

'Temperature + Humidity' Control and Recording System



HumiTherm Plus 96

128 X 64 Pixels Monochrome Graphic Display
Built-in Data Recording & Self-Tune PID Control
Water Level & Door Status Monitoring

Process Precision Instruments
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Maharashtra, India

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User Manual

PC Interface with 21 CFR Software



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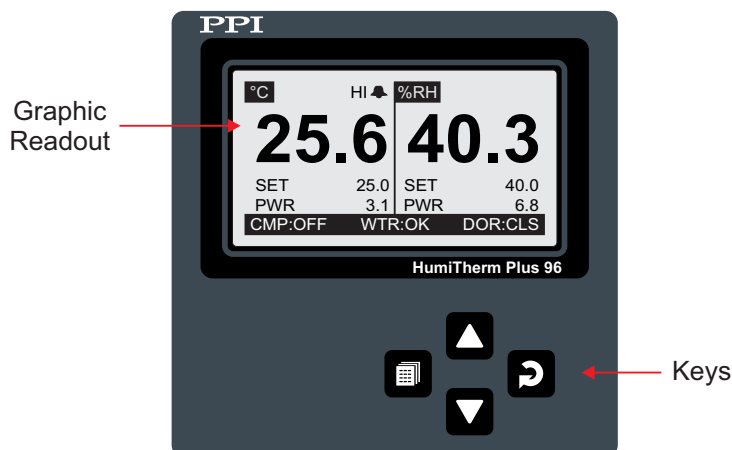
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Section 1

FRONT PANEL LAYOUT

The Controller front panel comprises of Graphic Readout and membrane keys as shown in Figure 1.1 below.

Figure 1.1



GRAPHIC READOUT

The Graphic Readout is a 128 X 64 Pixel Monochrome LCD Display. In Normal operation mode the display shows measured Process Values, Set Values, Output Powers, Alarm Status, Compressor On/Off Status, Water Level Status, Door Open/Close Status, Mains Fail Status & RTC Date/Time.

In Set-up Mode, the user can edit various parameters grouped under different access levels using front panel keys.

KEYS

There are four tactile keys provided on the front panel for configuring the controller and setting-up the parameter values.

The Table 1.1 below lists each key (identified by the front panel symbol) and the associated function.

Table 1.1

Symbol	Key	Function (in Set-up Mode)
	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 in setup mode. Can also be used as Alarm Acknowledgment in normal operation mode.

Section 2 BASIC OPERATIONS

POWER-UP DISPLAY

Upon powering up, the display shows the Model Name (HumiTherm Plus 96) followed by the controller hardware & software versions for approximately 2 seconds each as shown in figure 2.1(a) & 2.1(b).

Figure 2.1 (a)

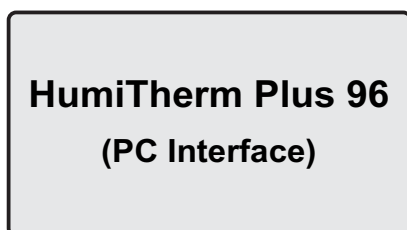


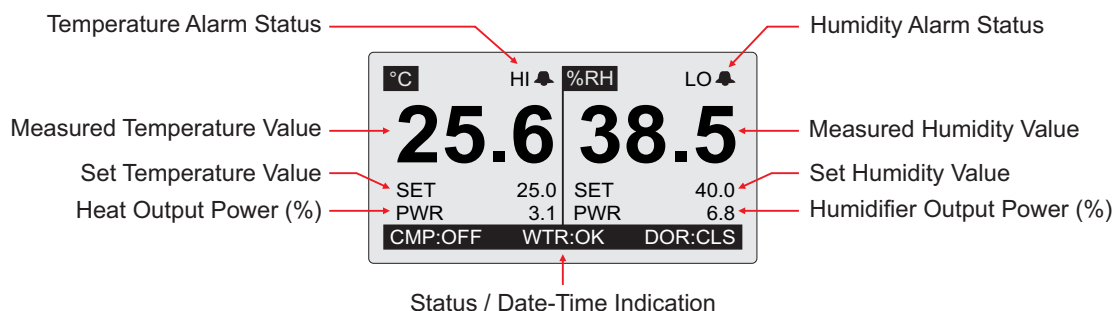
Figure 2.1(b)



HOME SCREEN

After the Power-up display sequence the controller enters into RUN Mode. This is the normal operation mode wherein the controller starts PV Measurements, Alarm Monitoring and Control Loop execution. The display screen comprises the default Home Screen & the Records Status Screen. The Home Screen is depicted in the figure 2.2 below.

Figure 2.2



The Status & Date-Time indication can be toggled using Up key.

PV Error Indication

In case of measured temperature & humidity value errors, the messages listed in Table 2.1 are displayed in place of process values.

Table 2.1

Message	Error Type	Cause
OPN	Sensor Open	Sensor (RTD Pt100) Broken / Open. Not Applicable for %RH indication.
OVR	Over-range	Measured Temperature / %RH value is above 99.9 °C / % (Max. displayable value).
UNR	Under-range	Measured Temperature / %RH value is below 0.0 °C / % (Min. displayable value).

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Alarm / Tuning Status Indication



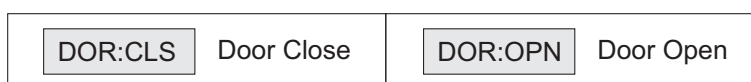
Compressor Status Indication



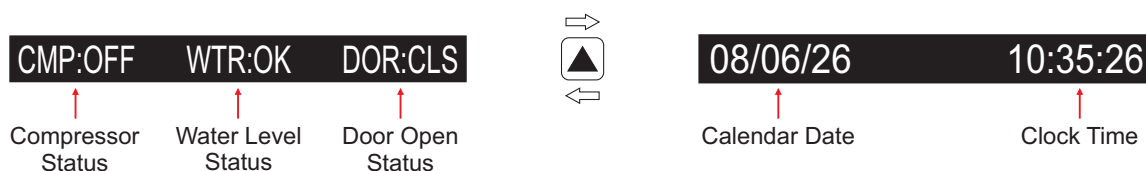
Water Level Status Indication



Door Status Indication



Status / Date-Time Indication



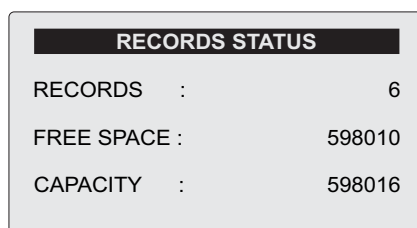
If Mains Fail feature is enabled (battery back-up provided), under mains failure the status screen also indicates 'MAINS FAIL' message. Use Up key to toggle status message and date/time as shown below.



RECORDS STATUS SCREEN

This screen is accessible using Enter key from the Home Screen. It shows the number of records stored, free space available for new records and the total record storage capacity.

Use Enter key to return to Home Screen.



Section 3

SET-UP MODE : ACCESS LEVELS & PARAMETER CONFIGURATION

The HumiTherm Plus 96 Process Data Recorder organizes various device and channel configuration parameters into hierarchical groups, called Levels and Sub-Levels. These groupings are structured based on access permissions and functional categories. Each level and sub-level is uniquely named and represented by an icon for easy identification.

The three **Access Levels** are:

- **Operator**
- **Supervisory** (Password Protected)
- **Factory** (Password Protected)

Each access level contains multiple **Sub-Levels**, which contain specific parameters. Within these sub-levels, parameters are always displayed in a fixed sequence:

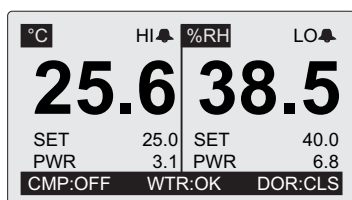
- **Upper row** : Parameter name
- **Lower row** : Configurable value

All parameters appear in the exact order outlined in their respective sections of this manual.

Entering Set-Up Mode

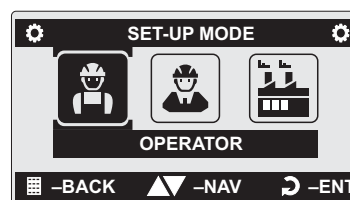
Set-Up Mode allows users to view and modify parameter values. Follow the below steps to access and configure parameters:

Step 1 : Access Set-Up Mode



Home Screen

Figure 3.1

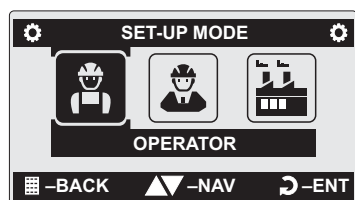


Set-Up Mode Screen

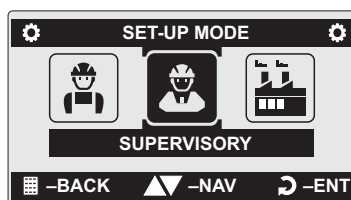
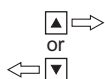
From the Home Screen, press and release the Page key. The SET-UP MODE screen will appear, displaying the available access levels (Figure 3.1).

