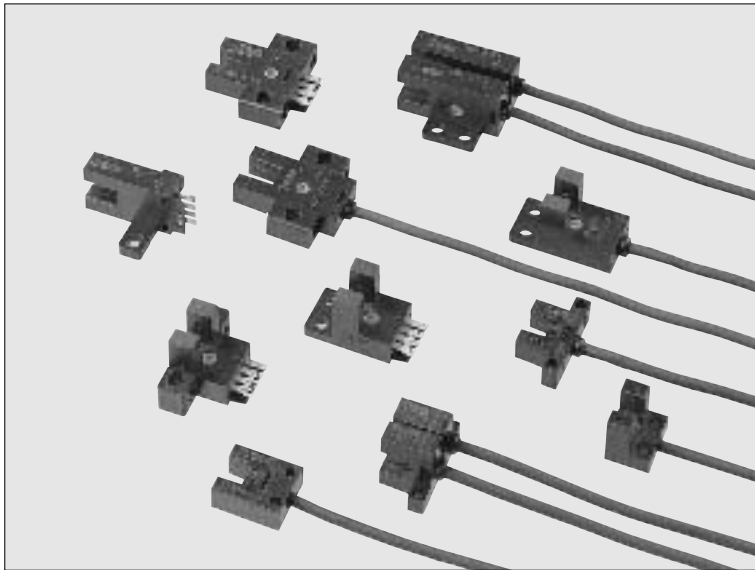


PM SERIES

U-shaped Micro Photoelectric Sensor

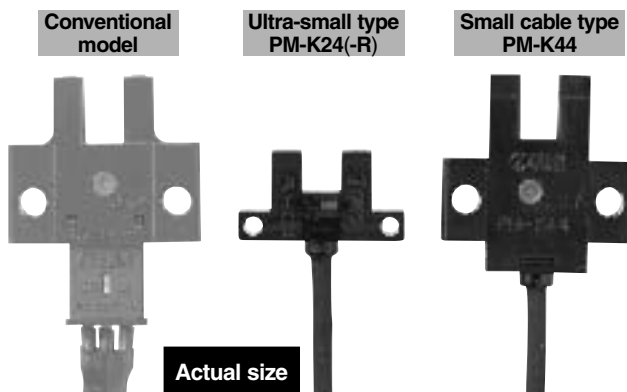


**Extremely Small Size
Enables Space Saving
and Quick Installation**

CE Marked
Conforming to EMC Directive

Extremely Small

Ultra-small type **PM-□24(-R)** contributes to the miniaturization of your equipment. Even the small cable type has become very compact.

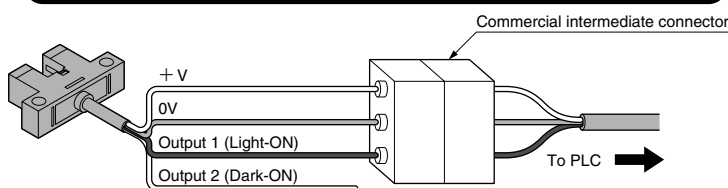


Equipped with Two Independent Outputs

All models are equipped with two independent outputs – Light-ON and Dark-ON. Hence, one model suffices even if the output is to be used differently, depending upon the location of use.

Also, since two independent outputs have been provided, cumbersome handling of the output conversion control input, or fear of logic inversion due to a cable break, is eliminated. The sensor can be connected to the existing wiring as it is.

Example of connection with a commercial intermediate connector



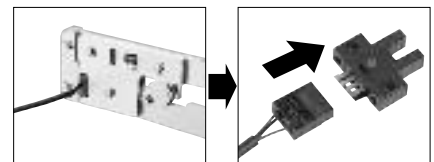
Just connect the cable of the used output (either Light-ON or Dark-ON).

Connected device side can be left as it is.

Note: Ensure to insulate the unused output wire.

Quick Fitting Hook-up Connector

Easy to maintain connector type models are available. Its exclusive connector is the industry's first hook-up connector. Since only crimping with exclusive pliers is to be done, cumbersome soldering or insulation is absolutely not required. Further, connector attached cable is also available.



Crimp the connector on the cable.

Quick connection to the sensor.

Wide Model Variety

A wide variety of 17 shapes and 29 models is available. You may select from this wide range to suit the mounting conditions.

