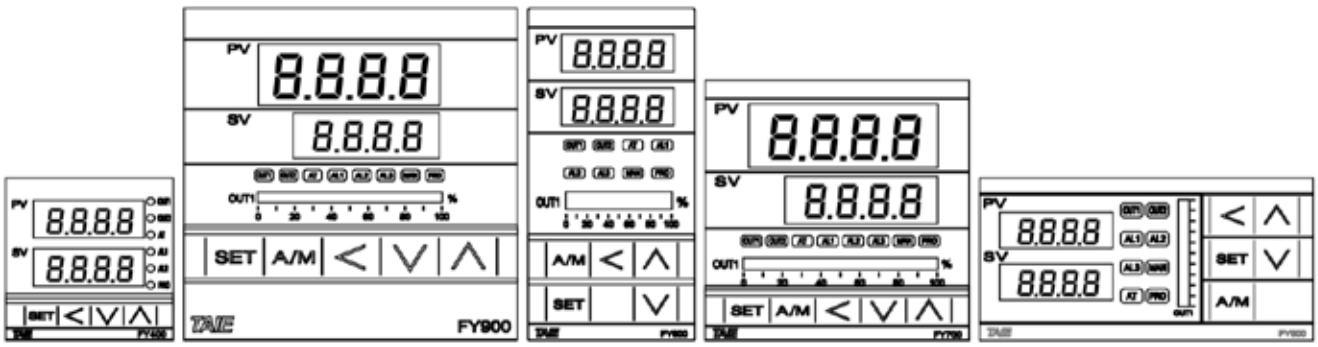
Digital Temperature Controller

FY400/600/700/800/900
FU400/FU48/72/86/96

Operation Manual



Ver 1.0

台灣儀控股份有限公司
TAIWAN INSTRUMENT & CONTROL CO., LTD

Content

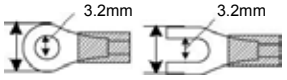
1. Notice

Warning

1. Beware of Electric Shock!
2. Once controller is activated, do not touch AC power wiring terminals to avoid electric shock!
3. First to confirm power is OFF, before working on the wiring of controller power supply!
4. Before using this product, please read through this operating manual thoroughly to understand the correct usage based on the fundamentals of its conten.
5. This product can be used in industrial equipment, working terminal, measurement equipment, but not in life-saving-related medical equipment.
6. In order to ensure safety even if the temperature controller fails, please set up another alarm system or safety redundancy.

Caution

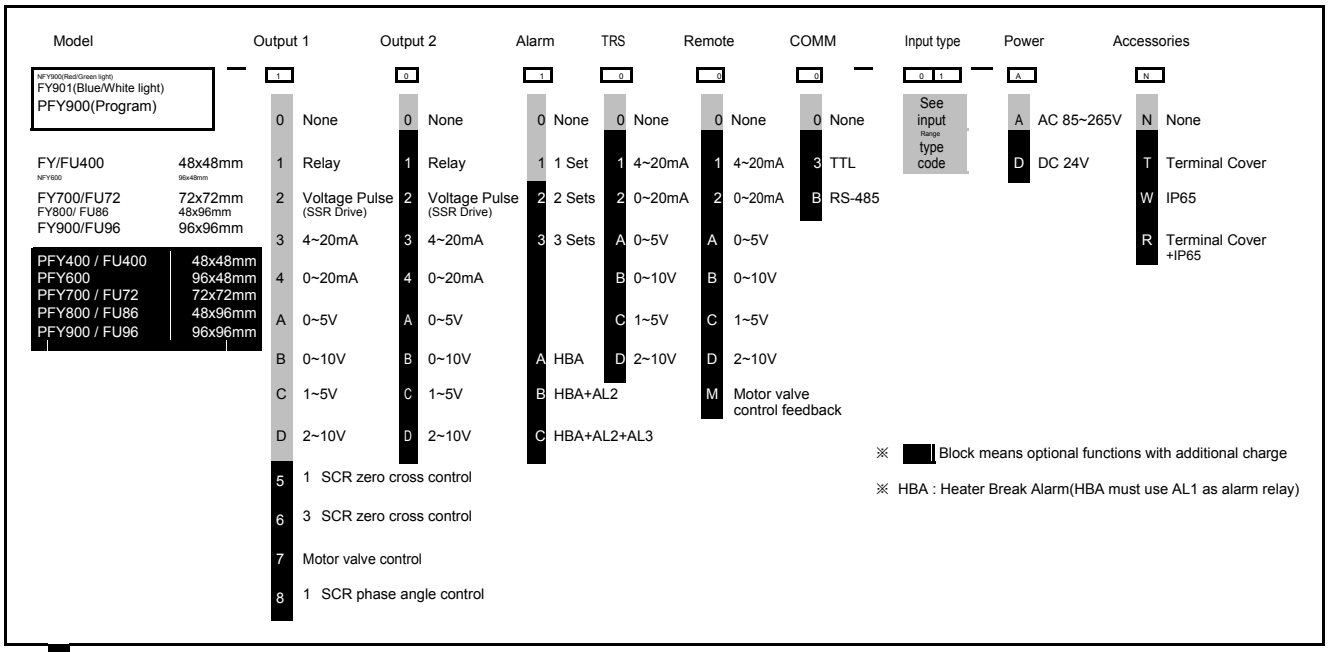
1. Before the controller transmits power, make sure that the position of the AC power assembly leg is correct. Otherwise, the controller may be seriously damaged after power transmission is initiated.
2. Before powering on, please confirm whether the power supply voltage is in accordance with the controller's specification (AC 85~265V or DC 24V.) Otherwise, the controller may be seriously damaged after power transmission is initiated.
3. Check if the wiring is connected to the terminal for the correct terminals (Input, Output.)
4. Please use crimp terminals suitable for M3 screws, as shown below:



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

5. Do not install the controller in places subject to high-frequency interference, corrosive gases, and high temperature and humidity (normal working environment: 0 ~ 50°C, 20 ~ 90% RH.)
6. To avoid noise interference, please keep the sensor wiring away from the power cord and the loading power cord.
7. When the thermocouple lead is extended, please use the compensation lead of the corresponding type to this thermocouple.
8. When the RTD lead wire is extended, please use those with lower resistance value. Please use the same wire between the three Wires.

2. Order Information



※ Boxed-in items are optional functions, which shall incur extra charges.

3. Specifications

Model		FY400/FU400/48	FY600	FY700/FU72	FY800/FU86	FY900/FU96
Supply Voltage		AC 85 ~ 265V, DC 24V (Optional Functions)				
Power Frequency		50/60 Hz				
Power Consumption		Approximately 6VA				
Memory		Non-Volatile Memory EEPROM				
Sensor Input ※Please refer to Input Range Table		Cold junction compensation diode external Accuracy : 0.1%				
		Cold junction compensation diode internal Accuracy : 0.3%				
		Sample time : 50ms				
		Thermalcouple: (K、J、R、S、B、E、N、T、W、PLⅡ、L)				
		RTD: PT100				
		DC Linear Analog Input: 0~20mA、4~20mA 0~1V、0~5V、0~10V、0~2V、1~5V、2~10V 0~25mV、0~50mV、0~70mV				
Output	OUT1 Relay	1a	1c	1c	1c	1c
		1a SPST-NO, 250 VAC, 5A (resistive load), electrical life: 100,000 operations 1c SPDT-NO, 250 VAC, 5A (resistive load), electrical life: 50,000 operations SPDT-NC, 250 VAC, 2A (resistive load), electrical life: 20,000 operations				
	OUT2 Relay	SPST-NO, 250 VAC, 5A (resistive load), electrical life: 100,000 operations				
	SSR Driver	ON: 24 V OFF: 0V max. load current: 20mA, with short circuit protection circuit				
	linear	4~20mA,0~20mA, 0~5V,0~10V, 1~5V,2~10V				
Control Method		ON-OFF or P、PI、PID control				
Alarm	Alarm 1	1a	1c	1a	1c	1c
		1a SPST-NO, 250 VAC, 5A (resistive load), electrical life: 100,000 operations 1c SPDT-NO, 250 VAC, 5A (resistive load), electrical life: 50,000 operations SPDT-NC, 250 VAC, 2A (resistive load), electrical life: 20,000 operations				
	Alarm 2	SPST-NO, 250 VAC, 5A (resistive load), electrical life: 100,000 operations				
	Alarm 3	---	1a	1a	1a	1a
		SPST-NO, 250 VAC, 5A (resistive load), electrical life: 100,000 operations				
TRS	Re-transmitted Signal	4~20mA、0~20mA、0~5V、0~10V、1~5V、2~10V				
	Source of Re-transmission	SV、PV				
	Accuracy	0.1%				
	Resolution	14 bit				
Remote SV	Signal	4~20mA、0~20mA、0~5V、0~10V、1~5V、2~10V				
	Resolution	18 bit				
	controlled by	SV				
Motor valve	Signal	1KΩ、560Ω				
	Resolution	18 bit				
	controlled by	PV2				
Communication	Interface	RS-485 Half duplex Communication MAX. 31 units, MAX. distance 1200 meters				
	Protocol	Modbus RTU , TAIE				
	Parity bit	NONE, ODD, EVEN				
	Data bit	8 bit				
	Stop bit	1 or 2 bit				
	Baud rate	2400,4800,9600,19200,38400,57600,115200 bps				
Operating Environment Temperature/Humidity		0 ~ 50°C (in the case of no freezing or condensatioin) / 20% ~ 90% RH				
Storage Environment Temperature		-25 ~ 65°C (in the case of no freezing or condensatioin)				
Dimension (mm)		W48 x H48 x D95	W96 x H48 x D95	W72 x H72 x D95	W48 x H96 x D95	W96 x H96 x D95
weight		Appox.120g	Appox.170g	Appox.150g	Appox.170g	Appox.230g

4. Input Range Table

Types of input			Code	Range	
				°C	°F
Thermalcouple	K	K1	01	-50.0~600.0	-58.0~999.9
		K2	02	-50~1200	-58~2192
	J	J1	03	-50.0~400.0	-58.0~752.0
		J2	04	-50~1200	-58~2192
	R	R	05	-50~1760	-58~3200
	S	S	06	-50~1760	-58~3200
	B	B	07	-50~1820	-58~3308
	E	E	08	-50~900	-58~1652
	N	N	09	-50~1300	-58~2372
	T	T1	10	-199.9~400.0	-199.9~752.0
		T2	11	-199~400	-326~752
	W	W	12	-50~2320	-58~4208
	PL	PL	13	-50~1200	-58~2192
	L	L	14	-50~800	-58~1472
RTD	PT100	PT1	15	-199.9~850.0	-199.9~999.9
		PT2	16	-199~850	-326~1562
		PT3	17	0~850	32~1562
Linear	AN1	0~25mV	18	-1.999~9.999 -19.99~99.99 -199.9~999.9 -1999~9999	
	AN2	0~50mV	19		
		0~20mA	20		
		0~1V	21		
		0~2V	22		
		0~5V	23		
		0~10V	24		
	AN3	0~70mV	25		
	AN4	4~20mA	26		
		10~50mV	27		
		1~5V	28		
		2~10V	29		

5. Packing List & Label Information

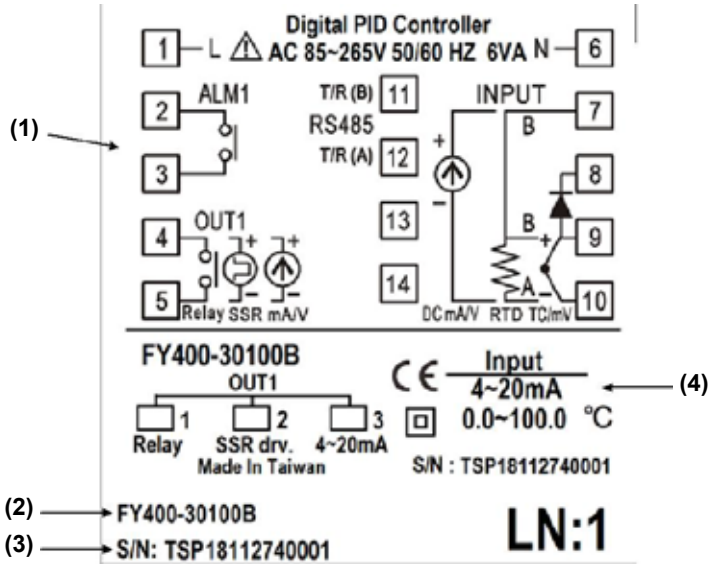
5.1 Packing List Guide

FY400/600/700/800/900

1. Temperature Controller…1 unit
2. Mounting frame……2 units
3. Brief manual……..1 pcs

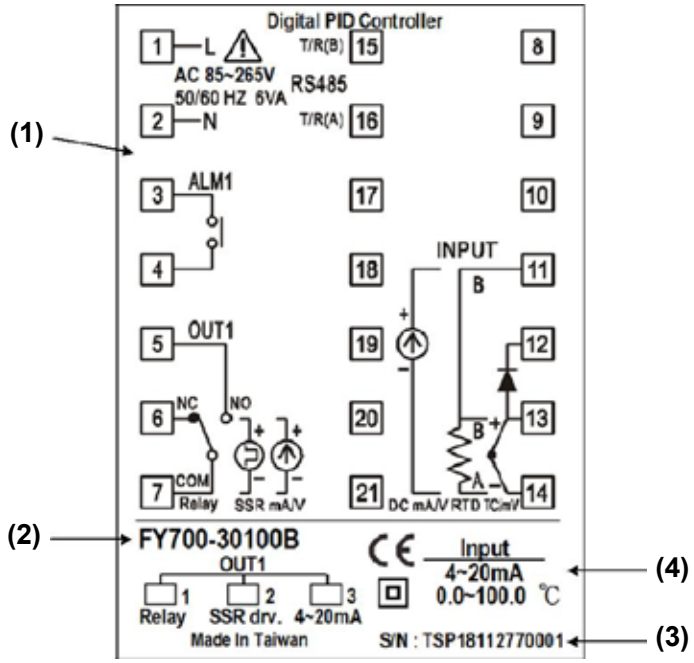
5.2 Label Guide

5.2.1 FY400/FU400/FU48



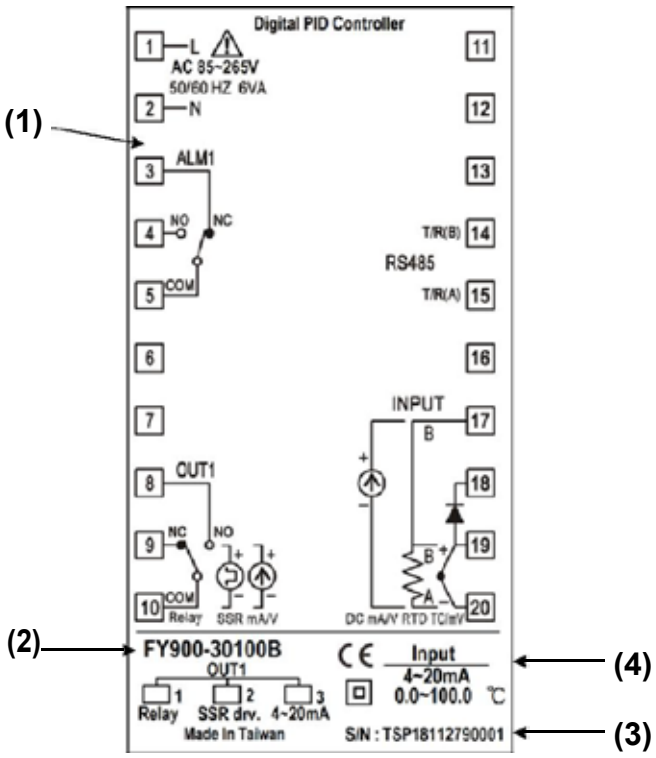
No.	Item	Description
(1)	Terminal arrangement	FY400 Terminal Wiring Diagram
(2)	Model number	FY400 model name
(3)	Serial number	18112740001
(4)	Input type	Controller Input Signal and Scope

5.2.2 FY700/FU72



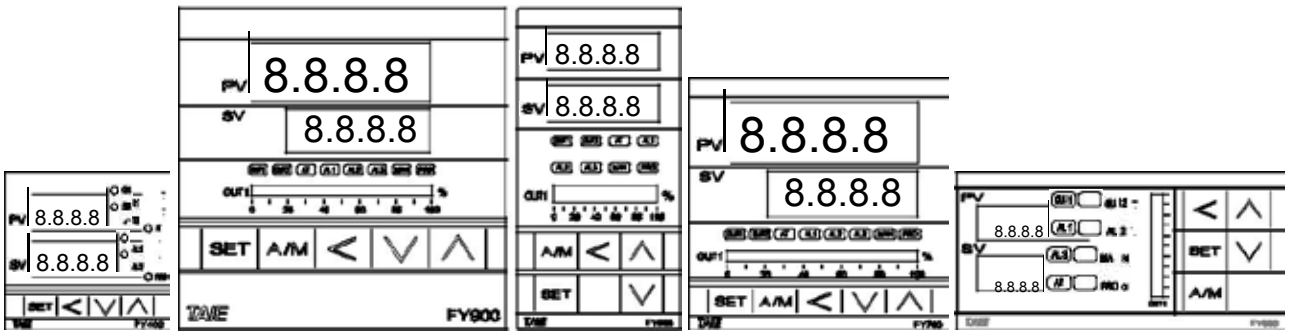
No.	Item	Description
(1)	Terminal arrangement	FY700 Terminal Wiring Diagram
(2)	Model number	FY700 model name
(3)	Serial number	18112770001
(4)	Input type	Controller Input Signal and Scope

5.2.3 FY600/800/900/FU86/96

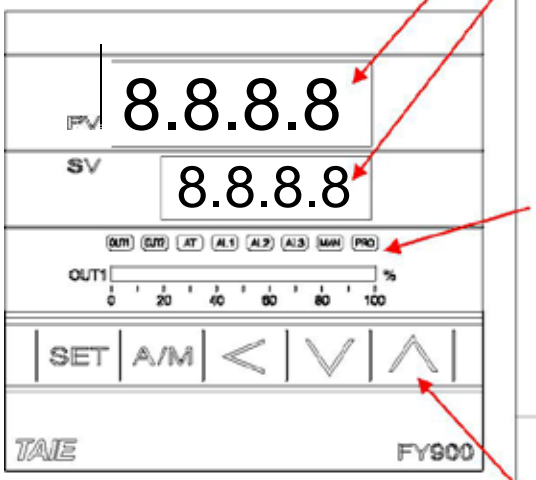


No.	Item	Description
(1)	Terminal arrangement	FY900 Terminal Wiring Diagram
(2)	Model number	FY900 model name
(3)	Serial number	18112790001
(4)	Input type	Controller Input Signal and Scope

6. Parts Description



FY400/FU400 FY900/FU96 FY800/FU86 FY700/FU72 FY600



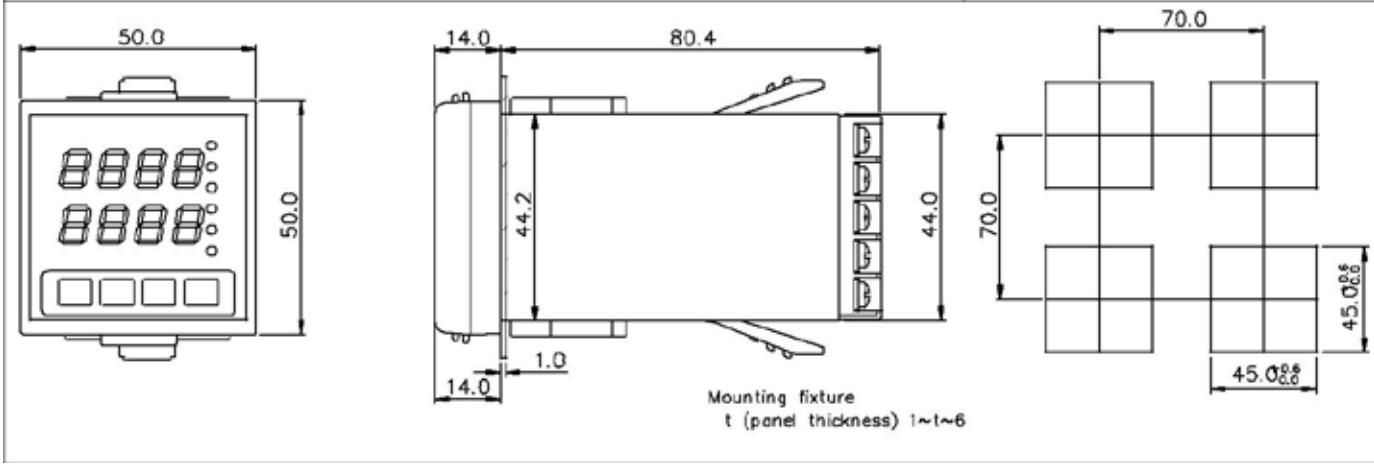
1	PV			Indicating PV (measured value) and character information such as parameter codes or error codes(Red)
2	SV			Indicating SV (target set value) or parameter values(Green)
3	LED	OUT1		Lamp lit when OUT1 is activated (Green)
		OUT2		Lamp lit when OUT2 is activated (Green)
		AT		Lamp lit when Auto tuning is activated (Orange)
		AL1		Lamp lit when Alarm 1 is activated (Red)
		AL2		Lamp lit when Alarm 2 is activated (Red)
		AL3		Lamp lit when Alarm 3 is activated (Red)
		MAN		Lamp lit when controller in manual mode or get error condition (Orange)
		PRO		When the program is executed, this light is on (orange)
		OUT1%		OUT1% bar-graph indicator(Green)
4	Keypad	SET	SET	For parameter call-up and set value registration
		A/M	A/M	Auto manual transfer
		<	SHIFT	Shift digits when changing settings
		V	DOWN	Decrease numerals
		^	UP	Increase numerals

7. Installation

7.1 FY400/FU400/FU48 Dimensions

(Unit: mm)

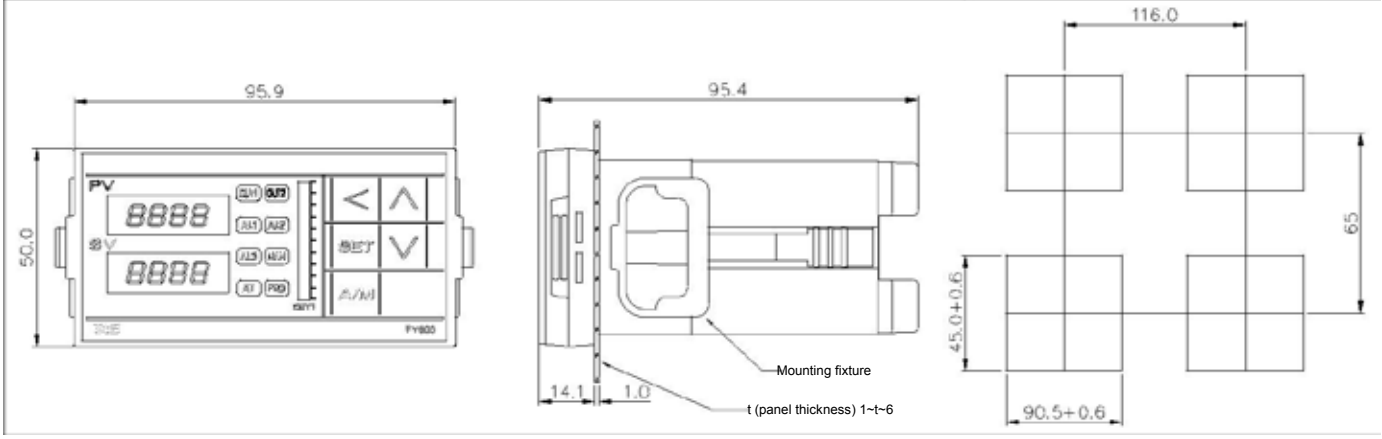
Dimensions	Individual mounting



7.2 FY600 Dimensions

(Unit: mm)

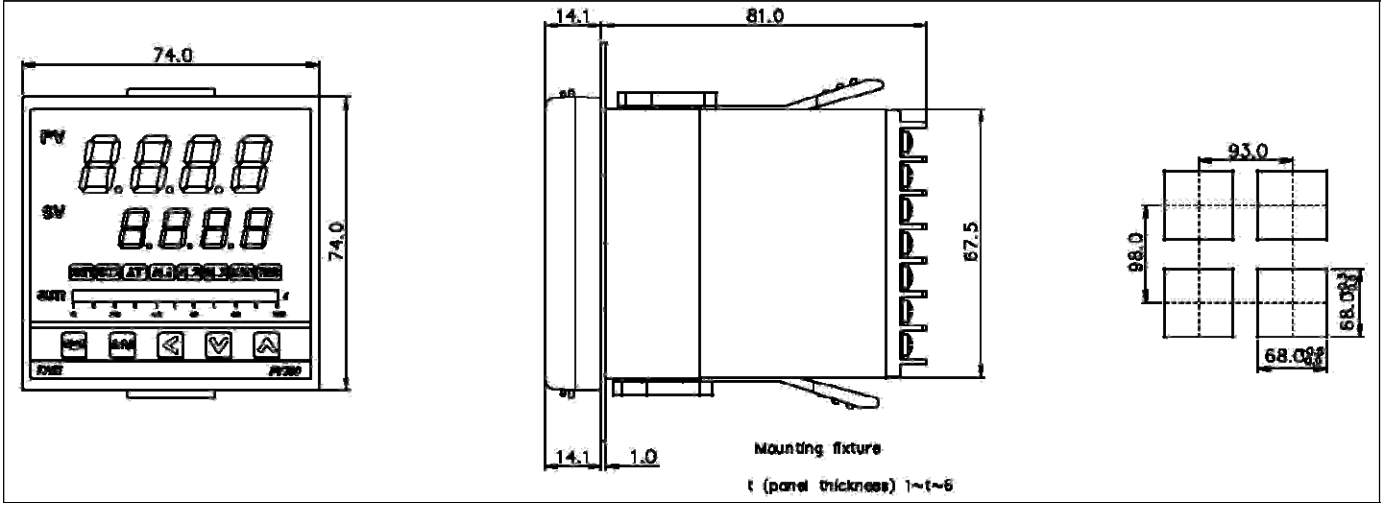
Dimensions	Individual mounting



7.3 FY700/FU72 Dimensions

(Unit: mm)

