WSAN-YSC4 NA

90.4-175.4

Installation and maintenance manual

en

M0N600003-00 04-2025

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

The original instructions are written in Italian.

All other languages are translations of the original instructions.

The data contained in this manual is not binding and may be changed by the manufacturer without prior notice. Reproduction, even is part, is FORBIDDEN

Summary

1. Safety considerations 6
- 1.1 Safety 6
- 1.2 Manual 6
- 1.3 Risk situations 6
- 1.4 Intended use 6
- 1.5 Installation 6
- 1.6 Maintenance 6
- 1.7 Modification 6
- 1.8 Breakdown/Malfuction 6
- 1.9 User training 6
- 1.10 Data update 6
- 1.11 Original instructions 6

3. Indications for the User 8
- 3.1 Breakdown/Malfuction 8
- 3.2 The installer must train the user, particularly on: 8
- 3.3 Unit indentification 8
- 3.4 Serial number 8

4. Information on refrigerant gas 9

5. SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R32 10
- 5.1 Area checks 10
- 5.2 Work procedures 10
- 5.3 General work area 10
- 5.4 Check the presence of refrigerant 10
- 5.5 Presence of the fire extinguisher 10
- 5.6 No ignition source 10
- 5.7 Ventilated area 10
- 5.8 Cooling equipment checks 10
- 5.9 Electrical device checks 10
- 5.10 Repairing sealed components 10
- 5.11 Reparation of intrinsically safe components 11
- 5.12 Wires 11
- 5.13 Leak detection methods 11
- 5.14 Removal and evacuation 11
- 5.15 Charging operations 11
- 5.16 Dismantling 12
- 5.17 Labelling 12
- 5.18 Recovery 12
- 5.19 Transport, mark and storage 12

6. Before installation 14
- 6.1 Reception 14
- 6.2 Storage 14
- 6.3 Packaging removing 14
- 6.4 Handling 14

7. Selecting the installation site 15
- 7.1 General 15
- 7.2 Functional spaces 15
- 7.3 Positioning 15
- 7.4 Air flow-rate on the coils 15

7.5 Condensate water ... 16
8. Water connections ... 17
8.1 Hydraulic system ... 17
8.2 Water quality ... 17
8.3 Cleanliness ... 17
8.4 New systems ... 17
8.5 Existing systems ... 17
8.7 Anti-freeze solution ... 18
8.8 Water flow-rate ... 18
8.9 Minimum system water content ... 18
8.10 Water operating pressures and temperatures ... 18
8.11 Flow Switch ... 18
8.12 Water filter ... 19
8.13 Non-return valve ... 19
8.14 Operation sequence ... 19
8.15 Hydronic units and connection diagrams recommended ... 19
9. Electrical connections ... 21
9.1 Electrical data ... 21
9.2 Connections ... 21
9.3 Power supply network requirements ... 21
9.4 Signals / data lines ... 21
9.6 Remote ON-OFF ... 22
9.7 Connections performed by Customer ... 23
9.8 Controller wiring sections ... 24
9.9 Computer connection ... 25
9.12 BACnet IP ... 28
9.13 BACNET MS/TP ... 28
9.14 Ecoshare ... 29
10. Start-up ... 31
10.1 Start-up sequence ... 32
10.3 Electric Circuit ... 34
10.4 Options ... 34
10.5 Reduced load operation ... 34
10.6 Checking the water flow-rate. ... 34
10.7 Start-up report ... 34
11. Control ... 35
11.1 LED ... 35
11.2 Display and buttons ... 35
11.5 Change mode ... 37
11.6 Change setpoint ... 37
11.7 Alarms ... 40
11.8 General list of alarms ... 40
12. Maintenance ... 46
12.1 Safety ... 46
12.2 General ... 46
12.3 Inspections frequency ... 46
12.4 Unit booklet ... 46
12.5 Standby mode ... 46
12.8 Water side exchanger ... 48
12.9 Water filter ... 48
12.10 Flow Switch ... 48

12.11 Circulation pumps ... 48
12.12 Air side exchanger ... 48
12.13 Insulations ... 48
12.14 Pressure relief valve ... 48
12.15 Structure ... 48
12.16 Electric fans ... 48
12.17 Compressor crankcase heater ... 49
12.18 Refrigerant leak detector ... 49
13. Anti-vibration mounts ... 50
14. Decommissioning ... 52
14.1 Disconnection ... 52
14.2 General information about the waste electrical and electronic equipment. 52
15. Residual risks ... 53
15.1 General ... 53
15.2 Handling ... 53
15.3 Installation ... 53
15.4 General risks ... 53
15.5 Electric parts ... 53
15.6 Moving parts ... 54
15.7 Refrigerant ... 54
15.8 Hydraulic parts ... 54
16. Technical information ... 55

1. Safety considerations

1.1 Safety

Operate in compliance with safety regulations in force.

To carry out the operations use protection devices:

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

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

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

1.2 Manual

The manual provides correct unit installation, use and maintenance.

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

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

The manual must be delivered to the User.

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 sipervision or istruction concerning the use of the appliance by a person responsible for their safety.

1.3 Risk situations

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

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

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

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

1.4 Intended use

Use the unit only:

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

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

1.5 Installation

▶ **Outdoor installation**

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

Follow local safety regulations.

Follow local safety regulations.

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

1.6 Maintenance

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

Turn the unit off before any operation.

1.7 Modification

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

1.8 Breakdown/Malfuction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

1.9 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

1.10 Data update

Continual product improvements may imply manual data changes.

Visit manufacturer web site for updated data.

1.11 Original instructions

The original instructions are written in Italian.

All other languages are translations of the original instructions.

2. Safety symbols on the unit's labels

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

This symbol shows that the manual should be read carefully.

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

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

3. Indications for the User

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

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

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

3.1 Breakdown/Malfuction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

Use original spares parts only.

Using the unit in case of breakdown or malfunction:

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

3.2 The installer must train the user, particularly on:

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

3.3 Unit indentification

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

The serial number label contains information such as, for example:

- 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.

3.4 Serial number

It identifies uniquely each unit.

It must be cited when ordering spare parts.

3.5 Assistance request

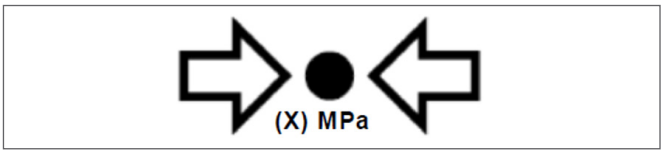
Note data from the serial number label and write them in the chart on side, so you will find them easily when needed.

Range
Size
Serial number
Year of production
Wiring diagram number

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.**



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

NOTE

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

5. SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R32

5.1 Area checks

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

5.2 Work procedures

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

5.3 General work area

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

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

5.4 Check the presence of refrigerant

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

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

5.5 Presence of the fire extinguisher

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

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

5.6 No ignition source

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

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

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

5.7 Ventilated area

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

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

5.8 Cooling equipment checks

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

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

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

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

5.9 Electrical device checks

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

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

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

Initial safety checks must include:

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

5.10 Repairing sealed components

- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc.

- If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.
- Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected
- This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.
- Ensure that the apparatus is mounted securely.
- Ensure that seals or sealing materials have not degraded to the point that they no longer serve the purpose of preventing the ingress of flammable atmospheres. Replacement parts shall be in accordance with the manufacturer's specifications.

5.11 Reparation of intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use.

Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

eplace 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 Wires

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

Detection of flammable refrigerants

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

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

5.13 Leak detection methods

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

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

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

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

If a leak is identified that requires brazing, all the refrigerant must be recovered from the system or isolated (using interception valves) in a section of the system far away from the leak. Oxygen-Free-Nitrogen (OFN) is then purged through the system both before and during the brazing procedure.

5.14 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;
- purge the circuit with inert gas;
- evacuate;
- continuously flush or purge with inert gas when using flame to open circuit;
- open the circuit by cutting or brazing.

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.

This operation is absolutely vital if brazing operations on the pipe-work are to take place. The outlet for the vacuum pump shall not be close to any potential ignition sources, and ventilation shall be available.

5.15 Charging operations

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

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

5.16 Dismantling

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

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

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

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

Before attempting the procedure, check that:

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

5.17 Labelling

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

Labels must be dated and signed.

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

5.18 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. Before using the recovery machine, check that it is in satisfactory working order, has been properly maintained and that any associated electrical components are sealed to prevent ignition in the event of a refrigerant release. Consult manufacturer if in doubt.

The recovered refrigerant shall be 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 evacuation process shall be carried out prior to returning the compressor to the suppliers.

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.

5.19 Transport, mark and storage

1 Transport of equipment containing flammable refrigerants.
Compliance with transport regulations

2 Marking of equipment with symbols.
Compliance with local regulations

3 Disposal of equipment employing flammable refrigerants.
Compliance with national regulations

4 Storage of equipment/devices.
The equipment must be stored in compliance with the instructions provided by the manufacturer.

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

6. Before installation

6.1 Reception

You have to check before accepting the delivery:

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

In case of damage or anomaly:

- Write down on the transport document the damage you found and quote this sentence: "Conditional acceptance clear evidence of deficiencies/damages during transport"
- Contact by fax and registered mail with advice of receipt to supplier and the carrier.

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 particolar:

minimum ambient temperature	(A)	5°F (-15 °C)
maximum ambient temperature	(B)	120.2°F (+49 °C)
maximum relative humidity	(C)	95%

Failure to comply with the above conditions can lead to:

A possible components damages

B possible safety valve opening

C possible damages to electrical components

WARNING

▶ **The unit may not be tilted more than 15° during transport.**

6.3 Packaging removing

Be careful not to damage the unit.

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

6.4 Handling

ATTENTION

▶ **Check that all handling equipment complies with local safety regulations (cran, forklifts, ropes, hooks, etc.).**

▶ **Provide personnel with personal protective equipment appropriate for the situation, such as hard hat, gloves, safety shoes, etc.**

▶ **Observe all safety procedures in order to guarantee the safety of the personnel present and the of material.**

▶ **Verify unit weight and handling equipment lifting capacity.**

1 Identify critical points during handling (disconnected routes, flights, steps, doors

2 Protect the unit properly to prevent damage

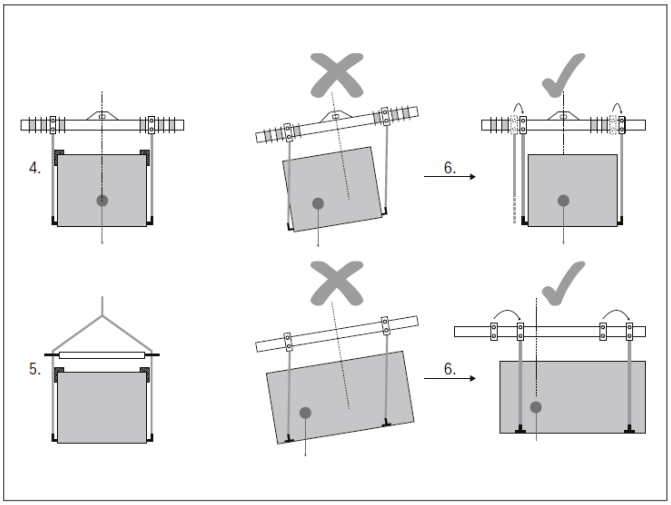
3 Lifting with balance

4 Lifting with spacer bar

5 Align the barycenter to the lifting point

Gradually bring the lifting belts under tension, making sure they are positioned correctly

Before starting the handling, make sure that the unit is stable.



7. Selecting the installation site

7.1 General

Installation must be in accordance with local regulations.

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

7.2 Functional spaces

Functional spaces are designed to:

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

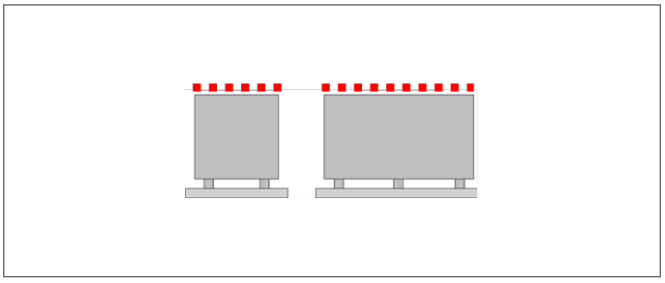
ATTENTION

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

7.3 Positioning

ATTENTION

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



Units are designed to be installed:

- in fixed positions
- level

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
- install the unit raised from the ground
- bearing points aligned and leveled
- discharged condensation water must not cause harm/ danger to people and property
- the accumulation of snow must not cause clogging of the coils

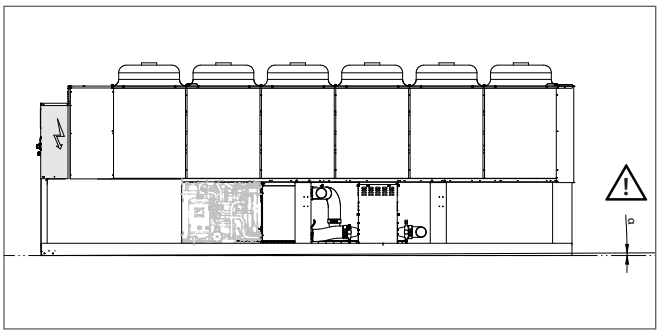
Limit vibration transmission:

- use anti-vibration devices or neoprene strips on the unit support points
- install flexible joints on the hydraulic and aeraulic connections

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

ATTENTION

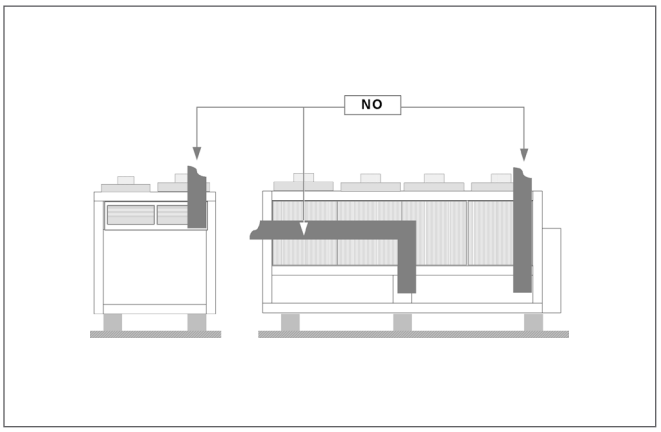
- ▶ **If possible, guarantee a slight slope of 1-2° (slope towards the side opposite the electrical panel) to allow the condensation water discharge generated by the finned coil.**



7.4 Air flow-rate on the coils

ATTENTION

- ▶ **The air flow must not be obstructed**



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

Avoid therefore:

- obstacles to the airflow
- difficulty of exchange
- leaves or other foreign bodies that can obstruct the air coil
- winds that hinder or favour the airflow

- heat or pollution sources close to the unit (chimneys, extractors etc..)
- stratification (cold air that stagnates at the bottom)
- recirculation (expelled air that is sucked in again)
- incorrect positioning, close to very high walls, attics or in angles that could give rise to stratification or recirculation phenomenons

Ignoring the previous indications could:

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

7.5 Condensate water

Only units in heat pump version.

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

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

8. Water connections

8.1 Hydraulic system

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

Keep the following parameters to a minimum:

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

8.2 Water quality

The water quality must be checked by qualified personnel.

Water with inadequate characteristics can cause:

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

Water features:

- within the limits indicated by table

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

8.3 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.

8.4 New systems

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

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

8.5 Existing systems

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

The system must be drained before installing the new unit.

Dirt can be removed only with a suitable water flow.

