




EE-SX770/771/772/870/871/872(A/P/R)

Thin, Compact Photomicrosensor with Attached Cable

- Next generation design available with NPN or PNP output
- Allows standard M3-screw mounting
- Twenty-four models available in standard, L-shaped, and T-shaped
- UL, EMC and CE approvals
- Each model equipped with a flexible cable that conforms to machine contours
- Compact size allows high-density mounting
- Indicators are visible from both sides
- Readily-visible, molded workpiece insertion mark allows fine-tuning of sensing position




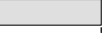
Ordering Information

Appearance	Sensing method	Sensing distance	Output configuration		Part number (See Note.)
<div>Standard</div> 	Through-beam (slot)	 5 mm (0.2 in) (slot width)	NPN	Dark-ON	EE-SX770(A)
			PNP		EE-SX770(P/R)
			NPN	Light-ON	EE-SX870(A)
			PNP		EE-SX870(P/R)
<div>L-shaped</div> 			NPN	Dark-ON	EE-SX771(A)
			PNP		EE-SX771(P/R)
			NPN	Light-ON	EE-SX871(A)
			PNP		EE-SX871(P/R)

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

(This table continues on the next page.)

Specifications Table - continued from previous page

Appearance	Sensing method	Sensing distance	Output configuration		Part number (See Note.)
	Through-beam (slot)	 5 mm (0.2 in) (slot width)	NPN	Dark-ON	EE-SX772(A)
			PNP		EE-SX772(P/R)
			NPN	Light-ON	EE-SX872(A)
			PNP		EE-SX872(P/R)

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

Specifications

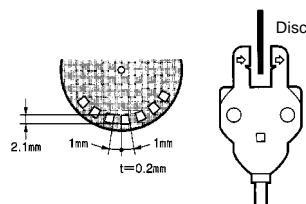
Item		Through-beam models(slot)							
Output configuration		Dark-ON				Light-ON			
Output		NPN		PNP		NPN		PNP	
Model		EE-SX770	EE-SX770A	EE-SX770P	EE-SX770R	EE-SX870	EE-SX870A	EE-SX870P	EE-SX870R
		EE-SX771	EE-SX771A	EE-SX771P	EE-SX771R	EE-SX871	EE-SX871A	EE-SX871P	EE-SX871R
		EE-SX772	EE-SX772A	EE-SX772P	EE-SX772R	EE-SX872	EE-SX872A	EE-SX872P	EE-SX872R
Supply voltage		5 to 24 VDC \pm 10%, ripple (p-p): 10% max							
Current consumption	NPN models	35 mA max.							
	PNP models	30 mA max.							
Slot width		5 mm							
Standard target object		Opaque: 2 x 0.8 mm min							
Differential travel		0.025 mm							
Control output		NPN open collector output models: At 5 to 24 VDC: 100 mA load current (I_C) with a residual voltage of 0.8 V max. When driving TTL: 40 mA load current (I_C) with a residual voltage of 0.4 V max. PNP open collector output models: At 5 to 24 VDC: 50 mA load current (I_C) with a residual voltage of 1.3 V max.							

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Specifications Table - continued from previous page

