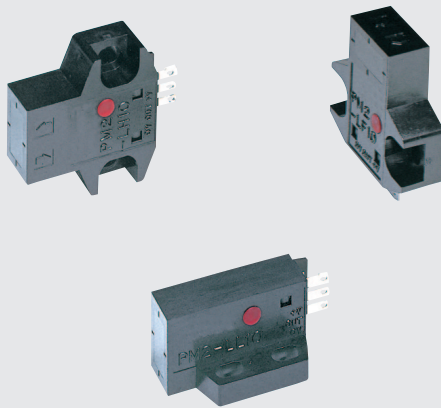


# PM2 SERIES

Related Information

- General terms and conditions..... F-17
- Sensor selection guide ..... P.441~
- Glossary of terms..... P.1359~
- General precautions ..... P.1405

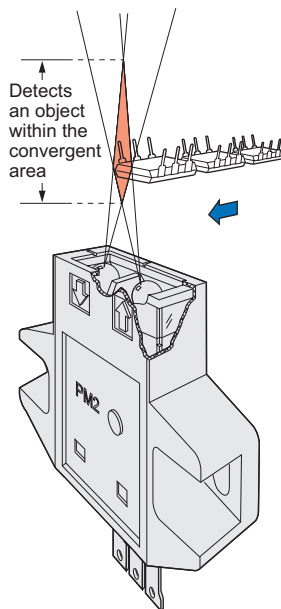


[panasonic-electric-works.net/sunx](http://panasonic-electric-works.net/sunx)

## Convergent reflection sensing ensures stable detection

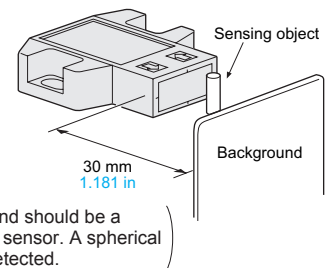
### Stable detection by convergent reflective mode

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



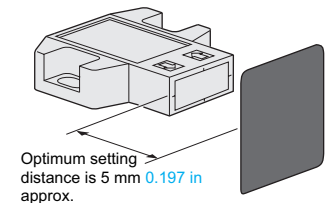
### Hardly affected by background

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



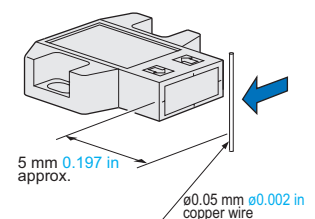
### Dark object detectable

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



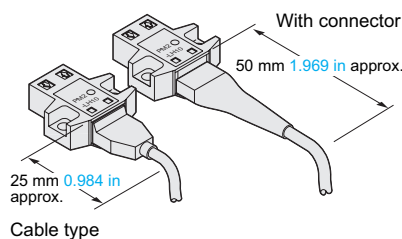
### Minute object detectable

A  $\varnothing 0.05$  mm  $\varnothing 0.002$  in copper wire can be detected at a distance of 5 mm 0.197 in under the optimum condition.



### Cable type is also available

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



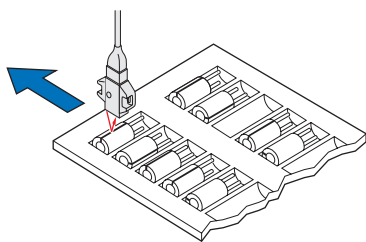
- Selection Guide
- U-shaped
- Convergent Reflective

PM2

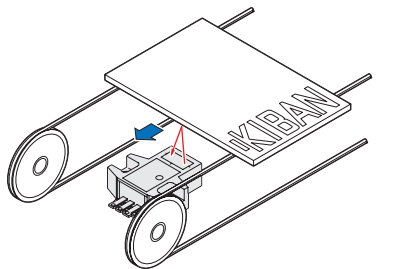
- FIBER SENSORS
- LASER SENSORS
- PHOTOELECTRIC SENSORS
- MICRO PHOTOELECTRIC SENSORS
- AREA SENSORS
- LIGHT CURTAINS
- PRESSURE / FLOW SENSORS
- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- SIMPLE WIRE-SAVING UNITS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- ENDOSCOPE
- LASER MARKERS
- PLC / TERMINALS
- HUMAN MACHINE INTERFACES
- ENERGY CONSUMPTION VISUALIZATION COMPONENTS
- FA COMPONENTS
- MACHINE VISION SYSTEMS
- UV CURING SYSTEMS

