



PHOTOMICRO SENSORS

Photomicro Sensors with Built-in Amplifier



EE-SX670

EE-SX670-WR

EE-SX770

EE-SX910-R



Standard EE-SX47/67 Series



Compact EE-SX91 Series



Thin EE-SX77/87 series

A Complete Product Lineup
for the Perfect Selection

EE-SX47/67

NEW

Photomicrosensor with 50- to 100-mA direct switching capacity for built-in application.

- Series includes models that enable switching between dark-ON and light-ON operation.
- Response frequency as high as 1 kHz.
- Easy operation monitoring with bright light indicator.
- Wide operating voltage range: 5 to 24 VDC
- Models in which the light indicator turns ON for dark-ON operation are also available.
- A wide range of variations in eight different shapes.
- Flexible robot cable is provided as a standard feature. *2



Be sure to read *Safety Precautions* on page 8.

*1. Only the EE-SX67 Series has pre-wired models.
*2. Pre-wired models only.

Ordering Information










Connector models

Appearance	Sensing method	Connect-ing method	Sensing distance	Output configuration	Indicator mode	Model	
						NPN output	PNP output
Standard 	Through-beam type (with slot)	Connector (4 poles)	5 mm (slot width)	Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX670	EE-SX670P
					No incident light	EE-SX670A	EE-SX670R
L-shaped 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX671	EE-SX671P
					No incident light	EE-SX671A	EE-SX671R
T-shaped 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX672	EE-SX672P
					No incident light	EE-SX672A	EE-SX672R
Close-mounting 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX673	EE-SX673P
					No incident light	EE-SX673A	EE-SX673R
Close-mounting 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX473	EE-SX473P
					No incident light	EE-SX674A	EE-SX674R
T-shaped, slot center: 10 mm 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX675 NEW	EE-SX675P NEW
					No incident light	EE-SX674A	EE-SX674R
F-shaped 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX676 NEW	EE-SX676P NEW
					No incident light	EE-SX674A	EE-SX674R
R-shaped 				Dark-ON/Light-ON (selectable) *3	Incident light	EE-SX677 NEW	EE-SX677P NEW
					No incident light	EE-SX674A	EE-SX674R

*3. These models can be used as Light-ON when the L terminal and positive (+) terminal are connected to each other. To use them as Dark-ON, do not connect these terminals to each other. When used at light-ON, it is useful to select the connector EE-1001-1. The L terminal and positive (+) terminal of this connector are short-circuited in advance.

Pre-wired Models and Models with Junction Connectors

 Infrared light

Appearance	Sensing method	Sensing distance		Output configuration	Indicator mode	Connecting method	Model	
							NPN output	PNP output
Standard 	Through-beam type (with slot)		5 mm (slot width)	Dark-ON/ Light-ON (selectable) *	Incident light	Pre-wired models (1 m)	EE-SX670-WR <u>NEW</u>	EE-SX670P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX670-C1J-R <u>NEW</u>	EE-SX670P-C1J-R <u>NEW</u>
L-shaped 						Pre-wired models (1 m)	EE-SX671-WR <u>NEW</u>	EE-SX671P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX671-C1J-R <u>NEW</u>	EE-SX671P-C1J-R <u>NEW</u>
T-shaped, slot center: 7 mm 						Pre-wired models (1 m)	EE-SX672-WR <u>NEW</u>	EE-SX672P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX672-C1J-R <u>NEW</u>	EE-SX672P-C1J-R <u>NEW</u>
Close-mounting 						Pre-wired models (1 m)	EE-SX673-WR <u>NEW</u>	EE-SX673P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX673-C1J-R <u>NEW</u>	EE-SX673P-C1J-R <u>NEW</u>
Close-mounting 						Pre-wired models (1 m)	EE-SX674-WR <u>NEW</u>	EE-SX674P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX674-C1J-R <u>NEW</u>	EE-SX674P-C1J-R <u>NEW</u>
T-shaped, slot center: 10 mm 						Pre-wired models (1 m)	EE-SX675-WR <u>NEW</u>	EE-SX675P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX675-C1J-R <u>NEW</u>	EE-SX675P-C1J-R <u>NEW</u>
F-shaped 						Pre-wired models (1 m)	EE-SX676-WR <u>NEW</u>	EE-SX676P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX676-C1J-R <u>NEW</u>	EE-SX676P-C1J-R <u>NEW</u>
R-shaped 						Pre-wired models (1 m)	EE-SX677-WR <u>NEW</u>	EE-SX677P-WR <u>NEW</u>
						Models with junction connectors (0.1 m)	EE-SX677-C1J-R <u>NEW</u>	EE-SX677P-C1J-R <u>NEW</u>

* These models can be used as Light-ON when the L line and positive (+) line are connected to each other. To use them as Dark-ON, do not connect these lines to each other.

Accessories for Models with Connectors (Order Separately)

Type	Cable length	Model	Remarks
Connector		EE-1001	
		EE-1001-1	L terminal and positive (+) terminal are already short-circuited.
		EE-1009	
Connector with Cable	1 m	EE-1006	
	2 m	EE-1006	
		EE-1010	
Connector with Robot Cable	1 m	EE-1010-R	
	2 m	EE-1010-R	
Connector Hold-down Clip		EE-1006A	For EE-1006 only.

Accessories for Models with Junction Connectors (Order Separately)

Type	Cable length	Model	Remarks
Connector with Robot Cable	2m	EE-1016-R-1 <u>NEW</u>	For EE-SX67□-C1J-R.

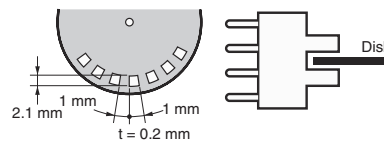
EE-SX47/67

Ratings and Specifications

Item	Type		Standard	L-shaped	T-shaped, slot center: 7 mm	Close-mounting		T-shaped, slot center: 10 mm	F-shaped	R-shaped
	NPN models	Connector	EE-SX670 EE-SX670A EE-SX470	EE-SX671 EE-SX671A EE-SX471	EE-SX672 EE-SX672A EE-SX472	EE-SX673 EE-SX673A EE-SX473	EE-SX674 EE-SX674A EE-SX474	EE-SX675	EE-SX676	EE-SX677
Pre-wired models		EE-SX670-WR	EE-SX671-WR	EE-SX672-WR	EE-SX673-WR	EE-SX674-WR	EE-SX675-WR	EE-SX676-WR	EE-SX677-WR	
Models with junction connectors		EE-SX670-C1J-R	EE-SX671-C1J-R	EE-SX672-C1J-R	EE-SX673-C1J-R	EE-SX674-C1J-R	EE-SX675-C1J-R	EE-SX676-C1J-R	EE-SX677-C1J-R	
PNP models	Connector	EE-SX670P EE-SX670R EE-SX470P	EE-SX671P EE-SX671R EE-SX471P	EE-SX672P EE-SX672R EE-SX472P	EE-SX673P EE-SX673R EE-SX473P	EE-SX674P EE-SX674R EE-SX474P	EE-SX675P	EE-SX676P	EE-SX677P	
	Pre-wired models	EE-SX670P-WR	EE-SX671P-WR	EE-SX672P-WR	EE-SX673P-WR	EE-SX674P-WR	EE-SX675P-WR	EE-SX676P-WR	EE-SX677P-WR	
	Models with junction connectors	EE-SX670P-C1J-R	EE-SX671P-C1J-R	EE-SX672P-C1J-R	EE-SX673P-C1J-R	EE-SX674P-C1J-R	EE-SX675P-C1J-R	EE-SX676P-C1J-R	EE-SX677P-C1J-R	
Sensing distance		5 mm (slot width)								
Sensing object		Opaque: 2 × 0.8 mm min.								
Differential distance		0.025 mm								
Light source		GaAs infrared LED with a peak wavelength of 940 nm								
Indicator *1		Light indicator (red) (turns ON when light is interrupted for models with A or R suffix)								
Supply voltage		5 to 24 VDC ±10%, ripple (p-p): 10% max.								
Current consumption		35 mA max. (NPN models), 30 mA max. (PNP models)								
Control output		NPN open collector: 5 to 24 VDC, 100 mA max. 100 mA load current with a residual voltage of 0.8 V max. 40 mA load current with a residual voltage of 0.4 V max. PNP open collector: 5 to 24 VDC, 50 mA max. 50 mA load current with a residual voltage of 1.3 V max.								
Response frequency *2		1 kHz min. (3 kHz 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								
Ambient humidity range		Operating: 5% to 85%, Storage: 5% to 95%								
Vibration resistance		Destruction: 20 to 2,000 Hz (peak acceleration: 100 m/s ²) 1.5-mm double amplitude for 2 h (4-min periods) each in X, Y, and Z directions								
Shock resistance		Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions								
Enclosure rating		IEC60529 IP50								
Connecting method		Special connectors (direct soldering possible), Pre-wired models (Standard cable length: 1 m), Models with junction connectors (Standard cable length: 0.1 m)								
Weight (pack-aged)	Connector	Approx. 3.1 g	Approx. 3 g	Approx. 2.4 g	Approx. 2.3 g	Approx. 3 g	Approx. 2.7 g	Approx. 2.2 g	Approx. 2.2 g	
	Pre-wired models	Approx. 18.9 g	Approx. 17.3 g	Approx. 17.8 g	Approx. 16.8 g	Approx. 17.1 g	Approx. 18.3 g	Approx. 16.9 g	Approx. 16.9 g	
	Models with junction connectors	Approx. 6.3 g	Approx. 4.7 g	Approx. 5.2 g	Approx. 4.2 g	Approx. 4.5 g	Approx. 5.7 g	Approx. 4.3 g	Approx. 4.3 g	
Material	Case	Polybutylene phthalate (PBT)								
	Cover emitter/receiver	Polycarbonate								

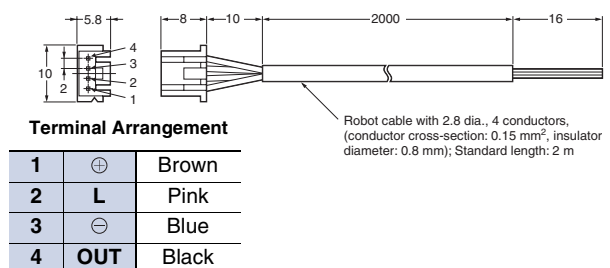
*1. The indicator is a GaP red LED (peak wavelength: 690 nm).

