

PID temperature controller

TC6 SERIES

OPERATION INSTRUCTIONS



Thank you very much for choosing **LORENTZZI** products
For your safety, please read the following before use

※ "Pay attention to safety" is to use the product safely and correctly to prevent dangerous accidents. Please observe the following contents.

※ Attention to safety can be divided into two parts: warning and attention

⚠ WARNING Failure to do so may result in serious injury or injury.

⚠ NOTICE Failure to do so may result in minor injury or product damage.

※ The symbols in the operating instructions are as follows

⚠ Accidents or dangers may occur under special conditions

⚠ WARNING

1. When it is used for machines that have great impact on personal and property (such as nuclear power control, medical devices, ships, vehicles, railways, aviation, inflammable devices, safety devices, disaster prevention / anti-theft devices), double safety protection devices must be installed.

Otherwise, it may cause fire, personal injury or property loss.

2. The panel must be installed when using.

Otherwise, there is a risk of electric shock.

3. Do not carry out maintenance work under power on state.

Otherwise, there is a risk of electric shock.

4. Please confirm the terminal number before wiring.

Otherwise, it may cause fire.

5. The product shall not be modified except for the maintenance personnel of the company.

Otherwise, electric shock or fire may be caused.

⚠ NOTICE

1. Do not use the product outdoors.

Otherwise, the service life of the product may be shortened.

2. When wiring the power input terminal and relay output terminal, please use AWG 20 (0.50mm²) cable, and keep the screw tightening torque between 0.74N · m ~ 0.90N · M.

Poor contact may cause fire. 3. Please use the product within the rated specifications.

Otherwise, the service life of the product will be shortened and there will be fire hazard.

4. Please use the load less than the allowable capacity of the relay for electric shock.

Otherwise, it will cause poor insulation, contact adhesion, poor contact, relay damage, fire, etc.

5. Do not use water or mailing solvent when cleaning, but wipe with towel.

Otherwise, contact or fire may be caused.

6. Avoid using the product in inflammable, explosive, humid, direct sunlight, thermal radiation, vibration and other places. Otherwise, the ash may cause fire or explosion.



7. Do not allow dust or cable residue to enter the product interior.

Otherwise, it may cause fire or damage to the product.

8. Please connect the thermocouple wiring correctly after confirming the polarity of the terminal.

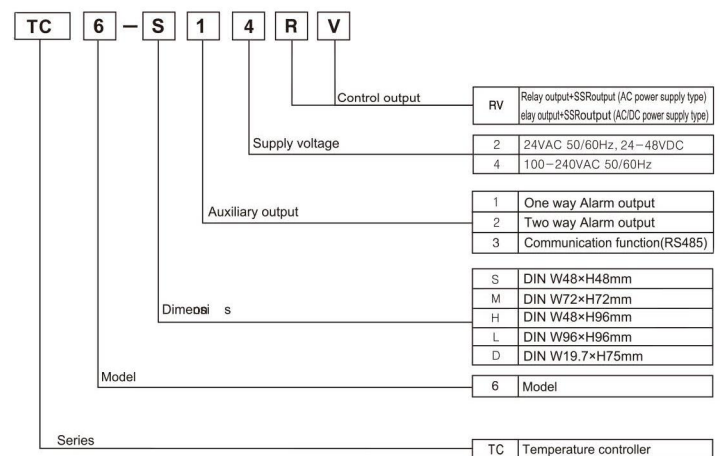
Otherwise, it may cause fire or explosion.

9. In order to achieve the purpose of strengthening insulation, please use the power supply device that can ensure the strengthened insulation above.

