Stainless Steel Housing Ideal for Food Industry

- Strong resistance against detergents, disinfectants, and jet liquid flow.
- Product lineup includes BGS Reflective Models and Through-beam Models with built-in slits.
- Certified by Ecolab Europe.

Features

**World’s Strongest**
Withstands Detergent and Disinfectant Spray

We used SUS316L for the case and the best material for all parts to achieve 200 times the durability of the E3Z (in 1.5% solution of sodium hydroxide at 70°C) to make the E3ZM suitable for the cleaning conditions of food-processing machinery.

**World’s First**
Superior Protective Structure

The first IP69K* (DIN 40050-9) protective structure in the world for a square metal photoelectric sensor. Suitable for high-temperature, high-pressure jet water spray cleaning applications.

* Refer to the footnote on page 5 (ratings and specifications table).

**Industry’s Best**
Shape and Markings Designed for Greater Hygiene

Few indentations in the shape means less dust and water can collect, making the E3ZM more hygienic. No labels have been used in order to prevent foreign matter contaminating food products. The E3ZM model and lot numbers are imprinted using a laser marker.

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

Be sure to read Safety Precautions on page 13.
Structural Design That Provides Excellent Environment-resistance*

Unique Members of the E3ZM Family

BGS Reflective Models
E3ZM-LS6@H/LS8@H

Three models with different fixed sensitivity (rated sensing distances) have been created. These models cover the sensing ranges of the E3Z-LS61.

Through-beam Inner Aperture Models
E3ZM-T63

Fine beam without attaching an external aperture. This eliminates malfunctions from residual water drops, even immediately after washing.

A Better Fit for the Application

The E3ZM can be used in those harsh cleaning environments in which the E3Z was difficult to use. E3ZM passed the material resistance tests and is certified by Ecolab.

*Do not use the E3ZM in an oily environment.

E3ZM

Processing and wrapping of meat or raw food products
### Ordering Information

#### Sensors  
*(Refer to Dimensions on page 15.)*

<table>
<thead>
<tr>
<th>Sensing method</th>
<th>Appearance</th>
<th>Connection method</th>
<th>Sensing method</th>
<th>Model</th>
<th>NPN output</th>
<th>PNP output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Through-beam (Emitter + Receiver)</td>
<td><img src="image1" alt="Image" /></td>
<td>Pre-wired (2 m)</td>
<td>Pre-wired (2 m)</td>
<td>E3ZM-T61 2M</td>
<td>E3ZM-T81 2M</td>
<td>E3ZM-T66</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector (M8, 4 pins)</td>
<td></td>
<td>E3ZM-T63 2M</td>
<td>E3ZM-T83 2M</td>
<td>E3ZM-T68</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T61-L 2M</td>
<td>E3ZM-T81-L 2M</td>
<td>E3ZM-T66-L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T61-D 2M</td>
<td>E3ZM-T81-D 2M</td>
<td>E3ZM-T66-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre-wired (2 m)</td>
<td></td>
<td>E3ZM-T61-L 2M</td>
<td>E3ZM-T81-L 2M</td>
<td>E3ZM-T66-L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector (M8, 4 pins)</td>
<td></td>
<td>E3ZM-T61-D 2M</td>
<td>E3ZM-T81-D 2M</td>
<td>E3ZM-T66-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T63-L 2M</td>
<td>E3ZM-T83-L 2M</td>
<td>E3ZM-T68-L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T63-D 2M</td>
<td>E3ZM-T83-D 2M</td>
<td>E3ZM-T68-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pre-wired (2 m)</td>
<td></td>
<td>E3ZM-T61-L 2M</td>
<td>E3ZM-T81-L 2M</td>
<td>E3ZM-T66-L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Connector (M8, 4 pins)</td>
<td></td>
<td>E3ZM-T61-D 2M</td>
<td>E3ZM-T81-D 2M</td>
<td>E3ZM-T66-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T63-L 2M</td>
<td>E3ZM-T83-L 2M</td>
<td>E3ZM-T68-L</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T63-D 2M</td>
<td>E3ZM-T83-D 2M</td>
<td>E3ZM-T68-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T66-L</td>
<td>E3ZM-T86-L</td>
<td>E3ZM-T66-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T66-D</td>
<td>E3ZM-T86-D</td>
<td>E3ZM-T66-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T68-L</td>
<td>E3ZM-T88-L</td>
<td>E3ZM-T68-D</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E3ZM-T68-D</td>
<td>E3ZM-T88-D</td>
<td>E3ZM-T68-D</td>
</tr>
</tbody>
</table>

