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

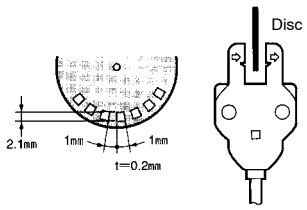
The operation indicator of models with suffix code (A) or (R) will turn ON when the light is interrupted.

Appearance	Sensing method	Sensing distance	Output configuration		Part number
Standard 	Slot	5 mm (0.2 in) (slot width)	NPN	Dark-ON	**EE-SX770**
					EE-SX770A
			PNP		**EE-SX770P**
					EE-SX770R
			NPN	Light-ON	**EE-SX870**
					EE-SX870A
			PNP		**EE-SX870P**
					EE-SX870R
L-shaped 			NPN	Dark-ON	**EE-SX771**
					EE-SX771A
			PNP		**EE-SX771P**
					EE-SX771R
			NPN	Light-ON	**EE-SX871**
					EE-SX871A
			PNP		**EE-SX871P**
					EE-SX871R
T-shaped 			NPN	Dark-ON	**EE-SX772**
					EE-SX772A
			PNP		**EE-SX772P**
					EE-SX772R
			NPN	Light-ON	**EE-SX872**
					EE-SX872A
			PNP		**EE-SX872P**
					EE-SX872R

Specifications

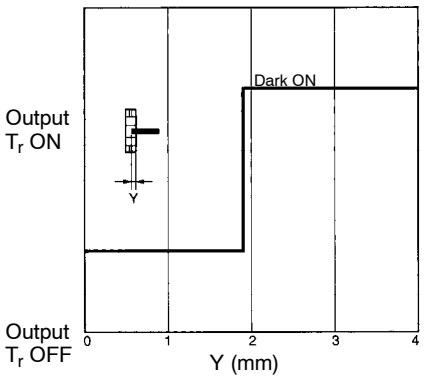
Item		Through-beam models(slot)							
Output configuration		Dark-ON				Light-ON			
Output type		NPN		PNP		NPN		PNP	
Model		EE-SX770 EE-SX771 EE-SX772	EE-SX770A EE-SX771A EE-SX772A	EE-SX770P EE-SX771P EE-SX772P	EE-SX770R EE-SX771R EE-SX772R	EE-SX870 EE-SX871 EE-SX872	EE-SX870A EE-SX871A EE-SX872A	EE-SX870P EE-SX871P EE-SX872P	EE-SX870R EE-SX871R EE-SX872R
Supply voltage		5 to 24 VDC ± 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.							
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)							

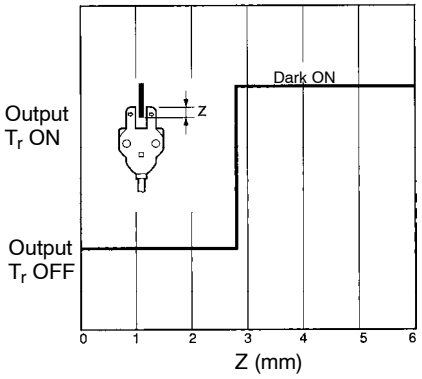
Note: 1. The operation indicator of models with suffix code (A) or (R) will turn ON when the light is interrupted.
2. The response frequency is a value obtained when the EE-SX detects a rotating disc with holes in it, as shown to the right.
3. Operates when the load current exceeds the rated value of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



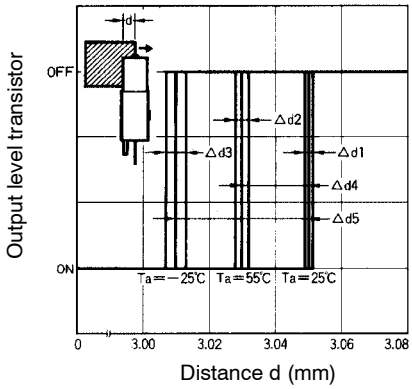
Engineering Data

■ SENSING POSITION (EE-SX77/87)





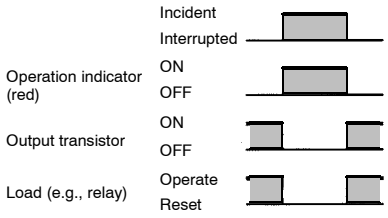
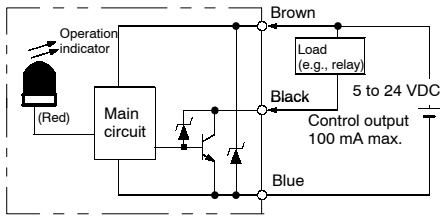
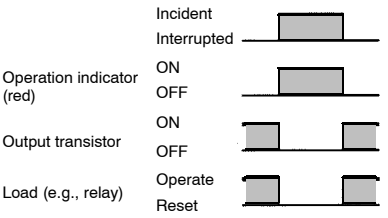
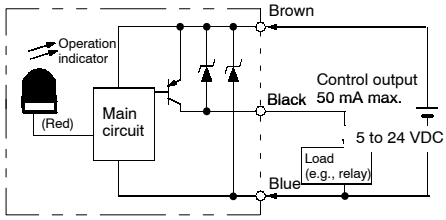
■ REPEATED SENSING POSITION CHARACTERISTICS (TYPICAL)



