C207-14 User's Manual

Revision History

The following revision history table summarizes changes contained in this document.

Revision Number	Revision Data	Author	Description of Changes
V1.00	02/09/2015	Tech07	Initial public release

1 Description

C207 series Controller is designed for refrigeration equipment control. It can control and protect the compressor. At the same time it can control the defrosting, the circle defrosting or the real time defrosting to meet the needs of different occasions. And it can control the evaporator fan. In addition there are 3 types temperature measurement. That is it can measure the temperature in the cabinet, the evaporator temperature, and the condenser temperature.

1.1 Description of the display

The display has 2.5 digits (Its most display is –188.), and 5 symbols (refrigeration, fans, defrost, alarm and clock).

1. Refrigeration: It shows when compressor start, flashes when the activation of the compressor is delayed by protection times.
2. Fans: It shows the work status of the evaporator fan.
3. Defrost: It comes on when an alarm situation occurs.
4. Clock: It sets the parameter associated with the clock.
5. Alarm: It comes on when an alarm occurs or the instrument is in the situation of setting parameter.
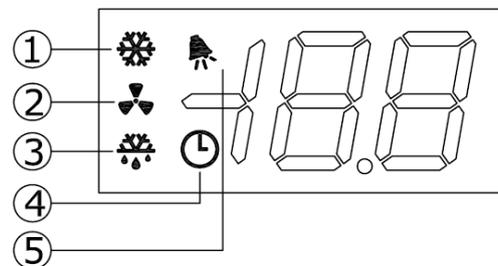
FIG 1

Warnings: When you set the parameters, alarm symbol flash frequency is 0.5 Hz.

1.2 Description of the buttons

The controller has four buttons SET, ▲, ▼, to operate the controller.

1 Button $\boxed{\text{SET}}$

In normal operation, press and hold for more than 3 seconds, display the set point; press and hold for more than 5 seconds, access the menu for setting the parameters.

Press $\boxed{\text{SET}}$ and $\boxed{\blacktriangledown}$ at the same time, the controller will activate the procedure for setting the default parameters.

In parameter setting mode: alternates the display of the value of each parameter with the name; if pressed for more than 3 seconds saves the changes.

In set point display model, if press $\boxed{\text{SET}}$, the changes will be saved.

In set point display mode: if pressed saves the changes.

2 Button $\boxed{\blacktriangle}$

In normal operation: if pressed for more than 3 seconds display the temperature of RT2; if pressed together with ❄ for more than 3 seconds, activates /deactivates the defrosting cycle; if pressed together with $\boxed{\blacktriangledown}$ for more than 3 seconds, display the real time clock.

In parameter setting mode: moves from one parameter to the next; increases the value associated with the parameter.

In set point display mode: increases the value of the set point.

3 Button $\boxed{\blacktriangledown}$

In normal operation: if pressed for more than 3 seconds, display the temperature of RT3; if pressed together with $\boxed{\blacktriangle}$ for more than 3 seconds, display the real time clock, if pressed together with $\boxed{\text{SET}}$ for more than 5 seconds, activates the procedure for setting the default parameters.

In parameter setting mode: moves from one parameter to the previous; decreases the value associated with the parameter.

In set point display mode: decreases the value of the set point.

4 Button ❄

In normal operation: if pressed for more than 3 seconds changes the status of the controller (ON/OFF), if pressed together with $\boxed{\blacktriangle}$ for more than 3 seconds activates /deactivates the defrosting cycle.

1.3 Technical specifications

Power supply: 115VAC±10%, or 230VAC±10%, 50/60Hz;
Operating conditions: -20~60°C (-4~140°F), humidity <90%RH, non-condensing;
Storage conditions: -30~70°C (-22~158 ^{o}F), humidity <90%RH, non-condensing;
Front panel index of protection: panel installation with IP65 gasket;
Communication: RS485, Modbus RTU;
Relay outputs:
      3 relays, 10A/250VAC, normal open contact;
Probe:
      NTC, 10Kohm@25 ^{o}C(77 ^{o}F).
      Probe RT1: used to measure the temperature in the cabinet
      Probe RT2: used to measure the evaporator temperature;
      Probe RT3: used to measure the condenser temperature.
Measurement range: -45~99 ^{o}C (-49~199 ^{o}F), resolution 1 °C/°F;

Temperature accuracy: +/-1 ^{o}C (-20~30 ^{o}C), or +/-2 ^{o}F (-4~86 ^{o}F);
Communication: RS-485 bus, Modbus RTU mode.

