Humidity Temperature Controller

HTC307

OPERATING INSTRUCTIONS

Doc. name: OP INST HTC307 OP3172-V01

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96 x 96

CE

SALIENT FEATURES

⁙RTD & Humidity Input

Provision of analog input for RTD and Humidity controlling action.

⁙Adaptive Tuning

For better performance, a feature of adaptive tuning is added along with self & Auto tuning.

⁙Selectable lower display

User selectable lower display options enable quick setting of different parameters such as Set points,Humidity PV,PID values,Tuning etc.

⁙Outputs

In single output model both control & alarm o/p is provided for humidity as well as temperature.

⁙Special Modes

User selectable special modes

PID & proportional control for temp.& Humidity respectively along with ON/OFF control,auto/manual,soft start.

Others

- ⁙ Dual 4 digit display
- ⁙ Digital Filtering
- ⁙ Sensor break indication
- ⁙ Sensor error compensation
- ⁙ Programmable parameter lockouts
- ⁙ 90 to 270VAC/DC
- ⁙ Compliance- CE
- ⁙ IP65 front panel protection

1. TECHNICAL SPECIFICATIONS

1. DISPLAY

Display
HTC307 - **96** X **96** – Dual 4 digit 7- segment LED.**Upper display**:18.5mm high White(Temp. process value).**Lower Display(selectable)**:10.9mm high Green(Default**:**Humidity process value).

Led Status Annunciators	OUT1,OUT2, AL1, AL2, AT, ⇌

2. INPUT

Input	**Humidity:** HS-A-100. **RTD:** Pt100**.**
Sampling time	200 ms.
Resolution	1/0.1^{o} For RTD 1/0.1^{o} For Humidity
Indication accuracy	**RTD**: ± 0.25% of span or 1^{o} whichever is greater. (20min of warmup time) Cold Junction Calibration accuracy for RTD input 0.1% of F.S ±1^{o}C **HUMIDITY:** ±3% for RH 10% to 80% ±4% for below 10% or above 80%
Digital filtering	OFF, 1 to 99 sec.

3. OUTPUT

3.1. Control Output

Relay contact output	**Relay 1 & Relay 3** : 10A@250VAC or 28VDC Life expectancy : 100000 cycles at maximum load rating

3.2. Alarm Output

Relay contact output	**Relay 2 & Relay 4** : 5A@250VAC or 30VDC Life expectancy : 100000 cycles at maximum load rating

4. FUNCTION

Main control	Control:PID(temperature) & P(Humidity) or ON/OFF. Output:Time Proportioning or Linear DC Proportional band: 0 to 400° Integral time: 0 to 3600 sec Derivative time: 0 to 200sec Cycle time:0.1 to 100.0sec Auto tune,Self tune,Adaptive tune. Programmable % output
Alarms	Modes : Deviation high,Deviation Low,Band, Full scale high,full scale low,sensor break. Operation: Absolute, Deviation & break mode Hystersis: Programmable Reset action: Automatic Probe break action: Programmable

5. SERIAL COMMUNICATION

Interface standard	RS485
Communication address	1 .... 99, maximum of 32 units per line.
Transmission mode	Half duplex.
Transmission protocol	MODBUS RTU.
Transmission distance	500 m maximum.
Transmission speed	115200,57600,38400,19200,9600,4800,2400 bits/sec.
Parity	None, Odd, Even.
Stop bits	1 or 2.
Response time	100ms (max and independent of baud rate).

6. ENVIRONMENTAL CONDITIONS

Operating range	0 .... 50°C.
Storage range	-20 .... 75°C.
Storage humidity	85% max. RH (non condensing) from 0 to 50°C.

7. POWER SUPPLY

Power supply	90.... 270VAC/DC.
Frequency	50/60Hz.
Power consumption	6 VA max.

8. ISOLATION BREAKDOWN RATINGS

AC line w.r.t. all inputs and outputs	2500volts
All other inputs and outputs w.r.t. Relay contacts	2500volts

9. SAFETY AND EMC STANDARDS

Compliance	CE.
LVD	As per BS EN 61010.
EMC	As per BS EN 61326.
Panel sealing	IP65.

WEIGHT : HTC307 : 280gms

10. HOUSING : Flame retardant engineering plastic.

11. INPUT SENSOR RANGES :

Sensor type	Range
PT100	-100 to 850°C
HS-A-100	0 to 100%

1. SAFETY INFORMATION

SAFETY SUMMARY

This manual is meant for the personnel involved in wiring installation,operation, and routine maintenance of the equipment.All safety related modifications; symbols and instructions that appear in this operating manual or on the equipment must be strictly followed to ensure the safety of the operating personnel as well as the instrument.

If the equipment is not handled in a manner specified by the manufacture it might impaire the protection provided by the equipment.

⚠ **CAUTION**: Read complete instructions prior to installation and operation of the unit.

⚠ **CAUTION**: Risk of electric shock.

INSTALLATION INSTRUCTIONS

⚠ **CAUTION:**

1. This equipment, being built-in-type,normally becomes a part of the main control panel and in such case the terminals do not remain accessible to the end user after installation and internal wiring.
2. Conductors must not come in contact with the internal circuitry of the equipment or else it may lead to a safety hazard that may in turn endanger life or cause electrical shock to the operator.
3. Circuit breaker or mains switch must be installed between power source and supply terminals to facilitate power 'ON' or 'OFF' function. However this switch or breaker must be installed in a convenient position normally accessible to an operator.

⚠ **CAUTION:**

1. The equipment shall not be installed in environmental conditions other than those specified in this manual.
2. Fuse Protection - The equipment does not contain built-in fuse. Installation of external fuse for electrical circuitry is highly recommended. Recommended rating of such fuse shall be 275VAC/1Amp.
3. Since this is a built-in type equipment (finds place in main control panel), its output terminals get connected to host equipment. Such equipment shall also comply with basic EMI/EMC and safety requirements like BS EN 61326-1 and BS EN 61010 respectively.
4. Thermal dissipation of equipment is met through ventilation holes provided on chassis of equipment. Such ventilation holes shall not be obstructed else it can lead to a safety hazard.
5. The output terminals shall be strictly loaded to the manufacturer specified values/range.

MAINTENANCE

1. The equipment should be cleaned regularly to avoid blockage of ventilating parts.
2. Use soft cloth for cleaning. Do not use isopropyl alcohol or any other organic cleaning agent.

WIRING INSTRUCTION:

⚠ CAUTION:

1.To prevent the risk of electric shock power supply to the equipment must be kept OFF while doing the wiring arrangement.

2.Terminals and electrically charged parts must not be touched when the power is ON.

3.Wiring shall be done strictly according to the terminal layout with shortest connections. Confirm that all connections are correct.

4.Use lugged terminals to meet M3.5 screws.

5.To eliminate electromagnetic interference use of short wire with adequate ratings and twists of the same in equal size shall be made.

6.Cable used for connection to power source, must have a cross section of 1 or greater. These wires shall have insulation capacity made of at least 1.5KV.

