



Aquapura X60 HT



INSTALLATION AND USER MANUAL

Dear Client,

We appreciate your preference when purchasing equipment designed to heat sanitary water.

The X60 Aerothermal System will certainly satisfy all your expectations and provide you with many years of comfort with maximum energy savings.

Our organization dedicates a lot of time, energy and economic resources to develop innovations that promote energy savings in our products.

With your choice, you have just demonstrated your sensitivity and attention to energy consumption that affects the environment.

We are permanently committed to designing innovative and efficient products so that this rational use of energy can actively contribute to safeguarding the planet's environment and natural resources.

Keep this manual, which aims to inform, warn and advise on the use and maintenance of this equipment.

Our services are always at your disposal.

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1 INFORMATION

This manual is an aid for qualified technicians to correctly install, operate and carry out maintenance services on the heat pump.

Read this manual carefully before attempting to install, operate or carry out any intervention on the heat pump. Failure to follow these instructions may cause heat pump failure, electric shock, injury or property damage.



Installer:


Before leaving the premises, double-check the manual to make sure the heat pump was installed correctly. Start the unit and verify that the equipment is operating within normal parameters.

2 SECURITY INFORMATION

In order to protect the physical integrity of the operator, as well as the equipment, it is essential that all safety information noted in this manual is taken into account.




Hydraulic and electrical connections must comply with current regulations at the installation site.

 DANGER	Any process that the supplier believes may involve a danger of personal injury and/or property damage must be marked with a DANGER SIGN. As a means of further classifying the hazard, the symbol will be accompanied by one of the following words: <ul style="list-style-type: none"> • DANGER: when the operator and/or people in the vicinity of the equipment are subject to personal injury. • ATTENTION: when equipment and/or nearby materials are subject to material damage.
 INFO	All information that the supplier believes can contribute to the better performance and conservation of the equipment must be marked with the informative sign.



 NOTICE	Children must not play with the appliance. Cleaning and maintenance must not be carried out by children without supervision. This appliance can be used by children aged 8 years and over and by people with limited physical, sensory or mental capabilities or lack of experience and knowledge if they are supervised or have received instructions concerning use of the appliance in a safe way and understand the risks. involved;
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2.1 Danger


INSTALLATION:



	Description
 DANGER	The heat pump must be installed by qualified technicians. Improper installation may cause water leaks, electric shocks or fires.
	Make sure that the BC ground connection is properly connected. A bad connection can cause an electric shock.
	The refrigerant in the unit is flammable.
	<ul style="list-style-type: none"> • Carry out brazing or welding only on empty pipes that are clean of any lubricating oil residues; • Do not bring flames or other heat sources close to pipes containing refrigerant fluid; • Do not operate with an open flame near the unit;

DURING OPERATION:

	Description
	It is prohibited to place fingers, hands or other objects on the fans. Failure to comply may cause serious injury or destruction of equipment.
 DANGER	If you detect something wrong with your BC such as a burning smell, too much noise, etc. immediately turn off the power supply. Leaving the BC operating could result in fire or destruction of the equipment.


MAINTENANCE:

	Description
 DANGER	If you need to move the BC to another location, please contact the salesperson or qualified technician. Improper installation may cause water leakage, electric shock, injury or fire.





 DANGER	Maintenance or repairs must be performed by the dealer or qualified technician. Poor intervention could cause water leaks, electric shocks, injuries or fire.
	The user is prohibited from carrying out any intervention on the BC. Failure to do so may cause water leakage, electric shock, serious injury or fire.

2.2 Notice

INSTALLATION:

	Description
 DANGER	The BC cannot be installed in places with flammable gas. The occurrence of a gas leak could cause an explosion or fire.
	Make sure that the base where you are going to install the BC is sufficiently solid, thus avoiding cracks or even falling of the BC.
	Make sure you install a separate circuit breaker for the BC. The lack of a circuit breaker can cause an overload in the circuit and, consequently, the risk of fire in the installation.

MAINTENANCE:

	Description
 DANGER	Before carrying out any intervention on the BC such as cleaning, maintenance, etc. disconnect it from the electrical network.
	It is expressly prohibited to make any type of blackout on the protection fuses. Fuses must be replaced by a qualified person.
	Do not spray the BC with flammable liquids, this may cause a fire.
	Do not use cleaning agents that contain sand, acid or chlorides, as these may damage the surface of the BC.

3 GENERAL

3.1 Manufacturer's responsibility

Our products are manufactured respecting the requirements of the various directives Europeans .

Ever worried about the quality and performance of ours products, we continually strive to improve them . Therefore, we reserve the right of modify at any moment the information described in this document .

As manufacturers, we are no longer responsible for the malfunction or even breakdown of equipment whenever:

- Instructions for use are not followed.
- No respect the instructions installation.
- Lack in maintenance (if required).

3.2 Installer's responsibility

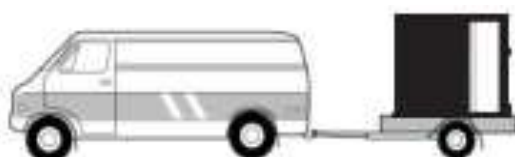
The installer is responsible for correctly installing the equipment and starting its operation. The installer must pay attention to the following notes:

- Read and carefully follow the instructions in the manuals supplied with the device.
- Carry out the installation in accordance with the standards in force and required by the manufacturer.
- Perform the initial start-up of the equipment and check all control points.
- Explain the installation to the user and how to use the equipment.
- Warn the user of the obligation, if required, to carry out inspection and maintenance operations on the equipment.
- Provide the user with all documentation provided with the equipment (manuals and warranty certificate).

4 TRANSPORT

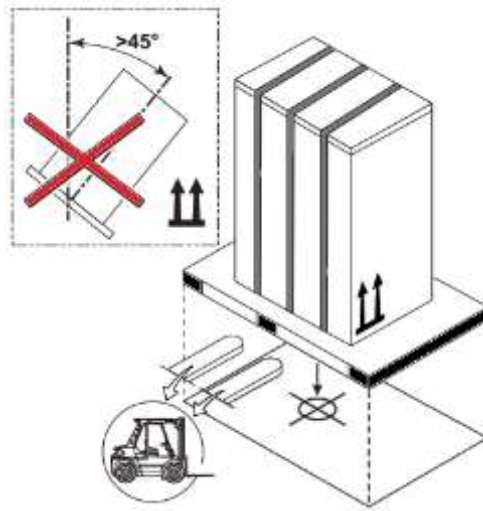
The Heat Pump is packed in a bottomless cardboard box and is fixed to a treated pine wood pallet with plastic straps.

When transporting, the BC must be kept vertical, otherwise damage could occur to the equipment's interior/exterior components.



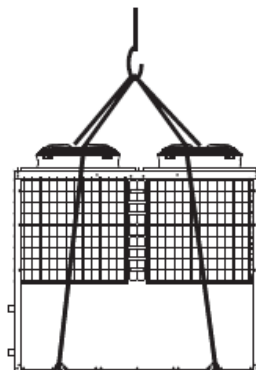
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The BC must be transported to the installation location on a pallet. During transport, keep the equipment as level as possible, without tilting more than 45°.



The recommended tool for transporting the unit while it is still on the pallet is a forklift. When transporting the unit, be sure to lift it only from the bottom and always with the unit placed on the pallet. Do not attempt to move the unit without assistance.

If you need to lift the pump, an 8m cable is needed and place a shock absorber between the cables and the pump to avoid damaging it when it is being lifted.



	Description
 NOTICE	<p>The unit has been tested and inspected prior to shipment from the manufacturer for quality assurance. Carefully inspect the equipment components upon receipt to ensure that the equipment was not damaged during transportation.</p> <p>Confirm that all parts ordered were received as specified and that the unit type, size and voltage are correct.</p>

5 OPERATION PRINCIPLE

The heat pump works based on a working fluid (refrigerant R290), which changes state (gas / liquid) in a continuous cycle, absorbing and releasing heat.

The ambient air is drawn in by the fan, passing it through the evaporator. The air passing through the evaporator transfers all its energy to the working fluid (the refrigerant) changing its state from liquid to gas.

With the aid of an electrically driven compressor, the refrigerant, now vaporized but still cold, is compressed and thus heated.

The refrigerant leaves the compressor in the form of a hot gas and, as it passes through the condenser, releases energy to the heating system, condenses and leaves the refrigerant in the form of a hot liquid. With this, the water in the heating system is heated to the desired temperature.

At the exit of the condenser, the gas is already in a liquid state and is transferred to the expansion valve. In the expansion valve, the pressure is reduced suddenly, consequently also lowering the temperature of the liquid quickly. The cold liquid refrigerant is transferred to the evaporator and the cycle begins again.

6 CHARACTERISTICS OF THE HEAT PUMP

1- Advanced Control

Centralized control that allows you to control many parameters remotely via Wi-Fi or Bus mode.

2- Installation Flexibility

It has an elegant and compact structure, making it quite simple to install.

3- Noise level

High efficiency of the compressor, fan and water pump allow for a low noise level.

4- Eco-Friendly Refrigerant

Refrigerant that is less harmful to the ozone layer.

5- Economic

Compared to a diesel boiler, gas boiler or electric heater, the heat pump provides quality of life, with low operating costs, thanks to its high efficiency.

6- Installation Environment

R290 refrigerant is inflammable and explosive. It is prohibited to be installed in an environment with potential sources of ignition.

7 Operating Conditions

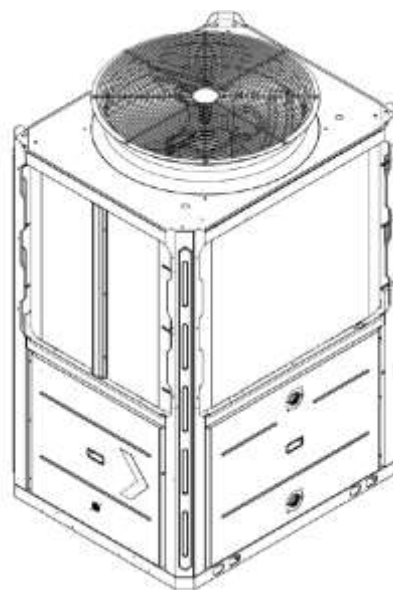
7.1 Heating Mode

- Minimum ambient temperature -25°C ;
- Inlet water temperature from 15°C to 55°C .

