# E3C

CSM_E3C_DS_E_8_1

## Thin, Compact Head Saves Space and Mounts Closely. Built-in Interference Protection Provided.

- Input indicator on the Sensor Unit simplifies settings.

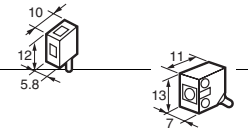
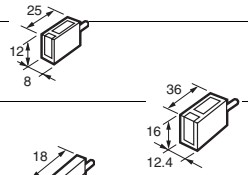
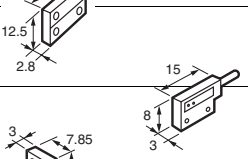
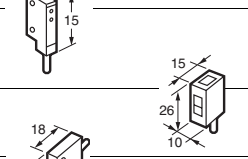
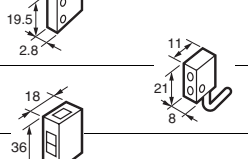
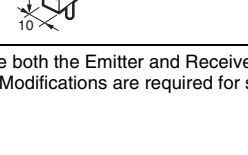
Be sure to read *Safety Precautions* on page 11.

## Ordering Information

### Sensors

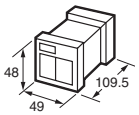
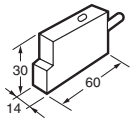
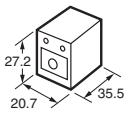
**Sensor Units** [Refer to *Dimensions* on page 12.]

Red light  Infrared light

| Sensing method | Application | Appearance | Sensing distance | Model |
|---|---|---|---|---|
| Through-beam (Emitter + Receiver) * | Small type |  | 100 mm | **E3C-S10 2M**<br>Emitter E3C-S10L 2M<br>Receiver E3C-S10D 2M |
| | | | 500 mm | **E3C-S50 2M**<br>Emitter E3C-S50L 2M<br>Receiver E3C-S50D 2M |
| | |  | 1 m | **E3C-1 2M**<br>Emitter E3C-1L 2M<br>Receiver E3C-1D 2M |
| | | | 2 m | **E3C-2 2M**<br>Emitter E3C-2L 2M<br>Receiver E3C-2D 2M |
| | Slim type |  | 200 mm | **E3C-S20W 2M**<br>Emitter E3C-S20LW 2M<br>Receiver E3C-S20DW 2M |
| | | | 300 mm | **E3C-S30W 2M**<br>Emitter E3C-S30LW 2M<br>Receiver E3C-S30DW 2M |
| | Side-view |  | | **E3C-S30T 2M**<br>Emitter E3C-S30LT 2M<br>Receiver E3C-S30DT 2M |
| Diffuse-reflective | Small type |  | 100 mm | **E3C-DS10 2M** |
| | Slim type | | 50 mm | **E3C-DS5W 2M** |
| | Side-view |  | 100 mm | **E3C-DS10T 2M** |
| Convergent-reflective | Small type | | 30±3 mm | **E3C-LS3R 2M** |

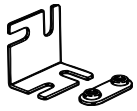
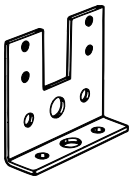
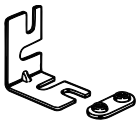
* Through-beam Sensors are normally sold in sets that include both the Emitter and Receiver.
Orders for individual Emitters and Receivers are accepted. (Modifications are required for some models. Ask your OMRON representative for details.)

### Amplifier Units [Refer to *Amplifier Units* on page 15.]

| Power supply | Application | Appearance | Functions | Model |
|---|---|---|---|---|
| AC | Standard models |   | --- | **E3C-A** |
| | | | Timer | **E3C-C** |
| DC | Slim type |   | Self diagnostic | **E3C-JC4P 2M** |
| | Small type |   | --- | **E3C-GE4** |

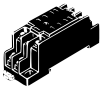
## Accessories (Order Separately)

### Mounting Brackets [Refer to *E39-L/F39-L/E39-S/E39-R* for Dimensions.]

| Appearance | Model | Quantity | Remarks |
|---|---|---|---|
|  | **E39-L41** | 2 | Provided with the E3C-1. |
| | **E39-L42** | 2 | Provided with the E3C-2.<br>Can be used with the E3C-DS10. |
|  | **E39-L127-T1** | 1 | Can be used with the E3C-S10. |
| | **E39-L127-T2** | 1 | |
| | **E39-L127-T3** | 1 | |
|  | **E39-L31** | 1* | Can be used with the E3C-S50. |

Note: Refer to *E39-L/F39-F/E39-S/E39-R* for Dimensions.
* When using through-beam models, order one bracket for the Receiver and one for the Emitter.

### Connector [Refer to *E39-L/F39-L/E39-S/E39-R* for Dimensions.]

| Name | Appearance | Model | Quantity | Remarks |
|---|---|---|---|---|
| Front connection socket | | **PF113A** | 1 | Provided with the E3C-A/C. |
| |  | **PYF08A** | 1 | Can be used with the E3C-GE4. |
| Rear connection socket | | **PY08** | 1 | Can be used with the E3C-GE4. |

## Ratings and Specifications

### Sensors

| Item / Sensing method | Through-beam | | | | | |
|---|---|---|---|---|---|---|
| Model | E3C-S10 | E3C-S20W | E3C-S50 | E3C-S30T<br>E3C-S30W | E3C-1 | E3C-2 |
| Sensing distance | 100 mm | 200 mm | 500 mm | 300 mm | 1 m | 2 m |
| Standard sensing object | Opaque, 2-mm dia. min. | | Opaque, 3-mm dia. min. | Opaque, 1.5-mm dia. min. | Opaque, 4-mm dia. min. | Opaque, 8-mm dia. min. |
| Directional angle | Emitter/Receiver: 10 to 60° each | | Emitter/Receiver: 10 to 40° each | | Emitter/Receiver: 3 to 20° each | Emitter/Receiver: 3 to 15° each |
| Light source (wavelength) | Infrared LED (950 nm) | | | Infrared LED (940 nm) | Infrared LED (950 nm) | |
| Ambient illuminance (Receiver side) | Incandescent lamp: 3,000 lx max., Sunlight 10,000 lx max. | | | | | |
| Ambient temperature range | Operating/Storage: –25°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 | 500 VAC at 50/60 Hz for 1 minute | | | | | |
| Vibration resistance | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | | | |
| Shock resistance | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | | | |
| Degree of protection | IEC 60529 IP64 Limited to indoor use | IEC 60529 IP50 Limited to indoor use | IEC 60529 IP64 Limited to indoor use | IEC 60529 IP60 Limited to indoor use | IEC 60529 IP66 Limited to indoor use | |
| Connection method | Pre-wired models (standard length: 2 m) | | | | | |
| Weight (packed state) | Approx. 50 g | | | Approx. 24 g | Approx. 60 g | Approx. 120 g |
| Material: Case | Polycarbonate | | ABS | Polycarbonate | | Zinc die-cast |
| Material: Lens | Polycarbonate | | Acrylics | Polycarbonate | | |
| Material: Mounting Brackets | --- | | | | Steel | |
| Accessories | Instruction manual | Phillips screw M2×8, spring washer, flat washer, M2 nut, instruction manual | Instruction manual | Phillips screw M2×8, spring washer, flat washer, nut M2, instruction manual | Mounting Bracket (with screws), instruction manual | Mounting Bracket (with screws), instruction manual |

