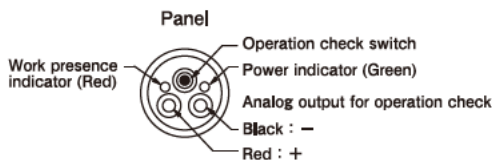
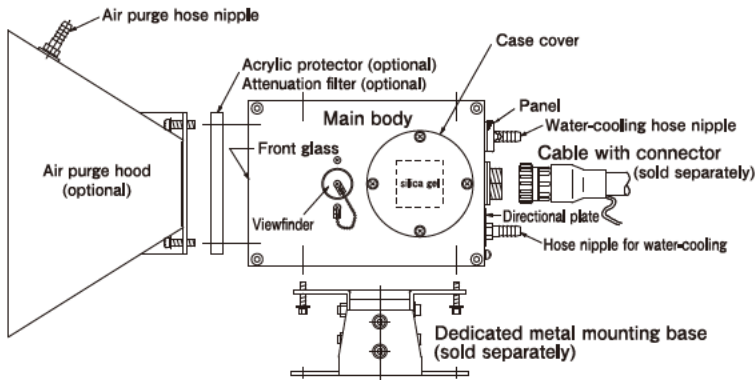


1 PARTS DESCRIPTION



2 SAFETY PRECAUTIONS

To ensure safety, be sure to follow the precautions below.

1. Do not use this product for safety critical applications.
2. Do not use this product when its housing or cable is damaged.
3. Do not attempt to disassemble, repair, or modify this product.
4. Do not use this product in an environment containing flammable, explosive, or corrosive gas.
5. Do not use this product in an environment exposed to chemicals or oil.
6. Do not use this product in an environment exposed to water including outdoors or underwater.
7. Use this product within its rated specification.
8. Do not expose this product to direct sunlight.
9. Do not use this product in a place where it is directly exposed to vibration or shock.
10. Do not use organic solvents such as alcohol or thinner to clean the product.
11. Perform a daily operation check, weekly periodical check, and maintenance to ensure correct operation.
12. This product should be disposed of as an industrial waste.

3 PRECAUTIONS FOR OPERATION

1. Be sure to route the sensor cables separate from any power transmission or high voltage line, or else use shielded cables. Using the same conduit or duct as high voltage or power lines will cause malfunctions or damage because of electromagnetic induction.
2. Do not apply excessive force to the cable.
3. The sensor starts operation 100 ms after power is applied. Always power on the sensor prior to loads.
4. The intrinsically-safe related equipment may generate an output pulse when the power is turned off. Turn off the power of the load first.
5. Avoid turning the power on and off consecutively.

4 INSTALLATION

4-1. Connection

Connector the PD801-H5 cable (5m in length, sold separately) to the sensor body.

Connector

Pin No.	Cable color	Description
1	Red, Purple	Power supply 24 VDC
2	Red/White, Purple/White, Black/White	Power supply 0V
3	Black	Analog output 0V
4	Green	Analog output 0 to 10 VDC
5	Green/White	Control (work presence) output 1, 0V
6	Blue	Control (work presence) output 2
7	Blue/White	Control (work presence) output 2, 0V
8	Yellow	Operation check input
9	Yellow/White	Operation check input, 0V
10	Brown	Video monitor output
14	Brown/White	Video monitor output, 0V
11	Peach	Slice timing monitor output
12	Light blue	SENS 1 input (sensitivity setting)
15	Light blue/White	SENS 1 input, 0V
13	Orange	SENS 2 input (sensitivity setting)
16	Orange/White	SENS 2 input, 0V

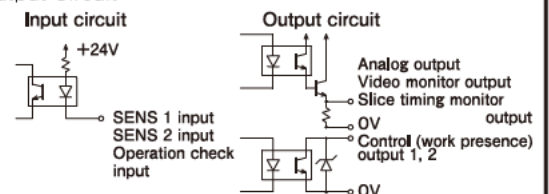
0V is internally common.

The dedicated connector cable (PD801-H5) must be installed in a separate conduit (duct).

Install DC power source in a location within reach of the connector cable (5m). Do not extend the power cable.

