



# **EVO Force-i** **(i19, i24, i28-3)** **MANUAL**



## **Installation & Operation**

**Read this manual carefully before  
installing or operating this unit**

## Contents

1. Preface .....	3
1.1 Caution & Warnings .....	5
2. Unit Dimensions.....	6
3. Installation & Connection.....	7
3.1 Installation Illustration .....	7
3.2 Unit Location.....	8
3.3 Minimum Clearances.....	8
3.4 Plumbing.....	9
3.5 Electrical Wiring .....	10
3.6 Initial Start-up of the Unit.....	10
4. Usage and Operation Instructions .....	11
4.1 Controller Introduction .....	11
4.2 Controller Functions.....	12
4.2.1 Start-up and Shutdown.....	12
4.2.2 Mode Switch and Target Temperature Setting.....	12
4.2.3 Clock Setting.....	13
4.2.4 Silent & Silent Timing Setting.....	15
4.2.5 Fault History .....	17
4.2.6 Colour Display Calibration .....	17
4.2.7 Temperature Curve .....	18
4.3 Parameter List and Breakdown Table .....	19
4.4 Interface Drawing.....	21
5. Maintenance and Inspection .....	23
6. Appendix .....	28
6.1 Cable Specifications.....	28
6.2 Comparison Table of Refrigerant Saturation Temperature.....	28
7. Warranty .....	29
7.1 Warranty Registration .....	30

## 1. Preface

To provide our customers with quality, reliability and versatility, this product has been made to strict production standards. This manual includes all the necessary information about installation, debugging, discharging and maintenance. Please read this manual carefully before you open or maintain the unit. The manufacturer of this product will not be held responsible if someone is injured or the unit is damaged as a result of improper installation, debugging, or unnecessary maintenance. It is vital that the instructions within this manual are always adhered to. The unit must be installed by qualified personnel.

- The unit can only be repaired by a qualified installer centre, personnel or an authorised dealer.
- Maintenance and operation must be carried out according to the recommended time and frequencies, as stated in this manual.
- Use genuine standard spare parts only.
- Failure to comply with these recommendations will invalidate the warranty.

The Force-i series has the following characteristics:

### **Durable**

The heat exchanger is made of PVC & Titanium tubing with can withstand prolonged exposure to swimming pool water.

### **Installation Flexibility**

The unit can be installed outdoors.

### **Quiet Operation**

The unit comprises of an efficient rotary/scroll compressor and a low-noise fan motor which guarantees its quiet operation.

### **Advanced Controlling**

The unit includes micro-computer controlling, allowing all operation parameters to be set. Operation status can be displayed on the LCD wire controller/

## **WARNING**

Do not use any means to accelerate the defrosting processor or to clean other than those recommended by the manufacturer.

The unit must be stored in a room without any continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater.)

Do not pierce or burn.

Be aware that refrigerants may not contain an odour.



NOTE: The manufacturer may provide other suitable examples or may provide additional information about the refrigerant odour.

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

The appliance shall be installed in accordance with national wiring regulations.

Do not operate your unit in a wet room such as a bathroom or laundry room.

Before obtaining access to terminals, all supply circuits must be disconnected.

An all-pole disconnection device must be incorporated which as at least 3mm clearances in all poles, a leakage current that may exceed 10mA, residual current device (RCD) having a rated residual operating current not exceeding 30mA and disconnection must be incorporated in the fixed wiring in accordance with the wiring rules.

The unit should be installed, operated and stored in a room with a floor area larger than 30m<sup>2</sup>.

- The installation of pipe-work shall be kept to a minimum 30 m<sup>2</sup>
- Spaces where refrigerant pipes shall be compliance with national gas regulations.
- Servicing shall be performed only as recommended by the manufacturer.
- The appliance shall be stored in a well-ventilated area where the room size corresponds to the room area as specified for operation.
- All working procedure that affects safety means shall only be carried by competent persons.

Transport of equipment containing flammable refrigerants

- Compliance with the transport regulations
- Marking of equipment using signs
- Compliance with local regulations
- Disposal of equipment using flammable refrigerants
- Compliance with national regulations
- Storage of equipment/appliances
- The storage of equipment should be in accordance with the manufacturer's instructions. Storage of packed (unsold) equipment
- Storage package protection should be constructed such that mechanical damage to the equipment inside the package will not cause a leak of the refrigerant charge.
- The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

## 1.1 Caution & Warnings

The unit can only be repaired by qualified personnel or an authorised dealer.

Children should be supervised to ensure that they do not play with the appliance.

Please make sure that the unit and power connection have good earthing, otherwise there is a risk of electrical shock.

Directive 2002/96/EC (WEEE):

The symbol depicting a crossed-out waste bin that is underneath the appliance indicates that this product at the end of its useful life, must be handled separately from domestic waste, and must be taken to a recycling centre for electric and electronic devices or handed back to the dealer when purchasing an equivalent appliance.

Directive 2002/95/EC (RoHs): This product is compliant with directive 2002/95/EC (RoHs) concerning restrictions for the use of harmful substances in electric and electronic devices.

The unit CANNOT be installed near flammable gas. If there is any leakage of the gas a fire can occur.

Make sure that there is circuit breaker for the unit, lack of circuit breaker can lead to electrical shock or fire.

The heat pump located inside the unit is equipped with an over-load protection system. It does not allow for the unit to start for at least 3 minutes from a previous stoppage.

The unit can only be repaired by the qualified personnel of an installer center or an authorized dealer.

Installation must be performed in accordance with the NEC/CEC by authorized person only (for North America market)

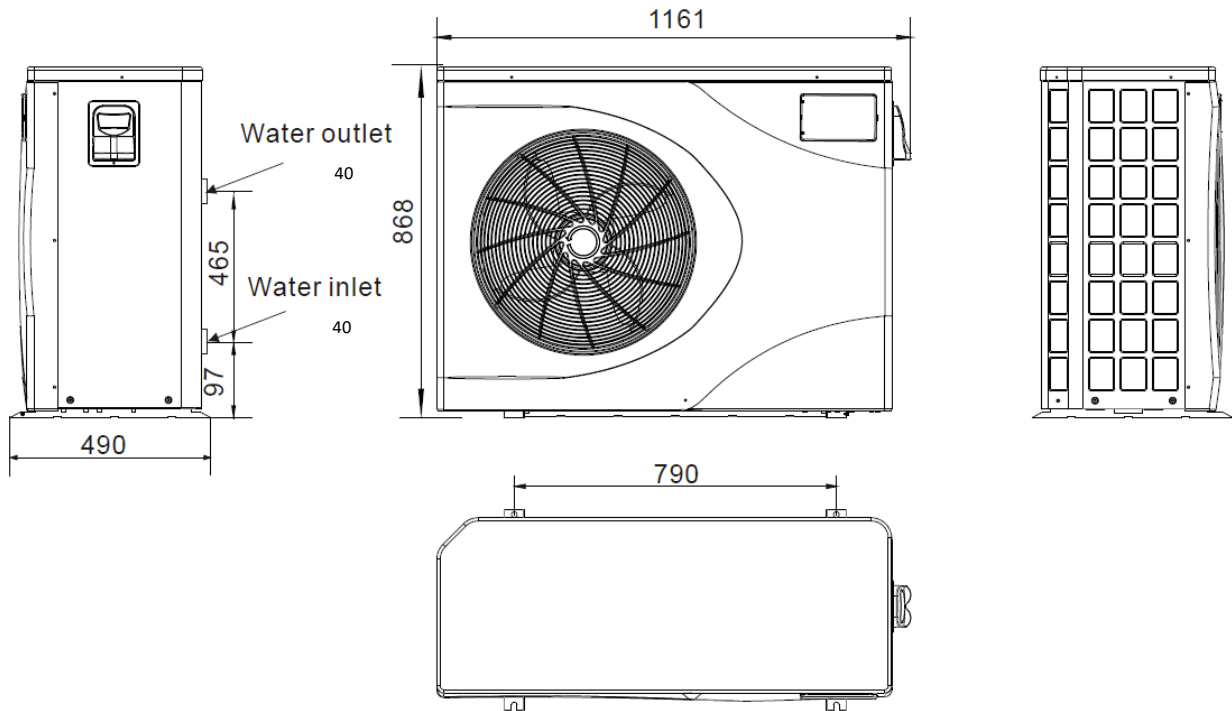
USE SUPPLY WIRES SUITABLE FOR 75°C.

Caution: Single wall heat exchanger, not suitable for potable water connection.