ELECTRICAL PRECAUTIONS DURING USE

Electrical noise generated by switching of inductive loads can create momentary disruption, erratic display, latch up, data loss or permanent damage to the instrument.
To reduce noise:
A) Use of MOV across supply of temperature controller & snubber circuits across loads are recommended. Part numbers are as follows:
1. Snubber: APRC-01.
B) Use separate shielded wires for inputs.
C) The unit should preferably be shielded from the contactor.

INSTALLATION GUIDELINES

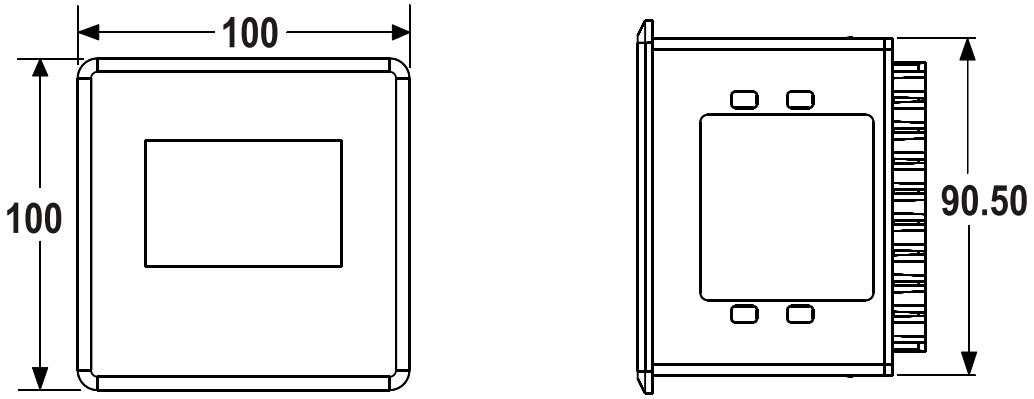
Mechanical Installation:

For installing the controller

1.Prepare the panel cutout with proper dimensions as shown.

OVERALL DIMENSIONS (All dimensions in mm)

Panel Cutout : 92mm X 92mm



2.Remove the clamp from the controller.

3.Push the controller into the panel cutout. Secure the controller in its place by pushing the clamp from the rear side.

⚠ CAUTION:
The equipment in its installed state must not come in close proximity to any heating sources, caustic vapors, oils, steam, or other unwanted process by-products.

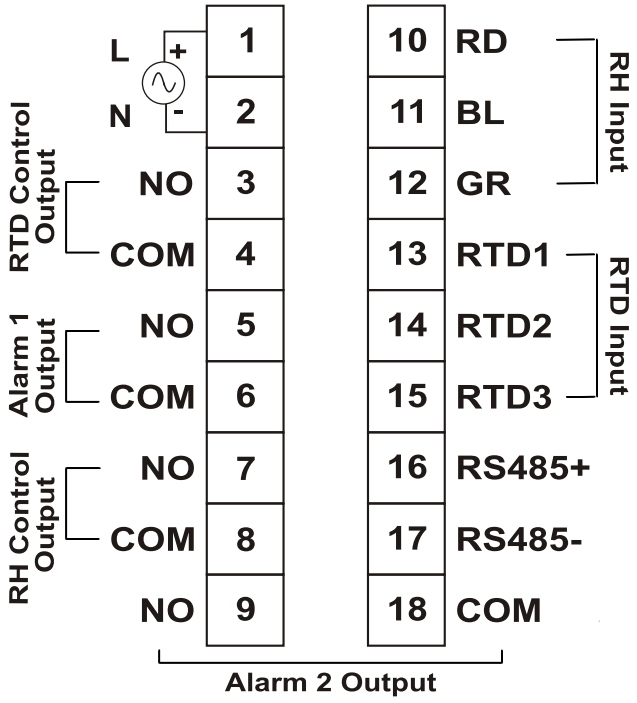
EMC Guidelines:

1. Use proper input power cables with shortest connections and twisted type.
2. Layout of connecting cables shall be away from any internal EMI source.

2. TERMINAL CONNECTIONS

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SUPPLY : 90 to 270V AC / DC, 50 / 60Hz,6VA max
RELAY : RLY1,3:10A@250V AC / 28V DC
RLY2,4: 5A@250V AC / 30V DC

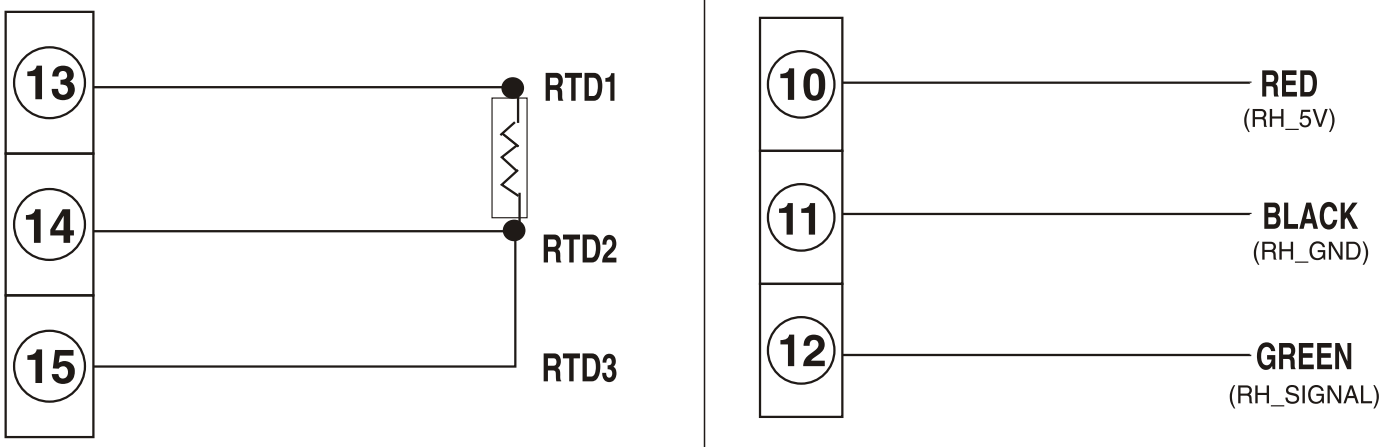


Note: "PIN RING TYPE LUG" is suggested for pannel wiring

3. SENSOR INPUT WIRING

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RTD	HUMIDITY



Humidity - HS-A-100.
RTD - PT100.

NOTE : 1) Refer Humidity type selection in level 1(only for humidity sensor) of programming menu.

2) For 2 Wire RTD, short terminals 13 & 14.

