

# DIN-Rail mounting controller CH3000

## INSTRUCTION MANUAL

Before operating this instrument, please read this manual carefully and fully understand its contents.

### WARNING

- If failure or error of this instrument could result in a critical accident of the system, install an external protection circuit to prevent such an accident.
- Do not turn on the power supply until all of the wiring is completed. Otherwise electric shock, fire or malfunction might result.
- Use this instrument within the scope of its specifications. Otherwise fire or malfunction might result.
- Do not use this instrument in the places subject to flammable or explosive gas.
- Do not touch high voltage blocks, such as power supply terminals. Otherwise electric shock may result.
- Never disassemble, repair or modify this instrument by yourself. This might cause malfunction.

## ◆ Main specifications

The CH3000 controller has the following principal characteristics:

- ◇ Multi input for thermocouple, RTD, Volt, and mA.
- ◇ Multi output for Relay; SSR; mA; Voltage
- ◇ RS485 serial interface with MODBUS/RTU protocol.
- ◇ PID control with auto tuning.
- ◇ Automatic/Manual operation.
- ◇ Initial preheating RAMP function.
- ◇ Power for two-wire transmitter.
- ◇ Opto-isolated digital input for second set point and other programmable functions.
- ◇ Settable OFF-SET for input signal.
- ◇ Selectable heating/cooling control.
- ◇ Max/min set points limitation by user.
- ◇ Selectable max output power to load.
- ◇ Pt100/Pt1000 selectable
- ◇ mA output/Voltage output selectable
- ◇ 0-20mA / 4-20mA output selectable
- ◇ Re-transmission, the transmission target can be set as PV; SV or the output power.

## ◆ Order code

Please check whether the delivered product is as specified by referring to the following model code list. And please specify the model code when you place the order.

**CH3000**     \*

**Din-Rail mounting controller**

**Control method**

F PID control (reverse action)  
 D PID control (direct action)

**Universal input**

Define factory setting of the Input/range  
 EX. K07 (thermocouple K input, range 0~1372°C)

**OUTPUT**

M Relay output  
 V SSR logic output  
 8 Voltage/mA continuous output  
 G SCR zero-cross output  
 T SCR phrase-shift output

**ALARM 1**

N NO ALARM 1  
  ALARM 1 active (Alarm code\*)

**ALARM 2**

N NO ALARM 2  
  ALARM 2 active (Alarm code\*)

**Power supply**

7 100 to 240VAC  
 I 24 to 30Vac/dc

## ◆ Technical features introduction

### ➤ Inputs

Following inputs can be programmed in the instrument

#### ◇ IEC 584 thermocouple

Input	Range Code	Range (°C)	Reso.
<b>K</b>	<b>01</b>	0 ~ 200	0.1/1
	<b>02</b>	0 ~ 400	0.1/1
	<b>03</b>	0 ~ 600	0.1/1
	<b>04</b>	0 ~ 800	0.1/1
	<b>05</b>	0 ~ 1000	0.1/1
	<b>06</b>	0 ~ 1200	0.1/1
	<b>07</b>	0 ~ 1372	0.1/1
<b>J</b>	<b>01</b>	0 ~ 200	0.1/1
	<b>02</b>	0 ~ 400	0.1/1
	<b>03</b>	0 ~ 600	0.1/1
	<b>04</b>	0 ~ 800	0.1/1
	<b>05</b>	0 ~ 1000	0.1/1
	<b>06</b>	0 ~ 1200	0.1/1
<b>R*</b>	<b>01</b>	0 ~ 1600	0.1/1
	<b>02</b>	0 ~ 1769	0.1/1
<b>S*</b>	<b>01</b>	0 ~ 1600	0.1/1
	<b>02</b>	0 ~ 1769	0.1/1
<b>B*</b>	<b>01</b>	400 ~ 1820	0.1/1
	<b>02</b>	0 ~ 1820	0.1/1
<b>E</b>	<b>01</b>	0 ~ 800	0.1/1
	<b>02</b>	0 ~ 1000	0.1/1
<b>N</b>	<b>01</b>	0 ~ 1200	0.1/1
	<b>02</b>	0 ~ 1300	0.1/1
<b>T</b>	<b>01</b>	0.0 ~ 400.0	0.1/1
	<b>02</b>	0.0 ~ 100.0	0.1/1
	<b>03</b>	0.0 ~ 200.0	0.1/1
	<b>04</b>	0.0 ~ 350.0	0.1/1

