

Thank you for purchasing this RKC product. In order to achieve maximum performance and ensure proper operation of your new instrument, carefully read all the instructions in this manual. Please place the manual in a convenient location for easy reference.

This manual explains the basic procedures for operating the THV-A1. For detailed handling procedures and various function settings, please refer to separate THV-A1 Instruction Manual [Detailed version] (IMR02D04-E1).

The above manuals can be downloaded from the official RKC website:
http://www.rkcinst.com/english/manual_load.htm.

1. PARTS DESCRIPTION

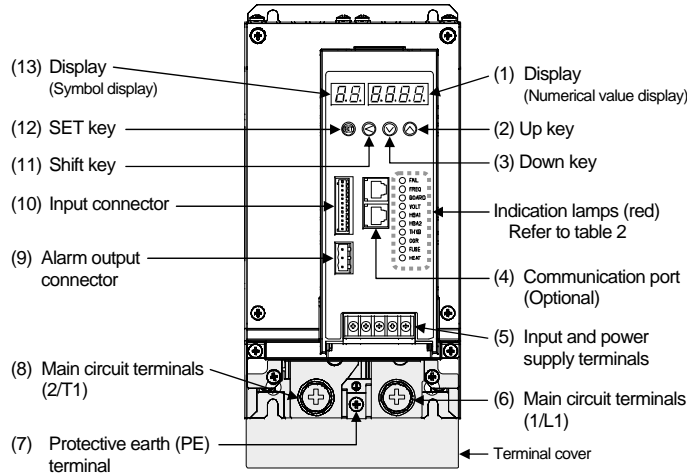


Table 1 Parts description [The name is the same as for each type (150 A, 200 A)]

No.	Name	Description
(1)	Display (Numerical value display)	Display the input signal values and parameters.
(2)	Up key	• Used to select the monitor item and function block (F□). • Increase numerals.
(3)	Down key	• Used to select the monitor item and function block (F□). • Decrease numerals.
(4)	Communication port (COM.PORT1, COM.PORT2)	Communication port for connecting a host computer or the THV-A1 in a multi-drop connection. (Optional)
(5)	Input and power supply terminals	Used to connect input signal (controller) and power supply (instrument power supply voltage) wires.
(6)	Main circuit terminals (1/L1)	Used to connect main circuit wires.
(7)	Protective earth (PE) terminal	Used to connect the grounding terminal.
(8)	Main circuit terminals (2/T1)	Used to connect main circuit wires.
(9)	Alarm output connector	Used to alarm output. (Number of output points: 2 points) The type of alarm to be output must be set.
(10)	Input connector	Used to connect with a setter (potentiometer), external contact or controller. A function must be assigned to the contact input (DI).
(11)	Shift key	• Used to select the mode. • Shift digits when settings are changed.
(12)	SET key	Used for parameter calling up and set value registration.
(13)	Display (Symbol display)	Display the parameter symbols.

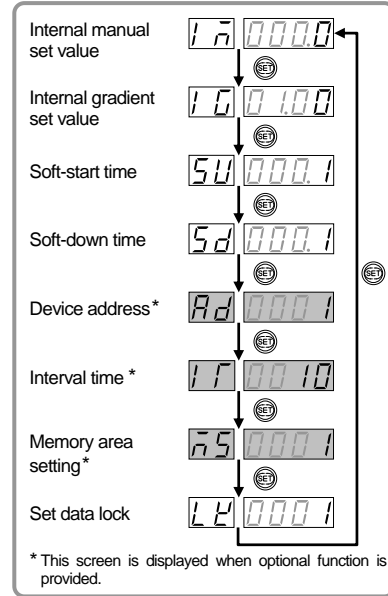
Table 2 Indication lamps [The name is the same as for each type (150 A, 200 A)]

Symbol	Name	Description
FAIL	FAIL	This lamp lights to indicate an error detected by the watchdog timer of the self-diagnosis function or the CPU power monitor.
FREQ	Power frequency error	This lamp lights if power frequency is out of the allowable range (detecting range) when power is turned on or during operation. (Detection range: 45.0 to 64.9 Hz)
BOARD	Board error	This lamp lights if a board error of this instrument is detected by the self-diagnosis function.
VOLT	Power supply voltage error	This lamp lights if the power voltage exceeds 264 V when the power is turned on or during operation. In addition, this lamp lights if the power voltage drops less than 90 V.
HBA1	Heater break alarm 1	Lights when HBA1 output is turned on. This alarm function is available on the instrument with a constant current control or constant power control.
HBA2	Heater break alarm 2	Lights when HBA2 output is turned on. This alarm function is available on the instrument with a constant current control or constant power control.
THY.B	Thyristor break-down alarm	Lights when thyristor break-down alarm output is turned on. This alarm function is available on the instrument with a constant current control or constant power control.
OCR	Over current	This lamp lights if the current of more than 1.2 times the rating of this instrument flows. This alarm function is available on the instrument with a constant current control or constant power control.
FUSE	Fuse break	This lamp lights if the fast-blow fuse inside the instrument blows. This alarm function is available on the instrument with a built-in fast-blow fuse.
HEAT	Heat sink temperature abnormality	This lamp lights if the temperature of the semiconductor controlled rectifier (SCR) rises above 120 °C. This alarm function is available on the instrument with a heat sink temperature detection function.