SERIES		TC6-S	TC6-M	TC6-H	TC6-L	TC6-D
Proportional band (P)		0.1~999.9℃				
Integral time (I)		0~9999 S				
Differential time (D)		0~9999 S				
Control period (T)		0.5~120.0 S				
Manual reset		0.0~100.0%				
Sampling period		100ms				
Withstand voltage	AC Power supply type	2000vac 50 / 60Hz 1 min (between input terminal and power supply terminal)				
	AC/DC Power supply type	1000VAC 50 / 60Hz 1 min (between input terminal and power supply terminal)				
Vibration resistance		5~55Hz (cycle 1 minute) amplitude 0.75mm x, y, z direction 2 hours				
Relay life	Mechanics	OUT:500 More than 10000 times, AL1 / 2: more than 5 million times				
	Electrical	OUT:20 More than 10000 times (250VAC 3A resistive load), AL1 / 2: more than 300000 times (250VAC 1A resistive load)				
Insulation impedance		Above 100m Ω (500VDC as reference)				
Anti-interference		Square wave interference of jamming simulator (pulse width 1 μs) ±2KV, R phase, S phase				
Memory preservation		About 10 years (using nonvolatile semiconductor storage)				
Ambient temperature		-10~50℃ (not frozen)				
Storage temperature		-20~60℃ (not frozen)				
Ambient humidity		35~85%RH, Storage: 35~85%RH				
Insulation type		Double insulation or enhanced insulation (identification:  detect the dielectric strength between the input part and the power supply part, AC power supply type: 2KV, AC / DC power supply type: 1KV)				
Authentication						
Weight		About 100g	About 133g	About 124g	About 179g	About 133g

※ The above weight does not include the outer packing.

■ Model description



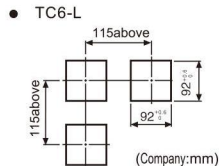
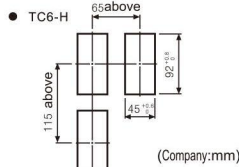
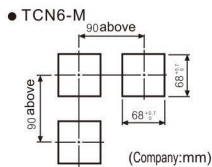
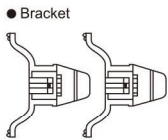
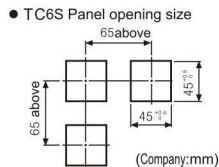
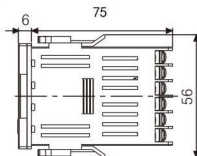
② Input Signal

Name	K	J	R	S	B	E	N	T	PT	CU	O.K	0-50	0-5V	1-50
Code	<i>K</i>	<i>J</i>	<i>R</i>	<i>S</i>	<i>B</i>	<i>E</i>	<i>N</i>	<i>T</i>	<i>PT</i>	<i>CU</i>	<i>O.K</i>	<i>0-50</i>	<i>0-5V</i>	<i>1-50</i>

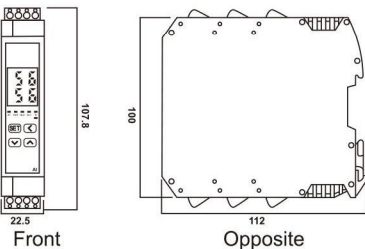
③ Alarm Output 1

Value of AL1T Value of AL2T	Significance
0	No alarm, the AL1, AL2 menu will not appear in the case of tacit sense
1	Upper limit absolute alarm
2	Upper limit deviation alarm (first alarm default value)
3	Lower limit absolute value alarm (second default value of alarm)
4	Lower limit deviation alarm
5	Out of band (out of interval) alarm
6	Intra band (interval) alarm
P-1	Upper absolute value alarm with power holding function
P-2	Upper limit deviation alarm with electric holding function
P-3	Lower absolute value alarm for electric holding function
P-4	Lower deviation alarm for electric holding function

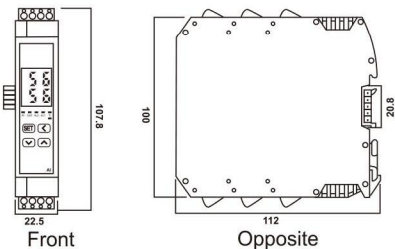
④ The alarm output 2 is the same as the alarm output 1



