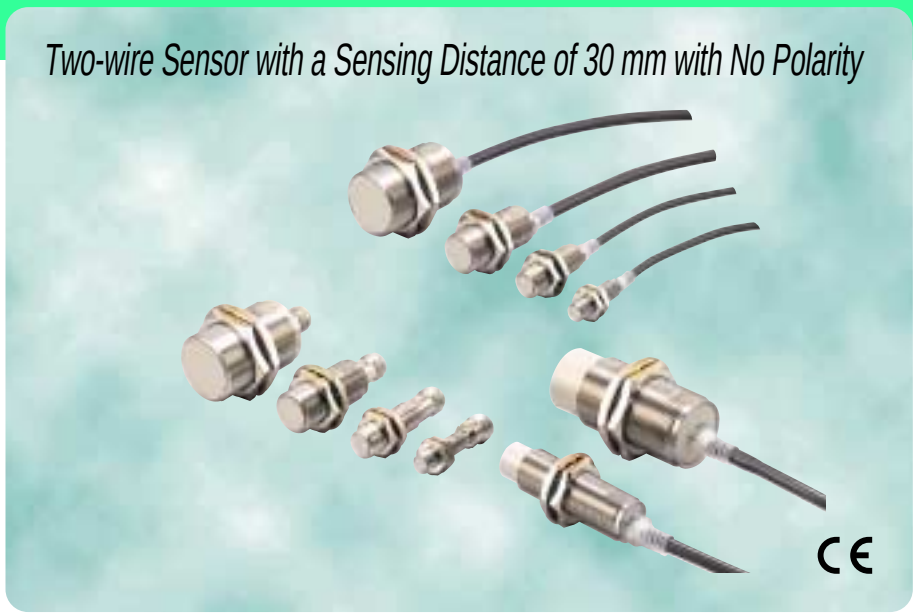
Long-distance Proximity Sensor

E2EM

Two-wire Sensor with a Sensing Distance of 30 mm with No Polarity



Features

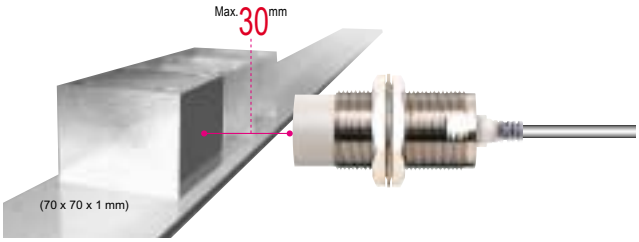
Reliability Over a Long Sensing Distance

Ensures a sensing distance approximately 1.5 to2 times larger that of any conventional OMRON Sensor.

Offers greater design flexibility and ease for the detection of large-sized or non-ferrous sensing objects.

Provides a sensing distance margin, thus eliminating problems such as the collision of workpieces, for example.

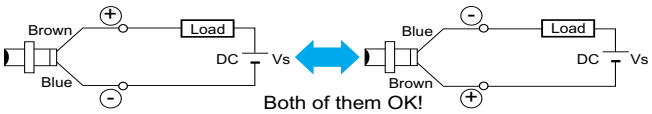
* DC 2-wire Models Non-shielded type M30



Easy Wiring with No Polarity

Two-wire Standard Models with No Polarity

The E2EM has no polarity thus eliminating problems associated with reversed wiring.



Inheriting the E2E's Features

Sturdy

Thicker Casing with Reinforced Base Bracket
The Sensor can be tightened very securely so that it will not loosened by vibration.

User-friendly

Cutouts Ensure Easier Tightening with a Wrench
The cutouts on the Sensor ensure easier tightening with a wrench, thus improving the efficiency of mounting work.

Improvements in Mounting and Maintenance Ease
The Sensor incorporates a cable protector with a tail indicator, thus allowing the connection of the cable to be checked with ease.

Reliable

Takes Accidental Wire Disconnection into Consideration
The Sensor incorporates a cable protector that prevents the cable end from accidental disconnection in case the cable is excessively bent.

Simple

Connector Models Available
Easy-to-Maintain connector models, which eliminate wiring effort, are available.

