Swimming pool heat pump
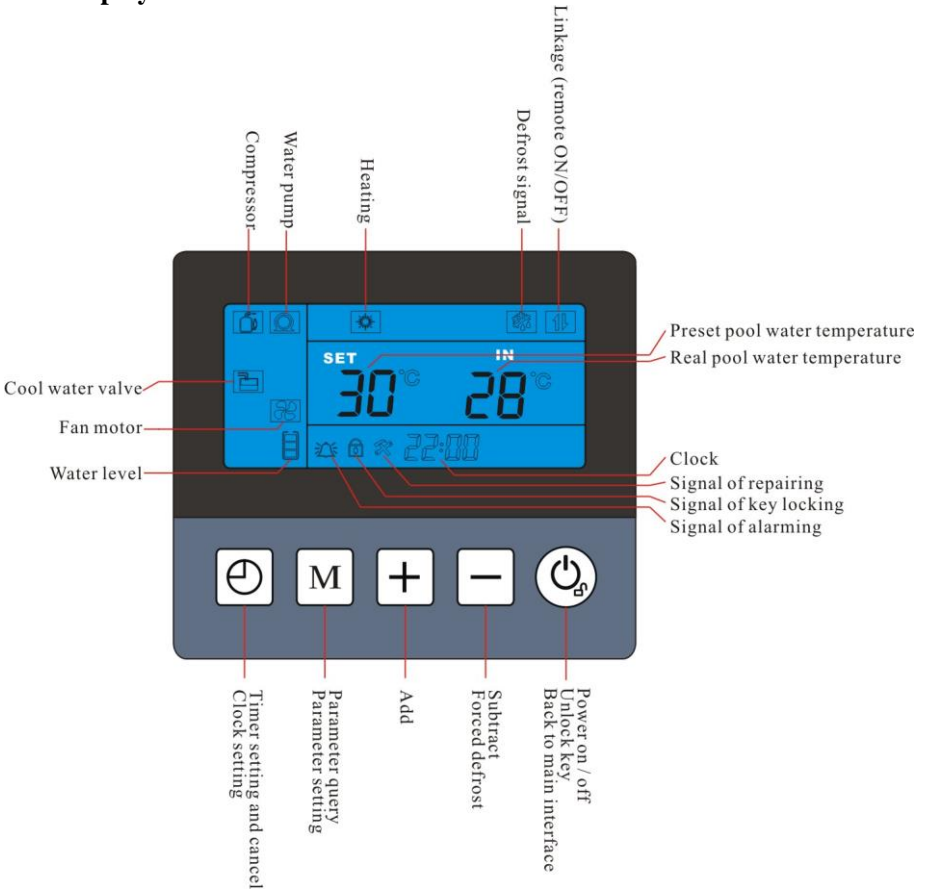## (Single compressor system)
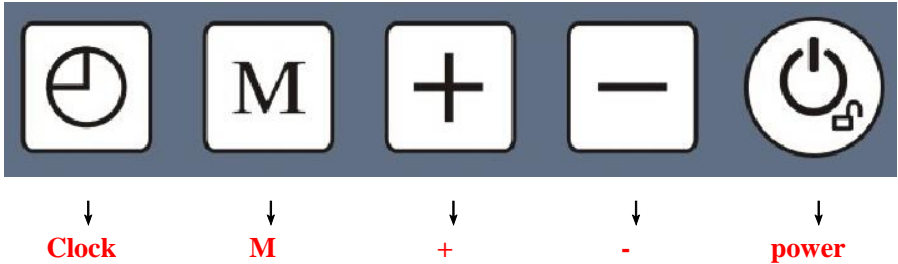
Operating manual

Part 1: Operating panel introduction

1. Display interface

Compressor
Water pump
Heating
Defrost signal
Linkage (remote ON/OFF)

Cool water valve
Fan motor
Water level

Preset pool water temperature
Real pool water temperature

SET 30℃   IN 28℃

Clock
Signal of repairing
Signal of key locking
Signal of alarming

Timer setting and cancel
Clock setting

Parameter query
Parameter setting

Add

Subtract
Forced defrost

Power on / off
Unlock key,
Back to main interface

2. Buttons function

↓	↓	↓	↓	↓
Clock	**M**	**+**	**-**	**power**

2.1 "Power" button

● Under unlock state, press this button for 1second, can turn on and turn off heat pump.