E7 Type Width: 22.5mm
Height: 107.8mm
Depth: 112mm



D7 Type Width: 22.5mm
Height: 107.8mm
Depth: 112mm Bottom with bus terminal interface



Company: mm

Model	Panel size	Shell size Long x wide x high	Aperture size
TC6-S	48×48	45×45×83	46×46
TC6-H	48×96	45×90×83	45×91
TC6-M	72×72	66×66×83	67×67
TC6-L	96×96	90×90×83	91×91
TC6-D	19.5×74.5	121.2×17.5×111.4	14.5×69.5

B1 Function Description of Operation Panel

■ Name of each part



- 1 Current value (PV) display (red)**
The current measured value (PV) is displayed in the operation mode, and the internal parameter name is displayed in the setting mode.
- 2 Set point (SV) display (green)**
The set value (SV) of control target is displayed in operation mode, and the current setting value of the parameter is displayed in the setting mode.

3 Control alarm output indicator

- Out: the light is on when the main control output is on.
※ When SSR controls the cycle / phase control of driving output mode, the light will be on when the operation amount exceeds 3.0% (except AC power supply type)
- AL1 / al2: when the alarm output is on, the light will be on.

4 Self tuning indicator: when self-tuning is performed, the at lamp flashes in a cycle of 1 second.

5 SET key: used to enter parameter group setting, return to operation mode, switch parameter group and save setting value.

6 Direction key: used to enter the setting value change mode or move the number of digits to change the value up / down.

7 Function key

- ☑ + ☑ press 3 seconds at the same time to start the (d-k) digital input key function (run / stop, alarm clear, self-tuning) setting.

8 Temperature unit (°C / °F) indicator: displays the current temperature unit.

B2 The main menu displays instructions (press and hold the SET key for 3 seconds to enter the main menu interface)

1. user parameters

In the normal state of measurement and control, click the set key to enter the user parameter setting.press again, then enter the next user parameter setting until all the parameters are set.

Code	Code	Parameter meaning	Explain	Set range	Default value	Display condition
SV	SV	Temperature setting	Temperature setting value	SLL-SLH	150 °C	Manual function closure,when the manual function is opened,display the power of control percentage
St	ST	Set the instrument running time	When the timing function is able to be able to be able (ET=1,2,3), this parameter exists.see the details of the timing section.parameter setting the display of the decimal point, said.	0-9999s/m	60	Cod=40 Ton=1000 ET!=0

2. Engineer parameters

When you hold the set key for 3 seconds, you can get into the shape of the engineer's parameters, if you want to quit,Then press set key for 1 seconds if you want to set the next parameter, then press the set key once.The paramet of the engineer are described in the following table

Code	Code	Parameter meaning	Explain	Set range	Default value	Display condition
AL1	AL1	First alarm	There are 12 modes of alarm, which are determined by AL1T.	-1999-9999	30	AL1!=0
AL2	AL2	Second alarm	There are 12 modes of alarm, which are determined by AL2T.	-1999-9999	50	AL2!=0
SC	SC	Display value correction	The =Pb value of the display value + internal measurement value;	-50-50	0	1
P	P	Proportional band	If it is 0, a bit control, and the D menu is not displayed at this point, but the HY menu will be displayed.	0-9999	30	1
OH	OH	Lower switching difference of bit control	When the master control is a two bit control (P=0) master control switching difference, PV < SV-OHL absorption	0-200	2	P = 0
OHH	OHH	Shift difference at the upper side of the position control	When the master control is a two bit control (P=0) master control switching difference, PV > SV+ OHH closes	0-200	0	P = 0
I	I	Integral time constant	If it is zero, the integral control function is cancelled	0-9999	240	P != 0
D	D	Differential time constant	If set to zero, cancel the differential action	0-9999	60	P != 0
T	T	Control cycle	The action cycle of the main control	0-100	20	P != 0
Pc	Pc	Proportional band (refrigeration side)	The 1-200% of the proportional band	Heating/cooling PID action	50	Dir = H-C
Tc	Tc	Proportional cycle cooling side	1-100sec (not set to 0)	Heating/cooling PID action	20	Dir = H-C
db	db	Not feeling	Temperature input, set (heating side) ratio band and (refrigeration side) proportion band between control action do not feel band, set negative number to overlap	-1999-9999	0	Dir = H-C
AR	AR	Integral limit	Use of integral limiting	0-100%	100	P != 0
ATU	ATU	Self tuning switch	OFF: shut down; ON: open the long press SW key for 3 seconds to enter quickly	OFF/ON	OFF	P != 0
CTH	CTH	Current detector input 1	0-9999A when the value is input to 100, the calibration point signal is 100A.	Slightly		
ACT	ACT	Heater broken line alarm	0-9999A when the detection CT end is less than ACT, the AL2 alarm output	Slightly		
Lck	Lck	Parameter lock	0: not locking; 1: lock the user parameters; 2: lock all the parameters	0-2	0	1