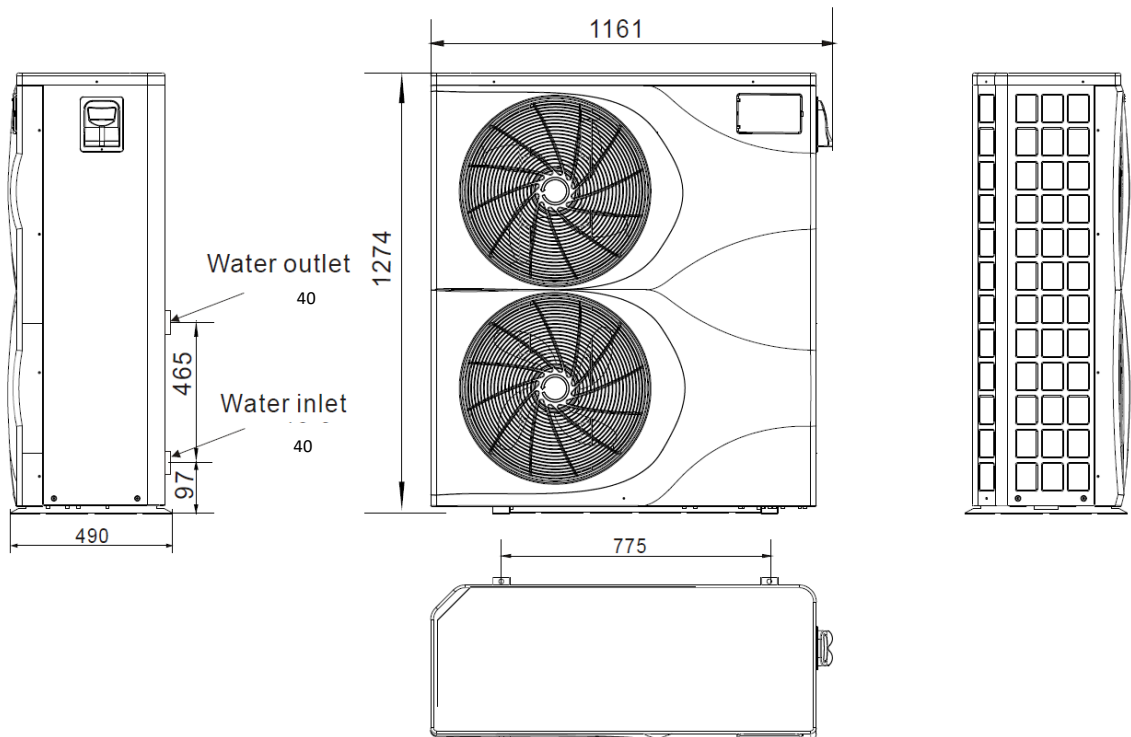
## 2. Unit Dimensions

### Force i19



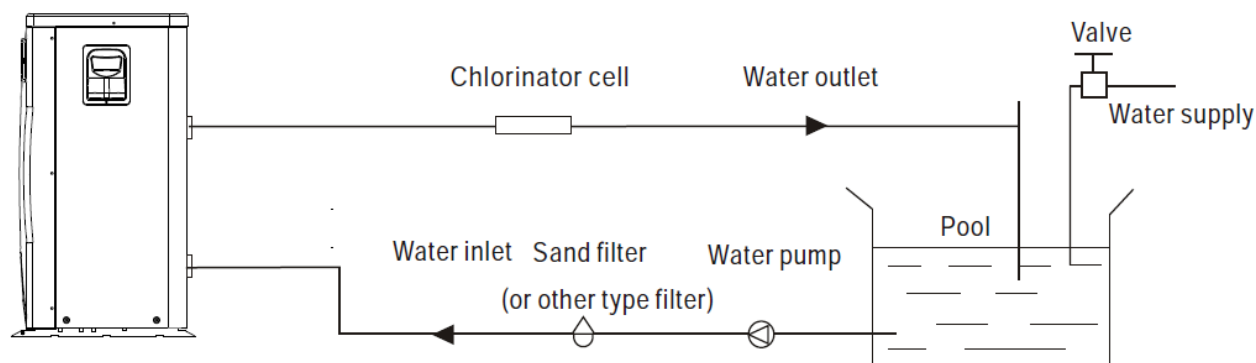
### Force i24/ Force i28-3

unit: mm



## 3. Installation & Connection

### 3.1 Installation Illustration



The factory only provides the main unit and the water unit, other items in the illustration above are necessary spare parts for the water system that are to be provided by the user or the installer.

#### ATTENTION:

Please follow these steps when using for the first time

1. Open valve and charge water
2. Make sure that the pump and the water-in pipe have been filled with water.
3. Close the valve and start the unit.

NOTE: It is necessary that the water-in pipe is higher than the pool surface.

The schematic diagram is for reference only. Please check the water inlet/outlet label on the heat pump while plumbing installation.

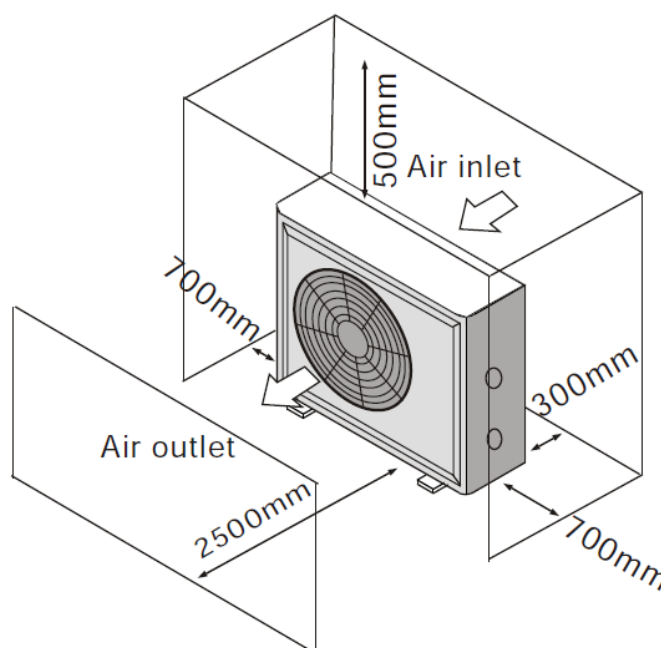
### 3.2 Unit Location

Before installation it is very important to ensure 4 variables are carefully checked to allow the unit to operate correctly:

- Adequate Air Flow
- Correct water flow volume
- Correct electrical connection & supply
- Heater condition

\*For indoor pools please consult the supplier.  
DO NOT place the unit in an enclosed area, where the units discharge air can be re-circulated.

In an enclosed area take measures to evacuate the cold waste air out of the room. Conversely make sure there is adequate air entering the room to supply the heat pump.



### 3.3 Minimum Clearances

Evo recommend the heat pump should ONLY be installed in a location with appropriate ventilation. See above for minimum airflow clearances.

The Evo pool heat pump should be installed with a minimum clearance of at least 3.5m to the water's edge. Furthermore, EvoHeat recommend installing the heat pump no greater than 7.5 meters away from the water's edge due to heat loss from the piping. If you do not have a location with these suggested clearances, please contact our EvoHeat Tech Support Specialist on 1300 859 933 to discuss appropriate installation locations.

The heat pump should be installed a maximum of 5m below the water level of the pool/spa.

Make sure the heat pump is not located where large amounts of water may run-off from a roof into the unit. Sharp sloping roofs without gutters will allow excessive amounts of rain water mixed with debris from the roof to be forced through the unit. A water deflector may be needed to protect the heat pump.

If installing the heater on an existing pump/filtration system, the heater must be installed AFTER the filter and BEFORE the chlorinator/sanitizer.

The heat pump should be installed on a flat level surface.

In the event that a suitable location is unavailable contact Evo Industries for specialist technical advice.



