E2ER/E2ERZ

Reduce Failures From Cutting Oil Ingress

- Fluororesin cable withstands cutting oil
- Sealing method eliminates gaps at cable joints
- Resin filling blocks ingress
- IP67G* degree of protection (JIS C 0920 Annex 1)

Refer to *Safety Precautions* on page 22.

* The IP67G is the degree of protection defined according to JIS (Japanese Industrial Standards).
The IP67 indicates the same level of protection as defined by IEC, and the G indicates resistance to oil.

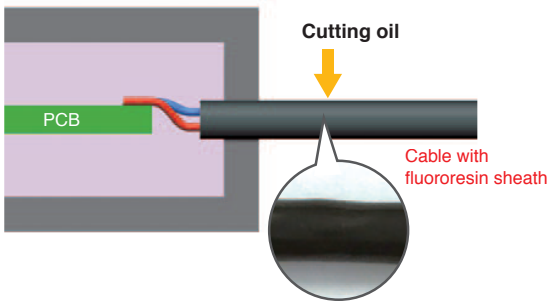
For the most recent information on models certified for safety standards, refer to your OMRON website.

Features

Fluororesin cable sheaths provide strong resistance to oil

Fluororesin Sheath

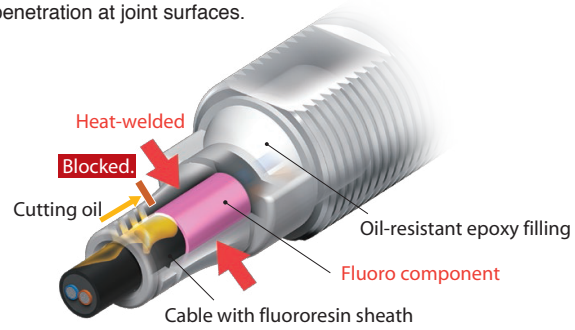
Over time, exposure to both water-soluble and water-insoluble oils causes PVC, PUR and polyethylene cable sheaths to harden and crack - allowing oil to seep through multiple entry paths, eventually destroying circuits or blocking light levels.



Patent Pending Heat-Sealing Method

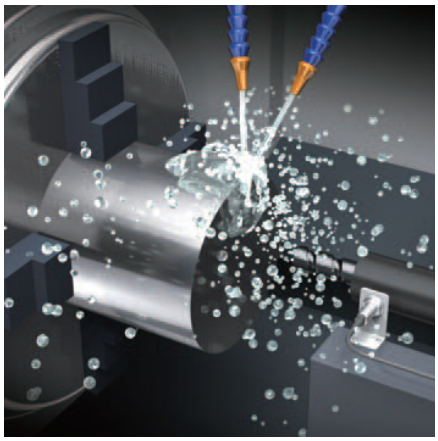
Heat-welding Sealing

By heat-welding a fluororesin cable with a fluoro component - which has high bondability and a melting point close to that of the cable itself - our patent pending sealing method blocks cutting oil from penetration at joint surfaces.

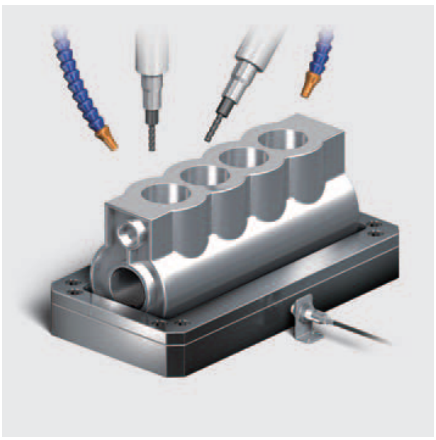


Applications

Detection of Cylinders



Detection of Cutting Workpieces



Ordering Information

Sensors

Standard Proximity Sensors [Refer to *Dimensions* on page 25.]

Appearance		Sensing distance	Connection method	Cable specifications	Model	
					Operation mode: NO	Operation mode: NC
Shielded 	M8	2 mm	Pre-wired Models (2 m)	Fluororesin	**E2ER-X2D1 2M** *	**E2ER-X2D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ER-X2D1-M1TGJ 0.3M**	**E2ER-X2D2-M1TGJ 0.3M**
	M12	3 mm	Pre-wired Models (2 m)		**E2ER-X3D1 2M** *	**E2ER-X3D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ER-X3D1-M1TGJ 0.3M**	**E2ER-X3D2-M1TGJ 0.3M**
	M18	7 mm	Pre-wired Models (2 m)		**E2ER-X7D1 2M** *	**E2ER-X7D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ER-X7D1-M1TGJ 0.3M**	**E2ER-X7D2-M1TGJ 0.3M**
	M30	10 mm	Pre-wired Models (2 m)		**E2ER-X10D1 2M** *	**E2ER-X10D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ER-X10D1-M1TGJ 0.3M**	**E2ER-X10D2-M1TGJ 0.3M**

* Models with 5-m cable length are also available with "5M" suffix. (Example: E2ER-X2D1 5M)

Chip-immune Proximity Sensors [Refer to *Dimensions* on page 25.]

