Single-phase Thyristor Unit

20 A/30 A/45 A
60 A/80 A/100 A

THV-10 Quick Operation Manual

IMR02W04-E1

In order to achieve maximum performance and ensure proper operation of the instrument, carefully read all the instructions in this manual. This manual describes how to switch the modes and parameters as well as how to change the numerical values on THV-10.

For detailed handling procedures and key operations, refer to separate **20 A/30 A/45 A/60 A/80 A/ 100 A types THV-10 Instruction Manual (IMR02W05-E□)**.

The manual can be downloaded from the official RKC website:
https://www.rkcinst.co.jp/english/download-center/

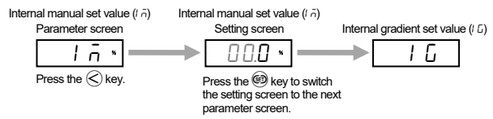
1. DESCRIPTION OF DISPLAYS, KEYS AND OPERATIONS

Name	Description
Display	Shows the parameter symbols, input signal values, and various set values.
Unit display	Shows the unit of input signal value or the unit of various set values.
Indication lamps	• SET: Lights up during the Setting mode [C], Parameter select mode [B] or Engineering mode [D]. Flashes while Data setting lock is active. • ARC: Lights while "knee points" is automatically calculated. (When a Non-linear resistance heater break alarm is used) • ALM: Lights or flashes when alarm occurs. The type of the generated alarm can be checked in the Alarm monitor (AL) in the Monitor mode.
UP key	• Increases numerals. • Used to select the function block (F□) of Engineering mode [D].
DOWN key	• Decreases numerals. • Used to select the function block (F□) of Engineering mode [D].
Shift key	• Shift digits when settings are changed. • Used to select the mode. • Used to show the parameter symbols. • Used to switch the screen to the setting screen.
SET key	• Used for set value registration. • Used to select the mode. • Used to select the parameters.

■ How to switch to the Setting screen

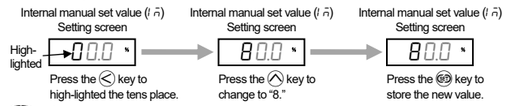
To switch to the Setting screen in the Parameter select mode [B], Setting mode [C], or Engineering mode [D], press the < key while the parameter screen is displayed.

Example: To switch to the Internal manual set value (I ā) in the Setting mode [C]



■ How to change numerical values on the Setting screen

Example: Change the Internal manual set value (I ā) in the Setting mode [C] to "80.0."

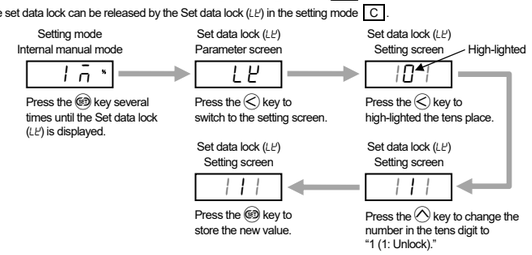


NOTE

Keep the instrument powered on for at least 2 seconds after having stored the changed value. If the instrument is powered off immediately after having stored the changed value, the changed value may not be stored.

