Programmable Digital Controller

MAP6A

Instruction manual

Thank you for purchasing SHIMAX products.
Please check that the delivered Item is the item you ordered.Read this instruction manual thoroughly and understand its contents before using this Products.

SHIMAX

SHIMAX CO.,LTD MAP6F-1AJ October 2008

Please ensure that this manual is given to the final user of this product.

1 Preface

This instruction manual is intended for those who will be involved in wiring, installation, operation and routine maintenance of the MAP6.

This manual describes the care, installation, wiring, function, and proper procedures regarding the operation of MAP6.

Keep this manual on hand while using this device. Please follow the provided guidance.

2 Matters regarding safety

This mark indicates hazardous conditions that could cause damage to equipment and/or facilities. Exercise extreme caution as indicated.

「⚠ WARNING 警告」

This mark indicates hazardous conditions that could cause injury or death of personnel. Exercise extreme caution as indicated.

「⚠ CAUTION 注意」

This mark indicates hazardous conditions that could cause damage to equipment and/or facilities. Exercise extreme caution as indicated.

「NOTE 」

This mark indicates additional instructions and/or notes.

「⚠警告 WARNING」

MAP6 is designed for controlling temperature, humidity, and other physical subjects in general industrial facilities. It must not be used in any way that may adversely affect safety, health, or working conditions.

「⚠注意 COUTION 」

To avoid damage to the connected equipment, facilities or the product itself due to a fault of this instrument, safety countermeasures must be taken before usage, such as proper installation of the fuse and the overheating protection device. No warranty, expressed or implied, is valid in the case of usage without having implemented proper safety countermeasures.

「⚠注意 COUTION 」

●The ⚠ mark on the plate affixed to the instrument on the terminal nameplate affixed to the case of your instrument, the ⚠ mark is printed. This is to warn you of the risk of electrical shock which may result if the charger is touched while it is energized.

●The external power circuit connected to the power terminal of this instrument must have a means of turning off the power, such as a switch or breaker. Install the switch or breaker adjacent to the instrument in a position which allows it to be operated with ease, and with an indication that it is a means of turning off the power. Use a switch or breaker, which meets the requirements of IEC127.

●Fuse

Since the instrument does not have a built-in fuse, do not forget to install a fuse in the power circuit to be connected to the power terminal. The fuse should be positioned between the switch or breaker and the instrument and should be attached to the L side of the power terminal.

Fuse Rating: 250V AC 0.5A/medium lagged or lagged type.

Use a fuse which meets the requirements of IEC127

●Load voltage/current to be connected to the output terminal and the alarm terminal should be within the rated range. Otherwise, the temperature will rise and shorten the life of the product and/or result in problems with the product.

●Voltage/current that differs from input specification should not be connected to the input terminal. It may shorten the life of the product and/or result in problems with the product.

●Input, output of voltage pulse, and output of electric current are not insulated. Therefore, do not ground an adjusted power terminal when a ground sensor is employed.

●A signal wire's common mode voltage to ground (signal wires other than contact output including power supply and event) should be less than 30V rms, 42.4V peak, and 60 VDC.

●All the wires for the interior distribution, except for communication and contact output (including power supply and event), should be less than 30m in length. When the wire's length is 30m or more, or in the case of outdoor wiring, the suitable measure against a lightning surge is required.

●MC standard (IEC61326) classifies MAP6 into Class A apparatus. Electromagnetic interference may occur when MAP6 is used at a business district or in the home. Please use after taking sufficient measures.

●There is a ventilation hole for radiation. Please make sure that the metal won't enter from this hole. It may be occur a breakdown and fire.

●Do not block the draft hole or allow dust or the like to stick to it. A rise in temperature or insulation failure may result in a reduction of the life of the product and/or problems with it or may cause a fire.

●It should be noted that repeated tolerance tests against voltage, noise, surge, etc. may lead to deterioration of the instrument.

●Users are prohibited from remodeling the product or abnormal use thereof.

3 Introductions

3-1Check before use

Before using MAP6, please check the model code, the exterior appearance and accessories. Also make sure that there are no errors, impairs and shortages.

Confirmation of model code

Check that the product you ordered is being delivered properly. Check the model code of the main body case against the following code table.

Check of accessories

「NOTE」 Please contact our agencies or business offices if you have any problem.
We welcome any kind of inquiry such as defect of the product, shortage of accessory and so on.

「⚠注意 COUTION」

Handling Instruction

- Do not operate the keys on the front panel with a hard or sharply pointed object. Operate the keys only by softly touching them with fingertips.
- When cleaning the instrument, wipe it softly with a dry cloth. Never use solvents such as thinner.

Order code table

Item	Code	Specifications			
Series	MAP6A−	96×96 size 5 digit display programmable Digital Controller			
Input		M	Full multi TC、RTD、mV、V、mA		※1
Control Output 1		C	Contact 1a 240V AC 2A(Resistance load)		
		S	Voltage pulse (SSR Drive Voltage) 12V DC max20mA		
		I	Current 4−20mA DC Load resistance max500Ω		
		V	Voltage 0−10V DC Load current max2mA		
		Y	Control motor (Servo control Output)Contact 1C 240V AC 2A		※2
		X	Control motor (Servo control Output)SSR 240V AC 2A		
Power supply		F−	90−264V AC 50／60Hz		
Event Output		E	Even Output 3 points (EV1−3) Contact 1a 240V AC 1A (Resistance load)		
Control Output 2		N−	None		
		C−	Contact 1a 240V AC 2A(Resistance Load)		※2
		S−	Voltage pulse 12V DC max20mA		
		I−	Current 4−20mA DC max500Ω		
		V−	Voltage 0−10V DC max2mA		
Event Output		E−	Event output 1Point (EV4) 240V AC 2A (Resistance load)		
DI(External operation input)		N	None		
		D	7 Points (DI1−7) 5V DC 0. 5mA		
DO−Ⅰ(External operation output Ⅰ)		N	None		
		J	3 Points(DO1−3) 24V DC 20mA		
DO−Ⅱ(External operation output Ⅱ)		N	None		
		J	3 Points(DO4−6) 24V DC 20mA		
CT(Current sensor input)		H	2 Points 50. 0A		
FB(Feedback input(FB))		P	Feedback potentiometer 3 wire 100～2kΩ		
AI(External analogue input)		N	None		
		I	Current 4−20mA DC (Reception resistance100Ω)		
		V	Voltage 0−10V DC (Input resistance about 500kΩ)		
AO(External analogue output)		N	None		
		T	Current 4−20mA DC Load resistance max300Ω		
		V	Voltage 0−10V DC max2mA		
Communication		N	None		
		R	RS−485		
		W	RS−232C		

*1When using by current input, shunt resistance of option parts or same as items (less than 0.05 % of 100 Ω) is needed.

*2When Motor control Y or X installed, Out2 and EV4 can not install.

4 Instalation and Wiring

4-1 Installation (environmental conditions)

「⚠注意 COUTION」

This instrument should not be used in any of the places mentioned below. Selection of these places may result in trouble with the instrument, damage to it or even a fire.

- ●Where flammable gas, corrosive gas, oil mist and particles generated.
- ●Where the temperature is below −10℃ or above 50℃.
- ●Where the relative humidity is above 90% RH or below the dew point.
- ●Where highly intense vibration or impact is generated or transferred.
- ●Near high voltage power lines or where inductive interference can affect the operation of the instrument.
- ●Where undergo influence of the equipment which generates a high frequency.
- ●Where the instrument is exposed to dew drops or direct sunlight.
- ●Where the height more than 2000 m.

Note: The environmental conditions belong to the installation category II of IEC664 and the degree of pollution is II.

4-2 Mounting

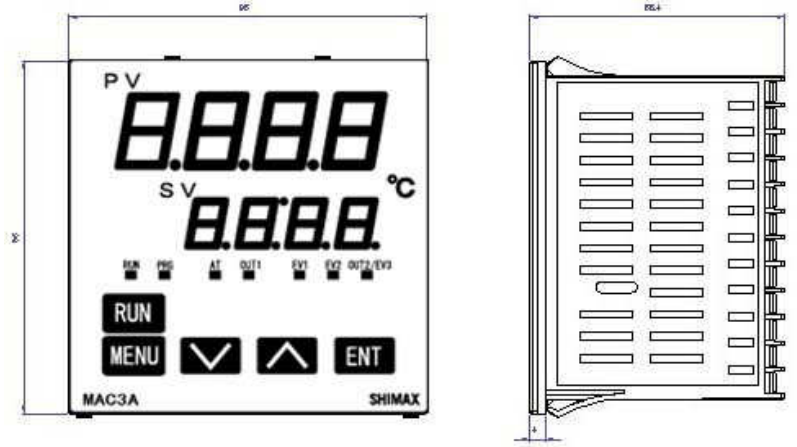
- ●Cut a hole for mounting the controller in the panel by referring to the cutout drawing.
- ●The panel thickness should be 1.2 to 3.2 mm.
  (It can be mounted up to 20mm of thickness using attachment)
- ●MAP6 has pawls of fixing, just press it from the front of the panel.

Note MAP6 is designed to be mounted on a panel. Do not use it without mounting on the panel.

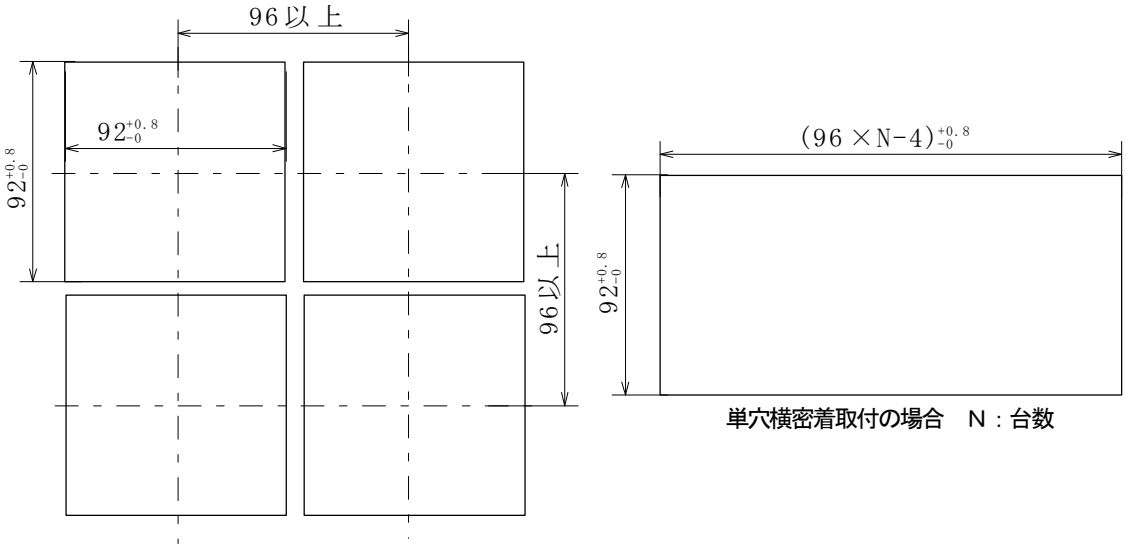
4-3 External Dimensions and Panel Cutout

External Dimension （Unit:mm）

側面図　　上面図



Panel cutout （Unit：mm）



Note: Proximity attachment by a single hole is possible only in the case of horizontal direction. When an apparatus that was attached in vertical direction is removed, a dedicated detachment tool is required.

Wiring

「⚠警告 WARNING」

◎When wiring, make sure to disconnect the power supply. Otherwise an electric shock may result.

◎After wiring, do not touch terminals or other charged elements while it is energized. Otherwise an electric shock may result.

◎After wiring, make sure the wiring are correct.

●Make sure that wiring operation is properly done in line with a terminal wire diagram.

●The press-fit terminal must fit an M3.0 screw and have a width of 6 mm or smaller.
(Clamp receiving torque: 0.5 to 0.6Nm)

●For wiring for power supply, use a 600V vinyl insulated wire or cable which is 1 mm2 or larger in section or a wire or cable of equivalent for higher performance.

●For Thermocouple input use compensation wire compatible with the type of thermocouple.

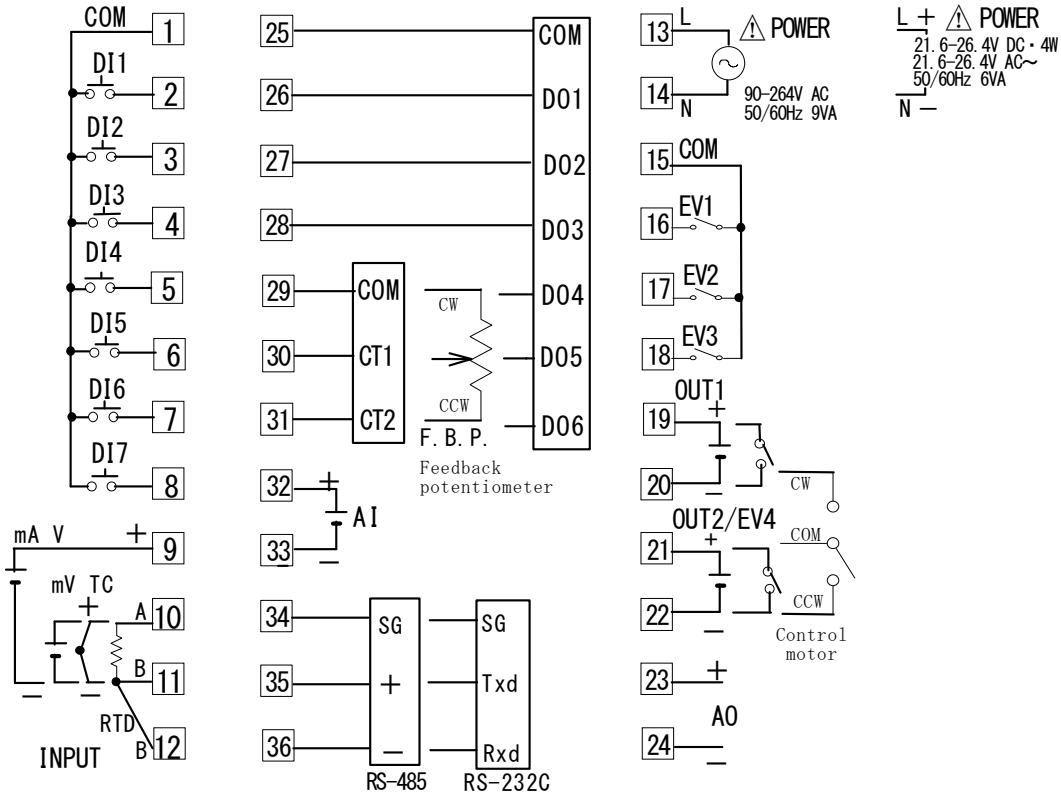
●For RTD input the resistance of single lead wire have to be 10Ω or less , and the three wire have to have same resistance.

●The input signal wire must not be accommodated with a high-voltage power cable in the same wiring conduit or duct.

●Shielded wire (one-point grounding) is effective to avoid electrostatic induction noise.

●Twisting the input wires at short and equal intervals is an effective way to avoid magnetic induction noise.

Terminal arrangement



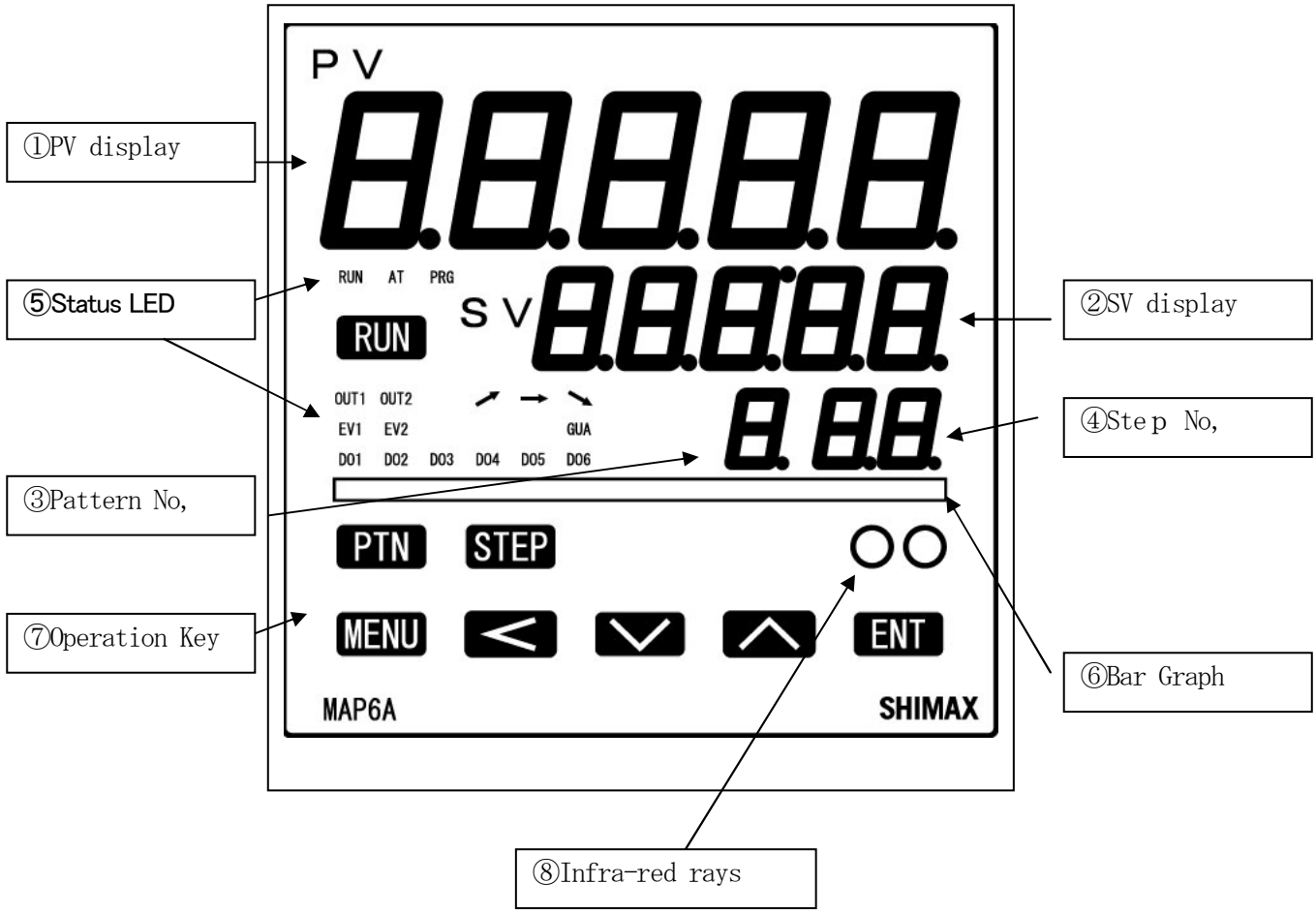
「Note」: If input type is thermocouple or voltage, errors may occur when terminal 11 and terminal 12 terminal are short-circuited

Terminal Arrangement Table

No.	Symbol	Function
1	COM	DI input
2	DI1	
3	DI2	
4	DI3	
5	DI4	
6	DI5	
7	DI6	
8	DI7	
9	＋	Voltage(V)or Current (mA)Input
11	－	
10	＋	Thermo couple or Voltage(mV)Input
11	－	
10	A	Resistance bulb input
11	B	
12	B	
13	L	Power supply 90～264V AC
14	N	
15	COM	EV output
16	EV1	
17	EV2	
18	EV3	
19	＋	Output 1
20	－	
21	＋	Output 2／ EV output(EV4)
22	－	

No.	Symbol	Function
20	CW	Control motor drive output
21	COM	
22	CCW	
23	＋	AO Output
24	－	
25	COM	DO Common
26	DO1	DO Output
27	DO2	
28	DO3	
29	DO4	DO Output
30	DO5	
31	DO6	
29	CW	Feadback input
30		
31	CCW	
29	COM	CT Input
30	CT1	
31	CT2	
32	＋	AI input
33	－	
34	SG	Communication RS 485
35	＋	
36	－	
34	SG	Communication RS232C
35	Txd	
36	Rxd	

Names and Functions of Parts on Front Panel



Explanation of each functions

①Display of measured value (PV) (red)

Measured value (PV) and type of setting is displayed on each setting screen.

