INKBIRD
SMART HOME I SMART LIFE

PID Temperature Controller

IPB—26
User Manual

Version 1.0

Catalogue

- Ensure the product using within the specification.

- Do not touch the terminals at least while power is being supplied. Doing so may occasionally result in injury due to electric shock.

- Do not allow pieces of metal, wire clippings, or fine metallic shaving or filings from installation to enter the product. Doing so may occasionally result in electric shock, fire, or malfunction.

- Do not use the product where subject to flammable or explosive gas. Otherwise, injury from explosion may occasionally occur.

- Don't put any object on the top of the radiator, otherwise it will block the heat radiator cooling.

- Non-professionals, do not disassemble, modify, maintain controller or touch internal parts, or there will occur electrocution, sparks or false actions.

- The sensor must be in the controlled object when opening the controller. If the sensor isn't in the controlled object, the controller's temperature will be low even if the controlled object is hot. The controller will provide heater with full power. It will make the controller overheat, break the device, even cause fire.

- Any abnormal indication or noise is being observed, turn down the controller, disconnect the power, and contact the manufacturer before reusing.

- If the controller is not used for a long time, please turn off the leakage switch.

Input voltage	AC 240V 60Hz
Output voltage	HEAT: AC 240V 60Hz
	PUMP: AC 120V 60Hz
Maximum Current	30A for 240V AC
Heat output	Built-in optical isolated SSR of the output switch device with no-voltage crossbar switch.
Pump output	Relay output: AC 120V 8A (resistance load)
	Relay electric life: 100000 times
Character display	PV/SV: 20.40mm character height red high light LED
Sensor Type	NTC sensor (R25 ºC=10KΩ)
Probe cable length	10 ft (3 meter)
Temperature resolution	0.1ºC or 0.1ºF
Temperature Control Range	-50~125°C / -58~257°F
Unit display	Celsius or Fahrenheit
Sampling period	0.5 second
Weight	About 6500g
Dimension	10×11.6×6.1 inch (255×295×155 mm) W×H×D
Working environmental temperature	-10~55ºC/14~131ºF(no freeze or condensation state)
Working environmental humidity	RH 35-85%
Storage environmental temperature	-25~65ºC/-13~149ºF(no freeze or condensation)
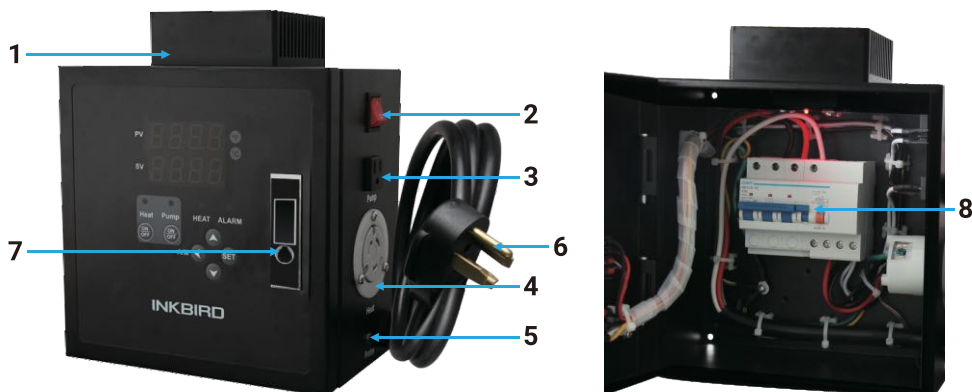
1. Aluminum Heat Sink
The aluminum heat sink is used for heat dissipation during the working process of solid state relay(SSR) , must be well placed under the ventilated environment.

2. Power Switch
The power switch controls the electricity supply of the controller power panel, it is not the master power switch.

3. Water Pump Control Outlet Socket
The load of external pump should not exceed 8A.

4. Heating Control Outlet Socket
240V/60Hz, 30 amp, NEMA L6-30, socket with lock nut.

5. Temperature Probe Interface
A port for supporting temperature sensor that comes with the controller.

6. Power Cord
10 ft, 30 amp, 4 Prong Dryer Power Cord.

7. Controller Box Lock
The lock of the controller box must be closed and locked before running the controller.

8. GFCI

Ground fault circuit interrupter (GFCI) is a type of circuit breaker which shuts off electric power when it senses an imbalance between the outgoing and incoming current.

Note: The controller may have problems such as damage and loosening during transportation, you should check the contents of the delivery promptly once received it. Unlock the controller cabinet to make sure that all the internal components are well fixed before using it.

