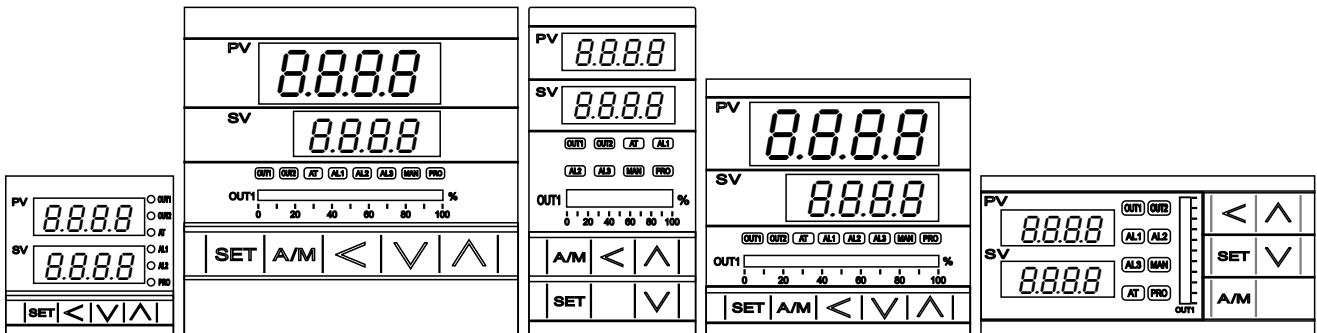

Digital Temperature Controller

NC2438/NC2538/NC2638/NC2738/NC2838

Operation Manual



Ver 1.6

Preface

Thank you for purchasing the NC series digital temperature controllers.

This User's Manual contains instructions for mounting, functions, operations and notes when operating the NC series digital temperature controllers.

To prevent accidents arising from the misuse of this controller, please ensure the operator receives this manual.

Notes

- This instrument should be used in accordance with the specifications described in the manual. If it is not used according to the specifications, it may malfunction or cause a fire.
- Be sure to follow the warnings, cautions and notices. If they are not observed, serious injury or malfunction may occur.
- The contents of this instruction manual are subject to change without notice.
- Care has been taken to ensure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our company.
- Measures must be taken to ensure that the operator cannot touch power terminals or other high voltage sections.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- NIPPON INDIA is not liable for any damage or secondary damage(s) incurred as a result of using this product, including any indirect damage.





WARNING : This mark indicates precautions that must be taken if there is danger of electric shock, fire, etc., which could result in loss of life or injury.



CAUTION : This mark indicates that if these precautions and operating procedures are not taken, damage to the instrument may result.

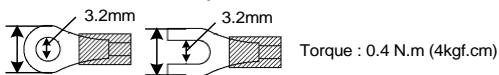


WARNING

- An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel.
- All wiring must be completed before power is turned on to prevent electric shock, fire or damage to instrument and equipment.
- This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.
- This instrument is not intended for use in locations subject to flammable or explosive gases.
- Do not touch high-voltage connections such as power supply terminals, etc. to avoid electric shock.
- NIPPON INDIA. is not responsible if this instrument is repaired, modified or disassembled by other than factory-approved personnel. Malfunction can occur and warranty is void under these conditions.

CAUTION

- This product is intended for use with industrial machines, test and measuring equipment. It is not designed for use with medical equipment and nuclear energy.
- This is a Class A instrument. In a domestic environment, this instrument may cause radio interference, in which case the user may be required to take additional measures.
- This instrument is protected from electric shock by reinforced insulation.
Provide reinforced insulation between the wire for the input signal and the wires for instrument power supply, source of power and loads.
- This instrument is designed for installation in an enclosed instrumentation panel. All high-voltage connections such as power supply terminals must be enclosed in the instrumentation panel to avoid electric shock by operating personnel.
- All precautions described in this manual should be taken to avoid damage to the instrument or equipment.
- All wiring must be completed before power is turned on to prevent electric shock, instrument failure, or incorrect action.
- The power must be turned off before repairing work for input break and output failure including replacement of sensor, contactor or SSR, and all wiring must be completed before power is turned on again.
- Prevent metal fragments or lead wire scraps from falling inside instrument case to avoid electric shock, fire or malfunction.
- Please use crimp terminals suitable for M3 screws, as shown below:



- Tighten each terminal screw to the specified torque found in the manual to avoid electric shock, fire or malfunction.
- When the thermocouple wiring is extended, please use the compensation lead of the corresponding type to this thermocouple.


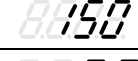

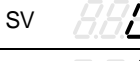


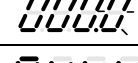


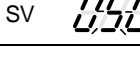



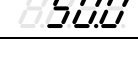

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8.8 Controlling With Manual Control

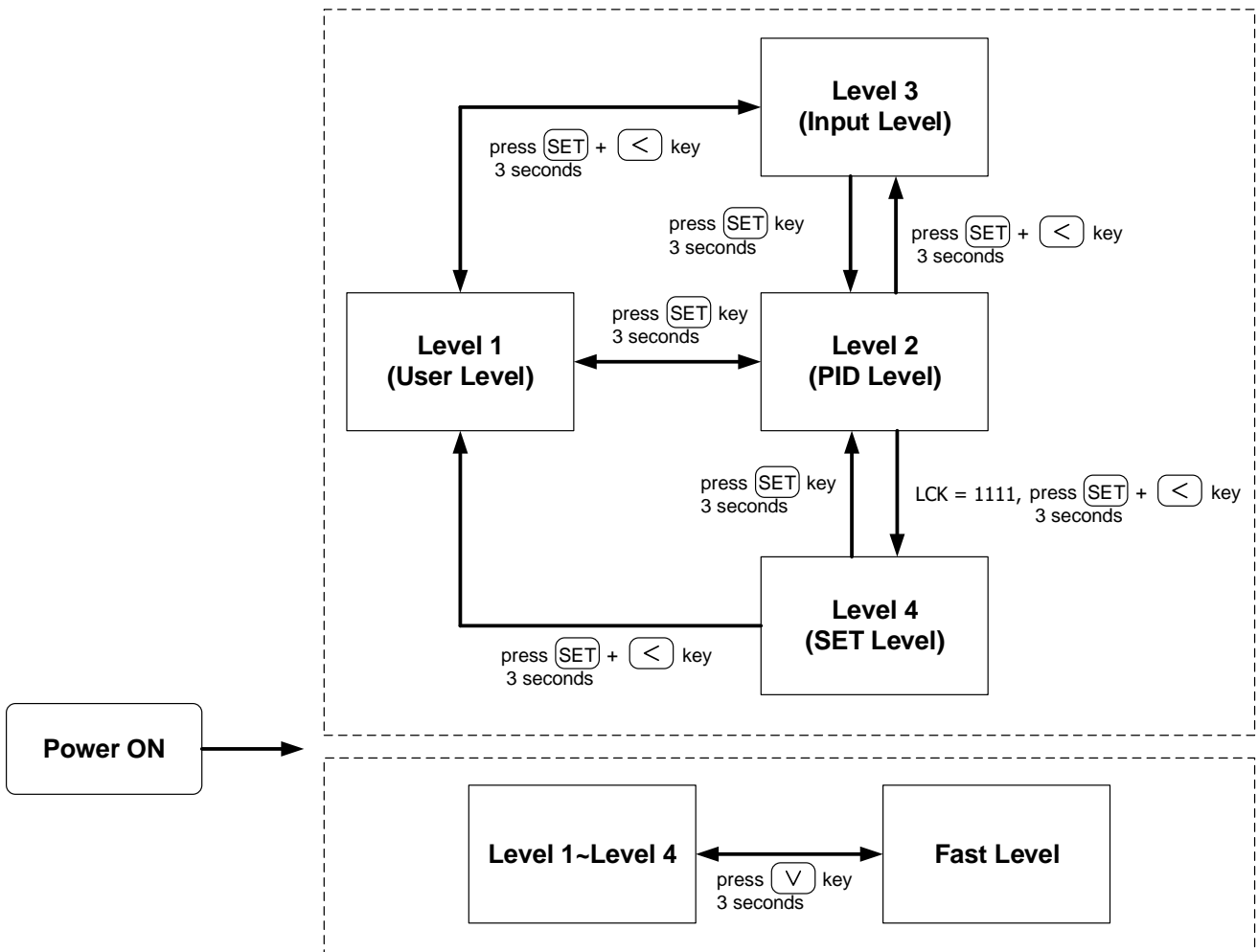
1.	PV  SV 	Display after power-on.	2.	PV  SV 	Hold  2 seconds.
3.	PV  SV 	When  key is pressed, the lower display flashes.	4.	PV  SV 	Press  key and  key to set the intended output% value.
5.	PV  SV 	Press  key to store new value.	In manual mode OUTL=100.0 , output=100.0 % continuously. In manual mode OUTL=20.0 , output=20.0 % continuously.		

9. Flow Chart of Parameter Setting

9.1 Level Operation Mode

1. LEVEL 1 enter to the LEVEL 2
Hold SET key for 3 seconds then entering LEVEL 2
2. LEVEL 1 enter to the LEVEL 3
Hold SET key + SHIFT key for 3 seconds then entering 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 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

9.2 Level Operation Diagram



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

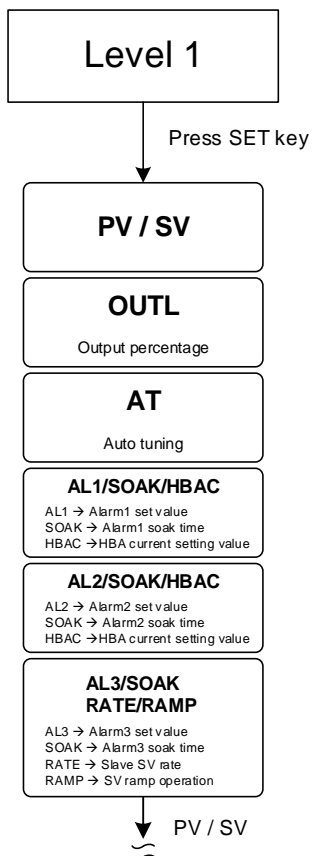
9.3 Data Lock Function

LCK provides a parameter protection function to prevent the operator from touching or modifying important parameters. Conversely, when the parameter cannot be modified, please check 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

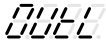
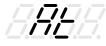
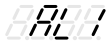

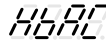




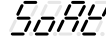
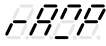

◎ : allow X : inhibit

9.4 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

9.5 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 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) 2 : PR.TU (Startup tuning, execute once) 3 : PRTU (Startup tuning, execute always when reboot)	PRTU	NO	NO	SET1.2
*AL1		Alarm1 set value (Please refer to Chapter 11)	USPL	-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 11)	USPL	-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 11)	USPL	-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 (Please refer to Chapter 10.7)	99.99	-19.99	10.00	ALD3=9 & SET2.1
RATE		Slave SV rate RATE SV = SV x (RATE/9999) (Please refer to Chapter 10.9)	9999	0	9999	SET2.1 & SET0.2

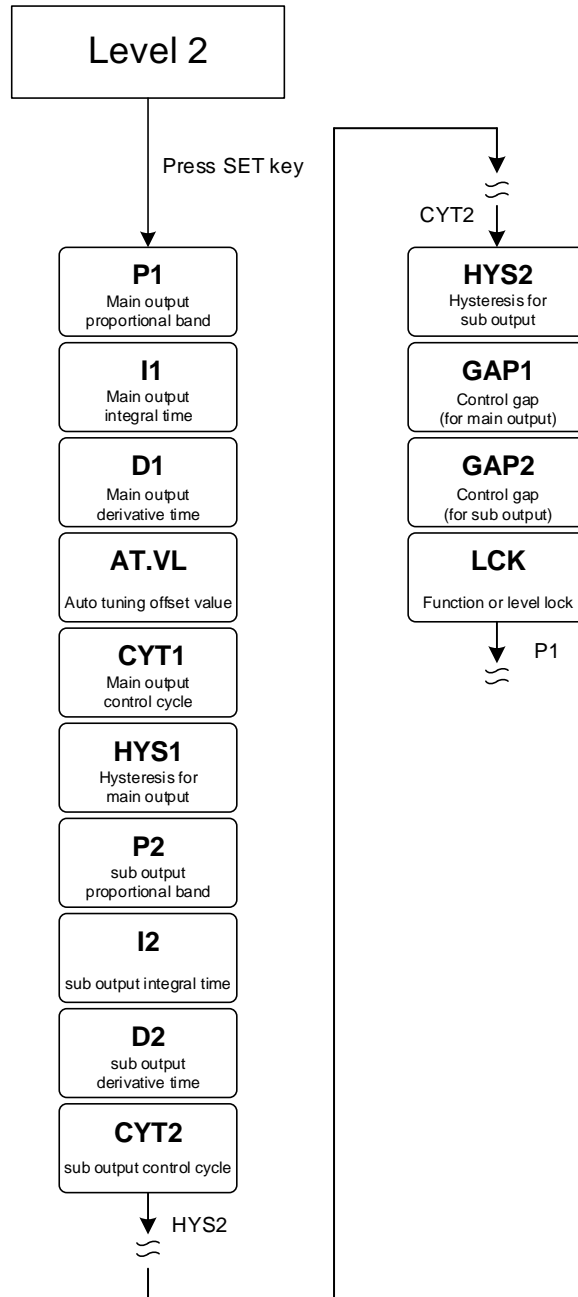
* Automatically display corresponding parameters according to different setting conditions

EX1: When alarm1 is used as HBA function(ALD1= 09), original AL1 will become HBAC display

EX2: When alarm2 is used as SOAK_B function(ALD2= 19), original AL2 will become SOAK display

EX3: When alarm3 is used as RAMP function(ALD3= 09), original AL3 will become RAMP display

9.6 Level 2 (PID Level) All Parameters Display

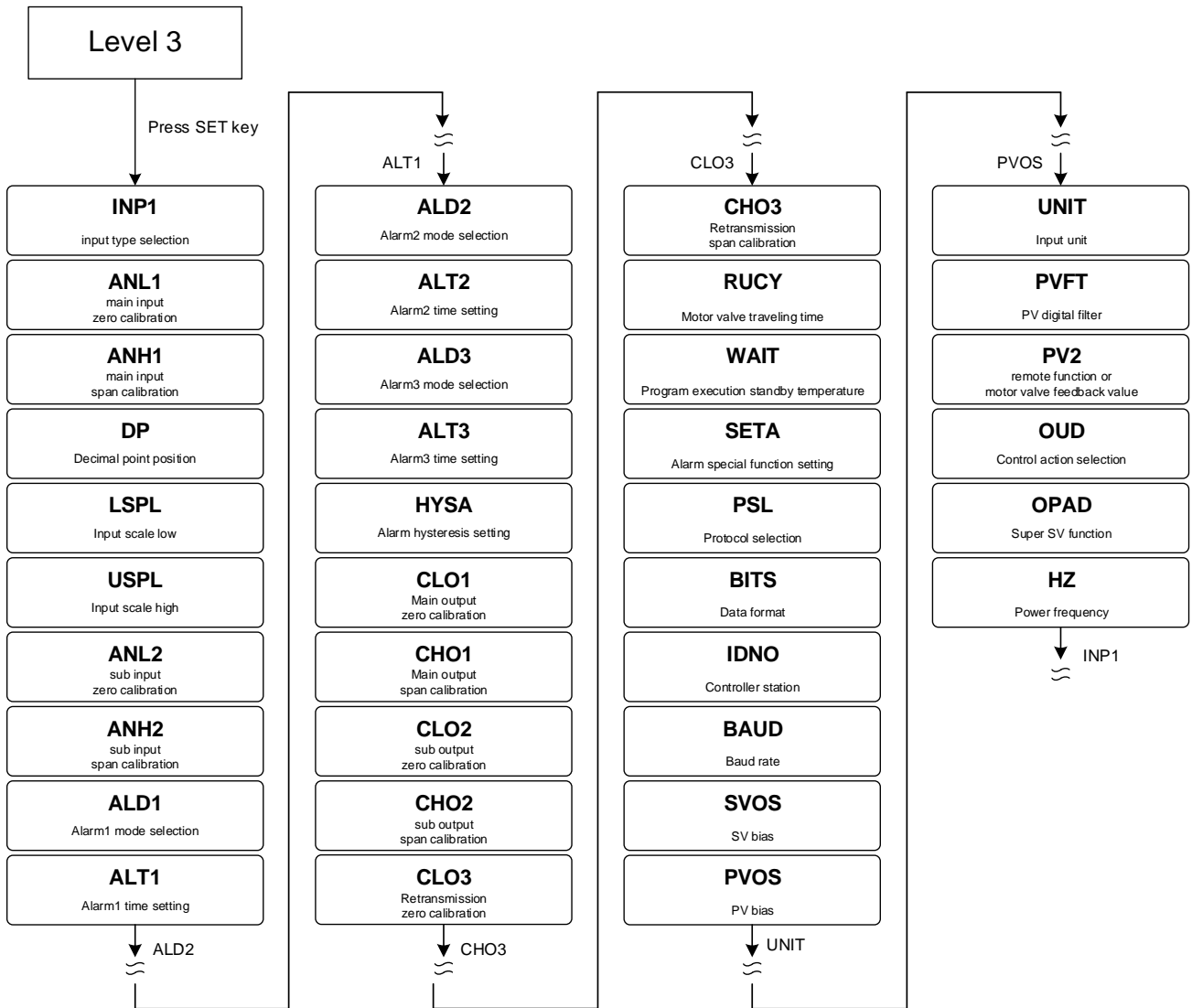


※ If no key is pressed within 60 seconds, it will automatically return to LEVEL 1 (user level) and display PV/SV

9.7 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 : $PV \geq (SV + HYS1) \rightarrow OUT1=OFF$ $PV \leq (SV - HYS1) \rightarrow OUT1=ON$ cooling formula : $PV \geq (SV + HYS1) \rightarrow OUT1=ON$ $PV \leq (SV - HYS1) \rightarrow OUT1=OFF$	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 9.3 Data Lock Function)	1111	0000	0000	---

9.8 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

9.9 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 3 Input Range Table)	AN4	K1	K1	---
ANL1		Main input zero calibration, only available in linear input (Please refer to chapter 14.4)	9999	-1999	0	SET2.2
ANH1		Main input span calibration, only available in linear input (hex display) (Please refer to chapter 14.4)	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

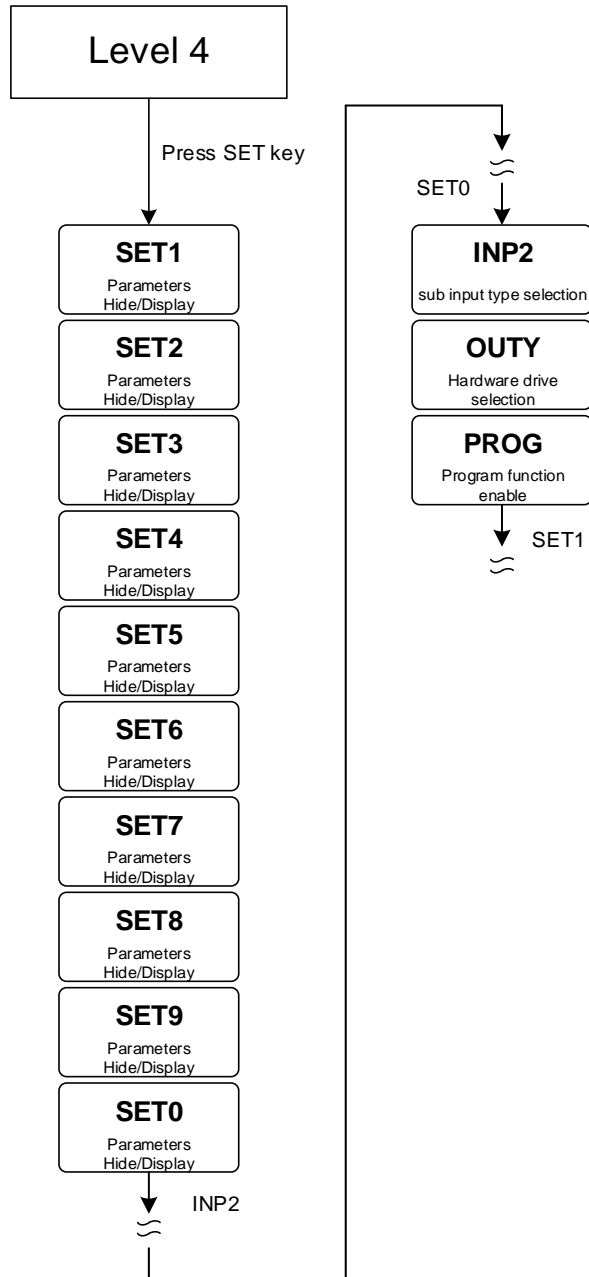
9.9 LEVEL_3 Parameter

Parameter	Symbol	Content	Range		Default	Hide/Display
			MAX	MIN		
LSPL		Input scale low	9999	-1999	---	SET2.3
USPL		Input scale high	9999	-1999	---	SET2.3
ANL2		Sub input zero calibration	9999	-1999	0	SET2.4
ANH2		Sub input span calibration (hex display)	0x7FFF	0x0000	0x5FFF	SET2.4
ALD1		Alarm1 mode selection (Please refer to Chapter 11.1 Alarm Mode)	19	0	11	SET3.1
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		Alarm2 mode selection (Please refer to Chapter 11.1 Alarm Mode)	19	0	0	SET3.3
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		Alarm3 mode selection (Please refer to Chapter 11.1 Alarm Mode)	18	0	0	SET4.1
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		Hysteresis setting for alarm1~3	999.9	-199.9	1.0	SET4.3
CLO1		Main output zero calibration , only available in linear output (Please refer to Chapter 13.5)	9999	0	0	SET4.4
CHO1		Main output span calibration , only available in linear output (Please refer to Chapter 13.5)	9999	0	3600	SET4.4
CLO2		Sub output zero calibration , only available in linear output	9999	0	0	SET5.1
CHO2		Sub output span calibration , only available in linear output	9999	0	3600	SET5.1
CLO3		Retransmission zero calibration	9999	0	0	SET5.2
CHO3		Retransmission span calibration	9999	0	3600	SET5.2
RUCY		Motor valve traveling time unit : second (Please refer to Chapter 10.6)	150	5	5	SET5.3
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 12)	100.0	0	0	SET5.3

9.9 LEVEL_3 Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
SETA		Alarm special function setting (Please refer to Chapter 11.2)	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 $PV = PV \times (PVOH / 5000) + PVOS$	199.9	-199.9	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	10.00	0.01	2.00	SET6.4
PV2		Use for motor valve feedback value	100.0	0.0	---	OUTY=2 & SET7.1
OUT		Control action selection 0 : HEAT reverse action 1 : COOL direct action	COOL	HEAT	HEAT	SET7.2
OPAD		Super SV function, suppressing overshoot 0 : OFF 1 : ON	ON	OFF	OFF	SET7.3
HZ		Power frequency 0 : 50HZ 1 : 60HZ	50HZ	60HZ	60HZ	SET7.4

9.10 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

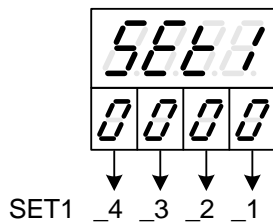
9.11 LEVEL_4 Parameter

Parameter	Symbol	Content	Range		Default	Hide/Display
			MAX	MIN		
SET1	SE01	Parameters Hide/Display	1111	0000	---	---
SET2	SE02	Parameters Hide/Display	1111	0000	---	---
SET3	SE03	Parameters Hide/Display	1111	0000	---	---
SET4	SE04	Parameters Hide/Display	1111	0000	---	---
SET5	SE05	Parameters Hide/Display	1111	0000	---	---
SET6	SE06	Parameters Hide/Display	1111	0000	---	---
SET7	SE07	Parameters Hide/Display	1111	0000	---	---
SET8	SE08	Parameters Hide/Display	1111	0000	---	---
SET9	SE09	Parameters Hide/Display	1111	0000	---	---

