



AIR-TO-WATER MONOBLOC

USER MANUAL

For models:

TGTP-4MBDA1
TGTP-6MBDA1
TGTP-8MBDA1
TGTP-10MBDA1
TGTP-12MBDA1
TGTP-12MBDB3
TGTP-14MBDB3
TGTP-16MBDB3

ENG

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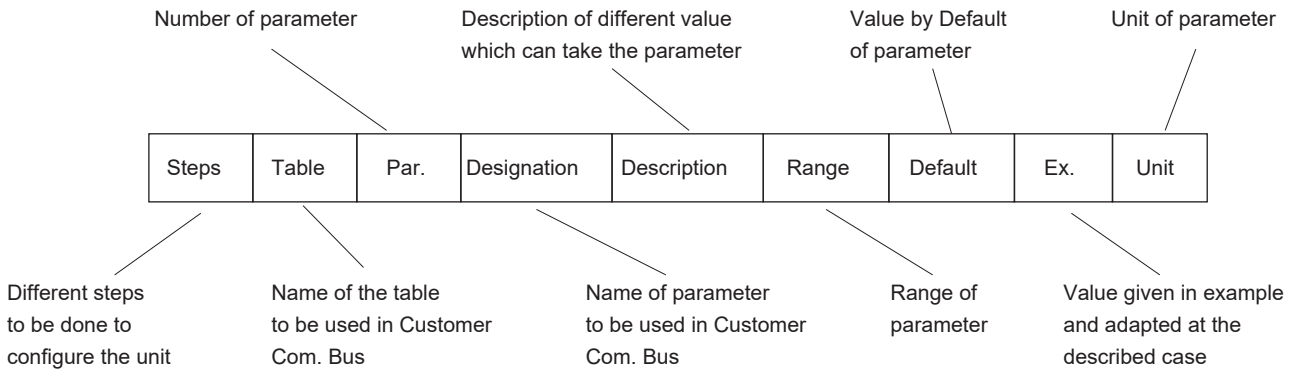
OPERATING INSTRUCTION

Note: All the pictures in this manual are just schematic diagrams, the actual is the standard. Please read this owner's manual carefully and thoroughly before operating the unit! Take care of this manual for future reference.

ACRONYMS AND LEGEND


Acronyms	
IAT	Indoor Air Temperature
BPHE	Brazed Plate Heat Exchanger
CHWS	Chiller Water System
DHW	Domestic Hot Water
EHS	Electric Heater Stage
EWT	Entering Water Temperature
FCU	Fan Coil Unit
LWT	Leaving Water Temperature
NHC	New Hydraulic Control (refer to wiring diagram'Main control card')
OAT	Outdoor Air Temperature
PMV	Pulse Modulating Valve
SHC	Space Heating / Cooling Control
TR	Refrigerant Temperature
UFC	Underfloor Cooling
UFH	Underfloor Heating
Wired Controller	User Interface (Wall-mounted User Interface)

Control Configuration Legend







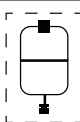





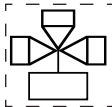

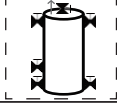
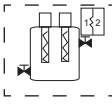





 Possible to configure by direct access on wired controller. Refer to wired controller end user Manual.

Check to be done

 Advanced Configuration Level (for basic operation no need to modify the setting)

Standard installation Legend

Label	Symbol	Designation	Notes
-		Device	Field supplied
-		Accessory	Field mounted
-		Option	Factory mounted
-		Balancing valve	Field supplied Balancing to adjust the water flow rate
-		Stop valve	Field supplied
-		Automatic Air vent	Field supplied Automatic air vent(s) on highest position in the loop
Add EXP-T		Additional expansion tank	Field supplied Additional expansion tank depending the total water in the loop contend - taking in account the expansion tank (XXL) embedded in hydraulic module
-		Boiler	Boiler used to boost or backup the heat pump for comfort
Eh1 & EH2		Electrical Heater (1 or 2)	Electrical heaters up to two with a max. stages up to 3 Used to boost or backup the heat pump for comfort
EH3		DHW-Electrical Heater Backup (1 stage)	Domestic Hot Water Electrical Heater - one stage used to backup DHW (when condions are out of heat pump map)
DHW-T		Domestic Hot Water - Tank	Field supplied
DHW-S		Domestic Hot Water - Sensor	Accessory to mount on top of the DHW-Tank Measure DHW-Temperature
DHW-V		Domestic Hot Water - Valve or Diverting valve	Accessory to be field mounted, it will position the valve to send either to comfort loop or DHW-T, the processed water
add_pmp		Additional Water Pump	Field Supplied, it is used for comfort loop as a secondary loop
De-Coupling Tank		De-Coupling Tank	Field Supplied, it is used to connect different water loop rates as well as to receive the boiler loop
Backup-EH		Backup electrical heater	Field Supplied, it is used for comfort loop as a Booster Heater (HP+EH) or Backup (EH only) when HP is out of the map.
-		Flexible	Field supply, it is used to lower vibrations transmissions if necessary
HTSS		High Temperature Safety Switch	Field supplied, use to stop system when UFH max, water temperature is triggered
Filter		Water filter of inlet pipe	Accessory of water inlet pipe filter to install at the inlet water pipe of unit to protect the Hydraulic part

Precaution for Using R32 Refrigerant

Pay careful attention to the following points:



Warning

- The mixing of different refrigerants within a system is prohibited.
- Ensure that foreign matter (oil, water, etc.) does not enter the piping.
- Operation, maintenance, repairing and refrigerant recovery should be carried out by trained and certified personnel in the use of flammable refrigerants and as recommended by the manufacturer. Any personnel conducting an operation, servicing or maintenance on a system or associated parts of the equipment should be trained and certified.
- Any part of refrigerating circuit (evaporators, air coolers, AHU, condensers or liquid receivers) or piping should not be located in the proximity of heat sources, open flames, operating gas appliance or an operating electric heater.
- The user/owner or their authorized representative shall regularly check the alarms, mechanical ventilation and detectors, at least once a year, where as required by national regulations, to ensure their correct functioning.
- A logbook shall be maintained. The results of these checks shall be recorded in the logbook.
- Ventilations in occupied spaces shall be checked to confirm no obstruction.
- Before a new refrigerating system is put into service, the person responsible for placing the system in operation should ensure that trained and certified operating personnel are instructed on the basis of the instruction manual about the construction, supervision, operation and maintenance of the refrigerating system, as well as the safety measures to be observed, and the properties and handling of the refrigerant used.
- The general requirement of trained and certified personnel are indicated as below:
 - a) Knowledge of legislation, regulations and standards relating to flammable refrigerants;
 - b) Detailed knowledge of and skills in handling flammable refrigerants, personal protective equipment, refrigerant leakage prevention, handling of cylinders, charging, leak detection, recovery and disposal; and,
 - c) Able to understand and to apply in practice the requirements in the national legislation, regulations and Standards;
 - d) Continuously undergo regular and further training to maintain this expertise.
- Protect the refrigerating system from accidental rupture due to moving furniture or reconstruction activities.
- To ensure no leaking, field-made refrigerant joints indoors shall be tightness tested. The test method shall have a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0,25 times the maximum allowable pressure (>1.04MPa, max 4.15MPa). No leak shall be detected.
- For joints made at the installation site:
Joints shall be tested with detection equipment with a capability of 5g/year of refrigerant or better, with the equipment in standstill and under operation or under a pressure of at least these standstill or operation conditions.



Caution

1. Installation (Space)

- Must comply with national gas regulations, state municipal rules and legislation. Notify relevant authorities in accordance with all applicable regulations.
- Must ensure mechanical connections be accessible for maintenance purposes.
- In cases that require mechanical ventilation, ventilation openings shall be kept clear of obstruction.
- When disposal of the product, do follow to the precautions in #12 and comply with national regulations.
- Always contact to local municipal offices for proper handling.

2. Servicing

1) Service personnel

- Any qualified person who is involved with working on or breaking into a refrigerant circuit should hold a current valid certificate from an industry-accredited assessment authority, which authorizes their competence to handle refrigerants safely in accordance with an industry recognised assessment specification.
- Servicing shall only be performed as recommended by the equipment manufacturer. Maintenance and repair requiring the assistance of other skilled personnel shall be carried out under the supervision of the person competent in the use of flammable refrigerants.
- Servicing shall be performed only as recommended by the manufacturer.
- The system is inspected, regularly supervised and maintained by a trained and certified service personnel who is employed by the person user or party responsible.
- Ensure refrigerant charge not to leak.

2) Work

- Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised.
- For repair to the refrigerating system, the precautions in #2-2 to #2-8 must be followed before conducting work on the system.
- Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapor being present while the work is being performed.

Precaution for Using R32 Refrigerant

- All maintenance staff and others working in the local area shall be instructed and supervised on the nature of work being carried out.
 - Avoid working in confined spaces. Always ensure away from source, at least 2 meter of safety distance, or zoning of free space area of at least 2 meter in radius.
 - Wear appropriate protective equipment, including respiratory protection, as conditions warrant.
 - Keep all sources of ignition away.
- 3) Checking for presence of refrigerant
- The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially flammable atmospheres.
 - Ensure that the leak detection equipment being used is suitable for use with flammable refrigerants, i.e. non sparking, adequately sealed or intrinsically safe.
 - In case of leakage/spillage happened, immediately ventilate area and stay upwind and away from spill/release.
 - In case of leakage/spillage happened, do notify persons downwind of the leaking/spill, isolate immediate hazard area and keep unauthorized personnel out.
- 4) Presence of fire extinguisher
- If any hot work is to be conducted on the refrigeration equipment or any associated parts, appropriate fire extinguishing equipment shall be available at hand.
 - Have a dry powder or CO₂ fire extinguisher adjacent to the charging area.
- 5) No ignition sources
- No person carrying out work in relation to a refrigeration system which involves exposing any pipe work that contains or has contained flammable refrigerant shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.
 - He/She must not be smoking when carrying out such work.
 - All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which flammable refrigerant can possibly be released to the surrounding space.
 - Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks.
- 6) Ventilated area
- Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work.
 - A degree of ventilation shall continue during the period that the work is carried out.
 - The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.
- 7) Checks to the refrigeration equipment
- Where electrical components are being changed, they shall be fit for the purpose and to the correct specification.
 - At all times the manufacturer's maintenance and service guidelines shall be followed.
 - If in doubt consult the manufacturer's technical department for assistance.
 - The following checks shall be applied to installations using flammable refrigerants:
 - The ventilation machinery and outlets are operating adequately and are not obstructed.
 - Marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected.
- 8) Checks to electrical devices
- Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures.
 - Initial safety checks shall include but not limit to:
 - That capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking.
 - That there is no live electrical components and wiring are exposed while charging, recovering or purging the system.
 - That there is continuity of earth bonding.
 - At all times the manufacturer's maintenance and service guidelines shall be followed.
 - If in doubt consult the manufacturer's technical department for assistance.
 - If a fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with.
 - If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used.
 - The owner of the equipment must be informed or reported so all parties are advised thereafter.
3. Repairs to sealed components
- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc.
 - If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
 - Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
 - Ensure that apparatus is mounted securely.
 - Ensure that seals or sealing materials have not degraded such that they no longer serve the purpose of preventing the ingress of

Precaution for Using R32 Refrigerant

flammable atmospheres.

- Replacement parts shall be in accordance with the manufacturer's specifications.

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

4. Repair to intrinsically safe components

- Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.
- Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere.
- The test apparatus shall be at the correct rating.
- Replace components only with parts specified by the manufacturer. Unspecified parts by manufacturer may result ignition of refrigerant in the atmosphere from a leak.

5. Cabling

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

6. Detection of flammable refrigerants

- Under no circumstances shall potential sources of ignition be used in the searching or detection of refrigerant leaks.
 - A halide torch (or any other detector using a naked flame) shall not be used.
- ### 7. The following leak detection methods are deemed acceptable for all refrigerant systems.
- No leaks shall be detected when using detection equipment with a sensitivity of 5 grams per year of refrigerant or better under a pressure of at least 0,25 times the maximum allowable pressure (>1.04MPa, max 4.15MPa). For example, a universal sniffer.
 - Electronic leak detectors may be used to detect flammable refrigerants, but the sensitivity may not be adequate, or may need recalibration. (Detection equipment shall be calibrated in a refrigerant-free area.)
 - Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used.
 - Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed and the appropriate percentage of gas (25 % maximum) is confirmed.
 - Leak detection fluids are suitable for use with most refrigerants but the use of detergents containing chlorine shall be avoided as the chlorine may react with the refrigerant and corrode the copper pipe-work.
 - If a leak is suspected, all naked flames shall be removed/extinguished.
 - If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. The precautions in #8 must be followed to remove the refrigerant.

8. Removal and evacuation

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

The following procedure shall be adhered to:

- remove refrigerant -> purge the circuit with inert gas -> evacuate -> purge again with inert gas
- open the circuit by cutting or brazing.
- The refrigerant charge shall be recovered into the correct recovery cylinders.
- The system shall be purged with OFN to render the appliances safe. (remark: OFN = oxygen free nitrogen, type of inert gas)
- This process may need to be repeated several times.
- Compressed air or oxygen shall not be used for this task.
- Flushing shall be achieved by breaking the vacuum in the system with OFN and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum.
- This process shall be repeated until no refrigerant is within the system.
- When the final OFN charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.
- This operation is absolutely vital if brazing operations on the pipe work are to take place.
- Ensure that the outlet for the vacuum pump is not close to any ignition sources and there is ventilation available.

9. Charging procedures

- In addition to conventional charging procedures, the following requirements shall be followed:
 - Ensure that contamination of different refrigerants does not occur when using charging equipment.
 - Hoses or lines shall be as short as possible to minimize the amount of refrigerant contained in them.
 - Cylinders shall be kept in an appropriate position according to the instructions.
 - Ensure that the refrigeration system is earthed prior to charging the system with refrigerant.
 - Label the system when charging is complete (if not already).
 - Extreme care shall be taken not to over fill the refrigeration system.

Precaution for Using R32 Refrigerant

- Prior to recharging the system it shall be pressure tested with OFN (refer to #7).
 - The system shall be leak tested on completion of charging but prior to commissioning.
 - A follow up leak test shall be carried out prior to leaving the site.
 - Electrostatic charge may accumulate and create a hazardous condition when charging and discharging the refrigerant. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before charging/discharging.
10. Decommissioning
- Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its details.
 - It is recommended good practice that all refrigerants are recovered safely.
 - Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of reclaimed refrigerant.
 - It is essential that electrical power is available before the task is commenced.
- a) Become familiar with the equipment and its operation.
 - b) Isolate system electrically.
 - c) Before attempting the procedure ensure that:
 - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - all personal protective equipment is available and being used correctly;
 - the recovery process is supervised at all times by a competent person;
 - recovery equipment and cylinders conform to the appropriate standards.
 - d) Pump down refrigerant system, if possible.
 - e) If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
 - f) Make sure that cylinder is situated on the scales before recovery takes place.
 - g) Start the recovery machine and operate in accordance with manufacturer's instructions.
 - h) Do not over fill cylinders. (No more than 80 % volume liquid charge).
 - i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
 - j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
 - k) Recovered refrigerant shall not be charged into another refrigeration system unless it has been cleaned and checked.
- Electrostatic charge may accumulate and create a hazardous condition when charging or discharging the refrigerant. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before charging/discharging.
11. Labelling
- Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant.
 - The label shall be dated and signed.
 - Ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.
12. Recovery
- When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.
 - When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed.
 - Ensure that the correct number of cylinders for holding the total system charge are available.
 - All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant).
 - Cylinders shall be complete with pressure relief valve and associated shut-off valves in good working order.
 - Recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
 - The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of flammable refrigerants.
 - In addition, a set of calibrated weighing scales shall be available and in good working order.
 - Hoses shall be complete with leak-free disconnect couplings and in good condition.
 - Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.
 - The recovered refrigerant shall be returned to the refrigerant supplier in the correct recovery cylinder, and the relevant Waste Transfer Note arranged.
 - Do not mix refrigerants in recovery units and especially not in cylinders.
 - If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant.
 - The evacuation process shall be carried out prior to returning the compressor to the suppliers.
 - Only electric heating to the compressor body shall be employed to accelerate this process.
 - When oil is drained from a system, it shall be carried out safely.

1 - INTRODUCTION

1.1 - Introduction

Prior to the initial start-up of the units, the people involved should be thoroughly familiar with these instructions and technical data for the installation.

The outdoor systems are designed to provide a very high level of safety and reliability making installation, start-up, operation and maintenance easier and more secure. They will provide safe and reliable service when operated within their application range.

The procedures in this manual are arranged in the sequence required for machine installation, start-up, operation and maintenance.

Be sure you understand and follow the procedures and safety precautions contained in the instructions supplied with the machine, as well as those listed in this guide, such as: protective clothing such as gloves, safety glasses, safety shoes and appropriate tools, and suitable qualifications (electrical, air conditioning, local legislation).

1.2 - Safety

1.2.1 - Installation safety considerations

After the unit has been received, and before it is started up, it must be inspected for damage. Check that the refrigerant circuits are intact, especially that no components or pipes have shifted or been damaged (e.g. following a shock). If in doubt, carry out a leak tightness check. If damage is detected upon receipt and before signature, immediately file a claim with the shipping company.

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.

Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

Do not remove the pallet or the packaging until the unit is in its final position. These units can be moved with a fork lift truck, as long as the forks are positioned in the right place and direction on the unit.

The units can also be lifted with slings (refer to Figure 1 and 2).

Use slings with the correct capacity, and always follow the lifting instructions on the certified drawings supplied for the unit.

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

DO NOT COVER ANY PROTECTION DEVICES.

This applies to fuse plugs and relief valves (if used) in the refrigerant or heat transfer medium circuits. Check if the original protection plugs are still present at the valve outlets. These plugs are generally made of plastic and should not be used. If they are still present, please remove them. Install devices at the valve outlets or drain piping that prevent the penetration of foreign bodies (dust, building debris, etc.) and atmospheric agents (water can form rust or ice). These devices, as well as the drain piping, must not impair operation and not lead to a pressure drop that is higher than 10% of the control pressure.

Control

When the unit is subjected to fire, the fluid may then be decomposed into toxic residues when subjected to the flame :

- Stay away from the unit.
- Set up warnings and recommendations for personnel in charge to stop the fire.
- Fire extinguishers appropriate to the system and the refrigerant type must be easily accessible.

All precautions concerning handling of refrigerant must be observed in accordance with local regulations.

Accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.

Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death.

Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products can be hazardous.

1.2.2 - Equipment and components under pressure

These products incorporate equipment or components under pressure, produced by manufacturers. We recommend that you consult your appropriate national trade association or the owner of the equipment or components under pressure (declaration, re-qualification, retesting, etc.). The characteristics of this equipment/these components are given on the nameplate or in the required documentation, supplied with the products.

The units are intended to be stored and operate in an

environment where the ambient temperature must not be less than the lowest allowable temperature indicated on the nameplate.

Do not introduce significant static or dynamic pressure with regard to the operating pressures used during operation or for tests in the refrigerant circuit or in the heat exchange circuits.

NOTES:

Monitoring during operation, re-qualification, re-testing, exemption from retesting:

- Follow local regulations on the monitoring of pressure containing equipment.
- The user or the operator is usually requested to create and maintain a monitoring and maintenance register.
- In absence of regulation or in addition to the regulations, follow the guidance in ISO 5149.
- Follow the local professional recommendations, whenever they exist.
- Regularly monitor the surface of the components to detect cavernous corrosion. To do this check an uninsulated part of the pressure vessel or at a joint in the insulation.

1 - INTRODUCTION

- Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities can cause wear and/or pitting corrosion.
- Filter the heat exchange fluid.
- The reports of the periodical checks by the user or the operator must be included in the monitoring and maintenance register.

REPAIR:

Any repair or modification of a pressure vessel is prohibited.

Only the replacement of the vessel by an original part from the manufacturer is allowed. In this case, the replacement must be carried out by a qualified technician. The replacement of the vessel must be entered in the monitoring and maintenance register.

RECYCLING:

The pressure equipment can be recycled in whole or in part.

After use they may contain refrigerant vapours and oil residue. Some parts are painted.

1.2.3 - Maintenance safety considerations

Professional technicians working on the electric or refrigeration components must be authorized, trained and fully qualified to do so.

All refrigerant circuit work must be carried out by a trained person, fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.

The units use high-pressure R32 refrigerant. Special equipment must be used when working on the refrigerant circuit (pressure gauge, charge transfer, etc.).

Do not clean the unit with hot water or steam. This may cause a pressure increase of the refrigerant.

Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorised technician, observing applicable standards (e.g. during draining operations). The unit must be switched off while this is done.

During any handling, maintenance and service operations the qualified technician working on the unit must be equipped with safety gloves, safety glasses, shoes and protective clothing.

Never work on a unit that is still energized. Never work on any of the electrical components, until the general power supply to the unit has been cut.

If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position and secure the machine upstream with a padlock.

If the work is interrupted, always ensure that all circuits are still de-energized before resuming the work.

Caution

Even if the unit has been switched off, the power circuit remains energized, unless the unit or customer circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels. When working in a fan area, specifically if the grilles have to be removed, isolate the power supply to the fans to prevent their operation.

Caution

The variable frequency drives (VFD) fitted to the units have circuit capacitors whose discharge time is five (5) minutes after disconnecting the power supply.

Therefore, after disconnecting the power supply of the control box, wait for 5 minutes before access it.

Before any intervention, verify that there is no voltage present at any accessible conducting parts of the power circuit.

Moreover be careful of contact with zones at hot temperature inside the unit, which can exist after the operation of unit (refrigerant and electronic parts).

It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious. The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid nuisance tripping or leaks, replace or re-calibrate the valve.

OPERATING CHECKS:

• IMPORTANT INFORMATION REGARDING THE REFRIGERANT USED:

Refrigerant type: R32

Global Warming Potential (GWP): 675

Periodic inspections for refrigerant leaks may be required depending on European or local legislation. Please contact your local dealer for more information.

Caution

1. Any intervention on the refrigerant circuit of this product should be performed in accordance with the applicable legislation.
2. Ensure that the refrigerant is never released to the atmosphere during installation, maintenance or equipment disposal.
3. The deliberate gas release into the atmosphere is not allowed.
4. If a refrigerant leak is detected, ensure that it is stopped and repaired as quickly as possible.

1 - INTRODUCTION

5. Only a qualified and certified personnel can perform installation operations, maintenance, refrigerant circuit leak test as well as the equipment disposal and the refrigerant recovering.
6. The gas recovery for recycling, regeneration or destruction is at customer charge.
7. Periodic leak tests have to be carried out by the customer or by third parties. The EU regulation set the periodicity here after:

System WITHOUT leakage detection	No Check	12 Months	6 Months	3 Months	
System WITH leakage detection	No Check	24 Months	12 Months	6 Months	
Refrigerant charge/circuit (CO2 equivalent)	< 5 Tons	5≤Charge <50 Tons	50≤Charge <500 Tons	Charge >500 Tons(1)	
Refrigerant charge/Circuit (kg)	R32(GWP 675)	Charge <7.4 kg	7.4 ≤Charge <74.1kg	74.1≤Charge <740.7kg	Charge >740.7kg
	R407C(GWP 1774)	Charge <2.8 kg	2.8 ≤Charge <28.2 kg	28.2 ≤Charge <281.9 kg	Charge >281.9 kg
	R410A(GWP 2088)	Charge <2.4 kg	2.4≤Charge <23.9 kg	23.9≤Charge <239.5 kg	Charge >239.5 kg
	HFO's:R1234ze	No requirement			

(1) From 01/01/2017, units must be equipped with a leakage detection system

8. A logbook must be established for equipments subject to periodic leak tests. It should contain the quantity and the type of fluid present within the installation (added and recovered), the quantity of recycled fluid, regenerated or destroyed, the date and output of the leak test, the designation of the operator and its belonging company, etc.

9. Contact your local dealer or installer if you have any questions.

Protection device checks:

- If no national regulations exist, check the protection devices on site in accordance with standard ISO 5149: every five years for external relief valves.

NOTE: The following statements are only indicated if a pressure switch is available on the unit.

The company or organisation that conducts a pressure switch test shall establish and implement a detailed procedure to fix:

- Safety measures
- Measuring equipment calibration
- Validating operation of protective devices
- Test protocols
- Recommissioning of the equipment.

Consult Service for this type of test. The manufacturer mentions here only the principle of a test without removing the pressure switch:

- Verify and record the setpoints of pressure switches and relief devices (valves and possible rupture discs)
- Be ready to switch-off the main disconnect switch (on the unit or on the installation) of the power supply if the pressure switch does not trigger (avoid over-pressure)
- Connect a calibrated pressure gauge (with Schrader female port of ½ UNF)

Caution

Inspect the protection devices such as valves.

If the machine operates in a corrosive environment, inspect the protection devices more frequently.

Check regularly for leaks and repair immediately. Ensure regularly that the vibration levels remain acceptable and close to those at the initial unit start-up.

Before opening a refrigerant circuit, transfer the refrigerant to bottles specifically provided for this purpose and consult the pressure gauges.

Change the refrigerant after an equipment failure, following a procedure such as the one described in NF E29-795 or carry out a refrigerant analysis in a specialist laboratory.

If the refrigerant circuit remains open after an intervention (such as a component replacement, etc.):

- Seal the openings if the duration is less than a day.
- If more than 1 day, charge the circuit with oxygen free nitrogen (inertia principle).

The objective is to prevent penetration of atmospheric humidity and the resulting corrosion.

1.2.4 - Repair safety considerations

All installation parts must be maintained by the personnel in charge to avoid deterioration and injury. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. After each unit repair check the operation of the protection devices and create a 100% parameter operation report.

Comply with the regulations and recommendations in unit and HVAC installation safety standards, such as: ISO 5149.

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

1 - INTRODUCTION

RISK OF EXPLOSION



Never use air or a gas containing oxygen during leak tests to purge lines or to pressurise a machine. Pressurised air mixtures or gases containing oxygen can be the cause of an explosion. Oxygen reacts violently with oil and grease.

Only use dry nitrogen for leak tests, possibly with an appropriate tracer gas.

If the recommendations above are not observed, this can have serious or even fatal consequences and damage the installation.

Never exceed the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) as well as the oil have been removed from the heat pump. Traces of vapour should be displaced with dry nitrogen. Refrigerant in contact with an open flame can produce toxic gases.

The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

Do not siphon refrigerant.

Avoid spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles and safety gloves. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

The accidental releases of the refrigerant, due to small leaks or significant discharges following the rupture of a pipe or an unexpected release from a relief valve, can cause frostbites and burns to personnel exposed. Do not ignore such injuries. Installers, owners and especially service technicians for these units must:

- Seek medical attention before treating such injuries.
- Have access to a first-aid kit, especially for treating eye injuries.

We recommend to apply standard ISO 5149.

Never apply an open flame or live steam to a refrigerant circuit. Dangerous overpressure can result.

During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment are described in standard NF E29-795. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are provided with the units.

Refer to the certified dimensional drawings for the units.

It is dangerous and illegal to re-use disposable (non-returnable) cylinders or attempt to refill them. When cylinders are empty, evacuate the remaining gas pressure, and move them to a designated place for recovery. Do not incinerate.

Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa and that the unit has been shut-down and de-energised before removing components or opening a circuit.

Do not attempt to repair or recondition any safety devices when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. If necessary, replace the device. Do not install safety valves in series or backwards.



Caution

No part of the unit must be used as a walkway, rack or support. Periodically check and repair or if necessary replace any component or piping that shows signs of damage.

Do not step on refrigerant lines. The lines can break under the weight and release refrigerant, causing personal injury.

Do not climb on a machine. Use a platform, or staging to work at higher levels.

Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.

Use only original replacement parts for any repair or component replacement. Consult the list of replacement parts that corresponds to the specification of the original equipment.

Do not drain water circuits containing industrial brines, without informing the technical service department at the installation site or a competent body first.

Close the entering and leaving water shut-off valves and purge the unit hydraulic circuit, before working on the components installed on the circuit (screen filter, pump, water flow switch, etc.).

Periodically inspect all valves, fittings and pipes of the refrigerant and hydraulic circuits to ensure that they do not show any corrosion or any signs of leaks.

It is recommended to wear ear defenders, when working near the unit and the unit is in operation.

Always ensure you are using the correct refrigerant type before recharging the unit.

Charging any refrigerant other than the original charge type (R32) will impair machine operation and can even lead to a destruction of the compressors. The compressors operate with R32 and are charged with asyntheticpolyol-ester oil.

Before any intervention on the refrigerant circuit, the complete refrigerant charge must be recovered.

