

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 	M5	E2CY-X1R5A 3M
	5.4 dia.	1.5mm E2CY-C1R5A-1 3M
	8 dia.	2mm E2CY-C2A 3M
	Flat	3mm E2CY-V3A 3M
	8 dia.	2mm 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 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 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 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 ² for 2 hours each in X, Y, and Z directions		
Shock resistance		Destruction: 500 m/s ² 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 ² for 2 hours each in X, Y, and Z directions	
Shock resistance		Destruction: 300 m/s ² 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.

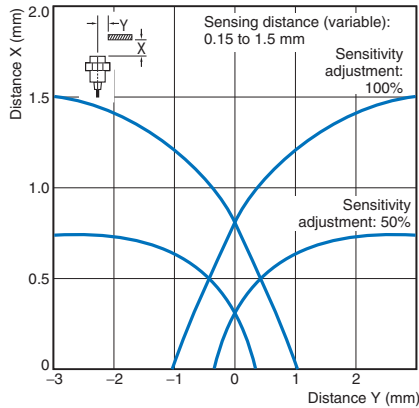
*2. When the temperature around the Sensor is stable at 23°C.

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

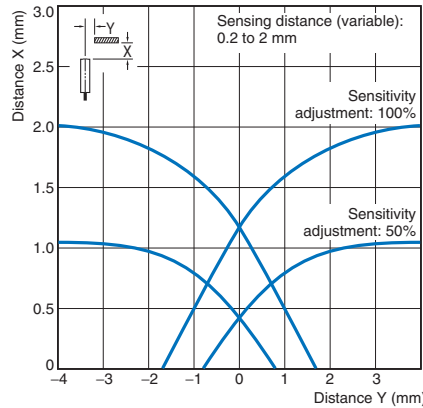
Engineering Data (Reference Value)

Sensing area

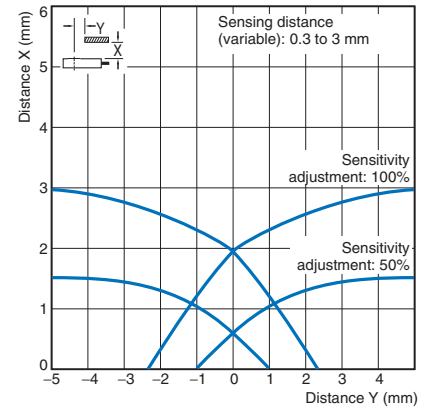
E2CY-X1R5A/E2CY-C1R5A-1



E2CY-C2A(F)

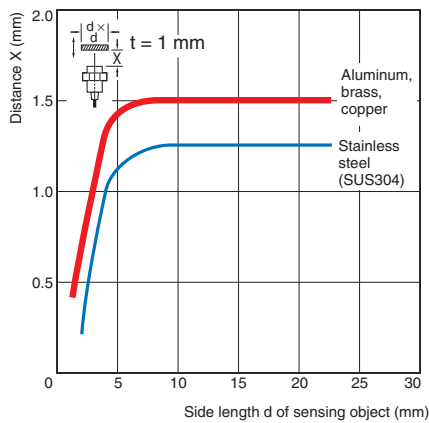


E2CY-V3A

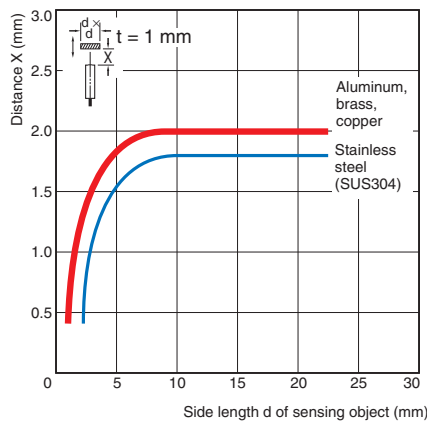


Influence of Sensing Object Size and Material

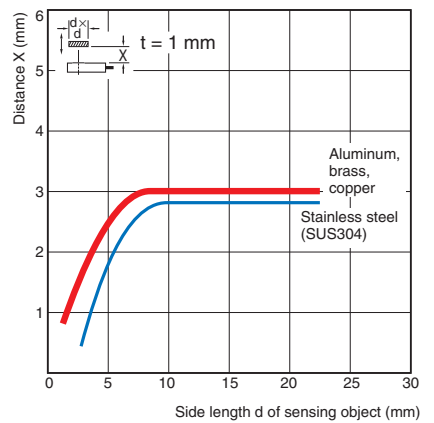
E2CY-X1R5A/E2CY-C1R5A-1



E2CY-C2A(F)