**APPLICATIONS**

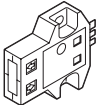

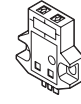
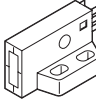
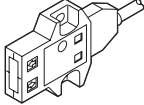
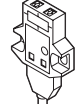
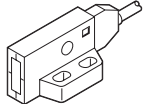
**Sensing capacitors in a tray**



**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)	<b>PM2-LH10</b>	NPN open-collector transistor	Light-ON
	Front sensing 		<b>PM2-LH10B</b>		Dark-ON
	L type (Top sensing) 		<b>PM2-LF10</b>		Light-ON
			<b>PM2-LF10B</b>		Dark-ON
Cable type	Top sensing 		<b>PM2-LL10</b>		Light-ON
	Front sensing 		<b>PM2-LL10B</b>		Dark-ON
			<b>PM2-LH10-C1</b>		Light-ON
	<b>PM2-LH10B-C1</b>		Dark-ON		
	L type (Top sensing) 		<b>PM2-LF10-C1</b>		Light-ON
			<b>PM2-LF10B-C1</b>		Dark-ON
			<b>PM2-LL10-C1</b>		Light-ON
			<b>PM2-LL10B-C1</b>		Dark-ON

FIBER SENSORS  
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SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS  
WIRE-SAVING SYSTEMS  
MEASUREMENT SENSORS  
STATIC CONTROL DEVICES  
ENDOSCOPE  
LASER MARKERS  
PLC / TERMINALS  
HUMAN MACHINE INTERFACES  
ENERGY CONSUMPTION VISUALIZATION COMPONENTS  
FA COMPONENTS  
MACHINE VISION SYSTEMS  
UV CURING SYSTEMS

Selection Guide  
U-shaped  
Convergent Reflective

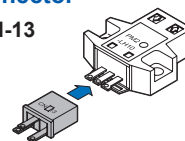
**PM2**

**OPTIONS**

Designation	Model No.	Description
Connector	<b>CN-13</b>	Dedicated connector
Connector attached cable	<b>CN-13-C1</b>	0.2 mm <sup>2</sup> 3-core cabtyre cable, 1 m 3.281 ft long
	<b>CN-13-C3</b>	0.2 mm <sup>2</sup> 3-core cabtyre cable, 3 m 9.843 ft long

