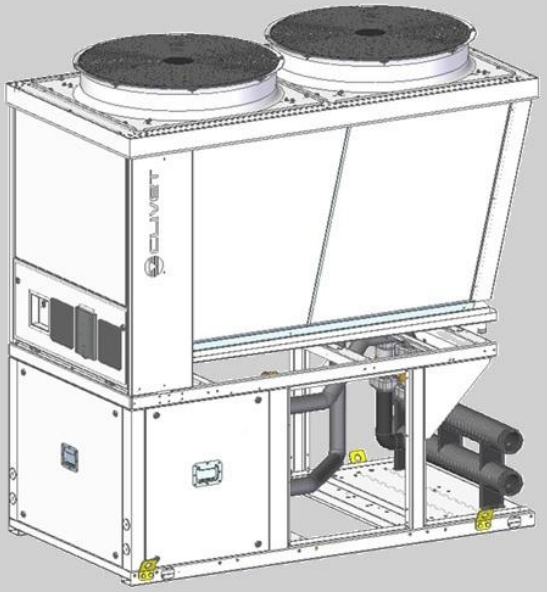
WISAN-YMD1 NA

40.2

Manual for installation, use and maintenance



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

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 maintenance, service, repair operations and in general, every working procedure that affects safety means shall only be carried out by competent persons according to Annex HH of UL 60335-2-40.

Examples for such working procedures are:

- breaking into the refrigerating circuit;
- opening of sealed components;
- opening of ventilated enclosures.

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 competency standards that may be set in legislation. The achieved competence should be documented by a certificate.

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 to people.

The manual must be delivered to the User.

This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, 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.

1.3 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 to people.

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.

1.4 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.

Check safety equipment before putting into service.

Be sure to use only specified accessories and parts for installation work. Failure to use specified parts may result in water leakage, electric shocks, fire, or collapse from its mount.

Do not install the unit by yourself. Ask your dealer or qualified personnel to perform installation work in accordance with this manual.

Improper installation could result in water leakage, electric shocks, or fire.

Every working procedure that affects safety means shall only be carried out by competent personnel.

The pipework, including piping material, pipe routing and installation shall include protection from physical damage in operation and service and be in compliance with national and local codes and standards such as ASHRAE 15, ASHRAE 15.2, IAPMO Uniform Mechanical Code, ICC International Mechanical Code or CSA B52. All field joints shall be accessible for inspection prior to be covered or enclosed.

Protection devices, piping and fittings shall be protected as far as possible against adverse environmental effects, for example the danger of water collecting and freezing in relief pipes or the accumulation of dirt and debris.

Provision shall be made for expansion and contraction of long runs of piping.

Piping in refrigerating systems shall be so designed and installed as to minimize the likelihood of hydraulic shock damaging the system.

Steel pipes and components shall be protected against corrosion with a rustproof coating before applying any insulation.

After completing the installation work, make sure that there is no refrigerant leakage.

1.5 Maintenance

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

Turn the unit off before any operation.

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

Maintenance shall only be carried out following the

manufacturer's instructions.

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

Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.

Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.

Check safety equipment before putting into service.

1.6 Modification

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

1.7 Breakdown/Malfunction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

1.8 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

1.9 Data update

Continual product improvements may imply manual data changes.

Visit manufacturer web site for updated data.

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 center 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/Malfunction

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 Unit identification

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

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

- unit type
- serial number (12 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.

2.3 Serial number

It identifies uniquely each unit.

It must be cited when ordering spare parts.

2.4 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. 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 show that only a competent 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.

4. Information on refrigerant gas

WARNING

- **This product contains fluorinated greenhouse gases covered by the Kyoto protocol.**
- **Do not discharge gas into air.**
- **Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.**
- **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).**
- **Do not pierce or burn.**
- **Be aware that refrigerants may not contain an odour.**
- **This appliance employs A2L flammable refrigerant R32.**

The characteristics of the refrigerant are reported below:

Physical characteristics of the R32 refrigerant				
Safety class (ISO 817)	A2L			
GWP (Global Warming Potential)	675		Kg CO_2 eq, 100yr	
LFL Low flammability limit	0,307	kg/m³@ T>30°C	0.019	lb/ft3 @ T>86°F
BV Burning velocity	6,7	cm/s	0.089	inch/s
Normal boiling point	-52	°C	-61.6	°F
Self-ignition temperature	648	°C	1198.4	°F

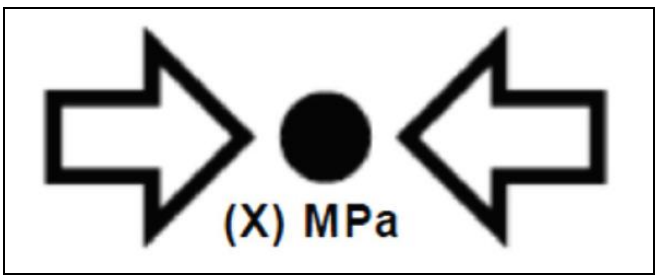
Quantity of refrigerant charged at the factory and tons of equivalent CO_2:

Size	Refrigerant (kg)	t CO_2 eq.

	C1	C2	-
40.2	6.8	6.8	9.18

NOTE

- **The refrigerant quantity is indicated on the unit plate.**



5. R32 gas safety warnings

WARNING

- **The following precautions should be complied with when installation, service, maintenance and repair, and decommissioning of appliances using flammable refrigerant.**
- **The main switch shall not be operated when the unit is working: before operating on the main switch to cut the power supply off, switch the unit to off (i.e. with the HMI) and wait until the compressors and the fans stop.**

5.1 Checks to the area

Prior to beginning work on systems containing flammable refrigerants, safety checks are necessary to ensure that the risk of ignition is minimised. For repair to the refrigerating system, clauses 5.2 to 5.6 shall be completed prior to conducting work on the system.

5.2 Work procedure

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

5.3 General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

The area around the workspace must be cordoned off. Ensure that the conditions within the area have been made safe by control of flammable material.

5.4 Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres.

Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e., non-sparking, adequately sealed or intrinsically safe.

5.5 Presence of fire extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

5.6 No ignition sources

No person carrying out work in relation to a refrigerating system which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion.

All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space.

Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. “No Smoking” signs shall be displayed.

5.7 Ventilated area

Ensure that the area is in the open or that it is adequately ventilated before breaking into the system or conducting any hot work.

A degree of ventilation shall continue during the period that the work is carried out. The ventilation should safely disperse any released refrigerant and preferably expel it externally into the atmosphere.

5.8 Checks to the refrigerating equipment

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

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

- the refrigerant charge is in accordance with the room size within which the refrigerant containing parts are installed;
- the ventilation machinery and outlets are operating adequately and are not obstructed;
- if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
- marking to the equipment continues to be visible and legible. Markings and signs that are illegible shall be corrected;
- refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which can corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

5.9 Checks to electrical devices

Repair and maintenance of electrical components must include initial safety checks and component inspection procedures.

In case of a fault that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with.

If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks must include:

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

5.10 Operation

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

5.11 Repairs to sealed components

Sealed electrical components shall be replaced.

Repairs are not allowed on such components.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

5.12 Repairs to intrinsically safe components

Intrinsically safe components must be replaced

Repairs are not allowed on such components.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

5.13 Cabling

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

5.14 Detection of flammable refrigerants

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

The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks but, in the case of flammable refrigerants, the sensitivity may not be adequate, or may need re-calibration (detection equipment shall be calibrated in a refrigerant-free area).

Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.

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

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

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to the following paragraph.

5.15 Removal and evacuation

When breaking into the refrigerant circuit to make repairs, or for any other purpose, conventional procedures shall be used.

However, for flammable refrigerants it is important that best practice be followed, since flammability is a consideration.

The following procedure shall be adhered to:

- safely remove refrigerant following local and national regulations;
- evacuate;
- purge the circuit with inert gas;
- evacuate;
- continuously flush with inert gas when using flame to open circuit; and
- open the circuit.

The refrigerant charge shall be recovered into the correct recovery cylinders if venting is not allowed by local and national codes. For appliances containing flammable refrigerants, the system shall be purged with oxygen-free nitrogen to render the appliance safe for flammable refrigerants. This process might need to be repeated several times. Compressed air or oxygen shall not be used for purging refrigerant systems.

For appliances containing flammable refrigerants, refrigerants purging shall be achieved by breaking the vacuum in the system with oxygen-free nitrogen and continuing to fill until the working pressure is achieved, then venting to atmosphere, and finally pulling down to a vacuum. This process shall be repeated until no refrigerant is within the system. When the final oxygen-free nitrogen charge is used, the system shall be vented down to atmospheric pressure to enable work to take place.

The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

Make sure there are no circuit branches sectioned off during the removal operation; if necessary open the circuit valves or remove/evacuate/flush from multiple plugs.

5.16 Charging procedures

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

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

Prior to recharging the system, it shall be pressure-tested with the appropriate purging gas.

The system shall be leak-tested on completion of charging but prior to commissioning. A follow up leak test shall be carried out prior to leaving the site.

5.17 Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all

its detail. It is recommended good practice that all refrigerants are recovered safely.

Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant.

It is essential that electrical power is available before the task is commenced.

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

5.18 Labelling

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant. The label shall be dated and signed.

For appliances containing flammable refrigerants, ensure that there are labels on the equipment stating the equipment contains flammable refrigerant.

5.19 Recovery

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

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

The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.

The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

5.20 Transport, mark, storage and disposal

- Transport of equipment containing flammable refrigerants 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.
- Signs for similar appliances used in a work area are generally addressed by local regulations and give the minimum requirements for the provision of safety and/or health signs for a work location. All required signs are to be maintained and employers should ensure that employees receive suitable and sufficient instruction and training on the meaning of appropriate safety signs and the actions that need to be taken in connection with these signs. The effectiveness of signs should not be diminished by too many signs being placed together. Any pictograms used should be as simple as possible and contain only essential details.
- Disposal of equipment using flammable refrigerants must be in compliance with national regulations.
- The storage of the appliance should be in accordance with the applicable regulations or instructions, whichever is more stringent.
- Storage of 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.
- 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).
- Storage package protection should be constructed in such a way that mechanical damage to the

equipment inside the package will not cause a leak of the refrigerant charge. The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.

6. Before installation

6.1 Reception

Before accepting the delivery check:

- 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 whether 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.**

6.2 Storage

Observe external packaging instructions. In particular:

Minimum ambient temperature	-4°F (-20°C)
Maximum ambient temperature	130.5°F (54°C)
Maximum relative humidity	95%

Failure to comply with the above conditions can lead to:

- possible components damages
- possible safety valve opening
- possible damages to electrical components

WARNING

- **The unit may not be tilted more than 15° during transport.**
- **Do not store the unit near heat sources, flame sources and high temperature equipment.**

6.3 Packaging removal

Be careful not to damage the unit.

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

Tear apart and throw away plastic packaging bags so that children will not play with them. Children that playing with plastic bags face danger of death by suffocation.

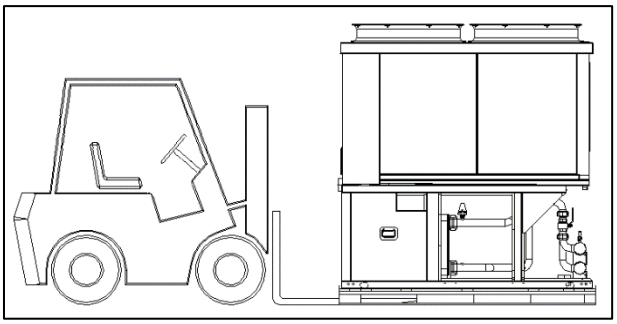
Safely dispose of packing materials such as nails and other metal or wood parts that could cause injuries.

6.4 Handling

WARNING

- **Check that all handling equipment complies with local safety regulations (crane, 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 present personnel and the material.**
- **Check the unit weight and lifting equipment capacity. Refer to the *Dimensional drawings* chapter.**
- **It's strictly forbidden to stand under the machine when it is hoisted.**
- **The unit may not be tilted more than 15° during handling.**

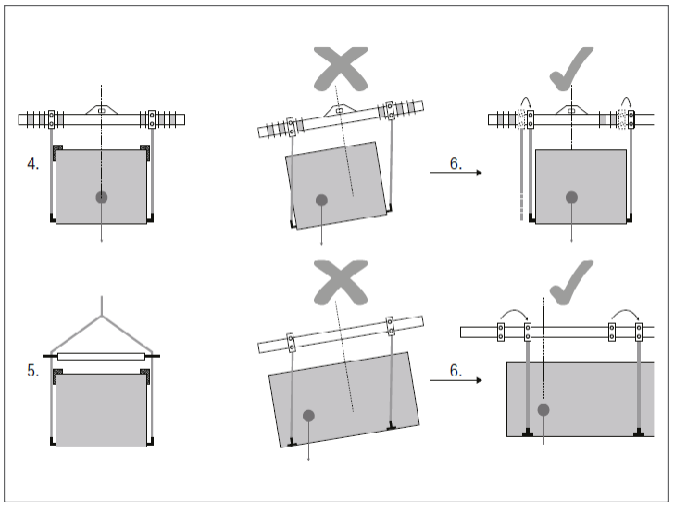
The unit is supplied with a wooden pallet fixed to its base. This is made to facilitate the handling and installation of the unit with a forklift. Forks must have a proper length according to the barycenter position.



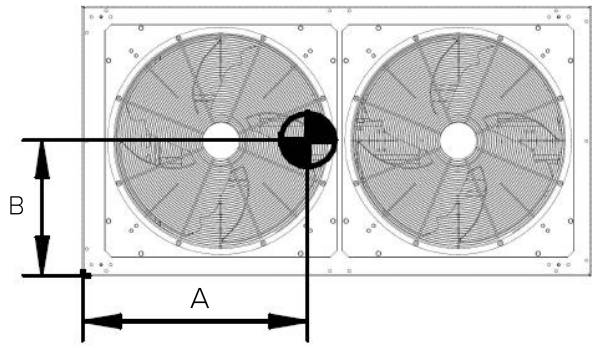
Proper lifting brackets are also installed to allow the unit to be lifted with a crane (see *Dimensional drawings*). After the installation the brackets can be removed.

Please observe the following indications when lifting the unit:

- Identify critical points during handling (disconnected routes, flights, steps, doors)
- Protect the unit properly to prevent damage
- Lift with balance
- Lift with spacer bar
- 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.



Center of gravity		
	2 pipes	**Stand alone**
A	29" 11/64 (74.1cm)	27" 43/64 (70.3cm)
B	22" 23/32 (57.7cm)	23" 11/32 (59.3cm)



7. Selecting the installation site

7.1 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. Ask your dealer or qualified personnel to perform installation work in accordance with this manual.

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

7.2 Maximum altitude of the installation

WARNING

- **The maximum altitude allowed for installation is 6600ft (~2000m).**
- **keep in mind that, as the altitude increases, due to the rarefaction of air, the unit's permissible operating range can be significantly reduced.**

7.3 Functional spaces

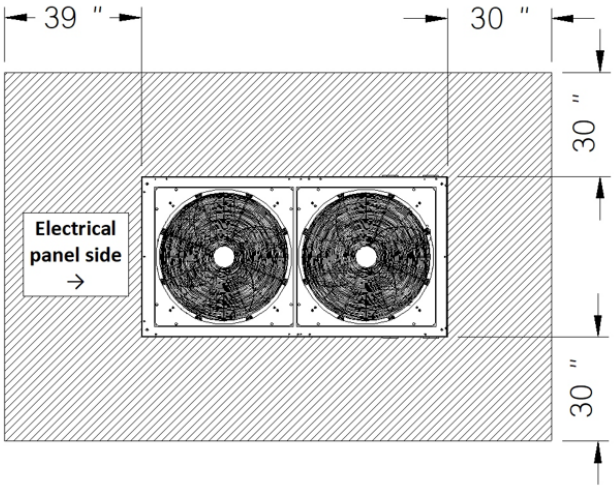
Functional spaces are designed to:

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

WARNING

- **Respect all functional spaces indicated in the following diagrams according to the adopted configuration.**
- **Do not smoke or use open flames within this area**

Stand-alone unit:

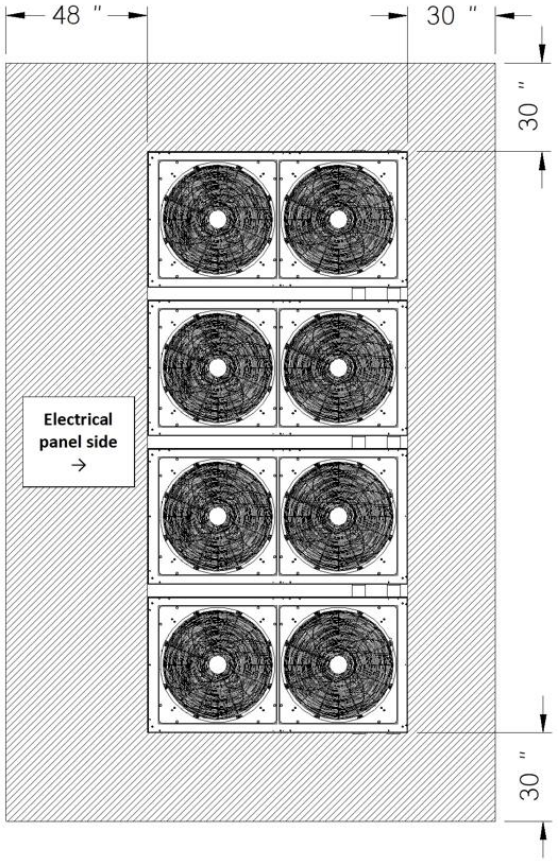


When the unit is placed with the longer sides near solid surfaces (walls, etc..) higher than 39" (100cm), lateral distances shall be increased to a minimum of 78" (200cm) to allow the correct air circulation.

