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R410A

Swimming Pool Heater User Manual

Before operating this product, please read the instructions carefully and save this manual for future use.

13 KW
9 KW
5 KW

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Thank you for choosing our quality product. Please read this manual carefully before use and follow the instructions to prevent damages to the device or injuries to staff.

Specifications are subject to change without notice for further improvement. Please refer to the name plate on the unit for updated specifications.

In cold weather (below 0℃), when the unit is no longer needed, do drain out all the water inside the system.

This heat pump swimming pool heater captures heat from the air and moves it to your pool water. It is a cost-effective, highly efficient way of heating your pool and spa. The unit can be used widely in different applications for such places as hotels, sauna centers, baths, schools, households, beauty&hair-dressing salons, villas etc.

The device should not be placed in an airtight place such as basement or garage. It is recommended to keep the unit away from other home appliances to avoid electromagnetic interference. The working temperature range of this device is -5℃～30℃. The highest output water temp can be 40℃.

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Content

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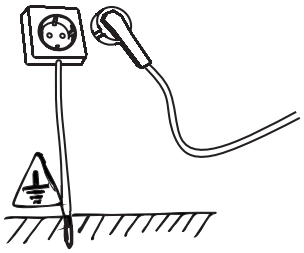
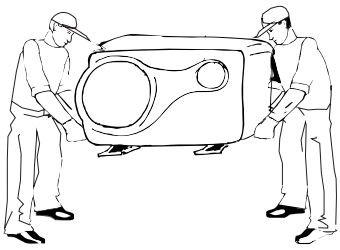
Safety Precautions

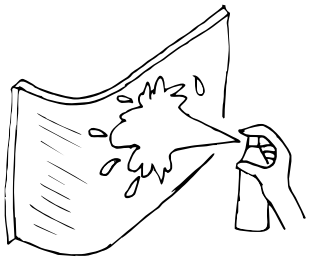
ELECTRICAL POWER MUST BE SWITCHED OFF
BEFORE STARTING ANY WORK ON JUNCTION BOXES



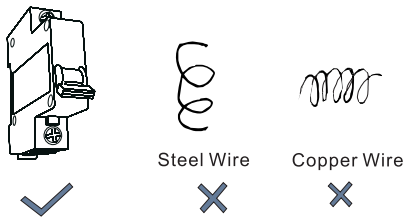
The unit must be earthed to avoid any risks caused by insulation defects.



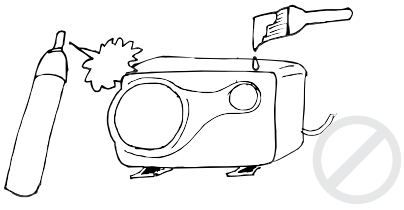
The installation, commissioning and maintenance of these machines should be performed by qualified personnel having a good knowledge of standards and local regulations as well as experience with this type of equipment.



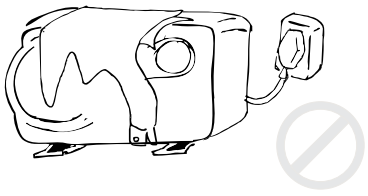
Clean the machine by washing it with a detergent and water at low pressure and then rinsing with clean water.



It is the responsibility of the installer to provide circuit breaker protection corresponding to the machine's capacity (refer to the unit electrical characteristics table),near to the machine.



Do not spread over any paint or insecticidal material on the surface of the unit.



Do not clog the evaporator with paper or any other foreign bodies; to keep the unit well ventilated.

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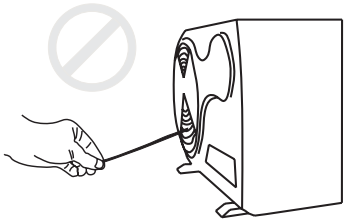
Safety Precautions

Do not pour any water on the unit



Do not touch the air outlet grill
when the fan motor is running

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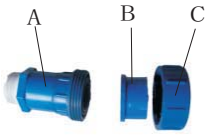
Accessories

User’ s manual, 1 pcs

Plug bolt, 4 pcs



Water inlet and outlet connectors, 2 sets

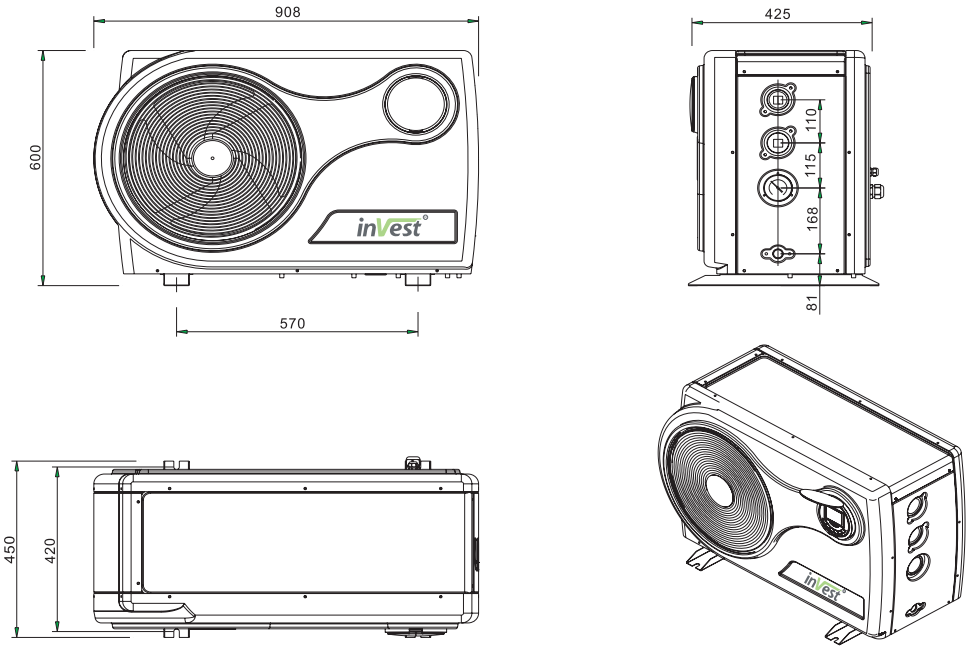
Drain connector, 1 pcs

Absorber, 4 pcs

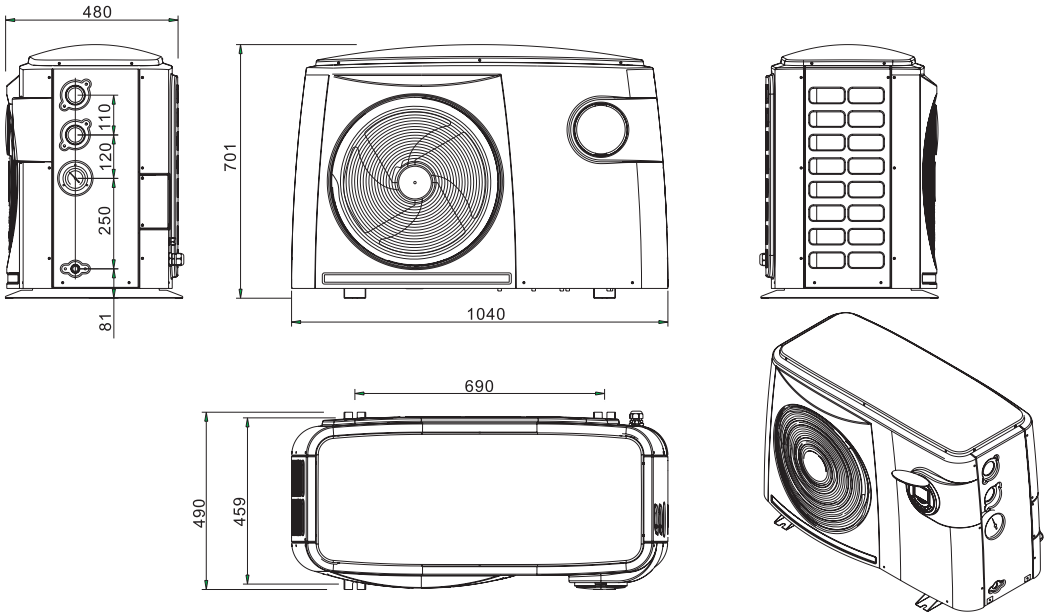
Drain pipe

Having received the equipment, use the packing list and check all the elements to ensure that no items are missing.

