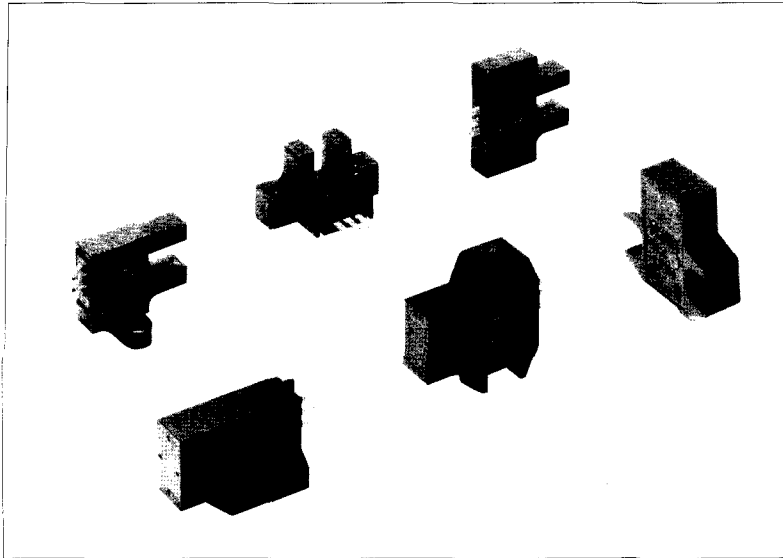
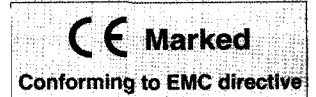


PM/PM2 SERIES

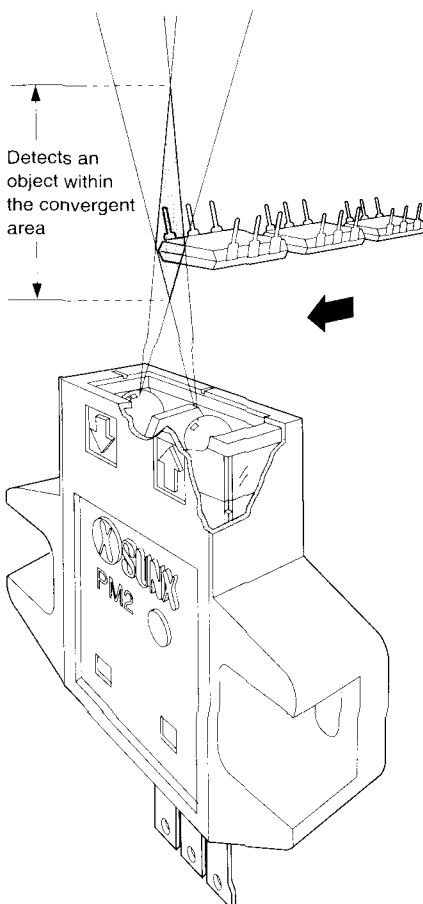
U-shaped Type/Convergent Reflective Type



Cost Effectiveness

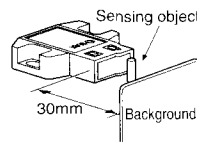


Stable Detection by Convergent Reflective Mode/PM2-□



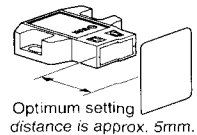
• Not affected by background

A background does not affect the sensing performance if the sensor is located 30mm away from it.



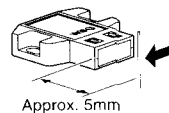
• Dark object detectable

The sensor can detect even a dark object of lower reflection ratio.



• Minute object detectable

A copper wire $\phi 0.05\text{mm}$ can be detected at 5mm distant.



High-speed Response Time : 20 μs /PM-□

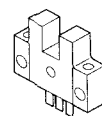
• High-speed response time : 20 μs (to the Light condition)

• Operation indicator

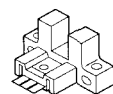
Every model is incorporated with the operation indicator for the initial check-up and the maintenance.

• Wide product range

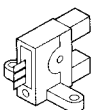
K type



L type



T type



• DC power operation

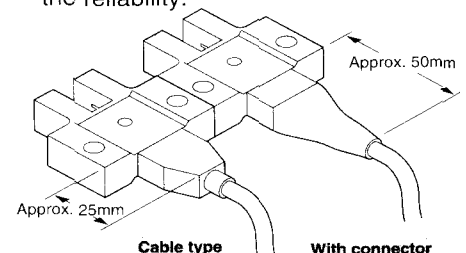
The supply voltage is accepted at 5 to 24V DC $\pm 10\%$.

