TAIE

FA series

Digital PID Temperature/Process Controllers

Operation Manual

FY/FU Series

CE RoHS compliant 符合无铅无毒无害环保规范

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1. Notice before start-up

FY series controller has got the CE approvals as below:

LVD： 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

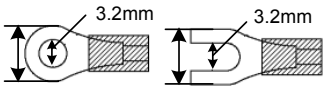
Please confirm the specification of controller is to totally with your requirement before using it, also read this manual in detail.

⚠ 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, FY100/FY101/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



Torque : 0.4 N.m (4kgf.cm)

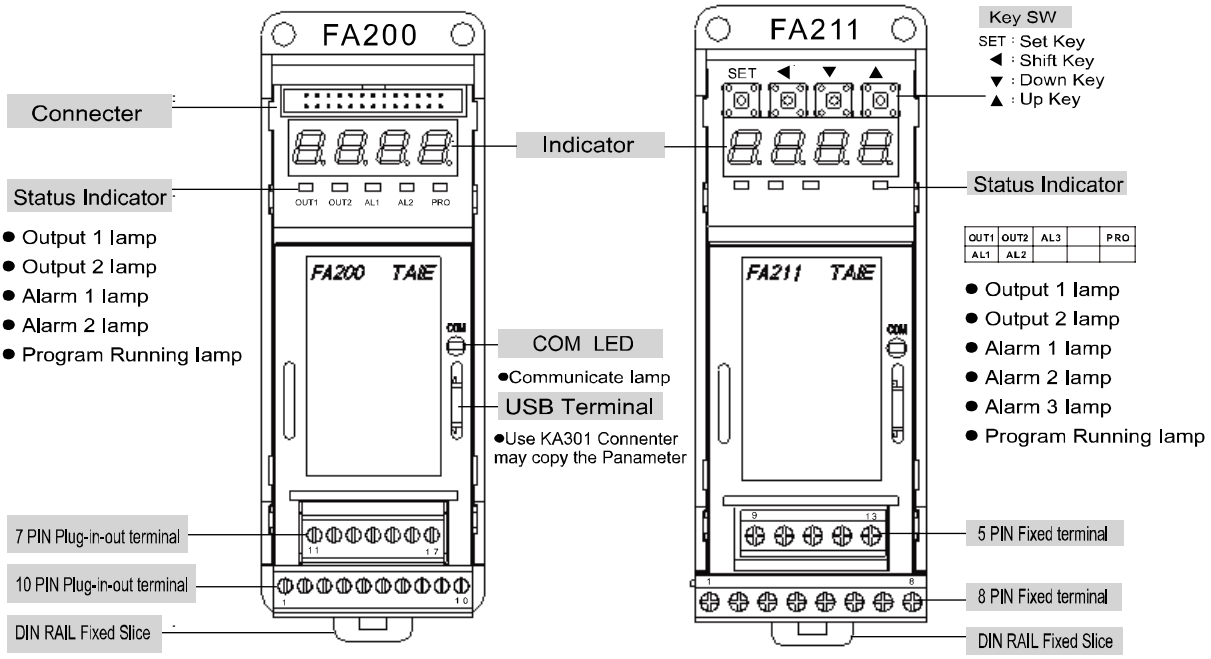
5. Avoid installing controller in following spaces:
   I. A place where the ambient temperature may reach beyond the range from 0 to 50℃
   II. A place where the ambient humidity may reach beyond the range from 20 to 90% RH.
   III. A place where the controller likely to come into contact with water, 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.

2. FA Series

2.1 Specifications

FA module controllers are divided two types FA200 Advance FA211 Economic

FA200 Advance Type	Plug in out terminal, External operating box with double displays
FA211 Economic Type	Fixed terminal, Build in 4 operating keys, Single display



● Standard Spec.

Model		Advance Type FA200	Economic Type FA211
	Outer case color	two colors of deep black & light gray are available	
	Wiring terminal	Plug in out terminal	fixed terminal
	Parameter setting	by external control box or by communication	build in 4 operating keys or by communication
	Assembly	DIN rail, M4 screw hole, magnetic seat	DIN rail or M4 screw hole
	Display	External control box with double display + PV single display	single display
	Standard accessories	1 Output + 1 Alarm	
	Maximum expansibility	1 Output + 2 Alarms or 2 Outputs + 1 Alarm	
Additional Option	Programmable 2 patterns by 8 segments	Yes (Option)	Yes (Option)
	High life SSR	Yes (Option)	Yes (Option)
	Communication	Yes (Option)	Yes (Option)
	Motor Valve Control	Yes (Option)	No
	TRS	Yes (Option)	No
	Remote SV	Yes (Option)	No
	Heater Break Alarm (HBA)	Yes (Option)	No

● General Spec.

Supply Voltage	AC 85-265V
Frequency	50 / 60 HZ
Power Consumption	Approx 4VA
Data Protection	EEPROM, Endurance : 1 Million write cycles, Data Retention : 10 years
Isolated resistance	main loop –case(ground) 、control loop – case(ground) DC500V > 10MΩ
Dielectric Strength	main loop –case(ground) AC 1500V 1min / control loop – case(ground) AC 1000V 1min
Vibration Endurance	10~55HZ 0.5mm (MAX 2G) XYZ various direction 2h
Assault Endurance	100m/s2 (Approx 10G) XYZ various direction 3 times
Protection Configuration	IP00
Display Height of Control box	LED Module PV : 14mm SV : 10mm without control box
Display Height of single range LED	7 section digital display : 7mm
Dimension	40 x 107 x 43 mm
Weight	Appro x 115g
Operating Ambient temperature	0~50˚C
Operating Ambient humidity	correspondent humidity 20-90% RH without dew
Reserved Temperature	-25˚C ~ + 65˚C

● Control Features

Control method	Heating,Cooling single output or Heating & Cooling both output PID,PI,PD,P,ON/OFF(P=0), FUZZY
PID Parameter	P : 0.0 - 200.0% I : 0 ~3600 sec. D : 0 ~900 sec.
Control Cycle	0~150 sec.

● Input Features

Input	**The point of signal point**	1 point
	Accuracy	0.2 % Full Scale ± 1digit
	Sample time	250 ms
	TC	K , J , R , S , B , E , N , T , W5Re/W26Re , PLII , U , L
	RTD	PT100 , JPT100
	mA (DC)	4-20mA , 0-20mA
	Voltage (DC)	0-1V , 0-5V , 0-10V , 1-5V , 2-10V, -10-10mV , 0-10mV , 0-20mV , 0-50mV , 10-50mV
	DP Position Option **0000 000.0 00.00 0.000**	When using the input of sensor signal, DP position for PV can be selected the sensor code No. 1~ 52 When using the input of DC mA or Voltage, DP position for PV can be selected code No. 61 ~96 by DP Parameter.

● Output Features

Output 1	**Relay**	SPDT type (a point 8A, b point 3A 220V)	SPST type (1a point 8A 220V)
	For external SSR drive	ON : 24V , OFF : 0V, Max. load current 20mA	
	4-20mA / 0-20mA	Max. load resistance 560 Ω	
	0-5V , 0-10 V	Max. load current 20mA	
	SSR high life relay	1A TRIAC SSR (Option)	
Output 2	**Relay**	SPST type 8A 220V	
	For external SSR drive	ON : 24V , OFF : 0V , Max. load current 20mA	
	4-20mA / 0-20mA	Max. load resistance 560 Ω	
	0-5V , 0-10 V	Max. load current 20mA	
	High life relay	1A TRIAC SSR (Option)	

● Communication

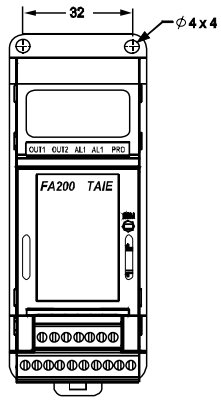
Interface	RS-485 two wires Half Duplex
Protocol	Modbus RTU、Modbus ASCII、TAIE
Data bit	8 bit
Start bit	1 bit
Stop bit	1 bit or 2 bit
Baud rate	38400、19200、9600、4800、2400 bps。
Error examine	Parity even 、 odd or CRC-16 (in Modbus)
Connective pieces	Maximum 32 pcs
Communicate range	Maximum 1200 m

● Alarms

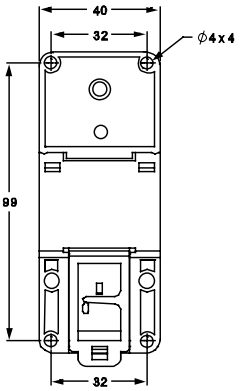
Alarm 1 Relay	SPDT type (a point 8A, b point 3A 220V)	SPST type 1a point 8A 220V
Alarm 2 Relay	SPST type 8A 220V	
Alarm setting range	-1999~9999 (Dot positions are different depended on the various Input Types)	

2.2 Outer Dimension

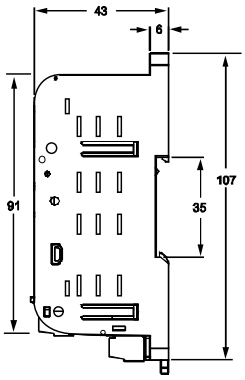
front drawing



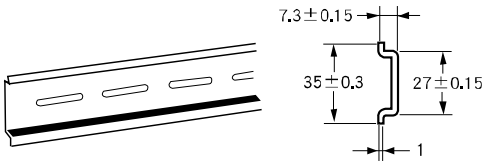
back drawing



side drawing

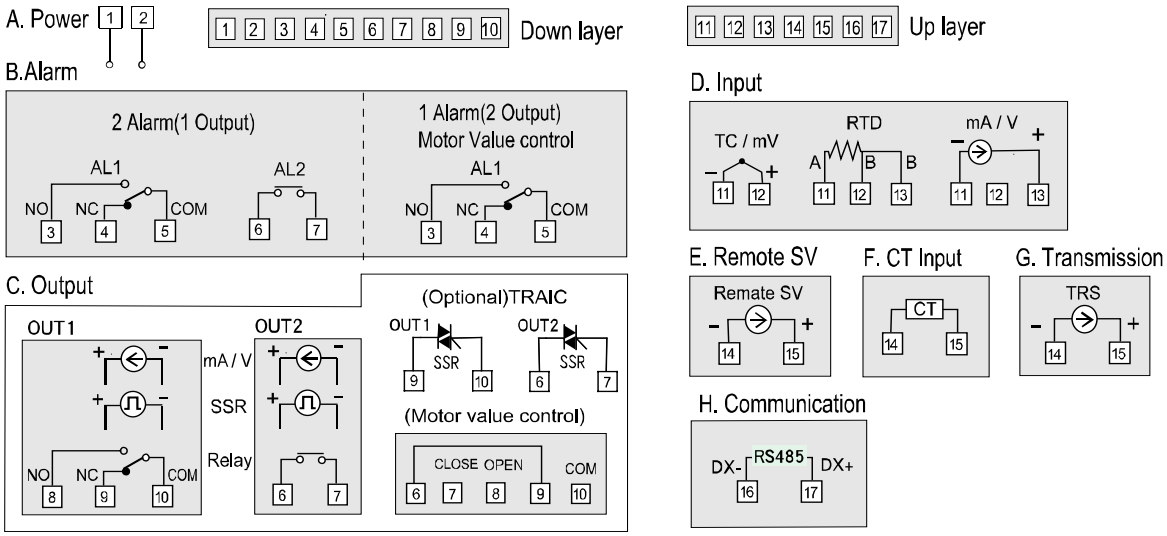


DIN Rail Dimension (reference)

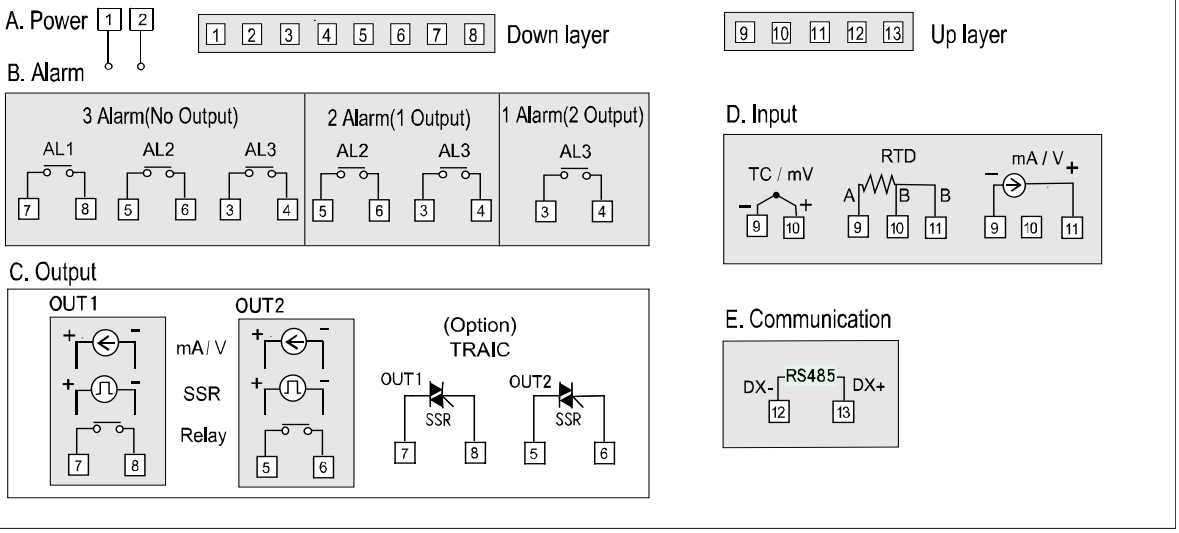


2.3 Terminal Wiring Diagram

FA 200 Advance Type Plug-in-out Pitch 3.5 mm plug-in-out terminal M2.0 using "—" screwdriver



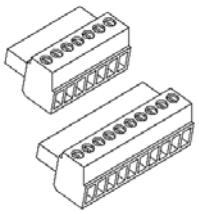
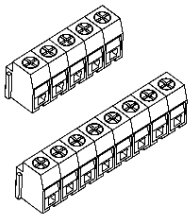
FA 211 Economic Type Fixed Pitch 5.0 mm fixed terminal M2.6 using "+" screwdriver



2.4 Assembly & Wiring

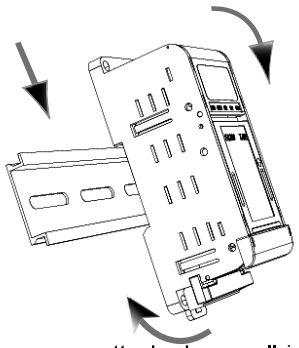
For FA200, please use plug-in-out wiring terminal = > using width 2.4mm "—" screwdriver

For FA211, please fixed wiring terminal => using width 3.0mm "+" screwdriver

plug-in-out terminal M2.0 using "—"screwdriver	fix terminal M2.6 using "+"screwdriver
	

Selecting suitable electric wire of AWG 16 ~ AWG22 Lock Screw torque: 0.3 N.m (3 kgf.cm)

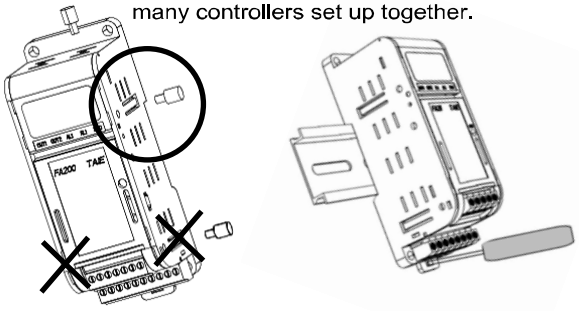
1. Please prevent the controllers from the environment of high noise, corrosive gas and high temperature and high humidity when controllers are assembling. (Normal operating environment : 0 ~ 50℃ , 20 ~ 90%RH)
2. Power wiring must be distant from main power and load power to avoid the interference of noise.
3. To extend the wires of thermocouple input, please use the correspondent compensation leading wires.
4. To extend the wires of RTD input, please use shield wires which have the same materials among 3 wires with low resistance.



Please use attached a small interval stick in the up half both of controllers to assure the heat issuing good when many controllers set up together.

5. Please vertically install FA series by crabwise direction, hear the light voice of "Ka" to sure fixing and no loose when assembling FA series with on DIN rail.

Do not insert a small interval stick in the down half both of controllers to prevent the efficiency of compensating normal temperature.



6. Separated secure cover of terminals are divided to up and down of two covers, please avoid the mistake and assure fixing when assembling

3 FY / FU Series

- **Standard spec.**

Model		FY400 / FU48	FY600	FY700 / FU72	FY800 / FU86	FY900 / FU96	FY100	FY101
Dimension		48X48mm	96X48mm	72X72mm	48X96mm	96X96mm	175X110mm	90X90mm
Supply voltage		AC 85~265V，DC 15~50V (Option)					AC 85~265V	
Frequency		50 / 60 HZ						
Power consumption		approx 3VA	approx 4VA	approx 3VA	approx 4VA	approx 4VA	approx 4VA	approx 3VA
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	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	130g	80g
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 / FU48	FY600	FY700 / FU72	FY800 / FU86	FY900 / FU96	FY100	FY101
Output 2	For heating and cooling control use. Relay , SSR , 4~20mA , 0~20mA , 0~5V , 0~10V , 1~5V , 2~10V						
Alarm 2	Available SPST type	Available SPDT type	Available SPST type	Available SPDT type	Available SPDT type	Available SPDT type	Not available
	3A , 220V , electrical life:100,000 times or more (under rated load)						
Alarm 3	Not available	Available SPST type	Available SPST type	Available SPST type	Available SPST type	Available SPST type	Not available
	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 (5.8mm dia , 0.0~80.0A) or SC-100-T (12mm dia , 0.0~99.9A)						
	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)**

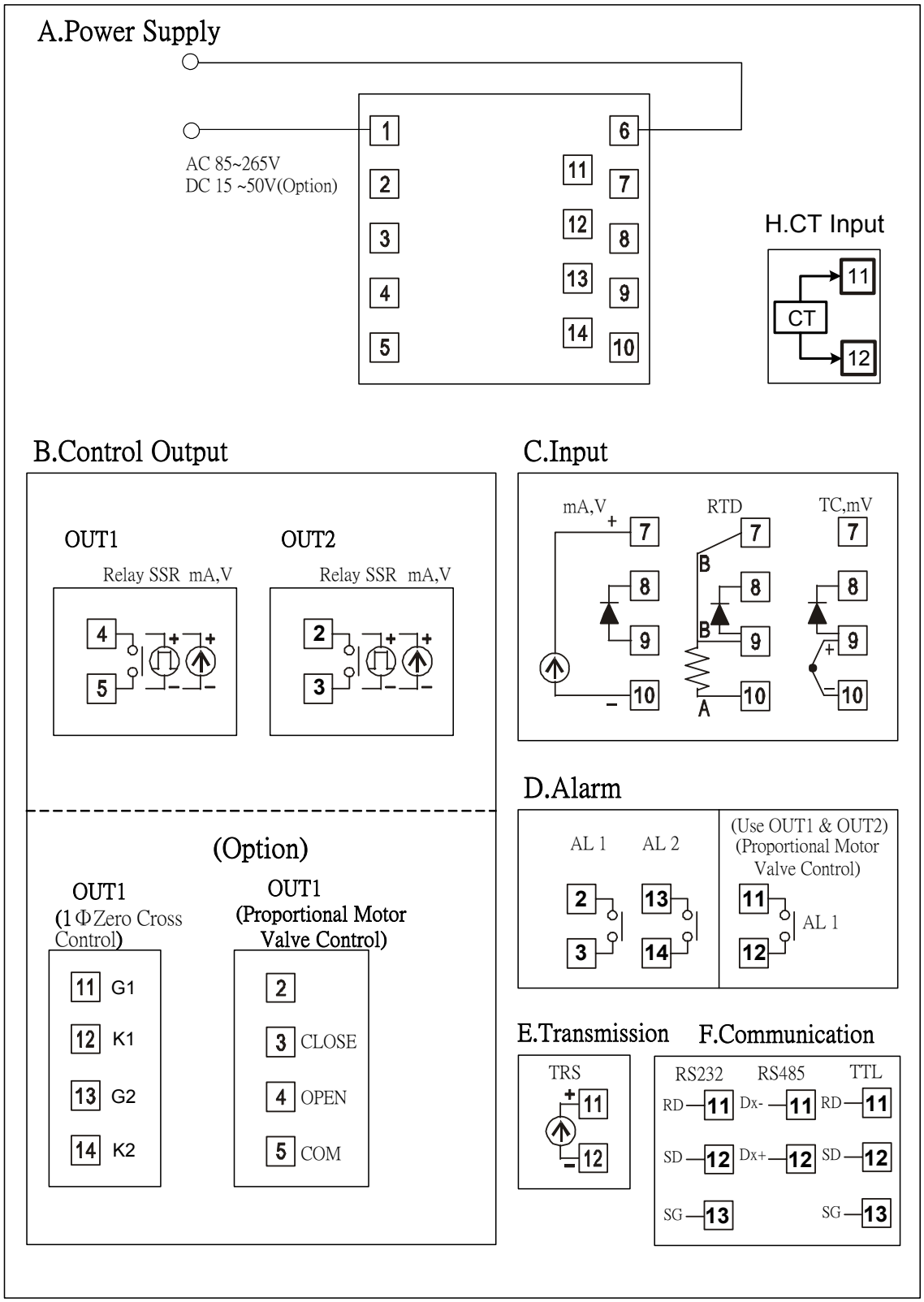
Model	FY400 / FU48	FY600	FY700 / FU72	FY800 / FU86	FY900 / FU96	FY100	FY101
1φ zero crossing control(1φSSR)	Available	Not available	Available	Not available	Available	Not available	Not available
3φ zero crossing control(3φSSR)	Not available				Available	Not available	Not available
Motor valve control	Available						
1φ phase angle control(1φSCR)	Not available	Available				Available	Not available
3φ phase angle control(3φSCR)	Not available				Available	Not available	Not available