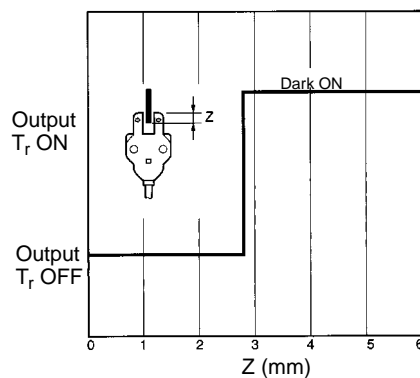
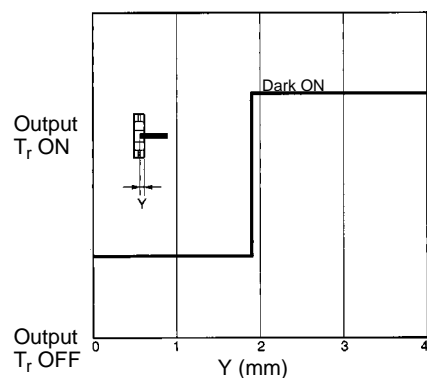
Item	Through-beam models(slot)							
Output configuration	Dark-ON				Light-ON			
Output	NPN		PNP		NPN		PNP	
Model	EE-SX770 EE-SX771 EE-SX772	EE-SX770A EE-SX771A EE-SX772A	EE-SX770P EE-SX771P EE-SX772P	EE-SX770R EE-SX771R EE-SX772R	EE-SX870 EE-SX871 EE-SX872	EE-SX870A EE-SX871A EE-SX872A	EE-SX870P EE-SX871P EE-SX872P	EE-SX870R EE-SX871R EE-SX872R
Operation indicator (See Note 1.)	Red LED is ON when the object to be detected is not present							
Response frequency (See Note 2.)	1 kHz							
Light source	GaAs infrared LED with a peak light wavelength of 940 nm							
Protective circuit (See Note 3.)	Overcurrent protection (built-in circuit)							
Ambient illuminance	Sensing surface: 1,000 lx max with fluorescent light							
Ambient temperature	Operating	-25°C to 55°C (-13°F to 131°F)						
	Storage	-30°C to 80°C (-22°F to 176°F)						
Ambient humidity	Operating	5% to 85%						
	Storage	5% to 95%						
Vibration resistance	Destruction: 20 to 2,000 Hz, 1.5-mm double amplitude for 2 hours each in X, Y, and Z directions							
Shock resistance	Destruction: 500 m/s ² (50G), three times each in X, Y, and Z directions							
Degree of protection	IEC60529 IP60							
Connection method (standard length)	Pre-wired: 2 m							
Casing material	PBT (polybutylene terephthalate)							
Cable material	PVC (polyvinyl chloride resin)							

- Note: 1. The operation indicator of models with suffix code (A) or (R) will turn ON when the light is interrupted.
2. The response frequency is a value obtained when the EE-SX detects a rotating disc with holes in it, as shown to the right.
3. Operates when the load current exceeds the rated value of 100 mA to inhibit a current flow exceeding 120 mA.

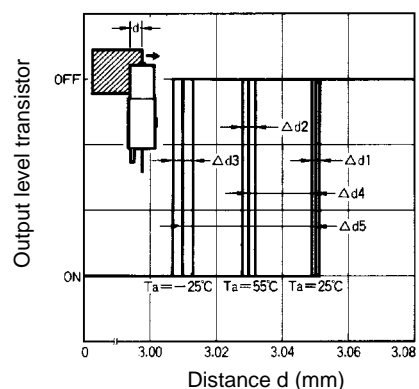


Engineering Data

■ SENSING POSITION (EE-SX77/87)



■ REPEATED SENSING POSITION CHARACTERISTICS (TYPICAL)



