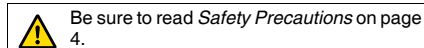


## Metal Head for long-distance Detection that Withstands Harsh Environments Where the Workpiece Can Rub against the Sensor

- Completely stainless-steel housing
- Long-distance detection equivalent to or greater than Proximity Sensors with Resin Heads \*1
- More than 20 times \*2 the durability of Proximity Sensors with Resin Heads
- Spatter-resistant Models with fluororesin coating are available.
- Aluminum chip immunity
- Pre-wired Smartclick Connector Models are also available.

\*1. The actual sensing distance will vary with the size or material of the object.  
For details, refer to Engineering Data.

\*2. Test results for stainless-steel brush rotating at 130 rpm.



Note: Models with a fluororesin coating also use vinyl chloride for the cable material and require separate protection.



## Ordering Information

**Sensors** [Refer to Dimensions on page 5.]

**Standard Models (Completely stainless-steel housing)**

| Connection method                           | Appearance | Sensing distance | Output               | Operation mode | Model                 |
|---------------------------------------------|------------|------------------|----------------------|----------------|-----------------------|
| Pre-wired Models (2m)                       |            | M8               | DC 2-Wire (polarity) | NO             | E2EF-X2D1 2M          |
|                                             |            | M12              |                      |                | E2EF-X3D1 2M          |
|                                             |            | M18              |                      |                | E2EF-X7D1 2M          |
|                                             |            | M30              |                      |                | E2EF-X12D1 2M         |
| Pre-wired Smartclick Connector Models (M12) |            | M8               |                      |                | E2EF-X2D1-M1TGJ 0.3M  |
|                                             |            | M12              |                      |                | E2EF-X3D1-M1TGJ 0.3M  |
|                                             |            | M18              |                      |                | E2EF-X7D1-M1TGJ 0.3M  |
|                                             |            | M30              |                      |                | E2EF-X12D1-M1TGJ 0.3M |

**Spatter-resistant Models (Completely stainless-steel housing with fluororesin coating)**

| Connection method                           | Appearance | Sensing distance | Output               | Operation mode | Model                  |
|---------------------------------------------|------------|------------------|----------------------|----------------|------------------------|
| Pre-wired Models (2m)                       |            | M8               | DC 2-Wire (polarity) | NO             | E2EF-QX2D1 2M          |
|                                             |            | M12              |                      |                | E2EF-QX3D1 2M          |
|                                             |            | M18              |                      |                | E2EF-QX7D1 2M          |
|                                             |            | M30              |                      |                | E2EF-QX12D1 2M         |
| Pre-wired Smartclick Connector Models (M12) |            | M8               |                      |                | E2EF-QX2D1-M1TGJ 0.3M  |
|                                             |            | M12              |                      |                | E2EF-QX3D1-M1TGJ 0.3M  |
|                                             |            | M18              |                      |                | E2EF-QX7D1-M1TGJ 0.3M  |
|                                             |            | M30              |                      |                | E2EF-QX12D1-M1TGJ 0.3M |

Note: Vinyl chloride is used for the cable material, and separate protection is required.

## Accessories (Order Separately)

**Sensor I/O Connectors**

**Smart Click Connectors**

| Cable connection direction | Cable specifications            | Cable length | No. of cable conductors | Model           | Applicable Proximity Sensor model number |
|----------------------------|---------------------------------|--------------|-------------------------|-----------------|------------------------------------------|
|                            | Flame-retardant, flexible cable | 2m           | 4                       | XS5F-D421-D80-F | E2EF-X□D1-M1TGJ                          |
|                            |                                 | 5m           | 4                       | XS5F-D421-G80-F | E2EF-QX□D1-M1TGJ                         |

Note: Refer to Sensor I/O Connector/Sensor Controller on your OMRON website for details.

