

Non-Ferrous-Metal-Detecting Proximity Sensor (Separate Amplifier Type)

# E2CY-SD



## Proximity Sensor with Separate Amplifier Unit for Detection of Non-ferrous Metals with Simple Sensitivity Adjustment

- Detects aluminum, copper, and other non-ferrous metals.
- Product lineup includes compact, flat Sensor Head (E2CY-V3A) and model with fluororesin (E2CY-C2AF) for resistance to chemicals.
- Simple teaching function to easily adjust sensitivity.
- Check detection status at a glance with numeric values on a digital display.



Be sure to read *Safety Precautions* on page 6.



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

## Ordering Information

**Sensors** [Refer to *Dimensions* on page 7.]

| Appearance   | Stable sensing distance | Model                    |
|--------------|-------------------------|--------------------------|
| Shielded<br> | M5                      | E2CY-X1R5A 3M            |
|              | 5.4 dia.                | 1.5mm<br>E2CY-C1R5A-1 3M |
|              | 8 dia.                  | 2mm<br>E2CY-C2A 3M       |
|              | Flat                    | 3mm<br>E2CY-V3A 3M       |
|              | 8 dia.                  | 2mm<br>E2CY-C2AF 3M      |

### Amplifier Units

#### DC 3-wire

| Output configuration | Model        |
|----------------------|--------------|
| NPN open collector   | E2CY-SD11 2M |
| PNP open collector   | E2CY-SD41 2M |

# E2CY-SD

## Ratings and Specifications

### Sensors

| Item                      | Model           | E2CY-X1R5A<br>E2CY-C1R5A-1   | E2CY-C2A(F)                           | E2CY-V3A                              |
|---------------------------|-----------------|--|---------------------------------------|---------------------------------------|
| Stable sensing distance   |                 | 0 to 1.5 mm  | 0 to 2 mm                             | 0 to 3 mm                             |
| Differential travel       |                 | 10% max. of sensing distance with Amplifier Unit in FINE mode<br>15% max. of sensing distance with Amplifier Unit in NORM mode |                                       |                                       |
| Detectable object         |                 | Non-ferrous metal  |                                       |                                       |
| Standard sensing object   |                 | Aluminum: 8 × 8 × 1 mm   |                                       | Aluminum: 12 × 12 × 1 mm              |
| Response frequency *1     |                 | 40 Hz min. with Amplifier Unit in FINE mode<br>100 Hz min. with Amplifier Unit in NORM mode                                    |                                       |                                       |
| Ambient temperature range |                 | Operating: -10 to 55°C, Storage: -25 to 70°C (with no icing or condensation)   |                                       |                                       |
| Ambient humidity range    |                 | Operating and Storage: 35% to 95% (with no condensation)   |                                       |                                       |
| Temperature influence *2  | -10 to 55°C     | ±15% max. of sensing distance at 23°C  | ±10% max. of sensing distance at 23°C | ±15% max. of sensing distance at 23°C |
|                           | 0 to 40°C       | ±10% max. of sensing distance at 23°C *3   |                                       | ±10% max. of sensing distance at 23°C |
| Vibration resistance      |                 | Destruction: 10 to 500 Hz, 2-mm double amplitude or 150 m/s <sup>2</sup> for 2 hours each in X, Y, and Z directions            |                                       |                                       |
| Shock resistance          |                 | Destruction: 500 m/s <sup>2</sup> 3 times each in X, Y, and Z directions   |                                       |                                       |
| Degree of protection      |                 | IEC 60529 IP67   |                                       |                                       |
| Connection method         |                 | Pre-wired Models (High-frequency coaxial cable, Standard cable length: 3 m)  |                                       |                                       |
| Cable length compensation |                 | 0.5 to 5 m *4  |                                       |                                       |
| Weight (packed state)     |                 | Approx. 35 g   |                                       |                                       |
| Materials                 | Case            | Stainless steel  |                                       | Zinc die-cast                         |
|                           | Sensing surface | Heat-resistant ABS (E2CY-C2AF: Fluororesin)  |                                       |                                       |
|                           | Cable           | Soft PVC (E2CY-C2AF: Fluororesin)  |                                       |                                       |
|                           | Clamping nut    | Nickel-plated brass (E2CY-X1R5A only)  |                                       |                                       |
|                           | Toothed washer  | Zinc-plated iron (E2CY-X1R5A only)   |                                       |                                       |
|                           | Mounting screws | Zinc-plated iron (E2CY-V3A only)   |                                       |                                       |

\*1. The average value when using the DC-switching 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 stable sensing distance.