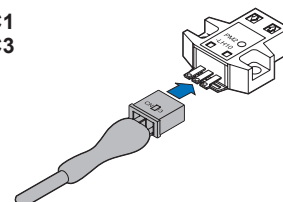
**Connector**

- **CN-13**



**Connector attached cable**

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



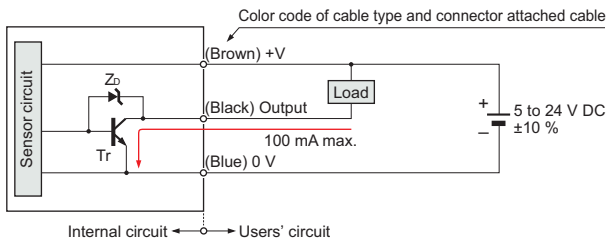
**SPECIFICATIONS**

Item	Model No.	Type	Connector type			Cable type		
			Top sensing	Front sensing	L type (Top sensing)	Top sensing	Front sensing	L type (Top sensing)
			Light-ON	PM2-LH10	PM2-LF10	PM2-LL10	PM2-LH10-C1	PM2-LF10-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 <b>0.098 to 0.315 in</b> (Conv. point: 5 mm <b>0.197 in</b> ) with white non-glossy paper (15 × 15 mm <b>0.591 in × 0.591 in</b> ) (Note 2)					
Min. sensing object			ø0.05 mm <b>ø0.002 in</b> copper wire (Setting distance: 5 mm <b>0.197 in</b> )					
Hysteresis			20 % or less of operation distance with white non-glossy paper (15 × 15 mm <b>0.591 × 0.591 in</b> )					
Repeatability (perpendicular to sensing axis)			0.08 mm <b>0.003 in</b> or less (Note 3)					
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					
Overcurrent 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 <b>+14 to +131 °F</b> (No dew condensation or icing allowed), Storage: -25 to +80 °C <b>-13 to +176 °F</b>					
	Ambient humidity		45 to 85 % RH, Storage: 45 to 85 % RH					
	Ambient illuminance		Incandescent light: 3,500 lx at the light-receiving face					
	EMC		EN 60947-5					
	Vibration resistance		10 to 55 Hz frequency, 1.5 mm <b>0.059 in</b> amplitude in X, Y and Z directions for two hours each					
Shock resistance			500 m/s <sup>2</sup> acceleration (50 G approx.) in X, Y and Z directions for three times each					
Emitting element			Infrared LED (Peak emission wavelength: 880 nm <b>0.035 mil</b> , modulated)					
Material			Enclosure: Polycarbonate, Terminal part: Copper alloy (Ag plated)			Enclosure: Polycarbonate, Fixed cable part: PBT		
Cable			—————			0.2 mm <sup>2</sup> 3-core cabtyre cable, 1 m <b>3.281 ft</b> long (Note 4)		
Cable length			Total length up to 2 m <b>6.562 ft</b> is possible with 0.3 mm <sup>2</sup> , or more, cable. (If the cable is extended for 2 m <b>6.562 ft</b> , or more, a capacitor of 10 µF must be connected between +V and 0 V terminals.)					
Weight			Net weight: 4.5 g approx. Gross weight: 85 g approx. (10 piece package)		Net weight: 4 g approx. Gross weight: 80 g approx. (10 piece package)		Net weight: 25 g approx Gross weight: 330 g approx (10 piece package)	

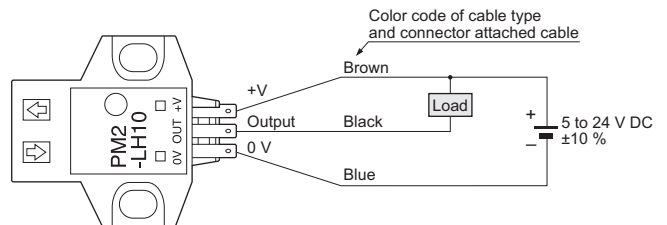
- Notes: 1) Where measurement conditions have not been specified precisely, the conditions used were an ambient temperature of +23 °C **+73.4 °F**.  
 2) The sensing range may extend up to 12.5 mm **0.492 in** with white non-glossy paper due to product variation.  
 3) The repeatability is specified for white non-glossy paper (15 × 15 mm **0.591 × 0.591 in**) at a setting distance of 5 mm **0.197 in**.  
 4) Cable cannot be extended.

**I/O CIRCUIT AND WIRING DIAGRAMS**

**I/O circuit diagram**



**Wiring diagram**



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

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

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AREA SENSORS

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SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

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STATIC CONTROL DEVICES

ENDOSCOPE

LASER MARKERS

PLC/ TERMINALS

HUMAN MACHINE INTERFACES

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FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