## Ratings and Specifications

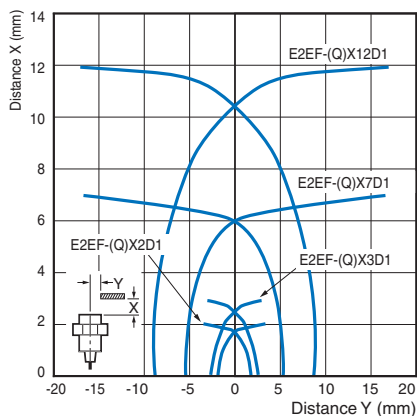
| Size<br>Shielded                                       |                                   | M8                                                                                                                                                   |                        | M12                                                                          |                        | M18                                       |                        | M30                                       |                             |
|--------------------------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|------------------------------------------------------------------------------|------------------------|-------------------------------------------|------------------------|-------------------------------------------|-----------------------------|
|                                                        |                                   | Shielded                                                                                                                                             |                        |                                                                              |                        |                                           |                        |                                           |                             |
|                                                        |                                   | Completely<br>stainless-<br>steel housing                                                                                                            | Fluororesin<br>coating | Completely<br>stainless-<br>steel housing                                    | Fluororesin<br>coating | Completely<br>stainless-<br>steel housing | Fluororesin<br>coating | Completely<br>stainless-<br>steel housing | Fluororesin<br>coating      |
| Item                                                   | Model                             | E2EF-X2D1<br>(-M1TGJ)                                                                                                                                | E2EF-QX2D1<br>(-M1TGJ) | E2EF-X3D1<br>(-M1TGJ)                                                        | E2EF-QX3D1<br>(-M1TGJ) | E2EF-X7D1<br>(-M1TGJ)                     | E2EF-QX7D1<br>(-M1TGJ) | E2EF-X12D1<br>(-M1TGJ)                    | E2EF-<br>QX12D1<br>(-M1TGJ) |
| Sensing distance                                       |                                   | 2mm±10%                                                                                                                                              |                        | 3mm±10%                                                                      |                        | 7mm±10%                                   |                        | 12mm±10%                                  |                             |
| Set distance                                           |                                   | 0 to 1.4 mm                                                                                                                                          |                        | 0 to 2.1mm                                                                   |                        | 0 to 4.9mm                                |                        | 0 to 8.4mm                                |                             |
| Differential travel                                    |                                   | 15% max. of sensing distance                                                                                                                         |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Sensing object                                         |                                   | Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to Engineering Data on page 6.)                                          |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Standard sensing object                                |                                   | Iron, 12 × 12 × 1 mm                                                                                                                                 |                        | Iron, 12 × 12 × 1 mm                                                         |                        | Iron, 30 × 30 × 1 mm                      |                        | Iron, 54 × 54 × 1 mm                      |                             |
| Response frequency *                                   |                                   | 200Hz                                                                                                                                                |                        | 80Hz                                                                         |                        | 100Hz                                     |                        | 50Hz                                      |                             |
| Power supply voltage                                   |                                   | 10 to 30 VDC, ripple (p-p) : 10% max.                                                                                                                |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Leakage current                                        |                                   | 0.8 mA max.                                                                                                                                          |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Output configuration                                   |                                   | With polarity                                                                                                                                        |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Control<br>output                                      | Switching<br>capacity             | 3 to 100 mA                                                                                                                                          |                        |                                                                              |                        |                                           |                        |                                           |                             |
|                                                        | Residual<br>voltage               | 3 V max.(Load current : 100 mA max., Cable length : 2 m)                                                                                             |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Indicators                                             |                                   | Operation indicator (red LED), Setting indicator (green LED)                                                                                         |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Operation mode<br>(with sensing object<br>approaching) |                                   | NO(normally open)                                                                                                                                    |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Protection circuits                                    |                                   | Surge suppressor, Load short-circuit protection                                                                                                      |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Ambient temperature<br>range                           |                                   | Operating : -10 to 70°C, Storage : -25 to 70°C (with no icing or condensation)                                                                       |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Ambient humidity range                                 |                                   | Operating/Storage : 35% to 95% (with no condensation)                                                                                                |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Temperature influence                                  |                                   | ±20% max. of sensing distance at 23°C in the temperature range of -10 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 <sup>2</sup><br>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 directions |                        |                                           |                        |                                           |                             |
| Degree of protection                                   |                                   | IEC 60529 IP67                                                                                                                                       |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Connection method                                      |                                   | Unmarked : Pre-wired Models (Standard cable length : 2 m)<br>Models ending with -M1TGJ : Pre-wired Connector Models (Standard cable length : 300 mm) |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Weight<br>(packed<br>state)                            | Pre-wired<br>Models (2 m)         | Approx. 105 g                                                                                                                                        |                        | Approx. 190 g                                                                |                        | Approx. 215 g                             |                        | Approx. 295 g                             |                             |
|                                                        | Pre-wired<br>Connector<br>Models  | Approx. 65 g                                                                                                                                         |                        | Approx. 85 g                                                                 |                        | Approx. 110 g                             |                        | Approx. 190 g                             |                             |
| Materials                                              | Case                              | Stainless steel (SUS303) (E2EF-QX□D : SUS303, with fluororesin coating)                                                                              |                        |                                                                              |                        |                                           |                        |                                           |                             |
|                                                        | Sensing<br>surface<br>(thickness) | Stainless steel (SUS303) (E2EF-QX□D : SUS303, with fluororesin coating)                                                                              |                        |                                                                              |                        |                                           |                        |                                           |                             |
|                                                        |                                   | 0.2mm                                                                                                                                                |                        | 0.4mm                                                                        |                        | 0.4mm                                     |                        | 0.5mm                                     |                             |
|                                                        | Clamping<br>nuts                  | Stainless steel (SUS303) (E2EF-QX□D : SUS303, with fluororesin coating)                                                                              |                        |                                                                              |                        |                                           |                        |                                           |                             |
|                                                        | Toothed<br>washer                 | Zinc-plated iron                                                                                                                                     |                        |                                                                              |                        |                                           |                        |                                           |                             |
|                                                        | Cable                             | PVC (flame retardant)                                                                                                                                |                        |                                                                              |                        |                                           |                        |                                           |                             |
| Accessories                                            |                                   | Instruction manual                                                                                                                                   |                        |                                                                              |                        |                                           |                        |                                           |                             |