*2. The response frequency was measured by detecting the rotating disk shown at the right.



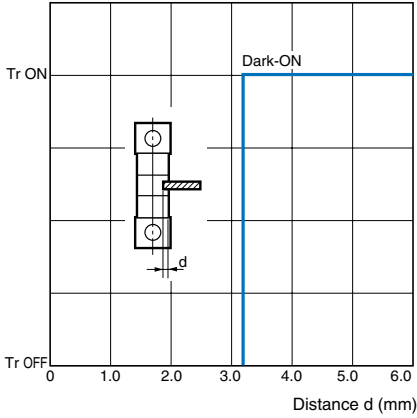
Connector for the EE-SX67 with Junction Connector

Item	Product Model	Connector with Robot Cable
	Appearance	EE-1016-R-1
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

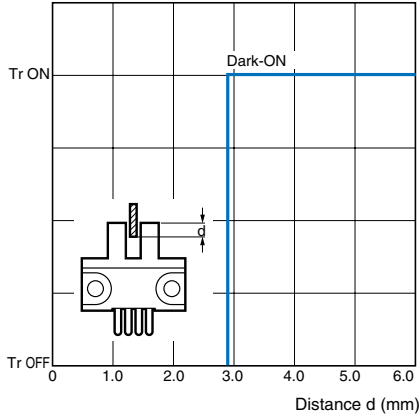


Engineering Data (Typical)

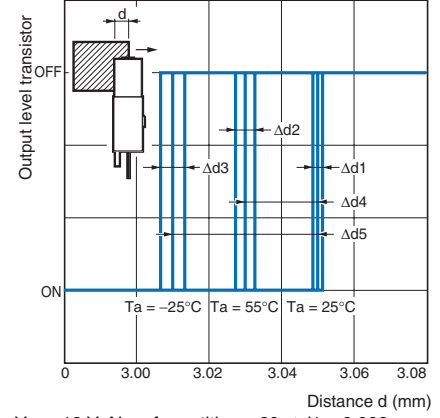
Sensing Position Characteristics



Sensing Position Characteristics



Repeated Sensing Position Characteristics



Vcc = 12 V, No. of repetitions: 20, Δd1 = 0.002 mm, Δd2 = 0.004 mm, Δd3 = 0.005 mm, Δd4 = 0.02 mm, Δd5 = 0.04 mm

I/O Circuit Diagrams

NPN Output

Model	Output configuration	Timing chart	Terminal connection	Output circuit
EE-SX67□ EE-SX67□-WR EE-SX67□-C1J-R	Light-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operates Releases	Short-circuited between ⊖ terminal and positive ⊕ terminal	
	Dark-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operates Releases	Open between ⊖ terminal and positive ⊕ terminal	
EE-SX670A EE-SX671A EE-SX672A EE-SX673A EE-SX674A	Light-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operates Releases	Short-circuited between ⊖ terminal and positive ⊕ terminal	
	Dark-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operates Releases	Open between ⊖ terminal and positive ⊕ terminal	
EE-SX470 EE-SX471 EE-SX472 EE-SX473 EE-SX474	Light-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load Operates Releases	---	

EE-SX47/67

PNP Output

Model	Output configuration	Timing chart	Terminal connection	Output circuit
EE-SX67□P EE-SX67□P-WR EE-SX67□P-C1J-R	Light-ON		Short-circuited between terminal and positive ⊕ terminal	
	Dark-ON		Open between terminal and positive ⊕ terminal	
EE-SX670R EE-SX671R EE-SX672R EE-SX673R EE-SX674R	Light-ON		Short-circuited between terminal and positive ⊕ terminal	
	Dark-ON		Open between terminal and positive ⊕ terminal	
EE-SX470P EE-SX471P EE-SX472P EE-SX473P EE-SX474P	Light-ON		--	

Safety Precautions

Refer to *Warranty and Limitations of Liability*.

⚠ WARNING

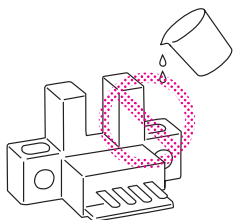
This product is not designed or rated for ensuring safety of persons either directly or indirectly. Do not use it for such purposes.



Precautions for Safe Use

● Operating Environment

These Photomicrosensors have an IP50 (conforms to IEC60529) enclosure and do not have a water-proof or dust-proof structure. Therefore, do not use them in applications in which the sensor will be subjected to splashes from water, oil, or any other liquid. Liquid entering the Sensor may result in malfunction.



Precautions for Correct Use

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

● Installation

- When direct soldering to the terminals, use the following guidelines.

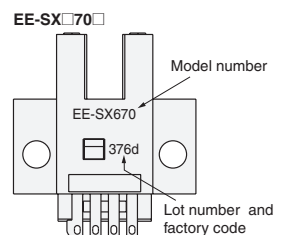
Soldering Conditions

Item	Temperature	Permissible time	Remarks
Soldering iron	350°C max.	3 s max.	The portion between the base of the terminals and the position 1.5 mm from the terminal base must not be soldered.

- The terminal base uses a polycarbonate resin, which could be deformed by excessive soldering heat, resulting in damage to the product's functionality.

● Lot Numbers and Models

In the right illustration, 376d indicates the lot number and factory where the product was manufactured. Do not include this code with the model number when ordering.



Dimensions

Sensors

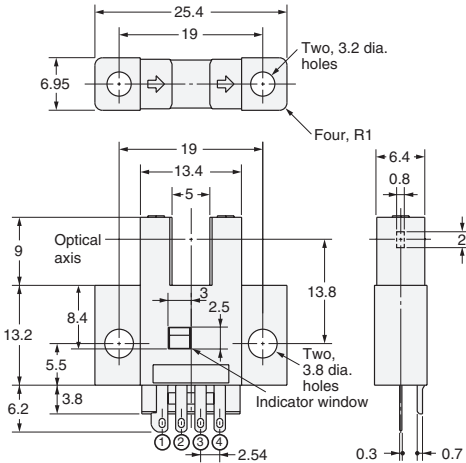
EE-SX670/670P
EE-SX670A/670R
EE-SX470/470P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L*
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

* L Terminal needs no connection for all EE-SX47□ series sensors.



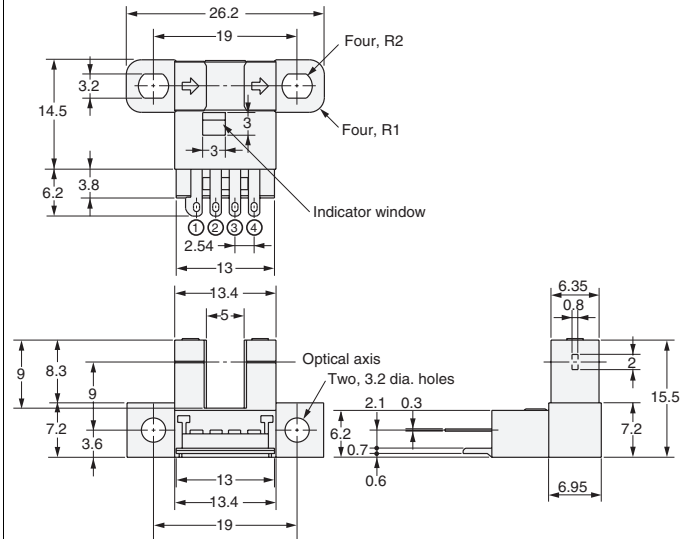
EE-SX671/671P
EE-SX671A/671R
EE-SX471/471P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L*
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

* L Terminal needs no connection for all EE-SX47□ series sensors.



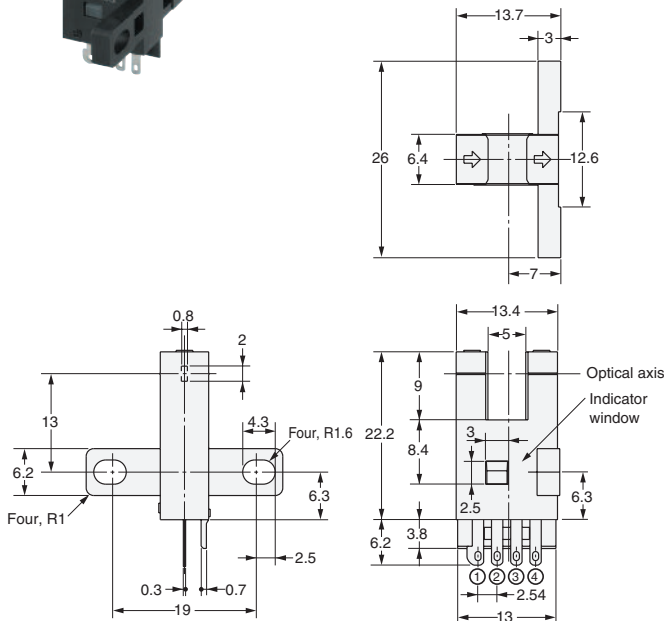
EE-SX672/672P
EE-SX672A/672R
EE-SX472/472P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L*
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

* L Terminal needs no connection for all EE-SX47□ series sensors.



