# THE DATASHEET OF

PM-K44P

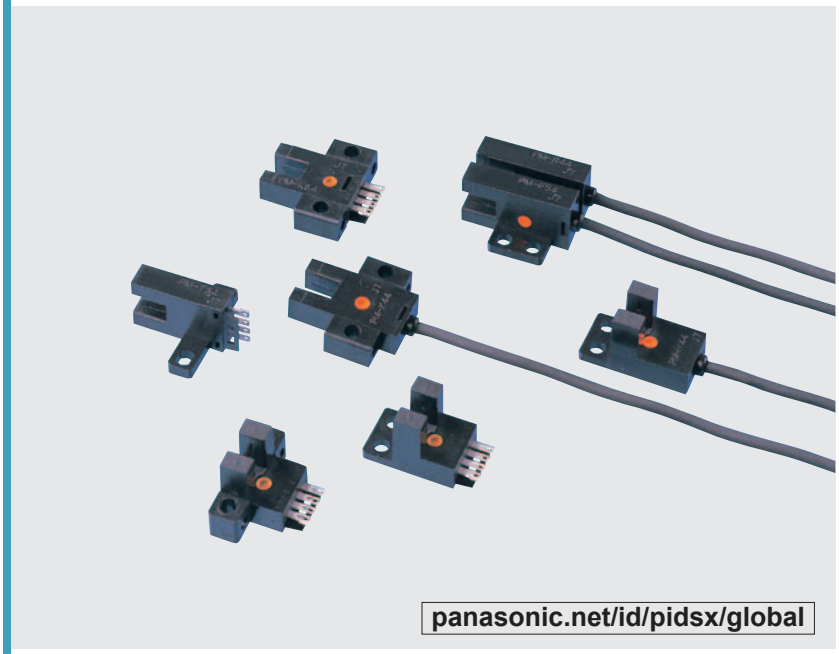
www.win-source.net 0086-755-83957316

Small U-shaped Micro Photoelectric Sensor Amplifier Built-in

# PM-44 SERIES PM-54 SERIES

Related Information
■ General terms and conditions ..... F-13
■ Glossary of terms / General precautions.....P.1455~ / P.1458~
■ Sensor selection guide..... P.427~
■ Korea's S-mark..... P.1506






Conforming to EMC Directive

Recognition

Certified (Some models only)

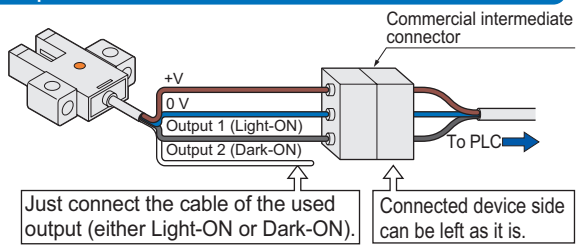
PNP output type available

## Enables space saving and quick installation!

### 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**




Note: Ensure to insulate the unused output wire.

### Wide model variety

A wide variety of 12 shapes and 24 models is available. You may select from this wide range to suit the mounting conditions.

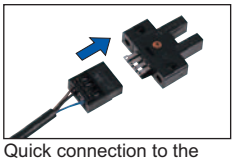
### Meets global requirements

Conforms to Europe's EMC Directive and obtains UL Recognition.
The NPN output type with cable (excluding 3 m 9.843 ft cable length type) has also obtained Korea's S-mark certification.
Both, NPN and PNP output models are available.

### Quick fitting hook-up connector

Easy to maintain connector type models are available. Its exclusive connector is the 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.

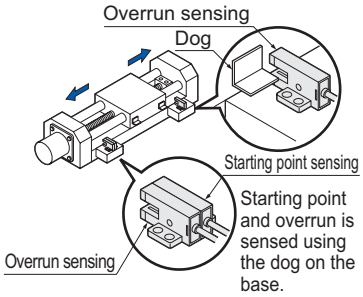
Crimp the connector on the cable.