• Sink current 100mA

Sink current is allowed up to 100mA even it is micro-sized. The open-collector transistor output can be wired directly to TTL logic circuit or PLC.

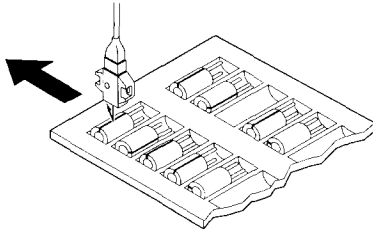
• Cable type is also available

Not required soldering. It helps saving a space and secures the reliability.

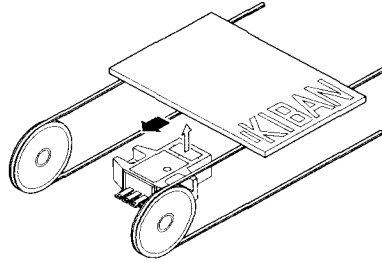


APPLICATIONS

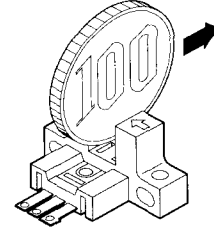
Sensing capacitors on tray



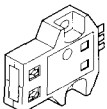
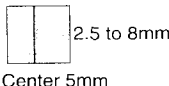
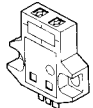
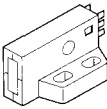
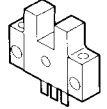
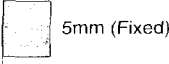
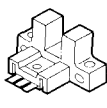
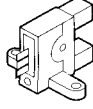
Sensing circuit boards



Counting coins



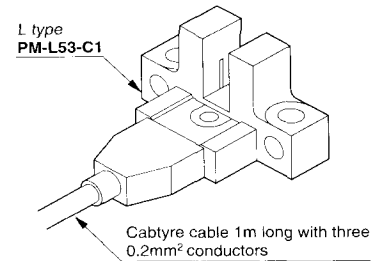
ORDER GUIDE

| Type | Appearance | Sensing range | Model No. | Output operation | |
|-----------------------|---|---|---|------------------|----------|
| Convergent reflective |  |  | PM2-LH10 | Light-ON | |
| | | | PM2-LH10B | Dark-ON | |
| |  | | PM2-LF10 | Light-ON | |
| | | | PM2-LF10B | Dark-ON | |
| | L type (Top sensing) | |  | PM2-LL10 | Light-ON |
| | | | | PM2-LL10B | Dark-ON |
| U-shaped thru-beam |  |  | PM-K53 | Dark-ON | |
| | | | PM-K53B | Light-ON | |
| | L type | |  | PM-L53 | Dark-ON |
| | | | | PM-L53B | Light-ON |
| | T type | |  | PM-T53 | Dark-ON |
| | | | | PM-T53B | Light-ON |

Cable type (U-shaped type only)

The cable-integrated sensors are available in U-shaped types. (Cable length : 1m). When ordering this type, add suffix "-C1" at the end of the model No.

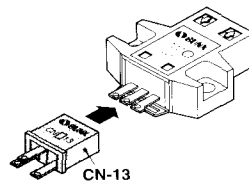
(e.g.) Cable type of **PM-K53** is "**PM-K53-C1**".



OPTION

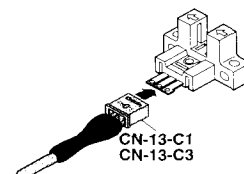
| Designation | Model No. | Description |
|--------------|-----------------|---|
| Connector | CN-13 | Dedicated connector |
| Mating cable | CN-13-C1 | Cable type cable 1m long with three 0.2mm ² conductors |
| | CN-13-C3 | Cable type cable 3m long with three 0.2mm ² conductors |