Outlines and Dimensions



5KW



9KW/13KW

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Specification

＊＊Testing Condition: outdoor air temperature DB/WB 27℃/21.5℃, water inlet temperature 26.7℃

Model		Unit	5KW	9KW	13KW
Refrigerant			R410A		
Power supply			220V/50HZ/1PH		
Rated heating capacity		KW	5.4	9	13
Nominal power input		KW	1.22	2.01	2.5
Running current		A	5.3	8.73	11
Max. power input		KW	1.41	2.86	3.0
Max. Running current		A	6.13	12.43	13.04
Compressor			Rotary		
Compressor quantity			1		
Rated water temp		℃	27		
Max. water temp		℃	40		
Ambient temp		℃	-5~38		
Water pressure drop		M(H2O)	2.0		
Water pipe connection			DN50(1-1/2")		
Max. water circulation pressure		Mpa	0.2		
Water pump			N.A		
Recommend water flow		m^3/h	1.73	3.13	4.5
Air side heat exchanger			Air condenser coil		
Water side heat exchanger			PVC shell-Titanium tube		
Fan motor	Type		Axial		
	Quantkty		1		
	Dimension	mm	400		
Net dimension(LxWxH)		mm	908x450x600	1040x490x700	
Packing dimension		mm	960x510x725	1090x570x825	
Net weight		kg	45	67	73
Packing weight		kg	62	86	92
Ground resistance		Ω	0.1	0.1	0.1

The specifications are subject to change without prior notice. For actual specifications of the unit, please refer to the specification stickers on the unit

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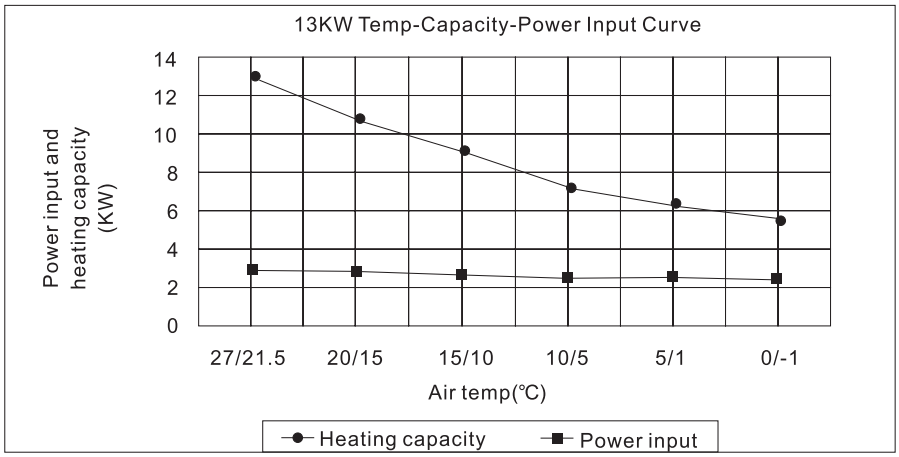
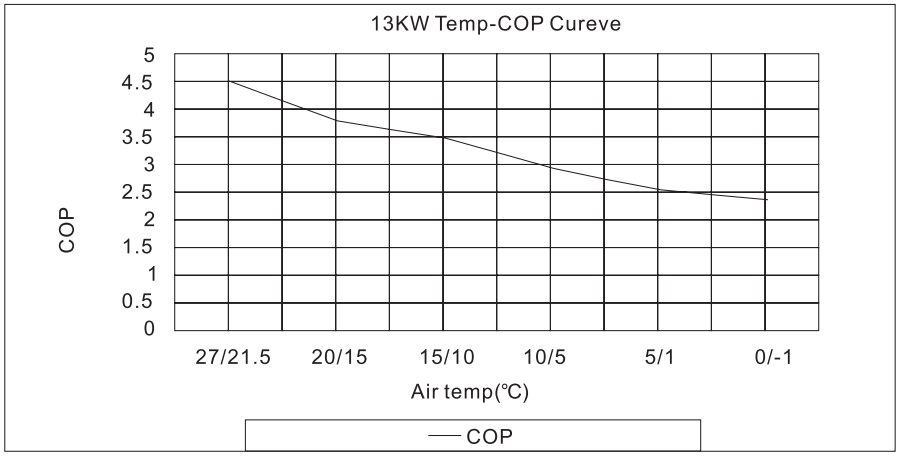
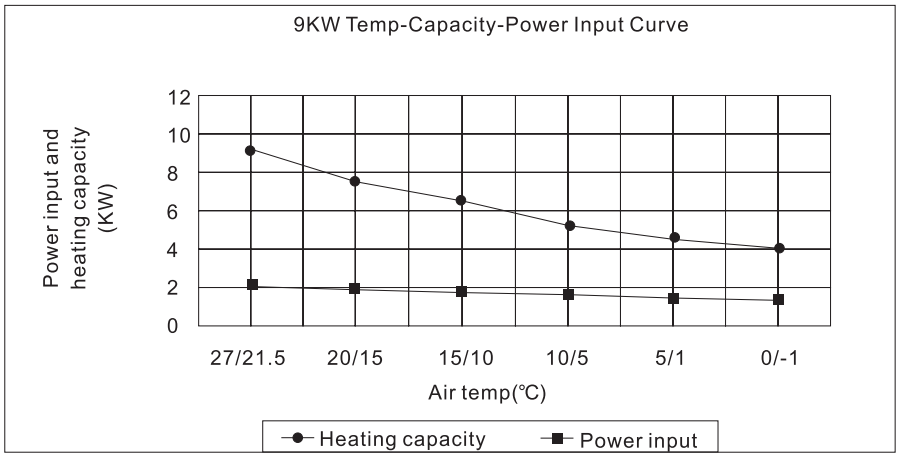
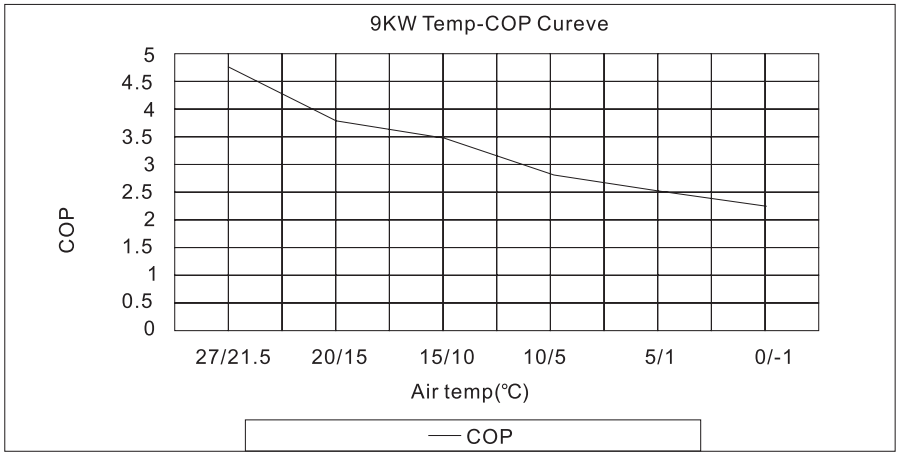
Performance Curve