| Item / Sensing method | Diffuse-reflective | | | Convergent-reflective |
|---|---|---|---|---|
| Model | E3C-DS5W | E3C-DS10T | E3C-DS10 | E3C-LS3R |
| Sensing distance | 50 mm (White paper 100 × 100 mm) | 100 mm (White paper 100 × 100 mm) | 100 mm (White paper 50 × 50 mm) | 30 ± 3 mm (White paper 10 × 10 mm) |
| Differential travel | 20% max. of sensing distance | | 10% max. | ±3% max. |
| Light source (wavelength) | Infrared LED (950 nm) | Infrared LED (950 nm) | | Red LED (680 nm) |
| Ambient illuminance (Receiver side) | Incandescent lamp: 3,000 lx max., Sunlight 10,000 lx max. | | | |
| Ambient temperature range | Operating/Storage: –25°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 | 500 VAC at 50/60 Hz for 1 minute | | | |
| Vibration resistance | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | Destruction: 500 m/s$^2$ for 3 times each in X, Y, and Z directions | | | |
| Degree of protection | IEC 60529 IP50 (Limited to indoor use) | | IEC 60529 IP64 (Limited to indoor use) | |
| Connection method | Pre-wired models (standard length: 2 m) | | | |
| Weight (packed state) | Approx. 50 g | | | Approx. 55 g |
| Material: Case | Polycarbonate | | | |
| Material: Lens | Polycarbonate | | | |
| Accessories | Phillips screw M2×8, spring washer, flat washer, M2 nut, instruction manual | Instruction manual | | |

## Amplifier Units

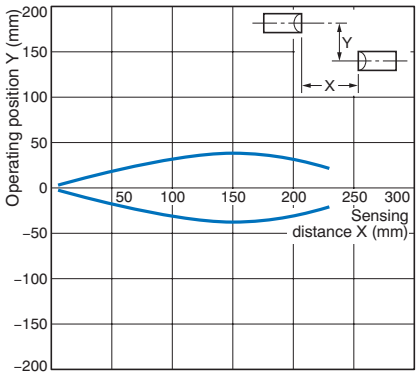
| Item | Model | E3C-A | E3C-C | E3C-JC4P | E3C-GE4 |
|---|---|---|---|---|---|
| Power supply voltage | | 100 to 240 VAC±10%, 50/60 Hz | | 12 to 24 VDC±10%, ripple (p-p): 1 V max. | |
| Power (current) consumption | | 3 W max. | | 50 mA max. | |
| Control output | Transistor output | Load power supply voltage: 24 VDC max., load current: 80 mA max., voltage output type, output current: 1 to 4 mA (residual voltage: 1.2 V max.)<br>Light-ON/Dark-ON switch selectable | | Load power supply voltage: 24 VDC max., load current: 100 mA max., NPN open collector output type (residual voltage: 1 V max.)<br>Light-ON/Dark-ON switch selectable | Load power supply voltage: 24 VDC max., load current: 80 mA max., voltage output type, output current: 1 to 4 mA (residual voltage: 0.7 V max.)<br>Light-ON/Dark-ON cable connection selectable |
| | Relay output | 220 VAC 1 A cosϕ=1<br>(resistive load)<br>SPDT contact only | | --- | |
| External synchronous input | | --- | H = 6 to 30 V<br>L = 0 to 2 V<br>When L, turns OFF the control output forcibly. | --- | |
| Timer function | | --- | ON/OFF, oneshot delay (selectable): 1 or 10 s max. | OFF-delay 0/40 ms (switch selectable) | --- |
| Ambient temperature range | | Operating: –10° to 55°C, Storage: –25° 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 | | 500 VAC at 50/60 Hz for 1 minute | | | |
| Vibration resistance | | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | | | |
| Shock resistance | | Destruction: 300 $ms^2$ three times in each of X, Y and Z directions | | | |
| Degree of protection | | IEC IP20<br>(limited to indoor use) | | IEC IP60<br>(limited to indoor use) | IEC IP20<br>(limited to indoor use) |
| Protection | | Reverse polarity protection, output short-circuit protection, mutual interference prevention | | | |
| Response time | No contact | Operate or reset: 1 ms max./2 ms max. each (switch selectable) | | Operate or reset: 1 ms max. | Operate or reset: 1 ms max./2 ms max. each (switch selectable) |
| | Relay | Operate or reset: 20 ms max. | | --- | |
| Connection method | | Terminal block | | Terminal block input cable pullout<br>(standard cable length: 2 m) | Terminal block |
| Weight (packed state) | | Approx. 200 g | | Approx. 80 g | Approx. 15 g |
| Material | Case | ABS | | | Polycarbonate |
| | Mounting Brackets | Stainless steel | --- | Iron | --- |
| Accessories | | Connection Socket (PF113A)<br>Instruction manual | | Mounting Bracket, Adjustment screwdriver, Caution label, Instruction manual | Instruction manual |

* The terminal pins are used for connection between amplifiers for synchronous operation.

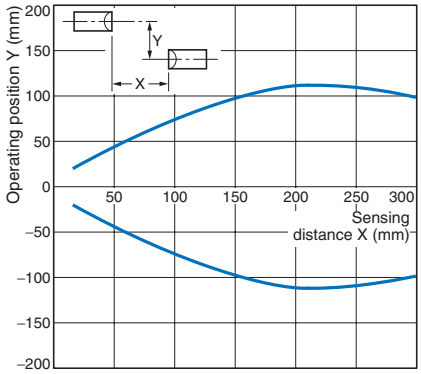
# Engineering Data (Typical)