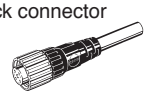
Appearance		Sensing distance	Connection method	Cable specifications	Model	
					Operation mode: NO	Operation mode: NC
Shielded 	M12	2 mm	Pre-wired Models (2 m)	Fluororesin	**E2ERZ-X2D1 2M** *	**E2ERZ-X2D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ERZ-X2D1-M1TGJ 0.3M**	**E2ERZ-X2D2-M1TGJ 0.3M**
	M18	4 mm	Pre-wired Models (2 m)		**E2ERZ-X4D1 2M** *	**E2ERZ-X4D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ERZ-X4D1-M1TGJ 0.3M**	**E2ERZ-X4D2-M1TGJ 0.3M**
	M30	8 mm	Pre-wired Models (2 m)		**E2ERZ-X8D1 2M** *	**E2ERZ-X8D2 2M** *
			M12 Pre-wired Smartclick Connector Models (0.3 m)		**E2ERZ-X8D1-M1TGJ 0.3M**	**E2ERZ-X8D2-M1TGJ 0.3M**

* Models with 5-m cable length are also available with "5M" suffix. (Example: E2ERZ-X2D1 5M)

Accessories (Sold Separately)

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

(Models for Pre-wired Connectors) A Sensor I/O Connector is not provided with the Sensor. It must be ordered separately as required.

Appearance	Cable diameter (mm)	Cable length	Sensor I/O Connector model number	Applicable Proximity Sensor model number
Straight, Smartclick connector 	4 dia.	2 m	**XS5FR-D423-D80-RB1**	E2ER-X□D□-M1TGJ E2ERZ-X□D□-M1TGJ
		5 m	**XS5FR-D423-G80-RB1**	
		10 m	**XS5FR-D423-J80-RB1**	

Note: Refer to the XS5□R on page 41 for connector details and for information on cables with connectors on both ends.

Ratings and Specifications

Standard Proximity Sensors

Item	Size	M8	M12	M18	M30
	Shielded	Shielded			
	Model	E2ER-X2D□	E2ER-X3D□	E2ER-X7D□	E2ER-X10D□
Sensing distance		2 mm ±10%	3 mm ±10%	7 mm ±10%	10 mm ±10%
Set distance *1		0 to 1.6 mm	0 to 2.4 mm	0 to 5.6 mm	0 to 8 mm
Differential travel		15% max. of sensing distance	10% max. of sensing distance		
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 19.)			
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 *2		1.5 kHz	1 kHz	0.5 kHz	0.4 kHz
Power supply voltage		10 to 30 VDC, (including 10% ripple (p-p))			
Leakage current		0.8 mA max.			
Control output	Load current	3 to 100 mA			
	Residual voltage	3 V max. (Load current: 100 mA, Cable length: 2 m)			
Indicators		D1 Models: Operation indicator (red), Setting indicator (green) D2 Models: Operation indicator (red)			
Operation mode (with sensing object approaching)		D1 Models: NO D2 Models: NC Refer to the timing charts under *I/O Circuit Diagrams* on page 21 for details.			
Protection circuits		Surge suppressor, Load short-circuit protection			
Ambient temperature range		Operating: –25 to 70°C, Storage: –40 to 85°C (with no icing or condensation)			
Ambient humidity range		Operating and Storage: 35% to 95% (with no condensation)			
Temperature influence		±15% max. of sensing distance at 23°C in the temperature range of –25 to 70°C	±10% max. of sensing distance at 23°C in the temperature range of –25 to 70°C		
Voltage influence		±1% max. of sensing distance at rated voltage in the rated voltage ±15% range			
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case			
Dielectric strength		1,000 VAC, 50/60 Hz for 1 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 resistance (destruction)		500 m/s^2 10 times each in X, Y, and Z directions	1,000 m/s^2 10 times each in X, Y, and Z directions		
Degree of protection		IP67 (IEC 60529) and IP67G *3 (JIS C 0920 Annex 1) Passed OMRON's Oil-resistant Component Evaluation Standards *4 (Cutting oil type: specified in JIS K 2241:2000, Temperature: 35 °C max.)			
Connection method		Pre-wired Models (Standard cable length: 2 m) and Pre-wired Connector Models (Standard cable length: 300 mm)			
Weight (packed state)	Pre-wired Models	Approx. 65 g	Approx. 75 g	Approx. 145 g	Approx. 215 g
	Pre-wired Connector Models	Approx. 30 g	Approx. 40 g	Approx. 90 g	Approx. 155 g
Materi-als	Case	Stainless steel (SUS303)	Nickel-plated brass		
	Sensing surface	Polybutylene terephthalate (PBT)			
	Clamping nuts	Nickel-plated brass			
	Toothed washer	Zinc-plated iron			
Accessories		Instruction manual			

