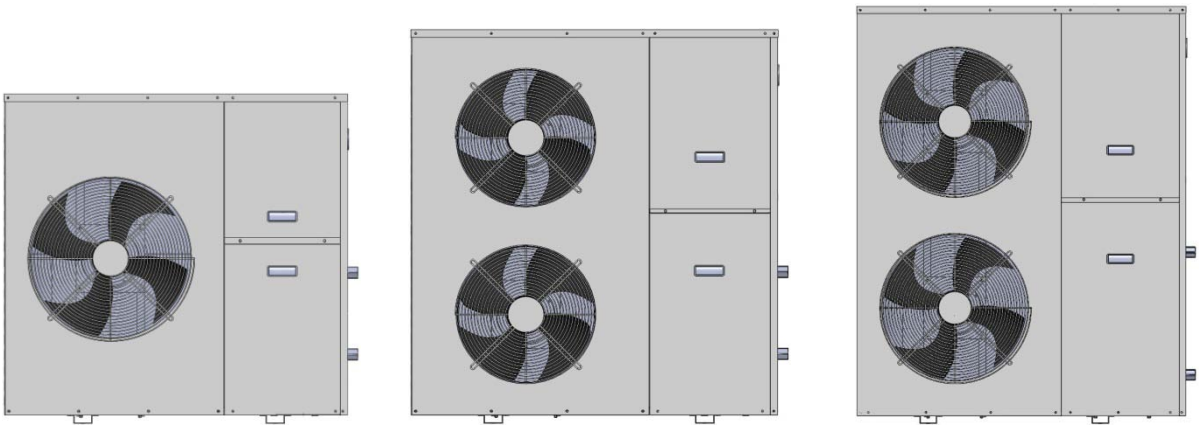
SEMTIC ECO THERMA

Luftvärmepump Luft/Vatten

- Installation och Service Manual -



www.semtic.se www.ttshop.se

Tel:0431-222 90

TERCAXAO-06 TERCAXAO-08 TERCAXAO-11
TERCAXAO-14/3 TERCAXAO-16/3 TERCAXAO-21/3

TABLE OF CONTENT

READ THIS MANUAL CAREFULLY BEFORE STARTING UP THE UNIT. DO NOT THROW IT AWAY.

KEEP IT IN YOUR FILES FOR FUTURE REFERENCE.

⚠ BEFORE OPERATING THE UNIT, MAKE SURE THE INSTALLATION HAS BEEN CARRIED OUT CORRECTLY BY A PROFESSIONAL DEALER. IF YOU FEEL UNSURE ABOUT OPERATION, CONTACT YOUR DEALER FOR ADVICE AND INFORMATION.

INTRODUCTION

This manual

This manual includes the necessary information about the unit. Please read this manual carefully before you use and maintain the unit.

General information

The luxury air source heat pump monobloc system consists out of only the outdoor unit in which all hydraulic parts are located. In this system no refrigerant lines need to be connected which makes the installation easier for the domestic installer. These units are used for both heating and cooling applications. The unit can be combined with fan coil units, floor heating, low temperature radiators, and the domestic hot water tanks.

The unit range consists out of two main versions: a heating/cooling/domestic hot water version and a heating/cooling version.

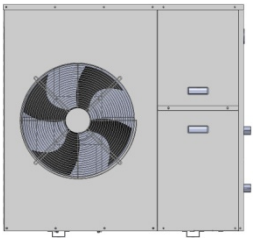
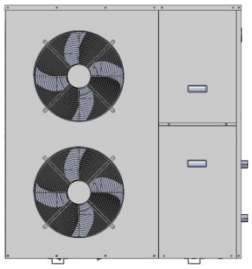
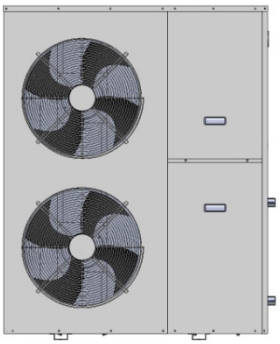
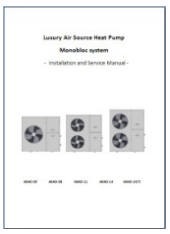
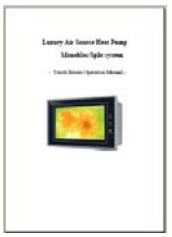
Both versions can optionally be delivered with an integrated backup heater for additional heating capacity during cold outdoor temperatures. The backup heater also serves as a backup in case of malfunctioning of the outdoor unit. The backup heaters are available in different capacities.

Domestic hot water tank option

An optional domestic hot water tank with integrated electrical booster heater can be connected to the indoor unit. The domestic hot water tank is available in different sizes.

Items inside product box

Thank you for choosing the luxury air source heat pump- Monobloc system.
Before starting installation, please make sure that all parts are found inside the product box.

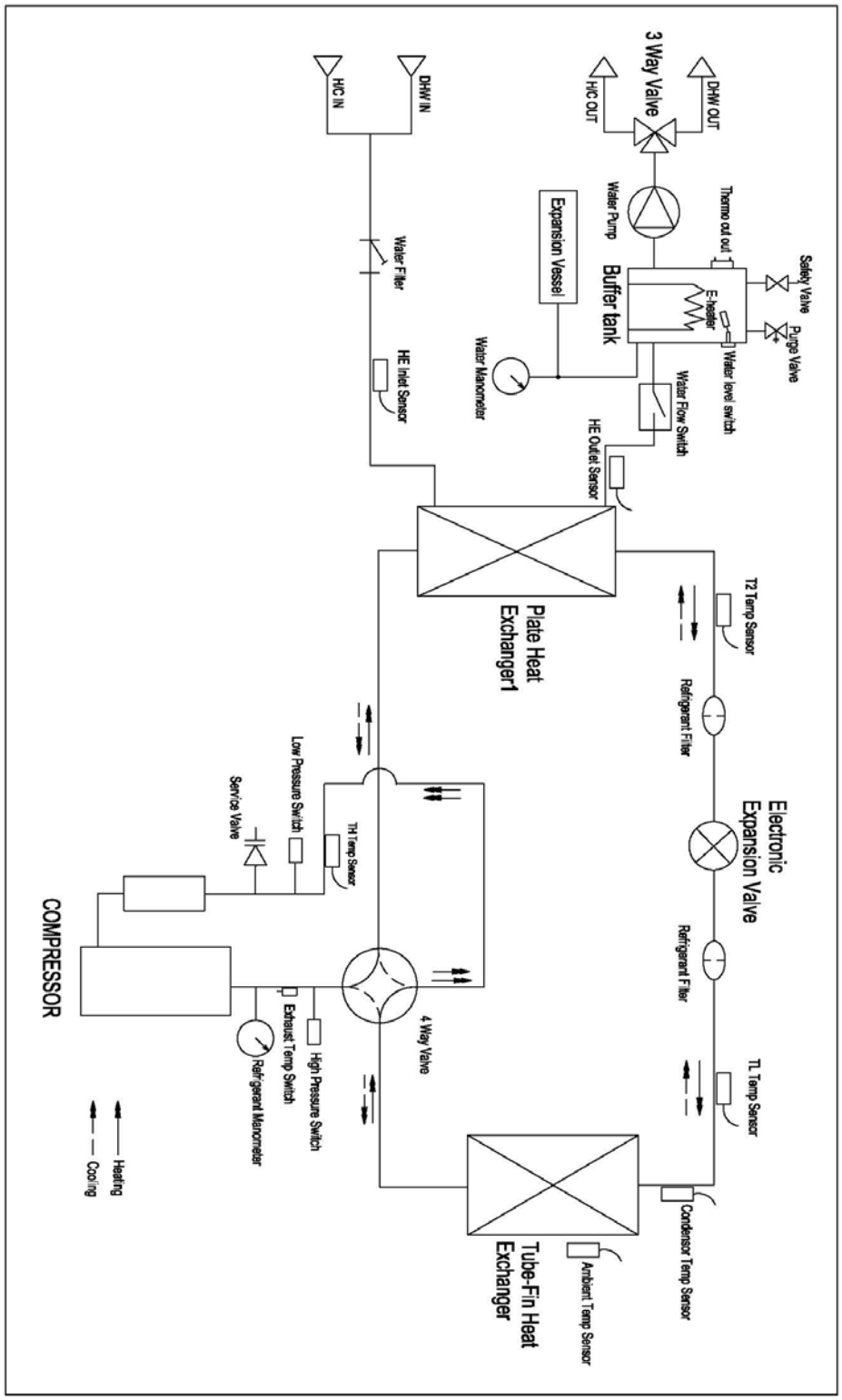
The Unit Box		
Item	**Image**	**Quantity**
AXAO-06 AXAO-08		1
AXAO-11		1
AXAO-14 AXAO-14/3 AXAO-16/3 AXAO-21/3		1
Installation and Service Manual		1
Operation Manual		1

Touch screen control and accessories		1
Installation box for touch screen control	 172mmX125mmX53mm	1
Power cable for touch screen control		1
Communication wiring between touch screen control and PCB board 1		1
Communication wiring between touch screen control and PCB board 2		1
Tank temperature sensor		1
Communication wiring for tank sensor		1

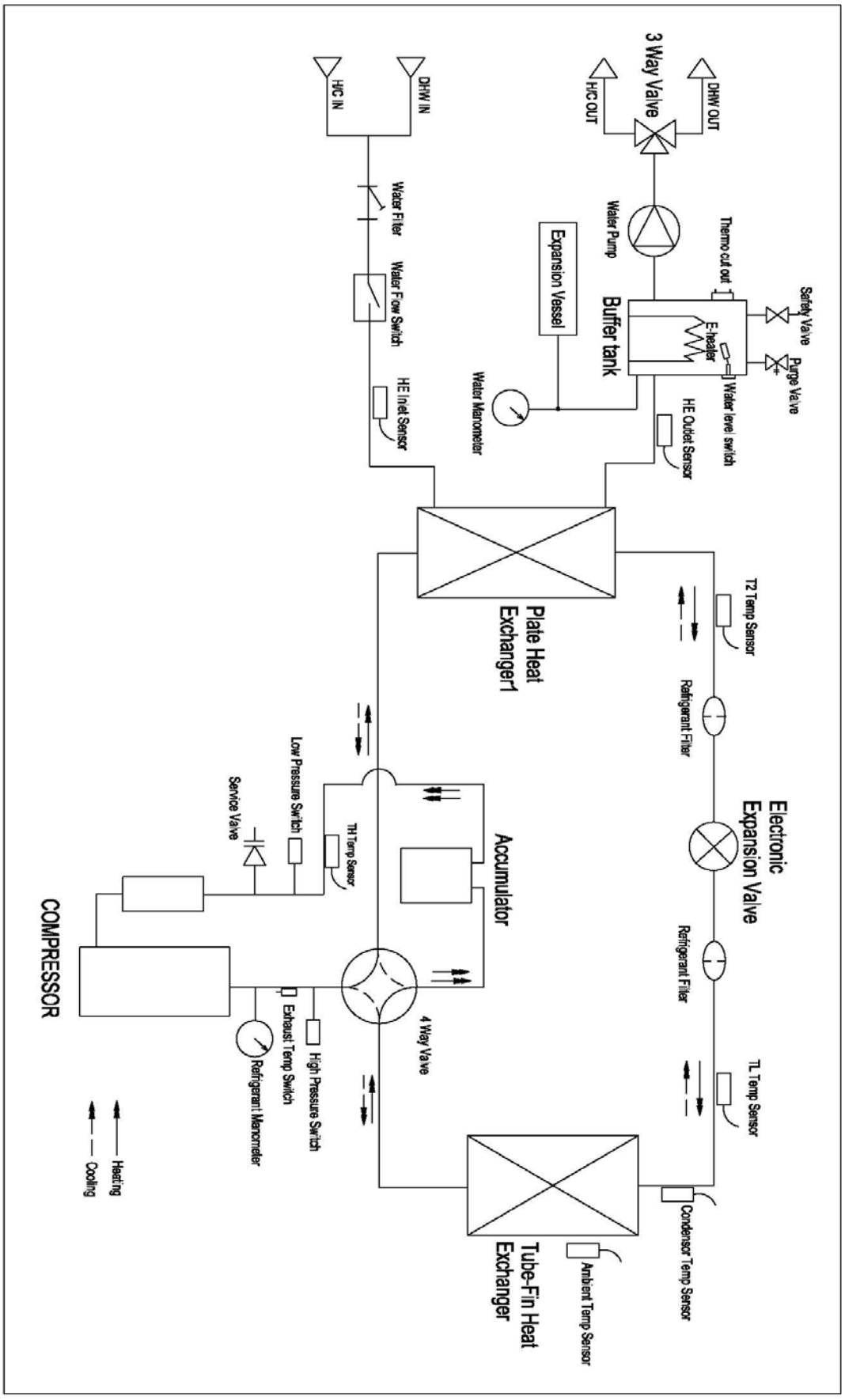
Cycle diagram

As the luxury air source monobloc unit is an air to water heat pump, there are two different fluids cycling inside the system, one is refrigerant and the other is water. The whole cycle diagram is shown below.
Heating/Cooling/Domestic Hot Water version:

Model: AXAO-06 , AXAO-08 and AXAO-11



Model: AXAO-14 , AXAO-14/3 ,AXAO-16/3 and AXAO-21/3



SAFETY PRECAUTIONS

To prevent injury to the user, other people, or property damage, the following instructions must be followed. Incorrect operation due to ignoring of instructions may cause harm or damage.

