

Temperature Controller

Model MX-F series



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■ MAIN PRODUCTS

- DIGITAL: Temperature Controller, Counter/Timer, Tachometer/Panel Meter
- SENSOR: Proximity Switch/Photo Electric Sensor, Rotary Encoder/Optical Fiber Sensor, R.T.D/Thermo Couple
- ANALOG: Timer/Temperature Controller

INSTRUCTION MANUAL

This manual primarily describes precautions required in installing and wiring the temperature controller. When using the temperature controller, please refer to the pertinent catalog for detailed information.



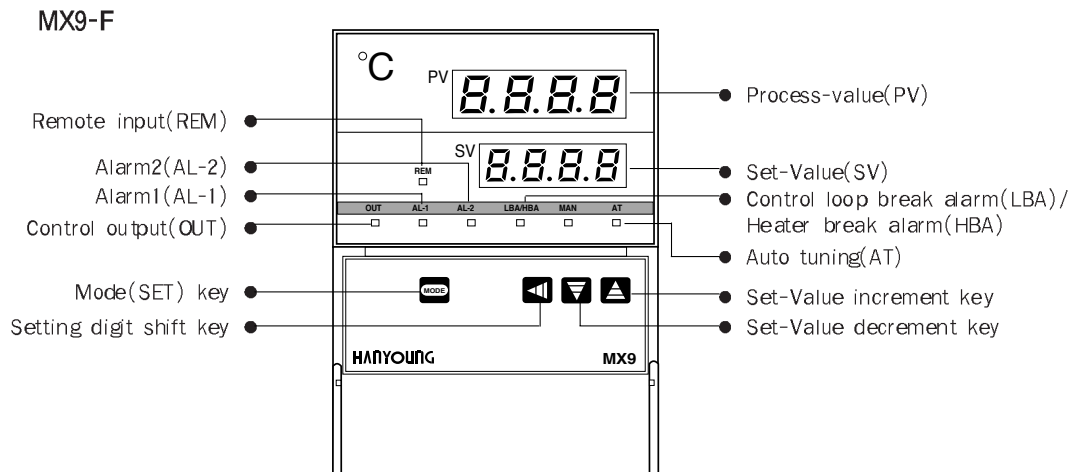
Model and Suffix code

MODEL	SUFFIX CODE					DESCRIPTION
MX <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	MX2/3/4/7/9
CONTROL						Normal PID Auto-tuning
OUTPUT (Heating)	M					Relay contact
	C					Current(4~20mA DC)
	S					SSR drive pulse voltage(0/12V DC)Voltage(1~5V DC)
	V					Voltage(1~5V DC)
OPTION	① Retransmission output	N			<input type="checkbox"/>	None Refer to CODE
	② Heater Break Alarm(HBA)	N			<input type="checkbox"/>	None HBA function(CT separately)
	③ Remote input			N	<input type="checkbox"/>	None Refer to CODE

* Option is not valid in MX4-F.

CODE	① DC 0~10mV	② DC 0~100mV	③ DC 0~1V	④ DC 0~5V
	⑤ DC 0~10V	⑥ DC 1~5V	⑦ DC 0~20mA	⑧ DC 4~20mA

Function Description

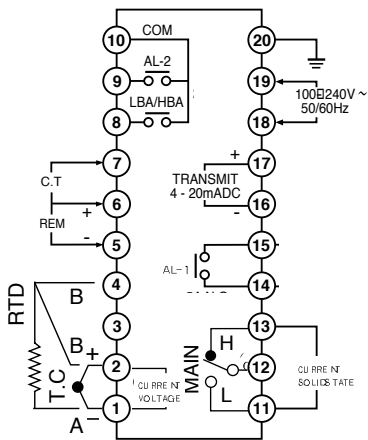


Alarm mode

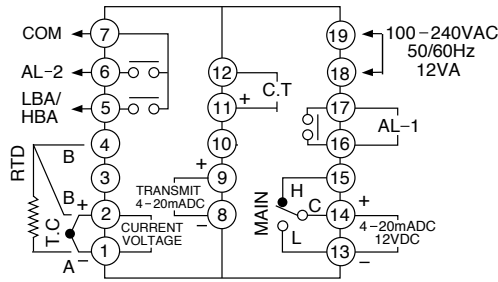
non	None
---C	Deviation high alarm
C---	Deviation low alarm
---E	Hold function of high alarm
C---	Hold function of low alarm
-C-	Band alarm
C-C	High and low alarm

