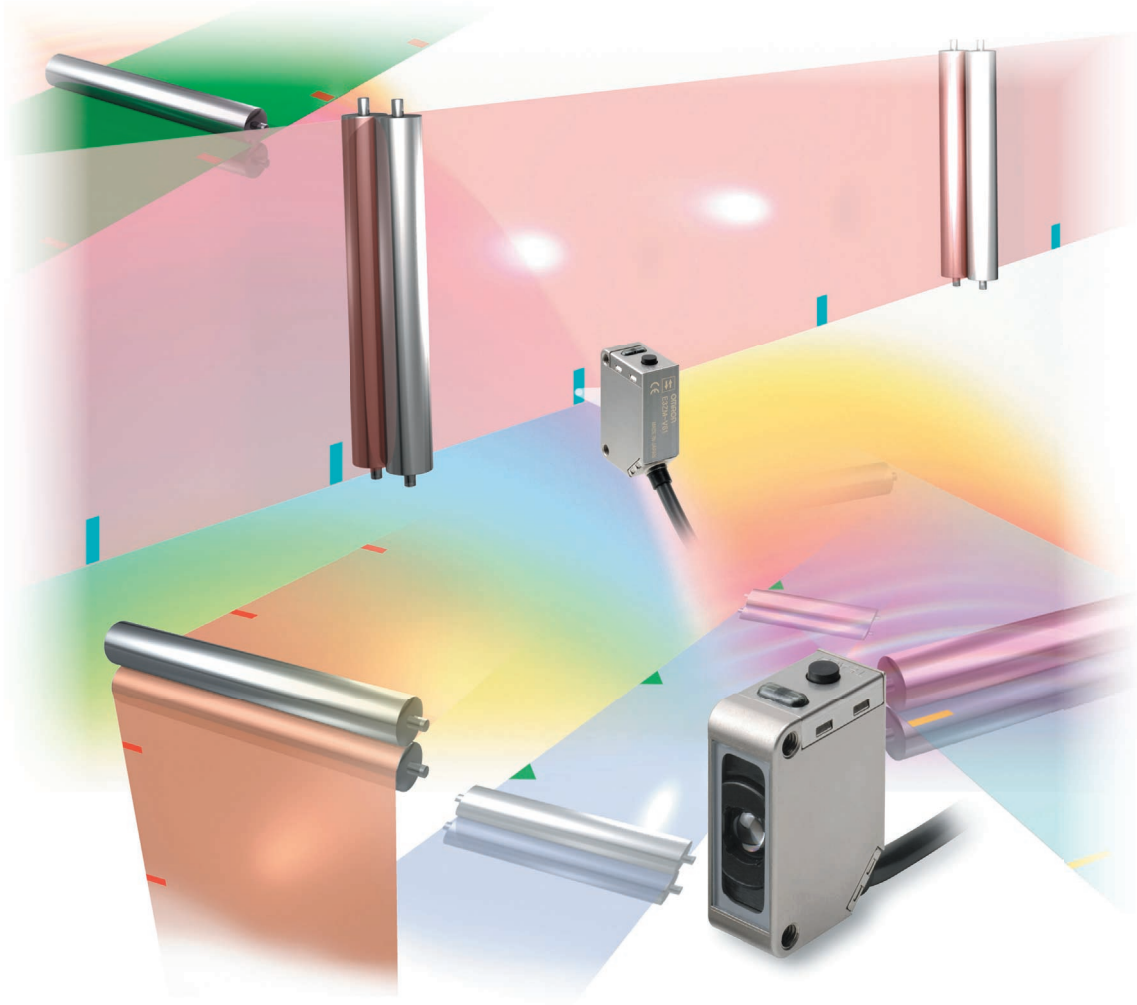


## Mark Sensor with Stainless Steel Housing



### Compact, Photoelectric Sensor with Built-in Amplifier and Teaching Function

- » Color Mark Detection a World-standard Size (11 x 21 x 32 mm)
- » High speed response (50  $\mu$ s)
- » Accuracy in Despite of Sensing Object

# World's Smallest\* Color-Mark Sensor with Built-in Amplifier

The E3ZM-V provides superior optical performance and yet is the same size as the E3Z. This compact, high-speed Mark Sensor remains accurate in spite of sensing object movement.

## Color Mark Sensors Now Join the E3ZM Series of Photoelectric Sensors for the Food Industry

### Space-saving Design with an SUS316L Housing

E3ZM Standard Size

The compact design reduces volume by 90% compared with previous OMRON models, and the world-standard dimensions contribute to standardized installation specifications.

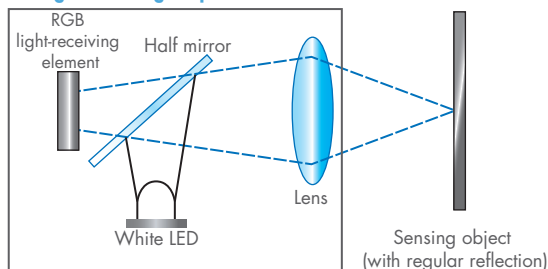


### Coaxial Optical System in a Compact Design

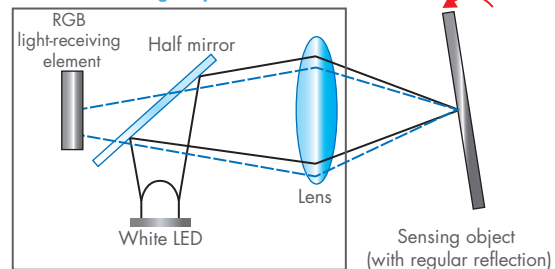
Although the E3ZM-V is only 11 × 21 × 32 mm, it uses a coaxial optical system.