Step 2 : Selecting an Access Level

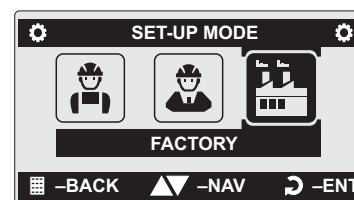
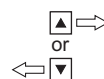
Figure 3.2



Selected Level : Operator



Selected Level : Supervisory

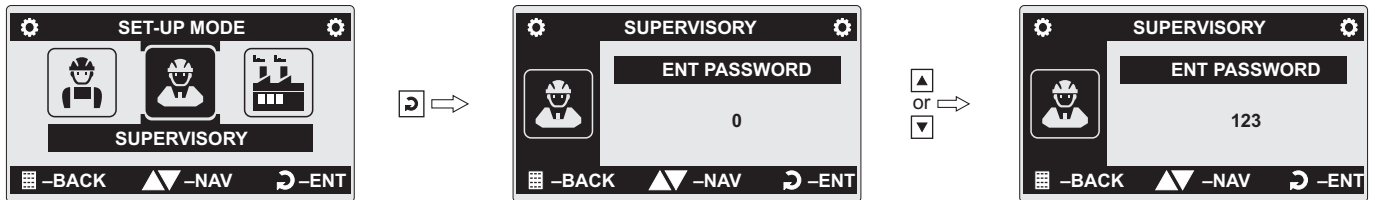


Selected Level : Factory

Use the Up/Down keys to navigate through the access levels. The currently selected access level is highlighted with an inverted colour scheme (white icon on a black background). Press Enter to confirm your selection.

Step 3: Entering a Password (If Required)

Figure 3.3

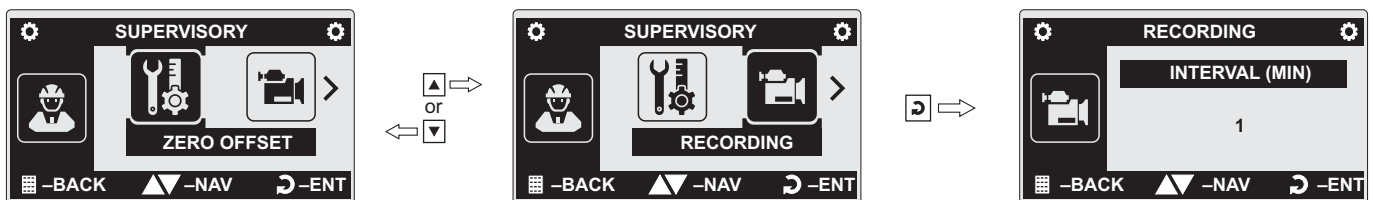


If the selected access level requires authentication, the **Enter Password** screen will appear. Use the **Up/Down** keys to enter the password (Figure 3.3). The default passwords are 123 for Supervisory and 321 for Factory access levels.

Press **Enter** to proceed. If the password is incorrect, the device will revert to the access level selection screen.

Step 4: Navigating Sub-Levels

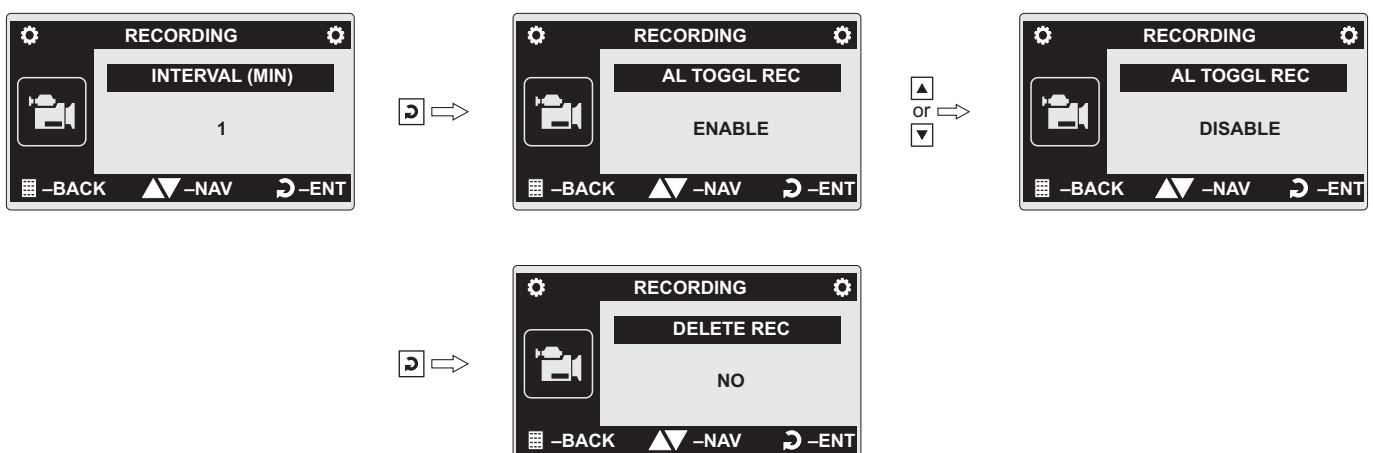
Figure 3.4



Once inside an access level, use the Up / Down keys to navigate and select a sub-level. Press Enter to access the parameters within the selected sub-level. The figure 3.4 above illustrates how to access the parameters within sub-level DATE / TIME under Supervisory access level.

Step 5: Editing Parameters

Figure 3.5



Once inside a sub-level, use Enter key to navigate through the parameters. Use the Up/Down keys to adjust the parameter value. Press Enter to save the modified value and proceed to the next parameter. The figure 3.5 above illustrates navigating to the parameters AL TOGGL REC within sub-level RECORDING under Supervisory access level and modifying its value from ENABLE to DISABLE.

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Summary of Access Levels, Sub-Level, and Parameters

Below is an overview of the available sub-levels and their corresponding parameters within each access level:

Access Level	Sub-Levels	Parameters
 OPERATOR	 °C SETPOINTS	Control Setpoint, Low Deviation Alarm, High Deviation Alarm
	 RH SETPOINTS	Control Setpoint, Low Deviation Alarm, High Deviation Alarm
 SUPERVISORY	 ZERO OFFSET	Temperature Offset RH Offset
	 RECORDING	Periodic Interval (Minutes), Enable Alarm Toggle Record, Delete Records, Device ID
	 DATE / TIME	Date (DD), Month (MM), Year (YYYY) Hours (hh), Minutes (mm), Sync
	 BUZZER	Enable / Disable on Alarm
	 CHANGE PSW	Change Password New Password
 FACTORY	 °C SETTINGS	Alarm Settings Control Settings, Sensor Input
	 RH SETTINGS	Alarm Settings Control Settings, Sensor Input
	 COMPRESSOR	Compressor Strategy (Off, On, SP Based, PV Based) Setpoint Offset, Hysteresis, Time Delay (Sec)

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Access Level	Sub-Levels	Parameters
 FACTORY	 WATER LEVEL	Enable, Water Strategy, Switch-1 Logic
	 DOOR OPEN	Enable, Switch Logic, Door Delay (Sec)
	 MAINS FAIL	Enable Switch Logic
	 RESET PARA	Reset
	 CHANGE PSW	Change Password New Password
	 UTILITIES	Reserved.



Section 4

OPERATOR ACCESS LEVEL PARAMETERS

Table 4.1

   OPERATOR °C SETPOINTS	
Parameter Description	Settings (Default Value)
CTRL SETPOINT (Control Setpoint) Set Value for Temperature Control.	SP Low Limit to SP High Limit (Default : 25.0)
LO DEV ALARM (Low Deviation Alarm) This Parameter sets a negative deviation (offset) limit with respect to the ' <i>Control Set-point</i> ' for Temperature. The Alarm is activated if the measured temperature value falls below this limit.	0.2 to 99.9 (Default : 2.0)
HI DEV ALARM (High Deviation Alarm) This Parameter sets a negative deviation (offset) limit with respect to the ' <i>Control Set-point</i> ' for Temperature. The Alarm is activated if the measured temperature value exceeds this limit.	0.2 to 99.9 (Default : 2.0)
   OPERATOR RH SETPOINTS	
Parameter Description	Settings (Default Value)
CTRL SETPOINT (Control Setpoint) Set Value for Humidity Control.	SP Low Limit to SP High Limit (Default : 60.0)
LO DEV ALARM (Low Deviation Alarm) This Parameter sets a negative deviation (offset) limit with respect to the ' <i>Control Set-point</i> ' for Humidity. The Alarm is activated if the measured Humidity value falls below this limit.	0.2 to 99.9 (Default : 2.0)
HI DEV ALARM (High Deviation Alarm) This Parameter sets a negative deviation (offset) limit with respect to the ' <i>Control Set-point</i> ' for Humidity. The Alarm is activated if the measured Humidity value exceeds this limit.	0.2 to 99.9 (Default : 2.0)



Section 5

SUPERVISORY ACCESS LEVEL PARAMETERS

The various parameters have been assembled in groups and sub-groups under the default factory set password 123.