### 3.4 Plumbing

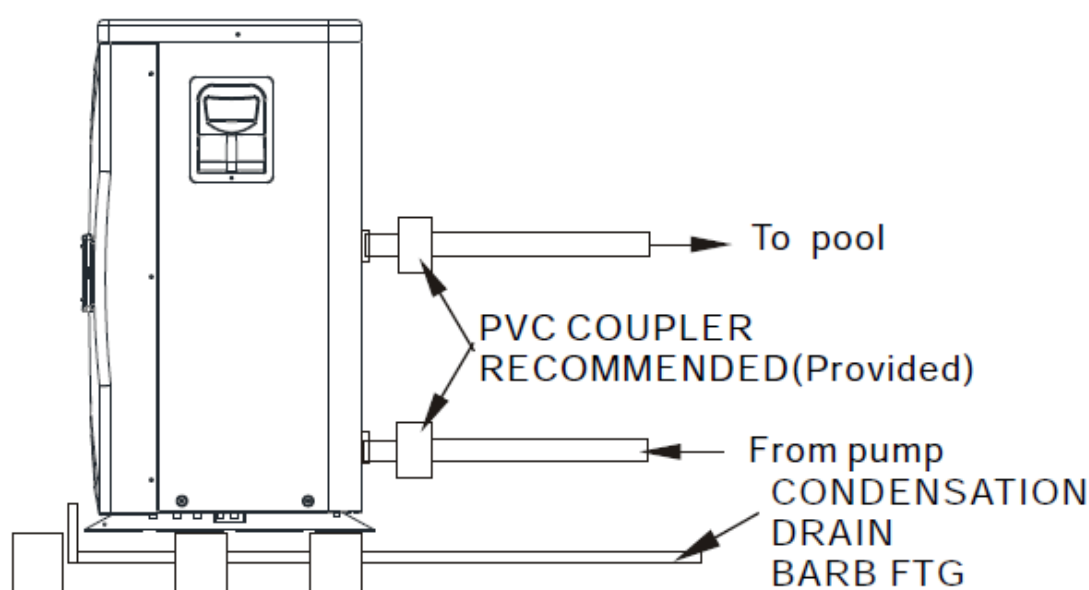
The Swimming Pool Heat Pumps exclusive rated flow titanium heat exchanger requires no special plumbing arrangements except bypass (please set the flow rate according to the nameplate).

The water pressure drop is less than 10kPa at max flow rate. Since there is no residual heat or flame temperatures, the unit does not need copper heat sink piping. PVC pipe can be run straight into the unit.

Location: Connect the unit in the pool pump discharge (return) line downstream of all filter and pool pumps, and upstream of any chlorinators, ozonators or chemical pumps.

Standard models have slip glue fittings which accept 40mm NB PVC pipe for connection to the pool or spa filtration piping. By using a 50 NB to 40NB you can plumb 40NB.

Give serious consideration to adding a quick coupler fitting at the unit inlet and outlet to allow easy draining of unit for winterizing and to provide easier access should servicing be required.



Since the Heat pump cools down the air about 4 -5°C, water may condense on the fins of the horseshoe shaped evaporator. If the relative humidity is very high, this could be as much as several litres an hour. The water will run down the fins into the basepan and drain out through the barbed plastic condensation drain fitting on the side of the basepan. This fitting is designed to accept 20mm clear vinyl tubing which can be pushed on by hand and run to a suitable drain. It is easy to mistake the condensation for a water leak inside the unit.

NB: A quick way to verify that the water is condensation is to shut off the unit and keep the pool pump running. If the water stops running out of the basepan, it is condensation. AN EVEN QUICKER WAY IS TO TEST THE DRAIN WATER FOR CHLORINE - if there is no chlorine present, then it's condensation.

### 3.5 Electrical Wiring

**NOTE:** Although the unit heat exchanger is electrically isolated from the rest of the unit, it simply prevents the flow of electricity to or from the pool water. Grounding the unit is still required to protect you against short circuits inside the unit. Bonding is also required.

The unit has a separate molded-in junction box with a standard electrical conduit nipple already in place. Just remove the screws and the front panel, feed your supply lines in through the conduit nipple and wire-nut the electric supply wires to the three connections already in the junction box (four connections if three phase). To complete an electrical hookup, connect the heat pump by electrical conduit, UF cable or other suitable means as specified (as permitted by local electrical authorities) to a dedicated AC power supply branch circuit equipped with the proper circuit breaker, disconnect or time delay fuse protection.

#### Disconnect

A disconnect means (circuit breaker, fused or un-fused switch) should be located within sight of and readily accessible from the unit, this is common practice on commercial and residential air conditioners and heat pumps. It prevents remotely-energizing unattended equipment and permits turning off power at the unit while the unit is being serviced.

### 3.6 Initial Start-up of the Unit

**NOTE:** For the unit to heat the pool or spa, the filter pump must be running to circulate water through the heat exchanger.

Start-up Procedure - After installation is completed, you should follow these steps:

1. Turn on your filter pump. Check for water leaks and verify flow to and from the pool.
2. Turn on the electrical power supply to the unit, then press the key ON/OFF on the wire controller, it should start in several seconds.
3. After running a few minutes make sure the air leaving the top (side) of the unit is cooler (Between 5-10 °C)
4. With the unit operating turn the filter pump off. The unit should also turn off automatically.
5. Allow the unit and pool pump to run 24 hours per day until desired pool water temperature is reached. When the water-in temperature reaches the desired setting, the unit will slow down for a period of time, if the temperature is maintained for 45 minutes the unit will turn off. The unit will now automatically restart (as long as your pool pump is running) when the pool temperature drops more than 0.2 below set temperature.

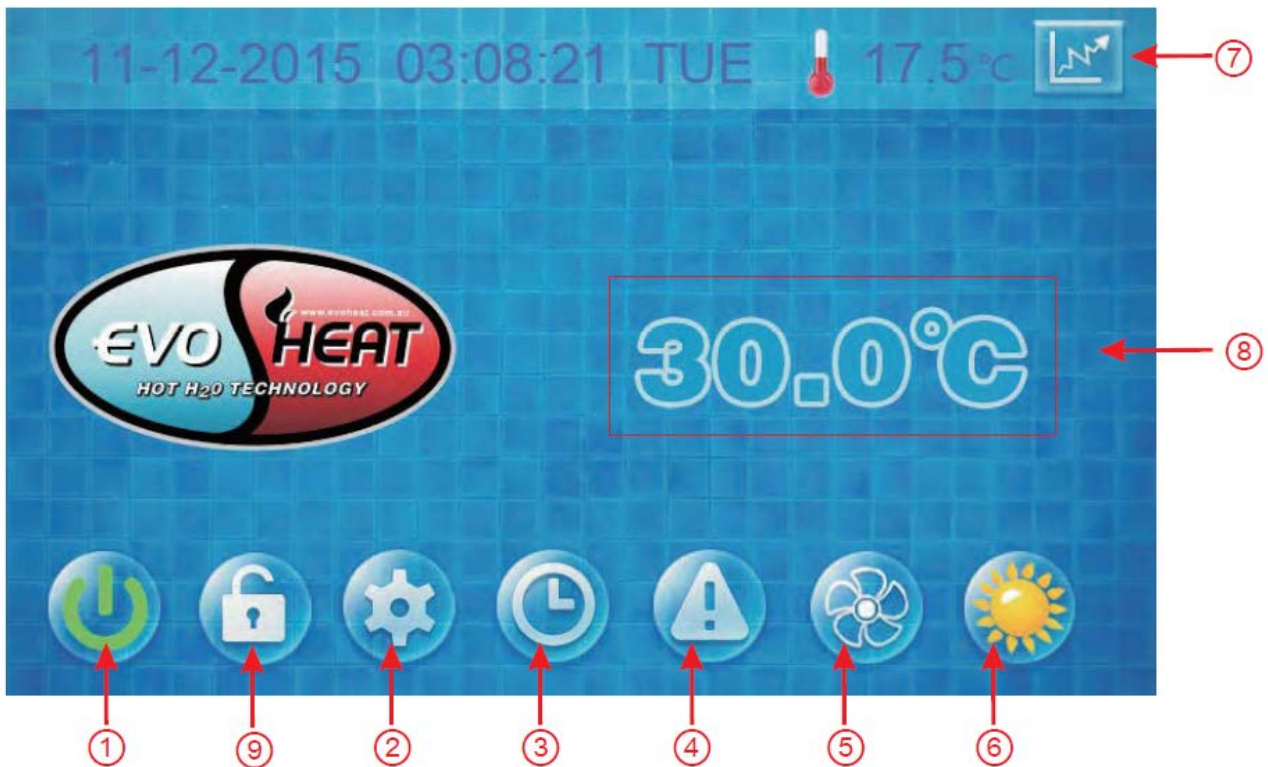
#### Time Delay

The unit is equipped with a 3-minute built-in solid-state restart delay included to protect control circuit components and to eliminate restart cycling and contactor chatter. This time delay will automatically restart the unit approximately 3 minutes after each control circuit interruption. Even a brief power interruption will activate the solid state 3-minute restart delay and prevent the unit from starting until the 5-minute countdown is completed.



