

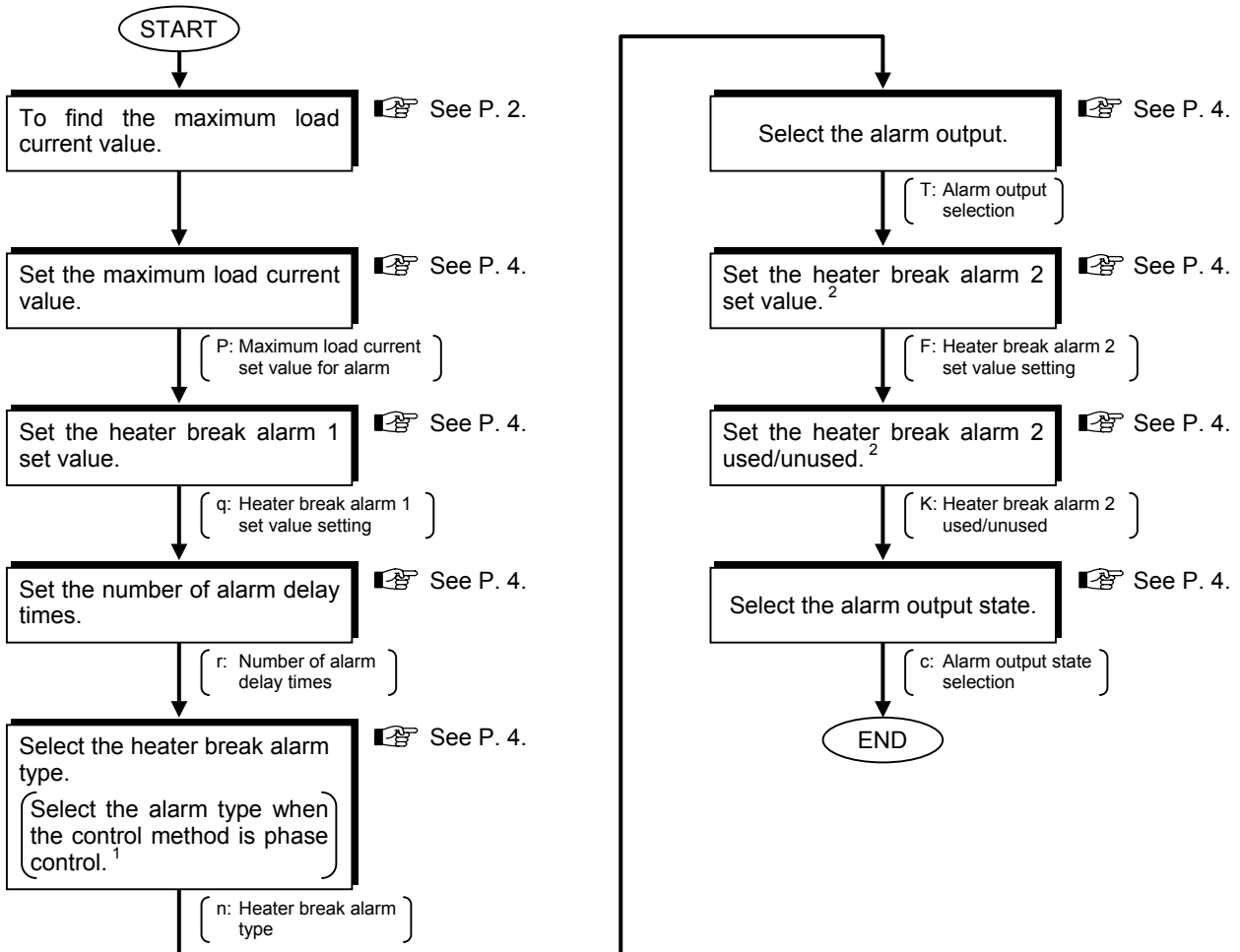
This manual describes the setting method of the heater break alarm (HBA). For descriptions of mounting, wiring, parameter contents, setting method and functions, see the **THV-1 Instruction Manual (IMR01M01-E□)**. In addition, before setting the heater break alarm (HBA), finish mounting the THV-1 and connecting the peripheral equipment necessary for operation.

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## 1. SETTING PROCEDURE

The procedure for setting the heater break alarm is the same as that for any of phase control and zero-cross control.



<sup>1</sup> Heater break alarm type is set when in phase control. When the control method is zero-cross control, the heater break alarm type is ignored.