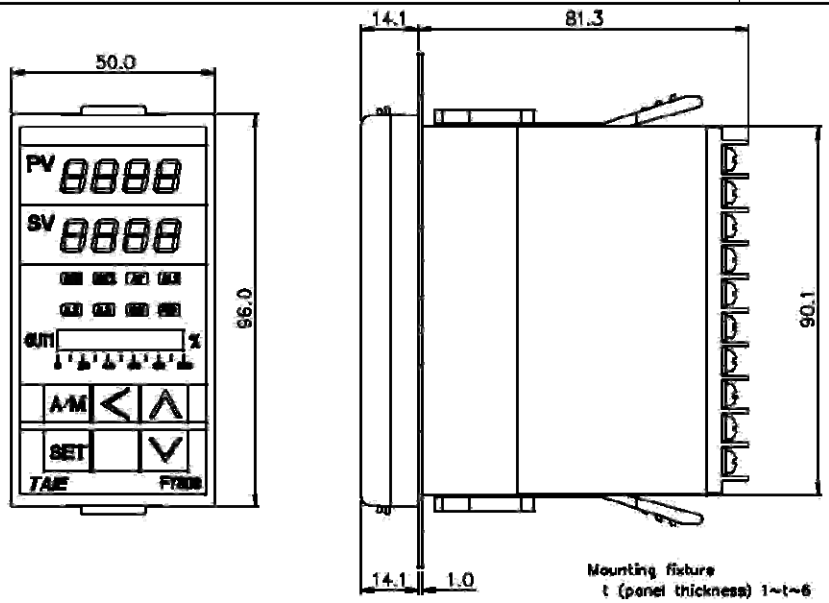
Dimensions	Individual mounting

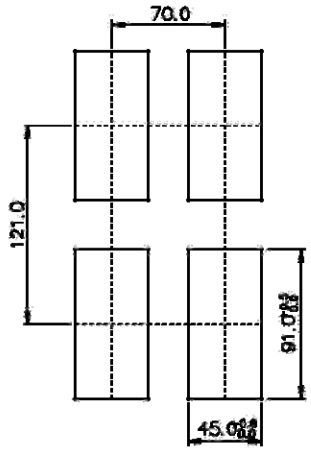


7.4 FY800/FU86 Dimensions

(Unit: mm)

Dimensions	Individual mounting

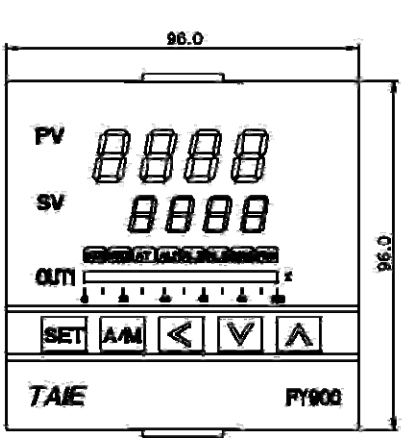


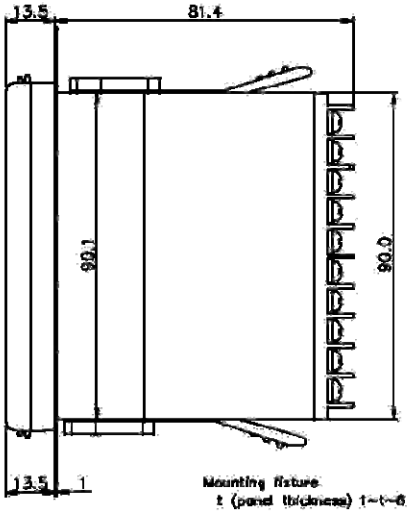


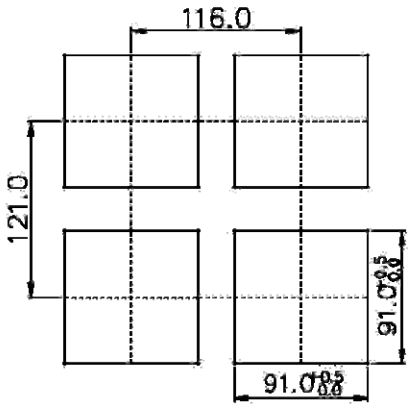
7.5 FY900/FU96 Dimensions

(Unit: mm)

Dimensions	Individual mounting



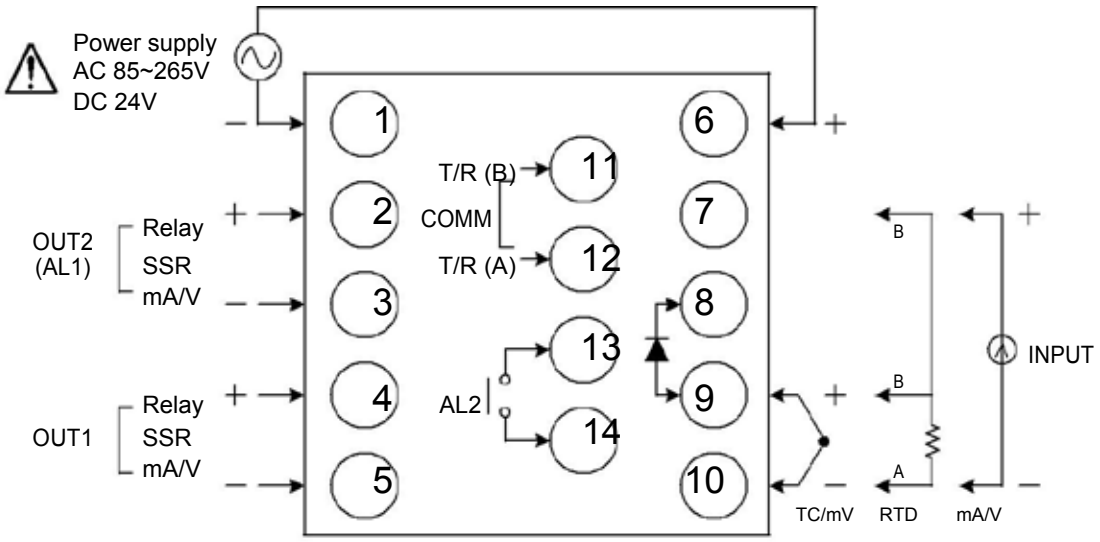


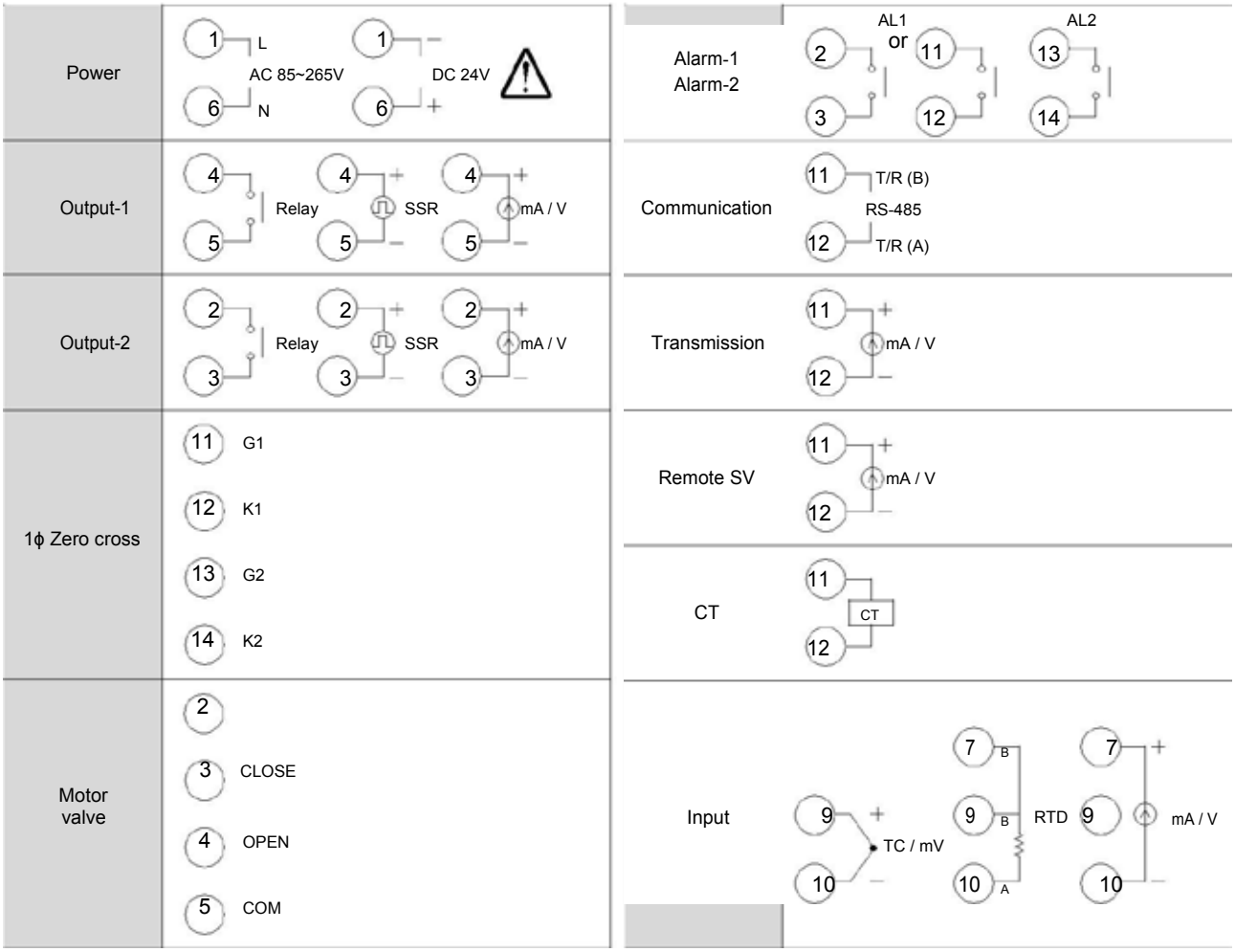


8. Terminal Arrangement

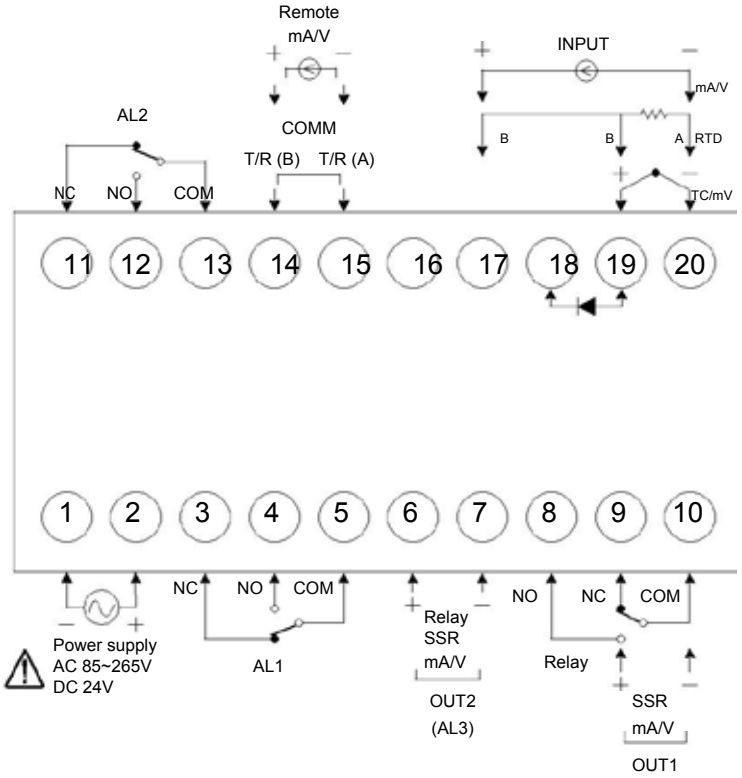
> **⚠ Caution**
>
> When implementing wiring for the controller power supply, please make sure that the power supply is turned off to avoid electric shock!
> Do not touch the live parts, such as the terminals, while the power is on. Otherwise death or serious injury may be resulted from short circuit of the contact electrode.

8.1 FY400/FU400/FU48 Terminal Arrangement





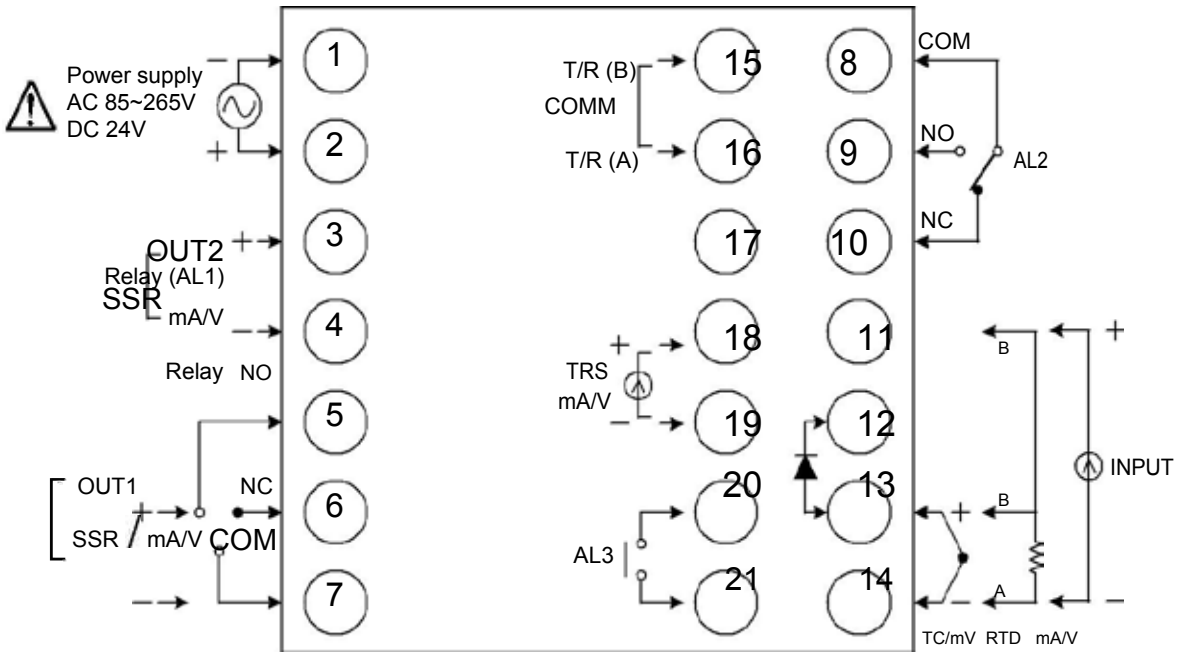
8.2 FY600 Terminal Arrangement

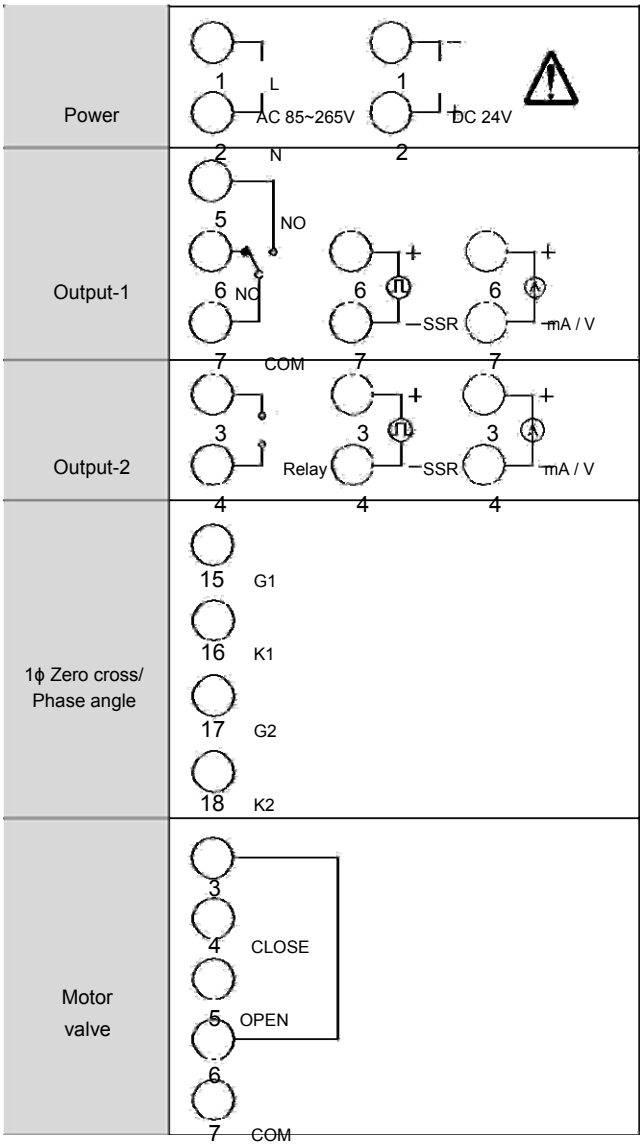


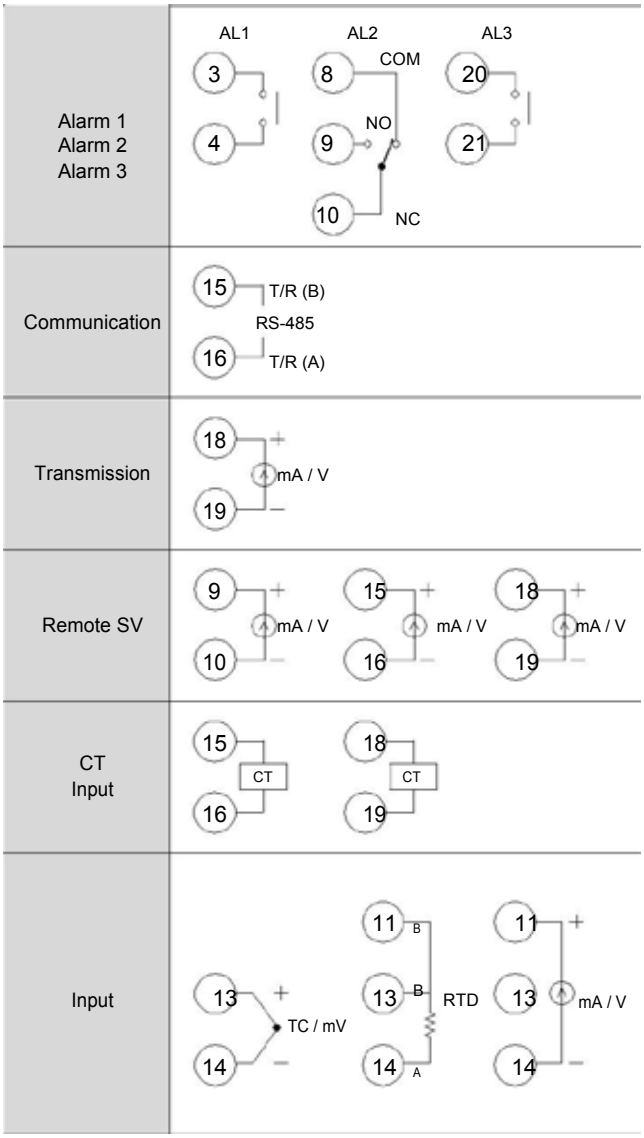
Power	1 L, 2 N — AC 85~265V; 1 −, 2 + — DC 24V
Output-1	8 NO, 9 NC, 10 COM; 9 (+) SSR 10 (−); 9 (+) mA / V 10 (−)
Output-2	6, 7 Relay; 6 (+) SSR 7 (−); 6 (+) mA / V 7 (−)
Motor valve	6, 7 CLOSE, 8 OPEN, 9, 10 COM

Communication	14 T/R (B), RS-485, 15 T/R (A)
Transmission	12 (+) mA / V 13 (−); 14 (+) mA / V 15 (−)
Remote SV/ CT Input	14 (+) mA / V 15 (−); 14 CT 15
Alarm 1 Alarm 2 Alarm 3	AL1: 3 NC, 4 NO, 5 COM; AL2: 11 NC, 12 NO, 13 COM; AL3: 6, 7
Input	19 (+) TC / mV 20 (−); 17 B, 19 B, 20 A; RTD 17 (+), 19 mA / V, 20 (−)