9.11 LEVEL_4 Parameter

Parameter	Symbol	Content	Range		Default	Hide/Display
			MAX	MIN		
SET0	SE00	Function enable/disable	1111	0000	---	---
INP2	INP2	Sub input type selection 0 : none 1 : 10~50mV / 4~20mA / 1~5V / 2~10V (only available in remote SV) 2 : 0~50mV / 0~20mA / 0~5V / 0~10V (only available in remote SV) 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 angle control	4	0	0	---
PROG	PR00	Program function enable 0 : OFF , SV source from keypad or communication 1 : ON , SV source from program	ON	OFF	OFF	---

9.12 Parameters Hide/Display Table on Level 4



SE00	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
SE02	SET2_1	0	Hide	AL3
		1	Display	AL3
	SET2_2	0	Hide	ANL1 ANH1 DP TRCL TRCH
		1	Display	ANL1 ANH1 DP TRCL TRCH
	SET2_3	0	Hide	LSPL USPL
		1	Display	LSPL USPL
	SET2_4	0	Hide	ANL2 ANH2
		1	Display	ANL2 ANH2
SE03	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
SE04	SET4_1	0	Hide	ALD3
		1	Display	ALD3
	SET4_2	0	Hide	ALT3
		1	Display	ALT3
	SET4_3	0	Hide	HYS A
		1	Display	HYS A
	SET4_4	0	Hide	CLO1 CHO1
		1	Display	CLO1 CHO1

SEEE	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 W MD
		1	Display	PSL BITS IDNO BAUD W MD

SEEE	SET6_1	0	Hide	SVOS
		1	Display	SVOS
	SET6_2	0	Hide	PVOS PVOH
		1	Display	PVOS PVOH
	SET6_3	0	Hide	UNIT
			Disable Fast Level	
		1	Display	UNIT
	SET6_4	0	Hide	PVFT
		1	Display	PVFT

SEEE	SET7_1	0	Hide	PV2
		1	Display	PV2
	SET7_2	0	Hide	ODU
		1	Display	ODU
	SET7_3	0	Hide	OPAD
		1	Display	OPAD
	SET7_4	0	Hide	HZ
		1	Display	HZ

SEEE	SET8_1	0	Program not repeat	
		1	Program repeat	
	SET8_2	0	No power failure protection	
		1	With power failure protection	
	SET8_3	0	Hide	PVST
			Program execute from 0	
		1	Display	PVST
	SET8_4	0	Hide	MLNB COMP OFFS
		1	Display	MLNB COMP OFFS

SEEE	SET9_1	0	Disable piece linear compensation	
		1	Enable piece linear compensation	
	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	

SEEE	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	

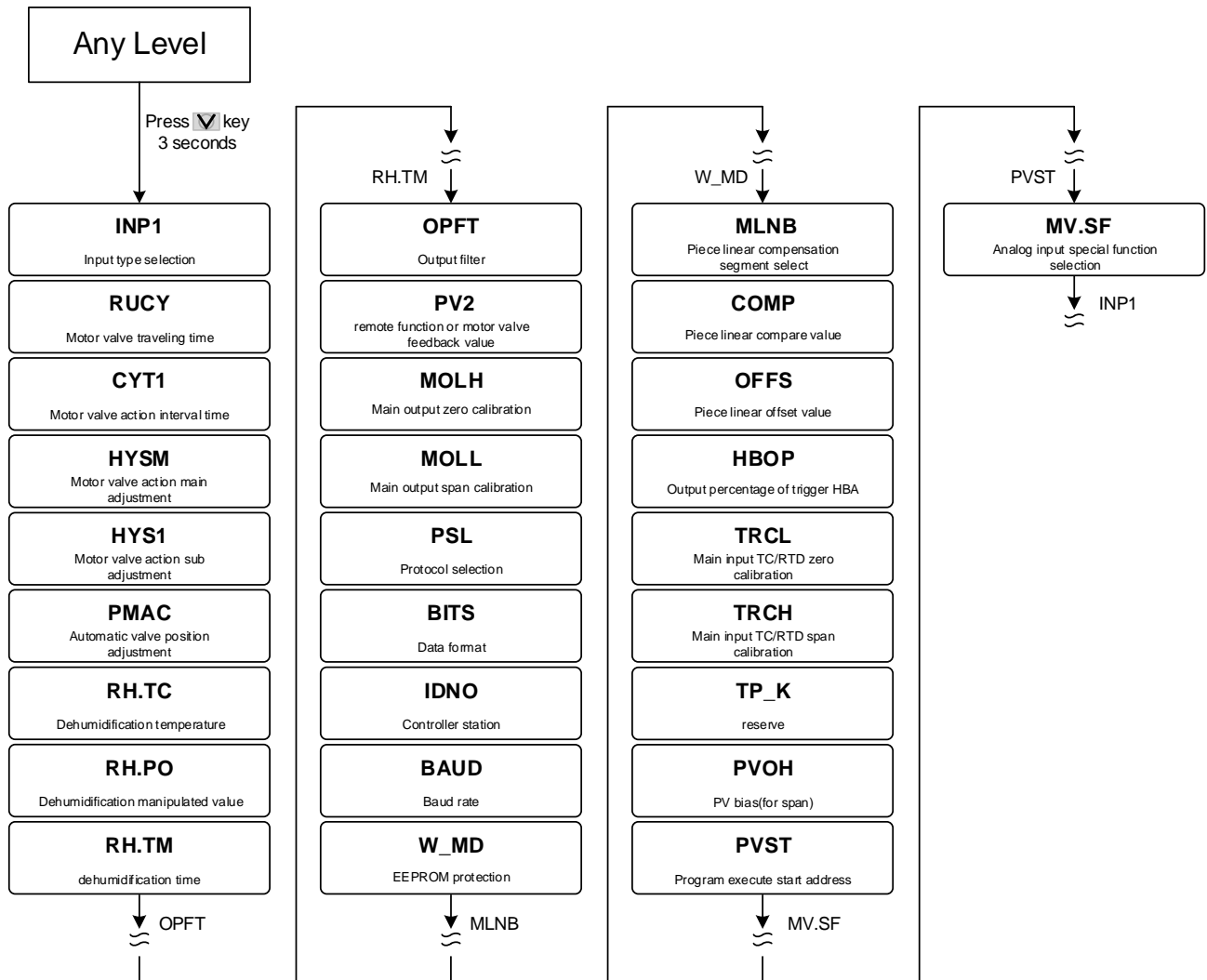
9.13 Fast Level All Parameters Display

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

SET6.3 = 1 (Enable Fast Level)

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

Leave fast level : press down key for 3 seconds at fast level



9.14 Fast Level 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 3 Input Range Table)	AN4	K1	K1	---
RUCY		Motor valve traveling time Time unit : second (Please refer to Chapter 10.6)	150	5	5	OUTY = 2 or 3
CYT1		Motor valve action interval time. Time unit : second	10	0	5	OUTY = 2 or 3
HYSM		Motor valve action main adjustment unit : percentage	5.0	0.0	1.0	OUTY = 2 or 3
HYS1		Motor valve action sub adjustment unit : percentage	HYSM	0.0	0.5	OUTY = 2 or 3
PMAC		Automatic valve position adjustment 0 : OFF stop automatic adjust 1 : ON start automatic adjust 2 : E_PB Valve position determined by external button	E_PB	OFF	OFF	OUTY=2
RH.TC		Dehumidification temperature If PV less than RHTC manipulated value = RHPO (Please refer to Chapter 10.5)	200.0	0.0	125.0	---

9.14 Fast Level Parameter

Parameter	Symbol	Content	Range		Default	Hide/Display
			MAX	MIN		
RH.PO		Dehumidification manipulated value 0 : OFF disable dehumidification function Other values : 0.1~100.0 manipulated value (Please refer to Chapter 10.5)	100.0	OFF	OFF	---
RH.TM		Dehumidification time time format : min.sec	99.59	0.00	15.00	---
OPFT		Output filter unit: second	10.00	0.10	2.00	---
PV2		Use for motor valve feedback value	100.0	0.0	---	OUTY=2 & SET7.1
MOLH		High limit setting of manipulated value for main output	100.0	0.0	100.0	---
MOLL		low limit setting of manipulated value for main output	100.0	0.0	0.0	---
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
W_MD		EEPROM protection 0 : OFF communication write command only write to CPU RAM 1 : ON communication write command write to CPU RAM and EEPROM	ON	OFF	ON	SET5.4
MLNB		Piece linear compensation segment select TRIP : leave setting loop 1~10 : segment select	10	TRIP	TRIP	SET8.4
COMP		Piece linear compare value	USPL	LSPL	LSPL	SET8.4
OFFS		Piece linear offset value	150.0	-150.0	0.0	SET8.4
HBOP		Output percentage of trigger HBA	100.0	0.0	90.0	INP2=4 & ALD1=9
TRCL		Main input TC/RTD zero calibration	9999	0	0	SET2.2
TRCH		Main input TC/RTD span calibration (hex display)	7FFF	0	5FFF	SET2.2
TP_K		reserve	100.0	10.0	15.0	PROG = ON
PVOH		PV bias(for span) $PV = PV \times (PVOH / 5000) + PVOS$	9999	0	5000	SET6.2
PVST		Program execute start address 0 : FULT (execute from current PV, but use segment 1 fully time) 1 : CUTT (execute from current PV,cut time)	CUTT	FULT	FULT	SET8.3

9.14 Fast Level Parameter

Parameter	Symbol	Content	Range		Default	Hide/ Display
			MAX	MIN		
MV.SF	<i>0.5F</i>	Analog input special function selection 0 : NONE (special function OFF) 1 : SQUA (analog input square) 2 : ROOT (analog input square root) 3 : REVE (analog input reverse) 4 : SQ.RE (analog input square reverse) 5 : RO.RE (analog input square root reverse)	RO.RE	NONE	NONE	INP1= AN1~AN4

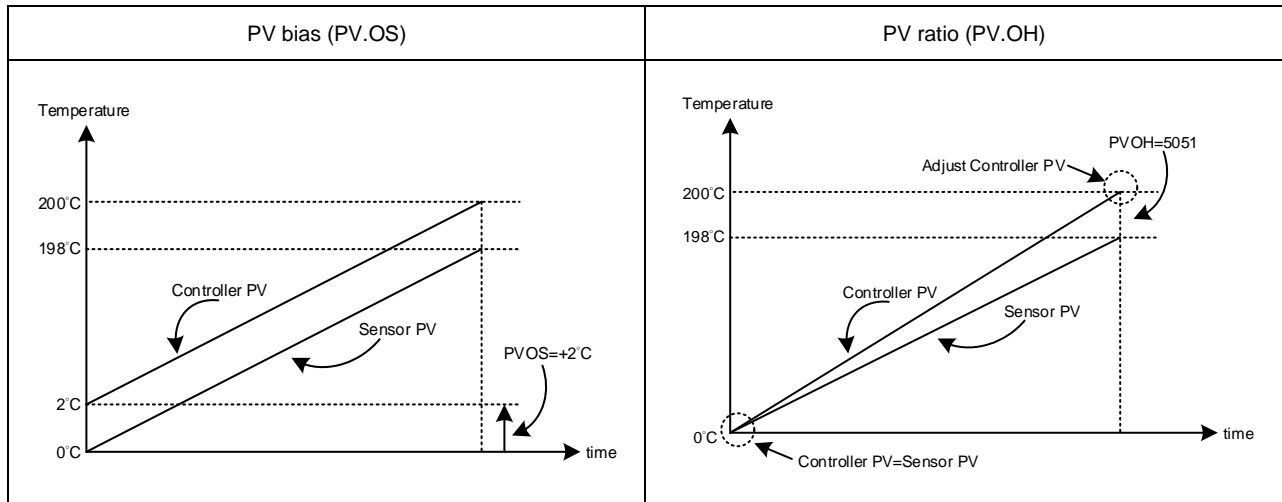
10. Functional Descriptions

10.1 PV bias

Description

The FY/FA 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



The related parameters of input calibration are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
PVOS	<i>PVOS</i>	PV bias(for zero) $PV = PV + PVOS$	199.9	-199.9	0	Level 3	SET6.2
PVOH	<i>PVOH</i>	PV bias(for span) $PV = PV \times (PVOH / 5000) + PVOS$	9999	0	5000	Fast	SET6.2

Examples

PV bias (PVOS) 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 (PVOS) 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
Fast	PVOH	5000	PV ratio unchanging

Example 2

PV ratio (PVOH) is a multiplier to be applied 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, if Controller B is compensated by the PV ratio (PVOH), then the PVOH parameter value is adjusted to display at 200°C. Consistent with Controller A, Controller B will show 0°C at 0°C.

Parameter Setting

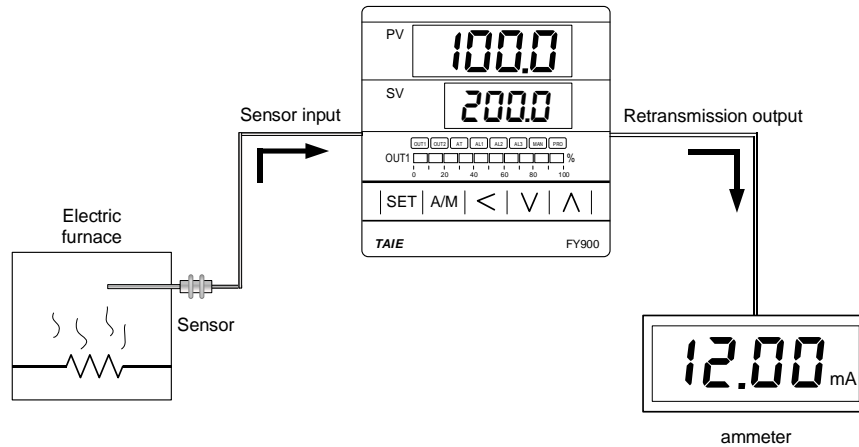
Level	Parameter	Set value	Description
4	SET6.2	1	Display PVOS / PVOH
3	PVOS	0	PV bias unchanging
Fast	PVOH	5129	$PV \text{ ratio} = (5129/5000) = 1.0258$

10.2 Retransmission

Description

The retransmission function of the FY/FA 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



The related parameters of Transmission are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
SET9.3	SEEE	0 : Retransmission SV disable 1 : Retransmission SV enable	1	0	0	Level 4	---
SET9.4	SEEE	0 : Retransmission PV disable 1 : Retransmission PV enable	1	0	0	Level 4	---
CLO3	LOO3	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

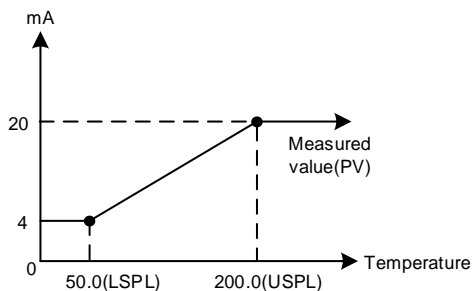
When the PV value is between -50.0 and 600.0, the retransmission signal is based on the PV value, and the linear output analog signal is presented.

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

- To order TRS function, please confirm the type of retransmission output signal and retransmit signal range.
- 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.
- Modify the parameter INP1/UNIT will reset the retransmission range.
- 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.
- The user only needs to set SET9.4 or SET9.3, the rest of the parameters will be set & calibrated at the factory.

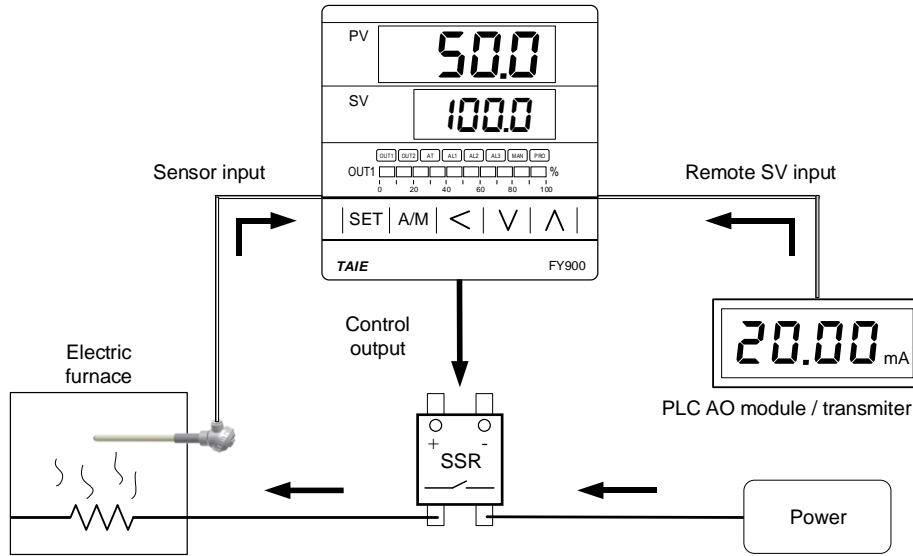
10.3 Remote SV

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



The related parameters of Remote SV are as below:

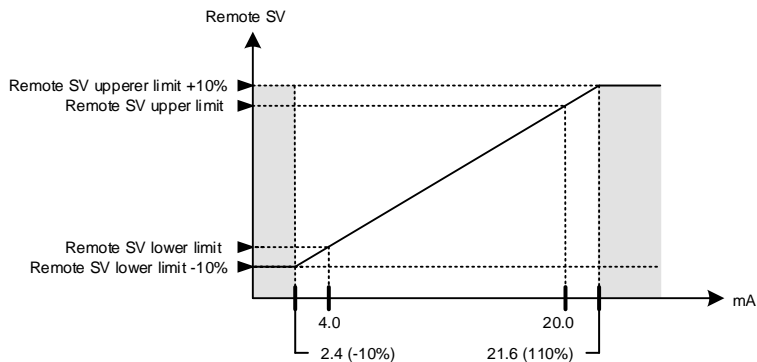
Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
SET0.3	<i>SEED</i>	0 : Remote SV disable 1 : Remote SV enable	1	0	0	Level 4	---
INP2	<i>INP2</i>	Sub input type selection 0 : none 1 : 10~50mV / 4~20mA / 1~5V / 2~10V (only available in remote SV) 2 : 0~50mV / 0~20mA / 0~5V / 0~10V (only available in remote SV) 3 : valve feedback 4 : CT input	4	0	0	Level 4	---
ANL2	<i>ANL2</i>	Sub input zero calibration	9999	-1999	0	Level 3	SET2.4
ANH2	<i>ANH2</i>	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 2.4mA, 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 21.6mA, 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.

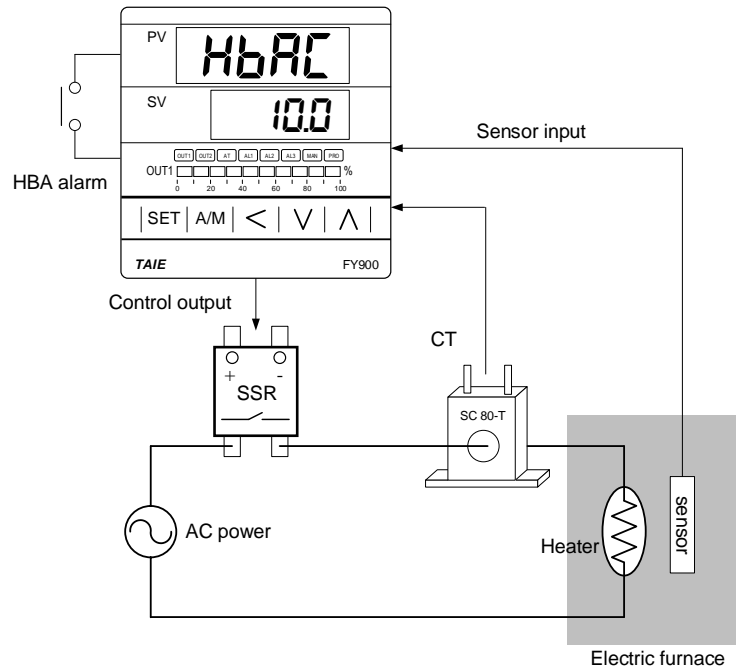
10.4 Heater Break Alarm

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



The related parameters of Heater Break Alarm are as below :

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
*HBAC	<i>HbAC</i>	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
HBOP	<i>HbOP</i>	Output percentage of trigger HBA	100.0	0.0	90.0	Fast	INP2=4 & ALD1=9

* when ALD1=9 & INP2=4 , original AL1 become HBAC display

HBA operating conditions

1. Heater current is less than the setting of HBAC
2. OUT1 output exceeds HBOP setting value
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 display area)

1. The heater current display value HBAC = 0.0(upper display area), when a heater disconnection occurs
→ The heater current is less than the set value of HBAC=1.0. At this time ,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 time ,condition 2 is
3. Satisfied, alarm_1 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 (Unit: A)
Fast	HBOP	90.0	When the output exceeds 90.0%
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)

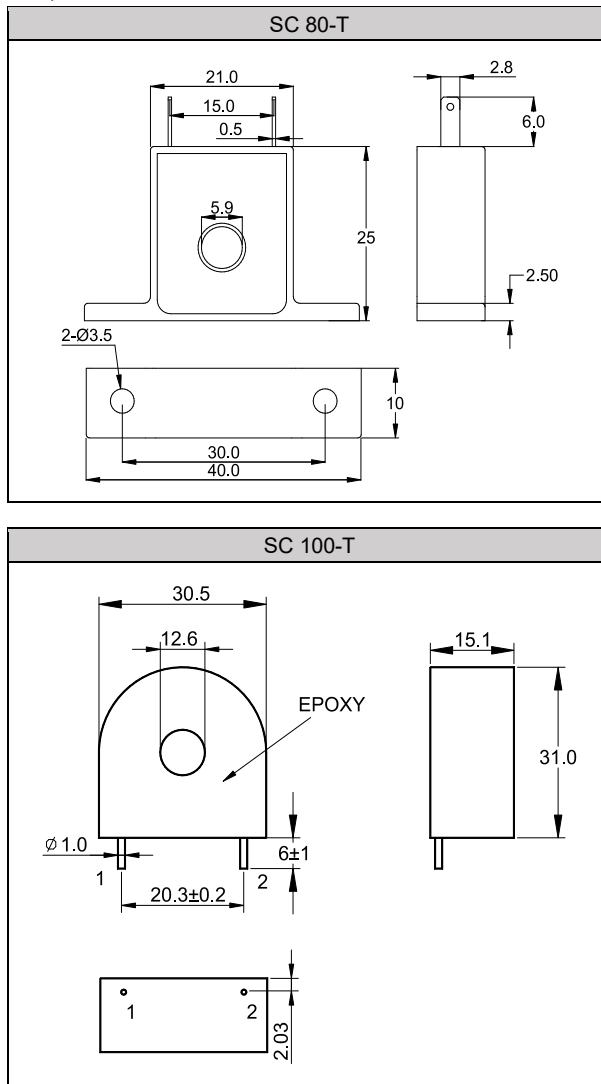
Notes

1. ANL2 & ANH2 is the current signal calibration parameters. It has been calibrated before leaving the factory. do not change these two parameters value.
2. The user only needs to set HBAC & HBOP, 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
Turns Ratio	800:1	1000:1
Max. continuous current	80A	100A
Accuracy	3%	5%
Aperture	5.9mm	12.6mm
Dielectric 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)

