# TTM-210 brief operation manual

Thank you for purchasing our TTM-210. Please thoroughly read this manual. This manual is a brief version of the operation manual. Please refer to the full version of the operation manual (User's Manual) for details. (It can be downloaded from our homepage)

Please purchase the loader cable additionally, when the loader communication is used. (Model: TTM-LOADER) If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired. **Cautions** For safety purpose, following symbols are used in this manual.

/!\ Cautions The case that a user may receive minor injury or the equipment may get damage Verify correct wiring before turning on electricity since incorrect wiring may cause an equipment failure or a fire. Modification of this equipment may cause malfunctioning or a fire. Do not add modification on this equipment. If the equipment is used in /!\ Warning a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

The case that a user may receive fatal damage, electric shock, or severe burn injury when the product is incorrectly used

Wiring: Do not use empty terminals for irrelevant purposes. / Cautions Operation: Do not use a sharp-pointed tool for operating keys.

- Hand over this operation manual to a person who actually operates the product. - Do not reprint or duplicate this manual without permission.

- Content of this manual may be subject to modification without prior notice. - Keep a password in a note if it is set.

⚠:Cautions, Danger, Refer to a manual 🛕: Cautions, Danger of Electric Shock 🔘: Alternating current

## Verification of the product

**/!**∖ Warning

1) Verification of the model: Refer the model name printed in the packing box to the order sheet.

The meaning of the symbols indicated on the label found at the side of the unit is as follows.

2)	<ol> <li>Verification of accessories: Mounting attachment and this manual</li> </ol>												
3)	Model	table: TTM-21							] - []				7
		T		$\neg$				T	_				
	M	lodel	_						Option				Power supply voltage
	4	48x48						S	CT1 input #				100-240VAC50/60Hz
	5	96x48						Т	CT2 input #				TTM-214 is 10VA Others are 11VA
	7	72x72						U	Event 1 input				24VAC/DC 50/60Hz
	9	96x96						V	Event 2 input			_	TTM-214 is 5W
		Output 1/2						W	Event 3,4 input				Others are 6W
	N						Option combination (Following limitation)						
	R						*214:ST,SV,UV M				M	Communication (RS-485)	
	Р	Relay contact (250 VAC, 3A) SSR drive (0-12 VDC)							ST,SV,UV,STW,SVW,U				* RS-485 is optinal
	Α	Open collector (24 VDC, 100 mA)							ctable either W (Evevt3 ( 219:ST、SV.UV.SVW.U\	,		tput	7 for TTM-217.
	K	Voltage: 0-1 VDC						215/2		, ,	VVV	$\neg$	
	J	1 Valtage 0.5 VD0							Al inpu			_	
	F Voltage: 1-5 VDC							Y	Remote SV input (V	oltage / curren	t only)		*Not selectable for TTM-214
	G Voltage: 0-10 VDC		Output3	/4	Output	5/6	Outpu	ıt7					
	- 1	A Oper	coll	ector (2	24 VE	OC, 100	mA)						
	H Voltage: 0-10 mVDC			/ cor	ntact (2	50 V	AC, 1A)						
# In case of the analog output only, the CT			*From output 5 to 7 are not selectable for TTM-214.										

## **Environmental condition**

option can not select.

- \*Output 7 is not selectable when W (Event3) is selected \*Output3~7 is optional (1) Service temperature/humidity range: 0 to 50 °C, 20 to 85 % RH (no dew condensation)
- (2) Storage temperature/humidity range: -20 to 70 °C (no freezing or dew condensation), 5 to 85 % RH (no dew condensation)
- (3) Equipment environment: 1) No corrosive gases, dust, and oil
  - 2) As far away as possible from an electric noise source, and little effect from electromagnetic field
  - 3) As few as possible with mechanical vibrations or impacts

\*Output 6 is not selectable for TTM-217.

- 4) No direct sunlight
- 5) Installation (overvoltage) category II /Pollution Degree 2
- 6) Indoor use / Altitude up to 2000m

7) Mains supply voltage fluctuations not to exceed -15/+10 percent of the nominal voltage However,24V does not exceed  $\pm$  10 percent.

### Prior to control operation

- Non-volatile memory is used for storing settings, which stays in the storage even when the power is cut. - Input form can be switched (Thermocouple, Resistance Temperature Detector, voltage, and current).
- Match the selected input form with input setting on the product.
- PID control and ON/OFF control are possible. Advantage/disadvantage of them are as follows. Select the control in consideration of the advantage / disadvantage.
- \* A self-tuning function is equipped on this product so that constants for PID are automatically calculated and reflected

0

to the control at start of control operation or change of SV.