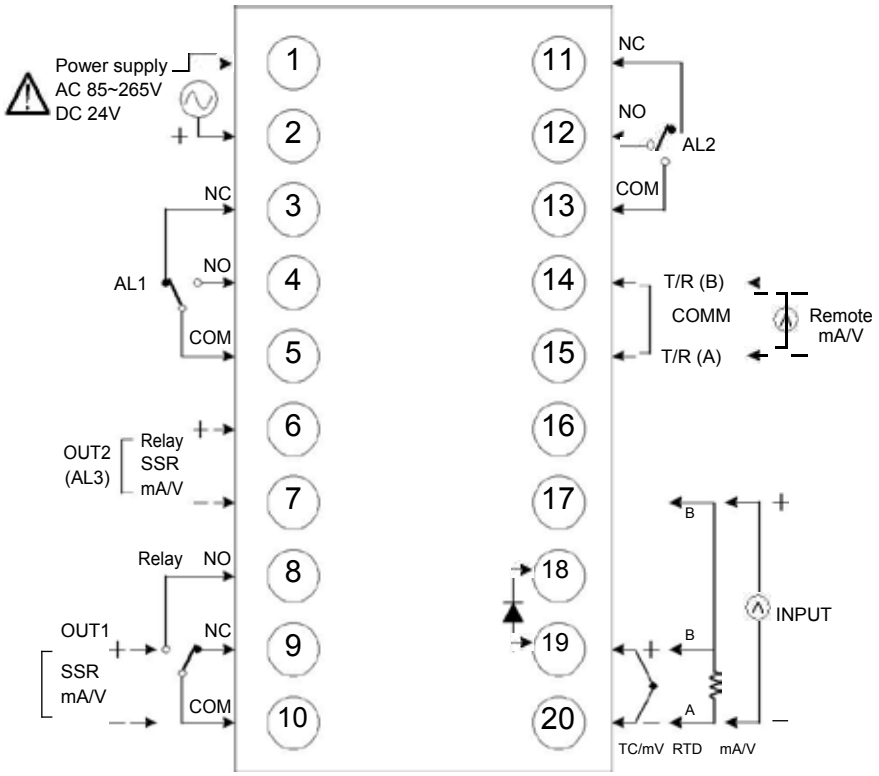
8.3 FY700/FU72 Terminal Arrangement

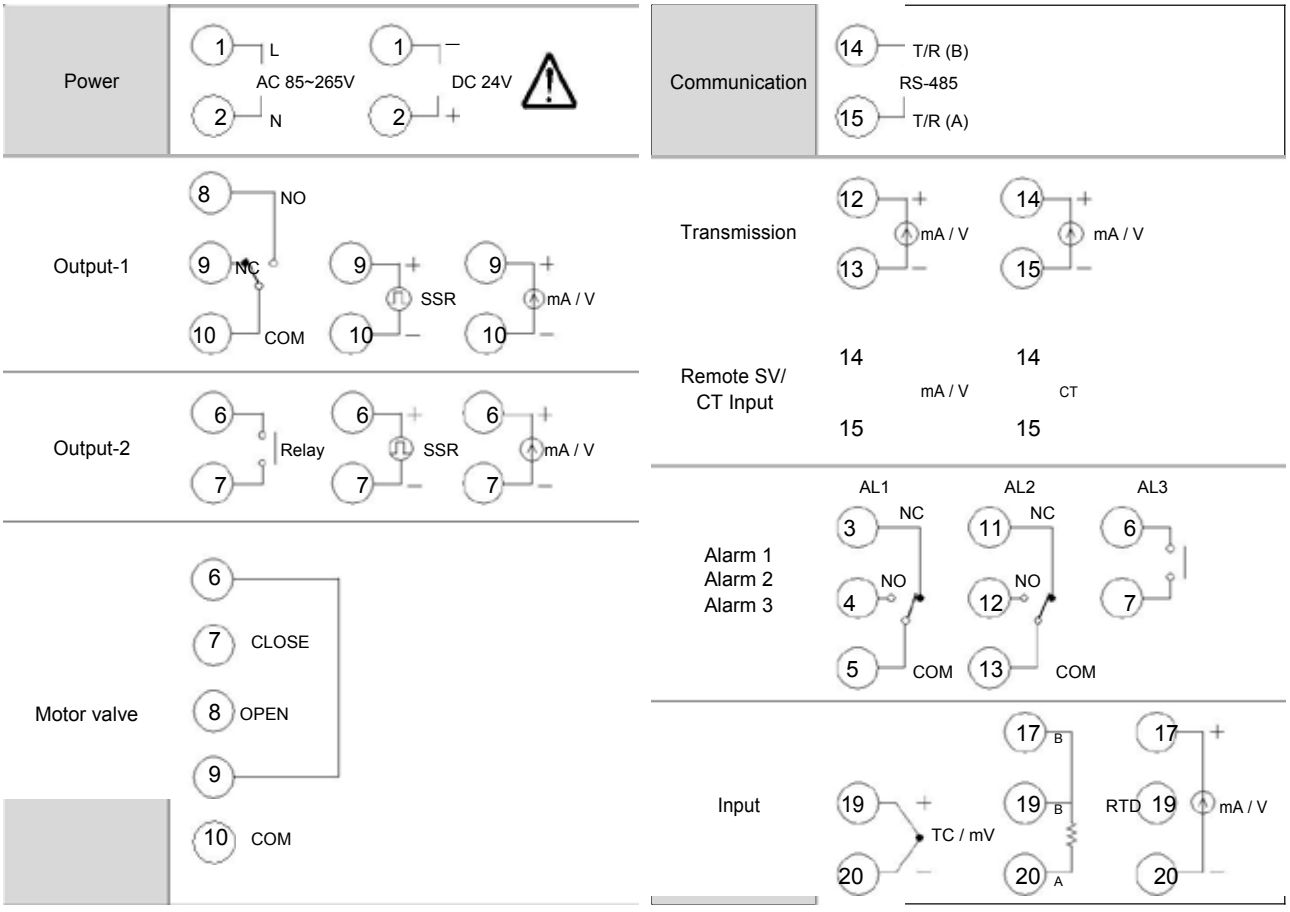




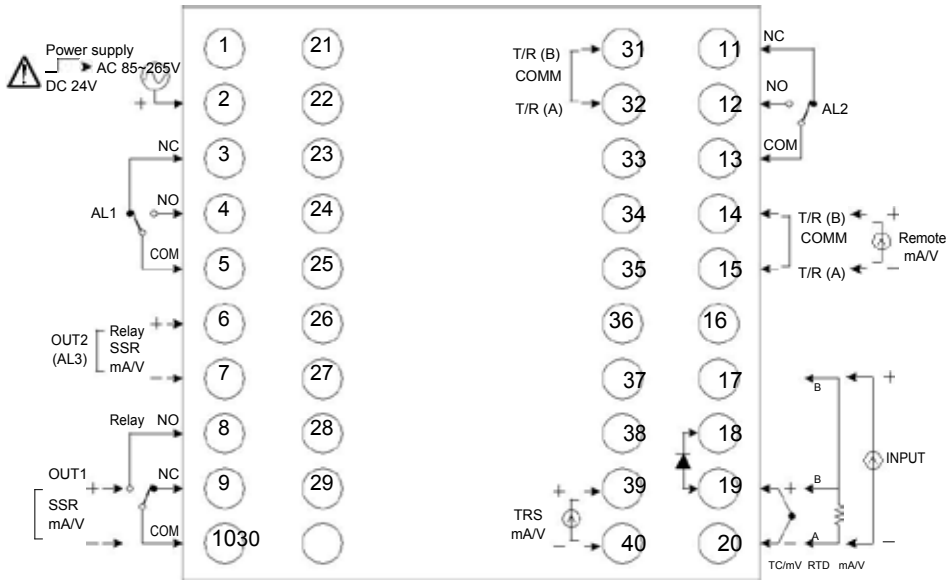


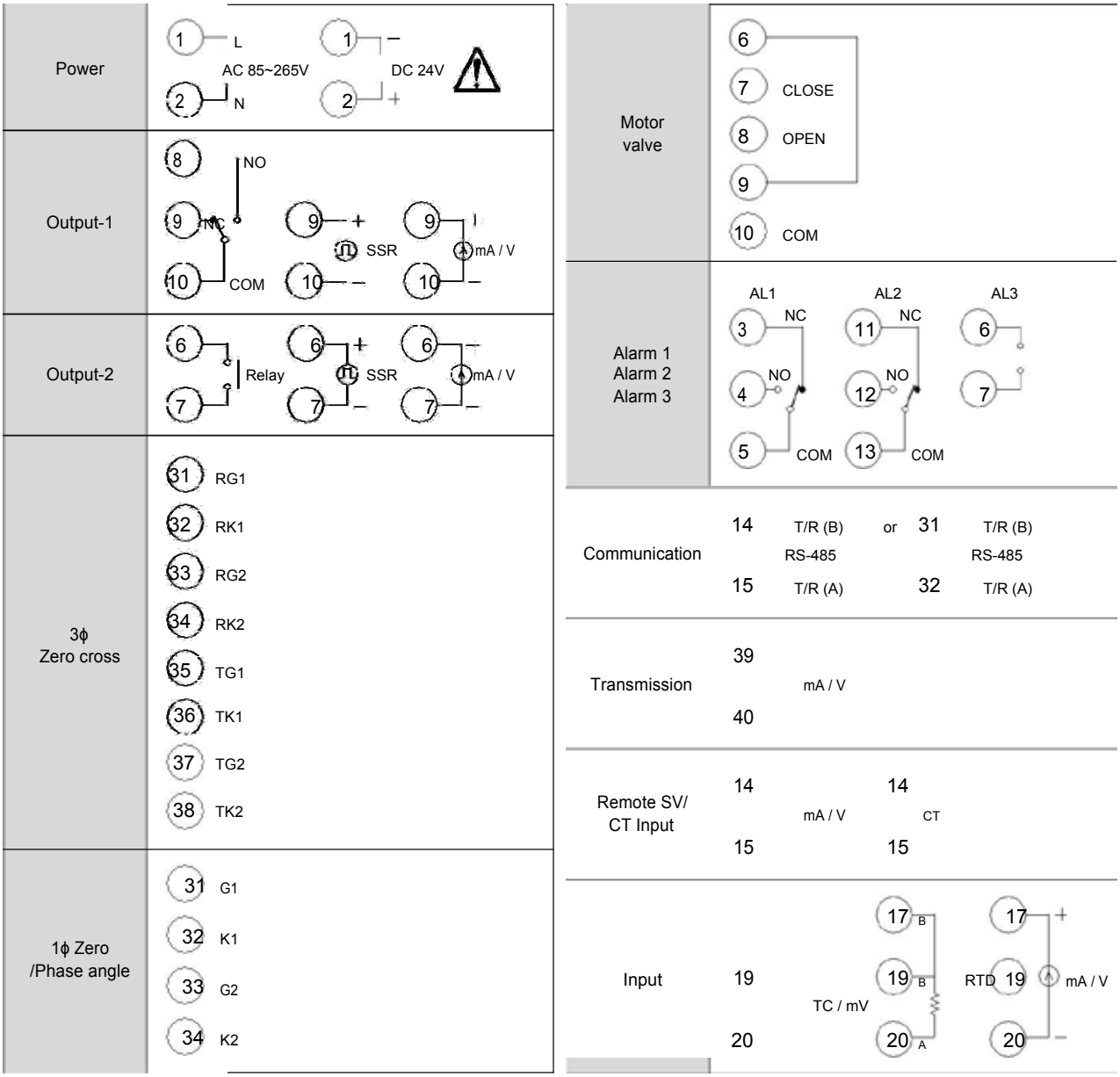
8.4 FY800/FU86 Terminal Arrangement





8.5 FY900/FU96 Terminal Arrangement





9. Basic Function Setting

9.1 Input Type Setting

1.	PV 25 SV 0	Display after power-on.	2.	PV inP1 SV t2	Hold SET key + ◁ key 3 seconds, to enter LEVEL_3 upper display showing "INP1" with lower display showing current input type.
3.	PV inP1 SV t2	Press ◁ key the lower display flashes.	4.	PV inP1 SV Pt1	Press △ key and ▽ key to enter the intended input type.
5.	PV inP1 SV Pt1	Press SET key to store new value of INP1.	Modify input type needs to interchange of jumper location, and it needs to recalibration for linear input type change. Please refer to chapter 15. "Input type modification".		

9.2 SV Value Setting

1.	PV 25 SV 0	Display after power-on.	2.	PV 25 SV 0000	When ◁ key is pressed, the lower display flashes.
3.	PV 25 SV 0150	Press △ key and ▽ key to adjust set value.	4.	PV 25 SV 150	Press SET key to store new value of SV.

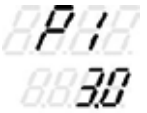
9.3 Auto Tuning Execution

1.	PV 25 SV 150	Display after power-on.	2.	PV At SV no	Press SET key until show "AT"。
3.	PV At SV no	When ◁ key is pressed, the lower display flashes.	4.	PV At SV YES	Press △ key or ▽ key to select auto tuning execution or not.
5.	PV At SV YES	Press SET key to store new value of AT.	When auto tuning AT LED lamp lit and start to output, through a few circles to get new PID value with the precise control, if finished the AT LED will be lamp off.		

9.4 PID Value Setting

1.	PV 25 SV 150	Display after power-on.	2.	PV P1 SV 30	Hold SET key 3 seconds, then entering into LEVEL_2 upper display showing "P1", with lower display show current P1 value.
3.	PV P1 SV 0030	When ◁ key is pressed, the lower display flashes.	4.	PV P1 SV 0500	Press △ key and ▽ key to set the intended P1 value.
5.	PV P1 SV 500	Press SET key to store new value of P1.	By the same procedure, use the same ways to set integral value(I1) and derivative value(D1).		

9.5 ON/OFF Control Setting

1.	PV SV		Display after power-on.	2.	PV SV		Hold SET key 3 seconds, then entering into LEVEL_2, as upper display shows “P1”, with lower display showing current P1 value.
3.	PV SV		When < key is pressed, the lower display flashes, upper display.	4.	PV SV		Press V key until P1 = 0.0
5.	PV SV		Press SET key to store new value.	6.	PV SV		Press SET key until show “HYS1”。
7.	PV SV		When < key is pressed, the lower display flashes.	8.	PV SV		Press ∧ key and V key to set the intended HYS1 value.
9.	PV SV		Press SET key to store new value.	Heat mode formula: PV > (SV + HYS1) → OUT1 OFF PV ≤ (SV - HYS1) → OUT1 ON Cool mode formula: PV ≥ (SV + HYS1) → OUT1 ON PV < (SV - HYS1) → OUT1 OFF			

9.6 Alarm Mode Setting

1.	PV SV		Display after power-on.	2.	PV SV		Hold SET key + < key 3 seconds, then entering into LEVEL_3 upper display showing “INP1” with lower display showing current input type.
3.	PV SV		Press SET key until show “ALD1”。	4.	PV SV		When < key is pressed, the lower display flashes
5.	PV SV		Press ∧ key and V key to set the intended ALD1 value.	6.	PV SV		Press SET key to store new value of ALD1. ※Please refer to ch12.1 Alarm mode.

9.7 Alarm Value Setting

1.	PV SV		Display after power-on.	2.	PV SV		Press SET key until show “AL1”。
3.	PV SV		When < key is pressed, the lower display flashes.	4.	PV SV		Press ∧ key and V key to set the intended AL1 value.
5.	PV SV		Press SET key to store new value of AL1.				

9.8 Manual Mode Selection

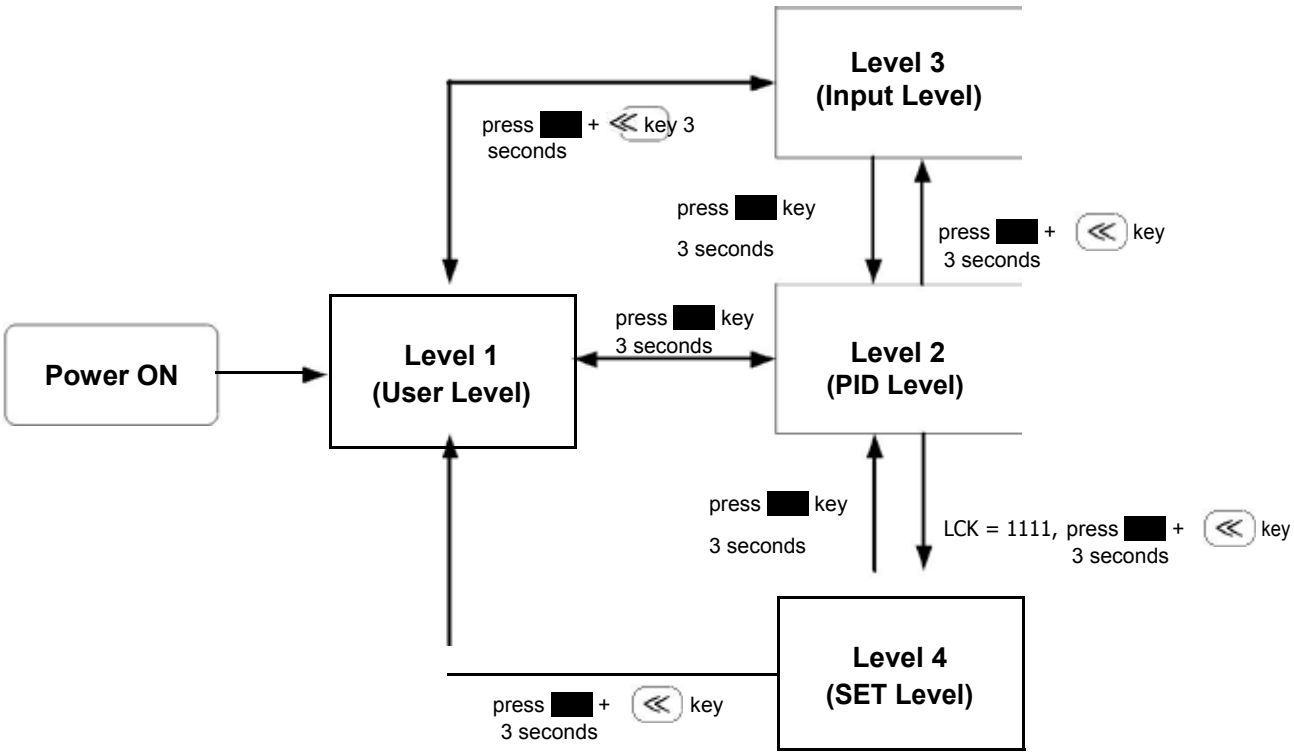
1.	PV 25 SV 150 Display after power-on.	2.	PV OUTL SV 0.0 Hold A/M 2 seconds.
3.	PV 25 SV 000.0 When < key is pressed, the lower display flashes.	4.	PV 25 SV 050.0 Press ∧ key and ∨ key to set the intended output% value.
5.	PV OUTL SV 50.0 Press SET key to store new value.	In manual mode OUTL=100.0，output=100.0 % continuously. In manual mode OUTL=20.0，output=20.0 % continuously.	

10. Flow Chart of Parameter Setting

10.1 Level Operation Mode

1. LEVEL 1 enter to the LEVEL 2
   Hold SET key for 3 seconds then entering into LEVEL 2
2. LEVEL 1 enter to the LEVEL 3
   Hold SET key + SHIFT key for 3 seconds then entering into LEVEL 3
3. LEVEL 2 return to the LEVEL 1
   Hold SET key for 3 seconds then return to LEVEL 1
4. LEVEL 2 enter to the LEVEL 3
   Hold SET key for 3 seconds then entering to LEVEL 3
5. LEVEL 2 enter to the LEVEL 4
   On the LEVEL 2 then press SET key to find parameter “LCK
   modify LCK value from current value to 1111
   after hold SET key + SHIFT key 3 seconds entering into LEVEL 4
6. LEVEL 3 return to the LEVEL 1
   Hold SET key + SHIFT key for 3 seconds then return to LEVEL 1
7. LEVEL 3 return to the LEVEL 2
   Hold SET key for 3 seconds then return to LEVEL 2
8. LEVEL 4 return to the LEVEL 1
   Hold SET key + SHIFT key for 3 seconds then return to LEVEL 1
9. LEVEL 4 return to the LEVEL 2
   Hold SET key for 3 seconds then return to LEVEL 2

10.2 Level Operation Diagram



※: If no key is pressed within 60 seconds, it will automatically return to LEVEL 1 (user level) and display PV/SV.

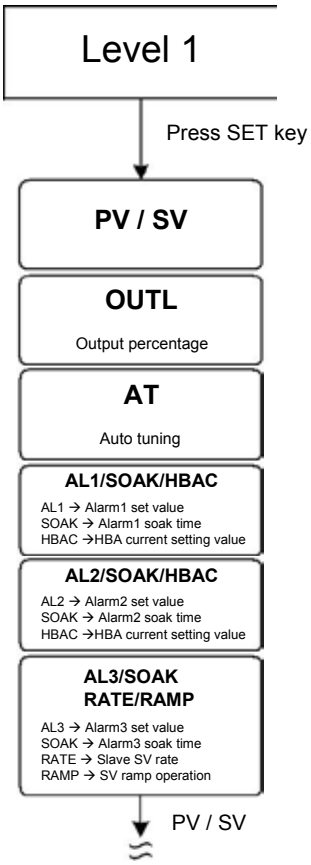
10.3 Data Lock Function

LCK provides a parameter protection function to prevent the first line operator from touching or modifying important parameters. Conversely, when the parameter cannot be modified, please make sure that the set value of LCK.

LCK	LEVEL				Descriptions
	Level_1 USER Level	Level_2 PID Level	Level_3 INPUT Level	Level_4 SET Level	
0000	◎	◎	◎	X	All parameters of Level 1, 2 & 3 are able to be modified (Factory default setting)
1111	◎	◎	X	◎	All parameters of Level 1, 2 & 4 are able to be modified
0100	◎	◎	X	X	All parameters of Level 1, 2 are able to be modified
0110	◎	◎	X	X	Only parameters of Level 1 and LCK can be modified
0001	◎	◎	X	X	Only SV, LCK can be modified
0101	◎	◎	X	X	Only LCK can be modified
Other	◎	◎	◎	X	Once jumping to other levels, LCK will be automatically restored to 0000

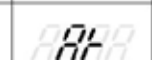
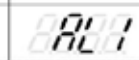
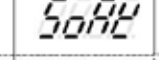
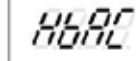
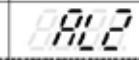
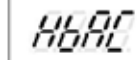
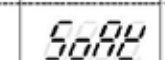
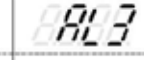
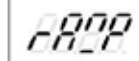
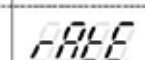
◎ : able to enter X : unable to enter

10.4 Level 1 (User Level) All Parameters Display



※: If no key is pressed within 60 seconds, it will automatically return to LEVEL 1 (user level) and display PV/SV

10.5 LEVEL_1 Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
PV	---	Process value	USPL	LSPL	---	---
SV	---	Set value	USPL	LSPL	---	---
OUTL		High limit setting of manipulated value main output when PID gain > OUTL use OUTL as manipulated value	100.0	0.0	100.0	SET1.1
AT		Auto-tuning execute selection 0 : NO PID control 1 : YES execute auto tuning	YES	NO	NO	SET1.2
*AL1		Alarm1 set value (Please refer to Chapter 12)	9999	-1999	1.0	SET1.3
SOAK		Alarm1 soak time Time format : hr.min	99.59	0.00	0.10	ALD1=10 or ALD1=19
HBAC		HBA current setting value Upper : heater current display Down : current setting value unit : ampere(A)	100.0	0.0	1.0	INP2=4 & ALD1=9
*AL2		Alarm2 set value (Please refer to Chapter 12)	9999	-1999	1.0	SET1.4
HBAC		HBA current setting value Upper : heater current display Down : current setting value unit : ampere(A)	100.0	0.0	1.0	INP2=4 & ALD2=9
SOAK		Alarm2 soak time Time format : hr.min	99.59	0.00	0.10	ALD2=10 or ALD2=19
*AL3		Alarm3 set value (Please refer to Chapter 12)	9999	-1999	1.0	SET2.1
SOAK		Alarm3 soak time Time format : hr.min	99.59	0.00	0.10	ALD3=10
RAMP		The rate of change during SV ramp operation format : °C / minute	99.99	-19.99	10.00	ALD3=9 & SET2.1
RATE		(Please refer to Chapter 11.7) Slave SV rate RATE SV = SV x (RATE/9999)	9999	0	9999	SET2.1 & SET0.2

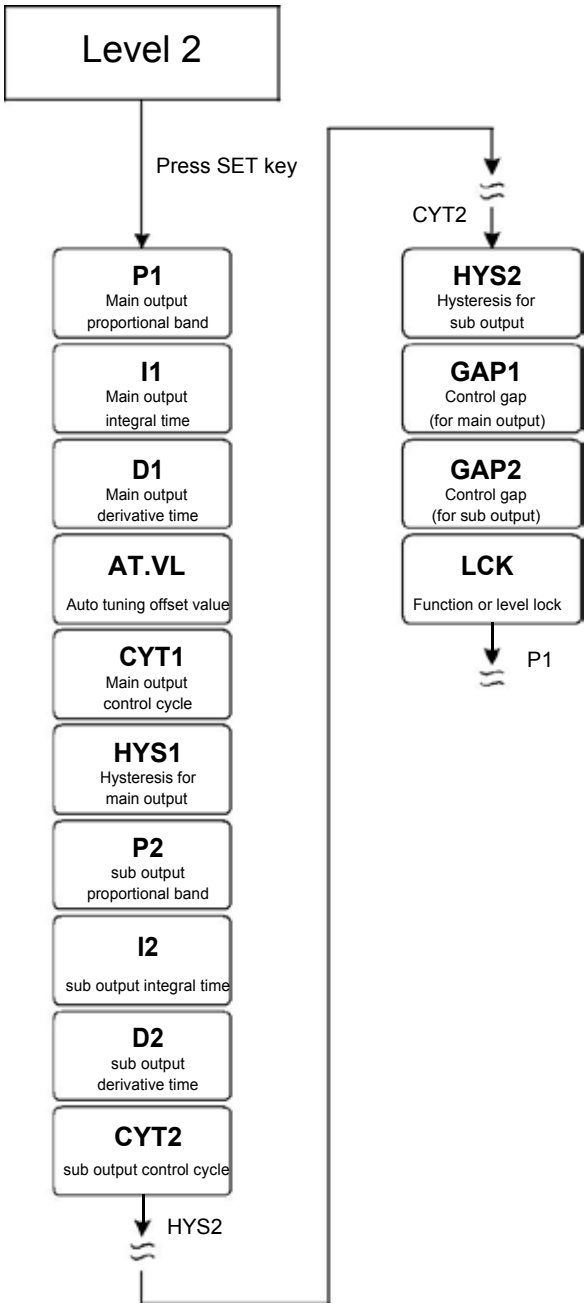
* Automatically display corresponding parameters according to different setting conditions

EX1: When alarm1 is used as HBA function, original AL1 will become HBAC display

EX2: When alarm2 is used as SOAK_B function(ALDX= 19), original AL2 will become SOAK display

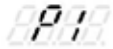
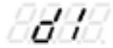
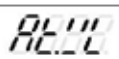
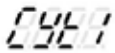
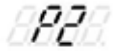
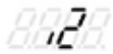
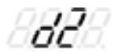
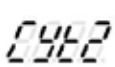
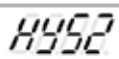
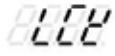
EX3: When alarm3 is used as RAMP function, original AL3 will become RAMP display

10.6 Level 2 (PID Level) All Parameters Display

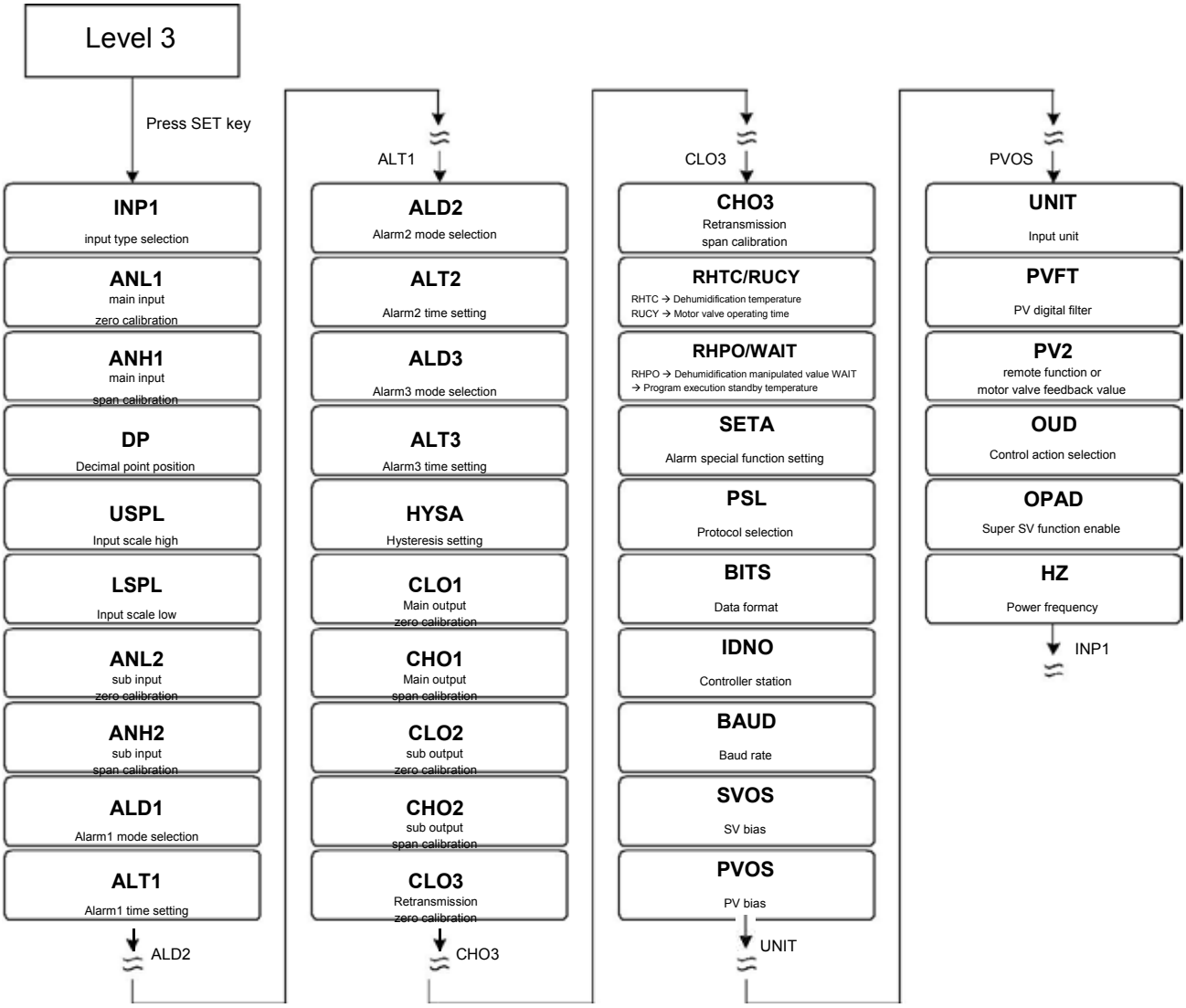


※ If no key is pressed within 60 seconds, it will automatically return to LEVEL 1 (user level) and display PV/SV

10.7 LEVEL_2 Parameter

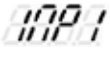
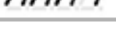
Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
P1		Main output proportional band 0.0 : ON/OFF control Other values : proportional band setting value	200.0	0.0	3.0	---
I1		Main output integral time 0 : disable integral function Other values : integral time setting value	3600	0	240	---
D1		Main output derivative time 0 : disable derivative function Other values : derivative time setting value	900	0	60	---
AT.VL		Auto tuning offset value execute auto tuning in (SV-ATVL) point	100.0	-100.0	0.0	---
CYT1		Main output control cycle 0 : Linear signal 1 : SSR drive 2~150 : Relay	150	0	10	---
HYS1		Hysteresis for main output on/off control use(when P1 = 0.0 appear) heating formula : PV ≥ (SV + HYS1) → OUT1=OFF PV ≤ (SV - HYS1) → OUT1=ON cooling formula : PV ≥ (SV + HYS1) → OUT1=ON PV ≤ (SV - HYS1) → OUT1=OFF	100.0	-100.0	1.0	P1 = 0.0
P2		Sub output proportional band 0.0 : ON/OFF control Other values : proportional band setting value	200.0	0.0	3.0	OUTY = 1
I2		Sub output integral time 0 : disable integral function Other values : integral time setting value	3600	0	240	OUTY = 1
D2		Sub output derivative time 0 : disable derivative function Other values : derivative time setting value	900	0	60	OUTY = 1
CYT2		Sub output control cycle 0 : Linear signal 1 : SSR drive 2~150 : Relay	150	0	10	OUTY = 1
HYS2		Hysteresis for sub output on/off control use(when P2 = 0.0 appear)	100.0	-100.0	1.0	P2 = 0.0
GAP1		Control gap (for main output)	1000	-1000	0	OUTY = 1
GAP2		Control gap (for sub output)	1000	-1000	0	OUTY = 1
LCK		Function or level lock (Please refer to Chapter 10.3 Data Lock Function)	1111	0000	0000	---

