

- Thank you for using **TAKEX** products.
- Please read this manual carefully prior to use the sensor.

1 Outline

The HD Series sensors directly detect infrared rays radiated from an object heated to a high temperature and output signals, and a set of sensors is composed of an amplifier unit and a receiver. Receivers come in two different types : cord connection (direct reception) and fiber optic (detachable/fixed fiber optic unit) types. Also the cord connection (direct reception) type includes high-temperature and low-temperature detection types. The operation mode can be selectable between on-delay, off-delay, one-shot and timer disabled with the operation setting DIP switch. In addition a DIN standard rail of 35 mm in width may be used for securing the socket.

2 Detection ability

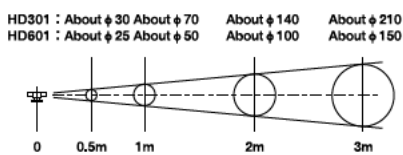
Part numbers and detection temperature

Amplifier unit	Optical receiver	Fiber optic unit	Detection temperature at a coverage ratio of 100% (ε=0.8 Fe)
HDA300A	HD301N		350°C min.
	HD601N		650°C min.
	HD400	GT205 (0.5m)	430°C min.
		GT21 (1m)	440°C min.
		GT22 (2m)	460°C min.
		GT23 (3m)	490°C min.
HD502F		560°C min.	

3 Detection Field of View Characteristics (Typical example)

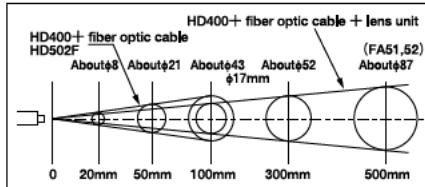
● Cable type

Model HD301N (HD301)
Model HD601N (HD601)



● Fiber type

Model HD400
Model HD502F



4 Specifications

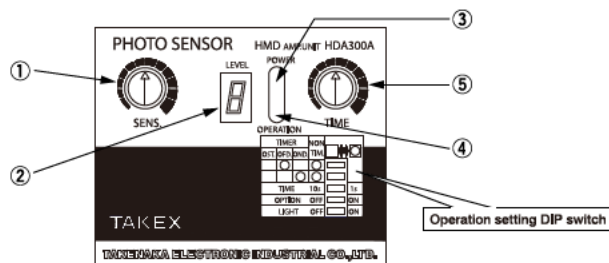
Specifications (Detector)

Models	HD301N (HD301)	HD601N (HD601)	Fiber optic type	
			HD400	HD502F
Wiring	Flying lead 20m length		Flying lead 20m	Flying lead 2m
Ambient temperature	-25 to +70°C		-25 to +70°C	
			Fiber unit -20 to +200°C	Fiber (+70°C)
Ambient humidity	35 to 85%RH		35 to 85%RH	
			Fiber unit 95%RH max. (70°C min. 20%RH max.)	
Withstand voltage	Case grounded		1500VAC for 1 minute	Case grounded
Insulation resistance			500VDC mega 20MΩ min.	
Protection	I P66		I P40	I P66

(Amplifier)

Model	HDA300A
Power supply	AC100 to 110V/AC200 to 220V ±10%, 50/60Hz
Current consumption	5VA Max.
Output mode	Relay output/Voltage output
Rating	Relay output : 1C AC250V 5A (Max.) (resistive load)
	Voltage output : 12VDC 5mA (Max.)
Operation mode	Light reception (for detection of heated material) : Selectable ON/OFF operation
	Timer selectable
	Timer : On-delay, Off-delay, One-shot and None timer selectable
Time	0.1 to 1 s / 1 to 10 s selectable
Response time	Relay output : 25ms, Voltage output : 3ms
Wiring	Terminal block (screw diameter : 3.5mm)
Protection	I P20

5 Panel description (HDA300A)



- ① SENS. Sensitivity adjustment volume
Turning right (clockwise) increases the sensitivity and decreases the detection temperature.
- ② LEVEL. Level indicator : Provides digital indication of the received light intensity. The preset operation level is approx. 2.5. "H" is shown for level 9 or higher, indicating saturation.
LEVEL 5 : Double the operation level
LEVEL H : Over quadruple the operation level.
- ③ POWER. Power indicator : Illuminates while the power is supplied.
- ④ OPERATION. Operation indicator of light reception : Illuminates for light reception (detection).
- ⑤ TIME. Timer adjustment volume : Turning right (clockwise) increases the time.

