

Intelligent Temperature Controller User Manual

Applied to TFY-B/TF-G version series



Features

- Multiple PID algorithms for options, built-in two sets of auto-tuning algorithms and will automatically exit when auto-tuning timeout.
- Heating & cooling dual PID control algorithm, support heating and cooling pid self-tuning simultaneously.
- With soft start & output power limiting function.
- With reservation start, Constant temperature timing, slope temperature control function.
- With LBA (loop break alarm) function.
- SSR cycle control output.
- The self-defining common menus.
- Free reorganization of communication register address to improve communication efficiency.

Version code: KKTFY-TF-B01E-A/1-20260511

The instruction explains temperature controller settings, connections, name,etc. Please read carefully before you use the temperature controller, and use it correctly based on understanding the content. Please keep it properly for necessary reference.

I. Safe Caution

⚠ Electric shock

- Please don't make power on before completing all the wires. Otherwise it may lead to electric shock, fire, fault.
- Do not touch power supply terminal and other high voltage part when power on.
- Do not remove, repair and modify this product, otherwise it may lead to electric shock, fire, fault.

🚫 Prohibition

- The product should not be used in atomic energy equipment and medical devices of human life.
- Do not use outside the scope of product specification, otherwise it may lead to fire, fault.
- Do not use in places with flammable, explosive gases.

⚠ Caution

- Please set the proper protection circuit in the external when the failure or abnormal of products lead to a major system accidents
- The product may occur radio interference when it used at home. Adequate countermeasures should be taken in this case.
- The product gets an electric shock protection through reinforced insulation. When the product is embedded in the devices and wiring, please subject to specification of embedded devices.
- In order to prevent surge occurring, proper surge suppression circuits should be set up for all indoor wiring that more than 30m occasions as well as wiring for outdoor.
- The product is based on panel mounting. In order to avoid users approaching high-voltage parts such as power terminals, please take necessary measures on the end product.
- Be sure to observe precautions in the manual, otherwise it may cause injuries or accidents.
- Please observe the local regulations when wiring.
- To prevent machine damage and failure, please install an appropriate capacity fuse on the connected power lines or larger capacity input/output lines or other ways to protect the circuit.
- Please don't mix metal pieces and wire debris into this product, otherwise it may lead to electric shock, fire, fault.
- Please tighten the screws according to the specified torque, otherwise it may lead to electric shock and fire.
- In order not to hinder the heat dissipation of this product, please do not block the cooling windows around the housing and equipment vents.
- Please do not connect any unused terminal.
- Please be sure to do cleaning after power off, use a dry soft cloth to wipe dirt on the product, and do not use moisture absorbers, otherwise it may lead to deformation and discoloration.
- Please do not knock or rub the panel with rigid thing.
- This manual assumes that the reader has a basic knowledge of electricity, control, computer and communication.
- The examples of illustrations, pictures and data used in this manual are recorded for the convenience of understanding, are not guaranteed to be the results of the operation.
- Regular maintenance is necessary for the safe long-term using. Some parts of this product are subject to a limited life span, and some may change in performance due to years of using.
- Without prior notice, the contents of this manual may be change. We hope there is no loophole, if you have any questions or objections, please contact us.

⚠ Cautions of Installation

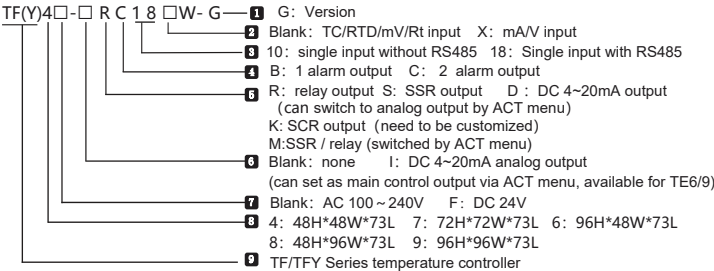
- This product is subject to the following environmental standards.
(IEC61010-1) [Overvoltage category II, class of pollution 2]
- Please use the product in the following scope: temperature:0~50°C
Humidity:45~85%RH. Environment condition: indoor. Altitude < 2000m.

- Please avoid using in the following places:
condensation status / generating corrosive or flammable gases/ direct vibration/ water, oil, chemicals, steam status/ full of noise, static electricity and magnetic field.
- Please consider the following points before installation.
To avoid heat saturation, please open sufficient ventilation space.
Please consider wiring and maintenance environment, and make sure there is more than 50mm below this product.
Please avoid installing directly above the high heat generating machine.
(E.g. heater, transformer, semiconductor operator, high capacity resistor.)
When the surrounding >50°C, please use a forced fan or cooling machine. But do not let the cool air blow directly to the product.
For better anti-interference performance and security, please try to stay away from high pressure machines, power machines to install.
The distance between the product and the power line should be more than 200mm.
Please install the power machine as far as possible.

⚠ Connection

- Cable cautions:
 - Please use specified compensation wire when TC input. Please use insulated TC if the measured device is heated metal.
 - For RTD input, please use wires with low resistance, and cables (3-wire type) with no resistance difference, but the length should < 5m.
 - For RTD input, please use wires with low resistance, and cables (3-wire type) with no resistance difference, parallel wiring, and a single wire resistance should < 10Ω.
 - In order to reduce the impact of power cables and load cables, it is recommended to use a noise filter when vulnerable. If using a noise filter, be sure to install it on a grounded disk, and make the wiring shortest between the noise filter output side and power terminal. Do not install fuse, switches, etc. on the wiring of the noise filter output side, otherwise, it will reduce filter effect.
 - The time from the input of power to the output is about 5s. Please use a timer relay when using interlocking circuit signals.
 - Please use the twisted-pair cable with a shielding layer for the transmission output line. It is necessary to connect the common mode coil at the front end of the signal receiving devices to suppress interference for stable signals.
 - Please use a shield-twisted pair as long the distance RS485 communication line, and connect the shield on the host side to ensure stable communication.
 - This product dose not have a fuse. If needed, please configure according to the rated voltage 250V, rated current 1A. Fuse type: delay fuse.
 - Please use the suitable screw torque and crimp terminal
Terminal screw size: M3X8 (with 6.8X6.8 square)
Recommended tightening torque of terminal: 0.4N.m
Suitable cable: 0.25 ~ 1.65mm single/multiple core cable
 - Please do not contact the crimp terminals or exposed sections with adjacent terminals.
Crimping Terminal Size
Note: conventional products are not equipped with this terminal, please purchase it separately if needed.
- Temperature resistance of the wires connected to the terminals should > 70 °C.

II. Model Illustration



III. Model Description

NO.	Model	OUT1 control output			Alarm output		Analog output	Comm.	Auxiliary power
		RELAY	SSR	4 ~ 20mA	AL1 OUT2	AL2			
1	TFY/TF4-C28□			●	●	●	⊙	●	●
2	TFY/TF4-C2□			●	●	●	⊙		●
3	TFY/TF4-R28□	●			●	●		●	
4	TFY/TF4-Q28□		●		●	●		●	
5	TFY/TF4-M2□	●	●		●	●			
6	TFY/TF7-C28□			●	●	●	⊙	●	●
7	TFY/TF7-C2□			●	●	●	⊙		●
8	TFY/TF7-M28□	●	●		●	●		●	
9	TFY/TF7-M2□	●	●		●	●			
10	TFY/TF6/8/9-IM28□	●	●	●	●	●	⊙	●	●
11	TFY/TF6/8/9-IM2□	●	●	●	●	●	⊙		●
12	TFY/TF6/8/9-C28□			●	●	●	⊙	●	●
13	TFY/TF6/8/9-C2□			●	●	●	⊙		●
14	TFY/TF6/8/9-M28□	●	●		●	●		●	
15	TFY/TF6/8/9-M2□	●	●		●	●			

- Input signal: Blank : TC / RTD / mV/ Rt X: 4-20mA / 0-10V
- Standard configuration function
- ⊙ TF/TFY temperature controller has only 1 loop DC 4-20mA output function, it can be switched to main control output by ACT menu configuration.

