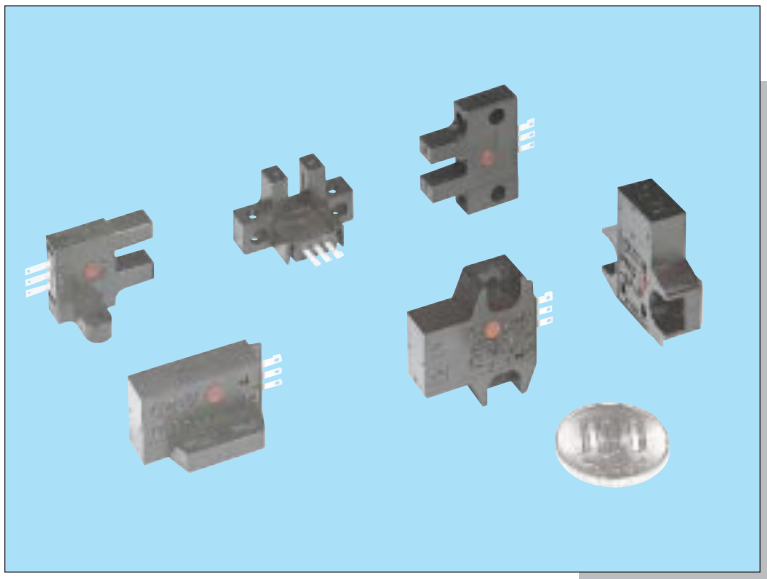
PM/PM2 SERIES

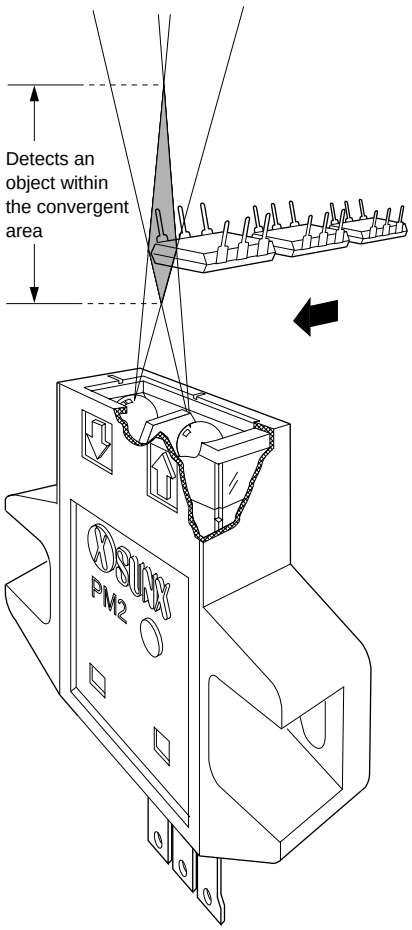
U-shaped Type/Convergent Reflective Type



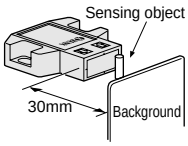
Cost Effectiveness

CE Marked
Conforming to EMC directive

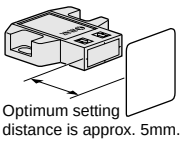
Stable Detection by Convergent Reflective Mode/PM2-□



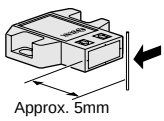
- **Not affected by background**
  A background does not affect the sensing performance if the sensor is located 30mm away from it.



- **Dark object detectable**
  The sensor can detect even a dark object of lower reflection ratio.



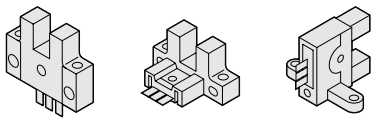
- **Minute object detectable**
  A copper wire ϕ0.05mm can be detected at 5mm distant.