*1. The Reflector is sold separately. Select the Reflector model most suited to the application.
2. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

### Accessories (Order Separately)

#### Reflectors  
*(A Reflector is required for each Retro-reflective Sensor: A Reflector is not provided with the Sensor. Be sure to order a Reflector.)*

*(Refer to Dimensions on E39-L/E39-S/E39-R)*

<table>
<thead>
<tr>
<th>Name</th>
<th>Sensing distance</th>
<th>Model</th>
<th>Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflector</td>
<td>3 m (100 mm)</td>
<td>E39-R1</td>
<td>1</td>
<td>* Reflector are not provided with Retro-reflective models.</td>
</tr>
<tr>
<td></td>
<td>4 m (100 mm)</td>
<td>E39-R1S</td>
<td>1</td>
<td>The MSR function is enabled.</td>
</tr>
<tr>
<td></td>
<td>5 m (100 mm)</td>
<td>E39-R2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2.5 m (100 mm)</td>
<td>E39-R9</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.5 m (100 mm)</td>
<td>E39-R10</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Fog Preventive Coating</td>
<td>3 m (100 mm)</td>
<td>E39-R1K</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Small Reflector</td>
<td>1.5 m (50 mm)</td>
<td>E39-R3</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>700 mm (150 mm)</td>
<td>E39-RS1</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Tape Reflector</td>
<td>1.1 m (150 mm)</td>
<td>E39-RS2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.4 m (150 mm)</td>
<td>E39-RS3</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

* Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

Note: If you use the Reflector at any distance other than the rated distance, make sure that the stability indicator lights properly when you install the Sensor.
E3ZM

**Mounting Brackets**  A Mounting Bracket is not enclosed with the Sensor. Order a Mounting Bracket separately if required.  
*(Refer to Dimensions on E39-L/F39-L/E39-S/E39-R)*

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Model (Material)</th>
<th>Quantity</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>E39-L153 (SUS304)</td>
<td>1</td>
<td>Mounting Brackets</td>
<td></td>
</tr>
<tr>
<td>E39-L104 (SUS304)</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E39-L43 (SUS304)</td>
<td>1</td>
<td>Horizontal Mounting Bracket</td>
<td></td>
</tr>
<tr>
<td>E39-L142 (SUS304)</td>
<td>1</td>
<td>Horizontal Protective Cover Bracket</td>
<td></td>
</tr>
<tr>
<td>E39-L44 (SUS304)</td>
<td>1</td>
<td>Rear Mounting Bracket</td>
<td></td>
</tr>
<tr>
<td>E39-L98 (SUS304)</td>
<td>1</td>
<td>Metal Protective Cover Bracket</td>
<td></td>
</tr>
<tr>
<td>E39-L150 (SUS304)</td>
<td>1 set</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E39-L151 (SUS304)</td>
<td>1 set</td>
<td>(Sensor adjuster)</td>
<td></td>
</tr>
<tr>
<td>E39-L144 (SUS304)</td>
<td>1</td>
<td>Compact Protective Cover Bracket</td>
<td></td>
</tr>
</tbody>
</table>

Note: When using a Through-beam Sensor, order one Mounting Bracket for the Receiver and one for the Emitter.  
*1. Cannot be used for Standard Connector models with mounting surface on the bottom. In that case, use Pre-wired Connector models.  
*2. Cannot be used for Standard Connector models.

