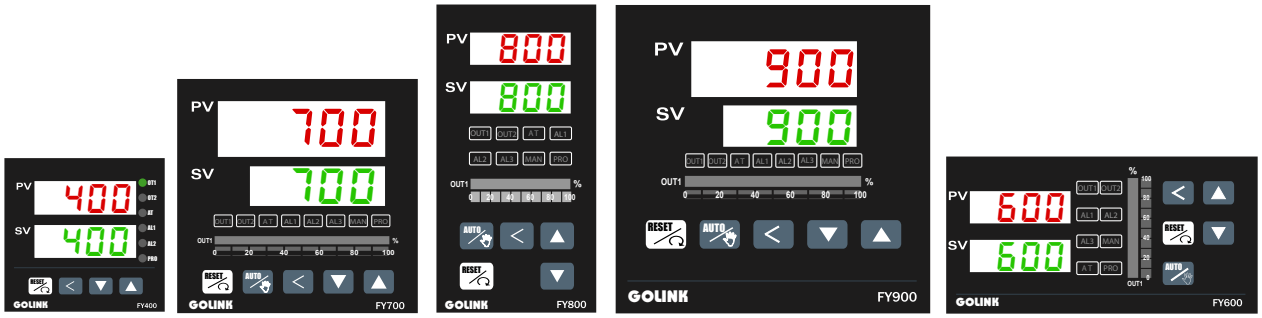
FY-Series Digital PID Controller
Operation Manual



FY400	**FY700**	**FY800**	**FY900**	**FY600**
48x48	72X72	48X96	96X96	96X48
(DIN 1/16)	(DIN 3/16)	(DIN 1/8)	(DIN 1/4)	(DIN 1/8)

NOVEMBER, 2005

FY_OPER_EN_V4

CONTENT

1. Notice before start-up

FY series controller has got the CE approvals as below:

LDV： D/N EN61010-1

EMC： EN 55 022 1994 /A1：1995/ A2：1997

EN 61 000-3-2： 1995 / -3-3： 1995

EN 61 000-4-2： 1995 / -4-3： 1996 / -4-5： 1995 / -4-6

1996 / -4-8： 1993 / -4-11：1996/ EN 50 204： 1995

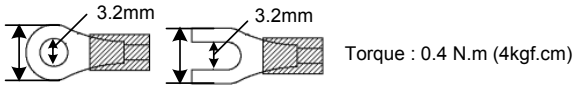
Please confirm the specification of controller is to totally with your requirement before using it, also read this manual in detail.

⚠ Danger

1. Danger! Electric Shock!
   DON'T touch AC power wiring terminals when controller has been powered!
   Keep the power off until all of the wirings are completed!

⚠ Warning

1. Please confirm the AC power wiring to controller is correct, otherwise it would be caused aggravated damage on controller. (FY400 connecting with Pin 1 and 6, FY600/700/800/900 with Pin 1 and 2).
2. Be sure to use the rated power supply (AC85~265V or DC24V), otherwise it would be caused aggravated damage on controller.
3. Please confirm wires are connected with correct terminal (Input, Output).
4. Use M3 screw-compatible crimp-on terminals with an insulation sleeve, as shown below



5. Avoid installing controller in following spaces:
   I. A place where the ambient temperature may reach beyond the range from 0 to 50℃
   II. A place where the ambient humidity may reach beyond the range from 20 to 90% RH.
   III. A place where the controller likely to come into contact with water, oil, chemicals, steam and vapor.
   IV. A place where the controller is subject to interface with static electricity, magnetism and noise.
6. For thermocouple (TC) input, use shield compensating lead wire.
7. For RTD input, use shield wires which have low resistance and no resistance difference between the 3 wires.

1. Specifications

- **Standard spec.**

Model		FY400	FY600	FY700	FY800	FY900
Dimension		48X48mm	96X48mm	72X72mm	48X96mm	96X96mm
Supply voltage		AC 85~265V，DC 15~50V (Option)				
Frequency		50 / 60 HZ				
Power consumption		approx 3VA	approx 4VA	approx 3VA	approx 4VA	approx 4VA
Input	Accuracy	0.2 % FS ± 1digit				
	Sample time	250ms				
	TC	K , J , R , S , B , E , N , T , W5Re/W26Re , PLII , U , L				
	RTD	PT100,JPT100,JPT50				
	mA dc	4~20mA ,0~20mA				
	mV / V dc	0~1V,0~5V,0~10V,1~5V,2~10V -10~10mV,0~10mV,0~20mV,0~50mV,10~50mV				
	Decimal point position	0000 , 000.0 , 00.00 , 0.000 Available for linear input (mA / mV / V)				
Output 1	Relay	SPST type	SPDT type	SPST type	SPDT type	SPDT type
		3A , 220V , electrical life:100,000 times or more (under rated load)				
	Voltage pulse	For SSR drive. ON : 24V , OFF : 0V , max load current : 20mA				
	mA dc	4~20mA, 0~20mA. Maximum load resistance:560 Ω				
	Voltage dc	0~5V , 0~10V , 1~5V , 2~10V . Max load current:20mA				
Alarm 1		3A , 220V , electrical life:100,000 times or more (under rated load)				
Control algorithm		PID，PI，PD，P，ON / OFF(P=0)，FUZZY。				
PID range		P: 0.0 ~ 200.0 %，I: 0~3600s，D: 0~900s				
Isolation		Output terminals(control output , alarm , transmission) and input terminals are isolated separately				
Isolated resistance		10MΩ or more between input and case (ground) at DC 500 V 10MΩ or more between output and case (ground) at DC 500 V				
Dielectric strength		1000V AC for 1 minute between input terminal and case (ground) 1500V AC for 1 minute between output terminal and case (ground)				
Operating temperature		0~50℃				
Humidity range		20~90%RH				
Weight		150g	225g	225g	225g	300g
Display Height		PV:7mm SV:7mm	PV:7mm SV:7mm	PV:14mm SV:10mm	PV:7mm SV:7mm	PV:14mm SV:10mm

● Optional Spec.

Model	FY400	FY600	FY700	FY800	FY900
Output 2	For heating and cooling control use. Relay , SSR , 4~20mA , 0~20mA , 0~5V , 0~10V , 1~5V , 2~10V				
Alarm 2	SPST type	SPDT type	SPST type	SPDT type	SPDT type
	3A , 220V , electrical life:100,000 times or more (under rated load)				
Alarm 3	Not available	Available	Available	Available	Available
		SPST type	SPST type	SPST type	SPST type
	3A , 220V , electrical life:100,000 times or more (under rated load)				
Heater Break Alarm (HBA)	Display range of heater current : 0.0~99.9A , Accuracy : 1%FS				
	Included CT : SC-80-T				
	Alarm relay : AL1				
Transmission	Available for PV or SV transmission				
	4~20mA , 0~20mA , 0~1V , 0~5V , 0~10V , 1~5V , 2~10V				
Remote SV	4~20mA , 0~20mA , 0~1V , 0~5V , 0~10V , 1~5V , 2~10V				
Communication	Protocol : MODBUS RTU , MODBUS ASCII , TAIE				
	RS232 , RS485 , TTL				
	Baud rate: 2400 , 4800 , 9600 , 19200 , 38400 bps. Data bits : 8 , Stop bit : 1 or 2bit , Odd or Even parity.				
Water/Dust proof	IP65				

● Special control output (OUT1)

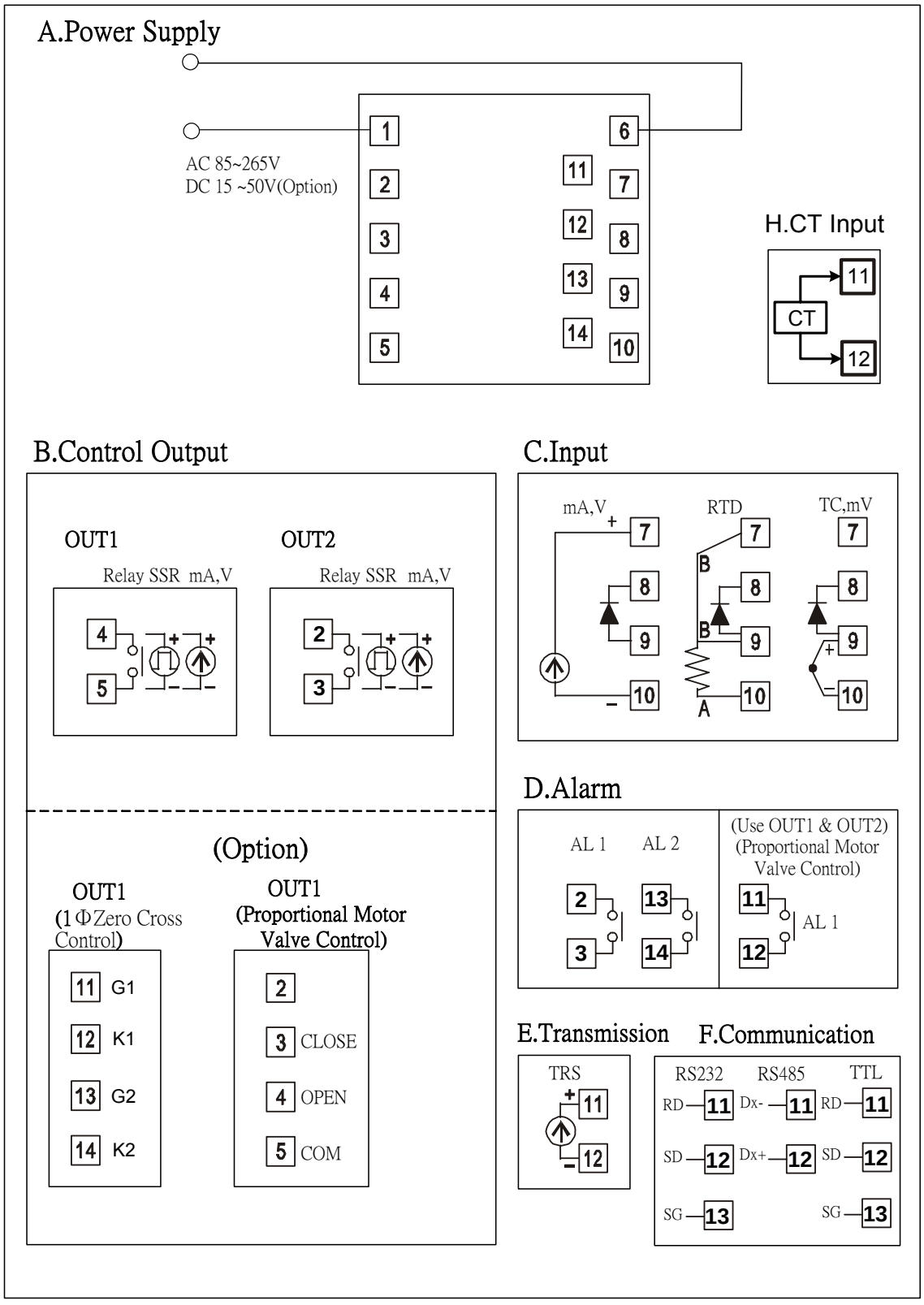
Model	FY400	FY600	FY700	FY800	FY900
1φ zero crossing control(1φSSR)	Available	Not available	Available	Not available	Available
3φ zero crossing control(3φSSR)	Not available				Available
Motor valve control	Available				
1φ phase angle control(1φSCR)	Not available	Available			
3φ phase angle control(3φSCR)	Not available				Available

● Programmable RAMP/SOAK

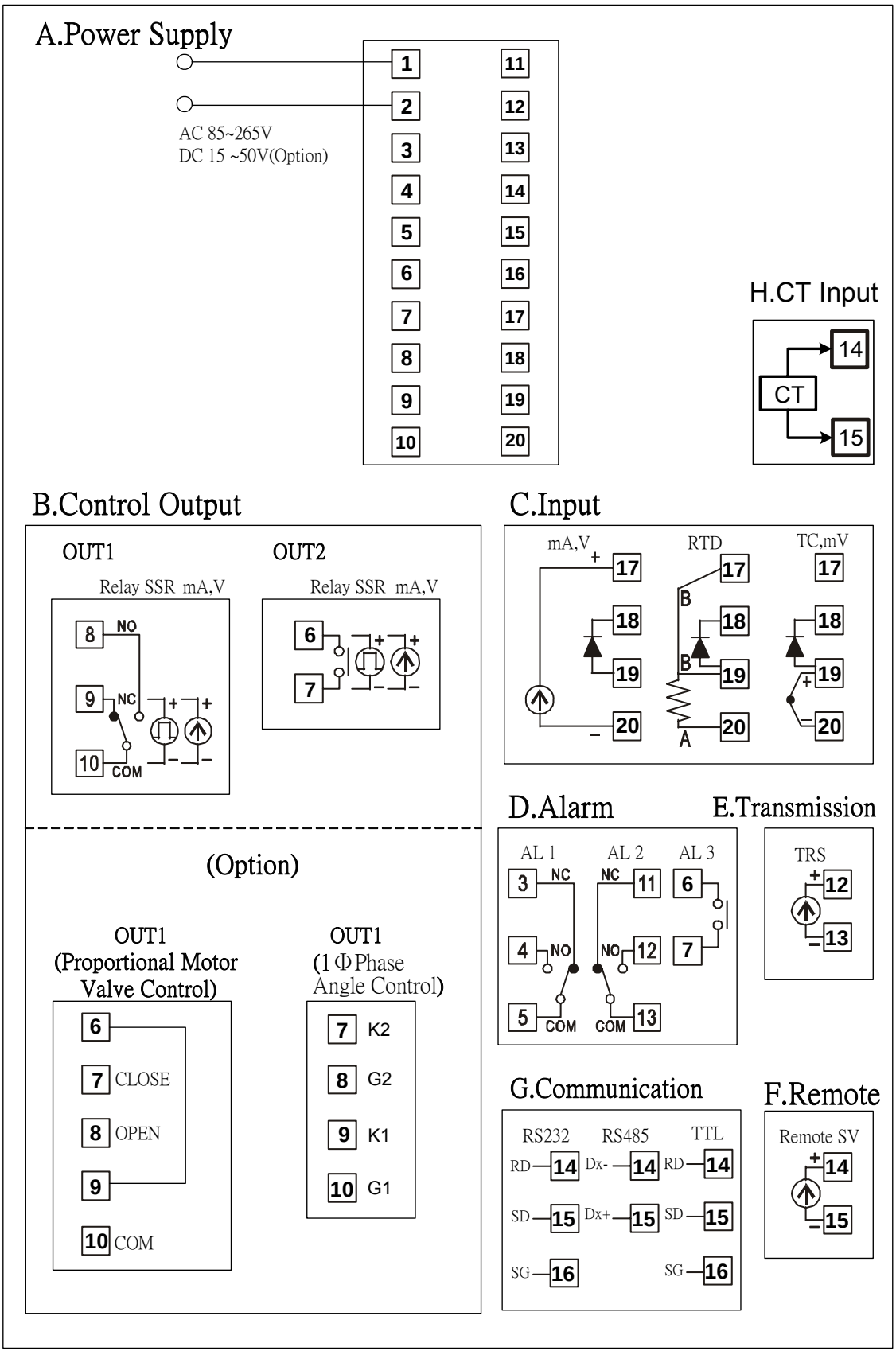
Model	PFY400	PFY600	PFY700	PFY800	PFY900
Programmable RAMP/SOAK	2 patterns with 8 segments each. The 2 patterns can be linked together as 16 segments use.				

3. Terminal arrangement

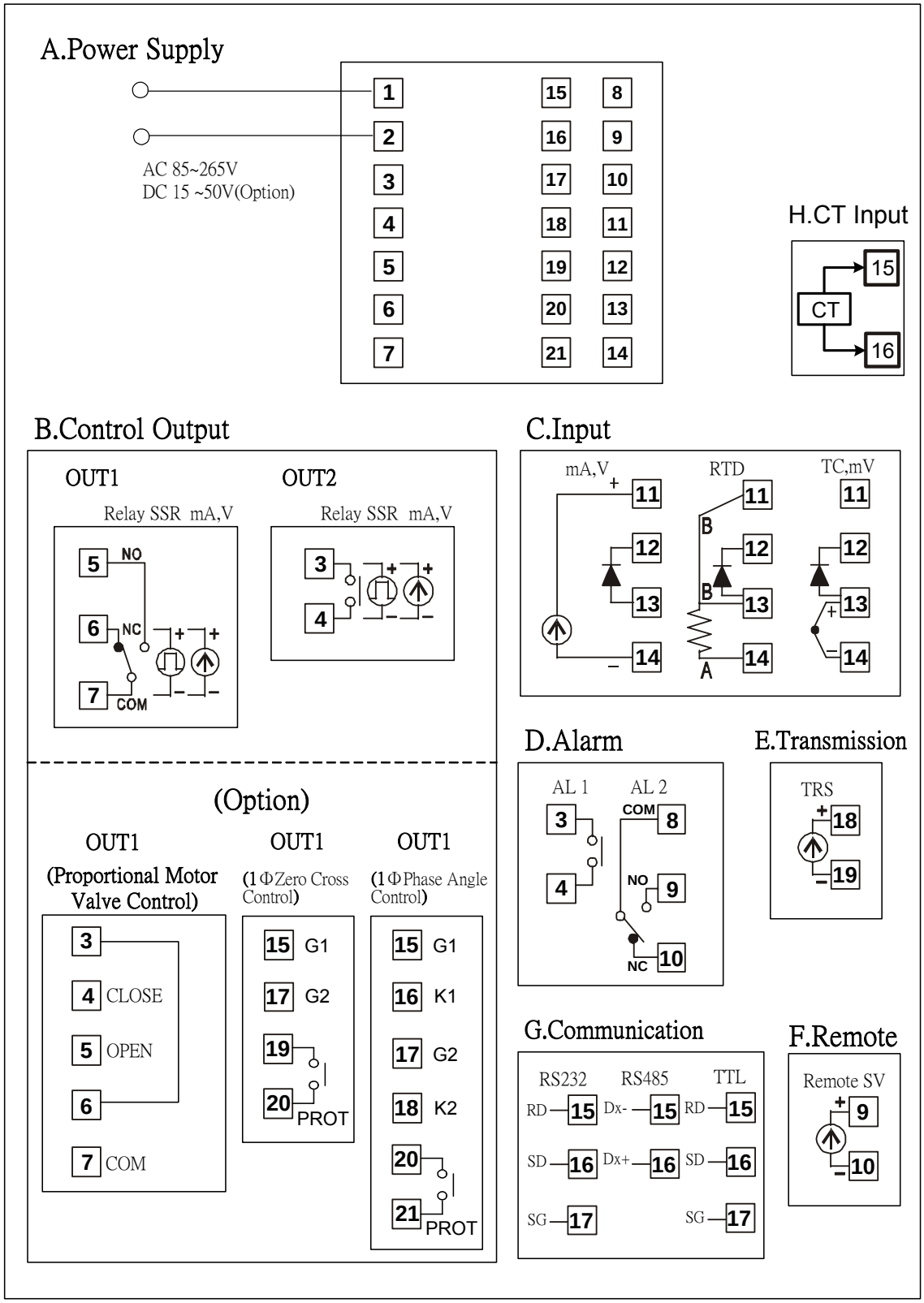
3.1 FY400 Terminals (48mm x 48mm , DIN 1/16)



