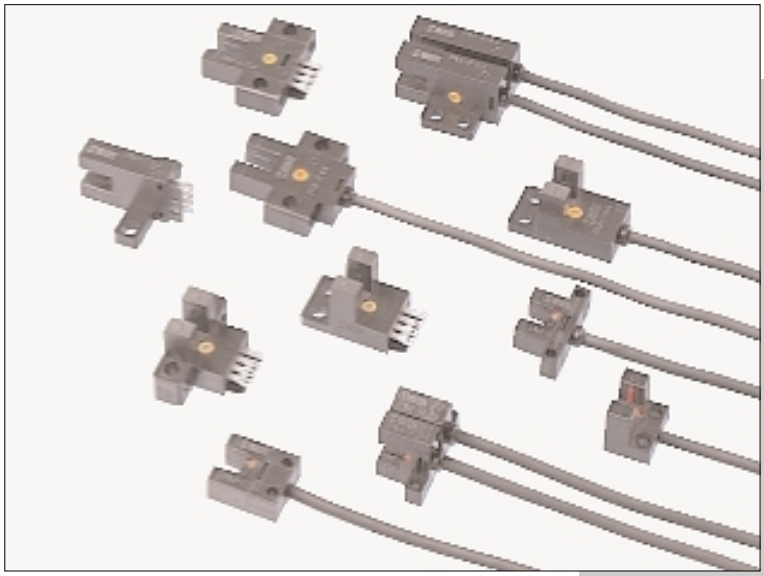
PM SERIES

U-shaped Micro Photoelectric Sensor

PNP output type available



Extremely small size enables space saving and quick installation!

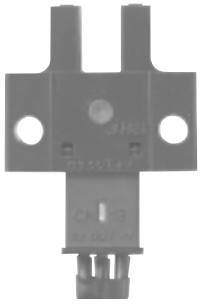
Conforming to EMC Directive

UL Recognition

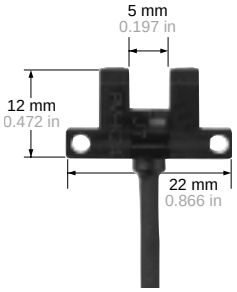
Extremely small

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

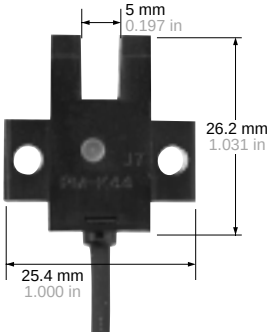
Conventional model



Ultra-small type PM-K24(-R)

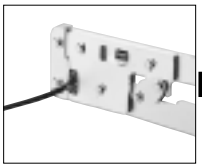


Small cable type PM-K44

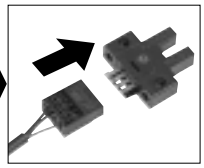


Quick fitting hook-up connector

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.

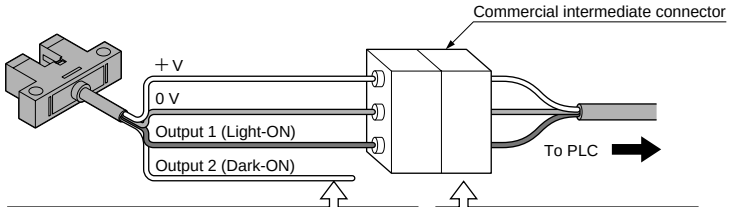


Quick connection to the sensor.

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.

Wide model variety

A wide variety of 17 shapes and 34 models is available. You may select from this wide range to suit the mounting conditions.

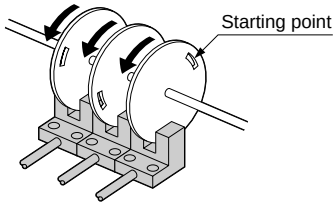
Meets global requirements

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

APPLICATIONS

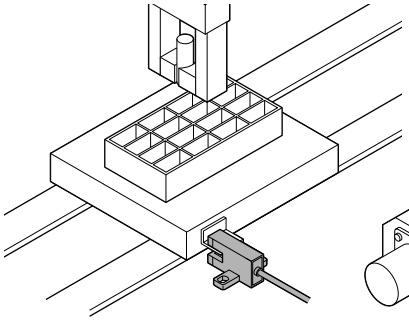
Sensing the starting point on a rotating body

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



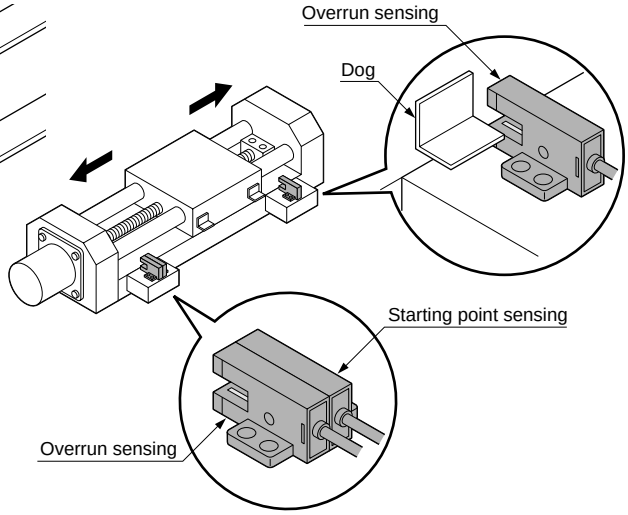
Determining the pallet position

Pallet is stopped by sensing the dog.