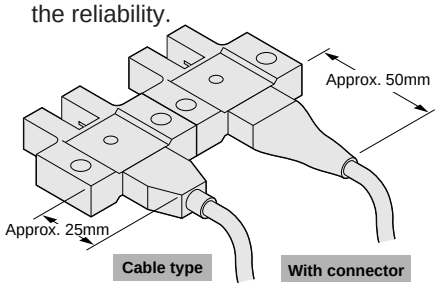
High-speed Response Time : 20μs/PM-□

- **High-speed response time : 20μs (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

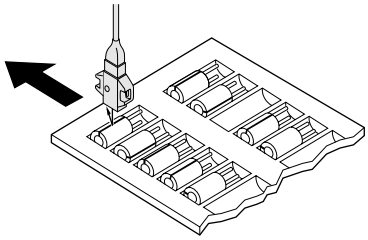


- **DC power operation**
  The supply voltage is accepted at 5 to 24V DC ± 10%.
- **Sink current 100mA**
  Sink current is allowed up to 100mA even it is micro-sized. The open-collector transistor output can be wired directly to TTL logic circuit or PLC.
- **Cable type is also available**
  Not required soldering.
  It helps saving a space and secures the reliability.

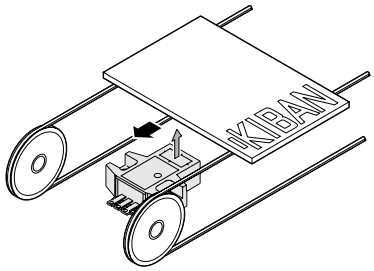


APPLICATIONS

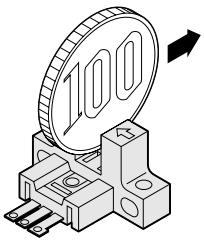
Sensing capacitors on tray



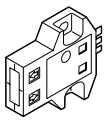
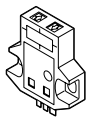
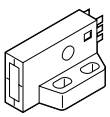
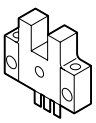
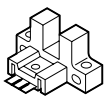
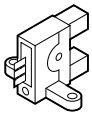
Sensing circuit boards



Counting coins



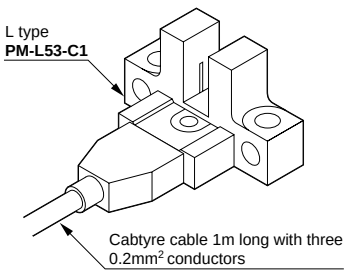
ORDER GUIDE

Type		Appearance	Sensing range	Model No.	Output operation
Convergent reflective	Top sensing		2.5 to 8mm Center 5mm	**PM2-LH10**	Light-ON
				PM2-LH10B	Dark-ON
	Front sensing			**PM2-LF10**	Light-ON
				PM2-LF10B	Dark-ON
	L type (Top sensing)			**PM2-LL10**	Light-ON
				PM2-LL10B	Dark-ON
U-shaped thru-beam	K type		5mm (Fixed)	**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.

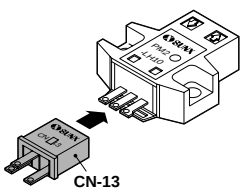
(e.g.) Cable type of **PM-K53** is "**PM-K53-C1**".



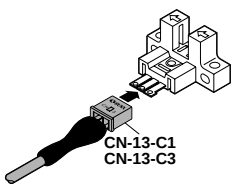
OPTION

Designation	Model No.	Description
Connector	**CN-13**	Dedicated connector
Mating cable	**CN-13-C1**	Cabtyre cable 1m long with three 0.2mm² conductors
	CN-13-C3	Cabtyre cable 3m long with three 0.2mm² conductors