7.2 Cooling Mode

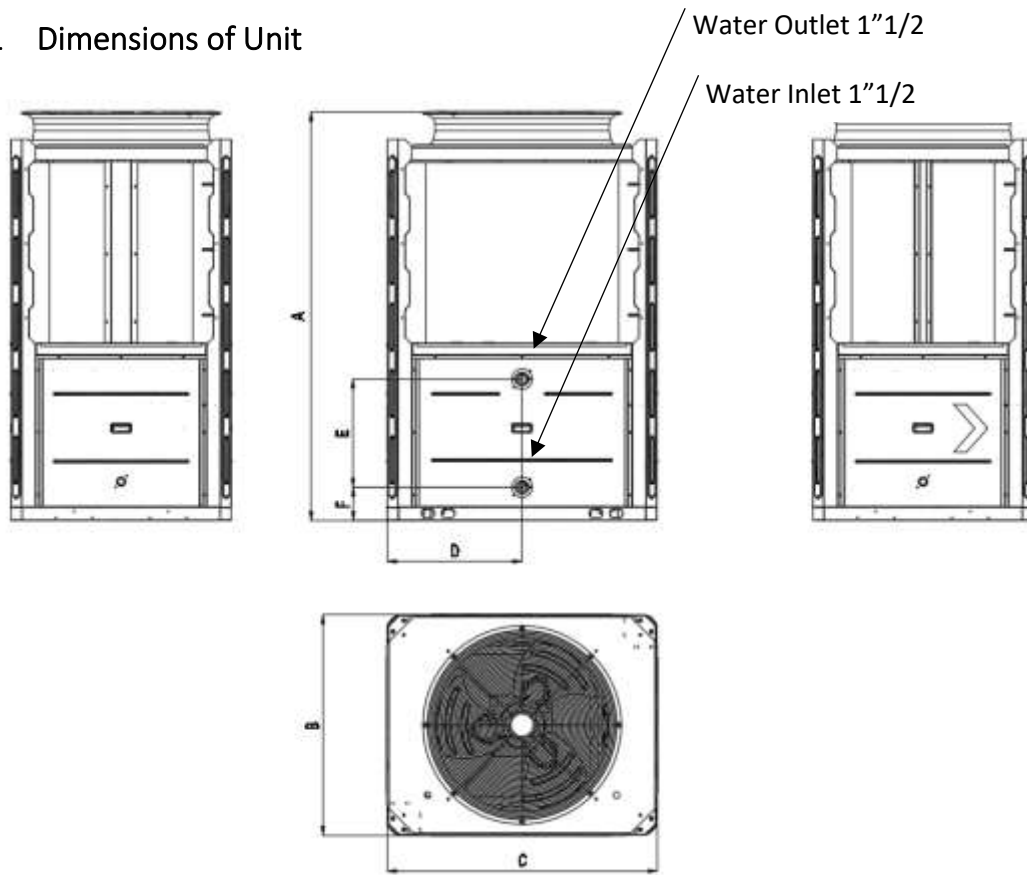
- Maximum ambient temperature 43°C ;
- Inlet water temperature from 25°C to 8°C .

8 UNIT OVERVIEW



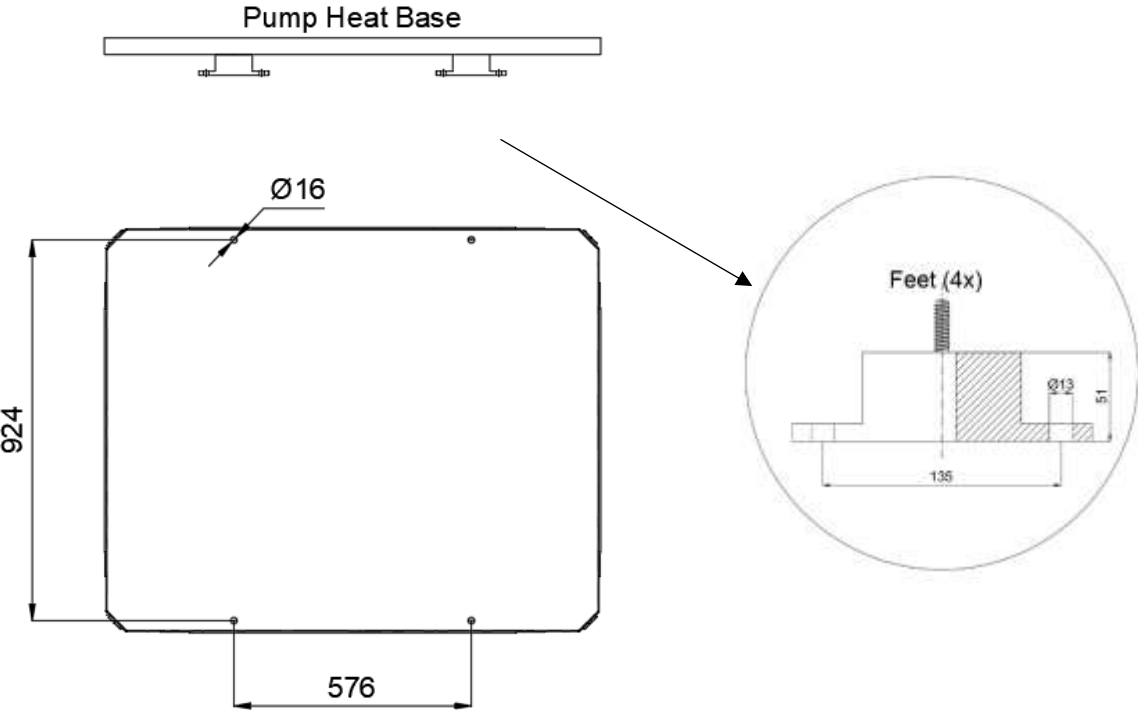
9 DIMENSIONS

9.1 Dimensions of Unit



Item	Dimension(mm)	Item	Dimension(mm)	Item	Dimension(mm)
A	1816	C	1198	E	480
B	980	D	598	F	148

9.2 Fixation of Pump in Place



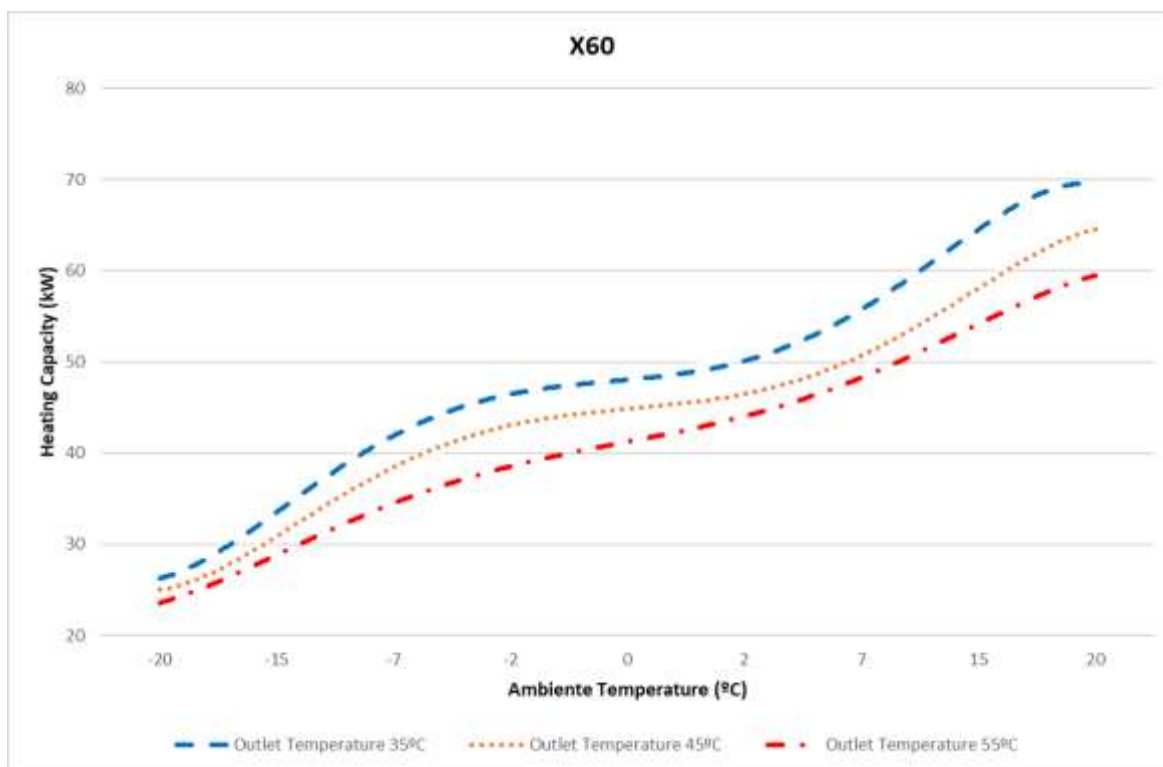
10 TECHNICAL INFORMATION

Technical Data		units	Aquapura X60HT
Electrical Supply			380-415V/3N- / 50Hz
Power Provided	Heating (Nominal/ Max)	kW	55,3 / 69,5
	Cooling (Nominal/ Max)	kW	36 / 51,8
Power Consumed	Heating (Nominal/ Max)	kW	11,74 / 17,2
	Cooling (Nominal/ Max)	kW	10,16 / 17,8
COP ¹	Nominal		4,71
ERROR ¹	Nominal		3,54
Energy Class at 35°C			A+++
SCOP Seasonal Efficiency at 35°C			4,53
Energy Class at 55°C			A++
SCOP Seasonal Efficiency at 55°C			3,27
Maximum temperature		°C	70
Maximum Consumption		kW	19,4
Maximum Operating Current		A	30
Refrigerator		g	1500x2
Refrigerant / CO2 Equivalent		T	0,0092
Compressor			DC Inverter
Sound Pressure		dB(A)	58
Hydraulic Connections		Inches	1"1/2
Water Flow		m ³ / h	9.0
Load Loss Hydraulic Circuit		kpa	80
Room temperature		°C	-25 to 43
Dimensions (HxWxD)		mm	1816x1198x980
Weight		kg	363

1: Ambient temperature (Dry/wet bulb temperature): 7 °C / 6 °C , Water temperature (inlet/outlet): 30°C/35°C.

10.1 Performance curve

It's possible to check the heat pump performance at different temperatures in the following graph.



11 INSTALLATION

11.1 Heat Pump Location

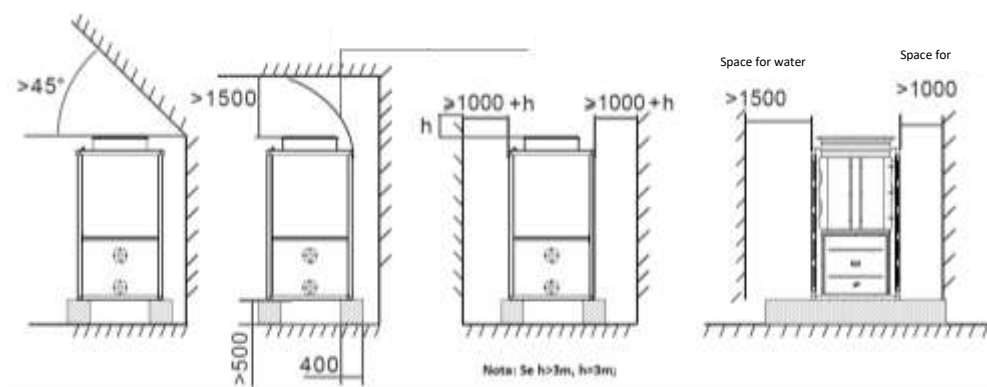
Before starting any installation procedure, check that the base of the location where the equipment will be placed is perfectly level. This prevents the compressor lubricating oil from working outside the indicated levels.