②Display of target value (SV) (green)

Target value and set value are displayed on each setting screen.

③Pattern No, Display (Green)

Execution pattern No, (1-8) is displayed at program operation.

Execution SV No, is displayed at FIX operation.

④Step No, display(Yellow)

Execution step No, is displayed(1- 96)at program operation

Execution PID No, is displayed at FIX operation.

⑤Status LED Display

Light on at RUN Operation, Blinking at Manual operation.

AT : If AT is chosen in ON or external control input (DI), blinks during AT execution. Lights up when AT is on standby, and Off with AT automatic termination or release.

PRG : On at the time of program control's standby or flat part control. Off at the time of FIX control selection.

OUT1 : At the time of a contact or a voltage pulse output, On with ON and Off with OFF. At the time Current Output or a Voltage Output, OFF with 0% power output, and ON with 100% power. And blinks at intermediate ratio.

OUT2 : Same as Output1

EV1 : ON at the allotted event output turns to ON

EV2～EV4 : Same as EV 1

DO1 : ON at the allotted event output (EV1-EV4) turns to ON

DO2～DO6 : Same as DO1

GUA : ON at GUA function execution.

During program operation, the SV value on program step proceed to flat step from ramp step, the PV value some time delay from the SV value and the flat step become shorter than the step. This function avoid and assuring the time of flat step.

HLD : ON at Hold function execution

↗ (UP step) : ON at UP step execution

→ (FLAT step) : ON at FLAT step execution

↘ (DOWN srep) : ON at DOWN step execution

⑥Bar graph display (20 Dot LED)

Bar graph displayed Output value, Valve position, progress of the program operation by 0 to 100 %. (5% / dot)

⑦Key-switch section

RUN(RUN)KEY:

Press for 3 seconds at STBY (control stop), then FIX or PROG control starts.

Press for 3 seconds while FIX or PROG is in operation, then control is stopped.

MENU(MENU)KEY:

Press this key to move onto the next screen among the screens.

Press MENU (MENU) key for three seconds on the basic screen, then it jumps to the lead screen of Mode 1. Press MENU key for three seconds on the lead screen of each Mode screens, then it jumps to the basic screen. Press MENU key for three seconds on the lead screen of FIX or PROG, then it jumps to the basic screen. When a program control option is added, press MENU(MENU) key for three seconds on the screen of operation mode 2, then it jumps to the screen of operation Mode 1.

Shift key: Move the digit which set the value

The digit can be changed are blinked.

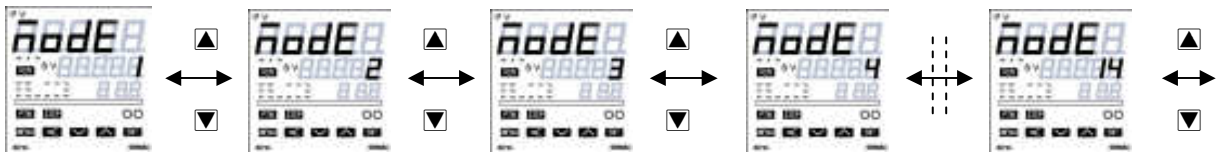
▼ Down key: One time press of ▼ key decreases by one numerical value. By pressing the key continuously, the value as well consecutively decreases.

A decimal point of the smallest digit blinks at this time.

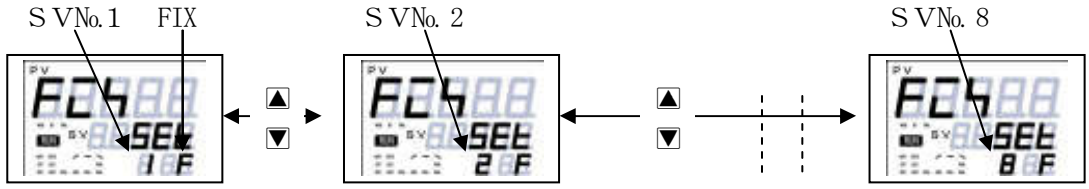
▲ Up key : Press ▲(UP) key one time, and the shown value increases by one numerical value.By pressing continuously, the value consecutively increases. A decimal point of the smallest digit blinks at this time.

▲ and ▼ Key can be shifted to each lead screen from each mode screen.

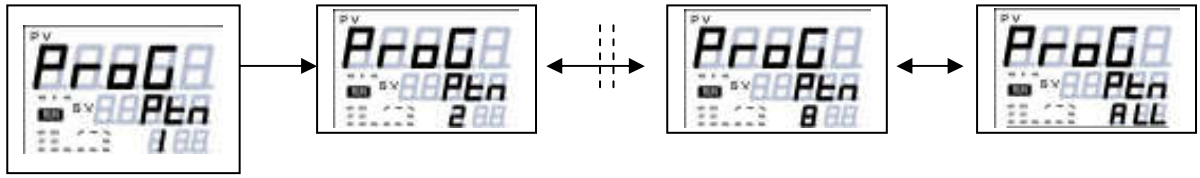
MODE1 MODE2 MODE3 MODE4 MODE14



▲ and ▼ Key can be shifted to SV No, 1-8 from FIX mode lead screen

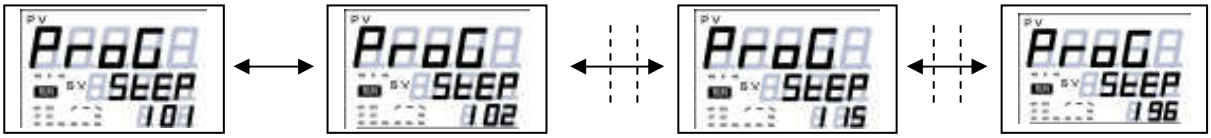


▲ and ▼ Key can be shifted to Pattern No, 1-8 from Program mode lead screen.



Pattern 1 Pattern 2 Pattern 8 Pattern common setting

▲ and ▼ Key can be shifted to Step No, 1-96 from Program step lead screen.



Pattern 1 Step 1 Pattern 1 Step 2 Pattern1 Step15 Pattern1 Step 96

ENT (ENTRY/REGISTER)key

The setting data changed on each screen is determined. (the decimal point of the minimum digit is also lighted off).

Press the key for 3 seconds on the Mode 1 screen, then it shifts to Mode 2 screen.

Press three seconds on the monitor screen during RUN operation it shifts between Manual output and automatic output.

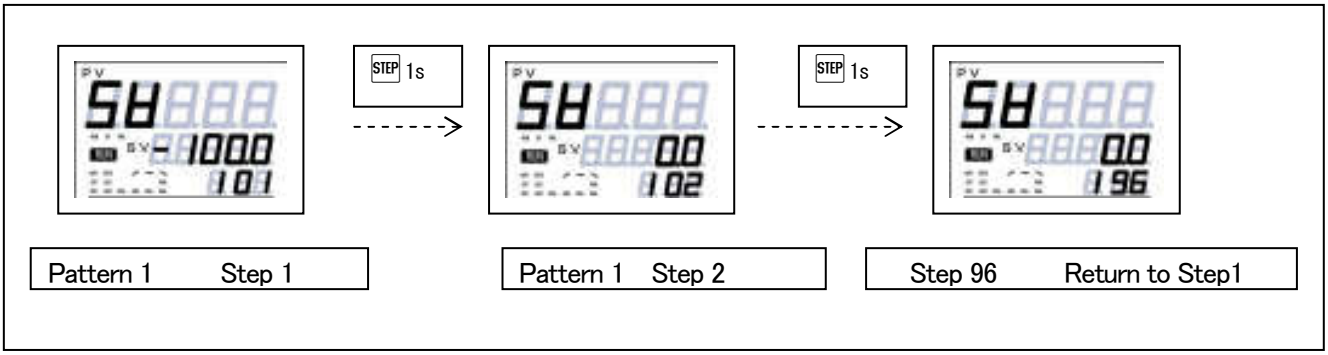
Push at FIX-PROG and each mode screens' lead screen, then shifts to setting screen.

PTN Pattern key :At a reset(RST) increment pattern No, on the basic screen.

Press at the lead screen on the step setting screen, it sift to lead screen on the Program pattern setting screen.

STEP Step Key :Shift to Step1 lead screen of Pattern setting screen by pressing at PROG pattern setting lead screen.

Press one second on the step setting screen, it shift to next step.



⑧Infrared-ray communication port.

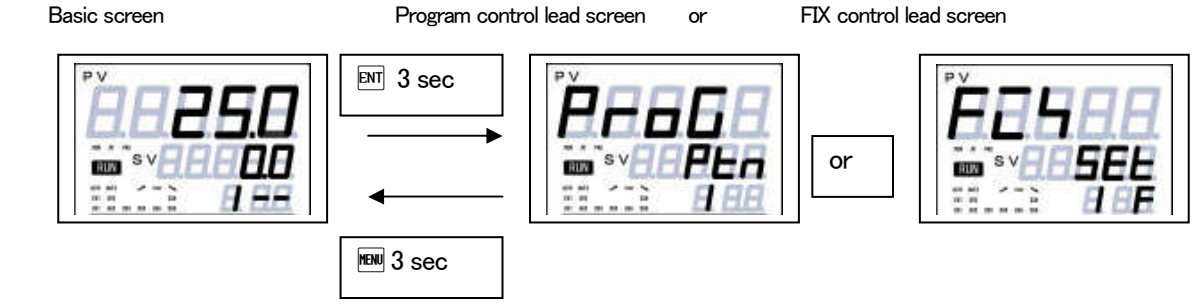
It can be communicated with MAP6 by USB adaptor and infrared-ray communication port.

USB Adaptor available on Optional parts.

Details refer to communication instruction Manual

Description of screens

How to move to another screen

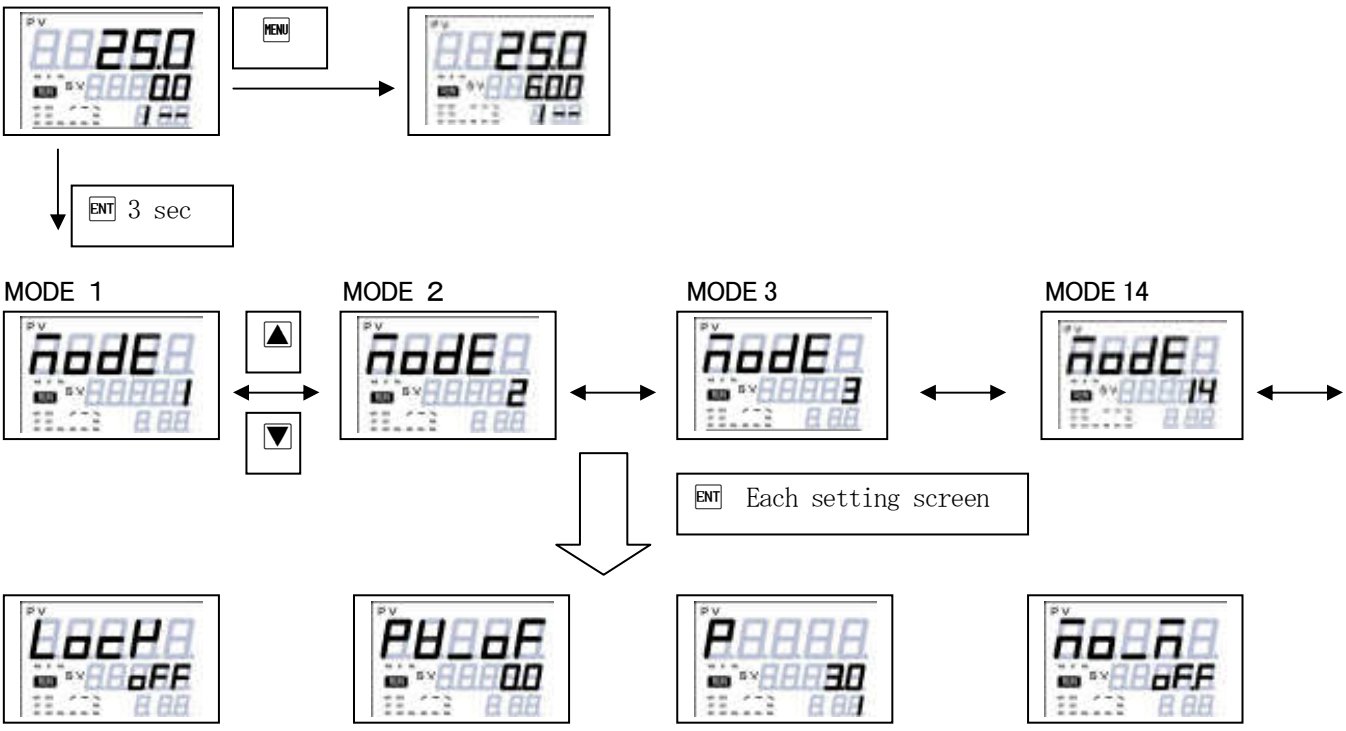


Press the ENT key for three seconds on a basic screen, then it shifts to the lead screen of PrOG (program control) setting screens.FCH (constant value control) setting screens, or to the lead screen of FCH (constant value control) setting screens.

Press the MNU key for 3 seconds on FCH or PrOG the lead screen of setting screens, then it shifts to the basic screen..The shift to PrOG is possible when the program option is selected at Mode2 .

The shift to FCH is possible when the FCH is selected at mode 2.

Basic screen



Every time you press the MNU key on a basic screen, it shifts to each screen of the basic screens.

Press the MNU key for 3 seconds on a basic screen, then it shifts to the lead screen of mode 1 screens.

Press the ▲ key on the lead screen of mode 1 screens , then it further advances to mode 2, and mode 3. (Notes: No corresponding if option is not found)

Press the ▼ key on the lead screen of mode 1 screens , then it further advances to mode 14, and mode 13. (Notes:No corresponding if option is not found)

Press the MNU key for 3 seconds on the lead screen of mode 1～ 14 screens, then it shifts to the basic screen.Press the ENT key on the lead screen of mode 1～14 screens, then it shifts to the first setting screen of each screens.

Press the MNU key on the the first setting screen of each screens, then it shifts to the next screen. Every time you press the MNU key, it shifts to the next setting screen.

Setting method

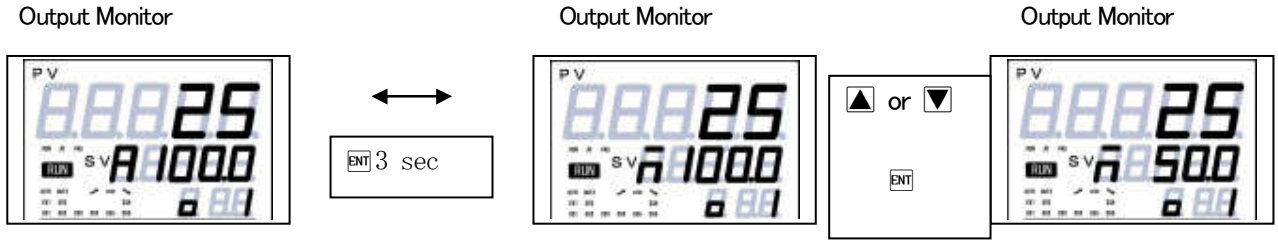
To change settings, display an appropriate screen and change the setting (value or function) by pressing ▲ or ▼ key. and determine buy pressing ENT key.

On the output monitor screen of basic screens, you can change the control output from "Automatic" to "manual" ,and save its change of setting. Display the output monitor screen, and then press ENT key for three seconds to shift from Automatic to Manual.

Then by pressing ▲ or ▼ key, you can adjust to the desirable output value. In this case, no need to press ENT key in order to determine the change of setting.

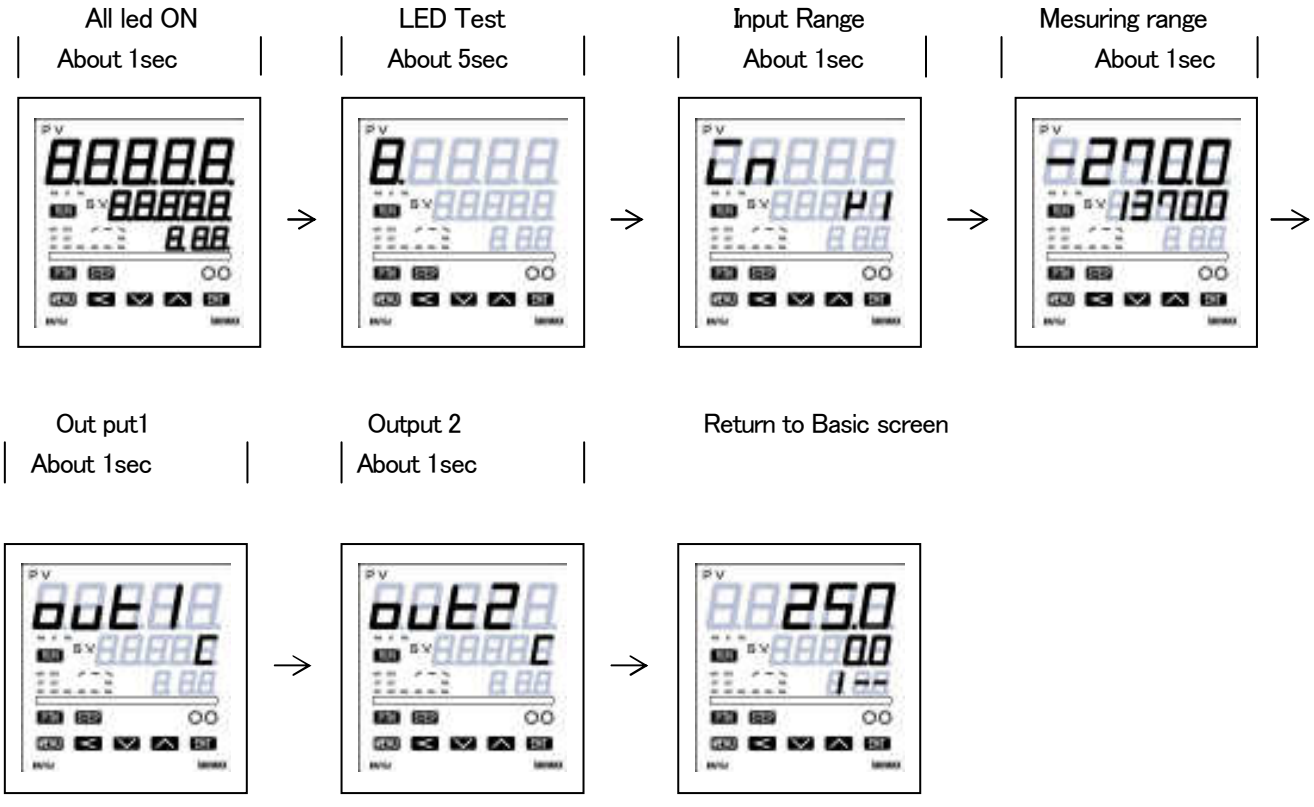
Press ENT key for three seconds as well to shift back to Automatic. Excluding when a keylock is OFF, Automatic⇔Manual switchover does not work while STBY<RST> and AT are in operation.

In the case of two-output type, the switchover between automatic and manual is operatable through output 1 and output 2. The setting is altered simultaneously.



Power on sequence

At power-on, the display section shows each screen of initial screens for one second , then moves on to the basic screen.



Explanation of each screen

Basic screen

Executed SV initial value : Sensor input 0
Linear input Lower limit of scaring

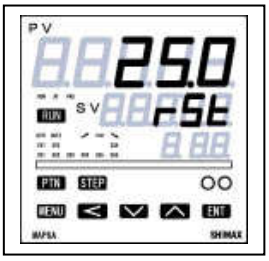
Setting range : Sensor input Within measuring range
Linear input With in scaring range
Within SV limiter besides

Targeted value (PV) is displayed on the upper row as 5-digit ,and target value (SV) is displayed on the lower row also as 5-digit.
(Notes:hereinafter,measured value and targeted value are referred to as"PV" and"SV")
At the time of FIX, execution SV is displayed and change of setting is possible.
PROG's SV is just displayed ,and change of setting is impossible.
During AT executing and Key lock level 2-4 are set, setting is impossible
At the time during At and key lock level 2-4 is set, change of setting impossible.
Execution Program No, can be changed by pressing PTN at the RST in Program.
When no key operation 3 minutes or more, screen will be shifted to basic screen or the screen of DI super key lock.

When measuring range, unit and scaling value changed, parameter will be initialized.

