

USER MANUAL

CDH

HYDROTHERMAL AND
WATER/WATER GEOTHERMAL UNITS
WITH CO₂ REFRIGERANT



EN
TRANSLATION OF THE ORIGINAL INSTRUCTIONS

HF61GJ0475 / 02_20

INTRODUCTION

CDH

 **WARNING**

CAREFULLY READ THIS MANUAL BEFORE USING THE UNIT.

 **DECLARATION OF CONFORMITY**

The declaration of conformity is attached separately to the documents on board the unit, usually placed inside the electrical compartment.

Dear Customer,

whilst thanking you for having chosen a product of ours, we are pleased to provide this manual for optimal use of our product for better work results.

Please read the recommendations described in the following pages carefully and keep the manual available to personnel who will be responsible for managing and maintaining the unit.

Our company is at your complete disposal for any and all questions that you should require both in the unit starting phase and at any time of its utilization.

Should scheduled and unscheduled maintenance be necessary, please contact our After-sales Technical Service for assistance and spare parts.

Please find our contact details below for a more rapid service:



ENEREN S.r.l.
Viale Spagna, 31/33
35020 Tribano (Pd) ITALY
Tel + 39 049 9271513
Fax + 39 049 9588522
e-mail : info@eneren.it



049-9271513



support@eneren.it

START-UP INSTRUCTIONS

1 YOUR INSTALLATION

All the tips required for a perfect installation of the equipment can be found in the installation manual. It is important to place a net filter at all water circuit inlets. The filter must be made of stainless steel with a mesh that

does not exceed 1 mm. See tables in section 5.3 INFORMATION ABOUT RECOMMENDED Y-SHAPED FILTERS p. 15 for the size.

2 REQUIRED ACCESSORIES FOR A PROPER INSTALLATION OF THE UNIT

For the proper operation of the unit and for the validity of the warranty, the installation of the following hydraulic components will be necessary:

- Y-strainers in the inlet pipes to the unit;
- anti-vibration couplings in each pipe connected to the unit;
- appropriately dimensioned safety valves on each circuit of the system;
- appropriately dimensioned expansion vessels on each circuit of the system.

3 FIRST START-UP

With at least 15 working days in advance, send the machine start request via email or fax to the following contact ENEREN:

Fax. 049 9588522

e-mail: support@eneren.it

Tel. 049 9271513

ENEREN Assistance will organize the intervention by putting you in contact with Authorized Technical Assistance Center of the area.

All the preliminary checks and testing of the machine will be carried out together with your staff.

Your staff will be given instructions for the correct running of the machine.

4 WARRANTY ISSUE

For the warranty to be valid, the first start-up by an Authorized Technical Assistance Center is mandatory. After testing, the Authorized Technical Assistance Center will issue a valid test certificate for the machine warranty.

5 CONNECTIONS

Here below are the minimum diameters for the pipes providing the connection to the units.

» Minimum diameter of the connection pipes for CDH units

CDH	Unit of measurement	
Minimum diameter of the connection pipes	inches	1"

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3 GENERAL DESCRIPTION


3.1 PRECAUTIONS FOR USE


The operating rules contained in this manual are solely applicable for the CDH units

The instructions manual must be read and used as follows:

- every unit operator and maintenance technician must carefully read the entire manual and comply with that stipulated therein;
- the employer must ensure that the operator has the requirements to operate the unit and has carefully read the manual;
- read the instructions manual carefully and consider it an integral part of the unit;
- the instructions manual must be readily available to operating personnel and maintenance technicians;
- keep the manual throughout the life of the unit;
- make sure that any update is included in the text;
- hand the manual to any other user or subsequent owner of the unit;
- use the manual in such a way so as not to damage its content;
- do not, for any reason, remove, tear or rewrite parts of the manual;
- keep the manual away from humidity and heat;
- if the manual is lost or partially damaged and therefore the contents can no longer be read entirely, it is advisable to request a new manual from the manufacturer by communicating the code found on the cover or the serial number of the unit.

Pay utmost attention to the following symbols and their meaning. Their purpose is to highlight specific information such as:

 **WARNING:** With reference to additional information or suggestions for the unit to be used correctly.

 **DANGER:** With reference to dangerous situations that could arise while using the unit, in order to guarantee personal safety.

 **WARNING:** With reference to dangerous situations that could arise while using the unit, in order to prevent damaging objects and the unit itself.

3.2 INTRODUCTION

The operating rules described in this manual are an integral part of the unit supply.

These rules are also intended for the previously trained operator specifically to operate this type of unit and contain all the necessary and important information for operating safely and optimal, proper use of the unit.

Hurried and incomplete training leads to improvisation, which is the cause of many accidents.

Before starting to work, read through and strictly observe the following suggestions:

- the operator must always have the instructions manual at his disposal;
- plan each action carefully;
- before starting work, make sure the safety devices function correctly and you have no doubts on how they work; otherwise, do not start-up the unit;
- carefully observe the warnings relating to special hazards contained in this manual;
- preventive and thorough maintenance guarantees constantly high operating safety for the unit. Never delay repairs and always have them carried out solely by qualified personnel; only original spare parts are to be used.

3.3 LIABILITY

The MANUFACTURER cannot be held liable for any personal accident or damage to property, which may arise from:

- failure to comply with the instructions provided in this manual regarding unit management, use and maintenance;
 - violent actions or incorrect manoeuvres when performing maintenance on the unit;
 - alterations made to the unit without prior written authorisation from the MANUFACTURER;
 - incidents beyond the normal and correct use of the unit.
- In any case, if the user attributes the incident to a defect in the unit, he must prove that the damage caused was a main and direct consequence of this "defect".

ATTENTION

- When installing or servicing the unit, the rules stipulated in this manual must be complied with together with those on board the unit and in any case all necessary precautions must be taken.
- The presence of pressurised fluids in the refrigerant circuit and of electrical components can create hazardous situations during installation and maintenance.
- Therefore, only qualified personnel may perform work on the unit.
- THE UNIT MUST BE STARTED UP FOR THE FIRST TIME ONLY BY QUALIFIED PERSONNEL AUTHORISED BY THE COMPANY PLACING IT ON THE MARKET.
- FAILURE TO COMPLY WITH THE RULES STIPULATED IN THIS MANUAL AND ANY ALTERATION TO THE UNIT WITHOUT PRIOR AUTHORISATION WILL IMMEDIATELY MAKE THE WARRANTY NULL AND VOID.
- Before performing any work on the unit, ensure it has been disconnected from the power supply.
- For maintenance service or repairs always and exclusively use original spare parts. THE MANUFACTURER declines all responsibility for damages that may occur due to non-compliance with the above.
- The unit is covered by the warranty according to the contractual agreements established at the time of sale.

- However, the warranty is rendered null and void if the regulations and user instructions stipulated in this manual are not complied with.
- In the event of a fault, do not try to repair it yourself or have an unauthorised technician perform the repairs. The warranty will otherwise be rendered null and void.

3.4 INTENDED USE

The CDH units are water-water heat pumps that, with no combustion or flame, warm or cool the whole house and autonomously produce technical hot water for domestic purposes, thanks to the heat exchanged with the ground outside.

Their use is recommended within the functioning limits carried in this manual, or else the warranty attached to the sales contract would cease.

Any other use is to be considered inappropriate and the manufacturer declines all liability for any damage caused to persons, property or the unit that may derive from such use.

DANGER

- Place the unit in environments where there is no risk of explosion, corrosion or fire.
- R744 refrigerant is a non-toxic gas, but suffocating. Ensure adequate ventilation to the installation room to protect against any refrigerant leaks. In case of installation in a closed environment, it is required to install a refrigerant leak detector which, in case of alarm, should turn off the unit to avoid the risk of asphyxia. Also, the circuit safety valve must be conveyed to an outside environment.
- Improper use could cause serious repercussions on the unit.
- All routine and special maintenance operations must be performed with the unit off and the power supply disconnected.

ATTENTION

- Before performing any work on the unit, each operator must be perfectly aware of how the unit and its controls work and must have read and understood all the technical information in this manual.
- It is forbidden to use the unit in conditions or for purposes other than those stipulated in this manual and THE MANUFACTURER cannot be liable for faults, issues or accidents due to non-compliance with this prohibition.
- Do not repair high pressure pipes with welds.
- It is forbidden to tamper with, alter or modify, even partially, the systems or equipment described in the instruction manual, and in particular, the guards and warning symbols required for personal safety.
- It is also forbidden to operate in manners different from those indicated or fail to perform operations necessary for safety reasons.
- Safety instructions are particularly important, as well as general information contained in this manual.

3.5 IDENTIFICATION OF THE UNIT

Each unit is distinguished by an identification label on the frame, which bears all the data required for installation, maintenance and unit traceability. Take note of the model, serial number, the definitive refrigerant charge and the reference drawings of the unit enclosed with this manual, in order to be easily retrieved in the event the data plate deteriorates and maintenance is required.

»



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2761

Modello - Model	
Matricola - Serial Number	
Code ID - Code ID	
Data di Produzione - Date of production	
Categoria PED/2014/68/EU Category	
Modulo di valutazione - Conformity Module	
Max pressione ammissibile	
Max allowed pressure PS [bar-rl]	
Max pressione ammissibile lato bassa	
Max allowed pressure low side PS [bar-rl]	
Max/Min temp. stoccaggio - Max/Min storage temp	
Potenza frigorifera - Cooling capacity*	
EER*	
Potenza termica - Heating capacity*	
COP*	
Refrigerante - Refrigerant [Ashrae 15/1992]/GWP	
Carica refrigerante - Refrigerant charge [kg]	
Refrigerante aggiunto - Refrigerant added [kg]	
Carica totale - Total Charge [kg]	
Ton. di CO2 equivalenti-Tonnes of CO2 equivalent	
Tar. press. lato ALTA-HIGH pressure Switch Set [bar-rl]	
Tar. press. lato BASSA-LOW pressure Switch Set [bar-rl]	
Taratura valvola sicurezza refrigerante	
Safety valve refrigerant Set [bar-rl]	
Taratura valvola sicurezza acqua	
Safety valve water side Set [bar-rl]	
Alim. elettrica principale-Main Power supply	
Alim. elettrica secondaria-Secondary Power supply	
Potenza massima assorbita - Max. absorbed power [kW]	
Corrente massima - Full load ampere FLA [A]	
Corrente di spunto - Starting Current LRA [A]	
Schema elettrico - Wiring diagram	
Schema frigorifero - Refrigeration diagram	
Peso a vuoto - Empty weight [kg]	

* EN14511-2

Contains fluorinated greenhouse gases

3.6 GENERAL INSTRUCTIONS

ATTENTION

- This manual must be stored carefully in a place that is known by the user of the unit, managers and operators in charge of transport, installation, use, maintenance, repairs and final dismantling.
- This manual indicates the intended use of the unit and provides instructions regarding transport, installation, assembly, adjustment and use. It provides information regarding maintenance, ordering spare parts, the presence of residual risks and personnel training.
- It is important to remember that the use and maintenance manual can never replace adequate user experience. This manual represents a reminder of the main operations to be performed by operators who have received

specific training, for example by attending training courses held by the manufacturer, with reference to particular maintenance operations.