IV. Specifications

1. Electrical parameters	
Sample rate	5 times/second
Relay capacity	AL1/AL2/OUT2: AC 250V/3A resistive load, Electrical life is 50000 times
	OUT1 (one loop normally open): AC 250V/3A universal load Electrical life is 10000 times (The electrical life test condition for 10000 times is AC250V/10A)
	OUT1 (one loop conversion): AC250V/3A resistive load Electrical life is 100000 times
Power supply	AC 100 ~ 240V 50/60Hz DC 24V
Power consumption	< 10VA
Environment	Use indoor, temperature: 0 ~ 50°C, no condensation. Humidity: < 85%RH Altitude<2000m
Storage environment	-10 ~ 60°C, no condensation
SSR output	DC 24V impulse level, load<30mA
Current output	DC 4 ~ 20mA, load < 500Ω, temperature drift 250PPM

Communication port	RS485 port Modbus-RTU protocol, access up to 30 units
Insulation impedance	Input, output, power supply to housing >20MΩ
ESD	IEC/EN61000-4-2 Contact ±4kV /Air ±8kV perf.Criteria B
Pulse train immunity	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
Dielectric strength	Between the signal input, output and power supply:3000VAC 1minute, Below 60V and between low voltage circuits AC500V 1 minute
Power-off protection	10 years, can write data for 1 million times
Protection level	IP65 (IEC60529)
Safety Standard	IEC61010-1, overvoltage category II , pollution level 2, levelII (reinforced insulation)
Shell material	Shell and panel base frame: PC/ABS (flame level UL94V-0)
Panel material	PC(F150/F200)
Total weight	About 400g

2. Measured signal parameters :

Input type	Symbol	Measuring range		Resolution	Accuracy (23°C±0.5)	Input impedance/ auxiliary current	Comm. parameter code
		°C	°F				
K1		-50 ~ 1200	-60 ~ 2200	1°C	0.3%F.S±1°C	>1MΩ	
K2		-50.0 ~ 999.9	-60.0 ~ 999.9	0.2°C	0.3%F.S±1°C	>1MΩ	
J1		0 ~ 1200	0 ~ 2200	1°C	0.3%F.S±1°C	>1MΩ	
J2		0.0 ~ 999.9	0 ~ 999.9	0.2°C	0.3%F.S±1°C	>1MΩ	
E1		0 ~ 850	0 ~ 1500	1°C	0.3%F.S±1°C	>1MΩ	
E2		0.0 ~ 850.0	0 ~ 999.9	0.3°C	0.3%F.S±1°C	>1MΩ	
T1		-50 ~ 400	-60 ~ 750	1°C	0.3%F.S±1°C	>1MΩ	
T2		-50.0 ~ 400.0	-60.0 ~ 750.0	0.4°C	0.3%F.S±1°C	>1MΩ	
B		250 ~ 1800	250 ~ 3200	1°C	0.5%F.S±2°C	>1MΩ	
R		-10 ~ 1700	-10 ~ 3000	1°C	0.5%F.S±2°C	>1MΩ	
S		-10 ~ 1600	-10 ~ 2900	1°C	0.5%F.S±2°C	>1MΩ	
N1		-50 ~ 1200	-60 ~ 2200	1°C	0.3%F.S±1°C	>1MΩ	
N2		-50.0 ~ 999.9	-60 ~ 999.9	0.2°C	0.3%F.S±1°C	>1MΩ	
PT100-1		-200.0 ~ 600.0	-200.0 ~ 999.9	0.2°C	0.3%F.S±1°C	0.33mA	
PT100-2		-200 ~ 600	-300 ~ 1100	1°C	0.3%F.S±1°C	0.33mA	
JPT100-1		-200.0 ~ 500.0	-200.0 ~ 900.0	0.2°C	0.3%F.S±1°C	0.33mA	
JPT100-2		-200 ~ 500	-300 ~ 900	1°C	0.3%F.S±1°C	0.33mA	
CU50-1		-50.0 ~ 150.0	-60.0 ~ 300.0	0.2°C	0.5%F.S±3°C	0.33mA	
CU50-2		-50 ~ 150	-60 ~ 300	1°C	0.5%F.S±3°C	0.33mA	
CU100-1		-50.0 ~ 150.0	-60.0 ~ 300.0	0.2°C	0.5%F.S±3°C	0.33mA	
CU100-2		-50 ~ 150	-60 ~ 300	1°C	0.5%F.S±3°C	0.33mA	
0 ~ 50mV		-1999 ~ 9999		12bit	0.3%F.S±3digits	0.33mA	
0 ~ 400Ω		-1999 ~ 9999		12bit	0.3%F.S±3digits	0.33mA	
*4 ~ 20mA		-1999 ~ 9999		12bit	0.3%F.S±3digits	<50Ω	
*0 ~ 10V		-1999 ~ 9999		12bit	0.3%F.S±3digits	>1MΩ	

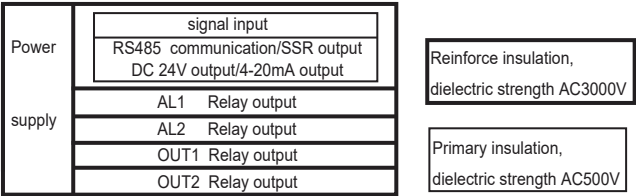
*: Please specify signal input requirements when ordering.

Temperature drift: 150ppm/°C

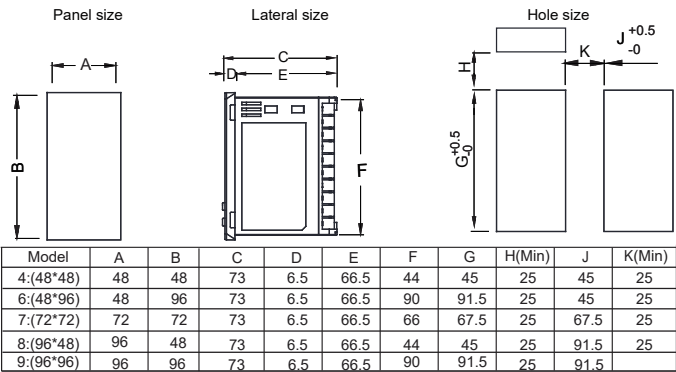
Note1: Additional 2°C allowable error should be added when TC input using internal cold end compensation.

Note2: When input type is B, in the range of 250~600°C, TC can measure but can not reach the calibration accuracy. In the range of 600~1800°C, TC can ensure measurement accuracy.

3. Isolation diagram:

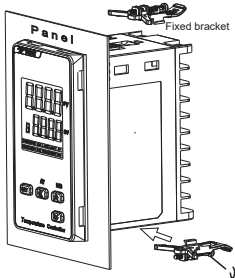


V. Installation hole dimensions



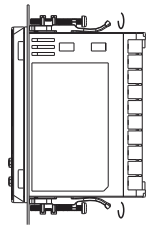
2. Installation of fixed bracket (take TFY6 as an example)

Pre-installation diagram



Installation method: First, embed the instrument into the pre-open installation hole, then place the fixing bracket on the installation slot of the instrument housing, and push the bracket towards the panel until it is clamped to the instrument (operation as shown in the installation diagram). If not tight enough, please tighten the fixing screw.