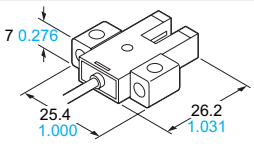
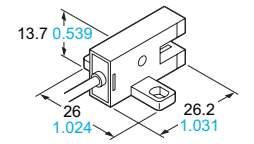
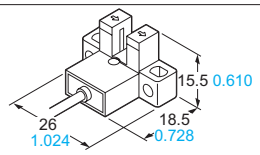
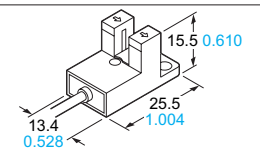
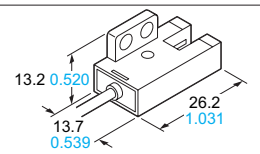
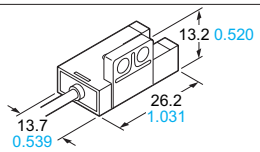
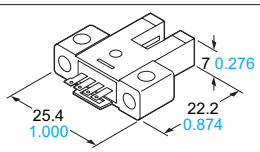
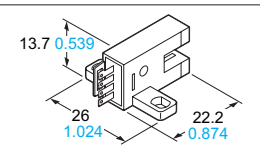
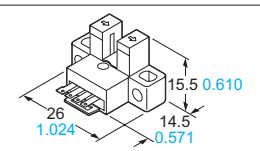
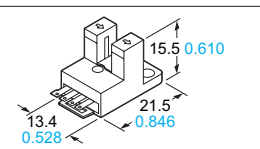
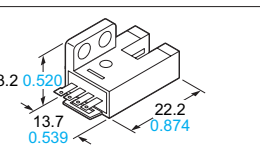
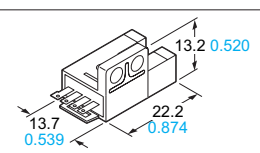
Quick connection to the sensor.

## APPLICATIONS

**Sensing the starting point and overrun of a moving body**



## 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

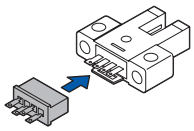
3 m 9.843 ft cable length type (standard: 1 m 3.281 ft) is also available.
When ordering this type, suffix "**-C3**" to the model No.
(e.g.) 3m 9.843 ft cable length type of **PM-K44** is "**PM-K44-C3**".

## 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: ø0.7 to ø1.2 mm ø0.028 to ø0.047 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: ø1.2 to ø1.52 mm ø0.047 to ø0.060 in | |
| Connector attached cable | **CN-14H-C1** | Length:<br>1 m 3.281 ft<br>Net weight:<br>20 g approx. | For the connector type, with 0.2 mm² 4-core cabtyre cable<br>Cable diameter: ø3.7 mm ø0.146 in |
| | **CN-14H-C3** | Length:<br>3 m 9.843 ft<br>Net weight:<br>65 g approx. | |
| Hook-up pliers | **CN-HP** | These are exclusive pliers for hook-up connectors **CN-14H** and **CN-14H-2**. | |