2 Function and Parameter

Parameters can be divided into essential parameter and advanced parameters.
Essential parameter St is user set point.
Advanced parameters are divided into 8 types: P/ (probe parameter), Pr (temperature control parameter), PC (compressor parameter), Pd (defrost parameter), PA (alarm parameter), PF (fan parameter), Pt (clock defrost parameter) and PH (system parameter).

2.1 Modifying the Parameters

2.1.1 Accessing the essential parameter（St）

Setting method:
1 In normal operation, press SET for 3 seconds, and then the display shows the current set point;
2 Press ▲ or ▼ to increase or decrease the value until to the desired value;
3 Press SET to confirm the new value in order to save the new value and return to the normal operation.

2.1.2 Accessing the Advanced Parameters

1 Press SET for more than 5S, and then the display shows the code of parameter "PS" (password);
2 Press SET to enter into the password set;
3 Press ▲ and ▼ to scroll the number to "-15";
4 Press SET to confirm the password and then the display shows "P/";
5 Press ▲ and ▼ to scroll the parameter type (P/, Pr, PC, Pd, PA, PF, Pt, PH);
6 Press SET to confirm the parameter type, and then the first parameter name of this kind of parameter will be shown;
    6.1 Press ▲ or ▼ to scroll the parameters;
    6.2 Press SET to display the relevant parameters;
    6.3 Press ▲ or ▼ to increase or decrease the value;
    6.4 Press SET to save the modified value temporarily and return to the display of the parameter;
    6.5 Repeat the procedure 6.1-6.4 to modify the other parameters;
    6.6 Press SET for more than 3 seconds to save modified parameter and return to the display of parameter type;
7 Repeat the procedure of 5-6 to modify the parameters of the other types;
8 If press SET for more than 3 seconds or no button is pressed within 60 seconds, exit the procedure of the parameter setting.

Warnings:
1 If no button is pressed for within 60 seconds, all the changes of parameters (the values saved temporarily in the RAM) will be invalid. And the previous setting will be restored.
2 If the instrument is cut off before the parameters are saved, all the values saved temporarily in the RAM will be lost.

2.2 Temperature Probes

Modify the probe:
Use the parameters in the following table to modify and stabilize the measured temperature by the temperature probes.
Probe parameters:

Para	Description	Type	Min.	Max.	Unit
/0	Probe measurement stability	P/	1	15	-
/1	Probe 1 offset	P/	-5	5	^{o}C/ ^{o}F
/2	Probe 2 offset	P/	-5	--	^{o}C/ ^{o}F
/3	Probe 3 offset	P/	-5	--	^{o}C/ ^{o}F
/5	Select °C/°F	P/	^{o}C	^{o}F	--

Description of the Parameters:
/0 Probe Measurement Stability
This parameter defines the coefficient used to stabilize the temperature measurement. Low values accelerate the response time of the probes; and the reading is however more sensitive to the disturbance. High values slow down the response time of the probes but it's not sensitive to the disturbance. That is, it has a more stable and more precise reading.

/1 Probe 1 offset
This parameter is used to correct the measured temperature of probe 1. The symbol of the value indicates that the temperature of probe 1 is added to (positive value) or subtracted from (negative value) the offset.

/2, /3 Probe 2, 3 offset
The using way of /2 and /3 is the same as that of /1.
After the parameter value is set to the sign of "—", this relevant probe will be disabled.

/5 Select °C/°F
Defines the unit of measure used for the control and the display.
°C = degrees centigrade
°F = degrees Fahrenheit

2.3 Temperature Control

Display or set the current temperature set point:
      Press SET for 3 seconds and then the display shows the value of the current set point;
      Press ▲ or ▼ to increase or decrease the value until to reach the desired value;
      Press SET again to confirm the new value.
Temperature Control Parameters:

Para	Description	Type	Min.	Max.	Unit
St	User set point	-	r1	r2	^{o}C/ ^{o}F
r1	Minimum set point allowed	Pr	-40	r2	^{o}C/ ^{o}F
r2	Maximum set point allowed	Pr	r1	194	^{o}C/ ^{o}F
rd	Difference	Pr	1	18	^{o}C/ ^{o}F

Description of the Parameter:
St User set point
Users set the working temperature.

r1 Minimum set point allowed
Define the minimum set point (St).

r2 Maximum set point allowed
Define the maximum set point (St).

rd difference
When the temperature value is <=St, the compressor stops to work; when the temperature is >= St + rd, the compressor begins to work.