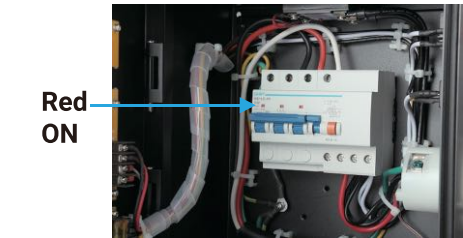### ✳ Operation diagram of the controller box lock

Unlocked   **Locked**

Push the lock and the clip will pop-up, then you can open the controller box. Fold the clip back to lock the the controller box when it is closed.

✳ Circuit breaker state diagram

Green
OFF

Red
ON
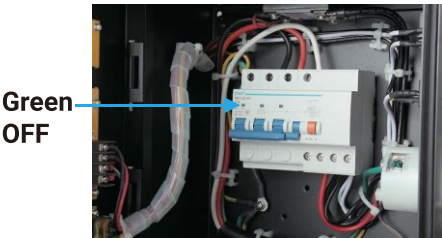
Must keep your hands dry before closing the circuit breaker to avoid serious injuries.
Do not touch the metal screws while holding the wires.
Keep the circuit breaker closed if not used for a long time.

✳ Panel instruction

PV Displaying Screen ①
SV Displaying Screen ②
Working Indicator Light ③
HEAT ON/OFF Button ④
PUMP ON/OFF Button ⑤
SHIFT Button ⑦
DOWN Button ⑧

⑨ UP Button
⑥ SET Button

PV **SV** **Heat** **Pump** **HEAT** **ALARM** **ON/OFF** **A/M** **SET**

INKBIRD

① **PV Displaying Screen:** Display the measuring value or the setting parameters.

② **SV Displaying Screen:** Display setting value or the set parameters readout.

③ **Working Indicator Light**

    HEAT: Control Output Indicating

    ALARM: Alarm Indicating

④ **HEAT ON/OFF Button:** Press it to turn on the heating output, the green lamp is on, and then press again to turn the heating output off, the green lamp is off.

⑤ **PUMP ON/OFF Button:** Press it to turn on the pump output, the green lamp is on, then press it again to turn pump output off, the green lamp is off.

⑥ **SET Button:** Press this button can read the value of control output and the set temperature. Hold and press this SET button for 3s or more will enter into the parameters settings mode.

⑦ **SHIFT BUTTON:** When setting the value or parameters,

    A, Press this button will switch to the required value position.

    B, Press this button will shift to the sub menu from the main menu.

    C, Press this button can be freely switching to another mode from manual or the automatic operation.
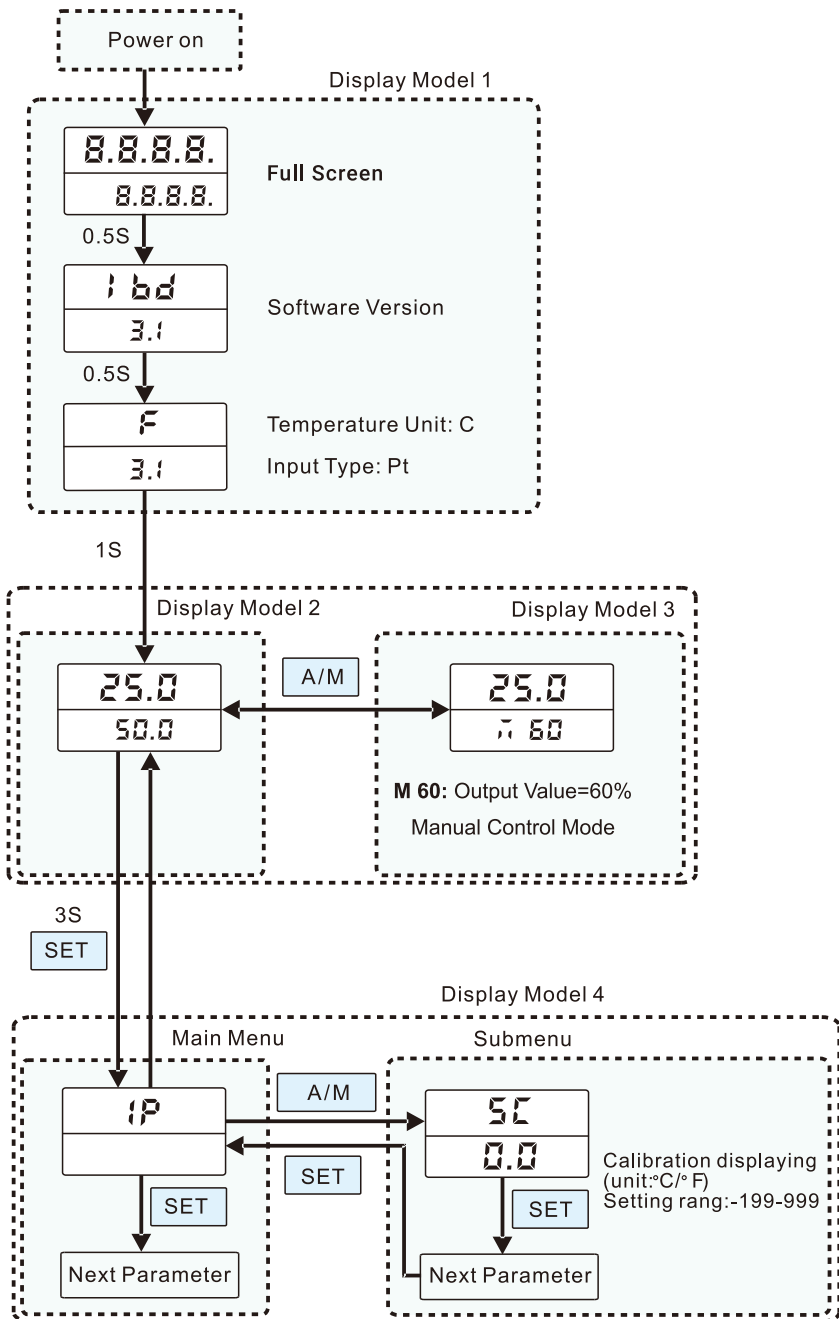
⑧ Press the down button to decrease the value when you are setting it, keep pressing the down button to reduce the value rapidly.

