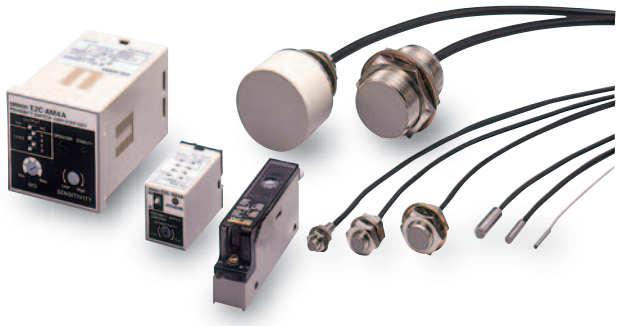
Separate Amplifier Proximity Sensor with Adjustment Potentiometer

# E2C/E2C-H

CSM_E2C_E2C-H_DS_E_9_2

## Separate Amplifier Sensor with Sensitivity Adjustment

- Compact design with smaller Sensor Head.
- Heat-resistance model available for application between −10 and 200°C.



⚠ Be sure to read *Safety Precautions* on page 15.

## Ordering Information

### Sensors [Refer to *Dimensions* on page 18.]

#### Standard Models

| Sensor | | | | Combination | Amplifier Units | | | |
|---|---|---|---|---|---|---|---|---|
| Appearance | | Stable sensing area * | Model | | Model | Power supply/ Output | Timer function | Self-diagnostic output |
| Shielded | 3.5 dia. | 0.8 (1.8) mm | E2C-CR8A 3M | | E2C-GE4A | DC/ (NPN) | --- | --- |
| | 3.8 dia. | 0.8 (1.8) mm | E2C-CR8B 3M | | E2C-GF4A | DC/ (PNP) | --- | --- |
| | M5 | 1 (2) mm | E2C-X1A 3M | | E2C-JC4AP 2M * | DC/ (NPN) | Yes | Yes |
| | 5.4 dia. | 1 (2) mm | E2C-C1A 3M | | E2C-JC4A 2M | DC/ (NPN) | Yes | --- |
| | M8 | 1.5 (3) mm | E2C-X1R5A 3M | | E2C-AM4A | DC/ (NPN / PNP) | --- | --- |
| | M12 | 2 (5) mm | E2C-X2A 3M | | E2C-AK4A | AC | --- | --- |
| | M18 | 5 (10) mm | E2C-X5A 3M | | | | | |
| | M30 | 10 (18) mm | E2C-X10A 3M | | | | | |
| Unshielded | 40 dia. | 20 (50) mm | E2C-C20MA 3M | | | | | |

*1. Values in parentheses are for the maximum sensing distances at 23°C.

* Self-diagnostic output, timer, and DIN Track mounting.

#### Heat-resistant Model

| Sensor | | | | Combination | Amplifier Unit |
|---|---|---|---|---|---|
| Appearance | | Stable sensing area | Model | | Model |
| Shielded | M8 | 1.5 mm | E2C-X1R5AH 3M | | E2C-JC4CH 2M |
| | M12 | 2 mm | E2C-X2AH 3M | | E2C-JC4DH 2M |
| | M18 | 5 mm | E2C-X5AH 3M | | E2C-JC4EH 2M |

Note: Characteristics will change if the cable length changes. Do not cut or extend the cable.

## Accessories (Order Separately)

**Mounting Brackets** **A Mounting Bracket is not provided with the Sensor. Order a Mounting Bracket separately if required.**
**[Refer to Dimension on page 21.]**

| Name | Model | Applicable Sensors | Remarks |
|---|---|---|---|
| **Mounting Brackets** | **Y92E-F3R5** | E2C-CR8A, for 3.5 dia. | --- |
| | **Y92E-F5R4** | E2C-C1A, for 5.4 dia. | |

**Connection Sockets** **A Socket is not provided with the Amplifier Unit. Order a Socket separately if required.**
**[Refer to Dimension on page 21.]**

| Name | Model | Applicable Amplifier Unit | Remarks |
|---|---|---|---|
| **Front Connection Sockets** | **PYF08A** | E2C-GE4A<br>E2C-GF4A | Hold-down Clips (Order Separately)<br>PYC-A1<br>Sold as a set. |
| | **P2CF-08** | E2C-AM4A | --- |
| | **P2CF-11** | E2C-AK4A | |
| **Back Connection Sockets** | **P3G-08** | E2C-AM4A | |
| | **P3GA-11** | E2C-AK4A | |
| | **PY08** | E2C-GE4A<br>E2C-GF4A | |

**Adapters** **An Adapter is not provided with the Amplifier Unit. Order an Adapter separately if required.**
**[Refer to Dimension on page 21.]**

| Name | Model | Applicable Amplifier Unit | Remarks |
|---|---|---|---|
| **Embedded Adapters** | **Y92F-30** | E2C-AM4A/-AK4A | --- |
| | **Y92F-70** | | |
| | **Y92F-71** | | |

For details on *Mounting Brackets, Protective Covers, and Sputter Protective Covers*, refer to *Accessories* on *Y92□*.

## Ratings and Specifications

### Standard Models

#### Sensors

| Item | Model | E2C-CR8A/ -CR8B | E2C-X1A/ -C1A | E2C-X1R5A | E2C-X2A | E2C-X5A | E2C-X10A | E2C-C20MA |
|---|---|---|---|---|---|---|---|---|
| Sensing distance (at 23°C) | | 1.8 mm | 2 mm | 3 mm | 5 mm | 10 mm | 18 mm | 50 mm |
| Stable sensing area | Ambient temperature | 0 to 0.8 mm | 0 to 1 mm | 0 to 1.5 mm | 0 to 2 mm | 0 to 5 mm | 0 to 10 mm | 0 to 20 mm |
| | At 0 to 40°C | 0 to 1.2 mm | 0 to 1.5 mm | 0 to 2 mm | 0 to 2.5 mm | 0 to 7 mm | 0 to 15 mm | 0 to 28 mm |
| Differential travel | | Refer to *Ratings and Specifications* on page 4 for Amplifier Unit specifications. | | | | | | |
| Detectable object | | Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 7.) | | | | | | |
| Standard sensing object | | Iron, 5 × 5 × 1 mm | | Iron, 8 × 8 × 1 mm | Iron, 12 × 12 × 1 mm | Iron, 18 × 18 × 1 mm | Iron, 30 × 30 × 1 mm | Iron, 50 × 50 × 1 mm |
| Response frequency *1 | | 1 kHz | | 800 Hz | | 350 Hz | 100 Hz | 50 Hz |
| Ambient temperature range | | Operating/Storage: −25 to 70°C (with no icing or condensation) | | | | | | |
| Ambient humidity range | | Operating/Storage: 35% to 95% (with no condensation) | | | | | | |
| Temperature influence | | 15% max. of sensing distance at 23°C in the temperature range of −25 to 70°C | | | | | | |
| Vibration resistance | | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X and Y directions | | | | | | |
| Shock resistance | | Destruction: 500 m/s$^2$ 3 times each in X and Y directions | | | | | | |
| Degree of protection | | IEC 60529 IP67, in-house standards: oil-resistant | | | | | | |
| Connection method *2 | | Pre-wired Models | | | | | | |
| | | High-frequency coaxial cable (Standard cable length: 3 m) | | | | | | |
| Weight (packed state) | | Approx. 40 g | Approx. 45 g | Approx. 50 g | Approx. 60 g | Approx. 140 g | Approx. 270 g | Approx. 300 g |
| Materials | Case | Stainless steel | Brass | | | | | |
| | Sensing surface | ABS resin | | | | | | |
| | Cable | Polyethylene | | | | | | |
| | Clamping nut | --- | Brass, nickel-plated (except E2C-C1A) | | | | | |
| | Toothed washer | --- | Brass, zinc-plated (except E2C-C1A) | | | | | |
| Accessories | | --- | | | | | | |

*1. The minimum value when using the solid-state control output on the Amplifier Unit.
Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.
*2. Refer to 6 for cable lengths when combining Amplifier Units and Sensors.
The characteristic impedance of the high-frequency coaxial cable is 50 Ω.

## Amplifier Units

| Item \ Model | | E2C-GE4A | E2C-GF4A | E2C-JC4A<br>E2C-JC4AP | E2C-AM4A | E2C-AK4A |
|---|---|---|---|---|---|---|
| Power supply voltage (operating voltage range) | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. *1 | | | | 100 to 240 VAC<br>(90 to 264 VAC)<br>50/60 Hz |
| Current consumption | | 25 mA max. | | 45 mA max. | 50 mA max. | 55 mA max. |
| Sensing distance adjustment range *2 | | 20% min. of rated sensing distance with 4-turn potentiometer | | 20% to 100% of rated sensing distance with 4-turn potentiometer | | |
| Differential travel adjustment range | | Differential travel fixed (10% max. of sensing distance) | | | 1% to 5% of rated sensing distance | |
| Response time | Solid-state | (Refer to the response frequency of the Proximity Sensor.) | | | | |
| | Relay | --- | | | | 20 ms max. |
| Control outputs | Solid-state | NPN<br>Load resistance: 4.7 kΩ,<br>100 mA max.<br>(30 VDC max.)<br>(Residual voltage: 1.5 V max.) | PNP<br>Load resistance: 4.7 kΩ,<br>100 mA max.<br>(30 VDC max.)<br>(Residual voltage: 1.5 V max.) | NPN<br>Open-collector output<br>100 mA max.<br>(30 VDC max.)<br>(Residual voltage: 0.7 V max.)<br>(E2C-JC4AP: 1 V max.) | NPN/PNP output<br>Open-collector output<br>200 mA max.<br>(30 VDC max.)<br>(Residual voltage: 1.5 V max.) | Transistor/photocoupler<br>50 mA max.<br>(40 VDC max.)<br>(Residual voltage: 2 V max.) |
| | Relay | --- | | | | Relay output, SPDT<br>2 A at 250 VAC, cosϕ = 1<br>(resistive load) *3 |
| Indicators | | Detection indicator (red)<br>(OPERATION) | | Detection indicator (red)<br>(OPERATION)<br>Stability indicator (green)<br>(STABILITY) | Detection indicator (red) (OPERATION)<br>Stability indicator (green) (STABILITY) | |
| Operation mode | | Changed with NO/NC switch. | | | | |
| Self-diagnostic output | | --- | | (E2C-JC4AP only)<br>Output transistor turns ON when Sensor open circuit or unstable sensing is detected; solid-state NPN open-collector<br>50 mA max.<br>(30 VDC max.)<br>(Residual voltage: 1 V max.) | --- | |
| Timer function | | --- | | OFF-delay: 40 ±10 ms | --- | |
| Cable length compensation between Sensor and Amplifier Unit | | --- | | (E2C-JC4AP only)<br>3 m/5 m, terminals<br>Short-plate switching<br>Shorted: 1 to 3 m<br>Open: 3 to 5 m | Mode switched with 4-position switch. | |
| Ambient temperature range | | Operating/storage: −10 to 55°C (with no icing or condensation) | | | | |
| Ambient humidity range | | Operating/Storage: 35% to 85% (E2C-JC4AP: 35% to 95%) (with no condensation) | | | | |
| Temperature influence | | 10% max. of sensing distance at 23°C in the temperature range of −10 to 55°C | | | | |
| Voltage influence | | DC Models: ±1% max. of sensing distance at rated voltage in the rated voltage ±20% range<br>AC Models: ±1% max. of sensing distance at rated voltage in the rated voltage ±10% range | | | | |
| Insulation resistance | | 50 MΩ min. (at 500 VDC) between current-carrying parts and case | | | | |
| Dielectric strength | | DC Models: 1,000 VAC, 50/60 Hz for 1 min between current-carrying parts and case<br>AC Models: 1,500 VAC, 50/60 Hz for 1 min between current-carrying parts and case | | | | |
| Vibration resistance | | Destruction: 10 to 25 Hz, 2-mm double amplitude for 2 hours each in X, Y, and Z directions | | Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions | Destruction: 10 to 25 Hz, 2-mm double amplitude for 2 hours each in X, Y, and Z directions | |