- **Programmable RAMP/SOAK**

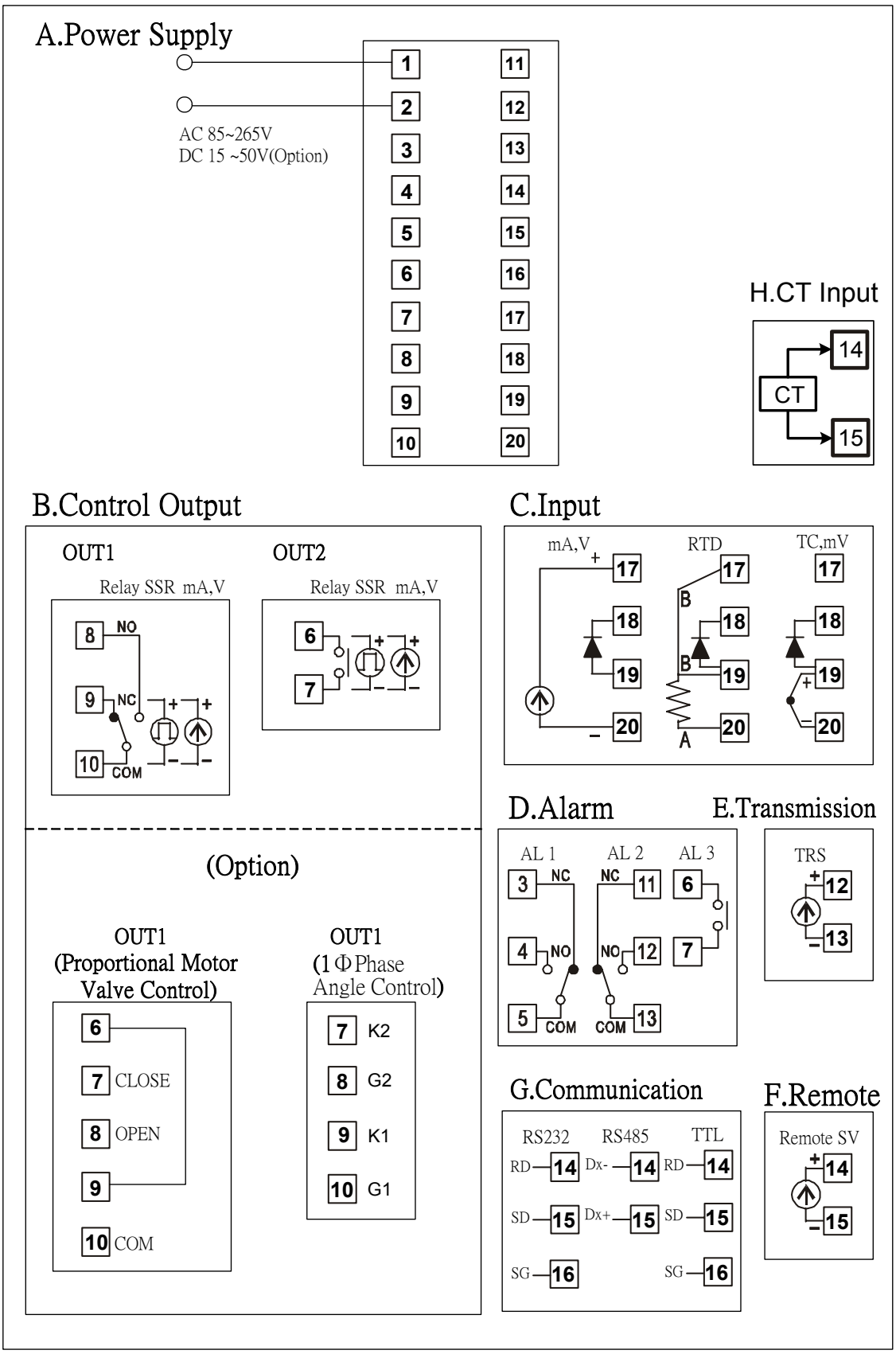
Model	PFY400	PFY600	PFY700	PFY800	PFY900	PFY100	PFY101
Programmable RAMP/SOAK	2 patterns with 8 segment each. The 2 patterns can be linked together as 16 segments use.						

4. Terminal arrangement

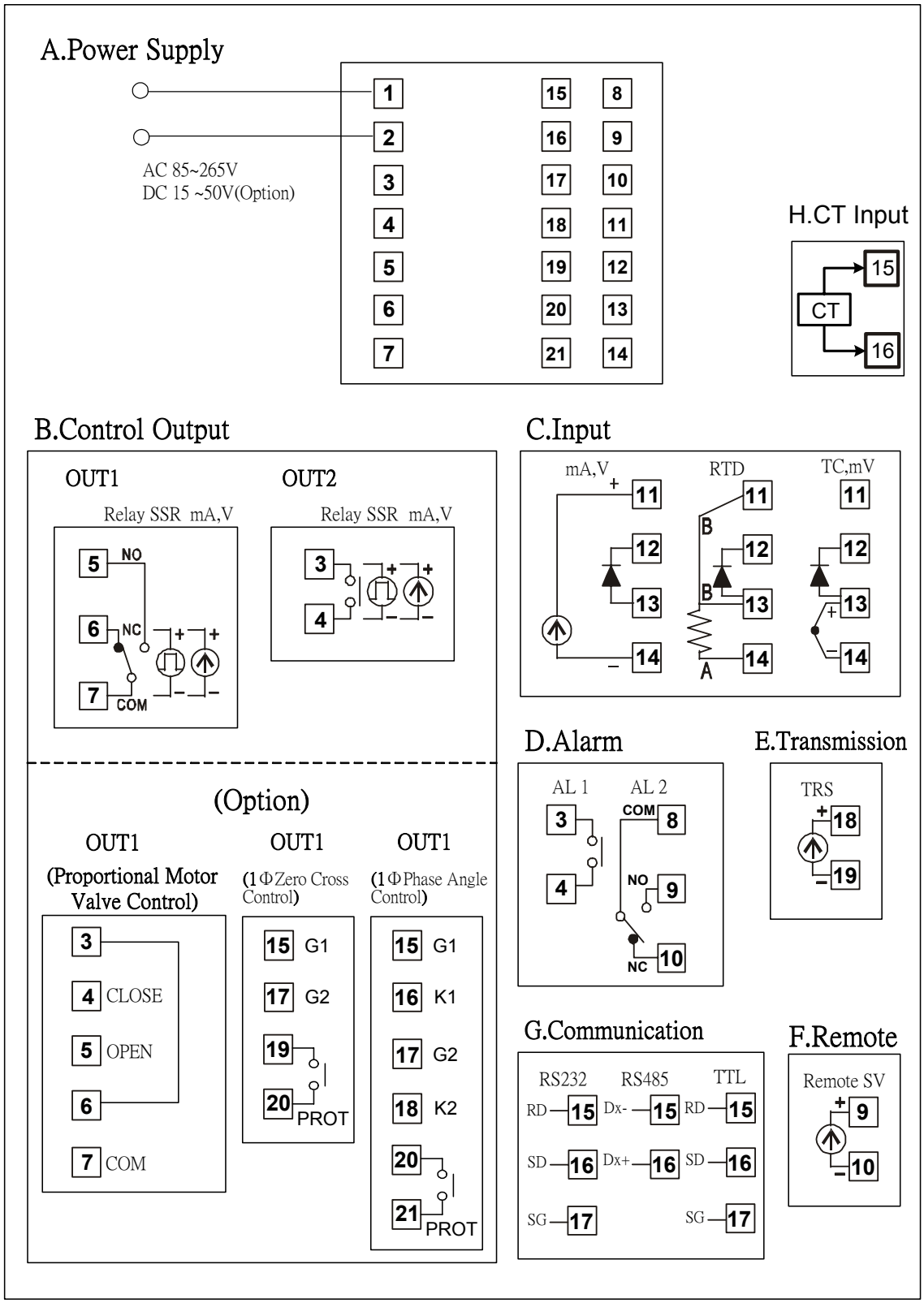
4.1 FY400 / FU48 Terminals (48mm x 48mm , DIN 1/16)



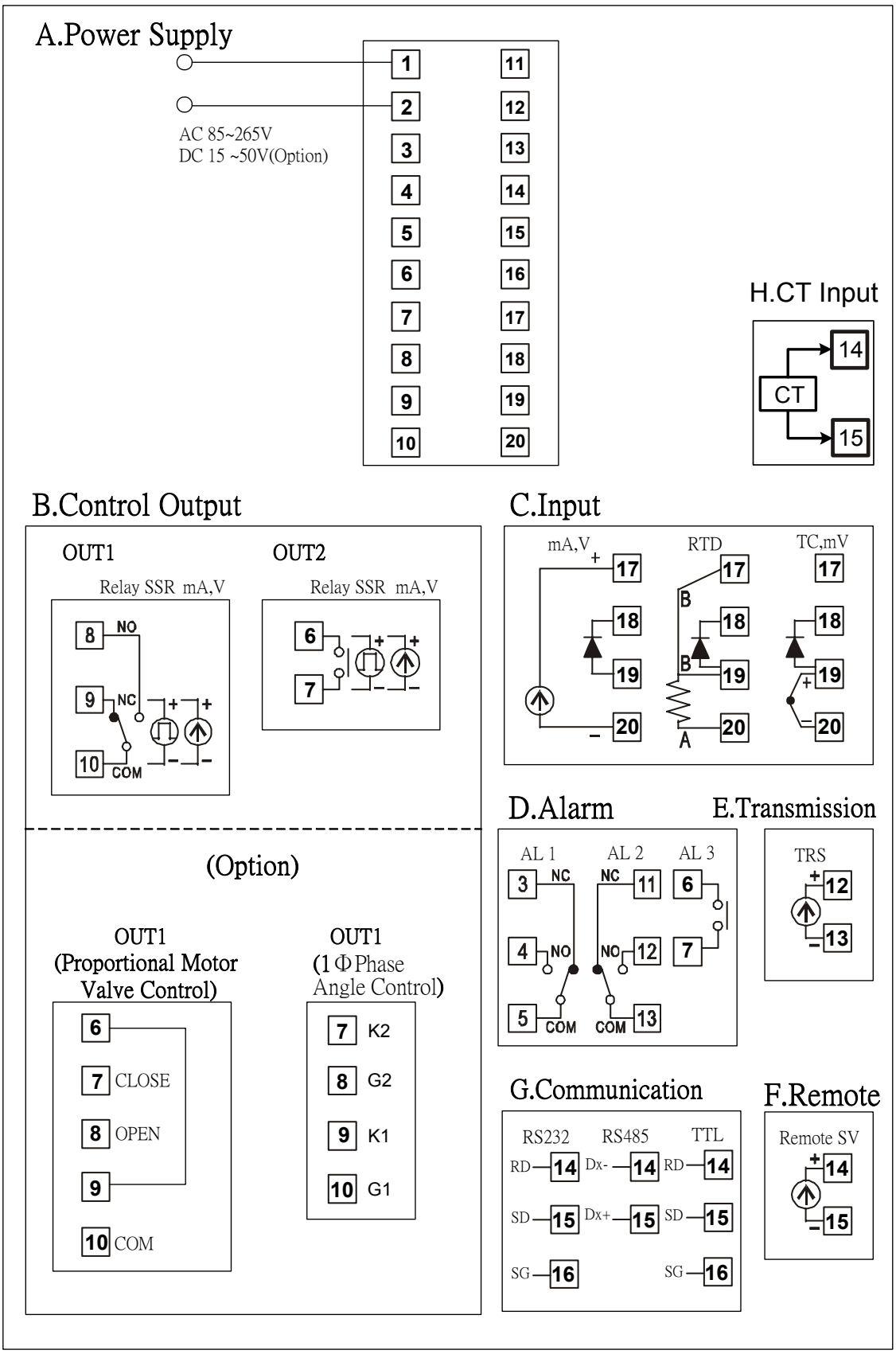
4.2 FY600 Terminals (96mm x 48mm , DIN 1/8)



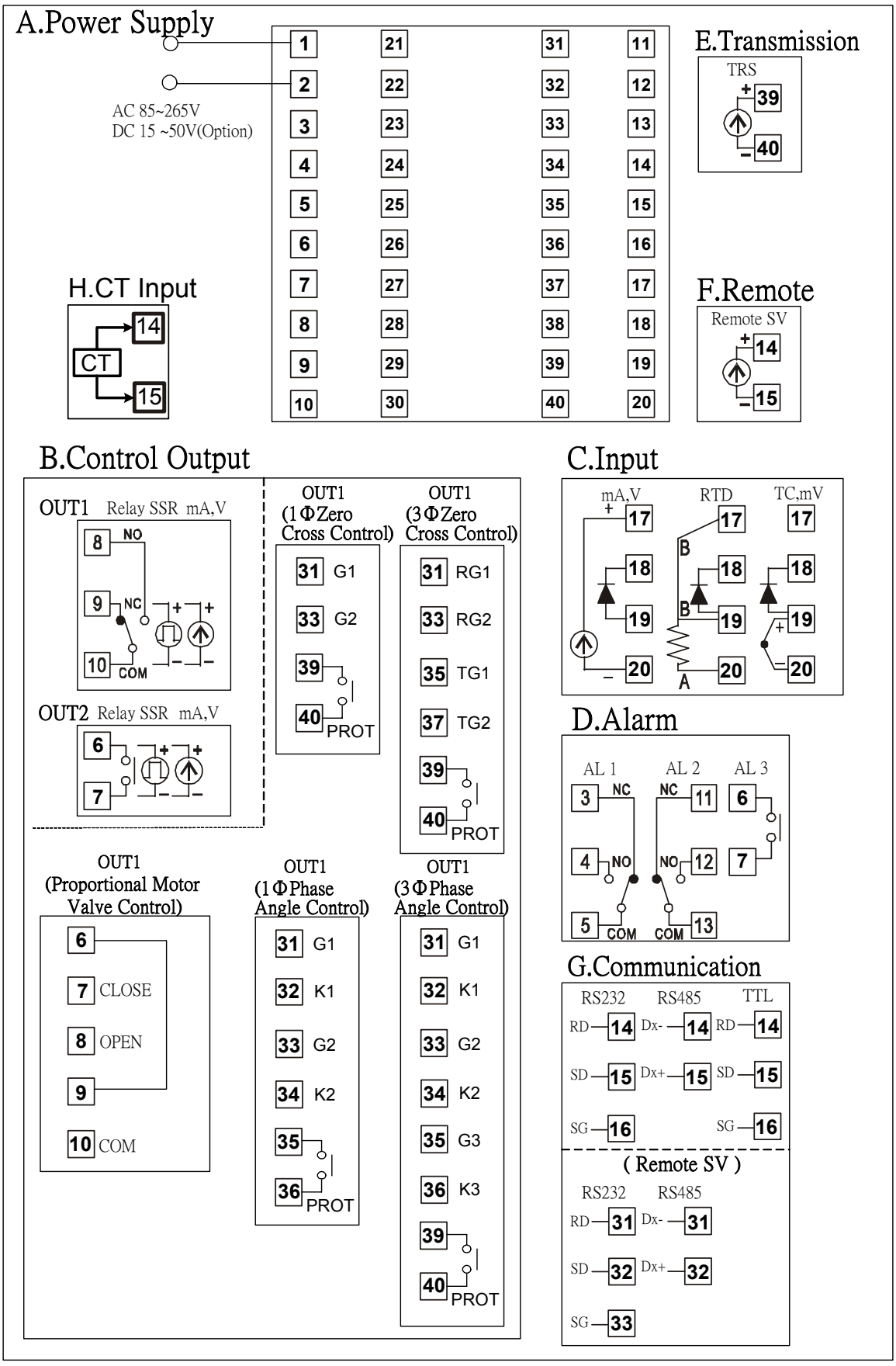
4.3 FY700 / FU72 Terminals (72mm x 72mm)



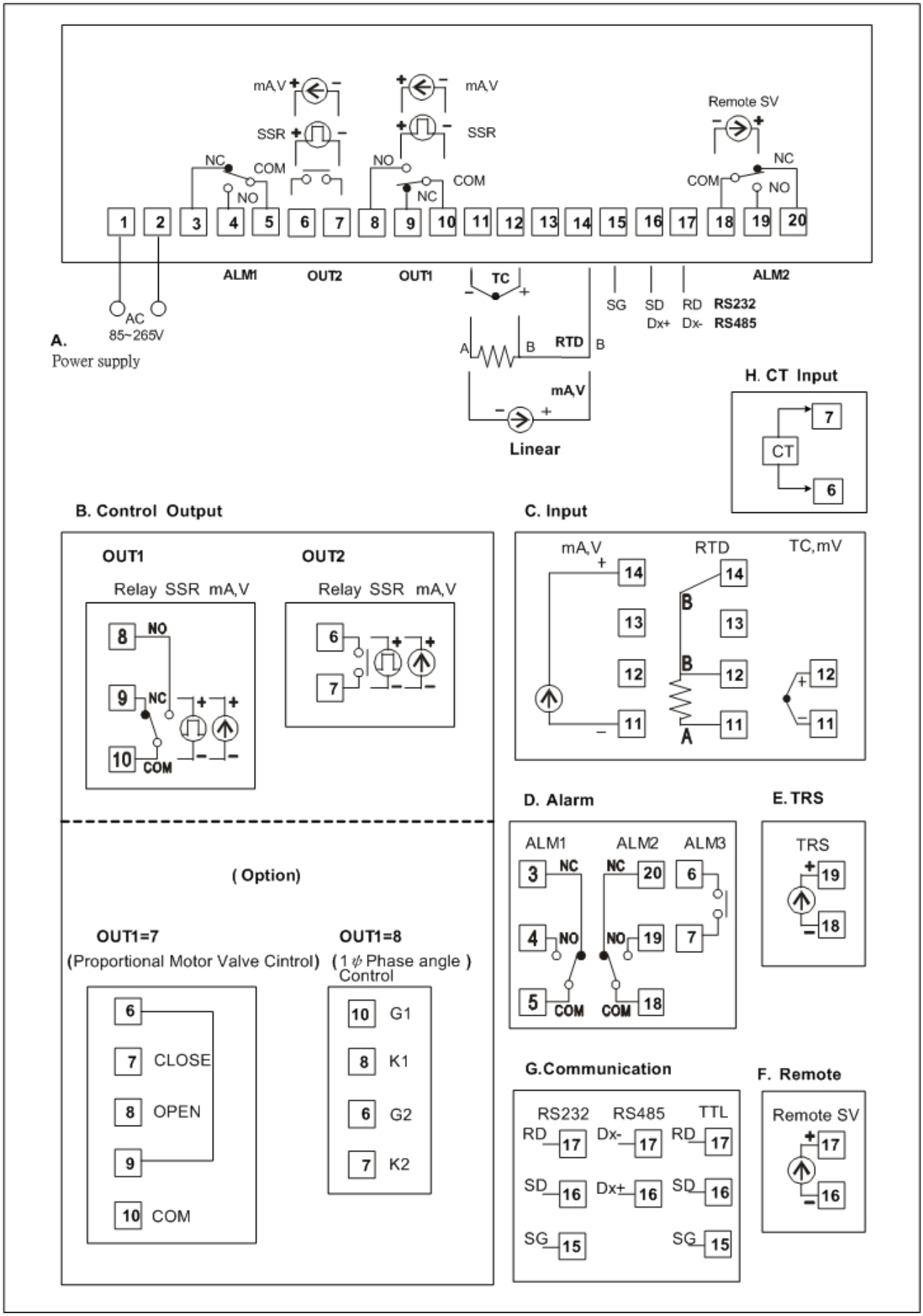
4.4 FY800 / FU86 Terminals (48mm x 96mm , DIN 1/8)



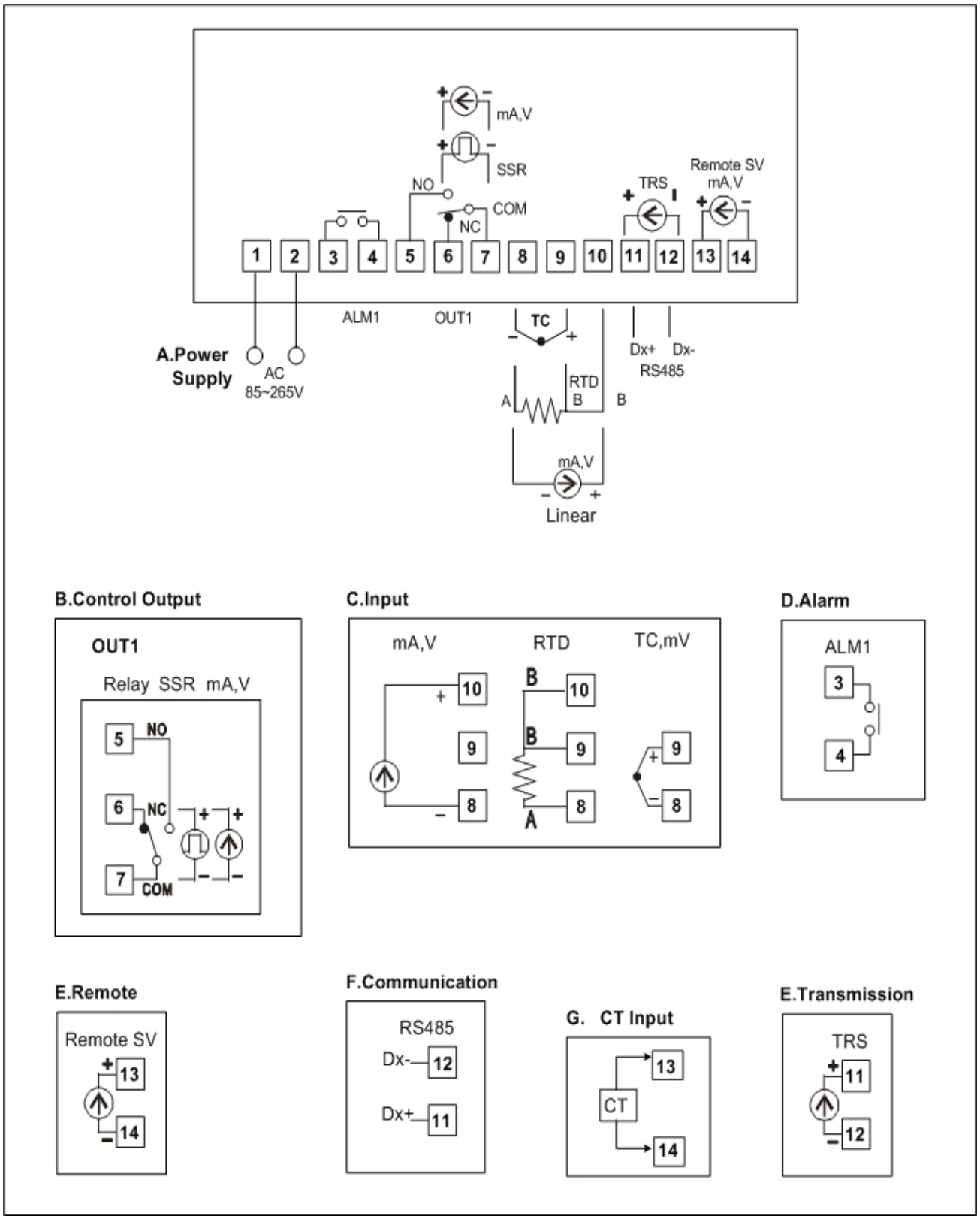
4.5 FY900 / FU96 Terminals (96mm x 96mm , DIN 1/4)