MENU

Action Mode 1



ENT 3 sec

MENU 3 sec

Action Mode 2

Initial value : rSt (Reset)
Setting range : rSt Control stop (Output Off)
run (RUN) conduct of control operation

Initial value : ProG
Setting range : ProG , FCt

MENU

During no operation the display will be rSt (Program) or Stby (FIX).
Choose RUN key and decided by ENT key then then Monitor LED's RUN lights up to start control operation.
Choose Stby (rSt) by ▲ key、Decide by ENT key,Then Monitor LED's RUN lights off and becomes control stop [Output OFF (0%)] conducting.
Priority is given to DI function ,when RUN is allotted to external control input. DI. Key operation cannot be performed unless allotment is canceled.

Press [ENT] key for 3 seconds, then it shifts to Action mode2 screen,when the program control option is added on this screen, FIX (constant value control) ←→PROG (program control) switchover is possible choose(Choose a program,then Monitor LED's PRG lights up)

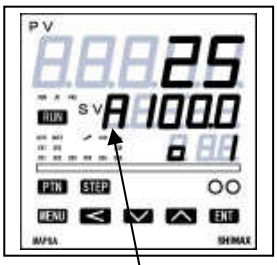
Press [MENU] key for 3seconds then it shift to Action mode 1.

Priority is given to DI function ,when PROG is allotted to external control input. DI. Key operation cannot be performed unless allotment is canceled.

Press [MENU] key then it shift to Output 1 monitor screen.

When measuring range, a unit, scaling, and output characteristics are changed ,parameter will be initialized and STBY (r-ST) is display.

Output 1 monitor screen



Auto : A
Manual : M

[MENU]

Manual output setting range: :0.0–100.0% (within output limiter)

At the time of automatic output,monitor display only.

Refer to automatic ⇔ manual switchover,and setting method at the time of manual operation.

A manual output is canceled when an operation mode is made into STBY (r-ST).

When a power source is intercepted and re-switched on, it returns to the condition just before intercepting.

When MANU is allotted to DI, DI is given priority. Automatic ⇔ manual switchover is not performed with key operation,and only the output value at the time of manual operation can be changed.

During AT executing or Key lock level 3-4 are set, setting is impossible

Output2 monitoring screen

Contents are the same with that of an output 1

Output 2 monitoring screen displays only when output 2 option is added.

[MENU]

CT1 monitor

Display range : 0.0～55.0A

Displays at the time of CT input option addition, and the current value detected by CT

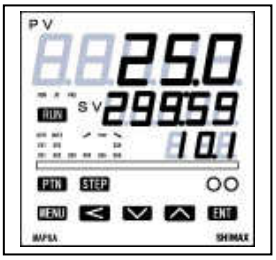
Sensor is displayed.

Upper Display: PV value

Middle Display: Current value

Lower Display: Detected CT sensor (CT1)

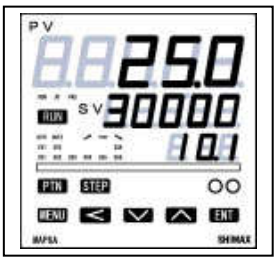
Program step remain time period Display screen



MENU

Display Range:000:00 – 299:59 or ∞(infinity)
Upper Display: PV value
Middle Display: Time remain
Lower Display: Pattern No, & Step No,
Displays while program is in operation.
On-going step No. and the remaining repeating time of pattern are displayed
A remaining time and an elapsed time is switchable by pressing the ENT key for 3 seconds. (Switchover is interlocked with the number of times of next screen pattern.)
In ∞ setting, remain time ∞ are displayed.
This screen is not displayed Program RST and FIX neither.

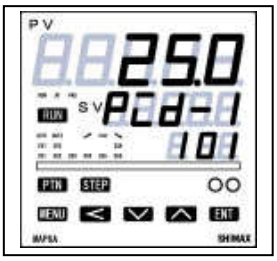
Program remaining repeating time of pattern



MENU

Display range:0 –30000 or ∞
Upper Display: PV value
Middle Display: Number of reputation time
Lower Display: Pattern No, & Step No,
On-going step No. and the remaining repeating time of pattern are displayed.
A remaining time and actually performed times are switchable by pressing the ENT key for 3 seconds. (Switchover is interlocked with front screen step time.)
The decimal point of the minimum digit lights up when actually performed times being displayed.
In ∞ setting, step No. and ∞ are displayed
Not displayed in the state of Program RST and FIX neither.

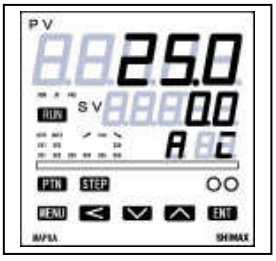
PID monitor screen



MENU

Display range :PID1 – PID8
PID No. is displayed when FIX is in operation.
PID No. chosen at each step and on-going step No. are displayed by turns when PROG.
No displayed in the state of STBY (RST).
No display at FIX mode.

External analogue input (AI) monitor screen.



External Analogue input Value which selected at Mode10 is displayed.
This screen is not displayed without a AI option and status ay Non at Mode 10.

MENU

Servo output position monitor screen

Display range 0.0% – 100.0%
Servo output position is displayed.
This screen is not displayed without Servo output option and feedback input.

MENU

Hold execution screen

While HOLD is executed, on the basic screen,SV value and HoLd is displayed by turns . If switched on while PROG is in operation , the operation temporary stops with as of then step time and SV value. While HOLD is in execution , SV value and HoLd is displayed by turns in basic screen.、
HOLD is used in order to perform AT in the middle of an inclination step or to compensate the insufficient time of flat step.
Controls is performed with SV value at the time of stopping,while HOLD is in execution HOLD is canceled if oFF is chosen while HOLD is in execution. The remaining time of the step is performed based on a program.
SKIP (skip)is unable to perform while HOLD is in execution
When HoLd is allotted to DI, DI is given priority.
Execution and release of HOLD with key operation is unable to perform.
This screen is not displayed the state of program rSt and FIX neither.

MENU

Skip execution screen

Initial value:: oFF
Setting range:: oFF、on
SKIP (skip) is the function that makes to end the on-going step compulsorily, and is to shift to the following step. The next step starts instantly, if performed.
When SKIP is continuously performed, about 1 second interval is required from execution to the next one.
Even if SKIP is allotted to DI, execution is able to perform with DI and key operation.
Not displayed in the state of program rSt and FIX neither.

MENU

Program pattern No, selection screen

Initial value: : 1
Setting range: : 1 – 8
The number of setting in the program pattern screen can be changed 1–8 to the number of program pattern.Only the pattern you did program pattern setting screen will be indicated.
Not displayed in the state of FIX operation

FIX execution SV setting screen

Initial Value: 1
Setting range: 1 ~ 8
SV setting screen.
Not display in the state of Program operation.

AT (Auto Tuning) execution screen

Initial Value: oFF
Setting Range: oFF、on
AT is performed by ON selection ,and canceled by OFF selection.
Not displayed at the time of STBY(RST), a manual output, and P(proportional band) =OFF.
Except in the setting of keylock OFF, AT is unable to perform in scale over, and even in such a case,halfway release is performed on this screen.
(At the time of DI allotment,execution of AT by DI can be performed .)
Release of AT, STBY(RST), EV operating point, setting of keylock, and mode 6,7,9,11,12 and 14 are operateable with key.
Except in th setting of AT normal end, execution of AT is canceled compulsorily at the time of time over(200min) scale over STBY(RST) selection and AT release setup.

EV 1 lower operating point setting screen

The operating point of the alarm type allotted to EV1 is set up.
No display when no EV ption installed or non, So, run, ,HoLd, Pr oG, d_SL,u_SL, GuA、and tS 1~tS4 are allotted to EV1.
The operation mode of each deviation alarm is run.
Effective at the time of automatic output.
Each deviation alarm serves as PV's deviation to Execution SV.
Event operation other than each deviation alarm is always effective.
In case of -100.0 to -0.1 set at StP, P·E,and End,EV will be activated before the time set to the End.
(When -10.0 sec set, EV wil be activated 10.0 sec before 10.0sec to the End, when 10.0 sec set EV will be activated 10.0 sec from the End, In case of 0 sec set no singal will be activated even if alloted)

MENU

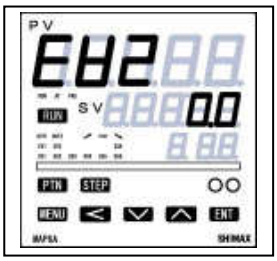
Function		
Upper limit absolute value alarm	HA	Belong to Range setting and scaling
Lower limit absolute value alarm	LA	Belong to Range setting and scaling
Upper limit deviation value alarm	Hd	-20000~30000 unit
Lower limit deviation value alarm	Ld	-20000~30000 unit
Within deviation alarm	Id	0~30000 unit
Without deviation alarm	od	0~30000 unit
CT1 Control loop alarm(heater braking)	ct1_b	0.0~ 50.0 A
CT1 Control loop alarm (loop)	ct1_L	0.0~ 50.0 A
CT2 Control loop alarm (Heater braking)	ct2_b	0.0~ 50.0 A
CT2 Control loop alarm (loop)	ct2_L	0.0~ 50.0 A
3 phases Control loop alarm(Heater braking)	ct3_b	0.0~ 50.0 A
3 phases Control loop alarm (loop)	ct3_L	0.0~ 50.0 A
Step signal	StP	100.0~ 100.0 sec
Pattern end signal	P_E	- 100.0~ 100.0 sec
Program end	End	- 100.0~ 100.0 sec

EV1 lower operating point setting screen

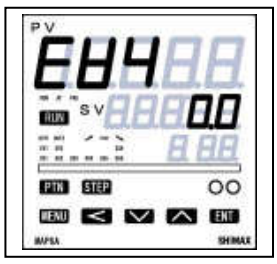
Initial value: Minimum value of setting range.
Display when EV1 allotted to cA or oA

Intial value:maximam value of setting range
Setting range:within mesuring range
Display when EV1 allotted to cA or oA

EV2 – EV4 operating point setting screen

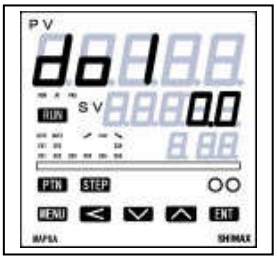


The operating point of the alarm type allotted to EV2 –EV4 is set up.
Details are same as EV1.



No display when no EV4 installed
Details are same as EV1

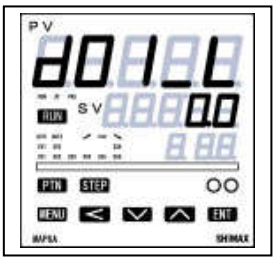
External operation output(DO)Setting screen



The operating point of the alarm allotted to DO1 is set up.
No display when no DO option installed, non, So, run, HoLd, PrOG, d_SL, u_SL, GuA, and Et1~Et4 are allotted to DO1.
The operation mode of each deviation alarm is run effective at the time of automatic output.
Each deviation alarm serves as PV's deviation to Execution SV.
Event operation other than each deviation alarm is always effective.
In case of -100.0 to -0.1 set at StP, P·E,and End,EV will be activated before the time set to the End.
(When -10.0 sec set, EV wil be activated 10.0 sec before 10.0sec to the End, when 10.0 sec set EV will be activated 10.0 sec from the End, In case of 0 sec set no singal will be activated even if alloted)

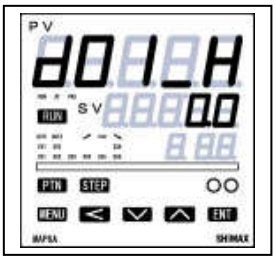
MENU

DO1 lower operating point setting screen

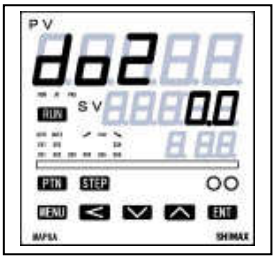


Intial value:minimum value of setting range
Setting range:within mesuring range
Display when DO1 allotted to cA or oA.

DO1 upper operating point setting screen



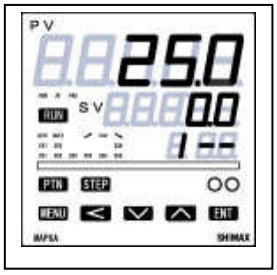
Intial value:Maximum value of setting range
Setting range:within mesuring range
Display when DO1 allotted to cA or oA.



DO2 – DO 6 details are same as DO1
No display when no DO option installed.

Latching release scrren

Return to Basic screen



Initial value: EV 1

Setting range: EV 1、EV2、EV3、EV4、do 1、do2、do3、do4、do5、do6、ALL.

On the latching setting screen of each EV and DO mode, on and ALL which chose on are displayed.

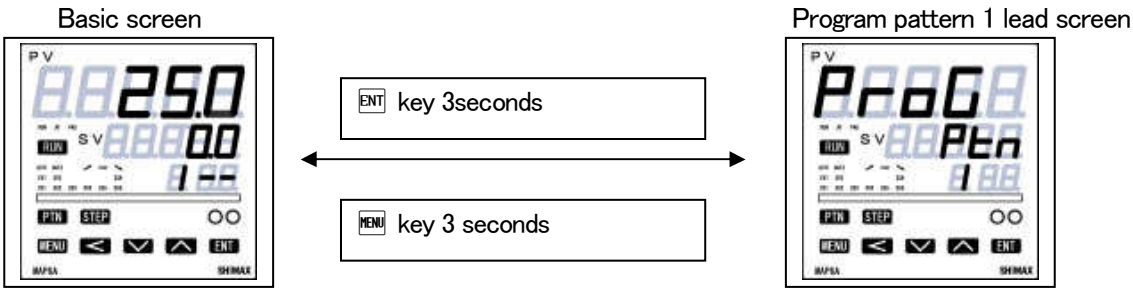
If latching is on,once EV and DO are outputted, output state are maintained even if the state of OFF. When EV and DO are in a latching state, decimal point of the minimum digit blinks, and it shows that release are possible. If ENT key is pressed,EV and DO released and a decimal point lights off. However, release is impossible when a state is in EV or DO power range.

No display when no EV and DO option are installed or all setting of Latching OFF.

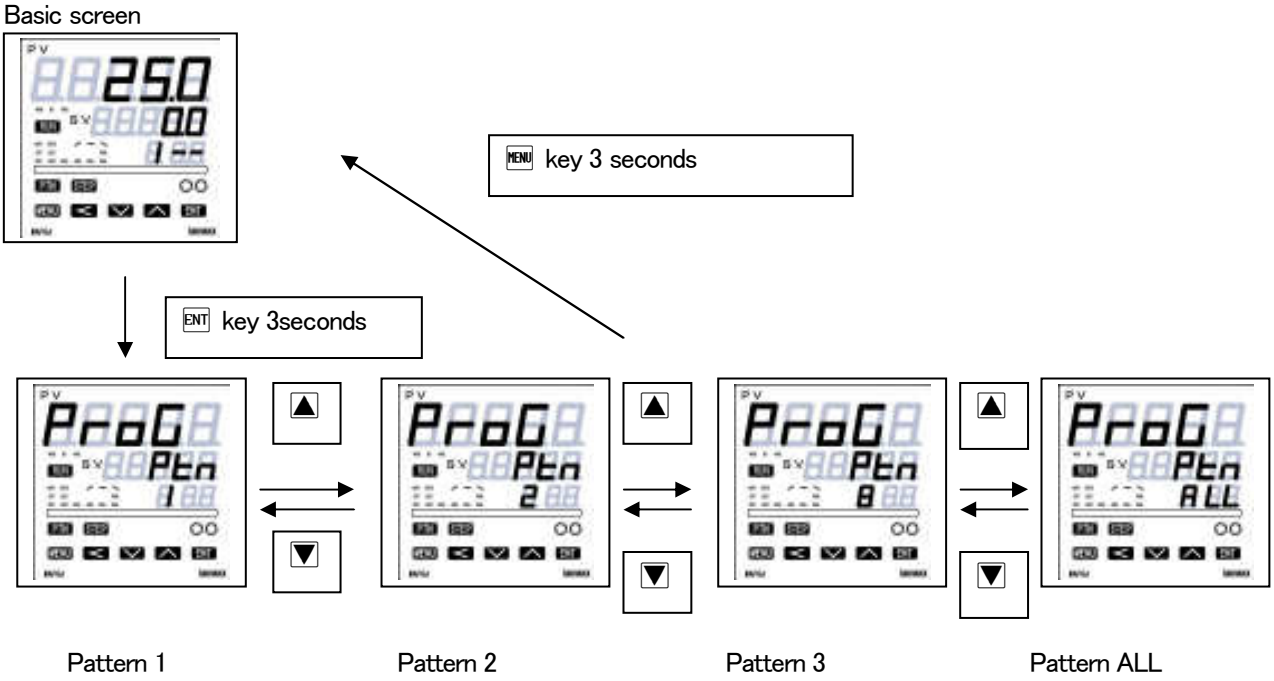
PROG (program control) setting screens

Press ENT key for 3 seconds, lead screen of the PROG setting screens is displayed,When program option is added and PrOG is chosen on Action mode2 screen of basic screens.

If MENU key is pressed for 3 seconds on lead screen(1to 8 or ALL), it returns to basic screen

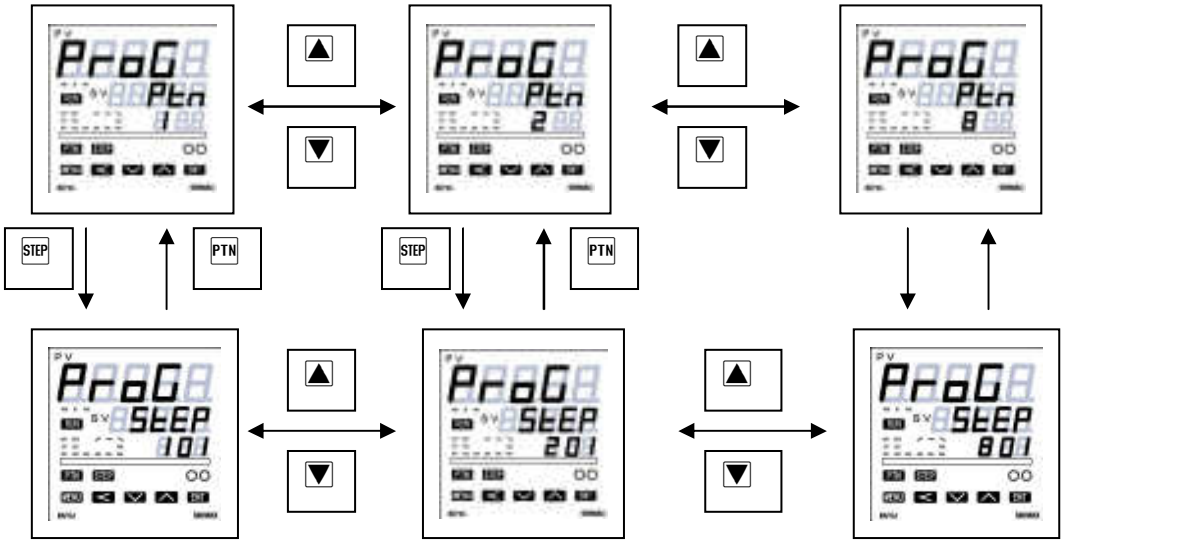


Press ▲ or ▼ at Program pattern 1 lead scfreen it shift to pattern 2·3·4·5·6·7·8·ALL·1 screen.



Press STEP each lead screen of program pattern it shift to Step setting screen.

Press PTN each step screen it shift to lead screen of program pattern setting screen.