Modular configuration:

In a multiple unit configuration, when the 2 pipe kits or 4 pipe kits are installed, the units are designed to be positioned one next to the other with very limited space between them. An increased distance in front of the units (electrical box side) must be respected to allow a unit to slide and free the sides of the refrigerating circuit box and plate exchanger (a proper sledge can be supplied - as an option - to ease this operation); in this way maintenance and repairs can be performed.

On the other sides of the units assemble the same spaces of the stand-alone unit must be maintained when there are no obstacles to the airflow.



When the assemble is placed with the longer or the rear sides near solid surfaces (walls, etc..) higher than 39"

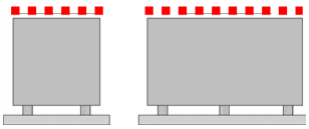
(100cm), lateral distances shall be increased to a minimum of 78" (200cm), whereas rear functional distance must be identified in the following table according to the number of units in parallel:

n° of units	Minimum rear distance	
	inch	cm
2÷3	30"	67
4÷6	55"	140
7÷8	87"	220

7.4 Positioning

ATTENTION

▶ **Do not place heavy loads or step on the upper surfaces indicated in the following image**



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 electrical grid is not sufficiently stable (unless the necessary corrective actions are implemented to stabilize 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 vapors are present, as may be the case in industrial areas with particular neighboring processes;
- do not install in areas where there are mineral oil vapors or sprays, which can deteriorate plastics and lead to water leaks from hydraulic seals or similar problems in other parts of the unit;
- where flammable gases may leak, where carbon fiber or ignitable dust is suspended in the air or where volatile flammables such as paint thinner or gasoline are handled. These types of gases might cause a fire;
- 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 7.9" - 200 mm to ensure sufficient space for installation of the piping and to protect against snow and flooding);
- bearing points aligned and leveled;
- install the unit on a solid surface (steel or concrete structure)
- the supporting structure must be level, firm and with a strength suitable for the unit's weight. Insufficient physical strength may cause the structure to fail and equipment to fall with possible injuries to people and damage to property;
- 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 are expected, corrective measurements should be taken like fences, walls, etc.
- perform specified installation work with full consideration of strong winds, hurricanes, or earthquakes. Improper installation work may result in accidents due to equipment falling.

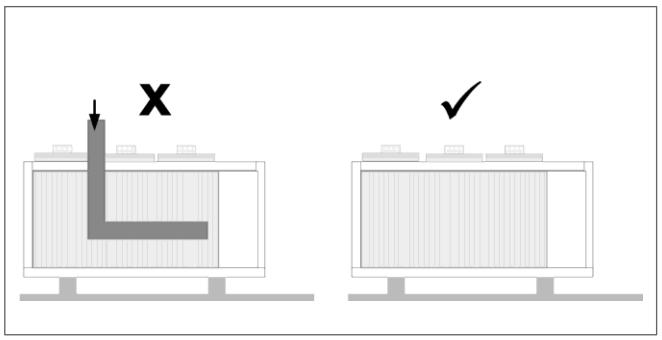
Limit vibration transmission:

- 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.

7.5 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 a good operation of the unit.

Avoid therefore:

- obstacles to the airflow
- difficulty of exchange
- leaves or other foreign bodies that can obstruct the air coil
- winds that hinder or favor 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 high walls, attics or in angles that could give rise to stratification or recirculation phenomenon's

Ignoring the previous indications could:

- reduce energy efficiency
- alarm lockout due to high pressure (in summer) or low pressure (in winter)

7.6 Condensate water

When a heat pump is running it produces a considerable amount of water due to the condensation of the humidity of the air passing through the external coil and from the defrosting cycles.

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. Installation of the anti-vibration mounts

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

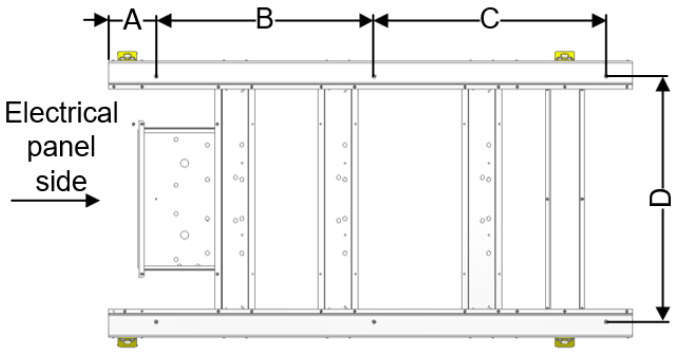
Place the anti-vibration mounts between the unit and the installation base.

Use the holes on the unit frame (~5/8" – 16.5 mm diameter).

NOTE

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

Supporting points position		
	inches	mm
A	~7" 7/8	200
B	~2' 11" 25/32	909
C	~3' 2" 5/32	969
D	~3' 4" 23/64	1025



Please refer to the *Technical Bulletin* for more detailed drawings.

9. Water connections

9.1 Hydraulic system

The piping must be designed and manufactured to limit pressure drops as much as possible, i.e. optimize 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 their lifetime.

The system pipes shall be connected following the inlet and outlet markings.

The pipes shall be easily removed and disassembled for maintenance and cleaning, as well as for inspection of the brazed plate heat exchanger status.

Proper pipe supports must be provided in order to eliminate any additional load 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 and for maintenance.

All the higher positions of the system must be equipped with air vents in order to eliminate the air trapped in the system during the preliminary activities that comes before the commissioning.

Don't run the system without having 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 system 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 dirt 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. This risk needs particular attention as it can lead the plate heat exchanger to fail with water and/or refrigerant leaks to the outside or refrigerant leaks into the water circuit.

The system shall be filled with water respecting the limits indicated by the following table. Provide a water treatment system if values fall outside the limits.

ATTENTION

- **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 system to prevent problems related to water quality.**

Water component for corrosion limit on copper	
PH (77°F)	7,5 ÷ 9
SO4--	≤ 100
HCO3- / SO4--	> 1
Total hardness	8 ÷ 15 °f
Cl-	< 50 ppm
PO4 3-	< 2,0 ppm
NH3	< 0,5 ppm
Free chlorine	< 0,5 ppm
Fe3+	< 0,5 ppm
Mn++	< 0,05 ppm
CO2	< 50 ppm
H_2S	≤ 50 ppb
Oxygen content	< 0,1 ppm
Sand	10 mg/L
Ferrite hydroxide Fe3O4 (black)	Dose < 7.5 mg/L 50% of mass diameter < 10 µm
Iron oxide Fe2O3 (red)	Dose < 7.5mg/L Diameter < 1 µm
Electrical conductivity (µS/cm)	< 500
Sodium nitrate (mgNaNo3/l)	< 100
Alkalinity(mgCaCo3/l)	< 100
Copper (mgCu/l)	< 1,0
Sulphide ion (S-/l)	None
Ammonium ion (mgNH4+/L)	< 1,0
Silica (mgSiO2/l)	50

Water component for corrosion limit on copper	
Max Ethylene, Propylene Glycol	50%
Nitrates	< 100
Free and aggressive carbonic acid	< 5

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 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 direct production of domestic hot water: a secondary heat exchanger is mandatory for this purpose.

9.5 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.

9.6 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.**

9.7 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 differential pressure-switch where some water can be trapped.
- It's responsibility 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.

The unit manages a proper antifreeze control logic even if it is switched to off. On the contrary if the unit is powered off, in the event of a power failure or if the manual 2-way valves are closed (unit isolated from the water system) the unit loses its protection and only the use of brine can prevent the risk of freezing.

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

Frost crack may happen to water-side heat exchanger during maintenance operations when refrigerant is injected to the unit or is discharged for repair. Pipe freezing is likely to happen any time when the pressure of refrigerant is below 116 psig. Therefore, the water in the heat exchanger must be kept flowing or be thoroughly discharged.

9.8 Anti-freeze solution

The use of an anti-freeze solution results in an increase in pressure drop. Please consider the correction factors indicated in the *Technical information* chapter.

Only use approved brine solutions i.e., ethylene glycol or propylene glycol. Make sure that the glycol type utilized is inhibited (not corrosive) and compatible with the water circuit components. Do not mix different glycol types (i.e., ethylene with propylene glycol).

The brine mixture must be properly selected and mixed to maintain a freezing point suitable for your climate and application.

ATTENTION

▶ **The unit must always be protected from freeze. Otherwise, irreversible damage may occur.**

% GLYCOL ETHYLENE / PROPYLENE BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°F	28.4	25	20.3	16	10.8	3.9	-2.2	-10.1	-18	-26.9
	°C	-2	-3.9	-6.5	-8.9	-11.8	-15.6	-19.0	-23.4	-27.8	-32.7
Safety temperature	°F	37.4	33.8	30.2	24.8	21.2	14	6.8	5	5	5
	°C	3	1	-1	-4	-6	-10	-14	-15	-15	-15

9.9 Minimum system water content

Minimum system water volumes are described within chapter *Technical information* under *Construction* and they have to be satisfied for a proper functioning of the unit.

9.10 Water operating pressures and temperatures

The maximum and minimum water operating temperatures, in cooling and heating mode, are given in the *Technical information* under *Operating range*.

The maximum and minimum water operating pressures are presented in the following table:

Water system allowable pressure range	
psig	bar
0÷290	0-20

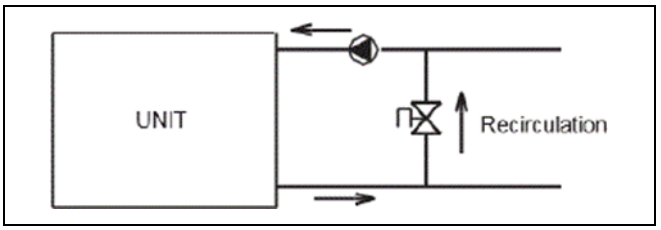
9.11 Water flow-rate

The design water-flow must be:

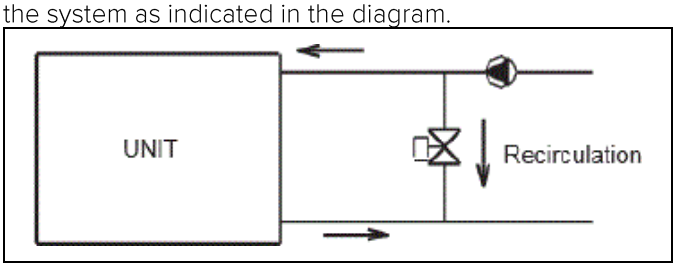
- within the limits indicated in the table of this paragraph of the operation manual.
- guaranteed, also with variable system conditions (for example in systems where some circuits are bypassed in particular situations).

Water flow-rate			
Min.		Max.	
gpm	m^3/h	gpm	m^3/h
48.4	11	132	30

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



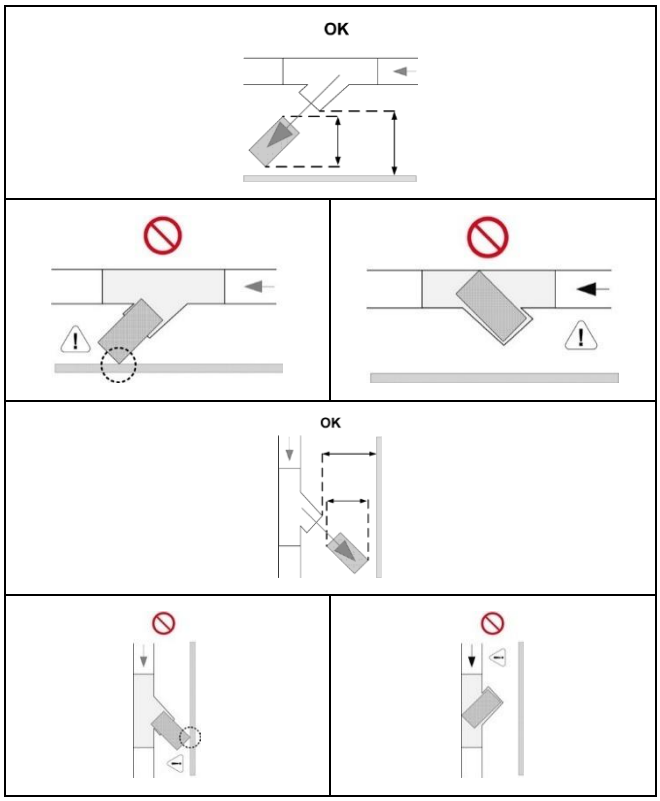
If the system capacity exceeds the minimum flow, bypass the system as indicated in the diagram.



9.12 Water 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 dirt 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, etc.



The filter must have a minimum mesh size of 20 holes per square 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 when selecting the system pump. An higher mesh size will result in good filtering but also high pressure drops and high frequency of intervention to remove the dirty from the filter.

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

A higher frequency of filter maintenance is needed during the first period after commissioning.

The filter is out of the scope of supply and must be selected and installed by the customer.

ATTENTION

- **A proper filter installation is mandatory. The filter should never be removed; this operation invalidates the guaranty.**

9.13 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 outlet connection: G 3/4" ISO228.

9.14 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 units are used in the system and the units are configured to operate in M/S, the capacity requirement is defined according to the total capacity of the system.

9.15 Selection of external water pump

The water pump is out of the scope of supply and must be selected and installed by the customer. The pump shall be controlled by the unit but its power supply must be independent.

The unit can control both on/off and inverter driven pumps, but different connections must be made in such cases (see Electrical Connections).

In case of high reliability systems, it is recommended to use at least one backup pump. The switch between the main pump and the backup pump is not managed from the unit and additional systems are needed. In the following chapters, this manual generically indicates only "pump", but it could mean also pumping group according to the installed configuration.

The selected pump must guarantee, in all the possible water system configurations, to stay within the water flowrate limits.

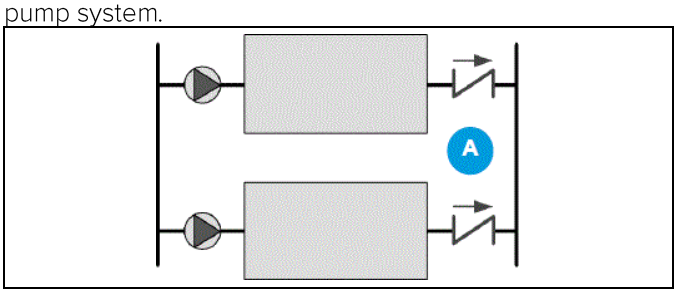
If the head of the pump cannot meet the requirements, more pumps in series can be used to increase the head at the given flowrate.

When multiple units are connected in a hydraulic parallel, the system can be designed with a single pump or with multiple pumps layout; in the latter case each unit shall have its dedicated pump (see connection diagrams) and the unit must be selected without the standard 2 pipe kit (stand alone version).

When the system is configured with a single pump, this will be controlled by the master unit.

9.16 Non-return valve

Provide for the installation of non-return valves (A) when the units are connected in parallel configuration with a multiple pump system.



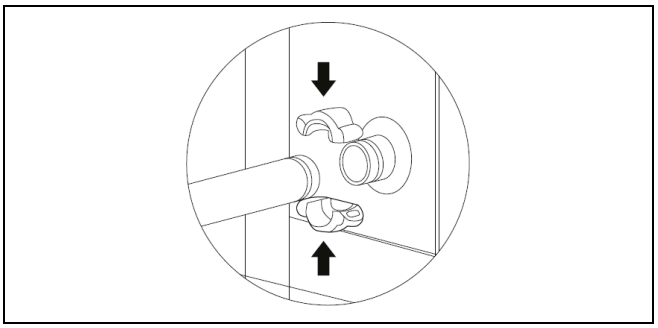
9.17 Water low pressure cut-off switch

In order to avoid the pump to run without water in the system it is recommended to install a low-pressure cut-off switch connected to the pipe upstream of the pump.

The unit can manage such pressure switch through the WA-WB connection points in the terminal box (dry contacts). If the pressure switch is open, the unit shuts down (error E9).

The water low pressure cut-off switch is out of the scope of

supply and must be selected and installed by the customer.



9.18 Victaulic fittings

The water inlet and outlet piping must be connected using Victaulic connection joints as shown in the figure below.

The water connection pipes have diameter 2".

Do not weld the system pipes with the Victaulic connection joints attached as this can damage the rubber gaskets.