Operation setting DIP switch :

Used to set the timer mode/operation mode.

TIMER			NON		(Turn the switch left for OFF and right for ON)
OST	OFD	OND	TIM		
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sw 1, 2 : Timer operation mode setting is made by the combination of two switches.
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
TIME			10s	1s	Sw 3 : Select the timer range between up to 1s or 10s.
OPTION			OFF	ON	Sw 4 : Option switch.
LIGHT			OFF	ON	Sw 5 : Turn OFF to invert the output logic.

(The operation DIP switch settings shown above indicate the factory settings.)

6 Adjustment

For easy adjustment, disable the setting of Sens. Down (SENS. Down) and Sens. Up (SENS. Up) on the timer mode (NON TIM Sw 1 : ON, Sw 2 : ON).

- ① Turn the sensitivity adjustment volume on the amplifier unit (SENS.) right all the way to the maximum sensitivity (clockwise).
- ② Adjust the sensitivity in the following cases :
 1. Sensor activated by the external light.
 2. Sensor activated sooner by reflection when high-temperature detection object approaches. Sensor stays activated due to reflection even after the heated material has passed.
 In any of the cases above, change the location of the receiver or decrease the sensitivity. When decreasing the sensitivity, adjust so as to achieve the level indication of "5" or higher at the time of detection.

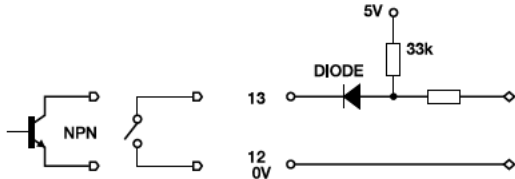
7 Operation

External gate (external synchronization)

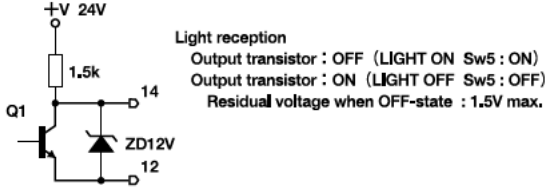
Terminals No. 12 and 13 are for external gate.

When not using external gate, leave the terminals open.

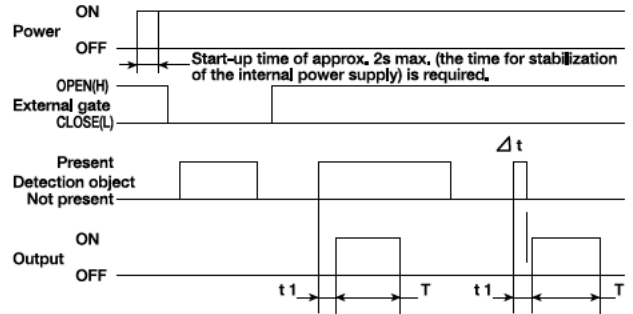
Short-circuiting terminals No. 12 and 13 disables the light reception operation. Provide contact or open collector for operation.



Output circuit



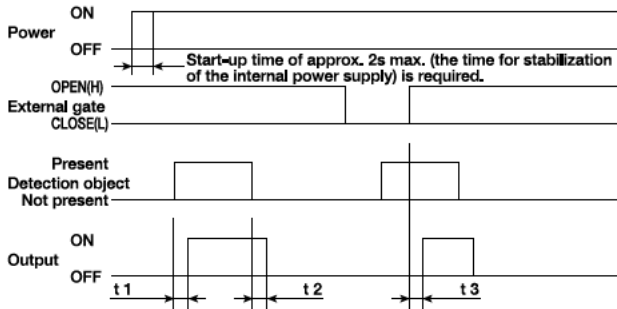
Timer operation (one-shot) (OST Sw 1 : OFF Sw 2 : OFF Sw 5 : ON)



t_1 : Response delay time = 25 ms max. for relay output, 3 ms max. for voltage output
 T : Timer time Δt : Minimum trigger time = 3 ms min. (minimum duration of light reception that enables trigger acceptance)