## Parallel Operating Range

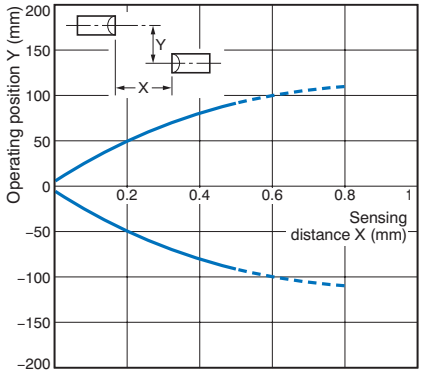
### Through-beam
### E3C-S10



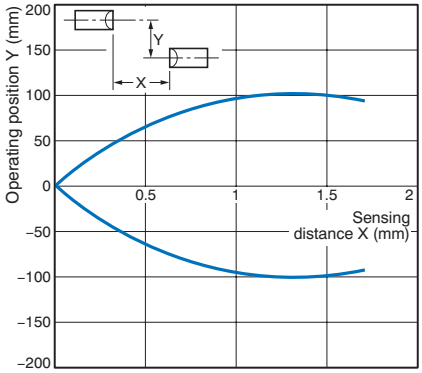

### Through-beam
### E3C-S20W



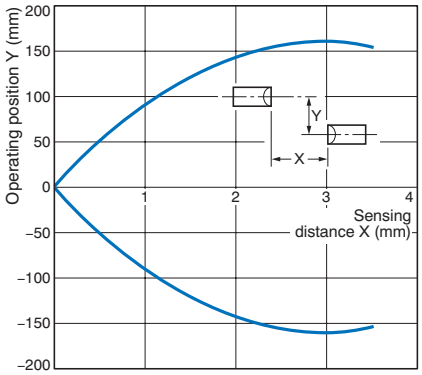

### Through-beam
### E3C-S50



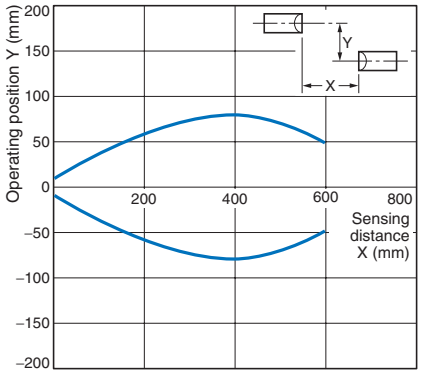

### Through-beam
### E3C-1




### Through-beam
### E3C-2

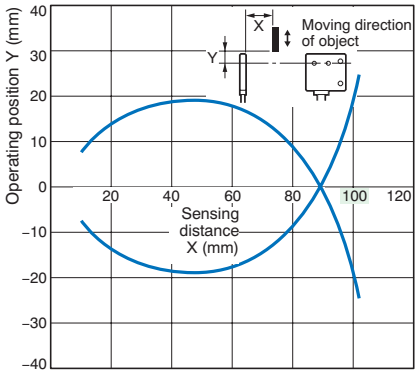



### Through-beam
### E3C-S30T/-S30W

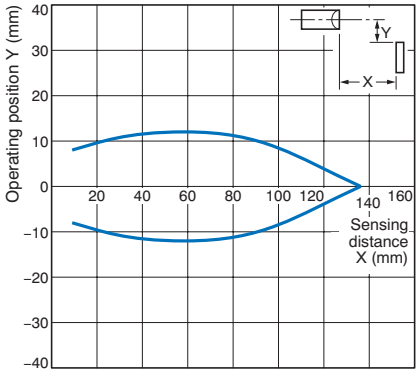



## Operating Range

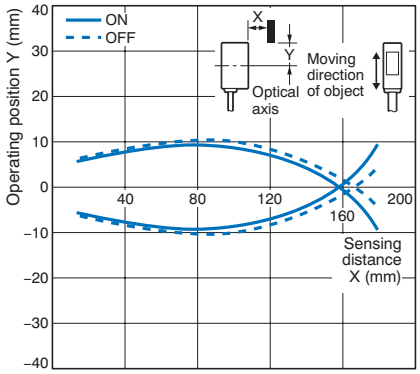
### Diffuse-reflective
### E3C-DS5W



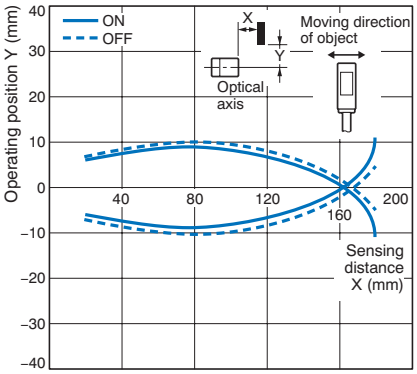

### Diffuse-reflective
### E3C-DS10T



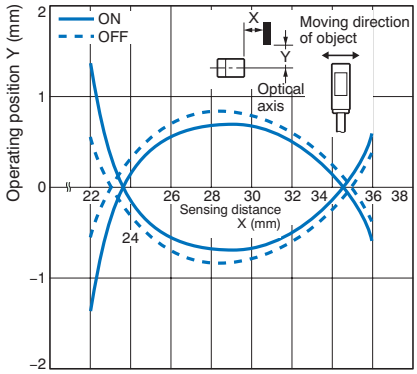

### Diffuse-reflective
### E3C-DS10 (Example 1)



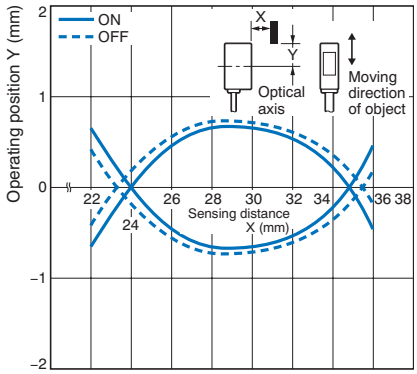
### Diffuse-reflective
### E3C-DS10 (Example 2)




