Rapid Low-Temperature Cooling Circulating Bath
CK-4010GD
User Manual

DRAWELL
Artist of Science

Please read operating manual before installation and operation.

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I. Overview:

This product has an auto-tuning PID algorithm without overshoot, with complete functions and easy to use. It is the best product for analog temperature control. It is a common temperature control equipment necessary for medical equipment and laboratory instruments, and widely used in petroleum and national defense, Metallurgy, chemical industry, physics, biological engineering, chemistry, medicine and health, life science, electronic instrumentation, quality inspection and measurement, factory experiment, colleges and universities, scientific research institutions and other research departments.

II. Features:

1. This machine adopts totally enclosed environmental protection compressor for refrigeration, and the system adopts international advanced non-fluorine environmental refrigeration technology, which has the advantages of energy saving and environmental protection.

2. The refrigeration system has multiple protection devices for overheating and overcurrent.

3. Temperature microcomputer intelligent control, simple operation, good temperature stability, upper and lower limit temperature over-temperature alarm, PID automatic control.

4. The large-screen LCD display adopts international display standards and has various function indicator icons for users to see at a glance.

5. The intelligent microcomputer can correct the deviation of the temperature measurement value, and the temperature correction accuracy can reach 0.1℃.

6. The PID of special users can be self-adjusted and has the function of self-adjusting temperature.

7. There are internal and external circulations. In the external circulation, the constant temperature liquid in the tank can be drawn outside, and a second constant temperature field can be established. It can also be used as a cold source (heat source) to draw the liquid outside the tank, which can lower (raise) the temperature of external experimental container of the tank,and expand the use range.

8. This instrument uses dual temperature sensors. When the operating temperature is 5° C higher than the ambient temperature, the instrument automatically cuts off the cooling function. It greatly improves the energy saving efficiency and prolongs the service life of the compressor. It is a novel energy-saving product.

III.Specifications

Model	Max.Temp （℃）	Min.Temp （℃）	Voltage V/AC	Volume （L）	Heating Power (W)	Cooling Power (W)	Constant Accuracy （℃）	Pump Flow （L/min）	Drainage	Power (W)
CK-4010GD	150	－40	220	10	2500	3620	±0.1	20	Yes	6120

IV. Operation Instructions

a) Add liquid medium to the tank, and the liquid level of the liquid medium cannot be lower than 30mm of the worktable.

Selection of liquid medium

Ａ. When the working temperature is lower than 5℃, alcohol is generally used as the liquid medium.

Ｂ. When the working temperature is between 5°C and 80°C, pure water is generally used as the liquid medium.

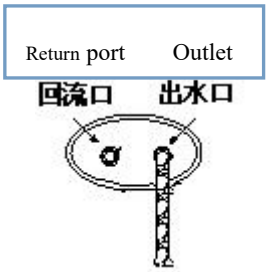
Ｃ. When the working temperature is 80℃-90℃, the liquid medium is generally 15% glycerin aqueous solution.

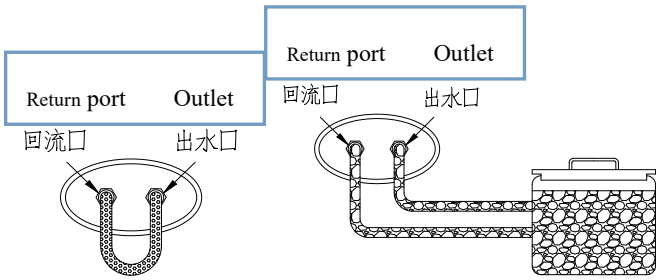
Ｄ. When the working temperature is above 90℃, the liquid medium is generally silicone oil.

b) Connection of circulating pump:

A. To connect the internal circulation pump, connect the outlet pipe and the inlet pipe with a hose.

B. The outer circulation pump is connected with the outer circulation, the liquid outlet pipe is connected to the inlet of the outer tank container with a hose, and the liquid inlet pipe is connected to the outlet of the outer tank container.





