



OPERATING INSTRUCTIONS



SZ-FC- 5000

Introduction :

This is a two-compressor controller with an inbuilt Free Cooling Capability.

It is specifically designed to maintain the Shelter temperature at a desired level with the help of Compressors or by using Free Cooling concept at low ambient to save energy.

MAIN FEATURES:

1. The Controller operates on 48 V DC which gives it advantage in situation where there are 230 VAC failures and the controller will switch ON a damper actuator thereby initiating Emergency Free Cooling.
2. Power Saving is another great feature of this controller whereby it reduces the fan speed according to the temperature.
3. Additional Safety features are added where a feedback is taken from the Evaporator Fan and a fan operative status is confirmed.


4. Free Cooling concept: In case of low ambient conditions controller will switch off the compressors and use outside ambient air with the help of dampers to maintain shelter temperature.
5. Separate settings for individual cooling units.
6. In case one compressor is not capable of handling the load the second compressor will activate and both compressors will cutout at the lowest set point in Compressor and Dual cooling mode.
7. The controller features cycling of compressors so that there is no overload on one compressor.
8. Current sensing of both the compressors is provided to protect them by switching them OFF in adverse conditions.
9. Separate HP, LP and MCB inputs to protect compressors.
10. Separate alarm outputs are with the LED display for easy diagnostics.

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Set Point	Function : To set the cutout point of the controller.		
Press & hold set key for 4 seconds and release.	Display will show 0 and flash. Press Up/Down keys to enter password. User can go into set mode by entering correct password.		
Set Point 1	Comp1 LED will flash along with respective setpoint1 for compressor 1. The setpoint1 value can now be changed by using the UP/DOWN keys. After achieving the desired value, press the set key and you will see "----" which confirms that the set point has been stored in memory.		
Min	Max	Fac.	
L3+2	P2-1	29°C	
Set Point 2	Comp2 LED will flash along with respective setpoint 2 for compressor 2. In the similar manner use UP/DOWN key to set the desired value and press set key to confirm the settings.		
Min	Max	Fac.	
L3+2	P2-1	30°C	
			


1

Parameter Setting	Function : To set the other parameters of the controller.
Hold up & down keys simultaneously for 4 seconds.	Display will show 0 & flash. To enter programming mode enter correct password by using Up/Down keys and press set key. Once user enters correct password display will show P2 and flash. To go to other parameters, use up / down keys. If user enters incorrect password, controller will come out of programming mode and will display temperature.
	
	


2

P1 Parameter	Function : Unit selection parameter of Controller .	
To change P1 parameter, Press SET key.	Use UP/DOWN key to set desired value. When P1 is set to 0 Both Cooling units are selected. 1 Cooling Unit 1 is selected. 2 Cooling Unit 2 is selected	
Min	Max	Fac.
0	2	0
Example : Setting this parameter at 1 will select Unit1 only, unit2 will be off. Setting this parameter to 0 will allow to function both the units simultaneously		

3

P2 Parameter	Function : To set maximum allowable high temperature limit.	
To change P2 parameter, Press SET key.	Use UP/DOWN key to set desired value. Once set at a particular value, this will not allow both set points to go above this value and below P3 setting.	
Min	Max	Fac.
XX°C	50°C	35°C
XX°C : Largest set point-1		
		
(Message on Display)		
Example : Setting this parameter at 35°C will not allow both set points to go above 35°C. Also if the temperature reaches 35°C, the display will show Ht (High Temperature), indicating that the temperature has reached or gone above the value in this parameter.		

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P3 Parameter	Function : To set minimum allowable low temperature limit.	
To change P3 parameter, press SET key.	Use UP/DOWN key to set desired value. Once set at a particular value, this will not allow both set points to go below this value and above P2 setting.	
Min	Max	Fac.
0°C	XX°C	24°C
XX°C : Free cooling set pt (L3)		
		
(Message on Display)		
Example : Setting this parameter at 24°C will not allow both set points to go below 24°C. Also if the temperature reaches 24°C, the display will show Lt (Low Temperature), indicating that the temperature has reached or gone below the value in this parameter.		

