PID Temperature Controller

PID500 / 110 / 330

OPERATING INSTRUCTIONS

Doc. name: OP INST PID500-110-330 OP159-V05/d.

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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
- 90 to 270 VAC/DC supply
- Compliance-
- IP66 front panel protection

Optional Features

- Extra Alarm output
- Heater current monitoring
- Linear DC outputs (Factory set) (0 to 10V, 0 to 5V, 0/4 to 20mA)
- Remote set-point input
- Motorised input
- RS-485 MODBUS communication
- 12 VDC 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	12VDC 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

** For PID110/PID330
18V DC SSR drive

XX	
00	Only Output 1 & Output 2
01	Output 3 (Relay)
02	Output 3 (12 VDC SSR drive)
03	Communication RS485
04	Output 3 (Relay) + Communication RS485
05	Output 3 (12 VDC SSR drive) + Communication RS485
06	CT Input
07	Output 3 (Relay) + CT Input
08	Output 3 (12 VDC 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 - 48x96 -** 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 to 56 mV, 0 to 10 VDC, 0 to 20 mA DC (Programmable scale type)
Sampling time	200 ms.
Resolution	1/0.1° for TC/RTD. 1/0.1/0.01/0.001 for Analog input. (Decimal point position)
Indication accuracy	$\pm$0.25% of span or 1° whichever is greater. (20min of warmup time). Cold junction calibration accuracy in TC mode $\pm$ 5°C.
Digital filtering	OFF, 1 to 99 sec.

3. OUTPUT

3.1. Control Output

Relay contact output	Rating: 5A @250 VAC or 30 VDC. Life expectancy: 100000 cycles at maximum load rating.
SSR drive voltage output (optional)	12 VDC.
Current output (Optional)	Range: 0 -20 mA DC, 4-20 mA DC (Factory set) Action: Control. Update rate: PID Update - Every Cycle time. Analog Output - 100 msec. Maximum output load resistance: 500E.
Voltage output (Optional)	Range: 0-5 VDC, 0-10 VDC.(Factory set) Action: Control. Update rate: PID Update - Every Cycle time. Analog Output - 100 ms. Minimum output load resistance: 10K.

3.2. Alarm Output

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

3.3. Retransmission output (optional)

Current output	Range: 0 / 4-20mA. Action: Retransmission Update rate: 100 ms 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. Proportional band: 0 to 400° Integral time: 0 to 3600 sec Derivative time: 0 to 200 sec 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. Proportional gain: 0 to 400 Cycle time: 0.1 to 100.0sec. Heat/Cool dead band overlap: Programmable
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	90 .... 270 VAC/DC. (Optional 24 VAC/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 600°C
S	0 to 1750°C	U	- 200 to 900°C
C	0 to 2300°C	W	0 to 2300°C
Platinel II	0 to 1390°C	PT100	- 100 to 850°C

Signal inputs:

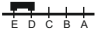
Input type	Range
Linear mV	-5 to 56mV
Voltage	0 to 10 VDC
Current	0 to 20mA

12. INPUT SELECTION JUMPER ASSIGNMENTS :

NOTE : The following parameters have been modified.

Short respective pins of JP1 as per the table given below for hardware selection of input sensor types :



Input type	JP1
TC / RTD / LIN (mV)	 (ED)
0 - 10V	 (CB)
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 for cleaning. Do not use isopropyl alcohol or any other organic cleaning agent.

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. Snubber: APRC-01.

B) Use separate shielded wires for inputs.

C) The unit should preferably be shielded from the contactor.

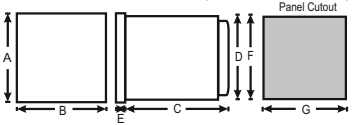
INSTALLATION GUIDELINES

Mechanical Installation:

For installing the controller

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

OVERALL DIMENSIONS (All dimensions in mm)



DIM / MODELS	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:

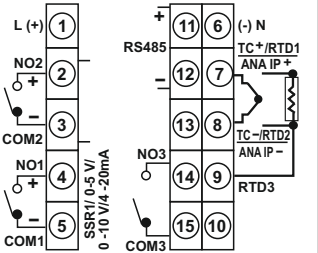
The equipment in its installed state must not come in close proximity to any heating sources, caustic vapors, oils, steam, or other unwanted process by-products.