*1. A full-wave rectification power supply of 24 VDC ±10% (average value) can be used (except for the E2C-GE4□).
*2. The sensing distance range required to maintain performed is given for using the Amplifier Unit in combination with the Sensor.
*3. Internal relay: G2R-14 DC 12V

| Item \ Model | E2C-GE4A | E2C-GF4A | E2C-JC4A<br>E2C-JC4AP | E2C-AM4A | E2C-AK4A |
|---|---|---|---|---|---|
| **Shock resistance** | Destruction: 100 m/s² 3 times each in X, Y, and Z directions | | | | |
| **Life expectancy** | --- | | | | Mechanical: 10,000,000 operations min.<br>Electrical: 100,000 operations min. |
| **Connection method** | Terminal block | | Pre-wired Models<br>(Standard cable length: 2 m) | Terminal block | |
| **Weight (packed state) *4** | Approx. 20 g | | E2C-JC4A: Approx. 50 g<br>E2C-JC4AP: Approx 80 g | Approx. 140 g | Approx. 250 g |
| **Accessories** | Instruction manual | | Caution labels, Mounting Bracket (E2C-JC4A: M3 × 15 Phillips mounting screw), instruction manual | Instruction manual | |

*4. The weight of the Connection Socket is not included.

## Heat-resistant Models

### Sensors

| Item \ Model | | E2C-X1R5AH | E2C-X2AH | E2C-X5AH |
|---|---|---|---|---|
| **Detectable object** | | Ferrous metal (The sensing distance decreases with non-ferrous metal, refer to *Engineering Data* on page 7.) | | |
| **Standard sensing object** | | Iron, 8 × 8 × 1 mm | Iron, 12 × 12 × 1 mm | Iron, 18 × 18 × 1 mm |
| **Stable sensing area** | | 0 to 1.5 mm | 0 to 2 mm | 0 to 5 mm |
| **Differential travel** | | 0.04 mm max. | | 0.1 mm max. |
| **Response frequency *1** | | 300 Hz | | |
| **Ambient temperature range** | | Operating/Storage: −10 to 200°C (with no icing or condensation) | | |
| **Ambient humidity range** | | Operating/Storage: 35% to 95% (with no condensation) | | |
| **Temperature influence** | | ±0.2%/°C | | |
| **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/s² 3 times each in X, Y, and Z directions | | |
| **Degree of protection** | | IEC 60529 IP60 *2 | | |
| **Connection method** | | Pre-wired Models (Cable length: 3 m)<br>Heat-resistant, high-frequency coaxial cable | | |
| **Weight (packed state)** | | Approx. 50 g | Approx. 60 g | Approx. 140 g |
| **Materials** | **Case** | Brass | | |
| | **Sensing surface** | PEEK (polyether ether ketone) | | |
| | **Cable** | Fluorine resin | | |
| | **Clamping nut** | Brass, nickel-plated | | |
| | **Toothed washer** | Iron, zinc-plated | | |

Note: Ratings and characteristic are given for 50% of the stable sensing area.

*1. Measurement conditions are as follows: standard sensing object, a distance of twice the standard sensing object, and a set distance of half the sensing distance.

*2. Do not operate the Sensor in areas exposed to water vapor because the enclosure is not waterproof.

### Amplifier Units

| Item \ Model | | E2C-JC4CH | E2C-JC4DH | E2C-JC4EH |
|---|---|---|---|---|
| **Power supply voltage *1 (operating voltage range)** | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | |
| **Current consumption** | | 45 mA max. | | |
| **Sensing distance adjustment range *2** | | 20% to 100% of rated sensing distance<br>4-turn potentiometer | | |
| **Control outputs** | **Load current** | NPN open collector, 100 mA max. (30 VDC max.) | | |
| | **Residual voltage** | 0.8 V max. | | |
| **Indicators** | | Detection indicator (red) | | |
| **Operation mode** | | Changed with NO/NC switch. | | |
| **Cable length compensation** | | Switched between 3 and 5 m. | | |
| **Ambient temperature range** | | Operating/storage: −10 to 55°C (with no icing or condensation) | | |
| **Ambient humidity range** | | Operating/storage: 35% to 85% (with no condensation) | | |
| **Temperature influence** | | ±0.08%/°C | | |
| **Voltage influence** | | ±2% max. of sensing distance at rated voltage in the rated voltage ±20% range | | |
| **Insulation resistance** | | 50 MΩ min. (at 500 VDC) between current-carrying parts and case | | |
| **Dielectric strength** | | 1,000 VAC, 50/60 Hz for 1 min between current-carrying parts and case | | |
| **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: 100 m/s² 3 times each in X, Y, and Z directions | | |
| **Degree of protection** | | IEC 60529 IP20 | | |
| **Connection method** | | Pre-wired Models (Cable length: 2 m) | | |
| **Weight (packed state)** | | Approx. 80 g | | |
| **Accessories** | | Caution labels, Mounting Bracket, instruction manual | | |

*1. A full-wave rectification power supply of 24 VDC ±10% (average value) can be used.

*2. The sensing distance range required to maintain performed is given for using the Amplifier Unit in combination with the Sensor.

## Cable Lengths for Sensor-Amplifier Unit Combinations

### Standard Models

| Sensor / Amplifier Units | E2C-CR8A | E2C-CR8B | E2C-X1A | E2C-C1A | E2C-X1R5A | E2C-X2A | E2C-X5A | E2C-X10A | E2C-C20MA |
|---|---|---|---|---|---|---|---|---|---|
| E2C-GE4A | Restricted to 3 m. | | | | | --- | --- | --- | --- |
| E2C-GF4A | | | | | | --- | --- | --- | --- |
| E2C-JC4AP | 1 to 3 m: Short cable length terminals *<br>3 to 5 m: Open cable length terminals * | | | | | | --- | --- | --- |
| E2C-JC4A | Restricted to 3 m. | | | | | | --- | --- | --- |
| E2C-AM4A | 0 to 5 m<br>Set cable length switch to desired position. * | | | | | 0 to 10 m<br>Set cable length switch to desired position. * | | | |
| E2C-AK4A | | | | | | | | | |

Note: The standard cable length is 3 m. Models with 5-m or 10-m are manufactured upon order.
* Refer to page 14 for the operation of cable length switching.

### Heat-resistant Models

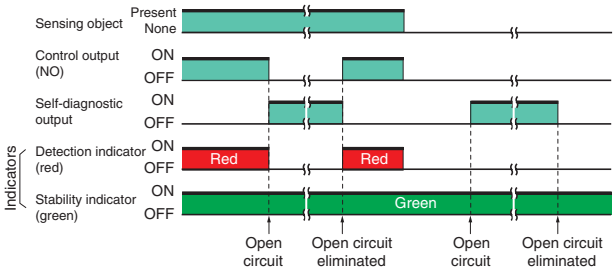
| Sensor / Amplifier Units | E2C-X1R5AH | E2C-X2AH | E2C-X5AH |
|---|---|---|---|
| E2C-JC4CH | Set 3 m/5 m cable length switch to desired position. | | |
| E2C-JC4DH | | | |
| E2C-JC4EH | | | |

Note: The standard cable length is 3 m. Models with 5-m are manufactured upon order.

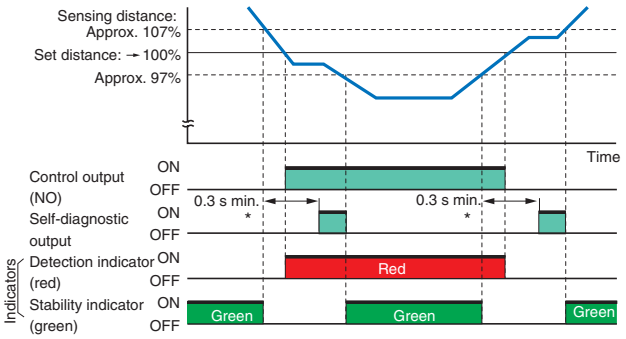
## Self-diagnostic Function

The self-diagnostic output transistor will turn ON in the following cases. (The output will turn ON for any of these conditions individually.)
(1) Sensor open circuit: Transistor will turn ON the instance there is an open circuit for the Sensor (including the cable).

**Sensor Open Circuit**




**Sensor Connected**

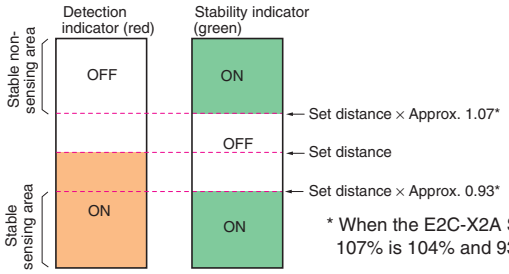



Note: When the E2C-X2A Sensor is used, 93% is 96% and 107% is 104%.
* The self-diagnostic output may turn ON if the sensing objects moves a low speed. In actual application, include an ON-delay timer circuit or other suitable measure.