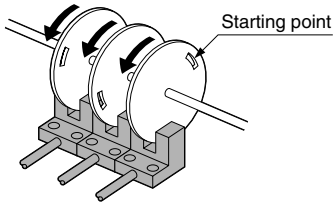
Meets Global Requirements

Conforms to Europe's EMC Directive. Both, NPN and PNP output models are available.

APPLICATIONS

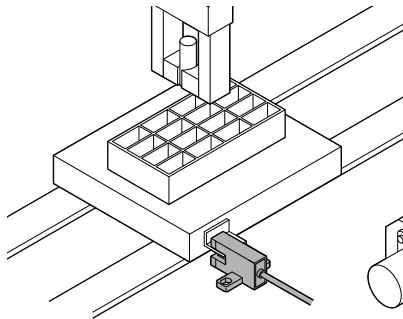
Sensing the starting point on a rotating body

The starting point can be sensed by making a slit in the rotating body.



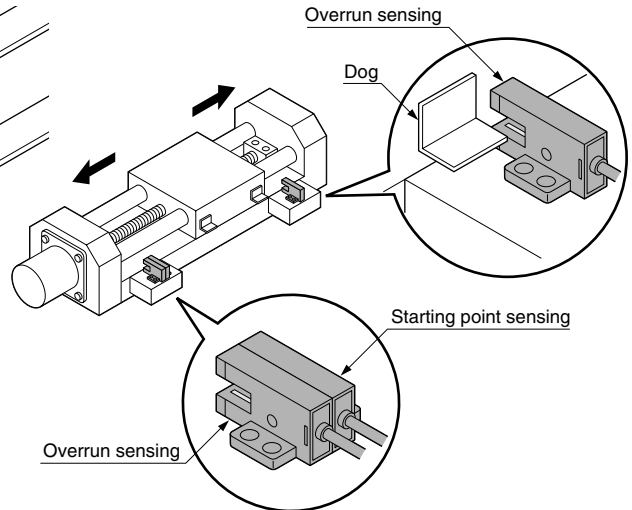
Determining the pallet position

Pallet is stopped by sensing the dog.



Sensing the starting point and overrun of a moving body

Starting point and overrun is sensed using the dog on the base.

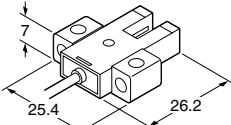
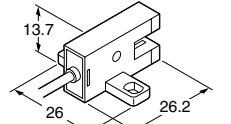
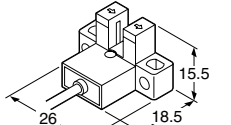
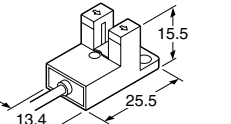
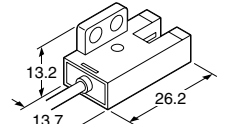
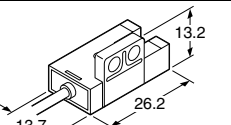
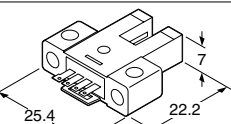
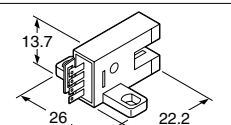
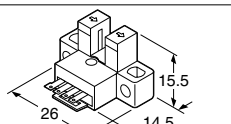
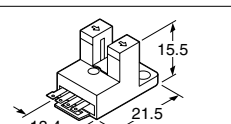
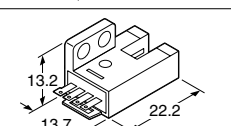
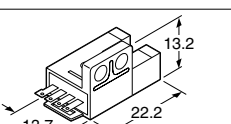


ORDER GUIDE

Type	Appearance (mm)	Sensing range	Model No. (Note)	Output	Output operation
Ultra-small		5mm (fixed)	PM-K24	NPN open-collector transistor	Incorporated with 2 outputs: Light-ON/Dark-ON
			PM-K24-R		
			PM-L24		
			PM-L24-R		
			PM-F24		
			PM-F24-R		
			PM-R24		
			PM-R24-R		
			PM-U24		
			PM-U24-R		

Note: The suffix '-R' indicates a inflection resistant cable type.

