

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 two set point PID controller. It is available in touch & keypad version. 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.

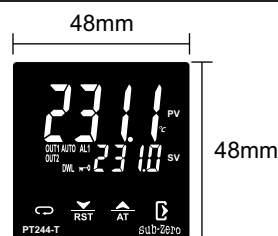
Maintenance: Cleaning: Clean the surface of the controller with a soft moist cloth. Do not use abrasive detergents, petrol, alcohol or solvents.

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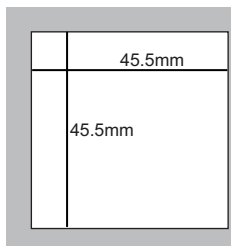
Controller: Controller should be installed in a place protected by vibration, water and corrosive gasses and where ambient temperature does not exceed the values specified in the technical data.

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

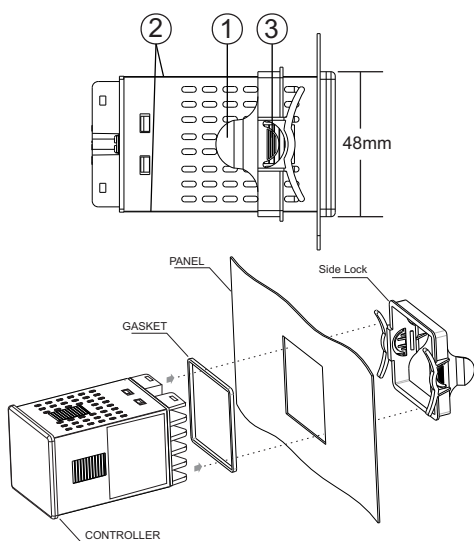


Panel Cutout

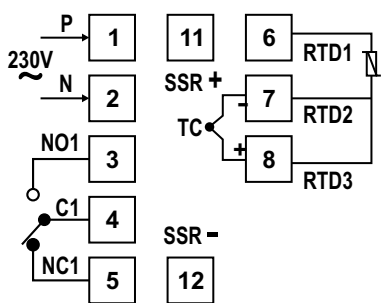


Product Mounting

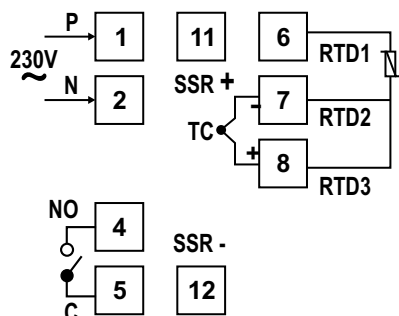
Installation: Fixing and dimensions of panel models: To fix the unit, slide the fastener (1) through the guides (2) as per the position shown in the figure. Move the fastener in the direction of the arrow, pressing tab (3) it permits to move the fastener in the opposite direction of the arrow.



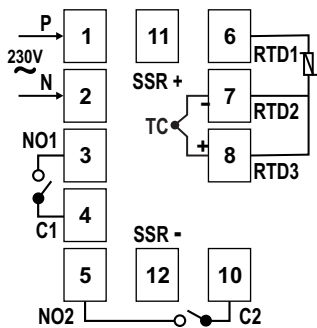
Connection Diagram (for PT244-T- W2C30)



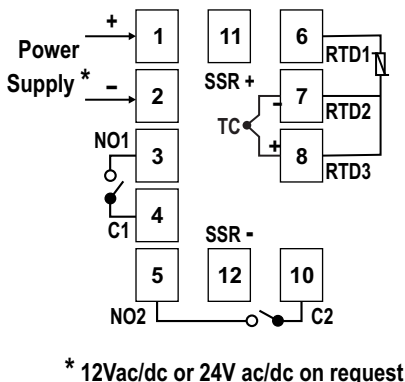
Connection Diagram (for PT244-T- W2C30AA)



Connection Diagram (for PT244-T/K-W2C34)



Connection Diagram (for PT244-T/K-W* C34)