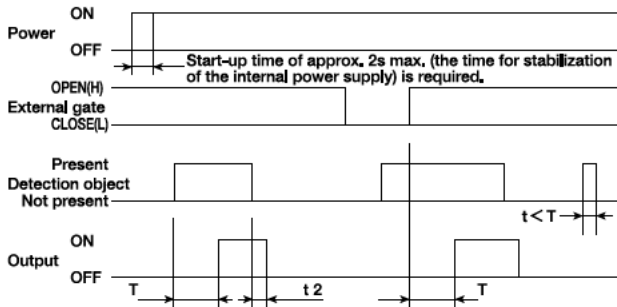
8 Timer Function

With the timer disabled (NON TIM Sw 1 : ON Sw 2 : ON Sw 5 : ON)



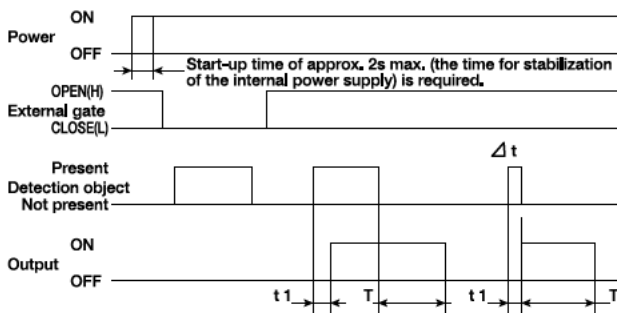
t_1, t_2 : Response delay time = 25 ms max. for relay output, 3 ms max. for voltage output
 t_3 : Gating delay time = 5 ms max.

Timer operation (on-delay) (OND Sw 1 : OFF Sw 2 : ON Sw 5 : ON)



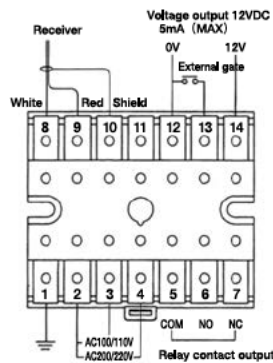
t_2 : Response delay time = 25 ms max. for relay output, 3 ms max. for voltage output
 T : Timer time

Timer operation (off-delay) (OFD Sw 1 : ON Sw 2 : OFF Sw 5 : ON)



t_1 : Response delay time = 25 ms max. for relay output, 3 ms max. for voltage output
 T : Timer time Δt : Minimum trigger time = 3 ms min. (minimum duration of light reception that enables trigger acceptance)

9 Wiring



- Be sure to limit the length of the receiver cable within the length of the cable originally provided and wire it separately from power supply lines. Extension of the cable or insecure connection of the shielded line may cause susceptibility to induction, which may lead to faulty operation.
- Be sure to connect the grounding terminal. Failure to ground may cause faulty operation due to induction.
- Short-circuit the external gate terminals (No.12 and 13) disables the output circuit. Connect a contact or open collector. When not using external gate, leave the terminals open.

10 Installation

Receiver

Use a mounting base not subject to vibration, etc.

Use two M6 bolts for mounting.

(Prepare bolts, nuts, washers, etc.)

Amplifier unit

Method for inserting or detaching the amplifier main unit into/from the socket and the socket into/from the rail

(1) Amplifier main unit and socket

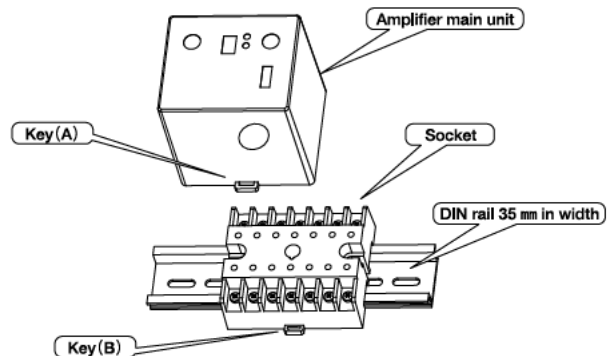
◆ Pull the white key (A) on the plug side and detach while moving the main unit up and down. Attempting to detach without pulling the key (A) may damage the amplifier main unit and the socket.

