WISAN-YSE1 NA

30.2

Manual for installation, use and maintenance

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Dear Customer,

We congratulate you on choosing these product

Clivet has been working for years to offer systems able to assure the maximum comfort for a long time with highly-reliable, efficient, high-quality and safe solutions.

The target of the company is to offer advanced systems, that assure the best comfort and reduce energy consumption as well as the installation and maintenance costs for the entire life-cycle of the system.

With this manual, we want to give you information that are useful for all phases: from reception, installation and use to disposal - so that such an advanced system can provide the best performances during installation and use.

Best regards and have a good read.

CLIVET Spa

Summary

1. Safety considerations

1.1 Safety

Operate in compliance with safety regulations in force.

To carry out the operations use protection devices:

gloves, goggles, helmet, headphones, protective knee pads.

All operations must be carried out by personnel trained on possible risks of a general nature, electrical and deriving from operating with equipment under pressure.

Consider that additional information on different procedures of installation, repair, maintenance is required to operate with flammable refrigerant.

The training of these procedures is carried out by national training organizations or manufacturers that are accredited to teach the relevant national competencies standard that may be set in legislation. The achieved competence should be documented by a certificate.

Only qualified personnel can operate on the unit, as required by the regulation in force.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowlodge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure the they do not play with the appliance.

1.2 Manual

The manual provides correct unit installation, use and maintenance.

It is advisable to read it carefully so you will save time during operations.

Follow the written indications so you will not cause damages to things and injuries people.

The manual must be delivered to the User.

1.3 Risk situations

The unit has been designed and created to prevent injures to people.

During designing it is not possible to plane and operate on all risk situation.

Read carefully “Residual risk” section where all situation which may cause damages to things and injuries to people are reported.

Installation, starting, maintenance and repair required specific knowledge; if they are carried out by inexperienced personnel, they may cause damages to things and injuries people.

1.4 Intended use

Use the unit only:

- for cooling/heating water or a water and glycol mix
- keep to the limits foreseen in the technical schedule and in this manual

The manufacturer accepts no responsibility if the equipment is used for any purpose other than the intended use.

1.5 Installation

▶ **Outdoor installation**

The positioning, hydraulic system, refrigerating, electrics and the ducting of the air must be determined by the system designer in accordance with local regulations in force.

Follow local safety regulations.

Verify that the electrical line characteristics are in compliance with data quotes on the unit serial number label.

1.6 Water main connection

If a potable water source is used for the equipment’s water supply, the source water supply should be protected against back siphonage by the equipment.

Consider that the unit is not intended to be operated for the production of domestic how water.

If the unit is used also for DHW production, a non-return valve is needed on water inlet of the DHW tank to avoid back-siphonage.

1.7 Maintenance

Read the relevant part of the manual before performing any work on the unit.

Plan periodic inspection and maintenance in order to avoid or reduce repairing costs.

Turn the unit off before any operation.

Maintenance should only be carried out following the manufacturer’s instructions.

Maintenance and repairt can be done only by trained personel with general competence on refrigeration systems and special competence concerning the use of flammable refrigerant.

1.8 Modification

All unit modifications will end the warranty coverage and the manufacturer responsibility.

1.9 Breakdown/Malfuction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

1.10 User training

The installer has to train the user on:

- Start-up/shutdown
- Set points change
- Standby mode
- Maintenance

- What to do / what not to do in case of breakdown

1.11 Data update

Continual product improvements may imply manual data changes.

Visit manufacturer web site for updated data.

1.12 Original instructions

The original instructions are written in Italian.

All other languages are translations of the original instructions.

2. Indications for the User

Keep this manual with the wiring diagram in an accessible place for the operator.

Note the unit data label so you can provide them to the assistance centre in case of intervention (see “Unit identification” section).

Provide a unit notebook that allows any interventions carried out on the unit to be noted and tracked making it easier to suitably note the various interventions and aids the search for any breakdowns.

2.1 Breakdown/Malfuction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

Use original spares parts only.

Using the unit in case of breakdown or malfunction:

- voids the warranty
- it may compromise the safety of the unit
- may increase time and repair costs

2.2 The installer must train the user, particularly on:

- Start-up/shutdown
- Set points change
- Standby mode
- Maintenance
- What to do / what not to do in case of breakdown

2.3 Unit indentification

The serial number label is positioned on the unit and allows to indentify all the unit features.

The type plate shows the indications foreseen by the standards, in particular:

- unit type
- serial number (22 characters)
- year of manufacture
- wiring diagram number
- electrical data
- type of refrigerant
- refrigerant charge
- manufacturer logo and address

The matriculation plate must never be removed.

2.4 Serial number

It identifies uniquely each unit.

It must be cited when ordering spare parts.

2.5 Assistance request

Note data from the serial number label and write them in the chart on side, so you will find them easily when needed.

Range
Size
Serial number
Year of production
Wiring diagram number

3. Information on refrigerant gas

WARNING

- **This product contains fluorinated greenhouse gases covered by the Kyoto protocol.**
- **Do not discharge gas into air.**
- **This product contains a flammable gas R32 (category A2L).**

The characteristics of the refrigerant are reported below:

Physical characteristics of the R32 refrigerant		
Safety class (ISO 817)	A2L	
GWP (Global Warming Potential)	675	t CO_2 eq, 100yr
LFL Low flammability limit	0,307	kg/m^3 @ T>30 °C
BV Burning velocity	6,7	cm/s
Normal boiling point	-52	°C
Self-ignition temperature	648	°C

Quantity of refrigerant charged at the factory and tons of equivalent CO_2:

Size	Refrigerant (Kg)	Ton. CO_2 eq.
30.2	11,4	7,70

NOTE

- **The refrigerant quantity is indicated on the unit plate**
- **Please consider that the refrigerant is odourless.**

4. Safety symbols on the unit's labels

This symbol shows that this appliance used a flammable refrigerant. If the refrigerant is leaked and exposed to an external ignition source there is risk of fire.

This symbol shows that the manual should be read carefully.

This symbol shos that only a competenct service personnel should be handling this equipment with reference to the technical manual.

This symbol shows that information is available such as the operating manual or installation manual.

5. Accessories supplied

T5	DHW tank temperature probe	1
Taf1	DHW tank antifreeze probe	1
TW	Outlet water probe	1
	Probe well	1
	Transformer for keypad power supply (input voltage: 187-253 V / 60 Hz)	1
	HMI wired controller with 10 m cable	1
	Installation and user manual	1
	Wiring diagram	1

▶ **Note: hydraulic connection fittings to the system are not supplied.**

6. R32 gas safety warnings

6.1 Area checks

Before working on systems containing flammable refrigerants, perform safety checks to reduce the risk of combustion to the minimum. Before performing any reparation operations on the cooling system, comply with the following warnings.

6.2 Work procedures

Operations must be performed following a controlled procedure so as to reduce the risk of flammable gases or vapours developing.

6.3 General work area

All the personnel in charge with maintenance operations and other operators working in the local area must be instructed and monitored as regards the nature of the intervention.

Avoid working in tight spaces. The area surrounding the working space must be cordoned off. Make sure the area is secured by monitoring the flammable material.

6.4 Check the presence of refrigerant

Both before and during operations, the area must be monitored with a dedicated refrigerant detector to make sure the technician is aware of the presence of potentially-flammable environments.

Make sure the leak detection equipment is suitable for use with flammable refrigerants and therefore without sparks, suitably sealed or intrinsically safe.

▶ **The refrigerant gas is odourless.**

6.5 Presence of the fire extinguisher

If hot interventions are not performed on cooling equipment or connected components, suitable fire fighting equipment must be kept at hand.

Keep a dry-powder or CO2 extinguisher near the loading area.

6.6 No ignition source

It is absolutely forbidden to use ignition sources that may lead to fire or explosion during operations on the cooling system or on pipes that contain or have contained flammable refrigerant.

All possible ignition sources, including cigarettes, must be kept sufficiently away from the installation, reparation, removal and disposal site as flammable refrigerant may be released in the surrounding area.

Before starting operations, the area surrounding the equipment must be inspected to guarantee the absence of flammables or combustion risks. “SMOKING IS FORBIDDEN” signs must be affixed.

Do not pierce or burn.

6.7 Ventilated area

Before intervening on the system or performing any hot intervention, make sure to be in an outdoor or suitably ventilated area.

Ventilation must be maintained during operations. Ventilation must disperse the released refrigerant safely, preferably outdoors in the atmosphere.

6.8 Cooling equipment checks

Should a replacement be necessary, the new components installed must be suitable for the purpose envisaged and compliant with specifications.

Always follow the manufacturer guidelines on maintenance and assistance. In case of doubt, contact the manufacturer technical office for assistance.

The following checks must be preformed on systems containing flammable refrigerants:

- the quantity of the charge must comply with the size of the room where the parts containing refrigerant are installed;
- the machine and ventilation intake function correctly and are not obstructed;
- If an indirect cooling circuit is used, the secondary circuits must be checked to verify the presence of refrigerants; the marking on the equipment remains visible and readable;
- make sure markings and symbols are always readable;
- cooling pipes or components must be installed in a position that makes improbable their exposure to substances that may corrode the components containing refrigerant, unless they are manufactured with material intrinsically resistant to corrosion or suitably protected against corrosion.

6.9 Electrical device checks

The reparation and maintenance of electric components must include initial safety checks and component inspection procedures.

In case of a fault that compromises safety, do not perform any electrical connection to the circuit until said fault is suitably resolved.

If it is not possible to repair the fault immediately and electrical components need to remain functioning, a temporary solution must be adopted. This must be reported to the owner of the equipment so as to keep all parties informed.

Initial safety checks must include:

- that capacitor are emptied. This operation must be performed safely to avoid any sparks:
- that electrical components and wiring are not exposed during the charging, recovering or venting phases;
- That the earth conductor is continuous

6.10 Operation

Do not use means to accelerate the defrost process or to clean the unit from icing.

6.11 Repairing sealed components

- Intrinsically safe components shall be replaced in case of failure. No maintenance is allowed on such components.

6.12 Reparation of intrinsically safe components

Intrinsically safe components shall be replaced in case of failure. No maintenance is allowed on such components.

6.13 Wires

Make sure wires are not subjected to wear, corrosion, excessive pressure or vibration, that there are no sharp edges and that they do not produce other negative effects on the environment. The inspection must also keep into consideration the effects of tine or the continuous vibration caused e.g. by compressors or fans.

6.14 Leak detection

Under no circumstance is it possible to use potential ignition sources to search or detect refrigerant leaks.

Do not use halide lights (or any other open flame detectors).

The following leak detection methods are considered acceptable for systems containing flammable refrigerants. Electronic leak detectors can be used to identify flammable refrigerants, although they do not present a suitable sensitivity level or require recalibration (detection equipment must be calibrated in an area free from refrigerants).

Check that the detector is not a possible source of ignition and that it is suitable for the refrigerant. Leak detection equipment must always be set to an LFL percentage and calibrated depending on the refrigerant used, so the correct gas percentage (25% max) must be verified.

Leak detection fluids are suitable for most refrigerants, although using detergents containing chlorine should be avoided as this substance may react with the refrigerant and corrode copper pipes.

If a leak is suspected, all open flames must be removed or switched off.

If a leak is identified that requires brazing, all the refrigerant must be recovered from the system or isolated (using interception valves) in a section of the system far away from the leak. The circuit must be filled with oxygen-free nitrogen (OFN) before and during the brazing process.

6.15 Removal and evacuation

When intervening on the cooling circuit to perform repair work or any other type of work, always follow the normal procedure. However, considering the risk of flammability, we recommend following the best practices. Comply with the following procedure:

- remove the refrigerant in accordance with local and national regulations;
- evacuate;
- purge the circuit with inert gas;
- purge again with inert gas inerte and flush the circuit with inert gas during brazing process;
- start brazing.

The refrigerant charge must be collected in suitable recovery tanks. To make the unit safe, flushing with Oxygen-free-Nitrogen must be performed. This procedure may have to be repeated multiple times. Do not use compressed air or oxygen for this operation.

Flushing is obtained interrupting the system vacuum with OFN and filling until the operating pressure is obtained, then releasing into the atmosphere and restoring the vacuum. This process must be repeated until there is no trace of refrigerant in the system.

When using the final OFN charge, the system must be vented to the atmospheric pressure to allow the intervention. This step is essential to perform brazing operations on the pipes.

Make sure that the vacuum pump supply is not near to any ignition sources and that there is suitable ventilation.

6.16 Charging operations

In addition to conventional charging operations, the following requirements must be complied with:

- When using charging equipment, make sure that the various refrigerants are not contaminated. Flexible tubes or conduits must be as short as possible to reduce to the minimum the quantity of refrigerant contained.
- Cylinders must be kept upright in an appropriate position in compliance with the relevant operating instructions.
- Before loading the system with refrigerant, check that the cooling system is earthed.
- Label the system when fully charged (unless already labelled).
- Make sure not to fill the cooling system excessively.
- Before recharging the system, the pressure must be tested with OFN. A leak test must be performed after the charging operations but before start-up. Before leaving the site, perform a leak test.

6.17 Dismantling

Before performing this procedure, it is essential that the technician has become familiar with the equipment and the relative details.

We recommend employing good practices for a safe recovery of the refrigerants.

Before performing the operation, take a sample of oil and refrigerant should an analysis be necessary before reusing the regenerated refrigerant. Before performing the operation, check the availability of electricity.

- Become familiar with the equipment and how it functions.
- Electrically isolate the system.

Before attempting the procedure, check that:

- The mechanical manipulation equipment is available, if necessary, to handle refrigerant tanks;
- All the personal protection equipment is available and employed correctly;

- The recovery procedure is monitored at all times by skilled personnel;
- The recovery equipment and tanks comply with suitable standards.
- If possible, pump the cooling system.
- If it is not possible to obtain a vacuum, make sure that a collector removes the refrigerant from various parts of the system.
- Before proceeding with the recovery, check that the tank is located on the scales.
- Start up the recovery machine and use it following the instructions by the manufacturer.
- Do not fill the tanks excessively. (Do not exceed 80% of the liquid volume).
- Do not exceed the tank's maximum operating pressure, not even momentarily.
- Once the tanks are filled correctly and the process is over, make sure that the tanks and equipment are immediately removed from the site and that all insulation valves on the equipment are closed.
- The refrigerant recovered must not be loaded into another cooling system unless it has been cleaned and checked.

6.18 Labelling

Equipment must be labelled reporting the dismantling and emptying of the refrigerant.

Labels must be dated and signed.

Make sure all the equipment is labelled and reporting the presence of flammable refrigerant.

6.19 Recovery

When removing the refrigerant from the system, please adopt good practices to remove all refrigerants safely in case of both assistance or decommissioning operations.

When transferring the refrigerant into the tanks, make sure only suitable tanks are used to recover the refrigerant.

Make sure enough tanks are used.

All the tanks to be used are designated for the recovered refrigerant and are labelled for that specific refrigerant (e.g. special tanks for refrigerant collection.

Tanks must be equipped with a perfectly-functioning safety valve and relative interception valves.

Empty recovery tanks are evacuated and, if possible, cooled before recovery.

Recovery equipment must be perfectly functioning with the respective instruction booklets at hand and they must be suitable to recover flammable refrigerants. Please contact the manufacturer in case of doubt.

A calibrated and perfectly-functioning scale must also be available.

Drain pipes and their fittings must also be in excellent condition and leak-free. Before using the recovery machine, make sure it is in good condition, maintained and that all associated electrical components are sealed to avoid combustion in case of a refrigerant leak. Please contact the manufacturer in case of doubt.

The refrigerant must be recovered in compliance with local and national regulations in a suitable cylinder and delivered with a completed waste transfer note.

Do not mix the refrigerants in the recovery units nor in the tanks.

If it is necessary to remove compressors or compressor oils, make sure they are evacuated to an acceptable level to make sure no trace is left of the flammable refrigerant inside the lubricant. The evacuation process must be performed before taking the compressors back to the suppliers.

The electric heater or external heating sources must not be used to accelerate this process.

Operations to discharge the oil from the system must be performed in full safety.

6.20 Transport, mark, storage and disposal

1 Transport of equipment containing flammable refrigerants.
Transport must be in compliance with local and national transport regulations. Attention is drawn to the fact that these may differ if flammable refrigerants are used. Please also carefully consider the maximum number of units that can be shipped together, again in compliance with applicable local and national regulations.

2 Equipment marking with symbols.
Symbols and labels on the unit and at the installation site are generally required to comply with local and national regulations and meet minimum safety requirements for people and property. All these labels must be kept and personnel involved in the installation/maintenance/disposal/recovery operations must be trained to understand the meanings of all safety labels and what they entail.

3 Disposal of equipment using flammable refrigerants.
Disposal of equipment must be in compliance with national regulations

4 Storage of equipment/devices.

5 The storage of the appliance should be in accordance with the applicable regulations or instructions, whichever is more stringent.

6 The equipment must be stored in compliance with the instructions provided by the manufacturer.

7 Storing packed (unsold) equipment.
Packing must be performed in such a way that mechanical damage to the equipment inside it does not cause refrigerant leaks. The maximum number of elements that can be stored together is determined by local regulations.

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

9 The appliance shall be stored so as to prevent mechanical damage from occurring.

7. Before installation

7.1 Reception

You have to check before accepting the delivery:

- That the unit hasn't been damaged during transport
- That the materials delivered correspond with that indicated on the transport document comparing the data with the identification label positioned on the packaging.

In case of damage or anomaly:

- Write down on the transport document the damage you found and quote this sentence: "Conditional acceptance clear evidence of deficiencies/damages during transport"
- Contact by fax and registered mail with advice of receipt to supplier and the carrier.
- After receiving the unit, please check wether the model, specification and quantity of the equipment are consistent with the order contract.
- Verify after unpacking of the unit that the accessories supplied with the unit are consistent with what is reported in this manual.
- In case of problems, please contact your local supplier or the original manufacturer.

WARNING

- **Any disputes must be made within 8 days from the date of the delivery. Complaints after this period are invalid.**

7.2 Storage

Observe external packaging instructions.

In particolar:

minimum ambient temperature	(A)	-22 °F
maximum ambient temperature	(B)	140 °F
maximum relative humidity	(C)	95%

Failure to comply with the above conditions can lead to:

a) possible components damages

b) possible safety valve opening

c) possible damages to electrical components

ⓘ When the unit is configured with a pump on it, the minimum ambient temperature is -4 °F.

WARNING

- **The unit may not be tilted more than 15° during transport.**
- **Do not store the unit near heat sources or in direct sunlight.**
- **Do not keep flame sources, high temperature equipment or pressurised gas tanks near the unit during storage/standby or during operation; this is necessary to avoid personal injury caused by high temperatures.**

7.3 Packaging removing

Be careful not to damage the unit.

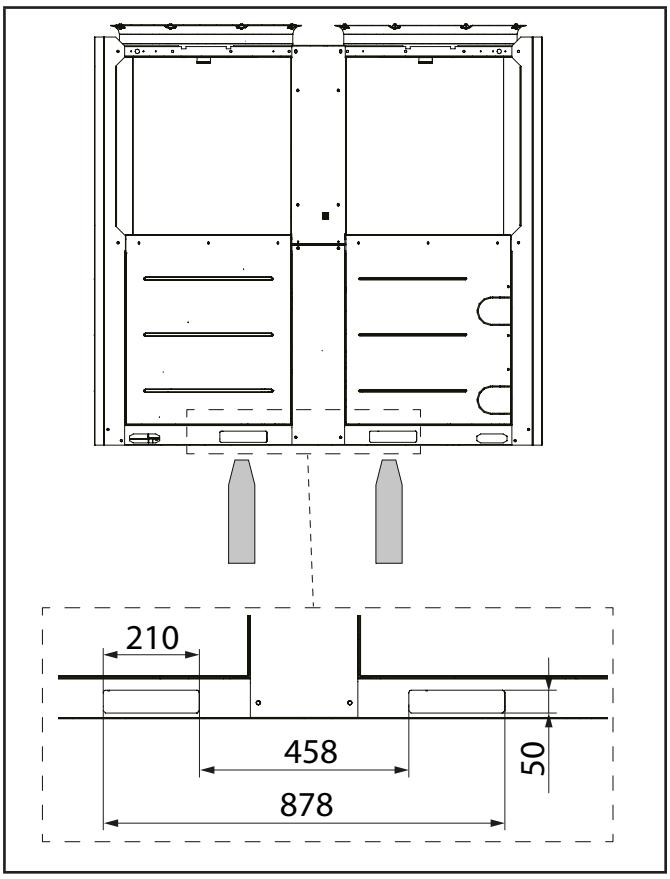
Recycle and dispose of the packaging material in conformity with local regulations.

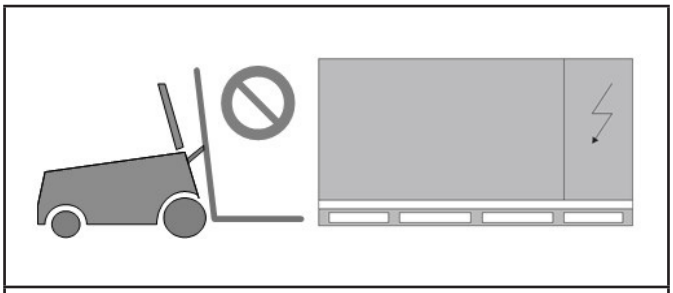
Safely dispose of packing materials in a way that exclude any chance of injury.

7.4 Handling

ATTENTION

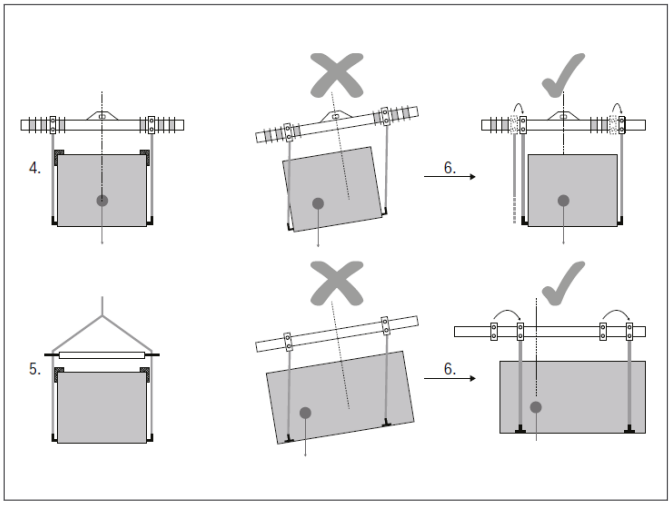
- **Check that all handling equipment complies with local safety regulations (cran, forklifts, ropes, hooks, etc.).**
- **Provide personnel with personal protective equipment appropriate for the situation, such as hard hat, gloves, safety shoes, etc.**
- **Observe all safety procedures in order to guarantee the safety of the personnel present and the of material.**
- **Check the unit weight and lifting equipment capacity. Refer to the TECHNICAL DATA chapter.**
- **It's stricly forbidden to stand under the machine when it is hoisted.**
- **The unit may not be tilted more than 15° during transport.**



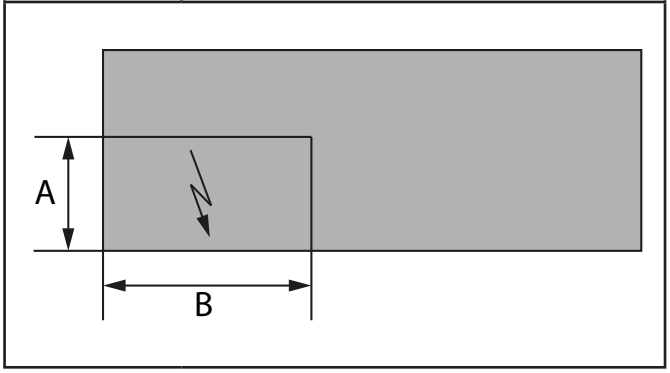


Do not lift from the short side

1 Identify critical points during handling (disconnected routes, flights, steps, doors
2 Protect the unit properly to prevent damage
3 Lifting with balance
4 Lifting with spacer bar
5 Align the barycenter to the lifting point
   - Gradually bring the lifting belts under tension, making sure they are positioned correctly
   - Before starting the handling, make sure that the unit is stable.