#### ◇ IEC 751 resistance temperature detector

Input	Range Code	Range (°C)	Reso.
<b>Pt100</b>	<b>01</b>	-199.9~649.0	0.1
	<b>02</b>	-199.9~200.0	0.1
	<b>05</b>	-100.0~200.0	0.1
	<b>08</b>	0.0 ~ 200.0	0.1
Order code <b>D</b>	<b>10</b>	0.0 ~ 500.0	0.1
	<b>01</b>	-50 ~ 100.0	0.1
<b>Cu50</b>	<b>02</b>	-50 ~ 150.0	0.1
	<b>03</b>	-50 ~ 50.0	0.1
	<b>04</b>	0.0 ~ 50.0	0.1
	<b>05</b>	0.0 ~ 100.0	0.1
	<b>06</b>	0.0 ~ 150.0	0.1
	Order code <b>C</b>	<b>06</b>	0.0 ~ 150.0

#### ◇ Linear signals

Input type	Code	Range	Resolution
Volt 0/1-5V*	<b>V</b>	-1999~9999	0.2%F.S.
mA 0/4-20mA	<b>A</b>	-1999~9999	0.2%F.S.

\*Other special input type, should be specified in the order.

### ➤ Main heating/cooling output

- ◇ Cycle time 1-100s
- ◇ Actuation
  - SPDT relay 5A@250V AC, 6A@125V AC
  - 0-12VDC logic, 35mA max load
  - Linear Current 0/4-20mA
  - Linear Voltage 0/1-5V

### ➤ Alarms

- ◇ 2 relay alarms
- SPDT relay 5A@250V AC

#### ◇ Alarm code\*:

- A** deviation high alarm
- B** deviation low alarm
- C** deviation high/low alarm
- D** band alarm
- E** deviation high alarm with hold action
- F** deviation low alarm with hold action
- G** deviation high/low alarm with hold action
- H** process high alarm
- J** process low alarm
- K** process high alarm with hold action
- L** process low alarm with hold action
- V** SV high alarm
- W** SV low alarm

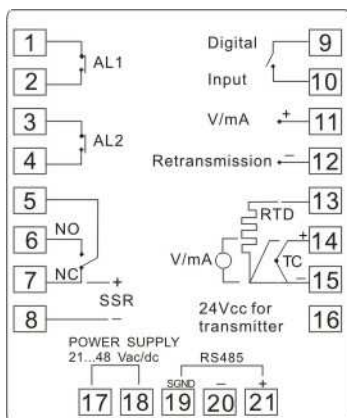
- **RS485 Serial interface**
  - ✧ MODBUS/RTU protocol
  - ✧ Read/write all device programming parameters.
  - ✧ Maximum devices on network: 128
  - ✧ Blinking LED indicates RS485 serial interface running status.
  
- **Supplementary power**
  - ✧ Power for a two-wire transmitter
  - ✧ 24VDC max 35mA
  - ✧ Short circuit protection
  
- **Digital input**
  - ✧ Opto-isolated 2.5Kvoltage
  - ✧ Programmable for: switching between two set points; auto/man switching; keypad lock.
  - ✧ Potential free contact actuation.
  
- **Environment**
  - ✧ 0 ~ 50°C ambient temperature
  - ✧ 45 ~ 85% non-condensing humidity
  
- **Power supply**
  - ✧ 100~240VAC 50-60Hz
  - ✧ Consumption: 4VA
  - ✧ 21~30V AC/DC
  - ✧ Consumption: 4VA

### ◆ Description of the front panel

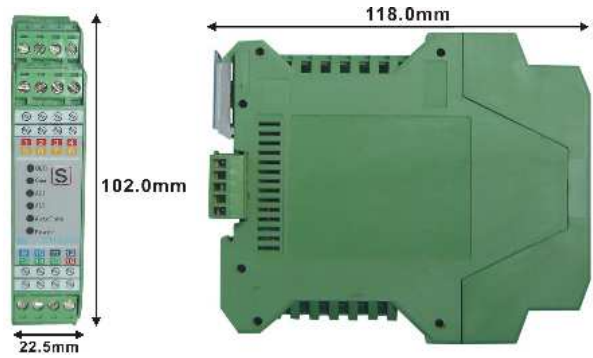


OUT1	Output indicating LED
COM	Communication LED
AL1	ALARM 1
AL2	ALARM 2
AutoTune	Auto tuning indicating LED
Power	Power LED
S key	Function key for defaulting communication parameters "add" "bps" "bit" "Int"

