OIM Px – 413 PID Digital Temperature Controller User Manual

USER'S OPERATING MANUAL FOR PID DIGITAL TEMPERATURE CONTROLLER
(Model: Px – 413 / 713)

Px - 413
(48 X 48)

Px - 713
(72 X 72)

Contents

SPECIFICATIONS

1. DISPLAY TYPE

    : 3 Digit 7 segment LED (Bright White)

Model No.	Px – 413	Px – 713
Display height (PV)	0.56″	0.80″

2. STATUS LED'S

    : OUT : Control Output Status

3. INPUT

Sensor input	: TC: J, K & RTD Pt-100
Range	: Refer below Table.

	d0/001.	d2t78 – 9t7 L-	000SV – 66-	(012I)00 kid
A0/00 LT-	d0/001.	d0666 – ZE	00666 – 0	0/1 (N)1V–I0
	d0/001.	d0666 – ZE	0009/ – 0	0/1 (r)mad
Aoeirmov	d0/30 uoRniosed	jo Joi a6ueN	00 Joi a6ueu	adAi Josuas

Sampling Time	: 125 msec.
Resolution	: 1°C / °F
CJC for TC	: Built in automatic
LWC for Pt-100	: Built in up to 18E max
Digital Filter	: 1 to 10 Sec.

4. RELAY OUTPUT

Contact Type	: N/O, N/C, COM
Contact Rating	: 5A @ 250VAC or 30 VDC
Life Expectancy	: > 5,00,000 operations
Isolation	: Inherent

5. SSR DRIVE OUTPUT

Drive Capacity	: 12V @ 30mA.
Isolation	: Non-Isolated.

6. FUNCTION

Output 1	: Main Control output (Selectable) 1) Relay 2) SSR

7. ENVIRONMENTAL

Operating Range	: 0 ~50°C, 5~90% Rh
Storage Humidity	: 95% Rh (Non-condensing)

8. POWER SUPPLY

Supply Voltage	: 90~270VAC, 50/60Hz.
Consumption	: 4W Maximum.

9. PHYSICAL

Housing	: ABS Plastic

INSTALLATION GUIDELINES

1. Prepare the cut-out with proper dimension as shown in figure.
2. Remove clamp from Controller.
3. Push the Timer through panel cut-out and secure the Controller in its place by tightening the side clamp.

SAFETY INSTRUCTION

MECHANICAL

- Ambient temperature and relative humidity surrounding the Controller must not exceed the maximum specified limits.
- The Controller in its installed state must be protected against excessive electrostatic or electromagnetic

interferences.

ELECTRICAL

- The Controller must be wired as per wiring diagram & it must comply with local electrical regulation.
- The Electrical noise generated by switching inductive loads might create momentary Fluctuation in display, latch up, data loss or permanent damage to the instrument. To reduce this use snubber circuit across the load.

TERMINAL CONNECTIONS:
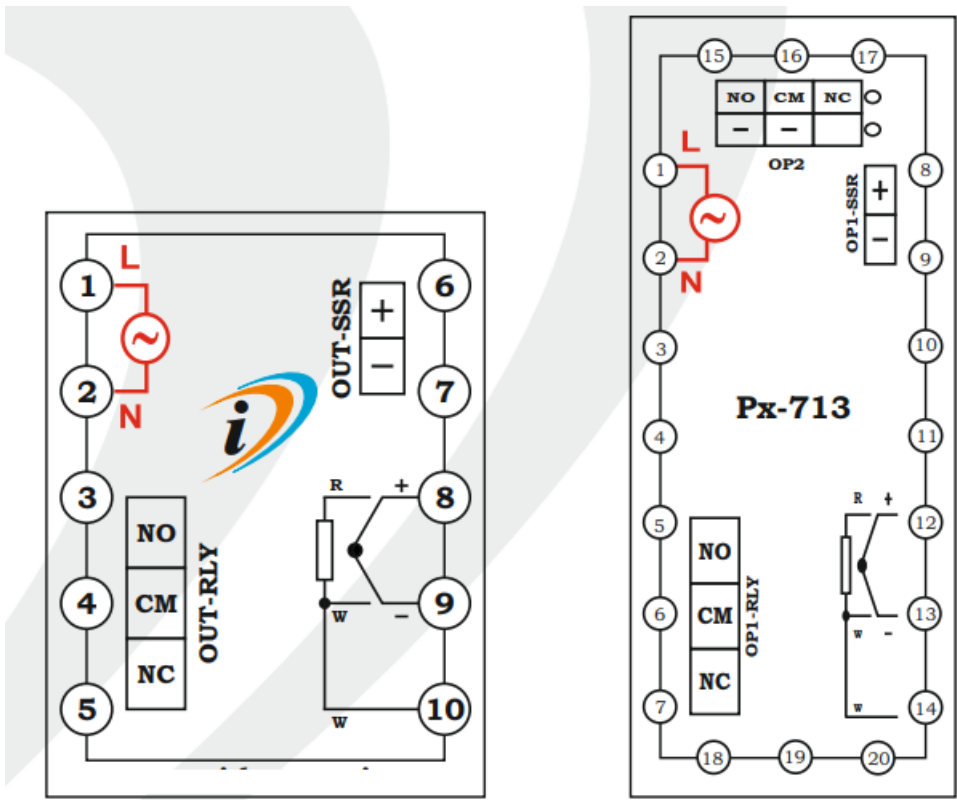
OVER ALL DIMENSIONS & PANEL CUT OUT (IN MM)
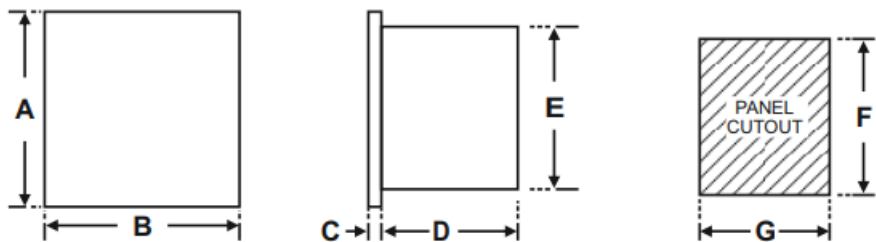
Dim Model	A	B	C	D	E	F	G
Px - 413	50	50	3	70	45	45	45
Px - 713	73	73	3	59	68	68	68