**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>Size</th>
<th>Cable</th>
<th>Appearance</th>
<th>Cable type</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>M8 (4 pins) *1</td>
<td>Standard</td>
<td>Straight *2</td>
<td>2 m</td>
<td>4-wire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>L-shaped *2 *3</td>
<td>2 m</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5 m</td>
<td></td>
</tr>
</tbody>
</table>

Note: When using a Through-beam Sensor, order one Mounting Bracket for the Receiver and one for the Emitter.  
*1. Cable specifications: Outer coating material: PVC, Nut material: Stainless steel, Degree of protection: IP67 (IEC 60529)  
*2. The connector will not rotate after connecting.  
*3. The cable is fixed at an angle of 180° from the sensor emitter/receiver surface.
IP69K Degree of Protection Specifications
IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards. The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.

The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensing method</th>
<th>Through-beam</th>
<th>Retro-reflective with MSR function</th>
<th>Diffuse-reflective Models</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN output</td>
<td>E3ZM-T61</td>
<td>E3ZM-T63</td>
<td>E3ZM-R61</td>
<td>E3ZM-D62</td>
</tr>
<tr>
<td></td>
<td>E3ZM-T66</td>
<td>E3ZM-T68</td>
<td>E3ZM-R66</td>
<td>E3ZM-D67</td>
</tr>
<tr>
<td>PNP output</td>
<td>E3ZM-T81</td>
<td>E3ZM-T83</td>
<td>E3ZM-R81</td>
<td>E3ZM-D82</td>
</tr>
<tr>
<td></td>
<td>E3ZM-T86</td>
<td>E3ZM-T88</td>
<td>E3ZM-R86</td>
<td>E3ZM-D67</td>
</tr>
<tr>
<td>Sensing distance</td>
<td>15 m</td>
<td>0.8 m</td>
<td>4 m [100 mm] (Using E39-R1S)</td>
<td>1 m (White paper 300 x 300 mm)</td>
</tr>
<tr>
<td>Spot diameter (typical)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Standard sensing object</td>
<td>Opaque: 12-mm dia. min.</td>
<td>Opaque: 2-mm dia. min.</td>
<td>Opaque: 75-mm dia. min.</td>
<td>--</td>
</tr>
<tr>
<td>Differential travel</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>20% of sensing distance max.</td>
</tr>
<tr>
<td>Black/white error</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Directional angle</td>
<td>Emitter, Receiver: 3° to 15°</td>
<td>Sensor: 3° to 10°</td>
<td>Reflector: 30°</td>
<td>--</td>
</tr>
<tr>
<td>Light source (wavelength)</td>
<td>Infrared LED (870 nm)</td>
<td>Red LED (660 nm)</td>
<td>Infrared LED (860 nm)</td>
<td></td>
</tr>
<tr>
<td>Power supply voltage</td>
<td>10 to 30 VDC, including 10% ripple (p-p)</td>
<td>40 mA max. (Emitter 20 mA max., Receiver 20 mA max.)</td>
<td>25 mA max.</td>
<td></td>
</tr>
<tr>
<td>Current consumption</td>
<td>40 mA max.</td>
<td>Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.)</td>
<td>Open-collector output (NPN/PNP output depending on model)</td>
<td></td>
</tr>
<tr>
<td>Control output</td>
<td>Light-ON/Dark-ON switch selectable</td>
<td>Reversed power supply polarity protection, Output short-circuit protection, and Reversed output polarity protection</td>
<td>Reversed power supply polarity protection, Output short-circuit protection, Mutual interference prevention, and Reversed output polarity protection</td>
<td></td>
</tr>
<tr>
<td>Protection circuits</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Response time</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Sensitivity adjustment</td>
<td>One-turn adjuster</td>
<td>One-turn adjuster</td>
<td>One-turn adjuster</td>
<td></td>
</tr>
<tr>
<td>Ambient illumination (Receiver side)</td>
<td>Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.</td>
<td>--</td>
<td>--</td>
<td></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>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Ambient humidity range</td>
<td>Operating: 35% to 85%, Storage: 35% to 95% (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>40 mA max. (Emitter 20 mA max., Receiver 20 mA max.)</td>
<td>25 mA max.</td>
<td></td>
</tr>
<tr>
<td>Dielectric strength</td>
<td>1,000 VAC, 50/60 Hz for 1 min</td>
<td>Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.)</td>
<td>Open-collector output (NPN/PNP output depending on model)</td>
<td></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>Reversed power supply polarity protection, Output short-circuit protection, and Reversed output polarity protection</td>
<td>Reversed power supply polarity protection, Output short-circuit protection, Mutual interference prevention, and Reversed output polarity protection</td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>Destruction: 500 m/s² 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, DIN 40050-9: IP69K</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Connection method</td>
<td>Pre-wired cable (standard length: 2 m)</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Indicator</td>
<td>Operation indicator (yellow), Stability indicator (green) (Emitter has only power supply indicator (green).)</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Weight (packed state)</td>
<td>Pre-wired models (with 2-m cable)</td>
<td>Approx. 150 g</td>
<td>Approx. 90 g</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connector models</td>
<td>Approx. 60 g</td>
<td>Approx. 40 g</td>
<td></td>
</tr>
<tr>
<td>Materials</td>
<td>Case</td>
<td>SUS316L</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lens</td>
<td>PMMA (polymethylmethacrylate)</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Display</td>
<td>PEI (Polyetherimide)</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sensitivity adjustment and mode selector switch</td>
<td>PEEK (polyetheretherketone)</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Seals</td>
<td>Fluoro rubber</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td>Instruction sheet (Note: Reflectors and Mounting Brackets are sold separately.)</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