- This manual is to be considered an integral part of the unit and must be stored near the unit in a special container until the unit is eventually demolished. Request a new copy from the manufacturer if it is lost or deteriorated.
- Make sure all the users have thoroughly understood the operating instructions together with the meaning of any symbols on the unit.
- Possible accidents can be avoided by following these technical instructions drafted in accordance with the Machinery Directive 2006/42/EC and subsequent additions.
- In any case, always comply with national safety regulations.
- Do not remove or damage the safety devices, labels and notices, especially those imposed by law.
- Adhesive labels intended for safer use are applied to the unit, therefore, it is very important to replace them if they become illegible.
- This manual reflects the applicable technology at the time the unit is sold and cannot be considered inadequate due to subsequent updates based on new experience.
- The MANUFACTURER has the right to update the production and manuals, without being obliged to update previous production and manuals, except for exceptional cases.
- Any updates or additions to this use and maintenance manual are to be considered an integral part of the manual and may be requested via the contact phone numbers listed in this manual.
- Contact THE MANUFACTURER for further information and to submit any proposals on how to improve the manual.
- THE MANUFACTURER kindly asks you to report the address of the new owner in case of transfer of the unit, in order to facilitate forwarding any supplements of the manual to the new user.

4 SAFETY PRESCRIPTIONS

4.1 GENERAL SAFETY RULES

4.1.1 Thoroughly know the unit

The unit must only be used by qualified personnel, who is obliged to be aware of the lay-out and function of all the controls, instruments, indicators, warning lights and various plates.

4.1.2 Wear protective clothing

Every operator must use personal protective equipment such as gloves, safety goggles and safety shoes.



4.1.3 Use safety equipment

A first aid kit and a fire extinguisher must be placed near the unit.

The extinguisher must always be fully loaded. Use it according to the Standards in force.



4.1.4 Warnings for inspections and maintenance

Display a sign with the warning: "INSPECTION IN PROGRESS" on all sides of the unit.

Check the unit carefully following the list of operations contained in this manual.



4.2 GENERAL PRECAUTIONS

The Machinery Directive 2006/42/EC provides the following definitions (attachment 1,1.1.1):

DANGER ZONE: any zone within and/or around machinery in which a person is subject to a risk to his health or safety.

EXPOSED PERSON: any person wholly or partially in a danger zone.

OPERATOR: the person or persons installing, operating, adjusting, maintaining, cleaning, repairing or moving machinery.

WARNING

- It is mandatory to read and comply with the instructions provided in this use and maintenance manual before performing any operation or maintenance on the unit. It is too late to do so while working: Persons may be seriously injured and property seriously damaged if operations are performed incorrectly or the unit is not used as intended.
- The employer must inform in detail all operators about the risks of accidents and particularly about risks related to noise, required personal protective devices and general accident prevention rules provided by laws or international standards and national standards in the Country of destination of the unit.

- All the operators must comply with international accident prevention regulations and those applicable in the country of use in order to prevent potential accidents.
- Please be reminded that the European Union has issued some directives concerning the safety and health of workers, among which the directives 89/391/EEC, 89/686/EEC, 89/654/EEC, 2009/104/EC, 89/656/EEC, 2003/10/EC, 92/58/EEC and 92/57/EEC that each employer has an obligation to observe and to enforce. In the event that the unit is installed outside the European union, always refer to the regulations in force in the country of installation.
- Before performing any work on the unit, each operator must be perfectly aware of how the unit and its controls work and must have read and understood all the technical information in this manual.

ATTENTION

It is forbidden to tamper with or replace parts of the unit not expressly authorised by the MANUFACTURER.

Using accessories, consumables or spare parts other than those recommended by the MANUFACTURER and/or stipulated in this manual can constitute a risk for the operators and/or damage the unit.

Any alteration to the unit that is not specifically authorised by the MANUFACTURER relieves the manufacturing company from any civil or criminal liability.

WARNING

- It is strictly prohibited to remove or tamper with any safety device.
- Any installation, ordinary and extraordinary maintenance operations must be carried out with the unit stopped and without power supply.
- Once the unit has been cleaned, the operator must check that there are no worn or damaged parts or parts that are not safely fixed, or if this is the case, ask the maintenance staff to fix the problem.
- Special attention must be paid to the state of repair of the pressurised pipes or other parts exposed to wear. It must also be ensured that there are no leaks of fluid, or other dangerous substances.
- In these cases, it is forbidden for the operator to restart the unit before the situation has been remedied.
- If any of these occurrences are detected, the operator, before leaving the unit unattended, must display a warning sign indicating that maintenance is in progress and it is forbidden to start the unit.
- It is prohibited to use flammable fluids to clean the unit.
- Periodically check the condition of the data plates and arrange, if necessary, for them to be restored.
- The operator work place must be kept clean, tidy and free from any objects that may limit unhindered movement.
- Operators should avoid operating the device from unsafe, uncomfortable positions that may affect their balance.
- The operators must pay attention to risks pertaining to clothing and/or being caught or entangled in moving parts. It is recommended to use a cap to put up long hair.
- Chains, bracelets and rings can also pose a hazard.
- The workplace must be adequately lit for the intended operations. Insufficient or excessively bright lighting can imply safety risks.

- Ensure adequate ventilation to the installation room to protect against any refrigerant leaks.
- The instructions, accident-prevention rules and warnings contained in this manual must be observed at all times.

DANGER

R744 refrigerant is a non-toxic gas, but suffocating. In case of installation in a closed environment, it is required to install a refrigerant leak detector which, in case of alarm, should turn off the unit to avoid the risk of asphyxia. Also, the circuit safety valve must be conveyed to an outside environment. Also follow the guidelines for CO2 emissions prevention in section 9.5 CHECKS DURING OPERATION p. 30.

DANGER

By using R744 refrigerant, the chiller works at high pressure and temperature levels, considerably higher than in a normal refrigeration / conditioning cycle.

We therefore recommend an even higher level of attention and scruple than the usual start-up, speed and maintenance operations and above all to carry out the latter only with the unit off.

Maintenance and panels removal must only be carried out when the unit is OFF. This will prevent scalding hazards and explosion-related hazards due to the presence of pressurised circuits.

4.2.1 Safety information

The units have been designed and built according to the current state-of-the-art and technical rules in force regarding residential water-water heat pumps that exchange heat with the external ground. Applicable laws, provisions, regulations, decrees and directives to such machinery have been complied with.

The materials and the equipment parts used, as well as the production, quality assurance and control processes meet the highest safety and reliability requirements.

Unit performance, continuous operation and durability are maintained by using the above-mentioned materials and parts for the purposes specified in this user manual, handling them with due care and performing thorough maintenance and up-to-standard service.

4.2.2 Accident prevention

The MANUFACTURER cannot be held liable for accidents caused when using the unit, due to the user not complying with laws, provisions, regulations and standards in force regarding fluid chillers and heat pumps.

4.2.3 Operational safety

The MANUFACTURER will not be responsible in case of malfunctions and damage if the unit:

- is used for purposes other than those intended;
- Is not handled and maintained according to the operating rules specified in this manual;
- It does not regularly and consistently receive maintenance as prescribed or non-original spare parts are used;
- Is modified or some components are replaced without the MANUFACTURER's written authorisation, especially

- when the effectiveness of the safety systems has been altered or minimised on purpose;
- Is used beyond the ambient temperature limits allowed.

4.3 MAINTENANCE PRECAUTIONS

4.3.1 Tools

Personal injury is prevented by not using worn or damaged, low quality or makeshift tools.

 **ATTENTION**

The manufacturer cannot be held liable for damage caused if modified tools are used.

4.3.2 Personnel

Ordinary maintenance prescribed in this manual must only be performed by authorised and trained personnel. For the maintenance or overhauling of components not specified in this manual, contact the MANUFACTURER.

4.3.3 Keep the unit clean

Oil and grease stains, misplaced tools or broken pieces are harmful to people as they can cause slipping or falls. Always keep the area where the unit is installed clean and tidy.

Do not use diesel fuel, oil or solvents to clean the unit as the first two leave an oily film that makes it easier for dust to stick, while solvents (even milder ones) damage the paint finish and cause rusting.

If a jet of water penetrates the electrical equipment the contacts oxidise and the unit may malfunction. Therefore, do not use jets of water or steam on the sensors, connectors or any electrical part.

4.3.4 Care and maintenance

The cause of damages and accidents is often attributable to wrong maintenance, such as:

- No water in the circuit;
- Incorrect percentage of refrigerant in the circuit;
- Inadequate refrigerant;
- Poor cleaning in the unit setting;
- Circuit inefficiency (pipe connections, loose pipes, screws, etc.).

Carry out maintenance work as required: this is also critical for your own safety.

Never postpone scheduled repairs.

Only assign skilled or authorised personnel to repair tasks.

Always observe the following safety rules, even when you are thoroughly familiar with the operations involved:

- Always keep the unit and the surrounding area clean;
- Before beginning to work, check the perfect efficiency of protective devices;
- Make sure that no unqualified or not specially appointed persons enter the unit operating area.

