Digital PID Controller for 520

TS81E/ TS84E/ TS85E/ TS87E/ TS89E

INSTRUCTION MANUAL

Carefully read all the instructions in this manual. TS8E-520-E4
Please place this manual in a convenient location for easy reference.

Specification

- TS8E series instrument: 4 big LED display, 0-100%LED bar display output , Accuracy: (Max±0.2% fus or ±1)≤±1 digit
  RTD or TC input, the maximum resolution is 0.1 degree. Analog input ,the maximum resolution is 0.001 degree.
- Pleases make sure that the power and output types are right before using, there is a wire diagram beside the controller, in the code NO4 ,you can see the output mode, such as relay, SSR or 4-20mA etc. (SEE 1. PRODUCT CHECK)
- Clients can set TC, RTD by keyboard ,please set the input type coincide with the sensor. Check details of the manual"6.3"parameter INP1,If need analog signal inputs, please specified when order. (Except 0-20mV or 0-50mV input)
- As usual, controllers were set as out1(heating) before leaving factory, of course, users can select out1(cooling), check manual "6.3 Parameter Oud in level2 "
- PID control: As usual, controllers have PID control before leaving factory, with Auto-tuning function.
- ON/OFF Control: Set P=0.0,it will be changed as on/off control. Check manual"6.1 parameter P " . Position difference is HYS. when heating :PV＞SV, OUT stop, when PV＜SV-HYS, OUT start, fitting for OUT1. When Cooling: PV＞SV+HYS, output start, when PV＜SV,output stop.
- Proportional control: when P≠0, I=0, d=0, which is purely Proportional control, Proportional reset is set as rSt, proportional cycle is Cyt. When heating, rSt value is smaller, then output is smaller. When cooling: rSt value is bigger, output is smaller.
- when PID Control, we suggest adopt the Autotuning to improve the control effect. Check "7.Autotuning"
- When anolog signal output, can using output buffer function when in some special control position, which can make output more stable.
  Check manual (6.1 level 2 bUFF parameter, and 6.3 level 2 bEr parameter)

1. PRODUCT CHECK

MODEL (Size: wideXhigh) CODE

TS81E (48mmX48mm)
TS84E (48mmX96mm)
TS85E (96mmX48mm)
TS87E (72mmX72mm)
TS89E (96mmX96mm)