U-shaped

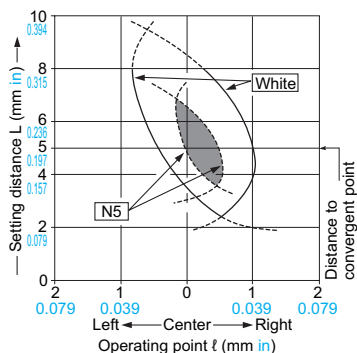
Convergent Reflective

PM2

**SENSING CHARACTERISTICS (TYPICAL)**

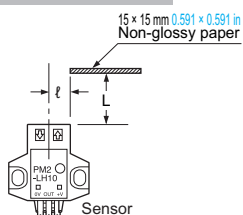
**Sensing fields**

- Horizontal (left and right) direction

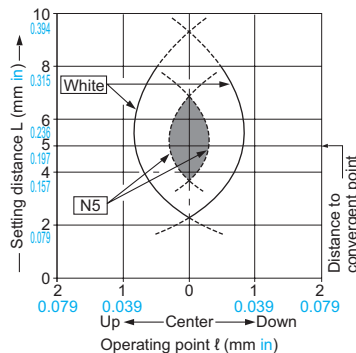


The sensors can be mounted side by side. However, if the sensor is slanted, there may be interference. Verify first whether there is any interference prior to use.

**Horizontal direction**

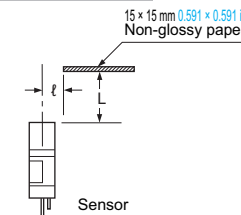


- Vertical (up and down) direction

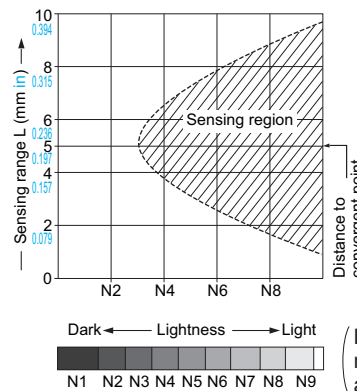


The sensors can be mounted side by side. However, if the sensor is slanted, there may be interference. Verify first whether there is any interference prior to use.

**Vertical direction**



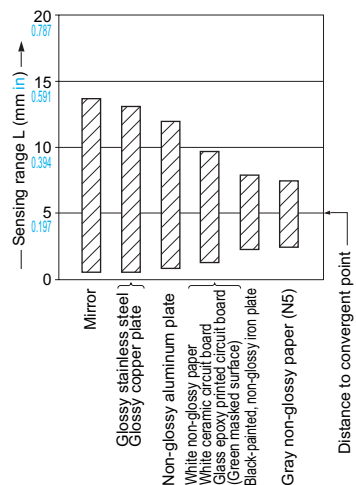
**Correlation between lightness and sensing range**



The sensing region (typical) 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 x 15 mm 0.591 x 0.591 in) and sensing range**



The bars in the graph indicate the sensing range (typical) 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 (conveyor, 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.

**PRECAUTIONS FOR PROPER USE**

Refer to General precautions.

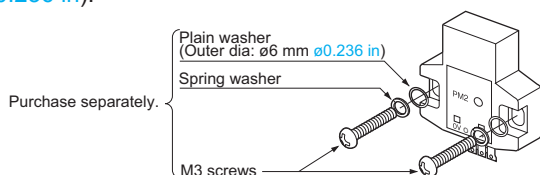
**All models**



- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

**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 (ø6 mm ø0.236 in).



**Others**

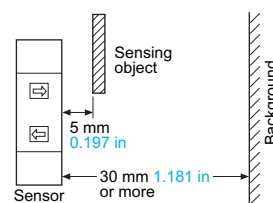
- Do not use during the initial transient time (50 ms) after the power supply is switched on.
- Take care that the product does not come in direct contact with oil, grease, or organic solvents, such as, thinner, etc.