* 12Vac/dc or 24V ac/dc on request

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	inpL	Sets the type of input sensor .
5	lnb	Sets input correction.
6	LSu	Sets the lower limit of PV input.
7	HSu	Sets the upper limit of PV input.
8	dWEL	To enable Dwell timer.
9	Ht-R	High temperature limit. (for 1 Relay)
10	Lt-R	Low temperature limit. (for 1 Relay)
11	Ent2	Sets control action for relay2. (for 2 Relay)
12	HYS2	Sets the hysteresis2. (for 2 Relay)
13	nod2	Sets the alarm type. (for 2 Relay)
14	ALrn	Sets AL1 icon as alarm relay. (for 2 Relay)
15	rSt	Factory reset parameter.
		Level2 Parameter
16	Ent1	Sets control action for relay1 / SSR.
17	At	Runs auto tuning.
18	LYt	Sets cycle time for PID action.
19	P	Sets proportional band.
20	I	Sets integration time.
21	d	Sets differential time.
22	HYS1	Sets the hysteresis1
23	out	Sets Control1 output.
24	LoL	Lock keypad.
		Alarm Types
		LED Indications
		Error Messages
		Pro-key (On-request)
		Ordering Information

User Interface



Sr. No.	Description
1	Process Value (PV) RUN mode : Displays current measured value. SETTING mode : Displays parameter.
2	Set value (SV) RUN mode : Displays set value. Displays countdown time when Dwell timer is running. 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	→ Turns ON when keypad is locked.
10	Next key : Used to enters parameters level, moves to next parameters. Press & hold this key atleast 2 seconds to enter in set mode. Press & hold this key atleast 4 seconds to enter in Level1 Parameters. Press & hold this key atleast 6 seconds to enter in Level2 Parameters.
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

1. PT244-T-W2C34 / PT244-K-W2C34 - Two Relay
2. PT244-T-W2C30AA - Single Relay
3. PT244-T-W2C30 / PT244-K-W2C30 - Single Relay
4. PT244-T-W5C34 / PT244-K-W5C34 - Two 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	: (For all PT244-T / PT244-K) Relay : 5A, 230V AC (Res.) or SSR (field selectable) : 10V DC, 30mA Except - (For PT244-T-W2C30 / PT244-K-W2C30) Relay : 10A, 230V AC (Res.) or SSR (field selectable) : 10V DC, 30mA (For PT244-T-W2C30AA) Relay : 16A, 230V AC (Res.) or SSR (field selectable) : 10V DC, 30mA
Auxiliary output	: (For all PT244-T / PT244-K) Relay : 5A, 230V AC (Res.)
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 setting time for TC)
Sampling Period	: 1 second

Input types & Input range

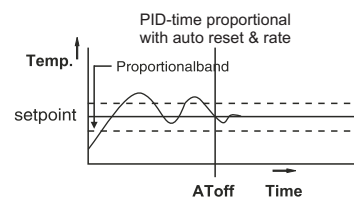
Input Type	Decimal Point	Display	Input Range (°C)
Thermocouple	J	J	-50 to 750°C
	K	K	-50 to 1200°C
RTD	Pt	rtd	-99 to 400°C
	100	rtd.1	-99.9 to 400.0°C

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.

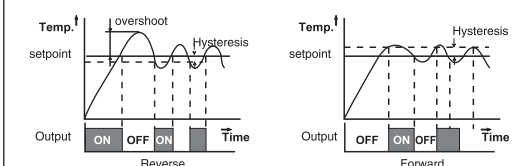
Note : In Auto Tuning running time, user can not change the parameter value.

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 lower than the set point.

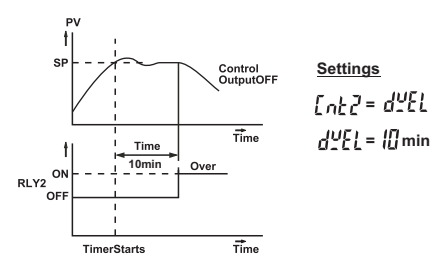
HYSTERESIS:

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



3. Dwell Timer :

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 completes, control output goes OFF and auxiliary output energises as an alarm.