B3 Factory Parameters

Hold down the setting button and shift key until Code(CodE) is displayed. Enter 010 in this state, then press the set button to enter the following menu. After setting it, press the set key again and return to the Code(CodE) state. The parameters of this layer are only suitable for use by the instrument engineer or manufacturer, and the ordinary users do not use it.

Code	Code	Parameter meaning	Explain	Set range	Default value	Display condition
AL1t	AL1T	Selection of the first alarm mode	See the alarm form	0-5,P1-P5	2	1
AL2t	AL2T	Selection of the second alarm mode	The alarm mode shows that there is no AL2 function when the function of current alarm is opened.	0-5,P1-P5	2	1
AH1	AH1	Switch difference of first alarm relay	Switch difference of alarm relay	0-200	1	1
AH2	AH2	Switch difference of second alarm relay	Switch difference of alarm relay	0-200	1	1
AH	AH	Overtemperature off deviation	Turn off the output when PV>SP+AH	0---999	30	
FP	FP	Proportional band lead	To reduce or eliminate the overshoot of the first heating by moving the proportion down FP degrees.	0-100	5	1
SLL	SLL	Minimum set value setting	The minimum set value that the user can set	Full range	0	1
SLH	SLH	Maximum set value setting	The maximum set value that the user can set	Full range	1370	1
PL	PL	Minimum power limit	The minimum output power to limit the output of the instrument	0-30%	0%	1
PH	PH	Maximum power limit	OUT=0 measure the maximum output power of the instrument for the linear input (voltage, current, etc.) it is used to this parameter	30-100%	100%	1
dLY	DLY	Minimum time interval of main control action during refrigeration	Prevent compressor start and stop frequently, lead to compressor damage or overload protection circuit action	0-200s	0	1
PSL	PSL	The display value of linear input zero position	Only when the input is a linear signal (voltage, current, etc.) it is used to this parameter	-1999-9999	0	1
PSH	PSH	The display value of linear input full degree	Only when the input is a linear signal (voltage, current, etc.) it is used to this parameter	-1999-9999	1370	1
dP	dP	PT100, CU50 The position of the decimal point at linear input	The decimal point is invalid only for the linear input (SV, EV) to the thermocouple and the thermal resistance signal	0-3	0	1
DF	DF	Filter coefficient	The larger the SL6 shows, the filtering effect is good and the display is stable.	0---250	200	
TSL	TSL	Adjust the transfer output zero position	When the measured value is less than TSL, the output output enters this state according to this value, and the output output is only related to the TSL.	0-9999	00	1
TSH	TSH	Adjust the output fullness of the output	When the measured value is more than TSL, the output output enters this state according to this value, and the output output is only related to the TSL.	0-9999	400	1
Addr	Addr	Postal address	Instrument communication address	1-250	1	Con=100
bPS	bps	Baud rate	Setting up the communication rate, the baud rate	300-38400	19200	Con=100
Et	ET	Timing function permit	0: No time 1: Master control output timing when AL1 reaches the time temperature. After the time of time, the control output is closed; and the operation is waiting; the 4 decimal points of the SP digital tube flicker in half a second, indicating the end of the timing and closing the output. Need; and press BL to open AL2 after 2: Single time time when AL1 reaches the time temperature, start time, after the end of the time, do not close the control output, only play the role of reminding, according to the BL set to open AL2. AL2 stops the time after 3. The time of the time. When AL1 reaches the time temperature, it starts time. After the end of the time, the control output is not closed, only the reminding function is played, and the AL2 is opened according to the BL setting. After the end of the AL2 time, the AL1 is time and circulate after it reaches the temperature 4: Timing startup, after the delay ST time, the master control begins to output.	0,1,2,3,4	0	Ton=1000
TIE	TIE	Timed time unit	0: seconds 1: points	0,1	0	Ton=1000
ALT	ALT	The lower deviation temperature triggered by a timing timer	When the temperature reaches the SP-ALT value at ET=1,2,3, the meter starts to countdown. If the value of ALT is larger, the meter can start to countdown as soon as it is on the power.	0-9999℃	1℃	Ton=1000
BL	BL	After the timing is completed, the time of the second alarm relay suck in	0: after the completion of the timer, the second alarm relay is not sucking. 250: after the completion of the timer, the second alarm relay often suck together. 1-249: after the completion of the timer, the timing time of the timing alarm relay is (seconds).	0-250s	5s	Ton=1000