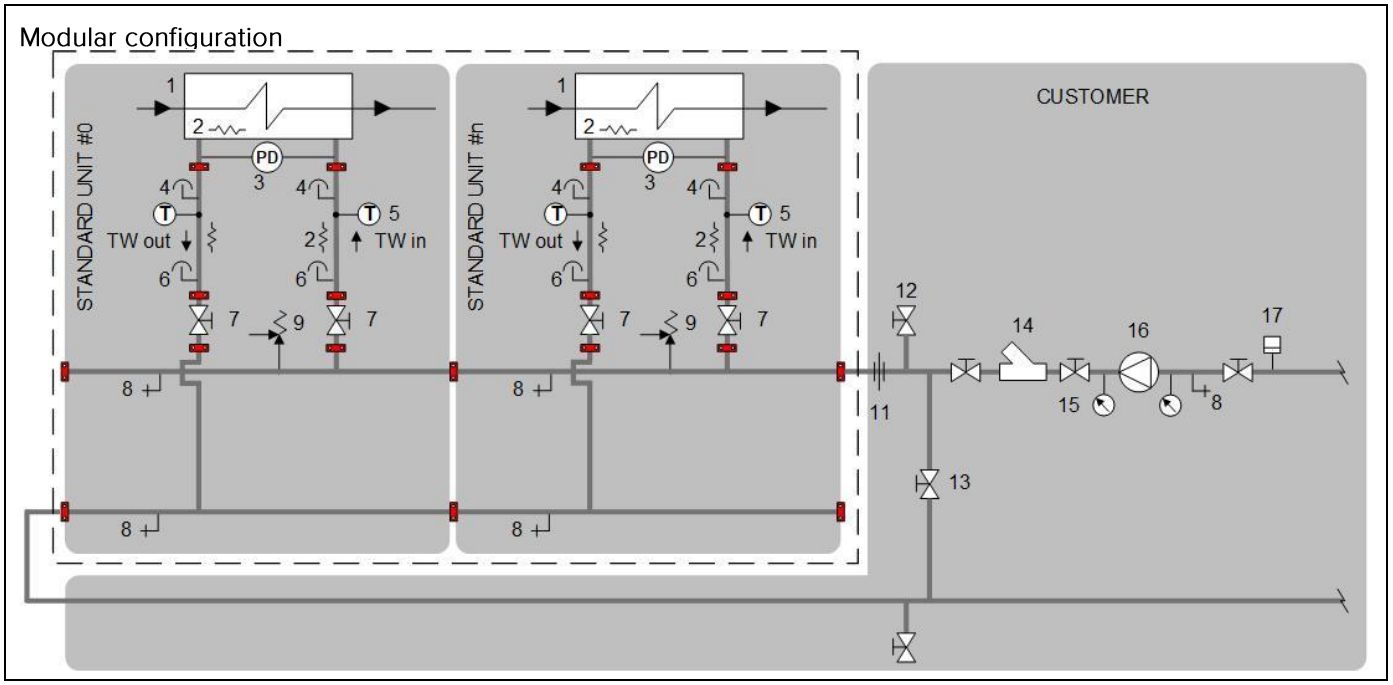
9.19 Hydronic groups and recommended connection diagrams

The installer must define:

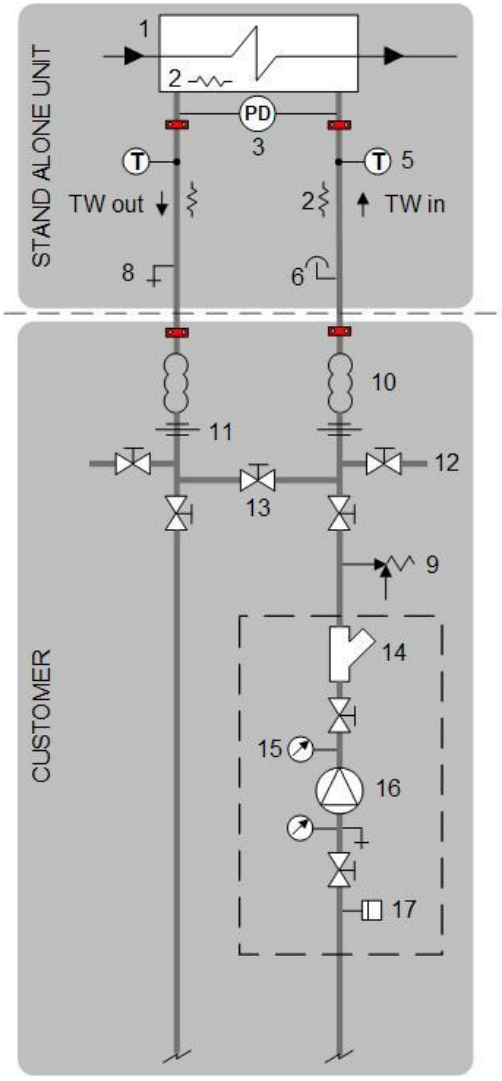
- type of components
- position in the system

See the following diagrams.

Modular configuration



Stand-alone unit



COMPONENTS

1. Exchanger
2. Antifreeze heater
3. Differential pressure switch
4. Automatic deaerator
5. Water temperature probes
6. Manual air vents
7. Shut-off valves
8. Drain
9. Pressure relief valve
10. Flexible couplings
11. Piping supports
12. Exchanger chemical cleaning bypass
13. System washing bypass (interlock closed during operation)
14. Filter
15. Pressure gauge
16. Pump
17. Low pressure cut-off switch

NOTE

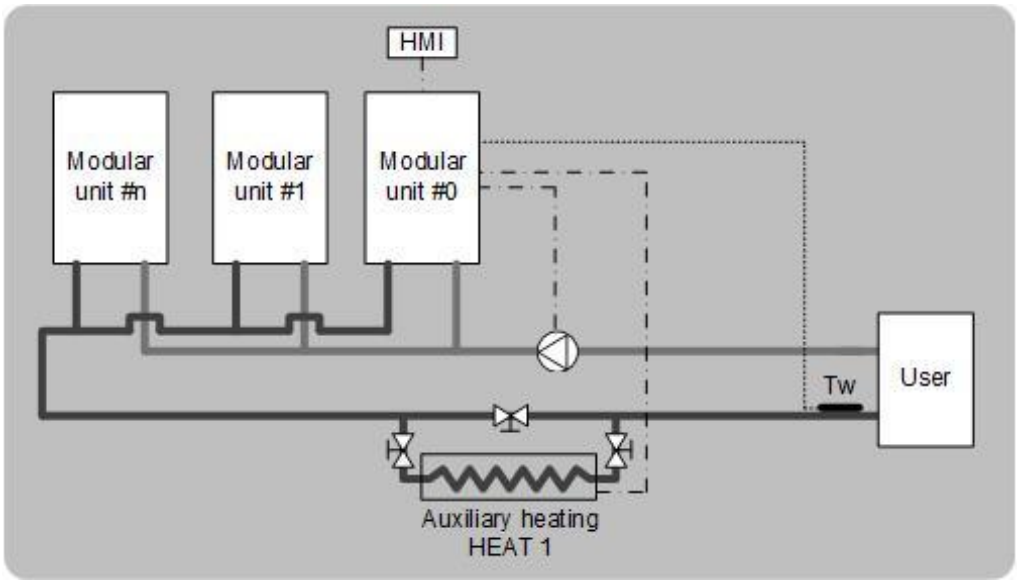
The above diagram, in the customer section, is purely indicative of the necessary system components. It must be considered as a non-exhaustive list of components and good engineering practice must be applied considering the characteristics of the installation site and the needed configuration.

The standard unit is supplied with the 2 pipes kit, which is intended to connect from 2 to 8 units in a hydraulic parallel system. On the contrary, the unit without pipes kit (option) is intended to be installed as a stand-alone heat pump. The above diagrams reflect these configurations, but are not comprehensive of all the possible system layouts.

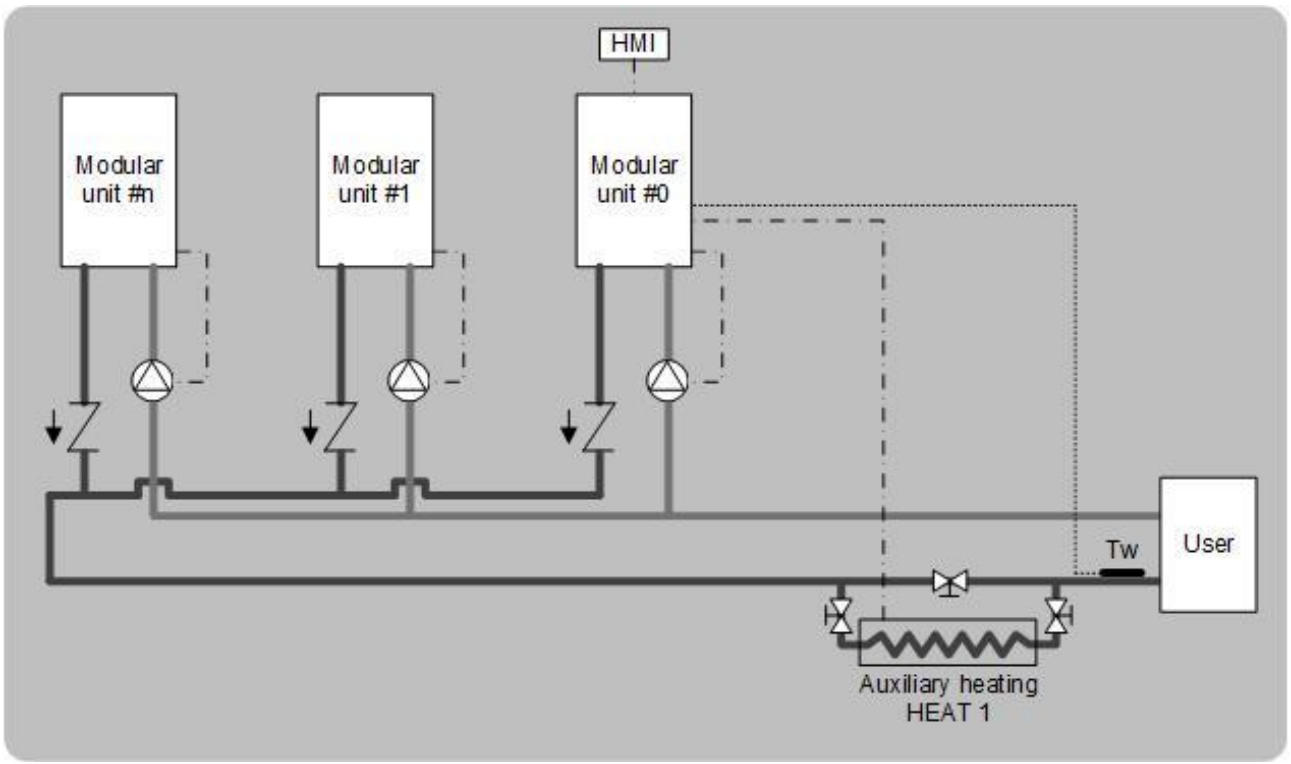
A generic indication of some possible system setups with units in parallel is presented in the following diagrams.

As shown in the images, a reverse return piping system is always recommended.

Modular configuration with single pump:



Modular configuration with multiple pumps:



9.21 Motor operated water valves

When the unit is supplied with one of the optional pipe kits (2 or 4 pipes), the unit will be equipped with motor operated valves in place of the manual shut-off valves.

These valves have a maximum differential pressure of 145psi (10 bar); in all the situations when the difference between the inlet and the outlet pressures is greater than this value, the valve motor will not be able to operate and it will be necessary to re-establish a correct pressure differential or to manually open/close the valve (e.g., during servicing if the water is drained from the unit and the water system has a pressure greater than 145psi).

9.22 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 system
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.
11 Leave various free service points (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.**

10. Electrical connections

The characteristics of the electrical lines must be determined by qualified electrical personnel able to design electrical installations; moreover, the lines must be in conformity with regulations in force. Insufficient capacity or improper electrical installation can cause electrical shock or fire.

Be sure to install an earth fault circuit interrupter according to local laws and regulations. Failure to install an earth fault circuit interrupter or incorrect earthing may cause electrical shocks or fire.

After all the wiring has been made, and before supplying the electrical power to the unit, check the integrity of cable insulation, that the wiring is secure, protected from water and not subject to external forces.

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

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

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

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 unit nameplate reports the 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 nameplate shows the following indications requested by the standards:

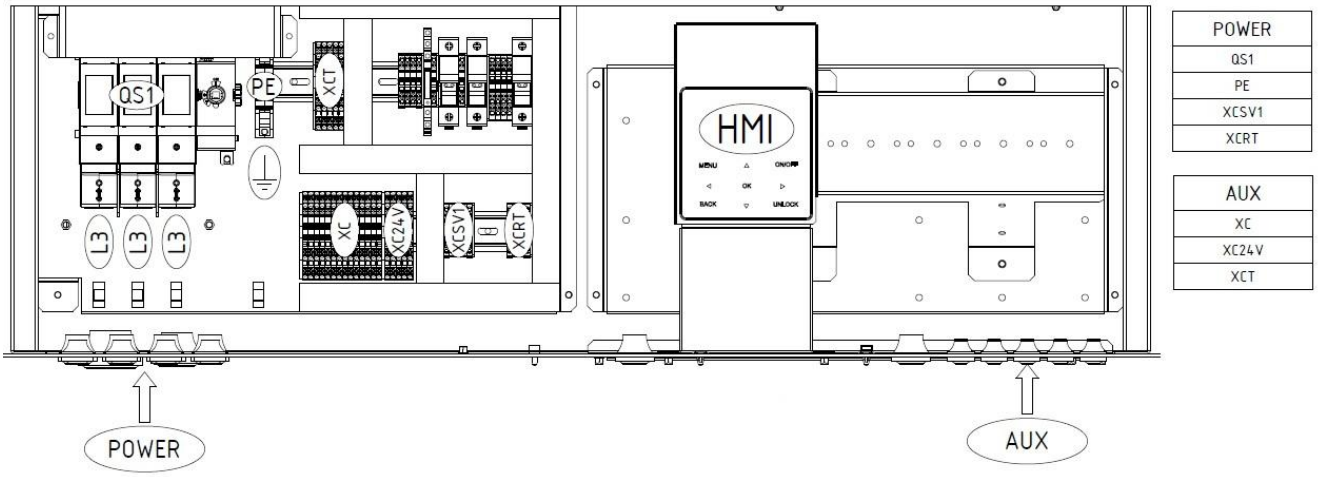
- Rated voltage and frequency
- Nature of supply
- Full load amperage (FLA)
- Full load I (FLI)
- Minimum Circuit Ampacity (MCA)
- Rating of overcurrent protective device (MOP)
- Compressors Rated input Current (RIC C1 - RIC C2)
- Fans full load amperage (FLA Fans)
- Fans quantity
- Fan nominal power in HP (HP)
- Short Circuit Current Rating (SCCR)
- Electrical wiring diagram Number

10.2 Connections performed by Customer

When the necessary wiring has to be made, please consider the following indications:

- Refer to the unit electrical diagram (the number of the diagram is shown on the nameplate).
- Verify that the electrical supply has characteristics conforming to the data shown on the nameplate.
- Before starting any connection work, be sure that the unit is isolated, unable to be turned on and a safety sign must be used.
- Ensure correct earthing connections.
- Do not connect the earthing wire to gas or water pipes, lightning conductors or telephone earth wires
- Ensure cables are suitably protected.
- Prevent dust, insects or rodents from entering the electrical panel as they can damage components and cables.
- The electrical panel is equipped with proper cable grommets for all the necessary electrical connections. Do not drill holes in the electrical panel as it would decrease the IP rating.
- Cables shall be properly fixed. If not, they may be subject to tearing or transmit unacceptable stresses to the unit terminals.
- All the cables wired from the customer to the electrical box must be properly secured. Tighten any loose connection.
- The cables must not touch the compressor and the refrigerant piping as they might reach high temperatures.
- Check the integrity of cables. If a cable is damaged it must be replaced.
- Before supplying power to the unit, make sure that all protections that were removed during the electrical connection work have been restored.
- Install the power supply wire at a proper distance from other devices which functioning may be disturbed by electromagnetic waves.

Please refer to the following image from the wiring diagram as it gives the position of the cable grommets provided for the different electrical connections.



10.3 Unit power supply

Power supply network shall meet the following requirements:

1 The short circuit capacity of the line must be less than 65 kA

2 Power supply 432-487V/3~/60Hz

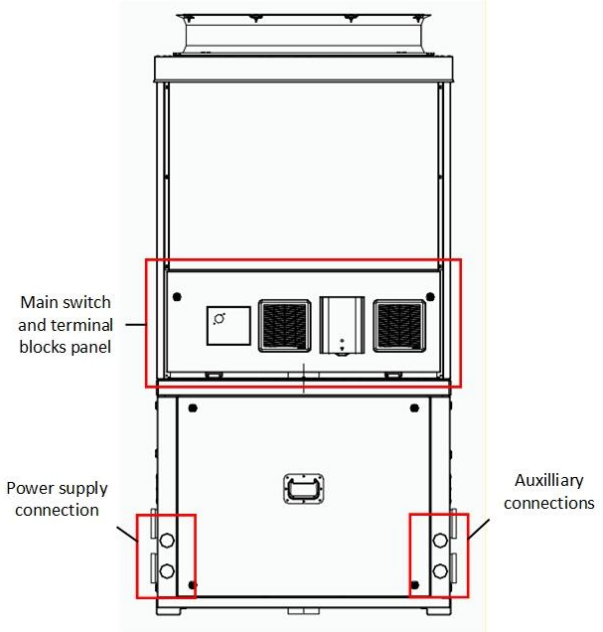
The power supply cables must be connected to the main switch through the holes in the external structure of the unit (remove the rubber caps – see the following image) and then through the cable grommets indicated above (POWER).

All the electrical connections necessary at the commissioning are made available opening the lower panel (main switch and terminal blocks panel).

The main switch is equipped with proper terminal lugs and the maximum cable cross section is 00 (2/0) AWG.

Connect also the protection conductor (PE) to its terminal block on the right of the main switch. Maximum allowed cable cross section is 2 AWG.

Please check that the cable specifications fit with the power supply characteristics.



The connection of the pipe antifreeze heaters power supply (XCRT - 230VAC) shall be made through the same passages (POWER).