	PID control	ON/OFF control
Advantage	Better control result than ON/OFF control	Longer service life of the relay than that of PID control
Disadvantage	Short service life of the relay due to frequent on/off of output	Larger temperature fluctuation than that of PID control



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## Front panel - names and tasks



●TTM-214

Other Output

- 5

+ 6

- 3 + 4 - 5 + 6 - 7 + 8 - 9 + 10 - 11 + 12

Other Output

- 3 + 4 - 5

+ 6 - 7

●TTM-215/219

- 3 + 4 Output 1 4

Output2 5

Output1 3

Output2 5

Output2 6 7 Output5 8

Relay Output C 3 NO 4

C 5

NO 6

Relay Output C 3 NO 4 C 5 NO 6 C 7 NO 8 C 9 NO 10 C 11 NO 12

●TTM-217

Relay Output
C 3
NO 4
C 5
NO 6
C 7

/!\ Warning

\*Depending on size, some functions may not be available. Refer to model table for details concerning individual functions

OUT1 to OUT7	Output 1 to 7 monitor (It appears when output)
RDY	RDY lamp (to light up at READY status)
COM	COM lamp (to flicker during communication)
DI1 to DI4	DI 1 to 4 monitor (It appears when DI 1 to 4 operates)
TMR	TMR lamp (to light up during timer operation)
TIME	To light up when setting is for timer
°C/°F	To light up when setting is for temperature
PV	Reading indication, character indication, and timer setting time indication
SV	Setting indication, operation amount indication, and timer remained time indication
MODE	Mode key To be used when screen is switched.
FUNC	Function key To execute set function
Δ	Up key To be used for increasing setting value To be used for switching input setting mode
$\nabla$	Down key To be used for decreasing setting value To be used for switching input setting mode
Wiring (%n	nark can choose only a relay or an open collector.)

13 Communication (RS-485)

16 DI1 (COM)

18 DI2 (COM)

22 CT2 —

23 Output7 \*\*

Do not use to measure exceeds the input range, and Do not use in the MAINS circuit.

17 DI2 DI Input

16 CT1 CT Input

18 CT2

29 DI1 (COM)

31 DI2(COM) DI Inpu

30 DI2

32 DI3

33 DI4

34 DI3,4(COM)

Relay Open Collector Output

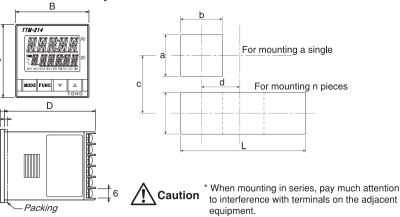
NO 23 + 23 - 24

Measurement category of inputs is not specified.

\* A conformity wire: copper/AWG18-24/Temperature rating 80°C.
\* Tightening torque: 0.5 Nm

NO 23

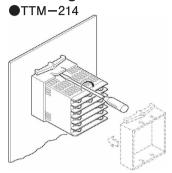
## **Dimensions and panel cut**



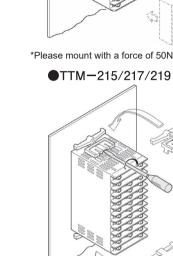
Model		а		b	С	d	Α	В	С	D	Е	L	
TTM-214	45	+0.6	45	+0.6	60	48	48	48	2.5	59.7	1.5	(Bxn-3)	+0.6
11101-214	45	-0	45	-0	(☆1)	40	40						-0
TTM-215	92	+0.6	45	+0.6	120	48	96	48	2	65	2	(Bxn-3)	+1
11101-215	92	-0	45	-0									-0
TTM-217	68	+0.6	68	+0.6	00	72	72	72	2	65	2	(Bxn-3)	+1
1 1 IVI-2 1 7		-0	00		90	12	12						-0
TTM-219	92	+0.6	92	+0.6	120	96	06	06	2	65	0	(Bxn-3)	+1
11101-219	92	-0	92	-0	120	90	96	96	)   2	65	2	(DXII-3)	-0
☆1:When using TTM-214, take careful note of dimensions in column c when using													

loader cable. Mounting

●TTM-214



## \*Please mount with a force of 50N on one side.



\* Attachment removal technique For removal, insert a flathead screwdriver in between body and attachment pawl, and

\*Wire with care for polarity (+ and -), if applicable.