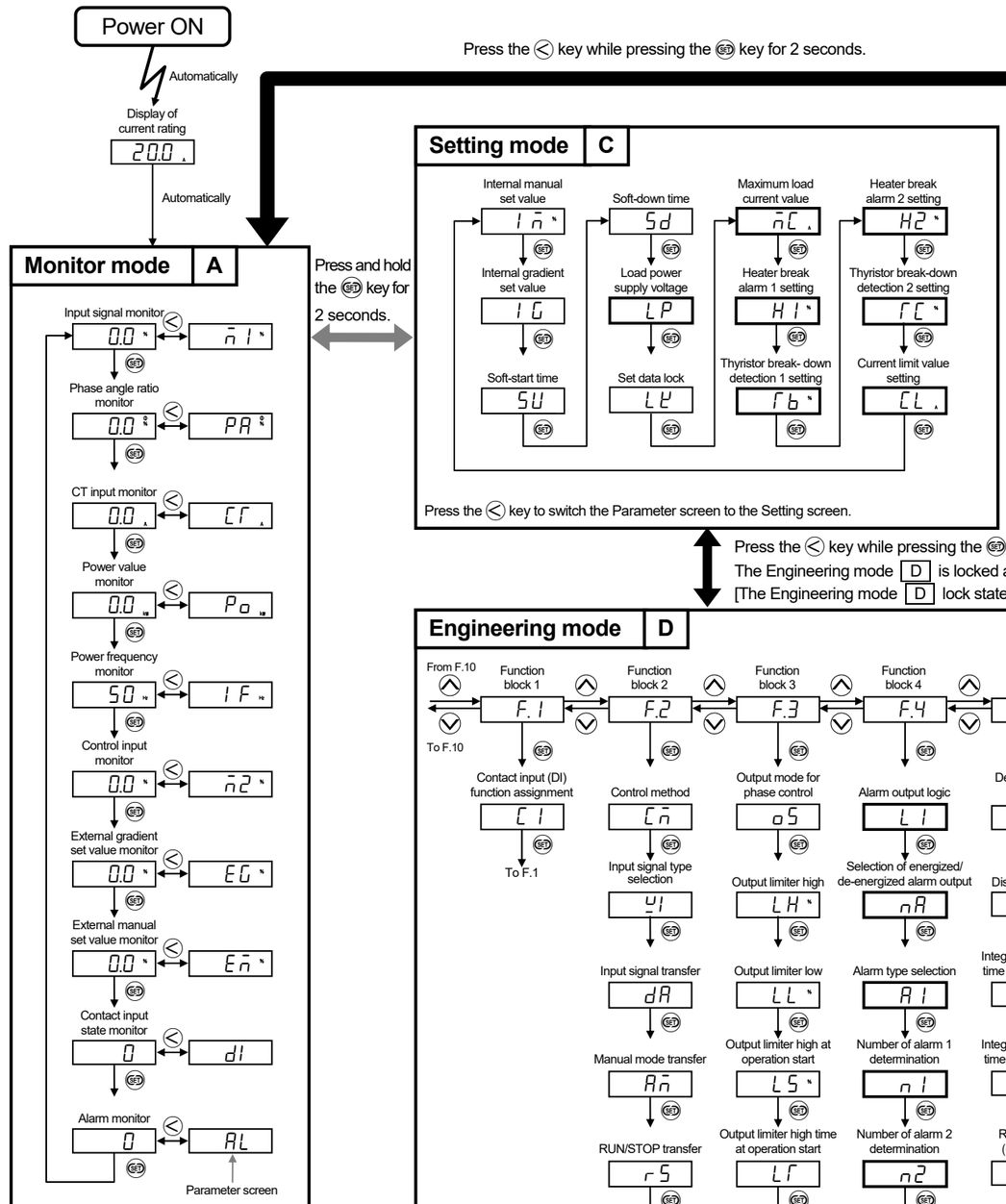
■ How to release the lock in the Engineering mode [D]

The set data lock can be released by the Set data lock (LY) in the setting mode [C].



2. LIST OF PARAMETER OPERATION AND HOW TO CHANGE NUMERICAL VALUES

Optional screens are not displayed unless specified at the time of ordering. Screens available by options are shown with a bold frame. If the instrument is not operated for one minute while a parameter screen or setting screen other than the Monitor mode is displayed, the screen set in "Default display selection (d5)" is automatically displayed.



■ Error Displays

When an error occurs, an error number screen is displayed. See "**5. ERROR DISPLAYS**" for the meaning of error codes.

E 1 : Adjustment data error

E 2 : Back-up error

E 4 : A/D conversion error

3. PARAMETER LIST

Some parameters or set values may not be displayed depending on the model code. The column with a title "No." shows a screen number. It is necessary when the screen is registered in the Parameter select mode [B].
(Refer to ■ **How to register screens**).
Parameters with a symbol "—" in the No. column cannot be registered into the Parameter select mode [B].

