Sinny®

S4

Economic 4-Digit Dual Display PID Temperature Controller

TC4/TCA4 Series

Manual Instructions

Thanks for your choosing Sinny's products

Pls read the following safety considerations before use

■ Safety Considerations

※Please observe all safety considerations for safe and proper product operations to avoid hazards.

※ Safety considerations are categorized as follows.

⚠Warning Failure to follow these instructions may result in serious injury or death.

⚠Caution Failure to follow these instructions may result in personal injury or product damage.

⚠Warning

1. **Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss.(e.g.nuclear power control, medical equipment,ships,vehicles,railways, aircraft,combustion apparatus,safety equipment,crime/disaster prevention devices,etc.)**
   Failure to follow this instruction may result in personal injury,fire,or economic loss.
2. **The unit must be installed on a device panel before use.**
   Failure to follow this instruction may result in electric shock.
3. **Do not connect,repair,or inspect the unit while connected to a power source.**
   Failure to follow this instruction may result in electric shock.
4. **Check the terminal numbers before connecting the power source.**
   Failure to follow this instruction may result in fire.
5. **Do not disassemble or modify the unit,Please contact us if necessary.**
   Failure to follow this instruction may result in electric shock or fire.

⚠Caution

1. **Do not use the unit outdoors.**
   Failure to follow this instruction may result in shorten the life cycle of the unit,or electric shock.
2. **When connecting the power input and relay output cables,use AWG20(0.50mm^2)cables and make sure to tighten the terminal screw bolt above 0.74N.m to 0.90N.m.**
   Failure to follow this instruction may result in fire due to contact failure.
3. **Use the unit within the rated specifications.**
   Failure to follow this instruction may result in shorten the life cycle of the unit or fire.
4. **Do not use loads beyond the rated switching capacity of the relay contact.**
   Failure to follow this instruction may result in insulation failure,contact melt,contact failure,relay broken or fire.
5. **Do not use water or oil-based detergent when cleaning the unit.Use dry cloth to clean the unit.**
   Failure to follow this instruction may result in electric shock or fire.
6. **Do not use the unit where flammable or explosive gas,humidity,direct sunlight,radiant heat, vibration,or impact may be present.**
   Failure to follow this instruction may result in fire or explosion.
7. **Keep dust and wire residue from flowing into the unit.**
   Failure to follow this instruction may result in fire or product damage.
8. **Check the polarity of the measurement input contact before wiring the temperature sensor.**
   Failure to follow this instruction may result in fire or explosion.
9. **For installing the unit with reinforced insulation,use the power supply unit which basic level is ensured.**

■ Model composition

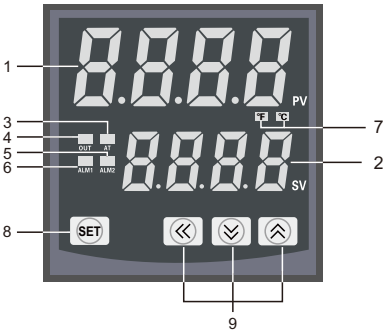
TC □-□-□ □ □-□

Power supply	2	100–240VAC
	4	24VDC
Input specification	T/R	TC(K E J N T S R B) RTD(Pt100 Cu50)
Alarm output	0	No alarm
	1	One alarm
	2	Two alarms
Output specification	W	Relay contact+SSR output
Size	S	W48 × H48mm
	H	W48 × H96mm
	W	W96 × H48mm
	M	W72 × H72mm
	L	W96 × H96mm
Product type	4	Series code
	A4	Series code
Item	TC	Temperature controllers