2.4 Compressor Protection

Para	Description	Type	Min.	Max.	Unit
c0	Compressor & fan start delay after power-on	PC	0	100	Min
c1	Min. time between successive compressor starts	PC	0	100	Min
c4	The compressor on time when the probe is fault	PC	0	99	Min
c5	The compressor off time when the probe is fault	PC	1	99	Min

c0 compressor & fan start delay after power-on
Represents the delay in starting the compressor and the evaporator fans from control power-on.
C1 min. time between successive compressor starts
The time between 2 consecutive starts of the compressor is at least c1 (UOM: Min).

c4 The compressor on time when the probe is fault
c5 The compressor off time when the probe is fault
c4 = 0, the compressor will be always on when the probe (RT1) error is detected;
At the moment the probe (RT1) error is detected, the compressor run the duty setting cycle starts from the current status of the compressor, and the time already elapsed is ignored.

2.5 Defrost

Para	Description	Type	Min.	Max.	Unit
d0	Defrost type	Pd	0	2	-
d1	Defrost interval	Pd	1	199	Hour
dt	End defrost temperature set point / defrost temperature threshold with temperature control	Pd	-40	199	^{o}C/ ^{o}F
dp	Defrost duration	Pd	0	199	Min
d6	Display when defrosting	Pd	0	2	-
d8	Alarm bypass time after defrost of power-on	Pd	0	199	Min
dd	Dripping time	Pd	0	15	Min

d0 defrost model
If d0 = 0, shield the function of the defrosting.
d0 = 1, defrosting cycle. The cycle of the defrosting is determined by the parameter d1.
d0 = 2, real time defrost. The clock set determines the defrosting.

d1 Defrost interval
The defrost interval starts counting from the end of the previous defrosting.

dt end defrost temperature set point / defrost temperature threshold with temperature control
During the procedure of the defrosting, if the evaporator temperature (probe 2) is higher than dt, the defrosting will not be performed.
Coming into the cycle of the defrosting, if the evaporator temperature is higher than dt, the cycle of the defrosting will not be performed.
If the defrost probe is shielded or broken, the defrost will be stopped after a maximum time equal to the value of dp.

dp defrost duration
Determine the maximum duration of the defrosting. After the period of dp, the defrosting will stop.

d6 display of controlling temperature "frozen" during the defrosting
This function is what the display shows during the defrosting.
d6= 0: The instrument displays the temperature in the cabinet and "dF" alternatively. After finishing the defrosting, the normal display will be restored.
d6= 1: If the display during the defrosting is not locked, the instrument displays the last value read before the current defrosting.
The display returns normally when the temperature in the cabinet is =< the set point (St) or after the set alarm bypass time after the defrosting.
d6= 2: If the display during the defrosting is not locked, the instrument displays "dF". The display returns normally when the temperature in the cabinet is equal to or lower than the set point (st) or for the set alarm bypass time after the defrosting (parameter 8).

d8 Alarm bypass time after defrost of power-on
When defrost, the temperature in the cabinet will become higher and the alarm of the high temperature will not occur. Indicate the time after finishing defrosting. After the period of d8, that an alarm occurs can be judged.

dd Dripping time
The parameter forces the compressor off after the defrosting in order to drip.

2.6 Alarm

Para	Description	Type	Min.	Max.	unit
AL	Low temperature alarm of probe 1	PA	-45	199	^{o}C/ ^{o}F
AH	High temperature alarm of probe 1	PA	-45	199	^{o}C/ ^{o}F
Ac	Condenser alarm set point	PA	-45	199	^{o}C/ ^{o}F
Ad	Probe 1 temperature alarm delay	PA	0	99	Min
AE	Condenser alarm delay	PA	0	99	Min

AL Low temperature alarm of probe 1
When the temperature in the cabinet (probe 1) is lower than AL and the condition meets the temperature alarm delay (see parameter Ad), an alarm will occur.

AH High temperature alarm of probe 1
When the temperature in the cabinet is higher than AH and the condition meets the temperature alarm delay (see parameter Ad), an alarm will occur.
Warnings: After the instrument is power on, the temperature in the cabinet alarm will be shielded. And after a period of d8, that an alarm occurs will be judged.

Ac condenser alarm set point
When the condenser temperature (probe 3) is higher than the set point and the condition meets the alarm delay (see parameter Ad), an alarm will occur.