No. of repetitions: 20 at $V_{cc} = 12\text{ V}$

$\Delta d1 = 0.002\text{ mm}$

$\Delta d2 = 0.004\text{ mm}$

$\Delta d3 = 0.005\text{ mm}$

$\Delta d4 = 0.02\text{ mm}$

$\Delta d5 = 0.04\text{ mm}$

Operation

■ OUTPUT CIRCUITS

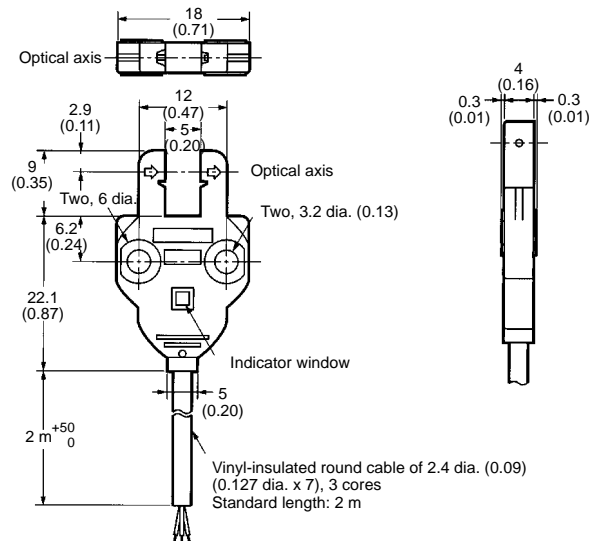
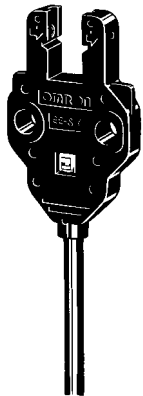
Output configuration	Model	Output transistor operation	Timing Charts	Output Circuit
NPN Output	EE-SX770 EE-SX771 EE-SX772 EE-SX770A EE-SX771A EE-SX772A	Dark-ON	<div> <div>Incident</div> <div>Interrupted</div> <div>Operation indicator (red)</div> <div>ON</div> <div>OFF</div> <div>Output transistor</div> <div>ON</div> <div>OFF</div> <div>Load (e.g., relay)</div> <div>Operate</div> <div>Reset</div> </div>	
	EE-SX870 EE-SX871 EE-SX872 EE-SX870A EE-SX871A EE-SX872A	Light-ON	<div> <div>Incident</div> <div>Interrupted</div> <div>Operation indicator (red)</div> <div>ON</div> <div>OFF</div> <div>Output transistor</div> <div>ON</div> <div>OFF</div> <div>Load (e.g., relay)</div> <div>Operate</div> <div>Reset</div> </div>	
PNP Output	EE-SX770P EE-SX771P EE-SX772P EE-SX770R EE-SX771R EE-SX772R	Dark-ON	<div> <div>Incident</div> <div>Interrupted</div> <div>Operation indicator (red)</div> <div>ON</div> <div>OFF</div> <div>Output transistor</div> <div>ON</div> <div>OFF</div> <div>Load (e.g., relay)</div> <div>Operate</div> <div>Reset</div> </div>	
	EE-SX870P EE-SX871P EE-SX872P EE-SX870R EE-SX871R EE-SX872R	Light-ON	<div> <div>Incident</div> <div>Interrupted</div> <div>Operation indicator (red)</div> <div>ON</div> <div>OFF</div> <div>Output transistor</div> <div>ON</div> <div>OFF</div> <div>Load (e.g., relay)</div> <div>Operate</div> <div>Reset</div> </div>	

Dimensions

Unit: mm (inch)

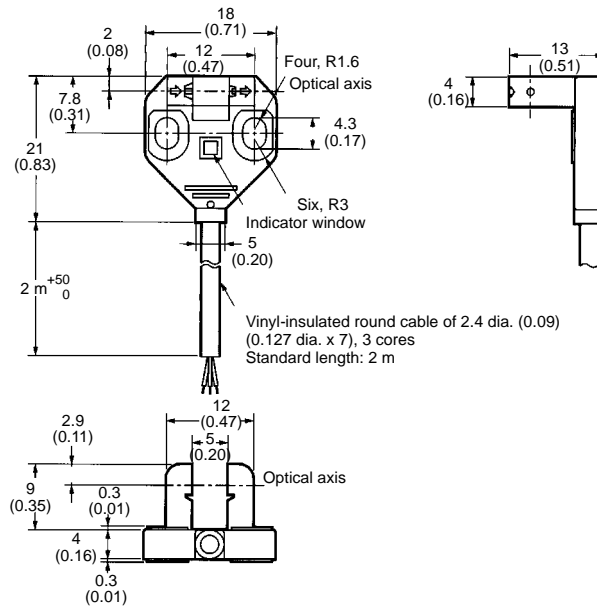
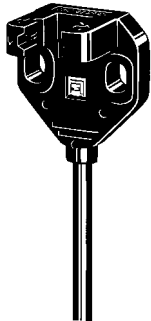
■ STANDARD MODELS