* IP69K Degree of Protection Specifications

The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.
### IP69K Degree of Protection Specifications

IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards. The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute. The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.

### BGS Reflective Models

<table>
<thead>
<tr>
<th>Model</th>
<th>Sensing method</th>
<th>Sensing distance</th>
<th>Spot diameter (typical)</th>
<th>Standard sensing object</th>
<th>Differential travel</th>
<th>Black/white error</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN output</td>
<td>E3ZM-LS61H</td>
<td>10 to 200 mm</td>
<td>12-mm dia. at sensing distance of 100 mm</td>
<td>---</td>
<td>3% of sensing distance max.</td>
<td>5% of sensing distance max.</td>
</tr>
<tr>
<td></td>
<td>E3ZM-LS66H</td>
<td>(White paper 100 x 100 mm)</td>
<td>（White paper 100 x 100 mm)</td>
<td>---</td>
<td>15% of sensing distance max.</td>
<td>10% of sensing distance max.</td>
</tr>
<tr>
<td>PNP output</td>
<td>E3ZM-LS81H</td>
<td>10 to 200 mm</td>
<td>18-mm dia. at sensing distance of 200 mm</td>
<td>---</td>
<td>20% of sensing distance max.</td>
<td>20% of sensing distance max.</td>
</tr>
<tr>
<td></td>
<td>E3ZM-LS86H</td>
<td>(White paper 100 x 100 mm)</td>
<td>（White paper 100 x 100 mm)</td>
<td>---</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Power supply voltage

10 to 30 VDC, including 10% ripple (p-p)

### Control output

Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.)

- Open-collector output (NPN/PNP output depending on model)
- Light-ON/Dark-ON cable connection selectable

### Protection circuits

- Reversed power supply polarity protection, Output short-circuit protection, Reversed output polarity protection
- Mutual interference protection

### Response time

Operate or reset: 1 ms max.

### Sensitivity adjustment

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### Ambient illumination (Receiver side)

- Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.