Barycentre	
	30.2
A (mm)	515
B (mm)	1077



8. Selecting the installation site

8.1 General

Installation must be in accordance with local regulations.

Do not install the unit by yourself. Only trained people with the approval of the original manufacturer or its distributor can perform the installation. Improper installation could result in water leakage, electric shocks , or fire.

During positioning consider these elements:

- customer approval
- unit weight and bearing point capacity
- safe accessible position
- functional spaces
- spaces for the air intake/exhaust
- Electrical connections
- max. distance allowed by the electrical connections
- Water connections
- noise requirements of the site

8.2 Maximum altitude of the installation

ATTENTION

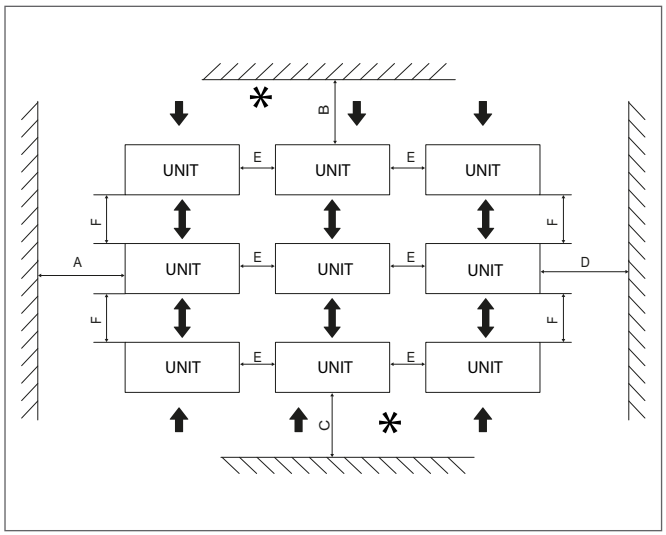
- ▶ **The maximum altitude allowed for installation is 2000 m.**
- ▶ **Keep in mind that, as the altitude increases, due to the rarefaction of air, the unit's permissible operating range can be significantly reduced.**

8.3 Functional spaces

Functional spaces are designed to:

- guarantee good unit operation
- carry out maintenance operations
- protect authorized operators and exposed people

For multiple unit installation the minimum distances reported below should be respected to allow a good operation of each single unit of the system:



✱ Air inlet

Functional spaces			
A	≥1500	**E**	≥800
B	≥1500	**F**	≥1100
C	≥1500	**G**	≥3000
D	≥1500		

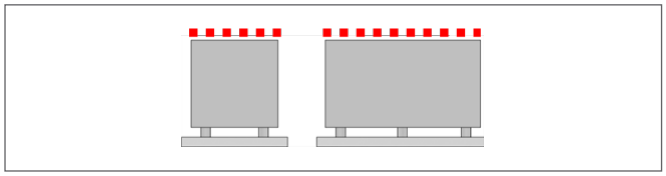
ATTENTION

- ▶ **Respect all functional spaces indicated in the DIMENSIONS section.**
- ▶ **Do not smoke or use open flames within this area**

8.4 Positioning

ATTENTION

- ▶ **Do not go up to the surface**
- ▶ **Do not place heavy loads.**



Units are designed to be installed:

- in fixed positions
- level
- on solid structures

Put the unit in a position where any leaking gas cannot enter buildings or stagnate in closed areas. In the latter case, observe the rules for machinery rooms (ventilation, leak detection, etc.).

Choose the installation place according to the following criteria:

- avoid installations in places subject to flooding
- do not install in vehicles or on ships.
- do not install where the grid is not sufficiently stable (unless the necessary corrective actions are implemented to stabilise the power supply).
- do not install in areas with high salt concentrations where corrosion could be excessive and reduce the lifecycle of the unit.
- avoid places close to combustion system exhausts where fumes or deposits can accelerate the corrosion processes of copper coils and pipes.
- do not install where there is other flammable material in suspension or near areas where other flammable substances are permanently or temporarily present.
- do not install where acid or alkaline, or more generally corrosive vapours are present, as may be the case in industrial areas with particular neighbouring processes.
- do not install in areas where there are mineral oil vapours or sprays, which can deteriorate plastics and lead to water leaks from hydraulic seals or similar problems in other parts of the unit.
- do not install in areas where there are other devices that emit electromagnetic waves which may disturb the control of the unit, causing it to malfunction, or which, due to their functionality, may be disturbed by the electromagnetic waves generated by the unit, causing it to malfunction prematurely.
- install the unit raised off the ground (at least 200 mm to ensure sufficient space for installation of the piping to protect against snow and flooding).
- bearing points aligned and leveled
- discharged condensation water must not cause harm/ danger to people and property
- snow build-up must not obstruct the coils or weigh too heavily on the unit
- for installation in which high wind speeds is expected. corrective measurements should be taken like fence, persians, walls. Also in such a case functional spaces should be respected.

Limit vibration transmission:

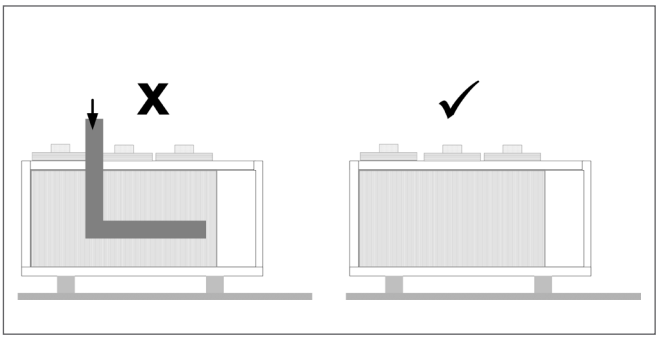
- use anti-vibration devices or neoprene strips on the unit support points
- evaluate the requirements of anti-vibration mounts basing on the characteristic of the roof/steel-frame/ foundation.
- install flexible joints on the hydraulic and aeraulic connections

Protect the unit with suitable fence in order to avoid access to unauthorised personnel (children, vandals, etc.)

8.5 Air flow-rate on the coils

ATTENTION

▶ **The air flow on the coils must not be obstructed.**



A correct circulation of the air is mandatory to guarantee the good unit operating.

Avoid therefore:

- obstacles to the airflow
- difficulty of exchange
- leaves or other foreign bodies that can obstruct the air coil
- winds that hinder or favour the airflow
- heat or pollution sources close to the unit (chimneys, extractors etc..)
- stratification (cold air that stagnates at the bottom)
- recirculation (expelled air that is sucked in again)
- incorrect positioning, close to very high walls, attics or in angles that could give rise to stratification or recirculation phenomenons

Ignoring the previous indications could:

- reduce energy efficiency
- alarm lockout due to HIGH PRESSURE (in summer) or LOW PRESSURE (in winter)

8.6 Condensate water

When a heat pump is running it produces a considerable amount of water due to the defrosting cycles of the external coil.

The condensate must be disposed in order to avoid damages to people and things.

In particular the drainage should ensure that condensate is directed away from roadways and footpaths, especially in locations where the climate is such that condensate may freeze.

The unit could be configured with water tray and heaters integrated to simplify the installation.

8.7 Installation of the anti-vibration mounts

Antivibration mounts are not supplied with the unit and can be purchased by the original manufacturer or by a third-party after a proper design that consider unit characteristics and weight distribution and relevant requirements and geometry of the installation.

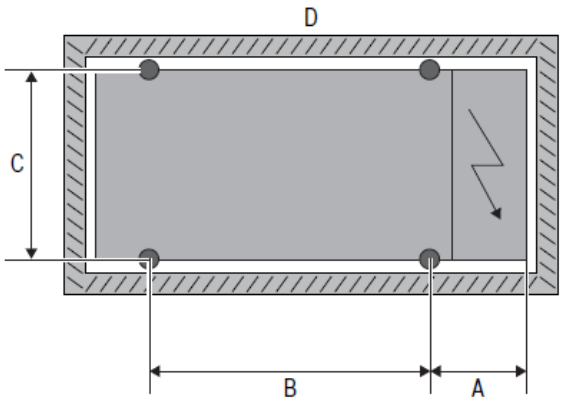
Place the anti-vibration mounts between the unit and the installation base.

Use the holes on the unit frame (15 mm diameter).

NOTE

- **If spring anti-vibration mounts are installed, the total height of the unit increases**

Supporting points	
	30.2
A (mm)	1550
B (mm)	51
C (mm)	860



8.8 Water safety valve

The drain pipe connected to the safety valve must be installed in a continuous downward direction to a suitable drain and protected from frost.

Valve discharge diameter: 0 1/2” F threaded

8.9 Anti-vibration mount kit

Option

30.2	
PE	**PEUS0000**
W1	MHS-160
W2	MHS-160
W3	MHS-160
W4	MHS-160

9. Water connections

9.1 Hydraulic system

- **Failure to comply with the installation requirements for water system may result in equipment damages, not covered by the warranty.**
- **Consider that the relevant installation regulations should be followed when there is the heat pump hydraulic connection to the plant.**
- **The pipelines should be free from any impurity.**

The piping must be designed and manufactured to limit pressure drops as much as possible, i.e. optimise performance of the system.

Keep the following parameters to a minimum:

- overall length
- number of bends
- number of vertical changes of direction

They should also be insulated to reduce heat losses and to avoid any condensate generation during the operation in cooling mode.

The condensate can accelerate galvanic corrosion of the pipes and reduce plant pipes lifetime.

The plant pipes should be connected with respect of inlet and outlet.

To connect the unit to the plant in the reverse way will decrease the performances and generate limitation of the available operative range.

The pipes should be easy to be removed and disassemble for maintenance and cleaining, as well as for inspection of the brazed plate heat exchanger status.

Extrernal pipes should be supported independently from the unit without creating additional weights and forces on the unit.

All the lowest positions in the water system should be provided with water drainage port to drain the water completely from the unit and the system during storage period.

All the higher position of the plant should be equipped with air vent in order to be able to have an effective and quick air venting during the preliminary activities that comes before the commissioning.

Don't run the system before to have an effective air removal from the system. Discharge valve and vent port should be also under heat preservation to facilitate maintenance.

To facilitate maintenance the inlet and outlet pipes should be equipped with thermometer and manometer that are not equipped on the unit and should be part of the plant layout.

Flexible connections between unit and system piping should be used to reduce vibrations transmitted between the unit and the system.

To facilitate maintenance, it is advisable to install shut-off valves at the connection point between the unit and the system.

By-pass pipes and valves must be mounted before the unit hydraulic connection to facilitate the cleaning procedures of the plant, and as extraordinary activity of the unit.

In particular during plant washing it's important to isolate the unit from the cleaning circuit to prevent the dirty to be accumulated on the heat exchanger.

The piping of the plant should be protected from physical damage in operation and service both by human activities and environmental effects and be in compliance with national and local codes and standards such as ASHRAE 15, IAPMO Uniform Code, ICC International Code or CSA B52. All field joints shall be accessible for inspection prior to be covered or enclosed.

Piping should be made considering the expansion and contraction due to thermal expansion of metal, and should be designed with particular attention to protect them against corrosion with resistant coatings applied on their external surface before to apply any thermal insulation.

9.2 Water quality

The water quality must be checked by qualified personnel.

Water with inadequate characteristics can cause:

- pressure drop increase
- reduces energy efficiency
- increased corrosion potential

Water features:

- within the limits indicated by table

Provide a water treatment system if values fall outside the limits.

9.3 Cleanliness

Before connecting the water to the unit, clean the system thoroughly with specific products effective to remove residues or impurities that may affect functioning. Existing systems must be free from sludge and contaminants and protected against build-ups.

9.4 New systems

In case of new installations, it is essential to wash the entire installation (with the circulator uninstalled) before commissioning the central installation. This removes residues of the installation process (welding, waste, joint products...).

The system must then be filled with clean high-quality tap water.

9.5 Existing systems

If a new unit is installed on an existing system, the system must be rinsed to avoid the presence of particles, sludge and waste.

The system must be drained before installing the new unit.

Dirt can be removed only with a suitable water flow.

Particular attention must also be paid to “blind spots” where a lot of dirt can accumulate due to the reduced water flow.

If, after rinsing, the quality of the water is still unsuitable, a few measures must be taken to avoid problems.

An option to remove pollutants is to install a filter.

ATTENTION

- **The warranty does not cover damages caused by limestone formations, deposits and impurities from the water supply and/or from failure to clean the systems.**
- **Water quality is crucial to ensure the normal and reliable operation of the equipment, otherwise it may cause damage to the unit, reduced its lifespan, decrease rapidly its performances. Therefore it’s necessary to ensure that the water quality meets the requirements of equipment use.**
- **Perform a water analysis at the commissioning of each plant to prevent problems related to water quality.**

Water component for corrosion limit on Copper	
pH (25°C)	7 ÷ 8
Cl_2	≤ 1.0 ppm
SO_4^{2-}	≤ 70 ppm
NH_3	≤ 2 ppm
Hardness	4 ÷ 8.5 dH
H_2S	≤ 0.05 ppm
H_2	≤ 0.5 ppm
HCO_3^-	≤ 70 ppm
CO_2	≤ 5 ppm
Chlorine	SS304

9.6 Risk of freezing

If the unit or the relative water connections are subject to temperatures close to 0°C:

- mix water with glycol, or
- safeguard the pipes with heating cables placed under the insulation, or
- empty the system in cases of long non-use
- Remove the water from the flow-switch where some unit can be trapped.
- It's responsability of the user to enable low water temperature production and to set a target temperature that is coherent to the glycol content of the system.

Note that the unit loses its frost protection in the event of a power failure.

Furthermore, it should be considered that a water flow is required to ensure frost protection. The flow-rate must be kept within the limits also during the standby period.

The output control of an external inverter water pump by the unit is possible through the connection of 0-10 V signal to CN108 of the expansion slave board.

The output control of an external inverter water pump by the unit is possible through the connection of 0-10 V signal to CN108 of the expansion slave board.

The contact give only the start/stop signal.

External pumps should be powered inependently from main power supply to the unit. If the power is taken from the unit and connected to CN 16 (208-230V/3ph/60hz) of AC filter board and the 10 A limif of the connection is overcome by the maximum load of the pump installed.

Please consider that damages caused by freezing is not covered by the warranty if the anti-freeze specification reported in this operation manual are not followed.

9.7 Anti-freeze solution

The use of an anti-freeze solution results in an increase in pressure drop.

Make sure that the glycol type utilized is inhibited (not corrosive) and compatible with the water circuit components.

Do not use different glicol mixture (i.e. ethylene with propylene).

ATTENTION

- **The unit must always be protected against frost. Otherwise, irreversible damage may occur.**
- **Let's consider that typically low qantitiy of glycol can lead to too accelerated corrosion of the plant. Take in consideration glycol datasheet specifications and respect their limits**

% GLYCOL ETHYLENE / PROPYLENE BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°C	-2	-3.9	-6.5	-8.9	-11.8	-15.6	-19.0	-23.4	-27.8	-32.7
Safety temperature	°C	3	1	-1	-4	-6	-10	-14	-19	-23.8	-29.4

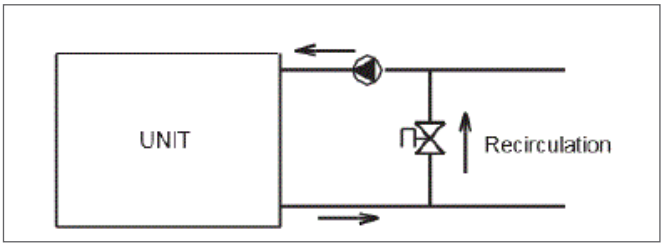
9.8 Water flow-rate

The design water-flow must be:

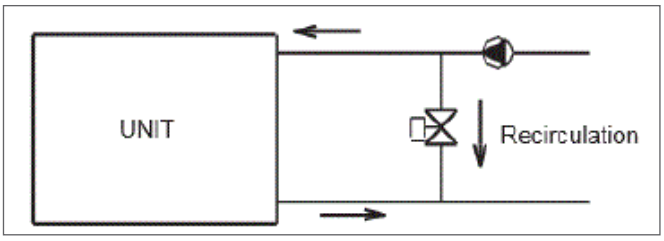
- within the limits indicated in the table of this paragraph of the operation manual.
- guaranteed, also with variable system conditions (for example in systems where some circuits are bypassed in particular situations).

Size	Description	Water flow-rate (gpm)	
		Min.	Max.
30.2	Outlet at normal temperature (S1-2=OFF)	38,12	57.08
	Outlet at high temperature (S1-2=ON)	17,62	57.08

If the system capacity is below the minimum flow, bypass the system as indicated in the diagram.



If the system capacity exceeds the minimum flow, bypass the system as indicated in the diagram.



Consider that in order to achieve 149 °F (65 °C) a temperature difference of 18 °F (7,8 °C) should be ensured between inlet and outlet. If the above requirements are not met, the outlet water temperature cannot reach 149 °F (65 °C) target and maximum water outlet temperature should be reduced to prevent unit alarms and ensure smooth operation of the unit.

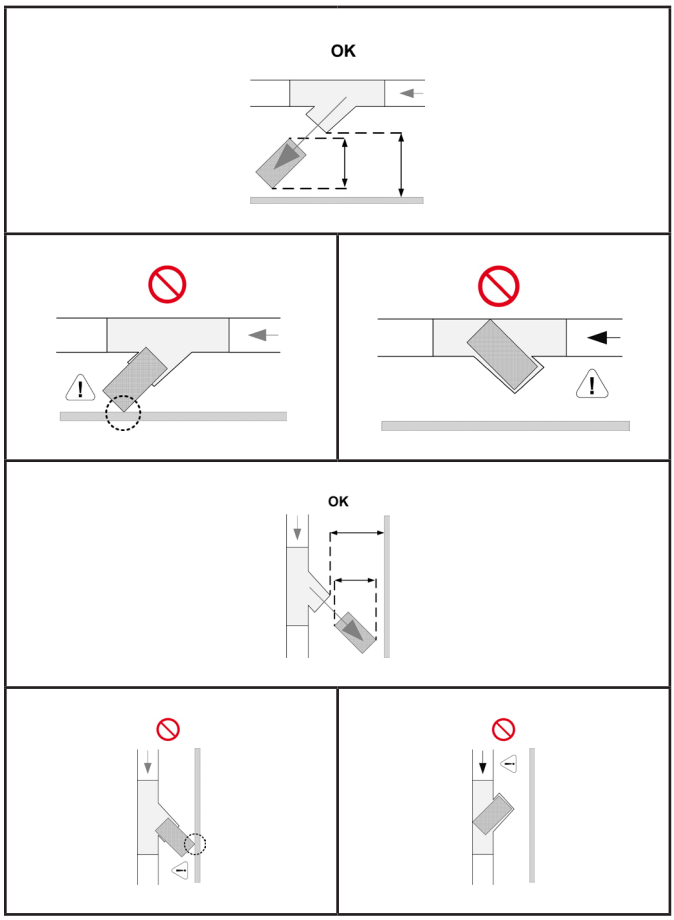
9.9 Minimum system water content

Minimum system water volumes are described within chapter TECHNICAL DATA and they have to be satisfied for a proper functioning of the unit.

9.10 Water Y filter

Must be installed immediately in the water input of the unit, in a position that is easily accessible for cleaning.

The aim of the filter is to protect the heat exchanger from being damaged or to accumulate dirty and to protect water flow switch that is sensitive to impurities. It can also protect all the other water components of the system like valves, water meters, pumps, ecc..



The filter must have a mesh size that prevents the inlet of particles.

More specifically, it must have a minimum requirement of less than 20 mesh holes per inch and be positioned at the inlet as close as possible to the opening to prevent dirt from entering the unit's brazed plate heat exchanger.

Please consider also water filter pressure drop in the design of the pump of the system.

Consider that a too small mesh will result in good filtering but high pressure drop and high frequence of intervention to remove the dirty from the filter blocked.

A regular maintenance of the filter is needed to prevent its blocking and to remove definitively dirty from the system.

The optimum maintenance plan really often consists in an increase intervention frequency in the first months after commissioning.

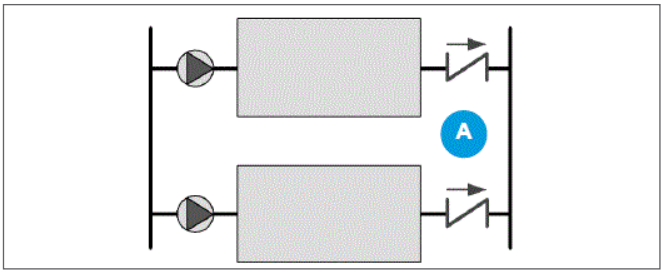
Plan these regular maintenance in advance.

ATTENTION

▶ **The filter never should be removed, this operation invalidates the guaranty.**

9.11 Non-return valve

Provide for the installation of non-return valves (A) in the case of several units connected in parallel.



9.12 Selection of the water tank

The role of the inertial tank is to avoid frequent start-ups and stops of the unit under low load conditions, ensuring smooth operation and longer unit lifecycle. Furthermore, the high volumes ensure stable operation of the unit close to the required setpoint even during defrosting, where the cycle is reversed and the supply water is cooled by the circuit. The high water capacity also ensures more stable system operation during transient phases of rapid load changes, avoiding unnecessary unit start-up and shutdown cycles.

Adequate water system capacity is a prerequisite for reliable unit operation. When the water system capacity is insufficient, an additional water tank must be provided to meet the minimum water capacity requirements for unit operation.