Table 5.1

  SUPERVISORY > ZERO OFFSET	
Parameter Description	Settings (Default Value)
°C OFFSET This value is algebraically added to the measured Temperature Value to derive the final Value that is displayed and compared for alarm / control. Use this value to nullify any known constant error. Final Temperature = Measured Temperature + °C Offset	-50.0 to 50.0 (Default : 0.0)
RH OFFSET This value is algebraically added to the measured Humidity Value to derive the final Value that is displayed and compared for alarm / control. Use this value to nullify any known constant error. Final Humidity = Measured Humidity + RH Offset	-50.0 to 50.0 (Default : 0.0)
  SUPERVISORY > RECORDING	
Parameter Description	Settings (Default Value)
INTERVAL (MIN) - Periodic recording interval in Minutes. - Setting to 0 disables periodic recording.	0 to 250 (Min) (Default : 5 Min)
AL TOGGL REC (Alarm Toggle Records) - If enabled, a record is generated each time an alarm changes its state from off-to-on or on-to-off. - Disabling this parameter turns off record generation on alarm status change.	Disable Enable (Default : Enable)
DELETE REC (Delete Records) This parameter deletes all the records from the controller memory.	No Yes (Default : No)
DEVICE ID - The MODBUS Slave ID for communication with the host PC. - The Baud Rate and Parity are fixed to 9600 bps & Even, respectively. - This port is used for online / offline data transfer using host PC.	1 to 127 (Default : 1)

 SUPERVISORY >  DATE & TIME	
Parameter Description	Settings
DATE (DD) Calendar date.	1 to 31
MONTH (MM) Calendar month.	1 to 12
YEAR (YYYY) Calendar year.	2000 to 2099
HOURS (hh) Time in hours. (24 hours format)	0 to 23
MINUTES (mm) Time in minutes.	0 to 59
SYNC To accurately synchronize the RTC with a reference clock: - Set the Date, Month, Year, Hours, and Minutes parameters. - Set the Minutes value 1 or 2 minutes ahead of the current reference time. - Set the Sync parameter to Yes. - Wait until the reference clock reaches the same minute value as the configured Minutes setting. - Immediately press the Enter key. Upon pressing Enter, the configured date and time are written to the RTC, with the Seconds value automatically set to 00. Example: If the reference clock shows 10:25:40, set the RTC parameters as required and set Minutes = 27. Set Sync = Yes. Wait until the reference clock reaches 10:27:00, then immediately press the Enter key. The RTC will be updated with the configured date and time, and the seconds value will be set to 00.	No Yes (Default : No)

 SUPERVISORY >  BUZZER	
Parameter Description	Settings (Default Value)
ON ALARM Enables / disables buzzer beeping on alarm activation.	DISABLE ENABLE (Default : ENABLE)
 SUPERVISORY >  CHANGE PSW	
Parameter Description	Settings (Default Value)
CHANGE PSW (Change Password) - Allows changing the Supervisory Access Level password. - Set to yes for changing the password. - Factory default is 123.	NO YES (Default : NO)
NEW PASSWORD Set new numeric password for Supervisory Access Level access.	0 to 9999



Section 6

FACTORY ACCESS LEVEL PARAMETERS

The various parameters have been assembled in groups and sub-groups under the default factory set password 321.

For convenience this Temperature Settings group is further divided into 3 sub-groups : Alarm Parameters, Control Parameters & Sensor Input Parameters.

 FACTORY >  °C SETTINGS	
Select Group > ALARM	
Parameter Description	Settings (Default Value)
HYSTERESIS This parameter sets a differential (dead) band between the ON and OFF Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.	0.1 to 99.9 (Default : 0.2)
INHIBIT NO The Alarm is not suppressed during the start-up Alarm conditions. YES The Alarm activation is suppressed until the Temperature value is within Alarm limits from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions.	NO YES (Default : YES)
Select Group > CONTROL	
Parameter Description	Settings (Default Value)
TUNE Set 'NO' to abort and 'YES' to activate the Tuning operation. <i>Note :</i> The tuning is always performed simultaneously for both Temperature & Humidity.	NO YES (Default : NO)
SP LO LIMIT (Setpoint Low Limit) Minimum permissible setpoint value for Temperature control.	-99.9 to SETPOINT HI LIMIT (Default : 10.0)
SP HI LIMIT (Setpoint High Limit) Maximum permissible setpoint value for Temperature control.	For RTD : SETPOINT LO LIMIT to 850.0 °C For mA/V : SETPOINT LO LIMIT to 999.9 (Default : 60.0)

Parameter Description	Settings (Default Value)
Control Zones : Dual	
CZ PROP BAND Sets proportional band for Cool Pre-dominant zone.	0.1 to 999.9 (Default : 50.0)
CZ INTEG TIME Sets integral time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off integral action.	0 to 3600 Sec (Default : 100 Sec)
CZ DERIV TIME Sets derivative time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off derivative action.	0 to 600 Sec (Default : 16 Sec)
HZ PROP BAND Sets proportional band for Heat Pre-dominant zone.	0.1 to 999.9 (Default : 50.0)
HZ INTEG TIME Sets integral time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off integral action.	0 to 3600 Sec (Default : 100 Sec)
HZ DERIV TIME Sets derivative time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off derivative action.	0 to 600 Sec (Default : 16 Sec)
CYCLE TIME >> Sets the total 'On + Off' time in seconds for time proportional power output through Relay / SSR.	0.5 to 100.0 Sec (Default : 1.0 Sec)
Control Zones : Single	
PROP BAND (Proportional Band) Sets proportional band (% output power per unit error).	0.1 to 999.9 (Default : 50.0)
INTG TIME (Integral Time) Sets integral time constant in Seconds. Setting the value to 0, cuts-off integral action.	0 to 3600 Sec (Default : 100 Sec)
DERIV TIME (Derivative Time) Sets derivative time constant in seconds. Setting the value to 0, cuts-off derivative action.	0 to 600 Sec (Default : 16 Sec)
CYCLE TIME Sets the total 'On + Off' time in seconds for time proportional power output through Relay / SSR.	0.5 to 100.0 Sec (Default : 1.0 Sec)

Select Group > SENSOR INPUT																				
Parameter Description	Settings (Default Value)																			
INPUT TYPE Select Input type in accordance with the type of Temperature sensor / transmitter connected for measurement.	RTD Pt100 0-20mA 4-20mA 0-5V 0-10V 1-5V (Default : RTD Pt100)																			
SIGNAL LO <i>(Available for DC linear V & mA Inputs only)</i> The transmitter output signal value corresponding to Range Low process value. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	<table border="1"> <thead> <tr> <th>Input Type</th><th>Settings</th><th>Default</th></tr> </thead> <tbody> <tr> <td>0 to 20 mA</td><td>0.00 to Signal High</td><td>0.00</td></tr> <tr> <td>4 to 20 mA</td><td>4.00 to Signal High</td><td>4.00</td></tr> <tr> <td>0 to 5 V</td><td>0.000 to Signal High</td><td>0.000</td></tr> <tr> <td>0 to 10 V</td><td>0.00 to Signal High</td><td>0.00</td></tr> <tr> <td>1 to 5 V</td><td>1.000 to Signal High</td><td>1.000</td></tr> </tbody> </table>		Input Type	Settings	Default	0 to 20 mA	0.00 to Signal High	0.00	4 to 20 mA	4.00 to Signal High	4.00	0 to 5 V	0.000 to Signal High	0.000	0 to 10 V	0.00 to Signal High	0.00	1 to 5 V	1.000 to Signal High	1.000
Input Type	Settings	Default																		
0 to 20 mA	0.00 to Signal High	0.00																		
4 to 20 mA	4.00 to Signal High	4.00																		
0 to 5 V	0.000 to Signal High	0.000																		
0 to 10 V	0.00 to Signal High	0.00																		
1 to 5 V	1.000 to Signal High	1.000																		
SIGNAL HI <i>(Available for DC linear V & mA Inputs only)</i> The transmitter output signal value corresponding to Range High process value. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	<table border="1"> <thead> <tr> <th>Input Type</th><th>Settings</th><th>Default</th></tr> </thead> <tbody> <tr> <td>0 to 20 mA</td><td>Signal Low to 20.00</td><td>20.00</td></tr> <tr> <td>4 to 20 mA</td><td>Signal Low to 20.00</td><td>20.00</td></tr> <tr> <td>0 to 5 V</td><td>Signal Low to 5.000</td><td>5.000</td></tr> <tr> <td>0 to 10 V</td><td>Signal Low to 10.00</td><td>10.00</td></tr> <tr> <td>1 to 5 V</td><td>Signal Low to 5.000</td><td>5.000</td></tr> </tbody> </table>		Input Type	Settings	Default	0 to 20 mA	Signal Low to 20.00	20.00	4 to 20 mA	Signal Low to 20.00	20.00	0 to 5 V	Signal Low to 5.000	5.000	0 to 10 V	Signal Low to 10.00	10.00	1 to 5 V	Signal Low to 5.000	5.000
Input Type	Settings	Default																		
0 to 20 mA	Signal Low to 20.00	20.00																		
4 to 20 mA	Signal Low to 20.00	20.00																		
0 to 5 V	Signal Low to 5.000	5.000																		
0 to 10 V	Signal Low to 10.00	10.00																		
1 to 5 V	Signal Low to 5.000	5.000																		
RANGE LO <i>(Available for DC linear V & mA Inputs only)</i> The process value corresponding to the Signal Low value from the transmitter. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	-99.9 to 999.9 Counts (Default : 0.0)																			
RANGE HI <i>(Available for DC linear V & mA Inputs only)</i> The process value corresponding to the Signal High value from the transmitter. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	-99.9 to 999.9 Counts (Default : 100.0)																			
FILTER Sets the time constant, in seconds, for the low-pass digital filter applied to the measured temperature. The filter helps smoothing / averaging the signal input and removing the undesired noise. The higher the filter value the lower the indication response to the PV changes and vice-a-versa.	0.5 to 60.0 Seconds (in steps of 0.5 Seconds) (Default : 2.0 sec.)																			

