Smart Laser Sensors
E3NC

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

- A wide variety of easy-to-use Laser Photoelectric Sensor Heads.
  - Coaxial Retro-reflective Models (E3NC-LH03).
  - Long-distance, variable spot, Diffuse-reflective Models (E3NC-LH02).
  - Small-spot (0.1 mm dia.), Limited-reflective Models (E3NC-LH01).
  - CMOS Reflective Models (E3NC-SH series).
- Smart Tuning to achieve stable detection with easy setup.
- White on black display characters for high visibility.
- Robot cables for reliable operation in harsh environments.

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

<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><img src="https://via.placeholder.com/150" alt="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>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>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

<table>
<thead>
<tr>
<th>Connecting method</th>
<th>Appearance</th>
<th>Inputs/outputs</th>
<th>Model</th>
<th>NPN output</th>
<th>PNP output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-wired (2 m)</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>2 outputs + 1 input</td>
<td>E3NC-LA21 2M</td>
<td>E3NC-LA51 2M</td>
<td></td>
</tr>
<tr>
<td>Wire-saving Connector</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>1 output + 1 input</td>
<td>E3NC-LA7</td>
<td>E3NC-LA9</td>
<td></td>
</tr>
<tr>
<td>M8 Connector</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>1 output + 1 input</td>
<td>E3NC-LA24</td>
<td>E3NC-LA54</td>
<td></td>
</tr>
<tr>
<td>Connector for Sensor Communications Unit *</td>
<td><img src="https://via.placeholder.com/150" alt="Image" /></td>
<td>---</td>
<td>E3NC-LA0</td>
<td></td>
<td></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

<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><img src="https://via.placeholder.com/150" alt="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></td>
<td></td>
<td></td>
<td></td>
<td>2 m</td>
<td>E3NC-SH250 2M</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></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)

<table>
<thead>
<tr>
<th>Connecting method</th>
<th>Appearance</th>
<th>Inputs/outputs</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>NPN output</td>
</tr>
<tr>
<td>Pre-wired (2 m)</td>
<td><img src="image1" alt="Image" /></td>
<td>2 outputs + 1 input</td>
<td>E3NC-SA21 2M</td>
</tr>
<tr>
<td>Wire-saving Connector</td>
<td><img src="image2" alt="Image" /></td>
<td>1 output + 1 input</td>
<td>E3NC-SA7</td>
</tr>
<tr>
<td>M8 Connector</td>
<td><img src="image3" alt="Image" /></td>
<td>1 output + 1 input</td>
<td>E3NC-SA24</td>
</tr>
</tbody>
</table>

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 (Dimensions → page 21)
A Reflector 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><img src="image4" alt="Image" /></td>
<td>E39-R21</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-LH02</td>
<td><img src="image5" alt="Image" /></td>
<td>E39-R22</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><img src="image6" alt="Image" /></td>
<td>E39-RS10</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><img src="image7" alt="Image" /></td>
<td>E39-RS11</td>
<td>1</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><img src="image8" alt="Image" /></td>
<td>E39-L190</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-LH02</td>
<td><img src="image9" alt="Image" /></td>
<td>E39-L185</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-LH01</td>
<td><img src="image10" alt="Image" /></td>
<td>E39-L186</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-SH250H</td>
<td><img src="image11" alt="Image" /></td>
<td>E39-L187</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-SH250</td>
<td><img src="image12" alt="Image" /></td>
<td>E39-L188</td>
<td>1</td>
</tr>
<tr>
<td>E3NC-SH100</td>
<td><img src="image13" alt="Image" /></td>
<td>E39-L189</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><img src="image14" alt="Image" /></td>
<td>E39-L190</td>
<td>1</td>
<td>Mounting Bracket: 1</td>
</tr>
<tr>
<td>E3NC-LH02</td>
<td><img src="image15" alt="Image" /></td>
<td>E39-L185</td>
<td>1</td>
<td>Nut plate: 1</td>
</tr>
<tr>
<td>E3NC-LH01</td>
<td><img src="image16" alt="Image" /></td>
<td>E39-L186</td>
<td>1</td>
<td>Phillips screws (M3×18): 2</td>
</tr>
<tr>
<td>E3NC-SH250H</td>
<td><img src="image17" alt="Image" /></td>
<td>E39-L187</td>
<td>1</td>
<td>Nut plate: 1</td>
</tr>
<tr>
<td>E3NC-SH250</td>
<td><img src="image18" alt="Image" /></td>
<td>E39-L188</td>
<td>1</td>
<td>Phillips screws (M3×18): 2</td>
</tr>
<tr>
<td>E3NC-SH100</td>
<td><img src="image19" alt="Image" /></td>
<td>E39-L189</td>
<td>1</td>
<td>Nut plate: 1</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>![Image]</td>
<td>2 m</td>
<td>4</td>
<td>E3X-CN21</td>
</tr>
<tr>
<td>Slave Connector</td>
<td>![Image]</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>No. of conductors</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8</td>
<td>Standard cable</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>
<tr>
<td></td>
<td></td>
<td></td>
<td>2 m</td>
<td>XS3F-M422-402-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 m</td>
<td>XS3F-M422-405-A</td>
</tr>
</tbody>
</table>