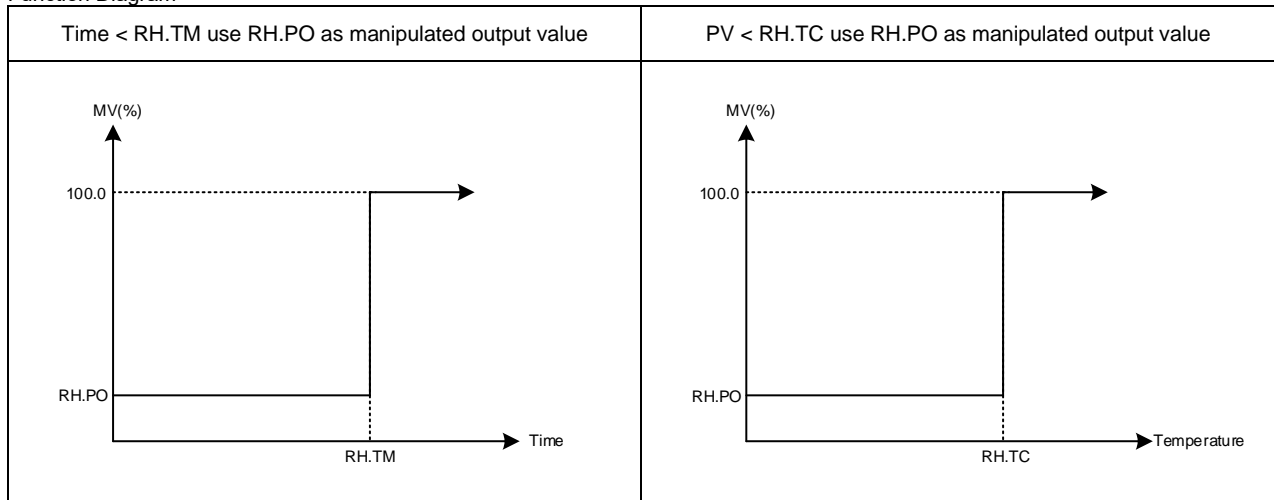


10.5 Dehumidification Function

Description

The FY/FA series 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



The related parameters of Dehumidification Function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
RH.TC		Dehumidification temperature If PV less than RHTC manipulated value = RHPO	200.0	0.0	125.0	Fast	---
RH.PO		Dehumidification manipulated value 0 : OFF disable dehumidification function Other values : 0.1~100.0 manipulated value	100.0	OFF	OFF	Fast	---
RH.TM		Dehumidification time time format : min.sec	COTI	0.00	15.00	Fast	---

Example

After the controller is turned on, when the PV does not reach 50°C, manipulated value fixed in 20%. 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
1	SV	100.0	Target temperature
Fast	RH.TC	50.0	Execute de-humidifying function when PV is lower than this temperature
Fast	RH.PO	20.0	When executing dehumidification function the manipulated value fixed in 20%
Fast	RH.TM	15.00	Max dehumidification function time

Notes

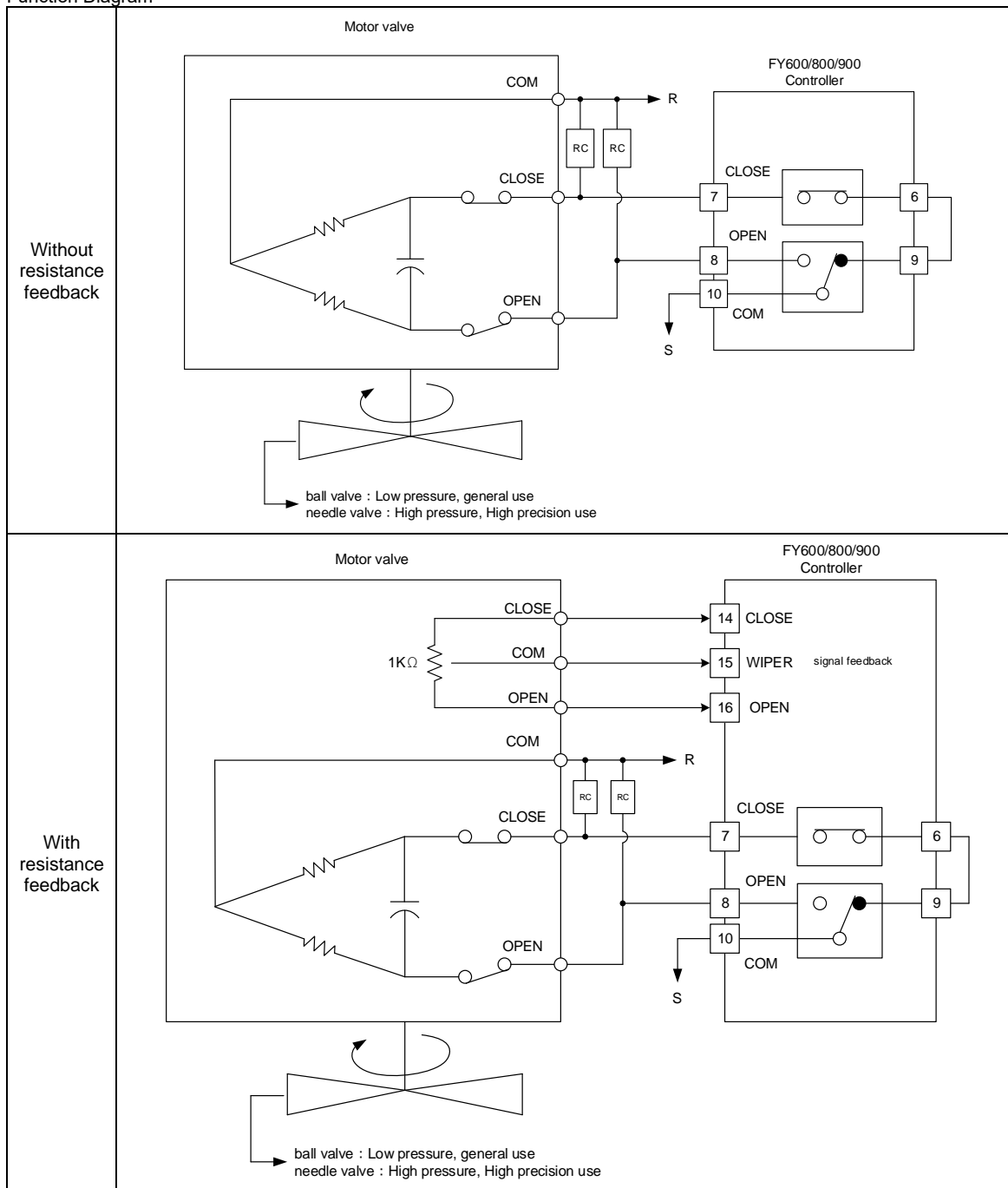
1. For use in heating mode only (OUD=HEAT)
2. SV must be greater than PV (SV>PV)

10.6 Motor Valve Control

Description

FY/FA motor valve control function converts the control output value of the controller into the corresponding signal to control a motor driven valve and then performs temperature control of a controlled object by regulating fluid flow.

Function Diagram



Description of function

When the feedback resistance is provided

1. Adjusting valve position automatically
2. The valve position can be manually changed.
3. Force the controller to switch to no feedback resistance control mode when feedback resistance input breaks
4. High/Low limit of valve position can be set.

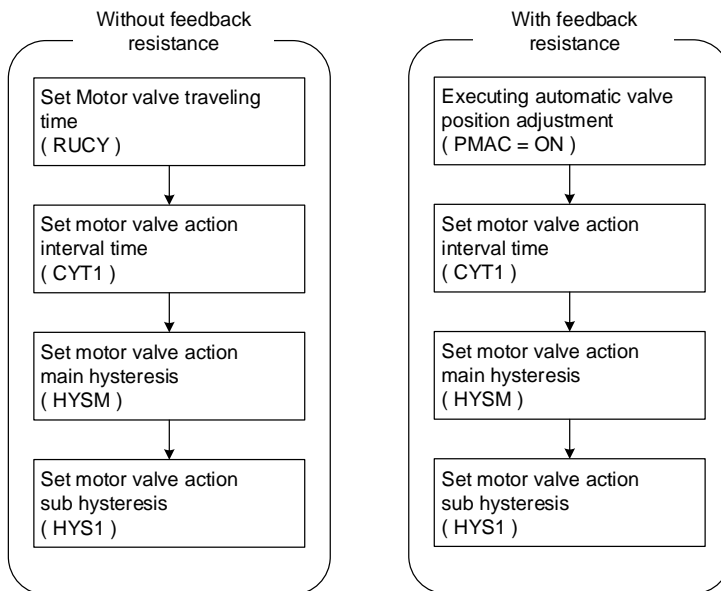
When the feedback resistance is not provided:

1. Control motor operation can be restricted by the parameter "OUTL".
2. The UP/DOWN key is used to output opening or closing signal in manual mode
 - 2.1 UP key(open-side) : While the UP key is being pressed, open-side output (OUT1) is output continuously.
Releasing the UP key turns off the output on the open-side to hold the opened state at that time.
 - 2.2 DOWN key(close-side) : While the DOWN key is being pressed, close-side output (OUT2) is output continuously.
Releasing the DOWN key turns off the output on the closed-side to hold the opened state at that time.

The related parameters of motor valve control function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
PV2		Valve opening monitor	100.0	0.0	---	Fast	OUTY=2 & SET7.1
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 angle control	4	0	0	Level 4	---
INP2		Sub input type selection 0 : none 1 : 10~50mV / 4~20mA / 1~5V / 2~10V (only available in remote SV) 2 : 0~50mV / 0~20mA / 0~5V / 0~10V (only available in remote SV) 3 : valve feedback 4 : CT input	4	0	0	Level 4	---
PMAC		Automatic valve position adjustment 0 : OFF stop automatic adjust 1 : ON start automatic adjust 2 : E_PB Valve position determined by external button	E_PB	OFF	OFF	Fast	OUTY=2
RUCY		Motor valve traveling time Time unit : second	150	5	5	Fast	OUTY = 2 or 3
CYT1		Motor valve action interval time. Time unit : second	10	1	5	Fast	OUTY = 2 or 3
HYSM		Motor valve action main adjustment unit : percentage	5.0	0.0	1.0	Fast	OUTY = 2 or 3
HYS1		Motor valve action sub adjustment unit : percentage	HYSM	0	0.5	Fast	OUTY = 2 or 3

Motor valve Initial Setting



1. Executing automatic valve position adjustment

Parameter	Symbol	Content	Default	Level
PMAC		Automatic valve position adjustment 0 : OFF stop automatic adjust 1 : ON start automatic adjust 2 : E_PB Valve position determined by external button	OFF	Fast

The motor valve low position(ANL2) and high position(ANH2) are calibrated and the travel time from completely open to completely closed is set automatically

When the measurement has been complete the setting of the parameter will change to OFF."PMER" will be display if any of following errors occurs during execution.If an error occur check the wiring and other factors and execute automatic valve position adjustment again.

2. Setting motor valve traveling time

Parameter	Symbol	Content	Default	Level
RUCY		Motor valve traveling time Time unit : second	5	Fast

With feedback resistance mode

Executing automatic valve position adjustment will get RUCY setting value automatically

Without feedback resistance mode

Check the motor valve specification and setting the RUCY value of a manually

3. Setting valve action interval time

Parameter	Symbol	Content	Default	Level
CYT1		Motor valve action interval time. Time unit : second	5	Fast

EX1 : Setting CYT1=5, after executing current valve action, If the controller calculates that the valve needs to be closed for 2 seconds, controller will delay 5 seconds before performing close valve action

EX2 : Setting CYT1=7, after executing current valve action, If the controller calculates that the valve needs to be open for 2 seconds, controller will delay 7 seconds before performing open valve action

4. Setting motor valve action main adjustment

Parameter	Symbol	Content	Default	Level
HYSM		motor valve action main adjustment unit : percentage	1.0	Fast

When error% accumulates to the set value of HYSM the controller will drive motor valve to eliminate this error%

EX1 : set HYSM =0.5, when error% accumulates to 0.5 the controller will drive motor valve to eliminate this error%

EX2 : set HYSM =1.0, when error% accumulates to 1.0 the controller will drive motor valve to eliminate this error%

The smaller the set value of this parameter, the more frequent the valve action, the more precise the control, but it will also affect the valve life, proper HYSM setting reduces valve operating frequency to protect valve life

5. Setting motor valve action sub adjustment

Parameter	Symbol	Content	Default	Level
HYS1		motor valve action sub adjustment unit : percentage	0.5	Fast

When the error% accumulates to the set value of HYSM, the controller will drive the valve to eliminate the set value of HYS1

EX1 : set HYSM =0.5, HYS1 =0.3, when error% accumulates to 0.5% the controller will drive motor valve to eliminate 0.3%

EX2 : set HYSM =1.0 · HYS1 =0.5, when error% accumulates to 1.0% the controller will drive motor valve to eliminate 0.5%

6. Setting motor valve high/low limit in resistance feedback control mode

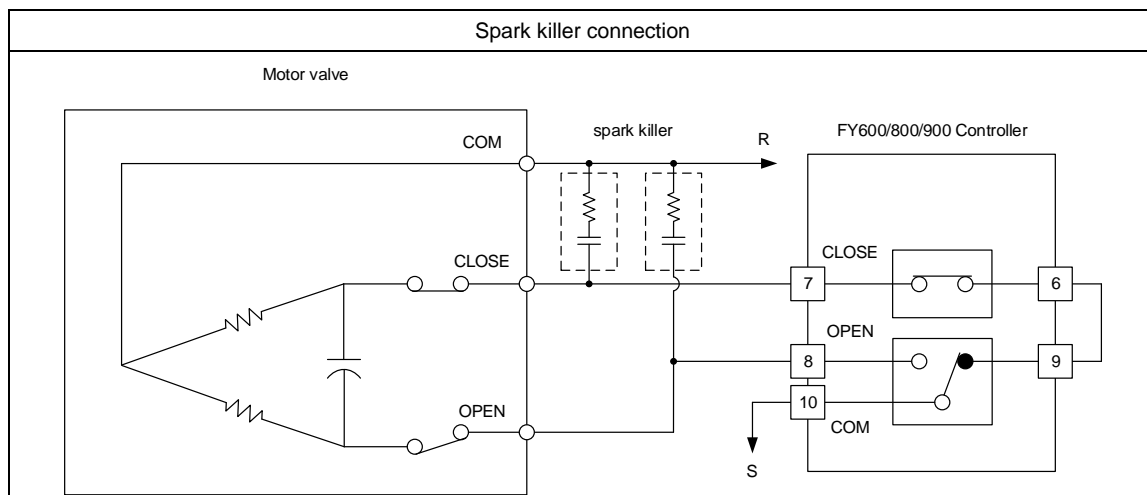
Parameter	Symbol	Content	Default	Level
MOLL		low limit of valve position	0.0	Fast
MOLH		high limit of valve position	100.0	Fast

EX1 : if you want set 20% low limit of valve position, setting MOLL=20.0

EX2 : if you want set 80% high limit of valve position, setting MOLH=80.0

Notes

1. The lowest valve position and the highest valve position are automatically written into ANL2 & ANH2 after executing automatic valve position adjustment
2. When performing automatic valve position adjustment(PMAC=ON), please make sure that the fuel is closed
3. When the controller detects that the feedback resistance is disconnected, it will automatically switch to no feedback control mode and PV area show "PMER" message
4. It is recommended to install spark killer at the relay junction to prolong the service life of the relay.



10.7 RAMP & SOAK

Description

The FY/FA series 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.

The related parameters of ramp and soak function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
SOAK (AL1)		Alarm1 soak time Time format : hr.min	99.59	0.00	0.10	Level 1	ALD1=10 or ALD1=19
SOAK (AL2)		Alarm2 soak time Time format : hr.min	99.59	0.00	0.10	Level 1	ALD2=10 or ALD2=19
SOAK (AL3)		Alarm3 soak time Time format : hr.min	99.59	0.00	0.10	Level 1	ALD3=10
RAMP (AL3)		The rate of change during an SV ramp 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=9, original AL3 become RAMP display

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

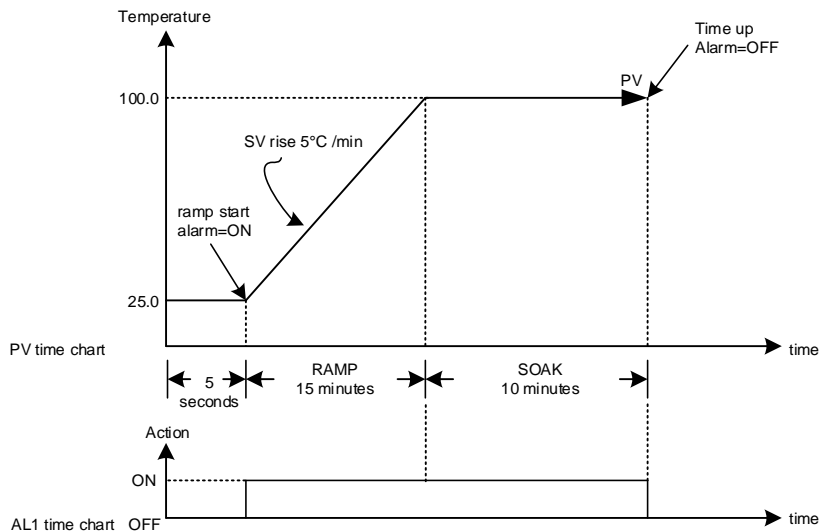
X : 1 / 2(SOAK function available in alarm1 or alarm2)

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 timer
3	ALD3	9	Enable RAMP function
1	SOAK(AL1)	0.10	Soak for 10 minutes
1	RAMP(AL3)	5.00	5.00°C rise per minute

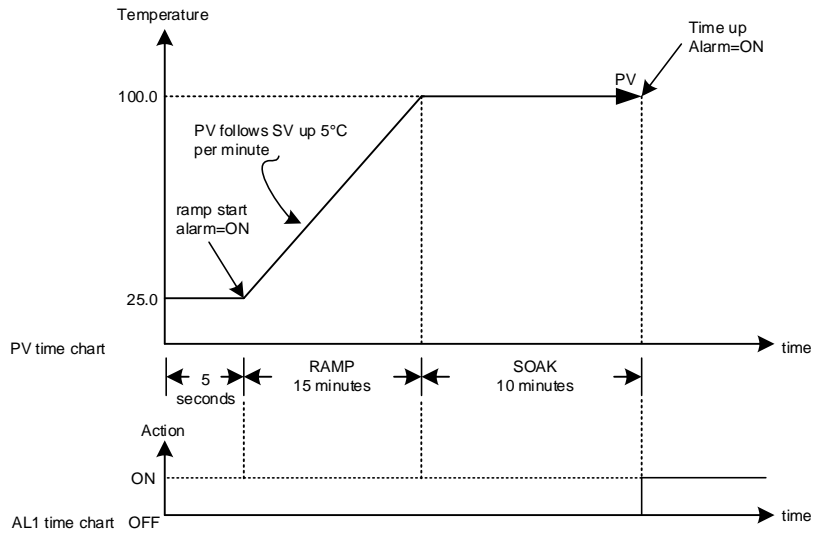


Example(2) Single RAMP+SOAK_B (ALD3=9 + ALD1=19)

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 timer
3	ALD3	9	Enable RAMP function
1	SOAK(AL1)	0.10	Soak for 10 minutes
1	RAMP(AL3)	5.00	5.00°C rise per minute

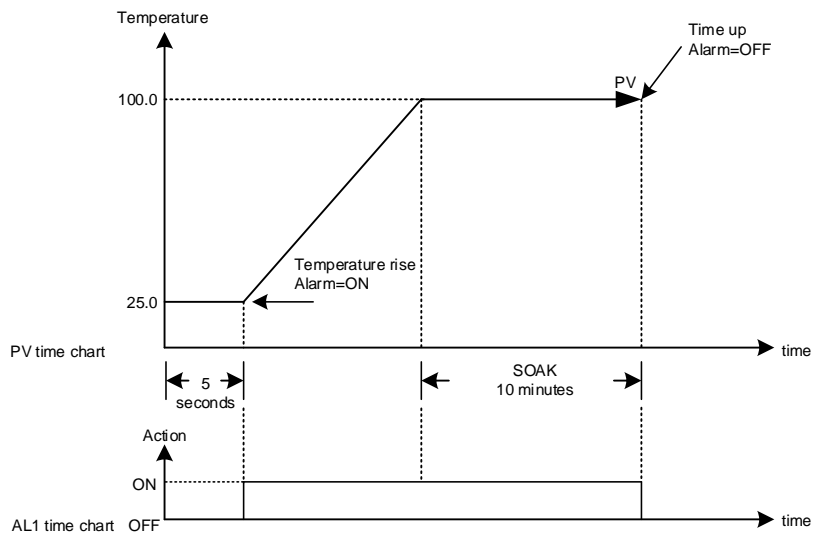


Example(3) only use SOAK_A (ALD1=10)

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 timer
1	SOAK(AL1)	00.10	Soak for 10 minutes

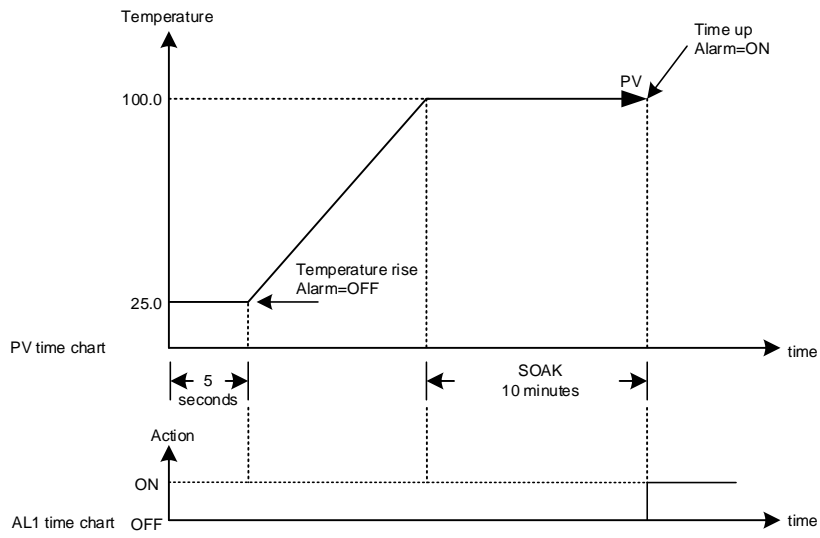


Example(4) only use SOAK_B (ALD1=19)

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 timer
1	SOAK(AL1)	00.10	Soak for 10 minutes

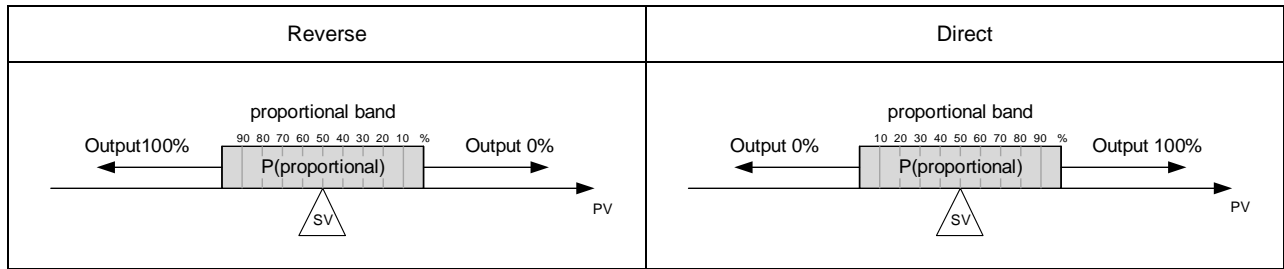


10.8 Proportional Control

Description

Proportional control is one of the simplest ways to control method, controller manipulated value proportional to input error signal, this chapter explains how to set related parameters.