1 - INTRODUCTION

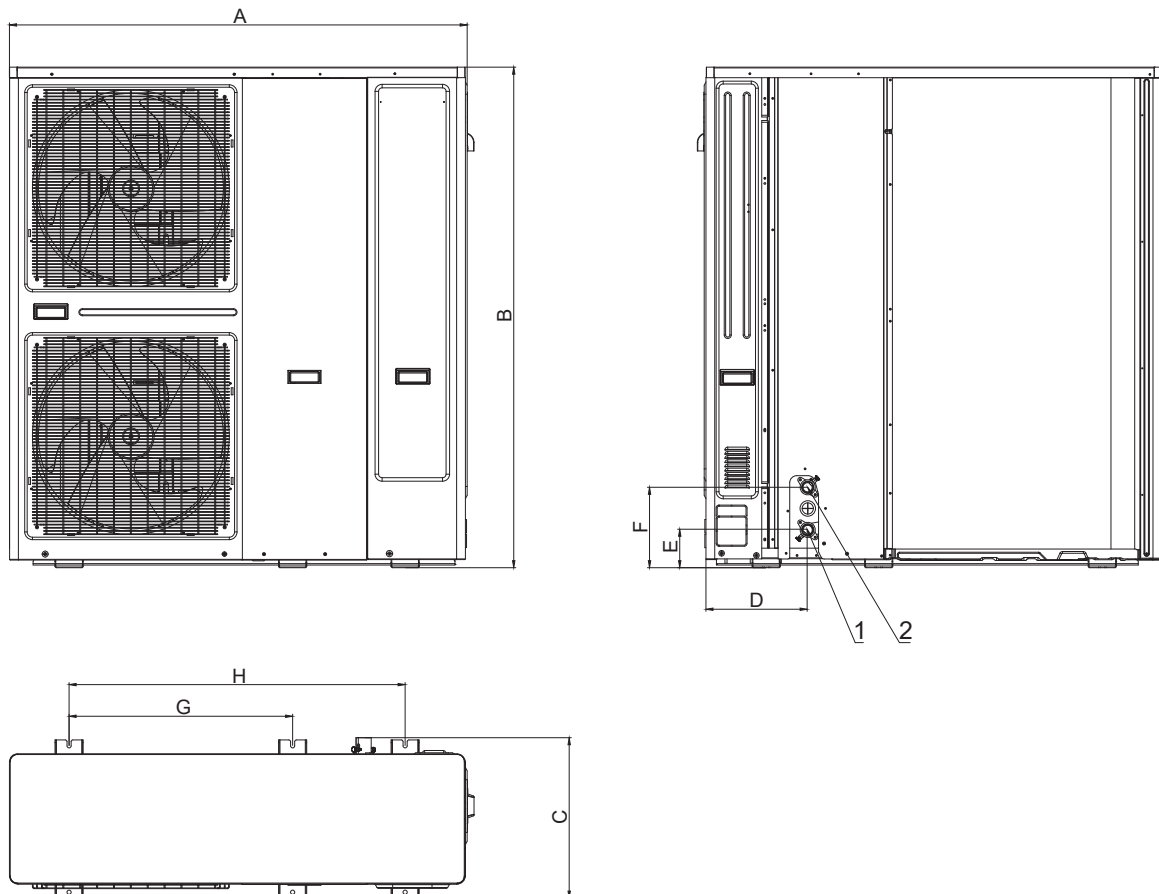
1.3 - Preliminary checks

Check equipment received:

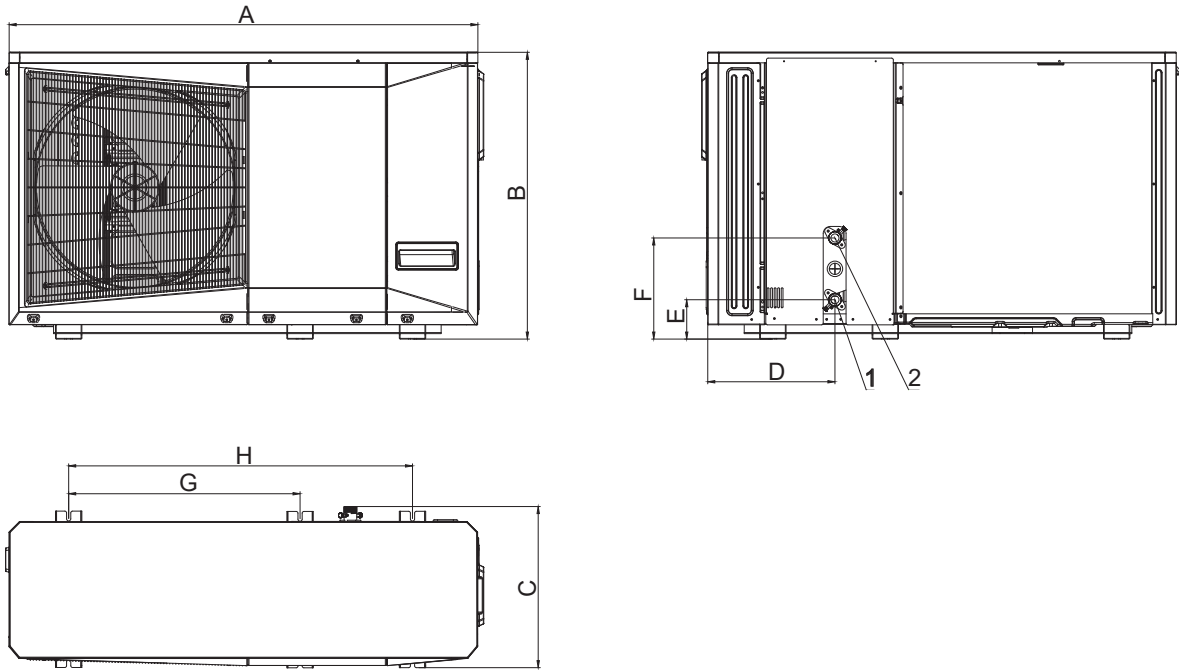
- Inspect the unit for damage or missing parts. If damage is detected, or if shipment is incomplete, immediately file a claim with the shipping company.
- Confirm that the unit received is the one ordered. Compare the name plate data with the order.
- The name plate is attached to the unit in two locations:
 - on the outside on one of the unit sides
 - on the inside
- The unit name plate must include the following information:
 - Model number - size
 - CE marking
 - Serial number
 - Year of manufacture, pressure and leak tightness test date
 - Fluid being transported
 - Refrigerant used
 - Refrigerant charge per circuit
 - PS: Min./max. allowable pressure (high and low pressure side)
 - TS: Min./max. allowable temperature (high and low pressure side)
 - Unit leak test pressure
 - Voltage, frequency, number of phases
 - Maximum power input
 - Unit net weight
- Confirm that all options ordered for on-site installation have been delivered, and are complete and undamaged. The unit must be checked periodically, if necessary removing the insulation (thermal, acoustic), during its whole operating life to ensure that no shocks (handling accessories, tools, etc.) have damaged it. If necessary, the damaged parts must be repaired or replaced. See also chapter §5. Maintenance.

1.4 - Dimensions and clearance for units

1.4.1 - Dimensions and location of hydraulic connections



1 - INTRODUCTION



With Electrical heater component

Model	A	B	C	D	E	F	G	H	Weight(kg)
4-6_1Ph	1335	816	459	362	112	279	659	979	103.9
8_1Ph	1335	816	459	362	112	279	659	979	114.7
10_1Ph	1335	816	459	362	112	279	659	979	121.3
12_1Ph	1302	1425	456	290	107	229	636	956	154.6
14-16_1Ph	1302	1425	456	290	107	229	636	956	156.8
12_3Ph	1302	1425	456	290	107	229	636	956	170.0
14-16_3Ph	1302	1425	456	290	107	229	636	956	172.0

NOTE : Dimensions are given in mm

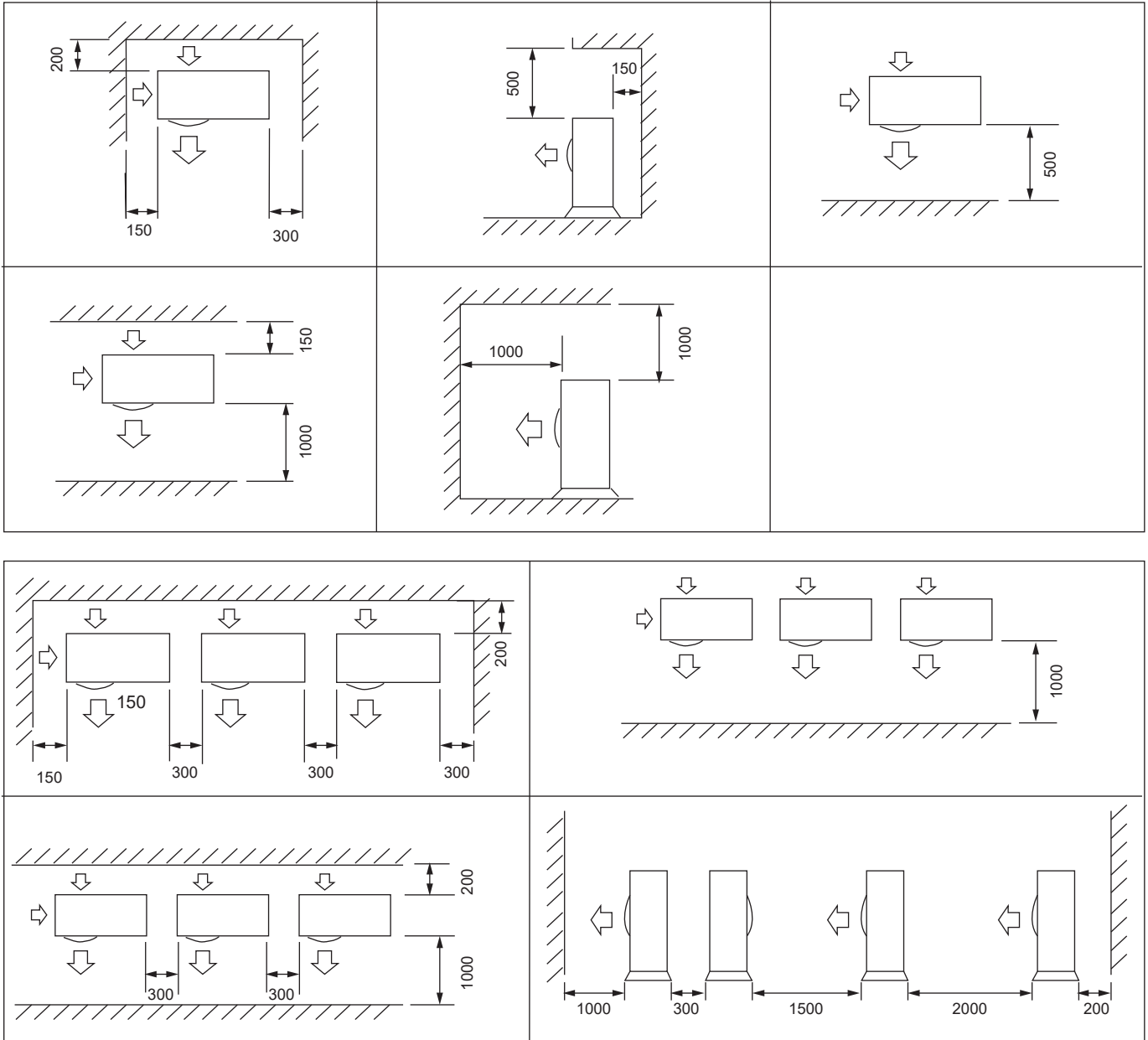
Without electrical heater component:

Model	A	B	C	D	E	F	G	H	Weight(kg)
4-6_1Ph	1335	816	459	362	112	279	659	979	102.0
8_1Ph	1335	816	459	362	112	279	659	979	112.9
10_1Ph	1335	816	459	362	112	279	659	979	119.5
12_1Ph	1302	1425	456	290	107	229	636	956	152.8
14-16_1Ph	1302	1425	456	290	107	229	636	956	155.0
12_3Ph	1302	1425	456	290	107	229	636	956	168.2
14-16_3Ph	1302	1425	456	290	107	229	636	956	170.2

NOTE : Dimensions are given in mm

1 - INTRODUCTION

1.4.2 -The picture presents the minimal distances of the wall to ensure the correct air flow on air heat exchanger⁽¹⁾.



(1) Anticipate different maintenance actions before to place the unit (access of different parts / opening of panel/ part replacement...)

1 - INTRODUCTION

1.5 - Specification data and electrical data of units

1.5.1 - Electrical data

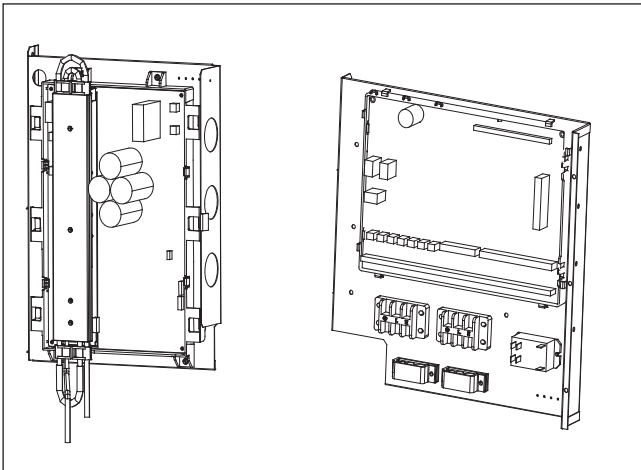
Model name			4 (1 Ph)	6 (1 Ph)	8 (1 Ph)	10(1 Ph)	12 (1 Ph)	14 (1 Ph)	16 (1 Ph)	12 (3 Ph)	14 (3 Ph)	16 (3 Ph)
Power circuit	Nominal power supply	V-ph-Hz	230-1N-50							400-3N-50		
	Voltage range	V	220-240							380-415		
Control circuit supply												
Maximum unit power input (Un) (1)		kW	3.3	3.52	4.4	4.84	5.5	6.6	6.6	5.94	7.26	7.26
Cos Phi unit at maximum power (1)			0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Maximum unit current drawn (Un-10%) (2)		A	15	16	20	22	25	30	30	9	11	11
Maximum unit current drawn (Un) (3)		A	15	16	20	22	25	30	30	9	11	11
Maximum Start-up current, standard unit (4)		A	Not Applicable (less than the operating current)									

(1) Maximum unit operating current at maximum unit power input and at 220V-1ph/400V-3ph (values given on the unit nameplate).

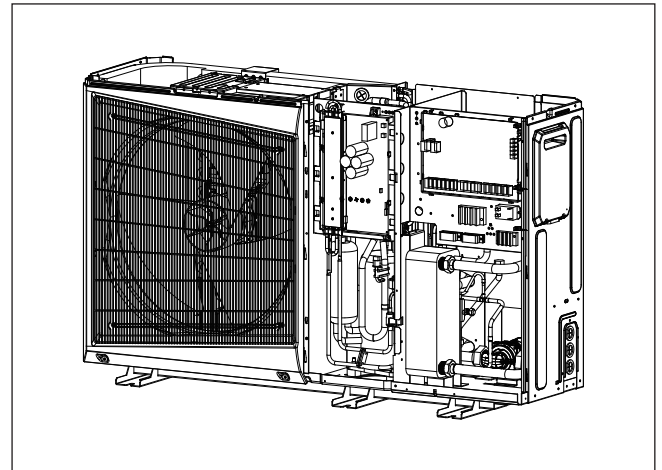
(2) Maximum instantaneous start-up current at operating limits (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

1.5.2 - Inside view

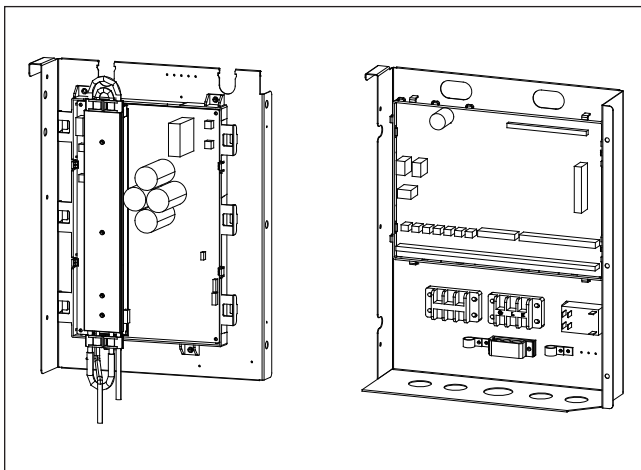
Electrical box



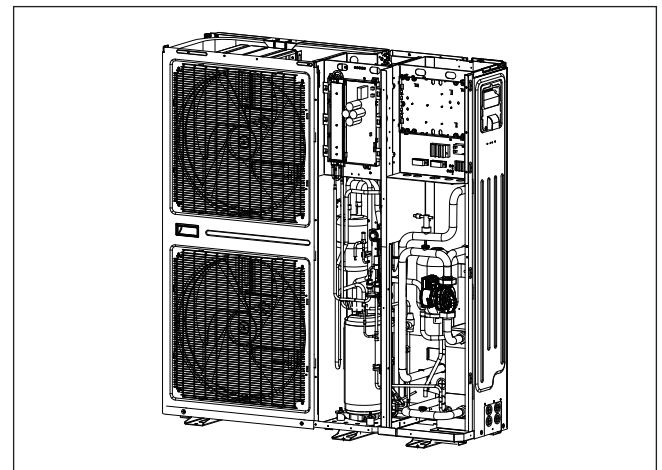
4-10kW unit (1 Ph)



Electrical box



12-16kW unit (1 Ph&3 Ph)



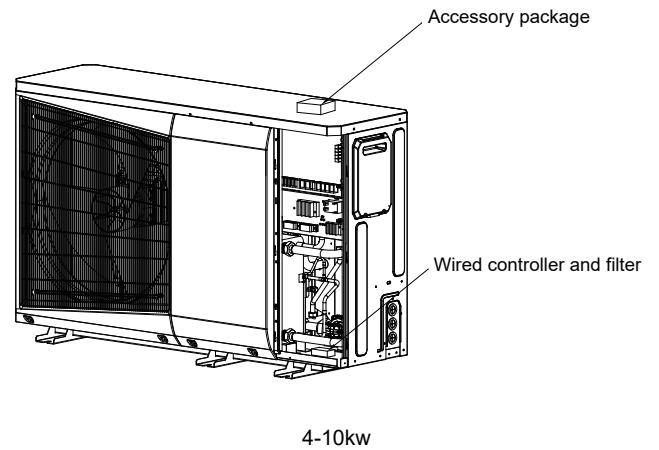
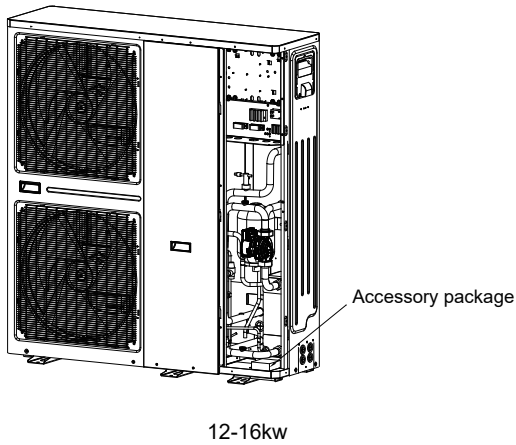
1 - INTRODUCTION

1.6 - ACCESSORIES

1.6.1 - Standard accessories table

Accessories	Description	Advantages	Utilisation
Manuals	One operation manual of wired controller and the other is IOM of unit	Useful for installation guidance and configuration	
Domestic hot water management sensor and filter	Sensor enabling to manage the water setpoint inside the tank used for domestic hot water production	Useful for domestic hot water production	
Wired controller	Remotely installed user interface	Remote heat pump control with room temperature sensor used to offset the water control point. Possibility to configure the unit on field.	
Additional outdoor ambient temperature sensor	Additional outdoor ambient temperature sensor	Better reading of outdoor air temperature	
Connection cable of wired controller	Use for connect the wired controller		

1.6.2 - Location of Accessory package



2 - INSTALLATION OF UNIT

2.1 - General

To install an unit the following steps are requested

1. Place the unit
2. Make electrical connections
3. Check for water leaks and the water flow rate control
4. Finally, make commissioning of the unit

2.2 - Moving and placing the unit

2.2.1 - Moving

See §1.2.1 Installation safety considerations.

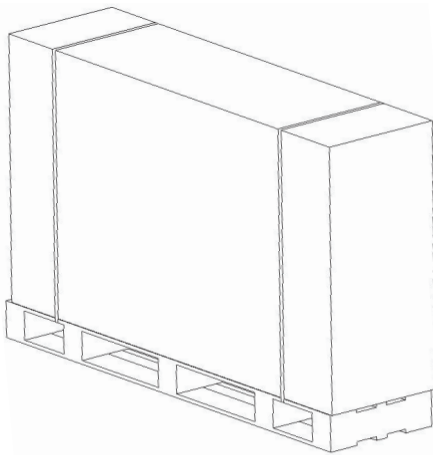


Figure 1: Transport configuration

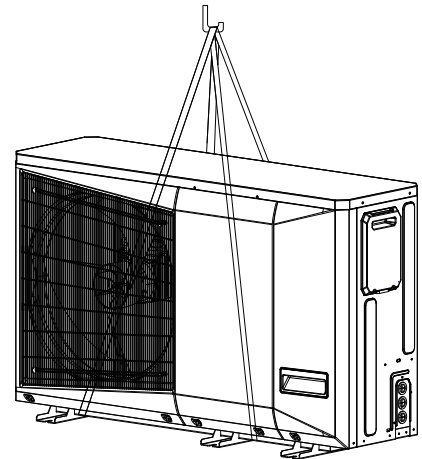


Figure 2: Offloading configuration

2.2.2 - Placing the unit

In case of extra-high units the machine environment must permit easy access for maintenance operations.

Always refer to § 1.4. Dimensions and clearance for units to confirm that there is adequate space for all connections and service operations. For the centre of gravity coordinates, the position of the unit mounting holes, and the weight distribution points, refer to the certified dimensional drawing supplied with the unit.

Typical applications of these units do not require earthquake resistance. Earthquake resistance has not been verified.

CAUTION:

Only use slings at the designated lifting points (refer to Figure 2 to offload the unit).

Before siting the unit check that:

- The permitted loading at the site is adequate or that appropriate strengthening measures have been taken.
- If the unit has to operate as a heat pump in temperatures below 0°C it must be raised at least 300 mm from the ground. This is necessary to avoid ice build-up on the unit chassis and also to permit correct unit operation in locations where the snow level may reach this height.
- The unit is installed level on an even surface (maximum tolerance is 5 mm in both axes).
- There is adequate space above the unit for air flow and to ensure access to the components (see dimensional drawings).
- The number of support points is adequate and that they are in the right places.
- The location is not subject to flooding.
- For outdoor installations, where heavy snowfall is likely and long periods of sub-zero temperatures are normal, provision has to be made to prevent snow accumulating by raising the unit above the height of drifts normally experienced. Baffles may be necessary to deflect strong winds. They must not restrict air flow into the unit.
- OAT sensor, located on the coil, should not be exposed to the sun or other heat sources.

CAUTION:

Before lifting the unit, check that all casing panels are securely fixed in place. Lift and set down the unit with great care. Tilting and jarring can damage the unit and impair unit operation.

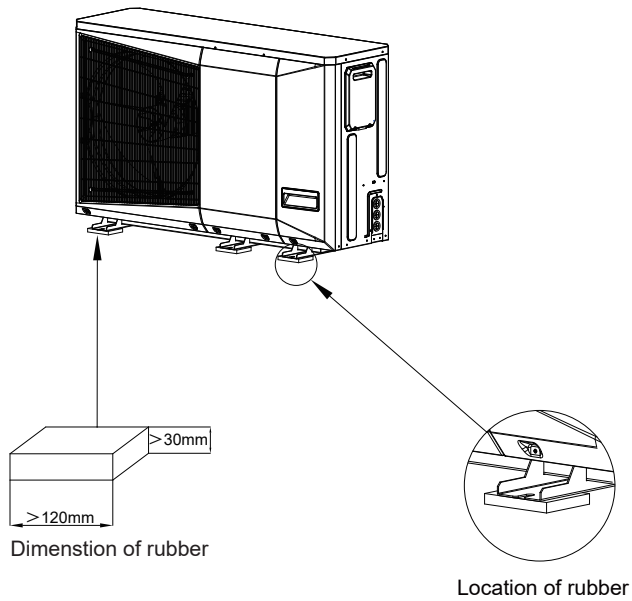
If units are hoisted with rigging, it is advisable to protect coils against crushing while a unit is being moved. Use struts or a lifting beam to spread the slings above the unit. Do not tilt a unit more than 15°.

CAUTION:

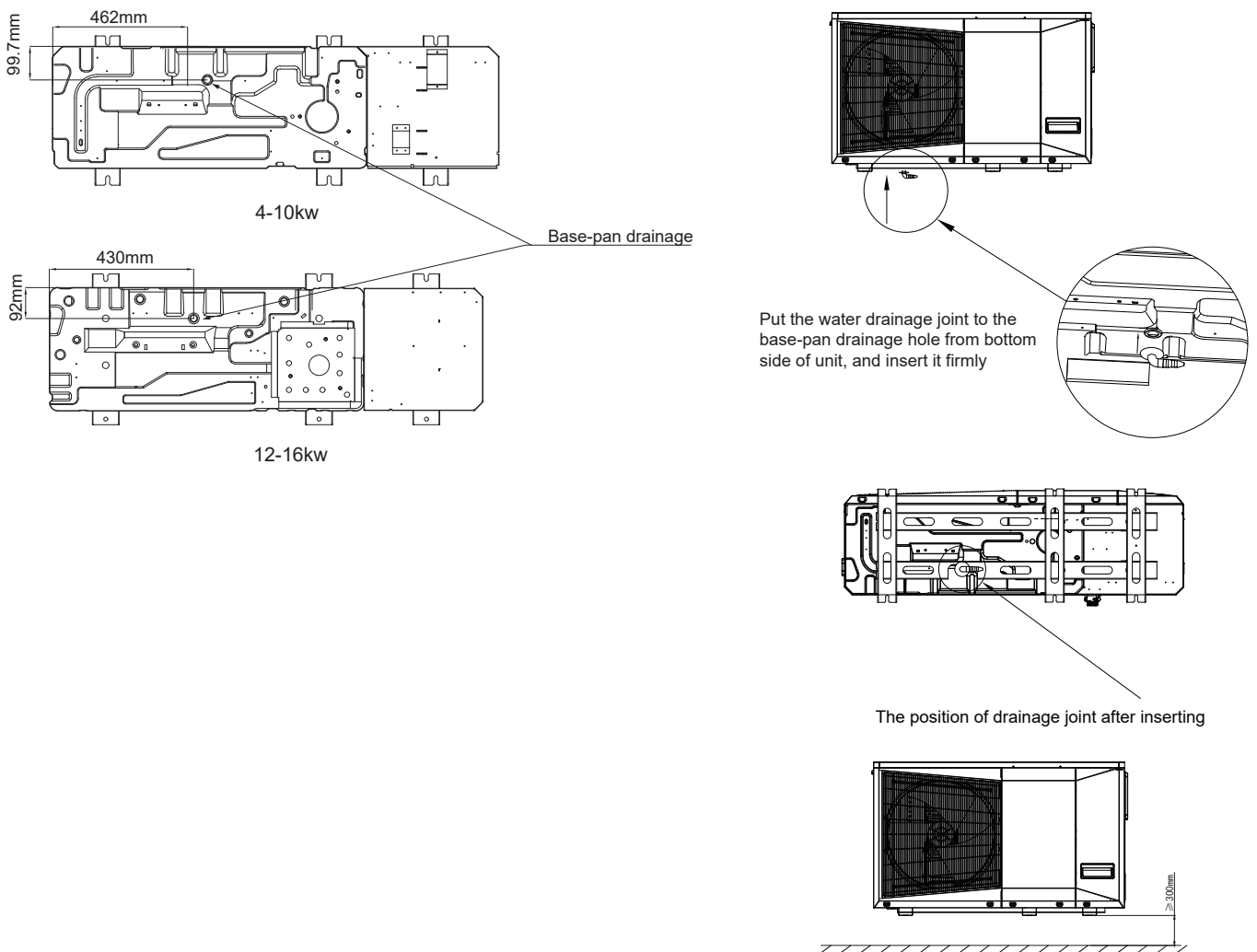
Never push or lever on any of the enclosure panels of the unit. Only the base of the unit frame is designed to withstand such stresses.

2 - INSTALLATION OF UNIT

CAUTION: Installation of anti-vibration rubber



CAUTION: Mandatory installation of base-pan water drainage joint



2 - INSTALLATION OF UNIT

2.2.3 - Removing the unit panel

To access at the inside of the unit (refrigerant parts / electrical parts), the panel can be removed. This operation must be carried out by a qualified technician.

