

Photomicrosensor Precautions

• For the precautions for each individual product, refer to **Safety Precautions** section for that particular product.

⚠ 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

Do not use the product with a voltage or current that exceeds the rated range.

Applying a voltage or current that is higher than the rated range may result in explosion or fire.

Do not miswire such as the polarity of the power supply voltage. Otherwise the product may be damaged or it may burn.

Do not short-circuit the load. Otherwise explosion or burning may occur.

This product does not resist water. Do not use the product in places where water or oil may be sprayed onto the product.

Precautions for Correct Use

Structure and Materials

The emitter and detector elements of conventional Photomicrosensors are fixed with transparent epoxy resin and the main bodies are made of polycarbonate. Unlike ICs and transistors, which are covered with black epoxy resin, Photomicrosensors are subject to the following restrictions.

1. Low Heat Resistivity

The storage temperature of standard ICs and transistors is approximately 150°C. The storage temperature of highly resistant Photomicrosensors is 100°C maximum. The heat resistance of the EE-SY169 Series which use ABS resin in the case, is particularly low (80°C maximum).

2. Low Mechanical Strength

Black epoxy resin, which is used for the main bodies of ICs and transistors, contains additive agents including glass fiber to increase the heat resistivity and mechanical strength of the main bodies. Materials with additive agents cannot be used for the bodies of Photomicrosensors because Photomicrosensors must maintain good optical permeability. Unlike ICs and transistors, Photomicrosensors must be handled with utmost care because Photomicrosensors are not as heat or mechanically resistant as ICs and transistors. No excessive force must be imposed on the lead wires of Photomicrosensors.

Mounting

- Screw Mounting

If Photomicrosensors have screw mounting holes, the Photomicrosensors can be mounted with screws.

Unless otherwise specified, refer to the following when tightening the screws.

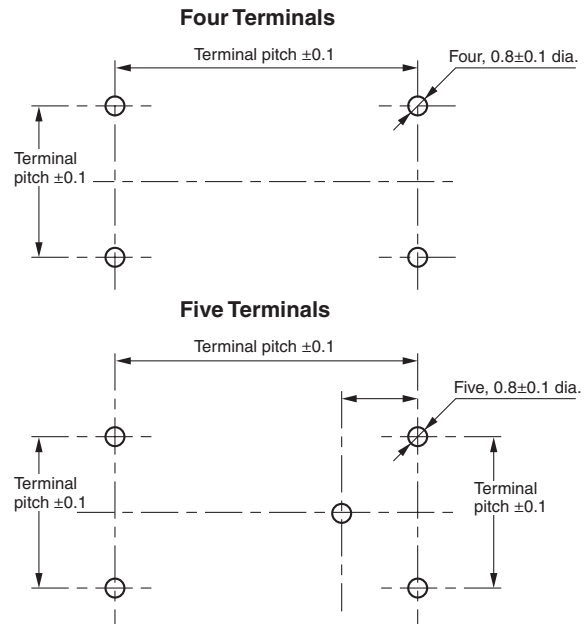
Hole diameter	Screw size	Tightening torque
2.1 dia.	M2	0.34 N • m
3.2 dia.	M3	0.54 N • m
4.2 dia.	M4	0.54 N • m

Read the following before tightening the screws.

1. The use of a torque screwdriver is recommended to tighten each of the screws so that the screws can be tightened to the tightening torque required.
2. The use of a screw with a spring washer and flat washer for the mounting holes of a Photomicrosensor is recommended. If a screw with a spring washer but without a flat washer is used for any mounting hole, the part around the mounting hole may crack.
3. Do not mount Photomicrosensors to plates stained with machining oil, otherwise the machining oil may cause cracks on the Photomicrosensors.
4. Do not impose excessive forces on Photomicrosensors mounted to PCBs. Make sure that no continuous or instantaneous external force exceeding 500 g (4.9 N) is imposed on any lead wire of the Photomicrosensors.

- PCB Mounting Holes

Unless otherwise specified, the PCB to which a Photomicrosensor is mounted must have the following mounting holes.



Soldering

- Lead Wires

Make sure to solder the lead wires of Photomicrosensors so that no excessive force will be imposed on the lead wires. If an excessive force is likely to be imposed on the lead wires, hold the bases of the lead wires.

- Soldering Temperature

Regardless of the device being soldered, soldering should be completed quickly so that the devices are not subjected to thermal stress. Care is also required in the processing environment for processes other than soldering so that the devices are not subject to thermal stress or other external force.

1. Manual Soldering

Unless otherwise specified, the lead wires of Photomicrosensors can be soldered manually under the following conditions.

These conditions must also be maintained when using lead-free solder, i.e., soldering with lead-free solder is possible as long as the following conditions are maintained.