Look for a place with a regular, safe and resistant floor, preferably concrete, taking into account the weight of the machine. At least the concrete base must be 400mm thick and if possible above ground level (>500mm)

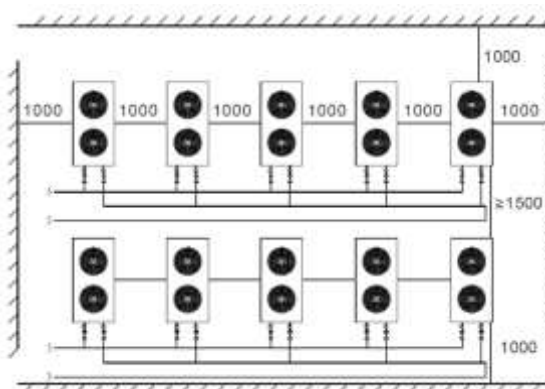
During its operation, the heat pump can create water caused by condensation from the evaporator, making it necessary to prepare the installation site with a drain point to facilitate its drainage.

Another important point is the minimum distances that the equipment must comply with in relation to walls, ceilings or any type of obstacles that could impair its performance and make access difficult, both during installation and in any maintenance operations.

Installing a unit:



Multiple unit installation (same pipe length [mm]):



Notes:

- The walls and ceiling of the technical room can be insulated with sound absorption panels if the noise level of the heat pump is too high.
- The BC's feet must be fixed to the base, preventing the equipment from moving due to the vibrations caused by its normal operation.
- Do not cover the unit's air outlet.
- If there is a barrier above the unit, keep it 3m above it.
- If there are objects stacked around the unit, keep them at a height lower by at least 0.4m from the top of the unit.
- If you install it in small rooms, you must take measures to prevent refrigerant leaks that could cause suffocation. Consult the seller to specify the measurements.

11.2 Installation Zone

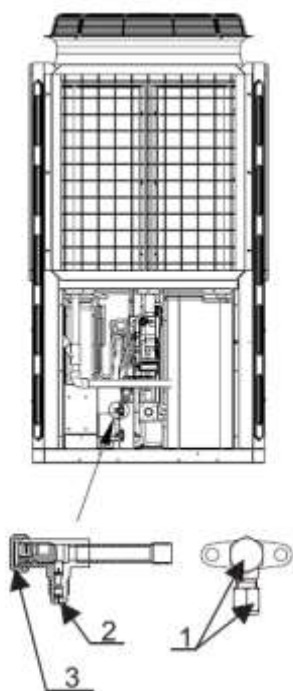
- The unit can be installed outside, as long as the location can support the weight of the machine.
- The location must have good ventilation.
- The location must be free from any heat radiation.
- A cover is necessary in winter to protect the Pump from snow.
- There must be no obstacles to the air inlet and outlet of the heat pump.
- A place free from strong drafts.
- There must be piping nearby to drain condensate.
- There must be sufficient space around the Heat Pump for Maintenance work.
- The location must be away from sources with potential for ignition (for example: gas-operated equipment, electric heaters, hot objects... etc.).

11.3 Refrigerant Charging

The heat pump is charged at high pressure with R290, please follow the following steps to charge the refrigerant if necessary:

1. Preparation

- 1.1- Make sure you are in a well-ventilated area.
- 1.2- Keep the Heat Pump away from ignition sources.
- 1.3- Disconnect the Heat Pump from the power source.




2. The Heat Pump must be charged at approximately 30Bar of nitrogen. Measure the pressure and check potential leakage areas before charging the R290. Using a wrench, remove nuts 1 and 3, and then, using a 5mm wrench, open valve 2. If high-pressure gas is coming out, it means there are no leaks).
3. All nitrogen is removed from the machine by opening Valve 2.
4. The circuit is vacuumed. Connect the vacuum pump to valve 2, keeping it running until the pressure drops to 30Pa or it has been running for more than an hour.
5. Charge the circuit with R290. Make sure it is in a liquid state and charge strictly with the amount defined in the machine's technical characteristics.
6. Once loading is complete, close valve 2 and tighten nuts 1 and 3.

11.4 Hydraulic installation

Take the following points into consideration when executing the hydraulic circuit:

- Reduce the number of bends in the pipes as much as possible to reduce pressure losses in the installation;
- Make sure that the system's accessories, strainers, water pumps and valves are designed for the full flow of the installation. Obstructions can impact the performance of the unit and the effectiveness of the central heating system;
- The pipes must be free of dirt, if possible clean the installation;
- Load the installation to check for possible leaks and then isolate the entire installation;
- Place an expansion vessel in the installation, the pressure in the expansion vessel must be 0.5bar higher than that in the installation;
- Check that the equipment's flow switch is working correctly. Simulate a flow failure by closing a filter and check whether the controller stops the BC operation and issues an alarm message;
- The hydraulic connections between the BC and the central heating circuit must be made with a flexible pipe to avoid the transmission of vibrations;
- Before putting the BC into operation, check that the hydraulic circuit is full and properly vented. If the hydraulic circuits are isolated, each circuit must be purged, ensuring that all air pockets are eliminated from the installation;
- Place a thermometer and pressure gauge at the water inlet and outlet to facilitate inspection;
- The pressure placed in the hydraulic circuit must be between the following values: Min. 1.5 bar and Max . 2 bar.

	Description
 NOTICE	The installation of the hydraulic network must be carried out by a competent professional, always respecting the hydraulic connection diagram presented by the manufacturer.

11.5 Condensate drainage system

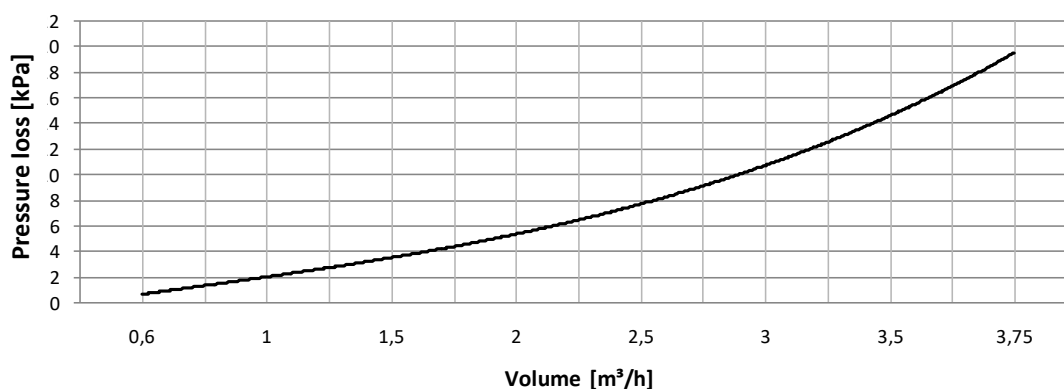
In normal operation, water is produced as a result of condensation in the evaporator and defrosting cycles. Prepare a good drainage system to prevent ice from forming on the floor, thus preventing possible falls. The drainage pipe must have a minimum diameter of 50mm, the water discharge must be carried out into the sewer and must not be exposed in places where frost forms.

11.6 Water filter

The filter blocks any impurities present in the hydraulic circuits. Residues left in the heating pipes can damage the heat exchangers and cause the BC to not work properly. It is mandatory to install the filter in the heating circuit return line, especially if the installation does not have an inertia tank.

Note 1 : The filter must contain a mesh with holes that do not exceed one millimeter.

Note 2: The filter must be kept clean and inspected periodically in order to maintain its condition, cleanliness and ensure the proper functioning of the BC.



11.7 Water quality

Water composition and quality have a direct effect on the performance of the entire system and the lifespan of the heat pump.

Normally the initial filling of the circuit is done with normal tap water. The water must have a pH value between 7-8 and be non-corrosive (chloride content > 150 mg/ l) or hardness (> 14 ° dH , hardness degree IV).

To eliminate any doubts, we advise you to request a water analysis.

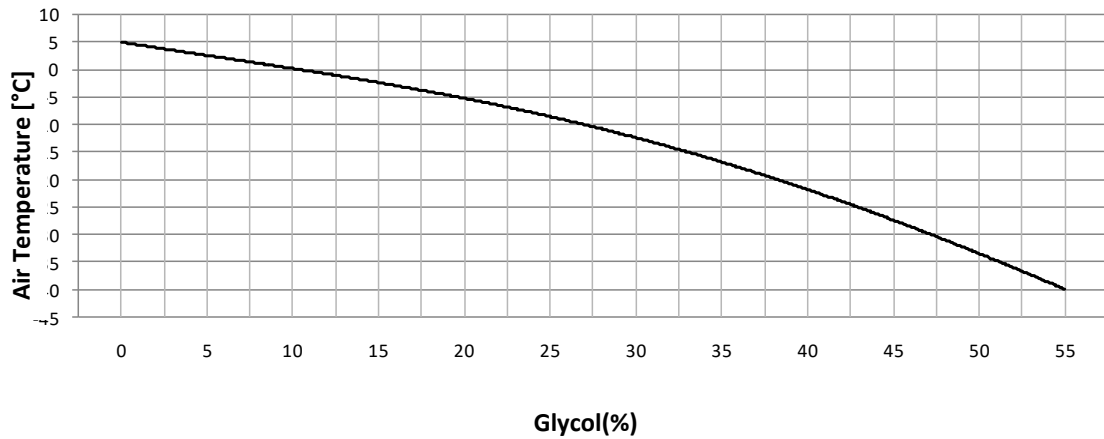
Note: The use of chemical anti-corrosive agents is not permitted.

Criterion	Max value _	Consequences
PH	7-8	Danger of corrosion on parts of the heating system.
Degree of hardness	< 14dH	Increased limescale deposit. Reduction in BC useful life.
Chloride content	< 150mg/l	Corrosion of materials.

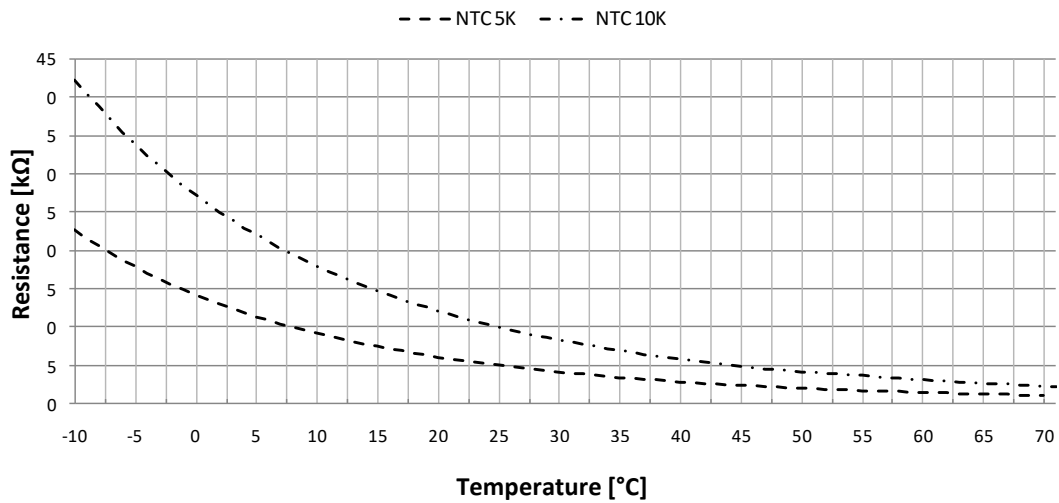
11.8 Glycol (%)

Glycol is used as an effective antifreeze in refrigeration and heating applications.

