



**AC&R Controller RWR470.10
Basic Documentation VR2002 for water to water
heat pump units**

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1 Summary

1.1 Key Features

Its main features are as follows:

- Non-programmable stand-alone controller, or networked via the communication of PCLBUS
- Strict user privilege control
- Multiple applications can be configured by setting parameters
- Control of inlet/outlet water/water temperature
- Fast application (with parameters) uploading and downloading via PolyStick
- Complete alarm and warning management
- User-friendly icon HMI, LCD display and light blue backlight

1.2 Important Notes



This symbol draws your attention to special safety notes and warnings. If such notes are not observed, personal injury and / or considerable damage to property can occur.

Field of Use

RWR470.10 controller may only be used for the control and supervision of heating, ventilation, air conditioning and chiller plant.

Electrical Installation

Prerequisites for flawless and safe operation of RWR470.10 controller are proper transport, installation, commissioning, and correct operation.

Fuses, switches, wiring and earthing must be in compliance with local safety regulations for electrical installations.

Commissioning

Preparation for use of commission of RWR470.10 controller must be undertaken by qualified staff who have been appropriately trained by Siemens Building Technologies.

Operation

RWR470.10 controller may only be operated by staffs who have been instructed by Siemens Building Technologies or their delegates and whose attention has been drawn to potential risks.

Wiring

When wiring the system, the AC 240V section must be strictly segregated from the AC 24V safety extra low-voltage (SELV) section in order to ensure protection against electric shock hazard!!

Storage and Transport

For storage and transport, the limit values given in the relevant Datasheet must be always be observed.

Maintenance

System sections accommodated in the control panel should be freed from dust and dirt whenever normal service visits are due.

Faults

Should system faults occur and you are not authorized to make diagnostics and to rectify faults, call your service staff of Siemens Building Technologies.



Only authorized staffs are permitted to make diagnostics, to rectify faults and to restart the plant. This also applies to work carried out within the control panel (e.g. safety checks or changing fuses).

Disposal

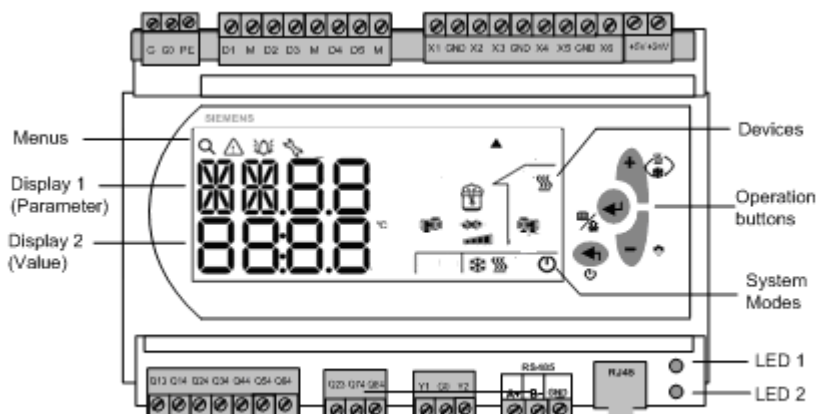
The products contain electrical and electronic components and may not be disposed of as household waste.

Local and currently legislation must be complied with!

2 Operation

2.1 LCD Display

Operation of RWR470.10 is fully driven by buttons and menus.



Operating buttons

Button	Name	Use
	<Esc>	In Menu /parameter setting mode, press it to return to the previous menu level, or cancel the parameter change .
	<Enter>	Press down it for more than 2 seconds and release it to enter the Menu mode In Menu/parameter setting mode, press it to confirm the selected menu level, or the parameter change . Press it to acknowledge/reset warnings and alarms
	<Plus>	Press it for 2 seconds to activate the System Mode in stop mode Or, press it to scroll the menu level, or to increase the value of selected parameter in Menu/parameter setting mode
	<Minus>	Press it to scroll the menu level, or to decrease the value of selected parameter in Menu/parameter setting mode

Legend for menus

Icon	Meaning	Function
	Query/view	Actual values of all temperature
	Warning	Existence of warning, and the latest 10 warnings
	Alarm	Existence of alarm and the latest 20 alarms
	Parameters	Set parameters and values (refer to chapter 2.2 Menu Tree)

Note

As for how to access the Query/Warning/Alarm/Parameter menus above, refer to <Chapter 4.2 Accessing the Menus>

Notes








Parameters listed under the menu vary with the password privileged user.

Before accessing the Parameter menu, select the user group (“**NO**” “**EU**” or “**ID**”) first and input the corresponding password that is required for the service men and factory users.

See also <Chapter 6.2 Accessing the Parameter Menu>

Legend for system Mode and status

On the right lower side, seven icons are used to indicate system modes and status.





Icon	Meaning	Icon	Meaning
	Power on/Off		Hot water(The icon is displayed in house)
	Cooling		compressor
	Heating		Communication
	House (All devices within this icon are called indoor devices.)		

Notes



When the device is activated, the corresponding icon will be lit.