Ordering Information

Sensors

DC 2-wire/Pre-wired Models

Shape		Sensing distance	Model	
			operating configuration, NO	operating configuration, NC
Shielded 	M12	4mm	**E2EM-X4X1***	**E2EM-X4X2**
	M18	8mm	**E2EM-X8X1***	**E2EM-X8X2**
	M30	15mm	**E2EM-X15X1***	**E2EM-X15X2**
Unshielded 	M18	16mm	**E2EM-X16MX1**	**E2EM-X16MX2**
	M30	30mm	**E2EM-X30MX1**	**E2EM-X30MX2**

* Connector relay models (cable length of 300mm) are available.

DC 3-wire/Pre-wired Models

Shape		Sensing distance	Model	
			Output form NPN NO	Output form NPN NC
Shielded 	M8	2mm	**E2EM-X2C1**	**E2EM-X2C2**
	M12	4mm	**E2EM-X4C1**	**E2EM-X4C2**
	M18	8mm	**E2EM-X8C1**	**E2EM-X8C2**
	M30	15mm	**E2EM-X15C1**	**E2EM-X15C2**

DC 3-wire/Connector Models

Shape		Sensing distance	Output form	Model
Shielded 	M8	2mm	NPN NO	**E2EM-X2C1-M1**
	M12	4mm		**E2EM-X4C1-M1**
	M18	8mm		**E2EM-X8C1-M1**
	M30	15mm		**E2EM-X15C1-M1**

Note: Models with output configuration of NPN NC is also available.

Accessories (Order Separately)

Sensor I/O Connectors

Shape	Cable length	Sensor I/O Connectors	Applicable proximity sensor models
Straight type 	2 m	**XS2F-D421-DC0-A**	E2EM-X□C□-M1
		XS2F-D421-D80-A	
	5 m	**XS2F-D421-GC0-A**	
		XS2F-D421-G80-A	
L type 	2 m	**XS2F-D422-DC0-A**	
		XS2F-D422-D80-A	
	5 m	**XS2F-D422-GC0-A**	
		XS2F-D422-G80-A	

Rating/performance

DC 2-wire Models (E2EM-X□X□)

Item \ Size		M12	M18		M30	
	Shielded	Shielded	Shielded	Unshielded	Shielded	Unshielded
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%
Setting distance*1		0 to 3.2 mm	0 to 6.4 mm	0 to 12.8 mm	0 to 12 mm	0 to 24 mm
Differential distance		15% max. of sensing distance				
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)				
Standard sensing object		Iron, 12 × 12 × 1 mm	Iron, 18 × 18 × 1 mm	Steel 45 x 45 x 1 mm	Iron, 30 × 30 × 1 mm	Iron, 70 × 70 × 1 mm
Response frequency*2		1 kHz	0.5 kHz	0.4 kHz	0.25 kHz	0.1 kHz
Power supply(Operating voltage range)		12 to 24 VDC, ripple (p-p) : 10 % max., (10 to 30 VDC)				
Leakage current		0.8 mA max.				
Control output	Switching	3 to 100 mA				
	Residual voltage*3	5.0 V max. (under load current of 100 mA with cable length of 2 m)				
Indicator lamp		X1 models: Operation indicator (red LED), operation set indicator (green LED) X2 models: Operation indicator (red LED)				
Operating status (with sensing object approaching)		X1 models: NO X2 models: NC				
Protective circuits		Surge absorber, load short-circuit protection				
Ambient temperature		Operating: -25°C to 70°C, Storage: -40°C to 85°C (with no icing or condensation)				
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)				
Temperature influence		±15% max. of sensing distance at 23°C in temperature range of -25°C to 70°C				
Voltage influence		±1% max. of sensing distance in rated voltage range ±15%				
Insulation resistance		50 MΩ min. (500 VDC) between current carrying part and case				
Dielectric strength		1000 VAC 50/60 Hz for 1 min between current carrying part and case				
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions				
Shock resistance		Destruction: 1,000 m/s^2 for 10 times each in X, Y, and Z directions				
Protective structure		IEC60529				
Connection method		Pre-wired models (standard length: 2 m)				
Weight (Packed state)		Approx. 60 g	Approx. 130 g	Approx. 150 g	Approx. 180 g	Approx. 210 g
Material	Case	Brass				
	Sensing surface	PBT				
Accessories		Instruction manual				

*1. Use within a range where the green indicator is lit. (Excluding the X2 models.)
*2. The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.
*3. Since the residual voltage is 5 V, confirm interface conditions with devices to be connected.