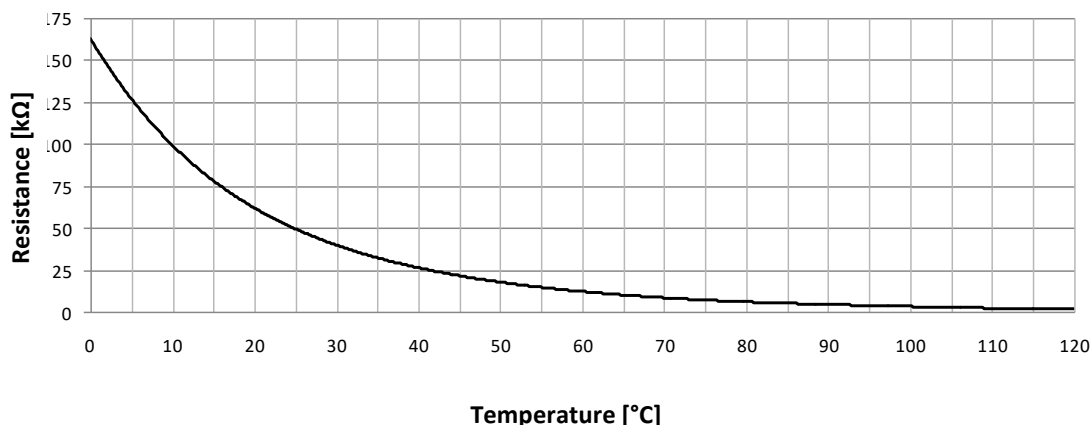
The percentage of glycol to be added to the hydraulic circuit is calculated according to the ambient air temperature, considering -5 °C. Taking this value as a reference, the installer must add 20% Ethylene Glycol to the hydraulic circuit.



11.9 Temperature probe information




NTC 50KΩ



12 ELECTRICAL INSTALLATION

12.1 General specifications


	Description
 NOTICE	<ul style="list-style-type: none"> • The installation of the electrical network must be carried out in accordance with current local regulations and by a qualified professional. • The installer must not make any type of electrical changes to the equipment.

Before making any type of connection, check that the supply voltage corresponds to the characteristics of the device.

The equipment must be connected directly to the general electrical distribution board. Dedicated protection systems must be installed for the BC (circuit breaker and differential). Connecting the equipment together with others can cause voltage drops, impairing the functioning of the equipment.

Pay attention to conduction losses in the device's power cables; the smaller the cable's cross-sectional area, the shorter the recommended maximum length. Take note of the electrical consumption reference values of the equipment and its distance from the power source and consult an electrical technician to advise on the diameter and type of cable to be used.

To make the electrical connection, open the side panel and connect the main power cable in the indicated locations.

	Description
 NOTICE	<ul style="list-style-type: none"> • The equipment must be earthed in accordance with the relevant standards for this purpose. • The manufacturer is not responsible for any damage caused by a lack of earthing of the equipment or an abnormality in the electrical supply.

12.2 Electrical network specifications/protection devices

Model	Electrical supply	Max current.	* Cable section
X60	380-415V /~ 50-60Hz	30A	6 mm ²

The wire section above was selected in accordance with current standards, considering a cable distance of 10 meters.

NOTE: Follow local regulations when selecting ground wires and circuit breakers.

Select protection systems according to the following table:

Model	Electrical supply	Max current.	CB	ELB (number of poles /A/ mA)
X60	380-415V /~ 50-60Hz	30A	40A	3F+N/ 40/ 30

CB – Circuit breaker; ELB – Differential



12.3 Connection outdoor unit with display




A cable comes with the equipment, which if it is not long enough and the distance between the outdoor unit and the display is less than 50 meters, we recommend installing a direct cable.

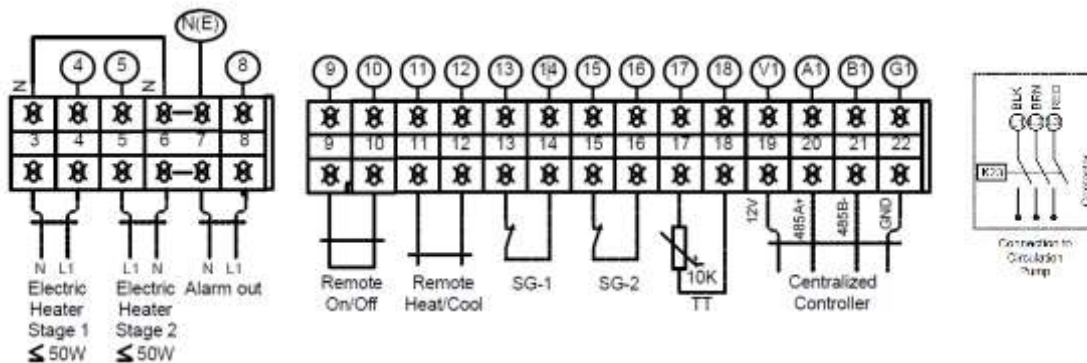
The cable must have at least 4 conductors with a section of 0.5mm and protected with a shield to avoid interference, with a maximum length of 200m.

- The power source must be through a wire that is connected to power source terminals on the control box.
- If the pump is located outside, place the power wire inside a cable also connected to the heat pump terminals.
- If an external heat source is added, it must be controlled by the heat pump controller, with a relay for auxiliary heat sources connected to an output of the controller.

	Description
 NOTICE	 The cable shield must be connected directly to the equipment's ground connection.

12.4 Connection terminals – Inputs

	Description
 NOTICE	The digital inputs 9-G1 are dry contacts (no voltage). Do not turn on (380-415V/~50-60Hz) on the terminals, otherwise it may cause irreversible damage to the controller and void the warranty.






Note: To connect the electrical heater to the “Electric heater stage 1” contact, electrical current must be supplied from an external source. A relay must be used, which is will be controlled by the heater contacts.

***Note:** The position of these terminals may vary depending on the model. Please check the electrical diagram of the machine

	Description
Electric Heater stage 1 terminal	Switch on or off the electric heater: <ul style="list-style-type: none"> • A relay should be connected to the terminal which will control the electric heater. This terminal is only active if the heater function is active on the unit parameters
Electric heater stage 2 terminal	Reserved
Alarm Out terminal	Reserved
REMOTE ON/OFF terminal	Turn equipment on or off remotely. <ul style="list-style-type: none"> • Contact open, BC OFF; • Contact closed, BC ON;
REMOTE HEAT/COOL terminal	Select Hot or Cold operating mode; <ul style="list-style-type: none"> • Open contact, BC in Cooling mode ; • Contact closed, BC in Heating mode ;
SG1 terminal	Activate/Deactivate the solar mode. It is necessary to activate this function on the parameters of the unit.
SG2 terminal	Activate/Deactivate the solar mode. It is necessary to activate this function on the parameters of the unit.

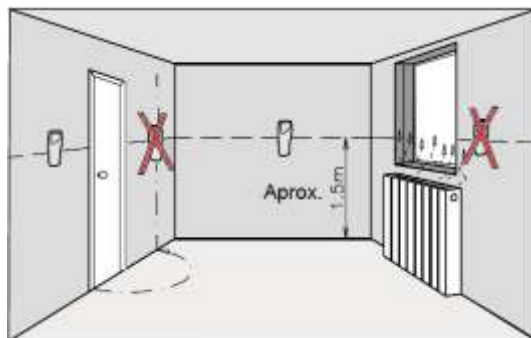
TT terminal	Reserved
Contactor	Circulation pump connections

	Description
 NOTICE	<p>ATTENTION: The digital inputs are inactive by default, giving priority to settings made via the console.</p> <p>To activate the digital inputs, you must contact a specialized technician or configure them according to the procedure indicated.</p>
 NOTICE	 <ul style="list-style-type: none"> • Use cable protected with steel mesh in the digital input connections, this way we protect the digital inputs against noise coming from the compressor, electrical network, etc. • Failure to use this type of cable may cause abnormal behavior in the operation of the equipment. • The mesh must be connected to the equipment earth.

13 ENVIRONMENTAL THERMOSTAT INSTALLATION

The simplest way to improve and control the comfort level of your installation is through a room thermostat.

Its installation location is extremely important, following a series of requirements as we can see in the following figure.



The thermostat must be installed:

- On an interior wall approximately 1.5m from the floor level;
- In a place where the temperature is as uniform as possible;
- Where there is good air recirculation around the thermostat.

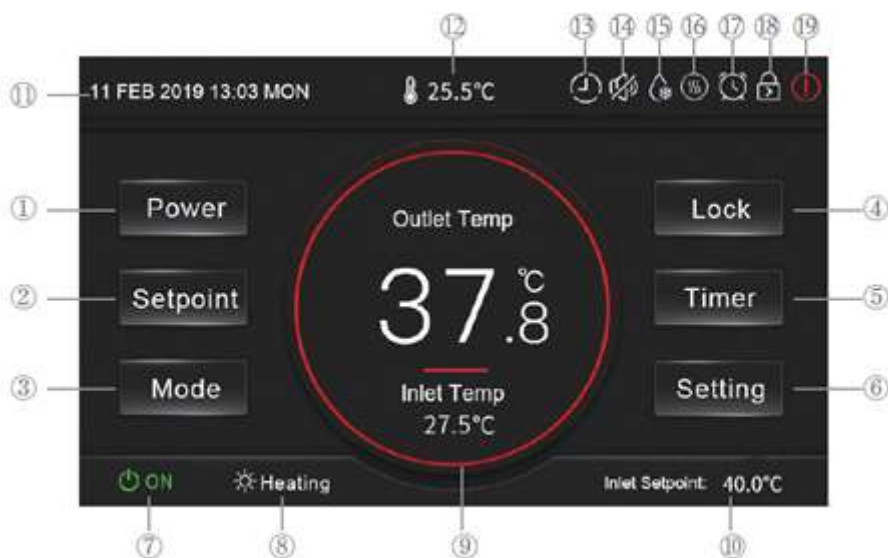
Installing the thermostat should be avoided:

- On exterior walls, near windows or behind doors;
- Near heat emitters (radiators, convectors, etc.);
- Behind or near doors

14 CONTROL PANEL – MAIN MENU



14.1 Description of the Main Panel










Button Function:

No.	Name	Function
1	<i>Power</i>	Click this button to turn ON or OFF
2	<i>Setpoint</i>	Click to set the temperature set-point
3	<i>Mode</i>	Click to set Cool Mode or Warm Mode
4	<i>Lock</i>	Click to Lock or Unlock the Display
5	<i>Timer</i>	Click to time Silent, On / Off , Temperature modes
6	<i>Setting</i>	Click to access Parameters

Description of Icons:

No.	Name	Description
7		Indicates that the Heat Pump is on
8		Indicates which mode it is in: Hot or Cold
9	Circle Display	Indicates the operating mode: blue – cold mode; red – hot mode; gray - off
10		Indicates the water inlet temperature
11	<i>Date/Time</i>	Indicates the Date and Time
12		Indicates the ambient temperature

13		Indicates that the temperature timer is active
14		Indicates that silent mode is activated
15		Indicates that defrost mode is activated
16		Indicates that the resistance is on
17		Indicates that the power timer is active
18		Indicates that the screen is locked
19		Indicates the existence of a fault. When the fault is removed the icon disappears

14.2 Instructions for operating the controller

1- Power On / Off

In the main menu, click on “ Power ” to turn the unit on/off.

