TEMPERATURE CONTROLLER SERIES: PR-69

INDEX:

⚠ CAUTION:

1. Always follow instructions stated in this product booklet.
2. Before installation, check to ensure that specifications agree with intended application.
3. Installation must be done by skilled technician.
4. Automation and controlled devices must be properly "installed" so that they are protected against any risk of involuntary actuations.
5. Suitable dampers should be provided in event of excessive vibrations.

1.0 CATALOG DESCRIPTION:

CAT ID	Action	O/P 1	O/P 2	O/P 3	Modbus	Symbol
151A12B	Single	Relay	Relay	SSR	NA	#1
151B12B	Single	Analog	Relay	SSR	NA	#2
151C12B	Single	Analog	Relay	Relay	NA	#3
151D12B	Single	Relay	Relay	Relay	NA	#4
151A13B1	Dual	Relay	Relay	SSR	Yes	#5
151B13B1	Dual	Analog	Relay	SSR	Yes	#6
151C13B1	Dual	Analog	Relay	Relay	Yes	#7
151D13B1	Dual	Relay	Relay	Relay	Yes	#8
151A13B	Dual	Relay	Relay	SSR	NA	#9
151B13B	Dual	Analog	Relay	SSR	NA	#10
151C13B	Dual	Analog	Relay	Relay	NA	#11
151D13B	Dual	Relay	Relay	Relay	NA	#12
151E12B	Single	Relay	SSR	NA	NA	#13

Note:

Models are indicated by special symbols as shown in table on Page 4 and given symbols are used while explaining the device functionality.

Eg: coeF#[5, 6, 7, 8, 9, 10, 11, 12]- Coefficient, Range: 0.1 to 10.0 default:1

The example above explains that the feature is applicable only for 151A13B1, 151B13B1, 151C13B1,151D13B1, 151A13B, 151B13B,151C13B, 151D13B.

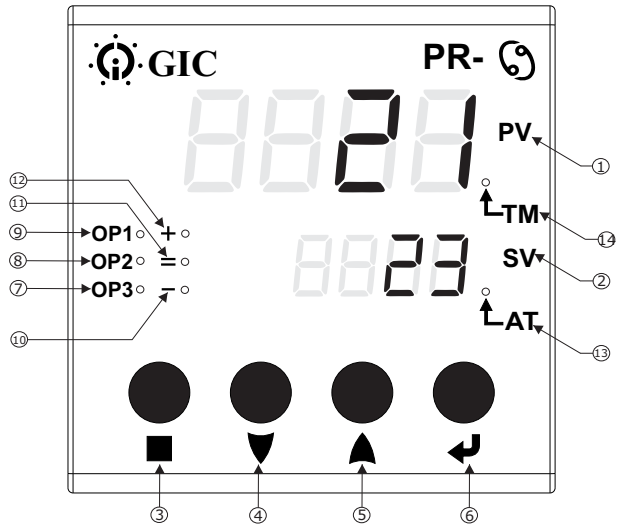
#Symbols appear where description vary based on models. If the # does not appear, then it indicates that the feature is applicable to all the models.

2.0 FEATURES:

- Field selectable thermocouple, RTD ,0-50 mV, 0-60 mV, 12-60 mV.
- Auto tuning.
- Field configurable process and deviation alarms.
- Bump less Auto Manual transfer.
- Soft Start mode.
- Temperature range selection 1.°C - Celsius 2.°F - Fahrenheit
- Dual display with configurable lower display.
  1.Co - Controller Output
  2.Effective Set Point
  3. Set Point
  4. Alarm threshold
  5. Timer time
  6. Unit
- Timer Functionality (only for single acting devices)
- Three outputs.
- Control modes: ON-OFF Symmetric, ON-OFF Asymmetric, Single acting PID control.
- Two set point storage.
- SSR driving with short circuit protection.
- Password "Enable" and "Disable" function added which helps user to enable the password as and when required. In Factory Default, Password is "Disabled".
- Additional Features available in dual acting devices:(Cat. Nos.: 151A13B1, 151B13B1, 151C13B1, 151D13B1,151A13B, 151B13B, 151C13B, 151D13B)

-> Control modes: Neutral zone ON-OFF, Dual acting PID control.
-> Additional two set point storage (Total Four Set point storage)
-> RS485 Mod-bus communication.(Not applicable for Cat ID:151A13B, 151B13B, 151C13B, 151D13B)

3.0 FRONT FASCIA:



FRONT FASCIA DESCRIPTION:

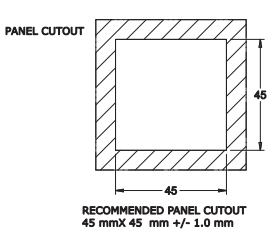
1. PV : Displays the "Process Value".
2. SV : Displays the "Set Value".
3. Key'■' : Configurable key 'C'.
4. Key'▼' : Scroll down key 'DN'.
5. Key'▲' : Scroll up key 'UP'.
6. Key'↵' : Enter key 'E'.
7. OP3 : LED indication for output 3.
8. OP2 : LED indication for output 2.
9. OP1 : LED indication for output 1.
10. '-' : Indicates that PV is less than(SP-Value in the setting LED).
11. '=' : Indicates that PV is equal to SP.
12. '+' : Indicates that PV is greater than(SP+Value in the setting LED).
13. 'AT' : This LED indicates the Auto tuning process is ON.
14. 'TM' : LED blinking- This indicates that timer process is ON.
    LED Continuous ON- Timer time completed.

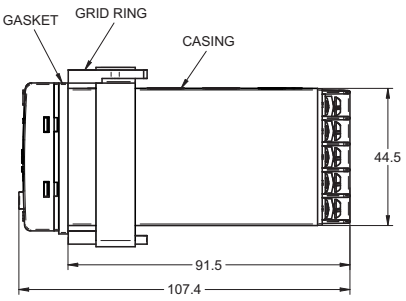
4.0 PRODUCT DESCRIPTION:

PR-69 is a single loop, single/dual acting Microprocessor based controller with ON-OFF, PID, and Auto tunning functionality. The product has two/four programmable set points and depending on model provides three different outputs.

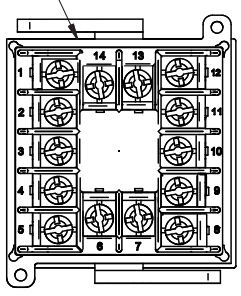
Three Input sensor accepted in PR-69:
1. Thermocouples
2. RTD: PT-100 (Three wire compensation)
3. Standard mV signals:0-50 mV,0-60 mV,12-60 mV.

5.0 DIMENSIONS (in mm):





BACK PLATE_WITH TERMINAL



BACK VIEW

Please refer pg. 84 to pg. 86 for connectiondiagrams.

6.0 TECHNICAL SPECIFICATIONS:

Supply Voltage
110-240 VAC/DC, -20% to +10%, 50-60 Hz

Power Consumption
8 VA

Temperature Sensors

J, K, E, S, B, R Thermocouple,
RTD (PT100, 3 wire compensation),
mV signals (0-50 mV, 0-60 mV, 12-60 mV)

Measurement Range

Sensor J: 0 to 700° C/32 to 1292° F
Sensor K: 0 to 1300° C/32 to 2372°F
Sensor E: 0 to 600° C/32 to 1112° F
Sensor S: 0 to 1750° C/32 to 3182° F
Sensor B: 250 to 1820° C/482 to 3308° F
Sensor R: 0 to 1750° C/32 to 3182° F
Sensor Pt100: -200 to 700° C/ -328 to 1292° F

Measurement Accuracy

0.5 % of full scale for Pt100,
1% of full scale for Tc and mV signals

Resolution

S, B, R, K: 1°C
J, E, Pt100: 0.1°C
mV: 0.001°C

Display
4- Digit 7 Segment LED Display with LED and with LED indication.

Keypad
4-Keys: Configurable(C), Down(DN), Up(UP), Enter(E).

Op1 rating #[1,4,5,8,9,12] SPST, 5A, 250 VAC/30 VDC(RES.)
Op1 rating #[2,3,6,7,10,11] 4-20 mA/0-10 VDC
Op1 rating #[13] SPDT, 10A, 250VAC/30VDC (RES.)

Op2 rating SPST, 5 A, 240 VAC/28 VDC
Op2 rating #[13] SSR Drive 12V, 24mA DC max

Op3 rating #[1,2,5,6,9,10] SSR Drive 12V, 24mA DC max
OP3 rating #[3,4,7,8,11,12] SPST,5 A,250VAC/30VDC (RES.)

Contact Material : AgNi

Life of relays:

OP1 #[1,4,5,8,9,12]	Mechanical life :	$5x10^6$
	Electrical life :	$1x10^5$
OP1 #[13]	Mechanical life :	$1x10^7$
	Electrical life :	$1x10^5$
OP2	Mechanical life :	$5x10^6$
	Electrical life :	$1x10^5$
OP3 #[3,4,7,8,11,12]	Mechanical life:	$5x10^6$
	Electrical life :	$1x10^5$

Max. Resistance in case of current output (terminal 1 and 13)#[2,3,6,7,10,11] **600Ω**

Min. Resistance in case of voltage output (terminals 14 and 13)#2,3,6,7,10,11
30 kΩ

Temperature Sampling Rate/PID Sampling Rate
150 ms / 1 s

Weight (Unpacked)
160gm

Humidity
80% Rh Non-condensing

Max. Operating Altitude
2000 m

Operating Temperature Range
0°C to 50 °C

Storage Temperature Range
-20°C to 60 °C

Pollution Degree
2

IP Protection
IP 40 only for front panel

Dimensions (W X H X D)
48 X 48 X 107.4 (in mm)

Mounting
Panel mounting

Terminal Capacity
2x2.5mm^2

Torque
0.8Nm

Certifications
CE, RoHS

7. EMC, SAFETY, ENVIRONMENTAL

Product Standard
IEC 61326

ESD
IEC 61000-4-2 Level II

Radiated Susceptibility
IEC 61000-4-3 Level III

Electrical Fast Transients
IEC 61000-4-4 Level IV

Surge
IEC 61000-4-5 Level III

Conducted Susceptibility
IEC 61000-4-6 Level III

Voltage Dips and Interruptions
IEC 61000-4-11 (AC)

Conducted Emission
CISPR 11 Class A

Radiated Emission
CISPR 11 Class B

Isolation Level:

151A12B/151A13B

	Sensor	OP1	OP2	OP3
Supply	2 kV	4 kV	4 kV	2 kV
Sensor	-	4 kV	4 kV	NA
OP1	-	-	4 kV	4 kV
OP2	-	-	-	2 kV

151B12B/151B13B

	Sensor	OP1	OP2	OP3
Supply	2 kV	2 kV	4 kV	2 kV
Sensor	-	NA	4 kV	NA
OP1	-	-	2 kV	NA
OP2	-	-	-	2 kV

151C12B/151C13B

	Sensor	OP1	OP2	OP3
Supply	2 kV	2 kV	4 kV	4 kV
Sensor	-	NA	4 kV	4 kV
OP1	-	-	2 kV	2 kV
OP2	-	-	-	4 kV

151D12B/151D13B

	Sensor	OP1	OP2	OP3
Supply	2 kV	4 kV	4 kV	4 kV
Sensor	-	4 kV	4 kV	4 kV
OP1	-	-	4 kV	4 kV
OP2	-	-	-	4 kV

151A13B1

	Sensor	OP1	OP2	OP3	RS485
Supply	2 kV	4 kV	2 kV	2 kV	2 kV
Sensor	-	4 kV	2 kV	NA	NA
OP1	-	-	4 kV	4 kV	4 kV
OP2	-	-	-	2 kV	4 kV
OP3	-	-	-		NA

151B13B1

	Sensor	OP1	OP2	OP3	RS485
Supply	2 kV	2 kV	2 kV	2 kV	2 kV
Sensor	-	NA	2 kV	NA	NA
OP1	-	-	2 kV	NA	NA
OP2	-	-	-	2 kV	4 kV
OP3	-	-	-		NA

151C13B1

	Sensor	OP1	OP2	OP3	RS485
Supply	2 kV	2 kV	4 kV	4 kV	2 kV
Sensor	-	NA	2 kV	2 kV	NA
OP1	-	-	2 kV	2 kV	NA
OP2	-	-	-	2 kV	4 kV
OP3	-	-	-	-	2 kV

Note(#[4,7]): As there is no isolation between RS-485 and OP1, user must take care that the ground of circuits to which these outputs are connected should be isolated from each other.

