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# Intelligent Temperature Controller **User Manual**

Applicable for TEW-E version



#### Features

 $\odot\operatorname{Optional}$  input signal types and models

 $\odot\,\ensuremath{\mathsf{With}}$  functions of measurement display, control output, alarm output, analog output, RS485 communication, etc.

⊙Multi PID control algorithms for option, and with auto-tune function.

⊙ Optional Positive-Negative of PID (refer to OT parameter)

OManual/automatic control switch (refer to A-M paramter)

O This product is used in industrial machinery, machine tools, general measuring instruments and equipment.

⊙ Economy and easy operation.

National High-tech Enterprise/ National St	150	GB		<b>\$</b>	
Hotline: 400-0760-168	Version code: KKTE	W-E0	1E-A/	/1-202	20506

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

### I. Safe Caution

A 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.

 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.

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
- 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.
- 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.
  17 ) In order to use this product with safety for long-term, regular maintenance is necessary. The life of some parts of the equipments are by some restrictions, but the performance of some will change for using many years. 18 ) Without prior notice, the contents of this manual will be change. We hope these is no
- any loopholes, if you have questions or objections, please contact us.

Caution of Install & Connection

1. Installation

Installation

 Installation
 This product is used in the following environmental standards. (IEC61010-1) [Overvoltage category IL, class of pollution 2]
 This product is used in the following scope:environment, temperature, humidity and environmental conditions. Temperature:0~50°C; humidity: 45~85% RH; Environment condition:Indoor warranty. The altitude is less than 2000m.
 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 directly by sunlight; where accumulation of heat will happen caused by radiation.
 On the occasion of the installation, please ensure adequate ventilation space.

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 between the product and power line.

2. Cable caution :

2) 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)

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.
 In order to avoid the effect of noise, please put the input dignal away from meter cable, power cable, load cable to wiring.
 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, otherwise it will reduce the effect of noise filter.
 I takes 5s from input power to output. If there is a place with interlocking actions circuit signal olease use time relay.

5) It takes 5s from input power to output.If there is a place with interlocking actions original, please use timer relay.
6) Please use twisted pair with a shield for analog output line, can also connect the common-mode coil to the front-end of the signal receiving device to suppress line interference if necessary, to ensure the reliability of signal.
7)Please use twisted pair with a shield for remote RS485 communication cable, and deal with the shield on the host side earth, to ensure the reliability of signal.
8) This product don't have the fuse; please set according to rated voltage 250V, rated current 14.5 from used frise

a) This product doi: 11 ave the loss, prease set according to rated voltage 250v, rated current 1A fryou need; fuse type:relay fuse.
 b) Please use suitable slotted screwdriver and wire.
 c) Please use don't put the Crimp terminal or bare wire part contact with adjacent contact with adjacent screwdriver.

#### II. Ordering information



18□W-E 12 Blank: TC/RTD/mV/Rt input X: mA/V input
 10: Single input without RS485 18: Single input with RS485
 10: Single input without RS485 18: Single input with RS485
 10: Single input Without C:2 alarm output A: No alarm
 110: Single input S: SSR output Des: DC 4-20mA output
 110: SCR output (a ba ordered)
 110: SCR output (a ba ordered)

K: SCR output (to be ordered) Control output by ACT menu) Blank: No this function
 Blank: AC/DC 100 ~ 240V F : AC/DC 24V (to be ordered)
 3: 72W\*36H\*70.5L 4: 48W\*48H\*100L 6: 48W\*96H\*100L
 7: 72W\*72H\*100L 8: 96W\*48H\*100L 9: 96W\*96H\*100L

80: 160W\*80H\*96L TE Series Temperature Controller

Please advise the input signal type when you choose the model. 1st: TC/RTD/mV/Rt; 2nd: mA/V. TE series has only one 4~20mA output function. For the size of 6/8/9, when relay/SSR output simultaneously exist with DC 4~20mA, it is identified by "I", e.g., IR, IS,etc. But there is no such model for size 3/4/7.