### Convergent-reflective
### E3C-LS3R (Example 1)

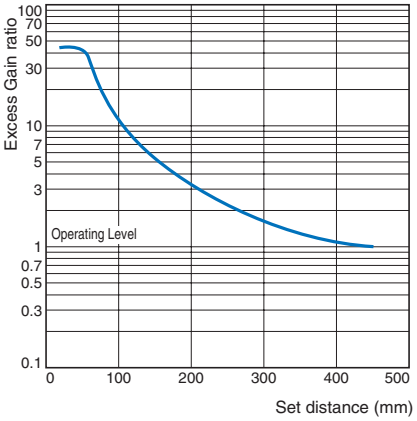



### Convergent-reflective
### E3C-LS3R (Example 2)

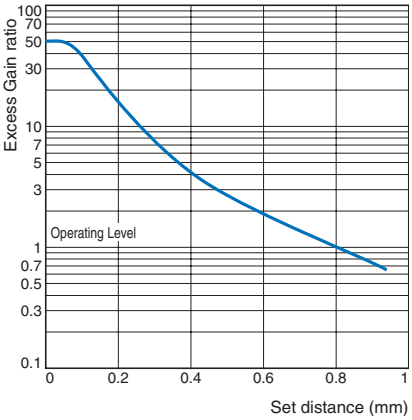



## Excess Gain vs. Set Distance

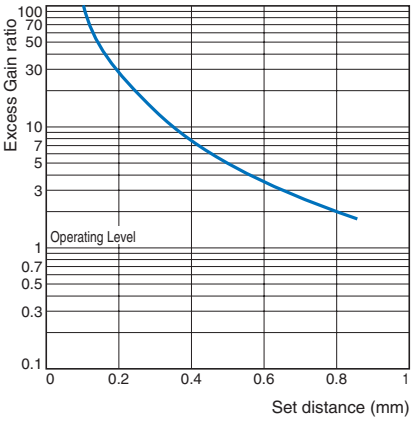
### E3C-S20W



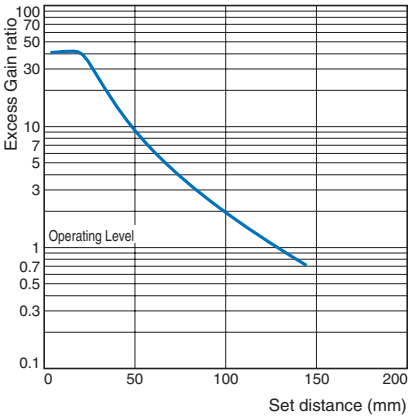

### E3C-S30T/-S30W



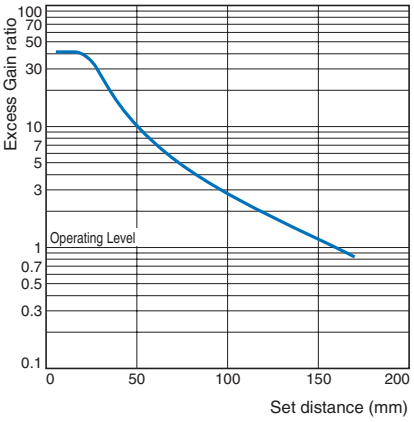

### E3C-S50



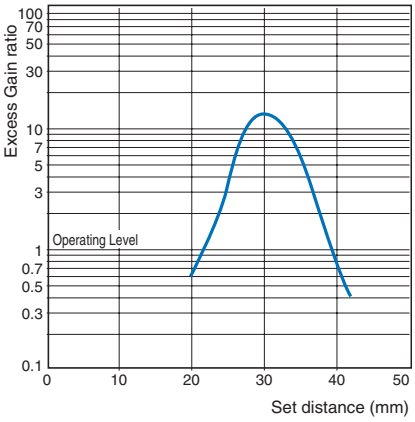

### E3C-DS5W




### E3C-DS10T

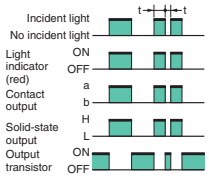
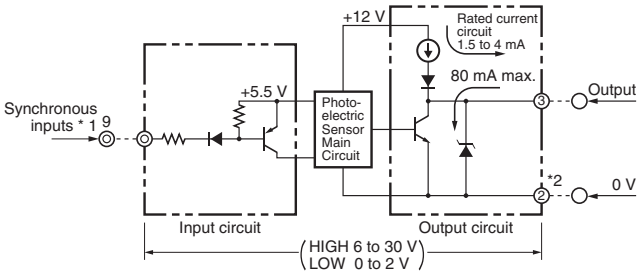
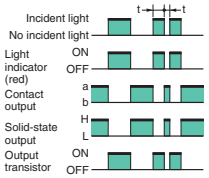
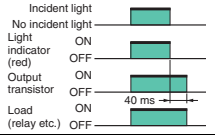
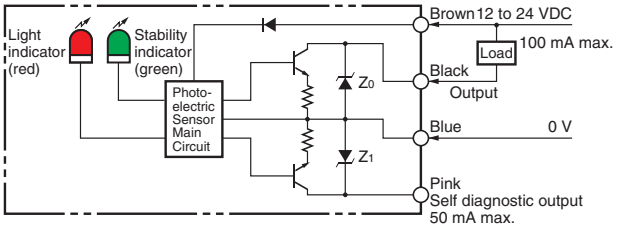
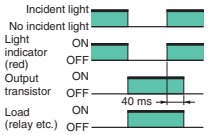
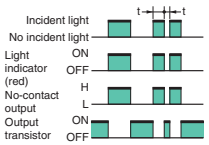
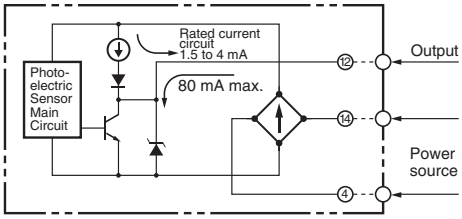
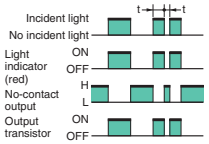



### E3C-LS3R



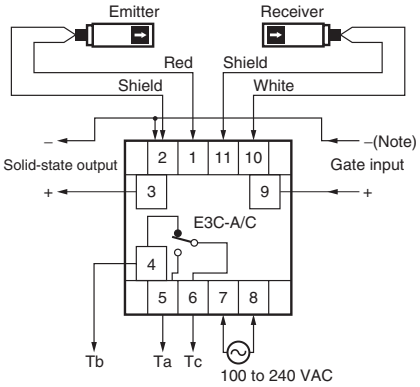
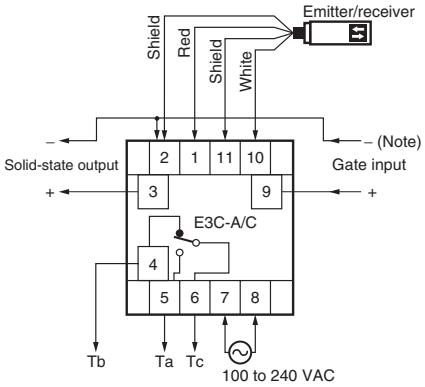
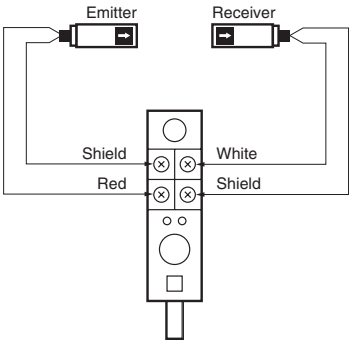
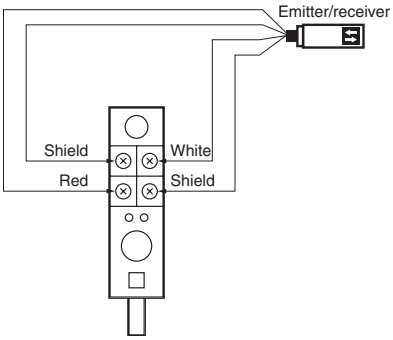
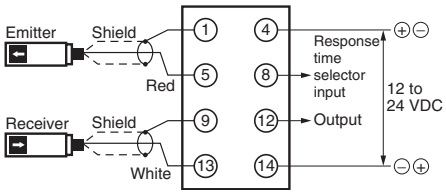
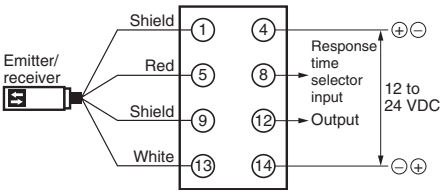
## I/O Circuit Diagrams

### NPN output

| Model | Operation mode | Timing charts * | Operation selector | Output circuit |
|---|---|---|---|---|
| E3C-A<br>E3C-C | Light-ON |  | LIGHT ON |  <br>* 1. E3C-C only<br>* 2. E3C-A/-C have SPDT contact output.<br>(About terminal number, please refer to the connection section.) |
| | Dark-ON |  | DARK ON | |
| E3C-JC4P | Light-ON |  | L-ON<br>(LIGHT ON) |  |
| | Dark-ON |  | D-ON<br>(DARK ON) | |
| E3C-GE4 | Light-ON |  | Switched with wiring.<br>14 + − 4<br>(LIGHT ON) |  |
| | Dark-ON |  | Switched with wiring.<br>14 − + 4<br>(DARK ON) | |

* For t in the timing chart, refer to *Part Names/Selection Method* on page 9.