Even if the sensing object is inclined, reflected light is captured with the coaxial optical system to provide stable detection.

#### Straight Sensing Object



#### Inclined Sensing Object



### IP69K Degree of Protection with an SUS316L Housing

E3ZM Durability

The housing is constructed of corrosion-resistant SUS316L, and the display cover is PES (polyethersulfone). Both materials are highly resistant to the effects of detergents and disinfectants. IP69K degree of protection also allows the E3ZM-V to withstand washing with high-temperature, high-pressure water. This makes the E3ZM-V well suited to use in sites requiring a high level of hygiene.



\* According to Omron investigation.



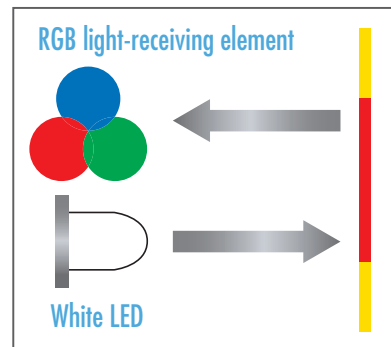
## Cutting-edge Technologies Give This Color Mark Sensor Its Compact Size and Superior Performance

### Improved Color-difference Discrimination, RGB Signal Processing

Discriminates fine color differences which was difficult for previous OMRON models.

Teaching enables automatic selection of ideal colors.

Response is a fast 50  $\mu$ s for both ON and OFF operation (Patent Pending).



## Easy Setting with 2-point and Automatic Teaching

### 2-point Teaching (Manual)

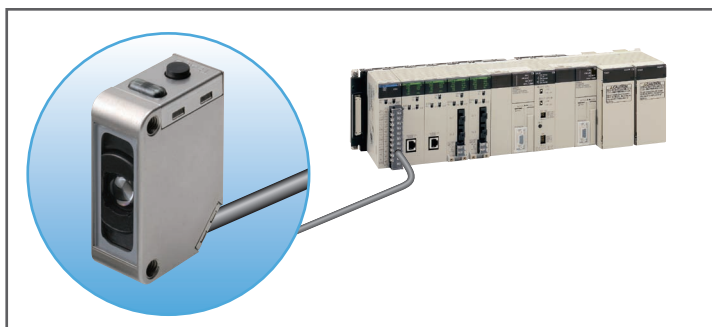
Simply aim the beam spot at the mark portion and background portion, and press the teaching button.



### Automatic Teaching (Remote)

Send a pulse to the remote control input and have the mark pass by seven times for automatic teaching.

(Note: There is no answer-back output.)



# Industry's Smallest Color Mark Sensor\*

- Space-saving design 90% smaller than previous OMRON model (E3M-V). Plus, an SUS316L housing for IP69K protection.
- Improved color-difference discrimination, and white LED+ RGB signal processing.
- Coaxial optical system maintains accuracy even against sensing object movement.
- Two Teaching methods available: 2-point Teaching (manual) and Automatic Teaching (remote).



\* According to Omron investigation.



## Ordering Information

### Sensor

 White light



| Sensing method                      | Appearance                                                                         | Connection method      | Sensing distance                                                                   |            | Model              |                    |
|-------------------------------------|------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------------|------------|--------------------|--------------------|
|                                     |                                                                                    |                        |                                                                                    |            | NPN output         | PNP output         |
| Mark Sensor<br>(Diffuse reflective) |  | Pre-wired (2 m)<br>*1  |  | 12±2 mm *2 | <b>E3ZM-V61 2M</b> | <b>E3ZM-V81 2M</b> |
|                                     |                                                                                    | Connector (M8, 4 pins) |                                                                                    |            | <b>E3ZM-V66</b>    | <b>E3ZM-V86</b>    |

\*1. Models with a 5-m pre-wired cable are also available. When ordering, add the cable length to the end of the model number (e.g., E3ZM-V61 5M).

\*2. A deviation of ±2 mm (typical value) can be handled for combinations of white, yellow, and black. Refer to page 7 for the detection capability for other color combinations.










## Accessories

### 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> |

**Note:** The outer cover of the cable is made of PVC (polyvinyl chloride), the nut is SUS316L, and the degree of protection is IP67. When high-pressure washing will be used, select an I/O Connector that has IP69K degree of protection.

