

## Proximity Sensor with Resin Case with Superb Water Resistance

- IP68 protection.
- Mutual interference prevention with models with different frequencies is also available.



Be sure to read *Safety Precautions* on page 5.

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 6.]

| Model                                                                                           |     | Sensing distance |  | Output configuration |                | Model          |                |
|-------------------------------------------------------------------------------------------------|-----|------------------|--|----------------------|----------------|----------------|----------------|
|                                                                                                 |     |                  |  |                      |                | Operation mode |                |
|                                                                                                 |     |                  |  |                      |                | NO             | NC             |
| Shielded<br> | M8  | 1.5 mm           |  |                      | DC 3-wire, NPN | E2F-X1R5E1 2M  | E2F-X1R5E2 2M  |
|                                                                                                 |     |                  |  |                      | DC 3-wire, PNP | E2F-X1R5F1 2M  | E2F-X1R5F2 2M  |
|                                                                                                 |     |                  |  |                      | AC 2-wire      | E2F-X1R5Y1 2M  | E2F-X1R5Y2 2M  |
|                                                                                                 | M12 | 2 mm             |  |                      | DC 3-wire, NPN | E2F-X2E1 2M *  | E2F-X2E2 2M *  |
|                                                                                                 |     |                  |  |                      | DC 3-wire, PNP | E2F-X2F1 2M    | E2F-X2F2 2M    |
|                                                                                                 |     |                  |  |                      | AC 2-wire      | E2F-X2Y1 2M *  | E2F-X2Y2 2M *  |
|                                                                                                 | M18 | 5 mm             |  |                      | DC 3-wire, NPN | E2F-X5E1 2M *  | E2F-X5E2 2M *  |
|                                                                                                 |     |                  |  |                      | DC 3-wire, PNP | E2F-X5F1 2M *  | E2F-X5F2 2M    |
|                                                                                                 |     |                  |  |                      | AC 2-wire      | E2F-X5Y1 2M *  | E2F-X5Y2 2M *  |
|                                                                                                 | M30 | 10 mm            |  |                      | DC 3-wire, NPN | E2F-X10E1 2M * | E2F-X10E2 2M * |
|                                                                                                 |     |                  |  |                      | DC 3-wire, PNP | E2F-X10F1 2M   | E2F-X10F2 2M   |
|                                                                                                 |     |                  |  |                      | AC 2-wire      | E2F-X10Y1 2M * | E2F-X10Y2 2M * |

\* Models with different frequencies are also available. The model numbers are E2F-X□□□5 (e.g., E2F-X5E15).

## Accessories (Order Separately)

### Protective Covers

Refer to Y92□ for details.