\*2. When the temperature around the Amplifier Unit is stable at 23°C.

\*3. E2CY-C1R5A-1: ±15% max. of sensing distance at 23°C

\*4. When extending the cable, use a 1.5D-2V (equivalent to JIS C 3501) cable with characteristic impedance of 50 Ω.

### Amplifier Units

| Item                              | Model                   | E2CY-SD11   | E2CY-SD41   |
|-----------------------------------|-------------------------|---|---|
| Power supply voltage              |                         | 12 to 24 VDC ±10%, ripple: 10% max.   |   |
| Power consumption                 |                         | 1,080 mW max. (45 mA max. at 24 VDC)  |   |
| Sensing distance adjustment range |                         | 10% min. of stable sensing distance   |   |
| Sensitivity setting               |                         | Teaching / manual adjustment  |   |
| Control output                    |                         | NPN open collector (26.4 VDC max.), load current: 100 mA max., residual voltage: 1 V max.                             | PNP open collector (26.4 VDC max.), load current: 100 mA max., residual voltage: 1 V max. |
|                                   | OFF-delay timer         | 0 to 40 ms (1 to 20 ms: 1-ms increments, 20 to 40 ms: 5-ms increments)  |   |
| Functions                         | Zero reset              | Supported.  |   |
|                                   | Initial reset           | Supported. (All settings are returned to their default values.)   |   |
|                                   | Hysteresis setting      | 3 to variable   |   |
|                                   | Self diagnosis          | Displays errors (sensor disconnection, sensor short-circuit, or output short-circuit)                                 |   |
| Operation mode                    |                         | Changed with NO/NC switch.  |   |
| Protection circuits               |                         | Power supply reverse polarity protection and output short-circuit protection  |   |
| Indicator                         |                         | Operation indicator (orange)  |   |
| Digital display *1                |                         | Detection amount display (FINE: 4,000 max., NORM: 2,000 max.), bar display, function display (red)                    |   |
| Reverse display                   |                         | Supported.  |   |
| Ambient temperature range         |                         | Operating: -10 to 55°C, Storage: -25 to 70°C (with no icing or condensation)  |   |
| Ambient humidity range            |                         | Operating and storage: 35% to 85% (with no condensation)  |   |
| Temperature influence *2          |                         | ±10% max. of sensing distance at 23°C in the temperature range of -10 to 55°C   |   |
| Voltage influence                 |                         | ±1% max. of sensing distance in the rated voltage range ±10%  |   |
| Insulation resistance             |                         | 20 MΩ min. (at 500 VDC) between current-carrying parts and case   |   |
| Dielectric strength               |                         | 1,000 VAC, 50/60 Hz for 1 minute. between current-carrying parts and case   |   |
| Vibration resistance              |                         | Destruction: 10 to 150 Hz, 1.5-mm double amplitude or 100 m/s <sup>2</sup> for 2 hours each in X, Y, and Z directions |   |
| Shock resistance                  |                         | Destruction: 300 m/s <sup>2</sup> 3 times each in X, Y, and Z directions  |   |
| Degree of protection              |                         | IEC 60529 IP50 (with Sensor cable connected and protective cover attached)  |   |
| Connection method                 |                         | Pre-wired Model (Standard cable length: 2 m)  |   |
| Weight (packed state)             |                         | Approx. 100 g   |   |
| Materials                         | Case                    | PBT   |   |
|                                   | Cover                   | Polycarbonate   |   |
|                                   | Cable connecting screws | Zinc-plated iron  |   |
| Accessories                       |                         | E39-L143 Mounting Bracket (SUS304 stainless steel), instruction manual  |   |

\*1. If the Sensor approaches iron or other ferrous metals, the digital display will show negative values. There are exceptions. Refer to *Fast Moving Ferrous Metals* in *Safety Precautions* on page 6.

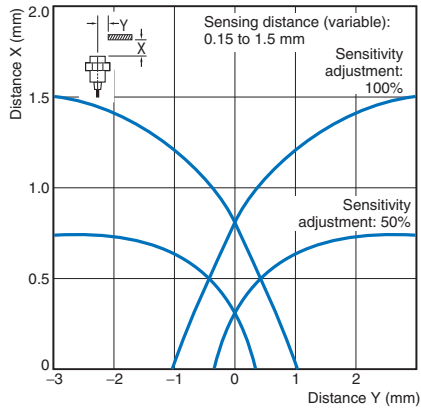
\*2. When the temperature around the Sensor is stable at 23°C.