⑨ Press the up button to increase the value when you are setting it, keep pressing the up button to increase the value rapidly.

04 | Display Modes

4.1 Display Modes

Note: Please get the flow charts in the following page.

■   Display Model 1：When power on, with all LED displaying, and the version number of the software will display 1 second later. Then 1 second later, display temperature unit such as C in display 1: temperature unit =ºC, display F =ºF.

■   Display Mode 2：In operating mode, PV displays current temperature value, SV displays setting value.

■   Display Mode 3：Press the shift button for 3 seconds to switch to the manual output mode, press the button again to switch back to the automatic output mode.

■   Display Mode 4：Press SET for 3 seconds to enter into main menu, displaying with the parameters type; press shift button to enter into submenu to change parameters setting, for the detailed parameter definition, please see table 3 or setting flow chart.

Power on

Display Model 1

8.8.8.8.
8.8.8.8.
Full Screen

0.5S

1 bd
3.1
Software Version

0.5S

F
3.1
Temperature Unit: C
Input Type: Pt

1S

Display Model 2

25.0
50.0

A/M

Display Model 3

25.0
M 60

M 60: Output Value=60%
Manual Control Mode

3S

SET

Display Model 4

Main Menu

1P

A/M

Submenu

SC
0.0

Calibration displaying
(unit:°C/°F)
Setting rang:-199-999

SET

SET

SET

SET

Next Parameter

Next Parameter

7

4.2 Operation Instruction

4.2.1 Change Setting Value (SV)

Press ▲ or ▼ button then release, the decimal point in the lower right corner of the rightmost value of the SV setting value will blink, then press ▲ or ▼ button to change the value; if need to change to larger value, then press the shift button to move the flickering decimal point to the position of the desired value, or press and hold ▲ or ▼button to get the desired value with rapidly changing; then press SET button to save the changed value, the flickering decimal point will turn off and operate. The controller will automatically save the changed value and operate after 15 seconds without any operation of the SET button or other buttons.

4.2.2 Change Displaying Mode

Display mode 2: in automatic running state, PV displays current temperature, SV displays set temperature; press A/M button for 3 seconds to enter display mode 3, PV displays current temperature, SV displays setting value of output. If you press the button again, it will return to display mode 2.

4.2.3 Automatic Mode/Manual Mode Conversion

Press the A/M (switch) button for 3 seconds to switch to the automatic or manual mode. If you switch to the manual mode, the leftmost side of the SV will display M (eg: M0~M100). In this mode, the output value can be set arbitrarily.

4.2.4 Self-tuning

The factory defaults setting is fuzzy PID control mode, if need to change to self-tuning mode, then enter into the menu to select OP (output type) - Ctrl (control mode)-At (Self-tuning). When in self-tuning, the temperature may exceed the setting temperature value (will be different value with different heating system) with On-Off controlling. At this time, there will be alternate displaying in SV (setting value) and "AT" value until the self-tuning finished.

