# Intelligent Temperature Controller User Manual



## Features

⊙ Optional input signal types and models

⊙ With multi-functions of measure display,control output,alarm output,analog output, RS485 communication and etc...

⊙ Multi types PID control arithmetic can be optional,and with auto-tuning function.

⊙ Using in industrial machinery,machine tools and masuring instruments.

⊙ Economical and easy operation.

KKTP-B01E-20180512

The instruction explain instrument settings, connections,name and etc,please read carefully before you use the temperature controller. Please keep it properly for necessary reference.

## ⚠ Warning

1) When the failure or abnormal of products lead to a system of major accidents,please set the proper protection circuit in the external.

2) Please don`t plug in before completing all the wire.Otherwise it may lead to electric shock, fire, fault.

3) Not allow to use outside the scope of product specification,otherwise it may lead to fire,fault.

4) Not allow to use in the place where is inflammable and explosive gas.

5) Do not touch power terminal and other high voltage part when the power on,otherwise you may get an electric-shock.

6) Do not remove,repair and modify this product,otherwise it may lead to electric shock, fire, fault.

## ⚠ Caution

1) The product should not be used in a nuclear facility and human life associated medical equipment.

2) The product may occur radio interference when it used at home.You should take adequate countermeasures.

3) The product get an electric shock protection through reinforced Insulation. when the product is embedded in the devices and wiring,please subject to the specification of embedded devices.

4) In order to prevent surge occurs,when using this product in the place of over 30m indoor wiring and wiring in outdoor,you need to set the proper surge suppression circuitry.

5) The product is produced based on mounting on the disk.In order to avoid to touch the wire connectors,please take the necessary measures on the product.

6) Be sure to observe the precautions in this manual, otherwise there is a risk of a major injury or accident.

7) When wiring, please observe the local regulation.

8) To prevent to damage the machine and prevent to machine failure, the product is connected with power lines or large capacity input and output lines and other methods please install proper capacity fuse or other methods of protection circuit.

9) Please don't put metal and wire clastic mixed with this product,otherwise it may lead to electric shock, fire, fault.

10) Please tighten screw torque according to the rules.If not,it may lead to electric shock and fire.

11) In order not to interfere with this products to dissipate heat, please don't plug casing around the cooling vent hole and equipment.

12) Please don't connect any unused terminal.

13) Please do the cleaning after power off, and use the dry cleaning cloth to wipe away the dirt. Please don't use desiccant, otherwise, it may casue the deformation or discoloration of the product.

14) Please don`t knock or rub the panel with rigid thing.

15) The readers of this manual should have basic knowledge of electrical,control, computer and communications.

16) The illustration, example of data and screen in this manual is convenient to understand,instead of guaranteeing the result of the operation.

## ⚠ Caution of Install & Connection

1. Installation：

1) This product is used in the following environmental standards.

（IEC61010-1）[Overvoltage categoryⅡ、class of pollution 2]

2) This product is used in the following scope:surrounding environment, temperature, humidity and environmental conditions.

Temperature：0 ~ 50℃; Humidity：45 ~ 85%RH;Environment condition：Indoor warranty,The altitude is less than 2000m.

3) Please avoid using in the following places:

The place will be dew for changing temperature;with corrosive gases and flammable gas;with vibration and impact;with water, oil,

chemicals, smoke and steam facilities with Dust, salt, metal powder;and with clutter interference, static electric and magnetic fields,

noise;where has air conditioning or heating of air blowing directly to the site; where will be illuminated directly by sunlight; where

accumulation of heat will happen caused by radiation.

4) On the occasion of the installation, please consider the following before installation.

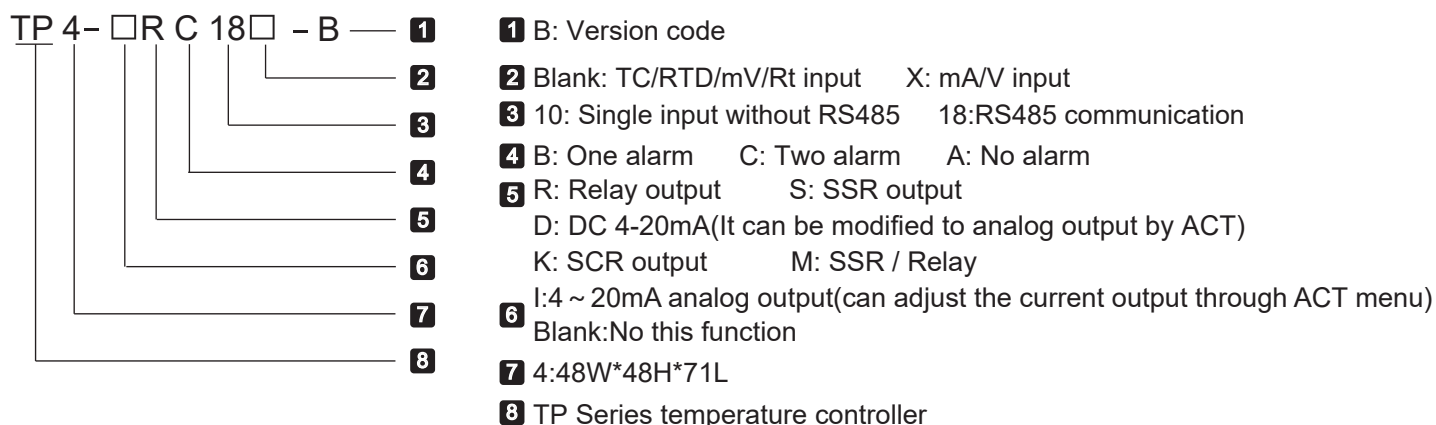In order to protect heat saturated, please ensure adequate ventilation space.

Please consider connections and environment,and ensure that the products below for more than 50mm space.