### Ambient temperature range

- Operating: -25 to 55°C, Storage: -40 to 70°C (with no icing or condensation)

### Ambient humidity range

- Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)

### Insulation resistance

20 MΩ min. at 500 VDC

### Dielectric strength

1,000 VAC, 50/60 Hz for 1 min

### Vibration resistance

Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions

### Shock resistance

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

### Degree of protection *

IEC: IP67, DIN 40050-9: IP69K

### Connection method

- Pre-wired cable (standard length: 2 m)
- M8 4-pin Connector

### Indicator

- Operation indicator (yellow), Stability indicator (green)

### Weight (packed state)

- Pre-wired models (with 2-m cable): Approx. 90 g
- Connector models: Approx. 40 g

### Materials

- Case: SUS316L
- Lens: PMMA (polymethylmethacrylate)
- Display: PEI (Polyetherimide)
- Seals: Fluoro rubber

### Accessories

- Instruction sheet (Note: Mounting Brackets are sold separately.)

---

*IP69K Degree of Protection Specifications

IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards.

The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute. The distance between the test item and the nozzle is 10 to 15 cm. The water is discharged at angles of 0°, 30°, 60°, and 90° from the horizontal plane for 30 seconds at each angle while the test item is rotated horizontally.
Engineering Data (Reference Value)

**Parallel Operating Range**

**Through-beam Models**
- E3ZM-T6
- E3ZM-T8

**Retro-reflective Models**
- E3ZM-R1(R6)

**Operating Range**

**Diffuse-reflective Models**
- E3ZM-D7

**BGS Reflective Models**
- E3ZM-LS1H(LS6H), Top to Bottom
- E3ZM-LS1H(LS6H), Left to Right

**E3ZM-LS2H(LS7H), Top to Bottom**

**E3ZM-LS2H(LS7H), Left to Right**

**E3ZM-LS4H(LS9H), Top to Bottom**

**E3ZM-LS4H(LS9H), Left to Right**
**Excess Gain vs. Distance**

**Through-beam Models**
- E3ZM-T@1(T@6)
- E3ZM-T@3(T@8)

**Retro-reflective Models**
- E3ZM-R@1(R@6)

**Diffuse-reflective Models**
- E3ZM-D@2(D@7)

**Sensing Object Size vs. Distance**
- Diffuse-reflective Models: E3ZM-D@2(D@7)
- BGS Reflective Models: E3ZM-LS@1H(LS@6H)

**Spot Diameter vs. Distance**
- BGS Reflective Models: E3ZM-LS@2H/LS@4H(LS@7H/LS@9H)
Sensing Distance vs. Sensing Object Material
BGS Reflective Models
E3ZM-LS®1H(LS®6H)

Inclination Characteristics (Vertical)
BGS Reflective Models
E3ZM-LS®1H(LS®6H)

Inclination Characteristics (Horizontal)
BGS Reflective Models
E3ZM-LS®1H(LS®6H)
I/O Circuit Diagrams

NPN Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation mode</th>
<th>Timing charts</th>
<th>Operation selector</th>
<th>Output circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Light-ON</strong></td>
<td>Light incident</td>
<td>Light interrupted</td>
<td>Operation indicator</td>
<td>Through-beam Receivers, Retro-reflective Models</td>
</tr>
<tr>
<td></td>
<td>Operation indicator</td>
<td>ON</td>
<td>OFF</td>
<td>Output circuit</td>
</tr>
<tr>
<td></td>
<td>Load (e.g., relay)</td>
<td>ON</td>
<td>OFF</td>
<td>Operate</td>
</tr>
<tr>
<td>E3ZM-T61*</td>
<td>L side (LIGHT ON)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-T63*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-T66*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-T68*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-R61</td>
<td>Dark-ON</td>
<td>Light incident</td>
<td>Light interrupted</td>
<td>Stability indicator (Green)</td>
</tr>
<tr>
<td>E3ZM-R66</td>
<td></td>
<td>Operation indicator</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>E3ZM-D62</td>
<td></td>
<td>Load (e.g., relay)</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>E3ZM-D67</td>
<td></td>
<td>Operate</td>
<td>Reset</td>
<td></td>
</tr>
</tbody>
</table>

* Models numbers for Through-beam Sensors (E3ZM-T\(\ bars\)) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3ZM-T61-L 2M), the model number of the Receiver, by adding "-D" (example: E3ZM-T61-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

Through-beam Emitter

- **Light-ON**
  - Operation indicator (near)
  - Output transistor
  - Load (e.g., relay)
  - Connect pink lead (2) to brown lead (1).

