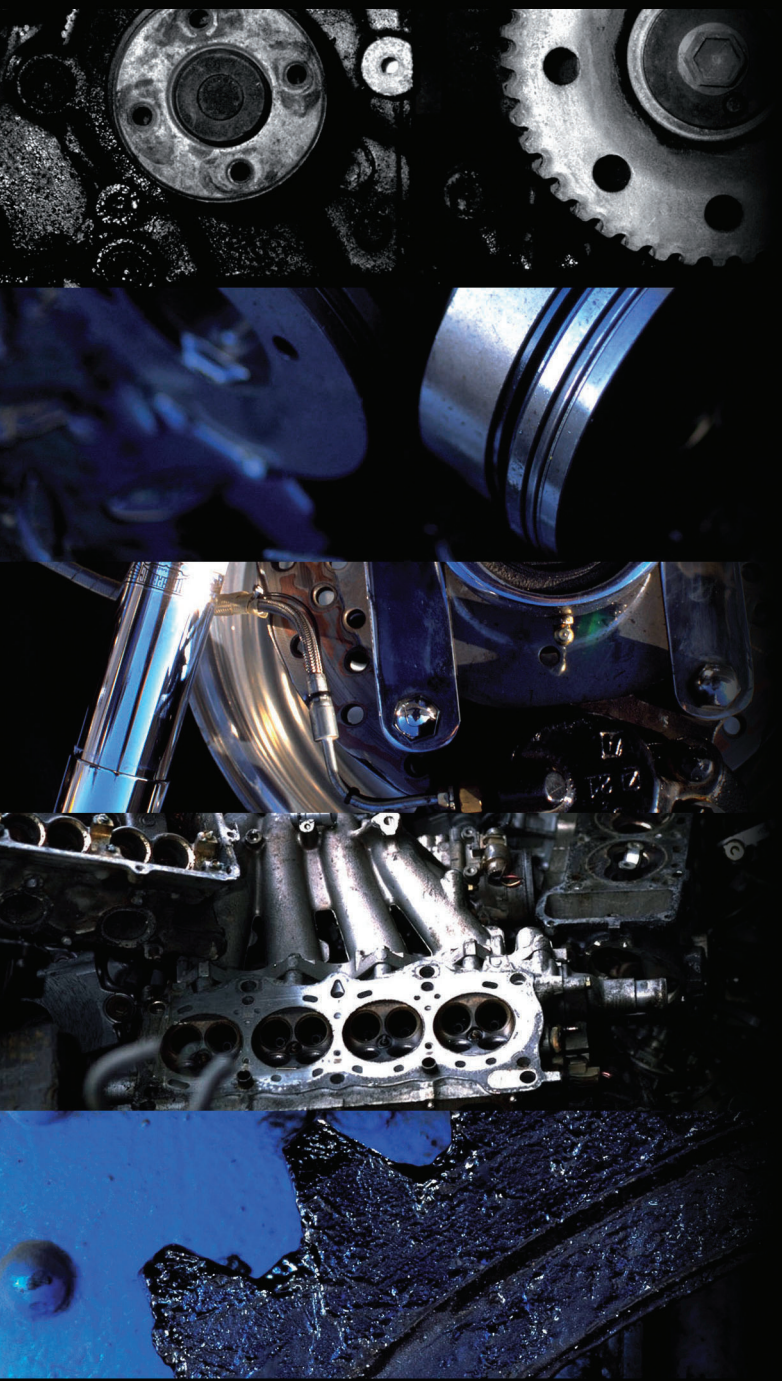
OMRON

# Stainless Steel Housing

**Oil-resistant, Robust, Compact Photoelectric Sensor with Built-in Amplifier**

# E3ZM-C

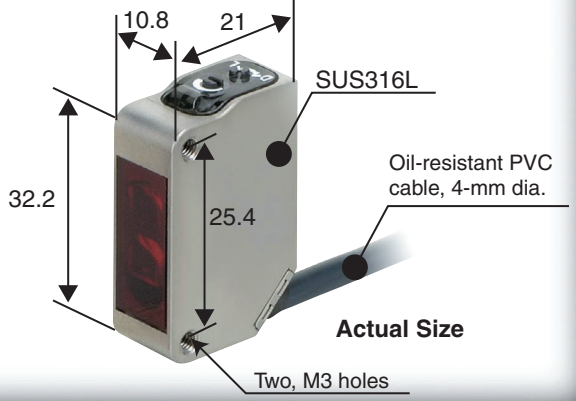
## A New Photoelectric Sensor Designed for the Automotive and Machine Tool Industries



realizing

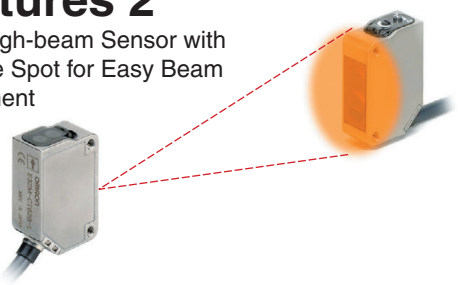
## Features 1

Oil-resistant, Robust, and Compact (IP67g Degree of Protection)




## Features 2

A Through-beam Sensor with a Visible Spot for Easy Beam Adjustment



## Features 3

Twist-and-Click M12 Pre-wired Connector

# A New Sensor with Stainless Steel Housing That's Strong, Compact, and Easy to Use!

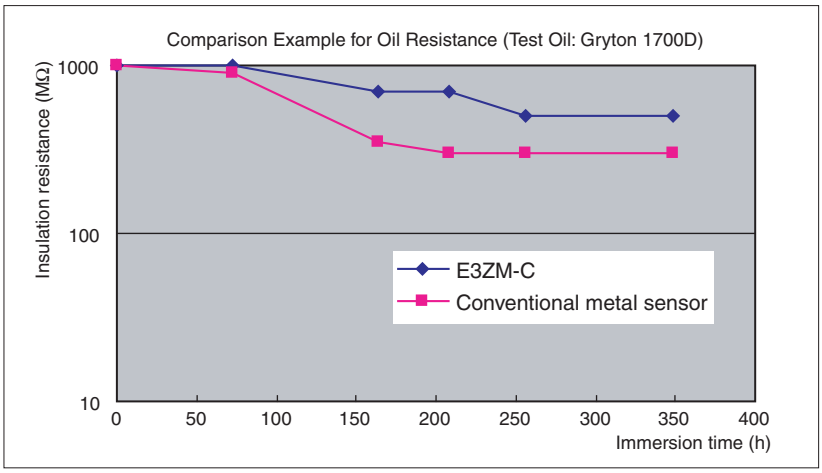
## Resists Oils and Coolants

The E3ZM-C features a simple shape and structure that resist oils and coolants, performance that meets or exceeds any previous models from OMRON.

The protective structure eliminates the need for screws to hold a cover, so there are no worries about loose screws leading to liquid penetration.

And the model number is laser-marked on the housing so it's always readable when the time comes to order maintenance parts.

The compact, easy-to-use E3ZM-C with built-in amplifier is ideal for oily environments.





