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MC-101Series
Intelligent Temperature ControllerUser Manual

Before operation, please carefully read and fully understand the content. And please keep it in good conditions for later use at any time.

Generai instructions

- MC-101 series instruments:Four-digit LED digital display,measurent accuracy0.3% the maximum resolution 0.1,degree at thermocouple and thermal resistance input,and the maximum resolution 0.001 at analong input.
- Before use, confirm whether the power supply and the output type are correct through the model definition and identification as well as the wiring diagrams, for example, the PID control of 101 series relay contact output is 411 , the solid state relay (SSR) is 511 , the analog current output is 811 , etc., see "1. Definition of Product Model".
- The thermocouple and thermal resistance of instrument input signals can be set freely. Before use, please select the instrument input signal, to make it consistent with the sensor. See "4.3 Description of Parameter INP" in the Manual. The analog input shall be stated at ordering.
- Before the factory delivery, the OUT of instruments is generally reaction control (heating-type), or the users can also choose a positive reaction control (cooling type) for OUT. See "4.3 Description of Parameter Oud in the Manual.
- PID Control: Before the factory delivery, the instruments are generally of PID control and provided with a self-tuning function. The users are recommended to adopt self-tuning ways to enhance the control effect. See "5. Self-tuning Description" . (This is particularly important to achieve better temperature effect.)
- Digit Control: Set the proportional band P to 0.0 to convert to digital control, see "4.1 Description of Parameter P" in the Manual. The digit return difference is OH. In heating effect, if PV is larger than SV, the output OUT will stop; and if PV is smaller than SV-OH, the output OUT will start. In cooling effect, if PV is larger than SV+0H, the output will be enabled; and if PV is smaller than SV, the output will stop.
- Time Proportional Control: If P≠0, I=0, and d=0, the pure time proportional control can be converted to. Set the proportion to rSt and the control period to t, in heating effect the smaller the rSt value is, the slower the heating will be. In cooling effect, the larger the rSt value is, the slower the cooling will be.
- In analog output, in some special control occasions, in order to make the output more stable, the output buffer function can be opened. See the instructions in "4.1 bUFF in Menu I".

1. Definition of Product Model

Confirm whether the desired product is of the following models and codes.

MC □ □ □ □ □

Input Specifications
1: Thermocouple (K, E, J, N, Wu3/Re25, S, T, R, B)
2: Thermal Resistance (Pt100)
3: Analog Current (0-20mA, 4-20mA)
4: Analog Voltage (0-20mV, 0-50mV, 0-10VDC, 2-10VDC, 0-5VDC, 1-5VDC)

Alarm Function
0: No alarm
1: Upper-limit alarm
2: Lower-limit alarm
3: Upper/lower-limit alarm

Output Specifications
0: No output
3: Relay contact output, ON/OFF adjustment
4: Relay contact output, PID control
5: Solid-state relay (SSR) voltage output, PID control
6: Relay contact + solid-state relay (SSR) voltage output, PID control (note: one output)
7: SCR zero-crossing trigger output, PID control or SCR phase shift trigger output
8: Analog current output
9: Analog voltage output

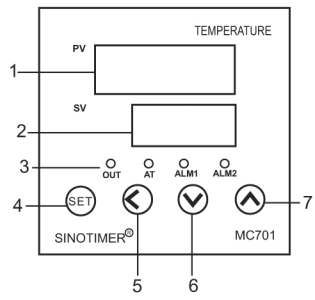
Size of face frame
101:48*48 401:48*96
701:72*72 901:96*96

XNY

For example, MC701-411refers to:
MC701-411 series intelligent meter, the panel size of 72X72mm, with 1-way alarm, thermocouple input, the master control being relay contact output, PID control.

At product ordering:
Please specify the model and the graduation number, the alarm requirements, the measurement scope and the supply voltage.

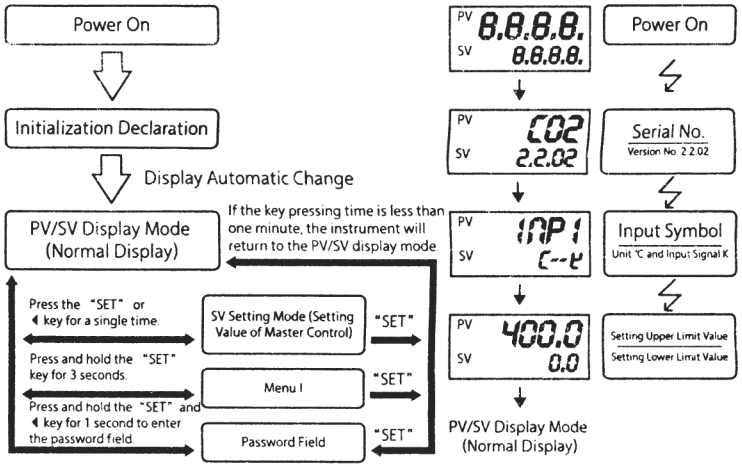
2. Name Description of Various Parts of Panel