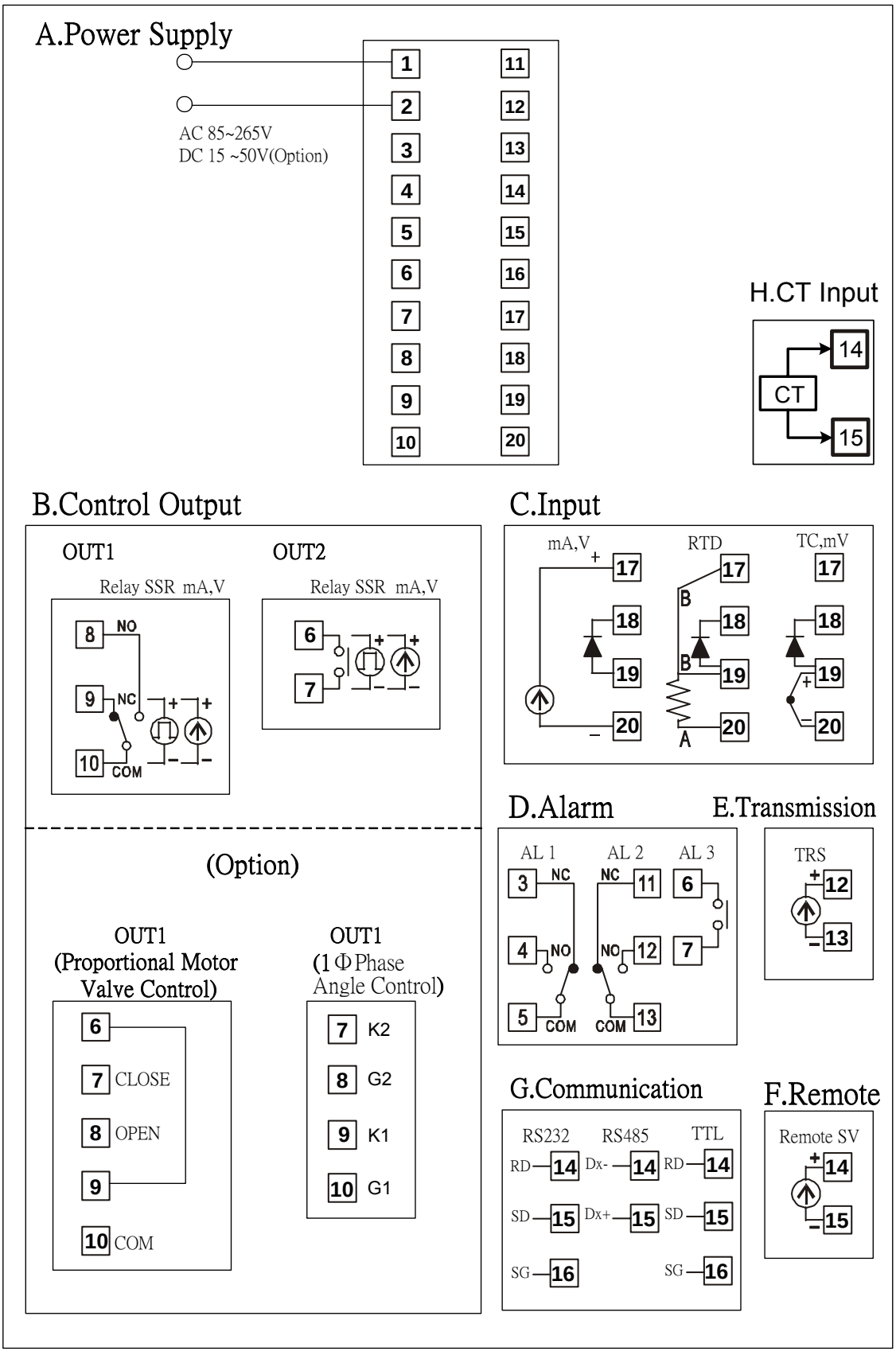
3.2 FY600 Terminals (96mm x 48mm , DIN 1/8)



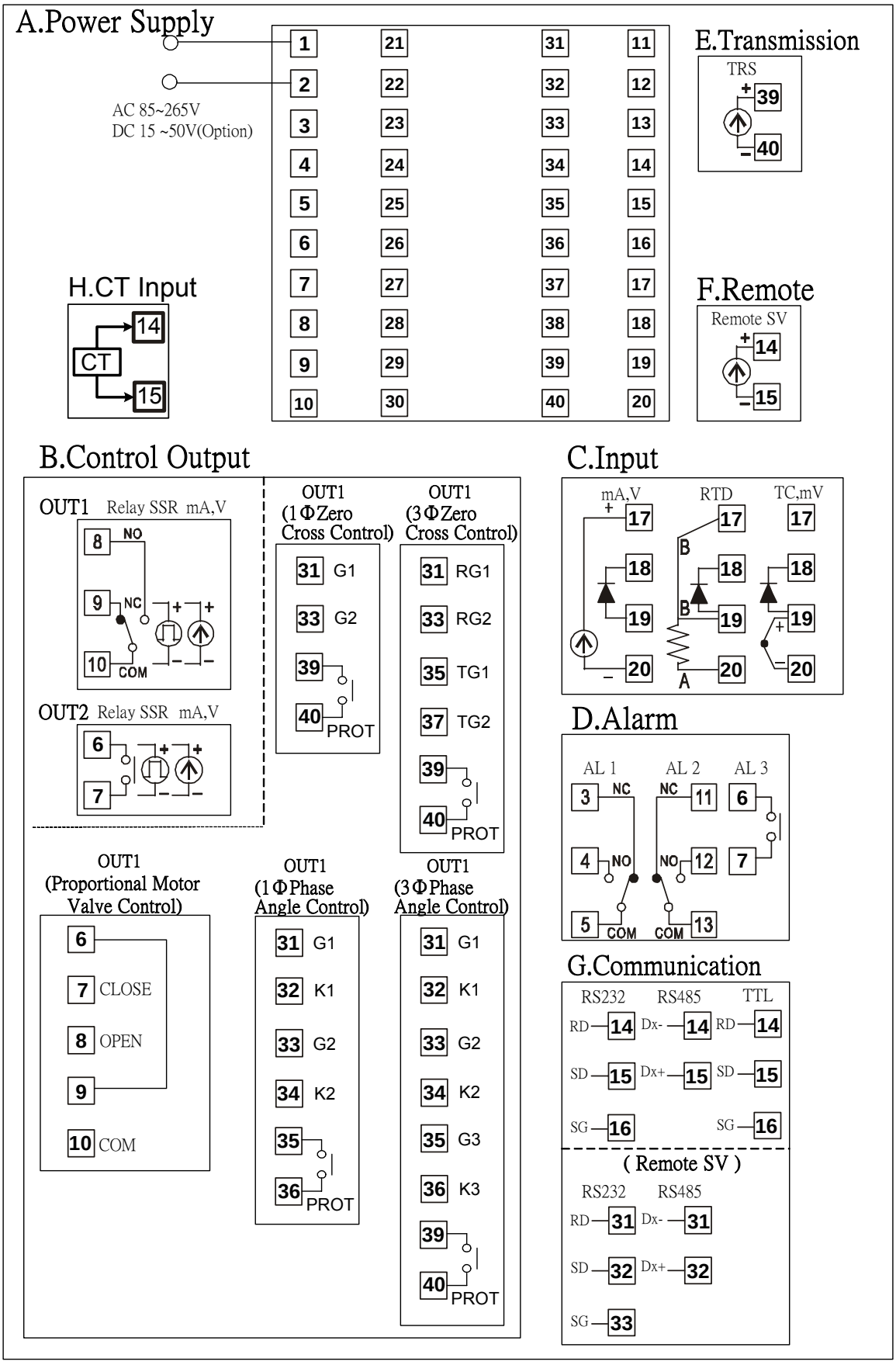
3.3 FY700 Terminals (72mm x 72mm)



3.4 FY800 Terminals (48mm x 96mm , DIN 1/8)

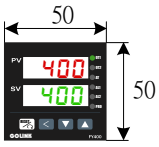


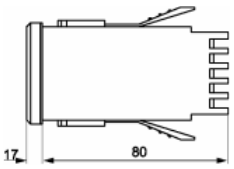
3.5 FY900 Terminals (96mm x 96mm , DIN 1/4)

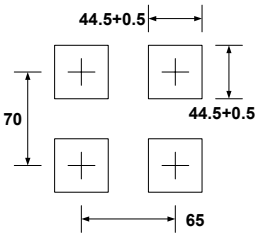


4. External dimension and panel cutout〈Unit：mm〉

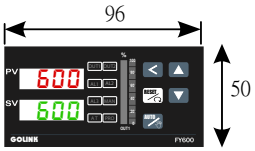
FY400

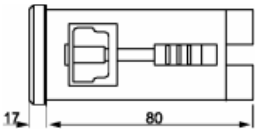


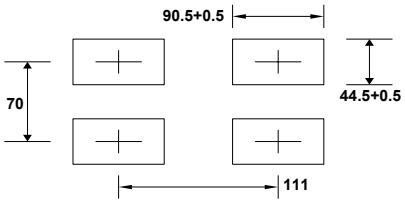




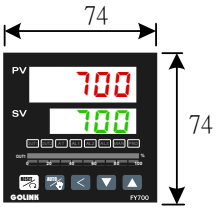
FY600

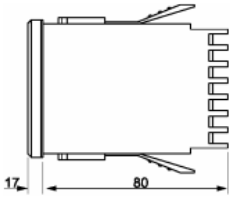


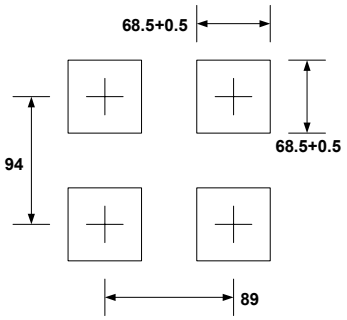




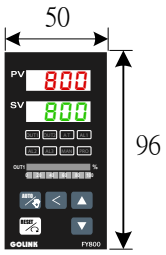
FY700

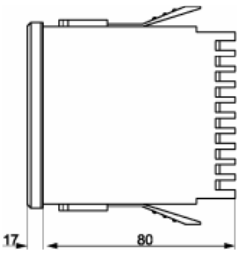


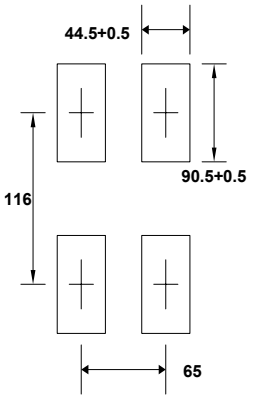




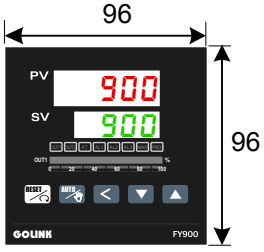
FY800

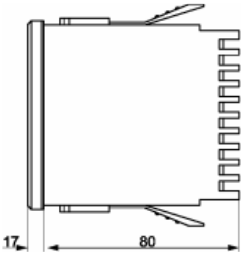


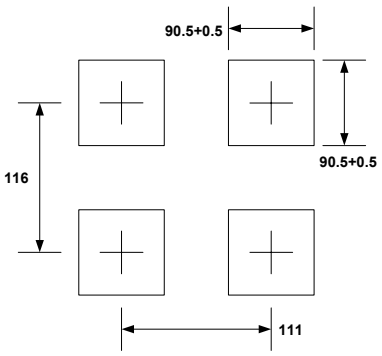




FY900

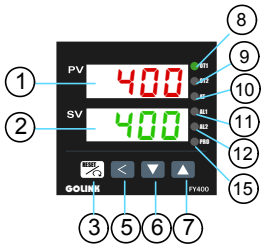




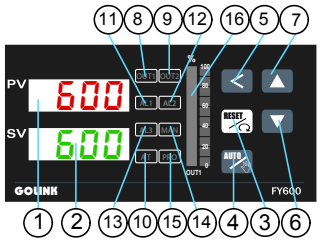


5. Parts description

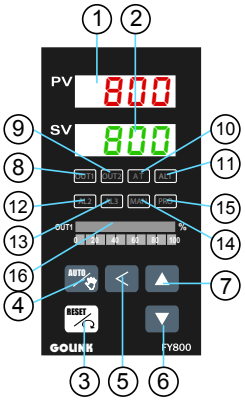
FY400



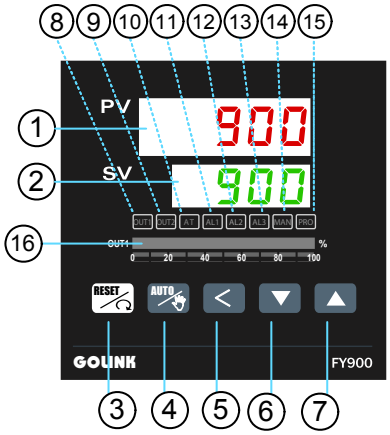
FY600



FY800



FY700 / FY900

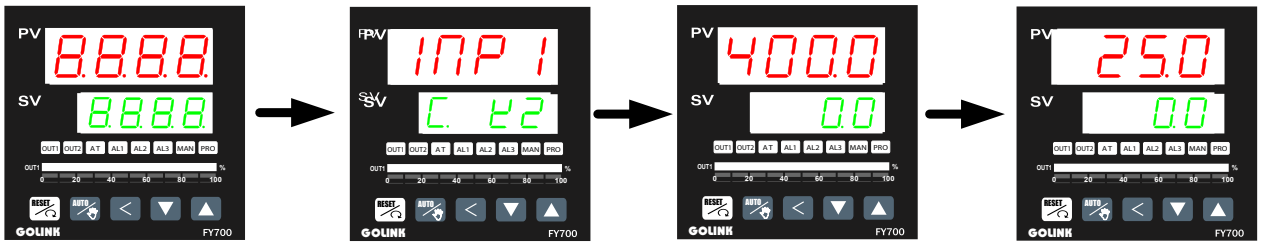


SYMBOL	NAME		FUNCTION
PV	①	Measured value (PV) display	Displays PV or various parameter symbols (Red)
SV	②	Set value (SV) display	Displays SV or various parameter set values (Green)
RESET	③	Set key	Used for parameter calling up and set value registration
AUTO	④	Auto/Manual key	Switches between Auto(PID) output mode and Manual output mode.
<	⑤	Shift key	Shift digits when settings are changed
▼	⑥	Down key **Program hold*	Decrease numbers (-1000,-100,-10,-1) * *Program hold*〈*Programmable controller*〉
▲	⑦	Up key **Program run*	Decrease numbers (+1000,+100,+10,+1) * *Program run*〈*Programmable controller*〉
OUT1	⑧	OUT1 lamp	Lights when OUT1 is activated (Green)
OUT2	⑨	OUT2 lamp	Lights when OUT2 is activated (Green)。
AT	⑩	Auto tuning lamp	Lights when Auto tuning is activated (Orange)
AL1	⑪	Alarm 1 lamp	Lights when Alarm 1 is activated (Red)
AL2	⑫	Alarm 2 lamp	Lights when Alarm 2 is activated (Red)
AL3	⑬	Alarm 3 lamp	Lights when Alarm 3 is activated (Red)
MAN	⑭	Manual output lamp	Lights when manual output is activated (Orange)
PRO	⑮	**Program running lamp*	**Flashes when program is running*〈*Programmable controller*〉。
OUT1%	⑯	OUT% bar-graph display	Output% is displayed on 10-dot LED.

6. Operations

6.1 Power On

Controller will display as below



displays will be lighted

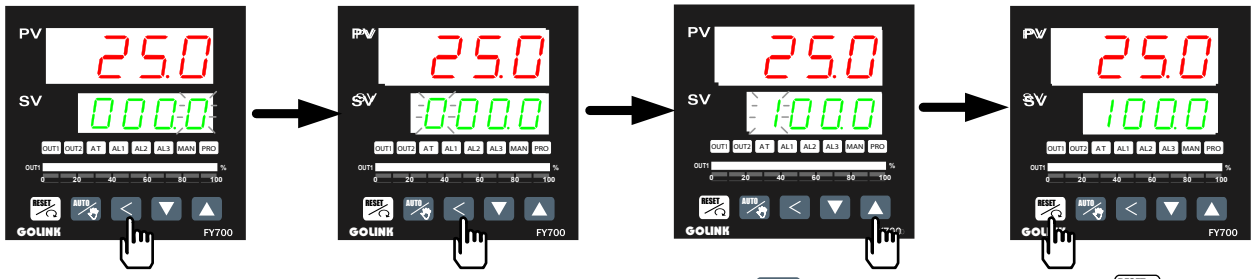
Display input type (K2)

Display range (0.0~400.0)

Ready for use

6.2 Change the Set Value (SV)

Change SV from 0.0 to 100.0



Press < key. The SV number started to flash. The flashing digit indicates which digit can be set.