4. CONTROL OUTPUT WIRING

Fig 1. Main/Control Output – Relay drive to load (resistive load less than 1A)

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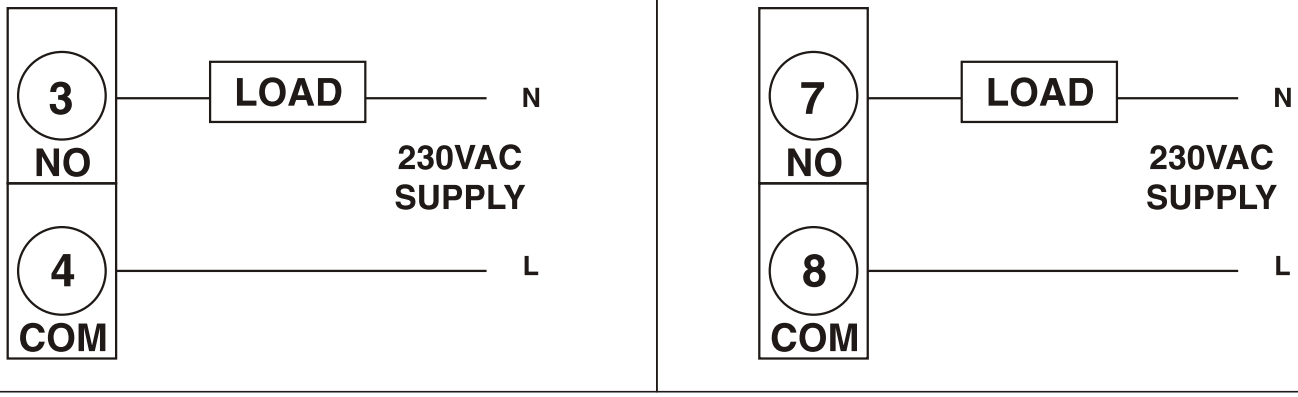


Fig 2. Alarm Output – Relay drive to load (resistive load less than 1A)

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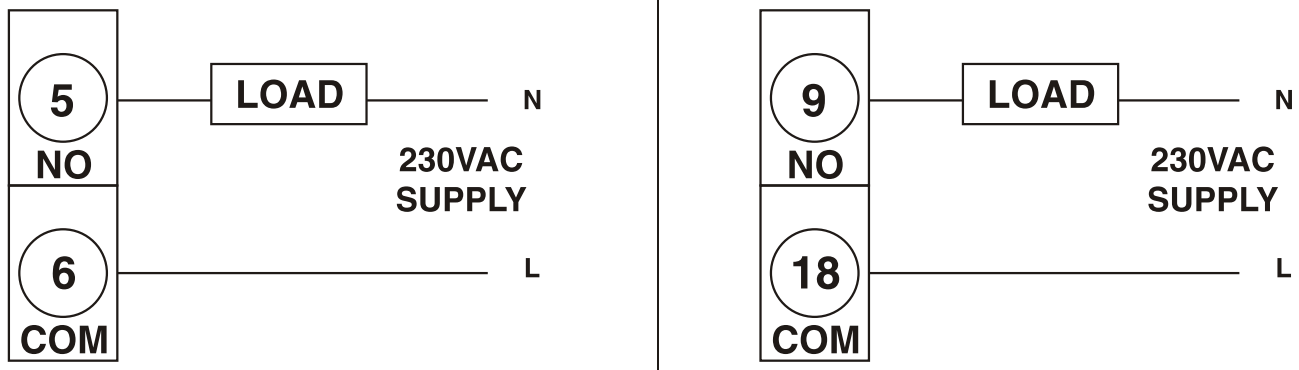
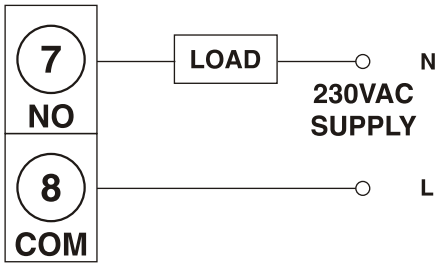


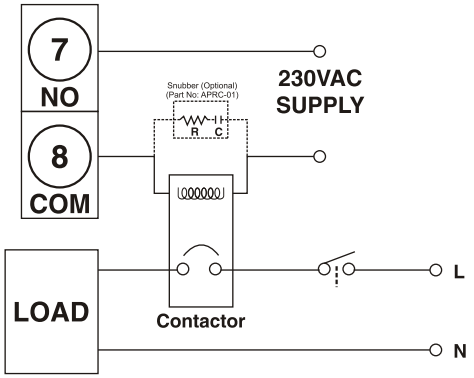
Fig3. Main/Control Output– Relay to drive contactor (For single phase)

