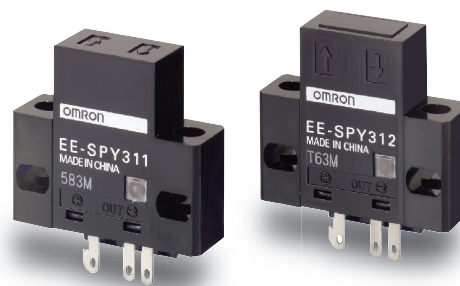


EE-SPY31/41

Accurately detects objects placed in front of shiny Background.

- A shiny background can be used as long as the distance between the sensor and the background is 20 mm or more.
- Detects minute objects such as a 0.05-mm-dia. pure copper wire.
- Small dispersion in sensing distance.
- Light modulation effectively reduces external light interference.
- Wide operating voltage range: 5 to 24 VDC






 Be sure to read *Safety Precautions* on page 4.

Ordering Information

Sensors

 Infrared light

| Appearance | Sensing method | Sensing distance | | Output type | Output configuration | Model |
|-------------------------------------------------------------------------------------------------------|----------------------------|-------------------------------------------------------------------------------------|-----------|-------------|----------------------|-----------|
| Horizontal type  | Convergent reflective type |  | 2 to 5 mm | NPN output | Dark-ON | EE-SPY311 |
| Vertical type  | | | | | Light-ON | EE-SPY411 |
| | | | | | Dark-ON | EE-SPY312 |
| | | | | | Light-ON | EE-SPY412 |

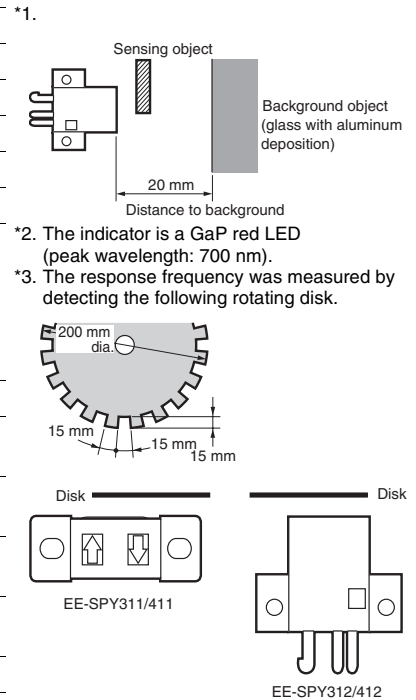
Accessories (Order Separately)

| Type | Cable length | Model | |
|------------------------------|----------------------------|-----------|-----------|
| Connector | | EE-1001 | |
| | | EE-1009 | |
| | Connector with Cable | 1 m | EE-1006 |
| | | | EE-1010 |
| | | 2 m | EE-1006 |
| | | EE-1010 | |
| | Connector with Robot Cable | 1 m | EE-1010-R |
| 2 m | | EE-1010-R | |
| NPN/PNP Conversion Connector | 0.46 m (total length) | EE-2002 | |

* Refer to *Accessories* for details.

Ratings and Specifications

| Item | Models | EE-SPY311, EE-SPY411, EE-SPY312, EE-SPY412 |
|---------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sensing distance | | 2 to 5 mm (Reflection factor: 90%; white paper 15 × 15 mm) |
| Minimum sensing object | | Pure copper wire (0.05 mm dia.) |
| Distance to background *1 | | 20 mm max. (glass with aluminum deposition) |
| Differential distance | | 0.2 mm (with a sensing distance of 3 mm, horizontally) |
| Light source | | GaAs infrared LED with a peak wavelength of 940 nm |
| Indicator *2 | | Light indicator (red) |
| Supply voltage | | 5 to 24 VDC ±10%, ripple (p-p): 5% max. |
| Current consumption | | Average: 15 mA max., Peak: 50 mA max. |
| Control output | | NPN voltage output: Load power supply voltage: 5 to 24 VDC Load current: 80 mA max. OFF current: 0.5 mA max. 80 mA load current with a residual voltage of 1.0 V max. 10 mA load current with a residual voltage of 0.4 V max. |
| Response frequency *3 | | 100 Hz min. |
| Ambient illumination | | 3,000 lx max. with incandescent light or sunlight on the surface of the receiver |
| Ambient temperature range | | Operating: -10 to +55°C Storage: -25 to +65°C |
| Ambient humidity range | | Operating: 5% to 85% Storage: 5% to 95% |
| Vibration resistance | | Destruction: 10 to 50 Hz, 1.5-mm double amplitude for 2 h each in X, Y, and Z directions |
| Shock resistance | | Destruction: 500m/s ² for 3 times each in X, Y, and Z directions |
| Degree of protection | | IEC IP50 |
| Connecting method | | Special connector (soldering not possible) |
| Weight | | Approx. 2.6 g |
| Material | Case | Polycarbonate |
| | Holder | Polybutylene phthalate (PBT) |