Connector
- **CN-13**



Mating cable
- **CN-13-C1**
- **CN-13-C3**

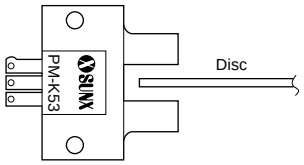


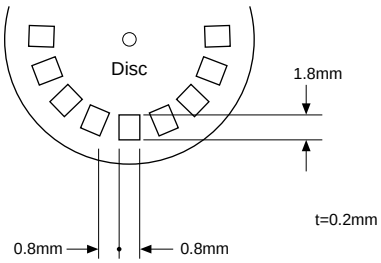
PM/PM2

SPECIFICATIONS

Item \ Type	Convergent reflective						U-shaped thru-beam					
	Top sensing		Front sensing		L type (Top sensing)		K type		L type		T type	
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 ϕ0.05mm (at the setting distance 5mm)						Opaque 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 ± 10% Ripple P-P 5% or less						5 to 24V DC ± 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 • 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 : 20μs or less Under the Dark condition : 200μs or less (Response frequency : 500Hz or more) (*3)					
Operation indicator	Red LED (lights up when the output is activated)											
Environmental resistance: Pollution degree	3 (Industrial environment)											
Environmental resistance: Ambient temperature	−10 to +55°C, Storage : −25 to +80°C						−25 to +60°C, Storage : −30 to +80°C					
Environmental resistance: Ambient humidity	45 to 85%RH (No dew condensation nor icing allowed), Storage : 45 to 85%RH											
Environmental resistance: Ambient illuminance (Extraneous light immunity)	Sun light : 11,000ℓx at the light-receiving face Incandescent light : 3,500ℓx at the light-receiving face						Fluorescent light : 1,000ℓx at the light-receiving face					
Environmental resistance: EMC	Emission : EN50081-2, Immunity : EN50082-2											
Environmental resistance: 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)					
Environmental resistance: 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 10μF 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.

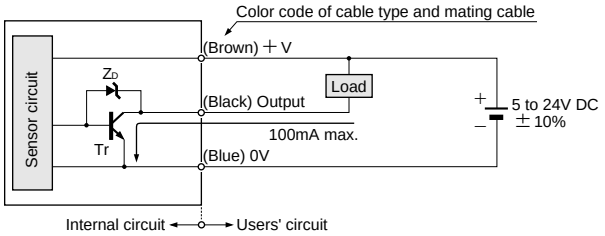




I/O CIRCUIT AND WIRING DIAGRAMS

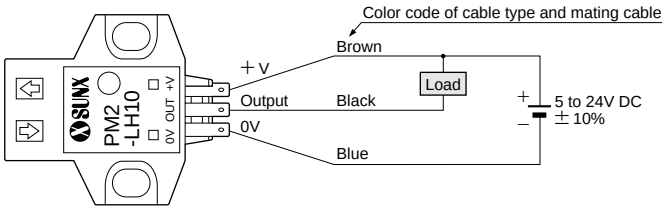
Color code has been changed in accordance with the IEC standard.

I/O circuit diagram



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

Wiring diagram



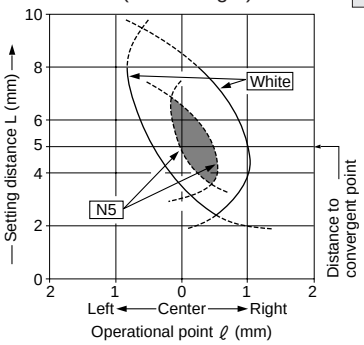
SENSING FIELDS (TYPICAL)

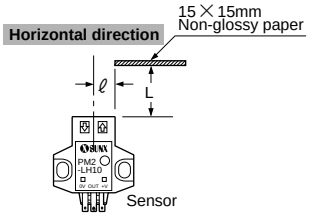
PM2-□

Sensing field

• Horizontal (left and right) direction

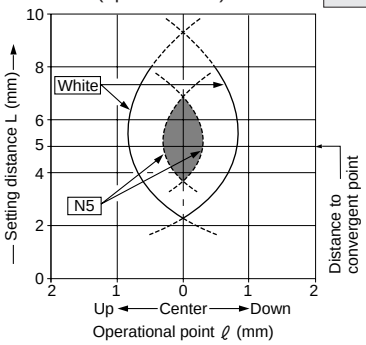
The sensors can be mounted side by side.

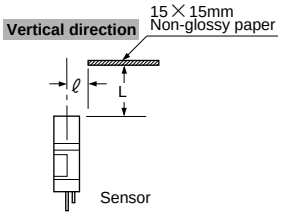




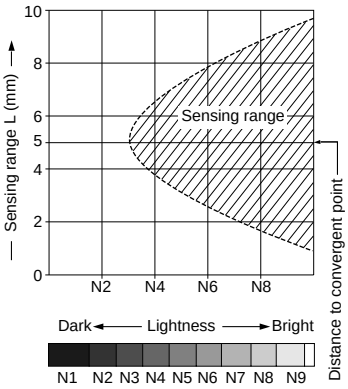
• Vertical (up and down) direction

The sensors can be mounted side by side.