10.8 Level 3 (Input Level) All Parameters Display



※ If no key is pressed within 60 seconds, it will automatically return to LEVEL 1 (user level) and display PV/SV

10.9 LEVEL_3 Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
INP1		Main input type selection Change this parameter USPL&LSPL will be reset (please refer to Chapter 4 Input Type Glossary)	AN4	K1	K1	---
ANL1		Main input zero calibration (please refer to chapter 15.4)	9999	-1999	0	SET2.2
ANH1		Main input span calibration (please refer to chapter 15.4) (hex display)	0x7FFF	0x0000	0x5FFF	SET2.2
DP		Decimal point position (only available in linear signal input AN1~AN4) 0 : 0000 1 : 000.0 2 : 0.00 3 : 0.000	0.000	0000	000.0	SET2.2

10.9 LEVEL_3 Parameter

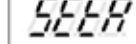
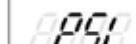
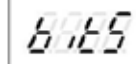
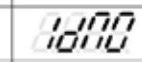
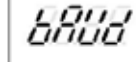
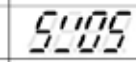
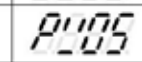
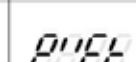
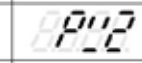
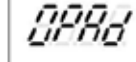
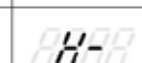
Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
LSPL	LSPL	Input scale low	9999	-1999	---	SET2.3
USPL	USPL	Input scale high	9999	-1999	---	SET2.3
ANL2	ANL2	Sub input zero calibration	9999	-1999	0	SET2.4
ANH2	ANH2	Sub input span calibration (hex display)	0x7FFF	0x0000	0x5FFF	SET2.4
ALD1	ALD1	Alarm1 mode selection (Please refer to Chapter 12.1 Alarm Mode)	19	0	11	SET3.1
ALT1	ALT1	Alarm1 time setting 0.00：Flicker 99.59：Continued ON 0.01~99.58：delay time Time format：min . sec	99.59	0.00	99.59	SET3.2
ALD2	ALD2	Alarm2 mode selection (Please refer to Chapter 12.1 Alarm Mode)	19	0	0	SET3.3
ALT2	ALT2	Alarm2 time setting 0.00：Flicker 99.59：Continued ON 0.01~99.58：delay time Time format：min . sec	99.59	0.00	99.59	SET3.4
ALD3	ALD3	Alarm3 mode selection (Please refer to Chapter 12.1 Alarm Mode)	18	0	0	SET4.1
ALT3	ALT3	Alarm3 time setting 0.00：Flicker 99.59：Continued ON 0.01~99.58：delay time Time format：min . sec	99.59	0.00	99.59	SET4.2
HYSA	HYSA	Hysteresis setting for alarm1~3	100.0	-100.0	1.0	SET4.3
CLO1	CLO1	Main output zero calibration only for linear signal (Please refer to Chapter 14.5)	9999	0	0	SET4.4
CHO1	CHO1	Main output span calibration only for linear signal (Please refer to Chapter 14.5)	9999	0	3600	SET4.4
CLO2	CLO2	Sub output zero calibration only for linear signal	9999	0	0	SET5.1
CHO2	CHO2	Sub output span calibration only for linear signal	9999	0	3600	SET5.1
CLO3	CLO3	Retransmission zero calibration	9999	0	0	SET5.2
CHO3	CHO3	Retransmission span calibration	9999	0	3600	SET5.2
*RHTC	rHtC	Dehumidification temperature If PV less than RHTC manipulated value = RHPO (Please refer to Chapter 11.5)	200.0	0.0	0.5	SET5.3
RUCY	rUCY	Motor valve operating time Time unit：second (Please refer to Chapter 11.6)	150	5	5	SET5.3
*RHPO	rHPo	Dehumidification manipulated value 0 : OFF disable dehumidification function Other values : 0.1~100.0 manipulated value (Please refer to Chapter 11.5)	100.0	OFF	OFF	SET5.3
WAIT	WAIT	Program execution standby temperature 0 : when program executed reach SV do not waiting for PV temperature Other values : when PV= (target SV-WAIT), program entering next segment (Please refer to Chapter 13)	100.0	0	0	SET5.3

* Automatically display corresponding parameters according to different setting conditions

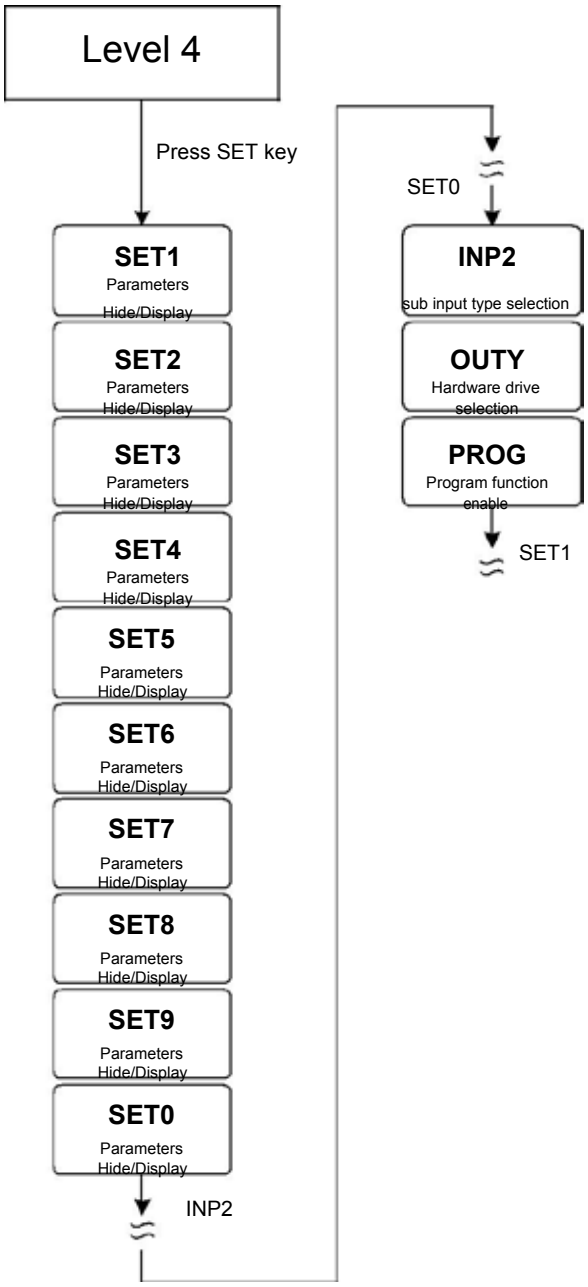
EX1: when OUTY= 3(motor valve drive) original RHTC will become RUCY display

EX2: when PROG= ON(program type) original RHPO will become WAIT display

10.9 LEVEL_3 Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
SETA		Alarm special function setting (Please refer to Chapter 12.2)	1111	0000	0000	SET5.3
PSL		Protocol selection 0 : TAIE 1 : RTU (Please refer to communication manual)	RTU	TAIE	RTU	SET5.4
BITS		Data format 0 : O_81 (parity bit=odd, stop bit=1) 1 : O_82 (parity bit=odd, stop bit=2) 2 : E_81 (parity bit=even, stop bit=1) 3 : E_82 (parity bit=even, stop bit=2) 4 : N_81 (parity bit=none, stop bit=1) 5 : N_82 (parity bit=none, stop bit=2)	N_82	O_81	O_81	SET5.4
IDNO		Controller station	254	0	1	SET5.4
BAUD		Baud rate 0 : 24(2400) 1 : 48(4800) 2 : 96(9600) 3 : 192(19200) 4 : 384(38400) 5 : 576(57600) 6 : 1152(115200) bps	1152	24	384	SET5.4
SVOS		SV bias	100.0	-100.0	0	SET6.1
PVOS		PV bias PV = PV + PVOS	100.0	-100.0	0	SET6.2
UNIT		Unit Change this parameter USPL&LSPL will be reset 0 : °C 1 : °F 2 : U (Linear signal)	2	0	---	SET6.3
PVFT		PV digital filter The PV filter is used to eliminate noise against the measured input Unit : second	5.00	0.01	0.10	SET6.4
PV2		Use for motor valve feedback value	---	---	---	SET7.1
OUD		Control action selection 0 : HEAT reverse action 1 : COOL direct action	COOL	HEAT	HEAT	SET7.2
OPAD		Super SV function enable 0 : OFF 1 : ON	ON	OFF	ON	SET7.3
HZ		Power frequency 0 : 50HZ 1 : 60HZ	50HZ	60HZ	60HZ	SET7.4

10.10 Level 4 (Setting Level) All Parameters Display



※ If no key is pressed within 60 seconds, it will automatically return to LEVEL 1 (user level) and display PV/SV

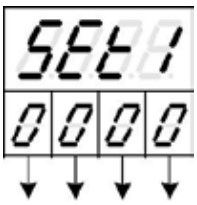
10.11 LEVEL_4 Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
SET1	SEt1	Parameters Hide/Display	1111	0000	---	---
SET2	SEt2	Parameters Hide/Display	1111	0000	---	---
SET3	SEt3	Parameters Hide/Display	1111	0000	---	---
SET4	SEt4	Parameters Hide/Display	1111	0000	---	---
SET5	SEt5	Parameters Hide/Display	1111	0000	---	---
SET6	SEt6	Parameters Hide/Display	1111	0000	---	---
SET7	SEt7	Parameters Hide/Display	1111	0000	---	---
SET8	SEt8	Parameters Hide/Display	1111	0000	---	---
SET9	SEt9	Parameters Hide/Display	1111	0000	---	---

10.11 LEVEL_4 Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
SET0	SEt0	Function enable/disable	1111	0000	---	---
INP2	InP2	Sub input type selection 0 : none 1 : 10~50mV / 4~20mA / 1~5V / 2~10V (remote SV use) 2 : 0~50mV / 0~20mA / 0~5V / 0~10V (remote SV use) 3 : valve feedback 4 : CT input	4	0	0	---
OUTY	OutY	Hardware drive selection 0 : single output control 1 : dual output control 2 : valve control with feedback 3 : valve control without feedback selection 4 : single phase control	4	0	0	---
PROG	P-GE	Program function enable 0 : OFF , SV source from keypad or communication 1 : ON , SV source from program	ON	OFF	OFF	---

10.12 Parameters Hide/Display Table on Level 4



SET1 _4 _3 _2 _1

SEt1	SET1_1	0	Hide	OUTL
		1	Display	OUTL
	SET1_2	0	Hide	AT
		1	Display	AT
	SET1_3	0	Hide	AL1
		1	Display	AL1
	SET1_4	0	Hide	AL2
		1	Display	AL2

SEt2	SET2_1	0	Hide	AL3
		1	Display	AL3
	SET2_2	0	Hide	ANL1 ANH1 DP
		1	Display	ANL1 ANH1 DP
	SET2_3	0	Hide	LSPL USPL
		1	Display	LSPL USPL
	SET2_4	0	Hide	ANL2 ANH2
		1	Display	ANL2 ANH2

SEt3	SET3_1	0	Hide	ALD1
		1	Display	ALD1
	SET3_2	0	Hide	ALT1
		1	Display	ALT1
	SET3_3	0	Hide	ALD2
		1	Display	ALD2
	SET3_4	0	Hide	ALT2
		1	Display	ALT2

SEt4	SET4_1	0	Hide	ALD3
		1	Display	ALD3
	SET4_2	0	Hide	ALT3
		1	Display	ALT3
	SET4_3	0	Hide	HYSA
		1	Display	HYSA
	SET4_4	0	Hide	CLO1 CHO1
		1	Display	CLO1 CHO1

SEt5	SET5_1	0	Hide	CLO2 CHO2
		1	Display	CLO2 CHO2
	SET5_2	0	Hide	CLO3 CHO3
		1	Display	CLO3 CHO3
	SET5_3	0	Hide	RUCY WAIT SETA
		1	Display	RUCY WAIT SETA
	SET5_4	0	Hide	PSL BITS IDNO BAUD
		1	Display	PSL BITS IDNO BAUD

SEt6	SET6_1	0	Hide	SVOS
		1	Display	SVOS
	SET6_2	0	Hide	PVOS
		1	Display	PVOS
	SET6_3	0	Hide	UNIT
		1	Display	UNIT
	SET6_4	0	Hide	PVFT
		1	Display	PVFT

SEt7	SET7_1	0	Hide	PV2
		1	Display	PV2
	SET7_2	0	Hide	OUD
		1	Display	OUD
	SET7_3	0	Hide	OPAD
		1	Display	OPAD
	SET7_4	0	Hide	HZ
		1	Display	HZ

SEt8	SET8_1	0	Program not repeat
		1	Program repeat
	SET8_2	0	No power failure option
		1	With power failure option
	SET8_3	0	Program starts from 0
		1	Program starts from PV
	SET8_4	0	reserve
		1	reserve

SEt9	SET9_1	0	reserve
		1	reserve
	SET9_2	0	Program Timer Unit = “Hour : Minute”
		1	Program Timer Unit = “Minute : Second”
	SET9_3	0	Disable transmission SV
		1	Enable transmission SV
	SET9_4	0	Disable transmission PV
		1	Enable transmission PV

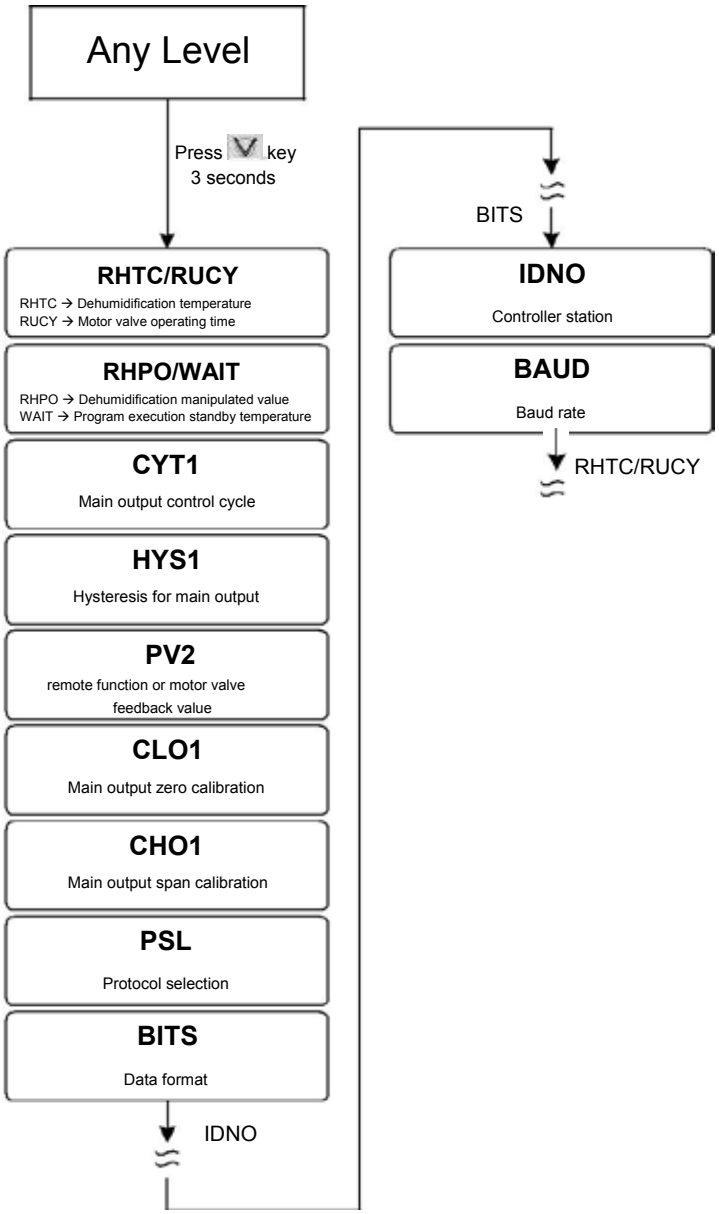
SEt0	SET0_1	0	TTL Communication (Slave)	
		1	TTL Communication (Master)	
	SET0_2	0	Hide	RATE
		1	Display	RATE
	SET0_3	0	Disable Remote SV function	
		1	Enable Remote SV function	
	SET0_4	0	use output relay “b” contact when motor valve closed	
		1	use output relay “a” contact when motor valve closed	

10.13 Fast Parameter Access

FY controller provides a fast parameter access operation, easy for users to quickly access communication group, program group, motor valve group related parameters

Enter fast parameter access operation: press down key for 3 seconds at any level

Leave fast parameter access operation: press down key for 3 seconds at fast parameter access operation

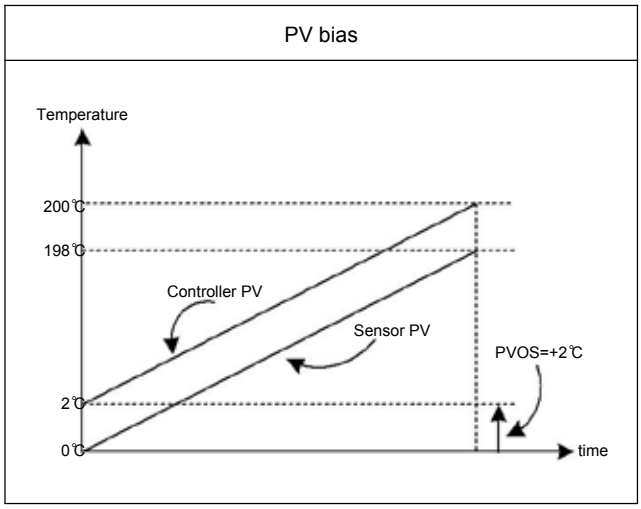


11. Functional Descriptions

11.1 PV bias

Description
The FY series controller offers PV bias for input calibration, PV bias functions correct the deviation of each sensor, as well as PV difference between controllers.

Function Diagram



Parameter

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
PVOS	PVOS	PV bias PV = PV + PVOS	100.0	-100.0	0	Level 3	SET6.2

Examples
PV bias (PV.OS) adds bias to the Measured value(PV):
When two controllers measure the temperature of the same type of load, the measured values of the respective characteristics of the sensors are displayed as
Controller A : 200°C Controller B : 195°C
As shown above, Controller B is compensated by PV offset (PV.OS) The PV.OS parameter value must be corrected by +5°C.
The display value will be changed to 200°C, Same as Controller A, but Controller B will show 5°C at 0°C.

Parameter setting

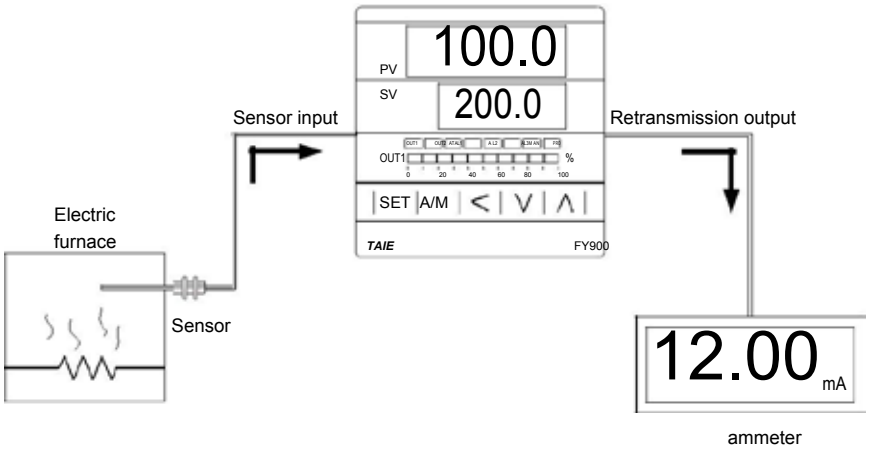
Level	Parameter	Set value	Description
4	SET6.2	1	Display PVOS
3	PVOS	5	PV adds +5°C

11.2 Retransmission

Description

The retransmission function of the FY series controller can provide digital values for parameters such as SV or PV etc. Analog signals are transmitted to external devices according to the set range (EX: PLC AI module, inverter, etc.).
transmission output signal selectable: 4~20mA, 0~20mA, 0~5V, 0~10V, 1~5V, 2~10V

Function Diagram



Parameter

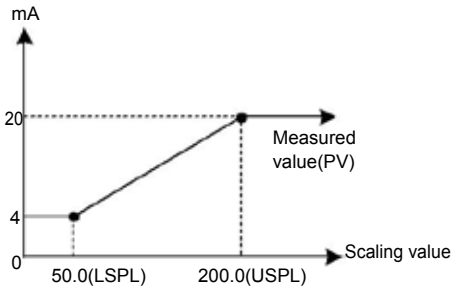
Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
SET9.3	SEt9	0 : Retransmission SV disable 1 : Retransmission SV enable	1	0	0	Level 4	---
SET9.4	SEt9	0 : Retransmission PV disable 1 : Retransmission PV enable	1	0	0	Level 4	---
CLO3	CLO3	Retransmission zero calibration	9999	0	0	Level 3	SET5.2
CHO3	CHO3	Retransmission span calibration	9999	0	3600	Level 3	SET5.2

Examples

Assume the input range (LSPL & USPL) = -50.0~600.0 retransmit PV
When the PV value is between -50.0 and 600.0, the retransmission signal is based on the PV value, and the linear output analog signal is presented.
When the PV is less than -50.0, the retransmission signal remains at 4mA
When the PV value is greater than 600.0, the retransmission signal remains at 20mA

Parameter setting

Level	Parameter	Set value	Description
3	SET9.4	1	Retransmission PV
3	CLO3	3133	Retransmission signal low point calibration value (each controller calibrate value is different)
3	CHO3	3508	Retransmission signal high point calibration value (each controller calibrate value is different)



Notes

1. To order TRS function, please confirm the type of retransmission output signal and retransmit signal range.
2. The user can select the source to be transmitted according to the parameter SET9.4 or SET9.3. The factory default is to retransmit the PV.
3. Modify the parameter INP1/UNIT will reset the retransmission range.
4. CLO3 & CHO3 are the calibration parameters of the re-transmission signal. It has been calibrated before leaving the factory. Do not change this parameter value.
5. The user only needs to set SET9.4 or SET9.3, the rest of the parameters will be set & calibrated at the factory.

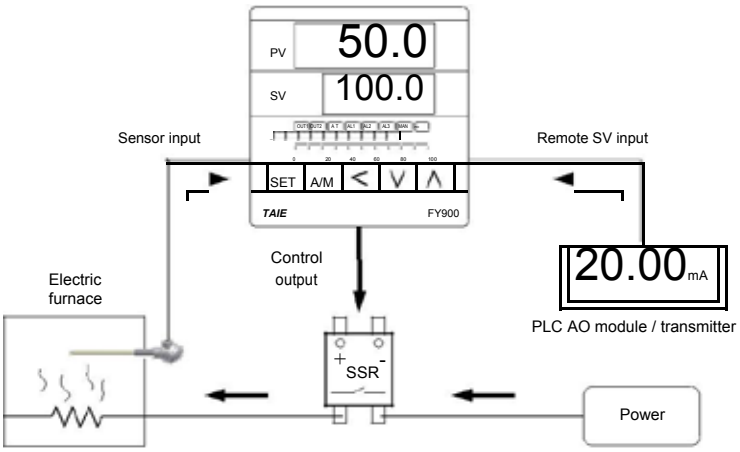
11.3 Remote SV

Description

Remote SV functions as an analog signal (4~20mA or 0~10V) generated by external devices (EX: PLC AO module, transmitter) to the Remote SV terminal of the controller, to change the SV with a preset range.

Remote SV signal selection: 4~20mA, 0~20mA, 0~5V, 0~10V, 1~5V, 2~10V

Function Diagram



Parameter

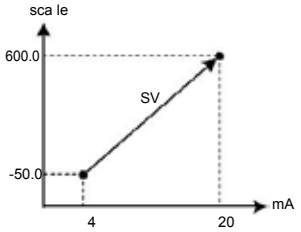
Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
SET0.3	SEt0	0 : Remote SV disable 1 : Remote SV enable	1	0	0	Level 4	---
INP2	inP2	Sub input type selection 0 : none 1 : 10~50mV / 4~20mA / 1~5V / 2~10V (remote SV use) 2 : 0~50mV / 0~20mA / 0~5V / 0~10V (remote SV use) 3 : valve feedback 4 : CT input	4	0	0	Level 4	---
ANL2	AnL2	Sub input zero calibration	9999	-1999	0	Level 3	SET2.4
ANH2	AnH2	Sub input span calibration (hex display)	0x7FFF	0x0000	0x5FFF	Level 3	SET2.4

Examples

Input signal is K1 and its range is -50.0~600.0. When an external analog signal is input to the Remote SV terminal, the signal will be based on the range presents linear display of SV parameters

When the signal input value is less than 4mA, the PV position shows nnn2, indicating that the signal of Remote SV is lower than the lower limit value

When the signal input value is greater than 20mA, the PV position shows uuu2, indicating that the signal of Remote SV is higher than the upper limit value



Parameter setting

Level	Parameter	Set value	Description
4	SET0.3	1	Enable Remote SV function
4	INP2	1	Remote SV signal=4~20mA
3	ANL2	744	Remote SV signal low point calibration value (each controller calibrate value is different)
3	ANH2	0x657C	Remote SV signal high point calibration value (each controller calibrate value is different)

Notes

1. To order Remote SV function, please confirm signal type and Remote SV input range first.
2. Modify the parameter INP1 & UNIT will reset the input range
3. The ANL2 and ANH2 are the calibration parameters of Remote SV. It has been calibrated before leaving the factory. Please do not change this parameter.

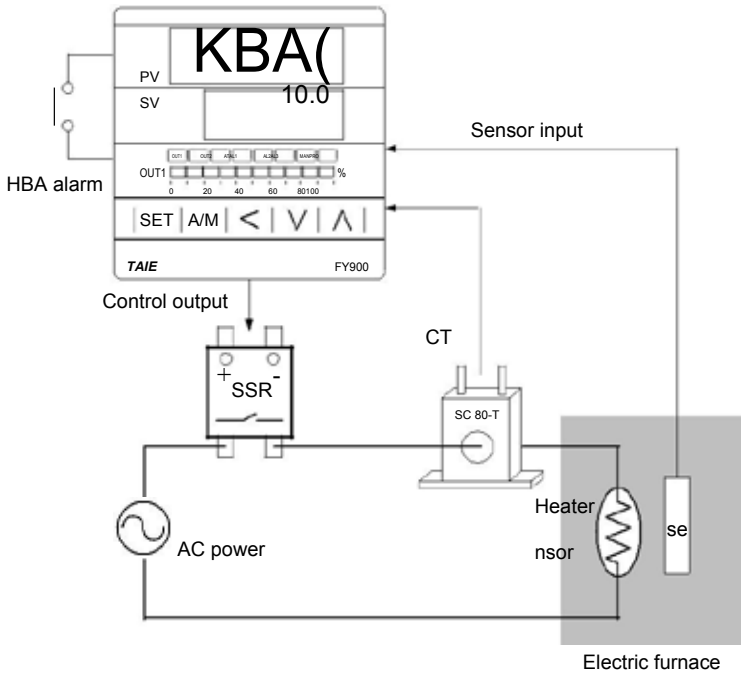
11.4 Heater Break Alarm

Description

The HBA (Heater-Break-Alarm) function measures the heater current and displays the measured current value on the parameter HBAC upper area so that the heater status can be monitored at any time.