151D13B1

	Sensor	OP1	OP2	OP3	RS485
Supply	2 kV	4 kV	4 kV	2 kV	2 kV
Sensor	-	4 kV	2 kV	2 kV	NA
OP1	-	-	4 kV	4 kV	4 kV
OP2	-	-	-	2 kV	4 kV
OP3	-	-	-	-	2 kV

151E12B

	Sensor	OP1	OP2
Supply	2 kV	4 kV	2 kV
Sensor	-	4 kV	NA
OP1	-	-	4 kV

Safety :

Test Voltage between I/P and O/P IEC 60947-5-1 2 kV
Impulse Voltage between Input and Output IEC 60947-5-1 Level IV
Single Fault IEC 61010-1
Insulation Resistance UL 508 > 50KΩ
Leakage Current UL 508 < 3.0 mA

Environmental:

Cold Heat IEC 60068-2-1
Dry Heat IEC 60068-2-2
Vibration IEC 60068-2-6, 5 g

8.0 MEASUREMENT:

Parameters for this are included in the group "InP". Inputs accepted are Thermocouples (J, K, E, S, B,R), mV signals (0 - 50 mV), (0 - 60 mV), (12-60 mV) & RTD PT100.For proper functionality,it is recommended to switch off and on the instrument, whenever these are modified. The parameters related to input are 'unit' - unit of measurement (°C , °F) and 'dP' - decimal point representation. In case of analog input, the input voltage gets divided over the range set in the parameters 'lScL' lower limit and 'lSch' upper limit. Instrument can be re-calibrated according to application needs, by using parameters. "oFSt" and "rAtE". If "rAtE" = 1.000, then using parameters "oFSt", it is possible to set positive or negative offset that is simply added to the value read by the probe.

If the offset is not constant for all the measurements, it is possible to operate the calibration on any of two points. In this case, in order to decide which values to program on parameters "oFSt" and "rAte", the following formulae must be applied:
"rAte" = (y2-y1)/(x2-x1)
"oFSt" = y2 - rate*x2

Where,
y1 = Measured temperature 1
x1 = temperature displayed by instrument
y2 = Measured temperature 2
x2 = temperature displayed by instrument
The instrument thus visualizes the temperature as :
y = x * "rAtE" + "oFSt"
where y = displayed value and x = measured value

8.1 Output in case of measurement error:

In case of measurement error (over range/under range/sensor break), the instrument supplies the power as programmed on parameters "oPP". In case of PID control, the power output is as a percentage of cycle time. In case of ON/OFF control, the Cycle time is automatically considered as 20s ("e.g. In event of probe error with ON/OFF control and "oPP = 50" the control output will be activated for 10s and deactivated for 10s till measurement error remains.)

If No Error

Controller	**Output Power**
PID	As per % of cycle time
On/Off	20 Secs

If Error

Controller	Output Power
Any	As per programmed in opp

9.0 DISPLAY:

Using parameters. "**dISP**", located in the group "**conF**", it is possible to configure the lower display to visualize different parameters like the Control Output (coP), operating set point (SP). In group "conF", the parameters. "LEd" is used to define the LED shift index functioning for the three LED's repesented as: '+', '-', '='.
The lighting up of the '=' LED indicates that the process value is within the range [SP-LEd] and [SP+LEd].
The lighting '-' LED indicates that the process value is lower than [SP-LEd] and lighting up of '+' indicates that the process value is higher than [SP+LEd]

Menu	**Sub menu**	**Options**
conF	dIsP	1.coP 2.SP 3.EFSP 4.A1th 5.A2th 6.Unit 7.timr

Note:
1) If we select Unit-->C/F i.e (C: Celsius ,F: Fahrenheit) then C or F will displays on the Lower display
2) If timr option is selected then set timer time will displayed on the lower display.

10.0 ACTIVE SET POINT SELECTION:

This instrument allows pre-programming of, up to 2 different set points ("SP1", "Sp2").....
(for #1,#2,#3,#4,#13)
OR
up to 4 different set points
("SP1", "SP2", "SP3", "SP4").....
(for #5,#6,#7,#8,#9,#10,#11,#12)

and then selection of which one must be active.
The effective set point can be selected:
-by parameter "EFsP" in the group of parameters "SP".
-By key "C" if parameter "kEy" = "SPSL".
The maximum number of set points is determined by parameter "nSP" located in the group of parameters "SP".
.....(for #5,#6,#7,#8,#9,#10,#11,#12)

11.0 CONTROL STATES:

The controller acts in three different ways :
1.Automatic Control
2.Control Off
3.Manual Control

Menu	Sub menu	Options
conF	kEy	oPLP oFF

Note: The instrument switches into "Auto" state at the end of auto-tuning. When switched ON, it automatically assume its state at the last switch off.

11.1 Automatic Control (Auto):

Automatic control is the normal functioning state of the controller. When in Auto mode, the device will function as per parameter programmed on parameters cont.

11.2 Control OFF (oFF):

In this mode, all the outputs are deactivated.

11.3 Bumpless Manual/Open Loop Control(oPLP):

This options allows to manually program the power percentage given as output by the controller by deactivating automatic control. When the instrument is switched to manual control, the power percentage Is same as last one supplied. To change the power output, adjust the parameter manual reset "rS" in the "rEg" group.

Menu	Sub menu	Options
rEg	rS	Value

12.0 CONTROL ACTIONS:

In automatic control, the controller can provide different control actions depending on the parameter "cont" in "rEg" group. The different control actions are explained as below:

Menu	Sub menu	Options
rEg	cont	onFs(On Off Symmetric) onFA(On Off Asymmetric) nr(Neutral Zone) PID(PID Control)

12.1 ON/OFF Control:

All the parameters regarding ON/OFF control are listed in group "rEg". This type of control can be set by programming parameters "cont"= onFs for ON-OFF action with symmetric hysteresis OR onFA for ON-OFF action with asymmetrical hysteresis. It drives the output programmed as coP [selected by parameters. oPcF#^{5,6,7,8,9,10,11,12} in oP], depending on the measured temperature value, on effective set point, function mode ("FUnc") and on the hysteresis ("hESt"). The action can be explained as follows , In case of reverse action i.e. hEAt being set on parameters "FUnc" in "rEg" menu, the controller activates the output when the process value "PV" goes below [SP-hEST]. It deactivates the output when the PV goes above "SP+hEST"in case of symmetric ON-OFF control and above "SP" in case of Asymmetric ON-OFF control.

Menu	Sub menu	Options
rEg	Func	hEAt

Symmetric On Off Control (hEAt):

Condition	Action
PV < [SP-hEST]	Controller Output is activated
PV > [SP+hEST]	Controller Output is deactivated

Asymmetric On Off Control:

Condition	Action
PV < [SP-hEST]	Controller Output is activated
PV > [SP]	Controller Output is deactivated

Similarly in case of direct action i.e. CooL being set on parameters. "Func", the controller activates the output when the process value "PV" goes above (SP+hEsT) and deactivates the output when "PV" goes below "SP-hEsT" in case of symmetric ON-OFF control and"SP" Asymmetric ON-OFF control.

DIRECT ACTING:

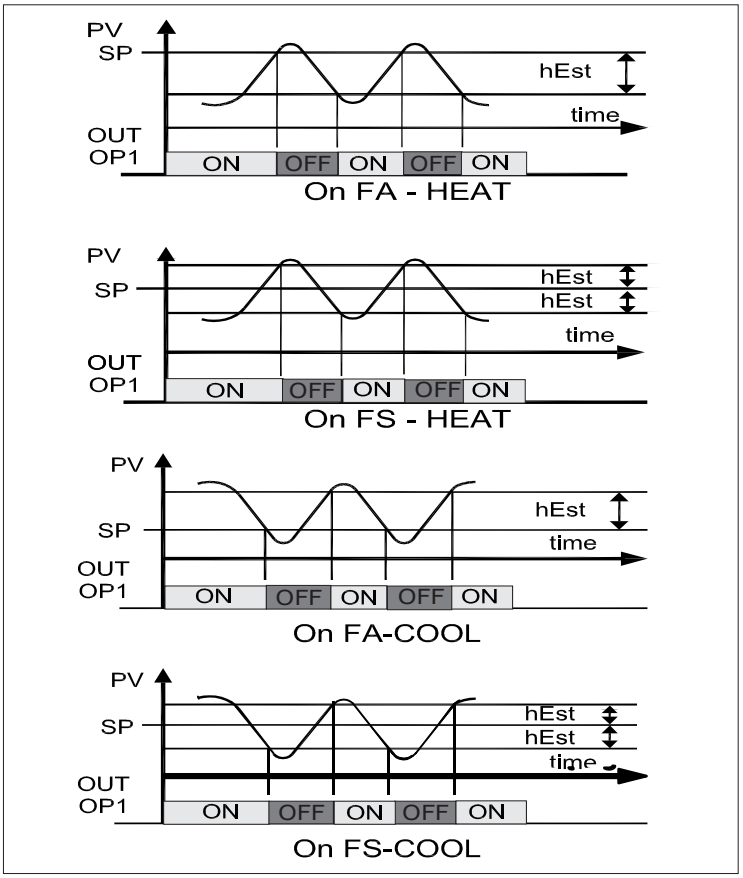
Menu	Sub menu	Options
rEg	Func	cooL

Symmetric On Off Control (cool):

Condition	Action
PV < [SP-hEST]	Controller Output is deactivated
PV > [SP+hEST]	Controller Output is activated

Asymmetric On Off Control:

Condition	Action
PV < [SP-hEST]	Controller Output is deactivated
PV > [SP]	Controller Output is activated



12.2 Neutral Zone ON/OFF Control (nr):

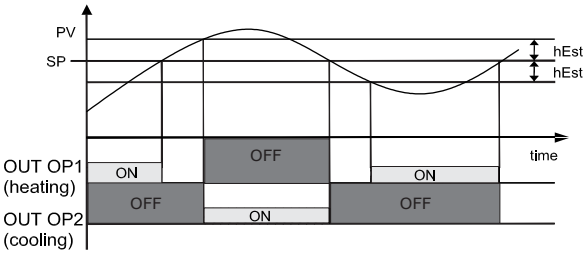
12.2.1 Action:

All the parameters referring to neutral zone ON/OFF control are listed in the group "rEg". This type of control can be set when two outputs, configured by parameter "oPcf" ("oPcF" = h1c2 configures OP1 as heater and OP2 as cooler) are programmed as "coP" and the parameters "cont" = nr. The neutral zone control is used to control processes in which there is an element which causes a positive increase in temperature (eg. Heater, Humidifier etc.) and an element which causes decrease in temperature (e.g. Cooler, de-humidifier, etc.) Depending on measurements of effective set point "SP" and on hysteresis "hESt", the control functions works on programmed outputs. The controller activates the output configured as heater when process value goes below [SP-hEst] and deactivates it once the PV reaches SP. Further it activates the output configured on cooler when process value goes above [SP+hESt]. The cooler output is deactivated when PV reaches SP again.