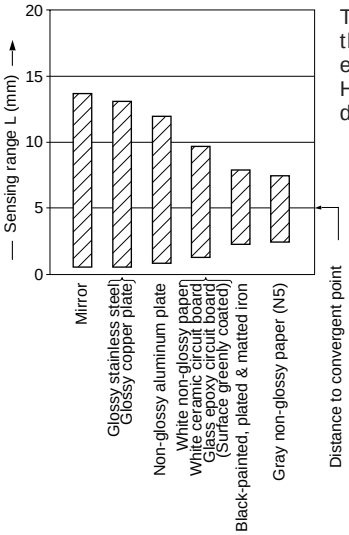
Correlation between lightness and sensing range



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 (15×15mm) 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

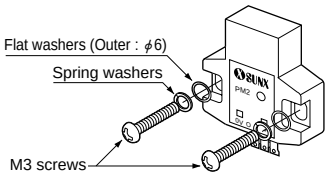
All models

This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body 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 ϕ6 washers under the following tightening torque.

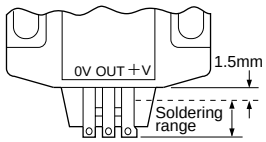
Model No.	Tightening torque
PM2-□ **PM-K53□** **PM-T53□**	0.49·Nm {5kgf·cm}
PM-L53□	0.29 N·m {3kgf·cm}



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.

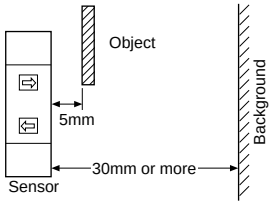
Others

• 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.

PM2-□

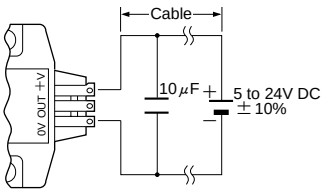
Setting

• 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

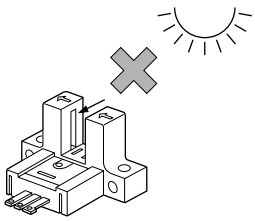
• The connection cable must be 2m or less with conductors 0.3mm² or more.
To extend it 2m or more, apply a capacitor approx. 10μF between +V and 0V lines.



PM-□

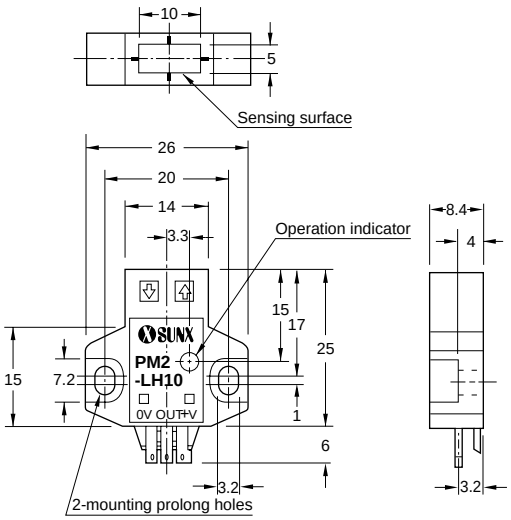
Others

• 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.

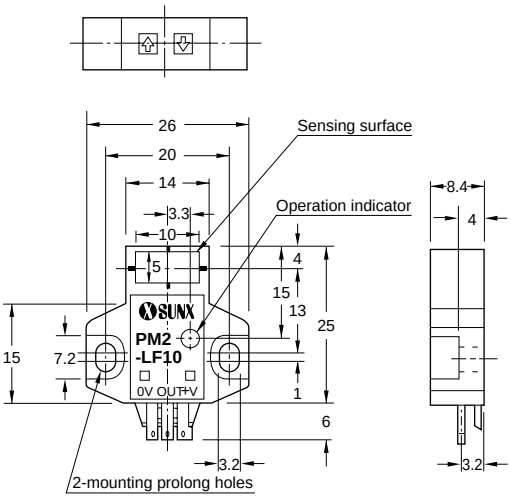


DIMENSIONS (Unit : mm)