Install the unit only when it complies with local regulations, by-laws and standards. Check the main voltage and frequency. This unit is only suitable for earthed sockets.

The following safety precautions should always be taken into account:
- Be sure to read the following WARNING before installing the unit.
- Be sure to observe the cautions specified here as they include important items related to safety.
- After reading these instructions, be sure to keep it together with the manual in a handy place for future reference.

Warning

⚠ WARNING

Do not install the unit yourself.
Incorrect installation could cause injury due to fire, electric shock, the unit falling or leakage of water. Consult the dealer from whom you purchased the unit or a specialized installer.

Install the unit securely in a place.
When insufficiently installed, the unit could fall causing injury. The minimum support weight of 20g/mm² of the installation place is required. When installing the unit in a small room, please take measures (like sufficient ventilation) to prevent the asphyxia caused by the leakage of refrigerant.

Use the specified electrical wires and attach the wires firmly to the terminal board (connection in such a way that the stress of the wires is not applied to the sections).
Incorrect connection and fixing could cause a fire.

Be sure to use the provided or specified parts for the installation work.
The use of defective parts could cause an injury due to possible fire, electric shocks, the unit falling etc.

Perform the installation securely and please refer to the installation instructions.
Incorrect installation could cause an injury due to possible fire, electric shocks, the unit falling, leakage of water etc.

Perform electrical work according to the installation manual and be sure to use a dedicated section.
If the capacity of the power circuit is insufficient or there is an incomplete electrical circuit, it could result in a fire or an electric shock.

The unit must always have an earthed connection.
If the power supply is not earthed, you may not connect the unit.

Never use an extension cable to connect the unit to the electric power supply.
If there is no suitable, earthed wall socket available, have one installed by a recognized electrician.

Do not move/repair the unit yourself.
Improper movement or repair on the unit could lead to water leakage, electrical shock, injury or fire.
Have any repairs and/or maintenance only carried out by a recognized service engineer.

Do not plug or unplug the power supply during operation
There is a risk of fire or an electric shock

Do not touch/operate the unit with wet hands
There is a risk of fire or an electric shock

Do not place a heater or other appliances near the power cable
There is a risk of fire or an electric shock

Be cautious that water could not be poured to the product directly, do not allow water to run into electric parts
There is a risk of fire or an electric shock

⚠ IF THE PRODUCT IS NOT USED FOR A LONG TIME, WE STRONGLY RECOMMEND NOT TO SWITCH 'OFF' THE POWER SUPPLY OF THE UNIT.

⚠ IF THE POWER IS NOT SUPPLIED, SOME SPECIAL PRODUCT-PROTECTING ACTIONS (SUCH AS WATER PUMP ANTI-LOCKING) WILL NOT BE PERFORMED.

Caution

⚠ CAUTION

Do not install the unit in a place where there is a chance of flammable gas leaks.
If there is a gas leak and gas accumulates in the area surrounding the unit, it could cause an explosion.

Perform the drainage/piping work according to the installation instruction.
If there is a defect in the drainage/piping work, water could leak from the unit and household goods could get wet and be damaged.

Do not clean the unit when the power is 'on'.
Always shut 'off' the power when cleaning or servicing the unit. If not, it could cause an injury due to the

high speed running fan or an electrical shock.

Do not continue to run the unit when there is something wrong or there is a strange smell.
The power supply needs to be shut ‘off’ to stop the unit; otherwise this may cause an electrical shock or fire.

Be cautious when unpacking and installing the product.
Sharp edges could cause injury. Especially watch the edges and the fins on the heat exchanger of the product.

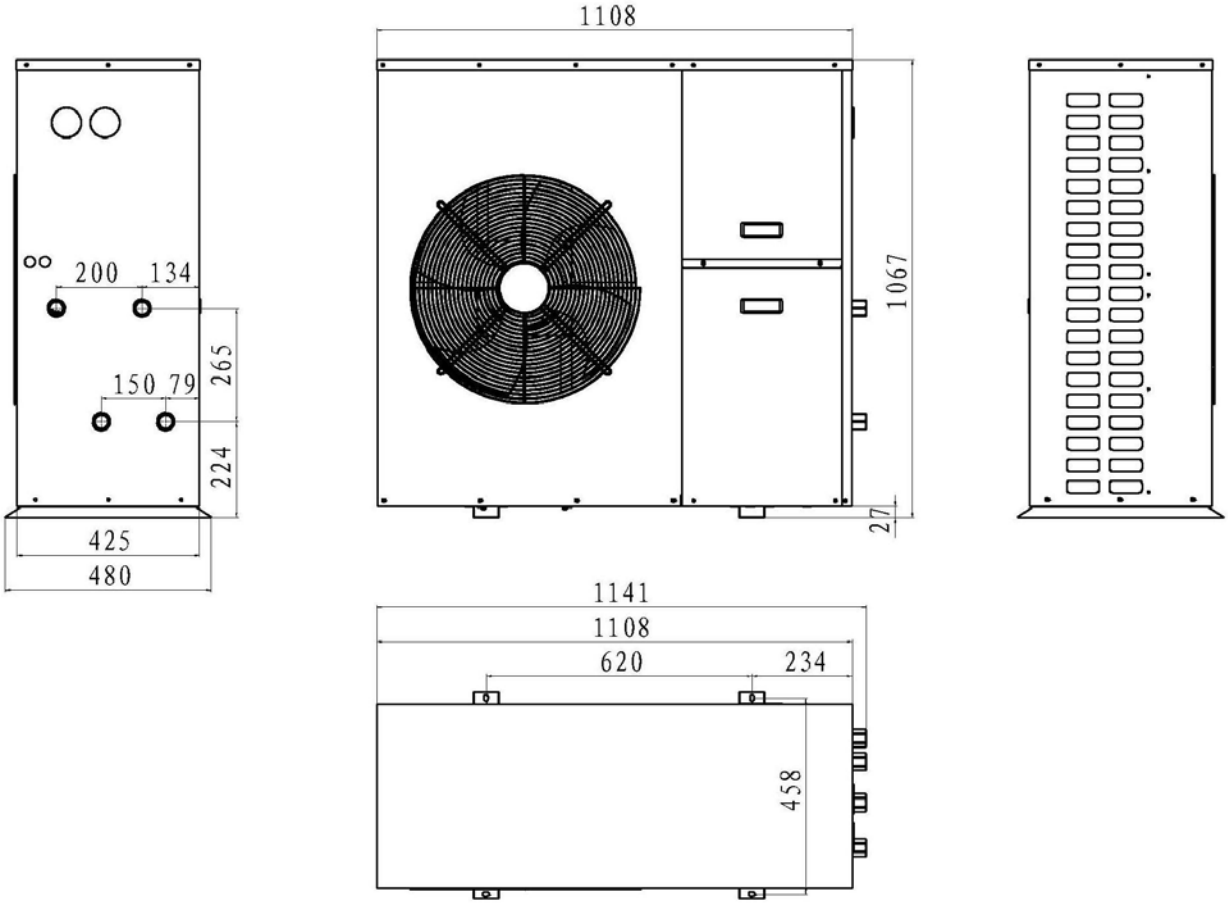
Always check for gas (refrigerant) leakage after installation or repair of product.
Low refrigerant levels may cause failure of the product.

Keep level even when installing the product.
This is to avoid vibration or water leakage.

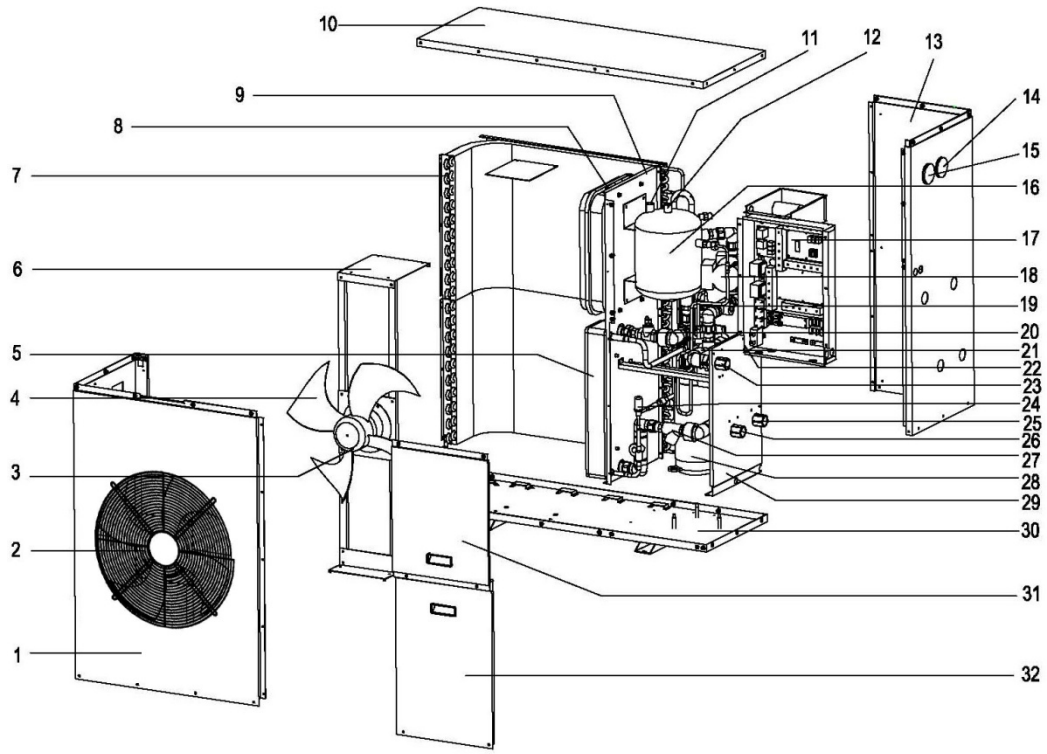
Do not put your fingers or others into the fan, or evaporator.
The ventilator runs at high speed, this could cause serious injury.