◆ To insert, it is possible to insert into the socket while the key (A) being pressed. Make sure that the key (A) is pressed after insertion.

(2) Rail and socket

◆ Put the top of the socket on the rail and press down. The socket is secured when it clicks.

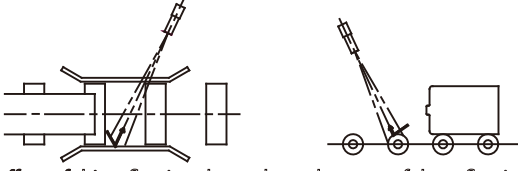
◆ To detach, pull the key (B) and pull the socket at an angle.



11 Installation location

Take note of the reflection.

If the detection object (heated material) is large and heated to a high temperature, the radiation may be reflected on the rollers, manipulator, side guide of the line, etc. when the material approaches and the receiver may be activated even if the material is outside of the detection field of view.



The effect of this reflection depends on the state of the reflection surface, type of the heated material, location of the receiver, etc. However the reflection may become equivalent to the heated material of 500 to 700°C if it is as large as an ingot or slab, etc. In such a place, install the receiver so as to ensure that the reflection surfaces such as rollers, etc. are out of the detection field of view.

External light

Visible light rays are completely cut off. However do not install the receiver in a location where rays of sunlight, incandescent lamps, etc., which have an infrared range, enters the receiver directly or by reflection. If it is unavoidable to install in a location that may subject to external light, use a light shielding plate (iron plate, etc.) for blocking the light.

- Examples of measures against external light

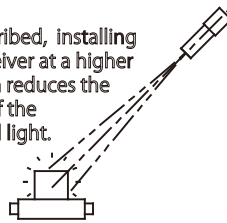
Ex. 1)

Light shielding plate (in this case, ensure that there is no effect of the reflection from the heated material as described above)



Ex. 2)

As described, installing the receiver at a higher location reduces the effect of the external light.



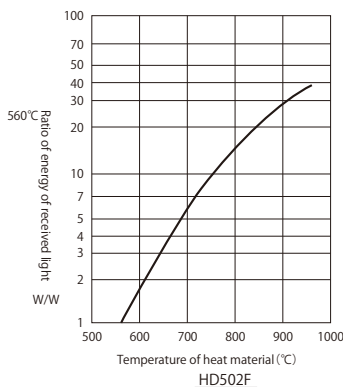
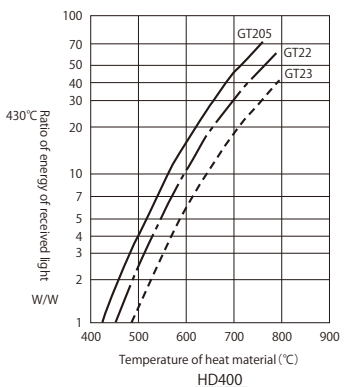
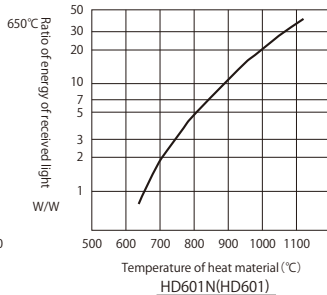
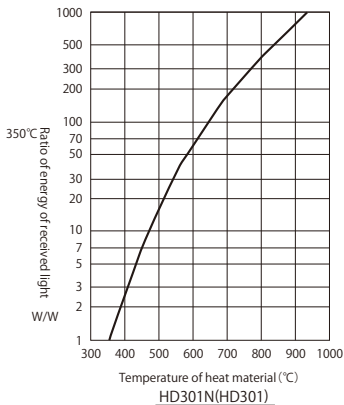
12 Data

Heated material temperature-received light energy ratio

This data shows how the received light energy (received light intensity) changes against the temperature of the heated material changes.

