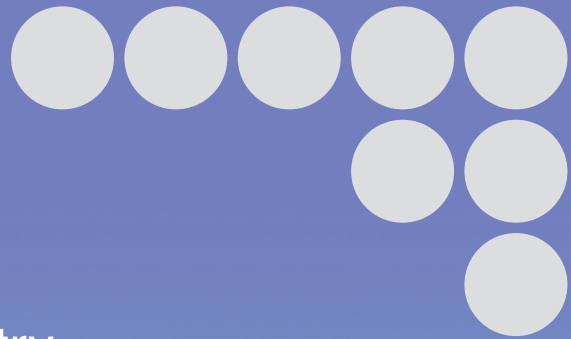


# OMRON

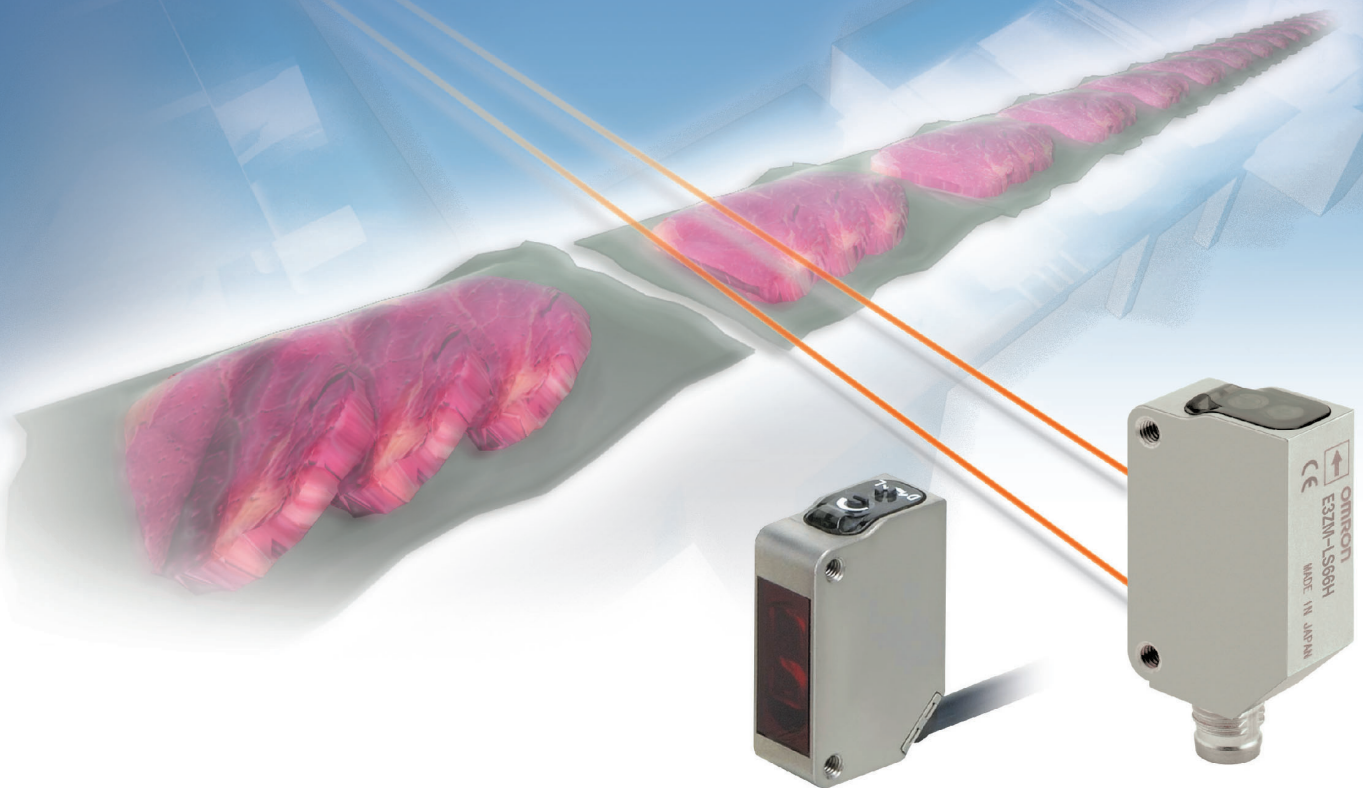
## Stainless Steel Housing

Compact Photoelectric Sensor with Built-in Amplifier

### E3ZM



Designed for the Food Industry.  
Hygienic, Durable, and Detergent Resistant.  
316L Stainless Steel Housing.  
IP69K



realizing

Patent pending

## Stainless Steel Housing - Ideal for the Food Industry!

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.

**Note:** Refer to page 16 for details on chemicals, detergents, and disinfectants.

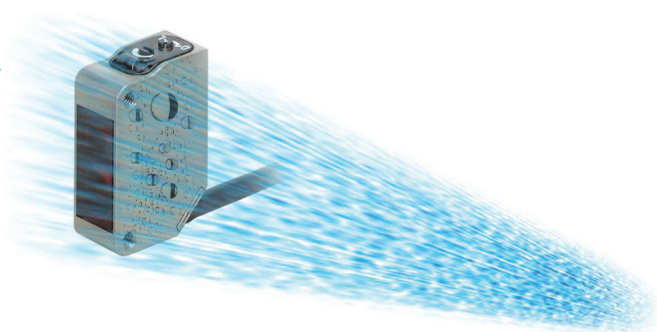


World's First

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.

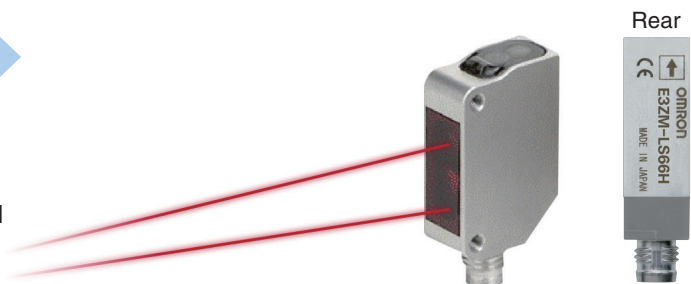
\*Refer to the footnote on page 8.



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.

