intensity at the measurement distance. Measurement may be influenced if there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object.

*4. Measured at the rated sensing distance.

*5. The E39-P5 contains a packing to prevent entry of foreign matter. The degree of protection between the E3NC-LH- and E39-P5- is not specified.
### Amplifier Units

<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Standard models</th>
<th>Model for Sensor Communications Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>E3NC-LA21</td>
<td>E3NC-LA7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3NC-LA51</td>
<td>E3NC-LA9</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3NC-LA24</td>
<td>E3NC-LA54</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3NC-LA0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre-wired</td>
<td>Wire-saving Connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MB Connector</td>
<td>Connector for Sensor Communications Unit</td>
</tr>
</tbody>
</table>

#### Inputs/outputs
- **Outputs**: 2 outputs, 1 output
- **External inputs**: 1 input

#### Power supply voltage
- 10 to 30 VDC, including 10% ripple (p-p); Supplied from the connector through the Sensor Communications Unit

#### Power consumption
- At Power Supply Voltage of 24 VDC
  - Normal mode: 1,560 mW max. (Current consumption: 65 mA max.)
  - Eco ON: 1,420 mW max. (Current consumption: 55 mA max.)
  - Eco LO: 1,200 mW max. (Current consumption: 45 mA max.)

#### Control outputs
- Load power supply voltage: 30 VDC max., open-collector output
- Load current: Groups of 1 to 3 Amplifier Units: 100 mA max., Groups of 4 to 30 Amplifier Units: 20 mA max.
  - Residual voltage: At load current of less than 10 mA: 1 V max.
    - At load current of 10 to 100 mA: 2 V max.
  - OFF current: 0.1 mA max.

#### External inputs
- Refer to *5

#### Indicators
- 7-segment displays (Sub digital display: green, Main digital display: white)
  - Display direction: Switchable between normal and reversed
  - OUT indicator (orange), L/D indicator (orange), ST indicator (blue), DPC indicator (green), and OUT selection indicator (orange, only on models with 2 outputs)

#### Protection circuits
- Power supply reverse polarity protection, output short-circuit protection, and output reverse polarity protection
- Power supply reverse polarity protection and output short-circuit protection

#### Response time
- **Super-high-speed mode (SHS)** 6
  - Operate or reset: 80 μs
- **High-speed mode (HS)**
  - Operate or reset: 250 μs
- **Standard mode (Stnd)**
  - Operate or reset: 1 ms
- **Giga-power mode (GIGA)**
  - Operate or reset: 16 ms

#### Sensitivity adjustment
- Smart Tuning (2-point tuning, full auto tuning, position tuning, maximum sensitivity tuning, power tuning, or percentage tuning (~99% to +99%), or manual adjustment)

#### Maximum connectable Units
- 30
- With E3NW-ECT: 30 units
- With E3NW-CRT: 16 units
- With E3NW-CCL: 16 units

#### No. of Units for mutual interference prevention
- **Super-high-speed mode (SHS)** 6
  - 0
- **High-speed mode (HS)**
  - 2
- **Standard mode (Stnd)**
  - 2
- **Giga-power mode (GIGA)**
  - 4

#### Dynamic power control (DPC)
- Provided

#### Functions
- **Timer**
  - Select from timer disabled, OFF-delay, ON-delay, one-shot, or ON-delay + OFF-delay timer: 1 to 9,999 ms
- **Zero reset**
  - Negative values can be displayed. (Threshold value is shifted.)
- **Resetting settings** 8
  - Select from initial reset (factory defaults) or user reset (saved settings)
- **Eco mode** 9
  - Select from OFF (digital display lit), ECO ON (digital display not lit), and ECO LO (digital display dimmed)
- **Bank switching**
  - Select from banks 1 to 4
- **Power tuning**
  - Select from ON or OFF
- **Output 1**
  - Select from Normal Detection Mode or Area Detection Mode
- **Output 2**
  - Select from normal detection mode, alarm output mode, or error output mode
  - Select from normal detection mode, alarm output mode, or error output mode
- **External input**
  - Select from input OFF, tuning, power tuning, laser OFF, zero reset, or bank switching

#### Hysteresis width
- Select from standard setting or user setting

---

1. Two sensor outputs are allocated in the programmable logic controller PLC I/O table.
2. Applicable Sensor Head is the series of E3NC-LH (Input/Output 10-30V DC Class 2)
3. At Power Supply Voltage of 10 to 30 VDC.
   - Normal mode: 1,650 mW max. (Current consumption: 55 mA max. at 30 VDC, 115 mA max. at 10 VDC)
   - Eco ON: 1,410 mW max. (Current consumption: 47 mA max. at 30 VDC, 95 mA max. at 10 VDC)
   - Eco LO: 1,350 mW max. (Current consumption: 51 mA max. at 30 VDC, 105 mA max. at 10 VDC)
4. The total for both outputs of a model with 2 outputs is 100 mA max. (Residual voltage: Load current of less than 10 mA: 1 V max., Load current of 10 to 100 mA: 2 V max.)
5. The following details apply to the input.
6. The residual voltage prevention function is disabled if the detection mode is set to super-high-speed mode.
7. When connected to an OMRON NJ-series Controller.
8. The bank is not reset by the user reset function or saved by the user save function.
9. Eco LO is supported for Amplifier Units manufactured in July 2014 or later.
<table>
<thead>
<tr>
<th>Item</th>
<th>Type</th>
<th>Standard models</th>
<th>Model for Sensor Communications Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NPN output</td>
<td>E3NC-LA21</td>
<td>E3NC-LA0</td>
</tr>
<tr>
<td></td>
<td>PNP output</td>
<td>E3NC-LA51</td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired</td>
<td>Wire-saving Connector</td>
<td>MB Connector</td>
</tr>
<tr>
<td></td>
<td>Connecting method</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* When the number of connected units is 11 or more, the ambient temperature is less than 50°C.