Soldering temperature: 350°C max. (The temperature of the tip of a 30-W soldering iron is approximately 320°C when the soldering iron is heated up.)

Soldering time: 3 s max.

Soldering position: At least 1.5 mm away from the bases of the lead wires.

The temperature of the tip of any soldering iron depends on the shape of the tip. Check the temperature with a thermometer before soldering the lead wires. A highly resistive soldering iron incorporating a ceramic heater is recommended for soldering the lead wires.

2. Dip Soldering

The lead wires of Photomicrosensors can be dip-soldered under the following conditions unless otherwise specified.

Preheating temperature: Must not exceed the storage temperature of the Photomicrosensors.

Soldering temperature: 260°C max. (the lead wires)

Soldering time: 10 s max.

Soldering position: At least 0.3 mm away from the bases of the housing.

The soldering temperature is specified as the temperature applied to the lead terminals. Do not subject the cases to temperatures higher than the maximum storage temperature. It is also possible for the sensor case to melt due to residual heat of the PCB. When using a PCB with a high thermal capacity (e.g., those using fiber-glass reinforced epoxy substrates), confirm that the case is not deformed and install cooling devices as required to prevent distortion. Particular care is required for the EE-SY169 Series, which use ABS resin in the case.

Because the position of the caulked portion is near the board mounting surface in the case of EE-SX1046 and EE-SX1049, particular care is necessary to prevent the caulked portion from being subjected to heat exceeding the maximum storage temperature when soldering.

When using heat shrink tubes, do not subject the cases to temperatures higher than the maximum storage temperature.

It is possible for the sensor case to melt and for the caulked portion that holds the element to become deformed, resulting in the element coming out.

Do not use non-washable flux when soldering EE-SA-series Photomicrosensors, otherwise the Photomicrosensors will have operational problems. For other Photomicrosensors, check the case materials and optical characteristics carefully to be sure that residual flux does not adversely affect them.

3. Reflow Soldering

The reflow soldering of Photomicrosensors is not possible except for the EE-SX1320, -SX1321, -SX1330, -SX1340, -SX1350, -SX3340, -SX3350, -SX4320, -SX4340, -SX4350 and EE-SY1200. The reflow soldering of these products must be performed carefully under the conditions specified in the datasheets of these products, respectively. Before performing the reflow soldering of these products, make sure that the reflow soldering equipment satisfies the conditions.

Compared to general ICs, optical devices have a lower resistance to heat. This means the reflow temperature must be set to a lower temperature. Observe the temperature provides provided in the specifications when mounting optical devices.

4. External Forces Immediately Following Soldering

The heat resistance and mechanical strength of Photomicrosensors are lower than those of ICs or transistors due to their physical properties. Care must thus be exercised immediately after soldering (particularly for dip soldering) so that external forces are not applied to the Photomicrosensors.

Cleaning Precautions

- Cleaning

Photomicrosensors except the EE-SA105 and EE-SA113 can be cleaned subject to the following restrictions.

1. Types of Detergent

Polycarbonate is used for the bodies of most Photomicrosensors. Some types of detergent dissolve or crack polycarbonate. Before cleaning Photomicrosensors, refer to the following results of experiments, which indicate what types of detergent are suitable for cleaning Photomicrosensors other than the EE-SA105 and EE-SA113.

Observe the law and prevent against any environmental damage when using any detergent.

Results of Experiments

Ethyl alcohol: OK

Methyl alcohol: OK

Isopropyl alcohol: OK

Trichlene: NG

Acetone: NG

Methylbenzene: NG

Water (hot water)*: The lead wires corrode depending on the conditions

* EE-SX1103, EE-SX1105, EE-SX1106, EE-SX4152 cannot be cleaned with water or hot water.

2. Cleaning Method

Unless otherwise specified, Photomicrosensors other than the EE-SA105 and EE-SA113 can be cleaned under the following conditions. Do not apply an unclean detergent to the Photomicrosensors.

DIP cleaning: OK

Ultrasonic cleaning: Depends on the equipment and the PCB size. Before cleaning Photomicrosensors, conduct a cleaning test with a single Photomicrosensor and make sure that the Photomicrosensor has no broken lead wires after the Photomicrosensor is cleaned.

Brushing: The marks on Photomicrosensors may be brushed off. The emitters and detectors of reflective Photomicrosensors may have scratches and deteriorate when they are brushed. Before brushing Photomicrosensors, conduct a brushing test with a single Photomicrosensor and make sure that the Photomicrosensor is not damaged after it is brushed.

Connector Insertion/Removal

When inserting/removing connectors, do so in a straight manner. Do not forcibly insert/remove connectors in a slanted manner horizontally or vertically. When inserting connectors, ensure that they are completely inserted.