(P4.1)Dispensing (P4.3)Internal Circulation (P4.2)External Circulation

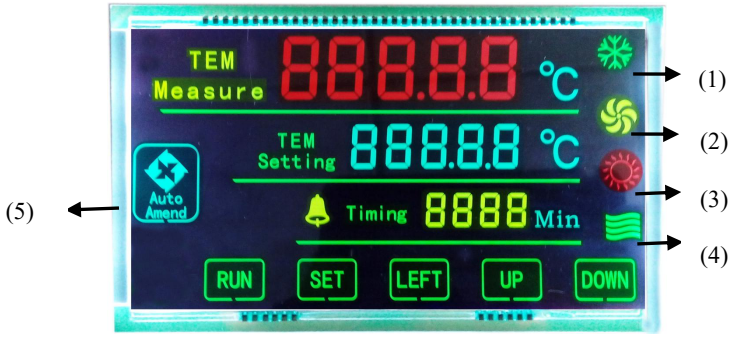
P1 **Pipeline Description**

Internal Circulation: Connect the water outlet and return port with hose（P4.1)

External Circulation： Connect the water outlet and return port to the outer container respectively to establish a second constant temperature field. (P4.2)

Dispensing: Direct drainage from the outlet(P4.3)

Display Description：



P1 Display

Buttons Description：

1. （1） Refrigeration indicator light: ‘on’ when the refrigeration output, flashes when the refrigeration delay, and ‘off ’ when the refrigeration is turned off;

（2） Circulating pump indicator light: ‘on’ when the circulating pump is output, and ‘off’ when it is off;

（3） Heating indicator: ‘on’ when there is heating output, ‘off ‘when heating is off; '

（4） Water level indicator light: ‘on’ when the water level alarms;

（5） Auto-tuning indicator: flashes during auto-tuning;

6. **RUN**： Long press to start and stop running.

7. **SET**： to set value modification, parameter recall and parameter modification confirmation；
8. **LEFT**：to shift the set value, control parameter or enter auto-tuning;
9. **UP**： to modify the setting value and control parameters or query the running status; long press to query the ambient temperature.
10. **DOWN**： to modify the set value and control parameters; in the standard state, long press to view the current operating segment number of the remaining operating cycle.
11. **RUN+SET**; single point and program control switch
12. **SET+LEF**; internal parameter setting

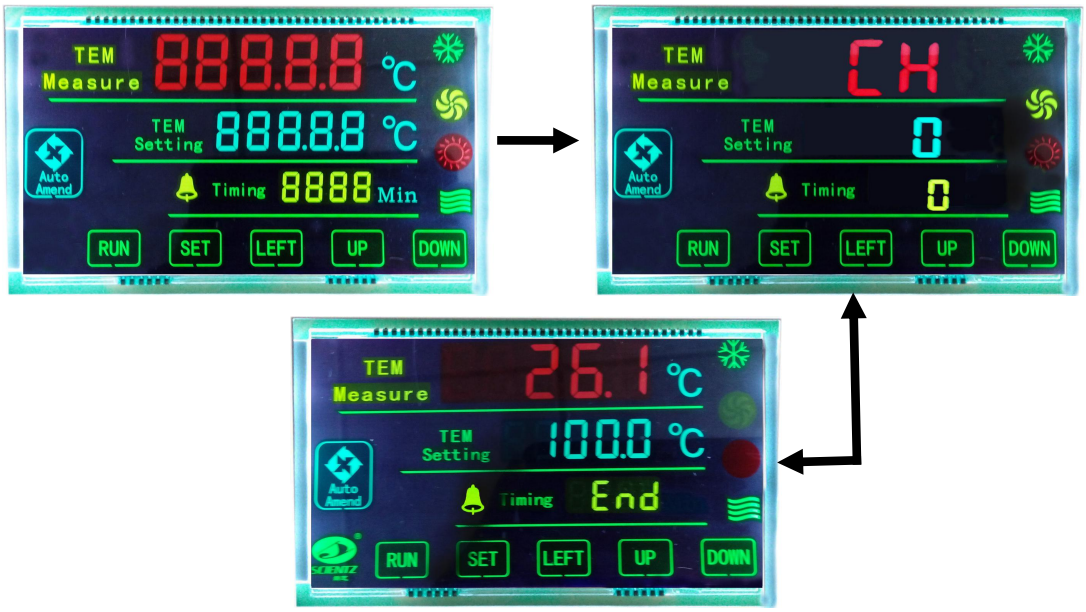
Remark：If **TEM Measure** shows "⌐¬⌐¬⌐¬", it means that the sensor is open or the input signal exceeds the upper limit of measurement; If it shows "¬⌐¬⌐¬⌐", it means the sensor is short-circuited or the input signal is lower than the lower limit of the range. When the input signal of the meter is not within the range, the buzzer will sound. Press any key to silence it.