Press MENU key 3seconds at any program step lead screen
It shift to Basic svreen

①Program pattern common setting screen

Program pattern common setting lead screen

Press ENT Key , it move to time unit seting screen

Time unit setting screen

Initial Value : AA:SS (minute:second)
Setting range : AA:SS、HH:AA、HHH.H

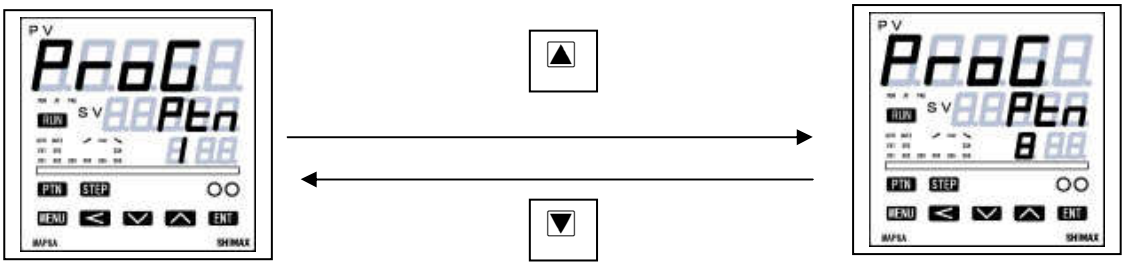
Press ENT Key , it move to Number of pattern screen

Number of pattern setting screen

Initial Value : 1
Setting range : 1 MAX 96steps
2 MAX 48steps each pattern
3 MAX 32steps each pattern
4 MAX 24steps each pattern
6 MAX 16steps each pattern
8 MAX 12 steps each pattern

Press ENT Key ,it move to Program pattern setting lead screen

②Each program pattern setting screen



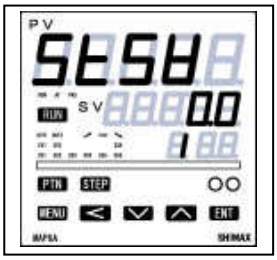
Press ENT Key , move to Start mode setting screen

Start mode setting screen

Intial value : SV
Setting range : SV(SV)、PV(PV)
This setting screen can decide if the start set point of program control should be PV, or should be the start SV which is set on the next screen.
When PV is chosen, and when PV is closer to the set point of Step1 than start wasting SV,time is omissible.

Press ENT Key , move to Start mode setting screen

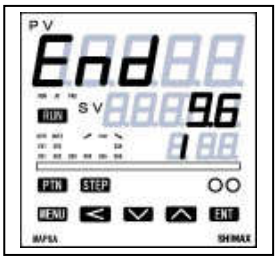
Start SV setting screen



Initial value : At the type of sensor input
linear input type scaling lower limit
Setting range: sensor input type within measuring range
linear input type within scaling range
Moreover, within limit of SV limiter.
When SV is chosen on start mode setting screen, this screen's set value becomes start set point. The basic screen SV display at the time of Program RST is the value set on this screen.

Press ENT Key , move to End step setting screen

End step setting screen



Initial value: 96
Setting range: 1-96 steps
Pattern termination step No, of program control is set.
Pttern 1: Max 96steps
Pttern 2:Max 48steps each step
Pttern 3: Max 32 steps each step
Pattern 4: Max 24 steps each step
Pattern 6:Max 16steps each step
Pattern 8:Max 12 steps each step

Press ENT Key , move to Number of execution Setting screen for repeating of program pattern

Number of execution Setting screen for repeating of program pattern

Initial value:1
Setting range:1～30000 or ∞
The number of execution of a program pattern is set.

Press ENT Key , move to Gurantee soak zone

Gurantee soak zone setting screen

Initial value:OFF
Setting range:OFF,1～10000 Digits(Time unit belong to the Time unit setting screen)
During program operation, the SV value on program step proceed to flat step from ramp step, the PV value some time delay from the SV value and the flat step become shorter than the step. This function avoid and assuring the time of flat step.

Press ENT Key ,each program pattern setting lead screen

Pattern setting lead screen

About PV start

In start mode,when PV is chosen, and when PV is closer to the set point of Step1 than start SV, wasting time is omissible.

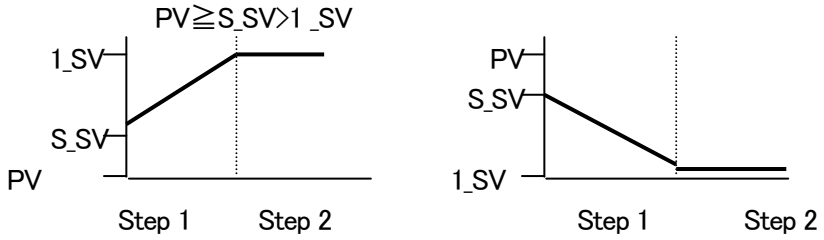
「example」: PV at the time of ″RST is 30℃, Start SV is 0 ℃, Step 1's attainment SV 100 ℃,
Execution time of Step1 is 60 minutes
Start at start SV,attainment time is 60 minutes.
When starts at PV, 100−30=70℃ ,therefore 60 minutes x70%= 42 minutes = 18 minutes' shortening

However, depending on the spatial relationship between PV, Start SV, and attainment SV, it may become SV start or Step1 may be skipped.

(1) case of SV start

PV≦S_SV(start SV) < 1_SV (step1 attainment SV)

PV≧S_SV>1 _SV

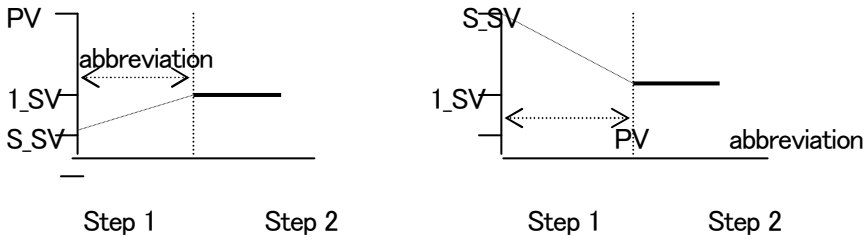


(2)When Step 1 is skipped and progresses to Step 2

S_SV < 1_SV < PV

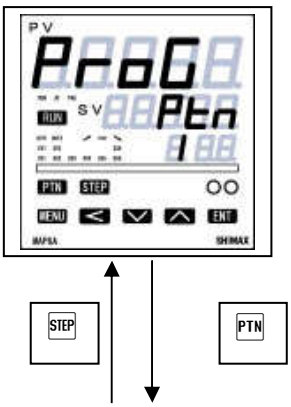
S_SV > 1_SV > PV

PV=1_SV

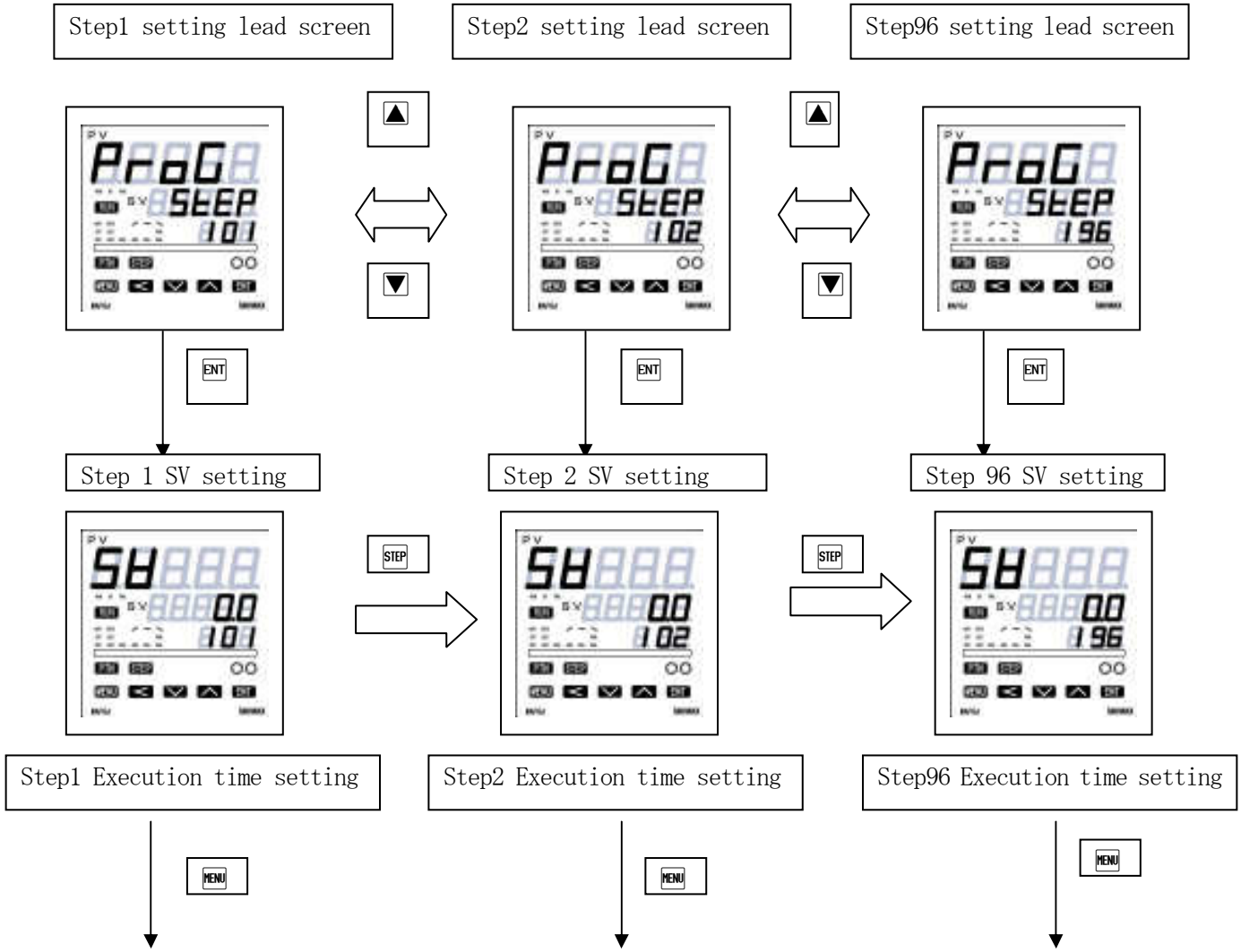


③Program step seting lead screen

Program step seting lead screen



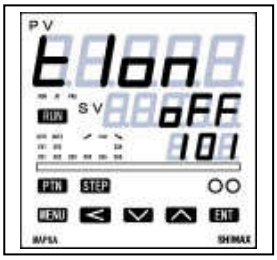
Press STEP at Program pattern setting lead screen it move to each step setting screen.
Press PTN at each step setting screen it move to same setting screen on othet pattern No,.



Execution PID setting screen

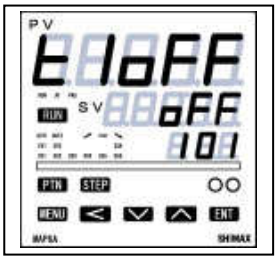
Initial Value : 1
Setting range :1 ～8
Step1 output1 PIDNo. setting screen
It have to be used both Out 1 and Out2.

Time signal 1 ON time setting screen



Initial value: oFF
Setting range :00:00 ～300:00 (min:sec Hour:min) or ∞
0.0 ～3000.0 (hour) or ∞
About time signal
ON time is the time that will be ON after step bigan.
Time signal setting screen is diplayed at EV or DO I is allotted to time signal.
Time signal setting has to be OFF when time setting is longer than step time.
When only ON time setting is set, it keep status ON until other step will be OFF.
When hold function is activated at program function, time signal Time also stops temporarily.
Time signal ON statue have to be finish compulsorily in pattern end.

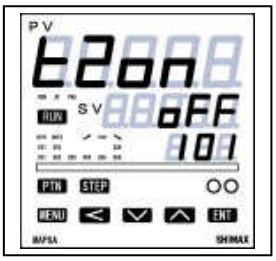
Time signal 1 off time setting screen



Initial value: oFF
Setting range :00:00 ～300:00 (min:sec Hour:min) or ∞
0.0 ～3000.0 (hour) or ∞
OFF time is the time that will be off after step bigan.

MENU

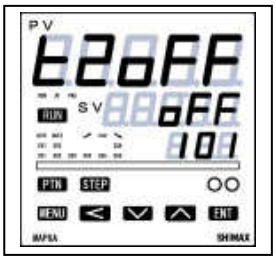
Time signal 2 ON time setting screen



Same as Time signal 1

MENU

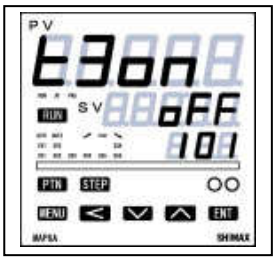
Time signal 2 off time setting screen



Same as Time signal 1

MENU

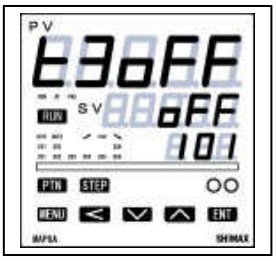
Time signal 3 ON time setting screen



Same as Time signal 1

MENU

Time signal 3 off time setting screen



Same as Time signal 1

MENU

Time signal 4 ON time setting screen

MENU

Time signal 4 OFF time setting screen

Same as Time signal 1

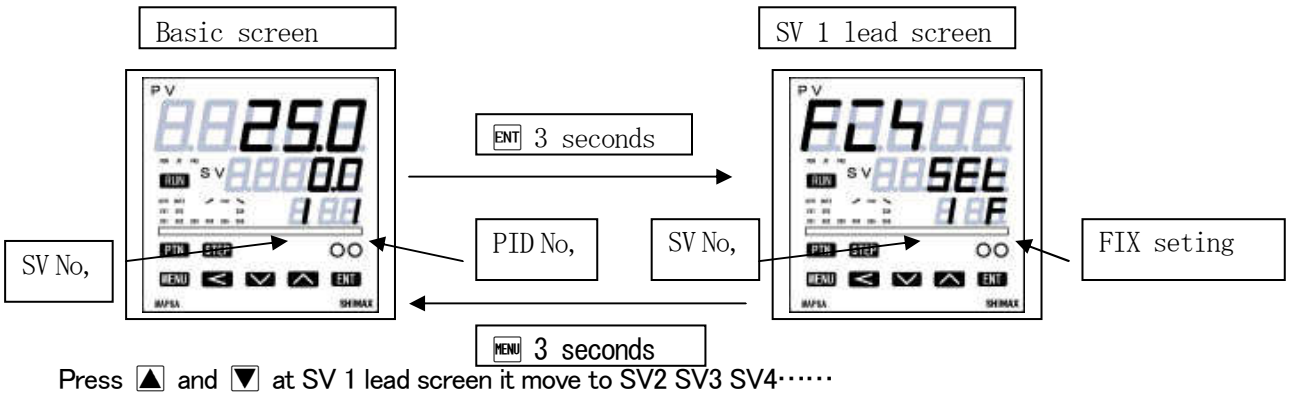
MENU

Step1 setting lead screen

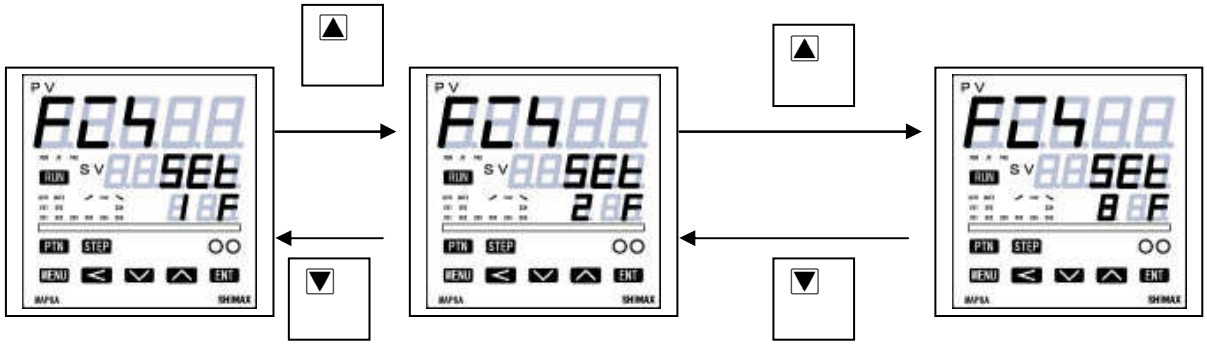
(3) FIX (constant value control) setting screens

When FC4 is chosen on Action mode2 screen of basic screens,lead screen of FIX setting screens is displayed when ENT key is pressed for 3 seconds at the basic screen.

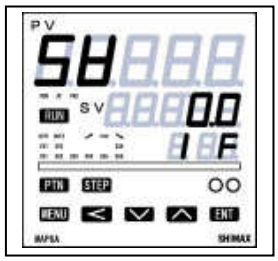
If MENU key is pressed for 3 seconds on lead screen of SV1 – SV8, it returns to basic screen.



Press ▲ and ▼ at SV 1 lead screen it move to SV2 SV3 SV4……



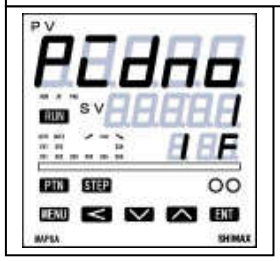
SV 1 setting screen



MENU

Initial Value: Initial value : At the time of sensor input 0
linear input time scaling lower limit
Setting range: sensor input time within measuring range
linear input time within scaling range
Moreover, within limit of SV limiter.
When SV1 is Execution SV,being reflected in basic screen.
Being initialized when measuring range, unit, and scaling are changed.

SV1 PID No, setting screen



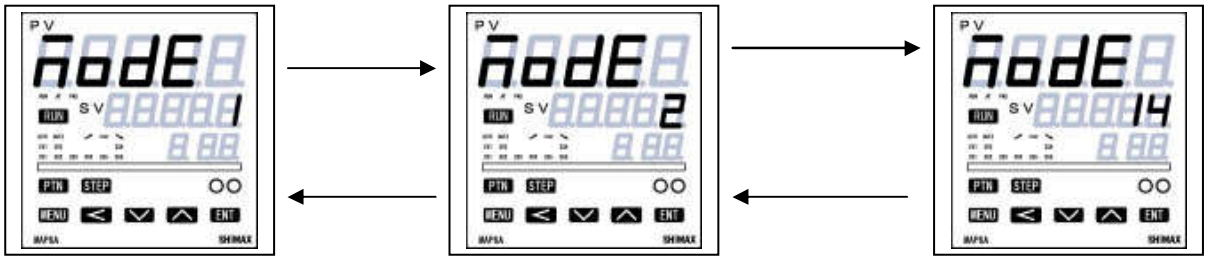
Initial Value: Initial value: 1
Setting range : 1,2,3,4,5,6,7 and 8.
When SV1 is Execution SV,PIDNo. that will be used is chosen from 1～8.

SV1 lead screen

(4)Mode setting

Press the MNU key for 3 seconds on a basic screen, then it shifts to the lead screen of mode 1 screens.

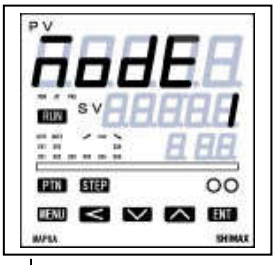
It can be shift from Mode1 to mode14 by pressing ▲ and ▼ key.



Mode 1 SV setting	Mode 2 PV setting
Mode 3 Out 1 PID setting	Mode 4 Out 2 PID setting
Mode 5 Zone PID setting	Mode 6 Event setting
Mode 7 DO setting	Mode 8 DI setting
Mode 9 AO setting	Mode 10 AI setting
Mode 11 CT setting	Mode 12 Communication setting
Mode 13 Servo setting	Mode 14 PV- SV multi vias setting

(5)Mode 1

Mode 1 setting lead screen



ENT

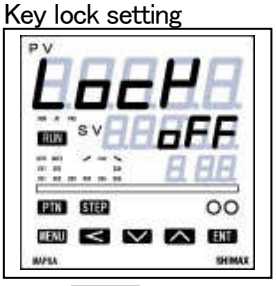
Press MENU key for 3 seconds on basic screen, then displayed

Press the ENT key, then it shifts to the first setting screen, keylock setting screen.

Press ENT key to each mode setting screen.

Press MENU key to advance each setting.

Key lock setting



MENU

Initial value:oFF

Setting range: oFF 1 2 3 4

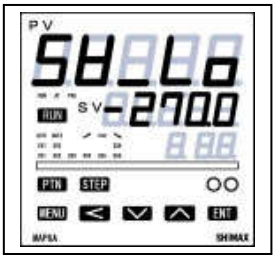
1 Only change of Execution SV (basic screen) and keylock is possible.