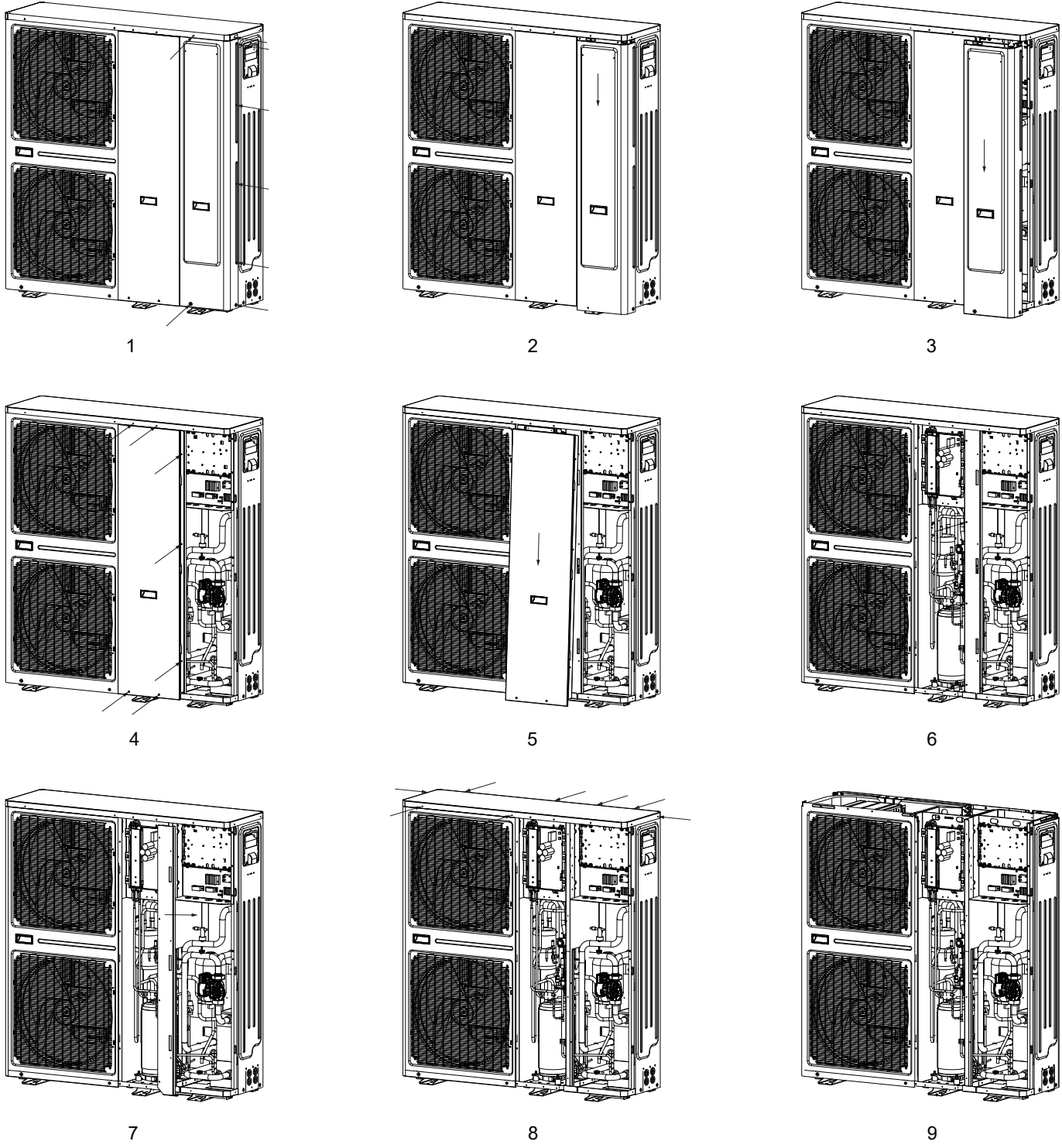
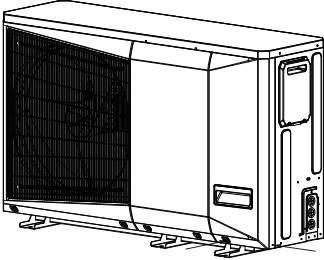
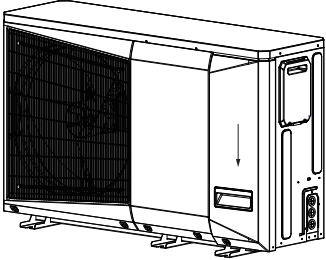


Figure 3 : How to remove front panel for 12-16kW units

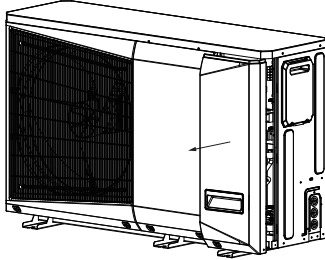
2 - INSTALLATION OF UNIT



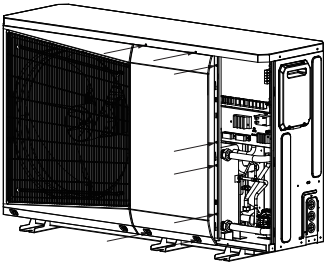
1



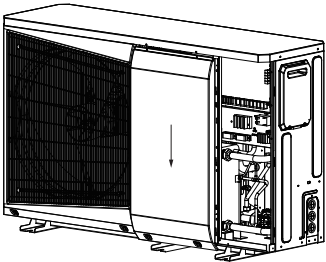
2



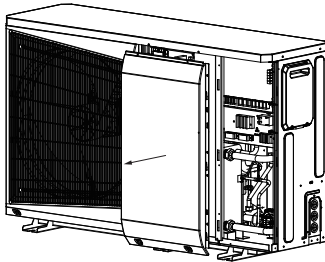
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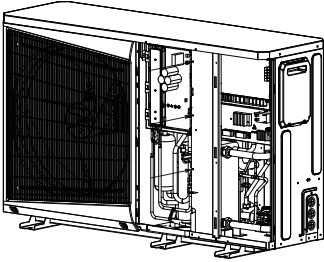
4



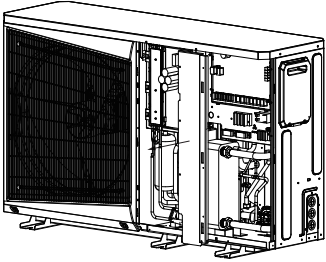
5



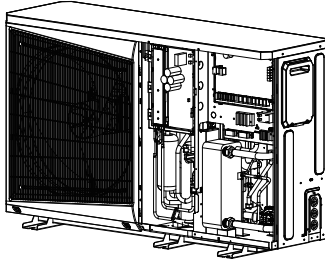
6



7



8



9

Figure 4 : How to remove front panel for 4-10kW units

2 - INSTALLATION OF UNIT

2.2.4 - Checks before system start-up

Before the start-up of the refrigeration system, the complete installation, including the refrigeration system must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams, and wiring diagrams.

For these checks national regulations must be followed. If the national regulation does not specify any details, refer to standard ISO 5149 as follows:

External visual installation checks:

- Ensure that the machine is charged with refrigerant. Verify on the unit nameplate that the 'fluid being transported' is R32 and is not nitrogen.
- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all protection documents and equipment provided by the manufacturer (dimensional drawings, P&ID, declarations etc.) to comply with the regulations are present.
- Verify that the environmental safety and protection devices and arrangements provided by the manufacturer to comply with the regulations are in place.
- Verify that all documents for pressure containers, certificates, name plates, files, instruction manuals provided by the manufacturer to comply with the regulations are present.
- Verify the free passage of access and safety routes.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases.
- Verify the installation of connections.
- Verify the supports and fixing elements (materials, routing and connection).
- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection against heat.
- Check the protection of moving parts.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation and of the vapour barriers.

2.3 - Water connections

For size and position of the unit water inlet and outlet connections refer to the certified dimensional drawings supplied with the unit. The water pipes must not transmit any radial or axial force to the heat exchangers nor any vibration.

The water supply must be analysed and appropriate filtering, treatment, control devices, shut-off and bleed valves and circuits built in, to prevent corrosion (example: damage to the protection of the tube surface if the fluid is polluted), fouling and deterioration of the pump fittings.

Before any start-up verify that the heat exchange fluid is compatible with the materials and the water circuit coating.

In case additives or other fluids than those recommended by the manufacturer are used, ensure that the fluids are not considered as a gas.

Recommendations on heat exchange fluids:

- No NH₄⁺ ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.
- Cl⁻ Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 10 mg/l.
- SO₄²⁻ sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No Fe²⁺ and Fe³⁺ ions with non negligible levels of dissolved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1mg/l.
- Water hardness: >0.5 mmol/l. Values between 1 and 2.5 mmol/l can be recommended. This will facilitate scale deposit that can limit corrosion of copper. Values that are too high can cause piping blockage over time. A total alkalimetric title (TAC) below 100 mg/l is desirable.
- Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.
- Electric conductivity: 0.001-0.06 S/m (10-600 µS/cm).
- pH: Ideal case pH neutral at 20-25°C (7 < pH < 8).

CAUTION:

Charging, adding or draining fluid from the water circuit must be done by qualified personnel, using air vents and materials suitable for the products. Water circuit charging devices are field-supplied.

Charging and removing heat exchange fluids should be done with devices that must be included on the water circuit by the installer. Never use the unit heat exchangers to add heat exchange fluid.

CAUTION:

The use of units in an open loop is forbidden.

2 - INSTALLATION OF UNIT

2.3.1 - Operating precautions and recommendations

The water circuit should be designed to have the least number of elbows and horizontal pipe runs at different levels. Below the main points to be checked for the connection:

- Comply with the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit.
- Use a pressure reducer to maintain pressure in the circuit(s) and install a relief valve as well as an expansion tank. Units with the hydraulic module include a relief valve and an expansion tank (if option chosen).
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install stop valves, close to the entering and leaving water connections.
- Use flexible connections to reduce vibration transmission.
- Insulate all pipework, after testing for leaks, both to reduce thermal leaks and to prevent condensation.
- Use thermal tape to seal joints and to seam the insulation.
- If the external unit water pipes are in an area where the ambient temperature is likely to fall below 0°C, they must be protected against frost (frost protection solution or trace heating).
- The use of different metals on hydraulic piping could generate electrolytic pairs and consequently corrosion. Verify then, the need to install sacrificial anodes.

The plate heat exchanger can foul up quickly at the initial unit start-up, as it complements the filter function, and the unit operation will be impaired (reduced water flow rate due to increased pressure drop).

Units with hydraulic module are equipped with Y filter as accessory.

Do not introduce any significant static or dynamic pressure into the heat exchange circuit (with regard to the design operating pressures).

The products that may be added for thermal insulation of the containers during the water piping connection procedure must be chemically neutral in relation to the materials and coatings to which they are applied. This is also the case for the products originally supplied by the manufacturer.

2.3.2 - General

For details on connection diameters, refer to §1.5.1 Physical data.

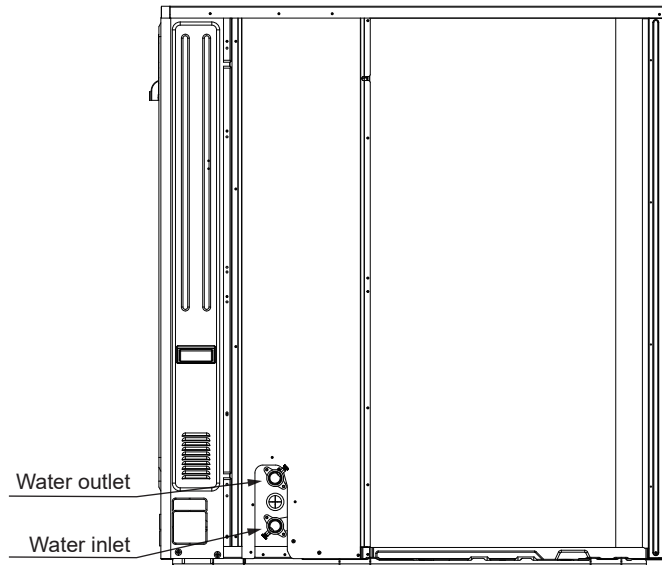


Figure 5: Water connection on unit

2.3.3 - Minimum water loop volume

The minimum water loop volume, in litres, is given by the following formula:

$$\text{Volume (l)} = \text{CAP (kW)} \times \text{N}$$

Where CAP is the nominal cooling capacity at nominal operating conditions.

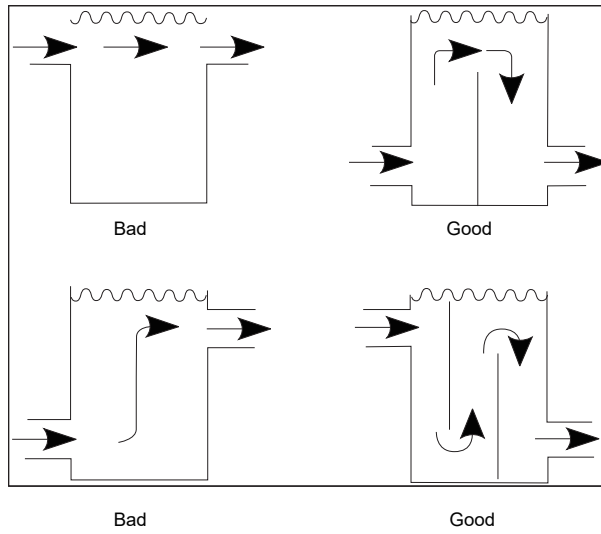
Application	N
Air conditioning	3,5
Heating or domestic hot water application	6
Industrial process cooling	See note below

NOTE:

For industrial process cooling applications, where high stability of water temperature levels must be achieved, the values above must be increased. We recommend consulting the factory for these particular applications.

2 - INSTALLATION OF UNIT

This volume is required to obtain temperature stability and precision. To achieve this volume, it may be necessary to add a storage tank to the circuit. This tank should be equipped with baffles to allow mixing of the fluid (water or brine). Please refer to the examples below.



2.3.4 - Maximum water loop volume

Units with hydraulic module incorporate an expansion tank that limits the water loop volume. The table below gives the maximum loop volume for pure water or ethylene glycol with various concentrations.

If the total system volume is higher than the values given above, the installer must add another expansion tank, suitable for the additional volume.

Water maximum volume (L) (4-16kW)		
Static pressure (bar)	1,5	3
Fresh water	200	50
Ethylen glycol 10%	150	38
Ethylen glycol 20%	110	28
Ethylen glycol 30%	90	23
Ethylen glycol 40%	76	19

2.3.5 - Hydraulic circuit

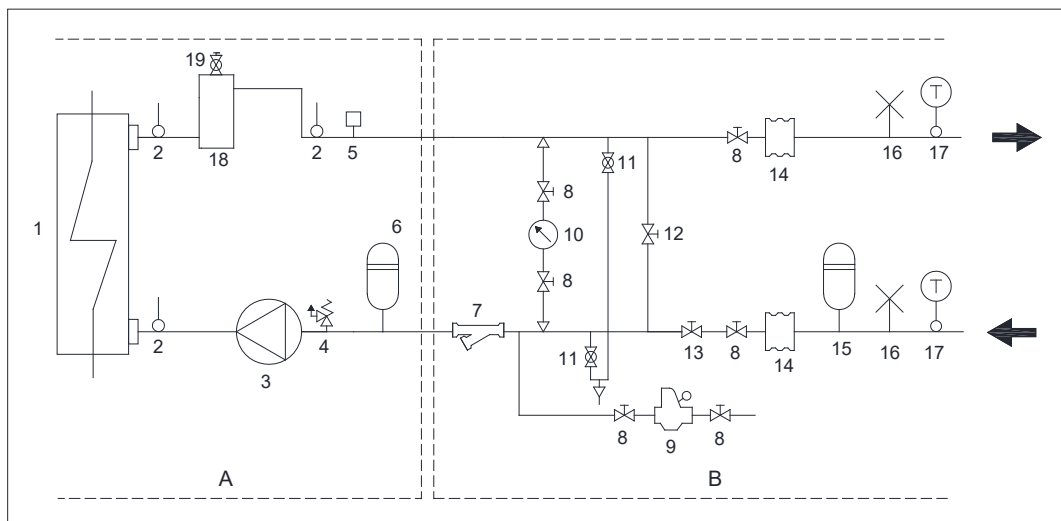


Figure 6: Typical diagram of the hydraulic circuit for 4-10kW units

2 - INSTALLATION OF UNIT

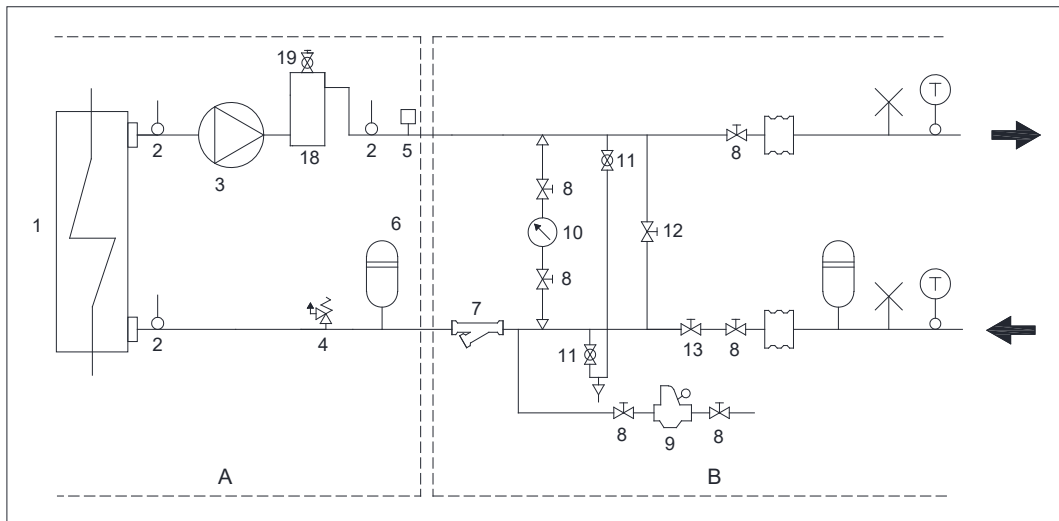


Figure 7: Typical diagram of the hydraulic circuit for 12-16W units

LEGEND:

A: Factory connections; B: Field connections (for installer); 1: Plate heat exchanger; 2: Temperature sensor; 3: Circulation pump; 4: Safety valve; 5: Flow switch; 6: Expansion vessel; 7: Mesh filters (available as an option); 8: Stop valves; 9: Filling valve; 10: Pressure gauge; 11: Discharge tap; 12: By-pass valve for freezing protection; 13: Calibration valve ; 14: Anti-vibration joint; 15: Additional expansion vessel (if necessary) ; 16: Air bleed; 17: Thermometer; 18: Electrical heating; 19: Air evacuation valve

CAUTION: The use of the hydraulic module on open loop is prohibited.

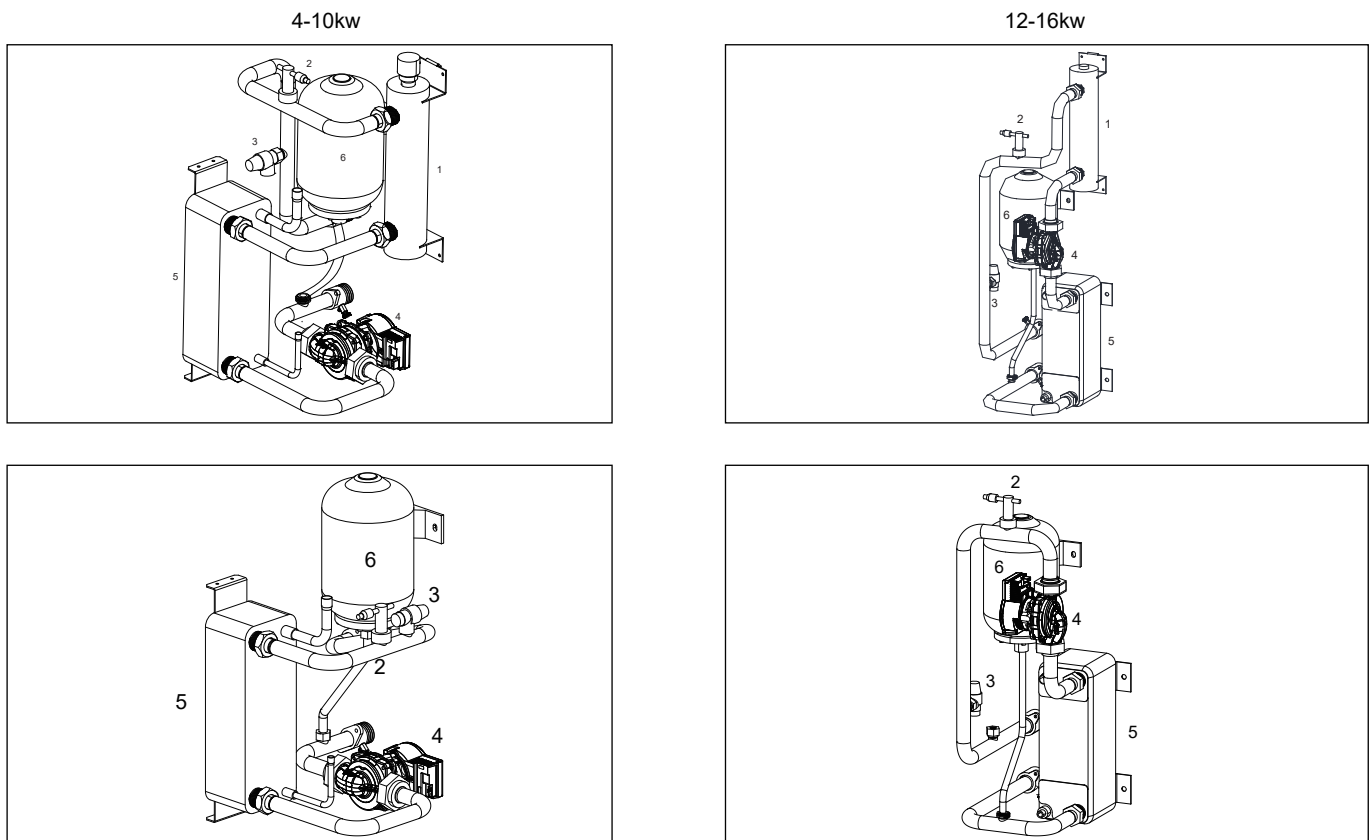


Figure 8: Hydraulic module equipped with variable speed single pump low available pressure with expansion tank

LEGEND:

1: Electrical heater component; 2: Flow switch; 3: Safety valve outlet; 4: Circulation pump; 5: BPHE; 6 :Expansion vessel

Minimum and maximum pressures necessary in the hydraulic circuit for correct operation of the units.

Hydraulic circuit	Minimum pressure at the suction of the pump to avoid the cavitation phenomena.	Maximum pressure at the suction of the pump before the opening of the water relief valve(1)
Variable speed hydraulic module	40 kPa (0.4 bar)	300 kPa(3 bar).

2 - INSTALLATION OF UNIT

2.4 - Electrical connections

Please refer to the certified wiring drawings, supplied with the unit.

2.4.1 - Power supply

The power supply must conform to the specification on heat pump nameplate. The supply voltage must be within the range specified in the electrical data table. For connections refer to the wiring diagrams and the certified dimensional drawings.

CAUTION:

After the unit has been commissioned, the power supply must only be disconnected for quick maintenance operations (one day maximum). For longer maintenance operations or when the unit is taken out of service and stored (e.g. during the winter or if the unit does not need to generate cooling) the power supply must be maintained to ensure supply to the electric heaters (compressor coil heater, unit frost protection).

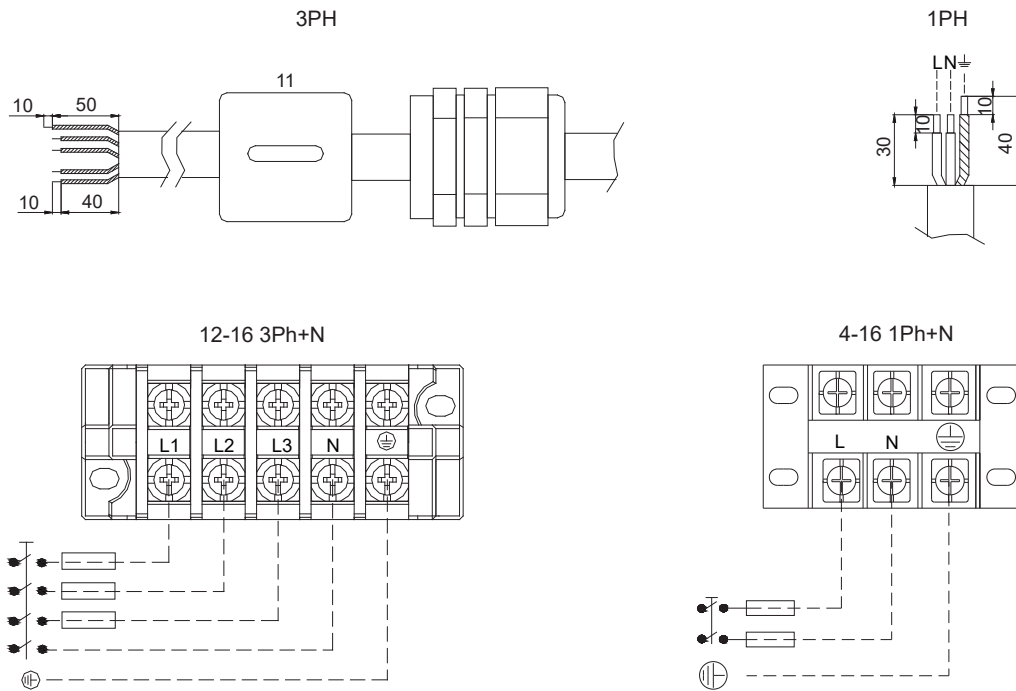


Figure 9: Power connection with Main Switch

2.4.2 - Recommended wire sections

Wire sizing is the responsibility of the installer, and depends on the characteristics and regulations applicable to each installation site. The following is only to be used as a guideline, and does not make Manufacturer in any way liable. After wire sizing has been completed, using the certified dimensional drawing, the installer must ensure easy connection and define any modifications necessary on site.

The connections provided as standard for the field-supplied power entry cables are designed for the number and type of wires, listed in the table below.

The calculations of favourable and unfavourable cases are performed by using the maximum current possible of each unit fitted with a hydraulic kit (see the tables of electrical data for the unit and the hydraulic module).

The calculation is based on PVC or XLPE insulated cables with copper core. A maximum ambient temperature of 46°C has been taken into consideration. The given wire length limits the voltage drop to < 5% (length L in metres - see table below).

IMPORTANT:

Before connection of the main power cables (L1 - L2 - L3 - N - PE or L1 - N - PE) on the terminal block, it is imperative to check the correct order of the 3 phases before proceeding to the connection and the good connection of the neutral wire (if the neutral conductor is not connected correctly, the unit can be damaged permanently).

2 - INSTALLATION OF UNIT

Table 1: Minimum and maximum wire section (per phase) for connection to units(with Electrical heater component)							
	Max. connectable section ⁽¹⁾	Calculation favourable case:			Calculation unfavourable case:		
		- Suspended aerial lines (standardised routing No. 17) - XLPE insulated cable			- Conductors in conduits or multi-conductor cables in closed conduit (standardised routing No. 41) - PVC insulated cable, if possible		
MODEL NAME	Section	Section ⁽²⁾	Max. length for voltage drop <5%	Cable type	Section ⁽²⁾	Max. length for voltage drop <5%	Cable type ⁽³⁾
	mm ² (per phase)	mm ² (per phase)	m	-	mm ² (per phase)	m	-
4/6 (1ph)	3×4 ²	3×4 ²	100	H07RNF	3×4 ²	80	H07RNF
8/10 (1ph)	3×6 ²	3×6 ²	100	H07RNF	3×6 ²	80	H07RNF
12 (1ph)	3×6 ²	3×6 ²	100	H07RNF	3×6 ²	80	H07RNF
14/16 (1ph)	3×8 ²	3×8 ²	100	H07RNF	3×8 ²	80	H07RNF
12(3ph)	5×4 ²	5×4 ²	100	H07RNF	5×4 ²	80	H07RNF
14/16 (3ph)	5×6 ²	5×6 ²	100	H07RNF	5×6 ²	80	H07RNF
Accessory wired controller	Use cables H07RN-F 4x0.75 mm ² up to 50m to connect the wired controller (not supplied with accessory)						

Table 1: Minimum and maximum wire section (per phase) for connection to units(without Electrical heater component)							
	Max. connectable section ⁽¹⁾	Calculation favourable case:			Calculation unfavourable case:		
		- Suspended aerial lines (standardised routing No. 17) - XLPE insulated cable			- Conductors in conduits or multi-conductor cables in closed conduit (standardised routing No. 41) - PVC insulated cable, if possible		
MODEL NAME	Section	Section ⁽²⁾	Max. length for voltage drop <5%	Cable type	Section ⁽²⁾	Max. length for voltage drop <5%	Cable type ⁽³⁾
	mm ² (per phase)	mm ² (per phase)	m	-	mm ² (per phase)	m	-
4 (1ph)	3×2.5 ²	3×2.5 ²	100	H07RNF	3×2.5 ²	80	H07RNF
6/8/10 (1ph)	3×4 ²	3×4 ²	100	H07RNF	3×4 ²	80	H07RNF
12 (1ph)	3×6 ²	3×6 ²	100	H07RNF	3×6 ²	80	H07RNF
14/16 (1ph)	3×6 ²	3×6 ²	100	H07RNF	3×6 ²	80	H07RNF
12(3ph)	5×2.5 ²	5×2.5 ²	100	H07RNF	5×2.5 ²	80	H07RNF
14/16 (3ph)	5×2.5 ²	5×2.5 ²	100	H07RNF	5×2.5 ²	80	H07RNF
Accessory wired controller	Use cables H07RN-F 4x0.75 mm ² up to 50m to connect the wired controller (not supplied with accessory)						

NOTES:

(1) Connection capacities actually available for each machine, defined according to the connection terminal size, the control box access opening size and the available space inside the control box.

(2) Selection simulation result considering the hypothesis indicated.