Ad Low & High temperature alarm delay

When the temperature is higher than AH (or lower than AL), an alarm will occur after the period of AE instead of occurring at once. During the delay time, alarm condition will be eliminated, an alarm delay will be cancelled and the calculator will become 0.
If set Ad=0, an alarm will occur at once.

AE condenser alarm delay
When the temperature is higher than AC, an alarm will occur after the period of AE instead of occurring at once. During the delay time, alarm condition will be eliminated, alarm delay will be cancelled and the calculator will become 0.
If set AE=0, and the temperature is higher than AC, an alarm will occur at once.

2.7 Evaporator Fan Management

Para	Description	Type	Min.	Max.	Unit
F0	Enable evaporator fan control	PF	0	2	-
F1	Evaporator fan controls set point	PF	-40	199	$^{o}C/^{o}F$
F3	Evaporator fan status during defrost	PF	0	1	-
F4	Evaporator fan delay after dripping	PF	0	99	Min
Fd	Evaporator fan controls the temperature difference	PF	1	18	$^{o}C/^{o}F$

In normal operation, the evaporator fans can be managed in the following models:
    1 always on
    2 on only when the compressor is operating
    3 on according to the temperature of the evaporator
During the defrosting model, the status of the evaporator fan is determined by parameter F3:
    on (F3=0)
    off (F3=1)
The fans are always off:
    1 during the dripping period (dd ≠0)
    2 when the instrument is power on c0（c0 ≠0）
Description of the parameters:
F0 enable evaporator fan control
F0 = 0: The fans are always on.
F0 = 1: The fans and the compressor are controlled synchronously.
F0 = 2: The evaporator temperature controls the fans.
In normal situation, fans can be operated according to the set model above not including the defrosting, the drainage and the power-on instrument.

F1 Evaporator fan controls set point
Evaporator fans control the set point.（F0=2）
When the evaporator temperature is <=F1, fans are on.
When the evaporator temperature is >=F1+Fd, fans are off.

F3 Evaporator fan status during defrost
F3=0: During the defrosting, the fans are on.
F3=1: During the defrosting, the fans are off.

F4 Evaporator fan delay after dripping
After dripping, it needs 4-time delay to start the fans.

Fd Evaporator fan controls the temperature difference
The fans control the temperature difference (see parameter F1).

2.8 Real Time Defrost and On & OFF controller

Para	Description	Type	Min.	Max.	Unit
t1	Defrosting time 1	Pt	00:00	24:00	HH:MM
t2	Defrosting time 2	Pt	00:00	24:00	HH:MM
t3	Defrosting time 3	Pt	00:00	24:00	HH:MM
t4	Defrosting time 4	Pt	00:00	24:00	HH:MM
t5	Defrosting time 5	Pt	00:00	24:00	HH:MM
t6	Defrosting time 6	Pt	00:00	24:00	HH:MM
O1	ON status time 1	Pt	00:00	24:00	HH:MM
F1	OFF status time 1	Pt	00:00	24:00	HH:MM
O2	ON status time 2	Pt	00:00	24:00	HH:MM
F2	OFF status time 2	Pt	00:00	24:00	HH:MM
O3	ON status time 3	Pt	00:00	24:00	HH:MM
F3	OFF status time 3	Pt	00:00	24:00	HH:MM
O4	ON status time 4	Pt	00:00	24:00	HH:MM
F4	OFF status time 4	Pt	00:00	24:00	HH:MM

t1~t6 defrosting time
When set t1~t6, you can switch the setting from "hour" to "minute", such as FIG 2.
If the clock runs to the setting hour and the parameter d1=0, the instrument begins to defrost.
If the value is 24:00, display "- -", means this time is disabled.

O1, F1 ON/OFF time 1
O2, F2 ON/OFF time 2
O3, F3 ON/OFF time 3
O4, F4 ON/OFF time 4
Ox ON status start time, Fx OFF status start time.
If the value is 24:00, display "- -", means this time is disabled.
Note: if the value of Fx less than Ox, means the Fx time as next day.
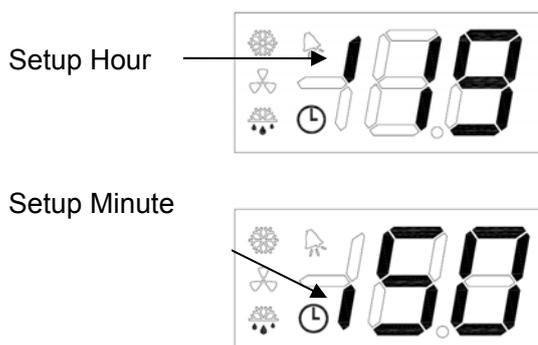
Setup Hour

Setup Minute

FIG 2

2.9 Clock and Time Band Parameters

When the controller is in the normal model, press ▲ together with ▼ for 3 seconds in order to enter into the clock view / setting model (see FIG 3), and then the indicator ⏱ is light and the display shows the current time (hour, 24-hour system). And press SET to switch to the minute display. Then you can press SET to exit the time display.