Legend for devices

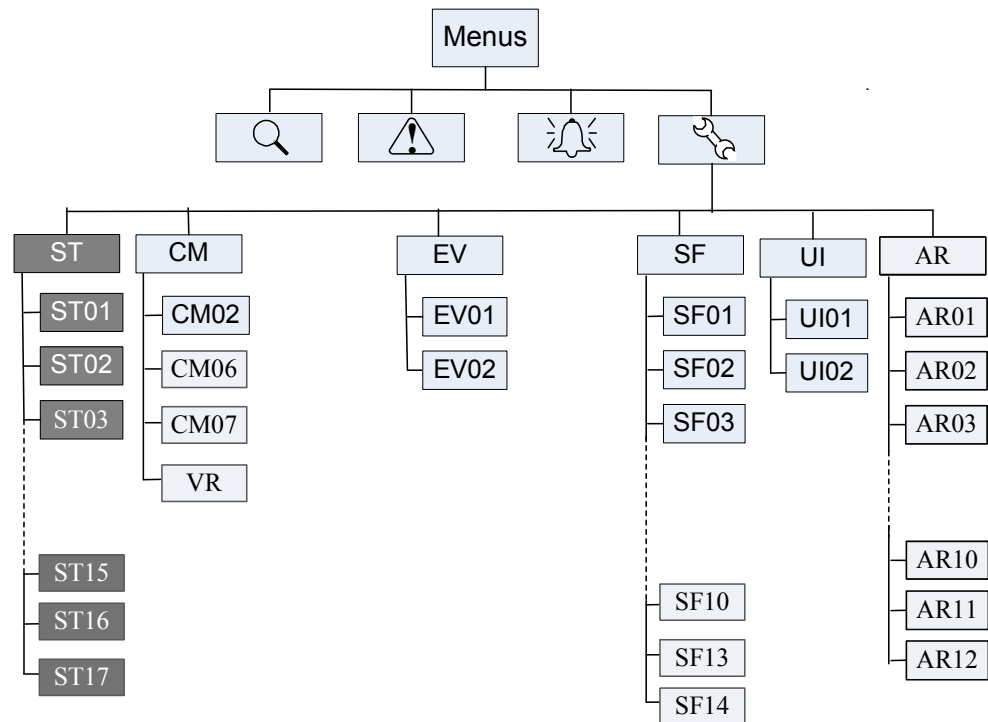
On the right middle area, the icons are used to indicate the work status of the devices.

Icon	Meaning	Status and Indication
	Compressor	On solid: Running Blinking : Alarms related to compressor
	Flow switch	Blinking: flow switch alarm
	Indoor pump	On solid: running Blinking: alarms detected
	Outdoor pump	

Notes

For any warning/alarm detected, the corresponding device icon and the  /  icon will blink continuously until the alarm is acknowledged or reset.

2.2 Menu Tree



Note

By default, end users can access parameters ST01 to ST10 in ST group.

Legend for parameter groups

Code	Indication	Code	Indication
CM	Compressor settings	ST	Setpoints
EV	Evaporator settings	UI	User interface
SF	Special functions	AR	Alarm settings

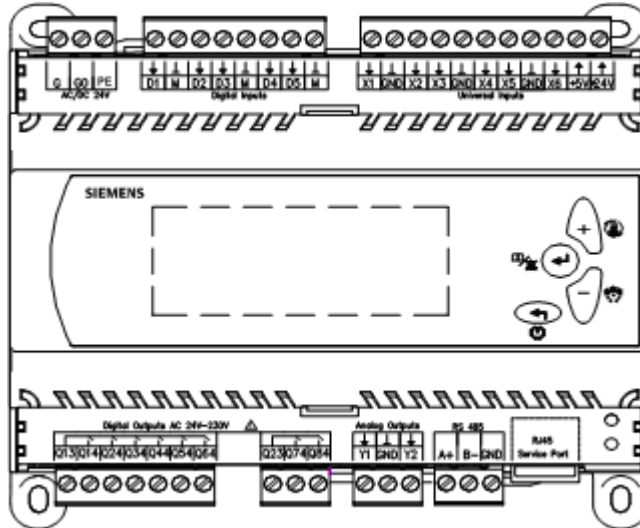
2.3 Access Rights

Three groups of users with different privilege levels are described below.

Privilege Level	User	Main Activities Special	All
ID	Factory User	<ul style="list-style-type: none"> • Password required • Configure and commission applications by setting/adjusting parameter values 	<ul style="list-style-type: none"> • View information and status • Acknowledge warnings and alarms • Heating /Cooling changeover
EU	Service Men	<ul style="list-style-type: none"> • Password required • Configure and commission applications by setting/adjusting parameter values 	
NO	End User	<ul style="list-style-type: none"> • No password is required • Adjust limited values of parameters (by default , can only adjust values of parameters in the "ST" group) 	

3 Wiring Examples

3.1 Connection Terminals

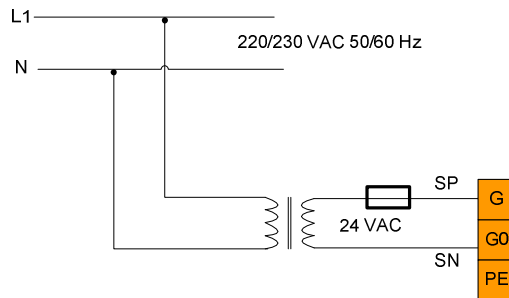


Brief descriptions of the inputs and the outputs are summarized as follows.

	<i>Terminal Assignments</i>		<i>Terminal Assignments</i>
G	Power supply AC/DC 24 V	Q13	Supply 1 (AC 24 V ...230 V)
G0	Power supply ground	Q14	Compressor1
PE	Safety ground	Q24	Compressor2
		Q34	Indoor water pump
X1	Inlet water temperature of indoor side	Q44	Outdoor water pump
X2	Outlet water temperature of indoor side	Q54	4-way valve
X3	Outdoor ambient temperature	Q64	Electric heater or boiler
X4	Hot water temperature		
X5	Outlet water temperature of outdoor side	Q23	Supply 2 (AC 24 V ...230 V)
X6	Exhaust gas temperature/return gas temperature	Q74	Hot water pump or revert valve
GND	Common reference point for analog input	Q84	Alarm
+5 V	DC 5 V power output for active sensor	Y1	Analog output 2, 0...10 V
+24 V	DC 24 V power output for active sensor	GND	Common reference point
		Y2	Analog output 2, 0...10 V
D1	Water flow switch		
D2	Low pressure switch	A+	A+ connector for RS485
D3	high pressure switch	B-	B- connector for RS485
D4	Air conditioner switch	GND	Optional for RS485 communication
D5	Hot water switch	RJ45	Service interface for parameters uploading and downloading
M	Common reference point for digital input		

