sub-Zero®

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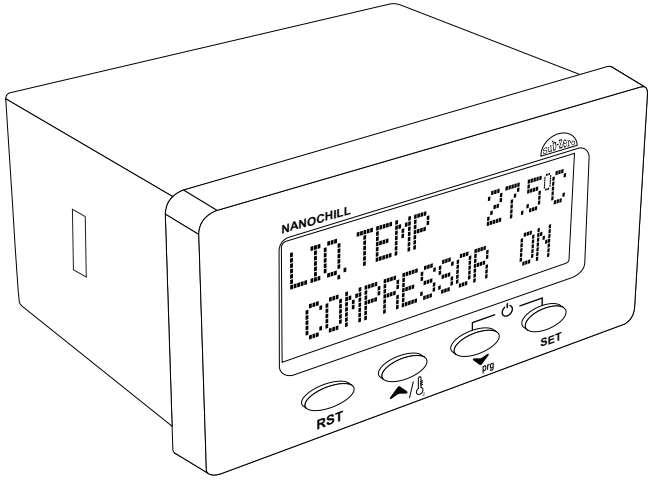
User Manual



NANOCHILL
NC-120A

sub-Zero®

Introduction

The Subzero “NANO CHILL”(NC 120) are controllers that integrates all the basic control functions required by a chiller. A user friendly Lcd screen displays all parameters, status and alarm messages.

Features:

- LCD with backlight to display all parameters.
- 3 NTC probes for Liquid temp, Antifreeze temperature, Condensor Temperature.
- Range : - 30.0ºC to + 50.0ºC
- Resolution 0.1^{o}C
- Relay outputs : Compressor , Precision SV, Condensor, Pump, Alarm & Water SV,
- HP,LP, Compressor O/L, SPP, Pump O/L, Auxiliary Fault trip protection for Compressor and pump
- Auto/Manual reset for HP, LP and AFT.
- Compressor current sensing upto 20Amp.
- It also protect compressor by tripping it in underload & overload conditions.

Items included :

NO.	ITEMS	QTY
1.	CONTROLLER	1No.
2.	TRANSFORMER	1No.
3.	SIDE LOCK (BIG)	2Nos.
4.	CATALOG	1No.
5.	PROKEY	1No.
6.	SENSORS	3Nos.

Optional :

NO.	ITEMS	QTY
1.	LIQUID LEVEL SWITCH	1Nos.
2.	CT WITH WIRE HARNESS	1 Set

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PARAMETER	DESCRIPTION	Pg. No.
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Parameter List

Min: MINIMUM Max : MAXIMUM
Fact. Set : FACTORY SETTING(DEFAULT)

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
	SET MODE	
01	CHILLER SET TEMP.	Function : To set Chiller Set point.
Press and hold "SET" key for 2 seconds and Release. SET		Lcd will change to set mode and flash. Then press set key once & release .Set point will flash. Set point can now be changed by using UP/DOWN key. After achieving the desired range, press the SET key .
Range		
Min	**Max** / **Fact. Set**	Lt℃ = Low temp Limit. Ht℃ = High temp.Limit
Lt +0.1ºC	Ht -0.1ºC / 10.0ºC	
	PROGRAM MODE	
02	To set other parameters.	LCD will show Program Mode. And the set Temperature To go to other parameters, use up/ down keys.
Hold prg key for 2 seconds and release.		
03	CHILLER SET TEMP.	Function : To set Chiller Set point.
To change Set Temp parameter, press the set key.		First set key once & release Parameter value will flash. Now Use UP/DOWN keys to set desired value.
Range		
Min	**Max** / **Fact. Set**	
Lt +0.1ºC	Ht -0.1ºC / 10.0ºC	
04	COMP. TIME DELAY	Function : To set compressor restart delay.
To change Comp Time Delay parameter,press the set key.		Use UP/DOWN keys to set desired value.

Contd.

