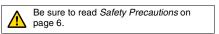
# Long-distance Proximity Sensor

- Long-distance detection at up to 30 mm enables secure mounting with reduced problems due to workpiece collisions.
- No polarity for easy wiring with DC 2-wire models.
- Cable protector provided as a standard feature.



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.] DC 2-Wire, Pre-wired Models

Appearan	Appearance		nsing di	stanco	Model		
Appearai	ice.	361	ising u	Stance	NO	NC	
Shielded	M12	4 m	m		E2EM-X4X1 2M *2	E2EM-X4X2 2M	
	M18	8	3 mm		E2EM-X8X1 2M *2	E2EM-X8X2 2M	
*1	M30		15	mm	E2EM-X15X1 2M *2	E2EM-X15X2 2M	
Unshielded	M18		16	mm	E2EM-X16MX1 2M	E2EM-X16MX2 2M	
	M30			30 mm	E2EM-X30MX1 2M	E2EM-X30MX2 2M	

\*1. There are installation restrictions that apply to Shielded Sensors. Refer to Reference *Influence of Surrounding Metal* in *Safety Precautions* on page 6. \*2. Pre-wired M12 Connector Models with a cable length of 300 mm are also available. Add -M1J to the end of the model number (example: E2EM-X4X1-M1J).

#### **DC 3-Wire, Pre-wired Models**

Annearan	Appearance		Sensing distance		Model		
Appearai		Sensing distance			Output configuration: NPN NO	Output configuration: NPN NC	
	M8	2 mm	   		E2EM-X2C1 2M	E2EM-X2C2 2M	
Shielded	M12	<b>4</b> m	m		E2EM-X4C1 2M	E2EM-X4C2 2M	
*	M18	8	3 mm		E2EM-X8C1 2M	E2EM-X8C2 2M	
	M30		15	mm	E2EM-X15C1 2M	E2EM-X15C2 2M	

\* There are installation restrictions that apply to Shielded Sensors. Refer to Reference Influence of Surrounding Metal in Safety Precautions on page 6.

#### DC 3-Wire, M12 Connector Models

Appoarar	Appearance		Sensing distance		Model		
Appearai		Sensing distance			Output configuration: NPN NO	Output configuration: NPN NC	
	M8	2 mm			E2EM-X2C1-M1	E2EM-X2C2-M1	
Shielded	M12	<b>4</b> mm			E2EM-X4C1-M1	E2EM-X4C2-M1	
*	M18	<b>8</b> m	m		E2EM-X8C1-M1	E2EM-X8C2-M1	
	M30		15 mm		E2EM-X15C1-M1	E2EM-X15C2-M1	

\* There are installation restrictions that apply to Shielded Sensors. Refer to Reference Influence of Surrounding Metal in Safety Precautions on page 6.

### Accessories (Order Separately)

#### Sensor I/O Connectors (M12, Sockets on One Cable End)

(Models for Connectors and with Pre-wired Connectors: A Connector is not provided with the Sensor. Be sure to order a Connector separately.) [Refer to XS2.]

Appearance	Cable length	Sensor I/O Connector model number	Applicable Proximity Sensor model number	
Straight	2 m	XS2F-D421-DC0-F	E2EM-X□C1-M1	
-	5 m	XS2F-D421-GC0-F		
- And	2 m	XS2F-D421-D80-F	E2EM-X□C□-M1	
	5 m	XS2F-D421-G80-F		
L-shape	2 m	XS2F-D422-DC0-F	E2EM-X□C1-M1	
	5 m	XS2F-D422-GC0-F		
	2 m	XS2F-D422-D80-F	E2EM-X□C□-M1	
<u> </u>	5 m	XS2F-D422-G80-F		

Note: Refer to Introduction to Sensor I/O Connectors/Sensor Controllers for details.