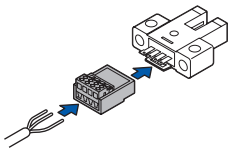
### Connector

- **CN-14**



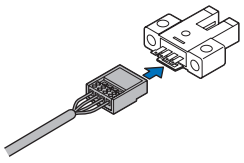
### Hook-up connector

- **CN-14H**
- **CN-14H-2**



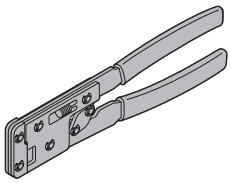
### Connector attached cable

- **CN-14H-C1**
- **CN-14H-C3**



### Hook-up pliers

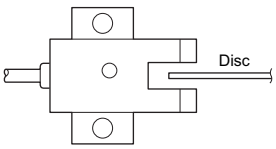
- **CN-HP**

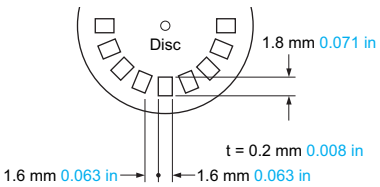


## SPECIFICATIONS

| Item | Type | Small | |
|---|---|---|---|
| | | With cable | With connector |
| Model No. | NPN output | **PM-□44** | **PM-□54** |
| | PNP output | **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, Under light interrupted condition: 100 µs or less<br>(Response frequency: 1 kHz or more) (Note 2) | |
| Operation indicator | | Vermilion LED (lights up under light received condition) | |
| Environmental resistance | Pollution degree | 3 (Industrial environment) | |
| | Ambient temperature | –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 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 (Peak emission wavelength: 940 nm 0.037 mil, non-modulated) | |
| Material | | Enclosure: PBT, Slit cover: Polycarbonate, Terminal part [**PM-□54**(**P**) only]: Solder plated | |
| Cable | | 0.09 mm² 4-core cabtyre cable, 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 | | Net weight: 15 g approx. | Net weight: 3 g approx. |

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 response frequency is the value when the disc, given in the figure below, is rotated.

