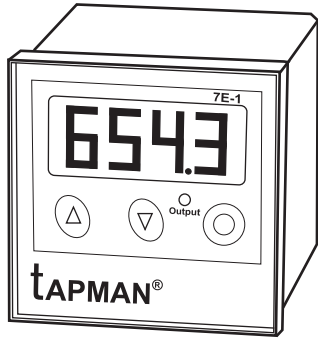# tAPMAN®

SINGLE OUTPUT TEMPERATURE CONTROLLER

OPERATING INSTRUCTIONS
Model: **7E1**

tAPMAN®

Congratulations
on selecting this state of the art microcontroller based instrument.

Please read the following before use

⚡ WARNING — Serious injury may result if instructions are not followed.

- This unit is not designed as a safety device.
- Failure of devices, such as the thermocouple/ RTD sensor, heater, output Relay, SSR or temperature controller itself can result in severe damage to a product while in process, melting of the heater or a damaging fire.
- An over-temperature protection device must be installed in your process that will remove all power from the heating circuit if the above failure occurs.
- Failure to install temperature limiting control protection where a potential hazard exists could result in damage to equipment and property and fatal injury to personal.

⚡ CAUTION — Product may be damaged or injury may result if instructions are not followed.

- This unit should be installed in a panel.
- Do not use the instrument outdoors.
- The protection device of this unit may be damaged if instructions are not followed.
- Do not use the instrument in places where there is excessive of dust, corrosive gases, oil spilling, high humidity, condensation, direct sunshine, radiant heat, vibration, shock occur.
- Unused terminals should not be used as jumper. As they may be connected internally.
- Clean the unit with dry cloth only after turning the power off.
- Do not modify or disassemble the unit.
- Power switch or a circuit breaker should be installed near the unit in order to cut the power supply.
- Do not connect power to sensor terminals.

Set Value Adjustment

The **Set value** can be adjusted when the controller is displaying the process temperature.

- ☞ Press the ◉ button. The display shows the SET VALUE.
- ☞ To change; keep the ◉ button pressed and using either ⓐ or ⓥ button to increase or decrease the set value respectively.
- ☞ Keeping either ⓐ or ⓥ button pressed for more than 2 seconds will result in a rapid change of the value.

Configuration

Before the controller can be used, it has to be configured properly. This can be done as follows:

- ✓ Remove power to the controller.
- ✓ Keep the ◉ button pressed and then apply power.

- ✓ When the display shows `CnF` release the ◉ button.
- ✓ On releasing the ◉ button the display shows `ESC`. ***
- ✓ Press the ⓐ button briefly the display shows `SEn`. Now press the ◉ button. The display now shows the selected sensor.
- ✓ Press ⓐ or ⓥ button to change the sensor.
- ✓ After the desired sensor is displayed, press the ◉ button again. The display now shows `SEn` again.
- ✓ Using ⓐ or ⓥ buttons navigate through the other configuration parameters.
- ✓ To change the value of any configuration parameter press ◉ button and then using ⓐ or ⓥ change to the desired value.
- ✓ After all the changes have been done use or button to comeback to `ESC`.

- ✓ To save the changes made, press the ◉ button when the display is still showing `ESC`.

*** If the controller is locked (Controller will be locked if the `LoC` configuration parameter has `CnF` or `ALL` value) then at step 4 above the user will be required to enter the correct password (as in `PAS`) in order to proceed.

Config Parameters
† is the factory default value.

`SEn`	**Sensor Selection**	
`Ptd`	Pt100$_{DIN}$	
`PtJ`	Pt100$_{JIS}$	
`ni`	Nickel$_{120}$	
† `J`	J type	
`K`	K type	
`E`	E type	
`t`	T type	
`hPtd`	Pt100$_{DIN}$	Res: **0.1°C**
`hPtJ`	Pt100$_{JIS}$	4 digit display model only
`hni`	Nickel$_{120}$	

`out`	**Control type**
† `hEAt`	Heating control
`CooL`	Cooling control

`Con`	**Control method**
† `o-F`	ON/OFF
`t-P`	Time Proportional

`LoC`	**Lock**
† `oPEn`	No Lock
`PAr`	Hysteresis-1, Band, Reset are locked.
`CnF`	Configuration parameters locked (Password protected)
`ALL`	Same as `PAr` + `CnF`

Config Parameters (continued)

`ont`	**ON Persistance time**
Significant only when `Con` is set to `o-F` Adj from 1 to 300 Seconds Default: 1 Sec.	

