Compact Pre-wired Photomicrosensor with Amplifier (Non-modulated)

EE-SX91

Fast response photo-sensor in miniature forked housing

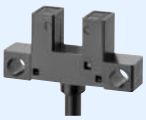
- Both light-ON and dark-ON outputs (antivalent outputs) provided.
- A compact size and choice of five models for a wide range of applications.
- Compact NPN and PNP output models.
- Mount using M3 or M2 screws.
- Indicator is visible from many directions for installation in any location.
- Maximum load current of 100 mA.
- Models with connectors simplify wiring and maintenance.
- Flexible robot cables are standard on all models.

Ordering Information

List of Models

Models with Robot Cables

Infrared light

Appearance	Sensing method	Sensing distance	Output configuration	Indicator mode	Connecting method (Cable length)	Model	
						NPN output	PNP output
Standard 	Through-beam type (with slot)	5 mm (slot width)	Light-ON Dark-ON (2 outputs)	Lit when light is incident	Pre-wired models (1 m)	**EE-SX910-R**	**EE-SX910P-R**
					Models with connectors (0.3 m)	**EE-SX910-C1J-R**	**EE-SX910P-C1J-R**
L-shaped 					Pre-wired models (1 m)	**EE-SX911-R**	**EE-SX911P-R**
					Models with connectors (0.3 m)	**EE-SX911-C1J-R**	**EE-SX911P-C1J-R**
F-shaped 					Pre-wired models (1 m)	**EE-SX912-R**	**EE-SX912P-R**
					Models with connectors (0.3 m)	**EE-SX912-C1J-R**	**EE-SX912P-C1J-R**
R-shaped 					Pre-wired models (1 m)	**EE-SX913-R**	**EE-SX913P-R**
					Models with connectors (0.3 m)	**EE-SX913-C1J-R**	**EE-SX913P-C1J-R**
U-shaped 					Pre-wired models (1 m)	**E-SX914-R**	**EE-SX914P-R**
					Models with connectors (0.3 m)	**EE-SX914-C1J-R**	**EE-SX914P-C1J-R**

Accessories (Order Separately)

Connector with Robot Cable

Type	Cable length	Model	Remarks
Connector with Cable	2 m	EE-1016-R	Connector with lock, AWG26, 4-core Robot Cable