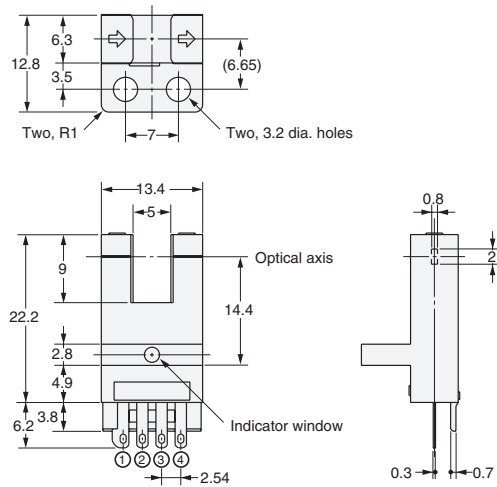
EE-SX673/673P
EE-SX673A/673R
EE-SX473/473P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L*
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

* L Terminal needs no connection for all EE-SX47□ series sensors.



EE-SX47/67

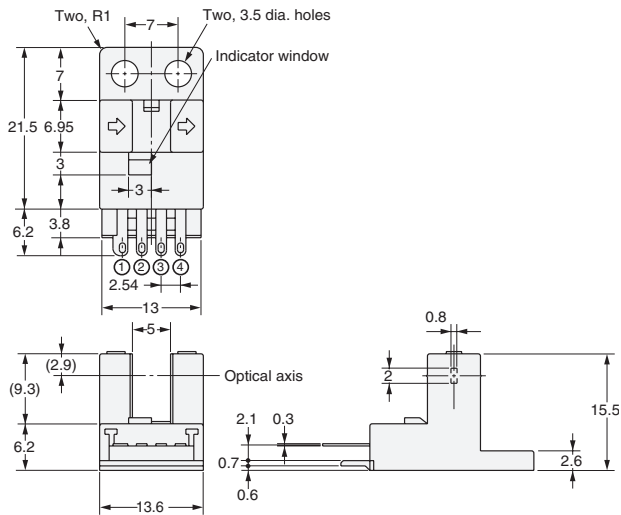
EE-SX674/674P EE-SX674A/674R EE-SX474/474P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L*
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

* L Terminal needs no connection for all EE-SX47□ series sensors.

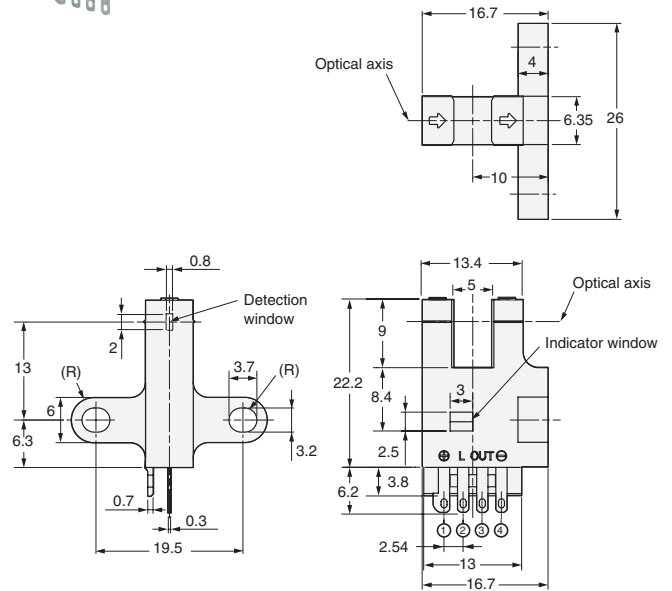


EE-SX675/675P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

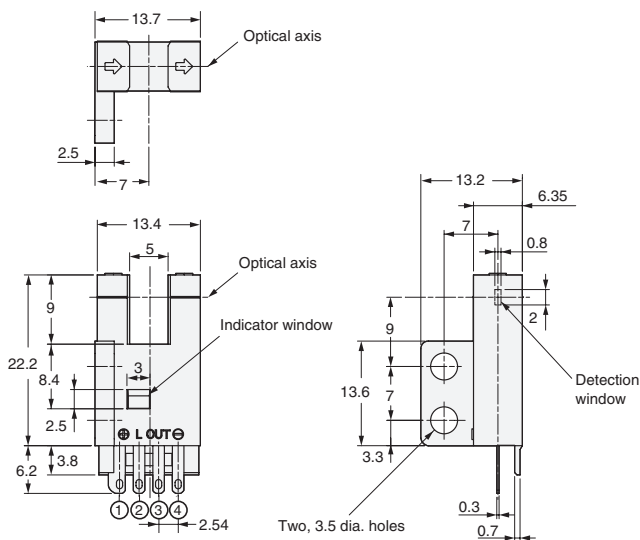


EE-SX676/676P



Terminal Arrangement

(1)	⊕	Vcc
(2)	L	L
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)

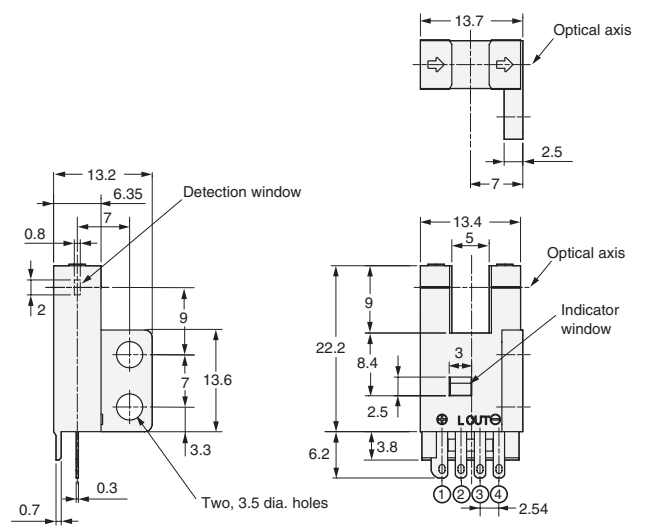


EE-SX677/677P



Terminal Arrangement

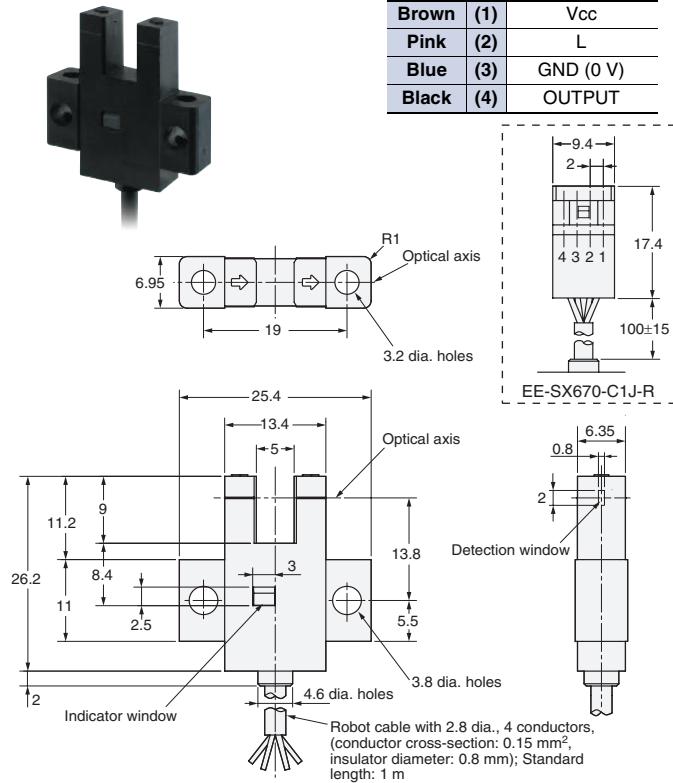
(1)	⊕	Vcc
(2)	L	L
(3)	OUT	OUTPUT
(4)	⊖	GND (0 V)



EE-SX670-WR/670P-WR
EE-SX670-C1J-R/670P-C1J-R

Terminal Arrangement

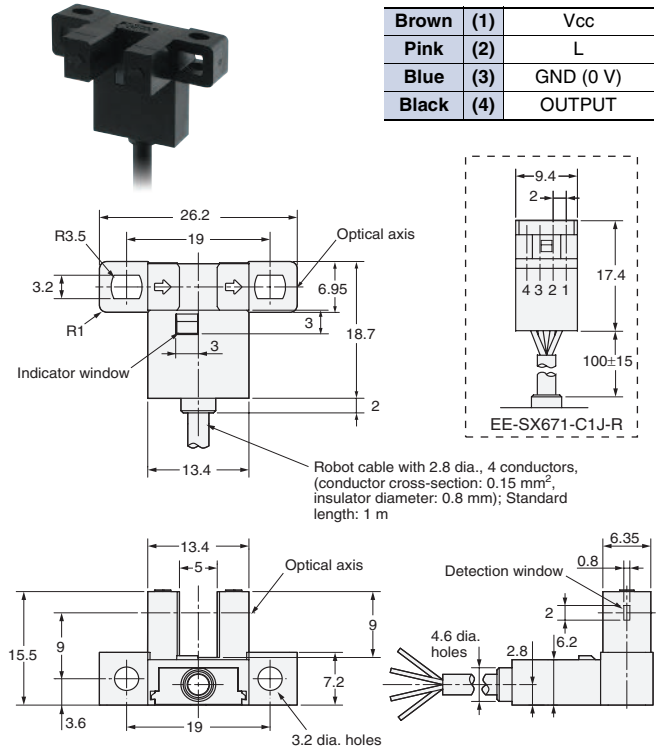
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX671-WR/671P-WR
EE-SX671-C1J-R/671P-C1J-R