Specific operation settings：

- Please add a liquid medium (such as silicone oil) into the water tank. If the instrument is used at a temperature higher than 80°C, a space of 2cm should be left under the slot to prevent oil expansion and overflow at high temperatures.
- Plug in the power cord and turn on the power switch on the back of the chassis.
- Turn on the red rocker switch on the back of the device (this switch is the circulating pump control switch), and adjust the flow adjustment knob under the switch to adjust the flow of the circulating pump.

➢ Program control：

1、When powering on, the screen will display CH in turn, (the first row of CH is program control, the second row is cycle cycle, and the third row, 0 means no constant temperature, 1 is constant temperature) At this time, the buzzer will alarm, sound 3 times and return to the standby state.
As shown below:



P2 Program standby

2、Set temperature value and time (Temperature range: highest temperature 150℃, lowest temperature -40℃)

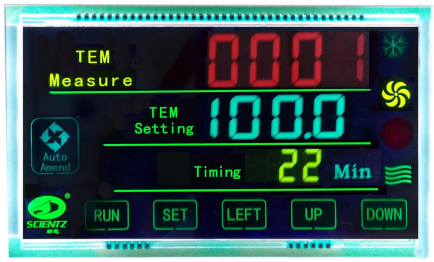
1）Press SET , the last digit of the segment number 0001 flashes in the TEM Measure area. Press the shift, increase and decrease keys to set the segment number (range: 1-30 segments)

2）Pres SET, enter the TEM Setting area, the last digit of the temperature setting value flashes, and set the required temperature by pressing the shift, increase and decrease keys.

3）Pres SET， enter the Timing zone and the last bit of the time setting value flashes. Set the required time by pressing the shift, increase and decrease keys. Press the SET button to save and return to the standby state. As shown in Figure 2-1:

① If the time of the first segment is directly set to 0, the program control will be converted into a single-point control without timing, and the temperature setting value of the first segment is the target setting temperature.

② Except for the first segment, the time is set to 0, the program runs to the end of this segment, and then another cycle starts from the first segment.

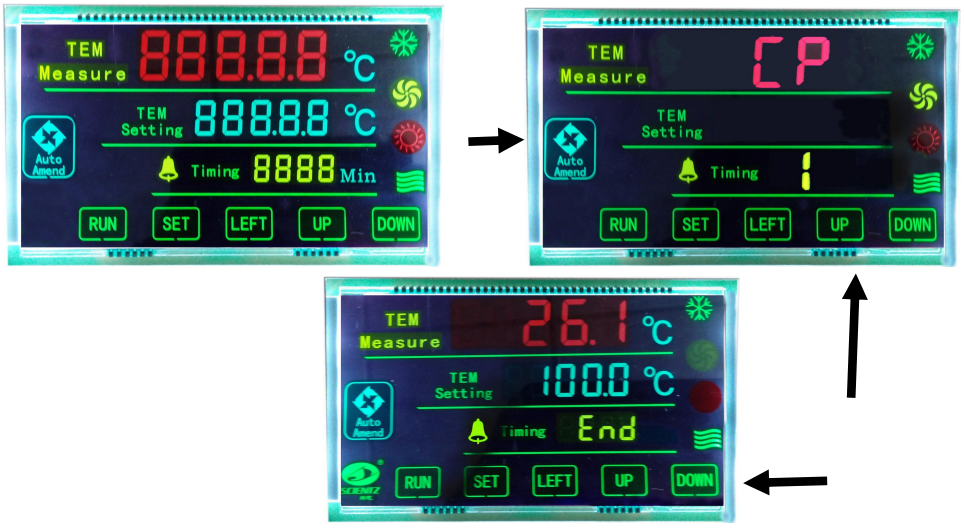


P2—1Temperature、Time Setting

Program setting parameter modification: Press SET , the TEM Measure area flashes, and the number of segments to be modified is displayed, press the increase or decrease key to modify, and then press the SET key to enter the temperature and time of this segment to modify the parameters.