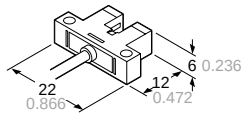
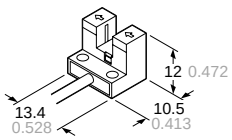
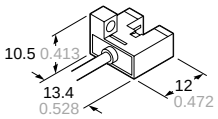
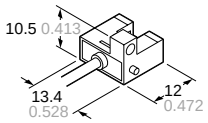
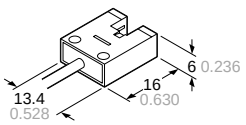


Sensing the starting point and overrun of a moving body

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



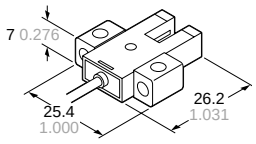
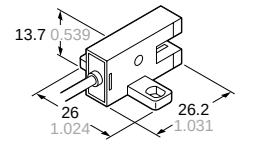
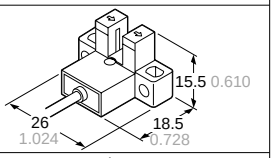
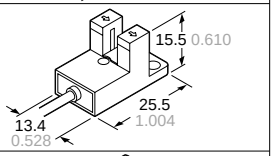
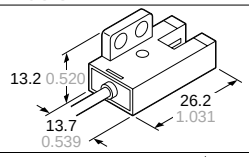
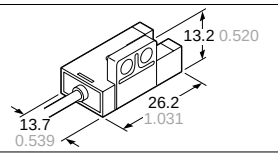
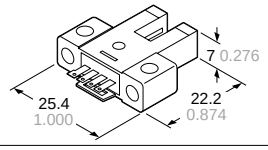
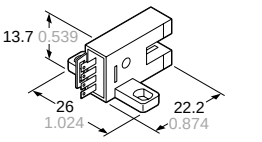
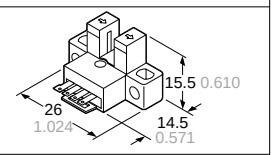
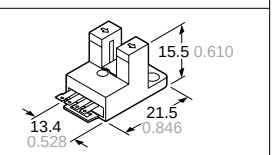
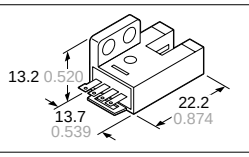
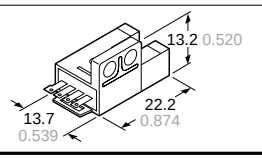
ORDER GUIDE

Type		Appearance (mm in)	Sensing range	Model No. (Note)	Output	Output operation
Ultra-small	K type		5 mm 0.197 in (fixed)	**PM-K24**	NPN open-collector transistor	Incorporated with 2 outputs: Light-ON / Dark-ON
				PM-K24-R		
	L type			**PM-L24**		
				PM-L24-R		
	F type			**PM-F24**		
				PM-F24-R		
	R type			**PM-R24**		
				PM-R24-R		
	U type			**PM-U24**		
				PM-U24-R		

Note: The suffix '**-R**' indicates a flexible cable type.

PM

ORDER GUIDE

Type			Appearance (mm in)	Sensing range	Model No.	Output	Output operation
Small	With cable	K type		5 mm 0.197 in (fixed)	**PM-K44**	NPN open-collector transistor	Incorporated with 2 outputs: Light-ON / Dark-ON
					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	
					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	

ORDER GUIDE

3 m 9.843 ft cable length type

3 m 9.843 ft cable length type (standard : 1 m 3.281 ft) is also available.

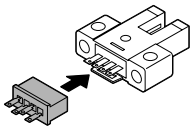
• Table of Model Nos.

Type				Standard	3 m 9.843 ft cable length type
Ultra-Small		K Type		**PM-K24**	**PM-K24-C3**
		L Type		**PM-L24**	**PM-L24-C3**
		F Type		**PM-F24**	**PM-F24-C3**
		R Type		**PM-R24**	**PM-R24-C3**
		U Type		**PM-U24**	**PM-U24-C3**
Small	With Cable	K Type	NPN out put	**PM-K44**	**PM-K44-C3**
			PNP out put	**PM-K44P**	**PM-K44P-C3**
		T Type	NPN out put	**PM-T44**	**PM-T44-C3**
			PNP out put	**PM-T44P**	**PM-T44P-C3**
		L Type	NPN out put	**PM-L44**	**PM-L44-C3**
			PNP out put	**PM-L44P**	**PM-L44P-C3**
		Y Type	NPN out put	**PM-Y44**	**PM-Y44-C3**
			PNP out put	**PM-Y44P**	**PM-Y44P-C3**
		F Type	NPN out put	**PM-F44**	**PM-F44-C3**
			PNP out put	**PM-F44P**	**PM-F44P-C3**
		R Type	NPN out put	**PM-R44**	**PM-R44-C3**
			PNP out put	**PM-R44P**	**PM-R44P-C3**

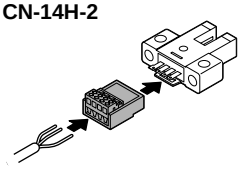
OPTIONS

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 0.2 mm² cable simply in one grip. Wire diameter: ϕ0.7 to ϕ1.2 mm ϕ0.028 to ϕ0.047 in
	CN-14H-2	Suitable for UL standard cable. This connector can be hooked-up on 0.18 to 0.22 mm² cable simply in one grip. Wire diameter: ϕ1.2 to ϕ1.52 mm ϕ0.047 to ϕ0.060 in
Connector attached cable	**CN-14H-C1**	Length: 1 m 3.281 ft Weight: 20 g approx. For the connector type, with 0.18 mm² 4-core cabtyre cable Cable diameter: ϕ3.8 mm ϕ0.150 in
	CN-14H-C3	Length: 3 m 9.843 ft Weight: 60 g approx.
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 pcs. lot). It can mount securely as it is spring washer attached.