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

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

- ![Image](E39-L143.png) E39-L143 1

**DIN Track (Dimensions ➔ page 27)**

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

- ![Image](PFP-M.png) PFP-M 1

**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.

- ![Image](PFP-M.png) PFP-M 1

**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>![Image]</td>
<td>E3NW-ECT</td>
</tr>
<tr>
<td>Sensor Communications Unit for CompoNet</td>
<td>![Image]</td>
<td>E3NW-CRT</td>
</tr>
<tr>
<td>Sensor Communications Unit for CC-Link</td>
<td>![Image]</td>
<td>E3NW-CCL</td>
</tr>
<tr>
<td>Distributed Sensor Unit *</td>
<td>![Image]</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></td>
<td>E3NC-LH03</td>
<td>E3NC-LH03+</td>
<td>E3NC-LH02</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 (Stnd)</td>
<td>6 m</td>
<td></td>
<td>750 mm</td>
</tr>
<tr>
<td></td>
<td>High-speed mode (HS)</td>
<td>3.5 m</td>
<td></td>
<td>250 mm</td>
</tr>
<tr>
<td></td>
<td>Super-high-speed mode (SHS)</td>
<td>2 m</td>
<td></td>
<td>200 mm</td>
</tr>
<tr>
<td>Beam shape</td>
<td>Spot</td>
<td>Line</td>
<td>Spot</td>
<td>Line</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</td>
<td>Line length: Approx. 50 mm at 500 mm</td>
<td>Line length: Approx. 45 mm at 500 mm</td>
</tr>
<tr>
<td>Differential distance*4</td>
<td>---</td>
<td>10% of sensing distance max.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indicators</td>
<td>OUT indicator (orange) and STABILITY indicator (green)</td>
<td></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>Insulation resistance</td>
<td>20 MΩ min. (at 500 VDC)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC at 50/60 Hz for 1 min</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>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>500 m/s² for 3 times each in X, Y, and Z directions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC IP67*5</td>
<td>IEC IP65 (E3NC-LH02: Applies only when adjuster is locked.)*5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired connector (standard length: 2 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Materials

<table>
<thead>
<tr>
<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>
</tr>
<tr>
<td>Lens Attachment</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>ABS</td>
<td>---</td>
<td>ABS</td>
</tr>
</tbody>
</table>

| Lens Attachment | --- | --- | --- |
| ---             | Methacrylic resin (PMMA) | --- | Methacrylic resin (PMMA) |

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

| Models with 2-m cable | Approx. 120 g/approx. 70 g | Approx. 115 g/approx. 65 g |
| Models with 5-m cable | Approx. 180 g/approx. 130 g | Approx. 175 g/approx. 125 g |

#### Accessories

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Accessory</td>
<td>Instruction Manual</td>
</tr>
</tbody>
</table>

---

1. These Sensors excluding the E3NC-LH03 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: 1220690) Application to the CDRH (Center for Devices and Radiological Health) is scheduled for the E3NC-LH03.