Mounting Brackets

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

\* Cannot be used for Standard Connector models.

| Sensing method                            |                                                                                                                                                                                                                                                                                               | Diffuse reflective (mark detection) |
|-------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Model                                     | NPN output                                                                                                                                                                                                                                                                                    | E3ZM-V61/-V66                       |
| Item                                      | PNP output                                                                                                                                                                                                                                                                                    | E3ZM-V81/-V86                       |
| <b>Sensing distance</b>                   | 12±2 mm *1                                                                                                                                                                                                                                                                                    |                                     |
| <b>Sensing range</b>                      | Depends on the combination of colors. Refer to <i>Engineering Data</i> on page 7 for details.                                                                                                                                                                                                 |                                     |
| <b>Spot diameter</b>                      | 2-mm dia. max.                                                                                                                                                                                                                                                                                |                                     |
| <b>Light source (wavelength)</b>          | White LED (450 to 700 nm)                                                                                                                                                                                                                                                                     |                                     |
| <b>Power supply voltage</b>               | 10 to 30 VDC, including 10% ripple (p-p)                                                                                                                                                                                                                                                      |                                     |
| <b>Power consumption</b>                  | 600 mW max. (current consumption for a 30-V power supply voltage: 20 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)                                                                                                                                   |                                     |
| <b>Remote control input</b>               | NPN output ON: Short-circuit to 0 V, or 1.5 V max. (source current: 1 mA max.)<br>NPN output OFF: Open or Vcc -1.5 V to Vcc (leakage current: 0.1 mA max.)<br>PNP output ON: Vcc -1.5 V to Vcc (sink current: 1 mA max.)<br>PNP output OFF: Open or 1.5 V max. (leakage current: 0.1 mA max.) |                                     |
| <b>Operating modes</b>                    | Set in the order of the teaching operation. *2                                                                                                                                                                                                                                                |                                     |
| <b>Protection circuits</b>                | Reversed power supply polarity, Load short-circuit protection, and Reversed output polarity protection                                                                                                                                                                                        |                                     |
| <b>Response time</b>                      | Operate or reset: 50 µs max.                                                                                                                                                                                                                                                                  |                                     |
| <b>Sensitivity adjustment</b>             | Teaching method                                                                                                                                                                                                                                                                               |                                     |
| <b>Ambient illumination</b>               | (Receiver side) Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.                                                                                                                                                                                                                    |                                     |
| <b>Ambient temperature range</b>          | Operating: -40 to 60°C (*3), 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 at 50/60 Hz for 1 min                                                                                                                                                                                                                                                               |                                     |
| <b>Vibration resistance (destruction)</b> | 10 to 55 Hz, 1.5-mm double amplitude for 2 h each in X, Y, and Z directions                                                                                                                                                                                                                   |                                     |
| <b>Shock resistance (destruction)</b>     | 500 m/s <sup>2</sup> for 3 times each in X, Y, and Z directions                                                                                                                                                                                                                               |                                     |
| <b>Degree of protection</b>               | IEC 60529: IP67, DIN 40050-9: IP69K                                                                                                                                                                                                                                                           |                                     |
| <b>Connection method</b>                  | Pre-wired cable (standard length: 2 m) or M8 4-pin connector                                                                                                                                                                                                                                  |                                     |
| <b>Indicator</b>                          | Operating indicator (yellow), Stability indicator (green), and Teaching indicator (red)                                                                                                                                                                                                       |                                     |
| <b>Weight (packed state)</b>              | Pre-wired models (2-m cable): Approx. 85 g<br>Connector models: Approx. 35 g                                                                                                                                                                                                                  |                                     |
| <b>Materials</b>                          | <b>Housing</b>                                                                                                                                                                                                                                                                                | SUS316L                             |
|                                           | <b>Lens</b>                                                                                                                                                                                                                                                                                   | PMMA (polymethylmethacrylate)       |
|                                           | <b>Indication</b>                                                                                                                                                                                                                                                                             | PES (polyethersulfone)              |
|                                           | <b>Buttons</b>                                                                                                                                                                                                                                                                                | Fluoro rubber                       |
|                                           | <b>Cable</b>                                                                                                                                                                                                                                                                                  | PVC (polyvinyl chloride)            |
| <b>Accessories</b>                        | Instruction sheet <b>Note:</b> Mounting Brackets are purchased separately.                                                                                                                                                                                                                    |                                     |

\*1. A deviation of ±2 mm (typical value) can be handled for combinations of white, yellow, and black. Refer to page 7 for the detection capabilities for other colors.

\*2. Mark Sensor output switching:  
When teaching, specify the ON color first and the OFF color second.

\*3. Do not bend the cable in temperatures of -25°C or lower.

Standard Sensing Object for the Mark Sensor

| Color        | Munsell color notation |
|--------------|------------------------|
| White        | N9.5                   |
| Red          | 4R 4.5/12.0            |
| Yellow-red   | 4YR 6.0/11.5           |
| Yellow       | 5Y 8.5/11.0            |
| Yellow-green | 3GY 6.5/10.0           |
| Green        | 3G 6.5/9.0             |
| Blue-green   | 5BG 4.5/10.0           |
| Blue         | 3PB 5.0/10.0           |
| (Black)      | (N2.0)                 |