## Ratings and Specifications

| Model                                               |                  | E2F-X1R5E□<br>E2F-X1R5F□<br>E2F-X1R5Y□                                                                                                                                                                                                                                                                  | E2F-X2E□<br>E2F-X2F□<br>E2F-X2Y□        | E2F-X5E□<br>E2F-X5F□<br>E2F-X5Y□                 | E2F-X10E□<br>E2F-X10F□<br>E2F-X10Y□    |
|-----------------------------------------------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------------------------------|----------------------------------------|
| Item                                                |                  |                                                                                                                                                                                                                                                                                                         |                                         |                                                  |                                        |
| Sensing distance                                    |                  | 1.5 mm ±10%                                                                                                                                                                                                                                                                                             | 2 mm ±10%                               | 5 mm ±10%                                        | 10 mm ±10%                             |
| Set distance                                        |                  | 0 to 1.2 mm                                                                                                                                                                                                                                                                                             | 0 to 1.6 mm                             | 0 to 4 mm                                        | 0 to 8 mm                              |
| Differential travel                                 |                  | 10% max. of sensing distance                                                                                                                                                                                                                                                                            |                                         |                                                  |                                        |
| Detectable object                                   |                  | Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to <i>Engineering Data</i> on page 3.)                                                                                                                                                                                      |                                         |                                                  |                                        |
| 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<br>*1                            |                  | E/F Models: 2 kHz,<br>Y Models: 25 Hz                                                                                                                                                                                                                                                                   | E/F Models: 1.5 kHz,<br>Y Models: 25 Hz | E/F Models: 600 Hz,<br>Y Models: 25 Hz           | E/F Models: 400 Hz,<br>Y Models: 25 Hz |
| Power supply voltage<br>(operating voltage range)   |                  | E/F Models: 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max.<br>Y Models: 24 to 240 VAC (20 to 264 VAC)                                                                                                                                                                                              |                                         |                                                  |                                        |
| Current consumption                                 |                  | E/F Models: 17 mA max.                                                                                                                                                                                                                                                                                  |                                         |                                                  |                                        |
| Leakage current                                     |                  | Y Models: 1.7 mA max. at 200 VAC (Refer to <i>Engineering Data</i> on page 3.)                                                                                                                                                                                                                          |                                         |                                                  |                                        |
| Control output                                      | Load current     | E/F Models: 200 mA max.<br>Y Models: 5 to 100 mA                                                                                                                                                                                                                                                        |                                         | E/F Models: 200 mA max.<br>Y Models: 5 to 300 mA |                                        |
|                                                     | Residual voltage | E/F Models: 2 V max. (Load current: 200 mA, Cable length: 2 m)<br>Y Models: Refer to <i>Engineering Data</i> on page 3.                                                                                                                                                                                 |                                         |                                                  |                                        |
| Indicators                                          |                  | E1 Models: Detection indicator (red), E2/F1/F2 Models: Operation indicator (red)<br>Y Models: Operation indicator (red)                                                                                                                                                                                 |                                         |                                                  |                                        |
| Operation mode<br>(with sensing object approaching) |                  | E1/F1/Y1 Models: NO    Refer to the timing charts under <i>I/O Circuit Diagrams</i> on page 4 for details.<br>E2/F2/Y2 Models: NC                                                                                                                                                                       |                                         |                                                  |                                        |
| Protection circuits                                 |                  | E/F Models: Reverse polarity protection, Load short-circuit protection, Surge suppressor; Y Models: None                                                                                                                                                                                                |                                         |                                                  |                                        |
| Ambient temperature range                           |                  | Operating/Storage: –25 to 70°C (with no icing or condensation)                                                                                                                                                                                                                                          |                                         |                                                  |                                        |
| Ambient humidity range                              |                  | Operating/Storage: 35% to 95%                                                                                                                                                                                                                                                                           |                                         |                                                  |                                        |
| Temperature influence                               |                  | ±10% max. of sensing distance at 23°C in the temperature range of –25 to 70°C                                                                                                                                                                                                                           |                                         |                                                  |                                        |
| Voltage influence                                   |                  | E/F Models: ±2.5% max. of sensing distance at rated voltage in rated voltage ±15% range<br>Y Models: ±1% max. of sensing distance at rated voltage in rated voltage ±10% range                                                                                                                          |                                         |                                                  |                                        |
| Insulation resistance                               |                  | 50 MΩ min. (at 500 VDC) between current-carrying parts and case                                                                                                                                                                                                                                         |                                         |                                                  |                                        |
| Dielectric strength                                 |                  | E/F Models:                    1,000 VAC, 50/60 Hz for 1 min between current-carrying parts and case<br>Y Models: (M8 Models): 2,000 VAC, 50/60 Hz for 1 min between current-carrying parts and case<br>(Other M8 Models):        4,000 VAC, 50/60 Hz for 1 min 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 <sup>2</sup> 10 times each in X, Y, and Z directions                                                                                                                                                                                                                             |                                         |                                                  |                                        |
| Degree of protection                                |                  | IEC 60529 IP68, in-house standards: oil-resistant *2                                                                                                                                                                                                                                                    |                                         |                                                  |                                        |
| Connection method                                   |                  | Pre-wired Models (Standard cable length: 2 m)                                                                                                                                                                                                                                                           |                                         |                                                  |                                        |
| Weight (packed state)                               |                  | Approx. 40 g                                                                                                                                                                                                                                                                                            | Approx. 50 g                            | Approx. 130 g                                    | Approx. 170 g                          |
| Materials                                           | Case             | Polyarylate resin                                                                                                                                                                                                                                                                                       |                                         |                                                  |                                        |
|                                                     | Sensing surface  |                                                                                                                                                                                                                                                                                                         |                                         |                                                  |                                        |
|                                                     | Clamping nuts    | Polyacetal                                                                                                                                                                                                                                                                                              |                                         |                                                  |                                        |
| Accessories                                         |                  | 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 the Sensor in environments subject to splashing cutting oil, deterioration may result due to the additives in the oil. The E2E is recommended in such environments.