2- Operating Mode Selection

In the main menu click “ Mode ” to select cold or hot mode. Depending on the mode chosen, the circle on the display will change color.

There are two modes that can be selected by swiping on the options:

Function	Description
<p>“ Heating ”</p> <p>Heating Function</p>	Heat pump working for room air conditioning – Heating mode
<p>“ Cooling ”</p> <p>Cooling function</p>	Heat pump working for room air conditioning – Cooling mode

3- Temperature Set-Point Selection

You must first define the operating mode (cold or hot), then click on “Set-Point” and go to the parameters interface and enter the temperature value defined according to the existing range on the display.

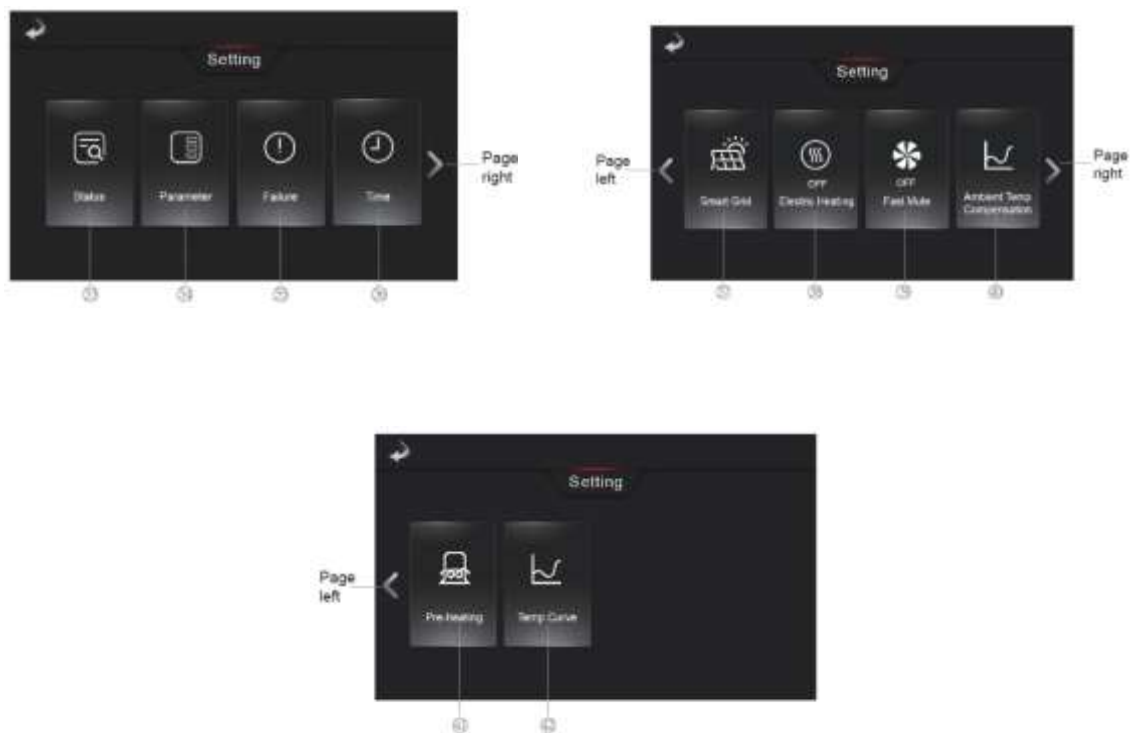
4- Lock Screen

On the main interface , click “ Lock ” to lock the screen. To unlock, you must click on “ Lock ” again and enter password 22.

14.3 Function menu – Setting

Swipe from right to left on the main interface to enter the setting interface, and swipe from left to right on the setting interface to return to the main interface.

The function conFIGuretion interface is shown in the figure below.



No.	Function
33	Status of the main equipment outputs (compressor, fan, etc.)
34	Click the key and enter the password "22" to enter the factory parameter settings and status parameter interface.
35	Click to view failure history
36	Click to open the operating timing parameters
37	Click to open the state and configure the function smart grid
38	Turning the electrical resistance mode on and off
39	Turning Fast Switch mode on and off
40	Click to open the weather compensation parameters menu
41	Click to open the resistance menu and turn on the resistance function
42	Click to see the temperature curve

14.3.1 Check equipment status

Setting " menu , click on status to open the following menu:



Click on button n°42 to check the heat pump's operating status. Click on button n°43 to consult the main variables of the equipment, such as: status of the compressor, water pump, 4-way valve, flow switch , pressure switches , temperature values, pressure values, current consumed by the compressor, etc.



14.3.2 Consult unit parameters

This function allows the installer to check the main parameters of the unit and set the correct operation modes according to the needs of the final customer. To access these parameters use the code “022”.

14.3.3 Smart grid

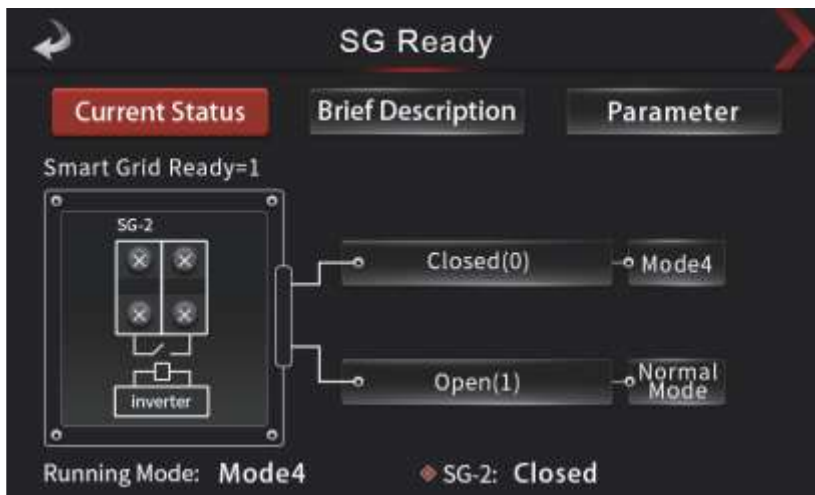
This function allows the user to control the operation of the unit accordingly with the energy produced in excess by a photovoltaic panel or another source of energy and harness that energy to heat up water. This function is deactivated by factory settings as you can see on the image below.



Accessing the parameters on this menu with the code “022”, it is possible to activate this function by modifying the parameter SG01 to 1 or 2. On this menu it is also possible to check and change other operating parameters of this function.

14.3.3.1 SG01=1

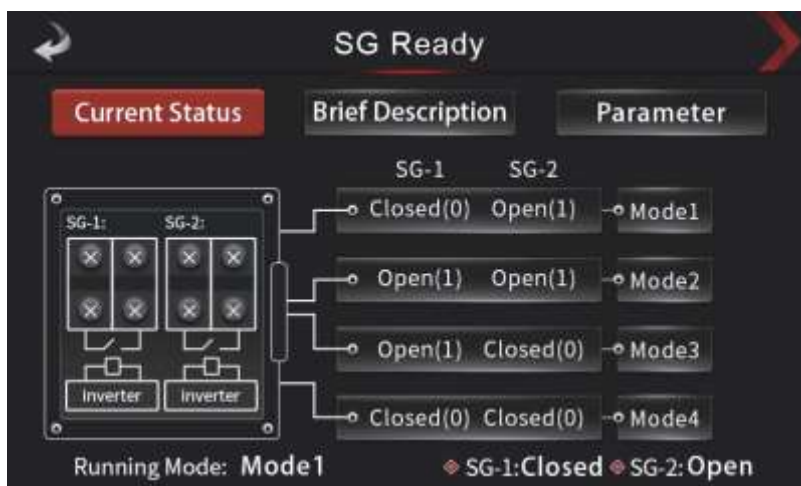
On this mode, only one contact is used to control the unit, in this case, the SG-2 contact. The interface will then show the following image:



The SG2 contact should then be closed to activate this function. As soon as this function is active, the unit will operate until a value above the initial set setpoint is reached and the electric heater may also be set to operate. This increased value and other settings may be defined in the parameter button

14.3.3.2 SG01=2

On this function 4 different modes may be set on the unit which are then controlled by the SG1 and SG2 contacts.



These 4 modes allow an advanced control of the heat pump according to available energy of the energy source.

14.3.4 Consult Alarm List

“Setting” menu , click on “Failure ” to open the following menu:



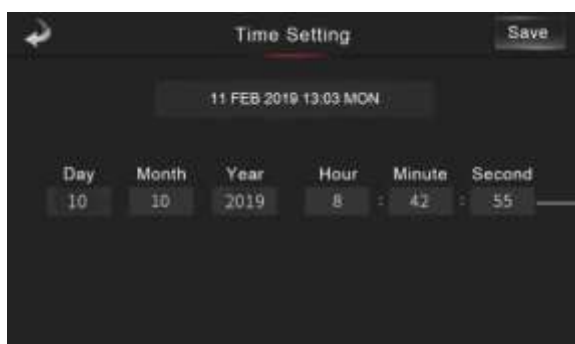
After the fault that caused the alarm has been resolved:

- The fault code, name, and date of occurrence will be saved.
- Click on button n°44 “Clear” to clear the error in this menu.



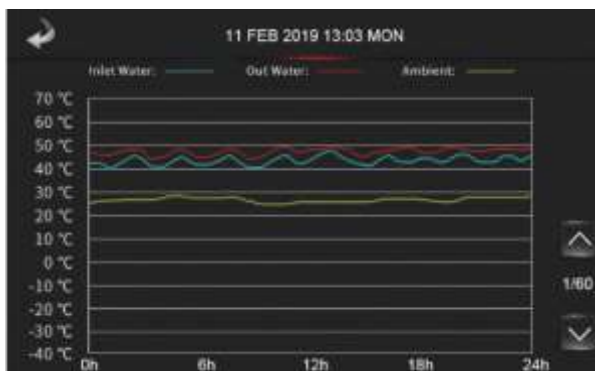
14.3.5 Set Date/Time

Setting ” menu , click on “Time” to open the menu. Click on each of the fields, enter the desired value and click on the “Save” button.



14.3.6 Temperature Graph

Setting ” menu , click on “ Temp Curve” to open the menu.



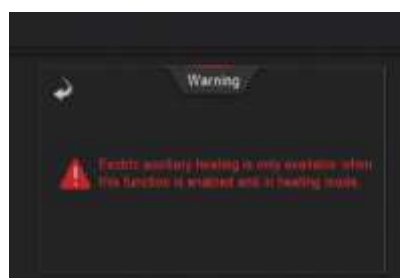
This function records the inlet water temperature, outlet water temperature, DHW tank water temperature and ambient temperature.

