Compact Photoelectric Sensor with Built-in Amplifier

E3Z-LS

Distance-settable Sensor Unaffected by Workpiece Color and Background

• Distance-settable triangulation model unaffected by color.
• Simple positioning settings using a clear LED spot. (E3Z-LS□3/LS□8)
• Detect minute steps.

Be sure to read Safety Precautions on page 8.

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

Ordering Information

Sensors (Refer to Dimensions on page 10.)

<table>
<thead>
<tr>
<th>Sensing method</th>
<th>Appearance</th>
<th>Connection method</th>
<th>Sensing distance (white paper)</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>NPN output</td>
<td>PNP output</td>
</tr>
<tr>
<td>Distance-</td>
<td>Pre-wired (2 m)</td>
<td>Connector (M8, 4 pins)</td>
<td>20 mm</td>
<td>200 mm</td>
</tr>
<tr>
<td>settable</td>
<td></td>
<td></td>
<td>BGS (at max. setting)</td>
<td>Incident light level threshold (fixed)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>FGS (at min. setting)</td>
<td>FGS (at max. setting)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E3Z-LS61 2M *1</td>
<td>E3Z-LS81 2M *1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E3Z-LS66</td>
<td>E3Z-LS86</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E3Z-LS63 2M</td>
<td>E3Z-LS83 2M *2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E3Z-LS68</td>
<td>E3Z-LS88</td>
</tr>
</tbody>
</table>

*1. M12 Standard Pre-wired Connector Models are also available. When ordering, add “M1J 0.3M” to the end of the model number (e.g., E3Z-LS61-M1J 0.3M). The cable is 0.3 m long.

*2. M12 Pre-wired Smartclick Connector Models are also available. When ordering, add “M1TJ 0.3M” to the end of the model number (e.g., E3Z-LS83-M1TJ 0.3M). The cable is 0.3 m long.

Accessories (Order Separately)

Mounting Brackets

Sensor I/O Connectors (Sockets on One Cable End)
(Models for Connectors: A Connector is not provided with the Sensor. Be sure to order a Connector separately.) (Refer to Dimensions on XS3)

<table>
<thead>
<tr>
<th>Cable specification</th>
<th>Appearance</th>
<th>Type of cable</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard M8 cable</td>
<td>Straight *1</td>
<td>2 m</td>
<td>4-wire</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L-shaped *1 *2</td>
<td>2 m</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 m</td>
<td>XS3F-M422-402-A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 m</td>
<td>XS3F-M422-405-A</td>
</tr>
</tbody>
</table>

*1. The connector will not rotate after connecting.

*2. The cable is fixed at an angle of 180° from the sensor emitter/receiver surface.
## Ratings and Specifications