Time Description: when the timing function is opened, the timing state can be viewed by shifting and reducing the keys. The SV position shows the timing state. When the timing is not started, the setting time is displayed, and the unit is timed. The decimal point display. Is the time course, display the countdown, unit of time, the The decimal point flashes in half a second, and the end of the timing shows 0000. In a non - menu state, long press Bit and key, reset the timing state (whether it is at the time or the end of the time), when the time reference is taken. When the number is modified, the timing state is also reset. When the timing is 2, the time is finished, Start heating.

B4 Setting parameter description

Hold down the setting and shift keys until the Cod(CodE) is displayed and lost in this state modify the Cod(CodE)=020 state by adding and subtraction keys. The parameters of this layer are only suitable for the manufacturer to be out of the house before adjusting, please do not use it after leaving the factory.

Display character	Code	Significance	Other instructions	Range	Default value
Sn	SN	Selection sensor Input signal	Different input models need to match different the input resistance. RE3 represents Wre3-25, RE5 represents 5-26. 5V. represents 0---5V input 5V represents 1 - 5V input	K, J, R, S, B, E, N, T, PT, CU, O.K. 0-50, 0-5V, 1-50	K
Unit	Unit	Unit selection	℃: Centigrade; ℉: Fahrenheit degree	℃, ℉	℃
out	OUT	Output mode choice	RLY: switch class (relay, 12V pulse voltage output, thyristor zero output); 1-5: (1-5V, 4-20mA control signal output) The corresponding output of MPO: (SCR phase-shift output) needs the support of the corresponding output module	RLY, 1-5, MPO	RLY
dir	Dir	Control direction	HOT: heating control, that is, reverse control; COL: refrigeration control, that is, forward control; H-C: heating and cooling together HOT, COL mode output control is OUT1 H-C mode OUT1 for heating control output OUT2 is the output of refrigeration control	HOT, COL, H-C Description: the COL and H-C control modes correspond only to the RLY mode	HOT
Tt	Tt	Temperature tracking	Make the display temperature close to the set value within the range of the set value of ± Tt	0-10	6
Hnd	Hnd	manual control is it allowed	0: manual control prohibition 1: manual control permit When the manual control is allowed, the shift key can be used to enter the manual control state, and the output power percentage of the instrument can be controlled by adding and subtraction keys in the manual control state.	0, 1	0
FAC	FAC	Overtemperature display limit	0- shutoff function Other values, beyond the set value. The portion of the excess is displayed proportionately Display value = SV+ (PV-SV) /FAC	0-100	0