Connector
• CN-13



Mating cable

- CN-13-C1
- CN-13-C3



PM/PM2

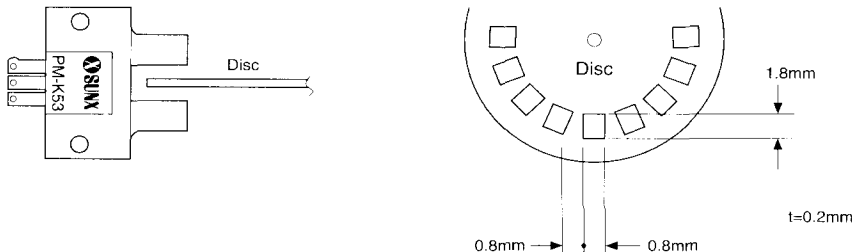
SPECIFICATIONS

| Item | Type Model No. | Convergent reflective | | | | | U-shaped thru-beam | | | | | | |
|--|-------------------|--|-----------|---------------|-----------|----------------------|---|---------|----------|---------|----------|------------|----------|
| | | Top sensing | | Front sensing | | L type (Top sensing) | K type | | L type | | T type | | |
| Item | Model No. | PM2-LH10 | PM2-LH10B | PM2-LF10 | PM2-LF10B | PM2-LL10 | PM2-LL10B | PM-K53 | PM-K53B | PM-L53 | PM-L53B | PM-T53 | PM-T53B |
| Sensing range | | 2.5 to 8mm (Center : 5mm) with white non-glossy paper (15 × 15mm) (*1) | | | | | 5mm (Fixed) | | | | | | |
| Min. sensing object | | Copper wire of ϕ 0.05mm (at the setting distance 5mm) | | | | | Translucent object of 0.8 × 1.8mm | | | | | | |
| Hysteresis | | 20% or less of operation distance with white non-glossy paper (15 × 15 mm) | | | | | 0.05mm | | | | | | |
| Repeatability | | 0.08mm (Perpendicular to axial direction) (*2) | | | | | 0.03mm | | | | | | |
| Supply voltage | | 5 to 24V DC \pm 10% Ripple P-P 5% or less | | | | | 5 to 24V DC \pm 10% Ripple P-P 10% or less | | | | | | |
| Current consumption | | Average : 25mA or less, Peak : 80mA or less | | | | | 30mA or less | | | | | | |
| Output | | NPN open-collector transistor <ul style="list-style-type: none"> • Maximum sink current : 100mA • Applied voltage : 30V DC or less • Residual voltage : 1V or less (at 100mA sink current) 0.4V or less (at 16mA sink current) | | | | | | | | | | | |
| Utilization category | | DC-12 or DC-13 | | | | | | | | | | | |
| Output operation | | Light-ON | Dark-ON | Light-ON | Dark-ON | Light-ON | Dark-ON | Dark-ON | Light-ON | Dark-ON | Light-ON | Dark-ON | Light-ON |
| Short-circuit protection | | Incorporated | | | | | | | | | | | |
| Response time | | 0.8ms or less | | | | | Under the Light condition : 20 μ s or less Under the Dark condition : 200 μ s or less (Response frequency : $\left. \begin{array}{l} \\ \\ \end{array} \right\}$ 500Hz or more) (*3) | | | | | | |
| Operation indicator | | Red LED (lights up when the output is activated) | | | | | | | | | | | |
| Pollution degree | | 3 (Industrial environment) | | | | | | | | | | | |
| Ambient temperature | | - 10 to + 55°C, Storage : - 25 to + 80°C | | | | | - 25 to + 60°C, Storage : - 30 to + 80°C | | | | | | |
| Ambient humidity | | 45 to 85%RH (No dew condensation nor icing allowed), Storage : 45 to 85%RH | | | | | | | | | | | |
| Ambient illuminance (Extraneous light immunity) | | Sun light : 11,000 ℓ x at the light-receiving face Incandescent light : 3,500 ℓ x at the light-receiving face | | | | | Fluorescent light : 1,000 ℓ x at the light-receiving face | | | | | | |
| EMC | | Emission : EN50081-2, Immunity : EN50082-2 | | | | | | | | | | | |
| Vibration-proof | | 10 to 55Hz frequency, 1.5mm amplitude, and X, Y, and Z directions each for two hours (unenergized) | | | | | 10 to 2,000Hz frequency (peak acceleration : 20G), 1.5mm amplitude, and X, Y, and Z directions each for four cycles (four minute cycle) (unenergized) | | | | | | |
| Shock-proof | | 500m/s ² acceleration (approx. 50G), and X, Y, and Z directions each for three times (unenergized) | | | | | 15,000m/s ² acceleration (approx. 1,500G), and X, Y, and Z directions each for three times (0.5ms pulse shock) (unenergized) | | | | | | |
| Emitting element | | Infrared LED (modulated) | | | | | Infrared LED (non-modulated) | | | | | | |
| Material | | Enclosure : Polycarbonate, Terminal part : HSM (Ag plated) | | | | | Enclosure : PBT, Terminal part : HSM (Ag plated) | | | | | | |
| Cable extension | | Maximum extension is 2m overall with a cable with conductors 0.3mm ² or more (If the cable is extended for 2m or more, a capacitor of 10 μ F must be connected between +V and 0V terminals) | | | | | Maximum extension is 100m overall with a cable with conductors 0.3mm ² or more | | | | | | |
| Weight | | Approx. 4.5g | | | | | Approx. 4g | | | | | Approx. 3g | |