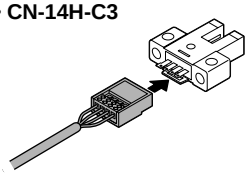
Connector
• CN-14



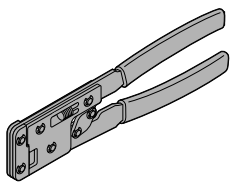
Hook-up connector
• CN-14H
• CN-14H-2



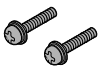
Connector attached cable
• CN-14H-C1
• CN-14H-C3



Hook-up pliers
• CN-HP



Mounting screw
• MS-M2

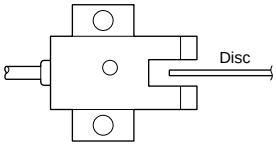


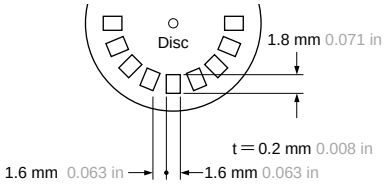
PM

SPECIFICATIONS

Item \ Type		Ultra-small		Small	
			With flexible cable	With cable	With connector
Model No.	NPN output type	**PM-□24**	**PM-□24-R**	**PM-□44**	**PM-□54**
	PNP output type	———		**PM-□44P**	**PM-□54P**
Sensing range		5 mm 0.197 in (fixed)			
Minimum sensing object		0.8 × 1.8 mm 0.031 × 0.071 in opaque object			
Hysteresis		0.05 mm 0.002 in or less			
Repeatability		0.03 mm 0.001 in or less			
Supply voltage		5 to 24 V DC ± 10 % Ripple P-P 10 % or less			
Current consumption		15 mA or less			
Output		<NPN output type> NPN open-collector transistor • Maximum sink current: 50 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 0.7 V or less (at 50 mA sink current) 0.4 V or less (at 16 mA sink current)		<PNP output type> PNP open-collector transistor • Maximum source current: 50 mA • Applied voltage: 30 V DC or less (between output and + V) • Residual voltage: 0.7 V or less (at 50 mA source current) 0.4 V or less (at 16 mA 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: 1 kHz 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 − 13 to + 131 °F (No dew condensation or icing allowed), Storage: − 30 to + 80 °C − 22 to + 176 °F			
	Ambient humidity	35 to 85 % RH, Storage: 35 to 85 % RH			
	Ambient illuminance	Fluorescent light: 1,000 ℓx at the light-receiving face			
	EMC	EN 50081-2, EN 50082-2, EN 60947-5-2			
	Voltage withstandability	1,000 V AC for one min. between all supply terminals connected together and enclosure			
	Insulation resistance	50 MΩ, or more, with 250 V DC megger between all supply terminals connected together and enclosure			
	Vibration resistance	10 to 2,000 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each			
	Shock resistance	15,000 m/s² acceleration (1,500 G 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		0.09 mm² 4-core cabtyre cable [**PM-□24-R**: 0.1 mm² flexible, oil and heat resistant cabtyre cable (Note 4)], 1 m 3.281 ft long		———	
Cable extension		Extension up to total 100 m 328.084 ft is possible with 0.3 mm², or more, cable.			
Weight		10 g approx.		15 g approx.	3 g approx.

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



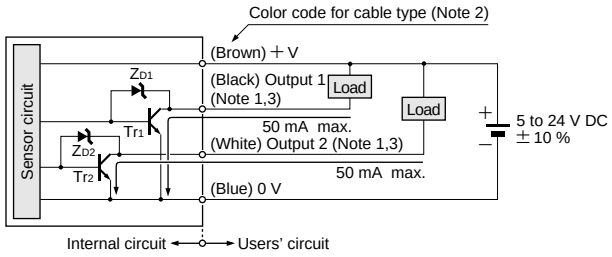


2) In case the ultra-small type **PM-□24(-R)** is used at an ambient temperature of + 50 °C + 122 °F, or more, make sure to mount it on a metal body.
3) Take care that the flexibility of the **PM-□24-R** cable is lost if the ambient temperature in near − 10 °C + 14 °F.
4) The cable of **PM-□24-R** is 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.

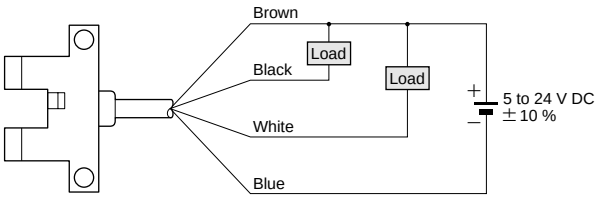
I/O CIRCUIT AND WIRING DIAGRAMS

PM-□24 PM-□24-R PM-□44 PM-□54 NPN output type

I/O circuit diagram



Wiring diagram



Notes: 1) Make sure to connect terminals correctly as the sensor does not incorporate a reverse polarity protection circuit.
Further, the output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load. Faulty wiring may result in damage.
2) The color code of the connector attached cable is also the same.
3) Ensure to insulate the unused output wire.