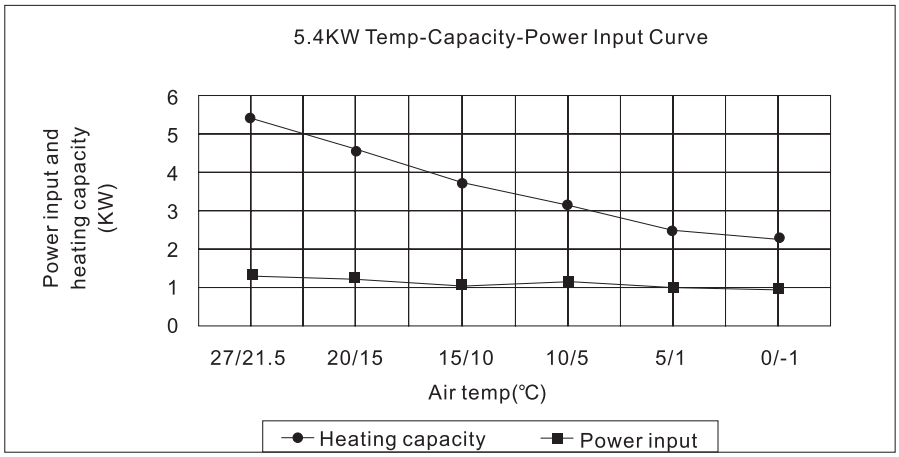


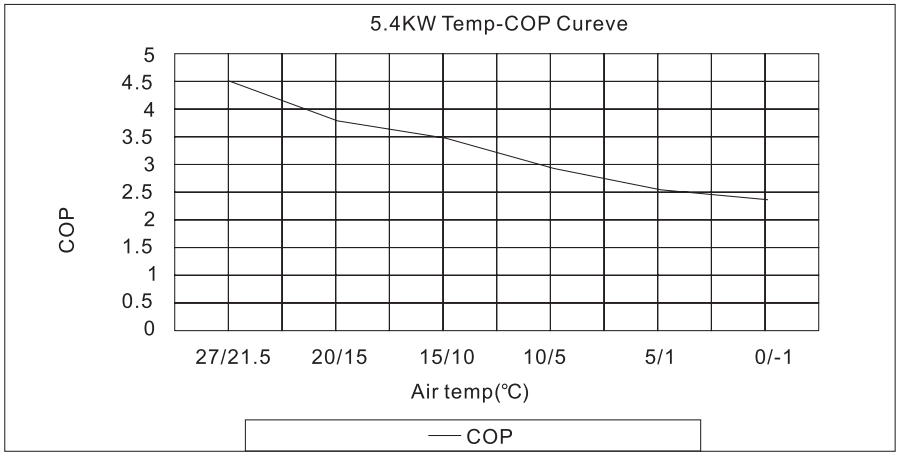
Performance Curve





Performance Curve





System and main components

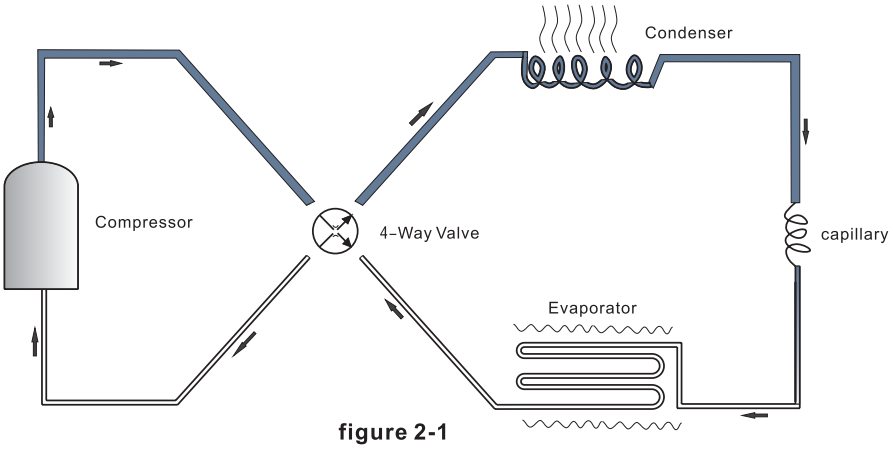


figure 2-1

The principle of operation of a Heat Pump:
The working fluid in its gaseous state is pressurized and circulated through the system by a compressor. On the discharge side of the compressor, the hot and highly pressurized gas is cooled in a heat exchanger (called a condenser) until it condenses into a high- pressure liquid of moderate temperature. The condensed refrigerant then passes through a pressure-lowering device, such as expansion valve, capillary tube, or, possibly, work-extracting device such as turbine. This device then passes the low-pressure, nearly liquid refrigerant to another heat exchanger, the evaporator, where the refrigerant evaporates into a gas by means of heat absorption. The refrigerant then returns to the compressor and the cycle is repeated.

Compressor

Capillary

System and main components

Four-way valve

Evaporator

Pressure switch

Water flow switch

Titanium /PVC exchanger

Pressure meter

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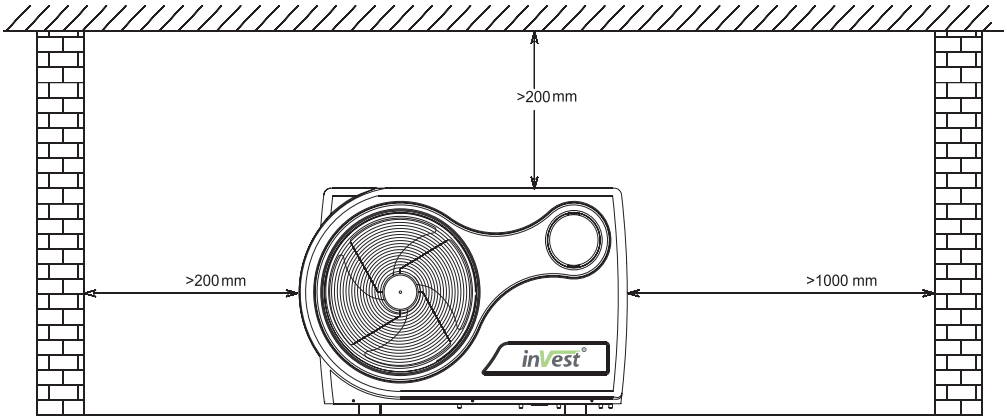
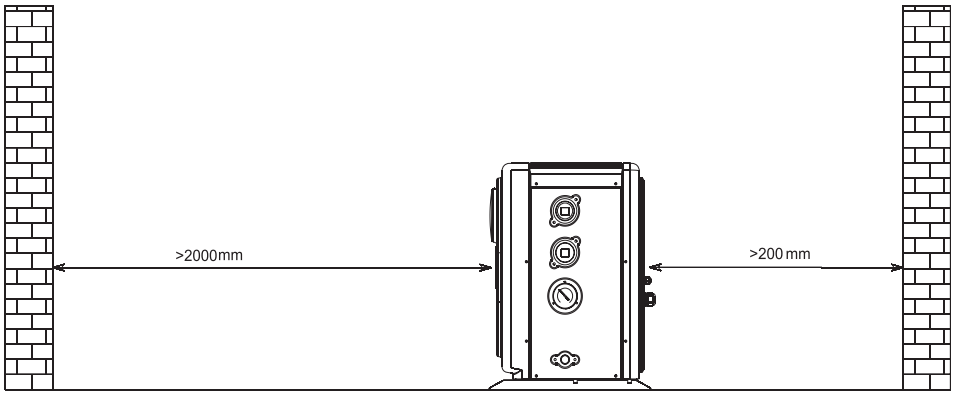
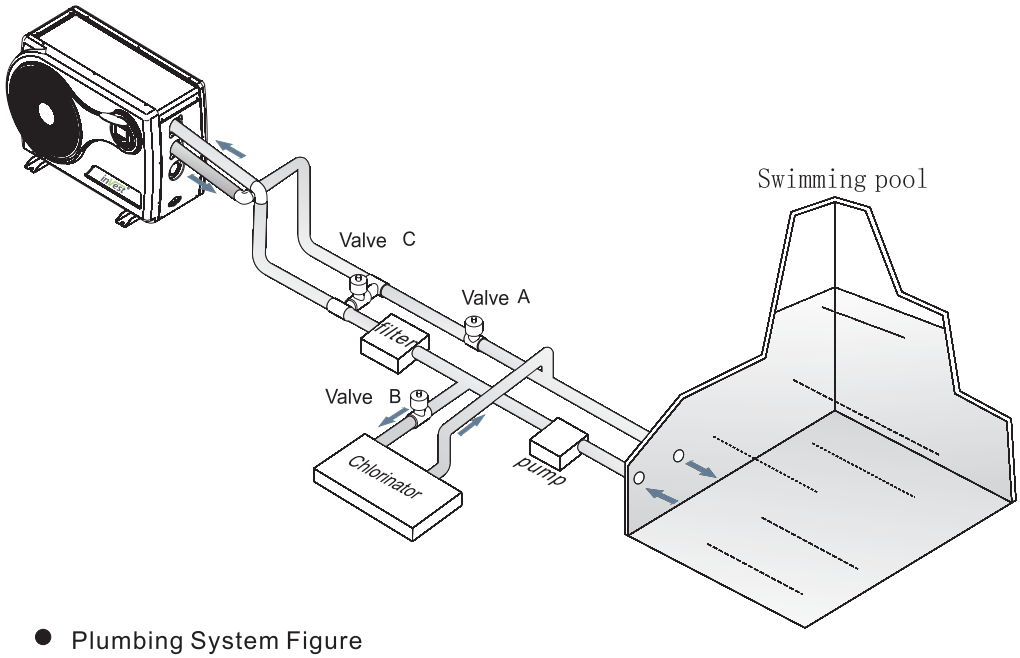
Installation

- **Installation Location**





Installation



- Plumbing System Figure

1.When heating is needed:
Open valve A and then keep the water inlet and outlet Temp difference at 2 ℃ by adjusting the open of valve C.

2.When heating is not needed:
Fully open valve A and C, so the water could circulate through the filter only.

3.When disinfection is needed:
Close valve A and open valve B to channel the water through thechlorinator.

- **Terminal insulation**

To keep power consumption at an appropriately low level and to comply with the standards n force, all hot water pipes must be insulated.

Note: Please ensure the water flow inside the unit no smaller than 80% of the rated water flow.