DC 3-wire Models (E2EM-X□C)

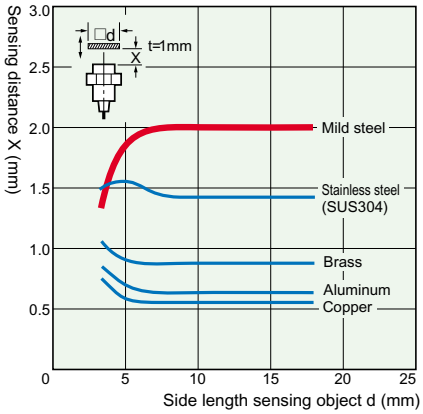
Item	Size	M8	M12	M18	M30
	Shielded	Shielded	Shielded	Shielded	Shielded
	Model	E2EM-X2C□(-M1)	E2EM-X4C□(-M1)	E2EM-X8C□(-M1)	E2EM-X15C□(-M1)
Sensing distance		2 mm ±10%	4 mm ±10%	8 mm ±10%	15 mm ±10%
Setting distance		0 to 1.6 mm	0 to 3.2 mm	0 to 6.4 mm	0 to 12 mm
Differential distance		10% max.			
Sensing object		Ferrous metal (Sensitivity lowers with non-ferrous metals)			
Standard sensing object		Iron, 8 × 8 × 1 mm	Iron, 12 × 12 × 1 mm	Iron, 18 × 18 × 1 mm	Iron, 30 × 30 × 1 mm
Response frequency*1		1.5 kHz	0.5 kHz	0.3 kHz	0.1 kHz
Supply voltage (operating voltage range)*2		12 to 24 VDC, ripple (p-p): 10% max.,(10 to 40 VDC)			
Current consumption		13 mA max.			
Control output	Switching capacity	200 mA max.			
	Residual voltage	2 V max. (under load current of 200 mA with cable length of 2 m)			
Indicator lamp		Operation indicator (Yellow LED)			
Operating status (with sensing object approaching)		C1 models: NO C2 type: NC			
Protective circuits		Reverse connection protection, surge absorber, load short-circuit protection			
Ambient temperature		Operating and Storage: -40°C to 85°C (-40°F to 185°F) with no icing or condensation			Operating: -25°C to 70°C, Storage: -40°C to 85°C (with no icing or condensation)
Ambient humidity		Operating/Storage: 35% to 95%RH (with no condensation)			
Temperature influence		±15% max. of sensing distance at 23°C within temperature range of -40°C to 85°C ±10% max. of sensing distance at 23°C within temperature range of -25°C to 70°C			±15% max. of sensing distance at 23°C within temperature range of -25°C to 70°C
Voltage influence		±1% max. of Sensing distance in rated voltage range ±15%.			
Insulation resistance		50 MΩ min. (500 VDC) between current carrying part and case			
Dielectric strength		1000 VAC 50/60 Hz for 1 min between current carrying part and case			
Vibration resistance		10 to 55 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions			
Shock resistance		Destruction: 500 m/s^2 for 10 times each in X, Y, and Z directions	Destruction: 1,000 m/s^2 for 10 times each in X, Y, and Z directions		
Protective structure		Pre-wired type: IEC60529; Connector type: IEC60529			
Connection method		Pre-wired type: Standard cable length: 2 m; Connector type			
Weight (Packed state)	Pre-wired	Approx. 55 g	65 g	Approx. 140 g	Approx. 190 g
	Connector type	Approx. 10 g	Approx. 20 g	Approx.40g	Approx. 90 g
Material	Case	Stainless steel (SUS303)	Brass		
	Sensing surface	PBT			
Accessories		Instruction manual			

*1. The response frequencies for DC switching are average values measured on condition that the distance between each sensing object is twice as large as the size of the sensing object and the sensing distance set is half of the maximum sensing distance.
*2. When using the M8 models within the temperature range from 70°C to 85°C, the voltage range must be from 10 to 30 VDC and control output (switching capacity) must be 100 mA max.