Note: This type of control is applicable for double acting cat ids only.

Menu	Sub menu	Options
rEg	cont	nr
OP	oPcF	h1c2

Condition	Heater	Cooler
PV < [SP-hEST]	ON	OFF
PV = SP	OFF	OFF
PV >[SP+hEST]	OFF	ON
PV = SP	OFF	OFF



12.2.2 cdty Menu:
Compressor duty cycle "cdty" is used to protect compressor short cycling. It is a time based activation of the compressor. The activation of compressor can be avoided till the time set on parameter "cdty". "thus" providing the delay. Time programmed on "cdty" is counted starting from last output deactivation and then even if the regulator requires to switch on the corresponding output, the activation is delayed till the time set on "cdty" elapses.

Note: This menu is visible only when control type is selected as nr(Neutral zone)

12.3 PID Control

12.3.0 Single Acting PID Control:
All the parameters referring to PID control are listed in the group "rEg". The single action PID control can be obtained by programming parameters. "cont" = Pid and works on output configured as "coP" Depending upon the effective setpoint "sP", function "FUnc" and on the instrument's PID algorithm the control output is calculated. The single action PID control algorithm foresees the setting following parameters:
"Pb" - Proportional Band.
"Int" - Integral Time
"dEr" - derivative time
"rS" - Manual Reset (if "Int=0" only)

for #[1,2,3,4,13]: "ct" - Cycle time

Menu	Sub menu	Options
rEg	cont	PID
OP	oPcF/OP1/OP2/OP3 (atleast one)	coP
rEg	FUnc	hEAt/cooL

12.3.1 Double Acting PID Control (#[5,6,7,8,9,10,11,12]):

All the parameters referring to PID control are listed in the group"rEg". The double action PID control is used to control processes where there is an element which causes a positive increase in temperature (ex. Heating) and an element which causes a decrease in temperature (cooling). This type of control is selected by setting "cont" as Pid setting. The outputs configured for HEAT or COOL action in oPcF menu should be configured as "coP" The effective set Point "SP" and the instruments algorithm decides the controller output of Double Action PID control. The cycle times "hct" (Heat cycle time: for output acting on heater) and "cct" (cool cycle time: for output acting on cooler) should have low value with frequent intervention of control outputs, so that good stability of process variable can be achieved, in case of fast processes. It is recommended to use solid state relays to drive actuators. The Double Action PID control algorithm needs the programming of following parameters:

"Pb" - Proportional Band
"Int" - Integral Time
"dEr" - derivative time
"hct" - Heat cycle time
"cct" - cool cycle time
"rS" - Manual Reset (if "Int=0 only)
"coEF" - Coefficient Relation between power heating and cooling element. Range between 0.1 to 10.
"coEF" > 1: represents that the cooling element is stronger than heating element.
"coEF" = 1: represents that the heating and cooling element are equally strong.
"coEF" < 1: represents that the heating element is stronger than cooling element.

Menu	Sub menu	Options
rEg	cont	PId
OP	oPcF	h1c2
OP	OP1/OP2/OP3 (atleast two)	coP

13.0 AUTO TUNING:

Auto tuning is a process by which the controller automatically calculates the values if Pb, Int & dEr suitable for the process. In this process , the controller carries out several operations on the process plant to determine these values. Steps for Auto-tuning are as follows:

1. Program and select desired Set Point.
2. Program parameters "cont"=PID.
3. For single action PID control, program parameters "Func" as "hEAt" if using heater or "cooL" if using cooler.
4. Also program the output to which the final control element is connected as "coP".
5. In case of Double action PID control, set "coP" on the two outputs selected using parameters "oPcF" to act on heater and cooler.

Menu	Sub menu	Options
rEg	cont	PId
OP	OP1/OP2/OP3 (two for double acting) OP1/OP2/OP3 (one for single acting)	coP
rEg	Func(If single acting)	hEAt/cooL
rEg	AUto	1,2,3,4

Note: Double acting device can be used as single acting device.

6. Program parameters. "Auto" as:

"1"- Tune at Every power ON. If auto-tuning is desired, each time the instrument is switched ON.
"2"- Tune at first power ON. If auto-tuning is desired, the next time the instrument is switched ON. Once the tuning is finished, the parameters.
"Auto" is swapped automatically to "OFF".
"3"- Tune manually. If auto-tunning is to be started manually by pressing the config key programmed as"stAt"
"4"- Tune at every set point change or at the end of soft start. This activates auto-tuning at every change of set point or at the end of soft-start cycle.
7. Switch OFF the instrument power and then switch it ON to start tuning if "Auto" is set as "1" or "2" or by pressing config. key programmed as "stAt". Flashing LED AT indicates the activation of Auto-tunning function. To start the auto tune following condition needs to satisfy:

For Single Acting mode, if "Func" is "hEAt" OR
For dual acting mode if first stage is heating.
Conditions...
PV < [SP - |SP/5|] if soft start is configured OR
PV < [SP - |SP/3|] if soft start is not configured.
and SP - PV > = 10

For Single acting mode, if "Func" is "cooL" or
For Double acting mode if first stage is cooling.
Conditions :
PV>[SP + [SP/5]] If Soft start is configured
OR
PV>[SP + [SP/3]] If Soft start is not configured and PV - SP > = 10
For example on Auto tunning , refer page no.88

If the above conditions are not satisfied at the start of auto tune, the display will show "ErAt" message and the instrument will take the control conditions according to previously programmed PID. To make 'ErAt' disappear, Press "ENTER" key. If auto tune is not completed in 2 hours, the instrument shows 'NoAt' on display. The cycle in progress in automatically get stopped in case of sensor error. After correct PID parameters are tuned, the calculated values are stored in instrument memory.

14.0 RAMP AND SOAK #[5,6,7,8,9,10,11,12]

1. The PR-69 has provision for three ramps & three soaks corresponding to SP1, SP2 and SP3.
2. All parameters related to Ramp-Soak functions are grouped in menu 'rEg'.
3. Three strategies have been adopted that determine the state of ramp and soak in case of power resumption after failure.

Note:-
At the end of the Ramp & Soak profile the controller switches 'OFF' all the outputs. To repeat the Ramp & Soak profile reset the device. This can be done by assigning 'rSEt' to the configurable key in the 'ConF' menu. If the Ramp & Soak profile is not desired, set all Ramp & soak parameters to 'InF' & then reset the device.

14.1 Power Down Resumption Mode (Prmd):

a. cont: The device keeps in memory the last set value before the power failure. After resumption, it starts from the same value and continues the profile. In case of soak stage once the power is resumed, the stage continues for the remaining time.

Power failure in	Action
Ramp stage	After power resumption, device will continue from the last virtual sp value. Assume 3 set points, SP1 = 50, SP2 = 80 and SP3 = 100. If the virtual set point is 65, and power failure occurs. After power resumption, device will start from last virtual set point with the respective ramp rate, irrespective of the PV value.

Power failure in	Action
Soak stage	After resumption device will continue for remaining soak time. Eg: Assume 3 set points, SP1 = 50, SP2 = 80 and SP3 = 100. If the device is in second Soak Stage and configured soak time is 50 minutes. If power failure occurs after 10 minutes, then after power resumption, device will continue with soak stage of 40 minutes and move towards the next SP with new ramp rate, irrespective of the PV

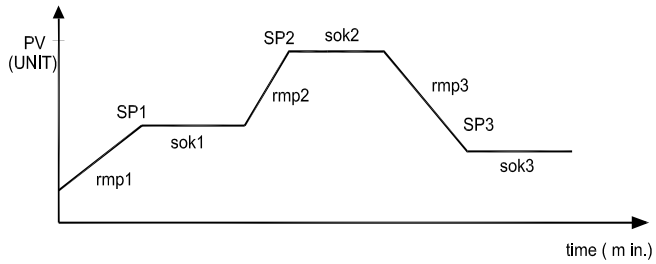
b. rbck: The device starts from present PV value and continues with the profile. In case of power failure in soak stage, once the power is resumed and if PV is not equal to the target SP of the given soak stage, then starting from PV the SP ramps up to the target SP value with the slope of previous ramp. Once target SP is reached, device move to soak stage which continues for the remaining time.

Power failure in	Action
Ramp stage	SP1=50C,SP2=60C,SP3=70C Ramp1=5C/min Ramp2=10C/min Ramp3=15C/min If device was in between 60C and 70C, if power fails then after power resumption device will check for PV. If PV is less than current Ramping stage set point i.e (SP2=60C) then device will start from 40C with ramp rate of second stage (Ramp2=10C/min).

Power failure in	Action
Soak stage	Device will compare SP with PV if not equal then device will ramp back from current PV with ramp rate of last set point till the soak stage reached then continue for remaining soaking period. **Eg:** Assume three set points SP1=50,SP2=60,SP3=70 If device was in between 60 and 70 if power fails then after power resumption device will compare PV with SP value. Consider PV is 40 which is not equal to last set point SP which was 60 then device will ramp back from 40 with ramp rate of second stage and reach till 60. After reaching 60 device will enter into soaking stage for remaining time.

c. rsEt: On power failure, the entire ramp and soak profile is reset. At the end of the profile irrespective of 'Prmd ' the device switches OFF all the control outputs.

Power failure in	Action
Ramp stage/ Soak stage	Profile is reset and device will start from beginning. Eg: Assume three set points SP1=50,SP2=60,SP3=70 If device was in between 60 and 70 if power fails then after power resumption device will start form 50 which is first set point irrespective of PV value in both stages.



14.2 Holdback (hbck):

14.2.0 Holdback In Ramp:

While in ramp mode if the difference between SP and PV value goes beyond Holdback value, the SP ramping stops and it is held on the given value as long as PV < (SP-hbck) (hEAt) OR PV >(SP+hbcK)(cool) range

14.2.1 Holdback In Soak:

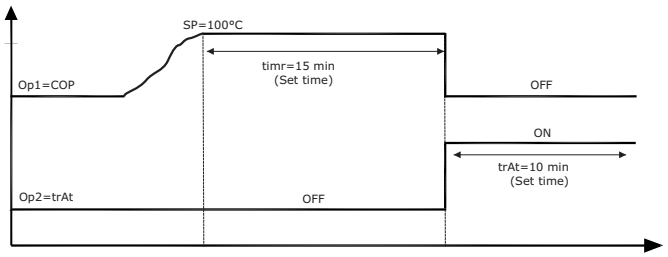
While in Soak mode if the difference between SP and PV value goes beyond Holdback value, the soak timing is stopped and it is resumed when PV comes back within (SP-hbck) (hEAt) and (SP+hbcK) (cool) range. .