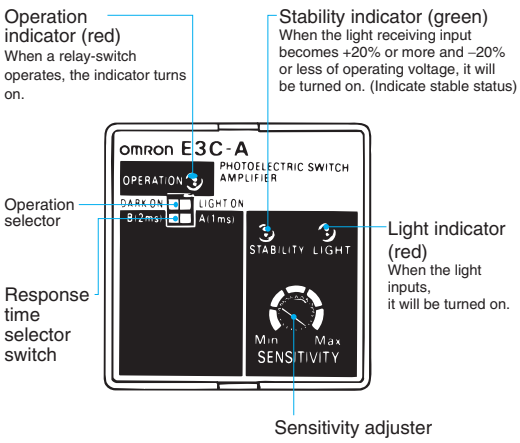
## Connection

| Amplifier Units | Connected to the through-beam model | Connected to the reflective model | Note |
|---|---|---|---|
| E3C-A/C<br>+<br>PF113A |  |  | Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red).<br>2. The E3C-A does not have a gate input function.<br>3. L when the gate input 2-9 terminals are connected, H when they are disconnected. |
| E3C-JC4P |  |  | Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red). |
| E3C-GE4 |  |  | Note: 1. The strip-off length of the shielded cable should always be 20 mm max. on the Receiver side (white) and 50 mm max. on the Emitter side (red).<br>2. The response time is 1 ms when (8) is disconnected, and 2 ms when (8) is connected to 0 V (negative side) of the power supply.<br>3. By setting the power supply terminal (4) to – and (14) to +, the output turns "H" when the light is received. With the E2 mode, the output transistor turns OFF. By setting (4) to + and (14) to +, the output turns "L" when the light is received. With the E1 mode, the output transistor turns ON. |

## Nomenclature/Settings

| Amplifier Units | Nomenclature | Settings |
|---|---|---|

### E3C-A



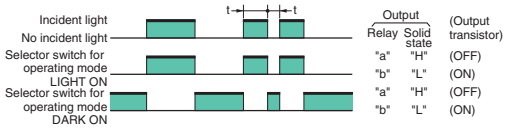

**Operation switching**

| | |
|---|---|
| DARK ON ■ LIGHT ON | DARK turns the relay ON and the transistor output "H". |
| DARK ON ■ LIGHT ON | LIGHT turns the relay ON and the transistor output "H". |

**Response time changing (The different frequency type can be made up by changing the response speed.)**

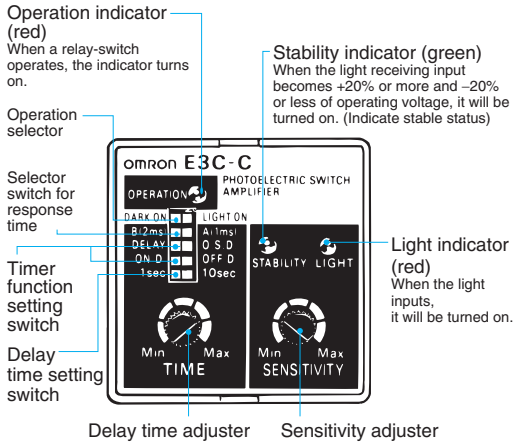
| | |
|---|---|
| 2 ms (B) ■ 1 ms (A) | The response time is set to 2 ms. |
| 2 ms (B) ■ 1 ms (A) | The response time is set to 1 ms. |

**Timing chart**




Note 1. Control output is produced only during input time.
2. When t exceeds 1 ms or 2 ms, solid-state output is produced. To produce relay output, t must be longer than 20 ms.

### E3C-C




**Operation switching**

| | |
|---|---|
| DARK ON ■ LIGHT ON | DARK turns the relay ON and the transistor output "H". |
| DARK ON ■ LIGHT ON | LIGHT turns the relay ON and the transistor output "H". |

**Response time changing (The different frequency type can be made up by changing the response speed.)**

| | |
|---|---|
| 2 ms (B) ■ 1 ms (A) | The response time is set to 2 ms. |
| 2 ms (B) ■ 1 ms (A) | The response time is set to 1 ms. |

**Delay time setting**

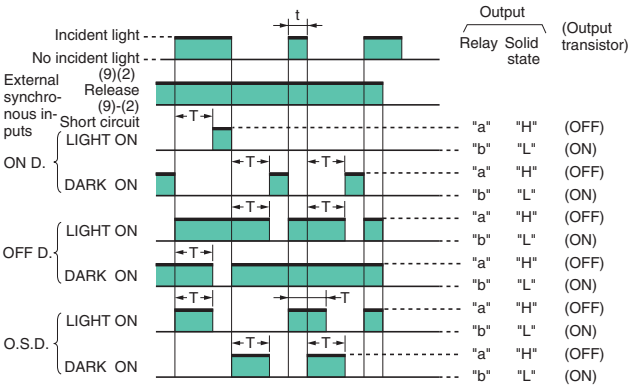
| | |
|---|---|
| 1 sec ■ 10 sec | 0.1 to 1 s can be set. |
| 1 sec ■ 10 sec | 1 to 10 s can be set. |

After setting the selector, fine-adjust the delay time with the variable adjuster. (Clockwise turn increases the delay time.)

**Timer function setting**

| | | |
|---|---|---|
| **When selecting ON delay (ON D.)** | DARK ON ■ LIGHT ON<br>2 ms (B) ■ 1 ms (A)<br>DELAY ■ O.S.D.<br>ON D. ■ OFF D.<br>1 sec ■ 10 sec | ←Set a position freely<br>←Set a position freely<br>←Set a position freely |
| **When selecting OFF delay (OFF D.)** | DARK ON ■ LIGHT ON<br>2 ms (B) ■ 1 ms (A)<br>DELAY ■ O.S.D.<br>ON D. ■ OFF D.<br>1 sec ■ 10 sec | ←Set a position freely<br>←Set a position freely<br>←Set a position freely |
| **When selecting one-shot delay (O.S.D.)** | DARK ON ■ LIGHT ON<br>2 ms (B) ■ 1 ms (A)<br>DELAY ■ O.S.D.<br>ON D. ■ OFF D.<br>1 sec ■ 10 sec | ←Set a position freely<br>←Set a position freely<br>←Since the function has stopped, it allows in both of the positions.<br>←Set a position freely |

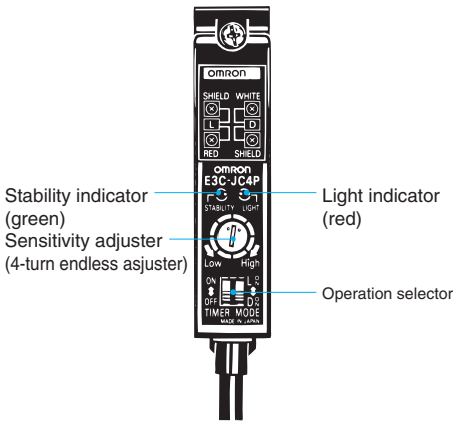
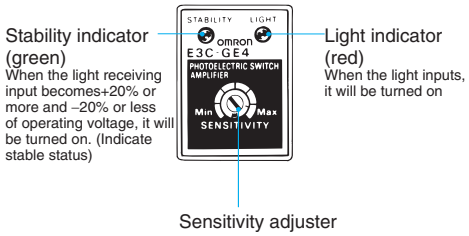
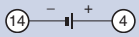
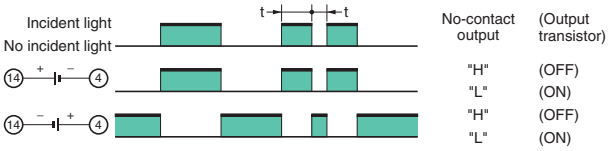
**Timing chart**




Note 1. t must be longer than 1 ms or 2 ms. 2. T denotes a delay time.

