

# Compact Photoelectric Sensor with Built-in Amplifier E3Z-F

## A Visible Spot That Simplifies the Usage of Photoelectric Sensors

- E3Z-F is added to the E3Z Series of Photoelectric Sensors that boasts annual worldwide sales of 1.5 million units.
- Many different sensing distances  
Diffuse-reflective: 100 mm, 300 mm, 500 mm, 1 m  
Through-beam: 20 m  
Retro-reflective: 4 m
- Models with infrared LEDs are also available.



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

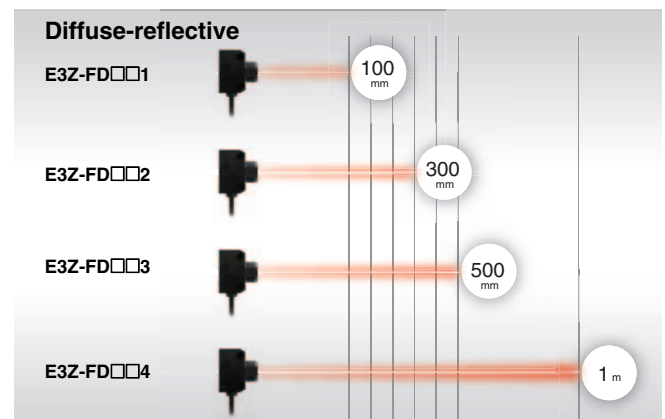
 Refer to the *Safety Precautions* on page 9.

## Features

### Visible spot for easy installation

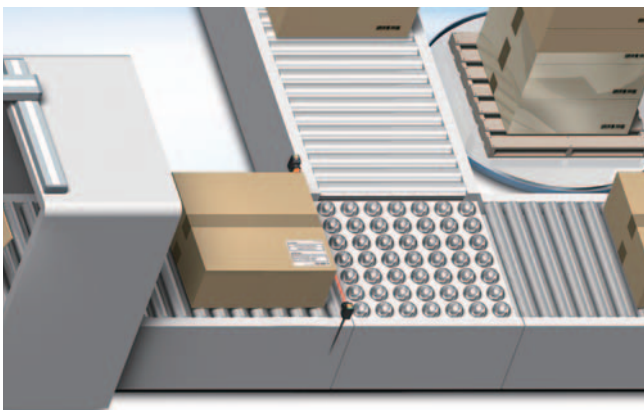


Many different sensing distances are available, so you can select the best model for your application distance.

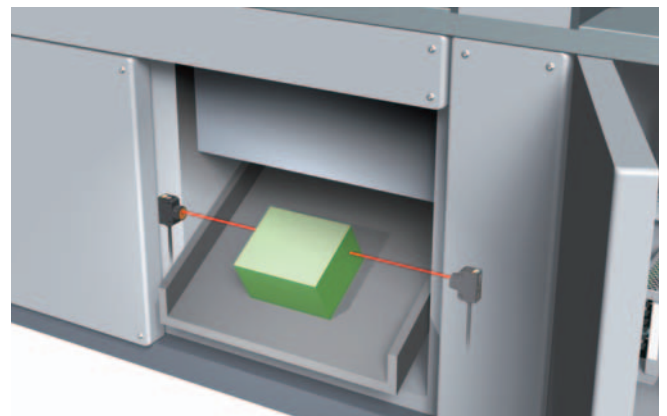


## Application

### Materials handling: detect passing cardboard boxes



### Molding machines: detect falling molded objects

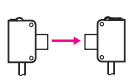
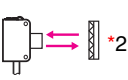
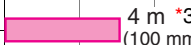


# E3Z-F

## Ordering Information

**Sensors** [Refer to Dimensions on page 10.]

 Red light  Infrared light

| Sensing method                        | Appearance                                                                         | Connecting method | Sensing distance                                                                                     | Model                                                                       |                                                                             |
|---------------------------------------|------------------------------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------------|
|                                       |                                                                                    |                   |                                                                                                      | NPN output                                                                  | PNP output                                                                  |
| Through-beam<br>(Emitter + Receiver)  |   | Pre-wired (2 m)   |  20 m               | <b>E3Z-FTN11 2M *1</b><br>Emitter E3Z-FTN11-L 2M<br>Receiver E3Z-FTN11-D 2M | <b>E3Z-FTP11 2M *1</b><br>Emitter E3Z-FTP11-L 2M<br>Receiver E3Z-FTP11-D 2M |
|                                       |                                                                                    | Connector (M12)   |  20 m               | <b>E3Z-FTN21 *1</b><br>Emitter E3Z-FTN21-L<br>Receiver E3Z-FTN21-D          | <b>E3Z-FTP21 *1</b><br>Emitter E3Z-FTP21-L<br>Receiver E3Z-FTP21-D          |
|                                       |                                                                                    | Pre-wired (2 m)   |  20 m               | <b>E3Z-FTN12 2M *1</b><br>Emitter E3Z-FTN12-L 2M<br>Receiver E3Z-FTN12-D 2M | <b>E3Z-FTP12 2M *1</b><br>Emitter E3Z-FTP12-L 2M<br>Receiver E3Z-FTP12-D 2M |
|                                       |                                                                                    | Connector (M12)   |  20 m               | <b>E3Z-FTN22 *1</b><br>Emitter E3Z-FTN22-L<br>Receiver E3Z-FTN22-D          | <b>E3Z-FTP22 *1</b><br>Emitter E3Z-FTP22-L<br>Receiver E3Z-FTP22-D          |
| Retro-reflective<br>with MSR function |   | Pre-wired (2 m)   |  4 m *3<br>(100 mm) | <b>E3Z-FRN11 2M</b>                                                         | <b>E3Z-FRP11 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  4 m *3<br>(100 mm) | <b>E3Z-FRN21</b>                                                            | <b>E3Z-FRP21</b>                                                            |
| Diffuse-reflective                    |  | Pre-wired (2 m)   |  100 mm             | <b>E3Z-FDN11 2M</b>                                                         | <b>E3Z-FDP11 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  100 mm             | <b>E3Z-FDN21</b>                                                            | <b>E3Z-FDP21</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  300 mm             | <b>E3Z-FDN12 2M</b>                                                         | <b>E3Z-FDP12 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  300 mm             | <b>E3Z-FDN22</b>                                                            | <b>E3Z-FDP22</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  500 mm             | <b>E3Z-FDN13 2M</b>                                                         | <b>E3Z-FDP13 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  500 mm            | <b>E3Z-FDN23</b>                                                            | <b>E3Z-FDP23</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  1 m              | <b>E3Z-FDN14 2M</b>                                                         | <b>E3Z-FDP14 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  1 m              | <b>E3Z-FDN24</b>                                                            | <b>E3Z-FDP24</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  100 mm           | <b>E3Z-FDN15 2M</b>                                                         | <b>E3Z-FDP15 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  100 mm           | <b>E3Z-FDN25</b>                                                            | <b>E3Z-FDP25</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  300 mm           | <b>E3Z-FDN16 2M</b>                                                         | <b>E3Z-FDP16 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  300 mm           | <b>E3Z-FDN26</b>                                                            | <b>E3Z-FDP26</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  500 mm           | <b>E3Z-FDN17 2M</b>                                                         | <b>E3Z-FDP17 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  500 mm           | <b>E3Z-FDN27</b>                                                            | <b>E3Z-FDP27</b>                                                            |
|                                       |                                                                                    | Pre-wired (2 m)   |  1 m              | <b>E3Z-FDN18 2M</b>                                                         | <b>E3Z-FDP18 2M</b>                                                         |
|                                       |                                                                                    | Connector (M12)   |  1 m              | <b>E3Z-FDN28</b>                                                            | <b>E3Z-FDP28</b>                                                            |