When multiple unit are used in the system and the units are configured to operate in M/S, to define the capacity requirement of the system basing on the total capacity of the system.

9.13 Selection of external water pump

The external water pumps should be run by the unit. The unit can run both on/off and inverter driven pumps. In both cases the power supply of the pump should be independent from the power of the unit.

If the unit is purchased without inverter pump onboard (option HYGU1VI), at least an external pump should be part of the system.

The unit can run on-off pump through CN123 port. An external contactor and an independent power supply of the pump is needed and it is not part of the supplied unit.

The unit can run inverter pump through CN108 port that guarantee a 0-10 V signal for an external inverter. A linking cable should be connected to the control cabinet that run the variable speed pump in such cases.

Independent protections are needed to protect the pump load.

Consider that in order to achieve 149 °F (65 °C) a temperature difference of 18 °F (7,8 °C) should be ensured between inlet and outlet. If the above requirements are not met, the outlet water temperature cannot reach 149 °F (65 °C) target and maximum water outlet temperature should be reduced to prevent unit alarms and ensure smooth operation of the unit.

ATTENTION

- **Care should be used to protect the pump from rain, sun and frost risk with protection measures to guarantee stable operation and long life.**
- **The installation should consider also the vibration of the pump to damper them avoiding failures in the operation.**

In case of high reliability systems, to use at least a standby pump is strongly suggested. However the unit can run only one pumps and if standby pump is needed, additional systems for this operation are needed.

The selected pump should guarantee in all the possible water plant configuration to stay within water flowrate limits.

If the head of the pump cannot meet the requirements, more pumps in series can the used to increase the head at the given flowrate. Additional systems for this operation are needed on plant side.

If the head of the pump cannot meet the requirements, more pumps in series can the used to increase the head at the given flowrate. Additional systems for this operation are needed on plant side.

Also in such cases, please consider that the unit interface is only given by CN123 for on-off pump and CN108 for inverter pump. Additional control devices are required to run such hydraulic systems.

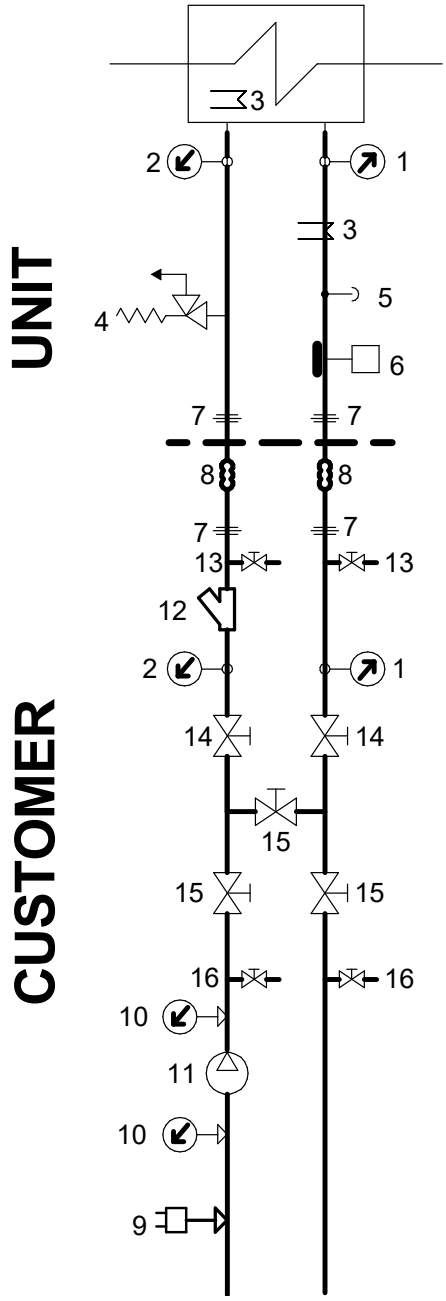
9.14 Hydronic units and connection diagrams recommended

The installer must define:

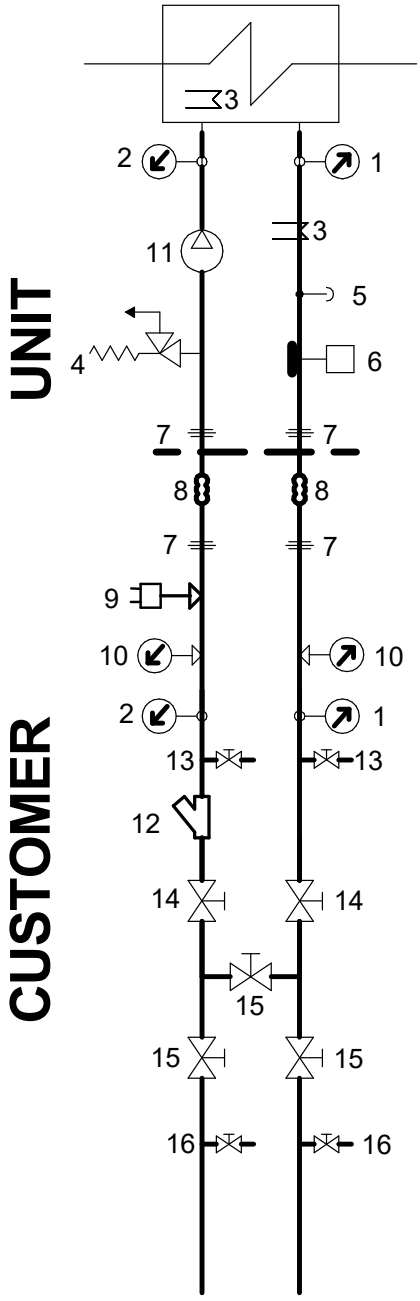
- type of components
- position in the system

See diagrams on the next pages.

9.15 Standard unit



9.16 Unit + pump



1 unit supply temperature sensor
2 unit return temperature sensor
3 Antifreeze heater
4 safety valve
5 deaereator
6 flow switch
7 pipe fixing brackets
8 flexible joints
9 system load pressure switch
10 pressure gauge
11 circulating pumps
12 Y filter
13 hydraulic connections for unit cleaning
14 unit shut-off valves
15 during operation
16 bypass shut-off valves kit for system cleaning
17 hydraulic connections for system cleaning

Note.
The diagrams indicated above are purely indicative of the necessary system components.
It is not certain that the components are placed in all the configurations in the order shown.

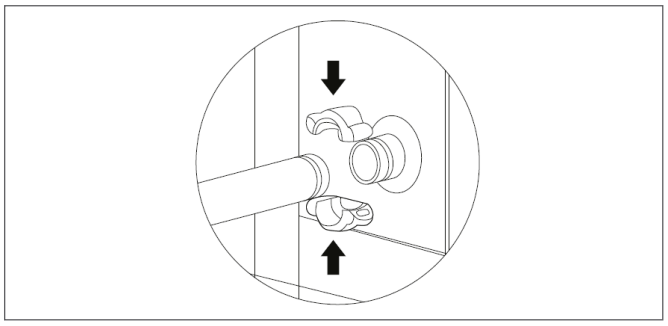
9.17 Victaulic fittings

The water inlet and outlet piping must be installed and connected as shown in the figure below, using victaulic connections.

The water connection pipes are 2".

Do not weld the system pipe with the Victaulic connection joint attached.

The rubber gaskets might be irreparably damaged



9.18 Operation sequence

Before starting the unit pump:

1. Close all vent valves in the high points of the unit hydraulic circuit
2. Close all drain shut-off valves in the low points of the unit's water circuit
   exchangers
   pumps
   collectors
   storage tanks
3. Carefully wash the system with clean water: fill and drain the system several times.
4. use the bypass to exclude the exchanger from the flow (diagram on the previous page)
5. fill and empty the system multiple times.
6. Apply additives to prevent corrosion, fouling, formation of mud and algae.
7. Fill the plant
8. Vent the system without using the unit pump, then do not use the unit pump and vent the system , then close all the vent valves.
9. Execute leakage test.
10. Isolate the pipes to avoid heat dispersions and formation of condensate.
    Leave various service points free (wells, vents, etc).

ATTENTION

- **Neglecting the washing will lead to several filter cleaning interventions and at worst cases can cause damages to the exchangers and the other parts.**

9.19 Unit in modular configuration

See specific chapter at the end of the manual.

9.20 Possible system diagrams

For the hydraulic plant scheme allowed make reference to the Technical bulletin of the series.

10. Electrical connections

The characteristics of the electrical lines must be determined by qualified electrica personnel able to design electrical installations; moreover, the lines must be in conformity with regulations in force.

The connected fixed wiring must be equipped with a dedicated overvoltage category III all-pole switching devices with at least 3 mm contact separation.

Such device should be part of the electrical installation, not supplied onboard.

Keep the switch as far away as possible from the unit as it can be a source of ignition.

Set differential current switch protective devices according to the requirements of national technical standards about electrical equipment without exceeding 30 mA in its rating.

Incorrect earthing may cause electrical shocks or fire.

Do not connect earthing wires to water and gas pipes and lightening conductors or communication earth wires.

Check that the devices mentioned above are correctly installed and coherent with the unit electrical data.

Consider also the specifications of the power supply wire in the checklist before the power supply.

Insufficient capacity or improper electrical construction can cause electrical shock or fire.

If the installation doesn't fit the above requirements, it's prohibited to power on the unit until the non conformities are rectified.

After completing all the wirings conduct carefull check their tightness and that their are protected from water and other adverse external forces before the power supply to the unit.

Incomplete connection or improper use may cause electrical shoks or fire.

Please read carefully all the labels reported on the electrical cabinet before to make any activities.

The protection devices of the unit power line must be able to stop all short circuit current, the value must be determined in accordance with system features.

The power cables and the protection cable section must be defined in accordance with the characteristics of the protections adopted.

The power wire and earthing wire must be fast up by suitable tools and must be connected to suitable terminals.

The unit should be placed far from the lightening arrester and earthing wires of the unit should be dedicated to the unit only.

It's advisable to use 3-core shielded cables for the main power connection to minimize interference.

Power wires should be run far from televisions and radio devices to prevent interference or noise.

All field supplier wiring must comply with NEC and applicable codes.

Only use electrical component as specified by the original manufacturer or its distributors.

If wiring connections doesn't conform to electrical installation specification, it may cause many troubles like failure on components with major damages.

Please don't repair components by yourself

Contact always the maintenance center of the distributor or original manufacturer, since improper repair may cause electrical shock or other component failures.

If the power supply cord is damaged it must be substituted before the power on.

All electrical operations should be performed by trained personnel having the necessary qualifications required by the regulations in force and being informed about the risks relevant to these activities.

Operate in compliance with safety regulations in force.

10.1 Electrical data

The serial number label reports the unit specific electrical data, included any electrical accessories.

The electrical data indicated in the technical bulletin and in the manual refer to the standard unit, accessories excluded.

The type plate shows the indications foreseen by the standards, in particular:

Power supply characteristic: 208-230/3~/60

MCA

MOP

RIC of compressors

FLA of pump and fans

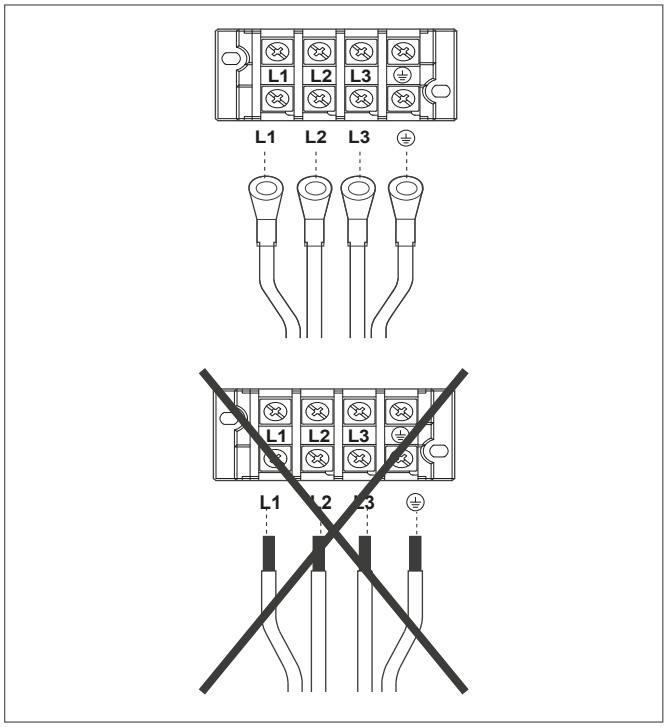
SCCR

FLA and hp of the most significant unit loads

Electrical wiringdiagram Nr.

10.2 Connections

Please use round-type terminal for cables and check that the cable specifications fits with the power supply characteristics.



ⓘ The hole of the cable eyelet should be at 8 mm.

1 Refer to the unit electrical diagram (the number of the diagram is shown on the serial number label).

2 Verify that the electrical supply has characteristics conforming to the data shown on the serial number label.

3 Before starting work, ensure the unit is isolated, unable to be turned on and a safety sign used.

4 Ensure correct earth connection.

5 Ensure cables are suitably protected.

6 Prevent dust, insects or rodents from entering the electrical panel as they can damage components and cables.

7 Use the special holes on the bottom of the frame for the power line inlet. Seal any residual openings to prevent noise from escaping the compressors compartment.

8 Fix the cables: if vacated, they may be subject to tearing.

9 Verify that cables in the control box terminals are not with loose connection. Tighten the weak connection in such cases.

10 The cables must not touch the compressor and the refrigerant piping (they reach high temperatures).

11 Do not drill holes in the electrical panel.

12 Alternatively, restore the IP rating with watertight systems and verify the correct protection with a dedicated test.

13 Before power the unit, make sure that all the protections that were removed during the electrical connection work have been restored.

10.3 Power supply network requirements

1 The short circuit capacity of the line must be less than 5 kA

2 Voltage characteristics 208-230/3~/60

3 Phase unbalance < 2%

4 Harmonic distortion less than 12% (THDv<12%)

5 Voltage interruptions lasting no longer than 3ms and with at least 1 s between each one

6 Voltage dips not exceeding 20% of the RMS value, lasting no longer than a single period (50Hz) and with at least 1 s between each dip.

7 Earth cable with minimum section at least equal to the section of the supply conductors but still complying with the following table:

Nominal unit current	Minimum section of protection conductor AWG (mm^2)	
Amps	A	B
	Earth protection conductor AWG (mm^2)	Protection conductor AWG (mm^2)
Nominal current <= 10 A	18 (0,82)	20 (0,85)
10 A <= Nominal current <= 13 A	16 (1,31)	18 (0,82)
13 A <= Nominal current <= 18 A	14 (2,08)	16 (1,31)
18 A <= Nominal current <= 25 A	12 (3,31)	14 (2,08)
25 A <= Nominal current <= 30 A	10 (5,26)	12 (3,31)
30 A <= Nominal current <= 40 A	8 (8,36)	10 (5,26)
40 A <= Nominal current <= 55 A	6 (13,29)	8 (8,36)
55 A <= Nominal current <= 70 A	4 (21,14)	6 (13,29)
Nominal current > = 70 A	2 (33,61)	4 (21,14)

* Note:

- When installing the unit in TT systems, it may be necessary to have a differential protection if the short circuit impedance value is high. The disconnection device must have a trip that can ensure a contact voltage of no more than 50 V (AC).

10.4 Signals / data lines

Do not exceed the maximum power allowed, which varies, according to the type of signal.

Lay the cables far from power cables or cables having a different voltage and that are able to emit electromagnetic disturbances.

Do not lay the cable near devices which can generate electromagnetic interferences.

Do not lay the cables parallel to other cables, cable crossings are possible, only if laid at 90°.

If the cables are necessarily parallel keep at least 300 mm distance below 10 A and 500 mm below 50 A of nominal current of the power line.

The type of cable must be suitable for RS-485 serial data communication.

A 3-pole shielded bus cable is required.

Any other type of wires may produce a signal interference that will cause the units to malfunction.

The data transmission bus cable must be verified according to the type of installation in which it will be placed and must comply with local standards.

The bus cable must comply with non-prescribed local electrical standards (e.g. insulation, voltages, flame propagation, etc.).

The cable shield must be grounded at a single point free from disturbances.

The shielding nets at both ends of the shielded wire must be earted. Alternatively the shielded nets of all shielded wires are interconnected together and then to earth through one metal plate.

In order to ensure correct communication, the earth connection of the shield can also be configured differently depending on the area and the types of interference.

Inside the unit, do not secure power cables to pipe-work (pipes can become very hot during operation).

Allowed topology: daisy-chain (enter and exit).

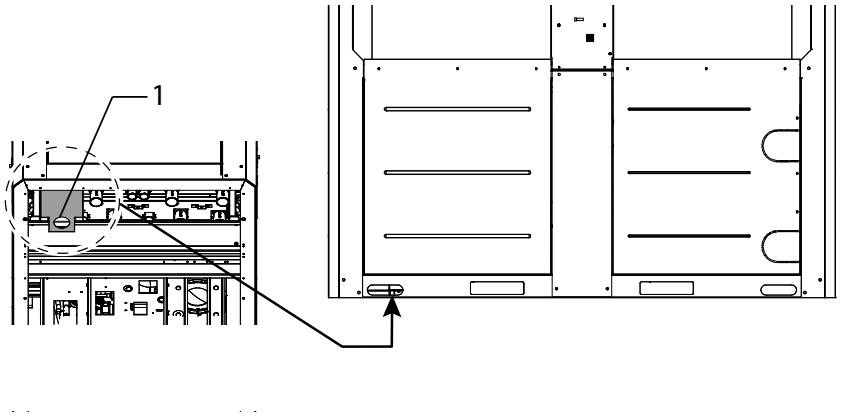
Other types such as "ring" or "star" are not allowed.

Do not use cable lugs on the communication bus.

Pay attention to the polarity of the control wire during wiring operations.

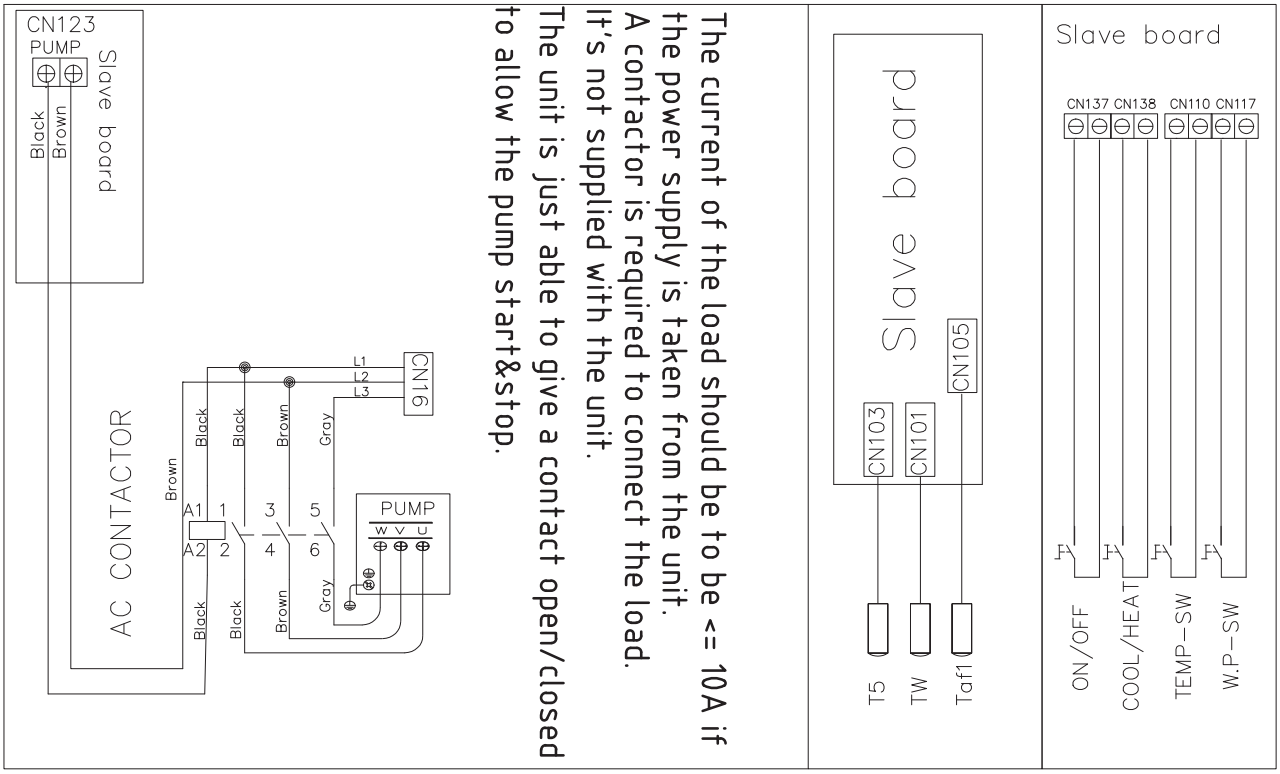
Do not bind control wire on refrigerant or water pipings.