4.6 FY100 Terminals (175mm x 110mm)

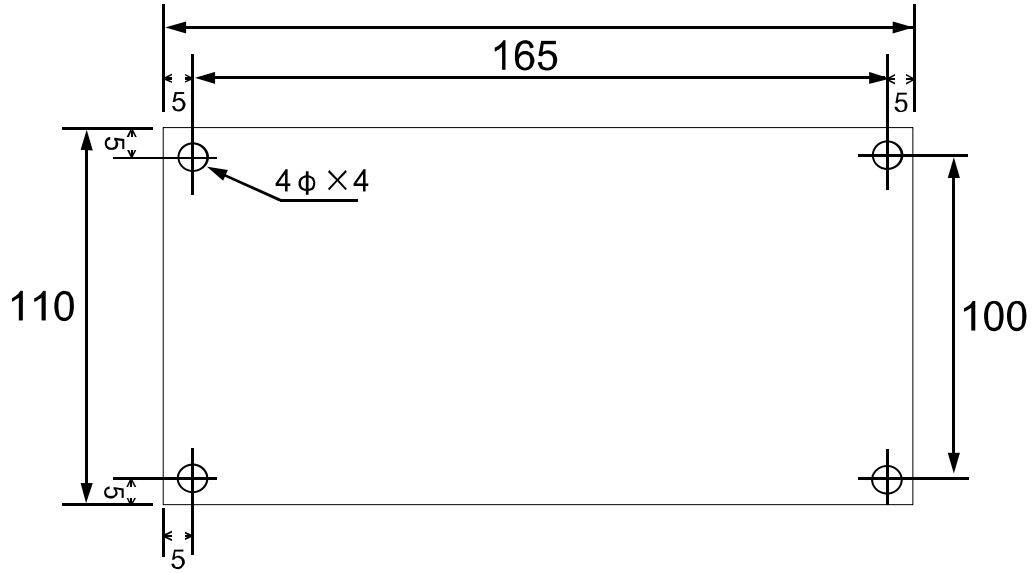


4.7 FY101 Terminals (90mm x 90mm)

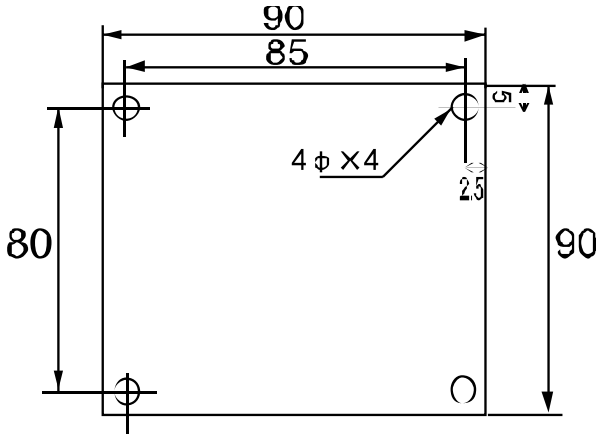


5. External dimension and panel cutout〈Unit：mm〉

5.1 FY100

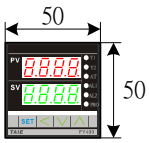


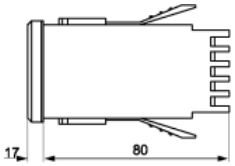
5.2 FY101

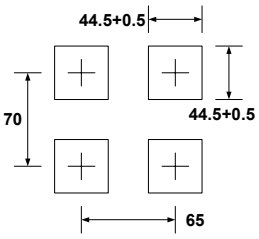


5.3 FY400~900 & FU48~96

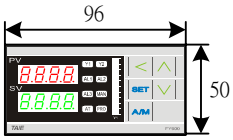
FY400/ FU48

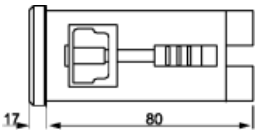


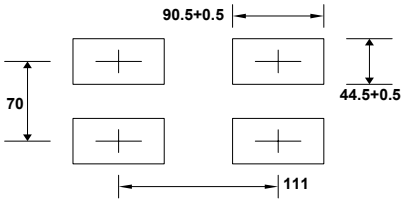




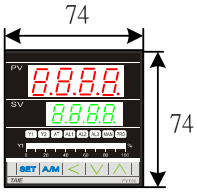
FY600

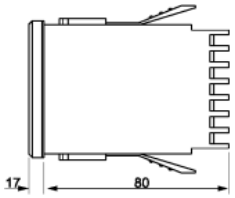


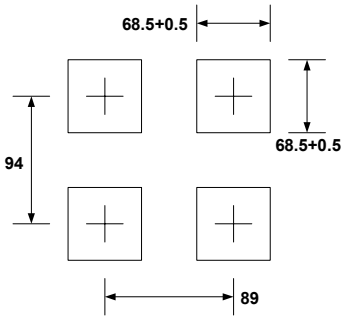




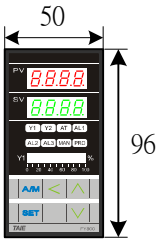
FY700/ FU72

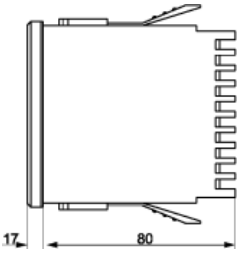


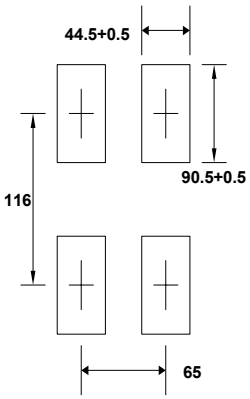




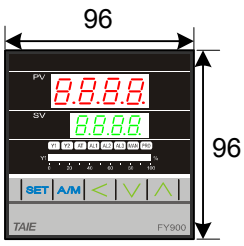
FY800/ FU86

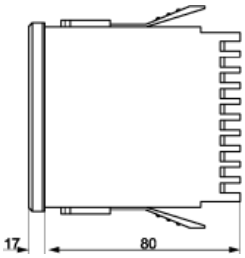


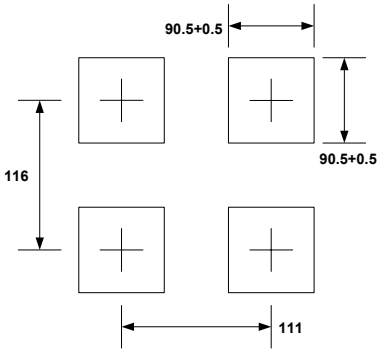




FY900/ FU96

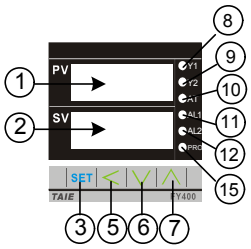




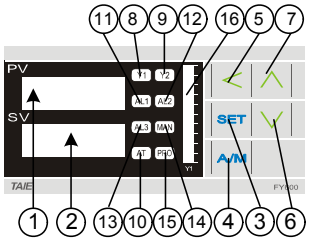


6. Parts description

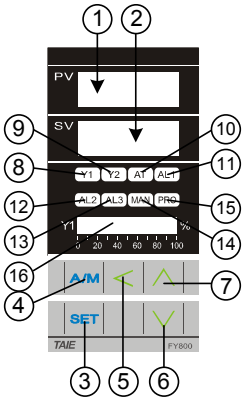
FY400/FU48



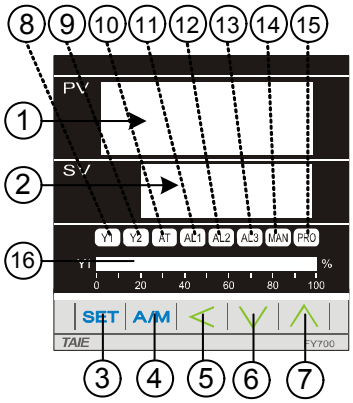
FY600



FY800/FU86



FY700/FY900/FU72/FU96
FY100/101 External Interface Unit

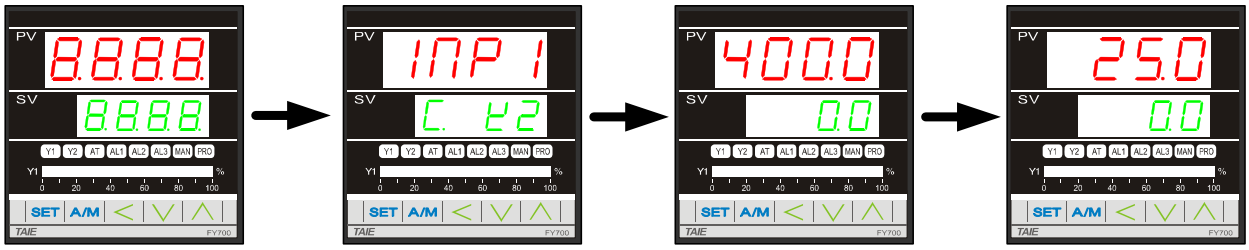


SYMBOL	NAME		FUNCTION
PV	①	Measured value (PV) display	Displays PV or various parameter symbols (Red)
SV	②	Set value (SV) display	Displays SV or various parameter set values (Green)
SET	③	Set key	Used for parameter calling up and set value registration
A/M	④	Auto/Manual key	Switches between Auto(PID) output mode and Manual output mode.
<	⑤	Shift key	Shift digits when settings are changed
V	⑥	Down key **Program hold*	Decrease numbers (-1000,-100,-10,-1) ** Program hold*〈*Programmable controller*〉
Λ	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.

7. Operations

7.1 Power On

Controller will display as below



All LED and 7 segment displays will be lighted

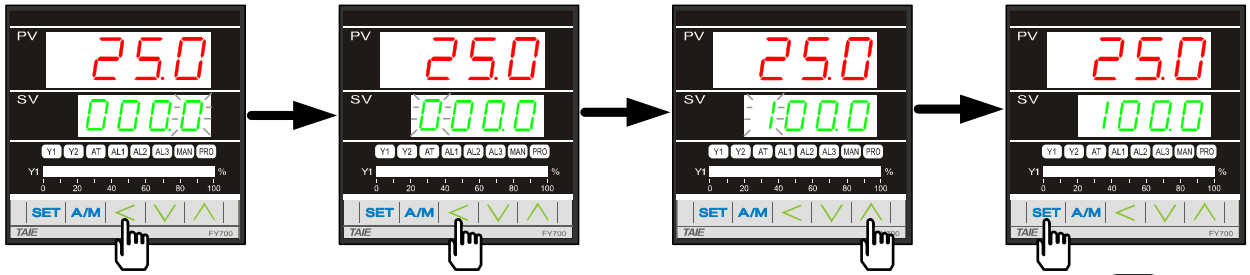
Display input type (K2)

Display range (0.0~400.0)

Ready for use

7.2 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.

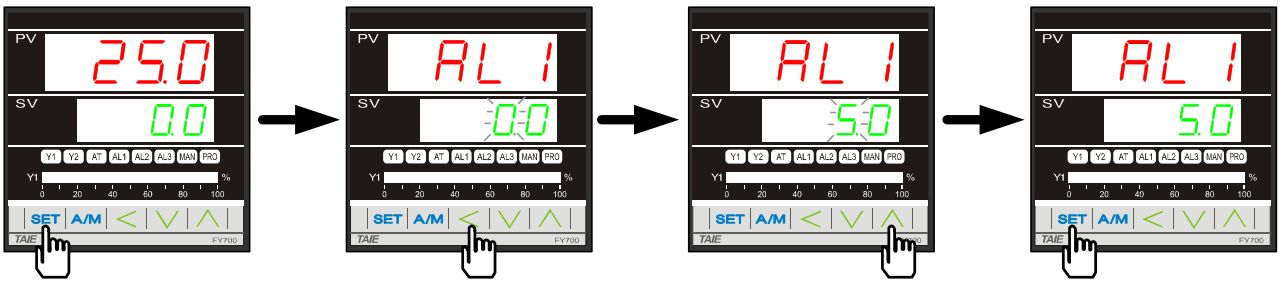
Press < key to select the hundreds digit.

Press ∧ key to change the number to 1

Press SET key to store the new set value.

7.3 Change the Alarm Value

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



Press SET key to display parameter AL1

Press < key to change AL1 value

Press ∧ key increase AL1 value

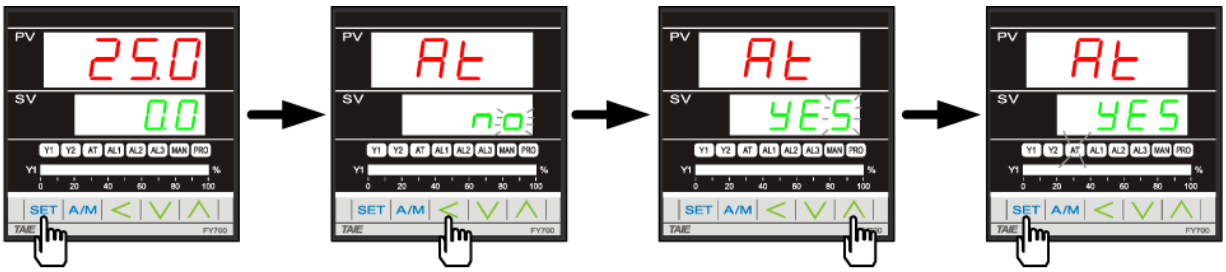
Press SET key store the new value of AL1

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

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

7.4 Autotuning (AT)

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



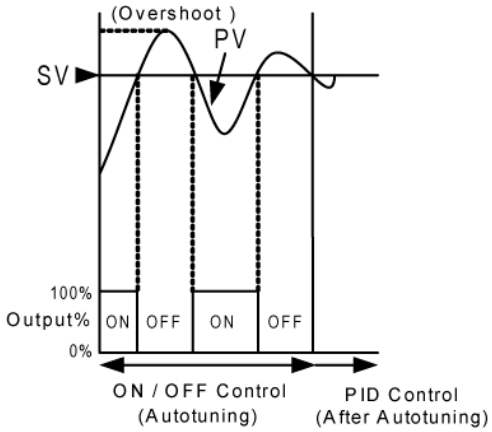
Press SET key to display parameter AT.

Press < key to change AT setting

Press ∧ key change AT to "YES"

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

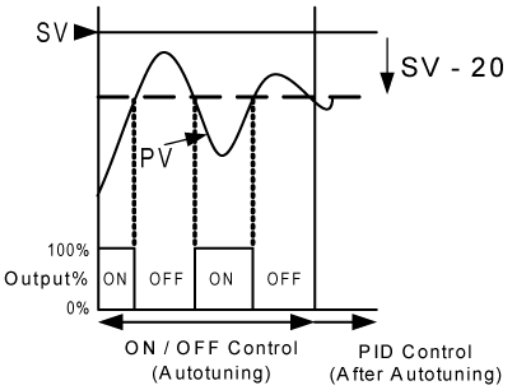
Autotuning
ATVL=0



Autotuning
ATVL=20

*Set ATVL to prevent overshoot occurred during autotuning process.

To set ATVL ,press SET key 3 seconds to enter Level 2 (PID Level) and then change the value.



Autotuning failure

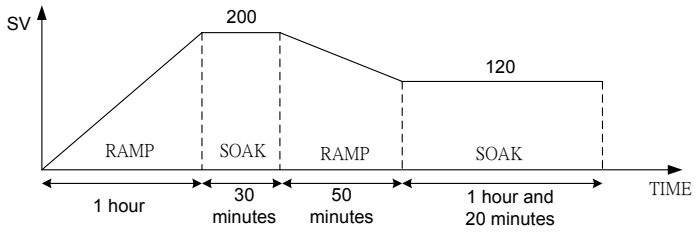
Possible cause 1: ATVL is too big. (If not sure，set ATVL=0)

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

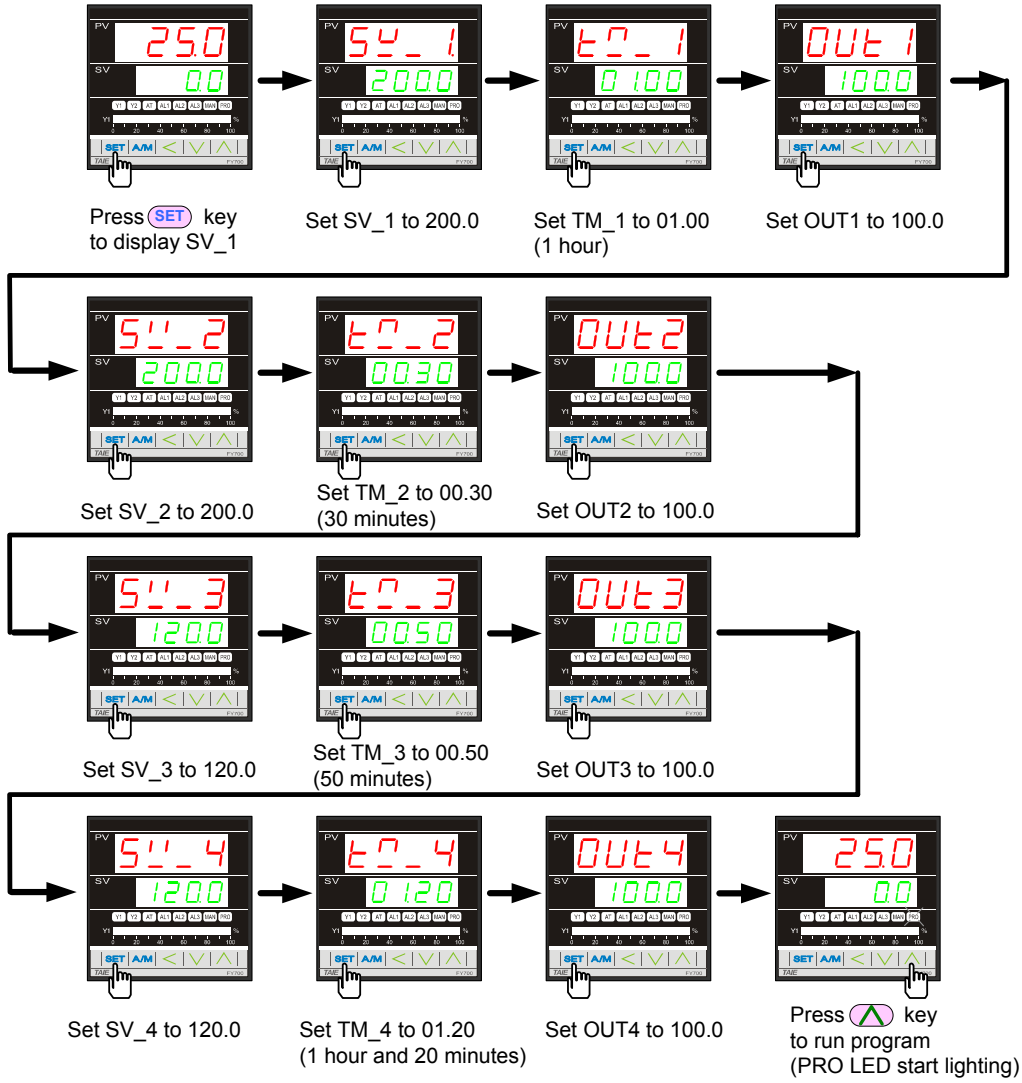
7.5 Programmable RAMP / SOAK (Only available for PFY model)

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

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



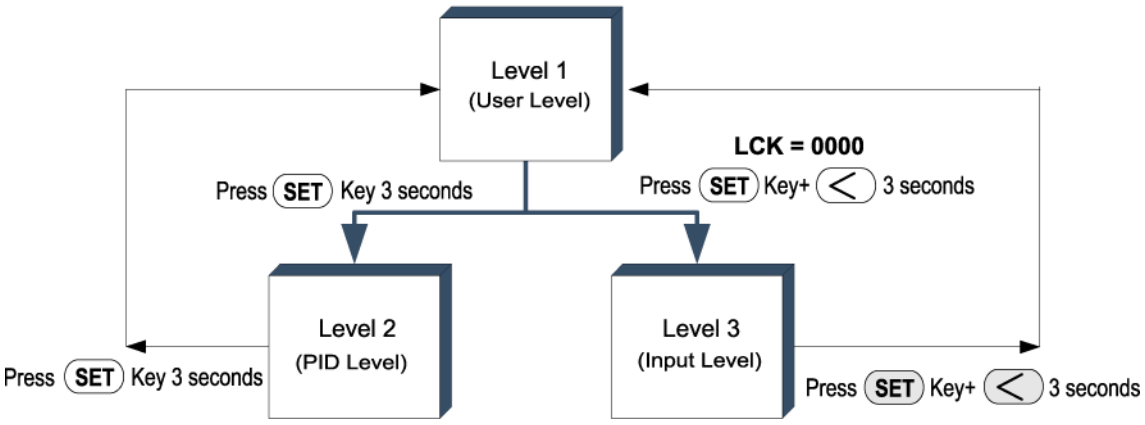
Please operate conroller as following steps:



8. Operation levels

8.1 Levels diagram

1. When the power is on, it will stay at Level 1(User Level) automatically.
2. The controller returns to Level 1 if there is no key operation within 60 seconds.
3. In any Level, press (A/M) key twice will return to Level 1.
   (FU48 don't have (A/M) key)



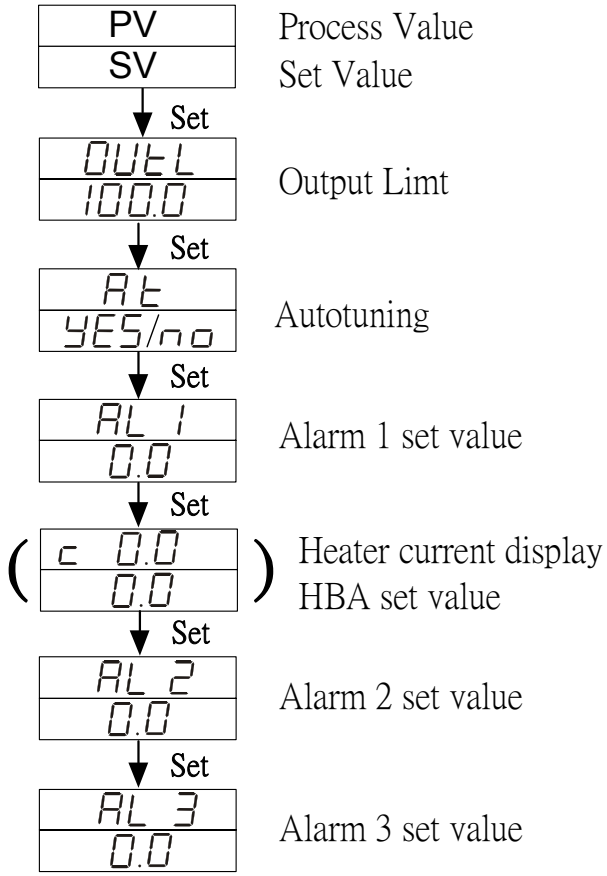
8.2 Lock function

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"