## Color vs. Detection Capability

E3ZM-V□□

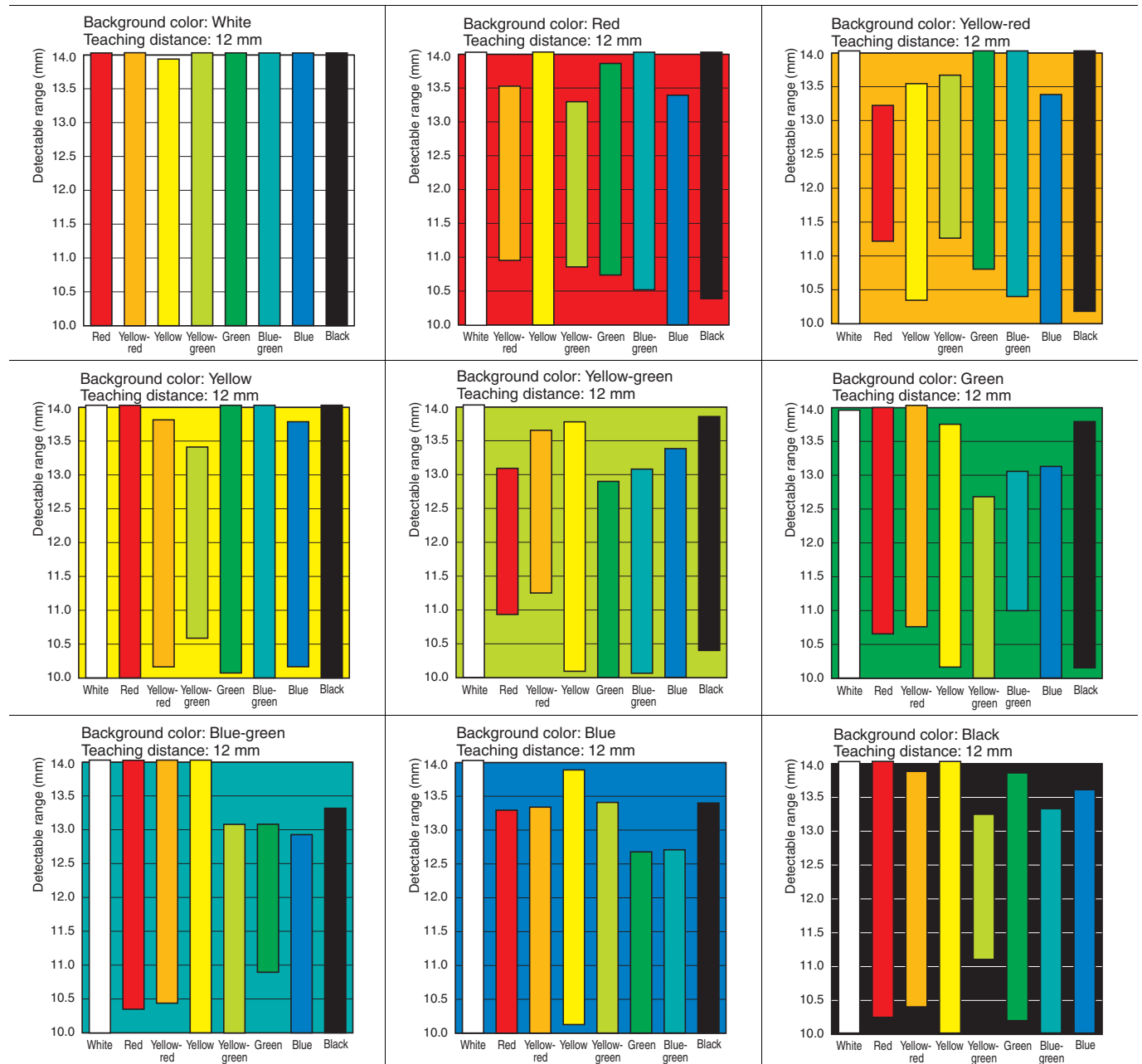
### Teaching Capabilities

|              | White | Red | Yellow-red | Yellow | Yellow-green | Green | Blue-green | Blue | Black |
|--------------|-------|-----|------------|--------|--------------|-------|------------|------|-------|
| White        | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Red          | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Yellow-red   | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Yellow       | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Yellow-green | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Green        | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Blue-green   | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Blue         | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |
| Black        | ○     | ○   | ○          | ○      | ○            | ○     | ○          | ○    | ○     |

\* The above chart shows the combinations of colors for which teaching is possible at a sensing distance of 12 mm.

