

Sinny[®] 3-Digit Dual Display PID Temperature Controller

S3 TC3 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

- 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.
- The unit must be installed on a device panel before use.** Failure to follow this instruction may result in electric shock.
- Do not connect, repair, or inspect the unit while connected to a power source.** Failure to follow this instruction may result in electric shock.
- Check the terminal numbers before connecting the power source.** Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit. Please contact us if necessary.** Failure to follow this instruction may result in electric shock or fire.

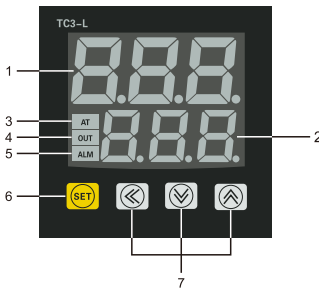
⚠ Caution

- Do not use the unit outdoors.** Failure to follow this instruction may result in shorten the life cycle of the unit, or electric shock.
- When connecting the power input and relay output cables, use AWG20(0.50mm²) 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.
- Use the unit within the rated specifications.** Failure to follow this instruction may result in shorten the life cycle of the unit or fire.
- 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.
- 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.
- 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.
- Keep dust and wire residue from flowing into the unit.** Failure to follow this instruction may result in fire or product damage.
- Check the polarity of the measurement input contact before wiring the temperature sensor.** Failure to follow this instruction may result in fire or explosion.
- For installing the unit with reinforced insulation, use the power supply unit which basic level is ensured.**

■ Model composition

| | | | | | |
|--------------|-------------------------------------|-------------------------|---|--------------------------|---|
| TC | - | - | - | - | * |
| Item | Com. output | Blank | NO RS485 function | | |
| | | C | RS485 Communication output (Modbus RTU method) | | |
| | Power supply | 2 | 100-240VAC | | |
| | | 4 | 24VDC | | |
| | Input specification | G | TC(K E J N T S R B) RTD(Pt100 Cu50) mA(0-20mA 4-20mA) V(0-5V 1-5V) | | |
| | | 0 | No alarm | | |
| | Alarm output | 1 | One alarm | | |
| | | Output specification | W | Relay contact+SSR output | |
| | 1U | | Voltage controlled output | | |
| | 2U | | Temperature variable voltage output | | |
| 1A | Current controlled output | | | | |
| 2A | Temperature variable current output | | | | |
| Size | S | W48 × H48mm | | | |
| | H | W48 × H96mm | | | |
| | M | W72 × H72mm | | | |
| | L | W96 × H96mm | | | |
| Product type | 3 | Series code | | | |
| | TC | Temperature controllers | | | |

■ 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 indicator(ALM)

When alarm 2 output is ON, the light turns ON

6. SET key

Used when entering into parameter setting group, returning to RUN mode, turning the parameters down, and saving the set values