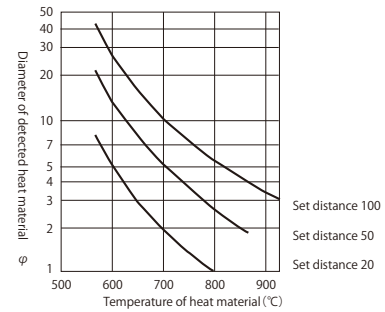
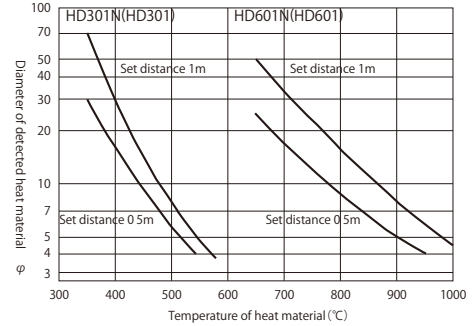
It is used for calculating the margin of the detection heated material. Take the data for HD301 (DATA : 1) as an example. It shows that when the detection heated material temperature is at 600°C, approx. 67 times higher received light energy (received light intensity) can be obtained compared to the detection heated material temperature at 350°C.

Also it means that when the heated material temperature is at 800°C, approx. 6 times higher received light energy (received light intensity) can be obtained compared to the detection heated material temperature at 600°C.

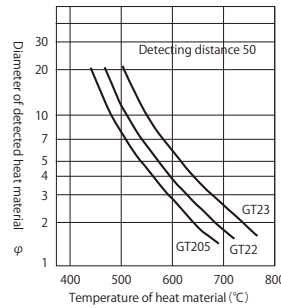


Minimum detection object diameter

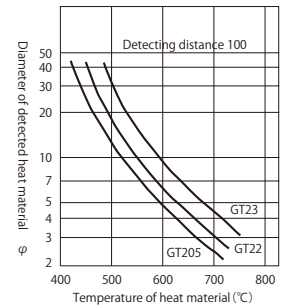
Indicates the thickness (diameter) of the detection heated material against the heated material temperature. For example, when HD301 is used as the receiver, the lowest detectable temperature of a steel bar of $\phi 20$ is approx. 425°C at a setting distance of 1m. The data only refers to specific setting distance. For other setting distances, multiply the ratio of each setting distance (ratio with reference to the respective setting distance data) by the diameter of the detection heated material in the data. For example, when HD301 is used at a distance of 2m, multiply the diameter of the detection heated material in the data by 2, since the setting distance 2m is double 1m.



HD502F The lowest detection heat material diameter



HD400 The lowest detection heat material diameter



13 Precautions

- It takes approx. 2s for the internal power supply to stabilize after turning on the power, during which no signal is output.
- Be sure to limit the length of the receiver cable within the length of the cable originally provided and wire it separately from power supply lines. Extension of the cable or insecure connection of the shielded line may cause susceptibility to induction, which may lead to faulty operation.
- Be sure to connect the grounding terminal. Failure to ground may cause faulty operation due to induction.
- Avoid any application that forces turning ON/OFF the power switch continuously.
- The relay cannot be replaced. Use as an auxiliary relay for longer service life.
- Be informed that the output may be activated instantaneously when the power is switched OFF.
- Appropriate handle of the fiber optic unit

Do not bend too much.

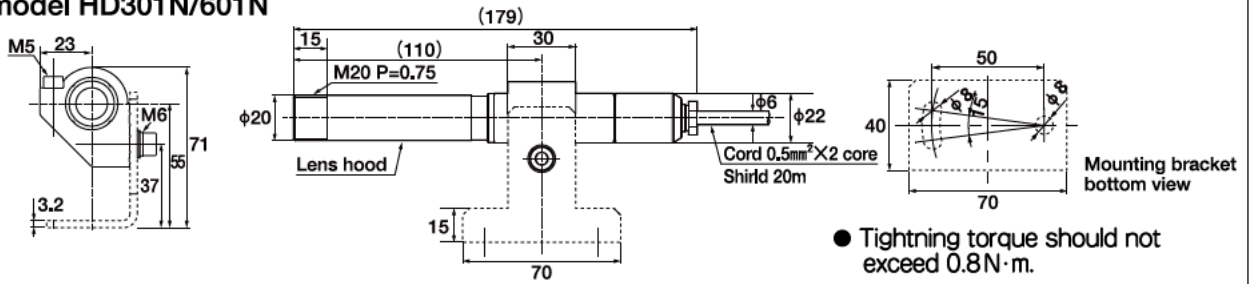
The fiber optic unit contains glass fiber (optical fiber) inside. An extremely small bending radius may damage the fiber optic unit. Conform to the bending radius tolerable range.

