Digital PID Controller
EM104/EM404/EM504/EM704/EM904
INSTRUCTION MANUAL

EM04-219-E1

Carefully read all the instructions in this manual. Please place this manual in a convenient location for easy reference.

⚠ **WARNING**

An external protection device must be installed if failure of this instrument could result in damage to the instrument, equipment or injury to personnel .

All wiring must be completed before power in turned on to prevent electric shock, fire or damage to instrument and equipment .

This instrument must be used in accordance with the specifications to prevent fire or damage to instrument and equipment.

This instrument is not intended for use in locations subject to flammable or explosive gases.

Do not touch high-voltage connections such as power supply terminals , etc. to avoid electric shock.

1. PRODUCT CHECK

MODEL (Size wideXhigh)   CODE
EM104 (48mmX48mm)
EM404 (48mmX96mm)
EM504 (96mmX48mm)
EM704 (72mmX72mm)
EM904 (96mmX96mm)

(1) Control action
　　N: No action
　　F: ReversePID action (for Heating) D: Direct PID action (for cooling)
　　B: ON/OFF control （for heating）   M: ON/OFF control （for cooling）
(2) Input type，(3) Range code: See"8.INPUT RANGE TABLE"
(4) Control output [OUT]
　　N: No action
　　M: Relay contact   V: Voltage pulse(for SSR)
　　2: Current(DC0~20mA)   8: Current(DC4 ~ 20 mA)
　　5: 0~5VDC   6: 0~10VDC
　　7: 1~5VDC   T: Triac single phase zero crossing control
(5) Remark code: N
(6) Alarm 1[AL1]   (7) Alarm 2[AL2]
　　A: Deviation high alarm   G: Deviation high/low alarm
　　　　　　　　　　　　　　　　　　　with hold action
　　B: Deviation low alarm   M: Deviation band alarm
　　　　　　　　　　　　　　　　　　　with hold action
　　C: Deviation high/low alarm   H: Process high alarm
　　D: Deviation band alarm   J : Process low alarm
　　E: Deviation high alarm   K: Process high alarm
　　　with hold action   with hold action
　　F: Deviation low alarm   L: Process low alarm
　　　with hold action   with hold action
(8) Power
　　B：85-265VAC
(9) Communication
　　N: No Communication   M : Rs485 communication Modbus-RTU

2. MOUNTING

2.1 Mounting Cautions

(1) Use this Instrument within the following ambient temperature and ambient humidity.
　Allowable ambient temperature: 0 to 50
　Allowable ambient humidity: 45 to 85% RH
(2) Avoid the following when selecting the mounting location.
　Rapid changes in ambient temperature which may cause condensation.
　Corrosive or inflammable gases.
　Direct vibration or shock to the mainframe.
　Water,oil,chemicals,vapor or steam splashes.
　Excessive induction noise, static electricity, magnetic fields or noise.
　Direct air flow from an air conditioner.
　Exposure to direct sunlight.
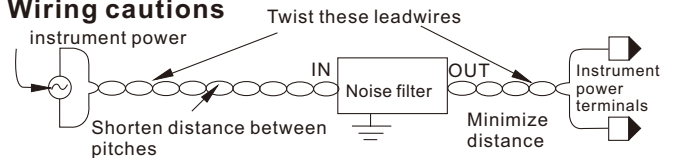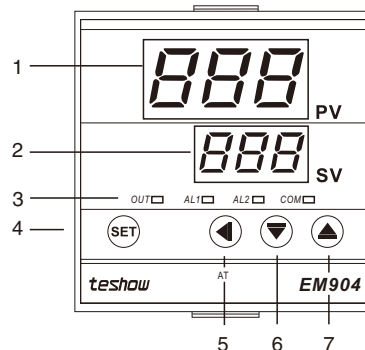　Excessive heat accumulation.