<table>
<thead>
<tr>
<th>Sensing method</th>
<th>Distance-settable</th>
<th>Sensing method</th>
<th>Distance-settable</th>
</tr>
</thead>
<tbody>
<tr>
<td>BGS</td>
<td>White or black paper (100 × 100 mm): 20 mm to set distance</td>
<td>BGS</td>
<td>White or black paper (100 × 100 mm): 20 mm to set distance</td>
</tr>
<tr>
<td>FGS</td>
<td>White paper (100 × 100 mm): Set distance to 200 mm min. Black paper (100 × 100 mm): Set distance to 160 mm min.</td>
<td>FGS</td>
<td>White paper (100 × 100 mm): Set distance to 200 mm min. Black paper (100 × 100 mm): Set distance to 160 mm min.</td>
</tr>
<tr>
<td>Setting range</td>
<td>White paper (100 × 100 mm): 40 to 200 mm Black paper (100 × 100 mm): 40 to 160 mm</td>
<td>Setting range</td>
<td>White paper (25 × 25 mm): 20 to 80 mm</td>
</tr>
<tr>
<td>Differential travel</td>
<td>10% of set distance max. (Refer to Differential Travel vs. Sensing Distance on page 4.)</td>
<td>Differential travel</td>
<td>2% of set distance max.</td>
</tr>
<tr>
<td>Reflectivity characteristic (black/white error)</td>
<td>10% of set distance max.</td>
<td>Reflectivity characteristic (black/white error)</td>
<td>5% of set distance max.</td>
</tr>
<tr>
<td>Light source (wavelength)</td>
<td>Red LED (680 nm)</td>
<td>Light source (wavelength)</td>
<td>Red LED (650 nm)</td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>12 to 24 VDC ±10%, ripple (p-p): 10% max.</td>
<td>Power supply voltage</td>
<td>12 to 24 VDC ±10%, ripple (p-p): 10% max.</td>
</tr>
<tr>
<td>Current consumption</td>
<td>30 mA max.</td>
<td>Current consumption</td>
<td>30 mA max.</td>
</tr>
<tr>
<td>Control output</td>
<td>Load power supply voltage: 26.4 VDC max., Load current: 100 mA max. (residual voltage 1 V max.), Open collector output (NPN or PNP depending on model), Light-ON/Dark-ON switch selectable</td>
<td>Control output</td>
<td>Load power supply voltage: 26.4 VDC max., Load current: 100 mA max. (residual voltage 1 V max.), Open collector output (NPN or PNP depending on model), Light-ON/Dark-ON switch selectable</td>
</tr>
<tr>
<td>BGS/FGS selection</td>
<td>BGS: Open or connected to GND FGS: Connected to Vcc</td>
<td>BGS/FGS selection</td>
<td>BGS: Open or connected to GND</td>
</tr>
<tr>
<td>Protection circuits</td>
<td>Reversed power supply polarity protection, Output short-circuit protection, Mutual interference prevention</td>
<td>Protection circuits</td>
<td>Reversed power supply polarity protection, Output short-circuit protection, Mutual interference prevention</td>
</tr>
<tr>
<td>Response time</td>
<td>Operate or reset: 1 ms max.</td>
<td>Response time</td>
<td>Operate or reset: 1 ms max.</td>
</tr>
<tr>
<td>Distance setting</td>
<td>5-turn endless adjuster</td>
<td>Distance setting</td>
<td>5-turn endless adjuster</td>
</tr>
<tr>
<td>Ambient illumination (Receiver side)</td>
<td>Incandescent lamp: 3,000 lx max.; Sunlight: 10,000 lx max.</td>
<td>Ambient illumination (Receiver side)</td>
<td>Incandescent lamp: 3,000 lx max.; Sunlight: 10,000 lx max.</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>Operating: -25 to 55°C, Storage: -40 to 70°C (with no icing or condensation)</td>
<td>Ambient temperature range</td>
<td>Operating: -25 to 55°C, Storage: -40 to 70°C (with no icing or condensation)</td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)</td>
<td>Ambient humidity range</td>
<td>Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)</td>
</tr>
<tr>
<td>Insulation resistance</td>
<td>20 MΩ min. at 500 VDC</td>
<td>Insulation resistance</td>
<td>20 MΩ min. at 500 VDC</td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC at 50/60 Hz for 1 minute</td>
<td>Dielectric strength</td>
<td>1,000 VAC at 50/60 Hz for 1 minute</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions</td>
<td>Vibration resistance</td>
<td>Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions</td>
</tr>
<tr>
<td>Shock resistance</td>
<td>Destruction: 500 m/s² for 3 times each in X, Y, and Z directions</td>
<td>Shock resistance</td>
<td>Destruction: 500 m/s² for 3 times each in X, Y, and Z directions</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP67 (IEC 60529)</td>
<td>Degree of protection</td>
<td>IP67 (IEC 60529)</td>
</tr>
<tr>
<td>Connection method</td>
<td>Pre-wired (standard lengths: 2 m and 0.5 m) Connector (M8, 4 pins)</td>
<td>Connection method</td>
<td>Pre-wired (standard lengths: 2 m and 0.5 m) Connector (M8, 4 pins)</td>
</tr>
<tr>
<td>Indicators</td>
<td>Operation indicator (orange), Stability indicator (green)</td>
<td>Indicators</td>
<td>Operation indicator (orange), Stability indicator (green)</td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Pre-wired Sensors, 2 m: Approx. 65 g</td>
<td>Weight (packed state)</td>
<td>Pre-wired Sensors, 2 m: Approx. 65 g</td>
</tr>
<tr>
<td>Material</td>
<td>Case: PBT (polybutylene terephthalate)</td>
<td>Accessories</td>
<td>Instruction manual (Mounting Brackets must be ordered separately.)</td>
</tr>
<tr>
<td>Lens</td>
<td>Modified polyarylate resin</td>
<td>Accessories</td>
<td>Instruction manual (Mounting Brackets must be ordered separately.)</td>
</tr>
</tbody>
</table>
Engineering Data (Reference Value)