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
	Range	**EXAMPLE:** If this parameter is set at 3 minutes, the compressor will cut off at the set temperature, but will not restart for a minimum of 3 minutes. This time delay is also effective at 'Power On' of the system. This safety feature is used to protect the compressor from restarting within a short period due to power fluctuations.
	Min / **Max** / **Fact. Set**: 0 Min / 20 Min / 3 Min	
05	DIFFERENTIAL	Function: To set temperature differential for compressor restart.
	To change DIFFERENTIAL parameter,press the set key.	Use UP/DOWN keys to set desired value.
	Range	**EXAMPLE:** If the set point is set at 10.0°C and differential is set as 2.0°C, then when the system reaches 10°C,the compressor will cutout. Since differential is 2.0°C, the compressor will cut in(restart) at 12.0°C (10.0°C + 2.0°C).
	Min / **Max** / **Fact. Set**: 0.1ºC / 10.0ºC / 2.0ºC	
06	HIGH TEMP. ALARM	Function: To set maximum allowable high temperature limit and alarm.
	To change High Temp parameter,press the set key.	First Press set key once & release Parameter value will flash. Now UP / DOWN keys to set desired value.
	Range	**EXAMPLE :** If this parameter is set to 50.0°C, then once chiller temperature goes above 50.0°C then controller will show "Ht" and alarm will be ON.
	Min / **Max** / **Fact. Set**: Set Point -1 / 50.0ºC / 50.0ºC	

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
07	LOW TEMP. ALARM	Function: To set minimum allowable low temperature limit and alarm.
	To change the Low Temp parameter, press the set key.	First Press set key once & release Parameter value will flash. Now UP / DOWN keys to set desired range.
	Range	**EXAMPLE:** Setting this parameter at 5.0°C will not allow the set point to go below 5.0°C Also, if the temperature reaches or goes below 5.0°C the display will show Low Temp. Alarm and at this point the alarm will activate.
	Min / **Max** / **Fact. Set**: AFT Set Temp. +0.1ºC / Set Temp. -0.1 / 5.0ºC	
08	AFT PROBE STATUS	Function : To enable or disable Antifreeze function.
	To change AFT PROBE STATUS parameter, press the set key.	Use UP/DOWN keys to set desired value. Disable = It disables the Antifreeze Trip function of the controller Enable = It enables the Antifreeze Trip function of the controller
	Range	
	Min / **Max** / **Fact. Set**: Disable / Enable / Disable	
09	AFT SET TEMP	Function: To set Antifreeze tripping point.
	To change AFT SET TEMP. parameter, press the set key.	Use UP/DOWN keys to set desired value.
	Range	**EXAMPLE:** If this parameter is set to 5.0ºC controller will trip the compressor on Antifreeze fault if the AFT sensor goes below 5.0ºC.
	Min / **Max** / **Fact. Set**: -30.0ºC / Lt-0.1ºC / 4.0ºC	

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
10	AFT DIFFERENTIAL	Function : To set fault resetting differential once it tripped of Aft set point.
To change the AFT Differential parameter, press the set key.		Use UP/DOWN keys to set desired value. **EXAMPLE :** If the AFT set point is set at 5.0ºC and differential is set to 2.0ºC then after tripping on AFT fault controller will clear the AFT fault only when the AFT Temperature goes above 7.0ºC(5.0ºC+2.0ºC).

Range		
Min	**Max**	**Fact. Set**
1.0ºC	10.0ºC	2.0ºC

11	LIQ. PROBE CAL.	Function : To set Main(Liquid) probe calibration.
To change Main Probe Cal. parameter, press the set key.		Use UP/DOWN keys to set desired range. During the course of time there may be a slight offset in the actual temperature and the temperature displayed. **EXAMPLE :** If the actual temperature is 20.0ºC and the temperature on the controller shows 22.0°C set this parameter to -2.0°C and once out of this mode, the temperature will display 20.0ºC. (22.0ºC-2.0ºC).

Range		
Min	**Max**	**Fact. Set**
-10.0ºC	10.0ºC	0.0ºC

12	AFT PROBE CAL	Function : To set Antifreeze probe calibration.
To change AFT Probe Cal. parameter, press the set key.		Use UP/DOWN keys to set desired value. **EXAMPLE :** Same as Main Probe Cal.