Note: You can mount the Amplifier Unit on a DIN Track without using the Mounting Bracket.

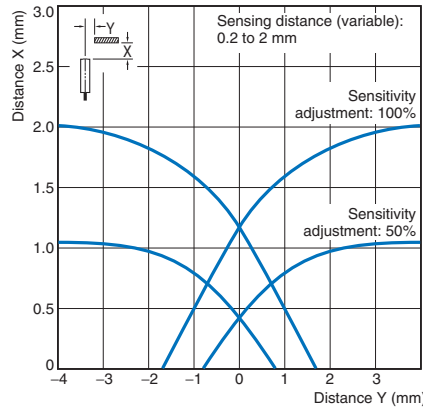
## Engineering Data (Reference Value)

### Sensing area

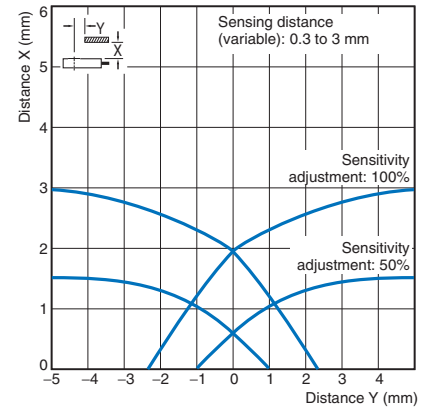
**E2CY-X1R5A/E2CY-C1R5A-1**



**E2CY-C2A(F)**

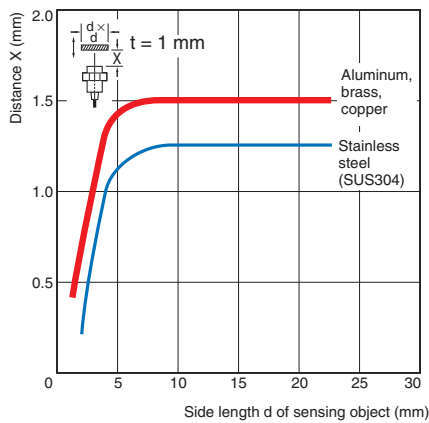


**E2CY-V3A**

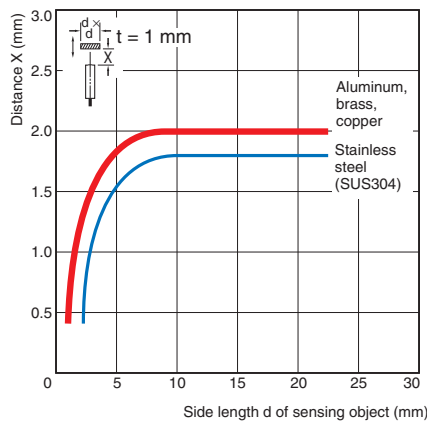


### Influence of Sensing Object Size and Material

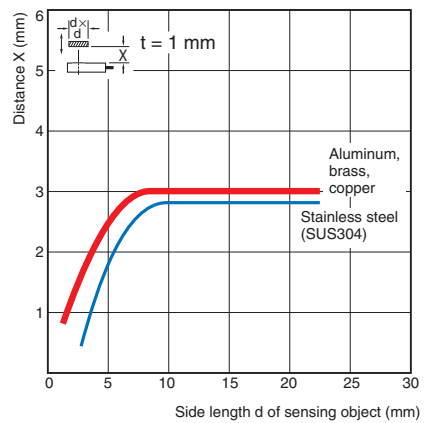
**E2CY-X1R5A/E2CY-C1R5A-1**



**E2CY-C2A(F)**

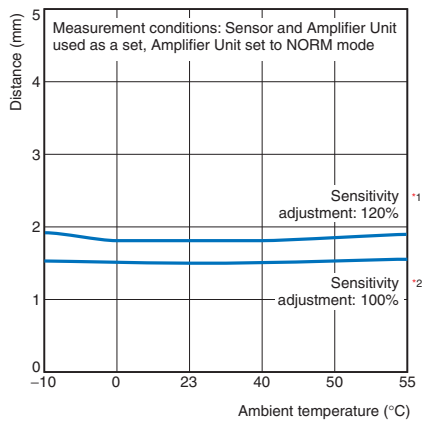


**E2CY-V3A**

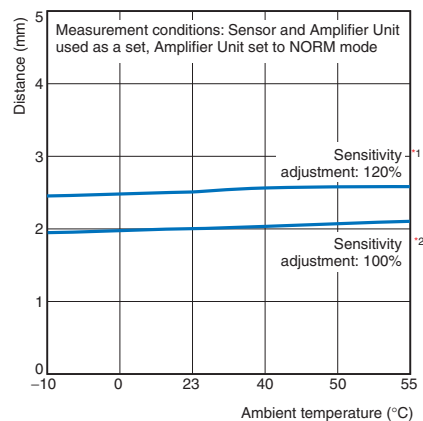


### Temperature influence

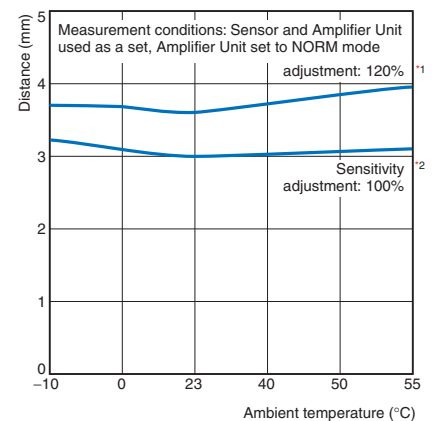
**E2CY-X1R5A/E2CY-C1R5A-1**



**E2CY-C2A(F)**



**E2CY-V3A**



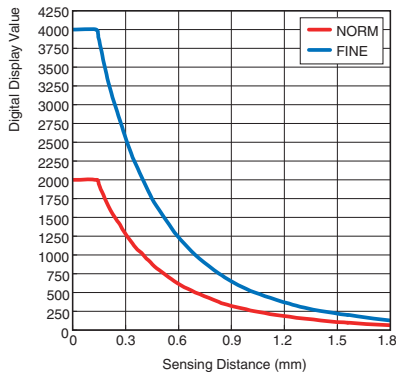
\*1. When the set distance is the maximum stable sensing distance multiplied by 1.2 and at an ambient temperature 23°C.