Main Menu Parameter	Function Setting	Description	Setting Range	Default	Note
IP	SC	Sensor Calibration	-199~999 ºC or ºF	0	5.2
	dL	Digital filtering	0~20	0	
OP	Ctrl	Control mode	PID: PID control AT: Self-tuning r: Reset to factory defaults ON/OF: On-Off control	PID	5.3
	H-C	Control system	HEAT: heating COOL: cooling	H	
ALP	Mode	Alarm Mode	0: Power on alarm prevent 1: power on with alarm	0	5.4
	HIAL	High limit alarm	-1999~9999 ºC or ºF	9999	
	LoAL	Low limit alarm	-1999~9999 ºC or ºF	-1999	
	dHAL	Positive deviation alarm	0~9999 ºC or ºF	9999	
	dLAL	Negative deviation alarm	0~9999 ºC or ºF	9999	
	dF	Hysteresis	0~200 ºC or ºF	0.3	
PId	Ctl	Control Period	1~120 seconds	4	5.5
	P	Proportional band	0~9999 %	50	
	I	Integral time	1~9999	30	
	d	Derivative time	1~9999	8	
unit	C-F	Temperature Unit	C: ºC F: ºF	C	5.6

Note: You can get the detailed setting instructions in the following content according to the direction in the Note column.
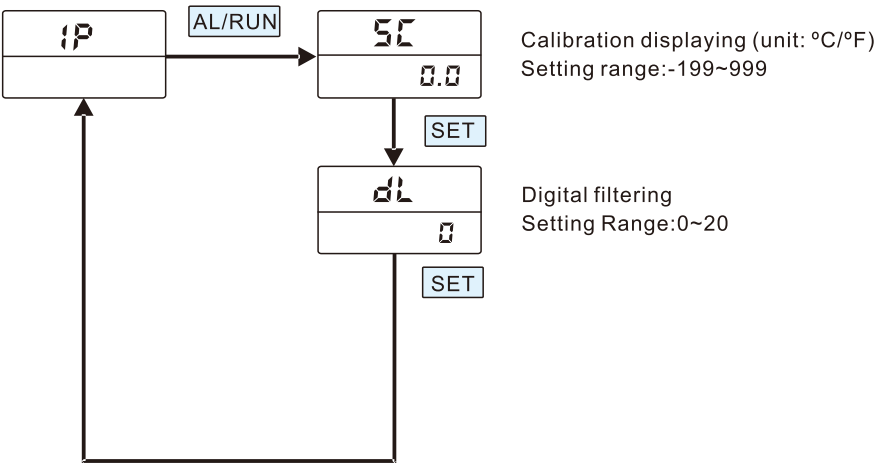
9

5.1 Setup Flow Chart

Main Menu Operation Flow Chart
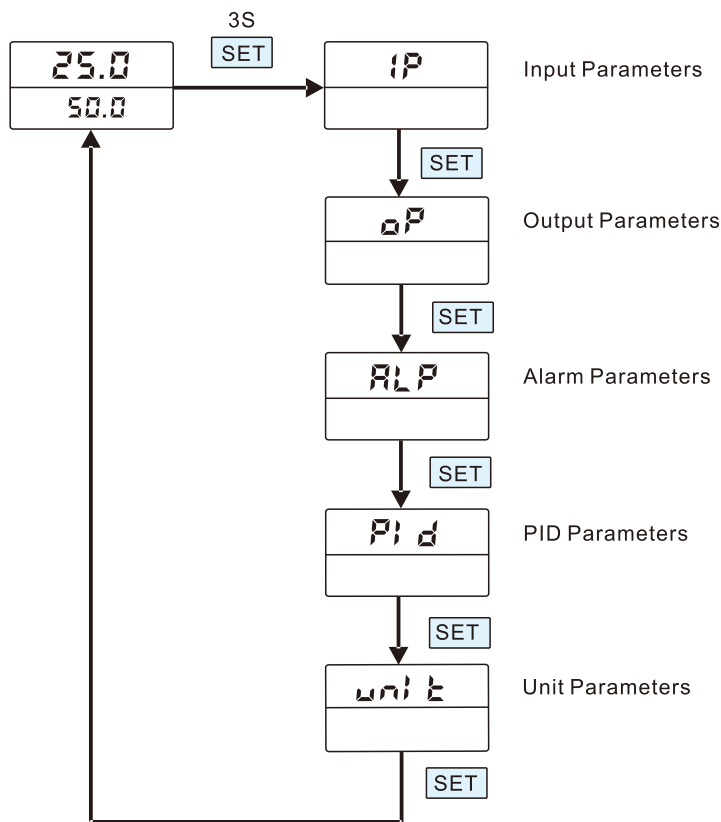
Press SET button for 3 seconds to enter into main menu, Output Parameters, Alarm Parameters, PID Parameters and Unit Parameters can be selected. Then press shift button to enter into the submenu if need to change the settings.