### Operating Range

**E3Z-LS□1/LS□6**

BGS

- Set distance: 40 mm, 200 mm
- Sensing object: White paper, 100 x 100 mm

FGS

- Set distance: 40 mm, 200 mm
- Sensing object: White paper, 100 x 100 mm

**E3Z-LS□3/LS□8**

- Set distance: 80 mm
- Sensing object: White paper, 100 x 100 mm

### Spot Diameter vs. Sensing Distance

**E3Z-LS□1/LS□6**

- Sensing distance (mm): 0, 30, 40, 50, 60, 70, 80, 90
- Spot diameter (mm): 4.5, 4.0, 3.5, 3.0, 2.5, 2.0, 1.5, 1.0, 0.5

**E3Z-LS□3/LS□8**

- Sensing distance (mm): 0, 20, 30, 40, 50, 60, 70, 80
- Spot diameter (mm): 4.8, 4.0, 3.2, 2.5, 1.8, 1.0, 0.5

### Close-range Characteristics

**E3Z-LS□1/LS□6**

- Set distance: 40 mm
- Sensing object: White paper
- Set distance: 200 mm

**E3Z-LS□3/LS□8**

- Set distance: 20 mm
- Sensing object: White paper
- Set distance: 80 mm

Material:

- White paper
- Black paper

Sensing distance (mm):

- 4 mm
- 9 mm
- 14 mm
- 19 mm
- 25 mm
- 31 mm
- 37 mm
- 43 mm
- 49 mm
- 55 mm

Spot diameter (mm):

- 0 mm
- 0.5 mm
- 1.0 mm
- 1.5 mm
- 2.0 mm
- 2.5 mm
- 3.0 mm
- 3.5 mm
- 4.0 mm
- 4.5 mm

Distance X (mm):

- 50, 100, 150, 200, 250

Operating range Y (mm):

- 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50

Distance X (mm):

- 10, 20, 30, 40, 50, 60, 70, 80, 90, 100

Operating range Y (mm):

- 80 mm

Material:

- White paper
- Black paper
Differential Travel vs. Sensing Distance

**E3Z-LS□1/LS□6**

- Black paper
- White paper

**E3Z-LS□3/LS□8**

- Black paper
- White paper

Sensing Object Angle Characteristics

**E3Z-LS□1/LS□6**

**Vertical**

- Set distance: 40 mm, 200 mm
- Sensing object: White paper, 100 mm x 100 mm

**Horizontal**

- Set distance: 40 mm, 200 mm
- Sensing object: White paper, 100 mm x 100 mm

**E3Z-LS□3/LS□8**

**Vertical**

- Set distance: 20 mm, 80 mm
- Sensing object: White paper, 100 mm x 100 mm

**Horizontal**

- Set distance: 20 mm, 80 mm
- Sensing object: White paper, 100 mm x 100 mm
FGS Mode Set Distance