● Under other state, press this button, can return main interface.

● Under locking state, press this button for 5 seconds, can unlock buttons.

2.2 "M" button

● Under main interface, press this button, can query the working status parameters

2.3 "+" and "- " button

● Open previous, next page of parameters to query and change the value

● Combine with "M" button, can query each parameter and set

● Under power on state, press "+" and "- "button, can set current working mode water temperature

2.4 "clock" button

● Press this button for 10seconds, enter clock setting interface

3. Operating

3.1 Parameters query and setting

①Working status parameters query

How to enter? Under main interface, press "M" button, can enter

working status parameters query interface.

Working status parameters (table 1)

Code	Meaning
No code	Water tank temp (IN water temp on panel)
A1	Air heat exchanger lowest tube temp
A2	Inlet gas temperature of compressor
A3	Outlet gas temperature of compressor
A4	Ambient air temperature
A5	Outlet water temperature
A6	Inlet water temperature
A7	Reserved
A8	Compressor current
A9	Electric expansion valve open degree
A10	Reserved
C1	Reserved
E1~E6	History error code

Remarks: Water tank temp sensor is installed on the titanium heat exchanger

inside heat pump, installer can move it to swimming pool if need.

Error code (table2)

Error code	Meaning
Er01	Wrong phase error
Er02	Lack phase error
Er03	Water flow switch error
Er05	Outlet gas pressure of compressor is too high error
Er06	Inlet gas pressure of compressor is too low error
Er09	Communication error
Er11	Time limit for locking heat pump reached
Er12	Outlet gas temp of compressor too high error

Er15	Water tank temp sensor error
Er16	Air heat exchanger lowest tube temp sensor error
Er18	Outlet gas temp sensor of compressor error
Er21	Ambient air temp sensor error
Er22	Inlet water temp sensor error
Er27	Outlet water temp sensor error
Er29	Inlet gas temp sensor of compressor error
Er35	Compressor current too high error
Er37	Inlet / outlet water temp difference too large protection
Er44	Ambient temp too low protection
Er45	Outlet water temp too high error

②**User parameters query and setting (both ON and OFF state can set)**

How to enter?

◆ Under main interface, press "M" for 3seconds, enter user parameter query interface, then press "+" and "- " button , can query L2 to L9 value.

◆ Under user parameter query interface, press "M" button, enter setting interface, press "+" and "- " button, to set the value of current parameter, press "M" button again, return query interface.

◆ Under user parameters query interface and setting interface, if there is not operation for 30seconds constantly, system will quit user parameter query or setting interface automatically, and return to main interface, press "power" button can return main interface too.

User parameters query and setting (table 3)

Code	Meaning	Setting range	Factory setting
///	Water tank temp setting	20℃～	55℃ (SET at the main

		F1 value	interface)
L2	Compressor restart temperature drop	2℃～ 25℃	5℃
L3	Preset water tank temperature	30℃～ F1 value	55℃
L4	Reserved	8～32℃	12℃
L5	Ambient air temperature below which electric heater is allowed to start	-25℃～ 25℃	5℃
L6	Reserved		
L7	Reserved		
L8	Compressor current	0～40A	0（0: will not detect current）
L9	Reserved		

③**Factory parameters query and setting（both ON and OFF state can set）**

How to enter?

◆ Under main interface, press "power" button and "+" button at the same time for 3seconds, enter factory parameters password interface, will display "0.0.0.0", At the interface, press "clock" button, can switch between the four figure of password, press "+" or"-" button, can change the value the four figure, their value should be "0.8.1.4", then press "M" button to confirm password, if password is correct, will enter factory parameter query interface

◆ At factory parameter query interface, press "M" button, enter current parameter setting state, now press "+" or"-" button, can change current parameter value, then press "M" button, back to query state.