Terminal Arrangement

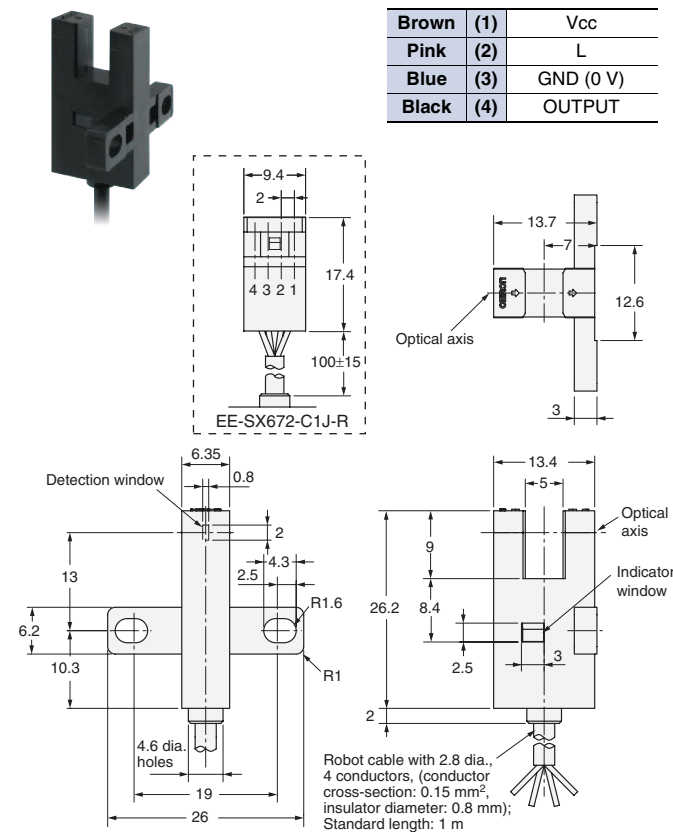
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX672-WR/672P-WR
EE-SX672-C1J-R/672P-C1J-R

Terminal Arrangement

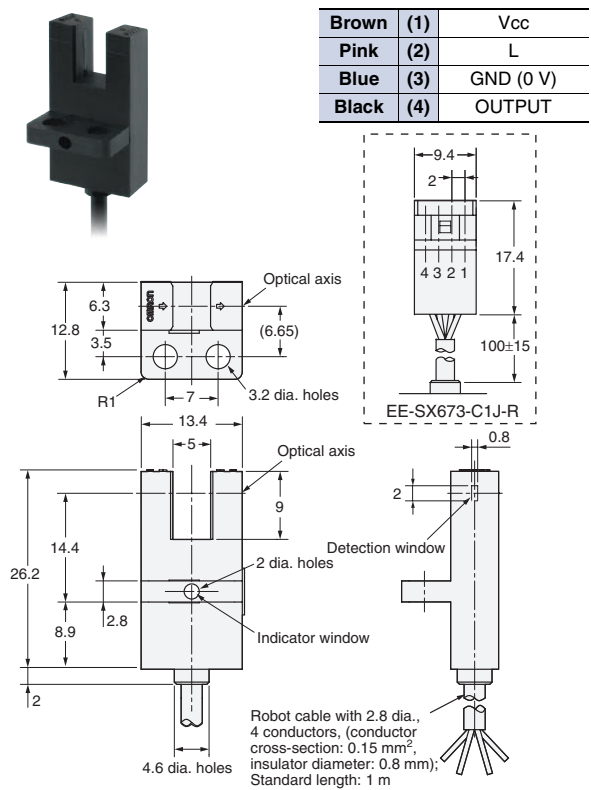
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX673-WR/673P-WR
EE-SX673-C1J-R/673P-C1J-R

Terminal Arrangement

Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT

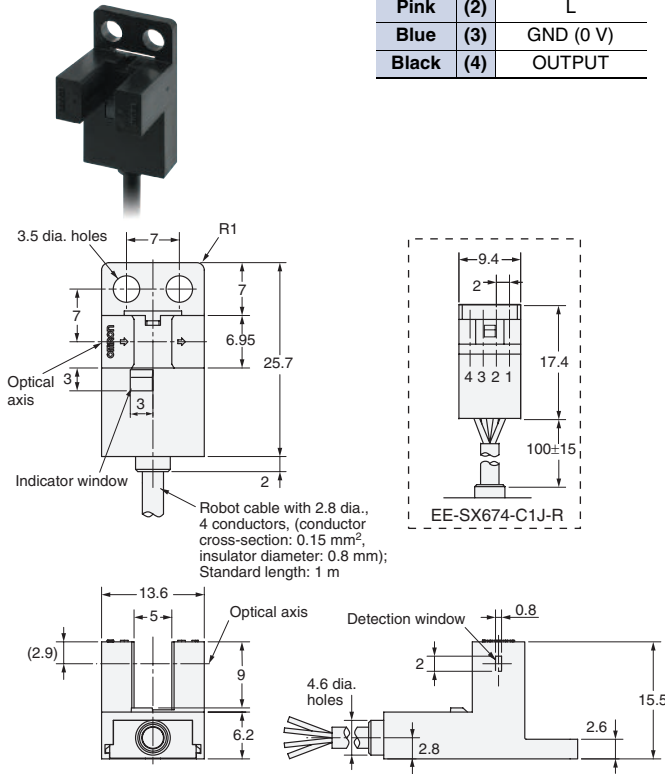


EE-SX47/67

EE-SX674-WR/674P-WR EE-SX674-C1J-R/674P-C1J-R

Terminal Arrangement

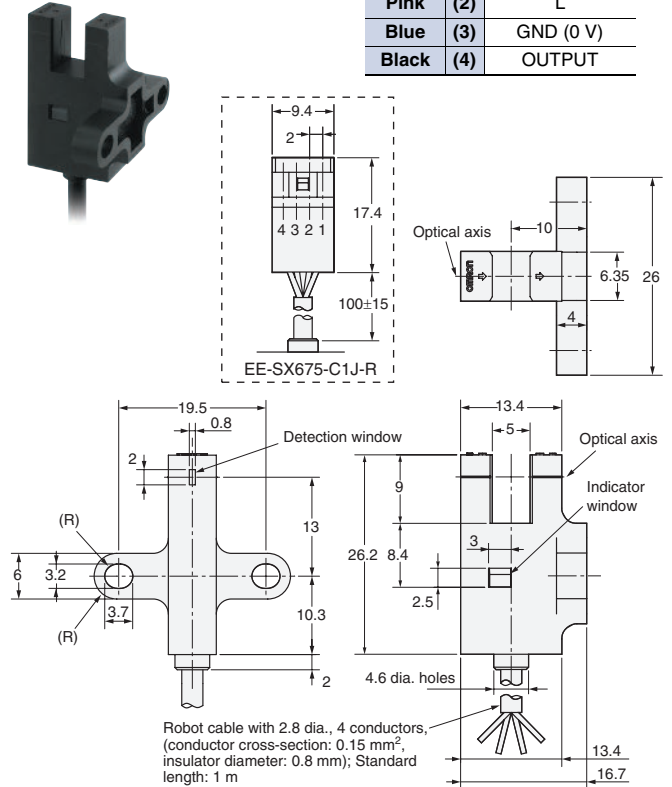
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX675-WR/675P-WR EE-SX675-C1J-R/675P-C1J-R

Terminal Arrangement

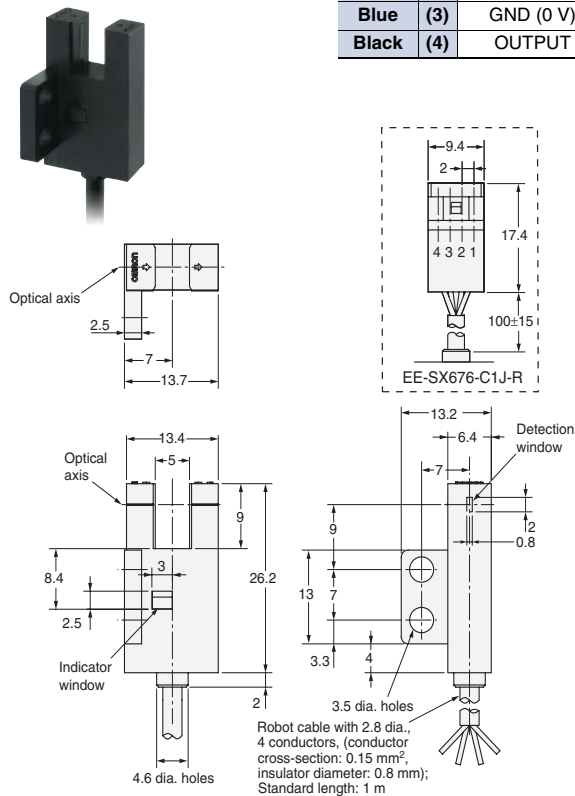
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX676-WR/676P-WR EE-SX676-C1J-R/676P-C1J-R