Post-installation diagram



3. Installation protection instruction (take TFY6 as an example)

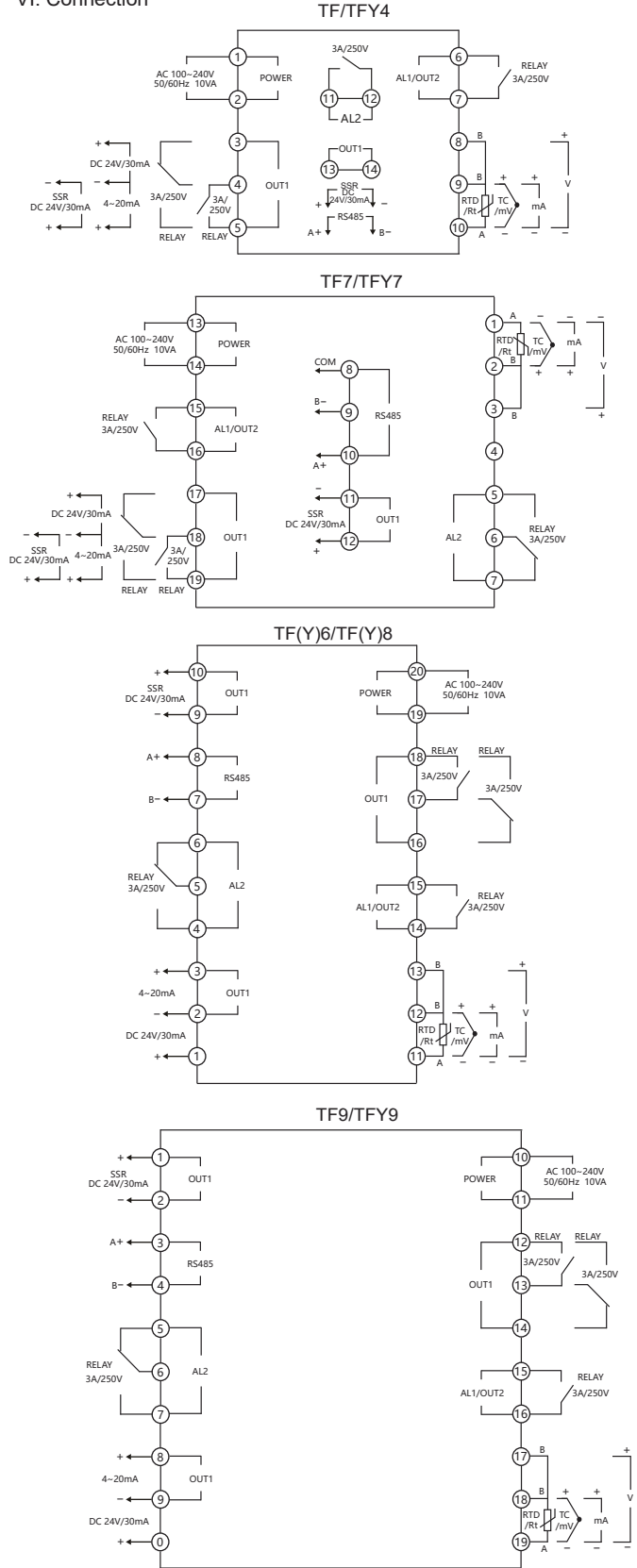
Waterproof gasket



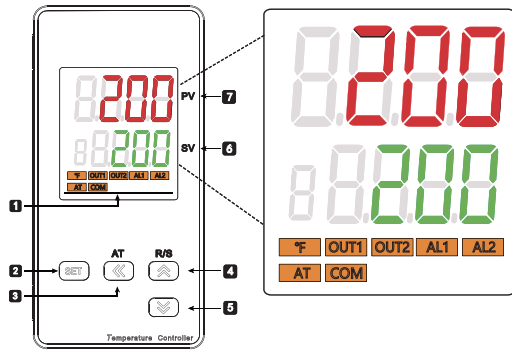
Disassembly method: First loosen the fixed screws, tilt up the tail of the fixed frame, and let the clamping teeth on the lower side of the fixing frame separate from the shell clamping teeth, then exit the fixing frame backward, the meter can be removed now.

The product is equipped with a waterproof gasket, and it must be installed on the product to ensure the protection level of the front panel reaches the IP54 level.

VI. Connection



VII. Panel Illustration

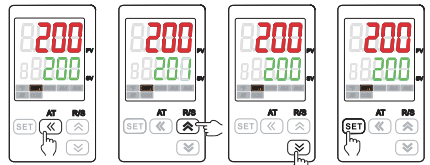


No.	Symbol	Name	Function
1	°F/°C	°F/°C (Orange)	Temperature unit selection
	OUT1	OUT1 (Orange)	Main control output indicator, indicates when output ON.
	OUT2	OUT2 (Orange)	Cooling output indicator, indicates when output ON.
	AL1	Alarm 1# (Orange)	1st alarm output indicator, lights on when alarm output, lights off when no alarm output.
	AL2	Alarm 2# (Orange)	2nd alarm output indicator, lights on when alarm output, lights off when no alarm output.
	AT	AT (Orange)	Auto-tuning indicator, lights on when it is on auto-tuning status.
	COM	COM (Orange)	The communication indicator will keep on flashing when communication is in progress.
2	SET	SET key	Menu key/confirm key, to enter/exit the modification mode, or to confirm / save the modified parameter.
3	⬅	Shift / AT key	Activate key / shift key / AT auto-tuning key (long press to enter/exit auto-tuning in measure and control mode)
4	⬆	Up key / R / S	Add key, in measure and control mode, in measurement control mode, long press it to switch RUN/STOP mode, or check the menu in reverse order.
5	⬇	Reduce key	Reduce key, check the menu in sequence
6	SV	Display (green)	Display window of set value / parameter, displays "STOP" when control is stopped.
7	PV	Display (red)	Display window of measurement value/parameter code.

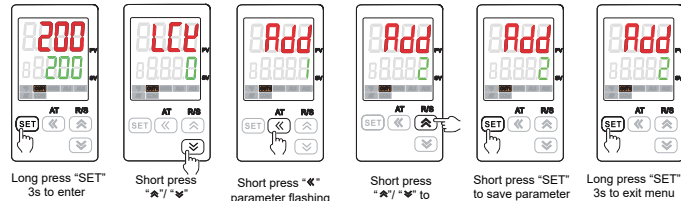
VIII. Operation process and menu illustration

1. 1. Operation process & method

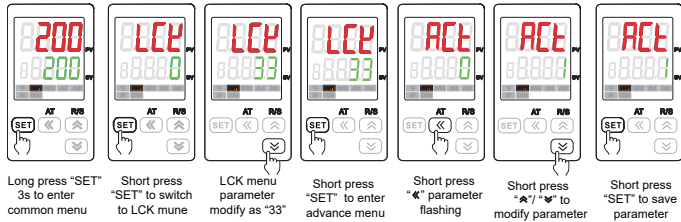
1) Modify the target set value



2) Common menu parameter setting



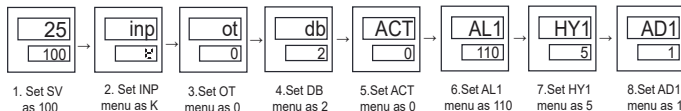
3) Advanced menu parameter setting



2. Examples of operation

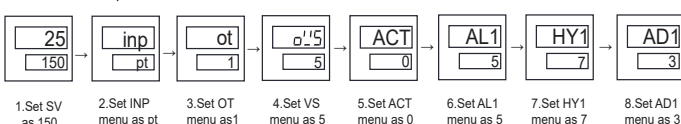
1) Example 1 for switching control output

Sensor indicator: K model, measurement temperature -50~1300°C
Control target temperature: 100°C Control mode: heating
Control requirement: ON/OFF control, when temperature = 100°C stops heating, <98°C reheating.
Control output: relay Alarm: 1 loop alarm, when temperature > 110°C alarm on, < 105°C alarm off.



2) Example 2 for PID control output

Sensor indicator: PT100 model Control output: SSR Measurement temperature -200~600°C
Control target temperature: 150°C Control mode: heating Control requirement: PID control
Note: please turn on auto-tuning when debugging for the first time to control the temperature stability. There is no need to repeat if the temperature control is stable after auto-tuning.
Alarm: 1 loop alarm, when alarm value > set value 5°C alarm on, < 2°C alarm off.



IX. Menu Illustration

□: Parameters that are always displayed no matter under what model or control mode.
■: Some parameters that are hidden according to different model and control mode.

