

- 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 35mm in width may be used for securing the socket.

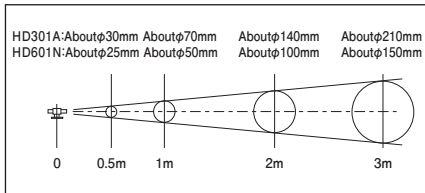
2 DETECTION ABILITY

Part numbers and detection temperature

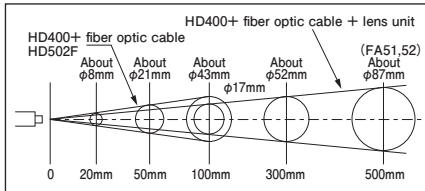
Amplifier unit	Optical receiver	Fiber optic unit	Detection temperature at a coverage ratio of 100% (ε=0.8 Fe)
HDA300A	HD301A		370°C min.
	HD601N		650°C min.
	HD400	GT205 (0.5m)	430°C min.
		GT21 (1m)	440°C min.
		GT22 (2m)	460°C min.
HD502F	GT23 (3m)	490°C min.	
			560°C min.

3 DETECTION FIELD OF VIEW CHARACTERISTICS (Typical example)

- Cable type
Model HD301A
Model HD601N



- Fiber type
Model HD400
Model HD502F



4 SPECIFICATIONS

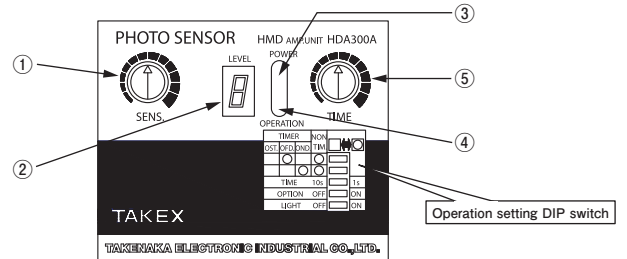
Specifications (Detector)

Models	HD301A	HD601N	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	
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 P 66		I P 40	I P 66

(Amplifier)

Model	HDA300A
Power supply	AC100/110V · AC200/220V ±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
	On-delay, Off-delay, One-shot and None timer selectable
Timer	0.1 to 1s / 1 to 10s selectable
Response time	Relay output : 25ms, Voltage output : 3ms
Wiring	Terminal block (screw diameter : 3.5mm)
Protection	I P 20

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		
OST	OFD	OND	TIM
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TIME	10s	<input type="checkbox"/>	1s
OPTION	OFF	<input type="checkbox"/>	ON
LIGHT	OFF	<input type="checkbox"/>	ON

(Turn the switch left for OFF and right for ON)

← Sw 1, 2 : Timer operation mode setting is made by the combination of two switches.

← Sw 3 : Select the timer range between up to 1s or 10s.

← Sw 4 : Option switch.

← Sw 5 : Ensure that it is always OFF when using. 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. Up ↑

- 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 :

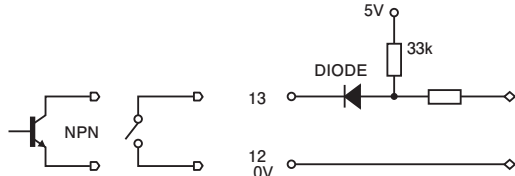
1. Sensor activated by the external light.
2. Sensor activated sooner by reflection when high-temperature detection object approaches. Sensor stays activated due to reflection even after the heated material has passed.

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.