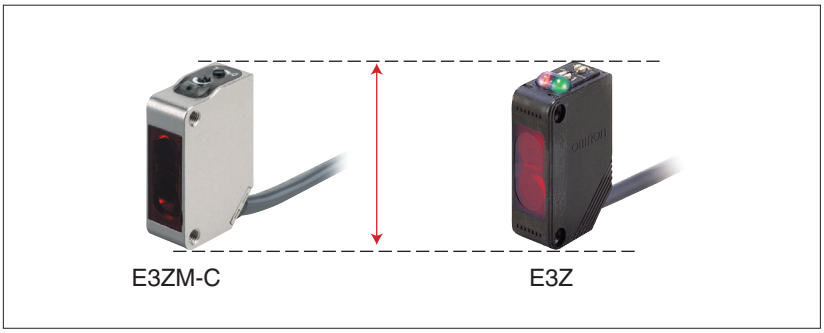
E3ZM-C Laser Marking

## World's Smallest, and Yet Robust

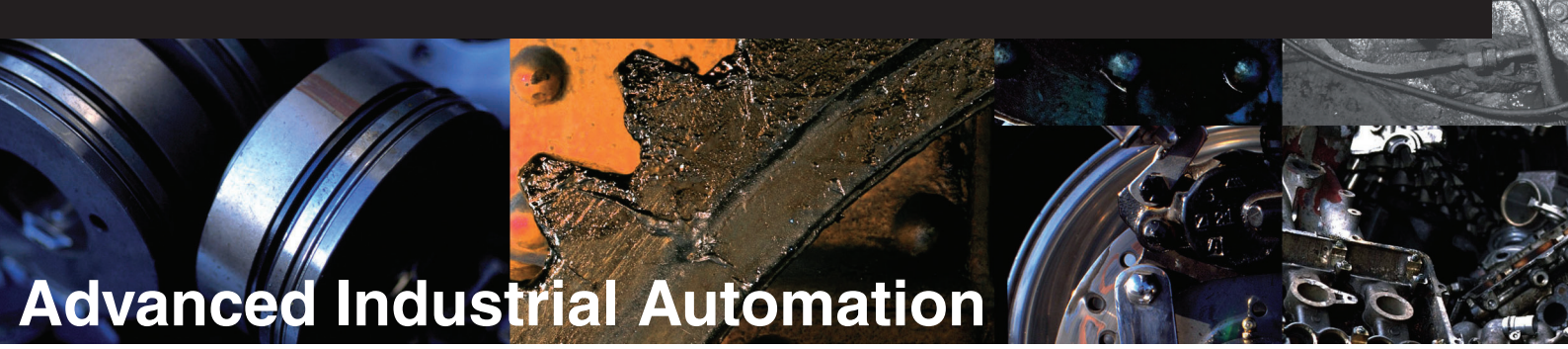
Patent Pending

The E3ZM-C is the same compact size as the E3Z, making it the smallest square metal photoelectric sensor in the world (according to OMRON investigation).

The SUS316L housing makes it robust, and removes all worries of the coating coming off.




**Application Precaution** Use the E3ZM-T/-R/-D/-LS in food processing or beverage filling applications where cleaners or disinfectants are present.



# Advanced Industrial Automation

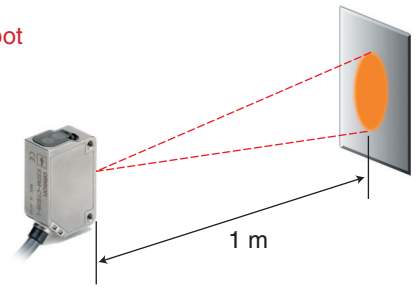
## Perfectly Reliable Detection Performance and Connection Method

### Visible Beam. Long-distance Operation Even in Dusty, Dirty Environments

The E3ZM-CT□2B uses a bright orange LED to generate a spot that's visible 1 m away. And the stronger beam used to achieve a detection distance of 20 m means that Sensor operation is possible even in dusty, dirty environments (response time: 2 ms). It all adds up to a more visible, more dependable worksite.

E3ZM-CT□2B

Bright Orange Spot

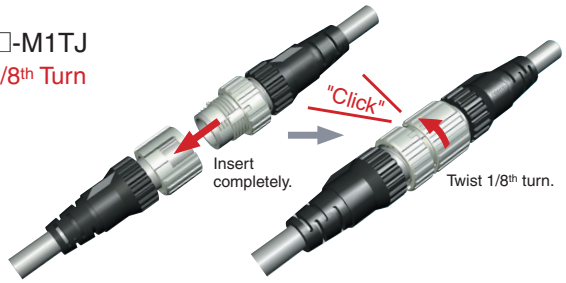



### Simple, Yet Dependable M12 Twist-and-Click Pre-wired Connectors

These Connectors match the XS5 Connectors, which reduce wiring work. They eliminate the troublesome need to control torque when tightening connectors, and remove worries about screws loosening due to vibration.

E3ZM-C□□□-M1TJ

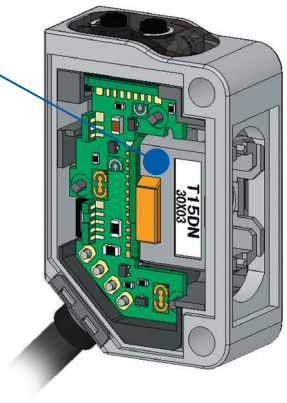
Locks with a 1/8th Turn




## Unique Miniaturization and Modularization Technologies

### Sensing Module

The optical system and signal processing are all contained in one module, providing all the main functions required of a Photoelectric Sensor.




Internal Structure

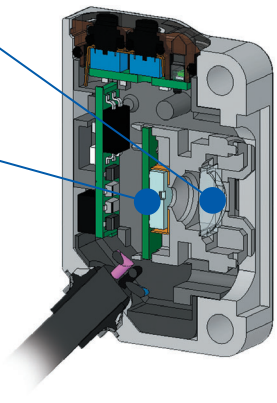
### Optical System

Maximizes manufacturing technology, including sophisticated inline optical axis adjustment.

### Signal Processing

Leading-edge technology for stabilization and miniaturization is obvious in the photo IC, which includes an external light interference prevention algorithm, CSP* mounting, and other components.

*Chip Scale Package



Cross Section

# Oil-resistant, Robust, Compact Photoelectric Sensor (Stainless Housing and Built-in Amplifier)

# E3ZM-C

## Designed for the Automotive and Machine Tool Industries

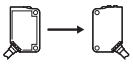
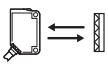
- **Oil-resistant, water-resistant, robust body made of stainless steel.**
- **Same size as the E3Z: The smallest square metal photoelectric sensor in the world.**
- **Through-beam Models with an orange spot that's visible 1 m away, and a long distance detection to reduce the influence of dirt (detection distance: 20 m, response time: 2 ms).**
- **Models with M12 twist-and-click pre-wired connectors.**
- **Reversed output polarity protection, external light interference prevention algorithm, and RoHS compliance to inherit the E3Z's reliability.**