Use the XS2F-D42 -- CO-A for the E2EM-X X1-M1J. (Terminal 3: 0 V (+V), Terminal 4: +V (0 V))

## **Ratings and Specifications**

#### E2EM-X X DC 2-Wire Models

	Size	M12	М	18	M30			
	Shielded	Shielded	Shielded	Unshielded	Shielded	Unshielded		
ltem	Model	E2EM-X4X	E2EM-X8X	E2EM-X16MX	E2EM-X15X	E2EM-X30MX		
Sensing	distance	4 mm ±10%	8 mm ±10%	16 mm ±10%	15 mm ±10%	30 mm ±10%		
Set dista	ance *1	0 to 3.2 mm 0 to 6.4 mm 0 to 12.8 mm 0 to 12 mm 0 to 24 mm						
Different	tial travel	15% max. of sensing of	listance					
Detectat	ole object	Ferrous metal (The se	nsing distance decreas	es with non-ferrous met	al. Refer to Engineering	g Data on page 4.)		
Standar	d sensing object	Iron, $12 \times 12 \times 1$ mm	Iron, $18 \times 18 \times 1$ mm	Iron, $45 \times 45 \times 1 \text{ mm}$	Iron, $30 \times 30 \times 1 \text{ mm}$	Iron, $70 \times 70 \times 1$ mm		
Respons	se frequency *2	1 kHz	0.5 kHz	0.4 kHz	0.25 kHz	0.1 kHz		
	upply voltage ng voltage	12 to 24 VDC (10 to 30	) VDC), ripple (p-p): 10	% max.				
Leakage	current	0.8 mA max.						
Con-	Load current	3 to 100 mA						
trol out- put	Residual volt- age *3	5 V max. (Load curren	t: 100 mA, Cable length	n: 2 m)				
Indicato	rs	X1 Models: Operation X2 Models: Operation	indicator (red), Setting i indicator (red)	indicator (green)				
	on mode nsing object hing)	X1 Models: NO X2 Models: NC	r to the timing charts un	der I/O Circuit Diagram	<i>s</i> on page 5 for details.			
Protectio	on circuits	Surge suppressor, Loa	ad short-circuit protectio	n				
Ambient range	temperature	Operating: -25 to 70°C	C, Storage: −40 to 85°C	(with no icing or conde	nsation)			
Ambient	t humidity range	Operating/Storage: 35	% to 95% (with no conc	lensation)				
Tempera	ature influence	±15% max. of sensing	distance at 23°C in the	temperature range of -	-25 to 70°C			
Voltage	influence	$\pm 1\%$ max. of sensing c	listance at rated voltage	e in the rated voltage $\pm 1$	5% range			
Insulatio	on resistance	50 M $\Omega$ min. (at 500 VE	OC) between current-ca	rrying parts and case				
Dielectri	c strength			irrent-carrying parts and				
Vibratio	n resistance			litude for 2 hours each	in X, Y, and Z directions	3		
Shock re	esistance		<sup>2</sup> 10 times each in X, Y					
•	of protection		use standards: oil-resis					
Connect	tion method	•	ndard cable length: 2 m					
Weight (	packed state)	Approx. 60 g	Approx. 130 g	Approx. 150 g	Approx. 180 g	Approx. 210 g		
	Case	Nickel-plated brass						
Materi- als	Sensing sur- face	PBT						
ulo	Clamping nuts	Nickel-plated brass						
	Toothed washer	Zinc-plated iron						
Accesso	ories	Instruction manual						

\*1. Use the Sensor within the range in which the setting indicator (green LED) is ON (except X2 Models).

\*2. The response frequency is an average value.

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.

\*3. The residual voltage is 5 V. Make sure that the device connected to the Sensor can withstand the residual voltage. (Refer to page 6 for details.)