## 4. Usage and Operation Instructions

### 4.1 Controller Introduction



NO.	Name	The button function
①	ON/OFF	Press to start /shut off the unit
②	Parameter	Click this button to view the unit state and the parameter
③	CLOCK	Press to set the clock, the timer on or timer off. When the timer was starting, the button is green
④	Fault display	Click to view fault history
⑤	Silent setting	Click to turn on/off silent function and to set timing Low speed function.
⑥	MODE	Click to enter mode setting and the target temp. Setting interface
⑦	Temp. curve	Click to view the temp. and power curve
⑧	Water Inlet Temp.	Click to enter mode setting and the target temp. Setting interface
⑨	LOCK	Click to lock the screen , Input "22" to unlock the screen by press the "lock button"

## 4.2 Controller Functions

### 4.2.1 Start-up and Shutdown

As shown in figure 4.1:

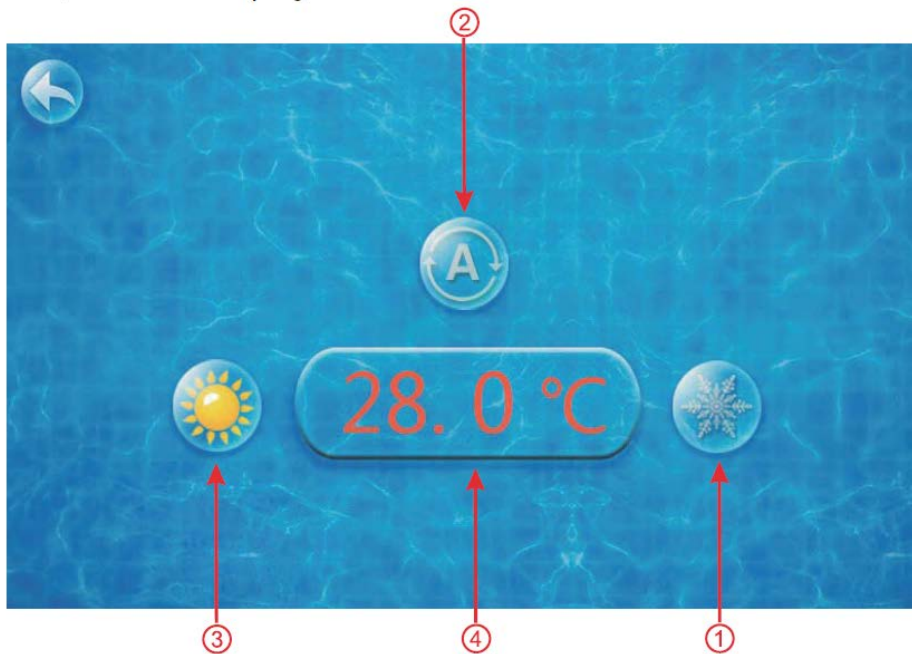
In shutdown status, click ① then the unit will be booted

In booting status, click ① then the unit will be shut down.

### 4.2.2 Mode Switch and Target Temperature Setting

#### MODE SWITCH

In the main interface, click mode button or inlet water temperature setting button, interface displays as follows:



Click the refrigeration mode button ①, automatic mode button ② or heating mode button ③ then you can select the corresponding mode.

Note: when the unit is designed for single automatic mode or single thermal mode, the mode can not be switched.

#### TARGET TEMP. SETTING

Click the temperature set button ④, you can set the target temperature.

### 4.2.3 Clock Setting

In the main interface, click on the clock Settings button, interface displays as follows:



#### 4.2.3.1 Time Setting

Click on the time Settings button ①, interface displays as follows:



Click the value to set time directly, the click confirm button to save the Settings.

For example: setup time: the 30-11-2016 16:00:00, input 30 11 16 16 00 00, the time change then click confirm button.

Note: if the input format is not correct, the wrong time will be saved by

## 4.2.3.2 Timing Setting

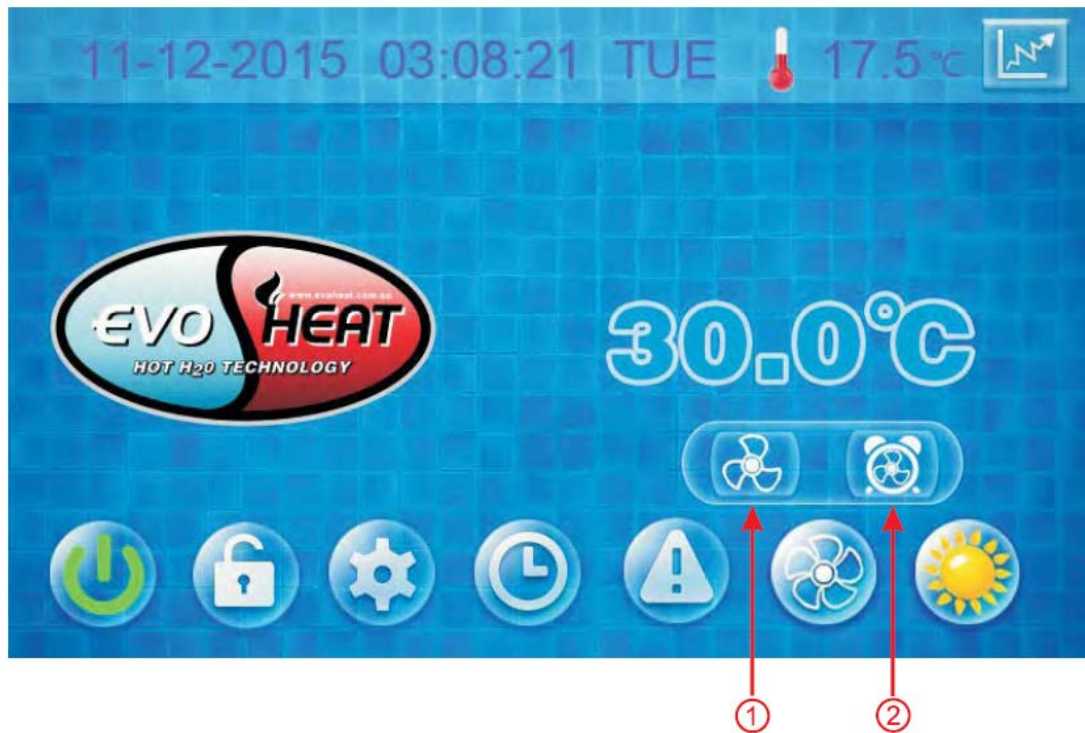
Click the timing set button ② to enter timing set interface.



NO.	Name	Button color	Button function
①	Timing start button	Start: green End: gray	Click this button to start or end timing start setting function
②	Timing on setting		Click to set start time of the timing
③	Timing end button	Open: red End: gray	Click this button to start or end timing end setting function
④	Timing off setting		Click to set end time of the timing

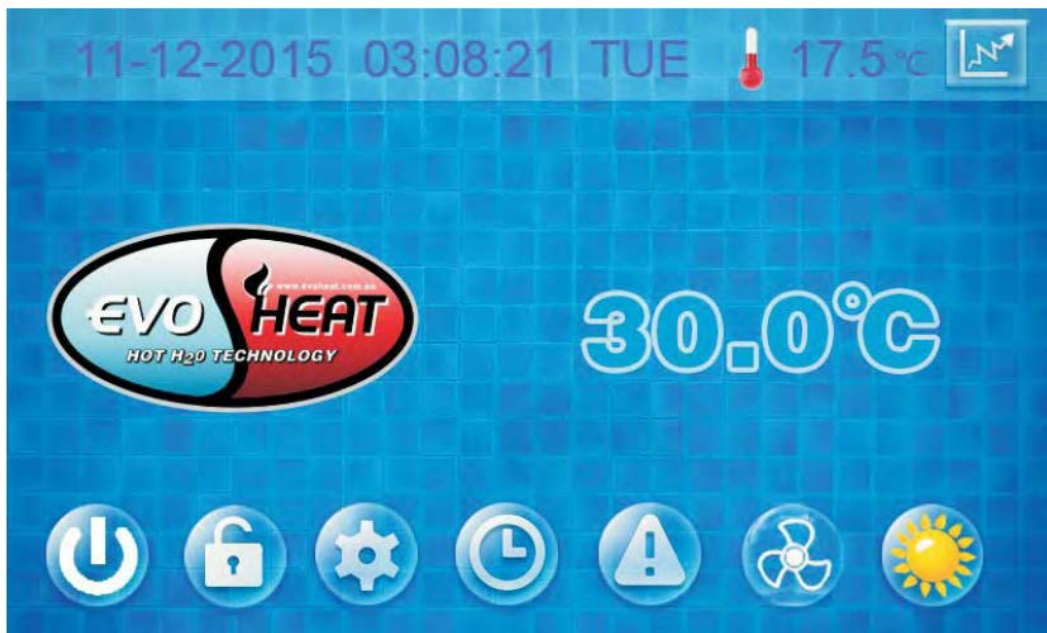
#### 4.2.4 Silent & Silent Timing Setting