Terminal Arrangement

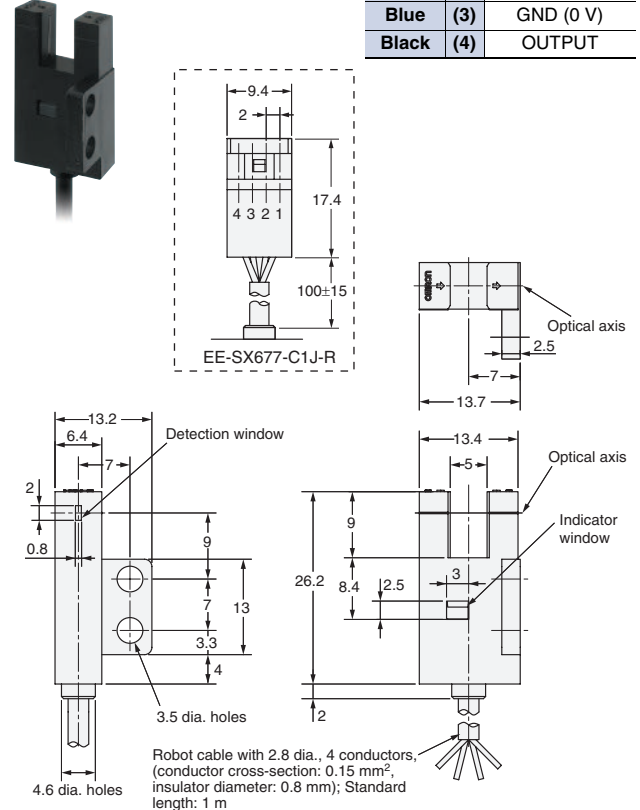
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX677-WR/677P-WR EE-SX677-C1J-R/677P-C1J-R

Terminal Arrangement

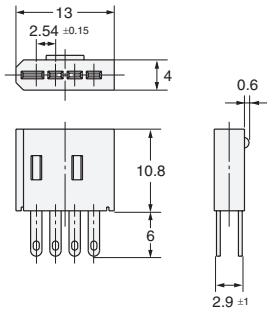
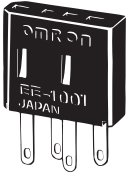
Brown	(1)	Vcc
Pink	(2)	L
Blue	(3)	GND (0 V)
Black	(4)	OUTPUT



EE-SX47/67 Connector Hold-down Clips

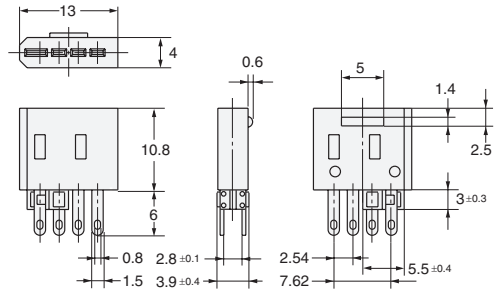
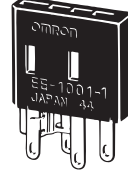
Connector

EE-1001



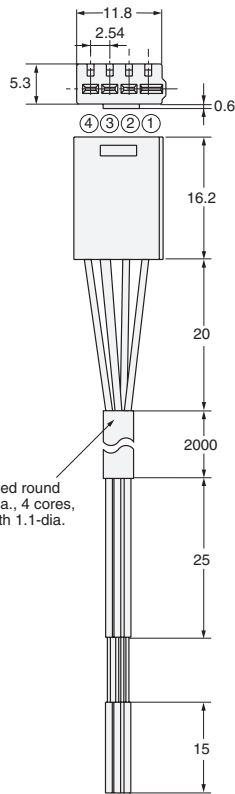
Connector (short-circuited between positive (+) and L terminals)

EE-1001-1



Connector with Cable

EE-1006



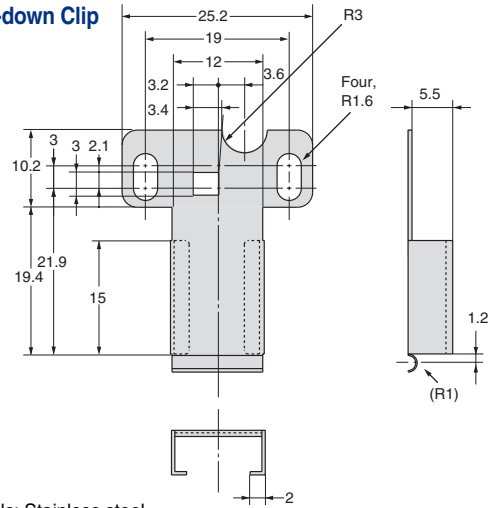
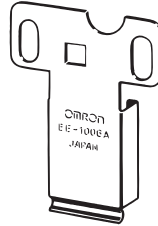
Cable:
Vinyl-insulated round
cable of 4 dia., 4 cores,
(0.2 mm² with 1.1-dia.
insulator)

Terminal Arrangement

(1)	⊕	Brown
(2)	L	Pink
(3)	OUT	Black
(4)	⊖	Blue

Connector Hold-down Clip

EE-1006A



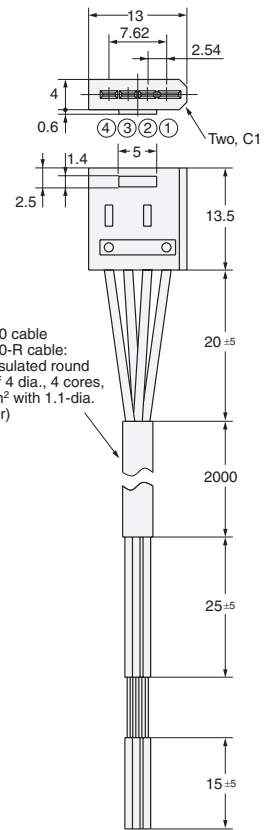
Materials: Stainless steel

Connector with Cable

EE-1010

Connector with Robot Cable

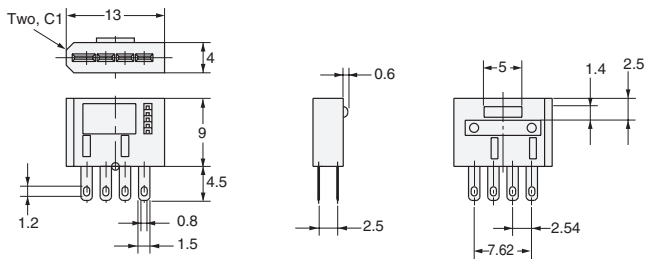
EE-1010-R



EE-1010 cable
EE-1010-R cable:
Vinyl-insulated round
cable of 4 dia., 4 cores,
(0.2 mm² with 1.1-dia.
insulator)

Connector

EE-1009



Terminal Arrangement

(1)	⊕	Brown
(2)	L	Pink
(3)	OUT	Black
(4)	⊖	Blue


In the interest of product improvement, specifications are subject to change without notice.

EE-SX77/87

Thin, Compact Photomicrosensor with Attached Cable.

- Compact, thin profile enables dense mounting.
- Indicator is visible from both sides.
- Wide operating voltage range: 5 to 24 VDC







 Be sure to read *Safety Precautions* on page 18.

Ordering Information

Pre-wired Models




 Infrared light

Appearance	Sensing method	Cable length	Sensing distance		Output configuration	Indicator mode *1	Model	
							NPN output	PNP output
Standard 	Through-beam type (with slot)	2 m		5 mm (slot width)	Dark-ON	Incident light	EE-SX770	EE-SX770P
						No incident light	EE-SX770A	EE-SX770R
					Light-ON	Incident light	EE-SX870	EE-SX870P
						No incident light	EE-SX870A	EE-SX870R
L-shaped 					Dark-ON	Incident light	EE-SX771	EE-SX771P
							No incident light	EE-SX771A
					Light-ON	Incident light	EE-SX871	EE-SX871P
						No incident light	EE-SX871A	EE-SX871R
T-shaped 	Dark-ON	Incident light	EE-SX772	EE-SX772P				
			No incident light	EE-SX772A	EE-SX772R			
	Light-ON	Incident light	EE-SX872	EE-SX872P				
		No incident light	EE-SX872A	EE-SX872R				

*1. The operation indicator of models with suffix code (A) or (R) will turn ON when the light is interrupted.

e-CON Junction Connector Models *

Infrared light

Appearance	Sensing method	Sensing distance		Output configuration	Indicator mode	Cable length	Model				
							NPN output				
Standard 	Through-beam type (with slot)		5 mm (slot width)	Dark-ON	Incident light	0.3 m	EE-SX770-ECON 0.3M				
					No incident light	2 m	EE-SX770-ECON 2M				
				Light-ON	Incident light	0.3 m	EE-SX770A-ECON 0.3M				
					No incident light	2 m	EE-SX770A-ECON 2M				
				L-shaped 	Through-beam type (with slot)		5 mm (slot width)	Dark-ON	Incident light	0.3 m	EE-SX771-ECON 0.3M
									No incident light	2 m	EE-SX771-ECON 2M
Light-ON	Incident light	0.3 m	EE-SX771A-ECON 0.3M								
	No incident light	2 m	EE-SX771A-ECON 2M								
T-shaped 	Through-beam type (with slot)		5 mm (slot width)					Dark-ON	Incident light	0.3 m	EE-SX772-ECON 0.3M
									No incident light	2 m	EE-SX772-ECON 2M
				Light-ON	Incident light	0.3 m	EE-SX772A-ECON 0.3M				
					No incident light	2 m	EE-SX772A-ECON 2M				

* e-CON is a new industrial standard being promoted by manufacturers of FA devices and connectors.
 The E39-ECON□M (cable length: 2 m or 5 m) with an e-CON connector on one end, and the E39-ECONW□M (cable length: 0.5 m to 2 m in units of 0.1 m) with e-CON connectors on both ends are available.
 The □ symbol is used to indicate the cable length (e.g., E39-ECON2M).