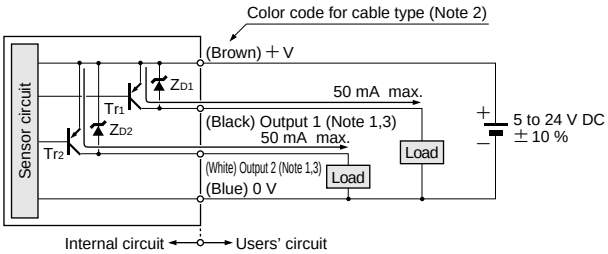
Symbols ... Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : NPN output transistor

Output operation

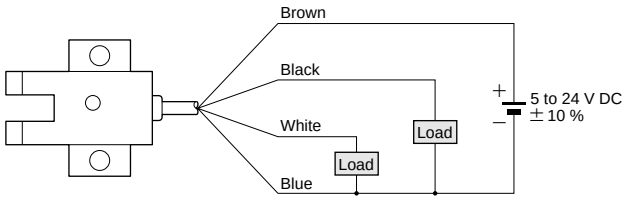
	Color code	Output operation
Output 1	Black	Light-ON
Output 2	White	Dark-ON

PM-□44P PM-□54P PNP output type

I/O circuit diagram



Wiring diagram



Notes: 1) Make sure to connect terminals correctly as the sensor does not incorporate a reverse polarity protection circuit.
Further, the output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load. Faulty wiring may result in damage.
2) The color code of the connector attached cable is also the same.
3) Ensure to insulate the unused output wire.

Symbols ... Z_{D1}, Z_{D2}: Surge absorption zener diode
Tr_1, Tr_2 : PNP output transistor

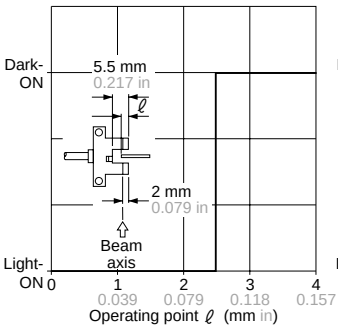
Output operation

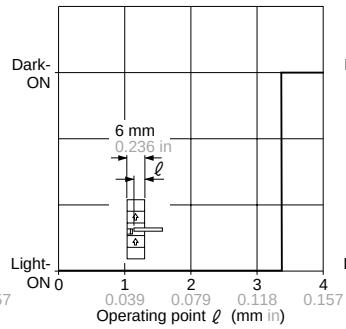
	Color code	Output operation
Output 1	Black	Light-ON
Output 2	White	Dark-ON

SENSING CHARACTERISTICS (TYPICAL)

PM-24□(-R) Ultra small type

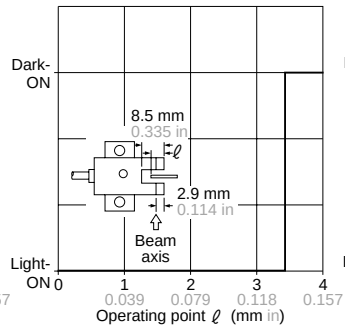
Sensing position

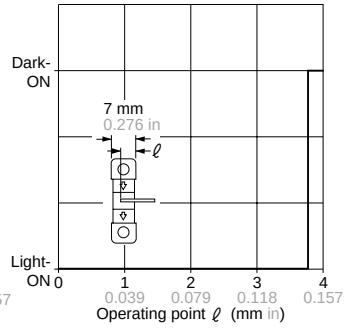




PM-□44(P) PM-□54(P) Small type

Sensing position





PM

PRECAUTIONS FOR PROPER USE

Refer to p.1135～ for general precautions.

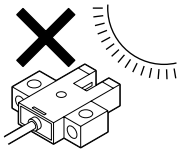
All models

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.

Make sure to connect terminals correctly as the sensor does not incorporate a reverse polarity protection circuit.
Further, the output is not incorporated with a short-circuit protection circuit. Do not connect it directly to a power supply or a capacitive load. Faulty wiring may result in damage.

Others

- Since the sensor is intended for use inside machines, no special counter-measures have been taken against extraneous light. Take care that extraneous light is not directly incident on the beam receiving section.



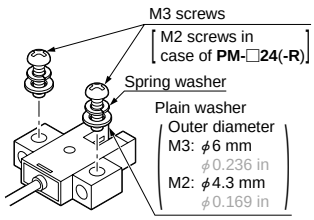
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- The cable of **PM-□24-R** is a flexible cable usable on a moving base. When the sensor is mounted on a moving base, fix the sensor cable joint so that stress is not applied to it.
- Take care that the flexibility of the **PM-□24-R** cable is lost if the ambient temperature is near −10 °C +14 °F.

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: ϕ6 mm ϕ0.236 in, M2: ϕ4.3 mm ϕ0.169 in)

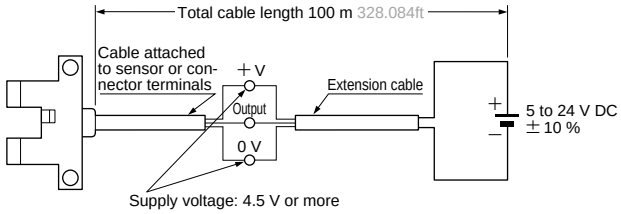
Model No.	Tightening torque
PM-□24(-R)	0.15 N·m
PM-□44(P)	0.5 N·m
PM-□54(P)	

Note: In case the ultra-small type **PM-□24(-R)** is used at an ambient temperature of +50 °C +122 °F, or more, make sure to mount it on a metal body.



Cable extension

- Cable extension is possible up to an overall length of 100 m 328.084 ft with a 0.3 mm², 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 mm²	Up to 5 m 16.404 ft
0.2 mm²	Up to 10 m 32.808 ft
0.3 mm²	Up to 20 m 65.617 ft

PRECAUTIONS FOR PROPER USE

Refer to p.1135～ for general precautions.

