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Super-compact Proximity Sensor

# E2S

CSM_E2S_DS_E_9_3

## Advanced Performance and Wide Range of Selections in a Super-compact Size

- Only 5.5 × 5.5 mm with a built-in Amplifier.
- Maximum sensing distance: 2.5 mm. Stable detection even with workpiece fluctuations.
- Response frequency: 1 kHz.
- Low current consumption.



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

Be sure to read *Safety Precautions* on page 6.

## Ordering Information

### Sensors [Refer to *Dimensions* on page 7.]

#### DC 2-Wire Models

| Appearance | Sensing surface | Sensing distance | Model | |
|---|---|---|---|---|
| | | | Operation mode | |
| | | | NO | NC |
| Unshielded  | Top | 1.6 mm | E2S-W11 1M *1 *2 | E2S-W12 1M |
| | Front | | E2S-Q11 1M *1 *2 | E2S-Q12 1M |
| | Top | 2.5 mm | E2S-W21 1M *1 *2 | E2S-W22 1M *2 |
| | Front | | E2S-Q21 1M *1 *2 | E2S-Q22 1M *2 |

*1. Models with a different frequency are also available to prevent mutual interference. The model numbers are E2S-□□□B (e.g., E2S-W11B).
*2. Models are also available with robotics (bend resistant) cables. Add “-R” to the model number.(e.g., E2S-W11-R 1M)

#### DC 3-Wire Models

| Appearance | Sensing surface | Sensing distance | Output configuration | Model | |
|---|---|---|---|---|---|
| | | | | Operation mode | |
| | | | | NO | NC |
| Unshielded  | Top | 1.6 mm | NPN | E2S-W13 1M *1 *2 | E2S-W14 1M |
| | Front | | | E2S-Q13 1M *1 *2 | E2S-Q14 1M |
| | Top | 2.5 mm | | E2S-W23 1M *1 *2 | E2S-W24 1M *2 |
| | Front | | | E2S-Q23 1M *1 *2 | E2S-Q24 1M *2 |
| | Top | 1.6 mm | PNP | E2S-W15 1M *1 | E2S-W16 1M |
| | Front | | | E2S-Q15 1M *1 | E2S-Q16 1M |
| | Top | 2.5 mm | | E2S-W25 1M *1 | E2S-W26 1M |
| | Front | | | E2S-Q25 1M *1 | E2S-Q26 1M |

*1. Models with a different frequency are also available to prevent mutual interference. The model numbers are E2S-□□□B (e.g., E2S-W13B).
*2. Models are also available with robotics (bend resistant) cables. Add “-R” to the model number.(e.g., E2S-W13-R 1M)

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## Accessories (Order Separately)

**Mounting Brackets** **Some Mounting Brackets are provided with the Sensor. Order other Mounting Brackets separately if required.**
**[Refer to *Dimensions* on page 7.]**

| Appearance | Model | Quantity | Remarks |
|---|---|---|---|
|  | **Y92E-C1R6** | 1 | Provided with E2S-□1□□.<br>(fixed with one screw) |
|  | **Y92E-C2R5** | | Provided with E2S-□2□□.<br>(fixed with one screw) |
|  | **Y92E-D1R6** | | For E2S-□1□□<br>(fixed with two screws) |
|  | **Y92E-D2R5** | | For E2S-□2□□<br>(fixed with two screws) |

## Model Number Legend

E2S- □ □ □ □ -□
(1) (2) (3) (4) (5) (6)

(1) Compact Square Series

(2) Sensing Direction
W: Top surface detection
Q: Front surface detection

(3) Size and Sensing Distance (Standard Sensing Object)
1: 5.5 × 5.5 mm, 1.6 mm (iron)
2: 8 × 8 mm, 2.5 mm (iron)

(4) Output
1: DC 2-wire NO
2: DC 2-wire NC
3: DC 3-wire NPN NO
4: DC 3-wire NPN NC
5: DC 3-wire PNP NO
6: DC 3-wire PNP NC