To extend the input/output wire, use shielded twisted pair wire of at least 0.5mm² cross-sectional area and a terminal block for connection. The maximum extension distance is 500m.

4-2. Input/Output Circuit



4-3. Sensitivity Adjustment

When connecting 24 VDC, SENS 1/SENS 2 Input is set to "H". When connecting 0V, SENS 1/SENS 2 Input is set to "L".

Sensitivity (100/50/10/5%) is set as shown in the below table according to the combination of H/L setting.

Sensitivity	Sensitivity high				Sensitivity low	
	100%	50%	10%	5%	H	L
SENS 1 Input	H	L	H	L		
SENS 2 Input	H	H	L	L		

When the sensitivity needs to be lowered than "Sensitivity low", attenuation filters (optional) are available.

Model: PD-9000PT25 cuts incoming light down to 25%.

Model: PD-9000PT12 cuts incoming light down to 12%.

4-4. Water-cooling

- When the ambient temperature exceeds 55°C, inject water via the water-cooling hose nipples to cool the sensor unit.
- There is no specified orientation of the water-cooling hose nipple.
- The cooling water temperature should be 10°C to 35°C, and the flow rate should be no more than 2 l/min.
- The resistant pressure is 0.6Mpa.
- The water should be pure water for industrial use. Do not use saline solutions or water with other added chemicals.

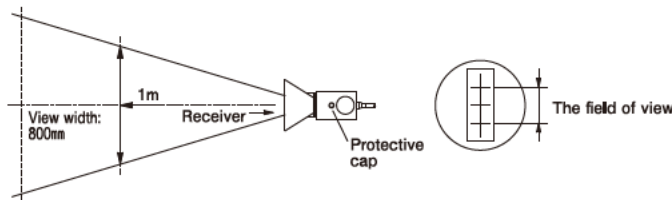
4-5. Air Purge Hood (sold separately)

- In an environment where water vapor or dirt can splash, inject compressed air into the air purge hose nipple for air purge.
- Air flow rate should be no more than 200 l/min. According to the field status, adjust the air flow rate.
- When no air purge is necessary, the hood can be used for dust protection.

5 SETTING

5-1. Field of View

- Direct the sensor toward the detection target.
- Remove the protective cap on the side of the sensor unit, and the image of the field of view is obtained through the viewfinder.
- Formed by a wide angle lens, the view image is reversed, inverted and small in size.
- From the center of the viewfinder scale, the range of one mark on each side of the scale shows an approximate size of the field of view of the sensor.



- The detection position and the width of the field of view can be checked through the viewfinder by using a handy light.

5-2. Scanning Direction

The scanning direction is fixed.

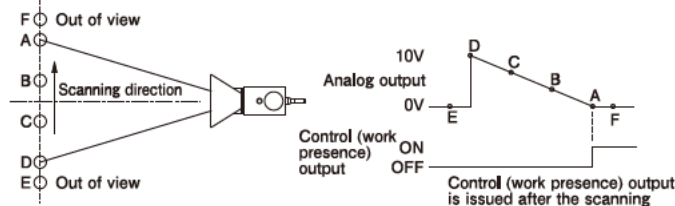
The scanning direction is stated on the directional plate beside the connector on the rear side of the sensor.

Directional plate The arrow mark ↑ indicates the scanning direction.



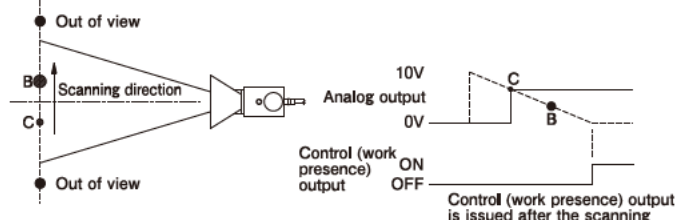
※The scanning direction can be reversed by changing the position of the dedicated metal mounting base.

- When a single work (hot steel bar) moves within the detection field of view, the analog output changes according to the detection position as below.



This figure shows how the output voltage varies when a single work article moves from D to A.

- When multiple works (hot steel bars) exist in the same field of view, the position of the first-detected work is output.