Range		
Min	**Max**	**Fact. Set**
-10.0ºC	10.0ºC	0.0ºC

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
13	COND PROBE CAL.	Function : To set Condensor probe calibration.
To change Cond Probe Cal. parameter, press the set key.		Use UP/DOWN keys to set desired value. **EXAMPLE :** Same as Main Probe Cal.

Range		
Min	**Max**	**Fact. Set**
-10°C	10°C	0°C

14	CURRENT CAL.	Function : To set CT sensing calibration.
To change CT Cal. parameter, press the set key.		Use UP/DOWN keys to set desired value. **EXAMPLE :** If the actual current is 10A and if controller is showing 9A ,then set this parameter to 1A. Once out of this mode controller will display 10A.

Range		
Min	**Max**	**Fact. Set**
-10Amp	10Amp	0Amp

15	HT POWER ON DLY	Function : This sets Power ON delay for high temperature alarm to avoid false alarms.
To change HT Power On Dly parameter, press the set key.		Use UP/DOWN keys to set desired value.

Range		
Min	**Max**	**Fact. Set**
0Min	99Min	20Min

16	COND PROBE ACTIVE	Function : To enable or disable condenser probe.
To change Cond Probe Enable parameter, press the set key.		Use UP/DOWN keys to set desired value. Enable = Enables condensor probe control. Disble = Disables condensor probe control.

Range		
Min	**Max**	**Fact. Set**
Disable	Enable	Disable

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
17	COND. SET TEMP.	Function : To set Condenser set temperature.
To change Cond. set temp. parameter, press the set key.		Use UP/DOWN keys to set desired value.
Range		**EXAMPLE :** If this parameter is set to 60ºC then controller will trip the compressor on Condenser High temperature, if the Condenser sensor goes above 60ºC.
Min	**Max** / **Fact. Set**	
1°C	99°C / 60°C	
18	COND. SET DIFF.	Function : To set differential for Condenser.
To change Cond. set differential parameter, press the set key.		Use UP/DOWN keys to set desired value.
Range		**Example:** If condenser set temperature is set to 60°C and condenser will trip compressor when condenser temperature goes above 60°C and will reset only if temperature goes below 58°C.
Min	**Max** / **Fact. Set**	
1°C	10°C / 2°C	
19	FAULT SENSE LOGIC	Function: To set tripping voltage of digital inputs.
To change Fault sense logic parameter, press the set key.		Use UP/DOWN keys to set desired value. 0Vac = Controller will sense faults at 0 voltage level. 230Vac = Controller will sense faults at 230Vac .
Range		
Min	**Max** / **Fact. Set**	
0Vac	230Vac / 230Vac	

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
20	FAULT IN STAND BY	Function : This decides whether controller should display faults in stand by mode or not.
To change Fault in Stand By parameter, press the set key.		Use UP/DOWN keys to set desired value. Disable = Faults are disabled in stand by mode. Enable = Faults are enabled in stand by mode. **Note :** Eventhough the fault sensing is disabled in satnd by controller will display High temperature and low temperature alarms and sensor fail alarms.
Range		
Min	**Max** / **Fact. Set**	
Disable	Enable / Disable	
21	LP SENSING DLY	Function: To set LP fault sensing delay on compressor on.
To change LP Sensing Dly parameter, press the set key.		Use UP/DOWN keys to set desired value. **EXAMPLE:** If this delay is set to 40seconds then the controller will ignore Lp fault for 40 seconds after compressor on it avoid false tripping of Compressor.
Range		
Min	**Max** / **Fact. Set**	
1sec	90sec / 40 sec	
22	HP/AFT RESET	Function : This parameter will set HP and AFT fault to Auto or Manual reset.
To change HP-AFT Fault Reset parameter, press the set key.		Use UP/DOWN keys to set desired value. Auto = Sets HP-AFT faults as Auto ressetable. Manual = Sets HP-AFT faults as Manual ressetable. User need to press RST key To clear these faults.
Range		
Min	**Max** / **Fact. Set**	
Manual	Auto / Auto	

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
23	LP FAULT RESET	Function : This parameter will set LP fault to Auto or Manual reset.
To change LP fault reset parameter, press the set key.		Use UP/DOWN keys to set desired value. Auto = Sets LP faults as Auto resettable. Manual = Sets LP faults as Manual resettable. User need to press RST key To clear these faults.