I/O Circuit Diagrams

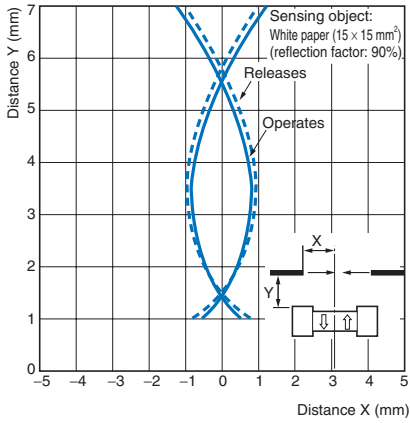
NPN Output

| Model | Output configuration | Timing charts | Output circuit |
|------------------------|----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|
| EE-SPY411 EE-SPY412 | Light-ON | <p>Incident Interrupted</p> <p>Light indicator (red) ON OFF</p> <p>Output transistor ON OFF</p> <p>Load 1 (relay) Operates Releases</p> <p>Load 2 H L</p> | <p>* Voltage output (when the sensor is connected to a transistor circuit)</p> |
| EE-SPY311 EE-SPY312 | Dark-ON | <p>Incident Interrupted</p> <p>Light indicator (red) ON OFF</p> <p>Output transistor ON OFF</p> <p>Load 1 (relay) Operates Releases</p> <p>Load 2 H L</p> | |

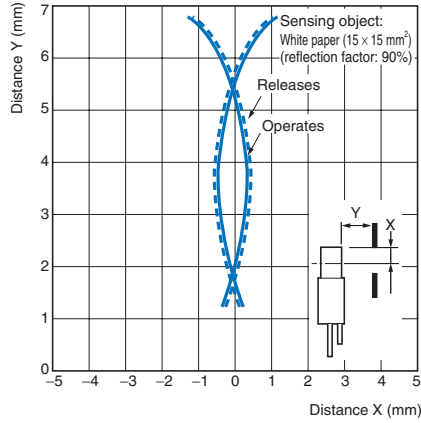
Engineering Data (Typical)

Operating Range Characteristics

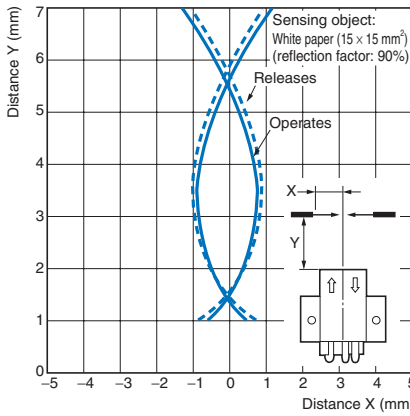
EE-SPY311/411



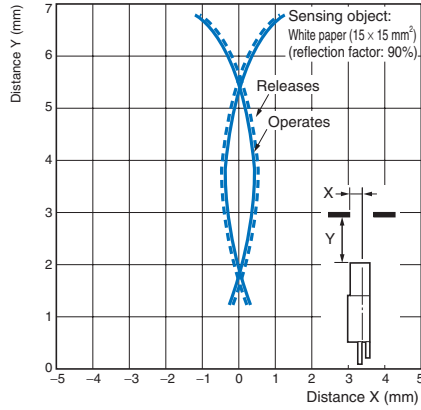
EE-SPY311/411



EE-SPY312/412

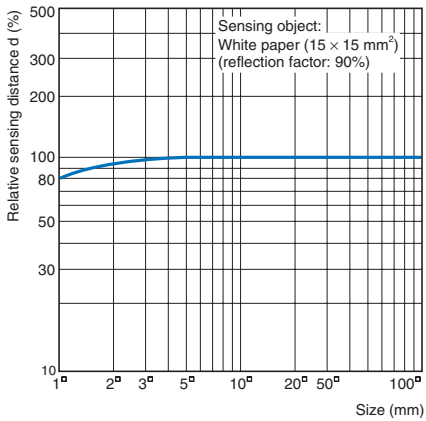


EE-SPY312/412



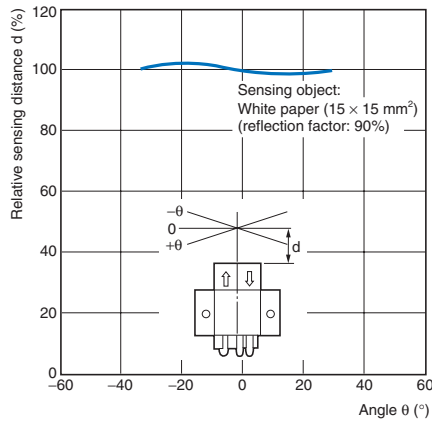
Sensing Distance vs. Object Area Characteristics