**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.)

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PARTICULAR USE SENSORS

SENSOR OPTIONS

SIMPLE WIRE-SAVING UNITS

WIRE-SAVING SYSTEMS

MEASUREMENT SENSORS

STATIC CONTROL DEVICES

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PLC / TERMINALS

HUMAN MACHINE INTERFACES

ENERGY CONSUMPTION VISUALIZATION COMPONENTS

FA COMPONENTS

MACHINE VISION SYSTEMS

UV CURING SYSTEMS

Selection Guide

U-shaped

Convergent Reflective

**PM2**

FIBER SENSORS  
LASER SENSORS  
PHOTO-ELECTRIC SENSORS  
MICRO PHOTO-ELECTRIC SENSORS  
AREA SENSORS  
LIGHT CURTAINS  
PRESSURE / FLOW SENSORS  
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ENDOSCOPE  
LASER MARKERS  
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HUMAN MACHINE INTERFACES  
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## PRECAUTIONS FOR PROPER USE

Refer to General precautions.

### Connector type

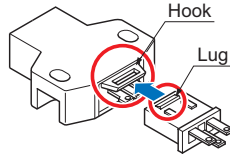
#### Cautions in plugging or unplugging a connector



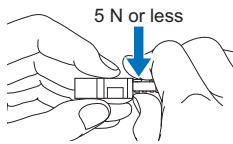
- Do not plug or unplug a connector more than 10 times.
- Be sure not to give stress more than 5 N to a terminal of both a connector and a sensor. If you do not follow the above cautions, it will cause a poor contact.

#### Procedures of plugging or unplugging a connector

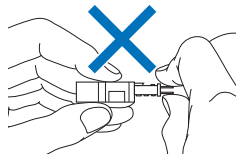
① Insert a connector straight into a sensor until the connector lug is locked by the sensor hook.



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.



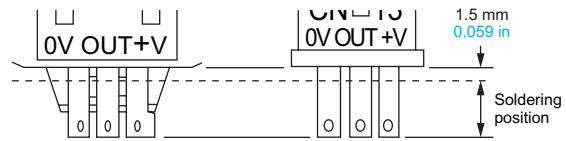
#### Soldering (Both connector CN-13 and sensor)

- 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

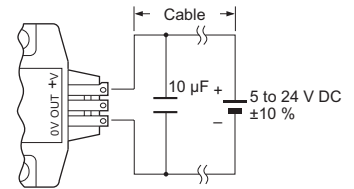
#### Sensor

#### Connector



#### Wiring

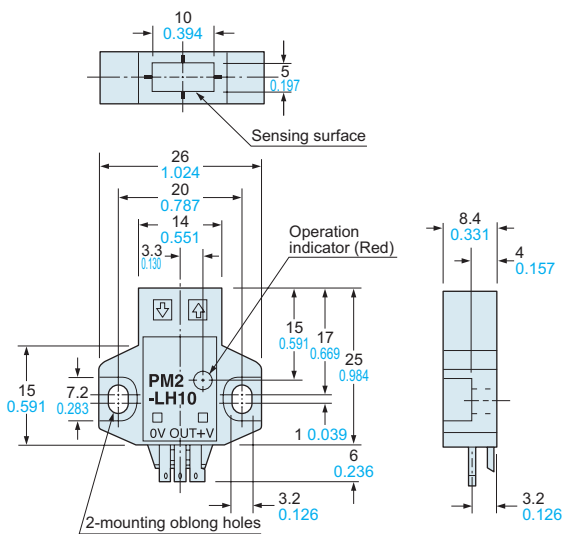
- The cable length must be 2 m 6.562 ft, or less, with 0.3 mm<sup>2</sup>, or more, cable. If the cable is extended for more than 2 m 6.562 ft, connect a capacitor of 10 μF approx. between +V and 0 V terminals.