OVERVIEW OF THE UNIT

External view: AXAO-06 AXAO-08

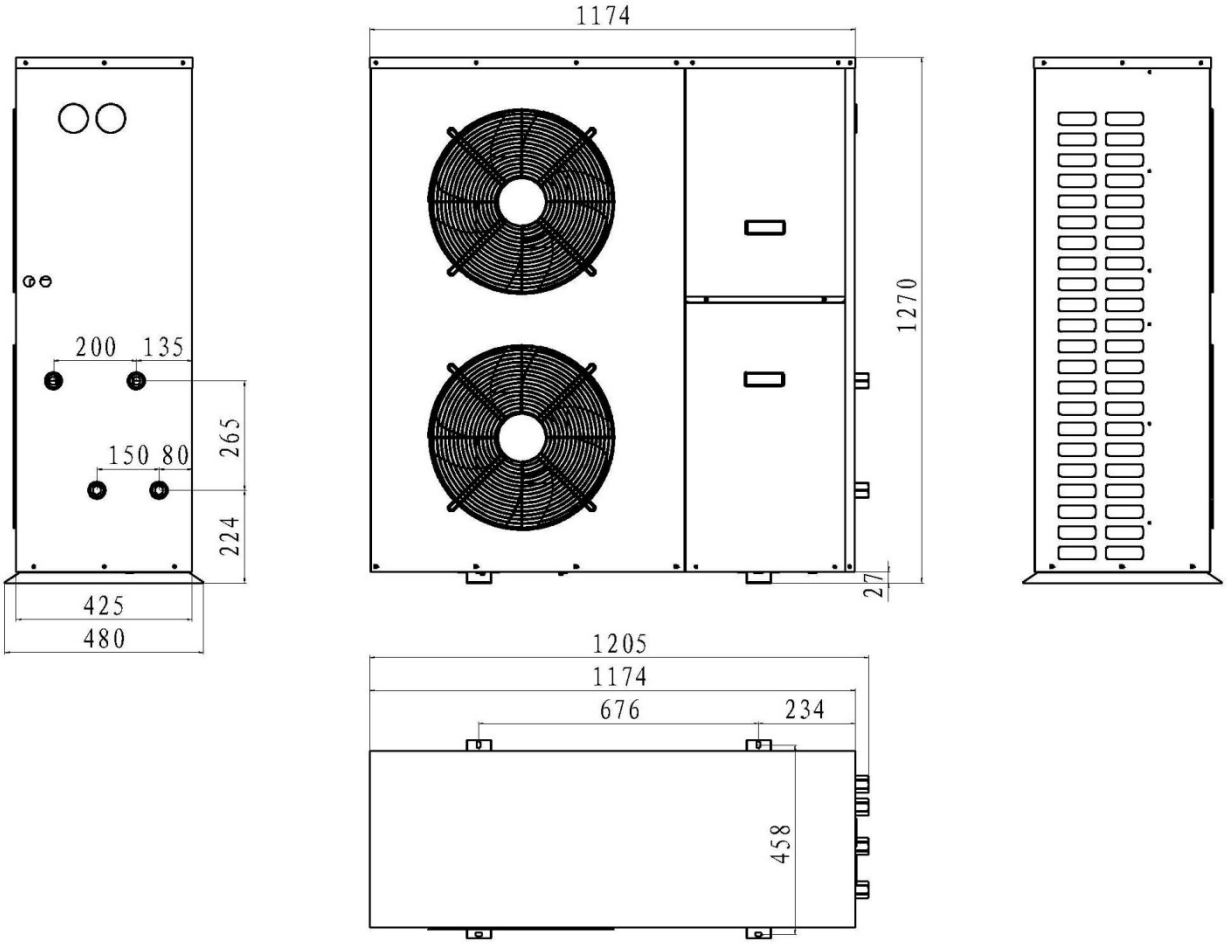


Internal view: AXAO-06 AXAO-08

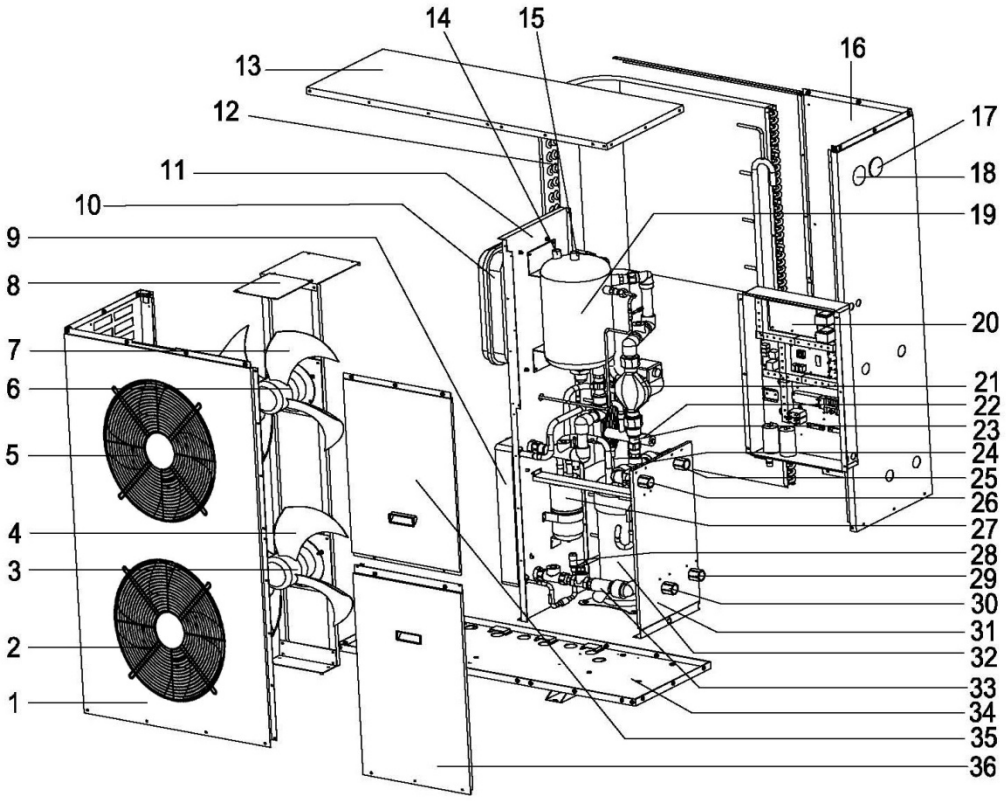


No.	Description	No.	Description
1	Left front plate	17	Switch box
2	Air outlet grill	18	Water pump (RS15/6)
3	Fan motor	19	Four-way valve assembly
4	Fan	20	Water flow switch
5	Plate heat exchanger	21	Three-way valve (only for DHW version)
6	Fan motor holder	22	H/C OUT
7	Condenser	23	DHW OUT (only for DHW version)
8	Expansion vessel (10L)	24	Electronic expansion valve
9	Separated plate	25	H/C IN
10	Top plate	26	DHW IN (only for DHW version)
11	Pressure relief valve	27	Water filter
12	Air purge valve	28	Compressor
13	Right back plate	29	Connector holder
14	Manometer (refrigerant pressure)	30	Base plate
15	Manometer (water pressure)	31	Right front plate 1
16	Backup heater vessel (15L)	32	Right front plate 2

External view: AXAO-11

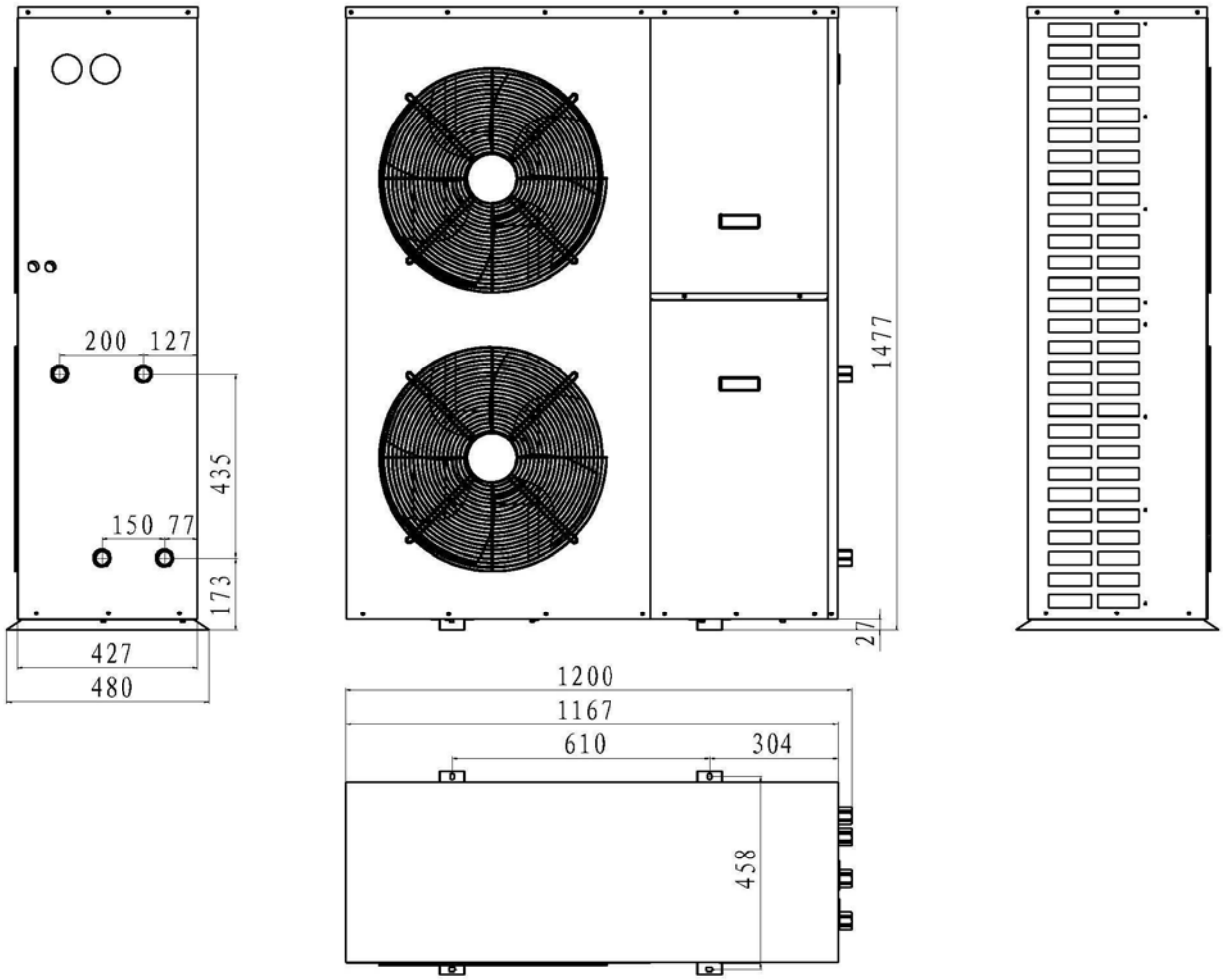


Internal view: AXAO-11

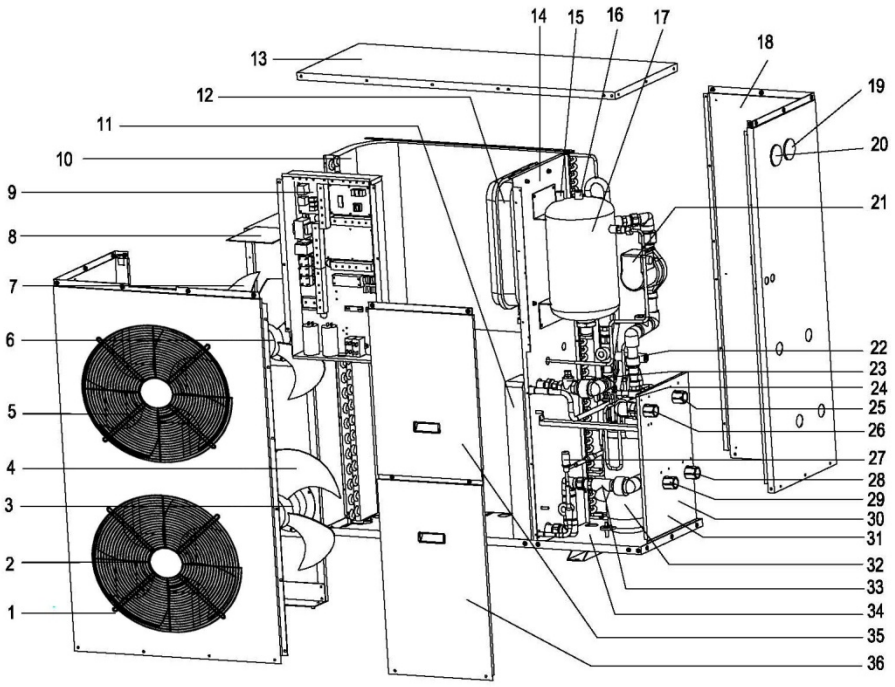


No.	Description	No.	Description
1	Left front plate	19	Backup heater vessel (20L)
2	Air outlet grill 1	20	Switch box
3	Fan motor 1	21	Water pump (RS25/8)
4	Fan 1	22	Four-way valve assembly
5	Air outlet grill 2	23	Water flow switch
6	Fan motor 2	24	Three-way valve (only for DHW version)
7	Fan 2	25	H/C OUT
8	Fan motor holder	26	DHW OUT (only for DHW version)
9	Plate heat exchanger	27	Accumulator
10	Expansion vessel (10L)	28	Electronic expansion valve
11	Separated plate	29	H/C IN
12	Condenser	30	DHW IN (only for DHW version)
13	Top plate	31	Connector holder
14	Pressure relief valve	32	Compressor
15	Air purge valve	33	Water filter
16	Right back plate	34	Base plate
17	Manometer (refrigerant pressure)	35	Right front plate 1
18	Manometer (water pressure)	36	Right front plate 2

External view: AXAO-14 AXAO-14/3 AXAO-16/3 AXAO-21/3



Internal view: AXAO-14 AXAO-14/3 AXAO-16/3 AXAO-21/3



No.	Description	No.	Description
1	Left front plate	19	Manometer (refrigerant pressure)
2	Air outlet grill 1	20	Manometer (water pressure)
3	Fan motor 1	21	Water pump (RS25/8)
4	Fan 1	22	Four-way valve assembly
5	Air outlet grill 2	23	Water flow switch
6	Fan motor 2	24	Three-way valve (only for DHW version)
7	Fan 2	25	H/C OUT
8	Fan motor holder	26	DHW OUT (only for DHW version)
9	Switch box	27	Electronic expansion valve
10	Condenser	28	H/C IN
11	Plate heat exchanger	29	DHW IN (only for DHW version)
12	Expansion vessel (10L)	30	Accumulator
13	Top plate	31	Connector holder
14	Separated plate	32	Compressor
15	Pressure relief valve	33	Water filter
16	Air purge valve	34	Base plate
17	Backup heater vessel (20L)	35	Right front plate 1
18	Right back plate	36	Right front plate 2

CONTROLPARTS PARTS

Control Panel

（Pls refer to the Touch Screen Operation Manual for details）

How to install the touch screen control?