E39-ECON□M



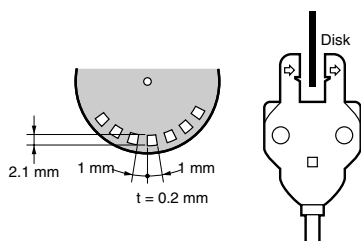
E39-ECONW□M

EE-SX77/87

Ratings and Specifications

Item	Type	Standard	L-shaped	T-shaped
	NPN models	EE-SX770/EE-SX870 EE-SX770A/EE-SX870A	EE-SX771/EE-SX871 EE-SX771A/EE-SX871A	EE-SX772/EE-SX872 EE-SX772A/EE-SX872A
PNP models	EE-SX770P/EE-SX870P EE-SX770R/EE-SX870R	EE-SX771P/EE-SX871P EE-SX771R/EE-SX871R	EE-SX772P/EE-SX872P EE-SX772R/EE-SX872R	
Sensing distance	5 mm (slot width)			
Sensing object	Opaque: 2 × 0.8 mm min.			
Differential distance	0.025 mm			
Light source	GaAs infrared LED with a peak wavelength of 940 nm			
Indicator	Light indicator (red) (turns ON when light is interrupted for models with A or R suffix)			
Supply voltage	5 to 24 VDC ±10%, ripple (p-p): 10% max.			
Current consumption	35 mA max. (NPN models), 30 mA max. (PNP models)			
Control output	NPN open collector: 5 to 24 VDC, 100 mA max. 100 mA load current with a residual voltage of 0.8 V max. 40 mA load current with a residual voltage of 0.4 V max. PNP open collector: 5 to 24 VDC, 50 mA max. 50 mA load current with a residual voltage of 1.3 V max.			
Response frequency *	1 kHz min. (3 kHz 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)			
Ambient humidity range	Operating: 5% to 85% Storage: 5% to 95% (with no condensation)			
Vibration resistance	Destruction: 20 to 2,000 Hz (peak acceleration: 100 m/s ²) 1.5-mm double amplitude for 2 h (4-min periods) each in X, Y, and Z directions			
Shock resistance	Destruction: 500 m/s ² for 3 times each in X, Y, and Z directions			
Enclosure rating	IEC60529 IP60			
Connecting method	Pre-wired (standard cable length: 2 m)			
Weight (packaged)	Approx. 20 g			
Material	Case: Polybutylene phthalate (PBT)			

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



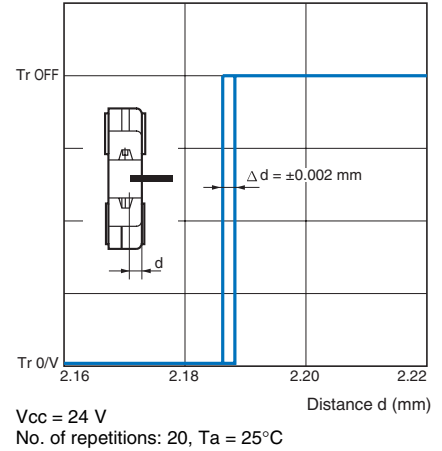
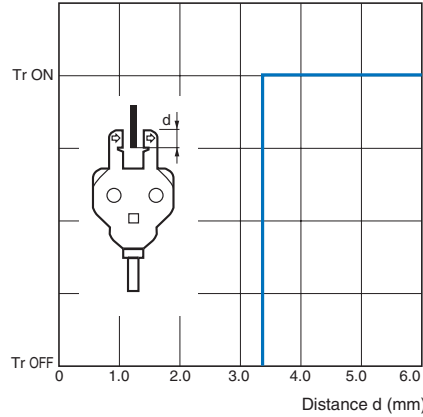
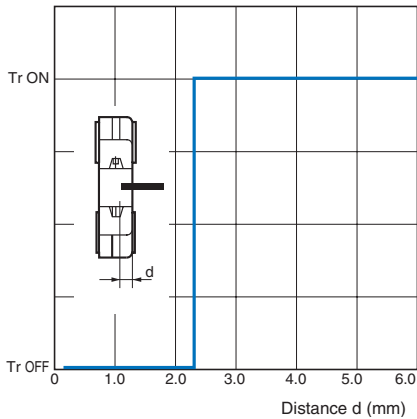
Engineering Data (Typical)

Sensing Position Characteristics

Sensing Position Characteristics

Repeated Sensing Position Characteristics

EE-SX770



I/O Circuit Diagrams

NPN Output

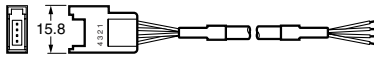
Model	Output configuration	Timing charts	Output circuit
EE-SX770 EE-SX771 EE-SX772	Dark-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (e.g., relay) Operates Releases	<p>Connector pin arrangement for e-CON junction connector</p> <p>Note: Pin 2 is not used.</p>
EE-SX870 EE-SX871 EE-SX872	Light-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (e.g., relay) Operates Releases	<p>Connector pin arrangement for e-CON junction connector</p> <p>Note: Pin 2 is not used.</p>
EE-SX770A EE-SX771A EE-SX772A	Dark-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (e.g., relay) Operates Releases	<p>Connector pin arrangement for e-CON junction connector</p> <p>Note: Pin 2 is not used.</p>
EE-SX870A EE-SX871A EE-SX872A	Light-ON	Incident Interrupted Light indicator (red) ON OFF Output transistor ON OFF Load (e.g., relay) Operates Releases	<p>Connector pin arrangement for e-CON junction connector</p> <p>Note: Pin 2 is not used.</p>

EE-SX77/87

PNP Output

Model	Output configuration	Timing chart	Output circuit
EE-SX770P EE-SX771P EE-SX772P	Dark-ON		
EE-SX870P EE-SX871P EE-SX872P	Light-ON		
EE-SX770R EE-SX771R EE-SX772R	Dark-ON		
EE-SX870R EE-SX871R EE-SX872R	Light-ON		

Applicable Connectors



E39-ECON□M



E39-ECONW□M

*1. The E39-ECON□M (cable length: 2 m or 5 m) with an e-CON connector on one end, and the E39-ECONW□M with e-CON connectors on both ends (cable length: 0.5 m to 2 m in units of 0.1 m) are available.

*2. The □ symbol is used to indicate the cable length (e.g., E39-ECON2M).

Shield color	Pin No.	Use
Brown	(1)	Power supply (+V)
White	(2)	---
Blue	(3)	Power supply (0 V)
Black	(4)	Output

Note: Pin 2 is not used for all EE-SX77□ and EE-SX87□ series sensors.

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.