3--C	Low alarm hold function of high/low alarm
C--E	High alarm hold function of high/low alarm
3--E	Hold function of high/low alarm
1--C	Process high alarm
1--E	Hold function of process high alarm
C--1	Process low alarm
3--1	Hold function of process low alarm

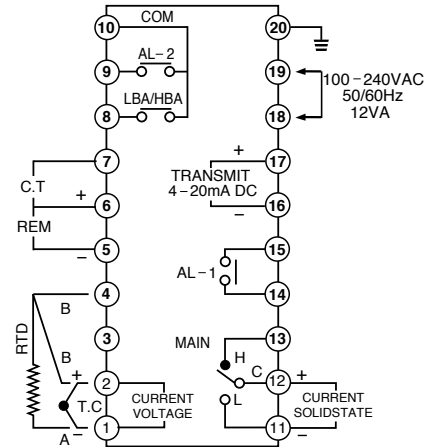
Connections



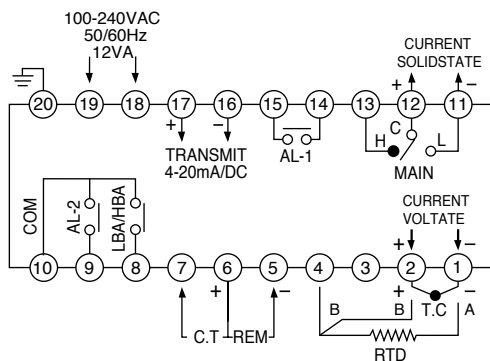
(MX9-F)



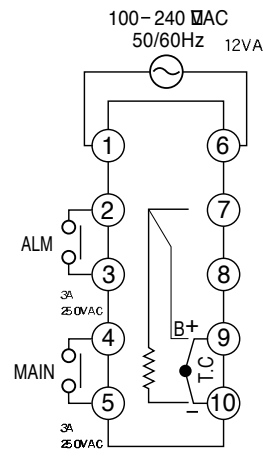
(MX7-F)



(MX2-F)

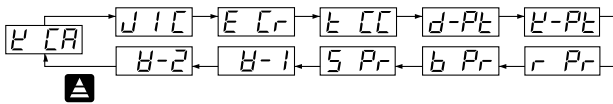


(MX3-F)



(MX4-F)

● **InP** : Input mode



● **SL-1**

LLLL

- 0: Indicator
- 1: Controller
- 0: ON/OFF
- 1: PID
- 0: Direct control action for cooling
- 1: Reverse control action for heating

MX -F Normal type

● **SL-2**

LLLL

- 0: °F
- 1: °C
- 0: 0.1°C resolution
- 1: 1°C resolution
- No function key (Do not modify)
- 0: Current output
- 1: Relay or voltage, Pulse

● **SL-3**

LLLL

- 0: Remote input function
- 1: No remote input function
- 0: Manual output function
- 1: No manual output function
- No function key (Do not modify)
- 0: Ramp function
- 1: No ramp function

● **In-5** : Input shift value
range: within free scale range

● **dP-P** : Decimal point selection
range : 0 ~ 3
(0001 → 000.0 in PV mode)