(3) If the maximum calculated section is for an XLPE cable type, this means that a selection based on a PVC cable type can exceed the connection capacity actually available. Special attention must be given to the selection.

Power cable entry

The power cables must be entered through the cable gland from the rear of the unit.

2 - INSTALLATION OF UNIT

Caution

- Please clamp it directly after the customer's terminal block.
- Please clamp the second one close to the cable gland.
- The power cable should not be in contact with hot parts of the system.

2.4.3 - Recommended customer electrical protection

Electrical protection is the responsibility of the installer, and depends on the characteristics and regulations applicable to each installation site. The following is only to be used as a guideline, and does not make manufacturer in any way liable.

Model (without Electrical heater component)			4kw	6-10kw	12-16kw-1ph	12-16kw-3ph
Circuit breaker	Type		C	C	C	C
	Current	A	20	32	40	20
Fuses	Type		gG	gG	gG	gG
	Current	A	25	32	50	25

Model(with Electrical heater component)			4kw	6-10kw	12-16kw-1ph	12-16kw-3ph
Circuit breaker	Type		C	C	C	C
	Current	A	32	40	50	40
Fuses	Type		gG	gG	gG	gG
	Current	A	32	50	63	50

Electrical data and operating conditions notes:

- Field connections:

All connections to the system and the electrical installations must be in full accordance with all applicable local codes.

- The units are designed and built in compliance with EN 60335-1 and 2 ⁽¹⁾.

NOTES:

- The operating environment for the units is specified below:

1.Physical environment⁽²⁾. The classification of environment is specified in standard EN 60364:

- outdoor installation: protection level IP44 ⁽²⁾
- operating temperature range: -25°C to +50°C
- storage temperature range: -20°C to +48°C
- altitude: ≤ 2000 m (see note for table 1.5.4 - Electrical data, hydraulic module)
- presence of hard solids, class AE3 (no significant dust present)
- presence of corrosive and polluting substances, class AF1 (negligible)

2 - INSTALLATION OF UNIT

2. Power supply frequency variation: $\pm 2\%$.
3. The neutral (N) conductor must be always connected to the unit
4. Overcurrent protection of the power supply conductors is not provided with the unit.
5. The units are designed for simplified connection on TT networks (IEC 60364).

CAUTION:

If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local representative.

- (1) The absence of main power disconnect switch is an exception that must be taken into account at field installation level.
- (2) The required protection level for this class is IP43BW (according to reference document IEC 60529). All units fulfil this protection condition:
 - When accessing to interface, the level is IPxxB

2.5 - Water flow rate control

2.5.1 - Water leakage

Check that the water-side connections are clean and show no sign of leakage.

2.5.2 - Minimum water flow rate

If the installation flow rate is below the minimum flow rate, there is a risk of excessive fouling.

2.5.3 - Maximum water flow rate

This is limited by the permitted water heat exchanger pressure drop.

2.5.4 - Water heat exchanger flow rate

Data applicable for:

- Fresh water 20°C
- In case of use of the glycol, the maximum water flow is reduced.

Units with hydraulic module			
Model	Minimum water	Nominal water flow	Maximum water
	flow rate(m ³ /h)	rate (1)(m ³ /h)	flow rate(m ³ /h)
4kw	0.4	0.69	4.9
6kw	0.4	1.03	4.9
8kw	0.4	1.38	4.9
10kw	0.4	1.72	4.9
12kw	0.75	2.06	7.2
14kw	0.75	2.41	7.2
16kw	0.75	2.76	7.2

2.5.5 - Nominal system water low control

The water circulation pumps of the units have been sized to allow the hydraulic modules to cover all possible configurations based on the specific installation conditions, i.e. for various temperature differences between the entering and the leaving water (ΔT) at full load, which can vary between 3 and 10 K.

This required difference between the entering and leaving water temperature determines the nominal system flow rate. Use this specification for the unit selection to find the system operating conditions.

In particular, collect the data to be used for the control of the system flow rate:

- Units with variable speed pump-control on adjustable constant speed: nominal flow rate.
- Units with variable speed pump - control on temperature difference: heat exchanger ΔT (variable flow).

If the information is not available at the system start-up, contact the technical service department responsible for the installation to get it. These characteristics can be obtained from the technical literature using the unit performance tables for a ΔT of 5 K at the water heat exchanger.

2 - INSTALLATION OF UNIT

Table 2: Steps to clean, purge, and define a flow rate for hydraulic circuit

	N°	Without Hydraulic module	With Variable Speed Hydraulic module Adjustable constant speed	With Variable Speed Hydraulic module ΔT	
Cleaning procedure	1	Open the manual control valve fully.	No manual control valve required with Variable Speed Hydraulic module		
	2	Start the external pump which is professional pump for clean water pipe system ⁽¹⁾ .			
	3	Read the BPHE pressure drop by taking the difference of the readings of the pressure gauge connected to the unit inlet and outlet.			
	4	Let the pump run for two consecutive hours to flush the hydraulic circuit of the system (presence of solid contaminants).			
	5	Take another reading.			
	6	Compare this value to the initial value.			
	7	If the pressure drop has decreased, this indicates that the screen filter must be removed and cleaned, as the hydraulic circuit contains solid particles.			
	8	In this case stop the pump ⁽¹⁾ and close the shut-off valves at the water inlet and outlet and remove the screen filter after emptying the hydraulic section of the unit.			
	9	Repeat, if necessary, to ensure that the filter is not contaminated.			
Purge procedure	1	After filling with water, wait about 24h before activating the purge procedure.			
	2	Activate the purge mode ⁽¹⁾ : water pump is requested to run continuously at maximum speed to purge the hydraulic circuit regardless the flow switch value ⁽²⁾ .			
	3	1. The air purge which is field-supplied: If the purge is automatic, air will vent from circuit automatically. If the purge is manual, open the valve to vent air from the circuit 2. The air purge which is standard with unit: It is manual, open the valve to vent air from the circuit			
Water flow control procedure	1	When the circuit is cleaned and purged, activate the pump in air purge mode ⁽¹⁾ , and read the pressures at the pressure gauges (entering water pressure - leaving water pressure), ...			
	2	... to find out the unit pressure drop (plate heat exchanger + internal water piping).		No need to adjust the flow rate because of ΔT control.	
	3	Compare the value obtained with the pressure drop (Graphic 2).	Compare this value to the graph of available external static pressure using the appropriate speed curve (Graphic 1).		
	4	If the pressure read is higher than the value specified the unit flow rate (and thus system flow rate) is too high. The pump supplies an excessive flow rate based on the global pressure drop of the application. In this case close the control valve and read the new pressure difference	If the flow rate corresponding is higher, decrease pump speed ⁽¹⁾ , and vice versa		
	5	Proceed by successively closing the control valve until you obtain the specific pressure that corresponds to the nominal flow rate at the required unit operating point.	Proceed by successively adjusting the pump speed until the expected water flow rate is achieved.		

(1) For configuration details, refer to user parameter configuration of wired controller manual.

(2) CAUTION: In purge mode, the value of the flow switch is ignored, so check that there is water in the circuit, to avoid damage to the pump.

NOTE:

If the system has an excessive pressure drop in relation to the available static pressure provided by the system pump the nominal water flow rate cannot be obtained (the resulting flow rate is lower) and the temperature difference between the water heat exchanger entering and leaving water will increase.

To reduce the pressure drops of the hydraulic system:

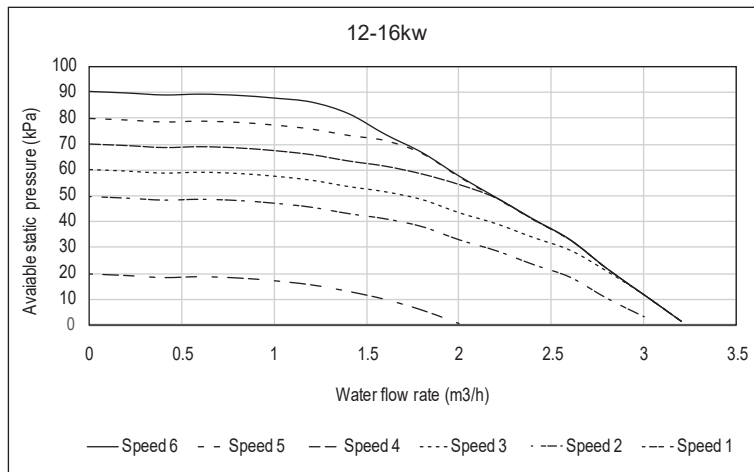
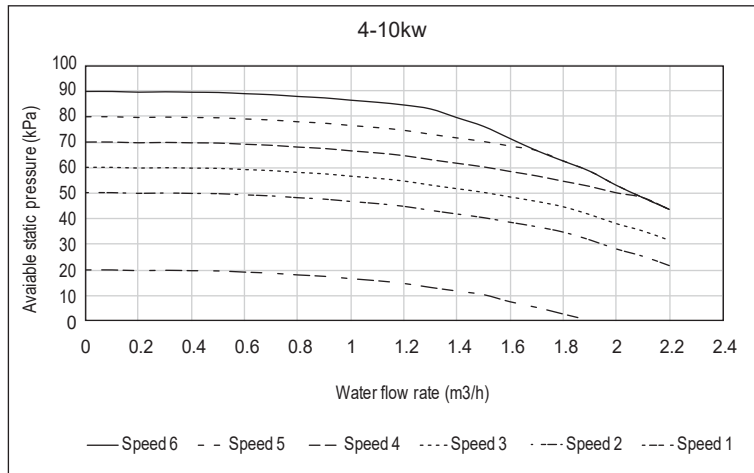
- reduce the individual pressure drops as much as possible (bends, level changes, options, etc.).
- use a correctly sized piping diameter.
- avoid hydraulic system extensions, wherever possible.

2 - INSTALLATION OF UNIT

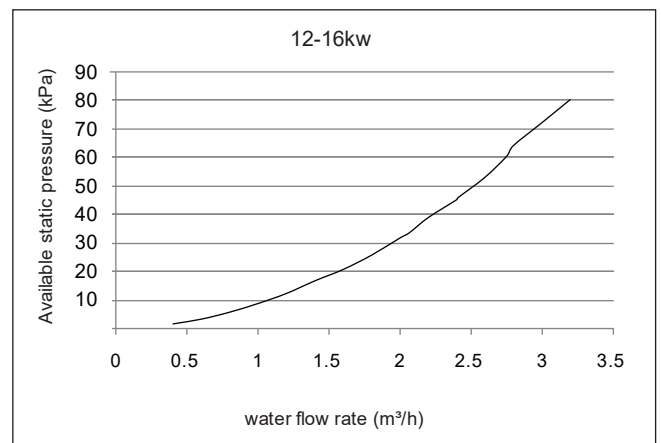
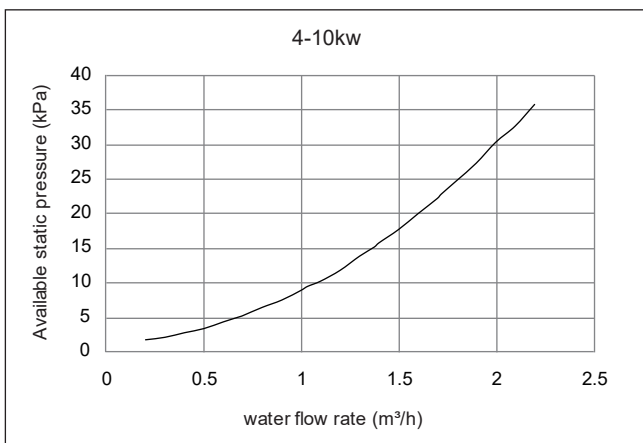
2.5.6 - Available external static pressure

Data applicable for:

- Fresh water 20°C
- If glycol is used, the maximum water flow is reduced.



Graphic 1: Available static pressure for 4 to 16kW units with hydraulic module



Graphic 2: Pressure drop for 4 to 16kW units with additional main water loop pump

2 - INSTALLATION OF UNIT

2.6 - Commissioning modes

IMPORTANT:

Field connection of interface circuits may lead to safety risks: any control box modification must maintain equipment conformity with local regulations. Precautions must be taken to prevent accidental electrical contact between circuits supplied by different sources:

- The routing selection and/or conductor insulation characteristics must ensure dual electric insulation.
- In case of accidental disconnection, conductor fixing between different conductors and/or in the control box prevents any contact between the conductor ends and an active energised part.

Refer to the wiring diagram supplied with the unit for the field control wiring of the following features:

- Safety switch (normally close contact, mandatory)

Three possible control configurations:

1. Connections to the customer remote control (for more details, refer to Figure 10 and §4.2.4 Switches)

- On/Off remote switch
- Heat/Cool select remote switch
- Home/Sleep select remote switch
- Alarm/Alert or Operation report...

2. Connections to the user interface

When the remote-mounted user interface accessory is chosen, the user interface has to be connected at the terminal block (refer to §3.7 Unit with remote user interface).

3. Connections to the customer communication bus

- The connection to the Modbus Protocol is carried out using a connector provided for this purpose inside the control box. One connector is provided to allow service connection.

2.7 - Check before start the unit

Never be tempted to start the heat pump without reading fully, and understanding, the operating instructions and without having carried out the following pre-start checks:

- Ensure that all electrical connections are properly tightened.
- Ensure that the unit is level and well-supported.
- Check that the hydraulic circuit has sufficient water flow and that the pipe connections correspond to the installation diagram.
- Ensure that there are no water leaks. Check the correct operation of the valves installed.
- All panels should be fitted and firmly secured with the corresponding screws.
- Make sure that there is sufficient space for servicing and maintenance purposes.
- Ensure that there are no refrigerant leaks.
- Confirm that the electrical power source agrees with the unit nameplate rating, wiring diagram and other documentation for the unit.
- Ensure that the power supply corresponds to the applicable standards.
- Make sure that compressors float freely on the mounting springs.

CAUTION:

- Commissioning and start-up of the heat pump must be supervised by a qualified refrigeration qualified technician.
- Start-up and operating tests must be carried out with a thermal load applied and water circulating in the water heat exchanger.
- All set point adjustments and control tests must be carried out before the unit is started up.

Ensure that all safety devices are operational, and that any alarms are acknowledged.

NOTE:

If the Manufacturer instructions (power and water connections and installation) are not observed, the Manufacturer warranty becomes invalid.

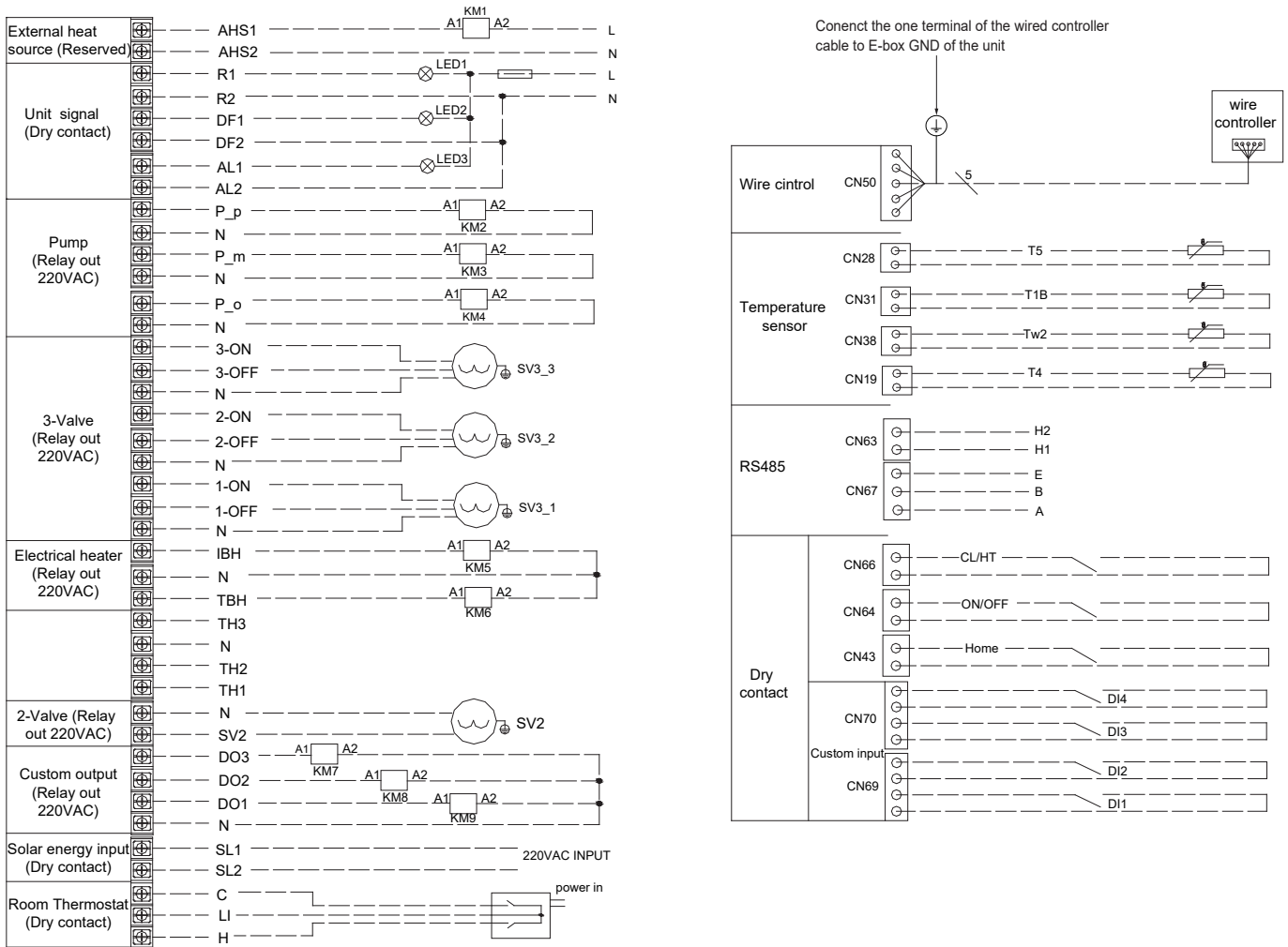
3 - INSTALLATION OF SYSTEM

In this section, the general customer electrical connection is detailed as well as the main steps of configuration and examples of standard installation:

- Installation with electrical booster heaters
- Installation with DHW production and boiler

To obtain the list of all parameters, refer to §7.Parameter overview.

3.1 - General customer electrical connection on terminal block



Code	Description	Code	Description
AHS1-2	External heat source interface terminal	Remote	Remote switch interface terminal
R1-2	Unit operation signal interface terminal	Pro_hyd/WFS	Water flow switch interface terminal
DF1-2	Unit defrost signal interface terminal	Home	Home / away mode interface terminal
AL1-2	Unit alarm signal interface terminal	ON/OFF	ON /OFF interface terminal
P_p/P_2	Zone2 on/off pump	CL/HT	Cooling / heating mode interface terminal
P_m	Main loop booster on/off pump	C_on/H_off	
P_o/P_1	Zone1 on/off pump	KM1-9	220V AC contactor
IBH, TBH	Electric heater interface terminal of domestic hot water	LED1-3	220V AC indicator
HT1-HT3	Electric heater interface terminal of main water loop	XT1-2	Terminal block
SV2	Heating water loop cut off valve in cooling mode	SV3_1	Additional heat source boiler 3-way valve
DO1-DO3	Custom output interface terminal	1_ON/1_OFF/N	
SL1-2	Solar energy input signal interface terminal	SV3_2	Zone2 mixing valve
DI1-DI4	Custom defined input interface terminal	ML1/ML2/N	
		SV3_3	DHW 3-way valve
		2_ON/2_OFF/N	
		D_on/D_off/N	
		3_ON/3_OFF/N	

3 - INSTALLATION OF SYSTEM

3.2 - First step of configuration: Setting the time and day

Before using any parameter menu of the wired controller, it is necessary to set the time and day of the control.

The following sections explain the procedures for unit with user interface. If there is no user interface on the unit, it is necessary to use Customer communication bus to configure the unit.



1. Press the "setting" button, go into the day and time setting;
 2. Through the "up" or "down" button to change the day of week, such as Monday;
 3. After the day of week has been selected, press the "confirm" button to confirm and go to hour setting;
 4. Through the "up" or "down" button to set the hour;
 5. After selected the hour, press the "confirm" button to confirm and go to minute setting;
 6. Through the "up" or "down" button to set the minute;
 7. After selected the minute, press the "confirm" button to confirm the minute setting.
- Setting button: press to set the parameter, refer to wired controller manual for detail
 "up" and "down" button: use to change the setting item and its value
 "confirm" button: use to confirm the setting

Parameter setting 1: press the setting button to get the below setting items:

Display on left digital tube	Items	Note
0	Day and time	
1	DHW schedule	
2	Power memory	
3	WIFI option--reserved	
4	Purge mode	
5	Home/away setting	
6	Night mode schedule	
7	Anti-legionella temperature	
8	Anti-legionella schedule	
9	Controller lock	

Parameter setting 2: press and hold the setting button for 10s to get the below setting items:

Display on left digital tube	Items	Note	Display on left digital tube	Items	Note
0	Controller type select	water/air setpoint control	13	Cool offset for ECO mode	
1	Controller interface	Wired control Contact	14	Cool offset for AWAY mode	
2	Auxiliary heat source setting		15	Heat offset for ECO mode	
3	Climate curve setting		16	Heat offset for AWAY mode	
4	Capacity test	Reserved	17	DHW temp. setting for ECO mode	
5	3-way valve type selection	Always on Always off	18	Minimmun OAT for heating	
6	DI1 setting		19	Booster OAT for heating	
7	DI2 setting		20	Warmup time	
8	DI3 setting		21	Booster delta temp.	
9	DI4 setting		22	Bi-zone select	
10	DO1 setting		23	Water pump ΔT control setting	
11	DO2 setting		24	Water pump control type setting	
12	DO3 setting		25	Water pump speed setting	

3.3 - Installation with electrical booster heaters

This installation could be composed of:

	Unit
	With or without integrated hydraulic kit (variable speed)
	With Remote User Interface
	Cooling Mode
	Heating Mode
	Up to three electrical booster heaters
	Additional Outdoor Air Temperature Sensor

Available accessories (if ordered)

IMPORTANT:

For more information, refer to §4.2.9 Electric Heaters.

3 - INSTALLATION OF SYSTEM

3.4.1 - Standard installation

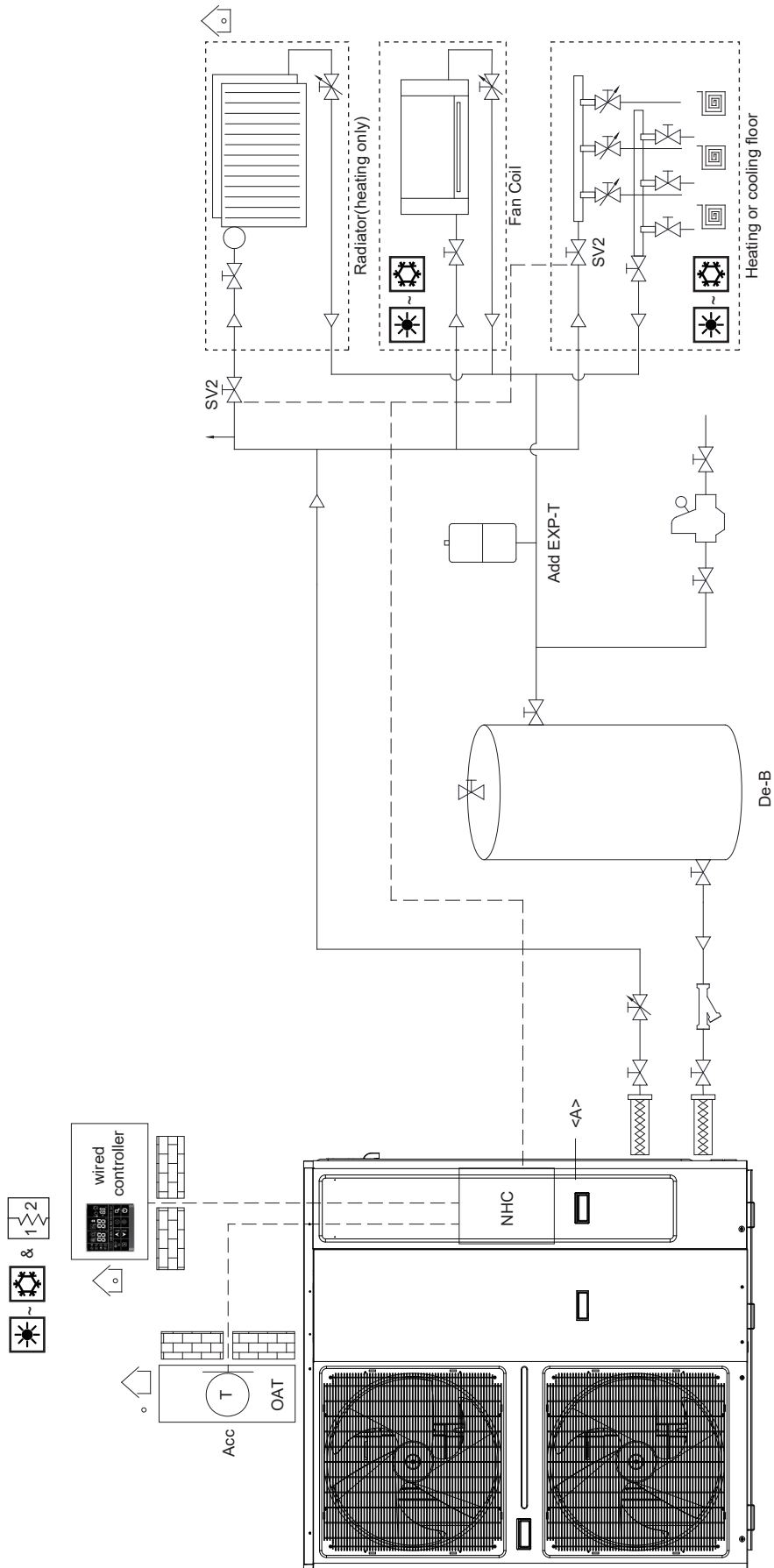
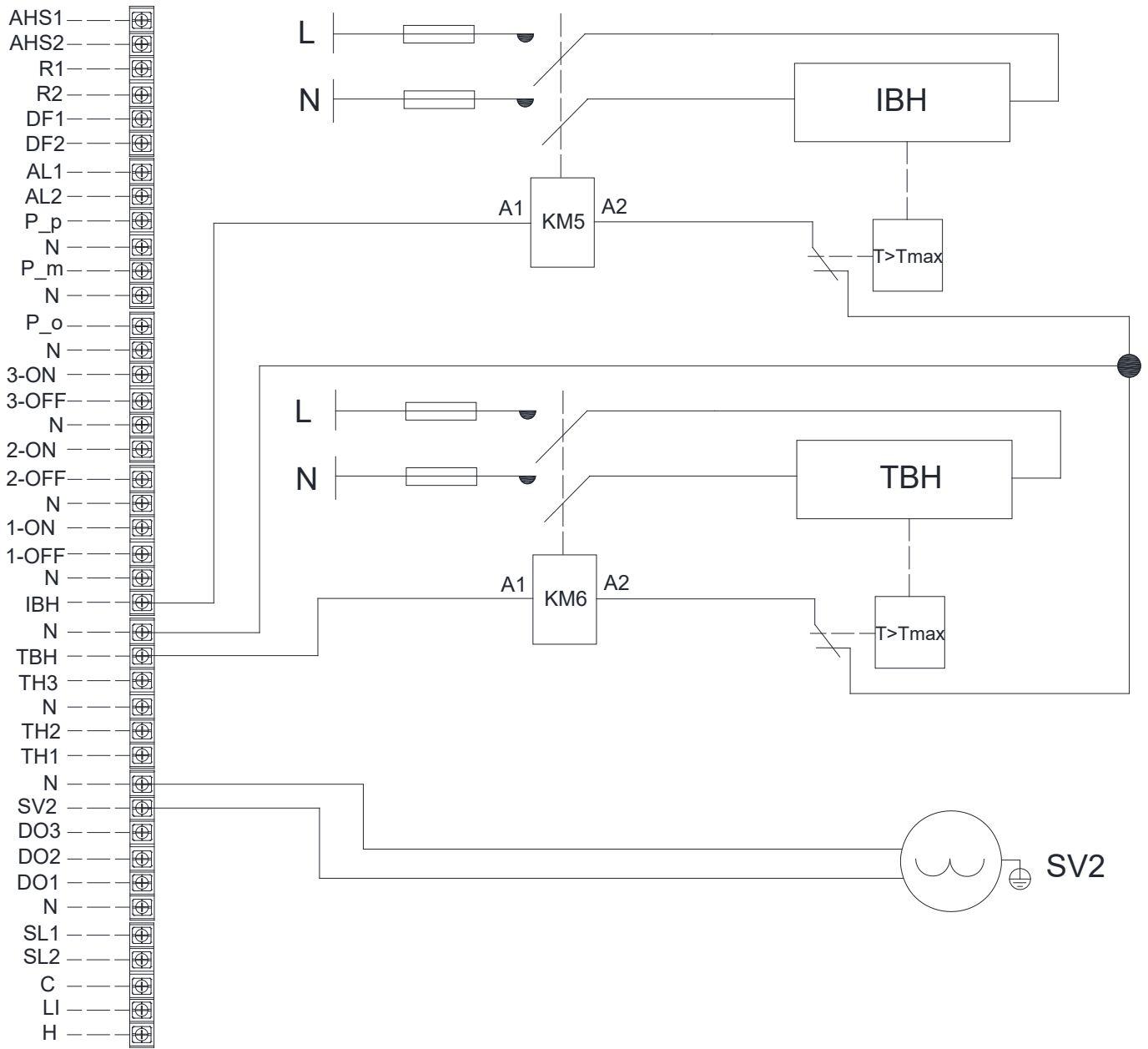


Figure 10: Standard installation with electrical booster heaters

3 - INSTALLATION OF SYSTEM

3.4.2 - Electrical connection










3.4.3 - Control configuration steps

Steps	Table	Par.	Designation	Description	Range	Default	Ex.	Unit
Set Booster stages	BCK_CONF	602	Backup Type	0-inner EH+DHW EH+gas boiler 1-inner EH+DHW EH 2-DHW EH+gas boiler 3-inncr EH+gas boiler 4-DHW EH 5-gas boiler 6-inner EH 7-no auxiliary heater	0 to 7	0	3	-
		602	Booster Warm up Timer	Once the unit has started, if after this timer has expired the capacity demand isat maximum and the setpoint isn't reached, then the booster is activated	0 to 120	0	0	min
		604	Booster OAT Threshold	Booster heating is allowed to run if OAT goes below this threshold (with 1 K hysteresis).	-20 to 15	-	-	-

3 - INSTALLATION OF SYSTEM

3.5 - Installation with DHW production and boiler

This installation could be composed of:

	Unit
	With or without integrated hydraulic kit (variable speed)
	With Remote User Interface
 	Cooling Mode Heating Mode
	DHW production
	Boiler
Available accessories (if ordered)	Additional Outdoor Air Temperature Sensor DHW sensor

IMPORTANT:

For more information, refer to § 4.2.7 Domestic hot water mode and § 4.2.10 Boiler.

