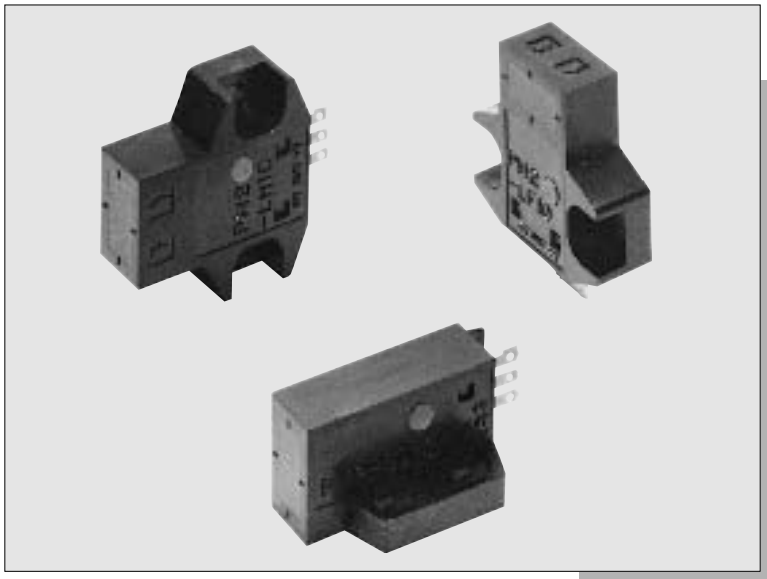
PM2 SERIES

Convergent Reflective Micro Photoelectric Sensor

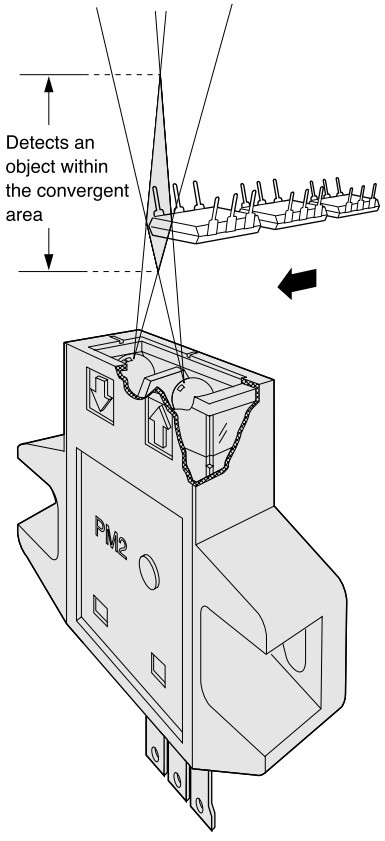


Convergent reflection sensing ensures stable detection

CE Conforming to EMC Directive

Stable detection by convergent reflective mode

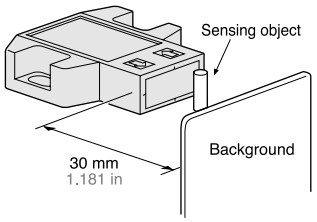
Stable detection characteristics are obtained since it is convergent reflective type and senses a limited area.



Not affected by background

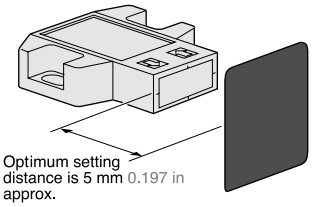
Even a specular background does not affect the sensing performance if the sensor is located 30 mm 1.181 in away from it.

(However, the specular background should be a plane surface, directly facing the sensor. A spherical or curved background may be detected.)



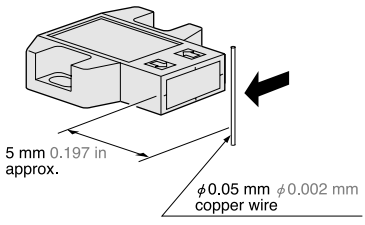
Dark object detectable

Since the sensor is very sensitive, it can detect even a dark object of low reflectivity.



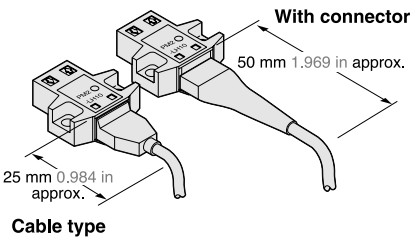
Minute object detectable

A ϕ0.05 mm ϕ0.002 in copper wire can be detected at a distance of 5 mm 0.197 in.