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

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

An option to remove pollutants is to install a filter.

ATTENTION

- **The warranty does not cover damages caused by limestone formations, deposits and impurities from the water supply and/or from failure to clean the systems.**

Water component for corrosion limit on Copper	
PH (25°C)	7,5 ÷ 9,0
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
H2S	< 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
Max Ethylene, Propylene glycol	50%
Nitrates	<100
Free&aggressive Carbonic Acid	<5

8.6 Risk of freezing

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

- mix water with glycol, or
- safeguard the pipes with heating cables placed under the insulation, or
- empty the system in cases of long non-use

8.7 Anti-freeze solution

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

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

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

ATTENTION

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

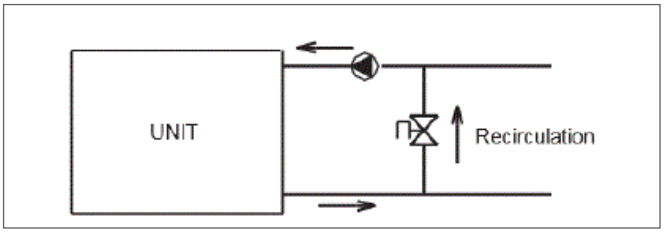
% GLYCOL ETHYLENE / PROPYLENE BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°F	28.4	25	20.3	15.98	10.8	3.9	-2.2	-10.1	-18	-26.9
	°C	-2	-3.9	-6.5	-8.9	-11.8	-15.6	-19.0	-23.4	-27.8	-32.7
Safety temperature	°F	37.4	33.8	30.2	24.8	21.2	14	6.8	-2.2	-10.8	-20.9
	°C	3	1	-1	-4	-6	-10	-14	-19	-23.8	-29.4

8.8 Water flow-rate

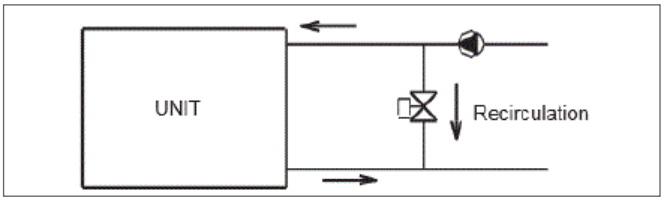
The design water-flow must be:

- inside the exchanger operating limits (see the TECHNICAL INFORMATION section)
- guaranteed, also with variable system conditions (for example in systems where some circuits are bypassed in particular situations).

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.



8.9 Minimum system water content

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

8.10 Water operating pressures and temperatures

The maximum and minimum water operating temperatures, in cooling and heating mode, are given in the TECHNICAL DATA chapter under FIELDS OF USE.

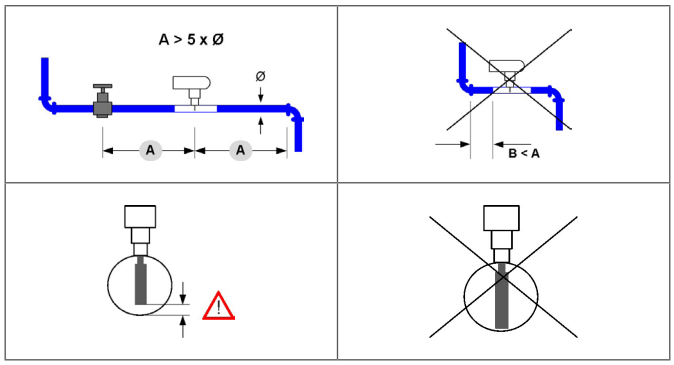
The maximum and minimum water operating pressures are differentiated by configuration with or without pump in the table below. In the configuration without a pump, the pressure is higher because of the maximum system pressure.

	Minimum pressure [MPa]	Maximum pressure [MPa]
Configuration with pump	0.05	0.6
Configuration without pump	0.05	1

8.11 Flow Switch

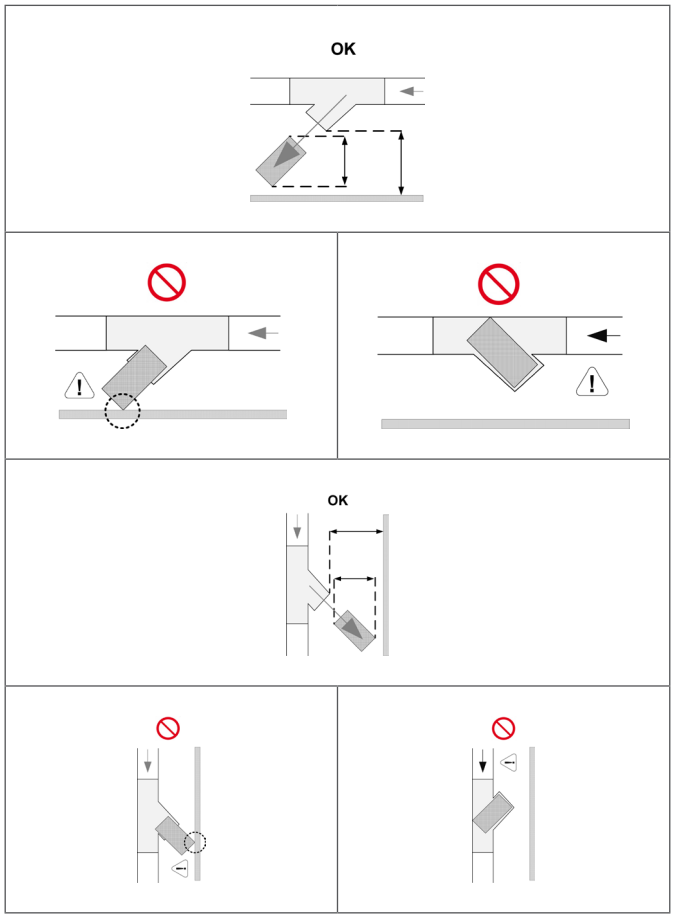
The flow switch must be present to ensure shutdown of the unit if water is not circulating.

It has to be installed in a duct rectilinear part, not in proximity of curves that cause turbulences.



8.12 Water filter

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



The filter must have an adequate mesh to prevent the entry of particles grater that:

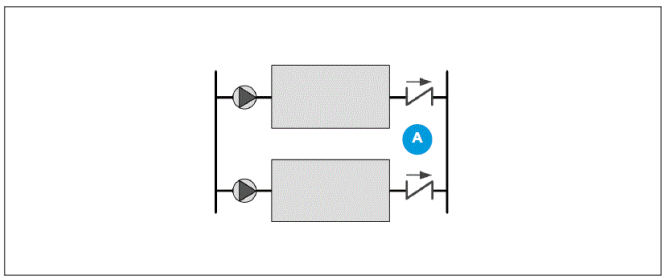
plate exchanger (mm)	1,6
shell and tube evaporator (mm)	0,87

ATTENTION

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

8.13 Non-return valve

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



8.14 Operation sequence

Before starting the unit pump:

1 Close all vent valves in the high points of the unit hydraulic circuit

2 Close all drain shut-off valves in the low points of the unit's water circuit
exchangers
pumps
collectors
storage tanks

3 Carefully wash the system with clean water: fill and drain the system several times.

4 use the bypass to exclude the exchanger from the flow (diagram on the previous page)

5 fill and empty the system multiple times.

6 Apply additives to prevent corrosion, fouling, formation of mud and algae.

7 Fill the plant

8 do not use the unit pump.

9 Execute leakage test.

10 Isolate the pipes to avoid heat dispersions and formation of condensate.
Leave various service points free (wells, vents, etc).

ATTENTION

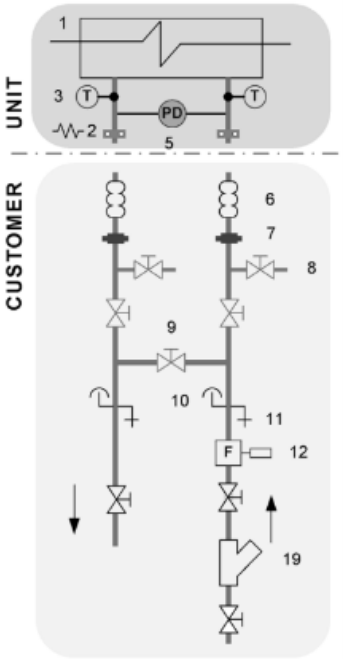
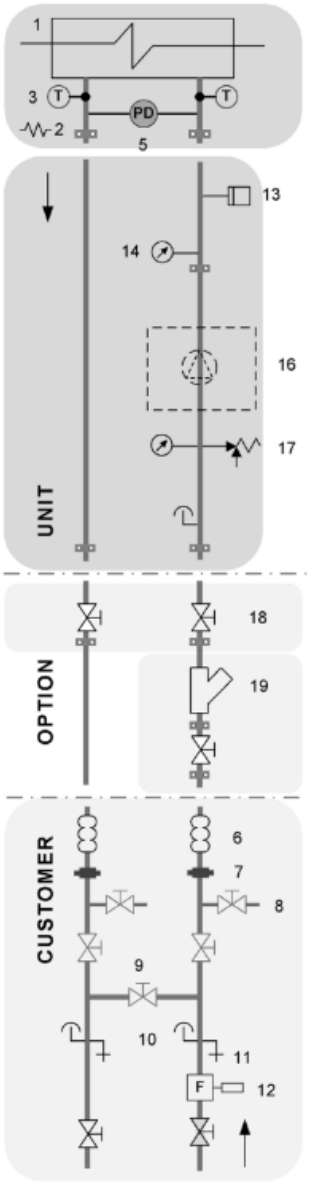
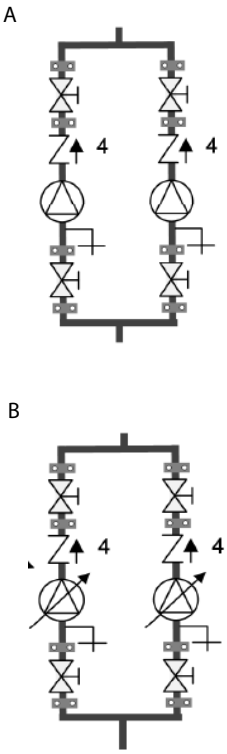
▶ **Neglecting the washing will lead to several filter cleaning interventions and at worst cases can cause damages to the exchangers and the other parts.**

8.15 Hydronic units and connection diagrams recommended

The installer must define:

- type of components
- position in the system

See diagrams on the next pages.

Standard unit	Unit + pumps	Pumps option
		

1 Exchanger
2 Antifreeze heater
3 Water temperature probe
4 non return valve
5 differential pressure switch
6 flexible couplings
7 piping supports
8 Exchanger chemical cleaning bypass
9 System washing bypass (interlock closed during operation)
10 vent
11 Drain
12 flow switch
13 System filling safety pressure switch
14 pressure gauge
15 non return valve
16 Pump
17 safety valve
18 shut-off valves
19 filter

A 1 pump + 1 on standby
B 1 pump + 1 on standby with inverter

9. Electrical connections

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

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

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

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.

9.1 Electrical data

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

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

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

Voltage

MCA: Minimum Circuit Ampacity

MOP: Rating of overcurrent protective device

Electrical wiringdiagram Nr.

9.2 Connections

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

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

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

4 Ensure correct earth connection.

5 Ensure cables are suitably protected.

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

7 Prevent noise from escaping from the compressor compartment; seal any openings made.

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

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

10 Do not drill holes in the electrical panel.

11 Alternatively, restore the IP rating with watertight systems.

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

9.3 Power supply network requirements

1 The short circuit capacity of the line must be less than 10 kA

2 The units can only be connected to TN, TT distribution systems - protect the unit adequately depending on whether the power supply system is TN or TT

3 Voltage 414 - 506V-3-60 (standard unit) / 517.5 - 632.5V-3-60 (optional) Power supply voltage interrupted or reset for no more than 3 ms, at any moment of the power supply cycle with more than 1 s between two successive interruptions

4 60 Hz +- 0,02 power supply frequency

5 Phase unbalance < 2%

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

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

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

9 Earth cable as specified in the WIRING DIAGRAM.

9.4 Signals / data lines

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

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

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

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

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

A 3-pole shielded bus cable is required.

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.

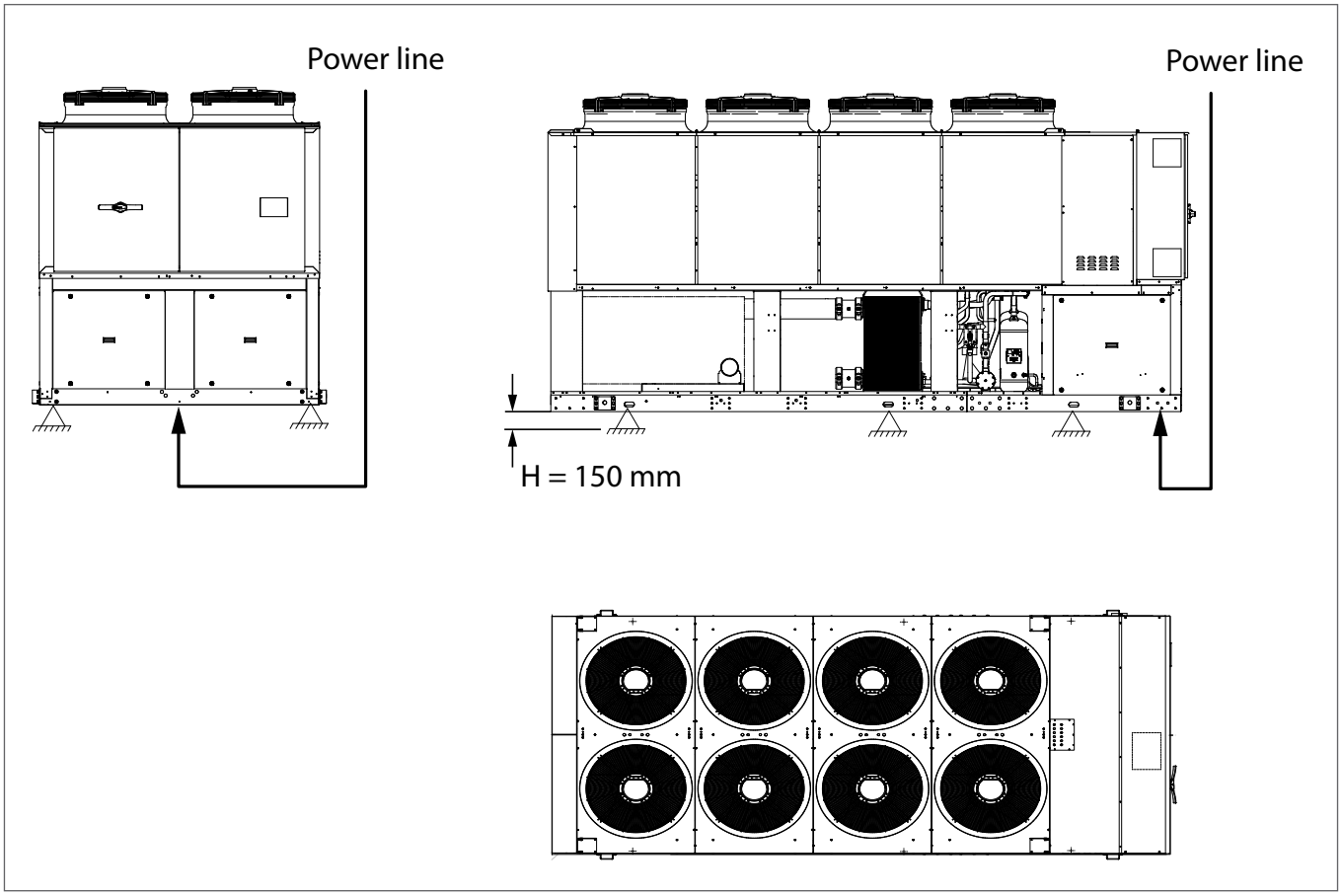
In order to ensure correct communication, the earth connection of the shield can also be configured differently depending on the area and the types of interference.