\*2. When the set distance is the maximum stable sensing distance and at an ambient temperature 23°C.

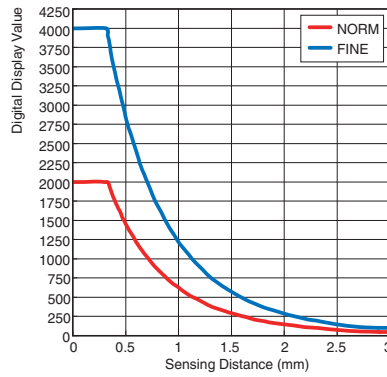
# E2CY-SD

## Sensing Distance Vs. Digital Display Value

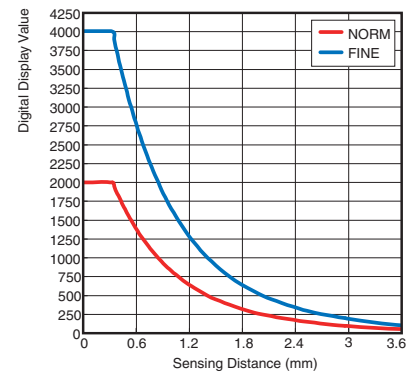
E2CY-X1R5A/E2CY-C1R5A-1



E2CY-C2A(F)



E2CY-V3A



## I/O Circuit Diagrams

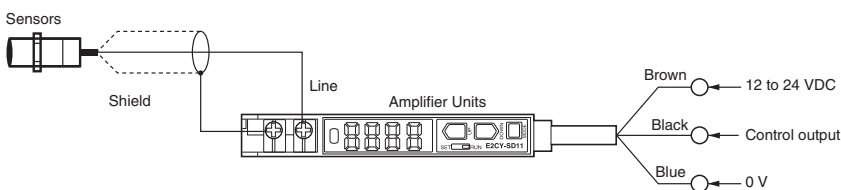
### NPN output

| Model     | Operation mode | Timing Chart  | Output circuit |
|-----------|----------------|---|----------------|
| E2CY-SD11 | NO             | <p>Sensing object Present: ON, Not present: OFF</p> <p>Output transistor ON: ON, OFF: OFF</p> <p>Amplifier Unit Operation ON: ON, OFF: OFF</p> <p>indicator (orange) OFF: OFF</p> |                |
|           | NC             | <p>Sensing object Present: OFF, Not present: ON</p> <p>Output transistor ON: OFF, OFF: ON</p> <p>Amplifier Unit Operation ON: ON, OFF: OFF</p> <p>indicator (orange) OFF: OFF</p> |                |