PROGRAMMING

USER LIST : To access the user list Press & Release SET key once.

Parameter	Display	Range	Description
Control Set Point	**5P** > `0`	LSPL – HSPL	User can change the SP value using UP/ DOWN and SHIFT keys. Holding the key will change the value at a faster rate. Press SET key to store the desired value.

CONTROL LIST: To enter in this mode press SET & DOWN key simultaneously for 3 sec.

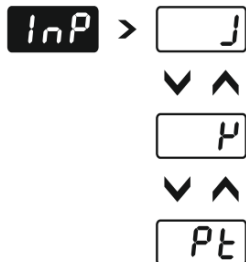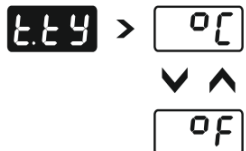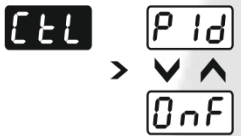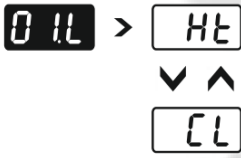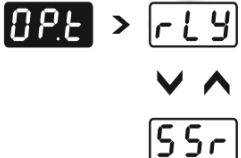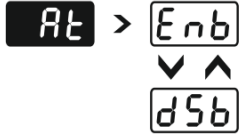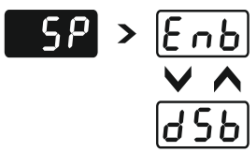| Parameter	Display	Range	Description	Default
Lock Code	**LCY** > `0`	1 – 9999	Set this parameter to 15 (Default LOCK CODE) to access Control List. User has a choice to set different Lock Code via USER LOCK CODE in Config. List.	15
Proportional Band	**Pb** > `5.0`	0.5 to 99.9°C	This parameter will be prompted only if selected control action is PID. It sets bandwidth over which the output power is adjusted depending upon the error (SV-PV). The value of this parameter is automatically set by Auto tune function.	5.0°C
Integral Time	**Int** > `240`	0 to 9999 Sec.	This parameter will be prompted only if selected control action is PID. It sets the time taken by PID algorithm to remove steady state error. Value of this parameter is automatically set by Auto Tune function. If set to '0', this function will be disabled.	240
Derivative Time	**dt** > `60`	0 to 300 Sec.	This parameter will be prompted only if selected control action is PID. It defines how strongly the Controller will react to the rate of change of PV. Value of this parameter is automatically set by Auto Tune function. If set to '0', this function will be disabled.	60
Cycle Time	**Ct** > `16.0`	0.5 0.User to 99.9 Sec.	This parameter will be prompted only if selected control action is PID. can set this value based on process being controlled & type of Output being selected. For Relay 0/P, cycle time should be more 12sec & for SSR 0/P, cycle time should be less than lOsec.	16.0 Sec.
Output Power Limit	**OPH** > `100`	0% to 100 %	This parameter will be prompted only if selected control action is PID. This parameter will decide the maximum output power in % applied to the load.	100%
Output Off	**0.0F** > `dSb`	1 to 10	This parameter will be prompted only if selected control action is PID. With this parameter 0/P will be Completely OFF after the Set Point + Offset Value. If Disable, 0/P will act Depending upon the PID Value after Set Point achieved.	Disable
Tune Offset	**t.0F** > `100`	50 % to 100 %	This parameter will be prompted only if selected control action is PID. This parameter allows the User to carry out Auto Tuning function below the set point. (If Tune offset is 50 % tuning will be carried out at 50 % of the set point and if 100 % tuning will be carried out at 100% of the set point.)	100%