#### E2EM-XC DC 3-Wire Models

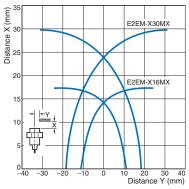
	Size	M8	M12	M18	M30				
	Shielded	Shielded	Shielded	Shielded	Shielded				
ltem	Model	E2EM-X2C□(-M1)	E2EM-X4C□(-M1)	E2EM-X8C□(-M1)	E2EM-X15C (-M1)				
Sensing	distance	2 mm ±10%	4 mm ±10%	8 mm ±10%	15 mm ±10%				
Set dista	nce	0 to 1.6 mm	0 to 3.2 mm	0 to 6.4 mm	0 to 12 mm				
Differenti	ial travel	10% max. of sensing distar	nce						
Detectab	le object	Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to <i>Engineering Data</i> on page 4.)							
Standard	sensing object	Iron, $8 \times 8 \times 1$ mm	Iron, $12 \times 12 \times 1$ mm	Iron, $18 \times 18 \times 1$ mm	Iron, $30 \times 30 \times 1$ mm				
Respons	e frequency *1	1.5 kHz	0.5 kHz	0.3 kHz	0.1 kHz				
	ipply voltage g voltage range) *2	12 to 24 VDC (10 to 40 VD	C), ripple (p-p): 10% max.						
Current c	consumption	13 mA max.							
Control	Load current *2	200 mA max.							
output	Residual voltage	2 V max. (Load current: 200	0 mA, Cable length: 2 m)						
Indicator	s	Operation indicator (yellow)							
	n mode (with sens- et approaching)	C1 Models: NO C2 Models: NC	ne timing charts under I/O C	<i>ircuit Diagrams</i> on page 5 fo	or details.				
Protectio	n circuits	Reverse polarity protection, Load short-circuit protection, Surge suppressor							
Ambient 1 *1	temperature range	Operating/Storage: -40 to 85°C (with no icing or condensation) Operating: -25 to 70 Storage: -40 to 85°C (with no icing or condensation) Storage: -40 to 85°C no icing or condensation							
Ambient	humidity range	Operating/Storage: 35% to 95% (with no condensation)							
Temperat	ture influence	$\pm 15\%$ max. of sensing distance at 23°C in the temperature range of -40 to 85°C $\pm 10\%$ max. of sensing distance at 23°C in the temperature range of -25 to 70°C $\pm 15\%$ max. of sensing distance at 23°C in the temperature range of -25 to 70°C $\pm 15\%$ max. of sensing distance at 23°C in the temperature range of -25 to 70°C							
Voltage in	nfluence	$\pm$ 1% max. of sensing distance at rated voltage in the rated voltage $\pm$ 15% range							
Insulation	n resistance	50 M $\Omega$ min. (at 500 VDC) between current-carrying parts and case							
Dielectric	c strength	1,000 VAC, 50/60 Hz for 1 minute 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 re	sistance	Destruction: 500 m/s <sup>2</sup> 10 times each in X, Y, and Z directions	Destruction: 1,000 m/s <sup>2</sup> 10	times each in X, Y, and Z d	lirections				
Degree o	f protection	Pre-wired Models: IEC 60529 IP67, in-house standards: oil-resistant Connector Models: IEC 60529 IP67							
Connecti	on method	Pre-wired Models (Standar Connector Models	d cable length: 2 m)						
Weight Pre-wired Models		Approx. 65 g	Approx. 75 g	Approx. 150 g	Approx. 195 g				
(packed state)			Approx. 40 g	Approx. 90 g					
	Case	Stainless steel (SUS303)	Nickel-plated brass						
Materials	Sensing surface	PBT							
	Clamping nuts	Nickel-plated brass							
	Toothed washer	Zinc-plated iron							
Accesso	ries	Instruction manual							

\*1. The response frequency is an average value.
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. When using an M8 Model at an ambient temperature between 70 and 85°C, supply 10 to 30 VDC to the Sensor and make sure that the Sensor has a control output of 100 mA maximum.