2 Possible to change numerical value value manualy ,and key lock level

3 Only change of a keylock is possible.

4 Only change of a keylock is possible It can be locked RUN key

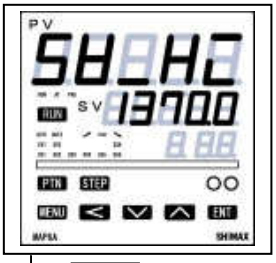
SV limiter lower limit setting screen



Initial value: measuring range lower limit
Setting range: measuring range lower limit value to measuring range upper limit value −1.
When upper limit value is smaller than lower limit value, the value compulsorily becomes lower limit value +1.

MENU

SV limiter upper limit value setting screen



Initial value: measuring range upper limit
Setting range:SV limiter lower limit value +1~ measuring range upper limit value

MENU

Bar graph setting screen

Initial value: non
Setting range: PV-SV (PV－SV deviation value)
out1 (Out 1 output rate)、out2(Out 2 output rate)
S_tim (Step time rate)
P_cnt (program pattern execution number)
SVoFb (Servo out position)
Bar graph displayed Output value, Valve position, progress of the program operation by 0 to 100 %. (5% / dot)
When bar graph is allotted to program functions, Execution finish will be “ON” and will be “ blinking” during execution.

MENU

PV-SV (PV－SV deviation value) (-50～+50%)

①～⑩-46～-50	②～⑩-41～-45	③～⑩-36～-40	④～⑩-31～-35
⑤～⑩-26～-30	⑥～⑩-21～-25	⑦～⑩-16～-20	⑧～⑩-11～-15
⑨～⑩-06～-10	⑩-01～-05	⑪+01～+05	⑪～⑫+06～+10
⑪～⑬+11～+15	⑪～⑭+16～+20	⑪～⑮+21～+25	⑪～⑯+26～+30
⑪～⑰+31～+35	⑪～⑱+36～+40	⑪～⑲+41～+45	⑪～⑳+46～+50

Deviation less than ±1% ⑨and ⑫ are indicated.

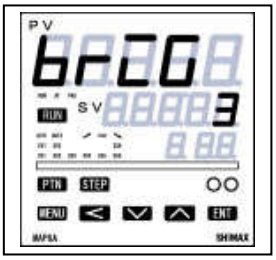
out1、out2, S_tim, P_cnt, SVoFb (0～100%)

[①|②|③|④|⑤|⑥|⑦|⑧|⑨|⑩|⑪|⑫|⑬|⑭|⑮|⑯|⑰|⑱|⑲|⑳]

①+01～+05	①～②+06～+10	①～③+11～+15	①～④+16～+20
①～⑤+21～+25	①～⑥+26～+30	①～⑦+31～+35	①～⑧+36～+40
①～⑨+41～+45	①～⑩+46～+50	①～⑪+51～+55	①～⑫+56～+60
①～⑬+61～+65	①～⑭+66～+70	①～⑮+71～+75	①～⑯+76～+80
①～⑰+81～+85	①～⑱+86～+90	①～⑲+91～+95	①～⑳+96～+100

Less than 1% is not indicated.

LED brightness setting screen



Initial Value: 3
Setting range: 1,2,3 &4
LED brightness can be changed by 4 levels, Please adjust it according to the environment.

↓

Status LED Mode setting

Initial value:1
Setting range:1,2 & 3
1: Lighting during the functions are executing
2: Dimness lighting at option function are installed and lighting during the function is executing.
3: Dimness lighting at option function are installed and allotted.
Lighting during the functions are executing.

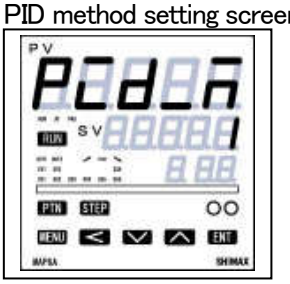
↓

Power failure compensation setting screen

Initial value: oFF
Setting range: oFF, on
Power failure compensation is the function that can be remained the status of operation before power failed.
It can be started up same status of operation again.
Step time of program function at power failure is not compensated.

↓ 

PID method setting screen



Initial value: 1
Setting range: 1,2
When PID 2 is choosen, ABC parameter will be appered at Mode3.
When PID method is changed during RUN status, status move to STBY.

↓ 

Sampling period time setting screen

Initial Value: 167
Setteing range : 50、 167、250、500ms

Sampling period time can be set according to each applications.
Being initialized when sampling period is changed.

↓ MENU

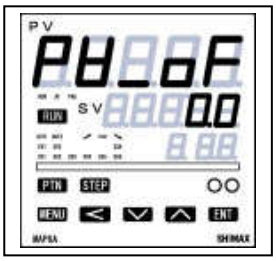
Mode1 lead screen

(6)Mode2 setting screen

Mode 2 setting scrren lead screen.

↓ ENT

PV offset correction (PV bias) setting screen

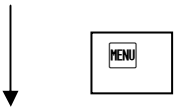


Initial Value: 0.0
Setting range: －５０００～５０００digit
Used for correction of input errors such as sensor.
If offset correction is performed, control is also performed with the corrected value

↓ MENU

PV gain correction setting screen

Initial value:0.000
Setting range: ±5.000%
Maximum input value is corrected within limit of ±5.00% of measuring range.
If corrected, inclination of spang changes in straight line which connects zero point and correction maximum value.

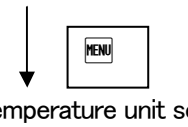


PV filter setting screen

Initial value: 0
Setting range: 0～10000sec
When input change is violent or noise is overlapped, used in order to ease the influences.
In 0 second setting, filter does not function.

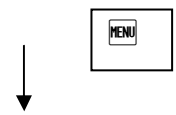
Mesuring range setting screen

Initial value: H1
Setting range: Chosen from 5-5.measuring range code table.
Combination of input type and measuring range is set by code.
Being initialized when measuring range is changed.



Temperature unit setting screen

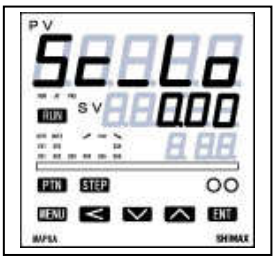
Initial value: °C
Setting range :°C、°F、H
The temperature unit at the time of a sensor input is set up from °C(℃) °F (℉)., H(kelvin)
Not displayed when linear input is chosen.
Being initialized when temperature unit is changed.



Cold junction compensation setting screen

Initial Value: Internal
Setting range: External
It can be choose cold junction compensation functioned from internal circuit or from external equipment at thermo couple input.
No display when linear input or resistance bulb input is chosen.

Input scaling lower limit value setting screen



Initial value:0.00
Setting range:−20000 ～31990
Scaling lower limit value at the time of linear input is set up

Input scaling upper limit setting screen

Initial value:100.00
Setting range:−19990 ～32000
Scaling upper limit value at the time of linear input is set up
Suppose that the difference between a lower limit value and upper limit value is 10 or less,or over 50,000. In this setting, upper limit value is compulsorily changed into that of +10 or ± 50,000 count. Upper limit value cannot be set as lower limit value of +10 count or less,or that of over 50,000 count.

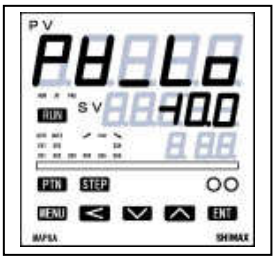
↓ MENU

Input scaling Decimal point position Setting screen

Initial value:0.00
Setting range: no decimal point 0～the 4th place after decimal point(0.0000)
Decimal point position of input scaling is set
The screen of input scaling serves as a monitor at the time of a sensor input.
Setting change cannot be performed.
Being initialized when decimal point is changed.

↓ MENU

PV limiter lower limit setting screen



Initial value:−10% of measuring range
Setting range:−10% ～110% of measuring range(within −19999 ～32000)
Under scale point(LLLLL) is set.

↓ MENU

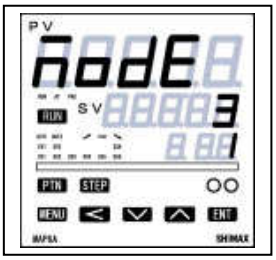
PV limiter upper limit setting screen

Initial value:110% of measuring range.
Setting range:−10% ～110% of measuring range(within −19999～32000)
Upper scale point(HHHHH) is set.

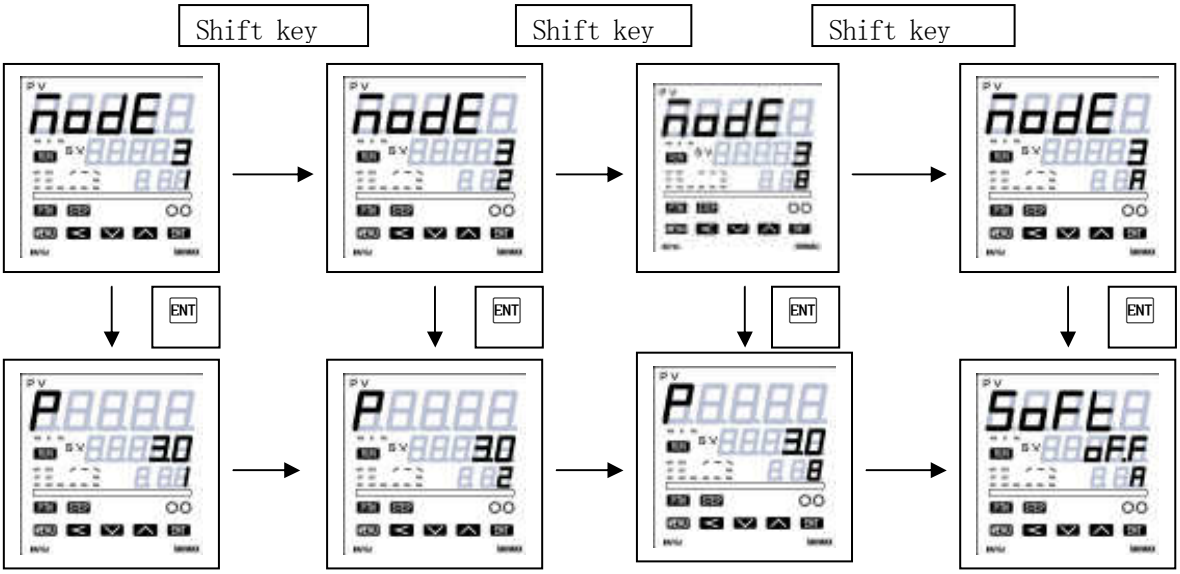
↓

Mode 2 lead screen.

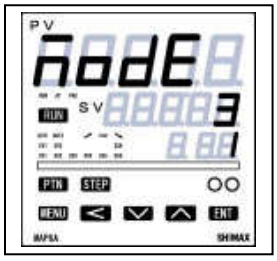
(7)MODE3 Out1 PID setting

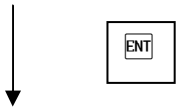


MAP6 has 8kinds of PID setting(PID1～PID8) both Out1 and Out2.
It can be moved PID1 to PID 8 by pressing shift key.



Mode3 PID1 lead screen





Output 1 PID1 proportional-band (P) setting screen

Initial value:3.0%
Setting range:OFF, 0.1 ～ 999.9%
When performing auto tuning, no necessity for a setting basically.
If OFF is chosen, it becomes ON-OFF (two positions) operation.

Output 1 PID1 Integral time (I) setting screen

Initial value: 120 seconds
Setting range: OFF, 1～6000 seconds
When performing auto tuning, no necessity for a setting basically.
This screen is not displayed at the time of ON-OFF operation.
Becomes P operation or PD operation in I=OFF setting.

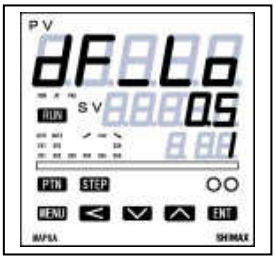
Output 1 PID1 Derivative time (D) setting screen

Initial value: 30 second
Setting range: OFF, 1～3600 seconds
When performing auto tuning, no necessity for a setting basically.
This screen is not displayed at the time of ON-OFF operation.
Becomes P operation or PI operation in D=OFF setting.

Output1 PID1 manual reset setting screen

Initial value:0.0(Output 1)
-50(Output1 &2)
Setting range: －50.0～50.0%
The offset correction at the time of I=OFF (P operation,PD operation]) is performed.
This screen is not displayed at the time of ON-OFF operation.

Out1 PID1 Lower differential-gap setting screen

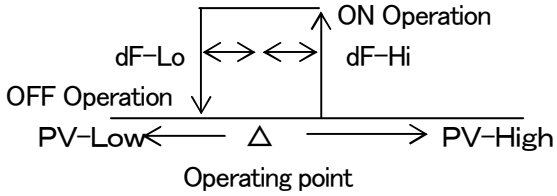


Intial value: 5 digit
Setting range:1～9999digit
The differential gap at the time of ON-OFF operation lower point is set.
Displayed at the time of P=OFF (ON-OFF operation) setup.

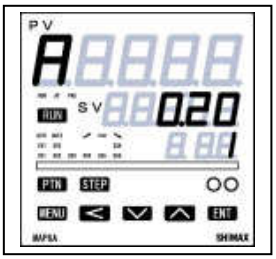
Out1 PID1 Upper differential-gap setting screen

Intial value:5 digit
Setting range:1～9999digit
The differential gap at the time of ON-OFF operation Upper point is set.
Displayed at the time of P=OFF (ON-OFF operation) setup.

Differential Gap lower ad Upper setting Operation figure



Out1 Flex PID factor A setting screen.

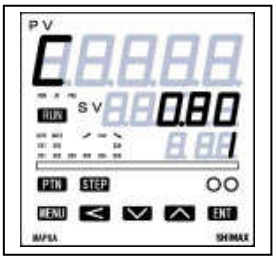


Initial Value:0.20 (program operation)
0.40(Fix operation)
Setting range:0.00 ～1.00
Display at the time of PID methiod is set 2.
Initialaized at Program and Fix has changed.
Refer to Explanation of Flex PID method

Out1 Flex PID factor B setting screen.

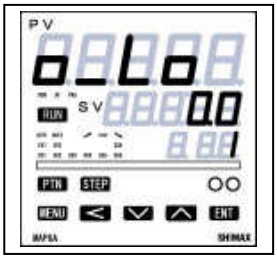
Initial Value:0.20 (program operation)
1.00(Fix operation)
Setting range:0.00 ～1.00
Display at the time of PID methiod is set 2.
Initialaized at Program and Fix has changed.
Refer to Explanation of Flex PID method

Out1 Flex PID factor C setting screen.



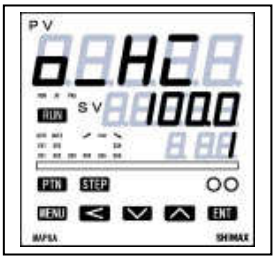
Initial Value:0.40 (Output 1 charator and Output2 character are same)
0.80(Output 1 charator and Output2 character are different)
Setting range:0.00 ～1.00
Display at the time of PID methiod is set 2.
Initialaized at Program and Fix has changed.
Refer to Explanation of Flex PID method

Output1 PID1 minimum limiter setting screen



Initial value:0.0
Setting range :0.0～99.9%
Output lower limit value of output 1 PID1 is set.

Output1 PID1 maximum limiter setting screen



Initial value:100.0
Setting range :0.0～99.9%
Setting range: output limiter lower limiter values +0.1～100.0%

Mode3 PID1 lead screen

About Output limit function.

At the time of Reset (standby) and Over scale , Output have to be 0.0% compulsorily with. nothing relate output limit setting value.

During AT tuning function , output value will be 0% and 100% with nothing relate output limit setting value.

At P=OFF operation Output type C and S will be 0% and 100% with nothing relate output limit setting value.

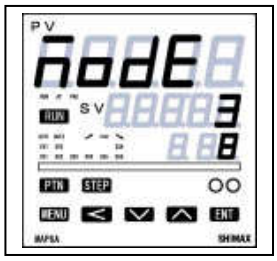
Please refer the table below:

AT		P=OFF	
S, C	I	S, C	I
0.0 or 100.0	0.0 or 100.0	0.0 or 100.0	OL or OH

At the time of defferencee between Output maximam limit value ansd minimum limit value will be less than 0.1 , it have to be set the maximum limitvalue ,+0.1 to minimum limit value.

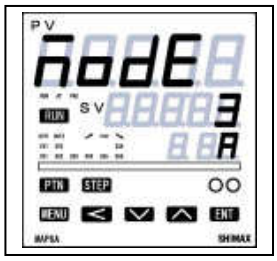
Out1 PID common setting

Common setting of PID can be moved from PID8 screen.



↓ Shift key

Out1 PID common setting screen

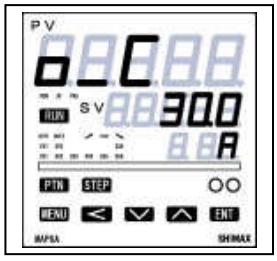


Out1 Soft start setting screen

Initial value: Off
Setting range:Off, 0.1～300.0 sec
This is the function that eases change of output at the time of a power-on and startup from 0% to 100%.
Does not function at the time of OFF setup.

↓

Output 1 proportional periodic time setting screen



Initial value:30.0 (Contact)3.0(Voltage pulse)
Setting range:0.5 ～300.0seconds (seting resolution 0.5seconds)
Proportional periodic time of output 1 is set.
No display beside Contact and Voltage pulse

↓

Output 1 characteristics setting screen

Initial value: RA
Setting range:RA, DA Characteristics of control output is chosenfrom RA (heating characteristics)and DA (cooling characteristics)

↓

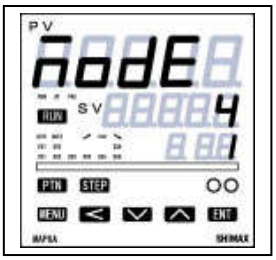
Out1 PID common setting screen

(8)Mode 4 Out2 setting

Mode 4screens is the setup screens of output 2 option. Not displayed when option is not added.

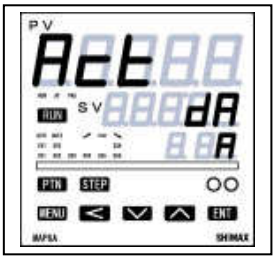
Mode 4 has PID dead band setting screen(db) instead of Out1 PID manual reset setting screen.

Out2 PID1 lead screen



Same as Out1

Dead band setting screen



Initial value: 0.0

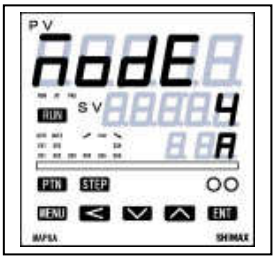
Setting range: －20000～30000digit

Same as Out1

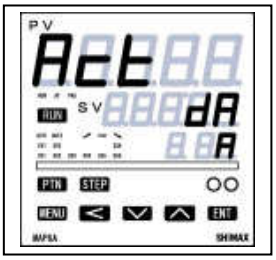
Out2 PID1 lead screen

Out2 PID common setting

Out2 PID common setting lead screen



Out2 PID common character setting screen



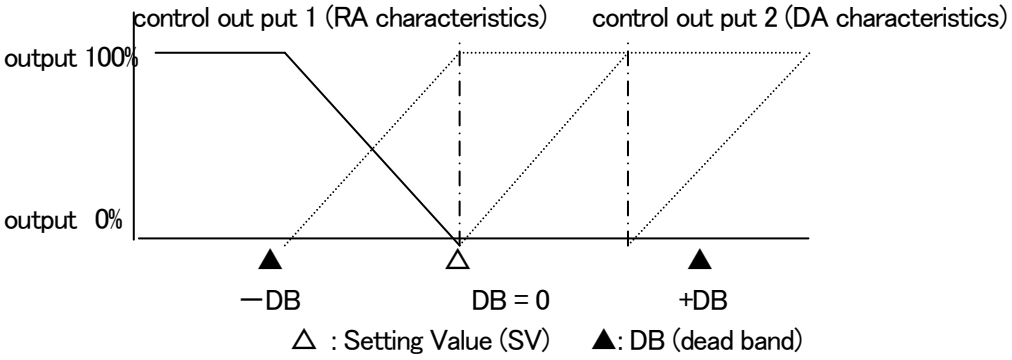
Initial value: dA
Setting range: rA、dA

Explanation of 2 output-characteristics figure

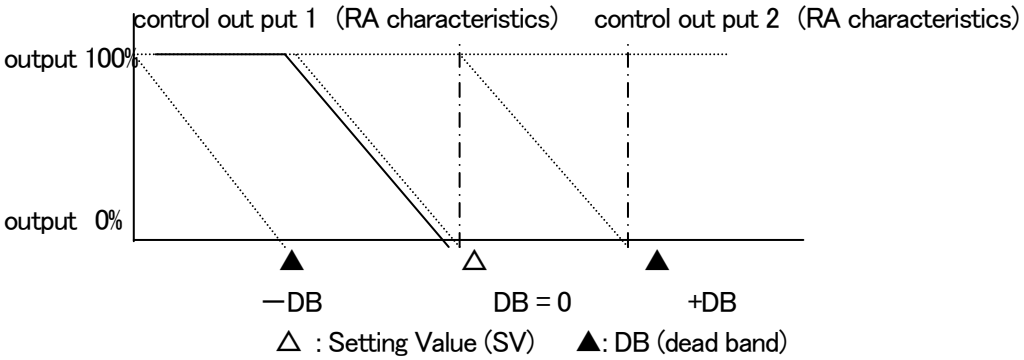
2-output -characteristics is shown in the following figure.