<sup>2</sup> When the heater break alarm type is Type 2, the heater break alarm 2 is not used. Set the heater break alarm 2 to "Heater break alarm 2 unused."

## 2. HOW TO FIND MAXIMUM LOAD CURRENT VALUE (P)

The maximum load current value means the current value flowing through each heater when the THV-1 output is at 100 % (phase angle: 180°). The following two methods are available to find the maximum load current value.

- Method of finding the maximum load current by the THV-1 output
- Method of finding the value through calculation  
(when it is not possible to flow the maximum current through each heater)

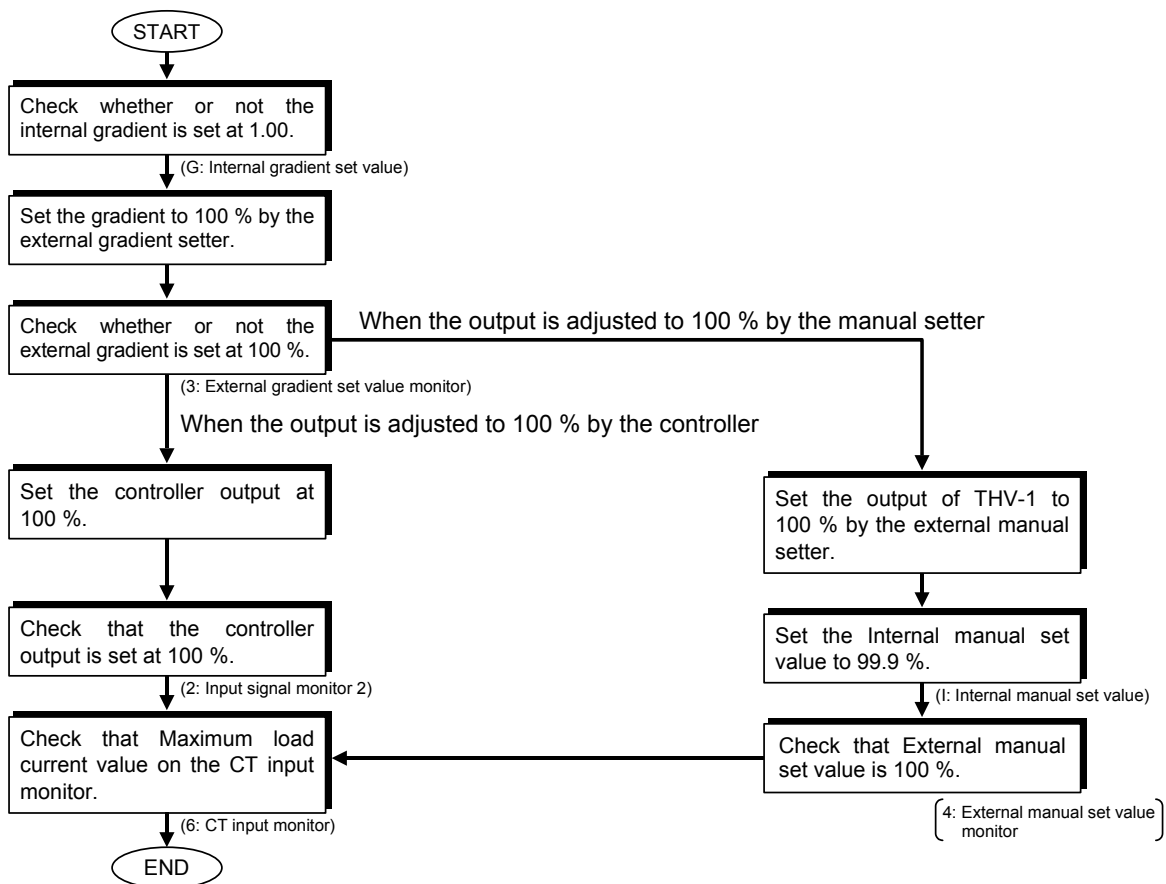


**If no maximum load current value is set, no heater break can be detected. Therefore, always set value. In addition, if no correct maximum load current value is set, malfunctioning may result.**

### 2.1 Method of Finding the Maximum Load Current by the THV-1 Output

Check the current value by the CT input monitor with the THV-1 output set at 100 %. The value checked at this time corresponds to the maximum load current value. Set the output at 100 % by the controller (auto mode) or manual setter (manual mode).