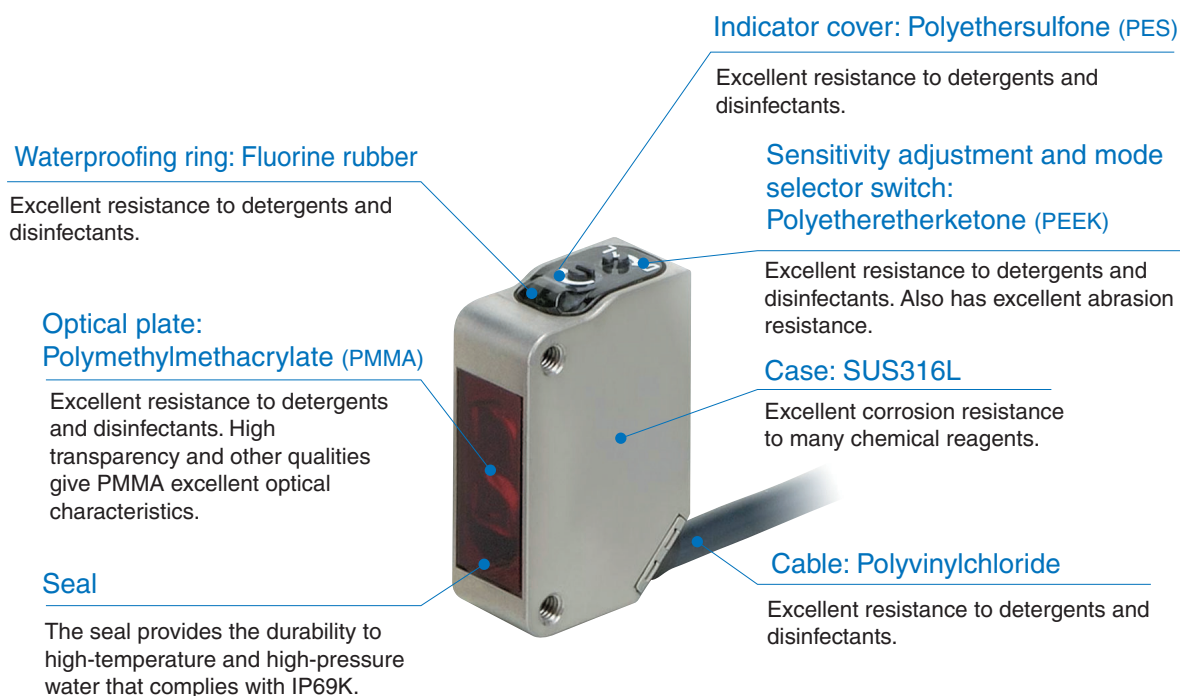


Rear



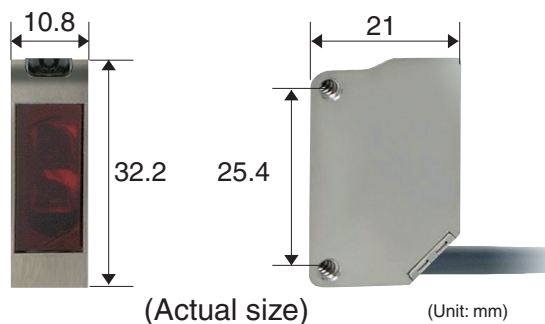


## Structural Design That Provides Excellent Environment-resistance



## Smallest Square Metal Photoelectric Sensor in the World

The same compact shape and mounting method as the E3Z. The E3ZM is durable, comes in a world standard size, and no other square metal photoelectric sensor is as easy to use.

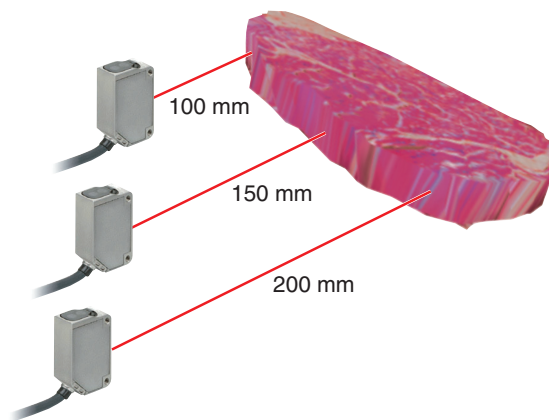


## Unique Members of the E3ZM Family

### BGS Reflective Models

E3ZM-LS6□H/-LS8□H

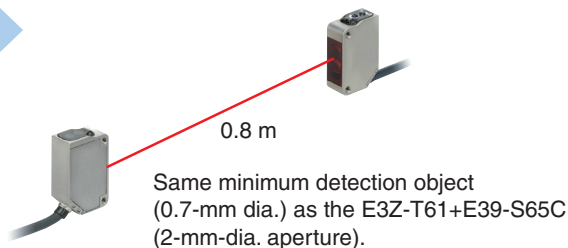
Three models with different fixed sensitivity (rated sensing distances) have been created. These models cover the sensing ranges of the E3Z-LS61.



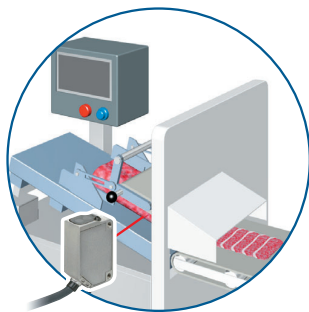
### Through-beam Inner Aperture Models

E3ZM-T63 (Typical model. Available soon.)

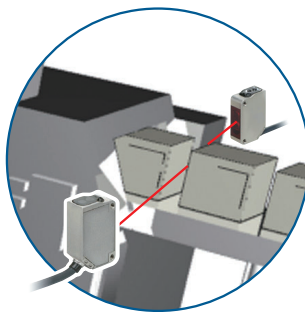
Fine beam without attaching an external aperture. This eliminates malfunctions from residual water drops, even immediately after washing.



## A Better Fit for the Application!



Meat slicing and similar processing



Wrapping raw food products



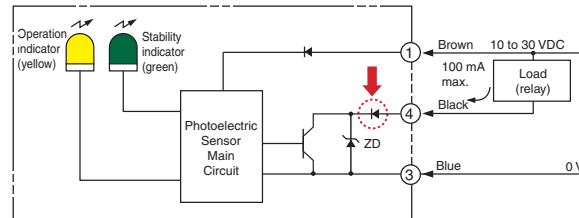
E3ZM passed the material resistance tests and is certified by Ecolab.



## Reliability Inherited from the E3Z

### Increased Voltage Range

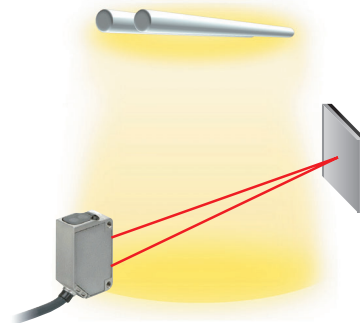
Reversed output polarity protection provided. The power supply voltage surpasses the standard E3Z at 10 to 30 V DC.



Wiring for NPN Output

### Immunity to External Light and Noise

Uses recognized algorithm to prevent external light interference in the reflective sensor. This provides reliability when using the E3ZM near inverter fluorescent lights and similar applications. Excellent noise immunity has also been inherited from the E3Z.



## And Of Course, Ecological

### Total European RoHS Compliance (Available soon)

Lead, mercury, cadmium, chromium, polybromide biphenyl, and polybromide diphenyl ether have been completely eliminated.

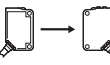

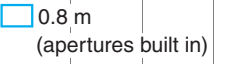
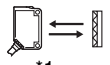

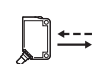

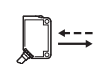
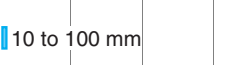
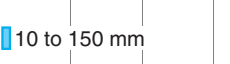

The environment-friendly features of the E3Z, such as energy-saving and resource-saving, are carried on to the E3ZM as well.

- Low-power circuit design
- Polyethylene packaging that can be incinerated as general waste

## Ordering Information

### Sensors

 Red light  Infrared light

| Sensing method                     | Appearance  | Connection method                         | Sensing distance  | Model             |                   |
|------------------------------------|---|---|---|-------------------|-------------------|
|                                    |   |   |   | NPN output        | PNP output        |
| Through-beam<br>*5                 |  | Pre-wired (2 m) *3                        |  | <b>E3ZM-T61</b>   | <b>E3ZM-T81</b>   |
|                                    |   | Connector (M8, 4 pins) *4                 |   | <b>E3ZM-T66</b>   | <b>E3ZM-T86</b>   |
|                                    |   | Pre-wired (2 m) *3 (released soon)        |  | <b>E3ZM-T63</b>   | <b>E3ZM-T83</b>   |
|                                    |   | Connector (M8, 4 pins) *4 (released soon) |   | <b>E3ZM-T68</b>   | <b>E3ZM-T88</b>   |
| Retro-reflective with MSR function |  | Pre-wired (2 m) *3                        |  | <b>E3ZM-R61</b>   | <b>E3ZM-R81</b>   |
|                                    |   | Connector (M8, 4 pins) *4                 |   | (Using E39-R1S)   | <b>E3ZM-R66</b>   |
| Diffuse-reflective                 |  | Pre-wired (2 m) *3                        |  | <b>E3ZM-D62</b>   | <b>E3ZM-D82</b>   |
|                                    |   | Connector (M8, 4 pins) *4                 |   |                   | <b>E3ZM-D67</b>   |
| BGS reflective (fixed distance)    |  | Pre-wired (2 m) *3                        |  | <b>E3ZM-LS61H</b> | <b>E3ZM-LS81H</b> |
|                                    |   | Connector (M8, 4 pins) *4                 |   | <b>E3ZM-LS66H</b> | <b>E3ZM-LS86H</b> |
|                                    |   | Pre-wired (2 m) *3                        |  | <b>E3ZM-LS62H</b> | <b>E3ZM-LS82H</b> |
|                                    |   | Connector (M8, 4 pins) *4                 |   | <b>E3ZM-LS67H</b> | <b>E3ZM-LS87H</b> |
|                                    |   | Pre-wired (2 m) *3                        |  | <b>E3ZM-LS64H</b> | <b>E3ZM-LS84H</b> |
|                                    |   | Connector (M8, 4 pins) *4                 |   | <b>E3ZM-LS69H</b> | <b>E3ZM-LS89H</b> |

\*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.