Code = 0040 enter factory parameter 4

- CTON = 1000 you can directly modify the Su value through the plus or minus keys, and Su is not displayed in the upper row
- TON = 0000 Alarm 1 is excitation Alarm
0001 Alarm 1 is a non excitation Alarm
=0000 Alarm 2 is excitation Alarm
0010 Alarm 2 is non excitation Alarm
=1000 with ET timing function

- 3 CON = 0001 You can manually open the closed output, power on to enter the closed output state, and press the shift key to open the output
0100 With communication function
1000 The adaptive function can be turned on

CODE=0060 Enter factory parameter 5

1 LBAT Output fault monitoring time

2 LBAB Output fault monitoring width

LBAT Heating output monitoring time, in seconds.

LBAB Monitoring width of heating output, the unit is the same as PV value.

After the full cycle heating output or full cycle shutdown output and the duration is LBAT time, the PV measurement temperature change is small

When it is in lbab, it will prompt heating failure. If the change is greater than lbab, it will not prompt heating failure. SV=EER1 Indicates a heating failure.

3 RLRS Solid state and relay selection outputs

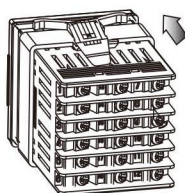
SrrL Select whether the heating type is relay or solid-state signal output

=0 Relay heating =1 Solid state heating

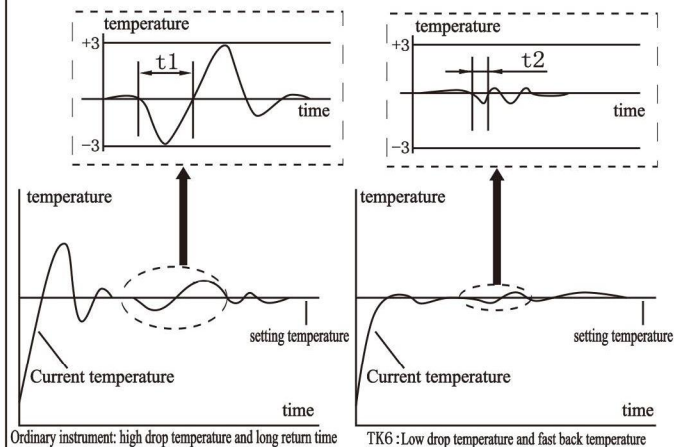
B5 Other information

Product installation method

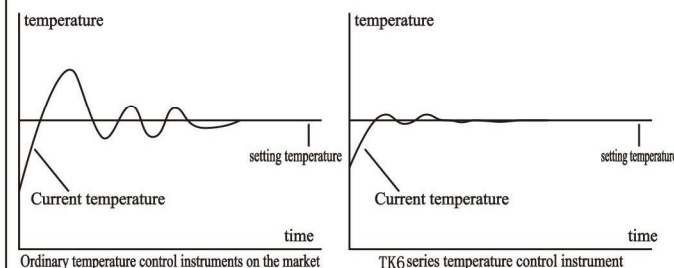
●TC6-S(48X48mm)Series



3. Comparison of anti disturbance performance



4. the first overshoot contrast



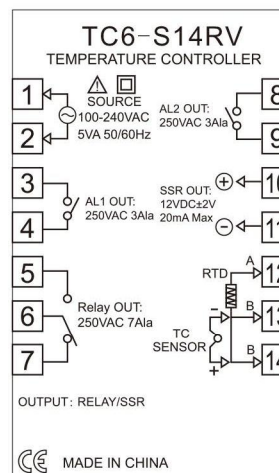
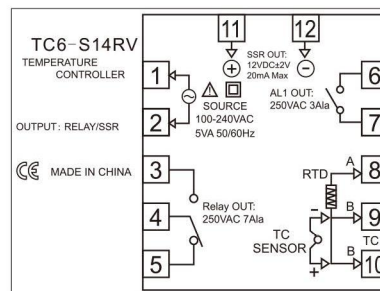
C1 Error Display Function

When the instrument does not work properly, the instrument will display the message prompt after the diagnosis.