Function Diagram



The related parameters of proportional control are as below:

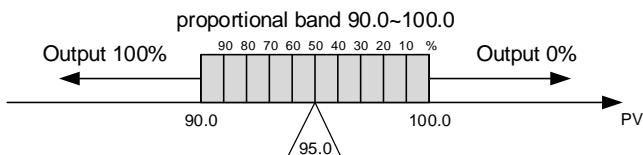
Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
SV	---	Set value	USPL	LSPL	---	Level 1	---
P1		Main output proportional band 0.0 : ON/OFF control Other values : proportional band setting value	200.0	0.0	3.0	Level 2	---
OUT		Control action selection 0 : HEAT reverse action 1 : COOL direct action	COOL	HEAT	HEAT	Level 3	SET7.2

Setting step

1. Select control action
2. Determine the proportional band
3. Set SV, $SV = (\text{proportional band maximum} + \text{proportional band minimum}) / 2$
4. Full range = (Range maximum – range minimum)
5. Calculate $P = ((\text{proportional band maximum} - \text{proportional band minimum}) / \text{Full range}) \times 100$

Example 1 :

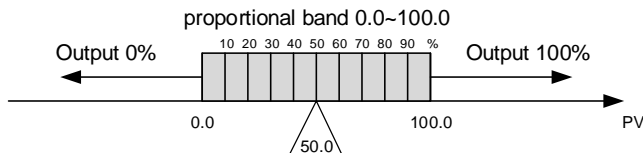
INP1 = K1(-50.0~600.0) when PV in the range of 90.0 ~ 100.0 output proportional(decrease) SV = ? P = ?



1. OUT = HEAT(Reverse)
2. Proportional band → 90.0~100.0
3. $SV = (\text{proportional band maximum} + \text{proportional band minimum}) / 2$
→ $(100.0 + 90.0) / 2 = 95.0$
4. Full range = (Range maximum – range minimum)
→ $600.0 - (-50.0) = 650.0$
5. $P = ((\text{proportional band maximum} - \text{proportional band minimum}) / \text{Full range}) \times 100$
→ $((100.0 - 90.0) / 650.0) \times 100 = 1.5384(\text{approx } 1.5)$

Example 2 :

INP1 = AN4(0.0~100.0) when PV in the range of 0.0 ~ 100.0 output proportional(increase) SV = ? P = ?



1. OUT = COOL(Direct)
2. Proportional band → 0.0~100.0
3. $SV = (\text{proportional band maximum} + \text{proportional band minimum}) / 2$
→ $(100.0 + 0.0) / 2 = 50.0$
4. Full range = (Range maximum – range minimum)
→ $100.0 - 0.0 = 100.0$
5. $P = ((\text{proportional band maximum} - \text{proportional band minimum}) / \text{Full range}) \times 100$
→ $((100.0 - 0.0) / 100.0) \times 100 = 100.0$

Notes

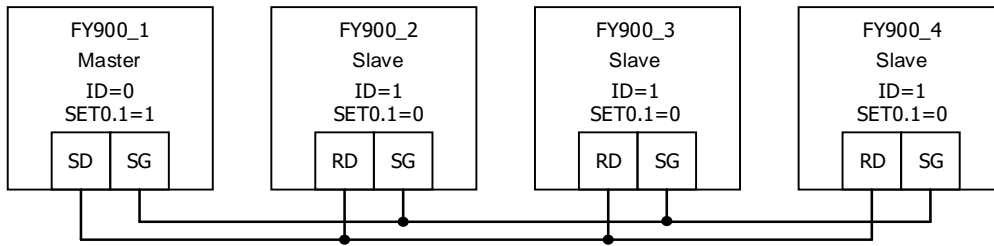
1. When using proportional control I1 and D1 must be set to 0
2. Full range please check Chapter 4 "Input Range Table"
3. Only using proportional control will eventually have a steady state error

10.9 Master-Slave communication

Description

Transmission master controller SV to slave controller SV, all slave controller SV can be consistent

Wiring



The related parameters of master-slave communication are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
RATE		Slave SV rate RATE SV = SV x (RATE/9999)	9999	0	9999	Level 1	SET2.1 & SET0.2
PSL		Protocol selection 0 : TAIE 1 : RTU (Please refer to communication manual)	RTU	TAIE	TAIE	Level 3	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	Level 3	SET5.4
IDNO		Controller station	254	0	1	Level 3	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	96	Level 3	SET5.4
SET0.1		0 : TTL Communication (Slave) 1 : TTL Communication (Master)	1	0	0	Level 4	---
SET0.2		0 : RATE hide 1 : RATE display	1	0	0	Level 4	---

Master controller setting step

1. IDNO= 0, PSL= TAIE
2. BITS= O_81, BAUD= 96
3. SET0.1= 1
4. SET0.2= 0
5. After completing the above steps, master controller start to transmit SV to slave controller SV

Slave controller setting step

1. IDNO= 1, PSL= TAIE
2. BITS= O_81, BAUD= 96
3. SET0.1= 0
4. SET0.2= 1
5. RATE= 9999
6. After completing the above steps, slave controller start to receive master controller SV

Notes

1. Afer adding master-slave communication, RS-485 communication not available
2. Master-slave communication only available in TAIE protocol(PSL= TAIE)
3. Master controller does not use parameter RATE, to attenuate the SV received by slave controller just adjust parameter RATE
4. Master controller can connect up to 10 slave controllers, and the wiring between every controller should not exceed 1 meter.

10.10 Piece Linear Compensation

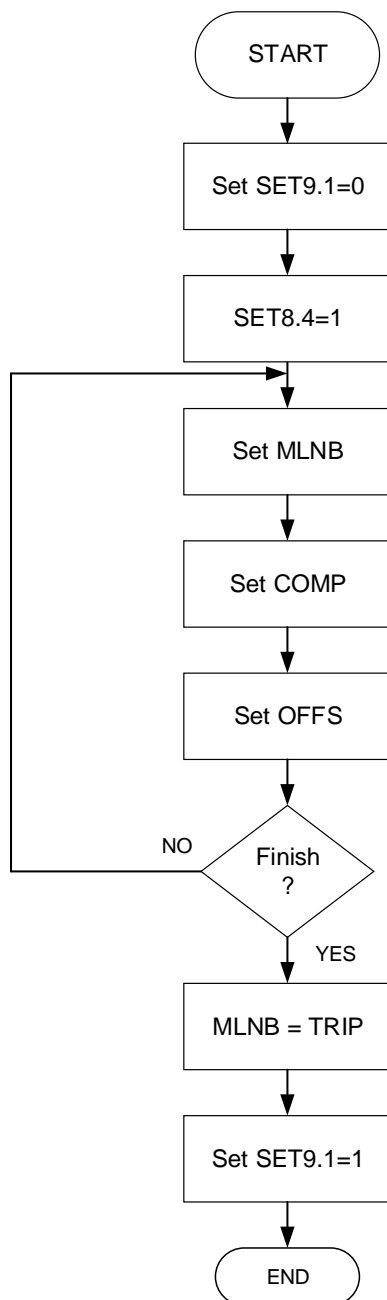
Description

When the analog input signal source is nonlinear, using piece linear compensation method to compensate this signal, make it linearity

The related parameters of piece linear compensation are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
MLNB		Piece linear compensation segment select TRIP : leave setting loop 1~10 : segment select	10	TRIP	TRIP	Fast	SET8.4
COMP		Piece linear compare value	USPL	LSPL	LSPL	Fast	SET8.4
OFFS		Piece linear offset value	150.0	-150.0	0.0	Fast	SET8.4
SET8.4		0 : MLNB, COMP, OFFS hide 1 : MLNB, COMP, OFFS display	1	0	0	Level 4	---
SET9.1		0 : Disable piece linear compensation 1 : Enable piece linear compensation	1	0	0	Level 4	---

Edit flow-chart



Set MLNB

Parameter	LED display	Description	Default	Level
MLNB		Piece linear compensation segment select TRIP : leave setting loop 1~10 : segment select	TRIP	Fast

When MLNB≠TRIP the display loop in MLNB → COMP → OFFS

When MLNB=TRIP leave piece linear compensation parameter loop

Set COMP

Parameter	LED display	Description	Default	Level
COMP		Piece linear compensation compare value	LSPL	Fast

When non-linear signal value within the set value of COMP, it needs to be compensated.

First COMP set value=LSPL

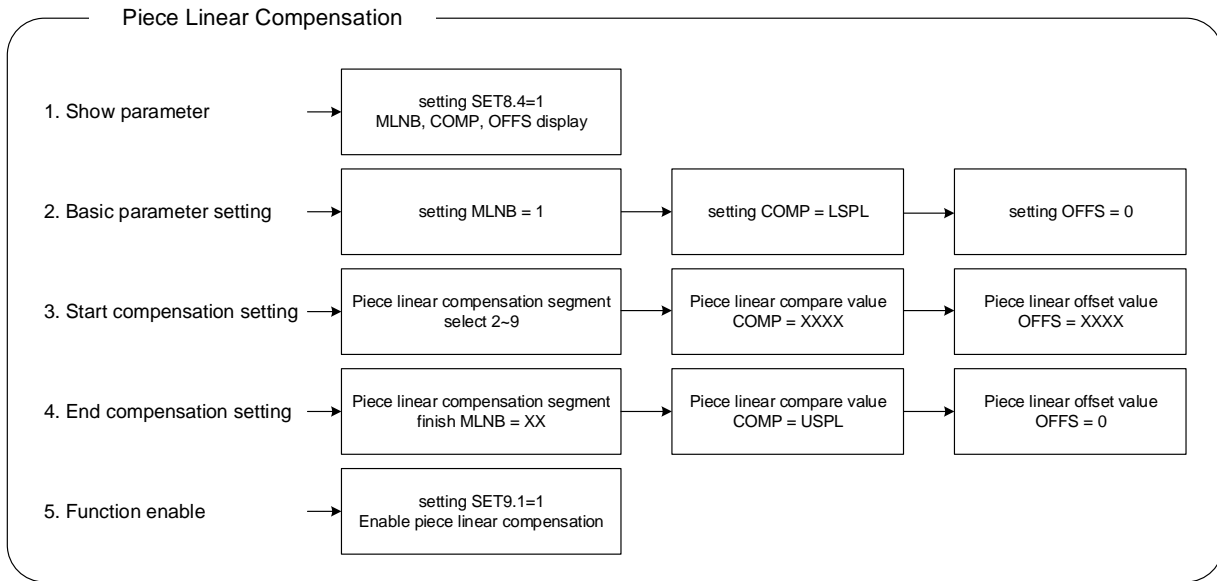
First COMP set value=USPL

Set OFFS

Parameter	LED display	Description	Default	Level
OFFS		Piece linear compensation offset value	0.0	Fast

When non-linear signal value within the set value of COMP, OFFS use for increase or decrease original non-linear signal

Before the function starts



Example1

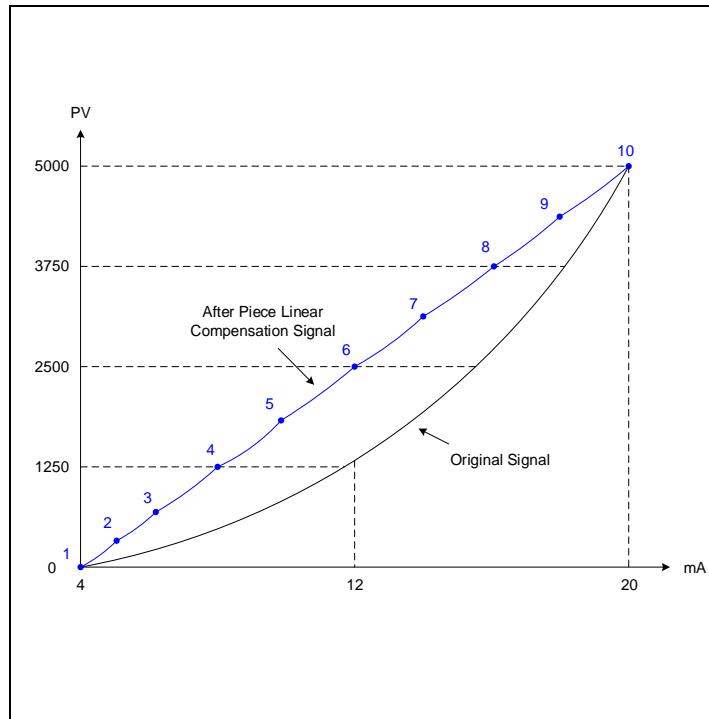
Assume signal source is a nonlinear signal within 320 °C, and the controller is set to correct at three temperature points.

- (1) When the temperature is 95°C, it needs to be corrected by +5°C.
- (2) When the temperature is 185°C, it needs to be corrected by +15°C.
- (3) When the temperature is 320°C, it needs to be corrected by +30°C.

- Step 1: Set SET8.4=1 and SET9.1=0
- Step 2: Set MLNB = 1, COMP = LSPL, OFFS = 0
- Step 3: set MLNB = 2, COMP = 95, OFFS = 5
- Step 4: Set MLNB = 3, COMP = 185, OFFS = 15
- Step 5: Set MLNB = 4, COMP = 320, OFFS = 30
- Step 6: Set MLNB = 5, COMP = USPL, OFFS = 0
- Step 7: Set MLNB = TRIP and SET9.1=1

Example2

Input signal 4~20mA, range 0~5000, the input signal is nonlinear (as shown in the figure below), use 10 points piece linear compensation.



Step1 : SET9.1 = 0 disable function
Step2 : SET8.4 = 1 display MLNB \ COMP \ OFFS
Step3 : MLNB = 1, COMP = 0(LSPL), OFFS = 0
Step4 : MLNB = 2, COMP = 100, OFFS = 400
Step5 : MLNB = 3, COMP = 150, OFFS = 550
Step6 : MLNB = 4, COMP = 500, OFFS = 750
Step7 : MLNB = 5, COMP = 800, OFFS = 1075
Step8 : MLNB = 6, COMP = 1300, OFFS = 1200
Step9 : MLNB = 7, COMP = 1900, OFFS = 1225
Step10 : MLNB = 8, COMP = 2650, OFFS = 1100
Step11 : MLNB = 9, COMP = 3720, OFFS = 680
Step12 : MLNB = 10, COMP = 5000(USPL), OFFS = 0
Step13 : SET9.1 = 1 enable function

Notes

1. The Piece Linear Compensation function must be enabled (SET9.1=1) when MLNB, COMP, OFFS are set, otherwise the controller may display an error message.
2. Regardless of the number of use segments, the first segment COMP must be equal to LSPL, the last segment COMP must be equal to USPL.

10.11 Auto-tuning and Startup tuning

Description

Auto-tuning

When AT is executed, the optimum PID constants for the SV at that time are set automatically. A method (called the limit cycle method) for forcibly changing the manipulated variable and finding the characteristics of the control object is employed.

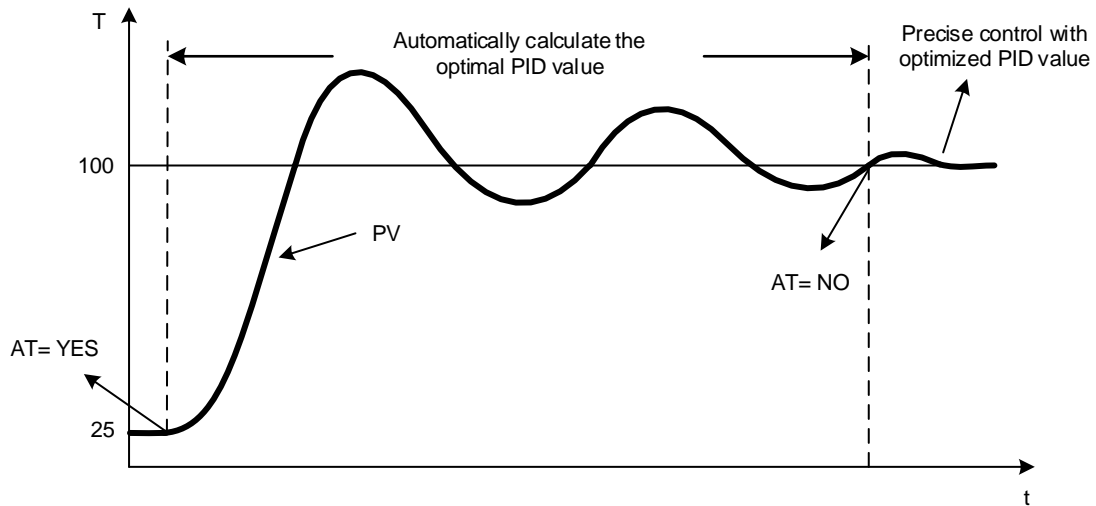
Startup tuning

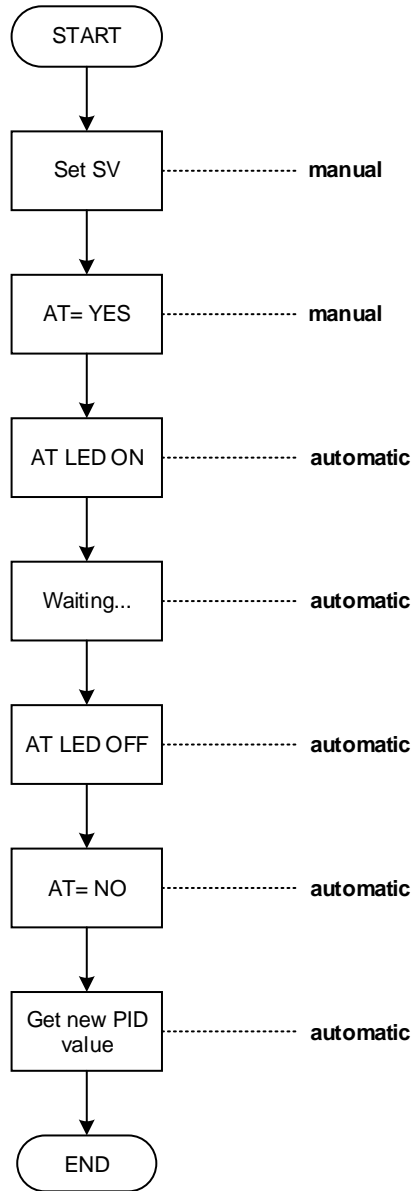
As simple auto-tuning, the PID values can be found in a short time without disturbing controllability for controlled systems with slow response at power ON.

The related parameters of Auto-tuning and Startup tuning function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
AT		Auto-tuning execute selection 0 : NO (PID control) 1 : YES (execute auto-tuning) 2 : PR.TU (Startup tuning, execute once) 3 : PRTU (Startup tuning, execute always when reboot)	PRTU	NO	NO	Level 1	SET1.2
AT.VL		Auto-tuning offset value execute auto-tuning in (SV-ATVL) point	100.0	-100.0	0.0	Level 2	---

Auto-tuning diagram





Notes

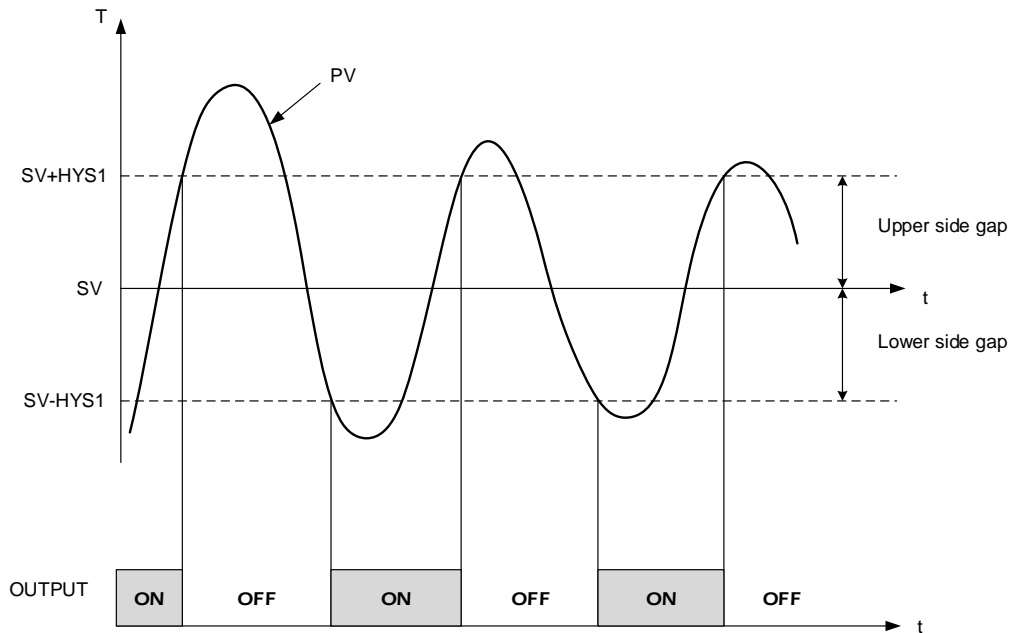
1. During the execution of auto-tuning, PV will change significantly, do not production during this period
2. During the execution of auto-tuning, please release the function of limiting the output percentage first(set OUTL=100.0)
3. If the alarm terminal link to output terminal, please release it before the execution of auto-tuning.
4. if execute auto-tuning over 2 hours, the controller will return to the control state and display the auto-tuning failure message (AUTF)
5. If the system components (e.g. heater, sensor...) are replaced, please execute the auto-tuning again
6. Auto-tuning can be used for heating or cooling equipment
7. Perform auto-tuning on the dual-output controller, the PID values on the heating side and cooling side will be updated at the same time
8. Can perform auto-tuning at any temperature

10.12 ON / OFF Control

Description

In ON/OFF control, the output is turned on or off depending on the measured value (PV) whether it is above or below the Set value (SV), user can set a hysteresis zone to prevent turned on and off too frequently for a small change of temperature.

Function Diagram (single output, heat mode)



The related parameters of ON/OFF control are as below:

Parameter	Symbol	Content	Range		Default	Level	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	Level 2	---
HYS1		Hysteresis for main output on/off control use(when P1 = 0.0 appear)	100.0	-100.0	1.0	Level 2	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	Level 2	OUTY = 1
HYS2		Hysteresis for sub output on/off control use(when P2 = 0.0 appear)	100.0	-100.0	1.0	Level 2	P2 = 0.0
GAP1		Control gap (for main output)	1000	-1000	0	Level 2	OUTY = 1
GAP2		Control gap (for sub output)	1000	-1000	0	Level 2	OUTY = 1
OD		Control action selection 0 : HEAT reverse action 1 : COOL direct action	COOL	HEAT	HEAT	Level 3	SET7.2

Example(1)
single output, heat mode

Description	When $PV \leq 95.0^{\circ}\text{C}$ OUT1 : ON · When $PV \geq 105.0^{\circ}\text{C}$ OUT1 : OFF
Formula	$PV \geq (SV + HYS1) \rightarrow \text{OUT1 OFF}$ $PV \leq (SV - HYS1) \rightarrow \text{OUT1 ON}$
diagram	
Parameter setting	SV=100.0 P1=0.0 HYS1=5.0 OD=HEAT

Example(2)
single output, cool mode

Description	When $PV \geq 20.0^{\circ}\text{C}$ OUT1 : ON · When $PV \leq 10.0^{\circ}\text{C}$ OUT1 : OFF
Formula	$PV \geq (SV + HYS1) \rightarrow \text{OUT1 ON}$ $PV \leq (SV - HYS1) \rightarrow \text{OUT1 OFF}$
diagram	
Parameter setting	SV=15.0 P1=0.0 HYS1=5.0 OUD=COOL

Example(3)
dual output(OUT1 : heat mode, OUT2 : cool mode)

Formula	heat side	$PV \geq (SV + GAP1) \rightarrow \text{OUT1 OFF}$ $PV < (SV + GAP1 - HYS1) \rightarrow \text{OUT1 ON}$
	Cool side	$PV \leq (SV + GAP2) \rightarrow \text{OUT2 OFF}$ $PV > (SV + GAP2 + HYS2) \rightarrow \text{OUT2 ON}$
diagram		

Example(4)
dual output(OUT1 : cool mode, OUT2 : heat mode)

Formula	Cool side	$PV \leq (SV + GAP1) \rightarrow \text{OUT1 OFF}$ $PV > (SV + GAP1 + HYS1) \rightarrow \text{OUT1 ON}$
	heat side	$PV \geq (SV + GAP2) \rightarrow \text{OUT2 OFF}$ $PV < (SV + GAP2 - HYS2) \rightarrow \text{OUT2 ON}$
diagram		

Notes

1. There is a large control error in ON/OFF control compared with PID control
2. Do not set the hysteresis parameter HYS1/HYS2 too small, so as to avoid frequent action of the relay and affect the lifetime
3. When performing ON/OFF control in dual output mode, both sets of outputs must be used for ON/OFF control, please do not adjust to one set of PID control and one set of ON/OFF control

10.13 Super SV

Description

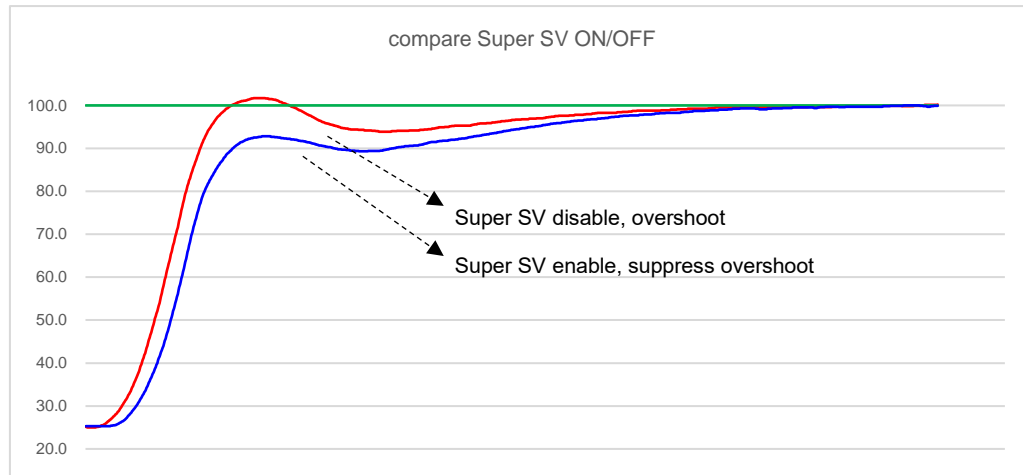
When the SV is changed, the output increases, massive output may cause overshoot and damage the system. FY series controllers provide the Super SV function, which can effectively suppress the overshoot

The related parameters of Super SV are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
OPAD	<i>OPAD</i>	Super SV function, suppressing overshoot 0 : OFF 1 : ON	ON	OFF	OFF	Level 3	SET7.3

Example

Set the SV to 100.0°C, use the default PID value to control the industrial oven, and compare the control curves of Super SV function on or off



Notes




1. The time to reach the set value after enabling Super SV function may be longer than the time without Super SV function
2. I (Integral) value cannot be zero when using Super SV function
3. Super SV function is recommended for single output heating system

10.14 Input Math Function

Description

TFY series controllers provide advance mathematical function in terms of input linear signals, such as inverse, square root, square etc. Users can directly connect differential pressure type flow transmitter to controller, or other transmitters that require special conversion.