Operating and Storage* Environments

- Observe the upper and lower limits of the operating and storage temperature ranges for all devices and do not allow excessive changes in temperature. As explained in the restrictions given in *Structure and Materials*, elements use clear epoxy resin, giving them less resistance to thermal stress than normal ICs or transistors (which are sealed with black epoxy resin). Refer to reliability test results and design PCBs so that the devices are not subjected to excessive thermal stress.
Even for applications within the operating temperature range, care must also be taken to control the humidity. As explained in the restrictions given in *Structure and Materials*, elements use clear epoxy resin, giving them less resistance to humidity than normal ICs or transistors (which are sealed with black epoxy resin). Refer to reliability test results and design PCBs so that the devices are not subjected to excessive humidity stress. Photomicrosensors are designed for application under normal humidities. When using them in humidified or dehumidified, high-humidity or low-humidity, environments, test performance sufficiently for the application.
- Because the gallium and arsenic from which the LED element is constructed may form a compound with chlorine, peeling of the LED element pad may occur. Do not use in chlorinated environments.

* Refers to the ambient temperature when power supply voltage and input signals are not applied.

Storage Conditions

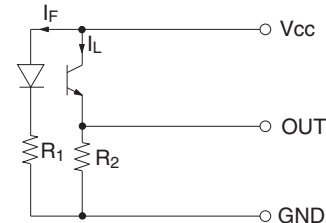
- Do not store in locations subjected to direct sunlight.
- The period during which the product can be used for assembly is 12 months after delivery only on the premise that storage takes place under normal temperatures, normal humidity, and normal pressure. Please dispose of the product after this period has passed. If attempting to use after this period has passed, please do so after sufficiently confirming that no problems with the product exist. Such use is at the discretion of the customer.

LED Drive Currents

- Photomicrosensors consist of LEDs and light detectors. Generally speaking, temporal changes occur to LEDs when power is supplied to them (i.e., the amount of light emitted diminishes). With less light, the photoelectric current is reduced for a sensor with a phototransistor output or the threshold current is increased for a sensor with a photo-IC output. Design circuits with sufficient consideration to the decline in the emitted light level. The reduction in emitted light is far greater for red LEDs than for infrared LEDs. Also, with red LEDs that contain aluminum, aluminum oxide will form if they are powered under high humidities, calling for a greater need for consideration of the decline in the emitted light level.

Light Interceptors

- Select a material for the light interceptor with superior interception properties. If a material with inferior light interception properties, such as a plastic that is not black, is used, light may penetrate the interceptor and cause malfunction. With Photomicrosensors, most of which use infrared LEDs, a material that appears black to the human eye (i.e., in the visible light range) may be transparent to infrared light. Select materials carefully.
- Guideline for Light Interceptors
When measuring the light interception properties of the light interceptor, use 0.1% maximum light transmission as a guideline.



Reflectors

- The reflectors for most Photomicrosensors are standardized to white paper with a reflection ratio of 90%. Design the system to allow for any differences in the reflection ratio of the detection object. With Photomicrosensors, most of which use infrared LEDs, a material that appears black to the human eye (i.e., in the visible light range) may have a higher reflection ratio. Select materials carefully. Concretely, marks made with dye-based inks or marks made with petroleum-based magic markers (felt pens) can have the same reflection ratio for infrared light as white paper.
- The reflectors for most Photomicrosensors are standardized to white paper with a reflection ratio of 90%. Paper, however, disperses light relatively easily, reducing the effect of the detection angle. Materials with mirrored surfaces, on the other hand, show abrupt changes in angle characteristics. Check the reflection ratio and angles sufficiently for the application.
- The output from most Photomicrosensors is determined at a specified distance. Characteristics will vary with the distance. Carefully check characteristics at the specific distance for the application.

Output Stabilization Time

- Photomicrosensors with photo-IC outputs require 100 ms for the internal IC to stabilize. Set the system so that the output is not read for 100 ms after the power supply is turned ON. Also be careful if the power supply is turned OFF in the application to save energy when the Photomicrosensor is not used.
- When using a Photomicrosensor with a phototransistor output outside of the saturation region, stabilization time is required to achieve thermal balance. Care is required when using a variable resistor or other adjustment.

• Application examples provided in this document are for reference only. In actual applications, confirm equipment functions and safety before using the product.
• Consult your OMRON representative before using the product under conditions which are not described in the manual or applying the product to nuclear control systems, railroad systems, aviation systems, vehicles, combustion systems, medical equipment, amusement machines, safety equipment, and other systems or equipment that may have a serious influence on lives and property if used improperly. Make sure that the ratings and performance characteristics of the product provide a margin of safety for the system or equipment, and be sure to provide the system or equipment with double safety mechanisms.

Note: Do not use this document to operate the Unit.