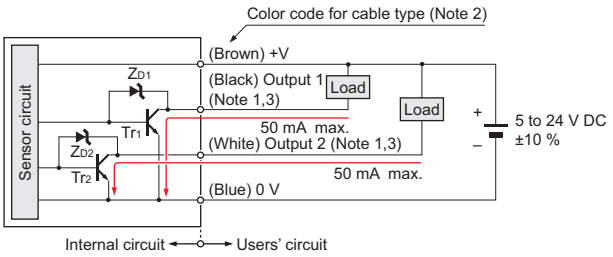


# I/O CIRCUIT AND WIRING DIAGRAMS

## PM-□44 PM-□54 — NPN output type

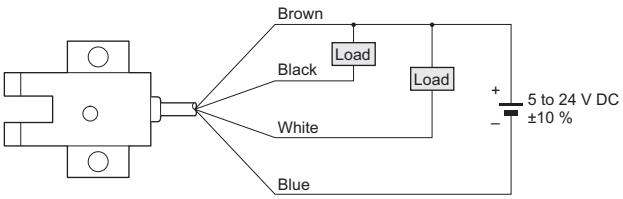
### I/O circuit diagram




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

### Wiring diagram

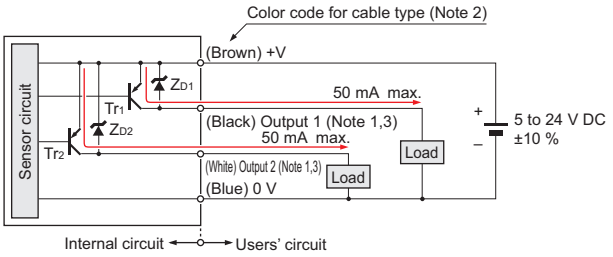



### Output operation

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

## PM-□44P PM-□54P — PNP output type

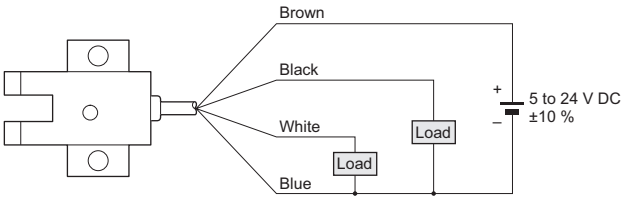
### I/O circuit diagram




Notes: 1) 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

### Wiring diagram



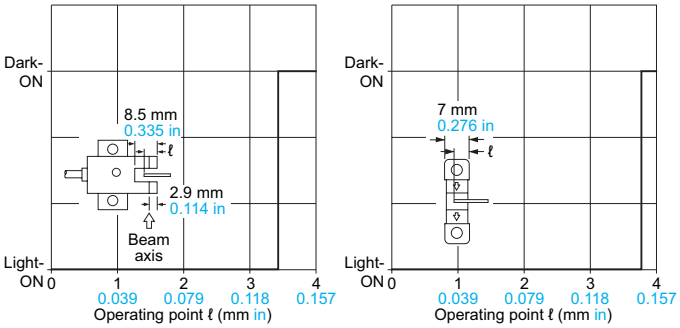

### Output operation

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

# SENSING CHARACTERISTICS (TYPICAL)

## PM-L44(P)/K44(P) PM-L54(P)/K54(P)

### Sensing position



## PRECAUTIONS FOR PROPER USE

Refer to p.1458~ for general precautions.

### All models

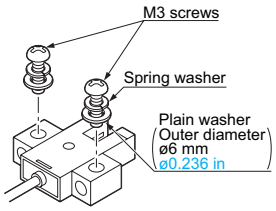
- Never use this product as a sensing device for personnel protection.
- In case of using sensing devices for personnel protection, use products which meet laws and standards, such as OSHA, ANSI or IEC etc., for personnel protection applicable in each region or country.

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.

### Mounting

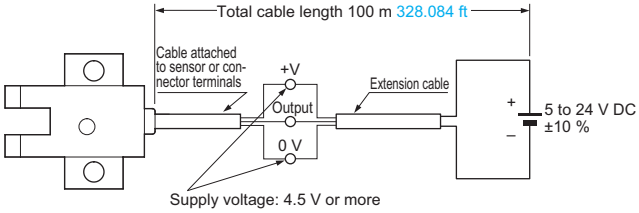
- When fixing the sensor with screws, use M3 screws and the tightening torque should not exceed the values given below.
  Further, use small, round type plain washers (ø6 mm ø0.236 in).

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




### 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.

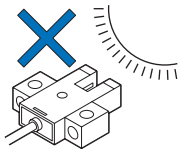



But, when the overall cable length, including the cable attached to the sensor, is as given below, there is no need to confirm the voltage.

| Conductor cross-section area of extension cable | 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 |

### Others

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



- Do not use during the initial transient time (50 ms) after the power supply is switched on.

## PRECAUTIONS FOR PROPER USE

Refer to p.1458~ for general precautions.

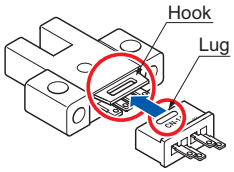
### PM-□54 PM-□54P

### Cautions in plugging or unplugging a connector

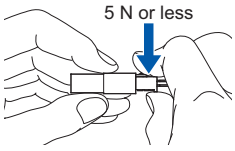
- Do not plug or unplug a connector more than 10 times.
- Be sure not to give stress more than 5 N to a terminal of both a connector and a sensor. If you do not follow the above cautions, it will cause a poor contact.

#### Procedures of plugging or unplugging a connector

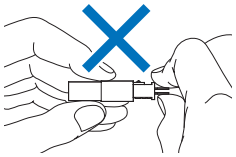
①Insert a connector straight into a sensor until the connector lug is locked by the sensor hook.




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



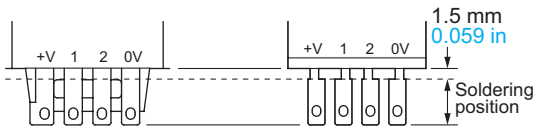

Caution: Be sure to hold a connector when plugging or unplugging it. Do not hold a terminal or a cable when plugging or unplugging the connector. Otherwise, it will cause a poor contact.



### Soldering (Both connector CN-14 and sensor)

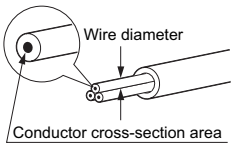
- If soldering is done directly on the terminals, strictly adhere to the conditions given below.