Click the silent setting button ,and the interface displays as follows:



##### 4.2.4.1 The Silent Button

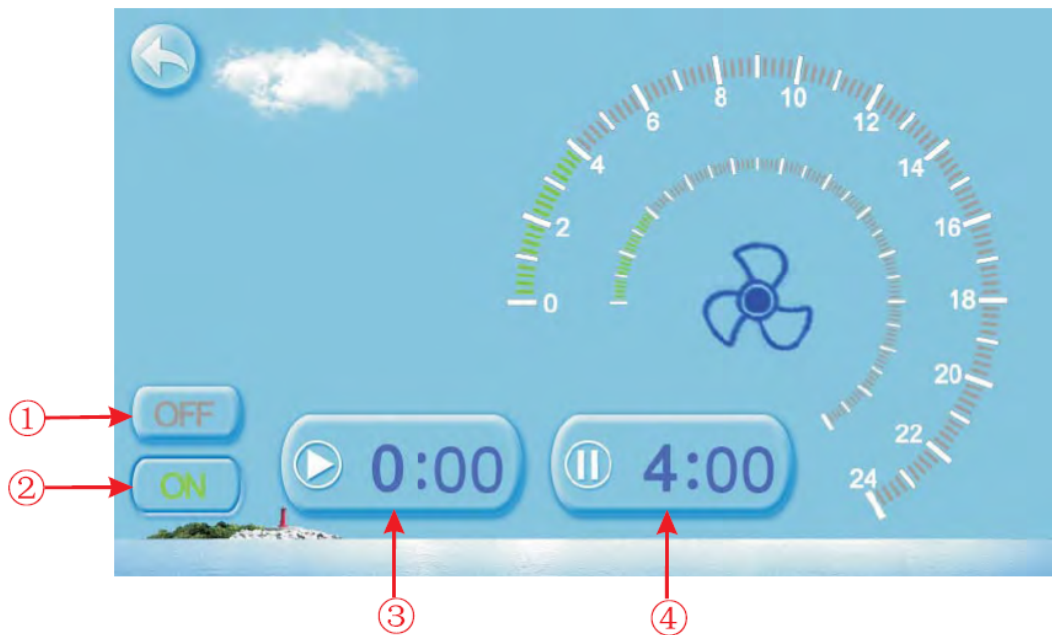
Click the silent button ①, the unit will enter the silent mode, and interface displays as follows:



Click the silent button ① again, to exit the silent mode.

## 4.2.4.2 Timing Silent Function Setting

Click timing silent button ②, and interface displays as follows:



NO.	Name	Colour	Function
①	Timing silent off	Used: red Unused:gray	Click to use or unuse timing off function
②	Timing silent on	Use:green Unused:gray	Click to use or unuse timing on function
③	Timing silent start time		Click this button to set the timing silent start time
④	Timing silent end time		Click this button to set the timing silent end time

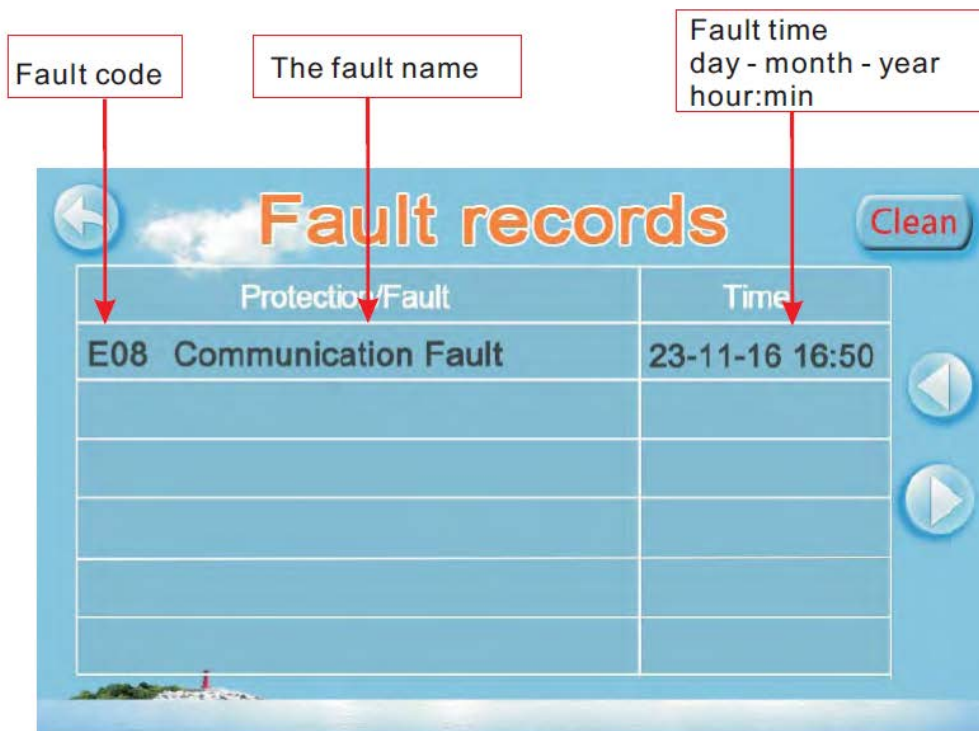
Start time and end time setting value must be among the range of 0:00-23:00, and setting value can be precise to hour digit.

For example above, click "ON" to use timing silent, the unit will start the silent at 0:00 points and end at 4:00; click "OFF" to unuse the timing silent, but if the unit is in timing silent mode, it will exit silent timing immediately.



#### 4.2.5 Fault History

In the main interface click fault display key, interface displays as follows:



If no failure, main interface displays static " ⚠ "

When fault occurs, the fault icon will flash between the " ⚠ " " ⚠ ", the failure interface will record time, code, name of the fault.

After troubleshooting, if you do not check the failure record, the main interface will display static " ⚠ "; if you check the failure record, the main interface will display static " ⚠ ";

Failure record is in reverse order, according to the happening time.

Press the "Clean" key, you can delete the fault record.

#### 4.2.6 Colour Display Calibration

Keep clicking quickly at the blank area on any interface until you hear a long beep. Then you will enter the calibration interface. Click "+" to start calibration. When you hear the beep again, you will finish the calibration and exit.

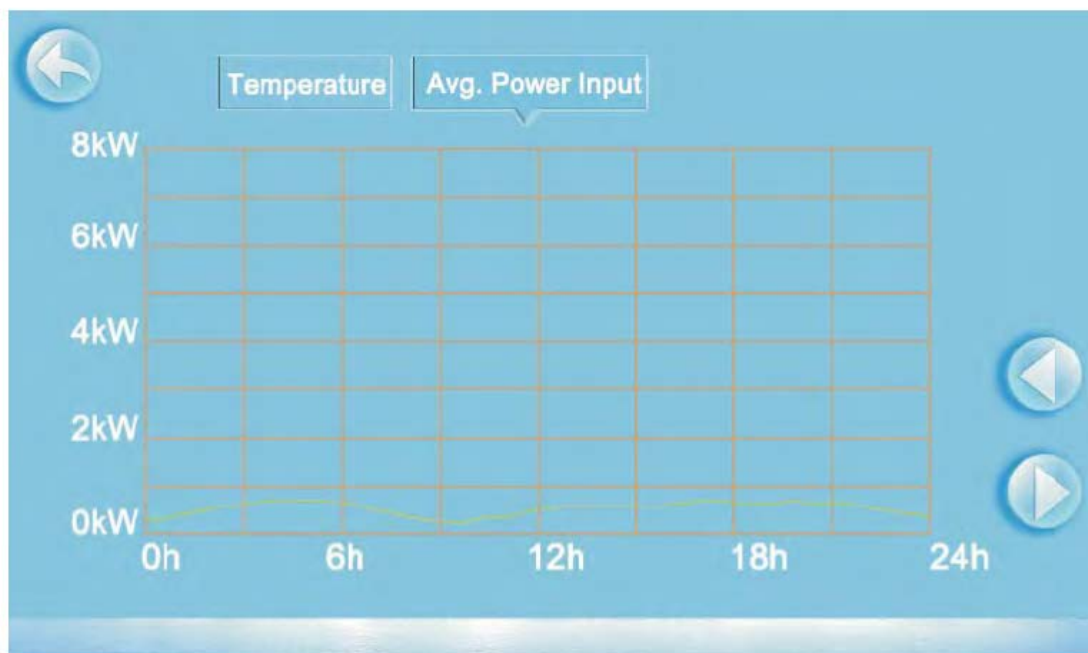
The wire controller can display the temperature unit as Fahrenheit or Celsius according to the unit model you bought.