**External synchronous input operation**

When the external synchronous input terminal (9) is open (HIGH), the output relay performs timer operation according to the input signals (LIGHT, DARK). When the external synchronous input terminaL (9) is connected to the 0 V terminal (2) (LOW), the output relay turns OFF, independently of the input signals and output status, and acts as an inhibit signal.

| Amplifier Units | Nomenclature | Settings |
|---|---|---|
| E3C-JC4P |  | --- |
| E3C-GE4 |  | **Operation switching**<br>  DARK turns the output "H".<br> LIGHT turns the output "H".<br>**Response time changing (The different frequency type can be made up by changing the response speed.)**<br>**⑧-0 V * connected** — The response time is set to 2 ms.<br>**⑧ disconnected** — The response time is set to 1 ms.<br>* 0 V of power supply<br>**Timing chart**<br>  |

## Safety Precautions

**Refer to *Warranty and Limitations of Liability*.**

**⚠ WARNING**

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

### Precautions for Correct Use

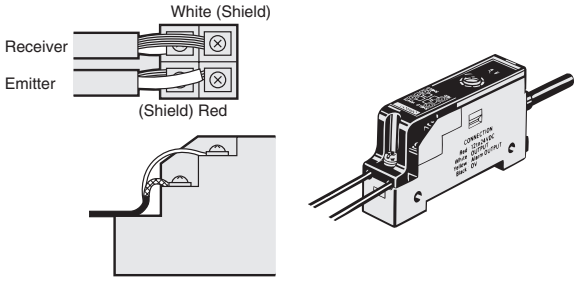
Do not use the product in atmospheres or environments that exceed product ratings.

#### Amplifier Units

**● Wiring**

**Connection of E3C-JC4P Amplifier Unit and Sensor**

Always run the shielded wires of the Emitter and Receiver separately. Also, route the sensor cable along the cable grooves of the cover and sensor and fix it with the cover.




**Connection Socket**

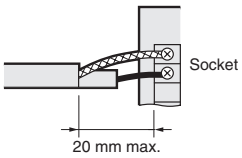
The standard socket is the PF113A for the E3C-A and -C, and the PYF08A, PYF08M or PY08 for the E3C-GE4. Avoid using any other sockets since they may not satisfy the characteristics. (There will be no problem when the STABILITY indicator turns ON)

#### Sensor Units

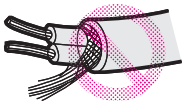
**● Wiring**

**Extension Cable**

- The extension distance of the sensor connection cable should be within 10 m.
- The strip-off length of the core in the connection cable should be 20 mm max. on the Receiver side and 50 mm max. on the Emitter side, and the core should be as short as possible. Avoid using the joint terminal and connector.

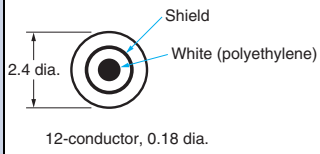
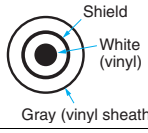
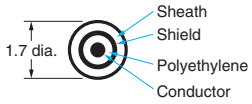
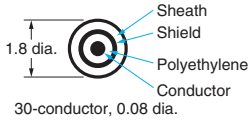



- Use independent shielded wires for the Emitter and Receiver. Using a common shielded wire can cause a malfunction.

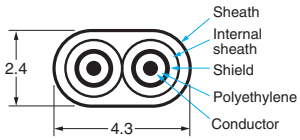
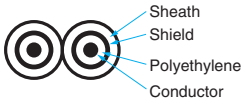


**Extension Cable**

**Through-beam**

| Cable / Model | Specified cable | Replacement cable |
|---|---|---|
| **E3C-S10**<br>**E3C-1**<br>**E3C-2**<br>**E3C-S50** | Polyethylene insulation shield Round cable<br>  <br><br>12-conductor, 0.18 dia. | 1-conductor shield/ vinyl wire, conductor cross section: 0.3 mm² min.<br>  <br> |
| **E3C-S20W** | Vinyl insulation shield round cable<br>  <br><br>12-conductor, 0.18 dia. | 1-conductor shield/ vinyl wire, conductor cross section: 0.3 mm² min. |
| **E3C-S30T**<br>**E3C-S30W** | Vinyl insulation shield round cable (robot cable)<br>  <br><br>30-conductor, 0.08 dia. | |

**Reflective model**

| Cable / Model | Specified cable | Replacement cable |
|---|---|---|
| **E3C-DS10**<br>**E3C-DS10T**<br>**E3C-VS1G**<br>**E3C-VS3R**<br>**E3C-LS3R** | Vinyl insulation shielded parallel cable<br>  <br><br>12-conductor, 0.18 dia. | When there is no1-conductor shielded, vinyl cable (parallel wire), use two 1-conductor shielded, vinyl wires. |
| **E3C-DS5W**<br>**E3C-VS7R**<br>**E3C-VM35R** | Vinyl insulation shielded parallel cable<br>  <br><br>7-conductor, 0.18 dia. | When there is no1-conductor shielded, vinyl cable (parallel wire), use two 1-conductor shielded, vinyl wires. |

**● Others**

When the E3C is used in a place where high-frequency noise will be generated, e.g. ultrasonic welder, grounding the 0-V terminal (on the shield side of the connection cable) of the Receiver may avoid a malfunction caused by induction.

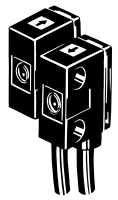
# Dimensions

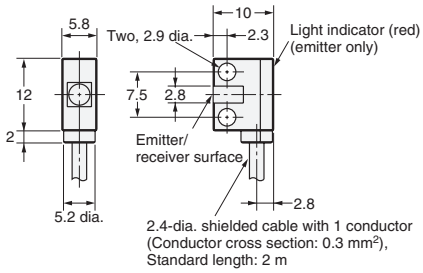
(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

