PID Temperature Controller

PID500 / 110 / 330

OPERATING INSTRUCTIONS

Document name: Operating / 0608 / PID500/110/330 / Ver1, OP159-V01. SN: 7183.

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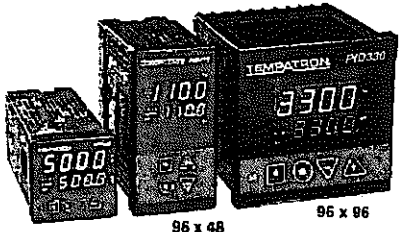


CE

SALIENT FEATURES

- **Universal Input**
  17 user selectable types including signal inputs.
- **Selectable lower display**
  User selectable lower display options enable quick setting of different parameters such as Set points, Alarms, PID values, Tuning etc.
- **Zone PID**
  4 programmable control zones.
- **Outputs**
  In signal output models output is selectable as control output or retransmission output.
- **Special Modes**
  User selectable special modes
  - Heat-Cool PID
  - Auto/Manual
  - Single point ramp/soak.
  - Soft start.

Others

- Dual 4 digit display
- Digital filtering
- Sensor break indication
- Sensor error compensation
- Programmable parameter lockouts
- 85 to 270 VAC / DC supply
- Compliance-CE
- IP66 front panel protection

Optional Features

- Extra Alarm output
- Heater current monitoring
- Linear DC outputs (0 to 10V, 0 to 5V, 0/4 to 20mA)
- Remote set-point input
- Motorised input
- RS-485 MODBUS communication
- 12VDC output to drive SSR.
- 24 VAC/DC supply voltage models

2. ORDERING CODE -

PID 500 / PID 110 / PID 330 – A – B – XX

A : Output 1	
0	Relay
1	18VDC SSR drive
2	4 - 20mA (Current)
3	0 - 10V (Voltage)
4	0 - 5V (Voltage)
5	0 - 20mA (Current)

B : Output 2	
0	Relay
1	12VDC SSR drive

00	Only Output 1 & Output 2
01	Output 3 (Relay)
02	Output 3 (12VDC SSR drive)
03	Communication RS485
04	Output 3 (Relay) + Communication RS485
05	Output 3 (12VDC SSR drive) + Communication RS485
06	CT Input
07	Output 3 (Relay) + CT Input
08	Output 3 (12VDC SSR drive) + CT Input
09	CT Input + Communication RS485
10	* Second Analog Input (valve positioner type)
11	* Second Analog Input (valve positioner type) + Communication Rs485
12	* Second Analog Input (Remote set point type)
13	* Second Analog Input (Remote set point type) + Communication RS485

* Second Analog Input			
Valve positioner type		Remote Set point type	
-P	Potentiometric f/b input	-C	4-20mA input
-C	4-20mA f/b input	-V	0-10V input
-V	0-10V f/b input		

ORDERING EXAMPLE

Note: Input is user selectable.
Only Model name & output needs to be specified in the ordering code.

1. PID500 – 3 – 0 – 01
   - 01 → Output 3 (Relay)
   - 0 → Output 2 (Relay)
   - 3 → Output 1 (Voltage)

1. TECHNICAL SPECIFICATIONS

1. DISPLAY

Display	**PID500 - 48 X 48 -** Dual 4 digit 7- segment LED. Upper display : 10mm high Red (process value). Lower display : 7mm high Green (selectable). **PID110 - 96x48 -** Dual 4 digit 7- segment LED. Upper display : 10mm high Red (process value). Lower display : 7mm high Green (selectable). **PID330 - 96x96 -** Dual 4 digit 7- segment LED. Upper display : 14mm high Red (process value). Lower display : 10mm high Green (selectable).
Led Status Annunciators	Main output (1). Alarm output (2, 3). Manual output (M). Tune (T).

2. INPUT

Input	**Thermocouple:** J,K,T,R,S,C,E,B,N,L,U,W,Platinel II. **RTD:** PT100. **Signal Inputs:** -5.00 to 56mV, 0...10VDC, 0...20mADC (Programmable scale type)
Sampling time	200ms.
Resolution	1/0.1°C for TC/RTD. 1/0.1/0.01/0.001 for Analog input. (Decimal point position)
Indication accuracy	±0.25% of span or 1°C whichever is greater. (20min of warmup time). Cold junction calibration accuracy in TC mode ± 5°C.
Digital filtering	OFF, 1 to 99 sec.