◎ Conditions: P operation, manual reset (Anr) —50.0%

1) OUT 1 RA (heating) ・OUT 2 DA (cooling) operation



2) OUT 1RA (heating)・ OUT 2 RA (heating)



Explanation of PID method.

MAC6 equipped with flex PID which can be suited SV (target value) change followingness as a disturbance in addition to the usual type SHIMAX PID which can be suited for a few target of a disturbance element (factory setting)

This is explainaton a modification method of two types PID method both SHIMAX PID methid and Flex PID method.

Adjustment of each Factor

Auto tuning function calculates standard PID for the turbulence response but best value is not necessarily obtained for all applications.

When the auto tuning function finished, it should be confirmed whether the auto tuning result is excellent by giving turbulence by intention while checking the control result.

The integration limitation coefficient is trimmed C as an adjustment of the overshoot and undershoots. When C is enlarged, it becomes easy for the overshoot and undershoot to go out though the restoration speed quickens.

C setting range=0.00～1.00 C Default Value(Value of Output1 0.4 as same Output 1 &2)

(0.8 As Reverse-characteristic Output 1& 2)

Adjustment of follow for Start up and SV change

The turbulence response and the SV change follow can be individually set by Flexible PID method in MAC3.It already set up the turbulence response, and now set it according to the purpose based on the table below.

A	b	Control method	Features	Remarks
1	1	I－P D(Measurements proportion differentiation early type)	For fixation control	1flexible PID control
1	0	I D － P （ Measurements proportionally early type)	The kickback by the SV value change is inferior and a no bur and the target value follow are a little inferior. For ramp control	
0	1	I P － D （ Measurements differentiation early type)		
0	0	PID(Deflection PID)	For target value follow valuing and cascade regulation	
A	0	P－I－PD(P2 flexi type)	Turbulence response and target value follow	like2flexible PID control

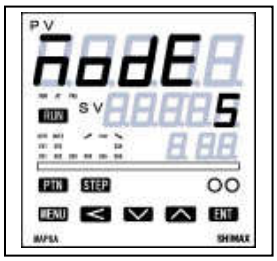
Ab setting range＝0. 00～1. 00 Default value(FIX: A＝0. 40 b＝1. 00)

(PRG: A＝0. 20 b＝0. 20)

A should be reduced when you want to improve the step response at the SV change and the start-up, A should be expanded when you wants to reduce the overshoot at the step responds and to reduce the output change.

b should be reduced when you want to improve the follow performance at the lamp control, b should be expanded When you wants to reduce the overshoot at the lamp ends and to reduce the output change

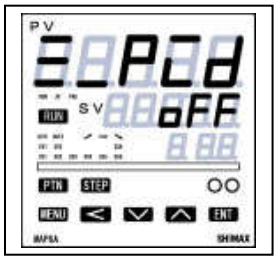
(9)Mode 5 Zone PID setting screen



This function can be set up to 4 differences PID Zone in mesuring range.
Most suitable PID value can be set in each measuring zone ,and it have to be controlled suitable for the condition of each application.

ENT

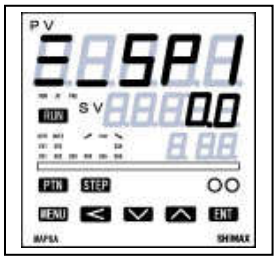
Zone PID setting screen



Initial value:OFF
Setting range :OFF, SV, PV
Zone PID function can be set by PV Value or SV value.

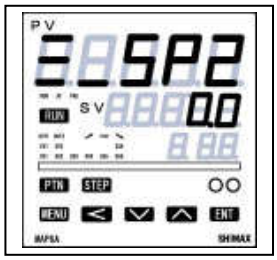
Being initialized when musuring range and scaling changed

Zone 1 SP(set point)setting screen



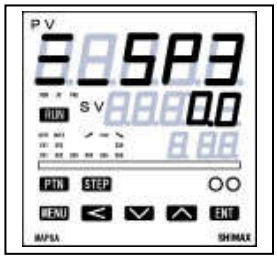
Initial value:0.0
Setting range : within measuring range ,scaling range and limit setting.
Change PID No, at set point.
No display at Zone PID OFF.
Being initialized when musuring range and scaling changed

Zone 2 SP(set point)setting screen



Initial value:0.0
Setting range : within measuring range ,scaling range and limit setting.
Change PID No, at set point.
No display at Zone PID OFF.
Being initialized when musuring range and scaling changed

Zone 3 SP(set point)setting screen



Initial value:0.0
Setting range : within measuring range ,scaling range and limit setting.
Change PID No, at set point.
No display at Zone PID OFF.
Being initialized when musuring range and scaling changed

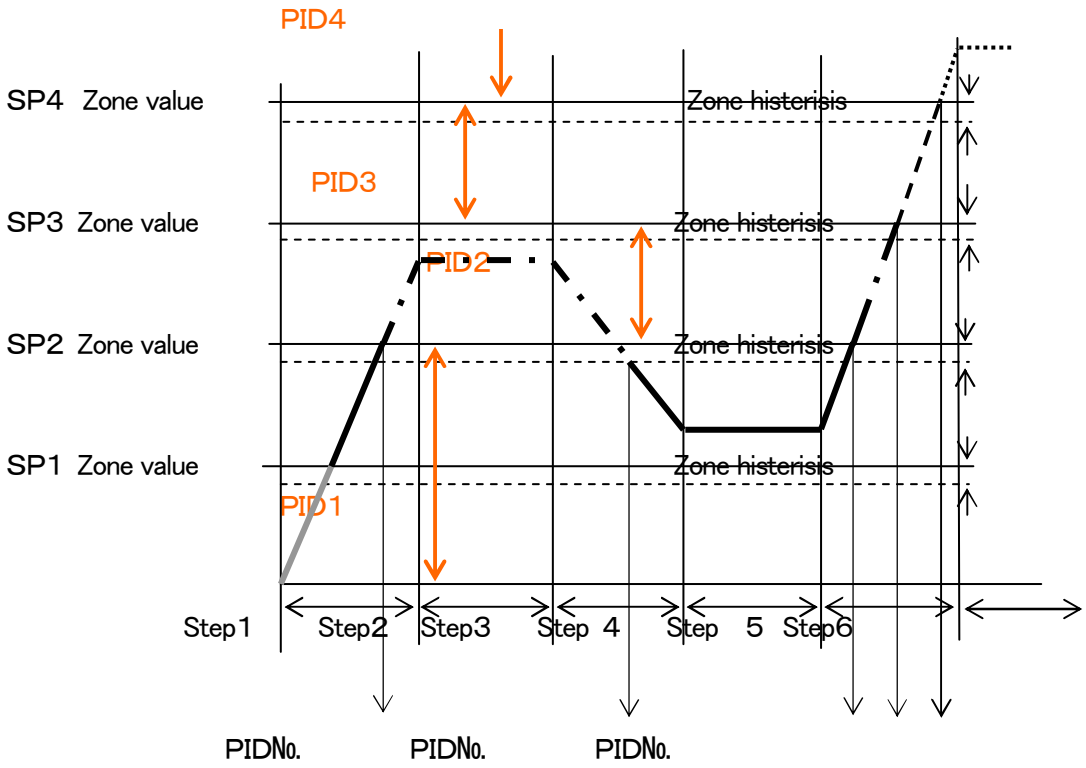
Zone 4 SP(set point)setting screen

Initial value:0.0
Setting range : within measuring range ,scaling range and limit setting.
Change PID No, at set point.
No display at Zone PID OFF.
Being initialized when musuring range and scaling changed

Zone histerisis setting screen

Initial value:2.0
Setting range:0～9999 digits

Mode 5 lead screen



PIDNo.1 ═══

PIDNo,2 ━ · ━

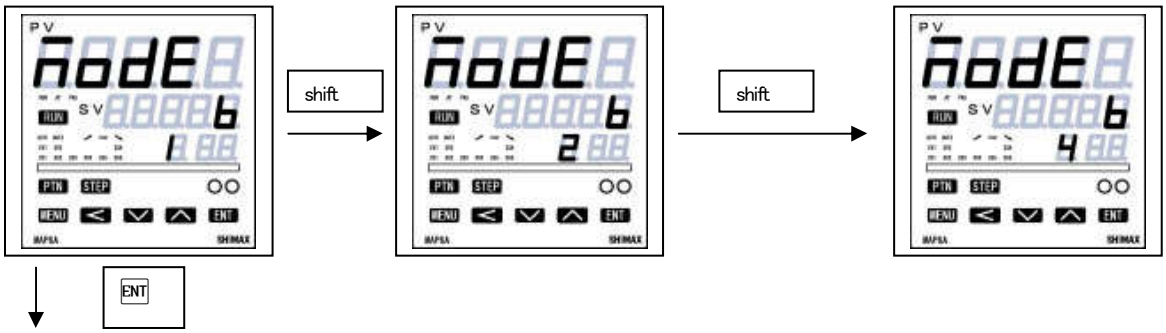
PIDNo.3 – – –

PIDNo.4 - - - - -

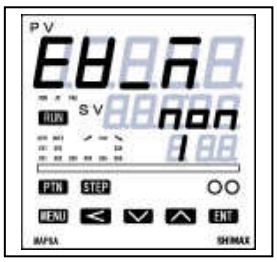
(10)Mode6 Event 1～4setting

Mode 6 screens is the setup screens of event 1～4 option. Not displayed of Event 4 when option is not added.Press shift key to shift EV1～4.

EV1 Lead screen　　EV2 lead screen　　EV4 lead screen



Event 1 operation-mode setting screen



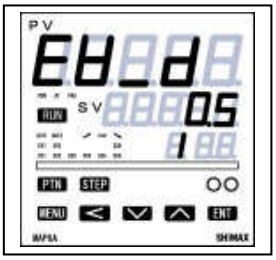
Initial Value: non

Setting range : Chosen from event type character table.

Being initialized if measuring range, scaling, and unit are changed.

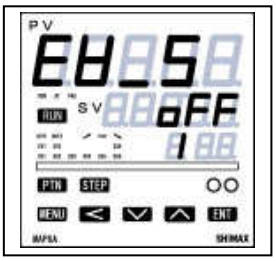
function		Note
No allotment	non	Default
Upper limit absolute value alarm	HA	
Lower limit absolute value alarm	LA	
Within Absolute Value alarm	iA	
Without Absolute Value alarm	oA	
Scale over alarm	So	
Upper limit deviation value alarm	Hd	
Lower limit deviation value alarm	Ld	
Within deviation alarm	id	
Without deviation alarm	od	
RUN signal	run	
CT1 Control loop alarm(heater braking)	ct1_b	
CT1 Control loop alarm (loop)	ct1_L	
CT2 Control loop alarm (Heater braking)	ct2_b	
CT2 Control loop alarm (loop)	ct2_L	
3 phases Control loop alarm(Heater braking)	ct3_b	
3 phases Control loop alarm (loop)	ct3_L	
Step signal	StP	
Pattern end signal	P_E	
Program end	End	
Step hold signal	HoLd	
Program signal	ProG	
Up slope signal	u_SL	
Down slope signal	d_SL	
Guarantee signal	GuA	
Time signal 1	tS1	
Time signal 2	tS2	
Time signal 3	tS3	
Time signal 4	tS4	

Event 1 differential-gap setting screen



Initial value:5Digits
Setting range: 1～9999 Digits
ON-OFF differential gap of event 1 is set
Not displayed, when the event 1 mode are as follows.
non、So、run、StP、P_E、HoLd、ProG、U_SL、d_SL. GuA、tS 1~4
Being initialized if measuring range, scaling, and unit are changed.

Event 1 standby operation setting screen



Initial value:: oFF
Setting range:: oFF、 1、2
oFF : No standby operation、 1 : standby-operation only at the time of a power-on.2 : Standby-operation in the following cases. ;At the time of power-on. When each alarm's operating point is changed,When deviation alarm's SV is performed, When RUN/STBY (RST) is switched, When AUTO/MAN is switched.
Not displayed, when the event 1 mode are as follows.
non、So、run、StP、P_E、HoLd、ProG、U_SL、d_SL. GuA、tS 1~4
Being initialized if measuring range, scaling, and unit are changed.

Event 1 latching setting screen

Initial value:oFF
Setting range:oFF、on
When latching is set as on, once event is output, even if event is OFF state event output state is held. Not displayed when event 1 mode is non.
Being initialized if measuring range, scaling, and unit are changed.

Event 1 output characteristics setting screen

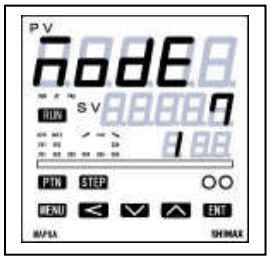
Initial value:no
Setting range:no、nc
no: normal open
nc: normal closing.
Not displayed when event 1 mode is non.
Note: If nc is chosen,relay turns to ON about 1.5 seconds later when power source is switched on,and turns to OFF in event output range.

EV1 setting lead screen

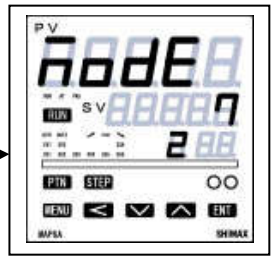
(11)Mode7 DO setting

Not displayed of Event 4 when option is not added.

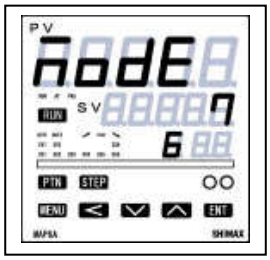
when CT or FB option is added,it is impossible to choose



Shift



Shift



ENT

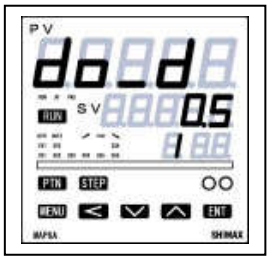
DO mode setting screen

Initial Value: non

Setting range : Chosen from Event type character table.

Being initialized if measuring range, scaling, and unit are changed.

Differential Gap setting



Initial Value:5 digit

Setting range:1～9999digit

ON-OFF differential gap of DO 1 is set

Not displayed, when the event 1 mode are as follows.

non、So、run、StP、P_E、HoLd、ProG、U_SL、d_SL、GuA、tS 1~4

Being initialized if measuring range, scaling, and unit are changed.

Stand by operation setting screen

Initial value:: oFF

Setting range:: oFF、1、2

oFF : No standby operation、 1 : standby-operation only at the time of a power-on.

2 : Standby-operation in the following cases. ;At the time of power-on.

When each alarm's operating point is changed,When deviation alarm's SV is performed,

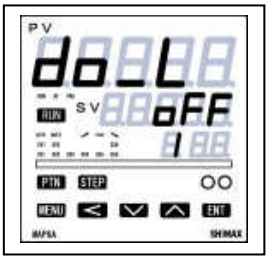
When RUN/STBY (RST) is switched, When AUTO/MAN is switched.

Not displayed, when the event 1 mode are as follows.

non、So、run、StP、P_E、HoLd、ProG、U_SL、d_SL、GuA、tS 1~4

Being initialized if measuring range, scaling, and unit are changed.

Latching release setting screen



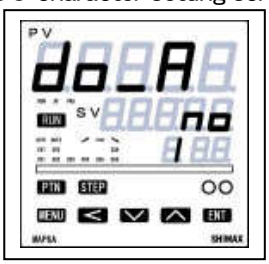
Initial value:oFF

Setting range:oFF、on

When latching is set as on, once DO is output, even if DO is OFF state event output state is held. Not displayed when DO 1 mode is non.

Being initialized if measuring range, scaling, and unit are changed.

DO character setting screen



Initial value:no

Setting range:no、nc

no: normal open

nc: normal close

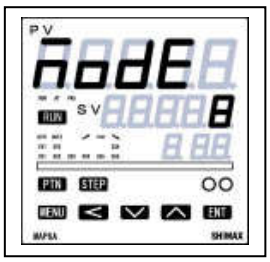
Not displayed when DO 1 mode is non.

Note: If nc is chosen,relay turns to ON about 1.5 seconds later when power source is switched on,and turns to OFF in DO output range.

DO Output rating: Open collector darlington output 24VDC(Max load 20mA)、ON saturated voltage1. 2V

Mode 7 lead screen

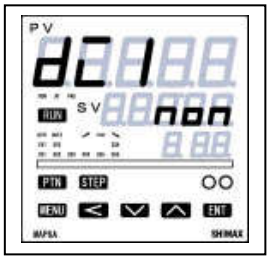
(12)Mode 8 DI setting



Mode 8 screens is the setup screens of external control input (DI) option.

↓ ENT

DI1 setting screen

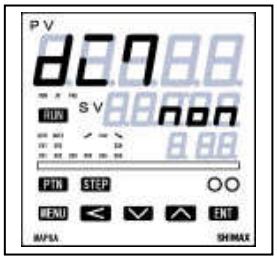


Initial Value: non

Setting range: chosen from DI operation character table

Function		Input detection	Contents
No allotment	non		Default setting
SV selection SV1 ↓ SV8	SV1 ↓ SV8	Level	Priority is given to younger number
SV3bit selection	SV_3b	Level	3 bits of continuation is occupied by the younger DI allotment
RUN	run	Level	RUN／STBY(RST)
PRG	Prog	Level	PRG／FIX
MAN	MAn	Level	MANUAL／AUTO
AT	At		Auto tuning execution
PTN selection PTN1 ↓ PTN8	Ptn1 ↓ Ptn8	Level	Priority is given to younger number
PTN 3bit selection	Ptn3b	Level	3 bits of continuation is occupied by the younger DI allotment
HOLD	Hold	Level	Program time stop
SKIP	SKIP	Edge	Shift to the following step of program,
Latching release	L_rS	Edge	All latching release
Super Key lock	LocK	Level	Fixed only to the basic screen key operation unacceptable

DI 2 ～DI7 are same as DI1

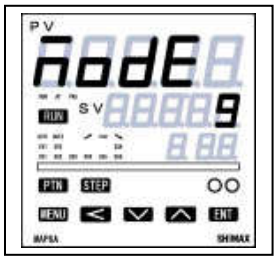


Initial Value: non
Setting range: chosen from DI operation character table

Mode 8 lead screen

*When SU 1 ～ SU8 are allotted to to each DI, priority is given to younger No,.
*AT can be performed at the time of a RUN-automatic output.
*When AT is allotted to, release in the middle of AT operation is carried out by off-key operation chosen in AT screen.
*While AT is performed, if STBY (RST) or a manual output is performed, AT is released.
*Even when a keylock is not OFF,conducting of DI is effective.
*The same operation other than non is impossible to allot to DI1-DI7 at a time.
*Operation allotted to DI takes priority over DI.. Key operation cannot be performed.
*Execution of DI operation is possible to perform. But neither release of AT nor numerical change of SV and manual output is possible to perform.*In DI input, 5VDC 0.5mA per point is impressed.Use endurable switch, transistor and so on.
*Wiring distance of DI should be less than **30m**.
*DI Input have to be needed at least 50msec signal to detect DI input .
*DI is non voltage contact or open collector.Rating: 5V DC 0.5mA/input

(13)Mode 9　AO setting



Not displayed when AO function is not installed

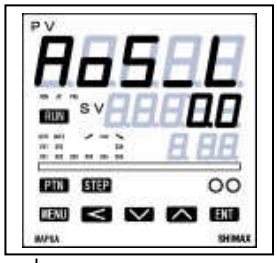
ENT

AO mode setting screen

Initial value: non
Setting range: Chosen from event type character table.
Data type allotted to analog output are chosen.