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



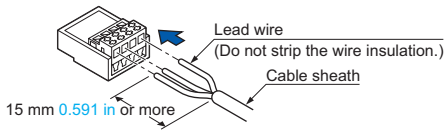

### Crimping of hook-up connectors CN-14H and CN-14H-2

| 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 | ø0.7 to ø1.2 mm ø0.028 to ø0.047 in | ø1.2 to ø1.52 mm ø0.047 to ø0.060 in |
| Wire insulation material | Vinyl chloride or soft polyethylene | |

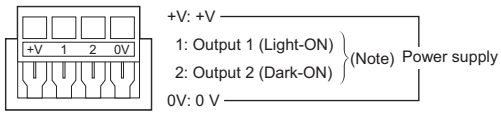



#### Crimping method

①Strip 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.



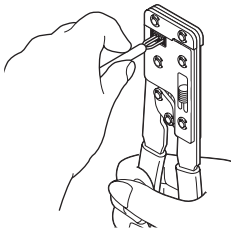

Arrangement of connector terminals




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

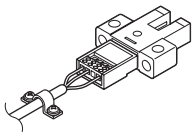
②Crimp with the exclusive hook-up pliers **CN-HP**.

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.

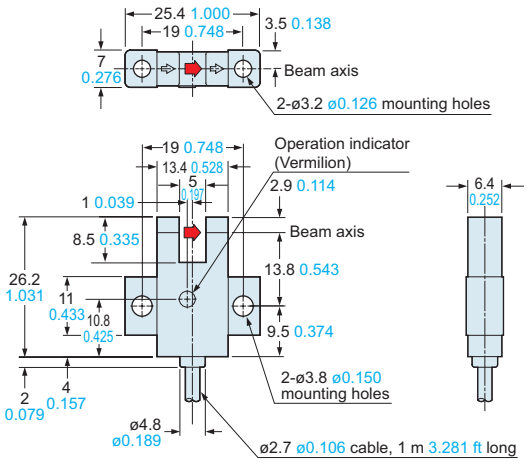
- Prior to using the sensor, affix the cable in a way as to avoid direct stress on the crimped part.



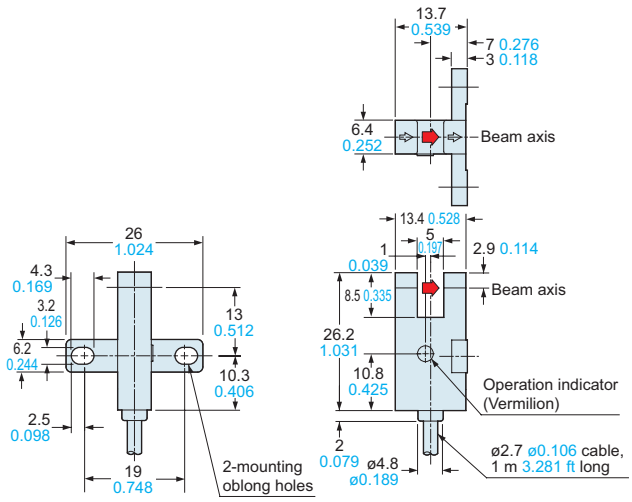
## DIMENSIONS (Unit: mm in)