#### 4.2.7 Temperature Curve

In the main interface, click the curve display button. It will display as follows:



##### 4.2.7.1 The average power curve



Temperature curve automatically updates every one hour, and the curve record can be stored for 60 days;

Start from the latest curve saved time, if power is off and curve data collecting time is less than one hour, the data in this period will not be saved;

### 4.3 Parameter List and Breakdown Table

#### (1) Electronic Control Fault Table

Can be judged according to the remote controller failure code and troubleshooting.

Protect/fault	Fault display	Reason	Elimination Methods
Standby	Non		
Normal boot	Non		
Inlet Temp. Sensor Fault	P01	The temp. Sensor is broken or short circuit	Check or change the temp. sensor
Outlet Temp. Sensor Fault	P02	The temp. Sensor is broken or short circuit	Check or change the temp. sensor
Ambient Temp. Sensor Fault	P04	The temp. Sensor is broken or short circuit	Check or change the temp. sensor
Coil1 Temp. Sensor Fault	P05	The temp. Sensor is broken or short circuit	Check or change the temp. sensor
Suction Temp. Sensor Fault	P07	The temp. Sensor is broken or short circuit	Check or change the temp. sensor
Discharge Temp. Sensor Fault	P081	The temp. Sensor is broken or short circuit	Check or change the temp. sensor
High Pressure Prot.	E01	The high-pressure switch is broken	Check the pressure switch and cold circuit
Low Pressure Prot.	E02	Low pressure1 protection	Check the pressure switch and cold circuit
Flow Switch Prot.	E03	No water/little water in water system	Check the pipe water flow and water pump
Anti-freezing Prot.	E07	Water flow is not enough	Check the pipe water flow and whether water system is jammed or not
Primary Anti-freezing Prot.	E19	The ambient temp. Is low	
Secondary Anti-freezing Prot.	E29	The ambient temp. Is low	
Inlet and outlet temp. too big	E06	Water flow is not enough and low differential pressure	Check the pipe water flow and whether water system is jammed or not
Low temperature protection	Non	The environment temp. is low	
Comp. Overcurrent Prot.	E051	The compressor is overload	Check whether the system of the compressor running normally
Exhaust Air over Temp Prot.	P082	The compressor is overload	Check whether the system of the compressor running normally
Communication Fault	E08	Communication failure between wire controller and mainboard	Check the wire connection between remote wire controller and main board
Antifreeze Temp. Sensor Fault	P09	Antifreeze temp sensor is broken or short circuited	check and replace this temp sensor
Waterway Anti-freezing Prot.	E05	Water temp. or ambient temp. is too low	
EC fan feedback Fault	F051	There is something wrong with fan motor and fan motor stops running	Check whether fan motor is broken or locked or not
Pressure sensor Fault	PP	The pressure Sensor is broken	Check or change the pressure sensor or pressure
Fan Motor1 Fault	F031	1. Motor is in locked-rotor state 2. The wire connection between DC-fan motor module and fan motor is in bad contact	1. Change a new fan motor 2. Check the wire connection and make sure they are in good contact
Low AT Protection	TP	Ambient temp is too low	
Fan Motor2 Fault	F032	1. Motor is in locked-rotor state 2. The wire connection between DC-fan motor module and fan motor is in bad contact	1. Change a new fan motor 2. Check the wire connection and make sure they are in good contact.
Communication Fault (speed control module)	E081	Speed control module and main board communication fail	Check the communication connection
Coil2 Temp. Sensor Fault	P15	The temp. sensor is broken or short circuit	Check or change the temp. sensor

Frequency Conversion Board Fault Table

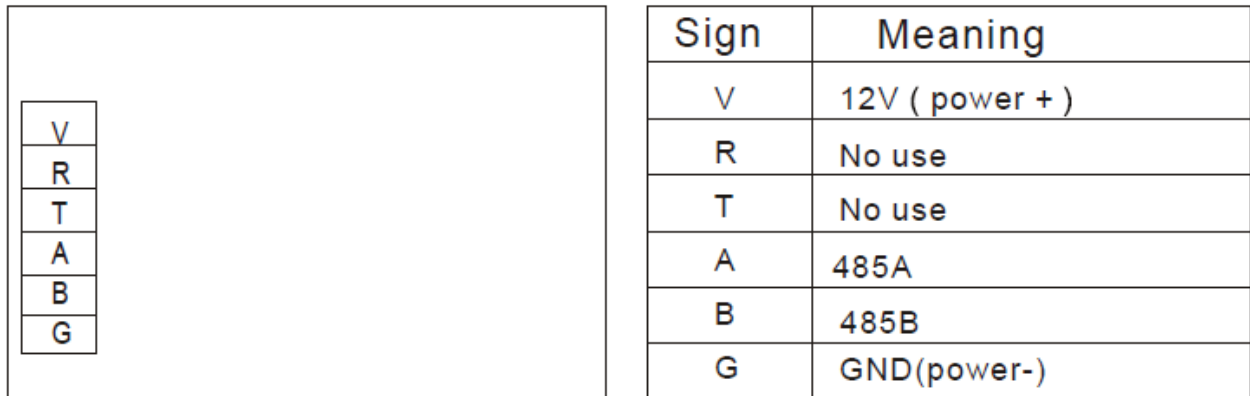
Protection/Fault	Fault Display	Reason	Elimination Methods
Drv1 MOP alarm	F01	MOP drive alarm	Recovery after the 150s
Inverter offline	F02	Frequency conversion board and main board communication failure	Check the communication connection
IPM protection	F03	IPM modular protection	Recovery after the 150s
Comp. Driver Failure	F04	Lack of phase, step or drive hardware damage	Check the measuring voltage check frequency conversion board hardware
DC Fan Fault	F05	Motor current feedback open circuit or short circuit	Check whether current return wires connected motor
IPM Overcurrent	F06	IPM Input current is large	Check and adjust the current measurement
Inv. DC Overvoltage	F07	DC bus voltage > Dc bus over-voltage protection value	Check the input voltage measurement
Inv. DC Lessvoltage	F08	DC bus voltage < Dc bus over-voltage protection value	Check the input voltage measurement
Inv. Input Lessvolt.	F09	The input voltage is low, causing the input current to be high	Check the input voltage measurement
Inv. Input Overvolt	F10	The input voltage is too high, more than outage protection current RMS	Check the input voltage measurement
Inv. Sampling Volt	F11	The input voltage sampling fault	Check and adjust the current measurement
Comm. Err DSP-PFC	F12	DSP and PFC connect fault	Check the communication connection
Input Over Cur.	F26	The equipment load is too large	
PFC Fault	F27	The PFC circuit protection	Check the PFC switch tube short circuit or not
IPM Over heating	F15	The IPM module is overheat	Check and adjust the current measurement
Weak Magnetic Warn	F16	Compressor magnetic force is not enough	
Inv. Input Out Phase	F17	The input voltage lost phase	Check and measure the voltage adjustment
IPM Sampling Cur.	F18	IPM sampling electricity is fault	Check and adjust the current measurement
Inv. Temp Probe Fail	F19	Sensor is short circuit or open circuit	Inspect and replace the sensor
Inverter Overheating	F20	The transducer is overheat	Check and adjust the current measurement
Inv. Overheating Warn	F22	Transducer temperature is too high	Check and adjust the current measurement
Comp. Overcut. Warn	F23	Compressor electricity is large	The compressor over-current protection
Input Over Cur. Warn	F24	Input current is too large	Check and adjust the current measurement
EEPROM Error Warn	F25	MCU error	Check whether the chip is damaged Replace the chip
V15V over/undervoltage fault	F28	The V15C is overload or undervoltage	Check the V15V input voltage in range 13.5v~16.5v or not