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For convenience this Humidity (%RH) Settings group is further divided into 3 sub-groups : Alarm Parameters, Control Parameters & Sensor Input Parameters.

 FACTORY >  RH SETTINGS	
Select Group > ALARM	
Parameter Description	Settings (Default Value)
HYSTERESIS This parameter sets a differential (dead) band between the ON and OFF Alarm status change. Keep it large enough to avoid frequent switching of the Alarm Status/Relay.	0.1 to 99.9 (Default : 0.2)
INHIBIT NO The Alarm is not suppressed during the start-up Alarm conditions. YES The Alarm activation is suppressed until the Humidity value is within Alarm limits from the time the controller is switched ON. This allows suppressing the Alarm during the start-up Alarm conditions.	NO YES (Default : YES)
Select Group > CONTROL	
Parameter Description	Settings (Default Value)
TUNE Set 'NO' to abort and 'YES' to activate the Tuning operation. <i>Note</i> : The tuning is always performed simultaneously for both Temperature & Humidity.	NO YES (Default : NO)
SP LO LIMIT (Setpoint Low Limit) Minimum permissible setpoint value for Humidity control.	0% to SETPOINT HI LIMIT (Default : 0%)
SP HI LIMIT (Setpoint High Limit) Maximum permissible setpoint value for Humidity control.	SETPOINT LO LIMIT to 100.0% (Default : 100.0%)

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Parameter Description	Settings (Default Value)
Control Zones : Dual	
CZ PROP BAND Sets proportional band for Cool Pre-dominant zone.	0.1 to 999.9 (Default : 50.0)
CZ INTG TIME Sets integral time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off integral action.	0 to 3600 Sec (Default : 100 Sec)
CZ DERIV TIME Sets derivative time constant in Seconds for Cool Pre-dominant zone. Setting the value to 0, cuts-off derivative action.	0 to 600 Sec (Default : 16 Sec)
HZ PROP BAND Sets proportional band for Heat Pre-dominant zone.	0.1 to 999.9 (Default : 50.0)
HZ INTG TIME Sets integral time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off integral action.	0 to 3600 Sec (Default : 100 Sec)
HZ DERIV TIME Sets derivative time constant in Seconds for Heat Pre-dominant zone. Setting the value to 0, cuts-off derivative action.	0 to 600 Sec (Default : 16 Sec)
CYCLE TIME Sets the total 'On + Off' time in seconds for time proportional power output through Relay / SSR.	0.5 to 100.0 Sec (Default : 1.0 Sec)
Control Zones : Single	
PROP BAND (Proportional Band) Sets proportional band (% output power per unit error).	0.1 to 999.9 (Default : 50.0)
INTG TIME (Integral Time) Sets integral time constant in Seconds. Setting the value to 0, cuts-off integral action.	0 to 3600 Sec (Default : 100 Sec)
DERIV TIME (Derivative Time) Sets derivative time constant in seconds. Setting the value to 0, cuts-off derivative action.	0 to 600 Sec (Default : 16 Sec)
CYCLE TIME Sets the total 'On + Off' time in seconds for time proportional power output through Relay / SSR.	0.5 to 100.0 Sec (Default : 1.0 Sec)

Select Group > SENSOR INPUT																				
Parameter Description	Settings (Default Value)																			
INPUT TYPE Select Input type in accordance with the type of %RH sensor / transmitter connected for measurement.	0-20mA 4-20mA 0-5V 0-10V 1-5V (Default : 0-5V)																			
SIGNAL LO The transmitter output signal value corresponding to Range Low process value. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	<table> <tr> <th>Input Type</th><th>Settings</th><th>Default</th></tr> <tr> <td>0 to 20 mA</td><td>0.00 to Signal High</td><td>0.00</td></tr> <tr> <td>4 to 20 mA</td><td>4.00 to Signal High</td><td>4.00</td></tr> <tr> <td>0 to 5 V</td><td>0.000 to Signal High</td><td>0.000</td></tr> <tr> <td>0 to 10 V</td><td>0.00 to Signal High</td><td>0.00</td></tr> <tr> <td>1 to 5 V</td><td>1.000 to Signal High</td><td>1.000</td></tr> </table>		Input Type	Settings	Default	0 to 20 mA	0.00 to Signal High	0.00	4 to 20 mA	4.00 to Signal High	4.00	0 to 5 V	0.000 to Signal High	0.000	0 to 10 V	0.00 to Signal High	0.00	1 to 5 V	1.000 to Signal High	1.000
Input Type	Settings	Default																		
0 to 20 mA	0.00 to Signal High	0.00																		
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0 to 5 V	0.000 to Signal High	0.000																		
0 to 10 V	0.00 to Signal High	0.00																		
1 to 5 V	1.000 to Signal High	1.000																		
SIGNAL HI The transmitter output signal value corresponding to Range High process value. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	<table> <tr> <th>Input Type</th><th>Settings</th><th>Default</th></tr> <tr> <td>0 to 20 mA</td><td>Signal Low to 20.00</td><td>20.00</td></tr> <tr> <td>4 to 20 mA</td><td>Signal Low to 20.00</td><td>20.00</td></tr> <tr> <td>0 to 5 V</td><td>Signal Low to 5.000</td><td>5.000</td></tr> <tr> <td>0 to 10 V</td><td>Signal Low to 10.00</td><td>10.00</td></tr> <tr> <td>1 to 5 V</td><td>Signal Low to 5.000</td><td>5.000</td></tr> </table>		Input Type	Settings	Default	0 to 20 mA	Signal Low to 20.00	20.00	4 to 20 mA	Signal Low to 20.00	20.00	0 to 5 V	Signal Low to 5.000	5.000	0 to 10 V	Signal Low to 10.00	10.00	1 to 5 V	Signal Low to 5.000	5.000
Input Type	Settings	Default																		
0 to 20 mA	Signal Low to 20.00	20.00																		
4 to 20 mA	Signal Low to 20.00	20.00																		
0 to 5 V	Signal Low to 5.000	5.000																		
0 to 10 V	Signal Low to 10.00	10.00																		
1 to 5 V	Signal Low to 5.000	5.000																		
RANGE LO The process value corresponding to the Signal Low value from the transmitter. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	0.0 to 100.0 Counts (Default : 0.0)																			
RANGE HI The process value corresponding to the Signal High value from the transmitter. Refer <i>Appendix-A : DC Linear Signal Interface</i> for details.	0.0 to 100.0 Counts (Default : 100.0)																			
FILTER Sets the time constant, in seconds, for the low-pass digital filter applied to the measured humidity. The filter helps smoothing / averaging the signal input and removing the undesired noise. The higher the filter value the lower the indication response to the PV changes and vice-a-versa.	0.5 to 60.0 Seconds (in steps of 0.5 Seconds) (Default : 2.0 sec.)																			

Compressor Switching Strategies

The PPI “Temperature + Humidity” composite controllers offer different programmable strategies for compressor switching to meet different design approaches by the manufacturers of Humidity Chambers. The various strategies and the implementations are described here.