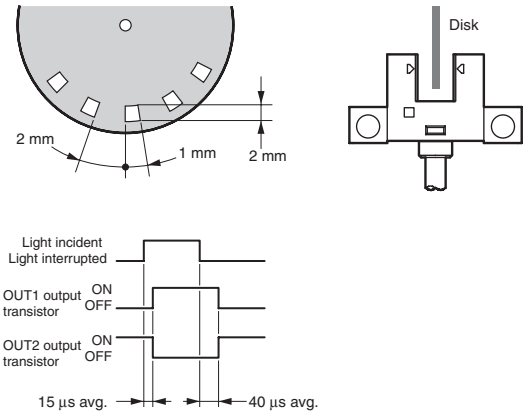
Ratings and Specifications

Item		Type	Standard	L-shaped	F-shaped	R-shaped	U-shaped
	NPN models	Pre-wired models	EE-SX910-R	EE-SX911-R	EE-SX912-R	EE-SX913-R	EE-SX914-R
		Models with connectors	EE-SX910-C1J-R	EE-SX911-C1J-R	EE-SX912-C1J-R	EE-SX913-C1J-R	EE-SX914-C1J-R
	PNP models	Pre-wired models	EE-SX910P-R	EE-SX911P-R	EE-SX912P-R	EE-SX913P-R	EE-SX914P-R
		Models with connectors	EE-SX910P-C1J-R	EE-SX911P-C1J-R	EE-SX912P-C1J-R	EE-SX913P-C1J-R	EE-SX914P-C1J-R
Supply voltage			5 to 24 VDC ±10%, ripple (p-p): 10% max.				
Current consumption			15 mA max.				
Sensing distance			5 mm (slot width)				
Differential distance			0.025 mm max.				
Light source			GaAs infrared LED				
Sensing object			Opaque: 1.2 × 0.8 mm min.				
Control output			Load power supply voltage: 5 to 24 VDC Load current: 100 mA max. 100 mA load current with a residual voltage of 1.0 V max. 5 mA load current with a residual voltage of 0.4 V max.				
Indicator			Light indicator (red LED)				
Protection circuits			Power supply reverse polarity protection; output reverse polarity protection				
Response frequency			3 kHz min. (8 kHz average) Light incident: 15 µs average; light interrupted: 40 µs average*				
Ambient illumination			1,000 lx max. with fluorescent light on the surface of the receiver				
Ambient temperature range			Operating: -25 to 55°C Storage: -30 to 80°C (with no icing or condensation)				
Ambient humidity range			Operating: 5% to 85% Storage: 5% to 95% (with no icing or condensation)				
Vibration resistance (Destruction)			10 to 2,000 Hz 0.75 mm single amplitude for 2.5 h (15 min periods, 10 cycles) each in X, Y, and Z directions				
Shock resistance (Destruction)			500 m/s^2 for 3 times each in X, Y, and Z directions				
Connecting method			Pre-wired Models (standard cable length: 1 m), Models with Connectors (standard cable length: 0.3 m)				
Enclosure rating			IEC IP50				
Weight (packaged)		Pre-wired Models	Approx. 17 g				
		Models with Connectors	Approx. 7 g				
Materials	Case		Polybutylene phthalate (PBT)				
	Cover						
	Emitter/Receiver		Polycarbonate (PC)				

Applicable Connector

Item		Connector with Cable
	Model	EE-1016-R
	Appearance	
Contact resistance		25 mΩ max. (at 10 mA DC and 20 mV max.)
Insertion strength		20 N max.
Surplus strength (housing holding strength)		15 N min.
Cable length		2 m
Ambient temperature range		-25 to 85 °C
Materials	Housing	Nylon
	Contact	Phosphor bronze

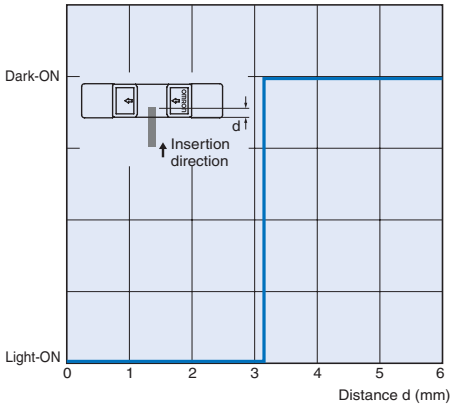
* The response frequency was measured by detecting the following rotating disk. The response times for light incidence and light interruption are shown in the timing chart.



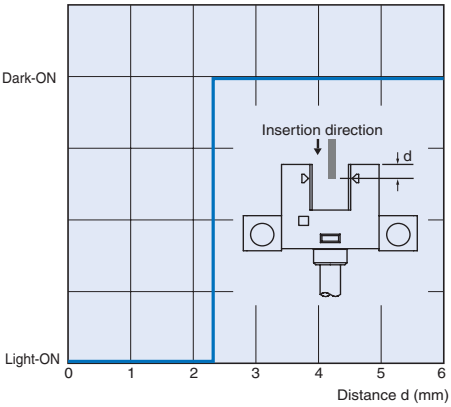
Engineering Data (Typical)