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For Relay Drive

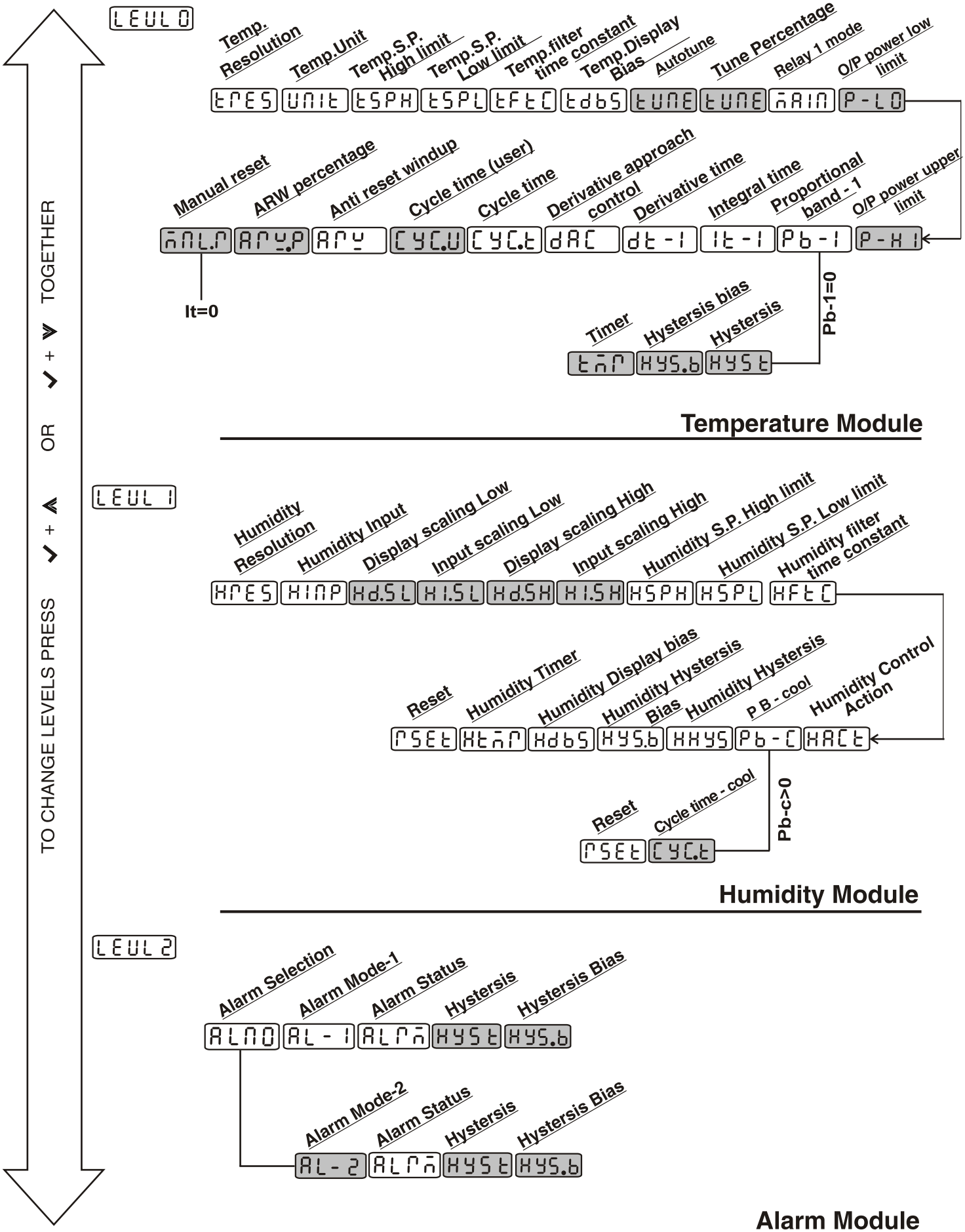


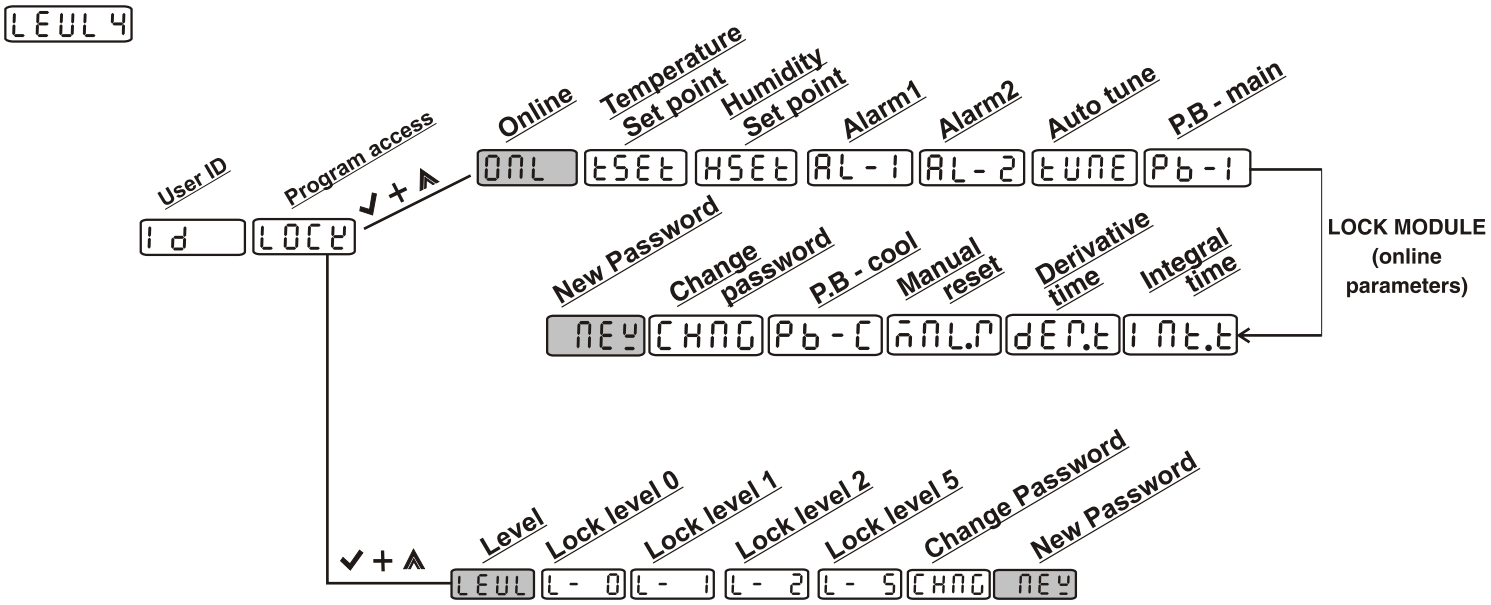
Contactor Drive



NOTE: Use snubber as shown above to increase life of internal relay of temperature controller.

1. FUNCTIONS MENU





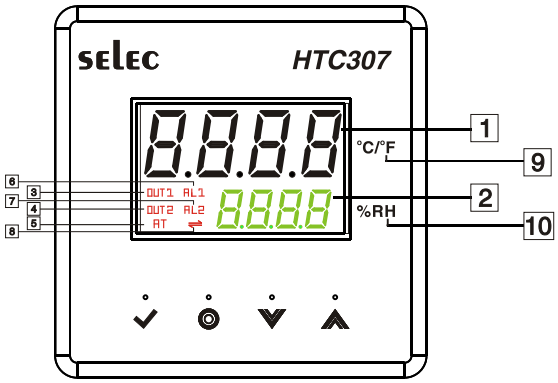
Lockout Module





Communication Module

Appearance of all shaded menus dependent on selection of other parameters.
Refer programming for further details.



2. KEYS DESCRIPTION

Functions	Key press
To enter or exit program mode	∧ + ∨ together for 3 seconds
To change levels	✓ + ∧ / ∨ to increase or decrease the level number.
To view function on the same level and to display the current option.	∧ or ∨ key once to view the next / previous function.
To increase or decrease the value of a particular function.	✓ + ∧ to increase and ✓ + ∨ to decrease the function value.
To view and change parameters online	◎ key to view the parameter and ◎ + ∧ / ∨ to scroll through the parameters. Press ✓ + ∧ / ∨ to change parameter value.

NOTE: The unit will autoexit program mode after 30 seconds of inactivity.

INDICATIONS AND DISPLAY

1 Temp.Process-value (PV)	Displays the processed temperature value.
2 Humidity Process- value(PV)	Displays the processed humidity value.
3 OUT1	Indicates the status of Temp. control output(relay 1).
4 OUT2	Indicates the status of Humidity Control output(relay 3).
5 AT	Indication for Tuning is in progress.
6 AL1	Indicates the status of Alarm output 1(relay 2).
7 AL2	Indicates the status of Alarm output 2(relay 4).
8 ⇌	Indicates Communication is in progress.
9 °C/°F	Temperature Unit
10 %RH	Humidity Unit

PROGRAMMING OF LEVELS

3. LEVEL 0: TEMPERATURE MODULE

Display	Name & Description	Range	Display condition	Default value
tRES	Temperature Resolution	1/0.1	——	0.1
UNIt	Temperature unit	°C / °F	——	°C
tSPH	Temp.set point high limit	Set point low limit to 850.	——	850
tSPL	Temp.set point Low limit	-100 to Set point high limit.	——	-100
tFtC	Filter Time constant	OFF,1 to 99 seconds	——	1
tdbS	Temp.Display Bias(DSP offset)	-99.9 to +99.9	——	0.0
tUNE	Auto Tune	St/At/Adt/ OFF	Pb>0 (PID Control)	OFF
tUNE	Tune Percentage	P.AU / P.15 to P.100	Tune=AT,ST, ADT	P.AU
rAIN	Relay 1 Mode	rE/Fd	——	rE
P-LO	Output power lower limit	0 % to o/p power high limit	PID control	0