*1. Use the Sensor within the range in which the setting indicator (green LED) is ON (except D2 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 IP67G is the degree of protection which is defined according to the JIS (Japanese Industrial Standards).
The IP67 indicates the same level of protection as defined by the IEC, and the G indicates that a device has resistance to oil.
*4. The Oil-resistant Component Evaluation Standards are OMRON's own durability evaluation standards.
The Pre-wired Connector Model meets the degree of protection when it is correctly connected with an XS5□R Oil-resistant Connector.
The degree of protection is not satisfied with the part where there is no XS5FR Oil-resistant Connector connected and cable wires are uncovered.
And as for the Pre-wired Models, the degree of protection is not satisfied with the part where cable wires are uncovered.

Chip-immune Proximity Sensors

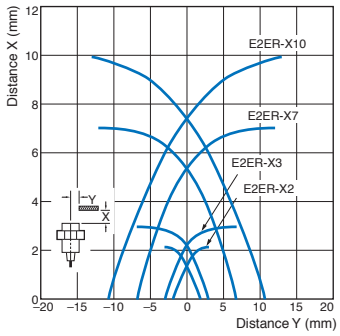
Item	Size	M12	M18	M30
	Shielded	Shielded		
	Model	E2ERZ-X2D□	E2ERZ-X4D□	E2ERZ-X8D□
Sensing distance		2 mm ±10%	4 mm ±10%	8 mm ±10%
Set distance *1		0 to 1.6 mm	0 to 3.2 mm	0 to 6.4 mm
Differential travel		20% max. of sensing distance		
Detectable object		Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 19.)		
Standard sensing object		Iron, 12 × 12 × 1 mm	Iron, 30 × 30 × 1 mm	Iron, 54 × 54 × 1 mm
Response frequency *2		200 Hz	100 Hz	30 Hz
Power supply voltage		10 to 30 VDC, (including 10% ripple (p-p))		
Leakage current		0.8 mA max.		
Control output	Load current	3 to 100 mA		
	Residual voltage	3 V max. (Load current: 100 mA, Cable length: 2 m)		
Indicators		D1 Models: Operation indicator (red), Setting indicator (green) D2 Models: Operation indicator (red)		
Operation mode (with sensing object approaching)		D1 Models: NO D2 Models: NC Refer to the timing charts under *I/O Circuit Diagrams* on page 21 for details.		
Protection circuits		Surge suppressor, Load short-circuit protection		
Ambient temperature range		Operating and Storage: 0 to 50°C (with no icing or condensation)		
Ambient humidity range		Operating and Storage: 35% to 95% (with no condensation)		
Temperature influence		±20% max. of sensing distance at 23°C in the temperature range of 0 to 50°C		
Voltage influence		±2.5% max. of sensing distance at rated voltage in the rated voltage ±10% range		
Insulation resistance		50 MΩ min. (at 500 VDC) between current-carrying parts and case		
Dielectric strength		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 resistance (destruction)		1,000 m/s^2 10 times each in X, Y, and Z directions		
Degree of protection		IP67 (IEC 60529) and IP67G *3 (JIS C 0920 Annex 1) Passed OMRON's Oil-resistant Component Evaluation Standards *4 (Cutting oil type: specified in JIS K 2241:2000, Temperature: 35 °C max.)		
Connection method		Pre-wired Models (Standard cable length: 2 m) and Pre-wired Connector Models (Standard cable length: 300 mm)		
Weight (packed state)	Pre-wired Models	Approx. 75 g	Approx. 145 g	Approx. 215 g
	Pre-wired Connector Models	Approx. 40 g	Approx. 90 g	Approx. 155 g
Materials	Case	Nickel-plated brass		
	Sensing surface	Polybutylene terephthalate (PBT)		
	Clamping nuts	Zinc-plated iron		
	Toothed washer	Zinc-plated iron		
Accessories		Instruction manual		

*1. Use the Sensor within the range in which the setting indicator (green LED) is ON (except D2 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 IP67G is the degree of protection which is defined according to the JIS (Japanese Industrial Standards).
The IP67 indicates the same level of protection as defined by the IEC, and the G indicates that a device has resistance to oil.
*4. The Oil-resistant Component Evaluation Standards are OMRON's own durability evaluation standards.
The Pre-wired Connector Model meets the degree of protection when it is correctly connected with an XS5□R Oil-resistant Connector.
The degree of protection is not satisfied with the part where there is no XS5FR Oil-resistant Connector connected and cable wires are uncovered.
And as for the Pre-wired Models, the degree of protection is not satisfied with the part where cable wires are uncovered.