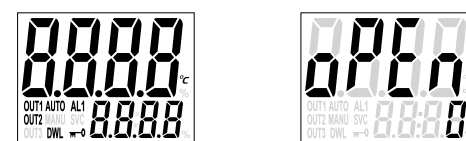
Settings
Ent2 = dWEL
dWEL = 10 min

Notes:

- 1) Countdown timer is displayed on the lower display. Once total time elapsed lower display will show "done". (Not applicable for PT244-K)
- 2) DWL icon LED blinking indicates that dwell timer is in progress. It switches to continuous 'ON' when dwell timer is over.
- 3) If Dwell time programmed as OFF, it will disable the dwell timer.
- 4) When soak in progress & dwell time is modified, new dwell time is applicable.
- 5) 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.
- 6) Once the timer output was energized it can be reset with the RST Reset key.

Initial Display when Power is ON

When power is On, entire display part will flash for 3 sec, software version will flash for 3 sec and then enter into RUN mode.



1. Entire display Part 2. Run Mode

Parameter Setting Mode

SET MODE	
1 SEt1	Function: To set control1 set point.
Press & hold [] key for 2 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	Function: To set control2 set point. (For 2 Relays)
This parameter is prompted only if Relay 2 is configured in Ent2.	
1. As absolute auxiliary control or as an alarm (High/Low) mode.	
2. As 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	Function: Sets the dwell time.
This parameter is prompted only if Relay 2 is configured in Ent2 as "dWEL".	
This parameter is prompted only if dWEL parameter in Ent1 is configured as YES. (Only for Single Relay)	
For dwell timer operation please refer Working section.	
Min Max Fac. OFF 9999 min OFF	

LEVEL1 Parameter	
Press & hold [] key for 4 seconds to enter into Level1 parameter setting (LEu1 will flash). When release the key, inpL 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 inpL	Function: Sets the type of input sensor .
While changing the sensor type SEt1, SEt2, ln 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.	
For J type sensor Min Max Fac. K rtd.1 J	
5 ln b	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 "ln b" 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. -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 will 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 will reset as HSV.

For J type sensor

Min	Max	Fac.
$L_{SV}+1$	750°C	750°C

8 d_{DEL} **Parameter** Function: To set Dwell Timer. (Only for Single Relay)

When Set to Y_{ES} Dwell timer is enabled.

Note: When selected dwell time can be set in Set Mode.

Min	Max	Fac.
n_0	Y_{ES}	n_0

9 H_{L-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 H_{L} (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.
L_{L-1}	$H_{SV}-1$	$H_{SV}-1$

(Message on display)

10 L_{L-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 L_{L} (Low temp) alarm indicating that the temperature has reached or gone below the value set in this parameter.

Min	Max	Fac.
$L_{SV}+1$	$H_{L}-1$	$L_{SV}+1$

(Message on display)

11 L_{nk2} **Parameter** Function: Sets control action for relay2. (only For 2 Relay)

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

n_0FF = No action
 rE = Reverse
 Fd = Forward

Min	Max	Fac.
n_0FF	d_{DEL}	rE

d_{DEL} = Dwell time

12 H_{YS2} **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 L_{nk2} 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

13 n_{od2} **Parameter** Function: Sets the alarm type. (only For 2 Relay)

It's applicable when L_{nk2} is rE (reverse) or Fd (forward).

Abs : Absolute
 dE_u : Deviation

For alarm types setting, please refer Alarm Type description.

Min	Max	Fac.
Abs	dE_u	Abs

14 A_{Lr_n} **Parameter** Function: Sets AL1 icon as alarm relay ON/OFF indicator for alarm indication. (only For 2 Relay)

Set " Y_{ES} " 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.
n_0	Y_{ES}	n_0

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)

15 r_{E1} **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.
n_0	Y_{ES}	n_0

LEVEL2 Parameter

Press & hold $[]$ key for 6 seconds to enter into Level2 parameter setting (L_{Lr_n} will flash). When release the key, L_{nk1} 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.

16 L_{nk1} **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

Min	Max	Fac.
rE	P_{Id}	P_{Id}

P_{Id} = PID

17 A_{Lr_n} **Parameter** Function: Runs auto tuning.

This parameter is used to set YES/NO to start and stop Auto-tuning. When Set as Y_{ES} , the unit starts auto-tuning. After Completing n_0 is automatically Set. During auto-tuning, the AUTO icon is continuously ON.