\*1. Through-beam Sensors are normally sold in sets that include both the Emitter and Receiver. An order for the Emitter or Receiver alone cannot be accepted.

\*2. The Reflector is sold separately. Select the Reflector model most suited to the application.

\*3. Values in parentheses indicate the minimum required distance between the Sensor and Reflector.

## Accessories (Sold Separately)

**Reflector** (Required for Retro-reflective Sensors) A Reflector is not provided with the Sensor. It must be ordered separately.  
 [Refer to *Dimensions on page 11.*]

| Appearance                                                                        | Sensing distance* |                 | Model   | Quantity | Remarks     |
|-----------------------------------------------------------------------------------|-------------------|-----------------|---------|----------|-------------|
|                                                                                   | Rated value       | Reference value |         |          |             |
|  | 4 m (100 mm)      | ---             | E39-R1S | 1        | for E3Z-FR□ |

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

**Mounting Brackets** A Mounting Bracket is not provided with the Sensor. It must be ordered separately as required.  
 [Refer to *Dimensions on page 11.*]

| Applicable Sensors | Mounting method       | Appearance                                                                        | Model    | Quantity |
|--------------------|-----------------------|-----------------------------------------------------------------------------------|----------|----------|
| All models         | M3 screw mounting     |  | E39-L189 | 1        |
|                    | M18 nut side mounting |  | E39-L183 | 1        |

Note: 1. When using Through-beam models, order one bracket for the Receiver and one for the Emitter.

### Sensor I/O Connectors (Sockets on One Cable End)

(Required for models for Connectors) A Connector is not provided with the Sensor. It must be ordered separately.

| Applicable Sensors | Size | Cable    | Appearance | Cable type                                                                          |     | Model           |
|--------------------|------|----------|------------|-------------------------------------------------------------------------------------|-----|-----------------|
| Connector (M12)    | M12  | Standard | Straight   |   | 2 m | XS2F-M12PVC4S2M |
|                    |      |          |            |                                                                                     | 5 m | XS2F-M12PVC4S5M |
|                    |      |          | L-shaped   |  | 2 m | XS2F-M12PVC4A2M |
|                    |      |          |            |                                                                                     | 5 m | XS2F-M12PVC4A5M |

Note: When using Through-beam models, order one sensor I/O connector for the Receiver and one for the Emitter.