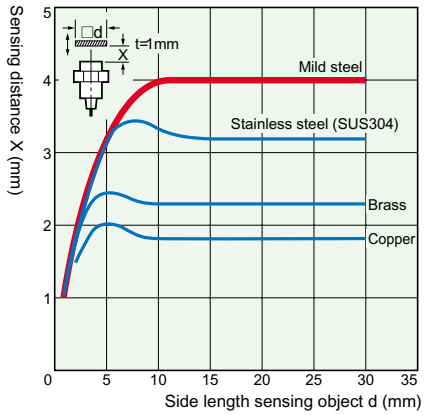
Characteristic data (typical)

Sensing Distance vs. Sensing Object

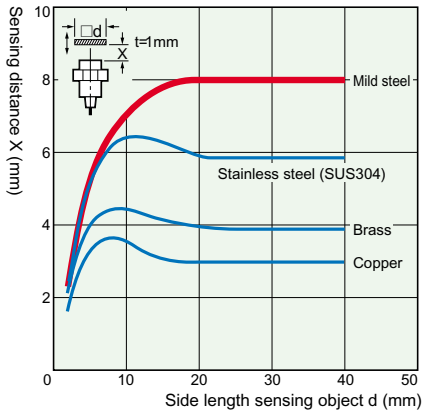
E2EM-X2□□(-M1)



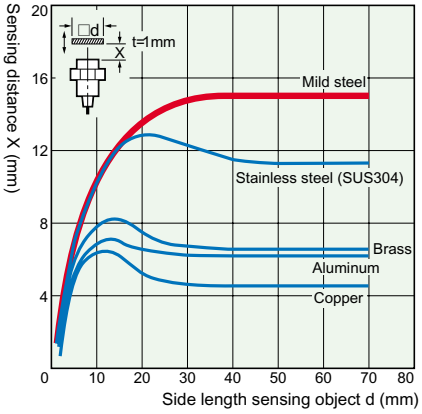
E2EM-X4□□(-M1)



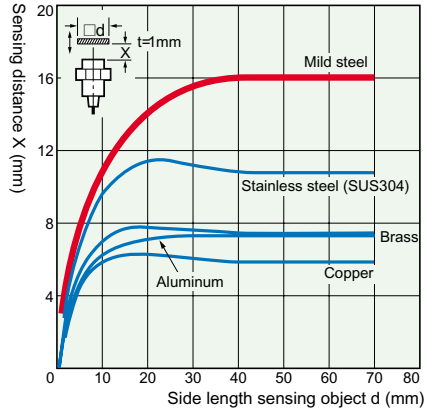
E2EM-X8□□(-M1)



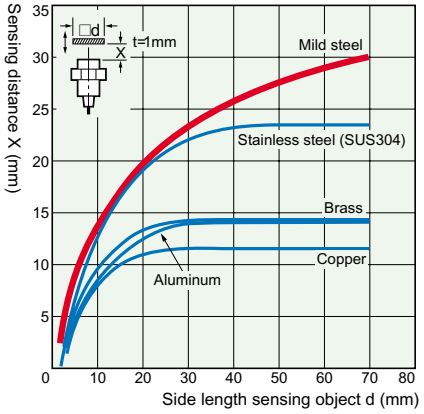
E2EM-X15□□(-M1)



E2EM-X16MX□

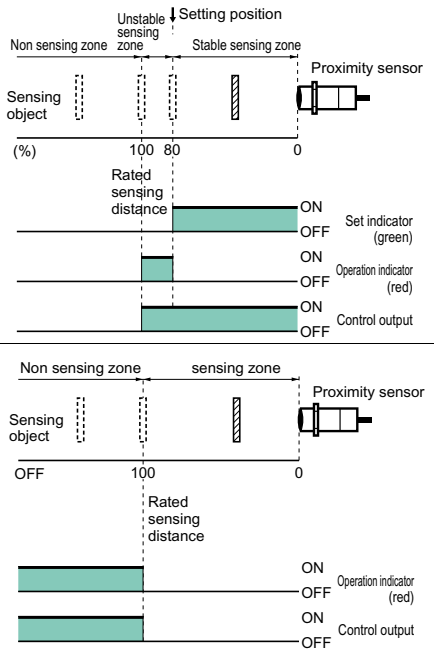
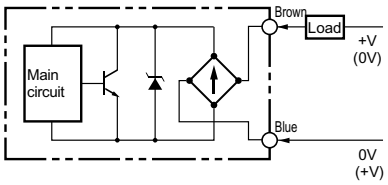