1. Choose the right place and fix the installation box;

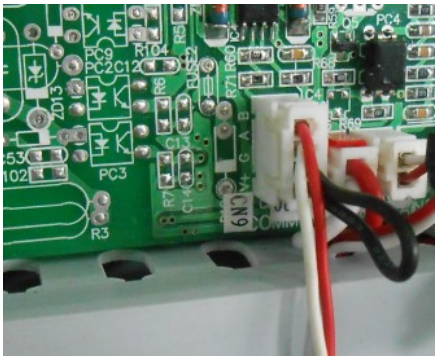
2. Fix the touch screen control to the installation box;

3. Connect the Communication wiring 2 to “COM” of the touch screen control, and fix it;

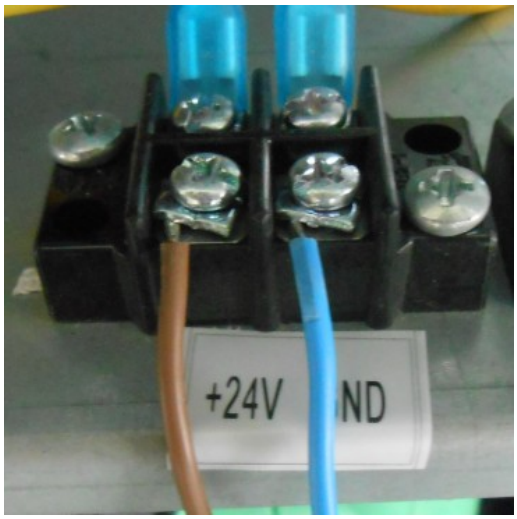
4. Connect the power cable to “24VDC” of the touch screen control, the brown wiring to “+”, and blue wiring to “- ”;

5. Fix the installation cover on the box by 4 screws;

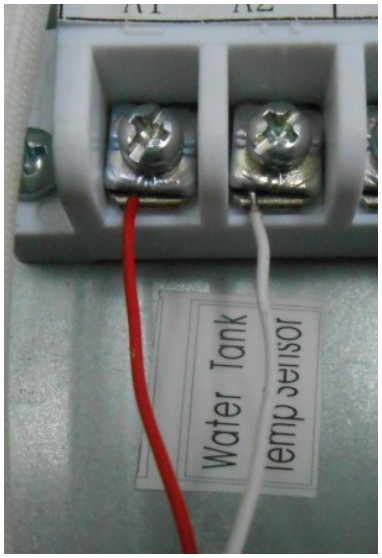
6. Connect the Communication wiring 1 to the Communication wiring 2 and PCB board “CN9”;



7. Connect the other side of power cable to the 24VDC terminal of heat pump, the brown wiring to "+24V", and blue wiring to "GND ";



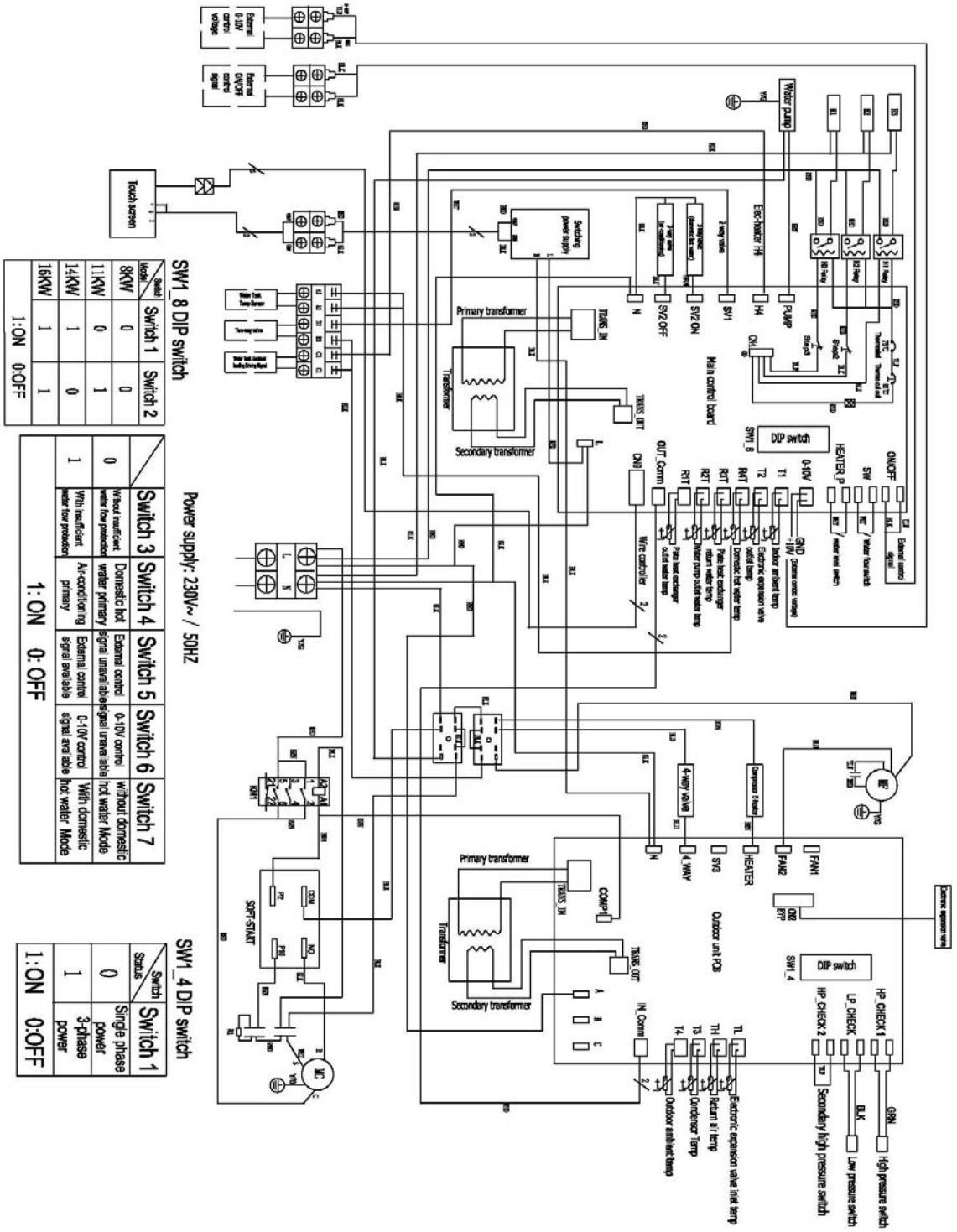
8. Connect the communication wiring of tank sensor to heat pump terminal "Water tank temp sensor" (no polar for the wirings, connect in random);



9. Put the tank temp sensor to the tank, and connect to the other side of communication wiring.

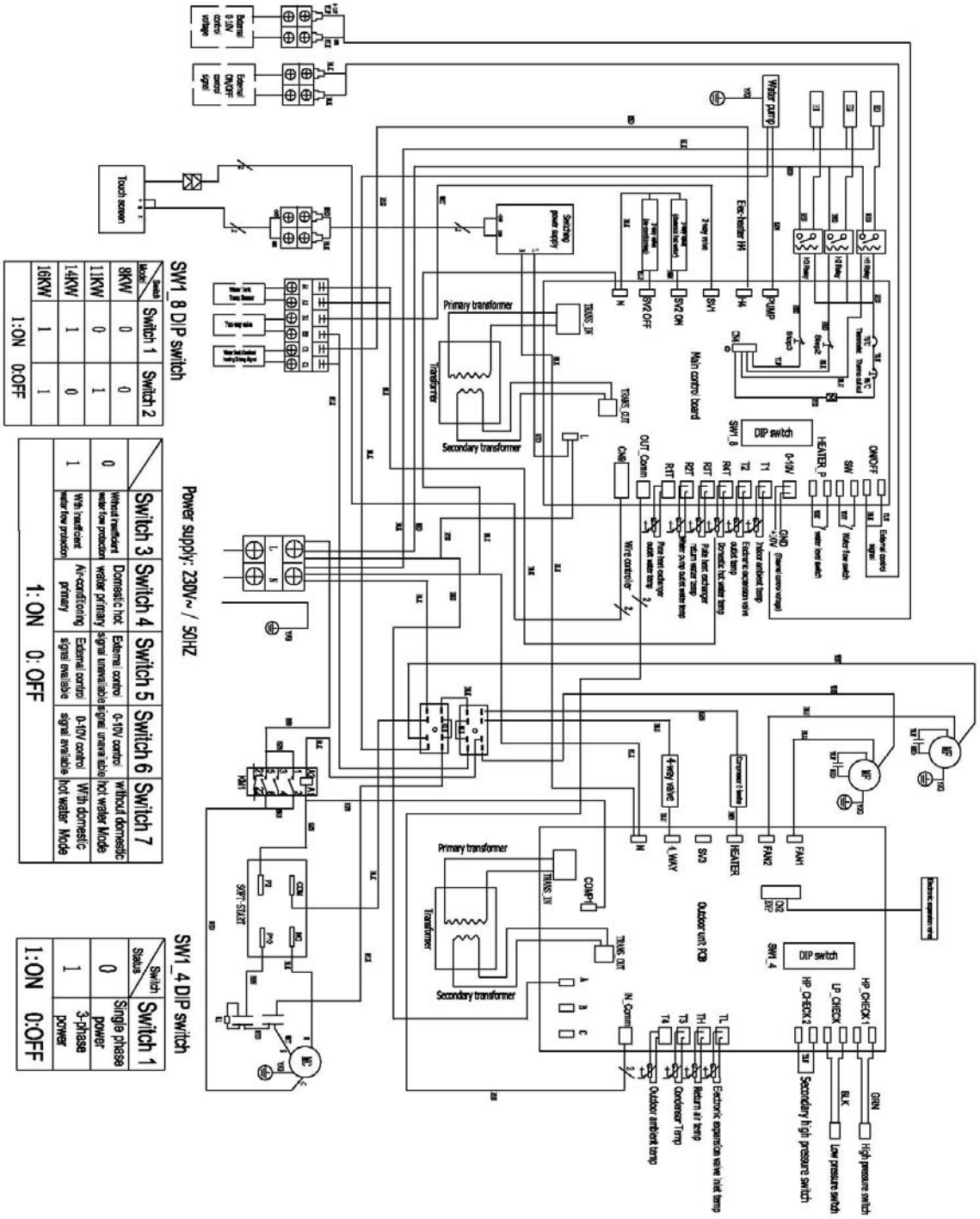
Wiring diagram:AXAO-06 AXAO-08

(Refer to the attached wiring diagram in the unit)



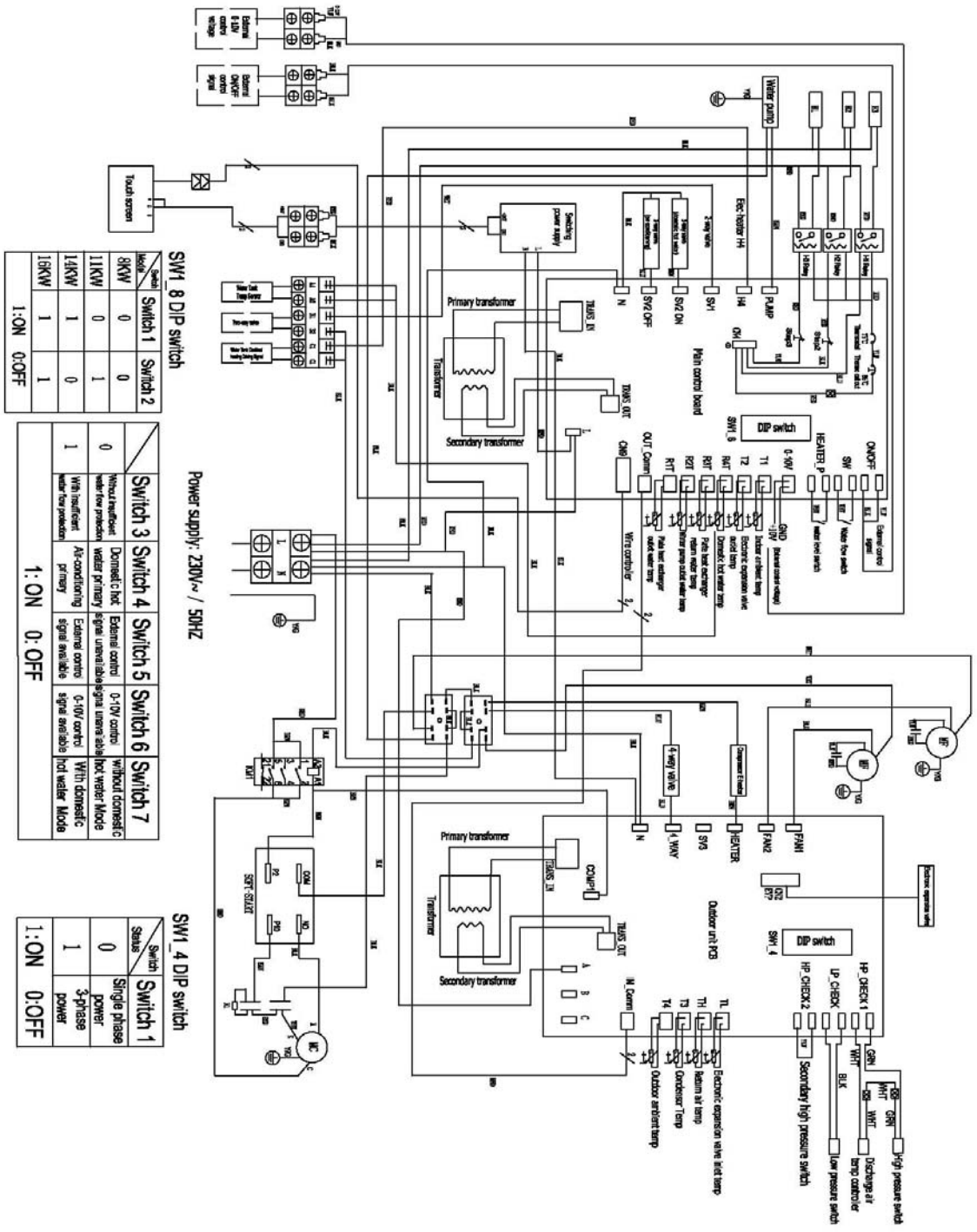
Wiring diagram: AXAO-11

(Refer to the attached wiring diagram in the unit)