**Ambient temperature range**

- Operating: Groups of 1 or 2 Amplifier Units: -25 to 55°C,
- Groups of 3 to 10 Amplifier Units: -25 to 50°C,
- Groups of 11 to 16 Amplifier Units: -25 to 45°C,
- Groups of 17 to 30 Amplifier Units: -25 to 40°C,
- Storage: -30 to 70°C (with no icing or condensation)

**Ambient humidity range**

- Operating and storage: 35% to 85% (with no condensation)

**Altitude**

2,000 m max.

**Installation environment**

Pollution degree 3 (as per IEC 60947-1)

**Dielectric strength**

1,000 V AC at 50/60 Hz for 1 min

**Vibration resistance (destruction)**

10 to 55 Hz with a 1.5-mm double amplitude or 100 m/s² for 2 hours each in X, Y, and Z directions

**Shock resistance (destruction)**

500 m/s² for 3 times each in X, Y, and Z directions

**Weight (packed state/Amplifier Unit only)**

- E39-R21: Approx. 115 g/approx. 75 g
- E39-R22: Approx. 60 g/approx. 20 g
- E39-RS10: Approx. 65 g/approx. 25 g
- E39-RS11: Approx. 60 g/approx. 25 g

**Materials**

- Case: Polycarbonate (PC)
- Cover: Polycarbonate (PC)
- Cable: Vinyl chloride (PVC)

**Accessories**

Instruction Manual

---

### Accessories

**Reflectors**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>Operating:</td>
<td>-10 to 55°C; Storage: -25 to 70°C (with no icing or condensation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambient humidity</td>
<td>Operating:</td>
<td>-10 to 55°C; Storage: 35% to 85% (with no condensation)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 55 Hz with a 1.5-mm double amplitude or 100 m/s² for 2 hours each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>500 m/s² 3 times each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC IP67 (E39-R21 and E39-R22 only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Reflective surface: Methacrylic resin (PMMA)</td>
<td>Back surface: Polybutylene terephthalate (PBT)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight (packed state/Reflector only)</td>
<td>Approx. 30 g/approx. 5 g</td>
<td>Approx. 35 g/approx. 10 g</td>
<td>Approx. 26 g/approx. 1 g</td>
<td>Approx. 30 g/approx. 5 g</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction Manual</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Ultra-compact CMOS Laser Sensor: E3NC-S

## Sensor Heads

<table>
<thead>
<tr>
<th>Item</th>
<th>Sensing method</th>
<th>Distance-settable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Light source (wavelength)*1</td>
<td>Visible semiconductor laser diode (660 nm), 1 mW (average output: 220 μW)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Visible semiconductor laser diode (660 nm), 0.5 mW (average output: 100 μW)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Measurement range</td>
<td>35 to 250 mm (display value: 350 to 2,500)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Standard detected level difference*2</td>
<td>35 to 180mm: 9 mm</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>180 to 250 mm: 25 mm</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Beam size*3</td>
<td>Approx. 1 mm dia. at 250 mm</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Approx. 0.5 mm dia. at 100 mm</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Ambient illumination (Receiver side)</td>
<td>Incandescent lamp: 4,000 lx max.,</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Sunlight: 8,000 lx max.</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Incandescent lamp: 2,000 lx max.,</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Sunlight: 4,000 lx max.</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>Operating: –10 to 50°C; Storage: –25 to 70°C (with no icing or condensation)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Altitude</td>
<td>2,000 m max.</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Installation environment</td>
<td>Pollution degree 3 (as per IEC 60947-1)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. (at 500 VDC)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC at 50/60 Hz for 1 min</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Vibration resistance (destruction)</td>
<td>10 to 55 Hz with a 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>500 m/s² 3 times each in X, Y, and Z directions</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC IP67</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired connector (Standard cable length: 2 m)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Materials</td>
<td>Case Polybutylene terephthalate (PBT)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Lens Methacrylic resin (PMMA)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td>Cable Vinyl chloride (PVC)</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Weight (packed state/Sensor Head only)</td>
<td>Approx. 125 g/approx. 75 g</td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>E3NC-SH250H</td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction Manual, laser warning label (E3NC-SH250H only)</td>
<td>E3NC-SH250H</td>
</tr>
</tbody>
</table>

*Note: Incorrect detection may occur outside the measurement range if the object has a high reflection factor.

*1. These Sensors are classified as Class 1 laser devices under IEC 60825-1 and the regulations of Laser Notice No. 50 for FDA certification. CDRH (Center for Devices and Radiological Health) registration has been completed. (Accession Number: 1220691)

*2. The values were measured at the center of the sensing distance using OMRON’s standard sensing object (white ceramic).

*3. Measurement may be influenced if there is light leakage outside the defined region and the surroundings of the target object have a high reflectance in comparison to the target object. Also, when detecting a workpiece that is smaller than the beam size, a correct value may not be obtained.
Amplifier Units

<table>
<thead>
<tr>
<th>Item</th>
<th>Standard models</th>
<th>Model for Sensor Communications Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>E3NC-SA21</td>
<td>E3NC-SA7</td>
</tr>
<tr>
<td></td>
<td>E3NC-SA24</td>
<td>E3NC-SA4</td>
</tr>
<tr>
<td></td>
<td>E3NC-SA0</td>
<td>E3NC-SA5</td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired</td>
<td>Wire-saving Connector</td>
</tr>
<tr>
<td></td>
<td>M8 Connector</td>
<td>Connector for Sensor Communications Unit</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Inputs/outputs</th>
<th>Outputs</th>
<th>External inputs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2 outputs</td>
<td>1 output</td>
</tr>
<tr>
<td></td>
<td>1 input</td>
<td></td>
</tr>
</tbody>
</table>

Power supply voltage *2

10 to 30 VDC, including 10% ripple (p-p) Supplied from the connector through the Sensor Communications Unit

Power consumption *3

At Power Supply Voltage of 24 VDC
Normal mode: 1,920 mW max. (Current consumption: 80 mA max.)
Eco ON: 1,680 mW max. (Current consumption: 70 mA max.)
Eco LO: 1,800 mW max. (Current consumption: 75 mA max.)