Contro l Hys.	`HYS` > `2`	1 to 25 °C	This parameter will be prompted only if selected control action is ON-OFF. It sets the dead band between ON & OFF switching of the Output. Larger value of hysterisis minimize the number of ON-OFF operation of load.This increases life of actuators like contactors but also produces large errors (between PV & SV).	2°C
Delay	`dLY` > `0`	0 to 500 Sec.	This parameter will be prompted only if selected control action is ON-OFF. It sets the main output restart time where 0/P once turned OFF will turn ON only after restart time, regardless difference between PV & SP in Heat or Cool mode. If set to '0', 0/P will be switched without delay. Also, Delay will be applicable in case of every power ON.	0 Sec.

CONFIGURATION LIST :
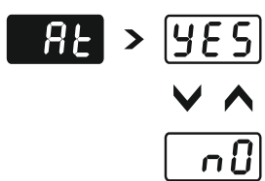
1. To enter in this mode, Press and hold SET & UP key simultaneously for 3 sec.
2. Press UP or DOWN key to scroll between parameter options.
3. Press SET key to store the current parameter & move on to the next parameter.

Param eter	Display	Description					Default
Lock C ode	`LCH` > `0`	Set this parameter to 15 (Default LOCK CODE) to access Config. List. User has a choice to set different Lock Code between 1 to 9999 via USER LOCK CODE in Config. List.					15
Input T ype	`InP` > `J` ∨ ∧ `H` ∨ ∧ `Pt`	This parameter value is set acco ding to the type of sensor (Thermocouple or RTD input) connected to the controller s input terminals.					
		Sensor Type	Range for °C	Range for °F	Resolution °C /°F	Accuracy	
		Fe-k(J) T/C	0 — 760°C	32 — 999° F	1°C/°F	±1°C/°F	
		Cr-AL(K) T/C	0 — 999°C	32 — 999° F	1°C/°F		
		Pt-100(RTD)	-99 — 450 °C	-146 — 84 2°F	1°C/°F		
Temp Type	`t.tY` > `°C` ∨ ∧ `°F`	°C : If selected, the instrument will display the temperature in °C.					°C
		°F : If selected, the instrument will display the temperature in °F.					
Lower LiSmit	`LSP` > `0`	Sets the minimum limit for set point adjustment. It can be set from minimum specified range of selected sensor to HSPL value. 0 C					°

Parameter	Display	Description	Default
Higher SP Limit	**HSP** > 400	Sets the maximum limit for set point adjustment. It can be set from L SPL value to maximum specified range of selected sensor.	° 400 400°C
Process Value Offset	**OFS** > 0	Function of this parameter is to add/subtract a constant value to the measured PV to obtain final PV for control applications. This parameter value can be altered : (i) To compensate for known thermal gradient. (ii)To match the display values with another recorder or indicator measuring the same PV.	0°C
Input Filter	**FLt** > 3	The controller is equipped with an adaptive digital filter which is used to filter out any extraneous pulses on the PV. The filtered PV Value is used for all PV dependent functions. If the PV signal is fluctuating due to noise, increase the filter time constant value.	
Control Mode	**Ctl** > Pld / OnF	User can select between PID or ON-OFF action algorithm to be adopted for output.	PID
Control Logic For Output	**O lL** > Ht	This parameter will be prompted only if selected control mode is ON-OFF. User can select heating logic in which OP1 will remain ON till PV < SR (PV increases when output is ON.)	Heat
	CL	This parameter will appear only if selected control mode is ON-OFF. User can select cooling logic in which OP1 will remain ON till PV > SR (PV decreases when output is ON.)	
Output Type	**OP.t** > rLY	User has to set this parameter very carefully in accordance with the output used. (Separate terminal for RELAY & SSR, Refer electrical installation) Select Relay if LOAD is connected via contactor. Whenever user selects Relay, Cycle time will automatically get set to 16 sec.	Relay
	SSr	Select SSR if LOAD is connected via SSR (DC voltage pulses). Whenever user selects SSR, Cycle time will automatically get set to 1sec. User can modify cycle time via control list.	
Overshoot Control Point	**OCP** > dSb	This parameter will be prompted only if selected control action is PID . Setting this parameter on higher side will proportionally slows down the rate of rise of PV to minimize overshoot (this may cause delay to reach SP). Disabling or Setting this parameter on lower side will proportionally increase the rate of rise of PV (which may cause overshoot). Disable this option if delay is not required to reach SP. (This may cause overshoot w.r.t. SP)	. Disable
Auto Tune	**At** > Enb / dSb	This parameter will be prompted only if selected control action is PID . If Enabled, this parameter will be prompted if user press Shift key for 3Sec.	
	dSb	If Disabled, this parameter will not be prompted if user press Shift key for 3Sec.	Enable

