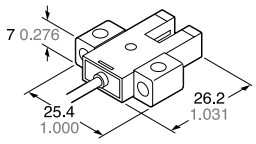
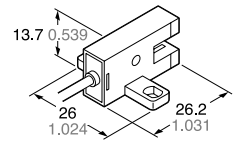
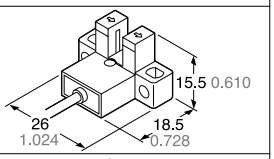
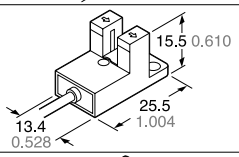
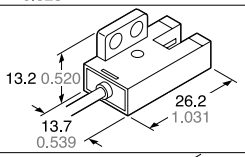
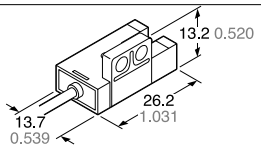
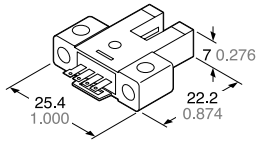
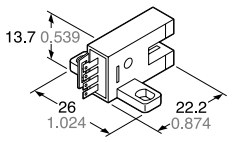
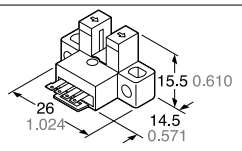
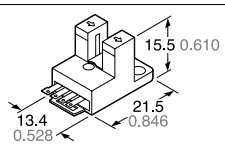
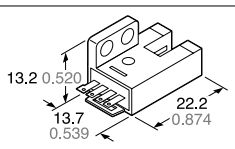
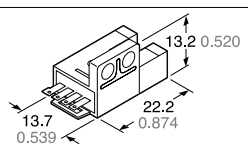
## ORDER GUIDE

| 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.

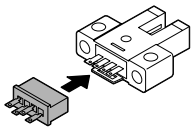
**• Table of Model Nos.**

| 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** |

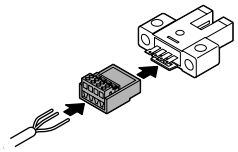
## OPTIONS

| 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.<br>Wire diameter: ϕ0.7 to ϕ1.2 mm<br>ϕ0.028 to ϕ0.047 in |
| | **CN-14H-2** | Suitable for UL standard cable.<br>This connector can be hooked-up on 0.18 to 0.22 mm² cable simply in one grip.<br>Wire diameter: ϕ1.2 to ϕ1.52 mm<br>ϕ0.047 to ϕ0.060 in |
| Connector attached cable | **CN-14H-C1** | Length: 1 m 3.281 ft Weight: 20 g approx.<br>For the connector type, with 0.18 mm² 4-core cabtyre cable<br>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. |

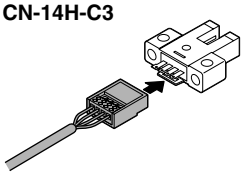
**Connector**
**• CN-14**



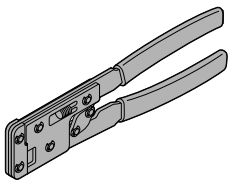
**Hook-up connector**
**• CN-14H**
**• CN-14H-2**



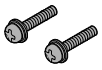
**Connector attached cable**
**• CN-14H-C1**
**• CN-14H-C3**



**Hook-up pliers**
**• CN-HP**



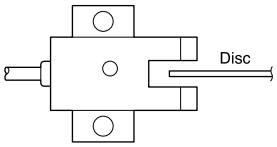
**Mounting screw**
**• MS-M2**

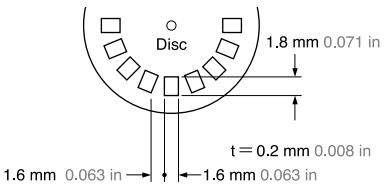


## SPECIFICATIONS

| 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><br>NPN open-collector transistor<br>• Maximum sink current: 50 mA<br>• Applied voltage: 30 V DC or less (between output and 0 V)<br>• Residual voltage: 0.7 V or less (at 50 mA sink current)<br>0.4 V or less (at 16 mA sink current) | | <PNP output type><br>PNP open-collector transistor<br>• Maximum source current: 50 mA<br>• Applied voltage: 30 V DC or less (between output and + V)<br>• Residual voltage: 0.7 V or less (at 50 mA source current)<br>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<br>Under light interrupted condition: 100 μs or less<br>(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.