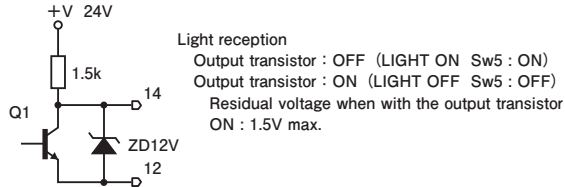
7 OPERATION

External gate (external synchronization)

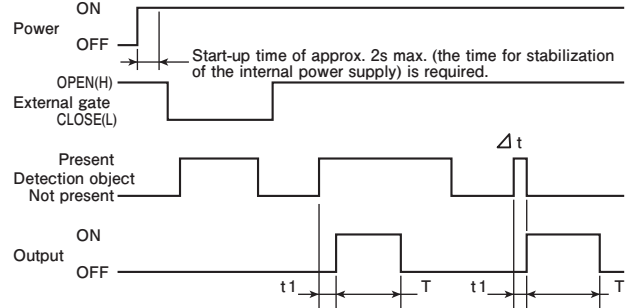
Terminals No. 12 and 13 are for external gate.
When not using external gate, leave the terminals open.
Short-circuiting terminals No. 12 and 13 disables the light reception operation. Provide contact or open collector for operation.



Output circuit



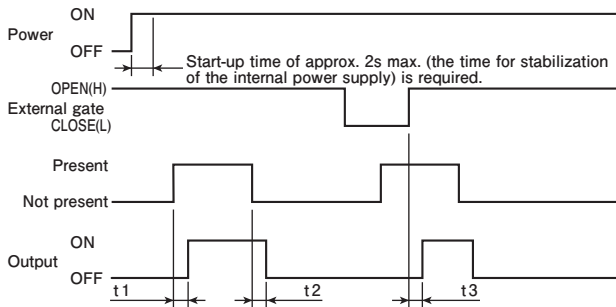
Timer operation (one-shot) (OST Sw 1 : OFF Sw 2 : OFF Sw 5 : ON)



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

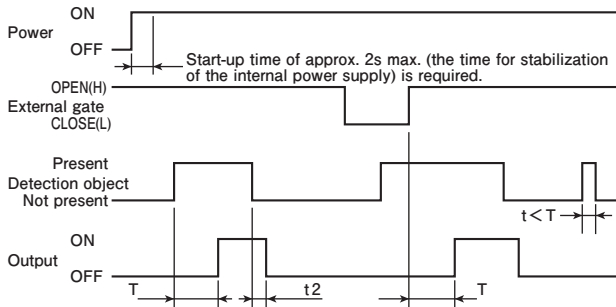
8 TIMER FUNCTION

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



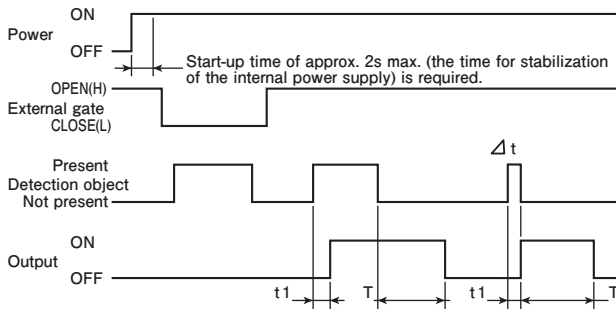
t_1, t_2 : Response delay time = 25ms max. for relay output, 3ms max. for voltage output
 t_3 : Gating delay time = 5ms max.

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



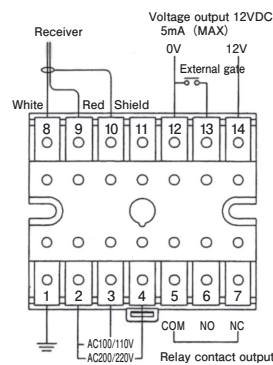
t_2 : Response delay time = 25ms max. for relay output, 3ms max. for voltage output
 T : Timer time

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



t_1 : Response delay time = 25ms max. for relay output, 3ms max. for voltage output
 T : Timer time Δt : Minimum trigger time = 3ms 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.
For installation, use two M6 bolts for HD301A and HD601N, and two M4 bolts for HD400 to secure. For HD502F, secure using the included screws. (Prepare any bolts, nuts, and/or washers as necessary.)