\*For relay contact output, "C: common" and "NO: normal open."

\*For output for SSR drive, match the polarity with input of SSR side and connect.

\*For CT input, use specified current transformer (CTL-6-P-H). Transient overvoltage of CT input is 250V, and rated current is 50A. \*Do not use paint thinner or similar chemical to clean with. Use standard grade alcohol. \*The panel to which the main unit is mounted should be a metal plate (Or something equivalent) with a thickness of 1 to 8mm

\* Relay Electric life: More than 80 thousand counts.

\* This Controller is not equipped with overcurrent protection device(Fuse). Please prepare time lag fuse (rated voltage:250V,rated current:1A) When making power source wiring, A Fuse connect to the live side. \* Unit is not provided with a disconnect. Use of an external disconnect is required. It should be in close proximity to the unit and be labelled as the disconnect for the unit.

\* Terminals other than the 100-240Vac power and relay output,connect to a circuit no risk of electric shock.

\* The use of Noise Filter close to the Power Supply terminal is recommended. Recommended Noise Filter:SUPF-EX10-ER-6(available from OKAYA)

Noise filter's terminal 3 and 4 should be connected to the unit.

+ 7 + 8

9

+ 19 + 20

+ 11 + 12

- 13

C 9

NO 19

NO 20 C 21

NO 11

C 13

8 Output4\*

12

14 CT1

15 CT2 16 CT2 —

19 Output3\*

20 Output4\*

11 Output3\*

12 Output4\*

9 Output3+4% RTD TC/10mV I/V

Al input (Voltage/current)

21 Output3+4% RTD TC/10mV I/V

+ 9 Al input (Voltage/current)

13 Output3+4% RTD TC/10mV I/V

10 b 10 10 -

11 B 11 - 11

12 A 12 + 12

22 b 22 22 + 23 B 23 - 23 -24 A 24 + 24

14 b 14 14 +

15 B 15 - 15 16 A 16 + 16

Caution \*Do not touch terminals while supplying electricity to the product in order to prevent electric shock. When the power supply voltage is DC24V connected plus (+) wire to ①terminal. and minus (-) wire

tion (RS-485)

20 DI 1 (COM)

22 DI 2 (COM)

24 DI 3 (COM)

\* Use specified size (M3 width 6mm or less) crimped terminals (UL Listed) for wiring and crimping machines & tools (UL Listed)

23 DI 3

21 DI 2

Input specificati

e to ②terminal	
tions	
nput e	1Mohm as standard
perature detector input uctor wire resistance: current	10ohm or less 2mA
	0-1VDC, 0-5VDC, 1-5VDC, 0-10VDC, 0-10mV

Input resistance

### No. of parameters and their descriptions Table 1 Timer monitor (indicates the time remained):

Tillode					
01:00 (upper line) On delay					
01:00 (lower line) Off delay					
ng operation, [:] flick	s, and the remained				
can be changed wit	h ▲/▼ keys.				
Setting of input type	: SET1, Item 1, SET2, Item1				
Type of sensor	Measuring/Setting Range				
K thermocouple	-200.0 to 1372.0				
J thermocouple	-200.0 to 1200.0				
T thermocouple	-200.0 to 400.0				
E thermocouple	-200.0 to 1000.0				
R thermocouple	-50 to 1768				
S thermocouple	-50 to 1768				
B thermocouple	0 to 1800				
N thermocouple	-200.0 to 1300.0				
U thermocouple	-200.0 to 400.0				
L thermocouple	-200.0 to 900.0				
WRe5-26	0 to 2300				
PR40-20	0 to 1880				
PLI	0.0 to 1390.0				
Pt100	-200.0 to 850.0				
JPt100	-200.0 to 510.0				
0-10 mVDC	-19999 to 29999				
0-1 VDC	-19999 to 29999				
0-5 VDC	-19999 to 29999				
1-5 VDC	-19999 to 29999				
0-10 VDC	-19999 to 29999				
4-20 mADC	-19999 to 29999				
	O (upper line) On o (lower line) Off congression, [:] flick can be changed with the can be called the cal				