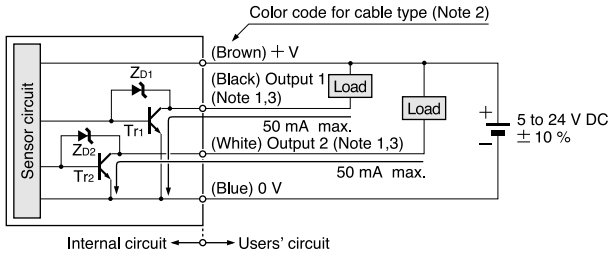




2) In case the ultra-small type **PM-□24**(**-R**) is used at an ambient temperature of + 50 °C + 122 °F, or more, make sure to mount it on a metal body.
3) Take care that the flexibility of the **PM-□24-R** cable is lost if the ambient temperature in near − 10 °C + 14 °F.
4) The cable of **PM-□24-R**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

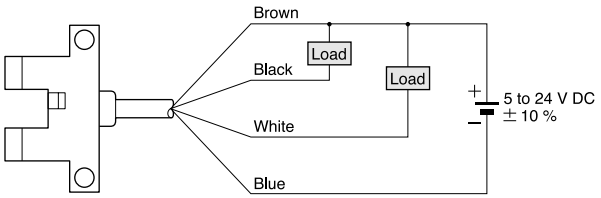
## I/O CIRCUIT AND WIRING DIAGRAMS

### 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.

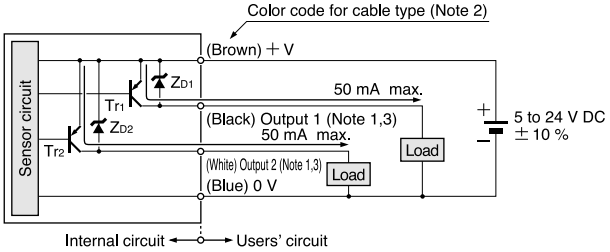
Symbols ... $Z_{D1}$, $Z_{D2}$: Surge absorption zener diode
$Tr_1$, $Tr_2$ : NPN output transistor

#### Output operation

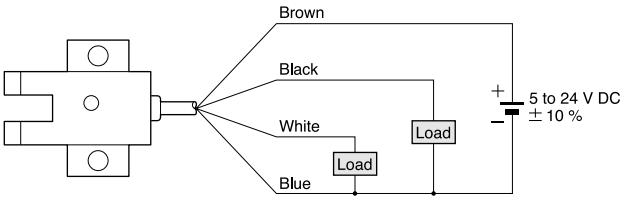
| | Color code | Output operation |
|---|---|---|
| Output 1 | Black | Light-ON |
| Output 2 | White | Dark-ON |