3. OUTPUT

3.1. Control Output

Relay contact output	Rating: 5A @250VAC or 30VDC. Life expectancy: 100000 cycles at maximum load rating.
SSR drive voltage output (optional)	18 VDC.
Current output (Optional)	Range: 0 / 4-20mADC. Action: Control. Update rate: PID Update - Every Cycle time. Analog Output - 100 msec. Maximum output load resistance: 500E.
Voltage output (Optional)	Range: 0-5 / 10VDC. Action: Control. Update rate: PID Update - Every Cycle time. Analog Output - 100 msec. Minimum output load resistance: 10K.

3.2. Alarm Output

Relay contact output (Relay 2, Relay 3 (optional)	Rating: 5A @250VAC or 30VDC. Life expectancy: 100000 cycles at maximum load rating.

3.3. Retransmission output (optional)

Current output	Range: 0 / 4-20mA. Action: Retransmission. Update rate: 100msec Maximum output load resistance: 500E.
Voltage output	Range: 0-5 / 10V. Action: Retransmission. Update rate: 100msec. Minimum output load resistance: 10K.

3. FUNCTION

Main control	Control: PID or ON/OFF. Output: Time proportioning or Linear DC. Cycle time: 0.1 to 100.0sec. Auto tune. Programmable % output.
Zone PID	4 programmable control zones.
Heat-cool PID mode	Control: PID or ON/OFF Output: Time proportioning. Cycle time: 0.1 to 100.0sec. Auto tune Heat/Cool dead band overlap: Programmable Programmable % output.
Alarms	Modes: Deviation high, Deviation low, Band, Full scale high, Full scale low, Sensor break. Operation: Absolute or Deviation mode. Hysteresis: Programmable. Hold/Standby mode: Programmable. Annunciator: Programmable. Reset action: Programmable - Automatic or latched. Probe break action: Upscale.

4. OPTIONAL

4.1. Remote set point input

Input type	0...20mA / 0...10V.
Input Resistance	100 ohms.
Over range	-5% ... 105%.
Scale range	-1999...9999 with fixed 1°C for TC/RTD and as per resolution selected for Analog input.

4.2. Heater current monitor input

Type	Single phase, full wave monitoring of load currents controlled by main output.
Input	100mA AC output from current transformer.
Display scale range	0....999.9A.
Input resistance	47 ohms.
Accuracy	±0.5% of full scale ± 1 digit.
Frequency	50...400Hz.
Alarm mode	LA / HA / BAND.
Over range	105% Capacity.
Over load	150mA (continuous).

4.3. Serial communication

Interface standard	RS 485.
Communication address	1 .... 99, maximum of 32 units per line.
Transmission mode	Half duplex.
Transmission protocol	MODBUS RTU.
Transmission distance	500 m maximum.
Transmission speed	9600, 4800, 2400, 1200, 600, 300 bits/sec.
Parity	None, Odd, Even, Mark, Space.
Stop bits	1 or 2.
Response time	100ms (max and independent of baud rate).

5. ENVIRONMENTAL CONDITIONS

Operating range	0 .... 50°C.
Storage range	-20 .... 75°C.
Storage humidity	85% max. RH (non condensing) from 0 to 50°C.

6. POWER SUPPLY

Power supply	85 .... 270VAC/DC. (Optional 24VAC/DC)
Frequency	50/60Hz.
Power consumption	5 VA max.

7. ISOLATION BREAKDOWN RATINGS.

AC line w.r.t. all inputs and outputs	2000 volts.
All other inputs and outputs w.r.t. Relay contacts	2000 VAC.

8. SAFETY AND EMC STANDARDS.

Compliance	CE.
LVD	As per BS EN 61010.
EMC	As per BS EN 61326.
Panel sealing	IP66.

9. WEIGHT : PID500 : 195 gms ; PID110 : 250 gms ; PID330 : 295 gms

10. HOUSING : Flame retardant engineering plastic.

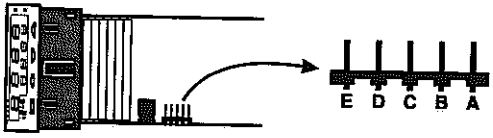
11. INPUT SENSOR RANGES (for 1°C resolution):