2.2 Dimensions
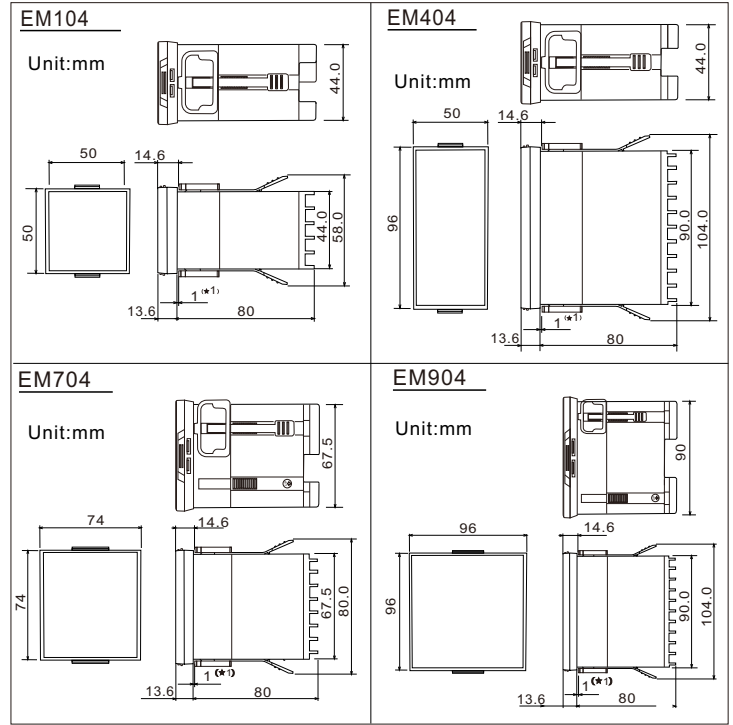
3. WIRING
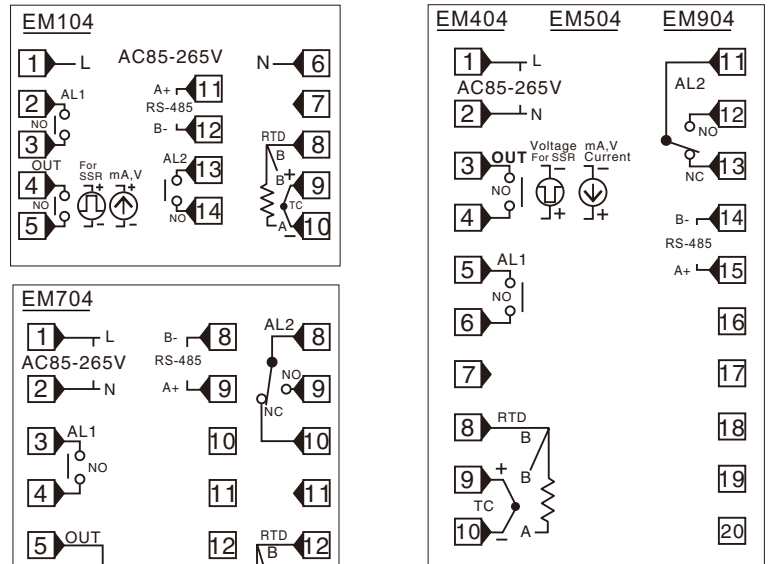
Alarm outut rated:
Relay contact output   250V AC, 5A (Resistive load)
Control output rated
Relay contact output: 250V AC,5A(Resistive load)
Voltage pulse output: 0/9 V DC

3.1 Wiring cautions

instrument power
Twist these leadwires
IN Noise filter OUT
Instrument power terminals
Shorten distance between pitches
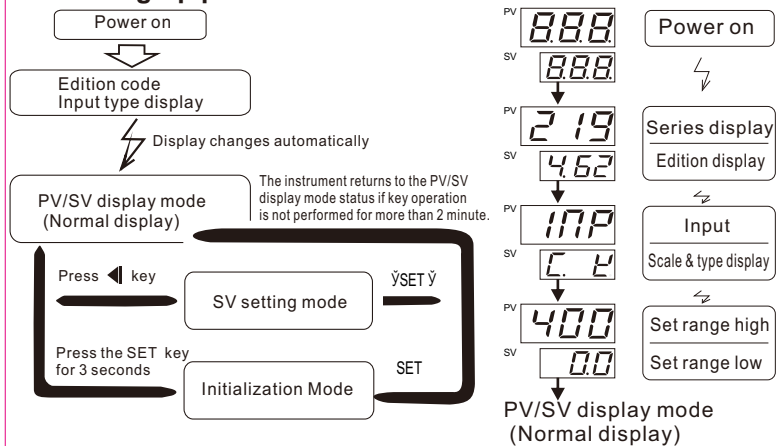Minimize distance