■ Specifications

Power supply		①100–240VAC ②24VDC
Allowable voltage range		90–110% of rated voltage
Power consumption		Max.8VA
Input specification	TC	K E J N T S R B
	RTD	Pt100 Cu50
Display accuracy		± 0.5%
Output specification		Relay contact output 250VAC 5A 1NO1NC
		SSR 12VDC ± 2V below 20mA
Alarm output		Relay 250VAC 5A Max.two sets of alarm outputs
Control method		ON/OFF position control、PID control
Sampling period		100ms
Relay life cycle		Mechanical above 2.5 million times, Electrical above 100000 times
Dielectric strength		2000VAC 50/60Hz for 1min. (between all terminals and case)
Vibration		0.75mm amplitude at frequency 5 to 55HZ(for 1min.) in each X,Y,Z direction for 2 hours
Insulation resistance		Min.100MΩ (500VDC) MEGA
Noise resistance		Square shaped noise by noise simulator(pulse width 1 μ s) ± 2kV R-phase,S-phase
Memory retention		Approx.10years(non-volatile semiconductor memory type)
Environment	Ambient temp.	-5~40℃ storage:-10~50℃
	Ambient humi.	35%~85%RH storage:35~85%RH

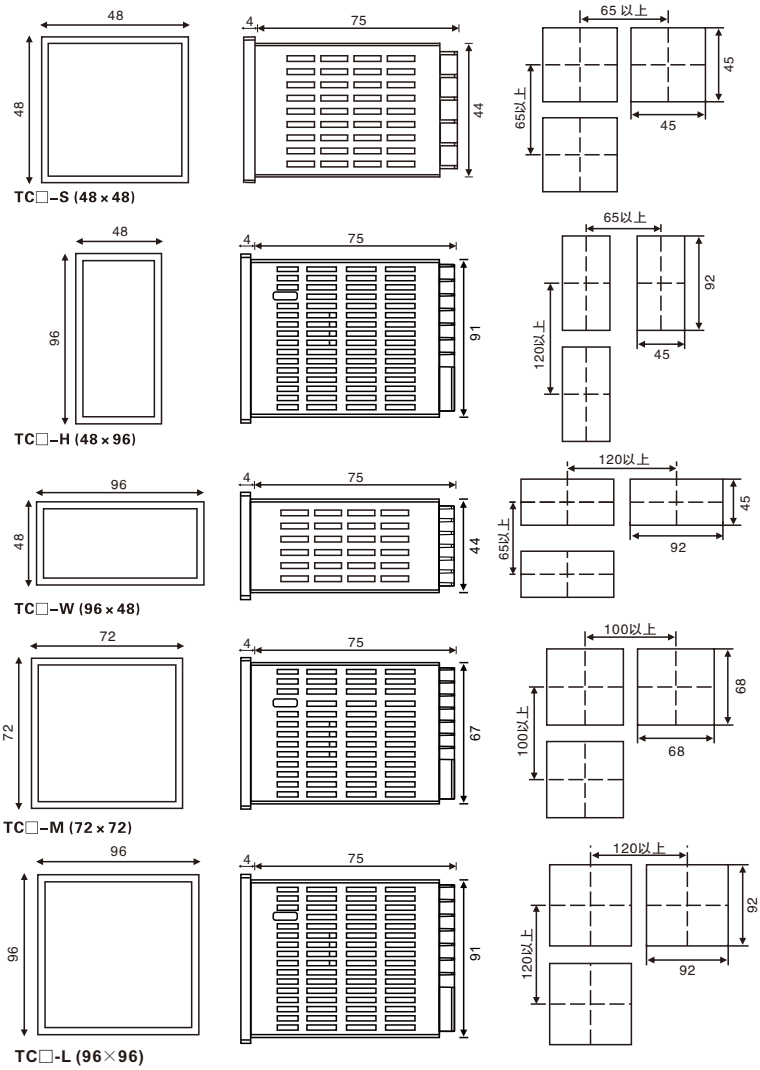
■ Parts description



1. **Present value (PV) display**
   1)RUN mode: Present value (PV) display
   2)Parameter setting mode:Parameter display
