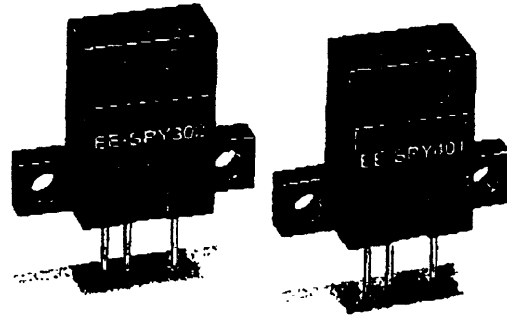


721-3920

**OMRON****Photomicrosensor****EE-SPY301/  
401/302/402****Light Modulation Effectively Reduces  
External Light Interference**

- Easy adjustment and optical axis monitoring with a LIGHT-ON indicator.
- Wide operating voltage range (5 to 24 VDC) makes smooth connection possible with a TTLs, relays, and programmable controllers (PC).
- Easy-to-wire connector assures ease of maintenance.

**Ordering Information**

Appearance	Sensing method	Sensing distance	Output configuration	Model	Weight
Horizontal type	Reflective type	5 mm	Light-OFF	EE-SPY301	Approx. 2.6 g
			Light-ON	EE-SPY401	
Vertical type		5 mm	Light-OFF	EE-SPY302	
			Light-ON	EE-SPY402	

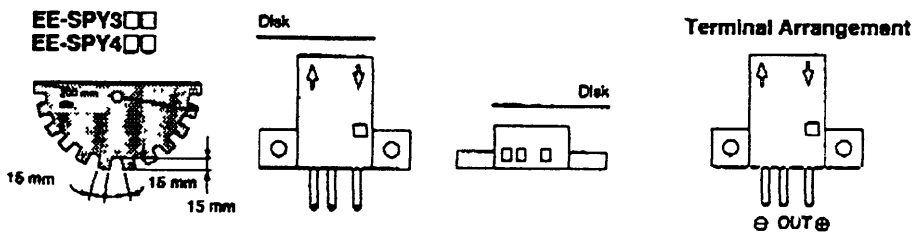
**Specifications****■ Ratings**

Item		Reflective			
		EE-SPY301	EE-SPY401	EE-SPY302	EE-SPY402
Supply voltage		5 to 24 VDC $\pm 10\%$ , ripple (p-p): 5% max.			
Current consumption		Average: 15 mA max.; Peak: 50 mA max.			
Rated sensing distance		5 mm (Reflection factor: 90%; white paper: 15 x 15 mm)			
Standard reference object		Transparent, opaque			
Differential distance		0.2 mm (with a sensing distance of 3 mm, horizontally)			
Control output		At 5 to 24 VDC: 80-mA load current ( $I_c$ ) with a residual voltage of 1.0 V max. When driving TTL: 10-mA load current ( $I_c$ ) with a residual voltage of 0.4 V max.			
Output configuration	Transistor on output stage without detecting object	ON	OFF	ON	OFF
	Transistor on output stage with detecting object	OFF	ON	OFF	ON
Indicator (see note 1)	Without detecting object	OFF			
	With detecting object	ON			
Response frequency (see note 2)		100 Hz			
Connecting method		EE-1002/1003 Connectors, soldering terminals			
Light source		GaAs infrared LED (pulse lighting) with a peak wavelength of 940 nm			
Receiver		Si photo-diode with a sensing wavelength of 850 nm max.			

Note: 1. The indicator is a GaP red LED (peak emission wavelength: 700 nm).

**EE-SPY301/401/302/402** ————— **OMRON** ————— **EE-SPY301/401/302/402**

2. The response frequency was measured by detecting the following Disks rotating.



**Characteristics**

<b>Ambient illumination</b>	Sensing face: fluorescent light/incandescent light: 3,000 lx max.
<b>Enclosure ratings</b>	IP50
<b>Ambient temperature</b>	Operating: -10° to 55°C Storage: -25° to 65°C
<b>Ambient humidity</b>	Operating: 35% to 85% Storage: 35% to 85%
<b>Vibration resistance</b>	Destruction: 10 to 55 Hz, 1.5-mm double amplitude for 2 hrs each in X, Y, and Z directions
<b>Shock resistance</b>	Destruction: 500 m/s <sup>2</sup> (approx. 50G) for 3 times each in X, Y, and Z directions
<b>Cable length</b>	2 m max. with a thickness of 0.3 mm <sup>2</sup> min.