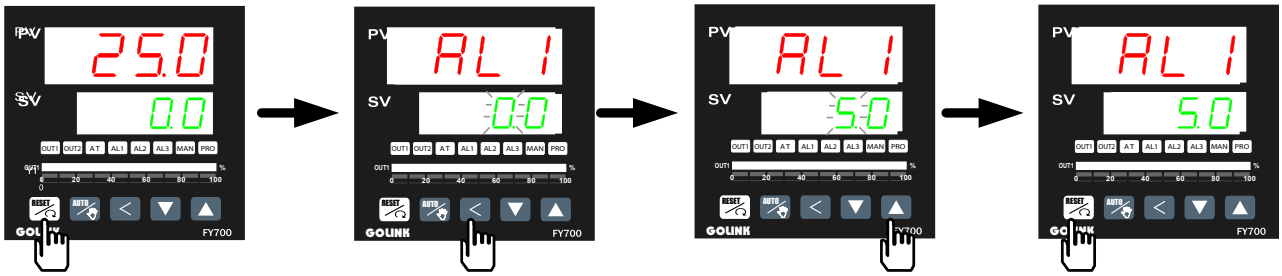
Press < key to select the hundreds digit.

Press ▲ key to change the number to 1

Press RESET key to store the new set value.

6.3 Change the Alarm Value

Change AL1 value to “5.0” (AL1 active, if PV exceeds SV over 5.0)



Press RESET key to display parameter AL1

Press < key to change AL1 value

Press ▲ key increase AL1 value

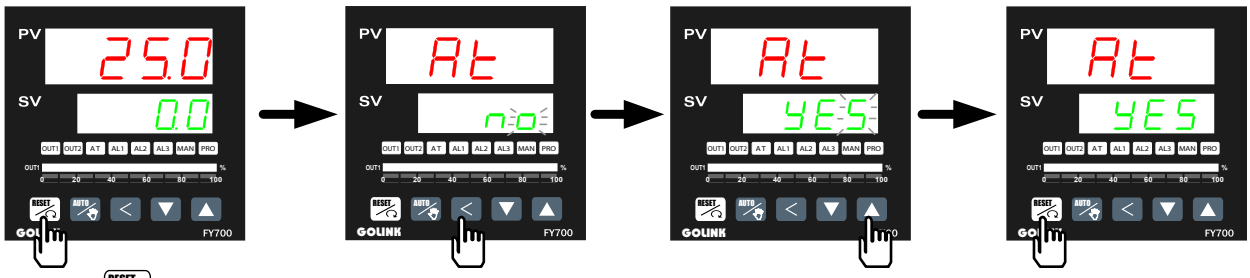
Press RESET key store the new value of AL1

* The are total 16 alarm mode types, please referred with “alarm mode” in page 30

* To change alarm mode, press RESET + < key 5 seconds to enter Level 3 (Input Level) and then change ALD1/ALD2/ALD3 value.

6.4 Autotuning (AT)

Use AT function to automatically calculate and set the optimize PID value for your system.



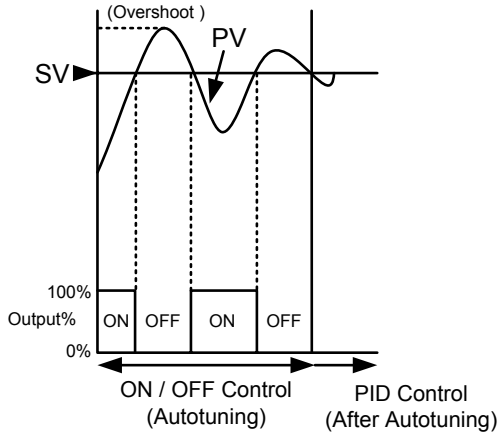
Press RESET key to display parameter AT.

Press < key to change AT setting

Press ▲ key change AT to "YES"

Press RESET key Start auto tuning (AT lamp will be lighted on)

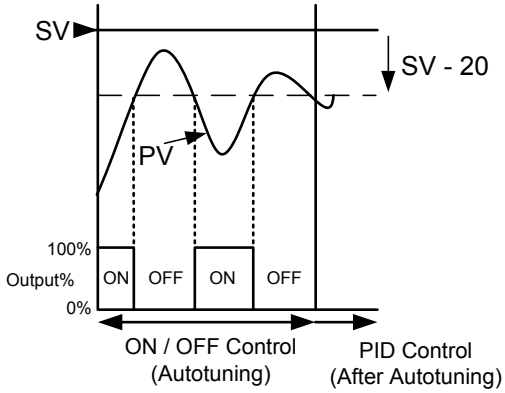
Autotuning
ATVL=0



Autotuning
ATVL=20

*Set ATVL to prevent overshoot occurred during autotuning process.

To set ATVL ,press RESET key 5 seconds to enter Level 2 (PID Level) and then change the value.



Autotuning failure

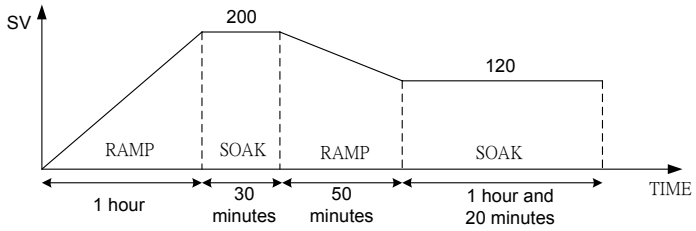
Possible cause 1： ATVL is too big. (If not sure，set ATVL=0)

Possible cause 2：Calculation time is too long.
(Set PID parameter manually)

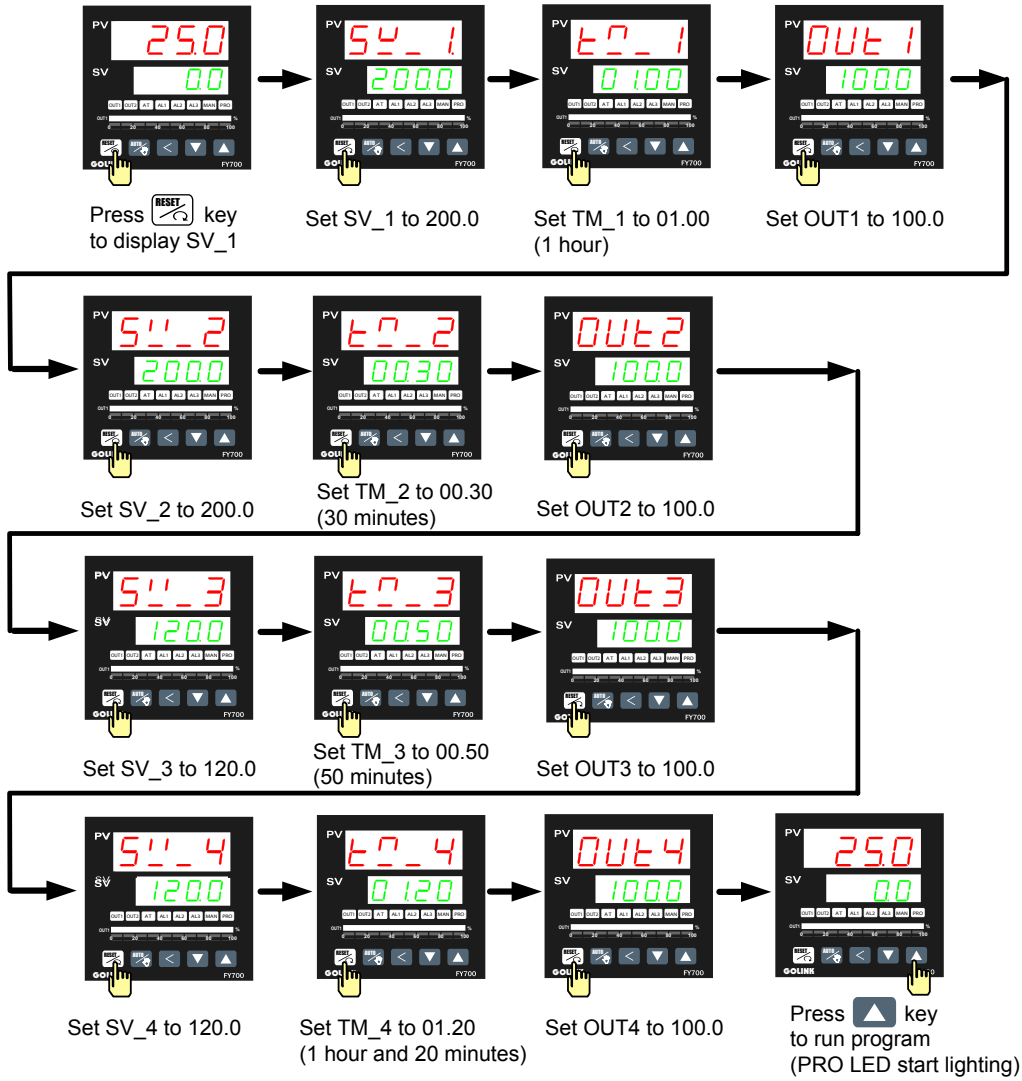
6.5 Programmable RAMP / SOAK (Only available for PFY model)

*For detail of the programmable instruction, please refer with page 25.

Assume the temperature profile is as below (use total 4 segments)

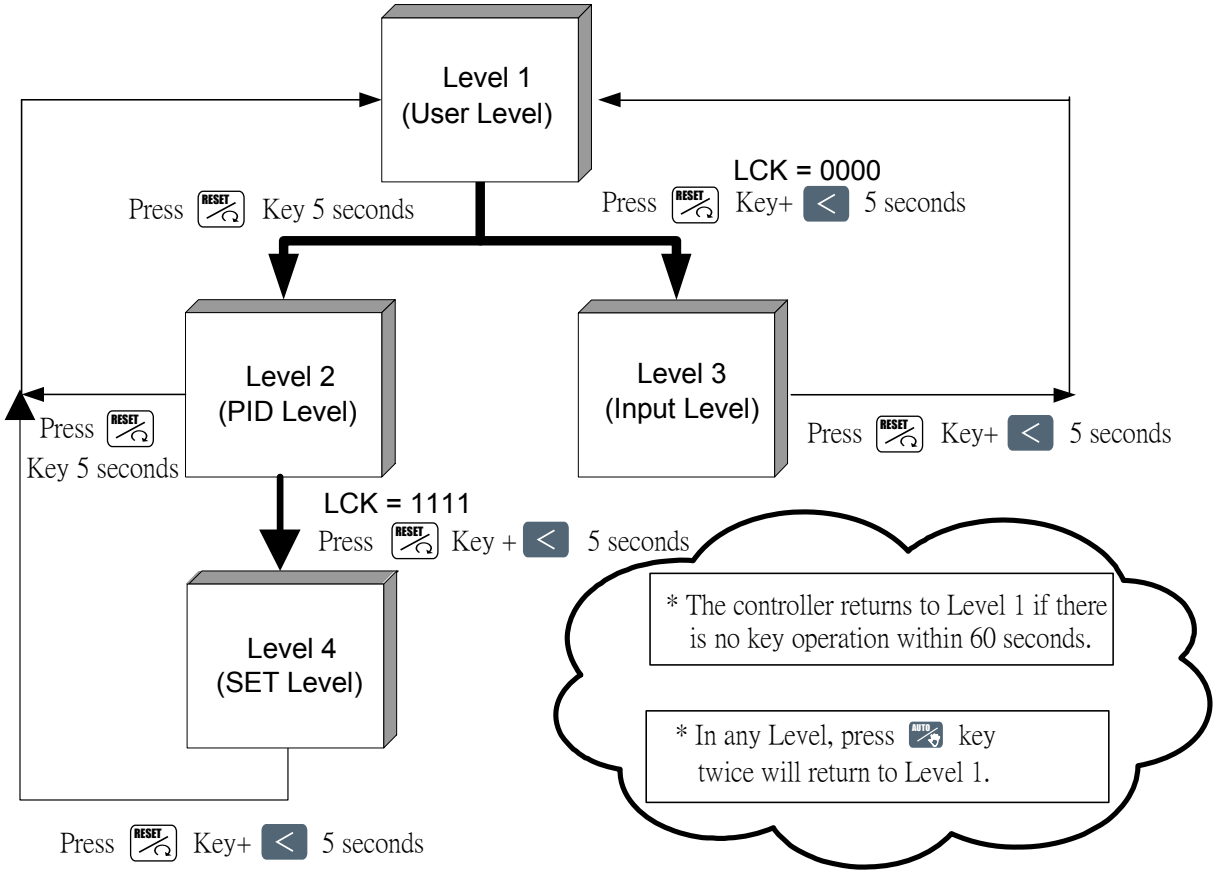


Please operate conroller as following steps:



7. Operation levels

7.1 Levels diagram



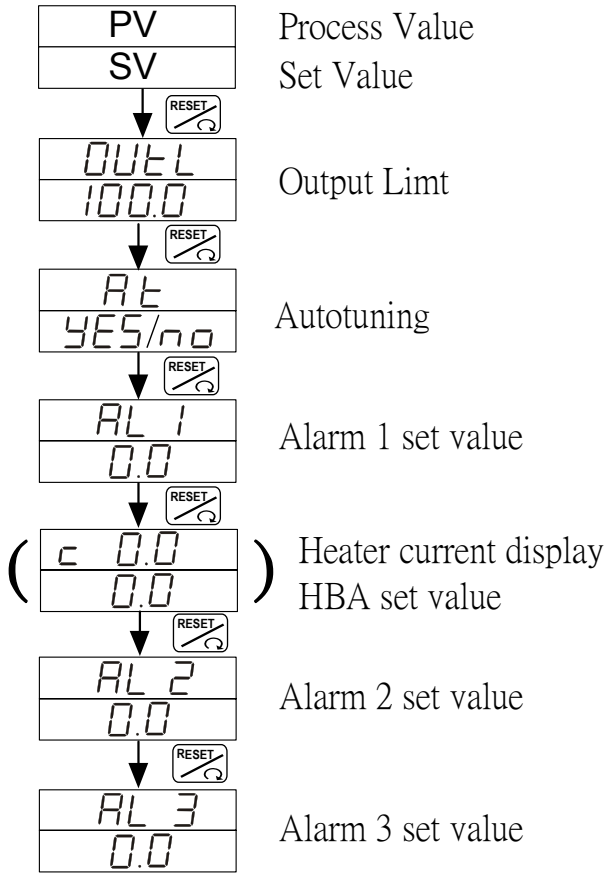
7.2 Lock function

To use lock function, please set parameter “LCK” in level 2.

LCK	Levels entering available				Parameters which can be changed
	Level 1 (User)	Level 2 (PID)	Level 3 (Input)	Level 4 (SET)	
0000	◎	◎	◎	------	All parameters (Factory set value)
1111	◎	◎	------	◎	All parameters
0100	◎	◎	------	------	All parameters except level 3
0110	◎	◎	------	------	Parameters in level 1
0001	◎	◎	------	------	“SV” and “LCK”
0101	◎	◎	------	------	Only “LCK”

8. Parameters

8.1 Level 1 (User Level)



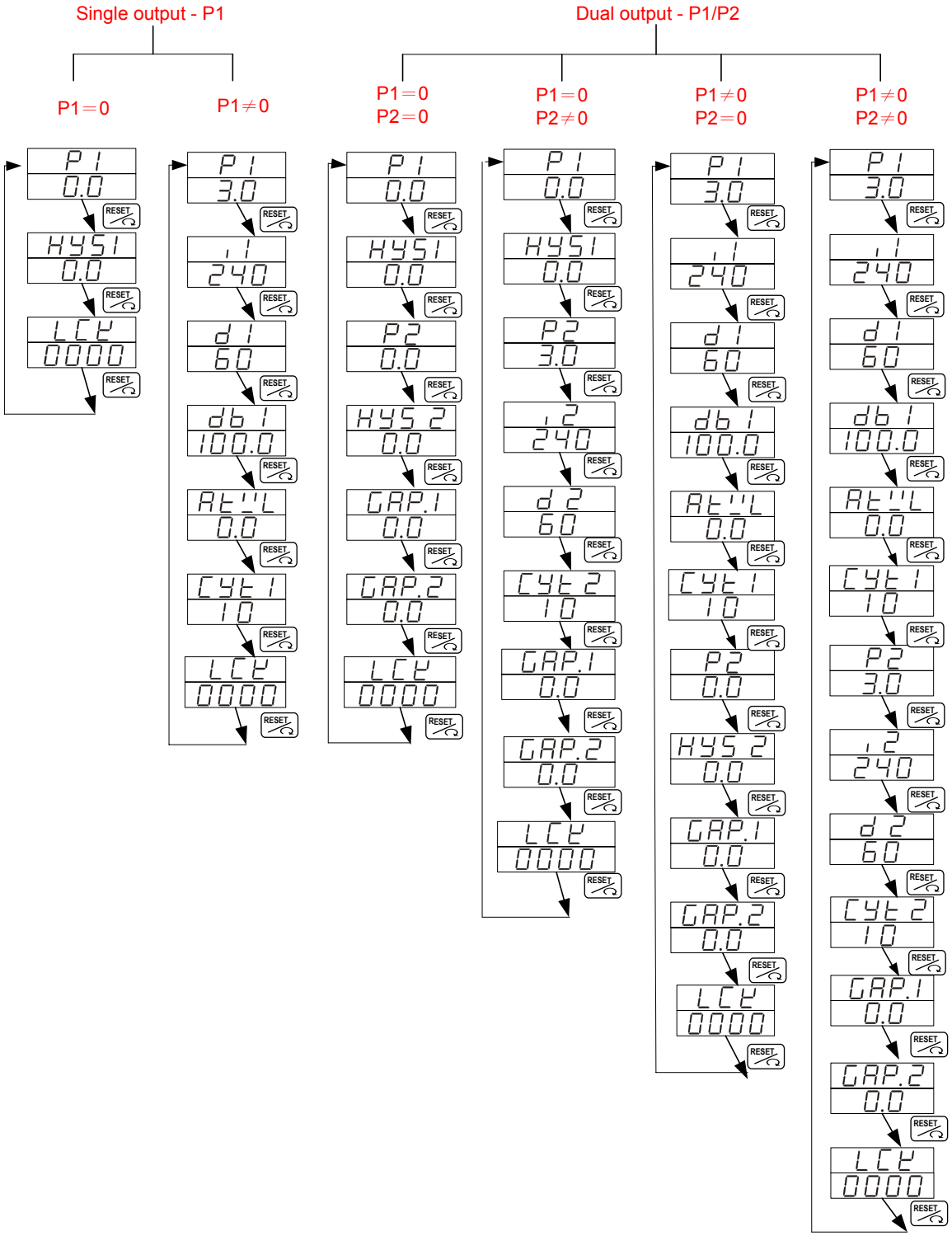
8.2 LEVEL 2 (PID Level)

To enter level 2, press SET key 5 seconds in level 1

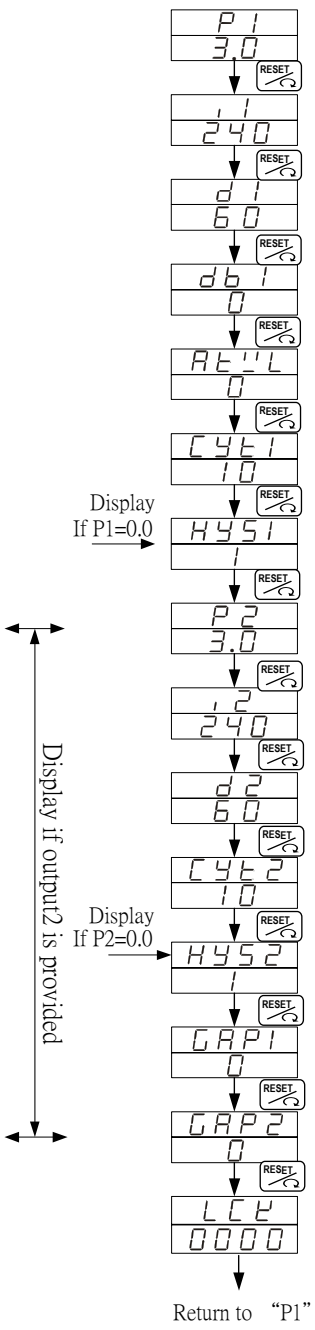
8.2.1 Level 2 parameters display / hiding condition

1. Press RESET key 5 seconds to enter level 2.
2. Set LCK to "1111".
3. Press RESET key and < key 5 seconds, to enter level 4 (Set level).
4. Set OUTY to "0" (Single output-P1) .