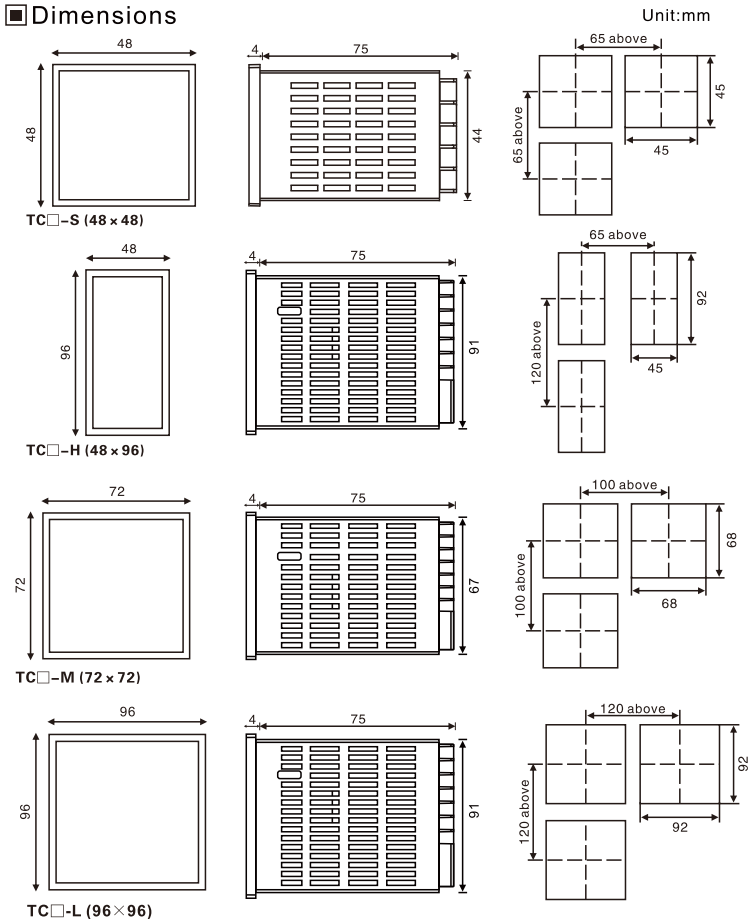
7. ← → ⏴ ⏵ key

Used when entering into set value change mode and digit up/down, press and hold the ← + ⏴ keys for 3s to use the shortcut function.

■ Specifications

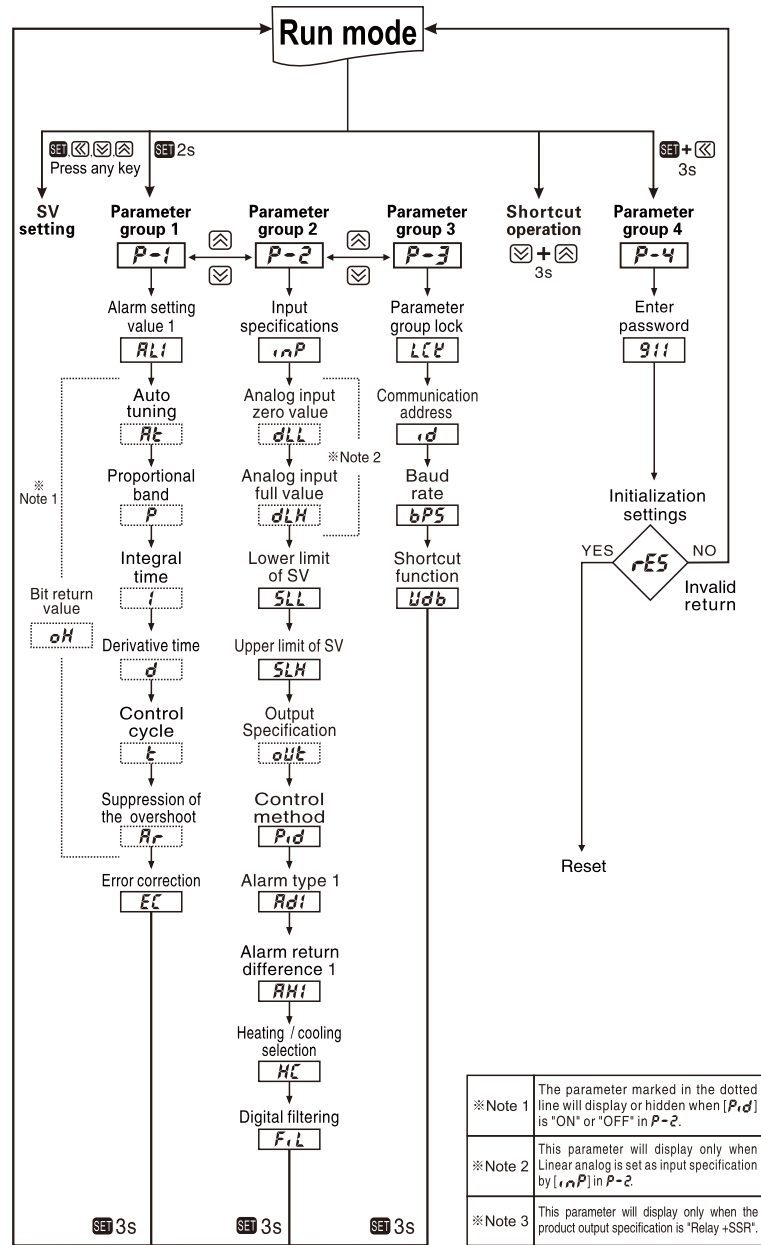
| | | |
|-------------------------|--|--|
| Power supply | ①100-240VAC ②24VDC | |
| Allowable voltage range | 90-110% of rated voltage | |
| Power consumption | Max.8VA | |
| Input specification | TC | K E J N T S R B |
| | RTD | Pt100 Cu50 |
| | Linear current | 0-20mA 4-20mA |
| | Linear voltage | 0-5V 1-5V |
| Display accuracy | ± 0.5% | |
| Output specification | Relay contact output | 250VAC 5A 1NO1NC |
| | SSR | 12VDC ± 2V below 20mA |
| | Voltage output(control output / variable output) | Current output(control output / variable output) |
| Option output | Alarm output | Relay 250VAC 5A Max.two sets of alarm outputs |
| | Com. output | RS485 Communication output (Modbus RTU method) |
| 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(for1min.) in eachX,Y,Z direction for 2 hours | |
| Insulation resistance | Min.100MΩ (500VDC) MEGA | |
| Noise resistance | Square shaped noise by noise simulator(pulse width 1 μs) ± 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 |