#### III. Models

No.	Model	OUT1	contr	ol output	Alarm	output	Analog Commu-A output nication		Auxilliary power
110.	NOGEI		SSR	4 ~ 20mA	AL1 OUT2	AL2	4 ~ 20mA	RS485	24V
1	TE3-DC18□W		•	٠	•	•	0	•	
2	TE3-DC10□W		•	•	•	•	۲		
3	TE3-DB10□W		٠	٠	٠		۲		
4	TE3-RC18□W	•	•		•	•		•	
5	TE3-RC10□W	•	٠		٠	٠			
6	TE3-RB10□W	•	٠		٠				
7	TE4/7-DC18□W			٠	•	٠	۲	•	•
8	TE4/7-DC10□W			۲	٠	•	0		•
9	TE4/7-SC18□W		٠		٠	•		•	
10	TE4/7-SC10□W		٠		٠	•			
11	TE4/7-SB10□W		٠		٠				
12	TE4/7-RC18□W	•			•	•		٠	
13	TE4/7-RC10□W	•			٠	•			
14	TE4/7-RB10□W	•			•				
15	TE6/8/9/80-ISC18□W		٠	٠	•	٠	0	•	•
16	TE6/8/9/80-ISC10□W		٠	٠	•	٠	0		•
17	TE6/8/9/80-SC18□W		•		•	•		•	
18	TE6/8/8/80-SC10□W		٠		٠	٠			
19	TE6/8/9/80-SB10□W		٠		٠				
20	TE6/8/9/80-IRC18□W	•		٠	٠	٠	0	•	•
21	TE6/8/9/80-IRC10□W	•		•	•	•	0		•
22	TE6/8/9/80-DC18□W			•	•	٠	۲	•	•
23	TE6/8/9/80-DC10□W			٠	•	•	0		•
24	TE6/8/9/80-RC18□W	٠			٠	•		٠	
25	TE6/8/9/80-RC10□W	٠			٠	•			
26	TE6/8/9/80-RB10□W	•			•				

□ : Blank: input signal is TC/RTD/Mv/Rt; "X" : input signal is 4 ~ 20mA/0 ~ 10V

Standard configuration function

 $^{\odot}$  : The meter has this function, but it is combined with another function. This series only have one loop 4~20mA output, but the user can modify menu ACT to use it as main control output or analog output.

## IV. Specifications

1. Electrical parameters:				
Sample rate	2 times per second			
Relay capacity	AC 250V /3A Life of rated load>100,000 times			
Power supply	AC/DC 100 ~ 240V( 85-265V )			
Power consumption	< 6VA			
Environment	Indoor use only, temperature: 0~50°C no condensation, humidity < 85%RH, altitude<2000m			
Storage enenvironment	-10 ~ 60°C, no condensation			
SSR output	DC 24V pulse voltage, load<30mA			
Current output	DC 4 ~ 20mA load<500Ω, temperature drift 250PPM			
Communication port	RS485 port Modbus-RTU protocol, max input 30 units			
Insulation impedance	Input, output, power VS meter cover > $20M\Omega$			
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 voltage	Signal input, output, power: 1500VAC 1min , <60V low voltage circuit: DC500V , 1min			
Total weight	About 400g			
Cover material	The shell and panel frame PC/ABS (Flame Class UL94V-0)			
Panel material	PET(F150/F200)			
Power failure memory	10 years, times of writing: 1 million times			
Panel Protection level	IP65(IEC60529)			
Safety Standard	IEC61010-1 Overvoltage category $\Pi$ , pollution level 2 , level $\Pi($ Enhanced insulation )			

2. Measured signal specifications :

z. measureu s	ignal speci	lications .				
Input type	Symbol	Measure range	Reso- lution	Accuracy	Input impedance /auxiliary current	
К	Ľ	-50 ~ 1200	1℃	0.5%F.S±3digits	> 500kΩ	0
J	J	0 ~ 1200	1℃	0.5%F.S±3digits	> 500kΩ	1
E	E	0 ~ 850	1℃	0.5%F.S±3digits	> 500kΩ	2
Т	F	-50 ~ 400	1℃	0.5%F.S±3°C	> 500kΩ	3
В	ь	250 ~ 1800	2℃	1%F.S±2°C	> 500kΩ	4
R	ſ	-10 ~ 1700	1℃	1%F.S±2℃	> 500kΩ	5
S	5	-10 ~ 1600	1℃	1%F.S±2°C	> 500kΩ	6
N	c	-50 ~ 1200	1℃	0.5%F.S±1°C	> 500kΩ	7
PT100	РЕ	-200 ~ 600	0.2°C	0.5%F.S±0.3℃	0.2mA	8
JPT100	JPE	-200 ~ 500	0.2°C	0.5%F.S±0.3℃	0.2mA	9
CU50	CUSO	-50 ~ 150	0.2℃	0.5%F.S±3°C	0.2mA	10
CU100	CU00	-50 ~ 150	0.2℃	0.5%F.S±1℃	0.2mA	11
0 ~ 50mV	āĽ	-1999 ~ 9999	12bit	0.5%F.S±3digits	> 500kΩ	12
0 ~ 400Ω	ς Έ	-1999 ~ 9999	12bit	0.5%F.S±3digits	0.2mA	13
*4 ~ 20mA	ā8	-1999 ~ 9999	12bit	0.5%F.S±3digits	100Ω	14
*0 ~ 10V	2	-1999 ~ 9999	12bit	0.5%F.S±3digits	>1MΩ	15

\* Pls indicate the requirement when choose the model.