(2) Detection: The output will turn ON if a sensing object is within 93% to 100% of the sensing distance continuously for 0.3 s or longer (e.g., for sensing object position offset).
(3) No detection: The output will turn ON if a sensing object is within 100% to 107% of the sensing distance continuously for 0.3 s or longer (e.g., when background is influencing detection).

## Indicators

- The detection indicator lights when a sensing object approaches the sensing distance to indicate that a sensing object has been detected.
- The stability indicator lights when the sensing object approaches within 93% of the sensing distance or moves away from 107% of the sensing distance to indicate a stable sensing or non-sensing condition.

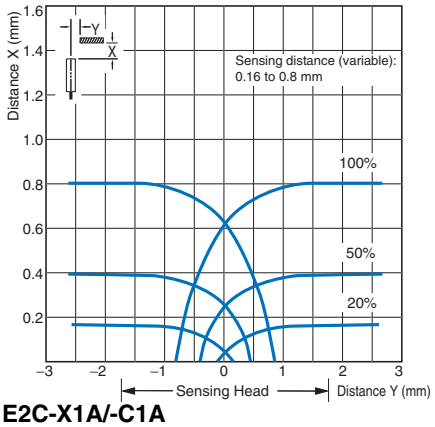



* When the E2C-X2A Sensor is used, 107% is 104% and 93% is 96%.

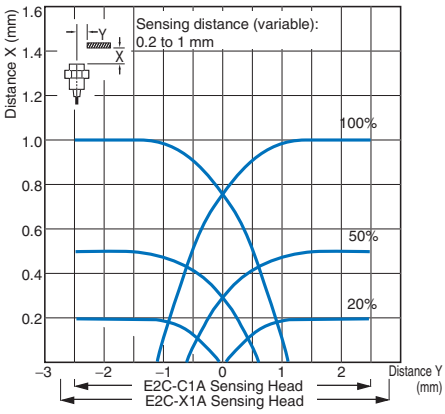
# Engineering Data (Reference Value)