E2EM-X30MX□



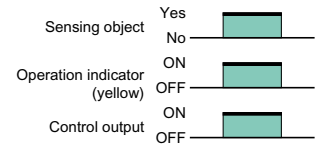
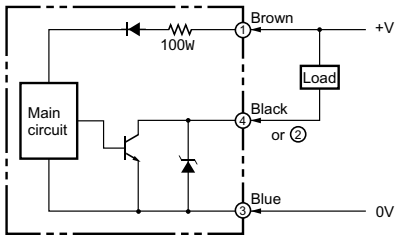
Output Circuit Diagram

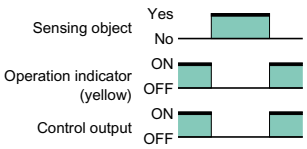
DC 2-wire Models (E2EM-X□X□)

<table>
<tr><th>Operating status</th><th>Model</th><th>Timing chart</th><th>Output circuit</th></tr>
<tr><td>NO</td><td>E2EM-X4X1
E2EM-X8X1
E2EM-X15X1
E2EM-X16MX1
E2EM-X30MX1</td><td rowspan="2"> 
</td><td rowspan="2"> 

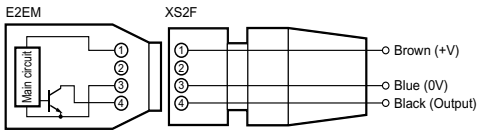
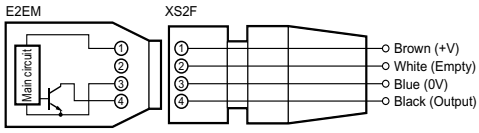
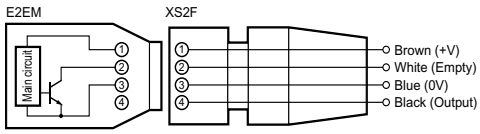
Note:
1. The load can be connected to either +V or 0 V line.
2. Since there is no polarity, there is no need to pay attention to the brown or blue polarity.</td></tr>
<tr><td>NC</td><td>E2EM-X4X2
E2EM-X8X2
E2EM-X15X2
E2EM-X16MX2
E2EM-X30MX2</td></tr>
</table>

DC 3-wire Models [E2EM-X□B□/C□(-M1)]

<table>
<tr><th>Operating status</th><th>Output specifi-cations</th><th>Model</th><th>Timing chart</th><th>Output circuit</th></tr>
<tr><td>NO</td><td rowspan="2">NPN open collector output</td><td>E2EM-X2C1(-M1)
E2EM-X4C1(-M1)
E2EM-X8C1(-M1)
E2EM-X15C1(-M1)</td><td> 
</td><td rowspan="2"> 

Note:
Pin 4 is NO and pin 2 is NC.</td></tr>
<tr><td>NC</td><td>E2EM-X2C2
E2EM-X4C2
E2EM-X8C2
E2EM-X15C2</td><td> 
</td></tr>
</table>

Connection with a sensor I/O connector

Proximity Sensors			Sensor I/O Connectors	Connection
Type	Operating status	Model		
DC 3-wire	NO	E2EM-X□C1-M1	1: Straight typ 2: L type XS2F-D42□-□C0-A D: 2-m cabl G: 5-m cabl	
			1: Straight type 2: L type XS2F-D42□-□80-A D: 2-m cable G: 5-m cable	
	NC	E2EM-X□C2-M1		

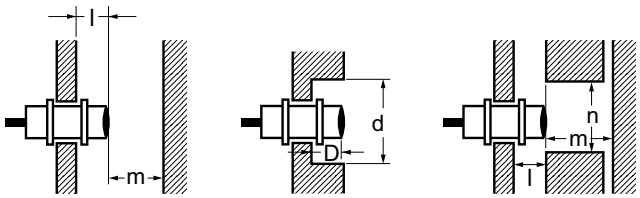
Precautions

Correct Use

Design

Effects of Surrounding Metal

Provide a minimum distance as shown in the table below between the Sensor and the surrounding metal.