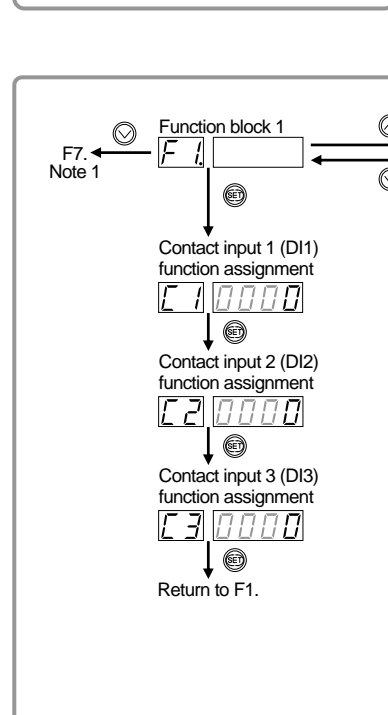
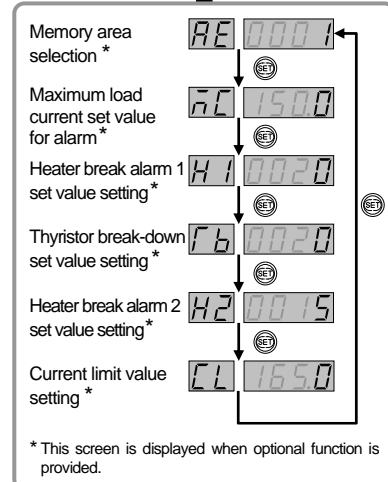
2. SETTING

2.1 Transfer to Each Mode and Parameter

Setting mode 1

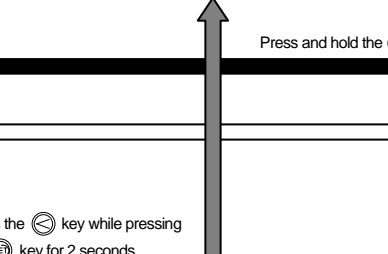
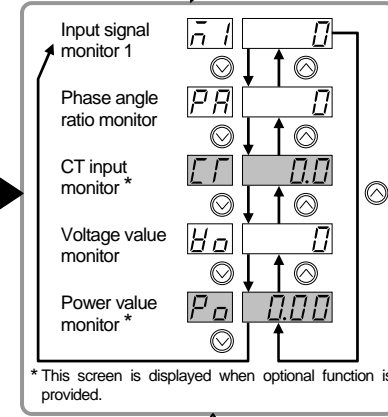