Temperature data is acquired every five minutes. Timing is done from the last data record , if power is interrupted for a period of time less than 1 hour, data during that period will not be saved.

Temperature recordings only occur when the equipment is turned on .

14.3.7 Activate Support Electrical Resistance

“ Setting ” menu , click on “ Electrical Heating ” to open the menu.



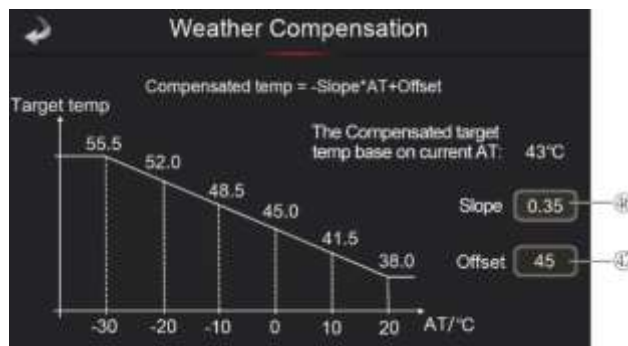
In heating operating mode, tap the “ On ” icon to activate/deactivate the support resistance (green icon active resistance/gray icon deactivate resistance)

The resistance is not an integral part of the equipment. Its installation will have to be done separately. The current of the heater should be supplied externally and controlled by a contactor connected to the heat pump through the contacts “electric stage 1”(230V)

Note: This function is deactivated at the factory. If you want to activate this function, you must access the settings with the code “022” and activate parameter R15.

14.3.8 Compensation curve - Outdoor temperature vs. Setpoint

In the “ Setting ” menu, click on “ Ambient Temp Compensation ” to open the menu.



The function of compensating outdoor temperature vs leaving water temperature for the central heating circuit must take into account that the setpoint will be adjusted depending on the temperature defined in the graph.

Vertical axis – Leaving water temperature;



Horizontal axis – Outdoor temperature;

Click on n°46 “ Slope ” and n°47 “ Offset ” to define the parameters;

When this function is not available, “---” appears in “target temp ”;

Note: This function is deactivated at the factory, so if you want to activate this function you must access the settings using the code “022” and activating parameter H41



14.3.9 Preheat function

Setting ” menu , click on “ Pre-Heating ” to activate the function and  appears, click on the button again to turn off this function and  appears. Preheats the compressor to prevent damage from cold starts, especially after long periods of stoppage.

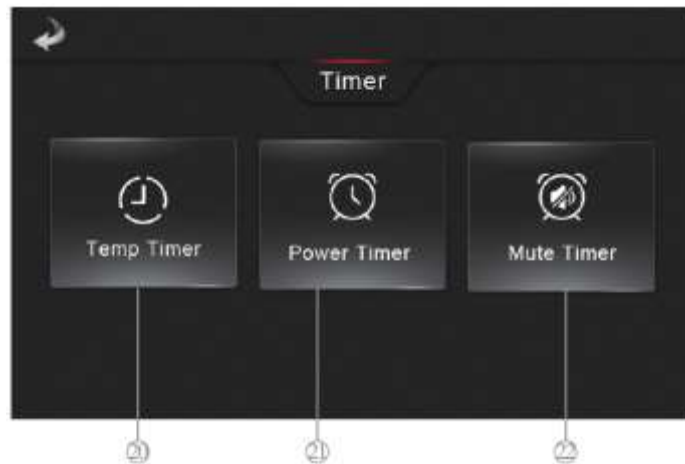


Note: This function can only be activated when the machine is turned off.

14.3.10 Quick Mute Function

Setting ” menu , click on “ Fast Mute ” to activate the function and  appears, click on the button again to turn off this function and  appears. Only available if the “Mute” function is available.

14.4 Function menu – Timer



No.	Description
20	Set temperature setpoint for a given period
21	Define Equipment Operation Period
22	Setting the period of operation in silent mode. In this operating mode, the compressor and fan will work at low frequencies

14.4.1 Set temperature setpoint for a specific period [Button 20]



No.	Description
23	Enable temperature control. In green it is active and in gray it is off
24	Set the Work Mode
25	Define the Set-Point for temperature control
26	Set the Time interval for temperature control
27	Setting the day of the week
28	Define other Periods

14.4.2 Set opening hours in ON/OFF mode [Button 21]



No.	Description
29	Click on the key to activate the start of the period (ON – blue icon / OFF – gray icon)
30	Set the time interval for power control
31	Setting the day of the week
32	Consult other Periods

14.4.3 Set opening hours in silent mode [Button 22]




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To start the sound timer, you must first click on button nº5 in the main menu. Then click on button nº22, and you will go to the “Mute Timer” menu where you will define the interval for which it will be active. Finally, click the On / Off button .

If the unit does not have this function, this operation is unavailable.

Note: This function is deactivated at the factory, please contact us if you wish to activate it.

 NOTICE	Changing settings/parameters without consulting a specialized technician may cause malfunctions or cause irreversible damage to the equipment.
---	--

15 ALARMS

15.1 Alarms – Electronic control

Anomaly	Code	Problem	Problem resolution
Communication failure	E08	Communication failure between control board and inverter drive.	Check the connections between the control board and inverter drive.
Display does not match the installed control board	E084	Display software version incompatible with the software version installed on the main board.	
System 1 - High pressure switch	E11	Damaged pressure switch or excess pressure in the circuit.	Check the status of the pressure switch and the pressure in the circuit.
System 2 - High pressure switch	E21	Damaged pressure switch or excess pressure in the circuit.	Check the condition of the pressure switch and the pressure in the circuit.
System 1 - Low pressure switch	E12	Damaged pressure switch or low pressure in the circuit.	Check the condition of the pressure switch and the pressure in the circuit.
System 2 - Low pressure switch	E22	Damaged pressure switch or low pressure in the circuit.	Check the condition of the pressure switch and the pressure in the circuit.
Flow switch	E032	Lack of water in the hydraulic circuit, excess air or clogged filter	Check the hydraulic circuit.
Overheating protection	E04	Resistance safety thermostat is damaged or water is too hot.	Check that the compressor is working correctly.
Anti-ice protection circuit 1	E19	Anti-freeze protection ($2^{\circ}\text{C} < \text{return water temp} < 4^{\circ}\text{C}$ and ambient temp $\leq 0^{\circ}\text{C}$).	Check room temperature.
Anti-ice protection circuit 2	E29	Anti-freeze protection ($2^{\circ}\text{C} < \text{return water temp} < 4^{\circ}\text{C}$ and ambient temp $\leq 0^{\circ}\text{C}$).	Check room temperature.
System 1: Hydraulic circuit anti-ice protection	E171	Leaving water temp $\leq 4^{\circ}\text{C}$.	Check water flow. temp probe connections . of the leaving water.
System 2: Hydraulic circuit anti-ice protection	E271	Leaving water temp $\leq 4^{\circ}\text{C}$.	Check water flow. temp probe connections . of the leaving water.
Temp . very high outlet water	E065	Hydraulic circuit without water or low flow.	Check the pump and pressure in the hydraulic circuit.
Fan 1 with excess temperature	E103	Check that the fan motor is working properly.	

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Fan 2 with excess temperature	E203	Check that the fan motor is working properly.	
Temp . very low outlet water	E071	Hydraulic circuit without water or low flow.	Adjust the leaving water temperature to $\geq 8^{\circ}\text{C}$.
Low Water Flow	E035	System is not receiving enough water.	Check whether the water flow meets the requirements and whether the water pump is damaged.
System 1 – 4-way valve	E121	4-way valve failure.	Check whether the valve status is in the desired positioning.
System 2 – 4-way valve	E221	4-way valve failure.	Check whether the valve status is in the desired positioning.
Inlet water temperature	P01	Temperature probe failure.	Check or replace probe.
Leaving water temperature	P02	Leaving water temperature probe failure.	Check or replace probe.
System 1 – Temperature Probe 1 Evaporator	P150	Evaporator temperature probe failure.	Check or replace probe.
System 2 – Temperature Probe 1 Evaporator	P250	Evaporator temperature probe failure.	Check or replace probe.
Ambient Temperature - AT	P04	Room temperature probe failure.	Check or replace probe.
System 1 – Suction Temperature	P17	Suction temperature probe failure.	Check or replace probe.
System 2 – Suction Temperature	P27	Suction temperature probe failure.	Check or replace probe.
System 1 – Evaporator Exit Temperature	P152	Failure to probe .	Check or replace probe.
System 2 - Evaporator Exit Temperature	P252	Failure to probe .	Check or replace probe.
System 1 -Temp. EVI input	P101	Failure to probe .	Check or replace probe.
System 1 - Temp. EVI output	P102	Failure to probe .	Check or replace probe.
System 2 -Temp. EVI input	P201	Failure to probe .	Check or replace probe.
System 2 - Temp. EVI output	P202	Failure to probe .	Check or replace probe.
System 1 - Discharge Temperature	P181	Compressor discharge temperature probe failure	Check or replace probe
System 2 - Discharge Temperature	P281	Compressor discharge temperature probe failure	Check or replace probe
System 1 – Aspiration Sensor	PP11	pressure transducer or lack of refrigerant.	Check or replace sensor. Check the pressure in the circuit.
System 2 – Aspiration Sensor	PP21	pressure transducer or lack of refrigerant.	Check or replace sensor. Check the pressure in the circuit.
System 1 – Discharge Sensor	PP12	pressure transducer or excess refrigerant.	Check or replace sensor. Check the pressure in the circuit.
System 2 – Discharge Sensor	PP22	pressure transducer or excess refrigerant.	Check or replace sensor. Check the pressure in the circuit.

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Outdoor Temperature (AT)	TP	Low outside temperature.	Check or replace probe.
System 1 – Temperature Probe 2 Evaporator	P154	Evaporator temperature probe failure.	Check or replace probe.
System 2 – Temperature Probe 2 Evaporator	P254	Evaporator temperature probe failure.	Check or replace probe.
Fan 1 Communication Failure with the Power Board	E081	Speed communication with the control board is abnormal	Check speed regulation on control board and check connections
Fan 2 Communication Failure with the Power Board	E082	Speed communication with the control board is abnormal	Check speed regulation on control board and check connections
System 1 - Inverter drive communication failure.	F151	Communication failure between the inverter drive and the control board.	Check communication between the inverter drive and the control board.
System 2 - Inverter drive communication failure	F251	Communication failure between the inverter drive and the control board.	Check communication between the inverter drive and the control board.
System 1: Compressor start failure	F152	Compressor fails to start.	Check if system 1 is blocked or if the compressor line is normal.
System 2: Compressor start failure	F152	Compressor fails to start.	Check if system 2 is blocked or if the compressor line is normal.
System 1: IPM Protection Failure at compressor start-up	F153	Current is too high when starting the compressor.	Check whether the high pressure is excessive and whether the compressor line is blocked.
System 2: IPM Protection Failure at compressor start-up	F253	Current is too high when starting the compressor.	Check whether the high pressure is excessive and whether the compressor line is blocked.
System 1: IPM Protection Failure during compressor operation	F154	Current is too high when operating the compressor.	Check if the pressure ratio is too high.
System 2: IPM Protection Failure during compressor operation	F254	Current is too high when operating the compressor.	Check if the pressure ratio is too high.
System 1: Protection due to excess current in the compressor	F156	Compressor operating current is too high.	Check if the pressure ratio is too high.
System 2: Protection due to excess current in the compressor	F256	Compressor operating current is too high.	Check if the pressure ratio is too high.
System 1: IPM Inverter Drive Failure	F155	Inverter compressor drive has low heat dissipation.	Check if there is a leak in the Inverter drive.
System 2: IPM Inverter Drive Failure	F255	Inverter compressor drive has low heat dissipation.	Check if there is a leak in the cold circuit.
System 1: High voltage protection in the inverter drive	F157	Voltage is too high.	Check if the voltage is higher than 480V.
System 2: High voltage protection in the inverter drive	F257	Voltage is too high.	Check if the voltage is higher than 480V.
System 1: Low voltage protection in the inverter drive	F158	Voltage is too high.	Check if the voltage is lower than 250V
System 2: Low voltage protection in the inverter drive	F258	Voltage is too high.	Check if the voltage is lower than 250V
Protection due to lack of phase in fan1 on the DC bus	F101	Failed to start the fan.	Check if the ventilation line is normal.