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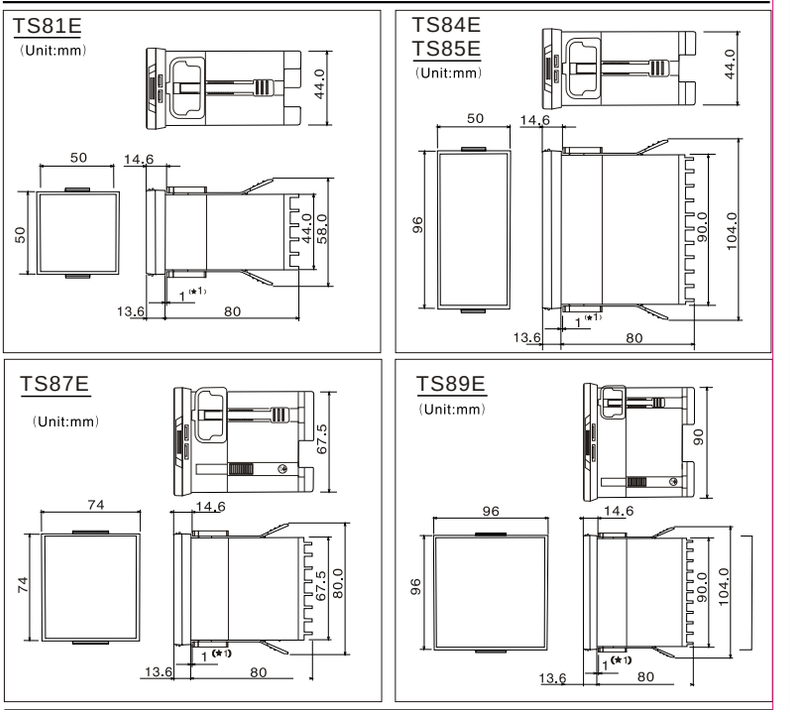
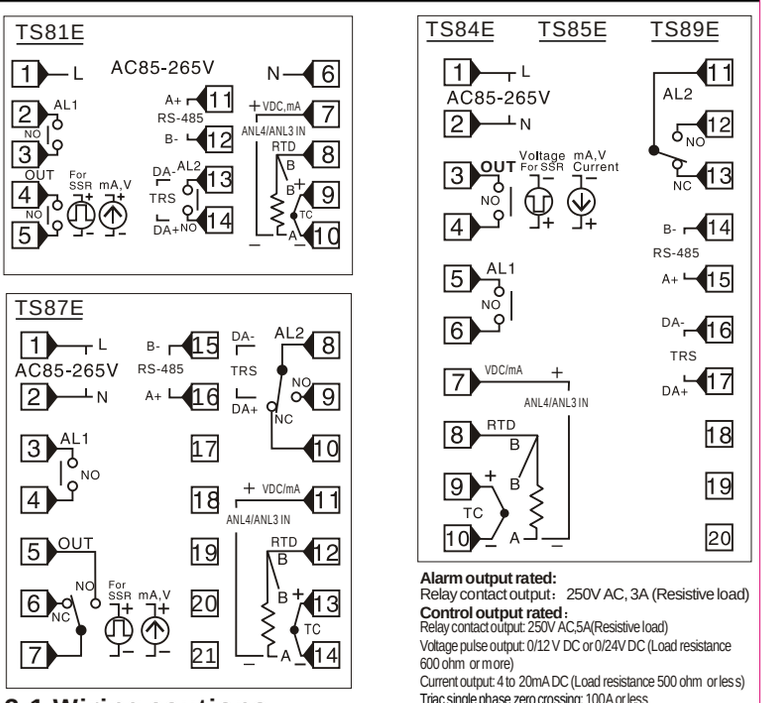
① ② ③ ④⑤ ⑥⑦ ⑧ ⑨

(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 ~ 20mA)
5: 0~5VDC 6: 0~10VDC
7: 1~5VDC T:Triac single phase zero crossing control
(5) Transmission
N:No transmission
C: PV transmission (4-20mA) E: SV transmission (4-20mA)
P: PV transmission (0-5V) R: SV transmission (0-5V)
Q: PV transmission (0-10V) S: SV transmission (0-10V)
(6) Alarm 1[AL1] (7) Alarm 2[AL2]
A: Deviation high alarm
B: Deviation low alarm
C: Deviation high/low alarm
D: Deviation band alarm
E: Deviation high alarm with hold action
F: Deviation low alarm with hold action
G: Deviation high/low alarm with hold action
M: Deviation band alarm with hold action
H: Process high alarm
J : Process low alarm
K: Process high alarm with hold action
L: Process low alarm with hold action
(8) Power
A: 220VAC B: 85-265VAC
(9) Communication
N: No Communication M : Rs485 communication Modbus-RTU

2. MOUNTING SIZE

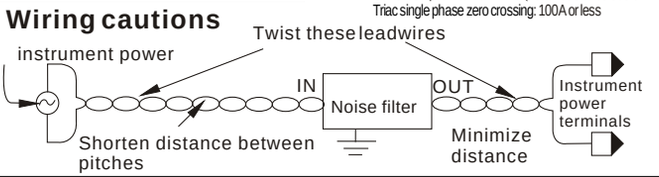


3. WIRING

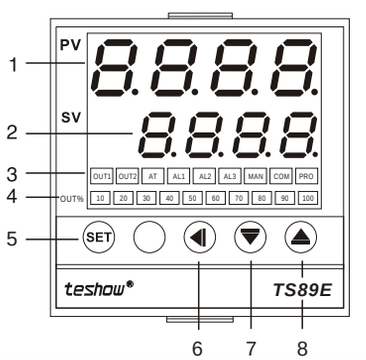


Alarm output rated:
Relay contact output: 250V AC, 3A (Resistive load)
Control output rated:
Relay contact output: 250V AC,5A(Resistive load)
Voltage pulse output: 0/12 V DC or 0/24V DC (Load resistance 600 ohm or more)
Current output: 4 to 20mA DC (Load resistance 500 ohm or less)
Triac single phase zero crossing: 100A or less