1. PV display window, to display the measured values
2. SV setting window, to display the settings
3. OUT lamp: light up at output
   AT self-tuning indicator lamp: flashing at self-tuning
   AL1 lamp: light up at AL1 alarm
   AL2 lamp: light up at AL2 alarm
4. Setting key, the main function key
5. Shift key, the auxiliary function key
6. Numeric reducing key
7. Numeric increasing key

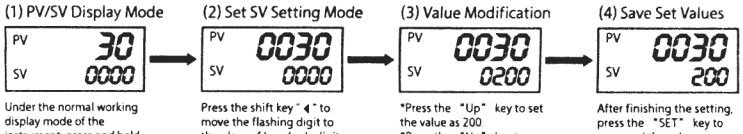
3. Setting

3.1 Program to enter each function mode



Display	E	E	J	n	u	S	t	r	b	AN4	AN3	AN2	AN1	Pt
Input	K	E	J	N	Wu3_ RE25	S	T	R	B	2-10VDC 1-5VDC 4-20mA	0-10VDC 0-5VDC 0-20mA	0-50mV	0-20mV	Pt100
Applicable Scope	1300℃	600℃	800℃	1300℃	2000℃	1600℃	400℃	1700℃	1800℃					800℃

3.2 Change set values (SV), for example: change the set value (SV) from 0 to 200℃.



Under the normal working display mode of the instrument, press and hold the "SET" key for 0.5 seconds to enter the setting mode, and flashing digit can be modified.

Press the shift key "◀" to move the flashing digit to the place of hundreds digit.

*Press the "Up" key to set the value as 200.
*Press the "Up" key to increase the number, and press the "Down" key to reduce the number.

After finishing the setting, press the "SET" key to save, and then the instrument will return to the PV/SV display mode.

Please note in parameter setting
*Press the "Up" or "Down" key for a single time, the number will increase or decrease by 1; if long press the "Up" or "Down" key, the number at one digit will quickly increase or decrease.
*After value modification, if the "SET" key is not pressed, the modification result will still be saved after 3 seconds.

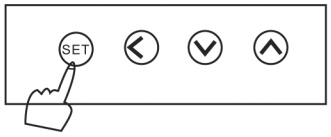
3.3 Set parameters beyond setting values (SV)

After entering different menus, the setting program is the same as the examples (2) to (4) in "change set values (SV)".

4. Menu

4.1 Menu I

As shown in the right figure, press and hold the "SET" key for 3 seconds to enter Menu I.



4.1.1 Description of Parameters in Menu I:

The following parameter symbols will successively and circularly display each time after pressing the "SET" key, the adjusted parameters are not saved till exiting the menu, or the modified parameters are saved and then exited by long press the "SET" key for 3 seconds.

Symbol	Name	Scope	Factory Defaults	Description
AT	Self-tuning At	NO or YES	NO	At=YES, the self-tuning is enabled, AT=NO, the self-tuning is disenabled.
AL1	1-way Alarm	-1999 to 9999	10	Used to set the value of Alarm I, and the 1-way alarm return difference = AH1
AL2	2-way Alarm	-1999 to 9999	10	Used to set the value of Alarm II, and the 2-way alarm return difference = AH2
SC	Measured Value Modification	-199 to 199	0.0	Used to modify the measured value errors caused by sensors and other factors
P	Proportional Band	0.0 to 200.0	30.0	The proportional band at PID adjustment, the unit is "degree", and when P=0.0, it is digit control
oH	Two-digit Return Difference	0 to 999	1.0	When P=0.0, it is digit control, and the return difference is 0H For heating process, when PV is larger than SV, it is enabled; and when PV is smaller than SV-0H, it is disenabled For cooling process, when PV is larger than SV+0H, it is enabled; and when PV is smaller than SV, it is disenabled
I	Integral Time	0 to 3600 seconds	210	For integral time, when I=0, the integral is closed The smaller I is, the stronger the integral action will be, but it is easy to cause fluctuation
d	Derivation Time	0 to 3600 seconds	30	For derivation time, when d=0, the derivation is closed And an appropriate increase will help to reduce the overshoot of the system.
t	Control Period	0 to 999 seconds	20	The control period at PID control It is suggested to be 20 seconds in relay output, and 2 seconds in SSR output.
rE				Standby
rSt	Proportion Resetting	-199 to 200	-5.0	Used to restrain the overshoot at PID control (rst is set to be larger than -P/2)
bUFF	Output Buffer Capacity	0.0 to 100%	100.0	It is best to conclude through self-tuning (the smaller the value is, the slower the heating will be) The analog output value (the maximum percentage of variation of the limit output quantity per second) 100% means not to buffer. *Only used for analog output instruments For example, buF=5% means that the maximum variation of output quantity per second is limited to5%"
LCK	Parameter Values	0-2	0	LCK=0: all the parameters are allowed for modification LCK=1: only the master control setting values and the self-tuning are allowed for modification LCK=2: only the self-tuning are allowed for modification

4.2 Password Field

As shown in the figure below, press and hold the "SET" key and the ◂ key at the same time for 3 seconds to enter the password field

Password Field PASS

4.3 Menu II

Password Field PASS

Enter the password PASS=0002 in the password field according to "4.2 Description", and then press the "SET" key to enter "Menu II".