E3Z-LS 1/LS 6

White Paper

Sensing Distance vs. Sensing Object Material

E3Z-LS 3/LS 8

Set Distance of 40 mm using White Paper

Set Distance of 200 mm using White Paper

Set Distance of 20 mm using White Paper

Set Distance of 80 mm using White Paper
### NPN Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation mode</th>
<th>Timing charts</th>
<th>Operation selector</th>
<th>BGS/FGS selection method</th>
<th>Output circuit</th>
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</thead>
<tbody>
<tr>
<td>E3Z-LS61</td>
<td>Light-ON</td>
<td>Operation indicator (orange) ON</td>
<td>NEAR FAR</td>
<td>L side (LIGHT ON)</td>
<td>BGS: Either leave the pink wire (2) open or connect it to the blue wire (3).</td>
</tr>
<tr>
<td>E3Z-LS66</td>
<td></td>
<td>Output transistor OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3Z-LS63</td>
<td></td>
<td>Load (e.g., relay) OFF (Between brown (1) and black (4) leads)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3Z-LS68</td>
<td>Dark-ON</td>
<td>Operation indicator (orange) ON</td>
<td>NEAR FAR</td>
<td>D side (DARK ON)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Output transistor OFF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Load (e.g., relay) OFF (Between brown (1) and black (4) leads)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The VERY FAR region is supported only for FGS. The incident light level threshold is fixed and cannot be set.
PNP Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation mode</th>
<th>Timing charts</th>
<th>Operation selector</th>
<th>BGS/FGS selection method</th>
<th>Output circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3Z-LS81</td>
<td>Light-ON</td>
<td>ON OFF NEAR</td>
<td>L side (LIGHT ON)</td>
<td>BGS: Either leave the</td>
<td></td>
</tr>
<tr>
<td>E3Z-LS86</td>
<td>Light-ON</td>
<td>ON OFF NEAR</td>
<td>L side (LIGHT ON)</td>
<td>BGS: Either leave the</td>
<td></td>
</tr>
<tr>
<td>E3Z-LS83</td>
<td>Dark-ON</td>
<td>ON OFF FAR</td>
<td>D side (DARK ON)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3Z-LS88</td>
<td>Dark-ON</td>
<td>ON OFF FAR</td>
<td>D side (DARK ON)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Plugs (Sensor I/O Connectors)

M8 connector

Pin arrangement

<table>
<thead>
<tr>
<th>Classification</th>
<th>Wire color</th>
<th>Connector pin No.</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown</td>
<td>1</td>
<td>DC</td>
<td>Power supply (+V)</td>
</tr>
<tr>
<td>White</td>
<td>2</td>
<td>BGS/FGS selection</td>
<td></td>
</tr>
<tr>
<td>Blue</td>
<td>3</td>
<td>Power supply (0 V)</td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>4</td>
<td>Output</td>
<td></td>
</tr>
</tbody>
</table>

Nomenclature

Set distance adjuster (5-turn endless adjustment)
Stability indicator (green)
Operation indicator (orange)
Operation selector
Safety Precautions

Refer to Safety Precautions of the E3Z and Warranty and Limitations of Liability.

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

⚠️ Caution
Do not connect an AC power supply to the Sensor. If AC power (100 VAC or more) is supplied to the Sensor, it may explode or burn.

Precautions for Safe Use
Be sure to abide by the following precautions for the safe operation of the Sensor.

● Wiring
Power Supply Voltage and Output Load

Power Supply Voltage
Make sure that the power supply to the Sensor is within the rated voltage range. If a voltage exceeding the rated voltage range is supplied to the Sensor, it may explode or burn.

Load Short-circuiting
Do not short-circuit the load, otherwise the Sensor may be damaged.

Connection without Load
Do not connect the power supply to the Sensor with no load connected, otherwise the internal elements may explode or burn.

● Operating Environment
Do not use the Sensor in locations with explosive or flammable gas.

Precautions for Correct Use
Do not use the product in atmospheres or environments that exceed product ratings.