EMC Guidelines:

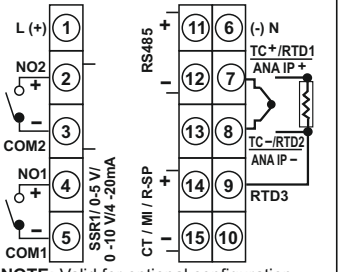
1. Use proper input power cables with shortest connections and twisted type.
2. Layout of connecting cables shall be away from any internal EMI source.

2. TERMINAL CONNECTIONS

PID500

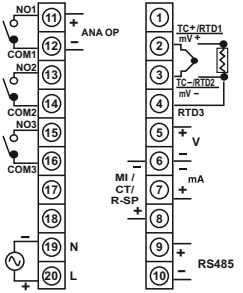


NOTE: Terminals 11 to 15 are optional

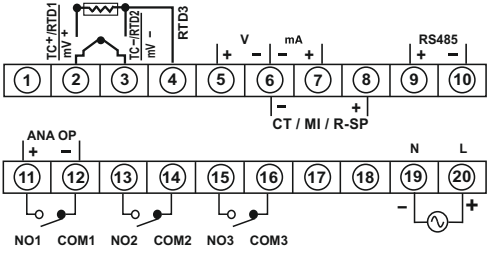


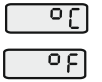
NOTE: Valid for optional configuration.

PID110



PID330

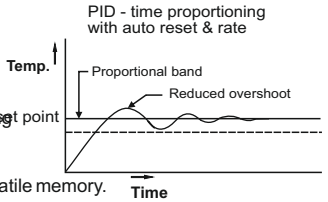


DISPLAY	DESCRIPTION	DISPLAY CONDITION
	**Output percentage**	This parameter is read only and cannot be altered.
	Elapsed soak time	Note: This parameter is prompted only if Ramp is ON / Hold. This parameter is read only and cannot be altered.
	**Temperature unit**	Note: This parameter is not prompted for 0-10 V / 4-20mA. This parameter is read only and cannot be altered.
	**Alarm acknowledge 1**	Note: This parameter is prompted only if Alarm1 is ON and Latch is ON.
	**Alarm acknowledge 2**	Note: This parameter is prompted only if Alarm2 is ON and Latch is ON.
	**Blank**	——

USER GUIDE

- **AUTO TUNING:**

Auto tuning is a function whereby the controller learns the process characteristics by itself and automatically sets the required P,I and D values. The auto-tuning function can be activated at any time during the process after power ON , while temperature is rising or when control has stabilized. Autotune is indicated by T LED blinking. After the auto tuning procedures are completed, the T LED will stop flashing and the unit will revert to PID control by using its new PID values. The PID values obtained are stored in the nonvolatile memory.



The auto-tuning is applied in cases of:

- Initial setup for a new process
- The set point is changed substanitally from the previous auto-tuning value.
- The control result in unsatisfactory.

The following controller parameters are automatically adjusted by Auto- tune according to the characteristics of the process:

Proportional Band (Pb-1)
Integral Time (It-1)
Derivative Time (dt-1)
Input Filter (FtC)

If the control performance by using auto-tuning is still unsatisfactory, the following rules can be applied for further adjustment of PID values:

ADJUST MENT SEQUENCE	SYMPTOM	SOLUTION
(1) Proportional Band (PB)	Slow Response	Decrease PB
	High overshoot or Oscillations	Increase PB
(2) Integral Time (IT)	Slow Response	Decrease IT
	Instability or Oscillations	Increase IT
(3) Derivative Time (TD)	Slow Response or Oscillations	Decrease TD
	High Overshoot	Increase TD

- **PROPORTIONAL BAND:**

Proportional band is the area around the set point where the controller is actually controlling the process; the output is at some level other than 100% or 0%.

Proportional band is expressed in terms of degree centigrade.

If the proportional band is too narrow an oscillation around the setpoint will result. If the proportional band is too wide the control will respond in a sluggish manner, could take a long time to settle at set point and may not respond adequately to upsets.

