

# Advanced Self-tune PID Temperature Controller with Timer



## zenex Pro & zenex Pro 96

Self-tune PID & On-Off Control  
Heat (Reverse) & Cool (Direct) Control Mode  
Auxiliary Control : Blower/Alarm/Compressor with Time Delay

**Process Precision Instruments**  
Vasai Road (E), Dist. Palghar - 401210,  
Maharashtra, India

[www.ppiindia.net](http://www.ppiindia.net)

# User Manual

48 x 48



96 x 96



## CONTENTS

1. FRONT PANEL LAYOUT	1
2. BASIC OPERATION	3
3. SET UP MODE : ACCESS & OPERATION	8
4. PAGE-10 : I / O CONFIGURATION PARAMETERS	10
5. PAGE-12 : OP2 FUNCTION PARAMETERS	12
6. PAGE-13: OP3 FUNCTION PARAMETERS	15
7. PAGE-14 : PID CONTROL PARAMETERS	17
8. PAGE-15 : SOAK TIMER PARAMETERS	19
9. PAGE-11 : SUPERVISORY PARAMETERS	22
10. MECHANICAL INSTALLATION	25
11. ELECTRICAL CONNECTIONS	27

# Advanced Self-tune PID Temperature Controller with Timer

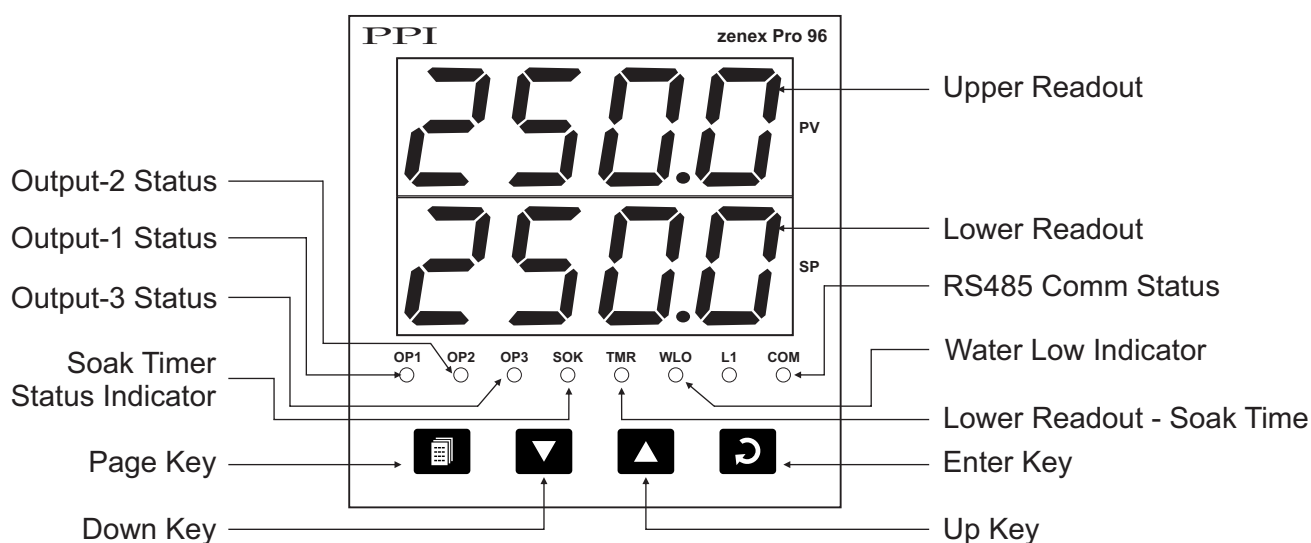
## Section 1 FRONT PANEL LAYOUT

The controller front panel comprises of digital readouts, LED indicators and tactile keys as shown in Figure 1.1(a) : 48 x 48 & Figure 1.1(b) : 96 x 96 below.

**Figure 1.1(a) : 48 x 48**



**Figure 1.1(b) : 96 x 96**



### READOUTS

The Upper Readout is a 4 digit, 7-segment bright green LED display and usually displays the Measured Temperature Value. In Program Mode, the Upper Readout displays parameter values/options.

The Lower Readout is a 4 digit, 7-segment bright green LED display and usually displays SP (Control Setpoint) Value. In Program Mode, the Lower Readout displays parameter names (prompts).

# Advanced Self-tune PID Temperature Controller with Timer

## INDICATORS

There are 8 front panel red LED indicators. These indicator show various statuses. The Table 1.1 below lists each LED indicator (identified by the front panel legend) and the associated status it indicates.





**Table 1.1**

Indicator	Status
OP1	<ul style="list-style-type: none"><li>Indicates Output-1 ON/OFF status if the Control Output is Relay or SSR drive.</li><li>Remains OFF if the Control Output is DC Linear.</li></ul>
OP2	<ul style="list-style-type: none"><li>Indicates Output-2 status if OP2 function is Auxiliary / Blower Control.</li><li>Flashes Alarm-1 status if OP2 function is Alarm.</li></ul>
OP3	<ul style="list-style-type: none"><li>Indicates Output-3 status if OP3 function is Auxiliary Control.</li><li>Flashes Alarm-2 status if OP3 function is Alarm.</li></ul>
SOK	Flashes while the Soak Timer is counting down. Glow steadily while the Soak Timer is outside the Timer Start Band or Hold Band.
TMR	Glow while the Lower Readout shows the Balance Soak Time.
WLO	Water Level Status. Flashes if water level is LOW.
L1	Unused.
COM	Serial Communication Status. Flashes when data is being exchanged with Master Device.

## KEYS

The Table 1.2 lists the four front panel keys and the associated function.

**Table 1.2**

Symbol	Key	Function
	PAGE	Press to enter or exit set-up mode.
	DOWN	Press to decrease the parameter value. Pressing once decreases the value by one count; keeping pressed speeds up the change.
	UP	Press to increase the parameter value. Pressing once increases the value by one count; keeping pressed speeds up the change.
	ENTER	Press to store the set parameter value and to scroll to the next parameter on the PAGE.



## Section 2 BASIC OPERATIONS

### POWER-UP

Upon power-up the controller executes the following sequence of operations.

- All displays and indicators are lit on for approximately 3 seconds to check any display segment failure.
- Displays controller model name on the Upper Readout and the firmware version on the Lower Readout, for approximately 1 second. This helps user to verify features and refer to the correct document versions.

### MAIN DISPLAY MODE

After the Power-up display sequence, the Upper Readout starts showing the Measured Temperature Value and the Lower Readout displays the SP (Control Setpoint). This is the MAIN Display Mode that shall be used most often.

If the controller is configured to operate in PID Control Mode; the Lower Readout can be toggled to indicate either SP or % Output Power using the ENTER Key. The default Lower Readout upon Power-up is SP. While indicating % Power, the left most digit indicates P and remaining digits indicate power value.

### Adjusting SP (Control Setpoint)

The SP value can be directly adjusted on the Lower Readout while the controller is in the MAIN Display Mode and the Lower readout is showing SP value. If permitted at Supervisory Level, step through the following sequence for adjusting the SP value:

1. While the Lower Readout shows SP value, press and release UP or DOWN key once. The Lower Readout starts flashing.
2. Use UP/DOWN keys to adjust the SP value.
3. Press and release ENTER key. The Lower Readout stops flashing and the new set value is registered and stored.

### Tune / Optimize Indication

The controller self detects the events such as new installation, significant change in SP, etc. for auto tuning itself to the process under control. Also, the controller can be issued 'Optimize' command by the user for optimization of the PID constant values.

While the controller is Tuning/Optimizing, the Lower Readout flashes the message (Busy). The user is advised not to disturb the process or alter any parameter values while the "Busy" message is being flashed. The "Busy" message automatically disappears upon completion of Tuning/Optimization.

### Timer (Soak) Mode Indication

While Soak Timer is in progress, the front panel indicator 'SOK' flashes or glows steadily depending upon whether the timer is counting down or it is in wait / hold state.

The Lower Readout can be toggled to display either Control Setpoint (SP) or Balance / Elapsed Soak Time or % Output Power, using ENTER key. While the Lower Readout shows balance / elapsed soak time, the indicator 'TMR' glows.

The balance / elapsed Soak time is in either 'Minutes : Seconds' or 'Hours : Minutes' or 'Hours', depending upon the time units selected for the Soak Timer. If the selected time units are 'Hours', then (a) If the balance/elapsed time is greater than 100 Hours, the time is shown in 'Hours'. (b) If the balance/elapsed time is less than 100 Hours, the time is shown in 'Hours : Minutes'.




# Advanced Self-tune PID Temperature Controller with Timer

## PV Error Indications

The process value is said to be in error if it exceeds the minimum / maximum range specified for the selected Input sensor type or if the sensor is disconnected (Open or Broken).

The PV Error type is indicated (flashing) on the Upper Readout. For different errors and the causes refer Table 2.1 below.