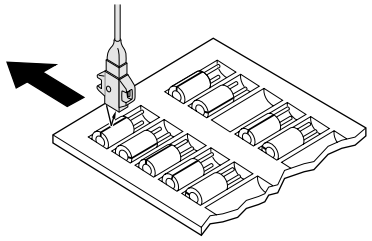
Cable type is also available

Cumbersome soldering is not required. It saves space and improves reliability.

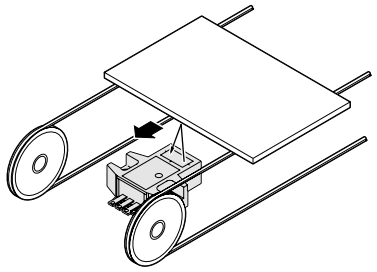


APPLICATIONS

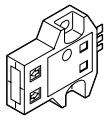
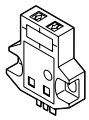
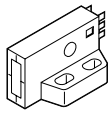
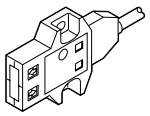
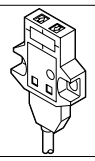
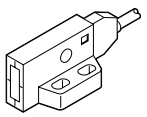
Sensing capacitors in a tray



Sensing printed circuit boards



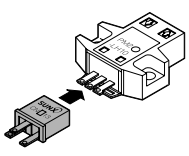
ORDER GUIDE

Type		Appearance	Sensing range	Model No.	Output	Output operation
Connector type	Top sensing		2.5 to 8 mm 0.098 to 0.315 in (Convergent point: 5 mm 0.197 in)	**PM2-LH10**	NPN open-collector transistor	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
Cable type	Top sensing			**PM2-LH10-C1**		Light-ON
				PM2-LH10B-C1		Dark-ON
	Front sensing			**PM2-LF10-C1**		Light-ON
				PM2-LF10B-C1		Dark-ON
	L type (Top sensing)			**PM2-LL10-C1**		Light-ON
				PM2-LL10B-C1		Dark-ON

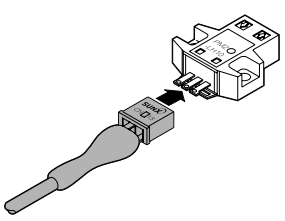
OPTIONS

Designation	Model No.	Description
Connector	**CN-13**	Dedicated connector
Mating cable	**CN-13-C1**	0.2 mm² 3-core cabtyre cable, 1 m 3.281 ft long
	CN-13-C3	0.2 mm² 3-core cabtyre cable, 3 m 9.843 ft long

