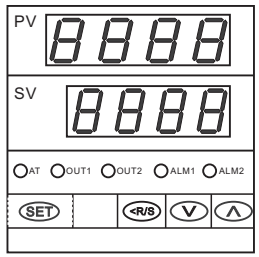
Digital Temperature Controller
User Manual

Thank you for purchasing our products, please read this manual before using and keep this manual for future reference

In normal operation, the operator must not remove the controller from its housing or have unrestricted access to the rear terminals, as this would provide potential contact with hazardous live parts.

Installation and configuration must be undertaken only by technically-competent servicing personnel.

1 Panel description



PV: Process value/Parameters display

SV: Setting value/Value for various parameters

(SET) : Function key, to goes to parameters list, to shift between parameters to save and exit from parameters list

(<R/S) : Shift to target digits/run or stop the program

(V) : Down key, decrease numerals

(Λ) : Up key, increase numerals

OUT1: Output 1 LED indicator

OUT2: Output 2 LED indicator

AT: Auto-tuning process LED indicator

ALM1: Alarm 1 indicator

ALM2: Alarm 2 indicator

2 Base display mode and basic configuration

2.1 Power up self-check

This device will perform self-checking after power up, below is the display sequence for this process

Upper display shows a symbol for input
Lower display shows the temperature unit and input sensor type

Upper display shows the default high limit for setting value
Lower display shows the default low limit for setting value

Upper display shows the current process value
Lower display shows the current setting value

2.2 Error Display

Upper display show "uuuu" and flashes, indicates overscale, check the sensor wiring and input code

Upper display show "oooo" and flashes, indicates underscale, check the sensor wiring and input code

Upper display shows the PV value but flashes means all wiring are correct but the PV has exceed the range of setting value high or low limit, adjust the setting value range.

2.3 Run and stop the program

Press shift key and hold still for more than three seconds can run/stop the program

2.4 Setting value(SV) configuration

Setting value can only be configured when controller shows PV in the upper display and SV at the hlower display

When controller displays PV/SV

SET ⟹ Light press less than 1 seconds

Upper display shows the current PV, lower display flashes at its four digits with the last digits brighter than other digits.

<R/S ⟹ to shift between different digits, when shift to target digits, press V Λ to increase and decrease the value

Change the SV to 80 for example

SET ⟹ Light press less than 1 seconds

Exit to PV/SV status, SV setting finished

3 Field parameters and setting

Some crucial parameters can be configured within field parameters level listed as below:

- Alarm value
- Auto-tuning switch on and off
- Proportional band value setting(referred as P in PID control)
- Integral time value setting(referred as I in PID control)
- Derivative time value setting(referred as D in PID control)
- Anti-reset windup value setting
- Control cycle time setting
- Protection Lock setting
- PV Bias value

Below sequence for configuring the parameters within field parameters level, press V Λ can change the value of parameters.

When controller displays PV/SV

SET ⟹ Press and hold still for at least five seconds to go to field parameters level

① ①:[AL1] First stage alarm value

SET

① ②:[AL2] Second stage alarm value(If alarm 2 is available)

SET

③ ③:[AT U] Auto-tuning switch, change the value to "1" will initialize the auto-tuning process

SET

④ ④:[P] Proportional band value for PID controller, the value for P normally calculated by controller's auto-tuning process,but can also be modified manually by technically-competen personnel to have a better control result

SET

⑤ ⑤:[I] Integral time value for PID controller, the value for I normally calculated by controller's auto-tuning process,but can also be modified manually by technically-competen personnel to have a better control result

SET

⑥ ⑥:[d] Derivative time value for PID controller, the value for D normally calculated by controller's auto-tuning process,but can also be modified manually by technically-competen personnel to have a better control result

SET

⑦ ⑦:[Ar] Anti-reset windup parameters, call suppress the overshoot or undershoot

SET

⑧ ⑧:[C] Control cycle time value(If heat or cool control mode) Heat-Side proportioning cycle(If heat & cool control mode)

SET

⑨ ⑨:[PC] Cool side proportional band(only available when controller under heat & cool control mode)

SET

⑩ ⑩:[db] Deadband, Set control action deadband between heat-side and cool-side proportional bands, minus(-) setting results in overlap.

SET

⑪ ⑪:[t] Cool side proportional cycle, Set control cool-side output cycle for heat & cooling control mode.