Setting mode 2

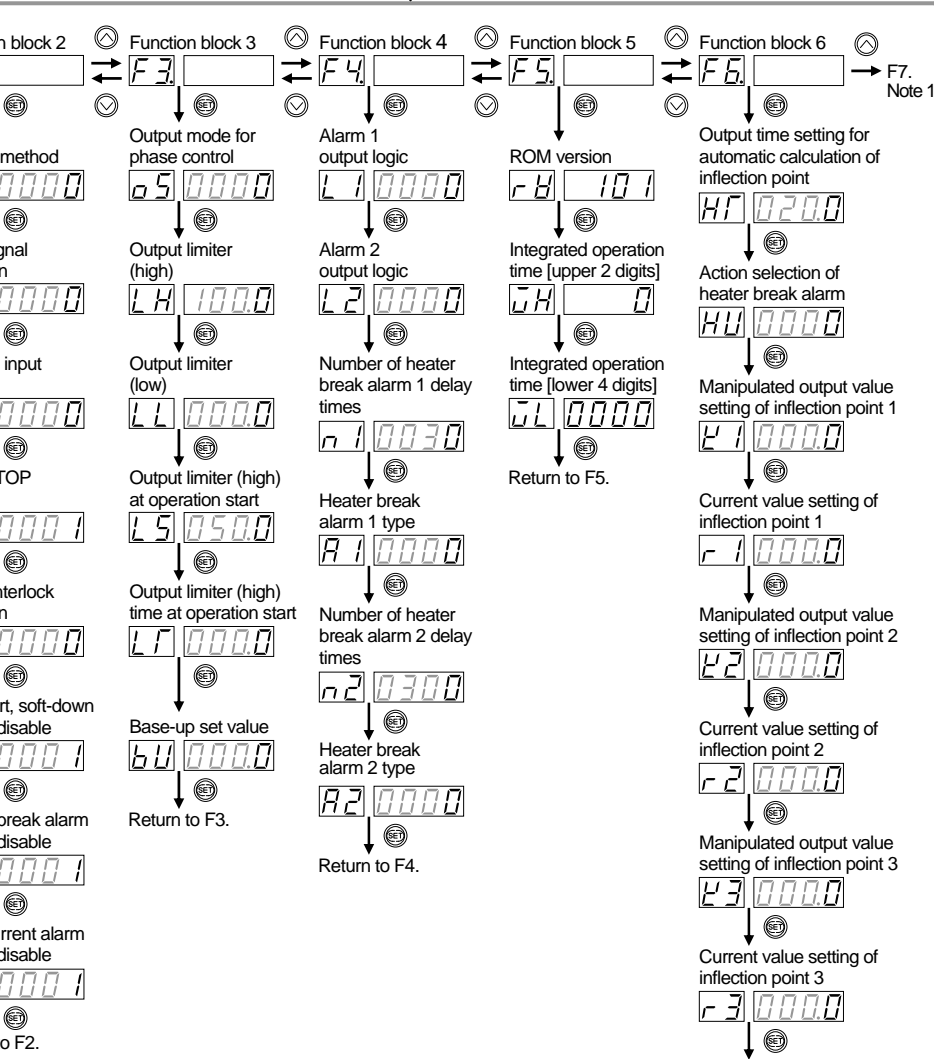


Power ON

After the rated current is displayed on the display, the display will automatically change to the input signal monitor 1. (Display for approx. 2 seconds)



Engineering mode



Note 1: Function block 7 (F7) is made up with the parameters related to Soft-start time in case of a break on the secondary side of a transformer and Protection function for the control of primary side of a transformer. For the parameters to Function block 7 (F7), refer to THV-A1 Instruction Manual [Detailed version] (IMR02D04-E1).

2.2 Parameter List

Monitor mode 1

Symbol	Name	Display range
I1 (M1)	Input signal monitor 1	0 to 100 % Select whether this shows the auto mode set value, the external manual set value, or the internal manual set value.
PA (PA)	Phase angle ratio monitor	0 to 100 % (0 to 180°: When the phase angle is 180°, display the 100 %.)
Ct (CT)	CT input monitor ¹	0.0 to 202.5 A (150 A type) 0.0 to 270.0 A (200 A type)
Vv (Vo)	Voltage value monitor	0 to 280 V (90 to 264 V AC [Including power supply voltage variation]) Rated value 100 to 240 V AC Display the output voltage of THV-A1.
Pv (Po)	Power value monitor ²	0.00 to 56.70 kW (150 A type) 0.00 to 75.60 kW (200 A type)

¹This screen is displayed on the instrument with a constant current control or constant power control.
²This screen is displayed on the instrument with a constant power control.

Monitor mode 2

Symbol	Name	Display range
If (IF)	Power frequency monitor	40 to 70 Hz
Vv (Vv)	Power supply voltage monitor	0 to 280 V (90 to 264 V AC [Including power supply voltage variation]) Rated value 100 to 240 V AC Display the power supply voltage.
I2 (M2)	Input signal monitor 2	0 to 100 % Display the auto mode set value (value of input signal from controller).
EG (EG)	External gradient set value monitor	0 to 100 %
Em (EM)	External manual set value monitor	0 to 100 %
dI (dI)	Contact input state monitor	01 0000 Contact input 1 (DI1) 0: Contact open 1: Contact closed Contact input 2 (DI2) 0: Contact open 1: Contact closed Contact input 3 (DI3) 0: Contact open 1: Contact closed
Mm (MM)	Memory area monitor [*]	1 to 4 The memory area number now used for alarm monitoring is displayed.

^{*}This screen is displayed on the instrument with a constant current control or constant power control.