**Table 2.1**

Message	PV Error Type
	Over-range PV above Max. Range
	Under-range PV below Min. Range
	Open Sensor / RTD broken

## CONTROL/ALARM STATUS UNDER PV ERROR CONDITIONS

- a) The tuning, if in progress, is aborted.
- b) The Soak Timer, if in progress, enters in Pause (halt) state.
- c) All the control outputs are switched off.
- d) For Alarm activation, the under-range condition is treated as minimum PV, whereas the over-range and open conditions are treated as maximum PV. Thus, Process High, positive Deviation Band and Window Band alarms activate under *Over-range/Open error*. Similarly, Process Low, negative Deviation Band and Window Band alarms activate under *Under-range error*.

## OPERATOR PAGE AND PARAMETERS

The controller provides a separate page that contains parameters that require frequent settings by the operator. The page is called Operator Page and the parameters are called Operator Parameters. The availability of operator parameters is controlled at supervisory level and these parameters are not affected by the master lock status.

### Accessing Operator Page & Adjusting Parameters

Step through the following sequence to open the operator page and to adjust the operator parameter values.

1. Press and release PAGE key. The Lower Readout shows PAGE and Upper Readout shows 0.
2. Press ENTER key. The Lower Readout shows prompt for the first available operator parameter and the Upper Readout shows value for the parameter.
3. Use UP/DOWN keys to adjust the value and then press ENTER key to store the set value and scroll to next parameter.

The controller automatically reverts to MAIN Display Mode upon scrolling through the last operator parameter. Alternatively, use PAGE key to return to MAIN Display Mode.

# Advanced Self-tune PID Temperature Controller with Timer

The Operator Parameters are described in Table 2.2. Note that the parameters presented on operator page depend upon the functions selected / enabled.

The operator parameter list mainly includes :

- a) Soak Start / Abort Command, if Soak Time feature is enabled.
- b) The Control Setpoint (SP).
- c) Alarm-1 Setpoint or Blower Setpoint or Auxiliary Control Setpoint for OP2 depending upon the function selected.
- d) Alarm-2 Setpoint or Auxiliary Control Setpoint for OP3 depending upon the function selected.
- e) Lock for Setpoint Editing on Lower Readout.

## PAGE 0 : OPERATOR PAGE

Table 2.2

Parameter Description	Settings
<b>TIMER START COMMAND</b> <span style="border: 1px solid black; padding: 2px;">St r t</span> Set to Yes to start Soak Timer. Not available if timer already running.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">n o</div>                     No                 </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">y e s</div>                     Yes                 </div>
<b>TIMER ABORT COMMAND</b> <span style="border: 1px solid black; padding: 2px;">A b r t</span> Set to Yes to abort a running timer.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">n o</div>                     No                 </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">y e s</div>                     Yes                 </div>
<b>TIME DURATION</b> <span style="border: 1px solid black; padding: 2px;">S o a k t</span> The set time value for the soak timer in the selected time units.	00.05 to 60.00 M:S or 00.05 to 99.55 H:M or 1 to 999 Hours

## OP2 Function : Alarm-1

Parameter Description	Settings
<b>ALARM-1 SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">A 1 S P</span> Process High / Process Low Alarm-1 Setpoint.	Min. to Max. Range for the Input Type
<b>ALARM-1 DEVIATION BAND</b> <span style="border: 1px solid black; padding: 2px;">A 1 d e</span> Positive (+) or Negative (-) Alarm-1 deviation band.	-1999 to 9999 or -199.9 to 999.9
<b>ALARM-1 WINDOW BAND</b> <span style="border: 1px solid black; padding: 2px;">A 1 b a</span> Symmetrical Alarm-1 window band.	3 to 999 or 0.3 to 99.9

# Advanced Self-tune PID Temperature Controller with Timer

## OP2 Function : Auxiliary Control

Parameter Description	Settings
<b>AUXILIARY CONTROL SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">SP2</span> Positive (+) or Negative (-) offset to Control Setpoint (SP) for defining Auxiliary Setpoint.	(Min. Range - SP) to (Max. Range - SP) for selected Input

## OP2 Function : Blower / Compressor Control

Parameter Description	Settings
<b>BLOWER / COMPRESSOR SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">BL.SP</span> Positive (+) offset to Control Setpoint (SP) for defining Blower / Compressor Setpoint.	0 to 250 <b>or</b> 0.0 to 25.0

## OP3 Function : Alarm-2

Parameter Description	Settings
<b>ALARM-2 SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">A2.SP</span> Process High / Process Low Alarm-2 Setpoint.	Min. to Max. Range for the Input Type
<b>ALARM-2 DEVIATION BAND</b> <span style="border: 1px solid black; padding: 2px;">A2.DE</span> Positive (+) or Negative (-) Alarm-2 deviation band.	-199 to 999 <b>or</b> -199.9 to 999.9
<b>ALARM-2 WINDOW BAND</b> <span style="border: 1px solid black; padding: 2px;">A2.WA</span> Symmetrical Alarm-2 window band.	3 to 999 <b>or</b> 0.3 to 999.9

## OP3 Function : Auxiliary Control

Parameter Description	Settings
<b>AUXILIARY CONTROL SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">SP3</span> Positive (+) or Negative (-) offset to Control Setpoint (SP) for defining Auxiliary Setpoint.	(Min. Range - SP) to (Max. Range - SP) for selected Input



# Advanced Self-tune PID Temperature Controller with Timer

## Control Setpoint (SP) Locking

Parameter Description	Settings
<b>SETPOINT LOCKING</b> <span>SLDC</span> Set to Yes to lock the SP editing on the Lower Readout.	<span>no</span> No <span>YES</span> Yes



## Section 3

### SET-UP MODE : ACCESS AND OPERATION

The various parameters are arranged in different groups, called PAGES, depending upon the functions they represent. Each group is assigned a unique numeric value, called PAGE NUMBER, for its access.

The parameters are always presented in a fixed format: The Lower Readout displays the parameter prompt (Identification Name) and the Upper Readout displays the set value. The parameters appear in the same sequence as listed in their respective sections.

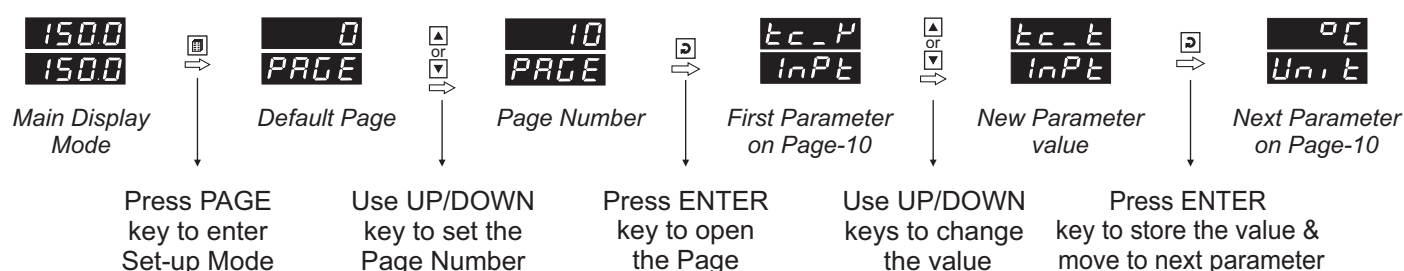
#### SET-UP MODE

The Set-up Mode allows the user to view and modify the parameter values. Follow the steps below for setting the parameter values:

1. Press and release PAGE key. The Lower Readout shows PAGE and the Upper Readout shows page number 0. Refer Figure 3.1.
2. Use UP / DOWN keys to set the desired PAGE NUMBER.
3. Press and release ENTER key. The Lower Readout shows the prompt for the first parameter listed in the set PAGE and the Upper Readout shows its current value. (If the entered PAGE NUMBER is invalid (contains no parameter list or any associated function), the controller reverts to the MAIN Display Mode).
4. Press and release the ENTER key until the prompt for the required parameter appears on the Lower Readout. (The last parameter in the list rolls back to the first parameter).
5. Use UP / DOWN keys to adjust the parameter value. (The display flashes if UP key is pressed after reaching the maximum value or DOWN key is pressed after reaching the minimum value).
6. Press and release the ENTER key. The new value gets stored in the controller's non-volatile memory and the next parameter in the list is displayed.

The Figure 3.1 illustrates the example of altering the value for the parameter 'Input Type'.

**Figure 3.1**



#### Notes

1. Each page contains a fixed list of parameters that are presented in a pre-determined sequence. Note however that availability of a few parameters, called Conditional Parameters, depend upon the settings for some other parameters. For example, the parameter 'Control Hysteresis' for Output-1 is available only if, the set value for the parameter 'Control Action' is 'On-Off'.
2. To exit the set-up mode and return to the MAIN Display Mode, press and release PAGE key.
3. If no key is pressed for approximately 30 seconds, the set-up mode times out and reverts to the MAIN Display Mode.

## MASTER LOCKING

The controller facilitates locking all the PAGES (except Operator PAGE) by applying Master Lock Code. Under Locking, the parameters are available for *view only* and cannot be adjusted. The Master Lock, however does not lock the operator parameters. This feature allows protecting the rather less frequently used parameters against any inadvertent changes while making the frequently used operator parameters still available for any editing.