- **MANUAL RESET:**

Virtually no process requires precisely 50% output on single output controls or 0% output on two output controls. The adjustment called manual reset allows the user to redefine the output requirement at the setpoint. A proportioning control without manual or automatic reset will settle out somewhere within the proportioning band but likely not on the setpoint.

- **INTEGRAL TIME:**

Integral time is defined as the time, in seconds, which corrects for any offset (between setpoint and process variable) automatically over time by shifting the proportioning band. Integral action (also known as “automatic reset”) changes the output power to bring the process to setpoint. Integral times that are too fast (small times) do not allow the process to respond to the new output value. This causes over-compensation and leads to an unstable process with excessive overshoot. Integral times that are too slow (large times) cause a slow response to steady state errors. Integral action may be disabled by setting the time to zero. If time is set to zero, the previous integral output power value is maintained. If integral action is disabled, manual reset is available by modifying the output power offset (“MNL.r” initially set to zero) to eliminate steady state errors. The controller has the feature to prevent integral action when operating outside the proportional band. This feature is called **“antireset wind-up”**.

- **DERIVATIVE TIME**

Derivative action is used to shorten the process response time and helps to stabilize the process by providing an output based on the rate of change of the process. In effect, derivative action anticipates where the process is headed and changes the output before it actually “arrives”. The derivative time is calculated in seconds. Increasing the derivative time helps to stabilize the response, but too much derivative time coupled with noisy signal processes, may cause the output to fluctuate too greatly, yielding poor control. None or too little derivative action usually results in decreased stability with higher overshoots. No derivative action usually requires a wider proportional and slower integral times to maintain the same degree of stability as with derivative action. Derivative action is disabled by setting the time to zero.

- **DERIVATIVE APPROACH CONTROL:**

Derivative approach control (DAC) helps in reducing overshoot at startup. The control output cutoff point is derived as DAC x Proportional band. Note that the DAC value is automatically calculated and fed after autotuning (if tuning is initiated at startup).

- **AUTO-TUNE OF HEAT/COOL SYSTEMS:**

During Autotune of heat/cool systems, the controller switches the cooling output (O2) ON and OFF in addition to the heat output (O1). The heat/cool overlap deadband parameter (db in Level 2) determines the amount of overlap or deadband between the two outputs during Autotune.
For most applications, set this parameter to 0.0 prior to starting Autotune. After the completion of Autotune, this parameter may need to be reset. It is important that external load disturbances be minimized, and if present, other zone controllers idled as these may have an effect on the PID constant determination.
Some water cooled processes exhibit an extreme non-linear gain characteristic. That is, the process cooling gain starts very high and flattens out deeper into the cooling region. This effect may result in regular oscillations at setpoint as the controller applies heat to counteract the effect. These processes may benefit from a lower cooling fan setting and/or reduced water flow in the jacket or manifold. The process heat and cool gains should be balanced as much as possible, and the controller gains adjusted to the process.

- **ANALOG OUTPUT-RETRANSMISSION:**

1. The analog retransmission output feature allows the retransmission of the control output to an external device.
2. The output is scaled by use of Analog low and high scaling points in level 2 of the programming menu. The analog output will be proportional to PV (derived from Analog Low and High scaling.)
3. A-LO : Displays the value that corresponds to 0V, 0/4mA as selected.
   A-HI : Displays the value that corresponds to 10V or 20mA as selected.
4. Note that the main output selection in level 4 has to be relay 2.

- **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-
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 -
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.

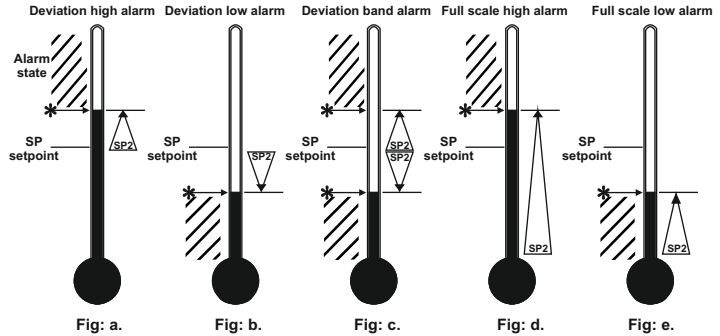


Fig: a. Fig: b. Fig: c. Fig: d. Fig: e.