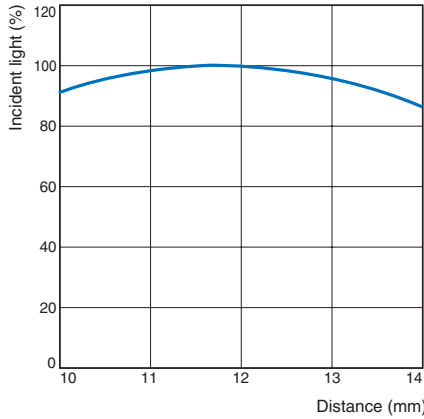
## Detectable Ranges

E3ZM-V□□



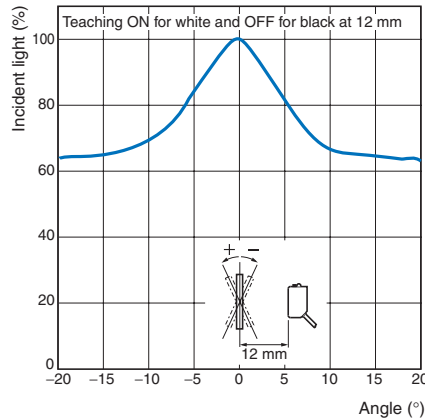
Excess Gain vs. Distance

E3ZM-V□□

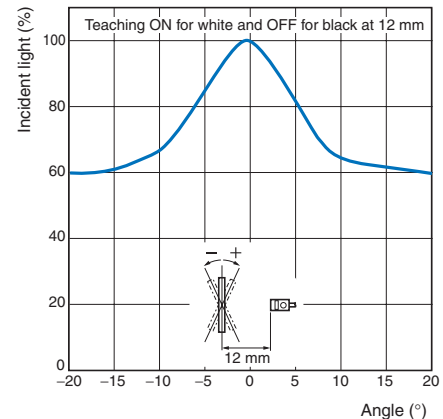


Angle vs. Incident Characteristics

E3ZM-V□□



E3ZM-V□□



I/O Circuit Diagrams

NPN Output

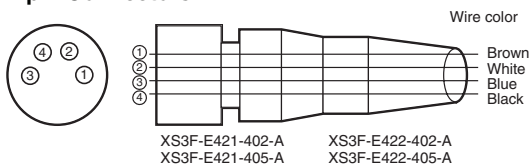
| Model                | Timing charts                                | Output circuit                      |
|----------------------|----------------------------------------------|-------------------------------------|
| E3ZM-V61<br>E3ZM-V66 | <p>Between brown (1) and black (4) leads</p> | <p>M8 Connector Pin Arrangement</p> |

PNP Output

| Model                | Timing charts                               | Output circuit                      |
|----------------------|---------------------------------------------|-------------------------------------|
| E3ZM-V81<br>E3ZM-V86 | <p>Between blue (3) and black (4) leads</p> | <p>M8 Connector Pin Arrangement</p> |

Plugs (Sensor I/O Connectors)

M8 4-pin Connectors



| Classification | Wire color | Connector pin No. | Application          |
|----------------|------------|-------------------|----------------------|
| DC             | Brown      | 1                 | Power supply (+V)    |
|                | White      | 2                 | Remote control input |
|                | Blue       | 3                 | Power supply (0 V)   |
|                | Black      | 4                 | Output               |

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



## Teaching Models



## Safety Precautions

### 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.



### 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.

When using an XS3F 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. When using another, commercially available connector, follow the usage and tightening torque instructions provided by the manufacturer.

#### 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.

#### Oily Environments

Do not use the Sensor in oily environments. They may damage parts and 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.

Do not use highly concentrated cleaning agents. Otherwise, malfunction may result. Also, do not use high-pressure water with a level of pressure that exceeds the stipulated level. Otherwise, the degree of protection may be reduced.

#### 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.

#### Cable Bending

Do not bend the cable in temperatures of  $-25^{\circ}\text{C}$  or below. Otherwise, the cable may be damaged.

## 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<sup>2</sup> and less than 50 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.

### 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

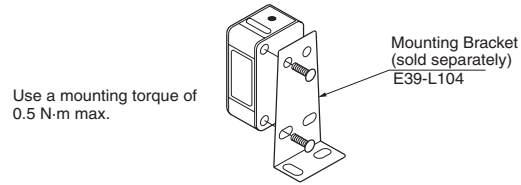
This Sensor is equipped with load short-circuit protection, but be sure to not short circuit the load. Be sure to not use an output current flow that exceeds the rated current. If a load short-circuit occurs, the output will turn OFF, so check the wiring before turning ON the power supply again. The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



### Resistance to Detergents, Disinfectants, and Chemicals

- The Sensor will maintain sufficient performance in typical detergents and disinfectants, but performance may suffer in some types of detergents, disinfectants, and chemicals. Refer to the following table prior to use.
- The E3ZM has passed detergent and disinfectant resistance testing for the substances listed in the following table. Use this table as a guide when considering detergents and disinfectants.

| Type                       | Product name                                     | Concentration | Temperature | Time  |
|----------------------------|--------------------------------------------------|---------------|-------------|-------|
| Chemicals                  | Sodium hydroxide, NaOH                           | 1.5%          | 70°C        | 240 h |
|                            | Potassium hydroxide, KOH                         | 1.5%          | 70°C        | 240 h |
|                            | Phosphoric acid, H <sub>3</sub> PO <sub>4</sub>  | 2.5%          | 70°C        | 240 h |
|                            | Sodium hypochlorite, NaClO                       | 0.3%          | 25°C        | 240 h |
|                            | Hydrogen peroxide, H <sub>2</sub> O <sub>2</sub> | 6.5%          | 25°C        | 240 h |
| Alkaline foaming cleansers | Topax 66s (Ecolab)                               | 3.0%          | 70°C        | 240 h |
| Acidic foaming cleansers   | Topax 56 (Ecolab)                                | 5.0%          | 70°C        | 240 h |
| Disinfectants              | Oxonia Active 90 (Ecolab)                        | 1.0%          | 25°C        | 240 h |
|                            | TEK121 (ABC Compounding)                         | 1.1%          | 25°C        | 240 h |

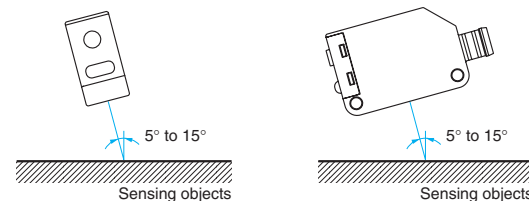
**Note:** The Sensor was immersed in the above chemicals, detergents, and disinfectants for 240 h at the temperatures given, and then passed an insulation resistance test at 100 MΩ min.