Amplifier unit

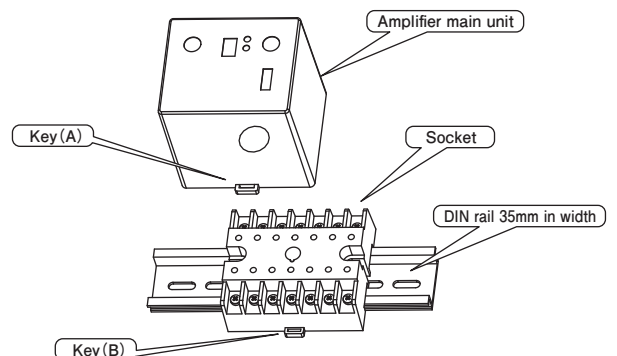
Method for inserting or detaching the amplifier main unit into/from the socket and the socket into/from the rail

(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) is being pressed. Make sure that the key (A) is pressed after insertion.

(2) Rail and socket

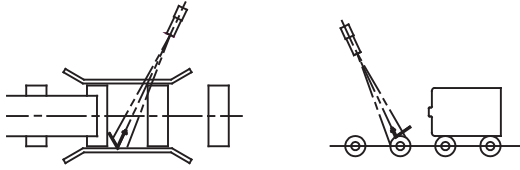
- Put the top of the socket on the rail and press down. The socket is secured when it clicks.
- To detach, pull the key (B) and pull the socket at an angle.



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

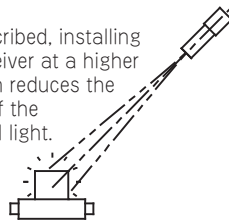
Ex. 1)

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



Ex. 2)

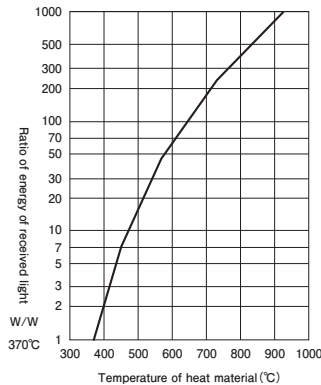
As described, installing the receiver at a higher location reduces the effect of the external light.



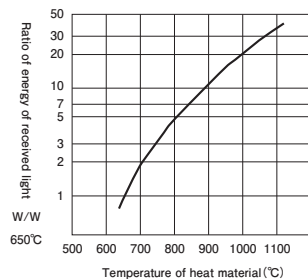
12 DATA

Heated material temperature-received light energy ratio

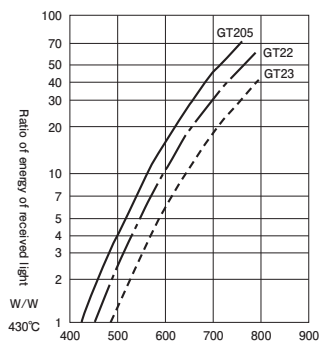
This data shows how the received light energy (received light intensity) changes against the temperature of the heated material changes. It is used for calculating the margin of the detection heated material. Take the data for HD301A as an example. It shows that when the detection heated material temperature is at 600°C, approx. 60 times higher received light energy (received light intensity) can be obtained compared to the detection heated material temperature at 370°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.