3 - INSTALLATION OF SYSTEM

3.5.1 - Standard installation

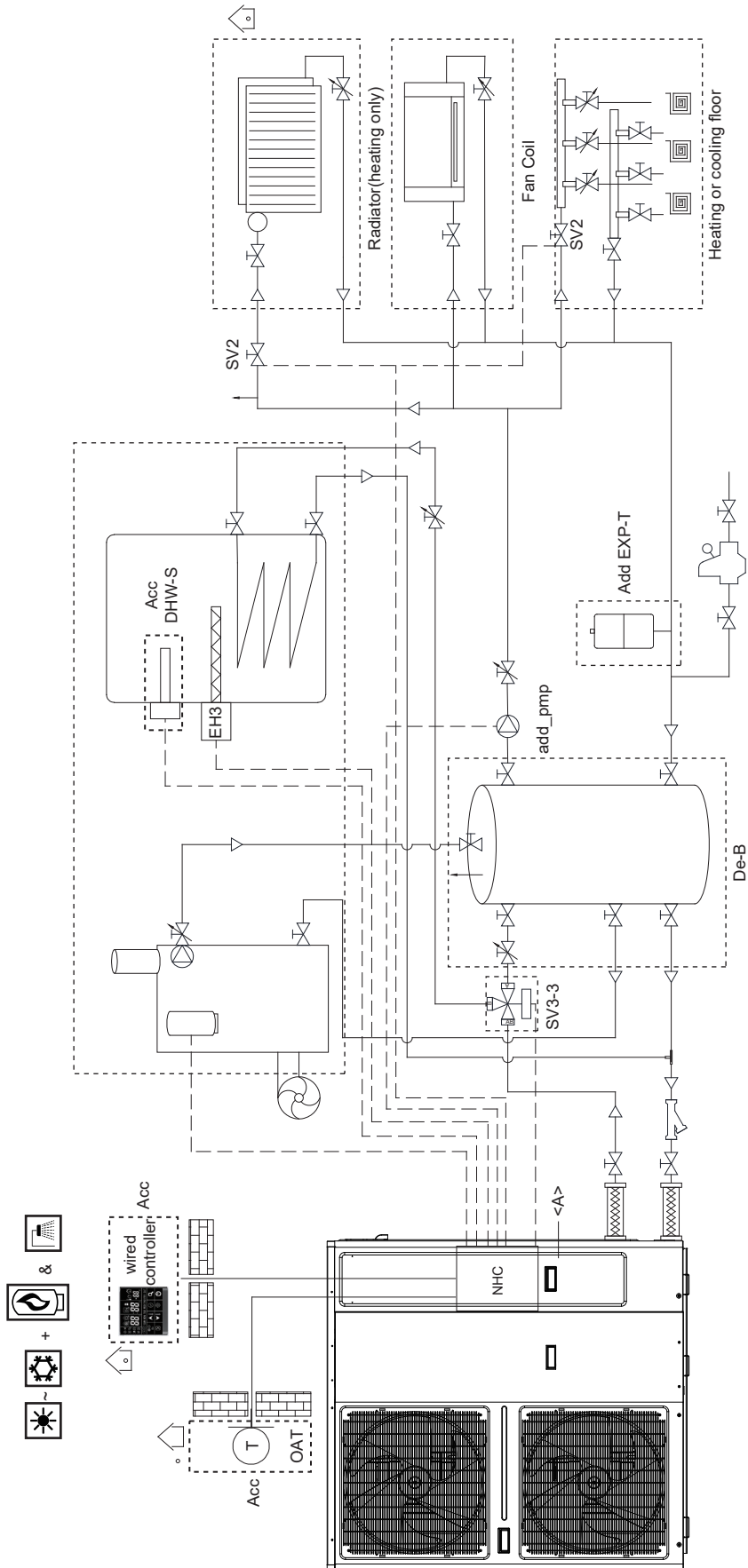


Figure 11: Standard installation with DHW production and boiler

3 - INSTALLATION OF SYSTEM

3.5.2 - Electrical connection

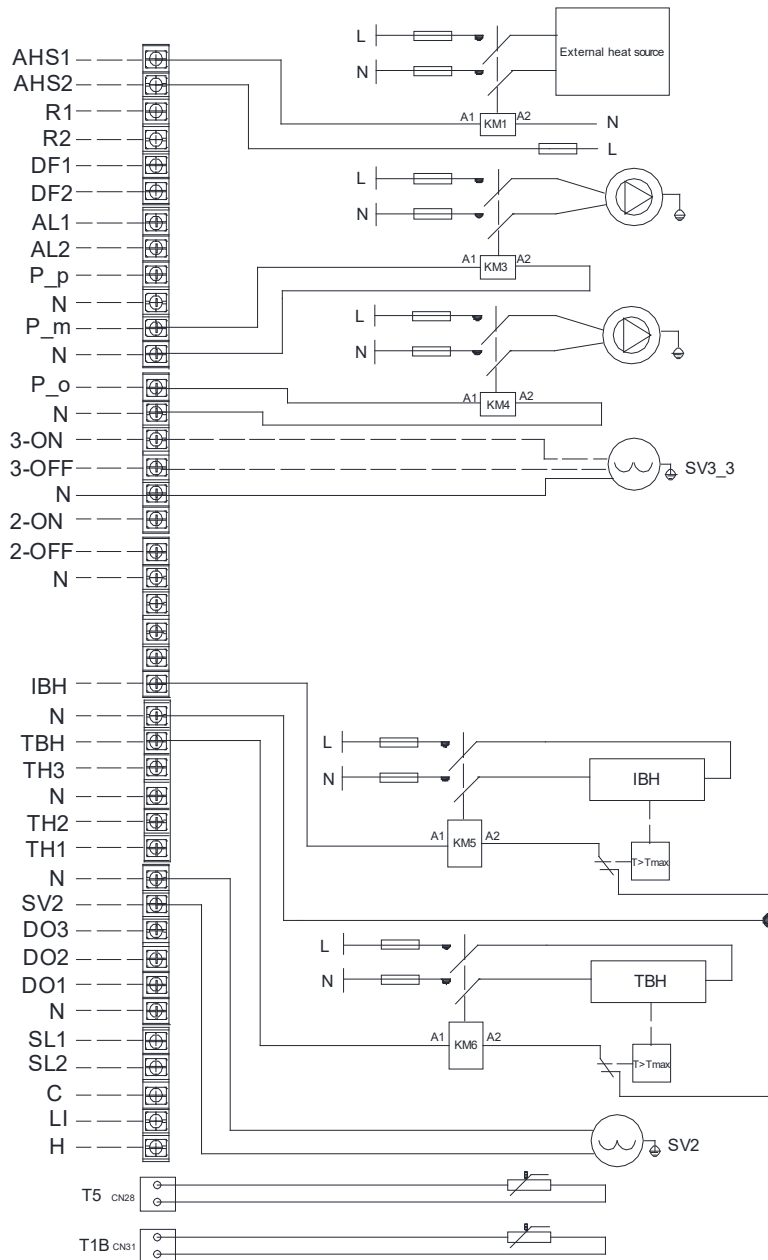


Figure 12: Electrical connection on terminal block for DHW production and boiler

3.5.3 - Control configuration steps

Steps	Table	Par.	Designation	Description	Range	Default	Ex.	Unit
Set Booster stages	BCK_CONF	602	Backup Type	0-inner EH+DHW EH+gas boiler 1-inner EH+DHW EH 2-DHW EH+gas boiler 3-inncr EH+gas boiler 4-DHW EH 5-gas boiler 6-inner EH 7-no auxiliary heater	0 to 7	0	3	-
		602	Booster Warm up Timer	Once the unit has started, if after this timer has expired the capacity demand isat maximum a nd the setpoint isn't reached, then the booster is activated	0 to 120	0	0	min
		604	Booster OAT Threshold	Booster heating is allowed to run if OAT goes below this threshold (with 1 K hysteresis).	-20 to 15	-	-	-

3 - INSTALLATION OF SYSTEM

3.6 - Unit with wired controller

3.6.1 - Electrical connection

The user interface is an accessory and must be installed indoors by the installer.

IMPORTANT: For more information on:

- how to use this user interface, please refer to wired controller manual,
- the setpoint control, refer to §4.2.5 Setpoint,
- Wired controller installation document, refer to document provided with accessory.

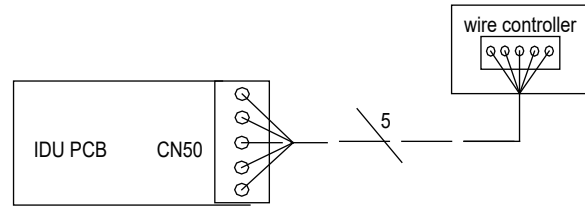


Figure 13: Electrical connection of remote interface

N°	Steps	Table	Par.	Designation	Description	Range	Default	Ex.	Unit
1	Check that the unit is configured in Remote Interface	UI_CONF	521	User Interface Type	0 = No User Interface 1 = Remote control by contacts or SUI 2 = Wired controller remotely installed in the house 3 = Wired controller locally installed on the unit for split	0 to 3	0	2	-
					Check on wired controller screen that the unit is configured in Air setpoint				
2	Control on air setpoint	AIR_STP	421	Heat Home Setpoint	Air setpoint for heating mode when Occupancy mode = Home	16.0 to 32.0	19	20	°C
			422	Heat Sleep Offset	Air offset for heating mode when Occupancy mode = Sleep	-20.0 to 0.0	-2.0	-1	°C
			423	Heat Away Offset	Air offset for heating mode when Occupancy mode = Away	-20.0 to 0.0	-4.0	-3	°C
			424	Cool Home Setpoint	Air setpoint for cooling mode when Occupancy mode = Home	16.0 to 32.0	26	24	°C
			425	Cool Sleep Offset	VAir offset for cooling mode when Occupancy mode = Sleep	0.0 to 10.0	5	2	°C
				Cool Away Offset	Air offset for cooling mode when Occupancy mode = Away	0.0 to 10.0	4	4	°C
3a	First possibility: control on predefined climatic curve	CLIMCURV	581	Heat Clim Curv Select	0 = No Curve / Fixed Water Setpoint 1 to 12 = Heating Climatic Curve #number 13 = Custom Climatic Curve	0 to 13	0	2	-
			412	Heat Curv Max Stp Offset	Heat Maximum Water Setpoint can be offsetted by this parameter, to adjsut at best the setpoint at customer needs	-5.0 to 5.0	0	5	°C
			586	Cool Clim Curv Select	0 = No Curve / Fixed Water Setpoint 1 to 2 = Cooling Climatic Curve #1number 3 = Custom Climatic Curve	0 to 3	0	1	-
			413	Cool Curve Min Stp Offset	Cool Minimum Water Setpoint can be offsetted by this parameter, to adjsut at best the setpoint at customer needs	-5.0 to 5.0	0	5	°C
3b	Second possibility: control on fixed LWT setpoint	WAT_STP	581	Heat Clim Curv Select	Heating climatic curve select	0 to 13	0	-1	-
			401	Heat Home Setpoint	Water setpoint for heating mode when Occupancy mode = Home	25.0 to 60.0	45	50	°C
			402	Heat Sleep Offset	Water offset for heating mode when Occupancy mode = Sleep	-20.0 to 0.0	-10	-5	°C
			403	Heat Away Offset	Water offset for heating mode when Occupancy mode = Away	-20.0 to 0.0	-10	-10	°C
			586	Cool Clim Curv Select	Cooling climatic curve select	0 to 3	0	0	-
			407	Cool Home Setpoint	Water setpoint for cooling mode when Occupancy mode = Home	5 to 25.0	12	18	°C
			408	Cool Sleep Offset	Water offset for cooling mode when Occupancy mode = Sleep	0.0 to 10.0	5	2	°C
			409	Cool Away Offset	Water offset for cooling mode when Occupancy mode = Away	0.0 to 10.0	5	5	°C
3c	Third possibility: control on customer climatic curve	CLIMCURV	581	Heat Clim Curv Select	Heating climatic curve select	0 to 13	0	0	-
			582	Heat Minimum OAT	In heating mode, Customer minimum OAT	-30.0 to 10.0	-7.0	-20	°C
			583	Heat Maximum OAT	In heating mode, Customer maximum OAT	10.0 to 30.0	20	20	°C
			584	CMin Water Setpoint	In heating mode, Customer minimum Water Temperature	20.0 to 40.0	20	20	°C
			585	Heat Max Water Setpoint	In heating mode, Customer maximum Water Temperature	30.0 to 60.0	38	38	°C
			412	Heat Curv Max Stp Offset	Heat Maximum Water Setpoint can be offsetted by this parameter, to adjsut at best the setpoint at customer needs	-5.0 to 5.0	0	5	°C
			586	Cool Clim Curv Select	Cooling climatic curve select	0 to 3	0	0	-
			587	Cool Minimum OAT	In cooling mode, Customer minimum OAT	0.0 to 30.0	20	22	°C
			588	Cool Maximum OAT	In cooling mode, Customer maximum OAT	24.0 to 46.0	35	35	°C
			589	Cool Min Water Setpoint	In cooling mode, Customer minimum Water Temperature	5.0 to 20.0	10	7	°C
			590	Cool Max Water Setpoint	In cooling mode, Customer maximum Water Temperature	5.0 to 20.0	18	15	°C
			413	Cool Curve Min Stp Offset	Cool Minimum Water Setpoint can be offsetted by this parameter, to adjsut at best the setpoint at customer needs	-5.0 to 5.0	0	5	°C

3 - INSTALLATION OF SYSTEM

3.7 - IAT sensor

The IAT sensor is built-in the wired controller, which is used to measure the room temperature. Its value is compared to air setpoint to determine the demand in heating or cooling.

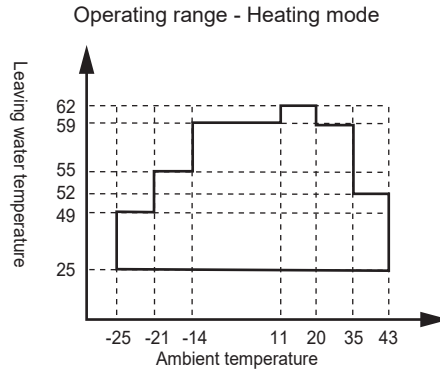
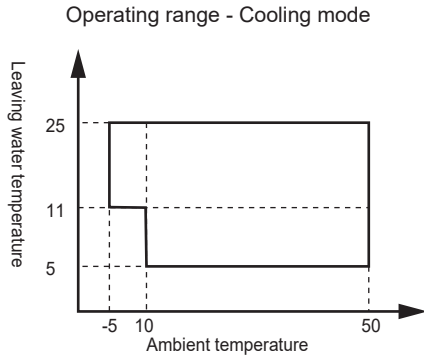
3.7.1 - Control configuration steps

Control configuration steps

Steps	Table	Par.	Designation	Description	Range	Default	Ex.	Unit
Check that the unit is configured in Air setpoint	UI_CONF		User Interface Type	0 = No User Interface 1 = Remote control by contacts or SUI 2 = Wired controller remotely installed in the house 3 = Wired controller locally installed on the unit for split type			2	-
				Check on wired controller screen that the unit is configured in Air setpoint				

4 - OPERATION

4.1 - Unit range



Note:
During heating/DHW mode, while the OAT is above 35°C, it can not keep the LWT below 35°C more than 8h.

4.2 - Operating modes

4.2.1 - Occupancy mode

Depending on unit configuration, the system can be controlled in two ways. The first possible method embraces the use of setpoints, where the outdoor air temperature has no effect on the temperature set by the control. The second control method is based on a climatic curve. In this case, the water temperature is adjusted in response to changes in the external temperature.

The unit may operate in HOME, SLEEP, or AWAY mode. The occupancy can be set manually by the user or automatically according to the schedule (refer to wired controller manual).

Occupancy	wired controller Display	Comfort Type
Home	No icon	Comfort
Sleep	Light on	Comfort
Away	Flashing	Eco

CAUTION:

In case of power cycle, the previous operating mode (cooling / heating / DHW) or occupancy mode (home / sleep / away) will be automatically restored.

4.2.2 - Operating modes

The user can normally choose one of three available operating modes, i.e. cooling, heating or domestic hot water production only.

The unit may run in the following modes:

- Off: Unit is requested to stop.
- Cool: Unit is requested to run in Cooling mode.
- Heat: Unit is requested to run in Heating mode.

When Cooling mode is selected, the chiller or heat pump will operate in the Cooling mode in order to cool the water loop to the selected temperature.

When the heat pump is in Heating mode, the heat pump heats the water loop to the selected temperature. When the outdoor air temperature is very low, electric heaters or boiler heating can be used in order to satisfy the heating demand.

It is also possible for the unit to operate in DHW mode when heating mode or cooling mode is selected, according to schedule / temperature condition / maximum runtime.

When the system is in the Off mode, the compressor and the pump are stopped (except for home anti-freeze protection and water freeze protection, refer to 4.2.6 Water freeze protection).

4.2.3 - Operating mode control

The operating mode selection may differ depending on access level and the use of communication methods, i.e. wired controller display, or JBus communication.

In the following sections of this document, the configuration steps are the same for all of these communication methods.

a - Wired controller control

If the unit is fitted with a user interface, the mode selection can be done by direct access on wired controller.

When the unit is Off, press the ON/OFF key to wake up the user interface and then press the Mode key to select the required operating mode.



System Mode	Wired controller display	Icon
Off	-	[no icon]
Cool		[steady icon]
Heat		[steady icon]
DHW		[steady icon]

For more information on user interface, please refer to the wired controller manual.

b - JBus communication

The unit can be started or stopped and its System Mode can be selected from the JBus network. Refer to JBus registers in § 7. Parameter overview.

4 - OPERATION

4.2.4 - Switches

Some modes described below could be activated or deactivated by switches. Moreover other remote contacts can be connected to the unit in order to add new features. If the unit is managed by remote contacts, it is necessary to change the value of parameter User Interface type in UI_CONF table, with [P521] = 1.

Table 4: Possible switches to install on system	
Switch	Definition
On/Off Switch (remote)	Used to start and stop the unit (if no user interface).
Mode Heat/Cool (remote)	Used to select (if no user interface): - Cooling Mode = contact opened - Heating Mode = contact closed
Normal/Eco (remote)	Used to select (if no user interface): - Home Mode = contact opened - Away Mode = contact closed
Safety Input Contact	This contact should be a 'normally closed' type.
Power Limitation Contact (Night Mode)	Used to reduce the compressor maximum frequency to avoid noise
Loadshed Request Switch	This contact is requested by electricity company (i.e. in Germany) to control the green electricity (wind, solar) production and consumption more efficiently. When switch is closed then unit shall be stopped as soon as possible
DHW Request Switch from tank	When this input is closed, the Domestic Hot Water production is requested. A thermal switch mounted on the Domestic Hot Water tank shall be connected to this input
DHW Priority Contact (thermal switch)	When the status of this input goes from open to closed, the unit is switched to Domestic Hot Water production for the programmed duration [P708] regardless of the Space Heating demand and the current DHW schedule
Anti-Legionella Cycle Request Button	When the status of this input goes from open to closed, the Domestic Hot Water production is requested with the Anti-Legionellasetpoint
External Alarm Indication Input	When this input is opened, alarm is tripped. This alarm is for information only, it does not affect the unit operation.

4.2.5 - Setpoint

To achieve better comfort, it is possible to adjust the room temperature setpoint or water temperature setpoint according to your needs. Please note that the temperature setpoint can be adjusted only within a range defined for each occupancy mode. When the unit is equipped with a remote user interface, the control can be based on the air setpoint.

Air setpoint configuration

Depending on the occupancy and heating/cooling/DHW mode, the air setpoint is as given below.

The air setpoint can be configured in two ways:

- By direct access to the wired controller (refer to wired controller manual)
- By access to the parameter menu via JBus (refer to § 7. Parameter Overview)

COOLING

Wired controller Occupancy	Air setpoint on wired controller direct access	Range	Air setpoint on parameter menu	Range
Home	Cool Home Setpoint	16 to 32°C	Cool Home Setpoint [P424]	16 to 32°C
Eco	Cool Sleep Setpoint	16 to 32°C	Cool Sleep Offset [P425]	0 to 10°C
Away				

4 - OPERATION

☀ HEATING

Wired controller Occupancy	Air setpoint on wired controller direct access	Range	Air setpoint on parameter menu	Range
Home	Heat Home Setpoint	16 to 32°C	Heat Home Setpoint [P421]	16 to 32°C
Eco	Heat Sleep Setpoint	16 to 32°C	Heat Sleep Offset [P422]	-20 to 0°C
Away	Heat Away Setpoint	16 to 32°C	Heat Away Offset [P423]	-20 to 0°C

Once air setpoints are defined, water setpoints must be configured (refer to §3.6 - Unit with wired controller). Please, find here below more details about water setpoint configuration.

Water setpoint configuration

The water setpoint calculation can be based on:

- 1) Predefined Climatic Curves depending on OAT: climatic curves already preconfigured in the control logic.
- 2) Fixed Water Setpoint: using a fixed value for each occupancy mode.
- 3) Custom Climatic Curve depending on OAT: define customized climatic curves in function of the application.
- 4) Offset on climatic curves (predefined and customer)

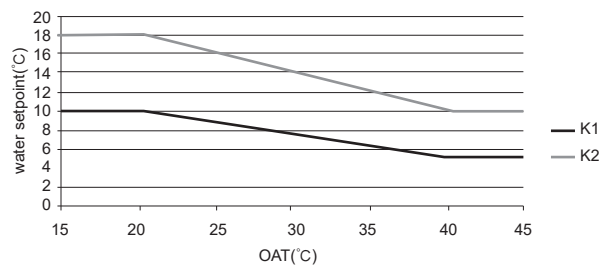
1. Predefined climatic curves

⚙ COOLING:

If the cooling climatic curve [P586] is configured to "1" or "2", the water setpoint will be calculated according to the selected cooling climatic curve.

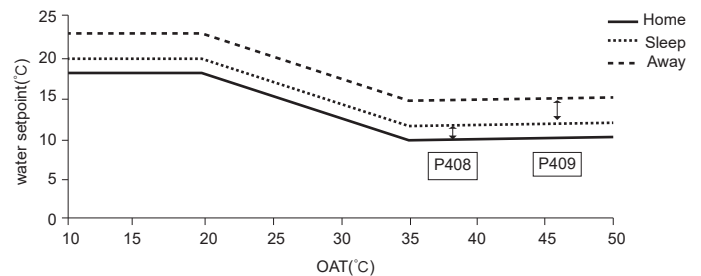
Two predefined cooling climatic curves are available:

Climatic Curve	Min.OAT	Max.OAT	Min.Water Temp	Max. Water Temp	Application
K1	20°C	40°C	5°C	10°C	FCU's
K2	20°C	40°C	10°C	18°C	UFC



Cooling Climatic Curves

The climatic curve corresponds to the water setpoint in Home mode. To define the other occupancy modes, it is necessary to configure Cool Sleep Offset [P408] and Cool Away Offset [P409]:



Cooling Climatic Curve in function of occupancy mode

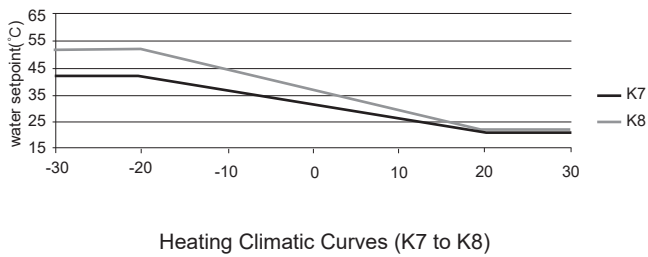
☀ HEATING:

If the heating climatic curve [P581] is configured to a parameter from "1" to "12", the water setpoint will be calculated according to the selected heating climatic curve.

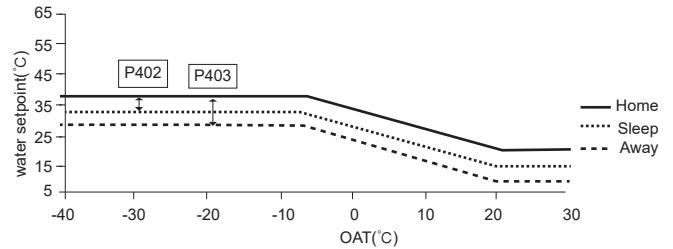
Twelve predefined heating climatic curves are available:

Climatic Curve	Min.OAT	Max.OAT	Min.Water Temp	Max. Water Temp	Application
K1	-7°C	20°C	20°C	38°C	UFH
K2	-5°C	20°C	20°C	33°C	UFH
K3	-9°C	20°C	20°C	45°C	FCU's
K4	-8°C	20°C	40°C	50°C	FCU's
K5	-5°C	20°C	40°C	55°C	Radiators
K6	0°C	20°C	40°C	60°C	Radiators
K7	-20°C	20°C	22°C	42°C	FCU's
K8	-20°C	20°C	23°C	55°C	Radiators
K9	-12.7°C	20°C	24°C	60°C	Radiators
K10	-5.9°C	20°C	25°C	60°C	Radiators
K11	-1.5°C	20°C	26°C	60°C	Radiators

4 - OPERATION



The climatic curve corresponds to the water setpoint in Home mode. To define the other occupancy modes, it is necessary to configure Heating Sleep Offset [P402] and Heating Away Offset [P403]:



Heating Climatic Curve in function of occupancy mode

2. Fixed water setpoint

If the cooling climatic curve [P586] or the heating climatic curve [P581] is configured to “-1”, the water control point will be determined according to the Occupancy mode.

The water setpoint can be configured in two ways:

- By direct access to the wired controller (refer to wired controller manual)
- By accessing the parameter menu via JBus or (refer to § 7. Parameter Overview)

COOLING

Wired controller Occupancy	Water setpoint on wired controller direct access	Range	Water setpoint on parameter menu	Range
Home	Cool Home Setpoint	5 to 25°C	Cool Home Setpoint [P407]	5 to 18°C
Eco	Cool Sleep Setpoint		Cool Sleep Offset [P408]	0 to 10°C
Away	Cool Away Setpoint		Cool Away Offset [P409]	0 to 10°C

HEATING

Wired controller Occupancy	Water setpoint on wired controller direct access	Range	Water setpoint on parameter menu	Range
Home	Heat Home Setpoint	25 to 62°C	Heat Home Setpoint [P401]	25 to 62°C
Eco	Heat Sleep Setpoint		Heat Sleep Offset [P402]	-10 to 0°C
Away	Heat Away Setpoint		Heat Away Offset [P402]	-10 to 0°C

DHW

Wired controller Occupancy	Water setpoint on wired controller direct access	Range	Water setpoint on parameter menu	Range
Home	DHW Setpoint	40 to 62°C	DHW Setpoint [P406]	40 to 62°C
Eco	DHW Anti-Legionella Stp	60 to 70°C	DHW Anti-Legionella Stp [P405]	60 to 70°C

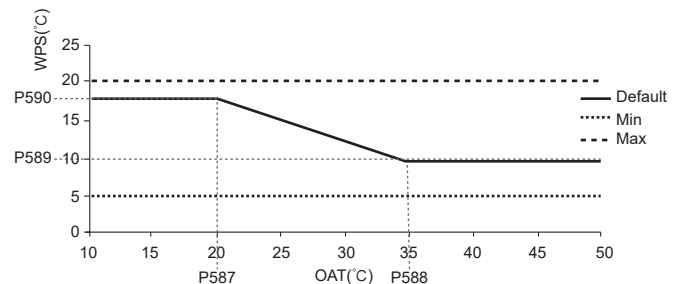
3. Custom climatic curve

COOLING:

If the cooling climatic curve [P586] is configured to “0”, the water setpoint will be calculated according to the custom cooling climatic curve.