Range		
Min	**Max**	**Fact. Set**
Manual	Auto	Auto

Sr.No.	Parameter (LCD Message)	Parameter setting method.
24	LIQUID LEVEL SENSOR	Function : This parameter enable / disables liquid level sensing.
To change Liquid level parameter, press the set key.		Use UP/DOWN keys to set desired value. Enable = This will enable liquid level sensing. Disable = This will disable liquid level sensing.

Range		
Min	**Max**	**Fact. Set**
Disable	Enable	Disable

Sr.No.	Parameter (LCD Message)	Parameter setting method.
25	PUMP RUN LOGIC	Function : This parameter configures pump to keep always on or on/off with compressor.
To change Pump start parameter, press the set key.		Use UP/DOWN keys to set desired value. Always On = Pump will remain always on. With Comp = Pump will switch on/ off with compressor.

Range		
Min	**Max**	**Fact. Set**
Always On	With Comp	Always On

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
26	COND RUN LOGIC	Function : This parameter configures Cond to keep always on or on/off with compressor.
To change Cond Start parameter, press the set key.		Use UP/DOWN keys to set desired value. Always On = Condensor will remain always on. With Comp = Condensor will switch on/ off with compressor.

Range		
Min	**Max**	**Fact. Set**
Always On	With Comp	Always On

Sr.No.	Parameter (LCD Message)	Parameter setting method.
27	COND START DLY.	Function: To set sensing delay of condenser on compressor ON.
To change Cond Start Dly. parameter, press the set key.		Use UP/DOWN keys to set desired value. If condenser is running with compressor And if this delay is set to 10seconds then condenser will switch on 10 seconds before compressor.

Range		
Min	**Max**	**Fact. Set**
1sec	60sec	10 sec

Sr.No.	Parameter (LCD Message)	Parameter setting method.
28	CURRENT INPUT	Function: To enable / disable Current Sensing
To change Ct Enable parameter, press the set key.		Use UP/DOWN keys to set desired value. Enable = To Enable Current Sensing. Disable = To Disable Current Sensing.

Range		
Min	**Max**	**Fact. Set**
Disable	Enable	Disable

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
29	CURRENT LO LIMIT	Function : This parameter sets Low current limit for the compressor below which it will trip on “Underload” Fault.
To change Ct LO reset parameter, press the set key.		Use UP/DOWN keys to set desired value. **Example :** If this parameter is set to 5Amp then controller will trip compressor on Underload fault incase it is drawing less than 5 Ampere.

Range		
Min	**Max**	**Fact. Set**
0	Ct Hi-1	5Amp

30	CURRENT HI LIMIT	Function : This parameter sets High current limit for the compressor below which it will trip on “Overload” Fault.
To change Ct HI parameter, press the set key.		Use UP/DOWN keys to set desired value. **Example :** If this parameter is set to 15Amp then controller will trip compressor on Overload fault incase it is drawing more than 15Ampere.

Range		
Min	**Max**	**Fact. Set**
Ct+Lo+1	20	15Amp

31	CURRENT RETRIALS	Function : No. of retrials before sensing underload / overload fault in auto mode.
To change Ct retrials parameter, press the set key.		Use UP/DOWN keys to set desired value.

Range		
Min	**Max**	**Fact. Set**
0	10	3

32	CURRENT FAULT RST	Function : To set current faults for Auto / Manual reset.
To change Ct fault reset parameter, press the set key.		Use UP/DOWN keys to set desired value. If CT fault is set to Auto then after no. of retrials compressor will trip on underload or overload fault and go to manual reset. If set to Manual in the first trip only controller will trip on underload or overload fault and go to manual reset.

Range		
Min	**Max**	**Fact. Set**
Manual	Auto	Manual

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
33	CONFIG AUX I/P	Function : This configures AUX i/p as EWFS fault or as AUX i/p to switch off whole system
To change CONFIG AUX I/P parameter, press the set key.		Use UP/DOWN keys to set desired value. This configures AUX i/p as EWFS fault or as AUX i/p to switch off whole system AS AUX = It will set i/p as Auxiliary fault. AS EWFS = It will set i/p as EWFS fault.