PM2-LH10 PM2-LH10B Sensor

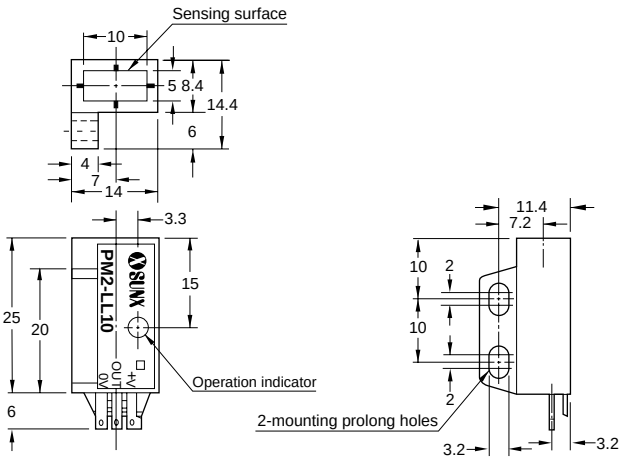


PM2-LF10 PM2-LF10B Sensor

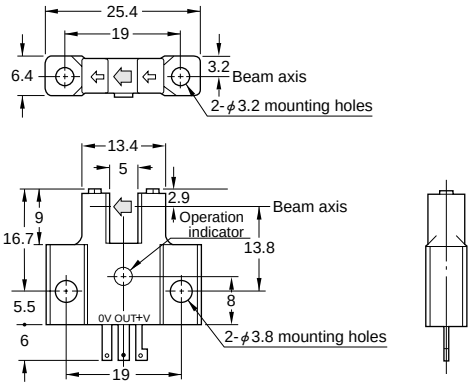


DIMENSIONS (Unit : mm)