This parameter will be prompted only if selected control action is PID in L_{nk1} .

Min	Max	Fac.
n_0	Y_{ES}	n_0

18 $L_{Y_{ET}}$ **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

19 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

20 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

21 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

22 H_{YS1} **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 L_{nk1} 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

23 n_{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

24 L_{ok} **Parameter** Function: To lock keypad.

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

n_0 = unlocked parameter
 Y_{ES} = Locked parameter

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

Min	Max	Fac.
n_0	Y_{ES}	n_0

Keypad Locked

Alarm Types (only for Two Relay)

Setting	Alarm Type	Description
$L_{nk2} = Fd$ $A_{Lr_n} = Y_{ES}$ $n_{od2} = Abs$	Absolute value high limit alarm	SV = S_{ET2} Alarm ON when PV > SV + H_{YS2} Alarm OFF when PV = SV
$L_{nk2} = rE$ $A_{Lr_n} = Y_{ES}$ $n_{od2} = Abs$	Absolute value low limit alarm	SV = S_{ET2} Alarm ON when PV < SV - H_{YS2} Alarm OFF when PV = SV
$L_{nk2} = Fd$ $A_{Lr_n} = Y_{ES}$ $n_{od2} = dE_u$	Deviation high limit alarm	SV = $S_{ET1} + S_{ET2}$ FD Alarm ON when PV > SV + H_{YS2} Alarm OFF when PV = SV
$L_{nk2} = rE$ $A_{Lr_n} = Y_{ES}$ $n_{od2} = dE_u$	Deviation low limit alarm	SV = $S_{ET1} + S_{ET2}$ FD Alarm ON when PV < SV - H_{YS2} Alarm OFF when PV = SV
H_{L}	High temperature alarm	PV ≥ H_{L-R} (Only for Single Relay)
L_{L}	Low temperature alarm	PV ≤ L_{L-R} (Only for Single Relay)

* H_{YS2} : Alarm output hysteresis

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 disabled.
	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
n_0PE_n	Displays 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.
H_{L}	Temperature above the maximum high temperature limit.
L_{L}	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 " P_{roK} ". 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

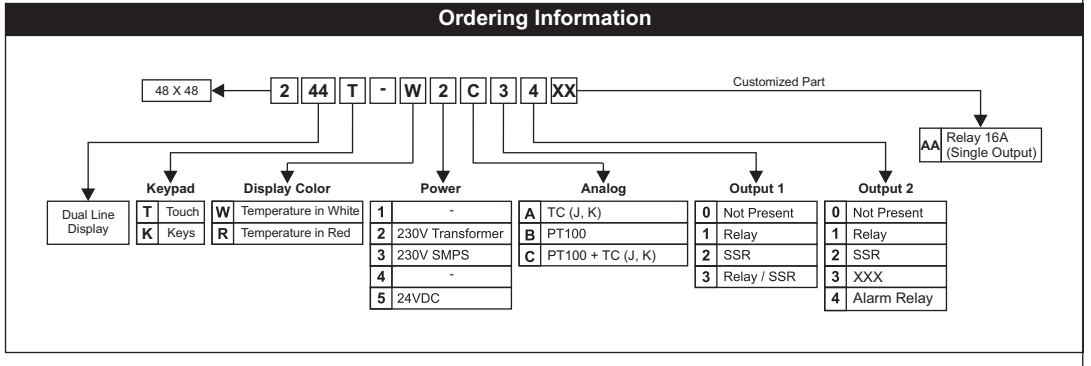
If user tries to enter Pro-key mode without inserting the pro key or with wrong connection, no further function will be activated after displaying " $[]$ " or " $[]$ ". Controller will display " P_{roK} ". Then switch off controller and insert the pro key properly and try to enter Pro key mode.

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 " $u \cdot dL$ " 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 " $d \cdot dL$ " once download is done. Once done press $[]$ key to exit and display will flash and return to normal mode.



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

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