EE-SPY□□□□



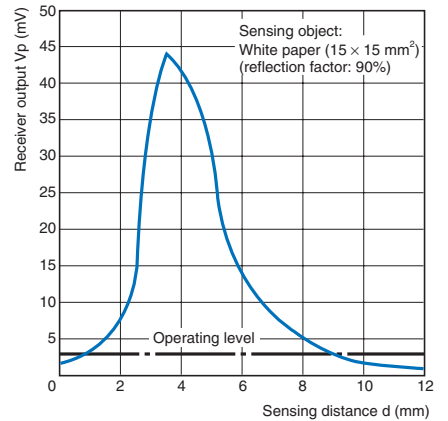
Sensing Angle vs. Sensing Distance Characteristics

EE-SPY312/412



Receiver Output vs. Sensing Distance Characteristics

EE-SPY□□□□



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.



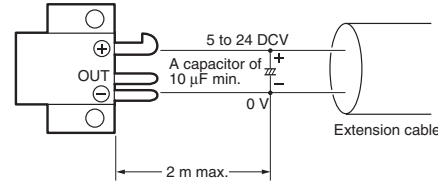
Precautions for Correct Use

Make sure that this product is used within the rated ambient environment conditions.

● **Wiring**

- Connection is made using a connector. Do not solder to the pins (leads).

- When extending the cable, use an extension cable with conductors having a total cross-section area of 0.3 mm². The total cable length must be 2 m maximum.
- To use a cable length longer than 2 m, attach a capacitor with a capacitance of approximately 10 μF to the wires as shown below. The distance between the terminal and the capacitor must be within 2 m. (Use a capacitor with a dielectric strength that is at least twice the Sensor's power supply voltage.)



- Make sure the total length of the power cable connected to the product is less than 10 m even if a capacitor is inserted.

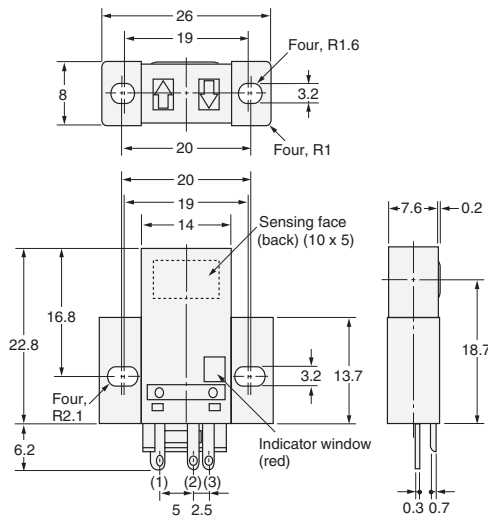
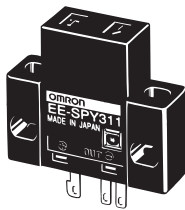
(Unit: mm)

Dimensions

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

Sensors

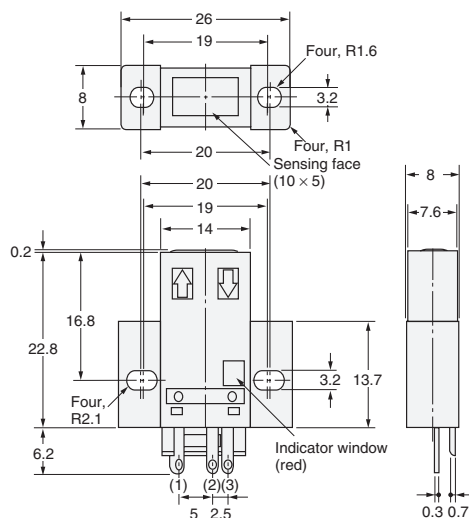
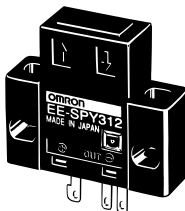
EE-SPY311
EE-SPY411



Terminal Arrangement

| | | |
|-----|-----|-----------------|
| (1) | + | V _{CC} |
| (2) | OUT | OUTPUT |
| (3) | - | GND (0 V) |

EE-SPY312
EE-SPY412



Terminal Arrangement

| | | |
|-----|-----|-----------------|
| (1) | + | V _{CC} |
| (2) | OUT | OUTPUT |
| (3) | - | GND (0 V) |

Accessories (Order Separately)

* Refer to *Accessories* for details.

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2008.11

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