Please avoid to installed over the machine of the calorific value(Such as heaters, transformer, semiconductor operations, the bulk

resistance).When the surrounding is more than 50℃, please using the force fan or cooling fans.But don't let cold air blowing directly to

the product.In order to improve the anti - interference performance and security, please try to stay away from high pressure machines,

power machines to install.Don`t install on the same plate with high pressure machine and the product.The distance should be more than 200mm

2.Cable caution：

1）Please use specified compensation wire in the place of TC input;Please use insulated TC if the measured device is heated metal.

2）Please use the cable of lesser resistance in the place of RTD input,and the cable(3 wire) must be no resistance difference,but the total length is within 5m.

3）In order to avoid the effect of noise,please put the input dignal away from meter cable,power cable,load cable to wiring.

4）In order to reduce the power cables and the load power cables on the effect of this product,please use noise filter in the place where easy to effect.You must install it on the grounding of the disk if you use the noise filter,and make the wiring to be shortest between noise filter output side and power connectors.Don`t install fuse and switch on the wiring of noice filter output side,otherwise it will reduce the effect of noise filter.

5）It takes 5s from input power to output.If there is a place with interlocking actions circuit signal,please use timer relay.

6）Please use twisted pair with a shield for analog output line,to ensure the reliabilty of signal, if necessary.

7）Please use twisted pair with a shield for remote RS485 communication cable,and deal with the shield on the host sideearth, to ensure the reliabilty of signal.

8）This product don't have the fuse; please set according to rated voltage 250V,rated current 1A if you need; fuse type:relay fuse.

9）Please use the suitable screw force and crimp terminal.The screw terminal size：M3X8（with 7.0X7.0 square base）Recommended tightening torque：0.4N.m Proper cables：0.25 ～ 1.65mm single cable/multiple core cable

10）Please don`t put the Crimp terminal or bare wire part contact with adjacent connector.

## Model Illustration

TP 4– □R C 18□ – B —— 1

1 B: Version code

2 Blank: TC/RTD/mV/Rt input     X: mA/V input

3 10: Single input without RS485     18:RS485 communication

4 B: One alarm     C: Two alarm     A: No alarm

5 R: Relay output     S: SSR output
D: DC 4-20mA(It can be modified to analog output by ACT)
K: SCR output     M: SSR / Relay

6 I:4 ~ 20mA analog output(can adjust the current output through ACT menu)
Blank:No this function

7 4:48W*48H*71L

8 TP Series temperature controller

There can be optional signal type: 1):TC/RTD/mV/Rt; 2):mA/V.

## Ordering Information

| Model | Control output | Alarm | Analog 4 ~ 20mA | RS485 |
|---|---|---|---|---|
| TP4-DC18 | 4 ~ 20mA | 2 | Yes | Yes |
| TP4-DC10 | 4 ~ 20mA | 2 | Yes | No |
| TP4-RC18 | Relay | 2 | No | Yes |
| TP4-MC10 | Relay/SSR | 2 | No | No |
| TP4-SC18 | SSR | 2 | No | Yes |
| TP4-MB10 | Relay/SSR | 1 | No | No |

## Specification
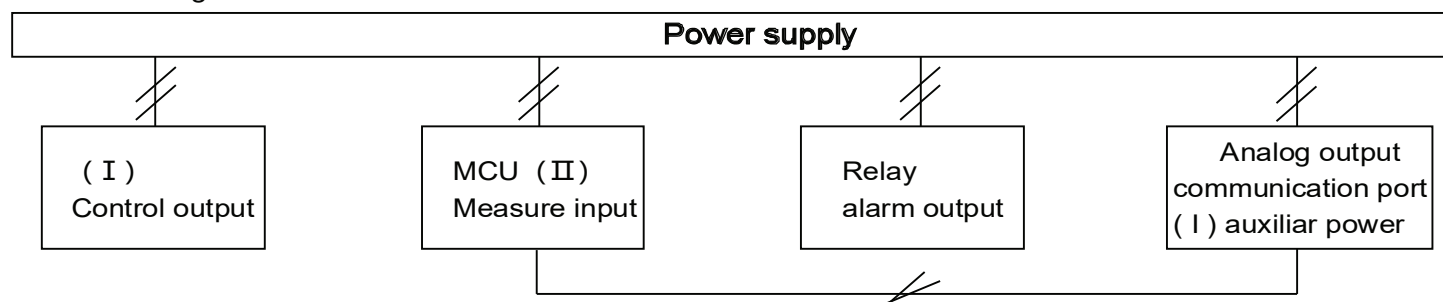
1.Electrical parameters:

| | |
|---|---|
| Sample rate | 2 times per second |
| Relay capacity | AC 250V /3A, the life of rated load >10W times. |
| Power supply | AC/DC 100 ~ 240V (85-265V) |
| Power consumption | < 6VA |
| Environment | Temperature indoor:0 ~ 50℃,no condensation;Humidity: < 85%RH,altitude<2000m |
| Storage environment | -10 ~ 60℃,no condensation |

| | |
|---|---|
| SSR output | DC 24V pulse level,load <30mA |
| Current output | DC 4~20mA,load >500Ω,temperature drift250PPM |
| Communication port | RS485 port  Modbus-RTU procotol, max input 30units |
| Insulation impedance | Input, output, power VS meter cover   > 20MΩ |
| ESD | IEC/EN61000-4-2   Contact ±4KV /Air ±8KV perf.Criteria B |
| Pulse traip anti-interference | IEC/EN61000-4-4  ±2KV  perf.Criteria B |
| Surge immunity | IEC/EN61000-4-5  ±2KV   perf.Criteria B |
| Voltage drop & short interruption immunity | IEC/EN61000-4-29  0% ~ 70%          perf.Criteria B |
| Isolation pressure-proof | The signal input and output and power 1500VAC 1min;It is DC500V,1min when the low voltage below 60V. |
| Total weight | About 400g |
| Cover material | The shell and panel frame PC/ABS (Flame Class UL94V-0) |
| Panel material | PC |
| Power failure memory | 10 years，times of writing:1 million times |
| Panel Protection level | IP65(IEC60529) |
| Safety Standard | IEC61010-1 Overvoltage category Ⅱ，pollution level 2，levelⅡ(Enhanced insulation) |