\*3. Pre-wired Models with a 5-m cable are also available for these products. When ordering, specify the cable length by adding "5M" to the end of the model number (e.g., E3ZM-LT61 5M).

M12 Pre-wired Connector Models are also available. When ordering, add "-M1J" to the end of the model number (e.g., E3ZM-R61-M1J 0.3m).

\*4. M8 Connector Models are also available with three-pin connectors. When ordering, add "-M5" to the end of the model number (e.g., E3ZM-T66-M5).

This does not apply to BGS Reflective Models, however, because they require 4 pins.

\*5. Through-beam Models are also available with a light emission stop function. When ordering, add "-G0" to the end of the model number (e.g., E3ZM-T61-G0).

### Accessories










#### Reflectors

| Name                   | E3ZM-R Sensing distance (typical) * | Model          | Quantity | Remarks   |
|------------------------|-------------------------------------|----------------|----------|---|
| Reflector              | 3 m (100 mm) (rated value)          | <b>E39-R1</b>  | 1        | <ul style="list-style-type: none"> <li>• Reflectors are not provided with Retro-reflective models.</li> <li>• The MSR function is enabled.</li> </ul> |
|                        | 4 m (100 mm) (rated value)          | <b>E39-R1S</b> | 1        |   |
|                        | 5 m (100 mm)                        | <b>E39-R2</b>  | 1        |   |
|                        | 2.5 m (100 mm)                      | <b>E39-R9</b>  | 1        |   |
|                        | 3.5 m (100 mm)                      | <b>E39-R10</b> | 1        |   |
| Fog Preventive Coating | 3 m (100 mm)                        | <b>E39-R1K</b> | 1        |   |
| Small Reflector        | 1.5 m (50 mm)                       | <b>E39-R3</b>  | 1        |   |
| Tape Reflector         | 700 mm (150 mm)                     | <b>E39-RS1</b> | 1        |   |
|                        | 1.1 m (150 mm)                      | <b>E39-RS2</b> | 1        |   |
|                        | 1.4 m (150 mm)                      | <b>E39-RS3</b> | 1        |   |

Note: When using a Reflector without a rated value, use 0.7 times typical value as a guideline for the sensing distance.







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

Mounting Brackets

| Appearance  | Model (Material)         | Quantity | Remarks                               | Appearance  | Model (Material)         | Quantity | Remarks  |
|---|--------------------------|----------|---------------------------------------|---|--------------------------|----------|--|
|  | <b>E39-L153 (SUS304)</b> | 1        | Mounting Brackets                     |  | <b>E39-L98 (SUS304)</b>  | 1        | Metal Protective Cover Bracket *   |
|  | <b>E39-L104 (SUS304)</b> | 1        |                                       |  | <b>E39-L150 (SUS304)</b> | 1 set    | (Sensor adjuster)  |
|  | <b>E39-L43 (SUS304)</b>  | 1        | Horizontal Mounting Bracket *         |  | <b>E39-L151 (SUS304)</b> | 1 set    | Easily mounted to the aluminum frame rails of conveyors and easily adjusted.<br>For left to right adjustment |
|  | <b>E39-L142 (SUS304)</b> | 1        | Horizontal Protective Cover Bracket * |   |                          |          |  |
|  | <b>E39-L44 (SUS304)</b>  | 1        | Rear Mounting Bracket                 |  | <b>E39-L144 (SUS304)</b> | 1        | Compact Protective Cover Bracket *   |

Note: When using Through-beam Models, order one bracket for the Receiver and one for the Emitter.  
\* Cannot be used for Standard Connector models.

Sensor I/O Connectors

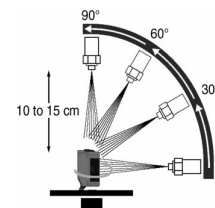
| Size                  | Cable  | Appearance   | Cable type |                        | Model                  |
|-----------------------|--|--|------------|------------------------|------------------------|
| M8 (4 pins)           | Standard   | Straight  | 2 m        | 4-wire                 | <b>XS3F-M421-402-A</b> |
|                       |  |  | 5 m        |                        | <b>XS3F-M421-405-A</b> |
|                       |  | L-shaped  | 2 m        |                        | <b>XS3F-M422-402-A</b> |
|                       |  |  | 5 m        |                        | <b>XS3F-M422-405-A</b> |
| M12 (For -M1J models) |  | Straight  | 2 m        | 3-wire                 | <b>XS2F-D421-DC0-A</b> |
|                       |  |  | 5 m        |                        | <b>XS2F-D421-GC0-A</b> |
|                       |  | L-shaped  | 2 m        |                        | <b>XS2F-D422-DC0-A</b> |
|                       |  |  | 5 m        |                        | <b>XS2F-D422-GC0-A</b> |
|                       | Straight  | 2 m  | 4-wire     | <b>XS2F-D421-D80-A</b> |                        |
|                       |  | 5 m  |            | <b>XS2F-D421-G80-A</b> |                        |
|                       |  | L-shaped  |            | 2 m                    | <b>XS2F-D422-D80-A</b> |
|                       |  |  |            | 5 m                    | <b>XS2F-D422-G80-A</b> |

Note: Depending on the connector specification, the IP67 performance applies. When using high-pressure washing, use connector compliant with IP69K.

Ratings and Specifications

| Model                                       | Sensing method   | Through-beam  |                        | Retro-reflective with MSR function  | Diffuse-reflective Models            |
|---|--|---|------------------------|---|--------------------------------------|
|   | NPN output   | E3ZM-T61<br>E3ZM-T66  | E3ZM-T63<br>E3ZM-T68   | E3ZM-R61<br>E3ZM-R66  | E3ZM-D62<br>E3ZM-D67                 |
| Item  | PNP output   | E3ZM-T81<br>E3ZM-T86  | E3ZM-T83<br>E3ZM-T88   | E3ZM-R81<br>E3ZM-R86  | E3ZM-D82<br>E3ZM-D87                 |
| <b>Sensing distance</b>                     |  | 15 m  | 0.8 m                  | 4 m [100 mm]<br>(Using E39-R1S)<br>3 m [100 mm]<br>(Using E39-R1)   | 1 m<br>(White paper<br>300 × 300 mm) |
| <b>Spot diameter (typical)</b>              |  | ---   |                        |   |                                      |
| <b>Standard sensing object</b>              |  | Opaque: 12-mm dia. min.   | Opaque: 2-mm dia. min. | Opaque: 75-mm dia. min.   | ---                                  |
| <b>Differential travel</b>                  |  | ---   |                        |   |                                      |
| <b>Black/white error</b>                    |  | ---   |                        |   |                                      |
| <b>Directional angle</b>                    |  | Emitter, Receiver: 3° to 15°  |                        | Sensor: 3° to 10°<br>Reflector: 30°   | ---                                  |
| <b>Light source (wavelength)</b>            |  | Infrared LED (870 nm)   |                        | Red LED (660 nm)  | Infrared LED (860 nm)                |
| <b>Power supply voltage</b>                 |  | 10 to 30 VDC, including 10% ripple (p-p)  |                        |   |                                      |
| <b>Current consumption</b>                  |  | Emitter, Receiver: 20 mA max. each  |                        | 25 mA max.  |                                      |
| <b>Control output</b>                       |  | Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.)<br>Open-collector output (NPN/PNP output depending on model)<br>Light-ON/Dark-ON switch selectable |                        |   |                                      |
| <b>Protection circuits</b>                  |  | Reversed power supply polarity protection, Output short-circuit protection, and Reversed output polarity protection   |                        | Reversed power supply polarity protection, Output short-circuit protection, Mutual interference prevention, and Reversed output polarity protection |                                      |
| <b>Response time</b>                        |  | Operate or reset: 1 ms max.   |                        |   |                                      |
| <b>Sensitivity adjustment</b>               |  | One-turn adjuster   |                        |   |                                      |
| <b>Ambient illumination (Receiver side)</b> |  | Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.  |                        |   |                                      |
| <b>Ambient temperature range</b>            |  | Operating: -25 to 55°C, Storage: -40 to 70°C (with no icing or condensation)  |                        |   |                                      |
| <b>Ambient humidity range</b>               |  | Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)   |                        |   |                                      |
| <b>Insulation resistance</b>                |  | 20 MΩ min. at 500 VDC   |                        |   |                                      |
| <b>Dielectric strength</b>                  |  | 1,000 VAC, 50/60 Hz for 1 min   |                        |   |                                      |
| <b>Vibration resistance</b>                 |  | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions  |                        |   |                                      |
| <b>Shock resistance</b>                     |  | Destruction: 500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions  |                        |   |                                      |
| <b>Degree of protection *1</b>              |  | IEC: IP67, DIN 40050-9: IP69K   |                        |   |                                      |
| <b>Connection method</b>                    |  | Pre-wired cable (standard length: 2 m)<br>M8 4-pin Connector  |                        |   |                                      |
| <b>Indicator</b>                            |  | Operation indicator (yellow), Stability indicator (green) (Emitter has only power supply indicator (green).)  |                        |   |                                      |
| <b>Weight (packed state)</b>                | <b>Pre-wired models (with 2-m cable)</b>               | Approx. 150 g   |                        | Approx. 90 g  |                                      |
|   | <b>Connector models</b>                                | Approx. 60 g  |                        | Approx. 40 g  |                                      |
| <b>Materials</b>                            | <b>Case</b>  | SUS316L   |                        |   |                                      |
|   | <b>Lens</b>  | PMMA (polymethylmethacrylate)   |                        |   |                                      |
|   | <b>Display</b>   | PES (polyethersulfone)  |                        |   |                                      |
|   | <b>Sensitivity adjustment and mode selector switch</b> | PEEK (polyetheretherketone)   |                        |   |                                      |
|   | <b>Seals</b>   | Fluoro rubber   |                        |   |                                      |
| <b>Accessories</b>                          |  | Instruction sheet (Note: Reflectors and Mounting Brackets are sold separately.)   |                        |   |                                      |