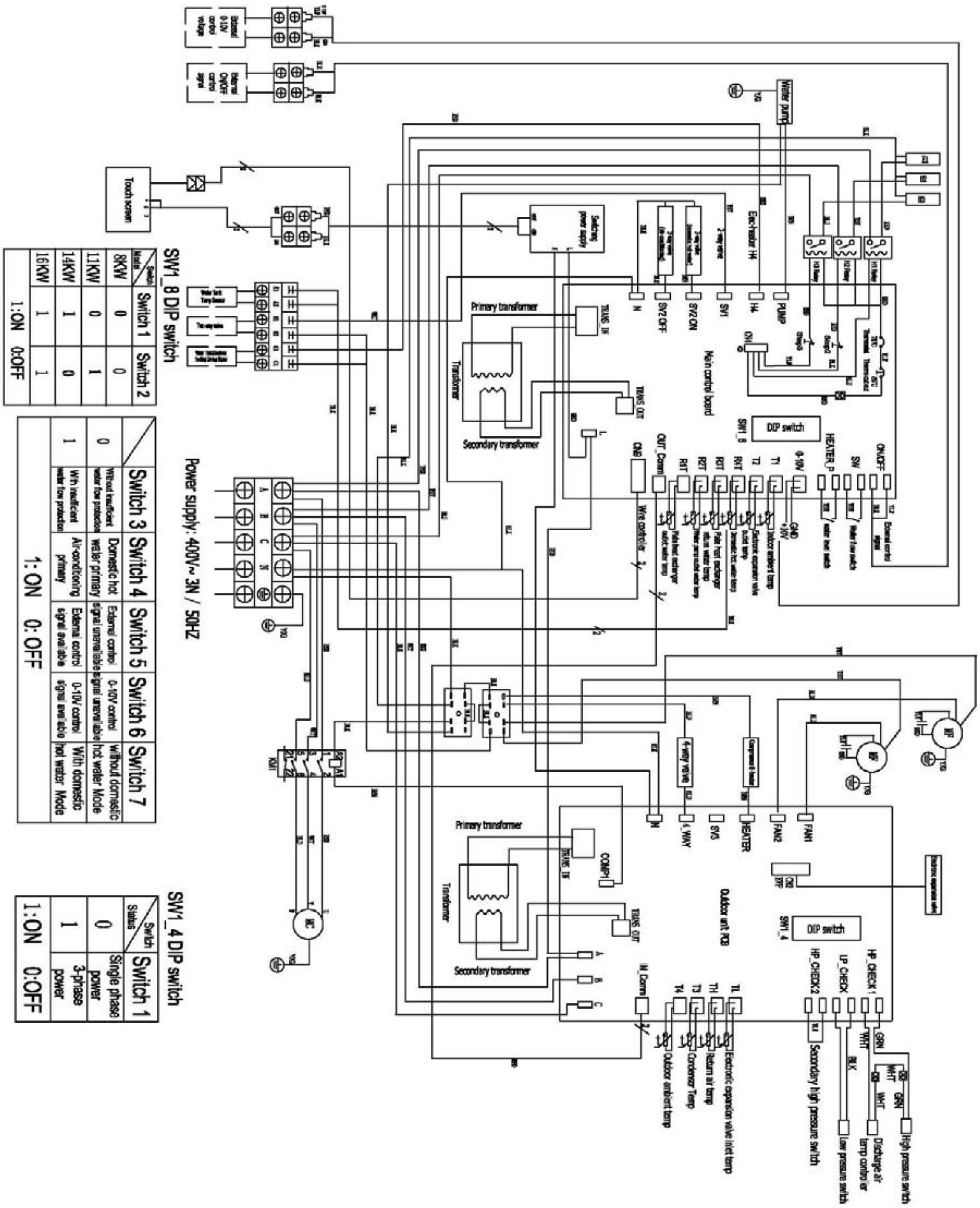
Wiring diagram: AXAO-14

(Refer to the attached wiring diagram in the unit)



Wiring diagram: AXAO-14/3 AXAO-16/3 AXAO-21/3

(Refer to the attached wiring diagram in the unit)



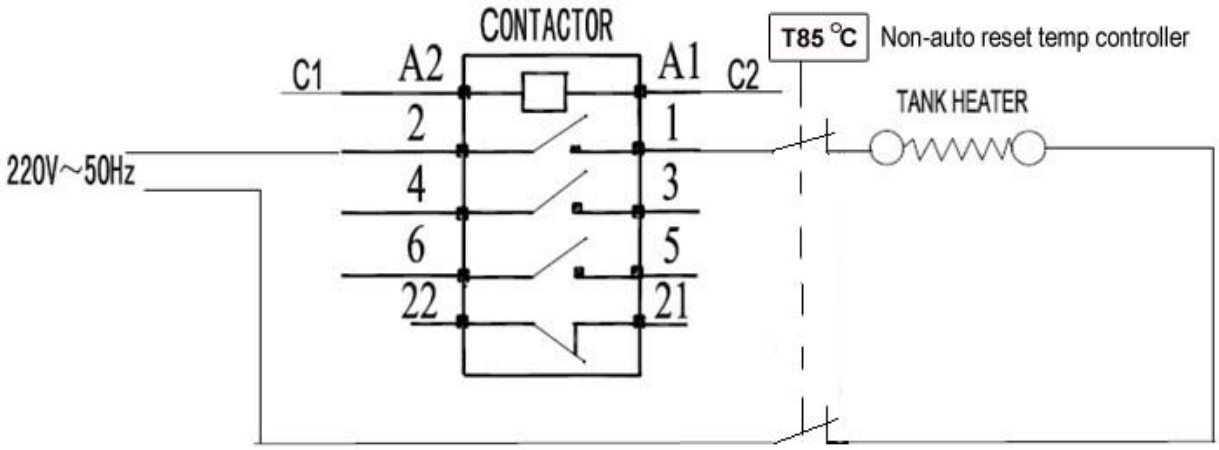
Remarks

-- For Two- way valve (B1 and B2)

This function is reserved for two-way valve control. If an external two-way valve needs to be controlled by the heat pump system, you can use these ports according to their output signal.
During space heating / cooling mode, the ports (B1 and B2) will provide power 220-240V~ for use.
During domestic hot water mode, no power is provided.

-- For Water Tank Electrical heating Driving Signal (C1 and C2)

When connecting the electrical tank heater to C1 and C2, one extra contactor is needed. Please refer to below drawing. One extra temperature controller (recommended action temp as 85℃) is needed to control electrical heater for water tank over heating protection.



-- For Buffer tank E-heater

The buffer tank electrical heater has three steps, each step is 2KW, total 3*2=6KW.
The first step 2KW is default set, and the other 2 steps can be set to ON or OFF by the switches built in the control box.

When the switch set to “I” position - it means ON
When the switch set to ‘O” position- it means OFF

For example, when the switches Step 2 and Step3 are set to “I” (please refer to the picture in the right), it means total 3 steps are ON, and the max. 6kw electrical heater power is permitted for the heat pump.

Remark: Set Step2 to “O” but Step3 to “I” is not recommended. Please set in subsequence.

INSTALLATION OF THE UNIT

Installation guidelines

Precautions for selecting the location

⚠ MAKE SURE TO PROVIDE FOR ADEQUATE MEASURES IN ORDER TO PREVENT THAT THE OUTDOOR UNIT WILL BE USED AS A SHELTER FOR SMALL ANIMALS.

⚠ SMALL ANIMALS MAKING CONTACT WITH ELECTRICAL PARTS CAN CAUSE MALFUNCTIONS, SMOKE OR FIRE. PLEASE KEEP THE AREA AROUND THE UNIT CLEAN.

1. Choose a place solid enough to bear the weight and vibration of the unit, where the operation noise will not be amplified.
2. Choose a location where the hot air discharged from the unit or the operation noise will not cause a nuisance to the neighbors of the user.
3. Avoid places near a bedroom and the like, so that the operation noise will cause no trouble.
4. There must be sufficient space for carrying the unit into and out of the site.
5. There must be sufficient space for air passage and no obstructions around the air inlet and the air outlet.
6. Locate the unit so that the noise and the discharged hot air will not annoy the neighbors.
7. The site must be free from the possibility of flammable gas leakage in a nearby place.
8. Install units, power cords and inter-unit cables at least 3m away from television and radio sets. This is to prevent interference to images and sounds.
9. Depending on radio wave conditions, electromagnetic interference can still occur even if installed more that 3m away.
10. In coastal areas or other places with salty atmosphere of sulfate gas, corrosion may shorten the life of the outdoor unit.
11. Since drain flows out of the outdoor unit, do not place anything under the unit which must be kept away from moisture.

Selecting a location in cold climates

⚠ WHEN OPERATING THE OUTDOOR UNIT IN A LOW OUTDOOR AMBIENT TEMPERATURE, BE SURE TO FOLLOW THE INSTRUCTIONS DESCRIBED BELOW.

- To prevent exposure to wind, install the outdoor unit with its suction side facing the wall.
- Never install the outdoor unit at a site where the suction side may be exposed directly to wind.
- To prevent exposure to wind, install a baffle plate on the air discharge side of the outdoor unit.
- In heavy snowfall areas it is very important to select an installation site where the snow will not affect the unit. If lateral snowfall is possible, make sure that the heat exchanger coil is not

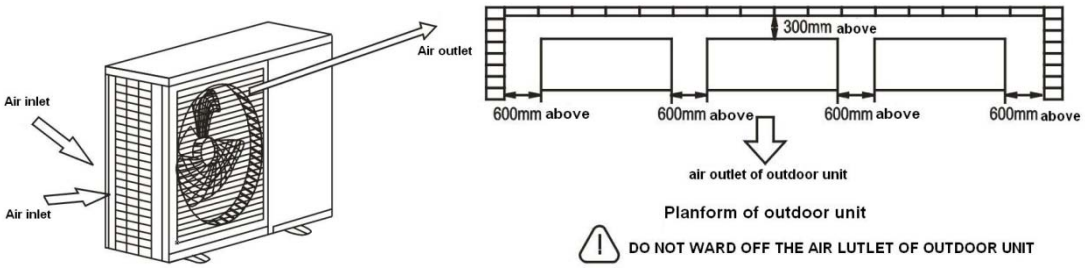
affected by the snow (if necessary construct a lateral canopy).

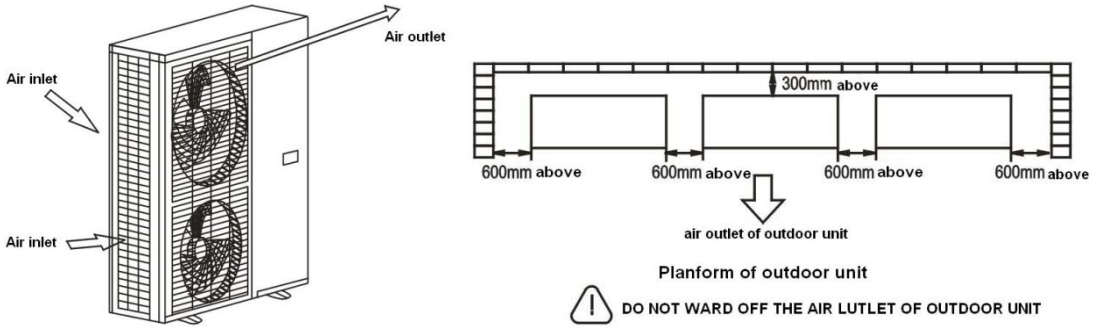
Construct a large canopy.

Construct a pedestal.

Install the unit high enough off the ground to prevent burying in snow.

Installation space

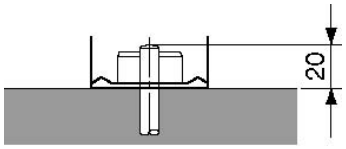




Mounting the unit

When installing the outdoor unit, please refer to “Installation guidelines” to select an appropriate location.

1. Check the strength and level of the installation ground so that the unit will not cause any operating vibration or noise after installation.
2. Prepare 4 sets of M8 foundation bolts, nuts and washers each (filed supply).
3. Fix the unit securely by means of the foundation bolts in accordance with the foundation drawing. It is best to screw in the foundation bolts until their length remains 20mm above the foundation surface.



Water pipe-work

Checking the water circuit

The 3-way valve is built-in the unit. So the unit is equipped with the water inlet/outlet for hot water connection, and the water inlet/outlet for space heating/cooling. The water circuits must be provided by a licensed technician and must comply with all relevant European and national regulations.

⚠ THE UNIT IS ONLY TO BE USED IN A CLOSED WATER SYSTEM. APPLICATION IN AN OPEN WATER CIRCUIT CAN LEAD TO EXCESSIVE CORROSION OF THE WATER PIPING.

Before continuing the installation of the unit, check the following points:

- The maximum water pressure is 3 bar.
- Four shut-off valves are not delivered with the unit. To facilitate service and maintenance, please install one at each water inlet/outlet. Mind position of the shut-off valves. Orientation of the integrated drain and fill valves is important for servicing.
- Drain taps must be provided at all low points of the system to permit complete drainage of the circuit during maintenance.
- Make sure to provide a proper drain for the pressure relief valve to avoid any water coming into contact with electrical parts.
- Air vents must be provided at all high points of the system. The vents should be located at points which are easily accessible for servicing. An automatic air purge is provided inside the indoor unit. Check that this air purge valve is not tightened too much so that automatic release of air in the water circuit remains possible.
- Take care that the components installed in the field piping can withstand the water pressure.

Checking the water volume and expansion vessel pre-pressure

The unit is equipped with an expansion vessel of 8 liters which has a default pre-pressure of 1 bar.
To assure proper operation of the unit, the pre-pressure of the expansion vessel might need to be adjusted and the minimum and maximum water volume must be checked.

1. Check that the total water volume in the installation is 32 L minimum.

   ⚠ IN MOST AIR CONDITIONING APPLICATIONS THIS MINIMUM WATER VOLUME WILL HAVE A SATISFYING RESULT. IN CRITICAL PROCESSES OR IN ROOMS WITH A HIGH HEAT LOAD THOUGH, EXTRA WATER VOLUME MIGHT BE REQUIRED
2. Using the table below, determine if the expansion vessel pre-pressure requires adjustment.
3. Using the table and instructions below, determine if the total water volume in the installation is below the maximum allowed water volume.