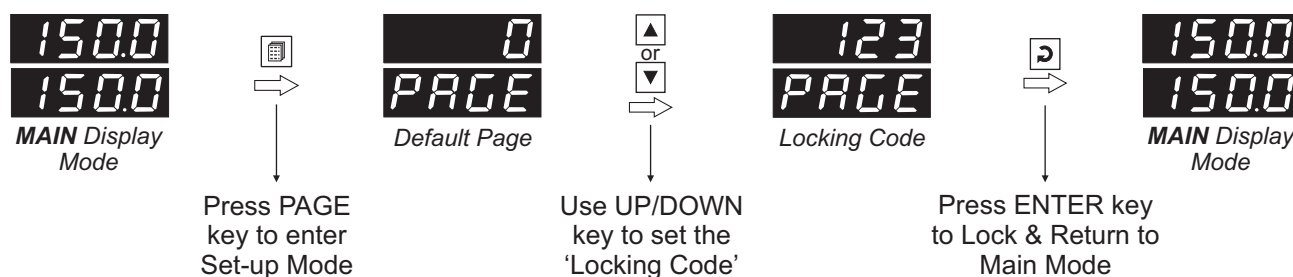
For enabling / disabling the Lock, step through the following sequence:

### Locking

1. Press and release PAGE key while the controller is in the MAIN Display Mode. The Lower Readout shows PAGE and the Upper Readout shows 0.
2. Use UP / DOWN keys to set the Page Number to 123 on the Upper Readout.
3. Press and release ENTER key. The controller returns to the MAIN Display Mode with the Lock enabled.

The Figure 3.2 below illustrates the Locking procedure.

**Figure 3.2**



### UnLocking

Repeat the Locking procedure twice for unlocking.



# Advanced Self-tune PID Temperature Controller with Timer

## Section 4

### PAGE 10 : I / O CONFIGURATION PARAMETERS

Table 4.1

Parameter Description	Settings Default Value
<b>INPUT TYPE</b> <span>INPT</span> Refer Table 4.2 for various available 'Input Types' along with their respective Ranges and Resolutions.	Refer Table 4.2 (Default : Type K)
<b>TEMPERATURE DISPLAY UNITS</b> <span>UNIT</span> Select as '°C' (Centigrade) or '°F' (Fahrenheit).	<span>°C</span> °C <span>°F</span> °F (Default : °C)
<b>TEMPERATURE RANGE</b> <span>RANG</span> This parameter value must be set in accordance with the Maximum Temperature Range for which the equipment / machine is designed. Set this parameter value appropriately as the same is used by the controller to determine whether or not to Self-Tune / Optimize the controller upon detecting the "Tune at Setpoint Change" condition.	Min. to Max. specified for the selected Input Type (Refer Table 4.2) (Default : 1376)
<b>CONTROL OUTPUT TYPE</b> <span>C-OP</span> Refer Table 4.3 for the available options.	Refer Table 4.3 (Default : Relay)
<b>CONTROL MODE</b> <span>CTRL</span> <i>On-Off</i> The control algorithm tends to maintain the PV at SP by either switching the output (say, Heater) fully OFF or fully ON. The On and Off switching is differentiated by the user settable 'Hysteresis Band'. <i>PID</i> The control algorithm uses a 2nd order equation to compute the '% Output Power' required to maintain the PV at SP. The constants P, I, D are automatically set by the controller.	<span>On-Off</span> On-Off <span>PID</span> PID (Default : PID)
<b>CONTROL LOGIC</b> <span>CLOG</span> <i>Direct</i> Cooling Control (Output Power increases with increase in PV). <i>Reverse</i> Heating Control (Output Power decreases with increase in PV).	<span>dir</span> Direct <span>rev</span> Reverse (Default : Reverse)
<b>HYSTERESIS</b> <span>HYST</span> (For ON-OFF Control only) Sets a differential (dead) band between the ON and OFF states. Keep it large enough to avoid frequent switching of the load without losing the desired control accuracy.	1 to 999°C or 0.1 to 99.9°C (Default : 2 or 0.2)

# Advanced Self-tune PID Temperature Controller with Timer

Parameter Description	Settings Default Value
<b>SETPOINT LOW LIMIT</b> <span style="border: 1px solid black; padding: 2px;">SP.Lo</span> This parameter sets the minimum limit on the Control Setpoint value.	Min. Range to Setpoint High for the selected Input Type (Default : -200)
<b>SETPOINT HIGH LIMIT</b> <span style="border: 1px solid black; padding: 2px;">SP.Hi</span> This parameter sets the maximum limit on the Control Setpoint value.	Setpoint Low to Max. Range for the selected Input Type (Default : 1376)

**Table 4.2**

Option	What it means	Range (Min. to Max.)	Resolution (Fixed or settable)
<span style="border: 1px solid black; padding: 2px;">tc_j</span>	Type J Thermocouple	0 to +960°C / +32 to +1760°F	Fixed 1°C / 1°F
<span style="border: 1px solid black; padding: 2px;">tc_k</span>	Type K Thermocouple	-200 to +1376°C / -328 to +2508°F	
<span style="border: 1px solid black; padding: 2px;">tc_t</span>	Type T Thermocouple	-200 to +385°C / -328 to +725°F	
<span style="border: 1px solid black; padding: 2px;">tc_r</span>	Type R Thermocouple	0 to +1770°C / +32 to +3218°F	
<span style="border: 1px solid black; padding: 2px;">tc_s</span>	Type S Thermocouple	0 to +1765°C / +32 to +3209°F	
<span style="border: 1px solid black; padding: 2px;">tc_b</span>	Type B Thermocouple	0 to +1825°C / +32 to +3092°F	
<span style="border: 1px solid black; padding: 2px;">tc_n</span>	Type N Thermocouple	0 to +1300°C / +32 to +2372°F	
<span style="border: 1px solid black; padding: 2px;">rtd</span>	3-wire, RTD Pt100	-199 to +600°C / -328 to +1112°F	0.1°C / 0.1°F
<span style="border: 1px solid black; padding: 2px;">rtd.i</span>	3-wire, RTD Pt100	-199.9 to 600.0°C / -199.9 to 999.9°F	

**Table 4.3**

Option	What it means	Remarks
<span style="border: 1px solid black; padding: 2px;">rly</span>	Relay	Applicable for OP1 as Relay / SSR
<span style="border: 1px solid black; padding: 2px;">ssr</span>	SSR (Solid State Relay)	
<span style="border: 1px solid black; padding: 2px;">0-20</span> <span style="border: 1px solid black; padding: 2px;">4-20</span>	0 to 20 mA current 4 to 20 mA current	Applicable for OP1 as DC Linear Current
<span style="border: 1px solid black; padding: 2px;">0-5</span> <span style="border: 1px solid black; padding: 2px;">0-10</span>	0 to 5 Volts 0 to 10 Volts	Applicable for OP1 as DC Linear Voltage

## Section 5

### PAGE 12 : OP2 FUNCTION PARAMETERS

Table 5.1

Parameter Description	Settings Default Value
<b>OUTPUT-2 FUNCTION SELECTION</b> <span style="border: 1px solid black; padding: 2px;">OP2F</span>  <i>None</i> OP2 module not installed or function not used. <i>Alarm</i> OP2 relay activates as Alarm status. <i>Auxiliary Control</i> OP2 relay activates as Auxiliary control status. <i>Blower</i> OP2 relay activates as Blower / Compressor control status.	<span style="border: 1px solid black; padding: 2px;">none</span> None <span style="border: 1px solid black; padding: 2px;">ALrā</span> Alarm <span style="border: 1px solid black; padding: 2px;">Ctrl</span> Control <span style="border: 1px solid black; padding: 2px;">bLDr</span> Blower (Default : None)

#### OP2 Function : Alarm-1

Parameter Description	Settings Default Value
<b>TYPE</b> <span style="border: 1px solid black; padding: 2px;">AL_1</span>  <i>Process Low</i> The alarm activates for PV less than or equal to Alarm Setpoint. <i>Process High</i> The alarm activates for PV greater than or equal to Alarm Setpoint. <i>Deviation Band</i> The alarm activates if the PV deviation from SP is greater than the set positive or negative 'Deviation Band' value. <i>Window Band</i> The alarm activates if the PV deviation from SP is greater than the set 'Window Band' value in either direction. <i>End Of Soak</i> The OP2 Relay / SSR is switched ON for the time duration set for the parameter 'Alarm Timer'.	<span style="border: 1px solid black; padding: 2px;">P_Lo</span> Process Low <span style="border: 1px solid black; padding: 2px;">P_Hi</span> Process High <span style="border: 1px solid black; padding: 2px;">dE</span> Deviation Band <span style="border: 1px solid black; padding: 2px;">bAnd</span> Window Band <span style="border: 1px solid black; padding: 2px;">EoS</span> End of Soak (Default : Process Low)
<b>SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">A 1SP</span>  Available for 'Process High' or 'Process Low' Alarms. Sets the Upper (Process High) or Lower (Process Low) Alarm Limit.	Min. to Max. Range for the selected Input type (Default : 0)
<b>DEVIATION BAND</b> <span style="border: 1px solid black; padding: 2px;">A 1dE</span>  Available for 'Deviation Band' Alarm. Sets a deviation band above (Positive value) or below (Negative value) the SP for alarm activation.	-199 to 999 or -199.9 to 999.9 (Default : 0)
<b>WINDOW BAND</b> <span style="border: 1px solid black; padding: 2px;">A 1bA</span>  Available for 'Window Band' Alarm. Sets a symmetrical band above and below the SP for alarm activation.	3 to 999 or 0.3 to 999.9 (Default : 3)