(*1) : The sensing range may extend to 12.5mm in maximum with white non-glossy paper by variation in products.

(*2) : The repeatability of the convergent reflective sensor is conditioned with using white non-glossy paper (15 × 15mm) at the setting distance of 5mm long.

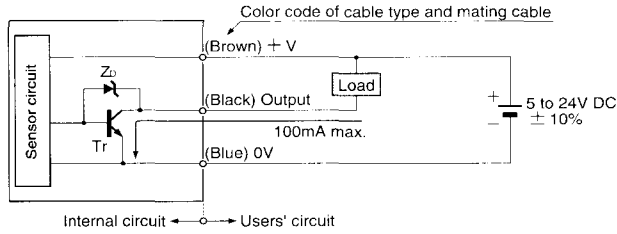
(*3) : The response frequency of the U-shaped type is conditioned with rotating the disc as shown below.



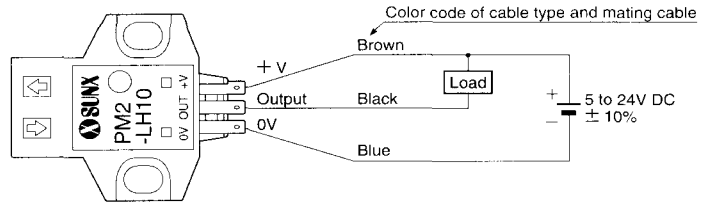
I/O CIRCUIT AND WIRING DIAGRAMS

Color code has been changed in accordance with the IEC standard.

I/O circuit diagram



Wiring diagram



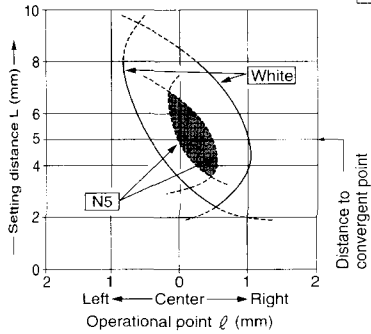
Symbol . . . Zb: Surge absorption zener diode
Tr: NPN output transistor

SENSING FIELDS (TYPICAL)

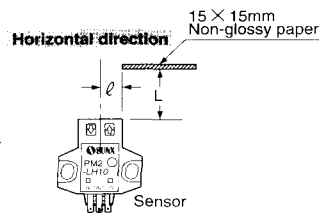


Sensing field

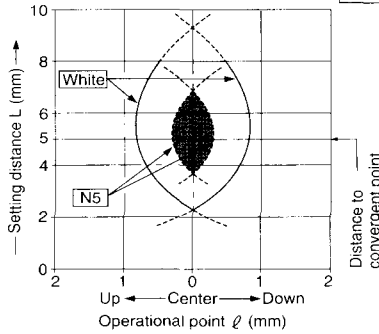
- Horizontal (left and right) direction



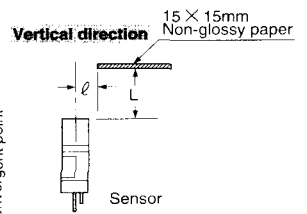
The sensors can be mounted side by side.



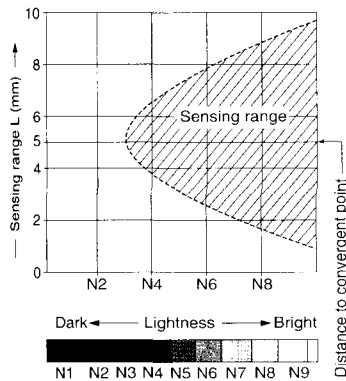
- Vertical (up and down) direction



The sensors can be mounted side by side.