⚠ Refer to *"Safety Precautions"* on page 13

## Ordering Information

### Sensors

Orange light  Red light  Infrared light

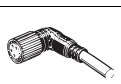
| Sensing method | Appearance | Connection method | Sensing distance | Model | |
|---|---|---|---|---|---|
| | | | | NPN output | PNP output |
| Through-beam |  | Pre-wired (2 m) | 15 m | E3ZM-CT61 | E3ZM-CT81 |
| | | Pre-wired (5 m) | | E3ZM-CT61 5M | E3ZM-CT81 5M |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CT61-M1TJ | E3ZM-CT81-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CT66 | E3ZM-CT86 |
| | | Pre-wired (2 m) | 20 m | E3ZM-CT62B | E3ZM-CT82B |
| | | Pre-wired (5 m) | | E3ZM-CT62B 5M | E3ZM-CT82B 5M |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CT62B-M1TJ | E3ZM-CT82B-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CT67B | E3ZM-CT87B |
| Retro-reflective |  | Pre-wired (2 m) | 4 m (100 mm) (Using E39-R1S) | E3ZM-CR61 | E3ZM-CR81 |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CR61-M1TJ | E3ZM-CR81-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CR66 | E3ZM-CR86 |
| Diffuse-reflective |  | Pre-wired (2 m) | 1 m | E3ZM-CD62 | E3ZM-CD82 |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CD62-M1TJ | E3ZM-CD82-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CD67 | E3ZM-CD87 |
| BGS reflective |  | Pre-wired (2 m) | 10 to 100 mm | E3ZM-CL61H | E3ZM-CL81H |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CL61H-M1TJ | E3ZM-CL81H-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CL66H | E3ZM-CL86H |
| | | Pre-wired (2 m) | 10 to 150 mm | E3ZM-CL62H | E3ZM-CL82H |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CL62H-M1TJ | E3ZM-CL82H-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CL67H | E3ZM-CL87H |
| | | Pre-wired (2 m) | 10 to 200 mm | E3ZM-CL64H | E3ZM-CL84H |
| | | M12 twist-and-click pre-wired connector (0.3 m) | | E3ZM-CL64H-M1TJ | E3ZM-CL84H-M1TJ |
| | | Connector (M8, 4 pins) | | E3ZM-CL69H | E3ZM-CL89H |

**Let Us Know What You Need**

1. Retro-reflective, Diffuse-reflective, and BGS-reflective Models are also available with a 5-m pre-wired cable. When ordering, add the cable length to the end of the model number (e.g., E3ZM-CD62 5M).
2. Models with no moving parts (i.e., without a sensitivity adjustor or mode selection switch) are also available, as are models with built-in slits (through-beam, 0.8 m) (e.g., E3ZM-CT83H 2M for no sensitivity adjustment, wire-connection selection of operating mode, and built-in slit).
3. Except for the E3ZM-CL□□H, models with 3-pin M8 connectors are available. When ordering, add "-M5" to the end of the model number (e.g., E3ZM-CT66-M5).
4. 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).
   Ask your OMRON representative for details on any models or specifications you require.

## Accessories

### Sensor I/O Connectors

| Size | Cable | Appearance | Cable type | | Model |
|---|---|---|---|---|---|
| M12 (For -M1TJ models) | Standard | Straight  | 2 m | 4-wire | **XS5F-D421-D80-A** |
| | | | 5 m | | **XS5F-D421-G80-A** |
| M8 (4 pins) | Standard | Straight  | 2 m | 4-wire | **XS3F-M421-402-A** |
| | | | 5 m | | **XS3F-M421-405-A** |
| | | L-shaped  | 2 m | | **XS3F-M422-402-A** |
| | | | 5m | | **XS3F-M422-405-A** |

**Note:** Ask your OMRON representative about connectors with other specifications.

### Mounting Brackets

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

### Reflector

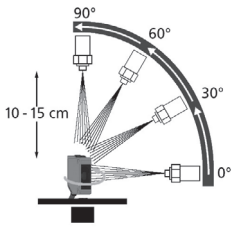
| Name | E3ZM-CR Sensing distance (typical) * | Model | Quantity | Remarks |
|---|---|---|---|---|
| Reflector | 3 m (100 mm) (rated value) | **E39-R1** | 1 | • Reflectors are not provided with Retro-reflective models.<br>• The MSR function is enabled. |
| | 4 m (100 mm) (rated value) | **E39-R1S** | 1 | |
| | 5 m (100 mm) | **E39-R2** | 1 | |
| | 2.5 m (100 mm) | **E39-R9** | 1 | |
| | 3.5 m (100 mm) | **E39-R10** | 1 | |
| Small Reflector | 1.5 m (50 mm) | **E39-R3** | 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.

## Ratings and Specifications

| Item \ Model | | Sensing method | Through-beam | | Retro-reflective with MSR function | Diffuse-reflective |
|---|---|---|---|---|---|---|
| | NPN output | | E3ZM-CT61 (-M1TJ)<br>E3ZM-CT66 | E3ZM-CT62B (-M1TJ)<br>E3ZM-CT67B | E3ZM-CR61 (-M1TJ)<br>E3ZM-CR66 | E3ZM-CD62 (-M1TJ)<br>E3ZM-CD67 |
| | PNP output | | E3ZM-CT81 (-M1TJ)<br>E3ZM-CT86 | E3ZM-CT82B (-M1TJ)<br>E3ZM-CT87B | E3ZM-CR81 (-M1TJ)<br>E3ZM-CR86 | E3ZM-CD82 (-M1TJ)<br>E3ZM-CD87 |
| Sensing distance | | | 15 m | 20 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) |
| Spot diameter | | | --- | | | |
| Standard sensing object | | | Opaque: 12-mm dia. min. | | Opaque: 75-mm dia. min. | --- |
| Differential travel | | | --- | | | 20% of sensing distance max. |
| Black/white error | | | --- | | | |
| Directional angle | | | Emitter, Receiver: 3° to 15°<br>(Distance between emitter and receiver. Rated sensing distance) | | Sensor: 3° to 10°<br>Reflector: 30° (Distance to Reflector. Rated sensing distance) | --- |
| Light source (wavelength) | | | Infrared LED (870 nm) | Orange LED (615 nm) | Red LED (660 nm) | Infrared LED (860 nm) |
| Power supply voltage | | | 10 to 30 VDC, including 10% ripple (p-p) | | | |
| Current consumption | | | 40 mA (Emitter 20 mA max., Receiver 20 mA max.) | | 25 mA max. | |
| Control output | | | 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 | | | |
| Protection circuits | | | Reversed power supply polarity protection, Output short-circuit protection, and Reversed output polarity protection | | Reversed power supply polarity protection, Output short-circuit protection, Reversed output polarity protection, and Mutual interference prevention | |
| Response time | | | Operate or reset:<br>1 ms max. | Operate or reset:<br>2 ms max. | Operate or reset: 1 ms max. | |
| Sensitivity adjustment | | | One-turn adjuster | | | |
| 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/s$^2$ 3 times each in X, Y, and Z directions | | | |
| Degree of protection * | | | IEC: IP67, DIN 40050-9: IP69K | | | |
| Connection method | | | -C□□1/-C□□2(B): Pre-wired cable (standard length: 2 m, -M1TJ: Pre-wired connector with 0.3-m cable)<br>-C□□6/-C□□7(B): M8 4-pin connector | | | |
| Indicator | | | Operation indicator (yellow), Stability indicator (green) (Emitter has only power supply indicator (green).) | | | |
| Weight (packed state) | Pre-wired models | | Approx. 150 g (-M1TJ: Approx. 90 g) | | Approx. 90 g (-M1TJ: Approx. 50 g) | |
| | Connector models | | Approx. 60 g | | Approx. 40 g | |
| Materials | Housing | | SUS316L | | | |
| | Lens | | PMMA (polymethylmethacrylate) | | | |
| | Indication | | PES (polyethersulfone) | | | |
| | Sensitivity adjustment and mode selector switch | | PEEK (polyetheretherketone) | | | |
| | Seals | | Fluoro rubber | | | |
| Accessories | | | Instruction sheet (Note: Reflectors and Mounting Brackets are sold separately.) | | | |

* 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.