\* The response frequency of the DC switching section 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.

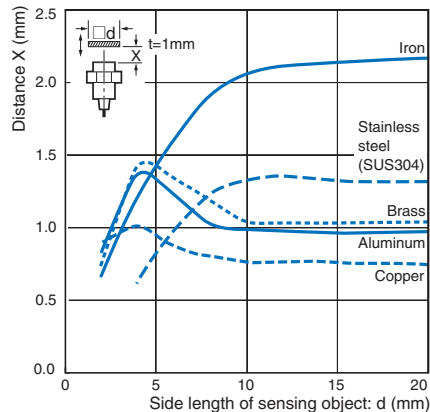
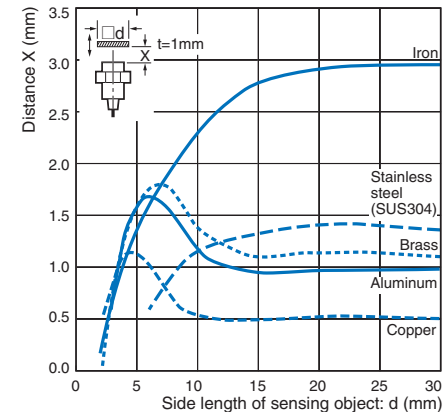
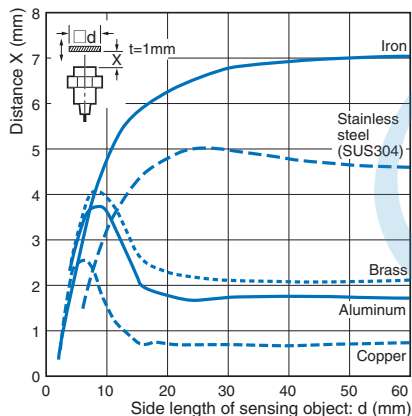
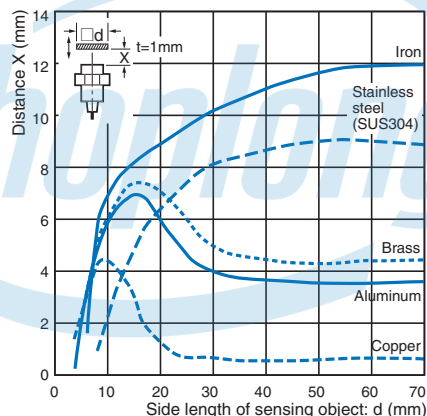
## I/O Circuit Diagrams

| Operation mode | Model                 | Timing chart | Output circuit |
|----------------|-----------------------|--------------|----------------|
| NO             | E2EF-(Q)X□D1 (-M1TGJ) |              |                |