PM-□54
PM-□54P

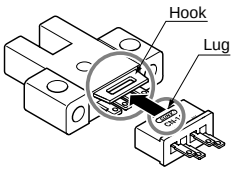
Cautions in plugging or unplugging a connector

- Do not plug or unplug a connector more than 10 times.
- Be sure not to give stress more than 5 N to a terminal of both a connector and a sensor.

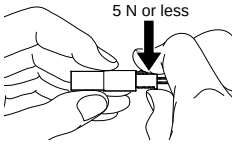
If you do not follow the above cautions, it will cause a poor contact.

Procedures of plugging or unplugging a connector

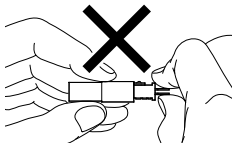
① Insert a connector straight into a sensor until the connector lug is locked by the sensor hook.



② When unplugging, give as much stress as a connector lug can be relieved from a hook. Then unplug it.

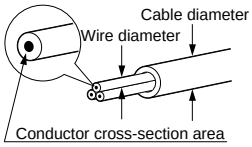


Caution: Be sure to hold a connector when plugging or unplugging it. Do not hold a terminal or a cable when plugging or unplugging the connector. Otherwise, it will cause a poor contact.



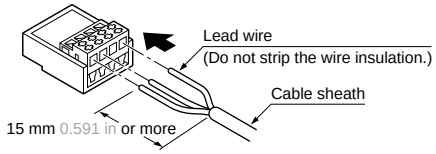
Crimping of hook-up connectors CN-14H and CN-14H-2

Item \ Model No.	CN-14H	CN-14H-2
Conductor cross-section area	0.08 to 0.2 mm² (AWG28 to AWG24)	0.18 to 0.22 mm² (AWG25 to AWG24)
Wire diameter	ϕ0.7 to ϕ1.2 mm ϕ0.028 to ϕ0.047 in	ϕ1.2 to ϕ1.52 mm ϕ0.047 to ϕ0.060 in
Wire insulation material	Vinyl chloride or soft polyethylene	

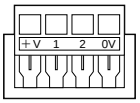


Crimping method

① Strip the cable sheath 15 mm 0.591 in, or more, and insert the wires into the connector insertion holes till the wire tips reach the end.



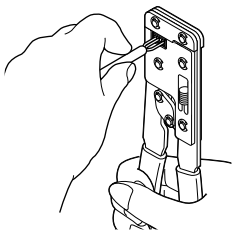
Arrangement of connector terminals



+V: +V
1: Output 1 (Light-ON)
2: Output 2 (Dark-ON)
(Note)
0 V : 0 V
Power supply

Note: Wire at Pin No.1 or 2 as per requirement.

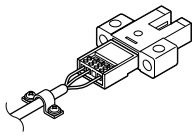
② Crimp with the exclusive hook-up pliers **CN-HP**.



Notes: 1) When attaching or detaching the connector fitted with a cable, make sure to hold the connector firmly before proceeding.
2) After crimping, do not pull on the cable.

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

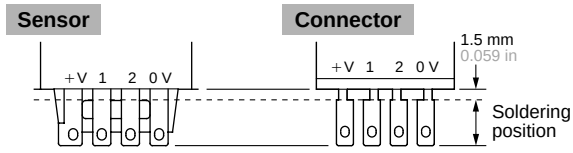
- Prior to using the sensor, affix the cable in a way as to avoid direct stress on the crimped part.



Soldering (Both connector CN-14 and sensor)

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

Soldering temperature	260 °C 500 °F or less
Soldering time	3 sec. or less
Soldering position	Refer to the below figure

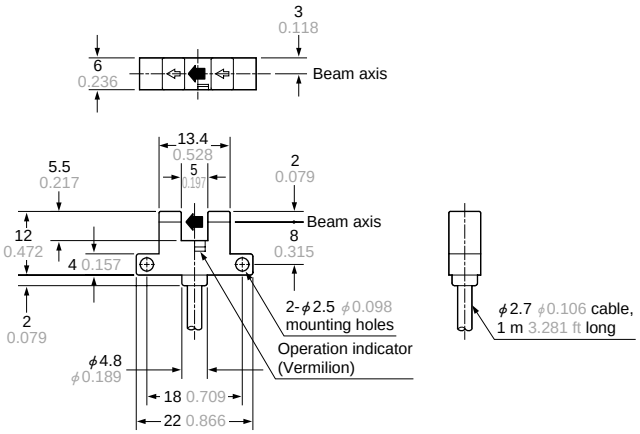


PM

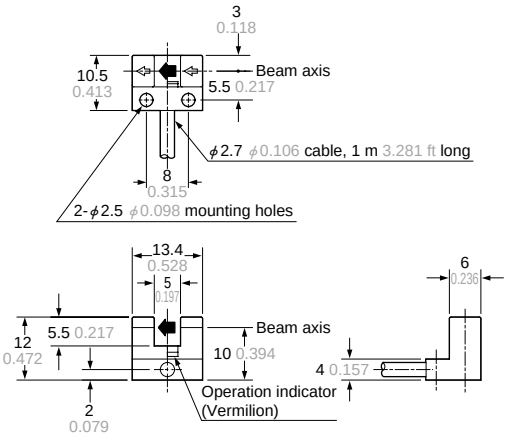
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