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Protection due to lack of speed in fan 1 on the DC bus	F102	Failed to start the fan.	Check if the engine is blocked.
IPM start protection on fan 1 DC bus	F103	Fan starting current is too high.	Check if the engine is blocked.
Protection of IPM operation on fan 1 on the DC bus	F104	Fan starting current is too high.	Check if the engine is blocked.
Protection due to excess current in fan 1 on the DC bus	F105	Fan starting current is too high.	Check if the engine is blocked.
Overtemperature protection on fan 1 on the DC bus	F106	Inverter Drive Fan 1 has low heat dissipation.	Check conditions for heat dissipation
Protection due to excess voltage of fan 1 on the DC bus	F107	Voltage is too high.	Check if the voltage is higher than 480V
Low voltage protection for fan 1 on the DC bus	F108	Voltage is too low.	Check if the voltage is lower than 250V
Protection due to lack of fan 2 output phase on the DC bus	F201	Fan start failure.	Check if the fan line is normal
Protection due to lack of fan 2 output speed on the DC bus	F202	Fan start failure.	Check if the engine is blocked.
IPM start protection on fan 2 DC bus	F203	Fan starting current is too high.	Check if the engine is blocked.
Protection of IPM operation on fan 2 on the DC bus	F204	Fan starting current is too high.	Check if the engine is blocked.
Overcurrent protection for fan 2 on the DC bus	F205	Fan starting current is too high.	Check if the engine is blocked.
Overtemperature protection on fan 2 on the DC bus	F206	Inverter Drive Fan 1 has low heat dissipation.	Check conditions for heat dissipation.
Overvoltage protection for fan 2 on the DC bus	F207	Voltage is too high.	Check if the voltage is higher than 480V.
Low voltage protection for fan 2 on the DC bus	F208	Voltage is too low.	Check if the voltage is lower than 250V.
Abnormal power failure	EE1	Energy failure.	The fault is cleared by the controller after 3 minutes
Current failure in fan motor 1 on the DC bus	F112	Fan 1 current is abnormal.	Check if the fan motor is blocked
Current failure in fan motor 2 on the DC bus	F212	Fan 1 current is abnormal.	Check whether the fan motor is blocked.
Overspeed protection for fan motor 1 on the DC bus	F109	Speed too high.	Check if the fan motor is blocked
Overspeed protection for fan motor 2 on the DC bus	F209	Speed too high.	Check if the fan motor is blocked
Protection due to low speed in fan motor 1 on the DC bus	F110	Speed is incorrect.	Check whether the fan motor is blocked.
Low speed protection for fan motor 2 on the DC bus	F210	Speed is incorrect.	Check whether the fan motor is blocked.
Compressor type error	F088	Compressor model is wrong.	Check whether the compressor parameters are consistent with the

			chosen model.
Low Temperature does not allow cooling	TC	Ambient temperature too low.	Check whether the ambient temperature probe is working correctly.
Protection for abnormal water inlet and outlet temperature	E064	Temperature differences that are too high.	Check water inlet and outlet probes.


16 PROBLEM SOLVING



Problem	Possible cause	Solution
BC does not work, display has no information	<ul style="list-style-type: none"> Electrical supply failure. Circuit breaker off. Power cord not properly connected. Phases switched. Blown controller fuse 	<ul style="list-style-type: none"> Check the electrical power supply. Check if there is any anomaly and turn the circuit breaker back on. Correctly connect the power cord. Change one of the phases. Check the fuse
Circulator pump makes a lot of noise or there is no water	<ul style="list-style-type: none"> Lack of water. in the hydraulic circuit, Air in the installation Closed valves Dirty or blocked water filter 	<ul style="list-style-type: none"> Check that there is no water leak. Fill the circuit Purge the hydraulic circuit. Open the valves Clean the filter
High compression temperature	<ul style="list-style-type: none"> Too much refrigerant gas; Low heat exchange in the evaporator 	<ul style="list-style-type: none"> Rectify the refrigerant gas charge; Check and clean the evaporator. Faulty fan.
Low pressure alarm	<ul style="list-style-type: none"> Lack of refrigerant gas Very low outside temperature. Obstruction of the refrigerant circuit. 	<ul style="list-style-type: none"> Refrigerant gas leak. Check that the evaporator is not clogged with ice. Check the filters
Compressor does not start	<ul style="list-style-type: none"> Compressor electrical supply failure contactor . Compressor thermal active. Return temperature probe faulty. Lack of flow 	<ul style="list-style-type: none"> Check the electrical power cable for compressor. Replace the contactor . High compression temperature. Replace temperature probe.

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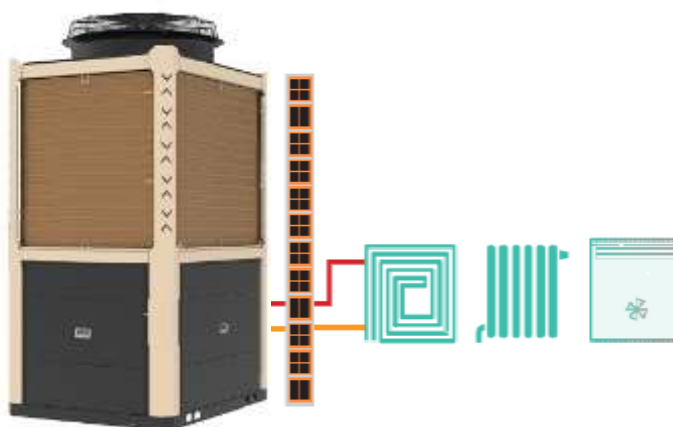
		<ul style="list-style-type: none"> • Circulator pump turned off. Clean the water filter.
Compressor makes a lot of noise	<ul style="list-style-type: none"> • Return of liquid to the compressor. • Compressor broken. 	<ul style="list-style-type: none"> • Clogged evaporator. Fan off. • Replace compressor.
Fan doesn't work	<ul style="list-style-type: none"> • Faulty fan relay. • Faulty fan. 	<ul style="list-style-type: none"> • Replace the relay. • Replace the fan
Compressor works, but does not heat or cool.	<ul style="list-style-type: none"> • Lack of refrigerant gas. • Clogged heat exchanger. • Damaged compressor. 	<ul style="list-style-type: none"> • Check that there are no leaks. Charge refrigerant gas. • Replace the condenser. • Replace the compressor.
Low leaving water temperature	<ul style="list-style-type: none"> • Lack of flow • Low operating setpoint . 	<ul style="list-style-type: none"> • Clean the filter and bleed the air from the hydraulic system. • Adjust the operating setpoint .
Flow switch alarm	<ul style="list-style-type: none"> • Obstruction of the hydraulic circuit. • Faulty flow switch. 	<ul style="list-style-type: none"> • Clean the filter and bleed the air from the hydraulic system. • Replace the flow switch.

17 ANNEX 1 – INSTALLATION PLANTS

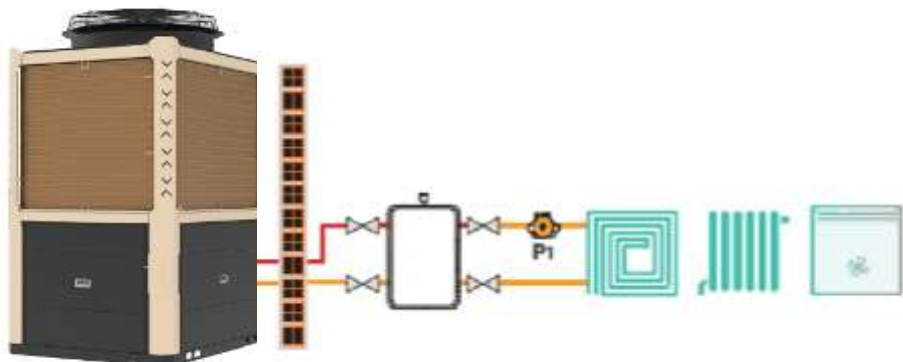
	Description
 NOTICE	<ul style="list-style-type: none"> Hydraulic diagrams represent only the central components of the application. There are many components that can be installed, such as water pressure sensors, temperature sensors, drainage, differential valve, etc. The sanitary hot water circuit, when implemented, has priority over the air conditioning circuit. Hydraulic diagrams represent only the central components of the application.