## (2) Parameter List

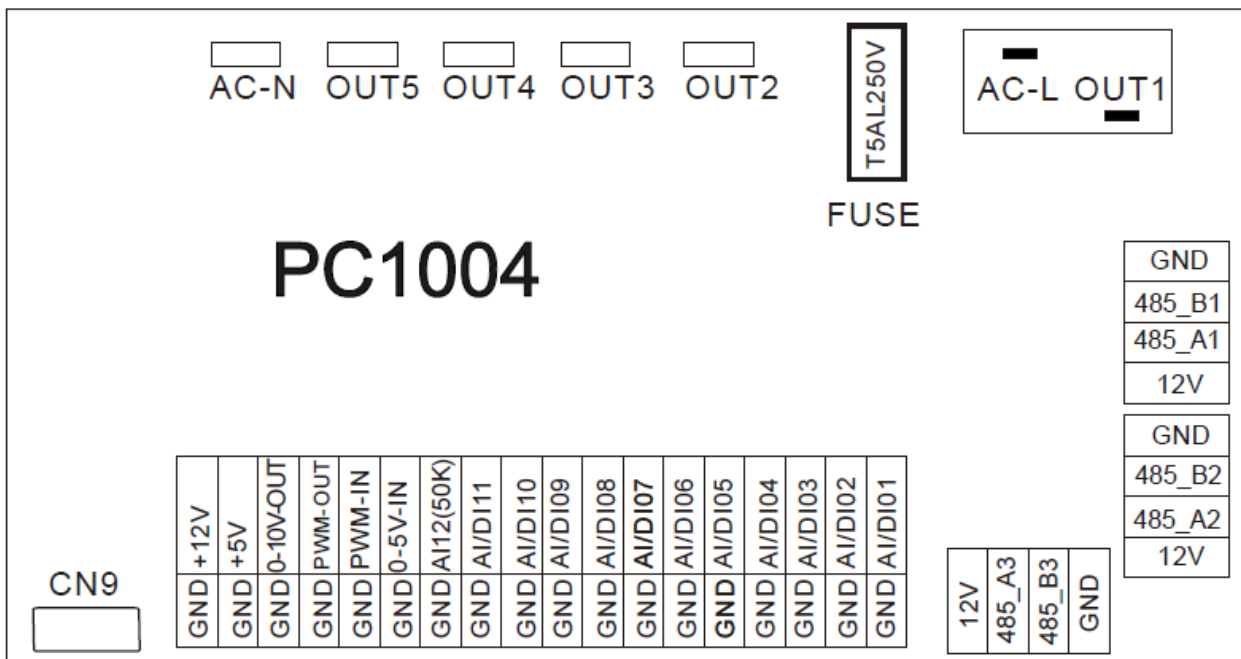
Meaning	Default	Remarks
Refrigeration target temperature set point	27°C	Adjustable
Heating the target temperature set point	27°C	Adjustable
Automatic target temperature set point	27°C	Adjustable

## 4.4 Interface Drawing

## (1) Wire Control Interface Diagram and Definition



## (2) Controller Interface Diagram and Definition



Main board of the input and output interface instructions below

Number	Sign	Meaning
01	OUT1	Compressor (output 220-230VAC)
02	OUT2	Water pump (output 220-230VAC)
03	OUT3	4-way valve (output 220-230VAC)
04	OUT4	High speed of fan (output 220-230VAC)
05	OUT5	Low speed of fan (output 220-230VAC)
06	AC-L	Live wire (input 220-230VAC)
07	AC-N	Neutral wire (input 220-230VAC)
08	AI/DI01	Emergency switch (input)
09	AI/DI02	Water flow switch (input)
10	AI/DI03	System low pressure (input)
11	AI/DI04	System high pressure (input)
12	AI/DI05	System suction temperature (input)
13	AI/DI06	Water input temperature (input)
14	AI/DI07	Water output temperature (input)
15	AI/DI08	System fan coil temperature (input)
16	AI/DI09	Ambient temperature (input)
17	AI/DI10	Mode switch (input)
18	AI/DI11	Master-slave machine switch/ antifreeze temperature (input)
19	AI12(50K)	System exhaust temperature (input)
20	0_5V_IN	Compressor current detection/pressure sensor (input)
21	PWM_IN	Master-slave machine switch/ Feedback signal of EC fan (input)
22	PWN_OUT	AC fan control (output)
23	0_10V_OUT	EC fan control (output)
24	+5V	+5V (output)
25	+12V	+12V (output)
26	GND	Frequency conversion board communications
27	485_B1	
28	485_A1	
29	12V	
30	GND	Colour line controller communication
31	485_B2	
32	485_A2	
33	12V	
34	CN9	Electronic expansion valve
35	GND	The port for centralized control system
36	485_B3	
37	485_A3	
38	12V	

## 5. Maintenance and Inspection

Check the water supply device and the release often. You should avoid the condition of no water or air entering into system, as this will influence unit's performance and reliability.

You should clear the pool/spa filter regularly to avoid damage to the unit as a result of the dirty or clogged filter.

The area around the unit should be dry, clean and well ventilated. Clean the side heating exchanger regularly to maintain good heat exchange as conserve energy.

The operation pressure of the refrigerant system should only be serviced by a certified technician.

Check the power supply and cable connection often, should the unit begin to operate abnormally, switch it off and contact the qualified technician.

Discharge all water in the water pump and water system, so that freezing of the water in the pump or water system does not occur. You should discharge the water at the bottom of water pump if the unit will not be used for an extended period of time. You should check the unit thoroughly and fill the system with water fully before using it for the first time after a break.

### Checks to the area

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, the following precautions shall be complied with prior to conducting work on the system. prolonged period of no usage.

### Work procedure

Work shall be undertaken under a controlled procedure to minimise the risk of a flammable gas or vapour being present while the work is being performed.

### General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided. The area around the workspace shall be sectioned off. Ensure that the conditions within the area have been made safe by control of flammable material.

### Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

### Presence of fire extinguisher

If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO<sub>2</sub> fire extinguisher adjacent to the charging

### No ignition sources

No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. No Smoking signs shall be displayed.



**Ventilated area**

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work. A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere. prolonged period of no usage.

**Checks to the refrigeration equipment**

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed. If in doubt consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using flammable refrigerants:

The charge size is in accordance with the room size within which the refrigerant containing parts are installed;

The ventilation machinery and outlets are operating adequately and are not obstructed; If an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;

Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;

Refrigeration pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

**Checks to electrical devices**

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment, so all parties are advised.

Initial safety checks shall include:

- . That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- . That there no live electrical components and wiring are exposed while charging, recovering or purging the system;
- . That there is continuity of earth bonding.

**Cabling**

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects. The check shall also consider the effects of aging or continual vibration from sources such as compressors or fans.





**Repairs to sealed components**

1) During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

2) Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

Ensure that apparatus is mounted securely.

Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

NOTE: The use of silicon sealant may inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to

**Repair to intrinsically safe components**

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating. Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

**Detection of flammable refrigerants**

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used.

**Leak detection methods**

The following leak detection methods are deemed acceptable for systems containing flammable refrigerants.

Electronic leak detectors shall be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need re-calibration. (Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25 % maximum) is confirmed.

Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Oxygen free nitrogen (OFN) shall then be purged through the system both before and during the brazing process.



**Removal and evacuation**

When breaking into the refrigerant circuit to make repairs or for any other purpose conventional procedures shall be used. However, it is important that best practice is followed since flammability is a consideration. The following procedure shall be adhered to:

- . Remove refrigerant;
- . Purge the circuit with inert gas;
- . Evacuate;
- . Purge again with inert gas;
- . Open the circuit by cutting or brazing.

The refrigerant charge shall be recovered into the correct recovery cylinders. The system shall be "flushed" with OFN to render the unit safe. This process may need to be repeated several times. Compressed air or oxygen shall not be used for this task.

Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place. This operation is absolutely vital if brazing operations on the pipe-work are to take place.

Ensure that the outlet for the vacuum pump is not close to any ignition sources and there is ventilation available. working on them.

**Labelling**

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed. Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

**Recovery**

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.

When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of flammable refrigerants. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.



The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The evacuation process shall be carried out prior to returning the compressor to the suppliers. Only electric heating to the compressor body shall be employed to accelerate this process. When oil is drained from a system, it shall be carried out safely.

### Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant. It is essential that electrical power is available before the task is commenced.

