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

EE-SX91

Meeting Customer Needs with Compact Sensors that Mount with M3 Screws

- Both light-ON and dark-ON 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 in many directions for installation in any location.
- Maximum load current of 100 mA.
- Flexible robot cables are standard on all models.

⚠ Be sure to read *Safety Precautions* on page 46.

CE

Features

A Compact Size and Choice of Five Models for a Wide Range of Applications

Select any of five models to minimize the space required.

Compact NPN and PNP Output Models

Both NPN and PNP output models are available for use according to system requirements.

Maximum Load Current of 100 mA

Output control of up to 100 mA is supported for either NPN or PNP outputs.

Flexible Robot Cables: Standard on All Models

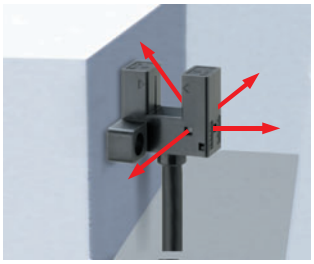
Robot Cables are effective for moving parts, and are provided as standard equipment with all models.

Both Light-ON and Dark-ON Outputs

Both light-ON and dark-ON outputs are provided on all models, allowing outputs to be switched by simply changing the wiring according to the application.

Indicator Visible from Many Directions for Installation in Any Location

The light indicator can be checked from up to four directions.



Mount Using M3 or M2 Screws

The EE-SX91 can be mounted using M3 or M2 screws, so it can easily replace an existing compact sensor mounted with M2 screws.

EE-SX91

Ordering Information

List of Models

Models with Robot Cables

Infrared light

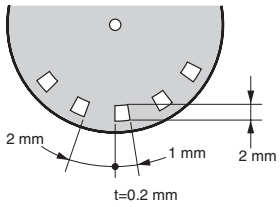
Appearance	Sensing method	Sensing distance	Output configuration	Indicator mode	Connecting method (Cable length)	Model	
						NPN output	PNP output
Standard 	Through-beam type (with slot)	5 mm (slot width)	Light-ON Dark-ON (2 outputs)	Lit when light is incident	Pre-wired models (1 m)	**EE-SX910-R 1M**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

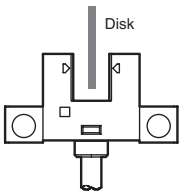
* Prewired models with a 3-m cable are also available. When ordering, specify the cable length by adding “3M” for the end of the model number (e.g., EE-SX910-R 3M).

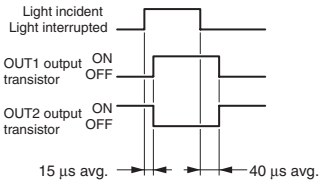
Ratings and Specifications

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
	PNP models	Pre-wired models		EE-SX910P-R	EE-SX911P-R	EE-SX912P-R	EE-SX913P-R	EE-SX914P-R
Sensing distance				5 mm (slot width)				
Sensing object				Opaque: 1.2 × 0.8 mm min.				
Differential distance				0.025 mm max.				
Light source				GaAs infrared LED with a peak wavelength of 940 nm				
Indicator				Light indicator (red LED)				
Supply voltage				5 to 24 VDC ±10%, ripple (p-p): 10% max.				
Current consumption				15 mA max.				
Control output				Load power supply voltage: 5 to 24 VDC Load current: 100 mA max. OFF current: 0.5 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.				
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				
Degree of protection				IEC60529 IP50				
Connecting method				Pre-wired Models (standard cable length: 1 m)				
Weight (packed state)			Pre-wired Models	Approx. 17 g				
			Models with Connectors	Approx. 7 g				
Materials	Case/cover			Polybutylene phthalate (PBT)				
	Emitter/receiver			Polycarbonate (PC)				

* 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.





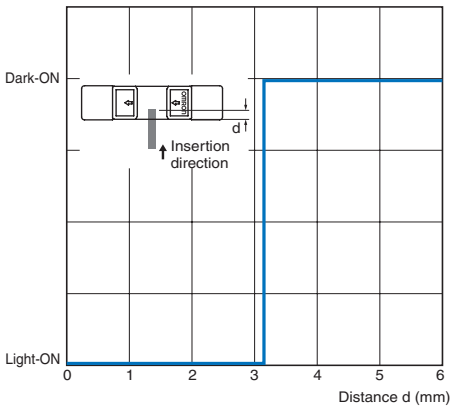


EE-SX91

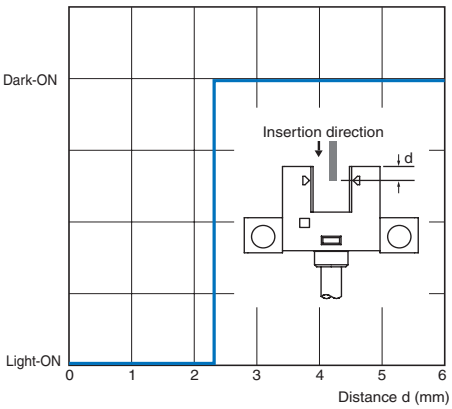
Engineering Data (Typical)