4. PARTS DESCRIPTION

1. Measured value (PV) display [RED]
2. Set value(PV)display [Red]
3. Indication lamps
　Control output lamps (OUT1)
　Alarm1 (AL1)   Alarm2 (Al2)
4. **SET** (Set key)
　Used for parameter calling up and set value registration
5. ◀ Shift & Autotuning key
6. ▼ (Down key) Decrease numbers
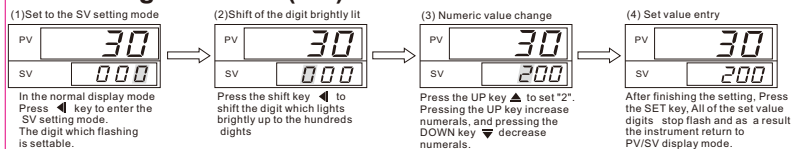7. ▲ (Up key) Decrease numbers

5. SETTING

5.1 Calling up procedure of each mode

A: Input type table

Display	Ʉ	ᵗ	E	J	ᥒ	Pt
Input	K	T	E	J	N	Pt100
Range	0 to 999 ℃	0 to 400 ℃	0 to999 ℃	0 to999 ℃	0 to 999 ℃	0 to 800 ℃

5.2 Setting set value(SV)
Example: Following is an example of set value(SV) to 200

(1)Set to the SV setting mode
In the normal display mode Press ◀ key to enter the SV setting mode. The digit which flashing is settable.

(2)Shift of the digit brightly lit
Press the shift key ◀ to shift the digit which lights brightly up to the hundreds dights

(3) Numeric value change
Press the UP key ▲ to set "2". Pressing the UP key increase numerals, and pressing the DOWN key ▼ decrease numerals.

(4) Set value entry
After finishing the setting, Press the SET key, All of the set value digits stop flash and as a result the instrument return to PV/SV display mode.

5.3 Setting parameters other than set value (SV)

The setting procedures are the same as those of example (2) to (4) in the above "Setting set value (SV)". Press the SET key after the setting end shifts to the next parameter. When no parameter setting is required, return the instrument to the PV/SV display mode.

6.Initialization Mode

6.1 User level (Level 1)

Press the SET key for 3 seconds to User level
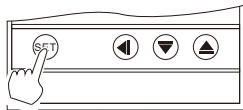
6.1.1After the value be registered ,you can press SET key for 3 seconds to return the instrument to the PV/SV display mode.
The following parameter symbols are displayed one by one every time the SET key is pressed.

Symbol	Name	Range	Description
AL 1	Alarm 1	-199 to 999	Set the alarm value for alarm 1 . Alarm differential gap=AH1
AL2	Alarm 2	-199 to 999	Set the alarm value for alarm 2 Alarm differential gap=AH2
LcY	Set data lock	0 to 999	Lck=0,Allow to modify any parameter and SV Lck=1,Only allow to modify SV, Lck=2,Only allow to modify SV,AL1,AL2, Lck=3, , Not allow to modify any parameter and SV Lck=808,Set to 808 and press SET key to level 2 Lck=809,Set to 809 and press SET key to level 3

6.2 PID level (Level 2)

Set to LcK to 808 and press SET key to PID level
The following parameter symbols are displayed one by one every time the SET key is pressed.
1# Factory set value

Symbol	Name	Range	1#	Description
P	Proportional band	1.0 to 200	20.0	Proportional band in PID with unit
I	Integral time	0 to 999	210	Set the time of integral action to eliminate the offset occurring in proportional control.
d	Derivative time	0 to 999	30	Set the time of derivative action to improve control stability by preparing for output changes.
CYt	Proportioning cycle	0 to 999	20	Proportioning cycle time for PID control (or compressor protect timer for cooling ON/OFF control)
HYS	Control Hysteresis	0 to 999	1.0	Control out differential gap=HYS (ON/OFF action)