2. **Set value (SV) display**
   1)RUN mode: Set value (SV) display
   2)Parameter setting mode:Parameter setting value display
3. **Auto tuning(AT) indicator**
   Flash when the auto-tuning function working
4. **Control output(OUT) indicator**
   When control output is ON,the light turns ON
5. **Alarm output 2 indicator (ALM2)**
   When alarm 2 output is ON,the light turns ON
6. **Alarm output 1 indicator (ALM1)**
   When alarm 1 output is ON,the light turns ON
7. **Temperature unit (℃/℉) indicator**
   When ℃ indicator lights up , the unit is Celsius and ℉ indicator lights up ,it is in Fahrenheit
8. **SET key**
   Used when entering into parameter setting group, returning to RUN mode,turn the parameters down, and saving the set values
9. **key**
   Used when entering into set value change mode and digit up/down, press and hold the + keys for 3s to use the shortcut function

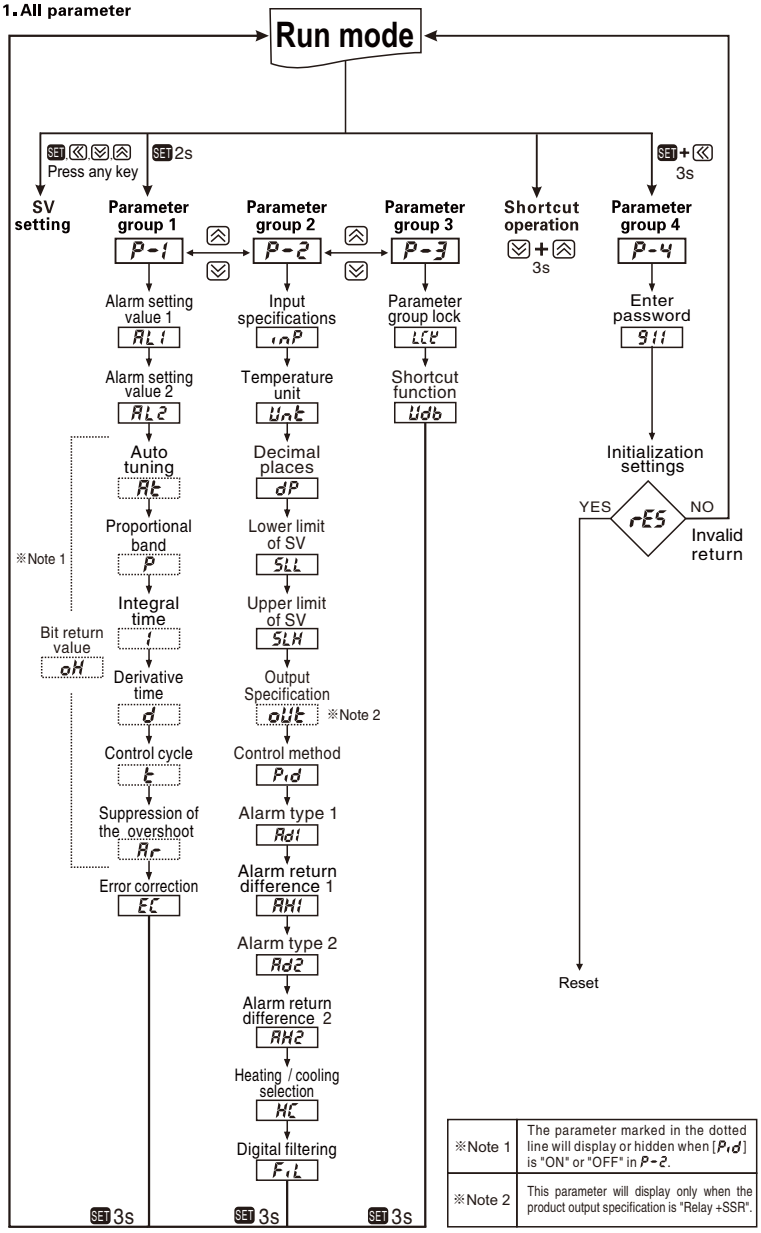
■ Dimensions

Unit:mm



▣ Parameter Setting

1. All parameter



※Note 1	The parameter marked in the dotted line will display or hidden when [Pid] is "ON" or "OFF" in P-2.
※Note 2	This parameter will display only when the product output specification is "Relay +SSR".