● **SL-F** : Span of free scale
range: -199~3200-1/1 MODE
(-1999~9999)-1/10 MODE

● **SL-U** : Zero of free scale
range: -199~3200-1/1 MODE
(-1999~9999)-1/10 MODE

● **AL-1** : Alarm-1 (Refer to alarm mode)
initial value : Deviation high alarm

● **Al db** : Dead band of AL-1
initial value: 1

● **Al dr** : Output terminal of AL-1

1

- 0: None
- 1: AL-1 output → AL-1 terminal (Initial value)
- 2: AL-1 output → AL-2 terminal
- 3: AL-1 output → LBA/HBA terminal

● **AL-2** : Alarm-2 (Refer to alarm mode)
initial value: Hold function of low alarm

● **A2 db** : Dead band of AL-2
initial value: 1.0

● **A2 dr** : Output terminal of AL-2

2

- 0: None
- 1: AL-2 output → AL-1 terminal (Initial value)
- 2: AL-2 output → AL-2 terminal
- 3: AL-2 output → LBA/HBA terminal

● **HASL** : LBA/HBA function

LbA non LbA H25 H50

(None) (LBA) (25A HBA) (50A HBA)

● **HA db** : Dead band of HBA(A)

● **HA dr** : Output terminal of LBA/HBA

0003

- 0: None
- 1: LBA/HBA output → AL-1 terminal
- 2: LBA/HBA output → AL-2 terminal
- 3: LBA/HBA output → LBA/HBA terminal

● **rEFF** : Retransmission display

PV non PV SV

(None) (PV) (SV)

● **Ro-H** : Span of retransmission output
range : 0~4095 initial value : 3500
(Do not modify)

3500

● **Ro-L** : Zero of retransmission output
range : 0~4095 initial value : 500
(Do not modify)

500

● **rEAL** : Remote input calibration
(Do not modify)

0000




Input and Range

Signal	Input	Temperature range	
<i>YCA</i>	K	-50~1372℃ (-50.0~999.9℃)	-50~2500°F (-50.0~999.9)
<i>YIC</i>	J	-50~1100℃ (-50.0~999.9℃)	-50~2000°F (-50.0~999.9)
<i>YCr</i>	E	-199~750℃ (-199.9~750.0℃)	-199~1400°F (199.9.0~999.9)
<i>YCC</i>	T	-199~400℃ (-199.0~400.0℃)	-199~750°F (-199.9~750.0)
<i>d-Pt</i>	Pt 100Ω (DIN)	-199~649℃ (-199.9~649.0℃)	-199~1200°F (-199.9~999.9)
<i>Y-Pt</i>	Pt 100Ω (JIS)	-199~649℃ (-199.9~649.0℃)	-199~1200°F (-199.9~999.9)

Signal	Input	Temperature range	
<i>rPr</i>	PR(R)	0~1760℃	32~3200°F
<i>bPr</i>	PR(B)	0~1760℃	32~3200°F
<i>sPr</i>	PR(S)	0~1760℃	32~3200°F
<i>H-1</i>	1~5V 4~20mA	-199~3200 (1℃ Mode) -1999~9999 (0.1℃ Mode)	
<i>H-2</i>	0~5V 0~20mA	-199~3200 (1℃ Mode) -1999~9999 (0.1℃ Mode)	

**Caution for input selection

- 1)When you select input mode, you must shift jump switch inside of PCB to CORRECT position first.
- 2)Afterwards select each input mode by key operation.

Input	T.C./voltage	RTD	Current
Switch position	 TC	 PT	 R

Specifications






Accuracy	[Setting Accuracy] T/C: Within $\pm(0.3\%$ of SV + 1 digit) or $\pm 2^\circ\text{C}$ (Whichever is larger) R.S: $\pm 4^\circ\text{C}$ + 1 digit R.T.D: Within $\pm(0.3\%$ of SV + 1 digit) or $\pm 0.8^\circ\text{C}$ (Whichever is larger) [Display accuracy] Same as setting accuracy.
Power supply	100 to 240V AC (Common to 50/60Hz)
Power consumption	Max. 15VA
Control output	Relay contact: AC 250V 3A (Resistive load) 1C(NO/NC) contact SSR driving: 12V DC (Constant voltage pulse) [load resistance more than 800 Ω] Current: 4-20mA DC [load resistance less than 600 Ω] Voltage: 1-5V DC [load resistance less than 1 k Ω]
Alarm output	Deviation or process setting Relay contact output: AC 250V 0.5A (AL-2), 3A(AL-1)
Ambient temperature	0 ~ 50℃ (32 ~ 122°F) *Ambient humidity: 35 ~ 85% RH