Connector
- **CN-13**



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



PM2

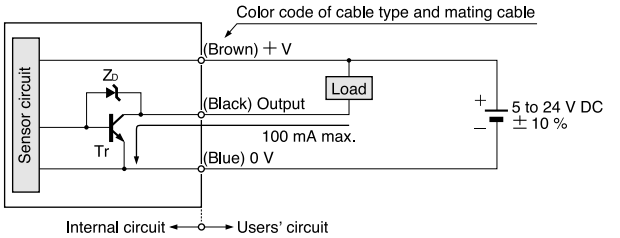
SPECIFICATIONS

Item \ Type		Connector type			Cable type		
		Top sensing	Front sensing	L type (Top sensing)	Top sensing	Front sensing	L type (Top sensing)
Model No.	Light-ON	**PM2-LH10**	**PM2-LF10**	**PM2-LL10**	**PM2-LH10-C1**	**PM2-LF10-C1**	**PM2-LL10-C1**
	Dark-ON	**PM2-LH10B**	**PM2-LF10B**	**PM2-LL10B**	**PM2-LH10B-C1**	**PM2-LF10B-C1**	**PM2-LL10B-C1**
Sensing range		2.5 to 8 mm 0.098 to 0.315 in (Conv. point: 5 mm 0.197 in) with white non-glossy paper (15 × 15 mm 0.591 in × 0.591 in) (Note 1)					
Min. sensing object		ϕ0.05 mm ϕ0.002 in copper wire (Setting distance: 5 mm 0.197 in)					
Hysteresis		20 % or less of operation distance with white non-glossy paper (15 × 15 mm 0.591 × 0.591 in)					
Repeatability (perpendicular to sensing axis)		0.08 mm 0.003 in or less (Note 2)					
Supply voltage		5 to 24 V DC ± 10 % Ripple P-P 5 % or less					
Current consumption		Average: 25 mA or less, Peak: 80 mA or less					
Output		NPN open-collector transistor • Maximum sink current: 100 mA • Applied voltage: 30 V DC or less (between output and 0 V) • Residual voltage: 1 V or less (at 100 mA sink current) 0.4 V or less (at 16 mA sink current)					
	Utilization category	DC-12 or DC-13					
	Short-circuit protection	Incorporated					
Response time		0.8 ms or less					
Operation indicator		Red LED (lights up when the output is ON)					
Environmental resistance	Pollution degree	3 (Industrial environment)					
	Ambient temperature	− 10 to + 55 °C + 14 to + 131 °F (No dew condensation or icing allowed), Storage: − 25 to + 80 °C − 13 to + 176 °F					
	Ambient humidity	45 to 85 % RH, Storage: 45 to 85 % RH					
	Ambient illuminance	Sunlight: 11,000 ℓx at the light-receiving face, Incandescent light: 3,500 ℓx at the light-receiving face					
	EMC	EN 50081-2, EN 50082-2, EN 60947-5-2					
	Vibration resistance	10 to 55 Hz frequency, 1.5 mm 0.059 in amplitude in X, Y and Z directions for two hours each					
	Shock resistance	500 m/s^2 acceleration (50 G approx.) in X, Y and Z directions for three times each					
Emitting element		Infrared LED (modulated)					
Material		Enclosure: Polycarbonate, Terminal part: HSM (Ag plated)			Enclosure: Polycarbonate, Fixed cable part: PBT		
Cable		—			0.2 mm^2 3-core cabtyre cable, 1 m 3.281 ft long (Note 3)		
Cable extension		Total 2 m 6.562 ft is possible with 0.3 mm^2, or more, cable. (If the cable is extended for 2 m 6.562 ft, or more, a capacitor of 10 μF must be connected between + V and 0 V terminals.)			—		
Weight		4.5 g approx.		4 g approx.	25 g approx.		

Notes: 1) The sensing range may extend up to 12.5 mm 0.492 in with white non-glossy paper due to product variation.
2) The repeatability is specified for white non-glossy paper (15 × 15 mm 0.591 × 0.591 in) at a setting distance of 5 mm 0.197 in.
3) Cable cannot be extended.

I/O CIRCUIT AND WIRING DIAGRAMS

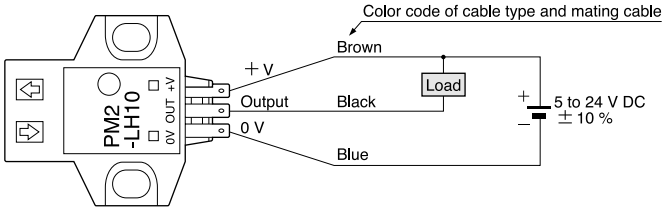
I/O circuit diagram



Note: Make sure to connect terminals correctly as the sensor does not incorporate a reverse polarity protection circuit.

Symbols ... Z_D: Surge absorption zener diode
Tr: NPN output transistor

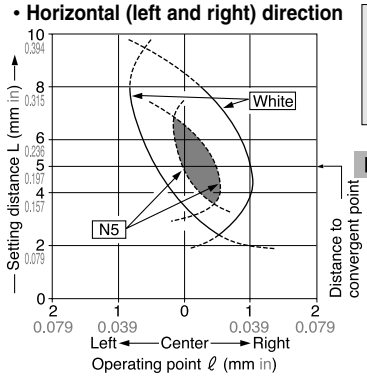
Wiring diagram



SENSING CHARACTERISTICS (TYPICAL)

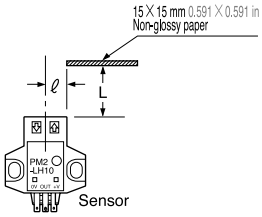
Sensing fields

• Horizontal (left and right) direction

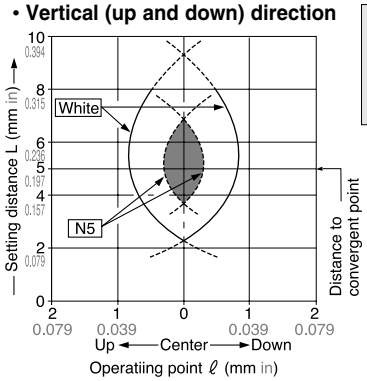


The sensors can be mounted side by side. However, if the sensor is slanted, there may be interference.
Verify first whether there is any interference prior to use.