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.

9.5 Power line inlet.

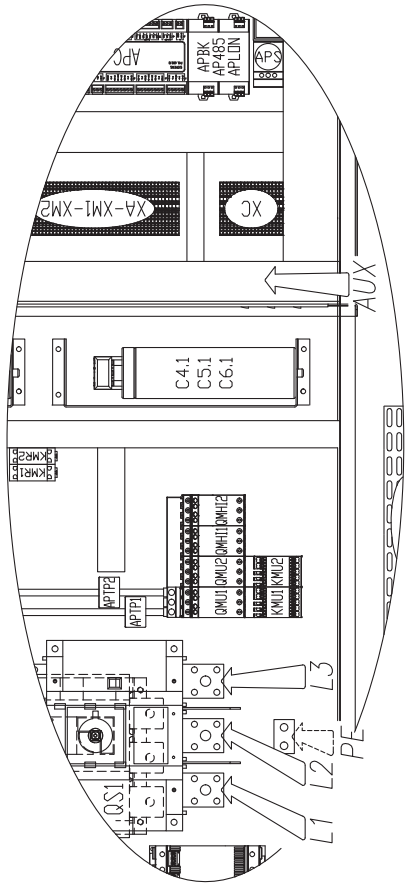


9.6 Remote ON-OFF

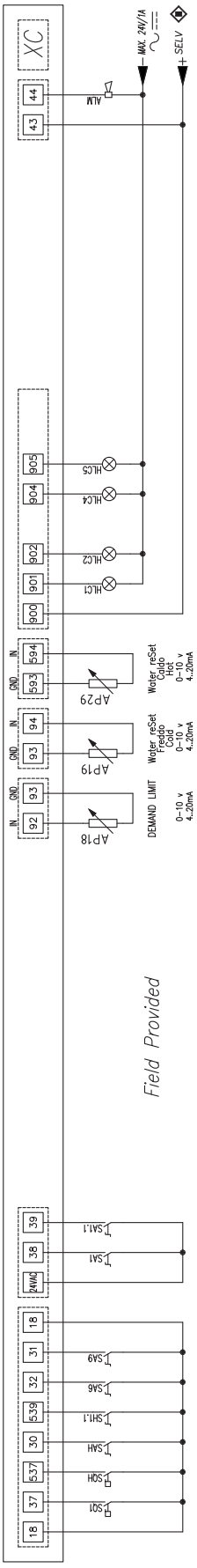
Do not perform short On-Off cycles.

Do not use the remote On-Off with a thermoregulation function.

9.7 Connections performed by Customer



HLC1-HLC6	compressor status signal lamp lampe de signalisation état compresseur lampada di segnalazione stato compressore	SA1	remote on/off selector sélecteur ON/OFF déporté selettore on/off remoto
ALM	cumulative fault signal signalisation alarme générale segnalazione blocco cumulativo	SA1.1	Second Set Point selector switch on cold use Sélecteur selon Point de Consigne sur utilisation froide Selettore secondo Set Point su utilizzo freddo
AP18		SA6	sanitary water cycle selector sélecteur demande eau sanitaire selettore richiesta acqua sanitaria
AP19	Cold use water reset Reset eau utilisation froide Water reset utilizzo freddo	SA9	cooling thermostat thermostat de demande refroidissement termostato di richiesta raffredamento
AP29	Hot use water reset Reset eau utilisation chaude Water reset utilizzo caldo	SAH	Heating request selector switch Sélecteur de demande chauffage Selettore di richiesta riscaldamento
SQ1	Flow switch on cold use Fluxostat sur utilisation Froide Flussostato su utilizzo Freddo	SH1.1	Second Set Point selector switch on hot use Sélecteur selon Point de Consigne sur utilisation chaude Selettore secondo Set Point su utilizzo caldo
SQH	Flow switch on hot use Fluxostat sur utilisation chaude Flussostato su utilizzo caldo		



9.8 Controller wiring sections

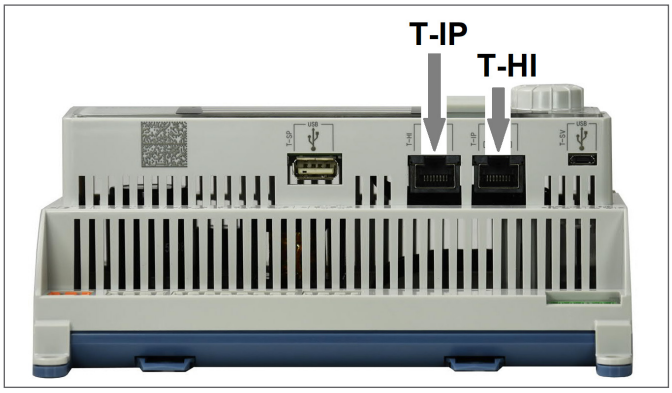
460V

	90.4	100.4	110.4	120.4	130.4	145.4	160.4	175.4
Max. cable section Cu (mm^2)	95	95	95	120	150	185	250	250
Max. cable section Cu (AWG-kcmil)	4/0	4/0	4/0	250	300	350	500	500

9.9 Computer connection

Configure PC

1 connect PC to electronic module with LAN cable
2 check in the taskbar that the connection is active
3 open Control Panel and select Network and sharing centre
4 select Modify board setting
5 select Local area network (LAN) connection
6 select Internet protocol version 4 (TPC/IPV4) and press the Property button
7 set IP address 192.168.1.100
8 set Subnet mask as 255.255.255.0
9 confirm (OK)
10 press Windows START button
11 write cmd
12 write Ping 192.168.1.42
13 check that a response string is given
14 open a browser (Chrome, Firefox, etc.)
15 write http:/192.168.1.42
16 Userid = WEB
17 Password = SBTAdmin!



1 Standard keypad
2 RJ45: standard connection
3 PC-not supplied
4 PC connection, shift RJ45 from T-HI to T-IP

9.10 Remote control

Option

1 Distance up to 350 m

2 Distance up to 700 m

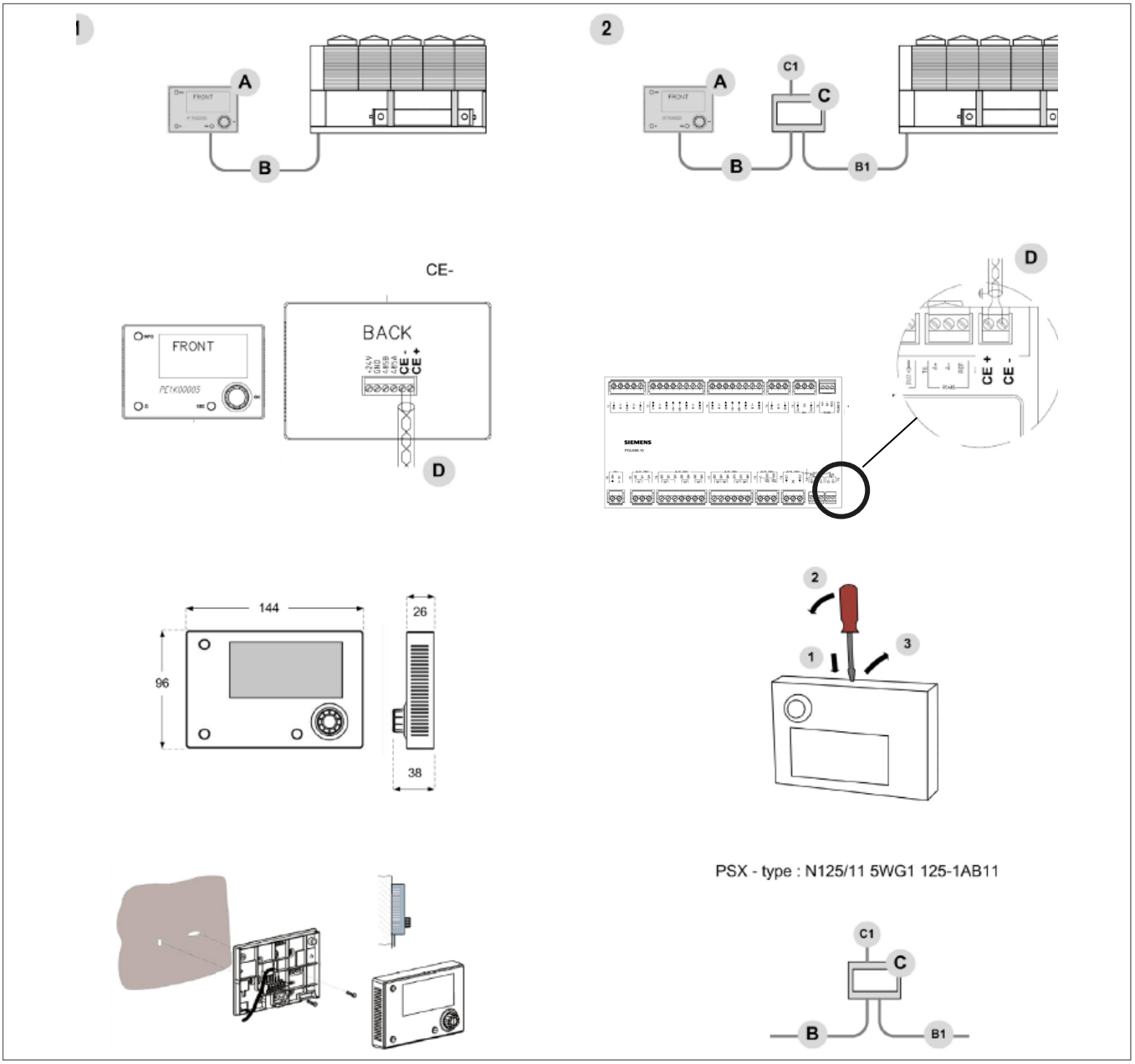
A User interface

B=B1 KNX bus, max 350 m
shielded twisted pair ø 0.8 mm
use an EIB/KNX marked cable

C PSX - Mains power output
power output N125/11 5WG1 125-1AB11

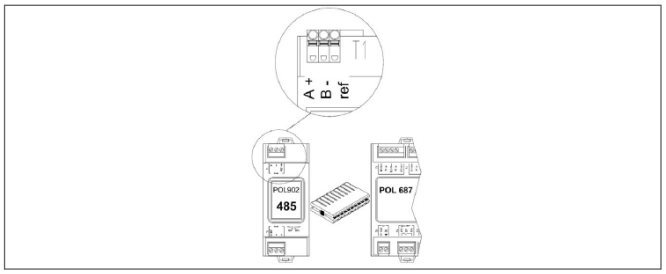
C1 AC 120...230V, 50...60Hz

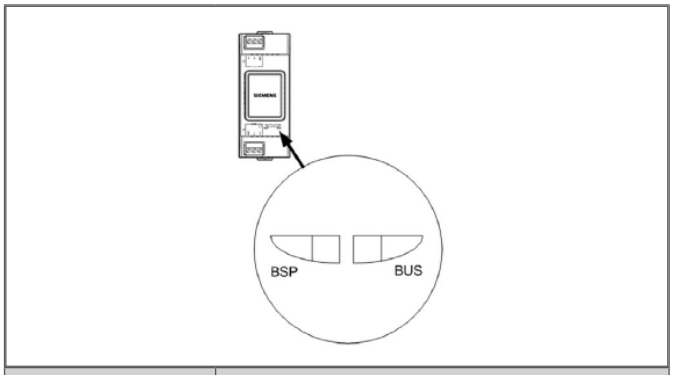
D KNX bus, max 350 m



9.11 Modbus - RS485

Option





LED BSP	communication with AP1 module
green	communication ok
yellow	software ok but communication with AP1 down
red	flashing: software error steady: hardware error
LED BUS	**Modbus communication**
green	communication ok
yellow	startup / 1 canal not communicating
red	communication down

9.11.1 Modbus cable requirements

Pair of twisted and shielded conductors

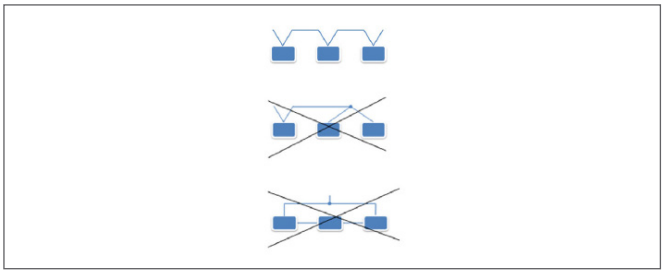
Conductor cross-section 0,22mm2...0,35mm2

Rated power between conductors < 50 pF/m

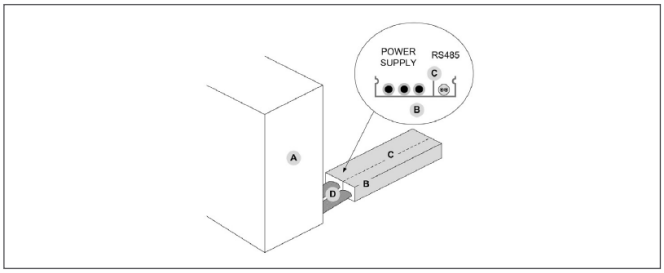
Nominal impedance 120 Ω

Recommended cable BELDEN 3106A

- Every RS485 serial line must be set up using the 'In/ Out' bus system.
- Other types are not allowed.



- The difference in potential between the earth of the two RS485 devices that the cable shielding needs to be connected to must be lower than 7 V
- There must be suitable arresters to protect the serial lines from the effects of atmospheric discharges
- A 120 ohm resistance 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.



A Unit

B Metal conduit

C Metal septum

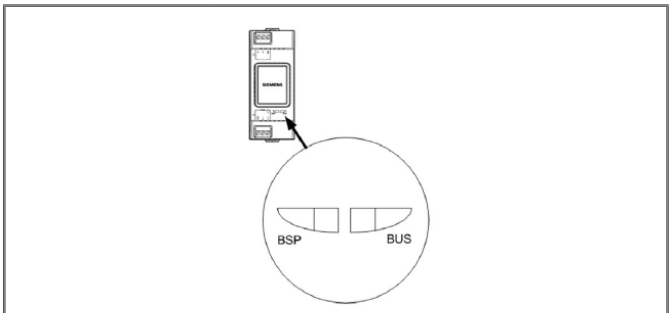
D Metal-lined sheath (sleeve)

9.12 BACnet IP

Option

Ethernet 10/100 Mbit(IEEE 8025.3U)

RJ45, 8 pins

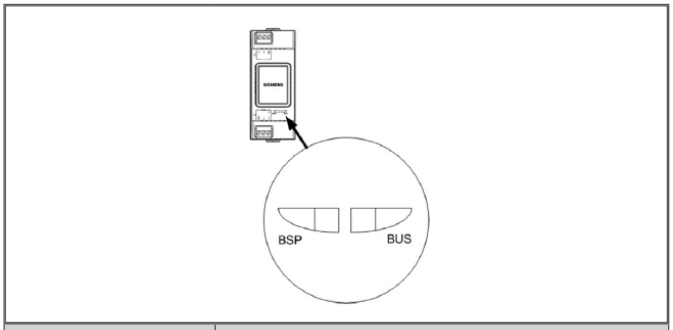


LED BSP	communication with AP1 module
red/green alternating	bios update in progress
steady green	module connected and working
steady amber	no communication with the main controller
flashing red	bios error
steady red	hardware error
LED BUS	**BACnet communication**
green	BACnet IP server started communication ok
amber	BACnet IP server initialization
red	hardware error or cable not connected

9.13 BACNET MS/TP

Option

RJ-458



LED BSP	communication with AP1 module
red/green alternating	bios update in progress
steady green	module connected and working
steady amber	no communication with the main controller (if started)
flashing red	bios error
steady red	hardware error
LED BUS	**BACnet communication**
green	BACnet MS/TP server started communication ok
amber	BACnet MS/TP server initialization
red	hardware error

9.14 Ecoshare

Option

The Master unit (identified by the LNAddress parameter = 1) controls the network.