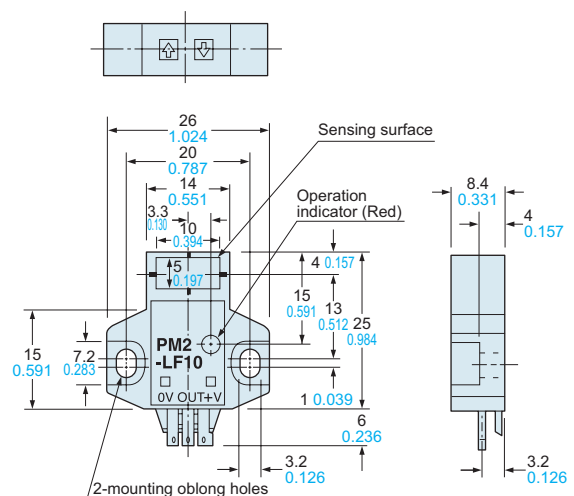
## DIMENSIONS (Unit: mm in)

The CAD data in the dimensions can be downloaded from our website.

### PM2-LH10 PM2-LH10B Sensor



### PM2-LF10 PM2-LF10B Sensor

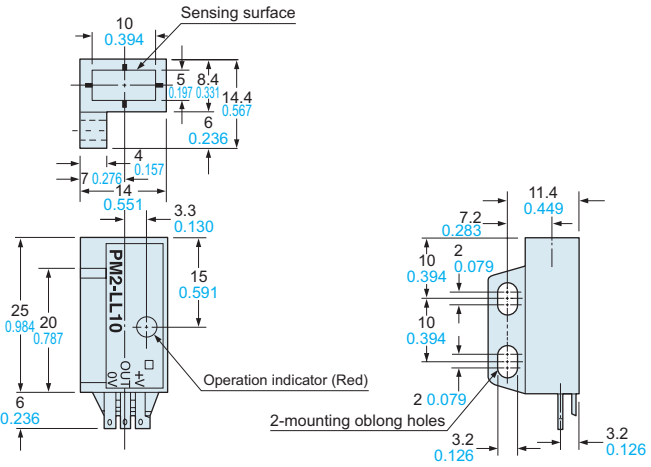


Selection Guide  
U-shaped  
Convergent Reflective  
**PM2**

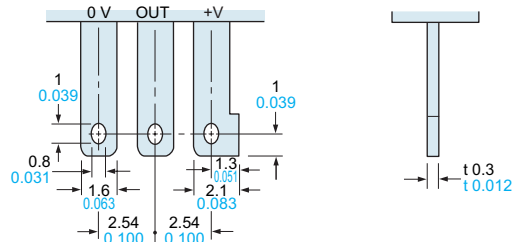
**DIMENSIONS (Unit: mm in)**

The CAD data in the dimensions can be downloaded from our website.