5.2 Input Parameters Setting

```
┌──────────┐   ┌─────────┐   ┌──────────┐
│    IP    │──▶│ AL/RUN  │──▶│    SC    │    Calibration displaying (unit: ºC/ºF)
│          │   └─────────┘   │     0.0  │    Setting range:-199~999
└──────────┘                 └──────────┘
     ▲                          │ SET
     │                          ▼
     │                       ┌──────────┐
     │                       │    dL    │    Digital filtering
     │                       │      0   │    Setting Range:0~20
     │                       └──────────┘
     │                          │ SET
     └──────────────────────────┘
```

2) Calibration Displaying SC
And this can be calibrated by setting SC parameter with the range of -199~999℃ or ﾟF, the formula: actual temperature –measuring temperature = SC setting value. This can be set at room temperature status.
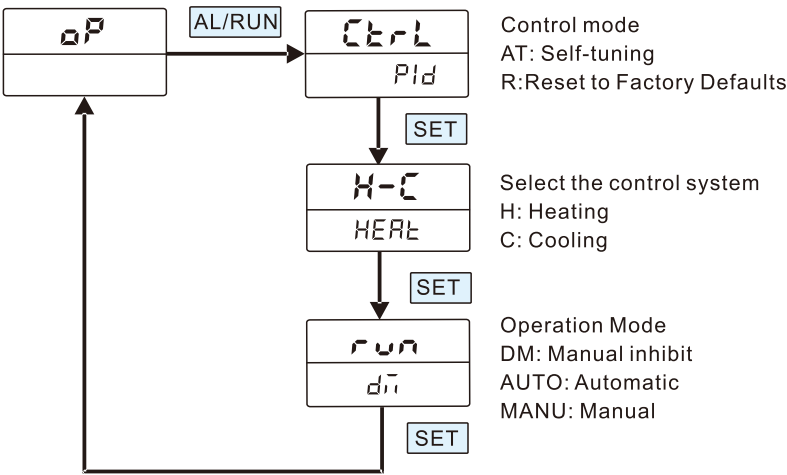e.g., Ensure there is default SC value before calibrating. If the actual temperature room temperature is 25ºC, but the controlling measuring the temperature at 20ºC, then set SC to 5.0ºC as the formula: 25ºC-20ºC＝5ºC.

3) Digital Filtering DL
There is the built-in digital filtering system of the temperature controller, if there is displaying with the frequent changing temperature values caused by the input interference, this dL can be set to get the stable average value. dL=0—20, the larger dL value set, the more stable measuring value will get, but also the slower response.
If there is no interference from working environment, then the dL value can be increased gradually until the instant alteration of the measuring values within 2-5 units. When verifying the instruments, the dL value should be set to 0 to speed up the response.

5.3 Output Parameters Setting

oP	

AL/RUN →

CtrL
PId

Control mode
AT: Self-tuning
R:Reset to Factory Defaults

SET

H-C
HEAt

Select the control system
H: Heating
C: Cooling

SET

run
dn

Operation Mode
DM: Manual inhibit
AUTO: Automatic
MANU: Manual

SET

1) Control Mode Ctrl
■ PID: default control mode, can be used at the first using, if there is not the controlling accuracy required, then can be changed to Self-tuning mode.

■ AT: Self-tuning control mode, can be set when there is not the required controlling accuracy by PID control mode, then the controller will be changed to on-off controlling. After 2-3 times switch actions of the temperature controlling, the microprocessor will analyze period, amplitude and oscillation wave caused by on-off control, then calculate the optimum parameter value. When in self-tuning, the temperature may exceed the setting temperature, and cause alarm, but there will be different value with different heating system. If there is not the required temperature value after self-tuning, then try to change the PID initial value before the self-tuning, or restart the self-tuning.

■ R： Reset to Factory Defaults, the PID parameters will be recovered to the defaults. After set the R, the self-tuning can be activated by pressing the shift button for more than 3 seconds, same operation as setting the AT to activate the self-tuning. After the self-tuning, the controller will be automatically enter into the PID setting, there is the optimal parameters saved after the self-tuning.