Effects of Surrounding Metal (Unit: mm)

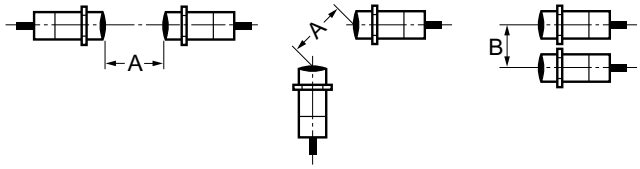
Type		Item	M8	M12	M18	M30
DC 2-wire E2EM-X□X□	Shielded	l		2.4	3.6	6
		d		18	27	45
		D	---	2.4	3.6	6
		m		12	24	45
		n		18	27	45
	Unshielded	l			25	45
		d			70	120
		D	---	---	25	45
		m			48	90
		n			70	120
DC 3-wire E2EM-X□C□	Shielded	l	0	2.4	3.6	6
		d	8	18	27	45
		D	0	2.4	3.6	6
		m	4.5	12	24	45
		n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

AND/OR Connection

When using the product in an AND/OR circuit, the product may not function properly due to incorrect pulses or leakage currents. Therefore, confirm that no problems will occur before actually using the product in such a circuit.

Mutual Interference

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



Mutual Interference (Unit: mm)

Type		Item	M8	M12	M18	M30
DC 2-wire E2EM-X□X□	Shielded	A		30	60	110
		B	---	20	35	90
	Unshielded	A		---	200	350
		B			120	300
DC 3-wire E2EM-X□C	Shielded	A	20	30	60	110
		B	15	20	35	90

About a connection check with a DC 2-wire proximity sensor and PLC (programmable logic controller)

(Required conditions)

Connection to 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.
3. The ON current of the PLC and the control output (IOUT) of the Proximity Sensor must satisfy the following.
   The ON current of the PLC will vary, however, with the power supply voltage and the input impedance used as shown in the following equation.
   ION=(VCC-VR-VPC)/RIN

VON: PLC ON voltage (14.4V)
ION: PLC ON current (typ.7mA)
IOFF: PLC OFF current (1.3mA)
RIN: PLC input impedance (3kΩ)
VPC: PLC internal remains voltage (4V)
VR: Output residual voltage the Proximity Sensor (5 V)
Ileak : Leakage current of Proximity Sensor (0.8 mA)
IOUT: Proximity sensors control output (3 to 100 mA)
VCC: Power supply voltage (PLC: 20.4 to 26.4 V)

Values in parentheses: The numerical value in the following form
PLC: C200H-ID212
Sensor: E2EM-X8X1

(A connectable example)

PLC: C200H-ID212, Sensor: E2EM-X8X1, Power supply voltage: 24 V

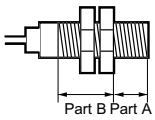
1. VON (14.4 V) ≤ VCC (20.4 V) - VR (5 V) = 15.4 V: OK
2. IOFF(1.3mA)≥Ileak (0.8mA): OK
3. ION[VCC (20.4 V) - VR (5 V) - VPC (4 V)]/RIN (3 kΩ)≈3.8 mA
   Therefor, It becomes of the following.

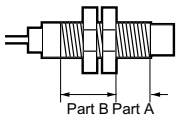
Mounting

Mounting

Do not tighten the nut with excessive force.

A washer must be used with the nut.



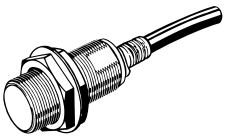


Note: 1. The table below shows the tightening torques for part A and part B nuts. In the previous examples, the nut is on the sensor head side (part B) and hence the tightening torque for part B applies. If this nut is in part A, the tightening torque for part A applies instead.
2. Following table bolting permission intensity shows the value at the time of using a washer.