Control outputs *4

Load power supply voltage: 30 VDC max., open-collector output
Load current: Groups of 1 to 3 Amplifier Units: 100 mA max., Groups of 4 to 30 Amplifier Units: 20 mA max.
Residual voltage:
At load current of less than 10 mA: 1 V max.
At load current of 10 to 100 mA: 2 V max.
OFF current: 0.1 mA max.

External inputs
Refer to *5.

Indicators

7-segment displays (Sub digital display: green, Main digital display: white)
Display direction: Switchable between normal and reversed
OUT indicator (orange), L/D indicator (orange), ST indicator (blue), ZERO indicator (green), and OUT selection indicator (orange, only on models with 2 outputs)

Protection circuits
Power supply reverse polarity protection, output short-circuit protection, and output reverse polarity protection
Power supply reverse polarity protection and output short-circuit protection

Response time

Super-high-speed mode (SHS) *6
High-speed mode (HS)
Standard mode (Stnd)
Giga-power mode (GIGA)
Operate or reset: 1.5 ms
Operate or reset: 5 ms
Operate or reset: 10 ms
Operate or reset: 50 ms

Sensitivity adjustment
Smart Tuning
(2-point tuning, full auto tuning, 1-point tuning, tuning without workpiece, 2-point area tuning, 1-point area tuning, or area tuning without workpiece), or manual adjustment

Maximum connectable Units
30
With E3NW-CCL: 16 units
With E3NW-CRT: 16 units
With E3NW-ECT: 30 units *7

No. of Units for mutual interference prevention

Super-high-speed mode (SHS) *6
High-speed mode (HS)
Standard mode (Stnd)
Giga-power mode (GIGA)
0
2
2
2

Functions

Timer
Select from timer disabled, OFF-delay, ON-delay, one-shot, or ON-delay + OFF-delay timer: 1 to 9,999 ms

Zero reset
Negative values can be displayed. (Threshold value is shifted.)

Resetting settings *8
Select from initial reset (factory defaults) or user reset (saved settings).

Eco mode *9
Select from OFF (digital display lit), ECO ON (digital display not lit), and ECO LO (digital display dimmed).

Bank switching
Select from banks 1 to 4.

Output 1
Select from Normal detection mode, Area detection mode, or hold mode.

Output 2
Select from Normal detection mode or Error output mode

External input
Select from input OFF, tuning, laser OFF, zero reset, or bank switching.

Keep function *10
Select from ON or OFF.

Background suppression *11
Select from ON or OFF.

Hysteresis width
Select from standard setting or user setting.

*1. Two sensor outputs are allocated in the programmable logic controller PLC I/O table.
PLC operation via Communications Unit enables reading detected values and changing settings.
*2. Applicable Sensor Head is the series of E3NC-SH.
*3. Applicable sensor is the series of E3NC-SA.
*4. The total for both outputs of a model with 2 outputs is 100 mA max. (Residual voltage: Load current of less than 10 mA: 1 V max., Load current of 10 to 100 mA: 2 V max.).
*5. The following details apply to the input.

<table>
<thead>
<tr>
<th>Contact input (relay or switch)</th>
<th>Non-contact input (transistor)</th>
<th>Input time *5</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN</td>
<td>ON: Shorted to 0 V (Sourcing current: 1 mA max.). OFF: Shorted to 0 V.</td>
<td>ON: 1.5 V max. (Sourcing current: 1 mA max.) OFF: Vcc – 1.5 V to Vcc (Leakage current: 0.1 mA max.)</td>
</tr>
<tr>
<td>PNP</td>
<td>ON: Shorted to Vcc (Sinking current: 3 mA max.). OFF: Open or shorted to 0 V.</td>
<td>ON: Vcc – 1.5 V to Vcc (Sinking current: 3 mA max.) OFF: 1.5 V max. (Leakage current: 0.1 mA max.)</td>
</tr>
</tbody>
</table>

*5-1. Input time is 25 ms (ON)/OFF only when (in tUnE) input is selected.
*6. The mutual interference prevention function is disabled if the detection mode is set to super-high-speed mode.
*7. When connected to an OMRON NJ-series Controller.
*8. The bank is not reset by the user reset function or saved by the user save function.
*9. Eco LO is supported for Amplifier Units manufactured in August 2014 or later.
*10. The output for a measurement error is set: ON: The value of the output from before the measurement error is retained. OFF: The output is turned OFF when a measurement error occurs.
*11. Only the sensing object is detected when tuning.
<table>
<thead>
<tr>
<th>Item</th>
<th>NPN output</th>
<th>PNP output</th>
<th>Connecting method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>E3NC-SA21</td>
<td>E3NC-SA51</td>
<td>Pre-wired</td>
</tr>
<tr>
<td></td>
<td>E3NC-SA7</td>
<td>E3NC-SA9</td>
<td>Wire-saving Connector</td>
</tr>
<tr>
<td></td>
<td>E3NC-SA24</td>
<td>E3NC-SA4</td>
<td>M8 Connector</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standard models</th>
<th>Model for Sensor Communications Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-SA21</td>
<td>E3NC-SA0</td>
</tr>
<tr>
<td>E3NC-SA7</td>
<td></td>
</tr>
<tr>
<td>E3NC-SA24</td>
<td></td>
</tr>
</tbody>
</table>