1. Press RESET key 5 seconds to enter level 2.
2. Set LCK to "1111".
3. Press RESET key and < key 5 seconds, to enter level 4 (Set level).
4. Set OUTY to "1" (Dual output - P1/P2) .



8.2.2 Description of parameters

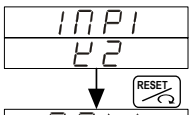
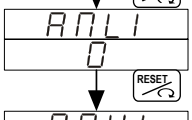
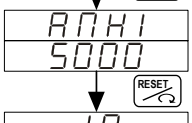
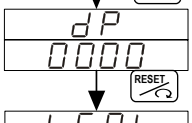
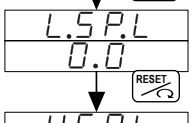
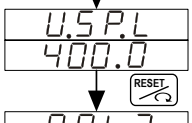
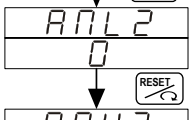
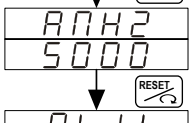
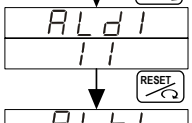
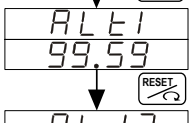
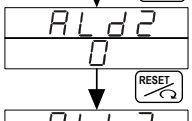
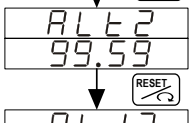
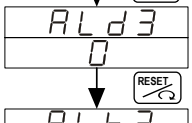
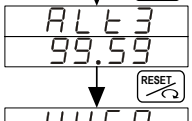
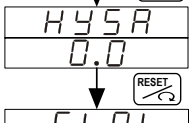
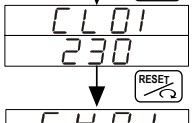
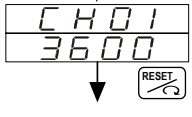


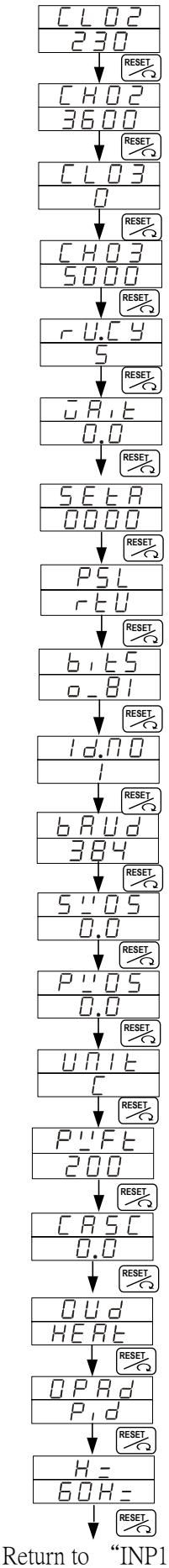
Proportional band 1 (For output 1)	Range：0.0~200.0% ON/OFF control if set to 0 (0.0)
Integral time 1 (For output 1)	Range：0~3600 seconds PD control if set to 0
Derivative time 1 (For output 1)	Range：0~900 seconds PI control if set to 0
Reserved	Reserved
Auto tuning offset value	Range：0~USPL
Output 1 cycle time	Range：0~150 seconds Relay output : 10 Voltage pulse output : 1 , mA output: 0
Hysteresis for output 1 ON/OFF control	Range：0~1000
Proportional band 2 (For output 2)	The same with P1
Integral time 2 (For output 2)	The same with I1
Derivative time 2 (For output 2)	The same with D1
Output 2 Cycle time	The same with CYT1
Hysteresis for output 2 ON/OFF control	The same with HYS1
Control gap 1 (For output 1)	Set point of output 1 (Heating side) =SV - GAP1
Control gap 2 (For output 2)	=SV + GAP2
Function lock	

LCK	Levels entering available				Parameters which can be changed
	Level 1 (User)	Level 2 (PID)	Level 3 (Input)	Level 4 (SET)	
0000	◎	◎	◎	------	All parameters (default value)
1111	◎	◎	------	◎	All parameters
0100	◎	◎	------	------	All parameters except level 3
0110	◎	◎	------	------	Parameters in level 1
0001	◎	◎	------	------	“SV” and “LCK”
0101	◎	◎	------	------	Only “LCK”

8.3 LEVEL 3 (Input Level)

To enter level 3 , set LCK to ”0000”and then press RESET key + Shift < keys for 5 seconds.

	Input type selection	
	Analog input low limit calibration (Used for mA and V input)	Range：-1999 ~ 9999
	Analog input high limit calibration (Used for mA and V input)	Range：0 ~ 9999
	Decimal point position (Available for mA and V input)	0000，000.0，00.00，0.000
	Lower Set-Point Limit	Scaling Low Limit
	Upper Set-Point Limit	Scaling High Limit
	Remote input low limit calibration	Range：-1999 ~ 9999
	Remote input high limit calibration	Range：0 ~ 9999
	Alarm mode of AL1	Range:00~19 Refer to “Alarm mode type”
	Alarm time of AL1	Range：0~99 Min 59 Secs 0=Flicker Alarm，99:59=Continued Others=On delay time (If ALD=07 , ALT means alarm on time)
	Alarm mode of AL2	The same with ALD1
	Alarm time of AL2	The same with ALT1
	Alarm mode of AL3	The same with ALD1
	Alarm time of AL3	The same with ALT1
	Hysteresis of all Alarm	Range：0~1000
	Output 1 low limit calibration (Used for mA and V output)	Range：0 ~ 9999
	Output 1 low limit calibration (Used for mA and V output)	Range：0 ~ 9999

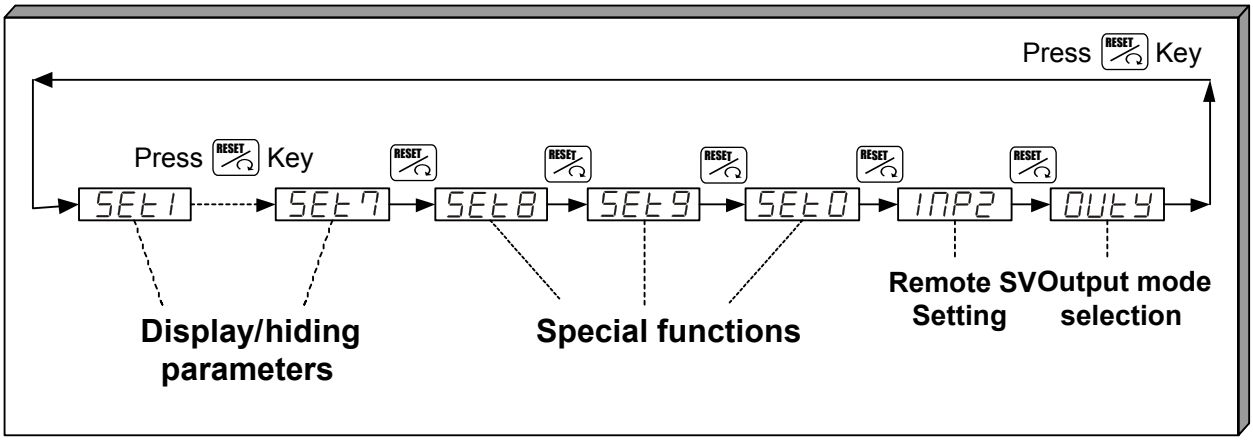


Output 2 low limit calibration (Used for mA and V output)	The same with CLO1
Output 2 high limit calibration (Used for mA and V output)	The same with CHO1
Retransmission low limit calibration	The same with CLO1
Retransmission high limit calibration	The same with CHO1
Full run time of proportional motor (Used for proportional motor valve control output)	Range：5~200 seconds
Used for programmable controller to wait continued operation	0=Not wait Others=Wait value
Communication Protocol Selection	MODBUS RTU / MODBUS ASCII / TAIE
Communication Bits Configuration	O_81 /O_82/E_81/ E_82
ID number	Range：0 ~ 255
Baudrate	2400 / 4800 / 9600 / 19200 / 38400 bps
SV compensation	Range：-1000~1000
PV compensation	Range：-100.0~500.0
Unit of PV & SV	C(℃) / F(℉) / A(Analog)
PV Filter	PV will responese faster if PVFT is smaller.
Reserved	
Control mode	Heat / Cool
Control algorithm	PID / Fuzzy
Frequency	50 / 60HZ

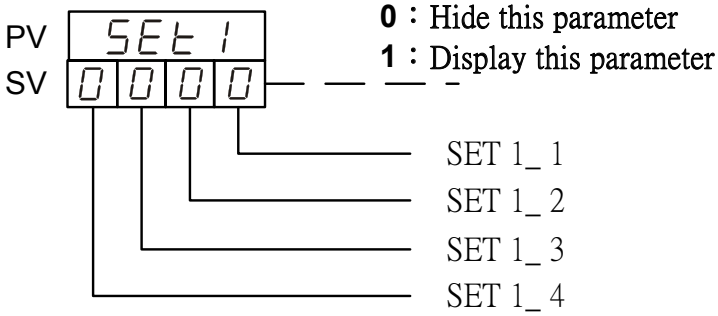
Return to “INP1”

8.4 Level 4 (SET level)

To enter level 4, set LCK to ”1111”and then press RESET key + Shift < key 5 seconds.



8.4.1 How to hide parameters (Use SET1~SET7)



*For the description of Level 1 parameters, please refer with page 17.

*For the description of Level 3 parameters, please refer with page 20.

SET	Display / hiding	Level	SET	Display / hiding	Level
1_1	OUTL	Level 1	5_1	CLO2,CHO2	Level 3
1_2	AT	Level 1	5_2	CLO3,CHO3	Level 3
1_3	AL 1	Level 1	5_3	r U.CY,bAt,SETA	Level 3
1_4	AL 2	Level 1	5_4	PSL,bits,Id.NO,bAUd	Level 3
2_1	AL 3	Level 1	6_1	SUOS	Level 3
2_2	ANL1,ANH1,dP	Level 3	6_2	PUOS	Level 3
2_3	L.SP.L,U.SP.L	Level 3	6_3	UNIT	Level 3
2_4	ANL2,ANH2	Level 3	6_4	PUFT	Level 3
3_1	ALd1	Level 3	7_1	CASC	Level 3
3_2	ALT1	Level 3	7_2	OUd	Level 3
3_3	ALd2	Level 3	7_3	OPAd	Level 3
3_4	ALT2	Level 3	7_4	H -	Level 3
4_1	ALd3	Level 3			
4_2	ALT3	Level 3			
4_3	HYSA	Level 3			
4_4	CLO1,CHO1	Level 3			

8.4.2 Special functions (Use SET8 / SET9 / SET0)

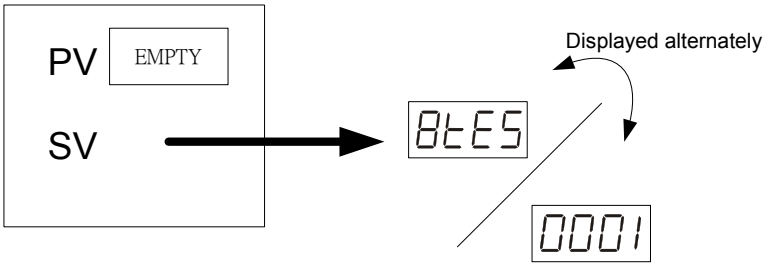
SET 8		Remark
8_ 1	0 : Program not repeat	Only available for programmable controller
	1 : Program repeat	
8_ 2	0 : No power failure option	
	1 : With power failure option	
8_ 3	0 : Program starts from 0	
	1 : Program starts from PV	
8_ 4	0 : Reserved (Don't change it)	

SET 9		Remark
9_ 1	0 : Reserved (Don't change it)	
9_ 2	0 : Timer Unit = "Hour : Minute"	Only available for programmable controller
	1 : Timer Unit = "Minute : Second"	
9_ 3	0 : Disable transmission	Used for transmission output
	1 : SV Transmission	
9_ 4	0 : Disable transmission	
	1 : PV Transmission	

SET 0		Remark
0_ 1	0 : TTL Communication (Slave)	Used for TTL communication
	1 : TTL Communication (Master)	
0_ 2	0 : Hide parameter "RATE"	
	1 : Display parameter "RATE"	AL3 will be replaced by "RATE"
0_ 3	0 : Disable Remote SV function	Used for Remote SV function
	1 : Enable Remote SV function	
0_ 4	0 : use output relay "b" contact when motor valve closed	Used for 3 wire proportional motor valve control
	1 : use output relay "a" contact when motor valve closed	

Please don't operate **SET 8_4**，otherwise the controller's process will be in confusion.

If SET8.4 is set to “1”, the controller will enter into “Single Display” mode, the PV LED will not display any values. The SV LED will display both the parameter value and the setting value alternately as shown in the diagram below.



To rectify the problem please press the SHIFT KEY < and change the setting value to “0000”.

8.4. 3 Remote SV type selection

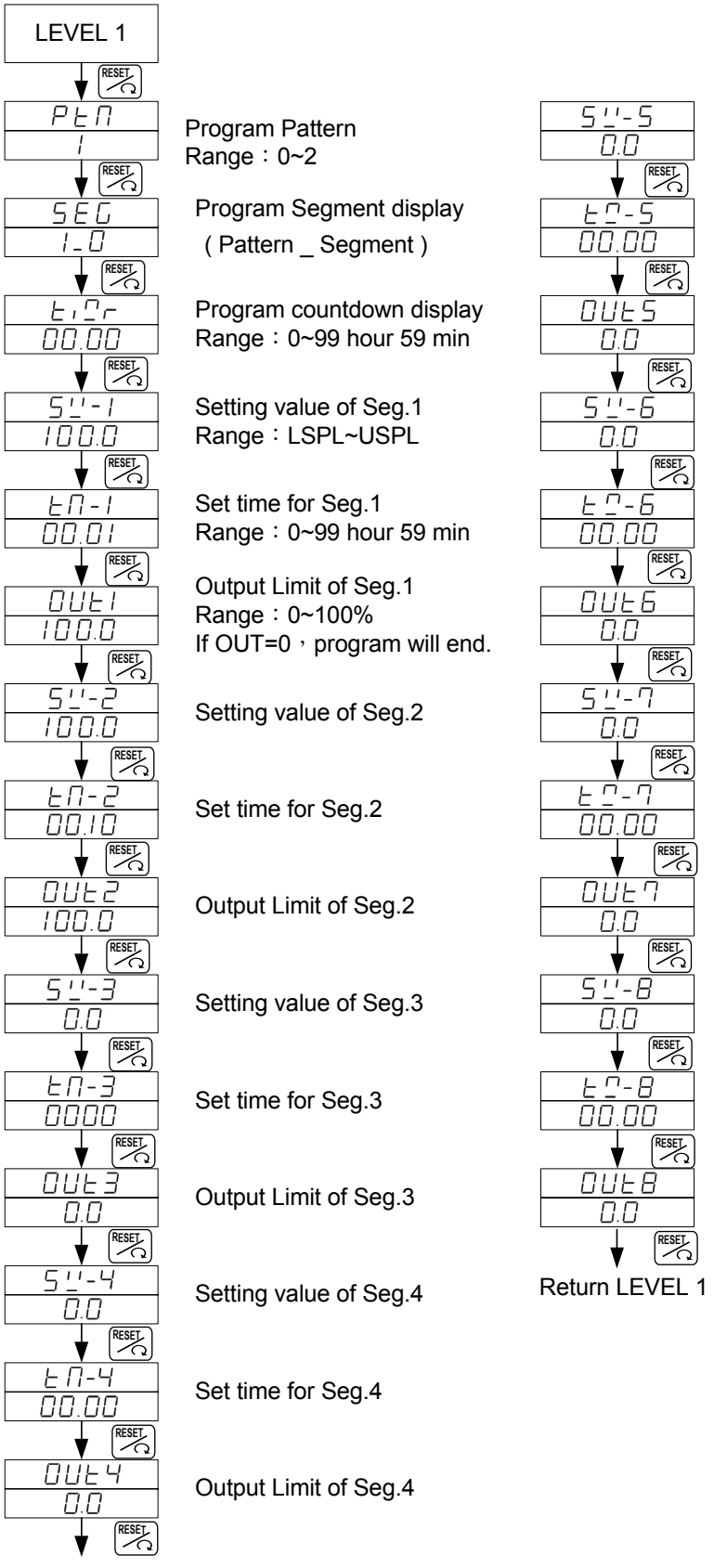
INP2=0 None
INP2=1 10~50mV / 4~20mA / 1~5V / 2~10V
INP2=2 0~50mV / 0~20mA / 0~5V / 0~10V
INP2=4 CT input
※Remote SV function is not available for programmable controller

8.4. 4 Output mode selection (Use OUTY)

OUTY=0 Single output (OUT1)
OUTY=1 Dual output (OUT1 / OUT2)
OUTY=2 Reserved
OUTY=3 3 wire proportional motor valve control
OUTY=4 1ψPhase angle control (1ψSCR)
OUTY=5 3ψPhase angle control (3ψSCR)

8.5 Program Level (Only displayed in programmable controller)

8.5.1 Description of parameters



8.5.2 Description of operation

1. There are 2 patterns can be used，each pattern contains 8 segments.
2. Terminologies

   Pattern ：A program consists of some steps.