1. Continuous Off

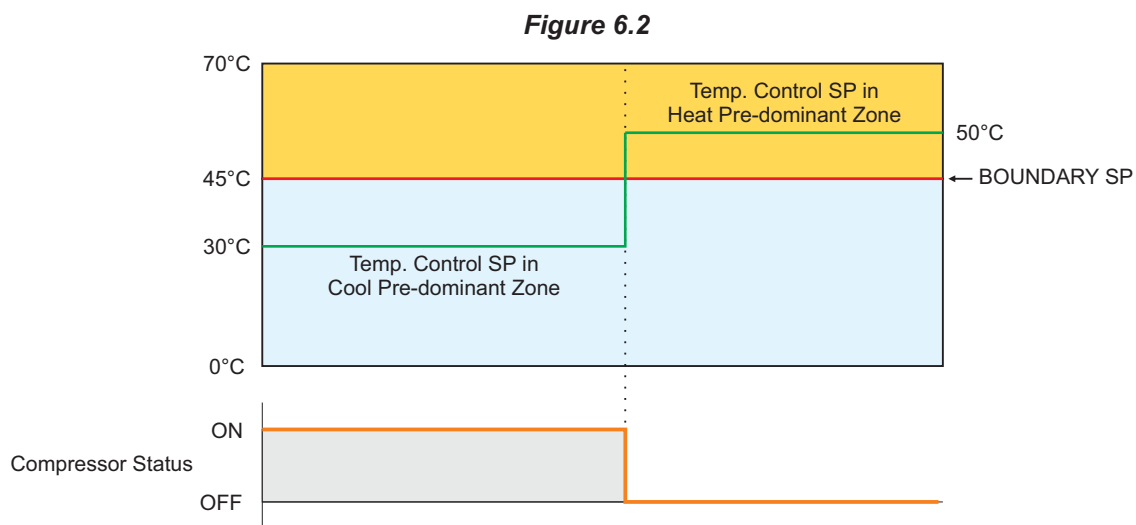
The compressor is kept Off. This strategy is usually selected for temperature values significantly above the ambient temperature.

2. Continuous On

The compressor is kept On regardless of the measured or set temperature value. This strategy is usually selected for temperature values significantly below the ambient temperature.

3. SP Based Strategy

In this strategy, the chamber temperature range is split in two zones by setting the parameter 'BOUNDARY SP'. Refer Figure 6.2 below.



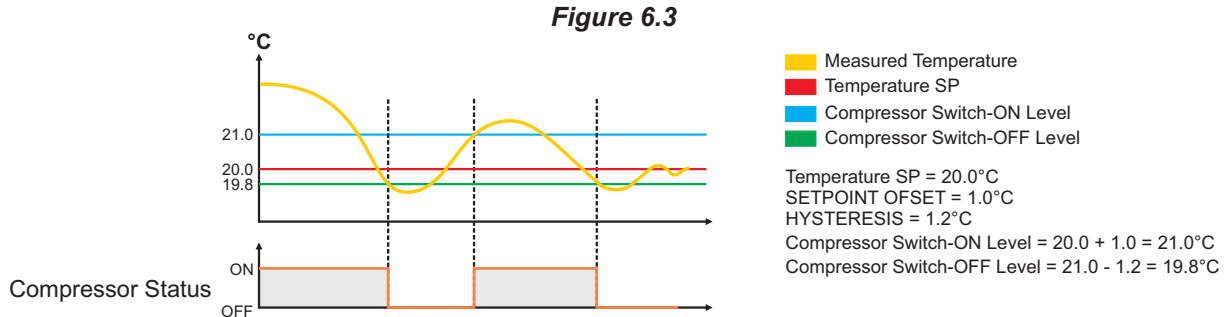
The zone at and above the BOUNDARY SP () is referred as Heat Pre-dominant zone and that below the BOUNDARY SP () is referred as Cool Pre-dominant zone. The controller automatically switches between the two zones depending upon the Temperature SP. If the Temperature SP is below BOUNDARY SP, Cool Pre-dominant zone is active and the compressor is kept ON. If the Temperature SP is at or above boundary SP, Heat Pre-dominant zone is active and the compressor is kept OFF. This strategy eliminates the need for the user to manually switch the compressor ON or OFF.

If the parameter *Control Zones* is set to “Dual”; separate tuning can be performed in the Cool and Heat Pre-dominant zones for accurate control in each zone. The controller maintains separate sets of Proportional Band, Integral Time & Derivative Time constants for each zone that are automatically selected and used by the controller depending upon the active zone.

However, if the parameter *Control Zones* is set to “Single”; the controller uses a single set of Proportional Band, Integral Time & Derivative Time constants for both zones.

4. PV Based Strategy

In this strategy, the compressor is switched to cool down the chamber air temperature. The controller switches the compressor ON or OFF based on the comparison between the chamber temperature value and the Temperature SP. Refer Figure 6.3 below.



The compressor is turned ON if the chamber air temperature value is above the Temperature SP by an amount set by the parameter 'SETPOINT OFFSET'. That is;

$$\text{Compressor Switch - ON Level} = (\text{Temperature SP}) + (\text{SETPOINT OFFSET})$$

Once the air temperature falls below Compressor Switch-ON Level by an amount set by the parameter 'HYSTERESIS', the compressor is turned OFF. That is;

$$\text{Compressor Switch - OFF Level} = (\text{Compressor Switch-ON Level}) - (\text{HYSTERESIS})$$

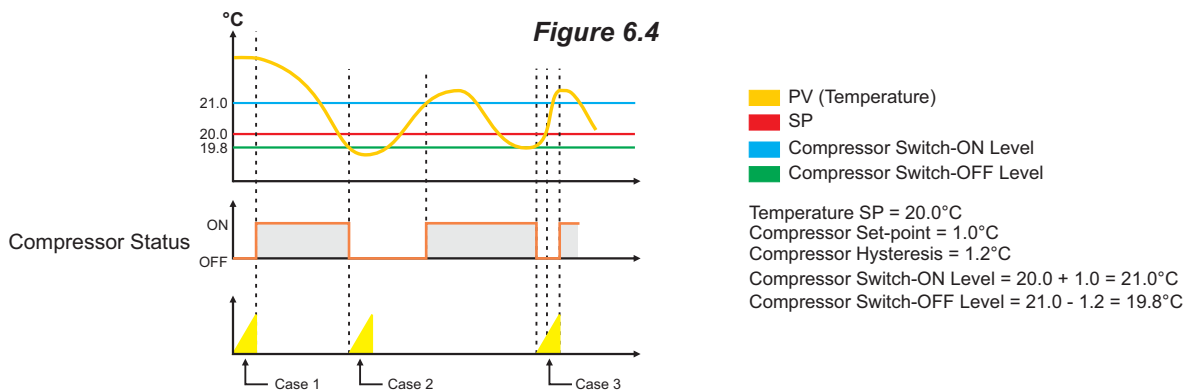
The hysteresis inserts a dead band between the Compressor Switch-ON Level and the Compressor Switch-OFF Level to avoid frequent switching of the compressor.

Compressor Time Delay

Once the compressor is switched off, a time delay is desired before it is turned ON again. The time delay prevents the possible damage due to short cycling. When the compressor switches off, it spins backward as pressure equalizes. If compressor is energized while it is still spinning backward, it continues to run backward until it trips on internal overloads. This may cause damage to the compressor.

The time delay cycle is executed every time the compressor is turned off. The compressor turning off may be a result of power failure or the on-off control algorithm executed by the controller. The controller in "Auto Mode" monitors the Process Value (PV) against the Set-Point (SP) and attempts to switch the compressor ON or OFF depending upon whether the PV is *above* or *below* the SP.

The time delay starts counting down from the instance the compressor is switched off. The compressor is inhibited from switching-on until the delay elapses regardless of the difference between the PV and SP. Once the time delay is elapsed, the control algorithm switches the compressor ON as and when the PV is above SP.



The figure 6.4 above illustrates 3 cases. Case (1) illustrates power-up delay. In case (2); the time elapses before PV rises above the SP. The compressor is thus switched ON as soon as the PV rises above the SP. In case (3); the PV rises above the SP while the time delay is still in progress. The compressor is switched ON as soon as the delay time elapses.

Table 6.2 lists various parameters required for setting-up appropriate compressor switching strategy and associated parameters.

For parameter description the user is requested to read the preceding section.