### Ambient temperature range
- **Operating:**
  - Groups of 1 or 2 Amplifier Units: −25 to 55°C,
  - Groups of 3 to 10 Amplifier Units: −25 to 50°C,
  - Groups of 11 to 16 Amplifier Units: −25 to 45°C,
  - Groups of 17 to 30 Amplifier Units: −25 to 40°C
- **Storage:** −30 to 70°C (with no icing or condensation)

### Ambient humidity range
Operating and storage: 35% to 85% (with no condensation)

### Insulation resistance
20 MΩ (at 500 VDC)

### Altitude
2,000 m max.

### Installation environment
Pollution degree 3 (as per IEC 60947-1)

### Dielectric strength
1,000 VAC at 50/60 Hz for 1 min

### Vibration resistance (destruction)
10 to 55 Hz with a 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions

### Shock resistance (destruction)
500 m/s² for 3 times each in X, Y, and Z directions

### Weight (packed state/Amplifier Unit only)
- Approx. 115 g/approx. 75 g
- Approx. 60 g/approx. 20 g
- Approx. 65 g/approx. 25 g

### Materials
- **Case:** Polycarbonate (PC)
- **Cover:** Polycarbonate (PC)
- **Cable:** Vinyl chloride (PVC)

### Accessories
Instruction Manual

* When the number of connected units is 11 or more, the ambient temperature is less than 50°C.
Engineering Data (Reference Value)

Beam Diameter Vs. Distance

Retro-reflective Model
E3NC-LH03

Retro-reflective Model
E3NC-LH03 + E39-P51

Diffuse-reflective Model
E3NC-LH02

Diffuse-reflective Model
E3NC-LH02 + E39-P52

Limited-reflective Model
E3NC-LH01

Distance-settable Model
E3NC-SH250/SH250H

Distance-settable Model
E3NC-SH100
### I/O Circuit Diagrams

#### NPN Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation mode</th>
<th>Timing chart</th>
<th>L/D indicator</th>
<th>Output circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LA21</td>
<td>Light-ON</td>
<td>ch1/ Incident light ch2 No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black (orange) leads)</td>
<td>L lit.</td>
<td><img src="image1" alt="NPN Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-SA21</td>
<td>Dark-ON</td>
<td>ch1/ Incident light ch2 No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black (orange) leads)</td>
<td>D lit.</td>
<td><img src="image2" alt="NPN Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-LA7</td>
<td>Light-ON</td>
<td>Incident light No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black (orange) leads)</td>
<td>L lit.</td>
<td><img src="image3" alt="NPN Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-LA24</td>
<td>Dark-ON</td>
<td>Incident light No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between brown and black (orange) leads)</td>
<td>D lit.</td>
<td><img src="image4" alt="NPN Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-SA7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SA24</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SA21</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1, 2, 3 and 4 are pin terminals of M8 Connector Type.

#### PNP Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation mode</th>
<th>Timing chart</th>
<th>L/D indicator</th>
<th>Output circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LA51</td>
<td>Light-ON</td>
<td>ch1/ Incident light ch2 No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between blue and black (orange) leads)</td>
<td>L lit.</td>
<td><img src="image5" alt="PNP Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-SA51</td>
<td>Dark-ON</td>
<td>ch1/ Incident light ch2 No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between blue and black (orange) leads)</td>
<td>D lit.</td>
<td><img src="image6" alt="PNP Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-LA9</td>
<td>Light-ON</td>
<td>Incident light No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between blue and black (orange) leads)</td>
<td>L lit.</td>
<td><img src="image7" alt="PNP Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-LA54</td>
<td>Dark-ON</td>
<td>Incident light No incident light OUT indicator Lit (orange) Not lit Output ON transistor OFF Load Operate (e.g., relay) Reset (Between blue and black (orange) leads)</td>
<td>D lit.</td>
<td><img src="image8" alt="PNP Output Circuit Diagram" /></td>
</tr>
<tr>
<td>E3NC-SA9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SA54</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: 1, 2, 3 and 4 are pin terminals of M8 Connector Type.
Nomenclature

Compact Laser Sensors
E3NC-LA21/LA51/LA0

- [L/D Indicator] Indicates the setting status: Light-ON (L) or Dark-ON (D).
- [ST Indicator] Turns ON when Smart Tuning is in progress.
- [MODE Button] Used to switch between Detection Mode and Setting Mode.
- [OUT1 Selection Indicator/OUT2 Selection Indicator] The indicator for the selected output channel is lit.
- [ZERO Indicator] Turns ON while a zero reset is set.
- [UP/DOWN Button] Used to fine-tune the threshold or change set values.
- [Tune Button] Executes Smart Tuning.
- [ZERO Indicator] Used to switch between Light-ON (L) and Dark-ON (D).
- [OUT Button] Turns ON when the output is ON.
- [DPC Indicator] W/ON when Dynamic Power Control is effective.
- [L/D Indicator] Used to switch between Light-ON (L) or Dark-ON (D).

Ultra-compact CMOS Laser Sensors
E3NC-SA21/SA51/SA0

- [L/D Indicator] Indicates the setting status: Light-ON (L) or Dark-ON (D).
- [ST Indicator] Turns ON when Smart Tuning is in progress.
- [MODE Button] Used to switch between Detection Mode and Setting Mode.
- [OUT1 Selection Indicator/OUT2 Selection Indicator] The indicator for the selected output channel is lit.
- [ZERO Indicator] Turns ON while a zero reset is set.
- [UP/DOWN Button] Used to fine-tune the threshold or change set values.
- [Tune Button] Executes Smart Tuning.
- [ZERO Indicator] Used to switch between Light-ON (L) and Dark-ON (D).