10.4 Auxiliary connections

The following connections are also available:

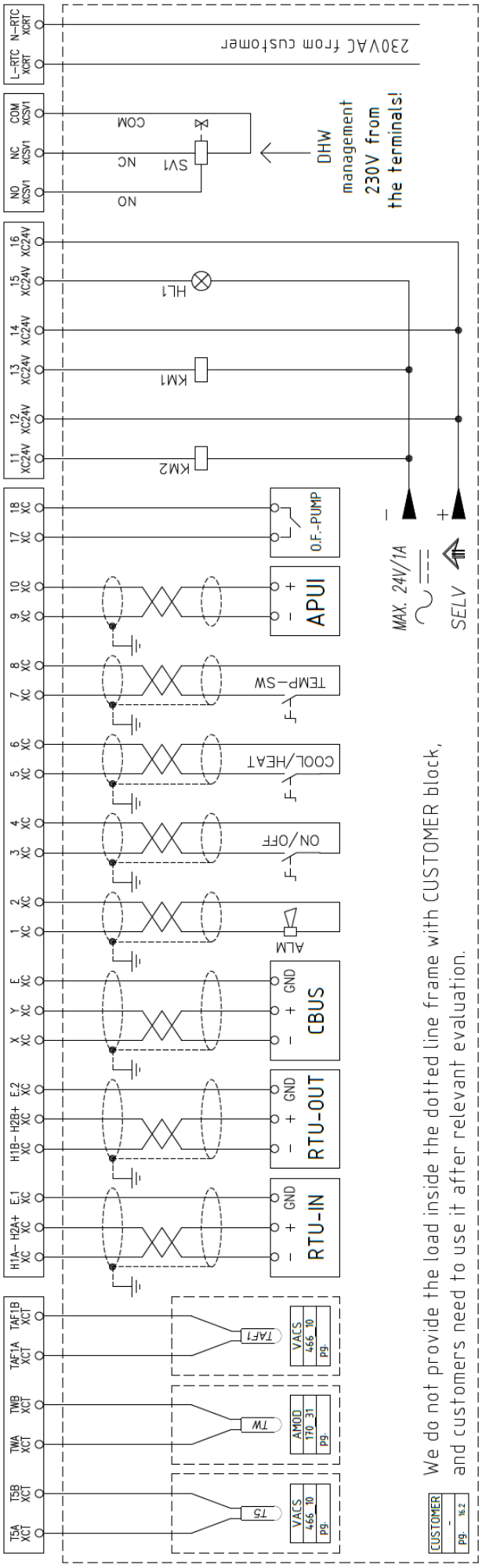
- CBUS: BUS communication for parallel units
- RTU-IN: Modbus RTU RS-485 – In
- RTU-OUT: Modbus RTU RS-485 – Out
- T5, TW, TAF1: remote temperature probes
- ALM: Cumulative fault signal
- ON/OFF: Remote ON/OFF selector
- COOL/HEAT: Remote cooling/heating selector
- TEMP-SW: Remote selector for set-point change
- APUI: 0-10V signal for variable speed pumps

. F.-PUMP: dry contact for on/off pump control

- KM1: Auxiliary pipe heater control relay
- HL1: Compressor status signal lamp

Similarly to the power supply, the auxiliary connection cables must pass through the holes in the external structure of the unit (remove the rubber caps – see the following image) and then through the available grommets for such connections which are shown in the previous images (AUX). In the same image the position of the terminal blocks is also shown.

With reference to the following image, we do not provide the load inside the dotted line frame and customers need to use it after relevant evaluation.



When connecting signals and data cables, please consider the following indications:

- 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 12inch distance below 10A and 20inch below 50A of nominal current of the power line.
- The cable type 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.
- 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.
- 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.

10.4.1 Cumulative fault signal

An alarm output is available at the terminal blocks XC-1 and XC-2 (dry contact):

- Contact is closed with the unit in alarm.
- Allowed power supply through the unit contacts is 220VAC/24VDC 0-1A

10.4.2 Remote control of the unit

The unit status (on/off) and operation mode (heating cooling) can be controlled remotely via 2 dry contacts. To do so, the S1-1 dip-switch must be set to ON. This configuration disables the wired controller and only remote control is available. The network control icon in the wired controller flashes.

The unit status external command must be connected to the XC-3 and XC-4 terminals:

- when the input signal is closed the unit is switched-on
- when the input signal is open the unit is switched-off

The heating/cooling is set via the XC-5 and XC-6 terminals:

- when the input signal is closed the unit works in heating mode.

- The setpoint and the hysteresis are defined by the parameters in the wired controller. If the wired controller is not connected, the setpoint is defaulted to 113°F (45°C) and the hysteresis is defaulted to 6.3°F (2°C).
- when the input signal is open the unit works in cooling mode.
- The setpoint and the hysteresis are defined by the parameters in the wired controller. If the wired controller is not connected, the setpoint is defaulted to 44.6°F (7°C) and the hysteresis is defaulted to 6.3°F (2°C).

10.4.3 Double setpoint (TEMP-SW)

In the wired controller it is possible to activate a double setpoint function: enter the USER MENU➔DOUBLE SETPOINT➔DISABLE/ENABLE. In the same DOUBLE SETPOINT menu, 2 cooling setpoints (SETPOINT COOL_1 and SETPOINT COOL_2) and 2 heating setpoints can be set (SETPOINT HEAT_1 and SETPOINT HEAT_2). The switch between first and second setpoint is managed through XC-7 and XC-8 wiring terminals (dry contact):

- when the input signal is open the first setpoint is followed
- when the input signal is closed the second setpoint is followed

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

10.4.4 Tw temperature probe

Tw temperature probe is already installed in the standard unit and connected to the XC wiring terminals.

When more units are going to be connected in a hydraulic parallel system, a separate additional Tw probe with a longer cable (10m) is supplied.

In this case it is necessary to change the standard Tw probe of the master unit with the longer one. The latter shall be wired to the same connectors (TWA-TWB) on the XCT terminal block and the sensing element shall be positioned as far as possible on the system discharge line, after the auxiliary electric heater (if present), but before any system load (it must sense the total outlet water temperature). The probe shall be installed into the supplied thermowell (connection 1/2" NPT, thermowell length 2.95" - 75mm).

10.4.5 Backup heater control (KM1)

An additional pipeline heater (HEAT1) can be controlled by the unit. This function works only in heating mode and must be activated by your local service center.

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.
- 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 heater is not in the scope of supply and the unit can manage only its control; therefore, a dedicated power supply and a supporting contactor are required.

HEAT1 ON/OFF signal is to be connected to the wiring terminals XC24-13 and XC24-14.

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

When more units are configured in a hydraulic parallel system the pipeline auxiliary heater is controlled by the master unit.

Refer to the Service manual for configuration.

10.4.6 Compressor running signal (HL1)

An external signaling device can be connected directly to the unit to give an indication when at least one compressor is running. The output (24VDC – 1a max) is activated when a compressor is turned on.

The device (out of the scope of supply) has to be connected to the XC24-HL1+ and XC24-HL1- wiring terminals.

10.4.7 ON/OFF pump control (O.F.-PUMP)

Water circulation pump shall be always controlled by the unit. When an on/off pump is installed, the start/stop signal is given through the XC-11 and XC-12 terminals: when the contact is closed, the pump shall be activated.

The pump is not in the scope of supply and the unit manages only its regulation; therefore, a dedicated power supply and a supporting contactor are required (if multiple pumps are used, the power supply must be designed accordingly).

Independent electrical protections shall be provided.

- In a single pump system there's only one circulation pump for all the units. The pump is controlled from the master unit; therefore, the connection shall only be made to the master units' electrical board.
- In a multiple pump system each unit has its dedicated circulation pump and cabling will be necessary between every pump and electrical board.

The external linkage water pump must be controlled by the host logic program and the signal should be linked with the external control cabinet. The communication line between the pump and the unit must be installed in a conduit.

10.4.8 Inverter driven pump control (APUI)

Water circulation pump shall be always controlled by the unit. When an inverter driven pump is installed, in addition to the start/stop signal, a 0-10V signal is available. The electrical connections that must be made are:

- XC-11 and XC-12 terminals for the start/stop signal.
- XC-9 and XC-10 terminals to control the pump speed (0-10V signal).

The pump is not in the scope of supply and the unit can manage only its control; therefore, a dedicated power

supply and a supporting contactor are required (if multiple pumps are used, the power supply must be designed accordingly.)

Independent electrical protections shall be provided.

The pump inverter must ensure that the flow rate range required by the application is correctly covered.

When more units are configured in a hydraulic parallel system, 2 situations must be distinguished:

- In a single pump system there's only one circulation pump for all the units. The pump is controlled from the master unit; therefore, the connection shall only be made to the master units' electrical board.
- In a multiple pump system each unit has its dedicated circulation pump and cabling will be necessary between every pump and electrical board.

The external linkage water pump must be controlled by the host logic program and the signal should be linked with the external control cabinet. The communication line between the pump and the unit must be installed in a conduit.

10.4.9 Low pressure cut-off switch (W.P-SW)

It is strongly recommended to install a low-pressure cut-off switch to prevent the pump from running without water in the system and protecting it from damages.

This switch could be installed in order to operate directly on the pump activation signal or it could be wired to the unit.

The XC-WA and XC-WB terminals are available for this purpose. On the standard unit these terminals are bridged together and the bridge must be removed to connect the pressure switch.

When more units are configured in a hydraulic parallel system, 2 situations must be distinguished:

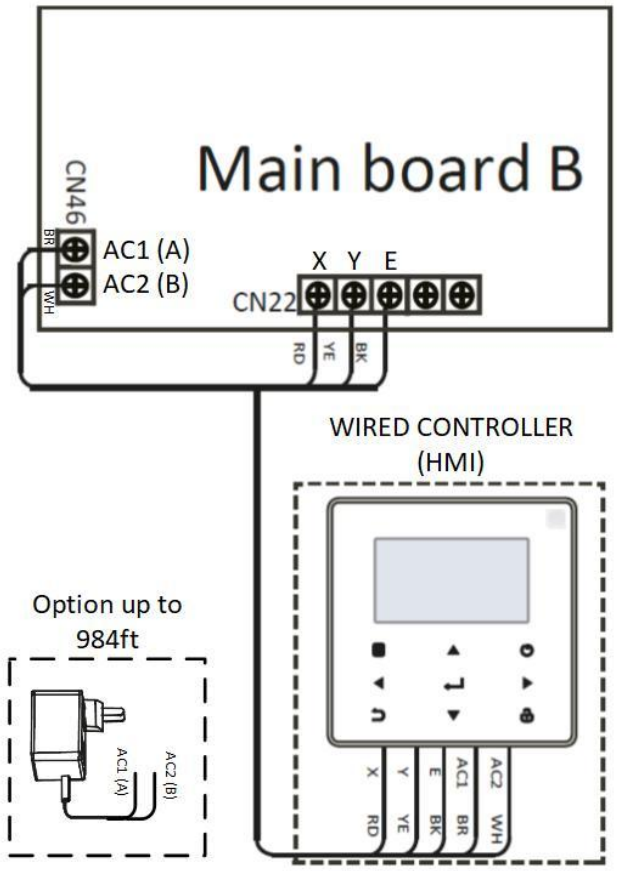
- In a single pump system, only one switch shall be installed and it shall be connected to the master unit.
- In a multiple pump system, each unit has its own switch and connection.

10.4.10 Remote wired controller

The wired controller on the unit can be removed and installed up to a distance of 33ft when the HMI power supply is connected to the unit. See the following picture and refer to the unit wiring diagram.

The installation distance can be increased up to 984ft if the HMI power supply is separated from the unit and connected to a transformer with 8-12VAC output. Maximum power consumption 0.5VA.

When more units are configured in a hydraulic parallel system, the wired controller shall be connected to the master unit only.



NOTE

The communication cable shall be shielded.

The wired controller must be installed in an environment protected from water and sunlight. The following operating conditions must be also considered:

Voltage range: 8÷12 VAC

Operating temperature range: -4÷140°F (-20÷60°C)

Operating humidity range: 40÷90%

10.4.11 Modbus RTU communication (RTU)

Modbus communication cable, if necessary, has to be connected to the XC-H1A-, XC-H2A+, XC-E.1 (inlet) and XC-H1B-, XC-H2B+, XC-E.2 (outlet).

Communication protocol must have the following specification:

Protocol	Modbus
Baud rate	9600bps
Data bits	8
Parity	None
Stop	1

The required cable characteristics are:

- Pair of twisted and shielded conductors
- Conductor cross-section 22AWG minimum
- Rated capacitance between conductors < 15 pF/ft
- Nominal impedance 120 Ω

Please follow the general recommendations about data cables when laying them and, in addition:

- RS485 serial line shielding must be connected to

the earth of the units; potential difference between the earths of the different units must be lower than 7V.

- There must be suitable arresters to protect the serial lines from the effects of atmospheric discharges
- A 120Ω resistor must be fitted on the end of the serial line. Alternatively, when the last serial board is equipped with an internal terminator, it must be enabled using the specific jumper or dip switch.
- The cable must have insulation features and non-flame propagation in compliance with national regulation.
- The RS485 serial line must be kept as far away as possible from sources of electromagnetic interference.

If the system is in a modular configuration, Modbus communication cable shall be connected only to the master unit.

Please refer to the *Technical information* chapter for the list of Modbus registers.

10.4.12 BUS communication for parallel units (CBUS)

When more units are configured in a hydraulic parallel system (modular configuration), they must be connected to each other to allow the communication between the master and the slave units (CBUS).

The dedicated wiring terminals are XC-X, XC-Y and XC-E.

The communication cable shall be wired starting from the master with a daisy chain connection (in-out) to the X-Y-E terminals of each unit (8 units maximum).

The characteristics of the cable must be the same indicated for the Modbus communication one.

A 100Ω resistor must be connected the terminals of the last unit.

10.4.13 230VAC

The 2 pipes kit and the 4 pipes kit are equipped with heating elements to protect the tubes from freezing. When one of such configurations is provided, the installer must connect the heaters power supply to the XCRT wiring terminals of the unit. Please refer to the following table for the power supply characteristics and consumption.

	Supply range	Power consumption
2 pipe kit	207-253VAC 50/60Hz	240W ±10%
4 pipe kit		480W ±10%

The heating cables have its own thermostat, therefore no control signal is needed.

10.5 Motor operated water valves

The unit can be supplied with 2 optional pipe kits that include some electrically actuated valves instead of the manually operated standard ones:

- pipe kit: 2 valves
- pipe kit: 4 valves

These valves are externally powered and controlled.

To connect the power supply, apply the following steps:

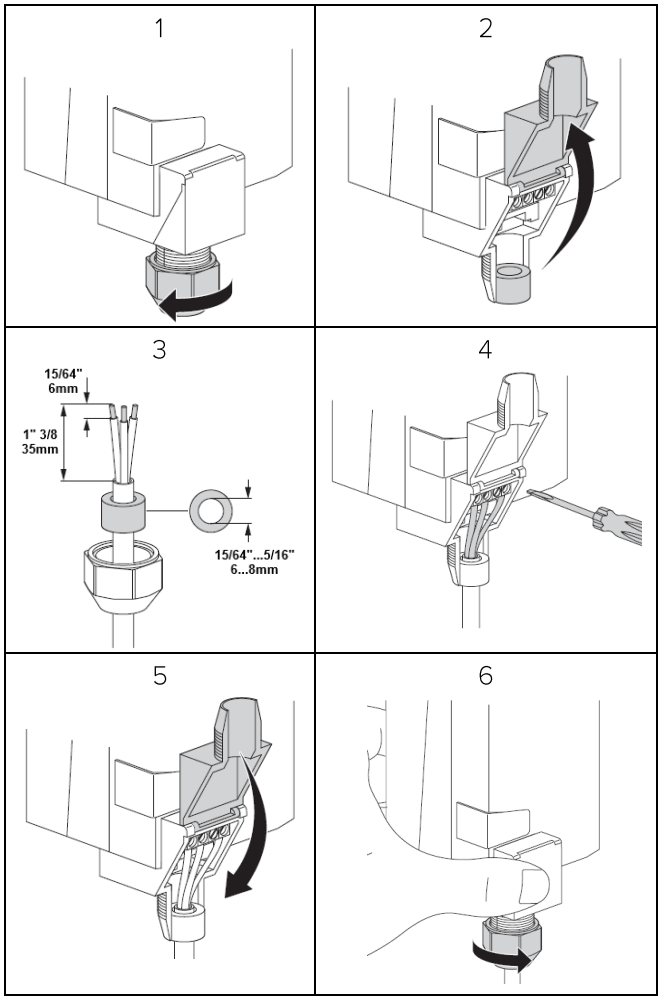
- Unscrew the closing nut
- Open the connection box
- Prepare and insert the cable following the indications in the image
- Connect the conductors to the wiring terminals
- Close the box
- Fasten the closing nut. Maximum tightening torque 2.95lb·ft (4Nm).

The electrically controlled water valve is powered by external power, the field-wiring of the valve shall comply with the local and national regulations as well as relevant national electrical standards.

The connection between the water valve, power supply and unit shall be installed in a conduit, and the wiring holes for fixing conduits shall be in accordance with the local and national regulations as well as relevant national electrical standards.

The power supply shall be reasonably fixed, an prevent from being stretched.

Power cables shall have at least a 2mm reinforced insulation and must be suitable for outdoor use. The prescribed wire size is AWG18.


1
2
3
15/64"
6mm
1" 3/8
35mm
15/64"...5/16"
6...8mm
4
5
6

11. Start-up

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

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

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

Please agree upon the commissioning date with the service center with sufficient advance.

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

Before proceeding with the preliminary check procedure, please verify the following conditions:

- the unit must be installed properly and in compliance with this manual
- the electrical power supply line must be switched off
- the unit main switch 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 Preliminary checks

Please refer to the different manual sections for the details.

