

Operating Manual



Introduction

A proportional-integral-derivative controller (PID controller or three term controller) is a control loop feedback mechanism widely used in industrial control systems and a variety of other applications requiring continuously modulated control. A PID controller continuously calculates an error value as the difference between a desired setpoint (SV) and a measured process variable (PV) and applies a correction based on proportional, integral, and derivative terms (denoted P, I, and D respectively) which give the controller its name.

PT244-T is a single set point PID controller. It is available in both touch & keypad versions. Customized iconic display interprets status easily.

Caution for your safety

WIRING: The probe and its corresponding wires should never be installed in a conduit next to control or power supply lines. The electrical wiring should be done as shown in the diagram. The power supply circuit should be connected to a protection switch. The terminals admit wires of upto 2.5sq mm.

WARNING: Improper wiring may cause irreparable damage and personal injury. Kindly ensure that wiring is done by qualified personnel only.

Maintenance: Cleaning: Clean the surface of the controller with a soft moist cloth. Do not use abrasive detergents, petrol, alcohol or solvents.

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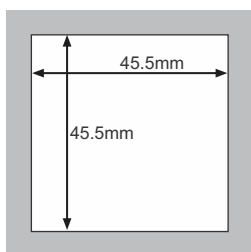
Controller: Controller should be installed in a place protected by vibration, water and corrosive gasses and where ambient temperature does not exceed the values specified in the technical data.

Probe: To give a correct reading, the probe must be installed in a place protected from thermal influences, which may affect the temperature to be controlled.

Dimensions

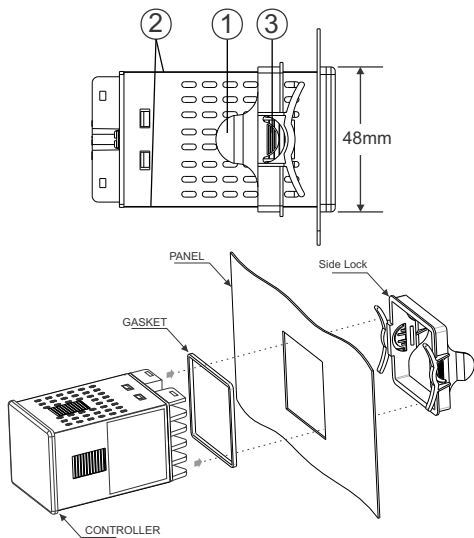


Panel Cutout

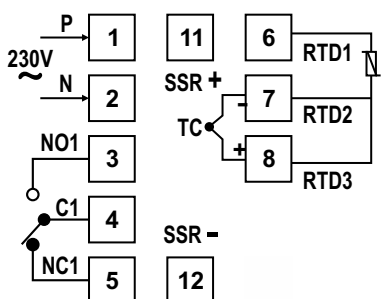


Product Mounting

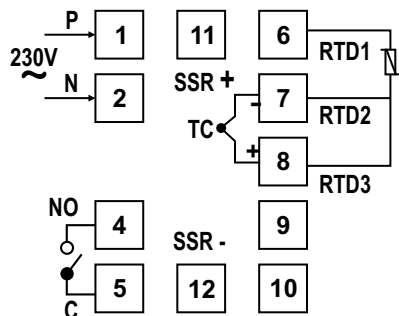
Installation: Fixing and dimensions of panel models: To fix the unit, slide the fastener ① through the guides ② as per the position shown in the figure. Move the fastener in the direction of the arrow, pressing tab ③ it permits to move the fastener in the opposite direction of the arrow.



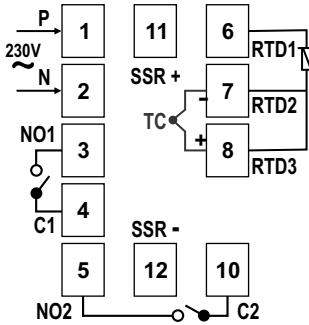
Connection Diagram (for Single Relay)



Connection Diagram (for PT244-T-AA- W2C30)



Connection Diagram (for Two Relay)