Setting mode 1

Symbol	Name	Setting range	Factory set value
I1 (IM)	Internal manual set value	0.0 to 100.0 %	0.0
I1 (IG)	Internal gradient set value ¹	0.00 to 2.00 (0.00: Internal gradient 0 % 2.00: Internal gradient 200 %)	1.00
SU (SU)	Soft-start time ²	0.0 to 100.0 seconds (0.0: Soft-start function unused)	0.1
Sd (Sd)	Soft-down time ²	0.0 to 100.0 seconds (0.0: Soft-down function unused)	0.1
Ad (Ad)	Device address ³	0 to 99	1
IT (IT)	Interval time ³	0 to 250 ms	10
MS (MS)	Memory area setting ⁴	1 to 4 Set the memory area used for alarm monitoring.	1
LK (LK)	Set data lock	0: Lock 1: Unlock Unlocked	0001

¹ This parameter becomes valid when the control method is the phase control or zero-cross control (continuous).
² This parameter becomes valid when the control method is the phase control.
³ This screen is displayed on the instrument with a communication function (RS-422A or RS-485).
⁴ This screen is displayed on the instrument with a constant current control or constant power control. When the memory area setting (MS) is changed, the memory area selection (AE) changes to the same memory area number. When a contact input (DI) is used, the contact input (DI) setting has priority.

Setting mode 2

(Setting mode 2 is not displayed when constant current control or constant power control is not provided.)

Symbol	Name	Setting range	Factory set value
AE (AE)	Memory area selection	1 to 4 Select the memory area used to store the set values.	1
MC (MC)	Maximum load current set value for alarm [*]	0.0 to 165.0 A (150 A type) 0.0 to 220.0 A (200 A type)	150.0 200.0
H1 (H1)	Heater break alarm 1 set value setting [*]	0 to 100 % of maximum load current set value [*] (0: Heater break alarm 1 unused)	20

^{*} Parameters which can be used in multi-memory area function
^{*} Although the following values are recommended, the alarm set value varies depending on the load type and the number of connection. Set the value suited to your system.
When the control method is Phase Control, RKC recommends:
- Set the heater break alarm set value to approximately 20 % of the maximum load current value for heater break alarm Type 1 (constant resistance type, deviation alarm).
- Set the heater break alarm set value to approximately 10 % of the maximum load current value for heater break alarm Type 2 (linearity resistor type, absolute value alarm). Do not set the heater break alarm set value to more than 15 %.
- In the case of a heater break alarm that supports non-linear resistance, there is no recommended value because the load characteristics vary depending on the non-linear load type.
When the control method is Zero-cross Control, RKC recommends:
- Set the heater break alarm set value to approximately 80 % of the reading of current transformer input.
- Set the heater break alarm set value to a slightly smaller value to prevent a false alarm when power supply variation is large.
- Set the heater break alarm set value to a slightly larger value to detect a failure of one heater when more than one heaters are connected in parallel. But the set value should be less than the maximum reading of current transformer input.

Setting mode 2

Symbol	Name	Setting range	Factory set value
F_b (Tb)	Thyristor break-down set value setting *	0 to 100 % of maximum load current set value ¹ (0: Thyristor break-down alarm unused)	20
H_2 (H2)	Heater break alarm 2 set value setting *	0 to 100 % of maximum load current set value ² (0: Heater break alarm 2 unused)	15
C_L (CL)	Current limit value setting *	0.0 to 22.0 A (20 A type) ³ 0.0 to 33.0 A (30 A type) ³ 0.0 to 50.0 A (45 A type) ³ 0.0 to 66.0 A (60 A type) ³ 0.0 to 88.0 A (80 A type) ³ 0.0 to 110.0 A (100 A type) ³	22.0 33.0 50.0 66.0 88.0 110.0

* Parameters which can be used in multi-memory area function

¹ Although the following values are recommended, the alarm set value varies depending on the load type and the number of connection. Set the value suited to your system.

When the control method is Phase Control, RKC recommends:

- Set the thyristor break-down set value to approximately 20 % of the maximum load current value for heater break alarm Type 1 (constant resistance type, deviation alarm).

- Set the thyristor break-down set value to approximately 10 % of the maximum load current value for heater break alarm Type 2 (linearity resistor type, absolute value alarm). Do not set the thyristor break-down set value to more than 15 %.

- In the case of a non-linear resistance heater break alarm, there is no recommended value because the load characteristics vary depending on the non-linear load type.

When the control method is Zero-cross Control, RKC recommends:

Set the thyristor break-down set value to approximately 80 % of the maximum load current value.

² Although the following values are recommended, the alarm set value varies depending on the load type and the number of connection. Set the value suited to your system.

When the control method is Phase Control and heater break alarm Type 1 (constant resistance type, deviation alarm) is selected, RKC recommends:

- Set the value must be equal or less than the heater break alarm 1 set value.