- **Dark-ON**
  - Operation indicator (near)
  - Output transistor
  - Load (e.g., relay)
  - Connect pink lead (2) to blue lead (3) or leave open.

10 to 30 VDC

0 V

100 mA max.

Brown

Black

Blue
## PNP Output

<table>
<thead>
<tr>
<th>Model</th>
<th>Operation mode</th>
<th>Timing charts</th>
<th>Operation selector</th>
<th>Output circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td>E3ZM-T81*</td>
<td>Light-ON</td>
<td>Operation indicator (yellow) ON OFF Light incident Output transistor ON OFF</td>
<td>L side (LIGHT ON)</td>
<td>Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models</td>
</tr>
<tr>
<td>E3ZM-T83*</td>
<td>Light-ON</td>
<td>Operation indicator (yellow) ON OFF Light interrupted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-T86*</td>
<td>Light-ON</td>
<td>Operation indicator (yellow) ON OFF Light interrupted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-T88*</td>
<td>Light-ON</td>
<td>Operation indicator (yellow) ON OFF Light interrupted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-R81</td>
<td>Dark-ON</td>
<td>Operation indicator (yellow) OFF ON Light interrupted Load (e.g., relay) Operate Reset (Between blue (1) and black (2) leads)</td>
<td>D side (DARK ON)</td>
<td></td>
</tr>
<tr>
<td>E3ZM-R86</td>
<td>Dark-ON</td>
<td>Operation indicator (yellow) OFF ON Light interrupted Load (e.g., relay) Operate Reset (Between blue (1) and black (2) leads)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-D82</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E3ZM-D87</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Models numbers for Through-Beam Sensors (E3ZM-T….) are for sets that include both the Emitter and Receiver. The model number of the Emitter is expressed by adding “-L” to the set model number (example: E3ZM-T81-L 2M), the model number of the Receiver, by adding “-D” (example: E3ZM-T81-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

### Connector Pin Arrangement

**M8 Connector (-CN)/M8 Pre-wired Connector**

**M8 4-pin Connector Pin Arrangement**

![M8 Connector Pin Arrangement Diagram]

**Plugs (Sensor I/O Connectors)**

**M8 4-pin Connectors**

![M8 4-pin Connectors Diagram]
Nomenclature

Sensors with Sensitivity Adjustment and Mode Selector Switch

Through-beam Models
E3ZM-T-D (Receiver)

Retro-reflective Models
E3ZM-R

Diffuse-reflective Models
E3ZM-D

Infinite Adjustment Emitter

BGS Reflective Models
E3ZM-LS-H

Through-beam Models
E3ZM-T-L (Emitter)
Safety Precautions

Refer to Warranty and Limitations of Liability.

**WARNING**
This product is not designed or rated for ensuring safety of persons. Do not use it for such a purpose.

**CAUTION**
Do not use the product with voltage in excess of the rated voltage. Excess voltage may result in malfunction or fire.

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

When cleaning the product, do not apply a concentrated spray of water to one part of the product. Otherwise, parts may become damaged and the degree of protection may be degraded.

High-temperature environments may result in burn injury.

---

**Precautions for Safe Use**

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

**Operating Environment**
Do not use the Sensor in an environment where explosive or flammable gas is present.

**Connecting Connectors**
Be sure to hold the connector cover when inserting or removing the connector.
If the XS3F is used, always tighten the connector cover by hand. Do not use pliers.
If the tightening is insufficient, the degree of protection will not be maintained and the Sensor may become loose due to vibration. 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.

**Load**
Do not use a load that exceeds the rated load.

**Low-temperature Environments**
Do not touch the metal surface with your bare hands when the temperature is low. Touching the surface may result in a cold burn.

**Rotation Torque for Sensitivity Adjustment and Selector Switch**
Adjust with a torque of 0.06 N·m or less.

**Oily Environments**
Do not use the Sensor in oily environments.

**Modifications**
Do not attempt to disassemble, repair, or modify the Sensor.

**Outdoor Use**
Do not use the Sensor in locations subject to direct sunlight.

**Cleaning**
Do not use thinner, alcohol, or other organic solvents. Otherwise, the optical properties and degree of protection may be degraded.