1. Monitoring interface description

No.	Symbol	Name	Illustration	Setting range	Factory setting
1	SV	SV	Set value	SLL - SLH	200
2	SP-M	SP-M	In the current slope heating status, can check current slope heating target value	—	—
3	TD	TD	Appointment timing remaining time, unit: minute	0 - 9999	0
4	TH	TH	heat preservation timing remaining time, unit:minute	0 - 9999	0

2. Common menu description

No.	Symbol	Name	Illustration	Setting range	Factory setting
—	PSW	PSW	Password of the full menu, input 0033 enter into common menu.	0 - 9999	0
1	BAD	BAD	Communication buad rate. 0 (4.8): 4800. 1 (9.6): 9600. 2 (19.2): 19200.	0 - 2	9.6
2	ADD	ADD	Modbus slave device address	1~247	1
3	PRTY	PRTY	Communication parity bit setting. 0: NO 1: ODD 2: EVEN	0~2	NO
4	DTC	DTC	Communication data transport sequence 000. 1st bit: function reserve. 2nd bit: byte sequence exchange 3rd bit: function reserve.	Refer to XII. note ③	0
5	AL1	AL1	1st alarm value. Attachment(1)alarm parameters&output diagram	FL - FH	10
6	HY1	HY1	1st alarm hysteresis. See attachment (1)	0 - 1000	1
7	AD1	AD1	1st alarm mode. Note: when AL1 is used as OUT2 (cooling output) should set AD1=0 (close the alarm function). When AD1>6, the 2nd alarm function is invalid. See attachment (1).	0 - 14	3
8	ATH1	ATH1	he 1st heat preservation mode alarm trigger condition, AD1=13 takes effect, attached (1) 0001: alarm heat preservation is completed; 0010: When the temperature exceeds the effective range [SV-THR, SV+THR], during heat preservation, make alarm 0100: alarm at the beginning of heat preservation, which can be used for feeding reminders after preheating; The above alarm modes can be freely combined according to requirement, alarm will be triggered when meet any condition	0, 1, 10, 11, 100, 101, 110, 111.	1
9	AL2	AL2	2nd alarm value. See attachment (1).	FL - FH	5
10	HY2	HY2	2nd alarm hysteresis. See attachment (1.)	0 - 1000	1
11	AD2	AD2	2nd alarm mode. See attachment (1).	0 - 14	4
12	ATH2	ATH2	The 2nd heat preservation mode alarm trigger condition, AD2=13 takes effect, function is same with ATH1	0, 1, 10, 11, 100, 101, 110, 111.	10
13	LBA	LBA	Loop break alarm time, Unit: second. See attachment (1).	0 - 9999	10
14	LBD	LBD	loop break alarm not sensing temperature band Unit: °C/°F	0 - 9999	10
15	LBF	LBF	loop break alarm judgment amplitude, Unit:°C/LBA,°F/LBA	0 - 9999	2
16	PS	PS	Display correction value, display value= actual measured value + display correction value	-1999 -9999	0
17	INP	INP	Input measured signal type selection. Note: the following parameters need to be set properly after modification: SV, AL1, HY1, AL2, HY2, P, OVS, DB.	Refer to signal table (IV.2)	K1
18	OT	OT	Control mode. 0: ON/OFF heating control. related parameters: DB; 1: PID heating, related parameters: P, I, D, OVS, CP, ST, PDC; 2: ON/OFF cooling control, related parameter DB; PT needs to be set for compressor control 3: PID heating and cooling (cooling control OUT2 is through AL1 relay), related parameters: P, I, D, P1, OVS, CP, CP1, PC, DB, ST, SPD, PDC; 4: Over temperature cooling output, related parameters: DB; 5: PID cooling. related parameter P, I, D, OVS, CP, ST, SPD, PDC	0 - 5	1
19	A-M	A-M	Manual control and automatic control switch, AUTO(0): fixed automatic control; MAN(1): fixed manual control; AM(2): Hand automatic one key switch; TH(3): Thermal insulation timing function	AUTO - TH	AUTO
20	THD	THD	Preset timing (unit: minutes) 0: close timing function	0 - 9999	0
21	THT	THT	Soak time/hold time (unit: minutes) 0: close timing function The THD/THT parameters modified in the RUN mode will not be taken effect this time, if you need to modify this countdown time, please modify it in the monitoring interface TD/TH.	0 - 9999	0
22	THR	THR	Holding start temperature range i.e. when PV reaches [SV-THR, SV+THR] and remain 5 seconds, then start heat preservation.If you need to trigger a countdown timing, when starting to heat preservation,you need to set bigger value	0 - 9999	0
23	THC	THC	Action after temperature holding condition: STOP: stop temperature control ; HOLD: keep heating preservation	STOP/HOLD	STOP
24	P	P	Proportion band, The smaller the value, the faster the system respond. Otherwise, it is slower. When P=0, PID control is invalid ; Resolution keep the same with PV value.	0 - 9999	20
25	I	I	Integration time, The smaller the value, the stronger the effect. Otherwise, it will be weaker. It will not work when I=0. Unit: s.	0 - 3200	400
26	D	D	Differential time, The larger the value, the stronger the differential action. D=0, no derivative action. When control pressure, speed and other quick response system, can set D as 0. Unit: second	0 - 3200	80
27	P1	P1	OT=3, OUT2 cooling PID parameter function and setting same as above	0 - 9999	20
28	I1	I1		0 - 3200	400
29	D1	D1		0 - 3200	80
30	OVS	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 suitable value according to the actual situation.	OFF, 1 - 9999	OFF
31	CP	CP	OUT1 control cycle. 1: SSR control output, 4~200:relay control output, Unit:second	1 - 200	20.0
32	CP1	CP1	OUT2 relay output cycle. Unit:second	4 - 200	20.0
33	DB	DB	ON/OFF control hysteresis(positive and negative numbers have the same effect). please adjust decimal point position appropriately after modifying INP parameter..	-1000 - 1000	5
34	LCK	LCK	Password lock function: 0001: SV value cannot be modified; 0010: Menu settings can only be viewed, cannot be modified; 0033: Can enter the advanced menu; 0123: Menu reset to factory setting, need to power off and restart;	0 - 9999	0

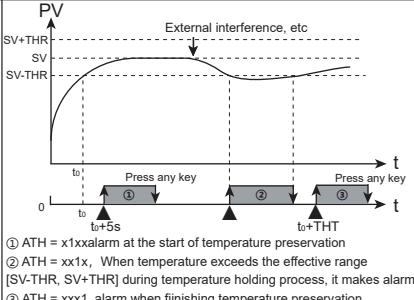
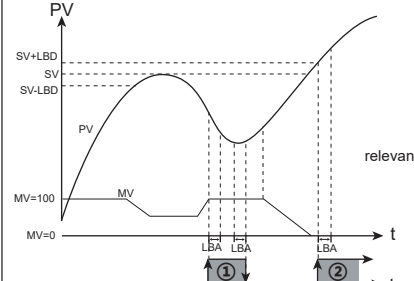
3. Advanced menu illustration