Index

Sr. No.	Para.	Description
		User Interface
		Technical Specification
		Input types & Input range
		Working
		Initial display when Power is ON
		Parameter setting mode
		Set mode
1	SEt1	Control1 set point.
2	SEt2	Control2 set point.
3	dWEL	Sets the dwell time.
		Level1 Parameter
4	inPt	Sets the type of input sensor .
5	inb	Sets input correction.
6	LSu	Sets the lower limit of PV input.
7	HSu	Sets the upper limit of PV input.
8	Ht-R	High temperature limit. (for 1 Relay)
9	Lt-R	Low temperature limit. (for 1 Relay)
10	Ent2	Sets control action for relay2. (for 2 Relay)
11	HYS2	Sets the hysteresis2. (for 2 Relay)
12	nod2	Sets the alarm type. (for 2 Relay)
13	ALrn	Sets AL1 icon as alarm relay. (for 2 Relay)
14	rSt	Factory reset parameter.
		Level2 Parameter
15	Ent1	Set control action for relay1 / SSR.
16	At	Runs auto tuning.
17	CYCt	Sets cycle time for PID action.
18	P	Sets proportional band.
19	I	Sets integration time.
20	d	Sets differential time.
21	HYS1	Sets the hysteresis1
22	out	Sets Control1 output.
23	LoL	Lock keypad.
		LED Indications
		Alarm Types
		Error Messages

User Interface



Sr. No.	Description
1	Process Value RUN mode : Displays current measured value. SETTING mode : Displays parameter.
2	Set value RUN mode : Displays set value. SETTING mode : Displays set value of parameter.
3	°C Displays the Temperature unit.
4	OUT1 Turns ON while control output1 is ON.
5	OUT2 Turns ON while control output2 is ON. (for two relay)
6	AL1 Turns ON when the corresponding alarm out turns ON.
7	AUTO Turns ON when auto tuning is in progress.
8	DWL Flashes during Dwell timer is in progress. Continuous ON : Dwell time elapsed.
9	0 Turns ON when keypad is locked.
10	Next key : Used to enters parameters level, moves to next parameters. Press & hold this key atleast 1 seconds to enter in set point mode. Press & hold this key atleast 4 seconds to enter in Level1. Press & hold this key atleast 8 seconds to enter in Level2.

11	Down / Reset Key : Used in Program mode to decrement parameter value. Used to reset the Dwell timer..
12	Up / AT Key : Used in Program mode to increment parameter value. Press this key for 2 seconds to start or stop auto-tuning.
13	Exit Key : Press this key to save the setting value and to exit the programming mode.

Model Description

- PT244-T-W2C34 / PT244-K-W2C34 - Two Relay
- PT244-T-AA-W2C30 - Single Relay
- PT244-T-W2C30 - Single Relay

Technical Specification

Housing : Polycarbonate Plastic
Dimensions : Frontal : 48 X 48mm, Depth : 78mm
Panel Cutout : 45.5 X 45.5mm
Mounting : Flush panel mounting with fasteners
Protection : IP65 Front
Connections : Terminal connectors.
 ≤ 2.5sq mm terminal only.
Display : 4 X 17mm 7 segment Red/White display,
 4 X 8mm 7 segment Green display
 7 Iconic LEDs for Indication
Data storage : Non-volatile flash memory
Operating temp. : 0°C to 60°C (non-condensing)
Operating humidity : 20% to 85% (non-condensing)
Storage temp : -25°C to 60°C (non-condensing)
Power input : 230 Vac ±15% , 50/60Hz Standard.
 85 to 265Vac, 12/24Vdc on request.
Control output : Relay : 5A, 230V AC or
 SSR (field selectable) : 10V DC, 30mA
(For PT244-T-W2C34 / PT244-K-W2C34)
 Relay : 10A, 230V AC or
 SSR (field selectable) : 10V DC, 30mA
(For PT244-T-W2C30)
 Relay : 16A, 230V AC or
 SSR (field selectable) : 10V DC, 30mA
(For PT244-T-W2C30)
Auxiliary output : Relay : 5A, 230V AC
(For PT244-T-W2C34 / PT244-K-W2C34)
Input Type : RTD : Pt100
 Thermocouple : J, K
Resolution : 0.1°C / 1°C for RTD (Pt100) input
 1°C for Thermocouple (J, K) input
Display Accuracy: RTD : 0.1% of F.S +/- 1°C
 Thermocouple : 0.3% of F.S
 (20 min of settling time for TC)
Sampling Period : 1 second

Input types & Input range

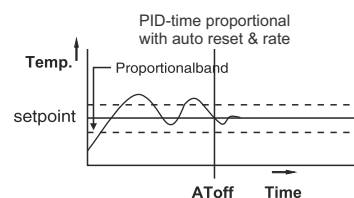
Input Type	Decimal Point	Display	Input Range (°C)
Thermocouple	J	J	-50 to 750°C
	K	ℓ	-50 to 1200°C
RTD	Pt	rtℓd	-99 to 400°C
	100	0.1	-99.9 to 400.0°C

Working

1. Auto tuning

The Auto-tuning function automatically computes and sets the proportional band (P), Integral time (I), Derivative time (D) as per process characteristics.