2. The values were measured using the CDRH (Center for Devices and Radiological Health) 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-LH03 and E39-P5 is not specified.
Amplifier Units

<table>
<thead>
<tr>
<th>Type</th>
<th>Standard models</th>
<th>Model for Sensor Communications Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN output</td>
<td>E3NC-LA21</td>
<td>E3NC-LA0</td>
</tr>
<tr>
<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>
</tr>
<tr>
<td></td>
<td></td>
<td>M8 Connector</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 input</td>
</tr>
</tbody>
</table>

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

| Power consumption 2  | At Power Supply Voltage of 24 VDC        |
|                      | Normal mode: 1,560 mW max. (Current consumption: 65 mA max.) |
|                      | Power saving eco mode: 1,200 mW max. (Current consumption: 50 mA max.) |

| Control outputs 3    | 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: |
|                      | All load current of less than 10 mA: 1 V max. |
|                      | All load current of 10 to 100 mA: 2 V max. |
|                      | OFF current: 0.1 mA max. |

| External inputs      | Refer to 4. |

| 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 |

| Response time        | Super-high-speed mode (SHS) 5 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 |

<table>
<thead>
<tr>
<th>No. of Units for mutual interference prevention</th>
<th>Super-high-speed mode (SHS) 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-speed mode (HS)</td>
<td>2</td>
</tr>
<tr>
<td>Standard mode (Stnd)</td>
<td>2</td>
</tr>
<tr>
<td>Giga-power mode (GIGA)</td>
<td>4</td>
</tr>
</tbody>
</table>

| Functions                                     | Dynamic power control (DPC) Provided |
|                                              | 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 6 Select from initial reset (factory defaults) or user reset (saved settings). |
|                                              | Eco mode Select from OFF (digital displays II) or ECO (digital displays not III). |
|                                              | 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. |
| 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. PLC operation via Communications Unit enables reading detected values and changing settings.

*2. At Power Supply Voltage of 10 to 30 VDC.

*3. 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.).

*4. The following details apply to the input.

*4-1. Input time is 25 ms (ON)/(OFF) only when (in TUnE) or (in PUn) input is selected.

*5. The mutual interference prevention function is disabled if the detection mode is set to super-high-speed mode.

*6. The bank is not reset by the user reset function or saved by the user save function.

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

*4-1. Input time is 25 ms (ON)/(OFF) only when (in TUnE) or (in PUn) input is selected.

*5. The mutual interference prevention function is disabled if the detection mode is set to super-high-speed mode.

*6. The bank is not reset by the user reset function or saved by the user save function.
## E3NC

### 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>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 for 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) Back surface: Polybutylene terephthalate (PBT)</td>
<td></td>
<td>Methacrylic resin (PMMA)</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) (JIS Class 2, IEC/EN Class 2, and FDA Class 2)</td>
<td>Visible semiconductor laser diode (660 nm), 0.5 mW (average output: 100 µW) (JIS Class 1, IEC/EN Class 1, and FDA Class 1)</td>
</tr>
<tr>
<td>Measurement range</td>
<td>35 to 250 mm (display value: 350 to 2,500)</td>
<td>35 to 100 mm (display value: 350 to 1,000)</td>
</tr>
<tr>
<td>Standard detected level difference *2</td>
<td>35 to 180mm: 9 mm</td>
<td>35 to 50 mm: 1.5 mm</td>
</tr>
<tr>
<td></td>
<td>180 to 250 mm: 25 mm</td>
<td>50 to 100 mm: 3 mm</td>
</tr>
<tr>
<td>Beam size*3</td>
<td>Approx. 1 mm dia. at 250 mm</td>
<td>Approx. 0.5 mm dia. at 100 mm</td>
</tr>
<tr>
<td>Indicators</td>
<td>OUT indicator (orange), STABILITY indicator (green), and ST indicator (blue)</td>
<td></td>
</tr>
<tr>
<td>Ambient illumination (Receiver side)</td>
<td>Incandescent lamp: 4,000 lx max., Sunlight: 8,000 lx max.</td>
<td>Incandescent lamp: 2,000 lx max., Sunlight: 4,000 lx max.</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></td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating and storage: 35% to 85% (with no condensation)</td>
<td></td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. (at 500 VDC)</td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC at 50/60 Hz for 1 min</td>
<td></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></td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>500 m/s² 3 times each in X, Y, and Z directions</td>
<td></td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IEC IP67</td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired connector (Standard cable length: 2 m)</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Case: Polybutylene terephthalate (PBT)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lens: Methacrylic resin (PMMA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cable: Vinyl chloride (PVC)</td>
<td></td>
</tr>
<tr>
<td>Weight (packed state/Sensor Head only)</td>
<td>Approx. 125 g/approx. 75 g</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction Manual, laser warning label (E3NC-SH250H only)</td>
<td></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. Beam size: Defined at the 1/e² (13.5 %) of the central intensity at the measurement center 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. 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>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-SA21</td>
<td>E3NC-SA7</td>
</tr>
<tr>
<td></td>
<td>PNP output</td>
<td>E3NC-SA51</td>
<td>E3NC-SA9</td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired</td>
<td>Wire-saving Connector</td>
<td>M8 Connector</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: 1,920 mW max. (Current consumption: 80 mA max.)
    - Power saving eco mode: 1,680 mW max. (Current consumption: 70 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.