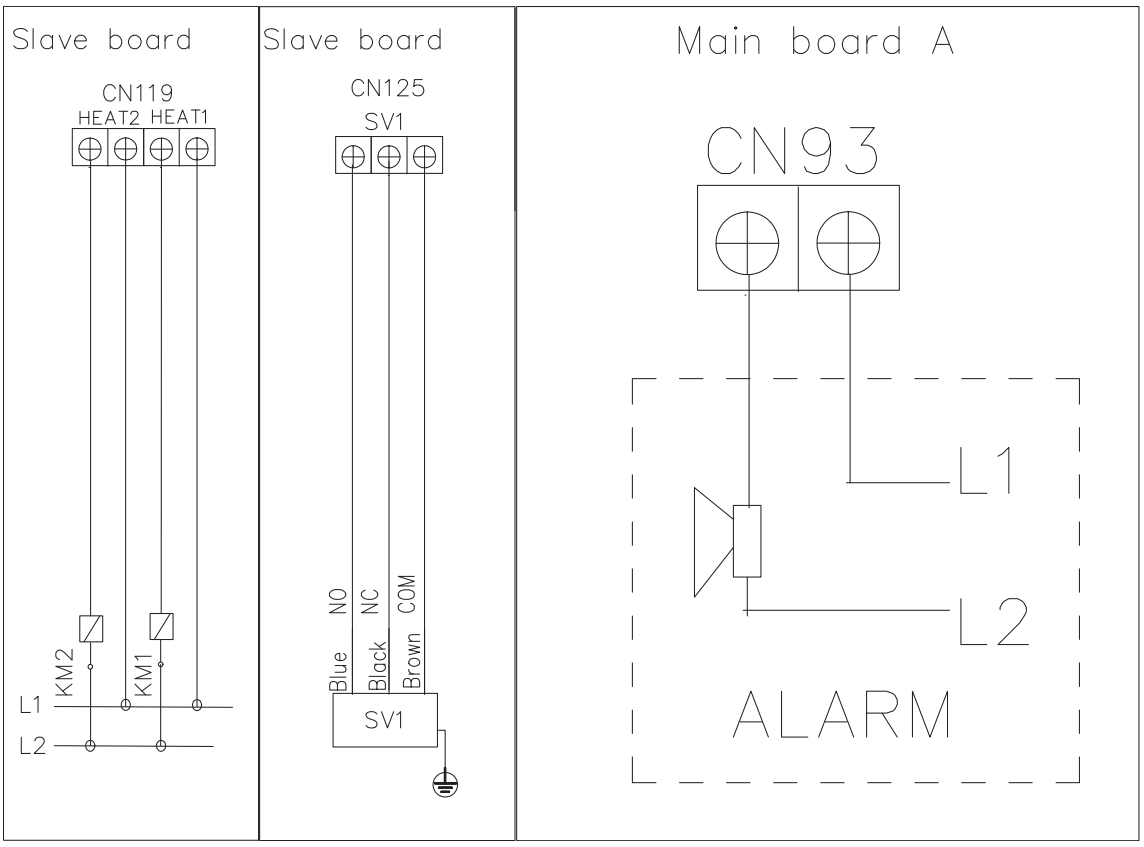
10.5 Controller wiring sections

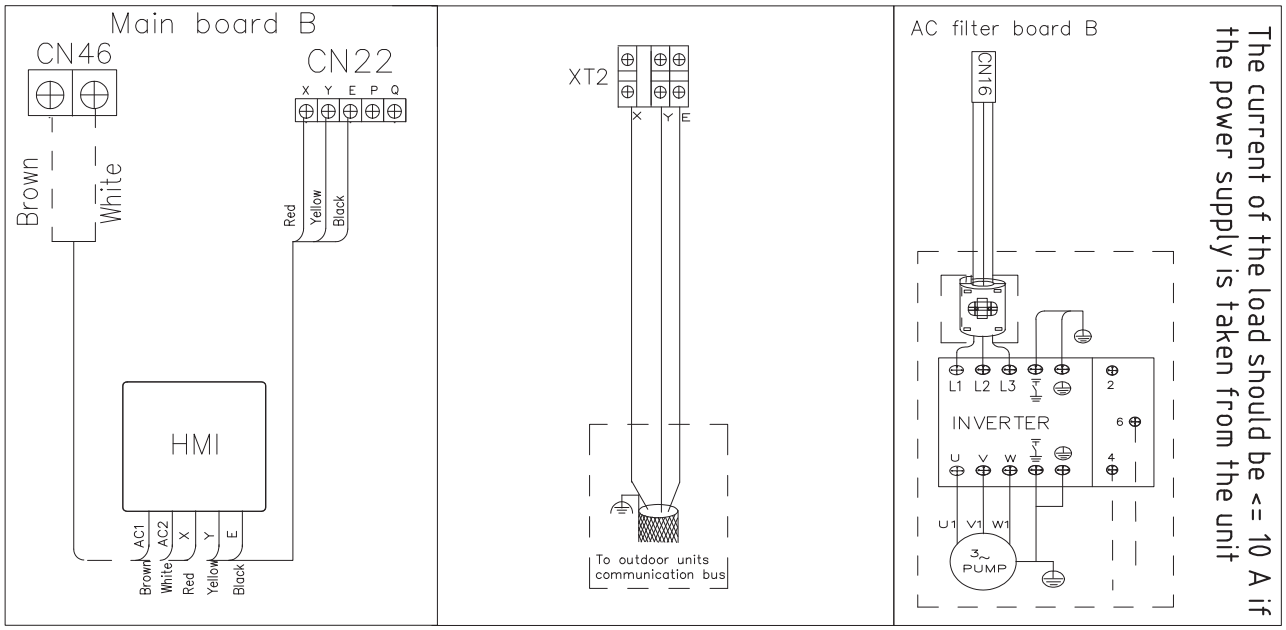
	30.2
Max. cable section Cu (mm^2)	67.4 (AWG 00)
Power cable inlet hole diameter (mm)	56
1 Power line inlet	

10.6 Connections performed by Customer

All the cables supplied and connected on site should be in double or reinforced insulation with reference to the maximum volatge of the unit: 230 V.







*Note: If the HMI is installed at more than 10m from the unit, a dedicated cable for control is required in the installation (the cable supplied with the unit is long 10 m). The power supply should be done by an external receptable through the transformer supplied with the unit or equivalent.

ⓘ The cable supplied for the control should be in double o reinforced insulation.

Wiring diagram

ⓘ Refer to the unit's diagram for the complete wiring diagram.

10.7 Remote control of the unit

With S1_1 ON, the unit is controlled remotely.

The wired controller is disabled.

ON/OFF status controlled by the On/Off input (CN137 on expansion slave board – 12VCC):

- input ON = unit ON
- input OFF = unit OFF

Heat/Cool mode controlled by the Heat/Cool input (CN138 on expansion slave board – 12VCC):

- On = heating
- Off = cooling

Double setpoint controlled by TEMP-SW (CN110 on expansion slave board – 12VCC):

- input ON = 2nd setpoint
- input OFF = Main setpoint
- this function must also be enabled from the wired controller.

With the units in modular configuration, remote control must be applied to the master unit, which transmits it to the slave units.

After setting S5_3, disconnect and reconnect the power supply to confirm the change.

10.8 TW probe

- The total system supply water control probe is in a plastic bag with a 10 m long cable inside the electrical panel and must be connected to the master unit on the expansion board at terminal CN 101 (3,3V DC).
- With the unit in modular configuration, the TW probe of the master unit must be re-installed as far away as possible on the common supply line of the system but before meeting any load. Use the additional probe support in the electrical panel.

Note: See also the dedicated chapter for further details.

10.9 Taf1 probe

- The domestic hot water antifreeze protection probe is in a plastic bag with a 10 m long cable inside the electrical panel.
- To connect probe Taf1, connect to the expansion board (terminal CN 105 - 3,3V DC). Install the probe on the discharge pipe from the domestic hot water inertial tank.

10.10 T5 probe

- The temperature probe that switches from the system to domestic hot water is in a plastic bag with a 10 m long cable inside the electrical panel on the expansion board (terminal CN 103 - 3,3V DC)

10.11 Backup heater control HEAT1 - KM1

HEAT 1 is the backup heater control for the heating system.

The function only applies to heat pump operation.

The heater can be used:

- as auxiliary anti-freeze protection. This function is useful when the unit is expected to be switched OFF for long periods with low outdoor air temperatures. The heaters are activated for water temperatures below 6°C.
- Integration with the heat pump in the following cases:
  - as a replacement for the heat pump if it is shut down due to failure or protection.
  - active in case of manual forcing.
  - with low air temperature, as integration with the heat pump.
  - to extend the operation limits, as integration with the heat pump.

The unit cannot supply the HEAT1 load directly and therefore a dedicated power supply and a supporting contactor are required. The unit is just capable of handling activation of this backup heater.

HEAT1 is to be connected to the expansion board (terminal CN119 HEAT1).

The unit's contactor and power supply must be sized according to the capacity of the backup heater in accordance with local regulations.

Refer to the Service manual for configuration.

10.12 Backup heater control HEAT2

HEAT 2 is the backup heater control for DHW.

The heater can be used:

- as a replacement for the heat pump if it is shut down due to failure or protection.
- active in case of manual forcing.
- with low air temperature, as integration with the heat pump.
- to extend the operation limits, as integration with the heat pump.
- when the DHW tank temperature is too low, as a replacement for the heat pump.
- in case of frequent compressor ON-OFF cycles, as a replacement for the heat pump.

The unit cannot supply HEAT2 directly and therefore a dedicated power supply and a supporting contactor are required. The unit is just capable of handling activation of this backup heater.

HEAT2 is to be connected to the expansion board (terminal CN119 HEAT2).

The unit's contactor and power supply must be sized according to the capacity of the backup heater in accordance with local regulations.

Refer to the Service manual for configuration.

10.13 Alarm signal

ALARM

- Closed contact with the unit in alarm.
- Contact on Main Board A: CN93.
- The alarm device, if audible, must be supplied by the installer.

10.14 Compressor running signal

HL1

- Closed contact with at least one compressor switched on.
- Contact on slave board: CN121.
- The alarm device, if audible, must be supplied by the installer.

10.15 External pump control on/off

PUMP-N

- If a unit is supplied without a circulation pump, control the external pump as shown in the wiring diagram.
- Use an auxiliary relay to enable the power supply contact on expansion board: CN 123.
- The power supply can be taken from filter board B (CN16) if the circulation pump does not exceed 10 A maximum current consumption, otherwise a dedicated power supply is required.

Note:

If the power supply is taken from the connection (CN 16 - 208-230 V/3~60 Hz), consider the corresponding electrical data increase due to the pump consumption in sizing main cables and electrical protections.

10.16 External pump control PUMP-INV

- If a unit is supplied without a circulation pump and you want it to be driven at variable speed, you can control the external inverter as shown in the diagram.
- The power supply can be taken from filter board B (CN 16 - 208-230 V/3~60 Hz) if the circulation pump does not exceed 10 A maximum current consumption, otherwise a dedicated power supply is required.
- In any case, the 0-10 V signal must be used to control the inverter supplying the hydronic unit. In this case, connect the external inverter to terminals CN 108 (0-10 V) on the expansion board.
- The programming of the external inverter must ensure that the pump is set to correctly cover the flow rate range required by the application.

10.17 External 3-way valve SV1 control

- The unit can run an external 3-way valve that can be used for domestic hot water production. The 3-way valve should be 208-23 power supply
- The valve must be wired according to the wiring diagram at terminals CN 125 (208-230 V/1~60 Hz) on the expansion board. More details are given in chapter 9.20 dedicated to this function

10.18 System load pressure switch

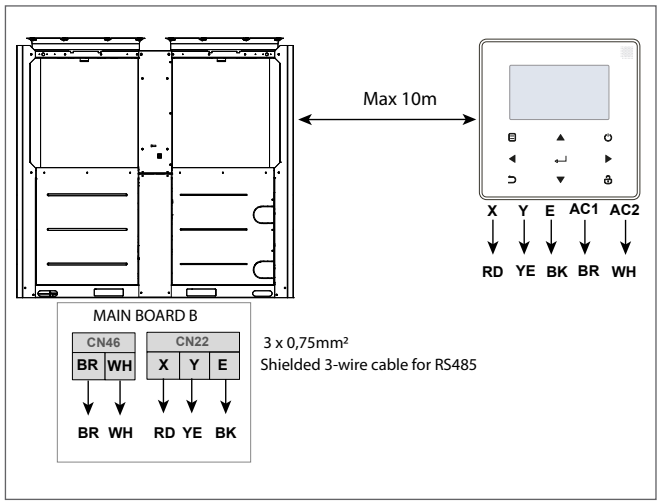
- A normally open pressure switch hydraulically connected to the circulation pump power supply must be connected to terminal CN 117 (12 VDC) on the expansion board to protect the pump from operating with large amounts of air in the circuit and to protect against cavitation phenomena.
- The device is mandatory for units with inverter pump integrated in the unit.
- Therefore, provide a well on the unit's water supply pipe for this purpose.
- The pressure switch must have an output with the following characteristics: 12 VDC.
- Where there is no pressure switch, in the case of an external hydronic pumping kit with separate protection, the contacts must be bridged as shown on the wiring diagram.

10.19 Use remote keypad control

The wired keypad on the unit can be removed and installed with a connection of up to 10 m away.

With a separate power supply, it can be connected up to 300 m away.

Power output provided with the unit.



- **Note: for installation of the HMI at more than 10 m of distance, the power supply of the HMI should be not taken from the unit but by a dedicated receptable through the transformer supplied with the unit or equivalent.**

ⓘ The cable supplied for the control should be in double o reinforced insulation.

10.20 Unit in modular configuration

See specific chapter at the end of the manual.

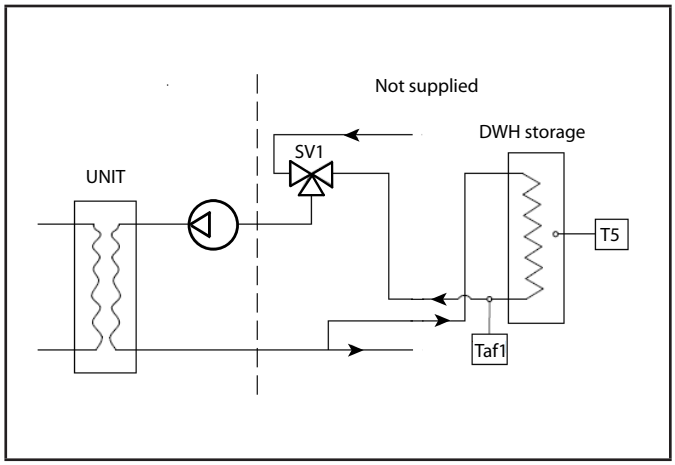
10.21 Domestic hot water

The unit does not have a 3-way valve on board for hot water production.

The valve must be part of the installation and connected consistently with the expected operation.

Components required:

- SV1 3-way valve
- Taf1 temperature probe, domestic hot water antifreeze protection
- T5 temperature probe, temperature control and switching between system and DHW

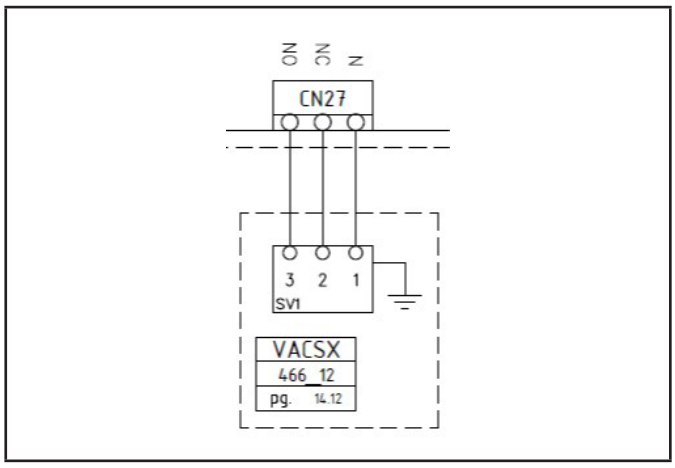


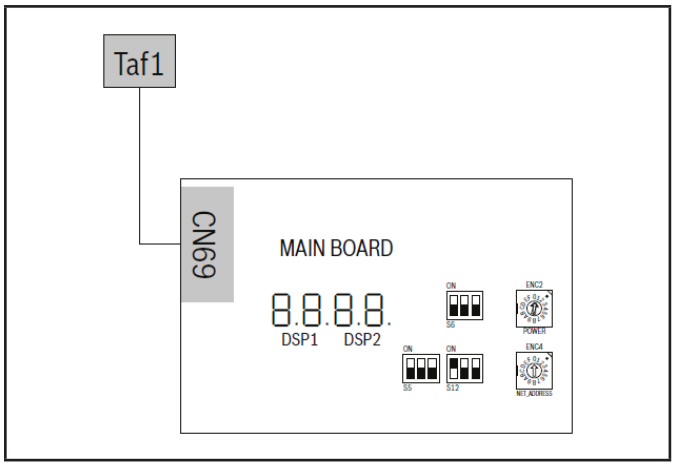
Sequence of operations:

1 connect probe Taf1 supplied with the unit with the 10 m cable (expansion - CN 105)

2 after connecting the cable, place the probe on the domestic hot water line

3 Connect probe T5 supplied with the unit to terminal CN 103 on the expansion board and insert probe T5 into the domestic hot water tank





In DHW production mode, the compressors start only if the DHW storage tank temperature is above a minimum threshold (see table).

To prevent it from falling below the minimum temperature, it is advisable to install a backup electric heater on the DHW tank (HEAT 2)

T outdoor	T5	compr.	backup heater
24°C < t.o ≤ 30°C	< 15°C	OFF	ON
24°C < t.o ≤ 30°C	≥ 15°C	ON	OFF
t.o > 30°C	< 20°C	OFF	ON
t.o > 30°C	≥ 20°C	ON	OFF

The maximum flow temperature threshold of the system varies according to the outdoor temperature.

The maximum value that can be set for T5S (domestic water set point) is lower than the maximum water outlet that can be attained by the unit to consider heat exchange through the customer's coil or DHW exchanger.

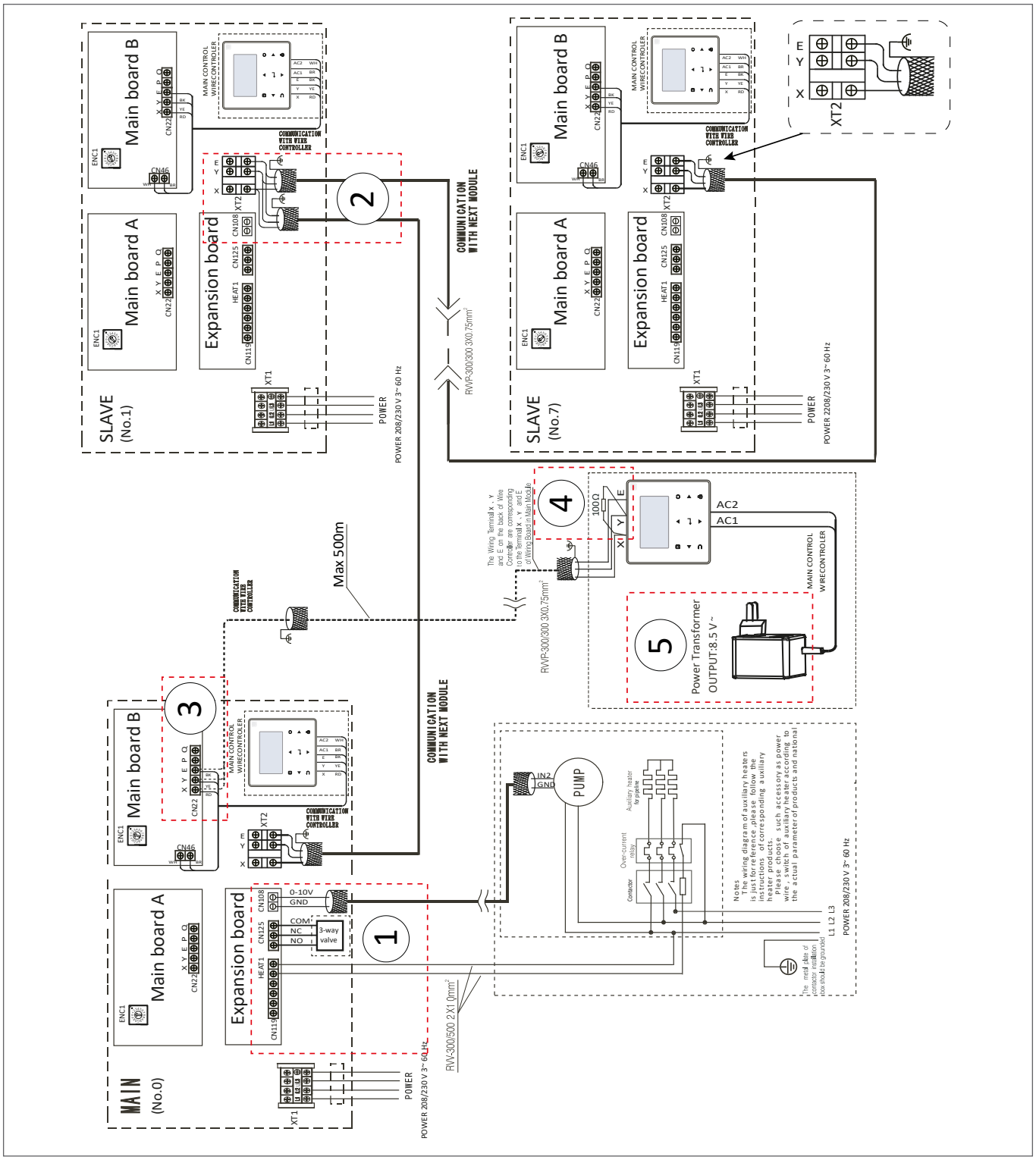
DHW priority is configurable on the menu:

DHW SWITCH	
SELECT ADDRESS	◄ 11 ►
DHW SWITCH	◄ SI ►
PRIORITY	◄ SI ►
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15	
←	▼▲ ◄►

10.22 Connection of units in cascade

With units connected in cascade, the unit address must be set on DIP switch ENC1.

With 0-F valid, 0/1 indicates the Master unit and 2-F indicates the Slave units.



Connections to be provided by customer

1 All external devices must be connected to the MASTER unit

2 M/S connection: maximum of 7 slaves and total maximum of 8 units

3 Connect the HMI remote keypad (where remote is required)

4 Termination heater mandatory

5 Connect transformer for HMI remote keypad power supply

11. Start-up

The operations indicated should be performed by qualified technicians with specific training on the product.

Upon request, the service centres can perform the start-up.

The electric, hydraulic connections and the other work of the system are the responsibility of the installer.

Please agree upon the start-up date with the service centre with sufficient advance.

Following commissioning procedure is mandatory, not only at the first commissioning, but also in all the restarting of the system after long-time shutdown.

Attention

- **A slight buzz noise is normal when the pump with inverter integrated is powered on**

Before checking, please verify the following:

- the unit should be installed properly and in compliance with this manual
- the electrical power supply line should be isolated at the beginning
- the unit isolator is open, locked and equipped with the suitable warning
- make sure no voltage is present

Attention

- **After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.**
- **Before accessing check with a multimeter that there are no residual voltages.**

11.1 Start-up sequence

For details refer to the different manual sections.

Unit OFF power supply

		✓
1	safety access	
2	suitable frame to withstand unit weight + people weight	
3	functional spaces	
4	air flow: correct return and supply (no bypass, no stratification)	
5	considered level to be reachable by snow	
6	considered main winds: there are deflectors, windbreaks, suitable anchor system	
7	lack of chimneys / corrosive atmospheres / pollutants	
8	structure integrity	
9	fans run freely	
10	unit on vibration isolators	
11	unit on level ground	
12	there is condensate drainage (only for heat pump units)	
13	unit input water filter + shut-off valves for cleaning	
14	hydraulic connections as per recommended diagram (check presence of flexible interface for vibration dampering)	
15	expansion tank (indicative volume = 10% system content)	
16	minimum system water content	
17	system washed + water quality check	
18	loaded system + corrosion inhibitor	
19	antifreeze protection: glycol solution, possible heating cable, thermal insulation of piping	
20	system under pressure + vented	
21	refrigerant circuit visual check	
22	earthing connection	
23	power supply features	
24	Customer connections: electrically connected, configured	
25	verify that power connection and ground connections are locked safely and in case tighten them before the power supply	
26	verify if the plant is acceptable with particular focus of special requirements for multiple units installation (plant layout, M/S connections, position of components to run the system)	
27	verify that fuse, switch, wire capacity is meeting the requirements	
28	verify absence of error with unit OFF (in case of error firstly remove source of error and then restore the error and start the unit)	
29	leak test	

11.2 Start-up sequence

For details refer to the different manual sections.