Table 6.2

Control Strategy : Heat + Cool		
COMPRESSOR STRATEGY >>		CONTINUOUS OFF CONTINUOUS ON SP BASED PV BASED (Default : CONTINUOUS ON)
CONT. ON	SP BASED	PV BASED
DELAY [SEC] >> 0 to 1000 Sec (Default : 200 Sec)	BOUNDARY SP >> 0.0 to 100.0 (Default : 45.0)	SETPOINT OFFSET >> 0.0 to 100.0 (Default : 2.0)
	CONTROL ZONES >> SINGLE DUAL (Default : SINGLE)	HYSTERESIS >> 0.1 to 99.9 (Default : 2.0)
	DELAY [SEC] >> 0 to 1000 Sec (Default : 200 Sec)	DELAY [SEC] >> 0 to 1000 Sec (Default : 200 Sec)

 FACTORY >  WATER LEVEL	
Parameter Description	Settings (Default Value)
ENABLE Set to 'Yes' if water level Sensor(s) is mounted for detecting Low / High water level.	NO YES (Default : NO)
STARTEGY <i>SINGLE SWITCH</i> A single float type sensor is installed for detecting low water level. <i>DUAL LOW/HIGH</i> A Sensor with two switches for detecting both Low & High levels is installed. <i>DUAL LOW/VERYLOW</i> A Sensor with two switches for detecting two different water levels as Low & Very Low is installed.	SINGLE SWITCH DUAL LO-HI DUAL LO-VLO (Default : SINGLE SWITCH)
SWITCH-1 LOGIC <i>OPEN : WATER LEVEL LOW</i> The water level is considered <i>Low</i> if the switch is OPEN. <i>CLOSE : WATER LEVEL LOW</i> The water level is considered <i>Low</i> if the switch is CLOSE.	OPEN : WATER LO CLOSE : WATER LO (Default : CLOSE : WATER LO)
SWITCH-2 LOGIC (Available only if water Level Sensor with Dual Switches is installed) Case-1 : Water Level Strategy is 'Dual Switch Low / High' <i>OPEN : WATER LEVEL HIGH</i> The water level is considered <i>High</i> if the switch is OPEN. <i>CLOSE : WATER LEVEL HIGH</i> The water level is considered <i>High</i> if the switch is CLOSE. Case-2 : Water Level Strategy is 'Dual Switch Low / Very Low' <i>OPEN : WATER LEVEL VERYLOW</i> The water level is considered <i>Very Low</i> if the switch is OPEN. <i>CLOSE : WATER LEVEL VERYLOW</i> The water level is considered <i>Very Low</i> if the switch is CLOSE.	OPEN : WATER HI CLOSE : WATER HI (Default : CLOSE : WATER HI) OR OPEN : WATER VLO CLOSE : WATER VLO (Default : CLOSE : WATER VLO)

 FACTORY >  DOOR OPEN	
Parameter Description	Settings (Default Value)
ENABLE Set to 'Yes' if a switch is mounted for detecting door <i>Open / Close</i> position.	NO YES (Default : NO)
SWITCH LOGIC <i>OPEN : DOR OPEN</i> The Door position is considered <i>Open</i> if the switch is OPEN. <i>CLOSE : DOR OPEN</i> The Door position is considered <i>Open</i> if the switch is CLOSE.	OPEN : DOR OPEN CLOSE : DOR OPEN (Default : CLOSE : DOR OPEN)
DELAY (SEC) This parameter sets a timer. From the time the door is opened, the timer begins counting down. If the door is not closed before the timer reaches 0, the <i>Door Open</i> alarm is activated.	0 to 1000 Sec (Default : 60 Sec)
 FACTORY >  MAINS FAIL	
Parameter Description	Settings (Default Value)
ENABLE Set to 'Yes' if provision is made for running the controller on an auxiliary power sources like battery or inverter and a Switch is mounted for detecting mains (Line) power source failure.	NO YES (Default : NO)
SWITCH LOGIC <i>CLOSE : FAIL</i> The CLOSE Switch position indicates that the Mains Power has failed and the Controller is operating on auxiliary power source. <i>OPEN : FAIL</i> The OPEN Switch position indicates that the Mains Power has failed and the Controller is operating on auxiliary power source.	CLOSE : FAIL OPEN : FAIL (Default : CLOSE : FAIL)
 FACTORY >  RESET PARA	
Parameter Description	Settings (Default Value)
RESET Set to 'Yes' to reset all the parameters to their Default Values.	NO YES (Default : NO)

 FACTORY >  CHANGE PSW	
Parameter Description	Settings (Default Value)
CHANGE PSW (Change Password) - Allows changing the Factory Access Level password. - Set to yes for changing the password. - Factory default is 321.	NO YES (Default : NO)
NEW PASSWORD Set new numeric password for Factory Access Level access.	0 to 9999
 FACTORY >  UTILITIES	
Parameter Description	Settings (Default Value)
ENTER CODE Reserved.	NA



Section 7 MECHANICAL INSTALLATION

Installation Precautions

Ensure the following precautions are taken while installing the device:

1. Environment

Install in a location free from corrosive/combustible gases and electrically conductive pollutants.

2. Temperature & Humidity

Avoid rapid temperature changes that may cause condensation. Ensure ambient conditions do not exceed the specified temperature and humidity limits.

3. Electromagnetic Interference (EMI)

Protect the installation site from excessive electrostatic or electromagnetic interference.

4. Vibration & Shock

Do not mount the device in areas with high vibration or mechanical shock.

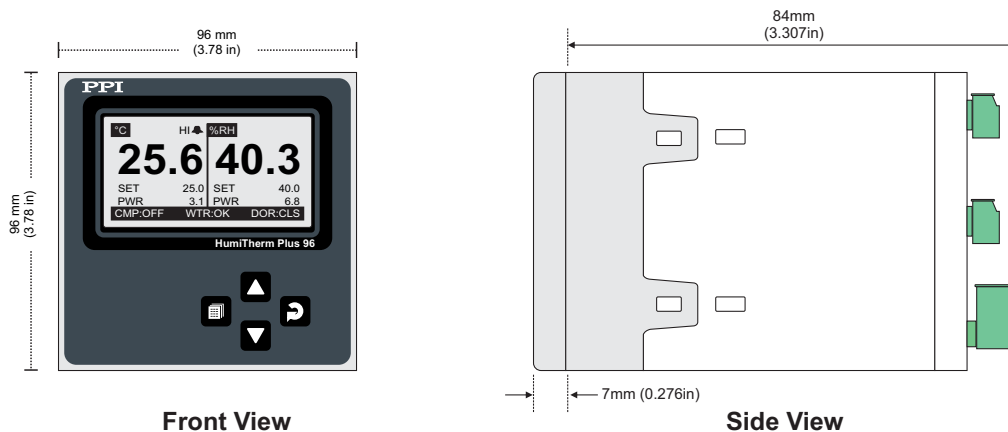
5. External Elements

Keep the device away from dust, salt air, direct sunlight, and radiant heat sources.

Outer Dimensions

Refer to Figure 7.1 for the outer dimensions of the device.

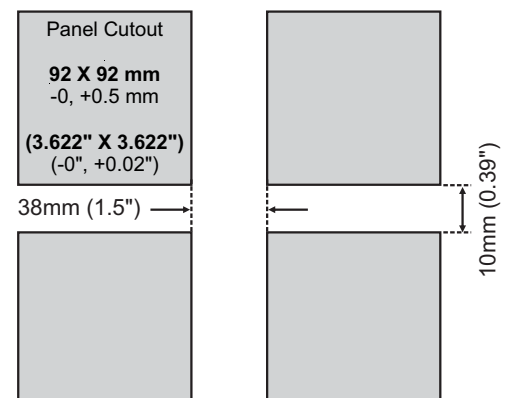
Figure 7.1



Panel Cutout & Spacing Requirements

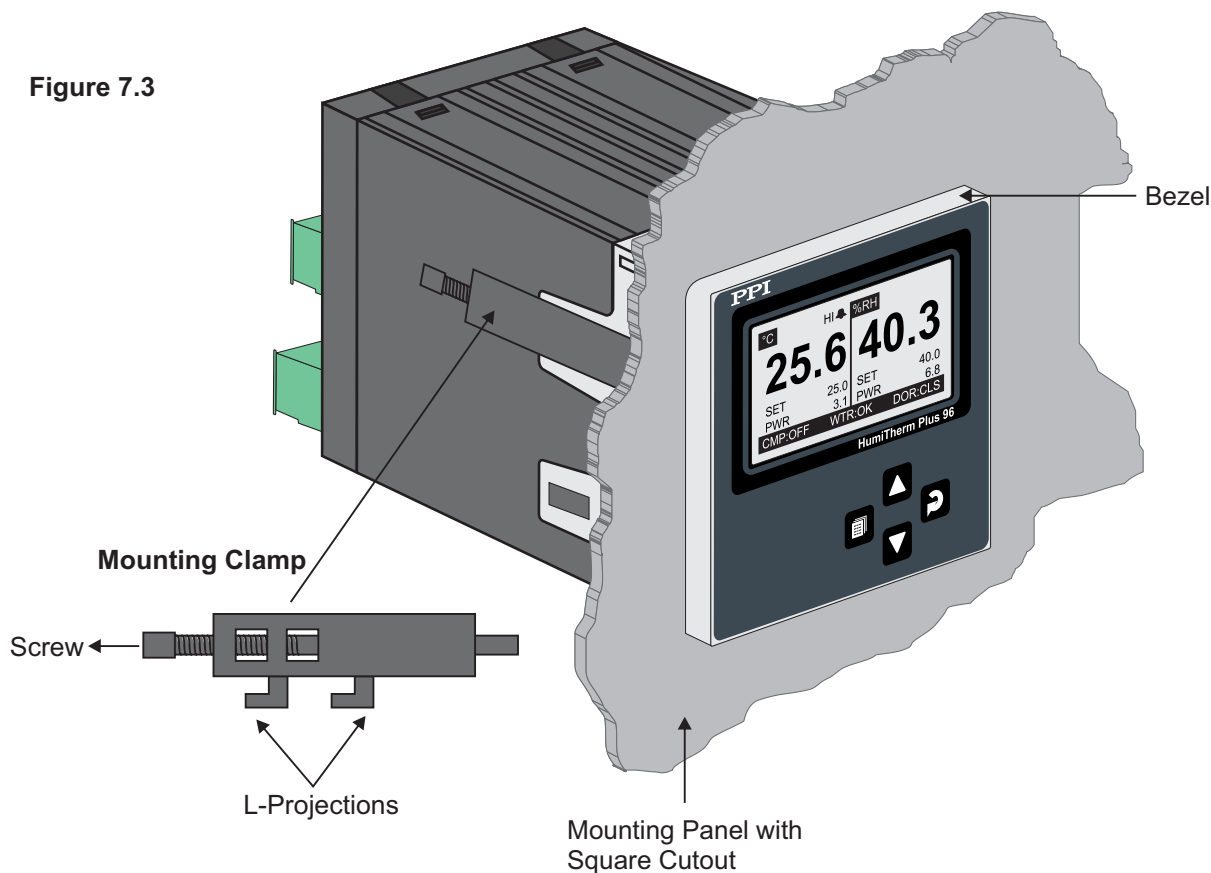
- Cutout Size
[92 × 92, mm, -0, +0.5 mm]
[3.622" × 3.622", -0, +0.02"]
- Minimum Spacing
Maintain the recommended clearance if installing multiple devices on the same panel.
- Reference
See Figure 7.2 for panel cutout dimensions and spacing guidelines.