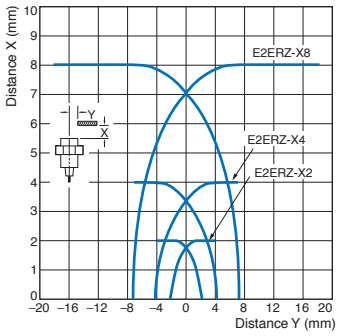
Engineering Data (Reference Value)

Sensing Area

Standard Proximity Sensors
E2ER-X□D□

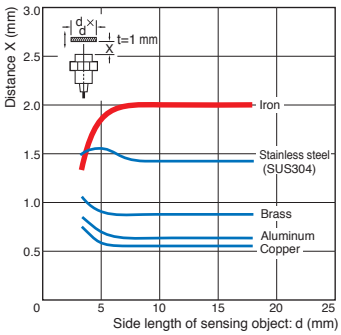


Chip-immune Proximity Sensors
E2ERZ-X□D□

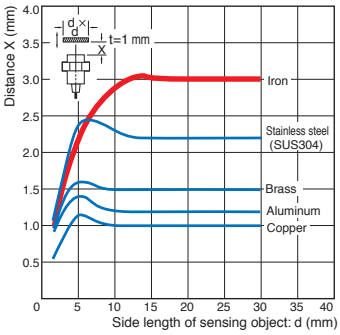


Influence of Sensing Object Size and Material

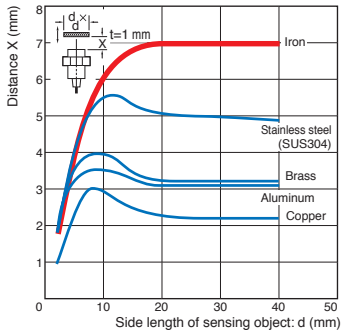
Standard Proximity Sensors
E2ER-X2



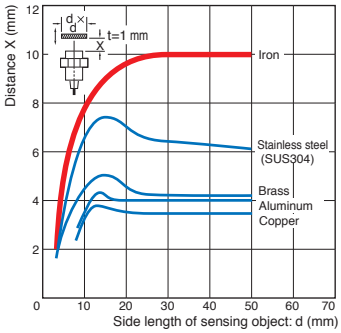
E2ER-X3



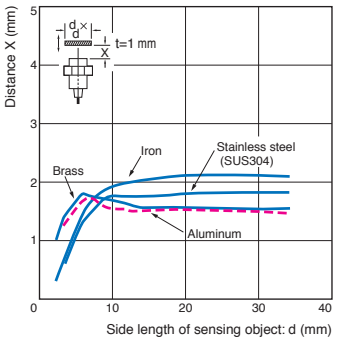
E2ER-X7



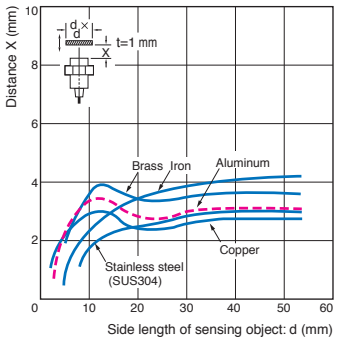
E2ER-X10



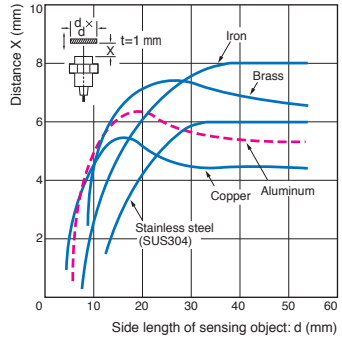
Chip-immune Proximity Sensors
E2ERZ-X2



E2ERZ-X4

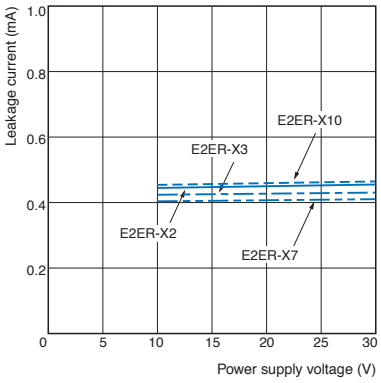


E2ERZ-X8

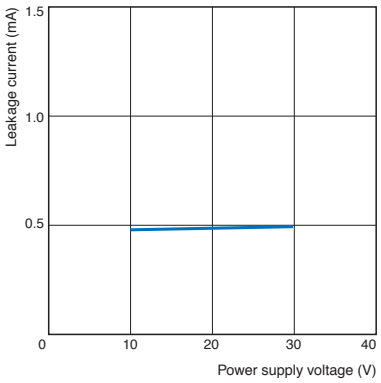


Leakage Current

Standard Proximity Sensors
E2ER-X□D□

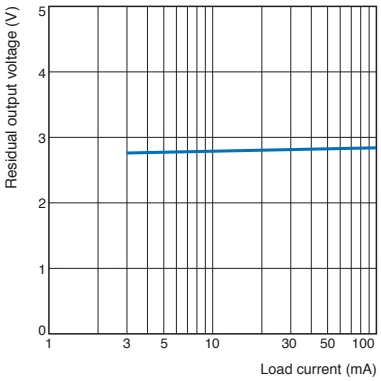


Chip-immune Proximity Sensors
E2ERZ-X□D□

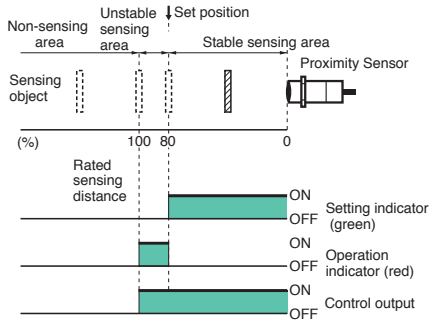
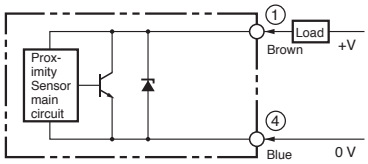
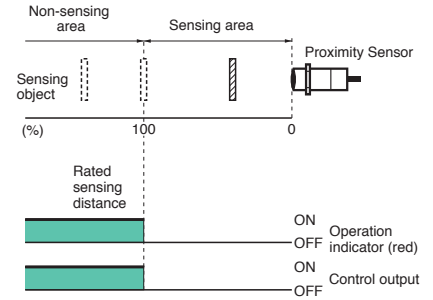
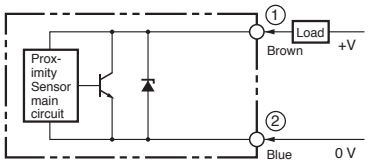


Residual Output Voltage

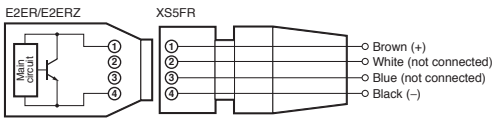
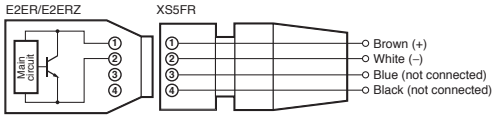
Standard Proximity Sensors / Chip-immune Proximity Sensors



I/O Circuit Diagrams

Operation mode	Model	Timing Chart	Output circuit
NO	E2ER-X□D1 E2ER-X□D1 -M1TGJ E2ERZ-X□D1 E2ERZ-X□D1 -M1TGJ		 Note: The load can be connected to either the +V or 0 V side. **Connector Pin Arrangement**  Note: Pins 2 and 3 are not used.
NC	E2ER-X□D2 E2ER-X□D2 -M1TGJ E2ERZ-X□D2 E2ERZ-X□D2 -M1TGJ		 Note: The load can be connected to either the +V or 0 V side. **Connector Pin Arrangement**  Note: Pins 3 and 4 are not used.