E3NC-LA7/LA9/LA24/LA54

- [L/D Indicator] Indicates the setting status: Light-ON (L) or Dark-ON (D).
- [ST Indicator] Turns ON when Smart Tuning is in progress.
- [MODE Button] Used to switch between Detection Mode and Setting Mode.
- [OUT1 Selection Indicator/OUT2 Selection Indicator] The indicator for the selected output channel is lit.
- [ZERO Indicator] Turns ON while a zero reset is set.
- [UP/DOWN Button] Used to fine-tune the threshold or change set values.
- [Tune Button] Executes Smart Tuning.
- [ZERO Indicator] Used to switch between Light-ON (L) and Dark-ON (D).
Safety Precautions

To ensure safe operation, be sure to read and follow the Instruction Manual provided with the Sensor.

Indication and Meaning for Safe Use

**WARNING**
Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.

**Precautions for Safe Use**
Supplementary comments on what to do or avoid doing, to use the product safely.

**Precautions for Correct Use**
Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

Sensor Heads

**Laser Safety**
Various safety standards regarding laser devices are stipulated in Japan and abroad. When this Sensor Head is used in Japan and when it is assembled in Japan but exported to a foreign country, the safety standards are classified into three cases.

1. **When Using the Sensor Head in Japan**
   JIS C6802 stipulates the safety measures that must be observed by the user for each type of laser equipment.
   - E3NC-LH03 Sensor Heads: Class 1
   - E3NC-SH01 Sensor Heads: Class 1
   - E3NC-SH02H Sensor Heads: Class 2

**WARNING**
Do not expose your eyes to the laser beam either directly or indirectly (i.e., after reflection from a mirror or shiny surface). The laser beam has a high power density and exposure may result in loss of sight.

Attention
Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Do not disassemble the Sensor Head. Doing so may cause the laser beam to leak, resulting in a risk of visual impairment.

- The following laser warning label and laser description labels are attached to the sides of the Sensor Heads.
  - E3NC-LH03
  - E3NC-LH01
  - E3NC-LH02
  - E3NC-SH03
  - E3NC-SH02H

2. **Using in the USA**
   When using devices in which the Sensor Head is installed in the USA, the devices are subject to FDA (Food and Drug Administration) laser regulations of the USA.
   - E3NC-LH03:
     These Sensor Heads are classified as Class 1 laser devices under IEC/EN 60825-1 and the regulations of Laser Notice No. 50 for this certification. CDRH (Center for Devices and Radiological Health) registration has been completed. (Accession Number: 1320739)
   - E3NC-LH01, E3NC-LH02:
     These Sensor Heads are classified as Class 1 laser devices under IEC/EN 60825-1 and the regulations of Laser Notice No. 50 for this certification. CDRH (Center for Devices and Radiological Health) registration has been completed. (Accession Number: 1220690)
   - E3NC-SH03, E3NC-SH02H:
     These Sensor Heads are classified as Class 1 or Class 2 laser devices under IEC/EN 60825-1 and the regulations of Laser Notice No. 50 for this certification. CDRH (Center for Devices and Radiological Health) registration has been completed. (Accession Number: 1220691)

   • For countries other than Japan
     Replace the warning label with the corresponding English label (supplied with SH02H).

3. **Using in Europe**
   - E3NC-LH03, E3NC-SH03:
     These Sensor Heads are classified in Class 1 under EN 60825-1.
   - E3NC-SH02H:
     These Sensor Heads are classified in Class 2 under EN 60825-1.
Precautions for Safe Use

The following precautions must be observed to ensure safe operation of the Sensor Head.

1. Installation Environment
   - Do not use the Sensor Head in an environment where explosive or flammable gas is present.
   - To secure the safety of operation and maintenance, do not install the Sensor Head close to high-voltage devices or power devices.

2. Power Supply and Wiring
   - Always use an E3NC-LA, E3NC-LA0, E3NC-SA, or E3NC-SA0 Amplifier Unit. If a different Amplifier Unit is used, damage or fire may occur.
   - If you short the cable, reconnect it as specified. If the connections are not correct, damage or fire may occur.
   - High-voltage lines and power lines must be wired separately from the Sensor Head. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
   - Always turn OFF the power supply before connecting or disconnecting the connectors.

3. Installation
   - Use screws for installation and tighten the screws securely, but do not exceed the specified tightening torque.
   - Specified torque (M3): 0.5 N·m

4. Others
   - Never disassemble (including removing labels), repair, modify, deform by pressure, or incinerate the Sensor Head. Do not turn the adjuster on the E3NC-LH02 with a force that is greater than 40 mN·m. Damage or fire may occur.
   - Dispose of the Sensor Head as industrial waste.
   - If you notice any abnormalities, immediately stop using the Sensor Head, turn OFF the power supply, and contact your OMRON representative.

5. Conditions of UL
   - (Applicable Models: E3NC-LH01/LH02 Only)
     - The E3NC-LH series sensor head accessories shall be used with the E3NC-LA amplifiers.
     - These amplifiers and sensor head accessories shall be installed within a suitable enclosure where all components, including cords and connectors, shall be entirely contained within the same enclosure.
   - (Applicable Models: E3NC-SH100/SH250 Only)
     - The E3NC-SH series sensor head accessories shall be used with the E3NC-SA amplifiers.
     - These amplifiers and sensor head accessories shall be installed within a suitable enclosure where all components, including cords and connectors, shall be entirely contained within the same enclosure.

6. Shortening the connection cable for use
   - (Applicable Models: E3NC-LH01/LH02/SH100/SH250 Only)
     - The shortened cable has not been evaluated by UL.
     - Specified tightening torque (M3): 0.2 N·m
     - Minimum specification (M3): 0.1 N·m
     - A ferrite core is attached to the Sensor Head end of the cable connected to the E3NC-LH03 5M. Do not remove the ferrite core or change its position. Also, do not bend the cable within 12 mm of each end of the ferrite core. Doing so may damage the cable.