While Auto-tune is in progress "AUTO" led will turn ON. After Auto-tuning is complete the "AUTO" led will turn OFF.



If auto-tuning is not complete after 3-4 cycles, it is suspected to fail. In this case, check the wiring & parameters such as the control action, input type etc. Carry out the auto-tuning again, if there is a change in setpoint or process parameters.

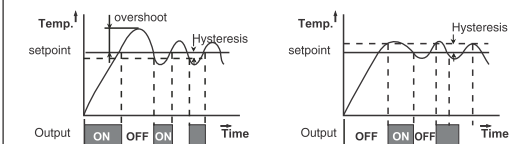
Note : In Auto Tunning running time, user can not change the parameter value.

2. ON/OFF control action (For reverse mode)

The relay is 'ON' up to the set temperature and cuts 'OFF' above the set temperature. As the temperature of the system drops, the relay is switched 'ON' at a temperature slightly lower than the set point.

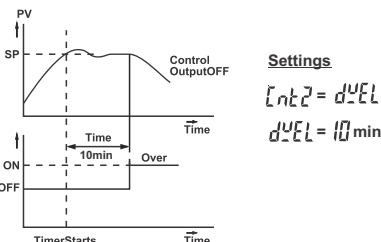
HYSTERESIS:

The difference between the temperature at which relay switches 'OFF' is the hysteresis or dead band.



3. Dwell Timer (Not applicable for PT244-K) :

A dwell timer is used to control a process at a fixed temperature for a defined period. Once the process reaches the setpoint, dwell timer starts to count until time out. After the time is completed, Control output goes OFF and auxiliary output energizes. As an alarm.



Note:

- Countdown timer is displayed on the lower display. Once total time elapsed display will show "done". (for Single relay)
- DWL icon LED blinking indicates that dwell timer is in progress. It switches to continuous 'ON' when dwell timer over.
- Dwell time programmed as OFF will disable the dwell timer.
- When soak in progress & dwell time modified. New dwell time is applicable.
- The dwell period can be reduced or increased when the timer is running. If it is reduced to meet the time elapsed, the timer will change to the end state.
- Once the timer output was energized it can be reset with the RST Reset key.

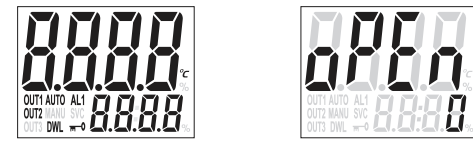
Pro-key (On Request) (Not for Single Relay)

User can Upload parameters settings from one controller and download them to multiple controllers.

This will make on site parameter setting easy.

Initial Display when Power is ON

When power is supplied, entire display part will flash for 5 sec and then enter in to RUN mode.



1. Entire display Part 2. Second Screen

Parameter Setting Mode

SET MODE	
1 SEt1 Parameter	Function: To set control1 set point. Press & hold [] key for 1 second. Display will show SEt1. User can change SEt1 value using UP/ DOWN keys. Holding the key, will change the value at a faster rate. Press [] key to store the desired value & move on to the next parameter. (For 2 relays SEt2 / Dwell). Set value also can be stored by pressing [] Key
2 SEt2 Parameter	Function: To set control2 set point. (For 2 Relays) This parameter is prompted only if Relay 2 is configured in Ent2as, 1. Either absolute auxiliary control or as an alarm (High/Low) mode. 2. Either deviation auxiliary control or as a deviation alarm mode. Note: If Ent2 set to OFF, SEt2 will not be shown in the SP setting.
3 dWEL Parameter	Function: Sets the dwell time. (Only for PT244-T) This parameter is prompted only if Relay 2 is configured in Cont2 as "dWEL" (For PT244-T). This parameter is prompted only if Relay 1 is configured in Cont1 as "dWEL" (For Single relay only). For dwell timer operation please refer user guide section.
LEVEL1 Parameter	
Press & hold [] key for 4 seconds to enter into Level1 parameter setting(LEt1 will flash). When release the key, inPt will flash. Press UP/DOWN keys to modify the set value and to go to the next parameter by pressing [] key. Press the [] key to save the set value and to come out of parameter setting after changing the set value.	
4 inPt Parameter	Function: Sets the type of input sensor . While changing the sensor type SEt1, SEt2, in-b, LSu, HSu, Ht-R, Lt-R parameters of level1 will reset accordingly. For type of input sensor & range please refer "Input types & Input range" table.
5 inb Parameter	Function: Sets input correction. In time it may be possible that the display may be offset by a degree or so. To compensate for this error, user may need to add or minus the degrees required to achieve the correct temperature. Example : The temperature on the display is 28°C, whereas the actual temperature is 30°C. User will have to set the " inb " parameter to 2°C, which means that once out of the programming mode, the temperature on display will be 30°C (28°C+ 2°C).