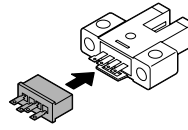
ORDER GUIDE

Type	Appearance (mm)	Sensing range	Model No.	Output	Output operation		
Small	With cable	5mm (fixed)	K type		PM-K44	NPN open-collector transistor	
					PM-K44P	PNP open-collector transistor	
			T type		PM-T44	NPN open-collector transistor	
					PM-T44P	PNP open-collector transistor	
			L type		PM-L44	NPN open-collector transistor	
					PM-L44P	PNP open-collector transistor	
			Y type		PM-Y44	NPN open-collector transistor	
				PM-Y44P	PNP open-collector transistor		
	F type			PM-F44	NPN open-collector transistor		
				PM-F44P	PNP open-collector transistor		
	R type			PM-R44	NPN open-collector transistor		
				PM-R44P	PNP open-collector transistor		
	With connector		K type		PM-K54	NPN open-collector transistor	Incorporated with 2 outputs: Light-ON/Dark-ON
					PM-K54P	PNP open-collector transistor	
T type			PM-T54	NPN open-collector transistor			
			PM-T54P	PNP open-collector transistor			
L type			PM-L54	NPN open-collector transistor			
			PM-L54P	PNP open-collector transistor			
Y type			PM-Y54	NPN open-collector transistor			
		PM-Y54P	PNP open-collector transistor				
F type		PM-F54	NPN open-collector transistor				
		PM-F54P	PNP open-collector transistor				
R type		PM-R54	NPN open-collector transistor				
		PM-R54P	PNP open-collector transistor				

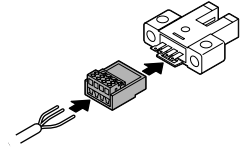
OPTIONS

Designation	Model No.	Description	
Connector	CN-14	Connector for soldering	
Hook-up connector	CN-14H	This connector can be hooked-up on 0.08 to 0.2mm ² cable simply in one grip. Wire diameter: ϕ 0.7 to ϕ 1.2mm	
	CN-14H-2	Suitable for UL standard cable. This connector can be hooked-up on 0.18 to 0.22mm ² cable simply in one grip. Wire diameter: ϕ 1.2 to ϕ 1.52mm	
Connector attached cable	CN-14H-C1	Length: 1m	For the connector type, with 0.18mm ² 4-core cabtyre cable Cable diameter: ϕ 3.8mm
	CN-14H-C3	Length: 3m	
Hook-up pliers	CN-HP	These are exclusive pliers for hook-up connectors CN-14H and CN-14H-2 .	
Mounting screw	MS-M2	Mounting screw with washers for the ultra-small type sensor (50 Nos. lot). It can mount securely as it is spring washer attached.	