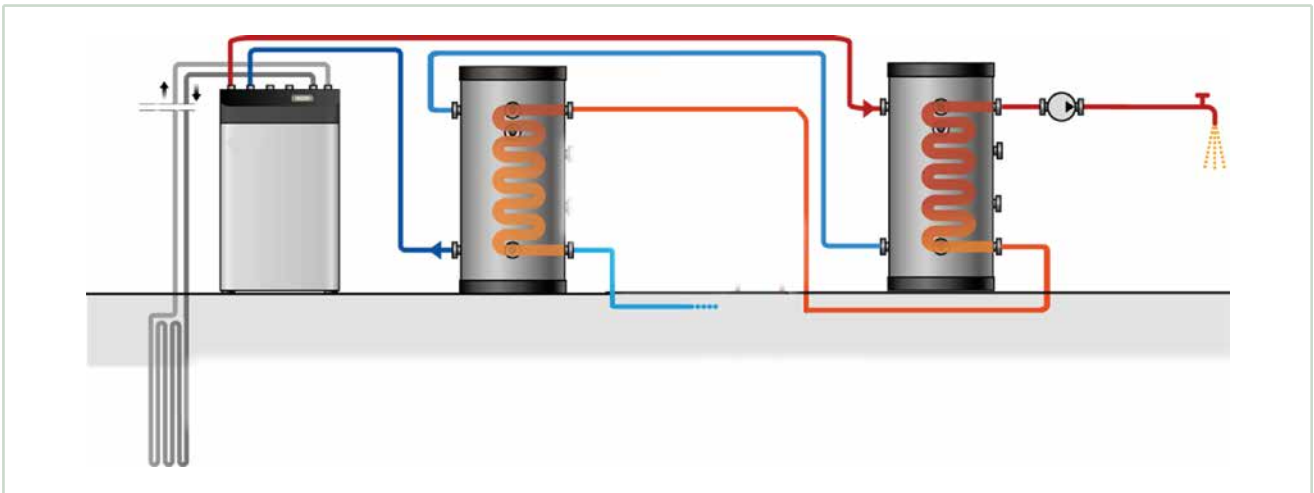
5 DESCRIPTION OF THE PRODUCT AND TECHNICAL DATA

5.1 SERIES

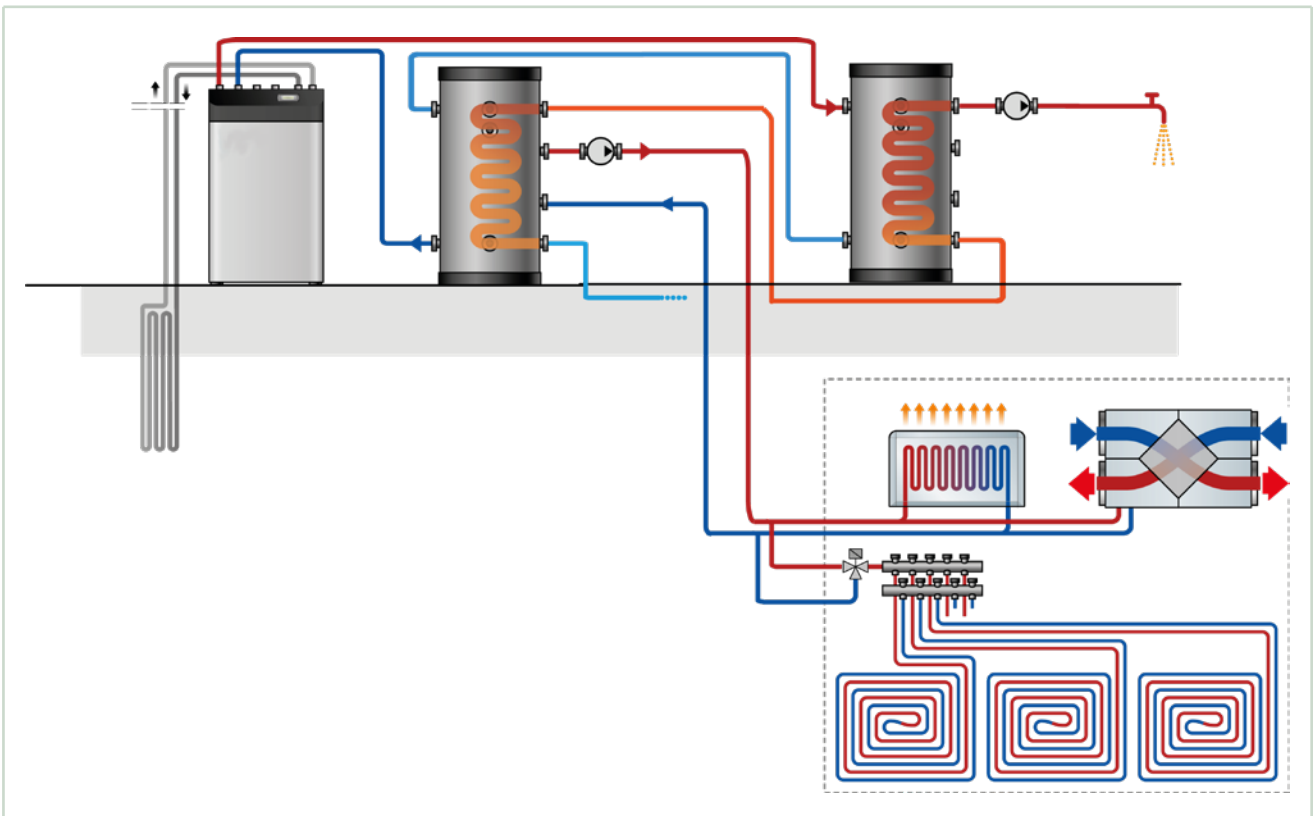
During autumn and winter operation, they heat the room or produce domestic hot water.

The CDH units described in this manual are heat pumps for the production of domestic hot water and/or heating of the living spaces.

1) Production of domestic hot water only.



2) These units have one reversible hot hydraulic side and another one dedicated to the domestic hot water production.



ATTENTION

The system diagrams shown in this manual are generic and illustrative. For proper installation guidelines, please follow the dimensional and wiring diagrams supplied with the unit.

ATTENTION

For proper installation guidelines, please follow the dimensional and wiring diagrams supplied with the unit.

5.1.1 Identification of the unit

Here are the features shared by the units of the series:

- Expansion device: EEV (electronic expansion valve) to benefit from the possibility of generating thermodynamic cycles with reduced pressure changes and therefore significant COP advantages.
- Integrated controller of the pump on the system circuit and DHW circuit: the pump is managed directly by the unit.
- Dissipation circuit pump with variable speed combined with an inverter.

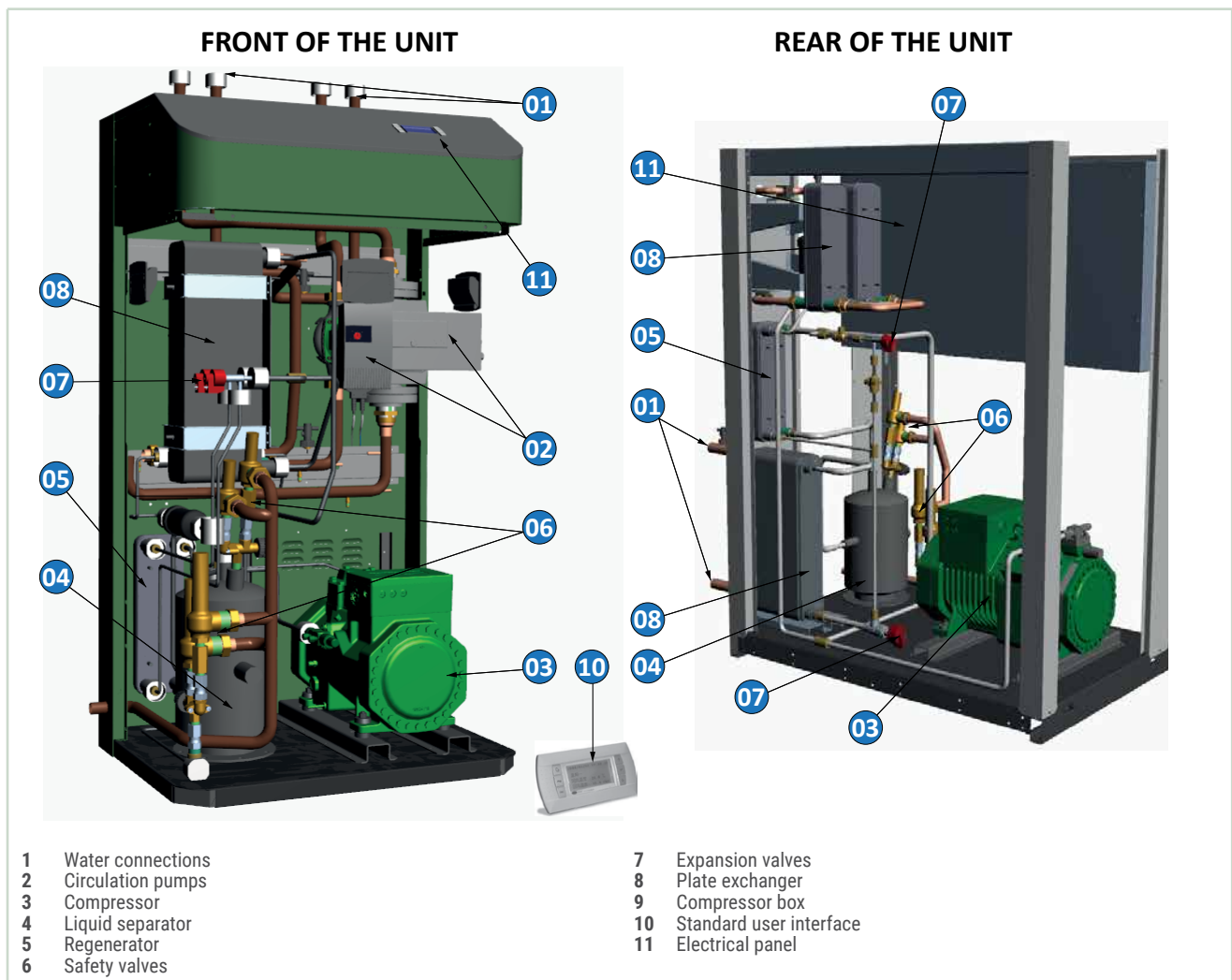
- AISI 316 Stainless steel high-efficiency plate heat exchangers.
- Advanced electronic control to adequately address the needs of capacity control of loads for optimal operation of partial loads, increasingly the subject of evaluation and discerning technical choices by heat engineering designers.

The basic selection in the development of the series consists in using the following:

- Reciprocating or twin-rotary compressors, on/off units or inverters

The structure of the internal unit features the following characteristics: side panelling in galvanised sheet metal painted with polyester epoxy powders and polymerised in the oven at 180°C and a front cover with a built-in display. The unit is fully panelled, but can be accessed on 3 sides since the panels can easily be removed, thus simplifying maintenance and/or inspections. All routine maintenance is performed from the front of the unit.