3. Isolation diagram



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

V. Dimension and installation size



VI. Connections







TE6

Note: If there is any change, please subject to the drawing on the meter.

VII. Panel Illustration

TE7



No.	Symbol	Name	Function					
	OUT1	OUT1 (red) *	Main control output indicator, lights on when output ON.					
	OUT2	OUT2 (red) *	Cooling output indicator, lights on when output ON.					
	AL1	Alarm 1# (red)	1st alarm output indicator, lights on when alarm output, lights off when no alarm output.					
1	AL2	AL2 Alarm 2# (red) 2nd alarm output indicator, lights on when alarm output, lights off when no alarm output.						
	AL3	Alarm 3#	AL3: this product does not have this function.					
	AT	AT indicator(green) Auto tune indicator, lights on when it is under auto t						
2	SET	SET key	Menu key/confirm key, to enter or exit the modification mode, or to confirm and save the modified parameter.					
3	<b>«</b> ат	Shift/AT key	Activate key/ shift key/ AT auto tune key (in measure and control mode, long press to enter/exit auto tune)					
4	R/S	Add key/ R/S Add key, in measure and control mode, long press it to shift RUN/STOP mode, or check the menu in reverse orde						
5	≽	Reduce key	Reduce key, check the menu in sequence					
6	SV	Display (green)	Set value / parameter display window, the control is stopped when it displays "STOP"					
7	PV	Display (red)	Measured value/ parameter code display window					
Ľ	PV	Display (red)	Measured value/ parameter code display window					

# \* : Size "3" is green LED.

VIII. Operation process and menu illustration

1. Operation process & method



4

a. After power on and under normal measure control mode, long press "(SET)" key more than 3s

a. After power off and under formal measure services non-processing procession of and under formal measure services non-processing procession of the menu parameters checking mode, press "()" and the menu parameters circularly.
c. In the menu checking mode, short press "()" can flash the current menu parameters to enter the parameter modify mode, and every short press can move one position to the left in cycle.
d. In the parameter modify mode, press "()" or "()" we once to add or reduce

e. In the parameter modifing mode, after the modification, press " ()" to save the modified

e. In the parameter modifing mode, after the modification, press (•••) to save the modified parameter, and exit to menu checking mode.
f. In the normal measure control mode, short press "(••)" to enter SV value modifing status.
The way of modifing SV value is same as that of modifing menu parameters.
g. In the normal measure control mode, long press "(••)" more than 3s to enter auto tune state.
During auto tune, PV value needs to be lower than SV value.
h. In the normal measure control mode, long press "(••)" key more than 3s to enter or exit
STOP model STOP model.

#### IX. Menu Illustration

 No mater what model, what control mode it is, it will always display these pair
 According to different model, control mode, these parameters will be hidden. : No mater what model, what control mode it is, it will always display these parameters.