# Advanced Self-tune PID Temperature Controller with Timer

Parameter Description	Settings Default Value
<b>LOGIC</b> <span>ALC</span> <i>Normal</i> The Alarm output (Relay/SSR) remains ON under alarm condition; OFF otherwise. Useful for Audio / Visual Alarm. <i>Reverse</i> The Alarm output (Relay / SSR) remains OFF under alarm condition; ON otherwise. Useful for Tripping the system under control.	<span>norm</span> Normal <span>rev</span> Reverse (Default : Normal)
<b>INHIBIT</b> <span>AIH</span> <i>No</i> Alarm is not suppressed for start-up condition. <i>Yes</i> The Alarm activation is inhibited (suppressed) until the PV is found within alarm limits from the time the controller is switched ON.	<span>YES</span> Yes <span>no</span> No (Default : Yes)
<b>ALARM TIMER</b> <span>ALT</span> Available for End of Soak Alarm. Sets time duration in seconds for which the alarm shall activate upon end of soak timer.	5 to 250 Seconds (Default : 10)

## OP2 Function : Auxiliary Control

Parameter Description	Settings Default Value
<b>OFFSET VALUE</b> <span>SP.2</span> Offset value for the Auxiliary Control Setpoint. Can be set as positive value or negative value. Auxiliary Control Setpoint = Control Setpoint (SP) + Offset Value	(Min. Range - SP) to (Max. Range - SP) specified for the selected Input Type (Default : 0)
<b>HYSTERESIS</b> <span>HY5.2</span> Sets a differential (dead) band between the ON and OFF control states.	1 to 999 or 0.1 to 999.9 (Default : 2 or 0.2)
<b>CONTROL LOGIC</b> <span>LOG.2</span> <i>Normal</i> The Output remains ON for PV <i>below</i> Setpoint and OFF otherwise. <i>Reverse</i> The Output remains ON for PV <i>above</i> Setpoint and OFF otherwise.	<span>norm</span> Normal <span>rev</span> Reverse (Default : Normal)

# Advanced Self-tune PID Temperature Controller with Timer

## OP2 Function : Blower / Compressor Control

Parameter Description	Settings Default Value
<b>OFFSET VALUE</b> <span style="border: 1px solid black; padding: 2px;">bL.SP</span> Sets a positive (+) offset to the SP to define the 'Blower / Compressor Setpoint'. Blower / Compressor Setpoint = Control Setpoint (SP) + Offset Value	0 to 250 <b>or</b> 0.0 to 25.0 (Default : 0)
<b>HYSTERESIS</b> <span style="border: 1px solid black; padding: 2px;">bL.HY</span> Differential (dead) band between the blower ON and OFF states.	1 to 250 <b>or</b> 0.1 to 250.0 (Default : 2 <b>or</b> 0.2)
<b>TIME DELAY</b> <span style="border: 1px solid black; padding: 2px;">t.dLY</span> This parameter is mainly used for Compressor Load. The set time delay is elapsed each time before the compressor is switched ON. Set the value to 0 if no Time Delay is required.	00.00 to 10.00 Min. Sec (in steps of 5 Seconds) (Default : 00.00)





## Section 6

### PAGE 13 : OP3 FUNCTION PARAMETERS

Table 6.1

Parameter Description	Settings Default Value
<b>OUTPUT-3 FUNCTION SELECTION</b> <span style="border: 1px solid black; padding: 2px;">OP3F</span>  <i>None</i> OP3 module not installed or function not used. <i>Alarm</i> OP3 relay activates as Alarm status. <i>Auxiliary Control</i> OP3 relay activates as Auxiliary control status. Water Level Low Alarm OP3 relay activates if water level is Low.	<span style="border: 1px solid black; padding: 2px;">none</span> None <span style="border: 1px solid black; padding: 2px;">ALrñ</span> Alarm <span style="border: 1px solid black; padding: 2px;">Ctrl</span> Control <span style="border: 1px solid black; padding: 2px;">LLOY</span> Water Level Low Alarm (Default : None)

#### OP3 Function : Alarm-2

Parameter Description	Settings Default Value
<b>TYPE</b> <span style="border: 1px solid black; padding: 2px;">AL_2</span>  <i>Process Low</i> The alarm activates for PV less than or equal to Alarm Setpoint. <i>Process High</i> The alarm activates for PV greater than or equal to Alarm Setpoint. <i>Deviation Band</i> The alarm activates if the PV deviation from SP is greater than the set positive or negative 'Deviation Band' value. <i>Window Band</i> The alarm activates if the PV deviation from SP is greater than the set 'Window Band' value in either direction. <i>End Of Soak</i> The OP3 Relay / SSR is switched ON for the time duration set for the parameter 'Alarm Timer'.	<span style="border: 1px solid black; padding: 2px;">P_Lo</span> Process Low <span style="border: 1px solid black; padding: 2px;">P_Hi</span> Process High <span style="border: 1px solid black; padding: 2px;">dE</span> Deviation Band <span style="border: 1px solid black; padding: 2px;">bAnd</span> Window Band <span style="border: 1px solid black; padding: 2px;">EoS</span> End of Soak (Default : Process Low)
<b>SETPOINT</b> <span style="border: 1px solid black; padding: 2px;">A2SP</span>  Available for 'Process High' or 'Process Low' Alarms. Sets the Upper (Process High) or Lower (Process Low) Alarm Limit.	Min. to Max. Range for the selected Input type (Default : 0)
<b>DEVIATION BAND</b> <span style="border: 1px solid black; padding: 2px;">A2dE</span>  Available for 'Deviation Band' Alarm. Sets a deviation band above (Positive value) or below (Negative value) the SP for alarm activation.	-199 to 999 or -199.9 to 999.9 (Default : 0)
<b>WINDOW BAND</b> <span style="border: 1px solid black; padding: 2px;">A2bA</span>  Available for 'Window Band' Alarm. Sets a symmetrical band above and below the SP for alarm activation.	3 to 999 or 0.3 to 999.9 (Default : 3)

# Advanced Self-tune PID Temperature Controller with Timer

Parameter Description	Settings Default Value
<b>LOGIC</b> <span style="border: 1px solid black; padding: 2px;">A2LG</span> <i>Normal</i> The Alarm output (Relay/SSR) remains ON under alarm condition; OFF otherwise. Useful for Audio / Visual Alarm. <i>Reverse</i> The Alarm output (Relay / SSR) remains OFF under alarm condition; ON otherwise. Useful for Tripping the system under control.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">nor</div> <div>Normal</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">rev</div> <div>Reverse</div> </div> (Default : Normal)
<b>INHIBIT</b> <span style="border: 1px solid black; padding: 2px;">A2.1h</span> <i>No</i> Alarm is not suppressed for start-up condition. <i>Yes</i> The Alarm activation is inhibited (suppressed) until the PV is found within alarm limits from the time the controller is switched ON.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">yes</div> <div>Yes</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">no</div> <div>No</div> </div> (Default : Yes)
<b>ALARM TIMER</b> <span style="border: 1px solid black; padding: 2px;">A2.t</span> Available for End of Soak Alarm. Sets time duration in seconds for which the alarm shall activate upon end of soak timer.	5 to 250 Seconds (Default : 10)

## OP3 Function : Auxiliary Control

Parameter Description	Settings Default Value
<b>OFFSET VALUE</b> <span style="border: 1px solid black; padding: 2px;">SP.3</span> Offset value for the Auxiliary Control Setpoint. Can be set as positive value or negative value. Auxiliary Control Setpoint = Control Setpoint (SP) + Offset Value	(Min. Range - SP) to (Max. Range - SP) specified for the selected Input Type (Default : 0)
<b>HYSTERESIS</b> <span style="border: 1px solid black; padding: 2px;">HY5.3</span> Sets a differential (dead) band between the ON and OFF control states.	1 to 999 <b>or</b> 0.1 to 999.9 (Default : 2 <b>or</b> 0.2)
<b>CONTROL LOGIC</b> <span style="border: 1px solid black; padding: 2px;">LOG.3</span> <i>Normal</i> The Output remains ON for PV <i>below</i> Setpoint and OFF otherwise. <i>Reverse</i> The Output remains ON for PV <i>above</i> Setpoint and OFF otherwise.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">nor</div> <div>Normal</div> </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">rev</div> <div>Reverse</div> </div> (Default : Normal)