15.0 SOFT START:

All parameters referring to the soft start functioning are contained in the group "rEg". The soft start functioning allows limitation of output power when instrument is switched on for a limited period of time.
Following parameters are needed:
"SSt" - Soft start time in hh: mm
"SSth" - Soft start threshold
"Stp" - Soft start power
Soft start functionality will abort when sst or ssth whichever earlier is met.

16.0 Timer:

1) When PV value reach or cross to SP then the timer will start, during this process Op1=cop will be in controlling action.
2) Op2 and Op3 can be assign to Timer alarm.
3) Timer functionality works in both PID & in ON-OFF mode.
For e.g: When Op1 reaches to SP=100°C then the timer will start, Timer will be on for timr=15 minutes then after completing timer time Op1 will be continues OFF and "ovEr" will displays on lower display. If alarm is configure to timer then alarm will be ON as the timer time is elapsed.

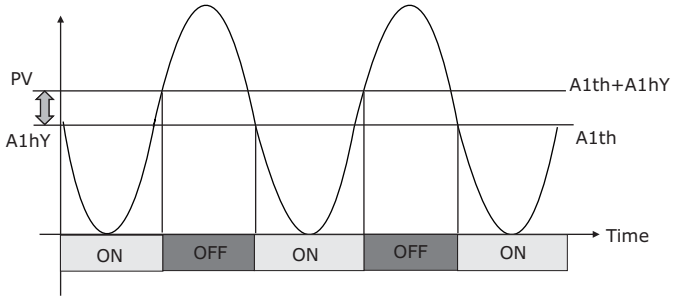


17.0 ALARMS :

17.1 Alarm Types:

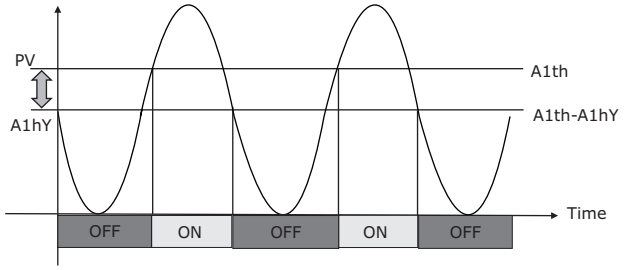
1. Absolute low ("AbLO" on display): Alarm is activated if PV goes below A1th and is deactivated if PV goess above (A1th+A1hY).

Menu	Sub menu	Options
AL1/AL2	A1tY	AbLo



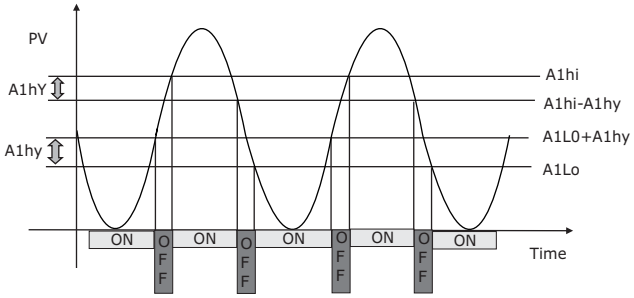
2. Absolute high ("Abhl" on display):
Alarm is activated if PV goes above A1th and is deactivated if PV goes below (A1th-A1hy).

Menu	Sub menu	Options
AL1/AL2	A1tY	AbLo



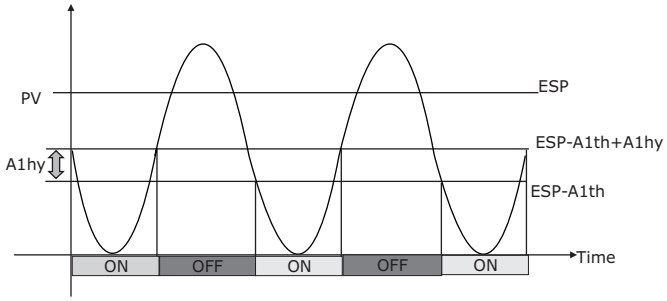
3. Absolute band ("AbbA" on display):
Alarm is activated if PV goes above A1hi or below A1Lo. It is deactivated if it goes below(A1hi-A1hy) or above (A1Lo+A1hy).

Menu	Sub menu	Options
AL1/AL2	A1tY	AbbA



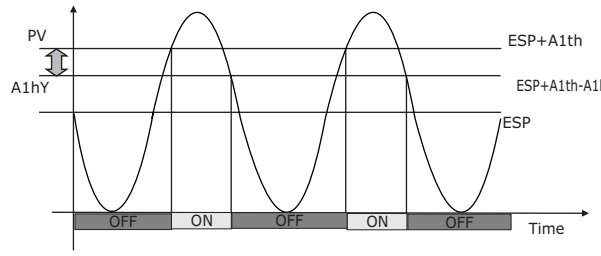
4. Deviation low ("dELo" on display):
Alarm is activated if PV goes below (Effective Set Point(ESP)- A1th) and is deactivated when it goes above (Effective Set Point(ESP) –A1th+A1hy).

Menu	Sub menu	Options
AL1/AL2	A1tY	dELo



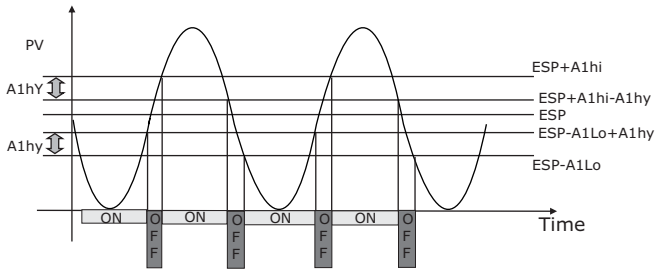
5. Deviation high("dEhi" on display):
Alarm is activated when PV goes above Effective Set Point(ESP)+A1th) and is deactivated When it goes below(Effective Set Point(ESP)+A1th-A1hy).

Menu	Sub menu	Options
AL1/AL2	A1tY	dEhi



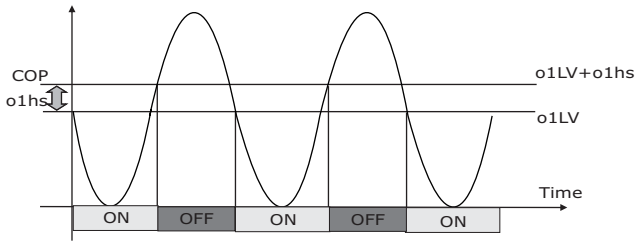
6. Deviation band ("dEbA" on display):
Alarm is activated when PV goes above(Effective Set Point(ESP)+A1hi) or below (Effective Set Point(ESP)-A1Lo) and is deativated when PV goes below (Effective Set Point(ESP)+ A1hi-A1hy)or above (Effective Set Point(ESP)-A1Lo + A1hy).

Menu	Sub menu	Options
AL1/AL2	A1tY	dEbA



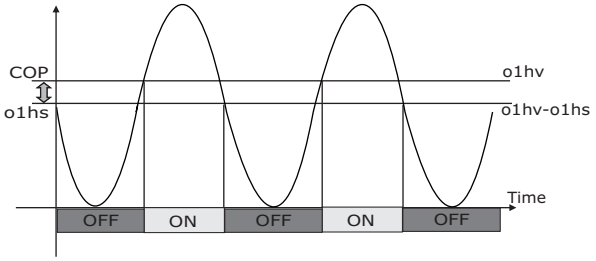
7. Output low("OPLO" on display):
Alarm is activated if output goes below o1LV and deactivated when output goes above (o1LV+o1hs).

Menu	Sub menu	Options
AL1/AL2	A1tY	oPLo



8. Output high("OPhi"on display):
Alarm is activated if output goes above o1hv and deactivated when output goes below (o1hv-o1hs).

Menu	Sub menu	Options
AL1/AL2	A1tY	oPhI



ALARM FUNCTIONALITY

Menu	Sub Menu	Options	Details	Dependencies	Functions
AL1 OR AL2	A1tY	AbLO	**Absolute Low** Activation: PV < A1th Deactivation: PV > A1th+A1hY	PV,A1th,A1hY	To alert user when PV falls below predefined value.(A1th)
		Abhl	**Absolute High** Activation: PV > A1th Deactivation: PV < A1th - A1hY	PV, A1th, A1hY	To alert user when PV exceeds predefined value.(A1th).
		AbbA	**Absolute band** Activation: PV > A1hi or PV < A1Lo Deactivation: PV < A1hi-A1hY or PV > A1Lo+A1hY	PV, A1hi, A1Lo, A1hY	To alert user when PV, 1.falls below predefined value.(A1Lo) OR 2.exceeds predefined value.(A1hi).
		dELo	**Deviation Low** Activation: PV < (SP - A1th) Deactivation: PV > (SP - A1th)+A1hY	PV, SP, A1th, A1hY	To alert user when PV falls below the SP by the value set in A1th
		dEhl	**Deviation High** Activation: PV > (SP + A1th) Deactivation: PV < (SP + A1th)-A1hY	PV, SP, A1th, A1hY	To alert user when PV exceeds the SP by the value set in A1th.
		dEbA	**Deviation Band** Activation: PV < (SP-A1Lo) or PV > (SP+A1hi) Deactivation: PV > (SP – A1Lo) + A1hY or PV < (SP + A1th) - A1hY	PV, SP, A1Lo, A1hi, A1hY	To alert user when, 1.PV falls below the SP by the value set in A1Lo. 2. PV exceeds the SP by the value set in A1hi.
		oPLo	**Output Low** Activation: COP < o1LV Deactivation: COP > o1LV + o1hS	COP,o1LV,01hS	To alert user when COP falls below value set in o1LV.
		oPhl	**Output High** Activation: COP > o1hV Deactivation: COP < o1hV + o1hS	COP,o1hV,01hS	To alert user when COP exceeds value set in o1hV.

Menu	Sub menu	Options
AL1/AL2	A1tY	AbLo Abhl AbbA dELo dEhl dEbA oPLo oPhl

17.2 Alarm Functions:

Sr	Value	Details	Application
1	0	**Normal** **Activation:** When alarm condition occurs. **Deactivation:** When the alarm condition disappears.	Normal
2	1	**Acknowledged** **Activation:** When alarm condition occurs. **Deactivation:** 1.When the alarm condition disappears. 2.When Configurable key programmed for alarm acknowledgment & press in alarm condition.	To ignore the alarm condition
3	2	**Delayed** **Activation:** delayed by time set in A1dL parameter after occurrence of the alarm condition. **Deactivation:** When the alarm condition disappears. Note: During the delay if the alarm condition disappears, alarm will not be generated.	To delay the alarm generation, some times alarm can be generated for shorter time due to some disturbance in system.
4	4	**Latched** **Activation:** When alarm condition occurs. **Deactivation:** When Configurable key programmed for alarm acknowledgment and press once alarm generated. **Note:** Alarm will not get automatically deactivated once generated.	To record or draw attention of alarm generation condition every time. Since no automatic of alarm.
5	8	**No alarm at Power On** **Activation:** If alarm condition exist at power on, alarm will not be activated. Once device goes in no alarm condition after power on, there after alarm will be activated at every occurrence of the alarm condition. **Deactivation:** Alarm will be deactivated In no alarm condition.	To avoid alarm after power on. Since possibility of alarm condition after every power on.
6	16	No alarm at SP change **Activation:** If alarm condition generates after SP change, alarm will not be activated. Once device goes in no alarm condition after SP change, there after alarm will be activated at every occurrence of the alarm condition. **Deactivation:** Alarm will be deactivated in no alarm condition.	To avoid alarm after change in SP. Since possibility of alarm condition after every time change in SP.