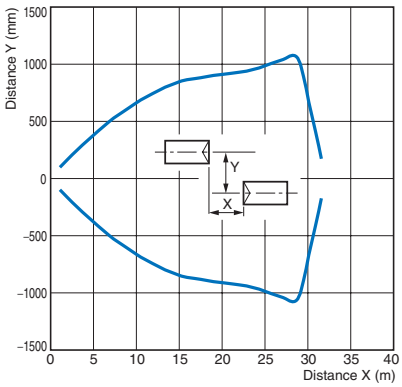
| Item | | Sensing method | BGS Reflective | | |
|---|---|---|---|---|---|
| Model | NPN output | | E3ZM-CL61H (-M1TJ)<br>E3ZM-CL66H | E3ZM-CL62H (-M1TJ)<br>E3ZM-CL67H | E3ZM-CL64H (-M1TJ)<br>E3ZM-CL69H |
| | PNP output | | E3ZM-CL81H (-M1TJ)<br>E3ZM-CL86H | E3ZM-CL82H (-M1TJ)<br>E3ZM-CL87H | E3ZM-CL84H (-M1TJ)<br>E3ZM-CL89H |
| Sensing distance | | | 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) |
| Spot diameter | | | 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 |
| Standard sensing object | | | --- | | |
| Differential travel | | | 3% of sensing distance max. | 15% of sensing distance max. | 20% of sensing distance max. |
| Black/white error | | | 5% of sensing distance max. | 10% of sensing distance max. | 20% of sensing distance max. |
| Directional angle | | | --- | | |
| Light source (wavelength) | | | Red LED (650 nm) | Red LED (660 nm) | |
| Power supply voltage | | | 10 to 30 VDC, including 10% ripple (p-p) | | |
| Current consumption | | | 25 mA max. | | |
| Control output | | | 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 | | |
| 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 | | | --- | | |
| 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/s$^2$ 3 times each in X, Y, and Z directions | | |
| Degree of protection * | | | IEC: IP67, DIN 40050-9: IP69K | | |
| Connection method | | | -CL□□1H/-CL□□2H/-CL□□4H: Pre-wired cable (standard length: 2 m, -M1TJ: Pre-wired connector with 0.3-m cable)<br>-CL□□6H/-CL□□7H/-CL□□9H: M8 4-pin connector | | |
| Indicator | | | Operation indicator (yellow), Stability indicator (green) | | |
| Weight (packed state) | Pre-wired models | | Approx. 90 g (-M1TJ: Approx. 50 g) | | |
| | Connector models | | Approx. 40 g | | |
| Materials | Housing | | SUS316L | | |
| | Cable | | Oil-resistant vinyl cable | | |
| | Lens | | PMMA (polymethylmethacrylate) | | |
| | Display | | PES (polyethersulfone) | | |
| | Seals | | Fluoro rubber | | |
| Accessories | | | Instruction sheet (Note: Mounting Brackets are sold separately.) | | |

