Light Convergent Reflective Photomicrosensor

EE-SPY31/41

CSM_EE-SPY31_41_DS_E_5_3

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.

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

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**
				Light-ON	**EE-SPY411**
Vertical type 				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 1M**
			EE-1010 1M *
		2 m	**EE-1006 2M**
			EE-1010 2M *
	Connector with Robot Cable	1 m	**EE-1010-R 1M** *
		2 m	**EE-1010-R 2M** *
NPN/PNP Conversion Connector		0.46 m (total length)	**EE-2002**

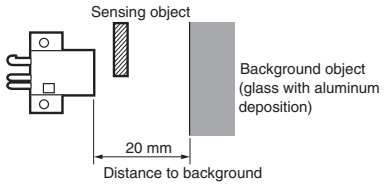
Note: Refer to *Accessories* for details.

* EE-1009- or EE-1010-series Connectors have a builtin locking mechanism to prevent cable disconnection when only the cable is pulled. To remove the Connector from the Sensor, grip the top and bottom of the Connector firmly and push into the Sensor once before pulling out. The locking mechanism prevents the Connector from being removed by pulling on the cable only and enables removal only when the Connector (housing) is pulled.

Ratings and Specifications

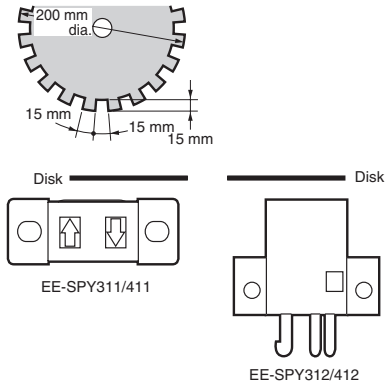
Item	Models	EE-SPY311, EE-SPY411, EE-SPY312, EE-SPY412
Sensing distance		2 to 5 mm (Reflection factor: 90%; white paper 15 × 15 mm)
Minimum sensing object		Pure copper wire (0.05 mm dia.)
Distance to background *1		20 mm max. (glass with aluminum deposition)
Differential distance		0.2 mm (with a sensing 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)

*1.



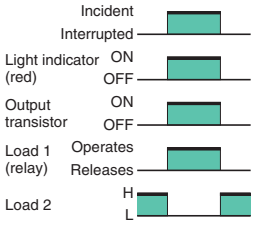
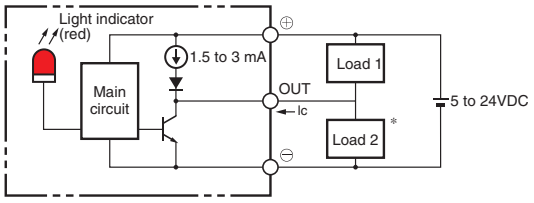
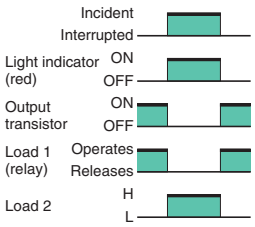
*2. The indicator is a GaP red LED (peak wavelength: 700 nm).

*3. The response frequency was measured by detecting the following rotating disk.



I/O Circuit Diagrams

NPN Output

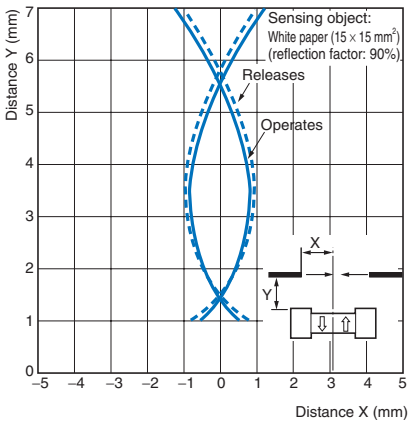
Model	Output configuration	Timing charts	Output circuit
EE-SPY411 EE-SPY412	Light-ON		
EE-SPY311 EE-SPY312	Dark-ON		

* Voltage output (when the sensor is connected to a transistor circuit)

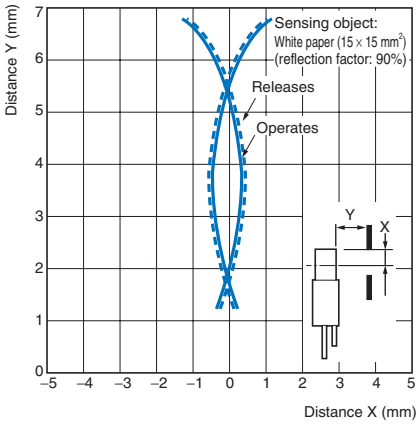
Engineering Data (Reference Value)