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

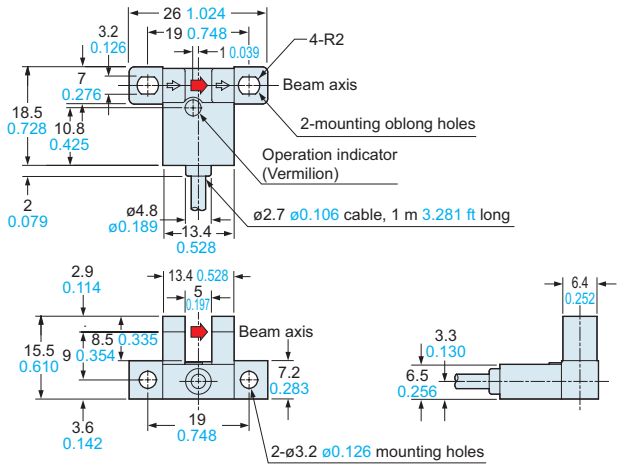
### PM-K44 PM-K44P Sensor



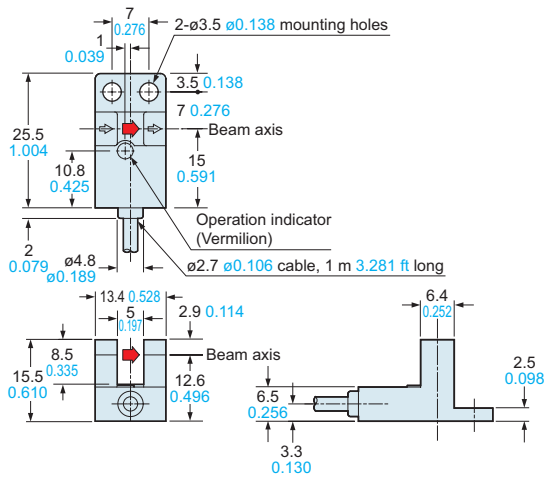

### PM-T44 PM-T44P Sensor



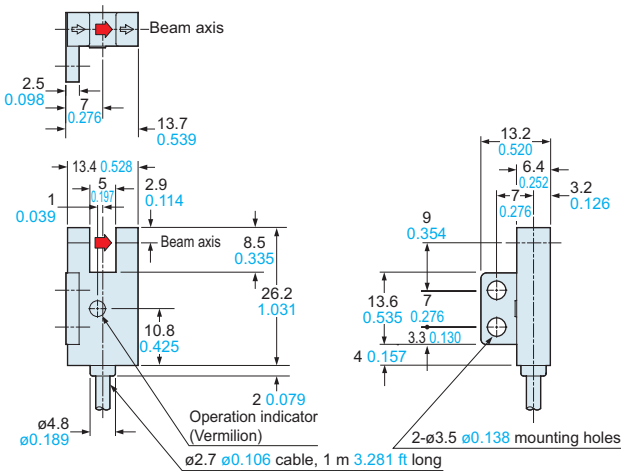

### PM-L44 PM-L44P Sensor



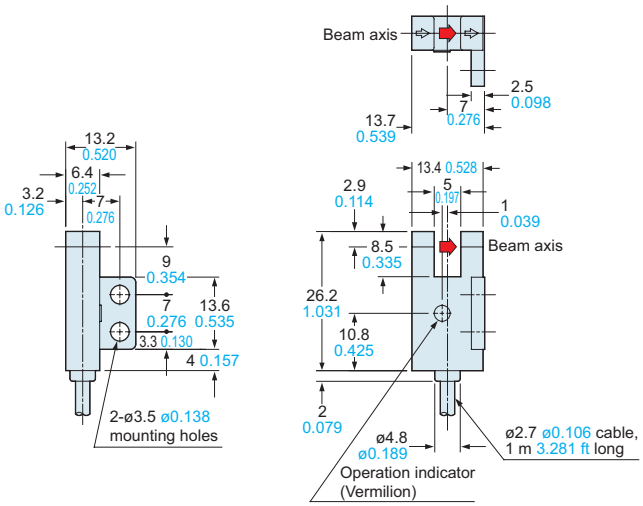

### PM-Y44 PM-Y44P Sensor




### PM-F44 PM-F44P Sensor



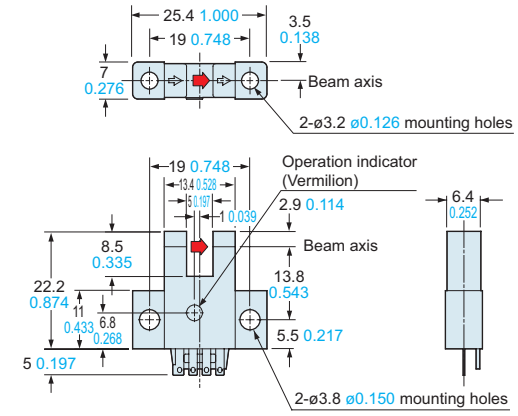

### PM-R44 PM-R44P Sensor



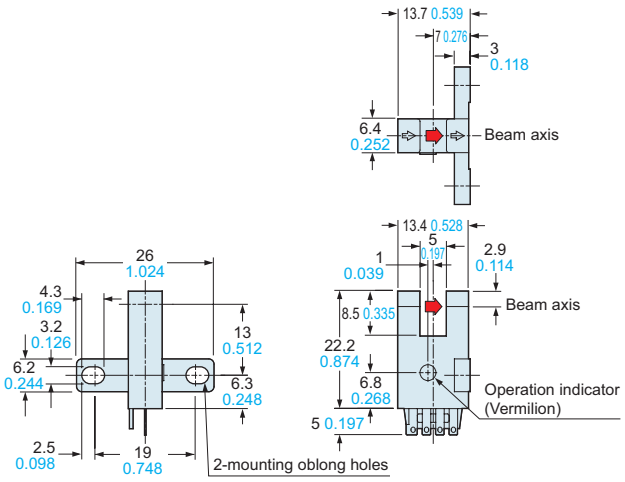
## DIMENSIONS (Unit: mm in)