Display	Name & Description	Range	Display condition	Default value
P-H 1	Output power upper limit	O/p power low limit to 100%	PID control	100
Pb-1	Proportional band- 1	0 to 400.0	PID control	10
It-1	Integral time	0 to 3600 sec.		120
dt-1	Derivative time	0 to 200 sec.		30
dAC	Derivative approach control	0.5 to 5.0 (x band)	PID control	1.0
CYC.t	Cycle time	USEr/ USr.F/A 15.0	PID control	USEr
CYC.U	Cycle time-user	0.1 to 100.0 sec	Cycle time = USEr	15.0
Ary	Anti-reset windup	AUtO/ mAnL	PID control	AUtO
Ary.P	Anti-reset windup %	5.0 to 100 %	ARW=MAN	25.0
HYSt	Temp. Hystersis	0.1 To 99.9	Pb-1=0 (ON/OFF control)	1.0
HYS.b	Temp. hystersis bias	- 9.9 To 9.9		0.0
tAr	Timer	0.0 To 99.9 minute	Pb-1=0 & Main=FD	0.0
mAL.r	Manual Reset	- 9.99 To 9.99	It=0 & Pb-1>0	0.0

PARAMETER EXPLANATIONS :

- **TEMPERATURE UNIT:**

The temperature unit is selectable between °C and °F.when temperature unit is changed, the temperature ranges will also change according to the present selection of unit. If changed, make sure to check all parameter.

- **RESOLUTION:**

The resolution is selectable between 1 and 0.1 for RTD & for humidity HS-A-100

- **SET POINT LIMIT VALUES:**

The controller has programmable high and low set point limit values to restrict the setting range of the set point.Set the limit values so that the temperature set point value cannot be set outside the safe operating area of the process.

- **FILTER TIME CONSTANT:**

The filter is an adaptive digital filter that discriminates between measurement noise and actual process changes.if the input signal is increasing too greatly due to measurement noise, increse the filter value.If accurate control is desired,increse the filter time constant whereas if the fastest controller response is required,decrese the filter time constant.

- **DISPLAY BIAS:**(DISPLAY OFFSET)

This function is used to adjust the PV value in cases where it is necessary for PV value to agree with another recorder or indicator or when the sensor cannot be Mounted in correct location.

- **AUTO TUNING:**

Auto tuning is a function whereby the controller learns the process characteristics By itself and automatically sets the required P,I and D values.the new P,I,D parameters will Be stored in non-volatile memory automatically.TUNE ON is indicated by 'AT' LED Blinking.(For detailed explanations of PID parameters refer USER GUIDE).

- **OUTPUT POWER LIMITS:**

These parameters are used to limit the minimum and maximum controller output power. The output power lower limit will ensure that a minimum percentage of output (as per requirement) is available in case any process disturbances or setpoint changes occur. The output power high limit ensures that in case any process disturbance or set point changes occur, the maximum value of output is limited to a value as per requirement.

- **CYCLE TIME:**

There are 3 selectable modes for programming cycle time:
USEr: User can program the cycle time. The mode will be altered to AutO when put to autotune.
Usr.F: User can fix the cycle time. This has the highest priority.
AutO: This is recommended. The cycle time value is calculated automatically during autotune.

- **ANTIRESET WINDUP:**

The anti-reset windup (ARW) inhibits the integral action until the PV is within the proportional band thus reducing overshoot on start-up. If the selection is -
1. AutO: The value will be calculated automatically during autotune (Recommended).
2. ManL: The value can be fed manually by the user.

4. LEVEL 1 : HUMIDITY MODULE

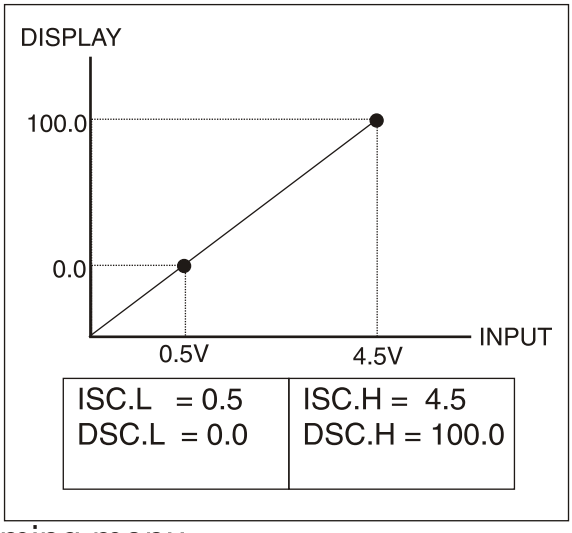
Display	Name & Description	Range	Display condition	Default value
HRES	Humidity Resolution	0.1 / 1	——	0.1
HINP	Humidity Input	H.100/0tHC	——	H.100
Hd.SL	Humidity Display value Scaling point1	0.0 to display Value scaling point 2	HINP = 0tHC	0.0
H1.SL	Humidity Input value Scaling point1	0 V to Input Value scaling point 2		0.50
Hd.SH	Humidity Display value Scaling point 2	Display value Scaling point 1 to 100.0		100.0
H1.SH	Humidity Input value Scaling point 2	Input value Scaling point 1 to 10 V		4.50
HSPH	Humidity set point High Limit	Set point low limit To 100	——	100
HSPL	Humidity set point Low Limit	00 To set point high limit	——	0
HFtC	Humidity Filter time Constant	OFF,1 to 99 seconds	——	1
HACt	Humidity control action	HUn/dHUn	——	HUn
Pb-C	Proportional band	0.00 To 400.0	——	0.0
CYC.t	Cycle time	0.1 To 100.0 Sec.	Pb-C>0	15.0
HHYS	Humidity Hystersis	0.1 To 99.9	Pb-C=0	1.0
HYS.b	Humidity hystersis bias	- 9.9 To 9.9		0.0

Display	Name & Description	Range	Display condition	Default value
HdbS	Humidity PV bias	-100.0 To 100.0	Pb-C=0	0.0
HtAn	Humidity timer	0.0 To 99.9 minute		0.0
rSEt	Reset	no/yES	——	no

PARAMETER EXPLANTIONS:

- **SCALING FOR ANALOG INPUT:**

To scale the controller,two scaling points are necessary.Each scaling point has a coordinate pair of display values and input values.it is recommended that the two scaling point be at the low and high ends of the input signal being measured.process value scaling will be linear between and continue past the entered points to the limits of the input range. (Factory setting example will display 0.0 at 0.5V input and display 100.0 at 4.5V input.



NOTE:This change will not be visible in the programming menu.