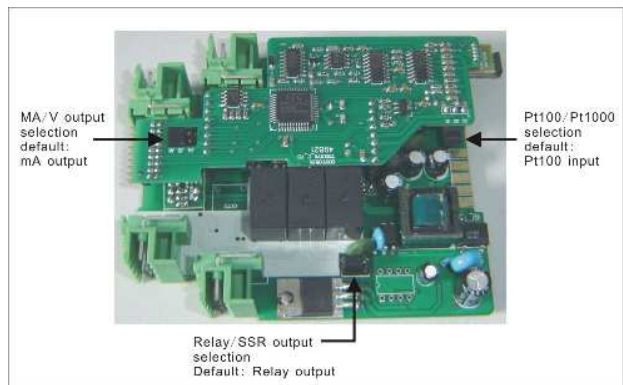
### ◆ Wire connection



### ◆ Dimensions



### ◆ Hardware selection



### ◆ Operation

How to set the parameters?

As there is no any digital display windows to show parameters, so we could set all parameters through PC software.

Please confirm all wire connection is right before use. Power on the instrument, and pressing "S" key 3 seconds at the same time to default the communication parameters, so that the PC software could find the device. The default parameters are:

Add=1; bps=2; bit=0; Int=0

When the PC software find the device, then users can set all parameters according to their requirements.

Notes: 1) The default setting values won't be memorized on EEPROM, to default the 4 parameters, users have to press "S" key 3 seconds at power on the instrument.

2) Supposed users changed the parameter "Add"=5, this value won't be active immediately, it will be valid until next power on. Other changed parameters are also only active at next power on.

### ◆ MODBUS address

#### Register Table

MODBUS add.	Parameters name	R/W
1	PV	Read only
2	SV	R/W
3	SP2	R/W
4	U%	R/W
5	Reserved --	
6	AL1	R/W
7	AL2	R/W
8	ATU	R/W
9	P	R/W

10	I	R/W
11	D	R/W
12	Ar	R/W
13	T	R/W
14	Reserved--	
15	Reserved--	
16	Reserved--	
17	dIf	R/W
18	Reserved--	
19	Reserved--	
20	SL1	R/W
21	SL2	R/W
22	SL3	R/W
23	SL4	R/W
24	SL5	R/W
25	SL6	R/W
26	SL7	R/W
27	SL8	R/W
28	SL9	R/W
29	SLA	R/W
30	SLB	R/W
31	SPH	R/W
32	SPL	R/W
33	dp	R/W
34	oh	R/W
35	AH1	R/W
36	AH2	R/W
37	ATP	R/W
38	dF	R/W
39	Poo	R/W
40	oPL	R/W
41	ST	R/W
42	Software V.	Read only
43	Hardware V.	Read only
44	Reserved--	
45	Reserved--	
46	Reserved--	
47	Addr	R/W
48	bPs	R/W
49	bit	R/W
50	Int	R/W
51	RTR	R/W
52	OFS	R/W
53	Y1R	R/W
54	Y2R	R/W
55	TLM	R/W
56	THM	R/W
57	ID mark	Read only

### Coils Table

1	Over range sensor 0=OK; 1=Over range	Read only
2	Under range sensor 0=OK; 1=Under range	Read only
3	Alarm 1 status 0=off; 1=on;	Read only

4	Alarm 2 status 0=off; 1=on;	Read only
5	Auto tuning status 0=off; 1=on;	R/W
6	A/M status 0=off; 1=on;	R/W
7	D/F control action 0=D; 1=F;	R/W
8	Unit 0=Celsius; 1=Fahrenheit	R/W
9	Digit input status 0=open; 1=close	Read only
10	Ramp status 0=off; 1=on;	Read only

### ◆ Parameters description

**PV** Process value

**SV** Set point

**SP2** The second set point. It can be switched to SV via digit input external contact. Setting range SPL to SPH

Factory set value 0020

**U%** Output power percentage

**AL1** Alarm value of ALARM 1. Factory set value is 0010. This parameter is connected to the alarm mode parameter SL4. Supposed the Alarm 1 mode is Deviation high alarm, AL1=10, then the alarm value would be 10 degrees higher than the set point. If AL1=0020, then alarm value should be 20 degrees higher than the set point.