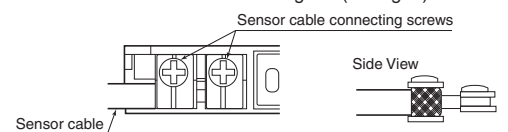
### PNP output

| Model     | Operation mode | Timing Chart  | Output circuit |
|-----------|----------------|---|----------------|
| E2CY-SD41 | NO             | <p>Sensing object Present: ON, Not present: OFF</p> <p>Output transistor ON: ON, OFF: OFF</p> <p>Amplifier Unit Operation ON: ON, OFF: OFF</p> <p>indicator (orange) OFF: OFF</p> |                |
|           | NC             | <p>Sensing object Present: OFF, Not present: ON</p> <p>Output transistor ON: OFF, OFF: ON</p> <p>Amplifier Unit Operation ON: ON, OFF: OFF</p> <p>indicator (orange) OFF: OFF</p> |                |

## Connection

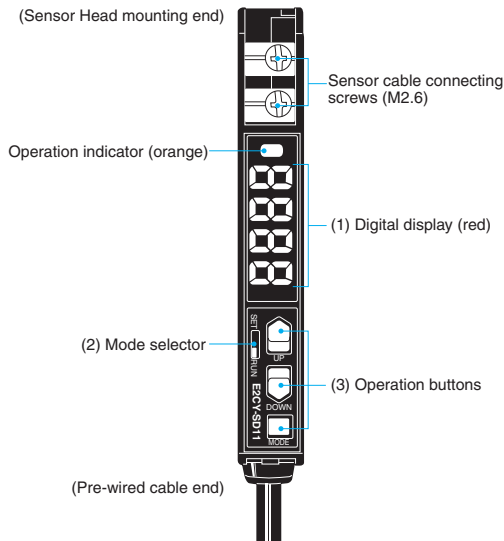


Sensor Cable Connection Diagram (Enlarged)



# Nomenclature

## Amplifier Units



### (1) Digital Display

The digital display shows information such as the detection amount or the current function name.

### (2) Mode Selector

The mode selector is used to switch between modes.

| Mode | Description  |
|------|--|
| SET  | Select this mode to set detection conditions, perform teaching, or to initialize settings to their default values.   |
| RUN  | Select this mode to perform actual sensing operation or to perform the following functions. <ul style="list-style-type: none"> <li>Manually adjusting the threshold</li> <li>Checking the current threshold value</li> <li>Zero reset</li> <li>Locking button operation</li> </ul> |

### (3) Operation Buttons

Use these buttons to change the display or to change the function settings. Button functions depend on the current mode.

| Button          | SET Mode  | RUN Mode   |
|-----------------|---|--|
| UP Button<br>   | Changes the function in the forward direction. Changes the set value in the forward direction. Performs positioning teaching.         | Increases the threshold value.                             |
| DOWN Button<br> | Changes the function in the reverse direction. Changes the set value in the reverse direction. Performs teaching without a workpiece. | Decreases the threshold value.                             |
| MODE Button<br> | Selects the function. Selects the set value.  | Checks the current threshold value. Performs a zero reset. |

The following table lists the available functions.