### 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

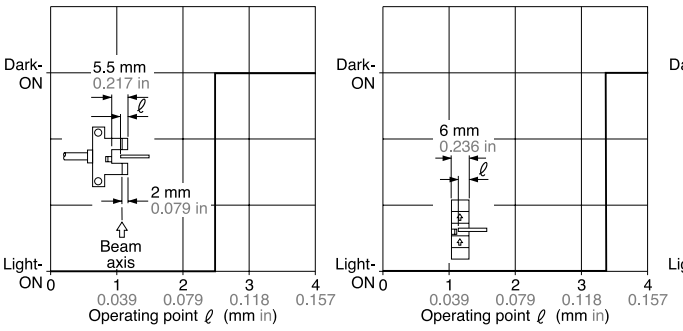
#### Output operation

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

## SENSING CHARACTERISTICS (TYPICAL)

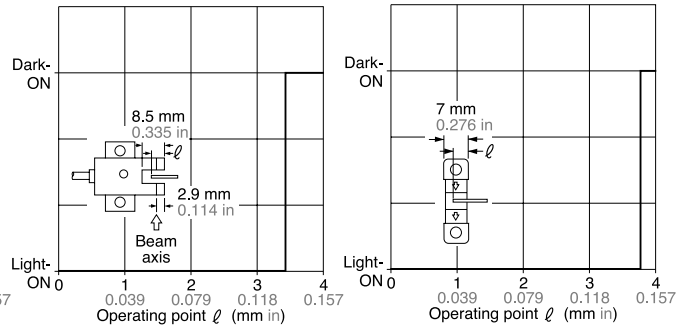
### PM-24□(-R) Ultra small type

#### Sensing position



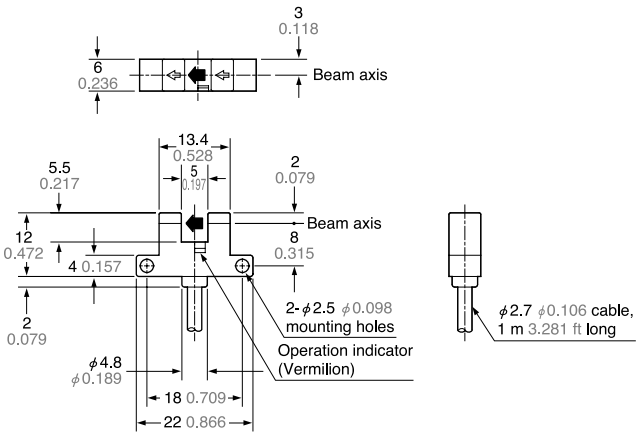

### PM-□44(P) PM-□54(P) Small type

#### Sensing position

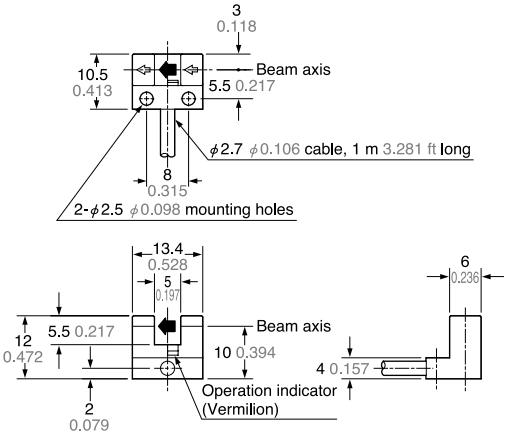