# Ratings and Specifications

| Item                                  | Sensing method       |                 | Through-beam                                                                                                                                                                                                                                | Retro-reflective with MSR function      | Diffuse-reflective                            |                                               |                                               |                                              |           |
|---------------------------------------|----------------------|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|----------------------------------------------|-----------|
|                                       | Model                | NPN out-put     | Pre-wired                                                                                                                                                                                                                                   | E3Z-FTN11                               | E3Z-FRN11                                     | E3Z-FDN11                                     | E3Z-FDN12                                     | E3Z-FDN13                                    | E3Z-FDN14 |
|                                       |                      | Connector (M12) | E3Z-FTN21                                                                                                                                                                                                                                   | E3Z-FRN21                               | E3Z-FDN21                                     | E3Z-FDN22                                     | E3Z-FDN23                                     | E3Z-FDN24                                    |           |
|                                       |                      | PNP out-put     | Pre-wired                                                                                                                                                                                                                                   | E3Z-FTP11                               | E3Z-FRP11                                     | E3Z-FDP11                                     | E3Z-FDP12                                     | E3Z-FDP13                                    | E3Z-FDP14 |
|                                       |                      |                 | Connector (M12)                                                                                                                                                                                                                             | E3Z-FTP21                               | E3Z-FRP21                                     | E3Z-FDP21                                     | E3Z-FDP22                                     | E3Z-FDP23                                    | E3Z-FDP24 |
| Sensing distance                      |                      |                 | 20 m                                                                                                                                                                                                                                        | 4 m (100 mm) *1<br>(when using E39-R1S) | 100 mm<br>(white paper: 300 × 300 mm)         | 300 mm<br>(white paper: 300 × 300 mm)         | 500 mm<br>(white paper: 300 × 300 mm)         | 1 m<br>(white paper: 300 × 300 mm)           |           |
| Spot diameter (reference value)       |                      |                 | ---                                                                                                                                                                                                                                         |                                         | 40 × 45 mm<br>(at sensing distance of 100 mm) | 40 × 50 mm<br>(at sensing distance of 300 mm) | 45 × 50 mm<br>(at sensing distance of 500 mm) | 120 × 150 mm<br>(at sensing distance of 1 m) |           |
| Standard sensing object               |                      |                 | Opaque: 7 mm dia. min.                                                                                                                                                                                                                      | Opaque: 75 mm dia. min.                 | ---                                           |                                               |                                               |                                              |           |
| Differential travel                   |                      |                 | ---                                                                                                                                                                                                                                         |                                         | 20% max. of sensing distance                  |                                               |                                               |                                              |           |
| Directional angle                     |                      |                 | 2° min.                                                                                                                                                                                                                                     |                                         | ---                                           |                                               |                                               |                                              |           |
| Light source (wavelength)             |                      |                 | Red LED (624 nm)                                                                                                                                                                                                                            |                                         |                                               |                                               |                                               |                                              |           |
| Power supply voltage                  |                      |                 | 10 to 30 VDC (including voltage ripple of 10% (p-p) max.)                                                                                                                                                                                   |                                         |                                               |                                               |                                               |                                              |           |
| Current consumption                   |                      |                 | 40 mA max.<br>(Emitter: 25 mA max., Receiver: 15 mA max.)                                                                                                                                                                                   | 25 mA max.                              |                                               |                                               |                                               |                                              |           |
| Control output                        |                      |                 | Load power supply voltage: 30 VDC max., Load current: 100 mA max.<br>(Residual voltage: 3 V max.)<br>Open collector output (NPN (negative common)/PNP (positive common) depending on model)<br>Light-ON/Dark-ON cable connection selectable |                                         |                                               |                                               |                                               |                                              |           |
| Indicators                            |                      |                 | Operation indicator (orange)<br>Stability indicator (green)<br>Trough-beam Emitter has only power indicator (green).                                                                                                                        |                                         |                                               |                                               |                                               |                                              |           |
| Protection circuits                   |                      |                 | Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection                                                                                                                           |                                         |                                               |                                               |                                               |                                              |           |
| Response time                         |                      |                 | Operate or reset: 0.5 ms max.                                                                                                                                                                                                               |                                         |                                               |                                               |                                               |                                              |           |
| Sensitivity adjustment                |                      |                 | One-turn adjuster                                                                                                                                                                                                                           |                                         |                                               |                                               |                                               |                                              |           |
| Ambient illumination (Receiver side)  |                      |                 | Incandescent lamp: 3,000 lx max.<br>Sunlight: 10,000 lx max.                                                                                                                                                                                |                                         |                                               |                                               |                                               |                                              |           |
| Ambient temperature range             |                      |                 | Operating: −25 to 55°C, Storage: −40°C 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, at 50/60 Hz for 1 min                                                                                                                                                                                                            |                                         |                                               |                                               |                                               |                                              |           |
| Vibration resistance (destruction)    |                      |                 | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions                                                                                                                                                       |                                         |                                               |                                               |                                               |                                              |           |
| Shock resistance (destruction)        |                      |                 | 500 m/s <sup>2</sup> for 3 times each in X, Y, and Z directions                                                                                                                                                                             |                                         |                                               |                                               |                                               |                                              |           |
| Degree of protection *2               |                      |                 | IEC IP67, DIN40050-9 standard IP69K                                                                                                                                                                                                         |                                         |                                               |                                               |                                               |                                              |           |
| Connecting method                     |                      |                 | Pre-wired (standard length: 2 m), Connector (M12, 4-Pin)                                                                                                                                                                                    |                                         |                                               |                                               |                                               |                                              |           |
| Weight (packed state/<br>Sensor only) | Pre-wired            |                 | Approx. 120 g/<br>Approx. 105 g                                                                                                                                                                                                             | Approx. 70 g/<br>Approx. 55 g           |                                               |                                               |                                               |                                              |           |
|                                       | Connector            |                 | Approx. 35 g/<br>Approx. 20 g                                                                                                                                                                                                               | Approx. 25 g/<br>Approx. 10 g           |                                               |                                               |                                               |                                              |           |
| Materials                             | Case                 |                 | ABS                                                                                                                                                                                                                                         |                                         |                                               |                                               |                                               |                                              |           |
|                                       | Lens                 |                 | Methacrylic resin (PMMA)                                                                                                                                                                                                                    |                                         |                                               |                                               |                                               |                                              |           |
|                                       | Display              |                 | Methacrylic resin (PMMA)                                                                                                                                                                                                                    |                                         |                                               |                                               |                                               |                                              |           |
|                                       | Sensitivity adjuster |                 | Polyacetal (POM)                                                                                                                                                                                                                            |                                         |                                               |                                               |                                               |                                              |           |
|                                       | Cable *3             |                 | Vinyl chloride (PVC)                                                                                                                                                                                                                        |                                         |                                               |                                               |                                               |                                              |           |
|                                       | Nuts                 |                 | ABS                                                                                                                                                                                                                                         |                                         |                                               |                                               |                                               |                                              |           |
| Accessories                           |                      |                 | Nuts (2 pcs),<br>Instruction manual                                                                                                                                                                                                         | Nut (1 pcs), Instruction manual         |                                               |                                               |                                               |                                              |           |

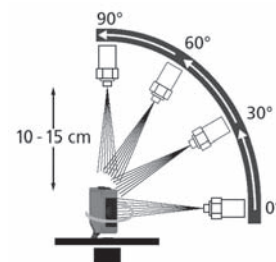
\*1. Values in parentheses indicate the minimum required distances between the Sensors and Reflectors.

\*2. IP69K Degree of Protection Specifications.

IP69K is a protection specification stipulated by DIN 40050 Part 9 of the German standards. The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.

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

\*3. Only for Pre-wired models.