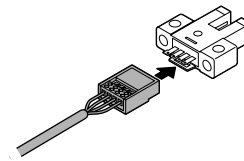
Connector



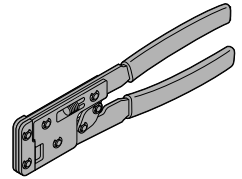
Hook-up connector



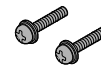
Connector attached cable



Hook-up pliers



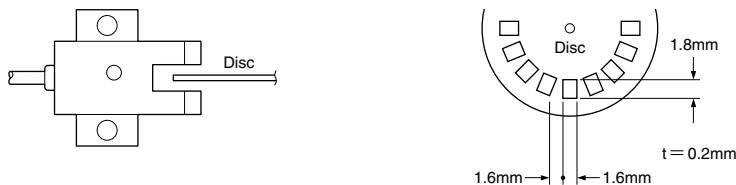
Mounting screw



SPECIFICATIONS

Item	Type		Ultra-small		Small	
	Model No.	NPN output type	PM-□24	With inflection resistant cable	With cable	With connector
		PNP output type		PM-□24-R	PM-□44	PM-□54
				PM-□44P	PM-□54P	
Sensing range			5mm (fixed)			
Minimum sensing object			0.8 × 1.8mm opaque object			
Hysteresis			0.05mm or less			
Repeatability			0.03mm or less			
Supply voltage			5 to 24V DC ± 10% Ripple P-P 10% or less			
Current consumption			15mA or less			
Output			<NPN output type> NPN open-collector transistor • Maximum sink current: 50mA • Applied voltage: 30V DC or less (between output and 0V) • Residual voltage: 0.7V or less (at 50mA sink current) 0.4V or less (at 16mA sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 50mA • Applied voltage: 30V DC or less (between output and +V) • Residual voltage: 0.7V or less (at 50mA source current) 0.4V or less (at 16mA source current)	
Utilization category			DC-12 or DC-13			
Output operation			Incorporated with 2 outputs: Light-ON/Dark-ON			
Response time			Under light received condition: 20 μs or less Under light interrupted condition: 100 μs or less (Response frequency: 1kHz or more)(Note 1)			
Operation indicator			Vermilion LED (lights up under light received condition)			
Environmental resistance	Pollution degree		3 (Industrial environment)			
	Ambient temperature (Note 2, 3)		- 25 to + 55°C (No dew condensation or icing allowed), Storage: - 30 to + 80°C			
	Ambient humidity		35 to 85% RH, Storage: 35 to 85% RH			
	Ambient illuminance		Fluorescent light: 1,000 lx at the light-receiving face			
	EMC		Emission: EN50081-2, Immunity: EN50082-2			
	Voltage withstandability		1,000V AC for one min. between all supply terminals connected together and enclosure			
	Insulation resistance		50MΩ, or more, with 250V DC megger between all supply terminals connected together and enclosure			
	Vibration resistance		10 to 2,000Hz frequency, 1.5mm amplitude in X, Y and Z directions for two hours each			
Shock resistance		15,000m/s ² acceleration (1,500G approx.) in X, Y and Z directions for three times each				
Emitting element			Infrared LED (non-modulated)			
Material			Enclosure: PBT, Slit cover: Polycarbonate, Terminal part [PM-□54(P) only]: Solder plated			
Cable			0.09mm ² 4-core cabtyre cable (PM-□24-R: 0.1mm ² inflection, oil and heat resistant cabtyre cable), 1m long			
Cable extension			Extension up to total 100m is possible with 0.3mm ² , or more, cable.			
Weight			10g approx.	15g approx.	3g approx.	

Notes: 1) The response frequency is the value when the disc, given in the figure below, is rotated.



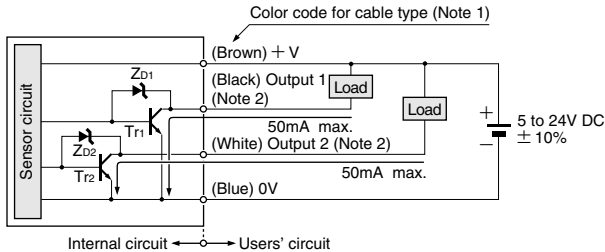
- 2) In case the ultra-small type PM-□24(-R) is used at an ambient temperature of + 50°C, or more, make sure to mount it on a metal body.
 3) Take care that the flexibility of the PM-□24-R cable is lost if the ambient temperature is near - 10°C.

I/O CIRCUIT AND WIRING DIAGRAMS

PM-□24 PM-□24-R
PM-□44 PM-□54

NPN output type

I/O circuit diagram

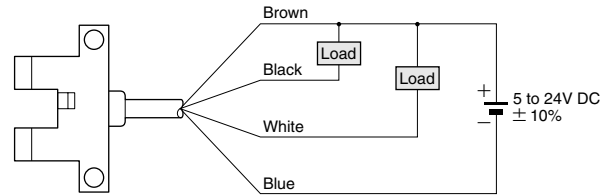


Notes: 1) The color code of the connector attached cable is also the same.

2) Ensure to insulate the unused output wire.

Symbols ... ZD1, ZD2: Surge absorption zener diode
Tr1, Tr2 : NPN output transistor

Wiring diagram



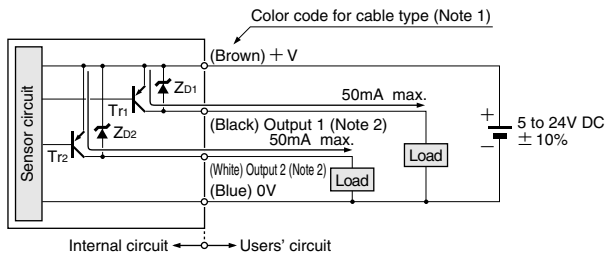
Output operation

	Color code	Output operation
Output 1	Black	Light-ON
Output 2	White	Dark-ON

PM-□44P
PM-□54P

PNP output type

I/O circuit diagram

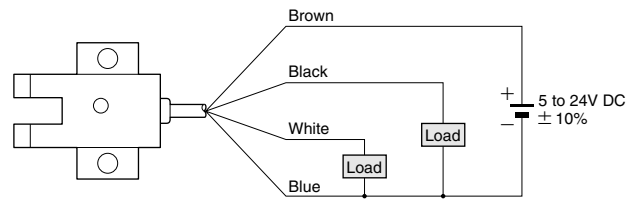


Notes: 1) The color code of the connector attached cable is also the same.