➢ Single point control:

1、When power on, it displays CP, (the first row of CP is for single point control, the second row is empty, the third row, 1 is to start timing when it reaches the set value, if it is 0, it starts timing when power is on) buzzer alarms and sounds Return to standby after 3 times.

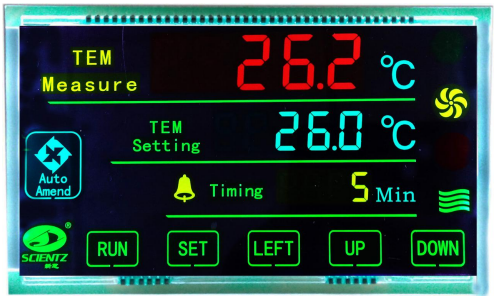


P3 Single point standby

2、Set temperature value and time:

1）Pres SET， The last digit of the temperature setting value in the TEM Setting area flashes. Set the desired temperature by pressing the shift, increase and decrease keys.

2） Pres SET , entering the Timing zone, the last bit of the time setting value flashes, and the required timing time is set by pressing the shift, increase and decrease keys. Press the SET button to save and return to the standby state.



P3—1 Single point temperature and time setting

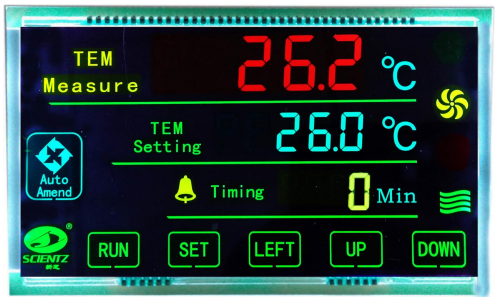
3、Timing function

When Timing is set to 0, the meter cancels the timing function and the meter keeps running; when Timing is not set to 0, the meter has timing function. When the running time of the meter is up, Timing displays END, the buzzer sounds, and the meter stops working. Press any key to mute the sound.

● Power On/Off:

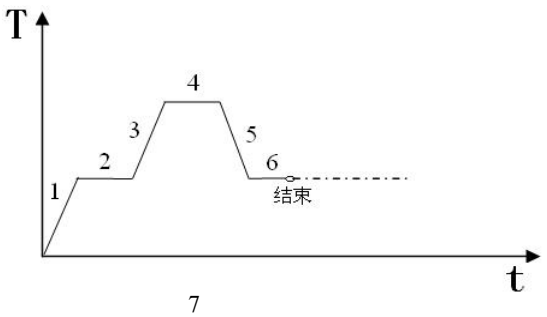
1、Turn on the left circulating pump switch, and the circulating pump must be kept on when it is working. (Open or close the left circulation pump control button to start/stop the circulation pump)

2、Long press the RUN button, the compressor buzzes, and the refrigeration and circulating pumps start to work. If you want to stop working, long press the RUN key to stop working, the buzzer will alarm, press any key to silence. (As shown below):

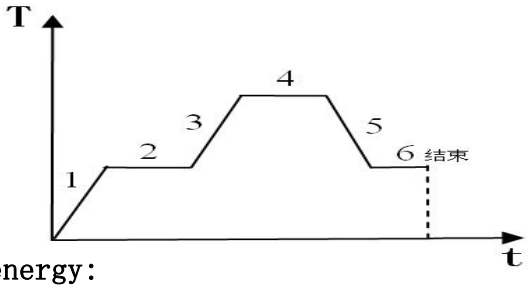


P4 Working status (Standard status)

2..1Temperature maintenance after the program ends (HS=1)



2.2 Heating stops after the program ends (HS=0)



Auto-tuning kinetic energy:

If the temperature control effect is not satisfactory, please auto-tune; when the set temperature reaches the intermediate temperature that needs to be controlled, press and hold the LEFT shift key for 4 seconds in the standard state, the meter will start auto-tuning, and the auto-tuning light will flash. A set of PID parameters with rapid temperature rise is output, and the instrument is controlled according to the new PID parameters. The new PID parameters can be checked on the instrument.