5.1.2 Main components of the indoor unit



5.1.3 Technical specifications

WARNING

For unit dimensions and technical data, please follow the dimensional drawings and the specific technical selection supplied with the unit.

5.2 OPERATING LIMITS

The diagrams below indicate the operating limits of the units. One can obtain the flow temperature that the unit can

supply according to the temperature of the water coming in from the source.

WARNING

All the temperatures on the perimeter of the operating areas can only be reached as transients and if the unit runs beyond these limits for a prolonged time, the software on board will implement corrective actions to restore the unit within the operating limits.

Heat transfer fluid:	water or mixture of water and max 30% glycol antifreeze
Maximum water side pressure:	5 bar
Maximum pressure on high pressure side:	125 bar-r
Maximum ambient Temp of the unit:	+50 °C
Minimum ambient Temp of the unit:	-15 °C
Maximum pressure on low pressure side:	90 bar-r (*)
Power supply voltage:	+/- 10% compared to plate voltage
Maximum storage Temp of the unit:	+60 °C
Minimum storage Temp of the unit:	-20 °C (limit determined by on board electronics)

(*) this value can only be reached during storage and determines the saturation pressure of 30 bar-r of the refrigerant on the low pressure side of the circuit (value which determines its limits).

ATTENTION

Using glycol is necessary in all cases in which the temperature of the heat transfer fluid drops below 0°C, i.e. even when the unit is switched off or only running in summer mode, should this temperature condition occur. This will prevent water freezing and the resulting internal damage to components.

The percentage of glycol must be selected according to the lowest expected temperature.

Glycol percentage by weight	%	0%	10%	15%	20%	25%	30%	40%	50%
Freezing temperature of the mixture with ethylene glycol	°C	0	-3	-5	-8	-11	-14	-22	-34
Freezing temperature of the mixture with propylene glycol	°C	0	-3	-5	-7	-10	-13	-21	-33

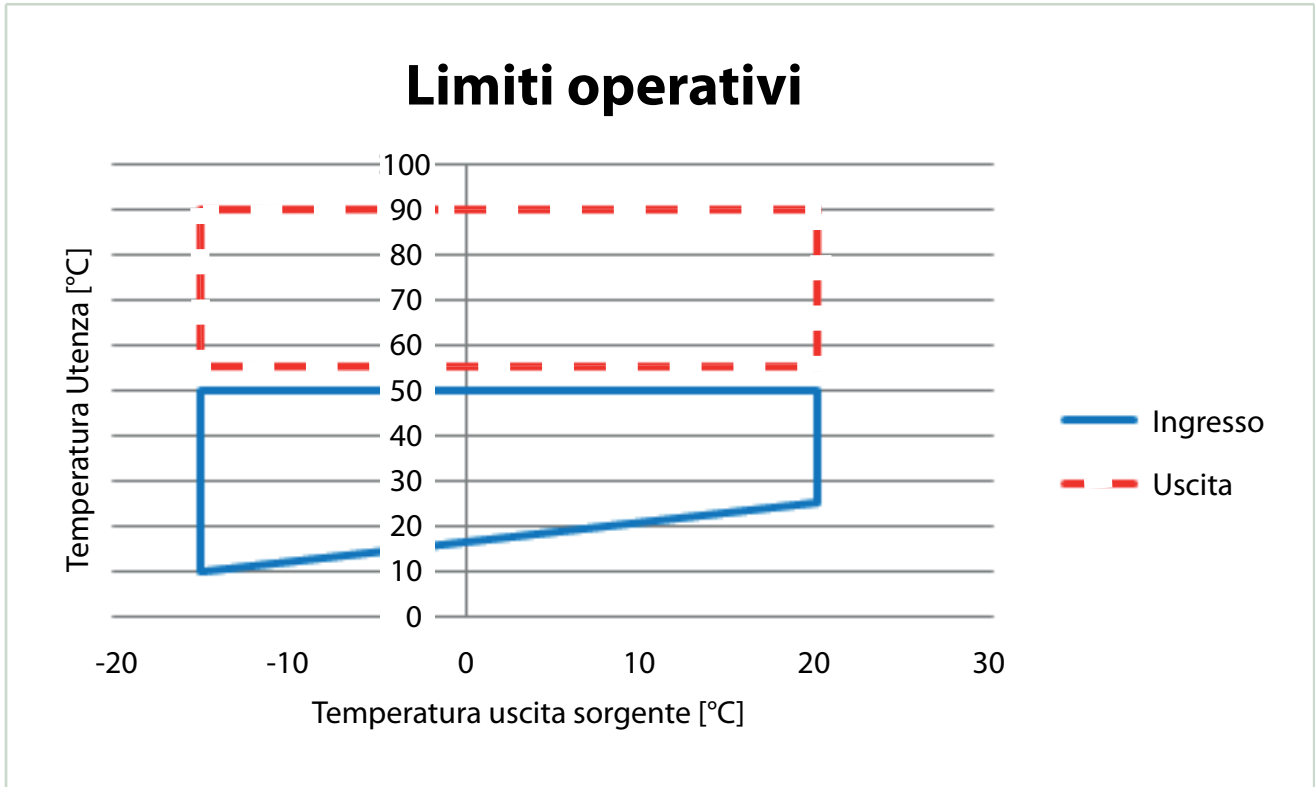
The use of glycol will change the thermal capacity, the water flow and the pressure drops. The corrective factors

depending on the amount of glycol present in the mixture are shown in the following table.

Glycol percentage by weight		0%	10%	20%	30%	40%
ETHYLENE-BASED	Developed heat capacity correction factor	1	0,998	0,994	0,989	0,983
	Water flow correction factor	1	1,047	1,094	1,14	1,199
	Pressure drop correction factor	1	1,157	1,352	1,585	1,86
PROPYLENE-BASED	Developed heat capacity correction factor	1	0,996	0,985	0,971	0,96
	Water flow correction factor	1	1,022	1,043	1,07	1,098
	Pressure drop correction factor	1	1,111	1,307	1,532	1,777

5.2.1 Operating limits

Operating limits for user water and source circuit temperature:



WARNING

The unit must operate within the above values. If not:

- The compressor may be subject to malfunction until breaking.
- The warranty will be invalidated.

- Body gasket BETAFLEX 71
- Sandblasted finish
- Thread EN-ISO 228/1
- AISI 304 stainless steel rhomboid micro-stretched sheet metal filter

5.3 INFORMATION ABOUT RECOMMENDED Y-SHAPED FILTERS

The following tables report the technical specifications of Y-shaped filters to be installed at the heat pump's inlet.

WARNING

Always follow the indications on the minimum diameter of the connecting piping reported in the table.

- Bronze body
- SN 5 UNI-EN1982 DIN 50930/6
- Bronze cap CW 617 N - UNI-EN12165



CDH	Size	020
Flow rate under nominal conditions	kg/h	5600
Filtering degree	μ	500
kv	m3/h	24.5
Filter pressure drops	kPa	6
Minimum filter diameter required	inches	1"1/2

5.4 CALIBRATION OF CONTROL DEVICES

5.4.1 General description

All the control devices are set and tested in the factory before the unit is dispatched. However, after the unit has been in service for a reasonable period of time you can perform a

check on the operating and safety devices. The settings are shown in Tables I and II.

DANGER

All service operations on the control equipment must be carried out **EXCLUSIVELY BY QUALIFIED PERSONNEL**: incorrect calibration values can cause serious personal injuries and damage the unit.

Many of the operating parameters and system settings are configured by means of the microprocessor control and are protected by passwords.

Table I – Setting of control devices

Control device	Set point	Differential
Hot user set °C	75	4

Table II – Setting of safety - control devices

Control device	Start up	Differential	Re-activation
Anti-freeze thermostat - °C	+4	1	Semi-automatic
High pressure set by probe - bar	120	5	Semi-automatic
Maximum pressure safety switch - bar	125	15-30	Automatic
Safety valve - bar	130	-	-
Minimum time lapse between two compressor's start-ups - s	450	-	-
Flow switch alarm delay - s	15 (start-up)	5 (running)	-
Low pressure alarm delay - s	0	-	-

5.4.2 Maximum pressure switch

The high pressure switch is of the automatically reset type and classifiable as category IV under 97/23 EC. It directly stops the compressor when the discharge pressure exceeds the set value.

ATTENTION

Any kind of block or alarm must be promptly reported to the After Sales Service!

The high pressure switch must be automatically reset; this is possible only when the pressure falls below the set differential (see Table II).

5.4.3 Service thermostat

This function starts and stops the compressors according to the demand for chilled water, as determined by a sensor placed at the evaporator inlet [water returning from the system].

This device is a function included in the microprocessor control and works with a proportional band width that may be set as desired.

5.4.4 Anti-freeze thermostat function

The anti-freeze sensor situated at the evaporator outlet detects the presence of excessively low temperatures and stops the unit. Together with the flow switch and low pressure switch, this device protects the evaporator from the risk of freezing as a result of faults in the water circuit.

This device is a function included in the microprocessor control.

ATTENTION

If there are any alarms relating to the intervention of the protections described, the unit must request the intervention of the Authorised Technical Service Centre, otherwise the warranty will be considered null and void.

6 INSPECTION, TRANSPORT AND POSITIONING

6.1 INSPECTION

The unit left the factory in perfect conditions, however when receiving the unit verify its integrity. Immediately report any damage to the carrier and write it down on the Delivery Note before signing it.

The manufacturer or its agent must be promptly notified of the extent of the damage.