◆ At factory parameter query interface and setting interface, if there is

not operation within 30seconds constantly, system will quit factory

parameters query or setting interface automatically, and back to main

interface. Press "Power" button can back to main interface too.

Factory parameters query and setting (table 4)

Code	Meaning	Setting range	Original setting	Remarks
H2	Ambient air temperature below which heat pump will stop working to protect	-30℃ ～ 0℃	-10℃	
H3	Defrost period setting	20min ～ 90min	55min	
H4	Air HE lowest tube temp below which system will enter defrost	-15℃ ～ -1℃	-3℃	
H5	Longest defrosting time setting	5min ～ 20min	8min	
H6	Air HE lowest tube temp above which system will quit defrost	1℃ ～ 40℃	13℃	
H7	The temp difference between ambient temp and air HE lowest tube temp higher than which system will enter defrost	0℃ ～ +15℃	2℃	
H8	Ambient temp below which system will enter defrost	0 ～ 20℃	10℃	
P1	Action period setting of electric expansion valve	20s ～ 90s	30s	
P2	Target superheat temp setting	-5℃ ～ 10℃	4℃	
P3	Outlet gas temp at which EEV will adjust to keep the temp	80℃ ～ 110℃	95℃	
P4	EEV open degree when defrosting	2 ～50	50	
P5	Min open degree of EEV	2 ～ 30	12	

Code	Meaning	Setting range	Initial value	Remarks
P6	EEV choice for automatically and manually	0/1	1	
P7	EEV step by manual	2～45	35	
F1	Upper limit of water tank temp setting	30℃ ～ 90℃	60℃	
F2	Circulating water pump choice when only electric heater working	0/1	1	0：work/1：not work
F3	Temp difference of displaying temp and real temp of water tank temp	-5℃ ～ 15℃	2℃	
F4	Water flow switch installing way choice	0 /1	0	0:independent/1：share
F5	Circulating water pump working way choice	0/1	1	1：stop/0：non-stop
F6	Outlet water temp too high protection	35℃ ～ 85℃	62℃	
F7	Reserved			
F8	Outlet gas temp setting for too high protection	100°C～ 126°C	115°C	

Remarks: F4 only valid for cascade connection way.

④Time limit setting

How to enter? Process is same as factory parameter query and setting,

password is "8.5.6.3"

Time limit query and setting (table 5)

Code	Meaning	Setting range	Initial value	Remarks
FF	Limited weeks after which heat pump will not allowed work	0～99	0	The unit is "week" "0"means not time limited

3.2 Other operation

①Clock setting

◆ At main interface, press "clock" button for 5 seconds, enter clock setting interface

◆ At clock interface, press "clock" button, then "hour" flash, press "+"or "-"button，can set hour.

◆ After finish setting hour, press "clock" button, then "minute" flash, now press "+"or"-"button，can set minute.

◆ After finish setting minute, press "clock" button, to confirm clock setting, and back to main interface.

◆ At clock setting interface, if there is not operation within 30seconds, system will confirm clock setting and back to main interface automatically.

◆ At clock setting interface, press "power" button, can confirm current clock setting and back to main interface.

② Lock keys and unlock keys

◆ At locking state, press "power" button for 3seconds, buzzer will give a voice of "Di", keys will be locked.

◆ If there is not operation within 60seconds constantly, will lock keys automatically.

③Forced defrosting

◆ At ON status, press "-" for 3seconds, enter forced defrost.

◆ To quit forced defrost, there are two ways.

　a. Automatic quitting: when defrost time reach H5 setting, can quit forced defrost.

　b. Forced quitting: Press "power" button，after power off, 3minutes later, will quit forced defrost completely.

④**Remove history error code**

At the interface of query history error code, press "power" and "M"
button together for 5seconds, can remove all the history error code.

⑤**One-click restore function**

Under power off status, press "power" and "-" button together for
5seconds, can restore factory setting.