| Item                                    | Model                | Sensing method     |                                                                                                                                                                                                                                             | Through-beam                             | Diffuse-reflective                       |                                          |                                       |           |
|-----------------------------------------|----------------------|--------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------------|------------------------------------------|---------------------------------------|-----------|
|                                         |                      | NPN<br>out-<br>put | Pre-wired                                                                                                                                                                                                                                   | E3Z-FTN12                                | E3Z-FDN15                                | E3Z-FDN16                                | E3Z-FDN17                             | E3Z-FDN18 |
|                                         |                      |                    | Connector<br>(M12)                                                                                                                                                                                                                          | E3Z-FTN22                                | E3Z-FDN25                                | E3Z-FDN26                                | E3Z-FDN27                             | E3Z-FDN28 |
|                                         |                      | PNP<br>out-<br>put | Pre-wired                                                                                                                                                                                                                                   | E3Z-FTP12                                | E3Z-FDP15                                | E3Z-FDP16                                | E3Z-FDP17                             | E3Z-FDP18 |
| Connector<br>(M12)                      | E3Z-FTP22            |                    | E3Z-FDP25                                                                                                                                                                                                                                   | E3Z-FDP26                                | E3Z-FDP27                                | E3Z-FDP28                                |                                       |           |
| Sensing distance                        |                      |                    | 20 m                                                                                                                                                                                                                                        | 100 mm<br>(white paper:<br>300 × 300 mm) | 300 mm<br>(white paper:<br>300 × 300 mm) | 500 mm<br>(white paper:<br>300 × 300 mm) | 1 m<br>(white paper:<br>300 × 300 mm) |           |
| Spot diameter (reference value)         |                      |                    | ---                                                                                                                                                                                                                                         |                                          |                                          |                                          |                                       |           |
| Standard sensing object                 |                      |                    | Opaque:<br>7 mm dia. min.                                                                                                                                                                                                                   | ---                                      |                                          |                                          |                                       |           |
| Differential travel                     |                      |                    | ---                                                                                                                                                                                                                                         | 20% max. of sensing distance             |                                          |                                          |                                       |           |
| Directional angle                       |                      |                    | 2° min.                                                                                                                                                                                                                                     | ---                                      |                                          |                                          |                                       |           |
| Light source (wavelength)               |                      |                    | Infrared LED ( 850 nm)                                                                                                                                                                                                                      |                                          |                                          |                                          |                                       |           |
| Power supply voltage                    |                      |                    | 10 to 30 VDC (including voltage ripple of 10% (p-p) max.)                                                                                                                                                                                   |                                          |                                          |                                          |                                       |           |
| Current consumption                     |                      |                    | 40 mA max.<br>(Emitter: 25 mA max.,<br>Receiver:15 mA max.)                                                                                                                                                                                 | 25mA max.                                |                                          |                                          |                                       |           |
| Control output                          |                      |                    | Load power supply voltage: 30 VDC max., Load current: 100 mA max.<br>(Residual voltage: 3 V max.)<br>Open collector output (NPN (negative common)/PNP (positive common) depending on model)<br>Light-ON/Dark-ON cable connection selectable |                                          |                                          |                                          |                                       |           |
| Indicators                              |                      |                    | Operation indicator (orange)<br>Stability indicator (green)<br>Trough-beam Emitter has only power indicator (green).                                                                                                                        |                                          |                                          |                                          |                                       |           |
| Protection circuits                     |                      |                    | Power supply reverse polarity protection, Output short-circuit protection, and Output reverse polarity protection                                                                                                                           |                                          |                                          |                                          |                                       |           |
| Response time                           |                      |                    | Operate or reset: 0.5 ms max.                                                                                                                                                                                                               |                                          |                                          |                                          |                                       |           |
| Sensitivity adjustment                  |                      |                    | One-turn adjuster                                                                                                                                                                                                                           |                                          |                                          |                                          |                                       |           |
| Ambient illumination (Receiver side)    |                      |                    | Incandescent lamp: 3,000 lx max.<br>Sunlight: 10,000 lx max.                                                                                                                                                                                |                                          |                                          |                                          |                                       |           |
| Ambient temperature range               |                      |                    | Operating: −25 to 55°C, Storage: −40°C 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, at 50/60 Hz for 1 min                                                                                                                                                                                                            |                                          |                                          |                                          |                                       |           |
| Vibration resistance (destruction)      |                      |                    | 10 to 55 Hz with a 1.5 mm double amplitude for 2 hours each in X, Y, and Z directions                                                                                                                                                       |                                          |                                          |                                          |                                       |           |
| Shock resistance (destruction)          |                      |                    | 500 m/s <sup>2</sup> for 3 times each in X, Y, and Z directions                                                                                                                                                                             |                                          |                                          |                                          |                                       |           |
| Degree of protection *1                 |                      |                    | IEC IP67, DIN40050-9 standard IP69K                                                                                                                                                                                                         |                                          |                                          |                                          |                                       |           |
| Connecting method                       |                      |                    | Pre-wired (standard length: 2 m), Connector (M12, 4-Pin)                                                                                                                                                                                    |                                          |                                          |                                          |                                       |           |
| Weight<br>(packedstate/<br>Sensor only) | Pre-wired            |                    | Approx. 120 g/<br>Approx. 105 g                                                                                                                                                                                                             | Approx. 70 g/<br>Approx. 55 g            |                                          |                                          |                                       |           |
|                                         | Connector            |                    | Approx. 35 g/<br>Approx. 20 g                                                                                                                                                                                                               | Approx. 25 g/<br>Approx. 10 g            |                                          |                                          |                                       |           |
| Materials                               | Case                 |                    | ABS                                                                                                                                                                                                                                         |                                          |                                          |                                          |                                       |           |
|                                         | Lens                 |                    | Methacrylic resin (PMMA)                                                                                                                                                                                                                    |                                          |                                          |                                          |                                       |           |
|                                         | Display              |                    | Methacrylic resin (PMMA)                                                                                                                                                                                                                    |                                          |                                          |                                          |                                       |           |
|                                         | Sensitivity adjuster |                    | Polyacetal (POM)                                                                                                                                                                                                                            |                                          |                                          |                                          |                                       |           |
|                                         | Cable *2             |                    | Vinyl chloride (PVC)                                                                                                                                                                                                                        |                                          |                                          |                                          |                                       |           |
|                                         | Nuts                 |                    | ABS                                                                                                                                                                                                                                         |                                          |                                          |                                          |                                       |           |
| Accessories                             |                      |                    | Nuts (2 pcs),<br>Instruction manual                                                                                                                                                                                                         | Nut (1 pcs), Instruction manual          |                                          |                                          |                                       |           |

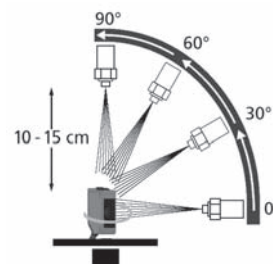
\*1. IP69K Degree of Protection Specifications.

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

The test item is sprayed with 80°C water from a nozzle of a specified shape at a water pressure of 80 to 100 bar. The amount of water is 14 to 16 liters per minute.

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

\*2. Only for Pre-wired models.