Sensing Position Characteristics

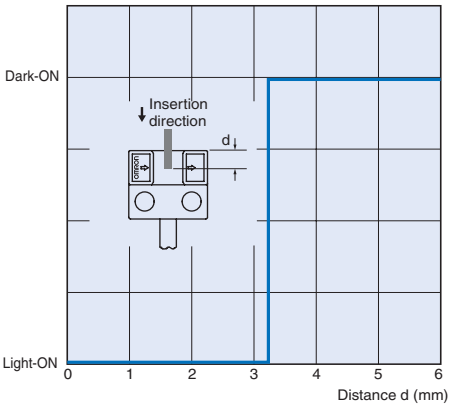
EE-SX910



EE-SX910

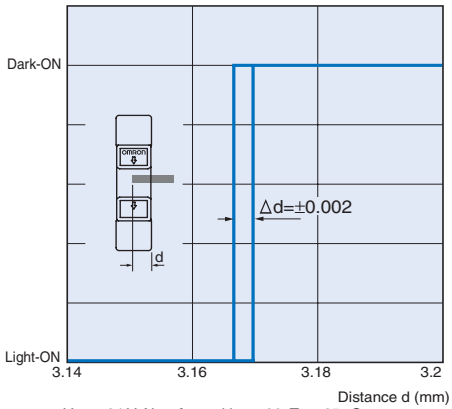


EE-SX911



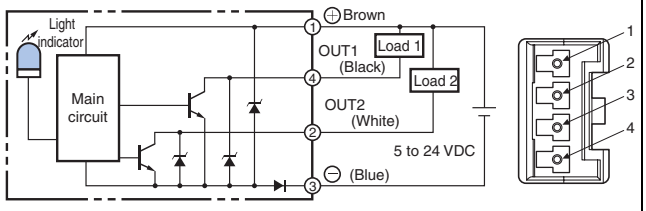
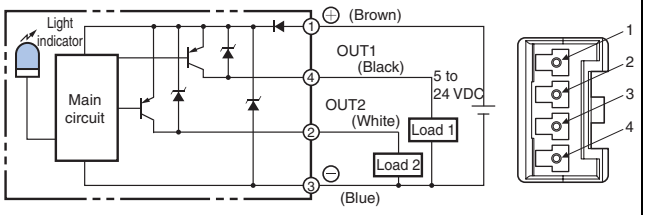
Repeated Sensing Position Characteristics

EE-SX910



Vcc = 24 V, No. of repetitions: 20, Ta = 25 °C
(Differential distance = 0.025 mm max.)

I/O Circuits

Output type	Model	Output transistor operation status	Timing charts	Output circuit
NPN output	**EE-SX910-R** **EE-SX910-C1J-R** **EE-SX911-R** **EE-SX911-C1J-R** **EE-SX912-R** **EE-SX912-C1J-R** **EE-SX913-R** **EE-SX913-C1J-R** **EE-SX914-R** **EE-SX914-C1J-R**	OUT1: Light-ON OUT2: Dark-ON	Light incident Light interrupted Light indicator (red) ON / OFF Output 1 transistor ON / OFF Load 1 (relay) Operates / Releases Output 2 transistor ON / OFF Load 2 (relay) Operates / Releases	
PNP output	**EE-SX910P-R** **EE-SX910P-C1J-R** **EE-SX911P-R** **EE-SX911P-C1J-R** **EE-SX912P-R** **EE-SX912P-C1J-R** **EE-SX913P-R** **EE-SX913P-C1J-R** **EE-SX914P-R** **EE-SX914P-C1J-R**			

Safety Precautions

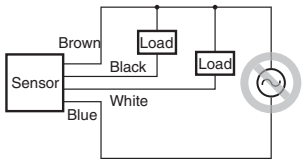
⚠ WARNING

Do not use this product in sensing devices designed to provide human safety.

Precautions for Safe Use

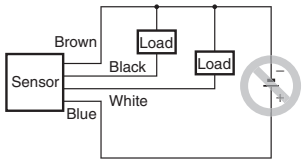
Power Supply Voltage

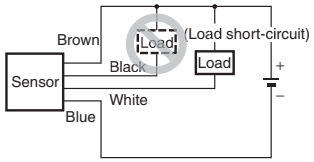
- Do not exceed the voltage range indicated in the specifications. Applying a voltage exceeding the specifications or using an AC power supply may result in rupture or burning.



Faulty Wiring

- Do not reverse the power supply polarity. Doing so may result in rupture or burning.
- Do not short-circuit the load. (Do not connect to the power supply.) Doing so may result in rupture or burning.
- Dispose of this product as industrial waste.