Sensor type	Range	Sensor type	Range
J	- 200 to 750°C	E	- 200 to 750°C
K	- 200 to 1350°C	B	+149 to 1820°C
T	- 200 to 400°C	N	- 200 to 1300°C
R	0 to 1750°C	L	- 200 to 900°C
S	0 to 1750°C	U	- 200 to 400°C
C	0 to 2300°C	W	0 to 2300°C
Platinel II	0 to 1390°C	PT100	- 100 to 850°C

Signal Inputs:

Input type	Range
Linear mV	-5 to 56mV
Voltage	0 to 10VDC
Current	0 to 20mA

12. INPUT SELECTION JUMPER ASSIGNMENTS: (Valid only for PID500)



Short respective pins of the jumper as per the table given below for hardware selection of input sensor types:

Input type	Short terminals
TC / RTD / LIN (mV)	 (ED)
0 - 10V	 (DC)
4 - 20 mA	 (BA)

NOTE : Sensor selection to be done in Level 0 of programming also.

1. SAFETY INFORMATION

SAFETY SUMMARY

This manual is meant for the personnel involved in wiring, installation, operation, and routine maintenance of the equipment. All safety related codifications; symbols and instructions that appear in this operating manual or on the equipment must be strictly followed to ensure the safety of the operating personnel as well as the instrument.

If the equipment is not handled in a manner specified by the manufacturer it might impair the protection provided by the equipment.

⚠ **CAUTION:** Read complete instructions prior to installation and operation of the unit.

⚠ **CAUTION:** Risk of electric shock.

INSTALLATION INSTRUCTIONS

⚠**CAUTION:**

1. This equipment, being built-in-type, normally becomes a part of the main control panel and in such case the terminals do not remain accessible to the end user after installation and internal wiring.
2. Conductors must not come in contact with the internal circuitry of the equipment or else it may lead to a safety hazard that may in turn endanger life or cause electrical shock to the operator.
3. Circuit breaker or mains switch must be installed between power source and supply terminals to facilitate power 'ON' or 'OFF' function. However this switch or breaker must be installed in a convenient position normally accessible to an operator.

⚠**CAUTION:**

1. The equipment shall not be installed in environmental conditions other than those specified in this manual.
2. Fuse Protection - The equipment does not contain built-in fuse. Installation of external fuse for electrical circuitry is highly recommended. Recommended rating of such fuse shall be 275VAC/1Amp.
3. Since this is a built-in type equipment (finds place in main control panel), its output terminals get connected to host equipment. Such equipment shall also comply with basic EMI/EMC and safety requirements like BS EN 61326-1 and BS EN 61010 respectively.
4. Thermal dissipation of equipment is met through ventilation holes provided on chassis of equipment. Such ventilation holes shall not be obstructed else it can lead to a safety hazard.
5. The output terminals shall be strictly loaded to the manufacturer specified values/range.

MAINTENANCE

1. The equipment should be cleaned regularly to avoid blockage of ventilating parts.
2. Use soft cloth soaked in water for cleaning. Do not use any other cleaning agent.
3. Care must be taken to prevent the water from entering into the electronic circuitry through the ventilating holes.

WIRING INSTRUCTIONS

⚠CAUTION:

1. To prevent the risk of electric shock power supply to the equipment must be kept OFF while doing the wiring arrangement.
2. Terminals and electrically charged parts must not be touched when the power is ON.
3. Wiring shall be done strictly according to the terminal layout with shortest connections. Confirm that all connections are correct.
4. Use lugged terminals to meet M3.5 screws.
5. To eliminate electromagnetic interference use of short wire with adequate ratings and twists of the same in equal size shall be made.
6. Cable used for connection to power source, must have a cross section of 1 or greater. These wires shall have insulation capacity made of at least 1.5KV.

ELECTRICAL PRECAUTIONS DURING USE

Electrical noise generated by switching of inductive loads can create momentary disruption, erratic display, latch up, data loss or permanent damage to the instrument. To reduce noise:

A) Use of MOV across supply of temperature controller & snubber circuits across loads are recommended. Part numbers are as follows:

1. MOV: AP-MOV-03 2. Snubber: APRC-01.

B) Use separate shielded wires for inputs.

INSTALLATION GUIDELINES

Mechanical Installation:

For installing the controller

1. Prepare the panel cutout with proper dimensions as shown.

OVERALL DIMENSIONS (All dimensions in mm)

MODELS \ DIM	A	B	C	D	E	F	G
PID500	48	48	100	45	7	45	45
PID110	96	48	74.5	90	10	92	45
PID330	96	96	74.5	90	10	92	92

2. Remove the clamp from the controller.
3. Push the controller into the panel cutout. Secure the controller in its place by pushing the clamp from the rear side.