Range		
Min	**Max**	**Fact. Set**
AS EWFS	AS AUX	AS EWFS

34	EWFS STARTUP DLY	Function : It sets power on delay for EWFS fault sensing.
To change EWFS Startup Dly parameter, press the set key.		Use UP/DOWN keys to set desired value.

Range		
Min	**Max**	**Fact. Set**
0Sec	120Sec	10Sec

35	EWFS NORMAL DLY	Function : It sets normal delay for EWFS fault sensing.This avoids false tripping due to water splashing.
To change EWFS Normal Dly parameter, press the set key.		Use UP/DOWN keys to set desired value.

Range		
Min	**Max**	**Fact. Set**
0Sec	90Sec	5Sec

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
36	AUX I/P SETTING	Function : This parameter will set pump functioning incase of Auxiliary fault.
To change Aux Input parameter, press the set key.		Use UP/DOWN keys to set desired value. Pump On = Will keep pump running in case of Auxilliary fault. All Off = Trip whole system on Auxilliary fault.
Range		
Min	**Max** / **Fact. Set**	
Pump ON	All OFF / Pump ON	
37	PRECISION MODE	Function : To enable / disable Controller to function in precision mode.
To change Precision Mode parameter, press the set key.		Use UP/DOWN keys to set desired value. **Example :** If this mode is enabled,then the compressor will remain in the on state, while Precesion SV will switch on/off on the set point to maintain the temperature precisely.
Range		
Min	**Max** / **Fact. Set**	
Disable	Enable / Disable	
38	AUTOSTART	Function : To enable auto start of controller at power on.
To change System Autostart parameter, press the set key.		Use UP/DOWN keys to set desired value. Enable = Auto start controller at power on. Disable = Start Controller with power key.
Range		
Min	**Max** / **Fact. Set**	
Disable	Enable / Disable	
39	KEYPAD LOCK	Function : To lock keypad.
To change Keypad Lock parameter, press the set key.		Use UP/DOWN keys to set desired value. Enable = All parameter are locked to set values. Disable = Use can change the values.
Range		
Min	**Max** / **Fact. Set**	
Disable	Enable / Enable	

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
40	CLEAR FAULT LOG	Function : To clear last fault history
To change Clear Fault Log parameter, press the set key.		Use UP/DOWN keys to set desired value. Clear = Clear all previous fault history Store = Store fault history **Example :** If this parameter is set to 'Clear"then it will clear all previous faults saved in the memory. "Store" will save last 15 faults.
Range		
Min	**Max** / **Fact. Set**	
Store	Clear / Store	
41	FACTORY DEFAULTS	Function : Revert to factory set parameter.
To change Factory Setting parameter, press the set key.		Use UP/DOWN keys to set desired value. To restore default settings of the controller. When set to Enable, all parameters are programmed to factory settings. Used to debug setting related problems.
Range		
Min	**Max** / **Fact. Set**	
Disable	Enable / Disable	
42	COMP RUN HRS	Function : To display total compressor working hours
		Use UP/DOWN keys to set desired value.
43	PUMP RUN HRS	Function: To display total pump working hours.
		Use UP/DOWN keys to set desired value.
44	CLR COMP RUN HRS	Function : To clear compressor run hours
To change Clear Comp Run parameter, press the set key.		Use UP/DOWN keys to set desired value. **Note :** User need to connect prokey at the back of the controller before entering in to the program mode.
Range		
Min	**Max** / **Fact. Set**	
Store	Clear / Store	

Description of parameters and functions.