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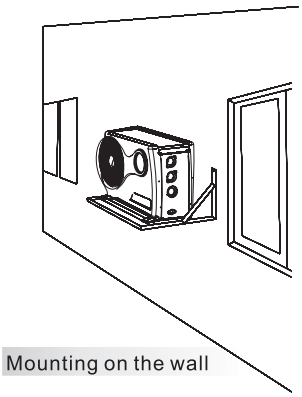
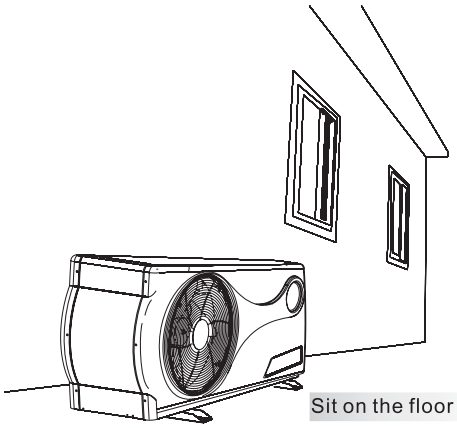
Installation

- **Locate the unit**

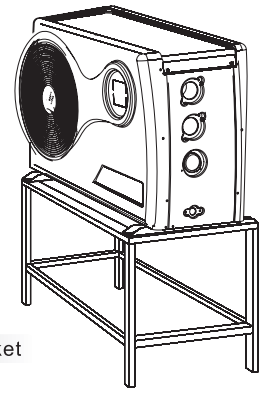


Mounting on the wall



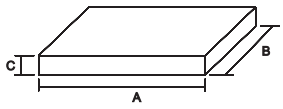
Sit on the floor

1. The unit must be located on a flat, solid, preferably cemented surface.
2. when installing the unit, introduce a tilt of 1cm/m for rain water evacuation.
3. when installing the unit in harsh climatic conditions, sub-zero temperatures, snow, humidity, it is recommended to raise the unit off the ground by about 20cm.
4. It is recommended to have a base of the following size for these units:



sit on bracket

model	A	B	C
13KW	1240	680	250
9KW	1240	680	200
5KW	1108	625	200



5. Rubber vibration absorbing mountings are recommended.
6. When sitting the unit, take care to leave sufficient free space all around it for maintenance.
7. The units are air cooled. so they must be installed outdoors in an area with sufficient clearance to allow free air circulation through the condenser coil.
8. Shield the unit from direct sunshine or rain, but never cover the unit to avoid bad ventilation.
9. The unit should be free from explosive and corrosive gas and grease.

Note: The tilt of the unit should be less than 20°at all tmie.

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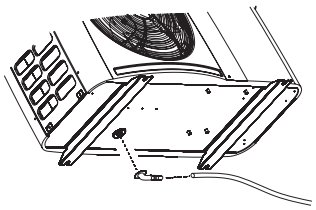
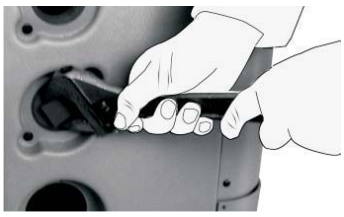
Installation

● Installation of the drain

Please install the drain connector as shown in the picture when necessary. Do not use the drain connector in cold climates (Temp below 0) to avoid it being clogged with ice.



● Installation of the water pipe



1 Screw the pipe cap off with a wrench.

2 Apply the sealant tape to the threads of the water inlet and outlet connectors.

3 Screw the water inlet and outlet connectors to the unit.

Note: Slope of the unit should be less than 20°all the time.

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Installation

4 Apply the pipe glue to the self-prepared water pipe within 30mm of the edge.

5 Insert this pipe into connector B to a depth of about 28 mm

6 Screw this finished pipe set onto the connector of the unit. There is no need to use sealant tape here because the connector already has a n o-ring.

Finished!

Note:
Swimming pool water should always pass through a filtering system before entering the unit. The dirt that has not been filtered may damage or choke the Titanium/PVC exchanger and cause failure of the device.

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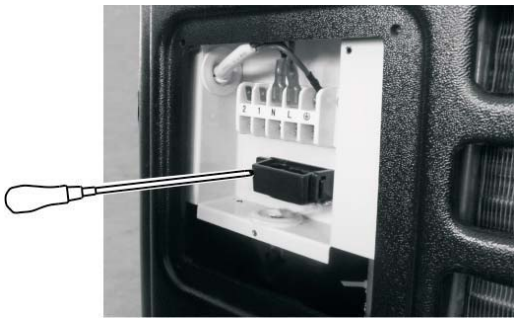
Installation

● Electrical Connection

1. On site wiring must be carried out in accordance with the wiring diagram affixed to the unit's junction box.
2. The unit must be earthed via a terminal block provided inside the junction box.
3. For the 3 phase model, the controller has set power phase protection. When it finds out that the power phase sequence has gone wrong or that a phase is missing, it will refuse to activate the unit and will display error code EE04 until malfunction is removed and power restarted.
4. The supply voltage must not vary by more than 10%. The imbalance between the phases must not be greater than 3%.

1 Take off 4 screws on the wiring panel at the back of the unit and remove the wiring panel.

2 Take off the internal metal cover of the junction box.



3 Take off the power cable clip.

4 Insert the power cable into the unit through the cable gland.

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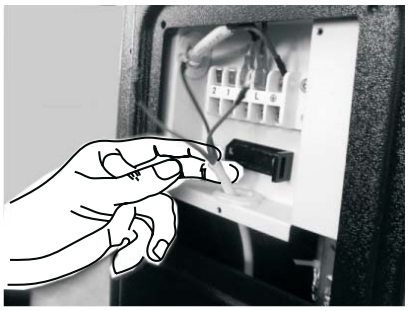
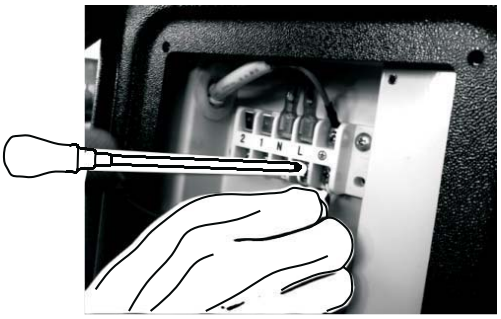
Installation

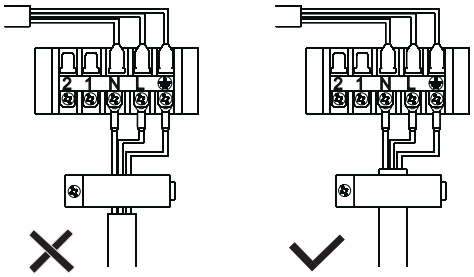


5 The power c abl e s hould go through another cable g land to enter the junction box.

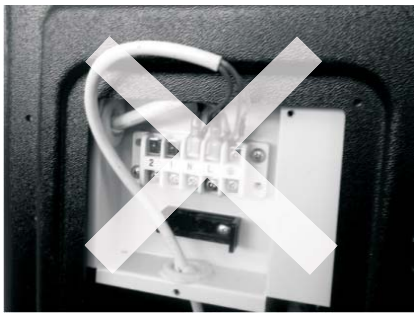


6 Please connect the power cable to the terminal block according to the mark on the terminal block.

Having connected the power cable to the terminal block in a correct way,install the power cable clip back to lockup the power cable.



Please do connect neutral wire of the power cable to the terminal marked "N", Live wire to the terminal marked "L" and earth wire to the terminal marked with "⏚".



NOTE:
INCORRECT WIRING MAY DAMAGE THE UNIT OR CAUSE ITS MALFUNCTION.

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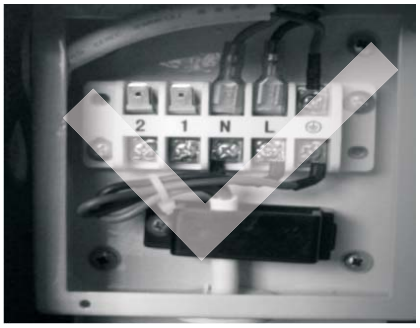
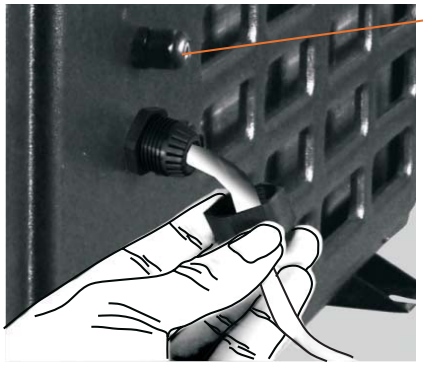
Installation



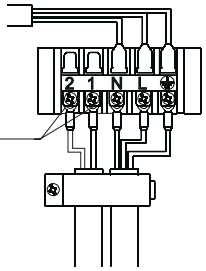
7 Fasten the screw of the power cable clip.