# Advanced Self-tune PID Temperature Controller with Timer

## Section 7

### PAGE 14 : PID CONTROL PARAMETERS

Table 7.1

Parameter Description	Settings Default Value
<b>% OUTPUT POWER</b> <span>OUT.P</span> <p>This is a view only parameter that facilitates the indication of '% Output Power' computed by the controller PID algorithm. The computed value lies between Min. power (0.0%) and Max. power (100.0%).</p>	Not Applicable
<b>CYCLE TIME</b> <span>CT</span> <p>(For 'PID' Control)            For time-proportionating PID control, the output power is implemented by adjusting the ratio of ON : OFF to a fixed time interval, called 'Cycle Time'. The larger the power the larger the ON time and vice-a-versa.</p> <p>Larger Cycle time ensures longer Relay/SSR life but may result in poor control accuracy and vice-a-versa. <i>The recommended Cycle Time values are; 20 sec. for Relay and 1 sec. for SSR.</i></p>	0.5 to 120.0 Seconds (in steps of 0.5 secs.) (Default : 0.5)
<b>PROPORTIONAL BAND</b> <span>Pb</span> <p>(For 'PID' Control)            The Proportional band is defined in terms of process value deviation from the setpoint (also known as process error). Within the band the output power is varied from maximum (100%) at maximum deviation to minimum (0%) at minimum deviation. The process value thus tends to stabilize at a point within the band where the power input equal losses. Larger Band results in better stability but larger deviation.</p> <p>The Proportional Band value is automatically calculated by controller's Self-Tune feature and seldom requires any manual adjustment.</p>	0.1 to 999.9 (Default : 10.0)
<b>INTEGRAL TIME</b> <span>IT</span> <p>(For 'PID' Control)            The application of proportional band alone results in process value stability within the band but away from the setpoint. This is called steady state Offset Error. The integral action is incorporated for automatic removal of offset error with minimum oscillations.</p> <p>The Integral Time value is automatically calculated by controller's Self-Tune feature and seldom requires any manual adjustments.</p>	0 to 1000 Seconds (Default : 100)

# Advanced Self-tune PID Temperature Controller with Timer

Parameter Description	Settings Default Value
<b>DERIVATIVE TIME</b> <span>dt</span> (For 'PID' Control) It is desired that the controller should respond to any dynamic changes in the process conditions (like variations in load, power supply fluctuations, etc.) fast enough so as retain the process value near the setpoint. The derivative time determines how strong the output power will change in response to the rate of change of measured PV.  The Derivative Time value is automatically calculated by controller's Self-Tune feature and seldom requires any manual adjustments.	0 to 250 Seconds (Default : 25)



# Advanced Self-tune PID Temperature Controller with Timer

## Section 8

### PAGE 15 : SOAK TIMER PARAMETERS

(Refer end of this section for detailed Soak Timer Operation)

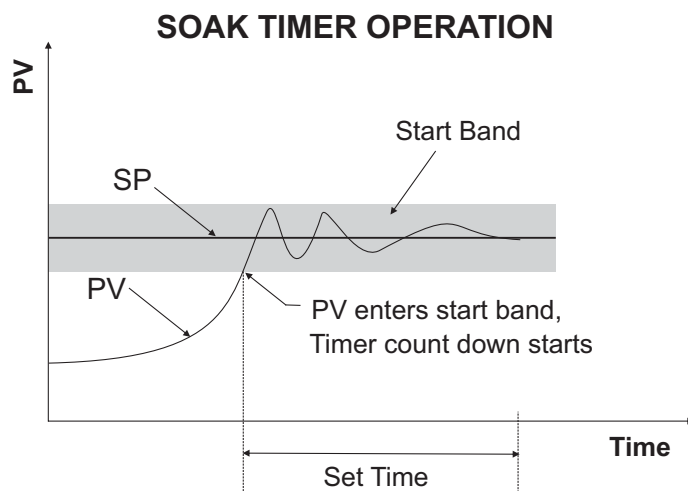
Table 8.1

Parameter Description	Settings Default Value
<b>TIMER ENABLE</b> <span>SEnb</span> Yes Soak Timer function and Start / Abort commands are enabled. No Soak Timer function and Start / Abort commands are disabled.	<div>no No</div> <div>YES Yes</div> (Default : No)
<b>TIME UNITS</b> <span>Unit</span> Select the time units depending on the minimum and/or maximum time value required.	<div>mm:ss Min:Sec</div> <div>HH:mm Hours:Min</div> <div>Hour Hours</div> (Default : Min: Sec)
<b>TIME DURATION</b> <span>SoPt</span> The preset time value in selected units for the Soak Timer.	00.05 to 60:00 Min:Sec 00.05 to 99:55 Hrs:Min 1 to 9999 Hours (Default : 00.10 Min:Sec)
<b>TIMER VIEW</b> <span>tu y</span> Balance : The Lower Readout shows the balance soak time. Elapsed : The Lower Readout shows the elapsed soak time.	<div>bALC Balance</div> <div>ELPS Elapsed</div> (Default : Balance)
<b>TIMER-START BAND</b> <span>S.bnd</span> After issuance of start command, the timer starts counting down once the PV enters the process band around SP defined by this parameter value.	0 to 9999 or 0.0 to 999.9 (Default : 5 or 0.5)
<b>HOLDBACK STRATEGY</b> <span>HOLD</span> None PV based timer pause is not required. Up Timer is paused if PV is outside holdband <i>above</i> SP. Down Timer is paused if PV is outside holdband <i>below</i> SP. Both Timer is paused if PV is outside holdband both <i>above</i> and <i>below</i> SP.	<div>none None</div> <div>UP Up</div> <div>dn Down</div> <div>both Both</div> (Default : None)
<b>HOLD BAND</b> <span>H.bnd</span> Sets the temperature limit(s) with respect to the SP for the timer to pause. The timer holds on counting should the PV cross the limit(s).	1 to 9999 or 0.1 to 999.9 (Default : 5 or 0.5)

# Advanced Self-tune PID Temperature Controller with Timer

Parameter Description	Settings Default Value
<b>SWITCH-OFF CONTROL OUTPUT AT TIMER END</b> <span style="border: 1px solid black; padding: 2px;">OP.OF</span> <b>Yes</b> The control output (OP1) is forced off upon completion of timer. <b>No</b> The control output state is not forced.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">no</div>                     No                 </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">YES</div>                     Yes                 </div> (Default : No)
<b>POWER-FAIL RECOVERY METHOD</b> <span style="border: 1px solid black; padding: 2px;">Pr.FL</span> <b>Abort</b> The timer operation is suspended until a new start command is issued. <b>Start</b> The timer re-runs the complete soak time. <b>Continue</b> The Soak Timer resumes operation for the balance time.	<div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Abt</div>                     Abort                 </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Stt</div>                     (Re)Start                 </div> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 2px; margin-right: 5px;">Cont</div>                     Continue                 </div> (Default : Continue)

**Figure 8.1**



## Basic Operation

The Soak Timer is essentially a *preset timer* that can be configured to run as :

- A Free Running Timer by setting timer 'Start Band' to 0. That is, the timer starts counting down immediately upon issuance of Start Command by the user and continues until set time is elapsed.
- A Setpoint Dependent Timer. That is, after issuance of Start Command, the count down starts only after the PV reaches within timer 'Start Band'. The timer start band is a symmetrical band centered around the SP. For example, for a start band of 2°C and SP value of 100°C, the count down begins once the PV reaches a value within 98°C (SP - Start Band) to 102°C (SP + Start Band). Note that, once the PV enters 'Start Band', the timer continues to run regardless of whether the PV remains within or outside the 'Start Band'.

## ***Hold Band Operation***

The timer is also provided with a 'Hold Band' that can be enabled to make sure that the timer counts down *only while* the PV is within the 'Hold Band'. That is, the timer pauses (holds counting down) whenever the PV is outside the 'Hold Band'. The 'Hold Band' is set with respect to the SP and can be set above or below or above and below the SP. For example, a 5 °C Hold Band below the SP (say, 100°C) will force the timer in pause state whenever the PV is equal or less than 95°C (SP - Hold Band).

## ***Power-fail Recovery Modes***

The timer facilitates 3 different power-fail recovery modes, viz., *Continue*, *Re-start* and *Abort*. In *Continue* mode, the timer resumes to execute the balance soak time once the PV is detected within Hold Band. In *Re-start* mode, the timer executes the complete set time all over again. In *Abort* mode, the timer stops execution until a start command is issued.

## ***End-of-Soak Events***

The output Relay/SSR modules, OP2 and/or OP3, can be configured as End-of-Soak Alarm with a settable alarm duration. That is, upon completion of Soak Time execution, the Relay energizes (say, to activate a buzzer) for the set alarm duration.

Additionally, the controller provides 'Output-Off' strategy that can be enabled to force the control output OP1 off upon End-of-Soak. The output becomes active again after issuance of Start Command for the execution of a new Soak Time Cycle.