9. Parameters

9.1 Level 1 (User Level)



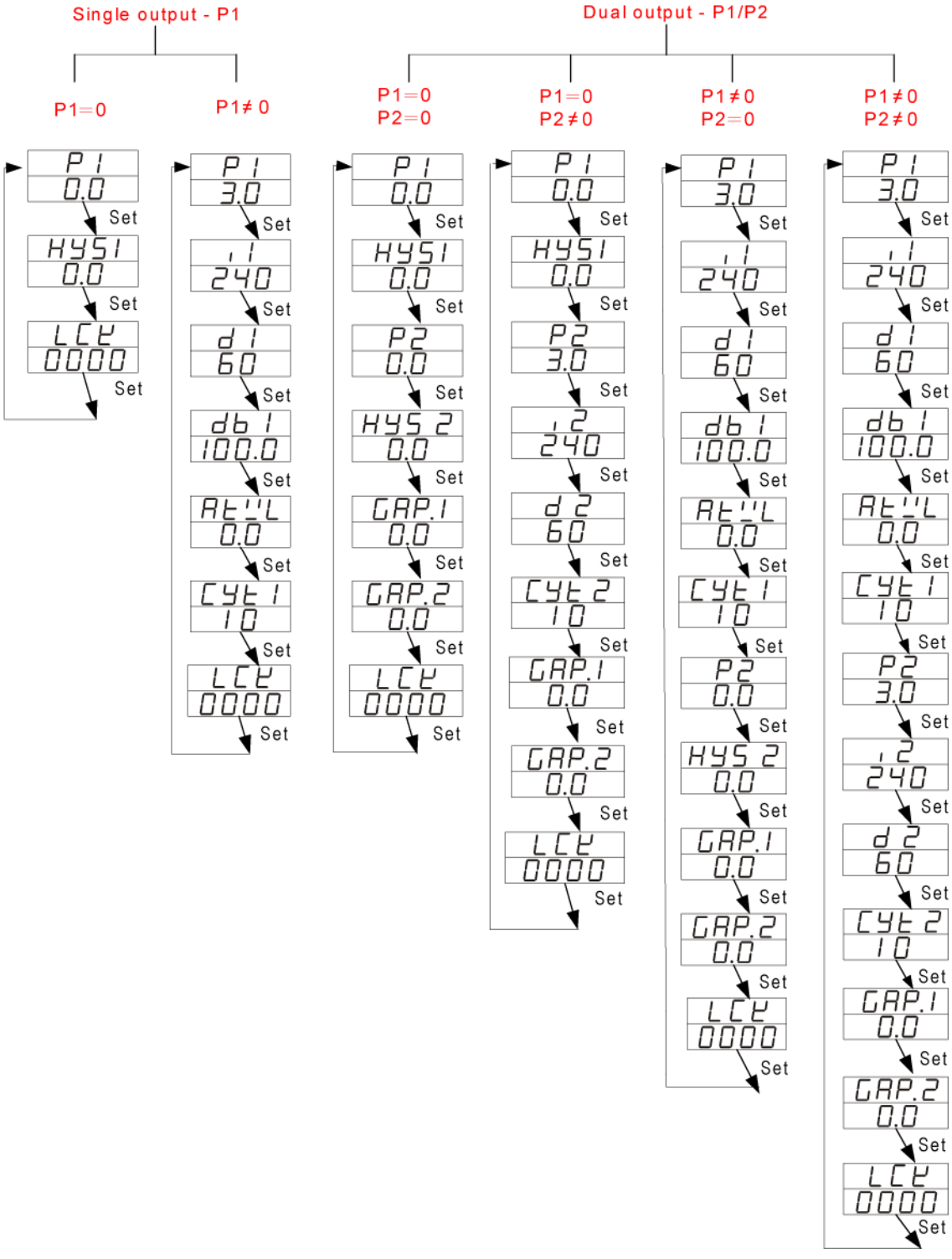
9.2 LEVEL 2 (PID Level)

To enter level 2, press SET key 3 seconds in level 1

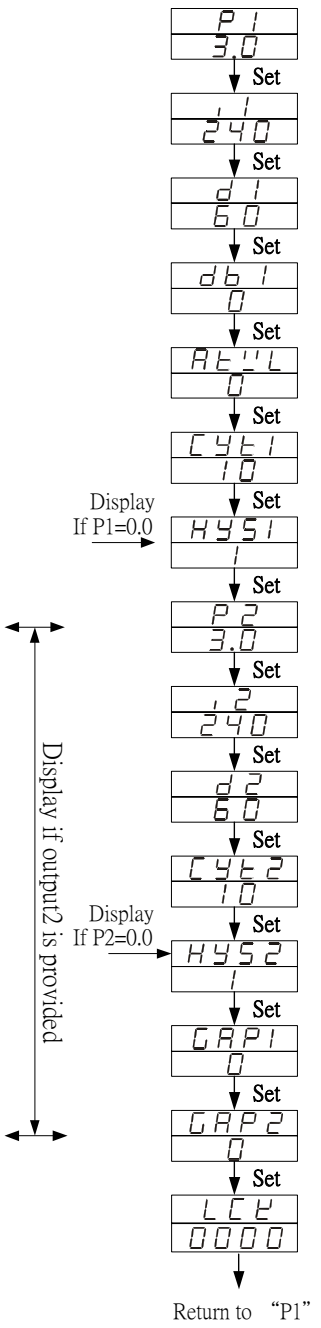
9.2.1 Level 2 parameters display / hiding condition

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

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



9.2.2 Description of parameters

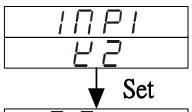
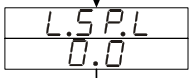
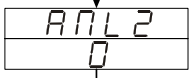
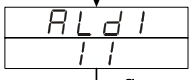
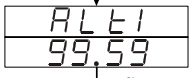
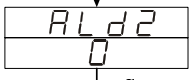
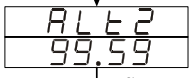
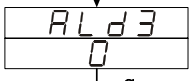
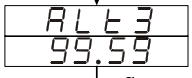
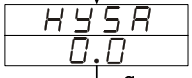
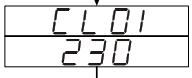
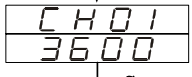


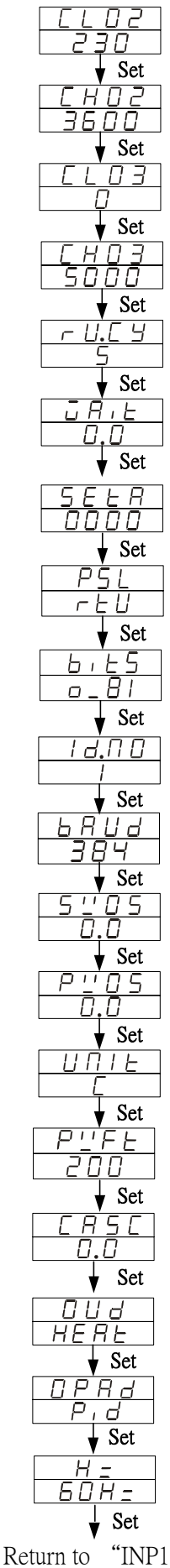
Proportional band 1 (For output 1)	Range：0.0~200.0% ON/OFF control if set to 0 (0.0)
Integral time 1 (For output 1)	Range：0~3600 seconds PD control if set to 0
Derivative time 1 (For output 1)	Range：0~900 seconds PI control if set to 0
Reserved	Reserved
Auto tuning offset value	Range：0~USPL
Output 1 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”

9.3 LEVEL 3 (Input Level)

To enter level 3 , set LCK to ”0000”and then press SET key + Shift(◁) key 3 seconds.

	Input type selection	
Set		
	Analog input low limit calibration (Used for mA and V input)	Range：-1999 ~ 9999
Set		
	Analog input high limit calibration (Used for mA and V input)	Range：0 ~ 9999
Set		
	Decimal point position (Available for mA and V input)	0000，000.0，00.00，0.000
Set		
	Lower Set-Point Limit	Scaling Low Limit
Set		
	Upper Set-Point Limit	Scaling High Limit
Set		
	Remote input low limit calibration	Range：-1999 ~ 9999
Set		
	Remote input high limit calibration	Range：0 ~ 9999
Set		
	Alarm mode of AL1	Range:00~19 Refer to “Alarm mode type”
Set		
	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)
Set		
	Alarm mode of AL2	The same with ALD1
Set		
	Alarm time of AL2	The same with ALT1
Set		
	Alarm mode of AL3	The same with ALD1
Set		
	Alarm time of AL3	The same with ALT1
Set		
	Hysteresis of all Alarm	Range：0~1000
Set		
	Output 1 low limit calibration (Used for mA and V output)	Range：0 ~ 9999
Set		
	Output 1 low limit calibration (Used for mA and V output)	Range：0 ~ 9999
Set		



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

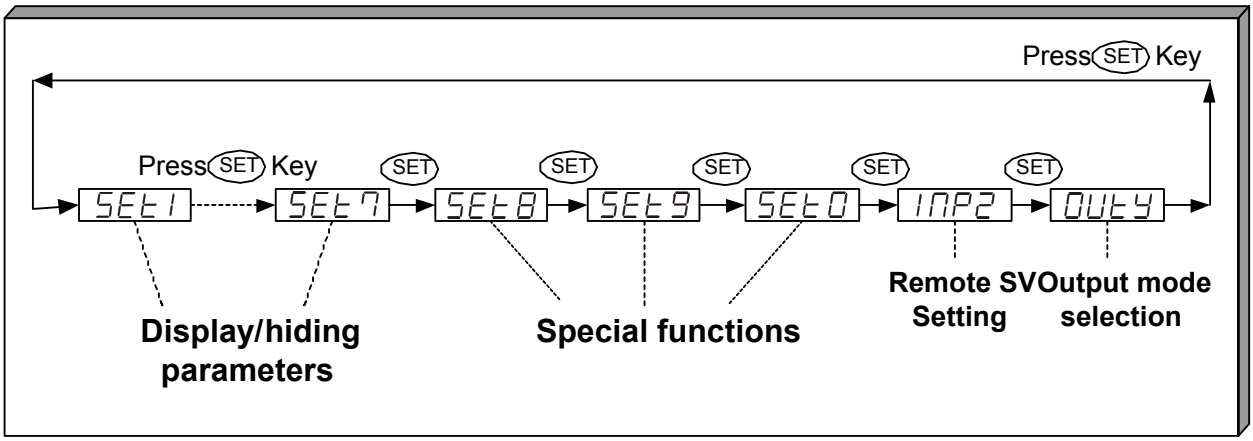
Control algorithm — PID / Fuzzy

Frequency — 50 / 60HZ

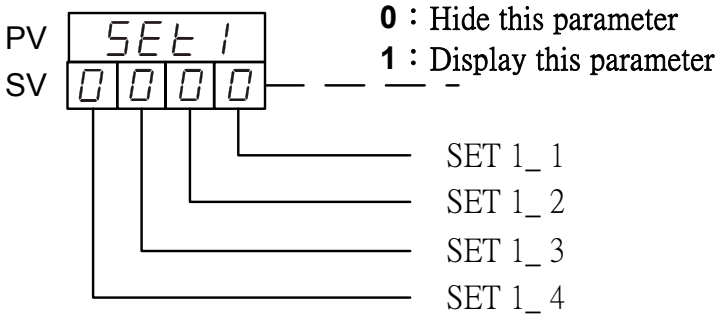
Return to “INP1”

9.4 Level 4 (SET level)

To enter level 4, set LCK to ”1111”and then press SET key + Shift(◁) key 3 seconds.



9.4.1 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,bAud,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			

9.4.2 Special functions (Use SET8 / SET9 / SET0)

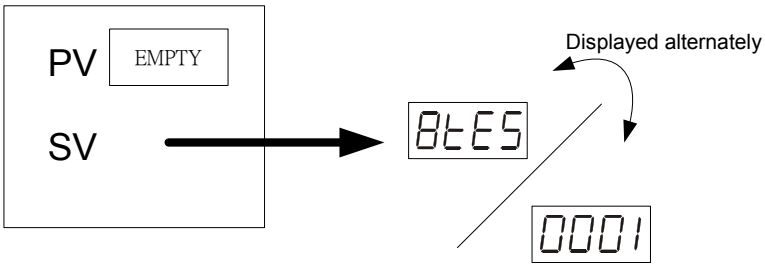
SET 8		Remark
8_ 1	0 : Program not repeat	Only available for programmable controller
	1 : Program repeat	
8_ 2	0 : No power failure option	
	1 : With power failure option	
8_ 3	0 : Program starts from 0	
	1 : Program starts from PV	
8_ 4	0 : Reserved (Don't change it)	

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”.

9.4.3 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

9.4.4 Output mode selection (Use OUTY)

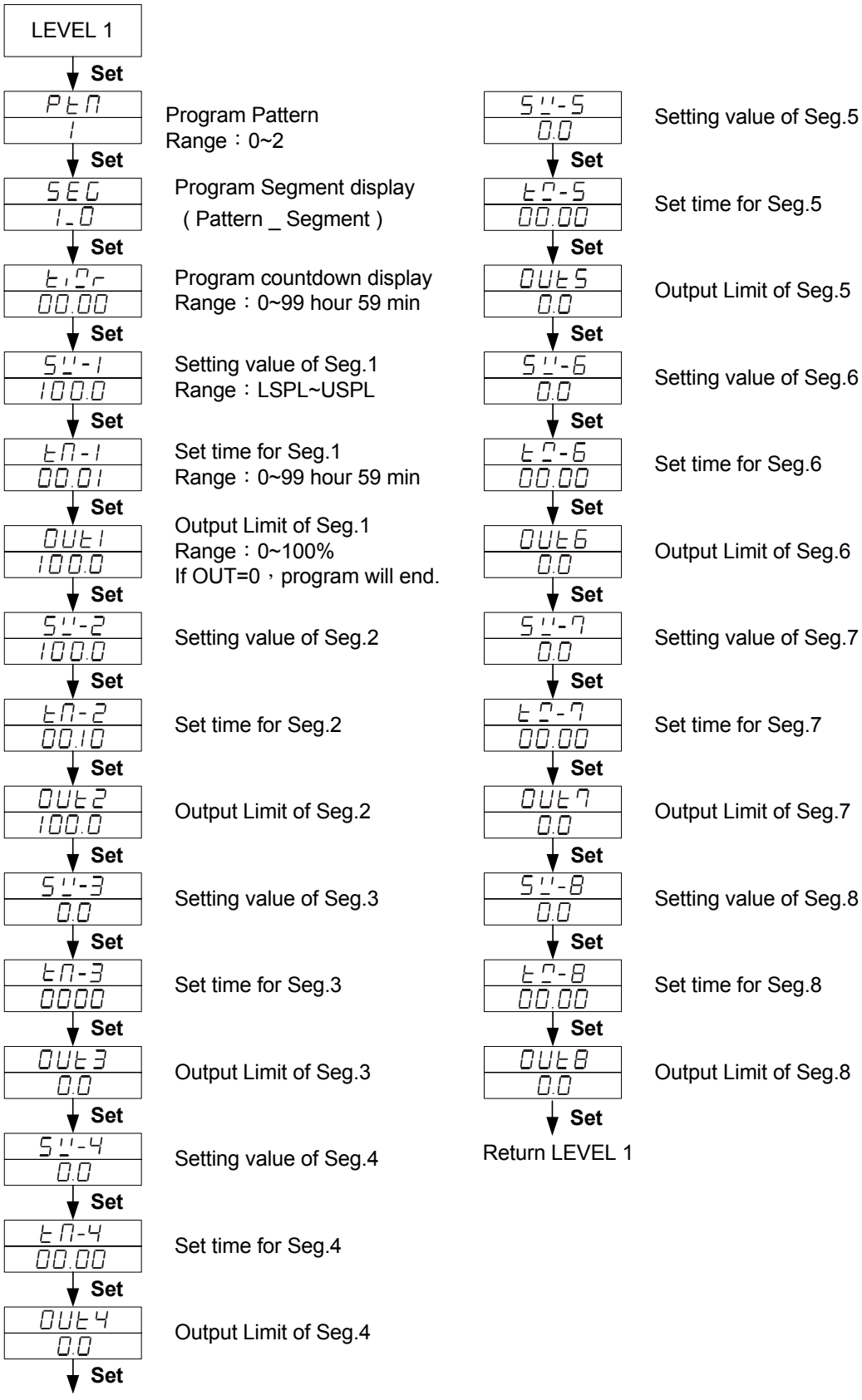
OUTY=0 Single output (OUT1)
OUTY=1 Dual output (OUT1 / OUT2)
OUTY=2 Reserved
OUTY=3 3 wire proportional motor valve control
OUTY=4 1ψPhase angle control (1ψSCR)
OUTY=5 3ψPhase angle control (3ψSCR)

9.4.5 Modify caution

If change parameter “BAUD”, “BITS”, “RUCY”, “OUTY” the power must be reset

9.5 **Program Level** (Only displayed in programmable controller)

9.5.1 Description of parameters



9.5.2 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.

   △ + **SET**(JUMP) ：Jump to previous segment.

   ▽ + **SET** (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 segments 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”

10. 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”.

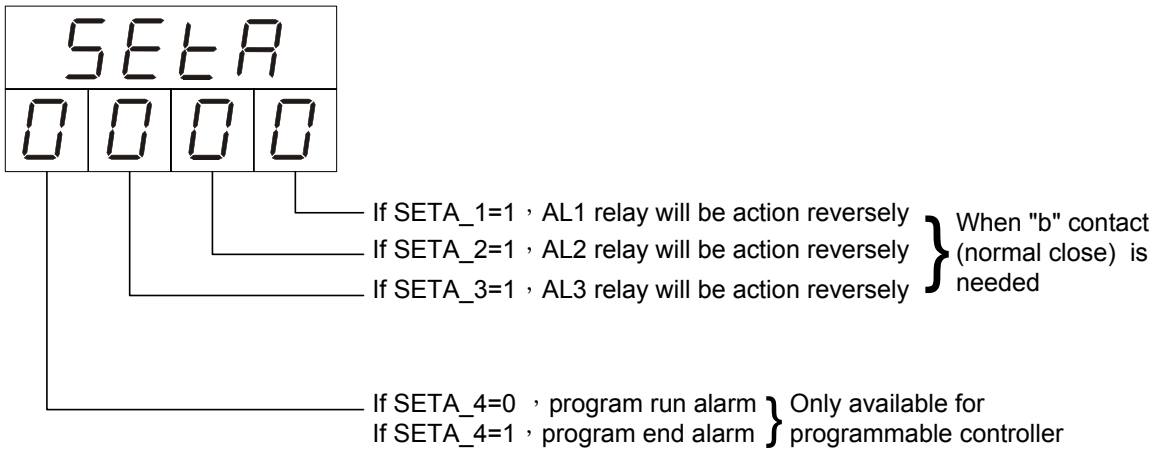
11. Alarm

11.1 Alarm time (ALT1/ALT2/ALT3)

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

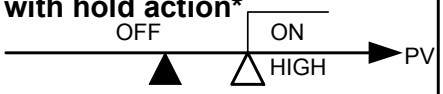
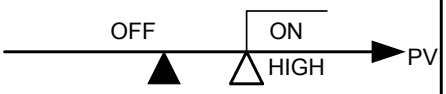
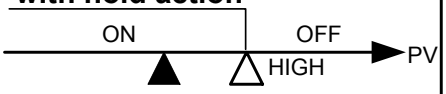
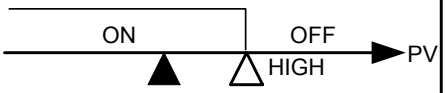
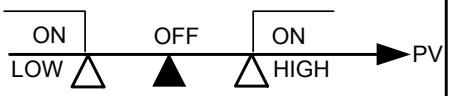
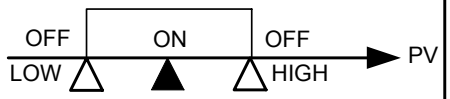
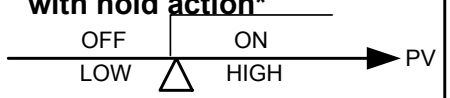
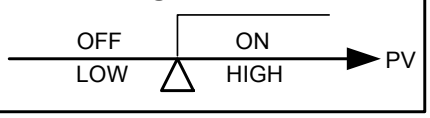
11.2 SETA

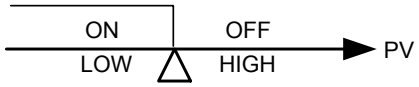
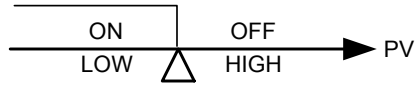
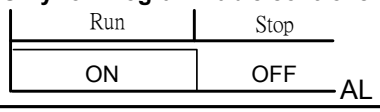
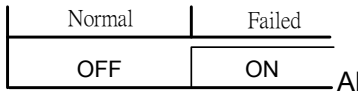
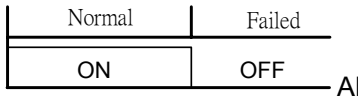
*SETA is in Level 3 (Input level)



11.3 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 Page39
00 10	**No alarm**
19	**RAMP & SOAK** If PV=SV, Alarm will delay for a while then (alarm set value) action. Range: 00.00~99.59(hr.min.)