#### ■ Procedure



### 2.2 Method of Finding the Value Through Calculation (When it is not Possible to Flow the Maximum Current Through Each Heater)

This is a method of finding the maximum load current value when each heater may be damaged if letting the maximum current flow through the heater. The maximum load current value is found by the equation for calculation.

#### 1. Check for heater power supply voltage and capacity.

Refer to the catalog or instruction manual for the heater used to check for the heater power supply voltage and capacity.

#### 2. Calculate the maximum load current value.

Find the maximum load current value by the equation for calculation.

Equation of calculating: Heater capacity/Power supply voltage = Maximum load current value


**<Example> For heaters with a capacity of 4 kw and a power supply voltage of 200 V AC  
(Power factor is assumed to be 1.)**

4000 (heater capacity)/200 (power supply voltage) = 20 (maximum load current value)

Maximum load current value 20 A

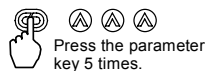
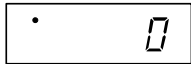
## 2.3 Example of Finding the Maximum Load Current Value with the THV-1 Output Set at 100 %

This is how to check the maximum load current value when used together with the controller. After the gradient is adjusted, set the controller output at 100 % and then check for the maximum load current value.

 When the contact input function (auto/manual mode transfer) is used, it is necessary to be set to the auto mode (contact open).

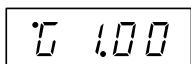
### 1. Check whether or not the internal gradient is set at 1.00.

Parameter group 1  
Input signal monitor 1



Press the parameter key 5 times.

Internal gradient set value

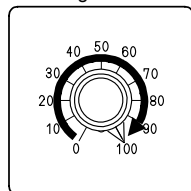


At the Input signal monitor 1 of parameter group 1, press the parameter key five times. The display goes to the internal gradient set value.


Check whether or not the internal gradient is set at "1.00." (Factory set value: 1.00)

### 2. Set the external gradient to 100 %.

External gradient setter

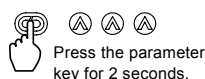
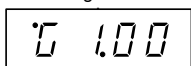


Align the arrow on the knob with "100" on the scale plate.

 When an external gradient setter is not used, go to procedure "4."

### 3. Check whether or not the external gradient is set at 100 %.

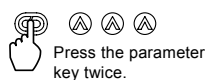
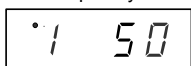
Parameter group 1  
Internal gradient set



Press the parameter key for 2 seconds.

Press the parameter key for two seconds to change to the parameter group 2.

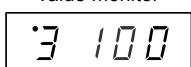
Parameter group 2  
Power frequency monitor




Press the parameter key twice.

Press the parameter key twice until external gradient set value monitor is displayed.

External gradient set value monitor

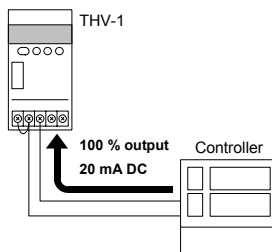


Check whether or not the external gradient is set at "100."

 When an external gradient setter is not used, go to procedure "4."

### 4. Set the controller output at 100 %.

- When the output of controller is 4 to 20 mA DC



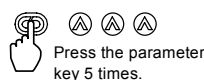
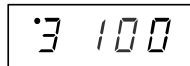
Make adjustment so that the controller output becomes 100 %.

When the output is manually set at 100 %

- When set by the manual setter, set the output at 100% with the knob placed in the position of "100."
- When set by the front key, maximize the output by setting the internal manual set value at "99.9."

### 5. Check that the controller output is set at 100 %.

Parameter group 2  
External gradient set value monitor

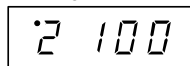


Press the parameter key 5 times.

Press the parameter key five times. The display goes to the input signal monitor 2.

(If the procedure "2." and "3." is omitted, first go to parameter group 2. Next, press the parameter key one times.)

Parameter group 2  
Input signal monitor 2



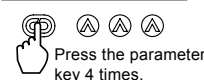
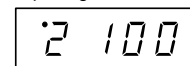
Check that the controller output is set at 100 %.

When the output is set at 100 % by the manual setter

- When set by the manual setter, check that the output is set at 100 % by the external manual set value monitor.

### 6. Check for the current value (maximum load current value) at a controller output of 100 %.

Parameter group 2  
Input signal monitor 2

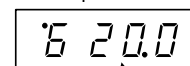


Press the parameter key 4 times.

Check for the current value at a controller output of 100 %.