When the control method is Phase Control and heater break alarm Type 2 (linearity resistor type, absolute value alarm) is selected:

- For the type 2, this item is not available. Set the "0: Heater break alarm 2 unused."

The heater break alarm 2 set value cannot be used as the non-linear resistance heater break alarm.

The heater break alarm 2 set value is activated as the standard heater break alarm.

When the control method is Zero-cross Control, RKC recommends:

- If the alarm needs to be output before a heater break occurs, set the set value of heater break alarm 2 to any value slightly larger than that of heater break alarm 1.

- If the alarm needs to be output before thyristor break-down occurs, set the set value of heater break alarm 2 to any value slightly smaller than that of heater break alarm 1.

³ If a current limit value is set to its maximum value, the current limit function is deactivated. When set to 0.0, the output of the THV-A1 turns off. In addition, the current limiter function is not available when the zero-cross control is selected.

Engineering mode

Symbol	Name	Setting range	Factory set value
F_1 (F1)	Function block 1	This is first parameter symbol of function block 1 (F1.).	
C_1 (C1)	Contact input 1 (DI1) function assignment	0: No function 1: Auto mode/Manual mode transfer ¹ 2: RUN/STOP transfer ²	0
C_2 (C2)	Contact input 2 (DI2) function assignment	3: Alarm interlock release ² 4: Heater break alarm enable/disable ^{2,3} 5: Soft-start, soft-down enable/disable ^{2,4} 6: Set data lock/unlock ^{2,5}	0
C_3 (C3)	Contact input 3 (DI3) function assignment	7: Over current alarm enable/disable ^{2,3} 8: Memory area transfer ^{3,6,7}	0

¹ Selection of the setting type may be necessary using the contact input action (dA) of function block 2.

² Contact input (DI) state

Name	Items selected depending on DI state	
	Open	Closed
Auto mode/Manual mode transfer	Auto mode	External manual mode or Internal manual mode
RUN/STOP transfer	STOP	RUN
Alarm interlock release		Alarm interlock release
Heater break alarm enable/disable	Enable	Disable
Soft-start, soft-down enable/disable	Enable	Disable
Set data lock/unlock	Lock	Unlock
Over current alarm enable/disable	Enable	Disable

³ This setting becomes valid on the instrument with a constant current control or constant power control.

⁴ This setting becomes valid when the control method is the phase control.

⁵ The mode locked by the contact input (DI) accords with the set data lock (LK) setting in setting mode 1.

⁶ If the non-linear resistance heater break alarm is used, memory area transfer cannot be used.

⁷ Memory area transfer uses two contact input (DI) points.

Assign memory area transfer to contact input 1 (DI1). When assigned to contact input 1 (DI1), memory area transfer is also automatically assigned to contact input 2 (DI2).

Memory area transfer cannot be assigned to contact input 2 (DI2) and contact input 3 (DI3).

DI No.	Memory areas selected depending on DI state			
	Memory area 1	Memory area 2	Memory area 3	Memory area 4
DI1	Open	Closed	Open	Closed
DI2	Open	Open	Open	Closed

Symbol	Name	Setting range	Factory set value
F_2 (F2)	Function block 2	This is first parameter symbol of function block 2 (F2.).	
C_M (CM)	Control method	0: Phase control 1: Zero-cross control (continuous) ¹ 2: Zero-cross control (input synchronous type) ¹	0
I_S (IS)	Input signal selection	0: 0 to 20 mA DC, 0 to 5 V DC, 0 to 10 V DC ² , 0/12 V DC, 0/24 V DC 1: 4 to 20 mA DC, 1 to 5 V DC, 0/12 V DC, 0/24 V DC	Factory set value varies depending on the instrument specification.
dA (dA)	Contact input action	0: External manual mode ↔ Auto mode ³ 1: Internal manual mode ↔ Auto mode ³ 2: Internal manual mode (fixed) ³ 3: External manual mode (fixed) ³	0

¹ When the zero-cross control is selected, the output mode for phase control becomes invalid.

² If 0 to 10 V DC is specified at the time of ordering, this cannot be changed to an input signal other than voltage pulse input (0/12 V DC, 0/24 V DC).

³ Settings that become effective based on the contact input (DI) setting:

Contact input action (dA) setting	Settings that become effective based on the DI setting	
	Closed	Open
0: External manual mode ↔ Auto mode	External manual mode	Auto mode
1: Internal manual mode ↔ Auto mode	Internal manual mode	
2: Internal manual mode (fixed)	Internal manual mode	
3: External manual mode (fixed)	External manual mode	

Function block 2 (F2.)