# Engineering Data (Typical)

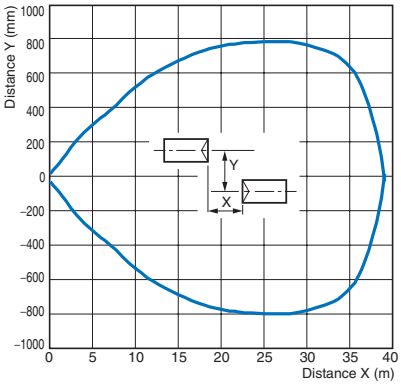
## Parallel Operating Range

### Through-beam Models

**E3ZM-CT□1/-CT□6**

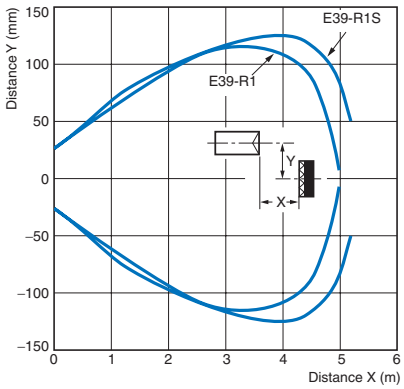



**E3ZM-CT□2B/-CT□7B**




### Retro-reflective Models

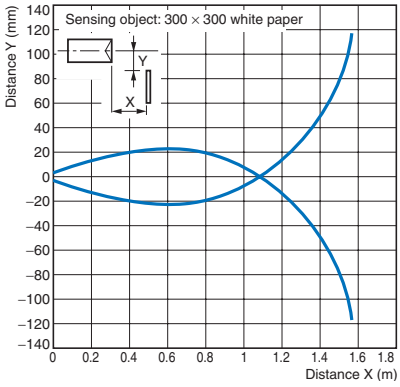
**E3ZM-CR□1/-CR□6**




## Operating Range

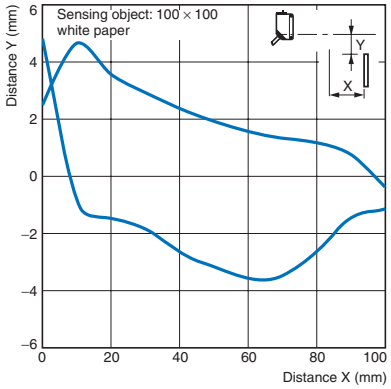
### Diffuse-reflective Models

**E3ZM-CD□2/-CD□7**

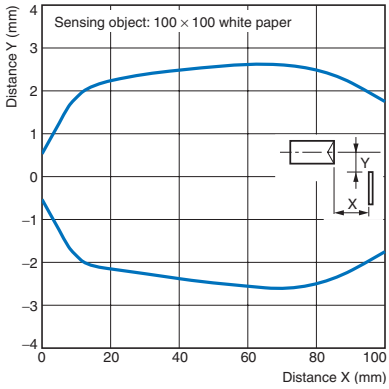



### BGS Reflective Models

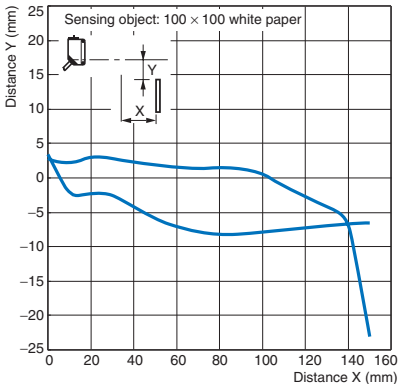
**E3ZM-CL□1H/-CL□6H (Vertical)**



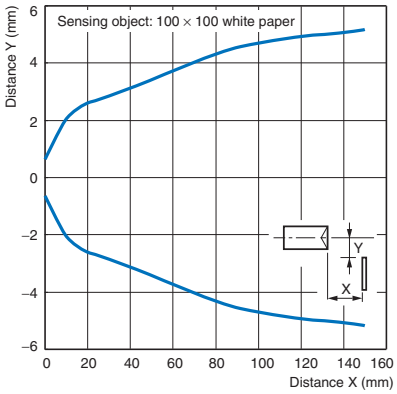

**E3ZM-CL□1H/-CL□6H (Horizontal)**



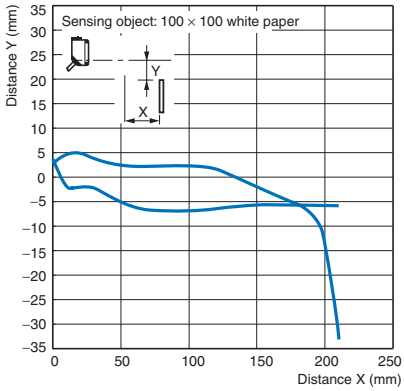

**E3ZM-CL□2H/-CL□7H (Vertical)**



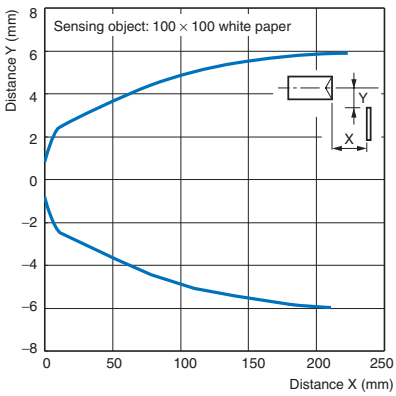

**E3ZM-CL□H/-CL□7H (Horizontal)**




**E3ZM-CL□4H/-CL□9H (Vertical)**



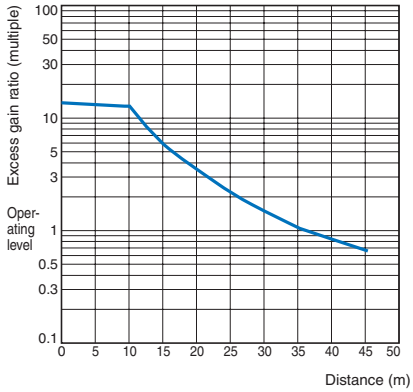

**E3ZM-CL□4H/-CL□9H (Horizontal)**



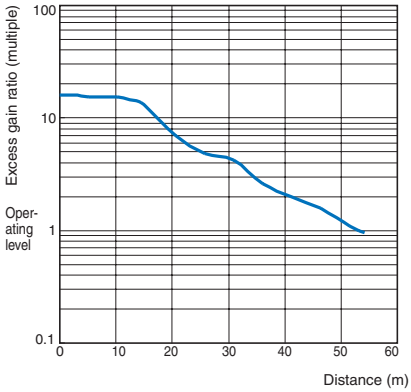
## Excess Gain vs. Distance

### Through-beam Models

**E3ZM-CT□1/-CT□6**

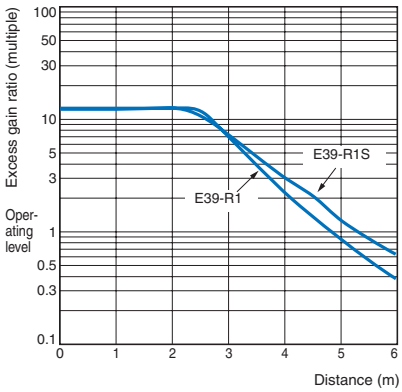



**E3ZM-CT□2B/-CT□7B**



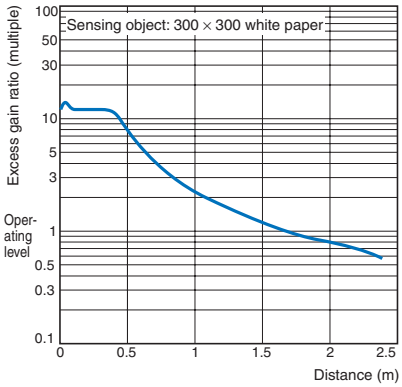

### Retro-reflective Models

**E3ZM-CR□1/-CR□6**




### Diffuse-reflective Models

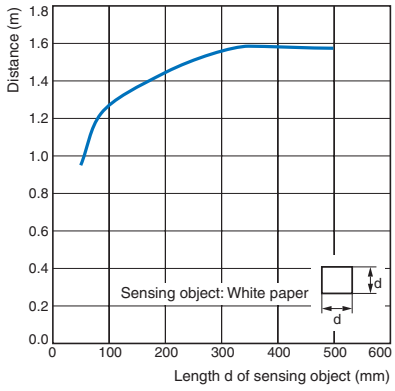
**E3ZM-CD□2/-CR□7**




## Sensing Object Size vs. Distance

### Diffuse-reflective Models

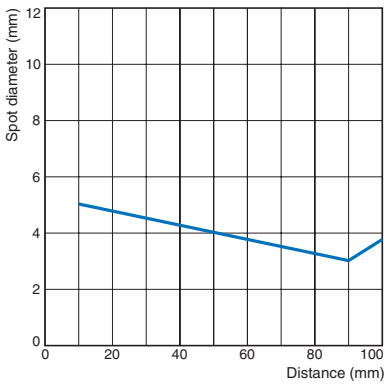
**E3ZM-CD□2/-CD□7**



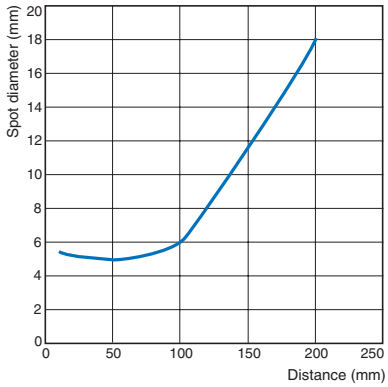

## Spot Diameter vs. Distance

### BGS Reflective Models

**E3ZM-CL□1H/-CL□6H**



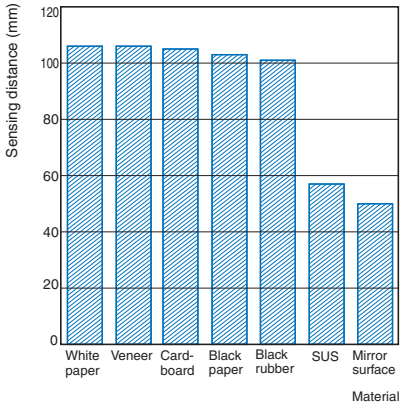

**E3ZM-CL□2H/-CL□4H/-CL□7H/-CL□9H**



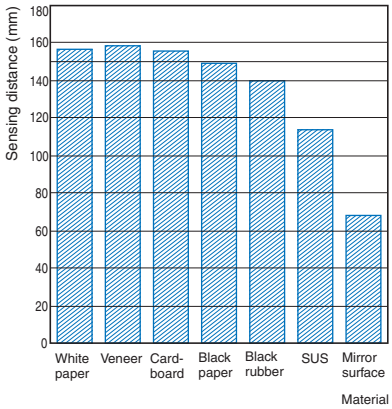
## Sensing Distance vs. Sensing Object Material