### OMRON Test Method

Usage conditions: 10 m or less under water in natural conditions

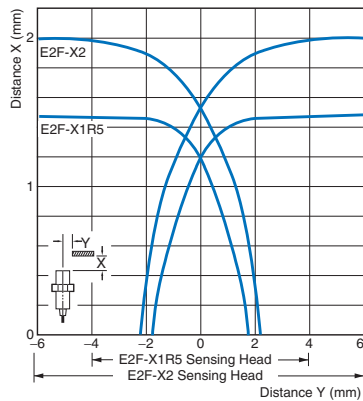
1. No water ingress after 1 hour under water at 2 atmospheres of pressure.

2. Sensing distance and insulation resistance specifications must be met after 20 repetitions of 1 hour in 0°C water and 1 hour in 70°C water.

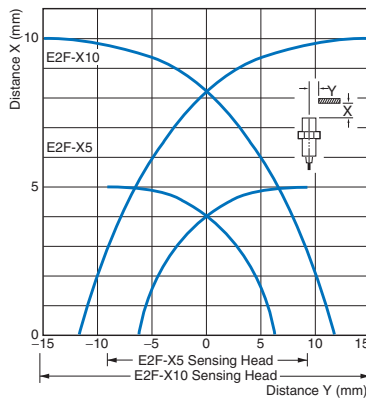
## Engineering Data (Reference Value)