	Description
INFORMATION	<p>The heat dissipation source represented in the diagrams is merely representative.</p> <p>The equipment can be installed with radiators, underfloor heating, fan coil units, etc.</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> <p>Ventilo convetor</p>  </div> <div style="text-align: center;"> <p>Radiant floor</p>  </div> </div>

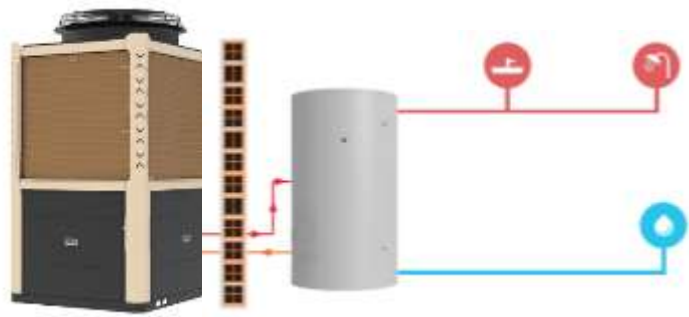
17.1 Central Heating



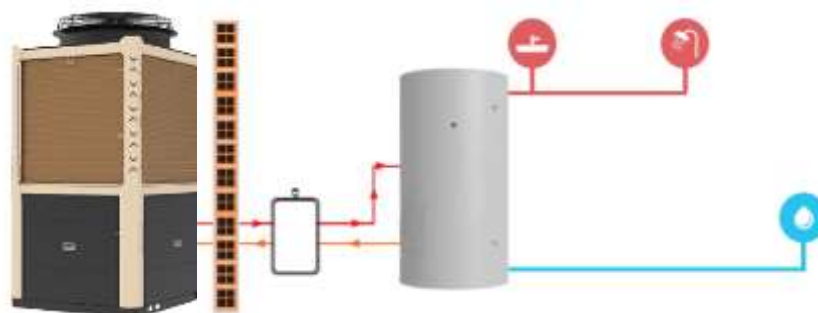
17.2 Central Heating with Inertia



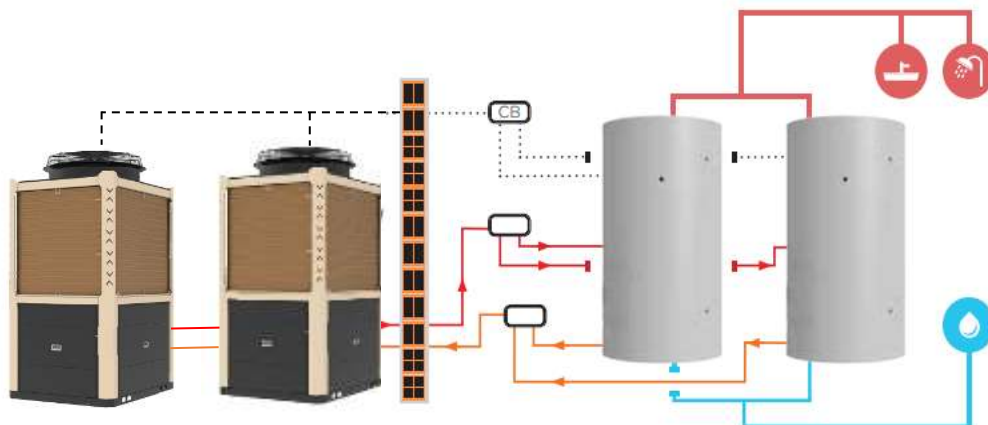
17.3 Sanitary Hot Water



17.4 Domestic Hot Water with Inertia



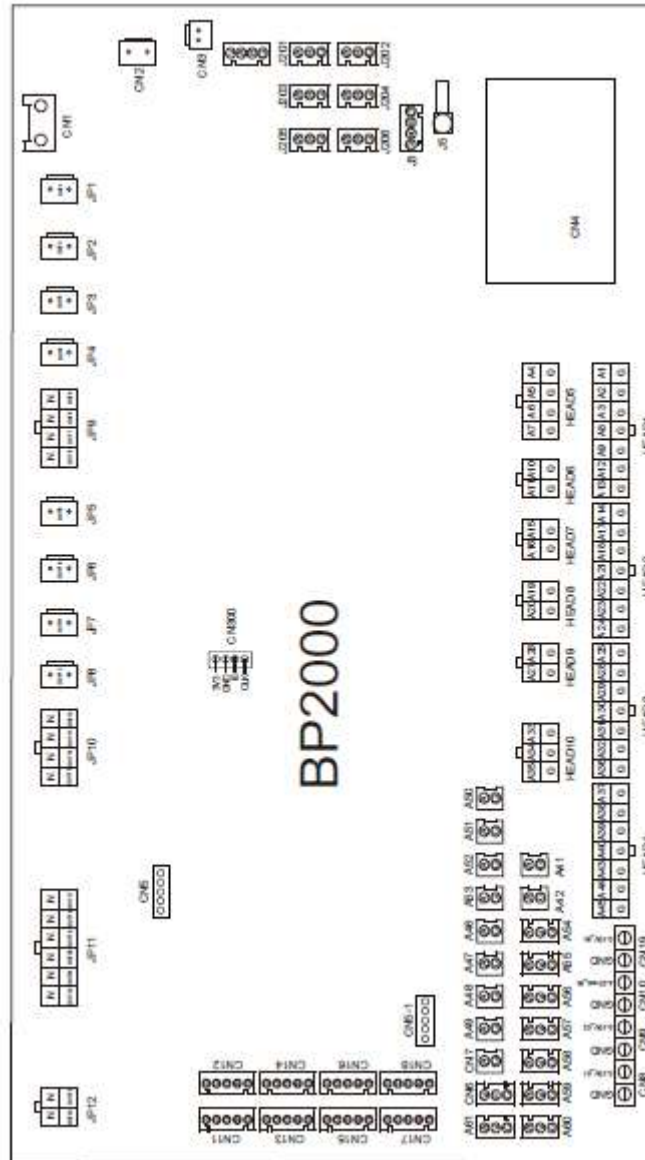
17.5 Domestic Hot Water with Inertia (Modular Installation)



*Up to 4 units

18 Interface Diagram

18.1 Control Board Diagram



18.2 Display Diagram

Symbol	Meaning
V	12 (power+)
R	Do not use
T	Do not use
A	485A
B	485B
G	GND (power-)

18.3 Entry and Exits

No.	Simb .	Description	No.	Simb .	Description
1	TO 1	System. 1: Anti- Freeze Temperature	58	A58	System. 1: Pressure Low
2	A2	System. 1: Evaporator Temperature 1	59	A59	System. 2: Pressure Low
3	A3	System. 1: Evaporator Temperature 2	60	A60	Transformer current 3
4	A4	Flow switch	61	A61	Reserved
5	A5	Emergency	62	CN1	220V input
6	A6	Mode	63	CN2	220V output
7	A7	Electric heater Overheating Protection	64	CN3	12V input
8	A8	System . 1: Evaporator Outlet Protection	65	CN4	PCle DTU
9	A9	System. 1 : Suction Temperature	66	CN5	Expansion board
10	A10	System . 1: High Pressure Switch	67	CN6	Reserved
11	A11	System . 1: Low Pressure Switch	68	CN7	Reserved
12	A12	Reserved	69	CN8	Reserved
13	A13	Reserved	70	CN9	Reserved
14	A14	System. 2: Anti- Freeze Temperature	71	CN10	Reserved
15	A15	System . 2: High Pressure Switch	72	CN11	System 1: Electronic Expansion Valve

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16	A16	System . 2: Low Pressure Switch	73	CN12	Reserved
17	A17	System. 2: Evaporator Temperature 1	74	CN13	System. 2: Valve Expansion Electronics
18	A18	System. 2: Evaporator Temperature 2	75	CN14	Syst2: EVI EEV Valve
19	A19	Reserved	76	CN15	Syst1: EVI EEV Valve
20	A20	Reserved	77	CN16	Syst2: EEV Small Valve
21	A21	System . 2: Evaporator Outlet Protection	78	CN17	Reserved
22	A22	System. 2 : Suction Temperature	79	CN18	Syst1: EEV Small Valve
23	A23	Reserved	80	CN19	Reserved
24	A24	Reserved	81	CN23	Reserved
25	A25	Reserved	82	CN300	Program Port
26	A26	Reserved	83	J1	DTU
27	A27	Reserved	84	J201	Compressor 1 Inverter Drive
28	A28	Reserved	85	J202	Compressor 2 Inverter Drive
29	A29	Reserved	86	J203	1 DC Fan Driver
30	A30	Reserved	87	J204	Reserved
31	A31	Reserved	88	J205	Controller Cable
32	A32	Reserved	89	J206	Reserved
33	A33	Water inlet temperature	90	J3	Centralized Controller Communication Port
34	A34	Water outlet temperature	91	OUT1	Reserved
35	A35	Ambient temperature	92	OUT2	Reserved
36	A36	Reserved	93	OUT3	Reserved
37	A37	Reserved	94	OUT4	Reserved
38	A38	Reserved	95	OUT5	System. 1: Fan 1 Crankshaft Heater
39	A39	Reserved	96	OUT6	System. 2: Fan 2 Crankshaft Heater
40	A40	Reserved	97	OUT7	Reserved
41	A41	Syst1: Fan Overload Prot.	98	OCT8	Reserved
42	A42	Syst2: Fan Overload Prot.	99	OCT9	System . 1: 4-way valve
43	A43	Reserved	100	OCT10	System. 2: 4-way valve

44	A44	Reserved	101	OCT11	Reserved
45	A45	Reserved	102	OCT12	Reserved
46	A46	SG-1	103	OCT13	Water plate heating belt
47	A47	SG-2	104	OCT14	Water plate heating belt
48	A48	Reserved	105	OCT15	Water plate heating belt
49	A49	Water tank temperature	106	OCT16	Alarm
50	A50	System. 1 : Discharge Temperature	107	OCT17	Syst1: Ventilator low speed
51	A51	System. 2 : Discharge Temperature	108	OCT18	Syst1: Ventilator high speed
52	A52	Reserved	109	OCT19	Syst1: Ventilator high speed 2
53	A53	Reserved	110	OCT20	Syst1: Ventilator low speed
54	A54	Syst1: High pressure	111	OCT21	Syst1: Ventilator high speed
55	A55	Syst1: High pressure	112	OCT22	Syst1: Fan high speed 2
56	A56	Transformer current 1	113	OCT23	Circulation Pump
57	A57	Transformer current 2	114	OCT24	Electric heater

19 WARRANTY CONDITIONS

This warranty covers confirmed defects in materials, excluding the payment of any compensation for personal or material losses that may be caused directly or indirectly.

The deadlines indicated below start from the date of purchase of the device, no later than 6 months after the date it leaves the warehouse.

Component	Warranty period
Water heater (domestic or industrial use)	3 (three) years with an extension of + 2 (two) years*
Heat pump, electrical components and removable parts	3 (three) years.

* The warranty extension of another 2 years is subject to the shipment of:

- Control and Warranty Sheet within a maximum of 15 days after installation.
- Documentary proof of magnesium anode replacement.
- Photos of the installation showing the safety group, expansion vessel, hydraulic and

electrical connections.

In the case of warranty, the replaced parts are the property of the manufacturer.

Repairs under warranty do not give rise to an extension of the period.

20 WARRANTY EXCLUSIONS

The warranty ends as long as the devices are not connected, used or assembled in accordance with the manufacturer's instructions, or have been operated by third-party technicians, have been modified and/or even if their serial number has been torn off or erased. The equipment must be installed by qualified technicians in accordance with current standards and/or the rules of art, or prescribed by our technical services. The following are also excluded from the warranty:

- Water heaters that are working in water with the following indexes:
 - Active chlorine > 0.2 ppm
 - Chlorides > 50 mg/l (Inox)
 - Hardness > 200 mg/l
 - Conductivity > 600 $\mu\text{S}/\text{cm}$ (20 °C)
 - 5.5 > PH and PH > 9 (Sorensen scale at 20°C)
 - And all Waters with a value higher than the VMA, by Decree-Law 236/98 (Portugal).
 - Parts subject to natural wear and tear – handles, switches, resistors, programmers, thermostats and others.
 - Damages resulting from shocks or transportation, electrical discharges, floods, humidity, or caused by improper use of the device.
 - The warranty expires when the device is transferred to another owner, even within the warranty period.
 - The warranty expires if this certificate is incorrectly filled out, corrupted or returned after 15 days from the date of purchase.

ATTENTION:

The technician's travel, even within the warranty period, is paid by the customer (km and travel time).

If there is no fault justifying the technician's travel, the customer will pay for the lost travel time.