**Washing**
Do not use highly concentrated detergents. They may cause malfunction. Do not use high-pressure water spray in excess of the specifications.

**Surface Temperature**
Burn injury may occur. The Sensor surface temperature rises depending on application conditions, such as the surrounding temperature and the power supply voltage. Use caution when operating or washing the Sensor.
Precautions for Correct Use

Do not install the Sensor in the following locations.
(1) Locations subject to direct sunlight
(2) Locations subject to condensation due to high humidity
(3) Locations subject to corrosive gas
(4) Locations where the Sensor may receive direct vibration or shock

Connecting and Mounting
(1) The maximum power supply voltage is 30 VDC. Before turning the power ON, make sure that the power supply voltage does not exceed the maximum voltage.
(2) Laying Sensor wiring in the same conduit or duct as high-voltage wires or power lines may result in malfunction or damage due to induction. As a general rule, wire the Sensor in a separate conduit or use shielded cable.
(3) Use an extension cable with a minimum thickness of 0.3 mm² and less than 100 m long.
(4) Do not pull on the cable with excessive force.
(5) Pounding the Photoelectric Sensor with a hammer or other tool during mounting will impair water resistance. Also, use M3 screws.
(6) Mount the Sensor either using the bracket (sold separately) or on a flat surface.
(7) Be sure to turn OFF the power supply before inserting or removing the connector.

Cleaning
Never use thinner or other solvents. Otherwise, the Sensor surface may be dissolved.

Power Supply
If a commercial switching regulator is used, ground the FG (frame ground) terminal.

Power Supply Reset Time
The Sensor will be able to detect objects 100 ms after the power supply is tuned ON. Start using the Sensor 100 ms or more after turning ON the power supply. If the load and the Sensor are connected to separate power supplies, be sure to turn ON the Sensor first.

Turning OFF the Power Supply
Output pulses may be generated even when the power supply is OFF. Therefore, it is recommended to first turn OFF the power supply for the load or the load line.

Load Short-circuit Protection
This Sensor is equipped with load short-circuit protection, but be sure to not short circuit the load. Be sure to not use an output current flow that exceeds the rated current. If a load short circuit occurs, the output will turn OFF, so check the wiring before turning ON the power supply again. The short-circuit protection circuit will be reset. The load short-circuit protection will operate when the current flow reaches 1.8 times the rated load current. When using a C load, use an inrush current of 1.8 times the rated load current or higher.

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

When disposing of the Sensor, treat it as industrial waste.

Mounting Diagram

Resistance to Detergents, Disinfectants, and Chemicals
- Performance is assured for typical detergents and disinfectants, but performance may not be maintained for some detergents and disinfectants. Refer to the following table when using these agents.
- The E3ZM passed testing for resistance to detergents and disinfectants performed using the items in the following table. Refer to this table when considering use of detergents and disinfectants.

<table>
<thead>
<tr>
<th>Category</th>
<th>Product name</th>
<th>Concentration</th>
<th>Temperature</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>Sodium hydroxide (NaOH)</td>
<td>1.5%</td>
<td>70°C</td>
<td>240h</td>
</tr>
<tr>
<td></td>
<td>Potassium hydroxide (KOH)</td>
<td>1.5%</td>
<td>70°C</td>
<td>240h</td>
</tr>
<tr>
<td></td>
<td>Phosphoric acid (H₃PO₄)</td>
<td>2.5%</td>
<td>70°C</td>
<td>240h</td>
</tr>
<tr>
<td></td>
<td>Sodium hypochlorite (NaCIO)</td>
<td>0.3%</td>
<td>25°C</td>
<td>240h</td>
</tr>
<tr>
<td></td>
<td>Hydrogen peroxide (H₂O₂)</td>
<td>6.5%</td>
<td>25°C</td>
<td>240h</td>
</tr>
<tr>
<td>Alkaline foam detergent</td>
<td>P3-topax-66s (Manufactured by Ecolab)</td>
<td>3.0%</td>
<td>70°C</td>
<td>240h</td>
</tr>
<tr>
<td>Acidic foam detergent</td>
<td>P3-topax-56 (Manufactured by Ecolab)</td>
<td>5.0%</td>
<td>70°C</td>
<td>240h</td>
</tr>
<tr>
<td>Disinfectant</td>
<td>P3-oxonia active 90 (Manufactured by Ecolab)</td>
<td>1.0%</td>
<td>25°C</td>
<td>240h</td>
</tr>
<tr>
<td></td>
<td>TEK121 (Manufactured by ABC Compounding)</td>
<td>1.1%</td>
<td>25°C</td>
<td>240h</td>
</tr>
</tbody>
</table>