■ Dimensions



Parameter Setting

1. All parameter



- ※ 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 [$i.nP$] parameters are changed, [SLL], [SLH], [RHi], in "Parameter group 2", [RLi], [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 [$i.d$], [$bP5$] in "Parameter group 3" and [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 group 2 [P-2]

| Setting item | Parameter | Range | Factory default | Description |
|-----------------------------|-----------|--|-----------------|---|
| Input specification | $i.nP$ | See table of input specifications and using range | | |
| Analog input zero value | dLL | -99 ~ 999 | 40 | For example, when the input is 4~20mA, show display value of 4mA |
| Analog input full value | dLH | -99 ~ 999 | 200 | For example, when the input is 4~20mA, show display value of 20mA |
| Lower limit of SV | SLL | The minimum 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 | $P.d$ | ON or OFF | ON | Control method selection, ON is PID control, OFF is ON / OFF position control. |
| Alarm Type1 | Rdi | 00 ~ 16 | 01 | 12 kinds of alarm types selection, see the alarm type for details. |
| Alarm Return Difference 1 | RHi | 0~100 | 1 | The difference required to return to the non-alarm state in the first set of alarm states |
| 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 | Range of use (°C) | |
|---------------------|---------|---------------------|-----------|
| Thermocouple | K | \mathcal{K} | -30 ~ 999 |
| | E | \mathcal{E} | -30 ~ 700 |
| | J | \mathcal{J} | -30 ~ 900 |
| | N | \mathcal{N} | -30 ~ 999 |
| | T | \mathcal{T} | -30 ~ 400 |
| | S | \mathcal{S} | 0 ~ 999 |
| | R | \mathcal{r} | 0 ~ 999 |
| Thermal resistance | B | \mathcal{b} | 200 ~ 999 |
| | Pt100 | Pt | -99 ~ 650 |
| Linear analog | Cu50 | Cu | -50 ~ 150 |
| | 4~20mA | RY | -99 ~ 999 |
| | 0~20mA | RD | |
| | 1~5V | UI | |
| 0~5V | UD | | |

3. Parameter group 1 [P-1]

| Setting item | Parameter | Range | Factory default | Description |
|------------------------------|-----------|-----------------|-----------------|---|
| Alarm setting value1 | RLi | The whole range | 10 | Set alarm 1 data. |
| Auto-tuning switch | Rt | ON or OFF | OFF | ON open auto-tuning, OFF close auto-tuning. |
| Proportional band | P | 0 ~ 999 | 30 | Proportional band of PID control, the unit is °C, recommended by auto-tuning. |
| Integral time | i | 0 ~ 999 | 240 | Integral time of PID control, the unit is second, recommended by auto-tuning. |
| Derivative time | d | 0 ~ 999 | 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 | Rr | 1 ~ 100 | 60 | Used to suppress PID control overshoot, auxiliary control, recommended 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 | LcL | 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 |
| Communication address | $i.d$ | 001 ~ 099 | 1 | User set address |
| Baud rate | $bP5$ | 24 48 96 192 384 | 96 | Multiply by 100 when reading the set value |
| 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°C to 250°C

- Press any key among **SET**, **←**, **↓**, **↑** key in RUN mode, the right digit as SV display flashes and it enters to SV setting group.
- Press **↓** key to move the desired digit.
- Press **↓** or **↑** key to move the desired number.
- Press **SET** key to save the value and it controls with this set value.







6. Shortcut operation

Press and hold the $\text{☑} + \text{☒}$ 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 [LCP].

| 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 $\text{☑} + \text{☒}$ 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 [rd], [bPS] in "Parameter group 3" and [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, automatic 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 [Pd] 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".