8 Reinstall the internal metal cover of the junction box.

9 Reinstall the wring panel



Cable gland preserved for the power cable of the water pump



Terminals preserved for external water pump

10 Tighten the cap of the cable fixture to lockup the power cable.

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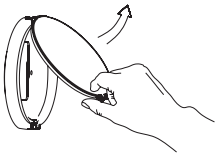
Operation Instructions

● Waterproof box cover

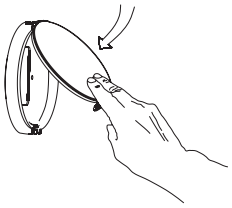
Waterproof box is used to protect the wired controller from rainwater and direct sunshine:

1.To open: Pinch the lock catch of the waterproof box cover and pull the waterproof box cover up.

2.To close: Press the waterproof box cover down to the right position where a “click” can be heard.



● Introduction of Wired Controller



ON/ OFF:
Press to turn on/off of the unit

Mode :
Press to change the working mode of the unit

Work together to check and set the parameter settings

Aux:
Preserved for auxiliary electric heater. Press to turn on/off the auxiliary electric heater.

Note: Please do not forget to close the waterproof box after finishing the setting of the wired controller.

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Operation Instructions

- Start up and Standby

1.The display will show all the symbols when t h e power i s on

2.The display will show the mode and ambient Temp 5 seconds after the power is on. The unit is o n standby.

3. If the main processor PCB and the wired controller cannot communicate with each other properly, failure code EE08 will be displayed.

- Mode selection

Press “MODE” to select the unit operation mode when the unit is on standby.

Cooling mode(W hen available)

Heat pump mode

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Operation Instructions

● Water Temperature

The parameters “00” and “01” are used to preset the target water temp in the cooling mode and heating mode. Please preset water temp as follows:

1. In standby condition, press “SET” to select the “00” parameter (in the cooling mode) or “01” parameter(in heating mode).

2. Then press “▲” or “▼” once to increase or decrease the water temp by 1 ℃ to choose the target water temperature.

● Setting of other parameters

1.When the unit is on standby, press “ SET” repeatedly to select the parameter.

2.Press “▲” and “▼” togther at the same time and hold for 5 seconds until you hear a long buzz indication that the parameter setting program has been activated.

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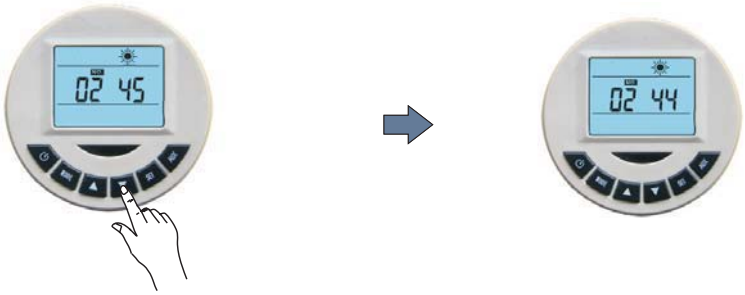
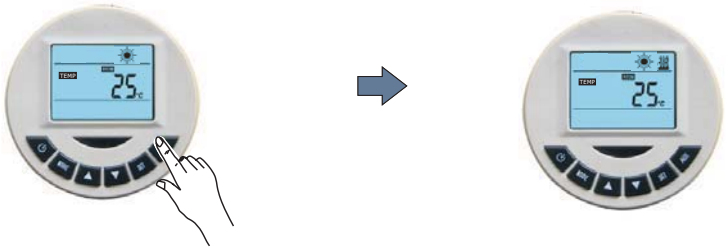
Operation Instructions



Press "▲" or "▼" to adjust the parameter setting. Please refer to parameter table 1 for the meaning of all parameters.

● Auxiliary Electric Heater



When the power is turned on, press " AUX" to turn on/off the auxiliary electric heater.

● ON/OFF

After all parameter settings are done, press " ⏻ " to turn on the unit.

The display shows the inlet and outlet water Temp.

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Operation Instructions

● Check Parameter Setting

When the power is turned on, press "SET" to check all the parameters.

When the power is fed to the unit, press "▲" or "▼" to check the Temp parameters

● Lock Function

When the unit is running, press "▲" and "▼", a buzz will indicate that all the buttons are locked. Press again to unlock all the buttons.

If no button is pressed wi t h in 5 seconds, the display will show the inlet and outlet water Temp.

Table 1

Ref.	Description	Range	Default	Remarks
00	Return Water Temp. in Cooling Mode	8-28℃	12℃	Adjustable
01	Return Water Temp. in Heating Mode	15-40℃	27℃	Adjustable
02	Defrosting Cycle in Heating Mode	30-90min	40min	Adjustable
03	Temp. to start defrosting operation in heating mode	-30-0℃	-3℃	Adjustable
04	Temp. to end defrosting operation in heating mode	2-30℃	13℃	Adjustable
05	Defrosting period	0-15min	8min	Adjustable
06	Compressor Quantity	1-2	1	Adjustable
07	Auto-restart Function	0-1	0	Adjustable
08	Function （Chiller/ Heat pump/Electrical Heating/Hot Water Coils）	0-3	1	Adjustable
09	Operation of Water Pump （Normal / Special）	0-1	0	Adjustable

Maintenance

Automatic defrosting

- **Unit enters into defrosting operation:**

  A. The system enters into defrosting operation, when it has been working for more than 40minutes <Parameter 02(30~90 minutes)> at ambient Temp less than 13℃<Parameter 04(2-30℃)>, and coil Temp Tp≤-7℃<Parameter 03(0-30)>.

  B. When the coil Temp. Sensor fails (Error Code Pp03), system enters into Timer Defrosting Operation, each time for 6 minutes after running in heating for 40 minutes < Parameter 02 (30-90)>.

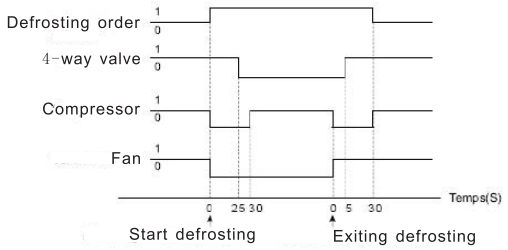
- **Conditions for ending a defrosting**:
  If the temperature of the sensor is >13°C, or if the defrosting takes longer than 8 minutes, the unit ends its defrosting.

- **Defrosting actions**:
  The following actions are activated when the conditions of the defrosting mode are met:
  A . Compressor and Outdoor Fan Motor stop. Then wired controller feels the indicative signal from outdoor unit, and gives the command to defrost.
  B. The four-way valve is disconnected from power 25 seconds after receiving the defrosting signal.
  C. The compressor restarts in 30 seconds
  D. The water pump keeps operating normally.

- **Exiting defrosting actions**:
  A The compressor stops, while the outdoor fan motor starts again. Then in five seconds, 4-way reserving valve will be fed with power.
  B The system enters into heating operation 30 seconds after the restart of the fan motor,. The system then clears its record of running time, and defrosting ends.

- **Abnormal ending of defrosting operation**
  A If the system is turned off during defrosting, it will stop only after the defrosting is finished.
  B Hi/Lo Pressure is not checked during defrosting. It is checked 1 minute after the system restarts for heating.

Note: Please do not change the defrosting parameter unless necessary.



● Condenser Coil

The condenser coils do not require any special maintenance, except when they are clogged with paper or any other foreign bodies. Cleaning is by washing with detergent and water at low pressure, and then rinsing with clean water:

Warning:

1.Before cleaning, make sure the unit is off.

2.The inside of the unit must be cleaned by a qualified person.

3.Do not use gasoline, benzene, detergent etc. to clean the unit. Do not spray the unit with insecticide to avoid damage. Cleansers made specifically for cleaning air conditioners are recommended.

4.Spray air conditioner cleanser onto the coils. Let the cleanser stay for 5-8 minutes.

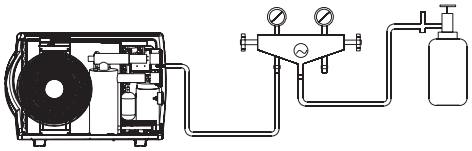
5.Then spray the coil with clean water.

6.An old hairbrush works well for brushing surface dirt and lint off the fins. Brush in the same direction as the slots between the fins so that the bristles could go between the fins.

7.After cleaning, use a soft and dry cloth to clean the unit.

● Gas Charging

Unless the unit has a leak in the sealed refrigeration system, the factory charged refrigerant should last for the life of the unit. Refrigerant is very stable and should not degrade or break down even under severe operating conditions. If your unit needs recharging, then it has a leak, and adding refrigerant will not solve the problem. The leak must be located and repaired.