	egular		m, e e	Setting	Factor
No.	Symbol	Name	Illustration	range	setting
1	80)	AL1	1st alarm value, note: the minus is dealed as absolute value when it is as a deviation value.	FL ~ FH	10
2	нуі	HY1	1st alarm hystersis	0 ~ 1000	1
3	83:	AD1 (1)	1st alarm mode,note: when AL1 is used as OUT2 (co- oling output), should set the value AD1=0 (close alarm function). When AD1>6, 2nd alarm function is invalid.	0 ~ 12	3
4	803	AL2	2nd alarm value, note: the minus is dealed as absolute value when it is as a deviation value.	FL ~ FH	5
5	885	HY2	2nd alarm hystersis	$0 \sim 1000$	1
6	895	AD2 (1)	2nd alarm mode	0 ~ 6	4
7	PS	PS	Amend value, display value= actual measured value + amend value	FL ~ FH	0
8	ьP	INP	Optional input signal. Note: after selecting the signal, pls properly set below relevant parameters: SV, AL1 , HY1 ,AL2 ,HY2 ,P ,OVS ,DB.	refer to input signal para- meters table (page 3)	К
9	ot	от	Control mode, 0:ON/OFF heating control, relevant parameter: DB. 1: PID heating control, relavant parameters: P, I, D, OVS, CP, ST, SPD, PDC. 2: ON/OFF cooling control, relevant parameter DB; need to set PT when it is used for compressor control. 3:PID heating & cooling control (cooling control OUT2 will output through AL1 relay), relevant parameters: P, I, D, OVS, CP, CP1, PC, DB, ST, SPD, PDC. 4: Over temperature cooling output , relevant parameter: DB 5. PID cooling, relevant parameter: P, I, D, OVS, CP, ST, SPD, PDC.	0 ~ 5	1
10	8-8	A-M	Auto-manual control switch, AUTO(0): auto control only; MAN(1): manual control only; AM(2): auto-manual shortcut switch	AUTO~AM	AUTC
11	ρ	Ρ	Proportional band, the smaller the value is, the faster the system responds, otherwise, it is slower. When P=0, no PID control, unit same as PV	0 ~ 9999	30
12	;	Ι	Integral time, the smaller the value is, the stronger the integral action is, otherwise, it is weeker. When I=0, no integral action, unit: s.	0 ~ 9999	120
13	6	D	Differential time, the greater the value is, the stronger the differential actiontion is, otherwise, it is weeker. When D=0, no differential action. Set D=0 when controlling fast systems, e.g., pressure, speed; unit: s	0 ~ 9999	30
14	o''S	ovs	Overshoot limit, during PID control process, when PV(measured value) > SV(set value) + OVS (overshoot limit), force to close output. The smaller this value is, the smaller the PID adjustment range is, the worse the control stability is. Please set the appropriate value according to the actual situation.	0 ~ 9999	5
15	C٩	СР	OUT1 control cycle, 1: SSR control output, 4-200: relay control output. Unit: s	1 ~ 200	20
16	CP:	CP1	OUT2 relay output cycle. Unit: s	4 ~ 200	20
17	90	PC	OUT2 cooling proportionality coefficient, the higher of value, the stronger of cooling	1 ~ 100	10
18	రం	DB	ON/OFF control hystersis(positive and negative numbers work the same); when OT=3, it is the dead zone for cooling control(positive and negative numbers work differently);after change the INP setting, please change this parameter according to the decimal point position.	-1000~1000	5
19	ιCγ	LCK	Lock function. 0001:SV value can' t be modified. 0010: menu setting value only can be checked, can' t be modified. 0033: can enter to advanced menu. 0123: menus reset to factory setting.	0~9999	0
			u illustration	Sotting	Footor
No.	Symbol	Name	Illustration	Setting range	Factory setting

No.	Symbol	Name	Illustration	Setting range	Factory setting
20	8C6	ACT	Control execution type. 0: relay or SSR output. 1:SSR output (only valid for TE3). 2: 4-20mA control output, setting should comply with the selected configuration of the meter. 3: 4~20mA retransimition output for size 3/4/7 products. For size 6/8/9 products, when this menu is set as 0 or 1, 4-20mA output is used as retransimition output.	0~2 (0~3)	0
21	881	AE1 (2)	1st alarm extensions function, refer to alarm extension function table	0~5	0
22	865	AE2 (2)	2nd alarm extensions function,refer to alarm extension function table	0~5	0
23	d٩	DP	Decimal point setting, maximum 1 decimal place for TC & RTD input	0~3	0
24	ძხი	DTR	PV fuzzy tracking value, properly set this value on some occasions, it can get a more stable control display value, this value is unrelated with actual measured value. Note: after setting this value, when alarm setting value is equal to SV set value, alarm output operation is subject to actual measured value. Set as 0 to close this function.	0.0 ~ 2.0 (0~20)	1.0 (10)
25	۶٤	FT	Filter coefficient, the higher of value, the stronger of filter function	0 ~ 255	10
26	UE	UT	Temperature unit: ℃: Celsius degrees. °F: Fahrenheit degrees. Note: No unit for linear signal	(25)℃ (26)℉	(25)°C