※ In the parameter setting mode, if no key is pressed within 30s, it will automatically return to the RUN mode and the changed parameters will not be saved.

※ In each parameter group, press SET once to save the set value and go to the next parameter.

※ In each parameter group, press SET for 3s to save the set value and return to the RUN mode. (In SV setting, press SET only once)

※ The parameters marked by [ ] may not be displayed depending on the model or other parameter settings.

※ When the [inP], [Unt], and [dP] parameters are changed, [SLL], [SLH], [AH1], [AH2] in "Parameter group 2" , [AL1], [AL2], [EC] in "Parameter group 1" and the "SV"setting value" parameter all will be initialized.

※ Set parameter as "parameter group 2" → "parameter group 1" → "SV setting" order considering parameter relation of each setting group.

※ After restoring the factory settings: 1. All parameters will be restored to the factory default(except for [oUt] in "Parameter group 2"). 2. Input specification defaults to "Required value of order " 3. the SV setting value is restored to "100".

2. Parameter group2[P-2]

Setting item	Parameter	Range	Factory default	Description
Input specification	inP	See table of input specifications and using range		
Temperature unit	Unt	℃ or ℉	℃	Set temperature units (℃ or ℉)
Decimal places	dP	0 or 1	0	Decimal places
Lower limit of SV	SLL	The minimun lower limit of the corresponding sensor type		Limit the lower limit of SV
Upper limit of SV	SLH	The maximum upper limit of the corresponding sensor type		Limit the upper limit of SV
Output Specification	oUt	RLY or SSR	RLY	Output specification selection, RLY for relay output, SSR for SSR output
Control Method	Pid	ON or OFF	ON	Control method selection,ON is PID control,OFF is ON / OFF position control.
Alarm Type1	Ad1	00 ~ 16	01	12 kinds of alarm types selection,see the alarm type for details.
Alarm Return Difference 1	AH1	0~100	1	The difference required to return to the non–alarm state in the first set of alarm states
Alarm Type2	Ad2	00 ~ 16	00	12 kinds of alarm types selection,see the alarm type for details.
Alarm Return Difference 2	AH2	0~100	1	The difference required to return to the non–alarm state in the second set of alarm states

continue from the Parameter group2[P-2] table

Heating/cooling Selection	HC	HET or COL	HET	HET is heating mode,COL is cooling mode.
Digital Filter	F.L	0 ~ 59	20	Unit is second, input sampling value filtering period

※Input specifications and usage range table

Input Specification		Display	Decimal places	Range of use (℃)	Range of use (℉)
Therm–ocouple	K	K	0	–30 ~ 1300	–22 ~ 2372
			1	–30.0 ~ 999.9	–22. 0 ~ 999.9
	E	E	0	–30 ~ 700	–22 ~ 1292
			1	–30.0 ~ 700.0	–22. 0 ~ 999.9
	J	J	0	–30 ~ 900	–22 ~ 1652
			1	–30.0 ~ 900.0	–22.0 ~ 999.9
	N	n	0	–30 ~ 1000	–22 ~ 1832
			1	–30.0 ~ 999.0	–22.0 ~ 999.9
	T	t	0	–30 ~ 400	–22 ~ 752
			1	–30.0 ~ 400.0	–22.0 ~ 752.0
	S	S	0	0 ~ 1760	32 ~ 3200
			1	0 ~ 999.0	32.0 ~ 999.9
	R	r	0	0 ~ 1750	32 ~ 3182
			1	0 ~ 999.0	32.0 ~ 999.9
	B	b	0	200 ~ 1800	392 ~ 3272
			1	200.0 ~ 999.0	392.0 ~ 999.9
Thermal resistance	Pt100	Pt	0	–200 ~ 650	–328 ~ 1202
			1	–99.0 ~ 650.0	–99.9 ~ 999.9
	Cu50	CU	0	–50 ~ 150	–58 ~ 302
			1	–50.0 ~ 150.0	–58.0 ~ 302.0