The network can be extended to a maximum of 7 units (1 master – 6 slaves).

The network addresses must be in sequence and set to values from 1 to 7.

The Master's address must be 1, the n Slave devices configured on the network must have addresses ranging from 2 to 7.

The master manages connected units in order to obtain:

- The coordination of operation (Mode, status, setpoint and signal commands of the DemandLimit function are transmitted from the Master unit to the Slave units).
- The rotation of unit operating priorities based on their wear (total number of hours of operation).
- The management of one or more units on standby. The units put on standby are always the ones showing more wear. The units on standby are rotated with daily frequency or when an alarm is triggered on the units in operation.

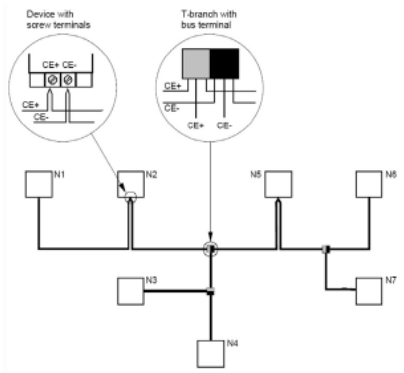
A different user side setpoint is set in each unit; this value is calculated starting from the setpoint set in the master unit, adding/removing, depending on the operating mode (cold/hot), an offset that can be parameterised.

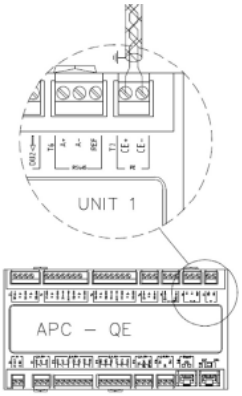
Example

- Master Mode = Cold
- Setpoint set in the Master = 7.0 °C
- Offset = 0.5 °C
- Slave 2 (less wear): Setpoint = 7.0 °C
- Slave 3 (wear less than Slave 2): SetPoint = 7.5 °C
- Master (wear less than Slave 3): Setpoint = 8.0 °C
- Slave 1 (more wear): Setpoint = 8.5 °C
- Status and mode of the Slave units are controlled by the Master
- Heat load: Each unit works independently on both the user side and the recovery side to fulfil the heat load based on the Setpoint and RecoverySetpoint assigned to it by the Master.

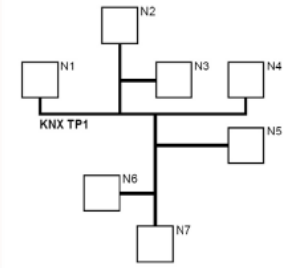
Connection requirements

- Maximum length of the bus line: 700 m
- Maximum distance between 2 units: 300 m
- Type of cable: shielded twisted pair, Ø 0,8 mm, use an EIB/KNX marked cable
- Possible connections: Tree, star, in/out bus, mixed
- It is not possible to use a loop connection
- No end-of-line resistance or terminator required
- There must be suitable arresters to protect the serial lines from the effects of atmospheric discharges
- The data line must be kept separate from the power conductors or powered at different voltages and away from possible sources of electrical interference

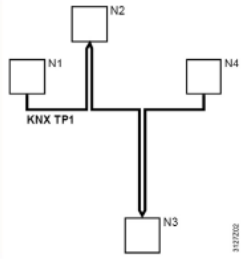




Tree topology (with stub lines)



Line topology (with loops)



Path: Main menu / Unit settings / Ecoshare		
Parameters	**Short description**	**Description**
P0191	Indirizzo Unita	Modbus address of unit in Ecoshare network (1 – 7; 1 = MASTER)
P0193	N.Unita in Rete	Number of units in Ecoshare network (1 – 7)
P0194	Unita in StandBy	Number of units on standby in Ecoshare network (1 – 6)
P0195	Offset SetPoint	Offset SetPoint

10. **Start-up**

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

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

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

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

Before checking, please verify the following:

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

Attention

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

10.1 Start-up sequence

For details refer to the different manual sections.

Preliminary checks - Unit power supply OFF		✓
1	safety access	
2	suitable frame to withstand unit weight + people weight	
3	functional spaces	
4	air flow: correct return and supply (no bypass, no stratification)	
5	considered level to be reachable by snow	
6	considered main winds: there are deflectors, windbreaks, suitable anchor system	
7	lack of chimneys / corrosive atmospheres / pollutants	
8	structure integrity	
9	fans run freely	
10	unit on vibration isolators	
11	unit on level ground	
12	there is condensate drainage (only for heat pump units)	
13	unit input water filter + shut-off valves for cleaning	
14	hydraulic connections as per recommended diagram	
15	expansion tank (indicative volume = 10% system content)	
16	minimum system water content	
17	cleaned system	
18	loaded system + corrosion inhibitor	
19	antifreeze protections: glycol solution + possible heating cable	
20	system under pressure + vented	
21	refrigerant circuit visual check	
22	earthing connection	
23	power supply features	
24	Customer connections: electrically connected, configured	

Preliminary checks - Unit power supply ON		✓
1	compressor crankcase heaters operating at least since 8 hours	
2	off-load voltage measure	
3	phase sequence check	
4	pump manual start-up and flow check	
5	shut-off valve refrigerant circuit open	
6	unit ON	
7	load voltage measure	
8	verify the lack of bubbles in the liquid light (if applicable)	
9	check of all fan operating: no abnormal noises or vibrations	
10	measure return and supply water temperature	
11	measure super-heating and sub-cooling	
12	run tests in both heat and cool mode (only for heat pump units)	
13	check no anomalous vibrations are present	
14	climatic curve personalization	
15	scheduling customisation	
16	check that all panels are closed and fastened properly	
17	complete and available unit documentation	

10.2 Refrigeration circuit

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

10.3 Electric Circuit

1. Verify that the unit is connected to the ground plant.
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-3-60 (standard unit) / 517.5 - 632.5V-3-60 (optional)
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.**

10.4 Options

Menu accessible only after having entered the password.

Access reserved only to specifically trained personnel.

Changing the parameters can cause irreversible damage.

10.5 Reduced load operation

The units are equipped with capacity steps and so can operate with reduced loads.

However, a constant and long reduced load operation with frequent compressor(s) stops and start-ups 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.

10.6 Checking the water flow-rate.

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

- unit power (kW) x 860 = Dt (°C) x flow-rate (L/h)

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 graph on WATER SIDE EXCHANGER PRESSURE DROPS

The measurement of pressure will be easier if pressure gauges are installed as indicated in the RECOMMENDED WATER CONNECTION DIAGRAM.

10.7 Start-up report

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

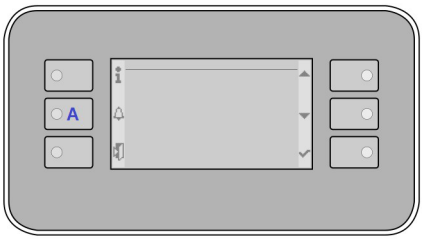
With unit at steady state, i.e. in stable and close-to-work conditions, identify the following data:

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

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

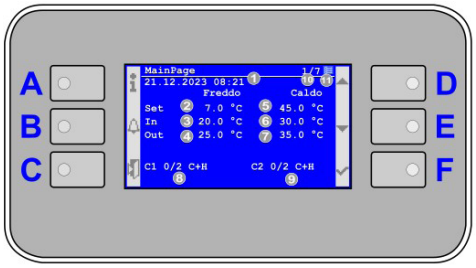
11. Control

11.1 LED



A	Flashing / Steady = alarm present

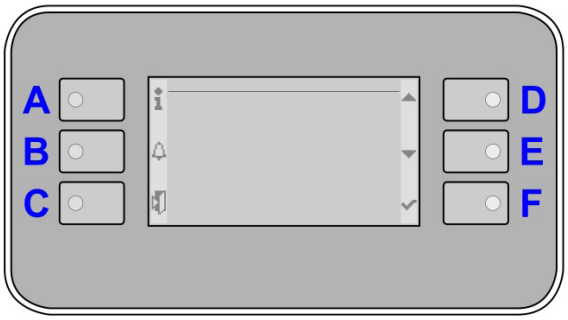
11.2 Display and buttons



Ref.	description
1	Date - Time
2	Cool setpoint
3	Cold side water inlet temperature
4	Cold side water outlet temperature
5	Heat setpoint
6	Hot side water inlet temperature
7	Hot side water outlet temperature
8	Capacity and circuit 1 diagram
9	Capacity and circuit 2 diagram
10	Line index
11	Password level entered

Ref.	Name	description
A	Info	Main menu
B	Alarm	Displays alarms
C	Cancel	Exit, Previous level, Keypad settings
D	Up	Increases value
E	Down	Decreases value
F	Enter	Confirm, Password

11.3 Menu

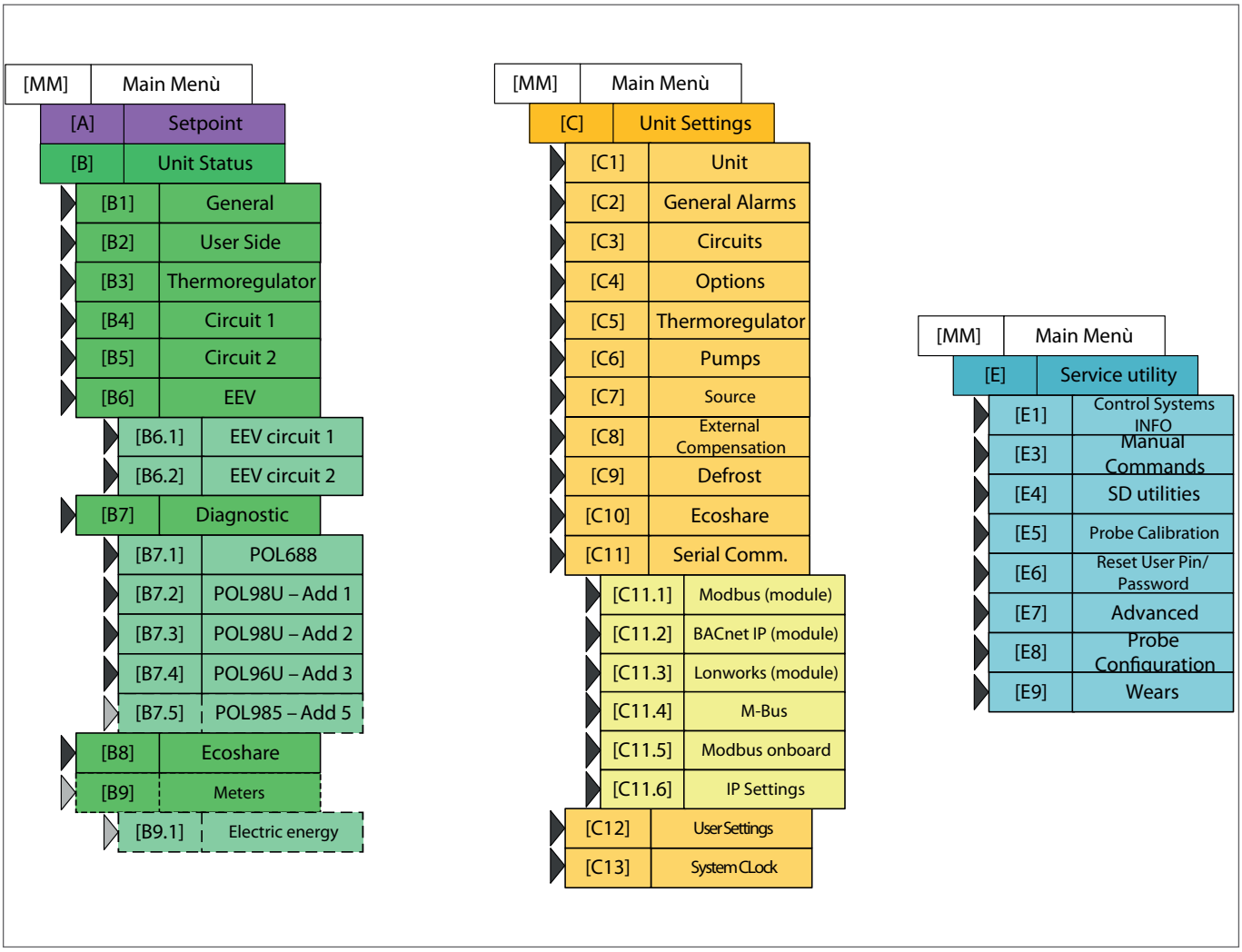


The various settings and status display menus can be accessed.

Depending on the password level entered, the entries accessible from that particular user level will be displayed.

Press button A on the home page to open the settings menu. Press buttons D and E to move from line to line and press button F to open the selected entry.

Navigation map



11.4 Change unit status

11.4.1 Definition

The unit status controls, their meanings and their possible operation priority are defined below.

The status change is the main unit function that interacts with all the system elements in relation to the selected control.

OFF	ON	ECO	PmpON
Prevents the unit from being started, but ensures the antifreeze protections are active on the user side	Allows the machine to start to produce water at the setpoint value set	Allows the machine to start to produce water at the eco setpoint value, through periodic operation on the system pumps	The pumps are activated at the value set in the P0586:MaxSignal parameter

The status can be set in C0001:Unit Control or from the BMS in C0003:BMS Unit Control.

The current status can be seen in: S0033:Unit status.

11.4.2 Status control

The unit status can be set:

- from the HMI, entering a user-level password
- from the WEB Browser, after establishing web communication, set a new status in the selection box

11.5 Change mode

11.5.1 Definition

The mode controls (Heat/Cool), their meanings and their possible operation priority are defined below.

The mode can be set in C0002:Mode Control or from the BMS in C0004:BMS Mode Control.

The current status can be seen in: S0034:Unit mode.

11.5.2 Mode control

The unit status can be set:

- from the HMI, entering a user-level password
- from the WEB Browser, after establishing web communication, set a new status in the selection box

11.6 Change setpoint

11.6.1 Definition

The setpoint defines the water temperature value to be produced by the unit, according to the operating mode selected and the type of unit.

ID	Description
C000A:SetPointCool	Setpoint setting - User side - Cool
C000D:SetPointHeat	Setpoint setting - User side - Heat

The water temperature values that can be assigned are limited by a maximum and minimum value that can be set in parameters MaxSetPoint, MinSetPoint according to the operating mode set.

	Minimum	Maximum
User side - Cool	P0001:MinSetPoint Cool	P0002:MaxSetPoint Cool
User side - Heat	P0003:MinSetPoint Heat	P0004:MaxSetPoint Heat

11.6.2 Change setpoint mode

The operating setpoint can be changed in different ways:

- from the HMI, entering a user-level password and opening the setpoint screen
- from the WEB Browser, after establishing web communication, set a new setpoint in the relevant field
- from a dry contact: if this option is enabled in parameter En2SetPoint, a 2nd setpoint can be assigned which is activated by closing the relevant dry contact [DI].