### Restrictions on Sensing Objects

Do not use this Sensor if the color and pattern of the background are similar to those of the mark.

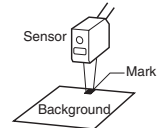
### Detection of Glossy Objects

Mount the Sensor at an angle of 5° to 15°, as shown in the following diagram. This will improve the mark detection capability.



## Two-point Teaching Using Teaching Button

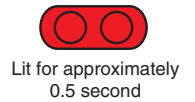
1. Place the point for which you want the output to go ON in the beam spot position. Then, press and hold the teaching button for at least 2 seconds.



The teaching indicator (red) will begin flashing quickly. (This indicates that the output ON teaching operation should begin.) Perform the following operation within 7 seconds of when you start pushing the button. (After 7 seconds, the Unit will return to its initial condition.)



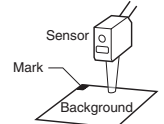
2. Press the teaching button for approximately 0.5 second. The teaching indicator (red) will light for approximately 0.5 second to show that the output ON teaching is completed.



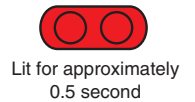
The teaching indicator (red) will then begin flashing quickly again to show that the output OFF teaching operation should begin.



3. Place the point where you want the output to go OFF in the beam spot position.



4. Press the teaching button for approximately 0.5 second. The teaching indicator (red) will light for approximately 0.5 second to show that the output OFF teaching is completed.

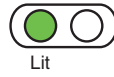


### When Teaching Is Successful

The stability indicator (green) shows that detection is stable.

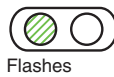
#### 1.Lights

→ This indicates stable detection, even if there is some fluttering in the sensing object.



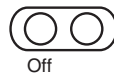
#### 2.Flashes

→ This indicates the possibility of unstable detection, due to fluttering in the sensing object.



#### 3.Remains OFF

→ This indicates unstable detection.



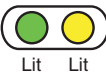
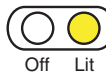


### When Teaching Is Not Successful

The teaching indicator (red) flashes slowly. (Flashes in cycles of approx. 6 seconds.)



Repeat the operation starting with step 1.

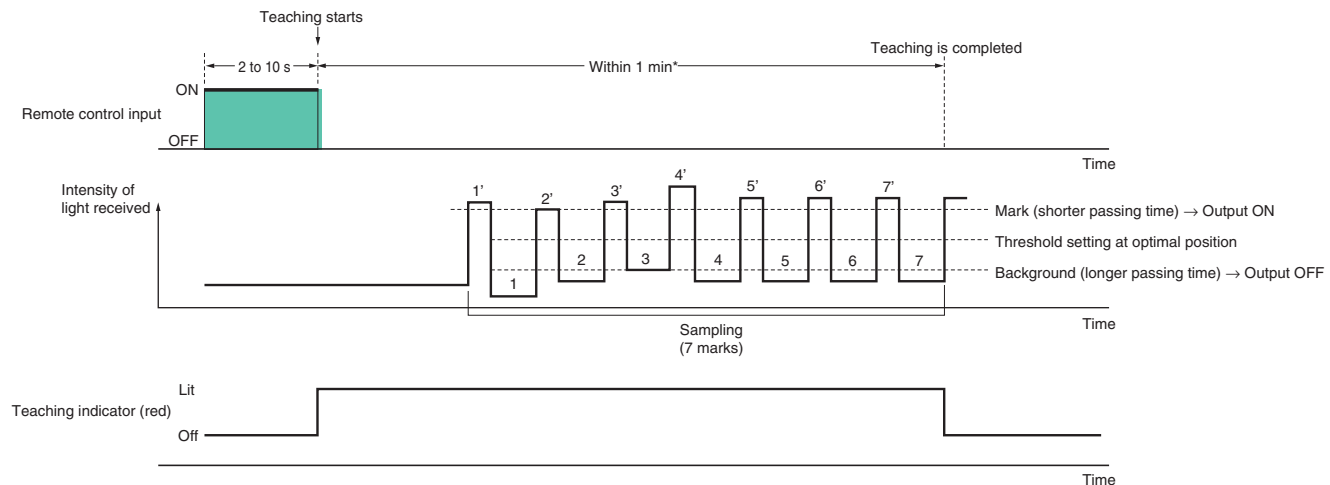
The Sensor enters normal operating condition.

|           | Stable detection                                                                               | Unstable detection                                                                             |
|-----------|------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| ON point  | <br>Lit Lit | <br>Off Lit |
| OFF point | <br>Lit Off | <br>Off Off |

## Automatic Teaching (Remote)

1. Send a pulse with a duration of at least 2 seconds but less than 10 seconds to the remote control input (pink).
2. Teaching will be performed automatically when the mark (the light level with the shorter detection time) passes through the beam spot.
  - Make sure the mark passes through the beam spot for at least 1.5 ms.
  - Pass the mark through the beam spot at least seven times to complete the teaching process.
  - There must be a difference in light intensity between the mark and the background for teaching to be successful.
3. Detection will begin and the output will turn ON when the mark (the light level with the shorter detection time) is detected.