The related parameters of Input math function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
LSPL		Input scale low	9999	-1999	---	Level 3	SET2.3
USPL		Input scale high	9999	-1999	---	Level 3	SET2.3
MV.SF		Analog input special function selection 0 : NONE (special function OFF) 1 : SQUA (analog input square) 2 : ROOT (analog input square root) 3 : REVE (analog input reverse) 4 : SQ.RE (analog input square reverse) 5 : RO.RE (analog input square root reverse)	RO.RE	NONE	NONE	Fast Level	INP1=AN1~AN4

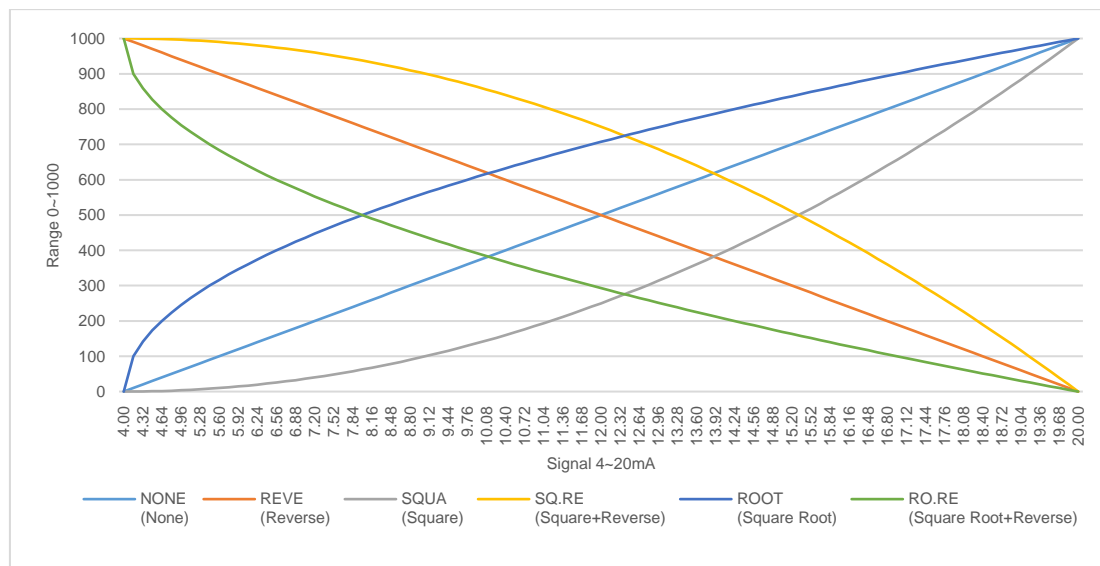
Notes

1. The parameter MV.SF is only available in when the input signal is a linear signal (INP1=AN1~AN4)
2. When using the SQUA/ROOT/SQ.RE/RO.RE function, you must ensure that the range is a positive range

Example(1)

Input signal 4~20mA aim range 0~1000, the value and graphical representation of MV.SF functions

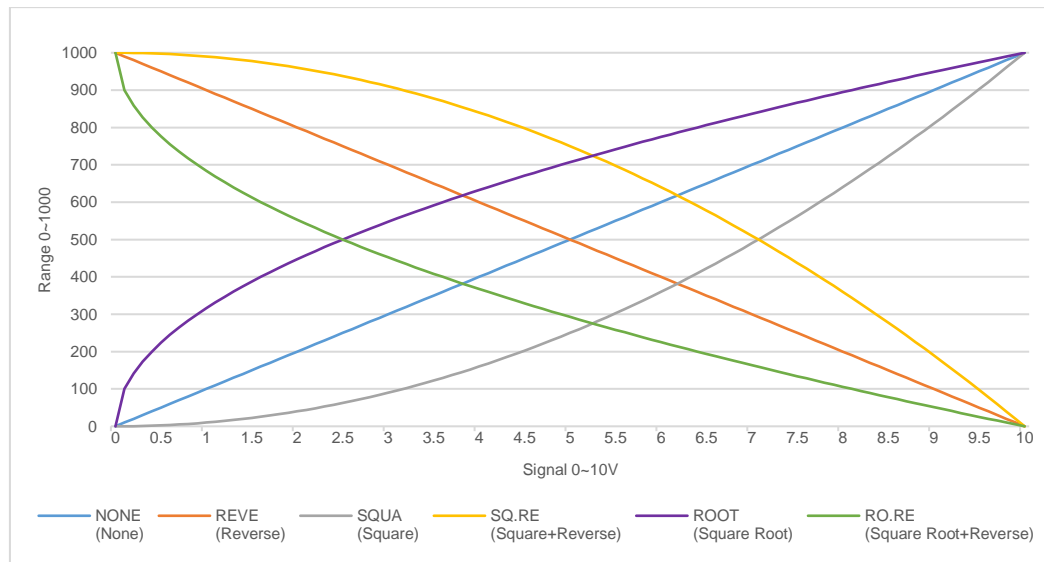
input signal 4~20mA	NONE	REVE (reverse)	SQUA (square)	SQ.RE (square+ reverse)	ROOT (square root)	RO.RE (square root+ reverse)
4.00	0	1000	0.0	1000.0	0.00	1000.00
4.32	20	980	0.4	999.6	141.42	858.58
4.64	40	960	1.6	998.4	200.00	800.00
4.96	60	940	3.6	996.4	244.95	755.05
5.28	80	920	6.4	993.6	282.84	717.16
5.60	100	900	10.0	990.0	316.23	683.77
5.92	120	880	14.4	985.6	346.41	653.59
6.24	140	860	19.6	980.4	374.17	625.83
6.56	160	840	25.6	974.4	400.00	600.00
6.88	180	820	32.4	967.6	424.26	575.74
7.20	200	800	40.0	960.0	447.21	552.79
7.52	220	780	48.4	951.6	469.04	530.96
7.84	240	760	57.6	942.4	489.90	510.10
8.16	260	740	67.6	932.4	509.90	490.10
8.48	280	720	78.4	921.6	529.15	470.85
8.80	300	700	90.0	910.0	547.72	452.28
9.12	320	680	102.4	897.6	565.69	434.31
9.44	340	660	115.6	884.4	583.10	416.90
9.76	360	640	129.6	870.4	600.00	400.00
10.08	380	620	144.4	855.6	616.44	383.56
10.40	400	600	160.0	840.0	632.46	367.54
10.72	420	580	176.4	823.6	648.07	351.93
11.04	440	560	193.6	806.4	663.32	336.68
11.36	460	540	211.6	788.4	678.23	321.77
11.68	480	520	230.4	769.6	692.82	307.18
12.00	500	500	250.0	750.0	707.11	292.89
12.32	520	480	270.4	729.6	721.11	278.89
12.64	540	460	291.6	708.4	734.85	265.15
12.96	560	440	313.6	686.4	748.33	251.67
13.28	580	420	336.4	663.6	761.58	238.42
13.60	600	400	360.0	640.0	774.60	225.40
13.92	620	380	384.4	615.6	787.40	212.60
14.24	640	360	409.6	590.4	800.00	200.00
14.56	660	340	435.6	564.4	812.40	187.60
14.88	680	320	462.4	537.6	824.62	175.38
15.20	700	300	490.0	510.0	836.66	163.34
15.52	720	280	518.4	481.6	848.53	151.47
15.84	740	260	547.6	452.4	860.23	139.77
16.16	760	240	577.6	422.4	871.78	128.22
16.48	780	220	608.4	391.6	883.18	116.82
16.80	800	200	640.0	360.0	894.43	105.57
17.12	820	180	672.4	327.6	905.54	94.46
17.44	840	160	705.6	294.4	916.52	83.48
17.76	860	140	739.6	260.4	927.36	72.64
18.08	880	120	774.4	225.6	938.08	61.92
18.40	900	100	810.0	190.0	948.68	51.32
18.72	920	80	846.4	153.6	959.17	40.83
19.04	940	60	883.6	116.4	969.54	30.46
19.36	960	40	921.6	78.4	979.80	20.20
19.68	980	20	960.4	39.6	989.95	10.05
20.00	1000	0	1000.0	0.0	1000.00	0.00



Example(2)

Input signal 0~10V aim range 0~1000, the value and graphical representation of MV.SF functions

input signal 0~10V	NONE	REVE (reverse)	SQUA (square)	SQ.RE (square+ reverse)	ROOT (square root)	RO.RE (square root+ reverse)
0.0	0	1000	0.0	1000.0	0.00	1000.00
0.2	20	980	0.4	999.6	141.42	858.58
0.4	40	960	1.6	998.4	200.00	800.00
0.6	60	940	3.6	996.4	244.95	755.05
0.8	80	920	6.4	993.6	282.84	717.16
1.0	100	900	10.0	990.0	316.23	683.77
1.2	120	880	14.4	985.6	346.41	653.59
1.4	140	860	19.6	980.4	374.17	625.83
1.6	160	840	25.6	974.4	400.00	600.00
1.8	180	820	32.4	967.6	424.26	575.74
2.0	200	800	40.0	960.0	447.21	552.79
2.2	220	780	48.4	951.6	469.04	530.96
2.4	240	760	57.6	942.4	489.90	510.10
2.6	260	740	67.6	932.4	509.90	490.10
2.8	280	720	78.4	921.6	529.15	470.85
3.0	300	700	90.0	910.0	547.72	452.28
3.2	320	680	102.4	897.6	565.69	434.31
3.4	340	660	115.6	884.4	583.10	416.90
3.6	360	640	129.6	870.4	600.00	400.00
3.8	380	620	144.4	855.6	616.44	383.56
4.0	400	600	160.0	840.0	632.46	367.54
4.2	420	580	176.4	823.6	648.07	351.93
4.4	440	560	193.6	806.4	663.32	336.68
4.6	460	540	211.6	788.4	678.23	321.77
4.8	480	520	230.4	769.6	692.82	307.18
5.0	500	500	250.0	750.0	707.11	292.89
5.2	520	480	270.4	729.6	721.11	278.89
5.4	540	460	291.6	708.4	734.85	265.15
5.6	560	440	313.6	686.4	748.33	251.67
5.8	580	420	336.4	663.6	761.58	238.42
6.0	600	400	360.0	640.0	774.60	225.40
6.2	620	380	384.4	615.6	787.40	212.60
6.4	640	360	409.6	590.4	800.00	200.00
6.6	660	340	435.6	564.4	812.40	187.60
6.8	680	320	462.4	537.6	824.62	175.38
7.0	700	300	490.0	510.0	836.66	163.34
7.2	720	280	518.4	481.6	848.53	151.47
7.4	740	260	547.6	452.4	860.23	139.77
7.6	760	240	577.6	422.4	871.78	128.22
7.8	780	220	608.4	391.6	883.18	116.82
8.0	800	200	640.0	360.0	894.43	105.57
8.2	820	180	672.4	327.6	905.54	94.46
8.4	840	160	705.6	294.4	916.52	83.48
8.6	860	140	739.6	260.4	927.36	72.64
8.8	880	120	774.4	225.6	938.08	61.92
9.0	900	100	810.0	190.0	948.68	51.32
9.2	920	80	846.4	153.6	959.17	40.83
9.4	940	60	883.6	116.4	969.54	30.46
9.6	960	40	921.6	78.4	979.80	20.20
9.8	980	20	960.4	39.6	989.95	10.05
10.0	1000	0	1000.0	0.0	1000.00	0.00

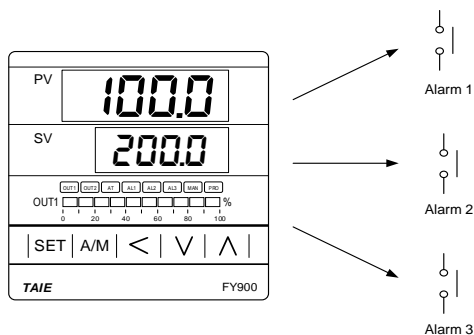


11. Alarm Action

Description

The FY/FA series 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



The related parameters of alarm function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
AL1	<i>AL1</i>	Alarm1 set value	USPL	-1999	1.0	Level 1	SET1.3
AL2	<i>AL2</i>	Alarm2 set value	USPL	-1999	1.0	Level 1	SET1.4
AL3	<i>AL3</i>	Alarm3 set value	USPL	-1999	1.0	Level 1	SET2.1
ALD1	<i>ALD1</i>	Alarm1 mode selection (Please refer to Chapter 11.1 Alarm Mode)	19	0	11	Level 3	SET3.1
ALT1	<i>ALT1</i>	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	<i>ALD2</i>	Alarm2 mode selection (Please refer to Chapter 11.1 Alarm Mode)	19	0	11	Level 3	SET3.3
ALT2	<i>ALT2</i>	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	<i>ALD3</i>	Alarm3 mode selection (Please refer to Chapter 11.1 Alarm Mode)	18	0	11	Level 3	SET4.1
ALT3	<i>ALT3</i>	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	<i>HYSR</i>	Hysteresis setting for alarm1~3	999.9	-199.9	1.0	Level 3	SET4.3
SETA	<i>SEER</i>	Alarm special function setting (Please refer to Chapter 11.2)	1111	0000	0000	Level 3	SET5.3

11.1 Alarm Mode

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

ALDX	Alarm mode	Description
0	No alarm function	Not drive any alarm relays and the corresponding LED lamp.
1	Deviation high (With hold action)	
		Formula $PV \geq (SV+ALX) \rightarrow \text{Alarm ON}$ $PV \leq (SV+ALX-HYSX) \rightarrow \text{Alarm OFF}$
2	Deviation low (With hold action)	<p>*ALX must be set to a negative value</p>
		Formula $PV \leq (SV+ALX) \rightarrow \text{Alarm ON}$ $PV \geq (SV+ALX+HYSX) \rightarrow \text{Alarm OFF}$
3	Deviation high/low (With hold action)	
		Formula $PV \geq (SV+ALX) \rightarrow \text{Alarm ON}$ $PV \leq (SV-ALX) \rightarrow \text{Alarm ON}$ $PV \geq (SV-ALX+HYSX) \rightarrow \text{Alarm OFF}$ $PV \leq (SV+ALX-HYSX) \rightarrow \text{Alarm OFF}$
4	Band (With hold action)	
		Formula $PV \leq (SV+ALX) \rightarrow \text{Alarm ON}$ $PV \geq (SV-ALX) \rightarrow \text{Alarm ON}$ $PV > (SV+ALX) \rightarrow \text{Alarm OFF}$ $PV < (SV-ALX) \rightarrow \text{Alarm OFF}$
5	Process high (With hold action)	
		Formula $PV \geq ALX \rightarrow \text{Alarm ON}$ $PV \leq (ALX-HYSX) \rightarrow \text{Alarm OFF}$
6	Process low (With hold action)	
		Formula $PV \leq ALX \rightarrow \text{Alarm ON}$ $PV \geq (ALX+HYSX) \rightarrow \text{Alarm OFF}$
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 HBOP set value 3. Conditions of 1 & 2 above are established and continue to exceed 20 seconds. *Please refer to Chapter 10.4 *This mode only available in ALD1 or ALD2
	Single RAMP	Please refer to Chapter 10.7 This mode only available in ALD3

11.1 Alarm Mode

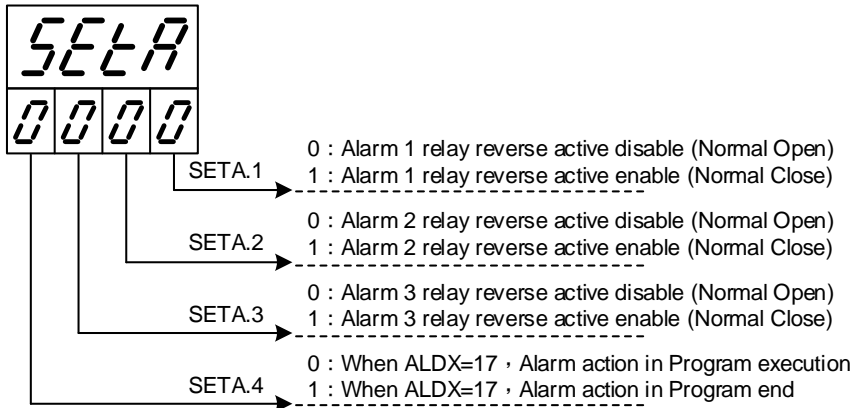
▲ : SV △ : Alarm set value X : 1 / 2 / 3 (There are up to 3 sets of alarms)

ALDX	Alarm mode	Description
10	SOAK_A	<p>Boot completed, the alarm is ON, when PV ≥ target SV start the timer, alarm and control function are turned OFF in timed out.</p> <p>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.</p> <p>*Please refer to Chapter 10.7</p> <p>*This mode only available in ALD1 or ALD2</p> <p>*In this mode, the time format is fixed to "hour.minute"</p>
11	Deviation high	
		<p>Formula</p> <p>$PV \geq (SV+ALX) \rightarrow$ Alarm ON</p> <p>$PV \leq (SV+ALX-HYSA) \rightarrow$ Alarm OFF</p>
12	Deviation low	<p>*ALX must be set to a negative value</p>
		<p>Formula</p> <p>$PV \leq (SV+ALX) \rightarrow$ Alarm ON</p> <p>$PV \geq (SV+ALX+HYSA) \rightarrow$ Alarm OFF</p>
13	Deviation high/low	
		<p>Formula</p> <p>$PV \geq (SV+ALX) \rightarrow$ Alarm ON</p> <p>$PV \leq (SV-ALX) \rightarrow$ Alarm ON</p> <p>$PV \geq (SV-ALX+HYSA) \rightarrow$ Alarm OFF</p> <p>$PV \leq (SV+ALX-HYSA) \rightarrow$ Alarm OFF</p>
14	Band	
		<p>Formula</p> <p>$PV \leq (SV+ALX) \rightarrow$ Alarm ON</p> <p>$PV \geq (SV-ALX) \rightarrow$ Alarm ON</p> <p>$PV > (SV+ALX) \rightarrow$ Alarm OFF</p> <p>$PV < (SV-ALX) \rightarrow$ Alarm OFF</p>
15	Process high	
		<p>Formula</p> <p>$PV \geq ALX \rightarrow$ Alarm ON</p> <p>$PV \leq (ALXH-HYSA) \rightarrow$ Alarm OFF</p>
16	Process low	
		<p>Formula</p> <p>$PV \leq ALX \rightarrow$ Alarm ON</p> <p>$PV \geq (ALXH+HYSA) \rightarrow$ Alarm OFF</p>
17	Program run	<p>SETA.4=0 When program execution, alarm action</p> <p>SETA.4=1 When program end, alarm action</p> <p>*This mode only available in program type controller</p>
18	System normal	The Alert action, when system in normal condition (no-error message)

11.1 Alarm Mode

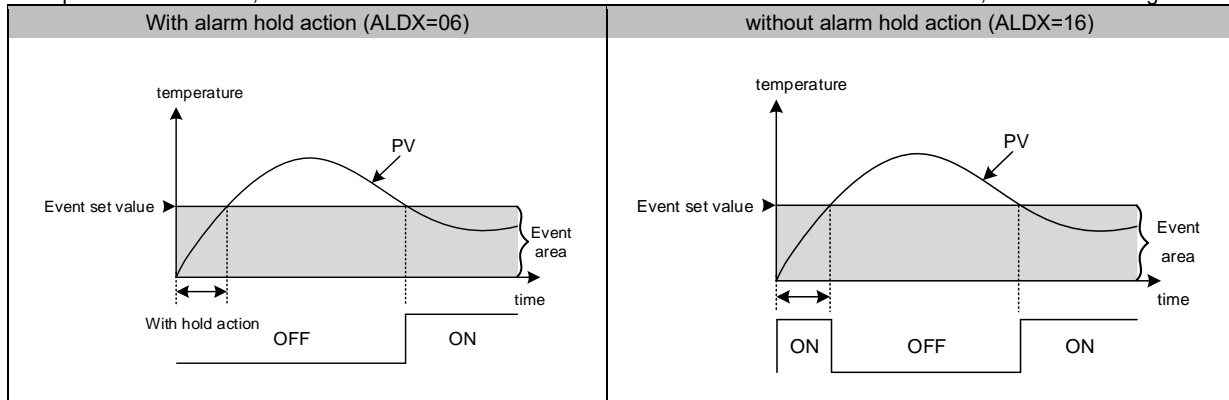
ALDX	Alarm mode	Description
19	SOAK_B	<p>Boot completed, the alarm is OFF, when PV ≥ target SV start the timer, alarm is turned ON and the control function keep ON in timed out.</p> <p>If the RAMP function is used, even if the RAMP SV has not reached the target SV, the timer will start counting as long as the condition PV ≥ target SV is met.</p> <p>*Please refer to Chapter 10.7</p> <p>*This mode only available in ALD1 or ALD2</p> <p>*In this mode, the time format is fixed to “hour.minute”</p>

11.2 Alarm Special Setting



11.3 Alarm Example

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

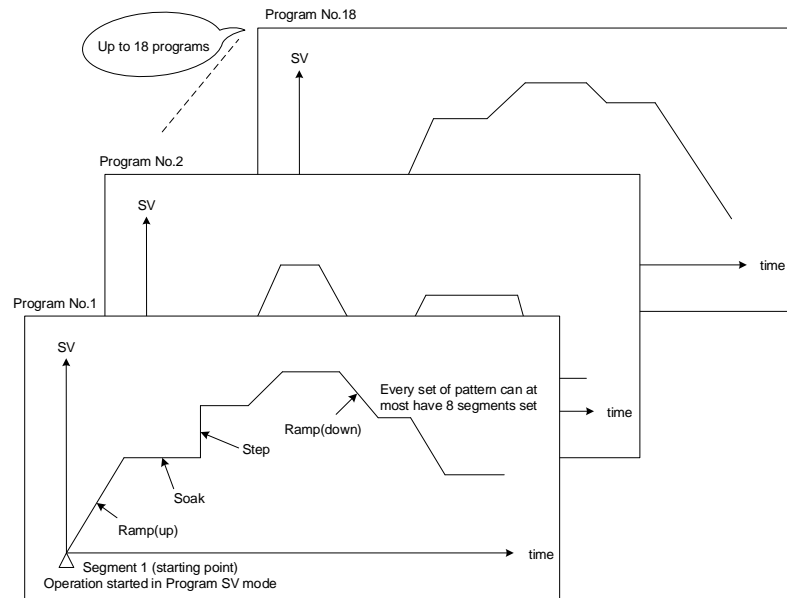


12. Programmable

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.



