XMT8000 temperature controller instruction

XMT8000/6000 temperature controller is an intelligent industrial adjusting meter, with reliable and superior performance, mainly used in automation systems to measure temperature, flow, pressure, level and other results in different industrial conditions.

* Available input include thermocouple, thermal resistance, analog and other signals, measuring accuracy above 0.3%FS, configurable measuring range;
* Combination of fuzzy theory and PID secure fast and smooth control.
* Selectable main output: Relay contact (heat/cool), SSR, Triac trigger (zero-cross or phase-shifting methods), analog signal.
* Auxiliary output: 1 channel analog signal for transmission, with real-time communication interface: RS232C or RS485
* 2 channels configurable alarm contact output. All parameters display can be activated or inactivated according to requirement, convenient for operation.

I. Specification

1 Input
Thermocouple (TC): S R B K N E J T
RTD: Pt100 Cu50 JPt100
Linear signal: 0-5V 1-5V mV (maximum 75) Ω
0-10mA 0-20mA 4-20mA
Definable non-standard signal inputs
2 Measuring accuracy: ±0.3% of display value ±1digit
3 Resolution: 1℃, 0.1℃ (Analog signal: 0.001)
4 Sampling cycle: 1/4 second, 1/8 second is selectable.
5 Alarm function: high alarm, low alarm, deviation high alarm, deviation low alarm, above scale high and below scale low, between scale low and scale high with hold action
6 Alarm output: Relay contact AC250V 3A (resistive load)
7 Control type: PID, Position proportioning control, Manual control
8 Control output: Relay contact (220V AC 3A)
SSR (DC 0/15V)
Triac trigger (Zero-cross): 1A 600V
Triac trigger (Phase-shifting): 1A 600V
0~10mA Current (resistive load less than 600 Ω)
0~20mA Current (resistive load less than 600 Ω)
4~20mA Current (resistive load less than 600 Ω)
9 Manual function: Change output value by keys pressing
10 Power supply: AC85~264V (50/60Hz)
21.6~26.4V AC (Rating 24V AC)
21.6~26.4V DC (Rating 24V DC)
11 Work environment: temperature 0~50℃, humidity < 85%RH, no corrosion, power < 5VA
12 Panel dimension: 80*160, 96*96, 72*72, 48*96, 96*48, 48*48mm

II Model Code

XMT □ 8 □ □ □ □ □ □ * □
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨

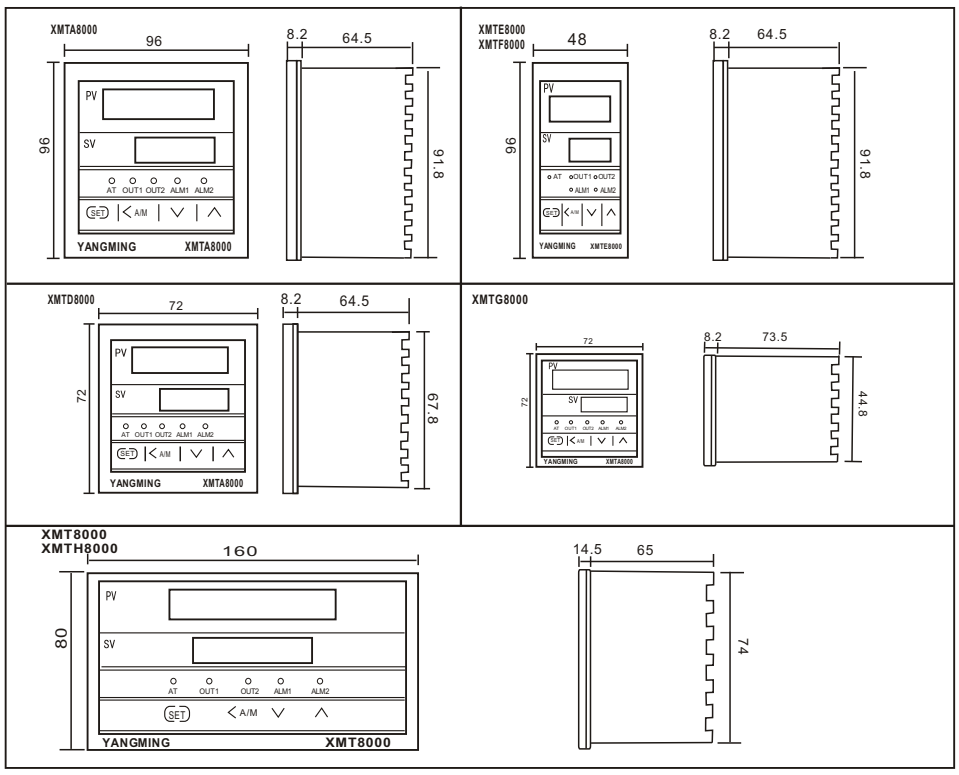
No.	Name	Description
①	Panel dimension (Height*Width mm)	N/A: 80*160 H: 160*80 A: 96*96 E: 96*48 F: 48*96 D: 72*72 G:48*48
②	Design code	8: XMT 8000 series
③	Control & Output	0: Position proportioning control; 2: Three-level position proportioning control; 3: PID control PWM output; 6: PID control trigger pulse output by means of phase-shifting; 7: PID Control trigger pulse output by means of zero-cross; 8: PID control level output, drive SSR; 9: PID control current output
④	Alarm	0: No alarm (oFF) 1: High alarm: HiAL PV above the scale high; dHAL Deviation above the scale high 2: Low alarm: LoAL PV below the scale low; dLAL Deviation below the scale low; LoC With hold action PV below the scale low; dLoC With hold action Deviation below the scale low; 3: Deviation high alarm and Deviation low alarm with hold action (or other combination) 4: ndAo Alarm when Deviation or with hold action Deviation above the scale high or below the scale low (same-contacts inputs) 5: dAo Alarm when Deviation between the scale low and scale high;
⑤	Input	1: Thermocouple; 2: RTD; 3: mV signal; 4: Remote transmitting resistance signal; 5: Standard current and voltage signal
⑥	Type symbol	S R B K N E J T Pt100 Cu50 JPt100 etc.
⑦	Input span	Specify when ordering. E.g. K 0~400℃
⑧	Transmission output	T: transmission output available N/A: N/A
⑨	Communication	N/A: N/A 4: RS485 2: RS232