# Advanced Self-tune PID Temperature Controller with Timer

## Section 9

### PAGE 11 : SUPERVISORY PARAMETERS

Table 9.1

Parameter Description	Settings Default Value
<b>TUNE / OPTIMIZE COMMAND</b> <span>OPT</span> (For PID Control Mode only) Set to 'Yes' for initiating Tune / Optimize operation.	<span>no</span> No <span>YES</span> Yes (Default : No)
<b>TUNE / OPTIMIZE ABORT COMMAND</b> <span>Abt</span> (For PID Control Mode only) Set to 'Yes' for terminating Tune / Optimize operation in progress.	<span>no</span> No <span>YES</span> Yes (Default : No)
<b>OVERSHOOT INHIBIT</b> <span>05.1h</span> (For PID Control Mode only) Set this parameter to 'Enable' if the process exhibits unacceptable overshoot upon start-up or a step change in SP. If enabled, the controller controls the rate of change of PV to minimize overshoot.	<span>d5bL</span> Disable <span>EnbL</span> Enable (Default : Disable)
<b>OVERSHOOT INHIBIT FACTOR</b> <span>0.1hF</span> This parameter adjusts the effectiveness of the Overshoot Inhibit feature. Increase the value if the overshoot is curbed but the PV takes longer to reach the SP. Decreases the value if the overshoot persists.	1.0 to 2.0 (Default : 1.2)
<b>SELF-TUNE ON SETPOINT CHANGE</b> <span>tn.SP</span> <i>Enable</i> Re-tune the controller if there is a substantial (large) change in the SP value. The P, I, D values are optimized. <i>Disable</i> Ignore any change in SP value and continue with the existing P, I, D values.	<span>d5bL</span> Disable <span>EnbL</span> Enable (Default : Disable)
<b>OFFSET FOR PV</b> <span>OFSt</span> This parameter adds positive or negative offset to the measured PV for removal of thermal gradient or known sensor error.	-1999 to 9999 or -199.9 to 999.9 (Default : 0)
<b>DIGITAL FILTER FOR PV</b> <span>FLtr</span> This value determines the averaging rate of measured PV and thus helps removing undesired rapid changes in the measured PV. The higher the filter value the better the averaging but the slower the response to actual changes.	0.5 to 25.0 Seconds in steps of 0.5 Seconds (Default : 1.0)



# Advanced Self-tune PID Temperature Controller with Timer

Parameter Description	Settings Default Value
<b>PERMISSION FOR OP2/OP3 SETPOINT EDITING ON OPERATOR PAGE</b> <span>SP.OP</span>  This parameter allows the user to enable (permit) or disable (restrict) the adjustment of the Setpoint for OP2 / OP3 functions.	<span>dsbl</span> Disable <span>Enbl</span> Enable (Default : Enable)
<b>SOAK ABORT COMMAND ON OPERATOR PAGE</b> <span>SO.KA</span>  This parameter allows the user to enable (permit) or disable (restrict) the issuance of 'Abort' command from operator page to Abort (Stop) the running Soak Timer.	<span>dsbl</span> Disable <span>Enbl</span> Enable (Default : Enable)
<b>SOAK TIME ADJUSTMENT ON OPERATOR PAGE</b> <span>SO.Kt</span>  This parameter allows the user to enable (permit) or disable (restrict) the adjustment of the 'Soak Time Duration' on Operator Page.	<span>dsbl</span> Disable <span>Enbl</span> Enable (Default : Enable)
<b>UTILITY OPTION</b> <span>OPt.n</span>  This parameter assigns one of the following functions to the Digital Input.  <i>General Purpose DI</i> Useful for remote monitoring the contact closure (switch) status using MODBUS address.  <i>Soak Start</i> Digital Input is used for issuing Soak Timer Start Command. An open to close contact will initiate the Soak Timer.  <i>Water Level Low</i> Digital Input is used for detecting Low Water Level.	<span>OP.d 1</span> General Purpose <span>St.r t</span> Soak Start Command <span>LEul</span> Water Level Low Detection (Default : None)
<b>WATER LEVEL-LOW DETECTION LOGIC</b> <span>LLC</span>  This parameter is available if Digital Input is used for Low Water Level Detection. Set to 'Open' or 'Close' depending upon whether <i>contact-open</i> or <i>contact-close</i> means <i>water low</i> detection.	<span>OPEn</span> Open <span>CLOS</span> Close (Default : Open)
<b>SLAVE ID</b> <span>1d</span>  This parameter assigns a unique identification number that the Master Device can use to address the instrument for any communication data transactions. The settable values are from 1 to 127.	1 to 127 (Default : 1)
<b>BAUD RATE</b> <span>baud</span>  This parameter defines the communication speed expressed in "Bits per second". The Baud Rate must be set to match the Baud Rate set for the Master Device.	<span>4.8</span> 4800 <span>9.6</span> 9600 <span>19.2</span> 19200 (Default : 9600)

# Advanced Self-tune PID Temperature Controller with Timer

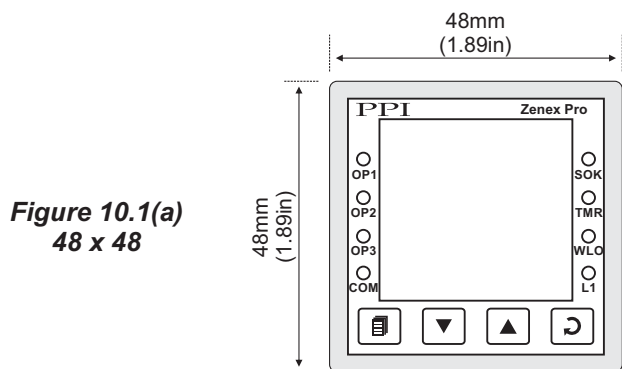
Parameter Description	Settings Default Value
<b>PARITY</b> <span>PAR.</span> Parity setting for serial communication protocol	<span>none</span> None <span>Even</span> Even <span>Odd</span> Odd (Default : Even)
<b>COMMUNICATION WRITE ENABLE</b> <span>CoñE</span> Yes The Read/Write parameters can be accessed for both reading and writing. No The Read/Write parameters can only be accessed for reading. That is, the parameter values cannot be altered through serial communication.	<span>no</span> No <span>YES</span> Yes (Default : Yes)



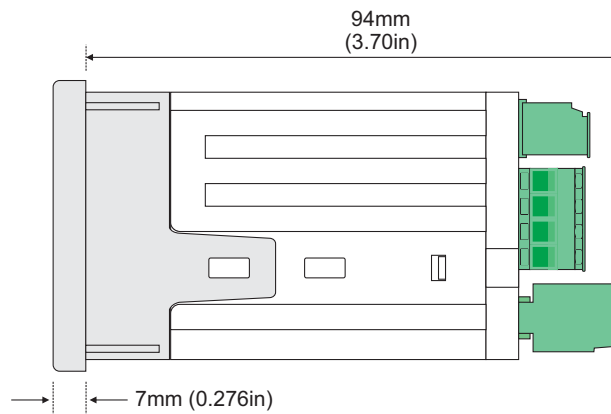
## Section 10 MECHANICAL INSTALLATION

### OUTER DIMENSIONS

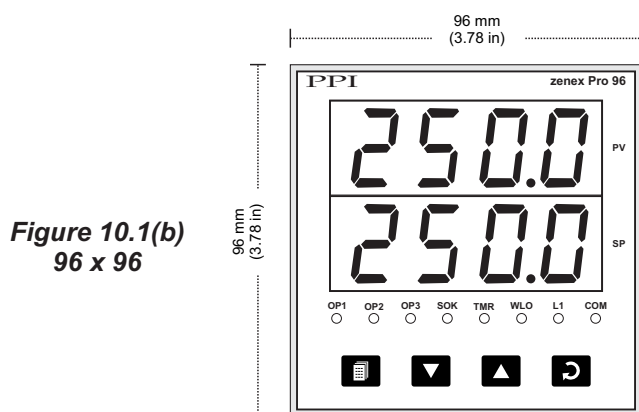
The Figure 10.1(a) : 48 x 48 & Figure 10.1(b) : 96 x 96 shows the controller outer dimensions.



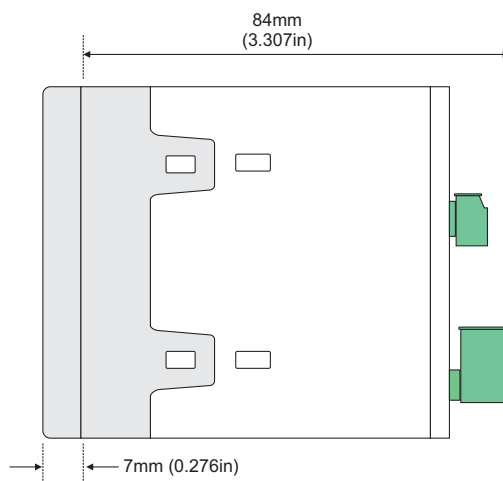
**Front View**



**Side View**



**Front View**

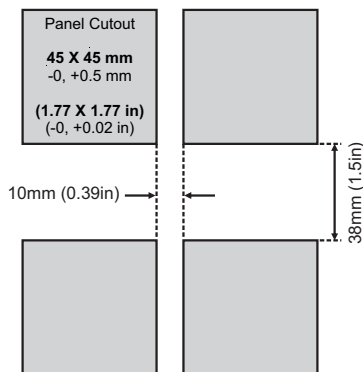


**Side View**

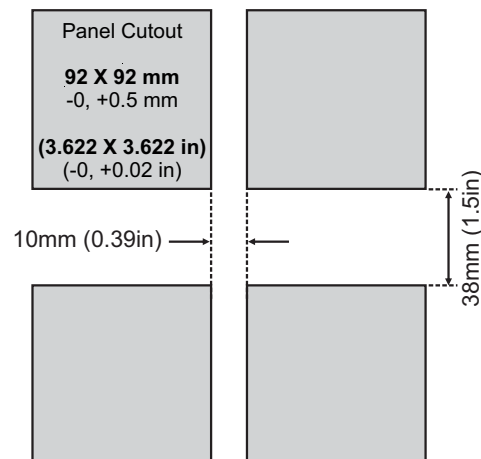
**Figure 10.2(a) : 48 x 48**

### PANEL CUTOUT AND RECOMMENDED MINIMUM SPACING

The Figure 10.2(a) : 48 x 48 & Figure 10.2(b) : 96 x 96 shows the panel cutout requirements for a single controller and also the minimum spacing recommended if several controllers are required to be mounted on a single panel.