| Function      | Set value               | Description   |
|---------------|-------------------------|---|
|               |                         | Change function: UP/DOWN Buttons<br>Change set value: UP/DOWN Buttons<br>Select function: MODE Button<br>Select set value: MODE Button  |
| <i>tEc h</i>  | Sensing threshold value | Performs the following types of teaching: <ul style="list-style-type: none"> <li>Teaching without a workpiece</li> <li>Positioning teaching</li> <li>Teaching with/without a workpiece</li> </ul>                     |
| 1- <i>o p</i> | NO/NC                   | Changes the operation mode. <ul style="list-style-type: none"> <li>NO (normally open): Turn output ON when an object is detected.</li> <li>NC (normally close): Turn output ON when no object is detected.</li> </ul> |
| 2- <i>fn</i>  | NORM/FINE               | Changes sensor precision. <ul style="list-style-type: none"> <li>NORM: Standard *</li> <li>FINE: High precision</li> </ul>  |
| 3- <i>tf</i>  | 0 to 40ms               | Changes the OFF-delay time. Sets a delay between 0 to 20 ms in increments of 1 ms. Sets a delay between 20 to 40 ms in increments of 5 ms.  |
| 4- <i>dp</i>  | Value/segment bar       | Changes the detection amount display.   |
| 5- <i>rw</i>  | Normal or reverse       | Changes the display direction. <ul style="list-style-type: none"> <li>Normal: The Sensor is connected to the left end.</li> <li>Reverse: The Sensor is connected to the right end.</li> </ul>                         |
| 6- <i>hy</i>  | 3 to variable           | Changes the hysteresis width.   |

\* FINE Mode enables you to perform measurements at twice the step of NORM Mode. However, this results in a slower response.

# E2CY-SD

## Safety Precautions

Be sure to read the precautions for all models in the website at: <http://www.ia.omron.com/>.


### 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 SAFE USE

Observe the following precautions for safe use of the product.

- (1) Do not use the product in environments subject to flammable or explosive gases.
- (2) Do not use the product in environments subject to exposure to water, oil, chemicals, etc.
- (3) Do not attempt to disassemble, repair, or modify the product in any way.
- (4) Do not apply voltages or currents that exceed the rated ranges.
- (5) Wire the product correctly, e.g., do not reverse the polarity of the power supply.
- (6) Connect the load correctly.
- (7) Do not short both ends of the load.
- (8) Do not use the product if the case is damaged.
- (9)  Dispose in accordance with applicable regulations.

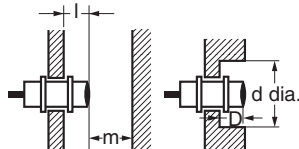
### Precautions for Correct Use

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

### Design

#### Influence of Surrounding Metal

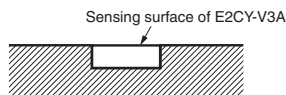
When mounting the Sensor within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the Sensor.



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

| Model        | Item | l | d   | D | m  |
|--------------|------|---|-----|---|----|
| E2CY-X1R5A   | 0    | 0 | 5   | 0 | 9  |
| E2CY-C1R5A-1 |      |   | 5.4 |   |    |
| E2CY-C2A(F)  |      |   | 8   |   | 15 |
| E2CY-V3A     |      |   | 12  |   | 18 |

The E2CY-V3A can be embedded in metal with the sensing surface at the same level as the metal surface.

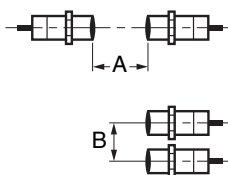


#### Mutual Interference

When installing Sensors face-to-face or side-by-side, ensure that the minimum distances given in the following table are maintained.

#### Mutual Interference (Unit: mm)

| Model        | Item | A  | B  |
|--------------|------|----|----|
| E2CY-X1R5A   | 20   | 30 | 15 |
| E2CY-C1R5A-1 |      |    |    |
| E2CY-C2A(F)  |      |    |    |
| E2CY-V3A     |      |    |    |



#### Effects of a High-frequency Electromagnetic Field

If the Sensor is located near a device that generates high frequencies or a transceiver, it may be affected by such a device and malfunctions may occur.

#### Fast Moving Ferrous Metal

At close range (50% or less of the sensing distance), iron and other ferrous metals may be detected if they are moving at high speed. If ferrous metals are present when objects are being detected at close range, make sure that the sensing objects move through the sensing range slowly (guideline: 20 ms or longer).

#### Mounting

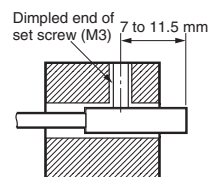
- Do not use excessive force when tightening the nuts on the E2CY-X1R5A. A toothed washer must be used with the nut.



| Model      | Torque   |
|------------|----------|
| E2CY-X1R5A | 0.98 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.



- Do not tighten the mounting screw for the E2CY-V3A with excessive force. Always use a washer when tightening the mounting screw.

| Model    | Torque   |
|----------|----------|
| E2CY-V3A | 0.15 N·m |

#### Adjustment

##### Power ON

The E2CY requires a minimum of 200 ms from the time the power supply is turned ON before it can begin detection. Do not remove the Sensor Head while the power supply is turned ON. If the E2CY-SD□ and load are connected to separate power supplies, always turn ON the power supply to the E2CY-SD□ first.