The following parameter symbols will be successively and circularly displayed each time after pressing the "SET" key, the adjusted parameters are not saved till exiting the menu. In this process, if there are no arguments to set, press and hold the "SET" key for 3 seconds to exit.

Symbol	Name	Scope	Factory Defaults	Description
INP	Input Signal Selection			

Display	H	E	J	n	U	S	t	r	b
Input	K	E	J	N	Wu3_RE25	S	T	R	B
Applicable Scope	1300℃	600℃	800℃	1300℃	2000℃	1600℃	400℃	1700℃	1800℃

Display	AN4	AN3	AN2	AN1	Pt
Input	2-10VDC 1-5VDC 4-20mA	0-10VDC 0-5VDC 0-20mA	0-50mV	0-20mV	Pt100
Applicable Scope					-200~800℃

dP	Decimal Point Position	0 to 3	0	0: no decimal point 1: one decimal point (applicable for all input signals) 2: two decimal points 3: three decimal point (only applicable for analog input signal)
SLL	Setting of Minimum Set Value	-1999 to 9999	0	Limit the lower limit of the master control set value or the 0-bit value at transmission output
SLH	Setting of Maximum Set Value	-1999 to 9999	400	Limit the upper limit of the master control set value or the full-bit value at transmission output
Unit	Display Unit	C or F	C	C: Celsius F: Fahrenheit R: No symbol
P_FT	Digital Filtering	0 to 60	55	1-30 as Grade I filtering, and 31-60 as enhanced filtering
ANL	Zero-bit Display Value of Linear Analog Input	-199~9999	0	For example, at 4-20mA input, the display value of 4mA is ANL
ANH	Full-bit Display Value of Linear Analog Input	-1999~9999	2000	For example, at 4-20mA input, the display value of 20mA is ANH
Ad1	1-way Alarm Mode	00 to 16	11	Used for setting the 1-way alarm mode, see ** alarm mode table
AH1	1-way Alarm Return Difference	0.0 to 100.0	0.4	1-way alarm output return difference (high alarm: lower return difference; low alarm: upper return difference)
Ad2	2-way Alarm Mode	00 to 16	10	Used for setting the 2-way alarm mode, see ** alarm mode table
AH2	2-way Alarm Return Difference	0.0 to 100.0	0.4	2-way alarm output return difference (high alarm: lower return difference; low alarm: upper return difference)
OUd	Reverse/Positive Reaction Setting	HEAT or COOL	HEAT	HEAt: Reverse reaction (heating) CooL: Positive reaction (cooling)
bEr	Analog Output Buffering Function (only for Analog Output Type)	0,1,2	0	0: no output buffering function 1: permanent buffering function of output variation 2: buffering function at output increase, and no buffering at output reducing (the variation rate of output increase per second is determined by buFF in the main menu). Selection 2 can also be used as a soft-start function of analog output
idNO	Communication Address	0-127	1	Used for setting communication address of instruments
bAUd	Baud Rate		9.6	Baud rate selections 2.4K, 4_8K, 9.6K and 19.2K

**Alarm Mode Table (Ad_=00~16)

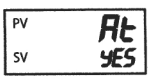
10: No alarm output function
11: Deviation high alarm
12: Deviation low alarm
13: Deviation scope outside alarm
14: Deviation scope inside alarm
15: Absolute value high alarm
16: Absolute value low alarm

00: No alarm output function
01: Deviation high alarm, with standby function
02: Deviation low alarm, with standby function
03: Deviation scope outside alarm, with standby function
04: Deviation scope inside alarm, with standby function
05: Absolute value high alarm, with standby function
06: absolute value low alarm, with standby function

Note: The "standby function" means that if the temperature in the first round of power-on is within the alarm scope, there will be no alarm, and only if the temperature is beyond the alarm scope and once again enters the alarm scope, the alarm will be sent.

5. Self-tuning (it is suggested for users to adopt self-tuning to improve the control effect)

At the beginning of power-on of the instrument, and the measured value is far lower than the set value, start the self-tuning to achieve the best effect.



Press and hold the "SET" key for 3 seconds or complete the cycle to exit Menu I and start self-tuning

Press and hold the "SET" key for 3 seconds to enter Menu I

The panel AT flashing lamp means entering the self-tuning state. To exit the self-tuning, set the AT value to "no" after entering AT menu. The self-tuning process is digit controlled, depending on different systems, the temperature in the self-tuning process may show large fluctuations, and the self-tuning time may also be different. After the self-tuning is completed, the AT window stops flashing alternately, the P, I, D, rE, rSt parameters obtained by self-tuning are automatically saved, and the instrument automatically returns to normal monitoring and controlling state to continue running with new parameters of P, I, D, rE and rSt.