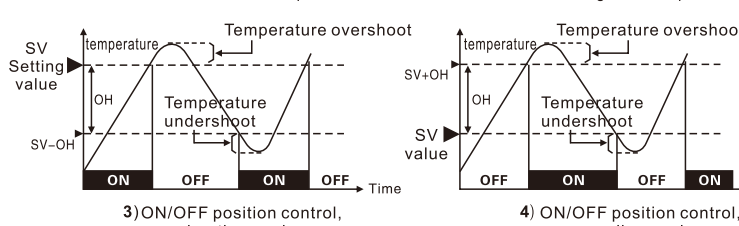
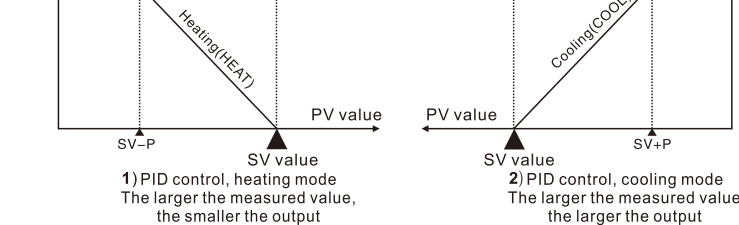
※During auto-tuning process, it will be automatically interrupted if there are failures code "HHH" or "LLL".

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

※Any interruption of auto tuning, the parameters P , i , d , Rr and other parameters will not be modified.

2. Control method [Pd]

Control method [Pd] 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.



3. Suppression of the overshoot [Rr]

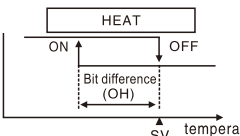
When the PID control is used, suppression of the overshoot adjustment is made. The larger the setting value is, the faster the heating is and the overshoot is easy. The smaller the setting value is, the slower the heating is, and the overshoot is not easy. factory default is 60, and it is recommended 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 [Pd] 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°C but controller displays 78°C, set input correction value [EC] as "002" and controller displays 80°C.

※Setting range -99-999°C


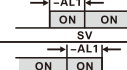
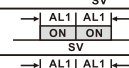
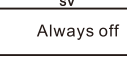
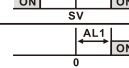
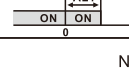


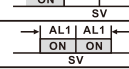
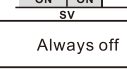
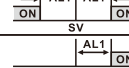

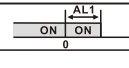
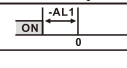
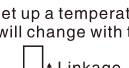
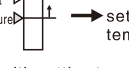
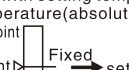
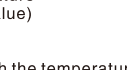

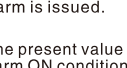
※As the result of error correction, if current temperature value (PV) is over the limit range, it displays "HHH" or "LLL".

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.

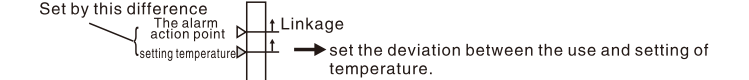
※When using this function, it is normal that the present value (PV) may deviate from the actual input value.

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 |

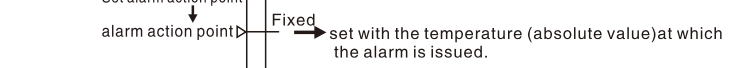
● Deviation alarm

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.



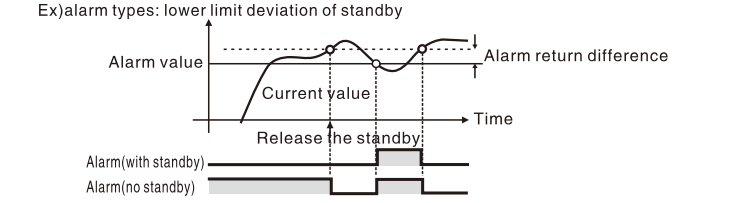
● Absolute value alarm

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.



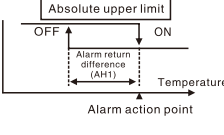
8. Alarm return difference 1 [RH1]

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

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

※Set range: 0 - 100°C.

※The factory default: 1°C



Error

| Display | Description | Troubleshooting |
|---------|------------------------------------|--|
| HHH | Input broken or out of input range | Pls check if the input signal is wrong |
| LLL | Input broken or out of input range | Pls check if the input signal is wrong |

Caution

- The connection wire of this unit should be separated from the power line and high voltage line in order to prevent from inductive noise.
 - Please install power switch or circuit-breaker in order to cut power supply off.
 - Keep away from the high frequency instruments. (High frequency welding machine & sewing machine, large capacity SCR controller)
 - This unit may be used in the following environments.
 - It shall be used indoor
 - Pollution degree 2
 - Altitude up to 2000m
 - Installation category II
- ※ Failure to follow these instructions may result in product damage.