*Setting of	of input type $2$ (SET 2, item 1) is from 16 to 20
Table 3 S	Setting of function of function keys: SET3, Item
No.	Function setting
*0	No function
*1	Digit move
*2	SET21 Operation type setting -Constant operation mode Control mode (MD)/Control stop (Rdy)
	-Program mode Program start/stop
*3	AT start/AT stop
*4	Timer start/reset
*5	Screen reverse travel
*6	ENT
*7	Bank switching
*8	MD/MANUAL Swiching
*9	SV/MV display change
*A	Constant operation mode/program mode switching
*b	Step forward
*C	Pause
*d	SET22 call function (SET22 short-cut function)
No.	Screen reverse travel
0*	None
1*	Pressing time 1 sec
2*	Pressing time 2 sec
3*	Pressing time 3 sec
4*	Pressing time 4 sec
5*	Pressing time 5 sec

### Table 4 Setting of control mode: SET4, Item 6 Character

- ,						
RdY	8 9	Control stop				
RUN	R 11 12	Control start				
MAN		Manual				
TIME1	<u> </u>	Timer 1 operation				
TIME2	F 1 W E 5	Timer 2 operation				
TIME3		Timer 3 operation				
Table 5 Setting of control type: SET4, Item 7						

No.	Primary control	Secondary control
0	Disable	Disable
1	PID	Disable
2	ON/OFF	Disable
3	PID	PID
4	PID	ON/OFF
5	ON/OFF	ON/OFF
6	Position proportionate	Position proportionate

# m 8

Table 6 Setting of PID control type: SET4, Iter							
No.	Control type						
0	Type A (normal)						
1	Type B (overshoot restraint)						
2	Type C (Disturbance restraint)						

### Table 7 Setting of Type B mode: SET 4, Item 9 No. Overshoot

Overshoot restraint - weak

1	Overshoot restraint - intermediate
2	Overshoot restraint - strong
Γable 8	Setting of tuning type: SET 4, Item 13
No.	Туре
1	Primary auto-tuning
2	Primary self-tuning
3	Secondary auto-tuning (Pri./Sec. PID)
4	Secondary self-tuning (Pri./Sec. PID)
5	Primary/secondary auto-tuning (Pri./Sec. PID)
5 Гаble 9	Primary/secondary auto-tuning (Pri./Sec. PIE Setting of AT sensitivity :SET 4, Item 15

able 9	Setting of AT sensitivity :SET 4, Item 15
	Setting of PV threshold :SET4 item 29,47
	Setting of PV change threshold :SET4 item 31,49
	Setting of primary control sensitivity :SET4, Item 34
	Setting of secondary control sensitivity :SET4, Item 51
	Setting of SV tolerable width: SET14, 15, 16, Item 3
	PV indication auto-switching: Switching range: SET 18, Item 6

Current/voltage

0.0 to 9	99.9°C, 0 to 999°C	0 to 9999 (digits)
Table 10		secondary) control : SET 4, Item 35 and 52 nd : SET 4, item 56
	couple/Resistance	Current/voltage

Thermocouple/Resistance

Temperature Detector

Thermocouple/Resistance Temperature Detector	Current/voltage			
-999.9 to 999.9℃ -999 to 999℃	-9999 to 9999 digits			
Table 11 Setting of connection target: SET 5 to 11, Item 1				
l No l De	scription			

0	Primary output
1	Secondary output
2	Event output
3	RUN output
4	RDY output
5	Timer 1 output
6	Timer 1 on delay output
7	Timer 1 off delay output
8	Timer 1 on + off delay output
9	Timer 2 output
10	Timer 2 on delay output
11	Timer 2 off delay output
12	Timer 2 on + off delay output
13	Timer 3 output
14	Timer 3 on delay output
15	Timer 3 off delay output
16	Timer 3 on + off delay output

10	Tillier 3 on + on delay output			
17	Transmission output (during analog output)			
18	End output (during program mode)			
* In SET 7 to 11 there is no item "17"				
		of event function 1: SET 5 to 11, Item 2		
No.		PV event function		
**0	)	None		
**1		Deviation upper/lower limit		
**2	2	Deviation upper limit		
**3	3	Deviation lower limit		
**4	ļ	Deviation range		
**5	5	Absolute value upper/lower limit		
**6	6	Absolute value upper limit		
**7 **8 No.		Absolute value lower limit		
		Absolute value range		
		Added function		
*0*		None		
*1*	:	Hold		
*2*		Standby		
*3*		Delay		
*4*		Hold + standby		
*5* *6*		Hold + delay		
		Standby + delay		
*7*		Hold + standby + delay		
No.		Control mode interlock function		
0**		All modes		
1**		BUN/MAN mode only		

# Table 13

2\*\*

Setting of event upper limit/lower limit :SET 5 to 11, Item 3 and 4			
Thermocouple/Resistance Temperature Detector	Current/voltage		
-1999.9 to 2999.9°C -1999 to 2999°C	-19999 to 29999 (digits)		