No.	Symbol	Name	Illustration	Setting range	Factory setting																						
35	ᠷᠢᠴᠡ	ACT	Control output. 0: relay output 1: SSR output 2: 4~20mA adjustment output 3: 4~20mA analog output(effective for TEY4 /TEY7) 4: SSR output, OUT1 relay used as AL2 alarm output 5: 4~20mA analog output, AL2 relay used as OUT1 output	0 - 5	0																						
36	ᠷᠡᠭᠡ	AE1	Alarm1 extension function: Menu option: AE1=A×1+B×10+C×100 <table><tr><td></td><td>C</td><td>B</td><td>A</td></tr></table> 1. A: overlimit alarm and power on alarm inhibition <table><tr><td>A</td><td>Alarm handling mode for display overlimit</td><td>Whether inhibit alarm when power on</td></tr><tr><td>0</td><td>alarm status remains the same</td><td rowspan="2">No inhibition</td></tr><tr><td>1</td><td>force alarm output</td></tr><tr><td>2</td><td>force alarm close</td><td rowspan="3">inhibition</td></tr><tr><td>3</td><td>alarm status remains the same</td></tr><tr><td>4</td><td>force alarm output</td></tr><tr><td>5</td><td>force alarm close</td><td></td></tr></table> 2. B: Alarm indication B=0, Ao alarm indication B=1, When the alarm is triggered, the lower line led flashes and display alarm information 3. C: alarm reset C=0: no alarm reset C=1: enable alarm reset function in heat preservation mode, when heat preservation starts or ends, triggering an alarm, press any button to clear the alarm status		C	B	A	A	Alarm handling mode for display overlimit	Whether inhibit alarm when power on	0	alarm status remains the same	No inhibition	1	force alarm output	2	force alarm close	inhibition	3	alarm status remains the same	4	force alarm output	5	force alarm close		0 - 5, 10 - 15, 100 - 105, 110 - 115.	0
	C	B	A																								
A	Alarm handling mode for display overlimit	Whether inhibit alarm when power on																									
0	alarm status remains the same	No inhibition																									
1	force alarm output																										
2	force alarm close	inhibition																									
3	alarm status remains the same																										
4	force alarm output																										
5	force alarm close																										
37	ᠷᠡᠭᠡ	AE2	AL2 Second alarm extension function; Description as above	0 - 5, 10 - 15, 100 - 105, 110 - 115	0																						
38	ᠳᠠᠫ	DP	Decimal point position. Can set one demical point maximum when input TC/RTD.	0 - 3	0																						
39	ᠳᠤᠷᠠ	DTR	PV fuzzy tracking value, setting this value appropriately in some situations can obtain stable display value. value is unrelated with actual process value. Note: After setting the menu, When the alarm set value is based on actual measurement value. set it as 0 to close the function.	0.0 - 2.0 (0 - 20)	1.0 (10)																						
40	ᠹᠤ	FT	Filter coefficient.The higher the value,the stronger the effect	0 - 255	10																						
41	ᠤᠤᠲᠤ	UT	Temperature unit setting °C: Celsius °F: Fahrenheit Note: no unit for linear signal.	(25)°C (26)°F	(25)°C																						
42	ᠴᠤᠪ	CB	Cold end compensation correction of zero point offset.	-199.9 - 199.9	0.0																						
43	ᠴᠤᠬᠤ	CK	Cold end compensation correction slope.	0.000 - 2.000	1.000																						
44	ᠹᠤᠯ	FL	Measurement range low and high limit . For Tc/Rtd input, no need to modify the default setting. For 4~20mA/0~10V, set the corresponding low and high limit range. eg. 0~10V corresponds to measurement -20~50, set FL as -20, set FH as 50. Range -1999~9999 is related with dP decimal point menu. Note: the range of lower&upper	Refer to signal table	-50																						
45	ᠹᠤᠬᠤ	FH	limits have a margin of 10%×(FH-FL), the accuracy is out of inspection scope when exceeding the calibration range.		1200																						
46	ᠰᠤᠯᠤ	SLL	Lower limit of the target set value range.	FL~FH	-50																						
47	ᠰᠤᠯᠤ	SLH	Upper limit of the target set value range.	FL~FH	1200																						
48	ᠪᠣᠷᠮ	BRM	Analog mode. PV(0): PV analog output. SV(1): SV analog output.	PV, SV	PV																						
49	ᠪᠣᠷᠯ	BRL	Lower & upper limit of the 4~20mA analog process value. E.g. 0~100 correspond to 4~20mA, set brL= 0, brH = 100. Note: analog output can be reversed.	FL~FH	-50																						
50	ᠪᠣᠷᠬ	BRH	E.g. 100~0 corresponds to 4~20mA.	FL~FH	1200																						
51	ᠠᠯᠤᠯ	OLL	Output upper limit. Only effective for 4~20mA when set value < 0.0.	-5.0 ~ 100.0	0.0																						
52	ᠠᠯᠤᠬ	OLH	Output upper limit. Only effective for 4~20mA when set value > 100.0	0.0 ~ 105.0	100.0																						
53	ᠠᠯᠤᠯᠤ	OLL1	OUT2 cooling output limit low limit	0.0 ~ 100.0	0.0																						
54	ᠠᠯᠤᠬᠤ	OLH1	OUT2 cooling output limit high limit	0.0 ~ 100.0	100.0																						
55	ᠠᠯᠤᠬᠤ	OLHM	Output high limit effective range: For heating control, when PV<OLHM , OLH become effective For cooling control, PV>OLHM , OLH become effective	FL ~ FH	1200																						
56	ᠰᠹᠰᠲ	SFST	Soft start time, time required from 0% to 100% output. unit: second. Note:changing set value dose not affect the soft start being acted	0 ~ 9999	0																						
57	ᠰᠲ	ST	Power on running mode, 0: Normal control, reset to thermal insulation status in insulation mode; 1: Automatically enter PID parameter self-tuning status, press the AT key more than 3seconds to exit self-tuning; 2: stop operating status. 3: Maintain the running status before power off ; 4: Maintain current temperature , use current measured temperature as target temperature, but doesn' t save and cover the original SV. 5: take effect on the insulation mode(A-M = TH), holding the insulation time before power-off. Start countdown when PV reaches [SV-THR, SV+THR]. Enter stop status if insulation is over before power-off.	0~5	0																						
58	ᠰᠢᠳᠤ	SPD	PID control speed adjustment, option: 0 (N) No , 1 (s) slow, 2 (ss) medium slow, 3(SSS)very slow, 4 (F) fast, 5 (FF) medium fast, 6 (FFF) very fast	0~6	N																						
59	ᠢᠳᠤᠴᠤ	PDC	PID algorithm selection. 0(FUZ): Advanced Fuzzy PID 1(STD):Common PID algorithm 2(NPID): new fuzzy PID 3(2DOF): 2-degree of freedom PID	0~3	FUZ																						
60	ᠷᠡᠭᠡ	ATE	PID self-tuning extension function: Menu options: ATE=A×1+B×1000 <table><tr><td>B</td><td></td><td></td><td>A</td></tr></table> 1. A: Auto-tuning timeout time (unit: minutes) When self-tuning exceeds the set value, the self-tuning will exit and keep PID parameters before auto-tuning. set range A∈[1,999]. 2. B: Auto-tuning algorithm selection (when PDC set as FUZ, it becomes effective) B=0, 90% tuning algorithm; B=1, 50% tuning algorithm.	B			A	1~1999	1180																		
B			A																								
61	ᠰᠢᠴᠤ	SPC	PID parameters application in different industry field; he controller is built in ten sets of commonly used PID parameters. Customer can invoke the PID parameters based on according industry field. Refer to Appendix (3)	NULL, PID0 - PID9	NULL																						

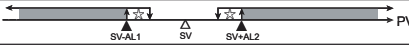
No.	Symbol	Name	Illustration	Setting range	Factory setting
62	ᠫᠤᠲ	PT	Compressor start delay time, Unit: s.	0 - 9999	0
63	ᠰᠰᠷᠮ	SSRM	SSR drive output execution mode, 0: standard; 1: cycle control refer to Appendix (2)	0 - 1	0
64	ᠴᠢᠯᠡ	CYLE	Cycle control time gears selection, the bigger value, the longer cycle control time.	0 - 2	0
65	ᠰᠫᠤᠲ	SPRT	Set value of temperature rise slope, setting OFF has no such function, unit: °C/minute. When SPRT setting is valid, the PID is running, if the measured value is lower than the given value, the temperature will rise to the given value at the temperature rise speed limit defined by SPRT. Unit: per minute. If SPRT=5, the temperature will rise to the given value at 5 °C per minute.	OFF, 1~9999	OFF
66	ᠴᠠᠡ	CAE	User self-calibration enable function,this parameter is only for input signals except TC/RTD.Y enable the self-calibration parameters. N don't use self-calibration parameters.	0 (N) 1 (Y)	N
67	ᠴᠠᠯ	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
68	ᠴᠠᠬ	CAH	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, input signal high end calibration is completed.	YES/OK	YES
69	ᠰᠰᠠ	SSM	Panel key switch RUN/STOP, 0: Disabled 1: 1: Enabled This setting is only related to the panel operation, not related with communication	0 ~ 1	0
70	ᠮᠠᠮᠤ	MVM	Panel key switch display MV output percentage, 0: Disabled 1: Enabled , When A-M=AUTO is enabled, you can short press "SET" button to switch display the output percentage.	0 ~ 1	0
71	ᠯᠢᠭᠲᠤ	LGT	LED brightness adjustment, the higher value, the greater brightness	1 ~ 8	4
72	ᠮᠤ1	MU1	Convenient user menu, User can set and associate any common menus. When set value is not NONE, this function is enabled. Press SET key more than 3seconds in meter monitoring interface to enter menus, it will Priority display the settled covenant menus. If need to check and set other menus , press 0033 to enter the advanced menus.	NONE, AL1~VER	NONE
73	ᠮᠤ2	MU2			
74	ᠮᠤ3	MU3			
75	ᠮᠤ4	MU4			
76	ᠮᠤ5	MU5			
77	ᠮᠤ6	MU6			
78	ᠮᠤ7	MU7			
79	ᠮᠤ8	MU8			
80	ᠯᠡᠭᠤ	VER	Software version, read only.		