5

P4 Parameter	Function : To set the differential of set point 1 and set point 2.	
To change P4 parameter, press SET key.	Once in this mode, comp1 LED and differential of setpoint 1 will flash. Use UP/DOWN keys to set desired value. Once desired value is achieved, press set key and you will see "----", this confirms differential for set point 1 has been stored.	
Differential 1		
Min.	Max.	Fac.
1°C	20°C	2°C
Differential 2		
Min.	Max.	Fac.
1°C	20°C	2°C
Immediately after up key is pressed comp2 LED flashes along with the differential for setpoint 2. Use UP/DOWN keys to set desired value. Once value is achieved, press set key. This confirms differential for setpoint 2.		
Example : If setpoint 1 is set at 29°C, and differential for setpoint 1 is set at 2°C, then when the system reaches 29°C, the relay for compressor1 will cutout and since the differential is 2°C, the relay will cutin (restart) at 31°C(29+2).		

6

P5 Parameter	Function : To set probe calibration for shelter temperature sensor.		
To change P5 parameter, press SET key.	Use UP/DOWN keys to set desired value. In time it may be possible that the display may be offset by a degree or so. To compensate for this error, you may need to add or minus the degrees required to achieve the correct temperature. Setting value is from -10°C to +10°C.		
Min	Max	Fac.	
-10°C	10°C	0°C	
Example : The temperature on the display is 28°C, whereas the actual temperature is 30°C. You will need to set the P5 mode to 2, which means that once out of the programming mode, the display will show temperature 30°C (28°C+2°C).			

7

P6 Parameter	Func.: Set time delay between relay restart time for comp1 and comp2.		
To change P6 parameter, press SET key.	Comp1 LED along with time delay for comp1 will flash. Use UP/DOWN keys to set desired value. Once desired value is achieved, press set key and you will see "----" which confirms time delay for set point 1 has been stored in memory.		
Time Delay 1			
Min	Max	Fac.	
0 Min	20 Min	3 Min	
Time Delay 2			
Min	Max	Fac.	
0 Min	20 Min	3 Min	
To prevent both compressors from switching on together, there is an internal 10 second time delay between simultaneous startups to prevent an electrical surge.			

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t2 Parameter	Function : To start second comp. incase comp 1 cannot achieve the lower setpoint.		
To change t2 parameter, press SET key.	This function is used to switch on the second compressor incase the heat load cannot be met with one compressor functioning. Example : If setpoint 1 is 29 and setpoint 2 is 30 and if t2 para is set to 9 minutes, if the second comp. cuts out at 30, if comp. 1 is not able to acheive 29 for a period of 9 minutes, then after 9 minutes, second compressor will also be switched on and both compressors will cutout at the lower setpoint.		
Min	Max	Fac.	
0 Min	30 Min	9 Min	

9

t3 Parameter	Function : To set minimum off time between two compressor.		
To change t3 parameter, press SET key.	This mode is used to set the time delay between the switching off of both compressors so that they do not switch off simultaneously. Example : If this mode is set to 5 seconds the second compressor will switch off after a minimum of 5 seconds from the first compressor switching off. If set to 0, this feature will not activate.		
Min	Max	Fac.	
0 Sec	15 Sec	5 Sec	

10

t4 Parameter	Function : To avoid overloading of either compressor.		
To change t4 parameter, press SET key.	This function is used to avoid overloading of any one compressor working at a stretch over a period of time. Example : If this parameter is set at 12 hours, the setpoint, differential & time delay of both compressors will interchange after 12 hours The interchange will occur every 12 hours. Time calculation will start at power on. This helps by not overworking any one compressor for long hours and increases compressor life. If for any reason the t4 and setpoints have been changed, the time calculation will start from the last change in any of these parameters.		
Min	Max	Fac.	
0 Hr	12 Hrs	12 Hrs	

11

Ad Parameter	Function: To set power on time delay for High temp alarm .		
To change Ad parameter, press SET key.	Use UP/DOWN keys to set desired value. This parameter sets a time delay on power on for the High temperature Alarm. Example : If this parameter is set to 20 Min, once the unit is powered on the high temperature alarm will not activate for 20 minutes even if there is a fault. This is very useful to eliminate the nuisance alarm when a unit is switched on and the ambient is above the max set limit. in P2. After 5mins if the temperature is above P2 parameter then Display will show "Ht" and Alarm3 relay will Activate.		
Min	Max	Fac.	
0 Min	20 Min	20 Min	