Sensing Position Characteristics

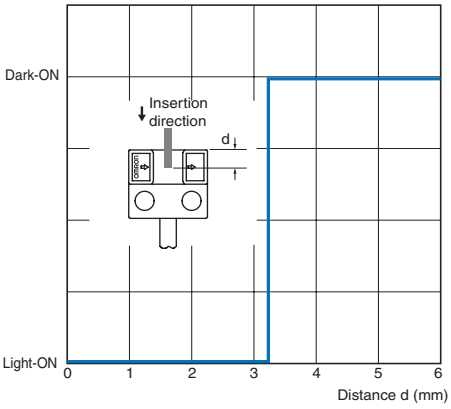
EE-SX910



EE-SX910

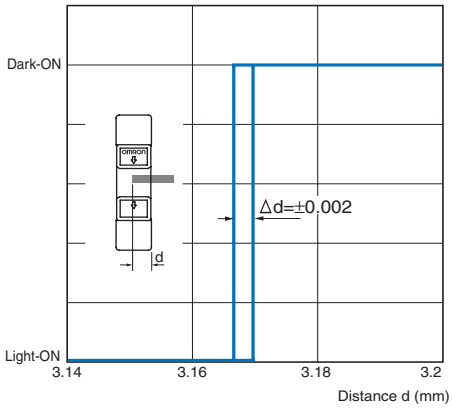


EE-SX911



Repeated Sensing Position Characteristics

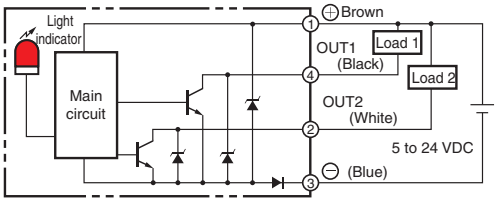
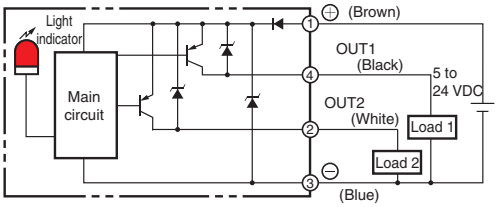
EE-SX910



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

Note: The data applies to dark status. Operation may be affected by external light interference or light coming through the sensing object.

I/O Circuit Diagrams

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

Safety Precautions

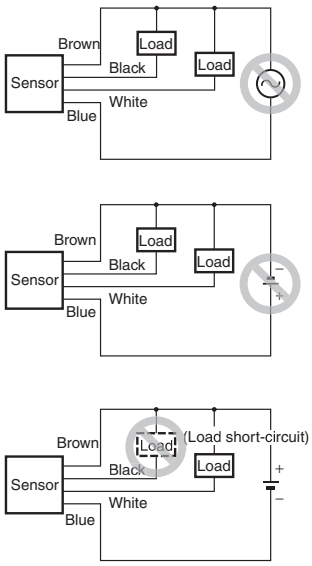
Refer to *Warranty and Limitations of Liability*.

⚠ 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 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.

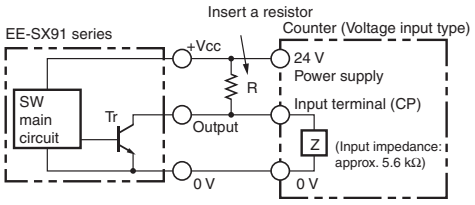
● Wiring

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 kΩ 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, aliphatic chloride hydrocarbons causing deterioration in characteristics. Do not expose the Sensor to such chemicals.
- Make sure the total length of the power cable connected to the product is less than 10 m.