Other Parameters Setting:

1、**Program setting:**

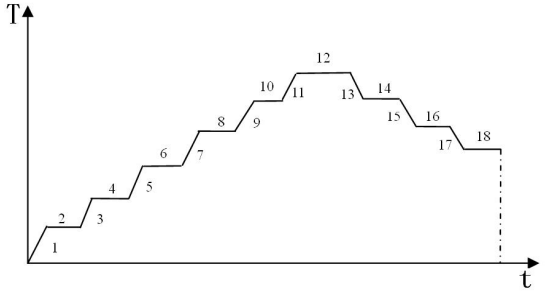
The program parameter menu is as follows: Press SET for more than 3 seconds in the standard state to enter the user parameter setting without password protection.

The user parameter menu is as follows:

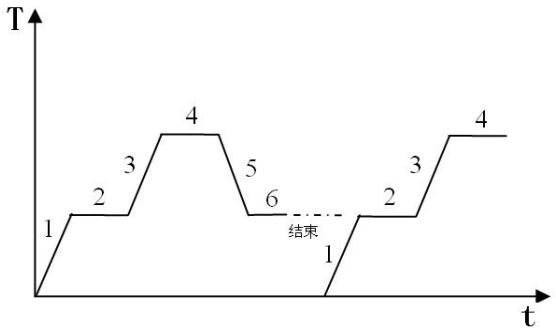
Hint		Range	Specification	Initial value
PG	Power-on operation selection	0-2	0：Power-on controller is in stop state; 1：Power on the controller starts to run from the first stage; 2：When the power is turned on, the controller starts to run from the last power-off point.	0
Cy	Cycle Time	0-99	The controller's opertion cycle is 0, it does not stop, one cycle continues another cycle.	0
HS	end the constant temperature selection	0～1	When the running cycle is over, select 0 to stop the machine, no heating. If it is 1, the constant temperature will continue.	0
md	Program or fixed value selection	0～1	0：Fixed value control; 1：30-segment program control	1

1.1、Programming curve operation example

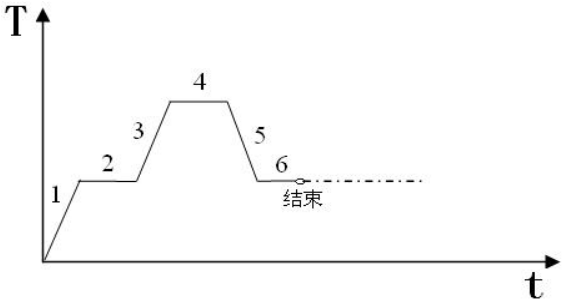
1）**Program control (Cy≠0)**



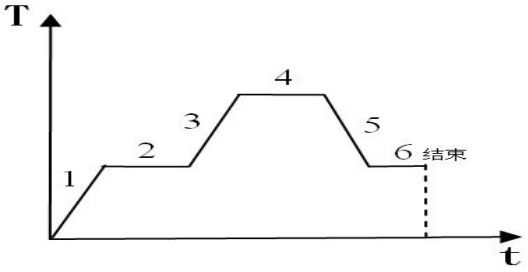
2）Cycle control（Cy=0 ）



3）Temperature maintenance after the program ends (HS=1)

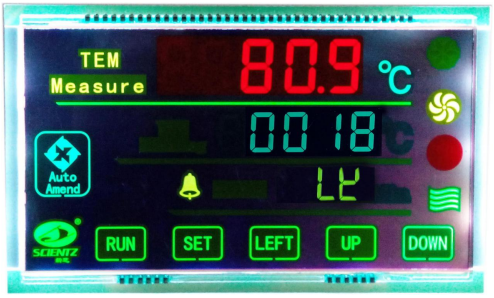


4）Heating stops after the program ends (HS=0)



2、Customer parameter and PID hierarchy menu parameter setting:

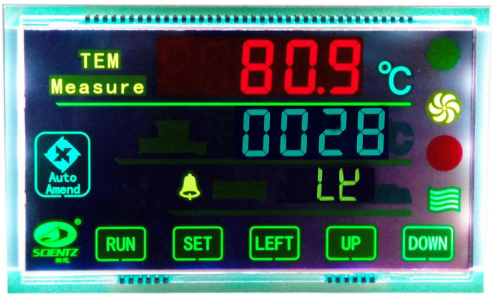
Long press SET and LEFT at the same time, when the LK parameter code appears in the Timing area, ① adjust LK=18, click the set button, the controller can enter the customer parameter setting; ② adjust LK=28, click the set button, control The device can enter the PID level menu parameter setting



P5 Customer parameter setting

The customer parameter menu is as follows:

Prompt		Setting Range	Description	Initial Value
HT	Time selection	0/1	0 means Minute 1 means Hour	0
SC	Correction of ambient temperature measurement	-9.00-+9.00	Adjust when the measured ambient temperature value deviates from the current ambient temperature	0.00
AL	Alarm	0～full	When the measured temperature exceeds the value of AL, the alarm relay outputs.	3.0
CL	Cooling control setting	0～full	Compressor start-stop control is valid. When the temperature exceeds the set value +CL and meets the compressor refrigeration control delay, the cooling light is on, the refrigeration contact is turned on, and the compressor is started.	0.5
Ct	Cooling control Delay	0～3600 Seconds	The delay time required to start the compressor twice, Ct=0 cancels the compressor function.	180
Pb	Zero adjustment	-100.0～100.0	When the zero error of the controller is large and the full-scale error is small, adjust this value. Generally, Pt100 rarely adjusts this value.	0.0
Pk	Full scale adjustment	-1000～1000	When the zero error of the controller is small and the full scale error is large, this value can be adjusted. Pk=4000×(Mercury thermometer reading value-current temperature measurement value)/current temperature measurement value.	0



P6 Hierarchy setting

2、PID hierarchy menu is as follows：

P	Proportional band	2～100	Proportional action adjustment, the larger the P, the smaller the proportional action, the lower the system gain, and it only acts on the heating side.	5.0
I	Integration time	20～3600S	Integral action time constant, the larger the I, the weaker the integral action.	400
d	Derivative time	0～3600S	Differential action time constant, the larger d, the stronger the differential action, and can overcome overshoot.	400
Ar	Overshoot suppression	0～100%	Used to suppress overshoot (Ar is determined to be: 1.5 to 2 times the steady-state output duty cycle)	100
t	Control	1～100S	The thyristor output is generally 2 to 3 seconds. For equipment with larger	3

	cycle		remaining power, increasing T can reduce the static error of PID control.	

Each parameter change can have a change control effect. It will automatically return to the standard mode without pressing a key within one minute, and every parameter change may change the control effect. (If you don't press the key within one minute, it will automatically return to the standard mode. Some function parameters may not be changed.

Precautions：

1、Liquid medium should be added to the tank before use. When the liquid is lower than 30mm on the work surface, the machine cannot be turned on to prevent the heater from burning out.

2、The power supply is 220VAC/50Hz, and the power supply capacity must be greater than the total power of the equipment. The equipment must be well grounded.

3. Pump switch: please do not press the forced switch of the circulating pump on the left side of the machine unless there is a special need.

3.1. If the forced switch of the circulating pump is pressed, the circulating pump will be turned off. In this way, the temperature of the liquid at different positions in the tank will be uneven, which will affect the constant temperature effect. At this time, press the forced switch of the circulating pump to start the circulating pump.

4. The instrument should be placed in a ventilated and dry place, with a distance of more than 300mm away from obstacles on the back and sides.

5. In the process of temperature rise, there will be oily smoke, please do a good job of ventilation. And pay attention to adding oil during this process, because some oil will evaporate due to high temperature, at this time, pay attention to safety not to touch the oil in the tank and the outer circulation pipe to prevent burns.

6. After use, the power switch on the back is turned off, and the power plug is unplugged.

7. The continuous working time of the instrument cannot exceed 72 hours.

Packing List

1、Main Machine	1pc
2、Cable wire	1pc
3、High temperature tub	1pc
4、Cover	1pc
5、Manual	1pc
6、Warranty Card	1pc
7、Certification Card	1pc

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