Connections to Sensor I/O Connectors

Proximity Sensor			Sensor I/O Connector model number	Connections
Type	Operation mode	Model		
DC 2-wire (Smartclick)	NO	E2ER-X□D1 -M1TGJ E2ERZ-X□D1 -M1TGJ	**XS5FR-D423-□80-RB1** D: 2-m cable G: 5-m cable J : 10-m cable	
	NC	E2ER-X□D2 -M1TGJ E2ERZ-X□D2 -M1TGJ	**XS5FR-D423-□80-RB1** D: 2-m cable G: 5-m cable J : 10-m cable	

Note: Different from Proximity Sensor wire colors.

Safety Precautions

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

Warning Indications

⚠ WARNING	**Warning level** Indicates a potentially hazardous situation which, if not avoided, will result in minor or moderate injury, or may result in serious injury or death. Additionally there may be significant property damage.
Precautions for Safe Use	Supplementary comments on what to do or avoid doing, to use the product safely.
Precautions for Correct Use	Supplementary comments on what to do or avoid doing, to prevent failure to operate, malfunction or undesirable effect on product performance.

Meaning of Product Safety Symbols

	**General prohibition** Indicates the instructions of unspecified prohibited action.
	**Caution, explosion** Indicates the possibility of explosion under specific conditions.

⚠ WARNING

This product is not designed or rated for ensuring safety of persons either directly or indirectly.
Do not use it for such purposes.

Risk of explosion.
Do not connect sensor to AC power supply.

Precautions for Safe Use

The following precautions must be observed to ensure safe operation.