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

- **External inputs**
  - Refer to *4.

- **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)

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

- **No. of Units for mutual interference prevention**
  - Super-high-speed mode (SHS)
    - 0
  - High-speed mode (HS)
    - 2
  - Standard mode (Stnd)
    - 2
  - Giga-power mode (GIGA)
    - 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**
    - Select from initial reset (factory defaults) or user reset (saved settings).
  - **Eco mode**
    - Select from OFF (digital displays lit) or ECO (digital displays not lit).
  - **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**
    - Select from ON or OFF.
  - **Background suppression**
    - Select from ON or OFF.
  - **Hysteresis width**
    - Select from standard setting or user setting.

### Notes

- **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.** At Power Supply Voltage of 10 to 30 VDC.
  - Normal mode: 2,250 mW max. (Current consumption: 75 mA max. at 30 VDC, 145 mA max. at 10 VDC)
  - Power saving eco mode: 1,950 mW max. (Current consumption: 65 mA max. at 30 VDC, 125 mA max. at 10 VDC)
- **3.** 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.).
- **4.** The following details apply to the input.
  - ON: Shorted to 0 V (Sourcing current: 1 mA max.).
    - OFF: Open or shorted to Vcc.
  - ON: 1.5 V max. (Sourcing current: 1 mA max.)
    - OFF: Vcc – 1.5 V to Vcc (Leakage current: 0.1 mA max.)
  - ON: 1.5 V to Vcc (Sinking current: 3 mA max.)
    - OFF: Vcc – 1.5 V to Vcc (Sinking current: 3 mA max.)
    - OFF: 1.5 V max. (Leakage current: 0.1 mA max.)
- **5.** Operate or reset: 1.5 ms
- **6.** Operate or reset: 10 ms
- **7.** Operate or reset: 1 ms
- **8.** Only the sensing object is detected when tuning.
<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-SA21</td>
<td>E3NC-SA0</td>
</tr>
<tr>
<td></td>
<td>PNP output</td>
<td>E3NC-SA51</td>
<td></td>
</tr>
<tr>
<td>Connecting method</td>
<td>Pre-wired</td>
<td>Wire-saving Connector</td>
<td>M8 Connector</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Connector for Sensor Communications Unit</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>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)</td>
<td>Operating: Groups of 1 or 2 Amplifier Units: 0 to 55°C, Groups of 3 to 10 Amplifier Units: 0 to 50°C, Groups of 11 to 16 Amplifier Units: 0 to 45°C, Groups of 17 to 30 Amplifier Units: 0 to 40°C, Storage: −30 to 70°C (with no icing or condensation)</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>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ (at 500 VDC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</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 for 2 hours each in X, Y, and Z directions</td>
<td></td>
<td>150 m/s² for 3 times each in X, Y, and Z directions</td>
</tr>
<tr>
<td>Shock resistance (destruction)</td>
<td>500 m/s² for 3 times each in X, Y, and Z directions</td>
<td></td>
<td>150 m/s² for 3 times each in X, Y, and Z directions</td>
</tr>
<tr>
<td>Weight (packed state/Amplifier Unit only)</td>
<td>Approx. 115 g/approx. 75 g</td>
<td>Approx. 60 g/approx. 20 g</td>
<td>Approx. 65 g/approx. 25 g</td>
</tr>
<tr>
<td>Materials</td>
<td>Case</td>
<td>Polycarbonate (PC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cover</td>
<td>Polycarbonate (PC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cable</td>
<td>Vinyl chloride (PVC)</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction Manual</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Engineering Data (Reference Value)