- a) Become familiar with the equipment and its operation.
- b) Isolate system electrically.
- c) Before attempting the procedure ensure that:
  - Mechanical handling equipment is available, if required, for handling refrigerant cylinders;
  - All personal protective equipment is available and being used correctly;
  - The recovery process is always supervised by a competent person;
  - Recovery equipment and cylinders conform to the appropriate standards.
- d) Pump down refrigerant system, if possible.
- e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- f) Make sure that cylinder is situated on the scales before recovery takes place.
- g) Start the recovery machine and operate in accordance with manufacturer's instructions.
- h) Do not overfill cylinders. (No more than 80 % volume liquid charge).
- i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.

### Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept upright.
- Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the refrigeration system.

Prior to recharging the system, it shall be pressure tested with OFN. The system shall be leak tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

The safety wire model is 5\*20\_5A/250VAC, and must meet the explosion-proof requirements



## 6. Appendix

### 6.1 Cable Specifications

#### Single Phase Unit

Nameplate maximum current	Phase line	Earth line	MCB	Creepage protector	Signal line
No more than 10A	2 x 1.5mm <sup>2</sup>	1.5mm <sup>2</sup>	20A	30mA less than 0.1 sec	n x 0.5mm <sup>2</sup>
10~16A	2 x 2.5mm <sup>2</sup>	2.5mm <sup>2</sup>	32A	30mA less than 0.1 sec	
16~25A	2 x 4mm <sup>2</sup>	4mm <sup>2</sup>	40A	30mA less than 0.1 sec	
25~32A	2 x 6mm <sup>2</sup>	6mm <sup>2</sup>	40A	30mA less than 0.1 sec	
32~40A	2 x 10mm <sup>2</sup>	10mm <sup>2</sup>	63A	30mA less than 0.1 sec	
40 ~63A	2 x 16mm <sup>2</sup>	16mm <sup>2</sup>	80A	30mA less than 0.1 sec	
63~75A	2 x 25mm <sup>2</sup>	25mm <sup>2</sup>	100A	30mA less than 0.1 sec	
75~101A	2 x 25mm <sup>2</sup>	25mm <sup>2</sup>	125A	30mA less than 0.1 sec	
101~123A	2 x 35mm <sup>2</sup>	35mm <sup>2</sup>	160A	30mA less than 0.1 sec	
123~148A	2 x 50mm <sup>2</sup>	50mm <sup>2</sup>	225A	30mA less than 0.1 sec	
148~186A	2 x 70mm <sup>2</sup>	70mm <sup>2</sup>	250A	30mA less than 0.1 sec	
186~224A	2 x 95mm <sup>2</sup>	95mm <sup>2</sup>	280A	30mA less than 0.1 sec	

#### Three Phase Unit

Nameplate maximum current	Phase line	Earth line	MCB	Creepage protector	Signal line
No more than 10A	3 x 1.5mm <sup>2</sup>	1.5mm <sup>2</sup>	20A	30mA less than 0.1 sec	n x 0.5mm <sup>2</sup>
10~16A	3 x 2.5mm <sup>2</sup>	2.5mm <sup>2</sup>	32A	30mA less than 0.1 sec	
16~25A	3 x 4mm <sup>2</sup>	4mm <sup>2</sup>	40A	30mA less than 0.1 sec	
25~32A	3 x 6mm <sup>2</sup>	6mm <sup>2</sup>	40A	30mA less than 0.1 sec	
32~40A	3 x 10mm <sup>2</sup>	10mm <sup>2</sup>	63A	30mA less than 0.1 sec	
40 ~63A	3 x 16mm <sup>2</sup>	16mm <sup>2</sup>	80A	30mA less than 0.1 sec	
63~75A	3 x 25mm <sup>2</sup>	25mm <sup>2</sup>	100A	30mA less than 0.1 sec	
75~101A	3 x 25mm <sup>2</sup>	25mm <sup>2</sup>	125A	30mA less than 0.1 sec	
101~123A	3 x 35mm <sup>2</sup>	35mm <sup>2</sup>	160A	30mA less than 0.1 sec	
123~148A	3 x 50mm <sup>2</sup>	50mm <sup>2</sup>	225A	30mA less than 0.1 sec	
148~186A	3 x 70mm <sup>2</sup>	70mm <sup>2</sup>	250A	30mA less than 0.1 sec	
186~224A	3 x 95mm <sup>2</sup>	95mm <sup>2</sup>	280A	30mA less than 0.1 sec	

### 6.2 Comparison Table of Refrigerant Saturation Temperature

Pressure (MPa)	0	0.3	0.5	0.8	1	1.3	1.5	1.8	2	2.3
Temperature (R410A)(°C)	-51.3	-20	-9	4	11	19	24	31	35	39
Temperature (R32)(°C)	-52.5	-20	-9	3.5	10	18	23	29.5	33.3	38.7
Pressure (MPa)	2.5	2.8	3	3.3	3.5	3.8	4	4.5	5	5.5
Temperature (R410A)(°C)	43	47	51	55	57	61	64	70	74	80
Temperature (R32)(°C)	42	46.5	49.5	53.5	56	60	62	67.5	72.5	77.4

## EVOHEAT Pump Warranty

1. The titanium heat exchanger tubing is guaranteed against corrosion for a period of **twenty five (25) years from the date of purchase when used with chlorine, salt, bromine or sea water.** (\*25 year warranty on the titanium heat exchanger is valid for Evo heat pumps purchased post 15.05.2018. If purchased prior please refer to your original operating manual for warranty details).
2. The compressor is guaranteed for five (5) years from the date of purchase.
3. All other parts are guaranteed for two (2) years from the date of purchase.
4. This warranty covers all labour for twelve (12) months from the date of purchase. Force 5 requires transport back to Evo Industries.
5. This warranty excludes any defect or injury caused by or resulting from misuse, abuse, neglect, accidental damage, improper voltage, vermin infestation, incompetent installation, any fault not attributable to faulty manufacture or parts, any modifications which affect the reliability or performance of the unit.
6. This warranty does not cover the following:
  - a. Natural Disasters (hail, lightening, flood, fire etc.)
  - b. Rust or damage to paintwork caused by a corrosive atmosphere
  - c. When serviced by an unauthorized person without the permission of **Evo Industries Australia**
  - d. When a unit is installed by an unqualified person
  - e. Where a unit is incorrectly installed
  - f. When failure occurs due to improper or faulty installation
  - g. Failure due to improper maintenance (refer Operating Instructions)
  - h. 'No Fault Found' service calls where the perceived problem is explained within the operation instructions
  - i. **Costs associated with delivery, handling, freighting, or damage to the product in transit**
7. If warranty service is required you should:
  - a. contact **Evo Industries Australia** on 1300 85 99 33 or via our **Contact Us** page on our web site
  - b. provide a copy of your receipt as proof of purchase
  - c. have completed the online warranty registration or provide a completed warranty card.
8. Home service is available within the normal operating area of your **Evo Industries** authorized **Service Centre**. Service outside this area will incur a travelling fee.

Unless otherwise specified to the purchaser, the benefits conferred by this express warranty and additional to all other conditions, warranties, rights and remedies expressed or implied by the Trade Practices Act 1974 and similar consumer protection provisions contained in legislation of the States and Territories and all other obligations and liabilities on the part of the manufacturer or supplier and nothing contained herein shall restrict or modify such rights, remedies, obligations or liabilities.



## Warranty Registration

To register your Warranty, please enter the following details or go online at [www.evoheat.com.au/warranty](http://www.evoheat.com.au/warranty) to register directly at our website. Fields with a star (\*) must be filled in before continuing. For information about what Evo Industries Australia will do with your personal details, please refer to our [Privacy Disclaimer](#).

Family Name: \* .....

Given Name: \* .....

Preferred Title: \* .....

Age Group: \*  18-24  25-34  35-44  45-54  55-64  64+

Street Address: \* .....

Suburb: \* .....

Postcode: \* .....

State: \* .....

Email: \* .....

Please tell us about which EvoHeat product you bought, who you bought it from and what you will be using it for.

Product & Model: \* .....

Serial Number: .....

Authorised Installer: .....

Date Purchased: \* .....

Date Installed: .....

Receipt Number: \* .....

Company you bought it from: \* .....

Did you purchase the item when you purchased your pool?: .....

If you purchased it after the pool, how many years did you wait?: .....

What size is your pool or spa?: .....

Why did you choose an **EVOHEAT** product?: .....