### Sensing Area

#### E2F-X1R5□□/X2□□

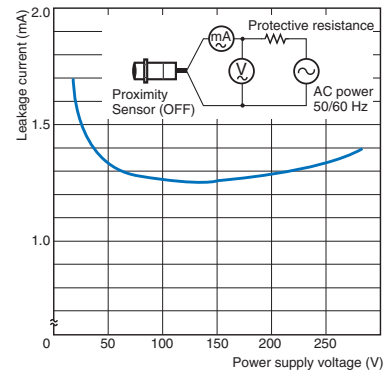


#### E2F-X5□□/X10□□



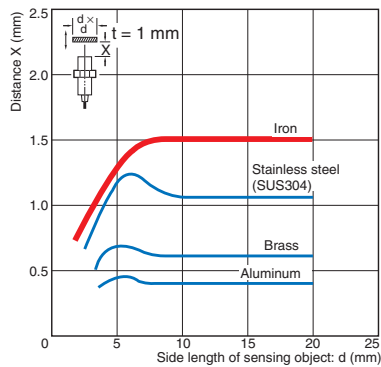
### Leakage Current

#### E2F-X□Y□

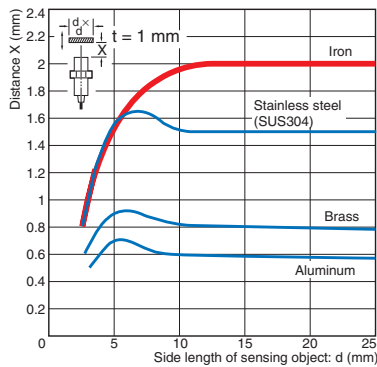


### Influence of Sensing Object Size and Material

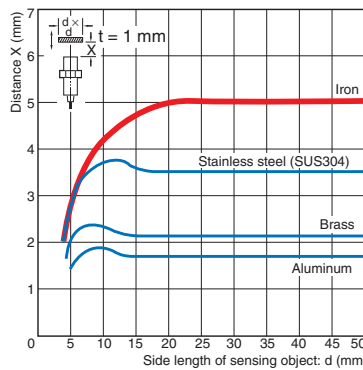
#### E2F-X1R5□□



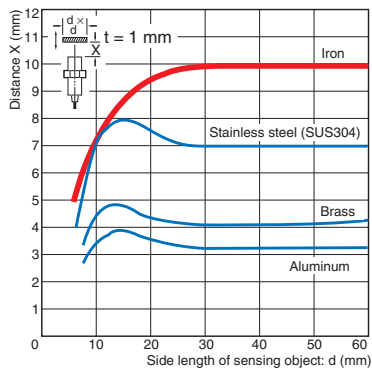
#### E2F-X2□□



#### E2F-X5□□

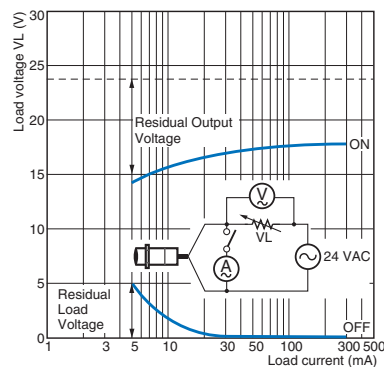


#### E2F-X10□□

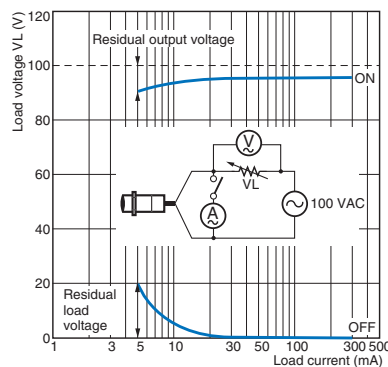


### Residual Output Voltage

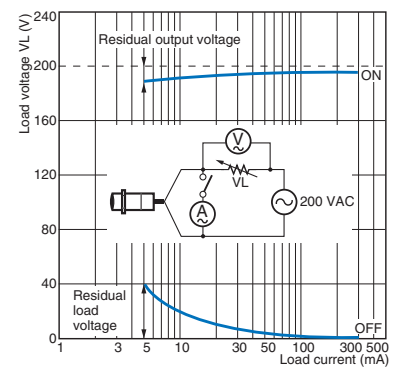
#### E2F-X□Y□ at 24 VAC



#### E2F-X□Y□ at 100 VAC



#### E2F-X□Y□ at 200 VAC



## I/O Circuit Diagrams

| Output configuration | Operation mode | Model                                           | Timing chart                                                                                                                                                                                                                                                      | Output circuit                                                                                             |
|----------------------|----------------|-------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| DC 3-wire NPN        | NO             | E2F-X1R5E1<br>E2F-X2E1<br>E2F-X5E1<br>E2F-X10E1 | <p>Sensing object</p> <p>Present</p> <p>Not present</p> <p>Load (between brown and black leads)</p> <p>Operate</p> <p>Reset</p> <p>Output voltage (between black and blue leads)</p> <p>High</p> <p>Low</p> <p>Detection indicator (red)</p> <p>ON</p> <p>OFF</p> | <p>E2F-X1R5E□</p> <p>*1. Load current: 200 mA max.<br/>*2. When a transistor is connected.</p>             |
|                      | NC             | E2F-X1R5E2<br>E2F-X2E2<br>E2F-X5E2<br>E2F-X10E2 | <p>Sensing object</p> <p>Present</p> <p>Not present</p> <p>Load (between brown and black leads)</p> <p>Operate</p> <p>Reset</p> <p>Output voltage (between black and blue leads)</p> <p>High</p> <p>Low</p> <p>Detection indicator (red)</p> <p>ON</p> <p>OFF</p> | <p>Except the E2F-X1R5E□.</p> <p>*1. Load current: 200 mA max.<br/>*2. When a transistor is connected.</p> |
| DC 3-wire PNP        | NO             | E2F-X1R5F1<br>E2F-X2F1<br>E2F-X5F1<br>E2F-X10F1 | <p>Sensing object</p> <p>Present</p> <p>Not present</p> <p>Load (between blue and black leads)</p> <p>Operate</p> <p>Reset</p> <p>Output voltage (between black and blue leads)</p> <p>High</p> <p>Low</p> <p>Detection indicator (red)</p> <p>ON</p> <p>OFF</p>  | <p>E2F-X1R5F□</p> <p>*1. Load current: 200 mA max.<br/>*2. When a transistor is connected.</p>             |