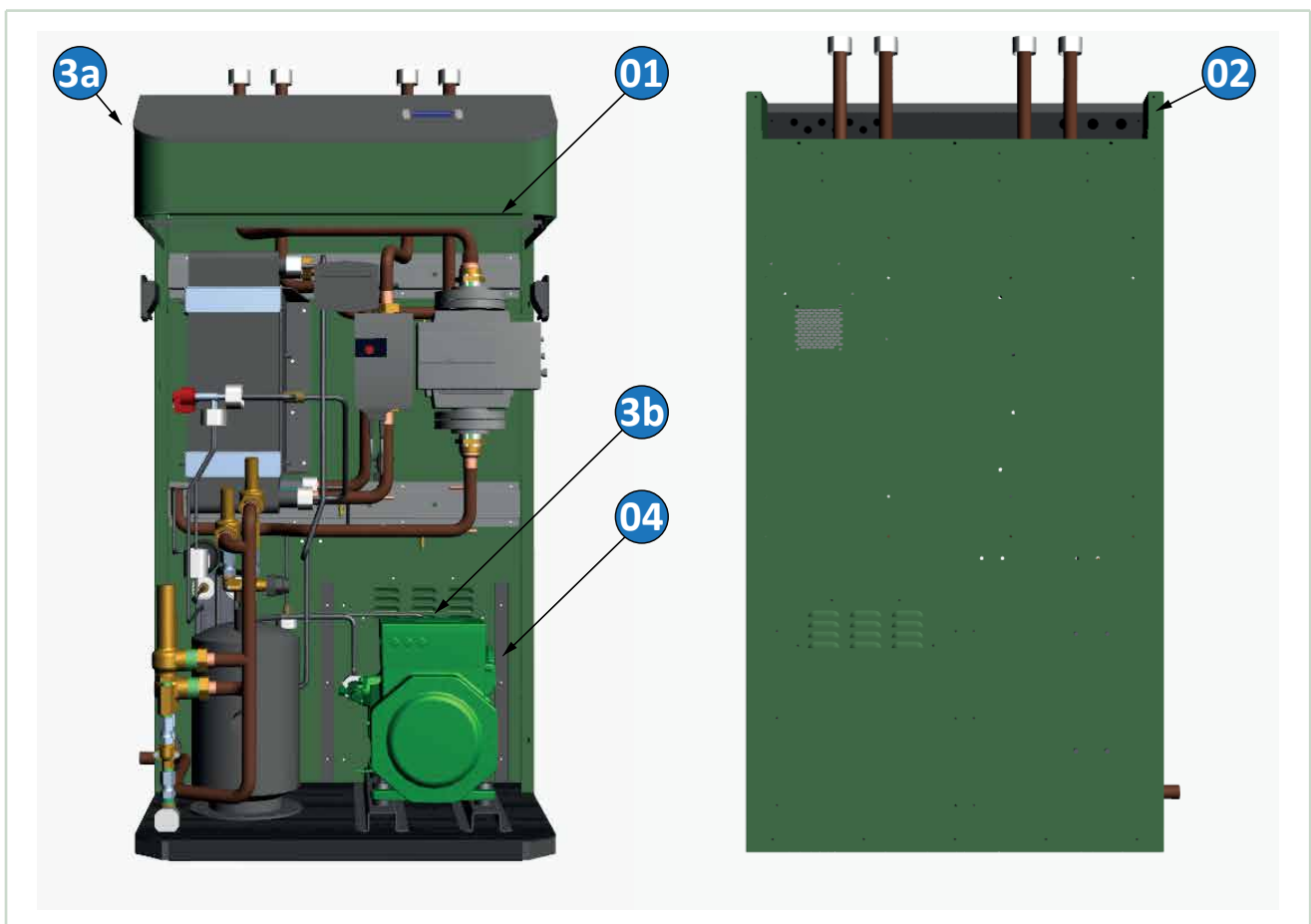
The Customer must submit a written report describing any significant damage.

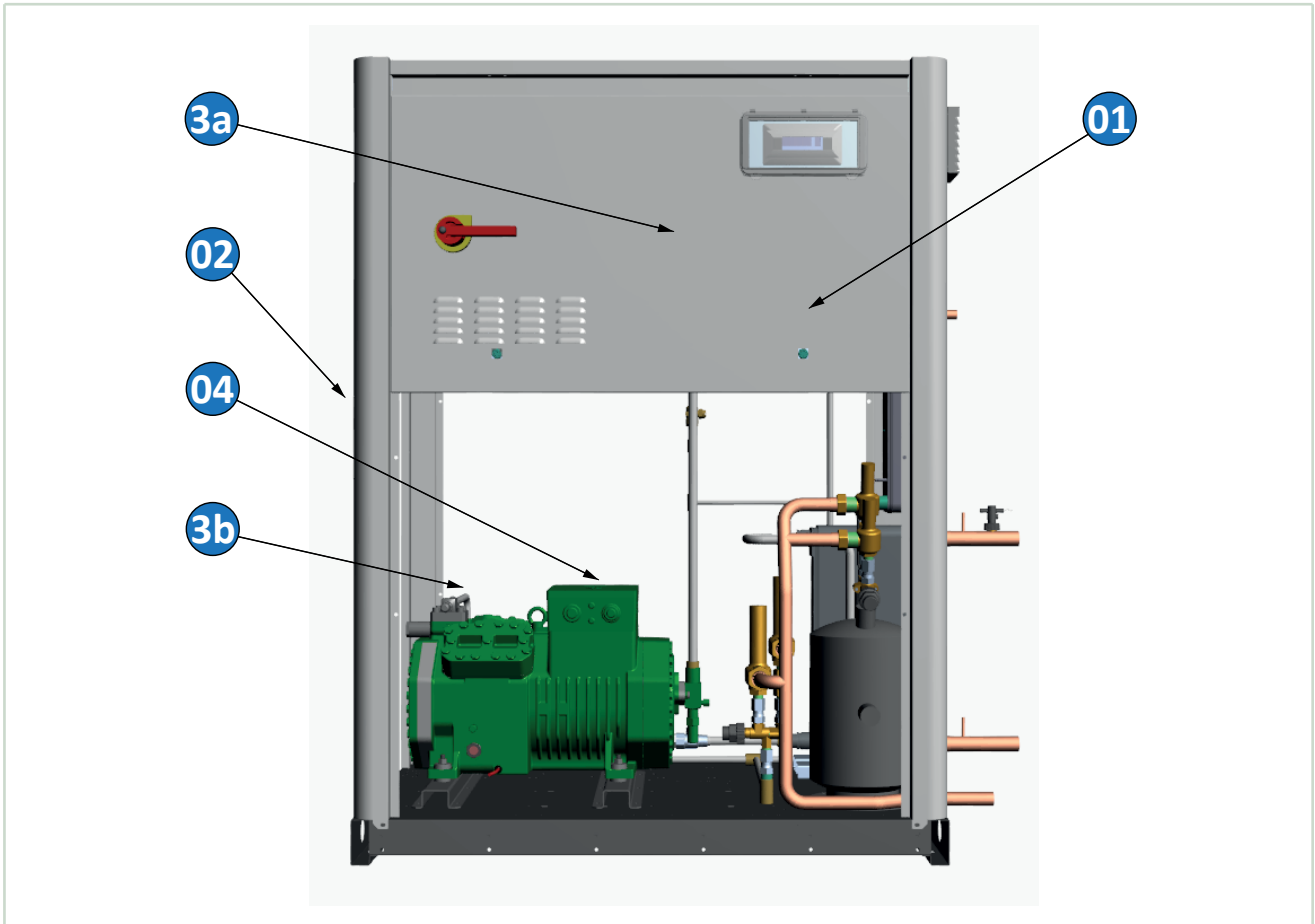
Check the integrity of the documents accompanying the unit and of this manual.

Check for the presence of the wiring diagram.





After starting up the unit, check the commissioning report.

6.2 LOCATION OF SAFETY DATA PLATES





6.2.1 Description of the safety labels

<p>1</p> <p>A. Warning: danger due to poor familiarity with all the functions of the unit and the resulting risks. B. Read the use and maintenance manual carefully before operating the unit.</p>	
<p>2</p> <p>Electric power supply data plate</p>	
<p>3</p> <p>A. Danger: live parts. B. Danger of burns.</p>	
<p>4</p> <p>Liquid refrigerant.</p>	

6.2.2 Residual risk areas

⚠ DANGER

It has not been possible to eliminate certain residual risks during the design phase, found in some areas of the unit, or protected with guards due to specific features of the unit.

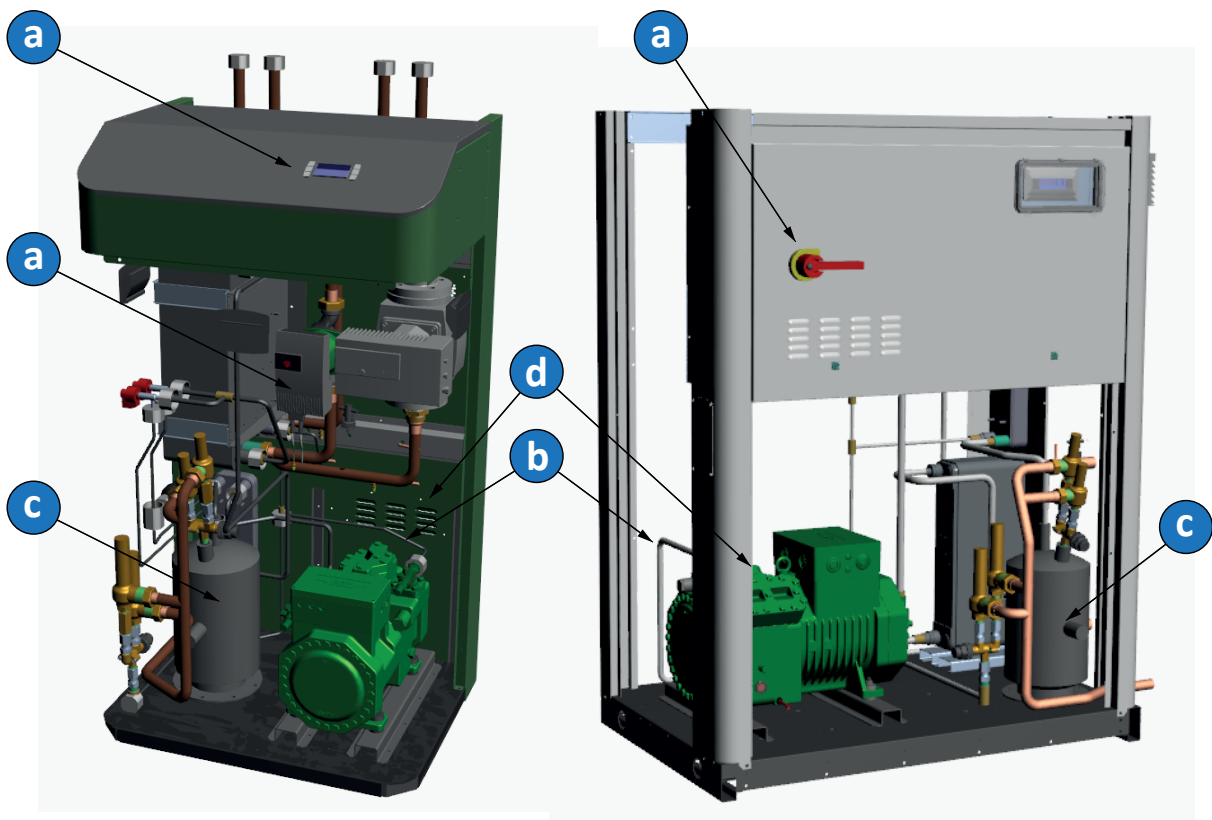
Each operator must be aware of the residual risks on this unit in order to prevent potential accidents.