e.g.: XMTA-8311-K 0~400-T*4 means the instrument has the following feature: time proportioning PID control, relay contact output, K type symbol, span 0~400℃, dHAL, transmission output, RS485 communicating interface, panel dimension 96*96.

III Mounting & Wiring

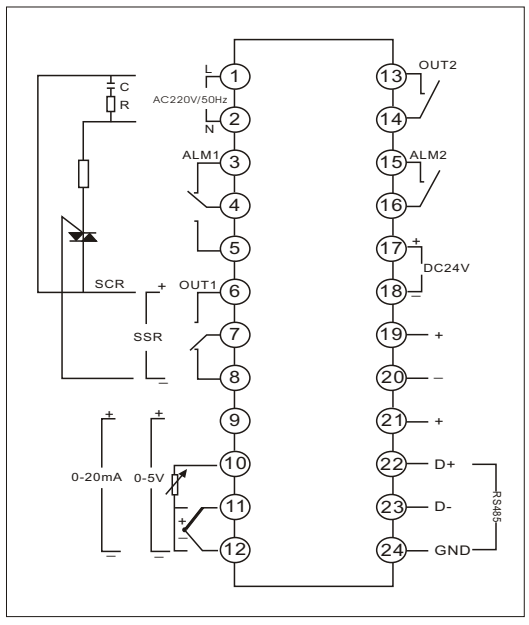
ITEM	ITEMPANEL DIM H*B*L	OPENING DIM h'*b'
XMT	80*160*65	$(75^{+1})*(152^{+1})$
XMTH	160*80*65	$(152^{+1})*(75^{+1})$
XMTA	96*96*64.5	$(92^{+1})*(92^{+1})$
XMTD	72*72*64.5	$(68^{+1})*(68^{+1})$
XMTE	96*48*64.5	$(92^{+1})*(44^{+1})$
XMTF	48*96*64.5	$(45^{+1})*(92^{+1})$
XMTG	48*48*73.5	$(45^{+1})*(45^{+1})$

Wiring cautions
① For thermocouple input, use the appropriate compensation wire.
② For RTD input, use three low resistance wires with no difference in resistance.
③ To avoid noise induction, keep input signal wire away from instrument power line, load lines and power lines of other electric equipment.
④ Five to six seconds are required as preparation time for contact output every time the instrument is turned on. Use a delay relay when the output line is used for an external interlock circuit.
⑤ This instrument is not furnished with a power supply switch or fuse. Just install one or both, if you think it's required.