**Engineering Data**

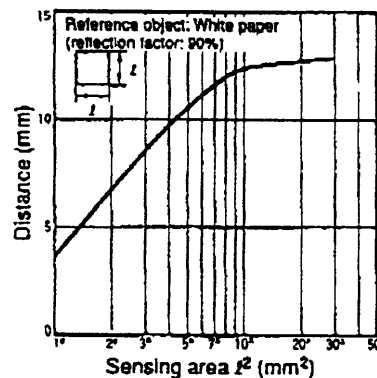
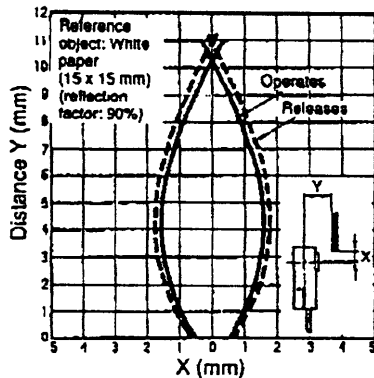
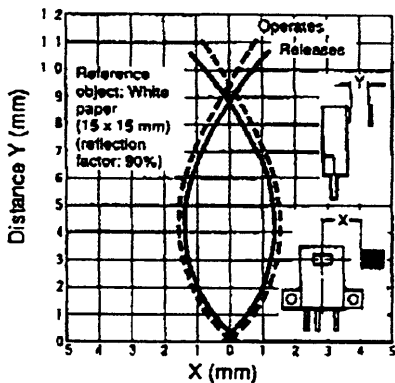
**Operating Range (Typical)**

EE-SPY301, EE-SPY401

EE-SPY301, EE-SPY401

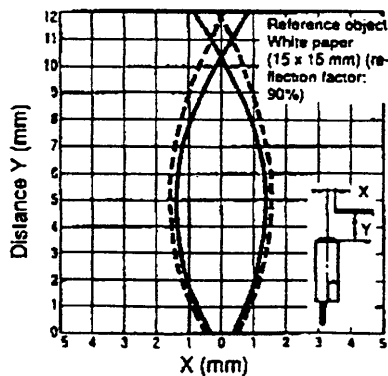
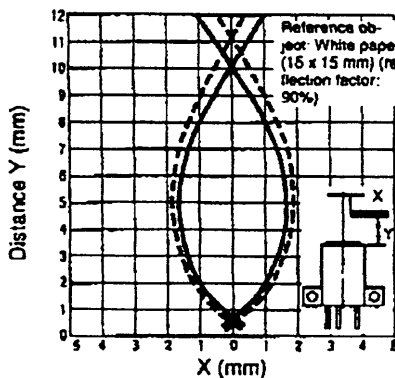
**Sensing Distance vs. Object Area (Typical)**

EE-SPY301, -SPY302, -SPY401, -SPY402



EE-SPY302, EE-SPY402

EE-SPY302, EE-SPY402



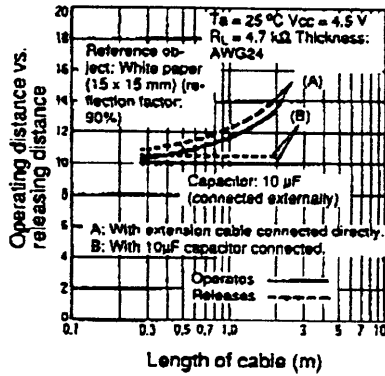
EE-SPY301/401/302/402

OMRON

EE-SPY301/401/302/402

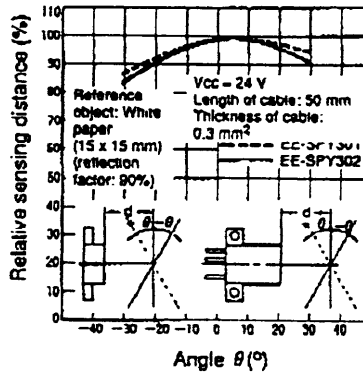
**Operating/Reset Distance vs. Cable Length (Typical)**

EE-SPY□□□



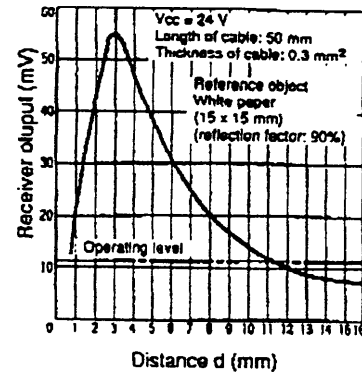
**Sensing Angel vs. Sensing Distance (Typical)**