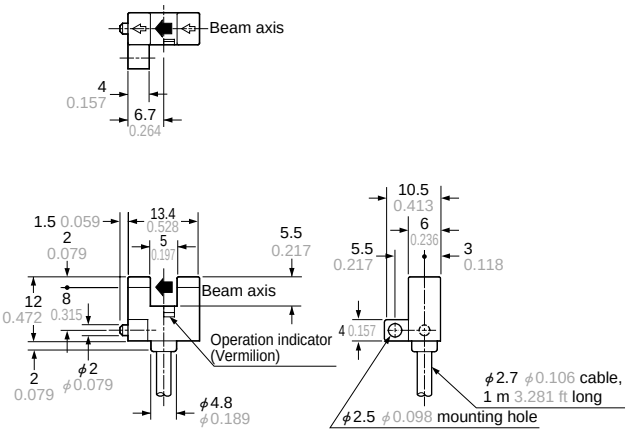
PM-K24 PM-K24-R Sensor



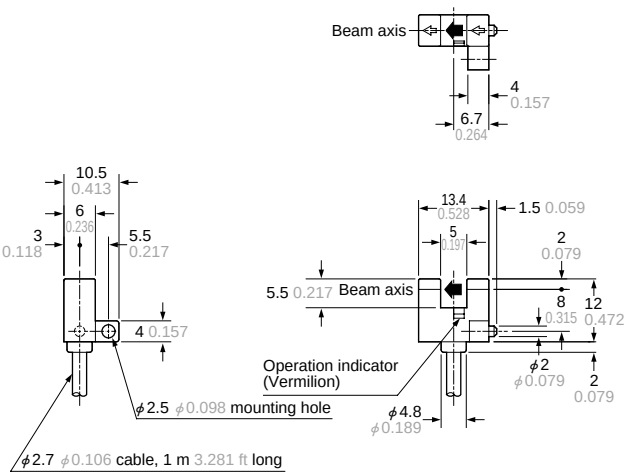
PM-L24 PM-L24-R Sensor



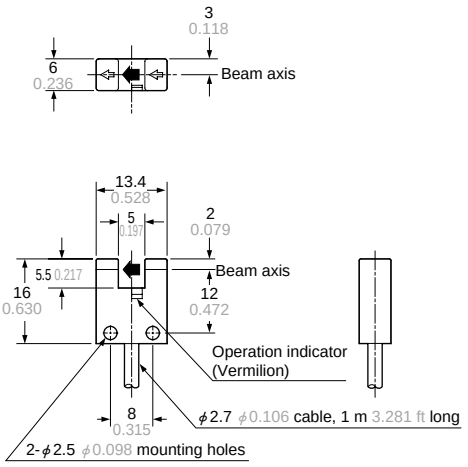
PM-F24 PM-F24-R Sensor



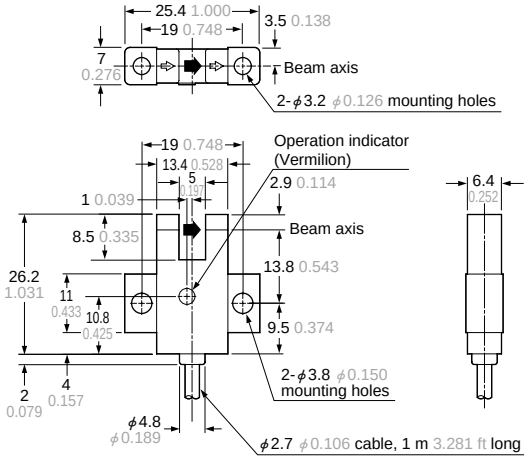
PM-R24 PM-R24-R Sensor



PM-U24 PM-U24-R Sensor



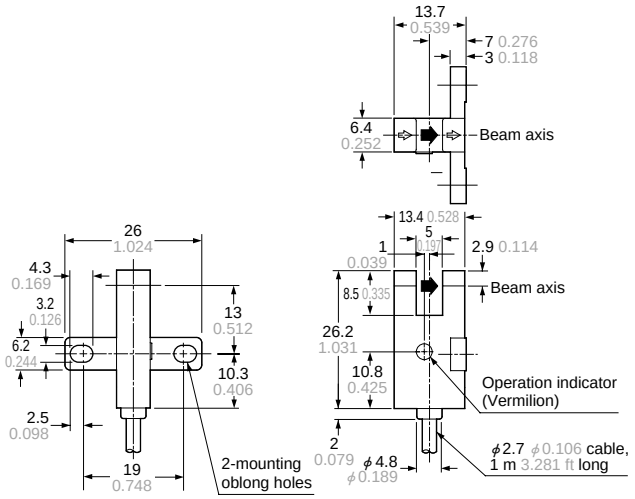
PM-K44 PM-K44P Sensor



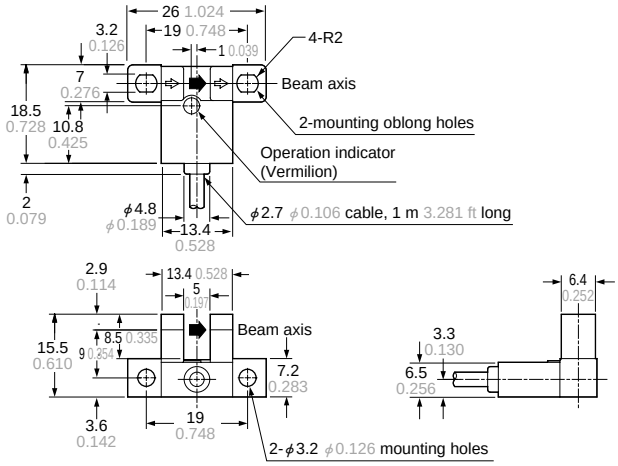
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