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C0 Parameter	Function : To set low current limit for compressor1.		
To change C0 parameter, press SET key.	Use UP/DOWN keys to set desired value. This parameter is used to switch off the compressor incase it draws lower than the set current.		
Min	Max	Fac.	
1	C2	1	
Unit1 : Amp			
<p>Example : If this parameter is set at 1A, the controller will trip comp1 if it draws less than 1A. Controller will restart the compressor after the set time delay. If after 3 retries within 1 hour, current drawn is still less than 1A, the controller will trip the compressor on fault and activate the respective alarm relay. Also display will flash "UL".</p> <p>Once fault is rectified user has to press reset key for 4 seconds to restart the Compressor.</p>			

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C1 Parameter	Function : To set low current limit for compressor2.		
To change C1 parameter, press SET key.	Use UP/DOWN keys to set desired value. This parameter is used to switch off the compressor incase it draws lower than the set current.		
Min	Max	Fac.	
1	C3	1	
Unit2 : Amp			
<p>Example : If this parameter is set at 1A, the controller will trip comp2 if it draws less than 1A. Controller will restart the compressor after the set time delay. If after 3 retries within 1 hour, current drawn is still less than 1A, the controller will trip the compressor on fault and activate the respective alarm relay. Also display will flash "UL".</p> <p>Once fault is rectified user has to press reset key for 4 seconds to restart the Compressor.</p>			

14

C2 Parameter	Function : To set high current limit for compressor1.		
To change C2 parameter, press SET key.	Use UP/DOWN keys to set desired value. This parameter is used to switch off the compressor1 incase it draws higher than the set current.		
Min	Max	Fac.	
C0	20	10	
Unit1 : Amp			
<p>Example : If this parameter is set at 10A, the controller will trip comp1 if it draws more than 10A. Controller will restart the compressor after the set timedelay. If after 3 retries within 1 hour, current drawn is still more than 10A, the controller will trip the compressor on fault and activate the respective alarm relay. Also display will flash "OL".</p> <p>Once fault is rectified user has to press reset key for 4 seconds to restart the Compressor.</p>			

15

C3 Parameter	Function : To set high current limit for compressor2.		
To change C3 parameter, press SET key.	Use UP/DOWN keys to set desired value. This parameter is used to switch off the compressor2 incase it draws higher than the set current.		
Min	Max	Fac.	
C1	20	10	
Unit2 : Amp			
<p>Example: If this parameter is set at 10A, the controller will trip comp2 if it draws more than 10A. Controller will restart the compressor after the set timedelay. If after 3 retries within 1 hour, current drawn is still more than 10A, the controller will trip the compressor on fault and activate the respective alarm relay. Also display will flash "OL".</p> <p>Once fault is rectified user has to press reset key for 4 seconds to restart the Compressor.</p>			

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C4 & C5 Parameter	Function : To set time delay for current alarms.		
To change C4 & C5 parameters, press SET key.	Use UP/DOWN keys to set desired value. This parameter sets a time delay on compressor start up before Overload ,Underload .		
Min	Max	Fac.	
0 Min	30 Min	1 Min	
<p>Example : If this parameter is set to 1 Min, once the compressor is on will ignore Overload, Underload for 1min. If the fault persists even after 1min then controller will sense Overload, Underload faults as described in C0 ,C1, C2& C3 parameters.</p> <p>C4 = Delay for Comp1 Alarms. C5 = Delay for Comp2 Alarms.</p>			

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L1 Parameter	Function : Free cooling Enable/ Disable for Unit1		
To change L1 parameter, press SET key.	Use UP/DOWN key to set desired value. When L1 is set to 0 = Free cooling for Unit1 is disabled. 1 = Free cooling for Unit1 is enabled.		
Min	Max	Fac.	
0	1	1	
<p>Example : Setting this parameter at 1 will enable the Free cooling for unit1.</p>			

18

L2 Parameter	Function : Free cooling Enable/ Disable for Unit2		
To change L2 parameter, press SET key.	Use UP/DOWN key to set desired value. When L2 is set to 0 = Free cooling for Unit2 is disabled. 1 = Free cooling for Unit2 is enabled.		
Min	Max	Fac.	
0	1	1	
Example : Setting this parameter at 1 will enable the Free cooling for unit2.			