2) Ensure to insulate the unused output wire.

Symbols ... ZD1, ZD2: Surge absorption zener diode
Tr1, Tr2 : PNP output transistor

Wiring diagram



Output operation

	Color code	Output operation
Output 1	Black	Light-ON
Output 2	White	Dark-ON

PRECAUTIONS FOR PROPER USE

All models



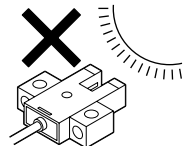
This product is not a safety sensor. Its use is not intended or designed to protect life and prevent body injury or property damage from dangerous parts of machinery. It is a normal object detection sensor.

Wiring

- Please carry out the wiring carefully since protection circuits against reverse power supply connection and output short-circuit are not incorporated.

Others

- Since the sensor is intended for use inside machines, no special countermeasures have been taken against extraneous light. Take care that extraneous light is not directly incident on the beam receiving section.
- Do not use during the initial transient time (50ms) after the power supply is switched on.
- The cable of **PM-□24-R** is a flexible cable usable on a moving base. When the sensor is mounted on a moving base, fix the sensor cable joint so that stress is not applied to it.
- Take care that the flexibility of the **PM-□24-R** cable is lost if the ambient temperature is near -10°C .



PM

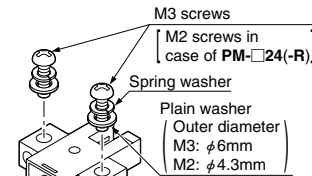
PRECAUTIONS FOR PROPER USE

All models

Mounting

- When fixing the sensor with screws, use M3 screws [M2 screws in case of **PM-□24(-R)**] and the tightening torque should not exceed the values given below. Further, use small, round type plain washers. (M3: $\phi 6\text{mm}$, M2: $\phi 4.3\text{mm}$)

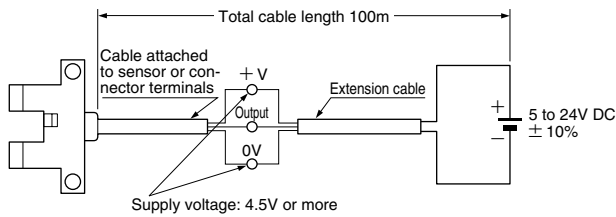
Model No.	Tightening torque
PM-□24(-R)	0.15N·m
PM-□44(P)	0.5N·m
PM-□54(P)	



Note: In case the ultra-small type **PM-□24(-R)** is used at an ambient temperature of $+50^{\circ}\text{C}$, or more, make sure to mount it on a metal body.

Cable extension

- Cable extension is possible up to an overall length of 100m with a 0.3mm^2 , or more, cable. However, since a voltage drop shall occur due to the cable extension, ensure that the power supply voltage at the end of the cable attached to the sensor or at the sensor terminals is within the rating.

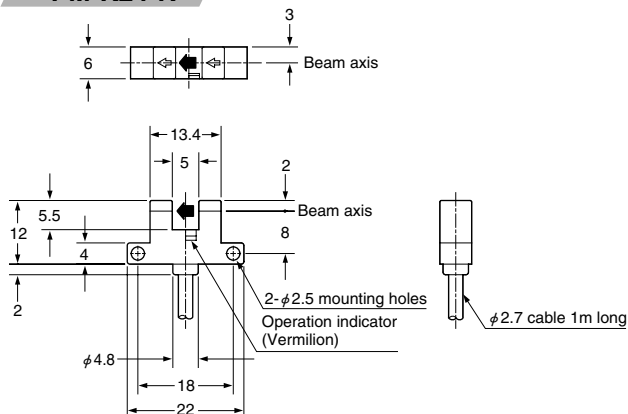


But, when the overall cable length, including the cable attached to the sensor, is as given below, there is no need to confirm the voltage.