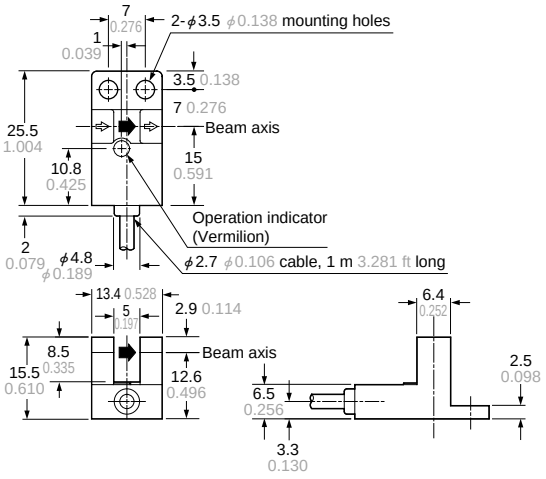
PM-T44 PM-T44P Sensor



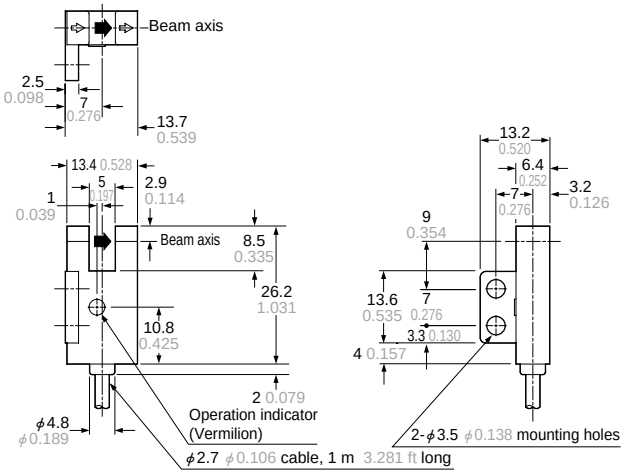
PM-L44 PM-L44P Sensor



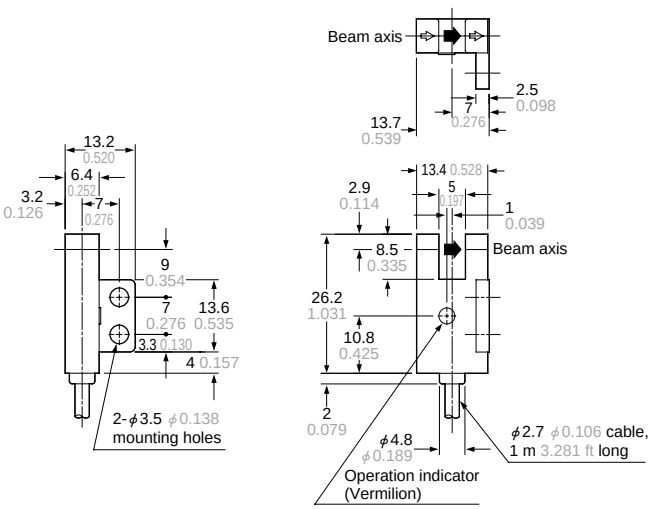
PM-Y44 PM-Y44P Sensor



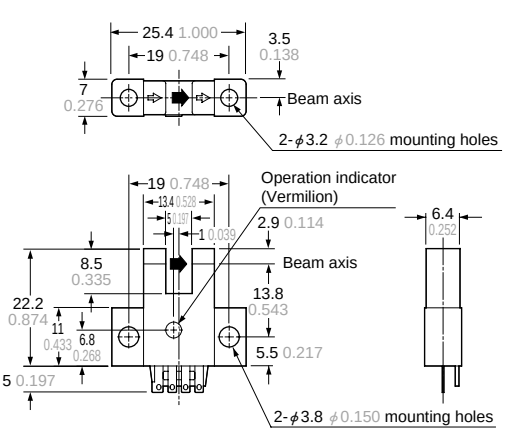
PM-F44 PM-F44P Sensor



PM-R44 PM-R44P Sensor



PM-K54 PM-K54P Sensor

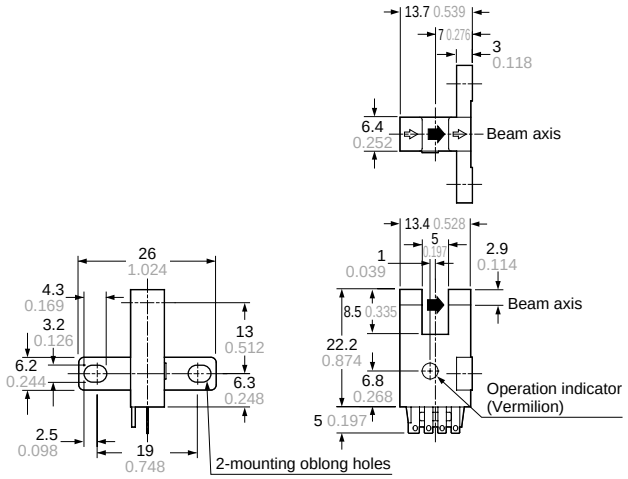


PM

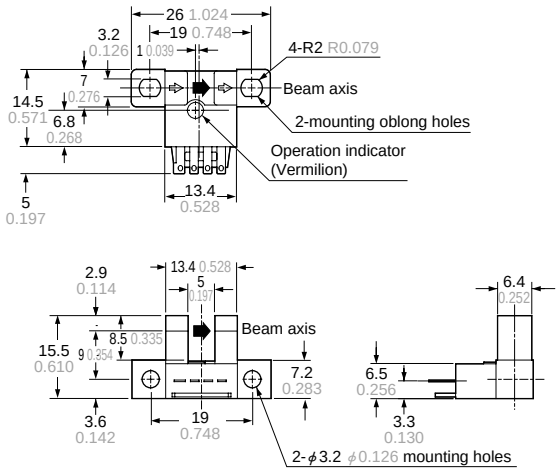
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