Press the parameter key four times until CT input monitor is displayed.

Parameter group 2  
CT input monitor



Maximum load current value (example: 20.0 A)

(For the 20 A or 30 A type, a decimal point is displayed.)


Check the current value displayed on the CT input monitor.

At this time, the current value being displayed on the CT input monitor corresponds to the maximum load current value.

### 3. Setting Example of Heater Break Alarm (HBA)

#### ■ Heater break alarm (HBA) for phase control

There are two alarm types (Type 1 or Type 2) available for phase control. Select the alarm type (Type 1 or Type 2) suitable for the heater to be connected.

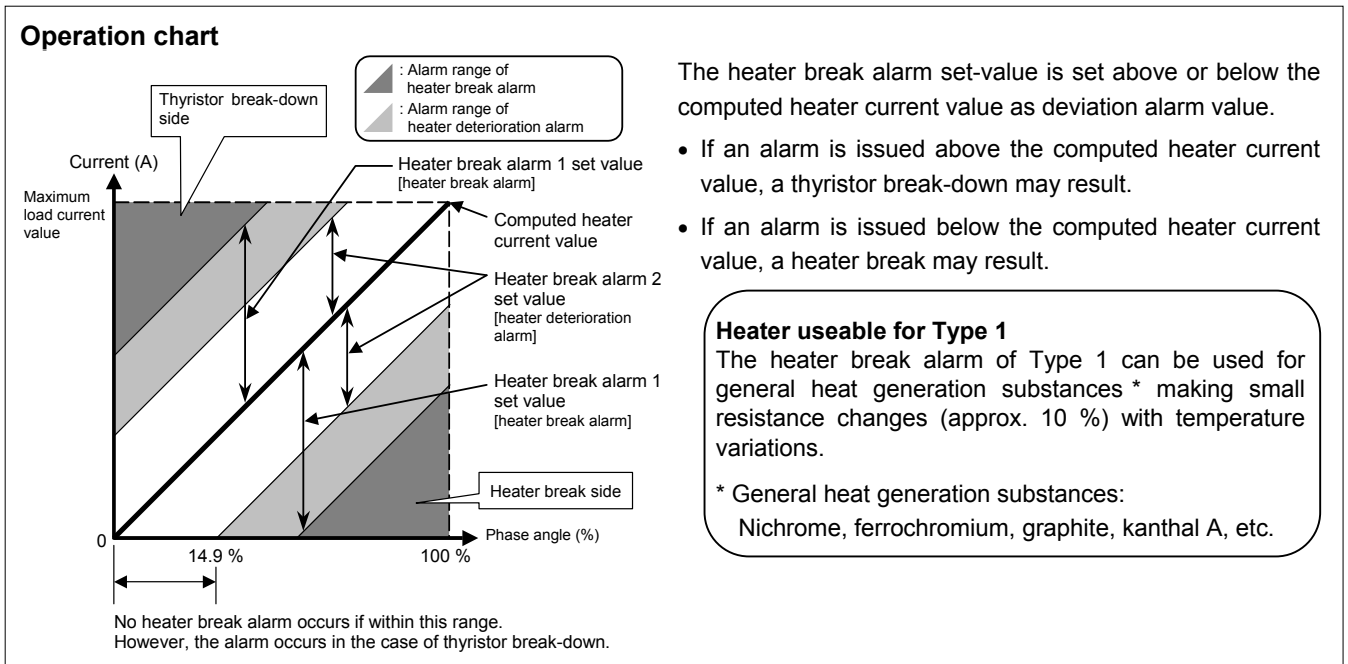
 **As the measuring accuracy of the current transformer is within  $\pm 2$  A (for the 20A or 30A type) or  $\pm 10$  % of the maximum load current (for the 45A type or higher), no heater break alarm may normally operate if used at a smaller load current value.**

#### (1) Type 1 (Deviation alarm)

For the Type 1 heater break alarm, the computed heater current value is found for each phase angle to decide the alarm state by deviation from the current transformer input value.

Type 1 can be used as follows by using two heater break alarm set values.


- Heater break alarm 1 set value: Used as heater break alarm.
- Heater break alarm 2 set value: Used as heater deterioration alarm. If any value smaller than the heater break alarm 1 set value is set, an alarm can be issued prior to a heater break.