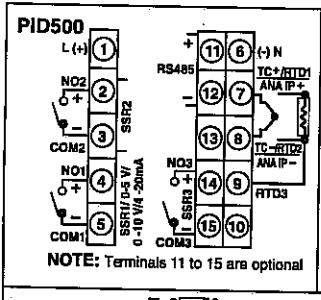
⚠CAUTION:

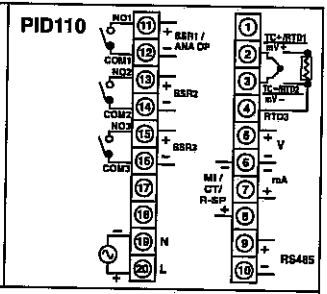
The equipment in its installed state must not come in close proximity to any heating sources, caustic vapors, oils, steam, or other unwanted process by-products.

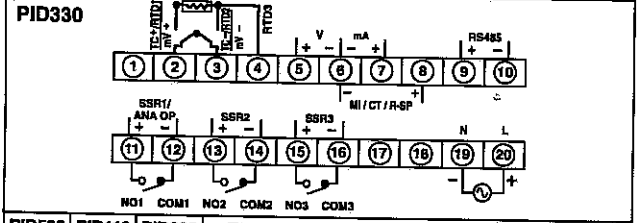
EMC Guidelines:

1. Use proper input power cables with shortest connections and twisted type.
2. Layout of connecting cables shall be away from any internal EMI source.

2. TERMINAL CONNECTIONS



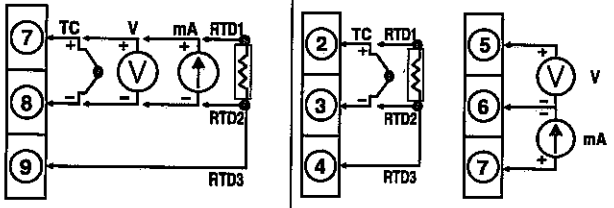




PID500	PID110	PID330	TERMINAL DESCRIPTIONS
1	20	20	LIVE (SUPPLY)
2	13	13	NO of relay 2
3	14	14	COM of relay 2
4	11	11	NO of relay 1
5	12	12	COM of relay 1
6	19	19	NEUTRAL (SUPPLY)
7	2	2	TC+ / RTD1 / **Analog Input +ve (for PID500 only)**
8	3	3	TC- / RTD2 / **Analog Input -ve (for PID500 only)**
9	4	4	3rd wire of RTD
-	5	5	Voltage input +ve
-	6	6	Voltage / Current input -ve
-	7	7	Current input +ve
11	9	9	Positive of RS485 — Optional
12	10	10	Negative of RS485 — Optional
14	15	15	NO of relay 3 — Optional
15	16	16	COM of relay 3 — Optional

3. SENSOR INPUT WIRING

PID500	PID110 & 330



TC - Thermocouple (J, K, T, R, S, C, E, B, N, L, U, W, Platinel II).
V - Voltage Input (0 to 10 V DC).
mA - Current Input (0 to 20mA DC)
RTD - PT100.

NOTE: **1) Refer Input type selection in level 0 of programming menu.**
2) For PID500 refer Input jumper selection as in point no. 12 on page 6.
3) For 2 wire RTD short terminals 8 & 9 (for PID500) and terminals 3 & 4 (for PID110 & PID330).

4. CONTROL OUTPUT WIRING

Fig1. Output 1 - Relay to drive load (resistive load less than 1A).

PID500	PID110 & 330

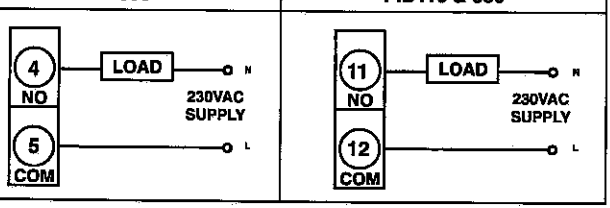
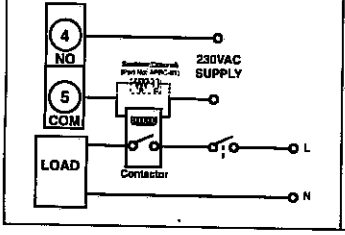
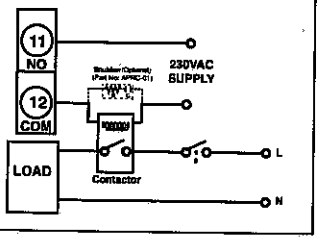


Fig2. Output 1 - Relay / SSR to drive contactor(For single phase).