12.1 Parameter

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
PTN		Program pattern selection 1~18	18	1	1	Level 1	PROG=ON
SEG		Current program segment display	144	1	1	Level 1	PROG=ON
TIMR		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		Segment 1 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_1		Segment 1 execute time setting, this parameter determines the link between segment and 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		Segment 1 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_2		Segment 2 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_2		Segment 2 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT2		Segment 2 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_3		Segment 3 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_3		Segment 3 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT3		Segment 3 output limit	100.0	0.0	100.0	Level 1	PROG=ON

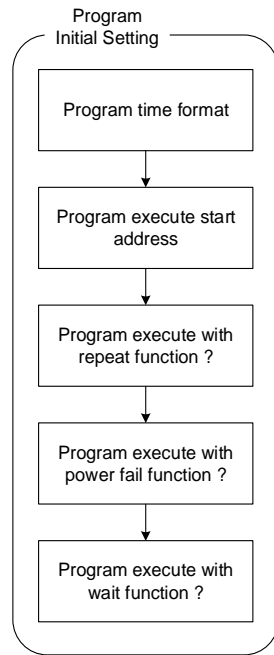
12.1 Parameter

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
SV_4		Segment 4 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_4		Segment 4 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT4		Segment 4 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_5		Segment 5 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_5		Segment 5 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT5		Segment 5 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_6		Segment 6 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_6		Segment 6 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT6		Segment 6 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_7		Segment 7 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_7		Segment 7 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT7		Segment 7 output limit	100.0	0.0	100.0	Level 1	PROG=ON
SV_8		Segment 8 SV	USPL	LSPL	0.0	Level 1	PROG=ON
TM_8		Segment 8 execute time setting	99.59	-1	0.00	Level 1	PROG=ON
OUT8		Segment 8 output limit	100.0	0.0	100.0	Level 1	PROG=ON
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		Program execute repeat 0 : disable repeat function 1 : Program execute repeat	1	0	0	Level 4	---
SET8.2		Program execute power fail protection 0 : disable power fail protection 1 : enable power fail protection	1	0	0	Level 4	---
SET8.3		Program execute start address 0 : execute from zero 1 : execute from current PV	1	0	1	Level 4	---
SET9.2		Program time format 0 : hour.minute 1 : minute.second	1	0	0	Level 4	---
PVST		Program execute start address 0 : FULT (execute from current PV, but use segment 1 fully time) 1 : CUTT (execute from current PV, cut time)	CUTT	FULT	FULT	Fast	SET8.3

12.2 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 lamp remains ON, at this moment upper area will display current temperature value and "HALT" message alternately.
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 jump to the parameter OUTL, then pressing the A / M key for 2 seconds return to PV / SV monitor.

12.3 Program Initial Setting



1. Setting program time format

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

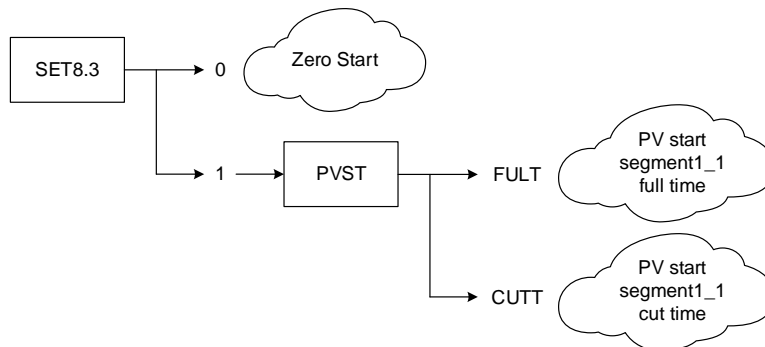
This parameter determines the time format of timer during program execution
 When SET9.2 = 0 , TM_n=33.23, it indicates that the execution time of this segment is 33 hours and 23 minutes
 When SET9.2 = 1 , TM_n=33.23, it indicates that the execution time of this segment is 33 minutes and 23 seconds

2. Setting program execute start address


Parameter	LED display	Description	Default	Level
SET8.3	<i>SEt8</i>	Program execute start address 0 : execute from zero 1 : execute from current PV	1	Level 4
PVST	<i>PVSt</i>	Program execute start address 0 : FULT (execute from current PV,but use segment 1 fully time) 1 : CUTT (execute from current PV,cut time)	FULT	Fast

When program starts, SV initial value will execute according to SET8.3 and PVST setting value

- (1) SET8.3 =0, PTN=1, PV=50.0, SV_1=100.0, TM_1=1.00(1 hour)
 When program starts, SV will start to execute from PV, and SV shall reach SV_1 in one hour
- (2) SET8.3 =1, PVST=FULT, PTN=1, PV=50.0, SV_1=100.0, TM_1=1.00(1 hour)
 When program starts, SV will start to execute from PV temperature of 50.0, and SV shall reach SV_1 in one hour
- (3) SET8.3 =1, PVST=CUTT, PTN=1, PV=50.0, SV_1=100.0, TM_1=1.00(1 hour)
 When program starts, SV will start to execute from PV, while controller will deduct the time taken to go from 0.0 to 50.0, as SV shall reach SV_1 in half hour




3. Setting program execute with repeat function

Parameter	LED display	Description	Default	Level
SET8.1		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		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 (target 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

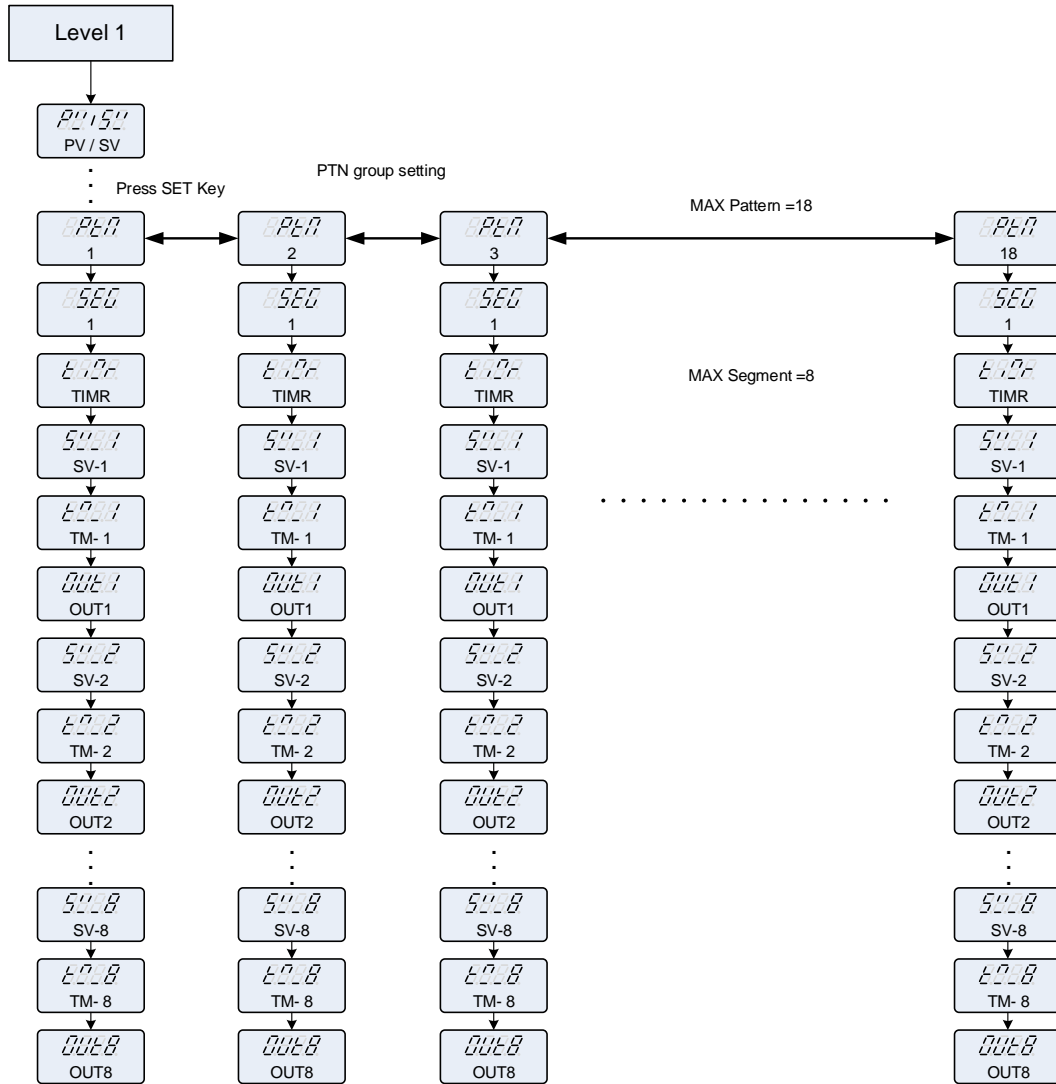
(2) WAIT = 5.0 with wait function set

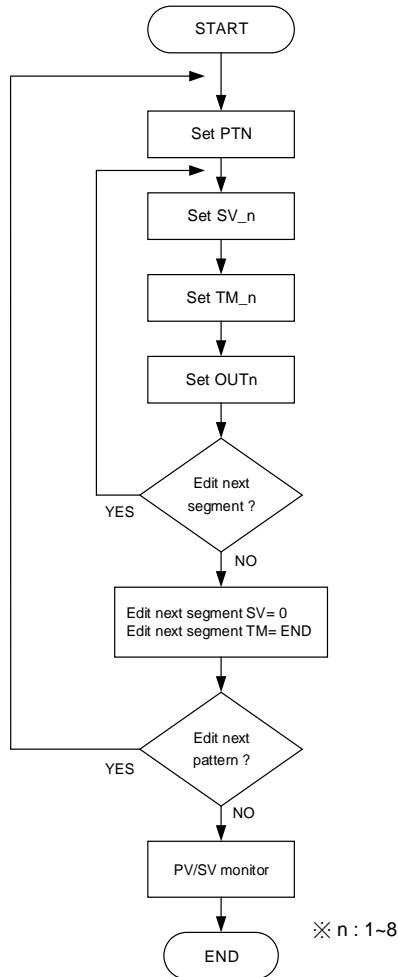
Assume the set temperature of current segment is 100.0°C, and as SV reaches the set temperature of this segment, PV temperature needs to reach 100.0-5.0 (SV-WAIT)=95.0 then entering the next segment

12.4 Create Program

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

Program structure diagram





1. Choose program pattern number

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

2. Setting segment n target SV

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

3. Setting segment n TM

Parameter	LED display	Description	Default	Level
TM_n		Segment 1 execute time setting, this parameter determines the link between segment and 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 in this segment, no end	0	Level 1

TM setting explain :

In segment_5(SEG_5) setting TM_5 =END → When the program finishes segment_4(SEG_4), program end and display “END” Message in segment_5(SEG_5).

In segment_5(SEG_5) setting TM_5=0.00 → When the program finishes segment_4(SEG_4), enter next segment, SV change suddenly.

In segment_5(SEG_5) setting TM_5 =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_5 =99.59 → When the program finishes segment_4(SEG_4) , enter next segment and executing continuously.

4. Setting segment n OUTn

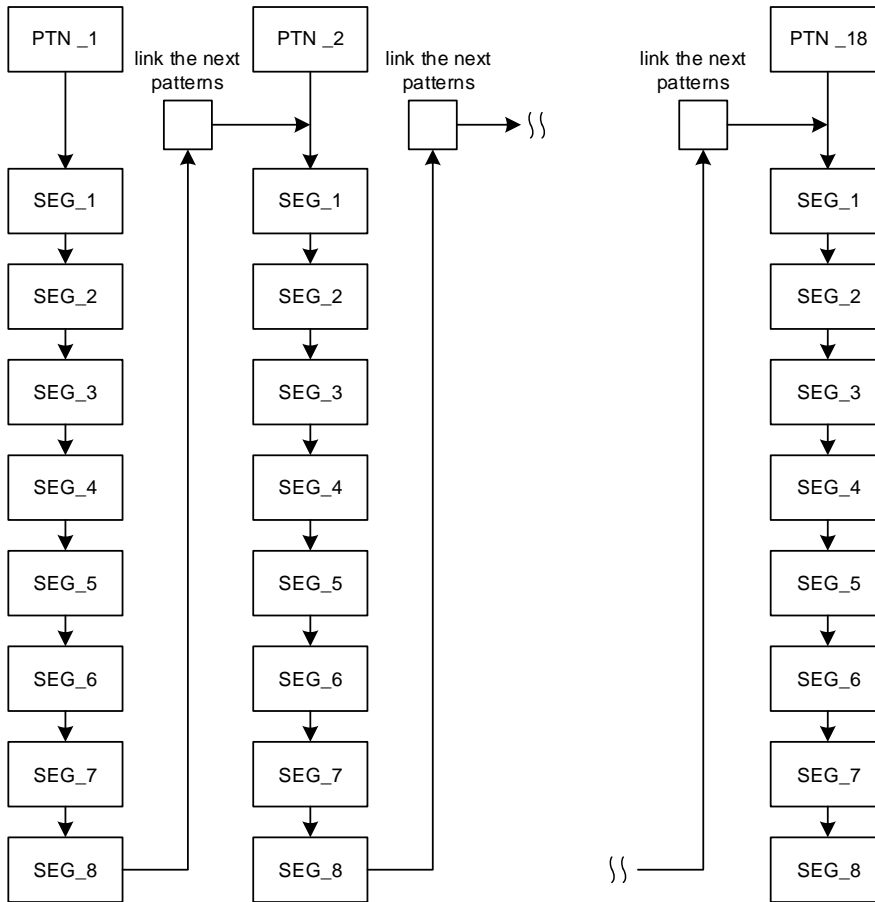
Parameter	LED display	Description	Default	Level
OUTn		Segment n output limit (n=1~8)	100.0	Level 1

Notes

1. When the program is executed, it will end when it hits TIMR=END. Please be sure to add an end segment after the last segment of the program.
2. When OUD=COOL, no matter what the PVST setting is, it will always start with PVST=FULT
3. Programs can be started from different PTN to execute different recipes
4. user can use the " Program Design Table " of [chapter 19](#) to plan the recipe in advance

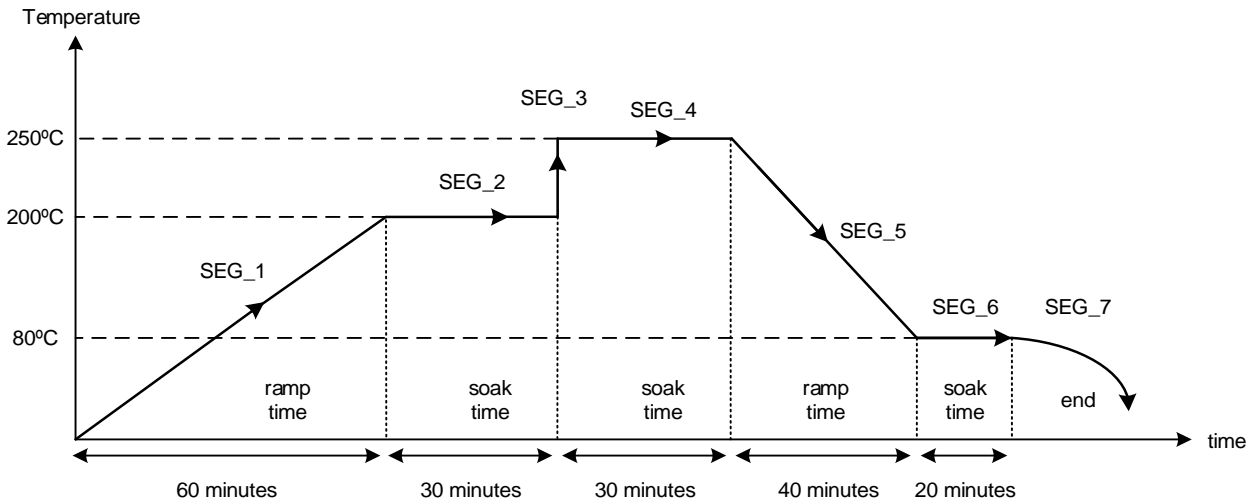
12.5 Program Execution Flow

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



12.6 Program Setting Example

In pattern_1 edit program ramp, soak, step then end



Initial setting

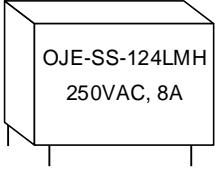
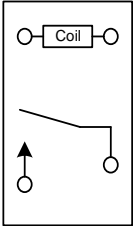
SET9.2 = 1	SET8.3 = 0	SET8.1 = 0	SET8.2 = 1	WAIT = 0.5
------------	------------	------------	------------	------------

Program edit

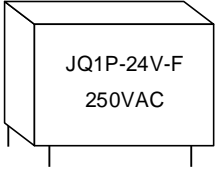
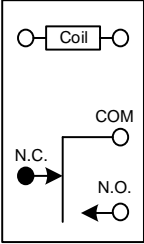
Segment_1	Segment_2	Segment_3	Segment_4	Segment_5	Segment_6	Segment_7
PTN = 1	PTN = 1	PTN = 1	PTN = 1	PTN = 1	PTN = 1	PTN = 1
SV_1 = 200	SV_2 = 200	SV_3 = 250	SV_4 = 250	SV_5 = 80	SV_6 = 80	SV_7 = 0
TM_1 = 60.00	TM_2 = 30.00	TM_3 = 0.00	TM_4 = 30.00	TM_5 = 40.00	TM_6 = 45.00	TM_7 = END
OUT1 = 100.0	OUT2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

13. Modification of Output Module

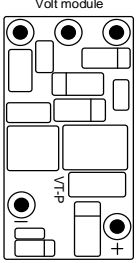

13.1 Relay Control (1a)

Side view	Bottom view	Software Setting
 <p>OJE-SS-124LMH 250VAC, 8A</p>	 <p>Coil</p>	<p>Parameter set as "CYT1 =10"</p>

13.2 Relay Control (1c)

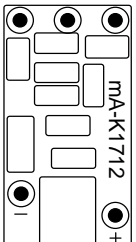
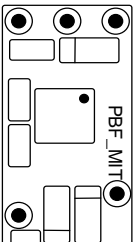
Side view	Bottom view	Software Setting
 <p>JQ1P-24V-F 250VAC</p>	 <p>Coil</p> <p>COM</p> <p>N.C.</p> <p>N.O.</p>	<p>Parameter set as "CYT1 =10"</p>

13.3 SSR Control

Top view	Bottom view	Software Setting
 <p>Volt module</p> <p>VTP</p> <p>+</p>	 <p>Volt module</p> <p>Pb</p> <p>VOLT_Pulse-K1712</p> <p>Made in Taiwan</p>	<p>Parameter set as "CYT1 =1"</p>

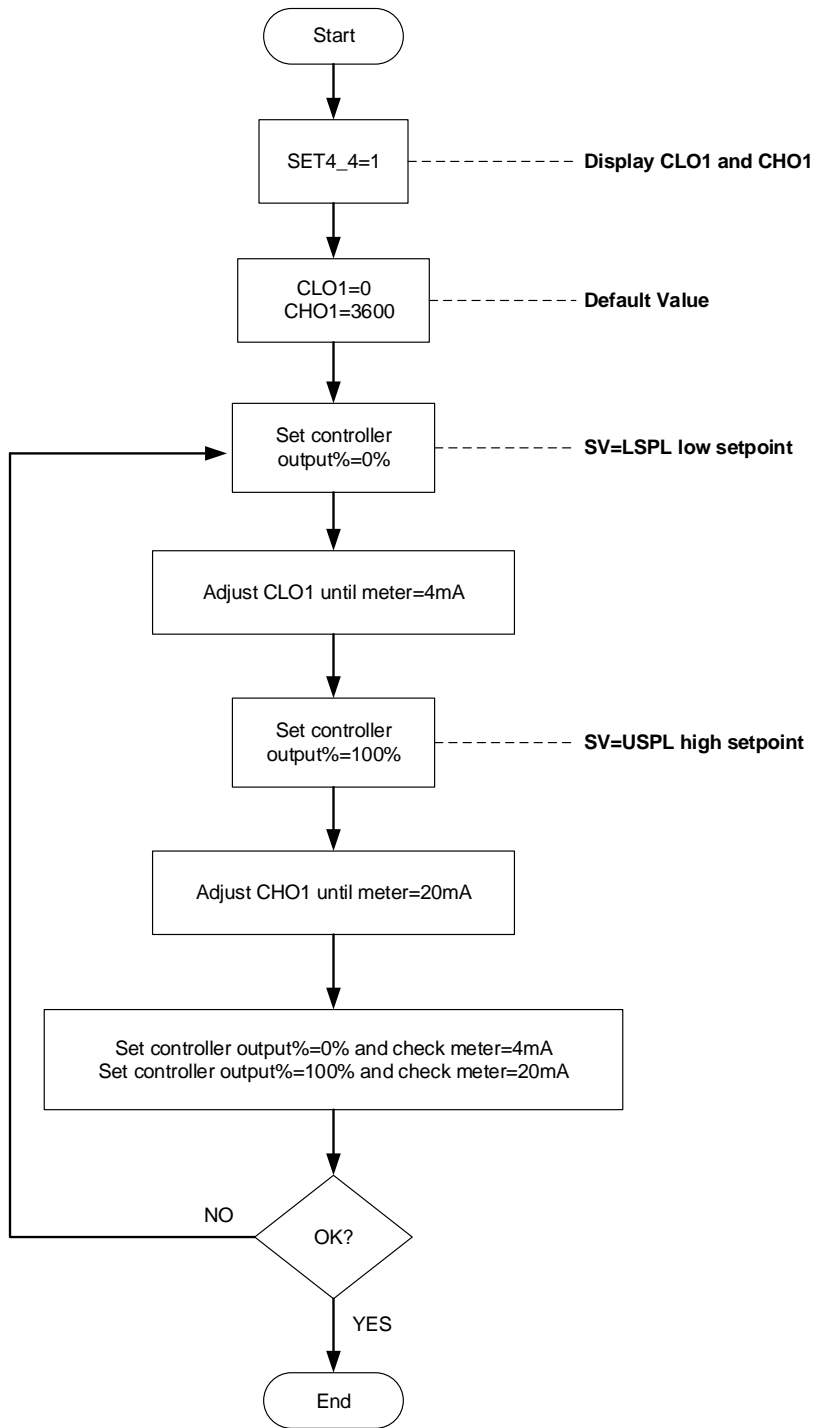
13.4 Linear Control

※ : When modifying mA current module, output signal needs to be calibrated, and for detailed calibration procedure, please refer to Chap. [13.5 Output Calibration Procedure Diagram](#).