No.	Symbol	Name	Illustration	Setting range	Factory setting
27	۶٤	FL	Measure range low limit, the set value must be less than measure range high limit	Refer to measured signal parameter table	-50
28	۶x	FH	Measure range high limit,the setting value must be more than measure range low limit.	Refer to measured signal parameter table	1200
29	ხინ	BRL	Analog range low limit, note: when this value is higher than analog range high limit, it is reverse analog output.	FL~FH	-50
30	668	BRH	Analog range high limit, note: when this value is lower than analog range low limit, it isreverse analog output.	FL~FH	1200
31	σιι	OLL	Output low limit, limit the output low limit current amplitude. Set value must be less than high limit setting	-5.0~100.0	0
32	σLΗ	OLH	Output high limit,limit the output high limit current amplitude. Setting value must be greater than low limit setting	0.0 ~ 105.0	100.0
33	SE	ST	Auto-tune activation after power-on, 0: work normally after power-on, 1: automatically enter PID parameters auto-tune status after power-on; long press (**) key to exit auto-tune.	0~1	0
34	SPd	SPD	PID control speed adjustment,option: 0 (N) no function, 1 (s) slow, 2 (ss) medium slow, 3 (SSS) very slow, 4 (F) fast, 5 (FF) medium fast, 6 (FFF) very fast	0~6	Ν
35	98C	PDC	PID algorithm option: 0(FUZ): Advanced fuzzy PID arithmetic; 1(STD): normal PID arithmetic	0~1	FUZ
36	Pb	PT	Compressor start delay time, unit: s	0~9999	0
37	583	BAD	Baud rate 0 (4.8): 4800 ; 1 (9.6): 9600; 2 (19.2): 19200	0~2	9.6
38	833	ADD	Communication ADD	0~255	1
39	P-89	PRTY	Communication parity check setting , 0 : NO 1 : ODD 2 : EVEN	0~2	N0
40	35C	DTC	Communication data transport sequence 000; 1st bit function reserved; 2nd bit is byte sequence exchange; 3rd bit function reserved.	Refer to COM. protocol note③	0
41	C88	CAE	User self-calibration enable function, this parameter is only for the input signals except TC/RTD; Y:enable the self-calibration parameters; N: don't use the self-calibration parameters.	0(N) 1(Y)	N
42	CAL	CAL	Self-calibration low limit input operation, after adding the low end signal to the signal input terminal, flash YES to activate, after confirm and display OK, the input signal low end calibration is completed.	YES/OK	YES
43	C88	САН	Self-calibration high limit input operation, after adding the high end signal to the signal input terminal, flash YES to activate, after confirm and display OK, the input signal high end calibration is completed.	YES/OK	YES
44	984	VER	Software version		

(1) Alarm parameters and output logic diagram:

Symbo	l description: "☆" means HY, "	▲" means alarm value, " △ " means SV value
Alarm code	Alarm mode	Alarm output ( AL1 & AL2 are independent from each ) Image:the hatched section means the alarm action
1	High limit absolute value alarm	
2	Low limit absolute value alarm	← → PV AL SV
3	※High limit deviation value alarm	→ PV
4	%Low limit deviation value alarm	SV-AL SV SV-AL SV
5	※High/low limit deviation value alarm	SV-AL SV SV+AL
6	∺High/low limit interval value alarm	→ ☆ ☆ PV SV-AL SV SV+AL
Alarm code	Alarm mode	The below two alarm parameters(AL1,AL2) are used in combination, AL1 alarm output, AD2 must be set as 0
7	High and low limit absolute value interval alarm	ALL SV AL2 PV
8	※High and low limit deviation value interval alarm	SV-ALL SV SV-AL2 ≻ PV
9	※High limit absolute value and low limit deviation value interval alarm	$\xrightarrow{f:r} \xrightarrow{\Delta} PV$ sv-AL1 Sv AL2
10	※High limit deviation value and low limit absolute value interval alarm	ALI SV SV+AL2 PV

<u>++</u>	High/low limit absolute value alarm	
12	High/low limit deviation value alarm	SVALL SV SV-AL2

When the alarm value with deviation alarm is set as a negative number, it will be dealed as an absolute value.

(2) Alarm extension function table

(=)/						
AE1/AE2 value	Alarm handling method when it displays HHHH/LLLL Power on, alarm inhibition					
0	Alarm status remains the same	e Power on, no alarm inhibition				
1	Forced alarm output	( As long as the alarm condition is met, alarm				
2	Forced alarm close	output immediately.)				
3	Alarm status remains the same	Power on, alarm inhibition				
4	Forced alarm output	(After power on and before the PV value reaches the SV for the first time, the alarm will not output.				
5	Forced alarm close	After that alarm work normally)				

X. Key function operation

1. Stop mode

- Under the measure mode, long press "(3)" key to enter the STOP mode, SV window will display "STOP", main control output will stop or keep the minimum output.
   Under STOP mode, long press "(3)" key to exit STOP mode, press "(4)" key to e

modify SV value. 3 ) Under STOP mode, alarm output and retransimition output work normally.