2.Measured signal specifications：

| Input type | Symbol | Measure range | Resolution | Accuracy | Input impedance/ auxiliary current | Communication parameter code |
|---|---|---|---|---|---|---|
| K | ヒ | -50 ~ 1200 | 1℃ | 0.5%F.S±3digits | > 500kΩ | 0 |
| J | ⅃ | 0 ~ 1200 | 1℃ | 0.5%F.S±3digits | > 500kΩ | 1 |
| E | E | 0 ~ 850 | 1℃ | 0.5%F.S±3digits | > 500kΩ | 2 |
| T | ヒ | -50 ~ 400 | 1℃ | 0.5%F.S±2℃ | > 500kΩ | 3 |
| B | b | 250 ~ 1800 | 2℃ | 1%F.S±2℃ | > 500kΩ | 4 |
| R | ┌ | -10 ~ 1700 | 1℃ | 1%F.S±2℃ | > 500kΩ | 5 |
| S | 5 | -10 ~ 1600 | 1℃ | 1%F.S±2℃ | > 500kΩ | 6 |
| N | ┌ | -50 ~ 1200 | 1℃ | 0.5%F.S±1℃ | > 500kΩ | 7 |
| PT100 | Pt | -200 ~ 600 | 0.2℃ | 0.5%F.S±0.3℃ | 0.2mA | 8 |
| JPT100 | JPt | -200 ~ 500 | 0.2℃ | 0.5%F.S±0.3℃ | 0.2mA | 9 |
| CU50 | CU50 | -50 ~ 150 | 0.2℃ | 0.5%F.S±3℃ | 0.2mA | 10 |
| CU100 | CU00 | -50 ~ 150 | 0.2℃ | 0.5%F.S±1℃ | 0.2mA | 11 |
| 0 ~ 50mV | ┌ｕ | -1999 ~ 9999 | 12bit | 0.5%F.S±3digits | > 500kΩ | 12 |
| 0 ~ 400Ω | ┌t | -1999 ~ 9999 | 12bit | 0.5%F.S±3digits | 0.2mA | 13 |
| * 4 ~ 20mA | ┌A | -1999 ~ 9999 | 12bit | 0.5%F.S±3digits | 100Ω | 14 |
| * 0 ~ 10V | ｕ | -1999 ~ 9999 | 12bit | 0.5%F.S±3digits | >1MΩ | 15 |

3.Isolation diagram

**Power supply**

| (Ⅰ) Control output | MCU (Ⅱ) Measure input | Relay alarm output | Analog output communication port (Ⅰ) auxiliar power |
|---|---|---|---|

"╱╱"：Isolation

Note：When the auxiliary power supply between(Ⅰ)&(Ⅱ)is used as the power supply of external sensor, if the sensor is non-isolated, it does not isolate.

# Panel Illustration
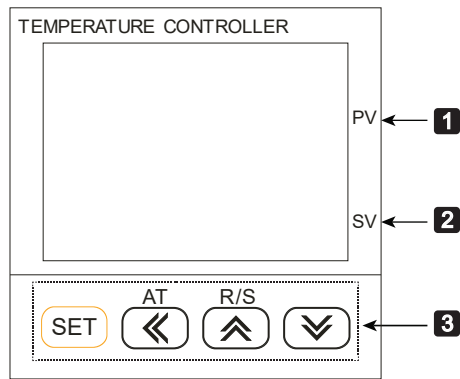


| No. | Symbol | Name | Function description |
|---|---|---|---|
| 1 | PV | Display window(Green) | Setting value or parameters display window;Display "STP" means stop controlling. |
| 2 | SV | Display window(Red) | Measuring value or parameters code display window |
| 3 | SET | SET key | Menu key / Enter key,which enter or quit or comfirm the parameters. |
| | ≪AT | Shift / AT key | Activate key / Shift key / AT auto-tuning key.It can enter or quit AT status under the measuring control. |
| | ⌃ R/S | Add key / R/S | Add key,keep press the key can switch RUN/STOP under the measuring control mode. |
| | ⌄ | Reduce key | Reduce key |