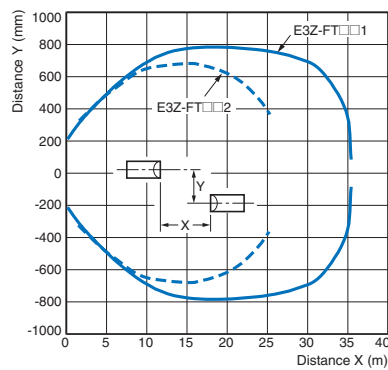
# E3Z-F

## Engineering Data (Reference Value)

### Parallel Operating Range

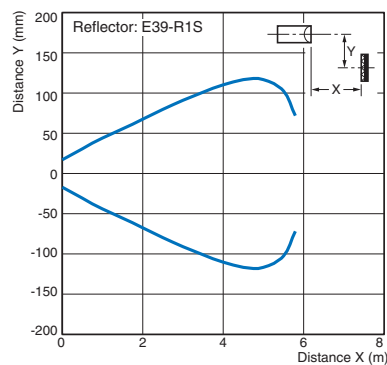
#### Through-beam

E3Z-FT□□1/-FT□□2



#### Retro-reflective

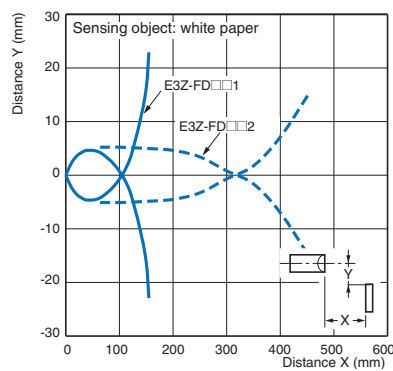
E3Z-FR□□



### Operating Range

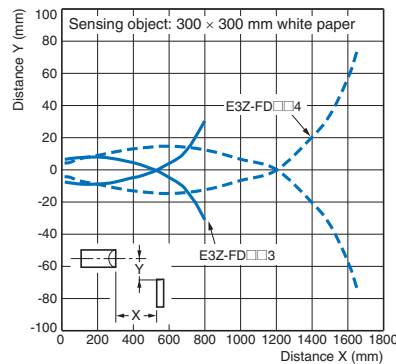
#### Diffuse-reflective

E3Z-FD□□1/-FD□□2



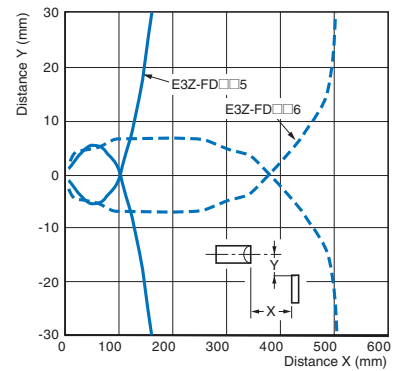
#### Diffuse-reflective

E3Z-FD□□3/-FD□□4



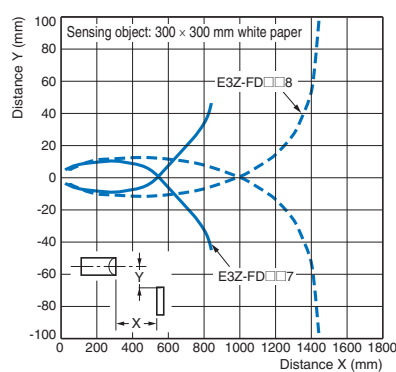
#### Diffuse-reflective

E3Z-FD□□5/-FD□□6



#### Diffuse-reflective

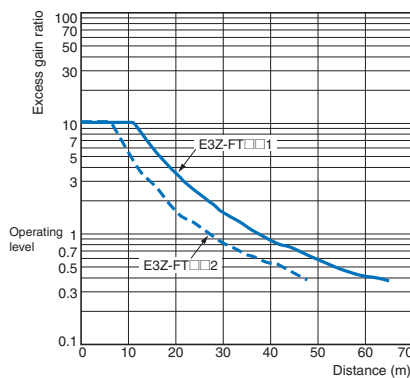
E3Z-FD□□7/-FD□□8



### Excess Gain vs. Distance

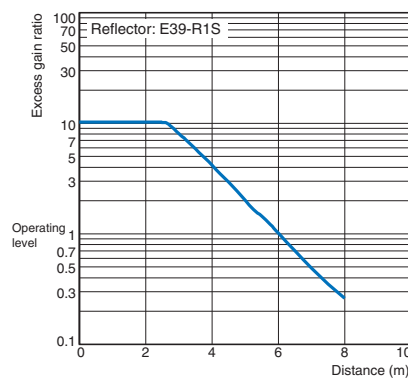
#### Through-beam

E3Z-FT□□1/-FT□□2



#### Retro-reflective

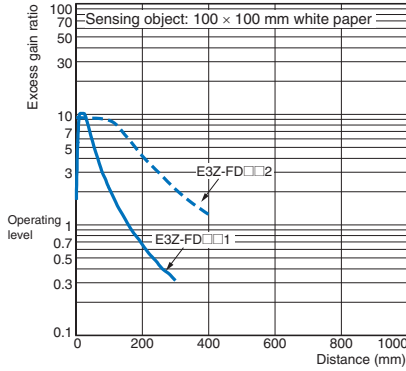
E3Z-FR□□



## Excess Gain vs. Distance

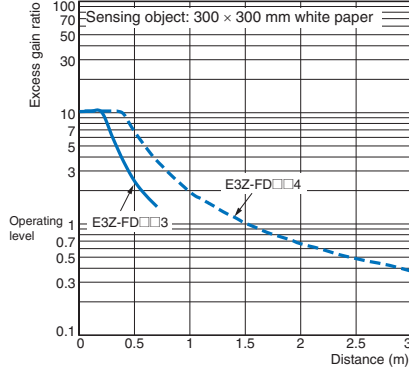
### Diffuse-reflective

#### E3Z-FD□□1/-FD□□2



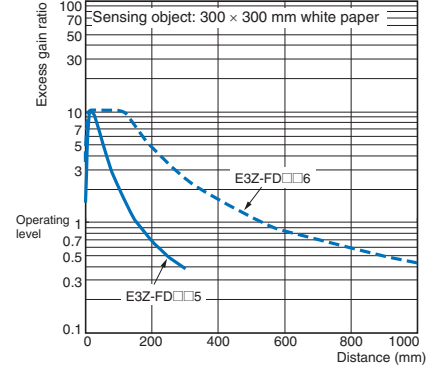
### Diffuse-reflective

#### E3Z-FD□□3/-FD□□4



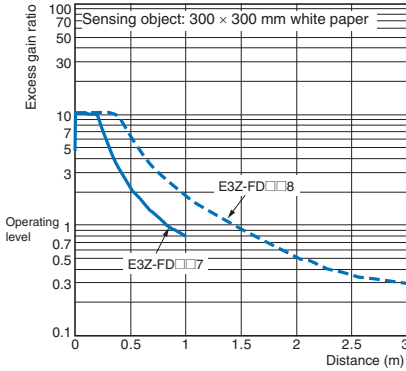
### Diffuse-reflective

#### E3Z-FD□□5/-FD□□6



### Diffuse-reflective

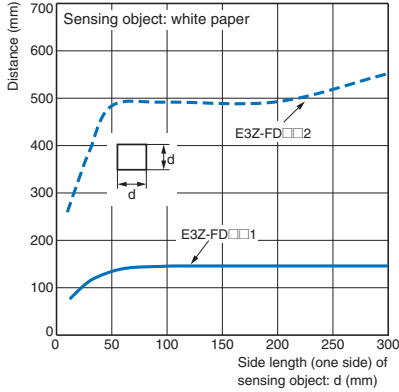
#### E3Z-FD□□7/-FD□□8



## Sensing Object Size vs. Distance

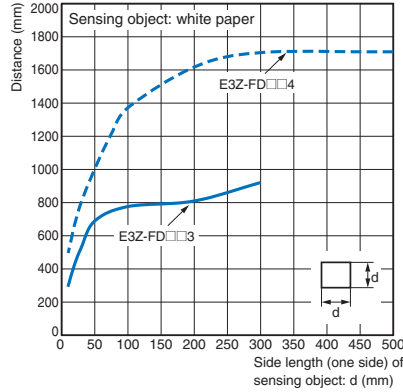
### Diffuse-reflective

#### E3Z-FD□□1/-FD□□2



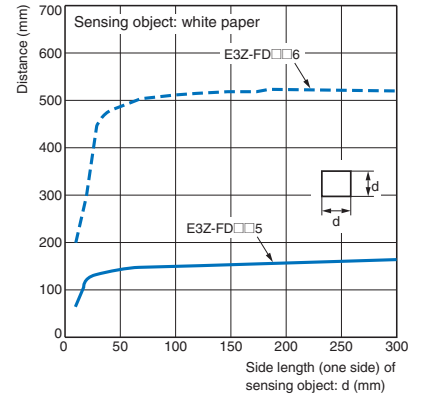
### Diffuse-reflective

#### E3Z-FD□□3/-FD□□4



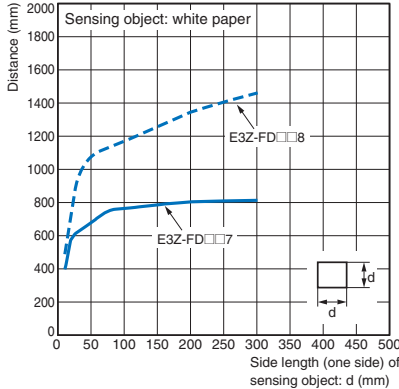
### Diffuse-reflective

#### E3Z-FD□□5/-FD□□6



### Diffuse-reflective

#### E3Z-FD□□7/-FD□□8



# E3Z-F

## I/O Circuit Diagrams

### NPN Output

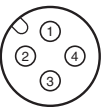
| Model                               | Operation mode       | Timing charts                                                                                                                                                                                                                                       | Operation selector                                     | Output circuit                                                    |
|-------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|-------------------------------------------------------------------|
| E3Z-FTN□□<br>E3Z-FRN□□<br>E3Z-FDN□□ | Light-ON             | <div>Incident light</div> <div>No incident light</div> <div>Operation indicator (orange) ON</div> <div>OFF</div> <div>Output transistor OFF</div> <div>ON</div> <div>Load Operate (e.g., relay) Reset (Between brown (1) and black (4) leads)</div> | Connect pink lead (2) to brown lead (1) or leave open. | Through-beam Receivers, Retro-reflective, Diffuse-reflective.<br> |
|                                     | Dark-ON              | <div>Incident light</div> <div>No incident light</div> <div>Operation indicator (orange) ON</div> <div>OFF</div> <div>Output transistor ON</div> <div>OFF</div> <div>Load Operate (e.g., relay) Reset (Between brown (1) and black (4) leads)</div> | Connect pink lead (2) to blue lead (3).                |                                                                   |
|                                     | Through-beam Emitter |                                                                                                                                                                                                                                                     |                                                        |                                                                   |

### PNP Output

| Model                               | Operation mode       | Timing charts                                                                                                                                                                                                                                      | Operation selector                                    | Output circuit                                                    |
|-------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------|-------------------------------------------------------------------|
| E3Z-FTP□□<br>E3Z-FRP□□<br>E3Z-FDP□□ | Light-ON             | <div>Incident light</div> <div>No incident light</div> <div>Operation indicator (orange) ON</div> <div>OFF</div> <div>Output transistor OFF</div> <div>ON</div> <div>Load Operate (e.g., relay) Reset (Between blue (3) and black (4) leads)</div> | Connect pink lead (2) to brown lead (1).              | Through-beam Receivers, Retro-reflective, Diffuse-reflective.<br> |
|                                     | Dark-ON              | <div>Incident light</div> <div>No incident light</div> <div>Operation indicator (orange) ON</div> <div>OFF</div> <div>Output transistor ON</div> <div>OFF</div> <div>Load Operate (e.g., relay) Reset (Between blue (3) and black (4) leads)</div> | Connect pink lead (2) to blue lead (3) or leave open. |                                                                   |