■ ON/OFF: On-Off Control, same as the mechanical thermostat, used in general controlling. The heating (cooling) will turn off when the temperature reach the set-point (set temperature value + temperature hysteresis value); and the heating (cooling) will turn on when the temperature drop to the set-point (set temperature value - temperature hysteresis value). The smaller hysteresis value set, the higher accuracy the controller control, but will cause the more frequent output control.
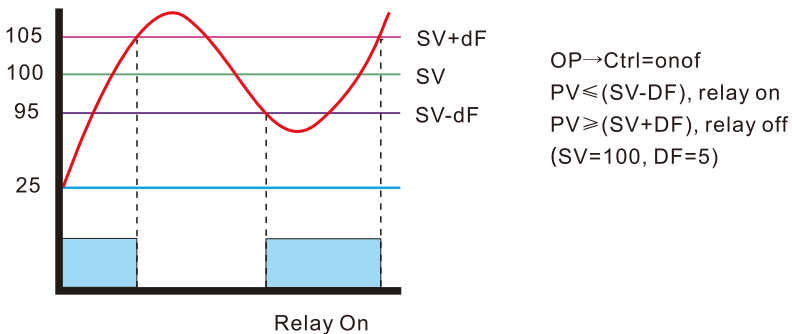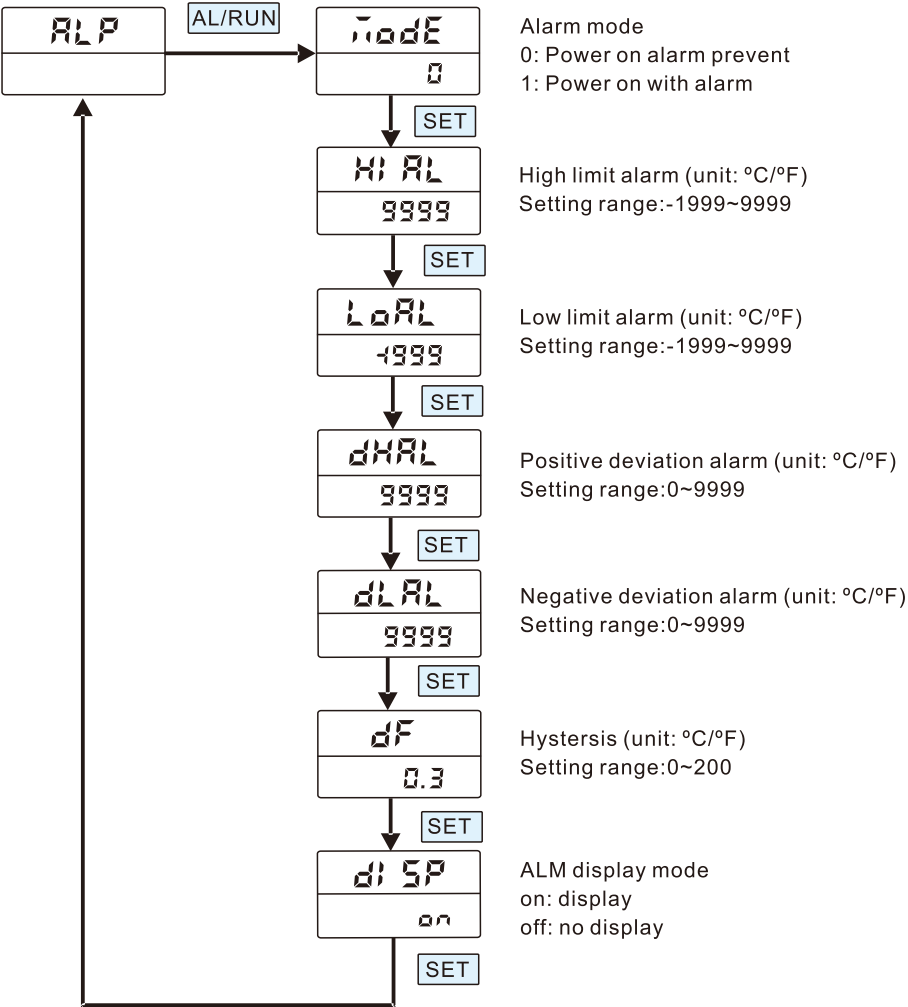

On/Off Control Figure

Control Operation Selection
■ HEAT: Heating, the factory default with heating settings.
■ COOL: Cooling, in cooling element control.

13

5.4 Alarm Parameters Setting

ALP → AL/RUN → **ModE** **0**
Alarm mode
0: Power on alarm prevent
1: Power on with alarm

SET

HI AL **9999**
High limit alarm (unit: ºC/ºF)
Setting range:-1999~9999

SET

LoAL **-1999**
Low limit alarm (unit: ºC/ºF)
Setting range:-1999~9999

SET

dHAL **9999**
Positive deviation alarm (unit: ºC/ºF)
Setting range:0~9999

SET

dLAL **9999**
Negative deviation alarm (unit: ºC/ºF)
Setting range:0~9999

SET

dF **0.3**
Hystersis (unit: ºC/ºF)
Setting range:0~200

SET

dISP **on**
ALM display mode
on: display
off: no display

SET

14

1) Alarm Mode
■ Set to 0：Power on alarm prevent, this will avoid alarming if the room temperatu re is far lower(higher) than the alarm set value when power on.
Alarm will be activated at the first time when power on the controller, the PV value rise (drop) to the same value as the SV and reach the alarm set value.
■ Set as 1：Power on with alarm, alarming will be activated once PV reach alarm set value. If need change the alarm control to heating (cooling) control output, it should be set to power no alarm prevent mode.