(5) Different Frequency
Blank: Standard
B: Different frequency

(6) Robotics (bend resistant) cables
Blank: Standard
R: Robotics (bend resistant) cables

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# Ratings and Specifications

## DC 2-Wire Models

| Item \ Model | | E2S-W11<br>E2S-W12 | E2S-Q11<br>E2S-Q12 | E2S-W21<br>E2S-W22 | E2S-Q21<br>E2S-Q22 |
|---|---|---|---|---|---|
| **Sensing surface** | | Top | Front | Top | Front |
| **Sensing distance** | | 1.6 mm ±15% | | 2.5 mm ±15% | |
| **Set distance** | | 0 to 1.2 mm | | 0 to 1.9 mm | |
| **Differential travel** | | 10% max. of sensing distance | | | |
| **Detectable object** | | Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 4.) | | | |
| **Standard sensing object** | | Iron, 12 × 12 × 1 mm | | Iron, 15 × 15 × 1 mm | |
| **Response frequency** * | | 1 kHz min. | | | |
| **Power supply voltage (operating voltage range)** | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | | |
| **Leakage current** | | 0.8 mA max. | | | |
| **Control output** | **Load current** | 3 to 50 mA max. | | | |
| | **Residual voltage** | 3 V max. (under load current of 50 mA with cable length of 1 m) | | | |
| **Indicators** | | □□1 Models: Operation indicator (red), Setting indicator (green)<br>□□2 Models: Operation indicator (red) | | | |
| **Operation mode (with sensing object approaching)** | | □□1 Models: NO<br>□□2 Models: NC | Refer to the timing charts under *I/O Circuit Diagrams* on page 5 for details. | | |

* 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.

## DC 3-Wire Models

| Item \ Model | | E2S-W13<br>E2S-W14 | E2S-Q13<br>E2S-Q14 | E2S-W23<br>E2S-W24 | E2S-Q23<br>E2S-Q24 | E2S-W15<br>E2S-W16 | E2S-Q15<br>E2S-Q16 | E2S-W25<br>E2S-W26 | E2S-Q25<br>E2S-Q26 |
|---|---|---|---|---|---|---|---|---|---|
| **Sensing surface** | | Top | Front | Top | Front | Top | Front | Top | Front |
| **Sensing distance** | | 1.6 mm ±15% | | 2.5 mm ±15% | | 1.6 mm ±15% | | 2.5 mm ±15% | |
| **Set distance** | | 0 to 1.2 mm | | 0 to 1.9 mm | | 0 to 1.2 mm | | 0 to 1.9 mm | |
| **Differential travel** | | 10% max. of sensing distance | | | | | | | |
| **Detectable object** | | Ferrous metal (The sensing distance decreases with non-ferrous metal. Refer to *Engineering Data* on page 4.) | | | | | | | |
| **Standard sensing object** | | Iron, 12 × 12 × 1 mm | | Iron, 15 × 15 × 1 mm | | Iron, 12 × 12 × 1 mm | | Iron, 15 × 15 × 1 mm | |
| **Response frequency** * | | 1 kHz min. | | | | | | | |
| **Power supply voltage (operating voltage range)** | | 12 to 24 VDC (10 to 30 VDC), ripple (p-p): 10% max. | | | | | | | |
| **Current consumption** | | 13 mA max. at 24 VDC (no-load) | | | | | | | |
| **Control output** | **Load current** | NPN open-collector output, 50 mA max. (30 VDC max.) | | | | PNP open-collector output, 50 mA max. (30 VDC max.) | | | |
| | **Residual voltage** | 1.0 V max. (under load current of 50 mA with cable length of 1 m) | | | | | | | |
| **Indicators** | | Operation indicator (orange) | | | | | | | |
| **Operation mode (with sensing object approaching)** | | □□3 Models: NO<br>□□4 Models: NC<br>Refer to the timing charts under *I/O Circuit Diagrams* on page 5 for details. | | | | □□5 Models: NO<br>□□6 Models: NC<br>Refer to the timing charts under *I/O Circuit Diagrams* on page 5 for details. | | | |

* 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.