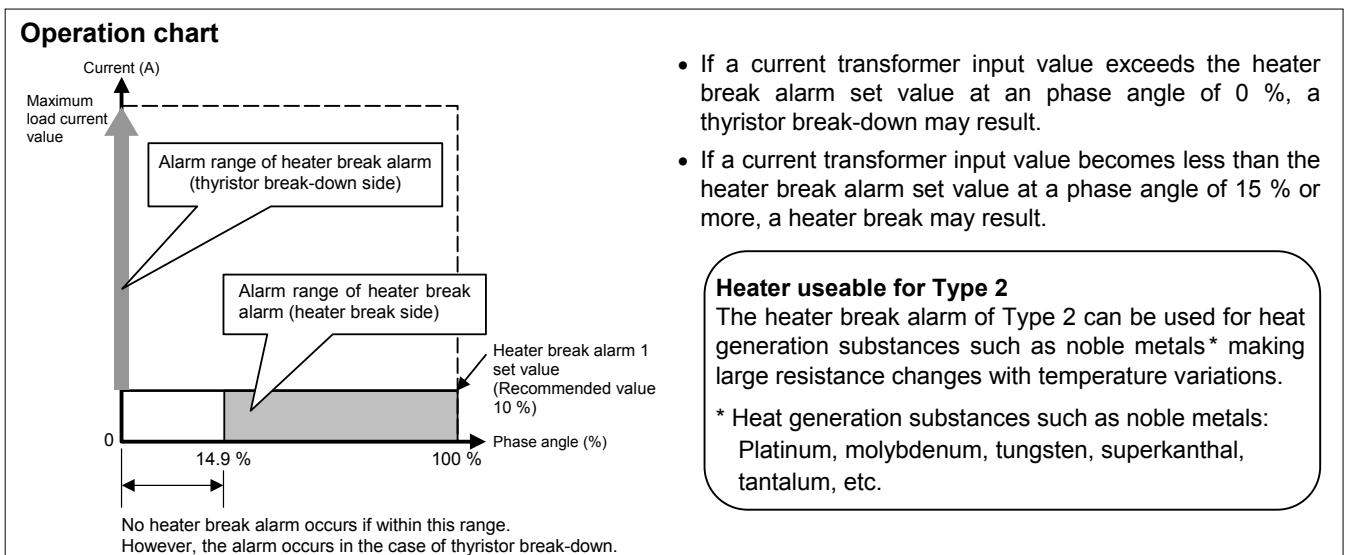


#### (2) Type 2 (Absolute value alarm)

The Type 2 heater break alarm is used for detecting a heater break when one heater is used. The alarm state is decided depending on whether a current transformer input value is below or above the heater break alarm set value.

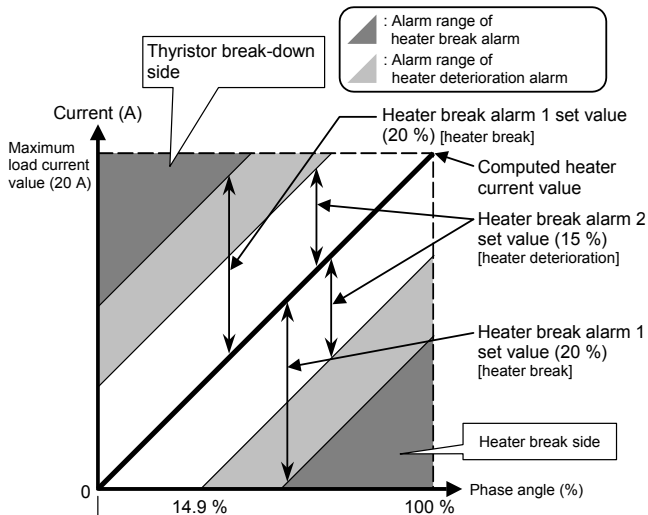
For Type 2, only heater break alarm 1 set value is used. Heater break alarm 2 set value is set to "Unused."

 No type 2 can be used when two or more heaters are used in parallel connection.



## ■ Setting Example

### Operation chart



No heater break alarm occurs if within this range.  
However, the alarm occurs in the case of thyristor break-down.

### <Operating condition>

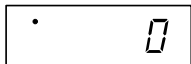
Control method:	Phase control
Output adjustment:	Auto mode
Power supply voltage:	200 V AC
Heater capacity:	4 kW
Heater break alarm 1 set value:	Use as a Heater brake alarm.
Heater break alarm 2 set value:	Use as a Heater deterioration alarm.
Heater break alarm type:	Type 1

#### 1. To find the maximum load current value.

Find the maximum load current value by referring to Item 2.3 Example of finding the maximum load current value with THV-1 output set at 100 % (P. 3). Here, the maximum load current value is set at 20 A as an example.