17.2 Alarm Functions:

Sr	Value	Details	Application
7	24 = 16+8	**No alarm at SP change + No alarm at Power On** **Activation:** If alarm condition exist at power on or If alarm condition generates after SP change, alarm will not be activated. Once device goes in no alarm condition after SP change or power on, there after alarm will be activated at every occurrence of the alarm condition. **Deactivation:** Alarm will be deactivated in no alarm condition.	Note: We can club the different alarm functionality by doing the addition of the set value for those alarm functions.

Note:
Alarm types and functions are explained for alarm
1. The explanation is same for alarm
2. Binary addition of alarm function allows Combination of different function.
Eg. If it is required to have no alarm at power On [8] and no alarm at sP change [16], set function as 24.

18.0 PROGRAMMING:

Follow given procedure to program the device:

1. Press key 'E' to enter menus.If password "Enabled", then 'PV' display shows "codE",which is blinking and 'SV' display shows "0".

2. Enter code as "69" using 'UP' key. Press key 'E' to enter into menu. If wrong code is entered, then the device exits from programming mode. If correct code is entered, the device enters into the set of menus.

3. Using 'UP' or 'DN'key we can move to desired set of parameter.

4. Press key 'E', to enter the group of parameters related to the main menu. Here, the 'PV' display shows the menu and 'SV' shows the value programmed on it.

5. To change this value, press key 'E'. Using 'UP' or 'DN' key, select the value to be entered. Press key 'E' to confirm the value or key 'C' to maintain the previous value.

6. Whenever the value of the menu is being edited, the 'PV' display blinks. Here, 'UP' and 'DN' key change the value on 'SV' display. When the display is not blinking, we can move to next menu using 'UP' or 'DN' key. To exit from the menu press key 'C'

7. Key 'C' acts as "EXIT" key when in programming mode. While on main screen, when 'PV' display shows temperature and 'SV' display shows user configured value, it performs the function as configured on it in the "key" parameter of "conF" menu.

19.0 SEVEN SEGMENT DISPLAY:

A	B	C	D	E	F	G	H	I	J	K	L	M
												
N	**O**	**P**	**Q**	**R**	**S**	**T**	**U**	**V**	**W**	**X**	**Y**	**Z**
												

20.0 MENUS: MAIN MENU: SP(Set point)

Parameter		Description
1	SPLL	Set point low level Range: -1999 to set point active, default: -1999
2	SPhL	Set point high level Range: Set point active to 9999, default: 9999
3	nSP#[5,6,7,8,] #[9,10,11,12,]	No. of. Set point Range: 1 to 4, default: 4
4	EFSP	Effective Set point. Range#[5,6,7,8,9,10,11,12]: 1 to nsP, Range#[1,2,3,4,13]: 1 to 2 default: 1
5	SP1	Set point 1 Range: sPLL to sPhL, default: 0
6	SP2	Set point 2. Range: sPLL to sPhL, default: 0
7	Sp3#[5,6,7,8] #[9,10,11,12]	Set Point 3 Range: sPLL to sPhL, default: 0
8	Sp4#[5,6,7,8] #[9,10,11,12]	Set Point 4 Range: sPLL to sPhL, default: 0

MAIN MENU: InP(Input)

1	SEnS	Sensor: Range: J : J Thermocouple K : K Thermocouple Pt1 : PT100 RTD E : E Thermocouple S : S Thermocouple B : B Thermocouple R : R Thermocouple Analog Input: 1260 : 12 to 60 mV 0_50: 0 to 50 mV 0_60 : 0 to 60 mV default: J Thermocouple
2	IScL	Low scale in case of analog inputs Range: -1999 to Isch, default: 0
3	Isch	High scale in case of analog inputs Range: IscL to 9999, default: 100
4	rAtE	Slope of straight line Range: 0.001 to 2.000, default: 1.000
5	oFSt	Offset of straight line Range: -1999 to 9999, default: 0
6	oPP	Output power in case of error Range: 0 to 100.0%#[1,2,3,4,13,] Range: -100.0% to 100.0% #[5,6,7,8,9,10,11,12] default: 0
7	dP	Decimal point Range: S/B/R/K thermocouple:0 J/E thermocouple & Pt 100:0 to 1, Analog Signals: 0 to 3, default: 0
8	Unit	Temperature measurement unit Range: C° or F°, default: C°
9	rFSh #[2,3,6,7,10,11]	Analog signal output update rate Range: 150 to 5000 ms, default: 150 ms
10	PvLo #[2,3,6,7,10,11]	Process variable low Range: -1999 to 9999, corresponds to 4 mA/0 V, default:0
11	Pvhl #[2,3,6,7,10,11]	Process variable High Range: -1999 to 9999 Corresponds to 20 mA /10 V, default:100
12	coLo #[2,3,6,7,10,11]	Controller output low Range: 0 to 100 #[2,3] , -100 to 100 # [6,7,10,11] Corresponds to 4 mA/0 V, default: 0
13	cohl #[2,3,6,7,10,11]	Controller output high Range: 0 to 100 #[2,3] , -100 to 100 # [6,7,10,11] Corresponds to 20 mA/10 V, default:100
14	Filt#[1-14]	Filter menu Range: 0 to 10, default: 2

Parameter		Description
14	Prmd #5,6,7,8 #9,10,11,12	Power down mode Range: 1. cont: Continue 2. rbck: Ramp back 3. rsEt: Reset, default: cont
15	rmP1 #5,6,7,8 #9,10,11,12	Ramp 1 Range: 0.00 to 99.99 - Inf unit/min, default: Inf
16	Sok1 #5,6,7,8 #9,10,11,12	Soak 1 Range: 0.00 to 99.59 - Inf hh:mm, default: Inf
17	rmP2 #5,6,7,8 #9,10,11,12	Ramp 2 Range: 0.00 to 99.99 - Inf unit/min, default: Inf
18	Sok2 #5,6,7,8 #9,10,11,12	Soak 2 Range: 0.00 to 99.59 - Inf hh:mm, default: Inf
19	rmP3 #5,6,7,8 #9,10,11,12	Ramp 3 Range: 0.00 to 99.99- Inf unit/min, default: Inf
20	Sok3 #5,6,7,8 #9,10,11,12	Soak 3 Range: 0.00 to 99.59 - Inf hh:mm, default: Inf
21	hbck #5,6,7,8 #9,10,11,12	Ramp hold back Range: OFF to 9999, default: OFF
22	SSP #1,2,3,4,13	Soft start power Range: 0.0 to 100.0, default: 0
22	SSP#5,6,7,8 #9,10,11,12	Soft start power Range: -100.0 to 100.0, default: 0
23	SSt	Soft start time Range: 0.00 (OFF) to 7.59 (hh:mm), default: Off
24	SSth	Soft start threshold Range: -1999 to 9999, default: 0

Main Menu: conF (Configuration)

Parameter		Description
1	KEY	Configurable key: Range: 1. stAt: Start tuning manually. Starts auto tuning manually if AuTo parameter is configured as 3. 2. oPLP: Open loop. Switches controller to manual mode if it is in auto mode and cont parameter is configured as Pid or changes it to auto mode if it is in manual mode. 3. Ack: Acknowledge. Used to acknowledge alarm if A1Fn is in alarm acknowledge mode. Also release the alarm if it is in latched mode. 4. oFF: Switch off the control action 5. SPSL: Select active set point 6. chSP: Change set point when on main screen 7. rSEt #5,6,7,8,9,10,11,12 : To Reset and restart the ramp profile 8. noFc: No function, default: chSP
2	dISP	Display configure: Range: 1. SP: Displays active set point on the lower display. 2. co: Displays controller output on the lower display 3. EFSP#5,6,7,8,9,10,11,12: Displays the set point which is set by EFSP 4. A1th: Alarm1 threshold 5. A2th: Alarm2 threshold 6.Unit : C/F 7.timr: Displays Timer set time on lower display, default: sP
3	LEd	Led shift index Range : 0 (Off) to 9999 units, default: 2

MAIN MENU: PWD (Password Enable /Disable)

Parameter	Description
PWD	Enable or Disable the Password En : Enable the Password dIS: Disable the Password

Parameter	Description
rSEt	To reset device and load default setting. Please press the enter key. If "Yes" - will display message to confirm reset. If "No" - will get back to menu.
cnfm	After Confirm, If " Yes " - Reset device and back to main screen. If "No" - Back to main screen.

Main Menu: modb (Modbus)#5,6,7,8

1	Addr	Device Id Range: 1 to 99, default: 1
2	bAUd	Baud rate: Range: 1. 3: 300 baud rate 2. 6: 600 baud rate 3. 12: 1200 baud rate 4. 24: 2400 baud rate 5. 48: 4800 baud rate 6. 96: 9600 baud rate 7. 192: 19200 baud rate, default: 96
3	PArt	Parity: Range: 1. EvEn: Even parity 2. odd: odd parity 3.None: None parity default: None
4	bItS	No. of bits Range: 8 to 9, default: 8
5	StPb	No. of stop bits Range: 1 to 2, default: 1

21.0 MODBUS :

PR-69 has adopted widely used MODBUS RTU protocol. The MODBUS RTU communication functions implemented in PR-69 series are: Function 3 – Read Holding Variables (read); Function 6 - Preset Single Register (write); Function 16 - Preset Multiple Register (write).

These functions allow the supervisory program to read and modify any data of the controller.

The communication is based on messages sent by the master station (host) to the slave stations (PR-69) and vice versa. Every a message contains four fields:

a) Slave address (from 1 to 99)
b) Function code: contains 3, 6 or 16 for specified functions.
c) Information field: contains data like word addresses and word values as required by function in use.
d) Control word: a cyclic redundancy check (CRC) performed with particular rules for CRC.

Note: For function 16 - Preset Multiple Register ,We can only write one parameter at a time.