2. PID auto-tune operation:

1) Before auto-tune procedure, please switch off the control output load power, or set the meter as STOP mode.

 Before auto-tune procedure, PV value should meet below condition: when it is PID heating control, PV needs to be much smaller than SV; when it is PID cooling control, PV needs to be much larger than SV. 6

- 3) Before auto-tune procedure, please set a proper alarm value or eliminate the alarm condition, in order to prevent the auto-tune procedure from being affected by alarm output.
- 4) Set PID type and SV value: the factory default setting is fuzzy PID
- 5) Set as PID control, if there is OLL & OLH output limiting, please set the output to a proper range; factory default setting is OLL=0%, OLH=100%.
- 6) Exit STOP mode, or switch on the load Power, immediately long press " ( r) key to enter auto-tune mode, then the AT indicator light is on.
- 7) The auto-tune procedure will take some time, in order not to affect auto-tune result please don't modify the parameters or power-off.
- 8) When AT light goes out, it automatically exits auto-tune mode, PID parameters will be updated automatically, and then the meter will control automatically and exactly.
- a) During the auto-tune procedure, below actions will cause the termination of the precess, long press "((\*)" key, measure beyond the scope, abnormal display, switch to STOP mode, power-off, etc.
  10) Note: In the occasions with output limiting operation, sometimes, even if the auto-tune is carried out, the best PID parameters still cannot be obtained.
  11) Experienced users can set a proper PID parameter according to their experience.
- 3.PID heating and proportional cooling control operation
  - 1) Set the control mode OT as 3.
  - 2) PID heating control acts on OUT1; proportional cooling control acts on OUT2.
  - 3) Proportional cooling control OUT2 outputs via AL1 alarm function terminals.
    4) Please set the cooling start hystersis DB to a value greater than 5, to ensure the cooling
  - output will not affect the PID heating control. 5) Please change the cooling control cycle CP1 and the cooling proportionality coefficient
- to 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. Auto-manual switch function
- 1) Enter common manual, set parameter A-M as "AM".
- 2) After return back to measure control interface, press "(ser)" key to switch auto-manual operation.
- 3) When it is switched to manual control, lower line LED will display output percentage: M0~M100 (corresponding to 0%~100%), press Add Key or Reduce Key to modify the output percentage
- A) Before the switch from manual control to auto control, in order to ensure the smooth switch, please press Left Key to modify the SV value first.
- 5) After the meter is rebooted, the default setting is manual control and output 0.
- 5. Fixed manual control function
  - 1) Set A-M parameter as "MAN".
  - 2) After return back to measure control interface, user can modify output percentage by manual.
- 3 ) After the meter is powered on again, the manual output percentage can be restored. 6. Linear signal self calibration function operation
- 1 ) Set up the INP type, and ensure it is one of these input 0 ~ 50mV, RT(0 ~ 400 $\Omega$ ), 4 ~ 20mA and 0 ~ 10V.
- 2) Add the input signal to the correct input channel.
- a) Unter the imput of and context imput channel.
   b) Enter menu low-limit calibration menu CAL, press "(())" to flash"YES"; and set the input signal to minimum value and input it to the meter.
   b) When "YEC" is discharged with the imput it to the meter.
- 4) When "YES" is flashing, and the minimum value of the signal has been input to the meter, please press "er" to ensure and save the calibrating value.
  5) After calibrating low-limit, enter the high-limit calibration menu CAH, and flash "YES".
  6) Set the input signal to maximum value and input it into the meter; when the "YES" is flashing areas and the artifector under and the artifector under a size.
- flashing, press "(ser)" to ensure and save the calibrating value. 7 ) After calibrating, enter menu CAE, change "N" to "Y" to enable the calibrating value;
- otherwise, it still use the factory default value. 8 ) The calibrated high-limit input linear signal value should not exceed the input standard
- value range ±10%.
- 9) If not satisfied with the calibrating result, could calibrate again.

### XI. Checking methods of simple fault

Display	Checking methods
	Checks whether the input disconnection and whether normal of FH/ FL value, working environment temperature and whether input signal is selected correctly.
	working environment temperature and whether input signal is selected correctly.