In case the alarm mode is set as deviation low alarm, AL1=0010, then alarm value is 10°C lower than set point.

**AL2** Alarm value of ALARM 2. Factory set value is 0010. It is concerned to the Alarm 2 mode parameter SL5. Function is same as AL1.

**ATU** Auto tuning

**0000** auto tuning inactive. (factory set value)

**0001** auto tuning active.

**NOTE:** It can be used with ATP parameter which is for setting auto tuning start on percentage of set point.

**P** Proportional band

Set when PI, PD or PID control is performed.

**0000** no proportional band, ON/OFF control.

Setting range 0 to 9999(999.9)

Factory set value 0030

**I** Integral time. Set the time of integral action which eliminates the offset occurring in proportional control.

**0000** no integral time, PD control

Setting range 0 to 3600 sec.

Factory set value 0240

**D** Differential time. Set the time of derivative action which prevents ripples by predicting output changes and thus improves control stability.

0000 no differential time, PI control.

Setting range 0 to 3600 sec.

Factory set value 0060.

**Ar** Limitation of integral time

Setting range 0 to 100 Factory set value 0100

EX.: SV is 100°C; P=30; Ar=100%, when PV=70°C, controller will enter proportional band

If, SV is 100°C; P=30; Ar=80%, then the controller will start integral action until PV=76°C(set point 100°C - Ar 80% x P30).

**T** Proportioning cycle. Set control output cycle.

Setting range 1 to 100 sec. (0 can not be set)

Factory set value 0020

**dlf** Proportional band for cooling action.

Setting range 1 to 1000%

Factory set value 0100 (100%)

If there is no OUT2 on hardware, this parameter will not display in the parameter menu.

**SL1** Programming codes for different input signals

Factory set value 0000 (thermocouple type K)

Code	Input type	Code	Input type
0000	K	1000	Pt100/Pt1000
0001	J	1001	Cu50
0010	E		
0011	N	1010	0-5V
0100	R	1011	1-5V
0101	S	1100	0-20mA
0110	B	1101	4-20mA
0111	T		

**NOTE:** Pt100 and Pt1000 should be selected via a jumper.

**SL2** Code of temperature unit.

**0000** Celsius      **0001** Fahrenheit

**SL3** Reserved parameter.

**SL4** alarm mode selection of ALARM 1

Code	Alarm mode
X <b>000</b>	Alarm 1 is inactive
X <b>001</b>	Deviation high alarm
X <b>010</b>	Deviation high/low alarm
X <b>011</b>	Process high alarm
X <b>101</b>	Deviation low alarm
X <b>110</b>	Band alarm
X <b>111</b>	Process low alarm
<b>0</b> XXX	NO hold action
<b>1</b> XXX	With hold action

Factory set value 0001 (deviation high alarm).

**SL5** Alarm mode selection of ALARM 2

programming codes are same as SL4.

Factory set value 0101(deviation low alarm)

**SL6** Control output (Factory set value 0001)

Code	Corresponding features
XXX <b>0</b>	Direct control action (D)
XXX <b>1</b>	Reverse control action (F)
XX <b>0</b> X	4-20mA output
XX <b>1</b> X	0-20mA output
X <b>0</b> XX	mA output selection is off
X <b>1</b> XX	mA output selection is on
<b>0</b> XXX	No OUT2
<b>1</b> XXX	OUT2 active(relay or SSR output only)

**SL7** Relay mode (alarm relay) (Factory set value 0000)

Code	Corresponding features
XXX <b>0</b>	Trigger NO – NC on alarm 1
XXX <b>1</b>	Trigger NC – NO on alarm 1
XX <b>0</b> X	Trigger NO – NC on alarm 2
XX <b>1</b> X	Trigger NC – NO on alarm 2

**SL8** Optional features code (Factory set value 0000)

Code	Corresponding features
XX <b>0</b> X	Auto/Man mode selection off
XX <b>1</b> X	Auto/Man mode selection on
X <b>0</b> XX	RS485 interface off
X <b>1</b> XX	RS485 interface on
<b>0</b> XXX	Output memory on Man mode is off
<b>1</b> XXX	Output memory on Man mode is on