# Dimensions (Unit:mm)

Panel size



Later size



Hole size
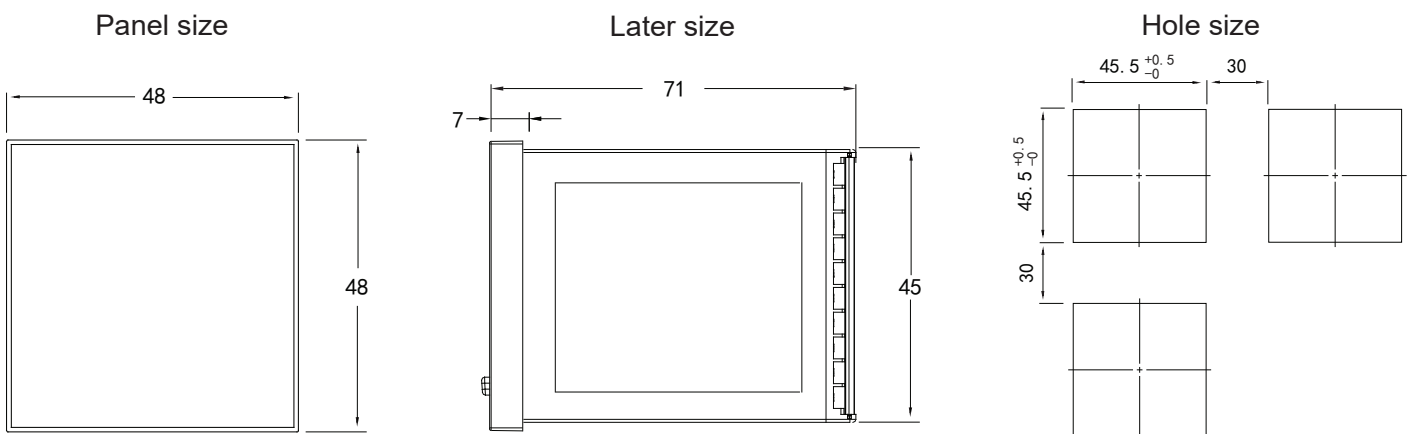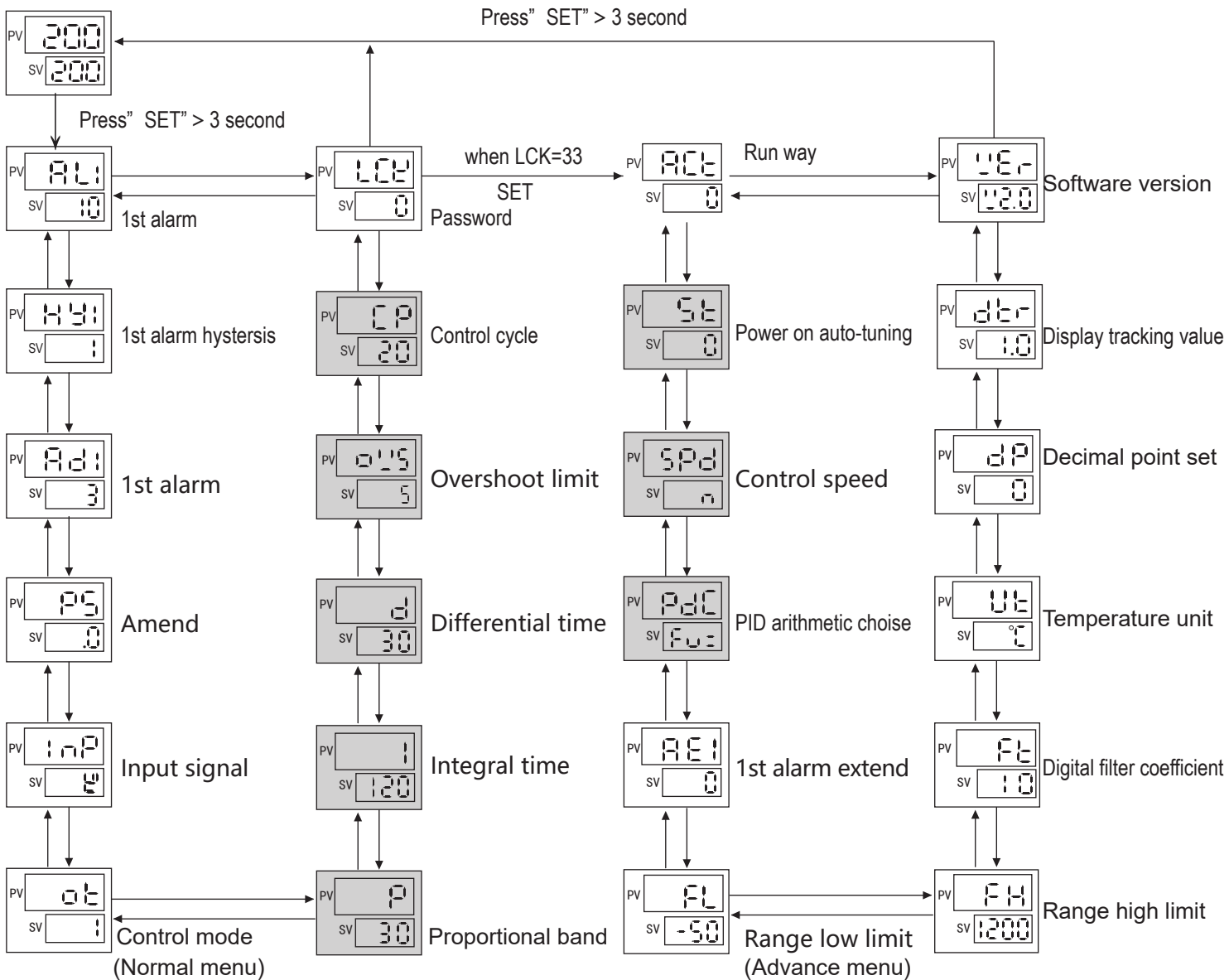
# Operation Process and Menu Indication

## 1.Operation process and method

Measuring control mode



## Menu Illustration

☐ :Parameters will keep displaying all the time for all the model and all the setting.

▨ :Parameters will be hided based on model and menu setting.

### 1. Normal menu illustration

| No. | symbol | menu name | Description | Set range | Factory set |
|------|--------|-----------|-------------|-----------|-------------|
| 1 | AL1 | AL1 | 1st alarm value.Note:the minus is dealed as absolute value when it is as a deviation value. | FL ~ FH | 10 |
| 2 | HY1 | HY1 | 1st alarm backlash value | 0 ~ 1000 | 1 |
| 3 | Ad1 | AD1 | 1st alarm type.Note: set the AD1=0, when 1st alarm is used as out2 (cooling output ). when AD1> 6,alarm 2 will not be acted. | 0 ~ 12 | 3 |
| 4 | AL2 | AL2 | 2nd alarm value.Note:the minus is dealed as absolute value when it is as a deviation value. | FL ~ FH | 5 |
| 5 | HY2 | HY2 | 2nd alarm backlash value | 0 ~ 1000 | 1 |
| 6 | Ad2 | AD2 | 2nd alarm type,note:the value should set as 0 to close alarm function when the AD1>6. | 0 ~ 6 | 4 |
| 7 | PS | PS | Amend value,display value=actual measured value+ amend value | FL ~ FH | 0 |