👉 WARNING

In order to avoid the risks listed above it is essentially important to:

- Use the electric panel in compliance with the manufacturer’s instructions. Do not place metal objects inside the electric panel. Do not place flammable substances near the unit.
- Do not alter any component of the cooling circuit and do not operate the unit beyond the limits stipulated by the manufacturer.
- Dispose of all the materials that make up the machine correctly, use suitable equipment for the recovery of the refrigerant gas (see chapter [Ref] [Ref]).
- Not touch the internal components during operation without adequate protection.

» Residual risk areas



a - Risk of short circuit and fire.
b - Risk of explosion due to the presence of high pressure circuits.

c - Risk of pollution due to the presence of oil.
d - Risk of burns due to the presence of very hot surfaces.

⚠ DANGER

By using R744 refrigerant, the chiller works at high pressure and temperature levels, considerably higher than in a normal refrigeration / conditioning cycle.

We therefore recommend an even higher level of attention and scruple than the usual start-up, speed and maintenance operations and above all to carry out the latter only with the unit off.

Maintenance and panels removal must only be carried out when the unit is OFF.

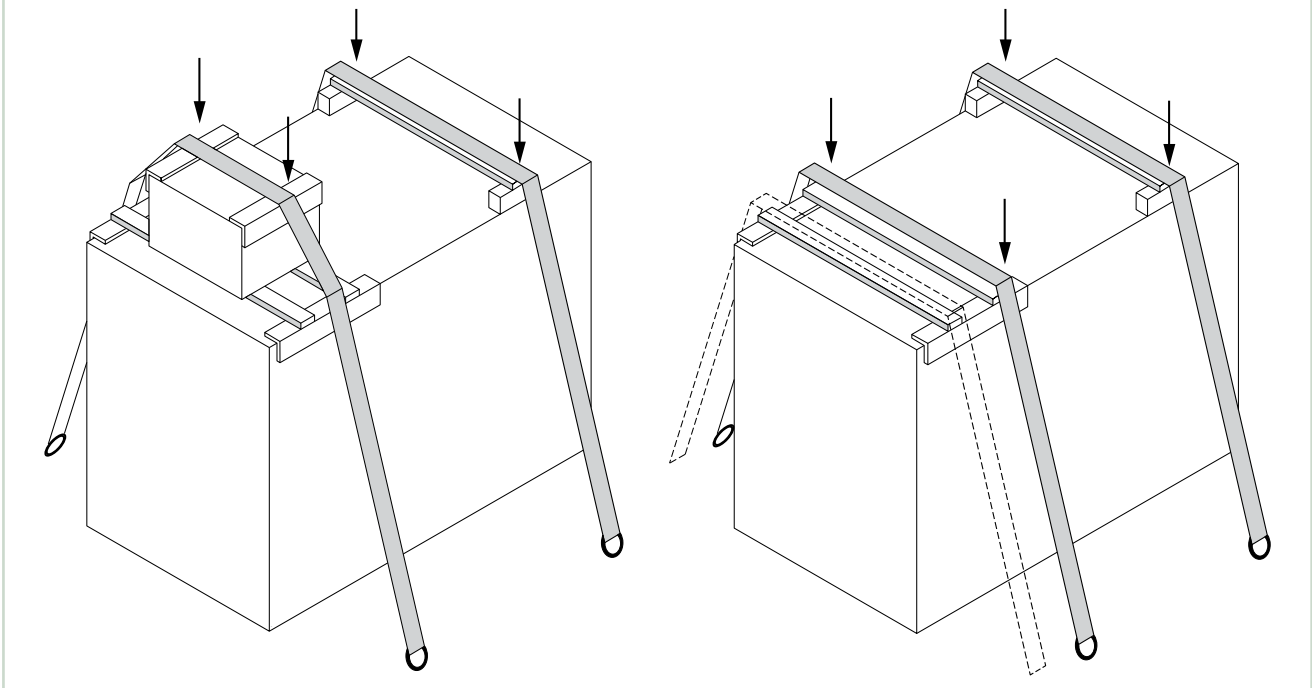
This will prevent scalding hazards and explosion-related hazards due to the presence of pressurised circuits.

6.3 LIFTING AND TRANSPORT

While the unit is being unloaded and positioned, utmost care must be taken to avoid abrupt or violent manoeuvres. Be

very careful when transporting it inside rooms. Do not use the unit components as anchors.

» **USE THE SUPPORTS TO FIX THE LOAD**



⚠ ATTENTION

During all lifting operations make sure the unit is firmly anchored, to prevent it from tilting or falling.

Do not move or lift the unit from the removable front panel.

6.4 UNPACKING

The packaging must be carefully removed to prevent damaging the unit. The packaging consists of various materials: wood, cardboard, nylon, etc.

It is recommended to keep them separately and deliver them to suitable waste disposal or recycling facilities in order to minimise their environmental impact.

7 INSTALLATION

7.1 POSITIONING AND INSTALLATION

You should bear in mind the following aspects when choosing the best site for installing the unit and the relative connections:

» the application limits of the unit

Maximum (ambient) temperature	°C	50
Minimum (ambient) temperature	°C	-15
Maximum (storage) temperature	°C	60
Minimum (storage) temperature	°C	-20

ATTENTION

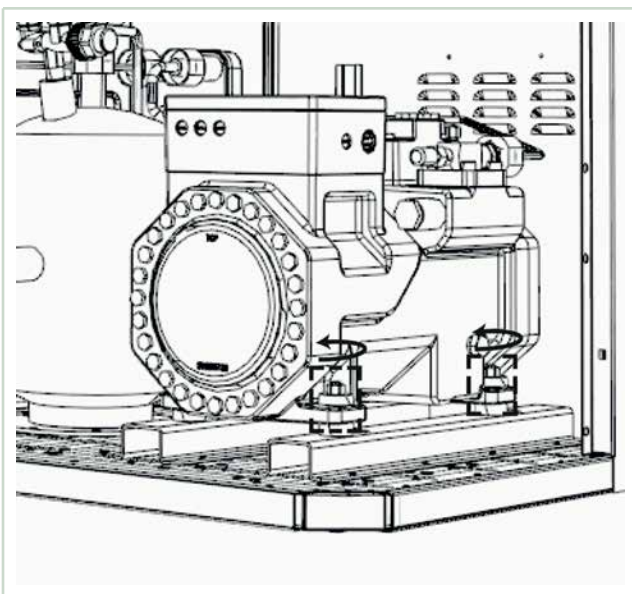
The indoor unit has a protection degree of IP22 that does not allow it to be installed outdoors. Make sure the unit is not exposed to much dust and protect it from humidity and salt spray. It is mandatory to use the anti-vibration mounts supplied.

ATTENTION

The spaces indicated in the dimensional drawings must be complied with for the units to function properly and routine maintenance to be performed.

ATTENTION

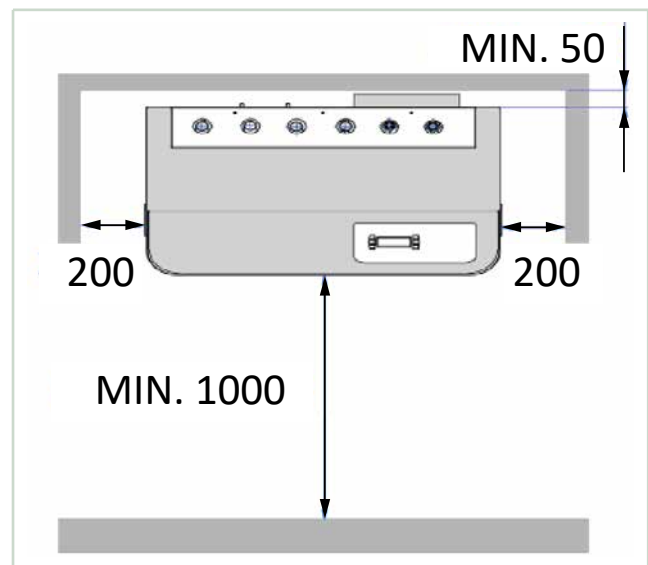
Before starting up the units, open the compressor box and loosen the clamping screws of the compressor, which are used to lock it into place during transport.



- Size and origin of water pipes;
- power supply location;
- accessibility for maintenance or repairs;
- solidity of the supporting surface
- the application limits of the unit:

ATTENTION

The spaces indicated in the figure to the side [mm] must be complied with for the units to function properly and routine maintenance to be performed.



7.2 QUALITY OF THE WATER IN THE SYSTEMS

7.2.1 Water quality

Calcification (solid sediments, especially calcium carbonate) might occur according to the quality of the water, especially in the heat exchanger.

This means that high concentrations of calcium hydrocarbonate can cause calcification.

This is why there is the need to treat a system's heating water (softening/desalination, neutralization, stabilization of the pH).

To fill the heating systems, it is advisable to comply with the applicable regulations in force, in particular the VDI-2035 standard.

Below are the values of dissolved substances and water characteristics recommended by the manufacturer.

WATER CONTENT	CONCENTRATION (ppm)
Alkalinity (HCO ₃ ⁻)	70 - 300
Sulphate (SO ₄ ²⁻)	< 70
HCO ₃ ⁻ / SO ₄ ²⁻	> 1.0
Electrical conductivity	10 - 500 µS/cm
pH*	7.5 - 9.0
Ammonium (NH ₄ ⁺)	< 2
Chloride (Cl ⁻)	< 50
Free chlorine (Cl ₂)	< 0.5
Hydrogen sulphide (H ₂ S)	< 0.05
Carbon dioxide (CO ₂)	< 5
Total hardness (°dH)	4.5 - 8.5
Nitrate (NO ₃ ⁻)	< 100
Iron (Fe)**	< 0.2
Aluminium (Al)	< 0.2
Manganese (Mn)**	< 0.05
Phosphate (PO ₄ ³⁻)	< 2
Ammonia (NH ₃)	< 0.5
Temperature (°C)	< 65 °C
Oxygen content	< 0.1

*Generally a low pH value (less than 6) increases the risk of corrosion and a high pH (above 7.5) decreases the risk of corrosion
 ** Fe₃ + and Mn₄ + are strong oxidants and can increase the risk of localized corrosion on stainless steel

7.2.2 Water quality on aquifer side (if the circuit is open)

If there is a large amount of solid substances (sand, mud) in the well water, provide for sedimentation tanks to avoid clogging the evaporator (a safety exchanger if necessary).