Unit ON power supply

			✓
1	compressor crankcase heaters operating at least since 8 hours		
2	off-load voltage measure		
3	phase sequence check		
4	manual pump start-up and check of flow-rate / head		
5	shut-off valve refrigerant circuit open		
6	unit ON		
7	load voltage measure		
8	verify the lack of bubbles in the liquid light (if applicable)		
9	check of all fan operating: no abnormal noises or vibrations		
10	measure return and supply water temperature		
11	measure super-heating and sub-cooling		
12	run tests in both heat and cool mode (only for heat pump units)		
13	check of absence of vibrations or abnormal noise and possible impact on the building's activities		
14	pump configuration: dip-switch S1-3, S1-4	*	
15	temperature configuration: dip switch S1-2 DIP switch configuration is part of the wiring diagram and service manual.		
16	remote control enabling (if applicable): dip switch S1-1 DIP switch configuration is part of the wiring diagram and service manual.		
17	HEAT1 and HEAT2 backup heater control configuration	*	
18	Climatic curve configuration	*	
19	Energy monitoring configuration	*	
20	dip-switch configuration consistent with the equipment supplied and the desired configuration (an inconsistent DIP switch configuration will cause FP errors)		
21	adjust the minimum outlet of the water pump to ensure that the minimum water flow-rate in the system, under the most unfavourable configuration conditions, is 110% of the minimum flow-rate indicated in the documentation		
22	Verify any problem in reaching the higher setpoint desired for the application		
23	Verify the correct operation of the unit and the control of external devices		
24	scheduling customisation		
25	check that all panels are closed and fastened properly		
26	complete and available unit documentation		
27	enable DHW (if applicable)		
28	enable energy saving modes (if desired by the customer)		
29	adjust the minimum set point in cooling mode, coherent with the application and to the glycol content charrged in the system.		
30	check the correct date and hour		
31	enable snow-blowing switch if the site can have strong snow fall (it's suggested to enable it)		
32	enable silent mode according to the customer needs (if applicable)		
*	Refer to the Service Manual for detailed instructions		

11.3 Refrigeration circuit

1 Check carefully the refrigerating circuit: the presence of oil stains can mean leakage caused by transportation, movements or other).
2 Check that the refrigerant circuit is under pressure: use unit pressure gauges, if fitted, or service pressure gauges or check the unit's operating status.
3 Make sure that all the service outlets are closed with proper caps; if caps are not present a leak of refrigerant can be possible.
4 Open the valves of the refrigerant circuit, if there are any.

Attention

- **In case of low pressure it's possible that a leak is present.**

In this case refrigerant should be fully recovered and the unit filled with nitrogen to find the leak and fix it as a second step.

Attention

- **Welding cannot be done untill the gas from the system is fully discharged.**

Before to inject refrigerant again in the system the whole refrigerant system must be completely dry thanks to the operation of a vacuum pump.

The vacuum level should last at least 3 hours and reach a pressure level below 50 Pa. Connect vacuum pipe on low-pressure port.

Connect vacuum pipe on low-pressure port.

Refrigerant needs to be injected in low pressure side and the quantity of refrigerant to be injected is reported in the label of the unit.

For small losses small amount of refrigerant can be charged in the system during the operation waiting some time to check the operation of the unit.

But in this case consider that the total amount of refrigerant is not well known.

This can lead to undercharged or overcharged systems that can have performance reduction and operation range reduced.

Fully drain/recharge the system to ensure that it charges properly.

During the injection if the pressure of the system and the refrigerant service cylinder equalizes, force the pump on to be able to pump in more refrigerant in the system.

Never inject substances different from refrigerant R32 or nitrogen in the system for any reason during service activities.

Attention

- **Do not accelerate the defrost process or clean source heat exchanger manually.**
- **Never touch any laking refrigerant since it can cause severe frostbite.**
- **Do not tuch refrigerant pipes during or just after the circuit operation since pipes can be very hot or very cold resulting in a burn or frostbite.**
- **Use always glover if you have to touch the piping and do it carefully since also with glover there can be a residual risk.**

11.4 Electric Circuit

1 Verify that the unit is grounded.
2 Check the conductors are tightened as the vibrations caused by handling and transport might cause these to come loose.
3 Connect the unit by closing the sectioning device, but leave it on OFF.
4 Check the grid voltage and frequency values which must be within the limits: 208-230/3/60
5 Check and adjust the phase balance as necessary: it must be lower than 2%

Attention

- **Working outside of these limits can cause irreversible damages and voids the warranty.**

11.5 Options

Menu accessible only after having entered the password.

Access reserved only to specifically trained personnel.

Changing the parameters can cause irreversible damage if done not correctly.

11.6 Start-up report

Identifying the operating objective conditions is useful to control the unit over time.

With unit at steady state, i.e. in stable and close-to-work conditions, identify the following data:

- total voltages and absorptions with unit at full load
- absorptions of the different electric loads (compressors, fans, pumps etc)
- temperatures and flows of the different fluids (water, air) both in input and in output from the unit
- temperature and pressures on the characteristic points of the refrigerating circuit (compressor discharge, liquid, intake)

The measurements must be kept and made available during maintenance interventions.

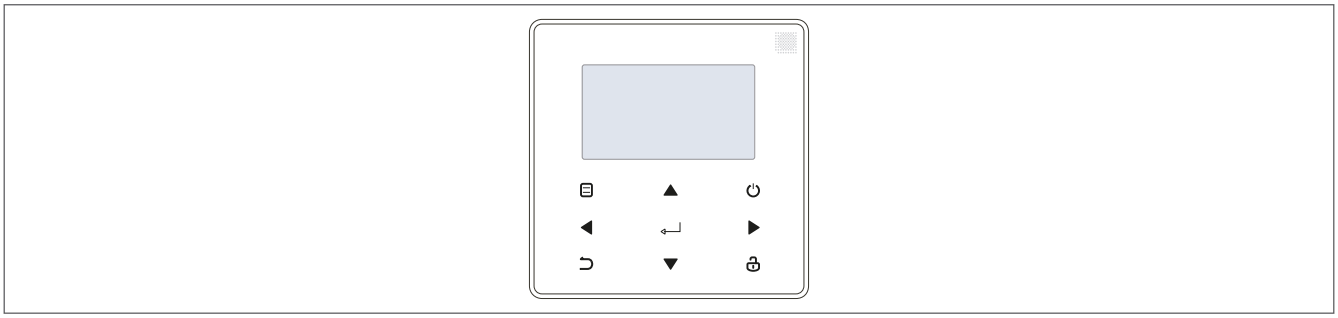
12. Control

This paragraph is applicable only to the wired controller. Read this document carefully and follow its instructions before operating the wired controller.

Always observe all the operative instructions and conserve the document to the end user operation after commissioning and maintenance phase.

If you, as user are not sure on how to operate the unit, contact your installer.

12.1 Panel



12.2 Controller specifications

Voltage range AC: 8 - 12 V

Operating temperature: -20 – 60 °C

Operating humidity: 40 - 90%

12.3 Buttons

Button	Name	Function
	UNLOCK	Locks/unlocks the buttons
	UP DOWN	Changes the current setpoint
	MENU	Opens the various menus from the HOME screen
	UP DOWN LEFT RIGHT	Moves the cursor, changes the selection, changes the set value.
	ENTER	Confirm an operation or change the menu page.
	ON OFF	Switches on/off.
	BACK	Returns to the previous level/page.

12.4 Lock/Unlock keys

Press for 3 seconds.	

12.5 Switch-On/Off

Press	

12.6 Unit in modular configuration

The information displayed on ALL controllers refers to the MASTER unit.

On the slave controllers, only the password-protected SERVICE menu can be opened.

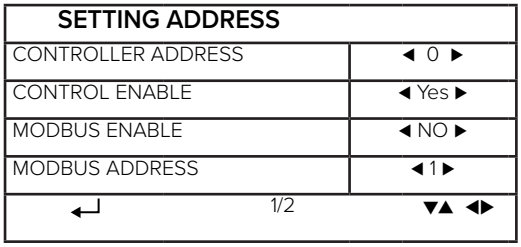
12.7 Display

Icon	Meaning
Cool	Cooling
Heat	Heating
DHW	Domestic hot water
OFF	Controller off
	Weekly timer active
	Compressor in operation
	Fan in operation
	Pump in operation
	Backup electric heater in operation
	Manual antifreeze or defrosting in operation
	Remote control: the unit is set from the keypad to be controlled by a remote terminal or by a remote selector switch.
	SILENT MODE
	Button lock
	Timer active
	Alarm: indicator on when there is a fault or a protection is tripped.

12.8 Select language

At the first unit start-up.

After selecting the language, select “YES” and confirm to access the control address setting.



The DHW mode is divided into single pump (no need to select the address) and multiple pumps (need to select address 00-15, and the address of the unit without DHW function is skipped directly).

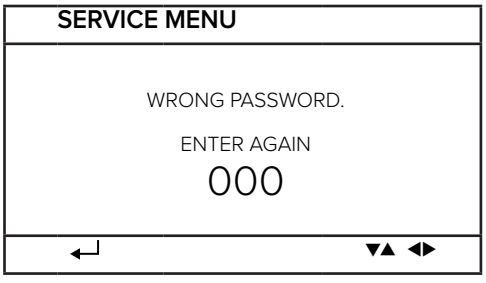
Only Tws/T5s and address can be set in cooling, heating and DHW production.

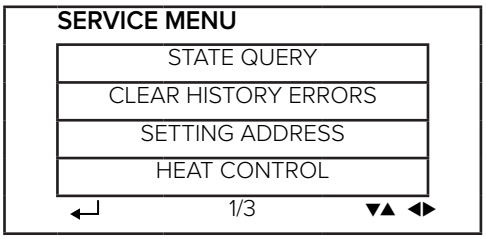
Tw and T5 can only be displayed, not be set.

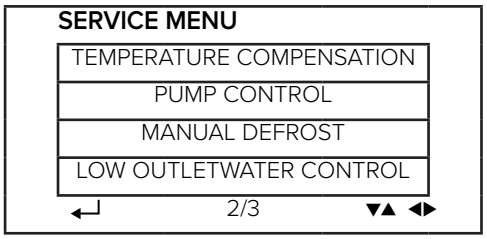
DHW can only be power on/off under the mode setting if the fuction is enabled via the access in Service Menu.

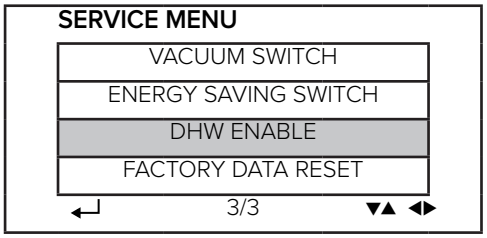
Access Service Menu -> Enable DHW function -> Enable DHW function also from the User Menu -> Define the priority of DHW from User Menu -> Activate DHW function from Mode Menu.

The steps are as follow:

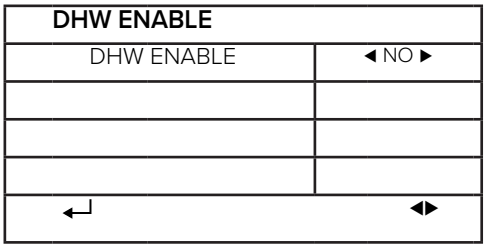








Activate DHW function.



Please consider that basing on the operation limits of the unit, the unit can limit the temperature of the water produced to protect itself. In such cases additional source is needed to reach the setpoint on water side.

Cooling setpoint limit can be reduced below 5 °C / 41 °F if needed enabling the Low temperature operation from the Service Menu and configuring the glycol content in the project menu.

I such cases:

- Glycol should be added to the system.
- The freezing point temperature of the antifreeze solution should be less than the coldest temperature of the site minus 5.5 °C / 10 °F.
- Use 30% glycol in volume or other anti-freeze percentage in line with the application setpoint and site coldest temperature.

12.9 Restoring control mode settings

This procedure restores the default settings.

Example: incorrect language selection.

Switch the control off and back on.

Press + +

Complete the operation within 60 seconds.

Press the buttons from left to right, from top to bottom, click ⊟ -> ▲ -> ⏻ ->...

Select numbers 1 to 9, wait for 100% initialization and enter the FCT page.

The version number is displayed. All set parameters are reset to the default parameters and saved. All mode settings are deleted.

Switch the power supply back on and exit the FCT.

12.10 Set Date, Time, Language

Menu

MODE
USER MENU
SERVICE MENU
PROJECT MENU

↵ ▼▲ ◀▶

USER MENU

QUERY
TIMER
GENERAL SETTING
DOUBLE SETPOINT

↵ ▼▲ ◀▶

GENERAL SETTING	
YEAR	◀ 2022 ▶
MONTH	◀ 7 ▶
Day	◀ 6 ▶
12-24HOUR	◀ 12 ▶
Time	◀ 10 ▶
↵ 1/2	▼▲ ◀▶

GENERAL SETTING	
MINUTE	◀ 55 ▶
AM/PM	◀ AM ▶
LANGUAGE	◀ ▶
BACKLIGHT OFF DELAY(s)	◀ 60 ▶
↵ 2/2	▼▲ ◀▶

GENERAL SETTING	
Unit setting	◀ S1 ▶
Buzzer	◀ NO ▶
↵ 3/2	▼▲ ◀▶

12.11 Set MODE and TEMPERATURE

Menu

MODE
USER MENU
SERVICE MENU
PROJECT MENU

↵ ▼▲ ◀▶

Press	⊟
Select Mode	▲▼
Confirm	↵
Select the mode or the temperature	◀▶
Control the mode or the temperature	▲▼
Confirm	↵

If no operations are performed for more than 60 seconds, the system automatically saves the mode setting and returns to the home page.

▶ **Please note that the mode menu is invalid when the unit is controlled by modbus.**

12.12 Double setpoint

The unit is capable of handling two different setpoints, in both heating and cooling modes.

The value can be set with the user interface.

Activation is via a dry contact on the specific terminal block.

Menu

MODE
USER MENU
SERVICE MENU
PROJECT MENU

↵ ▼▲ ◀▶

USER MENU

QUERY
TIMER
GENERAL SETTING
DOUBLE SETPOINT

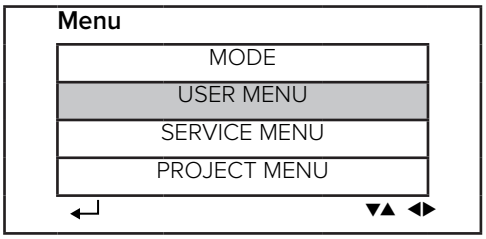
↵ 1/2 ▼▲ ◀▶

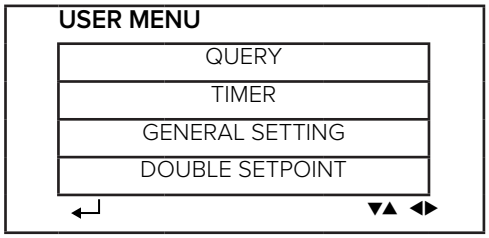
DOUBLE SETPOINT	
DOUBLE SETPOINT	◀ DISABLE ▶
SETPOINT COOL_1	◀ 7 ▶ °C
SETPOINT COOL_2	◀ 10 ▶ °C
SETPOINT HEAT_1	◀ 35 ▶ °C
SETPOINT HEAT_2	◀ 30 ▶ °C
↵	▼▲ ◀▶

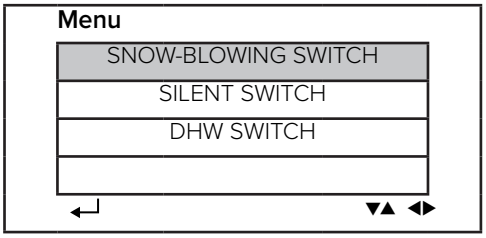
12.13 Snow protection function

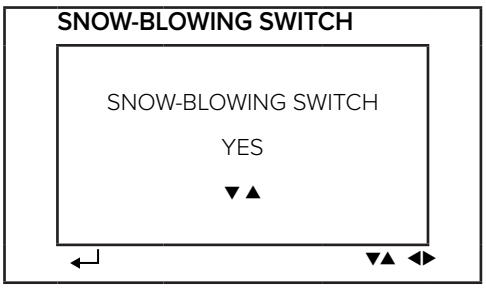
If enabled, the function activates the fans in order to prevent a build-up of snow.

The fans start for 2 minutes every 30 minutes when the air temperature is below 3°C and the unit is stopped.









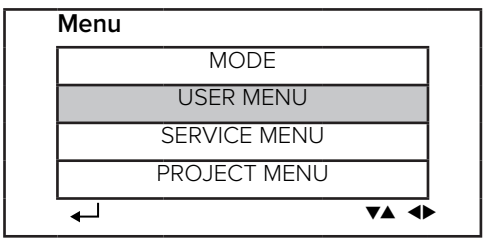
12.14 Silent mode

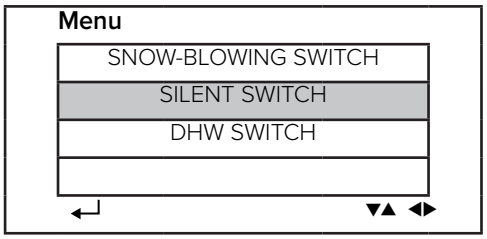
The SILENT MODE function lowers the sound emission level, which is especially useful at night.

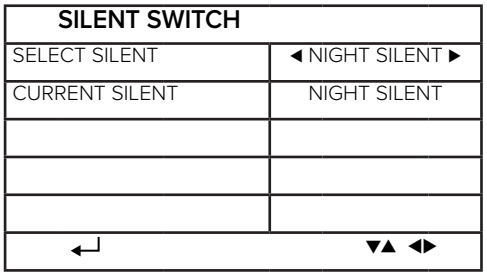
The compressor and fan speed is reduced.

There are four silence levels available: Standard, Silent, Super silent, Night.

Refer to the technical data in the different modes for the noise level reduction and power reduction levels of each sound configuration.





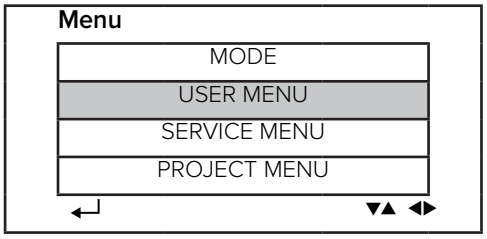


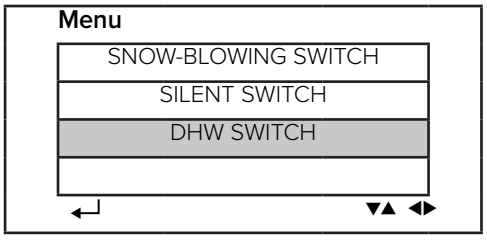
12.15 Domestic hot water

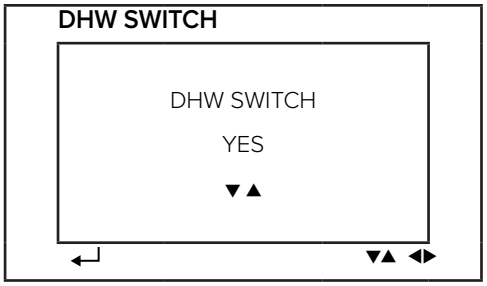
The unit is capable of handling domestic hot water production.

A dedicated valve diverts the water flow from the system to the domestic hot water tank until the DHW setpoint set on the user interface is attained.

The function must be enabled from the user interface, first from the SERVICE MENU and then from the USER MENU







DHW SWITCH	
SELECT ADDRESS	◄ 11 ►
DHW SWITCH	◄ SI ►
PRIORITY	◄ SI ►
00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15	
↵	▼▲ ◄►

12.16 Querying variables

The function displays some unit variables: operation status, temperatures, alarm history.