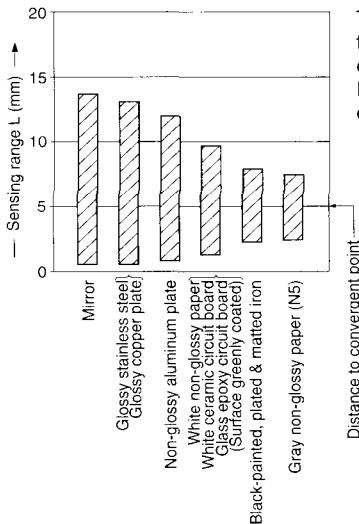
Correlation between lightness and sensing range



The detectable area is represented by oblique lines on the left figure. The sensitivity should be however set with an enough margin because of variation in products.

(Lightness on the left may differ slightly from the actual condition.)

Correlation between material (15x15mm) and sensing range




The bars on the graph indicate the detectable distance with each object. However, they may slightly differ in every product.

PM/PM2

PRECAUTIONS FOR PROPER USE

Refer to P.682~for general cautions

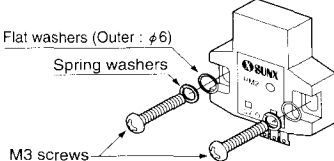
All models

 This product is not a safety sensor. Its use is not intended or designed to protect life, and prevent bodily injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Mounting

- Mount the sensor, with two M3 screws and $\phi 6$ washers under the following tightening torque.

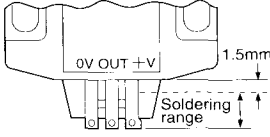
| Model No. | Tightening torque |
|-----------------------------|-----------------------|
| PM2-□ PM-K53□ PM-T53□ | 0.49 N·m (5kgf·cm) |
| PM-L53□ | 0.29 N·m {3kgf·cm} |



Soldering

- Solder the terminals under the following conditions.

| Item | Model No. | PM2-□ | PM-□ |
|-----------------------|-----------|----------------------------------|----------------|
| Soldering temperature | | 260°C or less | |
| Soldering time | | 10 sec. or less | 3 sec. or less |
| Soldering range | | Refer to the figure on the right | |



Wiring

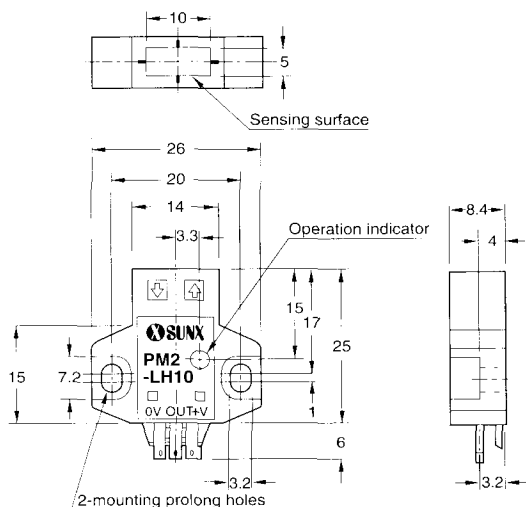
- Make sure to connect terminals according to the specified signal code as the sensor does not incorporate a reverse polarity circuit protection (PM2-□ incorporates with it.) or a short-circuit protection.
- Investigate the place how much the sensor will be influenced by surrounding noises before installation. At the place where the sensor is placed near a device which generates an inductive noise such as a motor, a solenoid valve, or a magnetic valve, apply a surge absorber to the sensor.

Others

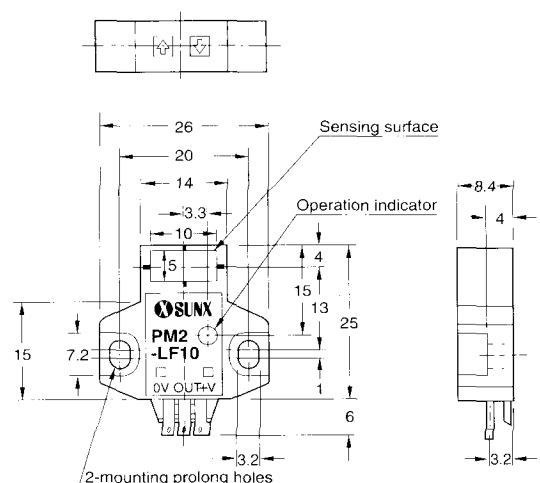
- The transient time duration is 50ms after power-up.
- Make sure that the sensor should not be exposed to chemical agent such as thinner or organic solvent.