## DIMENSIONS (Unit: mm in)

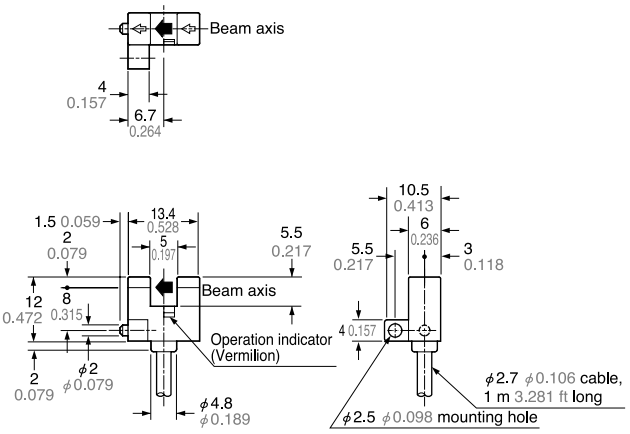
### PM-K24 PM-K24-R Sensor



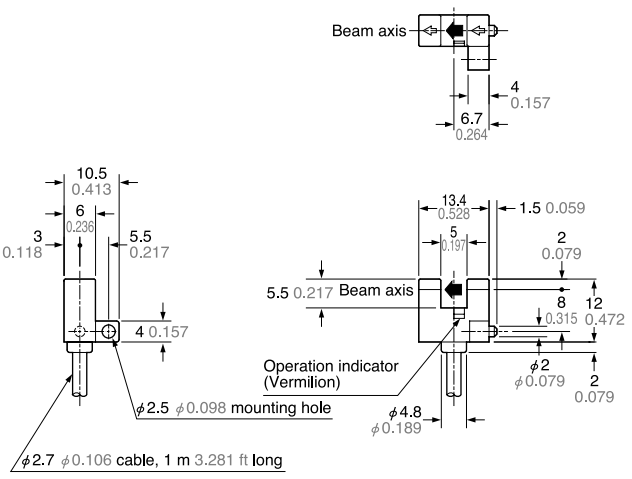

### PM-L24 PM-L24-R Sensor



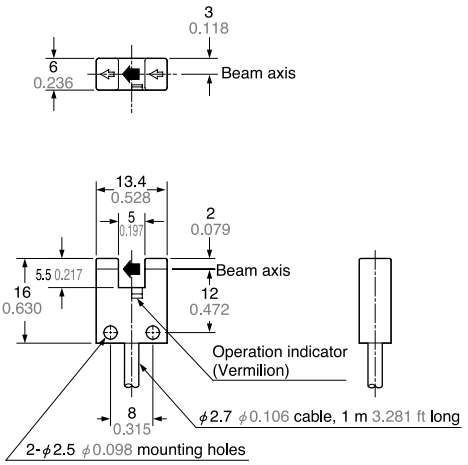

### PM-F24 PM-F24-R Sensor



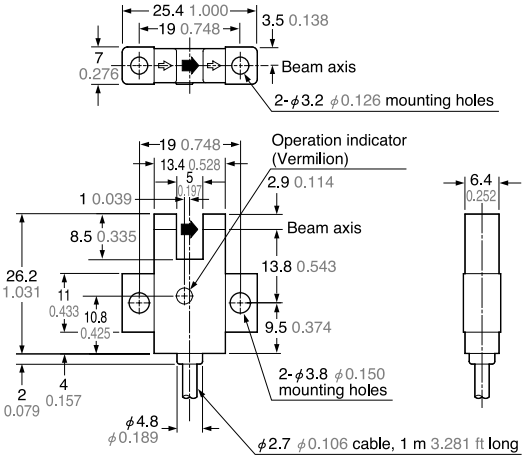

### PM-R24 PM-R24-R Sensor




### PM-U24 PM-U24-R Sensor

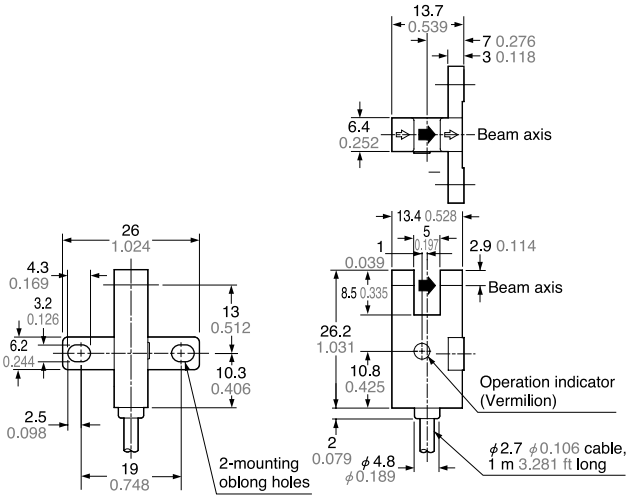