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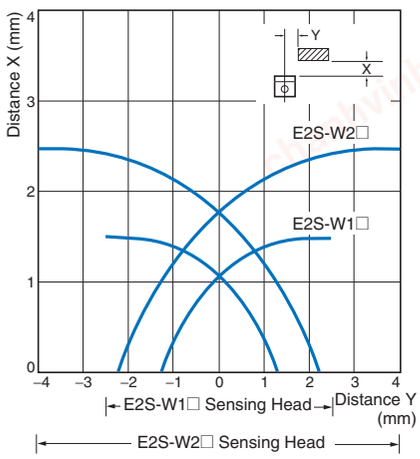
## Specifications

| Item | Model | E2S-□□□ |
|---|---|---|
| Protection circuits | | Reverse polarity protection, Surge suppressor |
| Ambient temperature range | | Operating: –25 to 70°C (with no icing or condensation), Storage: –40 to 85°C (with no icing or condensation) |
| Ambient humidity range | | Operating: 35% to 90% (with no condensation), 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 |
| Voltage influence | | ±2.5% 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 | | 1,000 VAC 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: 500 m/s$^2$ 3 times each in X, Y, and Z directions |
| Degree of protection | | IEC 60529 IP67 |
| Connection method | | Pre-wired Models (Standard cable length: 1 m) |
| Weight (packed state) | | Approx. 10 g |
| Materials | Case | Polyarylate resin |
| Accessories | | Mounting Brackets |

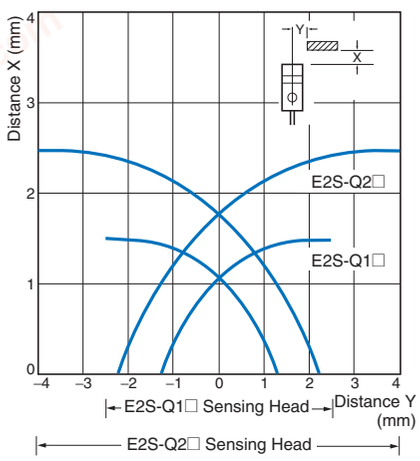
## Engineering Data (Reference Value)