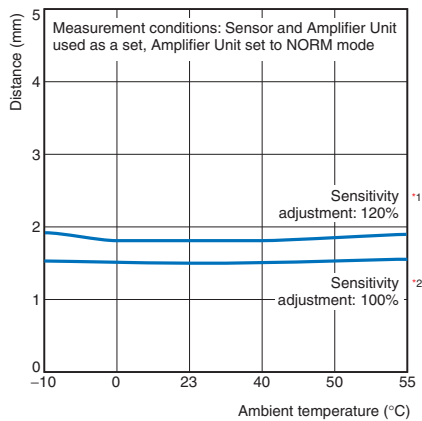


E2CY-V3A

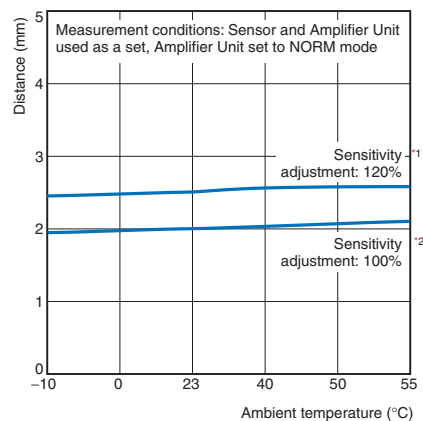


Temperature influence

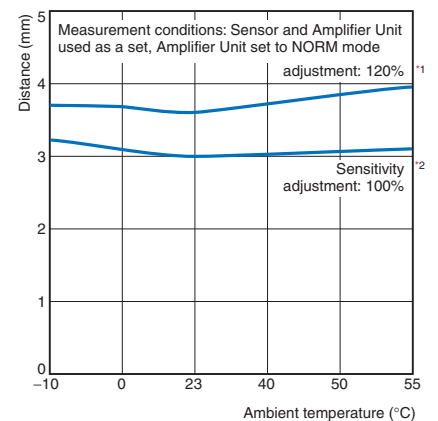
E2CY-X1R5A/E2CY-C1R5A-1



E2CY-C2A(F)



E2CY-V3A



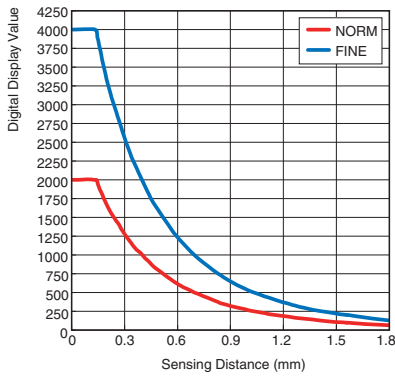
*1. When the set distance is the maximum stable sensing distance multiplied by 1.2 and at an ambient temperature 23°C.

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

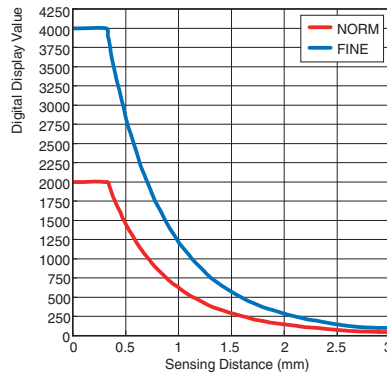
E2CY-SD

Sensing Distance Vs. Digital Display Value

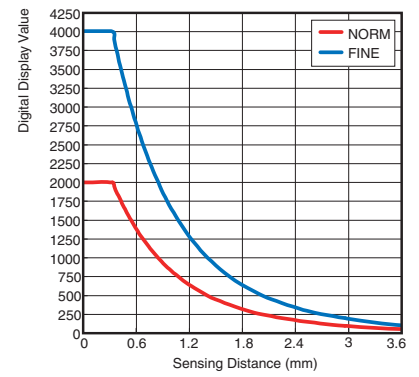
E2CY-X1R5A/E2CY-C1R5A-1



E2CY-C2A(F)



E2CY-V3A



I/O Circuit Diagrams

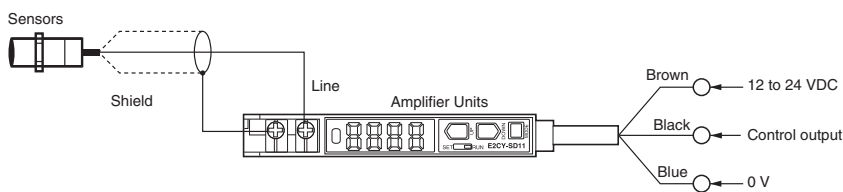
NPN output

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

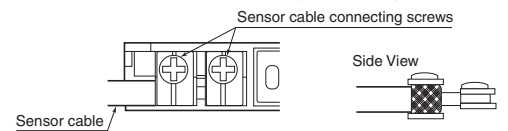
PNP output

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

Connection

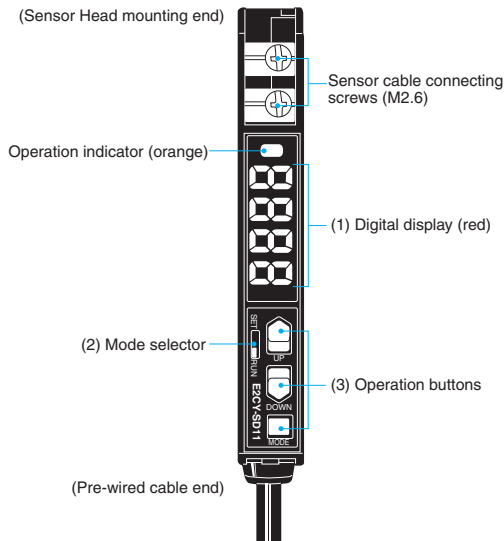


Sensor Cable Connection Diagram (Enlarged)