3.2 Wiring with Power Supply

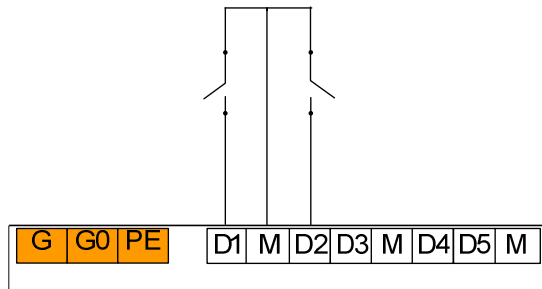
RWR470.10 is supplied with 24 VAC \pm 20 % or 24 VDC \pm 10 % via plug-in terminals G and G0



3.3 Wiring with Digital Inputs

RWR470.10 offers five digital inputs for connecting safety devices, alarms, device status, and remote switches. These digital inputs are voltage free.

The following figure represents an example of wiring the digital input

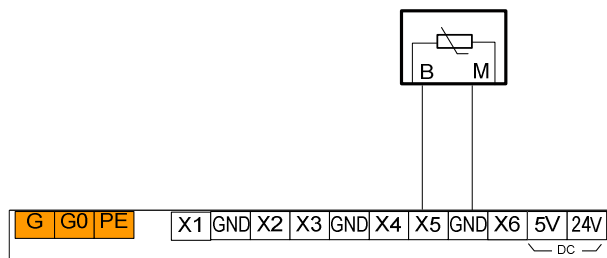


Digital Inputs

3.4 Wiring with Passive Temperature Sensors

Before wiring with passive sensor, pay attention to the following:

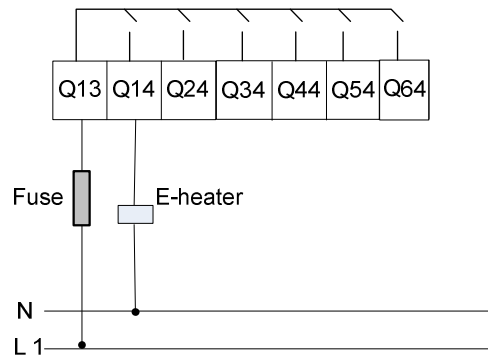
- Terminals X1...X6 can be wired with NTC 10K sensor.



QAZ36.526/109, NTC 10 k Ω
temperature sensor

3.5 Wiring with Digital Outputs

The following is a wiring example with relay output.



E-heater with 220/230 VAC supply voltage

4 General Device Settings

4.1 Modes of Operation

The current RWR470.10 controller consists of three kinds of operation modes:

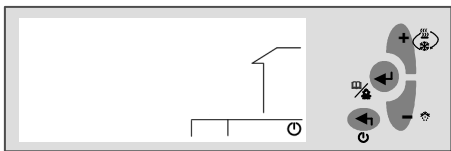




	<i>Mode</i>	<i>Function</i>
1	Normal working mode	Display all running devices and measured values
2	Menu mode*	View configured analog inputs, warning and alarm logs Set/adjust parameter values and also user privilege to parameters
3	Stop mode**	Normally shut-down status (all components stop running.)

*To enter menu mode, see also <Chapter 4.2. Accessing the Menus>.

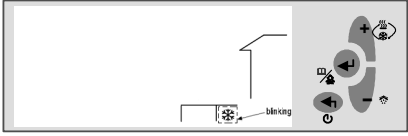
Notes

- In normal working mode, the back light will be timed out after 30seconds without any operation.

4.2 Accessing the Menus


<i>Display</i>	<i>Procedures</i>
	<p>In Stop mode, press the <Enter> button for 2 seconds and release it to enter the Menu mode.</p> <p>By default, the Query  icon is blinking, waiting for further instructions.</p>
<p>To view the latest 10 warnings generated:</p> <ul style="list-style-type: none"> • Navigate to the  menu by pressing <Plus> or <Minus>, and then press <Enter> to confirm and proceed. 	
<p>To view the latest 20 alarms generated:</p> <ul style="list-style-type: none"> • Navigate to the  menu by pressing <Plus> or <Minus>, and then press <Enter> to confirm and proceed. 	
<p>To set parameter values:</p> <ul style="list-style-type: none"> • Navigate to the  menu by pressing <Plus> or <Minus>, and then press <Enter> to confirm and proceed. Contents under this menu may vary with the privilege right of the user. <ul style="list-style-type: none"> – For end users, select “NO,” and press <Enter > to proceed. – For service men and factory users, select “EU” or “ID” and press <Enter> to input the password. 	

4.3 Selection of System Modes

Display	Procedures
	<p>In stop mode, press the <Plus> button for 2 seconds, and release it to activate the selection of system mode. The current system mode will start flashing.</p> <p>Press <Plus> or <Minus> to select the desired system mode, and then press <Enter > to confirm.</p>

The selection sequence of system modes varies with the <Plus> or <Minus> button you selected based on the current system mode (SF01). The corresponding icon(s) for system mode will blink once selected.

If the current system is heating & cooling(when SF01=1) , the full sequence of selecting the system modes will be as follows.

Activity	Sequence
Press <Plus>	    

Hot water mode can not be set on controller.

Start the unit :

Power on the controller, It will be on stop mode at first.

If SF13=0, SF14=0, unit on/off is controlled by A/C swith (D4) and hot water switch (D5).