EE-SPY□□□



**Receiver Output vs. Sensing Distance (Typical)**

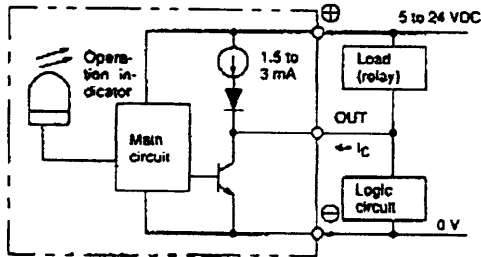
EE-SPY□□□



**Operation**

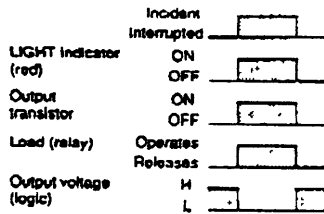
■ **Output Circuit Diagrams**

**Light ON/OFF**

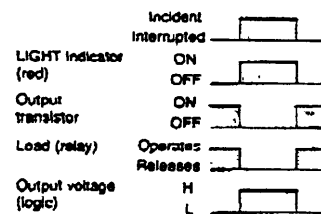


■ **Timing Chart**

**Light ON**



**Light OFF**



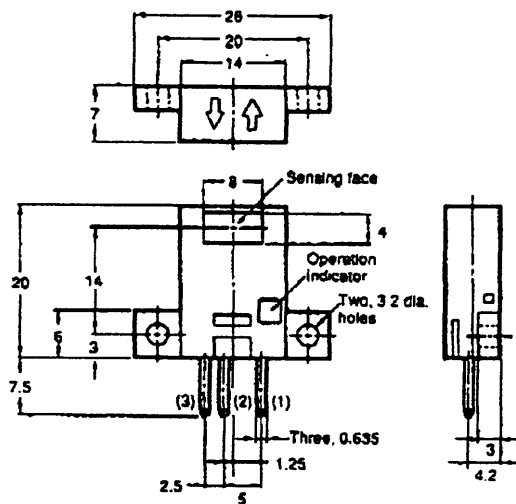
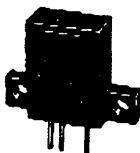
12-9.

**EE-SPY301/401/302/402** ——— **OMRON** ——— **EE-SPY301/401/302/402**

**Dimensions**

Note: All units are in millimeters unless otherwise indicated.

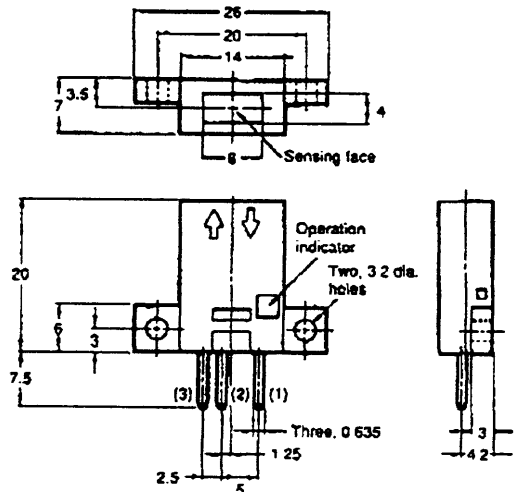
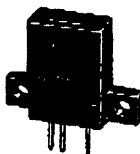
**EE-SPY301**  
**EE-SPY401**



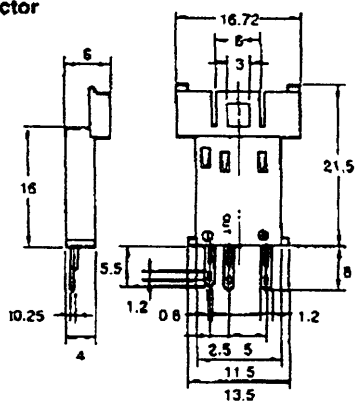
**Terminal Arrangement**

(1)	⊕	Vcc
(2)	OUT	OUT PUT
(3)	⊖	GND (0 V)