**SL9** Alarm for exceeding high /low input scale.

Code	Corresponding features
XXX <b>0</b>	Alarm 1, "PV" exceed alarm off

XXX <b>1</b>	Alarm 1, "PV" exceed alarm on
XX <b>0</b> X	Alarm 1, "PV" low limit alarm
XX <b>1</b> X	Alarm 1, "PV" high limit alarm
X <b>0</b> XX	Alarm 2, "PV" exceed alarm off
X <b>1</b> XX	Alarm 2, "PV" exceed alarm on
<b>0</b> XXX	Alarm 2, "PV" low limit alarm
<b>1</b> XXX	Alarm 2, "PV" high limit alarm

Factory set value 1111\* (see display at error occurrence)

**SLA** optional features selection

**0000** no limitation to any features

**0001** enable SV and SP2 switch

**0010** switch to Manual mode as external contact closed (digital input contact closed).

**0011** keyboard enabled(digital input contact open) Key board disabled(digital input contact closed).

Factory set value 0000

**SLB** RAMP set point (Factory set value 0000)

Code	RAMP features
<b>0</b> XXX	RAMP function is off
<b>1</b> XXX	RAMP function is on
X <b>0</b> XX	RAMP will not run as power on
X <b>1</b> XX	RAMP will run as power on
XX <b>0</b> X	One shot RAMP mode
XX <b>1</b> X	Continuous RAMP mode
XXX <b>0</b>	RAMP will not run when user change SV
XXX <b>1</b>	RAMP will run when user change SV

**SPH** High point of measurement range

EX. The input it type K, and range is 0-400°C, then set SLH=400. If you want range is 0-1000°C, then set SLH=1000.

Setting range depends on the input sensor signal. Please see 3.1 Inputs introduction.

Factory set value 0400

**SPL** Low point of measurement range

To define the low range, usually the value is 0

Factory set value 0000

**dp** Decimal point

Following parameters can be set decimal points PV, SV, SP2, P, SPH, SPL, AL1, AL2, AH1, AH2, and oH.

Factory set value 0000

**oH** Dead band of control output (ON/OFF control)

EX. Supposed SV=100°C, oH=5°C, when PV=100, controller would stop heating, when the temperature is 95°C, it will start heating, because the dead band is 5°C.

Factory set value 0005

**AH1; AH2** Dead band of ALARM 1 and ALARM 2

Factory set value 0005

**ATP** Auto tuning start on percentage of set point

Setting range 0 to 100 Factory set value 0080 (80%)

EX. Supposed SV is 100°C, and ATP is 80%, then auto tuning would be in action based on 80°C (ATP80% x SV 100°C).

**dlF** Filter the bias of PV

0000 filter off 0001 filter on

Factory set value 0001

**Poo** Offset on PID control output

Setting range 0 to 100.0% Factory set value 000.0

**oPL** Output power limit percentage on Auto/Man mode

Setting range 0 to 100.0% Factory set value 100.0

**ST** RAMP time

RAMP set point run in the time scale.

Setting range 0 to 900 min.  
Factory set value 0060 (60min.)

**Addr** Slave code on MODBUS protocol  
Setting range 1 to 255 Factory set value 0000

**bPS** Communication speed BAUD RATE  
**0000** 2400bps      **0001** 4800bps  
**0002** 9600bps      **0003** 19200bps

**bit** Digit structure on communication

Code	Bit	Checking bit	Stop bit
0	8	None	1
1	8	Odd	1
2	8	Even	1

**Int** Delay time on communication  
Setting range 0 to 2000ms Factory set value 0000

**RTR** Re-transmission selection  
0000 re-transmission function off  
0001 re-transmission target is the current output power  
0002 re-transmission target is the process value  
0003 re-transmission target is the set point

**oFS** Re-transmission range selection  
0000 0-20mA  
0001 4-20mA

**Y1R** Corresponding re-transmission value for 0 or 4mA

**Y2R** Corresponding re-transmission value for 20mA

**TLM** Modification for the re-transmission lower range

**THM** Modification for the re-transmission higher range

### ◆ **Special indication**

- ◇ When the input sensor break or exceed measurement range, the OUT1 indicating LED will blink.
- ◇ When the instrument communicate to PC software with the default setting values, the POWER indicating LED will blink.

### ◆ **Link**

NINGBO TAISUO TECHNOLOGY CO.,LTD  
Add: 2 East Yuzhou Road, Yuyao City, Ningbo 315400  
China  
Tel: 0086-574-62505590  
Fax: 0086-574-62506589  
Email: [taisuo@cnool.net](mailto:taisuo@cnool.net)  
<http://www.taisuo.com>