(1) Do not use the product in an environment where flammable or explosive gas is present.
(2) Do not attempt to disassemble, repair, or modify the product.
(3) Power Supply Voltage
Do not use a voltage that exceeds the rated operating voltage range. Applying a voltage that is higher than the operating voltage range may result in damage or burnout.
(4) Incorrect Wiring
Be sure that the power supply polarity and other wiring is correct. Incorrect wiring may cause explosion or burnout.
(5) Connection without a Load
If the power supply is connected directly without a load, the internal elements may explode or burn. Be sure to insert a load when connecting the power supply.
(6) Protective structure
Do not use the product with degrade protective structure such as swelling and crack in housing and/or sealing components. Otherwise cutting oil or other substance may enter the product. resulting in a risk of corruption or burning.
(7) Dispose of this product as industrial waste.

Precautions for Correct Use

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

● Operating Environment

(1) Do not install the product in the following locations.
Doing so may result in product failure or malfunction.
1. Outdoor locations directly subject to sunlight, rain, snow, water droplets, or oil.
2. Locations subject to atmospheres with chemical vapors, in particular solvents and acids.
3. Locations subject to corrosive gases.

(2) The Sensor may malfunction if used near ultrasonic cleaning equipment, high-frequency equipment, transceivers, cellular phones, inverters, or other devices that generate a high-frequency electric field. Please refer to the Precautions for Correct Use on the OMRON website (www.ia.omron.com) for typical measures.

(3) Laying the Proximity Sensor wiring in the same conduit or duct as high-voltage wires or power lines may result in incorrect operation and damage due to induction. Wire the Sensor using a separate conduit or independent conduit.

(4) Never use thinner or other solvents. Otherwise, the Sensor surface may be dissolved.

(5) The following conditions shall be observed if you use the product under an environment using cutting oil that may affect product's life and/or performance.
- Usage under the cutting oil condition designated by the specification
- Usage under the cutting oil dilution ratio recommended by its manufacturer
- Usage in oil or water is prohibited

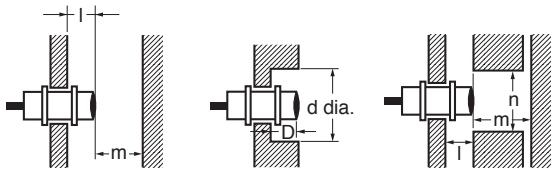
Impact on the product life may differ depending on the oil you use. Before using the cutting oil, make sure that it should not cause deterioration or degradation of sealing components.

(6) Connecting Connectors
- The E2ER/E2ERZ can be used in conditions of cutting oil use described in the specifications.
The oil resistance may not be ensured when the products are not mated to XS5□R Connectors, so use the products correctly.
- When mating the products to XS2 or other M12 Connectors, tighten the lock to a torque of 0.39 to 0.49 N·m.

● 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.

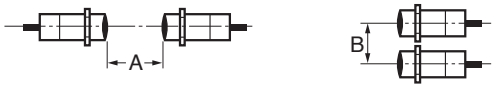


Influence of Surrounding Metal (Unit: mm)

Model	Item / Embedded material	l	d	D	m	n
E2ER-X2D□ E2ER-X2D□-M1TGJ	–	0	8	0	4.5	12
E2ER-X3D□ E2ER-X3D□-M1TGJ	–	0	12	0	8	18
E2ER-X7D□ E2ER-X7D□-M1TGJ	–	0	18	0	20	27
E2ER-X10D□ E2ER-X10D□-M1TGJ	–	0	30	0	40	45
E2ERZ-X2D□ E2ERZ-X2D□-M1TGJ	Iron	0	12	0	8	18
	Aluminum	2	25	2		36
E2ERZ-X4D□ E2ERZ-X4D□-M1TGJ	Iron	0	18	0	16	27
	Aluminum	5	40	5		54
E2ERZ-X8D□ E2ERZ-X8D□-M1TGJ	Iron	0	30	0	32	45
	Aluminum	10	70	10		90

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
E2ER-X2D□ E2ER-X2D□-M1TGJ	20	15
E2ER-X3D□ E2ER-X3D□-M1TGJ	30	20
E2ER-X7D□ E2ER-X7D□-M1TGJ	50	35
E2ER-X10D□ E2ER-X10D□-M1TGJ	100	70
E2ERZ-X2D□ E2ERZ-X2D□-M1TGJ	30	20
E2ERZ-X4D□ E2ERZ-X4D□-M1TGJ	40	50
E2ERZ-X8D□ E2ERZ-X8D□-M1TGJ	60	100

Aluminum and Iron Cuttings (Only for Chip-immune Proximity Sensors)

Normally aluminum or iron cuttings will not be detected even if they adhere to or accumulate on the sensing surface.
Detection signals may be output for the following:
If this occurs, remove the cuttings from the sensing surface.