Function	character
Non	non
PV	PV
ExecutinSV	SV
PV-SV Deviation	PV-SV
Output1	out1
Output2	out2
CT1	ct1
CT2	ct2
Servo position	SVoFb

AO scaling lower limit value setting screen



Initial Value:Refer to the table below
Setting range:Refer to the table below
Not displayed when AO mode is Non

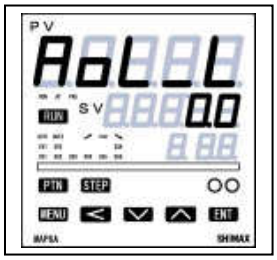
MODE		Setting range	Initial value
PV	Sensor input	Within mesuring range	measuring range lower limit value
SV	Linear input	Within scaling range	Scaling range lower limit value
Deviation,Out1, Out2, Servo position		0.0～99.9%	0.0%
CT1、CT2		0.0～49.9A	0.0A

AO scaling upper limit value setting screen

Initial Value:Refer to the table below
Setting range:Refer to the table below
Not displayed when AO mode is Non

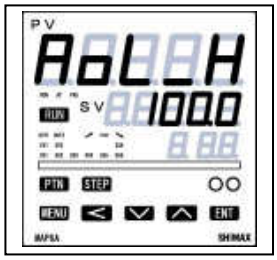
MODE		Setting range	Initial value
PV	Sensor input	Within mesuring range	measuring range upper limit value
SV	Linear input	Within scaling range	Scaling range upper limit value
Deviation,Out1, Out2, Servo position		0.1～100 %	100%
CT1、CT2		0.1～50.0A	50.0A

Analog output limiter lower limit value setting screen.



Initial velue: 0.0%
Setting range:0.0～100.0%
The lower limit value of analog output value (4-20mA or 0-10V) is set up by %.
For example, output value of a lower limit value in each setup are:8mA(25.0), 12mA(50.0), 16mA(75.0) and 20mA(100.0) respectively.
Not displayed when AO mode is Non.

Analog output limiter upper limit value setting screen



Initial velue:0.0%

Setting range:0.0～100.0%

The lower limit value of analog output value (4-20mA or 0-10V) is set up by %.

For example, output value of a lower limit value in each setup are:8mA(25.0), 12mA(50.0), 16mA(75.0) and 20mA(100.0) respectively.

Not displayed when AO mode is Non

If set as the same value as AL_L and AL_H, it is fixed to the value.

An analog output limiter can be made into reverse scaling.

Example: Output range :0℃ (4mA)～ 1200℃ (20mA) can be 0℃ (20mA) ～ 1200℃ (4mA).

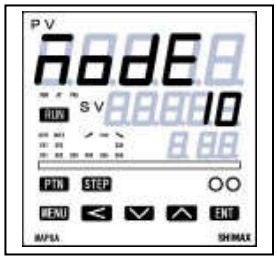
Set AL_L as 100% and AL_H as 0.0%.

Rating 4-20mA DC MAX load resistance 300 Ω

0-10V DC MAX load current 2mA

Mode 9 lead screen

(14)Mode 10 AI setting



Not displayed when AI function is not installed

ENT

AI operation mode setting screen

Initial Value: NON

Setting range: chosen from AI operation character table

Function	Character
Non	non
Executing SV	SV
PV offset correction	PV_oF
Out1 lower limit	out 1L
Out1 upper limit	out 1H
Out1 manual operation point	mAnu 1
Out2 lower limit	out2L
Out2 upper limit	out2H
Out2 manual operation point	mAnu2
Event 1 operating point	EV 1
Event 2 operationg point	EV2
Event 3 operating point	EV3
Event 4 operating point	EV4
DO1 operating point	do 1
DO2 operating point	do2
DO3 operating point	do3
DO4 operating point	do4
DO5 operating point	do5
DO6 operating point	do6

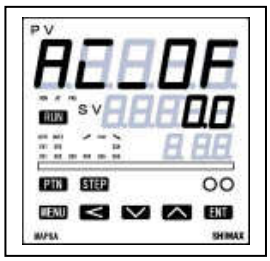
No display when no option function or no function allotted below function:

out2L、out2H、mAnu2、EV 1~4、do 1~6

Execute SV value can be effected at FIX control, it can be set at program control but not effective.

Manual operation point can be effected at Manual control.

AI offset correction setting screen

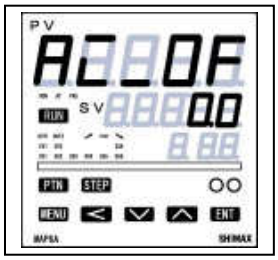


Initial value:0.0
Setting range:−5000～5000digit
Offset can be corrected input signal.

AI gain correction setting screen

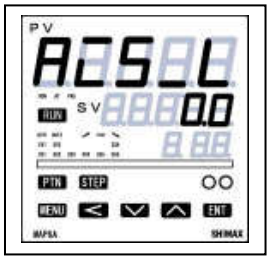
Initial value:0.000
Setting range: ±5.000
Maximum input value is corrected within limit of ±5.00% of measuring range.
If corrected, inclination of spang changes in straight line which connects zero point and correction maximum value.

AI filter setting screen



Initial value:0
Setting range:0～10000 sec
When input change is violent or noise is overlapped, used in order to ease the influences.
In 0 second setting, filter does not function.

AI scaling lower limit setting screen



Initial value: O or lower limit of each range.
Setting range:refer to the setting range table.
Lower limit value of range allotted to analog input is set up
An analog input limiter can be made into reverse scaling.

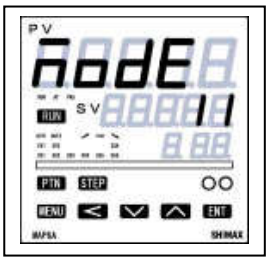
Function	Seting range
SH	Within measuring range
PH_oF	-5000~5000
out 1L	0.0~ 100.0
out 1H	0.0~ 100.0
AAnu 1	0.0~ 100.0
out2L	0.0~ 100.0
out2H	0.0~ 100.0
AAnu2	0.0~ 100.0
EH 1~4	Belong to EV setting
do 1~6	Belong to DO setting

AI scaling upper limit setting screen

Initial value: 0 or upper limit of each range.
Setting range:refer to the setting range table.
Upper limit value of range allotted to analog input is set up
An analog input limiter can be made into reverse scaling.

Mode 10 lead screen

(15)Mode 11 CT setting



Not displayed when CT function is not installed

↓ ENT

CT1 mode setting screen

Initial Value: non

Setting range: non、out 1、out2、EV 1、EV2、EV3、EV4

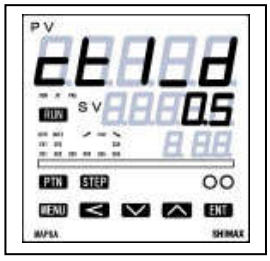
Object detected by CT (current) sensor is chosen.

In the case of a current or voltage pulse output, out 1 is not displayed.

out2 is not displayed without current output or output 2 option.

↓

CT1 delay time setting screen



Initial value:0.5

Setting range:0.1～1000.0 sec

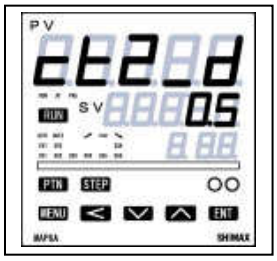
When control loop abnormal alarm is allotted to event, delay time from switchover of operation (ON-OFF) to detection start is set up.

↓

CT2 mode setting screen

Same as CT1 mode setting screen

CT2 delay time seting



Same as CT1 delay time setting

About control loop abnormal alarm
When the targeted output of a control loop abnormal alarm is ON, if current detected by CT is lower than the allotted event's operating point.(Setting Value of a basic screens, event operating point setting screen)alarm output is issued as breaking alarm.
When the targeted output is OFF, if detected current is higher than the allotted event's operating point(short-circuit, earth fault, etc.)

Mode 11 lead screen

（16）Mode 12 communication setting screen

No display when communication function not installed

Refer to Communication manual.

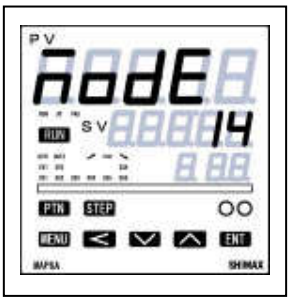
(17)Mode 13 Servo out setting screen

No display when Servo setting function not installed.

Refer to Servo setting manual.

(18)Mode 14 PV SV malti points compensation setting screen

Mode 14 lead screen

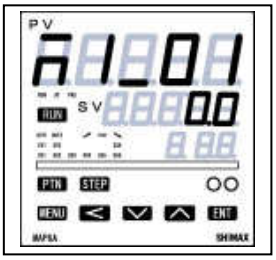


This function is used for compensation Input value.
More than 2 points of setting is needed to effecvtive this function.
Set point setting have to be needed bigger value than the previous value.

Operation mode setting screen

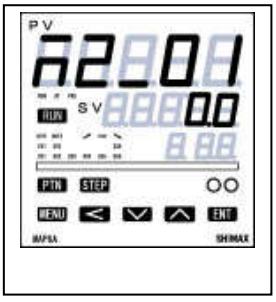
Initial Value: oFF
Setting range: oFF
LCnEA Linier input compensation
PV_PV PV-PV Compensation
SV_PV SV-PV Compensation
AI_SV AI-SV SV Compensation
LCnEA is not display at RTD and TC input.
AI_SV display when AI function is allotted to SV.

Set point 1 position setting screen



Initial Value: 0.0
Setting range: LCnEA -5.00～105.00%
PV_PV within measuring range(scaling)
SV_PV within measuring range(scaling)
AI_SV within measuring range(scaling)

Set point 1 value setting screen



Initial Value: 0.0
Setting range: LCnEA -5.00～105.00%
PV_PV ±10000 digit
SV_PV ±10000 digit
AI_SV ±10000 digit
Decimal point of PV_PV,SV_PV and AI_SV are depend on Mesuring range.

Set point 2 position setting ～Set point 11 position setting are same as 1
Set point 2 value setting ～ Set point 11 value setting are same as 1

6. Supplementary Explanation of Function

6-1. Auto return function

When there is no key operation 3 minutes or more,on the screen except for basic screen and each monitoring screen, screen automatically shifts to basic screen. (Auto return).

6-2. Output Soft Start Function

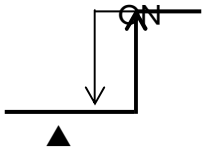
This is the function to increase the control output gradually with set-up time at the time of power-on, STBY→RUN, and normal return from scale over. This is effective for controlling the excessive current to loads, such as a heater.

1) Soft- start functions in the following conditions.

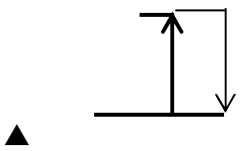
- At the time of the power-on in automatic operation, STBY(RST)→RUN, and normal return from scale over.
- Setup of proportional band (P) is other than OFF
- Soft starting time is not OFF

The figure of alarm operation figure allotted to event 1～4 is shown

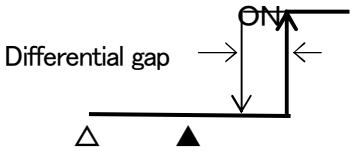
LA : Lower limit absolute value alarm



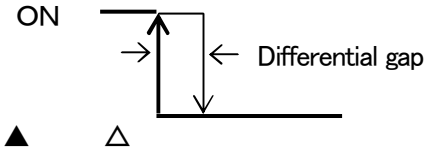
HA : Upper limit absolute value alarm



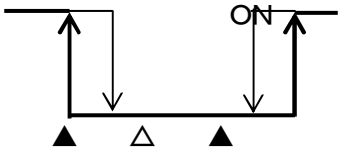
Hd : Upper limit deviation alarm



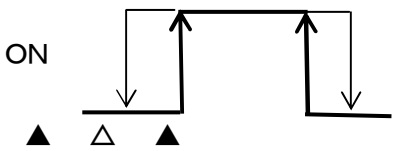
Ld : Lower limit deviation alarm



od : Without deviation alarm

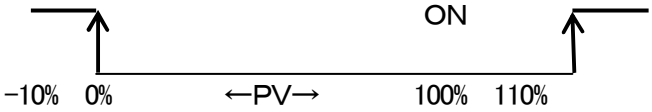


Cd : Within deviation alarm



△ : SV　　▲ : Alarm operating point setting value

So : Scale over



6-4. AT (Auto Tuning)

・If AT is performed by FIX (constant value control)、AT monitor LED blinks and light is put out by termination or intermediate release.

・When auto tuning is ended in inclination step or chosen all PID(s) , it is in standby state until one pattern is completed. then lights up, then puts out when one pattern is completed.

When AT is not completed within 1 pattern, AT conducting is released when one pattern is completed.

・Even in inclination step, AT is performed if it is in HOLD state

AT at the time of 2 output specification is as follows.
At the time of heating / cooling operation and cooling / heating operation = OUT1, OUT2 common – PID value
At the time of heating / heating operation and cooling / cooling operation, only OUT1 performs AT.
OUT 2 output while performing AT is 0% or output limiter lower limit value.

7-2. Cause and Treatment of Error Display

(1) Abnormality Display of Measurement Input

Contents of defects	Cause	Treatment
Error message display	Refer to cause and treatment of error display	Refer to cause and treatment of error display
PV display is not normal	Mismatch of instrument and input. Fault in the wiring.	Type code, check of specification. Check of wiring.
Display disappeared and does not operate	Power is not supplied. Abnormality of instrument.	Check of a power supply (voltage of terminal, switch, fuse, wiring).
Key operation impossible	Keylocked. Abnormality of instrument.	Release of keylock. Check of instrument, repair, exchange.

7-2. Cause and Treatment of Error Display

Error display	Contents	Cause	Treatment
(HHHH)	Scale over in upper limit	1.wire breaking of thermocouple input 2.wire breaking of resistance bulb input A 3.when input exceeds upper limit of measuring range by 10%	1.wire breaking check of thermocouple input wiring, replacement of thermocouple 2.check of resistance bulbA wiring, replacement of resistance bulb 3.check of input voltage value and current value, input transmitter and specification (matching of incoming

			signal and meter specification)
(LLLL)	Scale over in lower limit	1.when input exceeds lower limit of measuring range by 10% 2.wire breaking of resistance bulb input B*	1.polarity of input is everse, check of wiring and an input transmitter 2.check of resistance bulb B wiring,replacement of resistance bulb
		*B: Wiring of MAC3A, 3B's terminal No.11, Wiring of MAC 3D's terminal No.5	
(B－－-)	Breaking of resistance bulb input	1.wire breaking of b*	1.check of resistance bulb wiring
		*b: Wiring of MAC 3A, 3B's terminal No.12,wiring of MAC 3D's terminal No.6	
		2.multiple wire breaking combinations in Abb (A and B, A and b, B and b, all of ABB)	2.replacement of resistance bulb
(CJHH)	Cold junction (CJ) temperature of thermocouple input is scale over in upper limit side	When ambient temperature of a meter exceeds 80℃	1.make Ambient temperature of meter within use environment condition temperature 2. Check the meter when ambient temperature is not over 80℃
(CJLL)	Cold junction (CJ) temperature of thermocouple input is scale over in lower limit side	When ambient temperature of meter becomes less than －20℃	1.make Ambient temperature of meter within use environment condition temperature 2. Check the meter when ambient temperature is not less than -20℃

General specification

Display

(1) Display method

Digital display :PV red 7segment LED 5 digits (height of the character 20mm)

:SV green 7segment LED 5Digits(height of the character 13mm)

:PTN/SV-No, green 7segment LED 1digit(height of the character 10mm)

:STEP／PID-No. green 7segment LED 2digit(height of the character10mm)

Bar graph display :20dots green LED

Non allotment、deviation、OUT1、OUT2

Servo valve position・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ Servo

STEP time rate 、PTN step rate 、number of executions rate・・・・・・・・・・・・・・・PRG

Status display :OUT1, OUT2 green LED

:EV1～4 Yellow LED

:AT green LED

:RUN green LED(blinking at MANUAL)

:PRG green LED・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ PRG

:DO1～6 yellow LED

:GUA green LED・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ PRG

:HLD green LED・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ PRG

:↗(Up) yellow LED・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ PRG

:→(Flat) yellow LED・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ PRG

:↘(Down)yellow LED・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・・ PRG

(2) Display accuracy :TC ±(0. 1%FS+1digit) 、CJ error not include

RTD ±(0. 1%FS+0. 1deg)

Others ±(0. 1%FS+1digit)

(3) Accuracy maintenance range:23℃±5℃

(4) Temperature coefficient of the accuracy:±0. 005%(50ppm)FS／℃ or less

(5) Accuracy stability :±0. 04%FS(90days 23℃)、±0. 06%FS(1year 23℃)

(6) Display resolution :belong to measuring range and scaling(0.0001/0.001/0.01/0.1/1)

(7) Display range :Within PV limiter(－10%～110% of measuring range)

※ Lower limit of Display is -270℃

※ Lower limit of measuring range is -240℃ at P1, JP1, P2, and JP2

(8) Display renewal period :same as sampling period (50, 166. 7, 250, 500m sec)

(9) Input scaling :Possible at current input and voltage input(－20000～32000 span10～50000)

(10) Decimal point :Non、1/10 1/100 1/1000 1/10000、

Setting

(1) Setting method :MAC6A By 6 front keys(RUN MENU ・ ・ ・ ENT)

:MAP6A By 8 front keys(叡 MENU ・ ▼ ▲ ENT STEP PTN)

(2) Number of SV setting :MAX 8 points

(3) SV setting range :Same as measuring range (within SV limiter)

(4) Key lock :OFF、1～4(5 levels)

operation	Level	contents
Key setting	OFF	No lock
	1	Execution SV and a manual numerical change are possible. And change of a key lock level is possible. (RUN key operation acceptable)
	2	Possible to change numerical value manually and key lock level (RUN key operation acceptable)

	3	Possible to change key lock level. (RUN key operation acceptable)
	4	Possible to change key lock level. (RUN key operation unacceptable)
DI setting		Shift between screens prohibited. Fixed only to the basic screen. (RUN key operation unacceptable)

(5) PV limiter :Within measuring range (Lo＜Hi)

Over scale(HHHHH) or under scale(LLLLL) is displayed at outside measuring range

(6) SV limiter :Upper limit and Lower limit can be set individually within measuring range

(Lower limit＜Upper limit and within PV limit)

(7) Unit setting :℃(Centigrade) ℉(Fahrenheit) K(Kelvin)

(8) PV－SV characteristics correction :11point ±10000digInput

(1) Input :Full malt(TC・Pt・mV・V・mA)

Thermo couple :Input resistance 500kΩor more

:External resistance tolerance 100Ω or less

:Inferences of lead wire 1．2μV／10Ω

:Burn out Standard equipment up scale only

:Compensation accuracy of reference junction mode can be selected between internal and external.