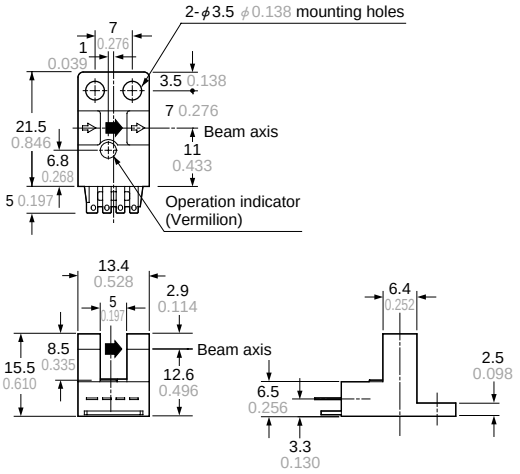
PM-T54 PM-T54P Sensor



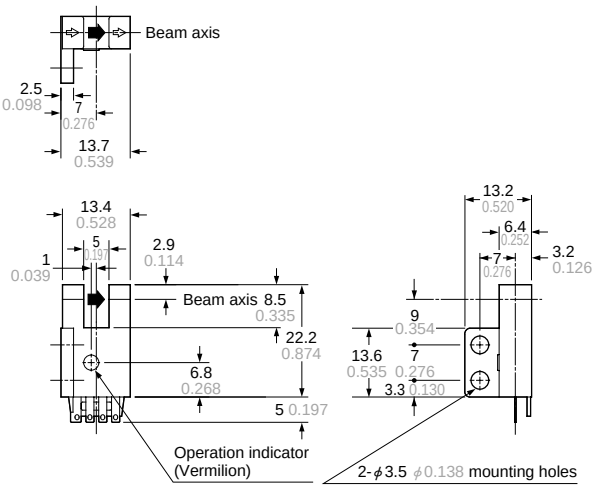
PM-L54 PM-L54P Sensor



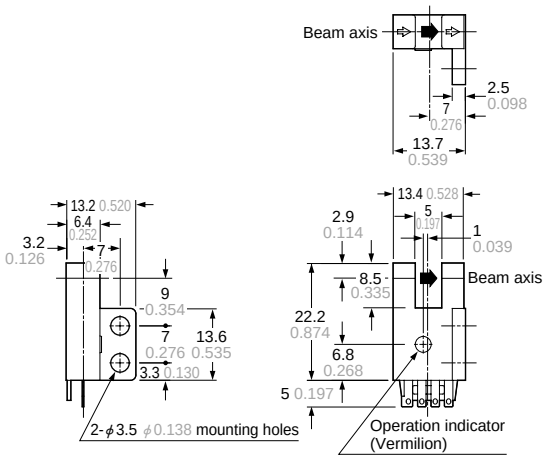
PM-Y54 PM-Y54P Sensor



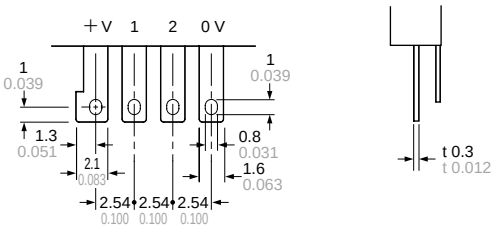
PM-F54 PM-F54P Sensor



PM-R54 PM-R54P Sensor



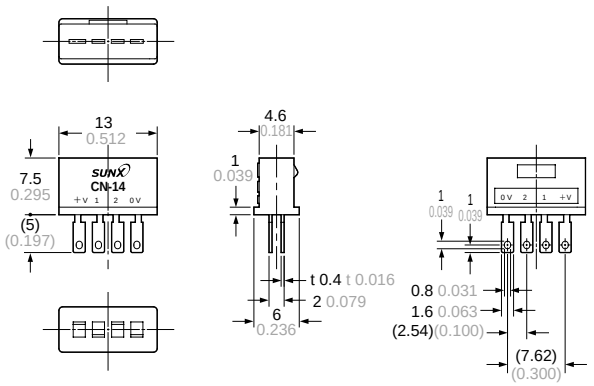
※Terminal part (PM-□54, PM-□54P)



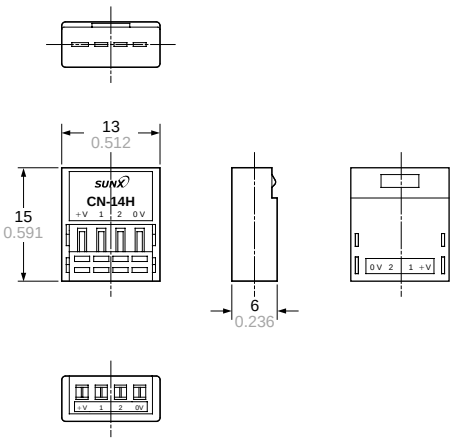
DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from the SUNX website: http://www.sunx.co.jp/

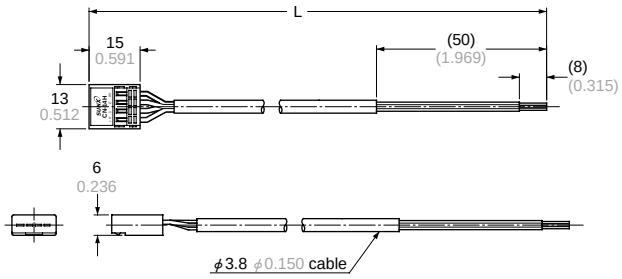
CN-14 Connector (Optional)



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



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



• Cable length L

Model No.	Cable length
CN-14H-C1	1 m 3.281 ft
CN-14H-C3	3 m 9.843 ft