SET

⑫ ⑫:[Pb] To compensate the deviation of process value, the value can be negative or positive, for example -10 or +10, the actual display of PV=(measuring value+ Pb value)

SET

⑬ ⑬:[LCY] Lock value to protect controller away from unauthorized acess

SET ⟹ Press and hold still for at least five seconds will exit to PV/SV and save the all changes has been made to the all parameters

● Table 1--- Field parameter details

Legend	Meaning	Range	Factory default	Sequence
AL1	Alarm value for alarm 1	-1999 to 9999	50/50.0	①
AL2	Alarm value for alarm 2	-1999 to 9999	50/50.0	②
ArU	auto-tuning switch	0 or 1	0	③
P	Proportional band	0-9999 or 0.1~999.9 0.1 to 100% of span	15/15.0	④
I	Integral time	1-3600 S(0 second: PD action)	40	⑤
d	derivative time	1-3600 S(0 second: PI action)	20	⑥
Ar	anti-reset windup	0~100%	25	⑦
C	Heatside proportional cycle	1-100S	20/2	⑧
PC	Cool side proportional band	1 to 1000% of heatside proportional band	20/2	⑨
db	Deadband	1-100S	20/2	⑩
t	Cool side proportional cycle	1-100S	20/2	⑪
Pb	PV Bias	-1999 to 1999/-199.9 to 999.9	0	⑫
LCK	Data Lock	***See table 2***	0000	⑬

● Table 2— Protection lock details

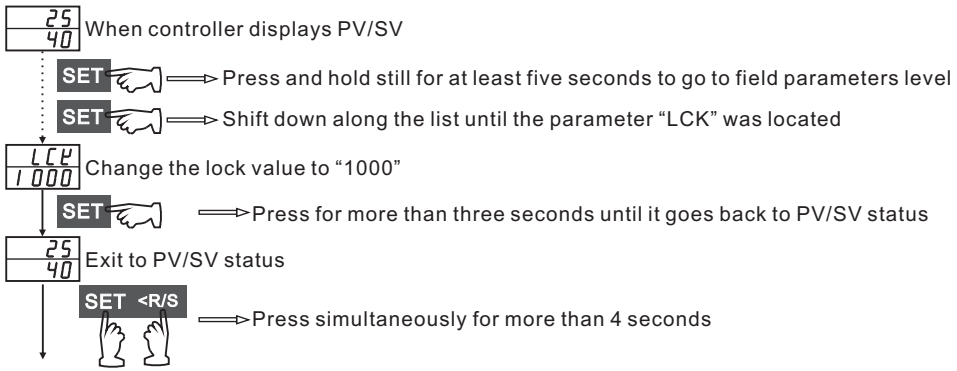
Lock value	Protection	Lock value	Protection
0000	SV and all parameters can be modified	0011	Only SV can be modified
0001	Only SV and alarm value can be modified	0101	Only alarm value can be modified
0010	All parameters expect alarm can be modified	0110	All parameters can be modified except SV and alarm
0100	All parameters expect SV can be modified	0111	All parameters are locked

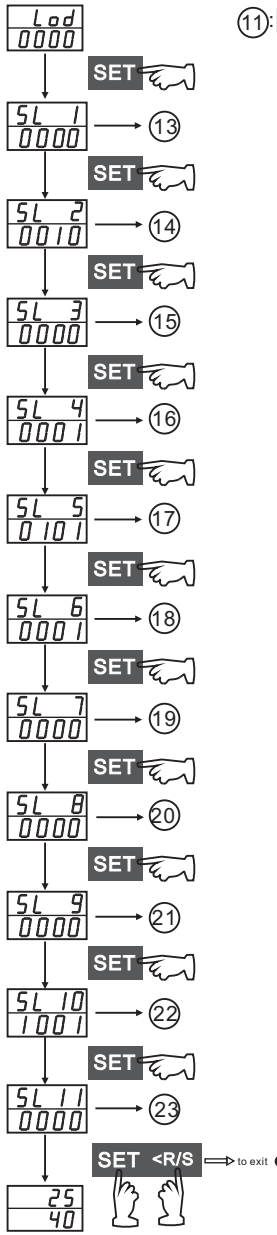
4 System parameters setting(LEVEL 1)

Parameters can be configured within system parameter level 1 listed as below

- Input sensor selection
- Alarm mode selection for first alarm and second alarm
- Output type code, output was fixed when products ready to ship, should not be modified.
- Run/Stop function configuration

Follow below sequence to go to system parameters level 1





⑪:[SL 1] Input sensor type parameters, this controller support universal input signals, to configure the controller and work with different signals, please refer to table 3 for details,press ∨ ∧ to change the value of parameters