## Sensing Area

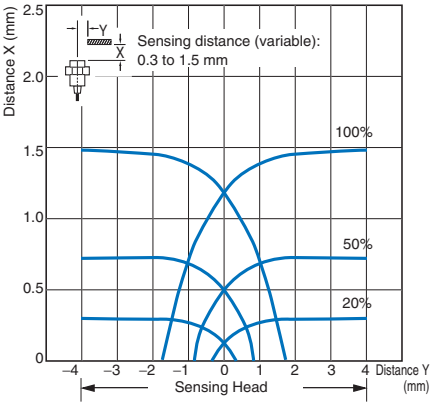
### E2C-CR8□



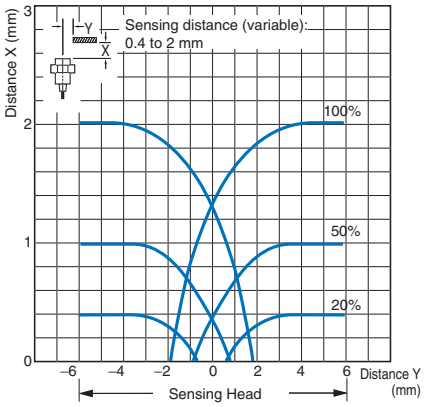

### E2C-X1A/-C1A



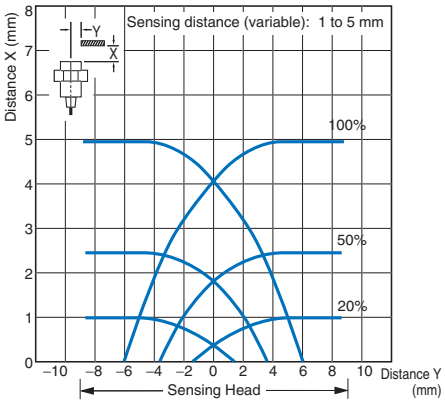

### E2C-X1R5A



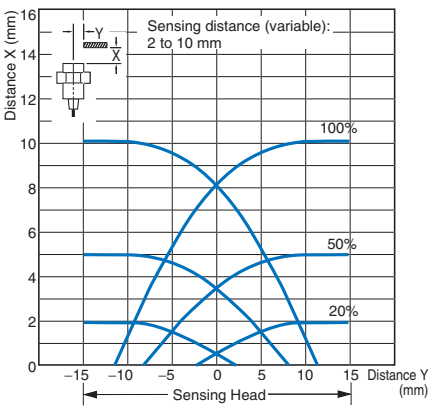

### E2C-X2A



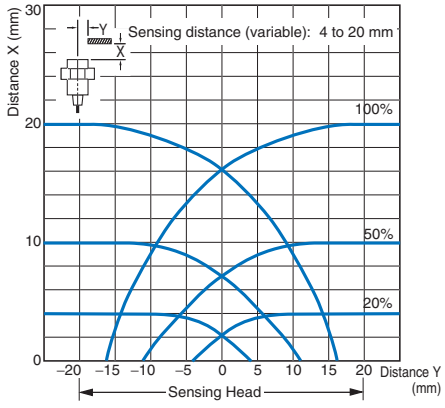

### E2C-X5A



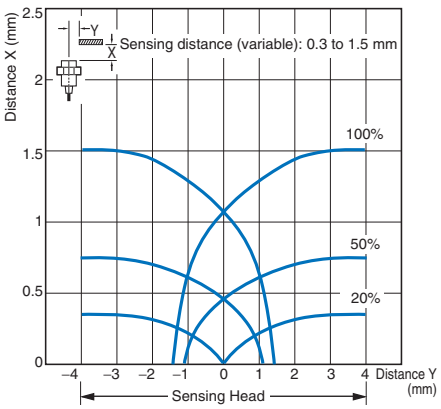

### E2C-X10A



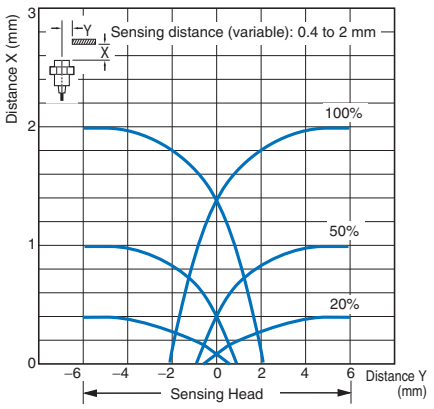

### E2C-C20MA



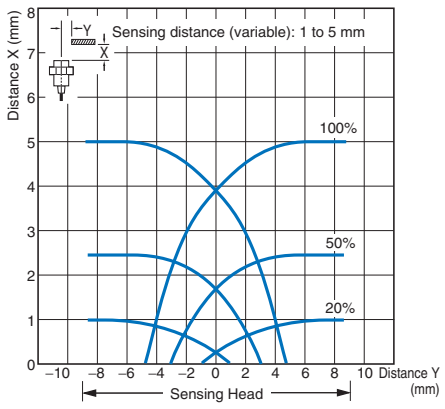

### E2C-X1R5AH + E2C-JC4CH




### E2C-X2AH + E2C-JC4DH

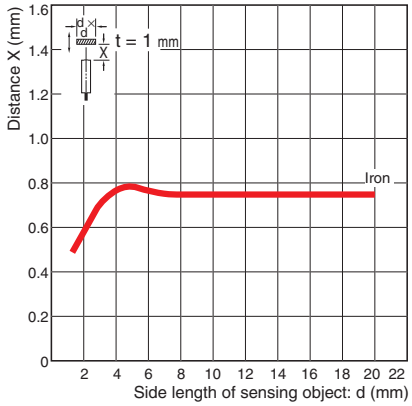



### E2C-X5AH + E2C-JC4EH

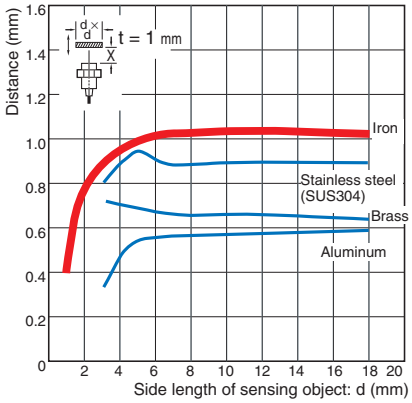


## Influence of Sensing Object Size and Material

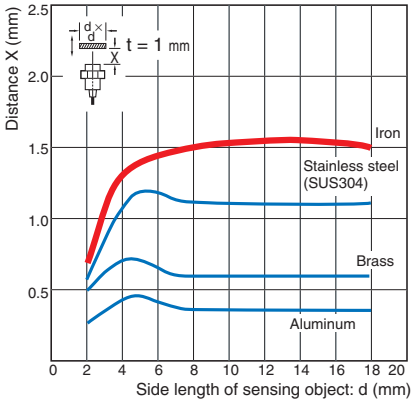
### E2C-CR8□



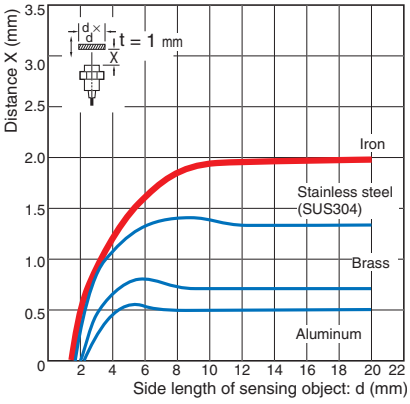

### E2C-X1A/-C1A



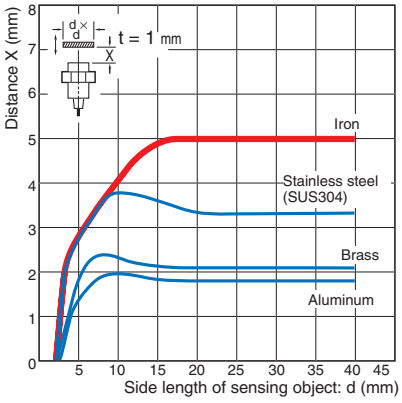

### E2C-X1R5A



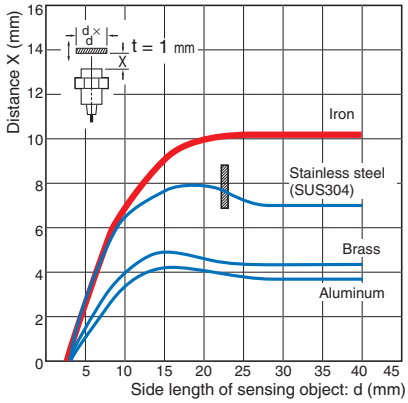

### E2C-X2A



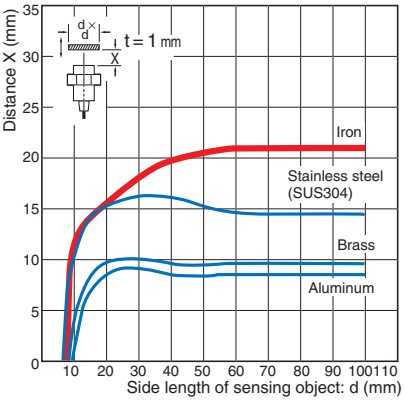

### E2C-X5A



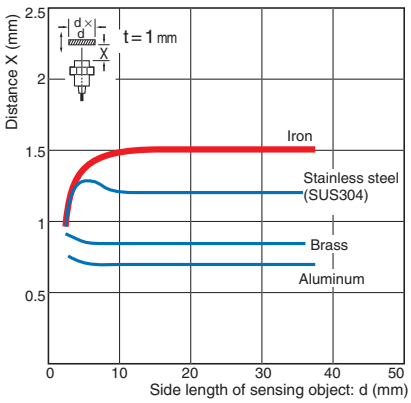

### E2C-X10A



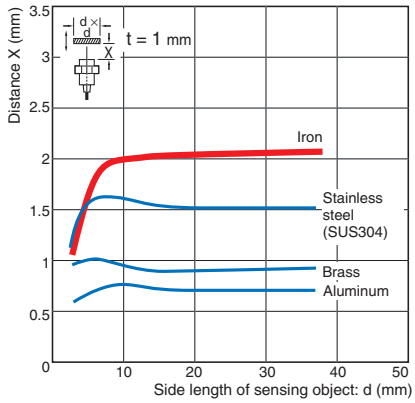

### E2C-C20MA



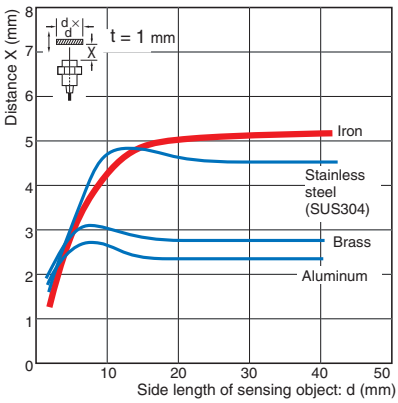

### E2C-X1R5AH + E2C-JC4CH



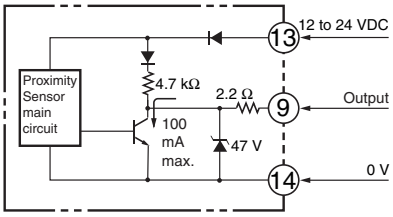

### E2C-X2AH + E2C-JC4DH

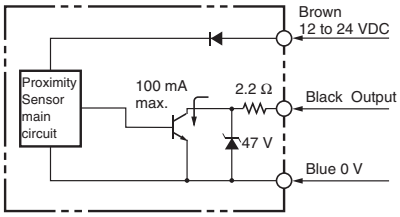
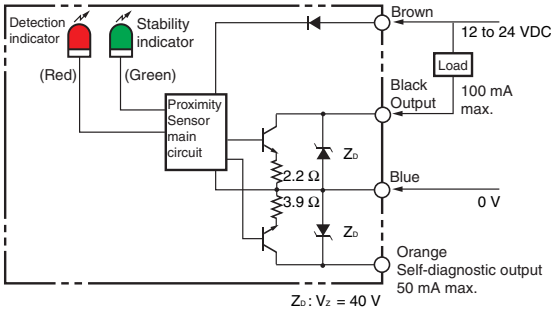
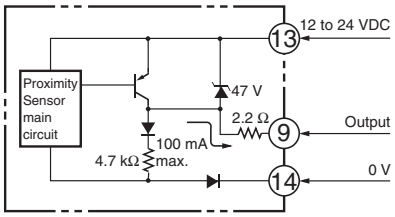
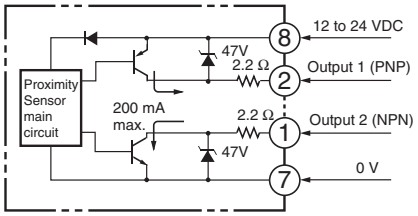
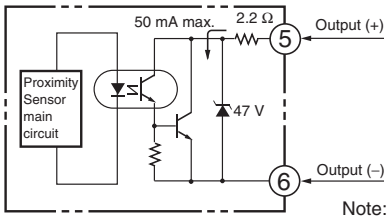



### E2C-X5AH + E2C-JC4EH



## I/O Circuit Diagrams

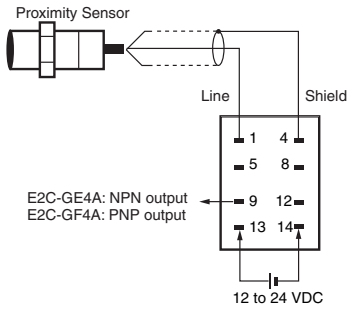
<table>
<tr><th>Output configuration</th><th>E2C-GE4A *</th><th>E2C-JC4A, E2C-JC4CH, E2C-JC4DH, E2C-JC4EH</th></tr>
<tr><td>NPN output</td><td> 

* A voltage output can be used if the NO/NC switch on the E2C-GE4A is set to NC, but an approximately 60-ms pulse will be generated when the power supply is turned ON. An initial reset will thus be required.<br>If the E2C-GF4A (model for PNP output) is used, the initial pulse will not occur.</td><td> 
</td></tr>
<tr><td>NPN output Self-diagnosis Function</td><td colspan="2">E2C-JC4AP<br> 
</td></tr>
<tr><td>PNP Output</td><td colspan="2">E2C-GF4A<br> 
</td></tr>
<tr><td>Both NPN and PNP outputs</td><td colspan="2">E2C-AM4A<br> 
</td></tr>
<tr><td>Transistor/ photocoupler<br><br>Relay output</td><td colspan="2">E2C-AK4A<br> 

Note: Terminals 1, 2, and 3 are the relay contact output (SPDT).</td></tr>
</table>

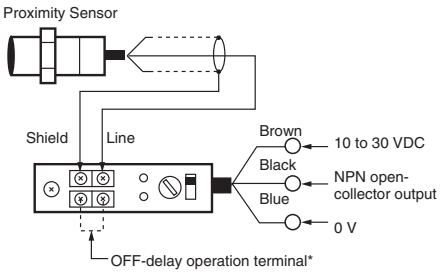
## Connections between Amplifier Unit and Sensor

### E2C-G□4A



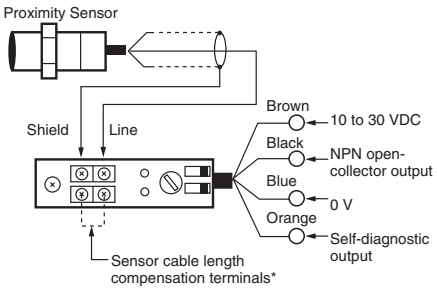

Applicable Socket:
PYF08A

### E2C-JC4A



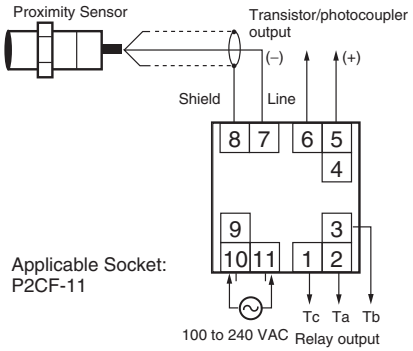

* OFF-delay timer setting
If the OFF-delay operation terminals are shorted, a 40-ms OFF-delay timer will start.

### E2C-JC4AP



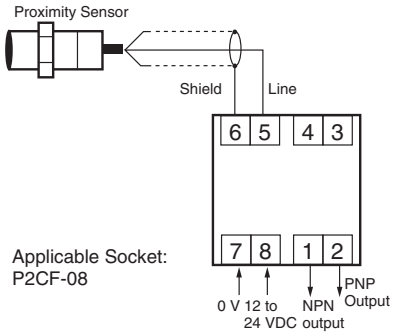

* Sensor Cable Length Compensation
These terminals can be use to switch the cable length.
Terminals shorted: 1 to 3 m
Terminals open: 3 to 5 m

### E2C-AK4A



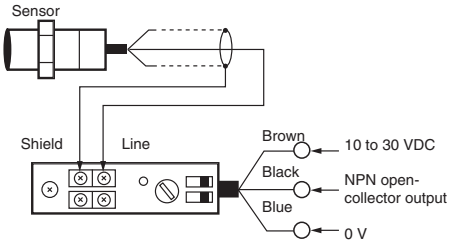

Applicable Socket:
P2CF-11

### E2C-AM4A



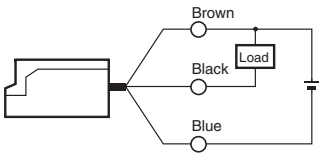
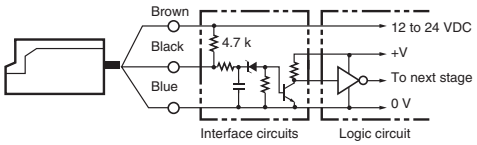

Applicable Socket:
P2CF-08

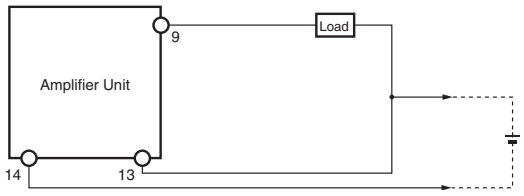
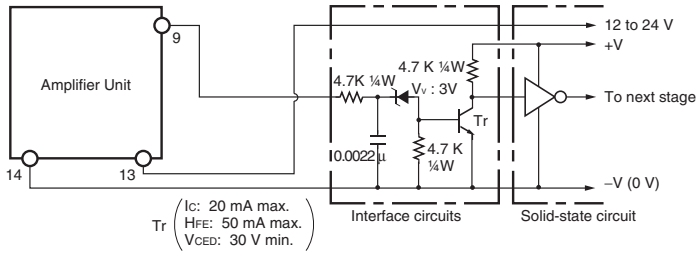
### E2C-JC4□H