3.1 Wiring cautions



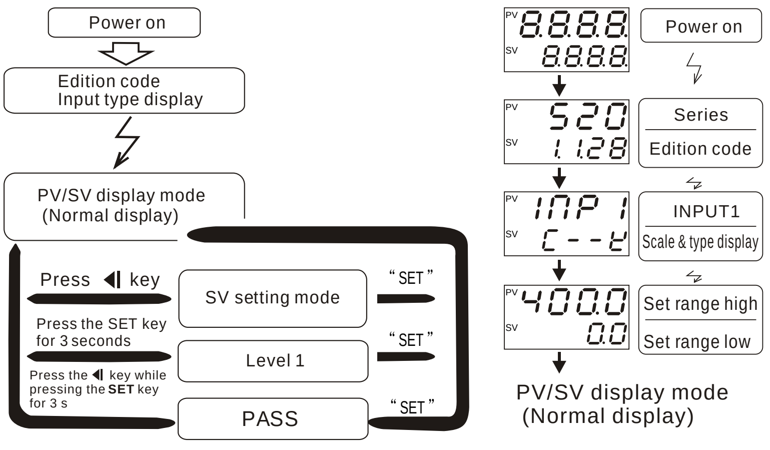
4. PARTS DESCRIPTION



1 Measured value (PV) display [RED]
2 Set value(SV)display [GREEN]
3 OUT1lamp: Output indication
OUT2 lamp: Remark lamp
AT lamp: Autotuning indication
AL1 lamp: Alarm 1 output indication
AL2 lamp: Alarm 2 output indication
AL3 lamp: Remark lamp
MAN lamp: Remark lamp
COM lamp: Communication indication
PRG lamp: Remark lamp
4 LED bar: Output1 % value indication
5 SET key: Used for parameter calling up and set value registration
6 ◀ : Shift key and setting SV key
7 ▼ : Down key, decrease numbers
8 ▲ :Up key ,increase numbers

5. SETTING

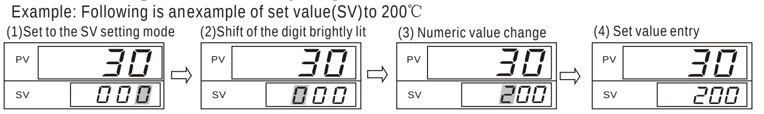
5.1 Calling up procedure of each mode



Display	K	E	J	N	W	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
Range	1300 ℃	600 ℃	800 ℃	1300 ℃	2000 ℃	1600 ℃	400 ℃	1700 ℃	1800 ℃					800 ℃

5.2 Setting set value(SV)

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



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

(2) Press the shift key to shift the digit which lights brightly up to the hundreds dights

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

(4) 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)

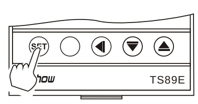
The setting procedures are the same as those of example (2) to (4) in the above "Setting set value (SV)". Press the SET key after the setting end shifts to the next parameter. When no parameter setting is required, return the instrument to the PV/SV display mode.

6. LEVEL

*In any time you can press SET key for 3 seconds to save value and exit level to PV/SV mode.

6.1 Level 1

Press the SET key for 3 seconds to level 1:



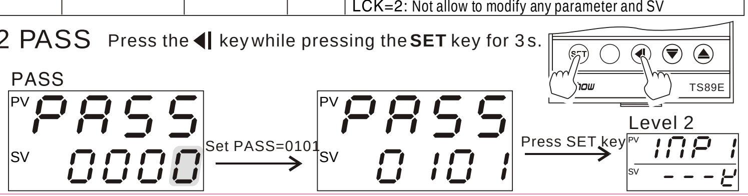
The following parameter symbols are displayed one by one every time the SET key is pressed. After the value be registered ,when no parameter setting is required, Press the SET key for 3 s to return the instrument to the normal display.