Horizontal direction

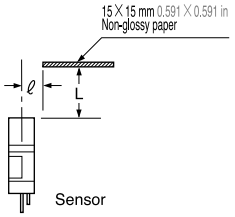


• Vertical (up and down) direction

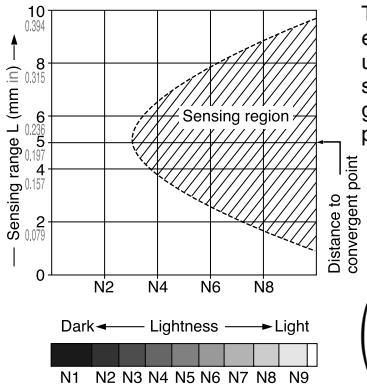


The sensors can be mounted side by side. However, if the sensor is slanted, there may be interference.
Verify first whether there is any interference prior to use.

Vertical direction



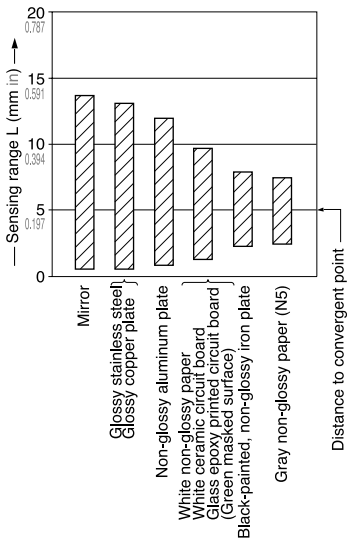
Correlation between lightness and sensing range



The sensing region is represented by oblique lines in the left figure. However, the sensitivity should be set with enough margin because of slight variation in products.

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

Correlation between material (15 × 15 mm 0.591 × 0.591 in) and sensing range



The bars in the graph indicate the sensing range for the respective material. However, there is a slight variation in the sensing range depending on the product. Further, if there is a reflective object (conveyer, etc.) in the background of the sensing object, since it affects the sensing, separate it by more than twice the sensing range shown in the left graph.

PM2

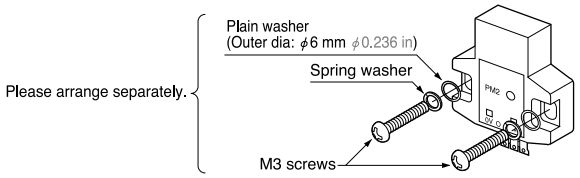
PRECAUTIONS FOR PROPER USE

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.

Mounting

- When fixing the sensor with screws, use M3 screws and the tightening torque should be 0.49 N·m or less. Further, use small, round type plain washers (ϕ6 mm ϕ0.236 in).

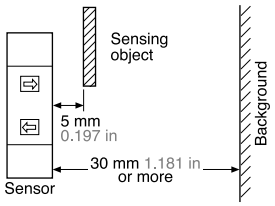


Wiring

- Make sure to connect terminals correctly as the sensor does not incorporate a reverse polarity protection circuit.
- If the sensor is being used in a noisy environment, examine the extent of noise. Further, if equipment, such as motor, solenoid or electromagnetic valve, which generates a large surge, is present near the sensor, connect a surge absorber to the equipment.

Setting

- The optimum setting distance (distance to convergent point) is 5 mm 0.197 in. The sensor is not affected even by a specular background if it is located 30 mm 1.181 in, or more, away from the sensor.



(However, the specular background should be a plane surface, directly facing the sensor. A spherical or curved background may be detected.)

Others

- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- Take care that the product does not come in direct contact with oil, grease, or organic solvents, such as, thinner, etc.

Connector type

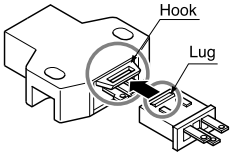
Cautions in plugging or unplugging a connector

- 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.