This custom cooling climatic curve can be defined using the following parameters:

Parameter	Description	Default	Min.	Max.
P587	Custom Minimum OAT	20°C	0°C	30°C
P588	Custom Maximum OAT	35°C	24°C	50°C
P589	Custom Minimum Water Temp	10°C	5°C	20°C
P590	Custom Maximum Water Temp	18°C	5°C	20°C



Example: Custom Cooling Climatic Curve

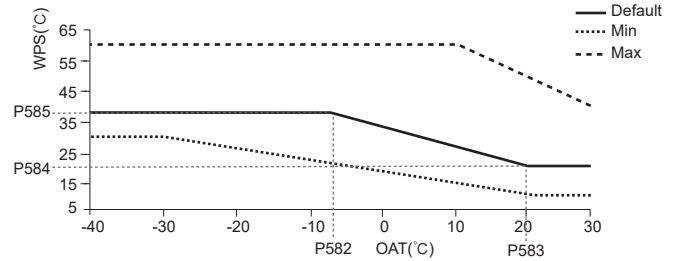
4 - OPERATION

☀ HEATING:

If the heating climatic curve [P581] is configured to "0", the water setpoint will be calculated according to the custom heating climatic curve.

This custom heating climatic curve can be defined using the following parameters:

Parameter	Description	Default	Min.	Max.
P582	Custom Minimum OAT	-7°C	-30°C	10°C
P583	Custom Maximum OAT	20°C	10°C	30°C
P584	Custom Minimum Water Temp	25°C	25°C	40°C
P585	Custom Maximum Water Temp	38°C	30°C	60°C

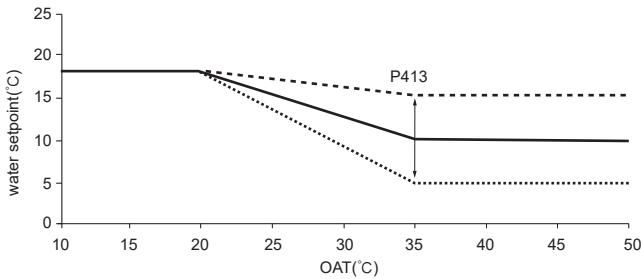


Example: Custom Cooling Climatic Curve

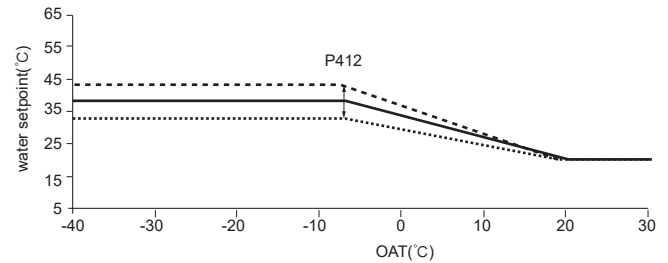
4. Offset on climatic curves (predefined and customer)

Two other parameters are also configurable to adjust water setpoint to suit customer needs:

- for cooling curve, Cool Minimum Water Setpoint [P589] can be offsetted by an offset on foot of the curve (Cool Curve Min Stp Offset [P413])
- and for heating curve, Heat Maximum Water Setpoint [P585] can be offsetted by an offset on head of the curve (Heat Curv Max Stp Offset [P412])



Custom Cooling Climatic Curve : Offset on foot of the curve



Heating Cooling Climatic Curve : Offset on head of the curve

4.2.6 - Water freeze protection

When the OAT is low (and pump is stopped), the risk to freeze the water exchanger and the water pipes is high. The pump shall be turned on regularly or continuously to make water circulate and decrease the risk. Likewise the BPHE and piping electric heaters present on the hydraulic kit (refer to Figures 6 and 7) are activated in some cases.

Standby mode:

If the OAT < 7°C, water temperature of BPHE is below 3°C, pump will run at maximum speed; anti-frozen EH, EH1, EH2, EH3 and auxiliary heat source will active if configure; unit start with heating mode

Heating mode and DHW mode:

If the OAT ≤ 3°C, water temperature of BPHE is below 3°C, pump will run at maximum speed; anti-frozen EH, EH1, EH2, EH3 and auxiliary heat source will active if configure; unit start with heating mode

Cooling mode:

If the water temperature of BPHE is below 3°C, pump will run at maximum speed; anti-frozen EH, EH1, EH2, EH3 and auxiliary heat source will active if configure; unit start with heating mode

Never switch off the unit, otherwise freeze protection cannot be guaranteed. For this reason the main unit and/or customer circuit disconnect switch must always be left closed.

If a shut-off valve is installed, a bypass must be included as shown below.

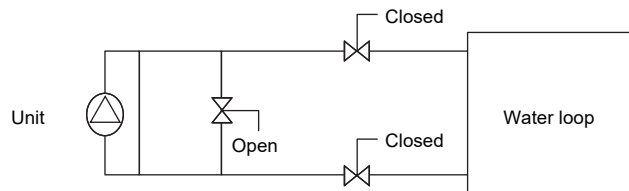


Figure 14: Winter position for unit with hydraulic module

IMPORTANT:

Depending on the atmospheric conditions in your area you must do the following when switching the unit off in winter:

- Add ethylene glycol or propylene glycol with an adequate concentration to protect the installation up to a temperature of 10 K below the lowest temperature likely to occur at the installation site.
- If the unit is not used for an extended period, it should be drained, and ethylene glycol or propylene glycol should be charged in the heat exchanger as a safety precaution, using the water inlet purge valve connection.

4 - OPERATION

- At the start of the next season, refill the unit with water and add an inhibitor.
- For the installation of auxiliary equipment, the installer must comply with basic regulations, especially for minimum and maximum flow rates, which must be between the values listed in the operating limit table (application data).
- To prevent corrosion by differential aeration, the complete drained heat transfer circuit must be charged with nitrogen for a period of one month. If the heat transfer fluid does not comply with the manufacturer regulations, the nitrogen charge must be added immediately.
- If frost protection is dependent on electric trace heaters, never switch off their power.
- If trace heating is not used, or during a prolonged power failure, the unit water system must be drained to protect the unit.
- The heat exchanger temperature sensor are part of frost protection: If piping trace heaters are used, ensure the external heaters do not affect the measurement of these sensors.

CAUTION:

Please note that water freeze protection is used in order to reduce the risk to freeze the water exchanger and the water pipes.

4.2.7 - Domestic hot water mode

For heat pump with a domestic water tank, the DHW mode is used to produce hot water for domestic purposes. The system control manages to operation the hot domestic water tank, as well as the diverting valve.

The heat pump is standard fitted with a variable speed pump in a hydraulic kit, and this pump is controlled with adjustable speed according to entering water temperature and leaving water temperature.

And an additional water pump can be installed on secondary water loop (refer to § Installation with DHW production and boiler for details).

a - DHW diverting valve

The units can drive a diverting valve to manage a domestic hot water storage tank application. In case of a domestic hot water request, the operating logic controls a diverting valve which directs the hot water to the storage tank.

Characteristics	Diverting valve with spring return and two wires control Recommendation: - Kvs = 16 - Max. Temperature = 150°C - CHAR:L
-----------------	--

b - DHW temperature sensor or thermostat

Accordinging the configuration, it is possible to control the DHW option with either a temperature sensor or thermostat

	Temperature sensor	Thermostat
Characteristics	Accessory Resistance = 5 KOhms Cable length = 4 m	When the thermostat is closed, the domestic hot water mode is requested

The DHW production is possible when:

- DHW schedule is activated and there is DHW production demand (temperature conditions) and operating time in this mode is below DHW Maximal Runtime [P707].

c - DHW electric heater

When the unit is requested to run in DHW mode, the DHW electric heater (if configured) can be used in order to provide domestic hot water. The discrete output can control a contactor (not supplied with unit).

Characteristics	Contactor Coil: 230 VAC 50Hz
-----------------	------------------------------------

Electric heater is started when tank temperature is below DHW setpoint and one of the following conditions is true:

- OAT is below Booster OAT Threshold [P604]
- OAT is above Maximum OAT for Heating [P515]
- Anti-legionella mode is active
- Defrost is active
- In case of unit of failure

IMPORTANT:

Electric heating is disabled when Load Shedding is active or in the case of DHW thermistor sensor failure (refer to § 4.2.4 Switch).

d - Domestic water tank

The water inside the domestic water tank must be constantly controlled in order to minimize the risk of any contamination, including legionella bacteria. Bearing this in mind, it is important to inform the user about the significance of water temperature control.

4 - OPERATION

Water tank protection system

The system is scheduled to heat up water in the domestic hot water tank in order to eliminate the possibility of legionella growth or kill any existing bacteria.

Legionella will not survive if the temperature is above 50°C. The risk of contamination is practically non-existent when the water temperature is set to 60°C.

Water tank protection settings

To protect the domestic water tank against legionella bacteria, the following parameters must be set:

- Anti-Legionella Start Day of Week [P714]
- Anti-Legionella Start Time [P715]
- Anti-Legionella Setpoint[P405] (anti-legionella protection is stopped when the water temperature reaches the pre-set temperature)

4.2..8 - Pump configuration

There are several possible configurations of the hydraulic circuit:

- Unit with hydraulic module (internal main pump included),
- If a secondary hydraulic loop is used, this will have its own additional pump.

Table 5: Different configurations of pump

Different configurations with pump	Internal main pump	Additional pump (not supplied)
	Variable speed pump	Fixed speed pump
Internal main pump		ü
External main pump	ü	ü

For external main pump and additional pump, the discrete output can control a contactor (not supplied with unit).

Characteristics	Contactor Coil: 230 VAC 50Hz
-----------------	------------------------------------

CAUTION:

The installer is responsible for ensuring the protection of any additional pump against the low water flow rate (no flow switch can be managed by unit control).

The management of different states of main water loop pump (ON / OFF) is different according to the kind of installation (options, accessories, applications). In the compatibility table below, the different control logics for main pump are presented in function of installation:

Table 6: Different control logic for main water loop pump

Main Pump Logic [P565]	Wired controller	OFF Mode	Cooling / Heating Mode	DHW		
			Satisfied Demand	Demand	On	Off
Always On	N.A.	Off	On	On	On	N.A.
Water Sampling	N.A.	Off	Off (On for sampling)	On	On	N.A.
According to setting Temp	N.A.	Off	According to Water setpoint or Air setpoint	On	On	N.A.

The management of different states of external heat source pump (ON / OFF) is different according to the kind of installation (options, accessories, applications). In the compatibility table below, the different control logics for additional pump are presented in function of installation:

Table 7: Different control logic for external heat source pump

Main Pump Logic [P565]	Wired controller	OFF Mode	Cooling / Heating Mode	Boiler		
			Satisfied Demand	Demand	On	Off
Always On	N.A.	Off	On	On	On	Off
According to setting Temp	N.A.	Off	According to Water setpoint or Air setpoint	On	On	Off

4 - OPERATION

4.2.9- Electric Heaters

NOTE:

The installer is responsible for ensuring that the installation complies with the applicable legislation in terms of electrical and thermal safety.

It is possible to include electric heaters in the hydraulic circuit to ensure heating in case of low OAT or heat pump failure.

When OAT is below Booster OAT Threshold [P604], then the electrical booster heaters can be activated. The electrical booster heaters can operate at the same time as the heat pump.

When OAT is below Min OAT for heating [P514], the heat pumps is stopped, and the electric heaters can be activated.

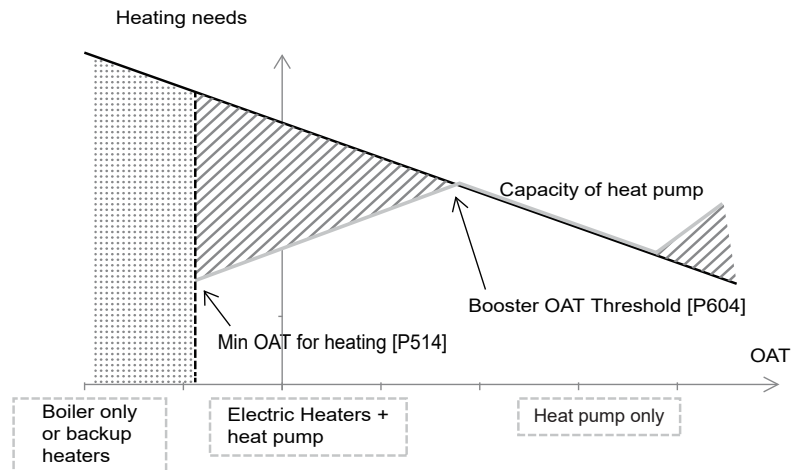


Figure 15: Operation of booster and backup

Depending on the configuration, it is possible to control up to three electric heaters or three electric heat stages (refer to § 3.1 General customer electrical connection on terminal block):

- Standard equip with one 3kw EH inside the hydraulic kit connecting to standard electric heat output: EH1.
- Another two standard electric outputs for field connect to EH2 and EH3.
- These three standard outputs: EH1, EH2, and EH3 can be configured even DHW heater is present.

Each discrete output can control a contactor (not supplied with unit).

Characteristics	Contacteur Coil: 230 VAC 50Hz
Electrical connection	Refer to § 3.4 Installation with electrical booster heaters
Configuration	Refer to § 3.4 Installation with electrical booster heaters

4.2.10 - Boiler

To satisfy the heating demand during periods very low ambient temperature, it is possible to install a boiler. The boiler is considered as a backup: when it is activated, the heat pump cannot operate. Boiler is activated when OAT is below Minimum OAT for Heating [P514] or in case of heat pump failure.

Characteristics	Contacteur Coil: 230 VAC 50Hz
-----------------	-------------------------------------

4.2.11 - Coil heating control for compressor

CAUTION:

When the unit doesn't operate, the compressor can be energized. The coil heating control has the function of heating the compressor by applying a current to the compressor when not operating instead of using a case heater.

This control is for the purpose of preventing stagnation of the refrigerant inside the compressor.

4.2.12 - Defrost cycle (traditional defrost)

When the outdoor air temperature is low and the ambient humidity is high, the probability of frost forming on the surface of the outdoor coil increases. The frost covering the outdoor coil may reduce the air flow across the coil and impair the performance of the unit. To remove the frost from the coil, the control initiates the defrost cycle when necessary.

During the defrost cycle, the refrigerant circuit is forced into the cooling mode. To prevent the water loop from cooling down, BPHE and piping electric heaters may be started.

4 - OPERATION

CAUTION:

Please note that “defrost” and “anti-freeze protection” are two different modes. Defrost is used in order to remove the frost that is covering the outside coil, whereas the antifreeze protection is used to protect the water loop against freezing.

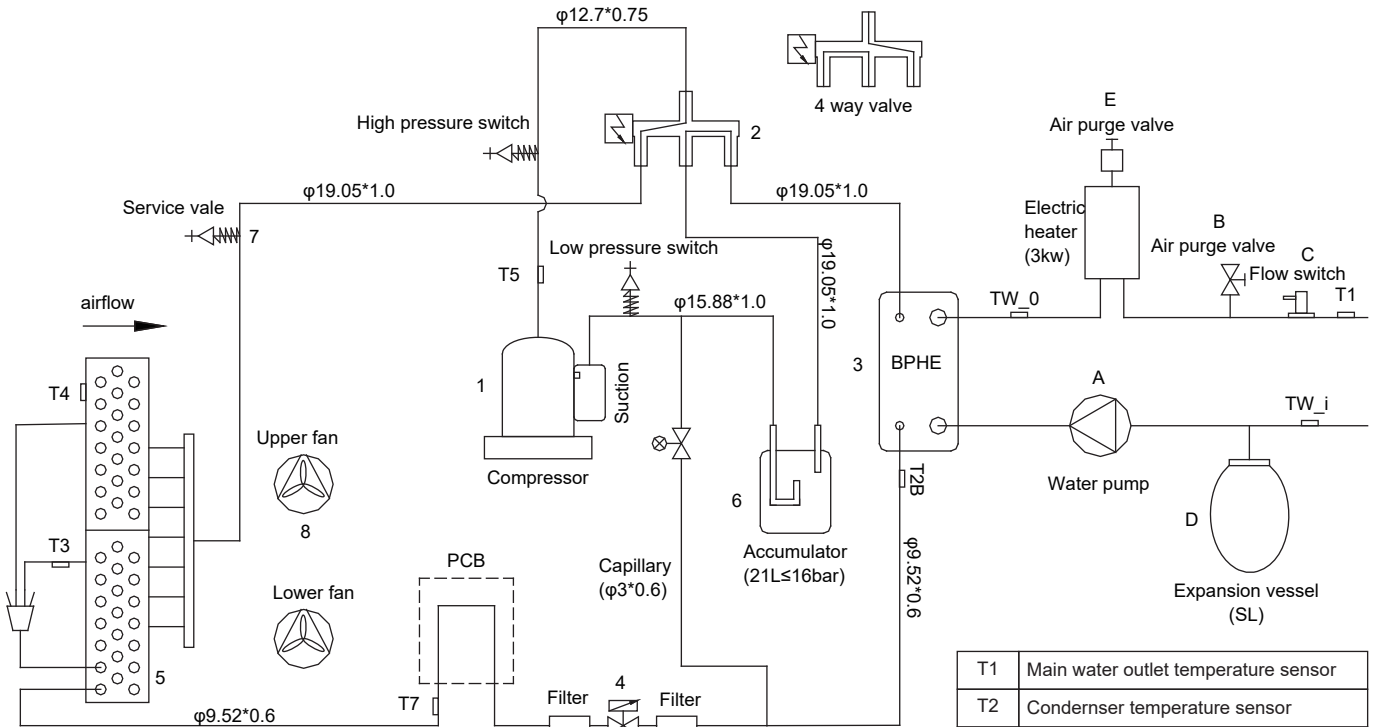
4.2.13 - Night mode capacity control

The night period is defined by the start hour and the end hour which can be set by the user. The night mode allows users to configure the unit to operate with specific parameters within a given period of time, e.g. night period. Particularly this mode permits the reduction of compressor frequency (and noise level) during defined period.

Steps	Table	Par.	Designation	Description	Range	Default	Ex.	Unit
Set the night mode	CMP_CONF	518	Night Mode Start Time	Hour of starting up of night mode	00:00 to 23:59	0:00	0:00	hh:mm
	GEN_CONF	519	Night Mode Stop Time	Hour of stop of night mode	00:00 to 23:59	0:00	0:00	hh:mm

4.3 - Major system components

4.3.1 - General – Refrigerant part



T1	Main water outlet temperature sensor
T2	Condenser temperature sensor
T4	Ambient temperature sensor
T5	Discharge temperature sensor
T7	Refrigerant cooling temperature sensor
TW_0	BPHEwater outlet temperature sensor
TW_i	BPHEwater inlet temperature sensor

Water side legend	
Label	Description
A	Water Pump - Main water pump - primary loop (in hydraulic module)
B	Water High Pressure Safety Relief Valve (300 kPa)
C	Flow Switch (standard)
D	Expansion vessel (in hydraulic module option)
E	Air vent
F	Hydraulic module equipped with variable speed single pump

Unit refrigeration circuit legend	
Label	Description
1	Variable speed rotary compressor
2	Reverse 4 way valve (energized when in Heating mode)
3	Water exchanger - BPHE
4	Expansion valve - pulse modulating valve
5	Air cooled Exchanger
6	Accumulator or anti-slugging bottle
7	Service valve (Schrader valve)
8	Upper & Lower fans

4 - OPERATION

4.3.2 - Compressors

The units use hermetic rotary compressor. It is driven by a variable frequency drive (VFD). The rotary compressor incorporates an oil coil heating inside the shell.

The compressor sub-assembly is complete with:

- Anti-vibration mountings between the unit and the compressor chassis.
- A compressor case thermostat control at the discharge of compressor.

The compressors installed in these units have a specific oil charge.

NOTE:

Do not use refrigerants and lubricant besides those specified. Do not compress air (there must be no air intake due to leakage in the refrigeration cycles).

4.3.3 - Air evaporator/condenser

The coils are heat exchangers with internally grooved copper tubes with aluminium fins.

4.3.4 - Fans

The fans are driven by permanent magnet synchronous motor. The motors are managed via a variable frequency drive (VFD).

4.3.5 - Pulse Motor Expansion Valve (PMV)

The PMV is equipped with a stepper motor (0-500 pulses). The 4 to 16kW units have one PMV in its refrigerant circuit.

4.3.6 - Filter drier

This is a one-piece, brazed filter drier, located in the liquid line. The role of the filter drier is to keep the circuit clean and moisture-free. The moisture indicator shows when it is necessary to change the filter drier. The filter drier is a biflow device on the units that means that it filters and dehydrates in both operating modes. The pressure drop is much higher in the heating mode. A difference in temperature between the filter inlet and outlet shows that the element is dirty.

4.3.7 - Water evaporator/condenser

The evaporator/condenser is a plate heat exchanger. The water connection of the heat exchanger is a threaded connection. It has a thermal insulation of polyurethane foam and includes frost protection, as standard. The products that may be added for thermal insulation of the containers during the water piping connection procedure must be chemically neutral in relation to the materials and coatings to which they are applied. This is also the case for the products originally supplied by the manufacturer.

NOTES- Monitoring during operation:

- Follow the regulations on monitoring pressurised equipment.
- It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.
- If there are no regulations or to complement them follow the control programmes of ISO 5149.
- If they exist follow local professional recommendations.
- Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities maybe the cause of the wear or corrosion by puncture.
- The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.

4.3.8 - Refrigerant

Units operate with refrigerant R32.

4.3.9 - Four-way valve

For the units, this device permits the reversal of the refrigeration cycle to allow operation in cooling mode, in heating mode, and during defrost cycles.

4.3.10 - Inverter subassembly for compressor and fans

The units are fitted with Inverter modules to control the compressor and the fan motors.

4.3.11 - Accumulator

The units are fitted with an accumulator in the compressor suction line to prevent liquid carry-over to the compressor, particularly during defrost cycle and transient operations.

5 - MAINTENANCE

5.1 - Standard maintenance

To ensure optimal efficiency and reliability of the units, we recommend establishing a maintenance contract with your local Service organisation. This contract will include regular inspections by Service specialists so that any malfunction is detected and corrected quickly, ensuring that no serious damage can occur.

A Service maintenance contract is the best way to ensure the maximum operating life for your equipment and, through the expertise of technicians, provides the ideal way to manage your system cost effectively. Air conditioning equipment must be maintained by professional technicians, whilst routine checks can be carried out locally by specialised technicians. See the standard ISO 5149.

All refrigerant charging, removal and draining operations must be carried out by a qualified technician and with the correct material for the unit. Any inappropriate handling can lead to uncontrolled fluid or pressure leaks.

CAUTION:

Before doing any work on the machine ensure that the power is switched off. If a refrigerant circuit is opened, it must be evacuated, recharged and tested for leaks. Before any operation on a refrigerant circuit, it is necessary to remove the complete refrigerant charge from the unit with a refrigerant charge recovery group.

Simple preventive maintenance will allow you to get the best performance from your HVAC unit:

- improved cooling and heating performance
- reduced power consumption
- prevention of accidental component failure
- prevention of major time-consuming and costly interventions
- protection of the environment

There are five maintenance levels for HVAC units, as defined by the AFNOR X60-010 standard.

NOTE:

Any deviation or non-observation of these maintenance criteria will render the guarantee conditions for the HVAC unit null and void, and the manufacturer, will no longer be responsible.

5.1.1 - Level 1 maintenance

See note in §5.1.3 Level 3.

Simple procedures can be carried out by the user on a weekly basis:

- Visual inspection for oil traces (sign of a refrigerant leak).
- Air heat exchanger cleaning - see §5.3 Air heat exchanger.
- Check for removed protection devices, and badly closed panels.
- Check the unit alarm report when the unit does not work (refer to wired controller manual).
- General visual inspection for any signs of deterioration.
- Verify the charge in the sight-glass.

Check that the water temperature difference between the heat exchanger inlet and outlet is correct.

5.1.2 - Level 2 maintenance

This level requires specific know-how in the electrical, hydraulic and mechanical fields.

The frequency of this maintenance level can be monthly or annually depending on the verification type.

In these conditions, the following maintenance operations are recommended.

Carry out all level 1 operations, then:

Electrical checks

- At least once a year tighten the power circuit electrical connections (refer to § 5.2 for the main electrical connections).
- Check and retighten all control/command connections, if required (refer to § 5.2 for the main electrical connections).
- Remove the dust and clean the interior of the control boxes, if required.
- Check the status of the contactors, disconnect switches and capacitors.
- Check the presence and the condition of the electrical protection devices.
- Check the correct operation of all electric heaters.
- Check that no water has penetrated into the control box.

Mechanical checks

- Check the tightening of the fan tower, fan, compressor and control box fixing bolts.

Water circuit checks

- Always take care when working on the water circuit to ensure that the condenser close by is not damaged.
 - Check the water connections.
 - Check the expansion tank for signs of excessive corrosion or gas pressure loss and replace it, if necessary.
 - Purge the water circuit (see §2.5 Water flow rate control).
 - Clean the water filter (see §2.5 Water flow rate control).
 - Examine the fixed speed pump bearing after 17500 hours of operation with water and the fixed speed pump mechanical seal after 15000 hours.
- Check the operation of the low water flow rate safety device.
- Check the status of the thermal piping insulation.

5 - MAINTENANCE

- Check the concentration of the anti-freeze protection solution (ethylene glycol or propylene glycol).

Refrigerant circuit

- Fully clean the air heat exchangers with a low-pressure jet and a bio-degradable cleaner.
- Check the unit operating parameters and compare them with previous values.
- Carry out an oil contamination test.
- Check the fouling of the filter drier. Replace it if necessary.
- Keep and maintain a maintenance sheet, attached to each HVAC unit.

All these operations require strict observation of adequate safety measures: individual protection garments, compliance with all industry regulations, compliance with applicable local regulations and using common sense.

5.1.3 - Level 3 (or higher) maintenance

The maintenance at this level requires specific skills/approval/tools and know-how and only the manufacturer, his representative or authorised agent are permitted to carry out these operations. These maintenance operations concern for example:

- A major component replacement (compressor, evaporator).
- Any intervention on the refrigerant circuit (handling refrigerant).
- Changing of parameters set at the factory (application change).
- Removal or dismantling of the HVAC unit.
- Any intervention due to a missed established maintenance operation.
- Any intervention covered by the warranty.
- One to two leak checks per year with a certified leak detector and carried out by a qualified person.

To reduce waste, the refrigerant and the oil must be transferred in accordance with applicable regulations, using methods that limit refrigerant leaks and pressure drops and with materials that are suitable for the products.

Any detected leaks must be repaired immediately.

The compressor oil that is recovered during maintenance contains refrigerant and must be treated accordingly.

Refrigerant under pressure must not be purged to the open air. If a refrigerant circuit is opened, plug all openings, if the operation takes up to one day, or for longer periods charge the circuit with nitrogen.

NOTE:

Any deviation or non-observation of these maintenance criteria will render the guarantee conditions for the HVAC unit null and void, and the manufacturer will no longer be held responsible.

5.2 - Tightening torques for the main electrical connections

Component	Designation in the unit	Value (N.m)
Terminal Block supply	L1 / L2 / L3 / N / PE	1,2
Terminal Block command		0,4 to 0,8
Transformer		0,5

5.3 - Air heat exchanger

We recommend, that finned coils are inspected regularly to check the degree of fouling. This depends on the environment where the unit is installed, and will be worse in urban and industrial installations and near trees that shed their leaves.

For coil cleaning, two maintenance levels are used.

- If the air heat exchangers are fouled, clean them gently in a vertical direction, using a brush.
- Only work on air heat exchangers with the fans switched off.
- For this type of operation switch off the HVAC unit if service considerations allow this.
- Clean air heat exchangers guarantee optimal operation of your HVAC unit. This cleaning is necessary when the air heat exchangers begin to become fouled. The frequency of cleaning depends on the season and location of the HVAC unit (ventilated, wooded, dusty area, etc.).

Clean the coil, using appropriate products. We recommend products for coil cleaning:

- No. 00PSP000000115A: traditional cleaning method.

CAUTION:

Never use pressurised water without a large diffuser. Do not use high-pressure cleaners for Cu/Cu and Cu/Al coils.

Concentrated and/or rotating water jets are strictly forbidden. Never use a fluid with a temperature above 45°C to clean the air heat exchangers.

Correct and frequent cleaning (approximately every three months) will prevent 2/3 of the corrosion problems.

5.4 - Water heat exchanger maintenance

Check that:

- the insulating foam is intact and securely in place.
- the BPHE and piping electric heaters are operating, secure and correctly positioned.
- the water-side connections are clean and show no sign of leakage.

5 - MAINTENANCE

5.5 - Unit maintenance

CAUTION:

Before any work on the unit ensure that the circuit is isolated and there is no voltage present. Note that it may take 5 minutes for the circuit capacitors to fully discharge after isolating the circuit. Only appropriately qualified personnel are authorised to work on the VFD.

In case of any alarm or persistent problem related to the VFD, contact Service.