### BGS Reflective Models

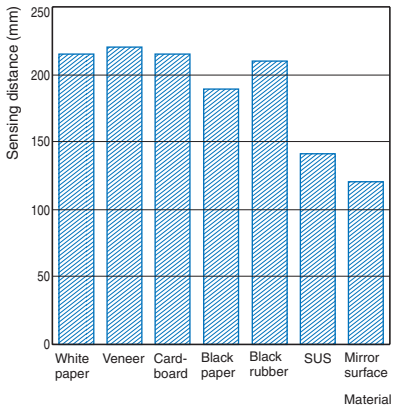
**E3ZM-CL□1H/-CL□6H**




**E3ZM-CL□2H/-CL□7H**



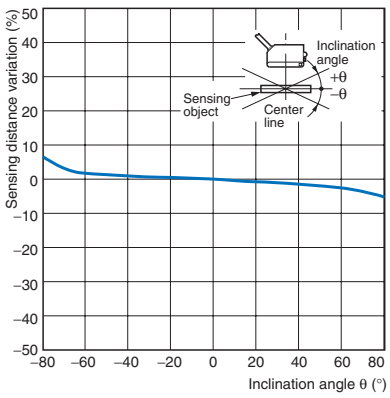

**E3ZM-CL□4H/-CL□9H**



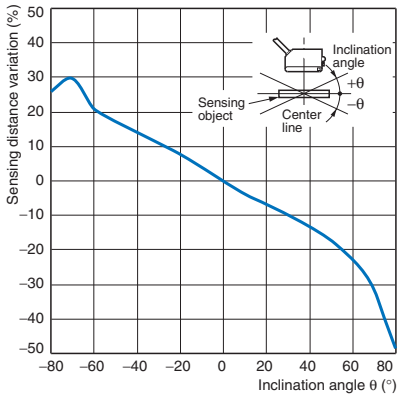

## Inclination Characteristics

### BGS Reflective Models

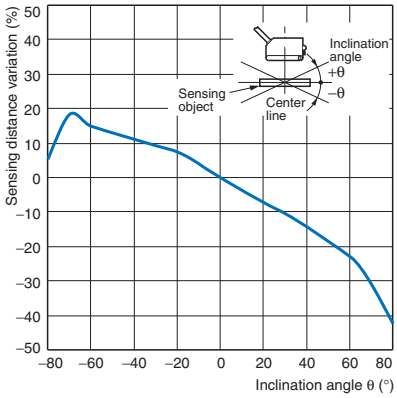
**E3ZM-CL□1H (CL□6H) (Vertical)**




**E3ZM-CL□2H (CL□7H) (Vertical)**



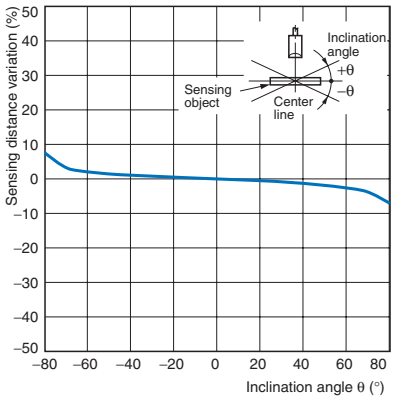

**E3ZM-CL□4H (CL□9H) (Vertical)**



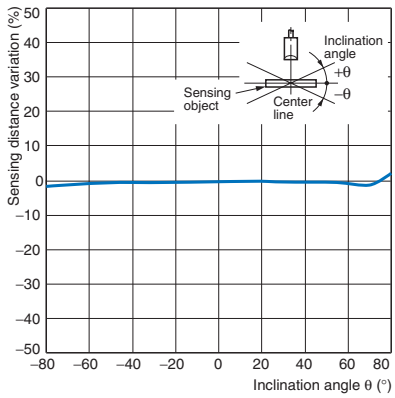

## Inclination Characteristics

### BGS Reflective Models

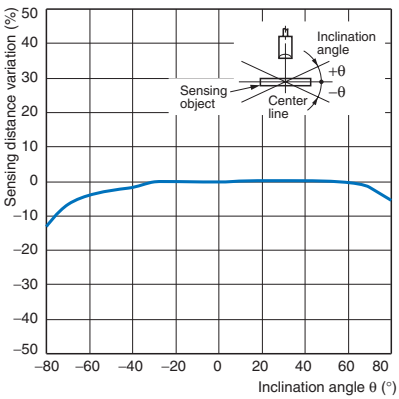
**E3ZM-CL□1H (CL□6H) (Horizontal)**




**E3ZM-CL□2H (CL□7H) (Horizontal)**

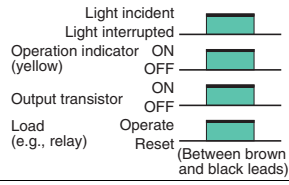
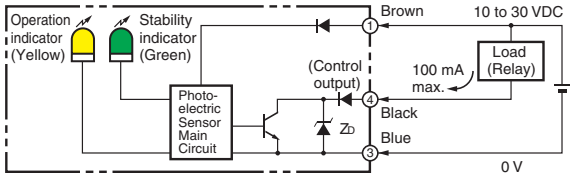
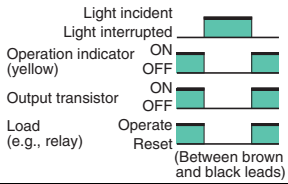
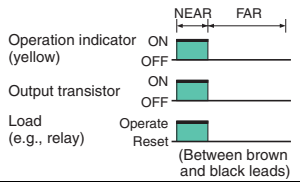
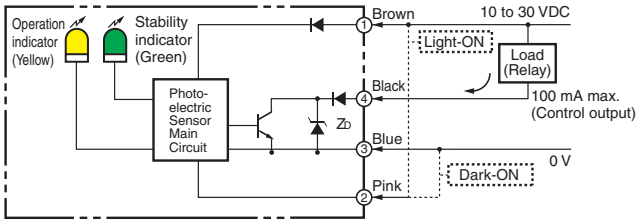
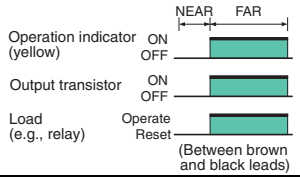



**E3ZM-CL□4H (CL□9H) (Horizontal)**

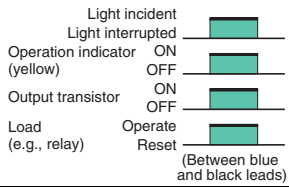
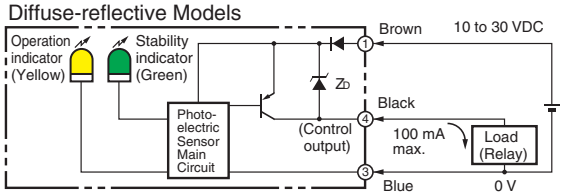
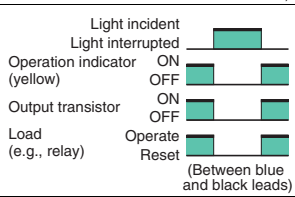
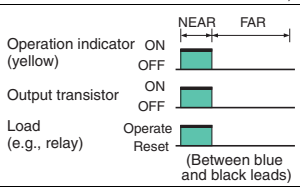
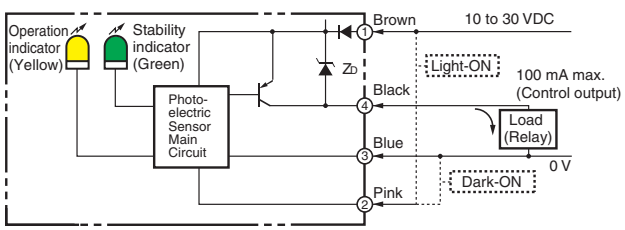
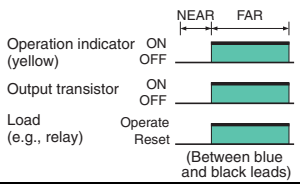