Close D4 , controller will run on heating or cooling mode

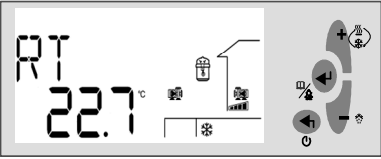
Close D5 ,controller will run on hot water mode

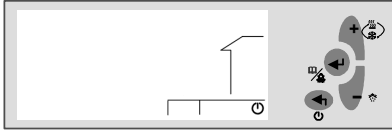

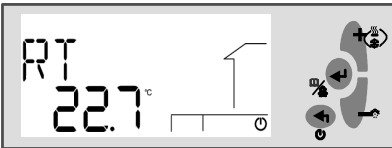
Close both D4 and D5, it will run on A/C and hot water mode but hot water mode is preferential.

Cut off D4 and D5, controller will be in stop mode.

If ST13=1,SF14=1, unit ON/OFF is remote control.

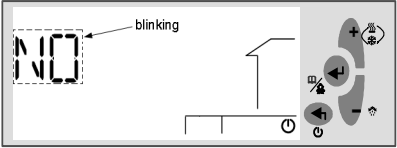



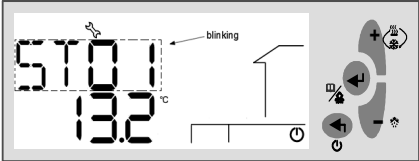
4.4 Viewing temperature

Display	Procedures
	<p>In normal working mode, press <plus> or <minus>to read the temperature.</p>

Display	Procedures
	<p>In stop mode, press the <Enter> button for 2 seconds and release it to enter the Menu mode.</p> <p>By default, the Query  icon is blinking, waiting for further instructions.</p>
	<p>Press the <Enter> button to enter the query mode.</p> <p>press <plus> or <minus>to read the temperature.</p>

Code	Describe
RT	Inlet water temperature of indoor side
ST	Outlet water temperature of indoor side
OT	Atmospheric temperature of outdoor
HT	Hot water temperature
STo	Outlet water temperature of outdoor side
ET	Exhaust gas temperature for heating only units/return gas temperature for heating&cooling units

4.5 Changing Setpoints (for end users)

Display	Procedures
In stop mode, press <Enter> for 2 seconds and release it to activate the Menu mode.	
	When the  icon is blinking, press <Plus> or <Minus> to navigate to the  menu, and then press <Enter> to proceed.
Contents under the  Parameter Menu may vary with the privilege right of the user. <ul style="list-style-type: none"> • For end users, select “NO,” and press <Enter > to proceed. • For service men and factory users, select “EU” or “ID”, and press <Enter> to input the 4-digit password . 	
	For end users, parameters in the “ST” group will by default be displayed. Press <Plus> and <Minus> to navigate to the parameter and press<Enter> to continue.
Or, continuously press <Esc> to exit out of the current level and back to the desired menu level.	

5 Fast Configuration via PolyStick



Only trained staff can perform fast configuration via PolyStick.

5.1 Downloading Application and Parameters from PolyStick

To download application and parameters from PolyStick to the controller, follow steps below:

- Power off the controller
- Plug PolyStick into RJ45 service interface
- Re-apply power to the controller




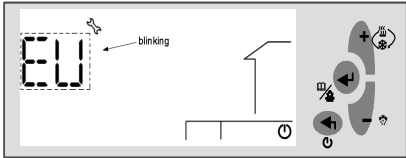
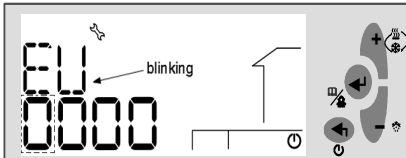
- Wait while the green LED is continuously blinking, indicating the data communication process
- Once finished, the controller will be set in Stop mode, and the green LED at the right bottom fixed
- Un-plug the PolyStick

Note: On the downloading process ,do not move any of the components and power can not be cut off. If transmitting process is interrupted, controller will be in trouble.

6 Customizing Application by Adjusting Parameter Values

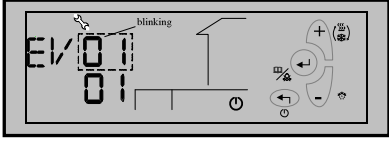
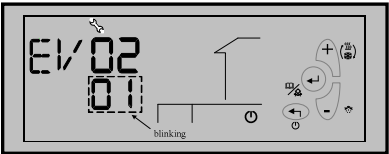
6.1 Accessing the Parameter Menu

Notes

Display	Procedures
In Stop mode, press <Enter> for 2 seconds and release it to activate the Menu mode.	
When the  icon is blinking, press <Plus> or <Minus> to navigate to the  menu, and then press <Enter> to proceed.	
Contents under the  menu may vary with the privilege right of the user. <ul style="list-style-type: none"> • For end users, select “NO” and press <Enter > to proceed. • For service men and factory users, select “EU” or “ID” and press <Enter>. Input the 4-digit password when the following screen is displayed 	
	Press <Enter> to confirm and continue to input the password.
	Password is required for the service man and factory users.
Input Password To input password, follow the instructions below: <ul style="list-style-type: none"> • When the digit is blinking, press <Plus>/<Minus> to select the value. Then, press <Enter> to confirm, and proceed to the next digit. • Or, press <Esc> at any time to cancel the input and return to the previous blinking digit. • Repeat steps above to input other three numbers. • After inputting the password, press <Enter> to confirm, and proceed to setting parameter values. • The EU and ID password refer to 10.5 user interface. 	

6.2 Adjusting Parameter Values


Procedures

<i>Display</i>	<i>Procedures</i>
<p>After inputting password and enter into the parameter setting mode, the “ST” parameter group will by default be displayed.</p>	
	<p>Press <Plus> or <Minus> to select the parameter code, and press <Enter> to confirm.</p>
	<p>The default value of the parameter will start flashing, allowing you to make a change.</p> <p>Press <Plus> or <Minus> to increase or decrease the value, and press <Enter> to confirm.</p>


Notes

Continuously press <Esc> to exit out of the current level and back to the desired menu level.