■ Monitor Mode [A]

No.	Symbol	Name	Display range	Factory set value
—	n1 (M1)	Input signal monitor	0.0 to 100.0 %	—
—	PA (PA)	Phase angle ratio monitor	0.0 to 100.0 %	—
—	CT (CT)	CT input monitor	0.0 to 40.0 A (20 A type) 0.0 to 40.0 A (30 A type) 0.0 to 90.0 A (45 A type) 0 to 120 A (60 A type) 0 to 160 A (80 A type) 0 to 200 A (100 A type)	—
—	Po (Po)	Power value monitor	0.0 to 7.5 kW (20 A type) 0.0 to 11.3 kW (30 A type) 0.0 to 17.0 kW (45 A type) 0.0 to 22.6 kW (60 A type) 0.0 to 30.2 kW (80 A type) 0.0 to 37.8 kW (100 A type)	—
—	IF (IF)	Power frequency monitor	40 to 70 Hz	—
—	n2 (M2)	Control input monitor	0.0 to 100.0 %	—
—	EG (EG)	External gradient set value monitor	0.0 to 100.0 %	—
—	En (EM)	External manual set value monitor	0.0 to 100.0 %	—
—	dI (dI)	Contact input state monitor	0: Contact open 1: Contact closed	—
—	AL (AL)	Alarm monitor	0 to 191 0: No alarm 1: Heater break alarm 1 2: Thyristor break-down alarm 1 4: Heater break alarm 2 8: Thyristor break-down alarm 2 16: Power frequency error 32: Over current alarm 128: FAIL If two or more alarms have occurred, the sum of the error numbers is displayed.	—

■ Parameter select mode [B]

For the details of Parameter select mode [B], refer to **THV-10 Instruction Manual (IMR02W05-E□)**.

■ Setting mode [C]

No.	Symbol	Name	Display range	Factory set value
1	In (IM)	Internal manual set value	0.0 to 100.0 % If the power is turned off, internal manual set value is reset to "0.0."	0.0
2	IG (IG)	Internal gradient set value	0.00 to 2.00	1.00
3	SU (SU)	Soft-start time	0.0 to 199.9 seconds (0.0: Soft-start function unused)	0.1
4	Sd (Sd)	Soft-down time	0.0 to 199.9 seconds (0.0: Soft-down function unused)	0.1
5	LP (LP)	Load power supply voltage	85 to 264 V	220
6	LK (LK)	Set data lock	101 Setting mode [C] Engineering mode [D] Parameter select mode [B] 0 and 2 to 9: Lock 1: Unlock Parameter select mode [B] and Engineering mode [D] are not displayed when locked.	101
7	nC (MC)	Maximum load current value	0.0 to 32.0 A (20 A type)	20.0
			0.0 to 32.0 A (30 A type)	30.0
			0.0 to 55.0 A (45 A type)	45.0
			0 to 70 A (60 A type)	60
			0 to 90 A (80 A type)	80
			0 to 110 A (100 A type)	100
8	HI (HI)	Heater break alarm 1 setting	0 to 100 % 0: Heater break alarm 1 unused	20
9	Tb (Tb)	Thyristor break-down detection 1 setting	0 to 100 % 0: Thyristor break-down alarm 1 unused	20
10	H2 (H2)	Heater break alarm 2 setting	0 to 100 % 0: Heater break alarm 2 unused	15
11	TC (TC)	Thyristor break-down detection 2 setting	0 to 100 % 0: Thyristor break-down alarm 2 unused	15
12	CL (CL)	Current limit value setting	0.0 to 32.0 A (20 A/30 A types)	32.0
			0.0 to 55.0 A (45 A type)	55.0
			0 to 70 A (60 A type)	70
			0 to 90 A (80 A type)	90
			0 to 110 A (100 A type)	110

■ Engineering mode [D]

F.1 : Function block 1

No.	Symbol	Name	Display range	Factory set value
13	CI (C1)	Contact input (DI) function assignment		0