| No. | symbol | menu name | Description | Set range | Factory set |
|---|---|---|---|---|---|
| 8 | InP | INP | Optional input measured signal type:refer to input signal parameters table. Note: it need to change the relevant parameters after changing. SV, AL1,HY1,AL2,HY2,P,OVS,DB | refer to input signal table (page 3) | K |
| 9 | ot | OT | Control type: 0:ON/OFF control; related pararmeter: DB 1: PID heating control,related parameter: P,I,D,OVS,CP,ST,SPD,PDC 2: ON-OFF cooling control , related parameter DB , when used for compressor cooling control , set parameter: PT 3:PID heating & cooling control. (cooling control OUT2) make output by AL1 relay. related parameters: P, I, D,OVS,CP,CP1,PC,DB,ST,SPD,PDC 4. Over-temperature cooling output , related parameter : DB 5, PID cooling , related parameters: P , I, D, OVS, CP, ST, SPD, PDC | 0 ~ 5 | 1 |
| 10 | A-M | A-M | Auto-manual control switch : AUTO(0): auto control output MAN(1): manual control output AM(2): manual and auto shift | AUTO~AM | AUTO |
| 11 | P | P | Proportional band, the less of setting value,the faster of system response conversely , system response slower . P=0 , PID control is not valid | 0 ~ 9999 | 30 |
| 12 | I | I | Integral time , the less of the value,the stronger of integral action. Conversely,integral action is lower. I=0, no integral action | 0 ~ 9999 | 120 |
| 13 | d | D | Differential time . The higher value,the stronger function of differential. Conversely, lower differential function. D=0, no differential function. Set D=0, when used to control pressure, speed, other quick response system. | 0 ~ 9999 | 30 |
| 14 | oVS | OVS | Overshoot limit,in the process of PID control,when PV>SV+OVS,it force off output; The lower value,the lower PID adjusted range,the worse control stability;please set a proper value according actual state. | 0 ~ 9999 | 5 |
| 15 | CP | CP | OUT1 control cycle,1:SSR control output, 4-200:relay control output. Unit:second | 1 ~ 200 | 20 |
| 16 | CP1 | CP1 | OUT2 control cycle,cooling relay output cycle.Unit:second | 4 ~ 200 | 20 |
| 17 | PC | PC | OUT2 cooling proportionality coefficient,the higher value,the stronger cooling | 1 ~ 100 | 10 |
| 18 | db | DB | On-off control backlash(nagetive backlash on-off control)or cooling control and compressor cooling control dead zone. please change value according to decimal position,when you change input sigal type type. | -1000~1000 | 5 |
| 19 | LCK | LCK | Lock function; 0001:SV value can not be modified, 0010:menu setting value only can be checked ,cannot modified. 0033: can enter to advanced menu. 0123: menus reset to factory setting. | 0~9999 | 0 |

2. Advanced Menu Illustration

| | | | | | |
|---|---|---|---|---|---|
| 20 | ACt | ACT | Control output mode, 0:relay output; 1: SSR output control 2.4-20mA control outpuy, please note that for TF3,TF4,TF7 3: set ACT as 3 to change 4-20mA to analog output. | 0~2 (0~3) | 0 |
| 21 | AE1 | AE1 | 1st alarm extensions (refer to alarm extend function table page8 ) | 0~5 | 0 |
| 22 | AE2 | AE2 | 2nd alarm extensions (refer to alarm extend function table page8 ) | 0~5 | 0 |
| 23 | dP | DP | Decimal point setting , TC/RTD iput , only can set 1 decimal point | 0~3 | 0 |
| 24 | dtr | DTR | PV fuzzy tracking value,it can get a stable control display value in some status. Note:when the alarm setting value is equal with SV setting value after setting the DTR value,operation of alarm output is subject to actual measured value.Setting 0 to close the function. | 0.0 ~ 2.0 (0~20) | 1.0 (10) |
| 25 | Ft | FT | Filter coefficient , the higher of value,the stronger of filter function | 0 ~ 255 | 10 |
| 26 | Ut | UT | Temperature unit: ℃: degrees Celsius  F:  Fahrenheit | ℃ ℉ | ℃ |
| 27 | FL | FL | Measure range low limit,the setting value must be less than measure range high limit | Refer to input signal table | -50 |
| 28 | FH | FH | Measure range high limit,the setting value must be more than measure range low limit. | Refer to input signal table | 1200 |

| No. | Symbol | Menu name | Description | Set range | Factory set |
|---|---|---|---|---|---|
| 29 | brL | BRL | Analog range low limit . Note: it also support reserse analog output function. | FL~FH | -50 |
| 30 | brH | BRH | Analog range high limit. Note: it also support reserse analog output function. | FL~FH | 1200 |
| 31 | oLL | OLL | Current output low limit amplitude, limit the current output low limit amplitude. | -5.0~100.0 | 0 |
| 32 | oLH | OLH | Current output high limit amplitude, limit the current output high limit amplitude. | 0.0 ~ 105.0 | 100.0 |
| 33 | St | ST | Power on auto-tuning switch . 0: normal control after power on 1:enter to PID auto-tuning status after power on . Long press AT key to exit the auto-tuning | 0~1 | 0 |
| 34 | SPd | SPD | PID control speed adjustment, optional 0(N)no function,1 (S) slow, 2(ss)medium slow, 3 (SSS) very slow, 4 (F) fast (5 FF) medium fast , 6 (FFF) express | 0~6 | N |
| 35 | PdC | PDC | Optional PID type : 0(FUZ): Advanced fuzzy PID arithmetic; 1(STD): normal PID arithmetic | 0~1 | FUZ |
| 36 | Pt | PT | Starting delay time of compressor, unit:second | 0~9999 | 0 |
| 37 | bAd | BAD | RS485 communication baud rate 0（4.8）: 4.8K; 1 (9.6): 9.6K | 0 (4.8)、 1 (9.6K) | 9.6K |
| 38 | Add | ADD | Communication Address | 0~255 | 1 |
| 39 | dtC | DTC | Sequenced transport of communication data and setting 000 of response delay;1st is function reserve, 2nd is byte sequenced exchange, 3rd is response delay, it can set 0~9 to 10~100ms. | Refer to communciation procotol ② | 0 |
| 40 | CAE | CAE | User auto-calibrating enable function,this parameter is only for use of input signal except TC/RTD; Y:user of enable auto-calibrating parameters N:user who don`t use enable auto-calibrating parameters | 0 (N), 1 (Y) | N |
| 41 | CAL | CAL | Operation of user auto-calibrating low limit input,it is starting,when The "YES" flash after signal input add the low-limit signal. It finished calibration of low-limit input signal when it display "OK". | YES/OK | YES |
| 42 | CAH | CAH | Operation of user auto-calibrating high limit input,it is starting,when the "YES" flash after signal input add the high-limit signal. It finished calibration of high-limit input signal when it display "OK". | YES/OK | YES |
| 43 | VEr | VER | Software version | ——— | V2.0 |