Top view	Bottom view	Software Setting
 <p>mA module</p> <p>mA-K1712</p> <p>+</p> <p>-</p>	 <p>mA module</p> <p>PBF_MIT</p>	<p>Parameter set as "CYT1 =0"</p>

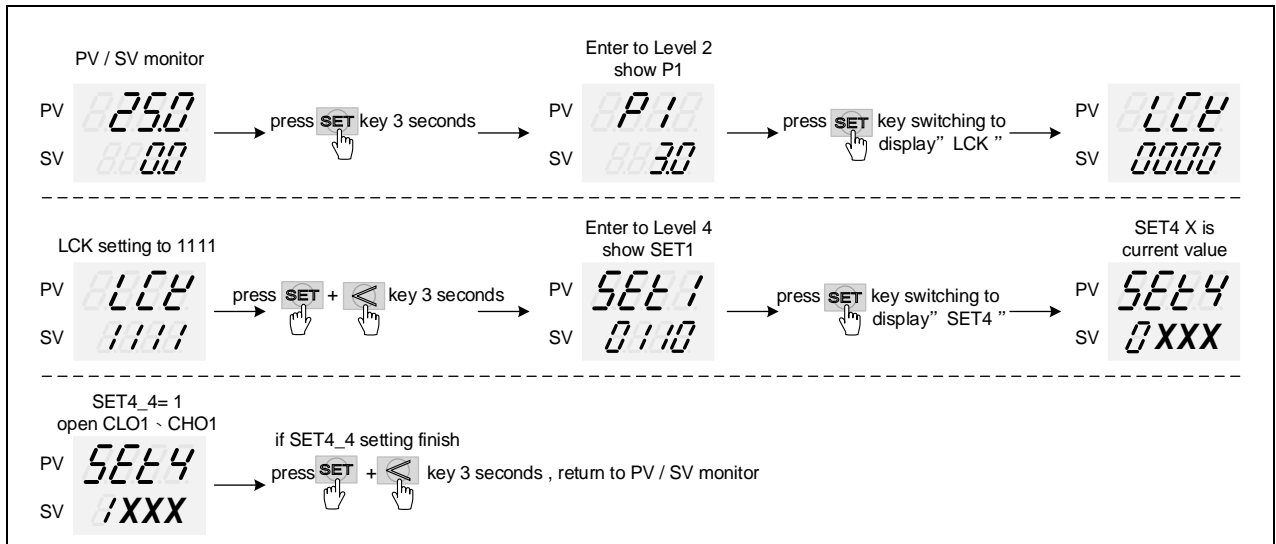
13.5 Output Calibration Procedure Diagram

Output1 Signal (4mA~20mA) calibration flowchart



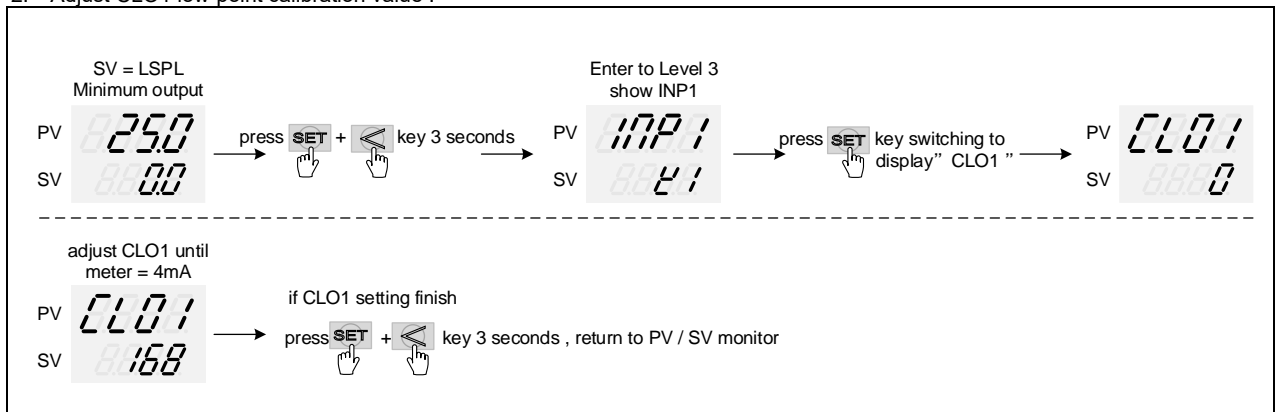
13.6 Output Calibration Steps

1. Display CLO1 & CHO1 :



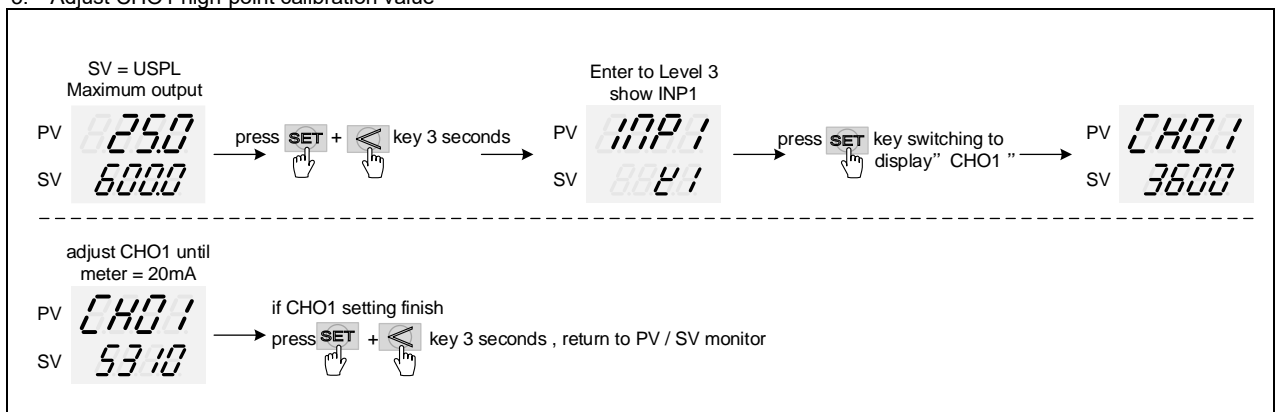
※ : X is default value which does not need to be modified

2. Adjust CLO1 low-point calibration value :



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

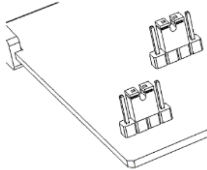
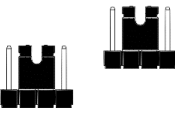
3. Adjust CHO1 high-point calibration value



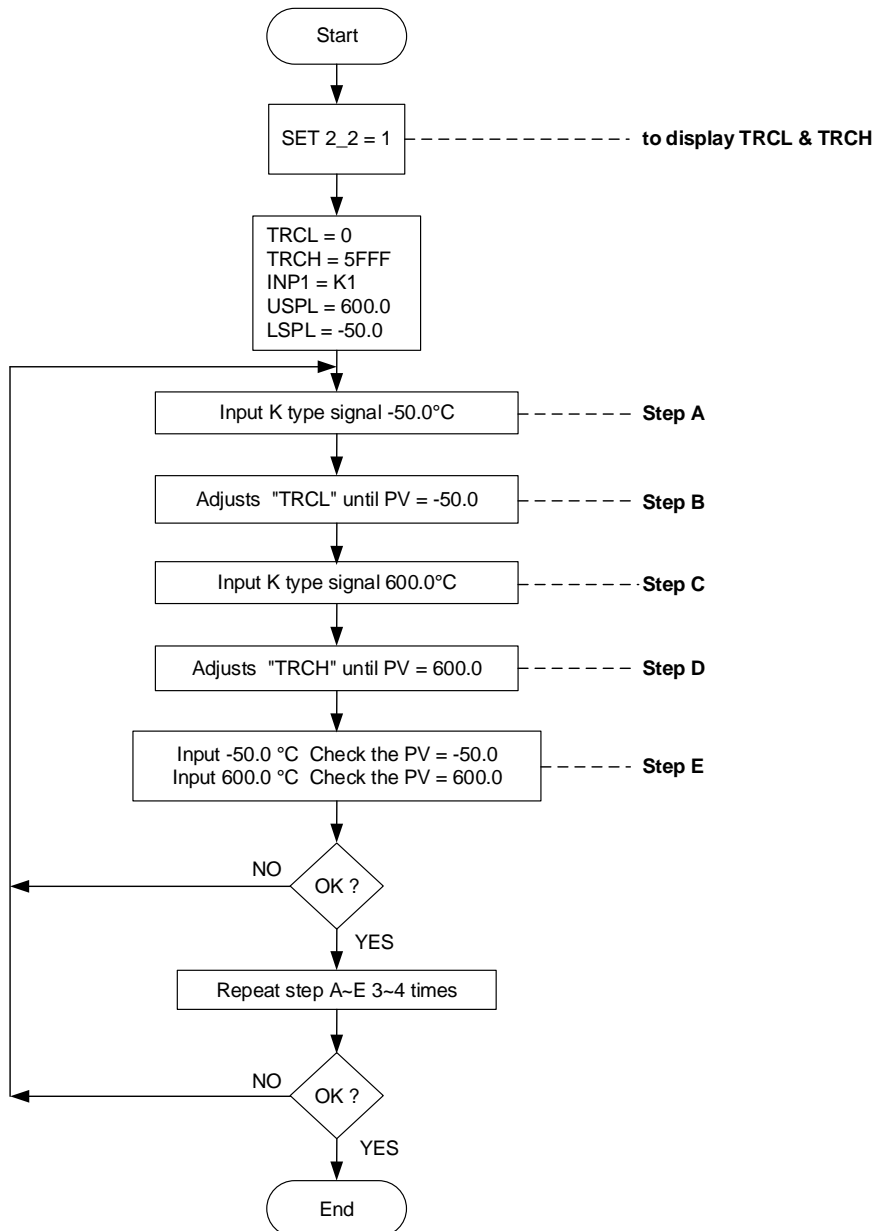
※ : CHO1 calibration value of each controller is different from the other

14. Modification of Input Signal

14.1 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



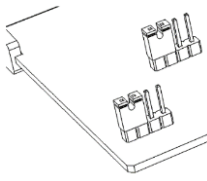
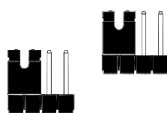
Set the range you want

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

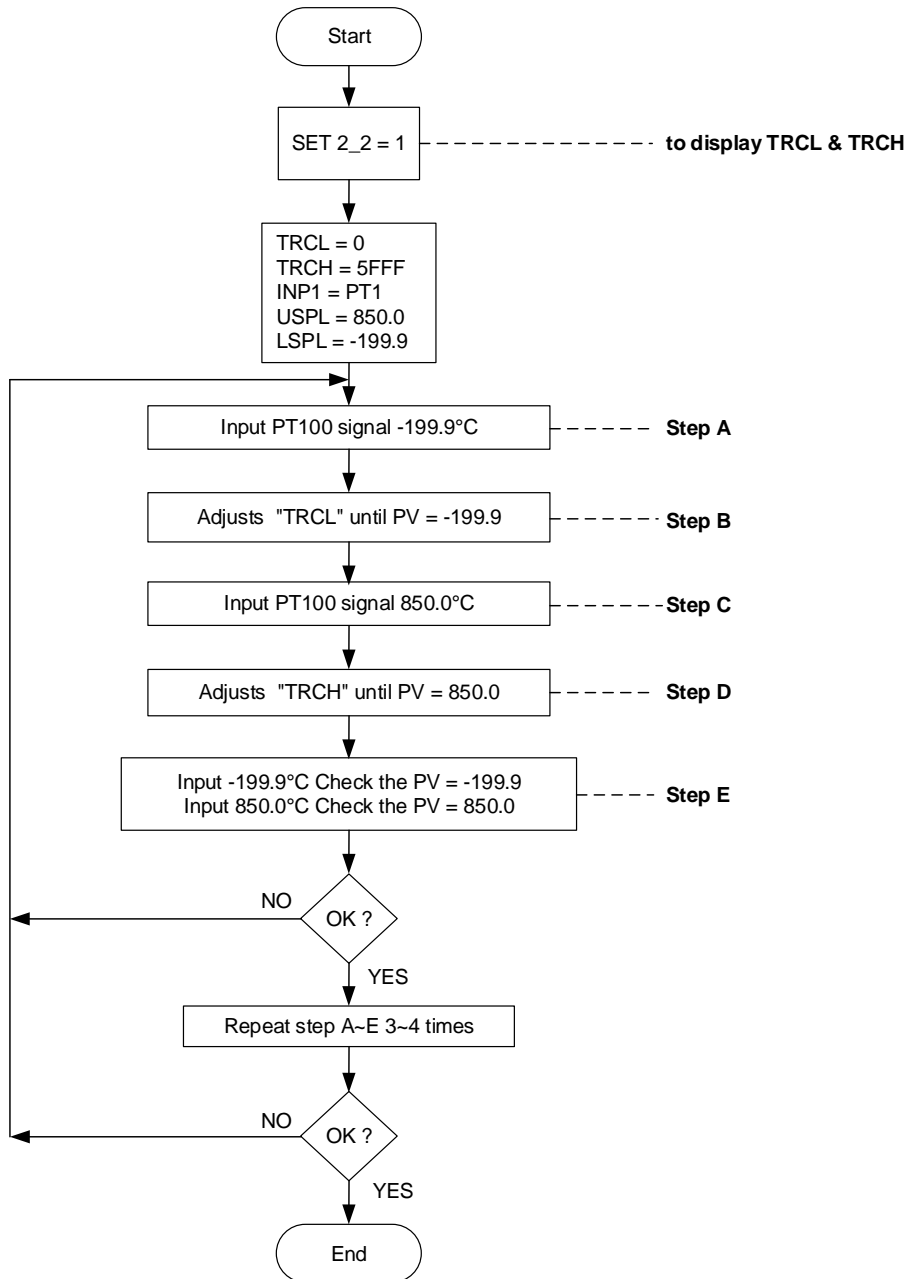
Notes

When input is thermocouple or PT100, it has been calibrated and tested at the factory, we don't recommend customers to make their own calibration.

14.2 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



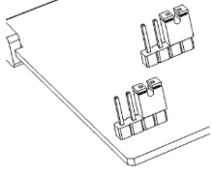
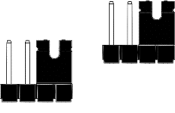
Set the range you want

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

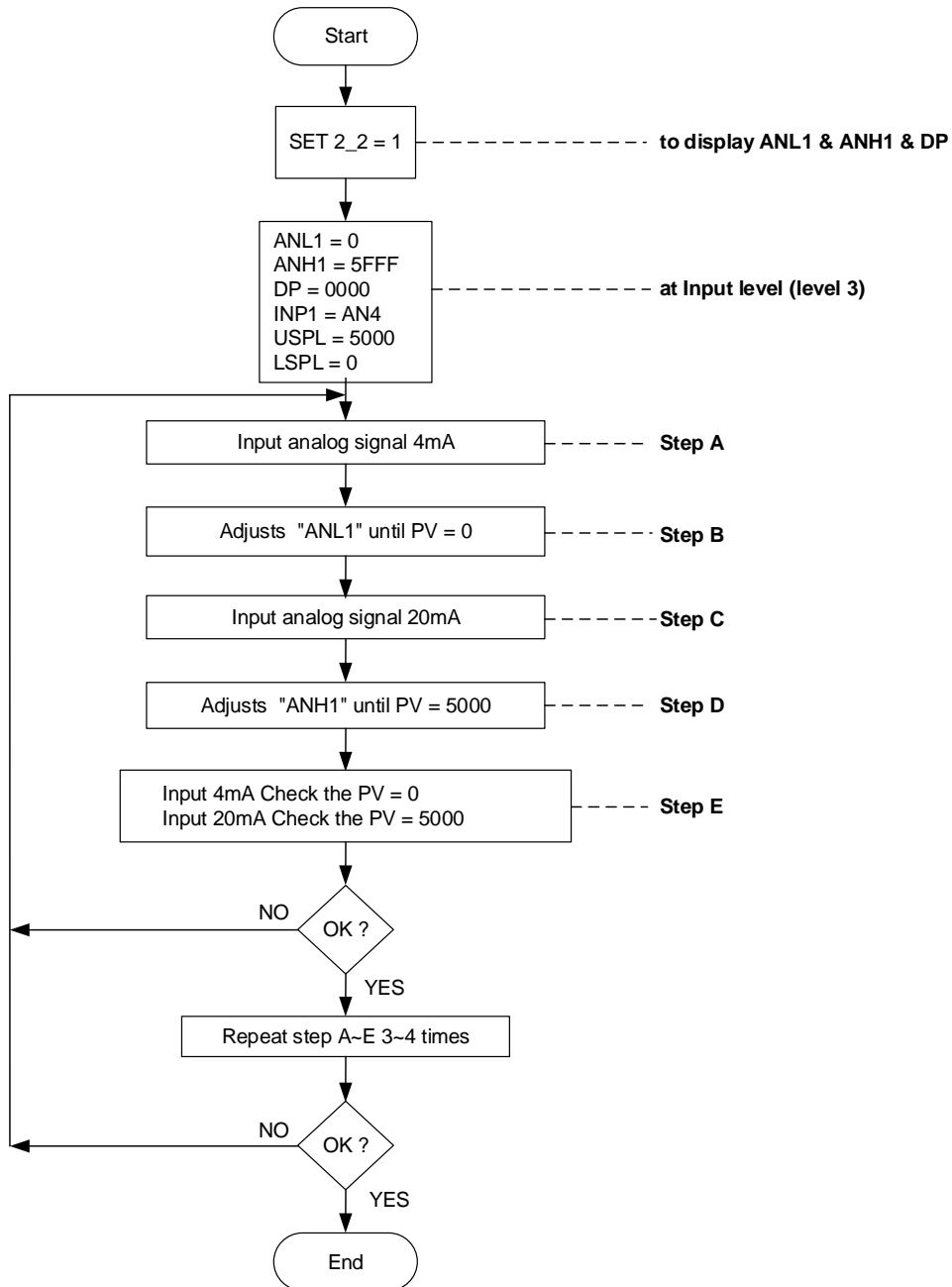
Notes

When input is thermocouple or PT100, it has been calibrated and tested at the factory, we don't recommend customers to make their own calibration.

14.3 Input modify to Linear (4~20mA)

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

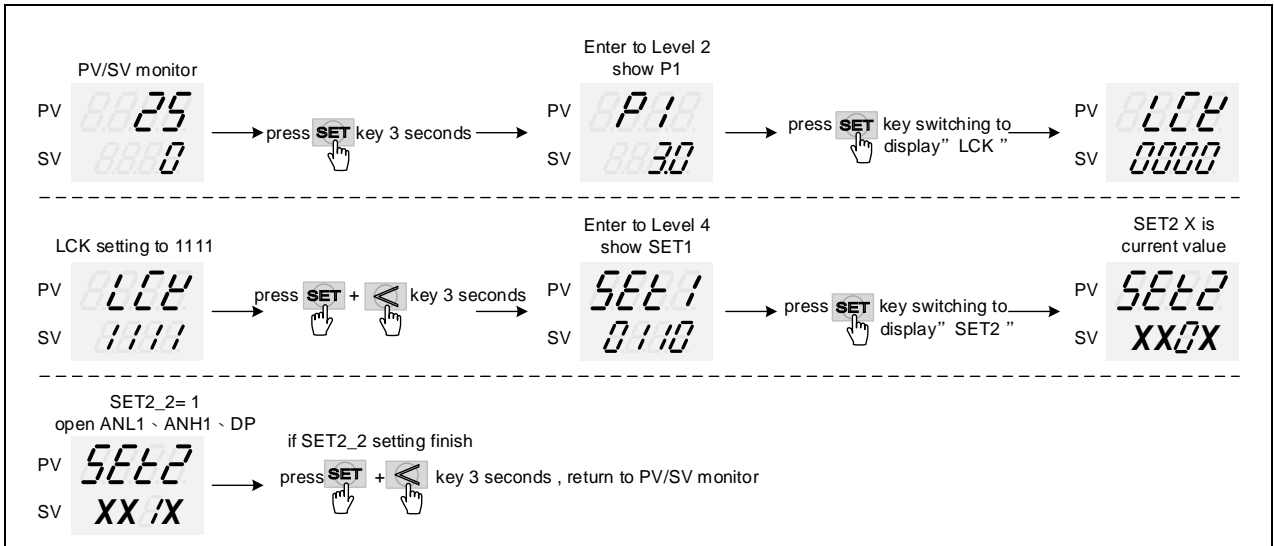
Linear analog signal (4~20mA) calibration flowchart



Set the range you want
 Ex: Low = -10.0, High = 10.0
 Set LSPL = -10.0, USPL = 10.0, DP : 000.0

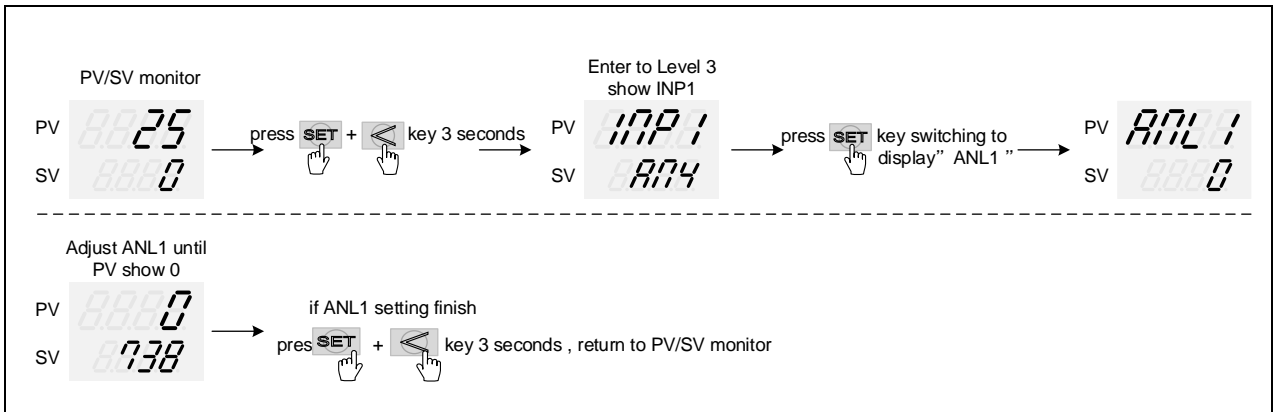
14.4 Steps For Linear Input Calibration

1. Display ANL1, ANH1, DP :



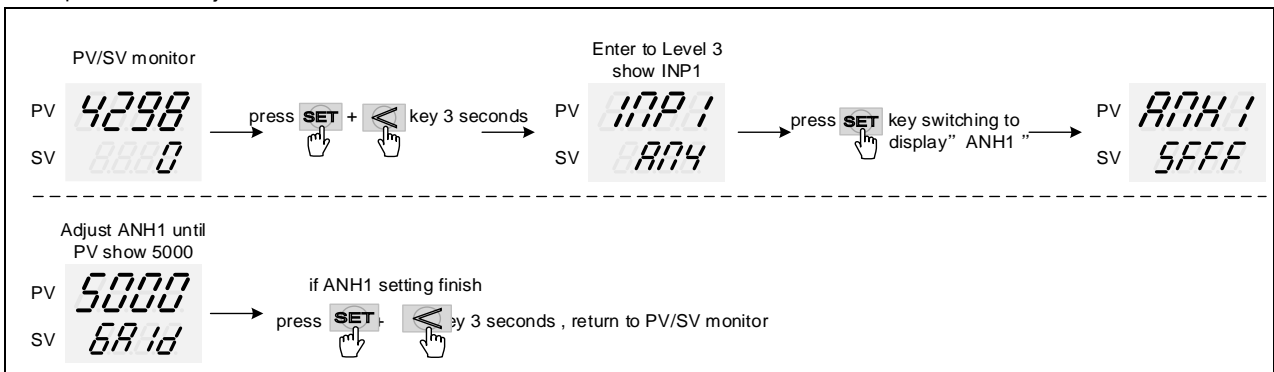
※ X is the default value which does not require modification