1.Gas charging must be performed by qualified person

2.To find out whether the system has enough refrigerant inside, check the low pressure inside the system.

3.The lower pressure inside the system varies depending on the ambient temp. in summer, the pressure will be around 1.0 Mpa. In spring and winter, it will be around 0.7 Mpa. If the unit cannot work properly and the pressure is lower than this, please recharge the unit.

● Water flow failure

A flow switch is standardly fitted on the water inlet pipe, leading to the evaporator in order to ensure adequate water flow to the evaporator before starting the unit. It acts both in the event of partial blockage(starting to take in ice) and int the event of a drop in water flow due to pump failure. This is main protection device of the machine. The hydraulic module requires no special maintenance. ***Fitting a mesh filter(charge by user) on the unit inlet is strongly advised***

● Usage in Winter:

Make sure that all of the various components are protected against freezing caused by the outside temperature. In the event of any accidental power failure, make sure to comply with the ice protection requirements.
In cold weather (below 0℃), when the unit is no longer needed, drain out all the water from inside the system.

● Treatment of scrap

Please dispose of the unit according to the local regulations. Take care of the refrigerant and compressor lube.

Maintenance

● Maintain of electrical box

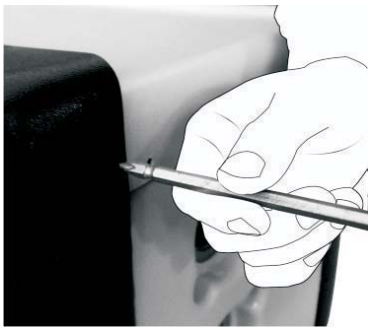
1

2

3

4

How to open the unit when necessary:
For 9KW&13KW unit: First take off the top cover and then remove the front panel and the two side panels.
For 5KW unit: First take off the front panel and then remove the top cover and two side panels.



1 Remove the screws on the top cover and the front panel

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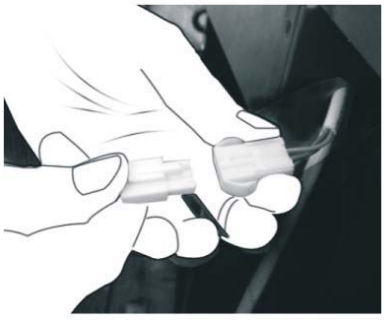
Maintenance

2 Open the front panel a little bit so you can see the wiring inside.

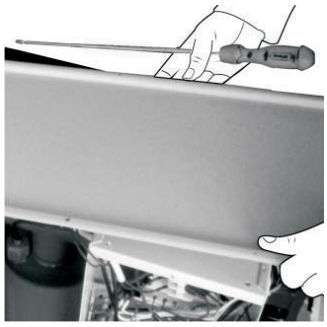


3 Plug off the connector of the wired controller.

4 Take off the front panel.

5 Remove the screws on the top cover

Maintenance



6 Take off the top cover

5KW

9KW&13KW

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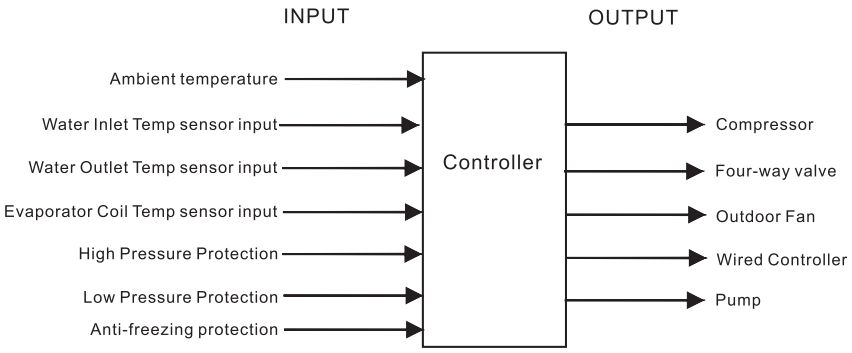
Maintenance

1.Working of the controller



2.Introduction

This controller is specifically designed for Air Cooled Heat Pump Swimming Pool Heater (single system).
1. The whole unit has two operation modes: cooling and heating
2. It can be controlled by either a wired controller or a central controlling system, or through a signal from linkage switch alone.
3. Its parameters can be displayed on the controller and set by a user, so the installation and operation of the unit become much easier.
4. The optional electrical heater can also be controlled.
5. The whole system has auto-protection and alarm functions, and the latest defaults can be recorded automatically.
6. This system has many protection functions, such as compressor delay protection, phase missing/dislocation protection, High Pressure/Low Pressure Protection, overload protection, sensor protection and water switch protection.
7. Communication between the main machine and the remote control works at a distance of 10 meters.
8. The system has a strong anti-interference protection and reliable performance.

3 . Cooling

Inlet water Temp can be set in the range between 8-28℃ with t h e default value of 12℃.
Working Procedure in Cooling Mode
When the 4-way valve is disconnected from power, the water pump turns on and the compressor runs in accordance with the water inlet temperature and its preset value.

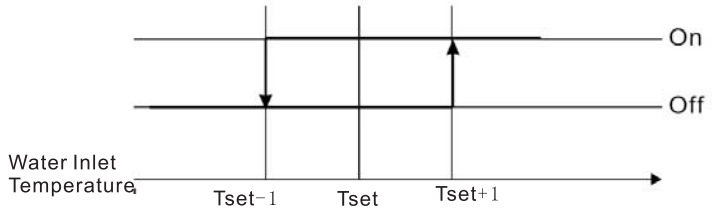
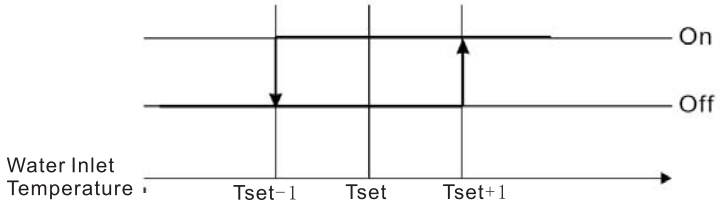


Figure 3-8 shows how the unit works in cooling mode.

4 Heating Mode

Inlet Water Temperature can be set in the range between 15-40℃ with t h e default value of 27℃.
Working Procedure in Heating Mode
When the 4-way valve is connected to power, the water pump turns on and the compressor runs in accordance with the inlet water temperature and its value setting.

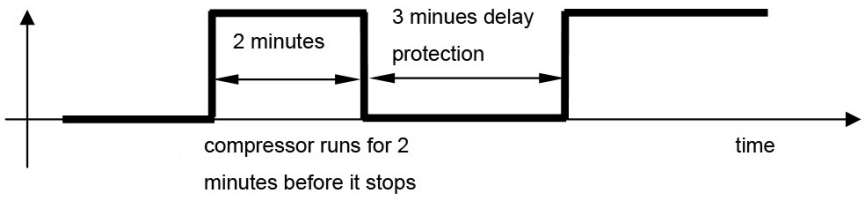


5. Working of the main parts

Time Sequence for the safe operation of the compressor

ON-OFF and ON-ON time sequence of single compressor system (for its operation in the defrosting mode, refer to Defrosting).

The compressor won't restart in 3 minutes after its shutdown, and in 5 minutes after its last startup.



Four-way Valve

The four-way valve is fed with power in t h e heating mode. It is activated 60 seconds before the compressor starts up, and stopped 2 minutes after the compressor stops. When the system operates in the heating mode and t h e temperature reaches the preset value, the compressor stops, but the four-way valve is still on.

1. When t h e system switches from t h e heating to the cooling mode, the four-way valve is OFF 2 minutes later.

2. When t h e system switches from the cooling to the heating mode (including electrical heating mode), the four-way valve is ON 60 seconds earlier.

3. When t h e system turns off in t h e heating mode, the four-way valve is OFF 2 minutes later.

4. When t h e system breaks down in t h e heating mode, the four-way reserve valve stops.

Fan Motor

The fan motor is activated 60 seconds before the startup of the compressor. For its operation in the defrosting mode, please refer to the Defrosting Section.

Water Pump

When the system is turned on, the water pump starts first, and the compressor starts in 60 seconds.

When the system is turned off, the water pump stops 30 seconds after the compressor shuts down.

Water pump keeps running in defrosting mode.

Trouble Shoot

1.Regular maintenance

(1) Regularly check the water flow inside the system. Insufficient water flow may damage the unit.
(2) Check and clean the filter regularly.
(3) The unit should be installed in clean, dry and well-ventilated places and should not be blocked in its air inlet and outlet.
(4) Regularly clean the evaporator to ensure its good performance.