Conductor cross-section area	Total cable length
0.08 to 0.1 mm^2	Up to 5m
0.2 mm^2	Up to 10m
0.3 mm^2	Up to 20m

DIMENSIONS (Unit: mm)

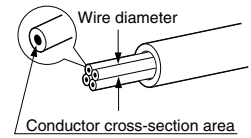
PM-K24 PM-K24-R Sensor



PM-□54 PM-□54P

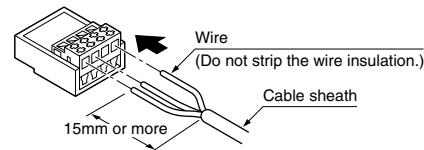
Crimping of hook-up connectors CN-14H and CN-14H-2

Item	Model No.	CN-14H	CN-14H-2
Conductor cross-section area		0.08 to 0.2 mm^2 (AWG28 to AWG24)	0.18 to 0.22 mm^2 (AWG25 to AWG24)
Wire diameter		$\phi 0.7$ to $\phi 1.2\text{mm}$	$\phi 1.2$ to $\phi 1.52\text{mm}$
Wire insulation material		Vinyl chloride or soft polyethylene	

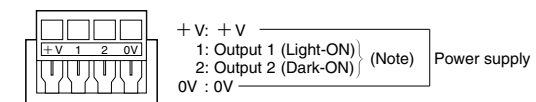


Crimping method

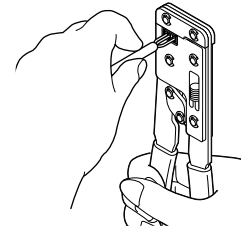
- Strip the cable sheath 15mm, or more, and insert the wires into the connector insertion holes till the wire tips reach the end.



Arrangement of connector terminals



- Crimp with the exclusive hook-up pliers **CN-HP**.

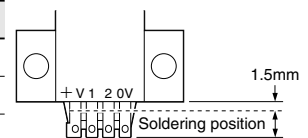


Caution: Make sure to use the exclusive hook-up pliers **CN-HP**. Commercially available pliers cannot be used.

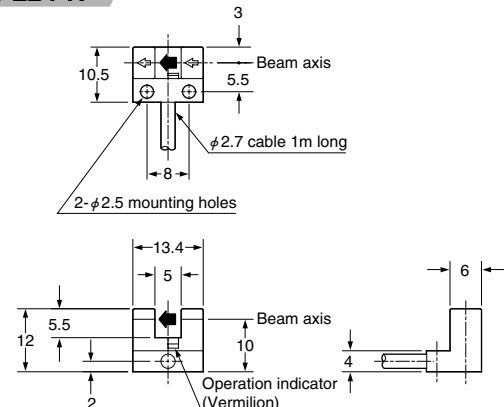
Soldering

- If soldering is done directly on the terminals, strictly adhere to the conditions given below.

Item	Model No.	PM-□54(P)
Soldering temperature		260 $^{\circ}\text{C}$ or less
Soldering time		3 sec. or less
Soldering position		Refer to the right figure

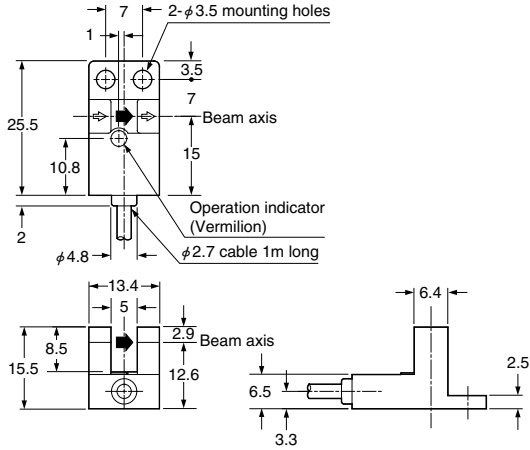


PM-L24 PM-L24-R Sensor

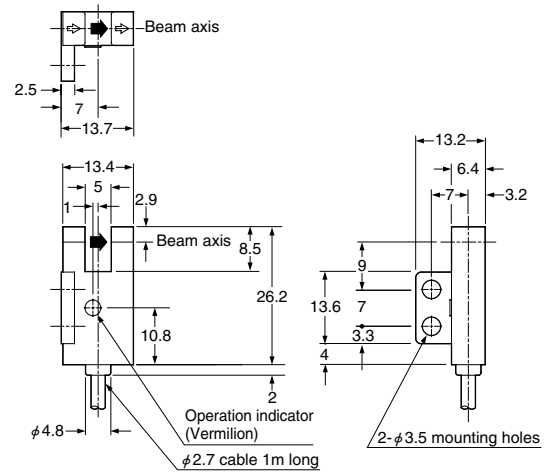


DIMENSIONS (Unit: mm)