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

15. Phase angle / Zero cross Control

Description

The FY controller can directly drive the thyristor. In the phase angle control mode, the phase angle of the thyristor can be controlled to cut the sine wave. In the zero cross control mode, it can automatically detect the zero point to turn-on or turn-off sine wave, phase angle control and zero cross control are the use of cutting or turn-on/off the sine wave to achieve the power control

The related parameters of Dehumidification Function are as below:

Parameter	Symbol	Content	Range		Default	Level	Hide/Display
			MAX	MIN			
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 angle control	4	0	0	Level 4	---
CYT1		Main output control cycle 0 : Linear signal 1 : SSR drive 2~150 : Relay	150	0	00	Level 2	---
CLO1		phase angle adjustment	9999	0	0	Level 3	SET4.4
CHO1		phase angle adjustment	9999	0	3600	Level 3	SET4.4

Phase angle control default setting : OUTY=4 、CYT1=0 、CLO1=150 、CHO1=3800

Zero cross control default setting : OUTY=0 、CYT1=1

control waveform diagram

Control	OUT%=10	OUT%=50	OUT%=80
Phase angle control			
Zero crossing control	 1 cycle ON and 9 cycle OFF	 5 cycle ON and 5 cycle OFF	 8 cycle ON and 2 cycle OFF

※ Description of zero cross control
power frequency=50HZ, the period of a sine wave is 20ms.
when the controller is in zero cross control the control period is 200ms

when OUT%=10 : 1 full sine wave is turned on within 200ms, and the remaining 180ms is turned off

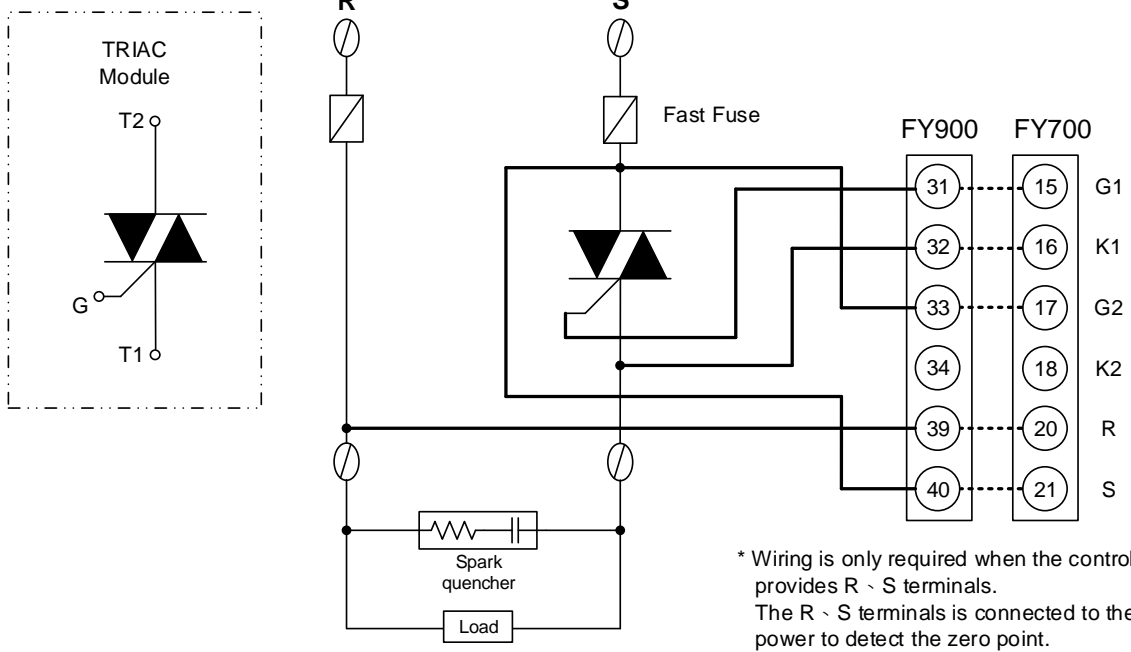
when OUT%=50 : 5 full sine wave is turned on within 200ms, and the remaining 100ms is turned off

when OUT%=80 : 8 full sine wave is turned on within 200ms, and the remaining 40ms is turned off

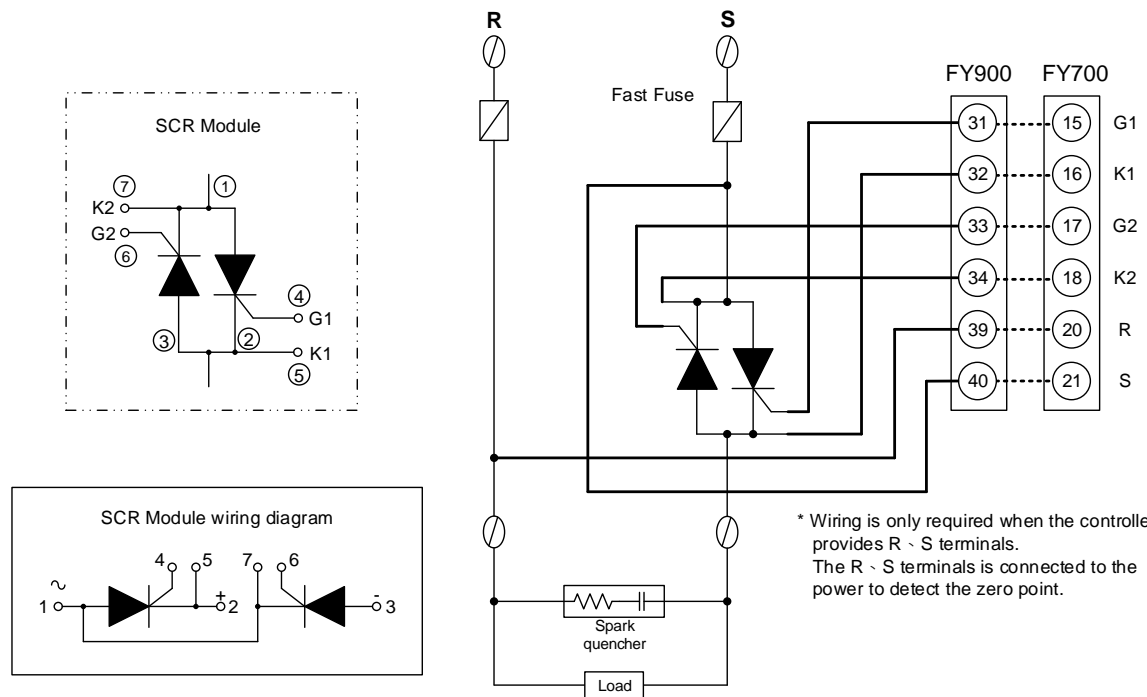
Note

1. Load power and control power need to be in the same phase
2. When single phase angle control is used, CLO1 and CHO1 are used to adjust the phase angle of the thyristor.
When the trigger waveform is abnormal, CLO1 can be increased or CHO1 can be reduced to meet the thyristor characteristics
3. When the phase angle control is used, if the load is a bulb, the brightness will change with continuous, and when the zero cross control is used, the brightness will change with flicker

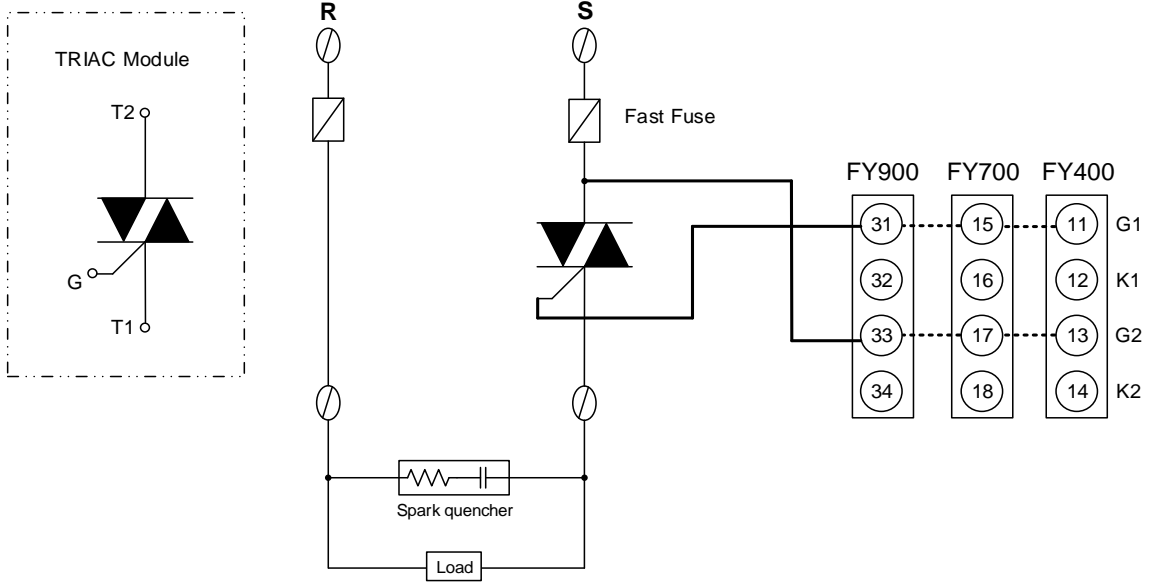
TRIAC Module



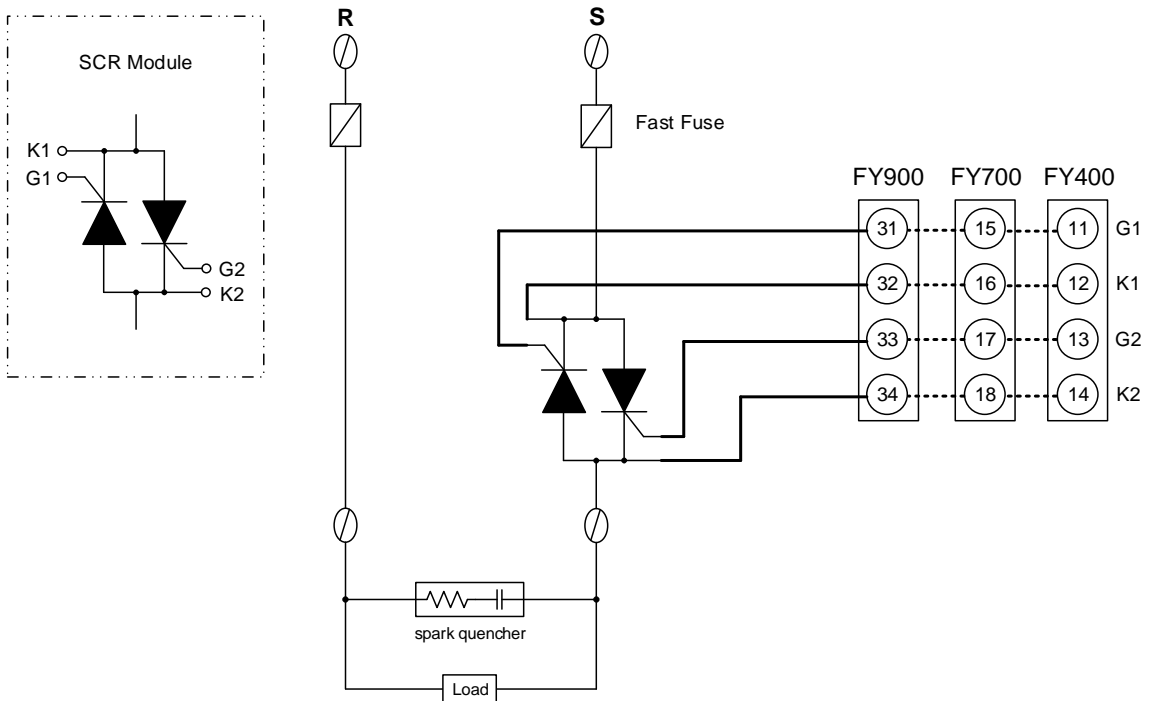
SCR Module



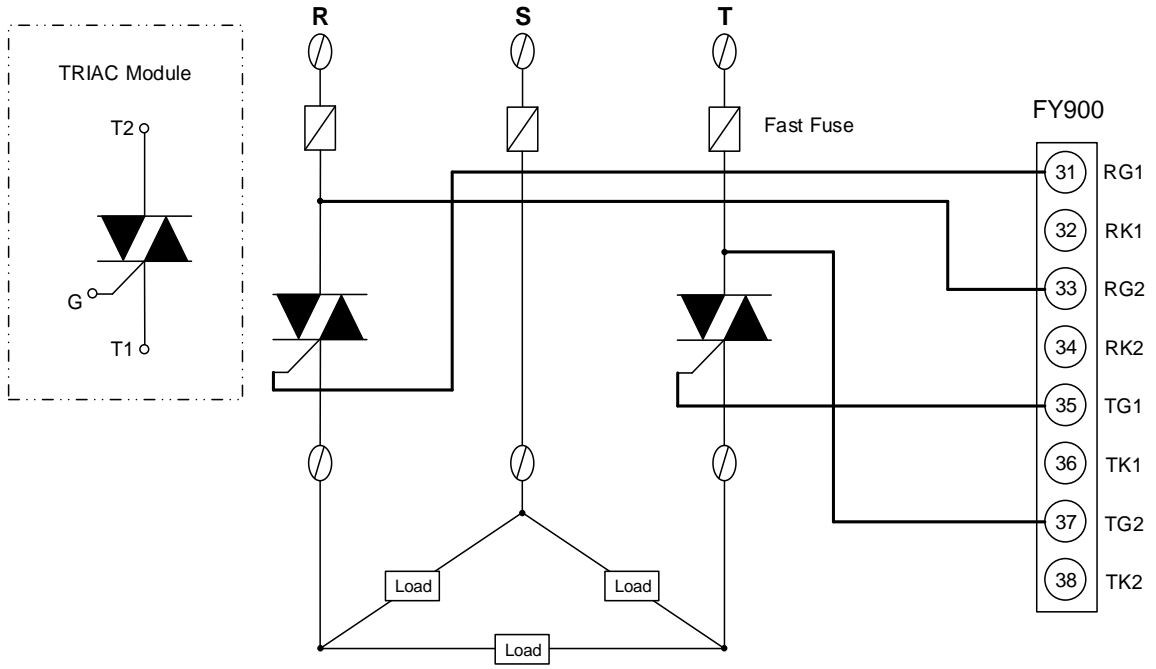
TRIAC Module



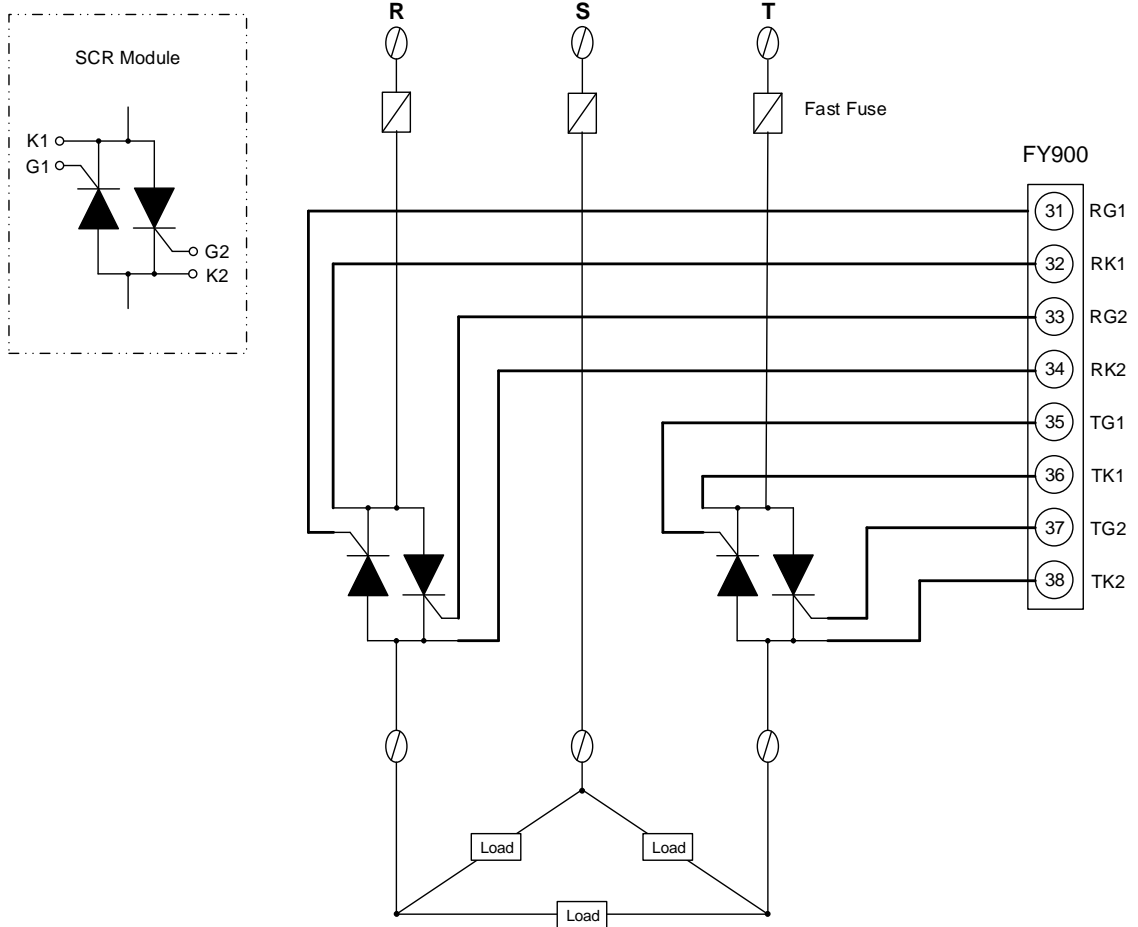
SCR Module



TRIAC Module



SCR Module



16. Error Message

If the solution is "contact distributor for repair", please do not try to repair it yourself. You can contact the distributor to send it for repair or replace the controller first.

Symbol	Meaning	Cause	Solution
<i>INIE</i>	Input signal error INIE and 7FFF toggle display	Input loop is opened.	Check whether input loop is opened or wiring is incorrect.
<i>7FFF</i>		Controller input circuit failure.	Contact distributor for repair
<i>UUU1</i>	PV above parameter USPL UUU1 and PV toggle display	Input signal greater than USPL	Check whether the input value is correct or not.
<i>NNN1</i>	PV below parameter LSPL NNN1 and PV toggle display	Input signal less than LSPL	Check whether the input value is correct or not.
<i>PMEF</i>	Valve feedback resistor failed. PMEF and PV toggle display	Valve feedback resistor failure	Check whether feedback resistor wiring is incorrect.
<i>AUTF</i>	Auto tuning failed. AUTF and PV toggle display	The auto tuning has been executed for more than 2 hours, and the controller can't calculate the optimal PID value.	Please set the PID value manually or use the default PID control and then fine-tune it.
<i>COMF</i>	Noise interference. COMF and PV toggle display	Nois interferes with RS-485 communication network	<ol style="list-style-type: none"> 1. Add a 110Ω termination resistor to the last device on the RS-485 network. 2. Separate power line and communication line 3. Contact TAIE support
<i>TRSF</i>	Transmission function failed. TRSF and PV toggle display	The controller can't detect the transmission hardware	<ol style="list-style-type: none"> 1. Optional transmission function : Contact distributor for repair 2. NO optional transmission function : Please check whether SET8.3 or SET8.4 is enabled
<i>RAMF</i>	EEPROM failed. RAMF and PV toggle display	The master continues to write new values to a certain parameter more than 1 million times, causing the memory cell to malfunction and unable to memorize it.	<ol style="list-style-type: none"> 1. Contact distributor for repair 2. Please refer to the "EEPROM Protection Mode" chapter of communication manual to avoid this situation from recurring on the controller that has been repaired.
<i>ADCF</i>	A/D convert failed. ADCF and PV toggle display	Controller input circuit failure.	Contact distributor for repair
<i>CJCE</i>	Cold junction compensation failed. CJCE and PV toggle display	Cold junction compensation failed.	Contact distributor for repair
<i>CJOR</i>	Cold junction compensation failed. CJOR and PV toggle display	Cold junction compensation failed.	Contact distributor for repair
<i>CJNR</i>	Cold junction compensation failed. CJNR and PV toggle display	Cold junction compensation failed.	Contact distributor for repair

18. FY/FA Fast Communication Register Address Table

Parameter	Register Address		R / W
	Hex	Dec	
INP1	0x48	72	R / W
RUCY	0x5D	93	R / W
CYT1	0x3E	62	R / W
HYSM	0x44	68	R / W
HYS1	0x3F	63	R / W
PMAC	0x12A	298	R / W
RH.TC	0x12F	303	R / W
RH.PO	0x130	304	R / W
RH.TM	0x131	305	R / W
OPFT	0x12D	301	R / W
PV2	0x68	104	R / W
MOLH	0x01	1	R / W
MOLL	0x12E	302	R / W
PSL	0x60	96	R

Parameter	Register Address		R / W
	Hex	Dec	
BITS	0x61	97	R
IDNO	0x62	98	R
BAUD	0x63	99	R
W_MD	0x119	281	R
MLNB	---	---	---
COMP	---	---	---
OFFS	---	---	---
MV.SF	0x12B	299	R / W
HBOP	0x12C	300	R / W
TRCL	0x132	306	R / W
TRCH	0x133	307	R / W
TP_K	0x121	289	R / W
PVOH	0x134	308	R / W

19. Program Design Table

OUD(control action)	<input type="checkbox"/> HEAT	_____
	<input type="checkbox"/> COOL	_____
WAIT		_____
Program repeat (SET8.1)	<input type="checkbox"/> 0 : not repeat	_____
	<input type="checkbox"/> 1 : repeat	_____
Power failure (SET8.2)	<input type="checkbox"/> 0 : disable	_____
	<input type="checkbox"/> 1 : enable	_____
Program start address (SET8.3)	<input type="checkbox"/> 0 : from zero	_____
	<input type="checkbox"/> 1 : from PV	_____
PVST	<input type="checkbox"/> 0 : FULT	_____
	<input type="checkbox"/> 1 : CUTT	_____
Program time format (SET9.2)	<input type="checkbox"/> 0 : hour.minute	_____
	<input type="checkbox"/> 1 : minute.second	_____

SEG	Parameter	PTN=1	PTN=2	PTN=3	PTN=4	PTN=5	PTN=6
1	SV_1						
	TM_1						
	OUT1						
2	SV_2						
	TM_2						
	OUT2						
3	SV_3						
	TM_3						
	OUT3						
4	SV_4						
	TM_4						
	OUT4						
5	SV_5						
	TM_5						
	OUT5						
6	SV_6						
	TM_6						
	OUT6						
7	SV_7						
	TM_7						
	OUT7						
8	SV_8						
	TM_8						
	OUT8						

SEG	Parameter	PTN=7	PTN=8	PTN=9	PTN=10	PTN=11	PTN=12
1	SV_1						
	TM_1						
	OUT1						
2	SV_2						
	TM_2						
	OUT2						
3	SV_3						
	TM_3						
	OUT3						
4	SV_4						
	TM_4						
	OUT4						
5	SV_5						
	TM_5						
	OUT5						
6	SV_6						
	TM_6						
	OUT6						
7	SV_7						
	TM_7						
	OUT7						
8	SV_8						
	TM_8						
	OUT8						

SEG	Parameter	PTN=13	PTN=14	PTN=15	PTN=16	PTN=17	PTN=18
1	SV_1						
	TM_1						
	OUT1						
2	SV_2						
	TM_2						
	OUT2						
3	SV_3						
	TM_3						
	OUT3						
4	SV_4						
	TM_4						
	OUT4						
5	SV_5						
	TM_5						
	OUT5						
6	SV_6						
	TM_6						
	OUT6						
7	SV_7						
	TM_7						
	OUT7						
8	SV_8						
	TM_8						
	OUT8						

20. 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			



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

Phone: +886-2-8226-1867
Fax: +886-2-8226-1834

E-mail: contact@fa-tale.com.tw
URL: <http://www.fa-tale.com.tw>