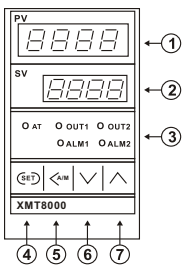


Terminal configuration (Take XMTA for example)

Voltage (take the power supply voltage of switch for example)
AC 85V~264V (50/60 Hz)
21.6-26.4VAC (rating 24VAC)
21.6-26.4VDC (rating 24VAC)
Power consumption
Max. 5VA(110VAC) Max. 7VA(240VAC)
Max. 5VA(24VAC) Max. 150mA (240VDC)
Alarm output
Relay contact output: 250VAC 3A (Resistive load)
Control Output
Relay contact output: 250V AC 3A (Resistive load)
Voltage pulse output (SSR Drive): 0/12V
DC (Load resistance 600Ω or more)
Current output: 0-100mA, 4-20mA, 0-20mA
DC (Load resistance 600Ω or less)
Triac trigger output:
Zero cross / phase-shifting method (100A or less)
Voltage used: 100VAC, 200V AC
Load used, resistive load
Triac trigger output: 0.5A (Ambient temperature: 40℃ or less)

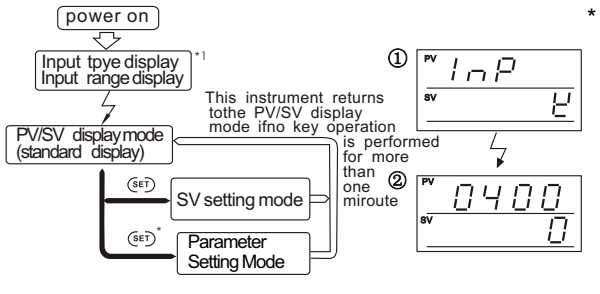


IV Parts Description & Parameter Table


PV
SV
AT OUT1 OUT2 ALM1 ALM2
SET
A/M
XMT8000
① Measured value (PV) display unit [Red]
• Displays measured value (PV)
• Displays various parameters' symbols
②Set value (SV) display unit [Green]
• Displays set value (SV)
• Displays various parameters' symbols
③ Indication lamps
Autotuning (AT) lamp [Green] Flashing during autotuning execution
Output (OUT1, OUT2) lamp [Green]
OUT1: Lights when control output is turned on **
OUT2: Lights when cool-side control output is turned on **
Lamp indication becomes as follows for continuous output:
For an output of less than 0%: Extinguished
For an output of more than 100%: Lit
For an output of more than 0% but less than 100%: Dimly lit
Alarm lamps (ALM1, ALM2) [Red]
ALM1: Lights when alarm 1 output is turned on
ALM2: Lights when alarm 2 output is turned on
④Set (SET) key
• Used to set target value
• To set the parameters by pressing the key for 3 sec
Pressing the key for 3 sec again to withdraw
• Accelerate when regulating manual output values (Press Up or Down key first, then press SET to accelerate)
⑤Shift & A/M key
• Shift digits when numerals are changed
• Manual output is available by pressing the key for 3 sec
Pressing the key for 3 sec again to withdraw
⑥Down key
Decreases numerals and switches mode
⑦Up key
• Increase numerals and switches mode
• Start/close the autotuning function by pressing for 10 sec

V Operation

V.1 Calling up procedure of each mode



*1 Input type and input range display
When instrument is powered on, it immediately confirms the input type and input range
Example: For a controller with the K thermocouple input type and range from 0 to 400℃

① Input type symbol
The short form of input type
Input type symbol (See Table** A)
② Display input range

Table ** A: Input type symbol table

display																		
input type	thermocouple (TC)							resistance temperature detector (RTD)			Current, Voltage, Resistance							
	K	J	R	S	B	E	T	N	Pt100	Cu50	JPt100	0-10mA	4-20mA	0-20mA	0-5V	1-5V	mV	

V.2 Detail of each mode

■ PV/SV Display Mode

Display measured value (PV) on the PV display unit and set value (SV) on the SV display unit.

Usually the control is set to this mode excepting that the set value and/or the parameter set value are changed.

■ SV Setting Mode

This is the mode used to set the set value SV, Factory Set Value: 200℃ (℉) or 200.0℃ (℉/%)

■ Parameters Setting Mode

This is the mode used to set the parameters such as alarms, PID constants, etc.

The following parameters symbols are displayed one by one when the SET key is pressed (the shielding items cannot be displayed).