1# Factory set value

Symbol	Name	Range	1#	Description
At	Autotuning	NO or YES	NO	YES: Autotuning on, NO: Autotuning off
AL1	Alarm 1	-1999 to 9999	10	Set the alarm value for alarm 1 . Alarm differential gap=AH1
AL2	Alarm 2	-1999 to 9999	10	Set the alarm value for alarm 2 Alarm differential gap=AH2
SC	PV bias	-199 to 199	0.0	Sensor correction is made by adding bias value to measured value(PV).
P	Proportional band	0.0 to 200.0	20.0	Proportional band in PID with unit ℃ for OUT1 P=0.0, ON/OFF control Please set P1=2.0 when analog input.
HYS	Control Hysteresis	0 to 999	1.0	Control out differential gap=HYS Only for ON/OFF action when P=0.0
I	Integral time	0 to 3600 s	210	Set the time of integral action to eliminate the offset occurring in proportional control.
d	Derivative time	0 to 3600 s	30	Set the time of derivative action to improve control stability by preparing for output changes.
CYt	Proportioning Cycle	0 to 999 s	20	Proportioning cycle time for PID control
rE	Spare	0.0 to 100.0	10.0	Spare
rSt	Proportional reset	-199 to 200	-5.0	Proportional reset for overshoot protection when first power on. (Auto setting after autotuning)
OPL	Output limit (Low)	0.0 to 100.0%	0.0	Output manipulated variable lowest limit
OPH	Output limit (High)	0.0 to 100.0%	100.0	Output manipulated variable highest limit
bUFF	Output buffer	0.0 to 100%	100.0	Output variance value percentage per second buffer limit Only for 4-20mA output
LCK	Set data lock	0-2	0	LCK=0: Allow to modify any parameter and SV LCK=1: Only allow to modify SV and AT LCK=2: Not allow to modify any parameter and SV

6.2 PASS

Press the key while pressing the **SET** key for 3 s.



6.3 Level 2

Press the key while pressing the **SET** key for 3 s to PASS, set PASS=0101, then press SET key to Level 2

The following parameter symbols are displayed one by one every time the SET key is pressed. After the value be registered ,when no parameter setting is required, Press the SET key for 3 s to return the instrument to the normal display.

1# Factory set value

Symbol	Name	Range	1#	Description
INP1	Main input type select			Setting: K E J N W S T R B / Input: K, E, J, N, Wu3_Re25, S, T, R, B / Range: 1300 ℃, 600 ℃, 800 ℃, 1300 ℃, 2000 ℃, 1600 ℃, 400 ℃, 1700 ℃, 1800 ℃; Setting: AN4, AN3, AN2, AN1, Pt / Input: 2-10VDC 1-5VDC 4-20mA, 0-10VDC 0-5VDC 0-20mA, 0-50mV, 0-20mV, Pt100 / Range: 800 ℃ (Pt100)
dP	Decimal point	0 to 3	0	0, 1 for TC or RTD or analog type 2,3 Only for Linear analog type input
LSPL	Low setting	-1999 to 9999	0	Set lower setting limiter Lower point of transmission
USPL	High setting	-1999 to 9999	400	Set high setting limiter Higher point of transmission
UNIt	Display scale	C ,F or A	C	C :Centigrade, F :Fahrenheit A :without scale
PVFt	PV follow-up PV input filter	0 to 60	55	PV variable-value control, 0-30: for general, 31-60:for enhanced
ANL1	Lowest value of PV display	-199~9999	0	Lowest value display when linear analog inputs ,Such as 4-20mA input.
ANH1	Highest value of PV display	-1999~9999	2000	Highest value display when linear analog inputs ,Such as 4-20mA input.
ALd1	Alarm1 mode	00 to 16	11	Select the type of alarm 1，See(**ALARM TYPE TABLE)
AH1	Alarm1 differential gap	0.0 to 100.0	0.4	Alarm1 differential gap setting
ALd2	Alarm2 mode	00 to 16	10	Select the type of alarm 2，See(**ALARM TYPE TABLE)
AH2	Alarm2 differential gap	0.0 to 100.0	0.4	Alarm2 differential gap setting
OUd	Control action	HEAT or COOL	HEAT	HEAt:Reverse action (Heating) CooL :Direct action (Cooling)
bEr	Buffer mode for out1 analog output	0,1,2	0	0: No buffer for analog output1 1: Always with buffer for analog output1 2: With buffer when the output1 increases only. (Soft-start) Output variance value percentage per second buffer limit according BUFF in Level1
IdNO	Device address setting	0-127	1	Communication device address setting.
bAUd	Band-rate setting		9.6	BAUd=2.4K，4.8K，9.6K，19.2K