① Alarm parameters and output logic diagram:
  Symbol descriptio："☆" means alarm hystersis，"▲" means alarm value" △" means SV value

| No. | Type | Alarm output (AL1,AL2 is independent of each other ) Image:the hatched section means the alarm action |
|---|---|---|
| 1 | High limit absolute value alarm |  |
| 2 | Low limit absolute value alarm |  |
| 3 | ※ High limit deviation value alarm |  |
| 4 | ※ Low limit deviation value alarm |  |
| 5 | ※ High/low limit deviation value alarm |  |
| 6 | ※ High/low limit interval value alarm |  |

| No. | Type | The following two group of alarm parameters(AL1,AL2) used in combination, AL1 alarm output , AD2 must set to 0 |
|---|---|---|
| 7 | High/low limit absolute value alarm |  |
| 8 | ※ High/low limit deviation value alarm |  |
| 9 | ※ Alarm between high limit absolute value and low limit deviation value. |  |
| 10 | ※ Alarm between high limit deviation value and low limit absolute value. |  |
| 11 | High/low absolute value alarm |  |
| 12 | ※ High/low limit deviation alarm |  |

When the alarm value with deviation alarm set to a negative number,it will deal with it as an absolute value.
（2）Alarm extension function table

| AE1/AE2 value | Alarm handling mode when show HHHH/LLLL | Remark |
|---|---|---|
| 0 | The state when alarm keep HHH/LLL in previous time | Power on alarm,  alarm does not inhibit (As long as meet the requirement of alarm , make alarm output) |
| 1 | Forced alarm output | |
| 2 | Forced alarm close | |
| 3 | The state when alarm keep HHH/LLL in previous time | Power on alarm , alarm inhibits. (Before PV value reach the set value at the first time ,the alarm does not output) |
| 4 | Forced alarm output | |
| 5 | Forced alarm close | |

Key function operation

1. Stop mode operation

   1) Under the measure mode, press R/S for several seconds to enter stop mode;and on the SV window display "STOP" , main control output will stop or keep at minimum output.

   2) under stop mode , short press R/S to exit stop mode , short press "AT " to modify SV value.

   3) Under stop mode , alarm output and analog output can work normally.

2. PID Parameter auto-tuning operation:

   1) Before auto-tuning, switch off the power supply of control output load at temporary or set the meter as stop mode.

   2) Before auto-tuning PV value should meet the requirement: PID heating control , PV value is much lower than SV value , PID cooling control, PV value is much larger than SV value.

   3) Before auto-tuning, set the proper alarm value,or remove the alarm effect to avoid the effect of alarm output,

   4) Set PID type and SV value;the factory default is PID with fuzzy.

   5) Set PID control,please set current output to proper range if it has OLL & OLH output limit; default set :OLL=0%,OLH=100%.

   6) Exit stop mode or connect load power supply, and long press" 《AT" to enter auto-tuning mode, now,AT indicator will flash.

   7) Auto-tuning need a period, to ensure the auto-tuning result,please don`t modify parameters or power-off during auto tuning.

   8) When AT light is off , it will exit the auto-tuning. PID will update automatcially, and can get good control result.

   9) During auto-tuning, long press " 《AT " key, measure beyond the range,display abnormally, shift "STOP" status,power-off and ect,which will stop the auto-tuning.

   10) Note: In the place with current output amplitude limit , it may not get the best PID parameters even after auto-tuning.

   11) Experienced users can set a proper PID parameter according to their experience.

3. PID heating & Cooling control operation

   1) Set the control mode OT to 3.

   2) PID heating control act on OUT1;  Cooling control act on OUT2.

   3) Cooling control OUT2 will make output by AL1 alarm relay.

   4) Please set the cooling start offset to a value larger than 5 , to ensure the cooling would not affect PID heating control impact.

   5) Please set the cooling control cycle CP1 to a proper value,and change the cooling scaling factor toa a proper value.

   6) When PV value > SV+DB value,the cooling control start to effect;the bigger value of PV,the longer output time of OUT2

4. Manual control and automatic control mode switch

   1) Enter the normal menu and set the A-M as AM

   2) Back to measure and control status , press SET key to switch manual control or automatic control

   3) Set as manual control mode , the lower line display shows the output scale : M0~M100 according to (0%~100%), press increase and decrease key to adjust the output scale .

   4) Before switch manual control to auto-control , can press left key to modify the SV value to get better control result.

   5) If set it as AM status , meter will work as manual control mode after power on and output 0%.

5. Fixed manual control output mode

   1) Set A-M menu as MAN

   2) Back to measure and control interface , can adjust the output scale by manual.

   3) It will reset to manual output scale after power on again.

6.Signal linear auto-tuning function operation

   1)Set up the INP type,and ensure one of inputs(0-50mV,RT(0-400Ω),4-20mA and 0-10V).

   2)Add the input signal to a proper input channel.