7 Warning Management

When a warning is detected, the corresponding warning code will be displayed on the LCD. The warning icon  will flash simultaneously.

Notes

Only the latest 10 warnings will be stored under the  menu.

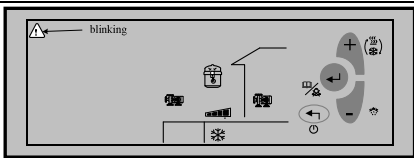



Upon power failure of the controller, the warning logs will be erased and recounted

7.1 Codes for Warnings

Two types of warnings are used to monitor the system.

Codes	Meaning
WN01	See <Chapter 9.7.1 Anti-freeze protection at stop mode>
002	See <Chapter 9.7.1 Anti-freeze protection at stop mode>


7.2 Viewing Warning Logs

Display	Procedures
Press down <Enter> for 2 seconds and release it to activate the Menu mode.	
	When the  icon is flashing, press <Plus>/<Minus> to navigate to the  menu, and then press <Enter> to confirm.
	Two letters "WN" will be displayed on the LCD, continuously flashing. Press <Enter> again to view the last 10 warning codes generated, if any. If no warning is generated, the word "NoNE" will be displayed.
Continuously press <Exit> to exit out of the current level, and back to the normal running mode.	


8 Alarm Management

Alarms in 470.10 are divided into two groups: auto reset alarms and manual reset alarms.

- For an auto reset alarm, users are not required to acknowledge and reset it. The corresponding device will be automatically restarted once the alarm status disappears.
- Once a manual reset alarm is detected, the system will be stopped. Users need acknowledge and reset it, and also manually restart the corresponding device after the fault status is cleared.

When an alarm is detected, the corresponding device icon (if any) and the  icon will continuously flash. An alarm code will be displayed on the screen.

Notes

- If more than one alarm is detected, the alarm codes will be displayed successively on the LCD screen until the alarm status disappears, or until they are manually acknowledged or reset (only for manual reset alarms).
- The latest 20 normal alarms and manual reset alarms generated in total are separately stored under the auto reset alarm (AR) and manual reset alarm (MR) categories in the  menu.

8.1 Auto Reset Alarms

The following are codes for auto reset alarms with their meanings.

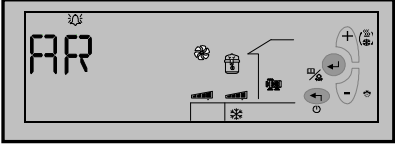

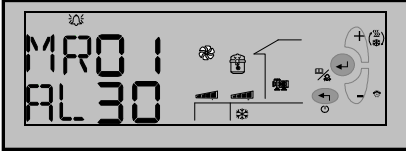
<i>Codes</i>	<i>Meaning</i>
AL01	Compressor low pressure (D2)
AL02	Compressor high pressure (D3)
AL03	Low indoor side outlet water temperature protection (when $ST \leq AR01$ in any mode)
AL04	Low outdoor side outlet water temperature protection (when $ST_o \leq AR11$ in heating mode)
AL05	Indoor side outlet water temperature is over the highest limit in heating mode(when $ST \geq AR03$)

8.2 Manual Reset Alarms

The following are codes for manual reset alarms with their meanings.

<i>Codes</i>	<i>Meaning</i>
AL11	RT sensor trouble (over 120 °C or lower than -35 °C) (X1)
AL12	ST sensor trouble (over 120 °C or lower than -35 °C) (X2)
AL13	OT sensor trouble (over 120 °C or lower than -35 °C) (X3)
AL14	HT sensor trouble (over 120 °C or lower than -35 °C) (X4)
AL15	ST _o sensor trouble (over 120 °C or lower than -35 °C) (X5)
AL16	ET sensor trouble (over 120 °C or lower than -35 °C) (X6)
AL17	Flow switch alarm after the delay (AR05)
AL18	Alarm number of compressor low pressure within 24 hours is over the limit(AR06)
AL19	Alarm number of compressor high pressure within 24 hours is over the limit(AR07)
AL20	Low evaporating temperature protection (AR08)
AL21	High exhaust gas temperature protection (over AR10)

8.3 Viewing Alarm Logs

Display	Procedures
	Press down <Enter> for 2 seconds, and release it to activate the Menu mode.
	<p>Press <Plus> or <Minus> to navigate to the  menu, and then press <Enter> to confirm.</p> <p>By default, auto reset alarm "AR" will be displayed on the LCD, flashing.</p>
	To view auto reset alarms generated, press <Enter> to continue when "AR" is displayed.
	<p>To view manual reset alarms, press<Minus> or <Plus> to navigate to the "MR" group, and then press <Enter> to continue.</p> <p>By default, the first manual reset alarm "MR01" will be displayed as follows. Press <Enter> to view the first manual reset alarm code.</p> <p>Or, press<Minus> or <Plus> to view other numbered alarms, and press<Enter> to view the specific code.</p>
	If no alarm is generated, the word "NoNE" will be displayed.
	Continuously press <Exit> to exit out of the current level, and back to the normal running mode.


Note

MR01 and AR01 are respectively the latest information of manual reset alarm and auto reset alarm.

8.4 Acknowledging and Resetting Manual Reset Alarms

Any alarm detected by the system, either an auto reset alarm or a manual reset alarm, will be displayed on the LCD. However, only manual reset alarms require user's acknowledgement and reset.