PID500	PID110 & 330
	

NOTE: Use snubber as shown above to increase life of internal relay of temperature controller.

Fig3. Output 1 - Pulsed voltage to drive SSR.

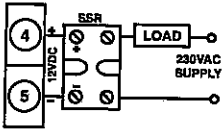
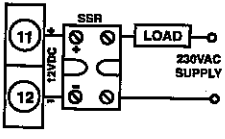
PID500	PID110 & 330
	

Fig4. Output 1 - Linear current.

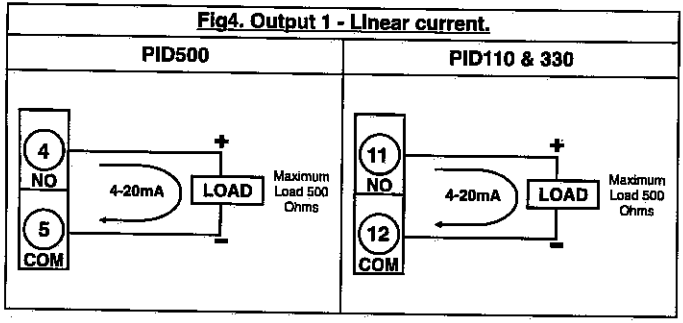
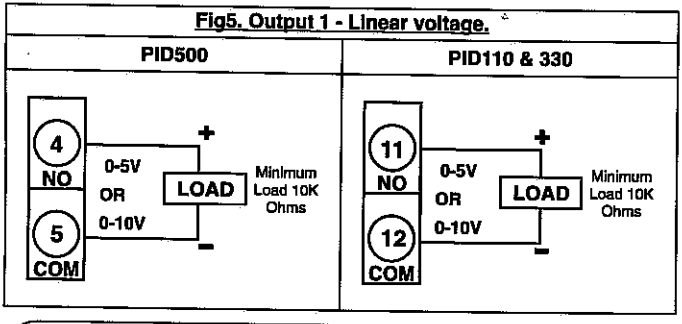


Fig5. Output 1 - Linear voltage.



NOTE:

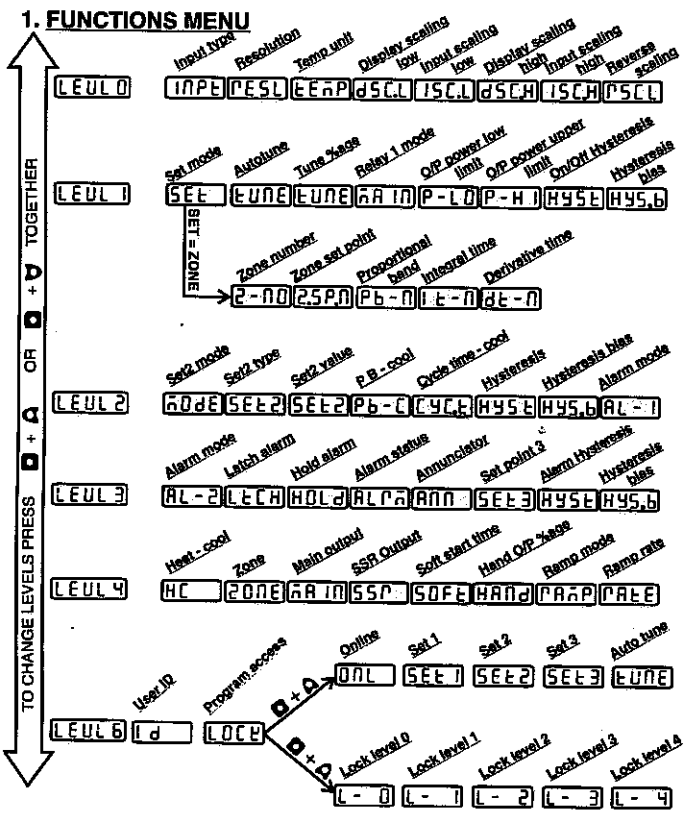
For output 2 and output 3:

1) Configuration is same.
2) Terminal nos -

Output 2 : **PID500** - 2 - 3. ; **PID110 & 330** - 13 - 14

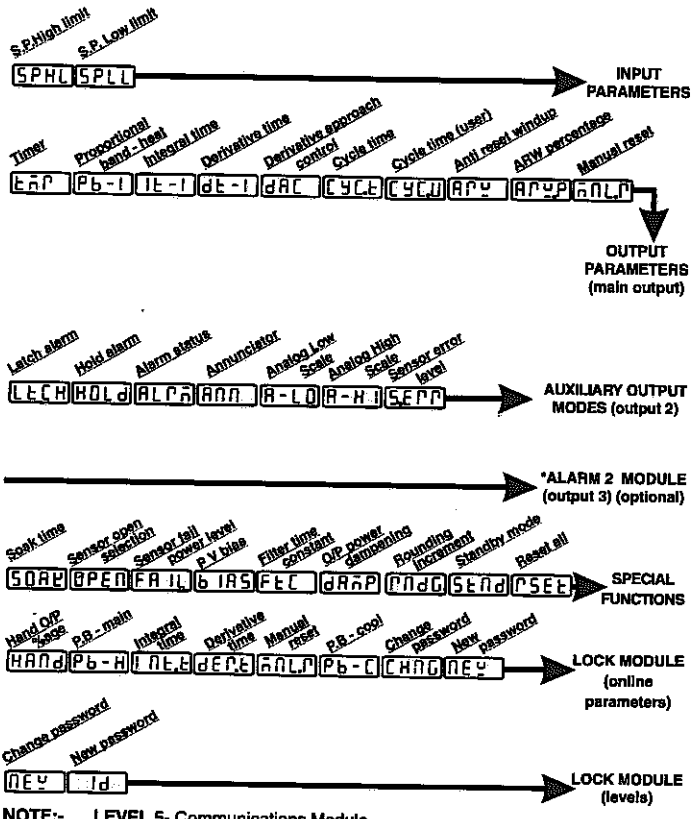
Output 3 : **PID500** - 14 - 15. ; **PID110 & 330** - 15 - 16

1. FUNCTIONS MENU

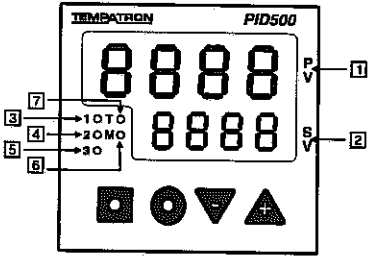


☞ Appearance of all shaded menus dependent on selection of other parameters. Refer programming for futher details

* - Applicable only if Alarm2 is available.



NOTE:- **LEVEL 5**- Communications Module.
LEVEL 9 - Heater current monitor input.
LEVEL 10 - Motorised input / Remote set point input.
Detailed description of the above levels will be provided as an addendum with the respective models.



2. KEYS DESCRIPTION

Functions	Key press
To enter or exit program mode	▲ + ▼ together for 3 seconds
To change levels	▲ or ▼ till Level is displayed. ■ + ▲ / ▼ to increase or decrease the level number.
To view function on the same level and to display the current option.	▲ or ▼ key once to view the next/previous function.
To increase or decrease the value of a particular function.	■ + ▲ to increase and ■ + ▼ to decrease the function value.
To view and change parameters online	● key to view the parameter and ● + ▲ / ▼ to scroll through the parameters. Press ■ + ▲ / ▼ to change parameter value.

NOTE: The unit will autoexit program mode after 60 seconds of inactivity.

INDICATIONS AND DISPLAY

1 Process-value (PV)	Display the process temperature value.
2 Set-value (SV)	Displays the value of the lower display option selected. By default display is set1 value.
3 Relay 1 (1)	Indicates the status of Main output (relay 1).
4 Relay 2 (2)	Indicates the status of Alarm output (relay 2).
5 Relay 3 (3)	Indicates the status of Alarm output (relay 3).
6 M	Indication for Fixed Manual output.
7 T	Indication for Tuning in progress.