\*1. IP69K Degree of Protection Specification  
 IP69K is a protection standard against high temperature and high-pressure water defined in the German standard DIN 40050, Part 9. The test piece is sprayed with water at 80°C at a water pressure of 80 to 100 BAR using a specified nozzle shape at a rate of 14 to 16 liters/min.  
 The distance between the test piece and nozzle is 10 to 15 cm, and water is sprayed horizontally for 30 seconds each at 0°, 30°, 60°, and 90° while rotating the test piece on a horizontal plane.





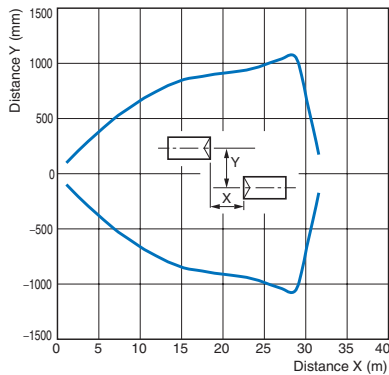
| Item  | Sensing method                           | BGS Reflective Models   |  |  |
|---|--|---|--|--|
|   |  | Model   | NPN output                                 | PNP output                                 |
|   |  | E3ZM-LS61H<br>E3ZM-LS66H  | E3ZM-LS62H<br>E3ZM-LS67H                   | E3ZM-LS64H<br>E3ZM-LS69H                   |
|   |  | E3ZM-LS81H<br>E3ZM-LS86H  | E3ZM-LS82H<br>E3ZM-LS87H                   | E3ZM-LS84H<br>E3ZM-LS89H                   |
| <b>Sensing distance</b>                     |  | 10 to 100 mm<br>(White paper 100 × 100 mm)  | 10 to 150 mm<br>(White paper 100 × 100 mm) | 10 to 200 mm<br>(White paper 100 × 100 mm) |
| <b>Spot diameter (typical)</b>              |  | 4-mm dia. at sensing distance of 100 mm   | 12-mm dia. at sensing distance of 150 mm   | 18-mm dia. at sensing distance of 200 mm   |
| <b>Standard sensing object</b>              |  | ---   |  |  |
| <b>Differential travel</b>                  |  | 3% of sensing distance max.   | 15% of sensing distance max.               | 20% of sensing distance max.               |
| <b>Black/white error</b>                    |  | 5% of sensing distance max.   | 10% of sensing distance max.               | 20% of sensing distance max.               |
| <b>Directional angle</b>                    |  | ---   |  |  |
| <b>Light source (wavelength)</b>            |  | Red LED (650 nm)  | Red LED (660 nm)                           |  |
| <b>Power supply voltage</b>                 |  | 10 to 30 VDC, including 10% ripple (p-p)  |  |  |
| <b>Current consumption</b>                  |  | 25 mA max.  |  |  |
| <b>Control output</b>                       |  | Load power supply voltage: 30 VDC max., Load current: 100 mA max. (Residual voltage: 2 V max.)<br>Open-collector output (NPN/PNP output depending on model)<br>Light-ON/Dark-ON cable connection selectable |  |  |
| <b>Protection circuits</b>                  |  | Reversed power supply polarity protection, Output short-circuit protection, Reversed output polarity protection, Mutual interference protection   |  |  |
| <b>Response time</b>                        |  | Operate or reset: 1 ms max.   |  |  |
| <b>Sensitivity adjustment</b>               |  | ---   |  |  |
| <b>Ambient illumination (Receiver side)</b> |  | Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.  |  |  |
| <b>Ambient temperature range</b>            |  | Operating: -25 to 55°C, Storage: -40 to 70°C (with no icing or condensation)  |  |  |
| <b>Ambient humidity range</b>               |  | Operating: 35% to 85%, Storage: 35% to 95% (with no condensation)   |  |  |
| <b>Insulation resistance</b>                |  | 20 MΩ min. at 500 VDC   |  |  |
| <b>Dielectric strength</b>                  |  | 1,000 VAC, 50/60 Hz for 1 min   |  |  |
| <b>Vibration resistance</b>                 |  | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions  |  |  |
| <b>Shock resistance</b>                     |  | Destruction: 500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions  |  |  |
| <b>Degree of protection *1</b>              |  | IEC: IP67, DIN 40050-9: IP69K   |  |  |
| <b>Connection method</b>                    |  | Pre-wired cable (standard length: 2 m)<br>M8 4-pin Connector  |  |  |
| <b>Indicator</b>                            |  | Operation indicator (yellow), Stability indicator (green)   |  |  |
| <b>Weight (packed state)</b>                | <b>Pre-wired models (with 2-m cable)</b> | Approx. 90 g  |  |  |
|   | <b>Connector models</b>                  | Approx. 40 g  |  |  |
| <b>Materials</b>                            | <b>Case</b>                              | SUS316L   |  |  |
|   | <b>Lens</b>                              | PMMA (polymethylmethacrylate)   |  |  |
|   | <b>Display</b>                           | PES (polyethersulfone)  |  |  |
|   | <b>Seals</b>                             | Fluoro rubber   |  |  |
| <b>Accessories</b>                          |  | Instruction sheet (Note: Mounting Brackets are sold separately.)  |  |  |

Engineering Data (Typical)

Parallel Operating Range

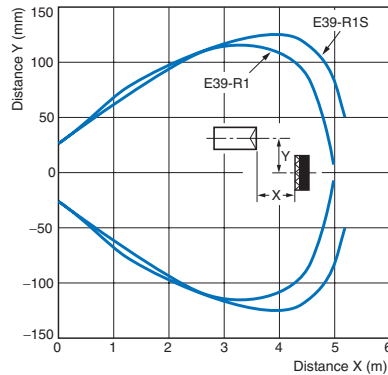
Through-beam Models

E3ZM-T□1(T□6)



Retro-reflective Models

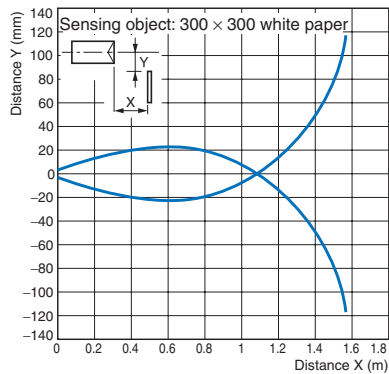
E3ZM-R□1(R□6)