Precautions for Correct Use

Observe the following precautions to prevent failure to operate, malfunctions, or undesirable effects on Sensor Head performance.

1. Installation Environment
   - Do not install the Sensor Head in locations subject to the following conditions:
     - Ambient temperatures outside of the rated range
     - Condensation caused by rapid changes in temperature
     - Relative humidity that is not between 35% and 85%
     - Corrosive or flammable gas
     - Dust, salt, or iron particles
     - Direct vibration or shock
     - Strong external light interference (such as other laser beams or electric arc-welding machines)
     - Direct sunlight or near heaters
     - Water, oil, or chemical fumes or spray
     - Strong magnetic or electric fields

2. Warming Up
   - The circuits will be unstable just after the power supply is turned ON, so measurement values may fluctuate gradually.
   - For accurate measurements, allow the product to stand for at least 10 minutes after turning ON the power supply before use. (E3NC-S Series)

3. Maintenance and Inspection
   - Always turn OFF the power supply before adjusting or connecting/disconnecting the Sensor Head.
   - Do not use thinner, benzene, acetone, or kerosene to clean the Sensor Head.
   - If large dust particles or dirt adheres to the filter on the front of the Sensor Head, use a blower brush (such as one used to clean camera lenses) to blow it off. Do not blow the dust particles or dirt with your mouth. To remove dust particles or dirt, wipe it off gently with a soft cloth (such as one for cleaning lenses) moistened with a small amount of alcohol. Do not wipe it off with excessive force. Scratches on the filter may cause errors.

4. Sensing Object
   - The Sensor Head cannot accurately measure objects with the following materials and shapes: Transparent objects (with the E3NC-LH03, objects that are extremely transparent), objects with an extremely low reflection ratio, objects smaller than the spot diameter, objects with a large curvature, excessively inclined objects, etc. Also, for long-distance detection, the Sensor may falsely operate if a white object approaches near the Sensor Head (E3NC-LH03).

5. Do not use the Sensor in water, rainfall, or outdoors.

6. A ferrite core is attached to the Sensor Head end of the cable connected to the E3NC-LH03 5M. Do not remove the ferrite core or change its position. Also, do not bend the cable within 12 mm of each end of the ferrite core. Doing so may damage the cable.

Attaching a Reflector

Mount the Reflector as shown in (Correct) below. Errors will be generated if you mount it at the angle shown in (Incorrect). Always install the Reflector at the same angle as the Sensor Head if the head is not mounted vertically or horizontally.

**Common for all models**

- (Correct) (Correct) (Incorrect) (Incorrect)

Sheet products (E39-RS10/E39-RS11) are peel-off stickers. Peel off the release paper and apply the sheet to a flat surface for installation. If there are any dirt and dust on the installation surface, a reduction in adhesion and deflection of a sheet may occur, resulting in malfunction.

**Note:** Beam is irradiated on the glossy surface.

Attaching a Lens Attachment (E39-P51 or E39-P52)

1. Check the widths of the slots in the Sensor and the widths of the tabs on the Lens Attachment and attach the Lens Attachment as shown below. (The Lens Attachment must be in the correct orientation, so the widths of the tabs on the Lens Attachment are different on the top and bottom.)

2. After you attach the Lens Attachment, make sure that the tabs are completely engaged in the slots in the Sensor.
Amplifier Units

**WARNING**

This Amplifier Unit is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.

Do not use the Amplifier Unit with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.

Never use the Amplifier Unit with an AC power supply. Otherwise, explosion may result.

---

**Precautions for Safe Use**

The following precautions must be observed to ensure safe operation of the Amplifier Unit. Doing so may cause damage or fire.

1. Do not install the Amplifier Unit in the following locations.
   - Locations subject to direct sunlight
   - Locations subject to condensation due to high humidity
   - Locations subject to corrosive gas
   - Locations subject to vibration or mechanical shocks exceeding the rated values
   - Locations subject to exposure to water, oil, chemicals
   - Locations subject to steam
   - Locations subjected to strong magnetic field or electric field
2. Do not use the Amplifier Unit in environments subject to flammable or explosive gases.
3. Do not use the Amplifier Unit in any atmosphere or environment that exceeds the ratings.
4. To secure the safety of operation and maintenance, do not install the Amplifier Unit close to high-voltage devices or power devices.
5. High-voltage lines and power lines must be wired separately from the Amplifier Unit. Wiring them together or placing them in the same duct may cause induction, resulting in malfunction or damage.
6. Do not apply any load exceeding the ratings. Otherwise, damage or fire may result.
7. Do not short the load. Otherwise, damage or fire may result.
8. Connect the load correctly.
9. Do not miswire such as the polarity of the power supply.
10. To use this device as connecting with each other, be sure to connect with the same power supply and turn ON the power simultaneously. Using a separate power supply will influence the functions when connecting the devices to use them.
11. Do not use the Amplifier Unit if the case is damaged.
12. Burn injury may occur. The Amplifier Unit surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Attention must be paid during operation or cleaning.
13. When setting the sensor, be sure to check safety such as by stopping the equipment.
14. Be sure to turn off the power supply before connecting or disconnecting wires.
15. Do not attempt to disassemble, repair, or modify the Amplifier Unit in any way.
16. When disposing of the Amplifier Unit, treat it as industrial waste.
17. Do not use the Sensor in water, rainfall, or outdoors.