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

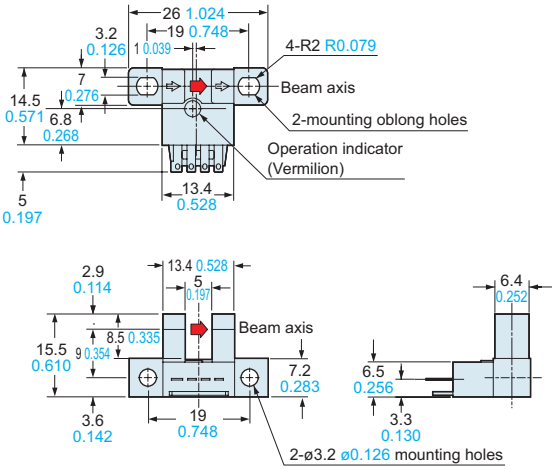
### PM-K54 PM-K54P — Sensor



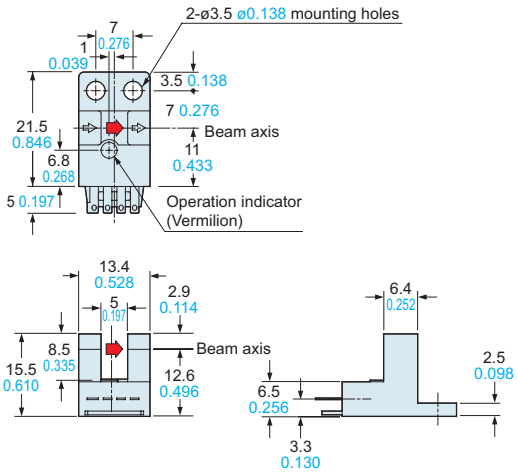

### PM-T54 PM-T54P — Sensor



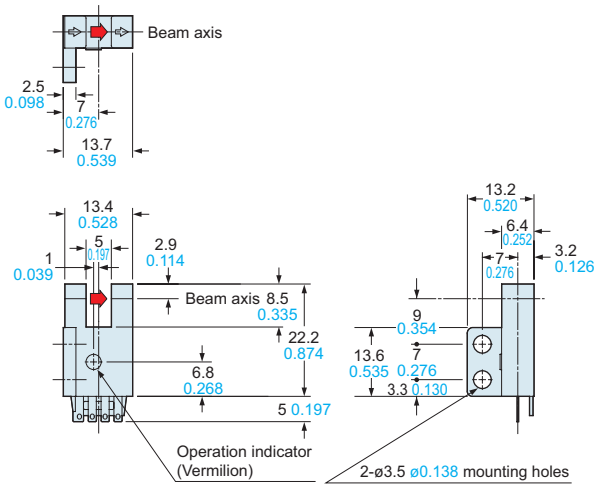

### PM-L54 PM-L54P — Sensor



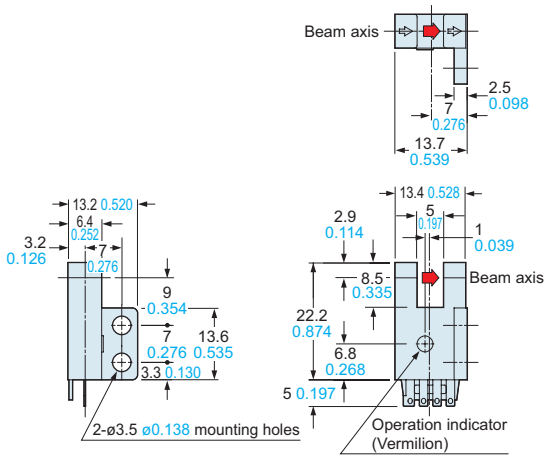

### PM-Y54 PM-Y54P — Sensor




### PM-F54 PM-F54P — Sensor



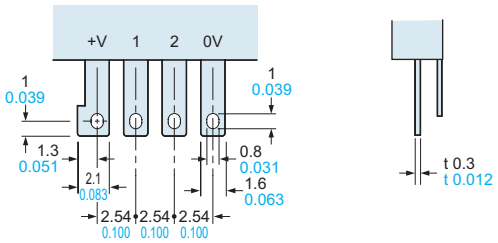

### PM-R54 PM-R54P — Sensor



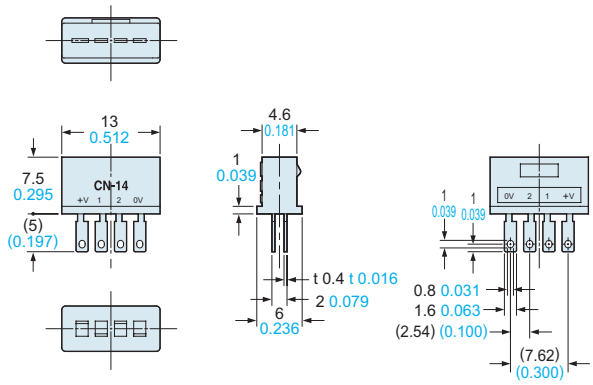