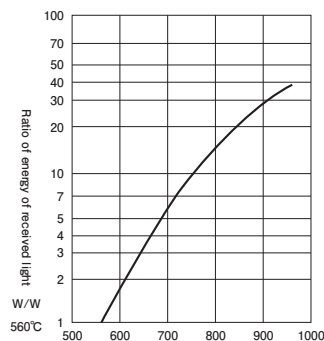
HD301A



HD601N



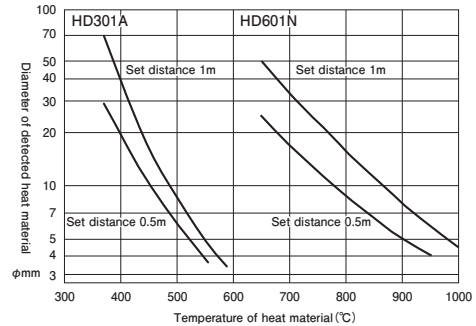
HD400



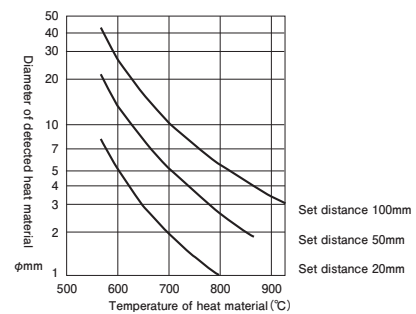
HD502F

Minimum detection object diameter

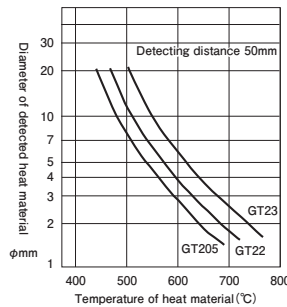
Indicates the thickness (diameter) of the detection heated material against the heated material temperature. For example, when HD301A is used as the receiver, the lowest detectable temperature of a steel bar of $\phi 20$ is approx. 440°C at a setting distance of 1m. The data only refers to specific setting 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 HD301A 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.



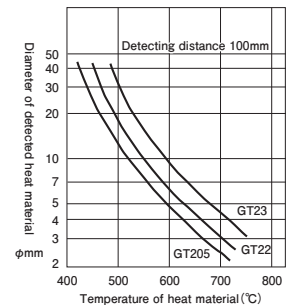
Temperature of heat material (°C)



HD502F The lowest detection heat material diameter



HD400 The lowest detection heat material diameter



13 PRECAUTIONS

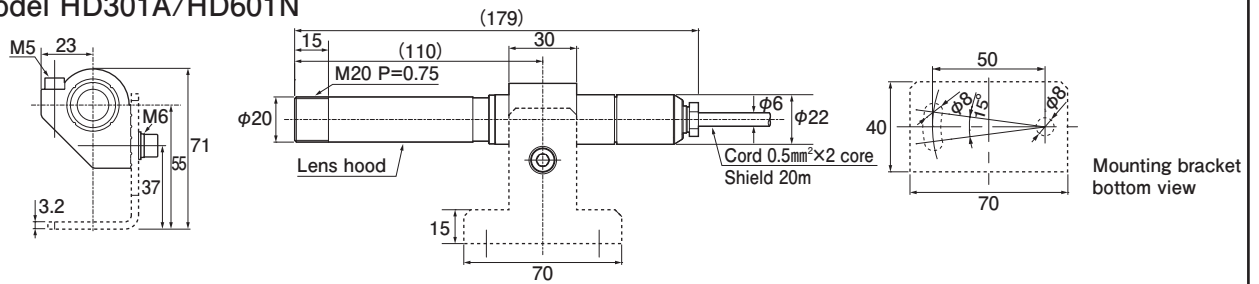
- Approximately 2 seconds elapse from power ON until the internal power stabilizes, during which time there is no output.
- The cord length should be no more than 2m for HD502F. For other sensors, the cord length should be no more than 20m.
- Avoid any use situations where the power supply is being repeatedly turned ON and OFF.
- The internal relay cannot be replaced. For extended relay life, use the sensor unit via an auxiliary relay.
- There may sometimes be a momentary output at power OFF, and this is normal.
- The bending radius of the GT2 Series fiber optic unit should be no less than 50R.
- The tightening torque of the hexagonal socket cap bolt of the HD301A/HD601N seismic platform should be as follows:
M5: no more than 3.7N·m less, M6: no more than 6.4N·m
- Screw tightening torque for HD400 (main body)
The tightening torque of M4 screw should be no more than 0.6N·m.
- Screw tightening torque for HD502F (main body)
The tightening torque of M2.3 should be no more than 0.3N·m.