**Note:** Determine when teaching has been completed by confirming that the output turns ON for the mark and OFF for the background within one minute after the remote control input is applied. If the output does not turn ON for the mark and OFF for the background within one minute after the remote control input is applied, teaching has not been successful. Apply the remote control input again.



\*If seven marks do not pass within one minute of the remote control input, the teaching operation will be cancelled.

### Precautions for Using Automatic Teaching (Remote)

- With automatic teaching (remote), the output is always turned ON for the light level with the shorter detection time. Use 2-point teaching (manual) to turn OFF the output for the light level with the shorter detection time.
- Faulty detection is possible when using automatic teaching (remote) if there is considerable movement in the sensing object or if the surface of the object is stepped or contains protrusions. In cases such as these, use 2-point teaching.
- Do not use automatic teaching for backgrounds that are not monochrome.

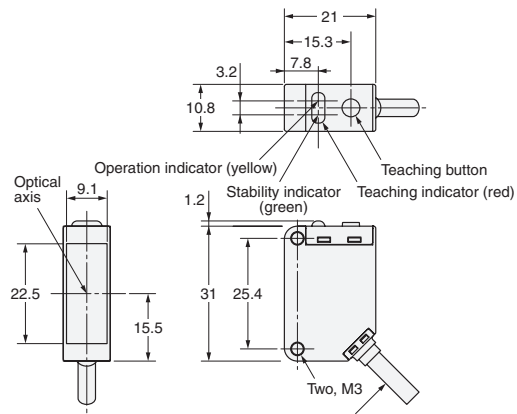
## Sensors

### Mark Sensor (Diffuse reflective)

#### Pre-wired Models

E3ZM-V61

E3ZM-V81



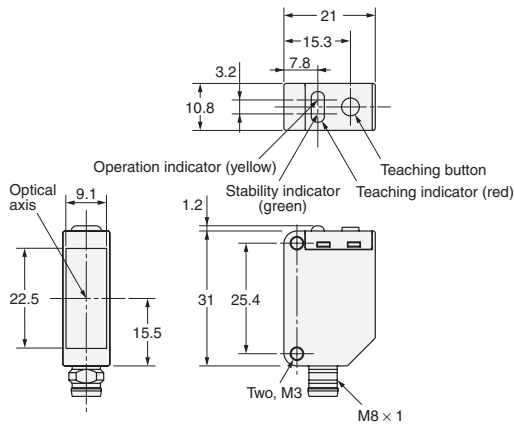
4-dia. Vinyl-insulated round cable with 4 conductors  
(Conductor cross section: 0.2 mm<sup>2</sup> (AWG.24), Insulator diameter: 1.1 mm), Standard length: 2 m

### Mark Sensor (Diffuse reflective)

#### M8 Connector

E3ZM-V66

E3ZM-V86





# Washdown-Resistant Sensor Options

Omron provides a complete sensor offering to solve your toughest detection problems.

## E3ZM

Detergent resistant photosensor.



Reduce replacement costs with E3ZM. It withstands years of high-pressure, high temperature washdown with harsh detergents and disinfectants used in meat processing and food packaging.

Through-beam: 15 m  
Retroreflective: 4 m  
Diffuse: 1 m  
Background suppression:  
10 to 100 mm; 10 to 150 mm;  
10 to 200 mm

## E3ZM-B

PET bottle detector.



Accurately detect PET bottles regardless of the wide variety of shapes and bottle geometries. Unique circuitry and optics prevent false signaling.

Polarized retroreflective  
Sensing distance:  
100 to 500 mm

## E3ZM-C

Oil-resistant photosensor.



Compact sensor tolerates long exposure to cutting oils, coolants and lubricants used in automotive and machine tool applications. Visible spot simplifies alignment.

Through-beam: 15 m, 20 m  
Retroreflective: 0.1 to 4 m  
Diffuse: 1 m  
Background suppression:  
10 to 100 mm; 10 to 150 mm;  
10 to 200 mm

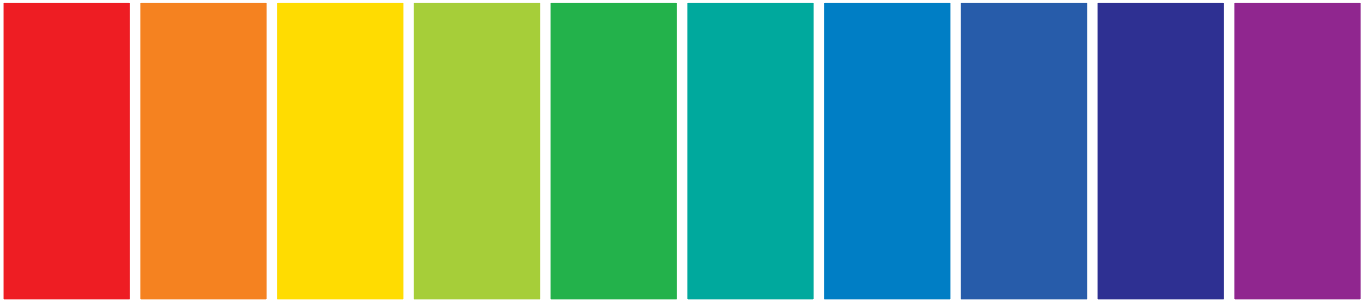
E3ZM Standard Models (E3ZM-T/-R/-D/-LS) Ideal for the Food Industry, and Models for PET Bottle Detection (E3ZM-B).