Installation height difference (a)	**Water volume**	
	≤460 L	**＞460 L**
≤ 7 m	No pre-pressure adjustment Required.	Actions required: pre-pressure must be decreased, calculate according to "calculating the pre-pressure of the expansion vessel" check if the water volume is lower than maximum allowed water volume (use graph below)
> 7 m	Actions required: pre-pressure must be increased, calculate according to "calculating the pre-pressure of the expansion vessel" check if the water volume is lower than maximum allowed water volume (use graph below)	Expansion vessel of the unit too small for the installation.

(a) Installation height difference: height difference (m) between the highest point of the water circuit and the indoor unit. If the indoor unit is located at the highest point of the installation, the installation height is considered 0 m.

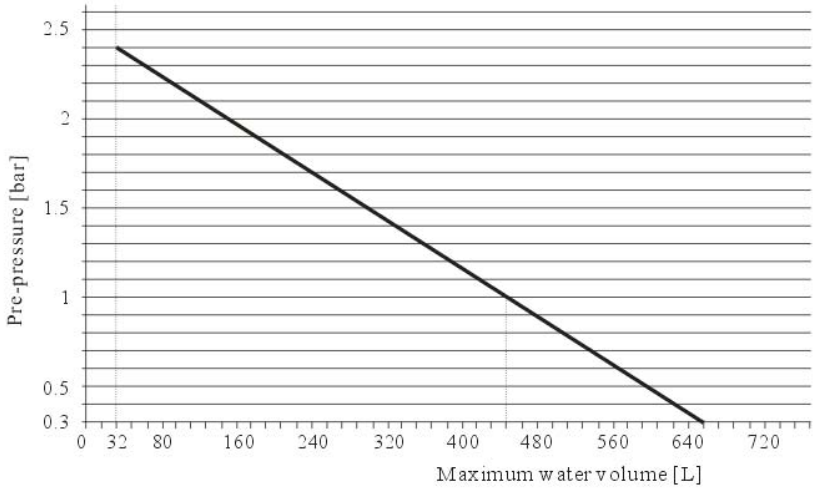
Calculating the pre-pressure of the expansion vessel

The pre-pressure (Pg) to be set depends on the maximum installation height difference (H) and is calculated as follows:
Pg = (H/10+0.3) bar

Checking the maximum allowed water volume

To determine the maximum allowed water volume in the entire circuit, proceed as follows:
1. Determine for the calculated pre-pressure (Pg) the corresponding maximum water volume using the graph below.
2. Check that the total water volume in the entire water circuit is lower than this value.

If this is not the case, the expansion vessel inside the indoor unit is too small for the installation.



Setting the pre-pressure of the expansion vessel

When it is required to change the default pre-pressure of the expansion vessel (1 bar), keep in mind the following guidelines:

- Use only dry nitrogen to set the expansion vessel pre-pressure.
- Inappropriate setting of the expansion vessel pre-pressure will lead to possible malfunctioning of the system. Therefore, the pre-pressure should only be adjusted by a licensed installer.

Connecting the water circuit

Water connections must be made in accordance with the outlook diagram delivered with the unit, respecting the water in- and outlet

⚠ BE CAREFUL NOT TO DEFORM THE UNIT PIPING BY USING EXCESSIVE FORCE WHEN CONNECTING THE PIPING. DEFORMATION OF THE PIPING CAN CAUSE THE UNIT TO MALFUNCTION.

If air, moisture or dust gets in the water circuit, problems may occur.

Therefore, always take into account the following when connecting the water circuit:

- Use clean pipes only.
- Hold the pipe end downwards when removing burrs.
- Cover the pipe end when inserting it through a wall so that no dust and dirt can enter.
- Use a good thread sealant for the sealing of the connections.
- The sealing must be able to withstand the pressures and temperatures of the system.
- When using non-brass metallic piping, make sure to insulate both materials from each other to prevent galvanic corrosion.
- Because brass is a soft material, use appropriate tooling for connecting the water circuit.

Inappropriate tooling will cause damage to the pipes.

⚠ THE UNIT IS ONLY TO BE USED IN A CLOSED WATER SYSTEM. APPLICATION IN AN OPEN WATER CIRCUIT CAN LEAD TO EXCESSIVE CORROSION OF THE WATER PIPING.

⚠ NEVER USE ZN-COATED PARTS IN THE WATER CIRCUIT. EXCESSIVE CORROSION OF THESE PARTS MAY OCCUR AS COPPER PIPING IS USED IN THE INTERNAL WATER CIRCUIT OF THE UNIT.

⚠ WHEN USING A 3-WAY VALVE OR A 2-WAY VALVE IN THE WATER CIRCUIT.
THE RECOMMENDED MAXIMUM CHANGEOVER TIME OF THE VALVE SHOULD BE LESS THAN 60 SECONDS.

Charging water

1. Connect the water supply to a drain and fill valve.
2. Make sure the automatic air purge valve is open (at least 2 turns).
3. Fill with water until the water manometer indicates a pressure of approximately 2.0 bar. Remove air in the circuit as much as possible using the air-purge valves. Air present in the water circuit might cause malfunctioning of the optional backup heater.
4. Regarding units with an optional backup heater:
   Check that the backup heater vessel is filled with water by opening the pressure relief valve. Water must flow out of the valve.

⚠ **NOTE**

- During filling, it might not be possible to remove all the air in the system. Remaining air will be removed through the automatic air purge valves during first operating hours of the system. Additional filling with water afterwards might be required.
- The water pressure indicated on the water manometer will vary depending on the water-temperature (higher pressure at higher water temperature).
- However, at all times water pressure should remain above 0.3 bar to avoid air entering the circuit.
- The unit might dispose some excessive water through the pressure relief valve.
- Water quality must be according to EN directive 98/83 EC.

Piping insulation

The complete water circuit, inclusive all piping, must be insulated to prevent condensation during cooling operation and reduction of the cooling and heating capacity.
If the temperature is higher than 30°C and the humidity is higher than RH 80%, then the thickness of the sealing materials should be at least 20 mm in order to avoid condensation on the surface of the sealing.

Field wiring

WARNING

- A main switch or other means for disconnection, having a contact separation in all poles, must be incorporated in the fixed wiring in accordance with relevant local and national legislation.
- Switch ‘off’ the power supply before making any connections.
- All field wiring and components must be installed by a licensed electrician and must comply with relevant European and national regulations.
- The field wiring must be carried out in accordance with the wiring diagram supplied with the unit and the instructions given below.
- Be sure to use a dedicated power supply. Never use a power supply shared by another appliance.
- Be sure to establish an earth. Do not earth the unit to a utility pipe, surge absorber, or telephone earth. Incomplete earth may cause electrical shock.
- Be sure to install an earth leakage protector.

  Failure to do so may cause electrical shock.

Wiring overview

The table below gives a wiring overview of the required field wiring.

Model	**AXAO-06 08 11 14**	**AXAO-14/3 16/3 21/3**
Power supply	≥ 10 mm^2×2 + 4 mm^2×1	≥ 4 mm^2×5

SYSTEM SET-UP

As the unit is designed to satisfy various installation environments, it is important to set up system correctly. If not configured correctly, improper operation or degrade of performance can be expected.

DIP switch setting overview

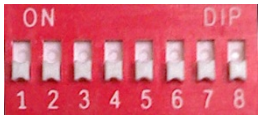
CAUTION

⚠ TURN 'OFF' THE ELECTRIC POWER SUPPLY BEFORE SETTING DIP SWITCH.

WHENEVER ADJUSTING THE DIP SWITCH, TURN OFF ELECTRIC POWER SUPPLY TO AVOID AN ELECTRIC SHOCK.

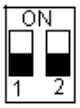
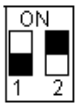
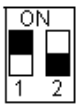
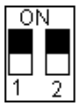
DIP switch introduction

The DIP switches are located on the main control and outdoor unit PCBs. They allow configuration of model selection, water flow protection, system priority, external control signal selection, 0-10V control signal selection, domestic hot water mode selection.



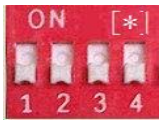
Main control PCB DIP Switch Introductions:

SW1-2:

			
6kw/8kW	11kW	14kW	16/21kW

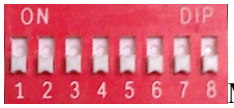
SW3-8:

Code	OFF	ON
3	Without insufficient water flow protection	With insufficient water flow protection
4	Domestic hot water primary	Air-conditioning primary
5	External control signal unavailable	External control signal available
6	0-10V control signal unavailable	0-10V control signal available
7	Without domestic hot water mode	With water domest ic hot water mode
8	Reserved	



Outdoor unit PCB DIP Switch Introductions:

Code	OFF	ON
1	Single phase power (220-240V)	3-phase power (380-415V 3N)
2~4	Reserved	



Main control PCB DIP Switch 5 & Switch 6 Introductions:

Code	OFF (Default)	ON
5	External control signal unavailable	External control signal available
6	0-10V control signal unavailable	0-10V control signal available

Code 5: External Control

This is to connect an On/Off control signal. When the signal is on and air-con mode of wire controller is on, the Heat Pump can work. The running mode will be decided by the setting of the wired controller.
If the signal is off, the Heat Pump can't work.
But if there is domestic hot water requirement the domestic hot water will not be affected by the external signal. It will always work as per the setting of wired controller of the heat pump.

Code 6: 0-10V Control

If the external controller gives a voltage control signal of 0 to +10V, the heat pump will produce water with different temperature according to a voltage-water temperature table. Once this control method is in force, the external signal will control the setting outlet temperature of space heating/cooling, the temperature setting of the wire controller is not in force anymore.
This control signal is for space heating and space cooling modes.

Voltage-Water temperature table for space cooling mode

Signal (Input Voltage)	Setting water outlet temp.	Signal (Input Voltage)	Setting water outlet temp.
0V	Waiting		
0.5V	7°C	5.5V	17°C
1.0V	8°C	6.0V	18°C
1.5V	9°C	6.5V	19°C
2.0V	10°C	7.0V	20°C
2.5V	11°C	7.5V	21°C
3.0V	12°C	8.0V	22°C
3.5V	13°C	8.5V	23°C
4.0V	14°C	9.0V	24°C
4.5V	15°C	9.5V	25°C
5.0V	16°C	10.0V	26°C

Voltage-Water temperature table for space heating mode (when controlled by inlet water temp)

Signal (Input Voltage)	Setting water outlet temp.	Signal (Input Voltage)	Setting water outlet temp.
0V	Waiting		
0.5V	22°C	5.5V	42°C
1.0V	24°C	6.0V	44°C
1.5V	26°C	6.5V	46°C
2.0V	28°C	7.0V	48°C
2.5V	30°C	7.5V	50°C
3.0V	32°C	8.0V	52°C
3.5V	34°C	8.5V	54°C
4.0V	36°C	9.0V	56°C
4.5V	38°C	9.5V	58°C
5.0V	40°C	10.0V	60°C

Voltage-Water temperature table for space heating mode (when controlled by outlet water temp)

Signal (Input Voltage)	Setting water outlet temp.	Signal (Input Voltage)	Setting water outlet temp.
0V	Waiting		
0.5V	30°C	5.5V	46°C
1.0V	32°C	6.0V	47°C
1.5V	34°C	6.5V	48°C
2.0V	36°C	7.0V	49°C
2.5V	38°C	7.5V	50°C
3.0V	40°C	8.0V	51°C
3.5V	42°C	8.5V	52°C
4.0V	43°C	9.0V	53°C
4.5V	44°C	9.5V	54°C
5.0V	45°C	10.0V	55°C

Pre-operation checks

Checks before initial start-up

⚠ SWITCH OFF THE POWER SUPPLY BEFORE MAKING ANY CONNECTIONS.