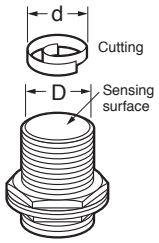
1. Relationship between the Size of the Cutting (d) and the Size of the Sensing Surface (D)

Cuttings of the size d ≥ $\frac{2}{3}$D on the sensing surface *

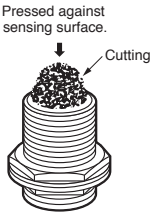
(Unit: mm)

Model Size	D
E2ERZ-X2D□	10 *
E2ERZ-X4D□	16
E2ERZ-X8D□	28

* E2ERZ-X2D□: d ≥ $\frac{1}{3}$D on the sensing surface.



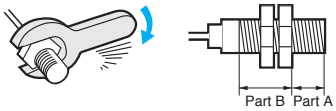
2. Cuttings Pressed against the Sensing Surface



● 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.

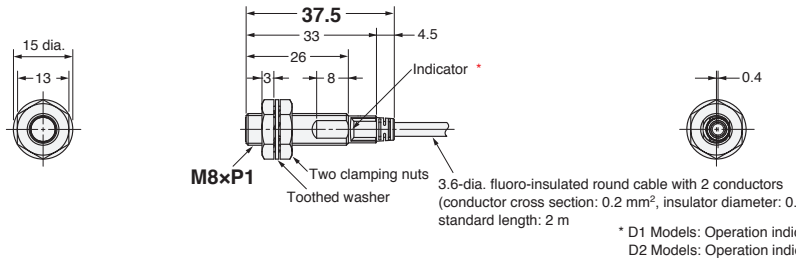
Type	Part A		Part B
	Dimension (mm)	Torque	Torque
M8	9	9 N·m	12 N·m
M12	30 N·m		
M18	70 N·m		
M30	180 N·m		

Dimensions

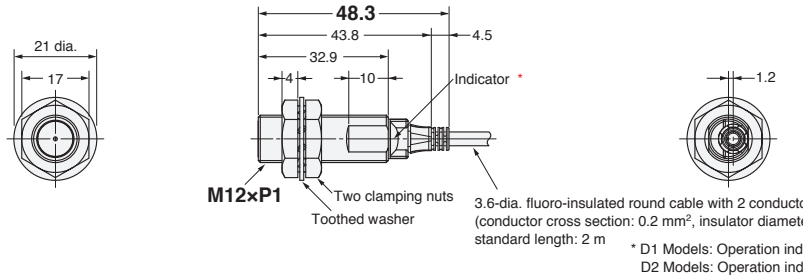
(Unit: mm)
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