|                      | NC             | E2F-X1R5F2<br>E2F-X2F2<br>E2F-X5F2<br>E2F-X10F2 | <p>Sensing object</p> <p>Present</p> <p>Not present</p> <p>Load (between blue and black leads)</p> <p>Operate</p> <p>Reset</p> <p>Output voltage (between black and blue leads)</p> <p>High</p> <p>Low</p> <p>Detection indicator (red)</p> <p>ON</p> <p>OFF</p>  | <p>Except the E2F-X1R5F□.</p> <p>*1. Load current: 200 mA max.<br/>*2. When a transistor is connected.</p> |
| AC 2-wire            | NO             | E2F-X1R5Y1<br>E2F-X2Y1<br>E2F-X5Y1<br>E2F-X10Y1 | <p>Sensing object</p> <p>Present</p> <p>Not present</p> <p>Load</p> <p>Operate</p> <p>Reset</p> <p>Operation indicator (red)</p> <p>ON</p> <p>OFF</p>                                                                                                             |                                                                                                            |
|                      | NC             | E2F-X1R5Y2<br>E2F-X2Y2<br>E2F-X5Y2<br>E2F-X10Y2 | <p>Sensing object</p> <p>Present</p> <p>Not present</p> <p>Load</p> <p>Operate</p> <p>Reset</p> <p>Operation indicator (red)</p> <p>ON</p> <p>OFF</p>                                                                                                             |                                                                                                            |

## 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.



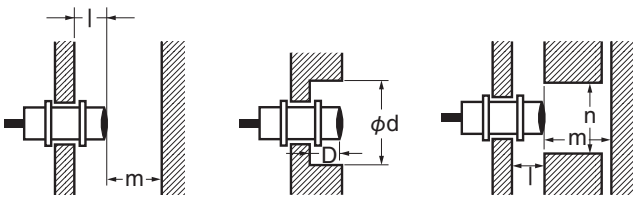
### Precautions for Correct Use

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.



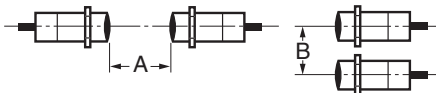
##### Influence of Surrounding Metal

(Unit: mm)

| Model      | Item | l  | d | D | m   | n  |
|------------|------|----|---|---|-----|----|
| E2F-X1R5□□ | 0    | 8  | 0 | 0 | 4.5 | 12 |
| E2F-X2□□   |      | 12 |   |   | 8   | 18 |
| E2F-X5□□   |      | 18 |   |   | 20  | 27 |
| E2F-X10□□  |      | 30 |   |   | 40  | 45 |

##### 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

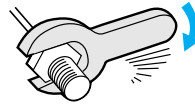
(Unit: mm)

| Model      | Item | A        | B       |
|------------|------|----------|---------|
| E2F-X1R5□□ |      | 20       | 15      |
| E2F-X2□□   |      | 30 (20)  | 20 (12) |
| E2F-X5□□   |      | 50 (30)  | 35 (18) |
| E2F-X10□□  |      | 100 (50) | 70 (35) |

Note: Values in parentheses apply to Sensors operating at different frequencies. Models numbers for Sensors with different frequencies are E2F-X□□□5.