## Ratings and Specifications

| Item                                                    | Sensing method | Through-beam                                                                                                                                                                                      |                        | Retro-reflective with MSR function                                                                                                                  | Diffuse-reflective Models         |
|---------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|
|                                                         | Model          | NPN output                                                                                                                                                                                        | E3ZM-T61<br>E3ZM-T66   | E3ZM-T63<br>E3ZM-T68                                                                                                                                | E3ZM-R61<br>E3ZM-R66              |
|                                                         | 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] * (Using E39-R1S)<br>3 m [100 mm] * (Using E39-R1)                                                                                     | 1 m<br>(White paper 300 × 300 mm) |
| <b>Spot diameter</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>                              |                | ---                                                                                                                                                                                               |                        |                                                                                                                                                     | 20% of sensing distance max.      |
| <b>Reflectivity characteristics (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>                              |                | 40 mA max. (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</b>                             |                | (Receiver side) Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.                                                                                                                        |                        |                                                                                                                                                     |                                   |
| <b>Ambient temperature range</b>                        |                | Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)                                                                                                                  |                        |                                                                                                                                                     |                                   |

\* Values in brackets are the minimum required distance between the Sensor and Reflector.

| Item                                                    | Sensing method | BGS Reflective Models                                                                                                                                                                                       |                                          |                                          | Models for PET Bottle Detection Retro-reflective (P-opaquin and MSR Function)       |
|---------------------------------------------------------|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------|-------------------------------------------------------------------------------------|
|                                                         | Model          | NPN output                                                                                                                                                                                                  | E3ZM-LS61H<br>E3ZM-LS66H                 | E3ZM-LS62H<br>E3ZM-LS67H                 | E3ZM-LS64H<br>E3ZM-LS69H                                                            |
|                                                         | PNP output     | E3ZM-LS81H<br>E3ZM-LS86H                                                                                                                                                                                    | E3ZM-LS82H<br>E3ZM-LS87H                 | E3ZM-LS84H<br>E3ZM-LS89H                 | E3ZM-B81<br>E3ZM-B86                                                                |
| <b>Sensing distance</b>                                 |                | 10 to 100 mm (White paper 100 × 100 mm)                                                                                                                                                                     | 10 to 150 mm (White paper 100 × 100 mm)  | 10 to 200 mm (White paper 100 × 100 mm)  | 100 to 500 mm<br>(Using E39-RP1)                                                    |
| <b>Spot diameter</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>                          |                | ---                                                                                                                                                                                                         |                                          |                                          | Transparent round 500-ml PET bottles (65 mm dia.)                                   |
| <b>Differential travel</b>                              |                | 3% of sensing distance max.                                                                                                                                                                                 | 15% of sensing distance max.             | 20% of sensing distance max.             | ---                                                                                 |
| <b>Reflectivity characteristics (black/white error)</b> |                | 5% of sensing distance max.                                                                                                                                                                                 | 10% of sensing distance max.             | 20% of sensing distance max.             | ---                                                                                 |
| <b>Directional angle</b>                                |                | ---                                                                                                                                                                                                         |                                          |                                          | Sensor: 3° to 10°<br>Reflector: 30°                                                 |
| <b>Light source (wavelength)</b>                        |                | Red LED (650 nm)                                                                                                                                                                                            | Red LED (660 nm)                         |                                          | Red LED (650 nm)                                                                    |
| <b>Power supply voltage</b>                             |                | 10 to 30 VDC, including 10% ripple (p-p)                                                                                                                                                                    |                                          |                                          |                                                                                     |
| <b>Current consumption/ power consumption</b>           |                | 25 mA max.                                                                                                                                                                                                  |                                          |                                          | 450 mW 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, Mutual interference prevention, and Reversed output polarity protection                                                         |                                          |                                          |                                                                                     |
| <b>Response time</b>                                    |                | Operate or reset: 1 ms max.                                                                                                                                                                                 |                                          |                                          |                                                                                     |
| <b>Sensitivity adjustment</b>                           |                | ---                                                                                                                                                                                                         |                                          |                                          | Adjusted by teaching                                                                |
| <b>Ambient illumination</b>                             |                | (Receiver side) Incandescent lamp: 3,000 lx max., Sunlight: 10,000 lx max.                                                                                                                                  |                                          |                                          |                                                                                     |
| <b>Ambient temperature range</b>                        |                | Operating: -25°C to 55°C, Storage: -40°C to 70°C (with no icing or condensation)                                                                                                                            |                                          |                                          | Operating: -40°C to 60°C,<br>Storage: -40°C to 70°C (with no icing or condensation) |



Use this color chart to demonstrate the E3ZM-V Color Mark Sensor.

# OMRON

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