**Figure 10.2(b) : 96 x 96**



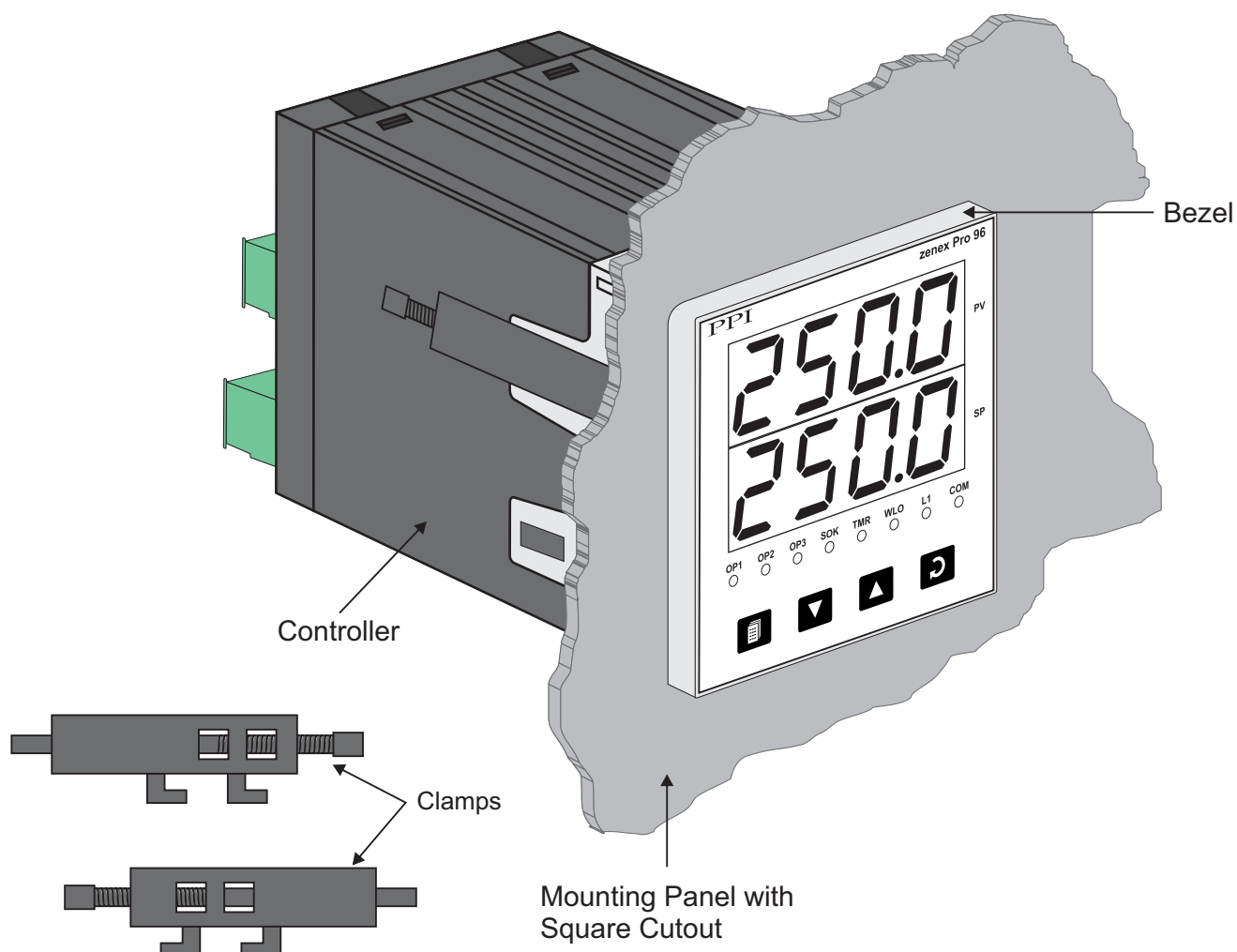
# Advanced Self-tune PID Temperature Controller with Timer

## PANEL MOUNTING

Follow the steps below for mounting the controller on panel:

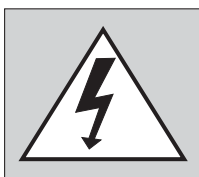
1. Prepare a square cutout to the size shown in Figure 10.2.
2. Remove the Panel Mounting Clamp from the controller Enclosure and insert the rear of the controller housing through the panel cutout from the front of the mounting panel.
3. Hold the controller gently against the mounting panel such that it positions squarely against the panel wall, see Figure 10.3. Apply pressure only on the bezel and not on the front label.
4. Insert the mounting clamps on either side of the controller in the slots provided for the purpose. Rotate the screws clockwise so that they move forward until they push firmly against the rear face of the mounting panel for secured mounting.

**Figure 10.3**



## Section 11

### ELECTRICAL CONNECTIONS



**WARNING**  
**MISHANDLING / NEGLIGENCE CAN**  
**RESULT IN PERSONAL DEATH OR**  
**SERIOUS INJURY.**

1. The user must rigidly observe the Local Electrical Regulations.
2. Do not make any connections to the unused terminals for making a tie-point for other wires (or for any other reasons) as they may have some internal connections. Failing to observe this may result in permanent damage to the controller.
3. Run power supply cables separated from the low-level signal cables (like RTD, DC Linear (Voltage) signals, etc.). If the cables are run through conduits, use separate conduits for power supply cable and low-level signal cables.
4. Use appropriate fuses and switches, wherever necessary, for driving the high voltage loads to protect the controller from any possible damage due to high voltage surges of extended duration or short-circuits on loads.
5. Take care not to over-tighten the terminal screws while making connections.
6. Make sure that the controller supply is switched-off while making/removing any connections or removing the controller from its enclosure.

### CONNECTION DIAGRAM

The connectors provided for wiring are pluggable male-female type. The female parts are soldered on the controller PCBs while the male parts are with screws and removable. The rear panel electrical wiring connection diagram is shown in Figure 11.1(a) : 48 x 48 & Figure 11.1(b) : 96 x 96.

Relay / SSR Control Output Version

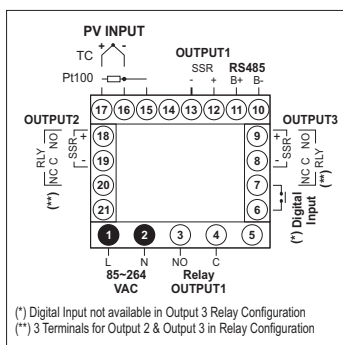


Figure 11.1(a) :  
48 x 48

DC mA/V Control Output Version

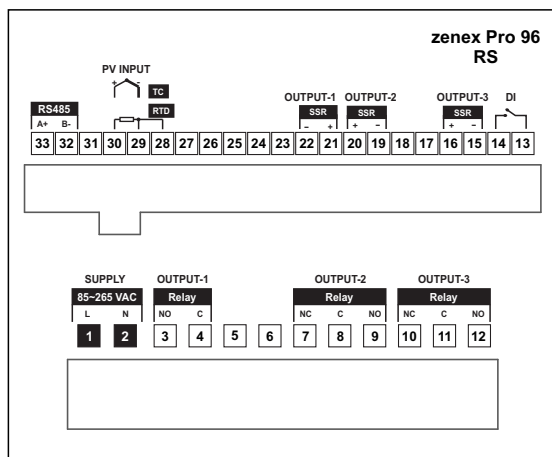
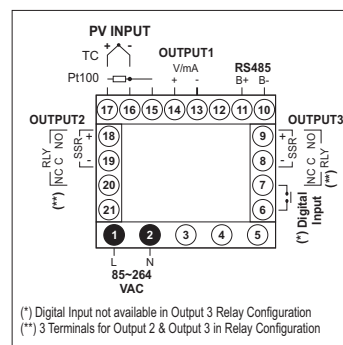
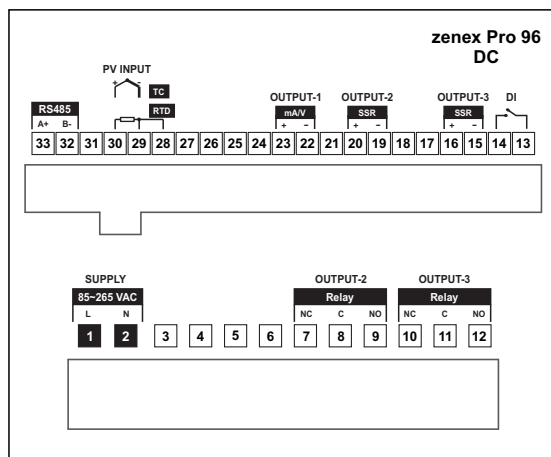