2.Trouble Shooting

Note : Below is a simple analysis of the failures

(1) See figure 2-1. The capacity and performance of the unit varies depending on ambient temperature and a mode l . This curve is just for reference when the unit works in different working conditions.
(2) Please Refer To Figure 4-1 For The Failures And Solutions Of All The Failure Codes.
(3) Solutions to the problems

★ Not enough heating

A. First check the ambient temperature and the water temperature, refer to the Performance Curve, estimate the effectiveness coefficient and compare to that obtained one, and judge if the performance has in fact declined.
B. Check if there is a ventilation obstacle. Solution: remove the obstacle.
C. Check if the general power supply is correct and if there is enough gas inside.
Solution: Find the gas leakage and recharge the unit.

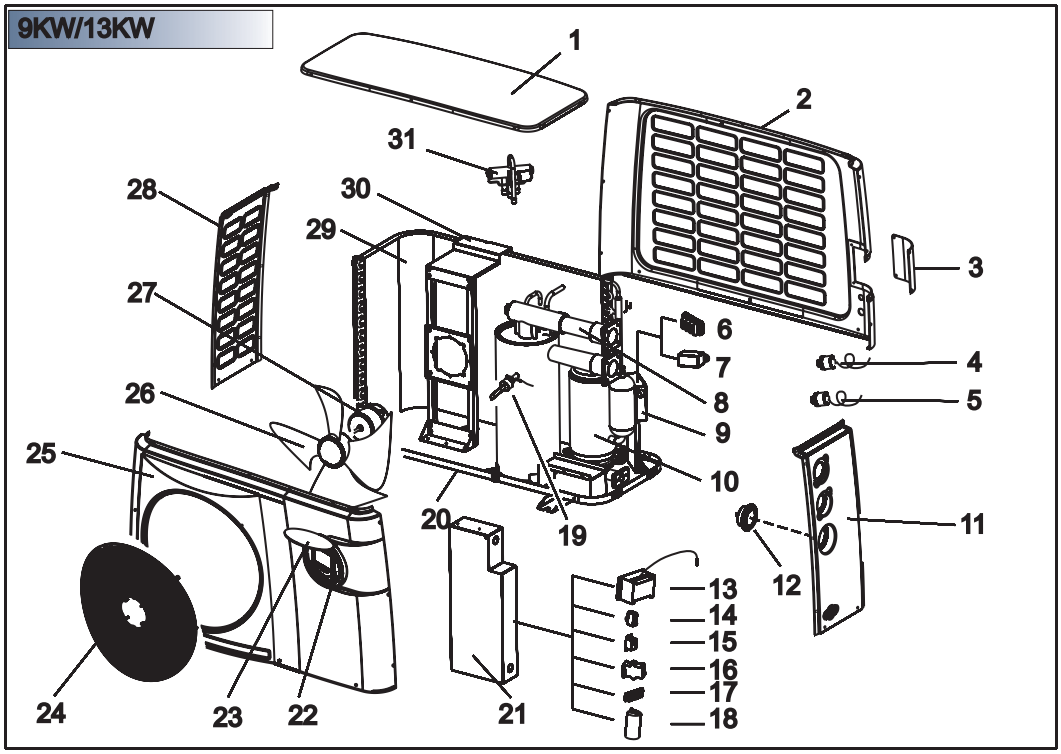
★ The evaporator is covered with ice, the unit does not start its defrosting function:
Solution: The evaporator coil temperature sensor, four-way valve or controller is not connected properly or fails to work. Replace the broken components if necessary.

Figure 4-1 Error codes, failures and solutions

No.	Code	Error	Analyse	Solution
1	EE03	No water/little water in water system	A. Check the pump is failure or not	Fix the pump
			B. Flow switch Failure	Change the flow switch
			C. Water system jammed	Clean all the circuit including filter
2	EE04		HP/LP protection for over 3 time in half hour	Check the refrigerant system
3	EE05	Water inlet and outlet temp. difference is too much	A. Water flow volume not enough	Check the water flow volume, or water system is jammed or not
4	EE08	Communication failure	A. Connection failure	Check the wiring
			B. Wired controller or controller is broken	Change the wired controller or controller
5	PP01	Water inlet temperature sensor failure	A. Temperature sensor fails	Check the value of the sensor and change it
			B. The sensor is open or short circuit	Check the wiring of the sensor
6	PP02	Water outlet temperature sensor failure	A. Temperature sensor fails	Check the value of the sensor and change it
			B. The sensor is open or short circuit	Check the wiring of the sensor
7	PP03	Evaporator coil Temp Sensor failure	A. Temperature sensor fails	Check the value of the sensor and change it
			B. The sensor is open or short circuit	Check the wiring of the sensor
8	PP05	Ambient Temperature Sensor failure	A. Temperature sensor fails	Check the value of the sensor and change it
			B. The sensor is open or short circuit	Check the wiring on the cooler
9	PP06	Overlarge water inlet and water outlet temperature difference protection	A. Water system jammed	Clean all the circuit including filter
			B. Check the pump is failure or not	Fix the pump
10	PP07	Anti freezing	A. The temperature of water is too cold	Stop the unit and drain out all the water inside the system

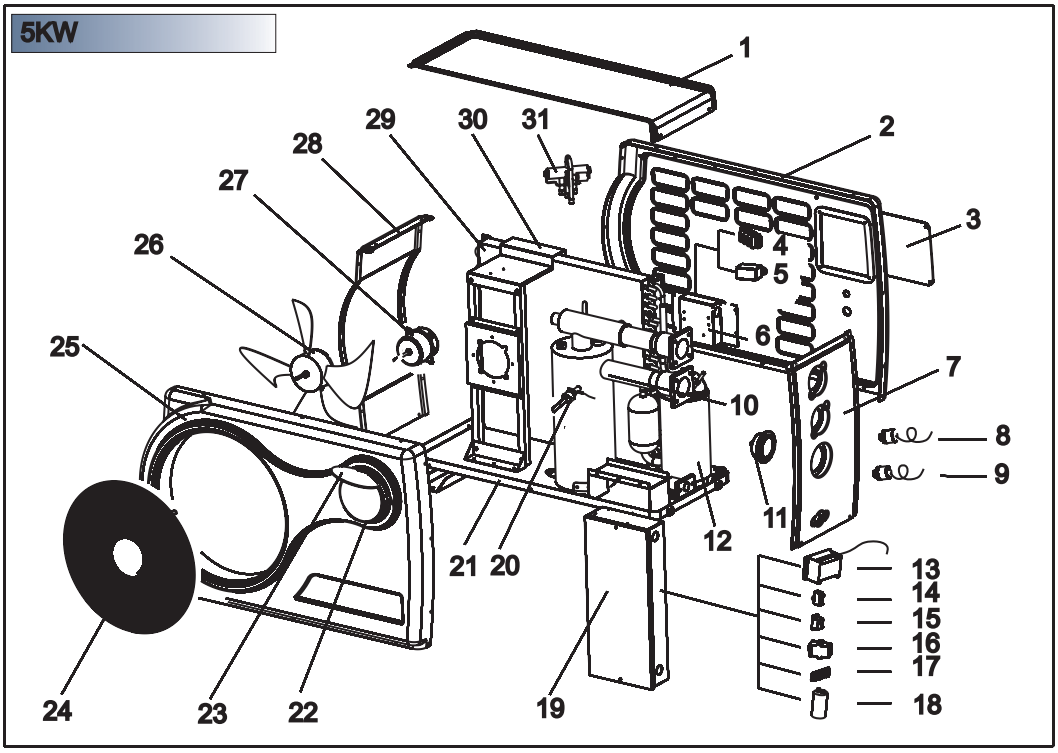
★ The unit makes noise
Solution: First check if the unit is installed properly and has rubber vibration absorbing mountings.
Check if there is no rubber gasket between the outdoor fan and the front panel.
Check if the water circulating system works properly.