Precautions for Correct Use

Installation

- It is assumed that EE-SX91 Sensors will be built into a device. These Sensors use non-modulated light and are not equipped to deal with interference from an external light source. When they are used in locations subject to external light interference, such as near a window or under an incandescent light, install them to minimize the effects of external light interference.
- Mount the Sensors securely on a flat surface.
- Use M3 or M2.0 screws to secure the Photomicrosensor. (The stronger M3 screws are recommended. In addition, use flat washers and spring washers to prevent the screws from loosening.) Refer to the following table for the correct tightening torque.

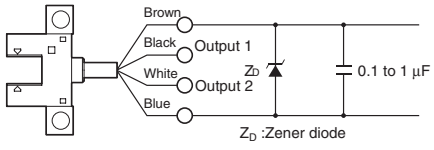
Screw diameter	Tightening torque
M2.0	0.15 N·m max.
M3	0.54 N·m max.

- If the Sensor is to be used on a moving part, secure the cable connection point so that it is not directly subjected to stress.

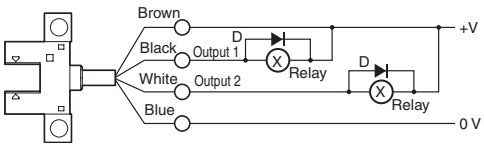
Wiring

Countermeasures Against Surge

If there is surge in the power supply, try connecting a capacitor (with a capacitance of 0.1 to 1 μF) or a Zener diode (ZD with a rated voltage of 30 to 35 V). Use the Sensor only after confirming that the surge has been removed.



- When driving a small inductive load, such as a relay, wire as shown below. (Be sure to connect a diode to absorb the reverse voltage.)



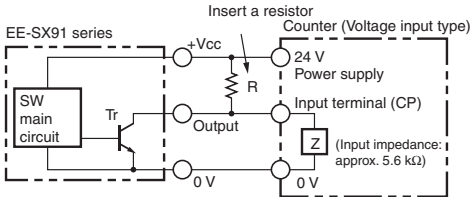
- If Photomicrosensor wires are placed in the same tubes or ducts as high-voltage lines or power lines, induction may be received and may result in faulty operation or burning. Either wire the Photomicrosensor separately or place the wires in separate tubes.

Unused Output Lines

Be sure to isolate output lines that are not going to be used.

Connecting to Devices with Voltage Input Specifications

A Sensor with an open-collector output can be connected to a counter with a voltage input by connecting a resistor between the power source and output. Select a resistor with reference to the following example. The resistance of the resistor is generally 4.7 Ω and its wattage is 1/2 W for a supply voltage of 24 V and 1/4 W for 12 V.



Example: EE-SX91 Series
Load Resistance of 4.7 kΩ Connected in a Counter

Counter Specifications

Input impedance	5.6 KΩ
Voltage judged as high level (input ON)	4.5 to 30 VDC
Voltage judged as low level (input OFF)	0 to 2 VDC

The high and low levels are found using the following formulas. The input device specifications must satisfy both formulas.

High level:

$$\text{Input voltage } V_H = \frac{Z}{R+Z} \quad Vcc = \frac{5.6\text{ k}}{4.7\text{ k}+5.6\text{ k}} \times 24\text{ V} = 13\text{ V}$$

Low level:

$$\text{Load current } Ic = \frac{Vcc}{R} = \frac{24\text{ V}}{R} = 5.1\text{ mA} \leq 100\text{ mA}$$

Input voltage $V_L \leq 1.0$ V (Residual voltage for 100-mA load current)

Note: Refer to the ratings of the Sensor for the residual voltage of the load current.