***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.

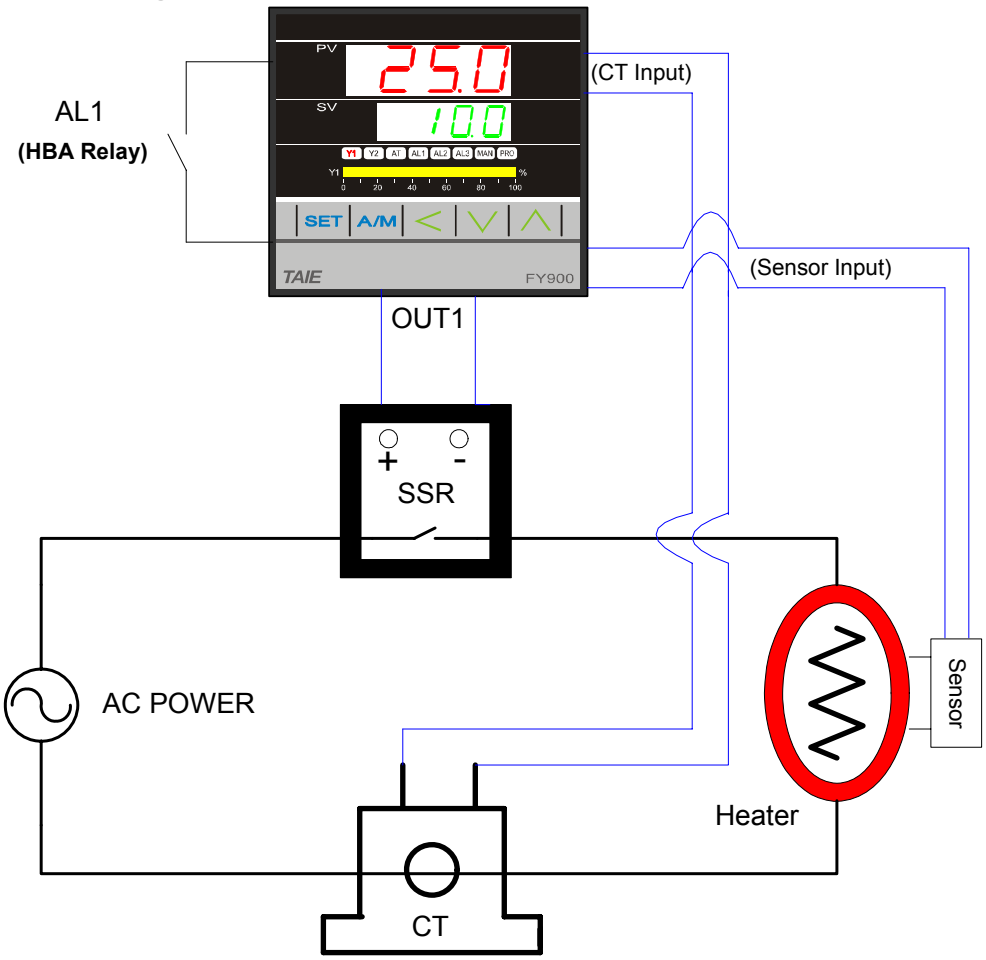
***System failed:**

It means that the controller display error message with one of following :

”UUU1” or “NNN1” or “CJCE”

12 Heater Break Alarm (HBA)

12.1 HBA Wiring Example

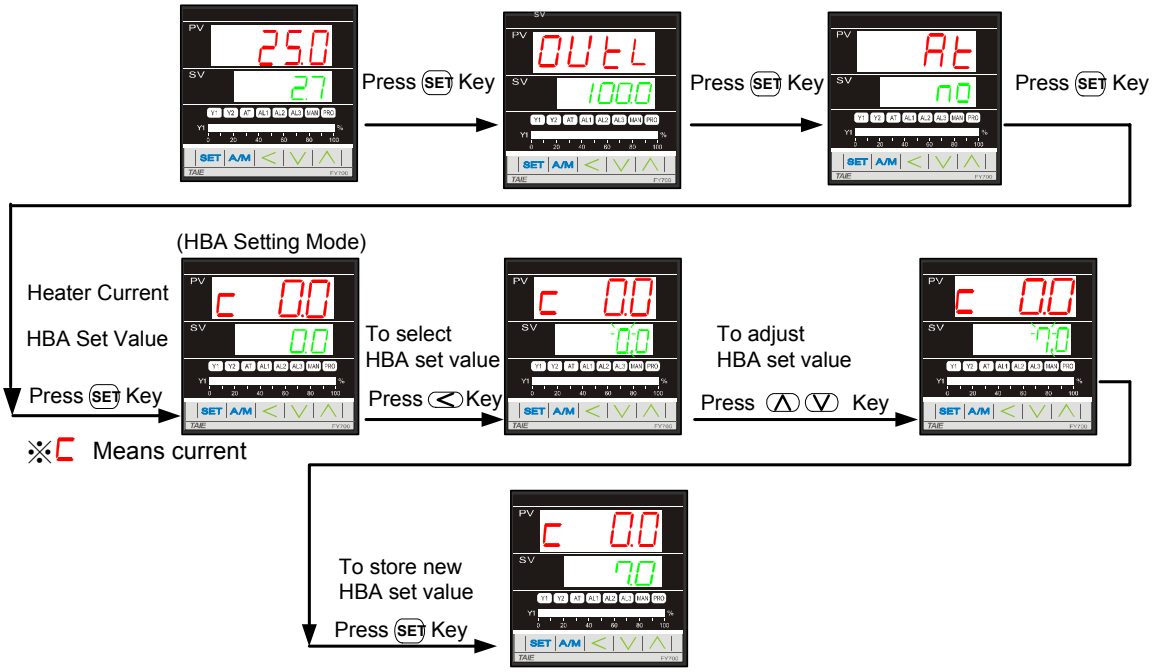


12.2 HBA Function Description

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.

12.3 HBA setting procedure



12.4 Parameters for HBA function

Name	Value	Operation Level
AL1	HBA Set Value	Level 1
ALD1	9	Level 3
SET0	X1XX	Level 4
INP2	4	Level 4

- How to enter Level 3：Set parameter “LCK” to 0000 in Level 2 , and then press “SET” key + “Shift” key 5 seconds to enter operation Level 3.。

- How to enter Level 4：Set parameter “LCK” to 1111 in Level 2 , and then press “SET” key + “Shift” key 5 seconds to enter operation Level 4.

- ‘X’ value available 0 or 1

12.5 Activated conditions of HBA

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

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

12.6 Remarks

- Available output(OUT1) type for HBA
  I. Relay
  II. Voltage pulse (SSR drive)

- Since HBA function uses AL1 as alarm relay, please set temperature alarms in AL2 or AL3.

12.7 CT specifications

12.7.1 SC-80T Specifications

Rated Primary Current (Amp.)：0.1A~80.0A

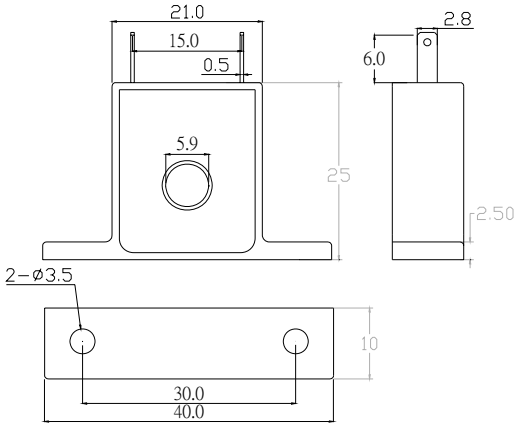
Turns Ratio： 800：1

D.C.Resistance Max.at 20 ℃(Ω)：45Ω

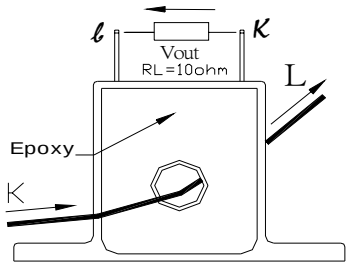
Accuracy (Linearity)：3%

Dielectric Withstanding Voltage(Hi-pot)：2500Vrms / 1 minute

Approx.Weight：12g



SC-80T Mechanical Dimensions (mm)



Test Circuit

12.7.2 SC-100T Specifications

Rated Primary Current (Amp.)：0.1A~100.0A

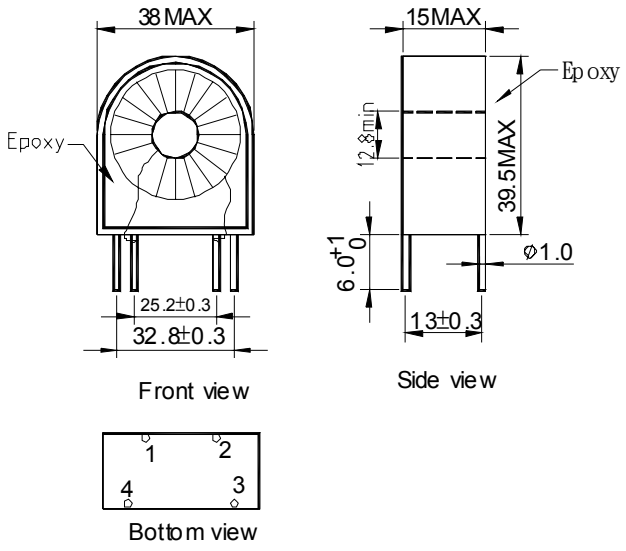
Turns Ratio： 1000：1

D.C.Resistance Max.at 20 ℃(Ω)：150Ω

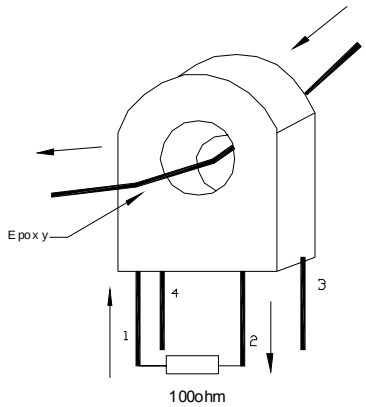
Accuracy (Linearity)：3%

Dielectric Withstanding Voltage(Hi-pot)：4000Vrms / 1 minute

Approx.Weight：55g

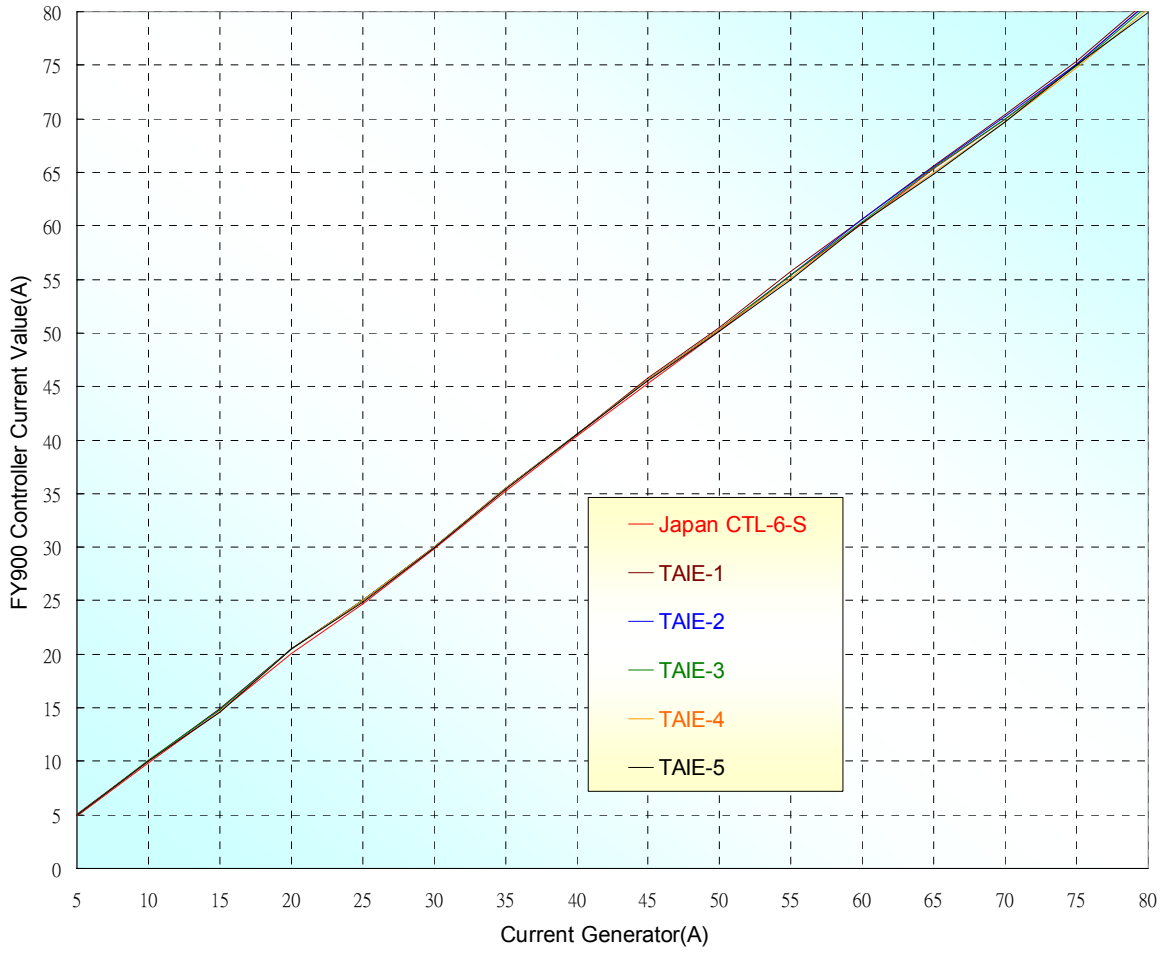


SC-100T Mechanical Dimensions (mm)



Test Circuit

11.7.3 SC-80T Linear Diagram



13. Error codes

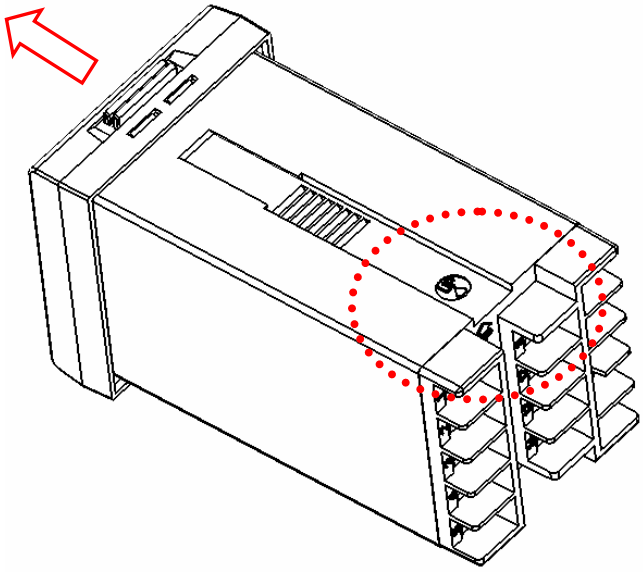
DISPLAY	DESCRIPTION
inIE	Open circuit of main control sensor.(INP1)
∗ AdCF	A/D convert failed.
∗ CJCE	Cold junction compensation failed.
in2E	Open circuit of sub control sensor.(Remote SV)
uuu1	PV exceeds USPL.
nnn1	PV under LSPL.
uuu2	Input signal of sub control exceeds the upper limit. (Remote SV)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

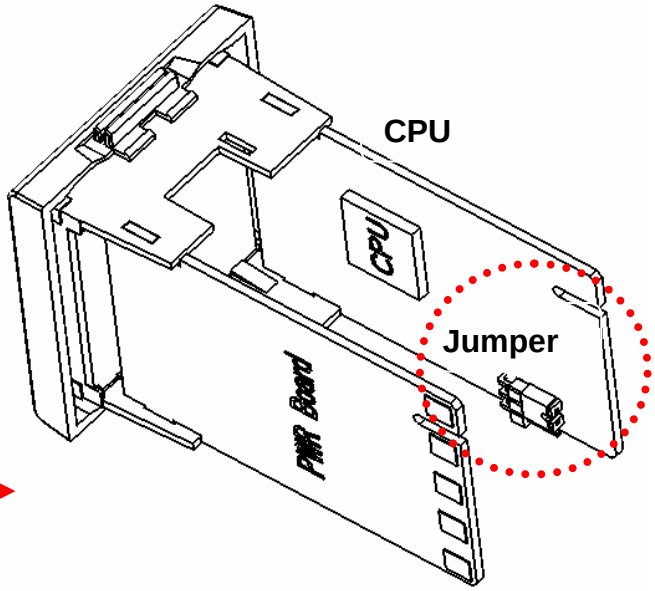
FY400 TC_Pt100 Switch Jumper Site Plan

*Note : Please change the input type at the display menu when you finished the jumper switch.

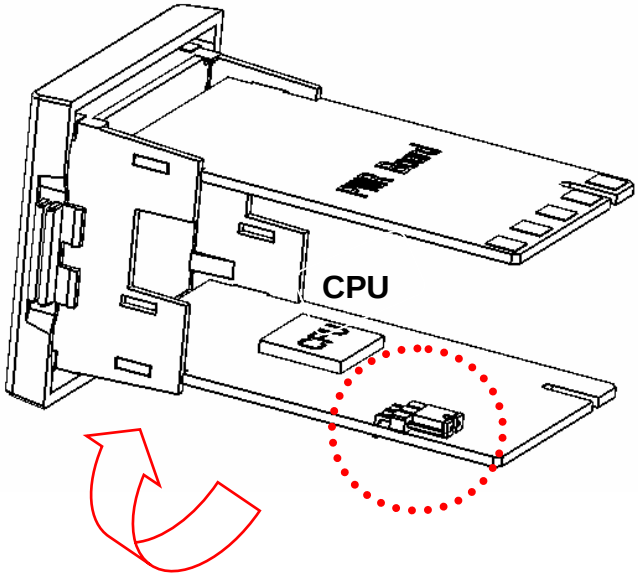
1. Keep controller flat, LED display forwards



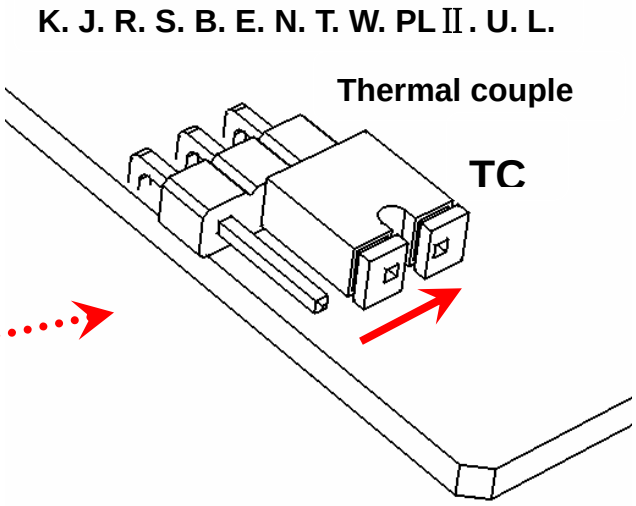
2. Pull out controller， jumper is below the CPU



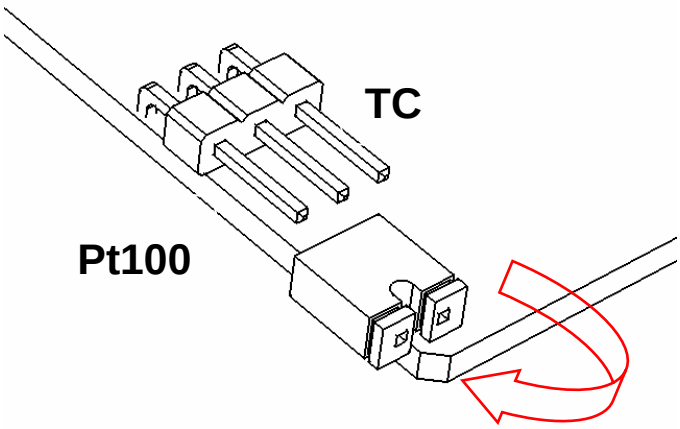
3. Turn the Power board up



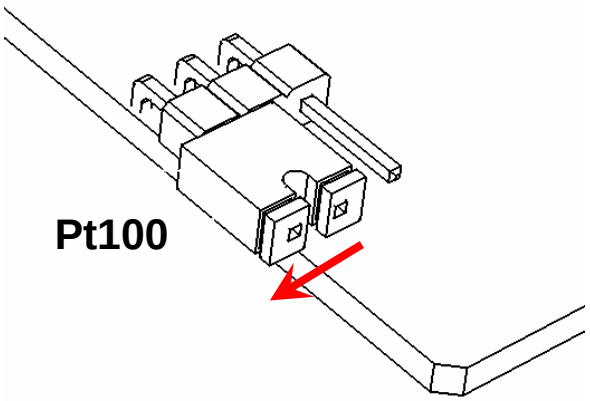
4. Sensor Input TC. Jumper insert the right site



5. Change Sensor input, pull the Jumper out



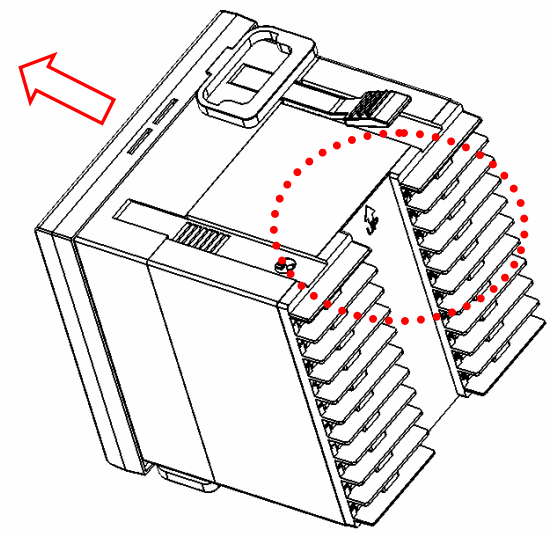
6. Sensor Input Pt100. Jumper insert the left site



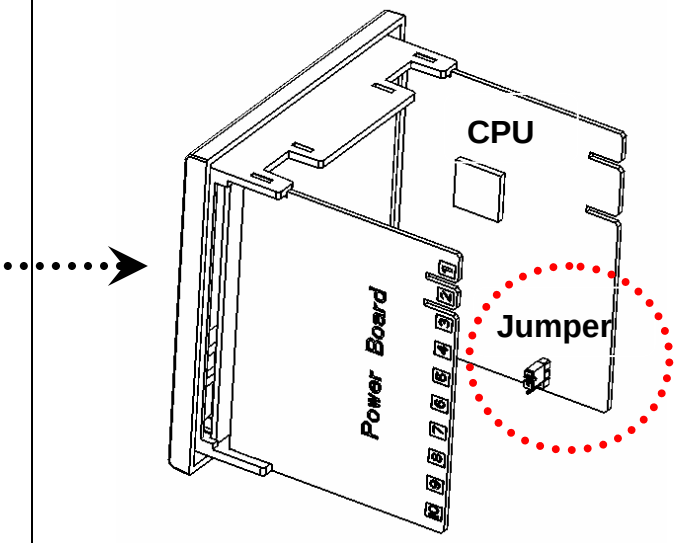
FY600/700/800/900 TC_Pt100 Switch Jumper Site Plan

*Note : Please change the input type at the display menu when you finished the jumper switch.