● Table 3— Input sensor description

Value				Input Type	Range
0	0	0	0	K	(0 to 1372 °C)
0	0	0	1	J	(0 to 1200 °C)
0	0	1	0	L	(0 to 900 °C)
0	0	1	1	E	(0 to 1000 °C)
0	1	0	0	N	(0 to 1300 °C)
0	1	1	1	R	(0 to 1769 °C)
1	0	0	0	S	(0 to 1769 °C)
1	0	0	1	B	(0 to 1820 °C)
1	0	1	0	W5Re/W26Re	(0 to 2320 °C)
1	0	1	1	PL II	(0 to 1390 °C)
0	1	0	1	T	(-199.9 to 400 °C)
0	1	1	0	U	(-199.9 to 600 °C)
1	1	0	0	Pt100(JIS/IEC)	(-199.9 to 649 °C)
1	1	0	1	JPt100(JIS)	(-199.9 to 649 °C)
1	1	1	0	0 to 5V DC	-1999 to 9999 (configurable)
1	1	1	1	1 to 5V DC	
1	1	1	0	0 to 20mA DC	-1999 to 9999 (configurable)
1	1	1	1	4-20mA DC	

⑭:[SL 4] Alarm mode for #1 alarm
Refer to table 4 for details

● Table 4— Alarm mode despcription

Value				Alarm Type
0	0	0	0	Alarm disabled
0	0	0	1	Deviation high-limit alarm
0	0	1	0	Deviation high/low-limit alarm
0	0	1	1	Absolute value high-limit alarm
0	1	0	1	Deviation low-limit alarm
0	1	1	0	Deviation high-low limit reverse alarm
0	1	1	1	Absolute value low-limit alarm

⑮:[SL 5] Alarm mode for #2 alarm
Refer to table 5 for details

● Table 5— Alarm mode despcription

Value				Alarm Type
0	0	0	0	Alarm disabled
0	0	0	1	Deviation high-limit alarm
0	0	1	0	Deviation high/low-limit alarm
0	0	1	1	Absolute value high-limit alarm
0	1	0	1	Deviation low-limit alarm
0	1	1	0	Deviation high-low limit reverse alarm
0	1	1	1	Absolute value low-limit alarm

⑯:[SL 6] Control mode selection. See Table 6 for details

- Table 6— Control mode description

Value				Control mode
0	0	0	0	PID direct control(Cooling)
0	0	0	1	PID reverse control(Heating)
0	0	1	0	PID heating+cooling(direct control)
0	0	1	1	PID heating+cooling(Reverse control)

⑳:[SL 10] Run/Stop function configuration, set value as "1001" will active the Run/Stop function via panel by press <R/S ,set value as "1000" to disable the Run/Stop function

▲ Parameters "SL2" "SL3" "SL7" "SL8" "SL9" "SL11" are not available for configuration

5 System parameters setting(LEVEL 2)

Some crucial parameters can be configured within in system parameters level 2 listed as below:

- Setting range high/low limit when input is TC/RTD
- Display range when input signal is analog signal(4-20ma/0-10ma/0-5V/1-5V)
- Decimal point setting when input signal is analog signal
- Action dead bank for on/off control mode
- Hysteresis value for alarm

Follow below sequence to go to system parameters level 1

25 / 40 When controller displays PV/SV

SET ⟹ Press and hold still for at least five seconds to go to field parameters level

SET ⟹ Shift down along the list until the parameter "LCK" was located

LCK / 1000 Change the lock value to "1000"

SET ⟹ Press for more than three seconds until it goes back to PV/SV status

25 / 40 Exit to PV/SV status

SET <R/S ⟹ Press simultaneously for more than 4 seconds

Cod / 0000 Upper shows the "Cod" level code, Lower shows "0000"

Cod / 0001 Change "Cod" value to "0001"

SET → SLH / 0400 → ㉔

㉔:[SLH] Setting value high limit when input is TC/RTD
Upper limit display when input is analog(0-10mA/4-20mA/0-5V/1-5V)

SET → SLL / 0000 → ㉕

㉕:[SLL] Setting value low limit when input is TC/RTD
Lower limit display when input is analog(0-10mA/4-20mA/0-5V/1-5V)

SET → PGdP / 0000 → ㉖

㉖:[PGdP] Decimal point setting when input is analog signal, maximum 3 decimals(parameters not available when input is RTD/TC)

SET → oH / 0001 → ㉗

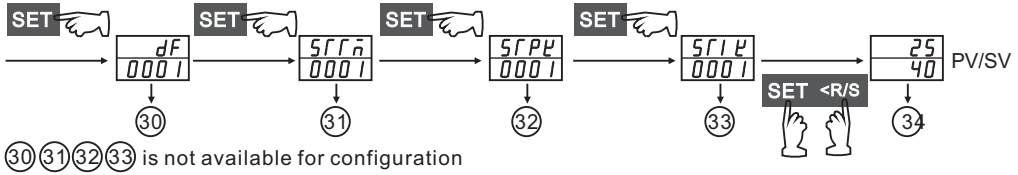
㉗:[HH] Hysteresis value for on/off control mode.
0 to 100 or 0.0 to 100.0
0.0% to 10.0% of full scale for analog input(Factory default is 2.0)