3. Parameter group 1[P-1]

Setting item	Parameter	Range	Factory default	Description
Alarm setting value1	AL1	The whole range	10	Set alarm1 data.
Alarm setting value2	AL2	The whole range	10	Set alarm 2 data.
Auto –tuning switch	At	ON or OFF	OFF	ON open auto– tuning, OFF close auto– tuning.
Proportional band	P	0.1 ~ 999.9	30.0	Proportional band of PID control, the unit is℃, recommended by auto– tuning.
Integral time	I	0 ~ 9999	240	Integral time of PID control,the unit is second, recommended by auto– tuning.
Derivative time	d	0 ~ 9999	60	Derivative time of PID control the unit is second, recommended by auto– tuning.
Control cycle	t	1 ~ 100	2 or 20	PID output control cycle , the recommended relay output is 20 seconds and the SSR output is 2 seconds.
Suppression of the overshoot	Ar	1 ~ 100	100	Used to suppress PID control overshoot,auxiliary control,recommened by auto– tuning.
Bit return control	oH	1 ~ 999	2	Set the interval between on and off for control(this parameter is displayed only in bit control)
Error correction	EC	–99~999	0	Error correction of display temperature.

4. Parameter group 3[P-3]

Setting item	Parameter	Range	Factory default	Description
Parameter group lock	LCK	0 1 2 3 4	0	0 Unlock 1 Lock [P-3] 2 Lock [P-3] , [P-2] 3 Lock [P-3], [P-2] 4 Lock [P-3], [P-2], [P-1], SV setting
Shortcut function	Udb	OFF AT AL OUT	OUT	See shortcut operation for more details

※When the current parameter group is locked, it can be viewed but not modified.

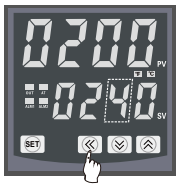
5. SV setting

You can set the temperature to control with SET, ≪, ≫, ≪ key.

Ex) In case of changing set temperature from 240℃ to 250℃.

1) 

Press any key among SET, ≪, ≫, ≪ key in RUN mode, the right digit as SV display flashes and it enters to SV setting group.

2) 

Press ≪ key to move the desired digit.

3) 

Press ≫ or ≪ key to move the desired number.

4) 

Press SET key to save the value and it controls with this set value.

6.Shortcut operation

Press and hold the ⩒ + ⩓ work for 3s to work the shortcut function.

※The specific function depends on the shortcut function type [Udb] in "Parameter group 3".

※Factory default : RELAY/SSR switching.

※This function is not affected by the parameter group lock [LCY].

Shortcut Key Parameters	Display	Description
OFF	/	No shortcut function.
AT		For auto-tuning work/stop, same function as Auto-tuning [At] in "Parameter group 1", ON for work, OFF for stop.
AL		The user can force the alarm to be released when it is alarm. ON is not released, OFF is released. When the alarm range is exceeded, this function is reset.
OUT		For changing output specifications, same function as output specification [oUt] in"Parameter group 2". RLY for relay output, SSR for SSR output

7.Restore factory settings

Press and hold SET + ⩤ at the same time for 3s and then enter into "Parameter group 4" and enter the password 911, which will enter into the parameter reset [rES].

Select "no" and previous settings are maintained. Select "YES" and all parameters resume to default setting.

※The [oUt] in "Parameter group 2" are not restored.

▣ Functions

1. Auto tuning[At]

PID auto- tuning measures the control subject's thermal characteristics and thermal response rate, and then determines the necessary PID time constant.And through this function,automic setting of parameters can be realized to achieve high-speed and stable control.