No. of repetitions: 20 at V_{cc} = 12 V
△d1 = 0.002 mm
△d2 = 0.004 mm
△d3 = 0.005 mm
△d4 = 0.02 mm
△d5 = 0.04 mm

Operation

■ OUTPUT CIRCUITS

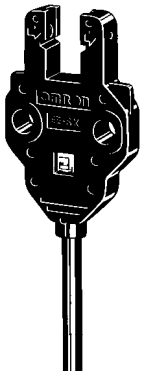
<table>
<tr><th>Output configuration</th><th>Model</th><th>Output transistor operation</th><th>Timing Charts</th><th>Output Circuit</th></tr>
<tr><td rowspan="2">NPN Output</td><td>EE-SX770
EE-SX771
EE-SX772
EE-SX770A
EE-SX771A
EE-SX772A</td><td>Dark-ON</td><td rowspan="2"> 
</td><td rowspan="2"> 
</td></tr>
<tr><td>EE-SX870
EE-SX871
EE-SX872
EE-SX870A
EE-SX871A
EE-SX872A</td><td>Light-ON</td></tr>
<tr><td rowspan="2">PNP Output</td><td>EE-SX770P
EE-SX771P
EE-SX772P
EE-SX770R
EE-SX771R
EE-SX772R</td><td>Dark-ON</td><td rowspan="2"> 
</td><td rowspan="2"> 
</td></tr>
<tr><td>EE-SX870P
EE-SX871P
EE-SX872P
EE-SX870R
EE-SX871R
EE-SX872R</td><td>Light-ON</td></tr>
</table>

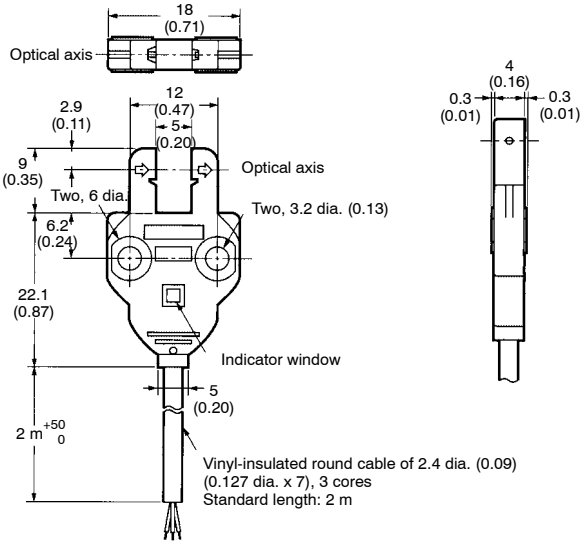
Dimensions

Unit: mm (inch)

■ STANDARD MODELS

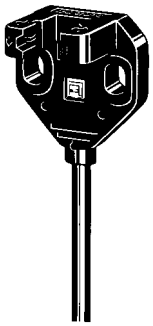
EE-SX770 **EE-SX870**
EE-SX770A **EE-SX870A**
EE-SX770P **EE-SX870P**
EE-SX770R **EE-SX870R**

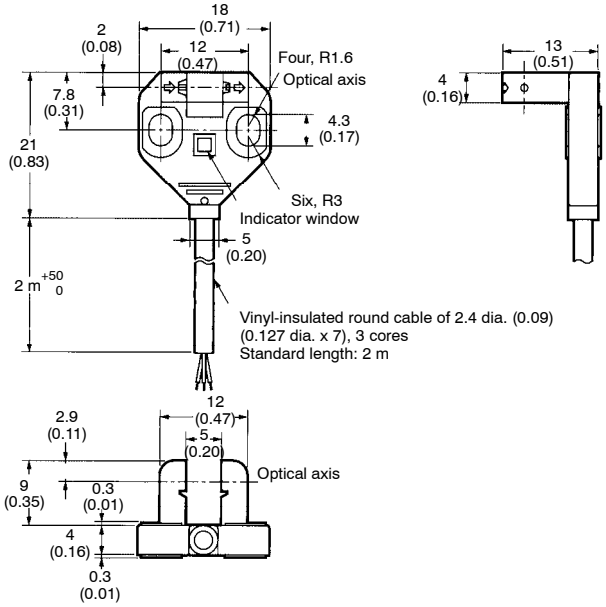




■ L-SHAPED MODELS

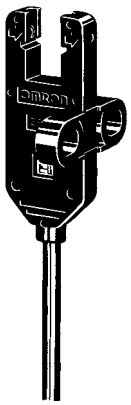
EE-SX771 **EE-SX871**
EE-SX771A **EE-SX871A**
EE-SX771P **EE-SX871P**
EE-SX771R **EE-SX871R**