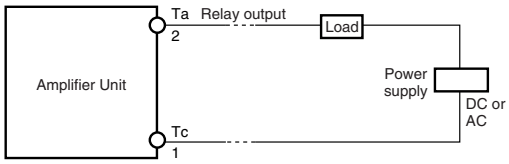
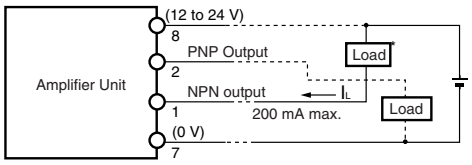
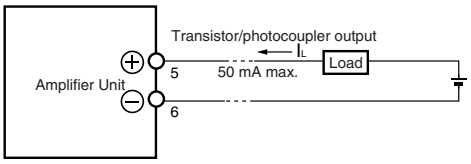
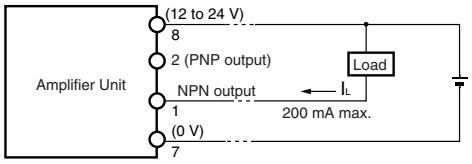
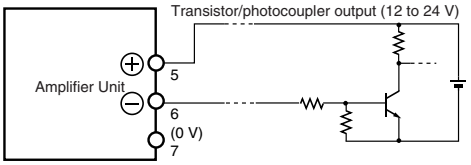
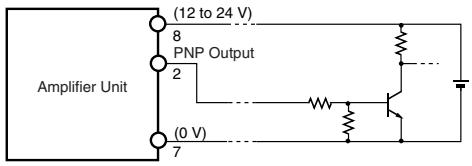



Note: Characteristics will change if the cable length changes. Do not cut or extend the cable.

## Load Connections

| Model / Load | E2C-JC4A, E2C-JC4□H |
|---|---|
| **DC load**<br>• **Relay**<br>• **Solenoid**<br><br>**Current-sinking load**<br>• **Programmable Controller**<br>• **Sensor Controller** |  |
| **Voltage load (logic circuit)** |  |

| Model / Load | E2C-GE4A |
|---|---|
| **DC load**<br>• **Relay**<br>• **Solenoid**<br><br>**Solid-state load**<br>• **Programmable Controller**<br>• **Sensor Controller** |  |
| **Voltage load (logic circuit)** |  |
| **Remarks** | When connecting to a CMOS IC or TLL, provide an interface circuit as shown above and connect to the solid-state circuit in the next stage. |

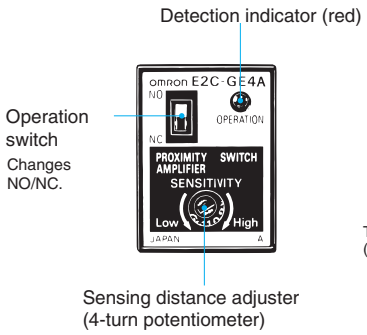
| Load \ Model | E2C-AK4A | E2C-AM4A |
|---|---|---|
| **DC load**<br>• **Relay**<br>• **Solenoid** |  |  <br>* Use 40 V maximum when connecting the load to a separate power supply. |
| **Solid-state load**<br>**Current-sinking load (photocoupler)**<br>• **Programmable Controller**<br>• **Sensor Controller** |  <br>* For a current-sourcing load, connect to the negative side of the transistor/photocoupler output. |  <br>* For a current-sourcing load, connect the PNP output. |
| **Voltage loads (logic circuit)** |  |  |

The E2C-AK4A supports relay and transistor/photocoupler outputs, and the E2C-AM4A supports both NPN and PNP open-collector output. They can be connected to a wide variety of load types and power polarities.

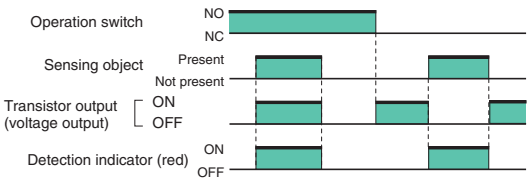
## Nomenclature and Timing Charts

### Amplifier Units

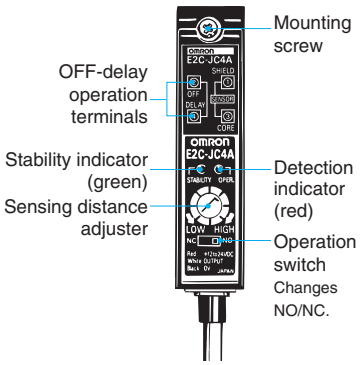
**E2C-G□4A**



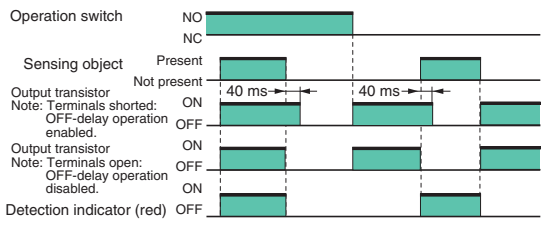

**Timing Chart**



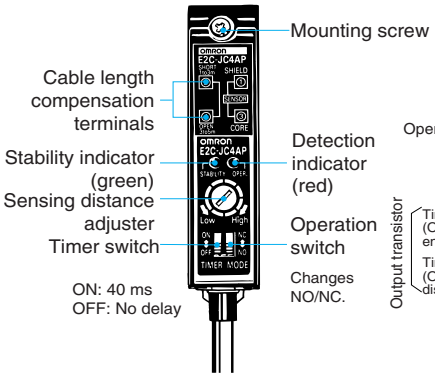

**E2C-JC4A**



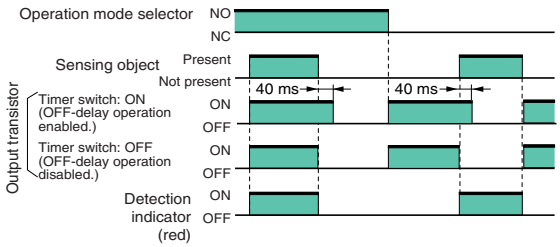

**Timing Chart**



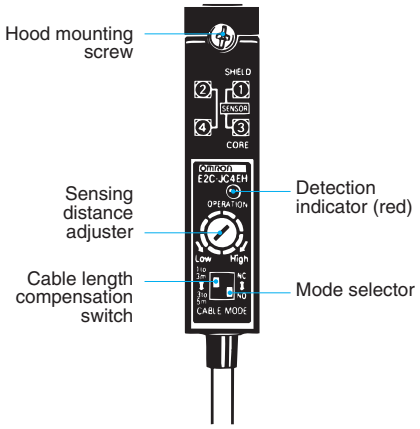
## E2C-JC4AP



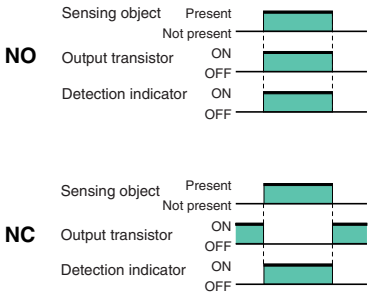

### Timing Chart



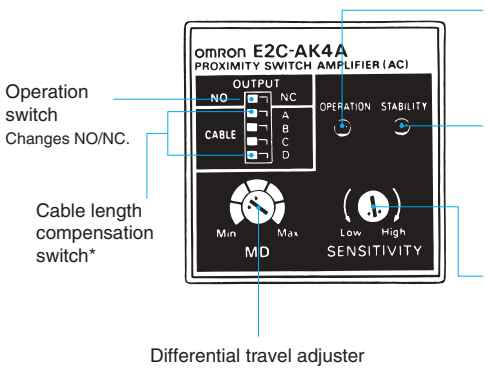

## E2C-JC4CH, E2C-JC4DH, E2C-JC4EH



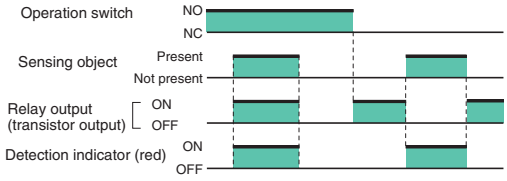

### Timing Chart



## E2C-A□4A




### Timing Chart




* Cable Length Compensation Switching
Set this switch to the proper setting depending on whether the standard cable length is being used or the cable has been cut shorter.

### Amplifier Unit Switch Settings

| Applicable Sensors / Cable length | 0 to 1 m | 1 to 2 m | 2 to 3 m | 3 to 4 m | 4 to 5 m | 5 to 6 m | 6 to 7 m | 7 to 8 m | 8 to 9 m | 9 to 10 m |
|---|---|---|---|---|---|---|---|---|---|---|
| **E2C-CR8A<br>E2C-CR8B<br>E2C-X1A<br>E2C-C1A<br>E2C-X1R5A** | | | | | | — | — | — | — | — |
| **E2C-X2A<br>E2C-X5A<br>E2C-X10A<br>E2C-C20MA** | | | | | | | | | | |

Note: 1. Mutual Interference Prevention: When mounting Sensors with the same diameter and cable length in parallel, set the DIP switch to modes that differ by 1 m in cable length. Specifications, however, may not be sufficiently met, so always check operation before actual application. This method cannot be used for the E2C-C20MA.
2. When using the E2C-CR5B + E2C-AM4A (or AK4A), set all the pins on the Amplifier Unit DIP switch to the left.

# 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.**

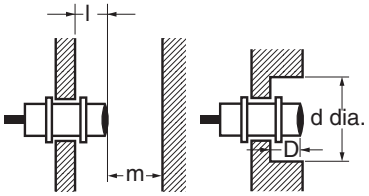
## Precautions for Correct Use

Do not use the Encoder under ambient conditions that exceed the ratings.

### ● Design

#### Influence of Surrounding Metal

When mounting the Sensor within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the Sensor.



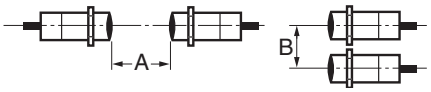

**Influence of Surrounding Metal** (Unit: mm)

| Model / Distance | l | d | D | m |
|---|---|---|---|---|
| E2C-CR8 | 0 | (3.5) | 0 | 2.4 |
| E2C-X1A | | (5) | | 3 |
| E2C-C1A | | (5.4) | | |
| E2C-X1R5A(H) | | (8) | | 4.5 |
| E2C-X2A(H) | | (12) | | 6 |
| E2C-X5A(H) | | (18) | | 15 |
| E2C-X10A | | (30) | | 30 |
| E2C-C20MA | 25 | 120 | 40 | 60 |

Note: Values in parentheses for diameter d are the outer diameters of Shielded Models.