   Ramp status：The status with changing SV.

   Soak status ：The status with fixed SV.
3. Operating

   I. "KEY" function (no changing parameter)

   ▲ (RUN) ：Start program procedure，**PRO** LED in panel start flicking.

   ▼ (HOLD) ：Suspend program procedure，**PRO** LED in panel will stop flicker but still light on.

   ▲ + RESET(JUMP) ：Jump to previous segment.

   ▼ + RESET (RESET)：Reset program procedure，**PRO** LED in panel will off.

   II. Alarm Function：

   ALD1 = “07”(Segment end alarm)，

   AL1 = “2”(It means when segment 2 end, AL1 will act)

   ALT1 =“00:10”(Relay on time is 10 seconds).

   ＊ In this case，when program proceeds to segment 2 end，the relay of AL1 will be on 10 seconds.

   III. END function：

   The Controller doesn’t have END order, so if program procedure is less than 8 segments, please set the last segment’s OUT to “0”. Program will end in this segment. Otherwise，it will proceed 8 or 16 segments.

   IV. Linking Function：

   PTN=1 proceed pattern 1，contains 8 segments.

   PTN=2 proceed pattern 2，contains 8 segments.

   PTN=0 linking proceed pattern 1 and 2 totally 16 segments.

   (Please set PTN1 and PTN2 at first，and then set PTN to 0)

   V. Other function(＊refer to LEVEL 4)

   SET 8_1=1 Program repeats.

   SET 8_2=0 No power failure function.

   SET 8_2=1 Enable power failure function.

   (When power shut down and on again，the controller will start from the segment which is near PV)

   SET 8_3=0 Program starts from 0.

   SET 8_3=1 Program starts from PV.

   SET 9_2=0 Timer Unit = “Hour : Minute”

   SET 9_2=1 Timer Unit = “Minute : Second”

9. Input type table (INP1 selection)

TYPE	CODE	RANGE
K	K 1	0.0 ~ 200.0℃ / 0.0 ~392.0℉
	K 2	0.0 ~ 400.0℃ / 0.0 ~752.0℉
	K 3	0 ~ 600℃ / 0 ~1112℉
	K 4	0 ~ 800℃ / 0 ~1472℉
	K 5	0 ~ 1000℃ / 0 ~1832℉
	K 6	0 ~ 1200℃ / 0 ~2192℉
J	J 1	0.0 ~ 200.0℃ / 0.0 ~392.0℉
	J 2	0.0 ~ 400.0℃ / 0.0 ~752.0℉
	J 3	0 ~ 600℃ / 0 ~1112℉
	J 4	0 ~ 800℃ / 0 ~1472℉
	J 5	0 ~ 1000℃ / 0 ~1832℉
	J 6	0 ~ 1200℃ / 0 ~2192℉
R	r 1	0 ~ 1600℃ / 0 ~2912℉
	r 2	0 ~ 1769℃ / 0 ~3216℉
S	S 1	0 ~ 1600℃ / 0 ~2912℉
	S 2	0 ~ 1769℃ / 0 ~3216℉
B	b 1	0 ~ 1820℃ / 0 ~3308℉
E	E 1	0 ~ 800℃ / 0 ~1472℉
	E 2	0 ~ 900℃ / 0 ~1652℉
N	n 1	0 ~ 1200℃ / 0 ~2192℉
	n 2	0 ~ 1300℃ / 0 ~2372℉
T	t 1	-199.9 ~ 400.0℃ /-199.9 ~752.0℉
	t 2	-199.9 ~ 200.0℃ / -199.9 ~392.0℉
	t 3	0.0 ~ 350.0℃ / 0.0 ~662.0℉
W5Re/W26Re	U 1	0 ~ 2000℃ / 0 ~3632℉
	U 2	0 ~ 2320℃ / 0 ~4208℉
PLⅡ	PL 1	0 ~ 1300℃ / 0 ~2372℉
	PL 2	0 ~ 1390℃ / 0 ~2534℉
U	U 1	-199.9 ~ 600.0℃ / -199.9 ~999.9℉
	U 2	-199.9 ~ 200.0℃ / -199.9 ~392.0℉
	U 3	0.0 ~ 400.0℃ / 0.0 ~752.0℉
L	L 1	0 ~ 400℃ / 0 ~752℉
	L 2	0 ~ 800℃ / 0 ~1472℉

TYPE	CODE	RANGE
JIS PT100	JP1	-199.9 ~ 600.0℃ / -199.9 ~999.9℉
	JP2	-199.9 ~ 400.0℃ / -199.9 ~752.0℉
	JP3	-199.9 ~ 200.0℃ / -199.9 ~392.0℉
	JP4	0 ~ 200℃ / 0 ~392℉
	JP5	0 ~ 400℃ / 0 ~752℉
	JP6	0 ~ 600℃ / 0 ~1112℉
DIN PT100	dP1	-199.9 ~ 600.0℃ / -199.9 ~999.9℉
	dP2	-199.9 ~ 400.0℃ / -199.9 ~752.0℉
	dP3	-199.9 ~ 200.0℃ / -199.9 ~392.0℉
	dP4	0 ~ 200℃ / 0 ~392℉
	dP5	0 ~ 400℃ / 0 ~752℉
	dP6	0 ~ 600℃ / 0 ~1112℉
JIS PT50	dP.1	-199.9 ~ 600.0℃ / -199.9 ~999.9℉
	dP.2	-199.9 ~ 400.0℃ / -199.9 ~752.0℉
	dP.3	-199.9 ~ 200.0℃ / -199.9 ~392.0℉
	dP.4	0 ~ 200℃ / 0 ~392℉
	dP.5	0 ~ 400℃ / 0 ~752℉
	dP.6	0 ~ 600℃ / 0 ~1112℉
AN1	AN1	-10 ~ 10mV / -1999~9999
AN2	AN2	0 ~ 10mV / -1999~9999
AN3	AN3	0 ~ 20mV / -1999~9999
AN4	AN4	0 ~ 50mV / -1999~9999
AN5	AN5	10 ~ 50mV /-1999~9999

＊The initial setting in factory is “K2”.

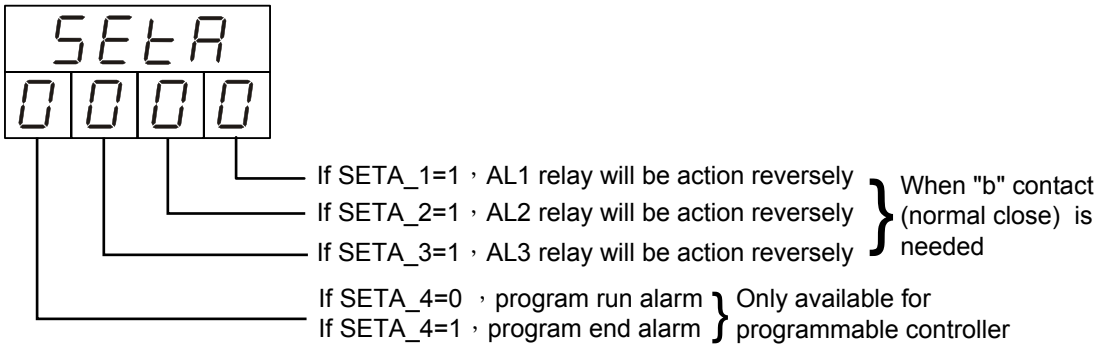
10. Alarm

10.1 Alarm time (ALT1/ALT2/ALT3)

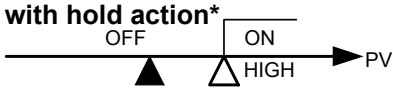
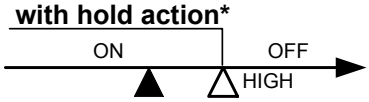
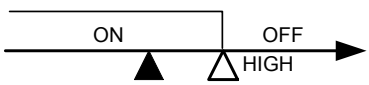
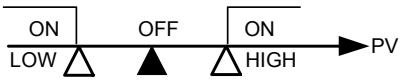
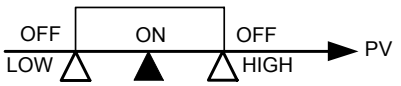
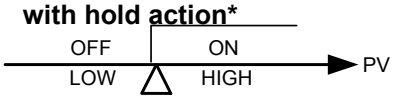
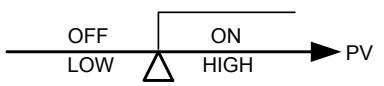
ALT1=0	Flicker alarm
ALT1=99.59	Continued alarm
ALT1=00.01 ~ 99.58	Alarm on delay time

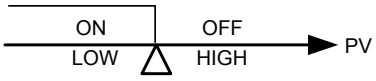
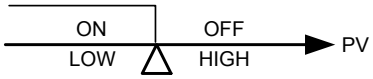
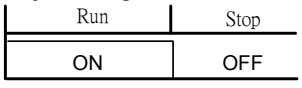
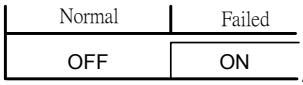
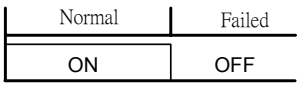
10.2 SETA

*SETA is in Level 3 (Input level)



10.3 Alarm mode (ALD1 / ALD2 / ALD3) (▲:SV △:Alarm set value)

01	**Deviation high alarm with hold action*** 
11	**Deviation high alarm** 
02	**Deviation low alarm with hold action*** 
12	**Deviation low alarm** 
03	**Deviation high/low alarm with hold action*** 
13	**Deviation high/low alarm** 
04 / 14	**Band alarm** 
05	**Process high alarm with hold action*** 
15	**Process high alarm** 

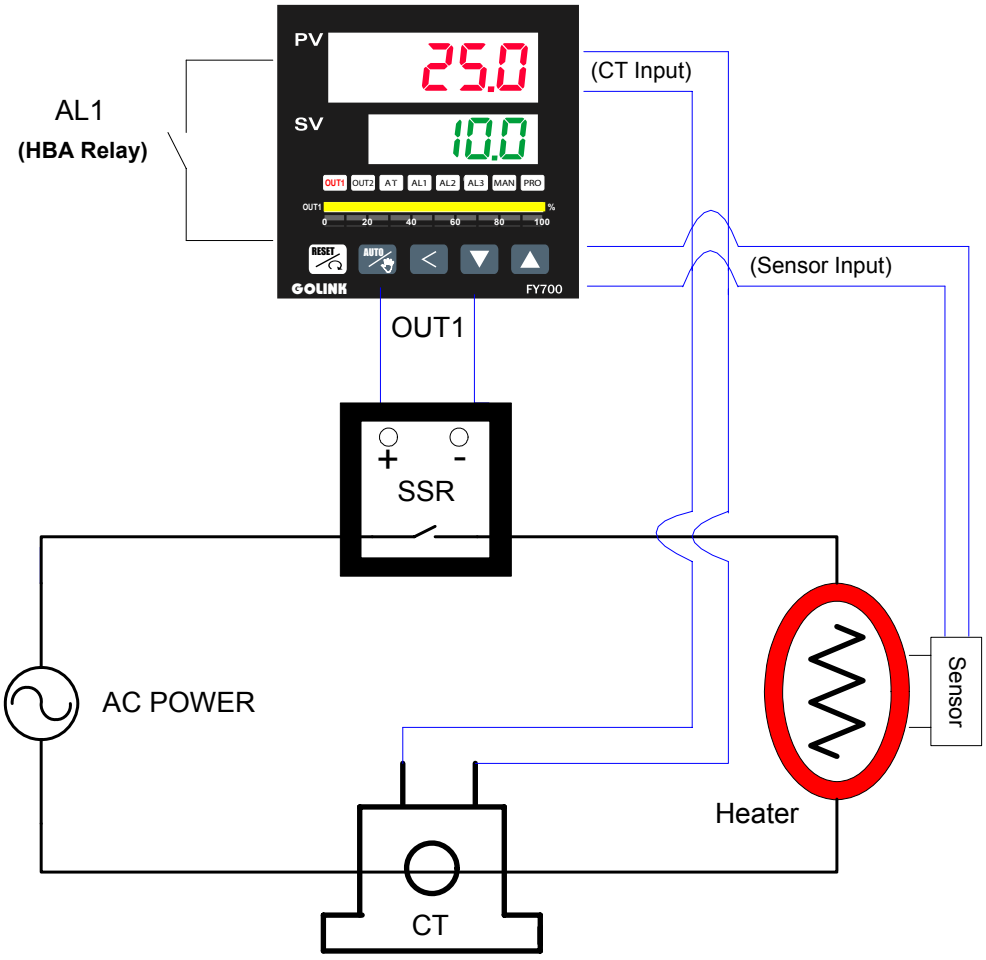
06	**Process low alarm with hold action*** 
16	**Process low alarm** 
07	**Segment End alarm (Only for Programmable controller)** (1) ALD1~3 , set **07** (2) ALD1~3=Alarm Segment (3) ALT1~3 defines as follows: **0** =flicker alarm **99.59** =continued alarm **others** =alarm ON time
17	**Program Run alarm (Only for Programmable controller)** 
08	**System failed alarm* (ON)** 
18	**System failed alarm* (OFF)** 
09	**Heater Break Alarm** (HBA) Please refer with HBA function description in page 31.
00 / 10	**No alarm**

***Hold action:**
When Hold action is ON, the alarm action is suppressed at start-up until the measured value (PV) enters the non-alarm range.

***System failed:**
It means that the controller display error message with one of the parameter symbol “UUU1” or “NNN1” or “CJCE”

11. Heater Break Alarm (HBA)

11.1 HBA Wiring Example

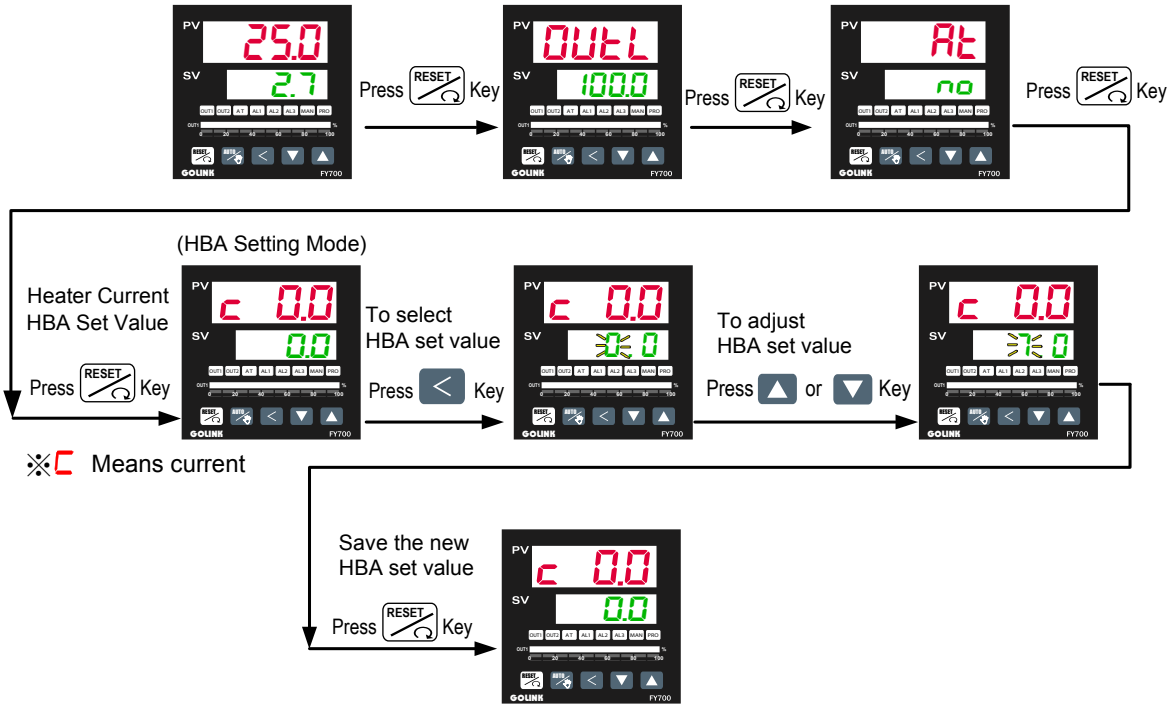


11.2 HBA Function Description

HBA function detects the AC current flowing through the heater by a Current Transformer (CT), and compares the CT input value and HBA set value. When OUT1 is ON and CT input value is less than HBA set value during 5 seconds , AL1 is activated. Otherwise, AL1 is not activated.

The AC current flowing through heater can also be monitored in HBA setting mode.

11.3 HBA setting procedure



11.4 Parameters for HBA function

Name	Value	Operation Level
AL1	HBA Set Value	Level 1
ALD1	9	Level 3
SET0	0100	Level 4
INP2	4	Level 4

- How to enter Level 3：Set parameter “LCK”to 0000 in Level 2 , and then press both the RESET key + < key for 5 seconds to enter the operation Level 3.
- How to enter Level 4：Set the parameter “LCK” to be “1111” in Level 2 , and press both the RESET key + < key for 5 sec. to enter the operation Level 4.

11.5 Activated conditions of HBA

1. OUT1 is ON
2. Heater current is less the HBA set value
3. Condition1 and 2 are continued for more than 5 seconds

AL1 will be activated, if condition 1 & 2 & 3 are all “true”.

11.6 Remarks

- Available output(OUT1) type for HBA
  - I. Relay
  - II. Voltage pulse (SSR drive)
- Since the HBA function uses AL1 as alarm relay, pls set temperature alarms by the AL2 or AL3.