● Designing
Power Reset Time
The Sensor is ready to operate 100 ms after the Sensor is turned ON. If the load and Sensor are connected to independent power supplies respectively, be sure to turn ON the Sensor before supplying power to the load.

● Wiring
Avoiding Malfunctions
If using the Sensor with an inverter or servomotor, always ground the FG (frame ground) and G (ground) terminals, otherwise the Sensor may malfunction.

Mounting the Sensor

● Mounting

Mounting the Sensor
• If Sensors are mounted face-to-face, make sure that the optical axes are not in opposition to each other. Otherwise, mutual interference may result.
• Always install the Sensor carefully so that the aperture angle range of the Sensor will not cause it to be directly exposed to intensive light, such as sunlight, fluorescent light, or incandescent light.
• Do not strike the Photoelectric Sensor with a hammer or any other tool during the installation of the Sensor, or the Sensor will lose its water-resistant properties.
• Use M3 screws to mount the Sensor.
• When mounting the case, make sure that the tightening torque applied to each screw does not exceed 0.54 N·m.

M8 Connector

• Always turn OFF the power supply to the Sensor before connecting or disconnecting the metal connector.
• Hold the connector cover to connect or disconnect it. If the XS3F is used, always tighten the connector cover by hand. Do not use pliers.
• If the connector is not connected securely, it may be disconnected by vibration or the proper degree of protection of the Sensor may not be maintained. The appropriate tightening torque is 0.3 to 0.4 N·m.
• If other commercially available connectors are used, follow the recommended connector application conditions and recommended tightening torque specifications.

Mounting Directions

• Make sure that the sensing side of the Sensor is parallel with the surface of the sensing objects. Normally, do not incline the Sensor towards the sensing object.

If the sensing object has a glossy surface, however, incline the Sensor by 5° to 10° as shown in the illustration, provided that the Sensor is not influenced by background objects.

• If there is a mirror-like object below the Sensor, the Sensor may not operate stably. Therefore, incline the Sensor or separate the Sensor from the mirror-like object as shown below.
Do not install the Sensor in the wrong direction. Refer to the following illustration.

Install the Sensor as shown in the following illustration if each sensing object greatly differs in color or material.

---

### Adjusting Indicator Operation

<table>
<thead>
<tr>
<th></th>
<th>Stability (green)</th>
<th>Operation (orange)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BGS</strong></td>
<td>L/ON ON</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>D/ON OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Stability (green)</th>
<th>Operation (orange)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>FGS</strong></td>
<td>L/ON OFF</td>
<td>OFF</td>
</tr>
<tr>
<td></td>
<td>D/ON OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Note: 1. If the stability indicator is lit, the detection/no detection status is stable within the rated ambient operating temperature (−25 to 55°C).
2. The VERY FAR region is supported only for FGS. The incident light threshold depends on the color and gloss of the sensing object's surface.

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### Inspection and Maintenance

#### Cleaning

Never use paint thinners or other organic solvents to clean the surface of the product.
E3Z-LS Dimensions

Dimensions in this datasheet unless otherwise specified.

Pre-wired Models
E3Z-LS61
E3Z-LS81
E3Z-LS63
E3Z-LS83

Emitter
Lens 7 dia.
Two, M3

Operation
Indicator (orange)

Set distance adjuster
Stability indicator (green)

Operation
selector

25.4
4 dia. vinyl-insulated round cable with
4 conductors (Conductor cross section:
0.2 mm² (AWG24), Insulator diameter:1.1 mm),
Standard length: 2 m and 0.5m

Receiver
Lens 7 dia.

Connector Models
E3Z-LS66
E3Z-LS86
E3Z-LS68
E3Z-LS88

Operation
Indicator (orange)

Set distance adjuster
Stability indicator (green)

Operation
selector

9.75

Terminal
No.
Specifications

1
+V

2
BGS/FGS switchable

3
0 V

4
Output

OMRON
Terms and Conditions Agreement

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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.

Programmable Products.
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.