## Sensing Area

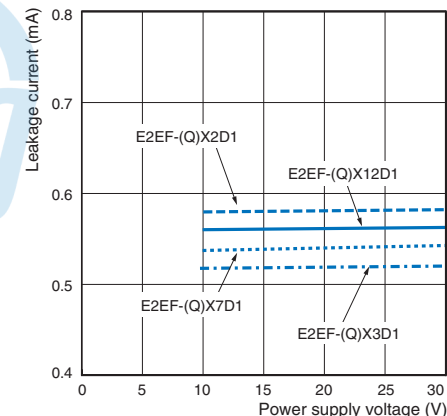
E2EF-X□  
-QX□

## Influence of Sensing Object Size and Material

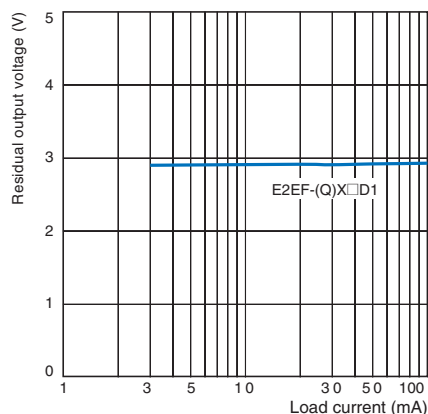
E2EF-X2D1  
-QX2D1E2EF-X3D1  
-QX3D1E2EF-X7D1  
-QX7D1E2EF-X12D1  
-QX12D1

## Leakage Current

E2EF-X□D1



## Residual Output Voltage

E2EF-X□D1  
-QX□D1

## Safety Precautions

### WARNING

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



Never use this product with an AC power supply. Otherwise, explosion may result.



### Precautions for Safe Use

The following precautions must be observed to ensure safe operation.

- Do not use the Sensor in an environment where inflammable or explosive gas is present.
- Do not attempt to disassemble, repair, or modify any Sensors.
- 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 explosion or fire.
- Incorrect Wiring**  
Be sure that the power supply polarity and other wiring is correct. Incorrect wiring may cause explosion or fire.
- 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.

### Precautions for Correct Use

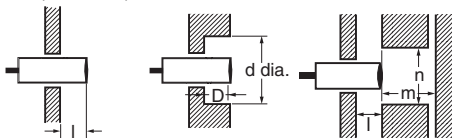
Do not use the Sensor under ambient conditions that exceed the ratings.

- Do not use the Sensor in the following locations.
  - Outdoor locations directly subject to sunlight, rain, snow, or water droplets
  - Locations subject to atmospheres with chemical vapors, in particular solvents and acids
  - Locations subject to corrosive gas
- 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. Refer to the OMRON website ([www.ia.omron.com/](http://www.ia.omron.com/)) for typical measures.
- Laying the 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.
- Cleaning**  
Never use thinner or other solvents. Otherwise, the Sensor surface may be dissolved.

### Design

#### Influence of Surrounding Metal

When the Proximity Sensor is embedded in metal, make sure that the clearances given in the following table are maintained. The values depend on the type of nuts used for mounting. Be sure to use the supplied nuts (SUS303).



(Unit: mm)

| Model         | Item<br>Embedding<br>material | l  | d   | D  | m  | n   |
|---------------|-------------------------------|----|-----|----|----|-----|
| E2EF-(Q)X2D1  | Iron                          | 0  | 8   | 0  | 8  | 30  |
|               | Aluminum                      | 10 | 50  | 10 | 8  | 50  |
| E2EF-(Q)X3D1  | Iron                          | 0  | 12  | 0  | 12 | 40  |
|               | Aluminum                      | 16 | 70  | 16 | 12 | 70  |
| E2EF-(Q)X7D1  | Iron                          | 0  | 18  | 0  | 28 | 60  |
|               | Aluminum                      | 16 | 80  | 16 | 28 | 80  |
| E2EF-(Q)X12D1 | Iron                          | 0  | 30  | 0  | 48 | 100 |
|               | Aluminum                      | 24 | 120 | 24 | 48 | 120 |

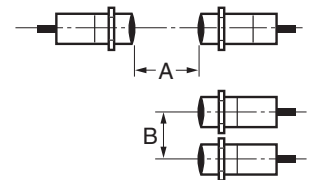
Note: The influence from other non-magnetic surrounding metals is nearly the same as that from aluminum.