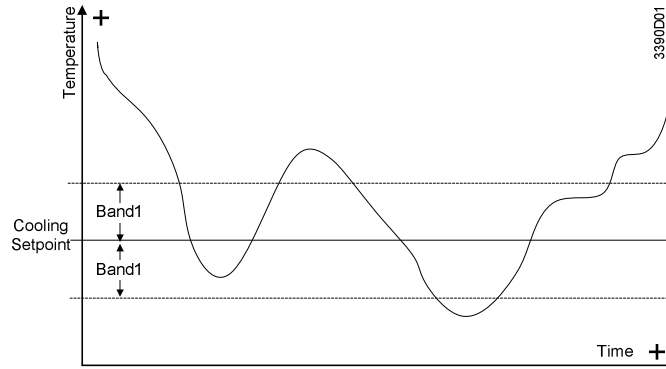
To do this, follow the steps below:

- Press <Enter> to acknowledge the alarm.
- If the alarm status is cleared, the corresponding device icon and alarm icon  that are flashing will accordingly disappear.
- Restart the system, as appropriate.

9 Main Control Logic

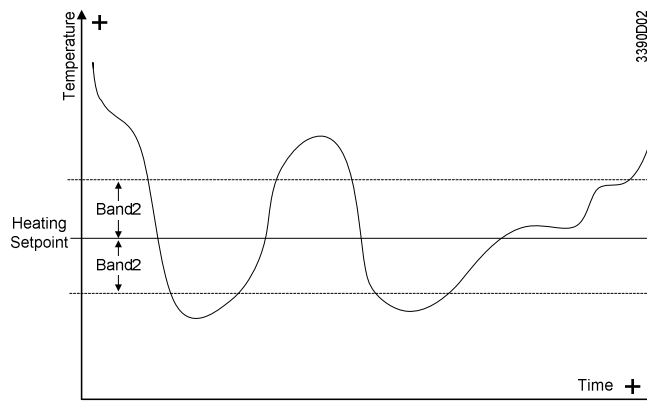
9.1 Compressor Capacity Control

For the compressor with stages, it will be started with full capacity when the system on.



In cooling mode:

- When the actual inlet/outlet temperature (inlet or outlet water temperature control depends on EV02 setting) is higher than the cooling setpoint (ST01) + temperature differential (ST03), the compressor capacity will be gradually increased by stages every a preset time (ST17).
- When the actual inlet/outlet temperature is lower than the cooling setpoint (ST01) - temperature differential (ST03), the compressor capacity will be gradually decreased by stages every a preset time (ST17).



In heating mode:

- When the actual inlet/outlet water temperature RT or ST is lower than the heating set point (ST02) – temperature differential (ST04), the compressor capacity will be gradually increased by stages every a preset time (ST17).
- When the actual inlet/outlet water temperature RT or ST is higher than the heating set point (ST02) + temperature differential (ST04), the compressor capacity will be gradually decreased by stages every a preset time (ST17).

In hot water mode:

- When the hot water temperature HT is lower than the Hot water set point (ST09) - (ST10), the compressor capacity will be gradually increased by stages every a preset time (ST17).
- When the actual hot water temperature HT is higher than the heating set point (ST09) , the compressor capacity will be gradually decreased by stages every a preset time (ST17).

9.2 Temperature compensation at HEAT

- The controller offers two type of temperature control mode at heat mode.
- When SF04=0, the set-temperature at heat will be controlled by ST02;
- When SF04=1, the set-temperature at heat will be controlled by ambient-temperature (OT) ,ST05 and ST06 according to the following formula:
Set-temperature at HEAT =ST05+ST06/10X (ST05-OT)
- The calculated temperature can be used for the control reference, but the maximum data will not exceed ST14

9.3 Electric heater

- At heating mode, ELECTRIC HEATER or boiler (Q64) works as follows:
- When $OT < ST07$, ELECTRIC HEATER will run as a energy stage by the requirement of temperature, but ELECTRIC HEATER will be the last to get into running, the first to quit from working.
- When $OT > ST07+ST08$, ELECTRIC HEATER function will be cancelled.

9.4 3 way valve/ daily hot water pump/indoor side water pump/4 way valve control

9.4.1 3 way valve /daily hot water pump control

Q74 could be connected to a 3 way valve or a daily hot water pump.

- If Q74 is connected to a 3 way valve, set SF10=0, Both the indoor side water pump and 3 way valve will be turned on when running the daily hot water mode.
- If Q74 is connected to a daily hot water pump, set SF10=1, Q74 will control the daily hot water pump. The indoor side water pump is OFF and the daily hot water pump will be ON when running daily hot water mode.

9.4.2 Indoor side water pump control

- EV01=0,indoor side water pump continues to run on working mode until it is on stop mode .
- EV01=1, indoor side water pump starts if compressor starting condition is met. It is off 10s delay after compressor stops .

9.4.3 4 way valve control

- SF01=1, 4 way valve run as following:
- CM07=0, 4 way valve off at heating or hot water mode, 4 way valve on at cooling mode
- CM07=1, 4 way valve on at heating or hot water mode, 4 way valve off at cooling mode.

9.5 Alarm (Q84)

The alarm (Q84) will be on when any alarm happen and will be off if the alarm is acknowledged.

9.6 Control process

9.6.1 TURN ON process at HEATING mode

When operate TURN ON at heat mode, the controller will work as the following process:

- 9.6.1.1 Start the indoor side water pump, 4 way valve (if CM07=1);
- 9.6.1.2 With 10s delay, start the outdoor side water pump;
- 9.6.1.3 With 10s delay, and if the water flow switch close and compressor Min. OFF time CM02 condition is met, start one compressor.
- 9.6.1.4 With 10s delay, and if CM02 condition of another compressor is met, start the other compressor if it is two compressors unit.

9.6.2 TURN OFF process at HEATING mode

When operate TURN OFF at heating mode, the controller will work as the following process:

- 9.6.2.1 if compressor Min. On time is over 10s, turn off one compressor;
- 9.6.2.2 With 10s delay, turn off another compressor if it is two compressors unit
- 9.6.2.3 With 10s delay, close outdoor side water pump;
- 9.6.2.4 With 10s delay, close indoor side water pump, 4 way valve.