Sr.No.	Parameter (LCD Message)	Parameter setting method.
45	CLR PUMP RUN HRS	Function : To clear pump run hours.
To change Clear Pump Run Hrs parameter, press the set key.		Use UP/DOWN keys to set desired value. **Note :** User need to connect prokey at the back of the controller before entering in to the program mode.
Range		
Min	**Max** / **Fact. Set**	
Store	Clear / Store	
46	ENTER YOUR NAME	Function : To set customer name to be displayed at controller power ON.
To change Enter Your Name parameter, press the set key.		Use UP/DOWN keys to set desired value. Customer can set the name required to display at controller power ON.
47	ENTER YOUR NO.	Function : To set customer service number.
To change Enter Your No. parameter, press the set key.		Use UP/DOWN keys to set desired value. Customer can set service telephone number which will display at power ON.
48	SET -EXIT UP/DOWN - SCROLL	Function : To end programming
To end Program mode press set key.		Once the SET key is pressed the control goes into the normal mode and displays the temperature.

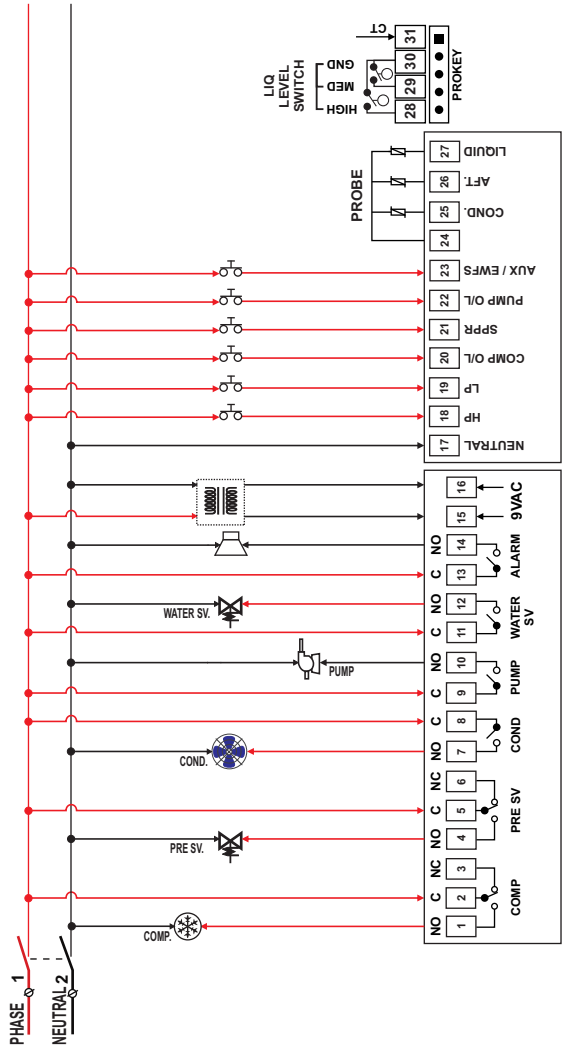
Key Functions :

Key	Description
RST	Press for 4 seconds to reset HP, LP, AFT faults in manual reset.
▲ / °F	Used in program mode and set mode to increment parameter value.
	Used to view to Antifreeze (AFT) Temperature & Condenser Temperature.
▼ prg	Used to enter into the program mode.
	Used in program mode and set mode to decrement parameter value.
SET	In program mode and set mode used to set the changed value of parameter or to enter into set mode.
▼ prg + SET	Press DOWN PRG and SET keys simultaneously to start or stop the chiller.