12. Error codes

DISPLAY	DESCRIPTION
inIE	Open circuit of main control sensor.(INP1)
∗ AdCF	A/D convert failed.
∗ CJCE	Cold junction compensation failed.
in2E	Open circuit of sub control sensor.(Remote SV)
uuu1	PV exceeds USPL.
nnn1	PV under LSPL.
uuu2	Input signal of sub control exceeds the upper limit. (Remote SV)
nnn2	Input signal of sub control under the lower limit. (Remote SV)
∗ RAMF	RAM failed.
inEF	Interface failed.
AUEF	Auto tuning failed.

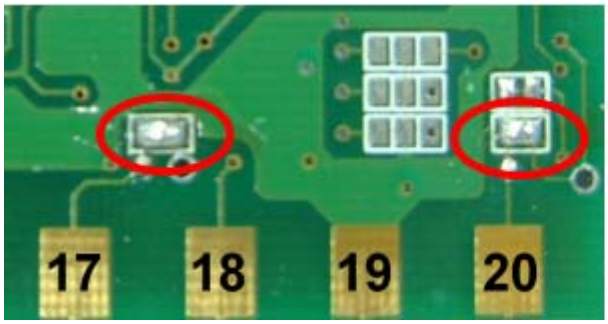
NOTE：If the "∗" marked error comes up，the controller needs to be repaired. Please send it to the nearest sales office or retail dealer.

13. Modify input type ("TC" ⇄ "RTD")

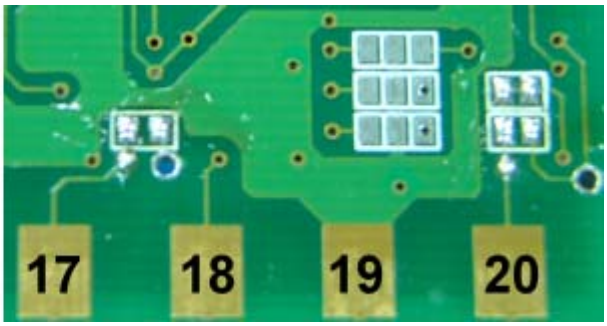
If the controller needs to modify input type from **TC** or **mV** to **RTD** , please make PAD short on the back side of PC board as following diagram and change input selection(INP1). On the contrary , modify from **RTD** to **TC** or **mV** , make PAD open.

96x96,48x96,96x48(mm)

RTD : Short pads

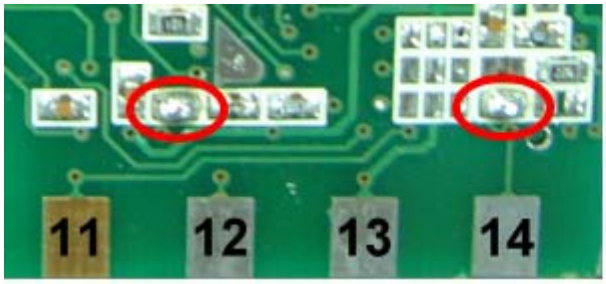


TC or mV : Open pads

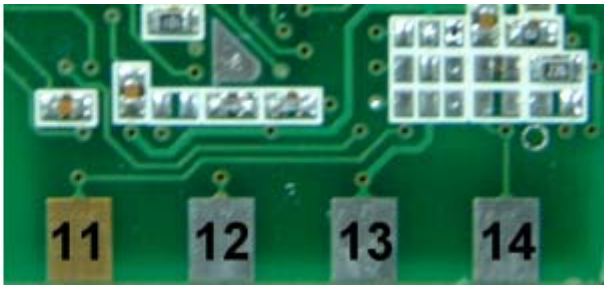


72x72(mm)

RTD : Short pads

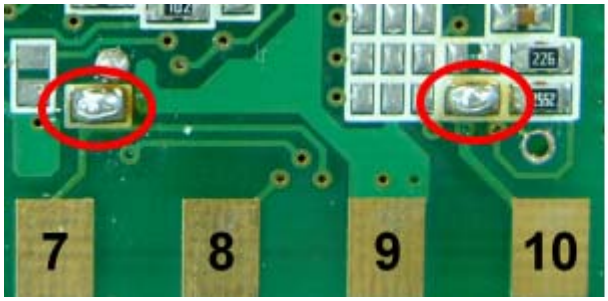


TC or mV : Open pads

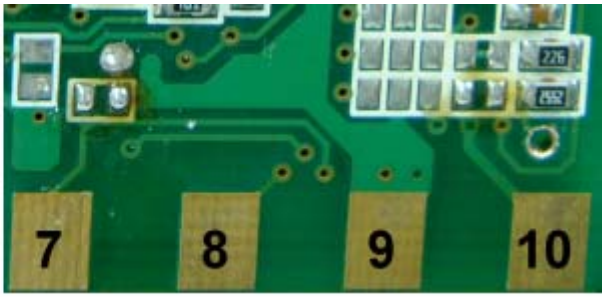


48x48(mm)

RTD : Short pads



TC or mV : Open pads



14. Modify input type : Linear Input (mA ,V)

14.1 Hardware：

	96×96，48×96，96×48	72×72	48×48
INPUT (+)	PIN 17	PIN 11	PIN 7
INPUT (-)	PIN 20	PIN 14	PIN 10

0~20mA (INP1=AN4)：(R3 use 100Ω，R5 use 2.4Ω， S3＆S5 SHORT)

4~20mA (INP1=AN5)：(R3 use 100Ω，R5 use 2.4Ω， S3＆S5 SHORT)

0 ~ 1V (INP1=AN4)：(R1 use 2KΩ，R4 use 100Ω，S1＆S4 SHORT)

0 ~ 5V (INP1=AN4)：(R2 use 10KΩ，R4 use 100Ω，S2＆S4 SHORT)

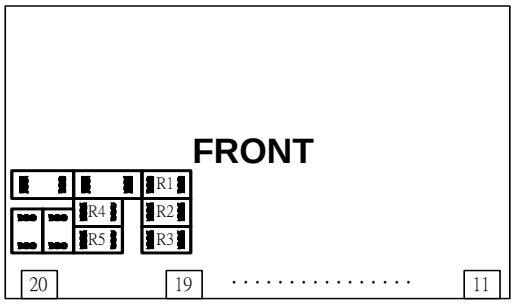
1 ~ 5V (INP1=AN5)：(R2 use 10KΩ，R4 use 100Ω，S2＆S4 SHORT)

0 ~ 10V (INP1=AN4)：(R3 use 22KΩ，R4 use 100Ω，S3＆S4 SHORT)

2 ~ 10V (INP1=AN5)：(R3 use 22KΩ，R4 use 100Ω，S3＆S4 SHORT)

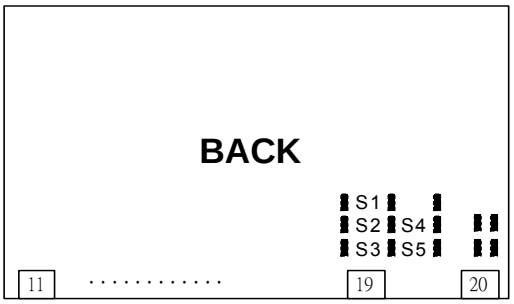
96×96，48×96，96×48

(PC Board)



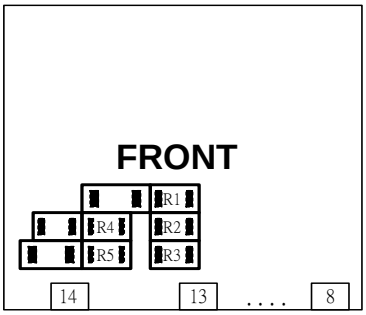
96×96，48×96，96×48

(PC Board)



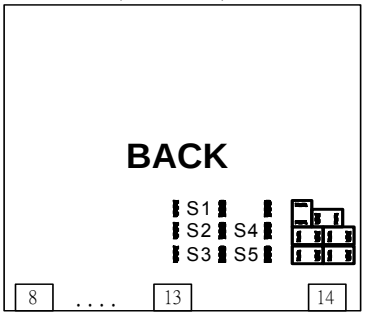
72×72

(PC Board)



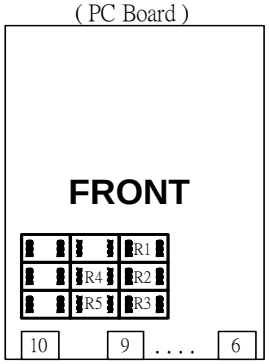
72×72

(PC Board)



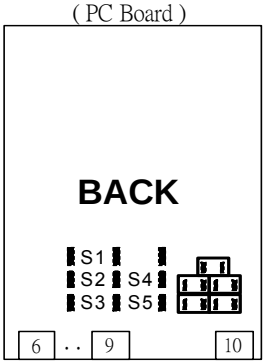
48×48

(PC Board)

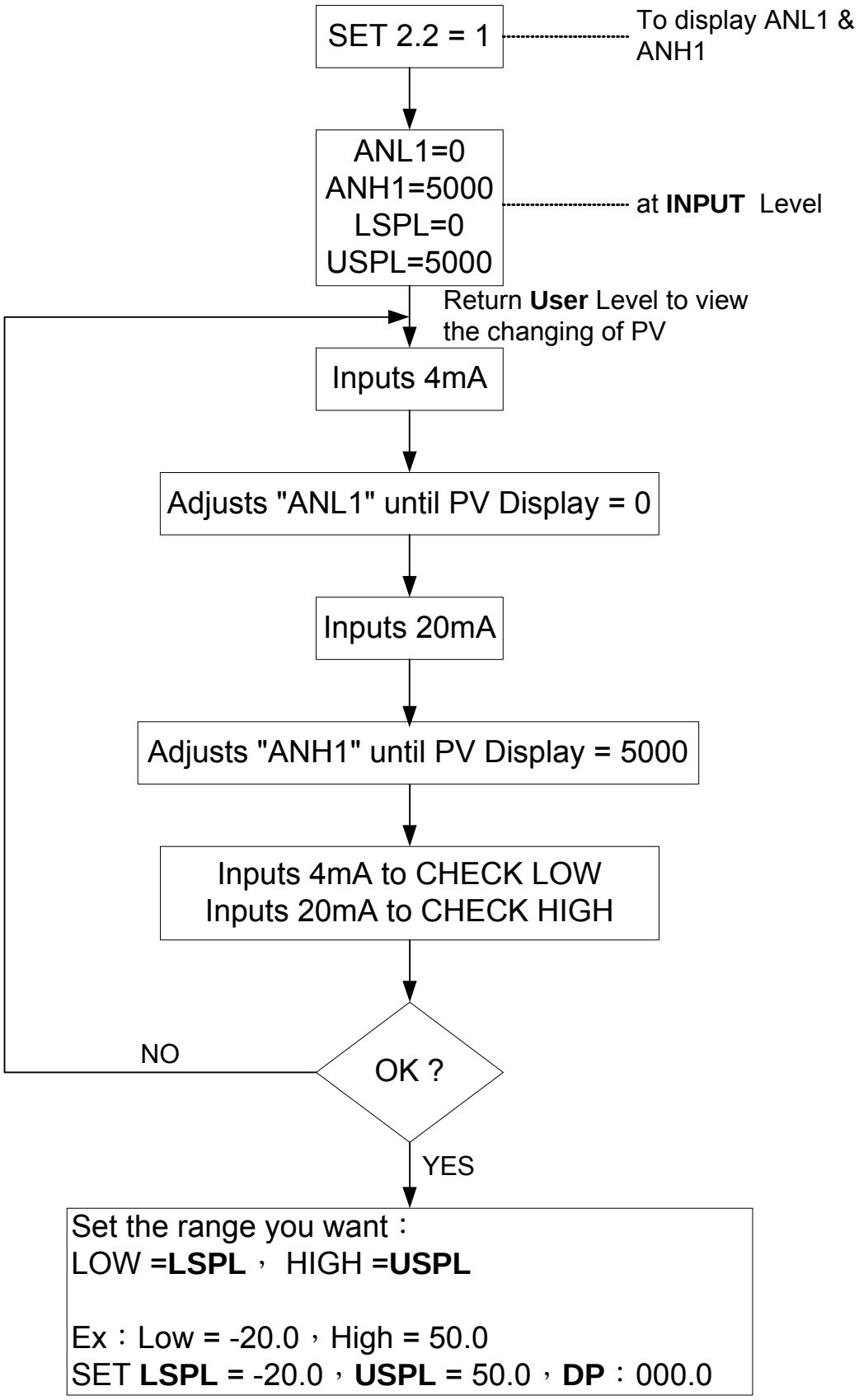


48×48

(PC Board)



14.2 Calibration：



15. Modify input type : Linear Input (mA ,V)

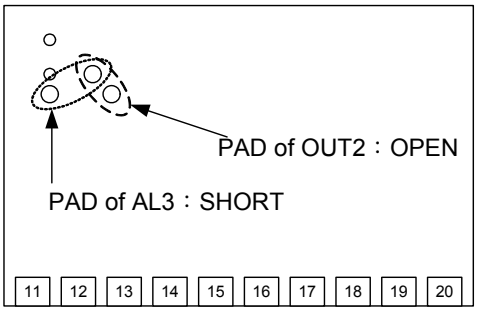
It just needs to change a module at the same position，
and modify parameter **CYT1** in LEVEL 2 .

➔Relay: CYT1=10, Voltage pulse: CYT1=1, 4~20mA:CYT1=0

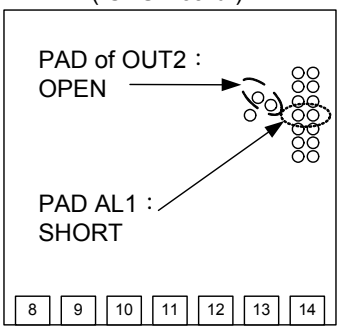
16. Modify output mode: OUT1/ALARM, OUT1/OUT2

OUT1 / ALARM

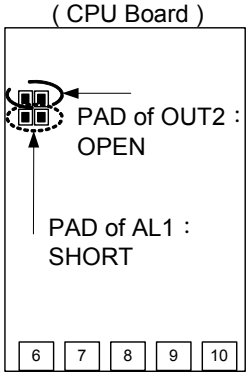
96x96，48x96，96x48
(CPU Board)



72x72
(CPU Board)

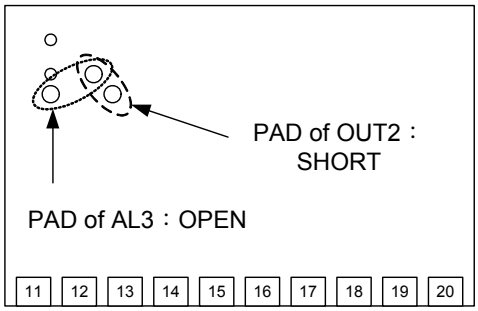


48x48
(CPU Board)

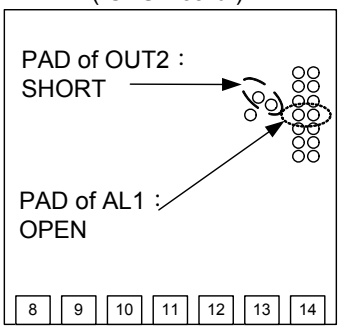


OUT1 /OUT2

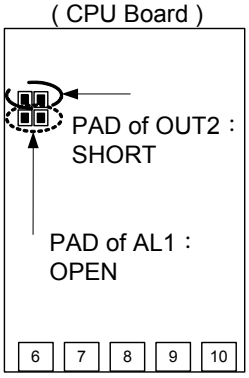
96x96，48x96，96x48
(CPU Board)



72x72
(CPU Board)



48x48
(CPU Board)



17. Applications

17.1 RAMP & SOAK

- **RAMP：**

I. SET2.1=1➔To display AL3

II. SET4.1=1➔To display ALD3

III. ALD3=9➔Open RAMP option

IV. Then, AL3 will not display. It was replaced by RAMP.

RAMP
0 0.0 0

Range：00.00 ~ 99.99(℃/ min)
(If RAMP is not used，please set ALD3 to 0)

- **SOAK**：

I. ALD1 / ALD2=19 ➔ To use Sock Timer.

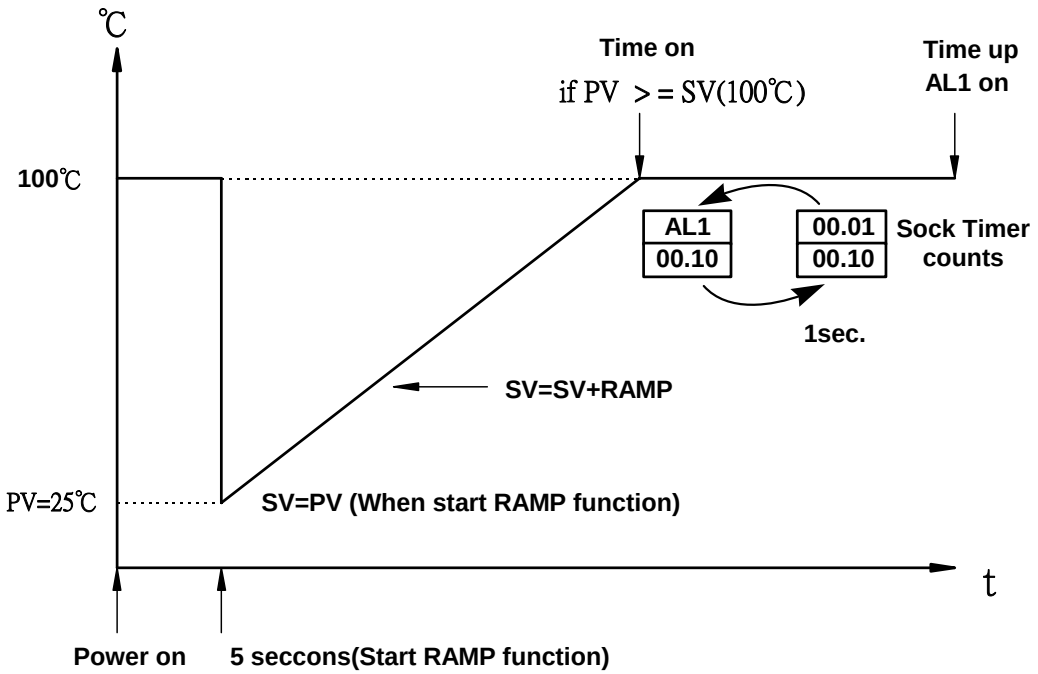
II. AL1 / AL2 will display as below:

AL1
0 0 . 0 0

Range：00.00 ~ 99.59(Hour.Minute)

- **Example：**

SV=100℃，RAMP=10.00 (℃/min)，AL1=00.10 min，PV=25℃



17.2 TTL Communication：SV output and RATE function

- **Open RATE function (use for slave controller)**

Display AL3 ：SET2.1=1

Display ALD3：SET4.1=1

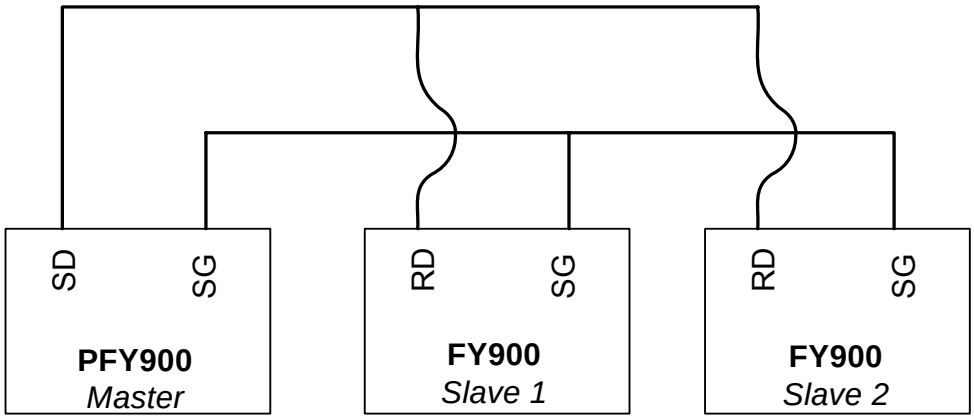
Display RATE(AL3 will be replaced) ：SET0.2=1

Set ALD3 to 0. (In Level 3)

Slave SV = (**RATE**÷9999)×master SV

- **Example：**

Connection Diagram

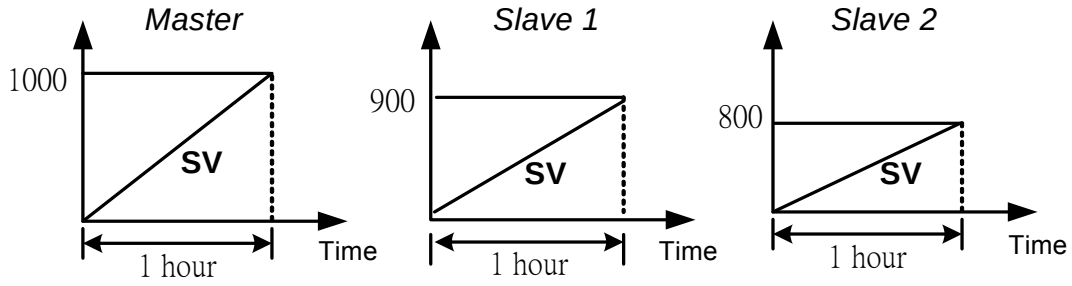


SV OUT (SET0.1=1)
IDNO=0 (SET5.4=1)
BAUD=2400(SET5.4=1)

IDNO=1 (SET5.4=1)
BAUD=2400
(SET5.4=1)
open RATE function

IDNO=1 (SET5.4=1)
BAUD=2400
(SET5.4=1)
open RATE function

Time Chart



SV_1=1000
TM_1=01:00
OUT_1=100%

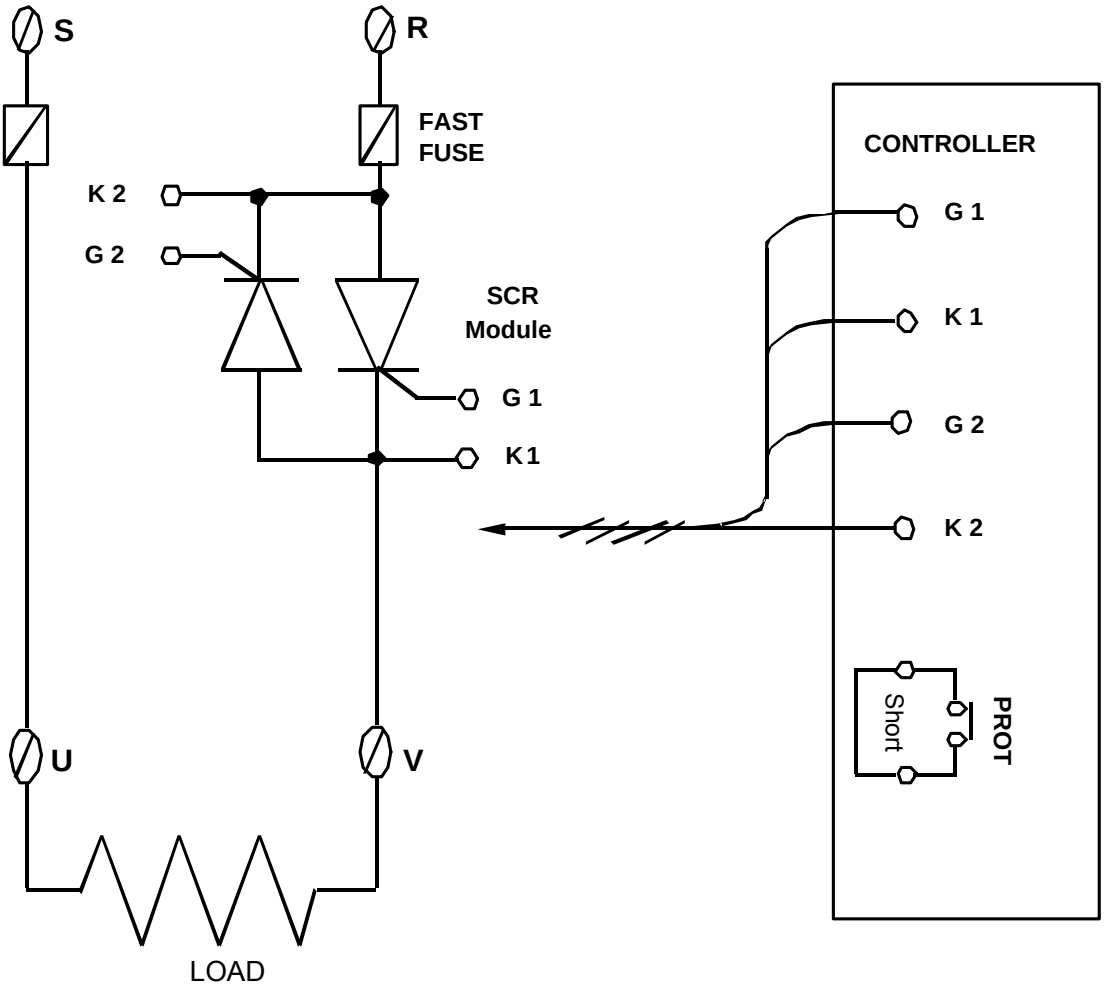
RATE = 9000
SV=900

RATE =8000
SV=800

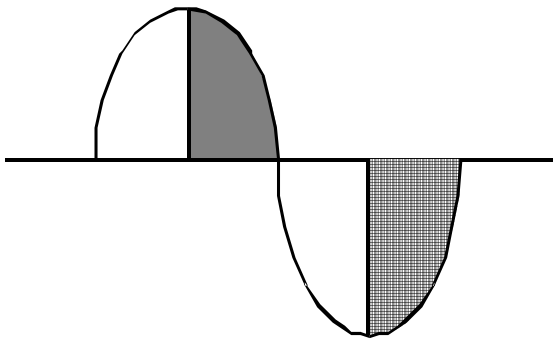
(Three controllers reach to the max value at the same time)

17.3 1ϕ Phase angle control (By SCR module)

- Available Models：FY900 / PFY900，FY700 / PFY700
- OUT1: 1ϕ SCR
- Parameter setting： OUTY=4
  CLO1=0，CHO1=4500 if use for resistance load
  CLO1=0，CHO1=4000 if use for inductor load

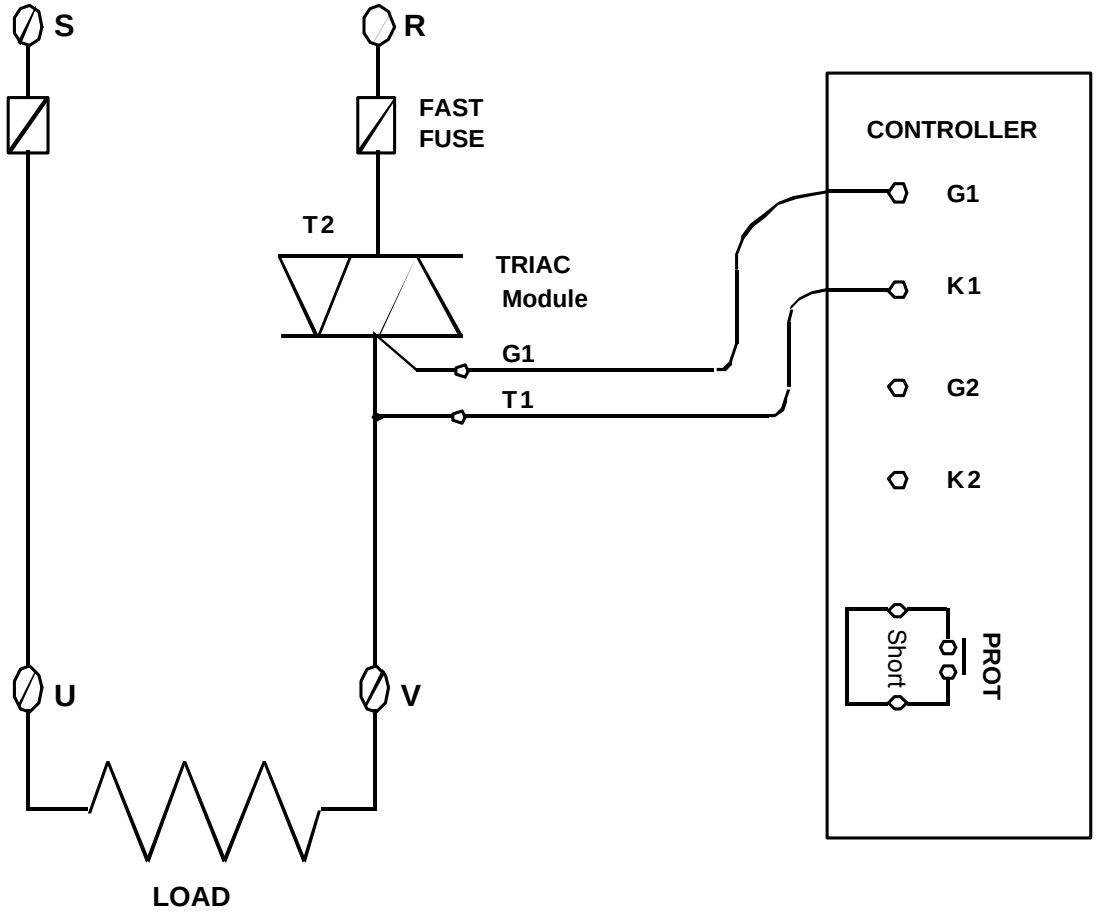


** Controller source phase must be same as load source phase

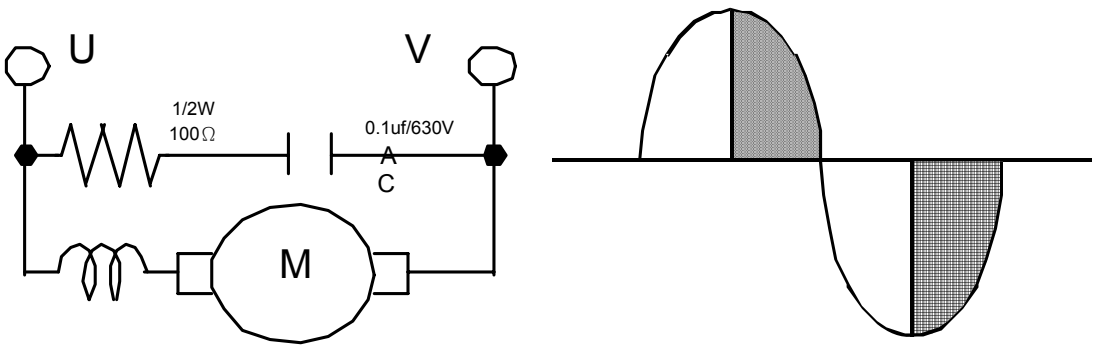


17.4 1ϕ Phase angle control (By TRIAC)

- Available Models：FY900 / PFY900，FY700 / PFY700
- OUT1: 1ϕ SCR
- Parameter setting： OUTY=4
  CLO1=0，CHO1=4500 if use for resistance load
  CLO1=0，CHO1=4000 if use for inductor load

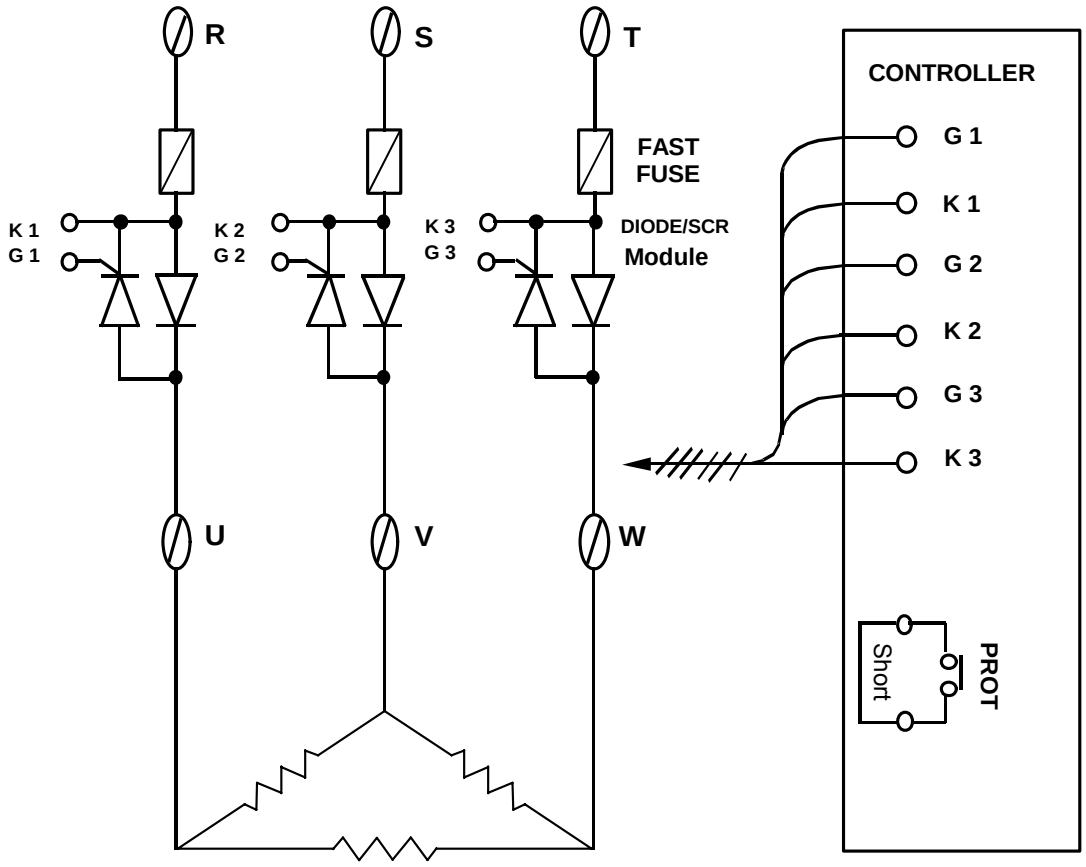


** Controller source phase must be same as load source phase



17.5 3ϕ Phase angle control (By DIODE/SCR module)

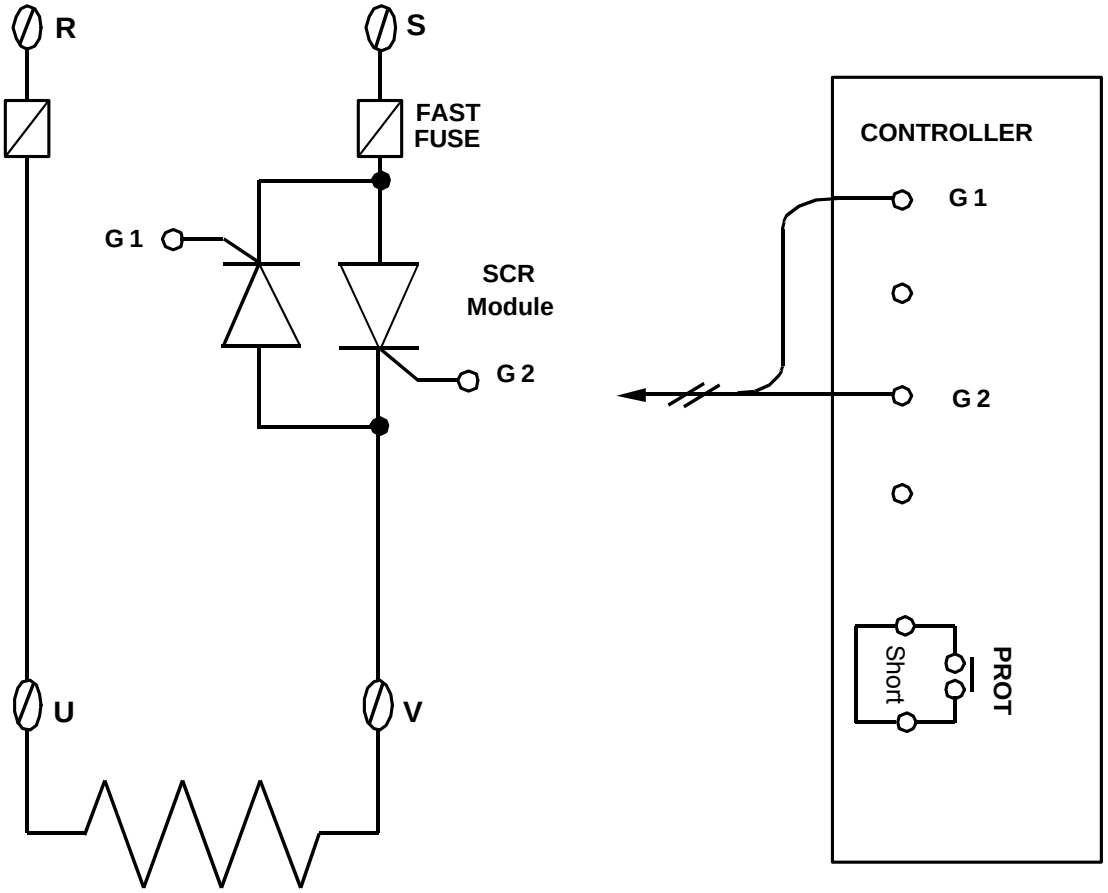
- Available Models：FY900 / PFY900
- OUT1: 3ϕ SCR
- Parameter setting： OUTY=5
  CLO1=0，CHO1=4500 only if use for resistance load
  CLO1=0，CHO1=4000 if use for inductor load