Figure 7.2



Panel Mounting Instructions

Figure 7.3



Follow these steps to securely mount the device on a panel:

1. Prepare the Cutout

Create a square cutout on the panel according to the dimensions in Figure 7.2.

2. Remove Mounting Clamps

Detach the Mounting Clamps from the device enclosure.

3. Insert the device:

- From the front of the panel, insert the rear side of the device housing through the cutout.
- Ensure the device sits squarely against the panel wall.
- Caution: Apply pressure only on the bezel, not on the front label.

4. Secure with Mounting Clamps:

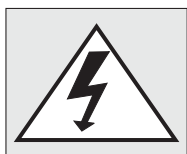
- Attach each clamp so that its L-projections fit into the holes on the left and right sides of the enclosure.
- Tighten the screws until the clamps firmly secure the device against the panel wall.

5. Reference

- See Figure 7.3 for panel mounting.

Section 8

ELECTRICAL CONNECTIONS



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

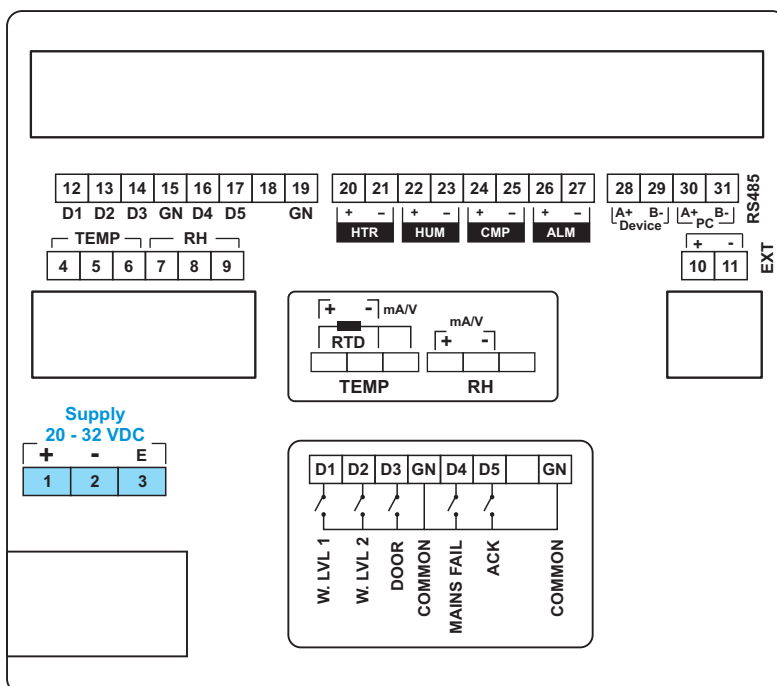
ELECTRICAL CONNECTIONS

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 Current/Voltage**, 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 Electrical Connection Diagram is shown on the back side of the controller enclosure. The diagram shows the terminals viewed from the **REAR SIDE** with the controller label upright.

Figure 8.1



DESCRIPTIONS

The back panel connections are described as under:

Temperature (°C) Sensor / Transmitter Input (Terminals : 4, 5, 6)

The Controller accepts RTD Pt100 (3-wire / 2-wire) or DC Current (mA) / DC Voltage (V) as Temperature input. The connections are described below.

Figure 8.2 (a)

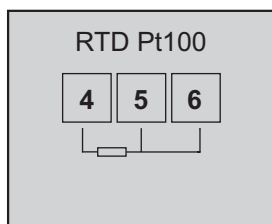


Figure 8.2 (b)

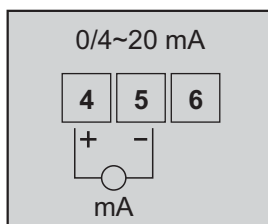
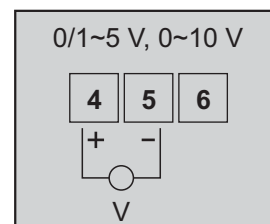


Figure 8.2 (c)



RTD Pt100, 3-wire

Connect single lead end of RTD bulb to terminal 4 and the double lead ends to terminals 5 & 6 as shown in Figure 8.2 (a). Use copper conductor leads of very low resistance ensuring that all 3 leads are of the same gauge and length. Avoid joints in the cable.

Temperature Transmitter with DC Current (mA) Output

The Figures 8.2 (b) depicts wiring connections for current output transmitter. The Excitation Voltage must be obtained from an external source.

Temperature Transmitter with DC Voltage (V) Output

The Figures 8.2 (c) depicts wiring connections for voltage output transmitter. The Excitation Voltage can be obtained from an external source or from the controller (5V @ 15 mA).

Humidity (%RH) Transmitter Input (Terminals : 7, 8, 9)

The Controller accepts DC Current (mA) / DC Voltage (V) as Humidity input. The connections are described below.

Humidity Transmitter with DC Current (mA) Output

The Figures 8.3(a) depict wiring connections for current output transmitter. The Excitation Voltage must be obtained from an external source.

Humidity Transmitter with DC Voltage (V) Output

The Figures 8.3(b) depicts wiring connections for voltage output transmitter. The Excitation Voltage can be obtained from an external source or from the controller (5V @ 15 mA).

Figure 8.3 (a)

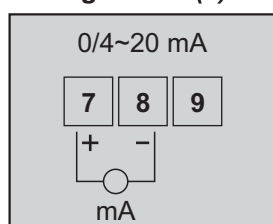
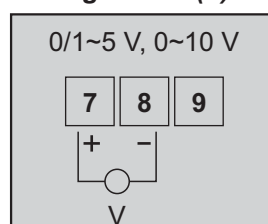
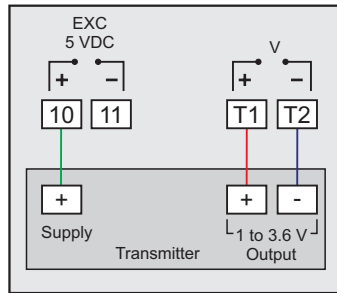


Figure 8.3 (b)

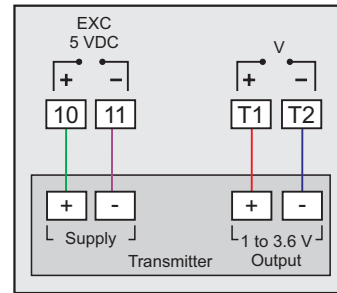


Excitation Voltage For Transmitters (Terminal 10, 11)

- The controller provides a 5 VDC power source @ 15 mA for exciting voltage output transmitters.
- For excitation voltages above 5 V (e.g. 12 V, 24 V) and for exciting current output transmitters, please use an external source.



3-wire Voltage Transmitter



4-wire Voltage Transmitter

- Notes :** 1) The output 1 to 3.6 V shown in above diagram is for example only.
2) The terminals T1 & T2 represent both temperature & RH inputs.

Heater Control Output (terminals : 20, 21)

Humidity Control Output (terminals : 22, 23)

Compressor Control Output (terminals : 24, 25)

Alarm Output (terminals : 26, 27)

All the above control & alarm outputs are Voltage pulses (12VDC @ 20mA, Short-circuit protected) for driving external SSR or Relay. The '+' and '-' terminals are for voltage 'Source' and 'Return' paths, respectively.