DIMENSIONS (Unit : mm)

PM2-LH10
PM2-LH10B Sensor



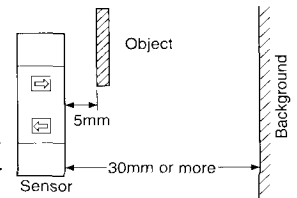
PM2-LF10
PM2-LF10B Sensor



PM2-□

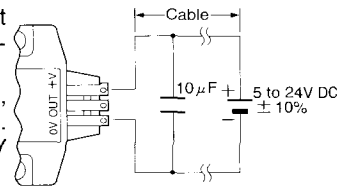
Setting

- The optimum setting distance (distance to convergent point) is 5mm. The sensor can not be affected by a specular background if it locates away from the sensor 30mm or more.



Wiring

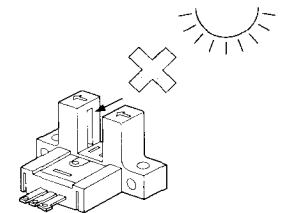
- The connection cable must be 2m or less with conductors 0.3mm² or more. To extend it 2m or more, apply a capacitor approx. 10 μ F between +V and 0V lines.



PM-□

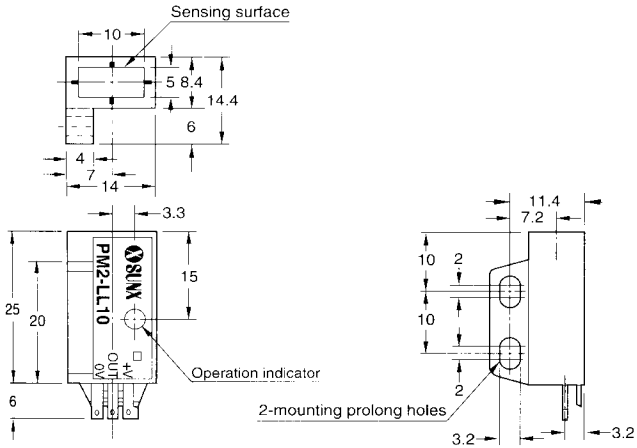
Others

- The sensor has been designed to use inside a machine so that it has no particular protection against ambient light. Do not expose the light-receiving face to any light directly.

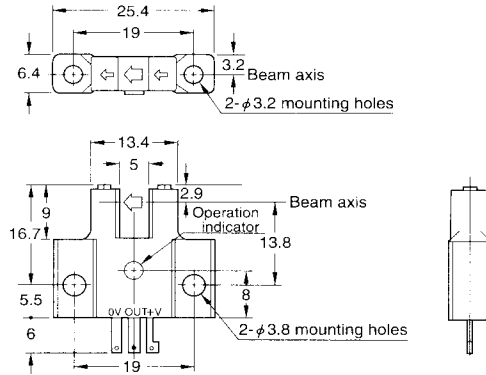


DIMENSIONS (Unit : mm)