|                                     | Through-beam Emitter |                                                                                                                                                                                                                                                    |                                                       |                                                                   |

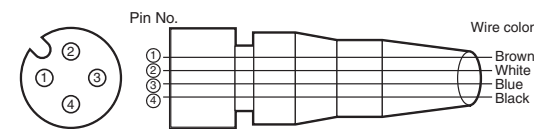
### Connector Pin Arrangement

#### M12 Connector Pin Arrangement



### Plugs (Sensor I/O Connectors)

#### M12, 4-pin Connectors



#### Pin arrangement

| Classification | Wire color | Connector pin No. | Application            |
|----------------|------------|-------------------|------------------------|
| DC             | Brown      | 1                 | Power supply (+V)      |
|                | White      | 2                 | L/on · D/on selectable |
|                | Blue       | 3                 | Power supply (0 V)     |
|                | Black      | 4                 | Output                 |

## Safety Precautions

To ensure safe operation, be sure to read and follow the Instruction Manual provided with the sensor.

### ■ Meanings of Alert symbols

|                                                                                                  |                                                                                                                                                                                                              |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <b>WARNING</b> | Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage. |
|--------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                  |                                                                                                                                  |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
|  <b>CAUTION</b> | Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in property damage. |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|

|                                 |                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------|
| <b>Precautions for Safe Use</b> | Supplementary comments on what to do or avoid doing, to use the product safely. |
|---------------------------------|---------------------------------------------------------------------------------|

|                                    |                                                                                                                                     |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|
| <b>Precautions for Correct Use</b> | Supplementary comments on what to do or avoid doing, to prevent a failure to operate, or undesirable effect on product performance. |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|

|                                                                                                  |
|--------------------------------------------------------------------------------------------------|
|  <b>WARNING</b> |
|--------------------------------------------------------------------------------------------------|

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



|                                                                                                   |
|---------------------------------------------------------------------------------------------------|
|  <b>CAUTION</b> |
|---------------------------------------------------------------------------------------------------|

Explosion, fire, or product malfunction may occur. Never use the product with an AC power supply. Do not use the product with voltage in excess of the rated voltage. Do not use the product with incorrect wiring.



|                                 |
|---------------------------------|
| <b>Precautions for Safe Use</b> |
|---------------------------------|

Be sure to follow the safety precautions below for added safety.

1. Do not use the product in atmospheres or environments that exceed product ratings.
2. Do not use the product in an environment where it may be exposed to inflammable or explosive gas.
3. Do not use the product in an environment where it may be exposed to oil or chemicals.
4. Do not use the product in water, in rain, or outdoors.
5. Do not use the product in locations subject to condensation due to high humidity.
6. Do not use the product in any other environment that exceeds the ratings.
7. Do not use the product in a location subject to direct sunlight.
8. Do not use the product in a location subject to direct vibration or shock.
9. Do not use organic solvents (such as thinners or alcohol).
10. Do not attempt to disassemble, repair, or modify the product.
11. Dispose of the product as industrial waste.
12. The E3Z-F devices shall be used with Class2 power supply in the United States.  
The ampere rating of the current protection shall be 1A for 26AWG, 2A for 24AWG, 3A for 22AWG, 5A for 20AWG.