Do not pull.

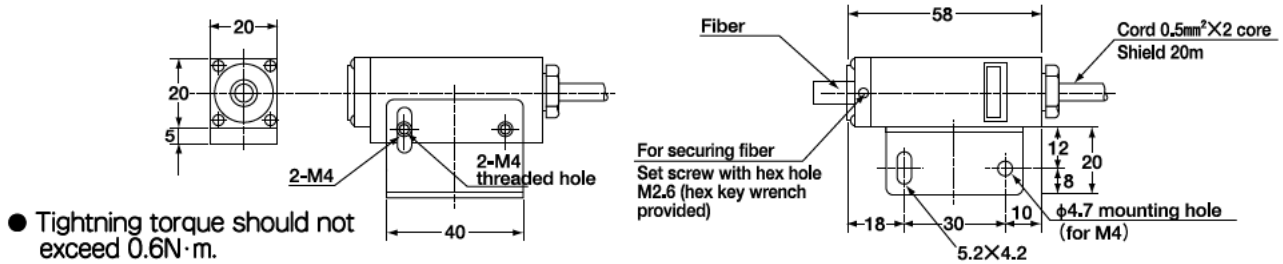
Ensure that the unit is not pulled by force. Provide an appropriate extra length.

14 Dimension (in mm)

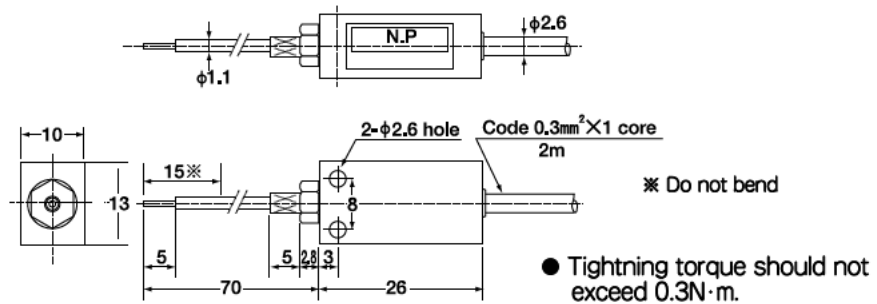
(Sensor) model HD301N/601N



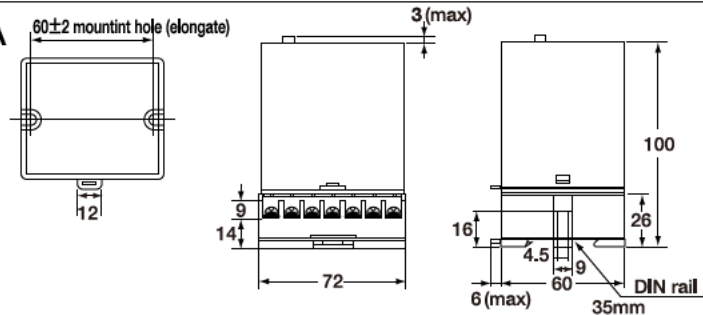
(Sensor) model HD400



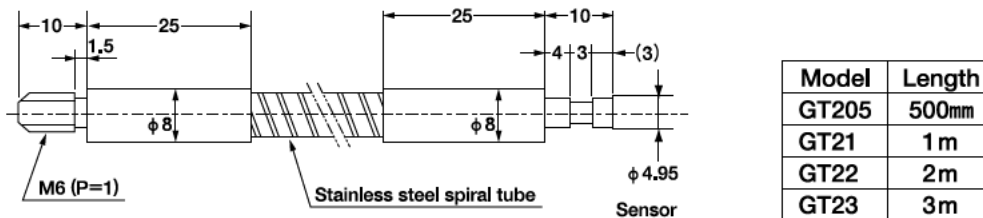
(Sensor) model HD502F



(Amplifier) model HDA300A



(Fiber) GT series



- This sensor is designed to detect a specific object. It is not provided with control functions for prevention of injuries or accidents in itself.
- Takex will not held responsible for any damage or loss incurred due to accidents, faulty installation, abuse, misuse, improper maintenance or acts of God including lightning surge.
- Specifications and dimensions may be subject to change without notice.