---

**Precautions for Correct Use**

1. Be sure to mount the unit to the DIN track until it clicks.
2. When using the Amplifier Units with Wire-saving Connectors, attach the protective stickers (provided with E3X-CN-series Connectors) on the unused power pins to prevent electrical shock and short circuiting.
   - When using the Amplifier Units with Connectors for Communications Units, attach the protective caps (provided with E3NW-series Sensor Communications Unit).
3. Use an extension cable with a minimum thickness of 0.3 mm² and less than 10 m long.
4. Do not apply the forces on the cord exceeding the following limits:
   - Pull: 40 N; torque: 0.1 N·m; pressure: 20 N; bending: 29.4 N
5. Do not apply excessive force (9.8 N max.) such as tension, compression or torsion to the connector of the Sensor Head that is fixed to the Amplifier Unit.
6. Always keep the protective cover in place when using the Amplifier Unit. Not doing so may cause malfunction.
7. It may take time until the received light intensity and measured value become stable immediately after the power is turned on depending on use environment.
8. The product is ready to operate 200 ms after the power supply is turned ON.
10. The mutual interference prevention function does not work when in combination with E3C/E2C/E3X.
11. If the unit receives excessive sensor light, the mutual interference prevention function may not work properly, resulting in malfunction of the unit. In such case, increase the threshold.
12. Standard models (E3NC-LA21/S17/0)
   - The Sensor Communications Unit E3X-DRT21-S, E3X-CRT, E3X-ECT and E3NW cannot be connected.

---

UL Standard Certification (Applicable Models: E3NC-LA21/LA51/S21/S5A1 Only)

Only the sensors with Enhanced UL Certification Mark are certified by UL. They are intended to be supplied by a “Class 2 circuit”. When used in United States and Canada, Please use the same Class 2 source for input and output. The overcurrent protection current rating is 2A max. They were evaluated as Open type and shall be installed within a enclosure.
Dimensions

Sensor Heads

Retro-reflective Model
E3NC-LH03

Vinyl-insulated Robot cable
Two, 2.3-dia., 6 conductors
(Conductor cross-section: 0.08 mm², Insulation diameter: 0.38 mm)
Standard cable length: 2 m, Minimum bending radius: 12 mm

Diffuse-reflective Model
E3NC-LH02

Vinyl-insulated Robot cable
Two, 2.3-dia., 6 conductors
(Conductor cross-section: 0.08 mm², Insulation diameter: 0.38 mm)
Standard cable length: 2 m, Minimum bending radius: 12 mm

Mounting Holes

Connector

* A blue ID tube is attached.

* A ferrite core is attached to the Sensor Head end of the cable attached to the E3NC-LH03 5M.

Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.
Distance-settable Models

E3NC-SH250H
E3NC-SH250
E3NC-SH100

*1 E3NC-SH100
L = 35 to 100 mm,
A = 15.92° to 5.67°

E3NC-SH250H/250
L = 35 to 250 mm,
A = 15.92° to 2.27°

Vinyl-insulated Robot cable
4-dia., 6 conductors
(Conductor cross-section: 0.08 mm², Insulation diameter: 0.38 mm),
Standard cable length: 2 m, Minimum bending radius: 12 mm

* A white ID tube is attached.

Limited-reflective Model

E3NC-LH01

E3NC
Limited-reflective Model
E3NC-LH01
14
12.412.4
34.5.53.2 38
8±0.05
4
5.8 18
11.5
26.826.8
49
8.5
18
11
2.7
6.2
6.2
16.9 11
18.5
12.3
13.
8
6.2
5.8
18
11.5
26.8
26.8
28.8
41
13
19
18
19
8.6
8.35
11.8
11.6
19
15.9
9.9
9.9
3.3
16
8±0.05
16 to 20
16±0.5
25.4±0.5
15±0.5
18
6
Two, M3 holes

Connector

Mounting Holes

Vinyl-insulated Robot cable
Two, 2.3-dia., 6 conductors
(Conductor cross-section: 0.08 mm², Insulation diameter: 0.38 mm),
Standard cable length: 2 m, Minimum bending radius: 12 mm

*1 A blue ID tube is attached.

Mounting Holes

Three, M3 holes

Connector

*2 A white ID tube is attached.
Amplifier Units

Pre-wired Amplifier Units
E3NC-LA21
E3NC-LA51
E3NC-SA21
E3NC-SA51

Pre-wired Amplifier Units
E3NC-LA21
E3NC-LA51
E3NC-SA21
E3NC-SA51

Amplifier Units with Wire-saving Connectors
E3NC-LA7
E3NC-LA9
E3NC-SA7
E3NC-SA9

*1. The indicators are as follows:
E3NC-LA21
E3NC-LA51
DPC indicator
E3NC-LA21
E3NC-LA51
Incident level (white, digital)
E3NC-SA21
E3NC-SA51
ZERO indicator
E3NC-SA21
E3NC-SA51
Measurement value (white, digital)

*3. Cable Specifications
Round vinyl-insulated cable, 4 dia., 5 conductors
(Conductor cross-section: 0.2 mm², Insulation diameter: 0.9 mm),
Standard cable length: 2 m, Minimum bending radius: 12 mm

Model
Outer diameter
No. of conductors
E3X-CN22 4.0
E3X-CN21 4

"1. The indicators are as follows:
E3NC-LA7
E3NC-LA9
DPC indicator
E3NC-LA7
E3NC-LA9
Incident level (white, digital)
E3NC-SA7
E3NC-SA9
ZERO indicator
E3NC-SA7
E3NC-SA9
Measurement value (white, digital)

"3. Cable Specifications
Round vinyl-insulated cable, 4 dia., 5 conductors
(Conductor cross-section: 0.2 mm², Insulation diameter: 0.9 mm),
Standard cable length: 2 m, Minimum bending radius: 12 mm
Amplifier Units with M8 Connectors

E3NC-LA24
E3NC-LA54
E3NC-SA24
E3NC-SA54

Amplifier Units with Connectors for Sensor Communications Unit

E3NC-LA0
E3NC-SA0

*1. The indicators are as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LA24</td>
<td>DPC indicator</td>
</tr>
<tr>
<td>E3NC-LA54</td>
<td>ZERO indicator</td>
</tr>
<tr>
<td>E3NC-SA24</td>
<td>DPC indicator</td>
</tr>
<tr>
<td>E3NC-SA54</td>
<td>ZERO indicator</td>
</tr>
</tbody>
</table>