The VFDs fitted with units do not require an insulation test, even if being replaced; they are systematically verified before delivery. Moreover, the filtering components installed in the VFD can falsify the measurement and may even be damaged. If there is a need to test the insulation of the unit components (fan motors and pumps, cables, etc.), the VFD must be disconnected at the power circuit.

5.6 - Refrigerant volume

The unit must be operated in cooling mode to find out if the unit charge is correct by checking the actual subcooling.

Following a small refrigerant leak a loss of refrigerant, compared to the initial charge will be noticeable in the cooling mode and affect the subcooling value obtained at the air heat exchanger (condenser) outlet, but it will not be noticeable in the heating mode.

IMPORTANT:

It is therefore not possible to optimise the refrigerant charge in the heating mode after a leak. The unit must be operated in the cooling mode to check, if an additional charge is required.

6 - ALARM DESCRIPTION

The units use high-pressure R32 refrigerant. Special equipment must be used when working on the refrigerant circuit (pressure gauge, charge transfer, etc.).

Note :

- A vacuum pump is not enough to remove moisture from oil.
- Oils absorb moisture rapidly. Do not expose oil to atmosphere.
- Never open system to atmosphere while it is under vacuum.
- When the system must be opened for service, break vacuum with dry nitrogen.
- Do not vent R32 into atmosphere.

6.1- Alarm listing

The following tables of alarms list their probable cause and the likely effect on the unit, as well as the reset type.

Table 8: Alarms listing	
Error code	Description
E0	Water flow switch fault
E1	Communication fault between IDU pcb and ODU PCB
E2	LWT sensor after EH(T1) fault
E3	T2: gas side of BPHE sensor fault -- reserved
E4	T2B: liquid side of BPHE sensor fault -- reserved
E5	ODU part error
E6	T7: water tank sensor fault
E7	T-in: EWT sensor fault
E8	T-out: LWT sensor fault
E9	Communication fault between wired controller and IDU PCB
EA	Tw-2: Bi-zone sensor fault (available when set the Bi-zone function)
Eb	T1B: auxiliary heat source sensor fault (available when set the auxiliary heat source)
Ec	Water pump fault
Ed	Reserved
EE	Reserved
EF	Mode conflict - reserved
P0	EPPROM fault
P1	Protection of huge tolerance between EWT and LWT
P2	Lack of water flow
P3	Protection of abnormal value between EWT and LWT
P6	Protection of the standard electrical heater overheat

6 - ALARM DESCRIPTION

Display on the PCB

Display content	Failure or protection definition	Remarks
E1	Three - phase supply phase - sequence fault	
E2	Communication failure between indoor unit and outdoor unit	Communication interrupted for 2mins or more between ODU and IDU
E4	Ambient temperature sensor failure	
E6	Condenser temperature sensor failure	
E8	Discharged temperature sensor failure	
E9	AC over voltage / under voltage protection	
E10	EEPROM failure	
EC	PCB refrigerant cooling sensor failure	
H0	Communication failure between the main control chip and the module board	
H1	Communication failure between the main control chip and the communication board	
H4	Display P6 protection for 3 times within 30 minutes	It can only be restored by repowering on the unit
H5	Display P2 protection for 3 times within 30 minutes	It can only be restored by repowering on the unit
H6	Display P4 protection for 3 times within 100 minutes	It can only be restored by repowering on the unit
H9	Display P9 protection for 2 times within 10 minutes	It can only be restored by repowering on the unit
H8	High pressure sensor failure	Exhaust pressure $P_c < 0.3\text{MPa}$
H10	Display P3 or P14 protection for 3 times within 60 minutes	It can only be restored by repowering on the unit
P1	High pressure protection	
P2	Low pressure protection	3 times P2 protection appears within 30 minutes and then reported H5
P3	Primary current overcurrent protection	
P4	Exhaust temperature is too high protection	3 times P4 protection appears within 100 minutes and then reported H6
P5	T3 high temperature protection	
P6	Module protection	3 times P6 protection appears within 30 minutes and then reported H4
P9	DC fan failure	2 times P9 protection appears within 10 minutes and then reported H9
P10	Typhoon protection	
P11	T2B refrigerant temperature of HPHE over-low protection	
P12	During heating operation the fan is in fault state in the area A for 5 minutes	

7 - START-UP CHECKLIST FOR HEAT PUMPS (USE FOR JOB FILE)

7.1 -General information

General information	
Job name	
Location	
Installing contractor	
Distributor	
Start-up performed by	Date
Equipment	
Unit type	
Serial number	
Software version [P654]	
Compressor	Model number
	Serial number
Air handling equipment	
	Manufacturer
	Model number
	Serial number

7.2 - Available options and accessories

Options	Yes	No	Accessories	Yes	No
Floor heating thermal cut off			Master / Slave sensor		
Backup heater			Domestic hot water management sensor		
Hydraulic module equipped with variable speed single pump low available pressure without expansion tank			Remote human interface		
Water filling system			Additional outdoor ambient temperature sensor		

7.3 - Checks before start of unit

	Yes	No	Comment
CHECKS BEFORE START-UP	Is there any shipping damage?		
	Unit is level in its installation		
	Power supply agrees with the unit name plate		
	Electrical circuit wiring has been sized and installed properly		
	Unit ground wire has been connected		
	Unit neutral wire has been connected		
	All terminals are tight		
	All cables and thermistors have been inspected for crossed wires		
	All plug assemblies are tight		
	All air handlers are operating		
	All water valves are open		
	All fluid piping is connected properly		
	All air has been vented from the system		
	Water pump is operating with the correct rotation		
	Water pump control has been properly interlocked with the heat pump		
Unit has been leak checked(including fittings):Locat, repair, and report any refrigerant leak			
All incoming power voltage is within rated voltage range			

7 - START-UP CHECKLIST FOR HEAT PUMPS (USE FOR JOB FILE)

7.4 - Checks during operation of unit

		Date / Hour					
CHECKS DURING OPERATION	Air	Outdoor Air Temp	P001	°C			
		Entering Water Temp	P003	°C			
	Water	Leaving Water Temp	P004	°C			
		Water Control Temp	P052	°C			
	Suction	Suction Temperature	P009	°C			
		Discharge Temperature	P010	°C			
	Discharge	Refrigerant Temperature	P005	°C			
		Requested Compressor Frequency	P022	Hz			
	Compressor	Actual Compressor Frequency	P023	Hz			
		Water Control Point	P051	°C			
	Water control	Flow Switch Status	P105	-			
		Safety Switch Status	P104	-			
	Water pressure / flow rate	Entering water heat exchanger pressure	-	kPa			
		Leaving water heat exchanger pressure	-	kPa			
		Pressure drop (without internal pump)	-	kPa			
		Flow rate from curves (without internal pump)	-	l/s			
		Or available external pressure (with internal pump)	-	kPa			
		Flow rate from curves (with internal pump)	-	l/s			
	Power	Network Voltage	-	V			
		Input Amperage	-	A			

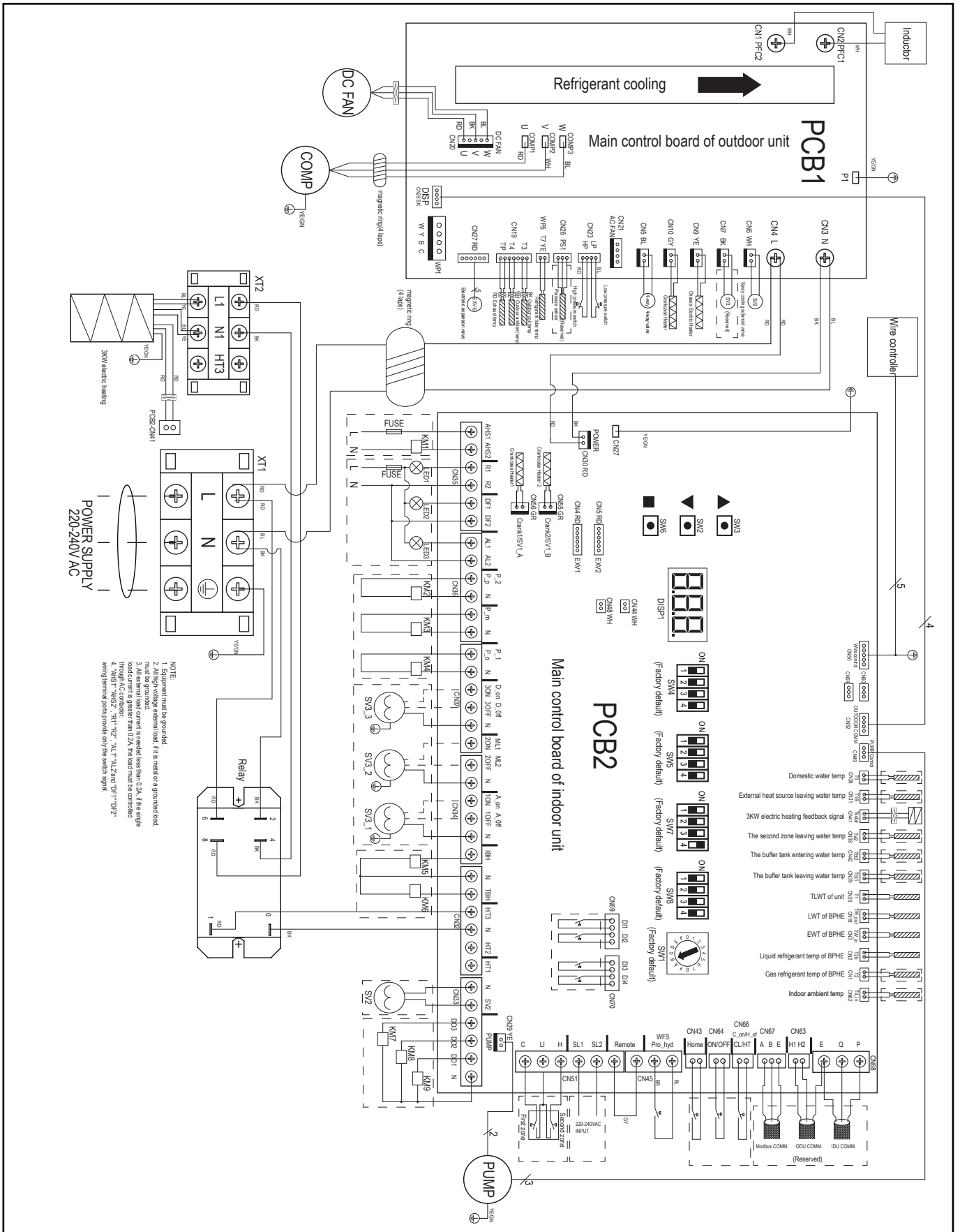
7.5 - Maintenance checks

		Date / Hour					
MAINTENANCE CHECKS	Control	Mechanical check					
		Leakage check					
		Relief valve check					
		Electrical connection check					
	Freeze protection	Water freeze protection check					
		Add glycol in water (%)					
	Cleaning	Coil cleaning					
		Water filter cleaning					

Comments:

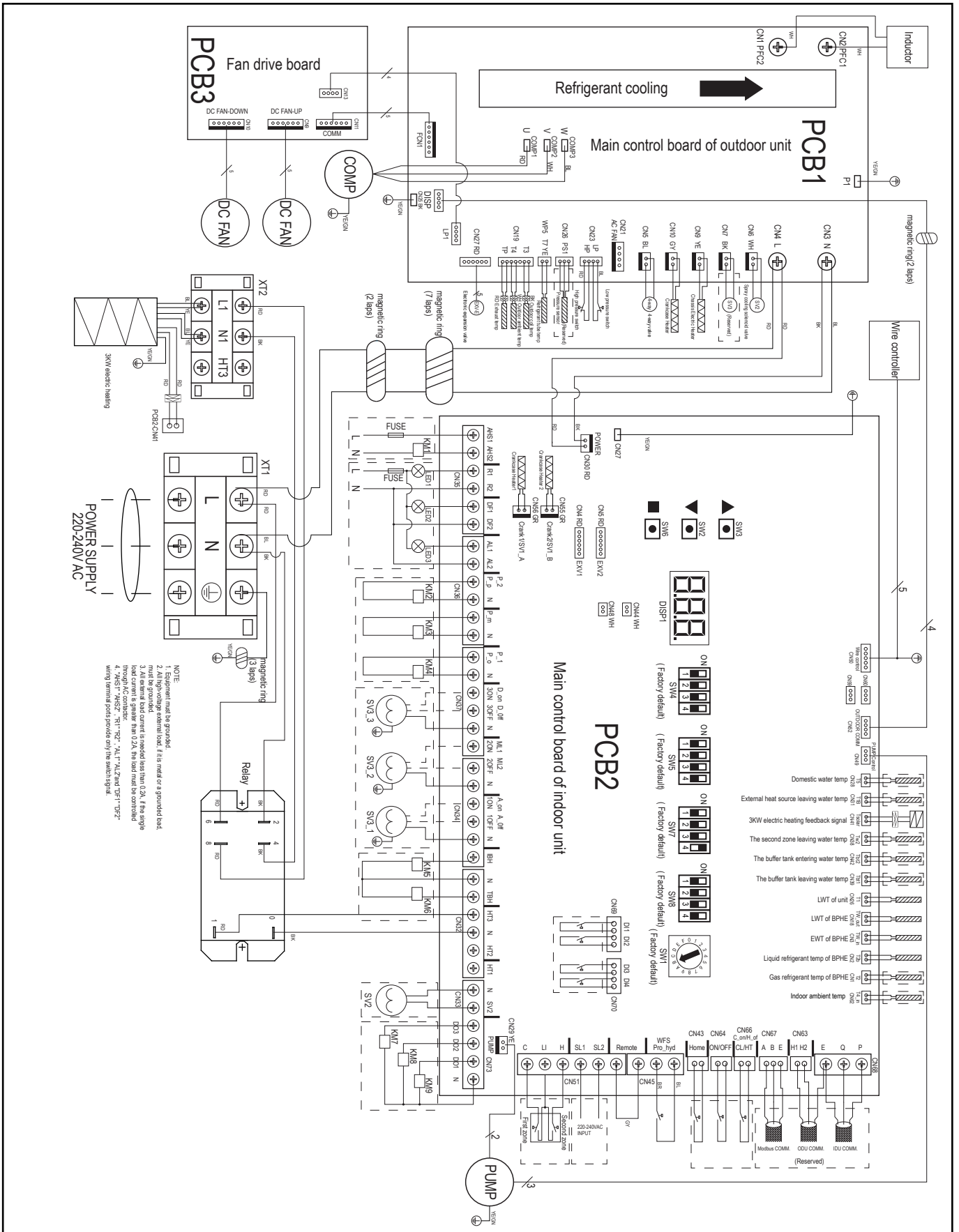
8 - ANNEX (ELECTRICAL WIRING DIAGRAM)

8.2 - 8-10kW, single phase with Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



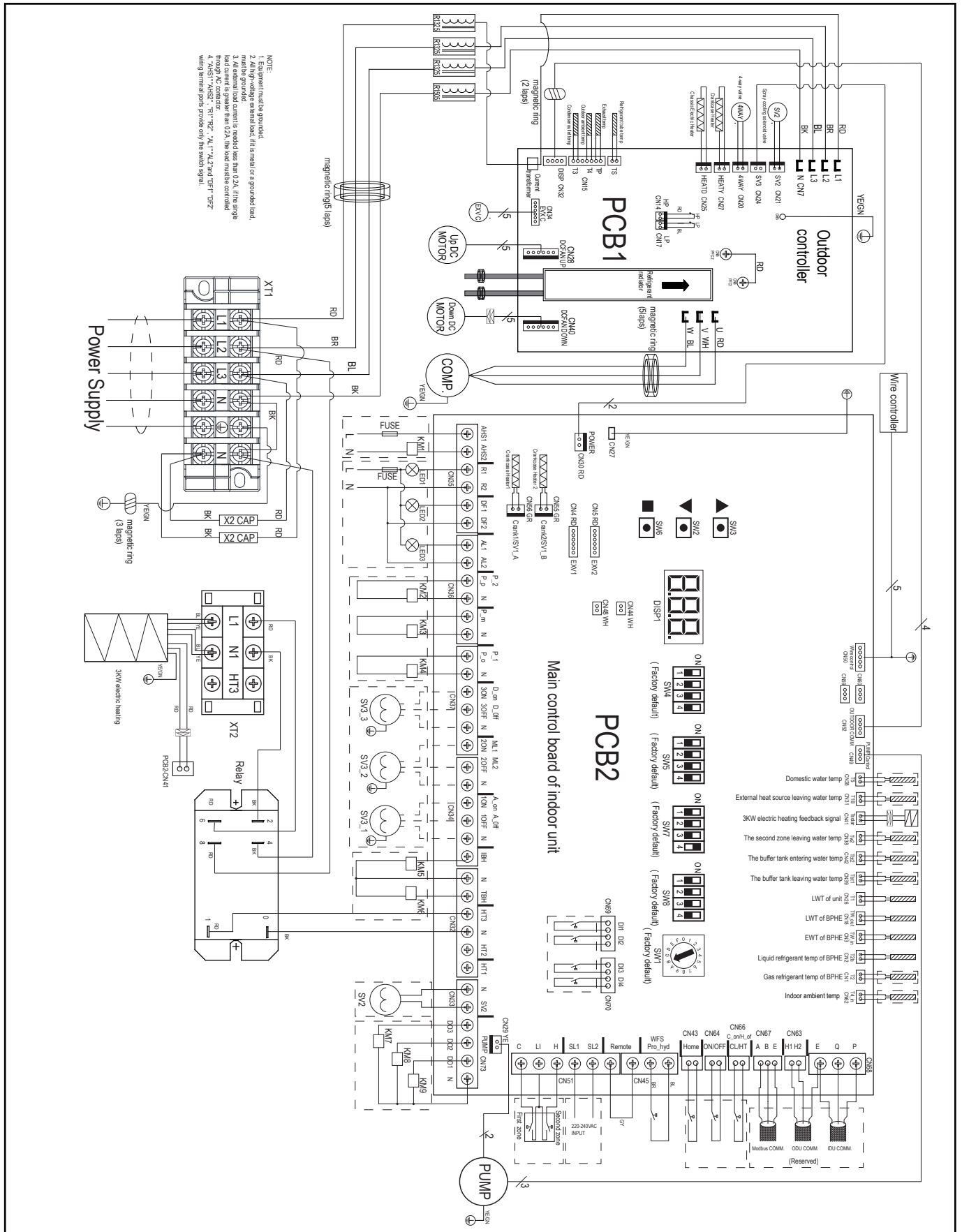
8 - ANNEX (ELECTRICAL WIRING DIAGRAM)

8.3 - 12-16kW, single phase with Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



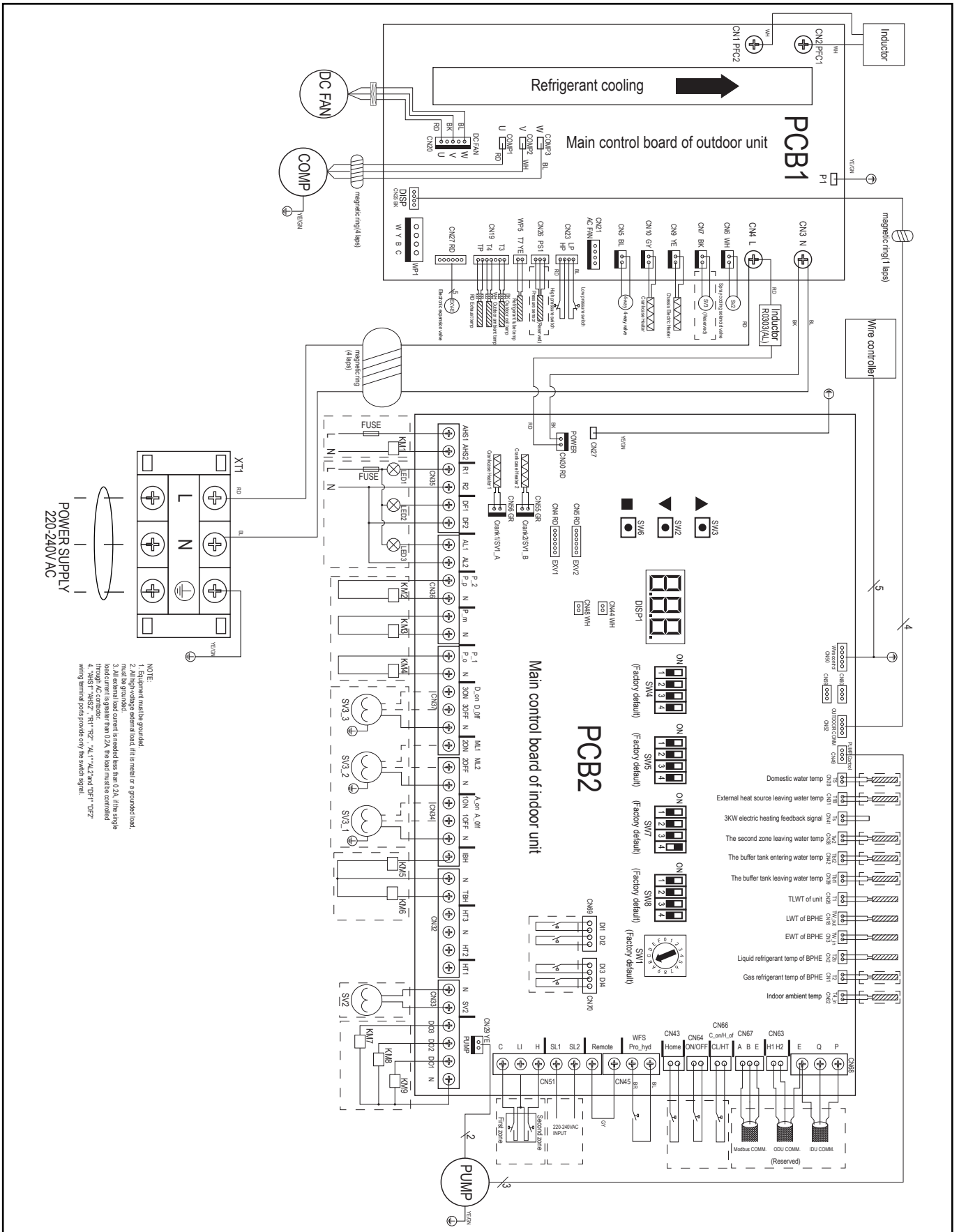
8 - ANNEX

8.4 - 12-16kW, three phase with Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



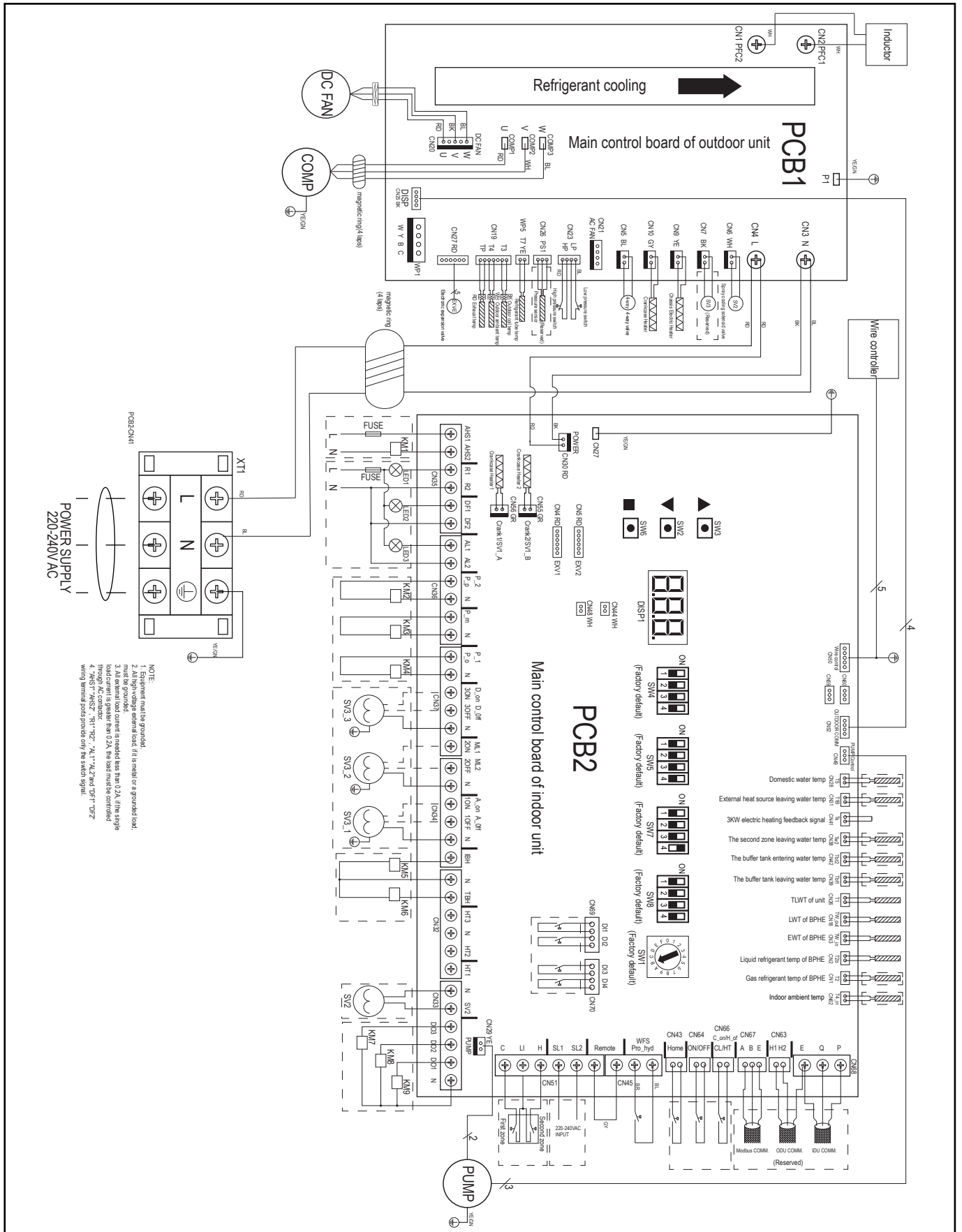
8 - ANNEX

8.5 - 4-6kW, single phase without Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



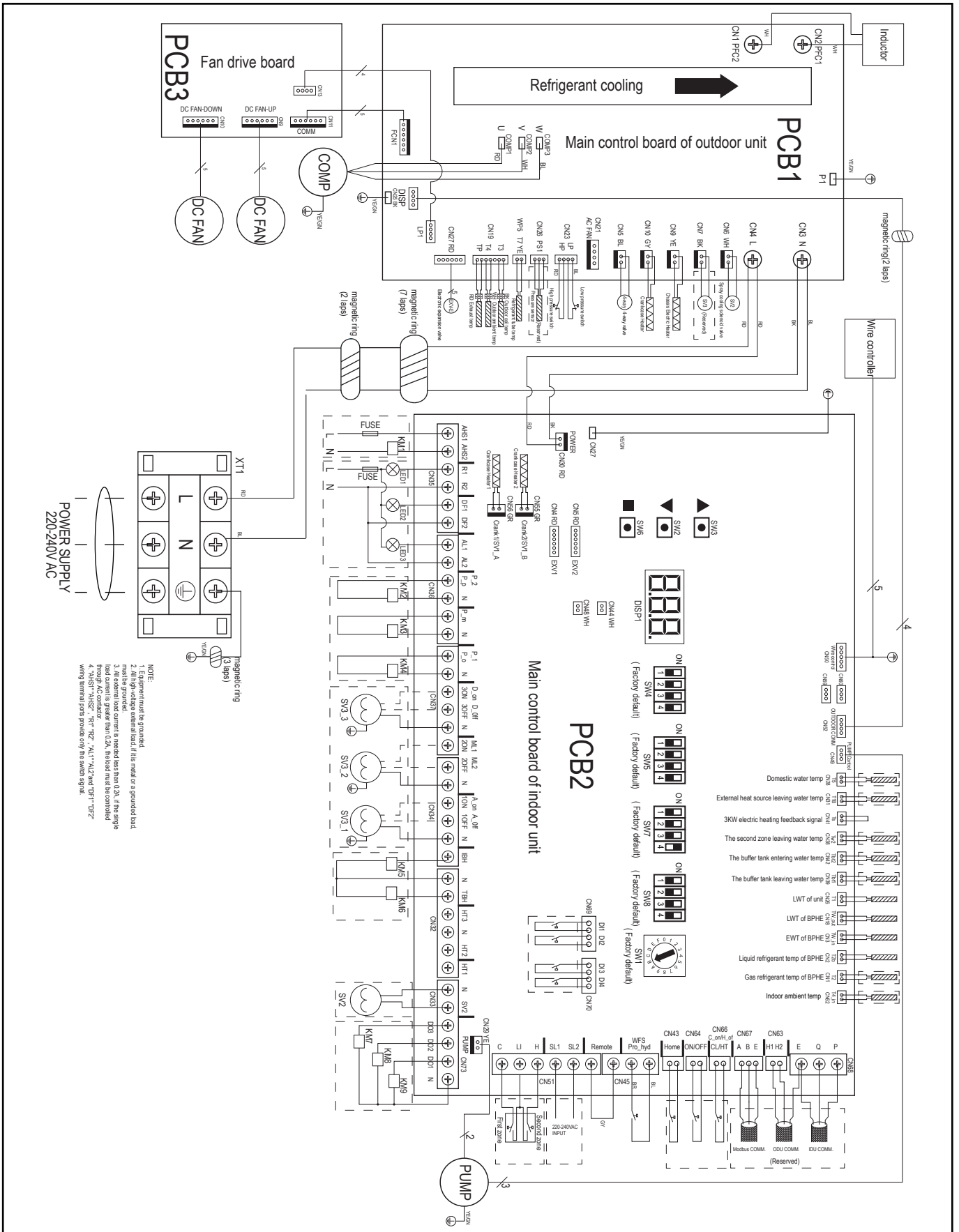
8 - ANNEX

8.6 - 8-10kW, single phase without Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