	Preliminary checks – Unit power supply OFF	✓
1	unit is safely accessible	
2	suitable frame to withstand unit weight + people weight	
3	functional spaces	
4	air flow: correct return and supply (no bypass, no stratification)	
5	level reachable by snow has been considered	
6	main winds have been considered: deflectors, windbreaks, suitable anchor system are installed	
7	absence of chimneys / corrosive atmospheres / pollutants	
8	structure integrity	
9	fans run freely	
10	unit on vibration isolation mounts	
11	unit on level ground	
12	condensate drainage is present	
13	Water inlet filter + shut-off valves for cleaning are installed	
14	hydraulic connections as per recommended diagram	
15	expansion tank (recommended volume = 10% system water content)	
16	minimum system water content	
17	water system washed + water quality check	
18	loaded water system + corrosion inhibitor	
19	antifreeze protection: glycol solution, possible heating cable, thermal insulation of piping	
20	water system under pressure + vented	
21	refrigerant circuit visual check	
22	earthing connection	
23	power supply characteristics	
24	auxiliary connections: correctly connected, configured	
25	verify that power connection and ground connections are locked safely and, if necessary, tighten them before switching on the power supply	
26	verify if the system is correctly configured with a particular focus on special requirements for parallel units installation (system layout, master-slave connections)	
27	verify that fuses, switches, wires capacities are meeting the requirements	

Preliminary checks – Unit power supply ON		Value	✓
1	compressor crankcase heaters operating at least for 8 hours (Unit powered ON and in OFF state since 8h)		
2	off-load supply voltage		
3	phase sequence check		
4	manual pump start-up and flow-rate check		
5	refrigerant circuit shut-off valves open (if present)		
6	unit ON		
7	load supply voltage		
8	verify the lack of bubbles in the liquid light (if present)		
9	check the operation of the fans: no abnormal noises or vibrations		
10	measure return and supply water temperatures		
11	measure superheating and subcooling		
12	run tests in both heating and cooling mode (only for heat pump units)		
13	check the absence of vibrations or abnormal noises and possible impact on the building's activities		
14	HEAT1 backup heater control configuration		
15	Climatic curve configuration		
16	dip-switch configuration consistent with the equipment supplied and the desired configuration (an inconsistent DIP switch configuration will cause FP errors)		
17	adjust the minimum outlet of the water pump to ensure that the minimum water flow-rate in the system, under the most unfavorable configuration conditions, is 110% of the minimum flow-rate indicated in the documentation		
18	Verify any problem in reaching the higher setpoint desired for the application		
19	Verify the correct operation of the unit and the control of external devices		
20	scheduling customization		
21	check that all panels are closed and properly fastened		
22	complete and available unit documentation		
23	enable energy saving modes (if desired by the customer)		
24	adjust the minimum set point in cooling mode, coherent with the application and to the glycol content charged in the system.		
25	check the correct date and hour		
26	enable snow-blowing switch if the site can have strong snow fall (suggested)		
27	enable silent mode according to the customer needs (if applicable)		

11.2 Refrigeration circuit

- Carefully check the refrigerating circuit: the presence of oil stains could be a symptom of refrigerant leakage (caused by transportation, handling or other reasons).
- 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.
- Make sure that all the service outlets are closed with proper caps; if caps are not present a leak of refrigerant can be possible.

Attention

▶ **If the refrigeration circuit pressure is low, 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.

11.3 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: 414÷506V/3~/60Hz

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.**

11.4 Options

Part of the menu is freely accessible to the customer. Only basic functions can be set in this section, the others are protected by password.

Access reserved only to specifically trained personnel.

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

11.5 Partial load operation

The unit is equipped with variable speed drive compressors so it can operate with reduced loads.

However, a constant and long operation at a reduced load below the minimum causes the unit to work with frequent compressor starts and stops and can cause irreparable damage due to the absence of oil return.

The above-described operating conditions must be considered outside the operating limits.

If the compressor breaks down due to operating in the above-mentioned conditions, the warranty shall no longer be valid and CLIVET spa shall not accept any liability.

Periodically check the average operating times and frequency of compressor start-ups: indicatively the minimum heat load must be such as to require a compressor to operate for at least ten minutes.

If average times are close to this limit, take appropriate corrective actions, e.g. increase the water content of the system, which is not sufficient in this application.

11.6 Water flow-rate check

Check that the difference between the exchanger inlet and outlet water temperature corresponds to the capacity according to this formula:

unit capacity [Btu/hr] = 500 · flow rate [gpm] · Dt [°F]

Check for water side exchanger pressure drops:

- determine the water flow-rate
- measure the difference in pressure between exchanger inlet and outlet and compare it with the technical data.

12 Start-up report

Identifying the operating conditions is useful to check if the unit is working properly and 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, etc)
- temperatures and flows of the different fluids (water, air) both in input and output to/from the unit
- temperature and pressures on the characteristic points of the refrigerating circuit (compressor discharge, liquid, intake)

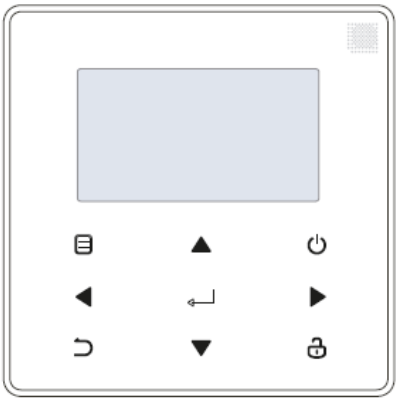
The measurements must be kept and made available during maintenance interventions.

12. Control

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

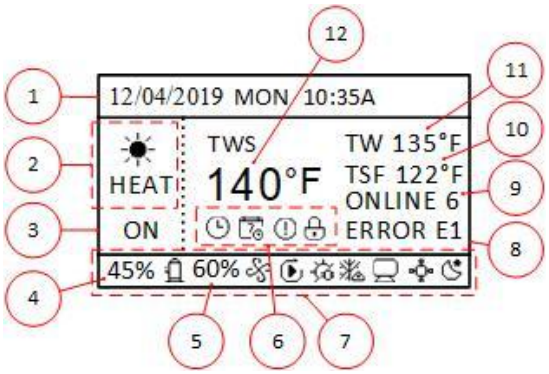
Always observe all the operative instructions and store the document into the unit as it must be accessible to the end user also outside commissioning and maintenance phases.

12.1 Panel



Button	Name	Function
	UNLOCK	Lock/unlock the buttons (hold 3 seconds)
	MENU	Give access to the menus
▲▼	UP DOWN	Scroll between menus, increase/decrease the setpoint value
◀▶	LEFT / RIGHT	Increase/decrease the values Move left/right
	OK	Enter the selected menu, confirm a value.
	ON OFF	Switch on/off the unit
	BACK	Return to the previous level/page.

12.2 Display



Ref. / Icon		Meaning
1		**Date/Time**
2		**Functioning mode**
		Cooling mode
		Heating mode
	COOL / HEAT	Operating mode
3		Unit status (when empty the unit is OFF)
4		Compressors % working speed
5		Fans % working speed
6		Icons group 1
		Daily scheduler ON
		Weekly scheduler active
		Fault alarm
		Locked buttons
7		Icons group 2
		Compressor/s ON
		Fans ON
		Pump ON
		Weekly timer active
		Backup electric heater ON

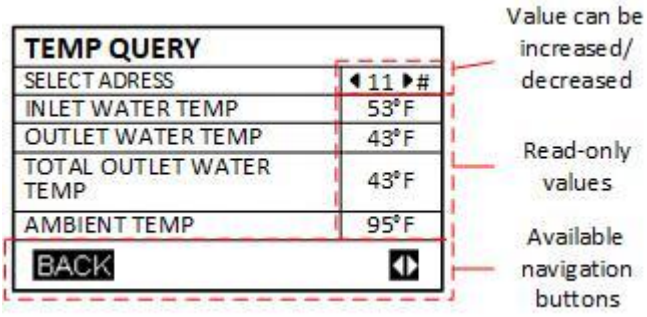
Ref. / Icon	Meaning
	Antifreeze or defrost mode ON
	Remote computer connected via Modbus RTU
	Control from remote/master HMI is enabled
	SILENT MODE
8	Fault description
9	Unit address
10	Safety temperature
11	In cooling/heating mode: total water outlet temperature TW
12	In cooling/heating mode: outlet temperature setpoint TWS

12.3 Menu navigation

To access the various menus, press the MENU button, select the desired menu with the UP/DOWN buttons and then press OK to enter. Press the BACK button to return to the previous page.

The available navigation buttons for the current page are shown in the lower part of the display.

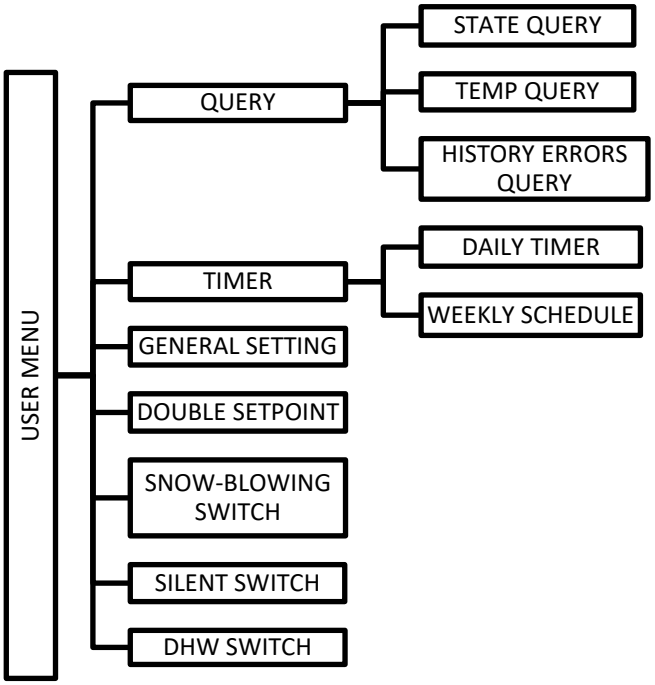
After accessing to a menu, scroll with the UP/DOWN buttons to select the lower rows. The parameters (values/text) shown in the right column can be adjusted when the left/right arrows are present in same column (in addition to the ones shown in the lower part as mentioned before). With the LEFT/RIGHT buttons increase/decrease the value or select the desired text. After setting the necessary parameters, press OK to confirm.



If there is no operation within 60 seconds, the HMI display will return to the main page and the buttons will be locked. The locked buttons icon is shown on the main page. To unlock the display, press the UNLOCK button for 3 seconds.

Only MODE and USER MENU are accessible without password. Please refer to the Service manual to enter the other menus.

Following is the navigation map for the USER MENU:



12.4 First start-up

When the unit is powered-on for the first time or powered-on after the factory settings has been restored, the wired controller displays the language setting page. Choose the desired language with the UP/DOWN/LEFT/RIGHT buttons and press OK.

Then the setting address interface is presented.

SETTING ADDRESS	
CONTROLER ADDRESS	10 #
CONTROL ENABLE	YES
MODBUS ENABLE	NO
MODBUS ADDRESS	10 #
OK	

CONTROLLER ADDRESS sets the unit which parameters are presented in the current HMI (when more units are connected together via CBUS, as for the modular configuration). A maximum of 16 units can be connected to the wired controller and the address range is 0÷15 (default value is 0).

CONTROL ENABLE allows, when set to YES, the parameters modification from the wired controller; when it is set to NO, it is only possible to check them.

MODBUS ENABLE allows to activate the modbus connection of the unit. CONTROL ENABLE must be set to YES to allow also the remote control.

MODBUS ADDRESS shall be configured when the connection is enabled. The address range is 01÷64.

After that proceed with the general setting configuration.

12.5 General setting

General setting can be done from the GENERAL SETTING menu (USER MENU -> GENERAL SETTING). Specifically, it is possible to set respectively current date and time, time format, HMI language, display backlight deactivation time, measurement system (international or imperial), buzzer activation. See the following images.

GENERAL SETTING	
YEAR	2020
MONTH	12
DAY	10
12-24HUOR	12
HUOR	10
OK	1/3

GENERAL SETTING	
MINUTE	55
AMPM	AM
LANGUAGE	ENGLISH
BACKLIGHT OFF DELAY(s)	20
OK	2/3

GENERAL SETTING	
MEASUREMENT SYSTEM	SI
Buzzer	NO
OK	3/3

12.1 Setpoint and functioning mode setting

Current setpoint can be changed directly from the HMI main page: press the UP/DOWN buttons and the setpoint value shown on the display will increase/decrease. When the desired setpoint is reached, press OK to confirm the setting. Adjustment step is 1°F.

To change the functioning mode, press the MENU button and select the MODE menu.

The display then returns to the main page and the current mode icon flashes. Using the UP/DOWN buttons the displayed mode is changed; press OK to confirm the setting.

While the mode icon is still flashing, it is possible to press the RIGHT button to switch to the setpoint setting.

Press the UP/DOWN buttons to increase/decrease the setpoint and OK to confirm.

12.2 Double setpoint function

A double setpoint function is available on the unit. This function allows to program 2 different setpoints for the cooling mode (SETPOINT COOL_1 and SETPOINT COOL_2) and 2 different setpoints for the heating mode (SETPOINT HEAT_1 and SETPOINT HEAT_2).

The switch between the setpoints is made through a digital input from the customer's system or via the Modbus control of the unit.

The activation/deactivation of the function and the setting of the setpoints can be made following the path USER MENU -> DOUBLE SETPOINT. Following is a picture of the menu:

DOUBLE SETPOINT	
DOUBLE SETPOINT	◂ DISABLE ▸
SETPOINT COOL_1	◂ 45 ▸ °F
SETPOINT COOL_2	◂ 50 ▸ °F
SETPOINT HEAT_1	◂ 130 ▸ °F
SETPOINT HEAT_2	◂ 140 ▸ °F
BACK	

12.3 Timer function

Some daily or weekly scheduling functions can be enabled on the unit (DAILY TIMER and WEEKLY SCHEDULE).

When activated, the unit will start and stop at the conditions set with the following variables:

- TIMER: timer number - it is possible to set 2 different timers
- ACT: activation = ON/OFF
- TIME ON: unit activation time
- TIME OFF: unit stop time
- MODE: functioning mode
- TWS: setpoint
- SILENT MODE: select the desired noise mode

DAILY TIMER

DAILY TIMER	
TIMER	◂ 1 ▸ #
ACT	◂ OFF ▸
TIME ON	◂ 10:00 ▸ A
TIME OFF	◂ 11:00 ▸ A
MODE	◂ HEAT ▸
BACK	1/2

DAILY TIMER	
TWS	◂ 100 ▸ °F
SILENT MODE	◂ NIGHT ▸ SILENT
BACK	2/2

WEEKLY SCHEDULE

WEEKLY SCHEDULE	
WEEKLYSCHEDULE	◂ MON ▸
WEEKLY SWITCH	◂ OFF ▸
OK	

MONDAY TIMER	
TIMER	◂ 1 ▸ #
ACT	◂ OFF ▸
TIME ON	◂ 10:00 ▸ A
TIME OFF	◂ 11:00 ▸ A
MODE	◂ HEAT ▸
BACK	1/2

MONDAY TIMER	
TWS	◂ 100 ▸ °F
SILENT MODE	◂ NIGHT ▸ SILENT
BACK	2/2

12.1 Low noise function

The SILENT SWITCH menu (USER MENU -> SILENT SWITCH) allows to activate a low noise function which could be useful, for example, during the night in residential areas. This function lowers the sound emission level reducing the compressor and fan maximum speed.

Three different noise emission levels are available: STANDARD, SILENT and SUPER SILENT.

Please refer to the technical data for the sound power and sound pressure values reached with the different configurations.

To activate the function, enter the SILENT SWITCH menu, scroll to SELECT SILENT and select the desired noise level. If no noise reduction is needed STANDARD mode must be selected.

CURRENT SILENT shows the current noise configuration.

SILENT SWITCH	
SELECT SILENT	◂ SILENT ▸
CURRENT SILENT	STANDARD
BACK	

12.2 Working parameters query

The QUERY menu allows to have an overview of the current working conditions of the unit and the errors occurred. Entering the menu, the following submenus can be selected:

- STATE QUERY (USER MENU -> QUERY -> STATE QUERY): scrolling down the pages it is possible to check the main current working data (pressures, temperatures, valve positions, etc...)

STATE QUERY	
SELECT ADDRESS	◂ 11 ▸ #
OPERATION STATE	STANDBY
RUNNING MODE	COOL
CURRENT SLIENT MODE	NIGHT SILENT1
BACK	

- TEMP QUERY (USER MENU -> QUERY -> TEMP QUERY): water and air temperatures are shown.

TEMP QUERY	
SELECT ADRESS	◂ 11 ▸ #
INLET WATER TEMP	53°F
OUTLET WATER TEMP	43°F
TOTAL OUTLET WATER TEMP	43°F
AMBIENT TEMP	95°F
BACK	

- HISTORY ERRORS QUERY (USER MENU -> QUERY -> HISTORY ERRORS QUERY): all the faults occurred to the unit are listed here along with the date and time of occurrence. In the second row a progressive fault number is shown. With the LEFT/RIGHT button it is possible to scroll to the other errors. A maximum of 16 errors is stored.

HISTORY ERRORSOUERY							
SELECT ADDRESS ◂ 11 ▸ #							
1	2	3	4	5	6	7	8
E2:11/3/2020 15:05P COMMUNICATION ERROR							
OK							

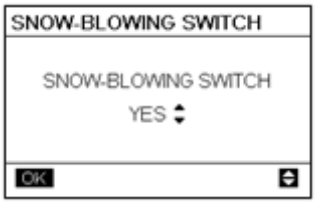
In each of these submenus the circuit to be analyzed must be selected in the first row.

When the units are in a modular configuration, in the first row the unit's address is selected.

12.3 Snow-blowing function

To avoid the accumulation of snow on the fans when the unit is stopped, a snow-blowing function is available. When enabled, this function activates the fans at regular intervals (the fans are activated 2 minutes every 30 minutes) when the ambient air temperature lowers below 37.4°F (3°C).