*2. The display is as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Display</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LA24</td>
<td>Incident level (white, digital)</td>
</tr>
<tr>
<td>E3NC-LA54</td>
<td>Measurement value (white, digital)</td>
</tr>
<tr>
<td>E3NC-SA24</td>
<td>Incident level (white, digital)</td>
</tr>
<tr>
<td>E3NC-SA54</td>
<td>Measurement value (white, digital)</td>
</tr>
</tbody>
</table>
Accessories (Sold Separately)

Reflectors for Retro-reflective Sensors

**E39-R21**

![E39-R21 Diagram]

**Materials**
- Reflective surface: Methacrylic resin (PMMA)
- Back surface: Polybutylene terephthalate (PBT)

**Mounting Holes**
- Two, 3.2 dia. holes
- Two, M3

**E39-RS10**

![E39-RS10 Diagram]

**Materials**
- Methacrylic resin (PMMA)

**E39-R22**

![E39-R22 Diagram]

**Materials**
- Reflective surface: Methacrylic resin (PMMA)
- Back surface: Polybutylene terephthalate (PBT)

**Mounting Holes**
- Two, 3.2 dia. holes
- Two, M3

**E39-RS11**

![E39-RS11 Diagram]

**Materials**
- Methacrylic resin (PMMA)

**Lens Attachment**

**E39-P51**

![E39-P51 Diagram]

**Materials**
- Main body: ABS
- Lens: Methacrylic resin (PMMA)

**With E39-P51 Lens Attachment Attached**

**E39-P52**

![E39-P52 Diagram]

**Materials**
- Main body: ABS
- Lens: Methacrylic resin (PMMA)

**With E39-P52 Lens Attachment Attached**
**Sensor Head Mounting Brackets**

**E39-L190**

Mounting Bracket
- Materials: Stainless steel (SUS304)
- Thickness: 1.2 mm
- Accessories: Phillips screws (M3×18, P = 0.5, stainless steel): 2, Nut plate: 1

![Diagram of Mounting Bracket](image)

**Nut Plate**
- Materials: Stainless steel (SUS304)
- Thickness: 1.5 mm

![Diagram of Nut Plate](image)

---

**With E39-L190 Mounting Bracket Attached for Bottom Mounting**

![Diagram](image)

**With E39-L190 Mounting Bracket Attached for Back Mounting**

![Diagram](image)
**E3-L185**

Mounting Bracket
- Material: Stainless steel (SUS304)
- Thickness: 1.2 mm
- Accessories: Phillips screws (M3×18, P = 0.5, stainless steel): 2
- Nut plate: 1

Radius: 21±0.1

Material: Stainless steel (SUS304)
Thickness: 1.5 mm

Two, 3.2-dia holes

Accessories: Phillips screws (M3×18, P = 0.5, stainless steel): 2

Nut plate: 1

**With E3-L185 Mounting Bracket Attached**

Mounting Bracket

Nut plate

Sensing distance reference surface

* When adjusted, the adjuster extends 0.8 mm from the Mounting Bracket surface.

**E3-L186**

Mounting Bracket
- Material: Stainless steel (SUS304)
- Thickness: 1.2 mm
- Accessories: Phillips screws (M3×18, P = 0.5, stainless steel): 2
- Nut plate: 1

Nut Plate
- Material: Stainless steel (SUS304)
- Thickness: 1.5 mm
- Two, M3 through holes
With E3-L186 Mounting Bracket Attached for Bottom Mounting

![Diagram of E3-L186 Mounting Bracket Attached for Bottom Mounting]

With E3-L186 Mounting Bracket Attached for Back Mounting

![Diagram of E3-L186 Mounting Bracket Attached for Back Mounting]

E3-L187

Mounting Bracket
- Material: Stainless steel (SUS304)
- Thickness: 1.2 mm
- Accessories: Phillips screws (M3×18, P = 0.5, stainless steel): 2
- Nut plate: 1

Nut Plate
- Material: Stainless steel (SUS304)
- Thickness: 1.5 mm
- Two, M3 through holes
- 14°
- Radius: 20
- Two, 3.2 dia. holes
- 16±0.1
- Two, Radius 25.4
- 25.4±0.1
- Two, 3.2 dia. holes
- 29
- 31.4
With E39-L187 Mounting Bracket Attached

E39-L187

Mounting Bracket
Material: Stainless steel (SUS304)
Thickness: 1.2 mm
Accessories: Phillips screws (M3×18, P = 0.5, stainless steel): 2
Nut plate: 1

Nut Plate
Material: Stainless steel (SUS304)
Thickness: 1.5 mm

With E39-L188 Mounting Bracket Attached
Wire-saving Connectors

Master Connector
E3X-CN21

Edge of Amplifier Unit

*4-dia. cable with 4 conductors, Standard cable length: 2 m (Conductor cross-section: 0.2 mm² (AWG24), Insulation diameter: 1.1 mm)

Slave Connector
E3X-CN22

Edge of Amplifier Unit

*4-dia. cable with 2 conductors, Standard cable length: 2 m (Conductor cross-section: 0.2 mm² (AWG24), Insulation diameter: 1.1 mm)

Sensor I/O Connectors

Straight
XS3F-M421-40-A

L-shaped
XS3F-M422-40-A
Amplifier Unit Mounting Bracket
E39-L143

Material: Stainless steel (SUS304)

DIN Track
PFP-100N
PFP-50N

Material: Aluminum

PFP-100N2

Material: Aluminum

End Plate
PFP-M

Materials: Iron, zinc plating
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