EE-SX770	EE-SX870
EE-SX770A	EE-SX870A
EE-SX770P	EE-SX870P
EE-SX770R	EE-SX870R



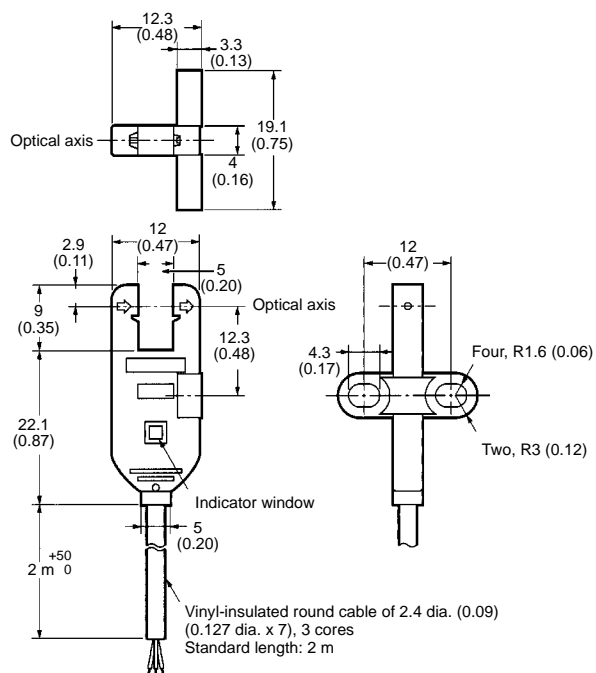
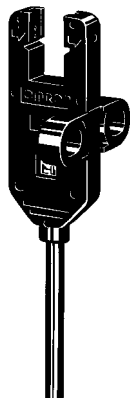
■ L-SHAPED MODELS

EE-SX771	EE-SX871
EE-SX771A	EE-SX871A
EE-SX771P	EE-SX871P
EE-SX771R	EE-SX871R



■ T-SHAPED MODELS

EE-SX772	EE-SX872
EE-SX772A	EE-SX872A
EE-SX772P	EE-SX872P
EE-SX772R	EE-SX872R



Precautions

■ MOUNTING

- The EE-SX77/87 is a photomicrosensor that should be built into equipment. For this reason, no special protective measures have been taken to protect the EE-SX77/87 from external light disturbance. Avoid malfunction by ensuring that the EE-SX77/87 is not influenced by incandescent lamps or other light sources that may cause external light disturbance.
- Mount the photomicrosensor securely to flat plates. The characteristics of the through-beam sensor change if the slot is deformed.
- Use M3 screws when mounting the EE-SX77/87. Be sure to use spring washers with the screws, so that the screws will not loosen. The tightening torque applied to each screw must be no more than $0.59 \text{ N} \cdot \text{m}$ ($6 \text{ kgf} \cdot \text{cm}$).
- Make sure that nothing will come into contact with the sensing element of the sensor. If the sensing element has scratch damage, the operating characteristics of the photomicrosensor will decrease.
- Securely mount the EE-SX77/87 to prevent loosening by vibration or shock.

■ OPERATING ENVIRONMENT

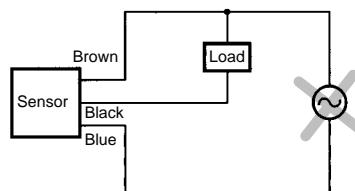
- *Do not* connect the EE-SX77/87 while power is applied, or the EE-SX77/87 may be damaged.
- *Do not* install the EE-SX77/87 in the following locations to avoid malfunction or damage:
 - A. Locations with excessive dust
 - B. Locations with corrosive gas
 - C. Locations where water, oil, or chemicals are directly sprayed
 - D. Locations exposed to direct sunlight
- Make sure that the operating ambient temperature is within the rated range.
- The photomicrosensor may be soluble in organic solvent, acid, and alkaline, aromatic hydrocarbon, and chlorinated aliphatic hydrocarbon solvents. The characteristics of the photomicrosensor may decrease as a result. Make sure that the photomicrosensor is free from these solutions.