When it is detected that the heater is disconnected or the heater current is abnormally reduced, an alarm message may be immediately output to notify the user.

Function Diagram



Parameter

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
*HBAC	HBAC	HBA current setting value Upper : heater current display Down : current setting value unit : ampere(A)	100.0	0.0	1.0	Level 1	INP2=4 & ALD1=9

* when ALD1=9，original AL1 become HBAC display

HBA operating conditions

1. Heater current is less than the setting of HBAC
2. OUT1 output exceeds 90%
3. The conditions of 1 & 2 above are established and continue to exceed 20 seconds

Examples

Heating system with SSR as control element, set HBAC=1.0(down area)

1. The heater current display value HBAC = 0.0(upper area), when a heater disconnection occurs
   → The heater current is less than the set value of HBAC=1.0. At this point, the operating condition 1 is satisfied.
2. The heater no longer heats when the heater disconnection occurs, and the gap between the PV and SV will become larger and larger.
   → The manipulated value of OUT1 is also getting larger and larger, and eventually exceeds 90%. At this point, action condition 2 is satisfied.
3. The AL1 alarm will be activated when both 1 & 2 conditions are met and continue for more than 20 seconds.

Parameter setting

Level	Parameter	Set value	Description
1	HBAC	1.0	HBA Action Current Set Value (Unit: A)
4	INP2	4	CT current input
3	ALD1	9	HBA Alarm
3	ANL2	-12	Current low-point calibration value (each controller calibrate value is different)
3	ANH2	0x4527	Current High-point calibration value (each controller calibrate value is different)

Notes

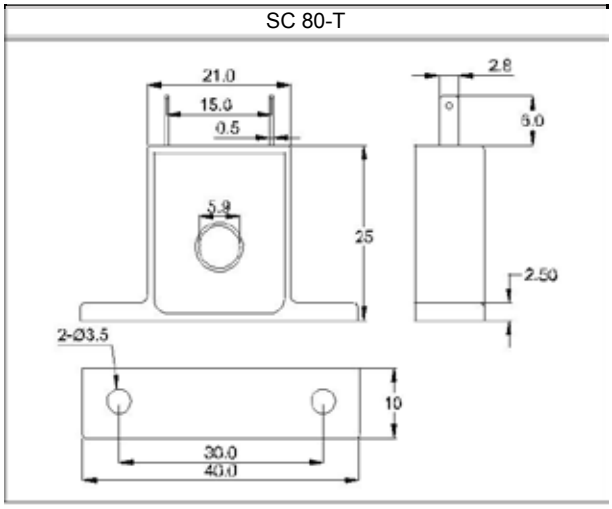
1. ANL2 & ANH2 is the current signal calibration parameters. It has been calibrated before leaving the factory. Do not change this parameter value.
2. The user only needs to set HBAC, the rest of the parameters will be set & calibrated at the factory.
3. CT has two specifications: SC 80-T & SC 100-T. Please check heater wire diameter and specify required CT.

CT Specifications

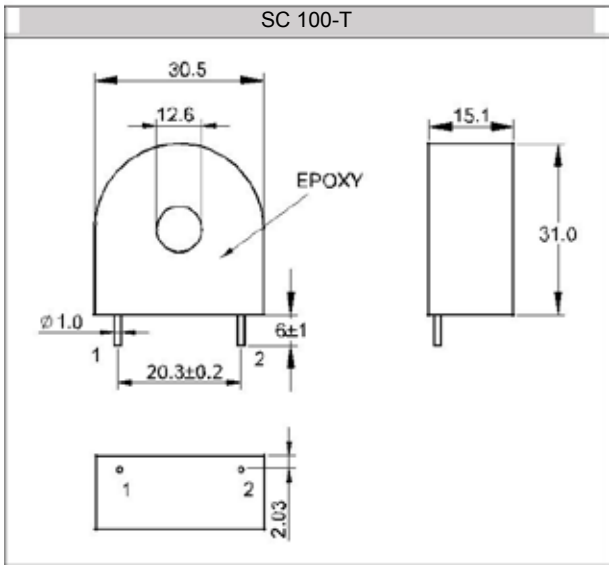
Item	Specifications	
Model number	SC 80-T	SC 100-T
Max. continuous current	80A	100A
Accuracy	3%	5%
Aperture	5.9mm	12.6mm
Dieiectric Withstanding Voltage(Hi-pot)	2500Vrms / 1 minute	4000Vrms / 1 minute
Vibration resistance	50 HZ, 98 m/s^2	
Weight	Approx. 12 g	Approx. 30 g

Dimensions (UNIT：mm)

SC 80-T



SC 100-T



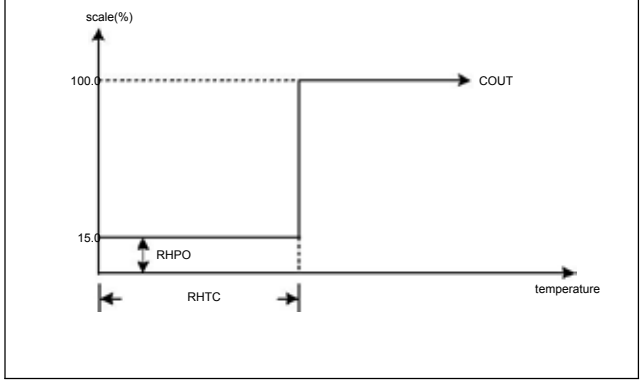
11.5 Dehumidification Function

Description

The FY controller provides dehumidification function to protect the heater. When the power is turned on, the heater is dehumidified with low power. When the dehumidification is completed, the normal power is output to the heater.

Function Diagram

PV < RHTC use RHPO as manipulated output value



Parameter

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
*RHTC	rHtC	Dehumidification temperature If PV less than RHTC manipulated value = RHPO (Please refer to Chapter 11.5)	200.0	0.0	0.5	Level 3	SET5.3
*RHPO	rHPo	Dehumidification manipulated value 0 : OFF disable dehumidification function Other values : 0.1~100.0 manipulated value (Please refer to Chapter 11.5)	100.0	OFF	OFF	Level 3	SET5.3

* This parameter is multi-display, wnen OUTY≠3 display RHTC

* This parameter is multi-display, wnen PROG=OFF display RHPO

Example

After the controller is turned on, when the PV does not reach 50°C, output will be 20% of the operation time. When the time exceeds 15 minutes or the PV is greater than 50°C, the controller will produce output of normal PID gain.

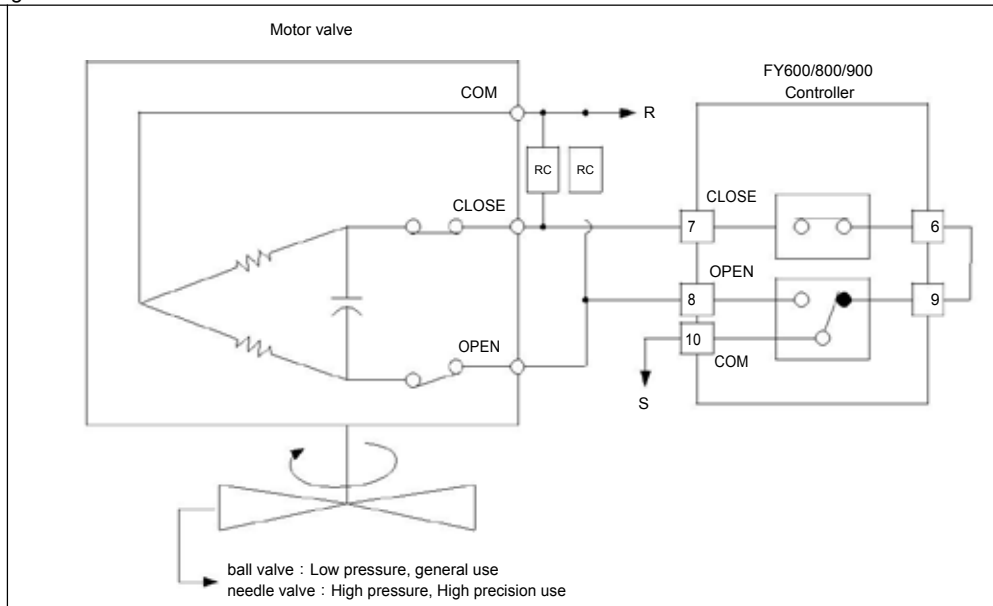
Parameter setting

Level	Parameter	Set value	Description
4	SET5.3	1	Display parameter RHTC、RHPO
1	SV	100.0	Target temperature
3	RHTC	50.0	Execute de-humidifying function when PV is lower than this temperature
3	RHPO	20.0	20% operation output when executing de-humidifying function

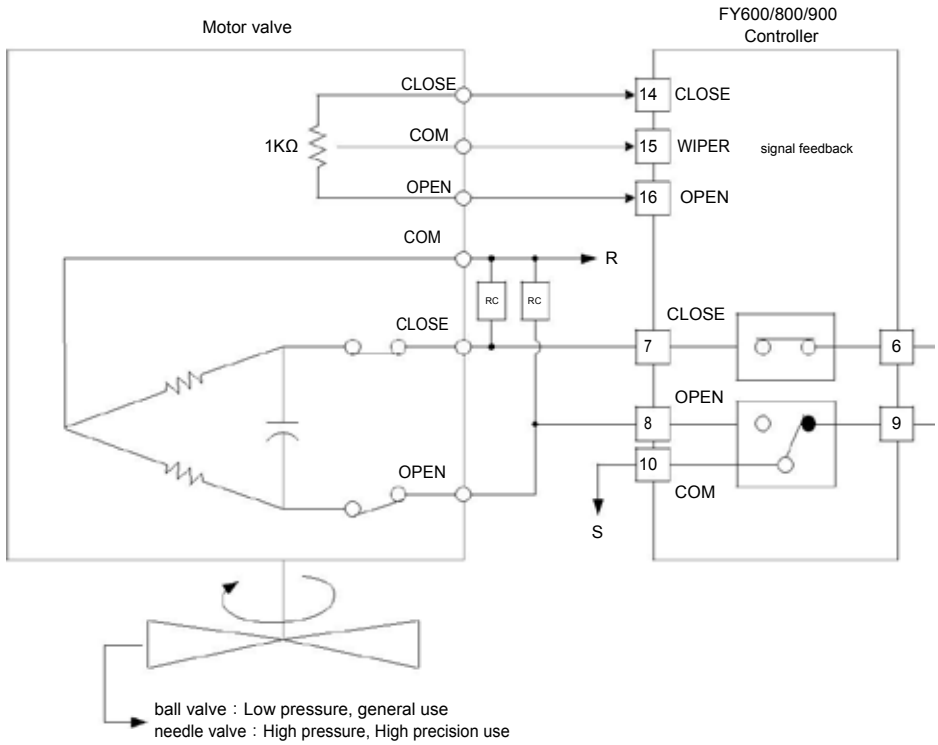
11.6 Motor Valve Control

Function Diagram

no feedback (NFMV)

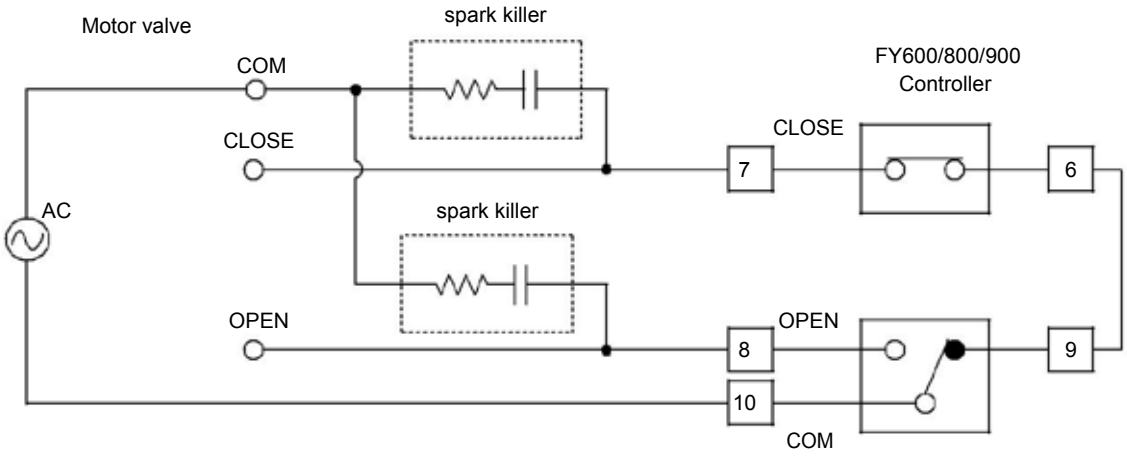


feedback (FBMV)



※ It is recommended to install spark killer at the relay junction to prolong the service life of the relay.

Spark killer connection



Parameter Setting

Level	Parameter	Set value	Description		
4	OUTY	3	Valve control, no feedback		
		2	Valve control, feedback		
4	INP2	2	Valve control, feedback		
4	*RUCY	5	Motor valve operating time (set the operating time according to the connected valve) ※Set runtime whether there is feedback or no feedback		
4	CYT1	1.5	Motor valve switching hysteresis adjustment	no feedback	1.5
				feedback	1.5 or more
4	SET0.4	0 or 1	0 : use output relay “b” contact when motor valve closed 1 : use output relay “a” contact when motor valve closed		

* when OUTY=3, original RHTC become RUCY display

11.7 RAMP & SOAK

Description

The FY general- purpose controller provides a single ramp and soak function, after booting completed, the SV starts to increase according to the set value of RAMP. when the soak condition is met the SOAK function will be executed according to the set value of SOAK, and driving the output and alarm to ON or OFF after the SOAK time is executed finish.

Parameter

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
SOAK (AL1)	SoAK	Alarm1 soak time Time format : hr.min	99.59	0.00	0.10	Level 1	ALD1=10 or ALD1=19
SOAK (AL2)	SoAK	Alarm2 soak time Time format : hr.min	99.59	0.00	0.10	Level 1	ALD2=10 or ALD2=19
SOAK (AL3)	SoAK	Alarm3 soak time Time format : hr.min	99.59	0.00	0.10	Level 1	ALD3=10
RAMP (AL3)	rAMP	The rate of change during SV ramp operation format : °C / minute	99.99	-19.99	99.99	Level 1	ALD3=9

※ when ALD1=10 or 19, original AL1 become SOAK display
when ALD2=10 or 19, original AL2 become SOAK display
when ALD3=10, original AL3 become SOAK display when ALD3=9, original AL3 become RAMP display

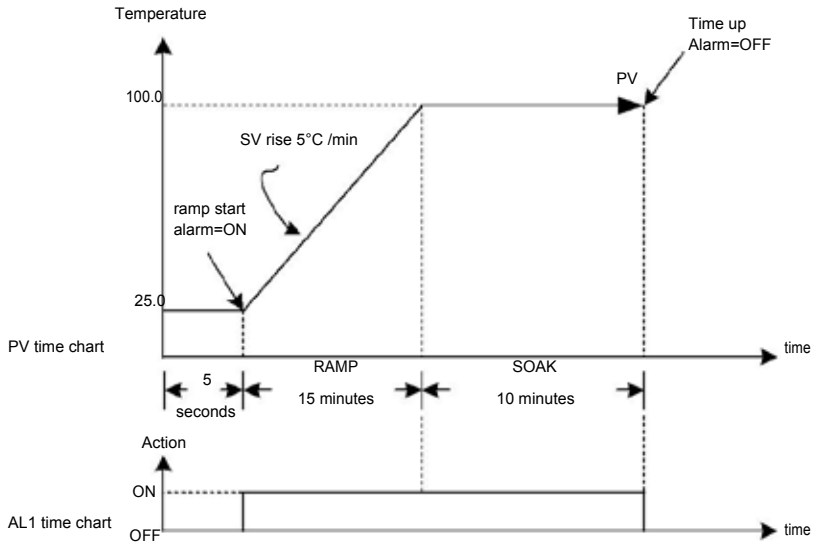
Parameter	Set value	Description
ALDX	10 (SOAK_A)	Boot completed, the alarm1 is ON, when PV≥SV start the timer, alarm and control function are turned OFF in timed out. (In this mode, the time format is fixed to “hour.minute”)
	19 (SOAK_B)	Boot completed, the alarm is ON, when PV≥SV start the timer, alarm is turned ON and the control function keep ON in timed out. (In this mode, the time format is fixed to “hour.minute”)

X：1 / 2(SOAK function available in alarm1 or alarm2)

Example(1) Single RAMP+SOAK_A (ALD3=9 + ALD1=10)
Boot completed, the alarm1 is ON, SV rise 5.00°C per minute. when the PV reaches 100 °C, the temperature is kept for 10 minutes. after 10 minutes alarm1 and control function are turned OFF

Parameter setting

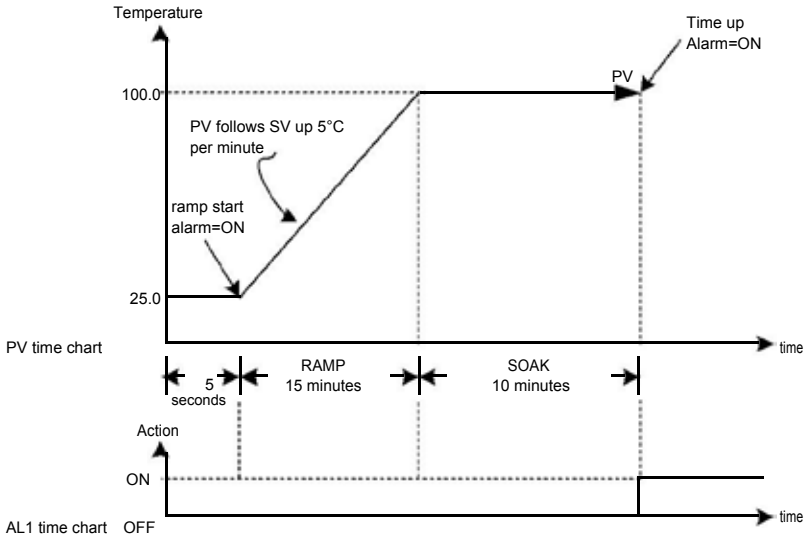
Level	Parameter	Set value	Description
1	SV	100.0	Target temperature
4	SET2.1	1	Display AL3
4	SET4.1	1	Display ALD3
3	ALD1	10	AL1 as soak alarm
3	ALD3	9	Enable RAMP function
1	SOAK(AL1)	0.10	10 minute temperature maintain
1	RAMP(AL3)	5.00	5.00°C rise per minute



Example(2) Single RAMP+SOAK_B (ALD3=9 + ALD1=19)
Boot completed, the alarm1 is OFF, SV rise 5.00°C rise per minute. when the PV reaches 100 °C, the temperature is kept for 10 minutes. after 10 minutes alarm is turned ON and the control function keep ON

Parameter setting

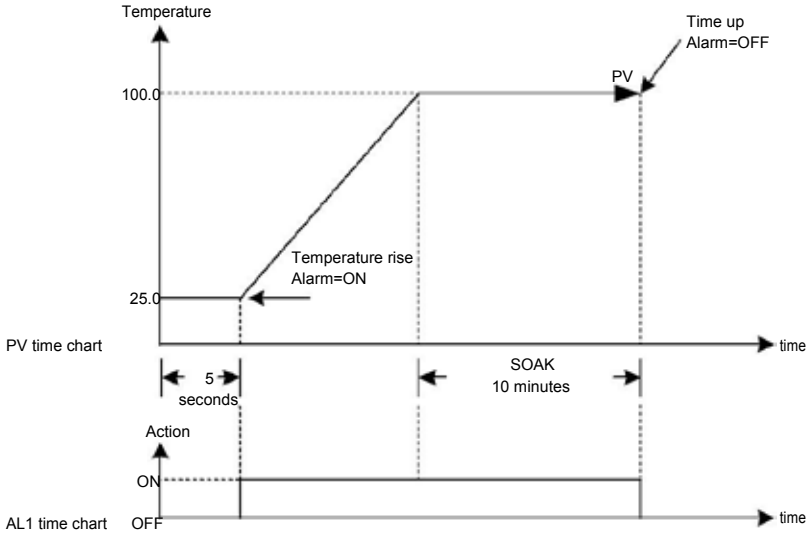
Level	Parameter	Set value	Description
1	SV	100.0	Target temperature
4	SET2.1	1	Display AL3
4	SET4.1	1	Display ALD3
3	ALD1	19	AL1 as soak alarm
3	ALD3	9	Enable RAMP function
1	SOAK(AL1)	0.10	10 minute temperature maintain
1	RAMP(AL3)	5.00	5.00°C rise per minute



Example(3) use only SOAK_A (ALD1=10)
Boot completed, the alarm1 is ON, and the PV is directly controlled at 100 °C. when the PV reaches 100 °C, the temperature is kept for 10 minutes. after 10 minutes alarm1 and control function are turned OFF

Parameter setting

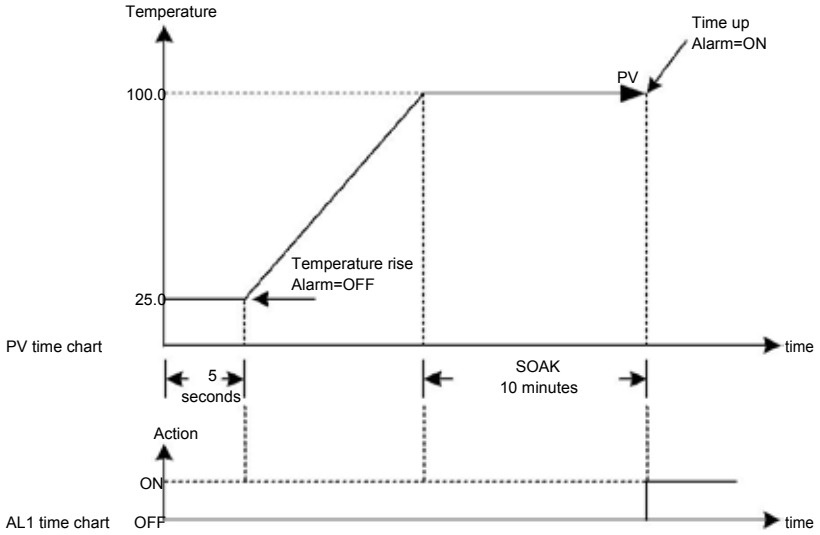
Level	Parameter	Set value	Description
1	SV	100.0	Target temperature
3	ALD1	10	AL1 as soak alarm
1	SOAK(AL1)	00.10	10 minute temperature maintain



Example(4) use only SOAK_B (ALD1=19)
Boot completed, the alarm1 is OFF, and the PV is directly controlled at 100 °C. when the PV reaches 100 °C, the temperature is kept for 10 minutes. after 10 minutes alarm is turned ON and the control function keep ON

Parameter setting

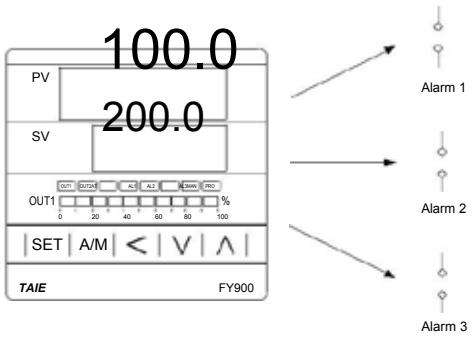
Level	Parameter	Set value	Description
1	SV	100.0	Target temperature
3	ALD1	10	AL1 as soak alarm
1	SOAK(AL1)	00.10	10 minute temperature maintain



12. Alarm Action

Description
The FY controller can support up to three sets of alarm functions. Each set of alarms has 19 mode.
Users can choose the most suitable alarm mode according to their needs for system protection or application.