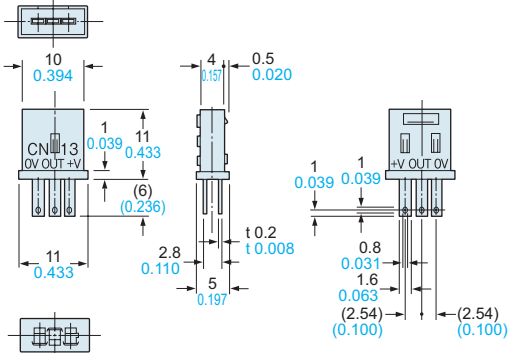
**PM2-LL10 PM2-LL10B** Sensor



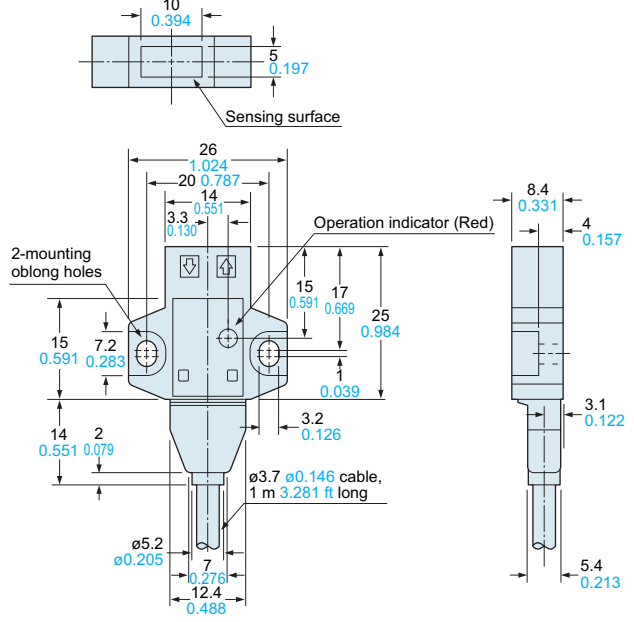
**\*Terminal part (Connector type)**



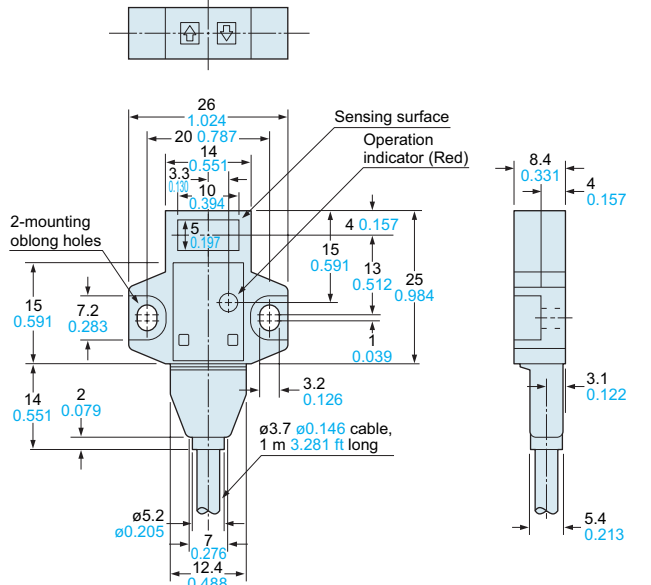
**CN-13** Connector (Optional)



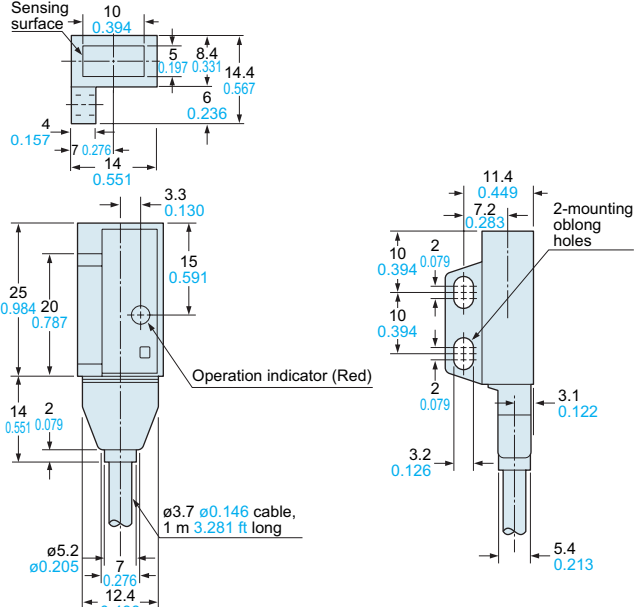
**PM2-LH10-C1 PM2-LH10B-C1** Sensor



**PM2-LF10-C1 PM2-LF10B-C1** Sensor



**PM2-LL10-C1 PM2-LL10B-C1** Sensor



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- INDUCTIVE PROXIMITY SENSORS
- PARTICULAR USE SENSORS
- SENSOR OPTIONS
- SIMPLE WIRE-SAVING UNITS
- WIRE-SAVING SYSTEMS
- MEASUREMENT SENSORS
- STATIC CONTROL DEVICES
- ENDOSCOPE
- LASER MARKERS
- PLC / TERMINALS
- HUMAN MACHINE INTERFACES
- ENERGY CONSUMPTION VISUALIZATION COMPONENTS
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- MACHINE VISION SYSTEMS
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- Selection Guide
- U-shaped
- Convergent Reflective

**PM2**