### Sensing Area

**E2S-W1□/-W2□**

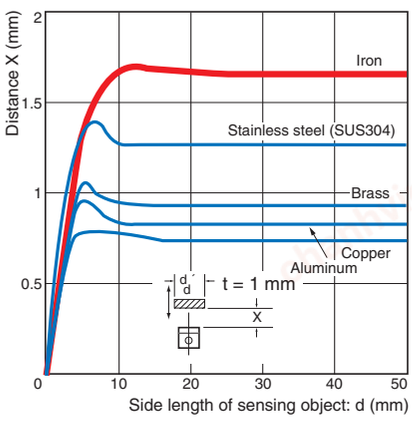



**E2S-Q1□/-Q2□**

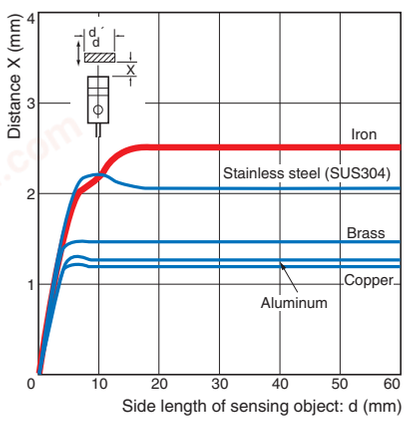



### Influence of Sensing Object Size and Material

**E2S-W1□/-Q1□**




**E2S-W2□/-Q2□**

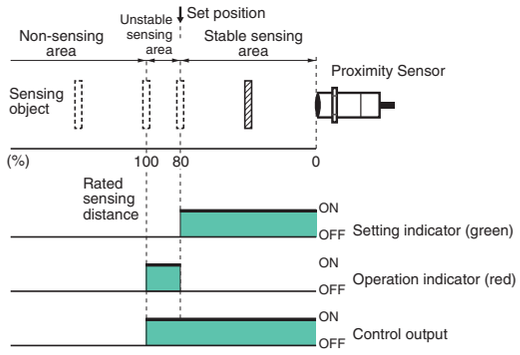
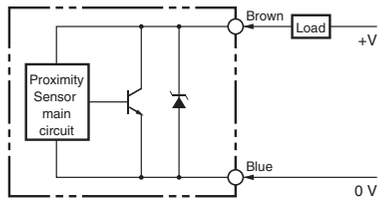
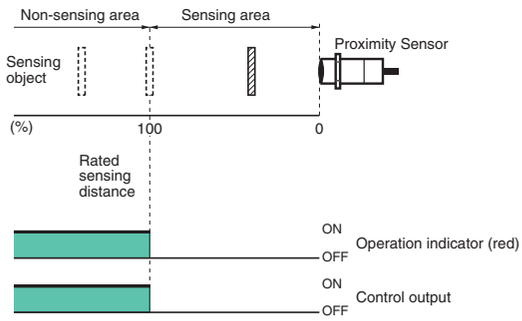


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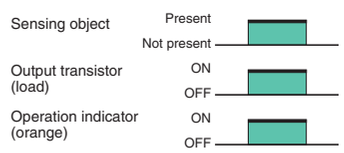
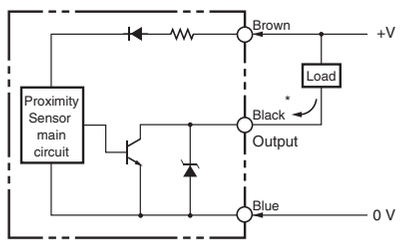
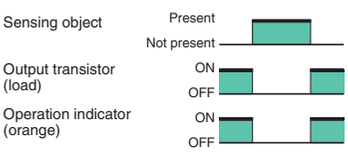
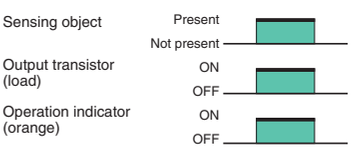
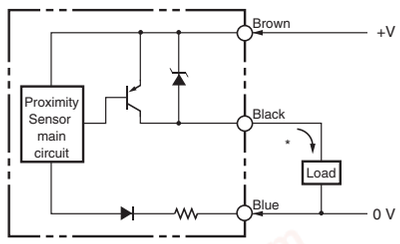
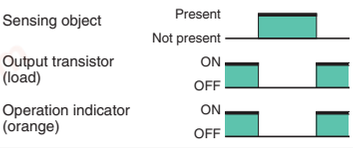


# I/O Circuit Diagrams

## DC 2-Wire Models

| Operation mode | Model | Timing chart | Output circuit |
|---|---|---|---|
| NO | E2S-W11<br>E2S-W21<br>E2S-Q11<br>E2S-Q21 |  |  |
| NC | E2S-W12<br>E2S-W22<br>E2S-Q12<br>E2S-Q22 |  | Note: The load can be connected to either the +V or 0 V side. |

## DC 3-Wire Models

| Operation mode | Output configuration | Model | Timing chart | Output circuit |
|---|---|---|---|---|
| NO | NPN | E2S-W13<br>E2S-W23<br>E2S-Q13<br>E2S-Q23 |  |  |
| NC | | E2S-W14<br>E2S-W24<br>E2S-Q14<br>E2S-Q24 |  | * Load current: 50 mA max. |
| NO | PNP | E2S-W15<br>E2S-W25<br>E2S-Q15<br>E2S-Q25 |  |  |
| NC | | E2S-W16<br>E2S-W26<br>E2S-Q16<br>E2S-Q26 |  | * Load current: 50 mA max. |