If the time is needed to set and when it is checked, please press ▲ or ▼ to adjust the time to become the correct time and then press SET to confirm.
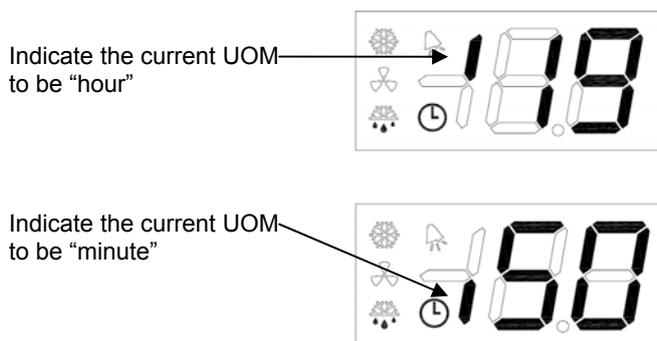
Indicate the current UOM to be "hour"

Indicate the current UOM to be "minute"

FIG 3

2.10 Other Parameters

Para	Description	Type	Min.	Max.	Unit
H0	Modbus address	PH	1	99	
H2	Not defined	PH	00	01	-
H3	Software version number	PH	-	-	-
H4	Parameter values are derived to the quick editor	PH	-	-	-

H0 Modbus address
        The address of Modbus is for communication.
H2 Not defined
H3 Software version number
        Software version number can be viewed by this parameter. It cannot be set and it is onboard data of the system.
H4 Parameter values are derived to the quick editor
        This function is reserved.

2.11 Alarm Code

Alarm code	Description
E0	Probe 1 fault (control)
E1	Probe 2 fault (evaporator)
E2	Probe 3 fault (condenser)
Lo	Low temperature alarm in the cabinet (probe 1)
Hi	High temperature alarm in the cabinet (probe 1)
CH	Condenser (probe 3) temperature alarm

When the controller displays alarm code above, check the relevant equipment or accessories, or check whether the controller parameter set is appropriate according to the relevant code.

2.12 Procedure for Setting the Default Parameter

To set the default parameter:
        1 Press SET and ▼ at the same time, the display shows the current default class;

2 Continue hold the buttons for more than 5 seconds, the value is flashed, then releases the buttons;

3 Press ▲ or ▼ to change the value(00, 01, 0F, 1F)until to the desired value;

4 Press SET for more than 3 seconds confirm the new value, and exit to normal operation. All the default value of parameter will be loaded automatically.

2.13 Parameter List

Para	Description	Type	Min.	Max.	Unit	Default class			
						00	01	0F	1F
/0	Probe measurement stability	P/	1	15	-	4	4	4	4
/1	Probe 1 offset	P/	-5	5	°C/ °F	0	0	0	0
/2	Probe 2 offset	P/	-5	--	°C/ °F	0	0	0	0
/3	Probe 3 offset	P/	-5	--	°C/ °F	0	0	0	0
/5	Select °C/°F	P/	°C	°F	--	°C	°C	°F	°F
St	User set point	-	r1	r2	°C/ °F	-24	-3	-11	27
r1	Minimum set point allowed	Pr	-40	r2	°C/ °F	-30	-10	-22	14
r2	Maximum set point allowed	Pr	r1	194	°C/ °F	-15	10	5	50
rd	Difference	Pr	1	18	°C/ °F	3	3	5	5
c0	Compressor & fan start delay after power-on	PC	0	100	Min	0	0	0	0
c1	Min. time between successive compressor starts	PC	0	100	Min	3	3	3	3
c4	The compressor on time when the probe is fault	PC	0	99	Min	30	30	30	30
c5	The compressor off time when the probe is fault	PC	1	99	Min	20	20	20	20
d0	Defrost type	Pd	0	2	-	2	2	2	2
d1	Defrost interval	Pd	1	199	Hour	8	8	8	8
dt	End defrost temperature set point / defrost temperature threshold with temperature control	Pd	-40	199	°C/ °F	8	8	46	46
dp	Defrost duration	Pd	0	199	Min	30	30	30	30
d6	Display when defrosting	Pd	0	2	-	2	2	2	2
d8	Alarm bypass time after defrost of power-on	Pd	0	199	Min	30	30	30	30
dd	Dripping time	Pd	0	15	Min	5	5	5	5
AL	Low temperature alarm of probe 1	PA	-45	199	°C/ °F	-35	-8	-31	18
AH	High temperature alarm of probe 1	PA	-45	199	°C/ °F	-7	5	19	41