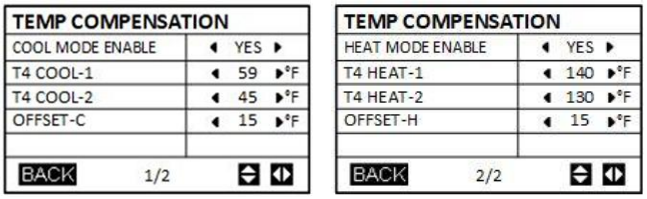
To activate the function enter USER MENU -> SNOW-BLOWING SWITCH menu, change to YES and press the OK button.



12.4 Temperature compensation function

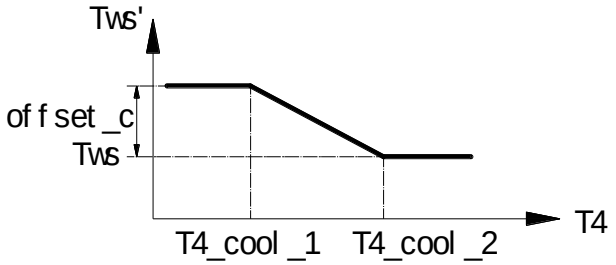
When the unit is working in cooling or heating mode, the current setpoint can be adjusted according to the ambient temperature T4.

This function is available in the SERVICE MENU (SERVICE MENU -> TEMPERATURE COMPENSATION). Please refer to your service center to configure and enable it.

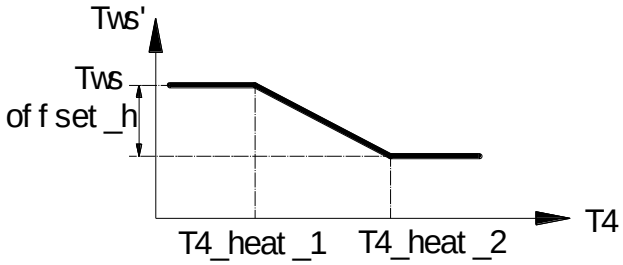


Temperature compensation could be enabled in heating or cooling separately. The following diagrams explain the control logic and show the meaning of the parameters to be set:

COOLING



HEATING



12.5 Modular configuration

Units can be connected in a hydraulic parallel system (modular configuration) up to a maximum of 8 units

Refer to *Water connections* and *Electrical connections* chapters for the system setup specific indication. A generic overview about the components and where they must be connected according to the system configuration (single or multiple pump) is presented in the following table:

	Component	Single pump	Multiple pump
		Connected to:	
COOLING/ HEATING	Tw	Master unit	Master unit
	HEAT1	Master unit	Master unit
	PUMP	Master unit	Each unit

The modular configuration in cooling or heating mode is always managed by the master unit which measures the total outlet temperature Tw and evaluates if the start-up conditions are met.

According to the actual required load of the system, the master unit evaluates if some units must be activated or deactivated and gives the command if necessary. Proper rotation rules are followed.

When a single pump system is configured, the pump is controlled from the master unit. When in a multiple pump system, each unit manages its own pump.

Auxiliary heater HEAT1 (when installed) is always managed from the master unit.

To configure the parallel system the address of each unit must be set. The address is assigned through the rotary dip switch on the unit PCB. Please contact your authorized service center to setup the system in a modular configuration.

The information displayed on all controllers refer to the master unit. On the slave controllers, only the password protected SERVICE menu can be opened.

12.6 Alarms

Before resetting an alarm, identify and remove its cause.

Repeated resets can cause irreversible damage or malfunction to the system.

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

The temperature probes are considered 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 signaled 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 run 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:

Fault code	Description	Group
E0	Wrong main PCB setting	A
E1	Phase sequence fault	A
E2	Communication failure of master wired controller	A
2E2	Communication failure between the main control and expansion board for 60s	A
3E2	Communication failure between master and slave boards within the same unit	C
E3	Total water outlet temperature sensor Tw failure	A
E4	Unit outlet water temperature sensor Two failure	B
1E5	Condenser tube temperature sensor T3A fault – circuit 1	C
2E5	Condenser tube temperature sensor T3A fault – circuit 2	C
E6	Water tank temperature sensor T5 fault	A/B
E7	Ambient temperature T4 sensor failure	B
E8	Power phase sequence protector output failure	A
E9	Water flow detection failure	A/B
2Eb	BPHE antifreeze protection sensor Taf2 failure	B
Ed	System exhaust temperature sensor Tp failure	C
1EE	Economizer inlet temperature sensor T6A fault	C
2EE	Economizer outlet temperature sensor T6B fault	C
EF	Water inlet temperature sensor Twi failure	B
EP	Exhaust temperature sensor Tp failure	C
EU	Temperature sensor Tz failure	C
P0	Discharge over-pressure or over-temperature alarm	C
P1	System low pressure fault	C
P3	Ambient over-temperature protection	B
1P4	AC current protection - circuit 1	C
2P4	Bus current protection - circuit 1	C
1P5	AC current protection - circuit 2	C
2P5	Bus current protection - circuit 2	C
P7	Air side exchanger high temperature protection	C
P9	High water temperature difference protection	B
PA	Abnormal water temperature difference protection	B
PC	Evaporator low pressure for antifreeze protection (cooling)	C
PE	Evaporator low temperature antifreeze protection (cooling)	B
PH	T4 over temperature protection (heating mode)	B

Fault code	Description	Group
PL	Inverter board over-temperature protection	C
C7	Inverter board over-temperature protection - blocking alarm	C
PU	Fan fault	C
FF	Fan fault - blocking alarm	C
H5	Power supply voltage too high or too low	A
1H9	Master board inverter module mismatch	C
HC	High pressure sensor failure	C
1HE	EXVA not connected	C
2HE	EXVB not connected	C
3HE	EXVC not connected	C
1F0	IPM module communication failure	C
F2	Low desuperheat (Tdsh)	C
F4	L10/L11/L12/L20 /L30/L34 faults appear 3 times within 60 minutes	C
1F6	System bus voltage fault	C
Fb	Low pressure sensor failure	C
Fd	Suction temperature sensor Th failure	C
FP	Inconsistent system pump dip-switch configuration	A
1bH	Compressor module board stuck relay or failed self-test	C
1L10	Hardware overcurrent protection	C
1L11	Instantaneous phase overcurrent protection	C
1L12	Phase overcurrent protection for 30s	C
1L20	Module over-temperature protection	C
1L30	Bus voltage too low fault	C
1L31	Bus voltage is too high fault	C
1L32	Bus voltage is severely high	C
1L34	Power supply phase failure	C
1L43	Abnormal current sampling bias	C
1L45	Motor code does not match	C
1L46	IPM protection (FO)	C
1L47	Module type does not match (after module resistance detection)	C
1L50	Start-up failure	C
1L51	Stall fault	C
1L52	Stall protection	C
1L60	Fan motor phase loss protection	C
1L65	IPM short circuit fault	C
1L66	FCT detection fault	C
1L6A	U phase upper tube open circuit	C
1L6B	U phase lower tube open circuit	C
1L6C	V phase upper tube open circuit	C
1L6D	V phase lower tube open circuit	C
1L6E	W phase upper tube open circuit	C
1L6F	W phase lower tube open circuit	C

Different actions are caused on the units by the different faults. For this reason, three different alarm groups are identified and reported on the third column:

- 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

E9/P0/P1/P4/P5/P7/C7/PU faults are blocking alarms: they can occur only a limited number of times in a defined period of time; after that the unit stops and can't restart even after the fault cause is solved. The unit can be restored only with a power off. See service manual for the detailed explanation.

The other alarms are always automatically restored when the cause has been eliminated.

13. Modbus registers

Reg	Data Type	R/W	Name	Description
0	S16	R&W	Running mode	Range: HP: 1-Cool, 2-Heat, 4-DHW, 8-OFF Default: 8-OFF Unit of measurement: - Notes: DHW mode setting is NOT valid for slave units of multi pump system which uses dedicated item at address 207
1	S16	R&W	Double setpoint temperature Tws 1	Range: HP cooling mode: R32 -10 ~ 25 HP heating mode: R32 25 ~ 60 NORMAL Default: HP cooling mode: 7 HP heating mode: 50 Unit of measurement: °C
2	S16	R&W	Double setpoint temperature Tws 2	Range: HP cooling mode: R32 -10 ~ 25 HP heating mode: R32 25 ~ 60 NORMAL Default: HP cooling mode: 10 HP heating mode: 50 Unit of measurement: °C
3	S16	R&W	Offset temperature (OFFSET-C/ OFFSET-H)	Range: Cooling mode 0 ~ 15 Heating mode: 0 ~ 30 Default: Cooling mode: 10 Heating mode: 10 Unit of measurement: °C
4	S16	R&W	DHW set temperature - T5S	Range: R32 30 ~ 60 NORMAL Default: 50 Unit of measurement: °C Notes: Available only for HP
5	S16	R&W	Reserved	always reads zero
6	S16	R&W	Clear lock errors	Range: 0-Invalid, 1-Clear all the lock errors Default: 0-Invalid Unit of measurement: -
7	S16	R&W	Snow blowing function	Range: 0 - OFF, 1 - ON Default: 0 - OFF Unit of measurement: -
8	S16	R&W	Reserved	always reads zero
9	S16	R&W	Metric and English unit switching HMI	Range: 0: Metric 1: Imperial Default: 0 Unit of measurement: - Notes: HMI UNIT SWITCH
10	S16	R&W	Metric and English unit switching MODUS	Range: 0: Metric 1: Imperial Default: 0 Unit of measurement: - Notes: MODBUS UNIT SWITCH
10 ~ 99			RESERVED	
100	S16	R&W	Silent mode	Range: 1 - Standard, 2 - Silent mode, 3 - Night silent mode1 , 4 - Night silent mode2 , 5 - Night silent mode3 , 6 - Night silent mode4 , 7 - Super silent mode Default: 1 - Standard Unit of measurement: -

Reg	Data Type	R/W	Name	Description
101	S16	R&W	Double setpoint	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: -
102	S16	R&W	Double setpoint temperature Tws 1 in cooling mode	Range: HP: R32 -10 ~ 25 Default: 7 Unit of measurement: °C
103	S16	R&W	Double setpoint temperature Tws 2 in cooling mode	Range: HP: R32 -10 ~ 25 Default: 10 Unit of measurement: °C
104	S16	R&W	Double setpoint temperature Tws 1 in heating mode	Range: R32 25 ~ 60 NORMAL Default: 50 Unit of measurement: °C
105	S16	R&W	Double setpoint temperature Tws 2 in heating mode	Range: R32 25 ~ 60 NORMAL Default: 50 Unit of measurement: °C
106	S16	R&W	Temperature compensation enable in cooling mode	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: -
107	S16	R&W	T4 COOL 1	Temperature compensation point 1 in cooling mode Range: 15 ~ 30 Default: 25 Unit of measurement: °C
108	S16	R&W	T4 COOL 2	Temperature compensation point 2 in cooling mode Range: 35 ~ 45 Default: 40 Unit of measurement: °C
109	S16	R&W	OFFSET-C	Temperature compensation offset in cooling mode Range: 0 ~ 15 Default: 10 Unit of measurement: °C
110	S16	R&W	Temperature compensation enable in heating mode	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: -
111	S16	R&W	T4 HEAT 1	Temperature compensation point 1 in heating mode Range: -25 ~ -15 Default: -5 Unit of measurement: °C
112	S16	R&W	T4 HEAT 2	Temperature compensation point 2 in cooling mode Range: 15 ~ 30 Default: 15 Unit of measurement: °C
113	S16	R&W	OFFSET-H	Temperature compensation offset in cooling mode Range: 0 ~ 30 Default: 10 Unit of measurement: °C
114	S16	R&W	Heat 2 force on	Range: 0 - No, 1 - Yes Default: 0 - No Unit of measurement: - Notes: Only valid for single pump system

Reg	Data Type	R/W	Name	Description
115	S16	R&W	DHW enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Only valid for single pump system
116	S16	R&W	T_Cool_Diff	Differential temperature in cooling mode Range: 1 ~ 5 Default: 2 Unit of measurement: °C
117	S16	R&W	T_Heat_Diff	Differential temperature in heating mode Range: 1 ~ 5 Default: 2 Unit of measurement: °C
118	S16	R&W	dT5_ON	Return hot water temperature difference Range: 2 ~ 10 Default: 8 Unit of measurement: °C
119	U16	R&W	DT1S5 Temperature difference of heat exchange in water heating	Heat1 start time delay Range: 5 ~ 20 Default: 90 Unit of measurement: °C Notes: Valid only for HP models
120	S16	R&W	TIM_CAP_ADJ Capacity adjustment period	Range: 60 ~ 360 Default: 80 Unit of measurement: [sec] Notes: 20step
121	S16	R&W	Tw differential temperature (TW_COOL DIFF/TW_HEAT_DIFF)	Range: 1 ~ 5 Default: 2 Unit of measurement: °C Notes:
122	S16	R&W	Ratio_Cool_First	Initial turn on ratio of cascade system in cooling mode Range: 0 ~ 100 Default: 50 Unit of measurement: [%] Notes: 5% step
123	S16	R&W	Ratio_Heat_First	Initial turn on ratio of cascade system in heating mode Range: 0 ~ 100 Default: 50 Unit of measurement: [%] Notes: 5% step
124	S16	R&W	T_diff_pro	Inlet and outlet water temperature difference protection Range: 8 ~ 15 NORMAL Default: 12 NORMAL Unit of measurement: [%] Notes: 1% step
125	S16	R&W	T_Frost	Defrost cycle time Range: 20 ~ 120 Default: 35 Unit of measurement: [min]
126	S16	R&W	T_Defrost_in	Defrost entry temperature Range: -5 ~ 5 Default: 0 Unit of measurement: °C
127	S16	R&W	T_Defrost_out	Defrost exit temperature Range: -10 ~ 10 Default: 0 Unit of measurement: °C

Reg	Data Type	R/W	Name	Description
128	S16	R&W	Heat 1 enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: -
129	S16	R&W	TEMP_AUXHEAT1_ON	Range: -15 ~ 10 Default: -5 Unit of measurement: °C
130	S16	R&W	Tw_Heat1_On	Range: 0 ~ 59 Default: 25 Unit of measurement: °C Notes: The "Water Shutoff Temperature" must be higher than the "Water Opening Temperature" (This parameter is invalid)
131	S16	R&W	Tw_Heat1_Off	Range: 1 ~ 60 Default: 45 Unit of measurement: °C Notes: The "Water Shutoff Temperature" must be higher than the "Water Opening Temperature" (This parameter is invalid)
132	S16	R&W	Heat 2 enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Only valid for single pump system with DHW function
133	S16	R&W	T_Heat2_delay	Heat 2 turn on delay Range: 60 ~ 240 Default: 90 Unit of measurement: [min] Notes: 5 min step. Only valid for single pump system with DHW function
134	S16	R&W	dT5_Heat2_Off	Range: 2 ~ 10 Default: 5 Unit of measurement: [min] Notes: Only valid for single pump system with DHW function
135	S16	R&W	T4_Heat2_On	Range: -5 ~ 20(1) -15°C to 20°C (2) Default: 5 Unit of measurement: °C Notes: (1) Only valid for single pump system with DHW function (2) Ambient temperature for water tank electric auxiliary heating > ambient temperature at which the HEAT2 heat pump stops operating
136	S16	R&W	Inverter pump enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Valid only for single pump system
137	S16	R&W	Inverter pump running speed	Range: 30 ~ 100 Default: 100 Unit of measurement: [%] Notes: 5% step. Only valid if register 136 is enabled
138	S16	R&W	Modbus control enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Enable this item before writing other Modbus registers
139	S16	R&W	Gycol type	Range: 0 - Ethylene 1- Propylene Default: 0 - Ethylene Unit of measurement: -

Reg	Data Type	R/W	Name	Description
140	S16	R&W	Glycol percentage	Range: 0 ~ 50 Default: 0 Unit of measurement: [%] Notes: 5% step
141	S16	R&W	Paf offset	Protection pressure compensation Range: 0 ~ 20 Default: 0 Unit of measurement: 0.01Mpa Notes: step of 5
142	S16	R&W	Water coil control	Range: 0 - Automatic, 1 - Manual1 (through), 2 - Manual2 (bypass) Default: 0 - Automatic Unit of measurement: - Notes: Valid only on FC units
143	S16	R&W	DtTws	Tws rising value after entering mix Range: 1 ~ 3 Default: 1 Unit of measurement: °C Notes: Only valid for FC/CO unit
144	S16	R&W	Dtmix	Enter mix hysteresis Range: 1 ~ 3 Default: 2 Unit of measurement: [%] Notes: Only valid for FC/CO unit
145	S16	R&W	FC Offset	FC enter offset Range: 1 ~ 15 Default: 3 Unit of measurement: °C Notes: Only valid for FC/CO unit
146	S16	R&W	FC Hyster	FC enter hysteresis Range: 1 ~ 3 Default: 1 Unit of measurement: °C Notes: Only valid for FC/CO unit
147	S16	R&W	TWI_O ABNORMAL	Abnormal difference between inlet and outlet water temperature Range: 1 ~ 5 Default: 2 Unit of measurement: °C
148	S16	R&W	Low outlet water control	Range: R32 -10 ~ 25 Default: 7 Unit of measurement: °C Notes: Can only write when LowCooling enable
149	S16	R&W	Power limit	Energy saving level Range: 40 ~ 100 Default: 40 Unit of measurement: [%] Notes: 10% step
150	S16	R&W	E9 protection time	Water flow switch protection time Range: 2 ~ 20 Default: 5 Unit of measurement: [s] Notes:
151	S16	R&W	E9 detection method	Range: 1 - Water flow detected before the pump is turned on, 2 - Water flow switch is detected after the pump is turned on Default: 1 Unit of measurement: - Notes:

Reg	Data Type	R/W	Name	Description
152	S16	R&W	Inverter pump MIN speed	Range: 40 ~ Max (100, Inverter pump MAX speed) Default: 75 Unit of measurement: [%] Notes: 5% step. Only valid for multiple pump system
153	S16	R&W	Inverter pump MAX speed	Range: Max（70，Min. ratio）~100% Default: 75 Unit of measurement: [%] Notes: 5% step. Only valid for multiple pump system
154	S16	R&W	Pump turn on time	Range: 5 ~ 60 Default: 5 Unit of measurement: [min] Notes: 5 min step
155	S16	R&W	Pump turn off time	Range: 0 ~ 60 Default: 0 Unit of measurement: [%] Notes: 5 min step
156	S16	R&W	TW_COOL_DIFF	Differential temperature Tw in cooling mode Range: 1 ~ 5 Default: 2 Unit of measurement: °C Notes:
157	S16	R&W	TW_HEAT_DIFF	Differential temperature Tw in heating mode Range: 1 ~ 5 Default: 2 Unit of measurement: °C Notes:
158	U16	R&W	DTW_HEAT1_ON	Range: 1 ~ 10 Default: 2 Unit of measurement: - °C Notes:
159	S16	R&W	T_HEAT1_DELAY	Range: 15 ~ 120 Default: 30 Unit of measurement: -[min] Notes:
160	S16	R&W	T4_HEATPUMP_OFF1	Heat pump shutdown ambient temperature (HEAT1) Range: -30 ~ 10 Default: -30 Unit of measurement: °C Notes: The heat pump shutdown ambient temperature for HEAT1 must be ≤ the available ambient temperature for auxiliary electric heating in the pipeline.
161	S16	R&W	FORCED-HEAT1-OPEN	Pipeline electric heating forced on Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes:
162	S16	R&W	T4_HEATPUMP_OFF2	Heat pump stop working ambient temperature (HEAT2) Range: -30 ~ 10 Default: -30 Unit of measurement: °C Notes: HEAT2 heat pump stops working when the ambient temperature is less than the available ambient temperature of the water tank electric auxiliary heating
163 ~ 199			RESERVED	

Reg	Data Type	R/W	Name	Description
200+(Unit Address)*100			RESERVED	
201+(Unit Address)*100	S16	R&W	Heat 2 enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Only valid for multi pump systems with DHW function
202+(Unit Address)*100	S16	R&W	Heat 2 force on	Range: 0 - OFF, 1 - ON Default: 0 - OFF Unit of measurement: - Notes: Only valid for multi pump systems with DHW function
203+(Unit Address)*100	S16	R&W	T-HEAT2-DELAY	Heat 2 opening delay Range: 60 ~ 240 Default: 90 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function
204+(Unit Address)*100	S16	R&W	DT-HEAT2-OFF	Heat2 turn off delta temperature Range: 2 ~ 10 Default: 5 Unit of measurement: °C Notes: Only valid for multi pump systems with DHW function
205+(Unit Address)*100	S16	R&W	T4-HEAT2-ON	Range: -15 ~ 20 Default: 5 Unit of measurement: °C Notes: Only valid for multi pump systems with DHW function
206+(Unit Address)*100	S16	R&W	DHW enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Only valid for multi pump systems
207+(Unit Address)*100	S16	R&W	DHW turn on	Range: 0 - OFF, 1 - ON Default: 0 - OFF Unit of measurement: - Notes: Only valid for multi pump systems
208+(Unit Address)*100	S16	R&W	DHW priority	Range: 0 - OFF, 1 - ON Default: 0 - OFF Unit of measurement: - Notes: Only valid for multi pump systems
209+(Unit Address)*100	S16	R&W	DHW cooling MAX running time	Range: 1 ~ 48 Default: 16 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function
210+(Unit Address)*100	S16	R&W	DHW cooling MIN running time	Range: 1 ~ 48 Default: 1 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function
211+(Unit Address)*100	S16	R&W	DHW heating MAX running time	Range: 1 ~ 48 Default: 16 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function
212+(Unit Address)*100	S16	R&W	DHW heating MIN running time	Range: 1 ~ 48 Default: 1 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function

Reg	Data Type	R/W	Name	Description
213+(Unit Address)*100	S16	R&W	DHW MAX running time in DHW mode	Range: 1 ~ 48 Default: 4 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function
214+(Unit Address)*100	S16	R&W	DHW MIN running time in DHW mode	Range: 1 ~ 48 Default: 1 Unit of measurement: [min] Notes: Only valid for multi pump systems with DHW function
215+(Unit Address)*100	S16	R&W	Inverter pump enable	Range: 0 - Disable, 1 - Enable Default: 0 - Disable Unit of measurement: - Notes: Only valid for multi pump systems
216+(Unit Address)*100	S16	R&W	Inverter pump running speed	Range: 30 ~ 100 Default: 100 Unit of measurement: [%] Notes: 5% step. Only valid for multi pump systems
217+(Unit Address)*100	S16	R&W	T5S	Water tank setpoint Range: R32 30 ~ 60 NORMAL Default: 50 Unit of measurement: °C Notes: Only valid for multi pump systems with DHW function
(218 ~ 235)+(Unit Address)*100			RESERVED	
236+(Unit Address)*100	U16	RO	Compressor running limitation	Range: 1-16 Default: Unit of measurement: Notes: ref to freq limit sheet
237+(Unit Address)*100	U16	RO	Water Flow alarm	Range: 0-1 Default: 0- No error, 1-Error Unit of measurement: Notes:
238+(Unit Address)*100	U16	RO	Total Number Of Starts	Range: 0-65535 Default: Unit of measurement: Notes:
239+(Unit Address)*100	S16	RO	Current engaged capacity	Range: 1 ~ 100 Default: Unit of measurement: [%] Notes:
240+(Unit Address)*100	S16	RO	ODU running mode	Range: 1 - Off, 2 - Cooling, 3 - Heating, 4 - DHW Default: - Unit of measurement: - Notes:
241+(Unit Address)*100	S16	RO	Silent mode	Range: 1 - Standard, 2 - Silent mode, 3 - Night silent mode1, 4 - Night silent mode2, 5 - Night silent mode3, 6 - Night silent mode4, 7 - Super silent mode Default: 1 - Standard Unit of measurement: - Notes:
242+(Unit Address)*100	S16	RO	T5S	Water tank setpoint Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000

Reg	Data Type	R/W	Name	Description
243+(Unit Address)*100	S16	RO	Total Number Of Operating Hours	Range: -32768 ~ 32767 Default: - Unit of measurement: [Hrs] Notes:
244+(Unit Address)*100	S16	RO	Twi	Inlet water temperature Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
245+(Unit Address)*100	S16	RO	Two	Outlet water temperature Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
246+(Unit Address)*100	S16	RO	Tw	Water temperature Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
247+(Unit Address)*100	S16	RO	T4	Ambient temperature Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
248+(Unit Address)*100	S16	RO	Compressor frequency	Range: -32768 ~ 32767 Default: - Unit of measurement: [Hz] Notes:
249+(Unit Address)*100	S16	RO	Compressor 1 current	Range: -32768 ~ 32767 Default: - Unit of measurement: [A] Notes: Invalid value 0x8000
250+(Unit Address)*100	S16	RO	Fan 1 speed	Range: -32768 ~ 32767 Default: - Unit of measurement: [rpm] Notes:
251+(Unit Address)*100	S16	RO	Fan 2 speed	Range: -32768 ~ 32767 Default: - Unit of measurement: [rpm] Notes:
252+(Unit Address)*100	S16	RO	Fan 3 speed	Range: -32768 ~ 32767 Default: - Unit of measurement: [rpm] Notes:
253+(Unit Address)*100	U16	RO	EXVA	EXV A current opening degree Range: 0 ~ 65535 Default: - Unit of measurement: [steps] Notes:
254+(Unit Address)*100	U16	RO	EXVB	EXV B current opening degree Range: 0 ~ 65535 Default: - Unit of measurement: [steps] Notes:
255+(Unit Address)*100	U16	RO	EXVC	EXV C current opening degree Range: 0 ~ 65535 Default: - Unit of measurement: [steps] Notes:

Reg	Data Type	R/W	Name	Description
256+(Unit Address)*100	S16	RO	SV4	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
257+(Unit Address)*100	S16	RO	SV5	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
258+(Unit Address)*100	S16	RO	SV8A	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
259+(Unit Address)*100	S16	RO	SV8B	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
260+(Unit Address)*100	S16	RO	4 way valve	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
261+(Unit Address)*100	S16	RO	Fix pump state	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
262+(Unit Address)*100	S16	RO	SV1 state	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
263+(Unit Address)*100	S16	RO	SV2 state	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
264+(Unit Address)*100	S16	RO	Heat 1 state	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
265+(Unit Address)*100	S16	RO	Heat 2 state	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
266+(Unit Address)*100	S16	RO	Tp1	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
267+(Unit Address)*100	S16	RO	Th	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
268+(Unit Address)*100	S16	RO	T3	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
269+(Unit Address)*100	S16	RO	Tz	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
270+(Unit Address)*100	S16	RO	T5	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000

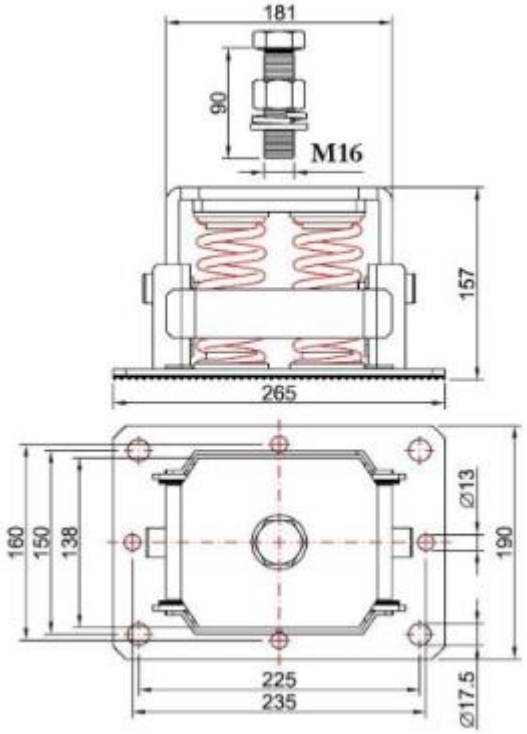
Reg	Data Type	R/W	Name	Description
271+(Unit Address)*100	S16	RO	Pressure	Range: -32768 ~ 32767 Default: - Unit of measurement: heating/DHW [0.01MPa], cooling [0.1MPa] Notes: Low pressure in cooling mode, high pressure in heating mode. Invalid value 0x8000
272+(Unit Address)*100	U16	RO	Error Code	Range: 0-65535 [0-No Error] Default: - Unit of measurement: - Notes: refer to sheet error code define.
273+(Unit Address)*100	U16	RO	Last error code of the error history	Range: 0-65535 [0-No Error] Default: - Unit of measurement: - Notes: refer to sheet error code define.
274+(Unit Address)*100	U16	RO	HMI software version	Version number Range: 0 ~ 65535 Default: - Unit of measurement: - Notes:
275+(Unit Address)*100	S16	RO	Tp2	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
276+(Unit Address)*100	S16	RO	T5s min	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
277+(Unit Address)*100	S16	RO	T6A	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
278+(Unit Address)*100	U16	RO	HMI error code	Range: 0/1/2 Default: - Unit of measurement: - Notes: 0: No error, 1: XYE communication lost, 2: number of online unit reduced
279+(Unit Address)*100	S16	RO	SV6 state	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
280+(Unit Address)*100	S16	RO	Compressor 2 current	Range: -32768 ~ 32767 Default: - Unit of measurement: [A] Notes: Invalid value 0x8000
281+(Unit Address)*100	U16	RO	Unit Capacity	Unit size Range: 0 ~ 65535 Default: - Unit of measurement: [kW] Notes:
282+(Unit Address)*100	S16	RO	Defrost status	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:
283+(Unit Address)*100	S16	RO	Anti-freezing electric heater	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes:

Reg	Data Type	R/W	Name	Description
284+(Unit Address)*100	S16	RO	Remote control	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes: Only the master unit provides this value
285+(Unit Address)*100	S16	RO	FCT status	Range: 0 - OFF, 1 - ON Default: - Unit of measurement: - Notes: Only the master unit provides this value
286+(Unit Address)*100	S16	RO	Pump system status	Range: 0 - Single pump, 1 - Multi pump Default: - Unit of measurement: - Notes:
287+(Unit Address)*100	S16	RO	Unit type	Range: 0 - HP, 1 - CO, 2 - FC Default: - Unit of measurement: - Notes:
288+(Unit Address)*100	S16	RO	T5s max	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
289+(Unit Address)*100	S16	RO	Tsafe	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
290+(Unit Address)*100	S16	RO	PAF	Range: -32768 ~ 32767 Default: - Unit of measurement: [MPa] Notes: Invalid value 0x8000
291+(Unit Address)*100	S16	RO	Taf1	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
292+(Unit Address)*100	U16	RO	Mainboard software version	Version number Range: 0 ~ 65535 Default: - Unit of measurement: - Notes:
293+(Unit Address)*100	U16	RO	MainBoard EEPROM Version	Version date Range: 0 ~ 65535 Default: - Unit of measurement: - Notes: 0 means outdoor unit does not have these data
294+(Unit Address)*100	S16	RO	COND PRESSURE	Range: -32768 ~ 32767 Default: - Unit of measurement: - Notes: Valid only for FC models
295+(Unit Address)*100	S16	RO	T6B	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
296+(Unit Address)*100	S16	RO	Taf2	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
297+(Unit Address)*100	S16	RO	Tfin1	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000

Reg	Data Type	R/W	Name	Description
298+(Unit Address)*100	S16	RO	Tfin2	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
299+(Unit Address)*100	S16	RO	Tfin3	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
1800 ~ 2299			RESERVED	
2300+(Unit Address)*200			TDSH	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
2301+(Unit Address)*200	S16	RO	TSSH	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
2302+(Unit Address)*200	S16	RO	TCSH	Range: -32768 ~ 32767 Default: - Unit of measurement: °C Notes: Invalid value 0x8000
2303+(Unit Address)*200	S16	RO	Inverter pump running speed	Range: 0-100 Default: - Unit of measurement: [%] Notes: Invalid value 0x8000
2304+(Unit Address)*200	U16	RO	ErrTypeGet	Range: 1 - New Method, 0- Old method Default: - Unit of measurement: - Notes: New method is not applicable for new units
2305+(Unit Address)*200	U16	RO	ErrCodeGetNew	Range: 0-65535 [0-No Error] Default: - Unit of measurement: - Notes: Two analysis methods: old fault analysis and new fault analysis, refer to sheet error code define, not applicable for new units.
2306+(Unit Address)*200	U16	RO	LastErrTypeGet	Range: 1- New Method, 0- Old method Default: - Unit of measurement: - Notes: New method is not applicable for new units
2307+(Unit Address)*200	U16	RO	LastErrCodeGetNew	Range: 0-65535 [0-No Error] Default: - Unit of measurement: - Notes: Two analysis methods: old fault analysis and new fault analysis, refer to sheet error code define. not applicable for new units.
(2308 ~ 2399) + (Unit Address)*200	U16	RO	RESERVED	

14. Anti-vibration mounts

The detail of the composition of the anti-vibration kit selected for the ordered unit (called PE.....) with details relating to each individual support point (W1, W2, etc.), is available inside the anti-vibration box shipped together with the unit.
Please refer to the dimensional drawings to identify the position of the support points (W1, W2, etc.).



15. Maintenance

15.1 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 general nature, electrical nature, deriving from operating with equipment under pressure and containing flammable refrigerants.

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

Servicing shall only be performed as recommended by the equipment manufacturer.

15.2 General

Maintenance must be done by authorized centers 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**
- **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 is no residual voltage.**

Warning

- **The main switch shall be operated only during maintenance. Do not operate when the unit is working: before operating on the main switch to cut the power supply off, switch the unit to off (i.e. with the HMI) and wait until the compressors and the fans stop.**

15.3 Inspection 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:

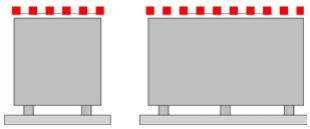
- frequent use (continuous or very intermittent use, near the operating limits, etc)
- critical use (service necessary)

Warning

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

ATTENTION

- **Do not place heavy loads or step on the upper surfaces indicated in the following image**



15.4 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.

15.5 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.

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.

15.6 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	terminals 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	survey of refrigerant circuit operating parameters (temperatures, pressures, etc.)			*
20	safety valve		X	
21	testing of protection devices: pressure switches, thermostats, flow switches, etc.			*
22	control system test: setpoint, climatic compensations, capacity stepping, water / air flow-rate variations		X	
23	control device test: alarm signaling, thermometers, probes, pressure gauges etc..		X	
24	water exchanger check			X
25	verifiy the status of the auxiliary heaters (if installed)			X

*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.

15.7 System drain

The system must be drained only if necessary.

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

- empty the system
- empty the exchanger, use all of the shut-off valves and grub screws present
- blow the exchanger with compressed air
- dry the exchanger with hot air; for greater safety, fill the exchanger with glycol solution
- protect the exchanger from air by filling it with nitrogen
- 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.

If the unit is equipped with the motor operated valves supplied with one of the optional pipe kits (2 or 4 pipes), please follow the indications regarding the maximum differential pressure in the *Water connections* chapter.

15.8 Compressor crankcase heater

Check:

- closing
- Operation

15.9 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.