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# 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.**



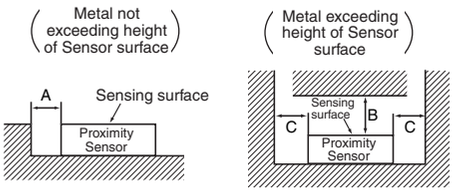
## Precautions for Correct Use

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

### ● Design

#### Influence of Surrounding Metal

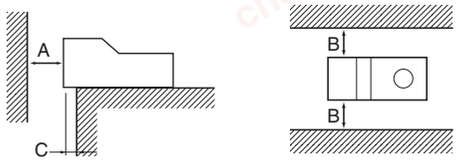
- When mounting the Sensor within a metal panel, ensure that the clearances given in the following table are maintained. Failure to maintain these distances may cause deterioration in the performance of the Sensor.
- Models with Top Sensing Surface




(Unit: mm)

| Model / Distance | A | B | C |
|---|---|---|---|
| E2S-W1□ | 0 | 8 | 2 |
| E2S-W2□ | | 15 | 10 |

- Models with Front Sensing Surface



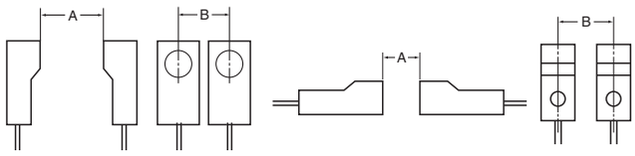

(Unit: mm)

| Model / Distance | A | B | C |
|---|---|---|---|
| E2S-Q1□ | 8 | 3 | 2 |
| E2S-Q2□ | 15 | 10 | 3 |

#### Mutual Interference

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

- Models with Top Sensing Surface
- Models with Front Sensing Surface




(Unit: mm)

| Model / Distance | A | B |
|---|---|---|
| E2S-W(Q)1□ | 50 (40) *1 | 20 (5.5) *1, *2 |
| E2S-W(Q)2□ | 75 (50) *1 | 25 (8) *1, *2 |

*1. Values in parentheses apply to Sensors operating at different frequencies.
*2. Mutual interference will not occur for close-proximity mounting if models with different frequencies are used together.

### ● Mounting

#### Tightening Torque

For the E2S-W(Q)2□, the maximum tightening torque that should be applied to the mounting screws is 0.7 N·m.

**Applicable e-CON Connector Models and Manufacturers**

The companies and model number of e-CON connections that can be used with Sensor cables are listed in the following table. Confirm applicability when purchasing e-CON connectors for connection to Pre-wired Sensors.

| Model | Applicable e-CON Connector | Manufacturer |
|---|---|---|
| E2S-W□3/4 | XN2A-1470 Cable Plug Connector | OMRON |
| E2S-Q□3/4 | | |

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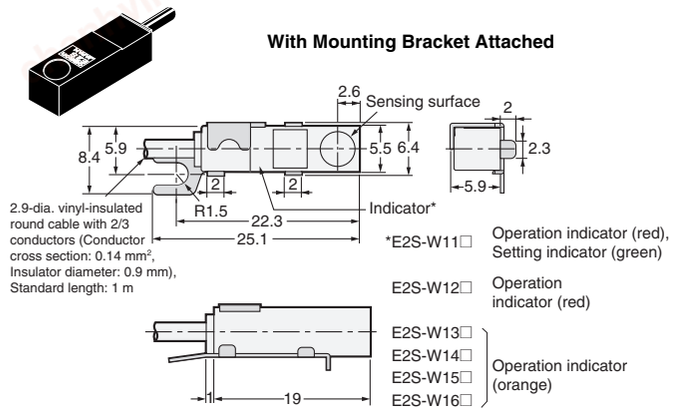