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L3 Parameter	Function : Free cooling setpoint.		
To change L3 parameter, press SET key.	Use UP/DOWN key to set desired value.		
Min	Max	Fac.	
P3	XX°C	26°C	
XX : Small Set Point-2			
Example : If this parameter is set to 26°C then controller will work in free cooling mode if the ambient temperature is below 26°C. Controller will switch over to Compressor mode if ambient temperature > smaller set point-2°C. In this mode both the dampers will be fully closed.			

20

L4 Parameter	Function : To set the differential for damper.		
To change L4 parameter, Press SET key.	Use UP/DOWN key to set desired value.		
Min	Max	Fac.	
1°C	4°C	2°C	
Example : If L4 is set to 2°C then in Free cooling mode controller will open the dampers when shelter temperature reaches or goes above the smallest set pt +2°C and will close the dampers at smallest set point.			

21

L5 Parameter	Function : To set Humidity limit to allow free cooling.		
To change L5 parameter, Press SET key.	Use UP/DOWN key to set desired value.		
Min	Max	Fac.	
35%	88%	70%	
If L5 is set to 70% and if shelter RH reaches or goes above 70% then the controller will close the dampers in steps. This will depend on L6 parameter.			
Example : If L5 parameter is set to 70%. Then if the Shelter RH goes above 70% ,Free Cooling will be OFF and Damper will be closed. Also Compressor will be switched ON . If L6 parameter is set 5% and if RH goes below 70 % (70-5) , Compressor will be switched OFF and Free Cooling will be ON, if Room Temperature is suitable .			

22

L6 Parameter	Function : To set differential for Humidity.		
To change L6 parameter, press SET key.	Use UP/DOWN key to set desired value.		
Min	Max	Fac.	
3%	10%	5%	
Example : As explained for L5 parameter.			

23

d0 Parameter	Function : To enable/disable HP fault input for Unit1.		
To change d0 parameter, press SET key.	Use UP/DOWN key to set desired value.		
Min	Max	Fac.	
0	1	1	
Example : If d0 is set to 1 = HP fault for Unit1 is enabled. 0 = HP fault for Unit1 is disabled. Setting this parameter to 0 will ignore HP fault for compressor1. If this parameter is set to 1 then controller will detect HP trip and in case of 3 HP trips in 1 hour or less time controller will trip the compressor1 on fault and activate the respective alarm relay. Also display will flash HP. After attending the fault user has to press RST key for 4 seconds to restart compressor.			

24

d1 Parameter	Function :To enable/disable HP fault input for Unit2.	
To change d1 parameter, press SET key.	Use UP/DOWN key to set desired value. Example : If d1 is set to 1 = HP fault for Unit2 is enabled. 0 = HP fault for Unit2 is disabled. Setting this parameter to 0 will ignore HP fault for compressor2. If this parameter is set to 1 then controller will detect HP trip and incase of 3 HP trips in 1 hour or less time controller will trip the compressor2 on fault and activate the respective alarm relay. Also display will flash HP. After attending the fault user has to press RST key for 4 seconds to restart compressor.	
Min	Max	Fac.
0	1	1

25

d2 Parameter	Function :To enable/disable LP fault input for Unit1.	
To change d2 parameter, press SET key.	Use UP/DOWN key to set desired value. Example : If d2 is set to 1 = LP fault for Unit1 is enabled. 0 = LP fault for Unit1 is disabled. Setting this parameter to 0 will ignore LP fault for compressor1. If this parameter is set to 1 then controller will detect LP trip and incase of 3 LP trips in 1 hour or less time controller will trip the compressor1 on fault and activate the respective alarm relay. Also display will flash LP. After attending the fault user has to press RST key for 4 seconds to restart compressor.	
Min	Max	Fac.
0	1	1