※ During auto tuning, the heating system should be in working condition, the measured value PV is lower than the set value SV.

※ Control method [P.d] when parameters are in state of "on",auto tuning switch will be displayed.

※ Set the auto- tuning switch[At] in state of "on" , AT indicator light starts flashing to indicate that it has entered the auto- tuning state.

※ During auto tuning process,all parameter groups and SV settings will be locked. if manual interruption of auto- tuning , the auto- tuning switch[At] should be set to"oFF" .

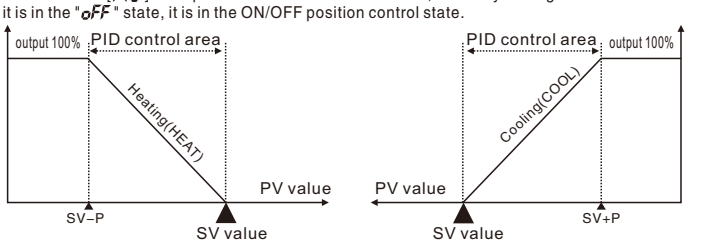
※ During auto- tuning process, it will be automatically interrupted if there are failures code "HHHH "or"LLLL" .

※ When finish auto tuning , AT indicator light stop flashing, the resulting parameters P、I、d、A are automatically saved, then return to new control state as new parameters P、I、d、A and other parameters continue to run.

※ Any interruption of auto tuning, the parameters P、I、d、Ar and other parameters will not be modified.

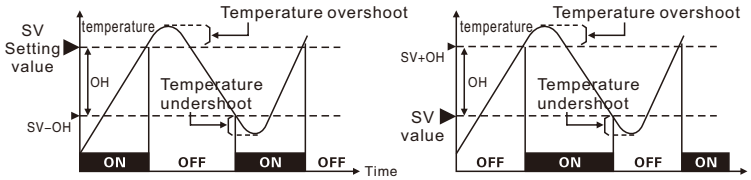
2. Control method [P.d]

Control method [P.d] when parameters are in state of "on ", currently belongs to PID control mode. if it is in the "oFF " state, it is in the ON/OFF position control state.



1) PID control, heating mode
The larger the measured value, the smaller the output

2) PID control, cooling mode
The larger the measured value, the larger the output



3) ON/OFF position control, heating mode

4) ON/OFF position control, cooling mode

3. Suppression of the overshoot [Ar]

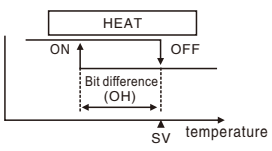
When the PID control is used , suppression of the overshoot adjustment is made. The larger the setting value is, the faster the heating is and the overshoot is easy. The smaller the setting value is ,the slower the heating is , and the overshoot is not easy. factory default is 60,and it is recommended to set the value by PID auto tuning.

4. Position control return difference [oH]

Set the interval between ON and OFF for controlling output in ON/OFF position control.

※ Control method [P.d]when parameters are in state of "oFF" bit difference [oH] will be displayed.

※ If the hysteresis is too small, control output instability may occur due to external interference, etc.



5.Error correction [EC]

Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error. If actual temperature is 80℃ but controller displays 78℃,set input correction value[EC] as "002 " and controller displays 80℃.

※ Setting range -99~999℃

※ As the result of error correction, if current temperature value(PV) is over the limit range ,it displays "HHHH" or "LLLL".