# Dimensions

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

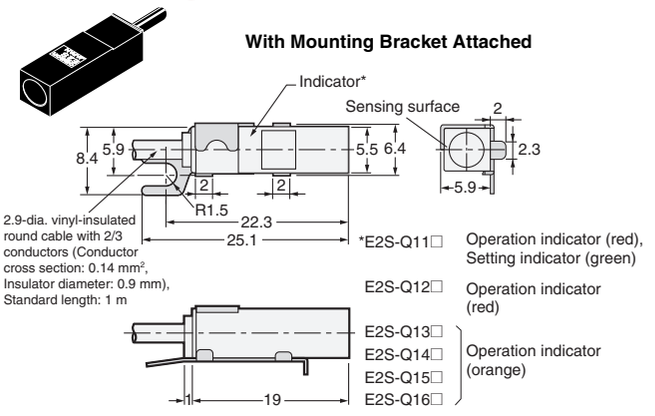
## Sensors

### E2S-W1□



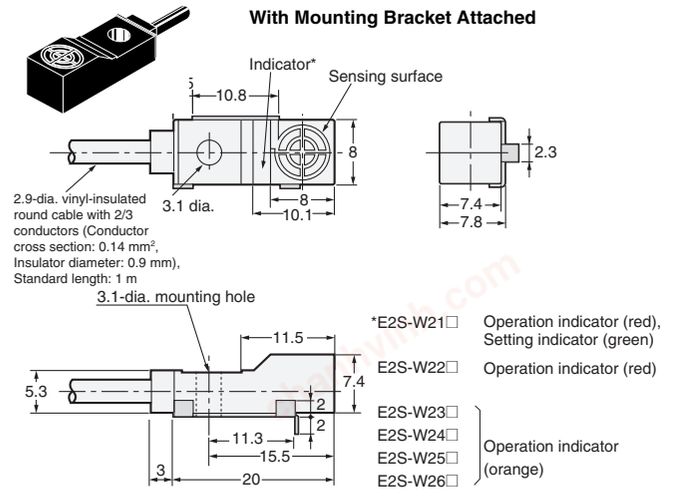

*E2S-W11□ Operation indicator (red), Setting indicator (green)
E2S-W12□ Operation indicator (red)
E2S-W13□ E2S-W14□ E2S-W15□ E2S-W16□ Operation indicator (orange)

### E2S-Q1□



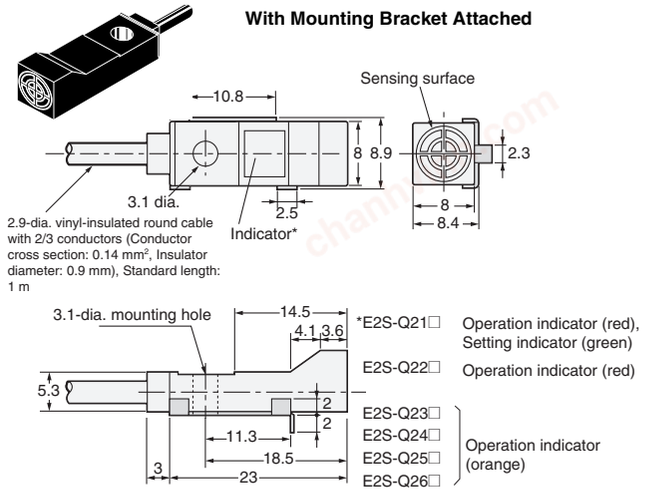

*E2S-Q11□ Operation indicator (red), Setting indicator (green)
E2S-Q12□ Operation indicator (red)
E2S-Q13□ E2S-Q14□ E2S-Q15□ E2S-Q16□ Operation indicator (orange)

### E2S-W2□




*E2S-W21□ Operation indicator (red), Setting indicator (green)
E2S-W22□ Operation indicator (red)
E2S-W23□ E2S-W24□ E2S-W25□ E2S-W26□ Operation indicator (orange)