:Compensation accuracy of reference junction

Within accuracy maintenance ±1℃ (ambient temperature 5～45℃ ±2℃)

*1 ±0．5%FS(PV value at -100 to 0℃)

*2 ±0．7%FS(PV value at －100℃ or less)

*3 Accuracy is not guaranteed below B:400℃(752℉)

Resistance bulb :Stipulated current about 1mA

:Resistance latitude of lead wire 5Ω or less (equivalent in the resistance value of 3 lines)

Inferences of lead wire resistance

MaxO．3%FS at 10Ω or more by each lead wire

MaxO．7%FS at 20Ω or more by each lead wire

Voltage :Input resistance 500kΩor more

Current :Reception resistance 100Ω(External resistance needed 0．05% 25ppm／℃)

(2) Sampling period :50，166．7，250，500m sec

(3) PV filter :0～10000sec

(4) PV off set :±5000unit

(5) PV gain :±5．000%

(6) Characteristics correction :①Linearity correction 11point ±10000digit

:②PV－PV Characteristics correction 11point ±10000digit

Measuring range

Thermocouple									
Character	℃		Centigrade	℉		Fahrenheit	K		Kelvin
r 1	−50. 0	～	1760. 0	−50. 0	～	3200. 0	220. 0	～	2030. 0
P 1	−270. 0	～	1370. 0	−450. 0	～	2500. 0	0. 0	～	1640. 0
P2	0. 0	～	800. 0	0. 0	～	1500. 0	270. 0	～	1070. 0
P3	−200. 0	～	400. 0	−300. 0	～	700. 0	70. 0	～	670. 0
P4	0. 0	～	300. 0	0. 0	～	600. 0	270. 0	～	570. 0
J 1	−200. 0	～	1200. 0	−320. 0	～	2200. 0	70. 0	～	1470. 0
J2	0. 0	～	600. 0	0. 0	～	1100. 0	270. 0	～	870. 0
t 1	−270. 0	～	400. 0	−450. 0	～	700. 0	0. 0	～	670. 0
E 1	−270. 0	～	1000. 0	−450. 0	～	1800. 0	0. 0	～	1270. 0
S 1	−50. 0	～	1760. 0	−50. 0	～	3200. 0	220. 0	～	2030. 0
U 1	−200. 0	～	400. 0	−300. 0	～	700. 0	70. 0	～	670. 0
n 1	−270. 0	～	1300. 0	−450. 0	～	2300. 0	0. 0	～	1570. 0
b 1	0. 0	～	1820. 0	0	～	3300	270. 0	～	2090. 0
S-26	0. 0	～	2320. 0	0	～	4200	270. 0	～	2590. 0
PL2	0. 0	～	1390. 0	0. 0	～	2500. 0	270. 0	～	1660. 0
RTD									
P 1	−200. 0	～	850. 0	−300. 0	～	1500. 0	70. 0	～	1120. 0
P2	−200. 00	～	300. 00	−300. 0	～	600. 0	70. 00	～	570. 0
P3	−100. 00	～	300. 00	−150. 0	～	600. 0	170. 0	～	570. 0
P4	−100. 00	～	200. 00	−150. 0	～	400. 0	170. 0	～	470. 0
P5	−100. 00	～	100. 00	−150. 00	～	200. 00	170. 0	～	370. 0
P6	0. 00	～	200. 00	0. 0	～	400. 0	270. 0	～	470. 0
P7	0. 00	～	100. 00	0. 00	～	200. 00	270. 0	～	370. 0
P8	−50. 00	～	50. 00	−60. 00	～	120. 00	220. 00	～	320. 00
P9	−20. 000	～	30. 000	0. 00	～	100. 00	250. 00	～	300. 00
JP 1	−200. 0	～	500. 0	−300. 0	～	900. 0	70. 0	～	770. 0
JP2	−20. 000	～	300. 00	−300. 0	～	600. 0	70. 00	～	570. 0
JP3	−100. 00	～	300. 00	−150. 0	～	600. 0	170. 0	～	570. 0
JP4	−100. 00	～	200. 00	−150. 0	～	400. 0	170. 0	～	470. 0
JP5	−100. 00	～	100. 00	−150. 00	～	200. 00	170. 00	～	370. 0
JP6	0. 00	～	200. 00	0. 0	～	400. 0	270. 0	～	470. 0
JP7	0. 00	～	100. 00	0. 00	～	200. 00	270. 0	～	370. 0
JP8	−50. 00	～	50. 00	−60. 00	～	120. 00	220. 0	～	320. 00
JP9	−20. 000	～	30. 000	0. 00	～	100. 00	250. 00	～	300. 00
Liner input									
n 1	−100	～	100	mV		Scaling −20000～32000 Span 10～50000以下 Decimal point Non 0. 1～0. 0001			
n2	0	～	100						
n3	0	～	50						
n4	10	～	50						
n5	0	～	20						
n6	−10	～	10						
n7	0	～	10						
U 1	−10	～	10	V					
U2	0	～	10						
U3	0	～	5						
U4	1	～	5						
U5	0	～	2						
U6	−1	～	1						
U7	0	～	1						
nA 1	0	～	20	mA					
nA2	4	～	20						

Control

(1) Control method :2mode PID method with Auto tuning ＋Zone PID method or ON－OFF operation
(2) Number of PID :Max 8
(3) Number of Zone :Max 4
(4) Zone hysteresis :0～9999 units
(5) Proportional band (P) :OFF ,0. 1～999. 9%FS(On－Off operation by OFF setting)
(6) ON-OFF Differential gap(H) : 1～9999 Units
(7) ON-OFF Differential gap(L) : 1～9999 Units
(8) Integration time(I) :OFF ,1～6000s(P or OD operation by OFF setting)
(9) Differential time(D) :OFF ,1～3600s(P or PI operation by OFF setting)
(10) Manual reset :±50. 0%(Effective at I＝OFF)
(11) Dead band :－19999～30000 Units
(12) Output limiter :(L) 0. 0～99. 9% (H)0. 1～100. 0% (resolution 0. 1)
(13) Soft start :OFF, 0. 1～300. 0s (resolution 0. 1)
(14) Control output characteristic :Possible to choose from RA(Heating) or DA(Cooling)
(15) Proportional period :0. 5～300. 0s (resolution 0. 5)
(16) Output renewal period :Same as sampling period (50, 166. 7, 250, 500m sec)
(17) Manual output :0. 0～100. 0% (resolution 0. 1)
(18) Flex PID setting method (ABC) :0. 00～1. 00

Control Output 1

(1) Contact :Normal open(1a) 240V AC 2A(resistance load)
(2) Voltage pulse(SSR drive) :12VDC －1～＋1. 5V (Max 20mA)
(3) Current :4－20mA(load resistance 500Ω) Load regulation 0. 2%FS
(4) Voltage :0－10V(Max load 2mA)
(5) Contact(Servo) :Normal open(2a) 240V AC 2A
(6) SSR(Servo) :2 circuits of Triode AC switch 240V AC 1. 5A
(7) Accuracy :±1. 0%FS(5～100% Output)
(8) Resolution :About 1／50000

Control Output2 (Option)

(1)～(4) :Same as Control Output 1(Exclusive selection option of Servo output)
(5)～(6) :No function
(7) Resolution :About 1／50000

Event Output (EV1～3)(Option)

(1) Output rating : Normal open (1a × 3points) 240V AC 1A(resistance load)

(2) Operation : ON－OFF operation

(3) Differential gap : 1～9999 unit(At alarm function)

(4) Types of Event : EV1 , EV2 and EV3

function		Note
No allotment	non	Default
Upper limit absolute value alarm	HA	
Lower limit absolute value alarm	LA	
Within Absolute Value alarm	iA	
Without Absolute Value alarm	oA	
Scale over alarm	So	
Upper limit deviation value alarm	Hd	
Lower limit deviation value alarm	Ld	
Within deviation alarm	id	
Without deviation alarm	od	
RUN signal	run	
CT1 Control loop alarm(heater braking)	ct1_b	
CT1 Control loop alarm (loop)	ct1_L	
CT2 Control loop alarm (Heater braking)	ct2_b	
CT2 Control loop alarm (loop)	ct2_L	
3 phases Control loop alarm(Heater braking)	ct3_b	
3 phases Control loop alarm (loop)	ct3_L	
Step signal	StP	
Pattern end signal	P_E	
Program end	End	
Step hold signal	HoLd	
Program signal	ProG	
Up slope signal	u_SL	
Down slope signal	d_SL	
Guarantee signal	GuA	
Time signal 1	tS1	
Time signal 2	tS2	
Time signal 3	tS3	
Time signal 4	tS4	

(5) Setting range

Upper limit absolute alarm ,Lower limit absolute alarm : Within measuring range

Deviation alarm : Upper limit －20000～30000、Lower limit －20000～30000 Unit

Without deviation : 0～30000 Unit

Within deviation : 0～30000 Unit

Control loop : 0. 0～50. 0A

(6) Stand by operation

OFF	No standby operation
1	Only at the time of Power on, stand by operation
2	At the time of Power On＋Execution SV、RUN／STBY、AUTO／MAN、andEV are changed.

(7) Output characteristic : Normal open(no)、Normal close(nc)

※If nc is chosen and power is turn on ,relay become On about ？？s and become off.

(8) Latching : Available

(9) Latching release : Release is done by key operation ,DI or power OFF, In case of release by DI and power OFF

all the alarm are called off simultaneously

(10) Output renewal period :same as sampling period(50, 166. 7, 250, 500m sec)

Event Output 4(EV4)(Option)

(1) Output rating :Normal open(1a) 240V AC 2A(resistance load)

(2)～(9) :same as EV1～3

(10) Additional condition :Exclusive selection option of Servo Output2

External operation input(DI) Option

(1) Number of input :7points

(2) Input detections :Edge and Level

Function		Input detection	Contents
No allotment	non		Default setting
SV selection SV1 ↓ SV8	SU 1 ↓ SU8	Level	Priority is given to younger number
SV3bit selection	SU_3b	Level	Priority is given to younger number
RUN	run	Level	RUN／STBY(RST)
PRG	ProG	Level	PRG／FIX
MAN	mAn	Level	MANUAL／AUTO
AT	At		Auto tuning execution
PTN selection PTN1 ↓ PTN8	Ptn 1 ↓ Ptn8	Level	Priority is given to younger number
PTN 3bit selection	Ptn3b	Level	3 bits of continuation is occupied by the younger DI allotment
HOLD	HoLd	Level	Program time stop
SKIP	SKCP	Edge	Shift to the following step of program,
Latching release	L_rS	Edge	All latching release
Super Key lock	LocK	Level	Fixed only to the basic screen key operation unacceptable

(3) Input rating :Voltage 5V DC(0. 5mA／1 input)

(4) Input signal time :Min 50msec

(5) Operation input :Dry contact or Open collector (min 50msec)

External operation output(DO) (Option)

(1) Number of output :6 points

(2) Types of Output :Same as EV1～3

(3) Output rating :Open collector darlington output 24VDC(Max load 20mA)、ON saturated voltage1. 2V

(4) Output renewal time :Same as sampling period(50, 166. 7, 250, 500m sec)

(5) Installation condition :DO4～6 Exclusive selection option of Feedback input and CT input

Program (option)

(1) Number of pattern:Max 8(1, 2, 3, 4, 6, 8patterns)

(2) Number of steps :12～96(Total steps＝96)

(3) Time setting :0. 0 hour ～3200. 0 hours or ∞ (by each steps)

:0 hour 0 minutes ～299 hours 59 minutes or ∞ (by each steps)

:0 minutes 0 second～299 minuets 59 seconds or ∞ (by each steps)

(4) Time setup resolution :0. 1 hour or 1 second

(5) Time accuracy :±(setting time ×0. 02%＋0. 1 second)

(6) Step setting parameter :SV、step time 、PID No.
(7) Step signal :At step to next step －1000. 0. ～1000. 0s (setting resolution 0. 5s)
(8) Pattern end signal :At pattern end －1000. 0. ～1000. 0s (setting resolution 0. 5s)
(9) Program END :At program end －1000. 0. ～1000. 0s (setting resolution 0. 5s)
(10) Time signal :By each 1step (possible to set ON or OFF)
(11) Pattern execution number:Max 30000 or ∞
(12) PV start :ON／OFF
(13) Guarantee soak :OFF、1～9999 units
(14) Hold :Possible by front key ,DI allotment or communication
(15) Skip :Possible by front key ,DI allotment or communication
(16) Power failure compensation
:ON／OFF(Step time which is at power failure is not guaranteed)

Communication function (option)

(1) Communication port :1ch
(2) Communication method :RS－232C／3 line system half-duplex system、 RS－485／2 line system half-duplex mulit-drop (bus) system
(3) Synchronization method :The start stop synchronization system
(4) Communications distance :RS－232C／ Max15m、 RS－485／ Max 500m(depend on a condition)
(5) Communication speed :1200, 2400、4800, 9600, 19200, 38400bps
(6) Data format :Start1 Stop1、2 Data 7、8bit Non parity odd number、even number
(7) Master mode :possible to chosen from SV、OUT1、OUT2(1:n Number of slave max 255)
※When MAC3 is a master, slave address range must be continuation.
※When MAC3 is a master, bus connection with other host PCs is not allowed.
※Input range of master machine and slave machine should be equal, at the time of cascade control.
(8) Slave address :1～255
(9) Parameter preservation mode :Choose from RAM, MIX and EEP mode.
(10) Error detection :None, Choose from ADD, complement of ADD +2, exclusive OR, CRC-16 and LRC
(11) Flow control :None
(12) Delay :1～500ms(resolution1ms)
(13) Communication code :ASCII code or binary code
(14) Protocol :SHIMAX Standard or MODBUS ACII, MODBUS RTU protocol
(15) Other condition :When P10 or JP10 chosen the data width with a parameter beyond 16bit, only to 1 digit of decimal point below.
(16) Number of connection :RS－232C／1set, RS－485／Maximum 256 sets (depends on conditions, host is included)
(17) Termination resistance :RS－232C／Non need, RS－485／120Ω (External connection)

External analogue input (AI) (option)

(1) Number of input ：1ch

(2) Allotment function：Execution SV、EV1～4 level、OUT1～2 Upper and lower limiter、PV Off set
Manual output

(3) Input rating ：4－20mA(Reception resistance100Ω)
：0－10V(Input resistance about 500kΩ)

(4) Accuracy ：±0. 1%FS

(5) Sampling period ：same as input sampling period(0. 2, 0. 667, 1, 2 sec)

(6) Scaling ：－19999～30000 reserve scaling permitted(within a setting range)

(7) AI Filter ：0～10000 sec

(8) AI offset ：±5000 unit

(9) AI gain ：±5. 000%

(10) PV－AI Characteristics correction ：11point ±32000digit

External analogue output(AO) (option)

(1) Number of output ：1ch

(2) Allotment function：PV、Execution SV、OUT1、OUT2、CT1、CT2、DEV

(3) Current ：4－20mA DC(Max load 300Ω) load regulation ±0. 05%FS

(4) Voltage ：0－10V DC(Max load 2mA)

(5) Output accuracy ：±0. 1%FS(±0. 2%FS at PV output)

(6) Scaling ：Within measuring range or output range

(7) Limiter ：0. 0～100. 0%(reserve setting permitted)

(8) Output resolution ：About 1／50000

(9) Output renewal period ：same as sampling period (50, 166. 7, 250, 500msec)

Current sensor input(CT1, 2)(option)

(1) Number of input ：2ch

(2) Detection method：Current judging system by CT sensor

(3) Detection range ：0. 0～55. 0A

(4) Sampling period ：100m sec

(5) Detection accuracy ：±3%fs

(6) Detection delay time ：0. 1～1000. 0 sec (resolution 0. 1sec)

(7) Alarm output ： Assigned to event

(8) Detection object ：Assigned to OUT1、OUT2、EV1、EV2、EV3、EV4

(9) Setting range ：0. 0～50. 0A (Default 0. 0)

(10) Recommended CT sensors ：U_RD co., CTL-6-L CTL-6-V CTL-6-P-H CTL-6-S-H CTL-12L-8

(11) Other condition ：Exclusive selection option of Feedback input

Feedback input(FB) (Servo control option)

(1) Potentiometer rating ：Any between 100Ω and 2kΩ／three-wire type

(2) Input accuracy ：±1%FS

(3) Sampling period ：100m sec

(4) Zero span adjustment ：Manual and Auto

(5) FB filter ：0～10000 sec

Infrared-ray communication

(1) Communication method ：Infrared link system

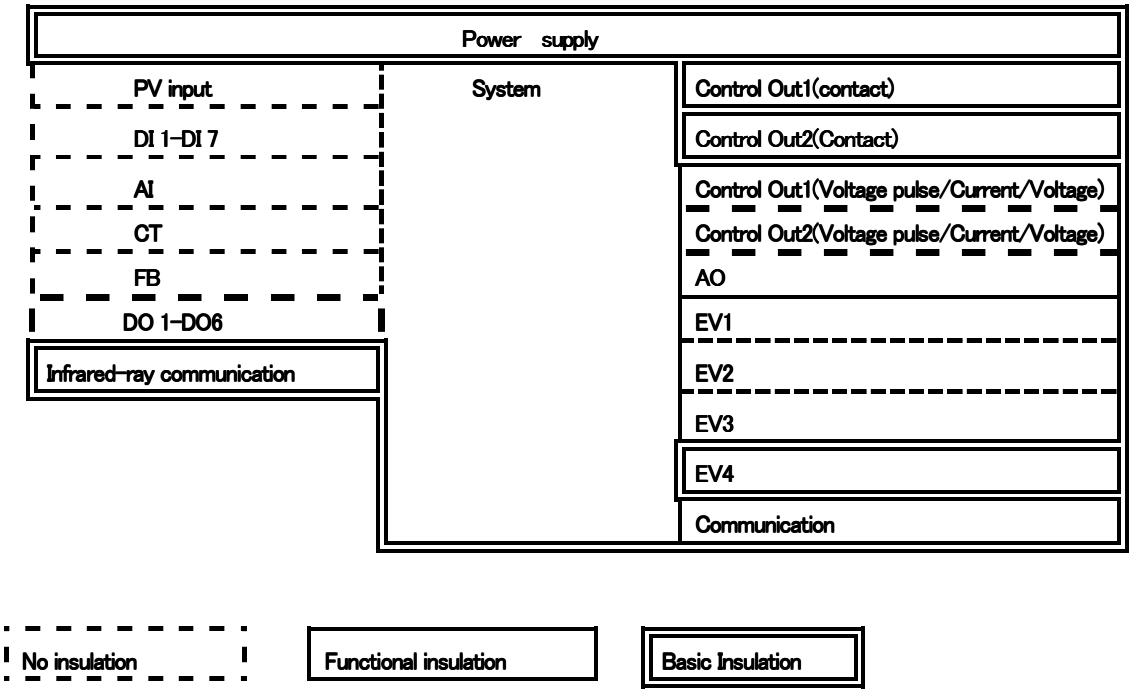
(2) Synchronous system ：Start stop synchronization system

(3) Communication speed :9600bps
(4) Data format : start 1 stop 1 Data 8bit non parity
(5) Slave address :1
(6) Parameter preservation mode :EEP
(7) Error detection :CRC－16
(8) Communication code :binary code
(9) Protocol :MODBUS－RTU

General specifications

(1) Data save :By nonvolatile memory (EEPROM)
(2) Temporary dead time :No influence within 0.05 second 100% dip
(3) Use environmental condition:Temperature／－10～55℃
Humidity／Below 90%RH (no dew condensation)
Height／ Altitude of 2000m or less
Category／Ⅱ
Contamination degree／2
(4) Storage temperature Conditions:－20～65℃
(5) Power supply :90～264V AC 50／60Hz
:21. 6～26. 4VAC 50／60Hz and DC
(6) Input noise removal ratio :Normal 50dB or higher
(7) Impulse-proof noise :Power-source Normal 100ns/1μs±1500V
(8) Insulation resistance :Between input/output terminal and power supply terminal 500V DC 20Ω or higher
:Between input/output terminal and earth 500V DC 20MΩor more
(9) Withstand voltage :Between input/output terminal and power supply 2300V AC 1minute
:Output and earth 1500V AC 1 minute(Output and others500V)
:Power supply and earth 1500V AC 1 minute
:Input and earth 500V AC 1 minute
:Input and output 500V AC 1 minute (Input and output(contact)2300V)
(10) Resistance to vibration :Frequency 10～ 55～10Hz, amplitude 0.75mm (one side amplitude)・・・100m/S^2 Direction
3 directions
Sweep speed 1 octave/minute (about 5 minutes for both-way/cycle) Number of sweep 10 times
(11) Power consumption : 12VA
(12) Applicable standard EMC :EN61326－1:1997＋Amendment1:1998＋Amendment2:2001
(EMI:ClassA EMS:AnnexA)
EN61000－3－2:2000 EN61000－3－3:1995＋Amendment1:2001
Safety :IEC1010－1 and EN61010－1:2001
Oscillation:IEC60068－2－6／1995
(13) Case material/color :PPO PPE ／Light gray (Mansel value 3.73B7.77/0.25)
(14) Outside dimension:H96×W96×D69mm(depth in panel 65mm)
(15) Thickness of applied panel:1. 2～3. 2mm(Mounting is possible up to 20mm with mounting bracket)
(16) Size of attachment hole :H92×W92mm
(17) Group mounting :Group mounting is possible of horizontal direction
※Attachment is needed of dismounting vertical plural mounting
(18) Weight :About 300g

Isolation block chart



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PRINTED IN JAPAN