3.1 Function 3 - Read n Word

The request has the following frame:

Filed Name	Byte Position
Slave MODBUS ID	Byte 0
Function Code(3)	Byte 1
First word Address MSB	Byte 2
First word Address LSB	Byte 3
Number of words MSB	Byte 4
Number of wordsLSB	Byte 5
CRC MSB	Byte 6
CRC LSB	Byte 7

The normal reply(as opposed to exception reply)has the following frame:

Filed Name	Byte Position
Slave MODBUS ID	Byte 0
Function Code(3)	Byte 1
NB Number of Read bytes	Byte 2
Value of first word MSB	Byte 3
Value of first word LSB	Byte 4
Following Words	Byte 5
CRC Error Check MSB	Byte NB+2
CRC Error Check LSB	Byte NB+3

MAIN MENU: oP(output)

Parameter		Description
1	oPcF #[6,7,10,11]	Output configure as: Range: 1.h2c3: heat 2 Cool 3, 2.h3c2: heat 3 Cool 2, default: h2c3
1	oPcF #[5,8,9,12]	Output Configure as: Range: 1. h1c2: heat 1 Cool 2 2. h1c3: heat 1 Cool 3 3. h2c3: heat 2 Cool 3 4. h2c1: heat 2 Cool 1 5. h3c1: heat 3 Cool 1 6. h3c2: heat 3 Cool 2, default: h1c2
2	o1cF #[2,3,6,7,10,11]	Output 1 configured as: Range: 1. I_OP: 4-20 mA output 2. V_OP: 0-10 V output, default: I_OP
3	oP1#[2,3]	Output 1 to act as: Range: 1. coP: Controller output 2.tEmP: temperature re-transmitted output, default: temP
3	oP1 #[6,7,10,11]	Output 1 to act as: Range: 1. coP: Controller output 2. tEmP: Temperature re-transmitted output 3. EsP: Effective Set Point, default: tEmP
3	Op1 #[1,4,5,8,9,12,13]	Output 1 to act as: Range: 1. coP: Controller output 2. A1no: Alarm 1 normally open 3. A1nc: Alarm 1 normally closed 4. A2no: Alarm 2 normally open 5. A2nc: Alarm 2 normally closed 6. SEnb: Sensor break 7. BrkL: Loop break alarm 8. OFF: Relay off, default: coP
4	oP2	Output 2 to act as: Range: 1. coP: Controller output 2. A1no: Alarm 1 normally open 3. A1nc: Alarm 1 normally closed 4. A2no: Alarm 2 normally open 5. A2nc: Alarm 2 normally closed 6. Senb: Sensor break 7. BrkL: Loop break alarm 8. oFF: Relay off 9. trAL#[1,4,13]: Timer Alarm, default: oFF
5	oP3	Applicable for all cat ids except #13. (Same Functionality as Op2, Only trAL: Timer Alarm is applicable for cat_id #[1,2,3,4])
6	LbOP #[5,6,7,8] #[9,10,11,12]	Loop break output Lbo1#[5,8,9,12]: Output 1 Lbo2 : Output 2 Lbo3 : Output 3 default : Lbo2
7	brkt	Break loop time Range: Off to 9999 s, default: oFF
8	timr #[1,2,3,4,13]	Timer time Range: Off to 9999 Min, default: oFF
9	trAt #[1,2,3,4,13]	Timer Alarm time Range: On to 9999 Min, default: On

MAIN MENU: AL1(Alarm1)

Parameter		Description
1	A1tY	Alarm 1 type: Range: 1. AbLo: Absolute low 2. AbhI: Absolute high 3. AbbA: Absolute band 4. dELo: Deviation low 5. dEhI: Deviation High 6. dEbA: Deviation band 7. oPLo: Output low 8. oPhI: Output High, default: AbLo
2	A1Fn	Alarm 1 function: 0: Alarm on error +1: Acknowledge alarm +2: Delayed alarm +4: Latch alarm +8: No alarm at power on +16: No alarm at set-point change Range: 0-31, default: 0
3	A1Lo	Alarm 1 low level Range: -1999 to A1th, default: -1999
4	A1th	Alarm 1 Threshold Range: A1Lo to A1Hi, default: 0
5	A1hI	Alarm 1 high level Range: A1th to 9999, default:9999
6	A1hY	Alarm 1 hysteresis Range: OFF to 9999, default: 1
7	o1LV	Output 1 low value Range#[1,2,3,4,13]: 0.0% to o1HV Range#[5,6,7,8,9,10,11,12] : -100.0% to o1HV, default: 0.0
8	o1hV	Output 1 high value Range: o1LV to 100.0 %, default: 100.0
9	o1hs	Output 1 hysteresis Range: OFF to 100.0 %, default:1
10	A1dL	Alarm 1 delay Range: OFF to 9999 s, default: Off

Menus for Alarm 2 are same as for Alarm 1.

MAIN MENU: REG(Regulator)

Parameter		Description
1	cont	Controller type: Range: 1. onFS: On-Off Symmetric, 2. onFA: On-Off Asymmetric 3. PID: PID controller 4. nr: neutral zone On-OFF default: PID
2	FUnc	Controller type: Range: 1. hEAt: Reverse acting 2. cooL: Direct acting, default: hEAt
3	hEst	Hysteresis for On-Off controller Range: OFF - 9999, default: 1
4	AUto	Auto tuning: Range: oFF: auto tuning off 1: auto tuning at every power on 2: auto tuning at first power on 3: Start manually 4: auto tune at every set point change, default: 2
5	Pb	Proportional band Range: 0 to 9999, default: 10
6	Int	Integral time Range: OFF to 9999 s, default: 120
7	dEr	Derivative time Range: OFF to 9999 s, default: OFF
8	ct #[1,2,3,4,13]	Cycle time Range:1 to 130 s, default: 20
9	rs #[1,2,3,4,13]	Manual reset Range: 0 to 100.0 %, default: 0
9	rs#[5,6,7,8] #[9,10,11,12]	Manual reset Range: -100.0 to 100.0 %, default: 0
10	hct#[5,6,7,8] #[9,10,11,12]	heat cycle time Range: 1 to 130 s, default: 10
11	cct#[5,6,7,8] #[9,10,11,12]	Cool cycle time, Range: 1 to 130 s, default: 10
12	coeF #[5,6,7,8] #[9,10,11,12]	Coefficient, Range: 0.1 to 10.0, default: 0.1
13	cdty #[5,6,7,8] #[9,10,11,12]	Compressor duty cycle Range: 0(Off) to 9999 s, default: 0

3.2 Function 6 - One word write. The request has the following frame:

Filed Name	Byte Position
Slave MODBUS ID	Byte 0
Function Code(6)	Byte 1
Word Address MSB	Byte 2
Word Address LSB	Byte 3
Value of first word MSB	Byte 4
Value of first word LSB	Byte 5
CRC Error Check MSB	Byte 6
CRC Error Check LSB	Byte 7

3.3 The exception reply

An exception reply is given when the request is formally correct, but cannot be satisfied standing particular situations; the reply contains a code indicating the cause of the missing regular reply. The frame is:

Filed Name	Byte Position
Slave MODBUS ID	Byte 0
Function Code(3)	Byte 1
First Word Address MSB	Byte 2
First Word Address LSB	Byte 3
Number of Word MSB	Byte 4
Number of Word LSB	Byte 5
CRC Error Check LSB	Byte 6
CRC Error Check MSB	Byte 7

3.4 Function 16 - Preset Multiple Register, one word write.
The request has the following frame:

Filed Name	Byte Position
Slave MODBUS ID	Byte 0
Function Code(0X10)	Byte 1
Start register no,(high byte)	Byte 2
Start register no,(Low byte)	Byte 3
No. of register to write(High byte)	Byte 4
No. of register to write(Low byte)	Byte 5
No. of data bytes	Byte 6
Data 0 MSB	Byte 7
Data 0 LSB	Byte 8
Data 1 MSB	Byte 9
Data 1 LSB	Byte 10
Data 2 MSB	Byte 11
Data 2 LSB	Byte 12
CRC bytes of 1 to 6 (LSB)	Byte 13
CRC bytes of 1 to 6 (MSB)	Byte 14

Note: Number Of data bytes that follows 3 registers X 2 Bytes each = 6

The normal reply(as opposed to exception reply) has the following frame:

Filed Name	Byte Position
Slave MODBUS ID	Byte 0
Function Code(0X10)	Byte 1
Start register no,(high byte)	Byte 2
Start register no,(Low byte)	Byte 3
No. of register written(High byte)	Byte 4
No. of register written(Low byte)	Byte 5
CRC bytes of 1 to 6 (LSB)	Byte 6
CRC bytes of 1 to 6 (MSB)	Byte 7

1) Illegal Function code -1
2) Illegal data address-2
3) Illegal data value field-3
4) Slave device busy-6

Address 0 used for broadcasting messages has not been implemented in Pr69.

22. MODBUS QUERIES:

1. Variable - Pv
Description: Process Variable
Data type: Signed short
Range: -1999 to 9999
Decimal dependence: dP
READ/WRITE: Read
Address (in HEX) : 1001

2. Variable - coP
Description: Control Output
Data type: Signed short
Range: -100 to 100
Decimal dependence: 0
READ/WRITE: Read
Address (in HEX): 1002

3. Variable - AL1
Description: Alarm 1 Status
Data type: Unsigned short
Range: OFF-xxxx xxx0, ON- xxxx xxx1
Decimal dependence: NA
READ/WRITE: Read
Address (in HEX): 1003

4. Variable - AL2
Description: Alarm 2 Status
Data type: Unsigned short
Range: OFF-xxxx xx0x, ON- xxxx xx1x
Decimal dependence: NA
READ/WRITE: Read
Address (in HEX): 1003

5. Variable - sEnb
Description: Sensor break alarm status
Data type: Unsigned short
Range: OFF-xxxx x0xx, ON- xxxx x1xx
Decimal dependence: NA
READ/WRITE: Read
Address (in HEX): 1003

6. Variable - LbA
Description: Loop break alarm status
Data type: Unsigned short
Range: OFF-xxxx 0xxx, ON- xxxx 1xxx
Decimal dependence: NA
READ/WRITE: Read
Address (in HEX): 1003

7. Variable - SP
Description: Effective set point
Data type: Signed short
Range: sPLL to sPHL
Decimal dependence: dP
READ/WRITE: Read
Address (in HEX): 1004

8. Variable - stAt
Description: Regulator status
Data type: Unsigned short
Range: OFF - 0, Manual - 1,
AUTO SYM ON/OFF-2, AUTO ASYM ON/OFF-3,
AUTO N ZONE ON/OFF-4,
AUTO PID TUNE ON-5, AUTO PID TUNE OFF-6
Address (in HEX): 1005
Decimal dependence: NA,
READ/WRITE: Read

9. Variable - MvEr
Description: Model Version
Data type: Unsigned short
Range:
1: Pr01, 2: Pr02, 3: Pr03, 4: Pr04, 5: Pr05, 6: Pr06, 7: Pr07,
8: Pr08,9 : Pr09, 10 : Pr10, 11 : Pr11, 12 : Pr12, 13 : Pr13
Decimal dependence: NA
READ/WRITE: Read
Address (in HEX): 1006

10. Variable - cvEr
Description: Code Version
Data type: Unsigned short
Decimal dependence: NA
READ/WRITE: Read
Address (in HEX): 1007

11. Variable - rFLg
Description: Ramp Soak Flg status
Data type: Unsigned short
Range:
NO RAMP SOAK ON: 0
RAMP1 STAGE: 1
SOAK1 STAGE: 2
RAMP2 STAGE: 3
SOAK2 STAGE: 4
RAMP3 STAGE: 5
SOAK3 STAGE: 6
RAMP SOAK END: 7
Decimal dependence: NA
READ/WRITE: Read, Address (in HEX): 1008

12. Variable - Aout#[6,7]
Description: Value Transmitted on Analog output
Data type: Unsigned short
Range: 3 to 21 or 0-10
Decimal dependence: NA
READ/WRITE: Read , Address (in HEX): 1009

13. Variable - Output 1 status (ON/OFF)#
Description :This is for indication of OP1
Data type: Unsigned short
Range: 0 : OFF , 1 : ON
Decimal dependence: NA
READ/WRITE: Read , Address (in HEX): 1009

14. Variable - Output 2 status (ON/OFF)#
Description: This is for indication of OP2
Data type: Unsigned short
Range: 0 : OFF - 1 : ON
Decimal dependence: NA
READ/WRITE: Read , Address (in HEX): 100A

15. Variable - Output 3 status (ON/OFF)#
Description: This is for indication of OP3
Data type: Unsigned short
Range:0 : OFF - 1 : ON
Decimal dependence: NA
READ/WRITE: Read , Address (in HEX): 100B