Function Diagram

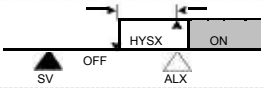
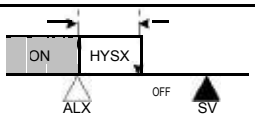
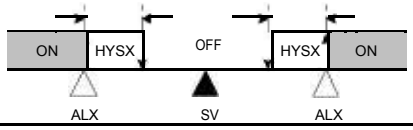
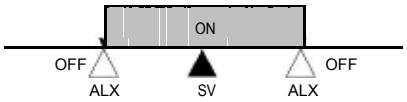
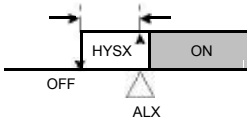
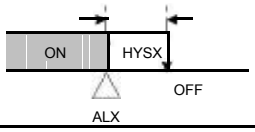


Parameter setting

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
AL1	AL1	Alarm1 set value	9999	-1999	1.0	Level 1	SET1.3
AL2	AL2	Alarm2 set value	9999	-1999	1.0	Level 1	SET1.4
AL3	AL3	Alarm3 set value	9999	-1999	1.0	Level 1	SET2.1
ALD1	ALd1	Alarm1 mode selection (Please refer to Chapter 12.1 Alarm Mode)	19	0	11	Level 3	SET3.1
ALT1	ALt1	Alarm1 time setting 0：Flicker 99.59：Continued ON 0.01~99.58：delay time Time format：min . sec	99.59	0.00	99.59	Level 3	SET3.2
ALD2	ALd2	Alarm2 mode selection (Please refer to Chapter 12.1 Alarm Mode)	19	0	11	Level 3	SET3.3
ALT2	ALt2	Alarm2 time setting 0：Flicker 99.59：Continued ON 0.01~99.58：delay time Time format：min . sec	99.59	0.00	99.59	Level 3	SET3.4
ALD3	ALd3	Alarm3 mode selection (Please refer to Chapter 12.1 Alarm Mode)	18	0	11	Level 3	SET4.1
ALT3	ALt3	Alarm3 time setting 0：Flicker 99.59：Continued ON 0.01~99.58：delay time Time format：min . sec	99.59	0.00	99.59	Level 3	SET4.2
HYSA	HYSA	Hysteresis setting for alarm1~3	100.0	-100.0	1.0	Level 3	SET4.3
SETA	SEtA	Alarm special function setting (Please refer to Chapter 12.2)	1111	0000	0000	Level 3	SET5.3

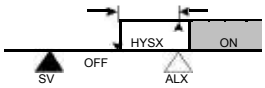
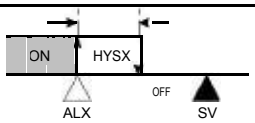
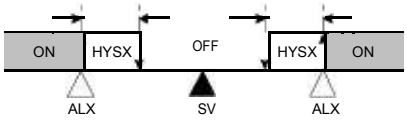
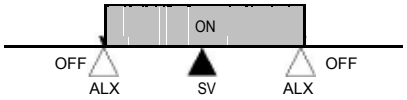
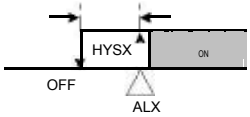
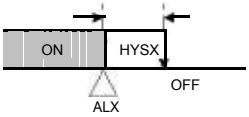
12.1 Alarm Mode

▲ : SV △ : Alarm set value **X** : 1 / 2 / 3 (There are up to 3 sets of alarms)

ALD**X**	Alarm mode	Description	
0	No alarm function	Not drive any alarm relays and the corresponding LED lamp.	
1	Deviation high (With hold action)		
		Formula	PV ≥ (SV+ALX) → Alarm ON PV ≤ (SV+ALX-HYSA) → Alarm OFF
2	Deviation low (With hold action)	 ·ALX must to be set to a negative value	
		Formula	PV ≤ (SV+ALX) → Alarm ON PV ≥ (SV+ALX+HYSA) → Alarm OFF
3	Deviation high/low (With hold action)		
		Formula	PV ≥ (SV+ALX) → Alarm ON PV ≤ (SV-ALX) → Alarm ON PV ≥ (SV-ALX+HYSA) → Alarm OFF PV ≤ (SV+ALX-HYSA) → Alarm OFF
4	Band (With hold action)		
		Formula	PV ≤ (SV+ALX) → Alarm ON PV > (SV-ALX) → Alarm ON PV ≥ (SV+ALX) → Alarm OFF PV < (SV-ALX) → Alarm OFF
5	Process high (With hold action)		
		Formula	PV ≥ ALX→ Alarm ON PV ≤ (ALX-HYSA) → Alarm OFF
6	Process low (With hold action)		
		Formula	PV ≤ ALX→ Alarm ON PV ≥ (ALX+HYSA) → Alarm OFF
7	Segment execute alarm	When SEG=ALX alarm ON ·This mode only available in program type controller	
8	System error	The Alert action, when PV displays error message	
9	HBA (Heater Break Alarm)	Activated conditions : 1. Heater current is less the HBAC set value 2. OUT1 manipulated value exceed 90% 3. Conditions of 1 & 2 above are established and continue to exceed 20 seconds. ·Please refer to Chapter 11.4 ·This mode only available in ALD1 or ALD2	
	Single RAMP	Please refer to Chapter 11.7 This mode only available in ALD3	

12.1 Alarm Mode

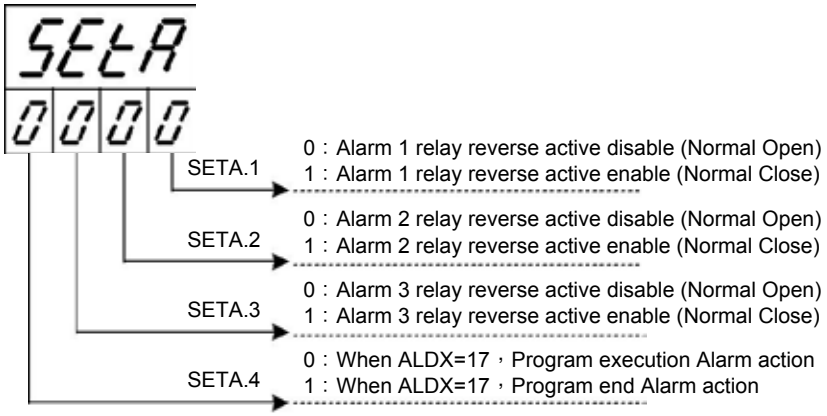
▲ : SV △ : Alarm set value **X** : 1 / 2 / 3 (There are up to 3 sets of alarms)

ALD**X**	Alarm mode	Description	
10	SOAK_A	Boot completed, the alarm is ON, when PV≥SV start the timer, alarm and control function are turned OFF in timed out. If the RAMP function is used, even if the RAMP SV has not reached the target SV, the timer will start counting as long as the condition PV≥target SV is met. ·Please refer to Chapter 11.7 ·This mode only available in ALD1 or ALD2 ·In this mode, the time format is fixed to “hour.minute”	
11	Deviation high		
		Formula	PV ≥ (SV+ALX) → Alarm ON PV ≤ (SV+ALX-HYSA) → Alarm OFF
12	Deviation low	 ·ALX must to be set to a negative value	
		Formula	PV ≤ (SV+ALX) → Alarm ON PV ≥ (SV+ALX+HYSA) → Alarm OFF
13	Deviation high/low		
		Formula	PV ≥ (SV+ALX) → Alarm ON PV ≤ (SV-ALX) → Alarm ON PV ≥ (SV-ALX+HYSA) → Alarm OFF PV ≤ (SV+ALX-HYSA) → Alarm OFF
14	Band		
		Formula	PV ≤ (SV+ALX) → Alarm ON PV > (SV-ALX) → Alarm ON PV ≥ (SV+ALX) → Alarm OFF PV < (SV-ALX) → Alarm OFF
15	Process high		
		Formula	PV ≥ ALX→ Alarm ON PV ≤ (ALXH-HYSA) → Alarm OFF
16	Process low		
		Formula	PV ≤ ALX→ Alarm ON PV ≥ (ALX+HYSA) → Alarm OFF
17	Program run	SETA.4=0 When program execution, alarm action SETA.4=1 When program end, alarm action ·This mode only available in program type controller	
18	System normal	The Alert action, when system in normal condition (no-error message)	

12.1 Alarm Mode

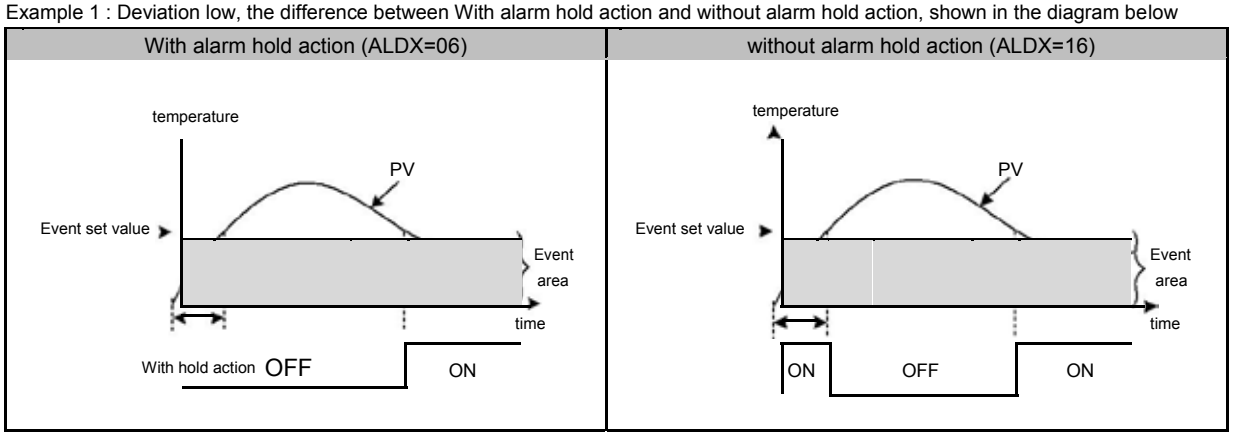
ALD**X**	Alarm mode	Description
19	SOAK_B	Boot completed, the alarm is OFF, when PV≥SV start the timer, alarm is turned ON and the control function keep ON in timed out. If the RAMP function is used, even if the RAMP SV has not reached the target SV, the timer will start counting as long as the condition PV≥target SV is met. ·Please refer to Chapter 11.7 ·This mode only available in ALD1 or ALD2 ·In this mode, the time format is fixed to “hour.minute”

12.2 Alarm Special Setting



12.3 Alarm Example

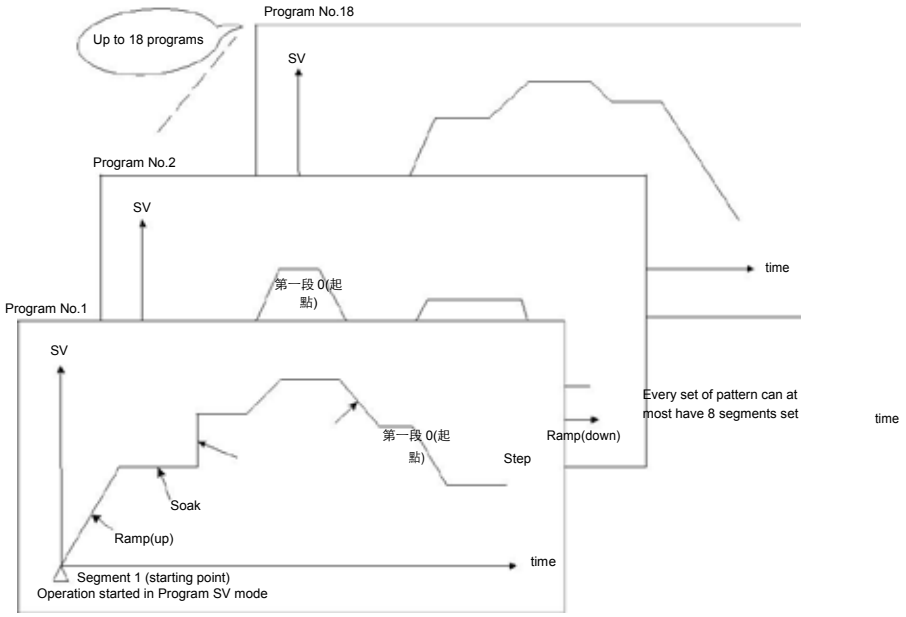
Example 1 : Deviation low, the difference between With alarm hold action and without alarm hold action, shown in the diagram below



13. Programmable

Description
Programmable function is SV function that is variable to time, as user can set SV value to their needs according to time-based variation curve, which is called program setting

1. There are at most 18 sets of pattern setting
2. Every set of pattern can at most have 8 segments
3. Every segment include 4 settings such as ramp, soak, step and continue
4. Pattern can be randomly linked up, as each pattern of program contains 144 segment, at most.



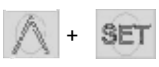
13.1 Parameter Setting

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
PTN	PtN	Program pattern selection 1~18	18	1	1	Level 1	PROG=ON
SEG	SEG	Current program segment display	8	1	1	Level 1	PROG=ON
TIMR	t.0r	Current segment remain time display Upper area：display current segment remain time Down area：display current segment executed time	99.59	0.00	0.00	Level 1	PROG=ON
SV_1	SV_1	Segment 1 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_1	tM_1	Segment 1 execute time setting, this parameter determines the link between a segment and a segment or pattern and pattern END(-1) : program end in this segment 0.00 : program step change in this segment 0.01~99.58 : program in this segment execute time 99.59 : program continue execute this segment no end	99.59	-1	0.00	Level 1	PROG=ON
OUT1	Out1	Segment 1 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_2	SV_2	Segment 2 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_2	tM_2	Segment 2 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT2	Out2	Segment 2 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_3	SV_3	Segment 3 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_3	tM_3	Segment 3 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT3	Out3	Segment 3 output limit	100.0	0.0	100.0	Level 1	PROG=ON

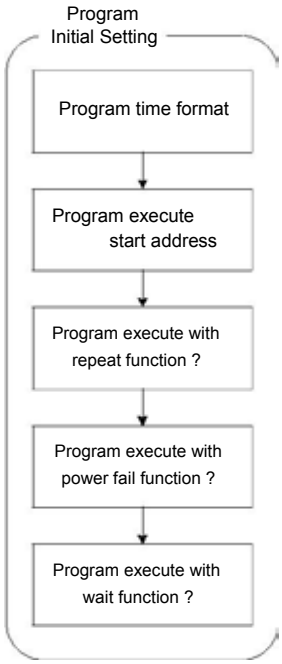
13.1 Parameter Setting

Parameter	Symbol	Content	Range		Default	Level	Hide/ Display
			MAX	MIN			
SV_4	SV_4	Segment 4 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_4	tM_4	Segment 4 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT4	Out4	Segment 4 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_5	SV_5	Segment 5 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_5	tM_5	Segment 5 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT5	Out5	Segment 5 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_6	SV_6	Segment 6 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_6	tM_6	Segment 6 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT6	Out6	Segment 6 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_7	SV_7	Segment 7 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_7	tM_7	Segment 7 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT7	Out7	Segment 7 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_8	SV_8	Segment 8 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_8	tM_8	Segment 8 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT8	Out8	Segment 8 output limit	100.0	0.0	100.0	Level 1	PROG=ON
WAIT	WAit	Program execution standby temperature 0 : when program execute do not wait for PV temperature Other values : when PV= (target SV-WAIT), program entering next segment	1000	0	0	Level 1	SET5.3
SET8.1	SEt8	Program execute repeat 0 : disable repeat function 1 : Program execute repeat	1	0	0	Level 4	---
SET8.2	SEt8	Program execute power fail protection 0 : disable power fail protection 1 : enable power fail protection	1	0	0	Level 4	---
SET8.3	SEt8	Program execute start address 0 : execute from zero 1 : execute from current PV,cut time	1	0	0	Level 4	---
SET9.2	SEt9	Program time format 0 : hour.minute 1 : minute.second	1	0	0	Level 4	---

13.2 Key Operation Description

Functions	Keys	Description
Run		Eexecuting program, PRO_LED lamp ON, Upper area shows 3 times "RUN" messages.
Halt		Pause executing program, PRO_LED lights remains ON,at this moment upper area will display current temperature value and “HALT” message alternately.
Segment Jump		Jump to the next segment, and it can skip segment continuously.
		Holding UP key and press SET key 1 time to skip 1 segment, press SET key 2 times to skip 2 segments, so on and so forth.
Reset		Stop executing program, PRO_LED lamp OFF, Upper area shows 3 times "REST" messages.
PV/SV monitor		Press the A / M key for 2 seconds to jump to the parameter OUTL, then press the A / M button for 2 seconds to jump to PV / SV monitor.

13.3 Program Initial Setting



1. Setting program time format

Parameter	LED display	Description	Default	Level
SET9.2	SEt9	Program time format 0 : hour.minute 1 : minute.second	0	Level 4

This parameter determines the time format of timer during program execution
When SET9.2 =0 , TM_n=33.23, it indicates that the execution time of this segment is 33 hours and 23 minutes When SET9.2 =1 , TM_n=33.23, it indicates that the execution time of this segment is 33 minutes and 23 seconds

2. Setting program execute start address

Parameter	LED display	Description	Default	Level
SET8.3	SEt8	Program execute start address 0 : execute from zero 1 : execute from current PV,cut time	1	Level 4

When program starts, SV initial value will execute according to SET8.3 set value
(1) SET8.3 =0, PTN=1 PV=50.0 SV_1=100 TM_1=1.00(1 hour)
When program starts, SV will start to execute from 0.0, and SV shall reach SV_1 in one hour

(2) SET8.3 =0, PTN=1 PV=50.0 SV_1=100 TM_1=1.00(1 hour)
When program starts, SV will start to execute from PV temperature of 50.0, while controller will deduct the time taken to go from 0.0 to 50.0, and SV shall reach SV_1 in half hour

3. Setting program execute with repeat function

Parameter	LED display	Description	Default	Level
SET8.1	SEt8	Program execute repeat 0 : disable repeat function 1 : Program execute repeat	0	Level 4

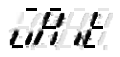
When program completes the execution of the final segment, and “END” message is not shown, the program will be executed again.

4. Setting program execute with power failure protection function

Parameter	LED display	Description	Default	Level
SET8.2	SEt8	Program execute power fail protection 0 : disable power fail protection 1 : enable power fail protection	0	Level 4

power failure during program execution, if there is power failure protection function set, controller will execute current segment program after booting finish
Assume power failure occurring in the segment_4, ramp temperature from 100°C to 200°C, and power failure occurring at SV=125, the program will execute from 100°C (segment_4), after controller booting finish

5. Setting program execute with wait function

Parameter	LED display	Description	Default	Level
WAIT		Program execution standby temperature 0 : when program execute do not wait for PV temperature Other values : when PV=(target SV-WAIT), program entering next segment	0.0	Level 3

When program executes, if WAIT=0.0, and SV reaches set temperature, whether PV reaches target temperature or not, the controller will enter the next segment
When program executes, if WAIT value is not 0.0, and SV reaches set temperature, as PV has not reached target temperature, controller will wait for PV temperature to reach SV-WAIT

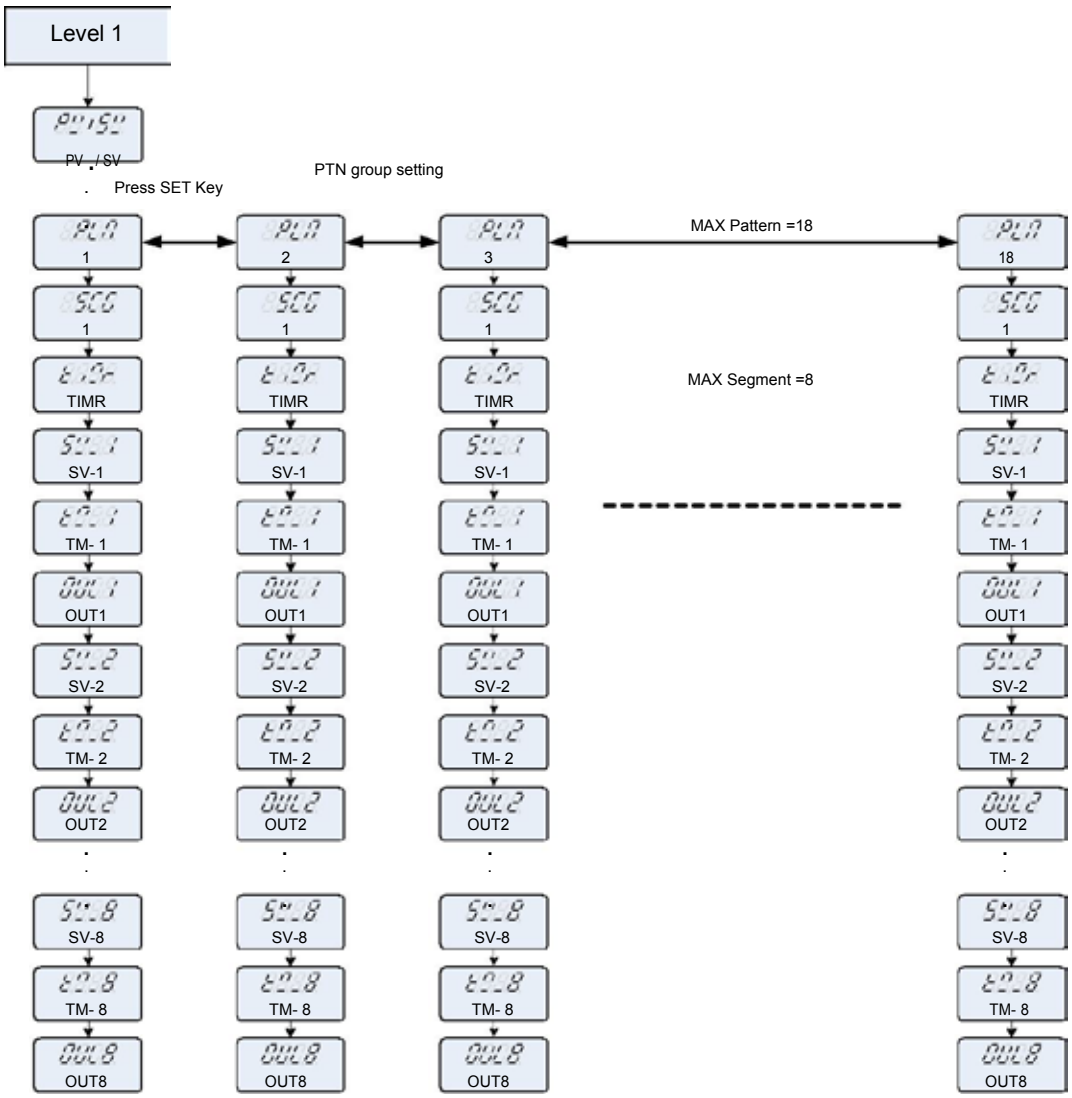
(1) WAIT = 0.0 without wait function set
Assume the set temperature of current segment is 100.0°C, and as SV reaches the set temperature of this segment, the controller will enter the next segment

(2) WAIT = 5.0 with wait function set
Assume the set temperature of current segment is 100.0°C, and as SV reaches the set temperature of this segment, PV temperature needs to reach 100.0-5.0 (SV-WAIT)=95.0 then entering the next segment

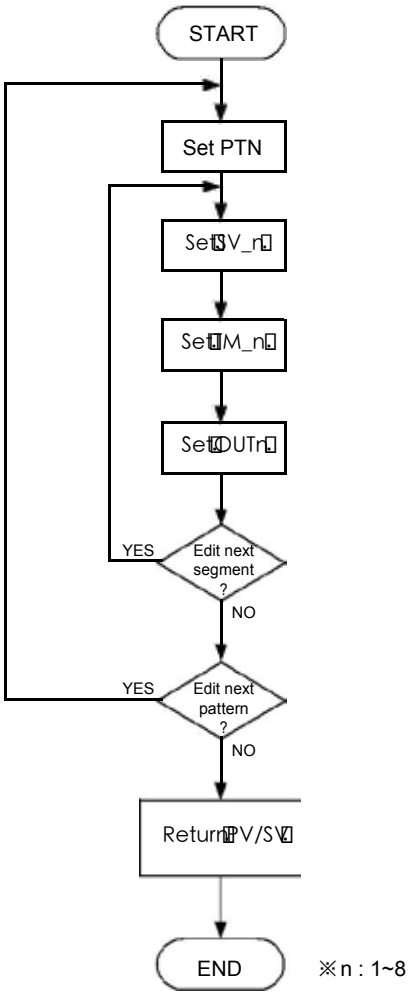
13.4 Create Program

There are 18 sets PTN to choose and each PTN have 8 segments for setting

Program structure diagram



Program edit flow-chat



1. Choose program pattern number

Parameter	LED display	Description	Default	Level
PTN	PTN	Program pattern selection 1~18	1	Level 1

2. Setting segment n target SV

Parameter	LED display	Description	Default	Level
SV_n	SV_1	Segment n SV (n=1~8)	0	Level 1

3. Setting segment n target TM

Parameter	LED display	Description	Default	Level
TM_n	TM_1	Segment 1 execute time setting, this parameter determines the link between a segment and a segment or pattern and pattern END(-1) : program end in this segment 0.00 : program step change in this segment 0.01~99.58 : program in this segment execute time 99.59 : program continue execute this segment no end	0	Level 1

TM setting explain :

In segment_5(SEG_5) setting TM =END ➔ When the program finishes segment_4(SEG_4), program end and display “END” message, can’t enter next segment.

In segment_5(SEG_5) setting TM =0.00 ➔ When the program finishes segment_4(SEG_4), enter next segment, SV change suddenly.

In segment_5(SEG_5) setting TM =10.00 ➔ When the program finishes segment_4(SEG_4), enter next segment and executing TM_5 setting value.

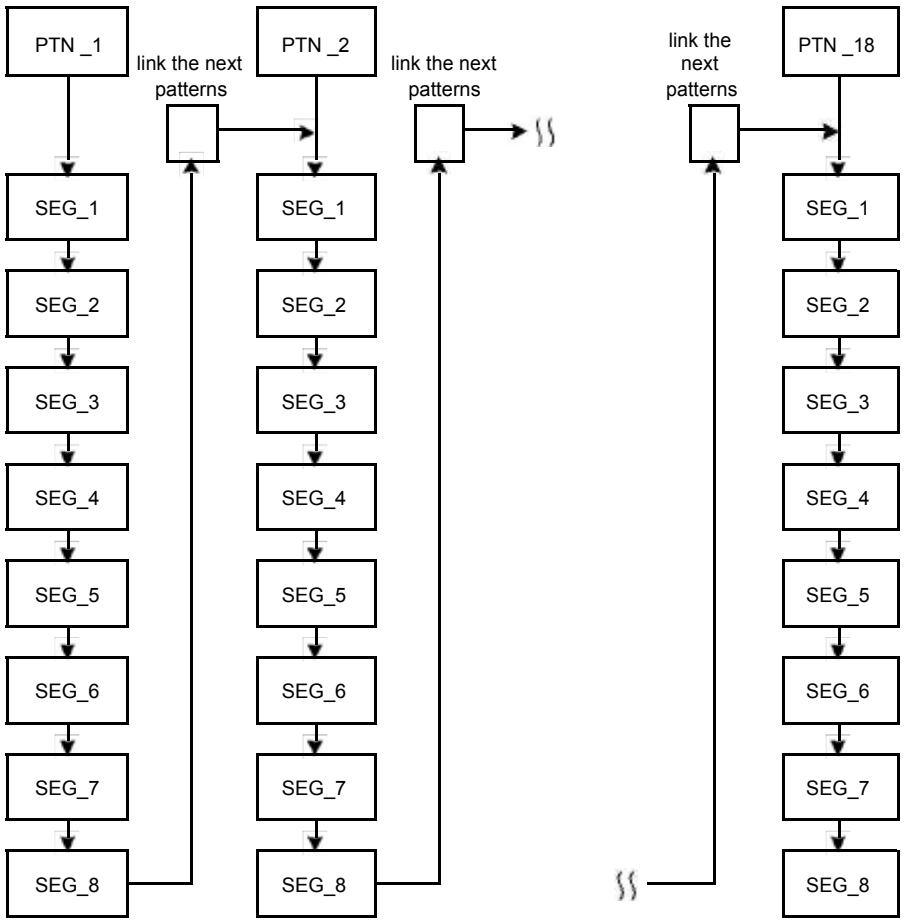
In segment_5(SEG_5) setting TM =99.59 ➔ When the program finishes segment_4(SEG_4) , enter next segment and executing continuously.