PROGRAMMING OF LEVELS

3. LEVEL 0 - INPUT PARAMETERS

Display	Name & Description	Range	Display condition	Default value
INPt	Input type Select input type as Thermocouples: J,K,T,R,S,C,E, B,N,L,U,W. Platinel II. RTD: PT100 Signal Inputs: Linear mV (-5 to 56mV), Voltage (0 to 10V), Current (4 to 20mA). Refer table on page 6 for input ranges.	J / b / t / r/S / C / E / b / n / L / U / y / PtnL / P100 / 0U/ 10U / 20nA	—	J
rESL	Resolution	TC * / RTD: 1 / 0.1 Analog input: 1 / 0.1 / 0.01 / 0.001	Not prompted for R, S, and B type thermocouple.	1
tEnP	Temperature unit	°C / °F	TC/RTD inputs.	°C
dSCL	Display value scaling point1 *1 Feed the value of the display required at the lower value of analog input	-1999 to Display value scaling point2	Analog input.	0
ISCL	Input value scaling point1 Feed the lower value of the analog input signal.	0.0 mA / - 5.0 mV / 0.0 Vto Input value scaling point2	Analog input.	As per input type selected.
dSCH	Display value scaling point2 *1 Feed the value of display required at the higher value of analog input	Display value scaling point1 to 9999	Analog input.	9999

* - Fixed 1°C resolution for R, S, B type thermocouple.

Display	Name & Description	Range	Display condition	Default value
ISC.H	Input value scaling point2 Feed the higher value of the analog input signal.	Input value scaling point1 to 20.00 mA /56 mV /10.00 V	Analog input.	As per input type selected.
RSCL	Reverse scaling Display scaling points can be reversed.	NO/YES	Analog input.	NO
SPHL	Set point high limit #1	Set point low limit to max. sensor range value. Set point low limit to 9999 for analog input.	—	750
SPLL	Set point low limit #1	Min. range of sensor to Set point high limit. -1999 to Set point high limit for analog input.	—	-200

Note: 1. Whenever resolution is changed from 1 to 0.1 SPLL and SPHL is limited to -199 and 999 respectively.
2. #1- Display is with fixed 1°C resolution for TC/RTD and as per decimal point selected for analog input.

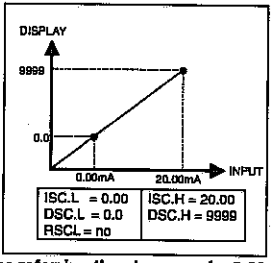
PARAMETER EXPLANATIONS :

TEMPERATURE UNIT:
The temperature unit is selectable between °C and °F. When temperature unit is changed, the temperature ranges will also be changed according to the present selection of unit. If changed, be sure to check all parameters.

RESOLUTION:
The resolution is selectable between 1 and 0.1 for TC and RTD inputs whereas it is selectable between 1, 0.1, 0.01,0.001 for analog inputs. If changed, be sure to check all parameters.

PARAMETER EXPLANATIONS : (contd...)

• **SCALING FOR ANALOG INPUT:**
To scale the controller, two scaling points are necessary. Each scaling point has a coordinate pair of Display Values and Input Values. It is recommended that the two scaling points be at the low and high ends of the input signal being measured. Process value scaling will be linear between and continue past the entered points to the limits of the input range. (Factory settings example will display 0.0 at 0 mA input and display 9999 at 20.00 mA input.)



Reverse acting indication can be accomplished by setting **reverse scaling** parameter as YES. In this case **referring the above eg.** for 0.00 mA input the display will show 9999 and 20.00 mA input the display will show 0.0
NOTE : This change will not be visible in the programming menu.

• **SET POINT LIMIT VALUES:**
The controller has programmable high and low set point limit values to restrict the setting range of the set point. Set the limit values so that the temperature set point value cannot be set outside the safe operating area of the process.

4. LEVEL 1 - OUTPUT PARAMETERS

Display	Name & Description	Range	Display condition	Default value
SEt	Set Mode	ALL/ZONE	Zone PID = YES in level 4.	ALL

Display	Name & Description	Range	Display condition	Default value
tUNE	Auto tune	OFF/ON	PID control	OFF
tUNE	Tune percentage	P.AU , 75 to 100	Tune = ON	P.AU
mA in	Main Output Mode	rE/Fd	Heat-cool = NO.	rE

Display	Name & Description	Range	Display condition	Default value
P-LO	Output power lower limit	0 % to o/p power high limit; -100 % to o/p power upper limit (in heatcool mode)	PID control	0 (-100 for heat - cool mode)
P-HI	Output power upper limit	O/p power low limit to 100 %	PID control	100
HYSt	ON-OFF control hysteresis	0.1 to 99.9	ON-OFF control*	1
HYS.b	Hysteresis bias	TC/RTD: -9.9 to 9.9 °C Analog input: -99 to 99 as per decimal point selected.	ON-OFF control*	0
tmr	Timer	0.0 to 99.9 minutes	Main= Fd and control is ON-OFF.*	0
Pb-1	Proportional band- heat	0 to 4000 °C	—	10
It-1	Integral time	0 to 3600 sec.	—	120
dt-1	Derivative time	0 to 200 seconds.	—	30
dAC	Derivative approach control	0.5 to 5.0 (x band)	—	1.0