After the installation of the unit, check the following before switching on the circuit breaker:

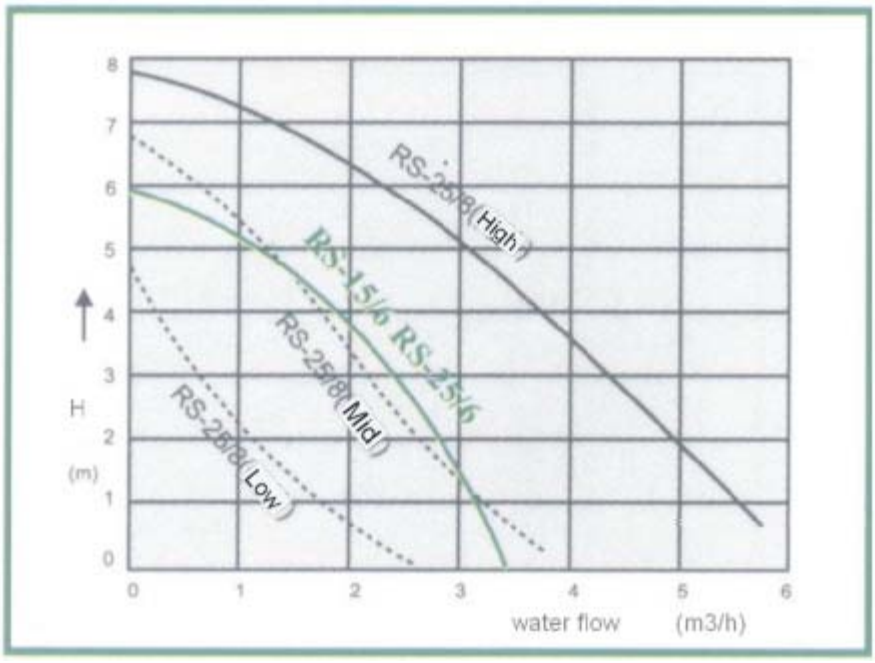
1. **Field wiring**
   Make sure that the field wiring between the local supply panel and domestic hot water tank has been carried out according to the instructions, according to the wiring diagrams and according to European and national regulations.
2. **Fuses or protection devices**
   Check that the fuses or the locally installed protection devices are of the size and type specified. Make sure that neither a fuse nor a protection device has been bypassed.
3. **Earth wiring**
   Make sure that the earth wires have been connected properly and that the earth terminals are tightened.
4. **Internal wiring**
   Visually check the switch box on loose connections or damaged electrical components.
5. **Fixation**
   Check that the unit is properly fixed, to avoid abnormal noises and vibrations when starting up the unit.
6. **Damaged equipment**
   Check the inside of the unit on damaged components or squeezed pipes.
7. **Refrigerant leakage**
   Check the inside of the unit on refrigerant leakage. If there is a refrigerant leak, call your local dealer.
8. **Power supply voltage**
   Check the power supply voltage on the local supply panel. The voltage must correspond to the voltage on the identification label of the unit.
9. **Air purge valve**
   Make sure the air purge valve is open.
10. **Pressure relief valve**
    Check if the backup heater vessel is completely filled with water by operating the pressure relief valve. It should purge water instead of air.
    ⚠ OPERATING THE SYSTEM WITH THE BACKUP HEATER VESSEL NOT COMPLETELY FILLED WITH WATER WILL DAMAGE THE BACKUP HEATER!
11. **Shut-off valves**
    Make sure that the shut-off valves are correctly installed and fully open.

    ⚠ OPERATING THE SYSTEM WITH CLOSED VALVES WILL DAMAGE THE PUMP!

Setting the pump speed

The pump speed can be selected on the pump. The default setting is high speed (III). If the water flow in the system is too high (e.g., noise of running water in the installation) the speed can be lowered (I or II). The available external static pressure (ESP, expressed in mH2O) in function of the water flow (l/min) is shown in the graph below.

Model: RS15/6 and RS25/8



MAINTENANCE

In order to ensure optimal availability of the unit, a number of checks and inspections on the unit and the field wiring have to be carried out at regular intervals.

⚠ BEFORE CARRYING OUT ANY MAINTENANCE OR REPAIR ACTIVITY, ALWAYS SWITCH 'OFF' THE CIRCUIT BREAKER ON THE SUPPLY PANEL, REMOVE THE FUSES OR OPEN THE PROTECTION DEVICES OF THE UNIT.

⚠ MAKE SURE THAT BEFORE STARTING ANY MAINTENANCE OR REPAIR ACTIVITIES THE POWER SUPPLY TO THE OUTDOOR UNIT IS SWITCHED 'OFF'.

The described checks must be executed at least once a year.

1. **Water pressure**
   Check if the water pressure is above 0.3 bar. If necessary add water.
2. **Water filter**
   Clean the water filter.
3. **Water pressure relief valve**
   Check for correct operation of the pressure relief valve by turning the red knob on the valve counter-clockwise:
   - If you do not hear a clacking sound, contact your local dealer.
   - In case the water keeps running out of the unit, close both the water inlet and outlet shut-off valves first and then contact your local dealer.
4. **Pressure relief valve hose**
   Check that the pressure relief valve hose is positioned appropriately to drain the water.
5. **Backup heater vessel insulation cover**
   Check that the back-up heater insulation cover is fastened tightly around the back-up heater vessel.
6. **Domestic hot water tank pressure relief valve (field supply)**
   Applies only to installations with a domestic hot water tank.
   Check for a correct operation of the pressure relief valve on the domestic hot water tank.
7. **Domestic hot water tank booster heater**
   Applies only to installations with a domestic hot water tank.
   It is advisable to remove lime build up on the booster heater to extend its life span, especially in regions with hard water. To do so, drain the domestic hot water tank, remove the booster heater from the domestic hot water tank and immerse in a bucket (or similar) with lime-removing product for 24 hours.
8. **Indoor unit switch box**
   - Carry out a thorough visual inspection of the switch box and look for obvious defects such as loose connections or defective wiring.
   - Check for a correct operation of contactors (with the use of an ohmmeter). All contacts of these contactors must be in open position.

TROUBLESHOOTING

This section provides useful information for diagnosing and correcting certain troubles which may occur in the unit.

General guidelines

Before starting the troubleshooting procedure, carry out a thorough visual inspection of the unit and look for obvious defects such as loose connections or defective wiring.
Before contacting your local dealer, read this chapter carefully, it will save you time and money.

⚠ WHEN CARRYING OUT AN INSPECTION ON THE SWITCH BOX OF THE UNIT, ALWAYS MAKE SURE THAT THE MAIN SWITCH OF THE UNIT IS SWITCHED 'OFF'.

When a safety device was activated, stop the unit and find out why the safety device was activated before resetting it. Under no circumstances safety devices may be bridged or changed to a value other than the factory setting. If the cause of the problem cannot be found, call your local dealer/installer.

If the pressure relief valve is not working correctly and needs to be replaced, always reconnect the flexible hose attached to the pressure relief valve, to avoid water dripping out of the unit!

General symptoms

Symptom 1: The unit is turned 'on' but the unit is not heating or cooling as expected

Possible causes	Corrective action
The temperature setting is not correct.	Check the controller set point.
The water flow is too low.	• Check that all shut off valves of the water circuit are completely open. • Check if the water filter needs cleaning. • Make sure there is no air in the system (purge air). • Check on the manometer that there is sufficient water pressure. The water pressure must be >0.3 bar (water is cold), >>0.3 bar (water is hot). • Check that the pump speed setting is on the highest speed. • Make sure that the expansion vessel is not broken • Check that the resistance in the water circuit is not too high for the pump.
The water volume in the installation is too low.	Make sure that the water volume in the installation is above the minimum required value.

Symptom 2: The unit is turned 'on' but the compressor is not starting (space heating or domestic water heating)

Possible causes	Corrective action
The unit must start up out of its operation range (the water temperature is too low).	In case of a low water temperature, the system utilizes the backup heater to reach the minimum water temperature first. • Check that the backup heater power supply is correct • Check that the backup heater thermal fuse is closed. • Check that the backup heater thermal protector is not activated. • Check that the backup heater contactors are not broken.

Symptom 3: Pump is making noise (cavitation)

Possible causes	Corrective action
There is air in the system.	Purge air.
Water pressure at pump inlet is too low.	• Check on the manometer that there is sufficient water pressure. The water pressure must be >0.3 bar (water is cold), >>0.3 bar (water is hot). • Check that the manometer is not broken. • Check that the expansion vessel is not broken. • Check that the setting of the pre-pressure of the expansion vessel is correct (refer to: "Setting the pre-pressure of the expansion vessel").

Symptom 4: The water pressure relief valve opens

Possible causes	Corrective action
The expansion vessel is broken.	Replace the expansion vessel.
The water volume in the installation is too high.	Make sure that the water volume in the installation is under the maximum allowed value (refer to: "Checking the water volume and expansion vessel pre-pressure").

Symptom 5: The water pressure relief valve leaks

Possible causes	Corrective action
Dirt is blocking the water pressure relief valve outlet.	Check for correct operation of the pressure relief valve by turning the red knob on the valve counter clockwise: • If you do not hear a clacking sound, contact your local dealer. • In case the water keeps running out of the unit, close both the water inlet and outlet shut-off valves first and then contact your local dealer.

Symptom 6: Space heating capacity shortage at low outdoor temperatures

Possible causes	Corrective action
Backup heater operation is not activated.	Check the backup heater is turned ‘on’. Check whether or not the thermal protector of the backup heater has been activated. Check whether or not the thermal fuse of the backup heater is blown.
Too much heat pump capacity is used for heating domestic hot water (applies only to installations with a domestic hot water tank).	Check that the 'space heating priority temperature' field settings are configured appropriately: - Make sure that the space heating priority is enabled

Error codes

When a safety device is activated, the user interface LED will be flashing, and an error code will be displayed.

A list of all errors can be found in the table below.

Code	Error code description	Possible reasons	Correction methods
E0	Plate heat exchanger outlet water R1T sensor failure	1) R1T sensor open circuit 2) R1T sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
E1	Domestic hot water R4T sensor failure	1) R4T sensor open circuit 2) R4T sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
E2	Plate heat exchanger return water R3T sensor failure	1) R3T sensor open circuit 2) R3T sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
E3	Reserved code		
E4	Condenser temp T3 sensor failure	1) T3 sensor open circuit 2) T3 sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
E5	Outdoor ambient temp T4 sensor failure	1) T4 sensor open circuit 2) T4 sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
E6	TH temp sensor failure	1) TH temp sensor open circuit 2) TH temp sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
E7	TL temp sensor failure	1) TL temp sensor open circuit 2) TL temp sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB

E8	Main EEPROM failure	Main PCB damaged	Replace the main PCB
E9	T2 temp sensor failure	1) T2 temp sensor open circuit 2) T2 temp sensor short circuit 3) Main PCB damaged	1) Check the sensor connection 2) Replace the sensor 3) Replace the main PCB
No Device Respo nse	Controller communication failure	1) Connection wiring failure between main control board and controller 2) Controller damaged 3) Main PCB damaged	1) Check the connection wire (2 cores wire)/ports between controller and main PCB, and check if the controller bottom side wirings are connected correctly. Replace the wiring or reconnect the ports 2) Replace the controller 3) Replace the main PCB
Eb	Communication failure between main PCB and Outdoor Unit PCB	1) Communication wiring or concerning connections failure between main PCB and Outdoor Unit PCB 2) Main PCB damaged 3) Outdoor Unit PCB damaged	1) Check the connection wiring (2 cores wiring)/ports between outdoor PCB and main PCB, and check if they are connected correctly. Replace the wiring or reconnect the ports 2) Replace the controller 3) Replace the main PCB
P0	High pressure protection	1) Water flow is too low when unit is heating water, or water temp is too high 2) Ambient temp is too high when unit is cooling water or outdoor fan's ventilation is bad 3) Too much refrigerant 4)Pressure switch failure 5) Outdoor Unit PCB damaged	1) Check whether water flow fit requirement, check whether plate heat exchanger inlet water temp is too high 2) Check unit ventilation 3) Purge surplus refrigerant 4)Replace pressure switch 5) Replace Outdoor Unit PCB
P1	Low pressure protection	1) Too less refrigerant 2)The electronic expansion valve assembly damaged 3) Pressure switch failure 4) Outdoor Unit PCB damaged	1) Check leakage and charge more refrigerant 2) Replace electronic expansion valve and expansion valve coil 3) Replace pressure switch 4) Replace Outdoor Unit PCB
P2	Wrong sequence protection	1)Wrong setting of Outdoor Unit PCB DIP switch 2)Wrong phase connection (only for 3 phases power supply) 3)Outdoor Unit PCB damaged	1) Correct Outdoor Unit PCB DIP switch setting 2) Correct power supply 3) Replace Outdoor Unit PCB
P4	Water flow switch protection	1) Water pump damaged or water pump wiring damaged 2) Water pump gear failure	1) Replace water pump or repair water wiring 2) Adjust right water pump gear

		3)Water filter block 4) Water flow switch damaged 5) Main PCB damaged	3)Clear water filter 4) Replace water flow switch 5) Replace main PCB
P5	Low temp protection	1)Too low circuit water temp 2)Too low circuit water flow 3)There is extra air in water system 4)Unreasonable anti freeze protection temp setting 5)Plate heat exchanger outlet water temp sensor damaged 6)Main PCB damaged	2)Adjust water pump to right gear, clear water filter, 3) Purge extra air from water system 4)Adjust to right anti freeze protection temp 5)Replace Plate heat exchanger outlet water temp sensor 6)Replace Main PCB
P6	Condenser high temp protection	1)Too high ambient temp 2)Bad outdoor unit ventilation 3)Condenser temp sensor failure 4)Outdoor unit PCB failure	1)Do not run unit until ambient temp is lower 2)Optimize outdoor unit ventilation 3)Replace condenser temp sensor 4)Replace outdoor unit PCB
P7	Secondary high pressure protection	1) Water flow is too low when unit is heating water, or water temp is too high 2) Ambient temp is too high when unit is cooling water or outdoor fan's ventilation is bad 3) Too much refrigerant 4)Pressure switch failure 5) Outdoor Unit PCB damaged	1) Check whether water flow fit requirement, check whether plate heat exchanger inlet water temp is too high 2) Check unit ventilation 3) Purge surplus refrigerant 4)Replace pressure switch 5) Replace Outdoor Unit PCB
P8	Insufficient water flow protection (Too big inlet/outlet temp difference protection)	1) Water pump gear failure 2) Water filter block 3) Resistance of water system is too big 4)Heat exchanger inlet/outlet water temp sensor failure 5) Main PCB damaged	1) Adjust water pump to right gear 2) Clear water filter 3) Improve water system, get down the water resistance 4) Replace heat exchanger inlet/outlet water temp sensor 5) Replace main PCB
P9	Buffer tank overheat protection	1)Too low water flow 2)Buffer tank temp controller failure 3)Buffer tank elec-heater relay failure 4)Main PCB failure	1) Adjust water pump to right gear, clear water filter 2)Replace buffer tank temp controller 3)Replace tank elec-heater relay 4)Replace main PCB