#### ● Mounting

Do not tighten the nut with excessive force.



| Model      | Torque   |
|------------|----------|
| E2F-X1R5□□ | 0.78 N·m |
| E2F-X2□□   |          |
| E2F-X5□□   | 2 N·m    |
| E2F-X10□□  |          |

#### ● Maintenance and Inspection

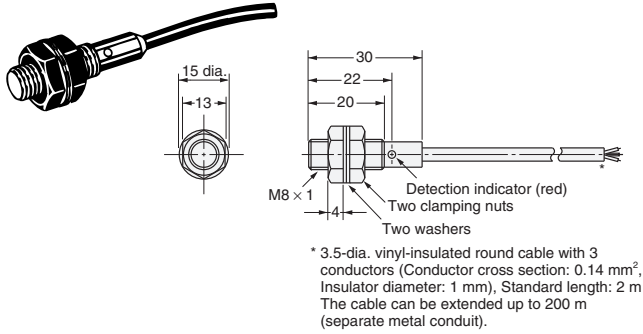
Do not use AC 2-Wire Models in water or in locations subject to water if the sensing surface or any other part of the Sensor is damaged, e.g., from contact with the sensing object. Electric shock may result.

## Dimensions

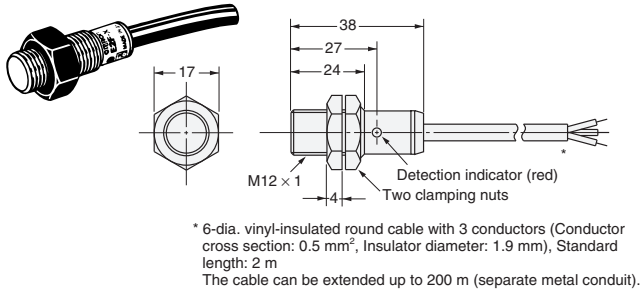
(Unit: mm)  
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