	Enabling	Second setpoint
User side - Cool	P025F: En 2SetPoint	C000B: Second setpoint cool
User side - Heat	P025F: En 2SetPoint	C000E: 2SetPointHeat

Depending on the mode, a hot side use setpoint and a cold side use setpoint will be available. The change modes apply similarly to all setpoints, each with its own limits and enabling options.

11.6.3 ECO mode operation

If the unit is controlled in ECO mode, the setpoint used is:

ID	Description
C000C:SetpointECO Cool	User side - Cool
C000F:SetpointECO Heat	User side - Heat

11.6.4 Change setpoint from climatic curve on outdoor air

The compensation of the SetPoint in relation to the external air value defines a linear variation curve of the unit SetPoint in relation to the selected operating mode, unit configuration and 4 parameter values.

The function can be enabled on the user side with parameter P0260:EnClimatica.

The climatic function is always on when enabled, it is cancelled in ECO operation.

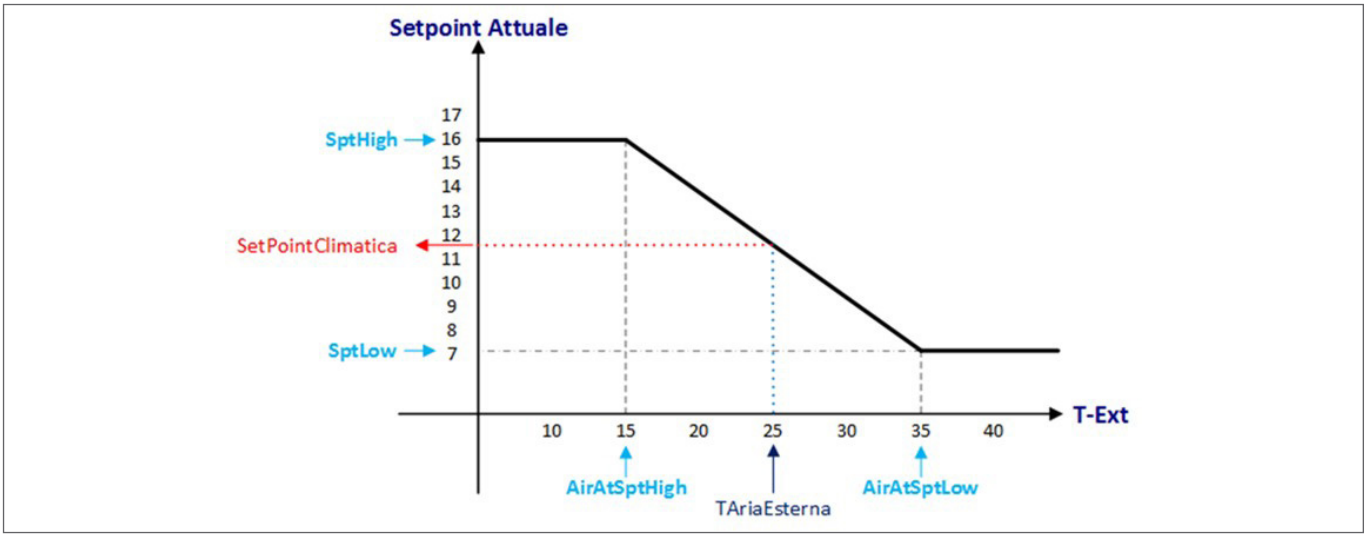
The setpoint change function given the outdoor air temperature involves calculating the current setpoint value again given two outdoor air values and two temperature setpoint values that can be set in the relevant parameters:

- SptHigh = maximum setpoint value that can be set
- SptLow = minimum setpoint value that can be set
- AirSptHigh = outdoor air temperature value at which the maximum setpoint is assigned
- AirSptLow = outdoor air temperature value at which the minimum setpoint is assigned

In the range between AirSptHigh and AirSptLow, a linear curve is defined from which the value to be assigned to the unit setpoint is calculated.

Depending on the configuration and type of unit, these values are set in parameters:

	SptLow	SptHight	AirSptLow	AirSptHigh
User side - Cool	P0323:CSptLow	P0324:CSptHigh	P0325:AirAtSptLowC	P0326:AirAtSptHigC
User side - Heat	P032B:SptLow lato caldo	P032C:SptHigh lato caldo	P032D:AirAtSptLow lato caldo	P032E:AirAtSptHigh lato caldo



11.6.5 Change setpoint from Water Reset analogue signal

The Water Reset function is used to recalculate the setpoint value according to an external analogue signal (0-10Vcc or 4-20mA).

The type of analogue signal used is defined by the relevant parameter: P0266:TypeWR.

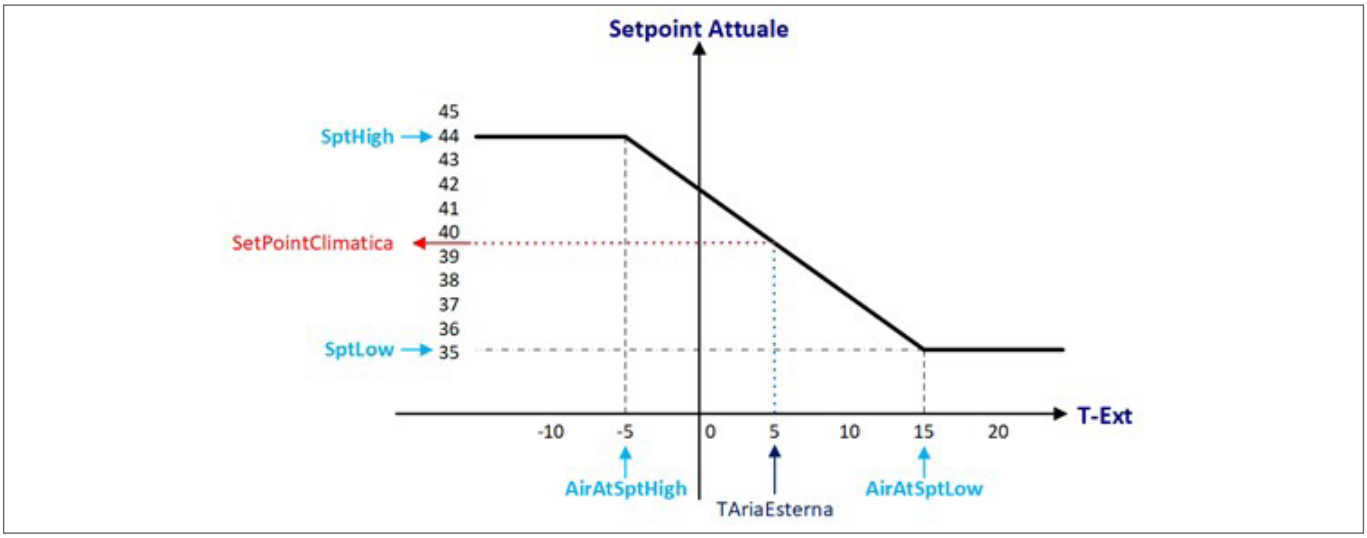
It can be enabled on the user side with parameter P025E:EnWaterReset.

The water reset function is always on when enabled, it is cancelled in ECO operation.

The reference parameters for the signal are:

	Minimum signal SWRMin	Maximum signal SWRMax	Maximum signal MaxCWRC
User side - Cool	P032F:SWRMinC	P0330:SWRMaxC	P0331:MaxCWRC
User side - Heat	P0332:SWRMinH	P0333:SWRMaxH	P0334:MaxCWRH

The setpoint value is recalculated by adding a correction deriving from a linear curve that takes an external analogue signal as a reference:



11.7 Alarms

- **Before resetting an alarm, identify and remove its cause.**
- **Repeated resets can cause irreversible damage or malfunction to the system.**

Example:

+ eE001 Phase monitor: Fault = active alarm

- EE002 Pump 1 cold side: Ok = alarm reset

11.8 General list of alarms

The alarm code consists of 2 characters followed by 4 alphanumerical digits.

The two initial characters define the type of alarm and the type of reset.

The next 4 characters form a unique index made up as follows:

1°	2°	3°	4°
Area it belongs to: 0: general 1: circuit 1 2: circuit 2 etc.	Hexadecimal number: unique alarm identifier		

Code	Meaning
a	Aeraulic
e	Electrical
f	Refrigerant circuit
i	Hydraulic

Code	Alarm type
ee, ff, ii	Automatic reset
eE, fF, iI	Automatic reset; after N activations, the alarm becomes manual reset
EE, FF, II	Manual reset

Examples:

ee025B	Outdoor Air T. probe failure
ee	Automatic reset
0	general category
25B	Alarm ID

fF1048	High source coil temp.
fF	Refrigerant alarm with automatic reset; after N interventions the alarm becomes manual reset
1	Circuit 1 alarm
048	Alarm ID

The last column of the alarms table shows whether or not the alarms are cumulative.

✓	belonging to cumulative alarms	X	not belonging to cumulative alarms

Code	Description	Cause	C
eE0001	Phase monitor	Phase monitor input open (off)	✓
EE0002	User side pump 1	Pump protection input open (off)	✓
EE0003	User side pump 2	Pump protection input open (off)	✓
EE0004	User side pump 3	Pump protection input open (off)	✓
ee0005	User side inverter	Inverter alarm input open (off)	✓
ee0006	User side inverter 2	Inverter alarm input open (off)	✓
ee0020	Crankcase heater fault	No crankcase heater operation feedback	✓
ee0100	I/O module Offline [Addr.1]	Communication error with the I/O peripheral device	✓
ee0101	I/O module Offline [Addr.2]	Communication error with the I/O peripheral device	✓
ee0102	I/O module Offline [Addr.3]	Communication error with the I/O peripheral device	✓
ee0104	I/O module Offline [Addr.5]	Communication error with the I/O peripheral device	✓
ee0211	Master Offline	No communication with the Master unit in the Ecoshare network	1
ee0202	Unit 2 alarm	Unit with address 2 with generic alarm	1
ee0212	Unit 2 Offline	No communication with the unit with address 2 in the Ecoshare network	1
ee0203	Unit 3 alarm	Unit with address 3 with generic alarm	1
ee0213	Unit 3 Offline	No communication with the unit with address 3 in the Ecoshare network	1
ee0204	Unit 4 in alarm	Unit with address 4 with generic alarm	1
ee0214	Unit 4 Offline	No communication with the unit with address 4 in the Ecoshare network	1
ee0205	Unit 5 in alarm	Unit with address 5 with generic alarm	1
ee0215	Unit 5 Offline	No communication with the unit with address 5 in the Ecoshare network	1
ee0206	Unit 6 in alarm	Unit with address 6 with generic alarm	1
ee0216	Unit 6 Offline	No communication with the unit with address 6 in the Ecoshare network	1
ee0207	Unit 7 in alarm	Unit with address 7 with generic alarm	1
ee0217	Unit 7 Offline	No communication with the unit with address 7 in the Ecoshare network	1
ee025C	User side In T.	Cold side inlet water temperature probe damaged or disconnected	✓
ee025D	User side Out T.	Cold side outlet water temperature probe damaged or disconnected.	✓
ee025B	Outdoor Air T.	Outdoor air temperature probe damaged or disconnected.	✓
ee0266	Electrical Panel T.	Pump electrical panel temperature probe damaged or disconnected	ü
ee0268	User side WaterReset	Demand Limit analogue input damaged or disconnected	✓
ee0269	User side Diff.P.	Cold side Water Reset analogue input damaged or disconnected	✓
ee0279	Cold side Diff.P.	User side differential pressure transducer damaged or disconnected	✓
ee027B	User side flow-rate signal	Measuring device flow-rate signal input disconnected or damaged	✓
ee0100	I/O module Offline [Addr.1]	Communication error with the I/O peripheral device	✓
ee0101	I/O module Offline [Addr.2]	Communication error with the I/O peripheral device	✓
ee0102	I/O module Offline [Addr.3]	Communication error with the I/O peripheral device	✓
ee0104	I/O module Offline [Addr.5]	Communication error with the I/O peripheral device	✓

Code	Description	Cause	C
ee1005	EEV 1 error	Electronic expansion valve or valve driver failure. See bitmap table for details	✓
ee1007	EEV 2 error	Electronic expansion valve or valve driver failure. See bitmap table for details	✓
EE1001	Compressor 1 protection	Compressor 1.1 protection input open (off)	✓
EE1002	Compressor 2 protection	Compressor 2.1 protection input open (off)	✓
EE1003	Compressor 3 protection	Compressor 3.1 protection input open (off)	✓
eE1006	Source fan protection	Electronic expansion valve or valve driver failure. See bitmap table for details	[3]
ee1008	EEV 3 error	Electronic expansion valve or valve driver failure. See bitmap table for details	✓
ee13ED	Comp. 1 discharge T.	Circuit discharge temperature probe damaged or disconnected	✓
ee13EE	Comp. 2 discharge T.	Circuit discharge temperature probe damaged or disconnected	✓
ee13EF	Comp. 3 discharge T.	Circuit discharge temperature probe damaged or disconnected	✓
ee13E9	Suction 1 T.	Circuit suction temperature probe damaged or disconnected	✓
ee13EA	Suction 2 T.	Circuit suction temperature probe damaged or disconnected	✓
ee13EB	Suction 3 T.	Circuit suction temperature probe damaged or disconnected	✓
ee13F1	Discharge P.	Discharge pressure transducer damaged or disconnected	✓
ee13F2	Suction P.	Suction pressure transducer damaged or disconnected	✓
ee2005	EEV 1 error	Electronic expansion valve or valve driver failure. See bitmap table for details	✓
ee2007	EEV 2 error	Electronic expansion valve or valve driver failure. See bitmap table for details	✓
EE2001	Compressor 1 protection	Compressor 1.2 protection open (off)	✓
EE2002	Compressor 2 protection	Compressor 2.2 protection open (off)	✓
EE2003	Compressor 3 protection	Compressor 3.2 protection open (off)	✓
eE2006	Source fan protection	Source ventilation protection input open (off)	[3]
ee2008	EEV 3 error	Electronic expansion valve or valve driver failure. See bitmap table for details	✓
ee23ED	Comp. 1 discharge T.	Circuit discharge temperature probe damaged or disconnected	✓
ee23EE	Comp. 2 discharge T.	Circuit discharge temperature probe damaged or disconnected	✓
ee23EF	Comp. 3 discharge T.	Circuit discharge temperature probe damaged or disconnected	✓
ee23E9	Suction 1 T.	Circuit suction temperature probe damaged or disconnected	✓
ee23EA	Suction 2 T.	Circuit suction temperature probe damaged or disconnected	✓
ee23EB	Suction 3 T.	Circuit suction temperature probe damaged or disconnected	✓
ee23F1	Discharge P.	Discharge pressure transducer damaged or disconnected	✓
ee23F2	Suction P.	Suction pressure transducer damaged or disconnected	✓
FF0001	Refrigerant leak	Refrigerant leak detector input open (off)	✓
ff0002	Low Outdoor Temp.	Outdoor air temperature lower than the value set in the parameter	x