Beam Diameter Vs. Distance
Retro-reflective Model
E3NC-LH03

![Graph showing beam diameter vs. distance for E3NC-LH03](image1)

Retro-reflective Model
E3NC-LH03 + E39-P51

![Graph showing beam diameter vs. distance for E3NC-LH03 + E39-P51](image2)

Diffuse-reflective Model
E3NC-LH02

![Graph showing beam diameter vs. distance for E3NC-LH02](image3)

Diffuse-reflective Model
E3NC-LH02 + E39-P52

![Graph showing beam diameter vs. distance for E3NC-LH02 + E39-P52](image4)

Limited-reflective Model
E3NC-LH01

![Graph showing beam diameter vs. distance for E3NC-LH01](image5)

Distance-settable Model
E3NC-SH250/SH250H

![Graph showing beam diameter vs. distance for E3NC-SH250/SH250H](image6)

Distance-settable Model
E3NC-SH100

![Graph showing beam diameter vs. distance for E3NC-SH100](image7)
## 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>
</table>
| E3NC-LA21   | Light-ON       | ch1: Incident light  
ch2: No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | L lit. | ![NPN Output Circuit](image1) |
| E3NC-SA21   | Dark-ON        | ch1: Incident light  
ch2: No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | D lit. | ![NPN Output Circuit](image2) |
| E3NC-LA7    | Light-ON       | Incident light  
No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | L lit. | ![NPN Output Circuit](image3) |
| E3NC-SA7    | Dark-ON        | Incident light  
No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | D lit. | ![NPN Output Circuit](image4) |
| E3NC-LA24   | Light-ON       | Incident light  
No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | L lit. | ![NPN Output Circuit](image5) |
| E3NC-SA24   | Dark-ON        | Incident light  
No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | D lit. | ![NPN Output Circuit](image6) |

### 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>
</table>
| E3NC-LA51   | Light-ON       | ch1: Incident light  
ch2: No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | L lit. | ![PNP Output Circuit](image7) |
| E3NC-SA51   | Dark-ON        | ch1: Incident light  
ch2: No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | D lit. | ![PNP Output Circuit](image8) |
| E3NC-LA9    | Light-ON       | Incident light  
No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | L lit. | ![PNP Output Circuit](image9) |
| E3NC-SA9    | Dark-ON        | Incident light  
No incident light  
Output ON  
Transistor OFF  
Load: Operate  
(e.g., relay)  
Reset  
(Output circuit)  | D lit. | ![PNP Output Circuit](image10) |
Nomenclature

**Compact Laser Sensors**

**E3NC-LA21/LA51/LA0**

- **[LD Indicator]** Indicates the setting status: Light-ON (L) or Dark-ON (D).
- **[OUT1 Indicator/OUT2 Indicator]** Turns ON when OUT1 or OUT2 is ON.
- **[L/D Indicator]** Turns ON when Smart Tuning is in progress.
- **[ST Indicator]** Turns ON when the output is ON.
- **[MODE Button]** Used to switch between Detection Mode and Setting Mode.
- **[UP/DOWN Button]** Used to fine-tune the threshold or change set values.

**Ultra-compact CMOS Laser Sensors**

**E3NC-SA21/SA51/SA0**

- **[LD Indicator]** Indicates the setting status: Light-ON (L) or Dark-ON (D).
- **[OUT1 Indicator/OUT2 Indicator]** Turns ON when OUT1 or OUT2 is ON.
- **[ST Indicator]** Turns ON when Smart Tuning is in progress.
- **[MODE Button]** Used to switch between Detection Mode and Setting Mode.
- **[UP/DOWN Button]** Used to fine-tune the threshold or change set values.