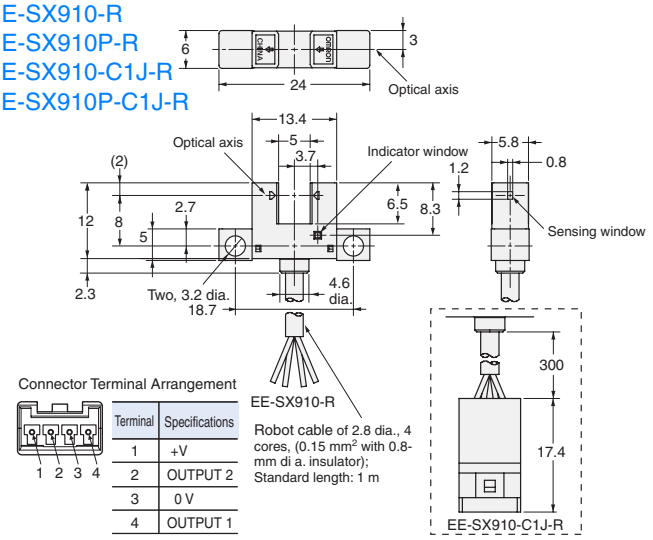
Other Precautions

- Do not disconnect the Connector from the Sensor when power is supplied to the Sensor, or Sensor damage could result.
- Do not install the Sensor in the following places to prevent malfunction or trouble:
  1. Places exposed to dust or oil mist
  2. Places exposed to corrosive gas
  3. Places directly or indirectly exposed to water, oil, or chemicals
  4. Outdoor or places exposed to intensive light, such as direct sunlight
- Be sure to use the Sensor under the rated ambient temperature.
- The Sensor may be dissolved by exposure to organic solvents, acids, alkali, or aromatic hydrocarbons, causing deterioration in characteristics. Do not expose the Sensor to such chemicals.

Dimensions (Unit: mm)

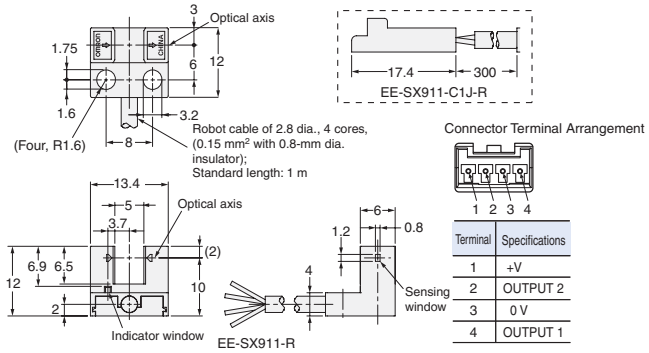
Photomicrosensors

EE-SX910-R
EE-SX910P-R
EE-SX910-C1J-R
EE-SX910P-C1J-R



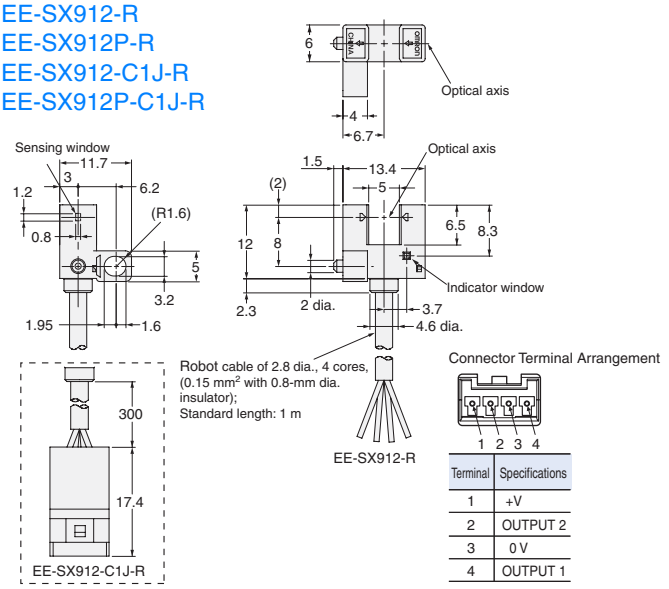
Terminal	Specifications
1	+V
2	OUTPUT 2
3	0 V
4	OUTPUT 1