# I/O Circuit Diagrams

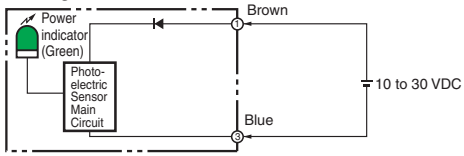
## NPN Output

| Model | Operation mode | Timing charts | Operation selector | Output circuit |
|---|---|---|---|---|
| E3ZM-CT61<br>E3ZM-CT66<br>E3ZM-CT62B<br>E3ZM-CT67B<br>E3ZM-CR61<br>E3ZM-CR66<br>E3ZM-CD62<br>E3ZM-CD67 | Light-ON |  | L side (LIGHT ON) | Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models<br>  |
| | Dark-ON |  | D side (DARK ON) | |
| E3ZM-CL61H<br>E3ZM-CL66H<br>E3ZM-CL62H<br>E3ZM-CL67H<br>E3ZM-CL64H<br>E3ZM-CL69H | 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 | Operation selector | Output circuit |
|---|---|---|---|---|
| E3ZM-CT81<br>E3ZM-CT86<br>E3ZM-CT82B<br>E3ZM-CT87B<br>E3ZM-CR81<br>E3ZM-CR86<br>E3ZM-CD82<br>E3ZM-CD87 | Light-ON |  | L side (LIGHT ON) | Through-beam Receivers, Retro-reflective Models, Diffuse-reflective Models<br>  |
| | Dark-ON |  | D side (DARK ON) | |
| E3ZM-CL81H<br>E3ZM-CL86H<br>E3ZM-CL82H<br>E3ZM-CL87H<br>E3ZM-CL84H<br>E3ZM-CL89H | Light-ON |  | Connect pink lead (2) to brown lead (1). |  |
| | Dark-ON |  | Connect pink lead (2) to blue lead (3) or leave open. | |

### Emitter (Either NPN or PNP Output)

| Model | Circuit |
|---|---|
| E3ZM-CT61<br>E3ZM-CT66<br>E3ZM-CT62B<br>E3ZM-CT67B<br>E3ZM-CT81<br>E3ZM-CT86<br>E3ZM-CT82B<br>E3ZM-CT87B | Through-beam Emitter<br>  |

## Connector Pin Arrangement

**M12 Pre-wired Connector**

**M12 Connector Pin Arrangement**

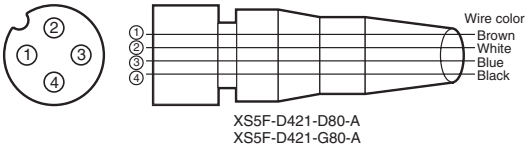
**M8 Connector**

**M8 4-pin Connector Pin Arrangement**

**M8 3-pin Connector Pin Arrangement**

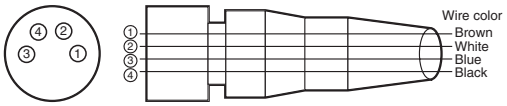
## Plugs (Sensor I/O Connectors)

**M12 Connector**




XS5F-D421-D80-A
XS5F-D421-G80-A

**M8 4-pin Connectors**




XS3F-M421-402-A
XS3F-M421-405-A
XS3F-M422-402-A
XS3F-M422-405-A

| Classification | Wire color | Connector pin No. | Application |
|---|---|---|---|
| DC | Brown | 1 | Power supply (+V) |
| | White | 2 | Operation selection/ stopping light emission (-G0 only) |
| | 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 Operation Selector

### Through-beam Models

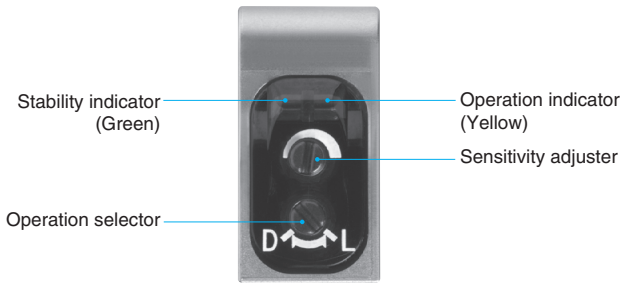
**E3ZM-CT□□ (Receiver)**

### Retro-reflective Models

**E3ZM-CR□□**

### Diffuse-reflective Models

**E3ZM-CD□□**



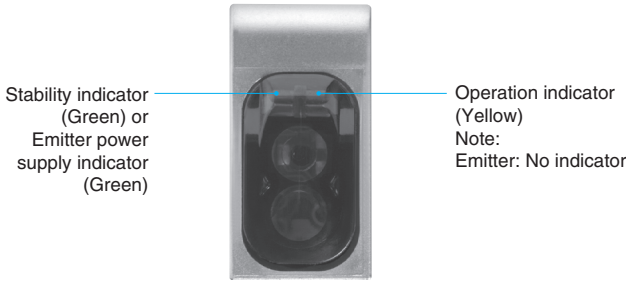

## Infinite Adjustment Emitter

### BGS Reflective Models

**E3ZM-CL□□H**

### Through-beam Models

**E3ZM-CT□□ (Emitter)**



# Safety Precautions

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

## ⚠ WARNING

**This product is not designed or rated for directly or indirectly 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 high-pressure 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 0.39 to 0.49 N·m for M12 metal connectors and 0.3 to 0.4 N·m for M8 metal connectors.

### 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.

### Environments with Cleaners and Disinfectants (e.g., Food Processing Lines)

Do not use the Sensor in environments subject to cleaners and disifectants. They may reduce the degree of protection.

### 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.

### Surface Temperature

Burn injury may occur. The Sensor surface temperature rises depending on application conditions, such as the ambient temperature and the power supply voltage. Use caution when operating or performing maintenance on the Sensor.

## Precautions for Correct Use

Do not use the Sensor in any atmosphere or environment that exceeds the ratings.

### 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 $mm^2$ 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

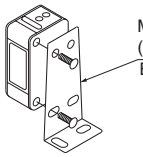
This Sensor is equipped with load short-circuit protection, but be sure to not short circuit the load. Be sure to not use an output current flow that exceeds the rated current. If a load short circuit occurs, the output will turn OFF, so check the wiring before turning ON the power supply again. The 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 capacitive load, use an inrush current of 1.8 times the rated load current or lower.

### Water Resistance

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

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

### Mounting Diagram




## Oil Resistance

- The Sensor has passed oil resistance testing for the oils listed in the following table. Use this table as a guide when considering lubricants and cutting oils.

| Test oil type | Product name | Kinetic viscosity at 40°C ($mm^2/s$) | pH (dilution rate) |
|---|---|---|---|
| Lubricants | Velocity Oil No. 3 | 2.02 | --- |
| Non-water-soluble cutting oils | Yushiron Oil No.2 AC | Less than 10 | --- |
| Water-soluble cutting oils | Yushiroken EC50T3 | --- | 10.1 (×30) |
| | Yushiroken EC50T5 | | 9.9 (×30) |
| | Yushiroken S46D | | 9.9 (×50) |
| | Yushiroken S50N | | 8.6 (×50) |
| | Yushiron Lubic HWC68 | | 9.1 (×30) |
| | Yushiroken Synthetic #770TG | | 9.9 (×20) |
| | Emulcut FA-900ST | | 9.7 (×30) |
| | Multicool CSF-9000 | | 9.7 (×20) |
| | Sugicut CS-68JS-1 | | 9.6 (×20) |
| | Toyocool 3A-666 | | 9.6 (×20) |
| | Gryton 1700 | | 9.1 (×10) |
| | Gryton 1700D | | 9.3 (×3) |

**Note:** **1.** The Sensor was immersed in the above oils for 240 h at 55°C and then passed an insulation resistance test at 100 MΩ.