9.6.3 TURN ON process at HOT WATER MODE

When operate TURN ON at hot water mode, the controller will work as the following process:

- 9.6.3.1 Start daily hot water pump (SF10=1) or start three way valve and indoor side water pump (SF10=0), 4 way valve (CM07=1)
- 9.6.3.2 With 10s delay, start outdoor side water pump;
- 9.6.3.3 With 10s delay, and if the water flow switch closes, and CM02 condition is met, start one compressor.
- 9.6.3.4 With 10s delay, if CM02 condition is met, start another compressor if it is two compressors unit.

9.6.4 TURN OFF process at HOT WATER MODE

When operate TURN OFF at hot water mode, the controller will work as the following process:

- 9.6.4.1 If compressor Min. on time is over 10s, close one compressor;
- 9.6.4.2 With 10s delay, if another compressor Min. on time is over 10s, close another compressor if it is two compressors unit;
- 9.6.4.3 With 10s delay, close outdoor side water pump;
- 9.6.4.4 With 10s delay, close daily hot water pump (or 3 way valve), indoor side water pump, 4 way valve.

9.6.5 HOT WATER mode priority

9.6.5.1 When the unit is working at heating mode, the controller get signal to produce daily hot water, the daily hot water pump or three way valve will start at once, the indoor side water pump will be controlled by SF10. At that time, the unit will transfer to HOT WATER mode directly until reach the daily hot water temperature, then turn back to HEATING mode directly.

9.6.5.2 When the unit is working at cooling mode, if the controller get signal to produce daily hot water, the unit will stop first, then start the HOT WATER mode until reach the daily hot water temperature, stop again and then revert back to COOLING mode.

9.6.6 Cooling mode

Cooling mode on/off process is same as heating mode ,just 4 way valve action is reversal.

9.7 Protection function

9.7.1 Anti-freeze protection at stop mode

The anti-freeze function will be valid only at the following conditions:

- The controller is at stop mode, but the unit is still connected with power supply.
- $OT \leq SF06$ (During anti-freeze working, when $OT \geq SF06 + SF07$, it will quit from the anti-freeze running.)
- At the above conditions, and $SF02 = 1$, when $ST \leq SF08$, the indoor side water pump is turned ON, a continuous blink warning code WN01 will appear on the LCD, until $ST \geq SF08 + SF09$, it will quit from the anti-freeze work.
- At the above conditions, and $SF03 = 1$. when $ST_o \leq AR11$, the outdoor side water pump is turned ON, a continuous blink warning code 002 will appear on the LCD, until $ST_o \geq AR11 + AR12$, it will quit from the anti-freeze work.

9.7.2 Low pressure protection (Code: AL01)

After starting the compressor, it will check the low pressure switch after AR09 delay. If $D2 = OFF$, all the compressors and outdoor side water pump will be stopped, other parts will keep its original state. A continuous blink code AL01 will appear on the LCD, until $D2 = ON$, the unit will turn to its normal work.

9.7.3 High pressure protection (Code: AL02)

Whenever $D3 = OFF$, all compressors and outdoor side water pump will be stopped, other parts will keep its original state. A continuous blink code AL02 will appear on the LCD, until $D3 = ON$, the unit will turn to its normal work.

9.7.4 Low indoor side outlet water temperature protection at any mode (Code: AL03)

At any mode, if $ST \leq AR01$, all the compressors and outdoor side water pump will be stopped, other parts will keep its original state. A continuous blink code AL03 will appear on the LCD, until $ST \geq AR01 + AR02$, the unit will turn to its normal work.

9.7.5 The outdoor side low outlet water temperature protection at HEATING mode (Code: AL04)

Note

When SF03=1, at heating mode working, if $STo \leq AR11$, all the compressors and outdoor side water pump will be stopped, other parts will keep its original state. A continuous blink code AL04 will appear on the LCD, until $STo \geq AL11+AL12$, the unit will turn to its normal work.

9.7.6 High indoor side outlet water temperature protection at HEATING mode (Code: AL05)

At heating mode running, $ST \geq AR03$, all the compressors and outdoor side water pump will be stopped, other parts will keep its original state. A continuous blink code AL05 will appear on the LCD, until $ST \leq AR03-AR04$, the unit will turn to its normal work.

9.7.7 Water flow switch protection (Code: AL17)

At normal working condition, if there is no signal from water flow switch within AR05 (D1=OFF) after starting the outdoor side water pump, a continuous blink code AL17 will appear on the LCD, all the compressors and outdoor side water pump will be stopped, other parts will keep its original state, a continuous blink code AL17 will appear on the LCD.

9.7.8 Low evaporating temperature protection (Code: AL20)

During normal working, if $ET \leq AR08$, all the compressors and outdoor side water pump will be stopped, other parts will keep its original state, a continuous blink code AL20 will appear on the LCD.

9.7.9 high exhaust gas temperature protection (code :AL21)

$ET > AR10$, all the compressors will be stopped, other parts will keep its original state, a continuous blink code AL21 will appear on the LCD.