**E3NC-SA7/LA9/LA24/LA54**

- **[LD Indicator]** Indicates the setting status: Light-ON (L) or Dark-ON (D).
- **[OUT1 Indicator]** Turns ON when the output is ON.
- **[ST Indicator]** Turns ON when Smart Tuning is in progress.
- **[MODE Button]** Used to switch between Detection Mode and Setting Mode.
- **[UP/DOWN Button]** Used to fine-tune the threshold or change set values.

**E3NC-SA7/SA9/SA24/SA54**

- **[LD Indicator]** Indicates the setting status: Light-ON (L) or Dark-ON (D).
- **[OUT1 Indicator]** Turns ON when the output is ON.
- **[ST Indicator]** Turns ON when Smart Tuning is in progress.
- **[MODE Button]** Used to switch between Detection Mode and Setting Mode.
- **[UP/DOWN Button]** Used to fine-tune the threshold or change set values.
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.

<table>
<thead>
<tr>
<th>Precautions for Safe Use</th>
<th>Precautions for Correct Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplementary comments on what to do or avoid doing, to use the product safely.</td>
<td>Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.</td>
</tr>
</tbody>
</table>

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-LH: Sensor Heads: Class 1
   - E3NC-SH: Sensor Heads: Class 1
   - E3NC-SH: Sensor Heads: Class 2

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. Application to the CDRH (Center for Devices and Radiological Health) is scheduled.
   - 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-SH, E3NC-SH: 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 SH).

3. **Using in Europe**
   - E3NC-LH, E3NC-SH:
     These Sensor Heads are classified in Class 1 under EN 60825-1.
   - E3NC-SH:
     These Sensor Heads are classified in Class 2 under EN 60825-1.

**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.

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-SH:

E3NC-SH:
H
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.

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. The degree of protection is IP67, but do not use the Sensor Head in water, rain, or outdoors. (E3NC-S Series)

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 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.

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### 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. Connect the load correctly.
8. Do not miswire such as the polarity of the power supply.
9. Do not use the Amplifier Unit if the case is damaged.
10. Burn injury may occur. The Amplifier Unit surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Use caution when operating or cleaning the Amplifier Unit.
11. When setting the sensor, be sure to check safety such as by stopping the equipment.
12. Be sure to turn off the power supply before connecting or disconnecting wires.
13. Do not attempt to disassemble, repair, or modify the Amplifier Unit in any way.
14. When disposing of the Amplifier Unit, treat it as industrial waste.

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### 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).

![Amplifier Unit with Wire-saving Connector](image1)

![Amplifier Unit with Connector for Sensor Communications Unit](image2)

3. Use an extension cable with a minimum thickness of 0.3 mm² and less than 100 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-...A21/51/7/9)
   - The Sensor Communications Unit E3X-DRT21-S, E3X-CRT, E3X-ECT and E3NW cannot be connected.
   - Model for Sensor Communications Unit (E3NC-...A0)
   - The Sensor Communications Unit E3NW can be connected.
   - E3X-DRT21-S, E3X-CRT, E3X-ECT cannot be connected.
13. If you notice an abnormal condition such as a strange odor, extreme heating of the unit, or smoke immediately stop using the product, turn off the power, and consult your dealer.
14. Do not use thinner, benzene, acetone, and lamp oil for cleaning.
Dimensions

Sensor Heads

Retro-reflective Model
E3NC-LH03

Diffuse-reflective Model
E3NC-LH02

VInyl-insuVlated 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 ferrite core is attached to the Sensor Head end of the cable attached to the E3NC-LH03 5M.
*2 A blue ID tube is attached.
Limited-reflective Model
E3NC-LH01

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 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  
Two, M3 holes

Connector

* A blue ID tube is attached.
Amplifier Units

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

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

*2. The display is as follows:
- E3NC-LA21 Incident level (white, digital)
- E3NC-LA51 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 Wire-saving Connectors
E3NC-LA7
E3NC-LA9
E3NC-SA7
E3NC-SA9

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

*2. The display is as follows:
- E3NC-LA7 Incident level (white, digital)
- E3NC-LA9 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

*1. The indicators are as follows:

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

*2. The display is as follows:

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

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>DPC indicator</th>
<th>ZERO indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LA0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SA0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*2. The display is as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Incident level (white, digital)</th>
<th>Measurement value (white, digital)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3NC-LA0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3NC-SA0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Accessories (Sold Separately)