## Sensors

### Sensor Units

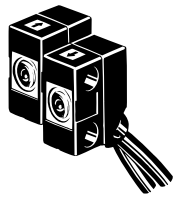
#### E3C-S10

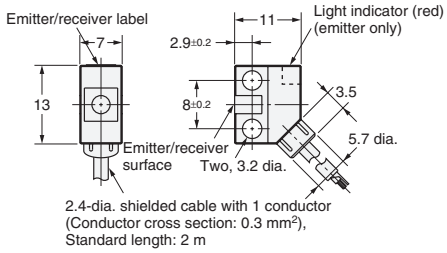





| | |
|---|---|
| Emitter: | E3C-S10L |
| Receiver: | E3C-S10D |

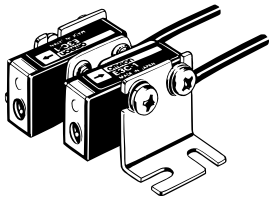
#### E3C-S50

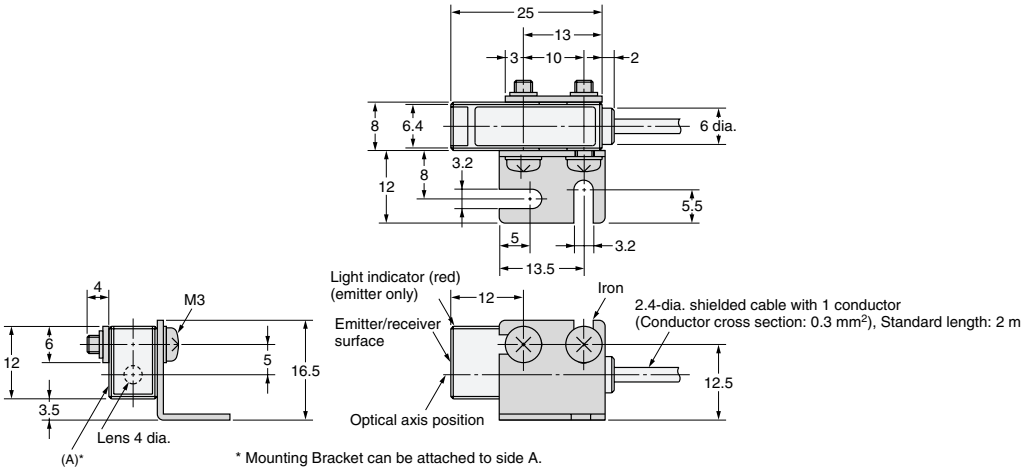





| | |
|---|---|
| Emitter: | E3C-S50L |
| Receiver: | E3C-S50D |

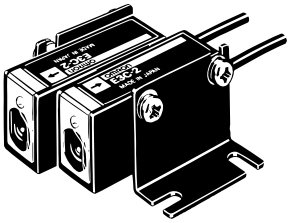
#### E3C-1

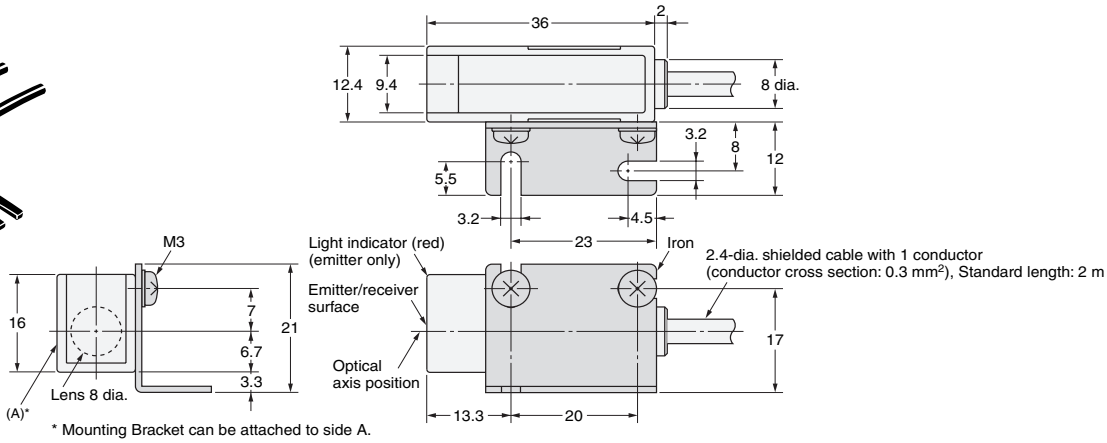





| | |
|---|---|
| Emitter: | E3C-1L |
| Receiver: | E3C-1D |

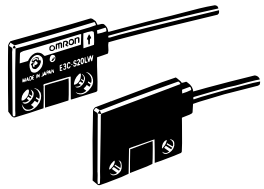
#### E3C-2

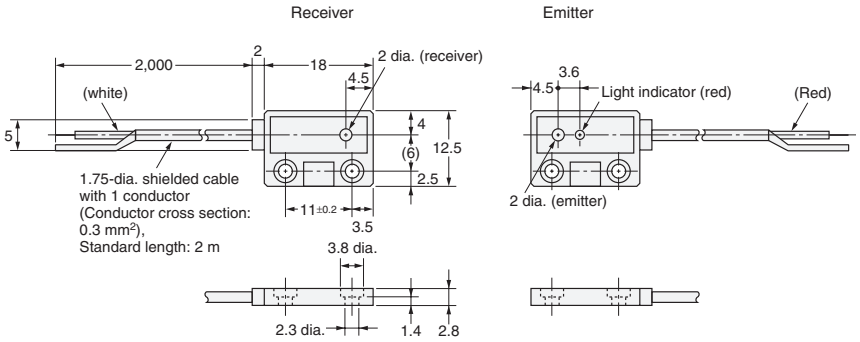





| | |
|---|---|
| Emitter: | E3C-2L |
| Receiver: | E3C-2D |

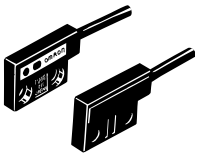
## E3C-S20W

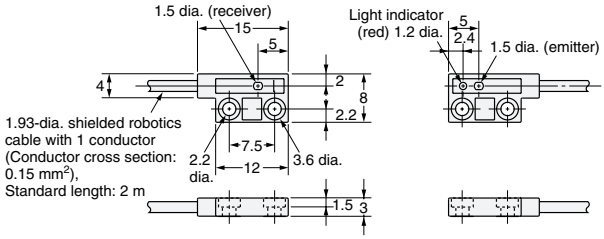





| | |
|---|---|
| Emitter: | E3C-S20LW |
| Receiver: | E3C-S20DW |

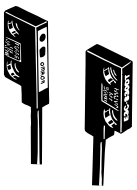
## E3C-S30W

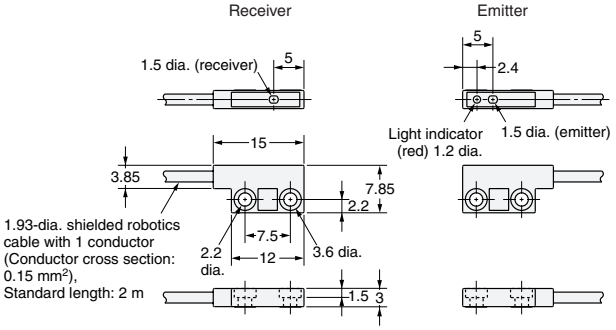





| | |
|---|---|
| Emitter: | E3C-S30LW |
| Receiver: | E3C-S30DW |

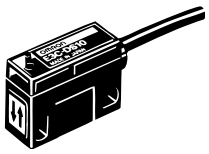
## E3C-S30T

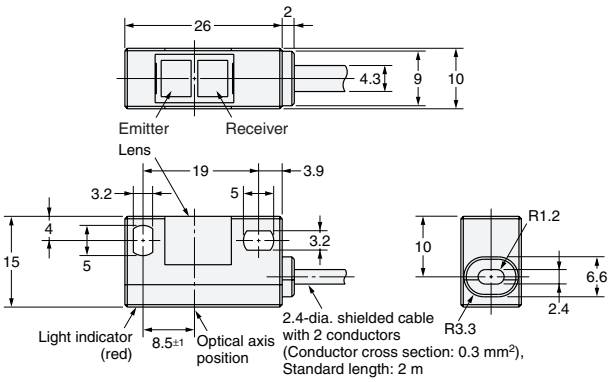




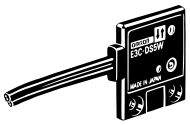