Operating Range

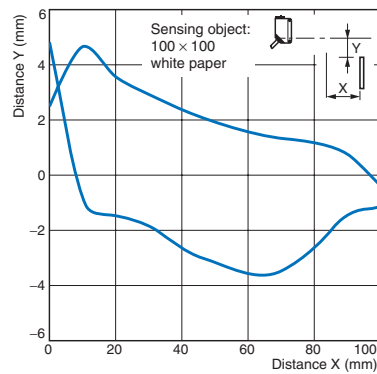
Diffuse-reflective Models

E3ZM-D□2(D□7)

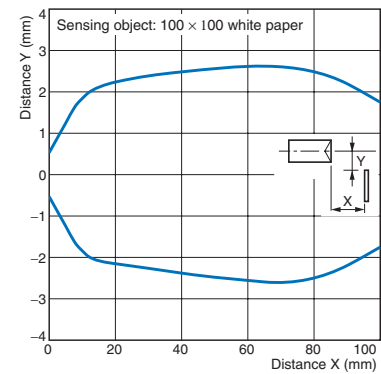


BGS Reflective Models

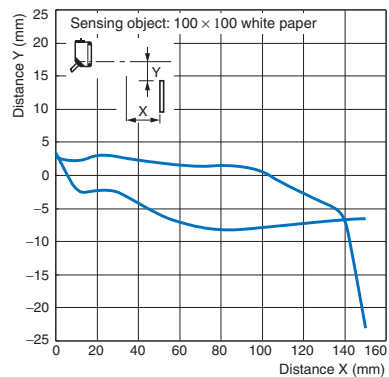
E3ZM-LS□1H(LS□6H), Top to Bottom



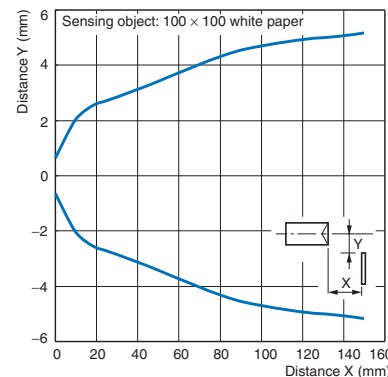
E3ZM-LS□1H(LS□6H), Left to Right



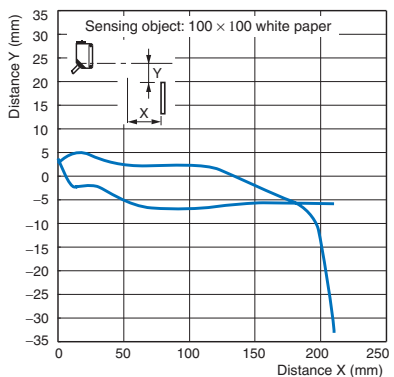
E3ZM-LS□2H(LS□7H), Top to Bottom



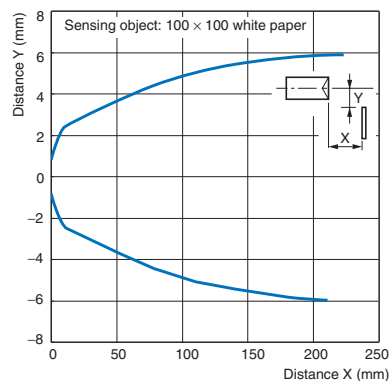
E3ZM-LS□2H(LS□7H), Left to Right



E3ZM-LS□4H(LS□9H), Top to Bottom



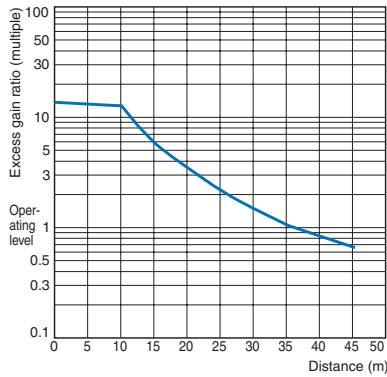
E3ZM-LS□4H(LS□9H), Left to Right



**Excess Gain vs. Distance**

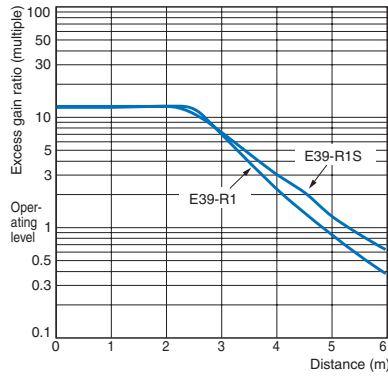
**Through-beam Models**

**E3ZM-T□1(T□6)**



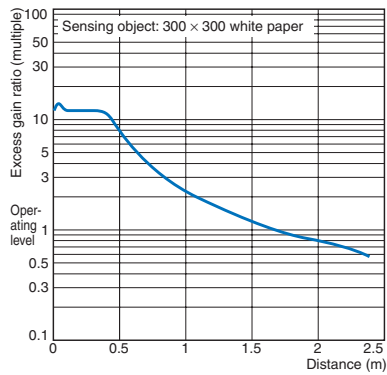
**Retro-reflective Models**

**E3ZM-R□1(R□6)**



**Diffuse-reflective Models**

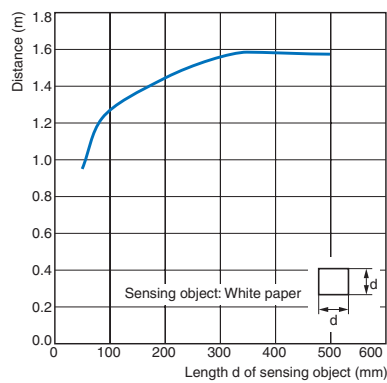
**E3ZM-D□2(D□7)**



**Sensing Object Size vs. Distance**

**Diffuse-reflective Models**

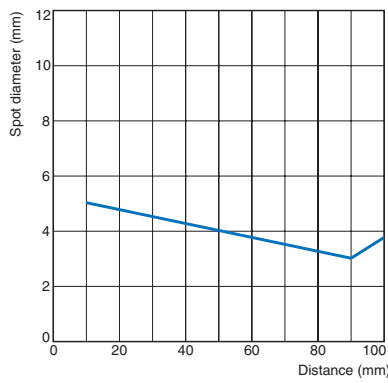
**E3ZM-D□2(D□7)**



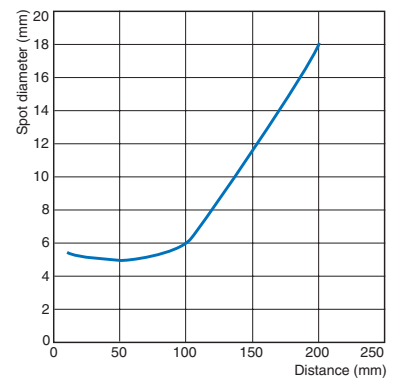
**Spot Diameter vs. Distance**

**BGS Reflective Models**

**E3ZM-LS□1H(LS□6H)**



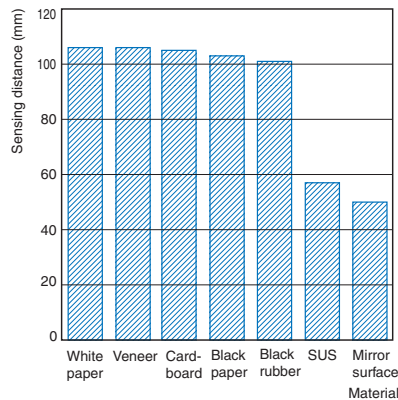
**E3ZM-LS□2H/LS□4H(LS□7H/LS□9H)**



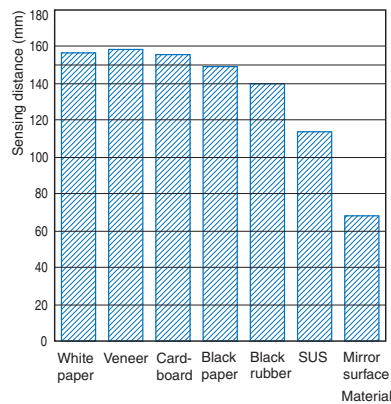
Sensing Distance vs. Sensing Object Material