#### Mutual Interference

When installing Sensors face-to-face or side-by-side, ensure that the minimum distances given in the following table are maintained. Mutual interference can be prevented by using the cable length compensation switch, but doing so will also change coil characteristics. Specifications such as temperature specifications and sensing distance, may not be sufficiently met, so always check operation before actual application.
This method cannot be used for the E2C-G□4A, E2C-JC4A, E2C-C20MA.



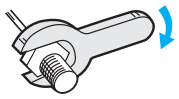

**Mutual Interference** (Unit: mm)

| Model / Distance | A | B |
|---|---|---|
| E2C-CR8 | 20 | 15 |
| E2C-X1A | | |
| E2C-C1A | | |
| E2C-X1R5A(H) | | |
| E2C-X2A(H) | 30 | 20 |
| E2C-X5A(H) | 50 | 35 |
| E2C-X10A | 100 | 70 |
| E2C-C20MA | 300 | 200 |

Note: The above values are for a differential travel setting of 5%.

#### Mounting

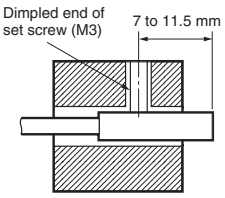
- Do not use excessive force when tightening the nuts on the E2C-X and E2C-C20MA. A washer must be used with the nut.



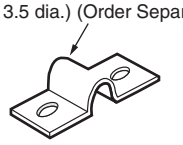
| Model | Torque |
|---|---|
| E2C-X1A | 0.98 N·m |
| E2C-X1R5A(H) | 2.0 N·m |
| E2C-X2A(H) | 5.9 N·m |
| E2C-X5A(H) | 15 N·m |
| E2C-X10A | 39 N·m |
| E2C-C20MA | 15 N·m |

Note: The above leeways in tighten torque assume that a toothed washer is being used.

- Mounting Unthreaded Cylindrical Models
  When using a set screw, tighten it to a torque of 0.2 N·m max.




Y92E-F3R5 Mounting Bracket (for 3.5 dia.) (Order Separately)



The Y92E-F5R4 (for 5.4 dia.) is also sold separately.

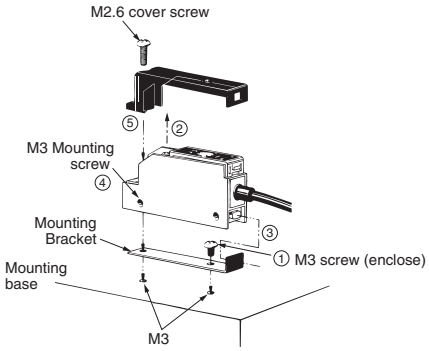
## ● Mounting

### Mounting the Amplifier Unit

**E2C-JC4A**

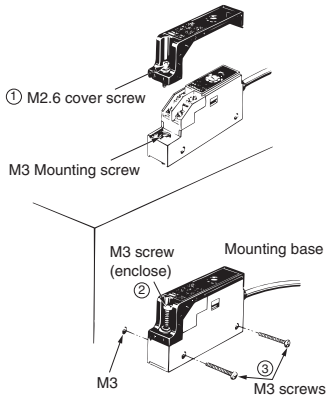
**Lengthwise Mounting**

(1)Secure the Mounting Bracket with the enclosed M3 screws.
(2)Loosen the M2.6 cover screw and remove the cover.
(3)Slide the protrusion on the Amplifier Unit into the hole on the Mounting Bracket.
(4)Using the M3 mounting screw inside the Amplifier Unit, secure the Amplifier Unit to the mounting base.
(5)Secure the cover to the case.




**Mounting to the Side**

(1)Loosen the M2.6 cover screw and remove the cover. Loosen the M2.6 cover screw and remove the cover, and remove the M3 screw.
(2)Attached the enclosed M3 screw to the cover and secure the cover to the case.
(3)Secure the Amplifier Unit with M3 screws from the side. You must provide these screws.

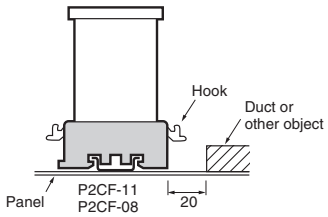



After completing adjustments, attach the enclosed caution label over the adjustment holes to prevent adjustment mistakes.

**E2C-A□4A**

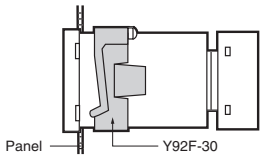
**Using P2CF-11, P2CF-08**

When aligning the Amplifier Unit vertically with the Socket, consider the space required for the hooks and allow a leeway of about 20 mm above and below the Amplifier Unit.

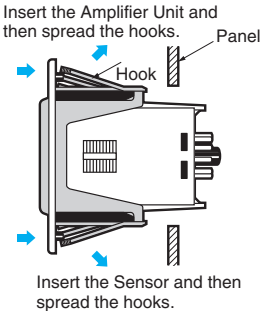



**Mounting Embedded in a Panel**

(1)When using the Y92F-30 Embedded Mounting Adapter, insert the Amplifier Unit into a square hold in the panel, attach the Adapter from the back and press in to reduce the gap with the panel. Then secure the Adapter with the screws.

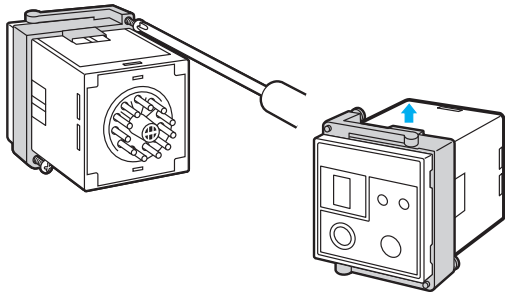



(2)When using the Y92F-70 or Y92F-71 Embedded Mounting Adapter, just press the Amplifier into a square hole in the panel. If the panel coating is too thick and the hooks do not lock in place, spread the hooks from the back by pushing in the directions of the arrows.

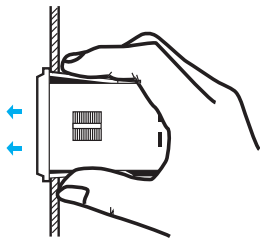


### Removing the Amplifier Unit

- When the Amplifier Unit is mounted using the Y92F-30, loosen the screws on the adapter, spread the hooks at the top and bottom, and remove the Adapter.



- Using Y92F-70, Y92F-71
  Press in on the hooks with your thumb and forefinger and press forward on the Amplifier Unit.



## ● Wiring

### Self-diagnostic Output

When not using the self-diagnostic output, connect the orange wire to 0 V or cut it and wrap it with insulation tape so that it does not come into contact with other terminals.

## ● Miscellaneous

The sensor does not have a water-resistant structure. Do not use it where it would be subjected to water or water vapor.

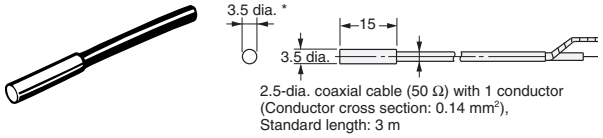
# Dimensions

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

## Main Units

### Sensor

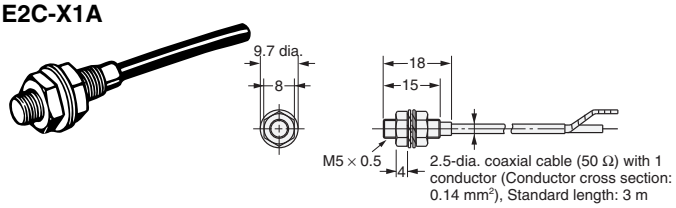
#### E2C-CR8A/-CR8B




2.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.14 mm²), Standard length: 3 m

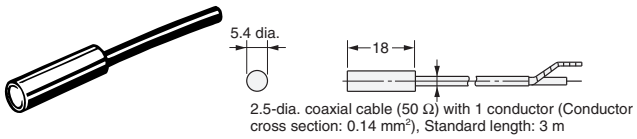
*E2C-CR8B: Diameter is 3.8.

#### E2C-X1A



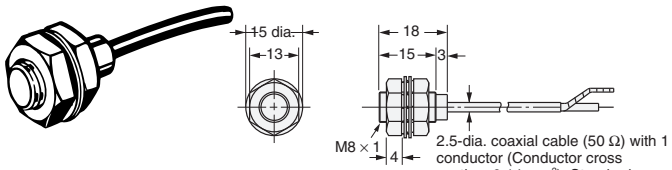

2.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.14 mm²), Standard length: 3 m

#### E2C-C1A



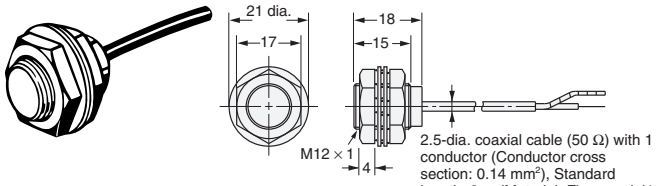

2.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.14 mm²), Standard length: 3 m

#### E2C-X1R5A
#### E2C-X1R5AH*



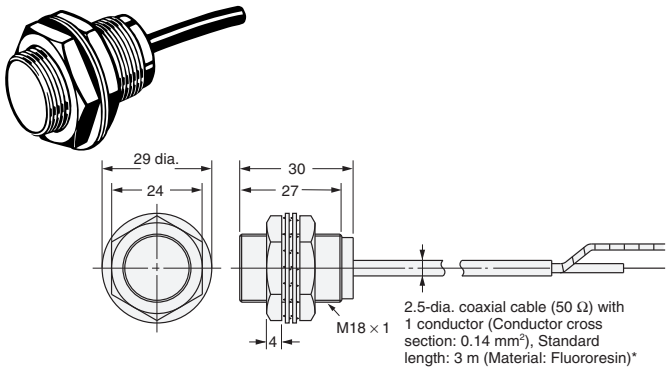

2.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.14 mm²), Standard length: 3 m (Material: Fluororesin)*