Pre-wired Models

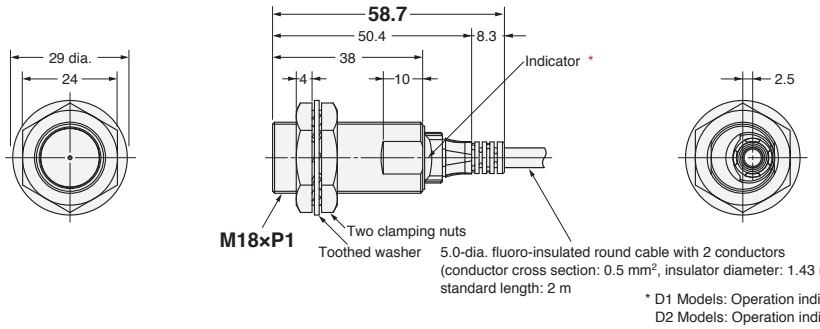
E2ER-X2D□



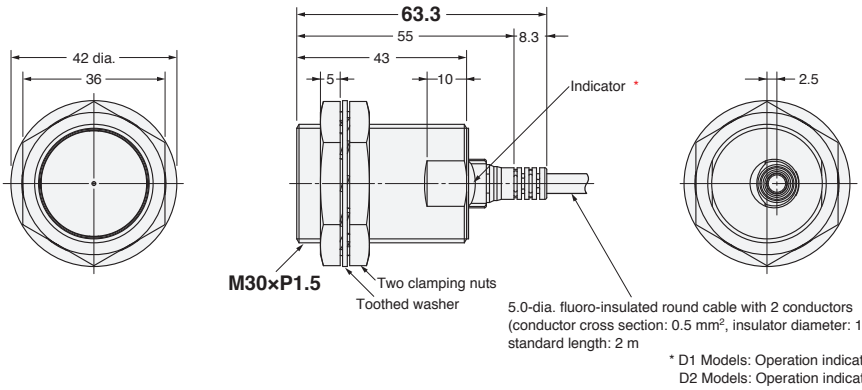
E2ER-X3D□
E2ERZ-X2D□



E2ER-X7D□
E2ERZ-X4D□



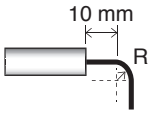
E2ER-X10D□
E2ERZ-X8D□



Mounting Hole Dimensions

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

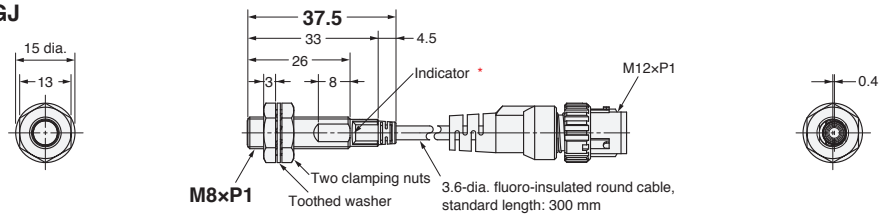
Angle R of the Bending Wire



Dimension	R (mm)
M8	22
M12	
M18	31
M30	

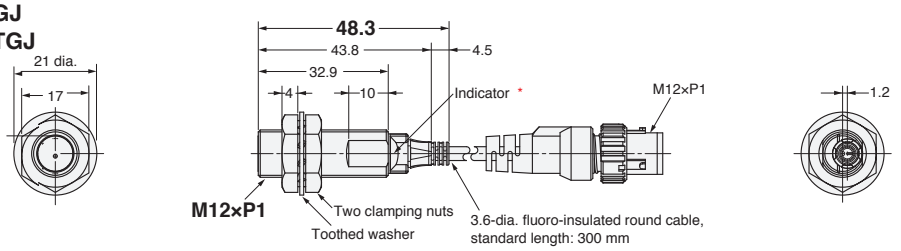
Pre-wired Connector Models

E2ER-X2D□-M1TGJ



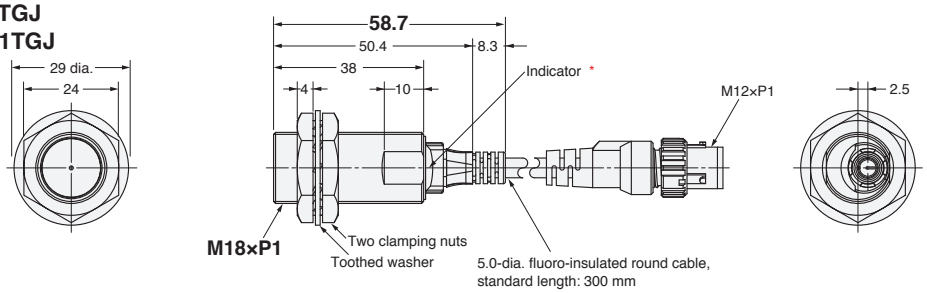
* D1 Models: Operation indicator (red), Setting indicator (green),
D2 Models: Operation indicator (red)

E2ER-X3D□-M1TGJ
E2ERZ-X2D□-M1TGJ



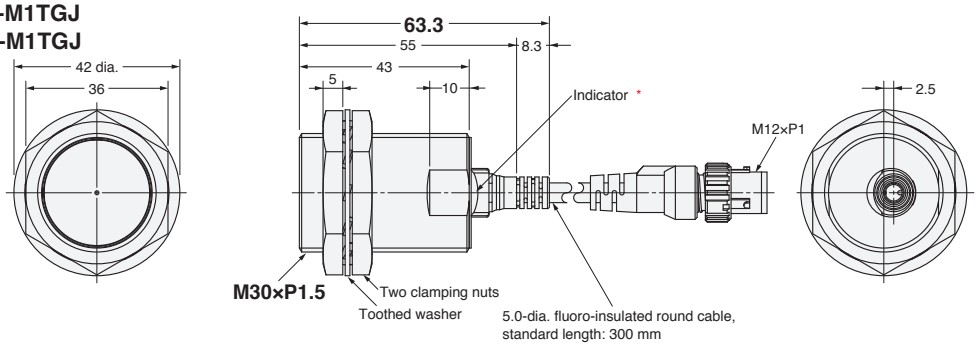
* D1 Models: Operation indicator (red), Setting indicator (green),
D2 Models: Operation indicator (red)

E2ER-X7D□-M1TGJ
E2ERZ-X4D□-M1TGJ



* D1 Models: Operation indicator (red), Setting indicator (green),
D2 Models: Operation indicator (red)

E2ER-X10D□-M1TGJ
E2ERZ-X8D□-M1TGJ

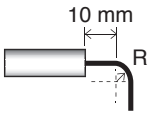


* D1 Models: Operation indicator (red), Setting indicator (green),
D2 Models: Operation indicator (red)

Mounting Hole Dimensions

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

Angle R of the Bending Wire



Dimension	R (mm)
M8	22
M12	
M18	31
M30	

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