Function	Open	Closed
0: No function	—	—
1: Control method	Phase control	Zero-cross control
2: Input signal transfer	Auto mode	Manual mode
3: Manual mode transfer	External manual mode	Internal manual mode
4: RUN/STOP transfer	STOP	RUN
5: Soft-start, Soft-down enable/disable	Enable	Disable
6: Heater break alarm enable/disable	Enable	Disable
7: Over current alarm enable/disable	Enable	Disable
8: Set data lock enable/disable	Enable	Disable

F.2 : Function block 2

No.	Symbol	Name	Display range	Factory set value
14	CM (CM)	Control method	0: Phase control 1: Zero-cross control (continuous) 2: Zero-cross control (input synchronous type)	0
15	XI (XI)	Input signal type selection	0: 4 to 20 mA DC 1: 1 to 5 V DC 2: 0 to 10 V DC, 0/12 V DC	Based on model code
16	dA (dA)	Input signal transfer	0: Auto mode 1: Manual mode	0
17	AM (AM)	Manual mode transfer	0: External manual mode 1: Internal manual mode	0
18	rS (rS)	RUN/STOP transfer	0: STOP (Output OFF) 1: RUN (Output ON)	1
19	SF (SF)	Soft-start, Soft-down enable/disable	0: Disable 1: Enable (Except switching from STOP to RUN) 2: Enable	2
20	HF (HF)	Heater break alarm enable/disable	0: Disable 1: Enable	1
21	oF (oF)	Over current alarm enable/disable	0: Disable 1: Enable	1

F.3 : Function block 3

No.	Symbol	Name	Display range	Factory set value
22	oS (oS)	Output mode for phase control	0: Proportional phase angle to input 1: Proportional voltage to input 2: Proportional square voltage (electric power) to input 3: Constant current control (optional) 4: Power proportional control (optional)	2
23	LH (LH)	Output limiter high	0.0 to 100.0 % Output limiter high ≧ Output limiter low	100.0
24	LL (LL)	Output limiter low	0.0 to 100.0 % Output limiter high ≧ Output limiter low	0.0
25	LS (LS)	Output limiter high at operation start	0.0 to 100.0 %	50.0
26	LT (LT)	Output limiter high time at operation start	0 to 600 seconds	0
27	bU (bU)	Base-up set value	–9.9 to +100.0 %	0.0
28	Mo (Mo)	Minimum output phase angle adjustment	Output phase angle 5.0 to 15.0 %	5.0
29	SC (SC)	SCR trigger signal setting *	Phase of the supply voltage for the instrument and the supply voltage for the load 0: Same phase 1: Opposite phase	0

* To change the set value, stop the instrument.

F.4 : Function block 4

No.	Symbol	Name	Display range	Factory set value
30	L1 (L1)	Alarm output logic	0 to 191 0: No output 1: Heater break alarm 1 2: Thyristor break-down alarm 1 4: Heater break alarm 2 8: Thyristor break-down alarm 2 16: Power frequency error 32: Over current alarm 128: FAIL (fixed at de-energized)	0
31	nA (nA)	Selection of energized/de-energized alarm output	0: Energized 1: De-energized If FAIL output is set, all alarm outputs are de-energized.	0
32	A1 (A1)	Alarm type selection	0: Type 1 (constant resistance type, deviation alarm) 1: Type 2 (linearity resistor type, absolute value alarm) 2: Non-linear resistance heater break alarm (Non-linear resistance type, deviation alarm) In the case of Zero-cross control (continuous, input synchronous type), alarm is operated as Type 2 regardless of the set value.	0
33	n1 (n1)	Number of alarm 1 determination	1 to 1000 times	30
34	n2 (n2)	Number of alarm 2 determination	1 to 1000 times	300
35	SA (SA)	Alarm enable/disable during STOP	0: Disable 1: Enable	0