Attachment (1) Alarm parameters and output logic diagram

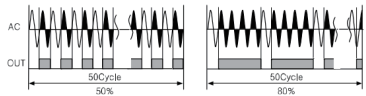
Symbol description: "☆" means HY. "▲" means alarm value. "△" means SV value.

Alarm code	Alarm mode	Alarm output (AL1 & AL3 are independent from each) 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	
13	Temperature holding mode relevant alarm	
14	LBA Alarm	

Alarm code	Alarm mode	The following two sets of alarm parameters are used in combination (AL1,AL2). AL1 (alarm output),AD2 must be set as 0
7	High-Low limit absolute value interval alarm	
8	※High-Low limit deviation value interval alarm	
9	※High absolute and low deviation value interval alarm	
10	※High deviation and low limit absolute value interval alarm	
11	High-Low limit absolute value alarm	

Alarm code	Alarm mode	The following two sets of alarm parameters are used in combination (AL1, AL2). AL1 (alarm output), AD2 must be set as 0
12	※High-Low limit deviation value alarm	

Attachment (2) cycle control: when turned on, the meter will control the loaded power by repeating the cycle change in output proportion based on a certain period.



Attachment (3) SPC industry standard PID parameter comparison table.

No.	Name	Industry	Parameter		
			P	I	D
1	PID0	Single screw extruder	23	568	143
2	PID1	Twin screw extruder	33	900	220
3	PID2	Vertical packaging machine	10	120	30
4	PID3	Shoe machine	15	295	65
5	PID4	Lithium battery coating machine(cathode)	55	550	70
6	PID5	Lithium battery coating machine (anodic)	40	160	40
7	PID6	Protective clothing pressing machine	350	20	15
8	PID7	Vertical three side sealing packaging machine	240	406	101
9	PID8	Electric oven	284	210	52
10	PID9	Experimental resistance furnace	97	336	840

※Due to the differences between devices, the above parameters are for reference only and not suitable for all devices of the same type.

X.Methods of simple fault

Display info	The exclusion method
LLLL/HHHH	Check whether the sensor is disconnected, poor contact or incorrect wiring; Check FH value and FL value; Check whether the work temperature and ambient temperature is out of range; Check if the input signal is selected correctly (INP menu)

XI. Key function operation

- Stop mode
 - In measurement and control mode, long press" R/S "key to enter Stop mode, SV window displays"STOP", main control stop/output at minimum.
 - In STOP mode, long press" R/S " key to exit STOP mode, short press  key to modify SV value.
 - In stop mode, alarm output and analog output keeps working.
- PID auto-tuning operation:
 - Please switch off the control output load power or set the meter as STOP mode before operating auto-tuning.
 - PV is required to meet the conditions before auto-tuning: PV should much less than SV under PID heating control (OT=1)/PID cooling control(OT=3). PV should much greater than SV under PID cooling control (OT=5).
 - Please set a proper alarm value or eliminate the alarm condition before auto-tuning, in case being affected by alarm output when auto-tuning.
 - Set the PID type and SV value, the factory default is fuzzy PID control. If the PID type is fuzzy PID control, select the appropriate auto-tuning algorithm(ATE), the factory default is 50% auto-tuning algorithm.
 - Set as PID control. Please set the output to a proper range if there are OLL & OLH output limits, factory default is OLL=0%, OLH=100%.
 - Exit STOP mode, or switch on the load power, and long press AT key immediately to enter auto-tuning mode, then the AT indicator lights on.
 - The auto-tuning process takes time, in order not to affect the results, please do not modify parameters or power-off.
 - When AT indicator lights off, it exits auto-tuning mode automatically, PID parameters will be updated automatically, and then the meter will control automatically and exactly.
 - Long press AT key, measure beyond the range, display abnormal, switch to STOP mode, power-off, etc., the above will all abort the auto-tuning process.
 - Note: when there is an output limit operation, the best PID parameters are sometimes not available even in auto-tuning mode.
 - Experienced users can set a proper PID parameter according to their experience.
- PID heating&cooling propotional control
 - Set the control mode OT as 3.
 - PID heating control act on OUT1, PID cooling control act on OUT2.
 - PID cooling control OUT2 will output by AL1 alarm function terminal.
 - Please set the heating control cycle (CP) & the cooling control cycle (CP1) to a proper value.
 - Please set a proper heating PID parameter (P, I, D) & cooling PID parameter (P1, I1, D1), or turning on auto-tuning for relatively proper values.
- Auto/manual tuning switched by one key
 - After entering the common menu, set parameter A-M as "AM"
 - Back to measurement control interface, press  key to complete auto/manual switching operation.
 - When switch to the manual tuning, the lower window will display the output, M0~M100 (corresponding to 0%~100%), press the increase/decrease key to directly adjust the output.
 - Before switching to the auto-tuning, the SV value can be modified first by pressing the left key in order to achieve non-disturbing switching.
 - The meter defaults as manual tuning and output as 0 after re-power on.
- Output limit function

Note: under analog output control (e.g. 4~20mA regulation output), the output limit is effective for the actuator, if the default limit is OLL=0.0, the upper limit OLH=100.0, output quantity 0.0%~100.0% corresponds to output 4~20mA. If ALL=20.0, OLH=80.0, the output quantity 0.0%~100.0% corresponds to output 7.2mA~16.8mA.

Under the On/Off control output, the output limit is directly takes effect on the output quantity, if OLL=20.0, OLH=80.0, then the lower limit of output quantity will be 20.0%, the upper limit of output quantity as 80.0%.

 - Enter the advanced menu to set the required output limit (OLL), output upper limit(OLH), when selecting the PID heating&cooling control (OT=3), OLL, OLH corresponds to the lower&upper limit of the heating output,OLL1, OLH1 corresponds to the lower&upper limit of cooling output.
 - For On/Off control, set the effective range (OLHM) of output upper limit (OLHM). Under heating control, PV<OLHM/ cooling control, PV>OLHM, the output upper limit takes effect.
- Soft start-up function
 - To set the soft start-up time in the advanced menu (SFST), it should be noted that this parameter is not related to the output limit. E.g. set the soft start-up timeSFST=100s,OLH=80.0, then the meter will reset the soft start-up function, the output quantity will be controlled by 1.0% increase per second, and reach to the output upper limit 80.0% in 80s (analog control output will continue accumulating to 100%).
 - Set the soft start-up effective range (OLHM). Soft start-up function takes effect when PV<OLHM/ cooling control, PV>OLHM under heating control.

Note: When PID heating/cooling control (OT=3), the soft start-up function is only effective on heating.

- Slop temperature control function
 - Enter the advanced menu to set a proper ramp temperature control set value (SPRT), heating&cooling parameters are all positive number, please consider whether the equipment can meet the corresponding heating&cooling speed before setting.
 - Under running status, the ramp temperature control takes effect before PV reaches SV, short press  key to switch the lower raw digital tube will display the current ramp target value.
- Reservation soak timer function
 - Enter the advanced menu to set A-M as"TH".
 - Set the reservation starting time in menu "THD" according to your demand.

"THT": insulation time. "THR": range of insulation temperature. "THC": action after insulation.