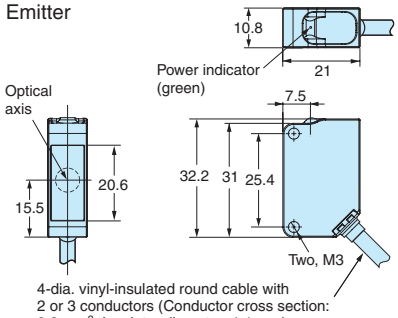
**2.** Use the kinetic viscosities and pHs in the above table as a guide when using the Sensor in environments containing oils not listed in the table. Additives in the oil may also affect performance. Always test applicability in advance.

# Dimensions

## Sensors

### Through-beam Models
**Pre-wired Models**
**E3ZM-CT61**
**E3ZM-CT81**
**E3ZM-CT62B**
**E3ZM-CT82B**

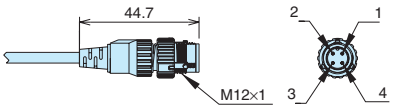
Emitter




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

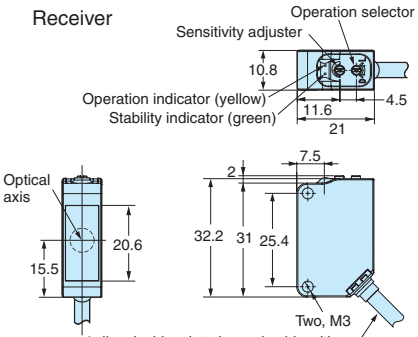
M12 Pre-wired Connector (E3ZM-□□□-M1TJ)

*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 0.3 m




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

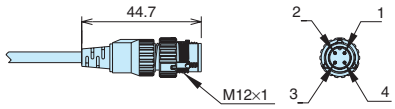
Receiver




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

M12 Pre-wired Connector (E3ZM-□□□-M1TJ)

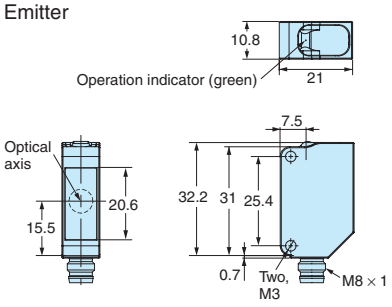
*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 0.3 m




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

### Through-beam Models
**Connector Models**
**E3ZM-CT66**
**E3ZM-CT86**
**E3ZM-CT67B**
**E3ZM-CT87B**

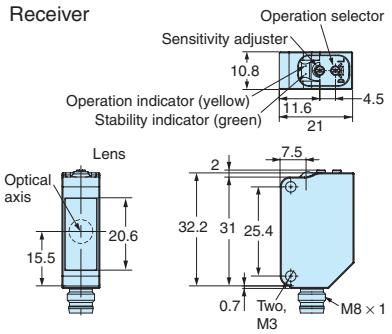
Emitter





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

Receiver

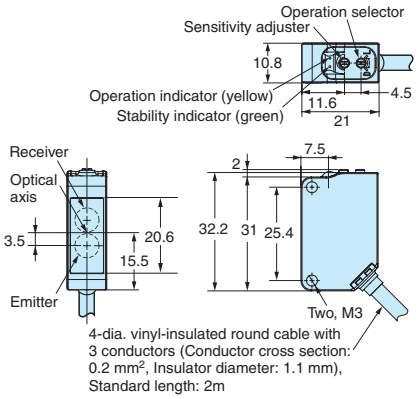




| Terminal No. | Specifications |
|---|---|
| 1 | +V |
| 2 | --- |
| 3 | 0 V |
| 4 | Output |

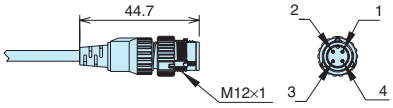
## Retro-reflective Models
**Pre-wired Models**
**E3ZM-CR61**
**E3ZM-CR81**

## Diffuse-reflective Models
**Pre-wired Models**
**E3ZM-CD62**
**E3ZM-CD82**




M12 Pre-wired Connector (E3ZM-□□□-M1TJ)

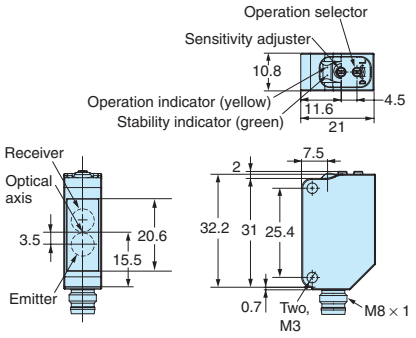
*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 0.3 m




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

## Retro-reflective Models
**Connector Models**
**E3ZM-CR66**
**E3ZM-CR86**

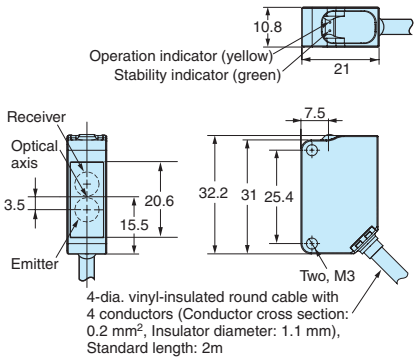
## Diffuse-reflective Models
**Connector Models**
**E3ZM-CD67**
**E3ZM-CD87**





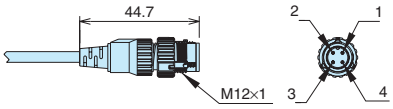
| Terminal No. | Specifications |
|---|---|
| 1 | +V |
| 2 | --- |
| 3 | 0 V |
| 4 | Output |

## BGS Reflective Models
**Pre-wired Models**
**E3ZM-CL61H**
**E3ZM-CL62H**
**E3ZM-CL64H**
**E3ZM-CL81H**
**E3ZM-CL82H**
**E3ZM-CL84H**



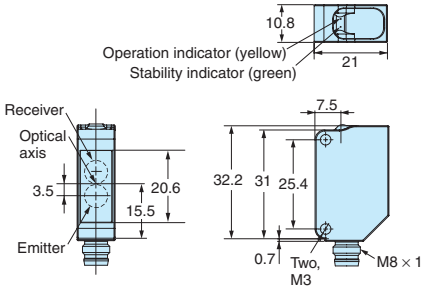

M12 Pre-wired Connector (E3ZM-□□□-M1TJ)

*4-dia. vinyl-insulated round cable with 3 conductors, Standard length: 0.3 m




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

## BGS Reflective Models
**Connector Models**
**E3ZM-CL66H**
**E3ZM-CL67H**
**E3ZM-CL69H**
**E3ZM-CL86H**
**E3ZM-CL87H**
**E3ZM-CL89H**





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

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