### PM-K44 PM-K44P Sensor

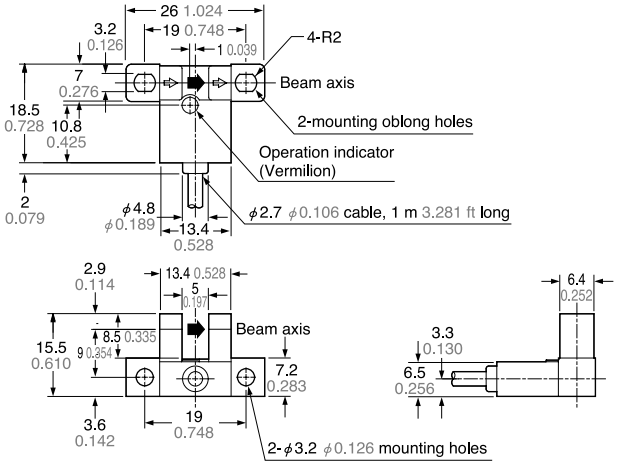


## DIMENSIONS (Unit: mm in)

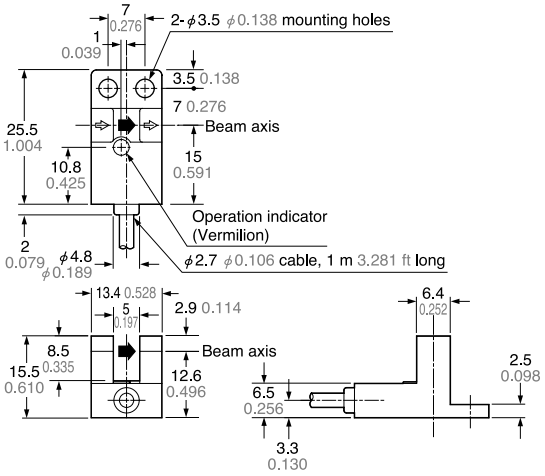
### PM-T44 PM-T44P Sensor



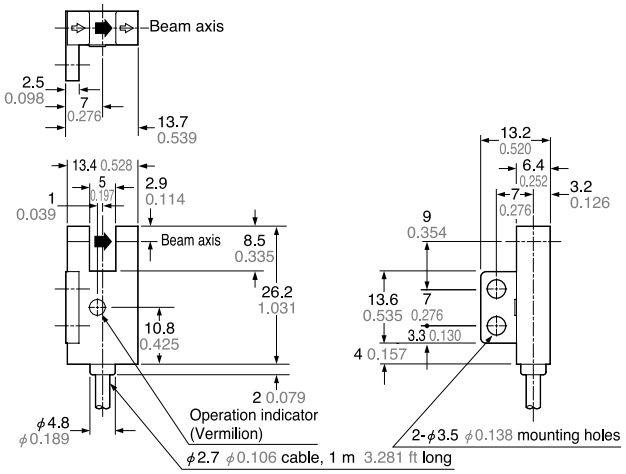

### PM-L44 PM-L44P Sensor



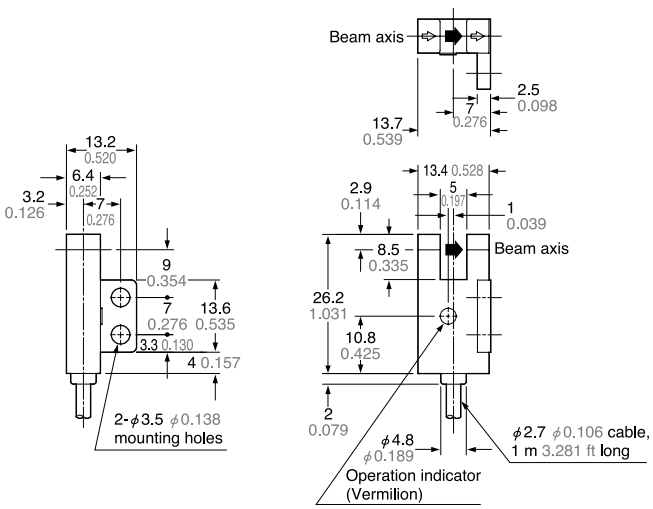

### PM-Y44 PM-Y44P Sensor




### PM-F44 PM-F44P Sensor




### PM-R44 PM-R44P Sensor




### PM-K54 PM-K54P Sensor