Note: The Sensor was immersed in the chemicals, detergents, and disinfectants listed above at the temperatures in the table for 240 hours and then passed an insulation resistance of 100 MΩ.
**Dimensions**

**Sensors**

**Through-beam Models**

*Pre-wired Models*

- E3ZM-T61
- E3ZM-T81
- E3ZM-T63
- E3ZM-T83

The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3ZM-T61-L 2M), the model number of the Receiver, by adding "-D" (example: E3ZM-T61-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.

**Through-beam Models**

*Standard Connector*

- E3ZM-T66
- E3ZM-T86
- E3ZM-T68
- E3ZM-T88

---

- **Emitter**
  - Power indicator (green)
  - 10.8 mm
  - 21 mm
  - 3 mm
  - 2.8 mm
  - 12.7 mm
  - 6.4 dia.
  - Two, M3

- **Receiver**
  - 4 dia. vinyl-insulated round cable with 2 or 3 conductors (Conductor cross section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm), Standard length: 2 m
  - 6.4 dia.
  - Two, M3

---

- **Emitter**
  - 10.8 mm
  - 21 mm
  - 3 mm
  - 2.8 mm
  - 12.7 mm
  - 6.4 dia.

- **Receiver**
  - Stability indicator (green)
  - Operation Indicator (yellow)
  - Sensitivity adjuster
  - Operation selector

---

**Terminal No.**

- **Specifications**

<table>
<thead>
<tr>
<th>Terminal No.</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+V</td>
</tr>
<tr>
<td>2</td>
<td>–</td>
</tr>
<tr>
<td>3</td>
<td>0 V</td>
</tr>
<tr>
<td>4</td>
<td>Output</td>
</tr>
</tbody>
</table>

---

**Dimensions (Unit: mm)**

Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

---

*Models numbers for Through-beam Sensors (E3ZM-T61-L) are for sets that include both the Emitter and Receiver.

The model number of the Emitter is expressed by adding "-L" to the set model number (example: E3ZM-T61-L 2M), the model number of the Receiver, by adding "-D" (example: E3ZM-T61-D 2M.) Refer to Ordering Information to confirm model numbers for Emitter and Receivers.
Retro-reflective Models
Pre-wired Models
E3ZM-R61
E3ZM-R81

Diffuse-reflective Models
Standard Connector
E3ZM-D62
E3ZM-D82

BGS Reflective Models
Pre-wired Models
E3ZM-LS61H
E3ZM-LS62H
E3ZM-LS64H
E3ZM-LS81H
E3ZM-LS82H
E3ZM-LS84H

Retro-reflective Models
Standard Connector
E3ZM-R66
E3ZM-R86

Diffuse-reflective Models
Standard Connector
E3ZM-D67
E3ZM-D87

BGS Reflective Models
Standard Connector
E3ZM-LS66H
E3ZM-LS67H
E3ZM-LS69H
E3ZM-LS86H
E3ZM-LS87H
E3ZM-LS89H

4 dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 mm² (AWG24), Insulator diameter: 1.1 mm)
Standard length: 2 m

Terminal No. Specifications
1 +V
2 —
3 0 V
4 Output
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