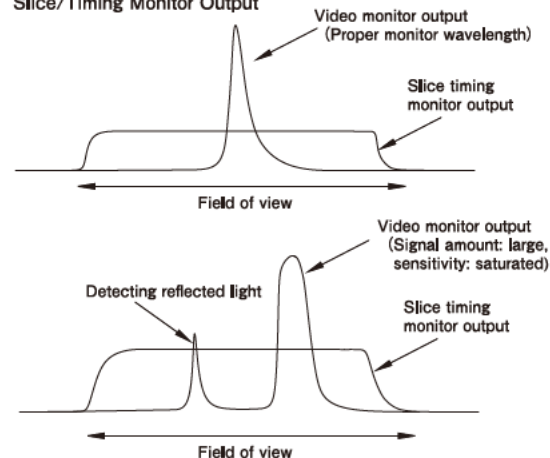
This figure has two work articles (hot steel bars) in positions B and C; the work at position C is output in analog, as it is initially detected by the scanning operation across the field of view. When the work C moves out of the field of view, then the position of work B is output.

5-3. Monitor Output

By connecting an oscilloscope to the video monitor output and slice timing monitor output, the detection status can be checked.

- Use the waveform of the slice timing monitor output to visually confirm the field of view (see the waveform example).
- The waveform of video monitor output shows the position and the temperature (strength of the received light intensity) of the work (hot steel bars).
- The above two waveforms can be used to check the work position within the field of view.
- When the work temperature is too high or the work is too large, the video monitor output becomes large in width. When this occurs, adjust the sensitivity to obtain a proper waveform. See 4-3. Sensitivity Adjustment (waveform example).
- When unwanted reflected light is present within the field of view, the waveform of the video monitor output indicates it (see the waveform example). When this occurs, adjust the sensitivity so that the sensor is free from interference from the reflected light.
- To determine the proper mounting position, an incandescent or halogen light may be used as a test article instead of hot steel bars.

Waveform example: Typical Wavelength of Video Monitor Output and Slice/Timing Monitor Output



5-4. Operation Check Switch and Operation Check Input

Inside the protective cap on the rear side of sensor, there are: work presence indicator (red), operation check switch, and analog output terminals for testing.

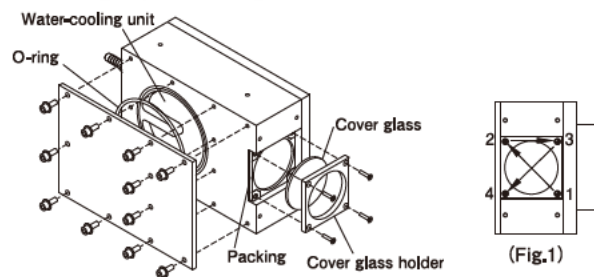
- Pressing the operation check switch enables an operational check of the sensor.
- When the sensor is correctly operated, the work presence indicator turns on, control (work presence) outputs 1 and 2 are activated, and approx. 10 VDC is output at the analog output terminals.

Short circuiting of the operation check inputs (Pin 8 and Pin 9) also enables the above operational check.

6 MAINTENANCE

6-1. Daily Maintenance

- When a work article is not present, use the operation check switch or a test article such as a handy light (see Note) to check whether the work presence indicator turns on. (Note) LED light cannot be used for checking.
- Move the test article within the range of the field of view, and check the output voltage using the analog output terminals.
- When the front glass becomes dirty, remove the air purge hood and wipe with a soft cloth. To clean the inside surface of the glass, remove it by following the steps below:
 - Remove the air purge hood.
 - Remove the SUS screws M3×15mm which hold the cover glass.
 - Remove the cover glass and the packing for cleaning.
 - Assemble in reverse order of removal.
 - The screw tightening torque is 0.3 to 0.5 N·m. Gradually tighten the screws across diagonals as in Fig.1. Do not overtighten, or else the cover glass holder may be deformed, resulting in poor sealing.



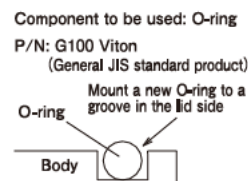
6-2. Replacing Desiccant

- Silica gel is placed in the round case cover on the side of the sensor unit. Replace it when the desiccating effect is lost due to dew condensation inside for example.
- Component to be used
Silica gel 10g, packed in a square vinyl bag

6-3. Cleaning of Water-Cooling Unit, Replacing Packings

No daily maintenance is needed, but clean to remove water scale or other dirt once in approx. three years.