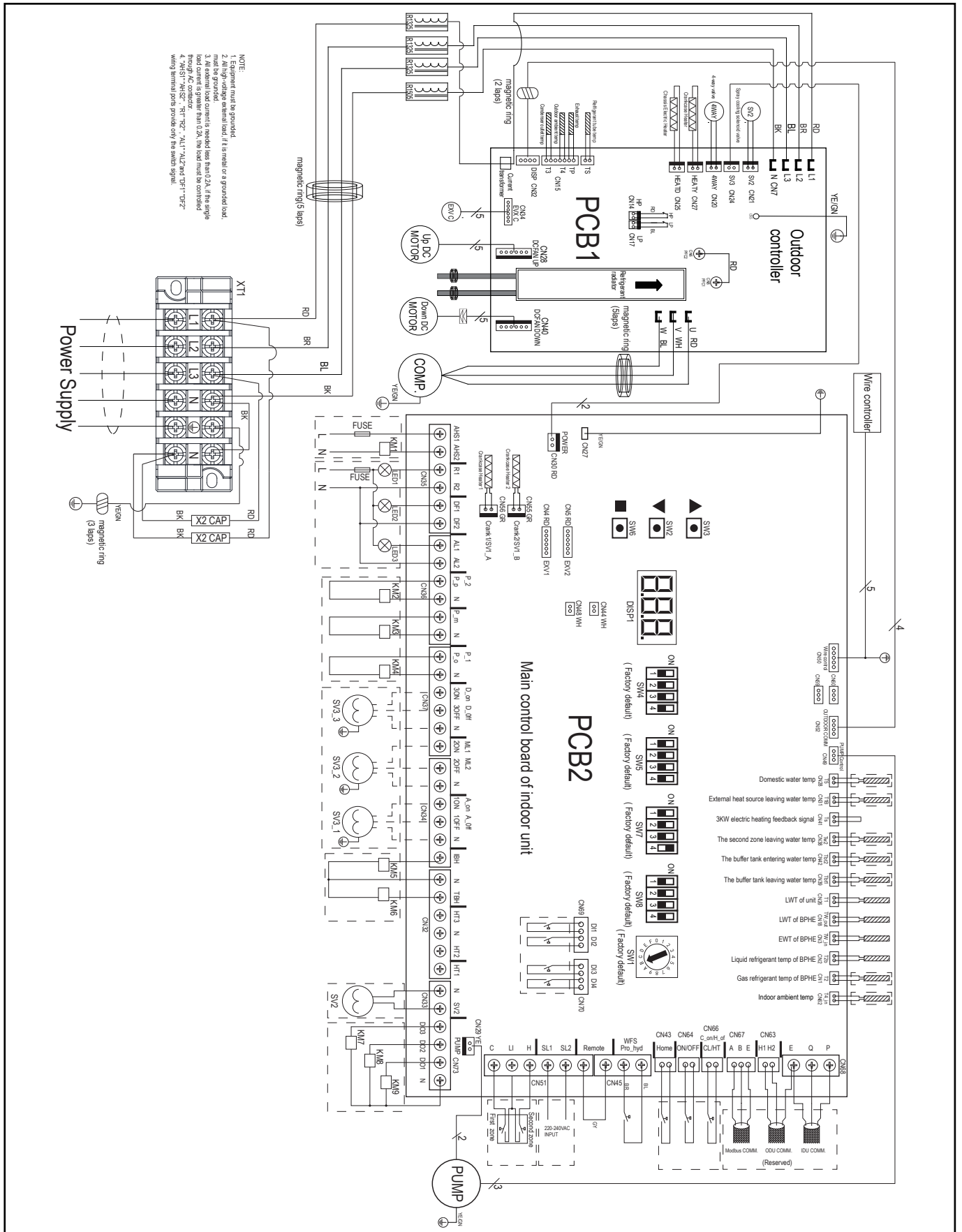
8 - ANNEX

8.7 - 12-16kW, single phase without Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



8 - ANNEX

8.8 - 12-16kW, three phase without Electrical heater component(For reference only , please refer to the wiring diagram on the unit)



8 - ANNEX

8.9 - Table for backup heaters and craft heaters

Configuration		Main water loop EHS	DHW EHS	Gas boiler	Anti-frozen craft heaters	Base-pan craft heater	Compressor craft heater
Back up function	0- Main water loop EHS + DHW EHS + boiler	✓	✓	✓	☉	☼	☼
	1- Main water loop EHS + DHW EHS	✓	✓	✗	☉	☼	☼
	2- DHW EHS + boiler	✗	✓	✓	☉	☼	☼
	3- Main water loop EHS + boiler	✓	✗	✓	☉	☼	☼
	4- DHW EHS only	✗	✓	✗	☉	☼	☼
	5- Boiler only	✗	✗	✓	☉	☼	☼
	6- Main water loop EHS only	✓	✗	✗	☉	☼	☼
7- Non back up	✗	✗	✗	☉	☼	☼	

NOTE:

Main water loop EHS: 3kw as standard in unit, can connect another two EHS in field

DHW EHS: can connect two EHS in field

Gas boiler: can connect to gas boiler and send the 220V start signal from unit

Anti-frozen craft heaters(2sets, 35W/25W): only for anti-frozen function

Base-pan craft heater(4-10kw: 150W; 12-16kw: 120W): Only for heating mode at low OAT

Compressor craft heater (35W): only for compressor pre-heat function

☉: mean will be on while anti-frozen function is active

☼: mean will be on while in heating mode at low OAT

☼: mean will be on while to pre-heat the compressor and oil

✓: means will be on according to control logic

✗: mean will be off always in any case

8.10- Modbus table

Default Baud Rate = 9600 Bauds, shall be configurable; Default Modbus Address = 11, shall be configurable; Modbus type = RTU; Frame type: shall be configurable (N,8,1)												
No.	GCHV Address (reading)	GCHV Address (writing)	Spec.	Note	R/W	Function code	Min	Max	Default	Unit	Conversion	
1	002CH	002CH	Setting mode	0 = Off 1 = Cool+DHW 2 = Heat+DHW 3 = Cool(only in GCHV) 4 = Heat(only in GCHV) 5 = DHW(only in GCHV)	RW	0x03 0x04 0x06 0x10	0	2		-		
2	002DH	N.A.	Running mode	0=Off 1 = Cool 2 = Heat 4 = DHW 7 = Defrost 20 = Home Anti-Freeze (In our logic, it is anti-frozen for unit protection, not to keep room in the certain temp.)	RO	0x03 0x04	0	20		-		
4	0209H	0209H	User Interface type	1=contacts, (ON/OFF; HOME/AWAY; MODE only available with dry contact) 2=Wired controller (ON/OFF; HOME/AWAY; MODE only available with wired controller)	RW	0x03 0x04 0x06 0x10	0	0		-		
5	0029H	0029H	Occupancy Mode	0=Away, 1=Sleep, 2=Home	RW	0x03 0x04 0x06 0x10	0	2		-		
6	0067H	N.A.	Normal/Eco Switch status	0=Normal, 1=Eco	RO	0x03 0x04	0	1		-		
7	0001H	N.A.	Outdoor Air Temperature	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
8	0002H	N.A.	Indoor Air Temperature	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
9	0003H	N.A.	Entering Water Temperature Tw-in	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
10	0004H	N.A.	Leaving Water Temperature T1	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
11	0005H	N.A.	Refrigerant Temperature T2B	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
13	000AH	N.A.	Discharge Temperature	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
14	000BH	N.A.	Air Exchanger Temperature T3	-40°C = Invalid	RO	0x03 0x04				1/10°C	Data=Temp*10	
17	0017H	N.A.	Actual Compressor Frequency		RO	0x03 0x04				1/10 Hz	Data=Freq*10	
18	0044H	N.A.	Frequency Reduction Mode - Night mode	0 = Frequency Reduction inactive 1 = Frequency Reduction active	RO	0x03 0x04	0	1	0	-		

8 - ANNEX

No.	GCHV Address (reading)	GCHV Address (writing)	Spec.	Note	R/W	Function code	Min	Max	Default	Unit	Conversion
20	0174H	N.A.	Compressor runtime		RO	0x03 0x04	0	65535		hours	
22	0176H	N.A.	Pump runtime		RO	0x03 0x04	0	65535		hours	
23	01A5H	01A5H	Occupied Heating Air Setpoint		RW	0x03 0x04 0x06 0x10	16°C	32°C	25°C	1/10°C	Data=Temp*10
24	01A6H	01A6H	Unoccupied Heating Air Setpoint offset		RW	0x03 0x04 0x06 0x10	-20 °C	0 °C	-4 °C	1/10 °C	Data=Temp*10
25	01A7H	01A7H	Economic Heating Air Setpoint offset		RW	0x03 0x04 0x06 0x10	-20 °C	0 °C	-2 °C	1/10 °C	Data=Temp*10
26	01A8H	01A8H	Occupied Cooling Air Setpoint		RW	0x03 0x04 0x06 0x10	16°C	32°C	25°C	1/10°C	Data=Temp*10
27	01A9H	01A9H	Unoccupied Cooling Air Setpoint offset		RW	0x03 0x04 0x06 0x10	0 °C	10 °C	4 °C	1/10 °C	Data=Temp*10
28	01AAH	01AAH	Economic Cooling Air Setpoint offset		RW	0x03 0x04 0x06 0x10	0 °C	10 °C	2 °C	1/10 °C	Data=Temp*10
29	0245H	0245H	Heating climatic curve selection	-1 = No Curve / Fixed Water Setpoint 0 = Custom Climatic Curve using Par.582 to Par.585 1 = Heating Climatic Curve #1 2 = Heating Climatic Curve #2 3 = Heating Climatic Curve #3 4 = Heating Climatic Curve #4 ... 12 = Heating Climatic Curve #12	RW	0x03 0x04 0x06 0x10	-1	12	-1	-	
30	0246H	0246H	Customized Heating Curve Min OAT		RW	0x03 0x04 0x06 0x10	-30°C	10°C		1/10°C	Data=Temp*10
31	0247H	0247H	Customized Heating Curve Max OAT		RW	0x03 0x04 0x06 0x10	10°C	30°C		1/10°C	Data=Temp*10
32	0248H	0248H	Customized Heating Curve Min LWT		RW	0x03 0x04 0x06 0x10	25°C	40°C		1/10°C	Data=Temp*10
33	0249H	0249H	Customized Heating Curve MaxLWT		RW	0x03 0x04 0x06 0x10	30°C	60°C		1/10°C	Data=Temp*10
34	024AH	024AH	Cooling climatic curve selection	-1 = No Curve / Fixed Water Setpoint 0 = Custom Climatic Curve using Par.587 to Par.590 1 = Cooling Climatic Curve #1 2 = Cooling Climatic Curve #2	RW	0x03 0x04 0x06 0x10	-1	2	-1	-	
35	024BH	024BH	Customized Cooling Curve Min OAT		RW	0x03 0x04 0x06 0x10	0°C	30°C		1/10°C	Data=Temp*10
36	024CH	024CH	Customized Cooling Curve Max OAT		RW	0x03 0x04 0x06 0x10	24°C	50°C		1/10°C	Data=Temp*10
37	024DH	024DH	Customized Cooling Curve Min LWT		RW	0x03 0x04 0x06 0x10	5°C	20°C		1/10°C	Data=Temp*10
38	024EH	024EH	Customized Cooling Curve MaxLWT		RW	0x03 0x04 0x06 0x10	5°C	20°C		1/10°C	Data=Temp*10
39	019CH	019CH	Heating Climatic Curve Max Setpoint Offset		RW	0x03 0x04 0x06 0x10	-5 °C	5 °C	0 °C	1/10 °C	Data=Temp*10
40	019DH	019DH	Cooling Climatic Curve Min Setpoint Offset		RW	0x03 0x04 0x06 0x10	-5 °C	5 °C	0 °C	1/10 °C	Data=Temp*10
41	0191H	0191H	Occupied Heating Water Setpoint		RW	0x03 0x04 0x06 0x10	25°C	63°C		1/10°C	Data=Temp*10
42	0192H	0192H	Unoccupied Heating Water Setpoint offset		RW	0x03 0x04 0x06 0x10	-20 °C	0 °C	-4 °C	1/10 °C	Data=Temp*10
43	0193H	0193H	Economic Heating Water Setpoint offset		RW	0x03 0x04 0x06 0x10	-20 °C	0 °C	-2 °C	1/10 °C	Data=Temp*10
44	0197H	0197H	Occupied Cooling Water Setpoint		RW	0x03 0x04 0x06 0x10	5°C	25°C		1/10°C	Data=Temp*10
45	0198H	0198H	Unoccupied Cooling Water Setpoint offset		RW	0x03 0x04 0x06 0x10	0 °C	10 °C	4 °C	1/10 °C	Data=Temp*10
46	0199H	0199H	Economic Cooling Water Setpoint offset		RW	0x03 0x04 0x06 0x10	0 °C	10 °C	2 °C	1/10 °C	Data=Temp*10
47	0055H	N.A.	Pump Speed		RO	0x03 0x04	0	100		-	
48	0033H	0033H	Water Control Point		RW	0x03 0x04 0x06 0x10	5°C	63°C		1/10°C	Data=Temp*10
49	0206H	0206H	Night Mode start time		RW	0x03 0x04 0x06 0x10	00:00	23:59	00:00	hh:mm	Data=(hh*256)+m m
50	0207H	0207H	Night Mode end time		RW	0x03 0x04 0x06 0x10	00:00	23:59	00:00	hh:mm	Data=(hh*256)+m m
51	0259H	0259H	Backup Type	0-inner EH+DHW EH+gas boiler 1-inner EH+DHW EH 2-DHW EH+gas boiler 3-inncer EH+gas boiler 4-DHW EH 5-gas boiler 6-inner EH 7-no auxiliary heater note: inner EH include EH1, EH2, EH3 for main water loop	RW	0x03 0x04 0x06 0x10	0	7		-	

8 - ANNEX

No.	GCHV Address (reading)	GCHV Address (writing)	Spec.	Note	R/W	Function code	Min	Max	Default	Unit	Conversion
52	025AH	025AH	Warmup Time		RW	0x03 0x04 0x06 0x10	0	60		min	
53	025BH	025BH	Booster Delta Temperature		RW	0x03 0x04 0x06 0x10	1 °C	20 °C		1/10 °C	Data=Temp*10
54	025CH	025CH	Booster OAT Threshold		RW	0x03 0x04 0x06 0x10	-20°C	15°C		1/10°C	Data=Temp*10
55	0202H	0202H	Minimum OAT for Heating (with compr.)		RW	0x03 0x04 0x06 0x10	-26°C	10°C		1/10°C	Data=Temp*10
56	0194H	0194H	DHW Type Normal Setpoint		RW	0x03 0x04 0x06 0x10	40°C	63°C		1/10°C	Data=Temp*10
57	0196H	0196H	Economic DHW Setpoint		RW	0x03 0x04 0x06 0x10	40°C	63°C		1/10°C	Data=Temp*10
58	02BFH	02BFH	DHW Priority	0=Automatic 1=Priority to DHW	RW	0x03 0x04 0x06 0x10	0	1		-	
59	02C7H	02C7H	DHW Scheduled days (bitmap)	b7=Monday, b6=Tuesday, ...	RW	0x03 0x04 0x06 0x10	000000 00	111111 10		-	bitfield
60	02C8H	02C8H	DHW Scheduled Starting Time		RW	0x03 0x04 0x06 0x10	00:00	23:59	00:00	hh:mm	Data=(hh*256)+m m
61	02C9H	02C9H	DHW Scheduled Stopping Time		RW	0x03 0x04 0x06 0x10	00:00	23:59	00:00	hh:mm	Data=(hh*256)+m m
62	00C9H	N.A.	DHW Mode	0=Eco 1=Anti-Legionella 2=Regular	RO	0x03 0x04				-	
63	00CEH	N.A.	DHW Tank Temperature		RO	0x03 0x04				1/10°C	Data=Temp*10
64	0195H	0195H	DHW Anti-legionella Setpoint		RW	0x03 0x04 0x06 0x10	60°C	70°C	60°C	1/10°C	Data=Temp*10
65	02CAH	02CAH	Anti-legionella Scheduled days (bitmap)	b7=Monday, b6=Tuesday, ...	RW	0x03 0x04 0x06 0x10	000000 00	111111 10		-	bitfield
66	02CBH	02CBH	Anti-legionella Scheduled Starting Time		RW	0x03 0x04 0x06 0x10	00:00	23:59	00:00	hh:mm	Data=(hh*256)+m m
67	01F6H	01F6H	Discrete Input #5 Type	0=disabled, 1=Power limitation(night mode), 2=Loadshed, 4=DHW Request, 5=DHW priority, 3 Anti-legionella request	RW	0x03 0x04 0x06 0x10	0	5	0	-	
68	01F7H	01F7H	Discrete Input #6 Type		RW	0x03 0x04 0x06 0x10					
69	01F8H	01F8H	Discrete Input #7 Type		RW	0x03 0x04 0x06 0x10					
70	01F9H	01F9H	Discrete Input #8 Type		RW	0x03 0x04 0x06 0x10					
71	01F4H	01F4H	Discrete Output #5 Type	0=disabled, 1=unit in alarm, 2=unit in standby, 3=unit running, 4=unit in cool mode, 5=unit in heat mode, 6=unit in DHW, 7=unit in defrost, 8= unit control by modbus	RW	0x03 0x04 0x06 0x10	0	8	0	-	
72	01FAH	01FAH	Discrete Output #8 Type		RW	0x03 0x04 0x06 0x10					
73	01FBH	01FBH	Discrete Output #9 Type		RW	0x03 0x04 0x06 0x10					
74	0069H	N.A.	Flow Switch Status	0=Opened, 1=Closed	RO	0x03 0x04	0	1		-	
75	006AH	N.A.	Discrete Input #5 Status	0=Opened, 1=Closed	RO	0x03 0x04	0	1		-	
76	006BH	N.A.	Discrete Input #6 Status	0=Opened, 1=Closed	RO	0x03 0x04	0	1		-	
77	006CH	N.A.	Discrete Input #7 Status	0=Opened, 1=Closed	RO	0x03 0x04	0	1		-	
78	006DH	N.A.	Discrete Input #8 Status	0=Opened, 1=Closed	RO	0x03 0x04	0	1		-	
79	0140H	0140H	Discrete Output #5 Force	0=Off, 1=On	RW	0x03 0x04 0x06 0x10	0	1		-	
80	0151H	0151H	Discrete Output #8 Force	0=Off, 1=On	RW	0x03 0x04 0x06 0x10	0	1		-	
81	0152H	0152H	Discrete Output #9 Force	0=Off, 1=On	RW	0x03 0x04 0x06 0x10	0	1		-	
83	00D2H	N.A.	DHW Valve status	0=Off, 1=On	RO	0x03 0x04	0	1		-	
107	1001H	N.A.	IDU side capacity demand		RO	0x03 0x04					
108	1002H	N.A.	Capacity demand after ODU rectify		RO	0x03 0x04					
109	1004H	N.A.	Actual capacity output		RO	0x03 0x04					
110	1005H	N.A.	Fan speed	0-8	RO	0x03 0x04	0	8		-	
111	1008H	N.A.	LWT after BPHE inside unit (Tw-out)		RO	0x03 0x04				1/10°C	Data=Temp*10
112	1012H	N.A.	EXV opening degree	Actual value=Display value *4	RO	0x03 0x04					
113	1013H	N.A.	IPM refrigerant cool pipe temp.		RO	0x03 0x04				1/10°C	Data=Temp*10
114	1014H	N.A.	AC current	Actual value=Display value *2	RO	0x03 0x04					
115	1015H	N.A.	DC current	Actual value=Display value *4	RO	0x03 0x04					
116	1016H	N.A.	AC voltage	Actual value=Display value	RO	0x03 0x04					
117	1017H	N.A.	DC voltage	Actual value=Display value /2	RO	0x03 0x04					

8 - ANNEX

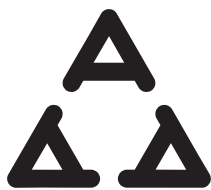
No.	GCHV Address (reading)	GCHV Address (writing)	Spec.	Note	R/W	Function code	Min	Max	Default	Unit	Conversion
118	1019H	N.A.	Compressor frequency limitation reason 1	0-non; 1-T3B limitation(ODU coil T); 2-T4 limitation; 4-T5 limitation; 8-Voltage limitation; 16-Current limitation; 32-T9 limitation; 64-Night mode limitation; 128-LWT limitation (if many reason occur at the same time, value=sum of all occur reason)	RO	0x03 0x04				-	
124	1025H	N.A.	Compressor frequency Limitation reason 2	0-non; 1-LWT&EWT tolerance limitation, 2-Heating SH3 limitation; 4-T4 lowest frequency limitation ; 8-Cooling T2B limitation	RO	0x03 0x04	0	1		-	
119	1020H	N.A.	Program version		RO	0x03 0x04				-	
120	1021H	N.A.	EEPROM version		RO	0x03 0x04				-	
121	1022H	N.A.	P6 error reason (IPM protection reason)	0x0A-IPM error;0x01-DC voltage too low protection; 0x02-DC voltage too high protection;0x04-MCE error/Synchronization/closed-loop; 0x05-Compressor speed fault; 0x07: Phase error; 0x08-Compressor speed changing fault; 0x09-Compressor speed uncorrect	RO	0x03 0x04				-	
122	1023H	N.A.	T9 IPM temp.		RO	0x03 0x04				1/10°C	Data=Temp*10
123	1024H	N.A.	T30 (Using for defrost logic calculation)		RO	0x03 0x04				1/10°C	Data=Temp*10
125	1026H	N.A.	Target discharged temp.		RO	0x03 0x04				1/10°C	Data=Temp*10
126	1027H	N.A.	ODU PCB CRCH	Hex	RO	0x03 0x04				-	
127	1028H	N.A.	ODU PCB CRCL	Hex	RO	0x03 0x04				-	
128	1029H	N.A.	IDU PCB CRCH	Hex	RO	0x03 0x04				-	
129	1030H	N.A.	IDU PCB CRCL	Hex	RO	0x03 0x04				-	
130	1031H	N.A.	Modbus baudrate		RO	0x03 0x04	9600	38400	9600	-	Data = Value / 100
131	1032H	N.A.	Modbus parity check	0: non 1: odd parity check 2: even parity check	RO	0x03 0x04	0	2		-	
132	1033H	N.A.	Modbus ID	ID: 1~255	RO	0x03 0x04	1	255	11	-	
133	1009H	N.A.	Alarm Bitmap #1	bit 0 = Alarm index 1 (water flow switch fail) bit 1 = Alarm index 2 (comm. fail between ODU and hydraulic side PCB) bit 2 = Alarm index 3 (LWT sensor after EH is fail) bit 3 = Alarm index 4 (refrigerant sensor of BPHE outlet fail--reserved)) bit 4 = Alarm index 5 (refrigerant sensor of BPHE inlet fail--reserved)) bit 5 = Alarm index 6 (ODU fail) bit 6 = Alarm index 7 (DHW tank sensor fail) bit 7 = Alarm index 8 (EWT of BPHE fail) bit 8 = Alarm index 9 (LWT of BPHE fail) bit 9 = Alarm index 10 (comm. fail between wired controller and PCB--reserved)) bit 10 = Alarm index 11 (Bi-zone sensor fail--when Bi-zone function is valid)) bit 11 = Alarm index 12 (LWT sensor fail of auxiliary heat --When auxiliary is valid)) bit 12 = Alarm index 13 (reserved) bit 13 = Alarm index 14 (reserved) bit 14 = Alarm index 15 (reserved) bit 15 = Alarm index 16 (reserved)	RO	0x03 0x04				bitfield	

8 - ANNEX

No.	GCHV Address (reading)	GCHV Address (writing)	Spec.	Note	R/W	Function code	Min	Max	Default	Unit	Conversion
134	100AH	N.A.	Alarm Bitmap #2	bit 0 = Alarm index 1 (reserved) bit 1 = Alarm index 2 (temp difference is too huge between ETW and LWT) bit 2 = Alarm index 3 (water flow rate shortage) bit 3 = Alarm index 4 (temp difference of WT and LWT abnormal) bit 4 = Alarm index 5 (reserved) bit 5 = Alarm index 6 (reserved) bit 6 = Alarm index 7 (EH FeedbackProtect) bit 7 = Alarm index 8 (reserved) bit 8 = Alarm index 9 (reserved) bit 9 = Alarm index 10 (reserved) bit 10 = Alarm index 11 (reserved) bit 11 = Alarm index 12 (reserved) bit 12 = Alarm index 13 (reserved) bit 13 = Alarm index 14 (reserved) bit 14 = Alarm index 15 (reserved) bit 15 = Alarm index 16 (reserved)	RO	0x03 0x04				bitfield	
135	100BH	N.A.	Alarm Bitmap #3	bit 0 = Alarm index 1 (condenser sensor fail) bit 1 = Alarm index 2 (discharged temp. sensor fail) bit 2 = Alarm index 3 (reserved) bit 3 = Alarm index 4 (high temp protection of BPHE outlet sensor for refrigerant) bit 4 = Alarm index 5 (P6 error 3 time in 30mins) bit 5 = Alarm index 6 (AC voltage abnormal) bit 6 = Alarm index 7 (OAT sensor fail) bit 7 = Alarm index 8 (over current protection) bit 8 = Alarm index 9 (IPM protection (P6)) bit 9 = Alarm index 10 (3 times high discharged temp protection in 100mins (H6)) bit 10 = Alarm index 11 (3 times IPM high temp. protection in 60mins (H12)) bit 11 = Alarm index 12 (EEPROM alarm (E10)) bit 12 = Alarm index 13 (High pressure protection (P1)) bit 13 = Alarm index 14 (3 time low pressure protection in 30mins (H5)) bit 14 = Alarm index 15 (2 times DC fan motor alarm in 10 mins (H9)) bit 15 = Alarm index 16 (condenser temp too high protection (P5))	RO	0x03 0x04				bitfield	
136	100CH	N.A.	Alarm Bitmap #4	bit 0 = Alarm index 1 (comm fail between IDU and ODU (E2) (reserved)) bit 1 = Alarm index 2 (ODU fan motor error (P9)) bit 2 = Alarm index 3 (IPM temp too high protection (Pb)) bit 3 = Alarm index 4 (IDU qty decrease--reserved (H7)) bit 4 = Alarm index 5 ((3 times over current protection in 60mins (H10)) bit 5 = Alarm index 6 (discharged sensor fail (P4)) bit 6 = Alarm index 7 (refrigerant cool pipe sensor fail (Ec)) bit 7 = Alarm index 8 (low pressure protection (P2))	RO	0x03 0x04				bitfield	

8 - ANNEX

No.	GCHV Address (reading)	GCHV Address (writing)	Spec.	Note	R/W	Function code	Min	Max	Default	Unit	Conversion
139	1006H	N.A.	Capacity of the unit	4 = 4 KW 6 = 6 KW 8 = 8 KW 10 = 10 KW 12 = 12 KW 14 = 14 KW 16 = 16 KW	RO	0x03 0x04					
140	100DH	100DH	Ambient temp. control/water temp. control	0: Water temp. control; 1: Ambient temp. control	RW	0x03 0x04 0x06 0x10					
141	100EH	N.A.	ODU output status	bit0-AC fan motor H port output bit1-AC fan motor L port output bit2-Compressor heater port output bit3-Chasis heater port output bit4-Power PTC output bit5-SV1 output bit6-4-way valve output bit7-SV2 output	RO	0x03 0x04					
142	100FH	N.A.	Required compressor frequency	Frequency*10	RO	0x03 0x04				1/10 Hz	Data=Freq*10
143	101AH	N.A.	Required fan speed of upper motor	Fan speed/10	RO	0x03 0x04					RPM/10
144	101BH	N.A.	Required fan speed of down motor	Fan speed/10	RO	0x03 0x04					RPM/10
145	101CH	N.A.	Required opening degree of EXV	Opening degree/4	RO	0x03 0x04					P/4
146	101DH	N.A.	Actual fan speed of upper motor	Fan speed/10	RO	0x03 0x04					RPM/10
147	101EH	N.A.	Actual fan speed of down motor	Fan speed/10	RO	0x03 0x04					RPM/10
148	101FH	N.A.	Outdoor unit input status	bit0-LP low pressure switch bit1-HP high pressure switch	RO	0x03 0x04					
149	102AH	N.A.	Water flow feedback from water pump	water flow*100	RO	0x03 0x04					m3/h * 100
159	0239H	0239H	Water Delta T Setpoint	Out of range value is invalid	RW	0x03 0x04 0x06 0x10	35	00:00	50		



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