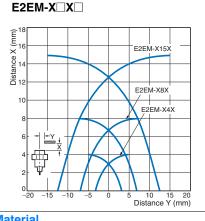
# **Engineering Data (Reference Value)**

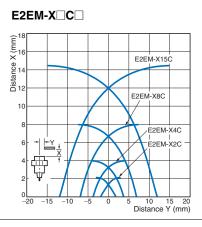
#### **Sensing Area**

Unshielded Models E2EM-X MX



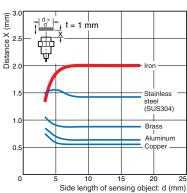
Shielded Models



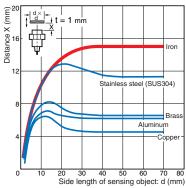


#### Influence of Sensing Object Size and Material

#### E2EM-X2 (-M1)

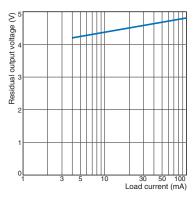


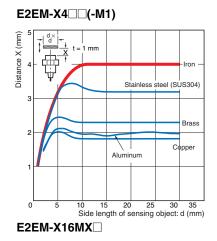
#### E2EM-X15 (-M1)

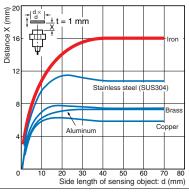


Residual Output Voltage

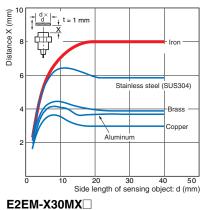
#### E2EM-X X

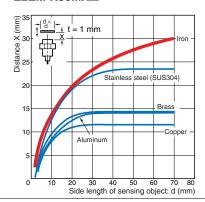






#### E2EM-X8□□(-M1)



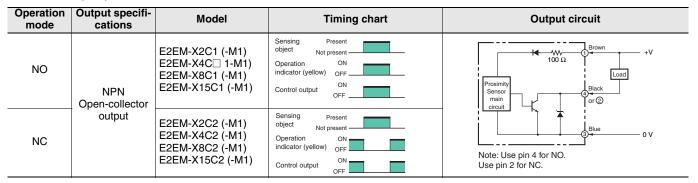


# I/O Circuit Diagrams

### E2EM-X X DC 2-Wire Models

Operation mode	Model	Timing chart	Output circuit
NO	E2EM-X4X1 E2EM-X8X1 E2EM-X15X1 E2EM-X16MX1 E2EM-X30MX1	Non-sensing Unstable Set position area area Stable sensing area (%) 100 80 (%) 100 80 Proximity Sensor (%) 100 80 OFF OFF OFF (green) ON Operation indicator OFF (red) ON Operation indicator OFF (red) ON Control output	Proximity Sensor circuit U U U U U U U U U U U U U U U U U U U
NC	E2EM-X4X2 E2EM-X8X2 E2EM-X15X2 E2EM-X16MX2 E2EM-X30MX2	Non-sensing area Sensing area Sensing i 100 0 (%) 100 0 Rated sensing distance OFF Operation indicator (red) OFF Control output	Note 1. The load can be connected to either the +V or 0 V side. Note 2. There is no polarity. Therefore, the brown and blue lines have no polarity. Note 3. Use pins 4 and 3 for NO. Use pins 1 and 2 for NC.

#### E2EM-XCC(-M1) DC 3-Wire Models



## **Connections for Sensor I/O Connectors**

	Proximity Sens	or	Sensor I/O Connector	Connections			
Туре	Operation mode	Model	model	Connections			
DC 2-wire	NO	E2EM-X□X1-M1J	XS2F-D42 	E2EM XS2F Brown (not connected) Blue (+) (-) Black (-) (+)			
	NC	E2EM-X□X2-M1J	1: Straight 2: L-shape XS2F-D42⊡-□80-F D: 2-m cable G: 5-m cable	E2EM XS2F Brown (-) (+) White (+) (-) Black (not connected) Black (not connected)			
	NQ	E2EM-X□C1-M1	XS2F-D42 	E2EM XS2F Brown (+V) Blue (0 V) Black (output)			
DC 3-wire			1: Straight 2: L-shape XS2F-D42⊡-⊡80-F	E2EM XS2F Brown (+V) White (not connected) Blue (0 V) Black (output)			
	NC	E2EM-X□C2-M1	D: 2-m cable G: 5-m cable	E2EM XS2F Brown (+V) White (output) Blue (0 V) Blue (0 V) Blue (0 V) Blue (not connected)			
	Refer to Introduction to Sensor I/O Connectors/Sensor Controllers for details.						