### XII. Communication procotol

Meter adoptS RS485 Modbus RTU communication protocol, RS485 half duplex communication. Read function code 0x03, write function code 0x10/0x06, Adopt 16 digit CRC check, the meter does not return for error check. Data frame format

Jala Irame Iormal.										
Start bit	Data bit	Stop bit	Check bit							
1	8	1	Set in Menu PRTY							

Handling of abnormal communication:

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, i.e.: communication cycle= time of request data sending +slave preparation time + response delay time + response return time, e.g.: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 1 data register. The memory code of decimal integer 200 is 0x00C8. Note: when reading data, should read DP value or confirm DP menu value first to ensure the decimal point postion, after that transform the read data to get the actual value. Conversely, it should transform the data to corresponding ratio before writing the data in meter.

	Host request (Read multi-register)											
1	2	3	4	1		5	e	5 7			8	
Meter ADD	Function code	Start ADD High bit	Sta AE Low	D	Data Len high	gťh	Data byte Length Iow bit		℅CRC code low bit		<pre>%CRC code high bit</pre>	
0x01	0x03	0x20	0x	00	0x	00	0x01		0x8F		0xCA	
Slave normal answer(Read multi-register)												
1	2	3			4	5			6 RC code ow bit		7 CRC code high bit	
Meter ADD	Function code	Data by Lengt				-						
0x01 0x03 0x02					00	0x	:C8 0		xB9		0xD2	
Function code abnormal answer: (For example: host request ADD is 0x2011)												

Slave abnormal answer(Read multi-register) \*CRC code \*CRC code Meter ADD Function code Error code low bit 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 decimal integer 150 is 0x0096.