F.5 : Function block 5

No.	Symbol	Name	Display range	Factory set value
36	dM (dM)	Default display selection	0: Input signal monitor 1: CT input monitor 2: Power frequency monitor 3: Power value monitor When the CT is not specified, even if "1: CT input monitor" or "3: Power value monitor" is set, the display will change to the input signal monitor.	0
37	dT (dT)	Display off timer	0 to 1000 seconds (0: Constantly lit)	0
38	WH (WH)	Integrated operation time (upper 3 digits)	0 to 999 (Display resolution:1000 hours)	0
39	WL (WL)	Integrated operation time (lower 3 digits)	0 to 999 (Display resolution:1 hour)	0
40	Vr (Vr)	ROM version (High-order)	Fixed value (Version number)	—
41	Vq (Vq)	ROM version (Low-order)	Fixed value (Running number)	—

F.6 : Function block 6

No.	Symbol	Name	Display range	Factory set value
42	HT (HT)	Automatic calculation time for knee points	0.0 to 1000 seconds (0: Automatic detection function of knee points unused)	20
43	HU (HU)	Automatic detection of knee points	0: OFF 2: Aborted 1: ON	0
44	K1 (K1)	Phase angle ratio at knee point 1	0 to 100 %	18
45	r1 (r1)	Current value at knee point 1	0.0 to 32.0 A (20 A type)	3.6
			0.0 to 32.0 A (30 A type)	5.4
			0.0 to 55.0 A (45 A type)	8.1
			0 to 70 A (60 A type)	11
			0 to 90 A (80 A type)	14
			0 to 110 A (100 A type)	18
46	K2 (K2)	Phase angle ratio at knee point 2	0 to 100 %	36
47	r2 (r2)	Current value at knee point 2	0.0 to 32.0 A (20 A type)	7.2
			0.0 to 32.0 A (30 A type)	10.8
			0.0 to 55.0 A (45 A type)	16.2
			0 to 70 A (60 A type)	22
			0 to 90 A (80 A type)	29
			0 to 110 A (100 A type)	36
48	K3 (K3)	Phase angle ratio at knee point 3	0 to 100 %	56
49	r3 (r3)	Current value at knee point 3	0.0 to 32.0 A (20 A type)	11.2
			0.0 to 32.0 A (30 A type)	16.8
			0.0 to 55.0 A (45 A type)	25.2
			0 to 70 A (60 A type)	34
			0 to 90 A (80 A type)	45
			0 to 110 A (100 A type)	56

F.7 : Function block 7

No.	Symbol	Name	Display range	Factory set value
50	TF (TF)	Protection function for control of primary side of a transformer	0: Protection function for control of primary side of a transformer disable 1: Protection function for control of primary side of a transformer enable	0
51	TA (TA)	Determination set value in case of a break on the secondary side of the transformer	0 to 100 % of reference current value	70
52	TL (TL)	Output limiter setting in case of a break on the secondary side of the transformer	15.0 to 50.0 % of phase angle	15.0
53	TU (TU)	Soft-start time in case of break on the secondary side of the transformer	0.1 to 100.0 seconds	0.1

F.8 : Function block 8

No.	Symbol	Name	Display range	Factory set value
54	Ao (Ao)	Retransmission output type	0: No retransmission output 1: Manipulated output value 2: CT input monitor (Optional) 3: Power value monitor (Optional)	Based on model code
55	AHS (AHS)	Retransmission output scale high	0.0 to 100.0 % (Retransmission output scale high≧ Retransmission output scale low)	100.0
56	ALS (ALS)	Retransmission output scale low	0.0 to 100.0 % (Retransmission output scale high≧ Retransmission output scale low)	0.0

F.9 : Function block 9

No.	Symbol	Name	Display range	Factory set value
57	CMP (CMP)	Communication protocol	0: RKC communication 1: Modbus	Based on model code
58	Add (Add)	Device address	RKC communication: 0 to 99 Modbus: 1 to 99	Based on model code
59	bPS (bPS)	Communication speed	0: 9600 bps 2: 38400 bps 1: 19200 bps 3: 57600 bps	0
60	bIT (bIT)	Data bit configuration	0 to 11 Refer to Data bit configuration table	0
61	InT (InT)	Interval time	0 to 250 ms	10