Min	Max	Fac.
LSu	HSu	0°C
HT-R	LT-R	0°C
OFF	9999 min	OFF
ℓ	rtℓd	J
0		
Min	Max	Fac.
-20°C	20°C	0°C

6 L_{SV} **Parameter** Function: Sets the lower limit of PV input.

Sets the minimum limit for set point adjustment. It can be set from minimum specified range of selected sensor to HSV-1 value.

Once set at a particular value, this will not allow the set point to go below this value.

When changing the setting value and $SV < LSV$, SV is reset as LSV.

For J type sensor

Min	Max	Fac.
-50°C	$H_{SV}-1$	-50°C

7 H_{SV} **Parameter** Function: Sets the upper limit of PV input.

Sets the maximum limit for set point adjustment. It can be set from LSV+1 value to maximum specified range of selected sensor.

Once set at a particular value, this will not allow the set point to go above this value.

When changing the setting value and $SV > HSV$, SV is reset as HSV.

For J type sensor

Min	Max	Fac.
$L_{SV}+1$	750°C	750°C

8 $Ht-R$ **Parameter** Function: To set maximum allowable high temperature limit. **(only for Single relay)**

Example: If this parameter is set to 700°C and the temperature reaches or goes above 700°C, display will show Ht (High Temp.) alarm indicating that the temperature has reached or gone above the value set in this parameter.

Note : Ht fault will be ignored at every power ON.

Min	Max	Fac.
Lt+1	HSU-1	HSU-1

(Message on display)

9 $Lt-R$ **Parameter** Function: To set minimum allowable low temperature limit. **(only for Single relay)**

Example: If this parameter is set to -40°C and the temperature reaches or goes below -40°C, display will show Lt (Low temp) alarm indicating that the temperature has reached or gone below the value set in this parameter.

Min	Max	Fac.
LSU+1	Ht-1	LSU+1

(Message on display)

10 $LnL2$ **Parameter** Function: Sets control action for relay2. **(only For 2 Relay)**

This parameter used to set required control action for relay 2 as,

OFF = No action

rE = Reverse

Fd = Forward

$dUEl$ = Dwell time

Min	Max	Fac.
OFF	$dUEl$	rE

11 $HYS2$ **Parameter** Function: Set the hysteresis for ON-OFF action in Control2. **(only For 2 Relays)**

This parameter will be prompted only if selected control action is rE (reverse) or Fd (forward) in Control2 setting. It sets the deadband between ON & OFF switching of the output.

Example (For Fd control) : If the set point is set at 100°C and hysteresis is set at 2°C, then when the system reaches 100°C, the heater relay will go OFF. Since the hysteresis is 2°C, the heater relay will get ON (restart) at 102°C (100°C + 2°C).

Min	Max	Fac.
1°C	100°C	2°C

12 $mod2$ **Parameter** Function: Sets the alarm type. **(only For 2 Relay)**

It's applicable when control2 action is rE (reverse) or Fd (forward).

AbS : Absolute

dEu : Deviation

For alarm types setting , please refer Alarm Type description.

Min	Max	Fac.
AbS	dEu	AbS

13 $ALrn$ **Parameter** Function: Sets AL1 icon as alarm relay ON/OFF indicator for alarm indication. **(only For 2 Relay)**

Set " YES " to enable AL1 icon. AL1 icon turns ON when the corresponding alarm output turns ON.

Type of alarm can be selected by using Mod2 parameter.