Set Point	**SP** > **Enb** ∨ ∧ **dSb**	If Enabled, User can View & edit the Set point (SP1) in USER list.	Enable
		If disabled, User can not View or edit Set Point (SP1) in USER list.	
User Lock Code	**U.LP** > **15**	Default USER LOCK CODE is 15 to access Control & Configuration List. User has a choice to set its own USER LOCK CODE between 1 to 9999, this is to prevent unauthorized access of Control & Configuration List.	15

AUTO TUNING MODE: To enter in this mode, Press & hold SHIFT key for minimum 3 sec in Run Mode.

Parameter	Display	Description	Default
Auto Tuning Mode	**At** > **YES** ∨ ∧ **nO**	This function will be executed only if selected control action is PID . Auto-tuning function is enabled by setting this parameter to 'YES'. The decimal of LSB flashes till Auto tuning function is in progress. During Auto-tuning, Controller learns the process characteristics by itself & calculates required P, I & D values. User can cancel or abort this feature by setting this parameter to 'NO'.	No

USER GUIDE:

ON-OFF ACTION: In this mode, Output (Relay/SSR) remains ON till actual temperature reaches to the set point value. On reaching SP, Output turns OFF & remains OFF till actual temperature drops down (in Heat logic) or raises (in Cool logic) equal to hysterisis set by User. (As shown in Fig : 3.1 & 3.2)
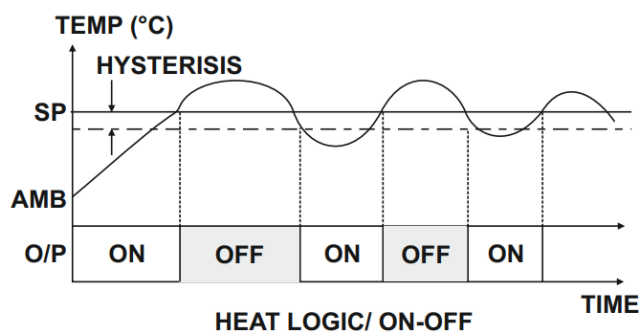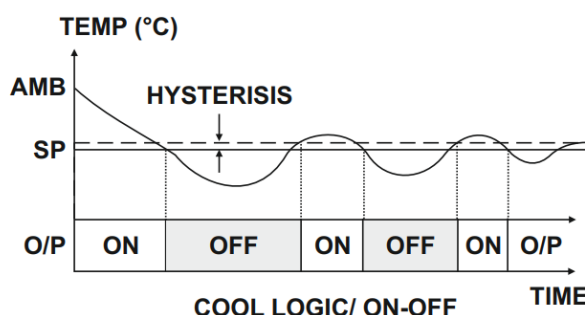

Fig : 3.1 HEAT LOGIC/ ON-OFF

Fig : 3.2 COOL LOGIC/ ON-OFF

AUTO TUNING MODE: In this mode, Controller learns the process characteristics by itself and calculates the required P,I & D values. It can be performed at any time after power ON but, it is best to start it when the process is at Ambient temperature in order to minimize overshoot & undershoot. Auto tuning is applied in case of :

1. Initial set up for a new process.

2. Substantial change in SP from previous auto tuning value.

3. Control accuracy is not satisfactory.

    If the control performance by using auto-tuning is still unsatisfactory, User can apply the further adjustments of

    P,I & D values as shown below

Adjust	Symptom	Solution
Proportional Band	Slow Response	Decrease PB
	Over Shoot or Oscillations	Increase PB
Integral Time	Slow Response	Decrease Int
	Instability or Oscillation	Increase Int
Derivative Time	Slow Response or Oscillation	Decrease Dt
	High Over Shoot	Increase Dt

Mfgd by: Innovative Instruments & Controls LLP
338, New Sonal Link Service Industrial Premises Co-op Society Ltd,
Building No.2, Link Road, Malad (W), Mumbai – 400064.
Tel: 022-66939916/17/18;
E-mail: **sales@itherm.co.in**
Website: **www.itherm.co.in**

https://www.youtube.com/channel/UCzWGtv0HuHUgZR4KKRyKG1w/videos

Documents / Resources

OIM Px - 413 PID Digital Temperature Controller [pdf] User Manual
Px - 413, Px - 713, Px - 413 PID Digital Temperature Controller, Digital Temperature Controller, Temperature Controller, Controller

References

- *i⁊* **Home - Itherm**
- *i⁊* **Home - Itherm**
- **User Manual**