Part 2. Working modes

1. Heating mode

◆Water tank temp ≤ Water tank preset temp L3-Compressor restart temp
drop setting L2, start to heat.

◆Water tank temp ≥ water tank preset temp L3, stop heating.

2. Defrost mode：

2.1 Conditions of entering defrost：

◆Ambient temp≤H8 value，and air heat exchanger lowest tube temp≤H4
value, and lasts for ≥ 3min；

◆Compressor total working time≥H2 value，and lasts for≥5min

◆(Ambient temp － Air heat exchanger lowest tube temp)≥preset temp
H7，and lasts for more than 30sec.

When all of above conditions are met, system will enter defrost.

2.2 Conditions of quitting defrost：

When air heat exchanger lowest tube temp＞H6 value, or defrosting time
reach H5, system quit defrost.

2.3 Defrost running：

①When defrost entering conditions are met, will work as below:

◆Compressor and fan motor stop working.

◆At 30sec, four way valve get electricity, electric heater start.

◆At 60sec, compressor starts.

②When defrost quitting conditions are met, will work as below:

◆Compressor stop working

◆At 55sec, four way valve losses electricity, electric heater stop working (according to electric heater controlling logistic to judge if electric heater continues to work)

◆At 60sec, fan motor starts.

◆At 65sec, compressor start, recover normal heating mode.

◆Compressor total working time will be reset, and re-timing.

2.4 Quit defrost abnormally：

◆Turn off heat pump when defrosting, system will quit defrost at once first, then heat pump stop working.

◆There are error happen and heat pump stop working to protect when defrosting, system will quit defrost at once, and stop working.

◆When defrosting, system doesn't detect low pressure protection.

Part 3. Each electrical component controlling

1. Compressor

◆Compressor start / stop according to hot water tank real temperature and preset temp.

◆After compressor stops, should need at least 3min, then it can restart again.

◆After compressor start, should work at least 2min first, then can stop. (Except turned off or there is error).

◆There is not 3min protection for the first time starting.

2. Four - way valve

◆When heating, 4-way valve lose electricity.

◆ Four way valve delay 2min to change direction after compressor stop.

◆ When defrosting and forced defrosting, 4-way valve get electricity, refer to defrosting process.

3. Circulating water pump

◆When system request power on, water pump start at once；

◆ When system request power off，water pump delay 30s to stop after compressor stop；

◆ When defrost, water pump doesn't stop.

◆Circulating water pump can select stop or not.

4. Fan motor

◆after water pump worked for 30s, fan motor start；When heat pump powers off, fan motor and compressor stop at the same time.

◆When defrosting, fan motor doesn't work, refer to defrosting process.

5. Auxiliary electric heater

5.1 Starting conditions：

◆At heating mode

◆Ambient temperature ≤ L5 setting.

◆Water tank temperature < water tank preset temperature - L2.

When all of above conditions are met, electric heater starts.

5.2 Stopping conditions:

◆ Water tank temp ≥ water tank preset temp when heating.

◆ Water tank temp sensor damaged and controller show error code.

◆ Ambient temp ≥ parameter L5+2℃；

Any of above condition is met, electric heater stops.

5.3 When defrosting, forced defrosting, secondary anti-freeze, electric heater

is forced to start..

6. Electric expansion valve

Because of electric expansion valve working is very complicated, here will not descript how it working.

Part 4. Error and protections

1. Communication error and protection

◆ Within 20seconds at the first time power on heat pump, if PC board can't get signal from operating panel all the time, operating panel can't exit from whole show. PCB will not conduct, system will work according to "the last time working status parameters that operating panel input" only.

◆ In the process of power on, if operating panel can't get signal from PC board constantly for 10seconds, system will judge this communication error, and display Er:09, heat pump work according to former preset temperature, when communication recover, Er:09 will disappear.

2.Three phase protection（only valid for 3phase heat pump）

When power on, system will check the three phase live line, if there is wrong phase or lack of phase, system will enter phase protection, and turn off all output and display error code, only after remove error and re-supply electricity, system will back to normal work.