Symbol	Name	Setting range	Description	Factory set value
AL-1	Alarm 1	P-SL ~ P-SH	Alarm 1 set value	400
AL-2	Alarm 2		Alarm 2 set value	400
P	Proportional band	Temperature input: 0℃~(P-SH) Analog signal input: P-SH 0.1~100%	Set it when PI, PD or PID control is performed. P=0 activates the position proportioning control.	30
I	Integral time	0~9999sec 0 second: PD action	Set the integral time value to remove the "residual error" in proportional control.	240
d	Derivative time	0~9999sec 0 second: PI action	Set the time of derivative action to improve control stability by preparing for output changes	30
T	Proportioning cycle of relay	1~100sec	Set control output cycle (When the SSR output is selected, set the cycle to 2 seconds)	20
Pb	PV bias	±100(10.0)	PV value is made by adding bias value to measured value	0
HY	Control output return difference	0(0.0)~100(10.0)	Only in position proportioning output (P=0), can this function be activated	1
dPu	Auto-tuning when PV value is low.	P-SL~P-SH	Set this value to reduce temperature overshoot. At that time, auto-tuning point value = SV - dPV	10
LocK	Data lock	0000 ~1111	Set it to "1000" to access to the following options	0000
P-SH	Set PV scale high	-1999 ~ +9999	Set the scale [High] of input	400
P-SL	Set PV scale low		Set the scale [Low] of input	0
Sn	Input type	Depending on input signals	See the Input type table for details	
out	Control output type	OFF: No output rLAy: Relay proportioning output & SSR drive output SCr: Triac trigger output by means of phase-shifting Zcr: Triac trigger output by means of zero-cross 0-10: 0~10 mA current output 4-20: 4~20 mA current output 0-20: 0~20 mA current output Note: Set P=0 to activate position proportioning output		rLAy
Poit	Decimal point position	Temperature input: Only zero or One decimal place can be set Analog input: From zero to Three decimal places can be set	Set it using Up and Down key	0000
ALP1	Alarm 1	oFF No alarm; LoC With hold action PV below the scale low HiAL PV above the scale high; dLoC With hold action Deviation below the scale low LoAL PV below the scale low ndAo Alarm when Deviation above the scale high or below the scale low dHAL Deviation above the scale high dAo Alarm when Deviation between the scale low and scale high dLAL Deviation below the sc dndA Alarm when with hold action above the scale high or below the scale low		dHAL
ALP2	Alarm 2			dLoC
HY-1	Alarm 1 return difference	0(0.0) ~ 100(10.0)	To set return difference for Alarm output	1
HY-2	Alarm2 return difference			
oP-b	PV transmission output	OFF、0-10、4-20、0-20	OFF: No output 0~10: 0~10mA output 4~20: 4~20mA output 0~20: 0~20mA output	4-20
SHo	Range of control output	P-SL ~ P-SH	Close output unconditionally when PV>SHo	9999
outH	Output scale high	P-SH 10% ~100%	Set the Max. value for output	100
outL	Output scale low	P-SH 0% ~90%	Set the Min. value for output	0
FiLt	Filter coefficient	0.0-10.0sec	The bigger this value, the more resistant of PV against noises and the more time needed	0.0
inPH	Non-standard signal input scale high	10-85mV 10-360Ω	Non-standard mV input scale high / Non-standard resistance input scale high	100
inPL	Non-standard signal input scale low	-10-90mV 0-90Ω	Non-standard mV input scale low / Non-standard resistance input scale low	0
cooL	Heat / Cool Switch	ON/OFF	ON: Cool-side output OFF: Heat-side output	OFF
oPPo	Soft start time	0 ~ 3600sec	The time interval from no output to output Max. value	0
C F	Unit for measured value	℃/℉	℃/℉	C
Addr	Device address	1-200		0
bAud	Communication speed	1200 2400 4800 9600 19200 38400	Unit: Hz ModBus protocol 1 stop bit/8 data bits/ no check bit/2 stop bits	9600

VI Set Data Lock Function & Autotuning Function

VI.1 Set Data Lock

Choose different levels for data lock function

Setting	Scope of protection
0001	Only SV, AL1 and AL2 can be set
0010	All parameters except for Alarms (ALM1, ALM2) can be set
0100	All parameters except for SV can be set
1000	Open the menu after LOCK

The data can only be monitored after being locked

VI.2 Auto-tuning Function

Auto-tuning automatically measures, calculates and sets the optimum PID constants.

Activating Auto-tuning function The auto-tuning function can be activated by pressing the Up key for 10 seconds at PV/SV monitor screen. After the function being activated, the AT lamp flashes.