- **TIMER:**

TIMER is main output restart time.In this main output once turned OFF will turn ON only after set time even if the temperature is increased or more than the set temperature.This is needed to prevent the compressor from restarting in a short time (less than the set time)

5. LEVEL 2 : ALARM MODULE

Display	Name & Description	Range	Display condition	Default value
ALNO	Alarm Selection	AL-1 / AL-2	——	AL-1
AL-1	Alarm 1 mode	OFF / dHI.t /dHI.H/dLO.t /dLO.H/bNd.t /bNd.H/ HA-t /LA-t/ S.bPt / S.bPH	ALNO=AL-1	HA-t
AL-2	Alarm 2 mode	OFF / dHI.t /dHI.H/dLO.t /dLO.H/bNd.t /bNd.H/ HA-H /LA-H/ S.bPt / S.bPH	ALNO=AL-2	HA-H
ALNA	Relay status for Alarm 1 & 2	EN/dEN	——	EN
HYSt	Hystersis for Alarm 1 & 2	0.1 To 99.9	These parameters are not prompted if Alarm1 & 2 mode is OFF /SbrT/sbrH.	1.0
HYS.b	Hystersis bias for Alarm 1 & 2	- 9.9 To 9.9		0.0

PARAMETER EXPLANTIONS:

- **ALARM MODES:**

  (Refer **USER GUIDE** for detailed explanation).

6. LEVEL 4:LOCKOUT MODULE

Display	Name & Description	Range	Display condition	Default value
Id	User ID	0 To 9999	——	0
LOCY	Program access setting #	ONL/LEVL	——	LEVL

 # If LOCK selection is ONL, the following parameters will be prompted.

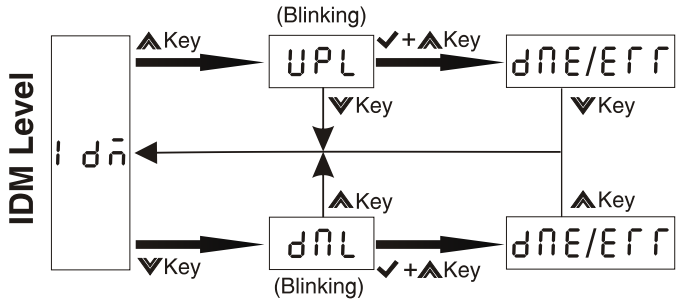
Display	Name & Description	Range	Display condition	Default value
tSEt	Lock Set	UNLY/REAd /LOCY	——	UNLY
HSEt	Lock Set	UNLY/REAd /LOCY	——	UNLY
AL-1	Lock Set	UNLY/REAd /LOCY	——	UNLY
AL-2	Lock Set	UNLY/REAd /LOCY	——	UNLY
tUNE	Lock tune	UNLY/REAd /LOCY	——	UNLY
Pb-1	Lock proportional	UNLY/REAd /LOCY	——	UNLY
INt.t	Lock integral time	UNLY/REAd /LOCY	——	UNLY
dEr.t	Lock derivative time	UNLY/REAd /LOCY	——	UNLY
rnL.r	Lock Manual reset	UNLY/REAd /LOCY	——	UNLY
Pb-C	Lock proportional band	UNLY/REAd /LOCY	——	UNLY
CHnG	Change Password	Id-n/Id-y	——	Id-n
nEy	New password	——	CHnG=Id-y	0

 # If LOCK selection is LEVEL, The following parameters will be prompted.

Display	Name & Description	Range	Display condition	Default value
L- 0	Lock Level 0	UNLK/READ /LOCK	——	UNLK
L- 1	Lock Level 1	UNLK/READ /LOCK	——	UNLK
L- 2	Lock Level 2	UNLK/READ /LOCK	——	UNLK
L- 5	Lock Level 5	UNLK/READ /LOCK	——	UNLK
CHNG	Change password	id-n/id-y	——	id-n
NEW	New password	——	CHNG = id-y	0

NOTE:
UNLK - Full access to the particular level / parameter.
READ - Particular level / parameter can be read but not edited.
LOCK - No access to the particular level / parameter.

IDM Level



Display	Parameter Description
idn	Independent Downloader Module
UPL	Upload from product to IDM
dNL	Download from IDM to product
dNE	Operation Successful
ERR	Operation unsuccessful

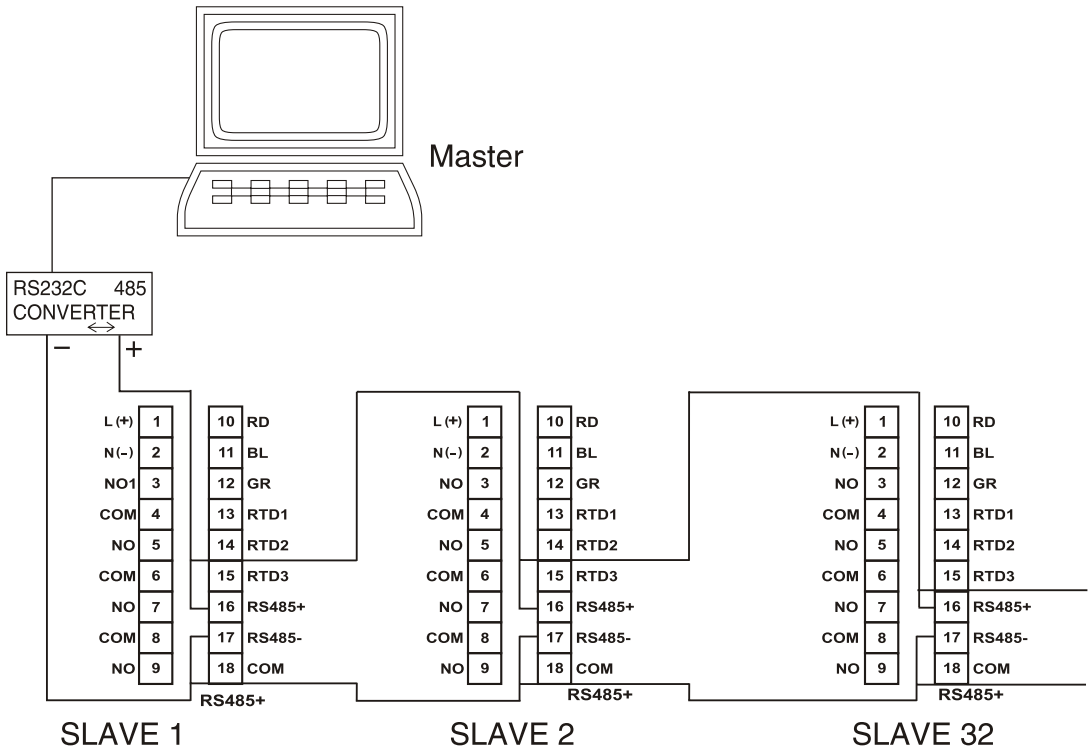
Note :
1) IDM Level - IDM should be connected before powering on the unit to enter in IDM level.
2) Long press ∧ or ∨ key for 3 sec to exit from IDM mode.

Caution: After Downloading, switch of the unit and then remove the IDM

LEVEL 5 - COMMUNICATION PARAMETERS

Display	Name & Description	Range	Display condition	Default value
bAUd	Baud Rate	2400/4800/9600/ 19200/38400/57600 115200	——	9600
AddR	Communication station No.	1 to 99	——	1
PAR I	Parity	NONE/EUEN Odd	——	NONE
StOP	Stop bit	1/2	——	1

CONNECTION DIAGRAM



Note:
1. Maximum 32 slave controllers can be connected to the master.
2. The total cable length should not exceed 500 meters.
3. Use shielded twisted -pair cables for RS485 connections.
4. Use terminators having a resistance of 100ohm (½ watt).