| | |
|---|---|
| Emitter: | E3C-S30LT |
| Receiver: | E3C-S30DT |

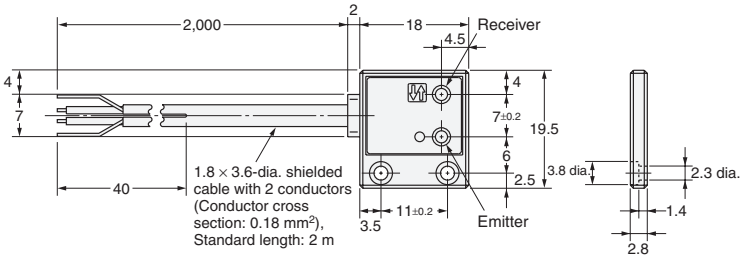
## E3C-DS10



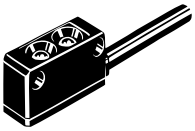


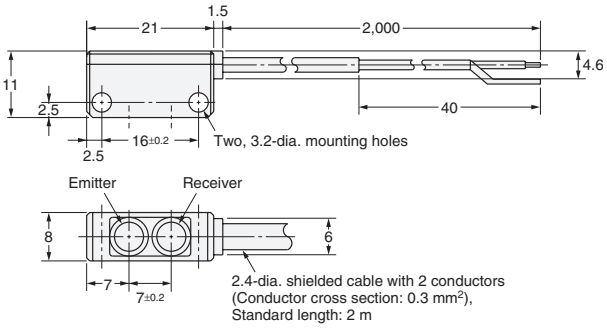
## E3C-DS5W



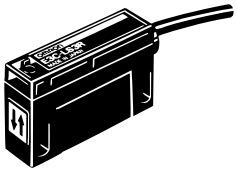


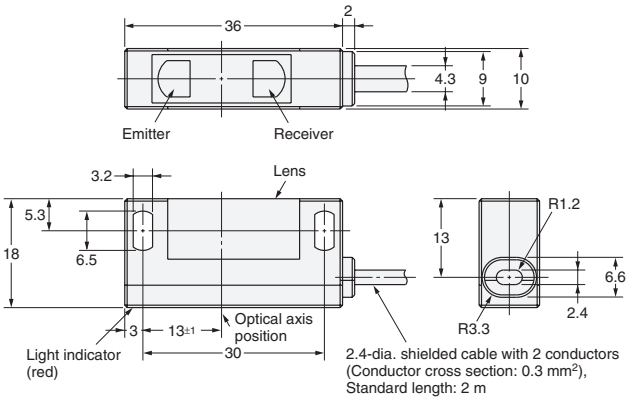

## E3C-DS10T





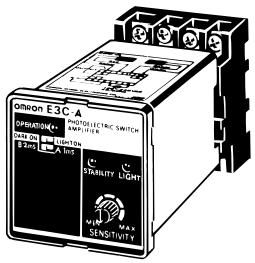

## E3C-LS3R

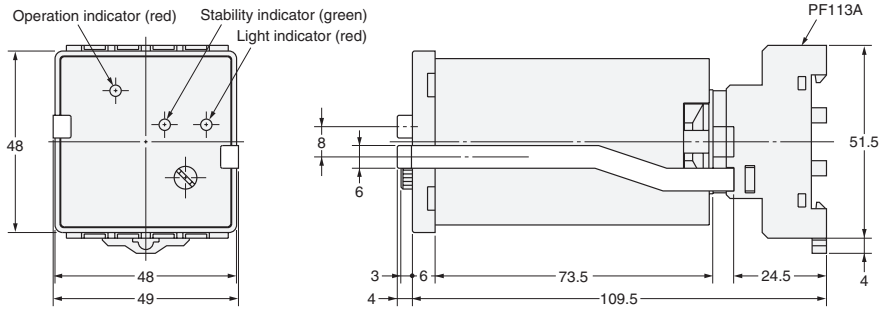




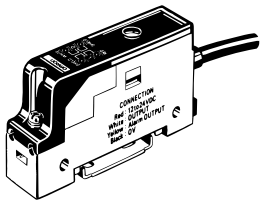
## Amplifier Units

### E3C-A
### E3C-C

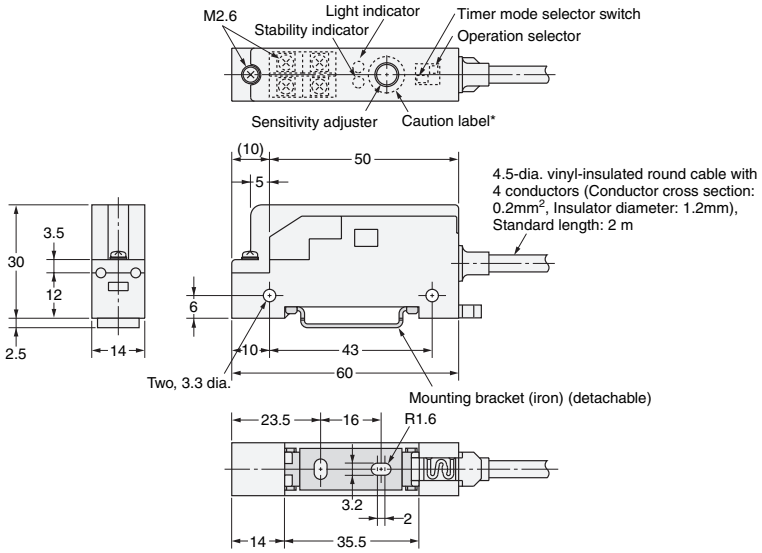





### E3C-JC4P

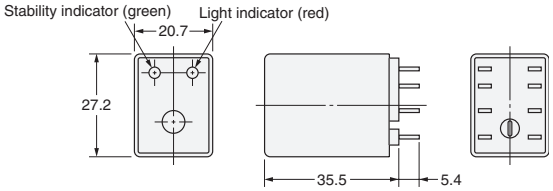


**With Mounting Bracket Attached**




*After adjusting the sensitivity, attach the caution label at the location indicated by ◌ above to prevent malfunction.

### E3C-GE4




**Connector**
Use the PYF08A front connection socket or PY08 rear connection socket.

## Accessories (Order Separately)

### Mounting Brackets

Refer to *E39-L/F39-L/E39-S/E39-R* for details.

### Connecting Sockets

Refer to *E39-L/F39-L/E39-S/E39-R* for details.

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2011.9

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