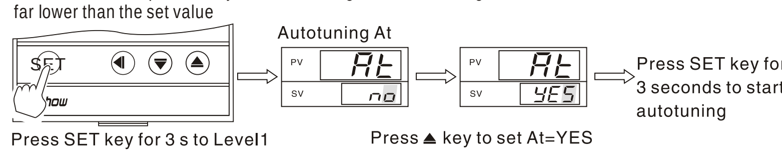
**ALARM TYPE TABLE (ALd_=00~16)

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

NOTE: With hold action, When Hod action is ON, the alarm action is suppressed at start-up until the measured value enters the non-alarm range.

7. AUTOTUNING

When controller's power are just on,it will be good to autotuning when the measured value is far lower than the set value



1, When begin to autotuning, AT light flash, which means to begin to autotuning,if you want to exit from autotuning, please enter into the AT menu, set AT=no

2,In the middle of the autotuning, it is ON/OFF control, according to the different systems, temperature may be have a big variance and the autotuning time is of a long short.

3,After finishing autotuning, AT light stops flashing, controller will automatically save P、I、d、rE、rSt parameters,then automatic return to the normal control state, controller will continue to run with new P、I、d、rE、rSt parameters value.

8. INPUT RANGE TABLE

Input type		Code	
K	0 to 400 ℃	K	A4
	0 to 600 ℃	K	A6
	0 to 1300 ℃	K	B3
E	0 to 200 ℃	E	A2
	0 to 400 ℃	E	A4
	0 to 600 ℃	E	A6
J	0 to 400 ℃	J	A4
	0 to 600 ℃	J	A6
	0 to 800 ℃	J	A8
T	0 to 200 ℃	T	A2
	0 to 300 ℃	T	A3
	0 to 400 ℃	T	A4
S	0 to 1600℃	S	B6
R	0 to 1700℃	R	B7
B	200 to 1800℃	B	B8
N	0 to 1300℃	N	B3
Wu3_Re25	600 to 2000℃	W	B0

Input type		Code	
Pt100	0 to 400 ℃	D	A4
	0 to 600 ℃	D	A6
	0 to 800 ℃	D	A8
	-100 to +200 ℃	D	C2
	-200 to +800 ℃	D	C8
	-100.0 to +200.0℃	D	F2
	-50.0 to +200.0℃	D	G2

Input type		Code	
0 to 20mV		V	01
0 to 50mV	-1999 to 9999	V	02
0 to 5VDC	-199.9 to 999.9	V	03
0 to 10VDC		V	04
1 to 5VDC	-19.99 to 99.99	V	08
2 to 10VDC		V	09
4 to 20mA	-1.999 to 9.999	A	03
0 to 20mA		A	02

Note: Clients can set TC, RTD by keyboard ,please set the input type coincid with the sensor. Check details of the manual"6.3"parameter INP1,If need analog signal inputs, please specified when order. (Except 0-20mV or 0-50mV input)