### Table 14 Setting of event sensitivity: SET 5 to 11, Item 5 Thermocouple/Resistance Current/voltage Temperature Detector 0.0 to 999.9℃ 0 to 9999℃ 0 to 9999

Table 15 Setting of event function 2: SET 5 to 11, Item 7		
No.	Function	
**0	None	
**1	Exists	
No.	Added function	
*0*	Disable	
*1*	Hold	
*2*	Delay	
*3*	Hold + delay	
No.	Control mode interlock function	
0**	All modes	
1**	RUN/MAN mode only	
2**	RUN mode only	
Table 16 Setti	ng of event function 3: SET 5 to 11, Item 8	

No.	Function
**0	None
**1	CT1 fault
**2	CT2 fault
**3	CT1 fault + CT2 fault
No.	Added function
*0*	None
*1*	Hold
*2*	Delay
*3*	Hold + delay
No.	Control mode interlock function
0**	All modes
1**	RUN/MAN mode only
2**	RUN mode only

2**	RUN mode only			
Table 17 Setting of event function 4: SET 5 to 11				
No.	Function			
**0	None			
**1	Exists			
No.	Added function			
*0*	Disable			
*1*	Hold			

# Table 18 Setting of transmission output function:

SET 5 and 6, Item 11			
No.	Transmission content		
*1	PV (measured value) output		
*2	SV (set value) output		
*3	MV1 (primary operation amount) output		
*4	MV2 (secondary operation amount) output		
*5	Control SV (setting value) output		
No.	Normal/reverse motion		
0*	Normal motion		
1*	Reverse motion		

### Table 19 Setting of CT connection target: SET 12, Item 1 and 4 Connection target Connected to OUT 1 (only DO Connected to OUT 2 (only DO) Connected to OUT 3 (Option) Connected to OUT 4 (Option)

Connected to OUT 5 (Option)

6			Connected to OUT 6 (Option)		
	7		Connec	cted to OUT 7 (Option)	
Table	e 20 Settin	g of DI	function	and polarity: SET 13, Item 1 and	
_	* *	*	*	DI 1 setting DI 2 setting DI 3 setting DI 4 setting DI 4 setting	
No.			Fund	ction	
				Active	
0		None		None	

	DI 4 setting				
No.	Function				
		Active			
0	None	None			
1 Bank switching Bank		Bank switching			
2	Constant operation mode MD	READY			
	Program mode start	Stop			
3	MD	MANUAL			
4	Reverse motion	Normal motion			
5	AT stop	AT startup			
6	Timer stop	Timer start			
7	Constant operation mode	Program mode			
8	_	Step forward (during program mode)			
9 — F		Pause (during program mode)			
A Interlock		_			
No.	No. Polarity				
0	0 Close active				
1	1 Open active				

\*DI function is an option

# Table 21 Setting of functions of timers

, 2 and 3: SET 14, 15 and 16, Item 1				
No. Description				
1	Auto start			
2	Manual start			
3	SV start			
4	DI1 start (Option)			
5	DI2 start (Option)			
6	DI3 start (Option)			
7	DI4 start (Option)			
8	Event 1 start			
9	Event 2 start			
10	Event 3 start (Option)			
11	Event 4 start (Option)			
12	Event 5 start (Option)			
13	Event 6 start (Option)			
14	Event 7 start (Option)			
15	Step start (during program mode)			
16	Soak start (during program mode)			

Table 22 Setting of ON/OFF delay timer :SET 14, 15 and 16, Item 4 and 5 Remained time monitor : SET 14, 15 and 16, Item 7

Table 23 Setting of communication parameters: SET 17, Item 2
* * * * * (STOP bits) 1 bit, 2: 2 bit (PARITY) N: None, o: Odd No. E: Even 1 (DATA) 7: 7 bit, 8: 8 bit (BCC) N: None, b: Exists
Table 24 Setting of communication speed: SET 17, Item 3

speed: SET 17, Item 3				
Numerical No.	Description			
2.4	2400bps			
4.8	4800bps			
9.6	9600bps			
19.2	19200bps			
38.4	38400bps			
Table 25 Setting of communication switching: SET 17, Item 6				