4. Setting segment n target OUTn

Parameter	LED display	Description	Default	Level
OUTn	OUT_1	Segment n output limit (n=1~8)	100.0	Level 1

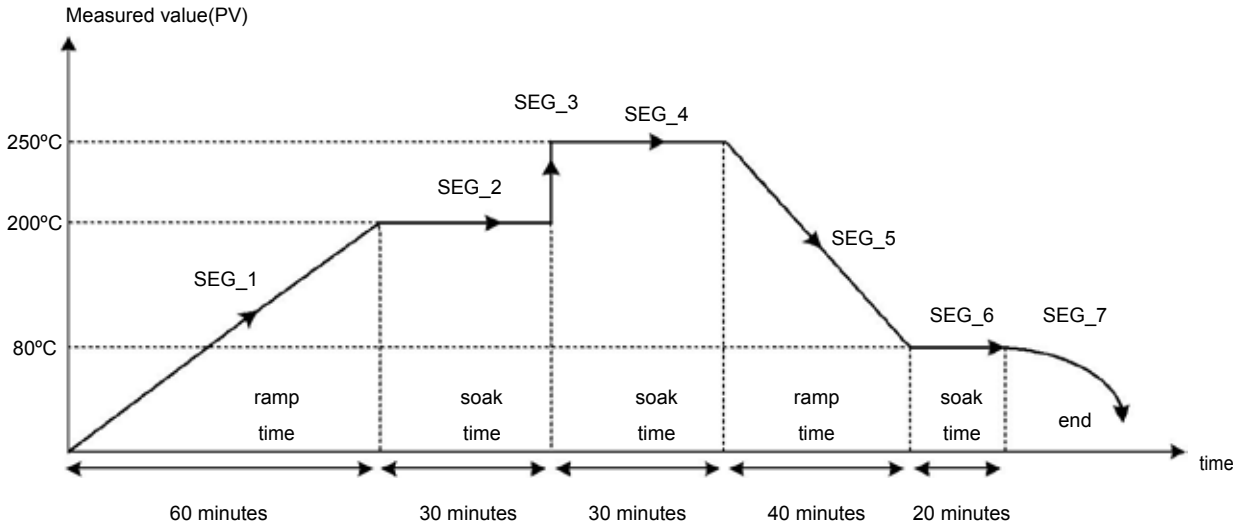
13.5 Program Execution Flow

The program can be up to 18 patterns. If you connect all the patterns, up to 144 segments.



13.6 Program Setting Example

In pattern_1 edit program ramp, soak, step and continue



Initial setting

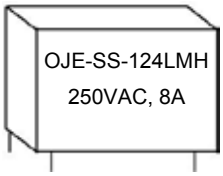
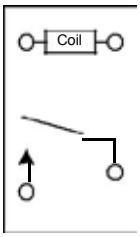
SET9.2 = 1	SET8.3 = 0	SET8.1 = 0	SET8.2 = 1	WAIT = 0.5

Program edit

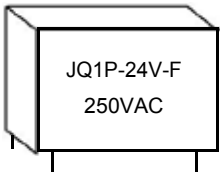
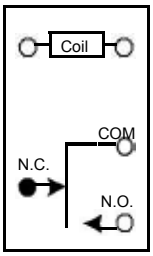
Segment_1	Segment_2	Segment_3	Segment_4	Segment_5	Segment_6	Segment_7
PTN = 1	PTN = 1	PTN = 1	PTN = 1	PTN = 1	PTN = 1	PTN = 1
SV_1 = 200	SV_2 = 200	SV_3 = 250	SV_4 = 250	SV_5 = 80	SV_6 = 80	SV_7 = 0
TM_1 = 60.00	TM_2 = 30.00	TM_3 = 0.00	TM_4 = 30.00	TM_5 = 40.00	TM_6 = 45.00	**TM_7 = END**
OUT1 = 100.0	OUT2 = 100.0	OUT3 = 100.0	OUT4 = 100.0	OUT5 = 100.0	OUT6 = 100.0	OUT7 = 0.0

14. Modification of Output Module

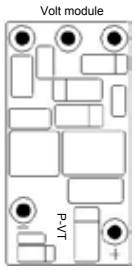
14.1 Relay Control (1a)

Side view	Bottom view	Software Setting
		Parameter set as “CYT1 =10”

14.2 Relay Control (1c)

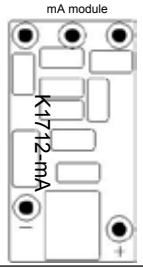
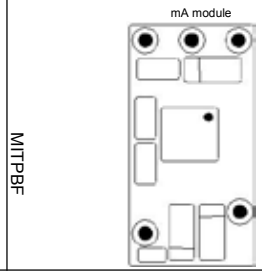
Side view	Bottom view	Software Setting
		Parameter set as “CYT1 =10”

14.3 SSR Control

Top view	Bottom view	Software Setting
		Parameter set as “CYT1 =1”

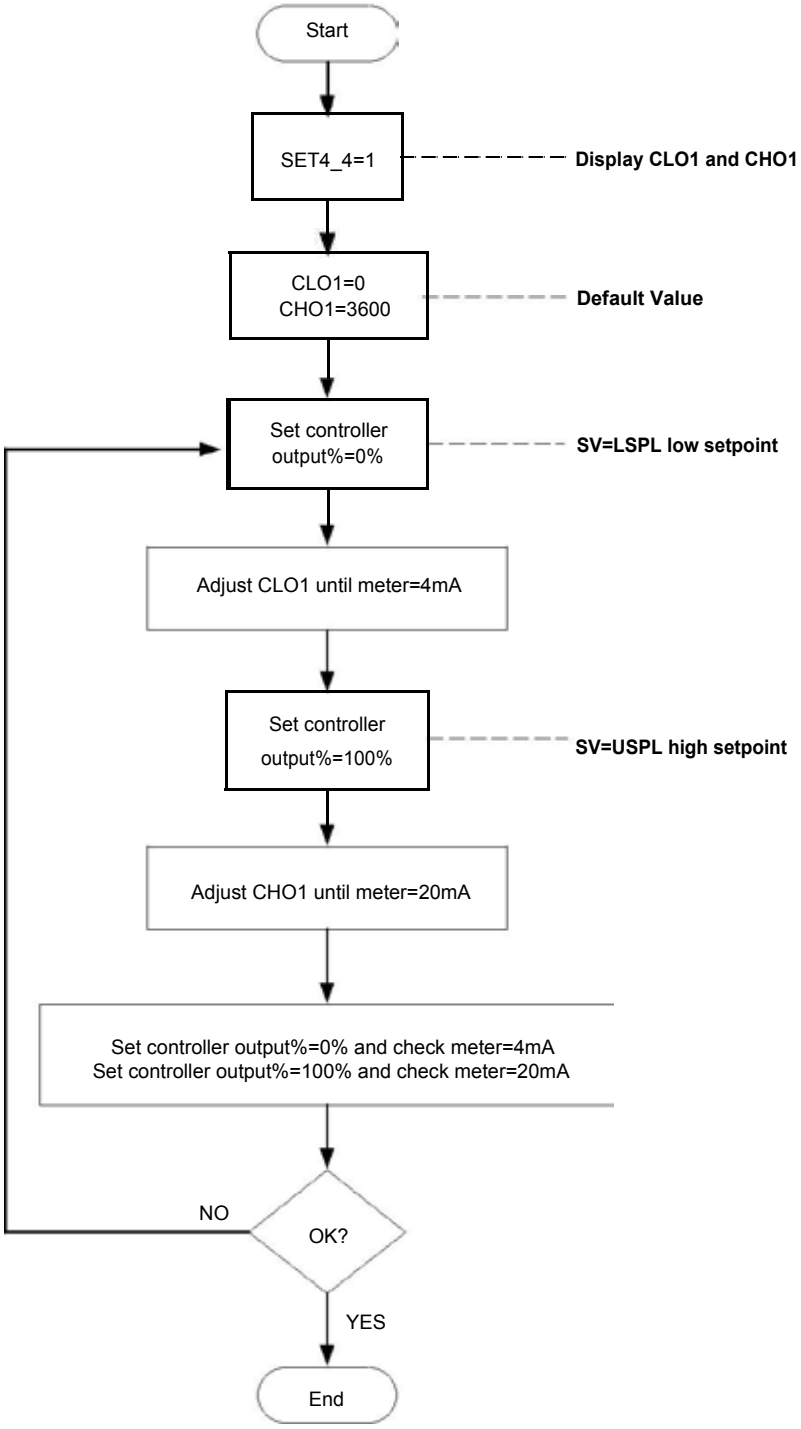
14.4 Linear Control

※ : When modifying mA current module, output signal needs to be calibrated, and for detailed calibration procedure, please refer to Chap. 14.5 Output Calibration Procedure Diagram.

Top view	Bottom view	Software Setting
		Parameter set as “CYT1 =0”

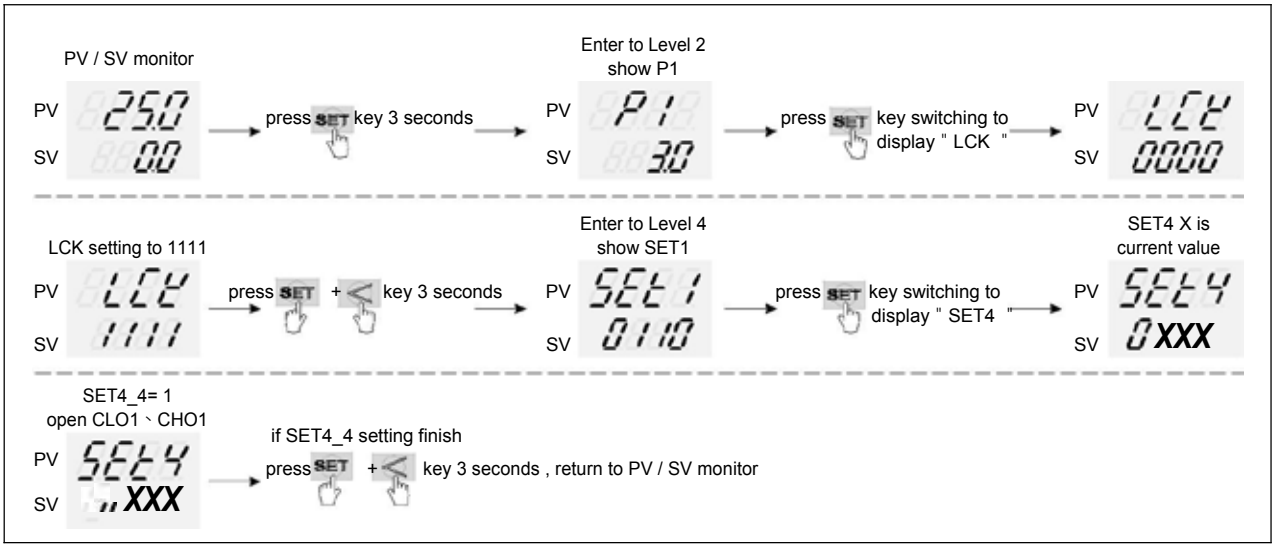
14.5 Output Calibration Proccedure Diagram

Output1 Signal (4mA~20mA) calibration flowchart



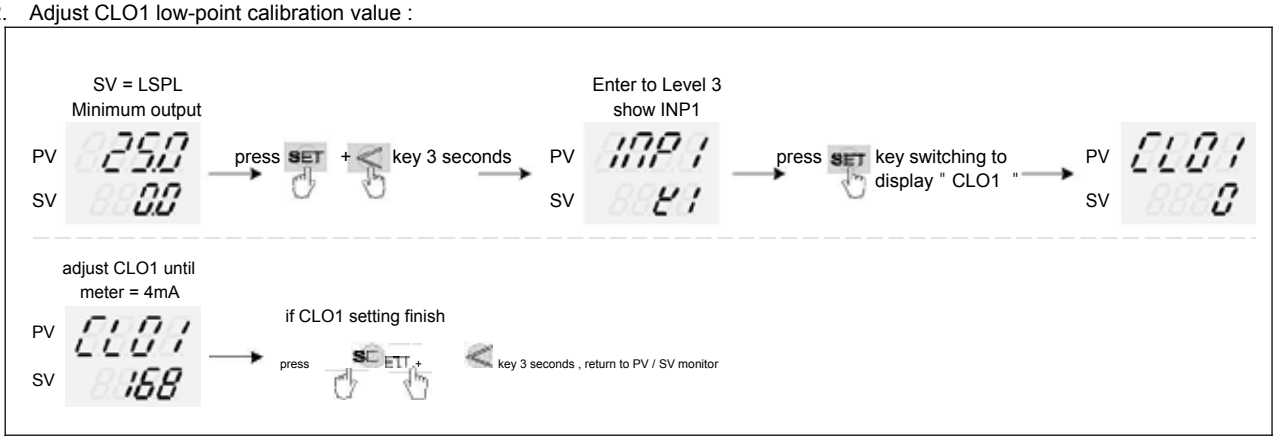
14.6 Output Calibration Steps

1. Display CLO1 & CHO1：



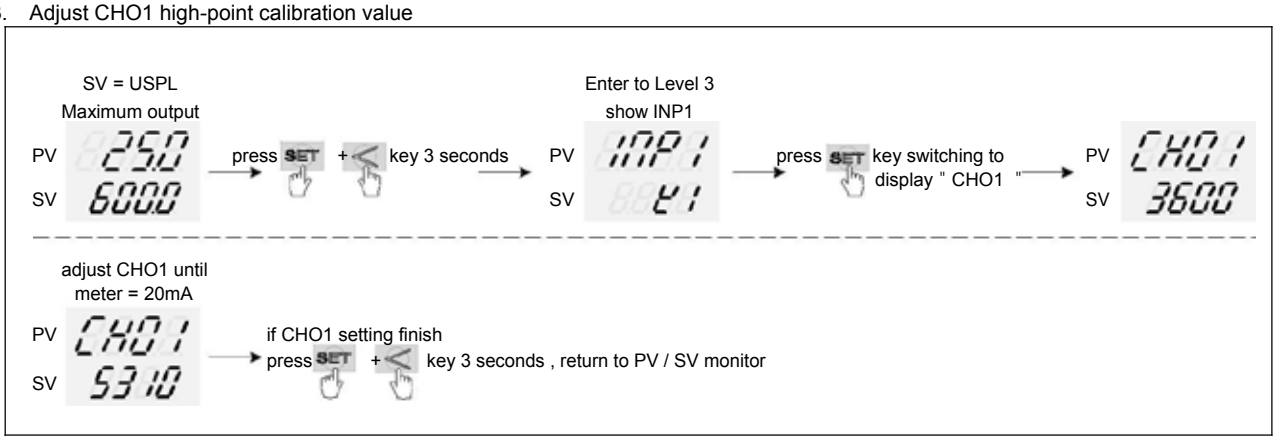
※ : X is default value which does not need to be modified

2. Adjust CLO1 low-point calibration value :



※ : CLO1 calibration value of each controller is different from the other

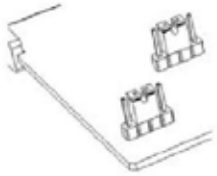
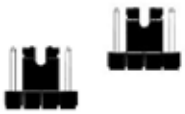
3. Adjust CHO1 high-point calibration value



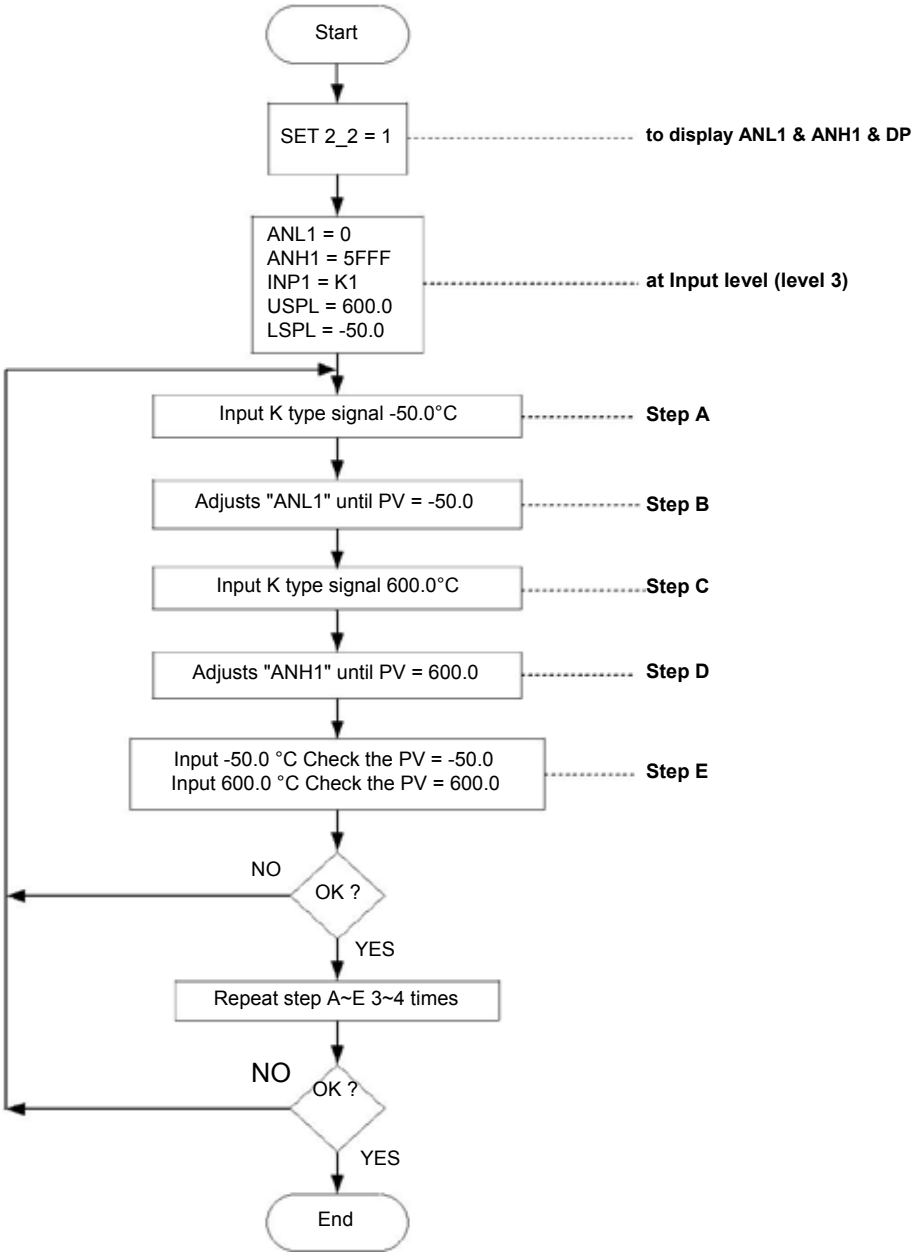
※: CHO1 calibration value of each controller is different from the other

15. Modification of Input Signal

15.1 Input modify to thermocouple

Jumper Position		Software Setting
Plug 2 pcs of Jumper in the middle slot as shown		
		Parameter set as “INP1=K1~L”

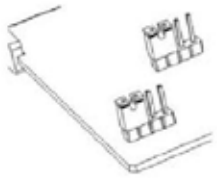
Thermocouple calibration flowchart



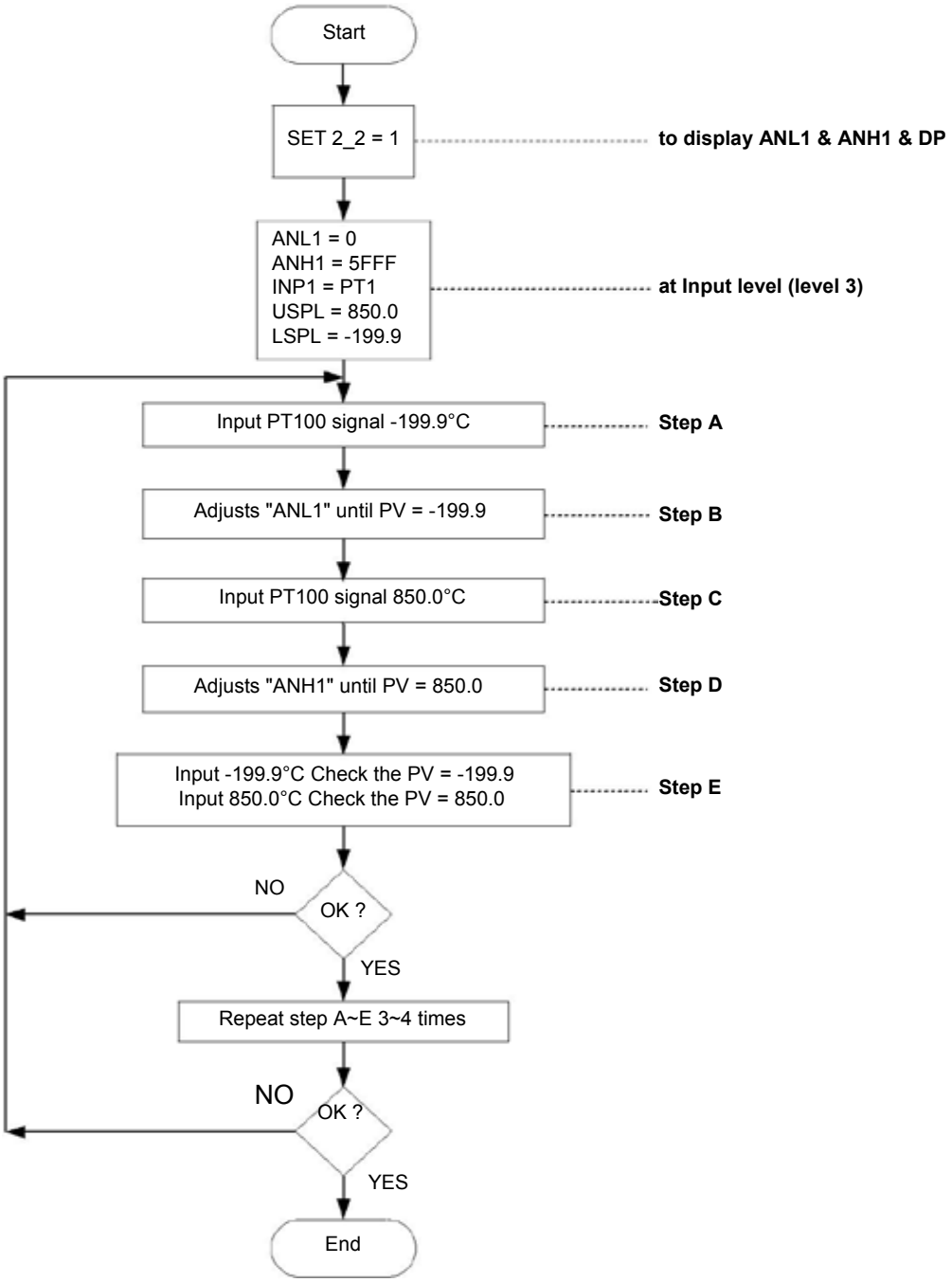
Set the range you want

Ex: Low = 0.0 , High = 200.0
Set LSPL = 0.0 , USPL = 200.0

15.2 Input modify to RTD

Jumper Position		Software Setting
Plug 2 pcs of Jumper in the left slot as shown		
		Parameter set as“INP1=PT1~PT3”

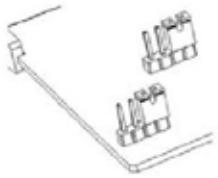
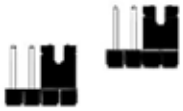
RTD calibration flowchart



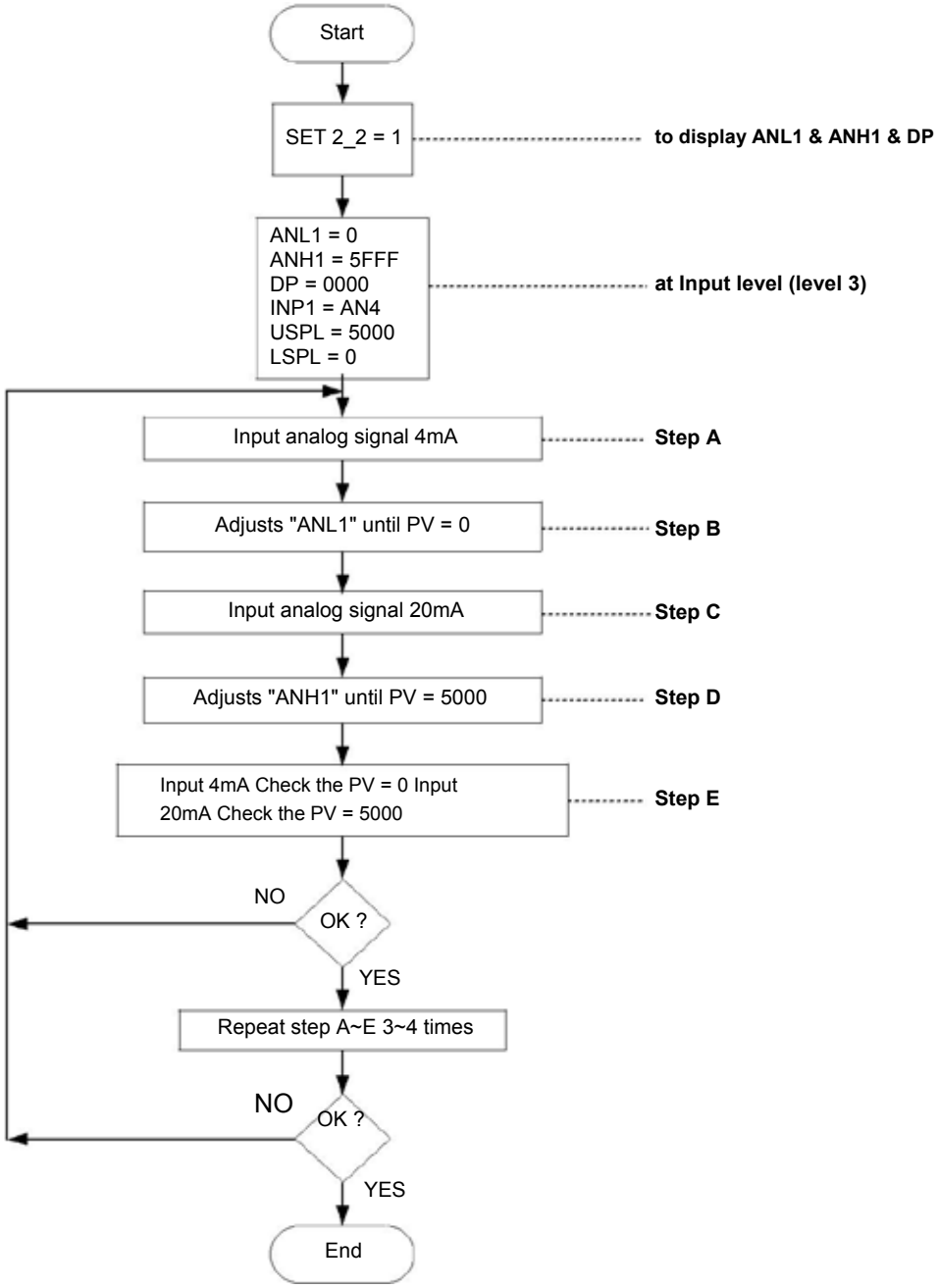
Set the range you want

Ex: Low = 0.0 , High = 200.0
Set LSPL = 0.0 , USPL = 200.0

15.3 Input modify to Linear (4~20mA)

Jumper Position Plug 2 pcs of Jumper in the right slot as shown		Software Setting
		Parameter set as “INP1=AN4”