Exploded View



NO.	Part name	NO.	Part name
1	Top cover	17	Terminal block 2
2	Back panel	18	Compressor capacitor
3	Back panel for maintenance	19	Water flow switch
4	H/p switch	20	Bottom plate
5	L/p switch	21	Electrical box
6	Terminal block	22	Wired controller
7	Wire clip	23	Waterproof box
8	Condenser(titanium he in pvc shell)	24	Fan guard
9	Electrical box 1	25	Front panel
10	Compressor	26	Fan blade
11	Front panel-right side	27	Fan motor
12	Pressure gauge	28	Front panel-left side
13	Controller	29	Evaporator
14	Fan motor capacitor	30	Fan bracket
15	Water pump relay	31	4-way valve
16	Ac contactor	32	Four-way valve coil

Exploded View



NO.	Part name	NO.	Part name
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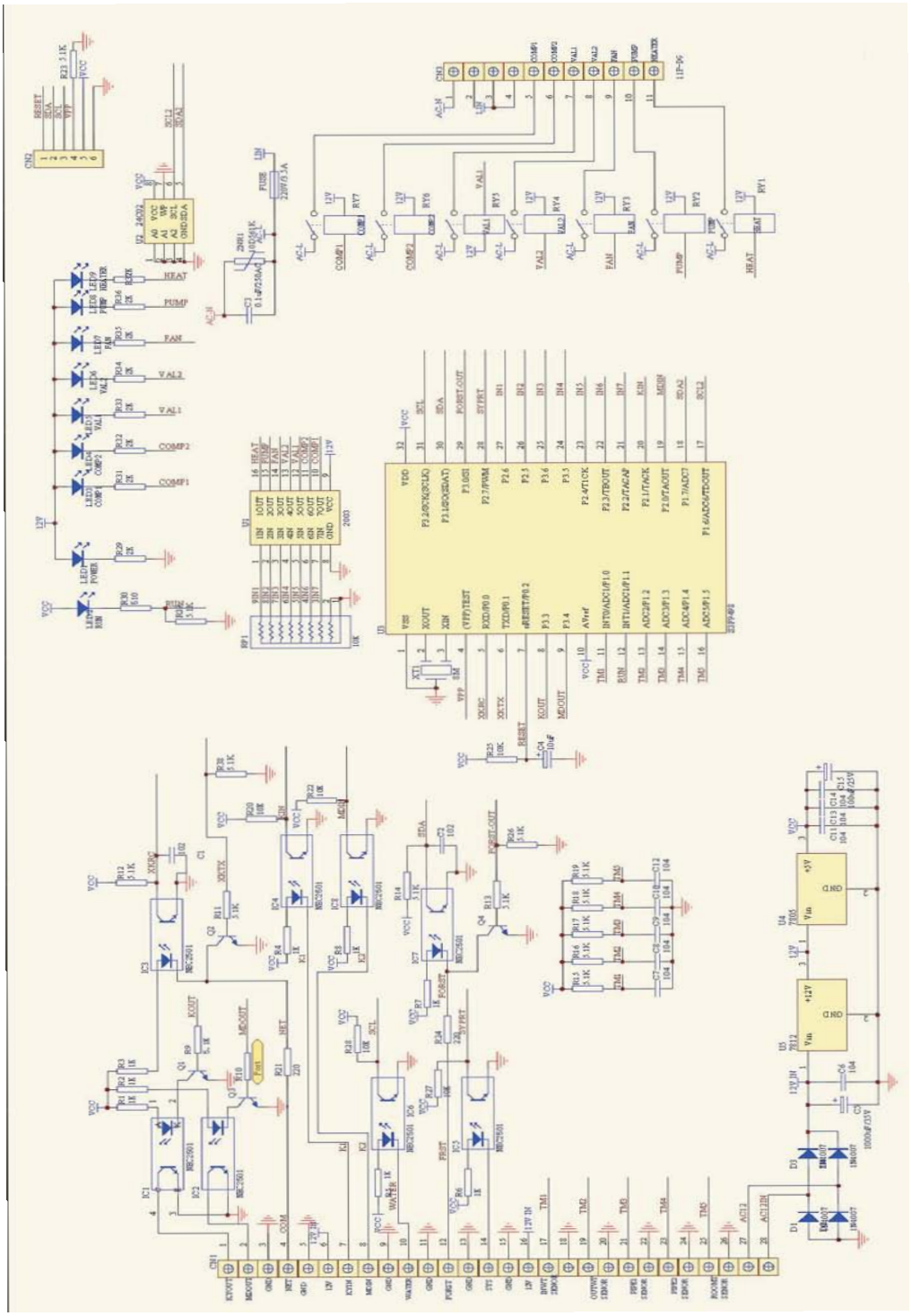
9	L/p switch	25	Front panel
10	Condenser（titanium he in pvc shell)	26	Fan blade
11	Pressure gauge	27	Fan motor
12	Compressor	28	Front panel-left side
13	Controller	29	Evaporator
14	Fan motor capacitor	30	Fan bracket
15	Water pump relay	31	4-way valve
16	AC contactor	31.1	Four-way valve coil

Electrical Diagram



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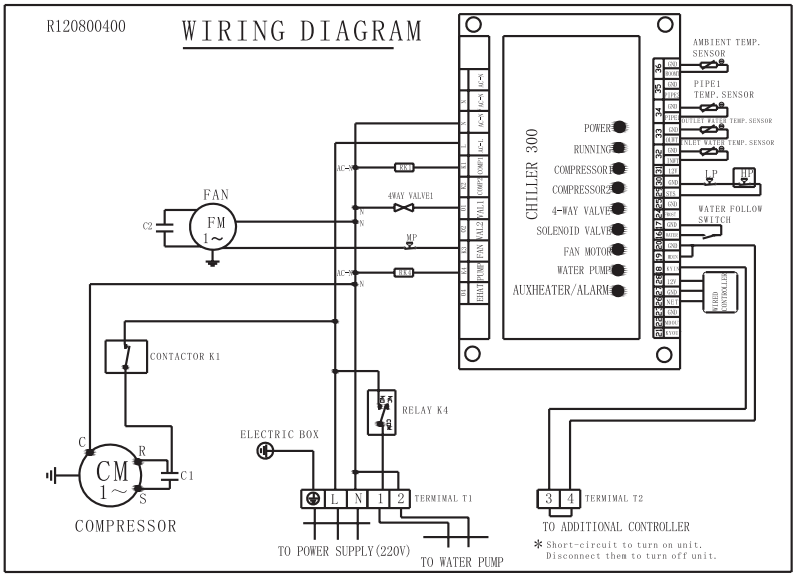
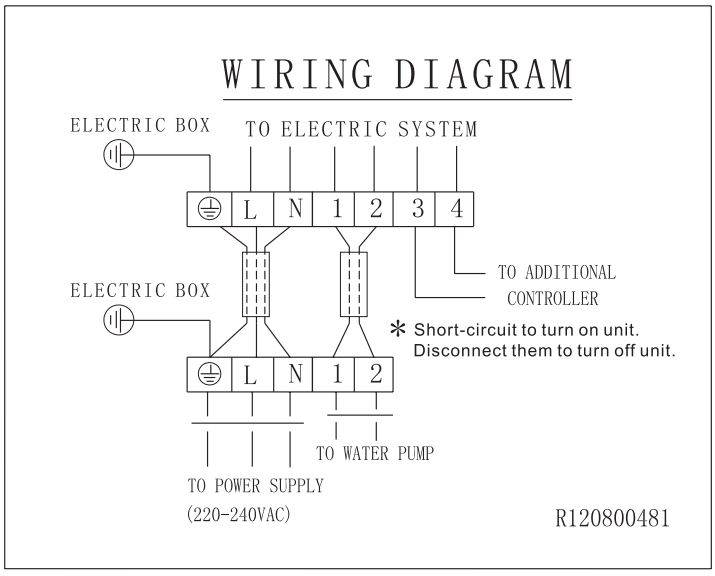
Wiring Diagram





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This diagram is correct at the time of publication. Manufacturing changes could lead to modifications. Always refer to the diagram suppplide with the product.

Resistance/Temperature table

°C	K (Ω)		°C	K (Ω)		°C	K (Ω)
-30.0	63.7306		18.0	6.59.34		42.0	2.6735
-25.0	48.5994		19.0	6.3333		43.0	2.5816
-20.0	37.3992		20.0	6.0850		44.0	2.4934
-15.0	29.0286		21.0	5.8479		45.0	2.4087
-10.0	22.7155		22.0	5.6213		46.0	2.3273
-5.0	17.9129		23.0	5.4048		47.0	2.2491
0.0	14.2293		24.0	5.1978		48.0	2.1739
1.0	13.6017		25.0	5.0000		49.0	2.1016
2.0	13.0057		26.0	4.8108		50.0	2.0321
3.0	12.4393		27.0	4.6298		55.0	1.7232
4.0	11.9011		28.0	4.4566		60.0	1.4666
5.0	11.3894		29.0	4.2909		65.0	1.2526
6.0	10.9028		30.0	4.1323		70.0	1.0734
7.0	10.4399		31.0	3.9804		75.0	0.9228
8.0	9.9995		32.0	3.8349		80.0	0.7959
9.0	9.5802		33.0	3.6955		85.0	0.6885
10.0	9.1810		34.0	3.5620		90.0	0.5973
11.0	8.8008		35.0	3.4340		95.0	0.5196
12.0	8.4385		36.0	3.3113		100.0	0.4533
13.0	8.0934		37.0	3.1937			
14.0	7.7643		38.0	3.0809			
15.0	7.4506		39.0	2.9727			
16.0	7.1513		40.0	2.8688			
17.0	6.8658		41.0	2.7692			

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