### DC 3-Wire Models

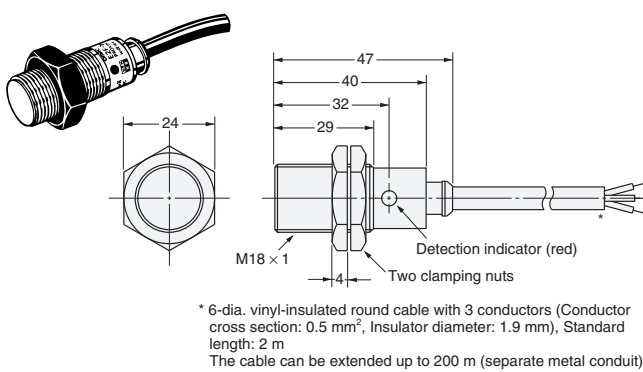
#### E2F-X1R5E□/-X1R5F□



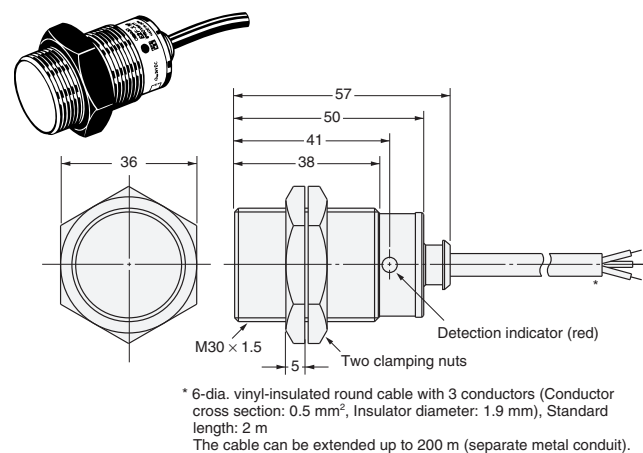
#### E2F-X2E□/-X2F□



#### E2F-X5E□/-X5F□

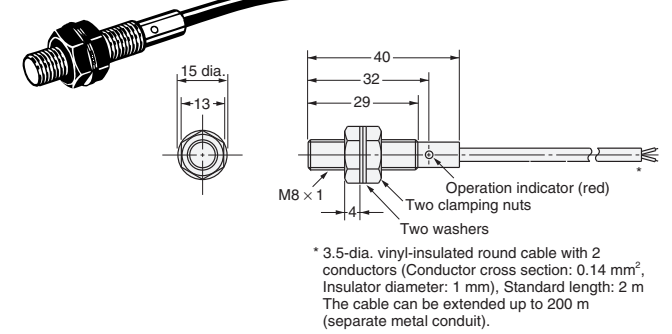


#### E2F-X10E□/-X10F□

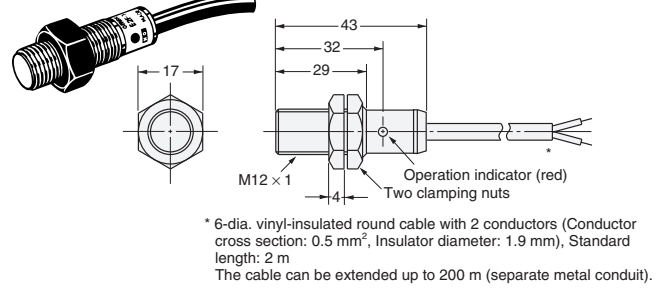


### AC 2-Wire Models

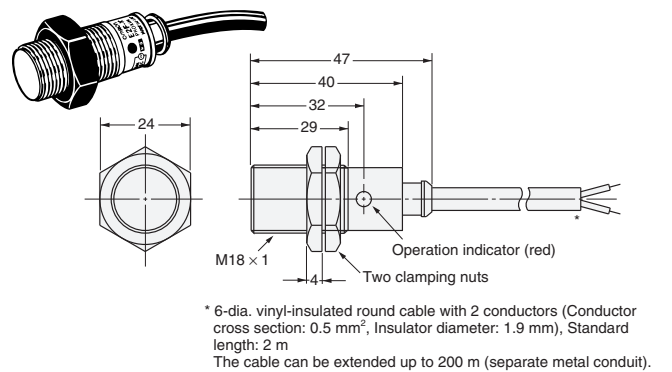
#### E2F-X1R5Y□



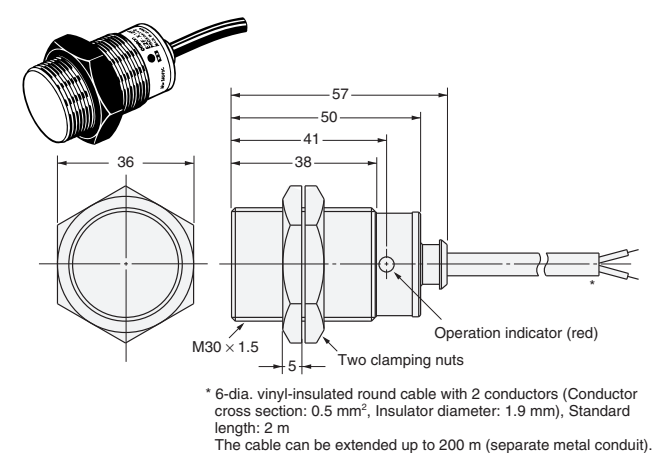
#### E2F-X2Y□



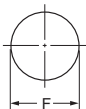
#### E2F-X5Y□



#### E2F-X10Y□



### Mounting Hole Dimensions



| Model  | E2F-X1R5□□                            | E2F-X2□□                               | E2F-X5□□                               | E2F-X10□□                              |
|--------|---------------------------------------|----------------------------------------|----------------------------------------|----------------------------------------|
| F (mm) | 8.5 <sup>+0.5</sup> <sub>0</sub> dia. | 12.5 <sup>+0.5</sup> <sub>0</sub> dia. | 18.5 <sup>+0.5</sup> <sub>0</sub> dia. | 30.5 <sup>+0.5</sup> <sub>0</sub> dia. |

## Terms and Conditions Agreement

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NEVER USE THE PRODUCT FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY OR IN LARGE QUANTITIES WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT(S) IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

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