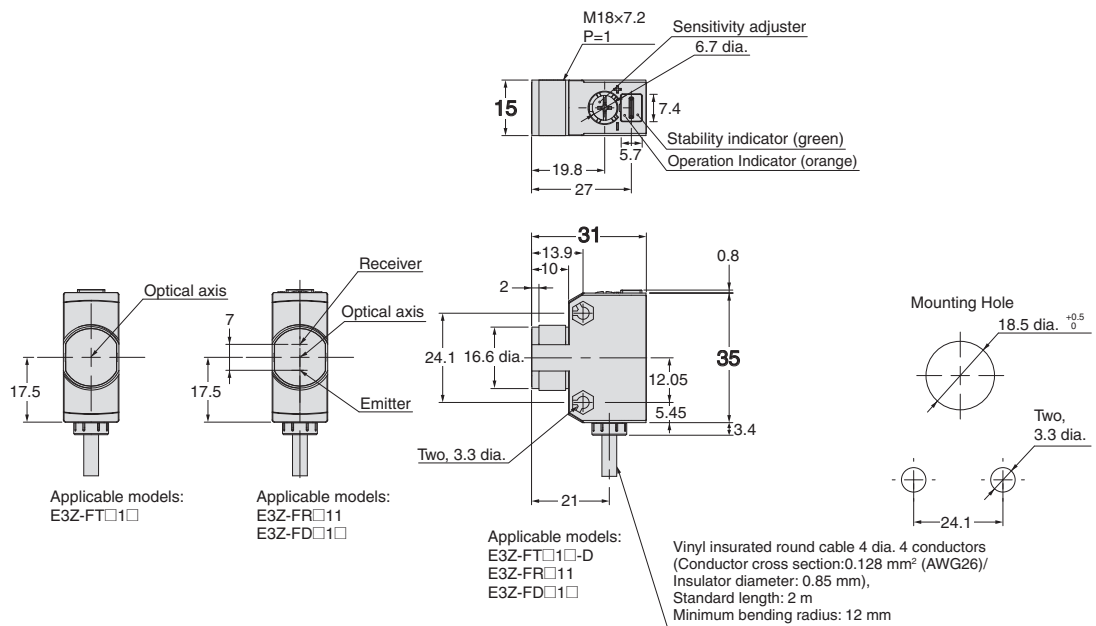
### Precautions for Correct Use

1. Laying Sensor wiring in the same conduit or duct as high-voltage wires or power lines may result in malfunction or damage due to conduit or use shielded cable. Separate the Sensor wiring or use a shielded cable.
2. Do not pull on the cable with excessive force.
3. If a commercial switching regulator is used, ground the FG (frame ground) terminal.
4. The sensor will be available 100 ms after the power supply is tuned ON. Start to use 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.
5. 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.
6. Do not tighten nuts or screws with excessive force. To secure the Sensor with nuts, use the nuts that are included with the Sensor, and tighten the nuts to a torque of 0.3 to 0.4 N·m (2.0 N·m max.). To secure the Sensor with M3 screws, tighten the screws to a torque of 0.6 N·m max..