16. Variable - Status OF PV w.r.t SP#
Description: This is for relation between PV & SP
Data type: Unsigned short
Range: 0 - 3
In case of sensor break : 0
"-" (PV<SP): 1
"=" (PV=SP):2
"+" (PV>SP):3
Decimal dependence: NA
READ/WRITE: Read , Address (in HEX): 100C

SP

1. Variable - SPLL
Description: Set point low
Data type: Signed short
Range: -1999 to setpoint as selected by EFSP
Decimal dependence: dP
READ/WRITE: Read/Write
Address (in HEX): 2001

2. Variable - SPhL
Description: Set point high
Data type: Signed short
Range: Setpoint as selected by EFsP to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2002

3. Variable - nSP
Description: Number of set point
Data type: Unsigned short
Range: 1 to 4
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2003

4. Variable - EFSP
Description: Effective set point
Data type: Unsigned short
Range: 1 to nsP
Decimal dependence: NA
READ/WRITE: Read/Write
Decimal dependence: dP, Address (in HEX): 2004

5. Variable - SP1
Description: Set point 1
Data type: Signed short
Range: spLL to sphL
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2005

6. Variable - SP2
Description: Set point 2
Data type: Signed short
Range: spLL to sphL
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2006

7. Variable - SP3
Description: Set point 3
Data type: Signed short
Range: spLL to sphL
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2007

8. Variable - SP4
Description: Set point 4
Data type: Signed short
Range: spLL to spHL,
Decimal dependence: dP,
READ/WRITE: Read/Write, Address (in HEX): 2008

InP

1. Variable - SEns
Description: Sensor select
Data type: Unsigned short
Range:
0 = J thermocouple, 1 = K thermocouple, 2 = E thermocouple
3 = S thermocouple, 4 = B thermocouple, 5 = Pt100 RTD
6 = 0-50 mV signal,7 = 0-60 mV signal, 8 = 12-60 mV,
9 = R thermocouple
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2009

2. Variable - IScL
Description: Analog input low
Data type: Signed short
Range: -1999 to Isch
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 200A

3. Variable - ISch
Description: Analog input high
Data type: Signed short
Range: IscL to 9999
Decimal dependence: dP
READ/WRITE: Read/Write
Address (in HEX): 200B

4. Variable - rAtE
Description: Measurment Rate
Data type: Signed short
Range: 0.001 to 2.000
Decimal dependence: 3
READ/WRITE: Read/Write
Address (in HEX): 200C

5. Variable - oFSt
Description: Measurement Offset
Data type: Signed short
Range: -1999 to 9999
Decimal dependence: dP
READ/WRITE: Read/Write
Address (in HEX) : 200D

6. Variable - oPP
Description: Output power in case of error
Data type: Signed short
Range: -100.0 to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 200E

7. Variable - dP
Description: Decimal point
Data type: Unsigned short
Range: 0 to 3
Decimal dependence: 0
READ/WRITE: Read/Write
Address (in HEX) : 200F

8. Variable - unIt
Description: Unit of measurement
Data type: Unsigned short
Range: 0 - °C, 1 - °F
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2010

9. Variable - rFSh#[6,7]
Description: Update pace of analog output
Data type: Unsigned short
Range: 150 to 5000
Decimal dependence: NA
READ/WRITE: Read/Write
Address (in HEX): 2011

10. Variable - PvLo#[6,7]
Description: Process value/Set point low value for analog output according to value defined on OP1.
Data type: Signed short
Range: -1999 to Pvhi
Decimal dependence: dP, READ/WRITE: Read/Write
Address (in HEX): 2012

11. Variable - Pvhi#[6,7]
Description: Process value/Set point high value for analog output according to value defined on OP1
Data type: Signed short
Range: PvLo to 9999
Decimal dependence: dP
READ/WRITE: Read/Write
Address (in HEX): 2013

12. Variable - CoLo#[6,7]
Description: Control output low value
Data type: Signed short
Range: -100.0 to CoHI
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 2014

13. Variable - CoHI#[6,7]
Description: Control output high value
Data type: Signed short
Range: CoLo to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write
Address (in HEX): 2015

oP

1. Variable - oPcF#[5,8]
Description: Output Configure
Data type: Unsigned short
Range: 0: H1C2, 1: H1C3, 2: H2C1, 3: H3C1,
4: H2C3, 5: H3C2
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2016

1. Variable - oPcF#[6,7]
Description: Output Configure
Data type: Unsigned short
Range: 0: H2C3, 1: H3C2
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2016

2. Variable - o1cF#[6,7]
Description: Output 1 Config
Data type: Unsigned short
Range: 0: I_oP, 1: V_oP
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2017

3. Variable - oP1#[6,7]
Description: Output1 act on
Data type: Unsigned short
Range: 0: coP, 1: temp, 2:esp
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2018

4. Variable - oP1#[5,8]
Description: Output1 act on
Data type: Unsigned short
Range: 0: coP, 1: A1no, 2: A1nc, 3: A2no, 4: A2nc,
5: sEnb, 6: BrkL, 7: Off
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2018

5. Variable - oP2
Description: Output 2 act on
Data type: Unsigned short
Range: 0: coP, 1: A1no, 2: A1nc, 3: A2no,4: A2nc,
5: sEnb, 6: BrkL, 7: Off
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2019

6. Variable - oP3
Description: Output 3 act on
Data type: Unsigned short
Range: 0: coP, 1: A1no, 2: A1nc, 3: A2no, 4: A2nc,
5: sEnb, 6: BrkL, 7: Off
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 201A

7. Variable - LboP
Description: Loop break alarm act on
Data type: Unsigned short
Range: 0: Lbo1#5,8, 1: Lbo2, 2: Lbo3, 0=Lbo2, 1: Lbo3
Decimal dependence:NA
READ/WRITE: Write, Address (in HEX): 201B

8. Variable - brkt
Description: Loop Break time
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 201C

Alarms Types

1. Variable - A1tY
Description: Alarm 1 type
Data type: Unsigned short
Range: 0: AbLo, 1: AbHI, 2: AbbA, 3: dELo, 4: dEHI,
5: dEbA, 6: oPLo, 7: oPHI
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 201D

2. Variable - A1Fn
Description: Alarm 1 Function
Data type: Unsigned short
Range: 0 to 31
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 201E

3. Variable - A1Lo
Description: Alarm 1 Function
Data type: Signed short
Range: -1999 to A1th
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 201F

4. Variable - A1th
Description: Alarm 1 Function
Data type: Signed short
Range: A1Lo to A1hi
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2020

5. Variable - A1hi
Description: Alarm 1 High
Data type: Signed short
Range: A1th to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2021

6. Variable - A1hY
Description: Alarm 1 hysteresis
Data type: Unsigned short
Range:0 to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2022

7. Variable - o1Lv
Description: Output Low alarm1 value
Data type: Signed short
Range: -100.0 to o1HV
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 2023

8. Variable - o1hv
Description: Output high alarm1 value
Data type: Signed short
Range: o1LV to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 2024

9. Variable - o1hs
Description: Output alarm hysterisis 1
Data type: Unsigned short
Range: OFF to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 2025

10. Variable - A1dL
Description: Alarm 1 delay
Data type: Unsigned short
Range: OFF to 9999
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2026

AI2

1. Variable - A2tY
Description: Alarm 2 type
Data type: Unsigned short
Range: 0: AbLo, 1: AbHi, 2: AbbA, 3: dELo
4: dEHi, 5: dEbA, 6: oPLo, 7: oPHi
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2027

2. Variable - A2Fn
Description: Alarm 2 Function
Data type: Unsigned short
Range: 0 to 31
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2028

3. Variable - A2Lo
Description: Alarm 2 Function
Data type: Signed short
Range: -1999 to A2th
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2029

4. Variable - A2Th
Description: Alarm 2 Function
Data type: Signed short
Range: A2Lo to A2hi
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 202A

5. Variable - A2hI
Description: Alarm 2 High
Data type: Signed short
Range: A2th to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 202B

6. Variable - A2hY
Description: Alarm 2 hysteresis
Data type: Unsigned short
Range :0 to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 202C

7. Variable - o2Lv
Description: Output Low alarm 2 value
Data type: Signed short
Range: -100.0 to 02Hv
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 202D

8. Variable - o2hv
Description: Output high alarm 2 value
Data type: Signed short
Range: o2LV to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 202E

9. Variable - o2hs
Description: Output alarm hysteresis 2
Data type: Unsigned short
Range: OFF to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write,Address (in HEX): 202F

9. Variable - o2hs
Description: Output alarm hysteresis 2
Data type: Unsigned short
Range: OFF to 100.0
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 202F

10. Variable - A2dL
Description: Alarm 2 delay
Data type: Unsigned short
Range: OFF to 9999
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2030

rEg

1. Variable - Cont
Description: Control type
Data type: Unsigned short
Range: 0: onFS, 1: onFA, 2: Pid, 3: nr
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2031

2. Variable - Func
Description: Control action functioning
Data type: Unsigned short
Range: 0: HEAt, 1: cooL
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2032

3. Variable - hESt
Description: On Off Hysterisis
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2033

4. Variable - AUto
Description: Autotune
Data type: Unsigned short
Range: 0: Off, 1: 1, 2: 2, 3: 3, 4: 4
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2034

5. Variable - Pb
Description: Proportional Band
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2035

6. Variable - Int
Description: Integral time
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2036

7. Variable - dEr
Description: Derivative time
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2037

8. Variable - rs
Description: Manual reset
Data type: Signed short
Range: -100 to 100
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 2038

9. Variable - hct
Description: Heater output cycle time
Data type: Unsigned short
Range: 1 to 130
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 2039

10. Variable - cct
Description: Cooler output cycle time
Data type: Unsigned short
Range: 1 to 130
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 203A

11. Variable - coEF
Description: Coefficient
Data type: Unsigned short
Range: 0.1 to 10.0
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 203B

12. Variable - cdty
Description: Compressor On delay time
Data type: Signed short
Range: 0 to 9999
Decimal dependence: 0
READ/WRITE: Read/Write, Address (in HEX): 203C

13. Variable - Prmd
Description: Power down resume mode
Data type: Unsigned short
Range: 0: Cont, 1: rbcK, 2: rSEt
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 203D

14. Variable - rmP1
Description: Ramp 1
Data type: Unsigned short
Range: 0 to 99.99
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 203E

15. Variable - rmP2
Description: Ramp 2
Data type: Unsigned short
Range: 0 to 99.99
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 203F

16. Variable - rmP3
Description: Ramp 3
Data type: Unsigned short
Range: 0 to 99.99
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 2040

17. Variable - soK1
Description: Soak 1
Data type: Unsigned short
Range: 0 to 99.59(hour:min)
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 2041

18. Variable - soK2
Description: Soak 2
Data type: Unsigned short
Range: 0 to 99.59(hour:min)
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 2042

19. Variable - soK3
Description: Soak 3
Data type: Unsigned short
Range: 0 to 99.59(hour:min)
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 2043

20. Variable - hbck
Description: Ramp Hold back
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 2044

21. Variable - SSP
Description: Soft start Power
Data type: Unsigned short
Range: -100 to 100
Decimal dependence: 1
READ/WRITE: Read/Write, Address (in HEX): 2045

22. Variable - SST
Description: Soft start time
Data type: Unsigned short
Range: 0 to 7:59 (hh:mm)
Decimal dependence: 2
READ/WRITE: Read/Write, Address (in HEX): 2046