 - Short/long press R/S key in measurement interface to run/stop insulation
When THD ≠0, reservation appointment countdown will be triggered immediately after start-up, temperature control will turn on after countdown.
After temperature reaches the interval [SV-THR, SV+THR] 5s will trigger countdown, which confined by "THT". (The 5s are included in the countdown)
 - In insulation, short press  key to switch the lower raw digital tube circularly,will display target value SV, remaining time of reservation appointment TD, remaining time of insulation appointment TH. After short press the lower raw digital tube for 1s, the lower raw will display target value SV. Similarly, "TD"&"TH" works the same.
 - ①After countdown/in STOP mode, when the lower raw display TD/TH the remaining time, modifying the remaining time by    will directly write into the "THD"&"THT" menu.
②In countdown status, modifying TD/TH the remaining time can extend or shorten the soak time, the result will not be saved, only affects this insulation.
 - To trigger the countdown from the start of heating/cooling, you need to set the "THR" large enough so that the interval [SV-THR, SV+THR] will contain the starting temperature.
 - When you need to set the insulation alarm, enter the common menu to set parameter AD1/AD2 as 13, the alarm mode can be combined freely by configuring the required alarm triggering conditions in the "ATH" menu. E.g. set ATH=0101 if you need alarm to be triggered at the beginning/end of insulation. Set ATH=0101 if alarm needed to be triggered when temperature deviates or insulation ends.
 - When setting the alarm at the begining/end of insulation in ATH, and the advanced menu AE1=X1XX, short press any key to clear the alarm.
 - If you need the insulation countdown to be inherited after power on, enter the advanced menu to set the power-on operation mode (ST) as 5. If the countdown is not over before power-off, after re-power on and the PV triggers the above insulation conditions, the insulation will continue from the time before power-off.

Note: ①If insulation is completed before power-off, then it would be STOP status after power-on. ②If the reservation appointment is not finished before power-off, the reservation will be reset and the countdown will start again after power-on. ③The series of products only support the power-off memory in minute, so the maximum countdown error of power on/off is 1 minute.
- Analog output
 - When using a model with analog output function, enter the advanced menu, set the control execution ACT#2 (48°48&72°72 size need to set ACT=3/5), to turn on the analog output function.
 - Switch to the analog mode (BRM) in the advanced menu, set PV as 0, SV as 1.
 - Switch to the analog output lower limit (BRL) &upper limit (BRH) in the advanced menu, set a proper value to complete the configuraion.
- LBA alarm function
 - In the common menu, set the alarm mode AD1/AD2 as 14.
 - In the common menu, set the disconnection alarm time (LBA), disconnection alarm non-action band (LBD), disconnection alarm judgement range (LBF) on demand.
 - Disconnection alarm takes effect when PV is outside the non-action temperature band [SV-LBD, SV+LBD]. If the change amplitude of PV is less than the disconnection judgement range (LBF) whintin the disconnection alarm time (LBA), software disconnection alarm will be triggered.
- User-defined the common menu
 - Enter the advanced menu to set MU1~MU8 as the common menu to turn on this function. If the common menu is less than 8, the remaining configuraion will be NONE, setting all the configura as NONE to close this function. Long press   when selecting the menu to increase/decrease fastly. Meters with communication can write the corresponding menu number within 0x2300~0x2307 by the communication configuraion.
 - After turning on this function, long press  key enter into the menu in the measurement interface can directly enter to the 1) configuration menu.
 - Switch to "PSW" menu in the user menu interface, input 0033 will display the full menu.

XII. Communication proctocol

The device uses Modbus RTU communication protocol for RS485 half-duplex communication, read function number 0x03, write function number 0x10 or 0x06, adopting 16-bit CRC verification, the device does not return check error. The factory setting defaults address as 1, baud rate 9600, no parity, 8 data bit, 1 stop bit, data type as 16 signed (unsigned) integer.

Data frame format :

Start bit	Data bit	Stop bit	Check bit
1	8	1	Set in the PRTY menu

Communication abnormal handling: for abnormal response, set the function number as the highest bit 1. E.g. if the function number requested by the host is 0x03, the corresponding function number returned by the slave should be 0x83.

Error code:

- 0x01---Illegal function: the function number sent by the host is not supported by the device.
0x02---Illegal address: the register address specified by the host exceeds the allowable range of the device address.
0x03---Illegal value: the write data value sent by the host exceeds the allowable range of the device.
- The communication cycle: It refers to the time from the completion of the host data request to the completion of the slave data return. That is: communication cycle = request data send time + slave reply time + response delay time + response return time. Take the 9600 baud rate as an example: the single measurement data communication period > 250ms.

1. Read the register

E.g.The host reads the integer SV1 (SV= 200), the address code of SV1 is 0x200C because SV is an integer (2 bytes) and occupies 1 data register. The memory code of demical 200 is 0x00C8.
Note: when reading data, you should read the DP value or confirm the DP menu value first to determine the decimal point position, then convert the read data to get the actual value.
Conversely, the data should be converted to the corresponding ratio before writing to the meter.

Host request (read multiple registers)							
1	2	3	4	5	6	7	8
Device 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 response (read multiple registers)						
1	2	3	4	5	6	7
Device add	Function code	Quantity of date bytes	Data high bit	Data low bit	※CRC code low bit	※CRC code high bit
0x01	0x03	0x02	0x00	0xC8	0xB9	0xD2

Function code abnormal response (e.g. host request address is 0x2011)

Slave abnormal response (read multiple registers)				
1	2	3	4	5
Device add	Function code	Error code	※CRC code low bit	※CRC code high bit
0x01	0x83	0x02	0xC0	0xF1

Slave normal answer (write single-register)							
1	2	3	4	5	6	7	8
Device add	Function no.	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 response (write single-register)							
1	2	3	4	5			
Device add	Function no.	Error code	※CRC code low bit	※CRC code high bit			
0x01	0x86	0x02	0xC3	0xA1			

Parameter address mapping table

No.	Address (register No.①)	Variable name	Register number	Read/ write	Note
1	0x0000 (40001)	Mapping add 1	1	—	1.Read & write register data configured in 0x2200~0x2209.
2	0x0001 (40002)	Mapping add 2	1	—	
3	0x0002 (40003)	Mapping add 3	1	—	
4	0x0003 (40004)	Mapping add 4	1	—	
5	0x0004 (40005)	Mapping add 5	1	—	
6	0x0005 (40006)	Mapping add 6	1	—	2.Read&write &mapping register
7	0x0006 (40007)	Mapping add 7	1	—	
8	0x0007 (40008)	Mapping add 8	1	—	
9	0x0008 (40009)	Mapping add 9	1	—	
10	0x0009 (40010)	Mapping add 10	1	—	
Inaccessible					
11	0x2000 (48193)	Set value SV	1	R/W	
12	0x2001 (48194)	1st loop alarm value AL1	1	R/W	
13	0x2002 (48195)	1st loop alarm hysteresis HY1	1	R/W	
14	0x2003 (48196)	2nd loop alarm value AL2	1	R/W	
15	0x2004 (48197)	2nd loop alarm hysteresis HY2	1	R/W	
16	0x2005 (48198)	Display lower limit FL	1	R/W	
17	0x2006 (48199)	Display upper limit FH	1	R/W	
8	0x2007 (48200)	Analog output lower limit BRL	1	R/W	
9	0x2008 (48201)	Analog output upper limit BRH	1	R/W	
10	0x2009 (48202)	Control output lower limit OLL	1	R/W	Default with 1-digit decimal
11	0x200A (48203)	Control output upper limit OLH	1	R/W	Default with 1-digit decimal
12	0x200B (48204)	Overshoot limit OVS	1	R/W	
13	0x200C (48205)	Heating&cooling control dead zone DB	1	R/W	
14	0x200D (48206)	Reserve	1	R/W	
15	0x200E (48207)	Amend value PS	1	R/W	
16	0x200F (48208)	Display fuzzy tracking value DTR	1	R	No decimal point when engineering
17	0x2010 (48209)	Process value PV	1	R	
18	0x2011 (48210)	Output quantity MV	1	R/W	-100~100 Note ②
19	0x2012 (48211)	Auto/manual switch A-M	1	R/W	0:auto 1:manual 2:auto/manual 3: insulation mode
20	0x2013 (48212)	Reserve	1	R/W	
21	0x2014 (48213)	Reserve	1	R/W	
22	0x2015 (48214)	Set value lower limit SLL	1	R/W	
23	0x2016 (48215)	Set value upper limit SLH	1	R/W	
24	0x2017 (48216)	Panel R/S operation switch SSM	1	R/W	
25	0x2018 (48217)	Reserve	1	R/W	
26	0x2019 (48218)	Reserve	1	R/W	
27	0x201A (48219)	Slope display value SP-M	1	R	
28	0x201B (48220)	Slope heat-up set value SPRT	1	R/W	
29	0x201C (48221)	Control loop fault alarm time LBA	1	R/W	
30	0x201D (48222)	Control loop fault alarm dead band LBD	1	R/W	
31	0x201E (48223)	Loop break alarm detection band LBF	1	R/W	
32	0x201F (48224)	Heat retention 1st alarm configuration ATH1	1	R/W	
33	0x2020 (48225)	Heat retention 2nd Alarm configuration ATH2	1	R/W	
34	0x2021 (48226)	Preset timing THD	1	R/W	
35	0x2022 (48227)	Soak time/hold time THT	1	R/W	
36	0x2023 (48228)	Holding start temperature range THR	1	R/W	
37	0x2024 (48229)	Action after temperature holding complete THC	1	R/W	
38	0x2025 (48230)	Analog mode BRM	1	R/W	
39	0x2026 (48231)	OUT2 Output lower limit OLL1	1	R/W	
40	0x2027 (48232)	OUT2 Output upper limit OLH1	1	R/W	
41	0x2028 (48233)	Output upper limit effective range OLHM	1	R/W	
42	0x2029 (48234)	Soft start-up time SFST	1	R/W	
43	0x202A (48235)	OUT1 Heating output quantity H_MV	1	R	0~1000 Note ②
44	0x202B (48236)	OUT2 Cooling output quantity C_MV	1	R	
Reserve					
45	0x2100 (48449)	1st loop alarm mode AD1	1	R/W	
46	0x2101 (48450)	2nd loop alarm mode AD2	1	R/W	
47	0x2102 (48451)	1st loop alarm extension mode AE1	1	R/W	
48	0x2103 (48452)	2nd loop alarm extension mode AE2	1	R/W	
49	0x2104 (48453)	Control mode OT	1	R/W	
50	0x2105 (48454)	Output mode ACT	1	R/W	