As for the quality of the groundwater, follow the values below:

WATER CONTENT	CONCENTRATION
pH	6,5 – 9
Chlorides	< 100 mg/kg
Sulphates	< 50 mg/kg
Nitrates	< 100 mg/kg
Manganese	< 0,1 mg/kg*
Free carbon dioxide	< 20 mg/kg
Ammonia	< 2 mg/kg
Iron	< 0,2 mg/kg*
Free chlorides	< 0,5 mg/kg
Electrical conductivity	> 50 mS/cm e < 600 mS/cm
Oxygen	< 2 mg/kg

If these limit values are exceeded, this will result in the siltation of the evaporator and incoming piping and clogging of the injection shaft.

7.3 GENERAL RECOMMENDATION FOR WATER CONNECTIONS

Install the following components on the piping:

- shut-off valves (gate valves) to isolate the unit from the water circuit for maintenance.

- metal mesh filter (incoming pipes), with a mesh not to exceed 1 mm, to protect the exchanger from scales or impurities present in the pipes.
- temperature and pressure indicators for routine maintenance and monitoring of the unit. Pressure control on the water side allows to assess the correct functioning of the expansion tank and to detect water leakage in advance.
- sumps on inlet and outlet piping for measuring temperatures, and for directly viewing the operating temperatures. They can also be viewed on the display on board the unit (if pCO).
- air vent valves, placed on the higher parts of the water circuits to bleed the air. [The internal pipes of the unit are fitted with manual air vent valves to bleed the unit: this

operation can only be carried out when the unit is disconnected from the power supply.]

- discharge cock and, if necessary, drain tank to empty the system for maintenance or seasonal stops.
- For process applications, it is recommended to install a decoupling heat exchanger, which avoids the fouling of the heat exchangers.

WARNING

It is extremely important that the water inlet is connected at the height of the "Water Inlet" sign.

If not, the evaporator would be exposed to the risk of freezing, since the anti-freeze thermostat would not be able to perform its function. Furthermore, in the cooling mode, countercurrent circulation would not be activated. Additionally, this position does not enable consent of the water flow control device.

The dimensions and position of the water connections are provided in the dimensional tables and overall drawings.

WARNING

The water circuit must be set up in such a way as to guarantee that the nominal flow rate of the water supplied to the evaporator remains constant (+/- 15%) in all operating conditions.

ATTENTION

When making the plumbing connections, make sure there are no open flames in proximity to or inside the unit.

ATTENTION

For this reason, make sure that the pressure on the pump intake side, where the expansion vessel is positioned, is always above 0.5 Bar with pump running: this helps reduce the risk of cavitation.

It is extremely important that the installer follows and verifies this procedure step-by-step to prevent the risk of tank implosion or pump cavitation:

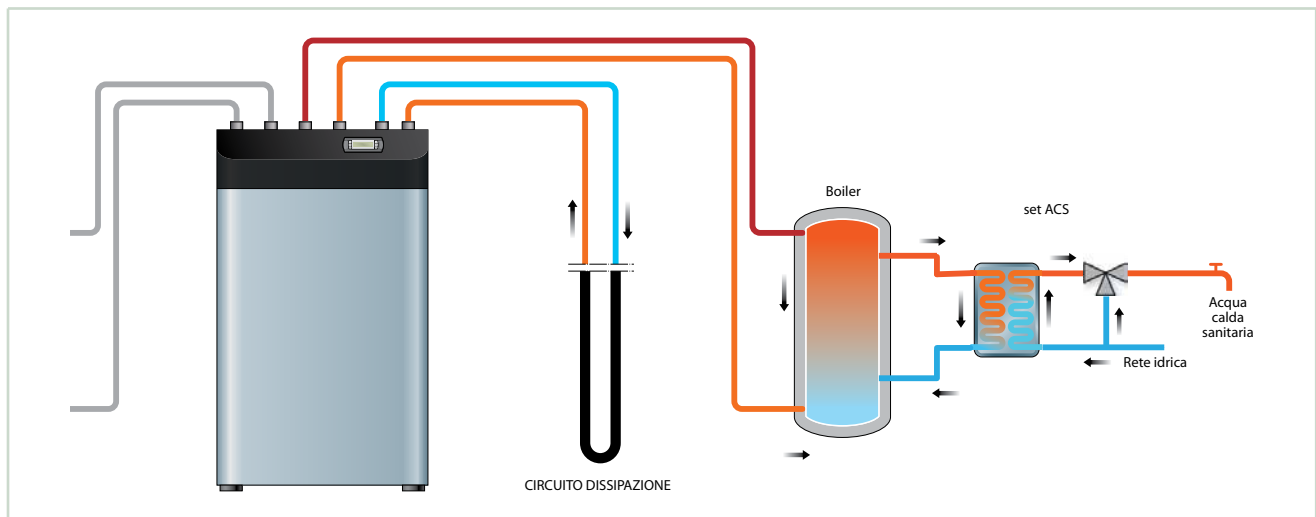
- Drain the expansion vessel in the system until the pressure reaches 0.5 bar
- Fill the system and pressurise it to approximately + 1 bar in pump suction (pump stopped)
- Bleed the system
- Check the pump suction pressure (about 1 bar) and start the system
- Stop the pump after 15-30 minutes. Repeat the procedure from step 3 until no more air system noise can be heard.

DRAINING THE SYSTEM

Drain outlets must always be set-up in the lower parts of the system. Drain the unit from the connections on the water pipes beneath the pumps.

7.4 OPTIONAL STORAGE TANKS

CDH can heat technical water for domestic hot water production. Domestic hot water production always requires a water storage tank (preferably technical) on the circuit used for this function. The storage tank is used to meet demand peaks without installing thermal powers that are too high. This leads to regular and continuous system operation and therefore better thermal performance. The water heated by the unit is stored inside the tank and the energy stored this way allows the tank to be used with an instantaneous preparer. The manufacturer proposes this solution as it allows for good thermal efficiency by heating the water with a thermal approach in countercurrent mode. An electric resistance can also be combined.

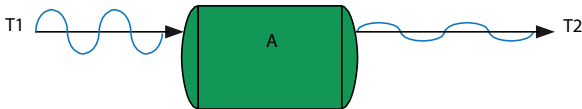


In systems containing little water, in which the thermal inertia is low, verify that the water content of the delivery section (to users) satisfies the equation below:

$$V = \frac{C_c \times \Delta\tau}{\rho \times Sh \times \Delta T \times N_s}$$

V	water content in the user section [m ³]
Sh	fluid specific heat [J/(kg/°C)]
ρ	fluid density [kg/m ³]
Δτ	minimum time between 2 restarts of the compressors [s]
ΔT	permitted waterT differential [°C]
C_c	refrigerating power [W]
N_s	No. of partial loading steps

of chillers designed for air-conditioning or liquid cooling systems, standard UNI EN 378-2 is taken into consideration.



T1	Inlet water T
T2	Outlet water T
A	inertial tank

⚠ ATTENTION

The units are supplied as standard with a device that controls the water flow rate (differential pressure switch or flow switch) on the hydraulic circuit. Any tampering with this device will immediately invalidate the warranty.

Installing a metal net filter on the water inlet piping.

7.5 SAFETY DEVICES ON THE HIGH PRESSURE SIDE

Cooling circuit safety devices are provided on each refrigerant circuit according to the volumetric capacity of the compressors installed, as prescribed by Directive 97/23 (PED); in particular, with respect to equipment design, this Directive requires manufacturers to abide by the technical standard nearest to the type of object produced; in the case

8 ELECTRICAL CONNECTIONS

8.1 GENERAL INFORMATION

⚠ DANGER

Before carrying out any operation on electrical parts, make sure that there is no applied voltage.

Check that the mains electricity supply is compatible with the specifications (voltage, number of phases, frequency) shown on the unit rating plate.

The power connection is made by means of a three-core cable plus neutral and earth cable or single-core cables (one per phase) + earth.

⚠ ATTENTION

The size of the cable and line protections must be dimensioned according to the minimum recommended protection provided in the wiring diagram.

The supply voltage may not undergo fluctuations exceeding $\pm 10\%$ and the unbalance between phases must always be below 2%.

⚠ WARNING

The unit must operate within the above values, or the warranty will be invalidated.

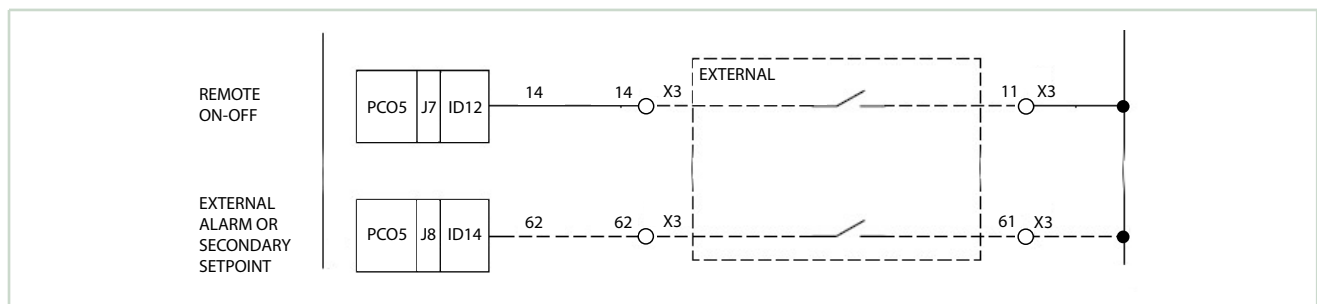
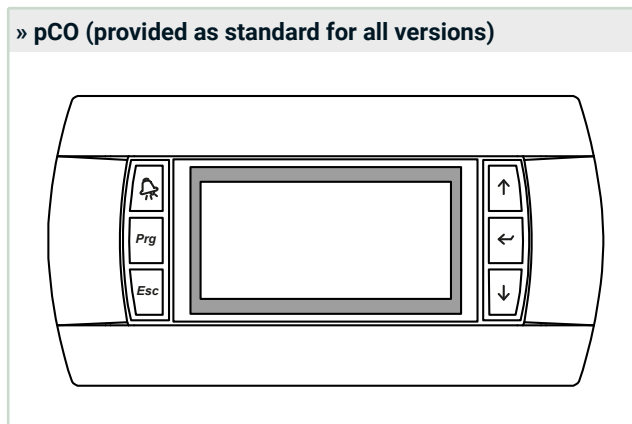
Carry out the electrical connections following the wiring diagram provided with the unit, as well as current regulations.