*NOTE : For operating in ON-OFF mode make Proportional band = 0

- **ALARM MODES:**

1. Absolute alarms (Independent Alarm):
Absolute alarm is a self-existent alarm independent of the main set point.For eg. If the main set point is 100°C and absolute alarm is set as 110°C, the alarm will be activated at 110°C.
There are two absolute alarms in PID500 -
Full scale High Alarm: sets off alarm signal when temperature rises above set point to a pre-set temperature above scale minimum. **Refer Fig: d.**
Full scale Low Alarm: sets off alarm signal when temperature falls below setpoint to a pre-set temperature above scale minimum. **Refer Fig: e.**

2. Deviation alarms (Error alarm):
This alarm is activated at an error on the main set point. For eg. If the main set point is 100°C and deviation alarm is set to +5 °C then the alarm will be activated at 100+5=105 °C. Incase of deviation band alarm the alarm will be activated on both sides of set point i.e. At 95 and 105.
There are three deviation alarms in PID500 -
Deviation High Alarm: sets off alarm signal when temperature rises above a pre-set temperature above the set point. **Refer Fig: a.**
Deviation Low Alarm: sets off alarm signal when temperature falls below a pre-set temperature below the set point. **Refer Fig: b.**
Deviation Band Alarm: sets off alarm signal when temperature rises above or falls below a pre-set temperature above or below the set point. **Refer Fig: c.**

3. BREAK ALARM:
Break Alarm: sets off alarm signal when sensor break / under range occurs.

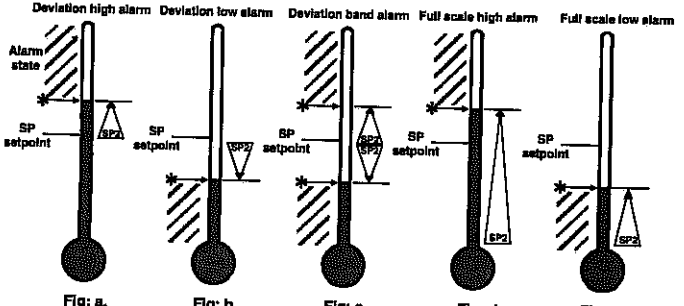


Fig: a. Fig: b. Fig: c. Fig: d. Fig: e.

• **Zone PID:**

There are 4 control Zones each having a set point and associated P, I and D values which can be programmed as per the process requirements. A control Zone is selected automatically and implemented as per the set value programmed, to accommodate changing process requirements. The corresponding P, I,D values will be used to control the process. The main advantage of Zone PID is in processes where there is a requirement of frequent tuning, due to change in setpoint. Consider a case where the process needs to be controlled at two different set points: 100°C and 400°C.
The Zone set points may be programmed as:
1. Zone setpoint 1 (Level1) : 150°C (This implies that for 0 < set1 < 150, Zone1 PID values will be considered.)
2. Zone setpoint 2 (Level1) : 450°C (This implies that for 150 < set1 < 450, Zone2 PID values will be considered.)

The P, I, D values for the respective Zones can be manually fed or can be tuned automatically.

How to tune the Zones

NOTE: Zone setpoint is not the tuning setpoint.

To tune, say, Zone 1 program the following:

1. Set1 (Online) = 100°C (for eg.) (Zone 1 : 0 - 150°C)
   Note: • Set1 < Zone setpoint 1.
   • The PID settings derived after tuning are stored in Zone 1.
   • After tuning, for 0 < Set1 < 150°C, PID settings of Zone 1 are applicable.

2. Program Tune = ON (in Level 1 or Online)

3. After tuning the controller is automatically loaded with the new PID values.

Now to tune the next Zone, Zone 2, program the following:

1. Set 1 (Online) = 400°C (Zone 2 : 150 - 450°C)
   Note: • Zone Setpoint 1 < Set 1 < Zone setpoint 2.
   • The PID settings derived after tuning are stored in Zone 2.
   • After tuning, for 150 < Set1 < 450°C, PID settings of Zone 2 are applicable.

Similarly, the four different Zones can be programmed.