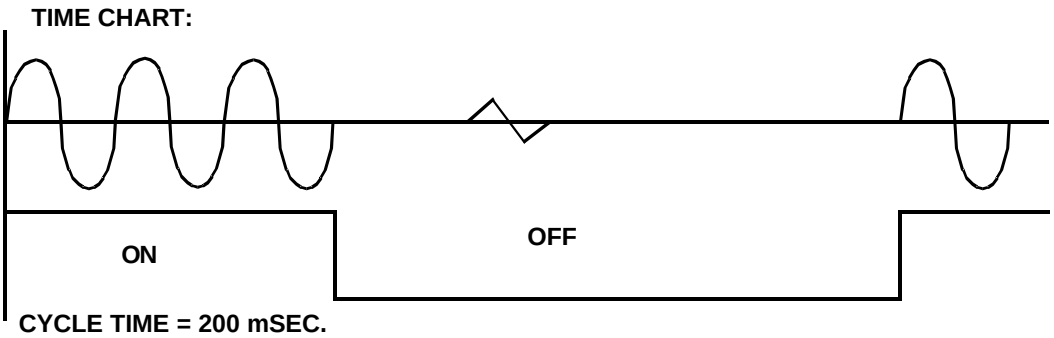


3φ LOAD

17.6 1ϕ Zero crossing control (By SCR module)

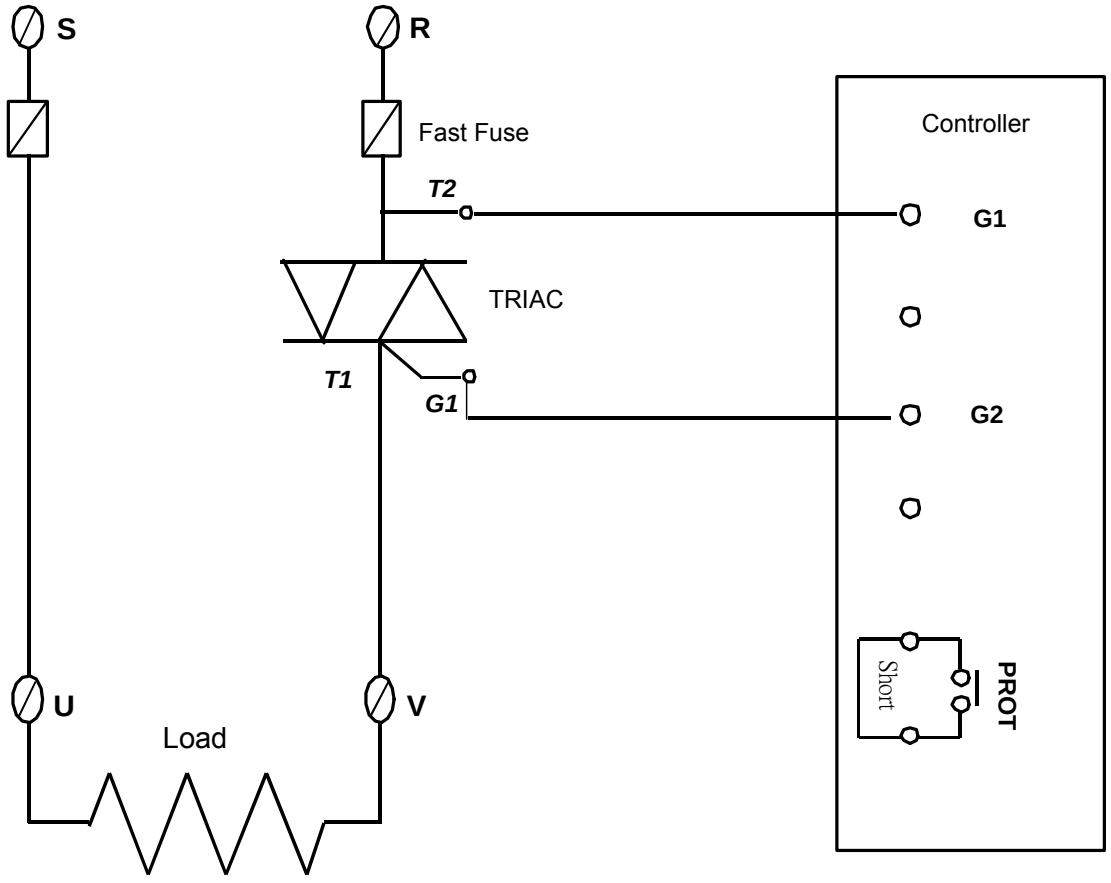
- Available Models： FY900 / PFY900，FY700 / PFY700
  FY400 / PFY400
- OUT1: 1ϕ SSR
- Parameter setting： OUTY=0
  CYT1=1





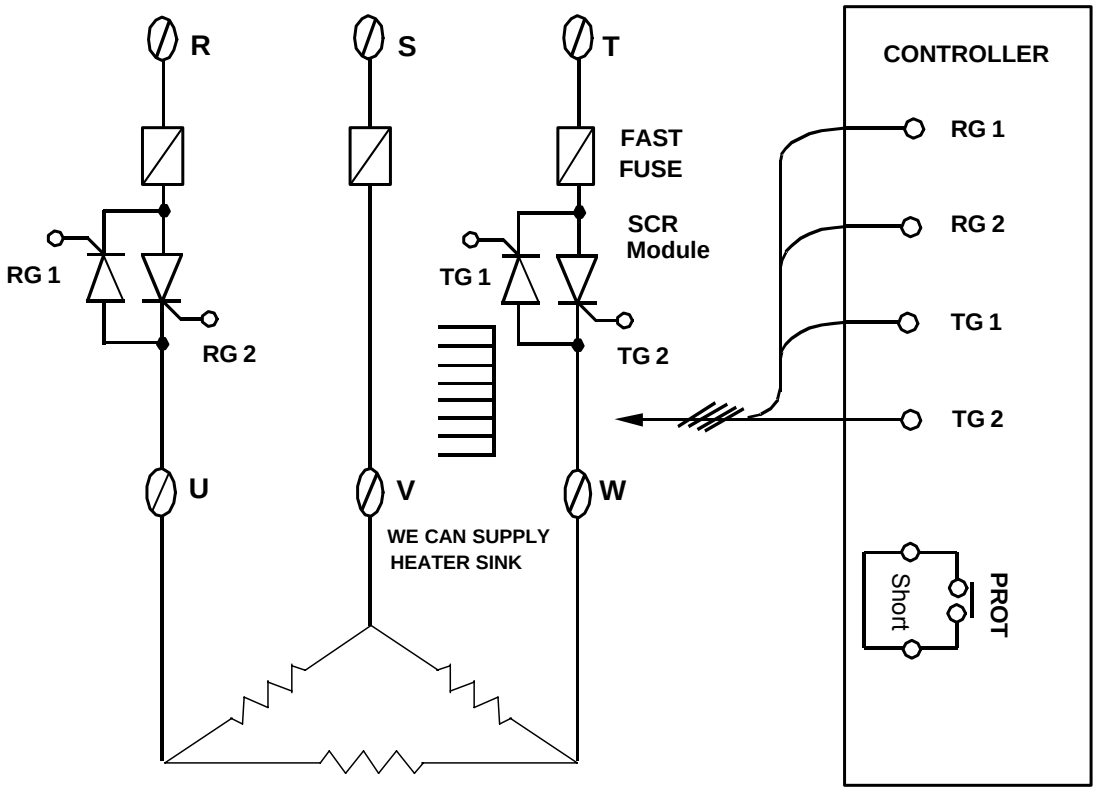
17.7 1ϕ Zero crossing control (By TRIAC)

- Available Models： FY900 / PFY900，FY700 / PFY700
  FY400 / PFY400
- OUT1: 1ϕ SSR
- Data Change： OUTY=0
  CYT1=1

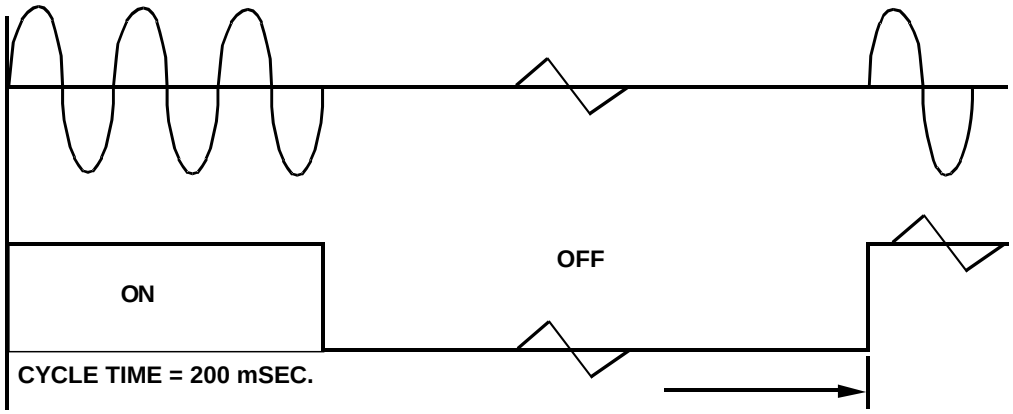


17.8 3ϕ Zero crossing control (By SCR module)

- Available Models：FY900 / PFY900
- OUT1: 3ϕ SSR
- Data Change： OUTY=0
  CYT1=1

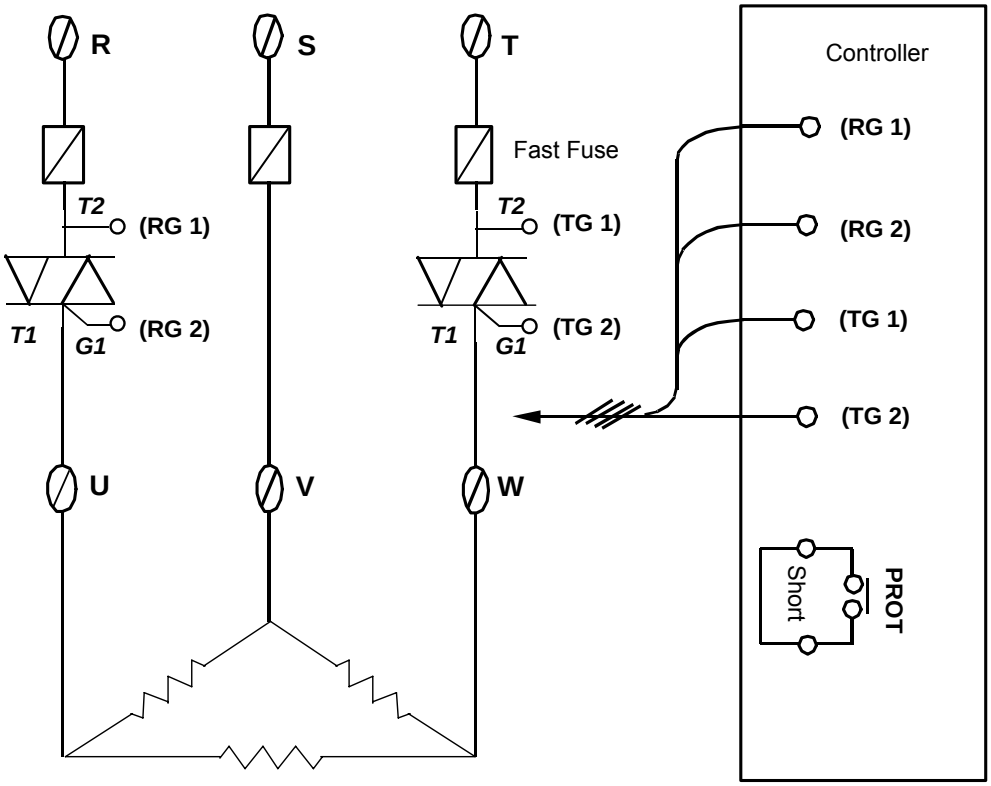


TIME CHART:



17.9 3ϕ Zero crossing control (By TRIAC)

- Available Models：FY900 / PFY900
- OUT1: 3ϕ SSR
- Data Change： OUTY=0
  CYT1=1

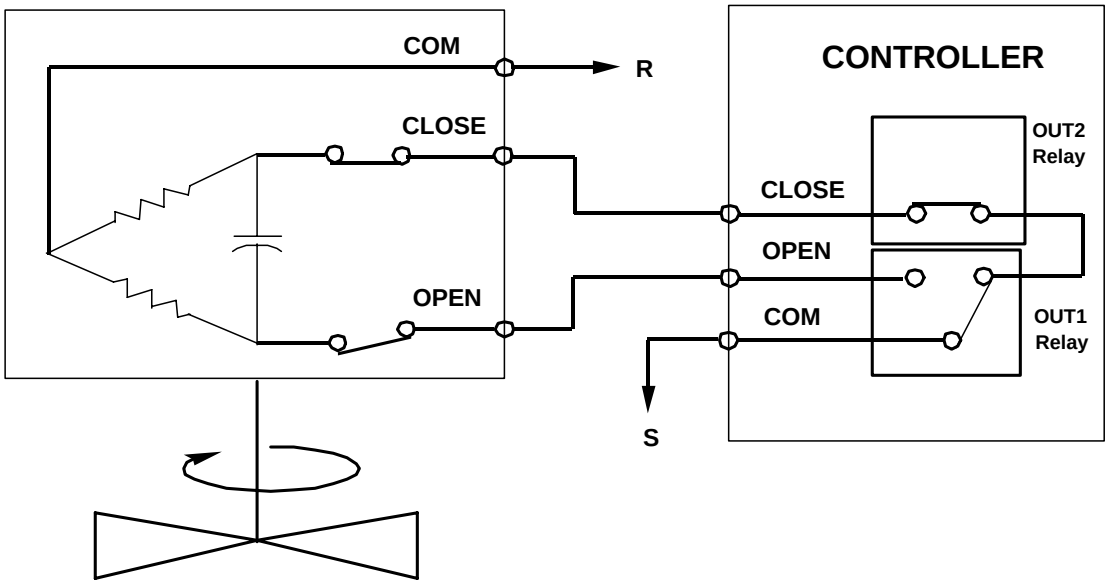


17.10 3 wires proportional motor valve control

- Available Models： FY900 / PFY900，FY700 / PFY700
  FY800 / PFY800，FY600 / PFY600
  FY400 / PFY400
- Data Change： OUTY=3
  CYT1=1 ~ 100sec.
  (Manufacturing default setting “5” seconds.)
  RUCY=5 ~ 200 seconds.

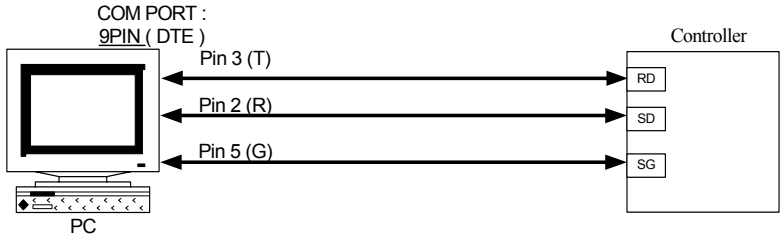
1. CYT1 is the cycle time of Open / Close
2. RUCY is the 0 ~ 100% running time of motor valve

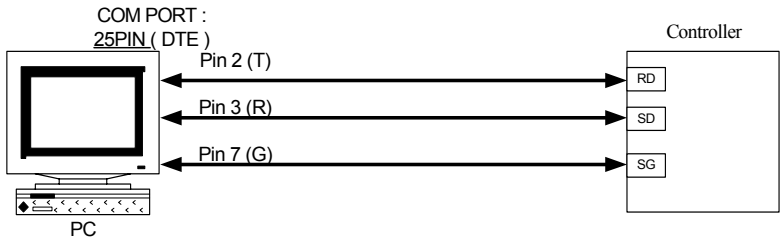
MOTOR VALVE



17.11 Wiring diagram of PC communication

RS232 Connection Diagram





NOTE:

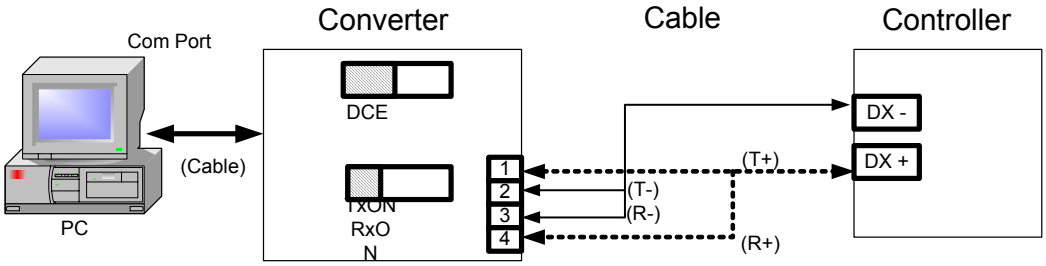
1.The length of cable be connected between controller and PC can't exceed 15 meter.

2.One Com Port can only be connected to one controller.
If more than one controller is connected to one Com Port，communication will be failed.

3.Ensure that the controller's IDNO and BAUD settings are the same with PC software's settings.

4.For the software communication format please refer to communication manual.

RS485 Connection Diagram



NOTE:
1.The length of cable be connected between Converter and Controller can't exceed 1.2 KM.
Suggestion:choose "Shielded Cable".

2.One Com Port can be connected up to a maximum of 30 Controllers.

3.Ensure that the Controller's IDNO and BAUD settings are the same with PC software's settings.

4.For the software communication format ,please refer to communication manual.