Linear analog signal (4~20mA) calibration flowchart

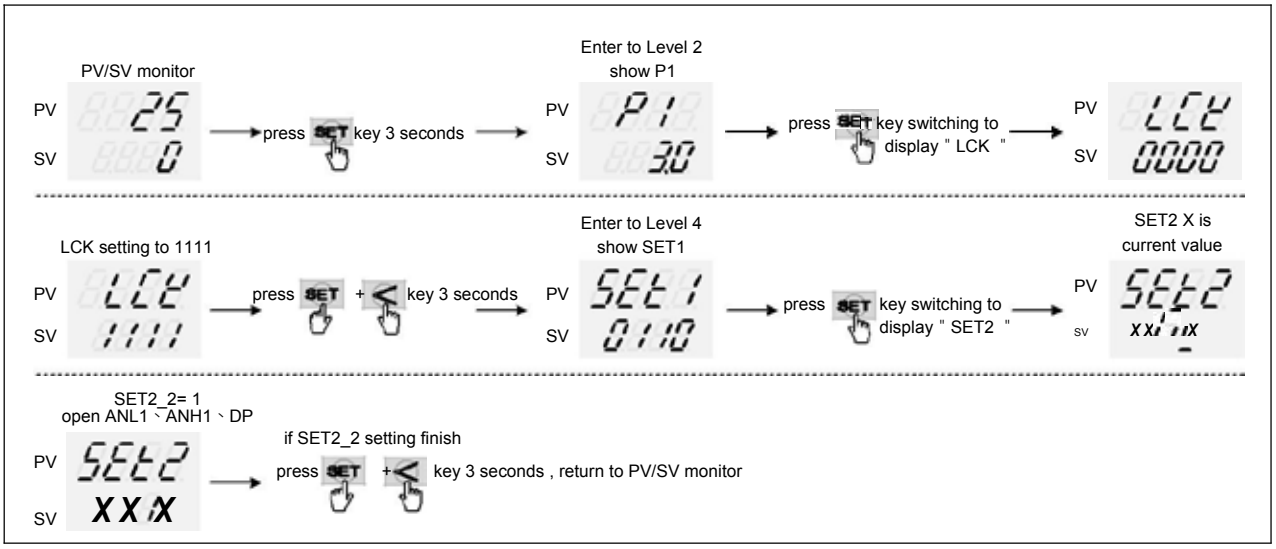


Set the range you want

Ex: Low = -10.0, High = 10.0
Set LSPL = -10.0, USPL = 10.0, DP : 000.0

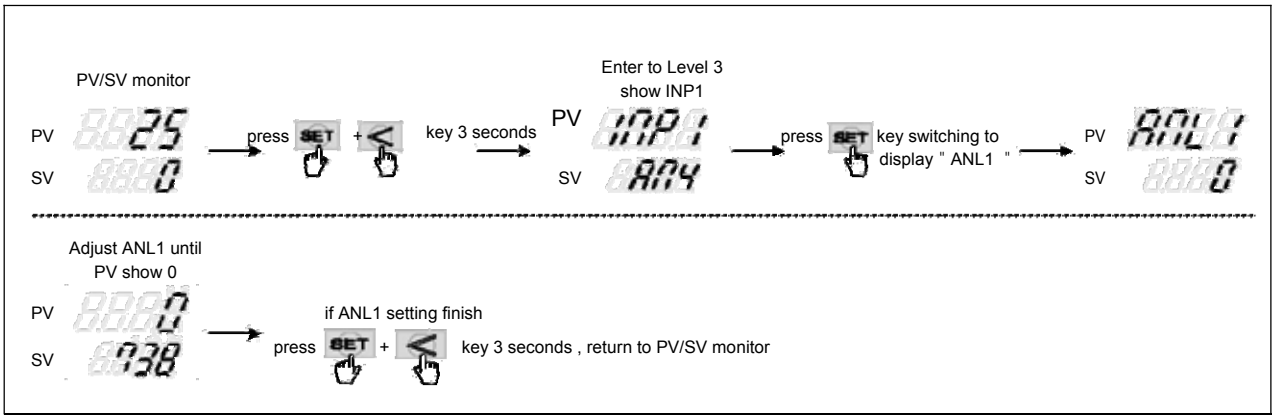
15.4 Steps For Linear Input Calibration

1. Display ANL1、ANH1、DP：



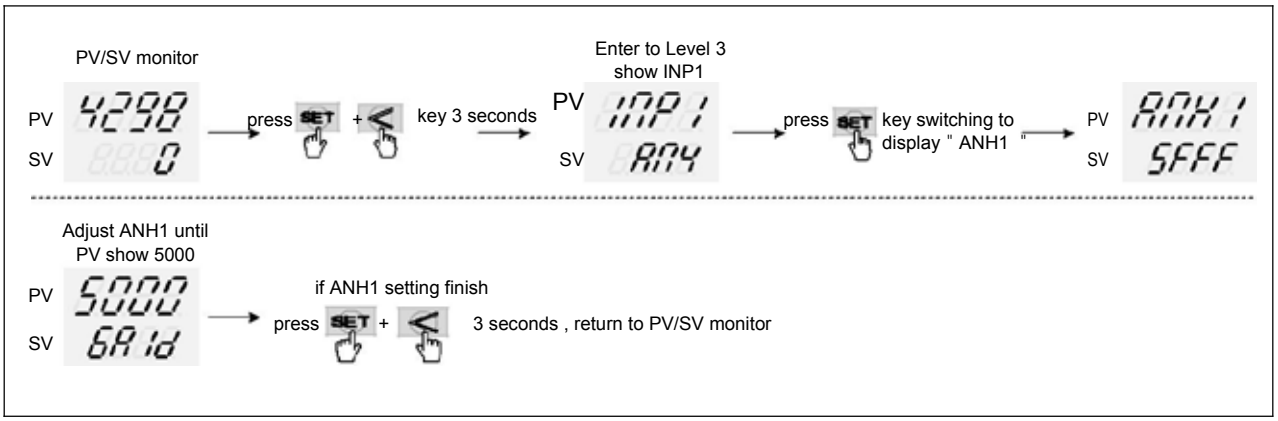
※ X is the default value which doest not require modification

2. input 4mA and djust ANL1 calibration values：



※ ANL1 calibration value of each controller is different from the other

3. input 20mA and djust ANH1 calibration values：

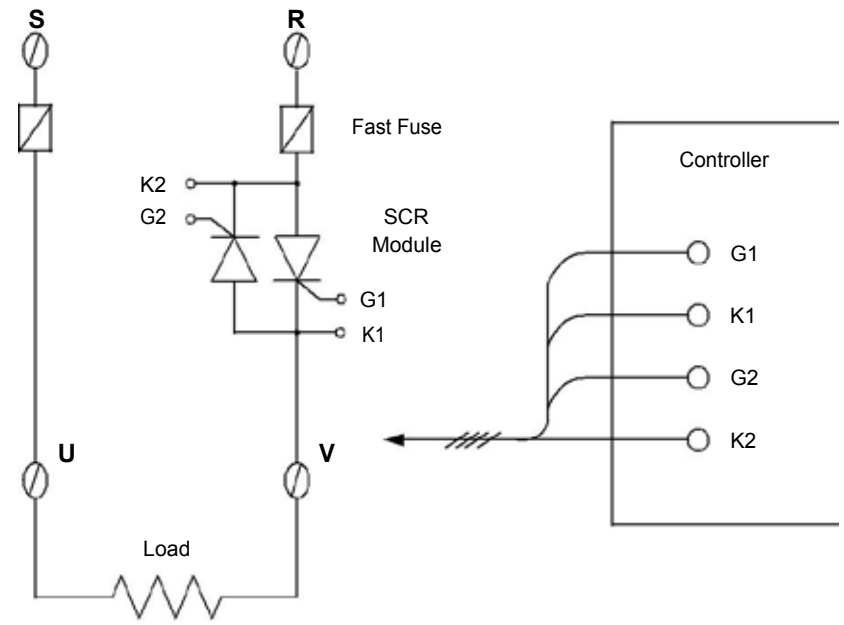


※ ANH1 calibration value of each controller is different from the other

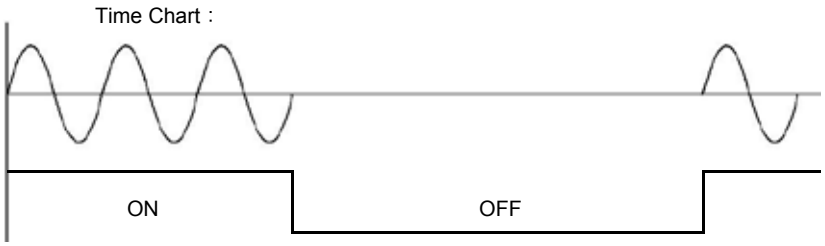
16. Zero / Phase Control

16.1 1ϕ Zero Cross Control (SCR module)

OUT1 : 1Φ SCR zero cross control
Parameter setting : OUTY= 0, CYT1= 1
Wiring Setup :



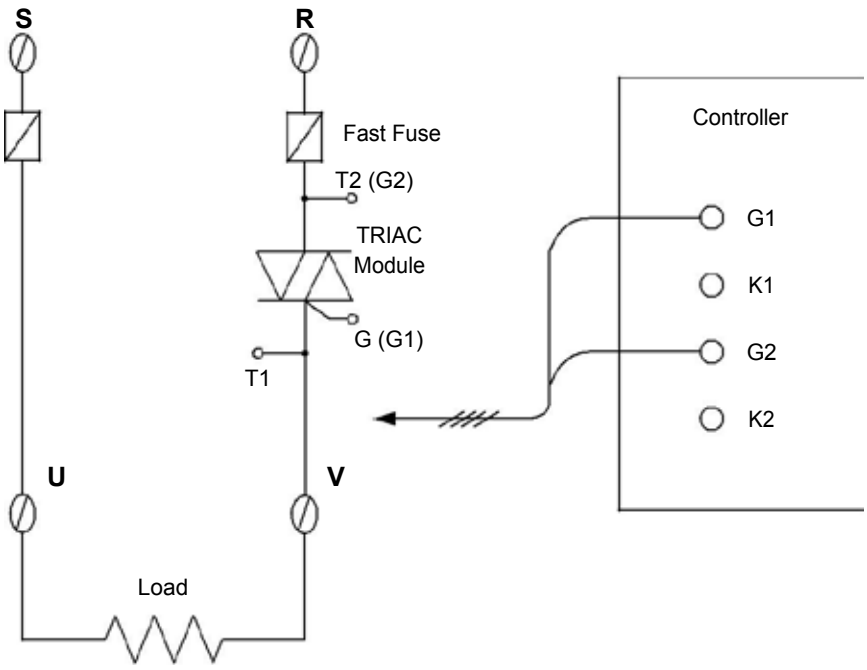
Time Chart :



CYCLE TIME = 200ms

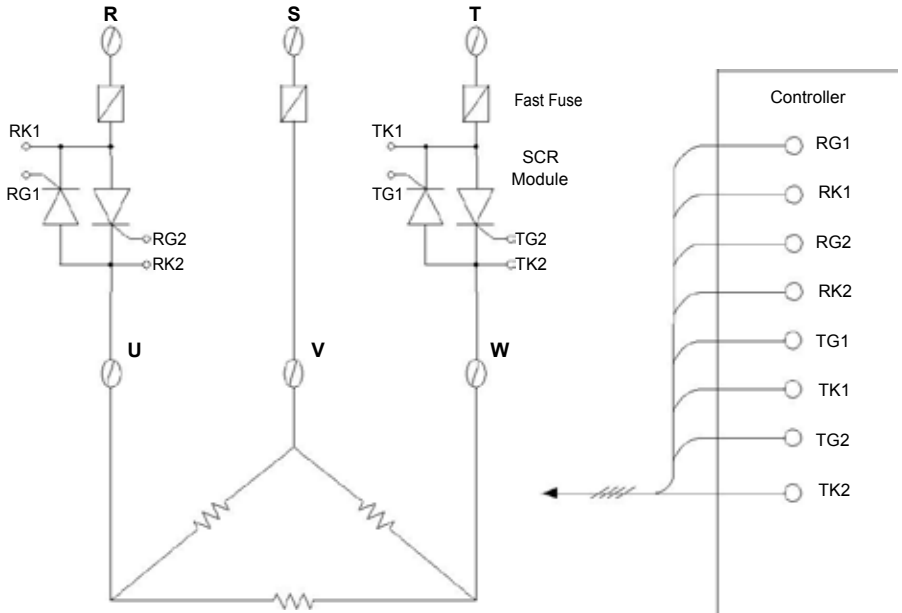
16.2 1ϕ Zero Cross Control (TRIAC module)

OUT1 : 1Φ SCR zero cross control
Parameter setting : OUTY= 0, CYT1= 1
Wiring Setup:



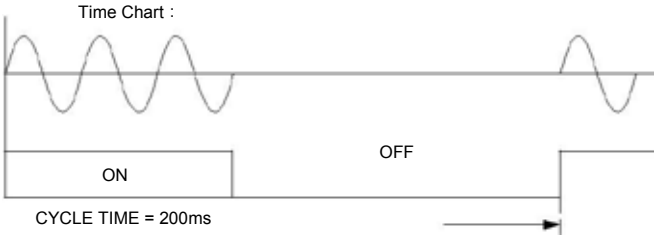
16.3 3ϕ Zero Cross Control (SCR module)

OUT1 : 3Φ SCR zero cross control
Parameter setting : OUTY= 0, CYT1= 1
Wiring Setup :



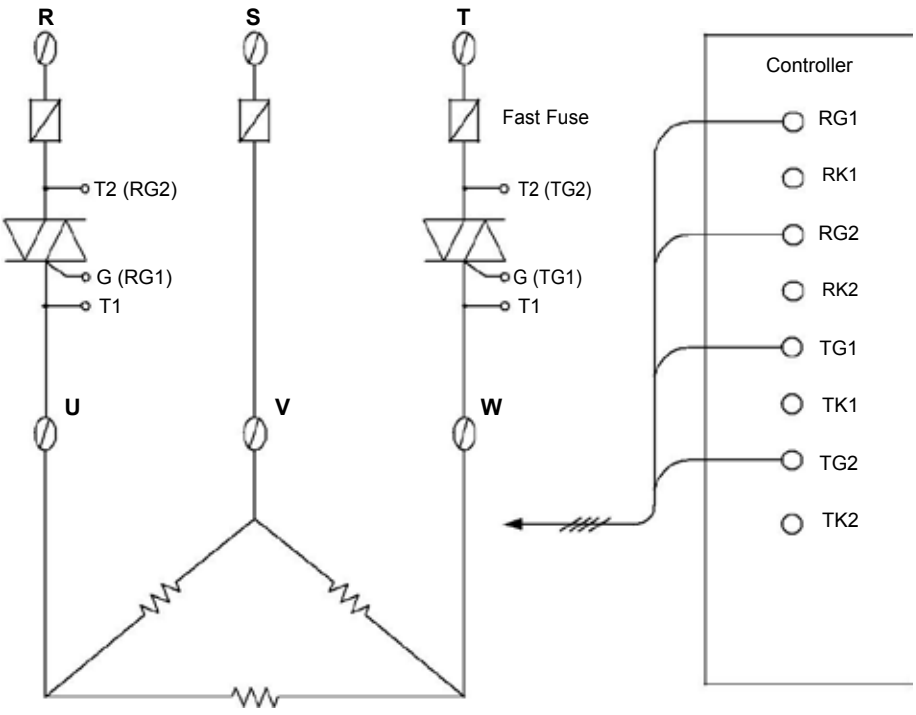
three phase three wire system

Time Chart :



16.4 3ϕ Zero Cross Control (TRIAC module)

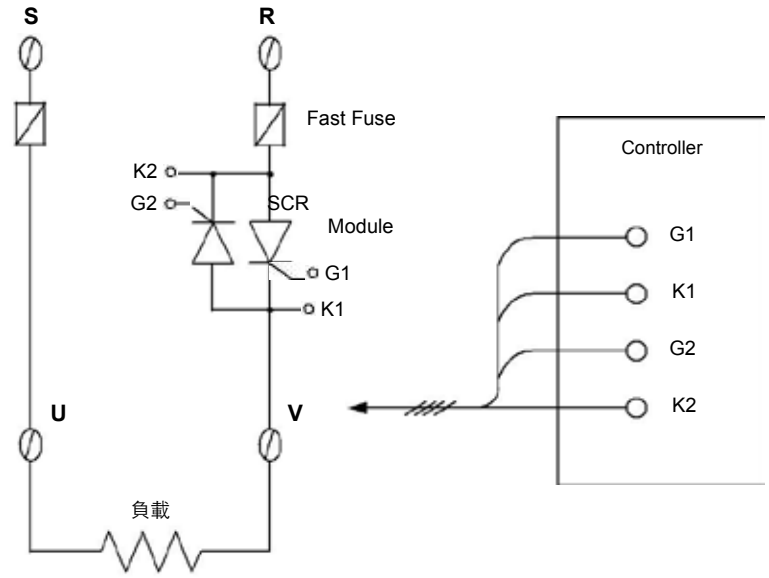
OUT1 : 3Φ SCR zero cross control
Parameter setting : OUTY= 0, CYT1= 1
Wiring Setup :

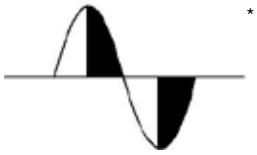


three phase three wire system

16.5 1ϕ Phase Angle Control (SCR module)

OUT1 : 1Φ SCR phase angle control
Parameter setting : OUTY= 4, CYT1= 0 CLO1
= 80, CHO1 = 4300
Wiring Setup :

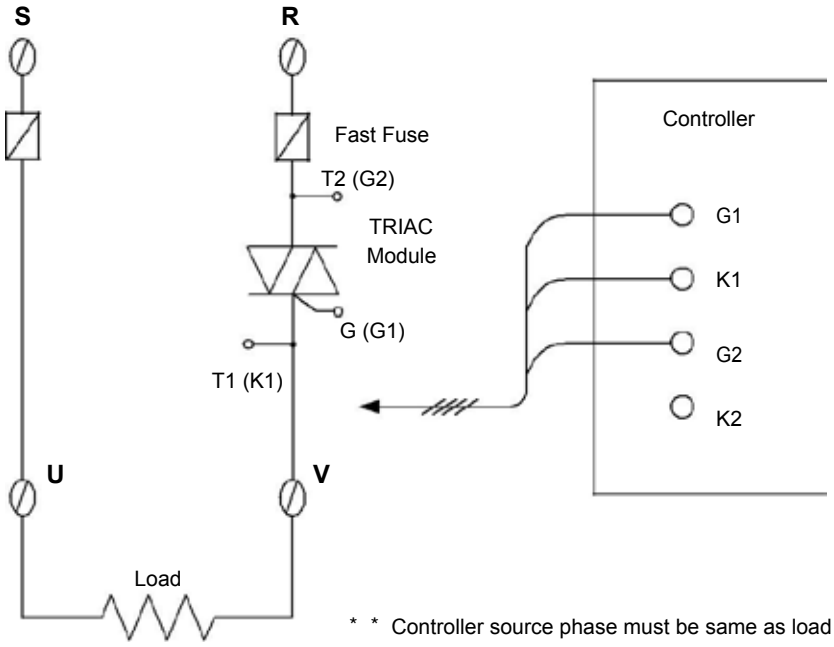




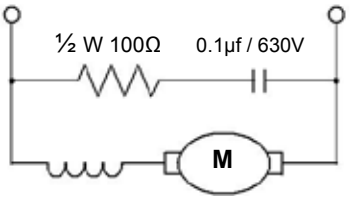
* * Controller source phase must be same as load source phase

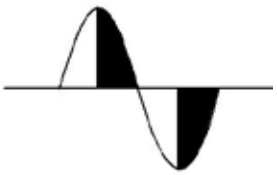
16.6 1ϕ Phase Angle Control (TRIAC module)

OUT1 : 1Φ SCR phase angle control
Parameter setting : OUTY= 4, CYT1= 0
CLO1 = 80, CHO1 = 4300
Wiring Setup :



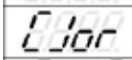
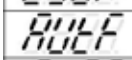
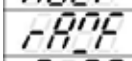
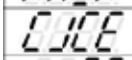
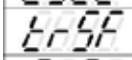
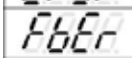
* * Controller source phase must be same as load source phase





17. Troubleshooting

This chapter describes error displays and procedures to follow when problems occur.

Symbol	Text	description	Solution
	INLE	Input1 Error	Check whether input loop is opened or wiring is incorrect.
	UUU1	PV is above USPL	Check whether the input value or input type is correct or not.
	NNN1	PV is below LSPL	Check whether the input value or input type is correct or not.
	CJOR	Ambient temperature over range(>50°C)	Decrease ambient temperature
	AUTF	Auto-tunning failure	Manually set the PID value
	ADCF	A/D convert failed	send for repair.
	RAMF	EEPROM failed	send for repair.
	CJCE	cold junction diode failure	send for repair.
	TRSF	transmission hardware failure	send for repair.
	FBER	valve potentiometer feedback error	1. check the potentiometer feedback wiring 2. send for repair.

18. FY/FU Communication Register Address Table

Parameter	Register Address		R / W
	Hex	Dec	
SV	0x00	0	R / W
OUTL	0x01	1	R / W
AT	0x02	2	R / W
AL1 SOAK HBAC	0x03	3	R / W
AL2 SOAK HBAC	0x04	4	R / W
AL3 SOAK RAMP RATE	0x05	5	R / W
PTN	0x06	6	R / W
SEG	0x07	7	R
TIMR	0x08	8	R
SV_1	0x09	9	R / W
TM_1	0x0A	10	R / W
OUT1	0x0B	11	R / W
SV_2	0x0C	12	R / W
TM_2	0x0D	13	R / W
OUT2	0x0E	14	R / W
SV_3	0x0F	15	R / W
TM_3	0x10	16	R / W
OUT3	0x11	17	R / W
SV_4	0x12	18	R / W
TM_4	0x13	19	R / W
OUT4	0x14	20	R / W
SV_5	0x15	21	R / W
TM_5	0x16	22	R / W
OUT5	0x17	23	R / W
SV_6	0x18	24	R / W
TM_6	0x19	25	R / W
OUT6	0x1A	26	R / W
SV_7	0x1B	27	R / W
TM_7	0x1C	28	R / W
OUT7	0x1D	29	R / W
SV_8	0x1E	30	R / W
TM_8	0x1F	31	R / W
OUT8	0x20	32	R / W
SV_12	0x21	33	R / W
TM_12	0x22	34	R / W
OUT12	0x23	35	R / W
SV_22	0x24	36	R / W
TM_22	0x25	37	R / W
OUT22	0x26	38	R / W
SV_32	0x27	39	R / W
TM_32	0x28	40	R / W
OUT32	0x29	41	R / W
SV_42	0x2A	42	R / W
TM_42	0x2B	43	R / W
OUT42	0x2C	44	R / W
SV_52	0x2D	45	R / W
TM_52	0x2E	46	R / W
OUT52	0x2F	47	R / W
SV_62	0x30	48	R / W
TM_62	0x31	49	R / W
OUT62	0x32	50	R / W
SV_72	0x33	51	R / W
TM_72	0x34	52	R / W
OUT72	0x35	53	R / W
SV_82	0x36	54	R / W
TM_82	0x37	55	R / W
OUT82	0x38	56	R / W
P1	0x39	57	R / W
I1	0x3A	58	R / W
D1	0x3B	59	R / W
AT.VL	0x3D	61	R / W
CYT1	0x3E	62	R / W
HYS1	0x3F	63	R / W

Parameter	Register Address		R / W
	Hex	Dec	
P2	0x40	64	R / W
I2	0x41	65	R / W
D2	0x42	66	R / W
CYT2	0x43	67	R / W
HYS2	0x44	68	R / W
GAP1	0x45	69	R / W
GAP2	0x46	70	R / W
LCK	0x47	71	R / W
INP1	0x48	72	R / W
ANL1	0x49	73	R / W
ANH1	0x4A	74	R / W
DP	0x4B	75	R / W
LSPL	0x4C	76	R / W
USPL	0x4D	77	R / W
ANL2	0x4E	78	R / W
ANH2	0x4F	79	R / W
ALD1	0x50	80	R / W
ALT1	0x51	81	R / W
ALD2	0x52	82	R / W
ALT2	0x53	83	R / W
ALD3	0x54	84	R / W
ALT3	0x55	85	R / W
HYSA	0x56	86	R / W
CLO1	0x57	87	R / W
CHO1	0x58	88	R / W
CLO2	0x59	89	R / W
CHO2	0x5A	90	R / W
CLO3	0x5B	91	R / W
CHO3	0x5C	92	R / W
RHTC RUCY	0x5D	93	R / W
RHPO WAIT	0x5E	94	R / W
SETA	0x5F	95	R / W
PSL	0x60	96	R
BITS	0x61	97	R
IDNO	0x62	98	R
BAUD	0x63	99	R
SVOS	0x64	100	R / W
PVOS	0x65	101	R / W
UNIT	0x66	102	R / W
PVFT	0x67	103	R / W
PV2	0x68	104	R / W
OUD	0x69	105	R / W
OPAD	0x6A	106	R / W
HZ	0x6B	107	R / W
SET1	0x6C	108	R / W
SET2	0x6D	109	R / W
SET3	0x6E	110	R / W
SET4	0x6F	111	R / W
SET5	0x70	112	R / W
SET6	0x71	113	R / W
SET7	0x72	114	R / W
SET8	0x73	115	R / W
SET9	0x74	116	R / W
SET0	0x75	117	R / W
INP2	0x76	118	R / W
OUTY	0x77	119	R / W
OUT%	0x87	135	R
OBIT	0x88	136	R
CV	0x89	137	R
PV	0x8A	138	R

19. Glossary of Characters Used In This Manual

LED Display										
Characters	0	1	2	3	4	5	6	7	8	9
LED Display										
Characters	A	B	C	D	E	F	G	H	I	J
LED Display										
Characters	K	L	M	N	O	P	Q	R	S	T
LED Display										
Characters	U	V	W	Y	Z	°C	°F			