Menu

MODE
USER MENU
SERVICE MENU
PROJECT MENU

↵ ▼▲ ◄►

USER MENU

QUERY
TIMER
GENERAL SETTING
DOUBLE SETPOINT

↵ 1/2 ▼▲ ◄►

QUERY

STATE QUERY
TEMP QUERY
HISTORY ERRORS QUERY

↵ ▼▲ ◄►

Select the unit's address (only for units in modular configuration)

STATE QUERY	
SELECT ADDRESS	◄ 11 ►
ODU MODEL	130 kW
COMP FREQUENCE	50 Hz
COMP1 CURRENT	20 A
COMP2 CURRENT	2 0A
↵ 1/9	▼▲ ◄►

STATE QUERY	
H-P PRESSURE	3.83 MPa
L-P PRESSURE	1.00 MPa
TP1 DISCHARGE TEMP	30 °C
TP2 DISCHARGE TEMP	30 °C
TH SUCTION TEMP	-20 °C
↵ 2/9	▼▲ ◄►

STATE QUERY	
TZ TEMP	-20 °C
T3 TEMP	-20 °C
T4 TEMP	-20 °C
T6A TEMP	40 °C
T6B TEMP	40 °C
↵ 3/9	▼▲ ◄►

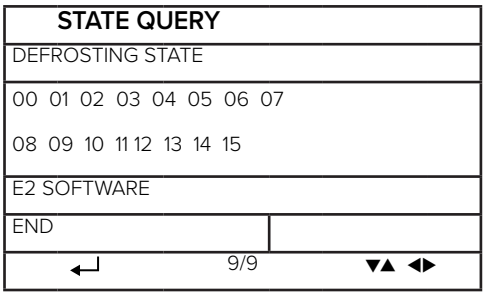
STATE QUERY	
TFIN1 TEMP	60 °C
TFIN2 TEMP	60 °C
TDSH	30 °C
TSSH	20 °C
TCSH	20 °C
↵ 4/9	▼▲ ◄►

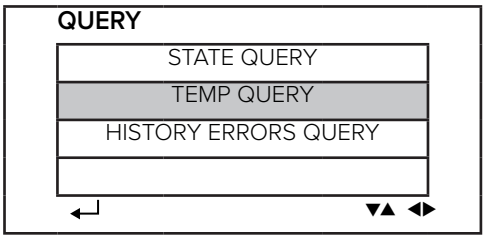
STATE QUERY	
FAN1 SPEED	850 RPM
FAN2 SPEED	850 RPM
FAN3 SPEED	850 RPM
EXV A	1800 P
EXV B	1800 P
↵ 5/9	▼▲ ◄►

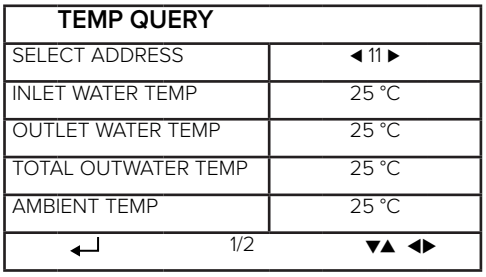
STATE QUERY	
EXV C	1800 P
Twi TEMP	30 °C
Two TEMP	30 °C
Tw TEMP	30 °C
TAF1 TEMP	30 °C
↵ 6/9	▼▲ ◄►

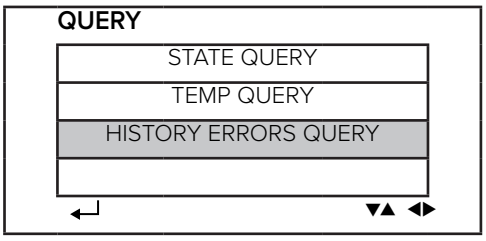
STATE QUERY	
TAF2 TEMP	30 °C
T5 TEMP	30 °C
COMP TIME1	120 MIN
COMP TIME2	120 MIN
COMP TIME3	120 MIN
↵ 7/9	▼▲ ◄►

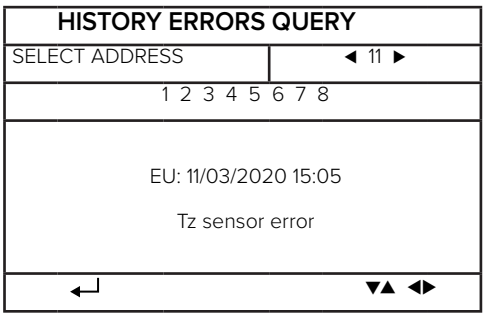
STATE QUERY	
COMP TIME	65535 H
FIX PUMP TIME	65535 H
INV PUMP TIME	65535 H
ODU SOFTWARE	V..
HMI SOFTWARE	V..
↵ 8/9	▼▲ ◄►

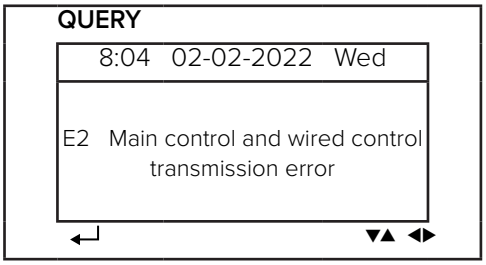








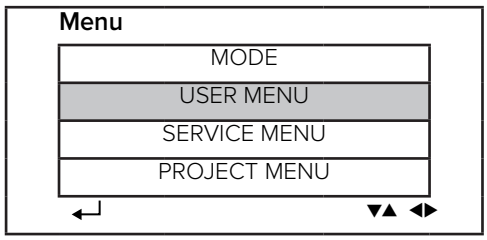


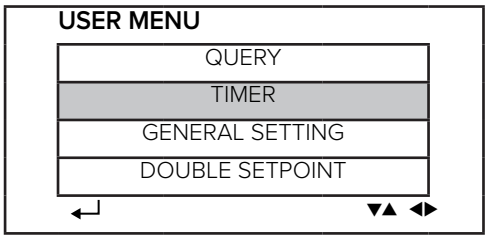


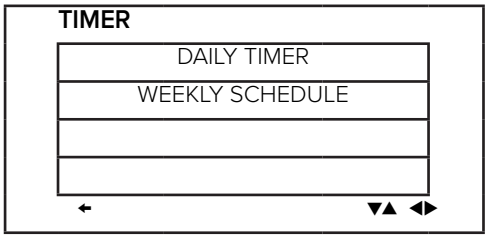
12.17 Timer

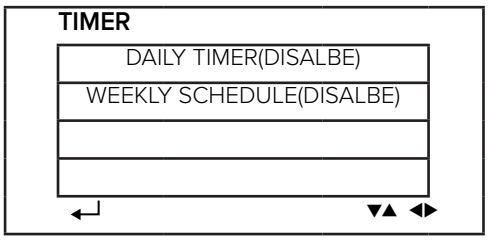
A daily or weekly schedule can be set.

If the unit is controlled via remote ON-OFF or via Modbus, the timers are disabled.

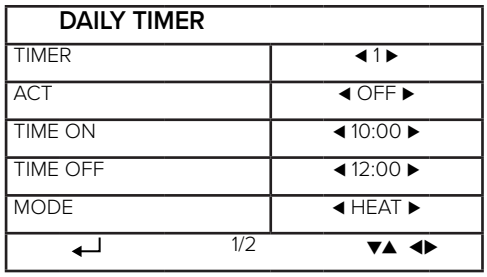


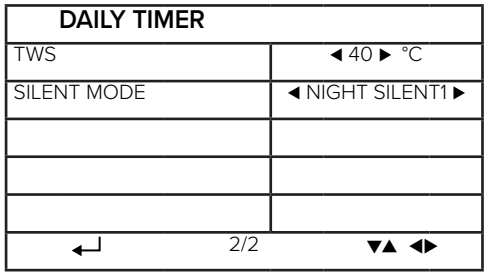






Daily programming





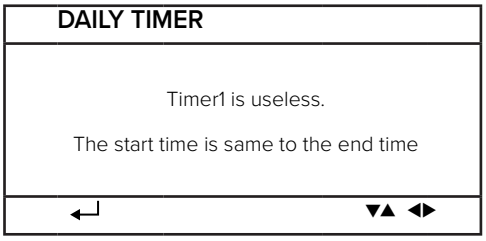
Only one setting is enabled between DAILY TIMER and WEEKLY SCHEDULE. If any pattern in WEEKLY SCHEDULE is set to ON DAILY TIMER is disabled.

DAILY TIMER can be set across days, but WEEKLY TIMER can not. Users can set up to two timers, and set the On and OFF time with 10 minutes interval.

The user can program also operation mode (heating, cooling, DHW for unit configured with single pump; only cooling and heating modes can be selected for multiple pumps.

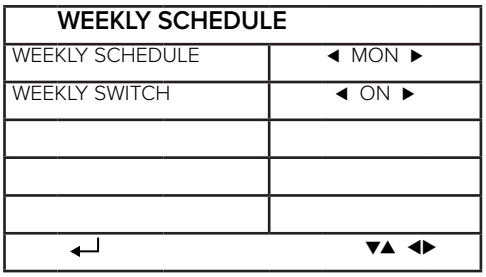
Furthermore the user can also set each segment of the timer.

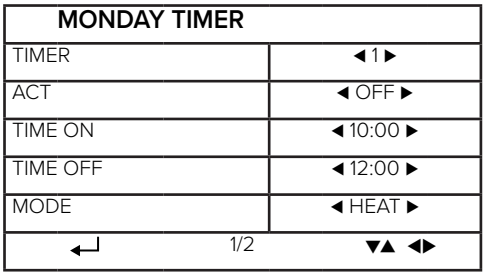
If the timer is set invalid the HMI displays as follows:

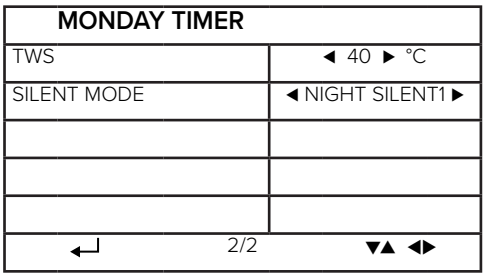


Weekly schedule

The day set for Timer 1 or Timer 2 for that day is displayed at the top.







12.18 Unit statuses

Code	Description
	Standby: Main unit address (left 88) + Online units (right 88), Power on: Display frequency Defrost: dFdF (alternately displayed with current operating frequency)
0.xx	Host address
1.xx	Outdoor unit matching (e.g. R32 model: display 70; R290 model: display 70/60/50)
2.xx	Online units (effective host)
3.xx	T4 capacity correction (reserved display "1")
4.xx	Operating mode (8 shutdown, 1 cooling, 2 heating, 4 hot water)
5.xx	Fan speed (0-35)
6.xx	Fan speed (reserved display "0")
7.xx	T3 (min)
8.xx	T4
9.xx	Outlet water temperature of T5 water tank
10.xx	Taf1
11.xx	Taf2
12.xx	Tw total outlet water temperature of the unit
13.xx	Twi unit inlet water temperature
14.xx	Two unit outlet water temperature
15.xx	Tz total cooling outlet temperature (for heating water side plate exchange refrigerant outlet temperature)
16.xx	THeatR heat recovery sensor temperature (reserved display "--")
17.xx	Exhaust temperature 1
18.xx	Exhaust temperature 2 (reserved display "--")
19.xx	Radiator temperature 1
20.xx	Radiator temperature 2 (reserved display "--")
21.xx	Exhaust superheat Tdsh
22.xx	Compressor current A
23.xx	Compressor B current (reserved display "--")
24.xx	--
25.xx	THeatR heat recovery sensor temperature (reserved display "--")
26.xx	Exhaust temperature 1
27.xx	Exhaust temperature 2 (reserved display "--")
28.xx	Radiator temperature 1
L.xx	Radiator temperature 2 (reserved display "--")
30.xx	Exhaust superheat Tdsh
31.xx	Compressor current A

Code	Description
32.xx	Compressor B current (reserved display "--")
33.xx	Static pressure selection (default 0 static pressure)
34.xx	DC voltage A (actual value * 10)
35.xx	DC voltage B (reserved display "--")
36.xx	Frequency limit number (reserved) (0: no frequency limit; 1: T4 frequency limit; 2: Tp exhaust frequency limit; 3: Tz total cooling frequency limit (refrigeration high pressure frequency limit); 4: Tf module temperature frequency limit; 5: Two outlet water frequency limit 6: pressure frequency limit; 7: current frequency limit; 8: voltage frequency limit
37.xx	Defrosting process status (first digit: T4 selection scheme; second digit: interval in the scheme; the third and fourth digits together indicate the defrosting timing)
38.xx	E fault: 1 for fault, 0 for no fault (reserved for 90kw)
39.xx	Defrosting scheme
40.xx	Initial frequency
41.xx	Tc (saturated temperature corresponding to high pressure) point inspection value +30
42.xx	Te (saturated temperature corresponding to low pressure) point inspection value +30
43.xx	T6a
44.xx	T6b
45.xx	Main control software version number
46.xx	Expansion board software version number
47.xx	Last first fault
48.xx	Last second fault
49.xx	Last third fault
50.xx	Last fourth fault
51.xx	Last fifth fault
52.xx	Last sixth fault
53.xx	----

12.19 Alarms

Alarm reset: switch the unit off and on again.

NOTE

- ▶ **Before resetting an alarm, identify and remove the cause of the alarm.**
- ▶ **Repeated resets can cause irreversible damage.**

The unit is in protection mode in the following conditions:

- High pressure or protection due to discharge temperature
- low voltage
- compressor current protection
- frequency protection of the inverter compressor
- high coil temperature
- high temperature difference between the inlet water and the outlet water
- antifreeze protection
- discharge temperature sensor malfunction
- low evaporator temperature
- frequency protection by voltage
- compressor inverter malfunction
- fan motor protection
- water return high temperature, in cooling mode
- low pressure antifreeze protection
- high temperature of the inverter compressor module

When the unit fails or is in protection mode, the water pump continues working (except for water flow alarm, voltage protection, phase sequence protection).

All of the temperature sensors are classed as faulty when the voltage on the corresponding input is lower than 0,05 V or higher than 4,95 V.

After an error has been signalled a circuit a unit or a system of unit will stop. The error is eliminated after the sensor has been restored.

In case the units runs under abnormal operation, failure protection code will display on both control panel and wired controller and the alarm indicator on wired controller will flash with 1 Hz frequency.

The display codes are shown in the table below:

Code	Description	Tipo
E0	Main control EPROM error	A
E1	Phase sequence error of main control board check	A
E2	Communication failure between master and the HMI or master and salve	A
2E2	Communication failure between main control and extension board	A
3E2	Communication failure between master and salve in a unit	
E3	Total water outlet temperature sensor failure	A
E4	Unit water outlet temperature sensor failure	B
1E5	Condenser tube temperature sensor T3A failure	C
E6	Water tank temperature sensor T5 failure	A/B
E7	Ambient temperature sensor failure	B
E8	Power supply phase sequence protector output error	A
E9	Water flow detection failure	A/B

Code	Description	Tipo
1Eb	Taf1 the pipe of the tank antifreeze protection sensor failure	A/B
2EB	Taf2 cooling evaporator low-temperature antifreeze protection sensor failure	B
Ed	System discharge temperature sensor failure	C
1EE	EVI plate heat exchanger refrigerant temperature T6A sensor failure	C
2EE	EVI plate heat exchanger refrigerant temperature T6B sensor failure	C
EF	Unit water return temperature sensor failure	B
EP	Discharge sensor failure alarm	C
EU	Tz sensor failure	C
P0	System high-pressure protection or discharge temperature protection	C
1P0	System high-pressure switch disconnect protection	C
P1	System low pressure protection Severe refrigerant leakage protection	C
P3	T4 ambient temperature too high in cooling mode	B
P4	1P4 System A current protection	C
	2P4 System A DC bus current protection	
P6	Inverter module failure	C
P7	High temperature protection of system condenser	C
P9	Water inlet and outlet temperature difference protection	B
PA	Abnormal water inlet and outlet temperature difference protection	B
PC	Cooling evaporator pressure too low	C
PE	Cooling evaporator low temperature antifreeze protection	B
PH	Heating T4 too high temperature protection	B
PL	Tfin module temperature too high protection	C
1PU	DC fan A module protection	C
1bh	Module 1 failure	C
H5	Voltage too high or too low	A
1H9	Compressor inverter module is not matched	C
HC	High pressure sensor failure	C
1HE	No inset A valve error	C
2HE	No inset B valve error	C

Code	Description	Tipo
3HE	No inset C valve error	C
1F0	IPM module A transmission error	C
F2	Superheat insufficient	C
F4	1F4 module 1L0 or 1LE protection occurs for 3 times in 60 minutes	C
1F6	A system bus voltage error (PTC)	C
Fb	Low pressure sensor error	C
Fd	Suction temperature sensor error	C
1FF	DC fan A error	C
FP	DIP switch inconsistency of multiple water pumps	A
1L10	Overcurrent protection	C
1L11	Transient phase current overcurrent protection	C
1L12	Phase current overcurrent lasts 30s protection	C
1L20	Module over temperature protection	C
1L31	Low bus voltage error	C
1L32	High bus voltage error	C
1L33	Excessively high bus voltage error	C
1L34	Phase loss error	C
1L43	Phase current sampling bias abnormal	C
1L45	Motor code not match	C
1L46	IPM protection	C
1L47	Module type not match	C
1L50	Startup failure	C
1L51	Out of step error	C
1L52	Zero speed error	C
L60	Fan motor phase loss protection	C
L65	IPM short circuit error	C
L66	FCT detection error	C
L6A	Open circuit of U-phase upper tube	C
L6B	Open circuit of U-phase lower tube	C
L6C	Open circuit of V-phase upper tube	C
L6D	Open circuit of V-phase lower tube	C
L6E	Open circuit of W-phase upper tube	C
L6F	Open circuit of W-phase lower tube	C

The last column of the alarms table shows which of the following it belongs to in case of fault.

A = shuts down all units in M/S

B = shuts down the unit affected by the alarm

C = shuts down only the circuit affected by the alarm

13. Maintenance

13.1 Safety

Operate in compliance with safety regulations in force.

To carry out the operations use protection devices:

gloves, goggles, helmet, headphones, protective knee pads.

All operations must be carried out by personnel trained on possible risks of a general nature, electrical and deriving from operating with equipment under pressure.

Only qualified personnel can operate on the unit, as required by the regulation in force.

13.2 General

Maintenance must be done by authorized centres or by qualified personnel.

The maintenance allows to:

- maintain the unit efficiency
- increase the life span of the equipment
- check information and data of unit operation to understand the state of the unit efficiency and avoid possible damages

Warning

- **before carrying on any activities, please verify the following**
- **the electrical power supply line should be isolated at the beginning**
- **the unit isolator is open, locked and equipped with the suitable warning**
- **make sure no voltage is present**
- **After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.**
- **Before accessing check with a multimeter that there are no residual voltage.**
- **Do not wash the unit with water since this can cause electrical shocks or fire.**
- **In any case if the power cord is damaged it must be replaced.**
- **Never leave the unit unattended during installation or operating when external panel are removed.**
- **Do not tocuh pipes during and immediately after operation as pipes may be hot and could burn your hands. Use always wear protective gloves during such procedures.**

13.3 Inspections frequency

Perform an inspection every 6 months minimum.

The frequency, however, depends on the use.

In the event of frequent use it is recommended to plan inspections at shorter intervals:

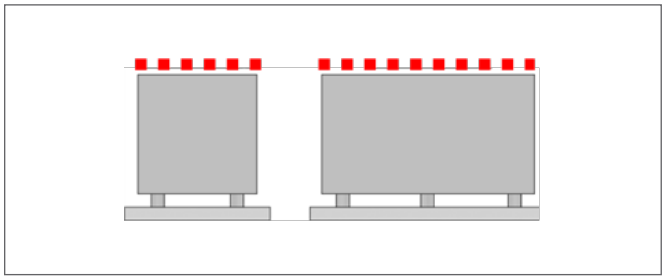
- frequent use (continuous or very intermittent use, near the operating limits, etc)
- critical use (service necessary)

Warning

- **Before performing any work, carefully read: SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R32**

ATTENTION

- **Do not go up to the surface**
- **Do not place heavy objects.**



13.4 Unit booklet

It's advisable to create a unit booklet to take notes of the unit interventions.

In this way it will be easier to adequately note the various interventions and aid any troubleshooting.

Report on the booklet:

- date
- intervention description
- carried out measures etc.

13.5 Standby mode

If a long period of inactivity is foreseen:

- turn off the power
- avoid the risk of frost (empty the system or add glycol)
- Turn off the power to avoid electrical risks or damages by lightning strikes.
- With lower temperatures keep heaters turned on in of the electrical panel (option).

It's recommended that the re-start after the stopping period is performed by a qualified technician, especially

after seasonal stops or seasonal switching.

When restarting, refer to what is indicated in the “start-up” section.

Schedule technical assistance in advance to avoid misunderstandings and to guarantee that the system can be used when required.

13.6 Recommended periodical checks

intervention frequency (months)		1	6	12
1	presence of corrosion			X
2	panel fixing			X
3	fan fixing		X	
4	coil cleaning		X	
5	water filter cleaning		X	
6	water: quality, ph, weight of glycol (%)		X	
7	check the heat exchanger efficiency	X		
8	circulating pumps			X
9	check of the fixing and the insulation of the power cables			X
10	verify water loss from the hydraulic system		X	
11	check of the earthing cable			X
12	electric panel cleaning			X
13	power contactors status (if applicable)			X
14	termina closing, cable insulation integrity			X
15	voltage and phase unbalancing (no load and on-load)			X
16	absorptions of the single electrical loads		X	
17	test of the compressor crankcase heaters		X	
18	Checking for leaks		X	
19	measurement of refrigerant circuit operating parameters (temperatures, pressures, etc.)			*
20	water pressure relief valve and system load pressure switch *		X	
21	testing of protection devices: pressure switches, thermostats, flow switches, etc. (no fuse plug)			*
22	control system test: setpoint, climatic compensations, capacity stepping, water / air flow-rate variations		X	
23	control device test: alarm signalling, thermometers, probes, pressure gauges etc..		X	
24	check of cables and auxiliary components driven by the heat pump			X
25	verifiy the status of the HEAT1 and HEAT2 in DHW tank. They should be clean and in good condition			X

Warning

- ▶ ***Refer to the local regulations. Companies and technicians performing installation, maintenance/repair, leak control and recovery operations must be CERTIFIED as set out by the local regulations.**

13.7 System drain

The system must be drained only if necessary.

Do not drain the system periodically; this can lead to corrosion.

1 empty the system
2 empty the exchanger, use all of the shut-off valves and grub screws present
3 blow the exchanger with compressed air
4 dry the exchanger with hot air; for greater safety, fill the exchanger with glycol solution
5 protect the exchanger from air by filling it with nitrogen
6 take the drain caps off the pumps

Any antifreeze liquid contained in the system should not be discharged freely as it is a pollutant. It must be collected and reused.

Before start-up, wash the system.

It's recommended that the re-start after the stopping period is performed by a qualified technician, especially after seasonal stops or seasonal switching.

When restarting, refer to what is indicated in the "start-up" section.

Schedule technical assistance in advance to avoid misunderstandings and to guarantee that the system can be used when required.

13.8 Compressor crankcase heater

Check:

- closing
- Operation

13.9 Water side exchanger

The exchanger must be able to provide the maximum thermal exchange, therefore its inner surfaces must be cleaned from dirt and incrustations.

After long-time operation oxides and other minerals will be settled on heat transfer surface of the heat exchanger.

These substances affect heat transfer performances if there is too much scale on it, increasing energy consumption and leading to operating range reduction or alarms.

Check the difference between the outlet water temperature and the evaporation temperature: if the difference is greater than 8°C–10°C, it is advisable to clean the exchanger.

Organic acids such as formic acide citric acid and acetic acid may be used to clean the surface from the scale settled on heat transfer surfaces.

In no way fluoroacetic of fluoride acid should be used for such treatment due to the erosion risk and leakage risk as a consequence.

It must be cleaned:

- with circulation opposite to the usual one
- at least 1.5 times faster than the nominal one
- with a suitable moderately acid product
- keeping the cleaning product for an adequate time and at a temperature suitable for the expected dirtying conditions
- after washing, flush with water to remove/prevent detergent residues
- water-side heat exchanger cleaning should be done by professionals.
- after cleaning is completed, consider that neutralization treatment of the waste water is needed. This should be done according to national and local laws and standards by relevant company authorized for such kind of waste treatment activities.

13.10 Water filter

Check that no impurities prevent the correct passage of water.

13.11 Flow Switch

- check operation
- remove scale from the blade

13.12 Circulation pumps

Check:

- there are no leaks
- status of the bearings (anomalies are indicated by abnormal noises and vibrations)
- the terminal protection covers are closed and the cable holders are properly positioned

13.13 Thermal and acoustical insulation

Check the status of the insulations: if necessary, apply glue and renew the seals.

13.14 Pressure relief valve and fusible plugad

The pressure relief valve must be replaced:

- if it is activated
- if there is oxidation
- based on the date of manufacture, in accordance with local regulations.

13.15 Structure

- Wash it at least once or twice a year, depending on exposure (pollution, salt deposits, dirt).

  Clean with neutral detergent and cold or warm water (max 30°C).

  Do not use solvents or acid, alkaline, abrasive products.
- Check the condition of the parts making up the structure.

  Treat those parts of the unit subject to oxidation, with paints act at eliminating or reducing the oxidation phenomena.
- Check fastening of the unit external panelling.