TECHNICAL SPECIFICATION

Single phase models

TECHNICAL DATA			6kw	8kw	11kw	14kw
Heating	Nominal capacity	kW	Refer to the nameplate			
	Power input	kW	Refer to the nameplate			
Cooling	Nominal capacity	kW	Refer to the nameplate			
	Power input	kW	Refer to the nameplate			
DHW	Nominal capacity	kW	Refer to the nameplate			
	Power input	kW	Refer to the nameplate			
Max. power input (+3 steps backup heater)		kW	2.6(+6)	3.5(+6)	4.06(+6)	5.5(+6)
Max. current(+backup heater)		A	11.9(+26)	16(+26)	18.6(+26)	26(+26)
Starting current (without soft start kit)		A	36.8	61	63	98.5
Starting current (with soft start kit)		A	15	24	25	39
Leakage current		A	≤2mA			
Power supply		V/Ph/Hz	220-240/1/50			
Working temperature range		°C	-15-43			
Max. leaving water temperature (without using backup heater)		°C	55			
Soft start kit			Optional			
Refrigerant circuit	Refrigerant	Type	R410A			
		Charge/Kg	2	2	2.5	3.5
	Compressor	Type	Rotary			Scroll
		Brand	TOSHIBA			DAIKIN
	Heat exchanger	Type	High efficicency hydrophilic fin-tube heat exchanger			
	Electronic expansion valve	Brand	Saglnomiya			
	Fan motor power input	W	95±10%	95±10%	(65±10%)x2	(95±10%)x2
	Size of fan	mm	500x145	500x145	430x154	500x145
	Air flow	m3/h	3800	3800	4900	7400
	Gas manometer	Pressure range	1.8--4MPa			
Water circuit	Heat exchanger	Type	Stainless steel plate heat exchanger			
	Water pump	Brand	WILO			
		Model	RS15/6		RS25/8	
		Power input (H/M/L) /w	93/67/46		151/113/81	
		Max. water head /m	(H/M/L speed) 6/4/2.5		(H/M/L speed) 7.8/6.8/4.8	

	3-way valve	Type	T type electromotion			
	Flow switch	Type	stopcock/brass			
		Flow check point / m3/h	0.3			
	Rated water flow	m3/h	1.2	1.5	1.8	2.5
	Expansion vessel	Type	squareness closed type			
		capacity /L	10			
	Backup heater vessel	capacity /L	15		20	
	Air purge valve	Brand	OR			
	Pressure relief valve	Brand	OR			
		Pressure set point	3 bar			
	Backup heater	Quantity *Power	3*2kW			
	Water manometer	Pressure range	0.1—0.3MPa			
	inlet/outlet pipe	inch	BG1“			
	Permitted pressure	MPa	0.3			
Dimensions (Net)	HxWxD	mm	1070x1140x480	1070x1140x480	1275x1205x480	1480x1200x480
Dimensions (Packing)	HxWxD	mm	1180x1205x510	1180x1205x510	1380x1275x510	1590x1265x510
Net weight		kg	125	130	179	200
Gross weight		kg	133	138	198	216
Noise level		dB(A)	53	53	55	58

NOTES:

Capacities and power inputs based on the following conditions:

- Heating: Water Inlet/Outlet temperature 30°C /35°C. Outdoor air dry bulb/wet bulb temperature 7°C /6°C
- Cooling: Water Inlet/Outlet temperature 23°C /18°C. Outdoor air dry bulb temperature 35°C
- Domestic Hot Water: Water temperature in the tank 40°C. Outdoor air dry bulb/wet bulb temperature 7°C /6°C

TECHNICAL SPECIFICATION

Three phase models

TECHNICAL DATA			14kw	16kw	21kw
Heating	Nominal capacity	kW	Refer to the nameplate		
	Power input	kW	Refer to the nameplate		
Cooling	Nominal capacity	kW	Refer to the nameplate		
	Power input	kW	Refer to the nameplate		
DHW	Nominal capacity	kW	Refer to the nameplate		
	Power input	kW	Refer to the nameplate		
Max. power input (+3 steps backup heater)		kW	5.5(+6)	6.8(+6)	8.0 (+6)
Max. current(+backup heater)		A	8.8(+8.7)	10.9(+8.7)	12.9(+8.7)
Starting current (without soft start kit)		A	48.2	63	67
Starting current (with soft start kit)		A	---	---	---
Leakage current		A	≤2mA		
Power supply		V/Ph/Hz	380-415/1/50		
Working temperature range		°C	-15-43		
Max. leaving water temperature (without using backup heater)		°C	55		
Soft start kit			NO		
Refrigerant circuit	Refrigerant	Type	R410A		
		Charge/Kg	3.5	3.5	3.5
	Compressor	Type	Scroll		
		Brand	DAIKIN		SANYO
	Heat exchanger	Type	High efficicency hydrophilic fin-tube heat exchanger		
	Electronic expansion valve	Brand	Saglnomiya		
	Fan motor power input	W	(95±10%)x2		
	Size of fan	mm	500x145		
	Air flow	m3/h	7400		
	Gas manometer	Pressure range	1.8--4MPa		
Water circuit	Heat exchanger	Type	Stainless steel plate heat exchanger		
	Water pump	Brand	WILO		
		Model	RS25/8		
		Power input (H/M/L) /w	151/113/81		
		Max. water head /m	(H/M/L speed) 7.8/6.8/4.8		

	3-way valve	Type	T type electromotion		
	Flow switch	Type	stopcock/brass		
		Flow check point / m3/h	0.3		
	Rated water flow	m3/h	2.5	2.9	3.5
	Expansion vessel	Type	squareness closed type		
		capacity /L	10		
	Backup heater vessel	capacity /L	20		
	Air purge valve	Brand	OR		
	Pressure relief valve	Brand	OR		
		Pressure set point	3 bar		
	Backup heater	Quantity *Power	3*2kW		
	Water manometer	Pressure range	0.1—0.3MPa		
	inlet/outlet pipe	inch	BG1“		
	Permitted pressure	MPa	0.3		
Dimensions (Net)	HxWxD	mm	1480x1200x480		
Dimensions (Packing)	HxWxD	mm	1590x1265x510		
Net weight		kg	200	200	205
Gross weight		kg	216	216	221
Noise level		dB(A)	58	58	58

NOTES:

Capacities and power inputs based on the following conditions:

- Heating: Water Inlet/Outlet temperature 30°C /35°C. Outdoor air dry bulb/wet bulb temperature 7°C /6°C
- Cooling: Water Inlet/Outlet temperature 23°C /18°C. Outdoor air dry bulb temperature 35°C
- Domestic Hot Water: Water temperature in the tank 40°C. Outdoor air dry bulb/wet bulb temperature 7°C /6°C

TEMPERATURE SENSOR R-T CONVERSION TABLE

R25 = 5.0KΩ±1.0％ B25-50 = 3470K±1.0％

T(℃)	Rmin(KΩ)	R(KΩ)	Rmax(KΩ)	T(℃)	Rmin(KΩ)	R(KΩ)	Rmax(KΩ)
-30.0	61.254	63.465	65.749	46.0	2.287	2.328	2.369
-29.0	58.028	60.090	62.219	47.0	2.209	2.250	2.290
-28.0	54.991	56.914	58.898	48.0	2.135	2.174	2.214
-27.0	52.130	53.924	55.773	49.0	2.063	2.102	2.141
-26.0	49.434	51.107	52.832	50.0	1.994	2.032	2.071
-25.0	46.892	48.454	50.063	51.0	1.927	1.965	2.003
-24.0	44.497	45.954	47.455	52.0	1.863	1.901	1.938
-23.0	42.237	43.598	44.998	53.0	1.802	1.839	1.876
-22.0	40.105	41.376	42.682	54.0	1.743	1.779	1.815
-21.0	38.094	39.280	40.499	55.0	1.686	1.721	1.757
-20.0	36.195	37.303	38.441	56.0	1.631	1.666	1.701
-19.0	34.402	35.437	36.499	57.0	1.579	1.613	1.647
-18.0	32.709	33.676	34.668	58.0	1.528	1.561	1.595
-17.0	31.109	32.012	32.939	59.0	1.479	1.512	1.545
-16.0	29.597	30.441	31.306	60.0	1.432	1.464	1.497
-15.0	28.168	28.957	29.765	61.0	1.386	1.418	1.451
-14.0	26.816	27.554	28.308	62.0	1.343	1.374	1.406
-13.0	25.538	26.227	26.932	63.0	1.301	1.331	1.362
-12.0	24.328	24.972	25.631	64.0	1.260	1.290	1.321
-11.0	23.183	23.785	24.400	65.0	1.221	1.250	1.280
-10.0	22.098	22.661	23.236	66.0	1.183	1.212	1.242
-9.0	21.071	21.598	22.135	67.0	1.147	1.175	1.204
-8.0	20.098	20.590	21.093	68.0	1.111	1.139	1.168
-7.0	19.176	19.636	20.106	69.0	1.077	1.105	1.133
-6.0	18.301	18.732	19.171	70.0	1.045	1.072	1.099
-5.0	17.472	17.875	18.285	71.0	1.013	1.040	1.067
-4.0	16.686	17.063	17.446	72.0	0.983	1.009	1.035
-3.0	15.940	16.292	16.650	73.0	0.953	0.979	1.005
-2.0	15.231	15.561	15.896	74.0	0.925	0.950	0.975
-1.0	14.559	14.867	15.180	75.0	0.897	0.922	0.947
0.0	13.920	14.208	14.501	76.0	0.871	0.895	0.919
1.0	13.313	13.582	13.856	77.0	0.845	0.869	0.893
2.0	12.736	12.988	13.244	78.0	0.820	0.843	0.867
3.0	12.188	12.423	12.662	79.0	0.796	0.819	0.842
4.0	11.666	11.887	12.110	80.0	0.773	0.795	0.818
5.0	11.170	11.376	11.585	81.0	0.751	0.773	0.795
6.0	10.698	10.891	11.086	82.0	0.729	0.751	0.773

7.0	10.249	10.429	10.611	83.0	0.708	0.729	0.751
8.0	9.822	9.990	10.160	84.0	0.688	0.709	0.730
9.0	9.414	9.572	9.730	85.0	0.668	0.689	0.709
10.0	9.027	9.173	9.321	86.0	0.649	0.669	0.690
11.0	8.657	8.794	8.932	87.0	0.631	0.651	0.671
12.0	8.305	8.432	8.561	88.0	0.613	0.632	0.652
13.0	7.969	8.088	8.208	89.0	0.596	0.615	0.634
14.0	7.648	7.760	7.872	90.0	0.579	0.598	0.617
15.0	7.343	7.446	7.551	91.0	0.563	0.581	0.600
16.0	7.051	7.148	7.245	92.0	0.548	0.566	0.584
17.0	6.773	6.863	6.953	93.0	0.533	0.550	0.568
18.0	6.507	6.5911	6.675	94.0	0.518	0.535	0.553
19.0	6.253	6.331	6.410	95.0	0.504	0.521	0.538
20.0	6.011	6.083	6.156	96.0	0.490	0.507	0.524
21.0	5.779	5.847	5.914	97.0	0.477	0.493	0.510
22.0	5.558	5.620	5.683	98.0	0.464	0.480	0.496
23.0	5.346	5.404	5.463	99.0	0.452	0.467	0.483
24.0	5.144	5.198	5.252	100.0	0.439	0.455	0.470
25.0	4.950	5.000	5.050	101.0	0.428	0.443	0.458
26.0	4.761	4.811	4.861	102.0	0.416	0.431	0.446
27.0	4.580	4.630	4.680	103.0	0.405	0.420	0.434
28.0	4.408	4.457	4.507	104.0	0.395	0.409	0.423
29.0	4.242	4.292	4.341	105.0	0.384	0.398	0.412
30.0	4.084	4.133	4.182	106.0	0.374	0.388	0.402
31.0	3.933	3.981	4.030	107.0	0.364	0.378	0.391
32.0	3.788	3.836	3.885	108.0	0.355	0.368	0.381
33.0	3.649	3.697	3.745	109.0	0.346	0.358	0.372
34.0	3.516	3.563	3.611	110.0	0.337	0.349	0.362
35.0	3.388	3.435	3.483	111.0	0.328	0.340	0.353
36.0	3.266	3.313	3.360	112.0	0.320	0.332	0.344
37.0	3.149	3.195	3.241	113.0	0.311	0.323	0.336
38.0	3.037	3.082	3.128	114.0	0.303	0.315	0.327
39.0	2.929	2.974	3.019	115.0	0.296	0.307	0.319
40.0	2.826	2.870	2.915	116.0	0.288	0.300	0.311
41.0	2.726	2.770	2.815	117.0	0.281	0.292	0.303
42.0	2.631	2.675	2.718	118.0	0.274	0.285	0.296
43.0	2.540	2.583	2.626	119.0	0.267	0.278	0.289
44.0	2.452	2.494	2.537	120.0	0.260	0.271	0.282
45.0	2.368	2.409	2.451				

Postadress:
TRÄDGÅRDSTEKNIK AB
Helsingborgsvägen 578, Varalöv
262 96 ÄNGELHOLM

Telefon : 0431-222 90
Bg.nr : 5743-7980
Org.nr : 556409-6120

URL:
www.tradgardsteknik.se
E-postadress:
info@tradgardsteknik.se