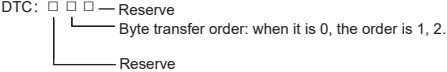
	Add(register no.①)	Variable name	Register	Read/write	Note
50	0x2106 (48455)	Run/stop operation	1	R/W	1: RUN 2: STOP 3: AT 4: ATSTOP
51	0x2107 (48456)	Decimal point DP	1	R/W	
52	0x2108 (48457)	Display unit UT	1	R/W	25 (°C) 26 (°F)
53	0x2109 (48458)	Filter constant FT	1	R/W	
54	0x210A (48459)	Proportional coefficient P	1	R/W	
55	0x210B (48460)	Integration time I	1	R/W	
56	0x210C (48461)	Derivation time D	1	R/W	
57	0x210D (48462)	Control rate fine-tune SPD	1	R/W	
58	0x210E (48463)	OUT1control cycle CP	1	R/W	Default with 1-digit decimal
59	0x210F (48464)	OUT2 cooling control cycle CP1	1	R/W	Default with 1-digit decimal
60	0x2110 (48465)	Cooling delay time PT	1	R/W	
61	0x2111 (48466)	Input signal selection INP	1	R/W	Refer to signal table
62	0x2112 (48467)	Meter address ADD	1	R/W	
63	0x2113 (48468)	Communication baud rate BAD	1	R	
64	0x2114 (48469)	Communication data transmission sequence DTC	1	R	Note ③
65	0x2115 (48470)	PID algorithm type PDC	1	R	
66	0x2116 (48471)	Lock key LCK	1	R	
67	0x2117 (48472)	Meter name	1	R	
68	0x2118 (48473)	Output status	1	R	Note ④
69	0x2119 (48474)	Odd/even parity	1	R	
70	0x211A (48475)	Reserve	1	R/W	
71	0x211B (48476)	Reserve	1	R/W	
72	0x211C (48477)	Cooling end parity offset CB	1	R/W	Default with 1-digit decimal
73	0x211D (48478)	Cooling end parity slope CK	1	R/W	Default with 3-digit decimal
74	0x211E (48479)	OUT2 cooling proportional coefficient P1	1	R/W	
75	0x211F (48480)	OUT2 cooling differential time I1	1	R/W	
76	0x2120 (48481)	OUT2 cooling differential time D1	1	R/W	
77	0x2121 (48482)	Power-on operation mode ST	1	R/W	
78	0x2122 (48483)	PID auto-tuning extension ATE	1	R/W	
79	0x2123 (48484)	Industry PID parameter call SPC	1	R/W	
80	0x2124 (48485)	Cycle control frequency CYLE	1	R/W	
81	0x2125 (48486)	Display brightness adjustment LGT	1	R/W	
82	0x2126 (48487)	SSR control execution mode SSRM	1	R/W	
83	0x2127 (48488)	Operation switch RS	1	R/W	Note ⑤
84	0x2128 (48489)	Auto-tuning switch AT	1	R/W	
Reserve					
85	0x2200 (48705)	Mapping add 1 configuration	1	R/W	Default: 0x2010 (PV)
86	0x2201 (48706)	Mapping add 2 configuration	1	R/W	Default: 0x2118(output)
87	0x2202 (48707)	Mapping add 3 configuration	1	R/W	Default: 0x2011 (MV)
88	0x2203 (48708)	Mapping add 4 configuration	1	R/W	Default: 0x2000 (SV)
89	0x2204 (48709)	Mapping add 5 configuration	1	R/W	Default: 0x2106 (RSA)
90	0x2205 (48710)	Mapping add 6 configuration	1	R/W	Default: 0x2012 (A-M)
91	0x2206 (48711)	Mapping add 7 configuration	1	R/W	Default: 0x210A (P)
92	0x2207 (48712)	Mapping add 8 configuration	1	R/W	Default: 0x210B (I)
93	0x2208 (48713)	Mapping add 9 configuration	1	R/W	Default: 0x210C (D)
94	0x2209 (48714)	Mapping add 10 configuration	1	R/W	Default: 0x210E (CP)
Inaccessible					
95	0x2300 (48961)	User menu MU1 configuration	1	R/W	Configure by writing the menu table no. of "9. the full menu desciption"
96	0x2301 (48962)	User menu MU2 configuration	1	R/W	
97	0x2302 (48963)	User menu MU3 configuration	1	R/W	
98	0x2303 (48964)	User menu MU4 configuration	1	R/W	
99	0x2304 (48965)	User menu MU5 configuration	1	R/W	
100	0x2305 (48966)	User menu MU6 configuration	1	R/W	
101	0x2306 (48967)	User menu MU7 configuration	1	R/W	
102	0x2307 (48968)	User menu MU8 configuration	1	R/W	

R: read only R/W: Read/write

Note ① : The register number is the address converted to decimal, plus 1 and then added the register identification code 4 in front. E.g. The register number of the data address 0x2000 is 8192 + 1 = 8193 and then added 4 in front.

Note ② : When MV is negative, it indicates the cooling output quantity of PID heating&cooling (OT=3). When there is output power limit, the actual output quantity needs to read H_MV(0x202A), C_MV(0x202B).

Note ③ : DTC communication data transmission sequence description



Note ④ measurement status indication: when data bit is 1 indicates ON, 0 indicates OFF.

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

Note ⑤ Precautions. (working switch RSA=operation switch RS+precautions of auto-tuning AT)

1) "working switch RSA" can not repeatedly read "AT(3)" , "Auto-tuning switch AT" can not repeatedly read "turn on (1)" , otherwise it may cause auto-tuning to be turned on again after completion.

2) Under auto-tuning, "working switch RSA" will continue to be "AT (3)" and automatically turn to "RUN(1)" after auto-tuning finished. When auto-tuning, write in "RUN(1)" / "STOP(2)" will both cause auto-tumig to stop, but write "turn on (1)" to "operation switch RS" would not affect auto-tuning.

3) Suggested usages are as follows:

① Working switch RSA: read only once when switching states, after that will read the register parity.
② Operation switch RS & auto-tuning switch AT: On "operation switch RS" will keep on writing status. When turning on auto-tuning, "operation switch RS" needs to be on "turn on (1)" status. Write "turn on (1)" once to "auto-tuning AT" to read the register parity.

XIII Version and revision history

Date	Version	Modification
2026.04.02	A/0	first archive
2026.05.11	A/1	Modify PID default setting value