  Bad fastening give rise to anomalous noises and vibrations.

13.16 Air side exchanger

▶ **Accidental contact with the exchanger fins can cause cutting injuries: use protective gloves.**

The coil must give the maximum thermal exchange, therefore its surface must be cleaned from dirt and incrustations.

Clean at least every three months.

The cleaning frequency must be increased according to the build-up of dirt/dust and the environment (e.g. coastal areas with chlorides and salts or industrial areas with aggressive substances).

Clean the air inlet side.

Use a soft brush, vacuum dirt exhauster, pressurised air jet or high-pressure washer.

Keep the direction parallel to the fins to avoid damage.

Check that the aluminium fins are not bent or damaged, in the event of damages contact the authorised service centre which will “comb” the coil to restore optimal air flow

13.17 Electric fans

Check:

- ensure that the fan and its protection grilles are fixed properly
- the fan bearings (anomalies are indicated by abnormal noise and vibrations)
- the terminal protection covers are closed and the cable holders are properly positioned

13.18 Extraordinary maintenance

After an extraordinary maintenance has been carried on, service personnel needs always to verify that the work has been done properly aligned to the original design of the unit.

In particular there are some constrction in Class II in the unit (external movable panels) and, after maintenance for such parts, it should be ensured that:

- or the construction in class II are restored
- or movable panels are grounded
- or there is a negligible risk of contact between power cables and external panels

  This can be done with an appropriate clamping of the wires to the pipes.

▶ **It’s always suggested to make pictures before the extraordinary maintenance and to restore the wiring similarly.**

14. Decommissioning

14.1 Disconnection

Warning

- **Before performing any work, carefully read: SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R32**
- **Comply with the national regulation.**

Avoid leak or spills into the environment.

Before disconnecting the unit, the following must be recovered, if present:

- refrigerant gas
- Anti-freeze solutions in the hydraulic circuit

Awaiting decommissioning and disposal, the unit can also be stored outdoors, as bad weather and rapid changes in temperature do not harm the environment provided that the electric, cooling and hydraulic circuits of the unit are intact and closed.

Do not dispose this product as unsorted municipal waste.

Collection of such waste separately for special treatment is necessary.

Do not dispose of electrical appliances with municipal waste, but use the dedicated disposal collection points throughout the territory.

If this is done, hazardous substances can leak into the environment getting into food chain damaging your health and well-being.

Electrical and electronic equipment must be disposed of together with all of its parts.

To dispose of “household” electrical and electronic equipment, the manufacturer recommends you contact an authorised dealer or an authorised ecological area.

“Professional” electrical and electronic equipment must be disposed of by authorised personnel through established waste disposal authorities around the country.

This equipment may contain:

- refrigerant gas, the entire contents of which must be recovered in suitable containers by specialised personnel with the necessary qualifications;
- lubrication oil contained in compressors and in the cooling circuit to be collected;
- mixtures with antifreeze in the water circuit, the contents of which are to be collected;
- mechanical and electrical parts to be separated and disposed of as authorised.

When machine components to be replaced for maintenance purposes are removed or when the entire unit reaches the end of its life and needs to be removed from the installation, waste should be separated by its nature and disposed of by authorised personnel at existing collection centres.

15. Residual risks

15.1 General

In this section the most common situations are indicated,as these cannot be controlled by the manufacturer and could be a source of risk situations for people or things.

Danger zone

This is an area in which only an authorised operator may work.

The danger zone is the area inside the unit which is accessible only with the deliberate removal of protections or parts thereof.

15.2 Handling

The handling operations, if implemented without all of the protection necesssary and without due caution, may cause the drop or the tipping of the unit with the consequent damage, even serious, to persons, things or the unit itself.

Handle the unit following the instructions provided in the present manual re-garding the packaging and in compliance with the local regulations in force.

Should the refrigerant leak please refer to the refrigerant “Safety sheet”.

15.3 Installation

The incorrect installation of the unit could cause water leaks, condensate accumulation, leaking of the refrigerant, electric shock, poor operation or damage to the unit itself.

Check that the installation has been implemented by qualified technical personnel only and that the instructions contained in the present manual and the local regulations in force have been adhered to.

The installation of the unit in a place where even unfrequent leaks of flammable gas and the accumulation of this gas in the area surrounding the area occur could cause explosions or fires.

Carefully check the positioning of the unit.

The installation of the unit in a place unsuited to support its weight and/or guarantee adequate anchorage may result in consequent damage to things, people or the unit itself.

Carefully check the positioning and the anchoring of the unit.

Easy access to the unit by children, unauthorised persons or animals may be the source of accidents, some serious.

Install the unit in areas which are only accessible to authorised person and/or provide protection against intrusion into the danger zone.

15.4 General risks

Smell of burning, smoke or other signals of serious anomalies may indicate a situation which could cause damage to people, things or the unit itself.

Electrically isolate the unit (yellow-red isolator).

Contact the authorised service centre to identify and resolve the problem at the source of the anomaly.

Accidental contact with exchange batteries, compressors, air delivery tubes or other components may cause injuries and/or burns.

Always wear suitable clothing including protective gloves to work inside the danger zone.

Maintenance and repair operations carried out by non-qualified personnel may cause damage to persons, things or the unit itself.

Always contact the qualified assistance centre.

Failing to close the unit panels or failure to check the correct tightening of all of the panelling fixing screws may cause damage to persons, things or the unit itself.

Periodically check that all of the panels are correctly closed and fixed.

If there is a fire the temperature of the refrigerant could reach values that in-crease the pressure to beyond the safety valve with the consequent possible projection of the refrigerant itself or explosion of the circuit parts that remain isolated by the closure of the tap.

Do not remain in the vicinity of the safety valve and never leave the refriger-ating system taps closed.

15.5 Electric parts

An incomplete attachment line to the electric network or with incorrectly sized cables and/or unsuitable protective devices can cause electric shocks, intoxication, damage to the unit or fires.

Carry out all of the work on the electric system referring to the electric layout and the present manual ensuring the use of a system thereto dedicated.

An incorrect fixing of the electric components cover may lead to the entry of dust, water etc inside and may consequently electric shocks, damage to the unit or fires.

Always fix the unit cover properly.

When the metallic mass of the unit is under voltage and is not correctly connected to the earthing system it may be as source of electric shock and electrocution.

Always pay particular attention to the implementation of the earthing system connections.

Contact with parts under voltage accessible inside the unit after the removal of the guards can cause electric shocks, burns and electrocution.

Open and padlock the general isolator prior to removing the guards and signal work in progress with the appropriate sign.

Contact with parts that could be under voltage due to the start up of the unit may cause electric shocks, burns and electrocution.

When voltage is necessary for the circuit open the

isolator on the attachment line of the unit itself, padlock it and display the appropriate warning sign.

15.6 Moving parts

Contact with the transmissions or with the fan aspiration can cause injuries.

Prior to entering the inside of the unit open the isolater situated on the con-nection line of the unit itself, padlock and display the appropriate warning sign.

Contact with the fans can cause injury.

Prior to removing the protective grill or the fans, open the isolator on the attachment line of the unit itself, padlock it and display the appropriate warning sign.

15.7 Refrigerant

The intervention of the safety valve and the consequent expulsion of the gas refrigerant may cause injuries and intoxication.

Always wear suitable clothing including protective gloves and eyeglasses for operations inside the danger zone.

Should the refrigerant leak please refer to the refrigerant “Safety sheet”.

Contact between open flames or heat sources with the refrigerant or the heating of the gas circuit under pressure (e.g. during welding operations) may cause explosions or fires.

Do not place any heat source inside the danger zone.

The maintenance or repair interventions which include welding must be carried out with the system off.

15.8 Hydraulic parts

Defects in tubing, the attachments or the removal parts may cause a leak or water projection with the consequent damages to people, things or shortcircuit the unit.

Please consider that in case of multiple unit installation common supply and return pipe should be oversized based on the numbers of units in the system.

Bad operation of the system due to under-sizing of these pipes is in charge of the plant designer/installer.

16. Unit in modular configuration

Maximum number of connectable units:	**8**

The system is completely controlled by the Master unit.

Each module can be equipped with an inertial system storage tank.

16.1 Control logic

In a cascade system, Tw (supply water flow temperature for the entire system) and TWS (set point temperature) are measured by the master unit.

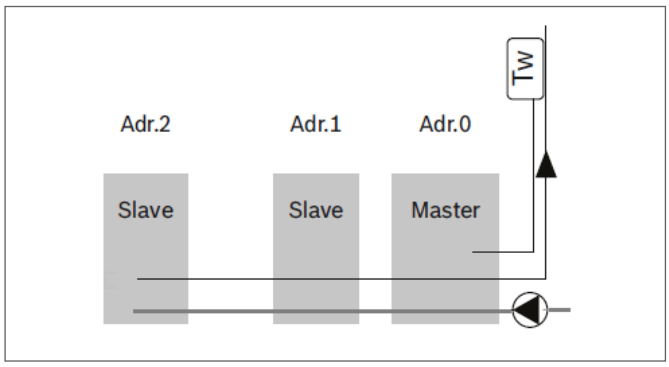
The master unit will periodically (standard time 80 seconds) evaluate the current load based on the outlet water temperature, the set point distance and speed difference of the water temperature.

Depending on evaluation of the load performed by the master unit, the number of units running will either be kept stable, increased or reduced.

Once it is switched on, a unit will continue to operate according to its own logic (T4, water temperature, etc.).

16.2 Tw control probe

The probe TW must be installed on the common supply line of the units, as far away as possible.



16.3 Domestic hot water

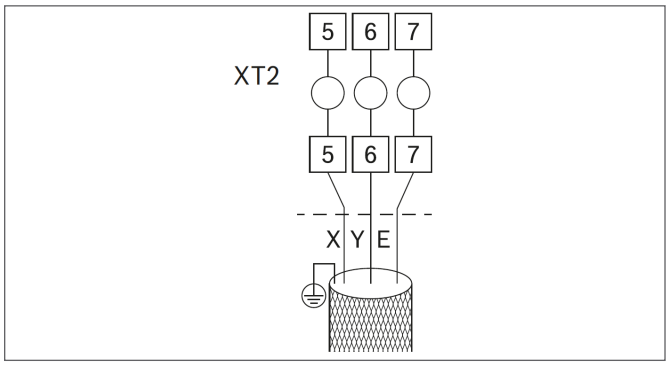
In a cascade system with DHW provision, the system configuration must be as follows:

- each unit must be fitted with its own pump, the S1-3 dial on all the units must be ON. Each unit must be fitted with its own external DHW boiler because the DHW load will be evaluated by each slave unit. In a system containing units with and without DHW valve, the highest address numbers must be assigned to the DHW units.

The three-way valve SV1 that controls the switching between heating mode and domestic hot water production mode is on CN125 of the expansion slave board. It is mandatory for the grid device to have a coil with a power voltage of 208-230 V, not supplied. It must be purchased from a third-party supplier.

16.4 Electrical connections

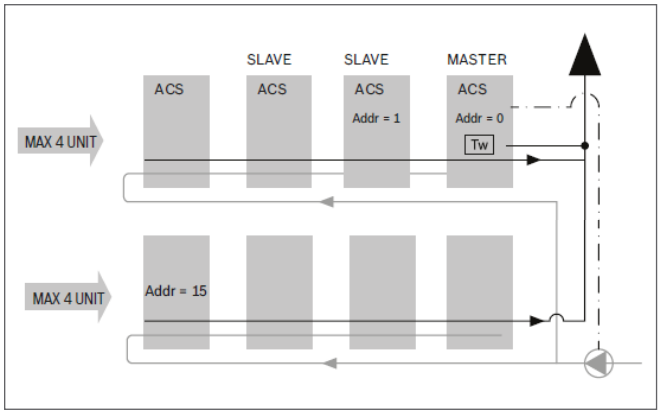
All units must be electrically connected to each other via the X-Y-E BUS.



ⓘ For electrical connections between several units, refer to the Connection of units in cascade chapter.

All system devices controlled by the unit, including probes Taf1, Tw and T5, must be wired to the MASTER unit.

16.5 System with reversed return connection



16.6 Input and output manifolds

Cooling capacity (kW)		In-out water piping
Min	Max	
15	30	DN40
30	90	DN50
90	130	DN65
130	210	DN80
210	325	DN100
325	510	DN125
510	740	DN150
740	1300	DN200

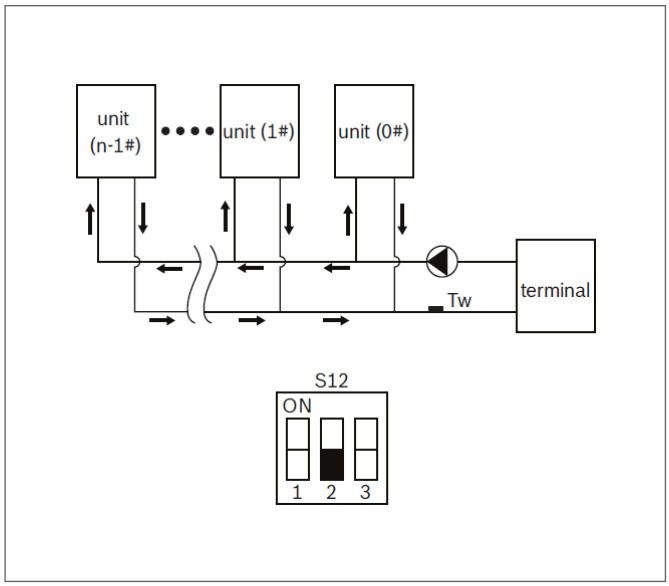
16.7 Single/multiple pump system

Configure DIP switch S1-3 according to the type of system.

16.7.1 Single water pump

A check valve is not required in single pump configuration.

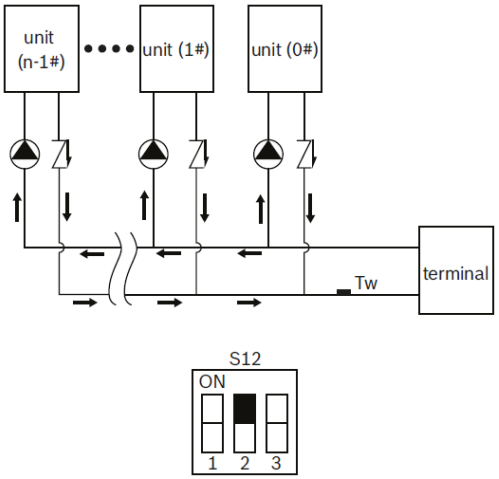
Pump control is only enabled on the master unit



16.7.2 Multiple water pumps

A check valve is required for each unit in multiple pump configuration.

Pump control is enabled on each unit



16.8 Addressing

Each connected module is identified by an address, from 0 to 7: the Master unit is identified as 0.

Set the correct date and time on each unit before connecting them to the network

Enable multiple configuration on each unit:

dip S1-3:

- ON units with on-board pump
- OFF units without on-board pump and a single pump in the system

The modular configuration consists of two networks: the controller network and the unit network (main boards).

Each network can have up to 7 addresses (from 0 to 7) and must be addressed separately.

Each network has its own master, which must have address = 0.

If some of the slave units do not have the DHW option:

- configure a unit without a DHW option as the master.
- assign the higher addresses to the slave units with DHW option
- For Single Pump systems, all units must be configured consistently with the Master. Only the Master manages the single external 3-way valve. In the design, consider that the units will switch simultaneously to fulfil the required load. It will not be possible to have simultaneous production on both the system side and the DHW side.

16.8.1 Addressing units

Units are addressed using encoder ENC4 on the back of the board.

The address is the number on the encoder.

The address is shown on display DSP1.

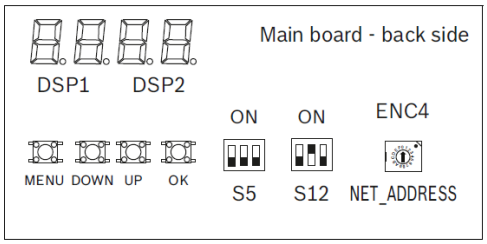
E.g.:

MASTER : address = 0 encoder = 0

SLAVE 1 : address = 1 encoder = 1

SLAVE 7 : address = 7 encoder = F

The address of the unit is shown on display “DSP1” on the main board.



16.8.2 Addressing controls

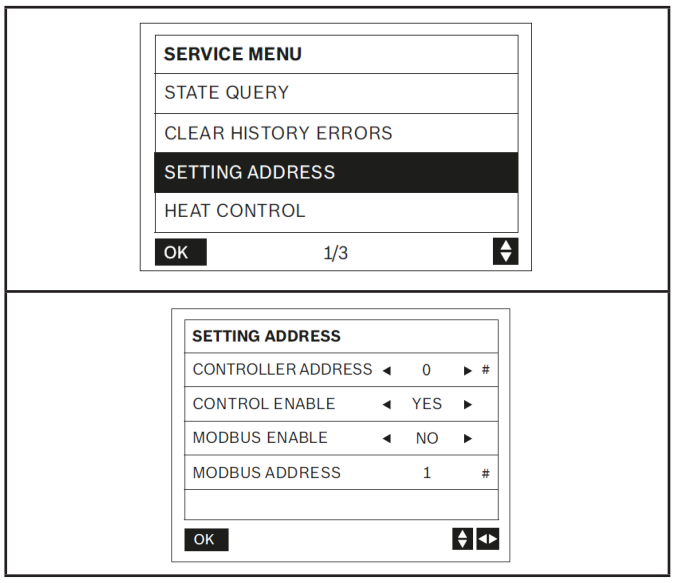
A maximum of 8 controls can be addressed, with addresses from 0 to 7; e.g.

- 8 units with relative controller on board, one of which is the master
- 6 units with relative controller on board + a remote controller as the master

Press ▼▲ to select SETTING ADDRESS.

Press ◄ ► to set the address

Press OK to confirm



16.9 Remote ON-OFF

With the units in modular configuration, remote control must be applied to the master unit, which transmits it to the slave units.

16.10 Start-up

Complete system management is carried out by the master unit, identified by address 0.

Thermoregulation takes place on the supply temperature of the entire system (Tw).

At switch-on, when a load is requested, the units are switched on in sequence based on their address, in numerical order.

When the load decreases, the units are switched off following the same sequence.

Example in cooling mode:

If Tw >= set point + 10°C

- the control activates 50% of the resources in sequence based on the set address.
- after a time interval (default: 240 seconds)
- if the load increases, additional resources are activated
- if the load decreases, the units are switched off following the same sequence (first start, first stop).

If Tw < set point + 10°C (in cooling mode)

- the control activates only the master unit.
- after a time interval (default: 240 seconds)
- if the load increases, additional resources are activated based on the set address
- if the load decreases, the master unit switches off.

16.11 Alarms

In the event of an alarm on one of the system units, there could be different outcomes:

- in the event of an alarm on a slave unit, the other system units will continue to operate
- in the event of a communication or common sensor alarm on the master unit, the entire system will stop.

Refer to the Service Manual for more details.

17. Modbus

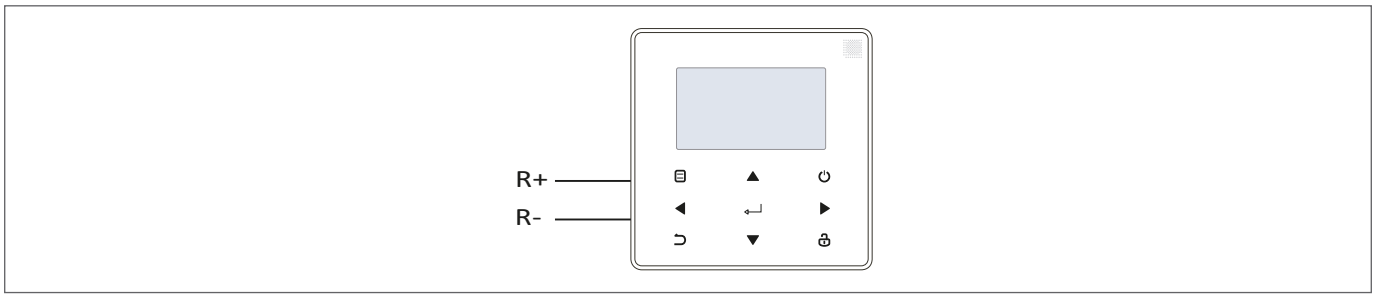
17.1 Communication specifications: RS - 485

Protocol	ModbusRTU: 9600, 8, N,1
Transmission speed	9600pbs
Data bit	8 data bits
Parity bit	None parity
Stop bit	1 stop bit

Connections

For single unit, connect Modbus to R-, R+ of the HMI.

For modular unit, connect Modbus to R-, R+ of the master unit's HMI and connect the units together via the XT2 terminals.