Check the difference between the outlet water temperature and the evaporation temperature: if the difference is greater than 14.4÷18°F, it is advisable to clean the exchanger.

It must be cleaned:

- with circulation opposite to the usual one
- with water flow rate at least 1.5 times greater than the nominal one
- with a suitable moderately acid product (95% water + 5% phosphoric acid)
- keeping the cleaning product for an adequate time and at a temperature suitable for the expected dirtying conditions
- after washing, rinse with water to remove detergent residues.

15.10 Water filter

Check that no impurities prevent the correct passage of water.

15.11 Differential pressure switch

Check operation.

15.12 Insulations

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

15.13 Pressure relief valve

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.

15.14 Structure

Check the state of the parts constituting the structure.

Treat those parts of the unit subject to oxidation: remove the rust and protect the metal with proper paints.

Check fastening of the unit external paneling.

Bad fastening gives rise to anomalous noises and vibrations.

15.15 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, pressurized air jet or high-pressure washer.

Keep the direction parallel to the fins to avoid damage.

Check that the aluminum fins are not bent or damaged; in the event of damages contact the authorized service center which will "comb" the coil to restore optimal air flow.

15.16 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.

15.17 Fuses type and rating

The following protection fuses are installed in the electrical box of the unit:

- Main switch fuses QS1:
  Class J, time-delay, dual element current limiting fuse
  Rated current 80A
  Interrupting rating 300kA at 600VAC
- Condensate tray heaters protection fuses FURB1 and FURB2
  Class CC, time-delay current limiting fuse
  Rated current 1A
  Interrupting rating 200kA at 600VAC
- Pipe heaters protection fuse FURT
  Class CC, time-delay current limiting fuse
  Rated current 2.5A
  Interrupting rating 200kA at 600VAC
- Fuse board
  Operating Class aR fuse
  Rated current 63A
  Interrupting rating 100kA at 700VAC

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.

16. Decommissioning

16.1 Disconnection

Warning

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

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.

16.2 General information about the waste electrical and electronic equipment

This equipment contain:

- refrigerant gas, see R32 gas safety warnings for indications about the recovery;
- lubrication oil contained in compressors and in the refrigeration circuit;
- solutions of water and antifreeze products in the water circuit;
- mechanic, electric and electronic components

When machine components and/or the contained substances are replaced for maintenance purposes or when the entire unit reaches the end of its life and needs to be removed from the installation, waste should be separated according to its nature and disposed of by authorized personnel following national and local regulations.

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 as municipal waste, use separate collection facilities. If electrical appliances are disposed of in landfills or dumps, hazardous substance can leak into the groundwater and get into the food chain, damaging your health and well-being.

17. Residual risks

17.1 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 for people or things.

Danger zone

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

17.2 Handling

The handling operations, if implemented without all of the protection necessary 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-grading the packaging and in compliance with the local regulations in force.

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

17.3 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 infrequent 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, unauthorized persons or animals may be the source of accidents, some serious.

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

17.4 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 main-switch handle).

Contact the authorized service center 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 center.

Failing to close the unit panels or failure to check the correct tightening of all of the paneling 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 increase the pressure beyond the safety valve opening setting 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 refrigerating system taps closed.

Do not touch the refrigerant pipes during or soon after operation as the refrigerant pipes may be hot or cold. Burns or frostbite are possible if you touch the refrigerant pipes. To avoid injury, leave the pipes return to normal temperature or, wear protective gloves if you have to touch the piping.

Do not touch the internal parts during or soon after operation. Touching the internal parts can cause burns. To avoid injury, leave the internal parts return to normal temperature or, wear protective gloves if you have to touch the piping.

17.5 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 cause electric shocks, damage to the unit or fires.

Always fix the unit cover properly.

Electric faults can cause the metallic mass of the unit (frame, etc..) to be live with electricity. If it is not correctly connected to the earthing system it may be the source of electric shock and electrocution.

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

Contact with live parts (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 live with electricity due to the startup of the unit may cause electric shocks, burns and electrocution.

When voltage is necessary for the circuit, switch the isolator on the supply line of the unit itself to ON,

padlock it and display the appropriate warning sign.

17.6 Moving parts

Contact with the fans can cause injury.

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

17.7 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 data sheet”.

Never directly touch any leaking refrigerant as it could cause severe frostbite.

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 switched off.

17.8 Hydraulic parts

Defects in tubing or the connection/disconnection of parts may cause a leak or water projection with the consequent damages to people, things or short-circuit the unit.

Please consider that in case of multiple unit installation common supply and return pipes should be sized considering the total number of units in the system.

Bad operation of the system due to under-sizing of the water circuit is in charge of the system designer / installer.

18. Technical information

18.1 Performance - Excellence

Acoustic configuration with compressor soundproofing (SC)

Size			40.2
Cooling Mode			
Cooling capacity		TR	28.6
Power input		kW	37.2
EER	1	Btu/W*h	9.22
IPLV		Btu/W*h	18.5
Water flowrate		gpm	68.1
Heating Mode Low water / High Air			
Thermal capacity		kBtu/h	379.0
Power input	2	kW	30.8
COP		kW/kW	3.61
Heating Mode Low water / Low Air			
Thermal capacity		kBtu/h	234.0
Power input	3	kW	29.6
COP		kW/kW	2.32
Heating Mode Medium water / High Air			
Thermal capacity		kBtu/h	382.0
Power input	4	kW	36.6
COP		kW/kW	3.06
Heating Mode Medium water / Low Air			
Thermal capacity		kBtu/h	229.0
Power input	5	kW	35.1
COP		kW/kW	1.91

1. AHRI 550-590 Cooling Capacity Conditions: 95°F Ambient Air, 54°F EWT and 44°F LWT.
2. Low water / High Air = 47°F ambient / 105°F leaving water temperature (Full Load Heating Performance Tested to AHRI Standard 550/590)
3. Low water / Low Air = 17°F ambient / 105°F leaving water temperature (Full Load Heating Performance Tested to AHRI Standard 550/590)
4. Medium water / High Air = 47°F ambient / 120°F leaving water temperature (Full Load Heating Performance Tested to AHRI Standard 550/590)
5. Medium water / Low Air = 17°F ambient / 120°F leaving water temperature (Full Load Heating Performance Tested to AHRI Standard 550/590)

18.2 Construction - Excellence

Acoustic configuration with compressor soundproofing (SC)

SIZE			40.2	
			C1	C2
Compressor				
Compressor Type			Scroll inverter	Scroll Inverter
Compressor number		Nr	1	1
Refrigerant type			R32	R32
Refrigerant charge per circuit		lbs	14,33	14,33
Refrigerant circuit number		Nr	2	
Oil charge		gal	0,607	0,607
User side heat exchanger				
Type of exchanger			BPHE	
Number of heat exchangers		Nr	1	
Water content		gal	2,78	
Source side Heat Exchanger				
Type of exchanger			Fin coil	
Number of heat exchangers		Nr	1	1
Fans				
Type of fans			Axial	
Number of fans		Nr	1	1
Motore type			Brushless	
Standard Air flow		cfm	25872	
Rated motor input	a	HP	2	2
MOC	a	A	4	4
Water circuit				
Connections diameter in/out		inch	2" / 2"	
Maximum operating pressure		psi	300	300
Minimum water content in heating		gal	264	
Power supply				
Standard power supply		V	460/3~/60	
Electrical data				
Power Current				
MCA		A	76,1	
MOP		A	80,0	
SCCR		kA	65,0	
Power Input		Hp	15	15

MCA: Min. Circuit Amps. (For wire diameter selection)
MOP: Maximum overcurrent protector
MOC: Maximum operating current of the motor
SCCR: Short Circuit Current rating.

a - data is related to the single component

18.3 Sound levels - Excellence

Acoustic configuration with compressor soundproofing (SC)

SIZE	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
40.2	76	77	77	79	82	78	72	71	74	87

Silenced acoustic version (LN)

SIZE	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
40.2	74	72	74	77	79	75	70	70	71	84

Super-Silenced acoustic version (EN)

SIZE	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
40.2	66	64	67	71	71	66	63	63	65	77

Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 3.28 ft from the standard unit outer surface operating in open field.

Measures according to UNI EN ISO 9614-2 regulations.

Data referred to the following conditions:

Cooling

- internal exchanger water temperature = 53.6 / 44.6 °F
- ambient temperature = 95 °F

Heating

- internal exchanger water temperature = 104 / 113 °F
- ambient temperature = 44.6 °F d.b. / 42.8 °F w.b.

For the silenced and super silenced versions, the correction factors for capacity and efficiency at rated operating conditions are as follows:

HEATING	Silenced version (LN)	Super-silenced version (EN)
Capacity	0.97	0.82
COP	1.015	1.050

COOLING	Silenced version (LN)	Super-silenced version (EN)
Capacity	0.92	0.80
EER	1.015	1.025

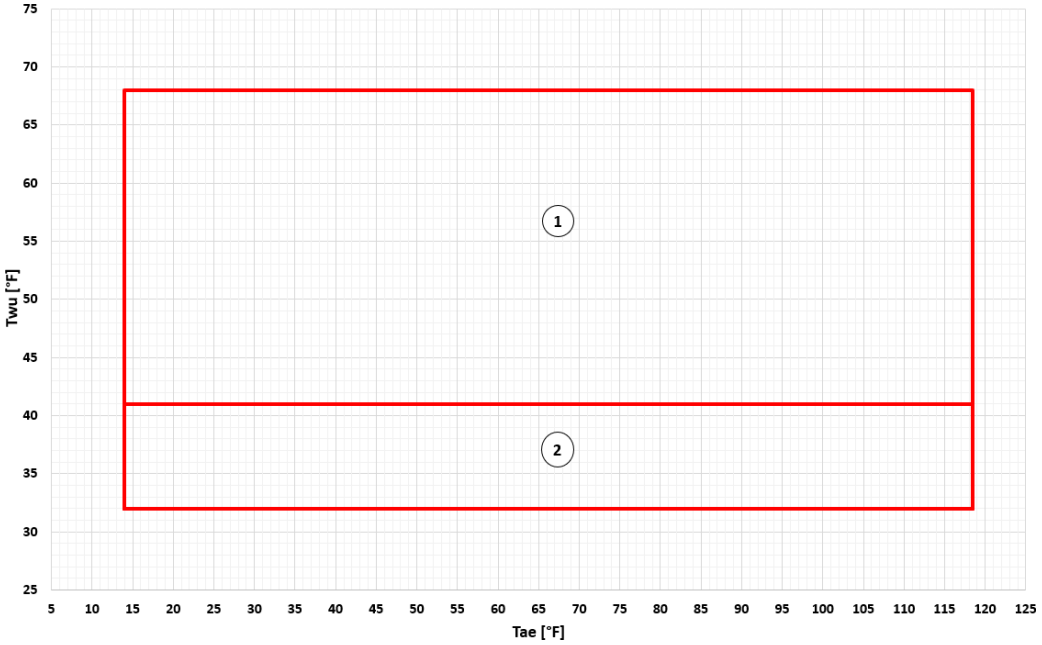
18.4 Operating range

The standard voltage of power supply is 460 V 3~ 60 Hz, the minimum allowable voltage is 414 V, and the maximum allowable voltage is 506 V.

Refrigerating circuit maximum working pressure is 623.7 psig (4.3 MPa).

The unit can be operated within the air and water temperatures presented in the following diagrams.

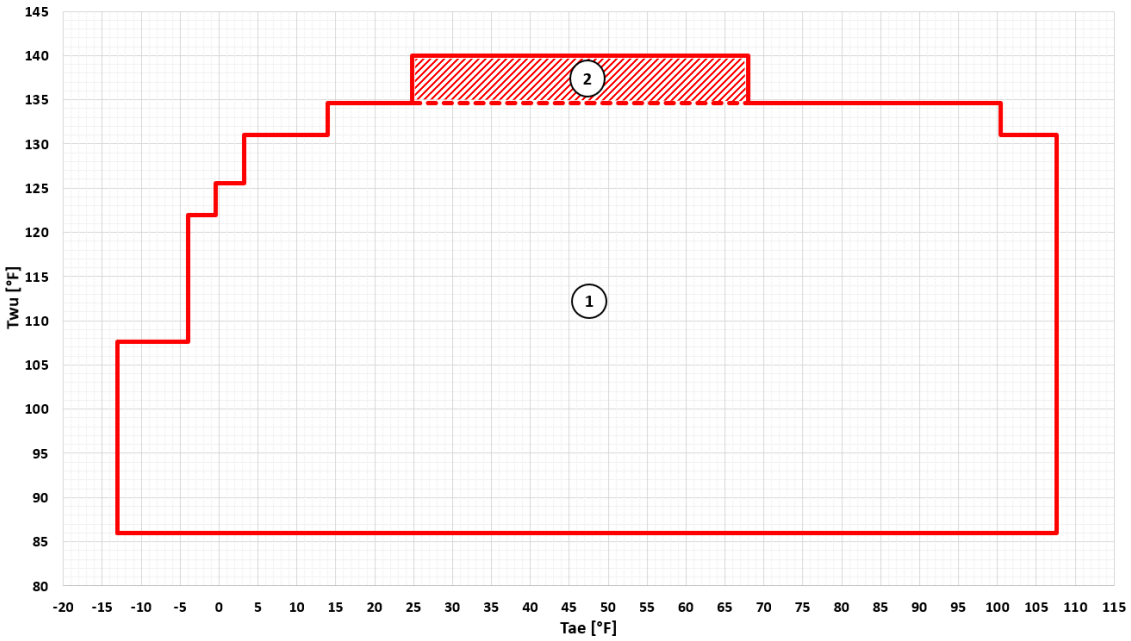
Cooling



To [°F] = Temperature of the outlet water from the exchanger.
Ta [°F] = External exchanger inlet air temperature

1. Standard unit operating range
2. Operating range where the use of ethylene or propylene glycol is mandatory in relation to the temperature of the outlet water from the user side exchanger, the set-point needs to be coherent with type and quantity of glycol in the system.

Heating

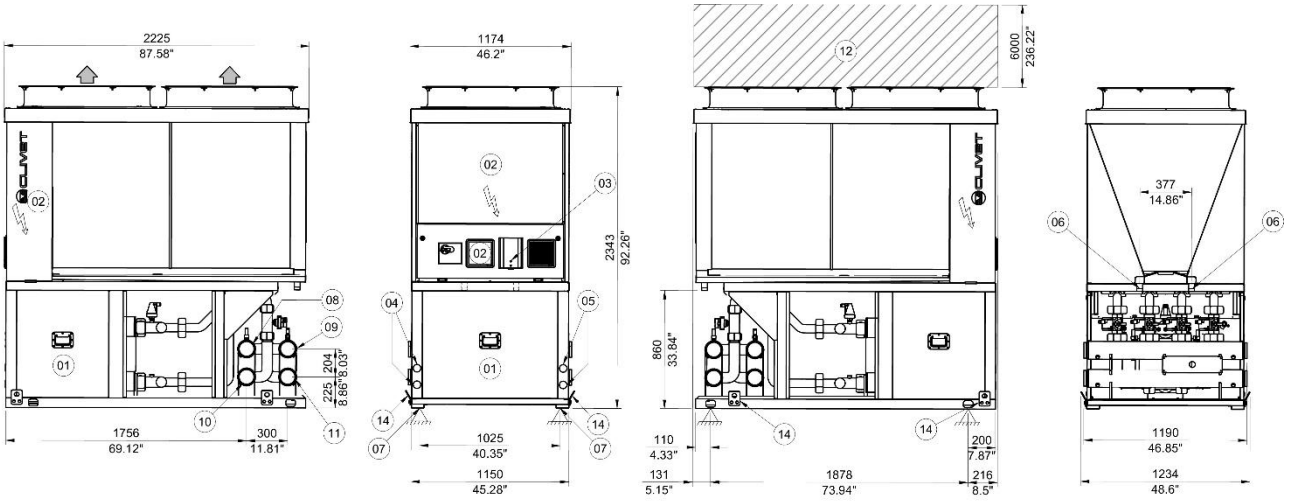


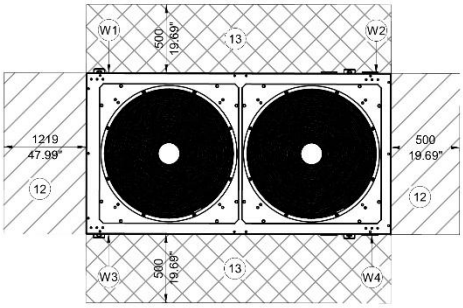
Twu [°F] = Temperature of the outlet water from the exchanger
Tae [°F] = External exchanger inlet air temperature

1. Standard unit operating range
2. Data provided on request - Please refer to Clivet S.p.A

19. Dimensional drawings

SIZE 40.2





1. Compressors enclosure
2. Electrical panel
3. Control keypad
4. Power input
5. Signal imput
6. Condensate drain
7. Fixing point
8. Water inlet PN20
9. Water inlet PN20 (4 tubes kit)
10. Water outlet
11. Water outlet PN20 (4 tubes kit)
12. Functional spaces
13. Functional spaces (Single machine only)
14. Lifting brackets (removeable)

SIZE		Straight pipes kit	2 pipes manual kit	2 pipes motorized	4 pipes kit
		40.2	40.2	40.2	40.2
Length	inch	87.58	87.58	87.58	87.58
Depth	inch	46.2	46.2	46.2	46.2
Height	inch	92.26	92.26	92.26	92.26
W1 Supporting point	lbs	588	585	585	675
W2 Supporting point	lbs	378	397	397	486
W3 Supporting point	lbs	589	680	680	680
W4 Supporting point	lbs	378	397	397	486
Shipping weight	lbs	1936	2107	2107	2332
Operation weight	lbs	1940	2187	2187	2479

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