26

d3 Parameter	Function :To enable/disable LP fault input for Unit2.	
To change d3 parameter, press SET key.	Use UP/DOWN key to set desired value. Example : If d3 is set to 1 = LP fault for Unit2 is enabled. 0 = LP fault for Unit2 is disabled. Setting this parameter to 0 will ignore LP fault for compressor2. If this parameter is set to 1 then controller will detect LP trip and incase of 3 LP trips in 1 hour or less time controller will trip the compressor2 on fault and activate the respective alarm relay. Also display will flash LP. After attending the fault user has to press RST key for 4 seconds to restart compressor.	
Min	Max	Fac.
0	1	1

27

d4 Parameter	Function :To set MCB fault as Auto / Manual reset.	
To change d4 parameter, press SET key.	Use UP/DOWN key to set desired value. if this parameter is set to 0 = MCB fault will Auto-resetable. 1 = MCB fault will be Manual reset.	
Min	Max	Fac.
0	1	0


28

d5 Parameter	Function :To Enable/Disable DC Fan fault feedback.	
To change d5 parameter, press SET key.	Use UP/DOWN key to set desired value. If D5 is set to 1 = DC Fan fault feedback input is enabled. 0 = DC Fan fault feedback input is disable.	
Min	Max	Fac.
0	1	1

29

d6 Parameter	Function : To Set the DC fan speed in Compressor Cooling Mode.	
To change d6 parameter, press SET key.	Use UP/DOWN key to set desired value. Example : If d6 is set to 75 %, when the Compressor is ON, both Fans will run at 75% speed .	
Min	Max	Fac.
40%	99%	75%

30

LP Parameter			Function : To lock keypad.
To change LP parameter, press SET key.			Use UP/DOWN keys to set desired value. This parameter can lock the keypad so that tampering is not possible by bystanders.
Min	Max	Fac.	0= Keypad unlocked. 1= Keypad locked.
0	1	1	When locked all parameters can only be viewed, but not modified.
			

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E1 Parameter			Function : Relay status on probe failure.
To change E1 parameter, press SET key.			Use UP/DOWN keys to set desired value.
Min	Max	Fac.	When set to 0 both the relays will be on with initial start-up delay set in parameter P6.
0	2	0	When set to 1 both compressor performs a duty cycle of 10 minutes ON and 4 minutes OFF.
			When set to 2 both relays will stay OFF.

32

PA Parameter			Function : To change password .
To change PA parameter, press SET key.			Use UP/DOWN keys to change password.
Min	Max	Fac.	User can not enter into program mode, set mode if correct password is not entered.
0	99	48	


33

FS Parameter			Function : To restore the default settings of the controller.
To change FS parameter, press SET key.			When set to 1 all parameters are programmed to factory values.
Min	Max	Fac.	Useful to debug setting related problems.
0	1	0	

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EP Parameter			Function : To end programming.
To end programming press set key.			Once the set key is pressed, the controller goes into the normal mode and displays the temperature and all settings are recorded.

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Operating messages and Icon status		
Message	Description	Parameter
Ht	Temperature equal to or above the maximum limit of the set point.	P2
Lt	Temperature equal to or below the minimum limit of the set point.	P3
PP	Probe short circuit, circuit open or without probe, or temperature >50°C or <0 °C	
UL	Compressor Drawing less current than the set value.	C0, C1, C4, C5
OL	Compressor Drawing more current than the set value.	C2, C3, C4, C5
HP/LP	HP/LP fault for Compressors	d0, d1, d2, d3
CP	CT input error	
 ON/OFF	Keypad locked/unlocked	LP

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IMPORTANT NOTES

1. Power keys for unit1 and unit2.
If the power key is pressed for 4 seconds the unit will toggle between on and off status.
2. The ON/OFF status of the units will be retained on power loss.