Symbol	Name	Setting range	Factory set value
r_S (rS)	RUN/STOP transfer ¹	0: STOP 1: RUN	1
I_L (IL)	Alarm interlock ²	0: Unused 1: Use	0
SF (SF)	Soft-start, soft-down enable/disable ^{1,3}	0: Soft-start, soft-down disable 1: Soft-start, soft-down enable	1
HF (HF)	Heater break alarm enable/disable ^{1,4}	0: Heater break alarm disable 1: Heater break alarm enable	1
oF (oF)	Over current alarm enable/disable ^{1,4}	0: Over current alarm disable 1: Over current alarm enable	1

¹ When a contact input (DI) is used, the contact input (DI) setting has priority.

² To use the alarm interlock release function in a contact input (DI), set to "1: Use." When in the alarm interlock release (contact closed) state, the alarm interlock function will not operate. The contact input (DI) setting has priority.

³ This parameter becomes valid when the control method is the phase control.

⁴ This parameter becomes valid on the instrument with a constant current control or constant power control.

Symbol	Name	Setting range	Factory set value
F_3 (F3)	Function block 3	This is first parameter symbol of function block 3 (F3.).	
oS (oS)	Output mode for phase control ¹	0: Proportional phase angle to input 1: Proportional voltage to input 2: Proportional square voltage (electric power) to input 3: Constant current control ² 4: Constant voltage control 5: Constant power control ³ 6: Square voltage feedback	Factory set value varies depending on the instrument specification.
LH (LH)	Output limiter (high) ⁴	0.0 to 100.0 % [Output limiter (low) ≤ Output limiter (high)]	100.0
LL (LL)	Output limiter (low) ⁴	0.0 to 100.0 % [Output limiter (low) ≤ Output limiter (high)]	0.0
LS (LS)	Output limiter (high) at operation start ⁵	0.0 to 100.0 % [Output limiter (high) at operation start ≤ Output limiter (high)]	50.0
LF (LT)	Output limiter (high) time at operation start ⁵	0.0 to 600.0 seconds (0.0: Output limiter function at operation start disable)	0.0
bL (bU)	Base-up set value ^{4,6}	-10.0 to +100.0 % [Base-up set value ≤ Output limiter (high)]	0.0

¹ This parameter becomes valid when the control method is the phase control.

² This setting becomes valid on the instrument with a constant current control or constant power control.

³ The setting becomes valid on the instrument with a constant power control.

⁴ This parameter becomes valid when the control method is the phase control or zero-cross control (continuous).

⁵ This function is activated when the control method is the phase control.

⁶ The base-up set value is effective only when the output limiter (low) is set to 0.0.

Symbol	Name	Setting range	Factory set value
F_4 (F4)	Function block 4	This is first parameter symbol of function block 4 (F4.).	
L_1 (L1)	Alarm 1 output logic ¹	0: No output 1: Power frequency error (energized) 2: Board error (energized) 4: Power supply voltage error (energized) 8: Heater break alarm 1 (energized) 16: Heater break alarm 2 (energized) ² 32: Thyristor break-down alarm (energized) ² 64: Over current (energized) ² 128: Fuse break (energized) 256: Heat sink temperature abnormality (energized) ³ 512: FAIL (de-energized) • To set the alarm output to "de-energized," set the thousands digit to "1." (However, excluding FAIL.) For example, to set the alarm output of "2: Board error (energized)" as "de-energized," set "1002." • To output the alarm output by logical OR, set the sum of the set values. For example, to generate the alarm output of "board error (energized)" and "over current error (energized)" by logical OR, set to "66." To set it as "de-energized," set to "1066." • Mixed output of energized and de-energized is not possible. In addition, logical OR output of FAIL (de-energized) is not possible, and thus this must be set independently.	0
L_2 (L2)	Alarm 2 output logic ¹		0
n_1 (n1)	Number of heater break alarm 1 delay times ²	1 to 100 times	30
r_1 (A1)	Heater break alarm 1 type ^{2,4}	0: Type 1 (constant resistance type, deviation alarm) 1: Type 2 (linearity resistor type, absolute value alarm)	0
n_2 (n2)	Number of heater break alarm 2 delay times ²	1 to 1000 times	300
r_2 (A2)	Heater break alarm 2 type ^{2,4}	0: Type 1 (constant resistance type, deviation alarm) 1: Type 2 (linearity resistor type, absolute value alarm)	0

¹ Alarm output is outputted on the instrument with an alarm output 2 points.

² This setting becomes valid on the instrument with a constant current control or constant power control.

³ The setting becomes valid on the instrument with a heat sink temperature detection function.