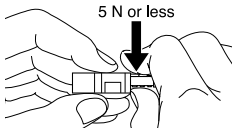
If you do not follow the above cautions, it will cause a poor contact.

Procedures of plugging or unplugging a connector

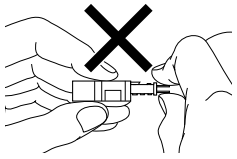
①Insert a connector straight into a sensor until the connector lug is locked by the sensor hook.



②When 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.

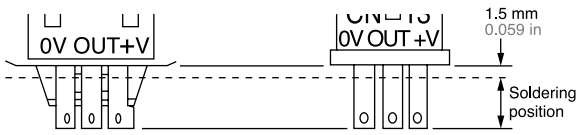


Soldering (Both connector CN-13 and sensor)

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

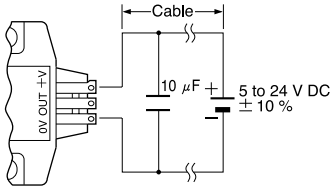
Soldering temperature	260 °C 500 °F or less
Soldering time	10 sec. or less
Soldering position	Refer to the below figure

Sensor **Connector**



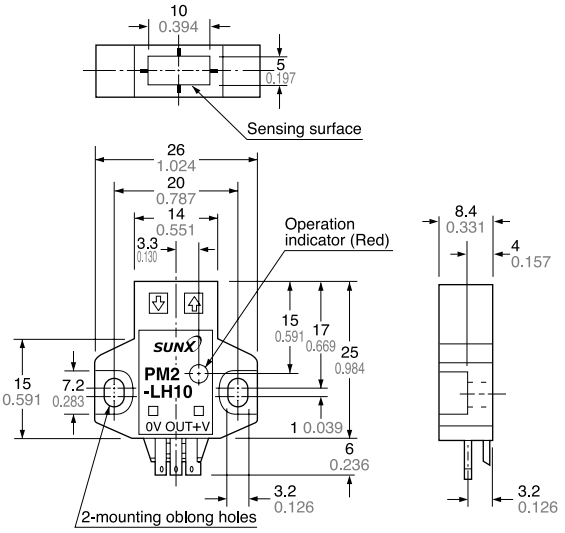
Wiring

- The cable length must be 2 m 6.562 ft, or less, with 0.3 mm², or more, cable. If the cable is extended for more than 2 m 6.562 ft, connect a capacitor of 10 μF approx. between + V and 0 V terminals.

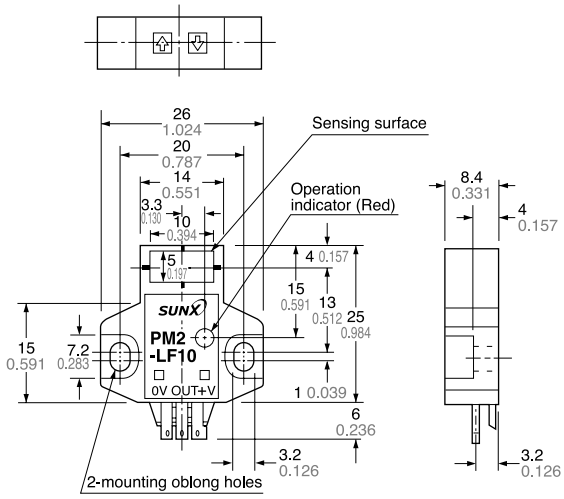


DIMENSIONS (Unit: mm in)