Requirements for auto-tuning cancellation:

- When the SV is changed
- When the AT does not end in 18 hours after it started.
- When the PV vibrated
- When the power failure of more than 20 ms occurs.
- When the dPV is changed
- The auto-tuning function can be stopped by pressing the Up key for 6 seconds. Then, the AT lamp extinguishes

VI.3 Application of Parameter Display Lock Mode

Press SET and shift keys before power on, then turn on the power and keep pressing the keys until the Parameter Display Lock Mode is displayed. All parameters scroll through on the PV display screen. Set SV display to "ON", all parameters can be displayed. Set it to "OFF", no parameter can be displayed. To switch between ON / OFF, using the Up and Down keys. Pressing SET key to store the new set value. Then, next parameter will be displayed. To Cancel the Parameter Display Lock mode, press the SET key for more than 3 seconds.

In this mode, the complex functions of this instrument can be saved and customer can feel no trouble to use it.

VII. Explanation of Parameters and Functions

VII.1 Auto-tuning at a point lower than SV value

In order to lessen the effect of overshoot, auto-tuning point can be set lower than the SV value. After the auto-tuning, SV value will be back to the temperature determination point. Auto-tuning point = Set value (SV) dPV

VII.2 Transmission output

By using the functions of transmission output (oP-b), PV scale high (P-SH) display and PV scale low display (P-SL), the instrument can output measured values as analog signals within certain range. It is able to scale the range and set signal type of the transmission output. Transmission accuracy: 0-20mA ± 0.1mA, above 0.5%

VII.3 Manual output

When the display is normal, keep pressing A/M key ("＜") for 3 sec to activate manual output. "H" is displayed on the four digital number of SV display unit, and last three digital numbers are used to denote the percentage (0.0~99.9%) of output power and can be adjusted by ↑ and ↓ keys. SET is the key for acceleration (must be used together with ↑ or ↓ : press SET first, then press ↑ or ↓). Press the A/M key ("＜") for 3 sec to withdraw.

VII.4 Valve position control by OUTH / OUTL

When using continuously current or voltage control output, this function limits the range of output value; when using interrupted output, it sets the proportion of interruption, namely, the close circuit time / control period ratio. Using the OUTH / OUTL function, the instrument can perform a software restriction against the valve in terms of position, output scale high and output scale low. Manual function can also change the position of valve. Output indication function can display the position of valve in both manual and automatic state. Set the HY parameter can change the insensitive range of the valve.

VII.5 Communication

Communicating interfaces like RS485, RS232C are selectable for this instrument. With those interfaces, it has ModBus communicating protocol, enabling various operations by PC.

VII.6 Alarm description with hold action

After power on, the measured temperature will rise from a lower point through the alarm point to the set point. At this time, the instrument will not alarm. It alarms only when the measured temperature decrease from the set point or above to the alarm point. For example, without this hold action, the instrument will turn off the power by mistake when the temperature rises from a lower point through to the alarm scale low point.

VII.7 Position proportioning control

For example, it is expected to output when PV is below the set value and stop output while above. This control is just the "position proportioning control", set P=0 to enable this control.

VII.8 Return difference of position proportioning control

Hy, HY-1, HY-2 symbolize the return differences of control output, alarm 1 output and alarm 2 output in the position proportioning control process. These values can be set individually. Suppose all value were set to 1.0℃. The instrument will stop output if measured temperature is equal to or above the set point (-1℃) and will activate output if temperature is below the set point.

■ P proportioning band, when temperature vibrates regularly, P value should be increase; when temperature vibrates irregularly, P value should be decreased.

■ I Integral time, when temperature vibrates regularly, "I" value should be increase; when steady-error can't be eliminated for a long time, "I" value should be decreased.

■ d Derivative time, increase the d value can help lessen the overheat of the system.

VIII. Error Displays

Over-scale and Under-scale display

Measured Value (PV) [Flashing]	PV is outside of input range.	WARNING: To prevent electric shock, always turn off the power before replacing sensors! Check sensors and input wire.
HHHH [Flashing]	Display measured value (PV) is above input scale high.	
LLLL [Flashing]	Display measured value (PV) is below input scale low.	

X. Repairing and Storing

Within 12 months following the issuing of invoice, we are responsible for freely repairing damages of the instrument caused by quality defects. For the damages caused by misuse, accidents or modifications, we only charge repairing cost. We are always responsible for repairing our instruments with reasonable charge.

The instrument should be well-packaged kept in a ventilated place, without exposure to corrosive air.