Figure 11.1(b) :  
96 x 96



# Advanced Self-tune PID Temperature Controller with Timer

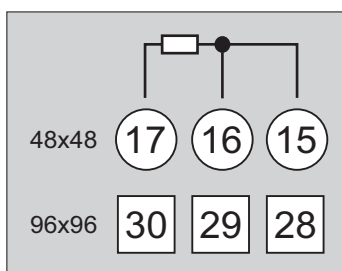
## DESCRIPTIONS

The back panel connections are described as under:

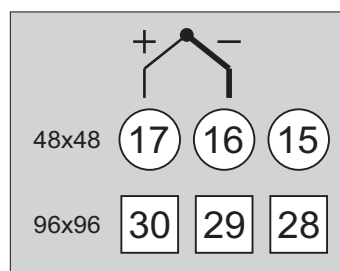
**PV INPUT** : RTD Pt100, 3-wire / Thermocouple

Connect 3-wire RTD Pt100 sensor or Thermocouple as shown below.

**Figure 11.2 (a)**  
**RTD Input**



**Figure 11.2 (b)**  
**Thermocouple Input**



### RTD Pt100, 3-wire

Connect single lead end of RTD bulb to terminal 17 / 30 and the double lead ends to terminal 16 / 29 and 15 / 28 (interchangeable) as shown in Figure 11.2 (a). Use low resistance copper conductor leads of the same gauge and length. Avoid joints in the cable.

### Thermocouple

Connect Thermocouple Positive (+) to terminal 17 / 30 and Negative (-) to terminal 16 / 29 as shown in Figure 11.2 (b). Use correct type of extension lead wires or compensating cable. Avoid joints in the cable.

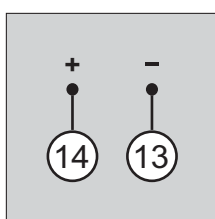
**OUTPUT1** : Control Output - Relay  
Control Output - SSR  
Control Output - V/mA

**OUTPUT2** : Alarm / Control - Relay  
Alarm / Control - SSR

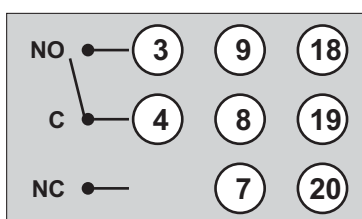
**OUTPUT3** : Alarm / Control - Relay  
Alarm / Control - SSR

Relay & SSR Control Outputs are available as standard. V / mA Control Output is available on request.

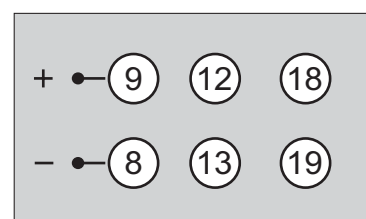
**Figure 11.3(a) :**  
**48 x 48**



**Output1**  
**V/mA**

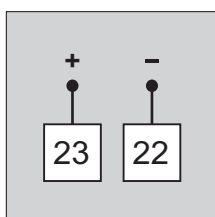


**Output1/ Output2 / Output3**  
**Relay**

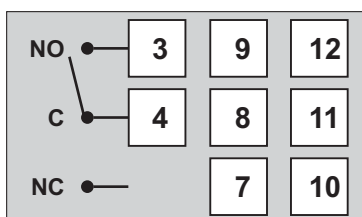


**Output1/ Output2 / Output3**  
**SSR**

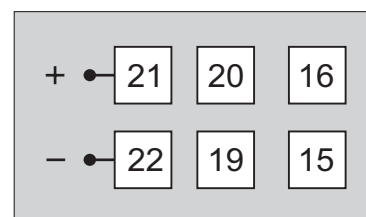
**Figure 11.3(b) :**  
**96 x 96**



**Output1**  
**V/mA**



**Output1/ Output2 / Output3**  
**Relay**



**Output1/ Output2 / Output3**  
**SSR**

# Advanced Self-tune PID Temperature Controller with Timer

## mA/V Output

The Positive (+) of mA/V is available at Terminal 14 / 23 & the Negative (-) at Terminal 13 / 22.

## Relay Output

Potential-free Relay changeover contacts NO (Normally Open) and C (Common) rated 5A/240 VAC (resistive load).

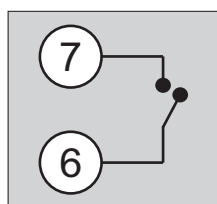
## SSR Output

Connect (+) and (-) terminals of SSR to (+) and (-) terminals of controller, respectively. Use Zero-Crossover, 3 to 30 VDC operated SSR.

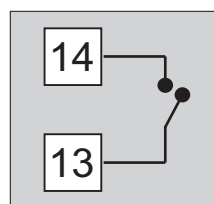
## Digital Input : Low Water-Level Detection or Timer Start Command Digital Input

Potential-free contact closure input terminals are provided as digital input. This input can either be used for low water level detection or for issuance of timer start command. When used as water level detection, an user programmable 'Open' or 'Close' switch position is detected as water level low. When used as timer start command, an Open to Close transition issues start command.

**Figure 11.4(a) : 48 x 48**



**Figure 11.4(b) : 96 x 96**

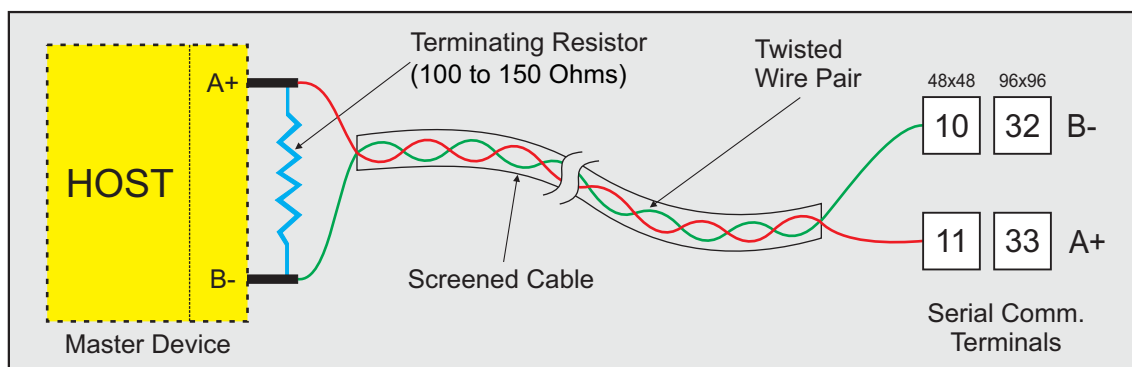


## RS485 : Serial Communication Port

Connect terminal 11 / 33 and 10 / 32 of the controller to (A+) and (B-) RS485 terminals of the Master device.

To ensure reliable operation of the Serial Communication Link (without data corruption due to line noise or reflections), use a pair of twisted wires inside screened cable with the terminating resistor (100 to 150 Ohms) at one end, as shown in Figure 11.5 below.

**Figure 11.5**

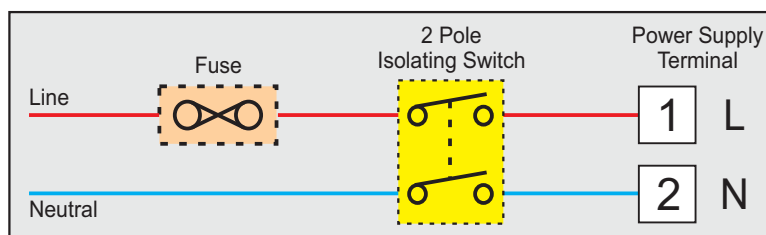


# Advanced Self-tune PID Temperature Controller with Timer

## 85~264 VAC : Power Supply

The controller is supplied with power connections suited for 85 to 264 VAC line supply. Use well-insulated copper conductor wire of the size not smaller than  $0.5\text{mm}^2$  for power supply connections. Connect Line (Phase) supply line to terminal 1 and the Neutral (Return) supply line to terminal 2 as shown in Figure 11.6 below. The controller is not provided with fuse and power switch. If necessary, mount them separately. Use a time lag fuse rated  $1\text{A} @ 240\text{ VAC}$ .

**Figure 11.6**





# Advanced Self-tune PID Temperature Controller with Timer

---

## Process Precision Instruments (An ISO 9001 : 2008 Company)

📍 101, Diamond Industrial Estate, Navghar, Vasai Road (E), Dist. Palghar - 401210, Maharashtra, India  
☎ Sales : 8208199048 / 8208141446 Support : 07498799226 / 08767395333  
✉ sales@ppiindia.net 🖱 www.ppiindia.net