# **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.



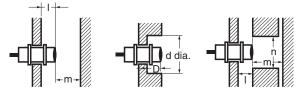
#### **Precautions for Correct Use**

Do not use this 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)

Туре		Item	M8	M12	M18	M30
		I		2.4	3.6	6
		d		18	27	45
	Shielded	D		2.4	3.6	6
		m		12	24	45
DC 2-wire		n		18	27	45
E2EM-X	Unshielded	I			25	45
		d			70	120
		D			25	45
		m			48	90
		n			70	120
		I	0	2.4	3.6	6
50 a .		d	8	18	27	45
DC 3-wire E2EM-X□C□	Shielded	D	0	2.4	3.6	6
		m	4.5	12	24	45
		n	12	18	27	45

#### Connecting a DC 2-wire Proximity Sensor to a PLC (Programmable Controller) **Required Conditions**

Connection to a PLC is possible if the specifications of the PLC and the Proximity Sensor satisfy the following conditions. (The meanings of the symbols are given below.)

1. The ON voltage of the PLC and the residual voltage of the Proximity Sensor must satisfy the following.

2. The OFF current of the PLC and the leakage current of the Proximity Sensor must satisfy the following.

 $IOFF \ge I_{leak}$ 

- (If the OFF current is not listed in the specifications, take it to be 1.3 mA.)
- 3. The ON current of the PLC and the control output (Iout) of the Proximity Sensor must satisfy the following.

IOUT (min.)  $\leq$  ION  $\leq$  IOUT (max.)

The ON current of the PLC will vary, however, with the power supply voltage and the input impedance, as shown in the following equation.

# ION = (VCC - VR - VPC)/RIN

Example

In this example, the above conditions are checked when the PLC Unit is the C200H-ID212, the

OK

Proximity Sensor is the E2EM-X8X1, and the power supply voltage is 24 V.

1. Von  $(14.4 \text{ V}) \leq \text{Vcc} (20.4 \text{ V}) - \text{Vr} (5 \text{ V}) = 15.4 \text{ V}$ : OK

2. IOFF (1.3 mA)  $\geq$  leak (0.8 mA):

3. ION =  $[V_{CC} (20.4 \text{ V}) - \text{V}_{R} (5 \text{ V}) - \text{V}_{PC} (4 \text{ V})]/\text{Rin} (3 \text{ k}\Omega) = \text{Approx. 3.8 mA}$ OK

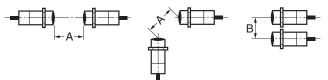
Therefore, IOUT(min.) (3 mA)  $\leq ION$  (3.8 mA):

#### **AND/OR Connections**

Error pulses and leakage current may prevent application in AND or OR circuits. Always confirm operation in advance to confirm if there are any problems in operation.

#### **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)

Туре	Item	M8	M12	M18	M30	
	Shielded	Α		30	60	110
DC 2-wire	Sillelueu	В		20	35	90
E2EM-X X	Unshield-	А			200	350
	ed	В			120	300
DC 3-wire	Shielded	Α	20	30	60	110
E2EM-X□C□	Silleided	В	15	20	35	90

- Von: ON voltage of PLC (14.4 V)
- ON current of PLC (typ. 7 mA) ION:
- OFF. OFF current of PLC (1.3 mA) Input impedance of PLC (3 k $\Omega$ ) RIN:
- Internal residual voltage of PLC (4 V) VPC: V<sub>R</sub>: Output residual voltage of Proximity
- Sensor (5 V) Leakage current of Proximity Sensor lleak
- (0.8 mA) Control output of Proximity Sensor (3 to lour:
- 100 mA) Vcc: Power supply voltage (PLC: 20.4 to 26.4 V)
- Values in parentheses apply to the following PLC model and Proximity Sensor model. PLC: C200H-ID212
- Sensor: E2EM-X8X1

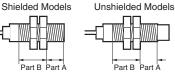
 $V_{ON} \leq V_{CC} - V_{R}$ 

### Mounting

#### **Tightening Force**

Do not tighten the nut with excessive force. A washer must be used with the nut.