`oFt`	**OFF Persistance time**
Significant only when `Con` is set to `o-F` Adj from 1 to 300 Seconds Default: 1 Sec.	

`CYC`	**Cycle time**
Significant only when `Con` is set to `t-P` Adj from 2 to 300 Seconds Default: 8 Sec.	

`hdu`	**Maximum duty clamp**
Significant only when `Con` is set to `t-P` Adj from 60% to 95% Default: 90%	

`Ldu`	**Minimum duty clamp**
Significant only when `Con` is set to `t-P` Adj from 5% to 40% Default: 10%	

`hSP`	**Setpoint Max Value**
Adj within the sensor operation range.	

Operator will not be able to set the set point more than this value. Can be used to set the upper limit of Set point.

LSP — Setpoint Min Value

Adj within the sensor operation range.

Operator will not be able to set the set point less than this value. Can be used to set the lower limit of Set point.

oSP — Overshoot protect %

Adj from 70% to 100%.

When the system is first turned on, to prevent overshoot; Setvalue considered by controller is a percent of the actual Set Value set by the user. Once the Process temperature crosses this point controller ignores this percentage. If this value is set to 100 then Off shoot protection is disabled.

PAS — Password

Adj from 0 to 999

User defined password for unlocking.

dEF — Factory default

| † uSEr | No change |
| FAC | Reset to Fac defaults |

On selecting FAC here the user can load all parameters with the Factory default values.

iPC — Input correction

Adj from -19.9° to 99.9° Centegrade.

Zero adjustment of sensor input.

ESC — Escape / Exit

Pressing the ◉ button at this parameter will save the changes and make the controller come out of config mode.
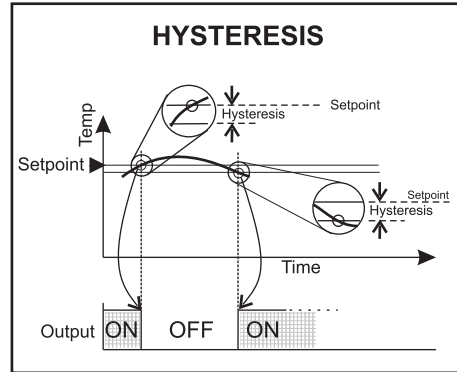
ON/ OFF Control

⊕ In this mode the output is switched OFF when the Process temperature crosses the Set Value.

⊕ When the process temperature falls back the output is turned ON again.
⊕ The difference between the point where the output is turned OFF and the point where it is turned back ON is called as the Hysteresis.
⊕ Hysteresis is expressed in °C.

HYSTERESIS

Hysteresis Adjustment

When the controller is displaying the Process temperature; hysteresis value can be changed as follows:
☞ Press the ⓐ button for more than 2 seconds. The display shows hYS and then the hysteresis value will be displayed.
☞ The display will be flashing.
☞ Leave the ⓐ button.
☞ To change, press ⓐ or ⓥ to increase or decrease the value respectively.
☞ To save this new hysteresis value, press the ◉ button while the display is still flashing.
☞ If the ◉ button is not pressed while the display is flashing, then the new value will be lost.

PERSISTENCE Time

✓Persistence time is the time for which the Output remains in a given state.
✓Without any control on the persistence time, the o/p is turned OFF the moment PV crosses the SV and turned back ON the moment PV falls below (SV-Hysteresis), assuming Heating mode is selected.
✓ In this model the minimum persistence time can be defined using the "Persistence Time" settings.