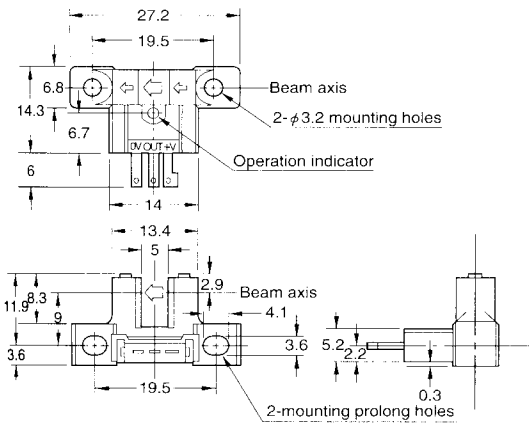
PM2-LL10 Sensor
PM2-LL10B Sensor



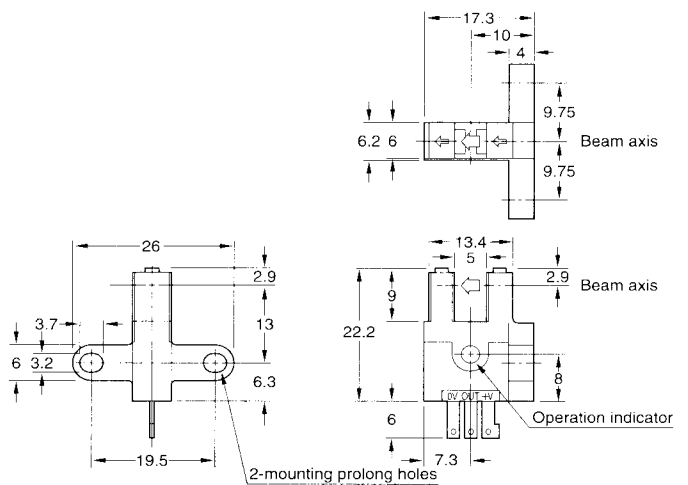
PM-K53 Sensor
PM-K53B Sensor



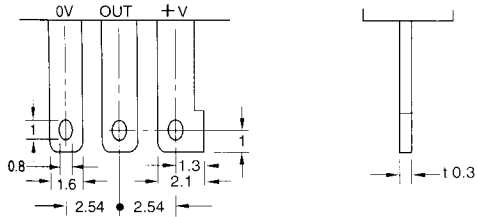
PM-L53 Sensor
PM-L53B Sensor



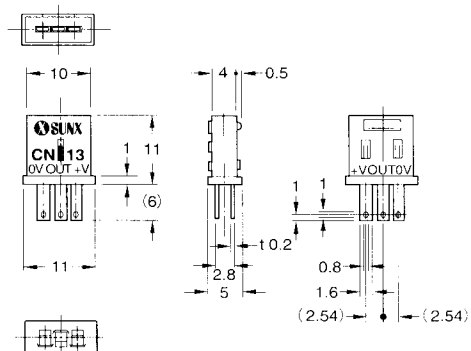
PM-T53 Sensor
PM-T53B Sensor



*** Terminal part (All models)**



CN-13 Connector

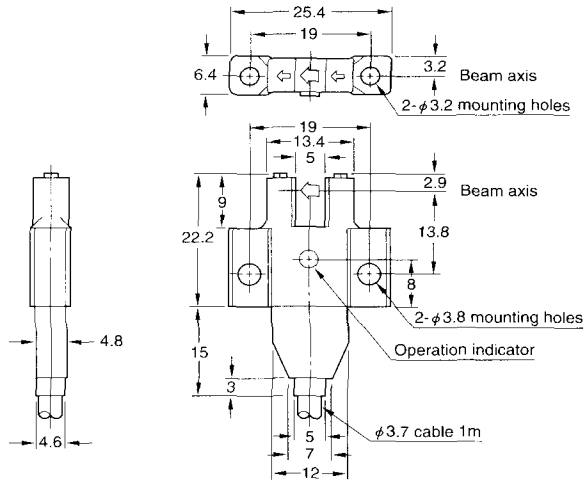


PM/PM2

DIMENSIONS (Unit : mm)

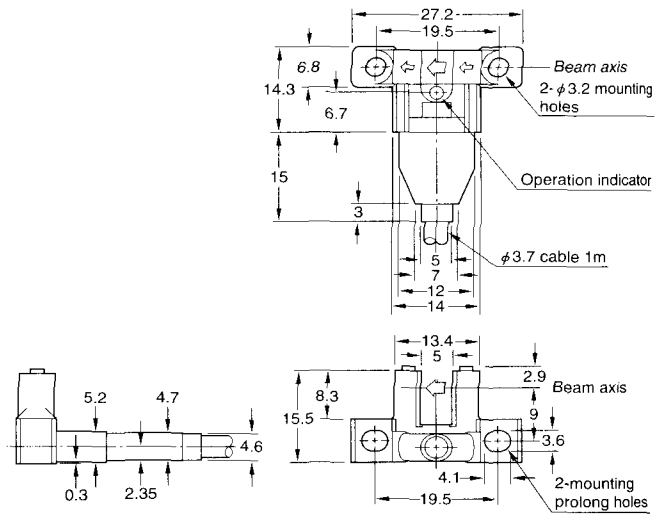
PM-K53-C1
PM-K53B-C1

Sensor



PM-L53-C1
PM-L53B-C1

Sensor



PM-T53-C1
PM-T53B-C1

Sensor