#### E2C-X2A
#### E2C-X2AH*



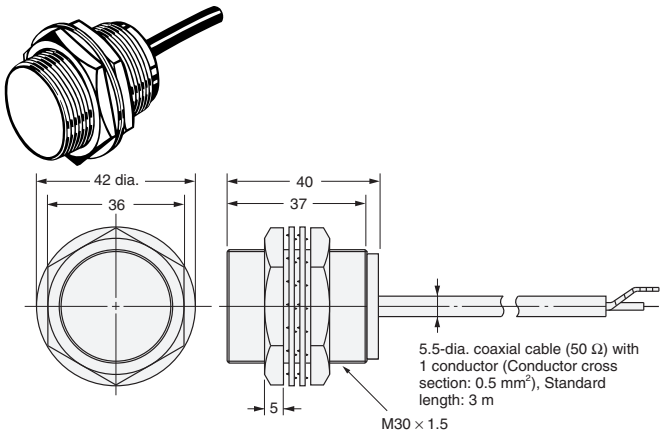

2.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.14 mm²), Standard length: 3 m (Material: Fluororesin)*

#### E2C-X5A
#### E2C-X5AH*



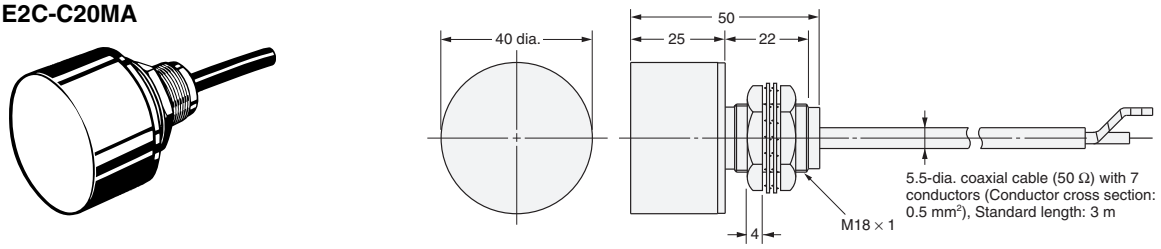

2.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.14 mm²), Standard length: 3 m (Material: Fluororesin)*

#### E2C-X10A



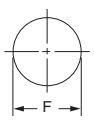

5.5-dia. coaxial cable (50 Ω) with 1 conductor (Conductor cross section: 0.5 mm²), Standard length: 3 m

#### E2C-C20MA




5.5-dia. coaxial cable (50 Ω) with 7 conductors (Conductor cross section: 0.5 mm²), Standard length: 3 m

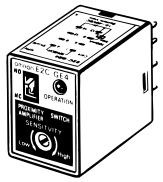
### Mounting Hole Dimensions

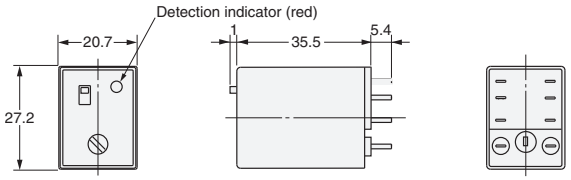



| Model | F (mm) | Model | F (mm) | Model | F (mm) |
|---|---|---|---|---|---|
| E2C-CR8A | 3.7-dia. $^{+0.3}_{0}$ | E2C-X1A | 5.4-dia. $^{+0.5}_{0}$ | E2C-X5A | 18.5-dia. $^{+0.5}_{0}$ |
| E2C-CR8B | 4.0-dia. $^{+0.3}_{0}$ | E2C-X1R5A | 8.5-dia. $^{+0.5}_{0}$ | E2C-X10A | 30.5-dia. $^{+0.5}_{0}$ |
| E2C-C1A | 5.7-dia. $^{+0.3}_{0}$ | E2C-X2A | 12.5-dia. $^{+0.5}_{0}$ | E2C-C20MA | 18.5-dia. $^{+0.5}_{0}$ |

## Amplifier Units

### E2C-GE4A
### E2C-GF4A

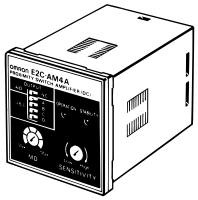


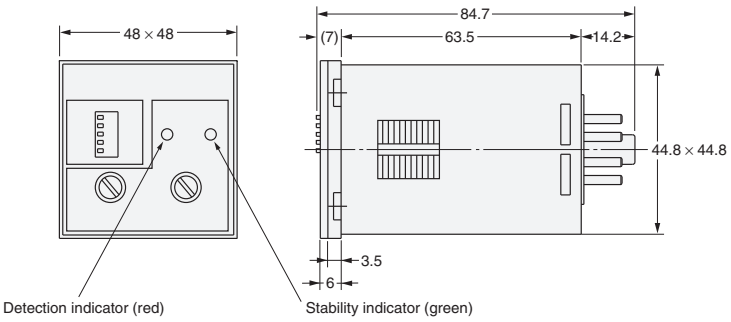



**Applicable Sockets (Sold Separately)**
- PYF08A
- PYF08

**Hold-down Clip**
- PYC-A1

### E2C-AK4A (11-pin)
### E2C-AM4A (8-pin)



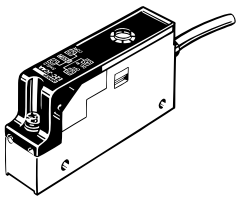



**Applicable Sockets (Sold Separately)**

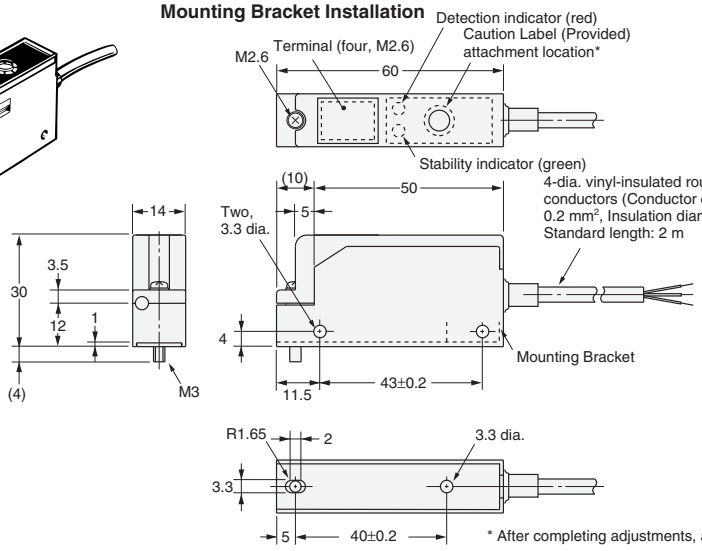
For E2C-AK4A (11-pin)
- P2CF-11
- P3GA-11

For E2C-AM4A (8-pin)
- P2CF-08
- P3G-08

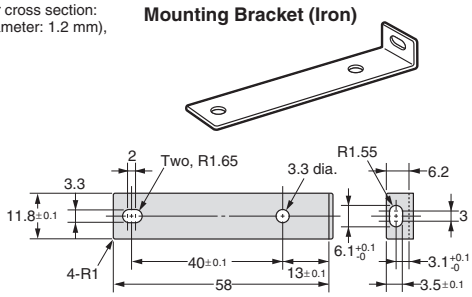
### E2C-JC4A



**Mounting Bracket Installation**

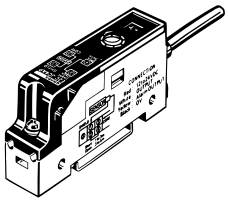



**Mounting Bracket (Iron)**

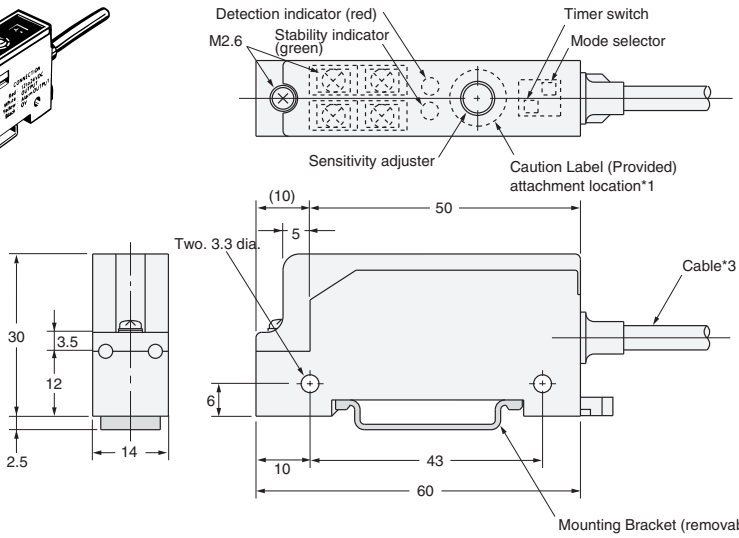



* After completing adjustments, attach the caution label to prevent adjustment mistakes.

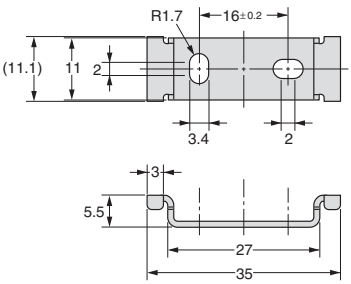
### E2C-JC4AP



**Mounting Bracket Installation**

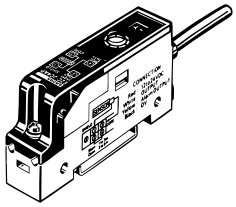


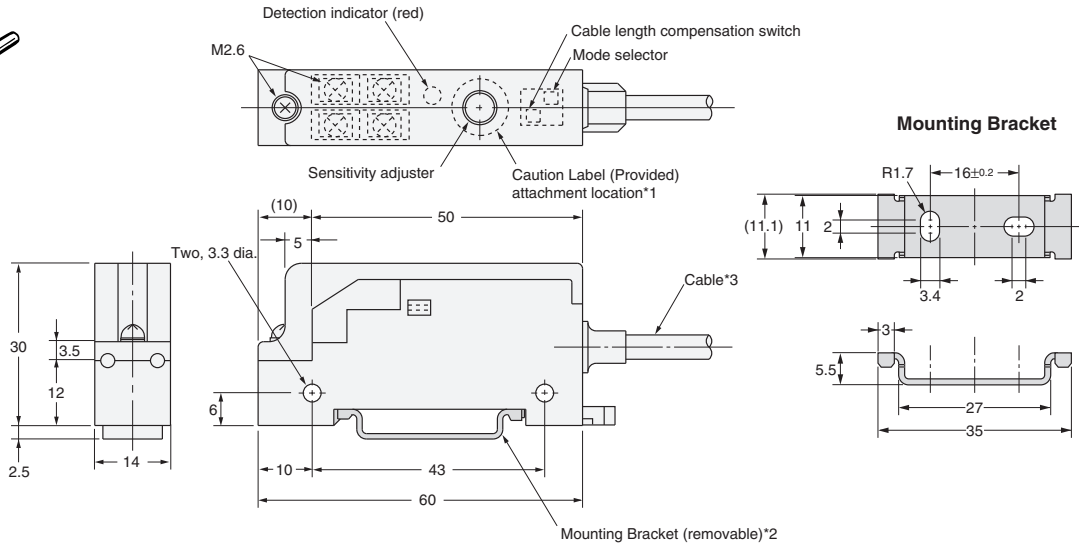

**Mounting Bracket (Iron)**




*1. After completing adjustments, attach the caution label to prevent adjustment mistakes.
*2. Not required when mounting to DIN Track.
*3: 4.5-dia. vinyl-insulated round cable with 4 conductors (Conductor cross section: 0.2 mm², Insulator diameter: 1.2 mm), Standard length: 2 m

## E2C-JC4□H



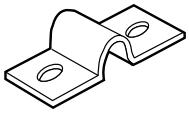



*1. After completing adjustments, attach the caution label to prevent adjustment mistakes
*2. Not required when mounting to DIN Track.
*3. 4-dia. vinyl-insulated round cable with 3 conductors (Conductor cross section: 0.2 $mm^2$, Insulator diameter: 1.2 mm), Standard length: 2 m
The cable can be extended up to 200 m (separate metal conduit).