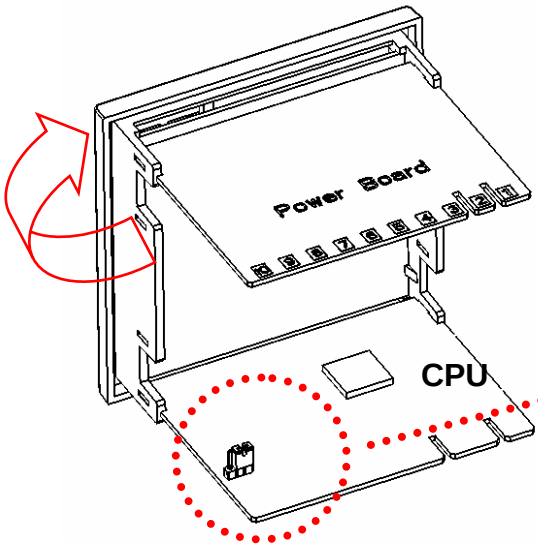
1. Keep controller flat, LED display forwards



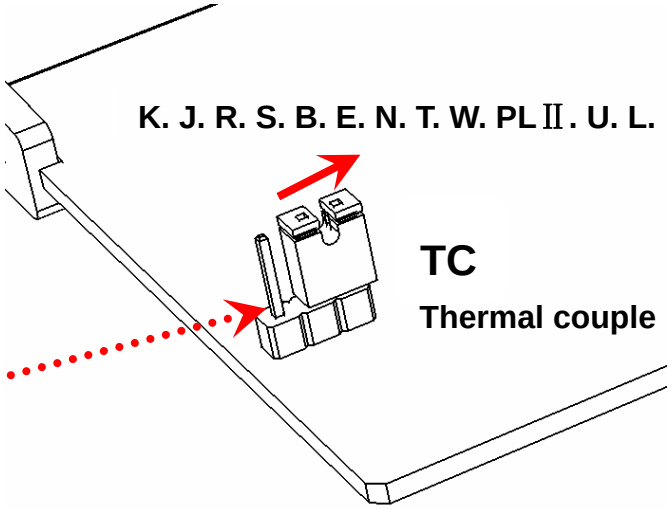
2. Pull out controller， jumper is below the CPU



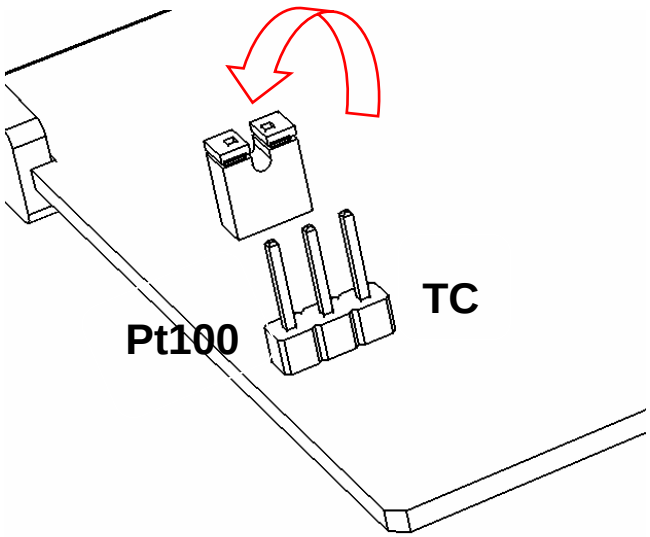
3. Turn the Power board up



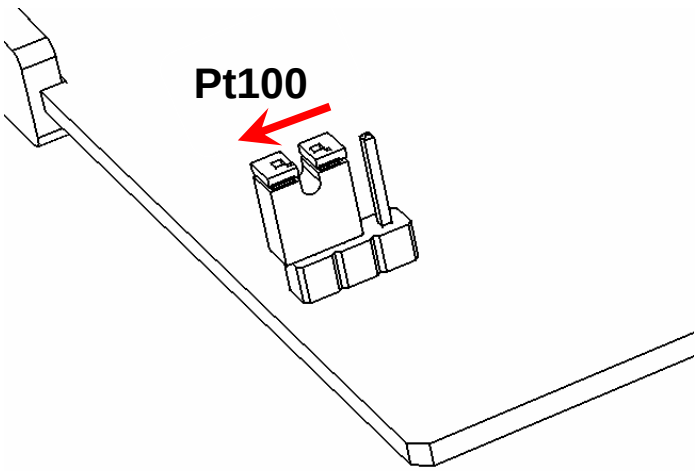
4. Sensor Input TC. Jumper insert the right site



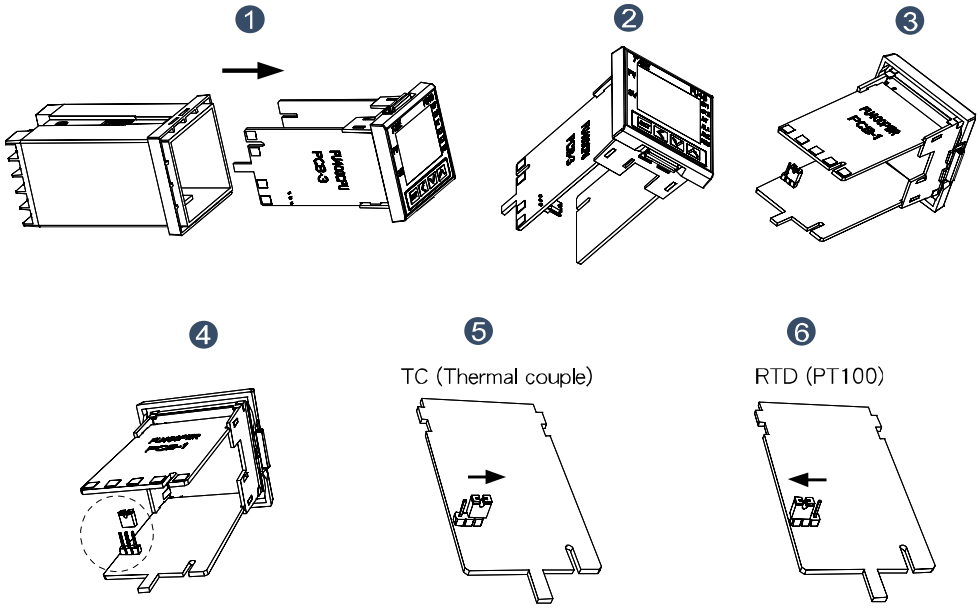
5. Change Sensor input, pull the Jumper out



6. Sensor Input Pt100. Jumper insert the left site



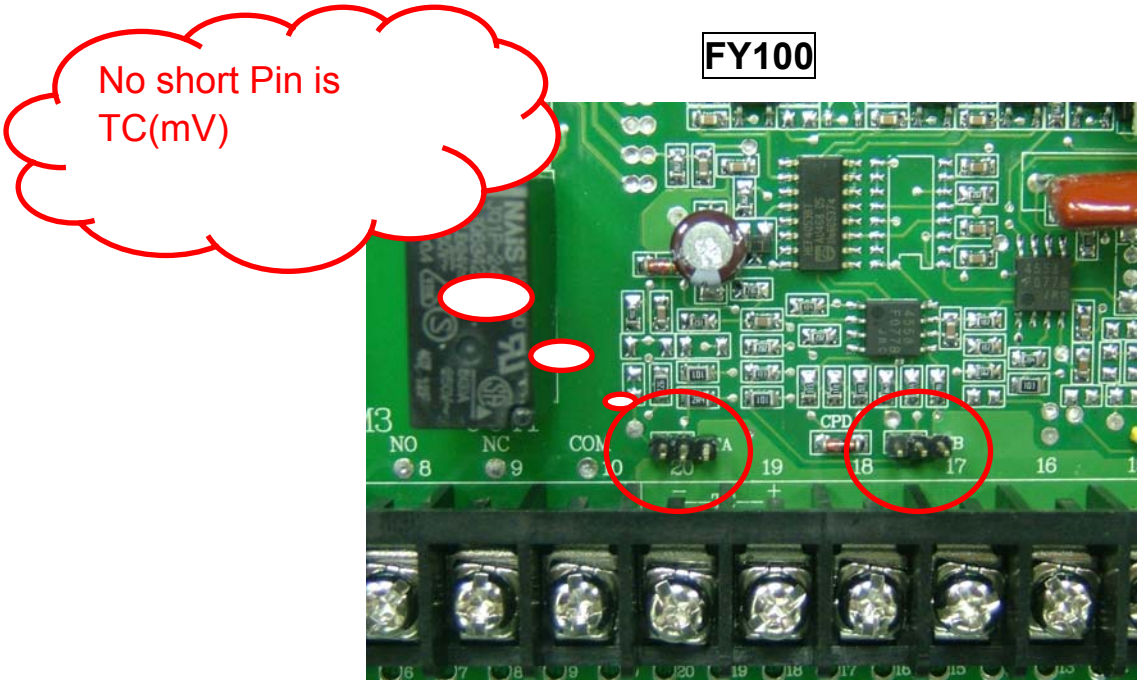
14.2 FU48~96



1. Take out the main body from outer case: adjust the jumper to the correct place.
2. Start power after setting jumper to the correct place.
3. Amend the input type from the front membrane to enter in Level 3 to set.
4. Please be sure to cut off power and start again after amending input type so that the new parameters could be effective.
5. To change input type of TC or RTD is available but linear input is unavailable. Please ask our local distributor for help.

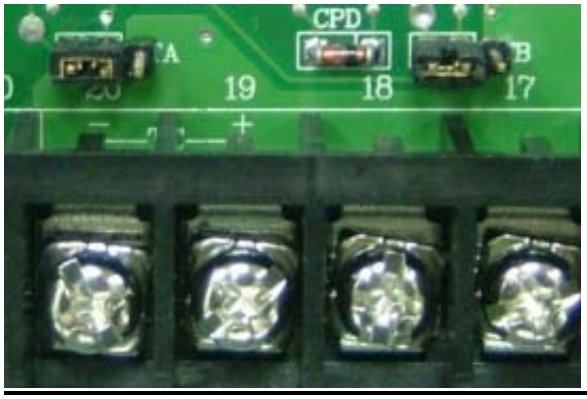
14.3 FY100~FY101

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.



RTD | **TC or mV**

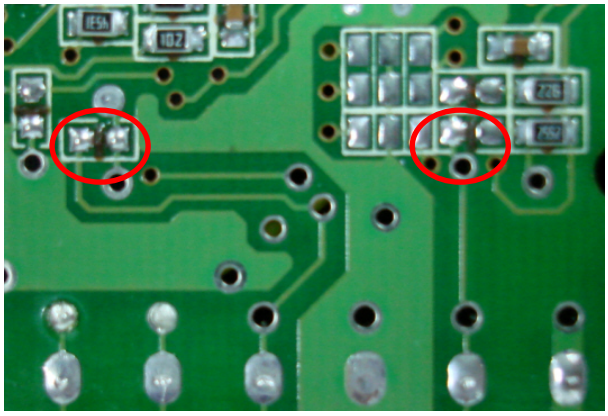
Short pin insert to left | Short pin insert to right or remove



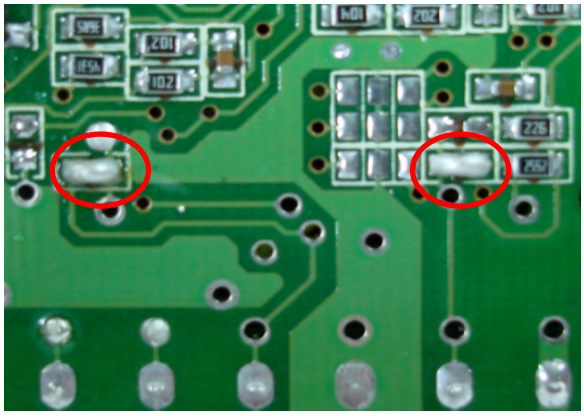
If the controller needs to modify input type from **TC** or **mV** to **RTD** ，please make PAD short on the back side of PC board as following diagram and change input selection(INP1). On the contrary，modify from **RTD** to **TC** or **mV**，make PAD open.

FY101

TC or mV



RTD



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

15.1 FY400~900 & FU48~96 Hardware：

	FY900，FY600，FY800 FU86，FU96	FY700 FU72	FY400 FU48
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)

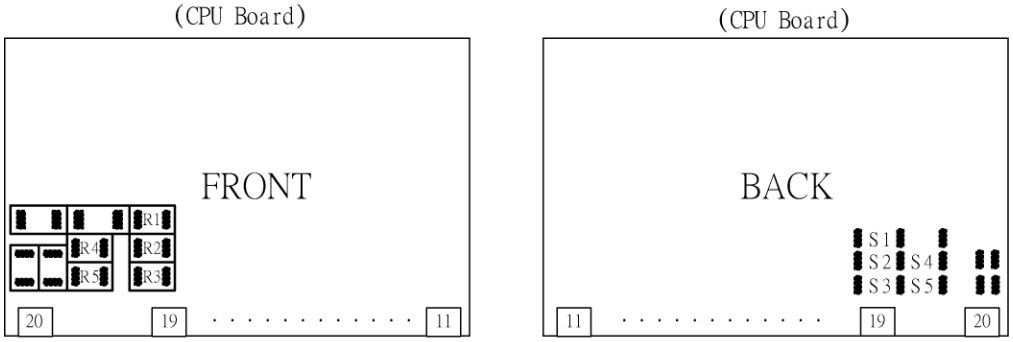
0 ~ 5V (INP1=AN4)：(R2 use 10KΩ，R4 use 100Ω，S2 & S4 SHORT)

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

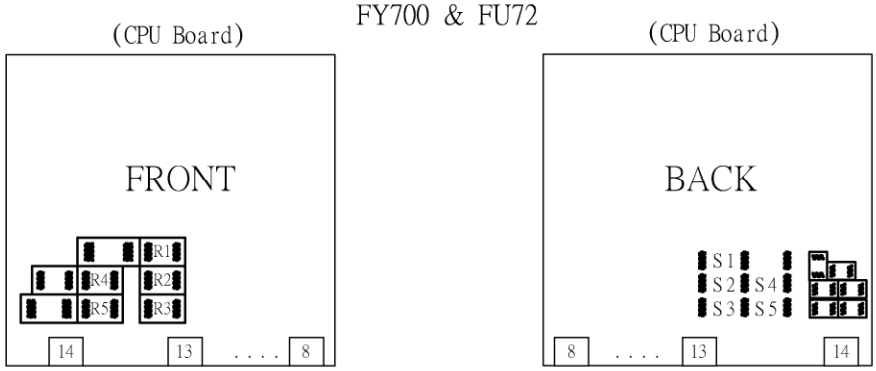
0 ~ 10V (INP1=AN4)：(R3 use 22KΩ，R4 use 100Ω，S3 & S4 SHORT)

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

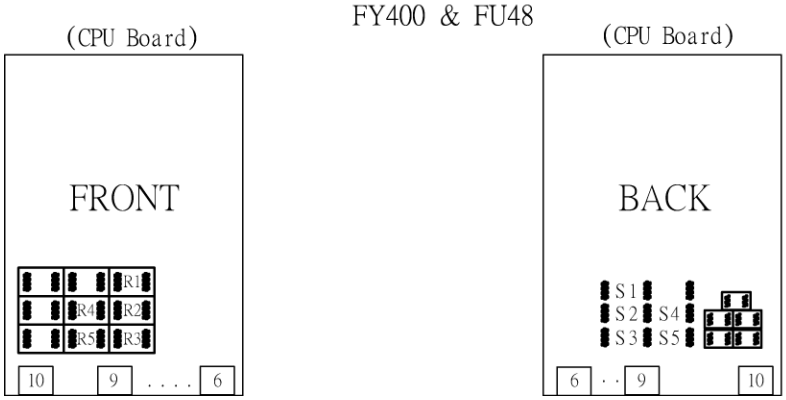
FY600 , FY800 , FY900 & FU86, FU96



FY700 & FU72



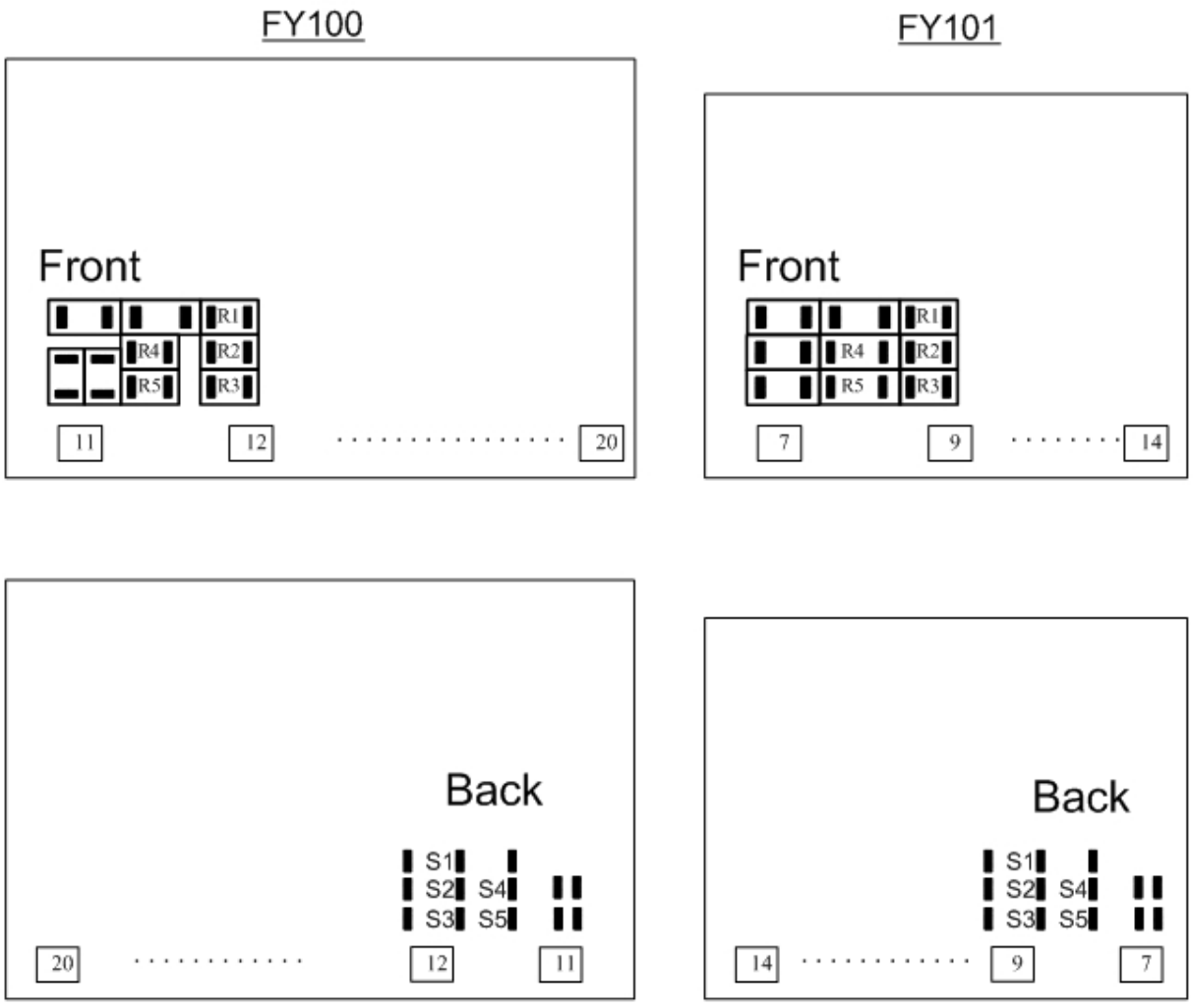
FY400 & FU48



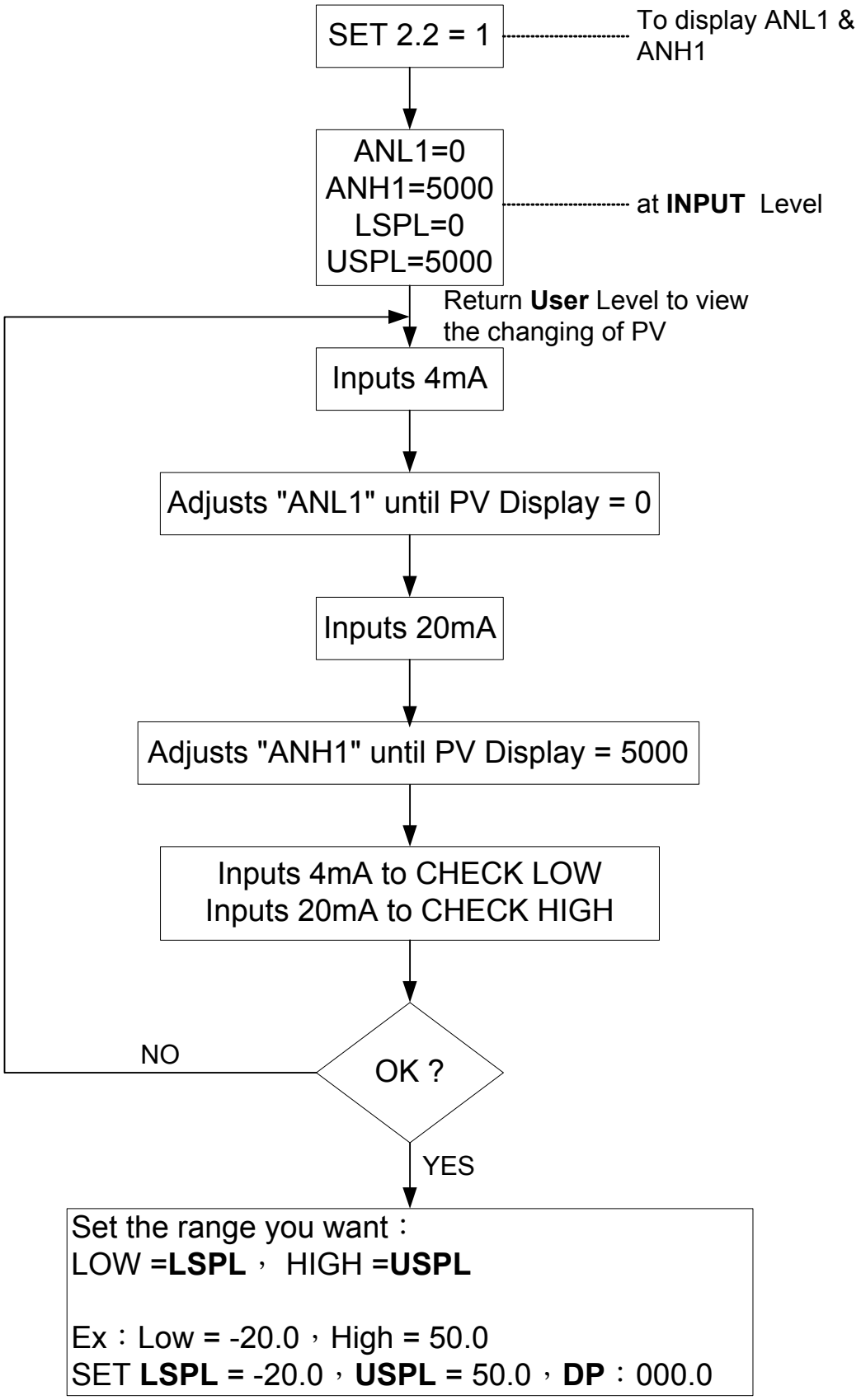
15.2 FY100/101 Hardware：

	FY100	FY101
INPUT (+)	PIN 14	PIN 10
INPUT (-)	PIN 11	PIN 8

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)