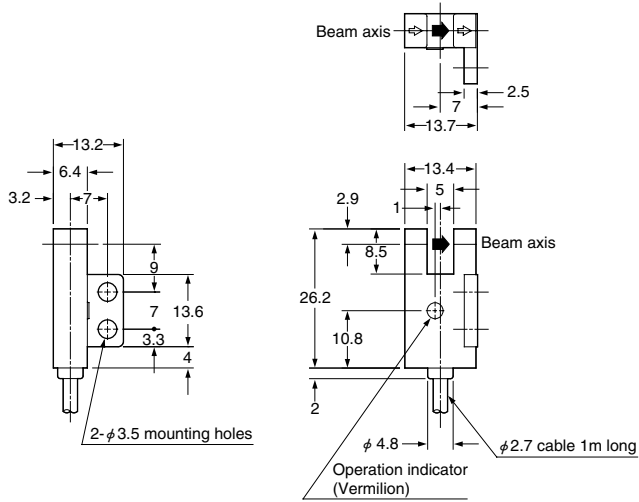
PM-Y44
PM-Y44P Sensor



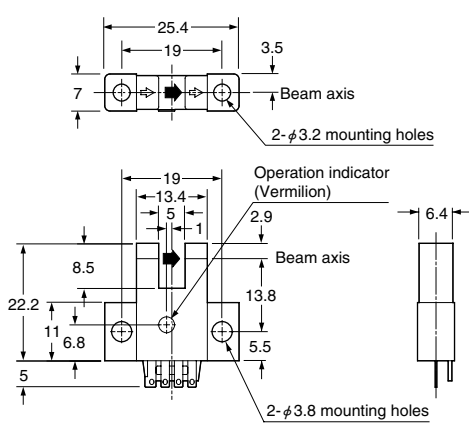
PM-F44
PM-F44P Sensor



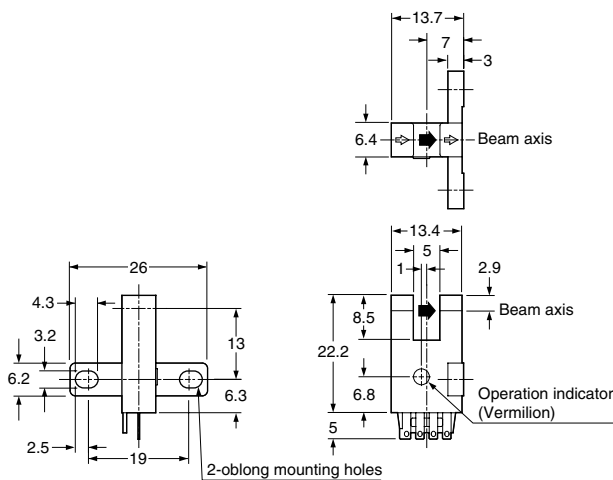
PM-R44
PM-R44P Sensor



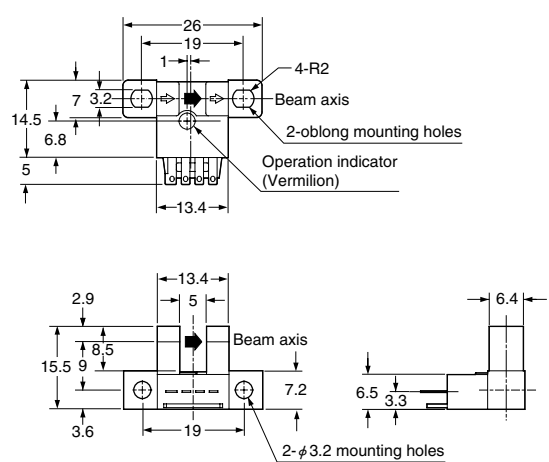
PM-K54
PM-K54P Sensor



PM-T54
PM-T54P Sensor

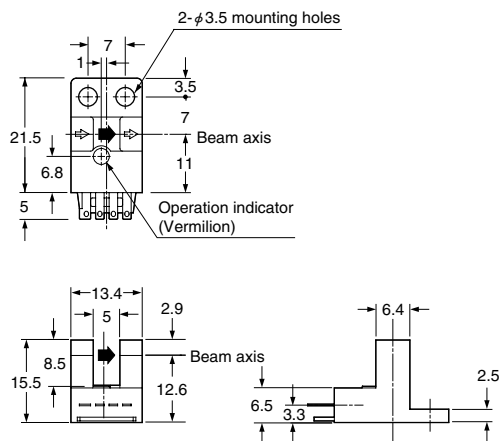


PM-L54
PM-L54P Sensor

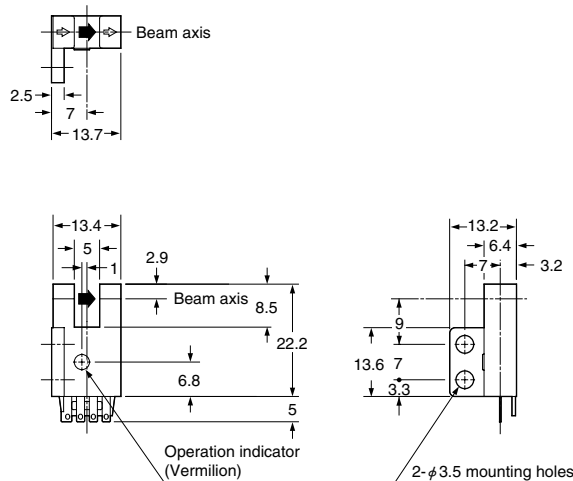


DIMENSIONS (Unit: mm)

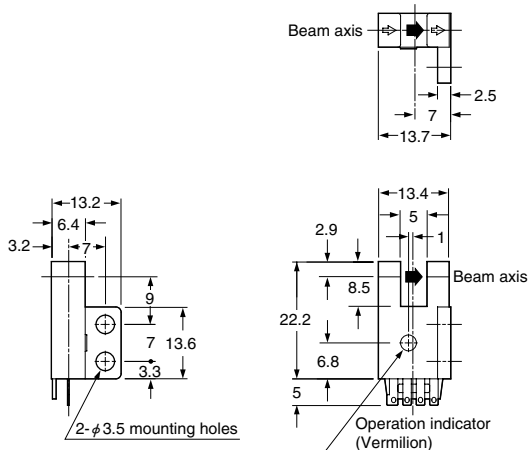
**PM-Y54
PM-Y54P** Sensor