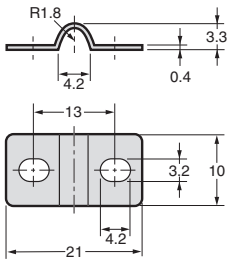
## Accessories (Order Separately)

### Mounting Bracket

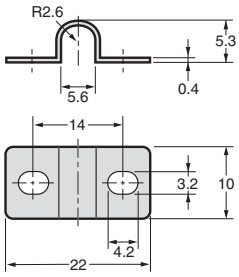
**Mounting Bracket (for Unthreaded Cylindrical Models)**
**Y92E-F3R5 (for 3.5 dia.)**
**Y92E--F5R4 (for 5.4 dia.)**



**Y92E-F3R5**

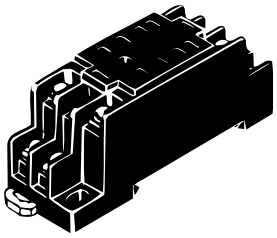


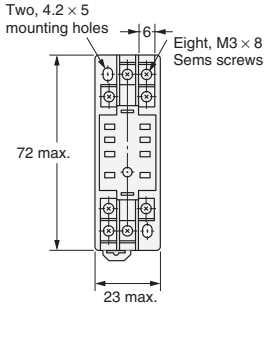

**Y92E-F5R4**



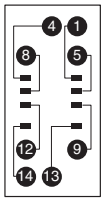

### Front Connection Sockets

**PYF08A**

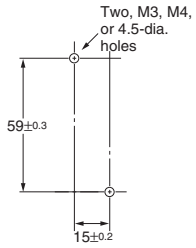





**Terminal Arrangement and Internal Connections (Top View)**

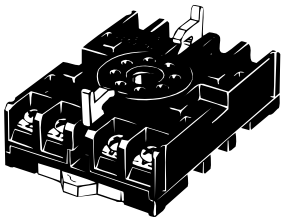


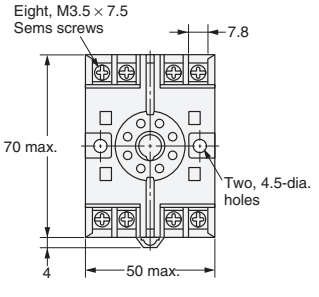

**Mounting Hole Dimensions**



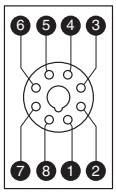

Note: Track mounting is also possible.

**P2CF-08**

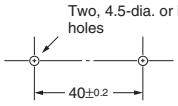





**Terminal Arrangement and Internal Connections (Top View)**

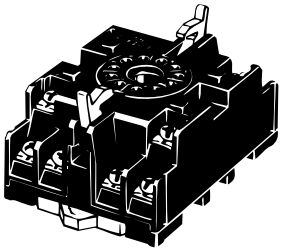


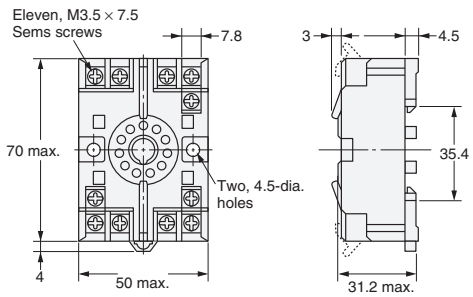

**Mounting Hole Dimensions**



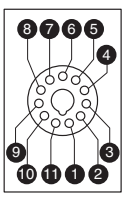

Note: Track mounting is also possible.

**P2CF-11**

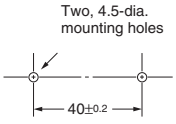





**Terminal Arrangement and Internal Connections (Top View)**



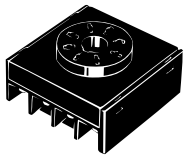

**Mounting Hole Dimensions**

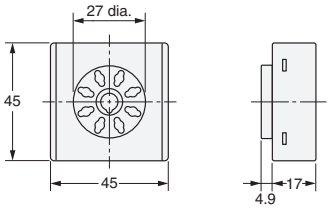



Note: Track mounting is also possible.

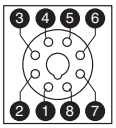
## Back Connection Sockets

### P3G-08

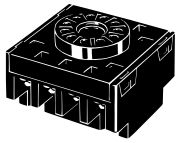


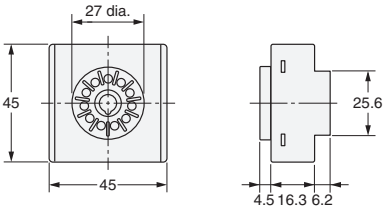



**Terminal Arrangement and Internal Connections (Bottom View)**

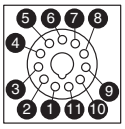



### P3GA-11

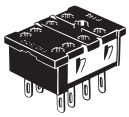


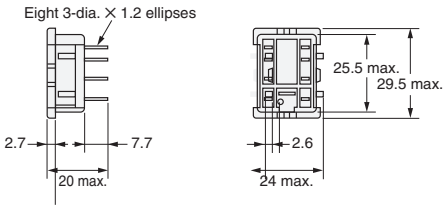



**Terminal Arrangement and Internal Connections (Bottom View)**

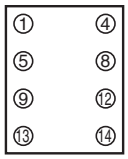



### PY08

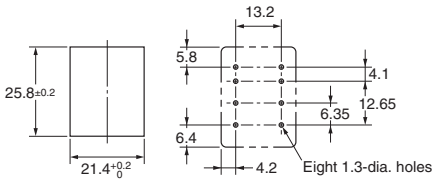





**Terminal Arrangement and Internal Connections (Bottom View)**

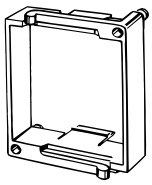


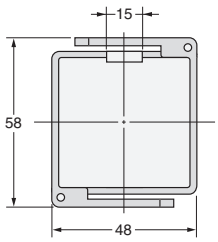

**Mounting Holes and PCB Cutout Dimensions**

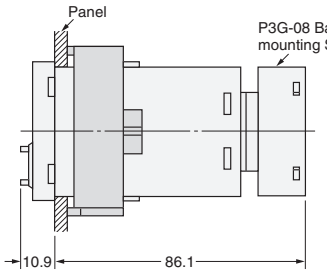


## Embedded Mounting Adapter (for E2C-AK4A/E2C-AM4A Amplifier Unit)

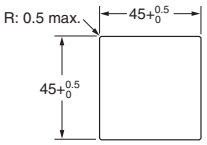
### Y92F-30





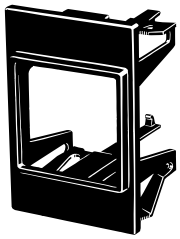



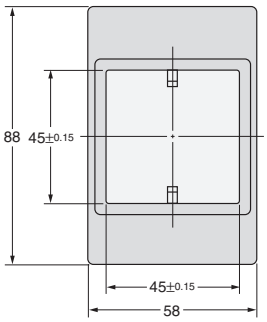

**Mounting Hole Dimensions**

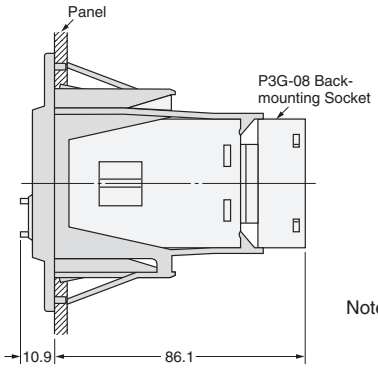



Note 1. Suitable mounting panel thickness: 1 to 5 mm
Note 2. Check the direction of the Adapter, which depends on whether Amplifier Units are arranged vertically or horizontally.

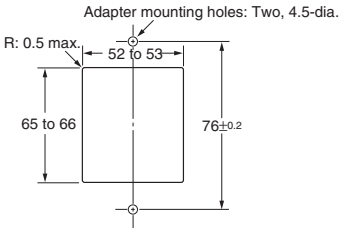
### Y92F-70





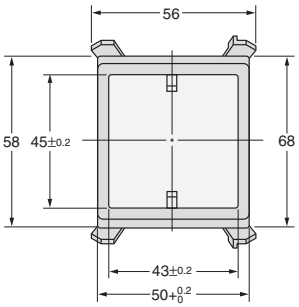



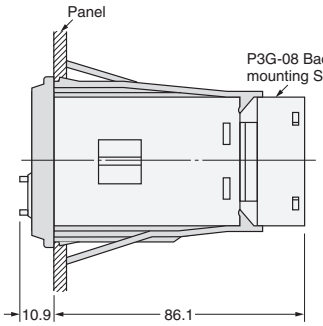

**Mounting Hole Dimensions**



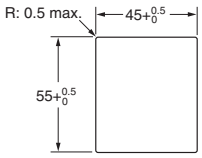

Note: Suitable mounting panel thickness: 1 to 3.2 mm

### Y92F-71




**Mounting Hole Dimensions**




Note: Suitable mounting panel thickness: 1 to 3.2 mm

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