Enabling

SERVICE MENU ➜ SETTING ADDRESS ➜ Modbus enable ➜ YES

Data in English only

Reg	Name	Description
0	Modeset	(1Cool,2Heat, 4 DHW,8Off) DHW mode is only valid for hot water models and single pump systems Invalid when external unit remote control = ON For cooling only/FC models, only 1 Cooling, 8 Off can be set.
1	Set Two Temperature A	COOL MODE Only Cool & Free Cooling : (Max (-8, TSafe °C ~ 20 °C) Heat pump: R32-10 °C ~ 25 °C R290 -5 ~ 25 °C HEAT MODE Only Cool & Free Cooling: (25 °C ~ 55 °C) Heat pump: R32 Normal 25 ~ 60 °C High temperature 25 ~ 65 °C Heat Pump: R290 conventional 25 ~ 75 °C High temperature 25 ~ 85 °C
2	Set Two Temperature B	COOL MODE Only Cool & Free Cooling : (Max (-8, TSafe °C ~ 20 °C) Heat pump: R3 2-10 °C ~ 25 °C R290 -5 ~ 25 °C HEAT MODE Only Cool & Free Cooling: (25 °C ~ 55 °C) Heat pump: R32 Normal 25 ~ 60 °C High temperature 25 ~ 65 °C Heat Pump:R290 conventional25 ~ 75 °C High temperature 25 ~ 85 °C
3	Offset Temperature OFFSET-C/OFFSET-H	COOL(0~15 °C) HEAT (0~30 °C)
4	Water Set Temperature	T5sMin °C ~ T5sMax °C (sent by master control) Heat pump: R32 Normal 30 ~ 60 °C High temperature 30 ~ 70 °C Heat Pump: R29 0Regular 20 ~ 70 °C High temperature 20 ~ 80 °C (Available for single pump) Invalid for models without hot water machine
5	WaterOffset Temperature	Reserved Set 0
6	Clear Lock Errs	(0 is invalid, 1 clears the fault, other values are invalid) Clear all lock errors

Reg	Name	Description
7	Snow blowing switch	Enable/Disable 1/0
8	Reserved	Reserved
9	Metric and Imperial unit switching	0: Metric 1: Imperial
100	Silent Mode	1: Standard mode 2: Silent mode 3: Night silent mode 1 4: Night silent mode 2 5: Night silent mode 3 Night silent mode 3 6: Night silent mode 4 7: Super silent mode
101	DOUBLE SETPOINT Dual target temperature setting	Enable/Disable1/0
102	SETPOINT COOL_1 First target temperature in cooling	COOL MODE Only Cool & Free Cooling : (Max(-8, TSafe °C ~20 °C) Heat pump: R32-10 °C ~ 25 °C R290 -5 ~ 25 °C
103	SETPOINT COOL_2 Second target temperature in cooling	COOL MODE Only Cool & Free Cooling : (Max(-8, TSafe °C ~ 20 °C) Heat pump: R32-10 °C ~ 25 °C R290 -5 ~ 25 °C
104	SETPOINT HEAT_1 First target temperature in heating	HEAT MODE Only Cool & Free Cooling: (25 °C ~ 55 °C) Heat pump: R32Normal 25 ~ 60 °C High temperature 25 ~ 65 °C Heat Pump:R290conventional25 ~ 75 °C High temperature 25~85 °C
105	SETPOINT HEAT_1 First target temperature in heating	HEAT MODE Only Cool & Free Cooling: (25 °C ~ 55 °C) Heat pump: R32 Normal 25 ~ 60 °C High temperature 25 ~ 65 °C Heat Pump: R290 conventional25 ~ 75 °C High temperature 25 ~ 85 °C
106	COOL MODE ENABLE Temperature compensation function setting in cooling	Enable/Disable
107	T4_COOL_1 Temperature compensation point 1 in cooling mode	15 ~ 30 °C
108	T4_COOL_2 Temperature compensation point 2 in cooling mode	35 ~ 45 °C
109	OFFSET-C Temperature compensation value in cooling	0 ~ 15 °C
110	HEATMODE ENABLE Temperature compensation function setting in heating	Enable/Disable
111	T4_HEAT_1 Temperature compensation point 1 in heating mode	-25 ~ 15
112	T4_HEAT_2 Temperature compensation point 2 in heating mode	15 ~ 30 °C
113	OFFSET-H Temperature compensation value in heating	0 ~ 30 °C
114	FORCED HEAT2 OPEN Forced auxiliary electric heater 2 of single pump	Enable/Disable1/0 (Available for single pump) Before the electric auxiliary heating 2 is enabled, it is not allowed to set forced opening Invalid for models without hot water machine
115	DHW SWITCH Water heating switch	Enable/Disable1/0 (Available for single pump)

Reg	Name	Description
116	TWO_COOL_DIFF Differential temperature of unit outlet water in cooling	1 °C ~ 5 °C
117	TWO_HEAT_DIFF Differential temperature of unit outlet water in heating	1 °C ~ 5 °C
118	DT5_ON Differential temperature of unit outlet water in water heating	2 °C ~ 10 °C Invalid for models without hot water machine
119	DT1S5 Temperature difference of heat exchange in water heating	5 °C ~ 20 °C Invalid for models without hot water machine
120	TIM_CAP_ADJ Capacity adjustment period	60S–360S Adjustment range 20s
121	TW_COOL_DIFF/ TW_HEAT_DIFF Differential temperature of total outlet water	COOL MODE: 1 °C ~ 5 °C HEAT MODE: 1 °C ~ 5 °C
122	RATIO_COOL_FIRST Initial startup ratio in cooling	5~100% Adjustment range 5%
123	RATIO_HEAT_FIRST Initial startup ratio in heating	5~100% Adjustment range 5%
124	T_DIFF_PRO Protection of temperature difference between inlet and outlet water	Normal 8 °C ~ 15 °C High temperature 8 °C~25 °C
125	T_FROST Defrost period	20min ~120min Adjustment range 5min
126	T_DEFROST_IN Entry temperature of defrosting	-5 °C ~ 5 °C
127	T_FROST_OUT Exit temperature of defrosting	-10 °C ~ 10 °C
128	HEAT1 ENABLE Auxiliary electric heater	Enable/Disable 1/0
129	TEMP_AUXHEAT1_ON Available ambient temperature of auxiliary electric heater	0 °C ~ 10 °C Invalid for cooling only/FC models -15 °C ~ 10 °C The available ambient temperature for pipeline auxiliary electric heating needs to be ≥HEAT1Heat pump stops working ambient temperature
130	TW_HEAT1_ON Opening water temperature of auxiliary electric heater	Heat Pump: 0 °C ~ 59 °C The "open water temperature" must be lower than the "close water temperature" (This parameter is invalid)
131	TW_HEAT1_OFF Closing water temperature of auxiliary electric heater	Heat Pump: 1 °C ~ 60 °C The "Shut-off water temperature" must be higher than the "Open water temperature" (This parameter is invalid)
132	HEAT2 ENABLE Auxiliary electric heater of water tank is enabled/disabled	Enable/Disable 1/0 (single pump effective) Invalid for models without hot water machine
133	T_HEAT2_DELAY Delay opening time of auxiliary electric heater of water tank	60min ~ 240min Adjustment range: 5min (valid for single pump) Invalid for models without hot water machine
134	DT5_HEAT2_0FF Hysteresis when auxiliary electric heater of water tank stops	2 °C ~ 10 °C (Single pump effective) Invalid for models without hot water machine

Reg	Name	Description
135	T4_HEAT2_ON Available ambient temperature of auxiliary heater electric of water tank	-5 °C ~ 20 °C (Single pump effective) Invalid for models without hot water machine -15 °C ~ 20 °C Water tank electric auxiliary heating available ambient temperature > HE-A-T2. Heat pump stops working ambient temperature
136	SWITCH ON THE PUMP Startup of inverter water pump	Enable/Disable 1/0 (single pump effective)
137	RATIO-PUMP Startup percentage of inverter water pump	30-100% Adjustment range 5% (single pump effective) Before the variable frequency water pump is turned on, the opening percentage cannot be set
138	MODBUS ENABLE Modbus write enable switch	Enable/Disable Write operation valid/write operation invalid 1/0
139	Glycol type	0 :ETHYLENEEthylene glycol 1 :PROPYLENEPropylene glycol (Available for Only Cool & Free Cooling)
140	Percent of glycol	0 ~ 50% Adjustment range 5% (Available for Only Cool & Free Cooling)
141	Protection pressure compensation value ΔPaf	0 ~ 20 : 0.0 ~ 0.2Mpa Mpa is the actual value*100, the adjustment range is 5: 0.05Mpa Psi is the actual value, which can be 0, 5, 15, 20, 30Psi (Available for Only Cool & Free Cooling) Invalid heat pump model
142	Water Coil Control	0 :AUTOMATIC 1 :MANUAL1 2 :MANUAL2 (FC models are available for Free Cooling)
143	Enter mixback Tws Rising value DtTws	1 °C ~ 3 °C (FC models are available for Free Cooling)
144	Enter mix Hysteresis Dtmix	1 °C ~ 3 °C (FC models are available for Free Cooling)
145	Enter FC margin FCoffset	1 °C ~ 3 °C (FC models are available for Free Cooling)
146	Enter FC Hysteresis FChy	1 °C ~ 3 °C (FC models are available for Free Cooling)
147	Abnormal values of inlet and outlet water temperature TWI-O ABNORMAL	1 °C ~ 5 °C
148	Minimum cooling water output LOW OUTLET WATER CONTROL	R32-10 ~ 25 °C R290 -5 ~ 25 °C
149	Power saving mode Energy saving switch	40%~100% Adjustment range 10% 100% means power saving mode is off
150	E9 delay protection time Set E9 time	2 ~ 20s
151	E9 Detection Method	1: Do not check rake flow before starting the pump 2: Check the rake flow before starting the pump
152	Minimum opening ratio of variable frequency water pump Invert pump min ratio	40 ~ Min(100%, Invert pump max ratio) Adjustment range 5% Multi-pump hot water machine
153	Maximum opening ratio of variable frequency water pump Invert pump max ratio	Max(70%, Invert pump min ratio) ~ 100% Adjustment range 5% Multi-pump hot water machine
154	Pump On Time	5 ~ 60min Adjustment range 5min

Reg	Name	Description
155	Pump Off Time	0 ~ 60min Adjustment range 5min
156	TW_COOL_DIFF Cool mode differential temperature of total outlet water	1 °C ~ 5 °C Conventional heat pump models, only valid for the host when the setting mode is cooling
157	TW_HEAT_DIFF Heat mode differential temperature of total outlet water	1 °C ~ 5 °C Invalid for cooling only and FC models Conventional heat pump models, only valid for the host when the setting mode is heating
158	Electric heating 1 start differential temperature DTW_HEAT1_ON	1 °C ~10 °C
159	Electric heating delay start T_HEAT1_DELAY	15MIN~120MIN Adjustment range 5min
160	Heat pump stops working ambient temperature (HEAT1) T4_HEATPUMP_OFF1	-30~10 °C HEAT1The ambient temperature when the heat pump stops working needs to be ≤ the available ambient temperature for pipeline auxiliary electric heating
161	Pipeline electric heating forced on FORCED-HEAT1-OPEN	Enable/Disable On/Off 1/0
162	Heat pump stops working ambient temperature (HEAT2) T4_HEATPUMP_OFF2	-30~10 °C HE-A-T2 The ambient temperature of the heat pump stopping operation needs to be less than the available ambient temperature of the water tank electric auxiliary heating
163-199	Reserved	
265+(Unit Address)*100	HEAT2 STATE	0 Off, 1 On This item is not configured for non-hot water models, and the data is invalid In a single pump system, only the data of host No. 0 is valid
266+(Unit Address)*100	Tp1 Discharge temperature 1	Unit: 1 °C 255: Invalid data
267+(Unit Address)*100	ThSuction temperature	Unit: 1 °C 255: Invalid data
268+(Unit Address)*100	T3 TEMP	Minimum value of T3A and T3B, unit: 1 °C 255: Invalid data
269+(Unit Address)*100	Tz TEMP	Unit: 1 °C 255: Invalid data
270+(Unit Address)*100	T5 TEMP	Unit: 1 ° This item is not configured for non-hot water models, and the data is invalid In a single pump system, only host No. 0 has this data 255: Invalid data
271+(Unit Address)*100	Heat Pump : P PRESSURE Only Cool & Free Cooling : EVA PRESSURE	Unit: 10 kPa 0: Invalid data
272+(Unit Address)*100	MainBoard Err or protect	See the external machine fault code table
273+(Unit Address)*100	MainBoardLast Err or protect	See the external machine fault code table
274+(Unit Address)*100	HMISoftware Version	Current HMI version number
275+(Unit Address)*100	Tp2 Discharge temperature2	Unit: 1 °C 255: Invalid data
276+(Unit Address)*100	T5sMin	Unit: 1 °C This item is not configured for non-hot water models, and the data is invalid 255: Invalid data
277+(Unit Address)*100	T6A TEMP	Unit: 1 °C 255: Invalid data
278+(Unit Address)*100	Wire Control Err	See the line control fault code table

Reg	Name	Description
279+(Unit Address)*100	SV6 STATE	0 Off, 1 On
280+(Unit Address)*100	Current of Compressor 2	Unit: 1A
281+(Unit Address)*100	Unit Capacity	Unit: 1kw
282+(Unit Address)*100	Defrosting Defrost	0 No, 1 Yes
283+(Unit Address)*100	Antifreeze heating belt Anti-freezing electric heater	0 Off, 1 On
284+(Unit Address)*100	Remote Control Remote Control	0 Off, 1 On The address of external unit No. 0 is read effectively
285+(Unit Address)*100	FCT working status FCT working state	0 Off, 1 On The address of external unit No. 0 is read effectively Only valid when the host enters FCT2/FCT3
286+(Unit Address)*100	Pump group status	1: Multiple pumps 0: Single pump
287+(Unit Address)*100	External machine model ODU Type	0: Normal Heat Pump Conventional heat pump 1: Only Cool 2: Free Cooling
288+(Unit Address)*100	T5sMax	Unit: 1 °C This item is not configured for non-hot water models, and the data is invalid
289+(Unit Address)*100	Safety temperature Tsafe	Unit: 1 °C (only cooling/FC model valid)
290+(Unit Address)*100	Protective pressurePAF	Unit: 10 kPa (Effective for cooling only/FC model) Invalid heat pump model
291+(Unit Address)*100	Taf1IN-LET BPHE TEMP	Unit: 1 °C 255: Invalid data
292+(Unit Address)*100	MainBoardSoftware Version	Current main control board program version number Note: Old heat pump models do not have this value; when the value is 0, it means that the outdoor unit does not have this data
293+(Unit Address)*100	MainBoardEEPROM Version	Current main control board EEPROM program version number Note: Old heat pump models do not have this value; when the value is 0, it means that the outdoor unit does not have this data
294+(Unit Address)*100	COND PRESSURE	Unit: 10 kPa (valid for FC models) 0: Invalid data Note: Old heat pump models do not have this value;
295+(Unit Address)*100	T6B TEMP	Unit: 1 °C 255: Invalid data
296+(Unit Address)*100	TAF2 TEMP	Unit: 1 °C 255: Invalid data
297+(Unit Address)*100	TFIN1 TEMP	Unit: 1 °C 255: Invalid data
298+(Unit Address)*100	TFIN2 TEMP	Unit: 1 °C 255: Invalid data
299+(Unit Address)*100	TFIN3 TEMP (Reserved)	Unit: 1 °C 255: Invalid data
(2200~2299)+(Unit Address)*200	Reserved	
2300+(Unit Address)*200	DSH TEMP	Unit: 1 °C 255: Invalid data
2301+(Unit Address)*200	SSH TEMP	Unit: 1 °C 255: Invalid data
2302+(Unit Address)*200	CSH TEMP	Unit: 1 °C 255: Invalid data
2303+(Unit Address)*200	Frequency conversion pump operation percentage Invert Pump Running Percent	0 ~ 100%

Reg	Name	Description
2304+(Unit Address)*200	oldRrNewErr	Current fault(2305+(Unit Address)*200)New and old fault code parsing tags. 0: Analyze according to the old fault, the fault content refers to272+(Unit Address)*100 1: Press NewFault analysis
2305+(Unit Address)*200	MainBoard Err or protect80E0	Two analysis methods: old fault analysis and new fault analysis
2306+(Unit Address)*200	oldRrNewErrLast	Historical failures (2307+(Unit Address)*200)New and old fault code parsing tags. 0:according toOld fault analysis, fault content reference273+(Unit Address)*100 1: Press NewFault analysis
2307+(Unit Address)*200	MainBoardLast Err or protect80E0	Two analysis methods: old fault analysis and new fault analysis
(2308~2399)+(Unit Address)*200	Reserved	

17.2 Allarmi

Code	Description	Tipo
E0	Main control EPROM error	A
E1	Phase sequence error of main control board check	A
E2	Communication failure between master and the HMI or master and salve	A
2E2	Communication failure between main control and extension board	A
3E2	Communication failure between master and salve in a unit	C
E3	Total water outlet temperature sensor failure	A
E4	Unit water outlet temperature sensor failure	B
1E5	Condenser tube temperature sensor T3A failure	C
E6	Water tank temperature sensor T5 failure	A/B
E7	Ambient temperature sensor failure	B
E8	Power supply phase sequence protector output error	A
E9	Water flow detection failure	A/B
1Eb	Taf1 the pipe of the tank antifreeze protection sensor failure	A/B
2EB	Taf2 cooling evaporator low-temperature antifreeze protection sensor failure	B
Ed	System discharge temperature sensor failure	C
1EE	EVI plate heat exchanger refrigerant temperature T6A sensor failure	C
2EE	EVI plate heat exchanger refrigerant temperature T6B sensor failure	C
EF	Unit water return temperature sensor failure	B
EP	Discharge sensor failure alarm	C
EU	Tz sensor failure	C
P0	System high-pressure protection or discharge temperature protection	
1P0	System high-pressure switch disconnect protection	C
P1	System low pressure protection Severe refrigerant leakage protection	C
P3	T4 ambient temperature too high in cooling mode	B
P4	1P4 System A current protection	C
	2P4 System A DC bus current protection	
P6	Inverter module failure	C
P7	High temperature protection of system condenser	C
P9	Water inlet and outlet temperature difference protection	B
PA	Abnormal water inlet and outlet temperature difference protection	B
PC	Cooling evaporator pressure too low	C
PE	Cooling evaporator low temperature antifreeze protection	B
PH	Heating T4 too high temperature protection	B
PL	Tfin module temperature too high protection	C
1PU	DC fan A module protection	C
1bh	Module 1 failure	C
H5	Voltage too high or too low	A
1H9	Compressor inverter module is not matched	C
HC	High pressure sensor failure	C
1HE	No inset A valve error	C
2HE	No inset B valve error	C
3HE	No inset C valve error	C

Code	Description	Tipo
1F0	IPM module A transmission error	C
F2	Superheat insufficient	C
F4	1F4 module 1L0 or 1LE protection occurs for 3 times in 60 minutes	C
1F6	A system bus voltage error (PTC)	C
Fb	Low pressure sensor error	C
Fd	Suction temperature sensor error	C
1FF	DC fan A error	C
FP	DIP switch inconsistency of multiple water pumps	A
1L10	Overcurrent protection	C
1L11	Transient phase current overcurrent protection	C
1L12	Phase current overcurrent lasts 30s protection	C
1L20	Module over temperature protection	C
1L31	Low bus voltage error	C
1L32	High bus voltage error	C
1L33	Excessively high bus voltage error	C
1L34	Phase loss error	C
1L43	Phase current sampling bias abnormal	C
1L45	Motor code not match	C
1L46	IPM protection	C
1L47	Module type not match	C
1L50	Startup failure	C
1L51	Out of step error	C
1L52	Zero speed error	C
L60	Fan motor phase loss protection	C
L65	IPM short circuit error	C
L66	FCT detection error	C
L6A	Open circuit of U-phase upper tube	C
L6B	Open circuit of U-phase lower tube	C
L6C	Open circuit of V-phase upper tube	C
L6D	Open circuit of V-phase lower tube	C
L6E	Open circuit of W-phase upper tube	C
L6F	Open circuit of W-phase lower tube	C

The last column of the alarms table shows which of the following it belongs to in case of fault.

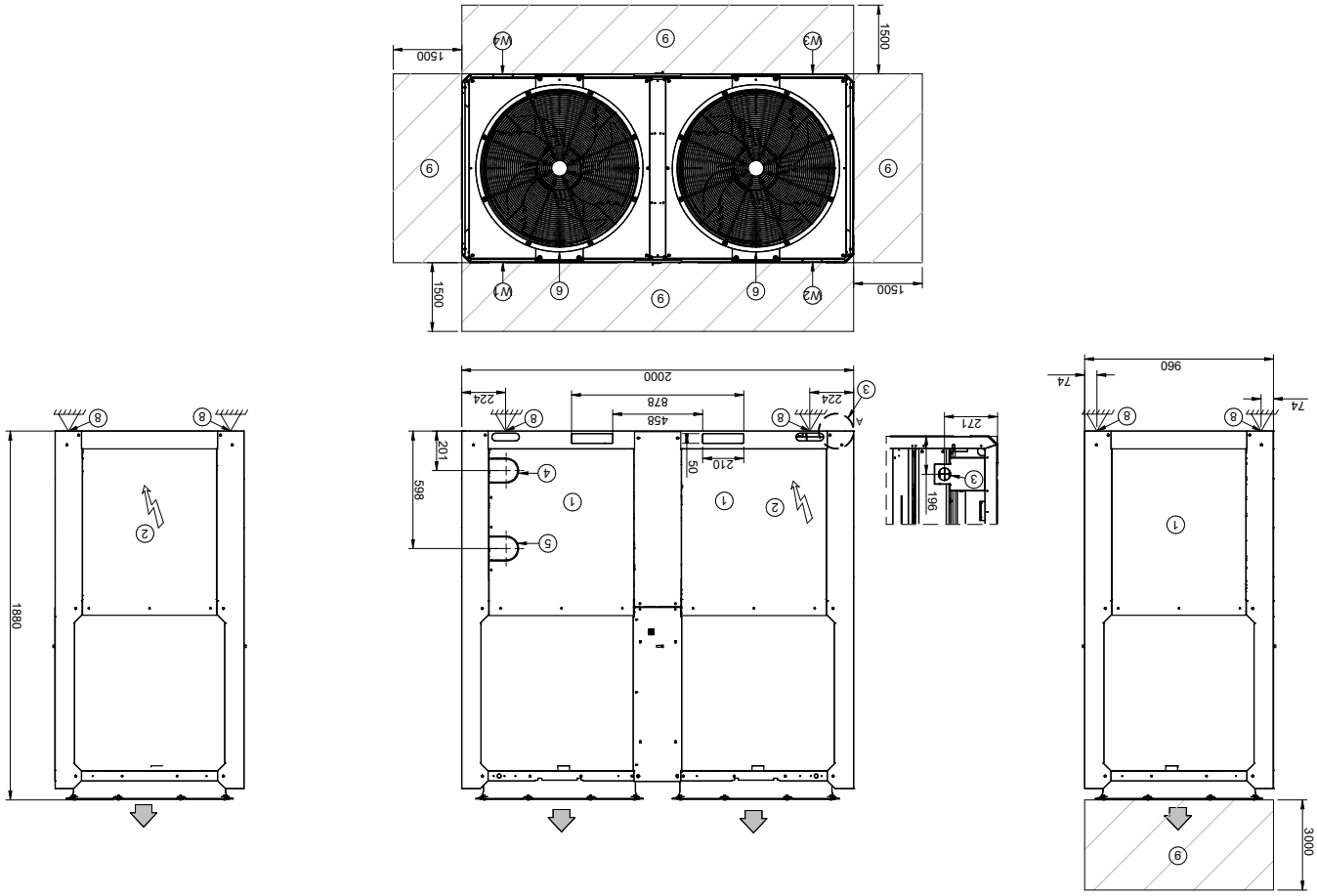
A = shuts down all units in M/S

B = shuts down the unit affected by the alarm

C = shuts down only the circuit affected by the alarm

18. **Dimensional drawings**

Size 30.2



1. Technical room
2. Electrical panel
3. Power input
4. 2” water connection inlet (Victaulic not supplied)
5. 2” water connection outlet (Victaulic not supplied)
6. Fan
7. Exchanger source
8. Unit fixing holes
9. functional spaces

SIZE		**30.2**
Length	mm/inch	2000 / 78.74
Depth	mm/inch	960 / 37.80
Height	mm/inch	1880 / 74.02
W1 Support point	kg / lbs	135 / 298
W2 Support point	kg / lbs	135 / 298
W3 Support point	kg / lbs	135 / 298
W4 Support point	kg / lbs	135 / 298
Operation weight	kg / lbs	541 / 1193
Operating weight	kg / lbs	565 / 1246

Weights are reported for standard configuration only. For unit with options check commercial documentation.

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