2) HIAL：High limit alarm, will be activated when measuring value higher than HIAL value, formula: $PV{>}HIAL{+}DF$(Hysteresis value).
3) LOAL：Low limit alarm, will be activated when measuring value lower than LOAL value, formula: $PV{<}LOAL{-}DF$(Hysteresis value).

4) DHAL：Positive deviation alarm, alarm will be activated when measuring value higher than DHAL value, formula: $PV{>}DHAL{+}DF$(Hysteresis value).

5) DLAL：Negative deviation alarm, alarm will be activated when measuring value higher than DLAL value, formula: $PV{>}DLAL{-}DF$(Hysteresis value).

6) DF: Hysteresis, also called temperature hysteresis, setting range 0-200℃ or °F(0=0.3℃ or °F). Set to avoid the false operation with frequent on-off from alarm output caused by the fluctuation of the input measuring value. DF hysteresis is work on both ON/OFF control and alarm setting. Alarm setting example：
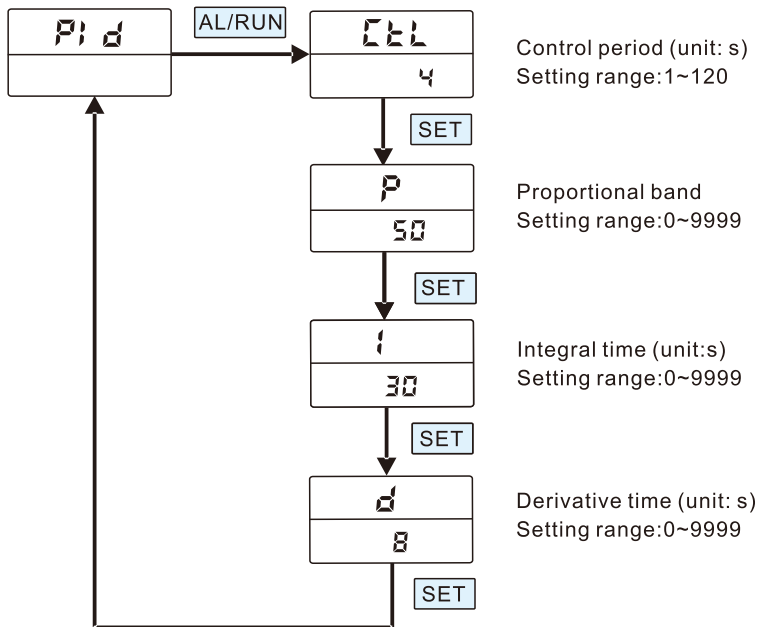

Relay On
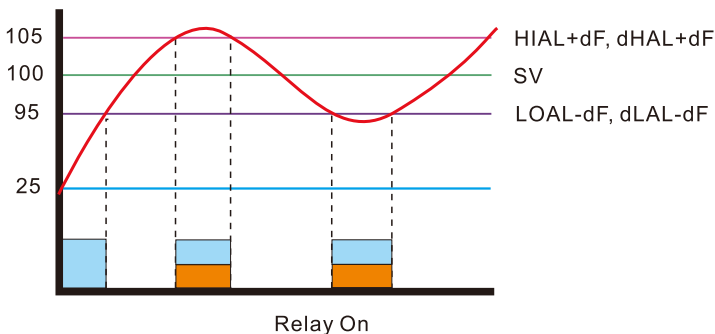
Alarm setting figure

1) DISP: Alarm display
■ ON: The alarm sign will be flashed in PV display window when alarming.
■ OFF: No alarm sign in PV display window when alarming.

5.5 PID Parameters Setting

PId → AL/RUN → **CtL** 4	Control period (unit: s) Setting range:1~120
SET ↓	
P 50	Proportional band Setting range:0~9999
SET ↓	
I 30	Integral time (unit:s) Setting range:0~9999
SET ↓	
d 8	Derivative time (unit: s) Setting range:0~9999
SET	

1）Ctl：Control period, setting range 0.5-120 seconds（0=0.5second）, the controlling accuracy will be higher if set Ctl within 4 seconds when in SSR control output, and normally set Ctl to 20 seconds when in relay control output. The time of Ctl can be shortened if there is not the satisfaction temperature controlling required. But based on the different heating system, the shorter control period will be accordingly shorten the working time of the mechanical switch.