Symbol	Name	Range	1#	Description
rSt	Proportional reset	-199 to 200	-5.0	Proportional reset for overshoot protection (Auto setting after autotuning)
OPL	Output limit (Low)	0.0 to 100%	0.0	Output manipulated variable lowest limit
OPH	Output limit (High)	0.0 to 100%	100	Output manipulated variable highest limit
bUF	Output buffer	0.0 to 100%	100	Output variance value percentage per second buffer limit Only for 4-20mA output

6.3 Input level (Level 3)

Set to LcK to 809 and press SET key to Input level
The following parameter symbols are displayed one by one every time the SET key is pressed.
1# Factory set value

Symbol	Name	Range	1#	Description
INP	Main input type select	/	K	K, t, E, J, N, Pt100
dP	Decimal point	0 to 1	0	0:No decimal point, 1:One decimal point mode
SPL	Low setting limiter	-199 to 999	0.0	Set lower setting limiter
SPH	High setting limiter	-199 to 999	400	Set high setting limiter
UNt	Display scale	C or F	C	C: Centigrade F Fahrenheit
SCb	PV bias	-199to 999	0.0	Sensor correction is made by adding bias value to measured value(PV).
FIL	PV follow-up PV input filter	0 to 60	55	PV variable-value control, 0-30: for general, 31-60: for enhanced
Act	Control action	/	rE	rE: PID action (reverse action) dr: PID action (Direct action)
CrL	Contron mode	/	Pid	Pid: PID control oF1: On/Off control oF2:On/Off control withcompressor protect timer
Ad 1	Alarm1 mode	00 to 16	11	Select the type of alarm1 See(**ALARM TYPE TABLE)
AH 1	Alarm1 differential gap	0.1 to 999	0.4	Alarm1 differential gap setting
Ad2	Alarm2 mode	00 to 16	10	Select the type of alarm2 See(**ALARM TYPE TABLE)
AH2	Alarm2 differential gap	0.1 to 999	0.4	Alarm2 differential gap setting
Add	Device address setting	0-127	1	Communication device address setting.
bAU	Band-rate setting	/	9.6	BAUd=2.4K 4.8K 9.6K 19.2K

ALARM TYPE TABLE (Ad_=00~16)

10: No alarm output	00: No alarm output
11: Deviation high alarm	01: Deviation high alarm with hold action
12: Deviation low alarm	02: Deviation low alarm with hold action
13: Deviation high/low alarm	03: Deviation high/low alarm with hold action
14: Deviation band alarm	04: Deviation band alarm with hold action
15: Process high alarm	05: Process high alarm with hold action
16: Process low alarm	06: Process low alarm with hold action

7.AUTOTUNING

Press ◀ for 3s

Press ▲ key to set "At" from "no" to "YES"
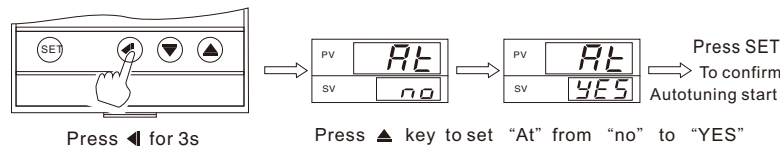
Change "At" from "on" to "OFF", then press SET key to confirm , then the Autotuning process will be cancelled.

8. INPUT RANGE TABLE

Input type			Code	
K	0 to 400 ℃		K	A4
	0 to 600 ℃		K	A6
	0 to 999 ℃		K	A0

Input type			Code	
J	0 to 400 ℃		J	A4
	0 to 600 ℃		J	A6
	0 to 999 ℃		J	A0

Input type			Code	
E	0 to 400 ℃		E	A4
	0 to 600 ℃		E	A6
	0 to 999 ℃		E	A0

Input type			Code	
T	0 to 400 ℃		T	A4
	0 to 600 ℃		T	A6
	0 to 999 ℃		T	A0

Input type			Code	
N	0 to 400 ℃		N	A4
	0 to 600 ℃		N	A6
	0 to 999 ℃		N	A0

Input type			Code	
Pt100	0 to 400 ℃		D	A4
	0 to 600 ℃		D	A6
	0 to 800 ℃		D	A8