SET → AH1 / 8888 → ㉘

㉘:[AH1] Hysteresis for alarm 1
0 to 100 or 0.0 to 100.0
0.0% to 10.0% of full scale for analog input(Factory default is 2.0)

SET → AH2 / 8888 → ㉙

㉙:[AH2] Hysteresis for alarm 2
0 to 100 or 0.0 to 100.0
0.0% to 10.0% of full scale for analog input(Factory default is 2.0)

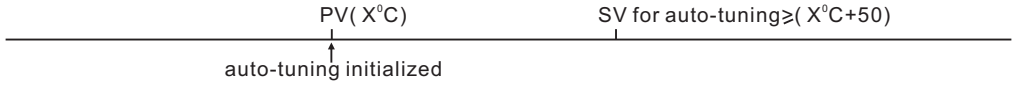


㉚㉛㉜㉝ is not available for configuration

6 Auto-tuning

Auto-tuning is a basic function of this controller, to have a better control result, the auto-tuning shall be initialized from ambient temperature and shall only be initialized after the wiring was done properly on the entire system.

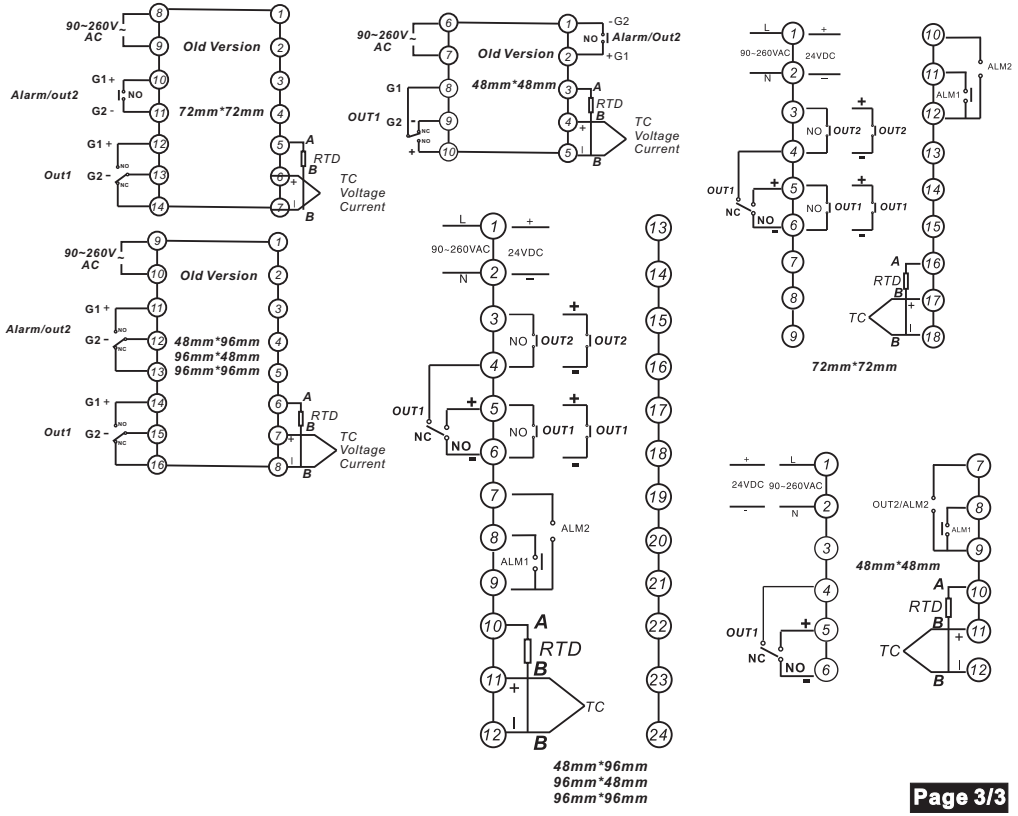
The Setting value for auto-tuning process should be larger than the initial temperature where the auto-tuning was triggered, and the minimum temperature difference should be 50C



The auto-tune will stop automatically after three cycles of heating and natural cooling process. No action should be made to the controller during the auto-tuning process.otherwise the auto-tuning will abort.

The controller will at on-off control mode during the auto-tuning process, grave overshoot is expected.be sure to pay strict attention if the system is vulnerable to the overshoot. be sure to set proper SV during auto-tuning in such a vulnerable system to avoid damage

5 Terminal Arrangements



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