Data bit configuration table

Set value	Data bit	Parity bit:	Stop bit
0	8	Without	1
1	8	Without	2
2	8	Even	1
3	8	Even	2
4	8	Odd	1
5	8	Odd	2

Set value	Data bit	Parity bit	Stop bit
6	7	Without	1
7	7	Without	2
8	7	Even	1
9	7	Even	2
10	7	Odd	1
11	7	Odd	2

: Not settable for Modbus

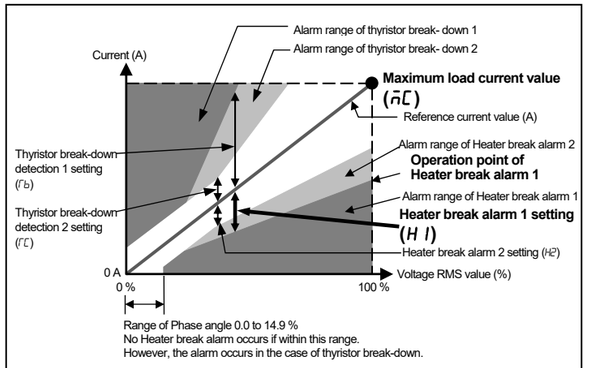
F.10 : Function block 10

No.		Symbol	Name	Display range
—	P1	Parameter select setting 1	0 to 61 (Screen No.) 0: No registration	For the details of Facory set value, THV-10 Instruction Manual (IMR02W05-E□).
⋮	⋮	⋮	⋮	
—	P22	Parameter select setting 22	0 to 61 (Screen No.) 0: No registration	

* To change the set value, stop this instrument.

4. SETTING EXAMPLE OF HEATER BREAK ALARM

This is a setting example when "Type 1 (Constant resistance type, Deviation alarm)" is selected at "Alarm type selection (A1)." Alarm of Type 1 is valid when the instrument is for phase control. Alarm status is determined by the deviation between the reference current and the alarm set value.



Operation chart of Heater break alarm [Type 1 (constant resistance type, deviation alarm)]

■ Setting example of Heater break alarm 1

☞ Refer to "**2. LIST OF PARAMETER OPERATION AND HOW TO CHANGE NUMERICAL VALUES**" for how to switch parameters.

Example: In case the maximum load current is "10.0 A" and the set value of Heater break alarm 1 is set to "20 % of the reference current":

1. Check the Maximum load current when the heater output is fully on (100%).
   Check the value in a way shown in either ① or ② shown below.

   ① Increase the heater output to 100% while observing it on the CT input monitor (CT).
   (Do not set the gradient setting)

   Monitor mode
   CT input monitor (CT) 10.0 A < Parameter screen CT A

   ② Check the heater supply voltage and the heater capacity, and obtain the maximum load current using the following equation.

   Heater capacity/Power supply voltage = Maximum load current value

2. Set the "Maximum load current value" obtained above ① to the Maximum load current value (nC) in the Setting mode [C].

   Setting mode
   Maximum load current value for alarm (nC) nC A < Setting screen 10.0 A Example: 10.0 A

3. Set the Heater break alarm 1 (Operating point of Heater break alarm 1) at Heater break alarm 1 setting (HI) in the Setting mode [C].

   Setting mode
   Heater break alarm 1 setting (HI) HI % < Setting screen 020 % Factory set value: 20 %

☞ For alarm other than the heater break alarm 1 set value, refer to **THV-10 Instruction Manual (IMR02W05-E□)**.

5. ERROR DISPLAYS

If an error occurs, the following display processing is made according to the cause of the abnormality. If two or more alarms have occurred, the sum of the error numbers is displayed.

Error display

E 4 : A/D conversion error

Error number	Description	Display	Action	Solution
1	Adjusted data error	Error number and Monitor mode screen alternatively.	THV-10 output OFF Alarm terminal open. Retransmission output OFF	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.
2	Back-up error			
4	A/D conversion error			
—	Watchdog timer	ALM lamp lights All others turn off		
—	Power supply voltage error	All lamp turns off		

The first edition: APR. 2020 [IMQ00]

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APR. 2020