⁴ This parameter becomes valid when the control method is the phase control.

Symbol	Name	Setting range
F_5 (F5)	Function block 5	This is first parameter symbol of function block 5 (F5.).
r_H (rV)	ROM version	Display the version of loading software.
W_H (WH)	Integrated operation time [upper 2 digits]	0 to 99 (Resolution of display: 10, 000 hours) Up to 999,999 from 0 including the upper and lower digits can be displayed.
W_L (WL)	Integrated operation time [lower 4 digits]	0 to 9999 (Resolution of display: 1 hours) If the total integrated operating time exceeds 9,999 hours, these digits move to the integrated operating time display [upper 2 digits].

Symbol	Name	Setting range	Factory set value
F_6 (F6)	Function block 6	This is first parameter symbol of function block 6 (F6.).	
H_T (HT)	Output time setting for automatic calculation of inflection point ¹	0.0 to 100.0 seconds (0.0: Inflection point calculation function unused)	20.0
H_U (HU)	Action selection of heater break alarm ¹	0: Standard heater break alarm 1: Non-linear resistance heater break alarm 2: Start inflection point calculation ²	0
K_1 (K1)	Manipulated output value setting of inflection point ¹	0.0 to 100.0 %	0.0
r_1 (r1)	Current value setting of inflection point ¹	0.0 to 22.0 A (20 A type) 0.0 to 66.0 A (60 A type) 0.0 to 33.0 A (30 A type) 0.0 to 88.0 A (80 A type) 0.0 to 50.0 A (45 A type) 0.0 to 110.0 A (100 A type)	0.0
K_2 (K2)	Manipulated output value setting of inflection point ²	0.0 to 100.0 %	0.0
r_2 (r2)	Current value setting of inflection point ²	0.0 to 22.0 A (20 A type) 0.0 to 66.0 A (60 A type) 0.0 to 33.0 A (30 A type) 0.0 to 88.0 A (80 A type) 0.0 to 50.0 A (45 A type) 0.0 to 110.0 A (100 A type)	0.0
K_3 (K3)	Manipulated output value setting of inflection point ³	0.0 to 100.0 %	0.0
r_3 (r3)	Current value setting of inflection point ³	0.0 to 22.0 A (20 A type) 0.0 to 66.0 A (60 A type) 0.0 to 33.0 A (30 A type) 0.0 to 88.0 A (80 A type) 0.0 to 50.0 A (45 A type) 0.0 to 110.0 A (100 A type)	0.0

¹ This parameter becomes valid on the instrument with a non-linear resistance heater break alarm.

² When the calculation of the inflection point is finished, the set value returns to "1."

It may not be possible to use the non-linear resistance heater break alarm function with some heater types.

Use this function in a system with a current capacity of 10 A or more.

As the measuring accuracy of the current transformer (CT) is within ±2 % of the THV-A1 rated current, no heater break alarm may normally operate if used at a smaller load current value.

When the zero-cross control is used, the non-linear resistance heater break alarm function cannot be used.

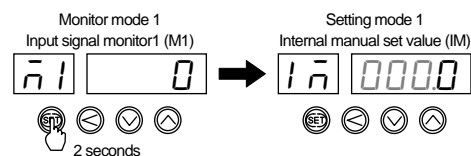
Symbol	Name	Setting range	Factory set value
F_7 (F7)	Function block 7 *	This is first parameter symbol of function block 7 (F7.). For the parameters to Function block 7 (F7.), refer to THV-A1 Instruction Manual [Detailed version] (IMR02D04-E).	

* Functions in Function block 7 (F7) are available on the instrument with a constant current control or constant power control.

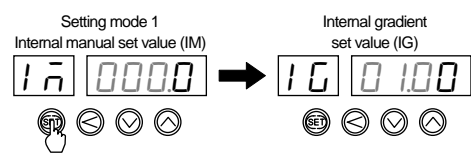
2.3 Changing Parameter Settings

Example: When set the internal gradient set value to "0.50"

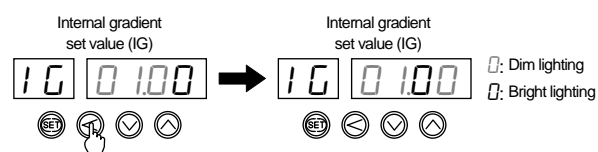
1. Press and hold the SET key for 2 seconds at Monitor mode 1 until Setting mode 1 is displayed.