15.3 Calibration：



16. Modify Output type: Relay, SSR, 4~20mA

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

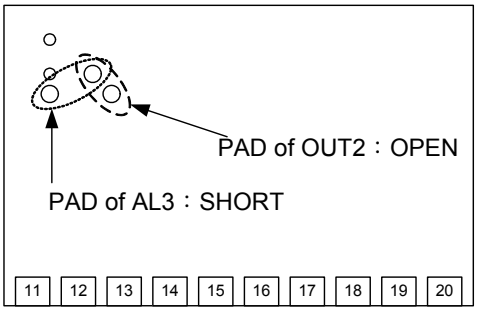
➔Relay: CYT1=10, Voltage pulse: CYT1=1, 4~20mA:CYT1=0

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

OUT1 / ALARM

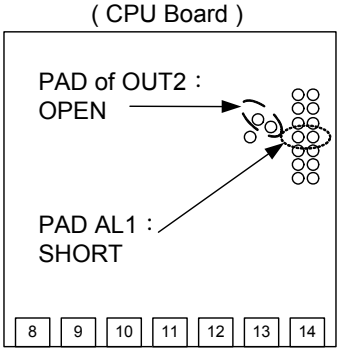
FY600 , FY800 , FY900

(CPU Board)



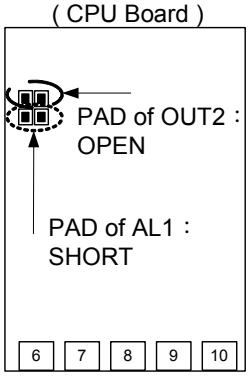
FY700

(CPU Board)



FY400

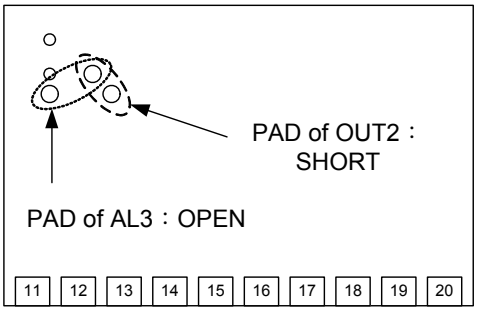
(CPU Board)



OUT1 /OUT2

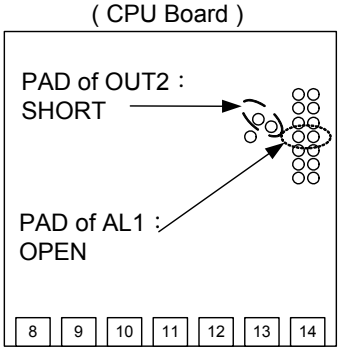
FY600 , FY800 , FY900

(CPU Board)



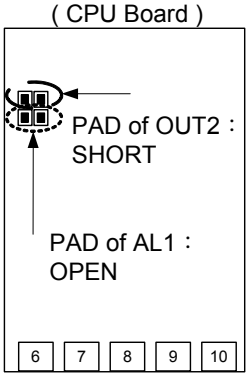
FY700

(CPU Board)



FY400

(CPU Board)



18. Applications

18.1 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.

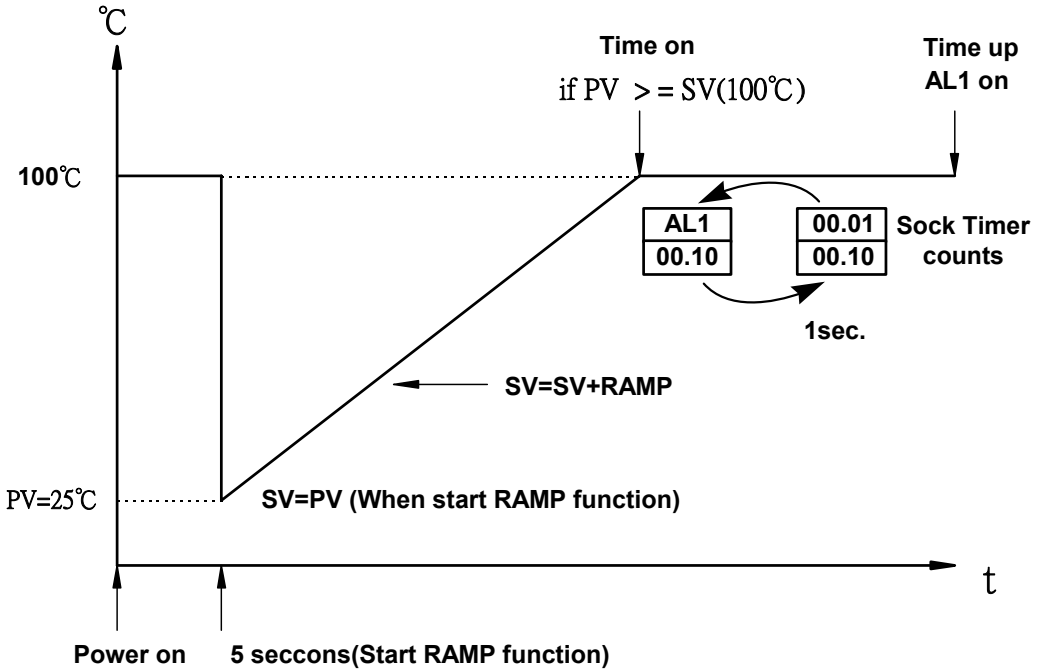
II. AL1 / AL2 will display as below:

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℃



18.2 TTL Communication：SV output and RATE function

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

Display AL3 ：SET2.1=1

Display ALD3：SET4.1=1

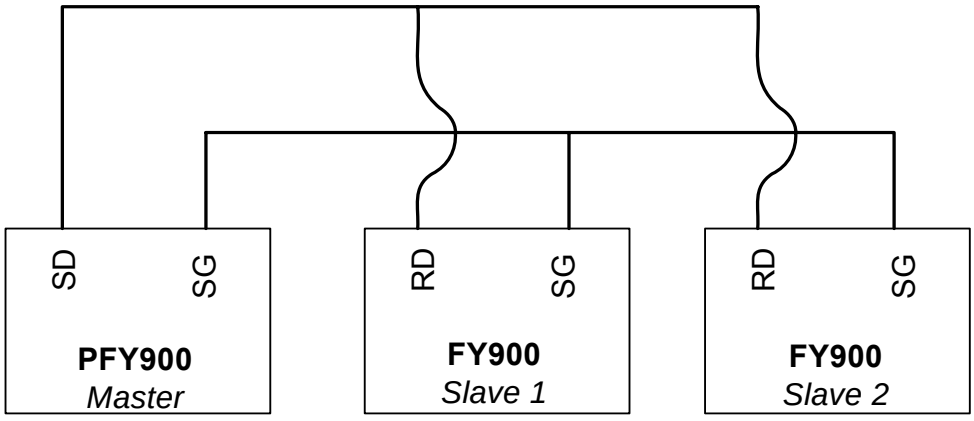
Display RATE(AL3 will be replaced) ：SET0.2=1

Set ALD3 to 0. (In Level 3)

Slave SV = (**RATE**÷9999)×master SV

- **Example：**

Connection Diagram

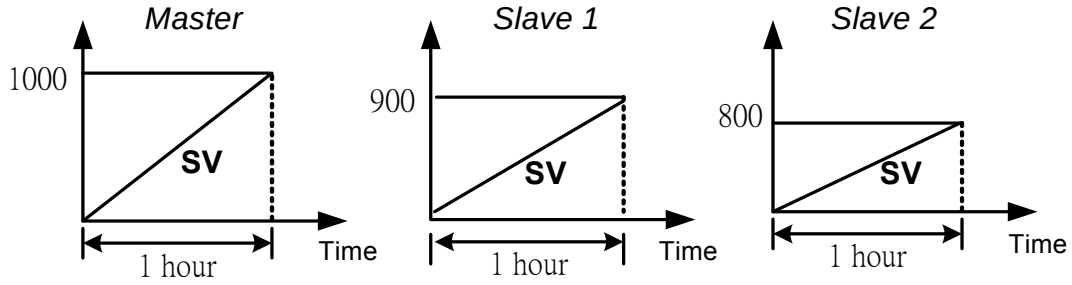


SV OUT (SET0.1=1)
IDNO=0 (SET5.4=1)
BAUD=2400(SET5.4=1)

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%

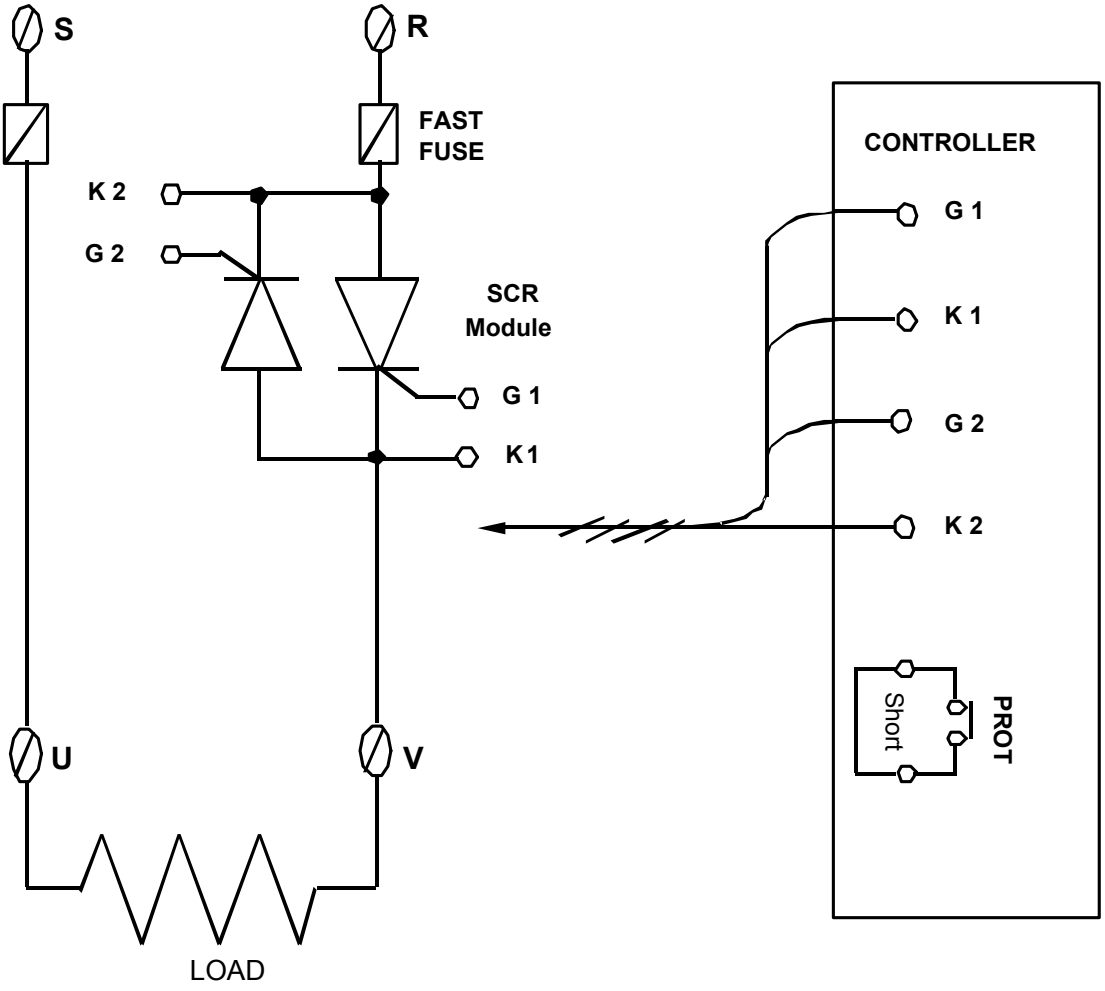
RATE = 9000
SV=900

RATE =8000
SV=800

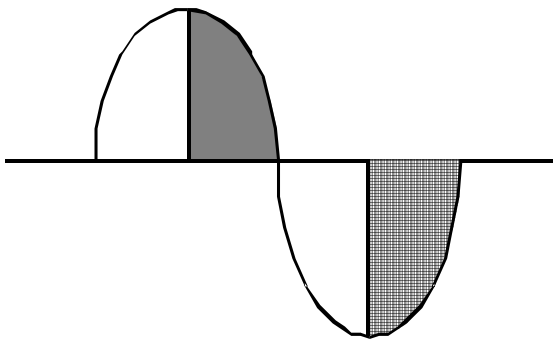
(Three controllers reach to the max value at the same time)

18.3 1ϕ Phase angle control (By SCR module)

- Available Models：FY900 / PFY900，FY700 / PFY700，FY800 / PFY800
  FY100 / PFY100
- OUT1: 1ϕ SCR phase angle control
- Parameter setting： OUTY=4
  CLO1=0，CHO1=4500 if use for resistance load
  CLO1=0，CHO1=4000 if use for inductor load

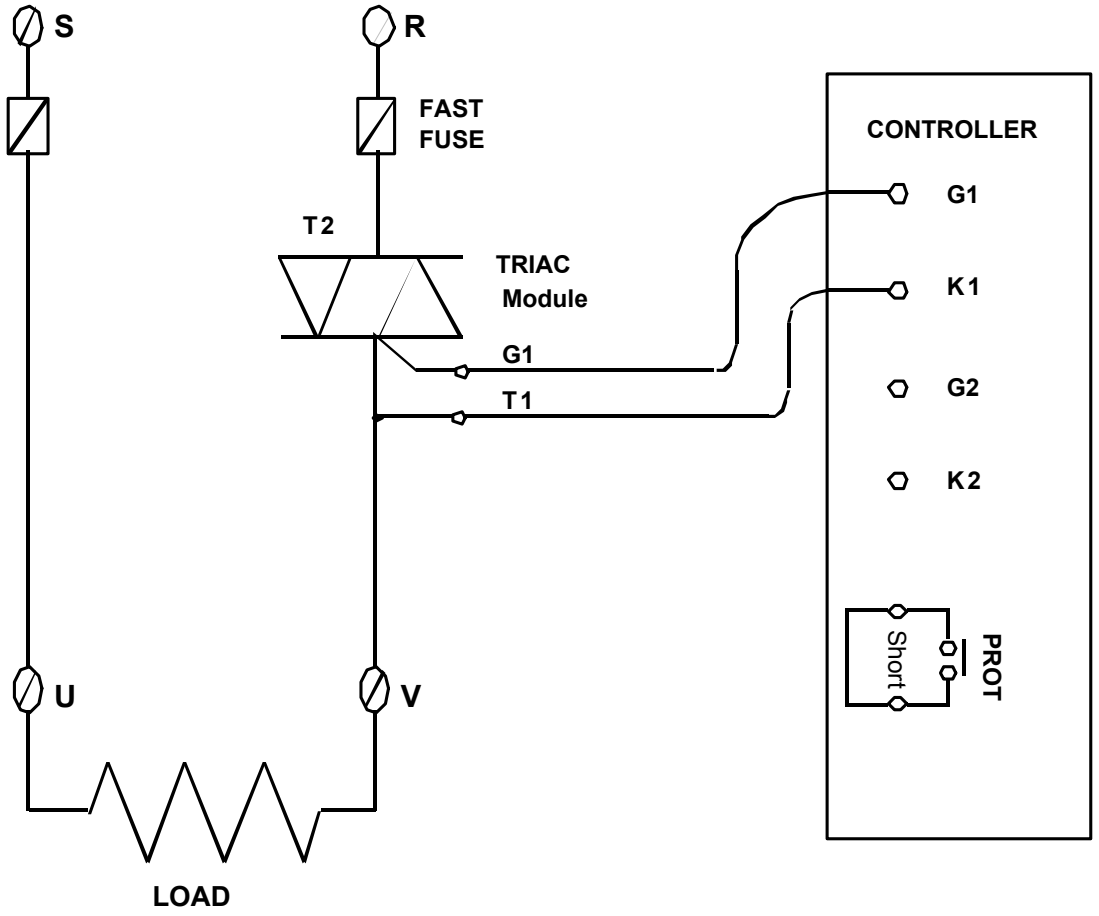


** Controller source phase must be same as load source phase

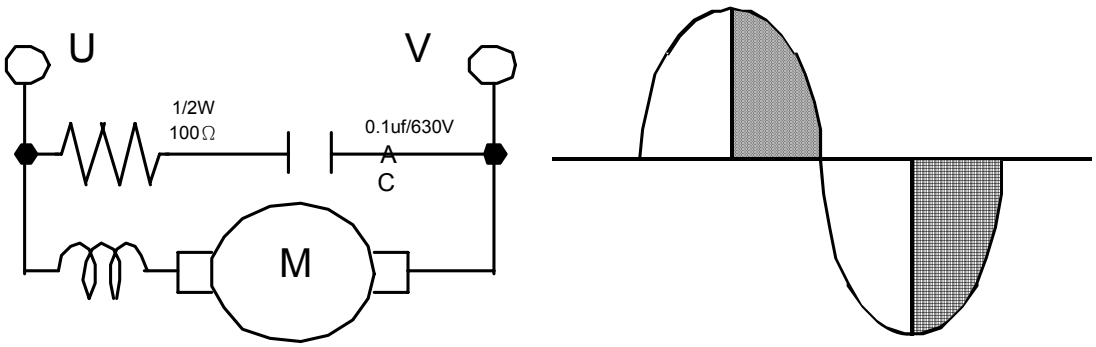


18.4 1ϕ Phase angle control (By TRIAC)

- Available Models：FY900 / PFY900，FY700 / PFY700，FY800 / PFY800
  FY100 / PFY100
- OUT1: 1ϕ SCR phase angle control
- Parameter setting： OUTY=4
  CLO1=0，CHO1=4500 if use for resistance load
  CLO1=0，CHO1=4000 if use for inductor load

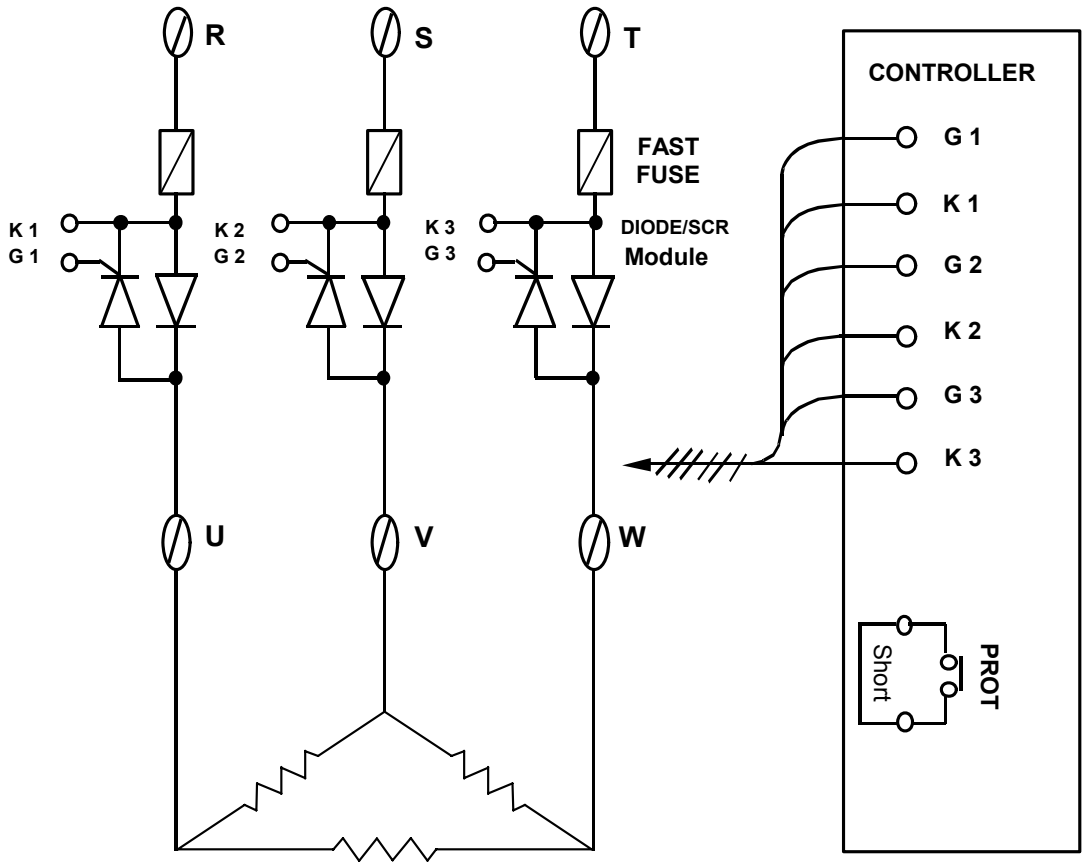


** Controller source phase must be same as load source phase



18.5 3ϕ Phase angle control (By DIODE/SCR module)