EE-SX911-R
EE-SX911P-R
EE-SX911-C1J-R
EE-SX911P-C1J-R



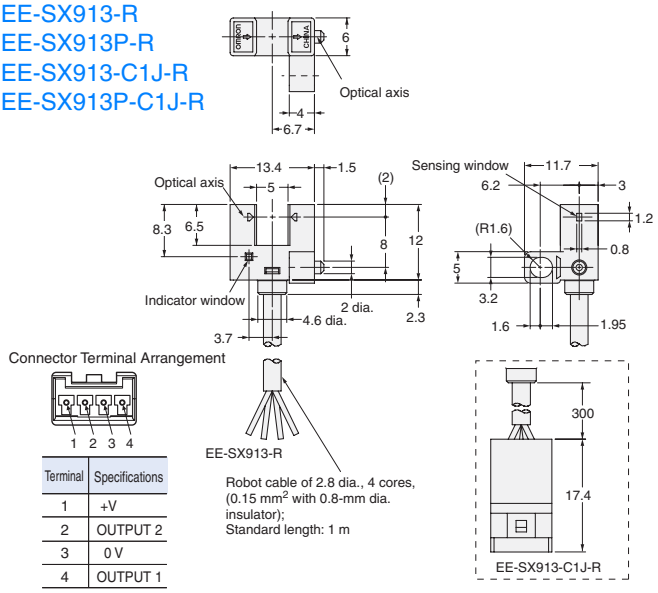
Terminal	Specifications
1	+V
2	OUTPUT 2
3	0 V
4	OUTPUT 1

EE-SX912-R
EE-SX912P-R
EE-SX912-C1J-R
EE-SX912P-C1J-R



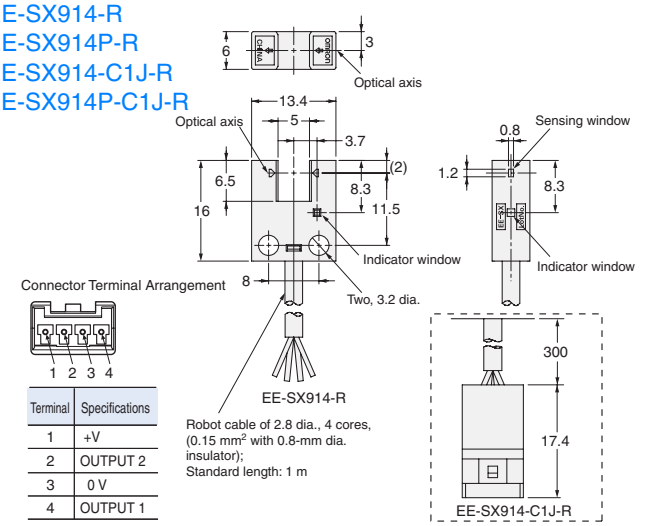
Terminal	Specifications
1	+V
2	OUTPUT 2
3	0 V
4	OUTPUT 1

EE-SX913-R
EE-SX913P-R
EE-SX913-C1J-R
EE-SX913P-C1J-R



Terminal	Specifications
1	+V
2	OUTPUT 2
3	0 V
4	OUTPUT 1

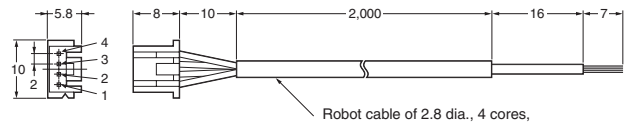
EE-SX914-R
EE-SX914P-R
EE-SX914-C1J-R
EE-SX914P-C1J-R



Terminal	Specifications
1	+V
2	OUTPUT 2
3	0 V
4	OUTPUT 1

Accessories (Order Separately)

Connector with Robot Cable
EE-1016-R



Terminal Arrangement

①	⊕	Brown
②	OUTPUT 2	White
③	⊖	Blue
④	OUTPUT 1	Black

Cat. No. E376-E2-01-X **In the interest of product improvement, specifications are subject to change without notice.**

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