   3) Enter menu low-limit to calibrate CAL,press " 《AT " to flash "YES" ;and set the input signal to min value and input to meter.

   4)When "YES" is flashing,and the min value of signal has input to meter,please press "SET" to ensure and save calibrating value

   5)After calibrating low-limit,enter the high limit to calibrate CAH in menu,and flash "YES" .

   6)Set the input signal to max value to meter,and press "SET" to ensure and save the calibrating value when the "YES" is flashing

   7)After calibrating,it can enter CAE,and change "N" to "Y" then it can use calibrating value,or it will use the factory default value.

   8)The linear signal value of high-limit input should not great than the inout standard value range ±10%.

   9)If you`re not satisfied with the calibrating result,you can reset.

# Connection
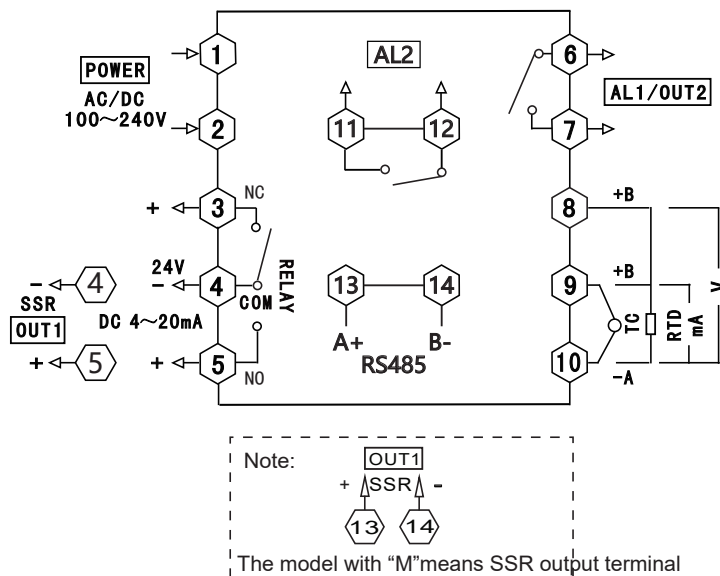


NOTE: If any difference here,please subject to the connection of meter.

## Methods of simple fault

| Display | Methods |
|---------|---------|
| LLLL/HHHH | Checks whether the input disconnection and whether normal of FH value,FL value,working environment temperature and whether input signal is selected correctly. |

## Communication procotol

Meter adopt RS485 Modbus RTU communication protocol, RS485 half duplex communication.Read function c ode:0x03, write function code 0x10/0x06.Adopts 16 digit CRC check, the meter does not return for error check.

Data frame format:

| Start bit | Data bit | Stop bit | Check bit |
|-----------|----------|----------|-----------|
| 1 | 8 | 1 | No |

Abnormal communication processing :

When abnormal response，put 1 on the highest bit of function code.For example:Host request function code 0x03,and slave response function code should be 0x83.

Error code:

0x01---Illegal function: the function code sent from host is not supported by meter.

0x02---Illegal address: the register address designated by host beyond the address range of meter.

0x03---Illegal data: Date value sent from host exceeds the corresponding data range of meter.

Communication cycle :

Communication cycle is the time from host request to slave response data . ie: communication cycle= time of request data sending +slave preparation time + response delay time + response return time

Eg:9600 Baud rate:communication cycle of single measured data ≥250ms.

1、Read register

For example:Host reads integer SV(set value 200 )

The address code of SV is 0x2000, because SV is integer(2 dyte),seizes 1data register.The memory code of 200 is0x00C8

Note:It should read DP value or confirm DP menu value first to ensure the decimal point postion when reading data,and converse the reading data to get the actual value. On the contrary ,it should converse the data to corresponding ratio first before writing the data into meter.

Host request（Read multi-register）

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|
| Meter ADD | Function code | Start ADD High bit | Start ADD Low bit | Data byte length high bit | Data byte length low bit | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x03 | 0x20 | 0x00 | 0x00 | 0x01 | 0x8F | 0XCA |

| Slave normal answer(Read multi-register) | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Meter ADD | Function code | Data byte number | Data high bit | Data low bit | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x03 | 0x02 | 0x00 | 0xC8 | 0xB9 | 0xD2 |

Function code abnormal answer：（For example:host request ADD is 0x2011）

| slave abnormal answer(Read multi-register) | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 8 | 9 |
| Meter ADD | Function ID | Error code | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x83 | 0x02 | 0xC0 | 0xF1 |

2. Write multi-register

For example:Host use 0x10 function code write SV （setting value 150）
ADD code of SV is 0x2000,because SV is integer(2 dyte),seizes 1 data register.The hexadecimal code of 150 is 0x0096.

| Host request （write multi-register） | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| Meter ADD | Function code | Start ADD High bit | Start ADD Low bit | Data byte Length/ high bit | Data byte Length/ low bit | Data byte Length | Data high bit | Data low bit | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x10 | 0x20 | 0x00 | 0x00 | 0x01 | 0x02 | 0x00 | 0x96 | 0x07 | 0xFC |

| Slave normal answer (write multi-register) | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Meter ADD | Function ID | Start ADD High bit | Start ADD Low bit | Data byte Length/ high bit | Data byte Length/ low bit | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x10 | 0x20 | 0x00 | 0x00 | 0x01 | 0x0A | 0x09 |

Host write SV with 0x06 function （setting value 150）

| Host request （write single-register） | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| Meter ADD | Function ID | ADD High bit | ADD Low bit | Data high bit | Data low bit | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x06 | 0x20 | 0x00 | 0x00 | 0x96 | 0x02 | 0x64 |

| Slave normal answer （write single-register） | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 2 | 7 | 4 | 5 | 6 | 7 | 8 |
| Meter ADD | Function ID | ADD High bit | ADD Low bit | Data high bit | Data low bit | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x06 | 0x20 | 0x00 | 0x00 | 0x96 | 0x02 | 0x64 |

| Slave abnormal answer ( write single-register) | | | | |
|---|---|---|---|---|
| 1 | 2 | 3 | 8 | 9 |
| Meter ADD | Function code | Error code | ※CRC code low bit | ※CRC code high bit |
| 0x01 | 0x86 | 0x02 | 0xC3 | 0xA1 |