OUT ON OUT ON OUT ON

12V

0V

←40%→←60%→←60%→←40%→

Ctl   Ctl

40%: SV=A 40 (M 40)   60%: SV=A 60 (M 60)
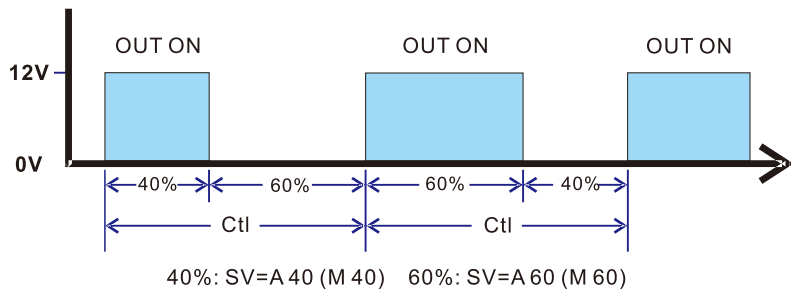
Time scale output figure

P: Proportional band, to accelerate the response speed and improve the adjustment accuracy of the system. The response speed and adjustment accuracy of the system will be improved by increasing P, but this may easily bring the overshooting and even the instability to the system. The too small value of P will reduce the accur acy, slow the response speed, delay the adjustment time and even break the static and dynamic performance of the system.

2）I：Integration time, to eliminate the steady-state errors of the system. The larger I value, the faster the steady-state errors can be eliminated, but too large I value will cause the integral saturation phenomena at initial stage of response process. If I value is too small, it will be hard to eliminate the steady-state errors of the system and it will also affect the adjustment accuracy of the system.

3）D：Derivative time, to improve the dynamic performance of the system, and it's main function is to restrain deviation's change in response process, and forecast the deviation change. But too large D value will advance the braking in response process, delay the adjustment time and will even degrade the anti-interference performance of the system.

5.6 Unit Parameters Setting

Temperature Unit
C：ºC   F：ºF
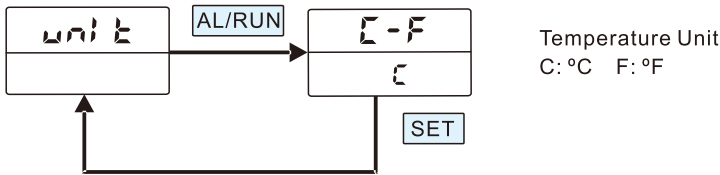
C-F：temperature unit
C for Celsius (ºC); F for Fahrenheit (ºF).

Malfunctions	Causes	Solutions
No Power	The Input Voltage doesn't meet the requirements of the controller	Input the correct supply voltage
	The RCCB(residual current circuit-breaker)is switched off	Turn on the RCCB
No Display	The controller power panel is broken	Replace a power panel
	The mainboard of the controller is broken	Replace a mainboard
Temperature Inaccuracy	Large temperature deviation	Calibrate the sensor value
	Sensor fault	Replace a new sensor
Display orAL	The sensor is not connected	Connect the sensor to the controller
	Sensor fault	Replace a new sensor
No Heat Output	The heating light on the panel doesn't work	Check if the settings are correct
	The heat light on the panel and the SSR light are all on	Replace a SSR

07 | Warranty and Service

7.1 Technical Assistance

If you have any problems installing or using this thermostat, please carefully and thoroughly review the instruction manual. If you require assistance, please write us to **Support@ink-bird.com**. We will reply your emails in 24 hours from Monday through Saturday.
You can also visit our web site **www.ink-bird.com** to find the answers of the common technical questions.

7.2 Warranty

INKBIRD TECH. C.L. warrants this thermostat for one year from the date of purchase when operated under normal condition by the original purchaser (not transferable), against defects caused by INKBIRD's workmanship or materials. This warranty is limited to the repair or replacement, at INKBIRD's discretion, of all or part of the thermostat. The original receipt is required for warranty purposes.
INKBIRD is not responsible for injury property damage or other consequential damages or damages of third parties arising directly from an actual or alleged in mater of workmanship of the product.
There are no representations, warranties, or conditions, express or implied, statutory or otherwise, other than herein contained in the sale of goods act or any other statue.

INKBIRD TECH.C.L

Support@ink-bird.com
www.ink-bird.com
+86-755-25738050
Shenzhen,GD,518000,China