### 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.

(Unit: mm)

| Model         | Item | A   | B   |
|---------------|------|-----|-----|
| E2EF-(Q)X2D1  |      | 35  | 35  |
| E2EF-(Q)X3D1  |      | 40  | 35  |
| E2EF-(Q)X7D1  |      | 65  | 60  |
| E2EF-(Q)X12D1 |      | 110 | 100 |



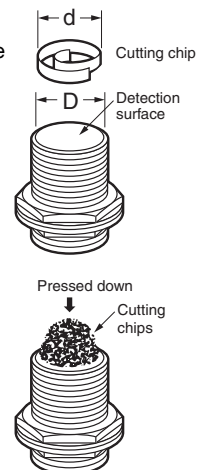
### Chips from Cutting Aluminum

Normally, chips from cutting aluminum will not cause a detection signal to be output even if it adheres to or accumulates on the detection surface. In the following cases, however, a detection signal may be output. Remove the cutting chips in these cases.

- If  $d \geq \frac{2}{3} D$  at the center of the detection surface where  $d$  is the cutting chip size and  $D$  is the detection surface size

(Unit: mm)

| Model         | Dimension | D  |
|---------------|-----------|----|
| E2EF-(Q)X2D1  |           | 6  |
| E2EF-(Q)X3D1  |           | 10 |
| E2EF-(Q)X7D1  |           | 16 |
| E2EF-(Q)X12D1 |           | 28 |



- If the cutting chips are pressed down

### Mounting

Do not tighten the nut with excessive force. A washer must be used with the nut. Do not use tightening force that exceeds the values in the following table.

| Model         | Torque  |
|---------------|---------|
| E2EF-(Q)X2D1  | 9 N·m   |
| E2EF-(Q)X3D1  | 30 N·m  |
| E2EF-(Q)X7D1  | 70 N·m  |
| E2EF-(Q)X12D1 | 180 N·m |



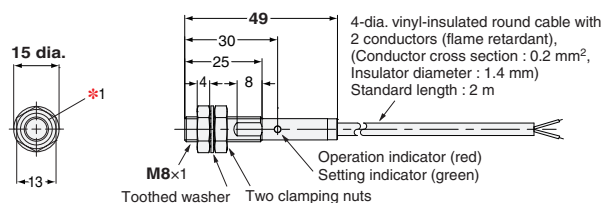
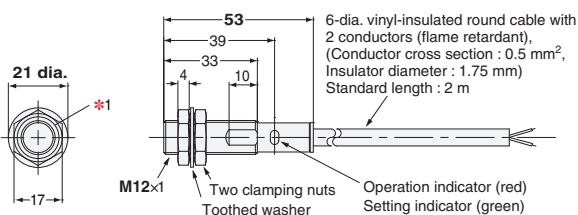
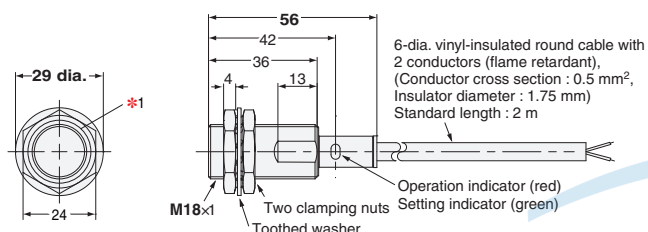
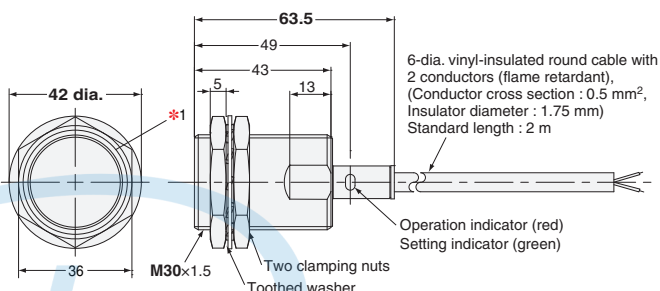
## Dimensions