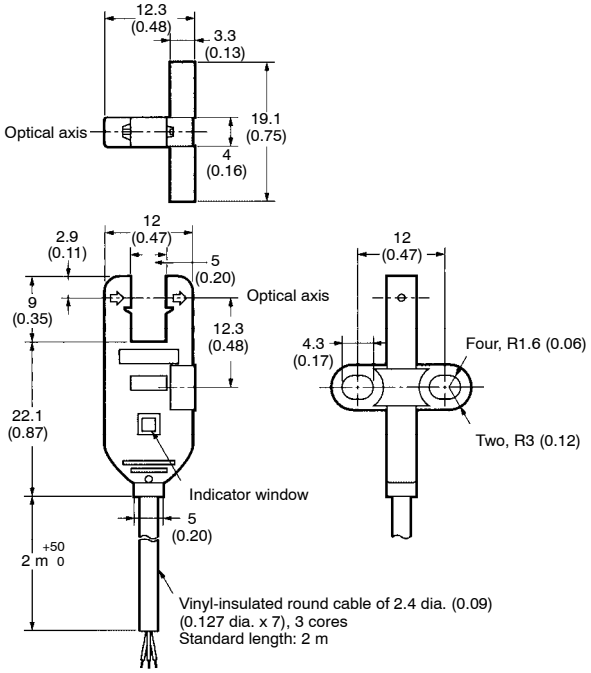




■ T-SHAPED MODELS

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 N • m (6 kgf • 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.

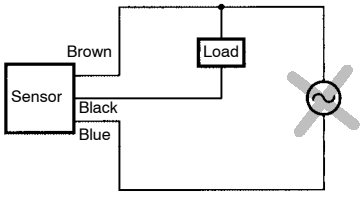
■ OPERATING ENVIRONMENT

- *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.

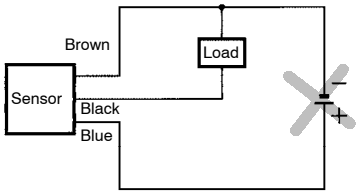
⚠ Caution

■ TO AVOID DAMAGE

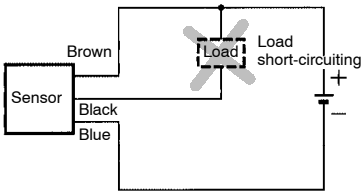
- Do not use the EE-SX77/87 at voltage exceeding the rated voltage range.



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



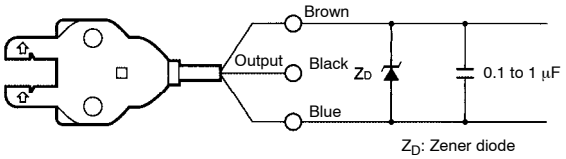
- Do not short-circuit the load (i.e., do not connect a power supply directly to the Sensor) as shown below.



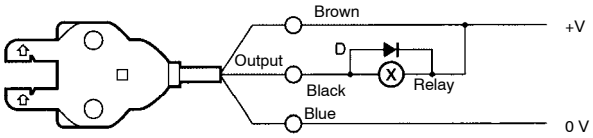
■ WIRING

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-μF capacitor in parallel to the power supply to absorb the surge voltage.



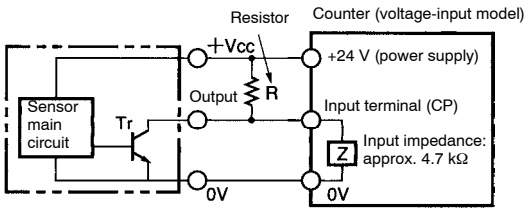
If the load is a relay or other small inductive load, connect it to the EE-SX77/87 as shown below. You must connect a diode for counter-voltage absorption.



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 kΩ 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-kΩ resistor.**

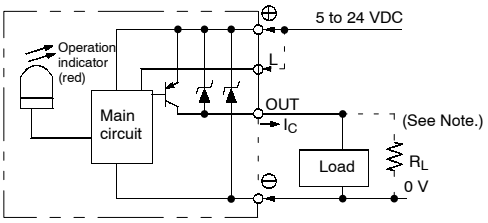
High level:

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

Low level:

Input voltage (V_L) ≦ 0.4 V

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



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.

NOTE: DIMENSIONS SHOWN ARE IN MILLIMETERS. To convert millimeters to inches divide by 25.4.

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