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"> Manually adjusting the threshold Checking the current threshold value Zero reset Locking button operation

(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 	Changes the function in the forward direction. Changes the set value in the forward direction. Performs positioning teaching.	Increases the threshold value.
DOWN Button 	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 	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 Change set value: UP/DOWN Buttons Select function: MODE Button Select set value: MODE Button
<i>tEc h</i>	Sensing threshold value	Performs the following types of teaching: <ul style="list-style-type: none"> Teaching without a workpiece Positioning teaching Teaching with/without a workpiece
1- <i>o p</i>	NO/NC	Changes the operation mode. <ul style="list-style-type: none"> NO (normally open): Turn output ON when an object is detected. NC (normally close): Turn output ON when no object is detected.
2- <i>fn</i>	NORM/FINE	Changes sensor precision. <ul style="list-style-type: none"> NORM: Standard * FINE: High precision
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"> Normal: The Sensor is connected to the left end. Reverse: The Sensor is connected to the right end.
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.

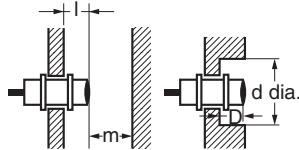
Precautions for Correct Use

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

Design

Influence of Surrounding Metal

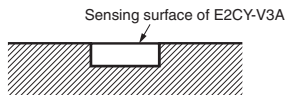
When mounting the Sensor within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the Sensor.



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.

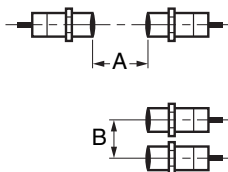


Mutual Interference

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	20	15
E2CY-C1R5A-1			
E2CY-C2A(F)			
E2CY-V3A			



Effects of a High-frequency Electromagnetic Field

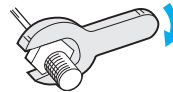
If the Sensor is located near a device that generates high frequencies or a transceiver, it may be affected by such a device and malfunctions may occur.

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

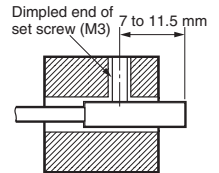
- Do not use excessive force when tightening the nuts on the E2CY-X1R5A. A toothed washer must be used with the nut.



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

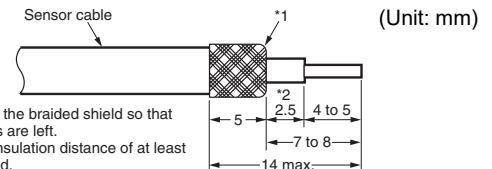
Output pulses may occur when the power supply is turned OFF. Turn OFF the power supply to the load or load line first.

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.



- Be sure to turn over the braided shield so that none of its thin wires are left.
- 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 mm² or greater for extensions.

Dimensions

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

Sensors

<p>E2CY-X1R5A</p>	<p>E2CY-C1R5A-1</p>
<p>E2CY-C2A(F)</p>	<p>E2CY-V3A</p>

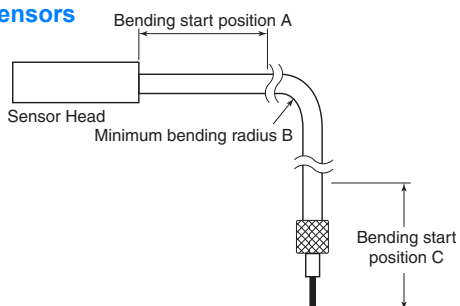
Amplifier Units

E2CY-SD11
E2CY-SD41

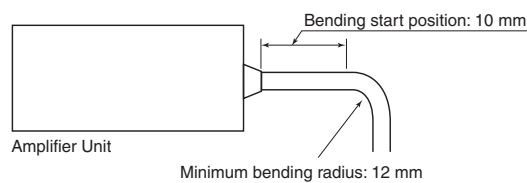
* The dimension to the digital display surface is 29.3 mm, and the dimension to the operation button surface is 29.8 mm.
Note: You can mount the Amplifier Unit on a DIN Track without using the Mounting Bracket.

Cable Bending Start Position and Minimum Bending Radius

Sensors



Amplifier Units



(Unit: mm)

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

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Note: Do not use this document to operate the Unit.

OMRON Corporation Industrial Automation Company

Kyoto, JAPAN

Contact : 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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