RS485-RS232 Converter
Part no.- AC-RS485-RS232-01

ONLINE DISPLAY OPTION

This function allows user to view online display options.

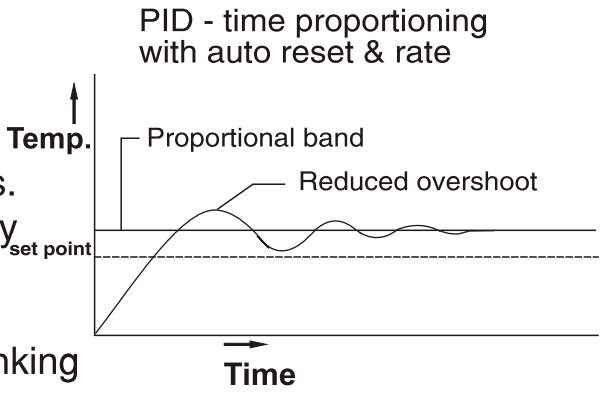
NOTE:

The parameters shown below are not prompted if they are locked in level 4

DISPLAY	DESCRIPTION	DISPLAY CONDITION
tSEt	**Temprature set point**	——
HSEt	**Humidity set point**	——
AL-1	**Alarm 1 set point**	Online access for AL1 not valid if Alarm mode1 = OFF/ sbrT/sbrH
AL-2	**Alarm 2 set point**	Online access for AL2 not valid if Alarm mode 2 = OFF/ sbrT/sbrH
tUnE	**Auto tune**	Auto tune is not prompted if Pb-1=0.
Pb-1	**Proportional band**	——
It-1	**Integral time**	Integral time is not prompted if Pb-1= 0
dt-1	**Derivative time**	Derivative time is not prompted if Pb-1= 0
rnL.n	**Manual reset**	Manual reset is prompted only if Integral-main=0(It-1=0) and Pb-1 > 0.
Pb-C	**Proportional band**	——
PErC	**Output percentage**	This parameter is read only and cannot be altered.
°C	**Temperature unit**	This parameter is read only and cannot be altered.
bLnk	**Blank**	——

USER GUIDE

• **AUTO TUNING:**



Auto tuning is a function whereby the controller learns the process characteristics by itself and automatically sets the required P,I and D values. The auto-tuning function can be activated at any time during the process after power ON , while temperature is rising or when control has stabilized. Autotune is indicated by AT LED blinking After the auto tuning procedures are completed, the AT LED will stop flashing and the unit will revert to PID control by using its new PID values. The PID values obtained are stored in the nonvolatile memory.

The auto-tuning is applied in cases of :

- Initial setup for a new process
- The set point is changed substantially from the previous auto-tuning value.
- The control result in unsatisfactory.

The following controller parameters are automatically adjusted by Auto- tune according to the characteristics of the process:
Proportional Band (Pb-1)
Integral Time (It-1)
Derivative Time (dt-1)
Input Filter (FtC)

If the control performance by using auto-tuning is still unsatisfactory, the following rules can be applied for further adjustment of PID values:

ADJUST MENT SEQUENCE	SYMPTOM	SOLUTION
(1) Proportional Band (PB)	Slow Response	Decrease PB
	High overshoot or Oscillations	Increase PB
(2) Integral Time (IT)	Slow Response	Decrease IT
	Instability or Oscillations	Increase IT
(3) Derivative Time (TD)	Slow Response or Oscillations	Decrease TD
	High Overshoot	Increase TD

- **PROPORTIONAL BAND:**

Proportional band is the area around the set point where the controller is actually controlling the process; the output is at some level other than 100% or 0%.

Proportional band is expressed in terms of degree centigrade.

If the proportional band is too narrow an oscillation around the setpoint will result. If the proportional band is too wide the control will respond in a sluggish manner, could take a long time to settle at set point and may not respond adequately to upsets.

- **MANUAL RESET:**

Virtually no process requires precisely 50% output on single output controls or 0% output on two output controls. The adjustment called manual reset allows the user to redefine the output requirement at the setpoint. A proportioning control without manual or automatic reset will settle out somewhere within the proportioning band but likely not on the setpoint.

- **INTEGRAL TIME:**

Integral time is defined as the time, in seconds, which corrects for any offset (between setpoint and process variable) automatically over time by shifting the proportioning band. Integral action (also known as “automatic reset”) changes the output power to bring the process to setpoint. Integral times that are too fast (small times) do not allow the process to respond to the new output value. This causes over-compensation and leads to an unstable process with excessive overshoot. Integral times that are too slow (large times) cause a slow response to steady state errors. Integral action may be disabled by setting the time to zero. If time is set to zero, the previous integral output power value is maintained. If integral action is disabled, manual reset is available by modifying the output power offset (“MNL.r” initially set to zero) to eliminate steady state errors. The controller has the feature to prevent integral action when operating outside the proportional band. This feature is called **“antireset wind-up”**.

- **DERIVATIVE TIME**

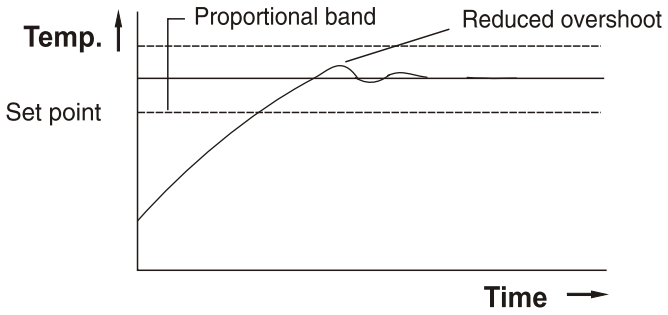
Derivative action is used to shorten the process response time and helps to stabilize the process by providing an output based on the rate of change of the process. In effect, derivative action anticipates where the process is headed and changes the output before it actually “arrives”. The derivative time is calculated in seconds. Increasing the derivative time helps to stabilize the response, but too much derivative time coupled with noisy signal processes, may cause the output to fluctuate too greatly, yielding poor control. None or too little derivative action usually results in decreased stability with higher overshoots. No derivative action usually requires a wider proportional and slower integral times to maintain the same degree of stability as with derivative action. Derivative action is disabled by setting the time to zero.

- **DERIVATIVE APPROACH CONTROL:**

Derivative approach control (DAC) helps in reducing overshoot at startup. The control output cutoff point is derived as DAC x Proportional band. Note that the DAC value is automatically calculated and fed after auto tuning (if tuning is initiated at startup).