9.7.10 temperature sensor trouble (code :AL11-AL16)

CODE	
AL11	RT sensor trouble,X1
AL12	ST sensor trouble,X2
AL13	OT sensor trouble,X3
AL14	HT sensor trouble,X4
AL15	Sto sensor trouble,X5
AL16	ET sensor trouble,X6

When any sensor trouble happen, all the compressors will be stopped, other parts will keep its original state, a continuous blink code will appear on the LCD

10 Paramter Tables

10.1 Compressor Settings

<Sec :Second;; Min :Minute: Hr: Hour privilege 2:ID,1 EU,0;N0>

<i>Para-meter</i>	<i>Descriptions</i>	<i>De-fault</i>	<i>Min.</i>	<i>Max.</i>	<i>Unit</i>	<i>Res.</i>	<i>Privi-lege</i>
CM02	Compressor minimum OFF time		1	1000	Sec	1	2
CM06	The number of compressors		1	2	-	1	2
CM07	The direction indicator of four-way valves(1 or 0 indicates heating mode)		0	1	-	1	1
VR	Version No.	2002					

10.2 Evaporator Settings

<i>Para-meter</i>	<i>Descriptions</i>	<i>De-fault</i>	<i>Min.</i>	<i>Max.</i>	<i>Unit</i>	<i>Res.</i>	<i>Privi-lege</i>
EV01	Indoor side water pump Control: 0=water pump will circulate continuously 1= The water pump on/off following compressor on/off		0	1	-	1	1
EV02	unit control referenced temperature sensor: - 0=RT (inlet water temperature sensor) - 1=ST (outlet water temperature sensor)		0	1	-	1	1

10.3 Special Functions

Para-meter	Descriptions	De-fault	Min.	Max.	Unit	Res.	Privi-lege
SF01	System mode - 0=Cooling only - 1=Heating & Cooling - 2=Heating only		0	2	-	1	1
SF02	Indoor Antifreeze function - 0=Disabled - 1=Enabled		0	1	-	1	1
SF03	Outdoor Antifreeze function - 0=Disabled - 1=Enabled		0	1	-	1	1
SF04	The compensation function of heating temperature - 0=Disabled - 1=Enabled		0	1	-	1	1
SF05	- Heat Recovery function - 0=Disabled - 1=Enabled		0	1	-	1	1
SF06	Outdoor temperature to turn on antifreeze		0	10	°C	1	2
SF07	Outdoor temperature differential to turn off antifreeze		1	10	°C	1	2
SF08	Indoor side outlet water temperature to turn on antifreeze		1	10	°C	1	2
SF09	Indoor side outlet water temperature differential to turn off antifreeze		1	10	°C	1	2
SF10	The compatibility between the Indoor water pump and hot water pump 0=compatible 1=incompatible		0	1	-	1	1
SF13	Air conditioning ON/OFF control method 0=DI 1=remote		0	1	-	1	1
SF14	Hot water ON/OFF control method 0=DI 1=remote		0	1	-	1	1

10.4 User Settings

Para-meter	Descriptions	De-fault	Min.	Max.	Unit	Res	Privi-lege
ST01	Setting temperature at cooling mode		ST11	ST12	°C/	0.1	0
ST02	Setting temperature at heating mode		ST13	ST14	°C/	0.1	0
ST03	Setting temperature differential at cooling mode		0	10	°C	0.1	0
ST04	Setting temperature differential at Heating mode		0	10	°C	0.1	0
ST05	Setting temperature at heating for compensation function		0	30	°C	0.1	0
ST06	Compensation factor for heating compensation function		0	30	-	0.1	0
ST07	Outdoor temperature to start the electric heater		-10	20	°C	0.1	0
ST08	Outdoor temperature differential to stop the electric heater		1	20	°C	0.1	0

ST09	<i>Hot water temperature</i>		ST15	ST16	°C	0.1	0
ST10	<i>Hot water temperature differential</i>		1	10	°C	0.1	0
ST11	<i>Minimum cooling temperature</i>		0	ST12	°C	0.1	1
ST12	<i>Maximum cooling temperature</i>		ST11	60	°C	0.1	1
ST13	<i>Minimum heating temperature</i>		0	ST14	°C	0.1	1
ST14	<i>Maximum heating temperature</i>		ST13	80	°C	0.1	1
ST15	<i>Minimum hot water temperature</i>		0	ST16	°C	0.1	1
ST16	<i>Maximum hot water temperature</i>		ST15	80	°C	0.1	1
ST17	<i>Pre set time of engery stage adjusting</i>		1	1000	Sec	1	2

10.5 User Interface

<i>Parameter</i>	<i>Descriptions</i>	<i>De-fault</i>	<i>Min.</i>	<i>Max.</i>	<i>Unit</i>	<i>Res.</i>	<i>Privi-lege</i>
UI01	Password for service user	6945 after 2009-6-29	0	9999	-	1	1
UI02	Password for factory user	9957 after 2009-6-29	0	9999	-	1	2

10.6 Alarm Settings

<i>Para-meter</i>	<i>Descriptions</i>	<i>De-fault</i>	<i>Min.</i>	<i>Max.</i>	<i>Unit</i>	<i>Res.</i>	<i>Privi-lege</i>
AR01	<i>Low indoor side outlet water temperature protection</i>		1	10	°C	1	2
AR02	<i>low indoor side outlet water temperature protection differential</i>		1	10	°C	1	2
AR03	<i>high outlet water temperature protection</i>		1	100	°C	1	1
AR04	<i>high outlet water temperature protection differential</i>		1	20	°C	1	2
AR05	<i>Feedback delay for water flow switch</i>		1	100	Sec	1	2
AR06	<i>Low pressure alarm times within 24 hours (Over this limit, alarm "AL18" will be reported.)</i>		1	10	-	1	2
AR07	<i>High pressure alarm times within 24 hours (Over this limit, alarm "AL19" will be reported.)</i>		1	10	-	1	2
AR08	<i>low evaporator temperature protection</i>		-10	10	°C	0.1	1
AR09	<i>Low pressure switch shielded time when compressor just on</i>		0	1000	Sec.	10	2
AR10	<i>high exhaust gas temperature protection</i>		100	130	°C	0.1	1
AR11	<i>outdoor side low outlet water temperature protection</i>		-20	10	°C	0.1	1
AR12	<i>differential of low outdoor side water temperature protection</i>		1	10	°C	0.1	1

Note: The default parameter setting data please refer to attachment "water to water models parameter default setting"