##### Power OFF

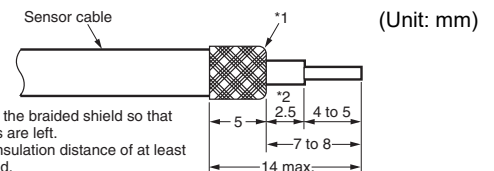
Output pulses may occur when the power supply is turned OFF. Turn OFF the power supply to the load or load line first.

##### Teaching

Make sure that the Sensor is in operating condition before making sensitivity adjustments.

#### Processing the Sensor Cable Ends

When cutting or extending the cable, the end of the Sensor cable connected to the E2CY-□ must be processed as shown in the following illustration.



- \*1. Be sure to turn over the braided shield so that none of its thin wires are left.
- \*2. Make sure that an insulation distance of at least 2.5 mm is maintained.

The length compensation range for cutting or extending the cable is 0.5 to 5 m. When extending the cable, use a 1.5D-2V (equivalent to JIS C 3501) cable with characteristic impedance of 50 Ω.

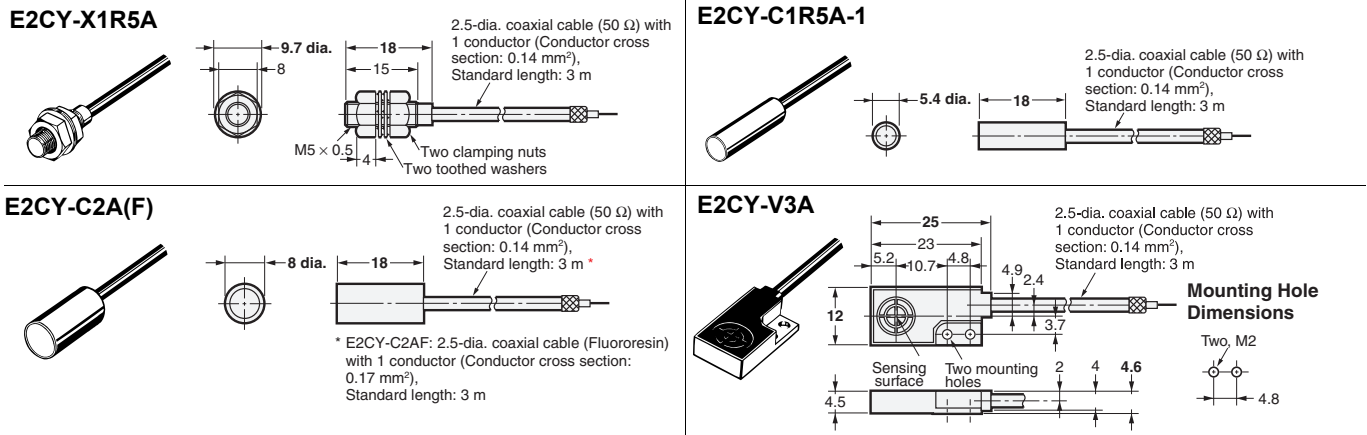
#### Amplifier Unit Cable Extension

Do not extend the cable to more than 30 m. Use a cable of 0.3 mm<sup>2</sup> or greater for extensions.