BGS Reflective Models

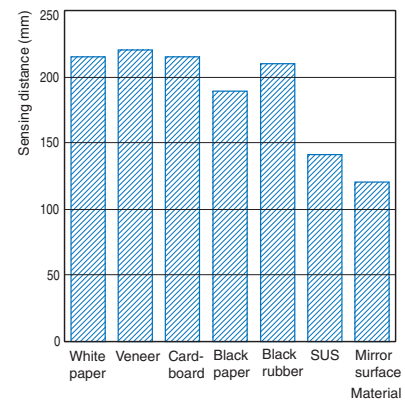
E3ZM-LS□1H(LS□6H)



E3ZM-LS□2H(LS□7H)



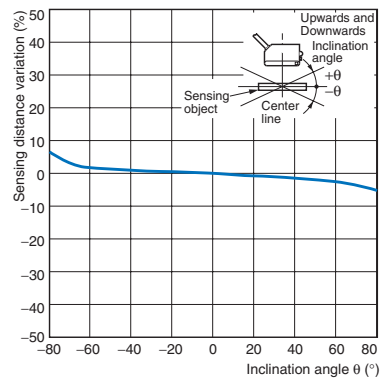
E3ZM-LS□4H(LS□9H)



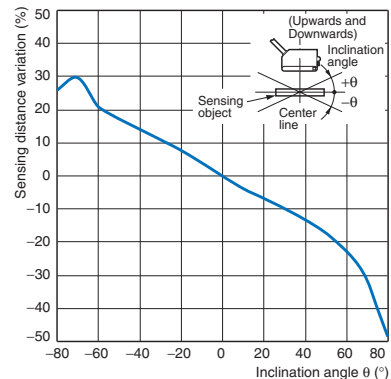
Inclination Characteristics (Vertical)

BGS Reflective Models

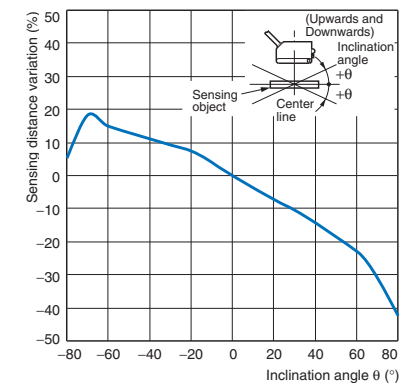
E3ZM-LS□1H(LS□6H)



E3ZM-LS□2H(LS□7H)



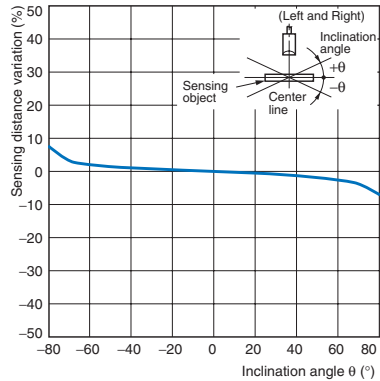
E3ZM-LS□4H(LS□9H)



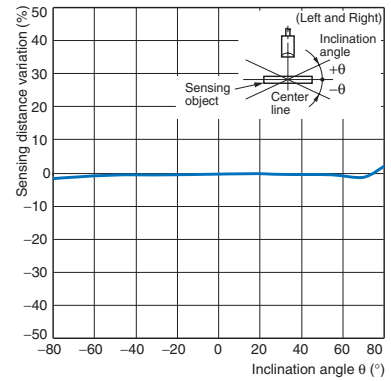
Inclination Characteristics (Horizontal)

BGS Reflective Models

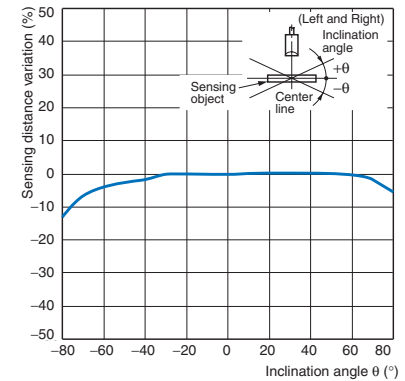
E3ZM-LS□1H(LS□6H)



E3ZM-LS□2H(LS□7H)



E3ZM-LS□4H(LS□9H)



I/O Circuit Diagrams

NPN Output

| Model  | Operation mode | Timing charts | Mode selector switch                                  | Output circuit  |
|--|----------------|---------------|---|---|
| E3ZM-T61<br>E3ZM-T63<br>E3ZM-T66<br>E3ZM-T68<br>E3ZM-R61<br>E3ZM-R66<br>E3ZM-D62<br>E3ZM-D67 | Light-ON       |               | L side (LIGHT ON)                                     | <p>Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models</p> |
|  | Dark-ON        |               | D side (DARK ON)                                      |   |
| <p>Through-beam Emitter</p>  |                |               |   |   |
| E3ZM-T61-G0<br>E3ZM-T63-G0<br>E3ZM-T66-G0<br>E3ZM-T68-G0                                     | ---            |               | ---   | <p>Through-beam Emitter</p>   |
| E3ZM-LS61H<br>E3ZM-LS66H<br>E3ZM-LS62H<br>E3ZM-LS67H<br>E3ZM-LS64H<br>E3ZM-LS69H             | Light-ON       |               | Connect pink lead (2) to brown lead (1).              |   |
|  | Dark-ON        |               | Connect pink lead (2) to blue lead (3) or leave open. |   |

PNP Output

| Model  | Operation mode | Timing charts | Mode selector switch                                  | Output circuit  |
|--|----------------|---------------|---|---|
| E3ZM-T81<br>E3ZM-T83<br>E3ZM-T86<br>E3ZM-T88<br>E3ZM-R81<br>E3ZM-R86<br>E3ZM-D81<br>E3ZM-D86<br>E3ZM-D82<br>E3ZM-D87 | Light-ON       |               | L side (LIGHT ON)                                     | <p>Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models</p> |
|  | Dark-ON        |               | D side (DARK ON)                                      |   |
| <p>Through-beam Emitter</p>  |                |               |   |   |
| E3ZM-T81-G0<br>E3ZM-T83-G0<br>E3ZM-T86-G0<br>E3ZM-T88-G0   | ---            |               | ---   | <p>Through-beam Emitter</p>   |
| E3ZM-LS81H<br>E3ZM-LS86H<br>E3ZM-LS82H<br>E3ZM-LS87H<br>E3ZM-LS84H<br>E3ZM-LS89H                                     | Light-ON       |               | Connect pink lead (2) to brown lead (1).              |   |
|  | Dark-ON        |               | Connect pink lead (2) to blue lead (3) or leave open. |   |

Connector Pin Arrangement

M12 Pre-wired Connector

M12 Connector Pin Arrangement



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

M8 4-pin Connector Pin Arrangement



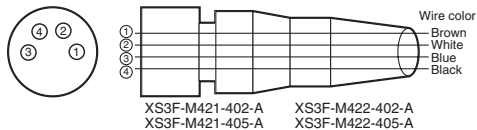
M8 Pre-wired 3-pin Connector

M8 3-pin Connector Pin Arrangement

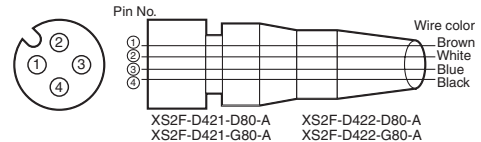


Plugs (Sensor I/O Connectors)

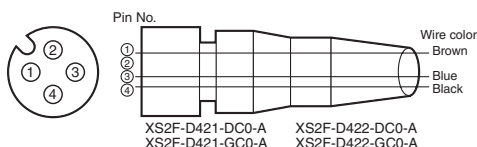
M8 4-pin Connectors



M12 4-wire Connectors



M12 3-wire Connectors



| Classification | Wire color | Connector pin No. | Application                                   |
|----------------|------------|-------------------|---|
| DC             | Brown      | 1                 | Power supply (+V)                             |
|                | White      | 2                 | Light emission stop input/operation selection |
|                | Blue       | 3                 | Power supply (0 V)                            |
|                | Black      | 4                 | Output  |

Note: The above M8 and M12 Connectors made by OMRON are IP67. Do not use them in an environment where IP69K is required.