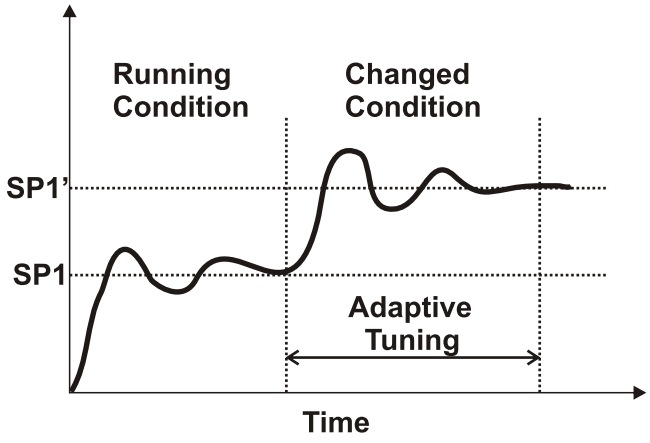
Self Tune (ST) : It is used where modification of PID parameters is required repeatedly due to frequent change in process condition eg. Setpoint.

- *Tune LED(AT) blinks at slower rate when Self-tuning is in progress.*
- *At the completion of self-tuning, Tune LED stop blinking.*



- Self-tuning is initiated under the following conditions :
  1)When setpoint is altered.
  2)When tune mode is altered. (TUNE=ST)
- ST will start only if PV < 50% of setpoint.
- ST will work only when ACT=RE.

Adaptive Tune (ADT) : It is used where modification of PID parameter is required repeatedly due to frequent change in process condition eg. Setpoint , Adaptive.
Tune LED(ADT) blink's at faster rate when Adaptive tuning is in progress.
At the completion of Adaptive-Tuning, ADT LED stop blinking.



- **ALARM MODES:**

1. Absolute alarms (Independent Alarm) :

Absolute alarm is a self-existent alarm independent of the main set point. For eg.If the main set point is 100°C and absolute alarm is set as 110°C. The alarm will be activated at 110°C

There are two absolute alarms-

Full scale High Alarm(HA-T/HA-H): sets off alarm signal when PV rises above set point to a pre-set value above scale minimum. **Refer Fig:d.**

Full scale Low Alarm(LA-T/LA-H):sets off alarm signal when PV falls below set point to a pre-set value below scale maximum. **Refer Fig:e.**

2. Deviation alarms (Error alarm) :

This alarm is activated at an error on the main set point. For eg. If the main set point is 100°C and deviation alarm is set to±5°C then the alarm will be activated at 100+5=105°C incase of deviation high alarm & for deviation low alarm it will be activated at 95°C. Incase of deviation band alarm the alarm will be activated on both sides of set point i.e.at 95° and 105°.

There are three deviation alarms-

Deviation High Alarm(dHI.t/dHI.h): sets off alarm signal when PV rises above a pre-set value above the set point.**Refer Fig: a.**

Deviation Low Alarm(dLo.t/dLo.h): sets off alarm signal when PV falls below a pre-set value below the set point.**Refer Fig:b.**

Deviation Band Alarm(bnd.t/bnd.h): sets off alarm signal when PV rises above or falls below a pre-set value above or below the set point. **Refer Fig: c.**

Configuration Record Sheet

3. BREAK ALARM:

Break Alarm: sets off alarm signal when sensor break / under range occurs.

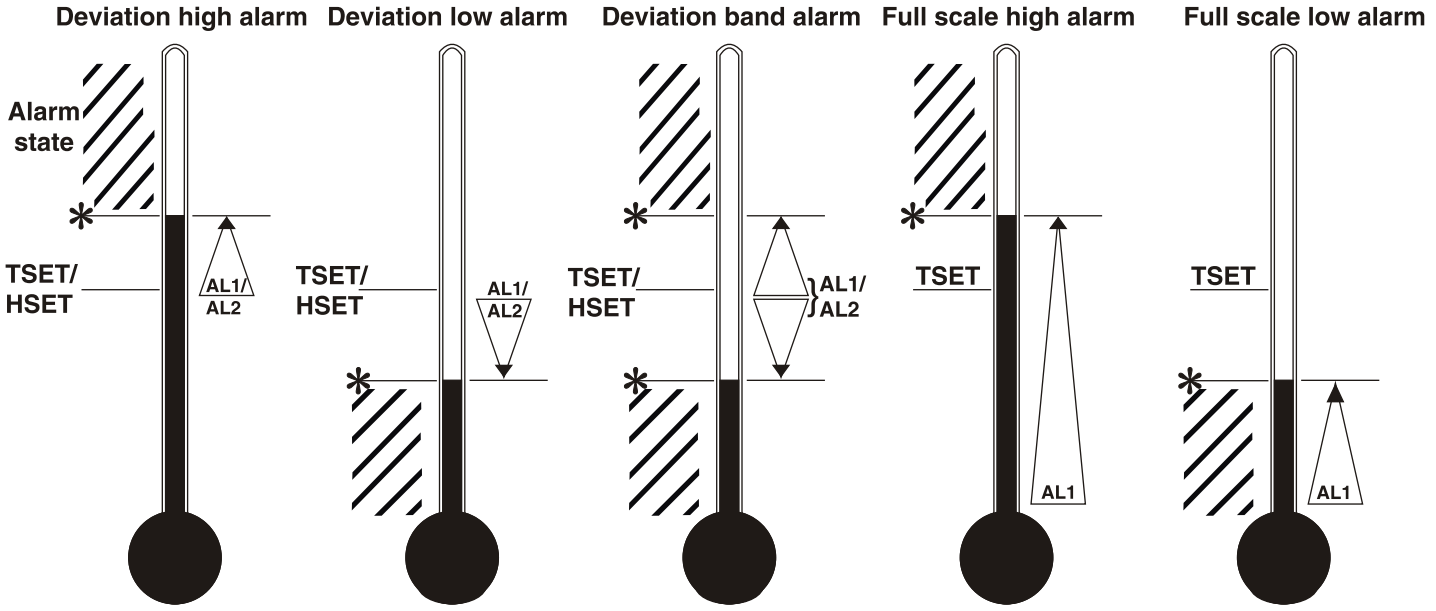


Fig: a. Fig: b. Fig: c. Fig: d. Fig: e.

For deviation & break alarm both the alarm Al1 & Al2 can be used for temperature (TSET) as well as humidity(HSET). If dhi.t, dlo.t, bnd.t, sbr.t are selected;it will be activated according to temperature. Whereas dhi.h, dlo.h, bnd.h, sbr.h are selected it will be activated according to humidity.

The absolute(HA-T/HA-H/LA-T/LA-H) Alarm 1 will be activated only according to Temperature & Alarm 2 will be activated according to humidity.

Calibration Certificate

SELEC

Model No: HTC307

Claimed Accuracy: ± 0.1% of full scale ±1 digit (After 20min warmup time)

Standard used for calibration of the product is traceable to NABL

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

SENSOR	Humidity	DISPLAY VALUE (°C)	SENSOR	CALIBRATION VALUE (0.1 resolution)	DISPLAY VALUE
HS-A-100	35.0	35.0	Voltage (VDC)	0.0	0.0
	700.0	700.0		10.0	10.0
	1350	1350			
PT100	0.0	0.0	Current (mA)	0.0	0.0
	500.0	500.0		20.0	20.0
	800.0	800.0			

The RTD curves are linearised in this microprocessor based product, and hence the values interpolated between the readings shown above are also equally accurate, at every point in the curve.

Unit is accepted as accuracy is withing the specified limit of claimed accuracy and certificate is valid upto one year from the date of issue.