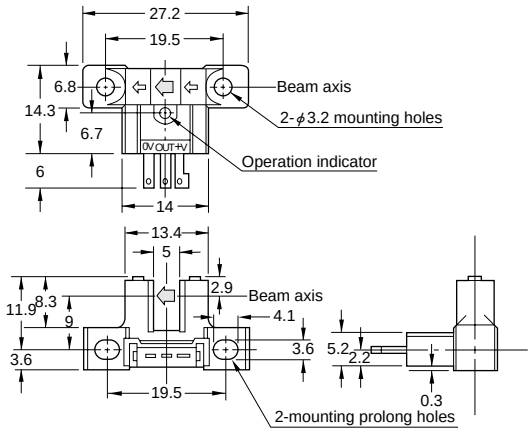
PM2-LL10 PM2-LL10B Sensor



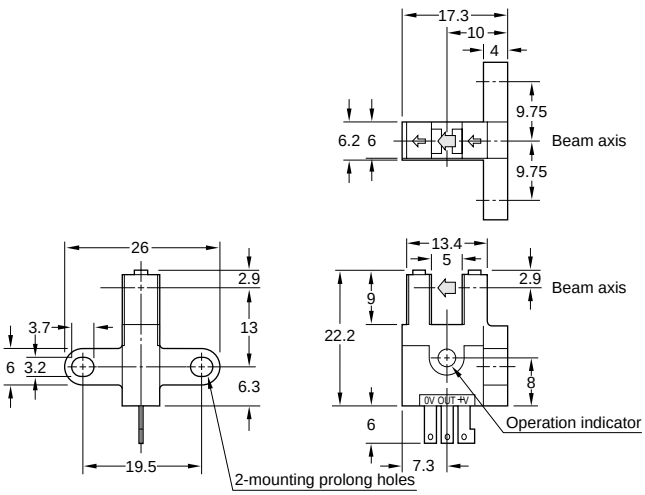
PM-K53 PM-K53B Sensor



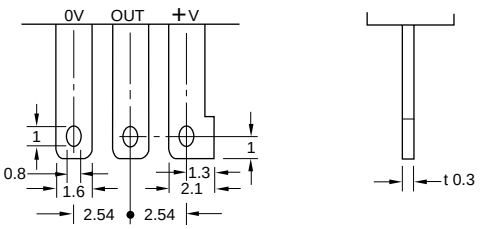
PM-L53 PM-L53B Sensor



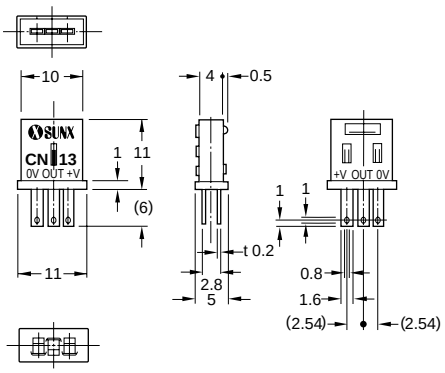
PM-T53 PM-T53B Sensor



※ Terminal part (All models)



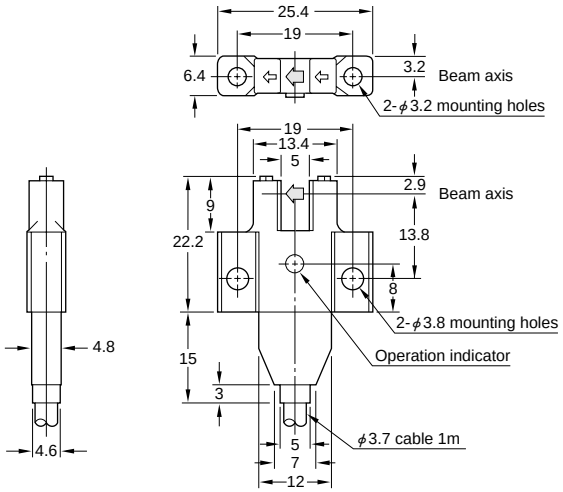
CN-13 Connector



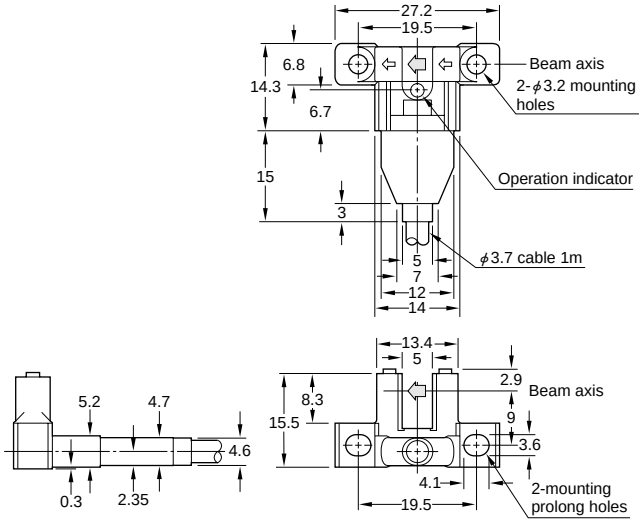
PM/PM2

DIMENSIONS (Unit : mm)

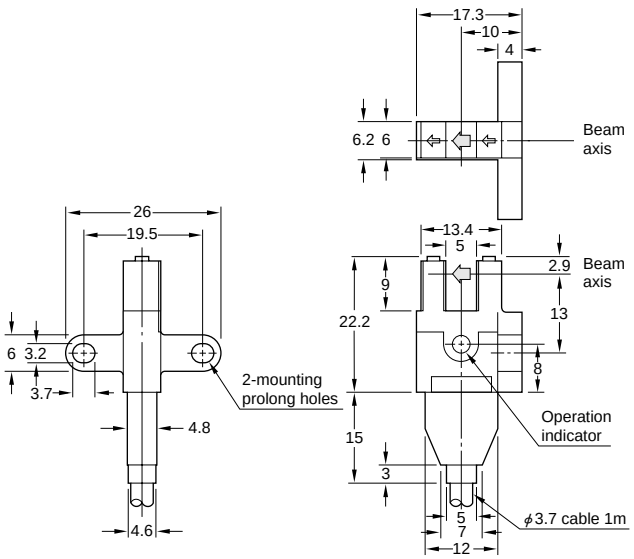
PM-K53-C1 PM-K53B-C1 Sensor



PM-L53-C1 PM-L53B-C1 Sensor



PM-T53-C1 PM-T53B-C1 Sensor



MEMO