## Nomenclature

### Sensors with Sensitivity Adjustment and Mode Selector Switch

#### Through-beam Models

E3ZM-T□□ (Receiver)

#### Retro-reflective Models

E3ZM-R□□

#### Diffuse-reflective Models

E3ZM-D□□



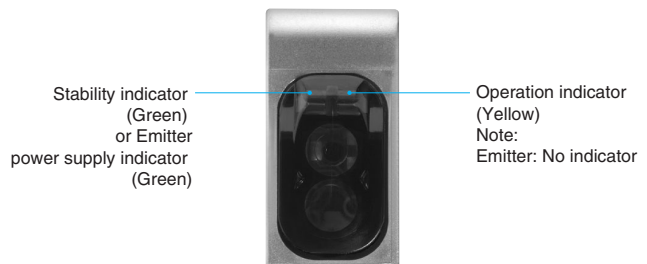
### Infinite Adjustment Emitter

#### BGS Reflective Models

E3ZM-LS□□H

#### Through-beam Models

E3ZM-T□□ (Emitter)



## Safety Precautions

Refer to *Warranty and Limitations of Liability* on page 20.

### ⚠ 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. Be sure to tighten the connector lock by hand; do not use pliers or other tools. 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.

#### 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 mm<sup>2</sup> 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 turned 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

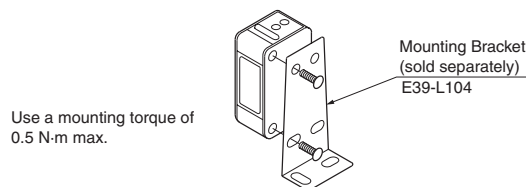
This Sensor is equipped with load short-circuit protection, but be sure to not short circuit the load. Be sure to not use an output current flow that exceeds the rated current. If a load short circuit occurs, the output will turn OFF, so check the wiring before turning ON the power supply again. The 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.

| Category                | Product name                                       | Concentration | Temperature | Time |
|-------------------------|--|---------------|-------------|------|
| Chemical                | Sodium hydroxide (NaOH)                            | 1.5%          | 70°C        | 240h |
|                         | Potassium hydroxide (KOH)                          | 1.5%          | 70°C        | 240h |
|                         | Phosphoric acid (H <sub>3</sub> PO <sub>4</sub> )  | 2.5%          | 70°C        | 240h |
|                         | Sodium hypochlorite (NaClO)                        | 0.3%          | 25°C        | 240h |
|                         | Hydrogen peroxide (H <sub>2</sub> O <sub>2</sub> ) | 6.5%          | 25°C        | 240h |
| Alkaline foam detergent | P3-topax-66s (Manufactured by Ecolab)              | 3.0%          | 70°C        | 240h |
| Acidic foam detergent   | P3-topax-56 (Manufactured by Ecolab)               | 5.0%          | 70°C        | 240h |
| Disinfectant            | P3-oxonia active 90 (Manufactured by Ecolab)       | 1.0%          | 25°C        | 240h |
|                         | TEK121 (Manufactured by ABC Compounding)           | 1.1%          | 25°C        | 240h |

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 min.



Dimensions

Sensors

Through-beam Models

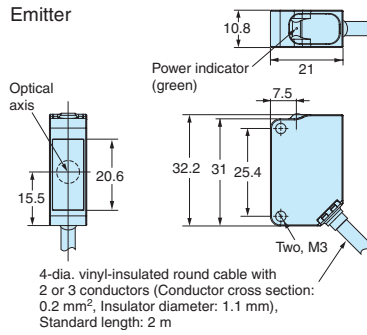
Pre-wired Models

E3ZM-T61(-G0)

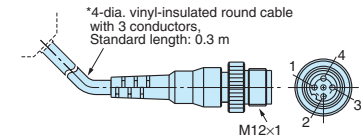
E3ZM-T81(-G0)

E3ZM-T63(-G0)

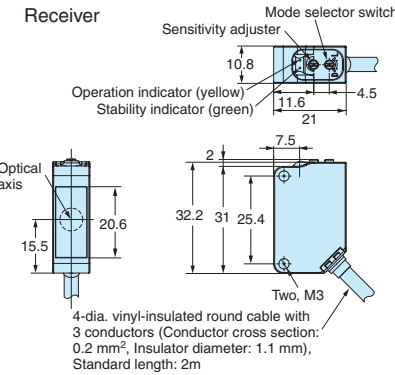
E3ZM-T83(-G0)



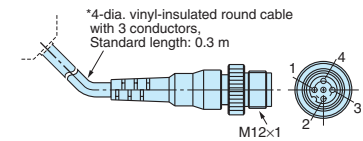
M12 Pre-wired Connector (E3ZM-□□□-M1J)



| Terminal No. | Specifications                       |
|--------------|--------------------------------------|
| 1            | +V                                   |
| 2            | Light emission stop input (-G0 only) |
| 3            | 0 V                                  |
| 4            | ---                                  |



M12 Pre-wired Connector (E3ZM-□□□-M1J)



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

Through-beam Models

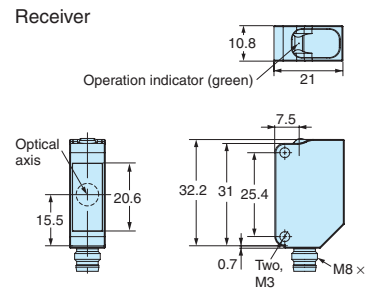
Standard Connector

E3ZM-T66(-G0)

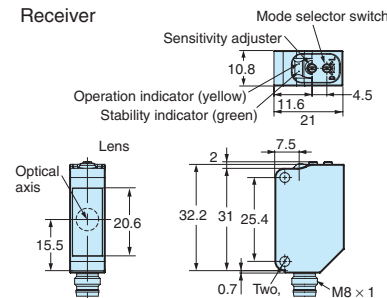
E3ZM-T86(-G0)

E3ZM-T68(-G0)

E3ZM-T88(-G0)



| Terminal No. | Specifications                       |
|--------------|--------------------------------------|
| 1            | +V                                   |
| 2            | Light emission stop input (-G0 only) |
| 3            | 0 V                                  |
| 4            | ---                                  |



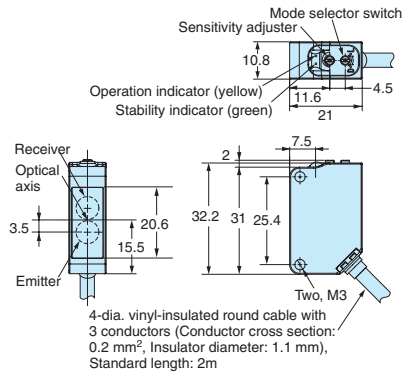
| Terminal No. | Specifications |
|--------------|----------------|
| 1            | +V             |
| 2            | ---            |
| 3            | 0 V            |
| 4            | Output         |

**Retro-reflective Models**

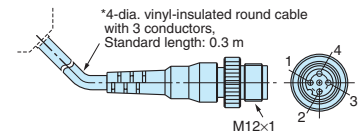
**Pre-wired Models**  
**E3ZM-R61**  
**E3ZM-R81**

**Diffuse-reflective Models**

**Standard Connector**  
**E3ZM-D62**  
**E3ZM-D82**



M12 Pre-wired Connector (E3ZM-□□□-M1J)



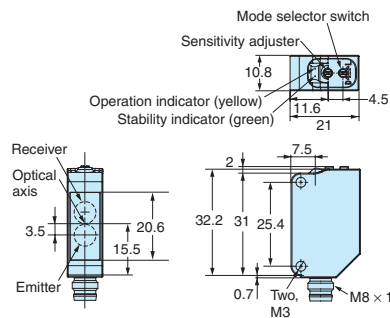
| Terminal No. | Specifications |
|--------------|----------------|
| 1            | +V             |
| 2            | ---            |
| 3            | 0 V            |
| 4            | Output         |

**Retro-reflective Models**

**Standard Connector**  
**E3ZM-R66**  
**E3ZM-R86**

**Diffuse-reflective Models**

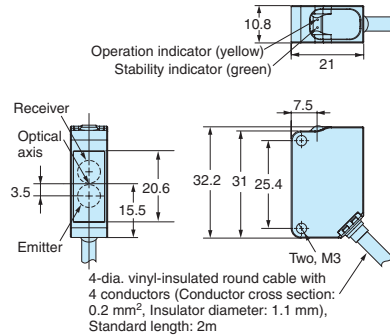
**Standard Connector**  
**E3ZM-D67**  
**E3ZM-D87**