3. Ambient air temperature sensor error

◆After heat pump power on, if detect ambient temperature sensor is short circuit or open circuit, system will judge ambient temperature sensor error, heat pump continue to work.

◆When this error happens, relative anti-freeze condition will be invalid.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:21.

4. Water tank temperature sensor error

◆After heat pump power on, if detect hot water tank temperature sensor is short circuit or open circuit, system will judge hot water tank temperature sensor error, heat pump will stop working.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:15.

5. Outlet water temperature sensor error

◆After heat pump power on, if detect outlet water temperature sensor is short circuit or open circuit, system will judge outlet water temperature sensor error, heat pump will stop working.

◆When this error happens, relative anti-freeze condition will be invalid.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:27.

6. Inlet water temperature sensor error

◆After heat pump power on, if detect inlet water temperature sensor is short circuit or open circuit, system will judge inlet water temperature sensor error, heat pump will continue to work.

◆When this error happens, inlet water function will be invalid.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:22.

7. Air heat exchanger lowest tube temperature sensor error

◆After heat pump power on, if detect air heat exchanger lowest tube temperature sensor of is short circuit or open circuit, system will judge air heat exchanger lowest tube temperature sensor error, heat pump will continue to work.

◆When this error happens, electric expansion valve controlling will be

changed to by manual.

◆This error can recover automatically. Defrost will be only according to time (defrost period according to H3)

◆When this error happen, operating panel will alarm, display Er:16.

8. Inlet gas temperature sensor error

◆After heat pump power on, if detect inlet gas temperature sensor is short circuit or open circuit, system will judge inlet gas temperature sensor error, heat pump will continue to work.

◆When this error happens, electric expansion valve controlling will be changed to by manual.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, display Er:29.

9. Outlet gas temperature sensor error

◆After heat pump power on, if detect outlet gas temperature sensor is short circuit or open circuit, system will judge outlet gas temperature sensor error, heat pump will stop working.

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, display Er:18.

10. Outlet gas pressure is too high protection

◆When standby, detect outlet gas pressure switch, if disconnects, system will enter high pressure protection, and heat pump stop working to protect.

◆When working, if detect outlet gas pressure switch disconnects for 10seconds, system will enter high pressure protection, and heat pump stop working.

◆If this problem happen 3times within 30minutes, system will not recover normal working unless cut off electricity (the first two times can recover

automatically)

◆When this error happen, operating panel will alarm, and display Er:05.

11. Inlet gas pressure is too low protection

◆When standby, detect inlet gas pressure switch, if disconnects, system will enter low pressure protection, and heat pump stop working to protect.

◆After compressor has started for 3min, if detect inlet gas pressure switch disconnects for 10seconds, system will enter low pressure protection, and heat pump stop working.

◆If this problem happen 3times within 30minutes, system will not recover normal working unless cut off electricity (the first two times can recover automatically)

◆When this error happen, operating panel will alarm, and display Er:06.

12. Outlet gas temperature is too high protection

◆1 minute after compressor start, detect outlet gas temperature, if the temperature ≥115℃ constantly for 10sec, then system will stop working to protect.

◆When detect outlet gas temperature ≤ L10-30℃, then system quit the protection.

◆If this error happen 3times within 30minutes, system will not recover normal working unless cut off electricity (the first two times can recover automatically)

◆When this error happen, operating panel will alarm, and display Er:12.

14. Outlet water temperature too high protection at heating mode

◆At heating mode, after compressor has running for 5min, when detect outlet water temperature ≥62℃ (F11), then system will enter too heat protection, compressor and fan motor stop working, water pump continue to

work.

◆When detect outlet water temperature ≤F11−5℃, then system quit the protection.

◆When this error happen, operating panel will alarm, and display Er:45.

15. Water flow protection

◆1 minute after circulating water pump start, detect water flow switch, if the water flow switch disconnect constantly for 10sec, then system will stop working to protect.

◆After this error happen, if error doesn't recover, system will start circulating water pump to detect water flow per 5min, when this error happen 3times constantly, system will not start circulating water pump, until detect water flow switch connects, then will start circulating water pump again,

◆This error can recover automatically.