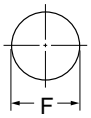
Type / Torque		Part A		Part B
		Length (mm)	Torque	Torque
M8	Shielded	9	9 N•m	12 N•m
M12		30 N•m		
M18		70 N•m		
M30		180 N•m		

Dimensions (Unit: mm)

Pre-wired Models (Shielded)



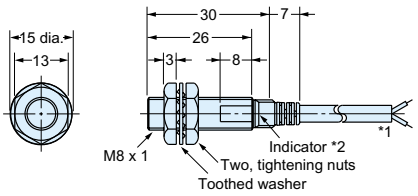
Mounting Holes



Outer diameter	M8	M12	M18	M30
F (mm)	8.5-mm $^{+0.5}_{0}$	12.5-mm $^{+0.5}_{0}$	18.5-mm $^{+0.5}_{0}$	30.5-mm $^{+0.5}_{0}$

E2EM-X2C□

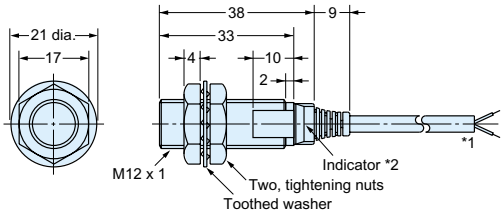
CAD file: E2E_26



*1: Vinyl-insulated round cable (2 cores/3 cores), 4 dia. (60/0.08 dia.)
Standard length: 2 m
Cable length (in single metal conduit): 200 m max.
*2: Operation indicator: yellow

E2EM-X4□□

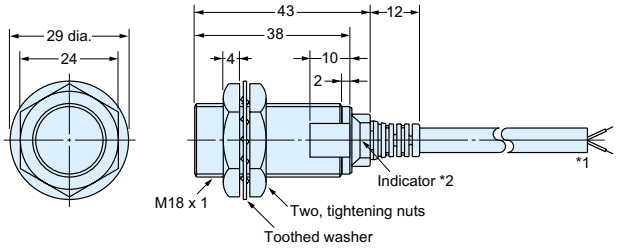
CAD file: E2EM_03



*1: Vinyl-insulated round cable (2 cores/3 cores9, 4 dia.
Conductor cross-section: 0.3 mm²/insulator diameter: 1.3 mm
Standard length: 2 m
*2: X1 models: Operation indicator: red, set indicator: green
X2 models: Operation indicator: red
B/C models: Operation indicator: yellow

E2EM-X8□□

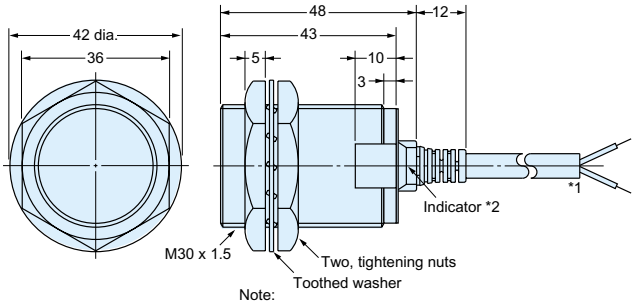
CAD file: E2EM_01



Note:
*1: Vinyl-insulated round cable (2 cores/3 cores), 6 dia.
Conductor cross-section: 0.5 mm²/insulator diameter: 1.9 mm
Standard length: 2 m
*2: X1 models: Operation indicator: red, set indicator: green
X2 models: Operation indicator: red
B/C models: Operation indicator: yellow

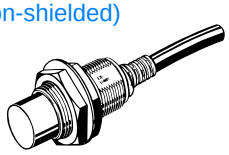
E2EM-X15□□

CAD file: E2EM_05

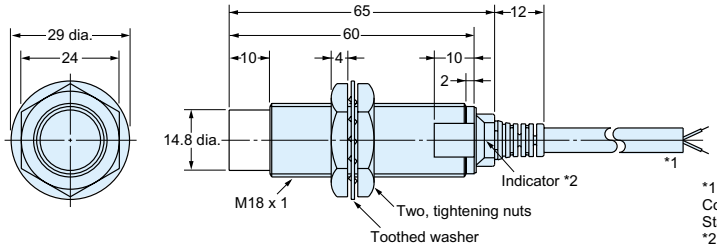


Note:
*1: Vinyl-insulated round cable (2 cores/3 cores), 6 dia.
Conductor cross-section: 0.5 mm²/insulator diameter: 1.9 mm
Standard length: 2 m
*2: X1 models: Operation indicator: red, set indicator: green
X2 models: Operation indicator: red
B/C models: Operation indicator: yellow