- **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.

Configuration Record Sheet

SELEC

Enter the value or selection for each prompt on this sheet so you will have a record of how your controller was configured.

Levels	Function Prompt	Value or Selection	Factory Setting
Input Parametrs	INPt	_____	J
	PESL	_____	1
	tEmP	_____	°C
	dSCL	_____	0
	ISCL	_____	As per input type selected.
	dSCH	_____	9999
	ISCH	_____	As per input type selected.
	PSCL	_____	no
	SPHL	_____	750
	SPLL	_____	-200
Output Parametrs	SEt	_____	ALL
	tUNE	_____	OFF
	tUNE	_____	P.AU
	GAIN	_____	PE
	P-LO	_____	0
	P-H1	_____	100
	Pb-1	_____	10
	HYSt	_____	1.0
	HYS.b	_____	0.0
	tmP	_____	0.0
	It-1	_____	120
	dt-1	_____	30

Levels	Function Prompt	Value or Selection	Factory Setting
Output Parametrs	dAC	_____	1.0
	CYC.t	_____	USEr
	CYC.U	_____	15.0
	Any	_____	AUt0
	Any.P	_____	100.0
	AnL.P	_____	0
Zone Settings	2-no	_____	1
	2SP 1	_____	0
	Pb-1	_____	10
	It-1	_____	120
	dt-1	_____	30
	2SP2	_____	0
	Pb-2	_____	10
	It-2	_____	120
	dt-2	_____	30
	2SP3	_____	0
	Pb-3	_____	10
	It-3	_____	120
	dt-3	_____	30
	2SP4	_____	0
	Pb-4	_____	10
	It-4	_____	120
	dt-4	_____	30

Levels	Function Prompt	Value or Selection	Factory Setting
Auxiliary Output Modes	AODE	_____	ALMA
	SET2	_____	dEU
	SET2	_____	0
	Pb-C	_____	0.0
	CYC.t	_____	15.0
	HYSt	_____	1.0
	HYS.b	_____	0.0
	AL-1	_____	dUHI
	LtCH	_____	OFF
	HOLd	_____	OFF
	ALMA	_____	En
	AMM	_____	OFF
	A-LO	_____	0
	A-HI	_____	1000
	S.ERR	_____	HI GH
Alarm 2 Module	AL-2	_____	dUHI
	LtCH	_____	OFF
	HOLd	_____	OFF
	ALMA	_____	En
	AMM	_____	OFF
	SET3	_____	0
	HYSt	_____	1.0
	HYS.b	_____	0.0

Levels	Function Prompt	Value or Selection	Factory Setting
Special Function	HC		NO
	ZONE		NO
	GAIN		PLY1/AOUt
	SSP		OFF
	SOFt		OFF
	HAND		OFF
	MAnP		OFF
	MAtE		100
	SOAK		0
	OPEN		AUtO
	FAIL		0
	bIAS		0.0
	FtC		1
	MAdG		1.0
	StAd		NO
	MSEt		NO
Communication	bAUd		9600
	AddR		1
	PAP I		NONE
	StOP		1

Model No: PID500-110-330

Claimed Accuracy: ± 0.25% of full scale ±1 digit (After 20min warmup time)

Standard used for calibration of the product is traceable to NABL

The calibration of this unit has been verified at the following values:

SENSOR	CALIBRATION TEMP (°C) (0.1 resolution)	DISPLAY VALUE (°C)	SENSOR	CALIBRATION VALUE (0.1 resolution)	DISPLAY VALUE
K	35.0	35.0	Voltage (VDC)	0.0	0.0
	700.0	700.0		10.0	10.0
	1350	1350			
PT100	0.0	0.0	Current (mA)	0.0	0.0
	500.0	500.0		20.0	20.0
	800.0	800.0			

The thermocouple / RTD curves are linearised in this microprocessor based product, and hence the values interpolated between the readings shown above are also equally accurate, at every point in the curve.

Unit is accepted as accuracy is withing the specified limit of claimed accuracy and certificate is valid upto one year from the date of issue.

Disclaimer : "This product is strictly for industrial use and for sale in non European countries only"