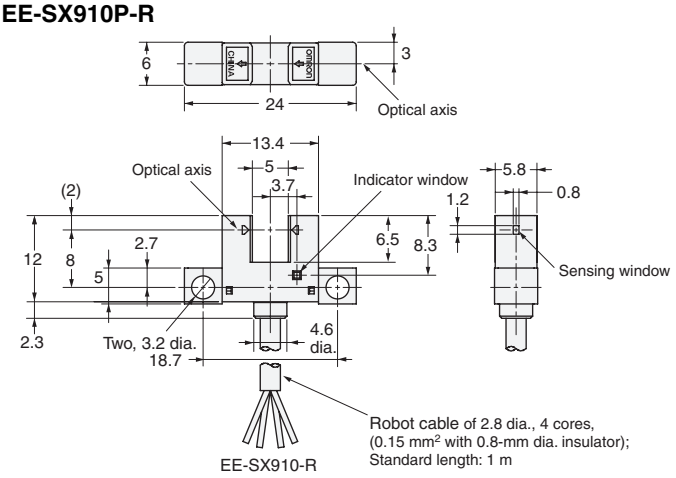
EE-SX91

Dimensions (Unit: mm)

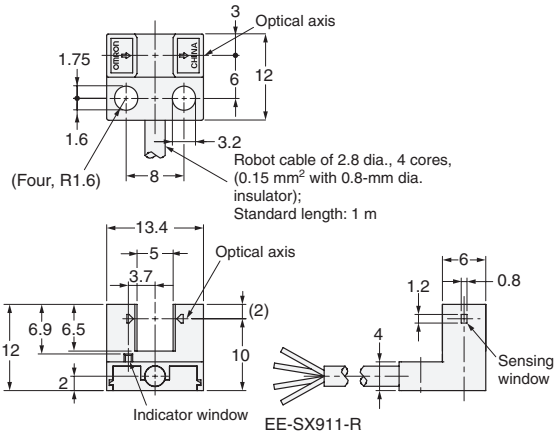
Tolerance class IT16 applies to dimensions in this datasheet unless otherwise specified.

Photomicrosensors

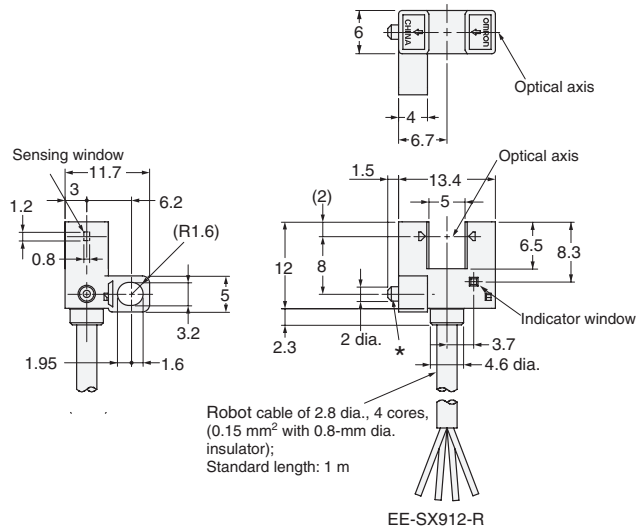
EE-SX910-R
EE-SX910P-R



EE-SX911-R
EE-SX911P-R

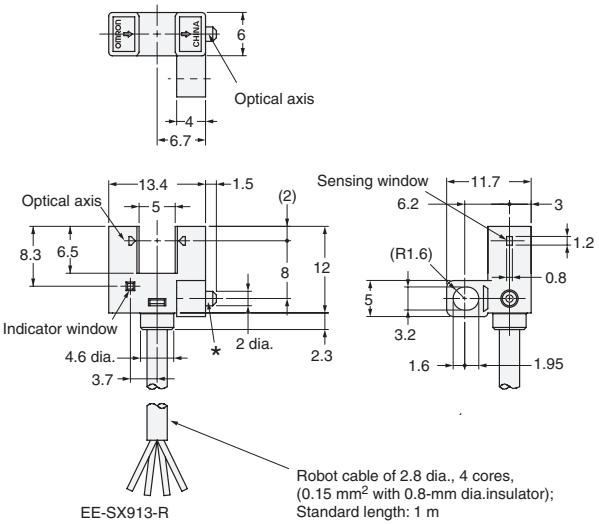


EE-SX912-R
EE-SX912P-R



* The lug is used to prevent turning. When installing, make a fixed hole of 2.1 to 2.3 mm dia.

EE-SX913-R
EE-SX913P-R



* The lug is used to prevent turning. When installing, make a fixed hole of 2.1 to 2.3 mm dia.

EE-SX914-R
EE-SX914P-R