Min	Max	Fac.
no	YES	no

For Single Relay :

When temperature is above high temperature limit or temperature is below low temperature limit, AL1 indication ON.

Both alarms will be ignore at power ON for first time till the setpoint not achieved. (First PID action performed)

14 $r5t$ **Parameter** Function : To restore default settings of the controller.

When Set to Yes all parameter are programmed to factory values. Useful to debug setting related problems.

Min	Max	Fac.
no	YES	no

LEVEL2 Parameter

Press & hold $[]$ key for 8 seconds to enter into Level2 parameter setting (L_{SV} will flash). When release the key, $LnL1$ will flash.

Press **UP/DOWN** keys to modify the set value and to go to the next parameter by pressing $[]$ key.

Press the $[]$ key to save the set value and to come out of parameter setting after changing the set value.

15 $LnL1$ **Parameter** Function: Sets control action for relay1/SSR.

This parameter is used to set required control action for relay 1/SSR as,

rE = Reverse

Fd = Forward

PId = PID

Min	Max	Fac.
rE	PId	PId

16 Aut **Parameter** Function: Runs auto tuning.

This parameter is used to set YES/NO to start and stop Auto-tuning. When Setting as ON , the unit starts auto-tuning. After Completing OFF is automatically Set. During auto-tuning, the AUTO indicator is continuously ON.

This parameter will be prompted only if selected control action is PID in $LnL1$.

Min	Max	Fac.
no	YES	no

17 $Cycle$ **Parameter** Function: Sets cycle time for PID action.

Cycle time also known as duty cycle, the total length of time for the controller to complete one ON/OFF cycle.

Example : With a 20 second cycle time, an on time of 10 seconds and an OFF time of 10 seconds represents a 50 percent power output. The controller will cycle ON and OFF while within the proportional band.

Min	Max	Fac.
1 sec	60 sec	3 sec

18 P **Parameter** Function: Sets proportional band.

Sets the proportional band of PID parameter.

Term P is proportional to the current value of the SV-PV error .

Example : If the (SV-PV) error is large and positive, the control output will be proportionately large and positive and vice versa if error is negative.

Min	Max	Fac.
0.1°C	100.0°C	10.0°C

19 I **Parameter** Function: Sets integration time.

Sets the integration time of PID parameter.

Term I accounts for past values of the SV-PV error and integrates them over time to produce the I term.

Example : If there is a residual SV-PV error after the application of proportional control, the integral term seeks to eliminate the residual error by adding a control effect due to the historic cumulative value of the error.

Setting "0" will turn OFF integration.

Min	Max	Fac.
0 sec	2000 sec	120 sec

20 D **Parameter** Function: Sets differential time.

Sets the differential time of PID parameter.

Term D is a best estimate of the future trend of the SV-PV error, based on its current rate of change. It is sometimes called "anticipatory control", as it is effectively seeking to reduce the effect of the SV-PV error by exerting a control influence generated by the rate of error change. The more rapid the change, the greater the controlling or dampening effect.

Setting "0" will turn OFF differential.

Min	Max	Fac.
0 sec	1000 sec	30 sec

21 $HYS1$ **Parameter** Function: Set the hysteresis width for ON-OFF action in Control1.

This parameter will be prompted only if selected control action is rE (reverse) or Fd (forward) in $LnL1$ setting. It sets the deadband between ON & OFF switching of the output.

Example (For Fd control) : If the set point is set at 100°C and hysteresis is set at 2°C, then when the system reaches 100°C, the heater relay will go OFF. Since the hysteresis is 2°C, the heater relay will get ON (restart) at 102°C (100°C + 2°C).

Min	Max	Fac.
1°C	100°C	2°C

22 out **Parameter** Function: Sets Control1 output.

This parameter is used to configure control1 out as,

SSr = SSR

rLY = Relay

User has to set this parameter in accordance with the output used.

Min	Max	Fac.
SSr	rLY	rLY

23 LoK **Parameter** Function: To lock keypad.

This parameter is used to lock the parameter so that tampering is not possible by by-standers.

no = unlocked parameter

YES = Locked parameter

When locked all parameters can only be viewed ,but can not be modified.