Code	Description	Cause	C
ff1005	Minimum SH EEV1	Overheating value calculated by the EEV driver lower than the value set in the parameter	x
ff1006	Minimum SH EEV2	Overheating value calculated by the EEV driver lower than the value set in the parameter	x
ff1007	Minimum SH EEV3	Overheating value calculated by the EEV driver lower than the value set in the parameter	x
fF1013	[DI] High pressure	High pressure switch input open (off)	✓
fF1015	[AI] High pressure	High pressure value higher than the value set in the parameter	✓
fF1017	Minimum compression ratio	Calculated compression ratio lower than the value set by the parameter	✓
fF1009	[AI] Low pressure	Intake pressure transducer value lower than the activation threshold set by the parameter	✓
FF1019	Maximum compression ratio	Number of times the compression ratio exceeds the maximum value (defined by the parameter) is greater or equal to the value set by the parameter	✓
FF1034	Empty circuit	Low pressure value lower than the value set in the parameter	✓
FF1046	Low pressure limit	Low pressure value lower than the value given by the parameter	✓
fF1045	Low discharge temperature alarm	Low discharge temperature	✓*
fF1047	Out of envelope	Out of compressor's safe operating area	✓
FF1030	Low Defrost temp	With circuit in diagram 9, minimum value between the user side exchanger inlet and outlet temperature lower than the value set by the parameter	x
ff1031	Low hot side Defrost temp	Defrost. Hot side water temperature between two values defined by the parameter	x
ff2005	Minimum SH EEV1	Overheating value calculated by the EEV driver lower than the value set in the parameter	✓
ff2006	Minimum SH EEV2	Overheating value calculated by the EEV driver lower than the value set in the parameter	✓
ff2007	Minimum SH EEV3	Overheating value calculated by the EEV driver lower than the value set in the parameter	✓
FF2013	[DI] High pressure	High pressure switch input open (off)	✓
FF2015	[AI] High pressure	High pressure value higher than the value set in the parameter	✓
fF2017	Minimum compression ratio	Calculated compression ratio lower than the value set by the parameter	✓
fF2009	[AI] Low pressure	Intake pressure transducer value lower than the activation threshold set by the parameter	✓
FF2019	Maximum compression ratio	Number of times the compression ratio exceeds the maximum value (defined by the parameter) is greater or equal to the value set by the parameter	✓
fF2020	Low circuit oil level	Circuit oil level input open (off)	✓
FF2034	Empty circuit	Low pressure value lower than the value given by the parameter	✓
FF2046	Low Pressure limit	Low pressure value lower than the value given by the parameter	✓
fF2047	Out of envelope	Out of compressor's safe operating area	✓

Code	Description	Cause	C
fF2045	Low discharge temperature alarm	Low discharge temperature	✓*
iI0001	Cold side Water Press.	Hydraulic system pressure switch input open (off)	✓
iI0002	Cold side flow	User side flow switch input open (off)	✓
II0003	Cold side Inlet frost	Minimum value between the exchanger inlet and outlet temperature lower than the value set in the parameter	✓
ii0004	Max. cold side pump temp.	Maximum value between the exchanger inlet and outlet temperature higher than the value given by the parameter	✓
II0005	WrongTempDelta	Value higher than 1 between the difference of the IN/OUT temperatures when the Mode is changed	✓
fF1020	Low circuit oil level	Circuit oil level input open (off)	✓
fF1021	Low compressor 1 oil level	Compressor 1 oil level input open (off)	✓
fF1022	Low compressor 2 oil level	Compressor 2 oil level input open (off)	✓
fF1023	Low compressor 3 oil level	Compressor 3 oil level input open (off)	✓
fF1048	High source coil temp.	High source temperature thermostat input open (off)	✓
FF2030	Low Defrost temp	With circuit in diagram 9, minimum value between the user side exchanger inlet and outlet temperature lower than the value set by the parameter	x
ff2031	Low hot side Defrost temp	Defrost. Hot side water temperature between two values defined by the parameter	x
fF2021	Low compressor 1 oil level	Compressor 1 oil level input open (off)	✓
fF2022	Low compressor 2 oil level	Compressor 2 oil level input open (off)	✓
fF2023	Low compressor 3 oil level	Compressor 3 oil level input open (off)	✓
fF2048	High source coil temp.	High source temperature thermostat input open (off)	✓

1 Configurable on request

	Decimal value	Meaning
[LSB] Bit 0	1	Generic driver error
Bit 1	2	EEV driver hardware error
Bit 2	4	UPS present but not available
Bit 3	8	Motor disconnected or incorrect connection
Bit 4	16	EEV driver overheating
Bit 5	32	Failsafe position not reached
Bit 6	64	Software configuration error
Bit 7	128	UPS does not charge
Bit 8	256	BSP version of expansion module not in accordance
Bit 9	512	Specific hardware errors for POL94x module
Bit 10	1024	Suction pressure less than 1 bar

12. Maintenance

12.1 Safety

Operate in compliance with safety regulations in force.

To carry out the operations use protection devices:

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

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

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

12.2 General

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

The maintenance allows to:

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

Warning

- **before checking, please verify the following:**
- **the electrical power supply line should be isolated at the beginning**
- **the unit isolator is open, locked and equipped with the suitable warning**
- **make sure no voltage is present**
- **After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.**
- **Before accessing check with a multimeter that there are no residual voltages.**

12.3 Inspections frequency

Perform an inspection every 6 months minimum.

The frequency, however, depends on the use.

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

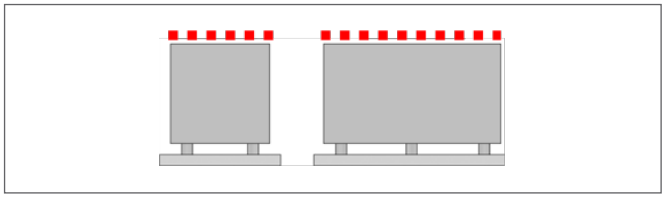
- frequent use (continuous or very intermittent use, near the operating limits, etc)
- critical use (service necessary)

Warning

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

ATTENTION

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



12.4 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.

12.5 Standby mode

If a long period of inactivity is foreseen:

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

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

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

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

12.6 **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	check of the earthing cable			X
11	electric panel cleaning			X
12	power contactors status			X
13	termina closing, cable insulation integrity			X
14	voltage and phase unbalancing (no load and on-load)			X
15	absorptions of the single electrical loads		X	
16	test of the compressor crankcase heaters		X	
17	Checking for leaks		X	
18	survey of the refrigerant circuit operating parameters			*
19	safety valve		X	
20	protective device test: pressure switches, thermostats, flow switches etc..			*
21	control system test: setpoint, climatic compensations, capacity stepping, water / air flow-rate variations		X	
22	control device test: alarm signalling, thermometers, probes, pressure gauges etc..		X	
23	control device test: alarm signalling, thermometers, probes, pressure gauges etc		X	
24	electrical heaters check - option			X
25	water coil check - option			X

* Refer to the local regulations. Companies and technicians that carry out installation, maintenance/fixing, leak control and recovery interventions must be CERTIFIED as required by local regulations

12.7 System drain

The system must be drained only if necessary.

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

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

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

Before start-up, wash the system.

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

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

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

12.8 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 8°C–10°C, it is advisable to clean the exchanger.

It must be cleaned:

- with circulation opposite to the usual one
- at least 1.5 times faster than the nominal one
- with an appropriate moderately acid product (95% water + 5% phosphoric acid)
- after washing, rinse with water to remove detergent residues

12.9 Water filter

Check that no impurities prevent the correct passage of water.

12.10 Flow Switch

- check operation
- remove scale from the blade

12.11 Circulation pumps

Check:

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

12.12 Air side exchanger

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

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

Clean at least every three months.

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

Clean the air inlet side.

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

Keep the direction parallel to the fins to avoid damage.

Check that the aluminium fins are not bent or damaged, if they are, contact an authorised service centre which will "comb" the coil to restore optimal air flow.

12.13 Insulations

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

12.14 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.

12.15 Structure

Check the state of the parts constituting the structure.

Treat those parts of the unit subject to oxidation, with paints act at eliminating or reducing the oxidation phenomena.

Check fastening of the unit external panelling.

Bad fastening give rise to anomalous noises and vibrations.

12.16 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

12.17 Compressor crankcase heater

Check:

- closing
- Operation

12.18 Refrigerant leak detector

Option

Refer to the component manufacturer's manual for specific information.

12.18.1 Maintenance

The inspection must be carried out by qualified servicing personnel.

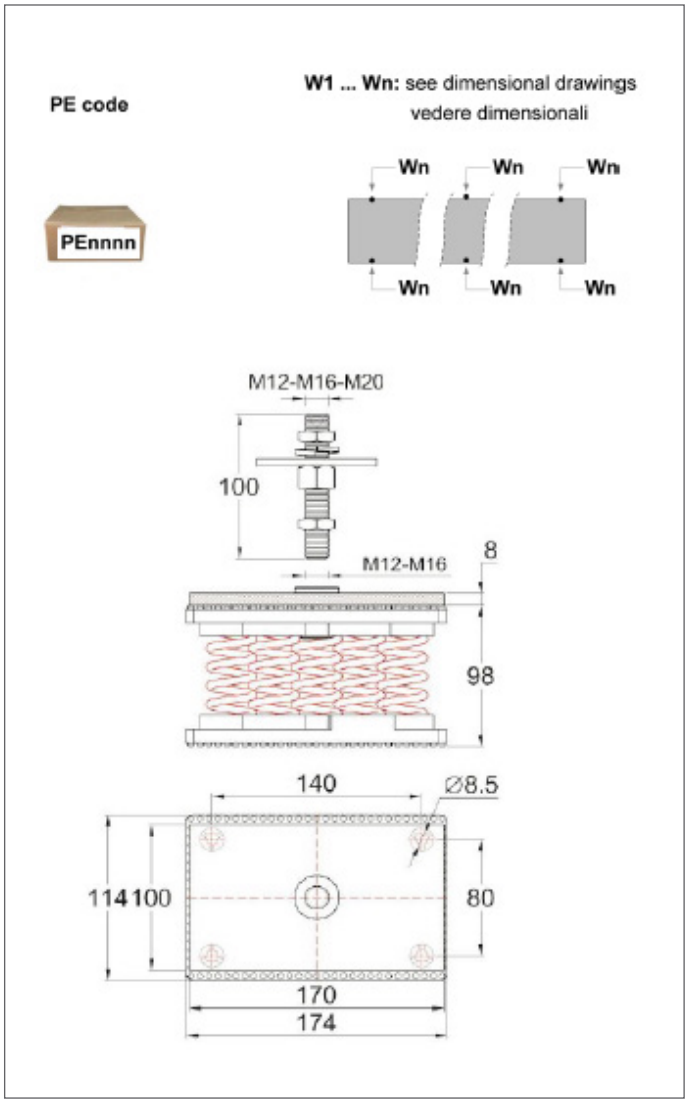
- Check correct operation of the LEDs.
- Check correct operation of the buzzer and relay.
- Check signal transmission to the BMS / central controller, if connected.
- Calibrate the sensor or contact the manufacturer to exchange the sensor with a factory-calibrated one.

Sensors have an average life of 2 to 5 years, depending on the type, after which they must be replaced.

▶ **Sensors must be checked after exposure to significant gas concentrations, which can reduce the duration of the sensor and/or reduce its sensitivity.**

13. Anti-vibration mounts

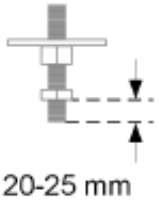
13.1 Anti-vibration mount support



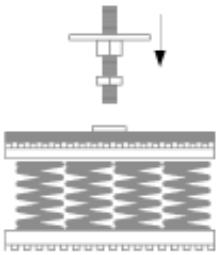
	W1	W2	W3	W4	W5	W6
PEN600002	RZ712P	RZ708Pr	RZ712P	RZ708Pr		
PEN600004	RX704P	RX703Pr	RX704P	RX703Pr		
PEN600006	RX704P	RZ708Pr	RZ705Pr	RX704P	RZ708Pr	RZ705Pr

1

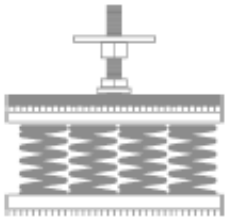
2



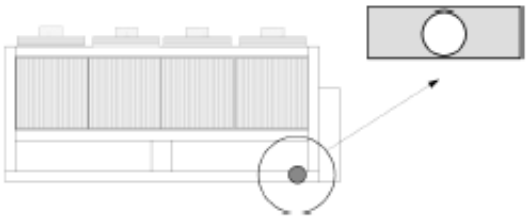
3



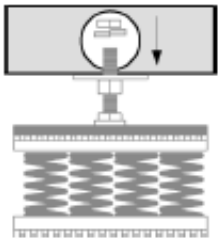
4



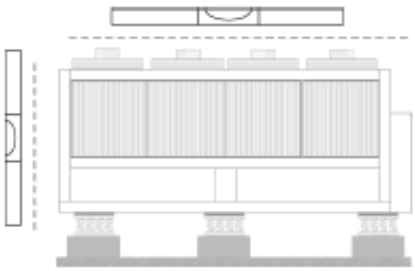
5

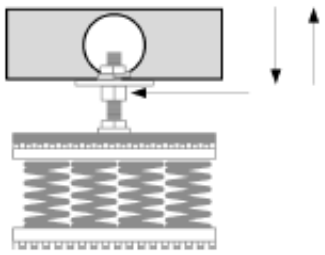


6

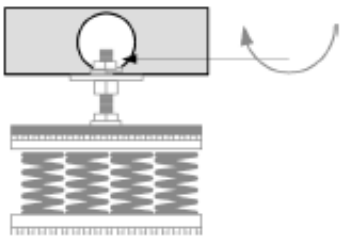


7





8



14. Decommissioning

14.1 Disconnection

Warning

▶ **Before performing any work, please read carefully: In|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.

14.2 General information about the waste electrical and electronic equipment.

Equipment bearing the crossed-out wheelie bin mark must be disposed of separately at the end of its life cycle to prevent damage to human health and to the environment.

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

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

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

This equipment may contain: refrigerant gas, the entire contents of which must be recovered in suitable containers by specialised personnel with the necessary qualifications;

- lubrication oil contained in compressors and in the cooling circuit to be collected
- mixtures with antifreeze in the water circuit, the contents of which are to be collected
- mechanical and electrical parts to be separated and disposed of as authorised.

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

15. Residual risks

15.1 General

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

Danger zone

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

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

15.2 Handling

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

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

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

15.3 Installation

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

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

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

Carefully check the positioning of the unit.

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

Carefully check the positioning and the anchoring of the unit.

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

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

15.4 General risks

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

Electrically isolate the unit (yellow-red isolator).

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

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

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

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

Always contact the qualified assistance centre.

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

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

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

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

15.5 Electric parts

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

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

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

Always fix the unit cover properly.

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

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

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

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

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

When voltage is necessary for the circuit open the isolator on the attachment line of the unit itself, padlock it and display the appropriate warning sign.

15.6 Moving parts

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

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

Contact with the fans can cause injury.

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

15.7 Refrigerant

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

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

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

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

Do not place any heat source inside the danger zone.