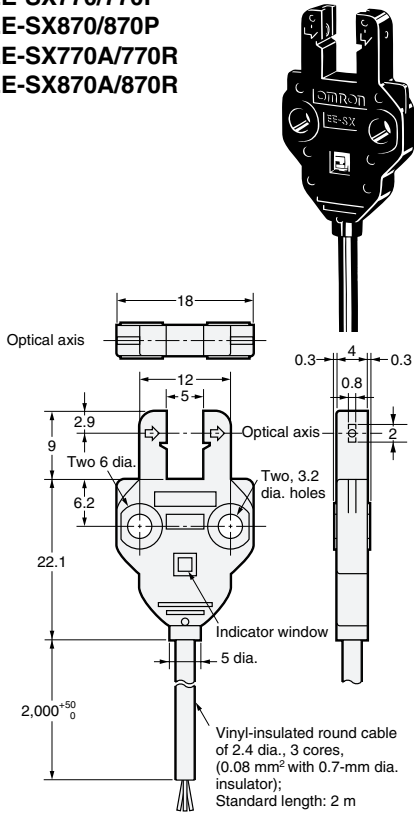
Precautions for Correct Use

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

Dimensions

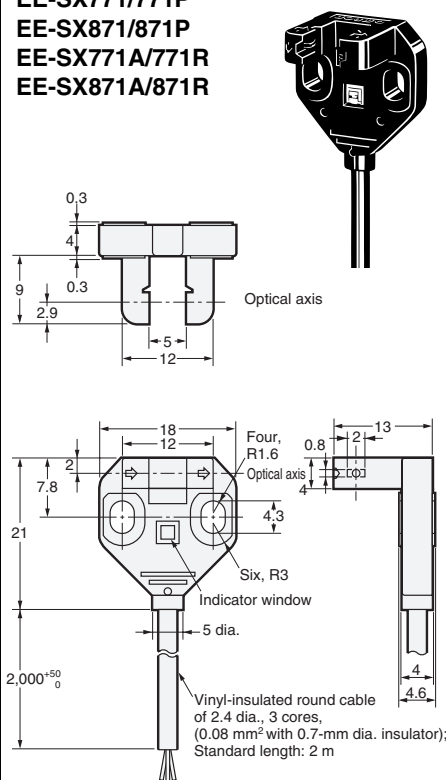
Standard

- EE-SX770/770P
- EE-SX870/870P
- EE-SX770A/770R
- EE-SX870A/870R



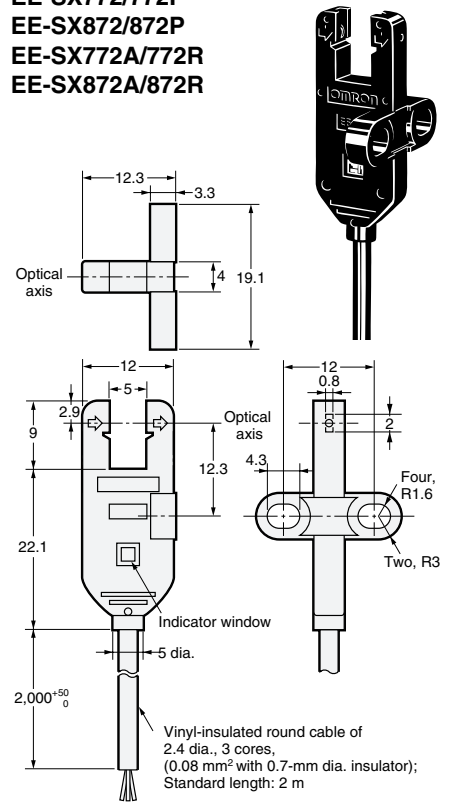
L-shaped

- EE-SX771/771P
- EE-SX871/871P
- EE-SX771A/771R
- EE-SX871A/871R



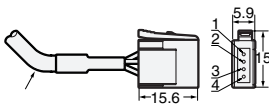
T-shaped

- EE-SX772/772P
- EE-SX872/872P
- EE-SX772A/772R
- EE-SX872A/872R



e-CON Junction Connector

EE-SX□□□-ECON

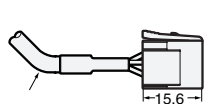


Vinyl-insulated round cable of 2.4 dia., 3 cores: 0.3/2 m

Terminal	Specifications
1	+ V
2	---
3	0 V
4	Output

e-CON Junction Connector

EE-SX□□□-ECON

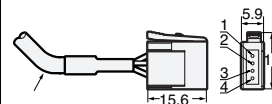


Vinyl-insulated round cable of 2.4 dia., 3 cores: 0.3/2 m

Terminal	Specifications
1	+ V
2	---
3	0 V
4	Output

e-CON Junction Connector

EE-SX□□□-ECON



Vinyl-insulated round cable of 2.4 dia., 3 cores: 0.3/2 m

Terminal	Specifications
1	+ V
2	---
3	0 V
4	Output

In the interest of product improvement, specifications are subject to change without notice.

EE-SX91

Meeting Customer Needs with Compact Sensors that Mount with M3 Screws

- Provided with Both light-ON and dark-ON outputs (antivalent outputs).
- A compact size and choice of five shape for various applications.
- Design available with Compact NPN or PNP output models.
- Allows standard M3 or M2 screws.
- Indicator is visible from many directions for installation in any location.
- Possible to directly switch up to 100 mA.
- Models with junction connectors for simplify wiring and maintenance.
- Flexible robot cables are standard on all models.



Features

A Compact Size and Choice of Five Shape for various Applications

Selectable any five shape to minimize the space required.



Design available with Compact NPN or PNP Output Models

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

Possible to directly switch up to 100 mA

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

Models with Connectors for Simplify Wiring and Maintenance

Using models with connectors allows wiring to be used as it is, with no need to replace anything but sensors.



Flexible Robot Cables are Standard on All Models

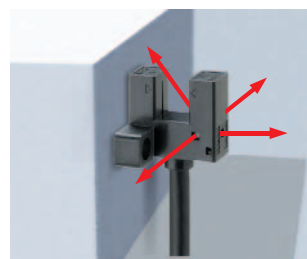
Robot Cables are effective for moving parts, and are provided as standard equipment with all models.

Provided with 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.

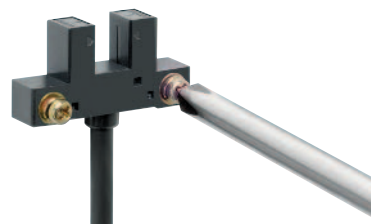
Indicator Visible from Many Directions for Installation in Any Location

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



Allows standard M3 or M2 Screws

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









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 junction 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 junction 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 junction 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 junction 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 junction 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

EE-SX91

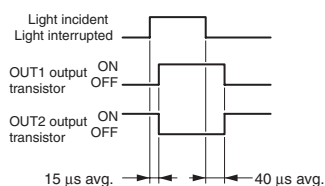
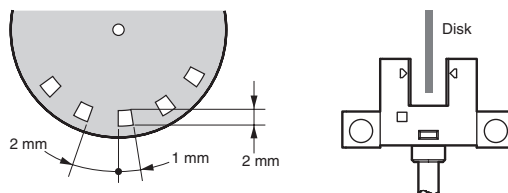
Ratings and Specifications

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	
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				
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. 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				
Connecting method			Pre-wired Models (standard cable length: 1 m), Models with Junction 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	Housing		Polybutylene phthalate (PBT)				
	Emitter/receiver		Polycarbonate (PC)				

Applicable Connector

Item	Product Model	Connector with Cable
	Appearance	EE-1016-R
Contact resistance	25m Ω 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

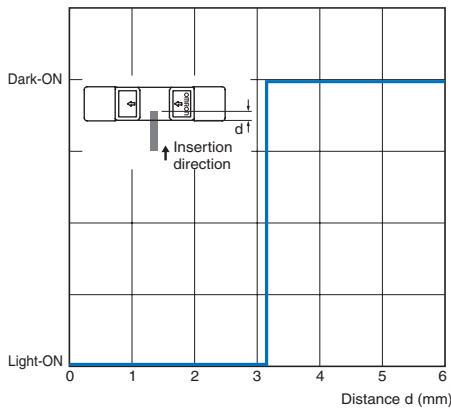
* The response frequency was measured by detecting the following rotating disk. The response times for light incidence and light interruption are shown in the timing chart.



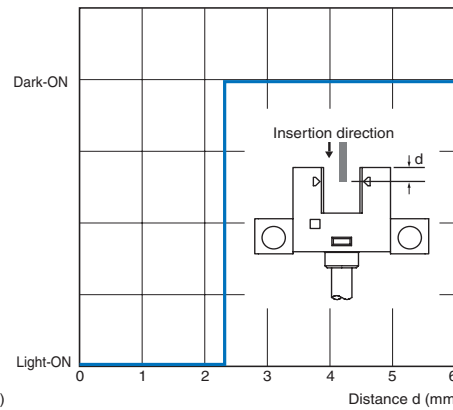
Engineering Data (Typical)

Sensing Position Characteristics

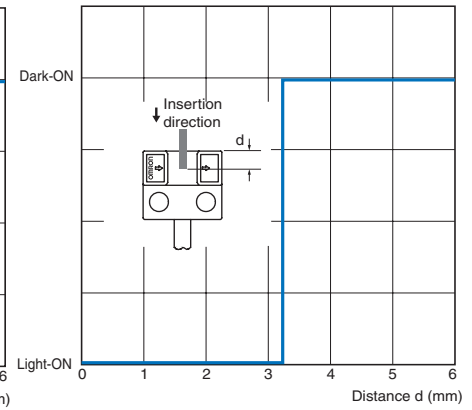
EE-SX910



EE-SX910

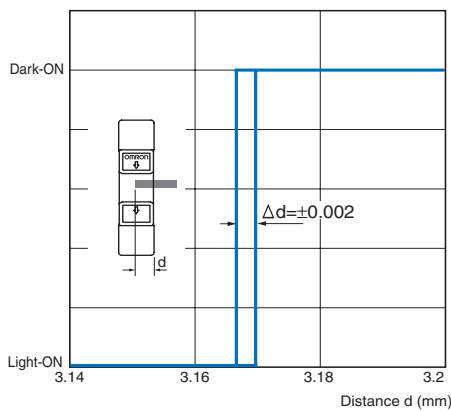


EE-SX911



Repeated Sensing Position Characteristics

EE-SX910



V_{CC} = 24 V, No. of repetitions: 20, T_a = 25°C
(Differential distance = 0.025 mm max.)

I/O Circuit Diagrams

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 ON (red) OFF						
	Output 1 transistor ON						
	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		OUT1: Light-ON OUT2: Dark-ON	Load 1 Operates (relay) Releases	
			Output 2 transistor ON				
			Load 2 Operates (relay) Releases				

EE-SX91

Safety Precautions

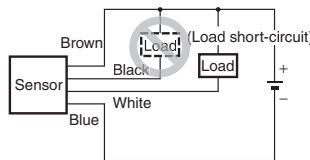
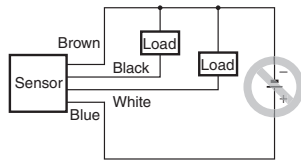
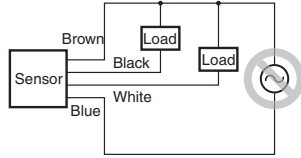
⚠ WARNING

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. (1.5 kgf·cm)
M3	0.54 N·m max. (5.5 kgf·cm)

- 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.

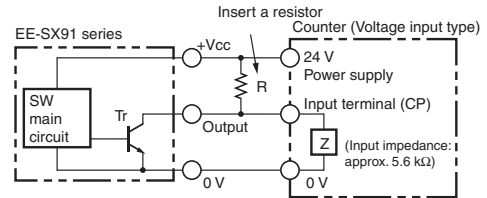
● Wiring

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:

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

Low level:

$$\text{Load current } I_C = \frac{V_{CC}}{R} = \frac{24 \text{ V}}{R} = 5.1 \text{ mA} \leq 100 \text{ mA}$$

Input voltage $V_L \leq 1.0 \text{ V}$ (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.