(Unit: mm)

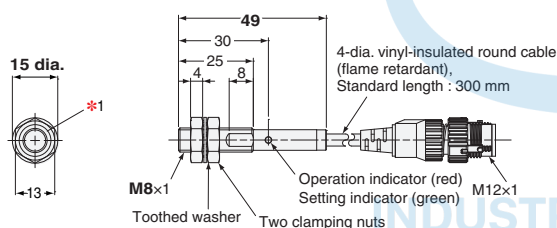
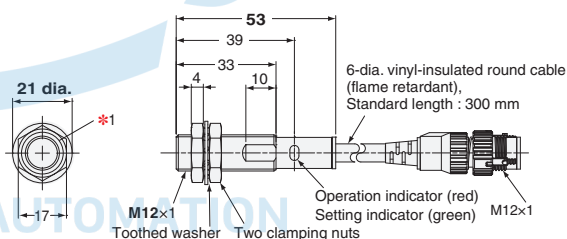
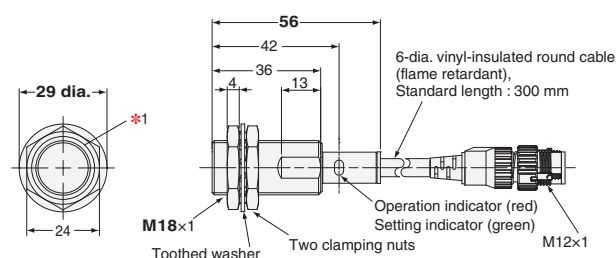
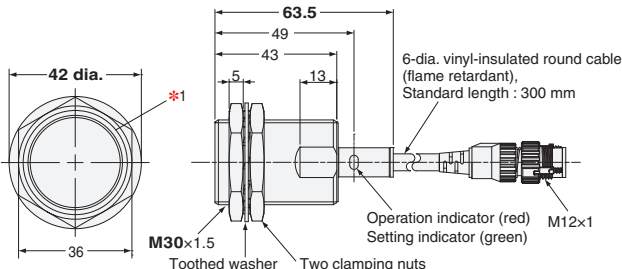
Tolerance class IT16 applies to dimensions in this data sheet unless otherwise specified.

## Sensors

## Pre-wired Models

E2EF-X2D1  
-QX2D1E2EF-X3D1  
-QX3D1E2EF-X7D1  
-QX7D1E2EF-X12D1  
-QX12D1

## Smartclick Connector Models

E2EF-X2D1-M1TGJ  
-QX2D1-M1TGJE2EF-X3D1-M1TGJ  
-QX3D1-M1TGJE2EF-X7D1-M1TGJ  
-QX7D1-M1TGJE2EF-X12D1-M1TGJ  
-QX12D1-M1TGJ

\*1. The E2EF-QX□D type Clamping nut (optional accessory) is grooved to identify the material (SUS303, with fluororesin coating).

OMRON Corporation Industrial Automation Company  
Tokyo, JAPANContact: [www.ia.omron.com](http://www.ia.omron.com)

## Regional Headquarters

## OMRON EUROPE B.V.

## Sensor Business Unit

Carl-Benz-Str. 4, D-71154 Nufringen, Germany

Tel: (49) 7032-811-0/Fax: (49) 7032-811-199

## OMRON ASIA PACIFIC PTE. LTD.

No. 438A Alexandra Road # 05-05/08 (Lobby 2),  
Alexandra Technopark,

Singapore 119967

Tel: (65) 6835-3011/Fax: (65) 6835-2711

## OMRON ELECTRONICS LLC

One Commerce Drive Schaumburg,

IL 60173-5302 U.S.A.

Tel: (1) 847-843-7900/Fax: (1) 847-843-7787

## OMRON (CHINA) CO., LTD.

Room 2211, Bank of China Tower,

200 Yin Cheng Zhong Road,

Pu Dong New Area, Shanghai 200120, China

Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

## Authorized Distributor:

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