Pre-wired Models (Non-shielded)



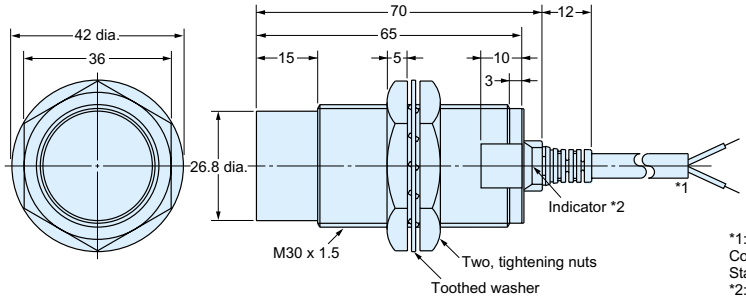
E2EM-X16MX□



*1: Vinyl-insulated round cable (2 cores), 6 dia.
Conductor cross-section: 0.5 mm²/insulator diameter: 1.9 mm
Standard length: 2m
*2: X1 models: Operation indicator: red, set indicator: green
X2 models: Operation indicator: red

CAD file: E2EM_08

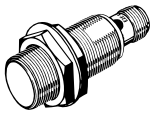
E2EM-X30MX□



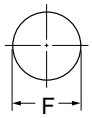
*1: Vinyl-insulated round cable (2 cores), 6 dia.
Conductor cross-section: 0.5 mm²/insulator diameter: 1.9 mm
Standard length: 2m
*2: X1 models: Operation indicator: red, set indicator: green
X2 models: Operation indicator: red

CAD file E2EM_06

Connector Models (Shielded)



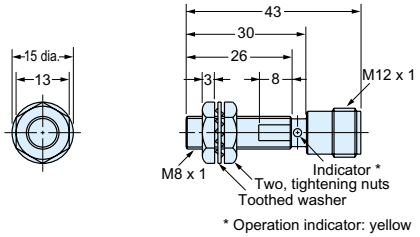
Mounting Holes



Outer diameter	M8	M12	M18	M30
F (mm)	8.5-mm dia. $^{+0.5}_{0}$	12.5-mm dia. $^{+0.5}_{0}$	18.5-mm dia. $^{+0.5}_{0}$	30.5-mm dia. $^{+0.5}_{0}$

E2EM-X2C□-M1

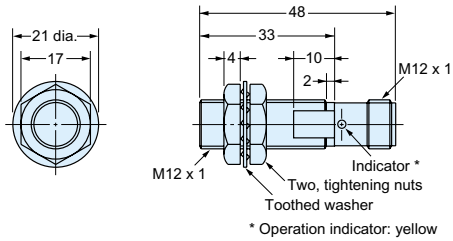
CAD file E2E_27



* Operation indicator: yellow

E2EM-X4C□-M1

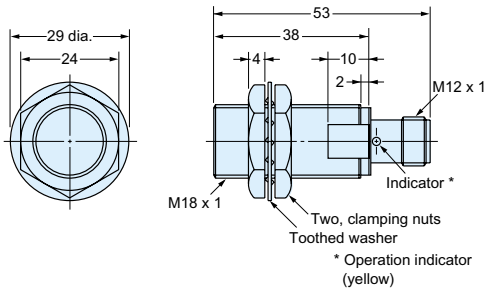
CAD file E2EM_04



* Operation indicator: yellow

E2EM-X8C□-M1

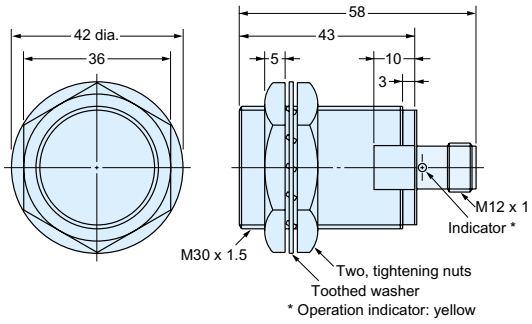
CAD file E2EM_02



* Operation indicator (yellow)

E2EM-X15C□-M1

CAD file E2EM_07



* Operation indicator: yellow