## DIMENSIONS (Unit: mm in)

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

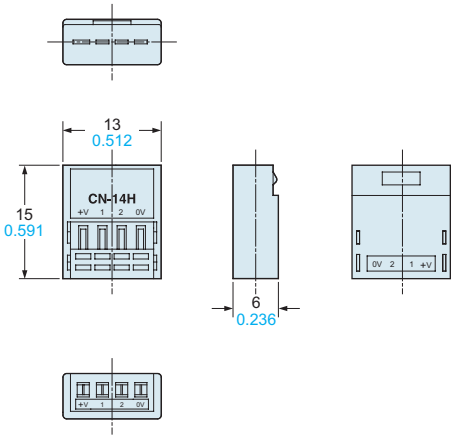
### * Terminal part (PM-□54, PM-□54P)



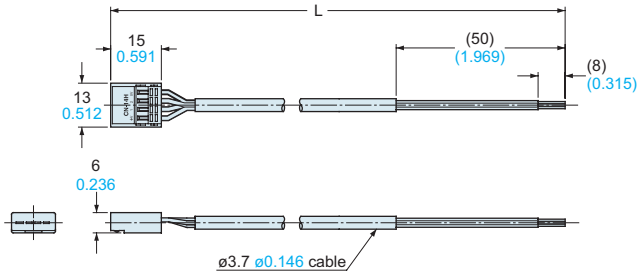

### CN-14 — Connector (Optional)




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




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




• Length L

| Model No. | Length L |
|---|---|
| CN-14H-C1 | 1 m 3.281 ft |
| CN-14H-C3 | 3 m 9.843 ft |

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