- Loosen and remove the hexagon socket head bolt from the lid of the water-cooling unit.
- Removing the lid finds the water-cooling unit and an O-ring for waterproof.
- Replace the O-ring with the new one.
- Assemble in reverse order of removal.



7 SPECIFICATION



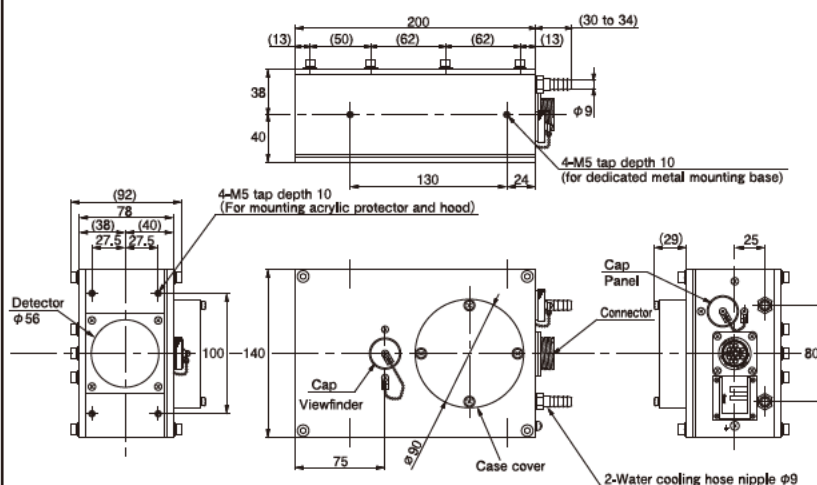
Model		HMPD9000	HMPD9001
Detection method		CCD scanning	
Detectable temperature		680°C or higher	
Field of view		800mm / 1m	400mm / 1m
Resolution capacity		Field of view × 1 / 256	
Diameter of minimum detectable object		Field of view × 2 / 256 or more	
Power supply		24 VDC ±10% ripple 10% or less	
Current consumption		200mA or less	
Output mode	Analog voltage	Rated voltage: 0 to 10 VDC, ±5% Output impedance: 47Ω	
	Control output (Work presence output)	NPN open collector 2 outputs Rated voltage: Sink current 100mA (30 VDC) or less ※Automatic reset fuse	
Operational mode		Voltage output in proportion to the position of radiation	
Response time		10 ms or less Control (work presence) output 1, 2	
Indicators		Power indicator (Green LED) Work presence indicator (Red LED)	
Adjustment function		Operation check switch SENS1 input (sensitivity setting) SENS2 input (sensitivity setting)	
Monitoring function		Video monitor output, Slice timing monitor output	
Material		Enclosure: aluminum Lens: glass	
Connection		Connector (twisted pair cable)	
Weight		Approx. 5 kg	
Accessories		Instruction manual	

Environmental specification

Ambient illuminance	500 lx or less
Ambient temperature	-10 to +55°C (no freezing, no condensation) At water-cooling: +80°C
Ambient humidity	35 to 85%RH
Protection structure	IP 66
Anti-vibration	10 to 55Hz, double amplitude 1.5mm X, Y, Z directions, 2 hours each