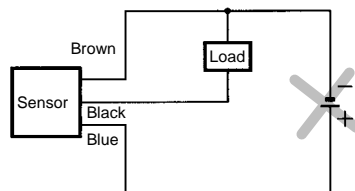
Caution

■ TO AVOID DAMAGE

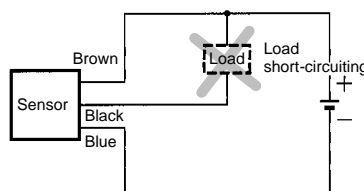
- Do not use the EE-SX77/87 at voltage exceeding the rated voltage range.



- Do not make mistakes in wiring, such as mistakes in polarity.



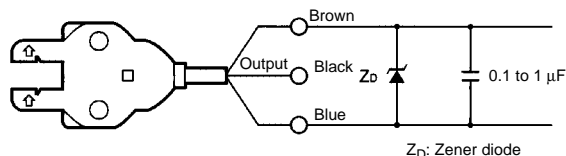
- Do not short-circuit the load (i.e., do not connect a power supply directly to the Sensor) as shown below.



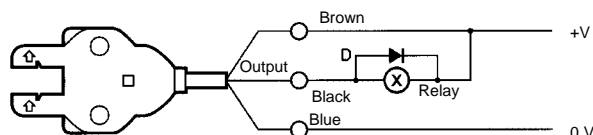
■ WIRING

For Surge Prevention

If the power supply has surge voltage, connect a Zener diode withstanding 30 to 35 V or a 0.1 to 1- μ F capacitor in parallel to the power supply to absorb the surge voltage.



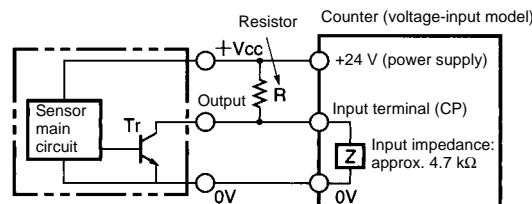
If the load is a relay or other small inductive load, connect it to the EE-SX77/87 as shown below. You must connect a diode for counter-voltage absorption.



Do not route power lines or high-tension lines in the same conduit with the EE-SX77/87 to avoid damage or malfunction due to induction.

Voltage Output

A photomicrosensor with open collector output can be connected to a device with voltage-input specifications by connecting a resistor between the power supply and output terminals, as shown in the following circuit diagram. The value of the resistor is normally 4.7 k Ω and must withstand a power of 0.5 W at 24 V and 0.25 W at 12 V.



- EE-SX77/87 series NPN models with a 4.7-k Ω resistor.

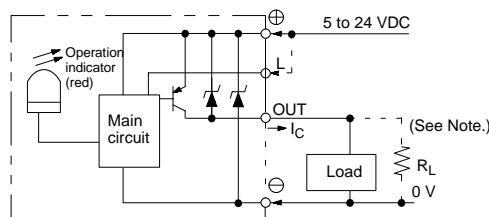
High level:

$$\text{Input voltage (V}_H\text{)} = \frac{Z}{R+Z} V_{CC} = \frac{4.7 \text{ k}}{4.7 \text{ k} + 4.7 \text{ k}} \times 24 \text{ V} = 12 \text{ V}$$

Low level:

$$\text{Input voltage (V}_L\text{)} \leq 0.4 \text{ V}$$

$$\text{Load current (I}_C\text{)} = \frac{V_{CC}}{R} = \frac{24 \text{ V}}{R} = 5.1 \text{ mA} \leq 100 \text{ mA}$$



Note: When using a voltage output, always insert a resistor in R_L .

Note: Refer to the ratings of the photomicrosensor for the relationship between the residual voltage and load current.

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