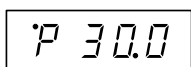
#### 2. Set the maximum load current value

Parameter group 1  
Input signal monitor 1



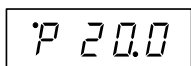
Press the parameter key 12 times.

Maximum load current  
set value for alarm



Press the UP key.

Maximum load current  
set value for alarm



(For the 20 A or 30 A type,  
a decimal point is displayed.)

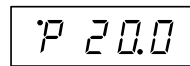
At the Input signal monitor 1 of Parameter group 1, press the parameter key twelve times. The display goes to the Maximum load current set value for alarm.

Press the UP key to set the maximum load current value at "20.0 A."

(Maximum load current  
set value: 20 A)

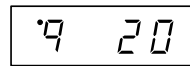
#### 3. Set the heater break alarm set value

Maximum load current  
set value for alarm



Press the parameter key once.

Heater break alarm 1  
set value setting



Press the parameter key once to change to the heater break alarm 1 set value setting.

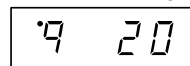
Set the heater break alarm 1 set value to "20 %."  
(Factory set value: 20)

"20 %": Recommended value. However, set any value meeting the customer's system. The UP key enables the numeric value to be changed.

For the Type 2 heater break alarm and recommended value in zero-cross control, refer to the THV-1 Instruction Manual (IMR01M01-E□).

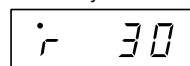
#### 4. Set the number of alarm delay times

Heater break alarm 1  
set value setting



Press the parameter key once.

Number of alarm  
delay times



Press the parameter key once to change to the number of alarm delay times.

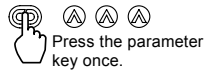
Set the number of alarm delay times to "30 times." (Factory set value: 30)

Here, "30 times" is set. However, set any value meeting the customer's system. The UP key enables the numeric value to be changed.

## 5. Set the heater break alarm type

Number of alarm delay times

30



Press the parameter key once to change to the heater break alarm type.

Heater break alarm type

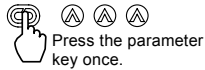
0

Set the heater break alarm type to "0: Type 1." (Factory set value: 0)

## 6. Select the alarm output type

Heater break alarm type

0

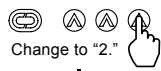


Press the parameter key once to change to the alarm output selection.

Alarm output selection

0

Press the UP key to set "2: Logical OR of heater break alarm 1 and heater break alarm 2."



Here, heater break alarm 1 and heater break alarm 2 are used. Therefore, "2: Logical OR of heater break alarm 1 and heater break alarm 2" is selected.

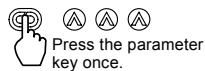
Alarm output selection

2

## 7. Set the heater deterioration alarm set value

Alarm output selection

2



Press the parameter key once to change to the heater break alarm 2 set value setting.

Here, the heater break alarm 2 set value is used for detecting heater deterioration.

Heater break alarm 2 set value setting

15

Set the heater break alarm 2 set value to "15 %." (Factory set value: 15)

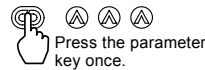
It is necessary to detect an alarm before the heater break alarm occurs. Therefore, set any value smaller than the heater break alarm set value. Here, "15 %" is set. However, set any value meeting the customer's system. The UP key enables the numeric value to be changed.

For the recommended value in zero-cross control, refer to the **THV-1 instruction manual (IMR01M01-E□)**.

## 8. Set the heater break alarm 2 to "1: Used."

Heater break alarm 2 set value setting

15

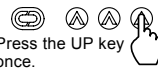


Press the parameter key once to change to the heater break alarm 2 used/unused.

Heater break alarm 2 used/unused

0

Press the UP key to set "1: used."



Heater break alarm 2 used/unused

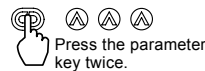
1

## 9. Select whether the open-collector output is turned on or off when the heater break alarm is output.

Heater break alarm 2 used/unused

1

Press the parameter key twice to change to the alarm output state selection.



Alarm output state selection

0

Set the alarm output state to "0: ON at alarm output." (Factory set value: 0)

Here, "0" is set. However, set any value meeting the customer's system. The UP key enables the numeric value to be changed.

Thus, the setting has been finished.