Ac	Condenser alarm set point	PA	-45	199	°C/ °F	55	55	131	131
Ad	Probe 1 temperature alarm delay	PA	0	99	Min	10	10	10	10
AE	Condenser alarm delay	PA	0	99	Min	10	10	10	10
F0	Enable evaporator fan control	PF	0	2	-	0	0	0	0
F1	Evaporator fan controls set point	PF	-40	199	°C/ °F	5	5	41	41
F3	Evaporator fan status during defrost	PF	0	1	-	0	0	0	0
F4	Evaporator fan delay after dripping	PF	0	99	Min	0	0	0	0
Fd	Evaporator fan controls the temperature difference	PF	1	18	°C/ °F	2	2	3	3
t1	Defrosting time 1	Pt	00:00	24:00	HH:MM	08:00	08:00	08:00	08:00
t2	Defrosting time 2	Pt	00:00	24:00	HH:MM	16:00	16:00	16:00	16:00
t3	Defrosting time 3	Pt	00:00	24:00	HH:MM	00:00	00:00	00:00	00:00
t4	Defrosting time 4	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
t5	Defrosting time 5	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
t6	Defrosting time 6	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
O1	ON status time 1	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
F1	OFF status time 1	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
O2	ON status time 2	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
F2	OFF status time 2	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
O3	ON status time 3	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
F3	OFF status time 3	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
O4	ON status time 4	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
F4	OFF status time 4	Pt	00:00	24:00	HH:MM	--:--	--:--	--:--	--:--
H0	Modbus address	PH	1	99	-	Not changed			
H2	Not defined	PH	00	01	-	Not changed			
H3	Software version number	PH	-	-	-	-	-	-	-
H4	Parameter values are derived to the quick editor	PH	-	-	-	-	-	-	-

2.14 Communication

The controller used RS-485 bus interface, Modbus RTU type.
Communication set up: baud rate 9600bps, 1 stop bit, no parity, non-zero.
Registers define reference document <C207-14 Modbus registers definition >.

3 Wiring Diagram

Wiring diagram is FIG 4.
Warnings:

1 Before use, please first confirm whether the power supply and the voltage can meet power supply's need of controllers. Or the instrument can't run normally, and even it is burned to destroy.

2 If the instrument doesn't be used for a long time, please confirm whether its clock is accurate before it is used again.
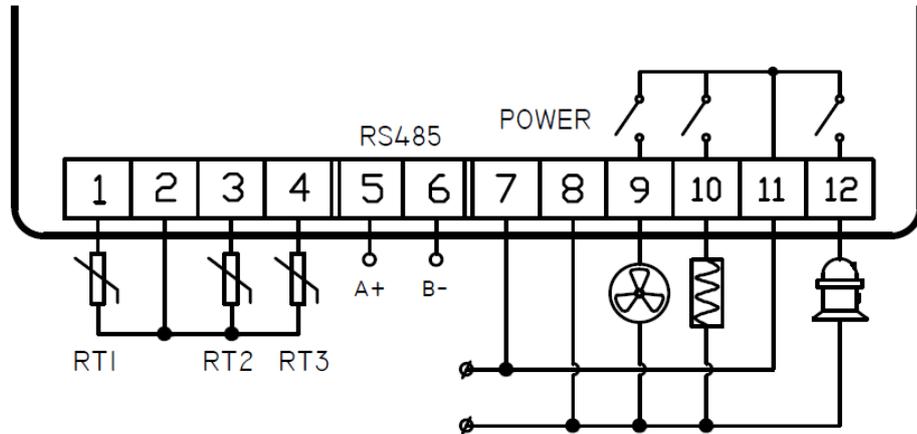
3 Connection terminal screw torque: 5Kg-cm.

FIG 4