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

15.8 Hydraulic parts

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

16. Technical information

Performance

Acoustic configuration Compressor soundproofing (SC)

SIZE			90.4	100.4	110.4	120.4	130.4	145.4	160.4	175.4
Cooling										
Cooling capacity	1	ton	67.7	73.4	79.1	84.1	92.1	103	115	126
Total power input	1	kW	77.3	87.1	95.8	104	114	125	139	157
EER	1	Btu/Wh	10.5	10.1	9.91	9.69	9.72	9.89	9.92	9.64
IPLV	1	Btu/Wh	17.4	17.2	16.9	16.6	16.7	17.1	17.0	16.6
Water flow-rate (User Side)	1	gpm	161	175	188	200	219	246	273	299
Internal exchanger pressure drops	1	ft H2O	5.12	5.29	6.08	4.78	4.46	5.55	6.76	5.65
Heating										
Heating capacity	2	MBH	825	892	960	1,063	1,166	1,329	1,467	1,604
Total power input	2	kW	69.9	75.5	82.6	89.3	96.4	110	123	138
COP	2	kW/kW	3.46	3.46	3.40	3.49	3.54	3.53	3.50	3.40
Water flow (user side)	2	gpm	166	180	193	214	235	268	296	323
Internal exchanger pressure drops	2	ft H2O	5.42	5.58	6.38	5.44	5.09	6.53	7.89	6.54
Heating										
Heating capacity	3	MBH	545	592	640	712	782	888	985	1,080
Total power input	3	kW	70.5	75.2	81.8	88.0	94.8	110	121	136
COP	3	kW/kW	2.27	2.31	2.29	2.37	2.42	2.37	2.38	2.33
Water flow (user side)	3	gpm	110	119	129	143	158	179	199	218
Internal exchanger pressure drops	3	ft H2O	2.56	2.64	3.04	2.54	2.38	3.03	3.69	3.09
Heating										
Heating capacity	4	MBH	813	881	949	1,052	1,154	1,314	1,451	1,588
Total power input	4	kW	81.3	88.0	96.3	104	112	128	142	160
COP	4	kW/kW	2.93	2.94	2.89	2.97	3.03	3.01	2.99	2.91
Water flow (user side)	4	gpm	164	178	192	213	233	266	294	321
Internal exchanger pressure drops	4	ft H2O	5.30	5.48	6.28	5.37	5.02	6.43	7.78	6.46

1. Data compliant to Standard AHRI 550/590 referred to the following conditions: Cold side exchanger water temperature = 54/44 °F. Entering external exchanger air temperature = 95 °F
2. Data compliant to Standard AHRI 550/590 referred to the following conditions: Hot side exchanger water temperature = 95/105 °F. Entering external exchanger air temperature = 47 °F d.b./43 °F w.b.
3. Data compliant to Standard AHRI 550/590 referred to the following conditions: Hot side exchanger water temperature = 95/105 °F. Entering external exchanger air temperature = 17 °F d.b./15 °F w.b.
4. Data compliant to Standard AHRI 550/590 referred to the following conditions: Hot side exchanger water temperature = 110/120 °F. Entering external exchanger air temperature = 47 °F d.b./43 °F w.b.

Performance

Super-silenced acoustic configuration (EN)

SIZE			90.4	100.4	110.4	120.4	130.4	145.4	160.4	175.4
Cooling										
Cooling capacity	1	ton	66.3	71.9	77.5	82.4	90.3	101	112	123
Total power input	1	kW	77.3	87.1	95.8	104.0	114	125	139	157
EER	1	Btu/Wh	10.3	9.91	9.71	9.50	9.53	9.69	9.72	9.45
IPLV	1	Btu/Wh	17.3	17.1	16.8	16.4	16.6	16.9	16.8	16.4
Water flow-rate (User Side)	1	gpm	158	171	185	196	215	241	267	293
Internal exchanger pressure drops	1	ft H2O	4.93	5.10	5.85	4.60	4.29	5.34	6.50	5.44
Heating										
Heating capacity	2	MBH	825	892	960	1063	1166	1329	1467	1604
Total power input	2	kW	69.9	75.5	82.6	89.3	96.4	110	123	138
COP	2	kW/kW	3.46	3.46	3.40	3.49	3.54	3.53	3.50	3.40
Water flow (user side)	2	gpm	166	180	193	214	235	268	296	323
Internal exchanger pressure drops	2	ft H2O	5.42	5.58	6.38	5.44	5.09	6.53	7.89	6.54
Heating										
Heating capacity	3	MBH	545	592	640	712	782	888	985	1080
Total power input	3	kW	70.5	75.2	81.8	88.0	94.8	110	121	136
COP	3	kW/kW	2.27	2.31	2.29	2.37	2.42	2.37	2.38	2.33
Water flow (user side)	3	gpm	110	119	129	143	158	179	199	218
Internal exchanger pressure drops	3	ft H2O	2.56	2.64	3.04	2.54	2.38	3.03	3.69	3.09
Heating										
Heating capacity	4	MBH	813	881	949	1052	1154	1314	1451	1588
Total power input	4	kW	81.3	88.0	96.3	104	112	128	142	160
COP	4	kW/kW	2.93	2.94	2.89	2.97	3.03	3.01	2.99	2.91
Water flow (user side)	4	gpm	164	178	192	213	233	266	294	321
Internal exchanger pressure drops	4	ft H2O	5.30	5.48	6.28	5.37	5.02	6.43	7.78	6.46

1. Data compliant to Standard AHRI 550/590 referred to the following conditions: Cold side exchanger water temperature = 54/44 °F. Entering external exchanger air temperature = 95 °F
2. Data compliant to Standard AHRI 550/590 referred to the following conditions: Hot side exchanger water temperature = 95/105 °F. Entering external exchanger air temperature = 47 °F d.b./43 °F w.b.
3. Data compliant to Standard AHRI 550/590 referred to the following conditions: Hot side exchanger water temperature = 95/105 °F. Entering external exchanger air temperature = 17 °F d.b./15 °F w.b.
4. Data compliant to Standard AHRI 550/590 referred to the following conditions: Hot side exchanger water temperature = 110/120 °F. Entering external exchanger air temperature = 47 °F d.b./43 °F w.b.

Construction

SIZE			90.4	100.4	110.4	120.4	130.4	145.4	160.4	175.4
Compressor										
Type of compressors	1		Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll	Scroll
Refrigerant			R32	R32	R32	R32	R32	R32	R32	R32
No. of compressors		Nr	4	4	4	4	4	4	4	4
Rated power (C1)		HP	38	38	44	44	56	56	68	68
Rated power (C2)		HP	38	44	44	56	56	68	68	80
Std Capacity control steps		Nr	6	5	4	4	4	5	6	5
Oil charge (C1)		gal	2.48	2.48	3.22	3.22	3.22	3.22	3.22	3.22
Oil charge(C2)		gal	2.48	3.22	3.22	3.22	3.22	3.22	3.22	3.22
Refrigerant charge (C1)		lbs	68	69	69	70	96	93	119	122
Refrigerant charge (C2)		lbs	68	69	69	94	96	119	119	127
Refrigeration circuits		Nr	2	2	2	2	2	2	2	2
Internal exchanger										
Type of internal exchanger	2		PHE	PHE	PHE	PHE	PHE	PHE	PHE	PHE
N. of internal exchanger		Nr	1	1	1	1	1	1	1	1
Water content		gal	7.42	8.56	8.56	11.2	12.2	12.2	12.2	15.8
Minimum system water content		gal	555	555	581	687	687	977	1,004	1,030
External exchanger										
Type of external exchanger	3		CCHY	CCHY	CCHY	CCHY	CCHY	CCHY	CCHY	CCHY
Number of coils		Nr	4	4	4	4	4	4	4	4
External Section Fans										
Type of fans	4		AX	AX	AX	AX	AX	AX	AX	AX
Number of fans		Nr	6	6	6	6	6	8	8	8
Type of motor	5		EC	EC	EC	EC	EC	EC	EC	EC
Standard airflow in cooling (SC)		CFM	73,661	73,661	73,661	73,661	73,661	98,214	98,214	106,355
Standard airflow in cooling (EN)		CFM	56,778	56,778	56,778	56,778	56,778	75,703	75,703	83,950
Connections										
Water fittings			4"	4"	4"	4"	4"	5"	5"	5"
Power supply										
Standard power supply			460/3~/60	460/3~/60	460/3~/60	460/3~/60	460/3~/60	460/3~/60	460/3~/60	460/3~/60
Electrical data (460V)										
MCA	6	A	173	186	200	217	237	269	300	324
MOP	7	A	200	200	225	225	250	300	350	350
SCCR	8	kA	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
Electrical data (575V)										
MCA	6	A	142	153	164	178	194	221	246	265
MOP	7	A	150	175	175	200	200	225	250	300
SCCR	8	kA	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0

1. SCROLL = SCROLL compressor
2. PHE = Plate exchanger
3. CCHY = Copper / aluminium condenser coil with hydrophilic treatment
4. AX = Ventilatore assiale
5. EC = Asynchronous motor with permanent magnet commuted electronically.
6. MCA = Min. Circuit Amps. (For wire diameter selection)
7. MOP = Maximum overcurrent protector
8. SCCR = Short Circuit Current rating

Sound levels cooling

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)
90.4	94	92	90	86	87	81	75	71	**70**	**90**
100.4	94	92	90	86	87	82	76	71	**71**	**91**
110.4	94	92	90	86	88	82	76	72	**71**	**91**
120.4	94	92	90	86	87	83	77	73	**71**	**91**
130.4	94	92	90	86	87	84	78	73	**71**	**91**
145.4	95	93	91	88	88	86	78	74	**72**	**92**
160.4	96	93	91	89	88	87	78	75	**73**	**93**
175.4	96	93	91	89	88	88	78	75	**73**	**93**

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

Sound levels heating

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)
90.4	94	92	90	86	87	81	75	71	**70**	**90**
100.4	94	92	90	86	87	82	76	71	**71**	**91**
110.4	94	92	90	86	88	82	76	72	**71**	**91**
120.4	94	92	90	86	87	83	77	73	**71**	**91**
130.4	94	92	90	86	87	84	78	73	**71**	**91**
145.4	95	93	91	88	88	86	78	74	**72**	**92**
160.4	96	93	91	89	88	87	78	75	**73**	**93**
175.4	96	93	91	89	88	88	78	75	**73**	**93**

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

Sound levels cooling

Super-silenced acoustic configuration (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)
90.4	91	88	86	82	83	78	72	67	**67**	**87**
100.4	91	88	86	82	84	78	72	68	**67**	**87**
110.4	91	88	86	82	84	78	72	68	**67**	**87**
120.4	91	88	86	82	84	79	73	69	**67**	**87**
130.4	91	88	86	82	83	81	74	70	**68**	**88**
145.4	92	89	87	84	84	82	74	70	**68**	**89**
160.4	92	89	87	85	84	83	75	71	**69**	**89**
175.4	92	89	87	85	84	84	75	71	**69**	**90**

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

Sound levels heating

Super-silenced acoustic configuration (EN)

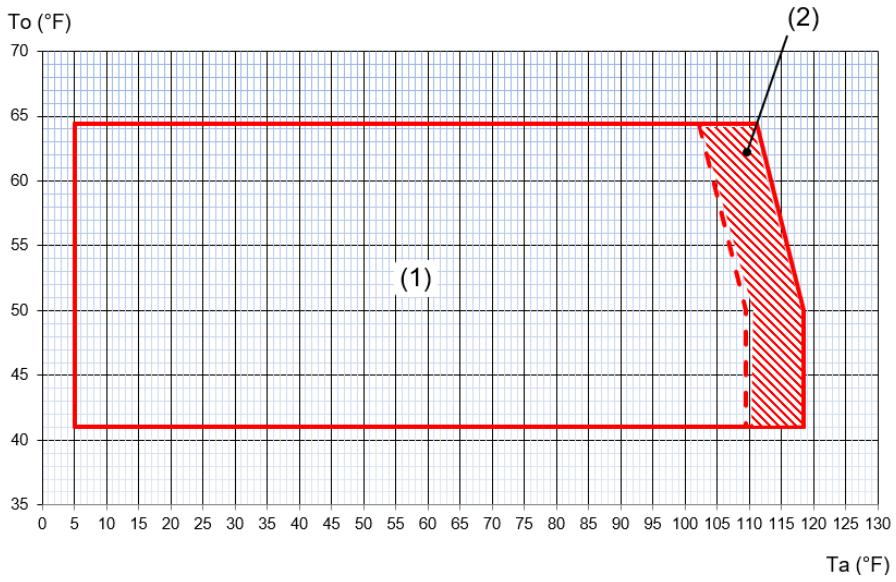
SIZE	Sound power level (dB) - Octave band (Hz)								Sound pressure level	Sound power level
	63	125	250	500	1000	2000	4000	8000	dB(A)	dB(A)
90.4	94	92	90	86	87	81	75	71	**70**	**90**
100.4	94	92	90	86	87	82	76	71	**71**	**91**
110.4	94	92	90	86	88	82	76	72	**71**	**91**
120.4	94	92	90	86	87	83	77	73	**71**	**91**
130.4	94	92	90	86	87	84	78	73	**71**	**91**
145.4	95	93	91	88	88	86	78	74	**72**	**92**
160.4	96	93	91	89	88	87	78	75	**73**	**93**
175.4	96	93	91	89	88	88	78	75	**73**	**93**

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 regolations.

Data referred to the following conditions:
- internal exchanger water temperature = 104 / 113 °F
- ambient temperature = 44.6 °F d.b. / 42.8 °F w.b.

Operating range

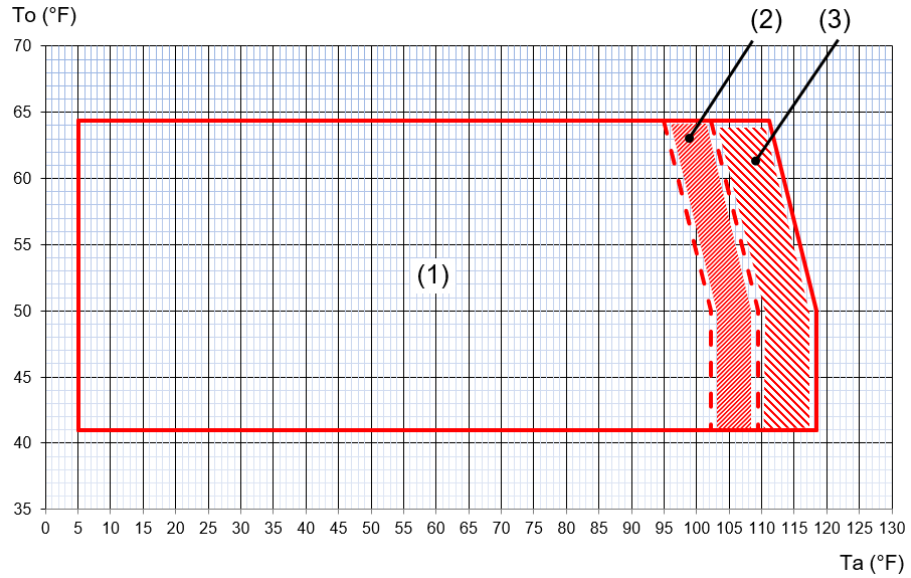
Cooling SC



Ta (°C) = External exchanger inlet air temperature (D.B.)
To (°C) = Internal exchanger outlet water temperature

1. Standard unit operating range at full load [SC]
2. Unit operating range with automatic staging of the compressor capacity

Cooling EN

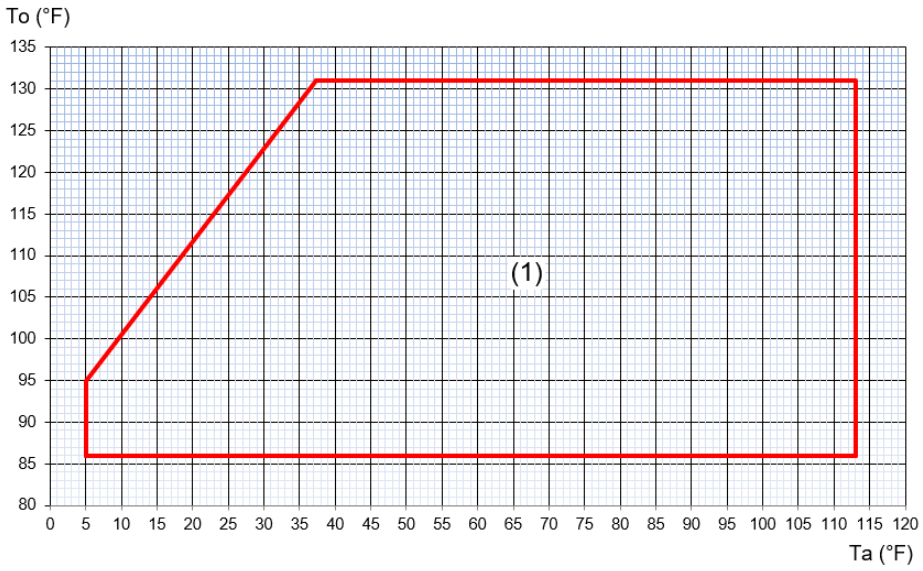


Ta (°C) = External exchanger inlet air temperature (D.B.)
To (°C) = Internal exchanger outlet water temperature