Operating Range Characteristics

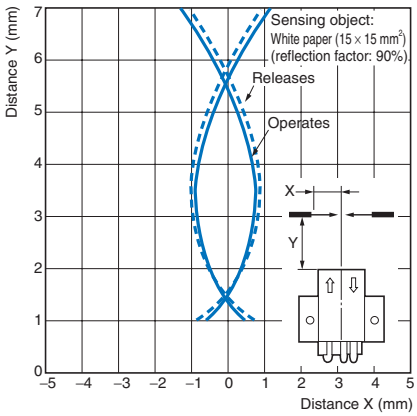
EE-SPY311/411



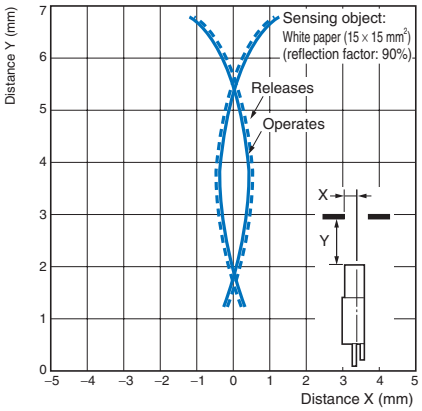
EE-SPY311/411



EE-SPY312/412

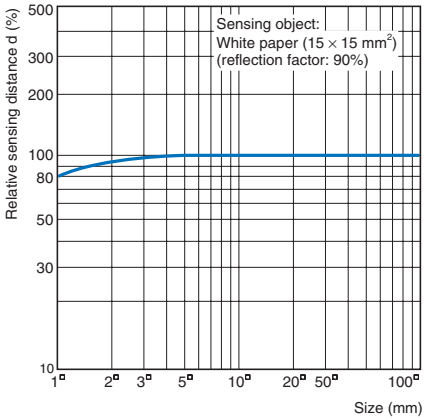


EE-SPY312/412



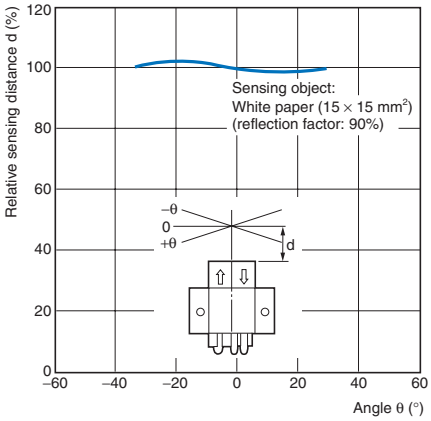
Sensing Distance vs. Object Area Characteristics

EE-SPY□□□



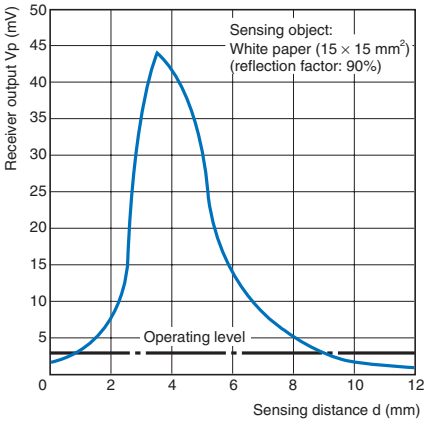
Sensing Angle vs. Sensing Distance Characteristics

EE-SPY312/412



Receiver Output vs. Sensing Distance Characteristics

EE-SPY□□□



Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

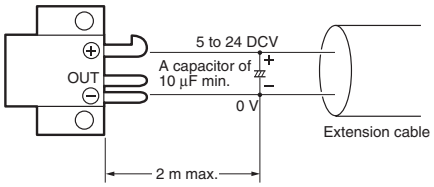
This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.

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 mm^2. 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.

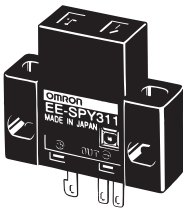
(Unit: mm)

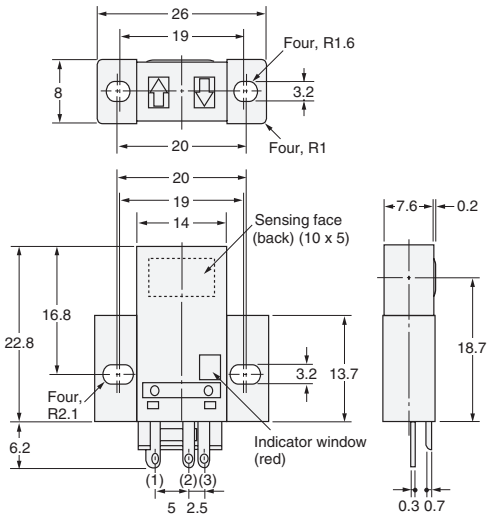
Dimensions

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

Sensors

EE-SPY311
EE-SPY411

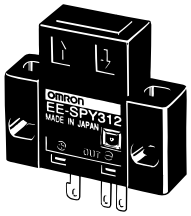


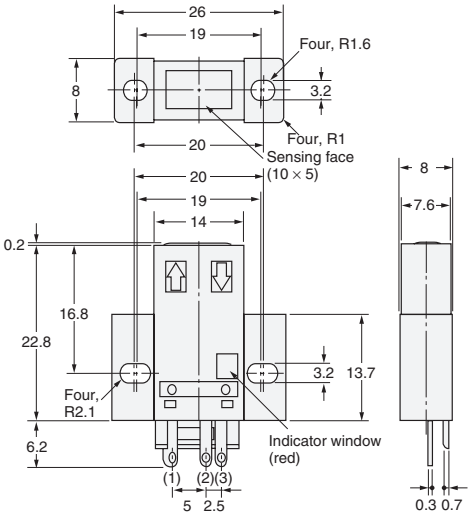


Terminal Arrangement

(1)	+	Vcc
(2)	OUT	OUTPUT
(3)	–	GND (0 V)

EE-SPY312
EE-SPY412





Terminal Arrangement

(1)	+	Vcc
(2)	OUT	OUTPUT
(3)	–	GND (0 V)

Accessories (Order Separately)

* Refer to *Accessories* for details.

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