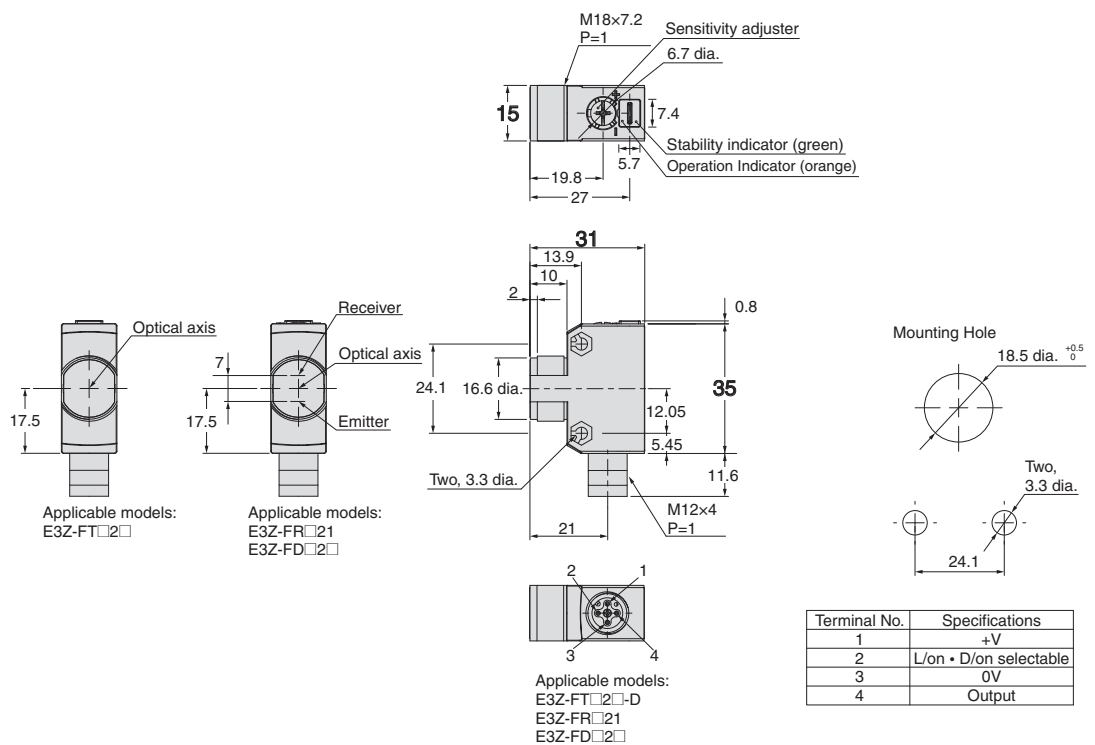
## Dimensions

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

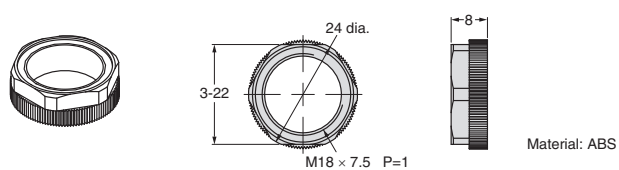
## E3Z-FD1



## E3Z-FD 2



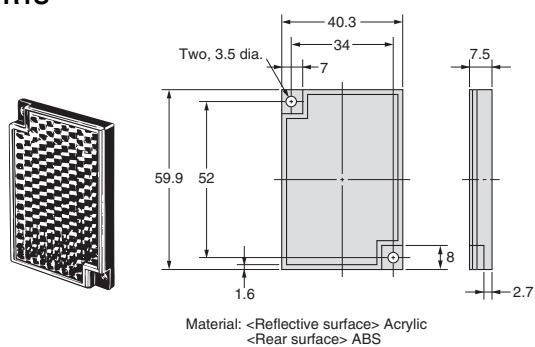
## Tightening Nuts



## Accessories (Sold Separately)

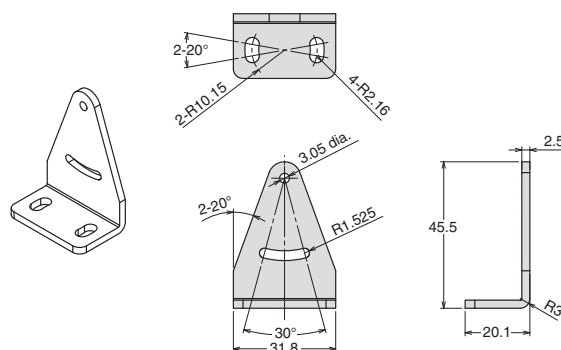
## Reflector

## E39-R1S



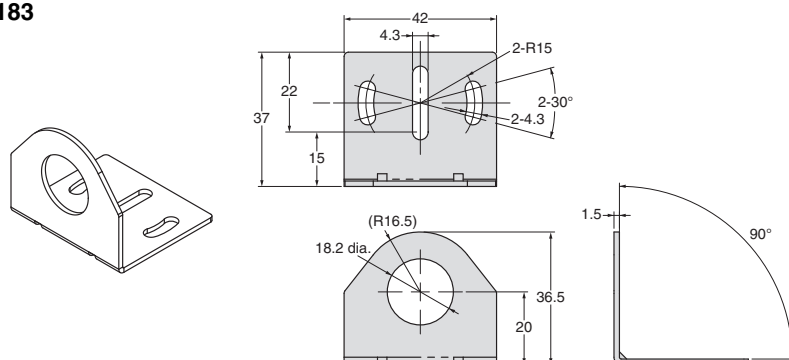
## Mounting Brackets

## E39-L189



## Mounting Brackets

## E39-L183



**Compact Photoelectric Sensor with Built-in Amplifier****E3Z**

The Standard for Photoelectric Sensors  
with a Secure Track Record of  
1.5 Million Sold Yearly.

- Long sensing distance of 30 m for Through-beam Models, 4 m for Retro-reflective Models, and 1 m for Diffuse-reflective Models.
- Mechanical axis and optical axis offset of less than  $\pm 2.5^\circ$  simplifies optical axis adjustment.
- High stability with unique algorithm that prevents interference of external light.

**Compact Laser Photoelectric Sensor with Built-in Amplifier****E3Z-LT/LR/LL**

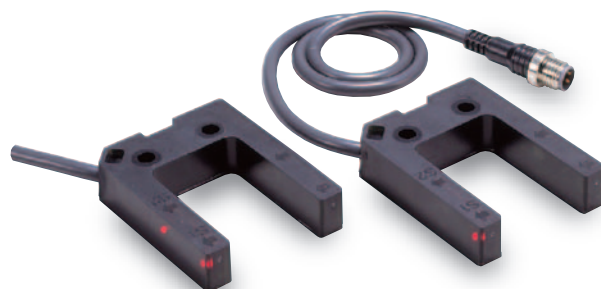
Compact and Reliable  
Laser Photoelectric Sensor

- Safety and reliability with laser class 1 (JIS and IEC).
- Product lineup includes models with distance setting without influence of color.
- Maximum ambient operating temperature of 55°C and waterproof construction (IP67) in E3Z class.

**Grooved-type Photoelectric Sensor with Built-in Amplifier****E3Z-G**

Photoelectric Sensor with  
Grooved Design and Easy Settings

- Grooved-type Sensor with groove width of 25 mm.
- Models are available with one or two light axes.
- Models are available with M8 pre-wired connectors.



## Compact Photoelectric Sensor with Stainless Steel Housing

**E3ZM**

## Stainless Steel Housing Ideal for Food Industry (SUS316L)

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



CE

## Color Mark Detection Compact Photoelectric Sensor

**E3ZM-V**

## Industry's Smallest Color Mark Sensor

- Excellent space savings.  
(Reduced by 90% compared with previous OMRON models.)
- Improved color-difference discrimination with white LED and RGB signal processing.
- Equipped with two types of teaching:  
(2-point teaching and automatic teaching.)



CE

## Transparent Object (PET Bottle) Detection Compact Photoelectric Sensor

**E3ZM-B**

## Excellent PET Bottle Detection

- New detection method that is independent of bottle shape, position, and contents.
- Automatic compensation against effects of contamination and temperature (except E3ZM-B□T).
- Product lineup includes models with adjuster (E3ZM-B□T).
- Detects transparent objects made by PET, resin, or glass.



CE

## Oil-resistant, Robust, Compact Photoelectric Sensor

**E3ZM-C**

## Photoelectric Sensor for the Automotive and Machine Tool Industries

- Oil-resistant, rugged body made of stainless steel.
- Spot visibility improved to as far as 1 m away.  
Product lineup includes through-beam models with orange spot.
- Product lineup includes M12 Smartclick pre-wired connector models.



CE

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1. **Offer; Acceptance.** These terms and conditions (these "Terms") are deemed part of all quotes, agreements, purchase orders, acknowledgments, price lists, catalogs, manuals, brochures and other documents, whether electronic or in writing, relating to the sale of products or services (collectively, the "Products") by Omron Electronics LLC and its subsidiary companies ("Omron"). Omron objects to any terms or conditions proposed in Buyer's purchase order or other documents which are inconsistent with, or in addition to, these Terms.
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  - d. Delivery and shipping dates are estimates only; and
  - e. Omron will package Products as it deems proper for protection against normal handling and extra charges apply to special conditions.
12. **Claims.** Any claim by Buyer against Omron for shortage or damage to the Products occurring before delivery to the carrier must be presented in writing to Omron within 30 days of receipt of shipment and include the original transportation bill signed by the carrier noting that the carrier received the Products from Omron in the condition claimed.
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17. **Export Controls.** Buyer shall comply with all applicable laws, regulations and licenses regarding (i) export of products or information; (ii) sale of products to "forbidden" or other proscribed persons; and (iii) disclosure to non-citizens of regulated technology or information.
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  - (i) Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
  - (ii) Use in consumer products or any use in significant quantities.
  - (iii) Energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
  - (iv) Systems, machines and equipment that could present a risk to life or property. Please know and observe all prohibitions of use applicable to this Product.
 NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON'S PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.
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