23. Variable - SSTH
Description: Soft start threshold
Data type: Signed short
Range: -1999 to 9999
Decimal dependence: dp
READ/WRITE: Read/Write, Address (in HEX): 2047

Conf

1. Variable - Key
Description: Configure Key
Data type: Unsigned short
Range: 0: StAt, 1: oPLP, 2: Ack, 3: oFF,
4: SPSL, 5: ChSP, 6: rSEt, 7: noFc
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2048

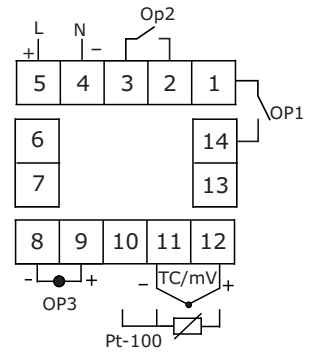
2. Variable - diSP
Description: Configure Display
Data type: Unsigned short
Range: 0: sP, 1:Co, 2:A1th, 3:A2th, 4:EFSP
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2049

2. Variable - diSP
Description: Configure Display
Data type: Unsigned short
Range: 0: sP, 1:Co, 2:A1th, 3:A2th, 4:EFSP
Decimal dependence: NA
READ/WRITE: Read/Write, Address (in HEX): 2049

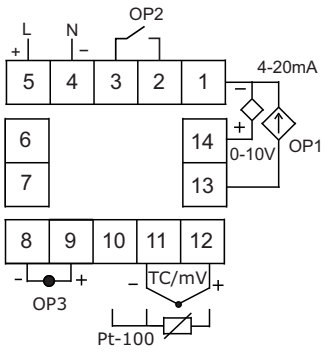
3. Variable - Led
Description: Led Compare Index
Data type: Unsigned short
Range: 0 to 9999
Decimal dependence: dP
READ/WRITE: Read/Write, Address (in HEX): 204A

23. CONNECTION DIAGRAMS:

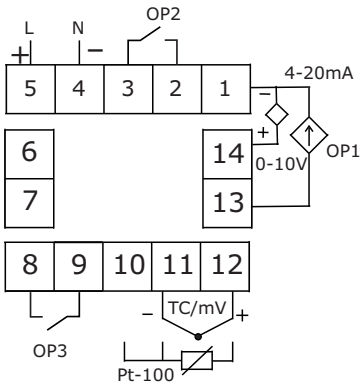
151A12B/151A13B



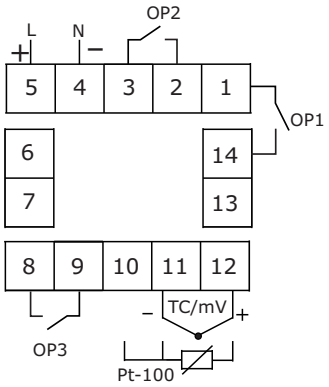
151B12B/151B13B



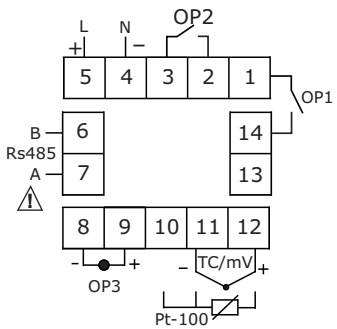
151C12B/151C13B



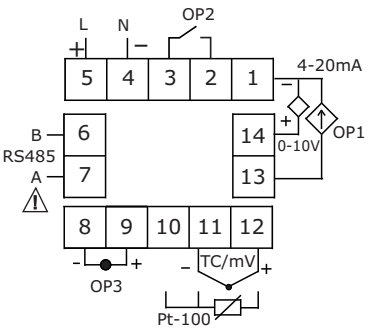
151D12B/151D13B



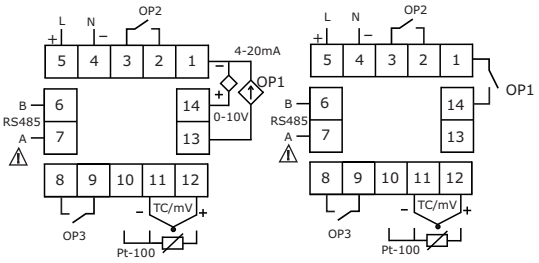
151A13B1



151B13B1

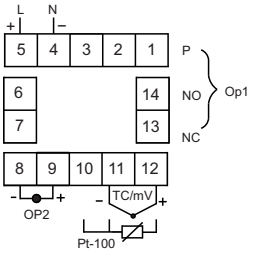


151C13B1



151D13B1

151E12B



24. FAQs:

1. How to change effective set point selection using key 'C'?

A."SLSP" (select effective set point) must be programmed on "kEy" parameter in the "conf" menu.If 'C' key is pressed and held for 2 sec while on main screen "EFsP" is displayed on the upper display and currently effective set point (1 if sP1 is effective and 2 if sP2 is effective) is displayed on the lower display.The upper display starts blinking. Using 'UP' /'DN' key the value can be changed. Press 'E' to activate the set point.Upper display stps blinking. Press 'C' key to exit from menu to main screen.

Menu	Sub menu	Options
conf	kEy	'C'

2.What is 'rAtE' and 'oFst' parameter in the 'InP' menu?'

A. If it is required to apply slope and/or offset to the temperature measured by the instrument, it can be done by using the above parameters. Any value set on above parameter allows the device to see temperature as below: Display temp. = rAtE* Measured Temp + oFst This helps to re-calibrate the instrument.

3. What is "Sens" Break alarm and break loop alarm?

A. To select sensor break alarm set "sEnb" on the desired output. Whenever sensor break error occurs,the corresponding relay is set. To select break loop alarm, break loop alarm time i.e. "Brkt " is to be set.If the controller output remains at 100% for the above time, then loop break alarm is given. If any relay output is set for the alarm, the given relay is switched on. Break loop alarm works only in PID mode. Break loop alarm can be turned off by moving the controller to OFF mode and then back to auto mode by pressing properly programmed 'C' key.

Menu	Sub menu	Options
OP	OP1 / OP2	sEnb
OP	brkt	value

Note : Break loop alarm works only in PID mode.

4.What is Soft start threshold and Soft start time?

A. Soft start time is the time for which the soft power is provided after On. Soft start threshold is the absolute temperature upto which soft power is provided. While in soft start, if any of the above value is reached, the soft start ends.

Menu	Sub menu	Options
rEG	Auto	1,2,3,4

5. How to start Auto tuning?

A. Depending on the value programmed on the parameter "Auto" in "rEg" group auto tuning can be started.
1: Auto tuning is started at every power ON of the instrument.
2: Auto tuning is started at first power ON of the instrument.
3: Auto tuning can be started manually by the user by pressing properly programmed 'C' key.
4: Auto tuning is started at every set point change.

The set point changed should be the effective point.
Even if the value on parameter "EFSP" in the "SP" menu is changed and the values parameter "SP1" and "SP2" in the menu are different, the auto tuning is started. Following condition must be satisfied to start auto tune: Controller should be in PID mode. If Soft start is configured and auto tune is on 1 or 2 or 4:
"sP" be set the on PV <(SP-|SP/5|) for HEAT action.
or PV >(SP+|SP/5|) for COOL action. In all other conditions:
PV <(SP-|SP/3|) for HEAT action or
PV >(SP+|SP/3|) for COOL action.

6. What value will be returned by the device if a read query for the PV is sent and the device has Sensor/Over/Under range error?

A. Following values will be sent as reply for the modbus query to read temperature if device is in error mode.

Senb (sensor open)	0xC000
ovrg (over range error)	0xC001
unrg (under range error)	0xC002
Error displayed	Value returned

7.How to restart ramp and soak profile?

A. To restart the ramp soak profile program "C" key as "rsEt", then while on the main screen press and hold the key for about 2 s. When reset, the lower display alternates between a message "rsEt" and value configured on it by the user. This message disappears after a time of about 1 min.

Menu	Sub menu	Options
conf	kEy	rSEt

8. How to change Set point while on main Screen?

A. It is possible to change the set point while on main screen. For this set "kEy" parameter in "conF" menu as "chsP". Then any time when on main screen if the "C" key is pressed for more than 2 sec currently effective set point appears on the screen. The upper display start blinking. By using "UP" key or "DOWN" key the value can be changed. Press "E" key to save the value. To discard the value press "C" key. To exit to main screen, press "C" key.

Menu	Sub menu	Options
conf	kEy	chsp

9. How to read SPLL value throught Modbus ?

A. The query structure of read query is explained earlier. Assume that Salve address is 01.

Filed Name	Byte Position
Slave MODBUS ID	0
Function Code(3)	03
First Word Address MSB	20
First Word Address LSB	01
Number of words MSB	04
Number of words MSB	01
CRC MSB	0A
CRC LSB	DE

10.Can we Autotune the device below ambient temperature in double acting mode?

A. Yes, but if SP > PV; then Auto tuning should be done only above ambient temperature. And if SP < PV, Autotuning should be done only below ambient temperature.

Ex 1.

If Auto tuning is desired for a Set Point of 60°C (i.e. SP = 60) & device is configured in Dual Acting mode or Single Acting mode (Func = HEAT), then auto tuning will start only if PV< [60 - | 60/3 |] = 40°C, if soft start is not configured.

Ex 2.

If Auto tuning is desired for a Set Point of 75°C (i.e. SP = 75) & device is configured in Dual Acting mode or Single Acting mode(Func = HEAT), then auto tuning will start only if PV< [75 - | 75/5 |] = 60°C, if soft start is configured.

11.How to see CJC temprature in device?

A. Press "UP" and "DOWN" key simultaneously. CJC value will appear on lower display. To remove CJC value Press "EXIT" key.Device will show value for which lower display is configured.

12. How to reset device ?

A. On main screen when you press the enter key , you will get the option for reset the device "rset" . When you press the reset you will get option as "yes" or " No" to reset device. If press "Yes" you will get option to confirm the reset device. If again press "Yes" then device will be reset and back to main screen .If press "No" after confirming to reset then you get back to main screen.

13.What happen if Sens ,ourg ,unrg or control action off condition occurs when timer is ON?

A. If the timer is started and any of the condition occurs then the timer time will get pause and resume again from the pause time when the condition vanish.

Note:

1) For Cat_ID 151E12B only Output 2 can be assign as Timer alarm(trAL).
2) For Using Timer Functionality #^{2,3} keep Op2=COP

25. Error Occurred in Device:

Error	Error Details	Reason	Action
SEnS	Sensor break error	Sensor is interrupted	Verify connection. between sensor and device & then verify the correct functioning of the sensor
oUr9	Over Range error	PV Value is above sensor limit	
Unr9	Under Range error	PV Value is under sensor limit	
ErAt	Auto Tune error	Auto tunning cannot be started because process value is too high or too low	Press error key to make error disappear
noAt	Auto tunning time out	Auto tunning is not finished within 2 hrs	
FA iL	Fail error	An attempt is made to change the auto tunning parameters during auto tunning	
cbrH	Loop break interrupted	Loop control interrupted	Configure exit key to off & make control output off
Err I	Memory error	Possibly EEPROM error	Press enter to make error disappear
SSr	SSR error	Possible SSR terminals are short	Check SSR terminals if error does not disappear after Enter key pressed

Notes

PASSWORD = 69