Parameters reflection address

| No. | Add reflection | Variable name | Register | Read/write | Remark |
|---|---|---|---|---|---|
| 1 | 0x2000 | Set value SV | 1 | R/W | |
| 2 | 0x2001 | 1st alarm value AL1 | 1 | R/W | |
| 3 | 0x2002 | 1st alarm backlash HY1 | 1 | R/W | |
| 4 | 0x2003 | 2nd loop alarm AL2 | 1 | R/W | |
| 5 | 0x2004 | 2nd alarm backlash HY2 | 1 | R/W | |
| 6 | 0x2005 | Display low limit FL | 1 | R/W | |
| 7 | 0x2006 | Display high limit FH | 1 | R/W | |
| 8 | 0x2007 | Analog output low limit BRL | 1 | R/W | |
| 9 | 0x2008 | Analog output high limit BRH | 1 | R/W | |
| 10 | 0x2009 | Control output low limit OLL | 1 | R/W | Default with 1 decimal point |
| 11 | 0x200A | Control output high limit OLH | 1 | R/W | Default with 1 decimal point |
| 12 | 0x200B | Overshoot limit OVS | 1 | R/W | |
| 13 | 0x200C | Heat & Cool control dead zone DB | 1 | R/W | |
| 14 | 0x200D | Proportional coefficient of cooling PC | 1 | R/W | Default with 1 decimal point |
| 15 | 0x200E | Amend | 1 | R/W | |
| 16 | 0x200F | Dispaly fuzzy tracking value DTR | 1 | R | Engineering work without decimal point |
| 17 | 0x2010 | Measure value PV | 1 | R | |
| 18 | 0x2011 | output scale MV | 1 | R/W | 0~100 |
| 19 | 0x2012 | manual-auto control switch A-M | 1 | R/W | 0: auto  1: manual |
| | | Reserve | | | |
| 20 | 0x2100 | 1st alarm mode AD1 | 1 | R/W | |
| 21 | 0x2101 | 2nd alarm mode AD2 | 1 | R/W | |
| 22 | 0x2102 | 1st alarm extended mode AE1 | 1 | R/W | |
| 23 | 0x2103 | 2nd alarm extended mode AE2 | 1 | R/W | |
| 24 | 0x2104 | Control type OT | 1 | R/W | |
| 25 | 0x2105 | Control output mode ACT | 1 | R/W | |
| 26 | 0x2106 | RUN STOP operation | 1 | R/W | 1：RUN  2：STP 3：Run auto-tuning 4：Stop auto-tuning |

| 27 | 0x2107 | Decimal point DP | 1 | R/W | |
|---|---|---|---|---|---|
| 28 | 0x2108 | Unit display UT | 1 | R/W | 25（℃）26（℉） |
| 29 | 0x2109 | Filter constants FT | 1 | R/W | |
| 30 | 0x210A | Proportional coefficient P | 1 | R/W | No decimal point |
| 31 | 0x210B | Integral time I | 1 | R/W | No decimal point |
| 32 | 0x210C | Differential time D | 1 | R/W | No decimal point |
| 33 | 0x210D | Control speed fine-tune SPD | 1 | R/W | |
| 34 | 0x210E | Heating control cycle CP | 1 | R/W | No decimal point |
| 35 | 0x210F | Cooling control cycle CP1 | 1 | R/W | No decimal point |
| 36 | 0x2110 | Cooling relay time PT | 1 | R/W | No decimal point |
| 37 | 0x2111 | Optional input signal INP | 1 | R/W | Refer to measured signal table |
| 38 | 0x2112 | Meter address ADD | 1 | R/W | |
| 39 | 0x2113 | Communication baud rate BAD | 1 | R | |
| 40 | 0x2114 | Communication delay setting DTC | 1 | R | Note ② |
| 41 | 0x2115 | PID arithmetic type PDC | 1 | R | |
| 42 | 0x2116 | Lock key LCK | 1 | R | |
| 43 | 0x2117 | Meter name | 1 | R | |
| 44 | 0x2118 | Output status | 1 | R | Note ① |

R：Read ；　　R/W：Read/write

Note① :Measuring status indication,it means operation when the data position is 1,but it means no opertion when it is 0.

| D7 | D6 | D5 | D4 | D3 | D2 | D1 | D0 |
|---|---|---|---|---|---|---|---|
| STOP | HHHH | LLLL | AT | AL2 | AL1 | OUT2 | OUT1 |

Note②:Sequenced transport and response delay of DTC communication data

DTC： □ □ □ —— Response delay ： 0 ～ 9 means 10 ～ 100ms
　　　　　　　—— Sequenced transport of byte ： 0 = 1，2，2 = 2，1
　　　　　　　—— Reserve
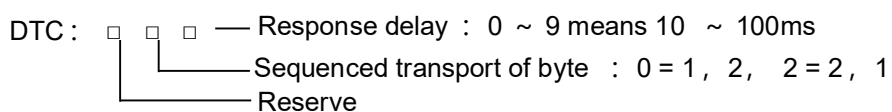
※16 digits CRC check code get C program

```c
unsigned int Get_CRC(uchar *pBuf, uchar num)
{
    unsigned i,j;
        unsigned int wCrc = 0xFFFF;
        for(i=0; i<num; i++)
        {
                wCrc ^= (unsigned int)(pBuf[i]);
                for(j=0; j<8; j++)
                {
                        if(wCrc & 1){wCrc >>= 1; wCrc ^= 0xA001; }
                        else
                                wCrc >>= 1;
                }
        }
    return wCrc;
}
```