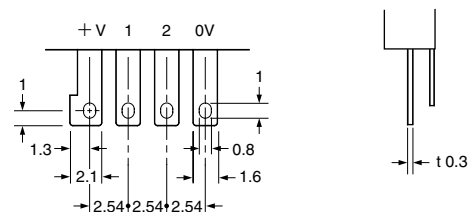
**PM-F54
PM-F54P** Sensor



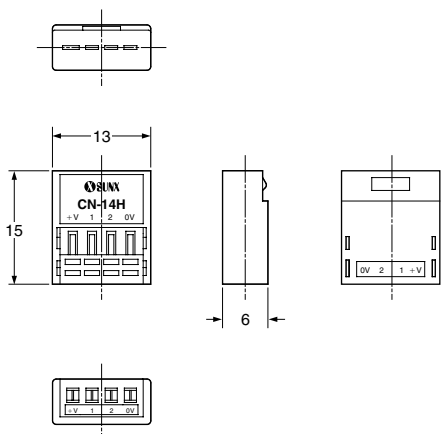
**PM-R54
PM-R54P** Sensor



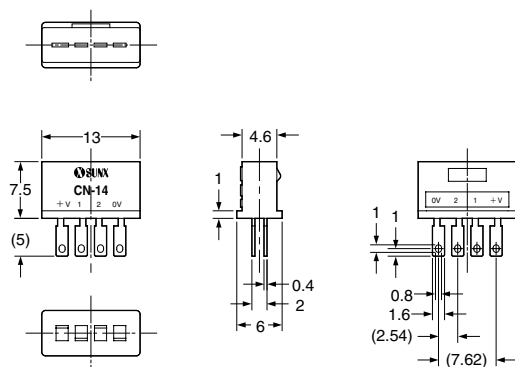
※Terminal part (PM-□54, PM-□54P)



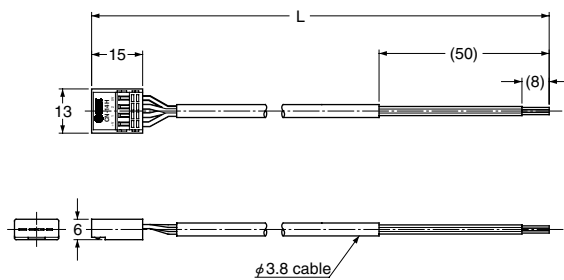
**CN-14H
CN-14H-2** Hook-up connector (Optional)



CN-14 Connector (Optional)



**CN-14H-C1
CN-14H-C3** Connector attached cable (Optional)



• Cable length L

Model No.	Cable length
CN-14H-C1	1m
CN-14H-C3	3m