◆When this error happen, operating panel will alarm, and display Er:03.

16. Compressor current is too small or too large protection

◆6 seconds after compressor start, detect compressor current, if current ≤1A and lasts for 6sec, or current ≥L8 and lasts for 6sec, system will stop working to protect.

◆When this error happen, operating panel will alarm, and display Er:35.

17. Ambient temperature too low protection

◆When ambient temperature <H2, compressor and fan motor will stop working. Hot water tank electric heater will start.

◆When this error happen, operating panel will alarm, and display Er:44.

◆When ambient temperature ＞H2+2, quit the protection, compressor and fan motor start, hot water tank electric heater will work according to normal

condition.

18. Anti-freeze protection in winter

◆Under standby or power off state, when ambient temperature <2℃, enter 1st step anti-freeze protection, circulating water pump will start to work for 5minutes per 40min. When outlet water temperature ≤ 4℃, circulating water pump needn't wait for 40min, can start water pump at once.

◆Under standby or power off state, When ambient temperature <2℃ and hot water tank temperature ≤4℃, enter 2nd step anti-freeze protection, heat pump will start to heat. When hot water tank temperature ≥15℃, stop heating, or when ambient temperature ≥8℃, system will quit the 2nd step anti-freeze.

◆At the process of anti-freeze, if detect outlet water temperature≤2℃, LCD show error code Er:04, when detect outlet water temperature≥4℃, quit the error, this error only display, no other function.

◆If there is hot water tank temp sensor error, entering 1st step anti-freeze will be only according to ambient temperature, and only 1st step anti-freeze is valid.

◆If there is ambient temperature sensor error, enter 1st step anti-freeze protection, when hot water tank temperature ≤4℃, enter 2nd step anti-freeze protection.

◆ If both ambient temperature and outlet water temperature have error, system will only enter 1st step anti-freeze, start water pump automatically.

Part 5. Other functions

1. Power-off memory function.

◆System will memory the preset working mode and all parameters when

power off.

◆When power on again, can resume the working status and parameters setting automatically.

2. Power on / off at fixed time

◆Fixed power on time and fixed power off time can be set.

◆Detailed information can be consulted wired panel operating part.

3. Forced defrosting function

◆Forced defrosting condition can be entered by operating wired panel.

◆Detailed information can be consulted operating panel introduction.

4. Error query and memory function

◆At query interface, when show "Er", press "＋"button or "－"button, can check history error.

◆Error code is recorded according to time sequence.

◆At least 6 history error codes can be recorded, and these history error codes can be remembered even power supply is cut off.

5. Time limit setting by password

◆Installer can set limited running time, when heat pump total running time reach preset time, heat pump will be locked, can't start to work anymore.

◆Time limit setting can be removed, details can be consulted operating panel introduction.

6. Water tank temperature display correction function

◆If F3 setting is 0, water tank temperature display correction function is invalid.

◆If F3 setting is not 0, water tank temperature display temp = water tank real temp + F3

7. When electric heater working only, circulating water pump can be

forced to start.

If F2 setting is 1, when electric heater start, circulating water pump will start 3sec in advance. When electric heater stops, circulating water pump will delay 3sec to stop. Factory setting of F2 is 1.

Part 6. Details of PC board

1. DIP switch

Switch code	1	2	3	4
Off (figure side)	3phase	Heating + cooling	Air source	Hot water
ON	1phase	Only heating	Water source	Swim pool

2. Output and input port

No	Digital input	Digital output	Analog input	Analog output
1	Water flow switch	Compressor	Water tan temperature sensor	Electric expansion valve
2	High pressure switch	Electric heater	Outlet water temperature sensor	
3		Four way valve	Air heat exchanger lowest tube temperature sensor	
4	Low pressure switch	Water pump	Outlet gas temperature sensor	
5	Linkage switch		Inlet gas temperature sensor	
6	3phase A		Ambient temp sensor	
7	3phase B		Inlet water temp sensor	
8	3phase C		Compressor current	