### E2S-Q2□



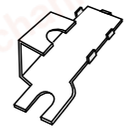

*E2S-Q21□ Operation indicator (red), Setting indicator (green)
E2S-Q22□ Operation indicator (red)
E2S-Q23□ E2S-Q24□ E2S-Q25□ E2S-Q26□ Operation indicator (orange)

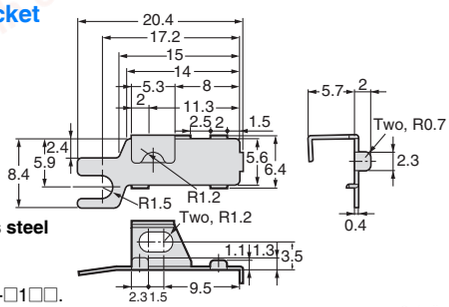
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## Accessories (Order Separately)

### Mounting Bracket
**Y92E-C1R6**

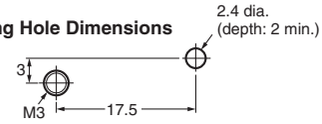




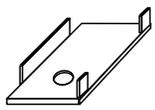

**Material: Stainless steel (SUS304)**

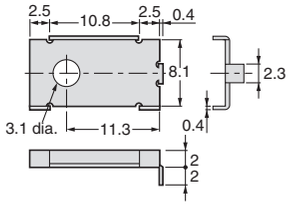
*Provided with E2S-□1□□.

**Mounting Hole Dimensions**




### Mounting Bracket
**Y92E-C2R5**

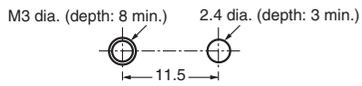





**Material: Stainless steel (SUS304)**

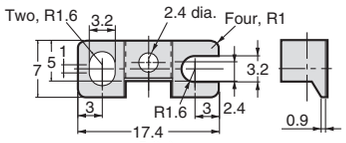
* Provided with E2S-□2□□.

**Mounting Hole Dimensions**



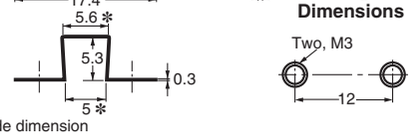

### Mounting Bracket
**Y92E-D1R6**





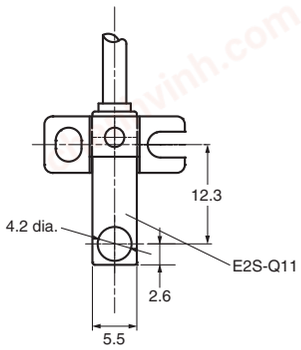

**Material: Stainless steel (SUS304)**

**Mounting Hole Dimensions**

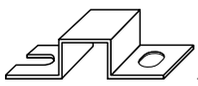


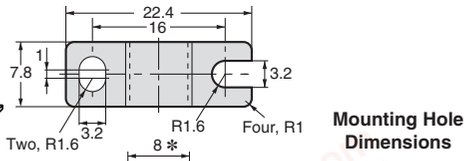

✻ Inside dimension

**Photoelectric Sensor Accessory is installed (Example of E2S-Q11)**



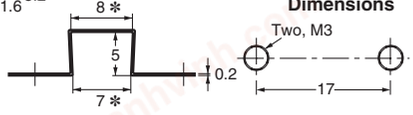

### Mounting Bracket
**Y92E-D2R5**





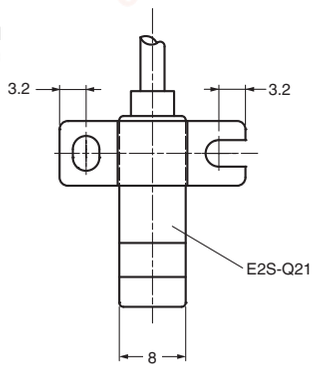

**Material: Stainless steel (SUS304)**

**Mounting Hole Dimensions**




✻ Inside dimension

**Photoelectric Sensor Accessory is installed (Example of E2S-Q21)**



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