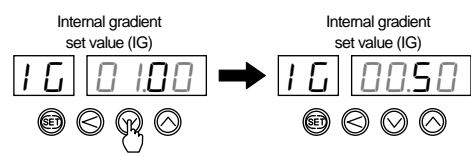
2. Press the SET key to enter the Internal gradient set value.



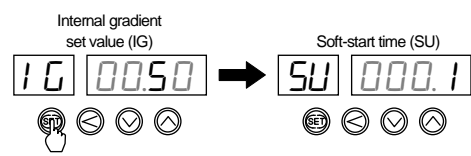
3. Press the shift key to high-light the one decimal place on display (numerical value display).



4. Press the DOWN key to change the number to "0.5."



5. Press the SET key to store the new value. The display goes to the next parameter.



When the value is changed, it will be automatically stored after two seconds without any key operation.

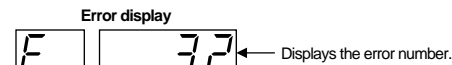
Setting mode 1 return to monitor mode 1 if key operation for more than one minute is not performed.

Other parameters can be set in the same way as the example above.

3. ERROR DISPLAYS

When the error occurs, the display changes to the error display. When two or more errors occur simultaneously, the error code numbers are totaled and displayed as one number.

When error "1," "4," "32," or "64" is cleared, the output of THV-A1 recovers and the display changes from the error display to monitor mode 1.



Error No.	Description	Action	Solution
1	Calibration data error	THV-A1 output OFF	Turn off the power at once.
2	Back-up error	THV-A1 output OFF	If an error occurs after the power is turned on again, please contact RKC sales office or the agent.
4	A/D conversion error	THV-A1 output OFF	
32	Power frequency error	THV-A1 output OFF	Check the value of power supply frequency, and turn off the power at once. If an error occurs after the power is turned on again, please contact RKC sales office or the agent.
64	Power supply voltage error	THV-A1 output OFF	Turn off the power at once.
128	Watchdog timer error	THV-A1 operation stops *	If an error occurs after the power is turned on again, please contact RKC sales office or the agent.

* When the operation of THV-A1 stopped, the output of THV-A1 turns OFF.

4. MODEL CODE

Check whether the delivered product is as specified by referring to the following model code list. If the product is not identical to the specifications, please contact RKC sales office or the agent.

THV-A1 PZ □ - □ * □ □ □ □ - □ (- □)*

(1) (2) (3) (4) (5) (6) (7) (8) (9) (10)

* The code for accessory will be more than one if the product has more than one accessory.

- (1) Power supply
1: Single-phase 100 to 240 V AC
- (2) Control method
PZ: Phase control/zero-cross control (configurable)
- (3) Rated current
020: 20 A AC 045: 45 A AC 080: 80 A AC
030: 30 A AC 060: 60 A AC 100: 100 A AC
- (4) Input signal
4: Voltage input 0 to 5 V DC 6: Voltage input 1 to 5 V DC 8: Current input 4 to 20 mA DC
5: Voltage input 0 to 10 V DC 7: Current input 0 to 20 mA DC

- (5) Output mode
6: Standard¹ and Constant voltage control²
E: Standard¹, Constant voltage control² and Constant current control³
W: Standard¹, Constant voltage control² and Constant power control^{3,4}
¹ Output mode of standard: Proportional phase angle to input, Proportional voltage to input and Proportional square voltage (electric power) to input
² With square voltage feedback
³ With Heater break alarm, Thyristor break-down alarm, Memory area, Current limiter, Over current alarm and Protection function for control of primary side of a transformer
⁴ With constant current control
- To control the primary side of the transformer, it is recommended to purchase a THV-A1 with a protection function for control of primary side of a transformer.

- (6) Fast-blow fuse
N: No fast-blow fuse F: Built-in fast-blow fuse
- (7) Alarm output
N: No alarm A: Alarm output 2 points
- (8) Heat sink temperature detection function/Non-linear resistance heater break alarm (ARC-HBA)
N: No function
A: Heat sink temperature detection function
B: Non-linear resistance heater break alarm *
C: Heat sink temperature detection function and Non-linear resistance heater break alarm *
* When the output mode is specified to E or W code, this alarm can be selected.

- (9) Communication function
N: No communication function 4: RS-422A 5: RS-485

- (10) Accessories
1: Setter for open loop control (potentiometer, knob and scale plate) [1 set] and Input connector (plug)
2: Setter for open loop control (potentiometer, knob and scale plate) [2 sets] and Input connector (plug)
9: Input connector (plug)
B: Alarm output connector (plug)

Code	Accessories
THVP-S01	Setter for open loop control (potentiometer, knob and scale plate)
THWP-C01	Input connector (plug)
THVAP-C01	Alarm output connector