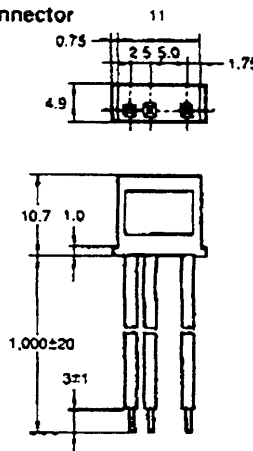
**EE-SPY302**  
**EE-SPY402**



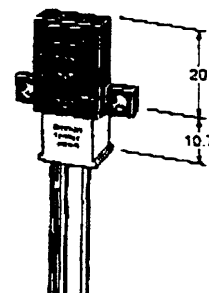
**EE-1002 Connector**



**EE-1003 Connector**

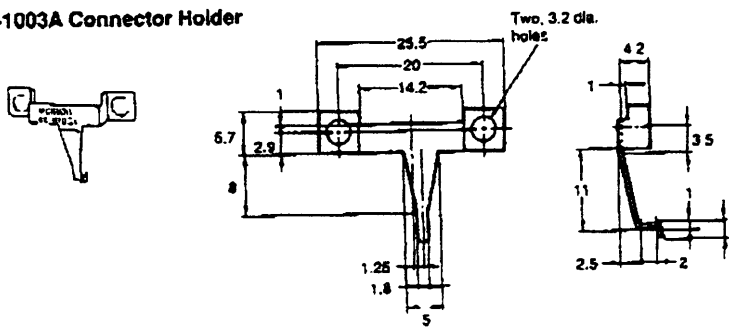


**EE-SP301 + EE-1003**



# EE-SPY301/401/302/402 ———— OMRON ———— EE-SPY301/401/302/402

## EE-1003A Connector Holder



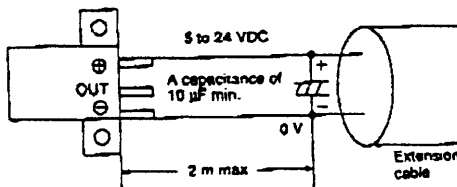
## Precautions

Refer to pages 15 to 17 for general precautions.

### Wiring

A cable with a thickness of 0.3 mm<sup>2</sup> or AWG22 min. and a length of 2 m max. must be connected to the output terminals.

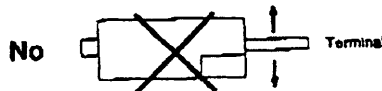
To use a cable longer than 2 m, attach a capacitor with a capacitance of approximately 10  $\mu$ F to the wires as shown below (the distance between the terminal and the capacitor must be within 2 m):



Do not solder the cable to the connectors. Use the EE-1002 Connector or EE-1003 Connector (with a 1-m cable attached) to connect the cable to the output terminals.

Use the EE1003A Connector Holder to prevent accidental disconnection of the EE-1003 Connector from the EE-SPY301/401/302/402 Photomicrosensor.

Do not impose excessive force on the terminals (refer to the diagram below). Excess force will damage the terminals.

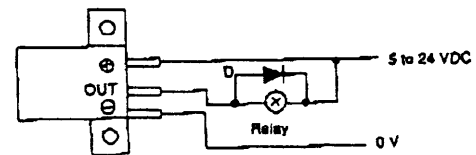


Do not disconnect the EE-1001 or EE-1006 Connector from the photomicrosensor when power is supplied to the photomicrosensor or sensor damage could result.

If the metal mounting base is subject to inductive electrical noise, the photomicrosensor can be activated accidentally. If noise is a problem, take the following countermeasures:

1. Connect the negative terminal to the mounting base so that there will be no difference in electric potential between the photomicrosensor and mounting base.
2. Connect the negative terminal to the mounting base via a 0.47- $\mu$ F capacitor.
3. Insert a plastic insulating plate with a thickness of approximately 10 mm between the photomicrosensor and mounting base.

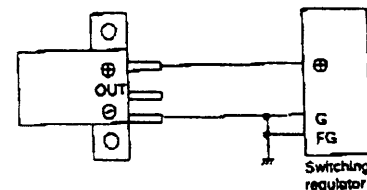
Wire as shown by the following illustration to connect a small inductive load (a relay for example) to the photomicrosensor. A diode must be connected parallel to the relay to absorb the reverse voltage.



When using a standard switching regulator, ground the FG and G terminal so that the photomicrosensor will be in a stable operating condition.

### Power Supply

When using a standard switching regulator, ground the FG and G terminal so that the photomicrosensor will be in a stable operating condition.



**ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.**  
To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.