8 DIMENSIONS (Units: mm)

HMPD9000 HMPD9001

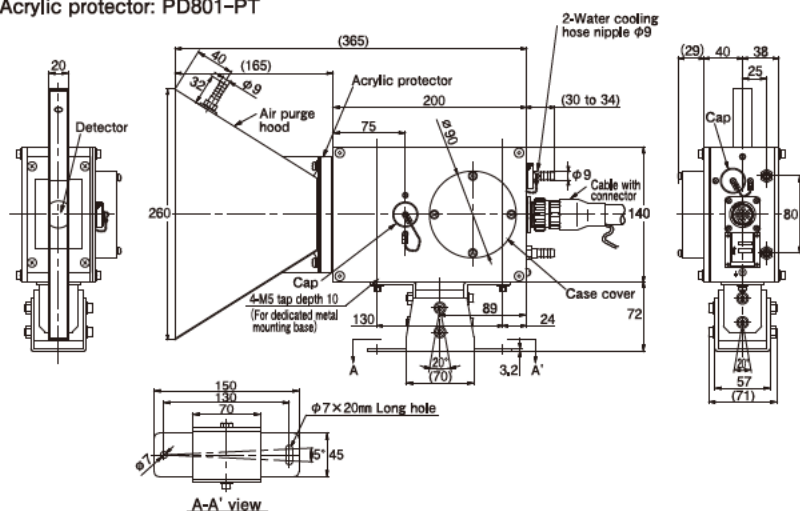


Typical combination of air purge hood and dedicated metal mounting base

Air purge hood: F800

Dedicated metal mounting base: IMAHL1

Acrylic protector: PD801-PT

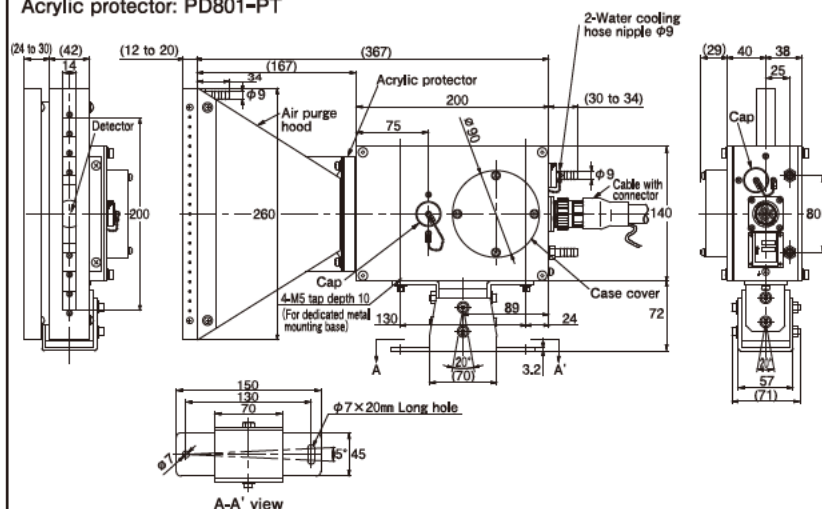


Typical combination of air purge hood and dedicated metal mounting base

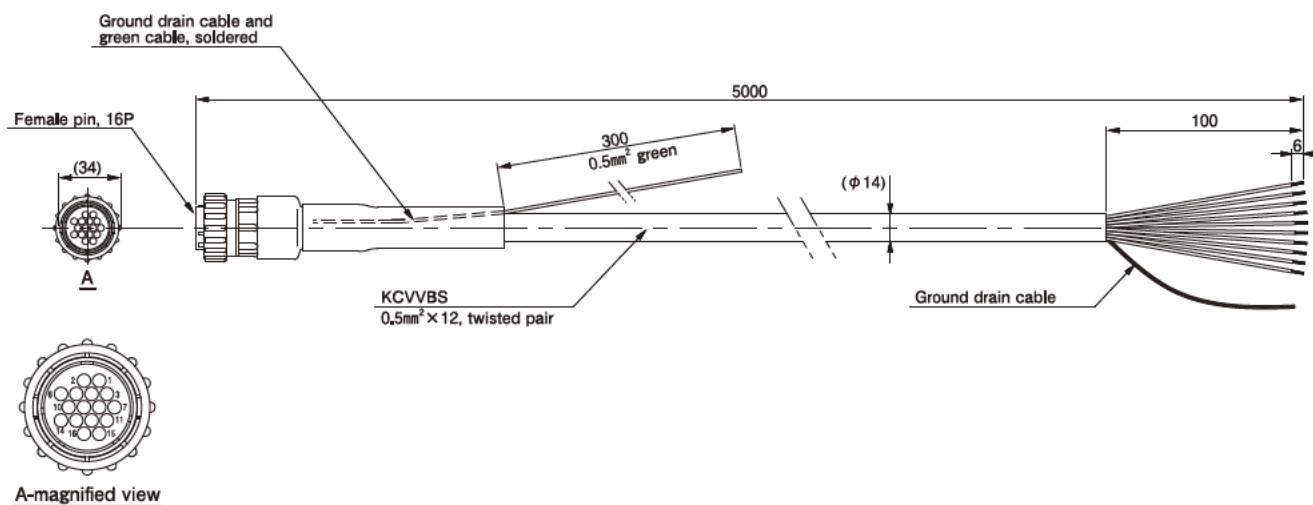
Air purge hood: F880

Dedicated metal mounting base: IMAHL1

Acrylic protector: PD801-PT



Cable with connector PD801-H5



9 WARRANTY

The product is covered by a warranty based on the Quality Regulations of Takenaka Electronic Industrial Co., LTD. (Takenaka). Regarding the warranty, please feel free to ask any questions to Takenaka, Takex sales office or authorized distributors.

1 《Warranty period》

The warranty period is one (1) year after delivery to a designated location. This warranty does not apply to expendable supplies like batteries or relays, and products of other manufacturers which Takenaka markets.

2 《Scope of warranty》

If any defect is found during the warranty period, Takenaka will, at its option, repair or replace the defective product at the location of delivery. This warranty is void and of no effect if the product is subject to improper use or handling, improper maintenance, modification, repair made by persons not authorized by Takenaka or a lack of reasonable care. The warranty does not cover defects caused by the other product, reason including fire, flood, earthquake, lighting surge and other natural disasters.

- ① If the product is used inappropriately or used under inappropriate conditions that are not described in the instruction manual or specifications.
- ② If the defect is caused by improper maintenance, including a failure to replace consumable or periodical parts as described in the instruction manual or specifications.
- ③ If the defect is not directly caused by the warranted product.
- ④ If the products is modified or repaired by persons not authorized by Takenaka.
- ⑤ If the defect is caused by rough handling, dropping, or collision after the product is delivered.
- ⑥ If the defect could not be predicted from a technical viewpoint at the time Takenaka made the agreement for, manufactured, or installed the product.
- ⑦ If the defect is caused by a natural disaster such as a fire, flood, earthquake, lightning (including a lightning surge) and so on, or an accident such as an abnormal voltage that Takenaka is not responsible for.

The warranty provided here is only for the Takenaka product and does not cover any secondary damage caused by problems related to the product.

3 《Target of Warranty》