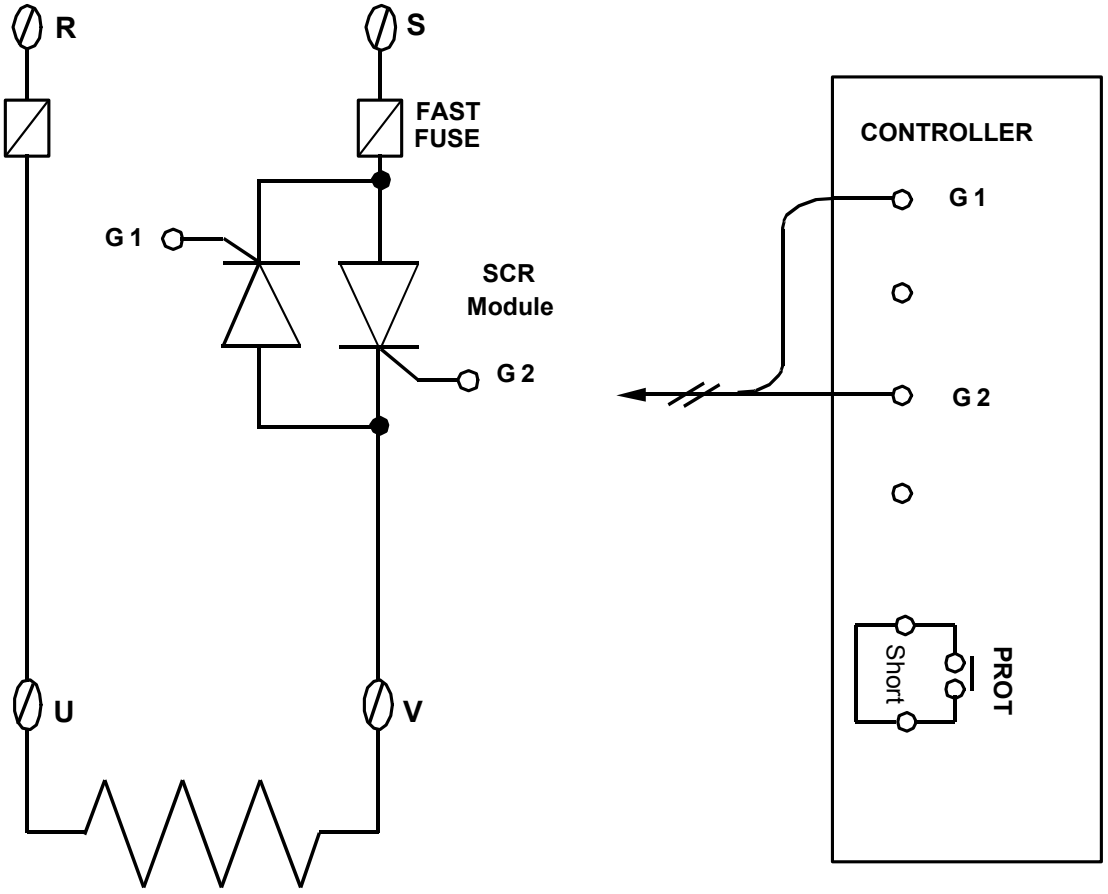
- Available Models：FY900 / PFY900
- OUT1: 3ϕ SCR phase angle control
- Parameter setting： OUTY=5
  CLO1=0，CHO1=4500 only if use for resistance load
  CLO1=0，CHO1=4000 if use for inductor load

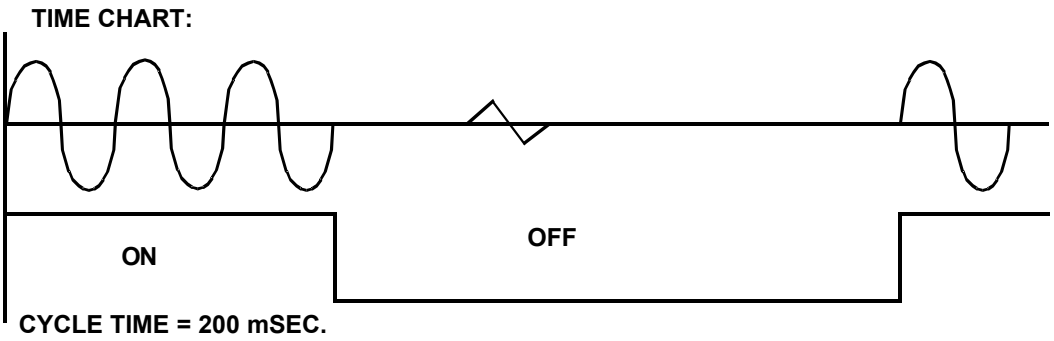


3φ LOAD

18.6 1ϕ Zero crossing control (By SCR module)

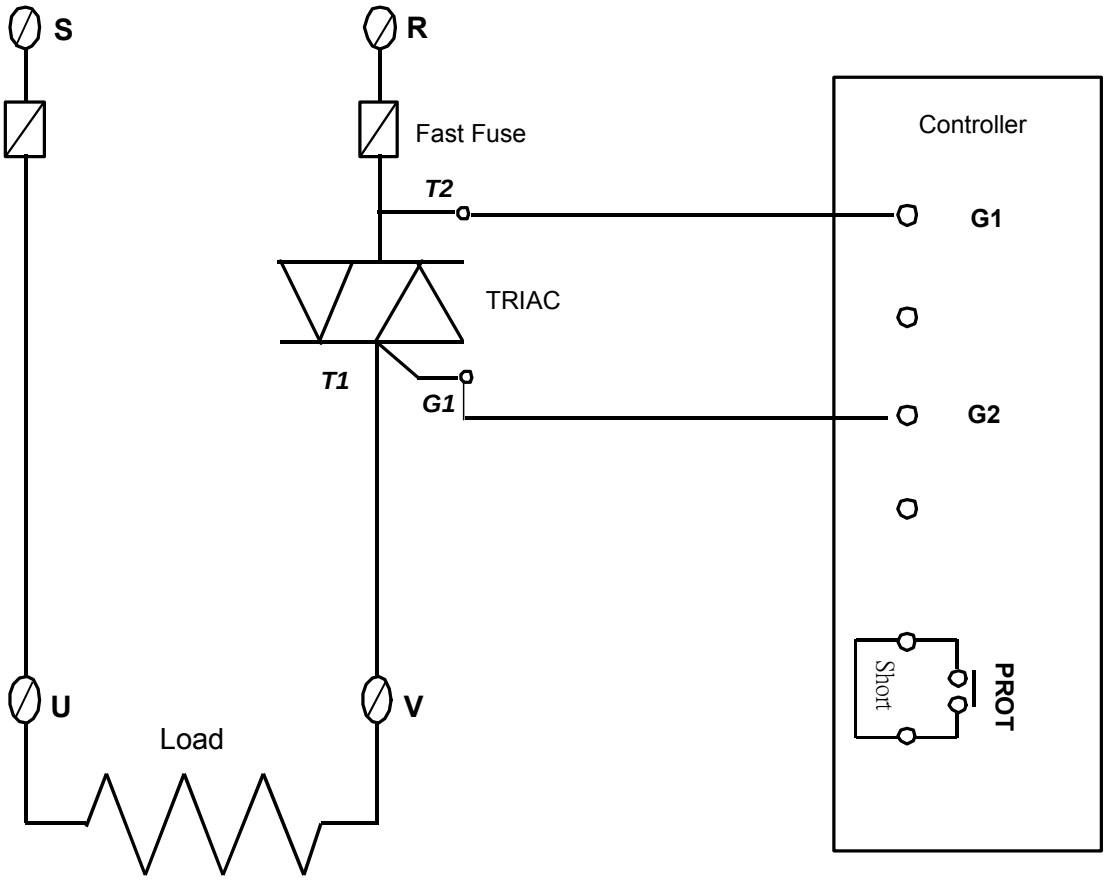
- Available Models： FY900 / PFY900，FY700 / PFY700
  FY400 / PFY400
- OUT1: 1ϕ SCR zero cross control
- Parameter setting： OUTY=0
  CYT1=1





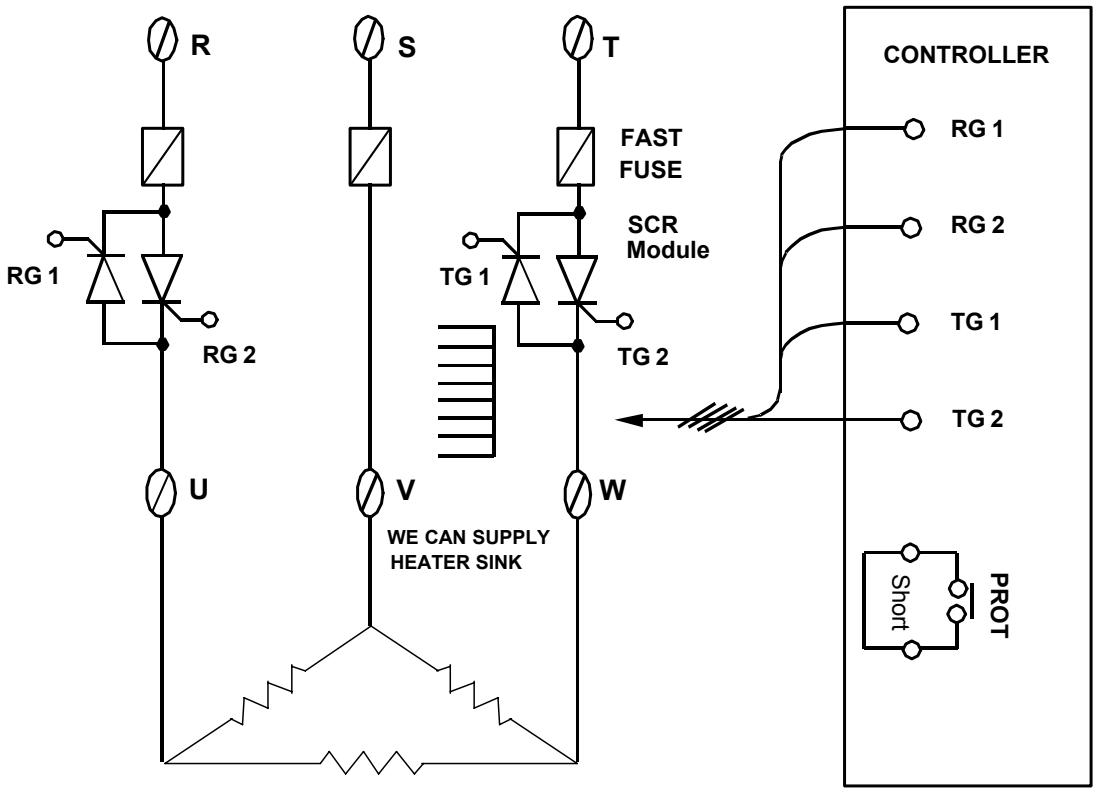
18.7 1ϕ Zero crossing control (By TRIAC)

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

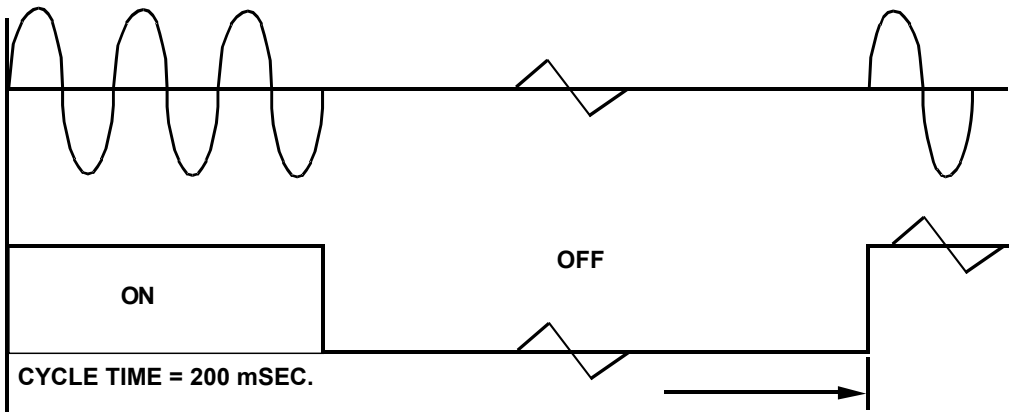


18.8 3ϕ Zero crossing control (By SCR module)

- Available Models：FY900 / PFY900
- OUT1: 3ϕ SCR zero cross control
- Data Change： OUTY=0
  CYT1=1

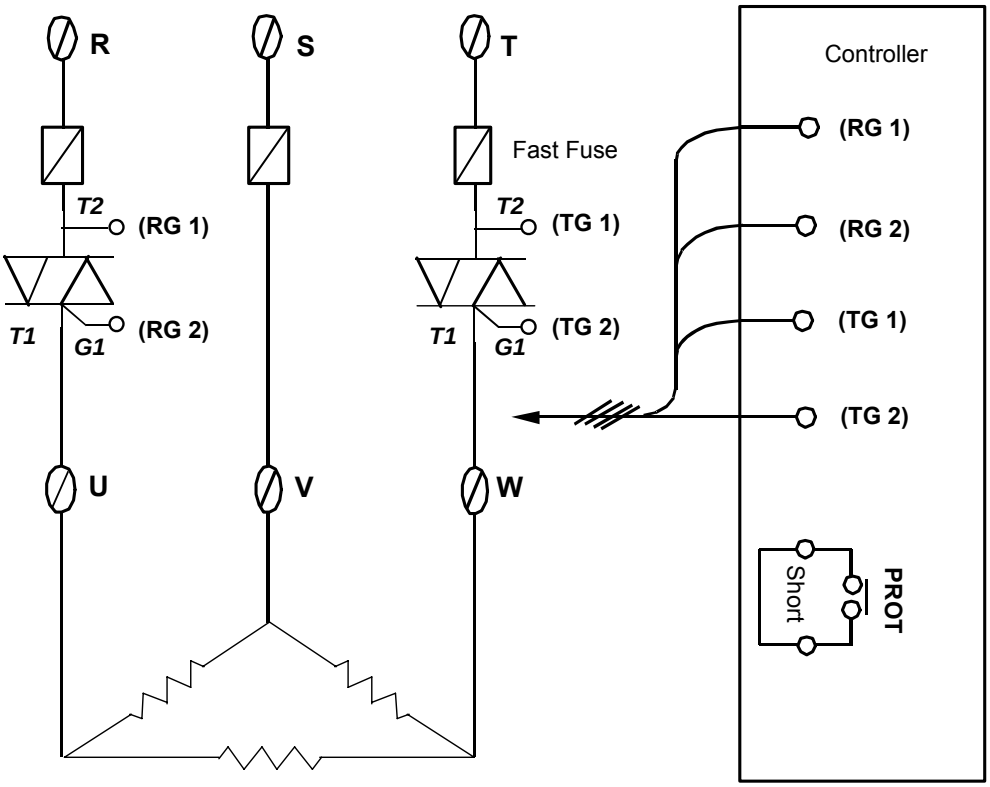


TIME CHART:



18.9 3ϕ Zero crossing control (By TRIAC)

- Available Models：FY900 / PFY900
- OUT1: 3ϕ SCR zero cross control
- Data Change： OUTY=0
  CYT1=1



18.10 3 wires proportional motor valve control

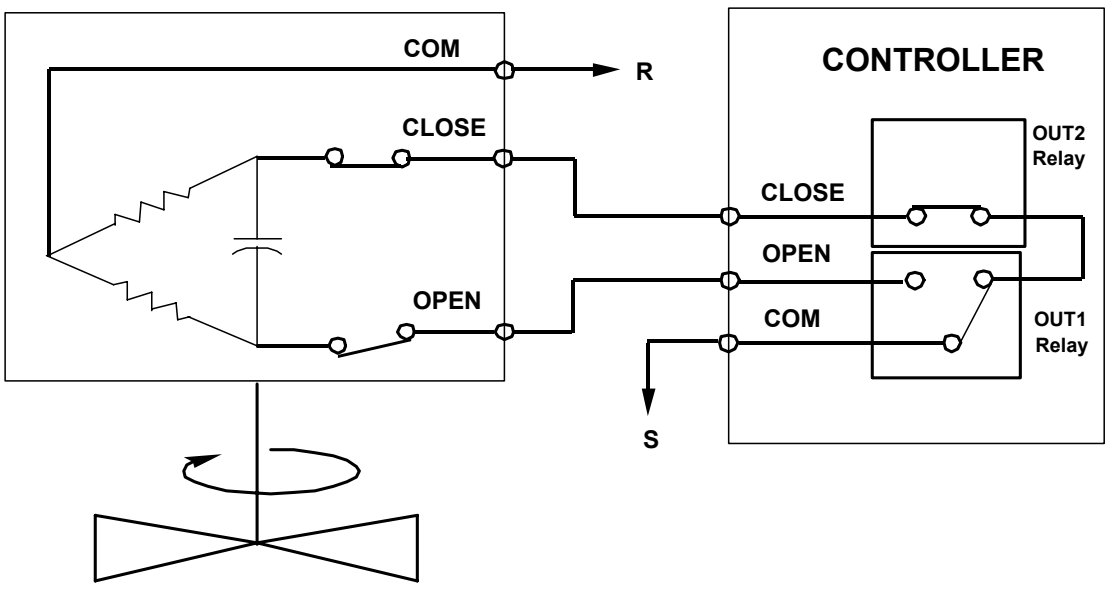
- Available Models： FY900 / PFY900，FY700 / PFY700
  FY800 / PFY800，FY600 / PFY600
  FY400 / PFY400，FY100 / PFY100
  FY101 / PFY101

- Data Change： OUTY=3
  CYT1=1 ~ 100sec.
  (Manufacturing default setting “5” seconds.)
  RUCY=5 ~ 200 seconds.

※After change “RUCY” the controller must be reset

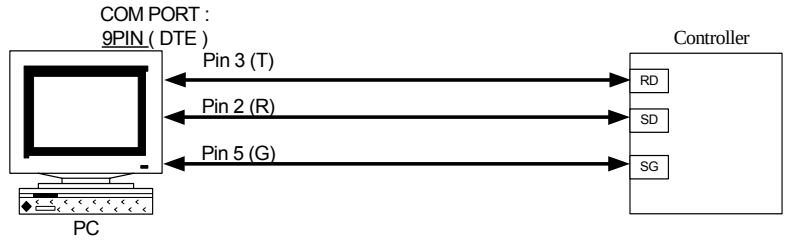
1. CYT1 is the cycle time of Open / Close
2. RUCY is the 0 ~ 100% running time of motor valve

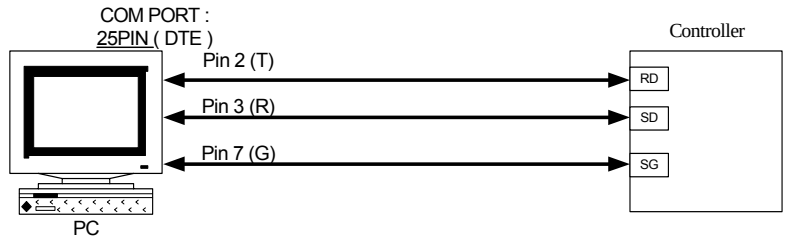
MOTOR VALVE



18.11 Wiring diagram of PC communication

RS232 Connection Diagram





NOTE:

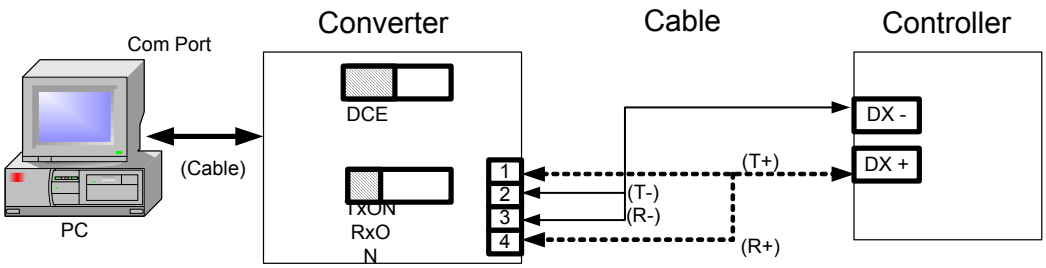
1.The length of cable be connected between controller and PC can't exceed 15 meter.

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".

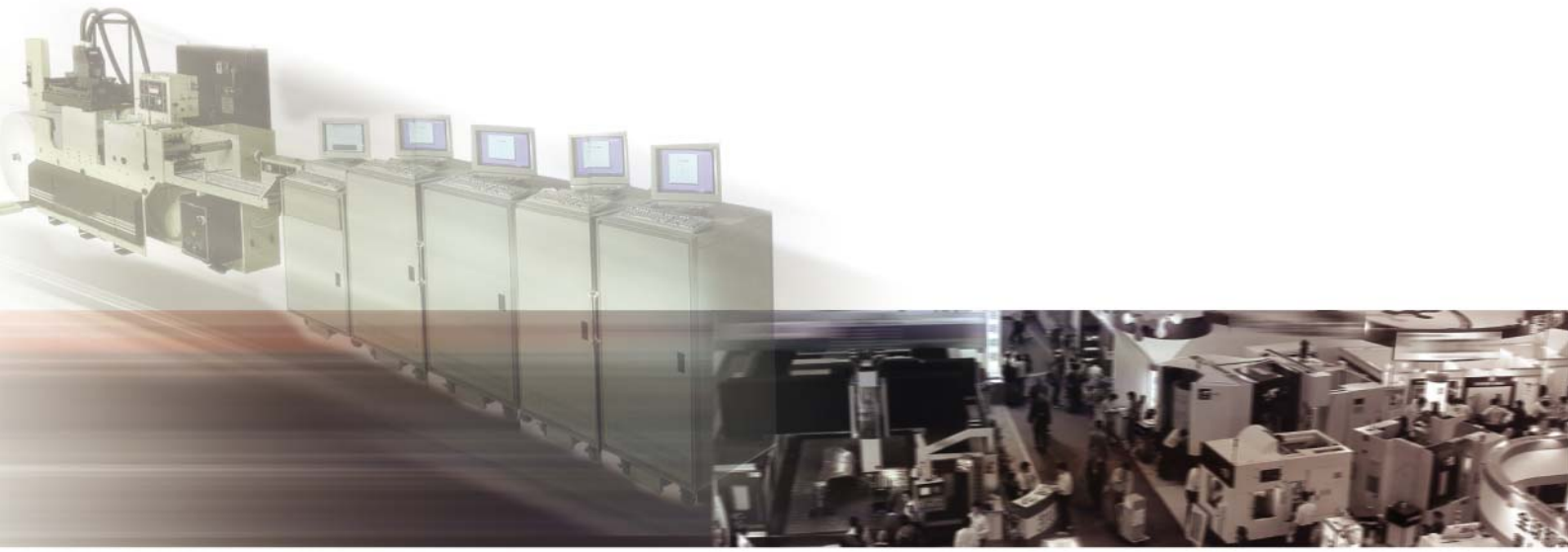
2.One Com Port can be connected up to a maximum of 30 Controllers.

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.

19. Order Information

19.1 FA Series



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● Our company's products continue to research and improvements, so the specification is subject to change without notice.

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