'Water Level Switch-1' Digital Input (Terminals 12, 15/19)

'Water Level Switch-2' Digital Input (Terminals 13, 15/19)

'Door Open' Digital Input (Terminals 14, 15/19)

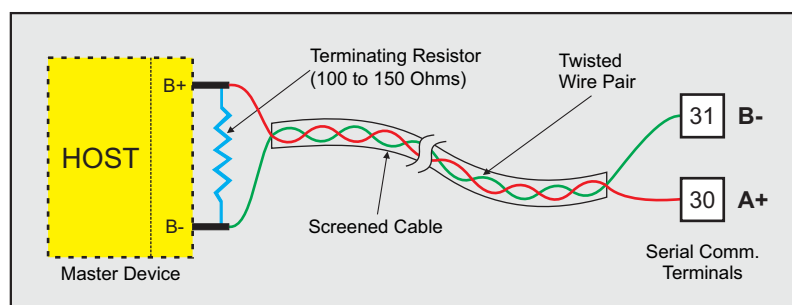
'Mains Fail' Digital Input (Terminal 16, 15/19)

'Alarm Acknowledge' Digital Input (Terminals 17, 15/19)

Potential-free contact closure input terminals are provided as digital inputs. An 'Open' or 'Close' switch position is detected as input.

PC COMMUNICATION PORT (Terminals 30, 31)

Figure 8.4



The controller Communication Port is RS485 and requires a similar port at the host (master) end. If, however, the host port is different (say, USB), use appropriate protocol converter (say, USB to RS485) for interface.

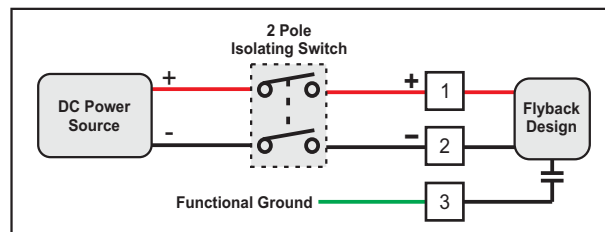
For reliable noise free communication, use a pair of twisted wires inside screened cable as shown in Figure 8.4. The wire should have less than 100 ohms / km nominal DC resistance (Typically 24 AWG or thicker). Connect the terminating resistor (Typically 100 to 150 ohm) at one end to improve noise immunity.

DEVICE COMMUNICATION PORT (Terminals 28, 29)

Unused. Do not make any connections as the terminals are connected to the internal electronics circuitry.

20 to 32 DC POWER SUPPLY (Terminals 1, 2 & 3)

Figure 8.5



As standard, the Module is supplied with power connections suited for 20 to 32 VDC power source. The accuracy / performance of the Module is not affected by the variations in the supply within specified limits of 20 to 32 VDC. Use well-insulated copper conductor wire of the size not smaller than 0.5mm² for power supply connections ensuring proper polarity as shown in Figure 8.5. The Module is not provided with fuse and power switch. If necessary, mount them separately. Use a slow blow fuse rated for 0.5A current.

For safety and enhanced electrical noise immunity, it is highly recommended to connect Main Power Supply 'Earth' to terminal 3.



APPENDIX A DC LINEAR SIGNAL INTERFACE

Overview

Various transmitters generate different signal types, such as mV, V, or mA, with distinct signal ranges. To ensure compatibility with a wide range of transmitters, PPI products offer configurable Signal Type and Range settings.

Common industry-standard signal ranges include:

- 0 to 80 mV, 0 to 160 mV
- 0 to 5 V, 1 to 5 V, 0 to 10 V
- 0 to 20 mA, 4 to 20 mA

Additionally, since transmitters output different signal ranges corresponding to specific process values (e.g., a 1 to 4.5 V signal may represent 5% to 95% RH), PPI products allow users to configure the process value range and resolution.

Required Parameters for Linear Transmitter Interface

For interfacing linear transmitters, the following six parameters must be configured:

Parameter	Definition	Example
Input Type	Defines the standard DC signal type in which the transmitter signal range falls.	4 to 20 mA
Signal Low	The minimum signal value corresponding to the lowest process value.	4.00 mA
Signal High	The maximum signal value corresponding to the highest process value.	20.00 mA
PV Resolution	Defines the smallest measurable unit for the process value.	0.01 psi
Range Low	The process value corresponding to Signal Low.	0.00 psi
Range High	The process value corresponding to Signal High.	5.00 psi

Mathematical Representation

The relationship between transmitter signal values and the corresponding process values follows a straight-line equation:

$$Y = mX + C$$

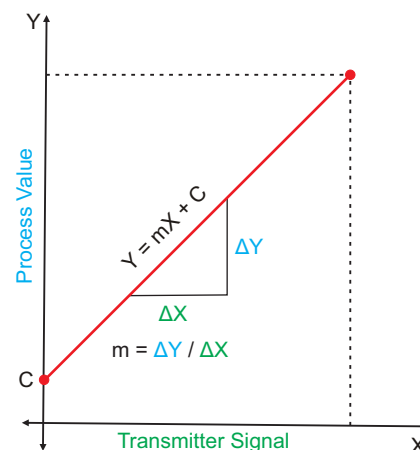
Where;

X : Signal Value from Transmitter

Y : Process Value Corresponding to X

C : Process Value Corresponding to X = 0 (Y-intercept)

m : Slope (Change in Process Value per unit Change in Signal Value)

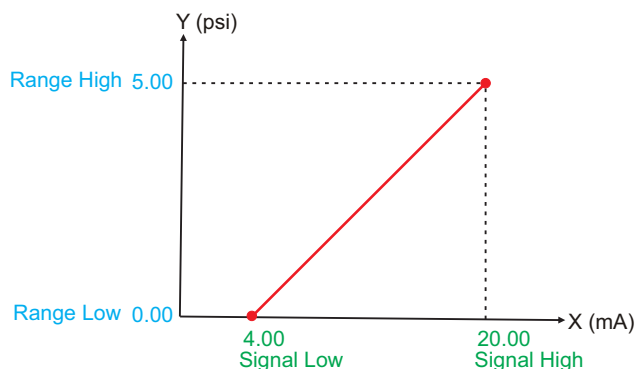


Examples of Transmitter Configurations

Example 1:

Pressure Transmitter (4 to 20 mA corresponding to 0 to 5 psi)

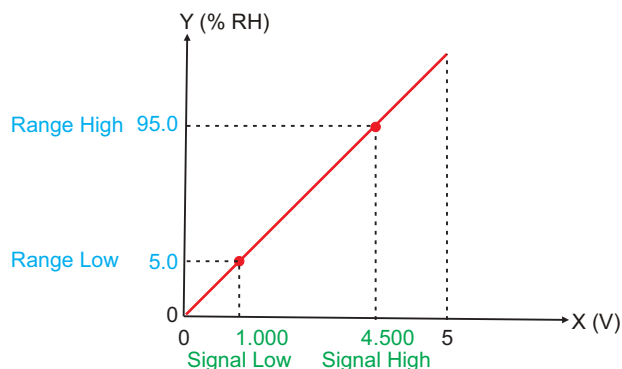
Input Type : 4-20 mA
Signal Low : 4.00 mA
Signal High : 20.00 mA
PV Resolution : 0.01
Range Low : 0.00
Range High : 5.00



Example 2

Humidity Transmitter (1 to 4.5 V corresponding to 5 to 95 %RH)

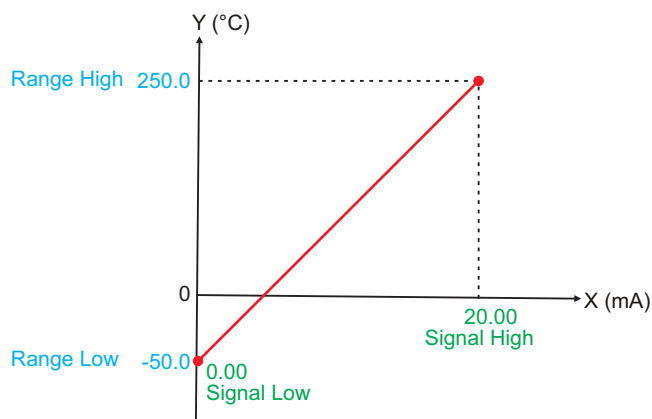
Input Type : 0-5 V
Signal Low : 1.000 V
Signal High : 4.500 V
PV Resolution : 0.1
Range Low : 5.0
Range High : 95.0



Example 3

Temperature Transmitter (0 to 20 mA corresponding to -50 to 250 °C)

Input Type : 0-20 mA
Signal Low : 0.00 mA
Signal High : 20.00 mA
PV Resolution : 0.1
Range Low : -50.0
Range High : 250.0



Process Precision Instruments (An ISO 9001 : 2008 Company)

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