Fiber unit handling precautions

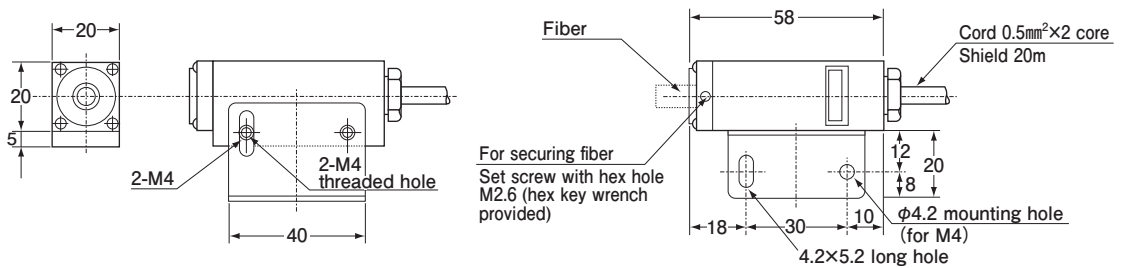
- Do not excessively bend the fiber unit
The fiber unit uses glass (optical) fibers. An excessively small bending radius can damage these fibers. Ensure that the specified bending radius or greater is used.
- Do not pull the fiber unit
Avoid forced pulling or twisting of the fiber unit. Maintain an appropriate clearance around the fiber unit.
- Avoid moving the fiber unit
The fiber unit contains approximately 1500 glass fiber filaments (50 μ m in diameter) bundled together. Frequent movement of the fiber unit can cause abrasion and damage to the fibers, and eventual breakage of the fibers could result.

14 DIMENSIONS (in mm)

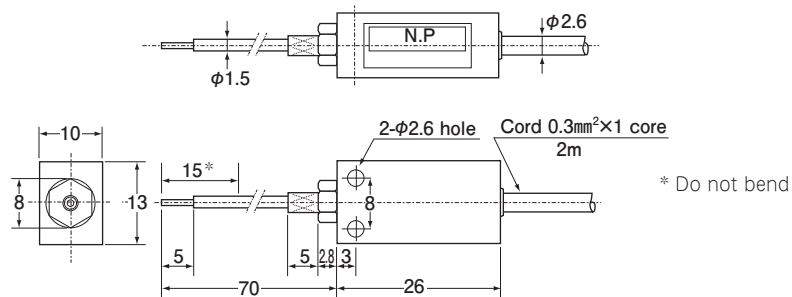
(Sensor) model HD301A/HD601N



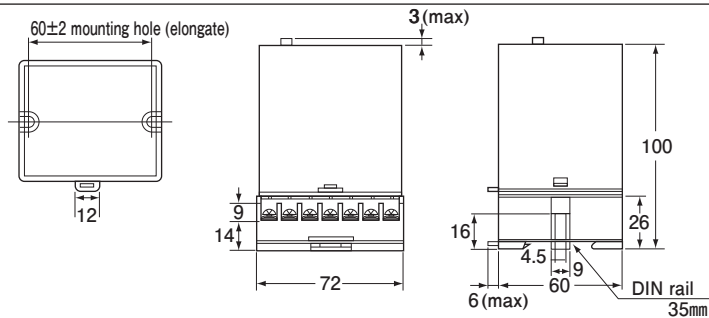
(Sensor) model HD400



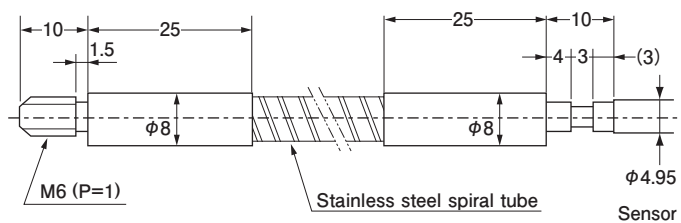
(Sensor) model HD502F



(Amplifier) model HDA300A



(Fiber) GT2 series



Model	Length
GT205	0.5m
GT21	1m
GT22	2m
GT23	3m

- The guarantee period of this product is one year after the delivery.
- If any defect is found during the guarantee period, Takenaka will repair or replace the defective product.
- This product is an industrial sensor which issues an output upon detecting an object. It does not have any function to prevent accidents, death or injuries.
- Takenaka 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.