Dimensions (Unit: mm)

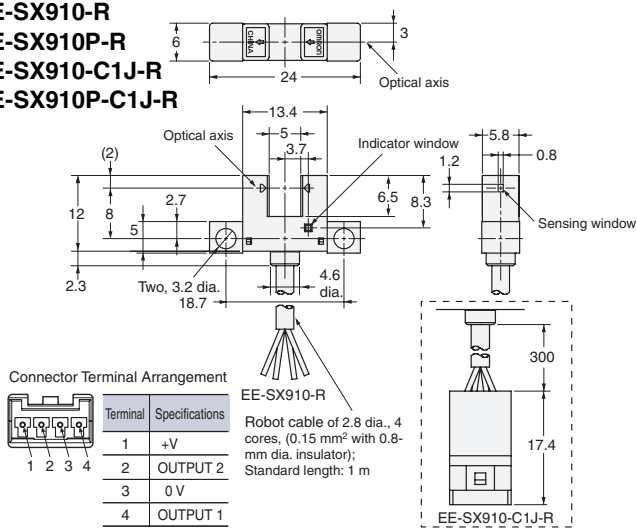
Photomicrosensors

EE-SX910-R

EE-SX910P-R

EE-SX910-C1J-R

EE-SX910P-C1J-R

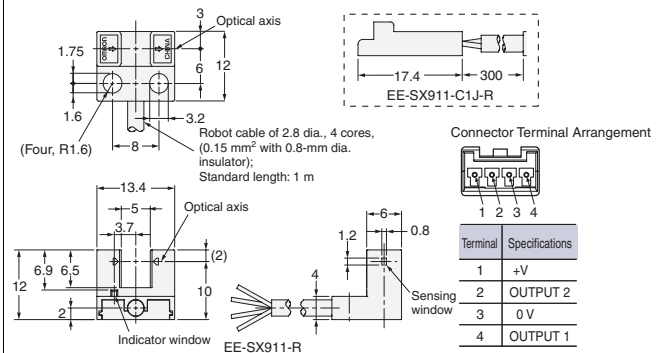


EE-SX911-R

EE-SX911P-R

EE-SX911-C1J-R

EE-SX911P-C1J-R

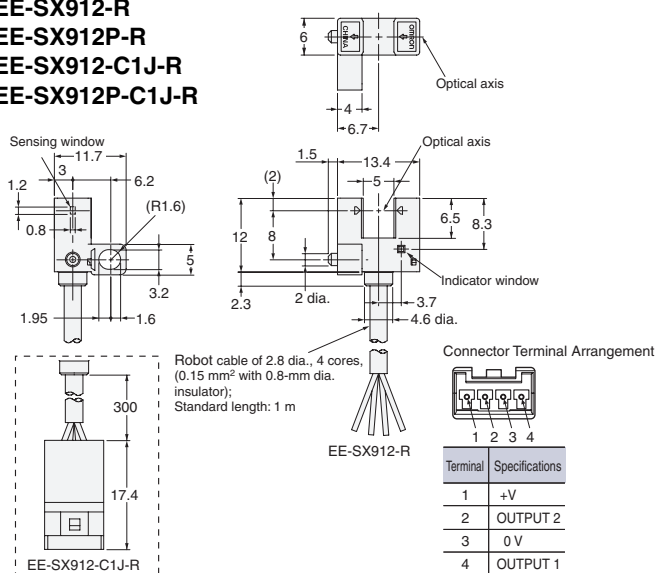


EE-SX912-R

EE-SX912P-R

EE-SX912-C1J-R

EE-SX912P-C1J-R

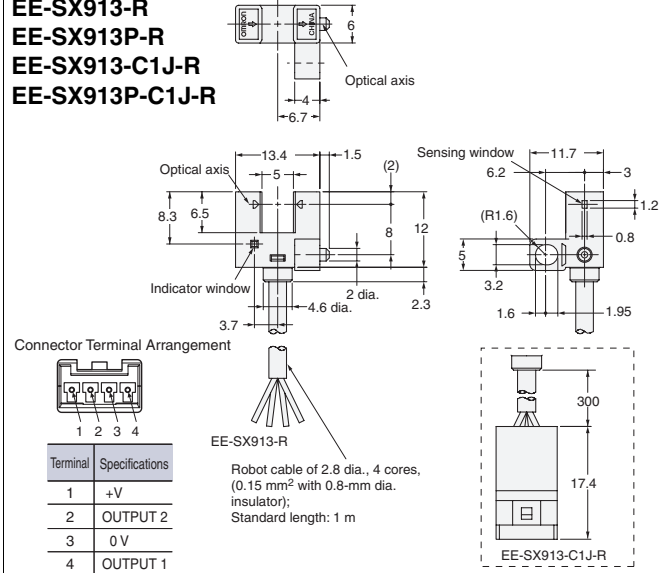


EE-SX913-R

EE-SX913P-R

EE-SX913-C1J-R

EE-SX913P-C1J-R

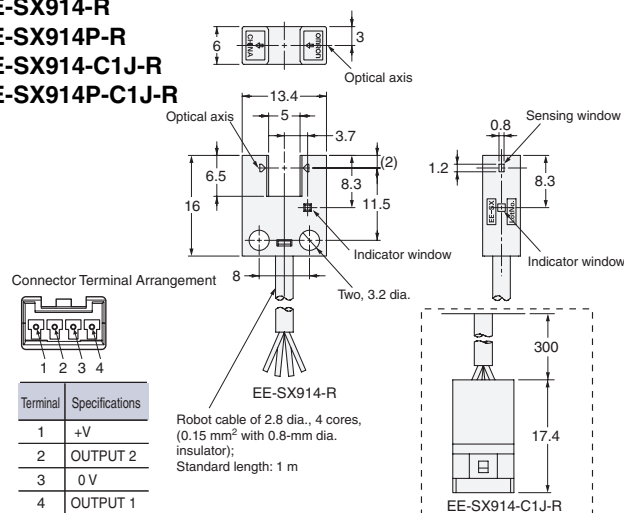


EE-SX914-R

EE-SX914P-R

EE-SX914-C1J-R

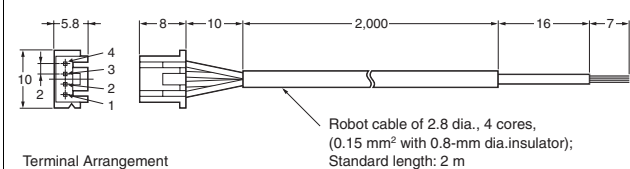
EE-SX914P-C1J-R



Accessories (Order Separately)

Connector with Robot Cable

EE-1016-R



Terminal Arrangement

Terminal	Color
①	Brown
②	White
③	Blue
④	Black

UL Standards (UNDERWRITERS LABORATORIES INC.)



LISTING MARK



RECOGNITION MARK

- A nonprofit organization established in 1894 by the American association of fire insurance companies. Underwriters Laboratories (abbreviated to UL hereafter) conducts certification testing on all kinds of electrical products. In many U.S. cities and states, UL certification is legally required on all electrical items sold. To obtain UL certification on an electrical product, all major internal components also require UL certification.
- UL offers two types of certification: the Listing Mark and the Recognition Mark. A Listing Mark generally constitutes the certification of a final product. Products display the Listing Marks shown below. The Recognition Mark applies to the components used in a product, and therefore constitutes a more conditional approval of a product. Products display the Recognition Marks shown below. Depending on a component's UL classification, use of the Recognition Mark may not be required.

- UL has integrated its standards with CSA to employ a co-certification system. These standards also adapt the requirements of the IEC standards.
- Since October 1992, UL has been recognized as a CO (council organization) and TO (test organization) by the SCC (Standard Council of Canada). This authorizes UL to conduct safety tests and certify products conforming to Canadian standards.
- The designs of the Listing and Recognition Marks were changed in January 1998 as shown below.

LISTING MARK

Marks for US	Marks for Canada	Marks for US and Canada

RECOGNITION MARK

Marks for US	Marks for Canada	Marks for US and Canada

■ Sensors with DC Power Supply of 30 V or Less

- When connected to one of the circuits (Class 2) described in (1), (2), and (3) below, a sensor can be used even if it is not UL certified. Use the following UL-certified products for combining DC power supplies.

(1) Limited voltage and current circuits according to UL508

Circuits taking as a power supply the secondary winding of an isolation transformer satisfying the following conditions:

- A maximum voltage (with no load) of 30 Vrms (42.4 V peak).
- A maximum current (1) of no more than 8 A (including short-circuiting) or (2) limited by a circuit breaker (such as a fuse).

No-load voltage (V peak)	Maximum rated current (A)
0 to 20	5.0
From 20 to 30	100 Peak voltage

(2) Class 2 Power Supply Unit according to UL1310

(3) Circuits with a maximum voltage of 30 Vrms (42.4 V peak) taking a Class 2 transformer as a power supply according to UL1585

- If a sensor with UL-certified DC power supply specifications is required, a UL Mark can be affixed to the model in the following table under the condition that it be used in a Class 2 circuit.

Product Certified for Use in Class 2 Circuits Only (Listing/Recognition Certification)

Model	File No.	Listing certification	Recognition certification
EE-S Series *	E41515		O

* Recognition Marks are not displayed for recognition certification of DC sensors. Only Listing Marks are displayed when UL marking is requested.

In the interest of product improvement, specifications are subject to change without notice.

READ AND UNDERSTAND THIS DOCUMENT

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- Systems, machines, and equipment that could present a risk to life or property.

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This document provides information mainly for selecting suitable models. Please read the Instruction sheet carefully for information that the user must understand and accept before purchase, including information on warranty, limitations of liability, and precautions.

ALL DIMENSIONS SHOWN ARE IN MILLIMETERS.

To convert millimeters into inches, multiply by 0.03937. To convert grams into ounces, multiply by 0.03527.

Cat. No. E382-E1-01 **In the interest of product improvement, specifications are subject to change without notice.**

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