Min	Max	Fac.
no	YES	no

LED Indication

LED	Status	Description
OUT1	ON	Relay1 / SSR ON.
	OFF	Relay1 / SSR OFF.
OUT2	ON	Relay2 ON.
	OFF	Relay2 OFF.
AUTO	ON	Tuning is in progress.
	OFF	Tuning Stop.
DWL	FLASHING	Dwell timer is in progress..
	ON	Dwell time elapsed.
	OFF	Dwell timer disable.
	ON	Alarm relay ON.
	OFF	Alarm Relay OFF.
	ON	Alarm indication ON. (for Single Relay)
AL1	OFF	Alarm indication OFF. (for Single Relay)
	ON	Parameters are Locked.
$m=0$	OFF	Parameters are Unlocked.

Error Messages

Message	Description
$OPEn$	Lit when input sensor is disconnected or sensor is not connected.
$HHHH$	Flashes when measured value is higher than input range.
$LLLL$	Flashes when measured value is lower than input range.
Ht	Temperature above the maximum high temperature limit.
Lt	Temperature below the minimum low temperature limit.

Pro-Key (On Request) (Not for Single Relay)

To use Pro-key user must insert it prior to power ON. Insert the pro-key and power ON controller. When the display flashes for 5 seconds, touch the $[]$ key for 1 second. Controller will enter into Pro-key mode and will display " $ProK$ ". Then touch either of the below given keys to use the Pro-key.

Functions of Pro-key and the keys to be used are as given below:

Function	Keys to be Used
To upload the parameters from the controller	touch " $[]$ " key
To download the parameters to the controller	touch " $[]$ " key
To set and exit	touch " $[]$ " key

If user tries to enter Pro-key mode without inserting the pro key or with wrong connection, no further function will be activated after displaying " $[]$ " or " $[]$ ". Controller will display " $ProK$ ". Then switch off controller and insert the pro key properly and try to enter Pro key mode.

User has to first Upload the parameters in the Subzero Validated Blank Pro-Key and then subsequently use it for downloading.

● Uploading mode

Press $[]$ key to upload the parameters to Pro Key. Lower display will show " $u \cdot oK$ " once uploading is done. Press $[]$ to exit display will show "----" and return to normal display.

● Downloading mode

Similarly connect Pro key to the controller . Press $[]$ key to download all parameters from Pro key to the controller. Lower display will show " $d \cdot oK$ " once download is done. Once done press $[]$ key to exit and display will flash and return to normal mode.



Alarm Types (only for Two Relay)

Setting	Alarm Type	Description
Cont2 = FD ALM = YES Mod2 = Absolute	Absolute value high limit alarm	$SV = SET2$ Alarm ON when $PV > SV + HYS2$ Alarm OFF when $PV = SV$
Cont2 = RE ALM = YES Mod2 = Absolute	Absolute value low limit alarm	$SV = SET2$ Alarm ON when $PV < SV - HYS2$ Alarm OFF when $PV = SV$
Cont2 = FD ALM = YES Mod2 = Deviation	Deviation high limit alarm	$SV = SET1 + SET2$ FD Alarm ON when $PV > SV + HYS2$ Alarm OFF when $PV = SV$
Cont2 = RE ALM = YES Mod2 = Deviation	Deviation low limit alarm	$SV = SET1 + SET2$ FD Alarm ON when $PV < SV - HYS2$ Alarm OFF when $PV = SV$
Ht	High temperature alarm	$PV \geq Ht-R$ (Only for Single Relay)
Lt	Low temperature alarm	$PV \leq Lt-R$ (Only for Single Relay)

* $HYS2$: Alarm output hysteresis

Calibration Certificate

DATE	
MODEL NO.	
CONTROLLER SR. NO.	

Claimed Accuracy :

For TC inputs : 0.3% of FS

For RTD inputs : 0.1% of FS +/- 1°C
(20 min of settling time for TC inputs)

Calibration Instrument & Sr. No :

Calibrated ON : _____

Valid Upto : _____

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

SENSOR TYPE	VALUE TESTED (°C)	VALUE Observed (°C)
RTD	0°C	All values within specified limit of accuracy
	100°C	
	350°C	
J,K	50°C	
	400°C	
	650°C	

Instrument is confirmed accepted as accuracy is within the specified limit. This certificate is valid upto one year from the date of issue.

Checked By :

(Specification are subject to change, since development is a continuous process.)

PVR Controls, India

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OUR OTHER PRODUCTS

Precision Control, always

Digital Panel Meter
Power Analyzer
Timer , PLC , HMI
Data Logger

02 / 28.05.19