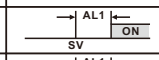
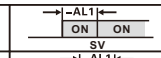
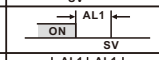
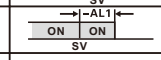
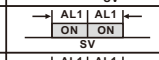
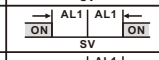
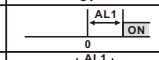
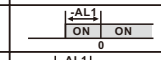
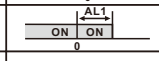
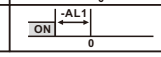
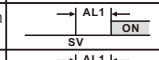
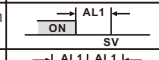
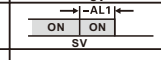
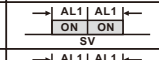
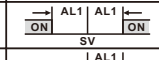
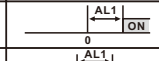
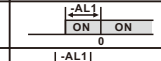
6. Digital filtering[F.L]

The present value (PV) may change repeatedly due to unstable input signal or external interference, which may prevent accurate control. In this case, the digital filtering function can be used to stabilize the present value (PV) and achieve accurate control.

※ If the digital filtering is set to 1 second, the input sample values will be filtered in 1 second cycles.

※ When using this function, it is normal that the present value (PV) may deviate from the actual input value.

7.Alarm type1 [Ad1]

Set value	Alarm	Positive alarm value(AL1)	Negative alarm value(-AL1)	Deviation alarm/ absolute value alarm
0	No alarm function	No output		
1	Upper limit Deviation			Deviation alarm
2	Lower limit Deviation			Deviation alarm
3	Interval alarm		Always off	Deviation alarm
4	Off-range alarm		Always on	Deviation alarm
5	Absolute upper limit			Absolute value alarm
6	Absolute lower limit			Absolute value alarm
10	No alarm function	No output		
11	Upper limit deviation of standby			Deviation alarm
12	Lower limit deviation of standby			Deviation alarm
13	Alarm within standby		Always off	Deviation alarm
14	Alarm outside standby		Always on	Deviation alarm
15	Absolute upper limit of standby			Absolute value alarm
16	Absolute lower limit of standby			Absolute value alarm

8.Alarm type2 [Ad2]

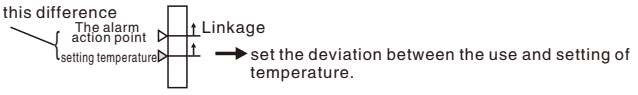
Idem, the default is "0".

● **Deviation alarm**

Use when you want to set up a temperature to produce a linkage.

The alarm action point will change with the change of setting temperature.

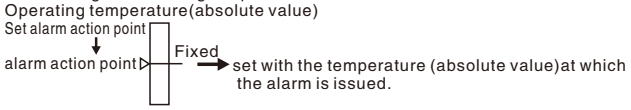
Set by this difference



● **Absolute value alarm**

No need to use linkage with setting temperature

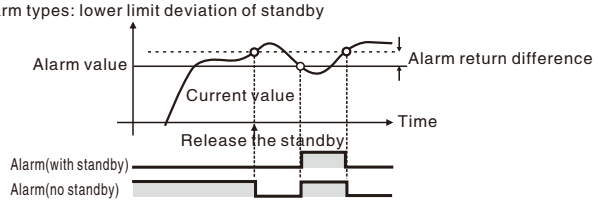
Operating temperature(absolute value)



● **Standby function**

The standby function means that start from the present value is out of the alarm range, and to the next alarm range before, even if the alarm ON condition is reached, the alarm will not be ON.

Ex)alarm types: lower limit deviation of standby



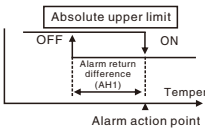
9.Alarm return difference 1 [AH1]

It is used to return to the difference of non-alarm state under the alarm state.

For example, the alarm action is 120℃ in total, and set the alarm return difference is 20℃.It is the alarm state when the temperature reaches above 120 ℃, and it is the non-alarm state when the temperature falls below 100 ℃.

※ Set range:0 ~ 100℃.

※ The factory default:1℃



10.Alarm return difference 2 [AH2]

Idem, the default is"1"

▣ Error

Display	Description	Troubleshooting
HHHH	Input broken or out of input range	Pls check if the input signal is wrong
LLLL	Input broken or out of input range	Pls check if the input signal is wrong