- (1) In case that the product is used in combination with other products or as a part of a system, Buyer should confirm the compatibility of the product to the application by relevant laws, decrees, standards and regulations.
- (2) This product is designed and manufactured for use in general industries. This warranty does not cover the application of the product to:
 - ① Nuclear power facilities including power station, incineration plant, public utilities including railway, vehicle and airway facilities, medical devices, amusement machines, safety devices and facilities that are governed by regulation of government or industrial organization.
 - ② Facilities that may cause danger or serious effects on human life and assets.
 - ③ Utilities like electricity, gas or water facilities. Facilities that are required 24 hour continuous operation.
 - ④ Outdoor use or use in improper conditions or environment.
 - ⑤ Other facilities which requires broad and detailed consideration concerning safety and reliability equivalent to the above.

This warranty may cover these application in case that Takenaka is notified about the application of the product before sale and Buyer approves the compatibility and the specifications of the product by written agreement and / or by providing required safety measures.

10 DISCLAIMER

- This product is designed to detect a presence or passage of an object. This product does not have any function to prevent accidents, death or injuries.
Takenaka will assume no responsibility for damages or losses resulting from accidents or disasters caused by a failure of the product, complete wiring or installation or any act that does not follow the instruction manual.
- Earthquakes, lightning (including lightning surges), fires that we are not responsible for, acts or incidents caused by third parties, intentional or accidental misuse, or usage under other abnormal conditions.
- Any secondary damage caused by the usage, faulty operation, or malfunction of the product like suspended operation or malfunction of a connected device or system, damage to a device, loss of profit, interruption of business, corruption or loss of memory contents, cost of restoration, etc.
- Misuse, failure related to maintenance, installation or deinstallation, or failure to follow the contents of the instruction manual.
- Any malfunction (including false alarm or lost alarm) caused by the combination with a connected device or software over that we have no control.
- The responsibility of Takenaka is limited to the extent of repair or replacement of the product. The expenses we are liable for will not exceed the original product cost.