Message	Explain	Elimination method
UUUU	Input broken line, polarity connection or beyond the input range	Please check whether the input signal is wrong
0000	Input broken line, polarity connection or beyond the input range	Please check whether the input signal is wrong

C2 Example Diagram of Wiring:

The following wiring diagram is only used for connection instructions, and the actual wiring is based on the wiring diagram of the instrument shell.



C3 Judgment and maintenance of simple instrument problem:

- The instrument can be electrified only after the correctunmistakable connection. The PV window displays the measured value, and the SV window displays the control value.
- There is no display on the instrument and no output action.
 - First of all, please check the instrument power connection is wrong?
 - Do you check the consistency of the instrument power and the input power?
 - Is it abnormal to measure the input power by an instrument?
- The PV window displays "UUUU" or "0000" after the instrument is on power.
 - The display "UUUU" or "0000" indicates the exception of the input part of the instrument signal.
 - First of all, please check the instrument signal input wiring is wrong?
 - Do you check the consistency of sensor specifications and instrument input specifications?
 - Does the sensor check whether the sensor is damaged or whether the sensor is damaged (open circuit or short circuit)?
- The instrument does not output after electricity, but the corresponding indicator light is displayed normally.
 - First check the output wiring of the instrument is wrong?
 - Do you check the output of the instrument to match the external load?
 - Is there a damage (open circuit or short circuit) for the inspection of the external load of the instrument?
- The display or control of the instrument is abnormal.
 - First check the wiring of the instrument is wrong?
 - Is it reasonable to check the parameters of the instrument?

RS485 Communication Protocol

Addr	Communication address	Instrument communication address	1-250	1	Con=100
Bps	Baud rate	Baud rated setting range	300-38400	19200	Con=100

The communication supports the Modbus protocol, using Modbus RTU (1 start bit, 8 data bits, 1 stop bit). It only supports the Modbus read holding registers command 03 and write single register command 06. The corresponding register data is described as follows:

Address	Code	Description	Read/write
0000H	PV	Measured value	R
0001H	LED	LED indicator	R
0002H	SV	Setting value	R/W
0003H	OOT	Output percentage	R
0004H	AT	Auto-tune on/off	R/W
0005H	AL1	Alarm 1	R/W
0006H	AL2	Alarm 2	R/W
0007H	HY1	Alarm hysteresis 1	R/W
0008H	HY2	Alarm hysteresis 2	R/W
0009H	P	Proportional value	R/W
000AH	I	Integral value	R/W
000BH	D	Derivative value	R/W
000CH	AR	Percentage suppression of integral overshoot	R/W
000DH	T	Control cycle time	R/W
000EH	PB(SC)	Measurement value correction	R/W
000FH	HY	Master control deadband (effective when P==0)	R/W
0010H	AL1T	Alarm method 1	R/W
0011H	AL2T	Alarm method 2	R/W
0012H	PC	Output 2 proportional value	R/W
0013H	TC	Output 2 control cycle time	R/W
0014H	DB	Died band	R/W
0015H	CTH	Current detector input	R/W
0016H	ACT	Open circuit alarm value	R/W
0017H	TON	Timer function switch 2	R
0018H	ET	Timer mode setting 3	R/W
0019H	TIE	Timer timing unit 3	R/W
001AH	ALT	Timing temperature deadband 3	R/W
001BH	BL	Alarm time after timing ends 3	R/W
001CH	ST	Timing duration setting 3	R/W
001DH	TIM	Current Timer Value (TIE==0 for seconds; TIE==1 for minutes)	R
001EH	TIS	Current Timer Value in Seconds (valid when TIE==1, corresponding to the set timer seconds) BL Count Value (AL2 Output Time)	R