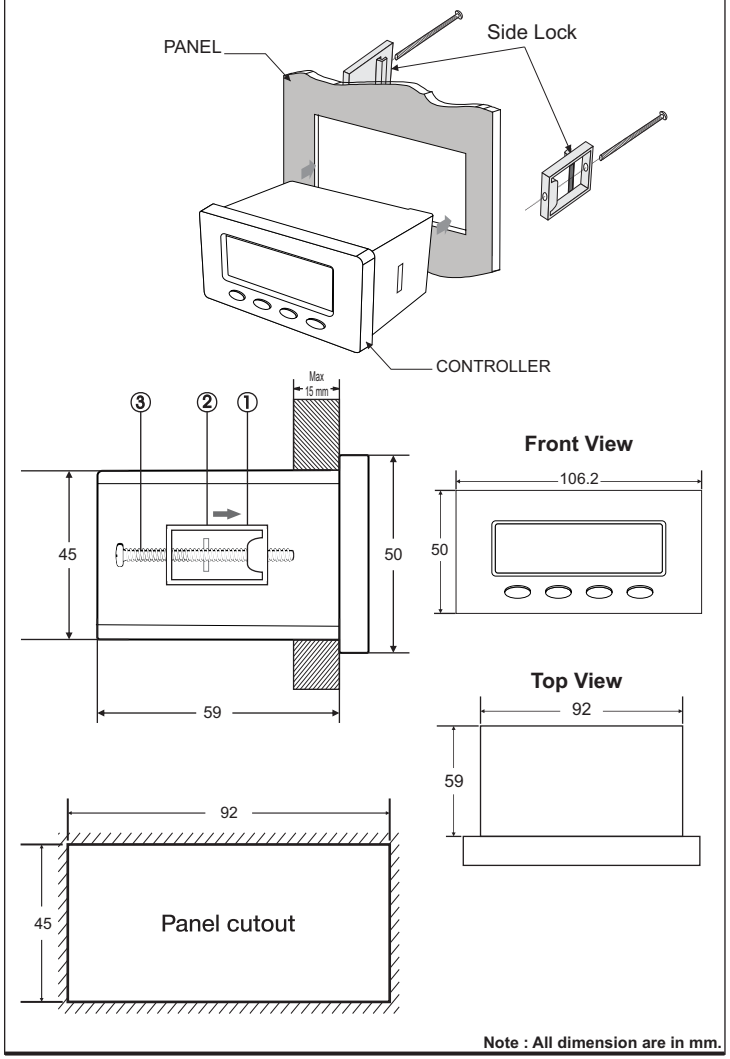
Technical Data

Housing	:	ABS Plastic
Dimensions	:	Front - 106.2 x 50 mm Depth- 59 mm
Panel Cutout	:	92 X 45 mm
Mounting	:	Flush panel mounting
Protection	:	IP54 Frontal
Connection	:	Plugable Screw terminal blocks. ≤ 2.5mm^2 one wire/terminal only.
Display	:	16x2 LCD
Data Storage :		Non-Volatile EEPROM Memory
Power Input	:	230Vac +/-10%, 50Hz
Operating Temp	:	5^{0}C to 50^{0}C(non-condensing)
Storage Temp	:	-20^{0}C to 70^{0}C(non-condensing)
Input	:	NTC Probe, SZ-N75
Range	:	-30.0^{0}C to +50.0^{0}C
Resolution	:	0.1^{0}C
Accuracy	:	+/-1^{0}C
Probe Tolerance	:	+/-0.3^{0}C AT 25^{0}C
All Relay	:	5A / 250Vac
Current Input	:	0 to 20Amp.
Resolution	:	0.1Amp.

Suggested Wiring Diagram



Panel Cutout & Dimensions



Note : All dimension are in mm.

Installation

Fixing and dimensions of panel models :To fix the unit, slide the side lock① through the guides ② as per the position shown in the figure. Move the side lock in the direction of the arrow, it permits to move the fastener in the opposite direction of the arrow.③ Fit the screw in the side lock in direction of the arrow to hold the controller in the panel.

Controller

Controller should be installed in a place protected by vibration, water and corrosive gasses and where ambient temperature does not exceed the values specified in the technical data.

Probe

To give a correct reading, the probe must be installed in a place protected from thermal influences, which may affect the temperature to be controlled.

CAUTION

WIRING : The probe and its corresponding wires should never be installed in a conduit next to control or power supply lines. The electrical wiring should be done as shown in the diagram. The power supply circuit should be connected to a protection switch. The terminals admit wires of upto 2.5sq mm.

WARNING : Improper wiring may cause irreparable damage and personal injury. Kindly ensure that wiring is done by qualified personnel only.

Maintenance : Cleaning : Clean the surface of the controller with a soft moist cloth. Do not use abrasive detergents, petrol, alcohol or solvents.

Notice

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Cold Room Controller
Chiller Controller
Two Compressors Controller
Heating Controller
Humidity Controller
Pressure Controller

CASTLE®

Ball Valves
Globe Valves
Hand Valves
Flow Switches
Solenoid Valves

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