Setting of constants in display

Signal on PV display	Name	Description	Setting range	Initial set
581	Temp. range	Temperature range in ramp	-199~3200 (-199.9~999.9)	-
rAMP	Ramp	Ramp(Rate) time setting	0~540 minutes	-
*P	Proportional band	Set when proportional control is performed.	1 to span °C(°F) 0.1~999.9 °C(°F)	20 °C(°F)
A	Anti-reset windup	Prevents overshoot and/or undershoot caused by integral action effect.	0~100°C(°F)	100°C(°F)
*I	Integral time	Eliminates offset occurring in proportional control. Integral action turns OFF with this action set to "0".	0 to 3600 sec.	240 sec.
*d	Derivative time	Prevents ripples by predicting output change thereby improving control stability. Derivative action turns OFF with this action set to "0".	0 to 3600 sec.	60 sec.
HYS	Hysteresis (in ON/OFF action)	Displays hysteresis Set-Value for main output.	0.1~100.0	1°C(°F)
C	Proportioning cycle	Displays manipulated output cycle(sec.).	1 to 100 sec. (0.1 to 100.0 sec.)	Relay contact output:20 sec. Voltage pulse output:2sec.

*Automatically set by Auto-tuning

PID Auto-Tuning

- Press the  key and  key at the same time. Then, AT indication lamp flashes to start the Auto-tuning function.
- If Auto-tuning function ends, the AT indication lamp stops flashing automatically.
when checking the auto-tuned value, press the  key and conform in turn.
- When you want Auto-tuning function to be suspended, press the  key and  key simultaneously, then the AT indication lamp stops flashing to release Auto-tuning function. In this case P.I.D and ARW values are not changed(Maintain the value before the Auto-tuning starts).
- When you want to change the SV(set-value) during Auto-tuning, suspend it and perform PID control using the values before Auto-tuning starts.

Remote input

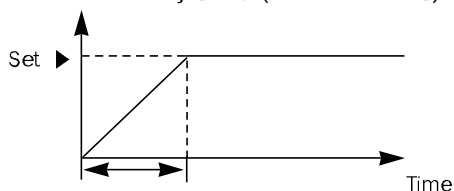
Set-value of controller can be set or changed from outside of the controller by direct voltage/current signal.

But the external signal should be input continuously.

(Auto-tuning function is not operated while the external signal is set)

Ramp function

Ramp rate can be adjusted. (0~540 minutes)



Control break alarm(LBA)

LBA function starts to measure time from the moment that the PID Computed Value (Output ON time/cycle) become 0% or 100%, and detects the amount of Process Value change at each LBA setting time, and determines by the amount of change whether LBA is to be ON or OFF.

- When the status at a 100% PID computed value continues beyond the LBA setting time, the LBA turns ON if the measured-value(PV) does not rise by 2°C(°F) or more. (In direct action, the above alarm turns ON if the measured-value does not fall by 2°C(°F) or more.
- When the status at a 0% PID computed value continues beyond the LBA setting time, the LBA turns ON if the measured-value(PV) does not fall by 2°C(°F) or more.

Heater break alarm(HBA)

The Set-value of HBA to be set about 85% to input of CT but the set-value should be less in case that the ratio of voltage variation is high.