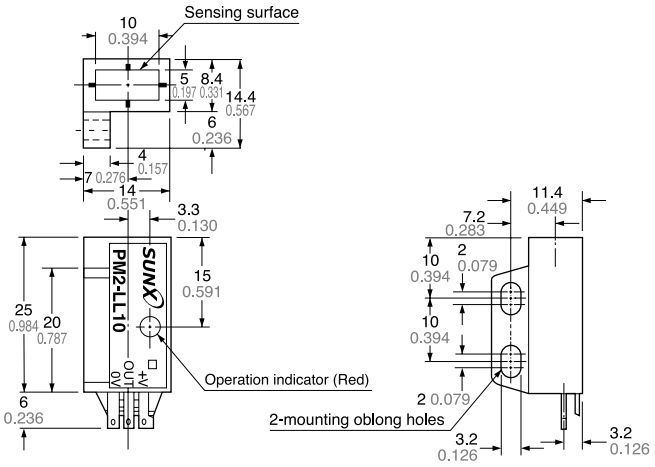
PM2-LH10 PM2-LH10B Sensor



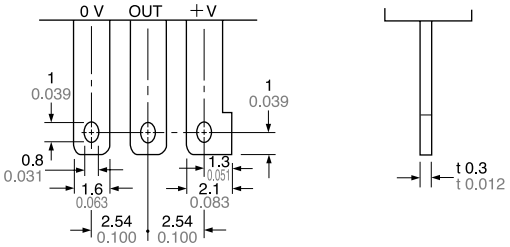
PM2-LF10 PM2-LF10B Sensor



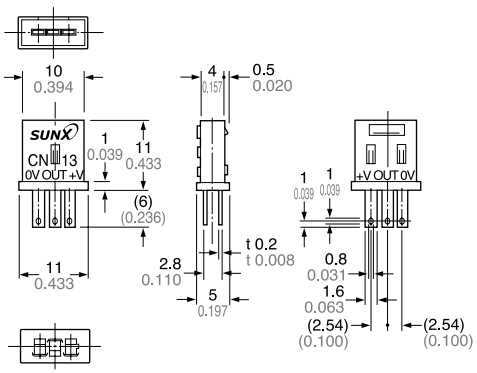
PM2-LL10 PM2-LL10B Sensor



※ Terminal part (Connector type)

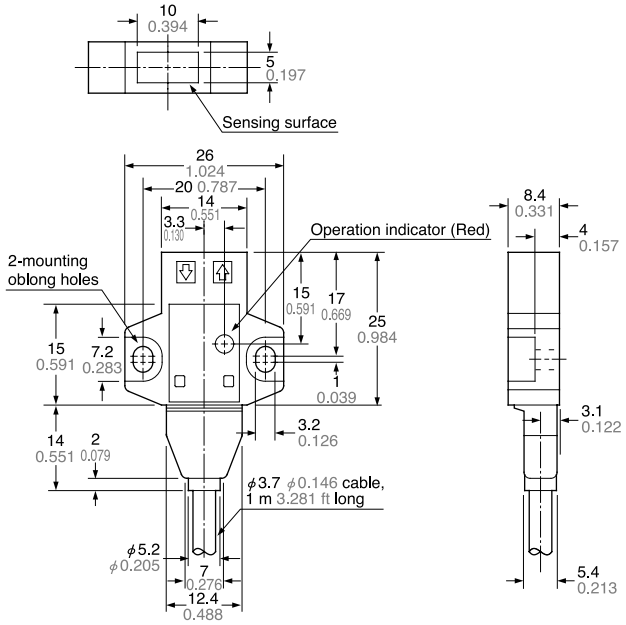


CN-13 Connector (Optional)

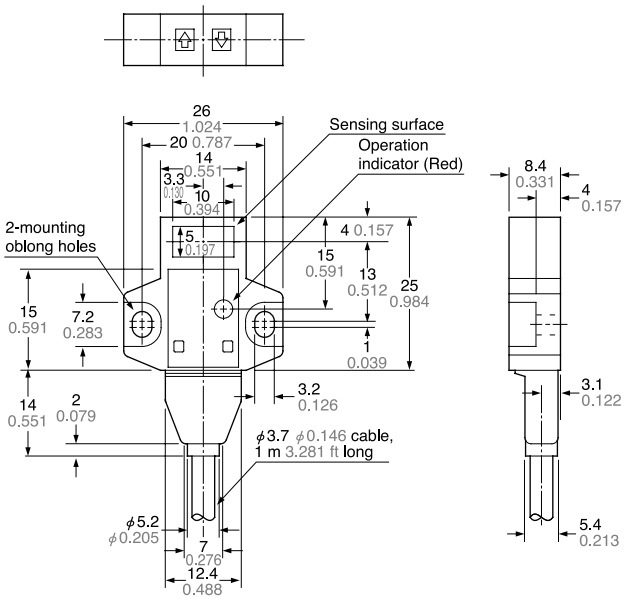


DIMENSIONS (Unit: mm in)

PM2-LH10-C1
PM2-LH10B-C1 Sensor



PM2-LF10-C1
PM2-LF10B-C1 Sensor



PM2-LL10-C1
PM2-LL10B-C1 Sensor