Example
➢If the "Persistence Time" is set to 40 Seconds, then the o/p will, as expected turn OFF the moment PV crosses the SV. But it will remain in this OFF state for at least 40 Seconds even if PV falls below (SV- Hysteresis).
➢This setting is really useful when the controlled system has heating (or cooling) device that should not be switched ON and OFF very fast.
➢It is especially useful when controlling air conditioning compressors and gas fired burners.
✓Similarly OFF persistence time can also be defined using the parameter oFt.

TIME PROPORTIONAL Control

This mode gives a closer control than the On-Off type.
⊕ In this mode the amount of Heat or (Cooling) going into the system is controlled by periodically turning ON and OFF the Output (Relay or SSR).
⊕ The time interval between two successive ON's is typically fixed and is called the Cycle time.
⊕ The amount of time the o/p remains ON varies in proportion to the deviation of the process temp

⊕ from the set value. This means that the duty cycle of the o/p is changed to control the system.
⊕ To prevent very short ON time the minimum duty cycle that the output assumes can be limited.
⊕ For example; The Minimum duty is set to 30% and the cycle time is set to 10 Seconds, then during the operation of the system the shortest ON time of the output will be 3 seconds.
⊕ Max duty is adjustable from 60% to 90%. At 90% and cycle time of 10 Sec, during the operation of the system the shortest OFF time of the output will be (100% - 90% = 10%) = 1 second.
⊕ The proportional action occurs within a range of temperature called the proportional BAND, expressed in ° C.

BAND Adjustment

When the controller is displaying the Process temperature; BAND can be changed as follows:
☞Press the ⓐ button for more than 2 seconds. The display shows bAnd and then the BAND value will be displayed.
☞The display will be flashing. Leave the ⓐ button.
☞To change, press ⓐ or ⓥ to increase or decrease the value respectively.
☞To save this new value, press the ◉ button while the display is still flashing.
☞If the ◉ button is not pressed while the display is flashing, then the new value will be lost.

⊕The band is normally centered about the Set Value. Hence at Set Value the o/p remains ON for the same amount of time as it remains OFF, i.e. the duty cycle is 50%.
⊕The Time proportional action is limited to the band below the Set Value. When the Process value crosses the Set Value the o/p is put OFF.
⊕The band can be positioned about the Set Value by using the RESET setting.
⊕RESET setting is the offset of the BAND from the Set Value; it is expressed in ° C.

RESET Adjustment

When the controller is displaying the Process temperature RESET can be changed as follows:
☞Press the ⓥ button for more than 2 seconds. The display shows rSt and then the RESET value will be displayed.
☞The display will be flashing.
☞Leave the ⓥ button.
☞To change, press ⓐ or ⓥ to increase or decrease the value respectively.
☞To save this new Band value, press the ◉ button while the display is still flashing.
☞If the ◉ button is not pressed while the display is flashing, then the new value will be lost.

Sensor Ranges

Sensor	3 Digit Model		4 Digit Model	
	Min	Max	Min	Max
Pt100$_{DIN}$	-99°C	660°C	-160°C	660.0°C
Pt100$_{JIS}$	-99°C	660°C	-160°C	660.0°C
Nickel$_{120}$	-80°C	260°C	-80°C	260.0°C
J	-99°C	870°C	-99°C	870°C
K	-99°C	999°C	-99°C	1300°C
E	-99°C	660°C	-99°C	660°C
T	-99°C	400°C	-99°C	400°C

ERROR Diagnosis

The instrument display flashes oPEn if

Condition 1: Sensor selected is Thermocouple:
Cause: Sensor is open or internal cold junction compensation circuit is damaged.
Short Terminals 1 and 2 together and then check again.
➔ If the display still flashes then the problem is internal to the unit. In this case send back the unit to the factory for service.
➔ If the display starts showing the room temperature, then check the wiring connection to the thermocouple.

Condition 2: Sensor selected is RTD:
Cause: Sensor is open or short circuited.
➔Connect a known good sensor to the unit and then check again.
➔If the display no longer flashes then check the wiring connection to the RTD