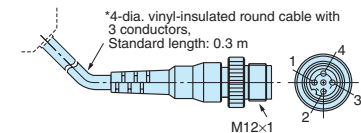
| Terminal No. | Specifications |
|--------------|----------------|
| 1            | +V             |
| 2            | ---            |
| 3            | 0 V            |
| 4            | Output         |

**BGS Reflective Models**

**Pre-wired Models**  
**E3ZM-LS61H**  
**E3ZM-LS62H**  
**E3ZM-LS64H**  
**E3ZM-LS81H**  
**E3ZM-LS82H**  
**E3ZM-LS84H**



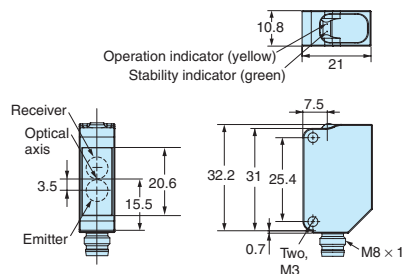
M12 Pre-wired Connector (E3ZM-□□□-M1J)



| Terminal No. | Specifications      |
|--------------|---------------------|
| 1            | +V                  |
| 2            | Operation selection |
| 3            | 0 V                 |
| 4            | Output              |

**BGS Reflective Models**

**Standard Connector**  
**E3ZM-LS66H**  
**E3ZM-LS67H**  
**E3ZM-LS69H**  
**E3ZM-LS86H**  
**E3ZM-LS87H**  
**E3ZM-LS89H**



| Terminal No. | Specifications      |
|--------------|---------------------|
| 1            | +V                  |
| 2            | Operation selection |
| 3            | 0 V                 |
| 4            | Output              |

# Terms and Conditions of Sale

1. **Offer; Acceptance.** These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
2. **Prices; Payment Terms.** All prices stated are current, subject to change without notice by Omron. Omron reserves the right to increase or decrease prices on any unshipped portions of outstanding orders. Payments for Products are due net 30 days unless otherwise stated in the invoice.
3. **Discounts.** Cash discounts, if any, will apply only on the net amount of invoices sent to Buyer after deducting transportation charges, taxes and duties, and will be allowed only if (i) the invoice is paid according to Omron's payment terms and (ii) Buyer has no past due amounts.
4. **Interest.** Omron, at its option, may charge Buyer 1-1/2% interest per month or the maximum legal rate, whichever is less, on any balance not paid within the stated terms.
5. **Orders.** Omron will accept no order less than \$200 net billing.
6. **Governmental Approvals.** Buyer shall be responsible for, and shall bear all costs involved in, obtaining any government approvals required for the importation or sale of the Products.
7. **Taxes.** All taxes, duties and other governmental charges (other than general real property and income taxes), including any interest or penalties thereon, imposed directly or indirectly on Omron or required to be collected directly or indirectly by Omron for the manufacture, production, sale, delivery, importation, consumption or use of the Products sold hereunder (including customs duties and sales, excise, use, turnover and license taxes) shall be charged to and remitted by Buyer to Omron.
8. **Financial.** If the financial position of Buyer at any time becomes unsatisfactory to Omron, Omron reserves the right to stop shipments or require satisfactory security or payment in advance. If Buyer fails to make payment or otherwise comply with these Terms or any related agreement, Omron may (without liability and in addition to other remedies) cancel any unshipped portion of Products sold hereunder and stop any Products in transit until Buyer pays all amounts, including amounts payable hereunder, whether or not then due, which are owing to it by Buyer. Buyer shall in any event remain liable for all unpaid accounts.
9. **Cancellation; Etc.** Orders are not subject to rescheduling or cancellation unless Buyer indemnifies Omron against all related costs or expenses.
10. **Force Majeure.** Omron shall not be liable for any delay or failure in delivery resulting from causes beyond its control, including earthquakes, fires, floods, strikes or other labor disputes, shortage of labor or materials, accidents to machinery, acts of sabotage, riots, delay in or lack of transportation or the requirements of any government authority.
11. **Shipping; Delivery.** Unless otherwise expressly agreed in writing by Omron:
  - a. Shipments shall be by a carrier selected by Omron; Omron will not drop ship except in "break down" situations.
  - b. Such carrier shall act as the agent of Buyer and delivery to such carrier shall constitute delivery to Buyer;
  - c. All sales and shipments of Products shall be FOB shipping point (unless otherwise stated in writing by Omron), at which point title and risk of loss shall pass from Omron to Buyer; provided that Omron shall retain a security interest in the Products until the full purchase price is paid;
  - d. Delivery and shipping dates are estimates only; and
  - e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. **Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
13. **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. (b) **Limitations.** OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, ABOUT NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OF THE PRODUCTS. BUYER ACKNOWLEDGES THAT IT ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. Omron further disclaims all warranties and responsibility of any type for claims or expenses based on infringement by the Products or otherwise of any intellectual property right. (c) **Buyer Remedy.** Omron's sole obligation hereunder shall be, at Omron's election, to (i) replace (in the form originally shipped with Buyer responsible for labor charges for removal or replacement thereof) the non-complying Product, (ii) repair the non-complying Product, or (iii) repay or credit Buyer an amount equal to the purchase price of the non-complying Product; provided that in no event shall Omron be responsible for warranty, repair, indemnity or any other claims or expenses regarding the Products unless Omron's analysis confirms that the Products were properly handled, stored, installed and maintained and not subject to contamination, abuse, misuse or inappropriate modification. Return of any Products by Buyer must be approved in writing by Omron before shipment. Omron Companies shall not be liable for the suitability or unsuitability or the results from the use of Products in combination with any electrical or electronic components, circuits, system assemblies or any other materials or substances or environments. Any advice, recommendations or information given orally or in writing, are not to be construed as an amendment or addition to the above warranty. See <http://oeweb.omron.com> or contact your Omron representative for published information.
14. **Limitation on Liability; Etc.** OMRON COMPANIES SHALL NOT BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR PRODUCTION OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED IN CONTRACT, WARRANTY, NEGLIGENCE OR STRICT LIABILITY. Further, in no event shall liability of Omron Companies exceed the individual price of the Product on which liability is asserted.
15. **Indemnities.** Buyer shall indemnify and hold harmless Omron Companies and their employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not Omron is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless Omron and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party.
16. **Property; Confidentiality.** Any intellectual property in the Products is the exclusive property of Omron Companies and Buyer shall not attempt to duplicate it in any way without the written permission of Omron. Notwithstanding any charges to Buyer for engineering or tooling, all engineering and tooling shall remain the exclusive property of Omron. All information and materials supplied by Omron to Buyer relating to the Products are confidential and proprietary, and Buyer shall limit distribution thereof to its trusted employees and strictly prevent disclosure to any third party.
17. **Export Controls.** Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (iii) disclosure to non-citizens of regulated technology or information.
18. **Miscellaneous.** (a) **Waiver.** No failure or delay by Omron in exercising any right and no course of dealing between Buyer and Omron shall operate as a waiver of rights by Omron. (b) **Assignment.** Buyer may not assign its rights hereunder without Omron's written consent. (c) **Law.** These Terms are governed by the law of the jurisdiction of the home office of the Omron company from which Buyer is purchasing the Products (without regard to conflict of law principles). (d) **Amendment.** These Terms constitute the entire agreement between Buyer and Omron relating to the Products, and no provision may be changed or waived unless in writing signed by the parties. (e) **Severability.** If any provision hereof is rendered ineffective or invalid, such provision shall not invalidate any other provision. (f) **Setoff.** Buyer shall have no right to set off any amounts against the amount owing in respect of this invoice. (g) **Definitions.** As used herein, "including" means "including without limitation"; and "Omron Companies" (or similar words) mean Omron Corporation and any direct or indirect subsidiary or affiliate thereof.

## Certain Precautions on Specifications and Use

1. **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 but the following is a non-exhaustive list of applications for which particular attention must be given:
  - (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
  - (ii) Use in consumer products or any use in significant quantities.
  - (iii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
  - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.

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'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
2. **Programmable Products.** Omron Companies shall not be responsible for the user's programming of a programmable Product, or any consequence thereof.
3. **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.
4. **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.
5. **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.

Complete "Terms and Conditions of Sale" for product purchase and use are on Omron's website at [www.omron.com/oei](http://www.omron.com/oei) – under the "About Us" tab, in the Legal Matters section.

**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

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