1. Standard unit operating range at full load [EN]
2. Extended operating range with air flow-rate automatic increasing. Inside this field the sound levels are the same of the 'compressor soundproofing (SC)' acoustic configuration
3. Unit operating range with automatic staging of the compressor capacity

Operating range

Heating



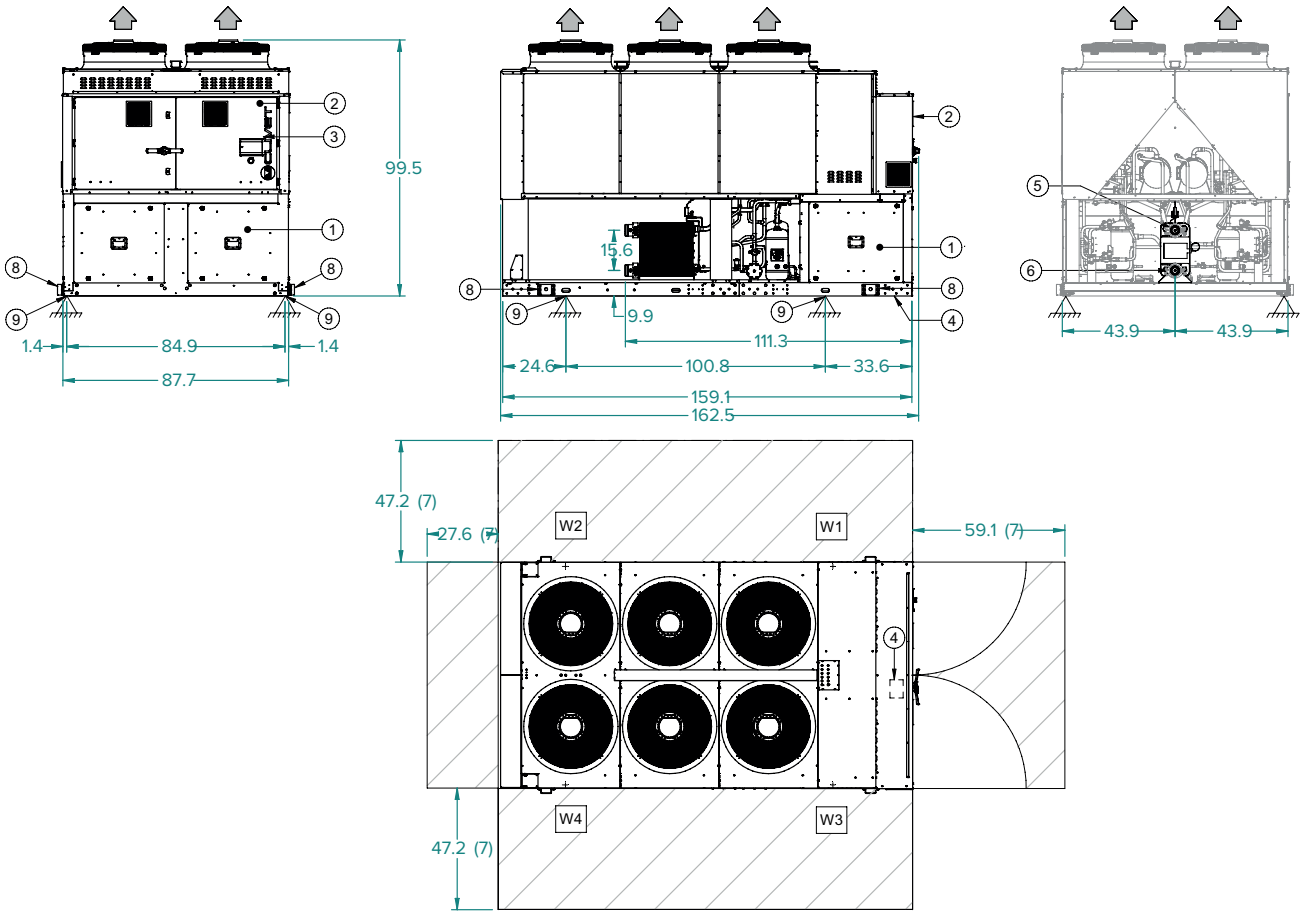
Ta (°C) = External exchanger inlet air temperature (D.B.)
To (°C) = Internal exchanger outlet water temperature

1. Standard unit operating range at full load

Dimensional drawings

SIZE 90.4 ÷ 110.4

DAAN60002_00
DATA/DATE 14/10/2024



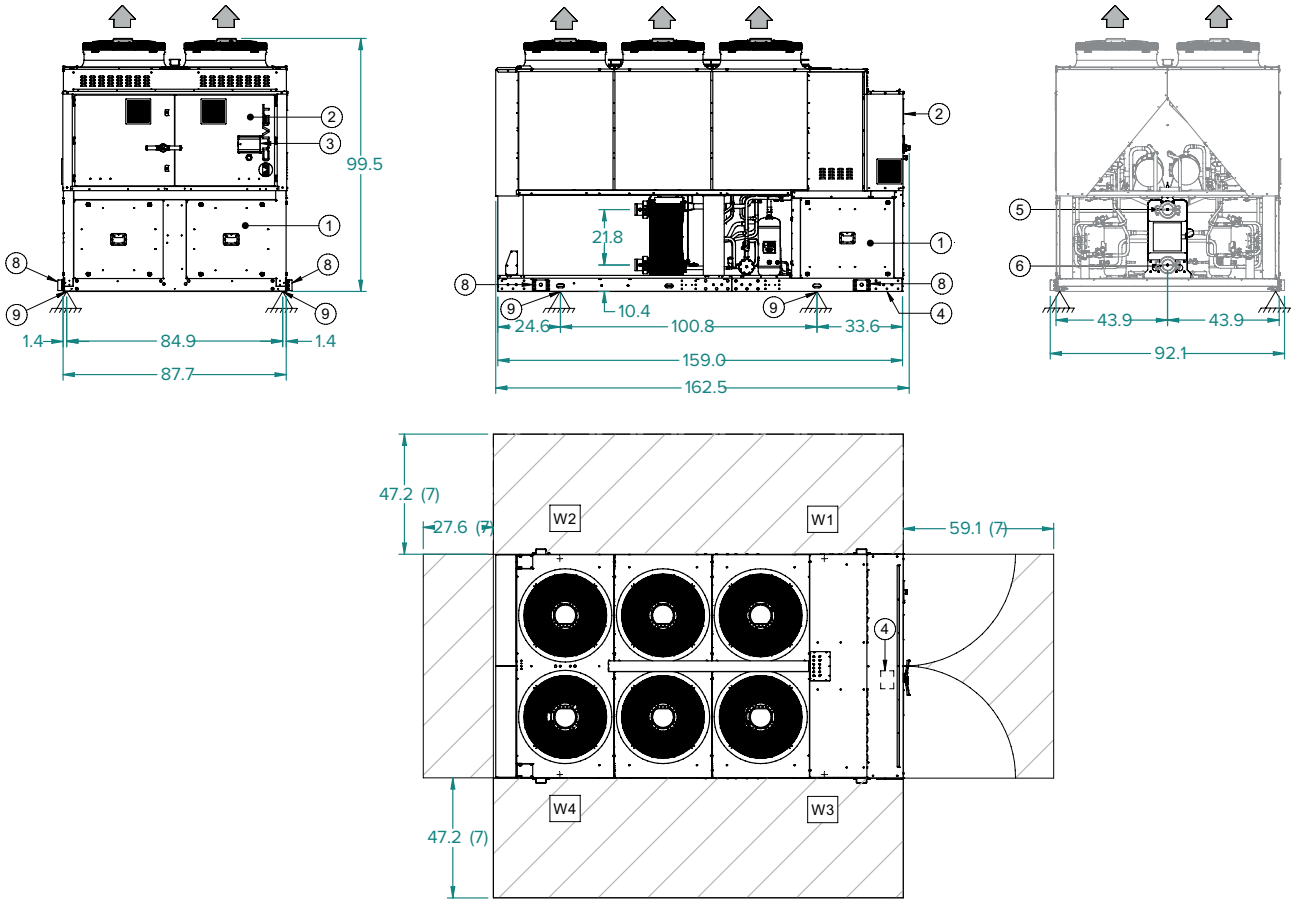
1. Compressor enclosure
2. Electrical panel
3. Control keypad
4. Power input
5. Water inlet 4" Victaulic
6. Water outlet 4" Victaulic
7. Functional spaces
8. Lifting bracket (removed)
9. Support points
10. Pump option
11. Water pump inlet 4" Victaulic
12. Water pump outlet 4" Victaulic

SIZE		90.4	100.4	110.4
Length	inch	162.5	162.5	162.5
Depth	inch	99.5	99.5	99.5
Height	inch	87.7	87.7	87.7
W1 Supporting point	lb	1818	1846	1876
W2 Supporting point	lb	1285	1299	1314
W3 Supporting point	lb	1818	1852	1876
W4 Supporting point	lb	1285	1306	1314
Operating weight	lb	6206	6303	6380
Shipping weight	lb	6144	6230	6307

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

SIZE 120.4 ÷ 130.4

DAAN60003_00
DATA/DATE 14/10/2024



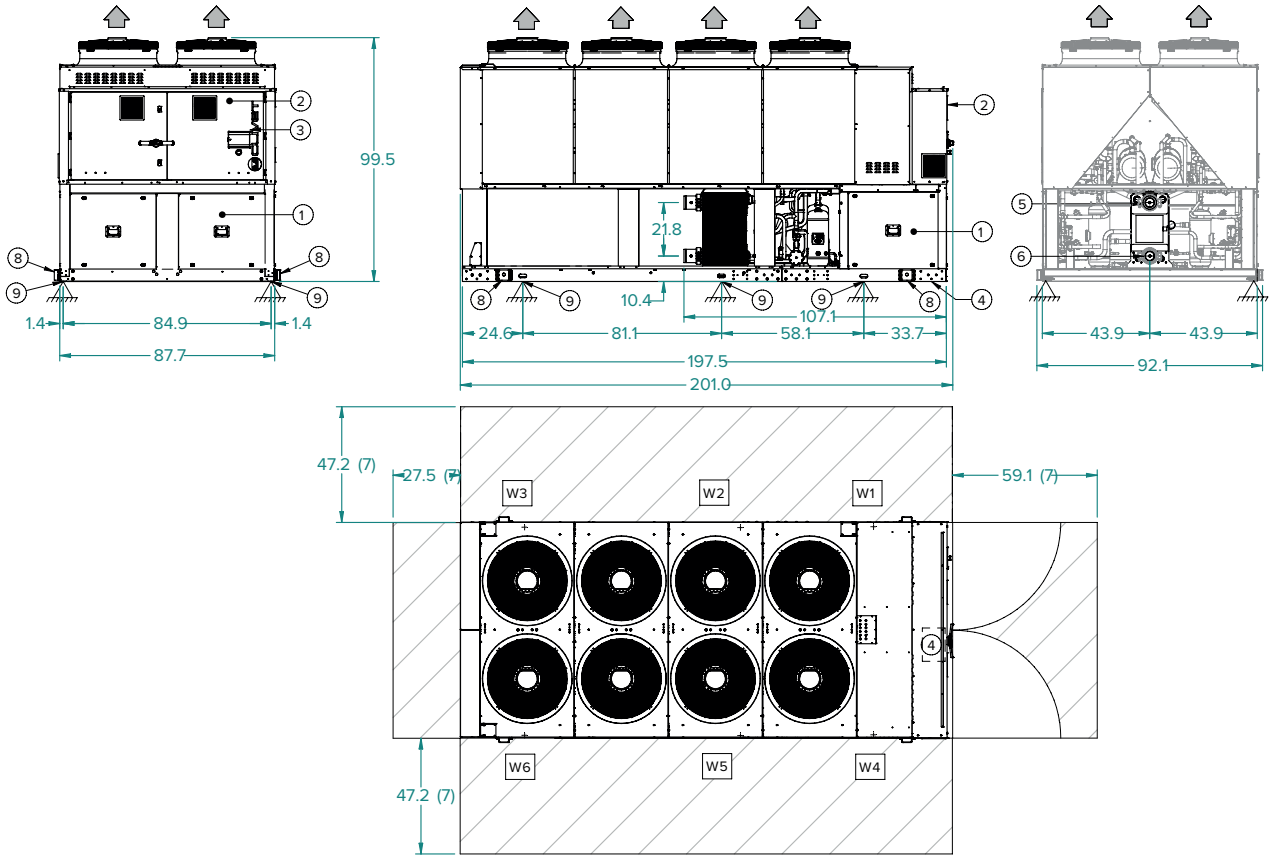
1. Compressor enclosure
2. Electrical panel
3. Control keypad
4. Power input
5. Water inlet 4" Victaulic
6. Water outlet 4" Victaulic
7. Functional spaces
8. Lifting bracket (removed)
9. Support points
10. Pump option
11. Water pump inlet 4" Victaulic
12. Water pump outlet 4" Victaulic

SIZE		120.4	130.4
Length	inch	162.5	162.5
Depth	inch	99.5	99.5
Height	inch	87.7	87.7
W1 Supporting point	lb	1956	2019
W2 Supporting point	lb	1392	1449
W3 Supporting point	lb	1958	2019
W4 Supporting point	lb	1394	1449
Operating weight	lb	6700	6936
Shipping weight	lb	6605	6828

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

SIZE 145.4 ÷ 175.4

DAAN60001_00
DATA/DATE 14/10/2024



1. Compressor enclosure
2. Electrical panel
3. Control keypad
4. Power input
5. Water inlet 5" Victaulic
6. Water outlet 5" Victaulic
7. Functional spaces
8. Lifting bracket (removed)
9. Support points
10. Pump option
11. Water pump inlet 5" Victaulic
12. Water pump outlet 5" Victaulic

SIZE		145.4	160.4	175.4
Length	inch	201.0	201.0	201.0
Depth	inch	99.5	99.5	99.5
Height	inch	87.7	87.7	87.7
W1 Supporting point	lb	2156	2210	2370
W2 Supporting point	lb	1043	1077	1097
W3 Supporting point	lb	753	778	784
W4 Supporting point	lb	2036	2211	2248
W5 Supporting point	lb	1067	1077	1124
W6 Supporting point	lb	750	778	781
Operating weight	lb	7805	8131	8405
Shipping weight	lb	7697	8023	8270

The presence of optional accessories may result in a substantial variation of the weights shown in the table.

Intentionally blank page

Intentionally blank page

Intentionally blank page

FOR OVER 35 YEARS WE HAVE BEEN
OFFERING SOLUTIONS FOR SUSTAINABLE
COMFORT AND THE WELL-BEING OF
PEOPLE AND THE ENVIRONMENT

Info & Contacts: www.clivet.com

CLIVET