# Description Write prohibited 2 Simultaneous temperature increase master

3   8	Simultaneous temperature increase slave			
Table 26 SET21: Operation type setting Item 1				
No.	Operation type			
0	Constant operation mode			
1	Program mode			
Table 27 SET21: Program mode setting Item 2				
No.	Power failure compensation			
0	Program mode 1 (without)			
1	Program mode 2 (without)			
2	Program mode 1 (with)			
3	Program mode 2 (with)			
*Program 1: The control stops after ending the program operation. (Rdy condition) *Program 2: The control continues after ending the program operation.				
Table 28 SET21: Time unit setting Item 4				
No.	Time unit			

	140.	Tillie uliit		
	0	Hr./min.: Step time		
	1	Hr./min.: Soak time 1		
	2	Hr./min.: Soak time 2		
	3	Min./sec : Step time		
	4	Min./sec.: Soak time 1		
	5	Min./sec.: Soak time 2		
*Step time: After the set time elapse (completion countdown), it will proceed to the next step. *Soak time 1: when it is within the set wait range.				
the counting starts.				
*Soak time 2: only what is within the set wait rang				
	will be counted.			

Table 29 SET23: Bank auto-switching function selection Item 1 Bank auto-switching function Bank auto-switching operation off
 Bank auto-switching operation on Table 30 SET23: Bank auto-switching source setting Item 2 No. Function (bank auto-switching source select) Select SV value

No.

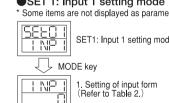
Select ramp SV value Control mode interlock function

> All mode RUN/MAN mode only

Run mode only

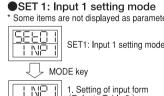
### Bank selection table according to DI status DI1 0 Bank0 Bank1 DI2 DI1 0 0 0 1 Bank1 0 Bank2 1 1 Bank3 DI3 DI2 DI1 Bank0 0 0 0 Bank1 Bank2 0 1 Bank3 0 Bank4 Bank5 1 | 0 Bank6

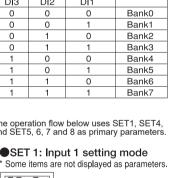
and SET5, 6, 7 and 8 as primary paran

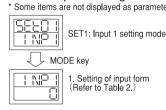


SET1: Input 1 setting mode

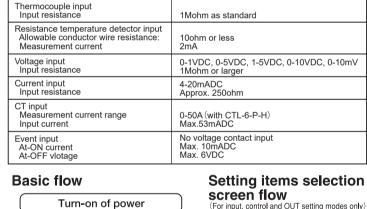
The operation flow below uses SET1\_SET4

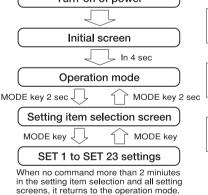






MODE key 2 sec MODE key





For input, control and OUT setting modes only SET1: Input 1 setting mode SET4: Control setting mode

▼/▲ key

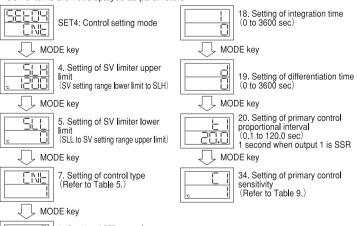
\_0U6

Character

SET5,6,7and 8: OUT 1,

2. 3 and 4 setting mode

### ●SET 4: Control setting mode \* Some items are not displayed as parameters



8. Setting of PID control type (Refer to Table 6.) ●SET 5, 6, 7, 8, 9, 10, 11 : OUT 1, 2, 3, 4, 5, 6, 7 setting mode MODE key \* Some items are not displayed as parameters. SET5,6,7and 8: OUT 1, 2, 3 , 4 setting mode 9. Setting of TYPE B mode (Refer to Table 7.) oUE I MODE key MODE key 2. Setting of event function 1 (Refer to Table 12.) 10. Setting of normal motion/ reverse motion
(0: reverse motion/1normal: motion) MODE key MODE key 13. Setting of tuning type 3. Setting of event upper limit

(Neter to Table 6.)	There to Table 13.7
MODE key	MODE key
16. AT startup screen (Start up/stop with ▲ or ▼ key.) (During AT, PV/SV indication)	4. Setting of event lower lim (Refer to Table 13.)
MODE key	MODE key
77. Setting of proportional band (0.1 to 200.0 %)	10. Setting of event polarity (0: normal open, 1: normal clos

2 8 8 8 Minus 9 Slash  $\mathbb{R}$  $\Box$ D (d) ᆸ G  $\vdash$ M K Ν 0  $\mathbb{P}$ N T(t) W  $\sqcup$ 닜 Χ 님

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