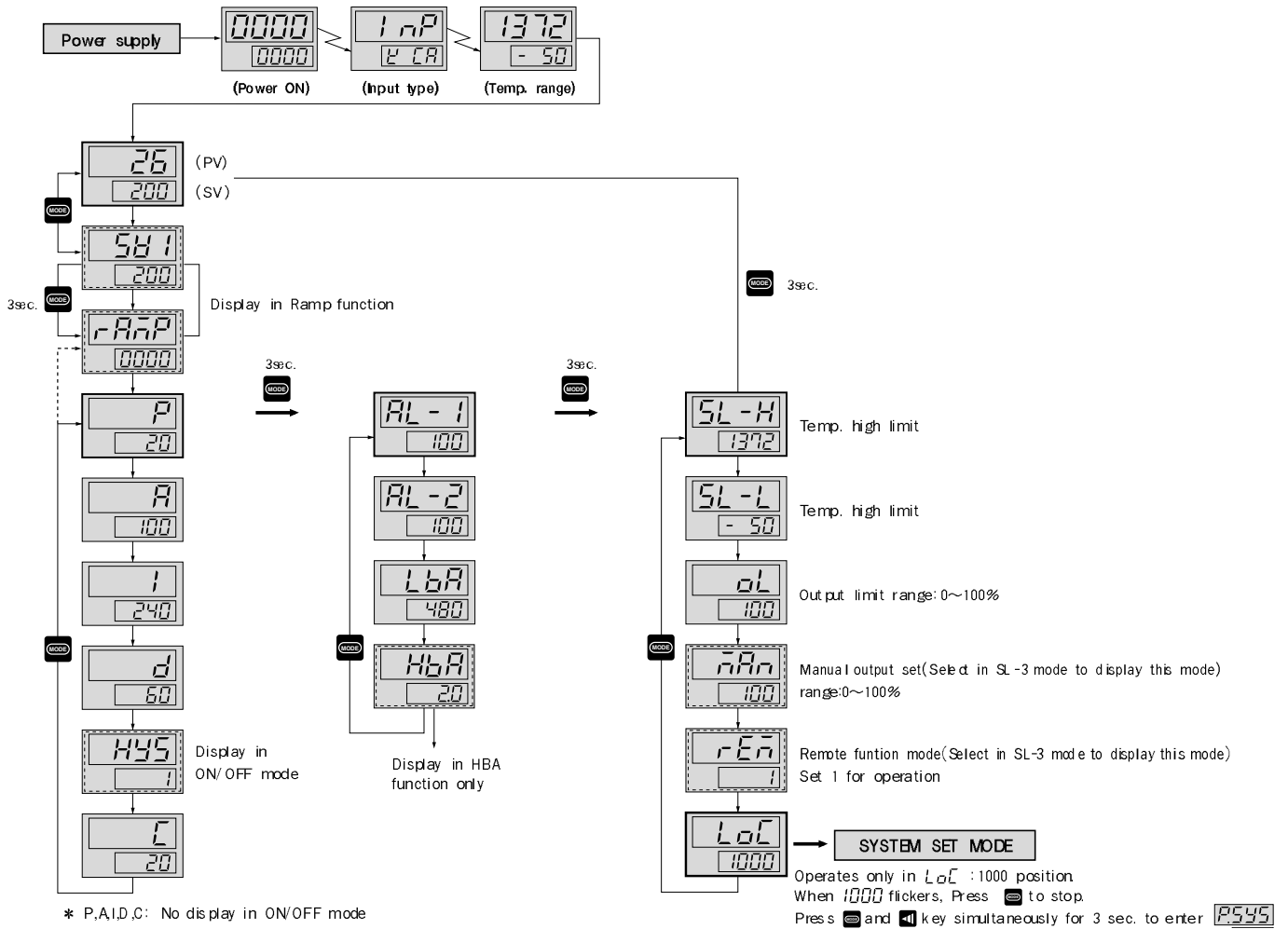
If several heaters are connected in parallel, the alarm may be turned ON even though one circuit is broken.

In such a case, set the value of HBA to be slightly high.

No HBA operates at "0.0" setting, but HBA operates at "25.0" or "50.0" setting.

Operation Manual

1. Normal mode



2. Function set mode