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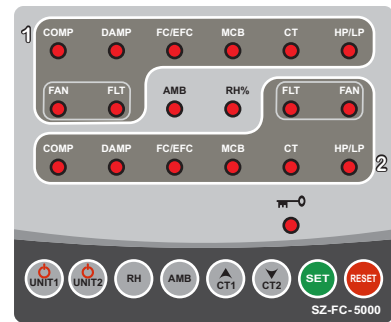
LED indications and status		
LED	LED Status	Description
FC/EFC	ON	Free Cooling is ON
	OFF	Free/Emergency Cooling is OFF.
	Flashing	Emergency Cooling ON.
DAMPER	ON	Damper Actuator in motion
	OFF	Damper Actuator Stopped.
FAN	ON	FAN is ON.
	OFF	FAN is OFF.
FLT	ON	FAN fault
COMP	ON	COMPRESSOR is ON.
	OFF	COMPRESSOR is OFF.
	Flashing	COMPRESSOR in time delay.
	Flashing (in prog. And set mode)	Represents the respective units.
MCB	ON	MCB FAULT
CT	Flashing	CT FAULT Overload
	Flashing	CT FAULT Underload
HP/LP	ON	HP FAULT
	Flashing	LP FAULT
AMB PROBE	ON	Ambient Temperature Probe Fail .
RH PROBE	ON	RH Probe fail(RH>90%).
	Flashing	RH Probe fail(RH<30%).

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Key Functions	
Key	Description
	Key to view compressor1 current / up key in program or set mode.
	Key to view compressor2 current / down key in program or set mode.
	Key to view Ambient Temperature.
	Key to view Shelter Humidity(%RH) .
	To save parameters and to enter set mode.
	To reset any pending faults in the controller.
	To switch ON or switch OFF UNIT1.
	To switch ON or switch OFF UNIT2.

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Front Sticker :



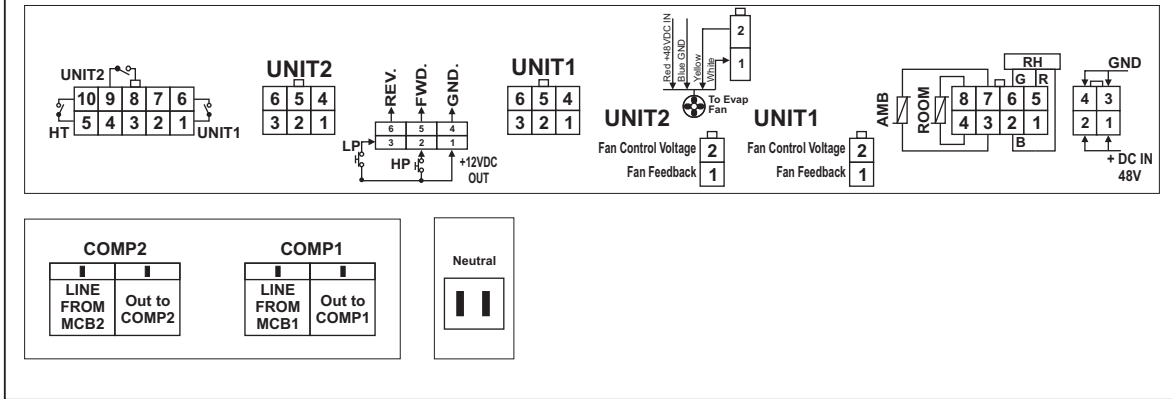
40

Technical Data :

Housing : ABS plastic.
Dimensions : 214mm X 168.5mm
Mounting : Wall mounting.
Connections : 2.5sqmm one wire/ terminal only.
Others : Minifit type connector.
Display : 2 X 14.2 mm (0.56") LED.
Operating temp. : 5°C to 50°C(non-condensing).
Data storage : Non-volatile EEPROM memory.
Power input : 48VDC.
Output :
Damper : 5A/250Vac.
Relay Comp : 20A/250Vac.
Alarm : 5A/250Vac.
Fan : 10A/250Vac.
Storage temp : -20°C to 70°C(non-condensing).
Input : Temp NTC probe, SZ-N75.
 (For Room & Amb Temp)
 Humidity, SZ-HS-220.
Range : 0°C to 50°C.
Resolution : 1°C.
Accuracy for temp. : +/- 1°C.
Accuracy for RH : +/- 5%.
Probe tolerance at 25°C : +/- 0.3°C.

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Connection Sticker



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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.

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.

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