Reflectors for Retro-reflective Sensors

**E39-R21**

- **Materials**
  - Reflective surface: Methacrylic resin (PMMA)
  - Back surface: Polybutylene terephthalate (PBT)
- **Mounting Holes**
  - Two, 3.2 dia. holes
  - 24 ± 0.1
- **Dimensions**
  - 25 x 29 x 3 mm

**E39-RS10**

- **Materials**
  - Methacrylic resin (PMMA)
- **Dimensions**
  - 25 x 29 x 3 mm

**E39-R22**

- **Materials**
  - Reflective surface: Methacrylic resin (PMMA)
  - Back surface: Polybutylene terephthalate (PBT)
- **Mounting Holes**
  - Two, 3.2 dia. holes
  - 34 ± 0.1
- **Dimensions**
  - 50 x 49 x 3 mm

**E39-RS11**

- **Materials**
  - Methacrylic resin (PMMA)
- **Dimensions**
  - 50 x 49 x 3 mm

Lens Attachment

**E39-P51**

- **Materials**
  - Main body: ABS
  - Lens: Methacrylic resin (PMMA)
- **Dimensions**
  - 12 x 4.5 x 6.2 mm

**With E39-P51 Lens Attachment Attached**

**E39-P52**

- **Materials**
  - Main body: ABS
  - Lens: Methacrylic resin (PMMA)
- **Dimensions**
  - 12 x 8.8 x 6.2 mm

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

**E39-L190**

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

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

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

*With E39-L190 Mounting Bracket Attached for Back Mounting*
**E3-L185**

**Mounting Bracket**
- Material: Stainless steel (SUS304)
- Thickness: 1.2 mm
- Accessories: Phillips screws (M3x18, P = 0.5, stainless steel): 2
- Nut plate: 1

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

**With E3-L185 Mounting Bracket Attached**

*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 (M3x18, P = 0.5, stainless steel): 2
- Nut plate: 1

**Nut Plate**
- Material: Stainless steel (SUS304)
- Thickness: 1.5 mm
With E3-L186 Mounting Bracket Attached for Bottom Mounting

With 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, 3.2 dia. holes
Two, M3 through holes
With E39-L187 Mounting Bracket Attached

E39-L188

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

With E39-L188 Mounting Bracket Attached
Wire-saving Connectors

Master Connector
E3X-CN21

Slave Connector
E3X-CN22

Sensor I/O Connectors

Straight
XS3F-M421-40-A

L-shaped
XS3F-M422-40-A

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

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

Read and understand this catalog. Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

### Warranties

(a) Exclusive Warranty. OMRON’s exclusive warranty is that the Products will be free from defects in materials and workmanship for a period of twelve months from the date of sale by OMRON (or such other period expressed in writing by OMRON). OMRON disclaims all other warranties, express or implied.

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### Suitability of Use

OMRON Companies shall not be responsible for conformity with any standards, codes or regulations which apply to the combination of the Product in the Buyer’s application or use of the Product. At Buyer’s request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use which apply to the Product. This information by itself is not sufficient for a complete determination of the suitability of the Product in combination with the end product, machine, system, or other application or use. Buyer shall be solely responsible for determining appropriateness of the particular Product with respect to Buyer’s application, product or system. Buyer shall take application responsibility in all cases. NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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OMRON Companies shall not be responsible for the user’s programming of a programmable Product, or any consequence thereof.

### Performance Data

Data presented in OMRON Company websites, catalogs and other materials is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON’s test conditions, and the user must correlate it to actual application requirements. Actual performance is subject to the OMRON’s Warranty and Limitations of Liability.

### Change in Specifications

Product specifications and accessories may be changed at any time based on improvements and other reasons. It is our practice to change part numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the Product may be changed without any notice. When in doubt, special part numbers may be assigned to fix or establish key specifications for your application. Please consult with your Omron’s representative at any time to confirm actual specifications of purchased Product.

### Errors and Omissions

Information presented by Omron Companies has been checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical or proofreading errors or omissions.

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2014.7

In the interest of product improvement, specifications are subject to change without notice.