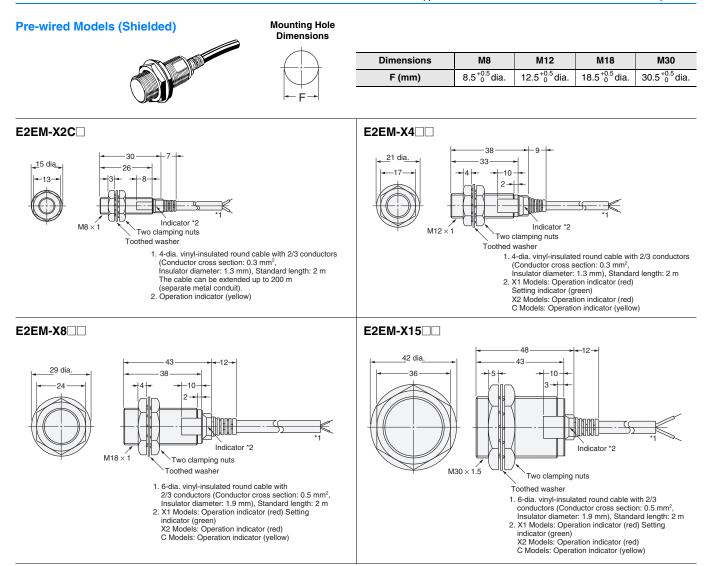
Note: 1. The allowable tightening strength depends on the distance from the edge of the head, as shown in the following table. (A is the distance from the edge of the head. B includes the nut on the head side. If the edge of the nut is in part A, the tightening torque for part A applies instead.)

2. The following strengths assume washers are being used.

	Torque	Pai	Part A		
Model		Dimension (mm)	Torque	Torque	
M8	Shielded	9	12 N⋅m		
M12					
M18		70 N⋅m			
M30		180 N·m			

## Dimensions

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

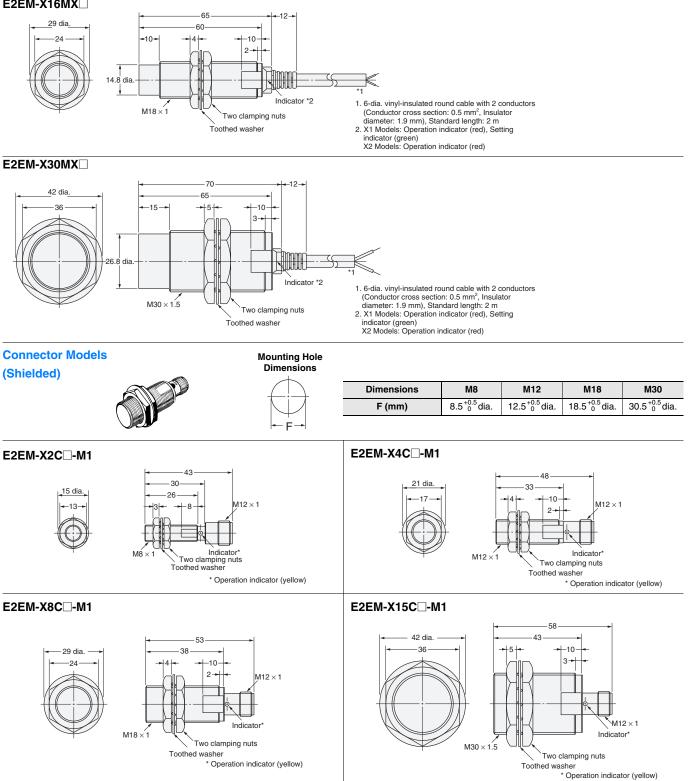


E2EM

### **Pre-wired Models** (Unshielded)



#### E2EM-X16MX



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