1	1	2	3		4	-	5	6	7		8	1	9	1	0	11	
			Star	+ 0	Start			Data byte			° Data		9 ata			*CRC	
	r Fun		ADE	5 2	ADD		ngth	Length			high		ow 0	XC co		code	
ADD	00	ode	High				h bit	low bit		ngth			bit		/ bit	high bit	
0x01	0	(10	0x20		x00		x00	0x01		x02 0x00 0x96 0x07						0xFC	
0.00.		(10	0/20										x50	1 0/			
					slave		al ans	wer (write	mult	i-regi	ster)						
1		2	3			4	_	5		6				7		8	
Mete		nction		ADD		rt AD		Data byte								CRC code	
ADD		ode	-	h bit		w bit	: lien	gth high b	ιτιε	-		DIT		ow bi	t	high bit	
0x0	1 0	x10	0x	20	(	)x00		0x00		0x0	1		(	0x0A		0x09	
Host \	ost write SV with 0x06 function ( set value 150 )																
						H	lost re	quest ( wri	te si	ngle-	regist	ter)					
	L	2		3		4	ļ.	5	6	;		7				8	
Meter Function Start ADD Sta							Start ADD Data Da				×(	CRC	C co	de	ЖC	CRC code	
AD	D	cod	е	High	bit	Lov	<i>w</i> bit	high bit	OV				w bit I			nigh bit	
0x	01	0x0	)6	0x20	)	0x00 0x00 0x9									0x64		
						Sla	ve nor	mal answe	er ( v	write s	sing <b>l</b> e	-re	giste	r)			
	1 2 3 4 5 6 7 8											8					
Me	eter	Fun	ction	AD	D	A	DD	Data		Data XCRC code XCRC				CRC code			
A	DD	co	de	High	bit	Lo	w bit	high bit				w b		high bit			
0>	:01	0x	06	0x2	20					0x96 0x02			:02	0x64			
				0	200	hnor	mal ar	nswer ( writ		ado r	ogiet	or)					
	1				avea		inai ai		0 31	igic-i	eyisi	<del>.</del>					
	1			2		$\rightarrow$		3		×0	4	hda	+	×.		5 code	
Μ	eter A	NDD	Fu	Inctio	n cod	code Error code				%CRC code low bit				hig			
	0x01		-	0x8	6			0x02			xC3		+			A1	
letar		meter	e odd			ing to		0702		L					08	A1	
										<b>D</b>	ator		0.01	_			
		egister		-	able		3			Regi	ster		2/W	_	R	emark	
		0 ( 48		-	value					1			/W				
2 (	)x200	1(48	3194)	1st	alarm	ı valu	ie AL1			1		R	/W				
3 (	)x200	2 ( 48	3195)	1st	alarm	ı hyst	teresis	s HY1		1		R	/W		-		
4 (	)x200	3 ( 48	196)	2nd	alarr	n val	ueAL2	)		1		R	/W	+			
		4 ( 48		-				s HY2			1 R/W						
_				-				51112						_			
		5 ( 48					nit FL			1			/W	_			
	0x2006(48199) Display high limit FH									1		R	/W				
8 (	0x2007(48200) Analog output low limit BRL									1		R	/W				
9 (	0x2008 (48201) Analog output high limit BRH 1									R	/W	-					
10 (	0x2009 (48202) Control output low limit OLL									1		R	/W	Def	ault 1	1 decimal point	
				-						1			/w	-		1 decimal point	
	0x200A (48203) Control output high limit OLH 0x200B (48204) Overshoot limit OVS												/w		aun	r decimal point	
	0x200C (48205) Heat & Cool control dead zone DB								1				_				
										1			/W	-			
		D (48		· ·				nt of cooling	PC	1			/W	Det	ault	1 decimal point	
15 0x200E ( 48207 ) Amend value PS 1 R/W							-										
16	0x200F ( 48208 ) PV fuzz				fuzzy	y tracking value DTR				1			R			ering work	
17 (	0x2010 ( 48209 ) Measu				2011	ed value PV				1	1 R			Witt	iout	decimal point	
					utput percentage MV					1			/W		0~100		
_				to-Manual switch A-M					1			/w	_		; 1: Manual		
19   (	JXZUI	.2 ( 40	5211)	Auto	)-ivia	nuars	SWIICH					N	/ • •	10.7	<b>hui</b> to	, 1. Manual	
20	0	0 / 40	2440 )					Reserve	;	1		D	/W	_			
		$\frac{00}{48}$					le AD'							_			
		$\frac{1}{2}$					de AD			1			/W	-			
		$\frac{12}{2}$ (48)						function A		1			/W	_			
		)3 ( 48						I function A	۹E2	1			/W	_			
		)4 ( 48		-	trol r					1			/W	_			
25	Ux210	)5 ( 48	3454)	Out	put m	ode ,	ACT			1		R	/W	_			
																2:STP	
26	Ux210	16 ( 48	5455)	וטאן	v/ST	JH Ol	peratio	on		1		Ŕ	/W			auto-tune	
				-										4:5	stop	auto-tune	
		)7 ( 48			imal					1			/W	_			
		)8 ( 48			disp					1			/W	25	( °C	2)26(°F)	
_		)9 ( 48		-	er cor					1		R	/W				
		)A ( 48			portic	nal c	oeffici	ent P		1		R	/W	N	o de	cimal point	
31	)x210	)B ( 48	3460)	Inte	gral t	ime I				1				cimal point			
32	)x210	)C ( 48	3461)		erenti					1		R	/W	N	o de	cimal point	
33 (	Dx210	D ( 48	8462					une SPD		1			/W				
		DE ( 48					ol cycl			1			/W	N	o de	cimal point	
_		)F ( 48						e CP1		1			/W			cimal point	
_		.0 ( 48					time I			1			/W			cimal point	
		1 ( 48					signa			1			/W			o signal table	
_		2 ( 48					s ADD			1			/W	$\top$			
		3 ( 48						id rate BA	D	1			R .	+			
				-				equence E		1			R	+	1	Note ③	
	0x2114 (48469) Com. data transfer sequence DTC 0x2115 (48470) PID arithmetic type PDC						-	1			R	+	<u> </u>				
		6 ( 48			k LCI		11.2			1			R	+			
_		7 ( 48		-						1			R	+			
				-						1			R	+	•	Note ②	
	0x2118 ( 48473 ) Output state									<u> </u>	+						

Host request (write multi-register)

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M

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45 0x2119 ( 48474 ) Parity Check PRTY R : Read only ; R/W : Read & write

Note: The register number is the address converted to decimal plus 1 and then the register identification code 4 is added in front; for example: the register number of the data address 0x2000 is 8192 + 1 = 8193 and then 4 is added in front, that is, the register number 48193; Related applications can be seen, such as Siemens S7-200 PLC. Note @: Measurement status indication. When the data bit is 1, it means execution, and when it

is 0, it means no execution.

	D7	D6	D5	D4	D3	D2	D1	D0				
	STOP	НННН	LLLL	AT	AL2	AL1	OUT2	OUT1				
Note③: DTC communication data transmission sequence description												

Ϋ́

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Byte transfer order: when it is 0, 1, 2, and when it is 1, 2, 1 Reserve

%16-bit CRC check code to get C program 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; } wCrc >>= 1;

8

return wCrc