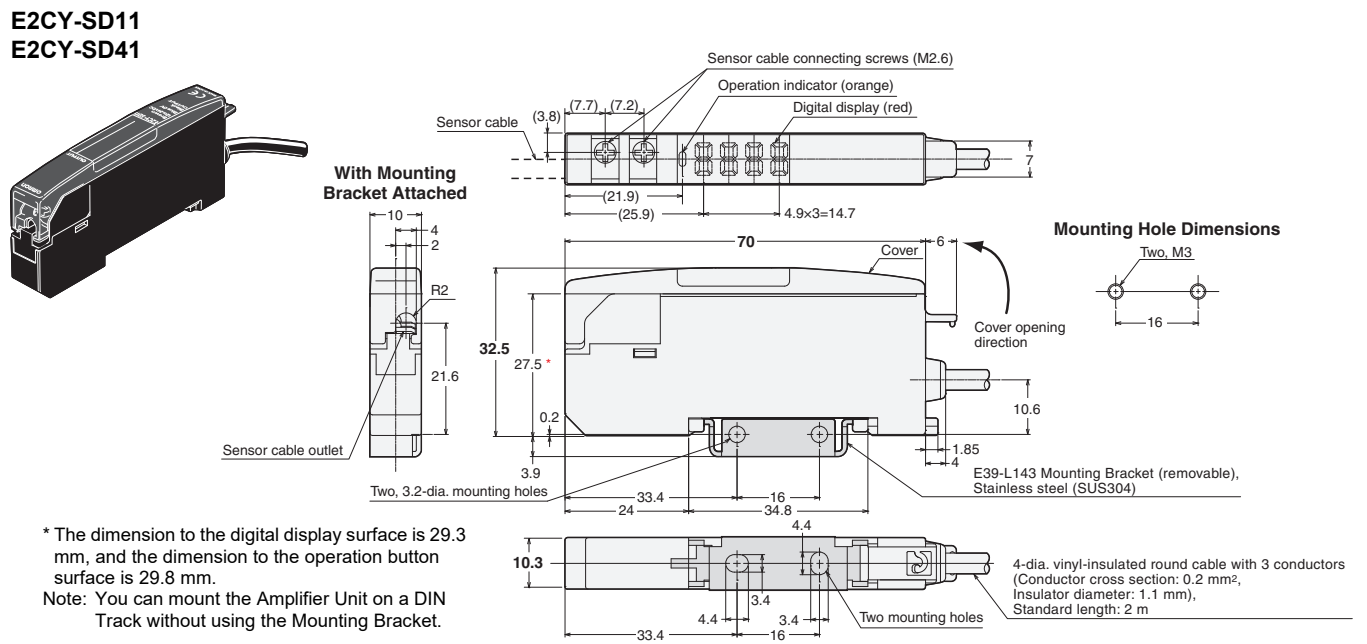
## Dimensions

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

### Sensors

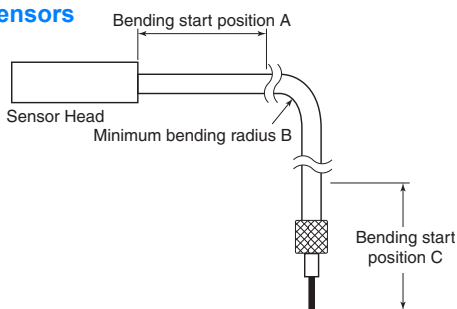


### Amplifier Units

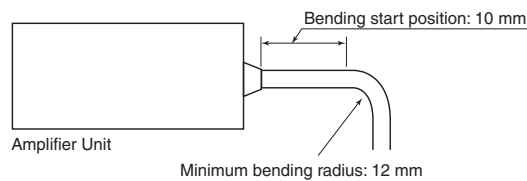


## Cable Bending Start Position and Minimum Bending Radius

### Sensors



### Amplifier Units



(Unit: mm)

| Model        | Item | A  | B  | C  |
|--------------|------|----|----|----|
| E2CY-X1R5A   |      |    |    | 35 |
| E2CY-C1R5A-1 |      | 15 | 25 |    |
| E2CY-C2A     |      |    |    |    |
| E2CY-C2AF    |      | 30 | 35 |    |
| E2CY-V3A     |      | 15 | 25 |    |

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**OMRON Corporation Industrial Automation Company**

**Kyoto, JAPAN**

**Contact : [www.ia.omron.com](http://www.ia.omron.com)**

**Regional Headquarters**

**OMRON EUROPE B.V.**

Wegalaan 67-69, 2132 JD Hoofddorp  
The Netherlands  
Tel: (31) 2356-81-300 Fax: (31) 2356-81-388

**OMRON ELECTRONICS LLC**

2895 Greenspoint Parkway, Suite 200  
Hoffman Estates, IL 60169 U.S.A.  
Tel: (1) 847-843-7900 Fax: (1) 847-843-7787

**OMRON ASIA PACIFIC PTE. LTD.**

438B Alexandra Road, #08-01/02 Alexandra  
Technopark, Singapore 119968  
Tel: (65) 6835-3011 Fax: (65) 6835-3011

**OMRON (CHINA) CO., LTD.**

Room 2211, Bank of China Tower,  
200 Yin Cheng Zhong Road,  
PuDong New Area, Shanghai, 200120, China  
Tel: (86) 21-6023-0333 Fax: (86) 21-5037-2388

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