8.2 REMOTE CONTROLS





If you intend to launch a remote control on the unit, you must remove the jumper between the contacts indicated in the wiring diagram and connect the remote control to the terminals themselves [see enclosed wiring diagram].

⚠ WARNING

All remote controls work with a very low voltage (24 Vac) supplied by the insulating transformer on the electric control board.



The user interface, pCO, consists of an LCD display and 6 keys. It can be used to execute all of the programme operations, show the conditions of the operating unit at any time and change the operating parameters. The functions of the 6 keys of the pCO interface are listed in the following table.

ICON	MEANING	DESCRIPTION
	ALARM	Press the ALARM key to access the alarm list. The button lights up when an alarm is triggered.
Prg	PROGRAM	Press the PRG key to access the main menu or to edit a parameter.
Esc	ESC	Press ESC to move up to a higher level in the menu.
	UP	Press UP to go to the next screen or increase the value of a parameter.
	ENTER	Press ENTER to access a parameter to be edited, to confirm editing of a parameter or to select a menu item.
	DOWN	Press the DOWN key to go to the previous mask or to decrease the value of a parameter.

 **ATTENTION**

If an alarm is triggered and the ALARM button (the bell) lights up, do not press the ALARM button to reset the alarm and immediately contact our After Sales Service. For the full list of alarms, refer to the documentation enclosed with the unit.

 **DANGER**

All service operations on the control equipment must be carried out **EXCLUSIVELY BY QUALIFIED PERSONNEL**: incorrect calibration values can cause serious personal injuries and damage the unit.

9 START-UP

9.1 PRELIMINARY CHECKS

- Check that all the valves in the cooling circuit are open.
- Check that the electrical connections have been made properly and that all the terminals are securely tightened. This check should also be included in a periodic six-month inspection.
- Check that the voltage at the RST terminals is $400\text{ V} \pm 10\%$ and make sure the yellow indicator light of the phase sequence relay is on. The phase sequence relay is only fitted on units with a three-phase power supply and it is distinguished by the abbreviation RSF; if the sequence is not duly observed, it will not enable the unit to start.
- Make sure that there are no refrigerant leaks due to accidental impacts during transport and/or installation.
- Check that the water connections have been properly made according to the indications given on the plates located on the unit itself and the dimensional drawings enclosed with the unit's documentation.
- Make sure that the water circuit is duly bled to completely eliminate the presence of air: fill the circuit gradually and open the air vent valves on the top part, which the installer should have set in place.
- Check that the machine has been electrically powered for at least 12 hours before the agreed start time to allow the crankcase heaters to preheat the oil.

 **WARNING**

The insertion of the resistors must be made at least 12 hours before, and takes place automatically closing the main switch. They are intended to elevate the T oil sump limiting the amount of refrigerant dissolved in it.

Water Connections:

- Attention: the unit is loaded with R744 refrigerant – Group II (non-hazardous substances).
- The heat pumps are intended to be integrated into systems, even complex ones, that employ water as a heat transfer fluid. Although all the components used in the hydraulic circuits are designed for this purpose by using suitable materials, we recommend checking the quality of the water used to fill and top up the system to ensure constant performance of the unit over time and avoid unpleasant failures.
- Water connections must be carried out respecting the inlets and outlets as marked on the connections and on the enclosed documentation. Take great care not to reverse the circuits.
- Provide cut-off valves on the water side to be able to intercept the unit respect to the system and insert a net filter (which can be inspected) on each water circuit.
- Load the water circuits and make sure you bleed out all the air inside them via the vents located on the highest points of the pipes and at the top of the tank, if there is one.

Electrical connections:

- **WARNING** the unit is not equipped with magneto-thermal protection. Provide for suitable protections before connecting the unit to the mains.
- Remove the front panel and the two screws under the instrument panel. Lift the interlocking cover to access the electric panel
- Introduce the power supply cable on the back of the electric panel.
- Connect the power supply and earthing wire to the terminals.
- Power on the equipment via the externally arranged protections.
- Put the main switch in the electric panel at the ON position.
- Close the electric panel and lock it with the screws removed earlier

Start-up:

- The clamping screws of the compressor must be loosened before start-up. If the unit is moved, completely secure the compressor with the screws again.
- Check that all valves of the water circuits are open and water flows properly (the flow alarm should not be triggered).
- Put the main switch at the ON position
- The unit is now in standby mode; start it as indicated in the manual
- Check that the water temperature on the source side does not exceed $20\text{ }^{\circ}\text{C}$ and that the inlet temperature on the user side does not exceed $35\text{ }^{\circ}\text{C}$.
- Check the water circuits for leaks.
- Completely turn off the unit.

Use:








- Consult the manuals supplied for all maintenance and/or advanced set-up operations.

 **WARNING**

When setting up the unit respect the legislative regulations of the State where the machine is installed. Responsibility for the correct use is borne by the user

9.2 STARTING THE UNIT


Ad for the commands mask, there can be different configurations based on the type of unit or the settings of the final user. The following table shows the various icons that may be featured, with their relative meaning.

POS.	ICON	DESCRIPTION
1		Main ON-OFF of the unit.
2		Access to information menu (work sizes, device status, software version).
		Selection of utility cold/hot mode (summer/winter). (IF APPLICABLE).
3		Adjustment of set-points of all utilities (air conditioning/DHW).
		Adjustment of air conditioning system set-point.
4		Access to advanced user/maintenance/manufacture parameters menu.
		DHW set-point adjustment.

Switching on from local or remote display:

To switch the unit on from the local/remote display, enter



the command screen and select the start command , then press ENTER to access the switch-on mask:



Use the UP or DOWN keys to select the new status; press ENTER to confirm the new status or press ESC to exit without changing the status.

The group will start if an enabling signal is received:

- linked to safety devices related to the water circulation pump(s)
- by the flow switch (or differential pressure switch)
- by the T sensor measuring the temperature of the water returning from the system (chiller inlet)
- there are no triggered alarms; if there are, clear the alarm to be able to start-up the unit.

WARNING

If the unit fails to start up, check whether the service thermostat has been set at the rated calibration values.

Switching on from digital input:

If remote ON-OFF has been enabled from the digital input, the input must be closed (with inverse logic) so that the unit can start (open with direct logic). Refer to the wiring diagram enclosed with the unit to correctly identify the terminals designed for the ON-OFF functions from the digital input.

ATTENTION

The remote ON/OFF terminals are normally bridged. In this case if you wish to use this function, remove the bridge and place a potential-free contact. The contact draws the 24Vac voltage directly from the unit. The digital input must be configured correctly.

Switching on from supervisor:

If ON-OFF from the supervisor is among the options selected, then the communication port BMS must be configured and the following values must be written on the variable:

- 0 = unit OFF
- 1 = unit ON

See the list of supervision variables featured in the documentation enclosed with the unit for the address of the specific variable.

ATTENTION

Before switching ON-OFF from the supervisor, make sure that the communication port has been configured properly, that the bus is wired correctly and with a suitable cable, and that the communication protocols are compatible.

Switching on from the LAN network Master:

If the unit is inserted in a LAN network between units, the start consent is determined by the Master logics and the final user cannot force starting. In this case the user can only switch the unit off, using the main switch on the local display.

ATTENTION




You should not disconnect the unit from the power supply during periods when it is idle but only when it is to be taken out of service for a prolonged period (e.g. at the end of the season).

WARNING

If one or several options among the ones listed in this paragraph have been activated, all the selected sources must provide their consent to switch on the unit.

9.3 SELECTING THE OPERATING MODES (IF APPLICABLE)

The active mode of the utility is indicated in the status bar on the main mask. The following table summarises the possible indications:

POS.	ICON	DESCRIPTION
1		SUMMER MODE ACTIVE
2		WINTER MODE ACTIVE
3		DISABLED UTILITY

In the "DISABLED UTILITY" mode, the unit only produces heat for Domestic Hot Water. In this case, the unit remains in standby if there is no DHW call.

For cooling/heating reversible units, the software offers various ways of selecting the mode, namely:

1. Select from local display
2. Select from remote display
3. Select from digital input
4. Select from supervisor

WARNING

To avoid incompatible mode choices, only one option can be selected.

WARNING

The "UTILITY DISABLED" function (OFF option from the display) can only be selected from the remote or local display.

Selection from the local or remote display:

To select the mode from the local display, select the command



from the command panel and press ENTER to access the setting mask of the operating mode.



Use the UP or DOWN keys to select the new status; press ENTER to confirm the new status or press ESC to exit without changing the status.

The selection from the local or remote display allows you also to choose the OFF mode, namely to disable the utility. In this case if the unit is multi-purpose, it will only start for domestic hot water production.

Selection from the digital input:

If the selection has been enabled from the digital input, the input must be closed (with inverse logic) so that the unit can be in summer mode (open with direct logic). In summer mode, the unit sets up to produce cold water, in winter mode, hot water. Refer to the wiring diagram enclosed with the unit to correctly identify the terminals designed for switching from summer to winter mode and vice versa from the digital input.

ATTENTION

The terminals for mode selection are normally bridged. In this case if you wish to use this function, remove the bridge and place a potential-free contact. The contact draws the 24Vac voltage directly from the unit. The digital input must be configured correctly.

Selection from supervisor:

If the mode has been selected from the supervisor, then the communication port BMS must be configured and the following values written on the variable:

- 0 = summer mode
- 1 = winter mode

See the list of supervision variables featured in the documentation enclosed with the unit for the address of the specific variable.

ATTENTION

Before using the mode, make sure that the communication port has been configured properly, that the bus is wired correctly and with a suitable cable, and that the communication protocols are compatible.

9.4 SETTING THE SET-POINTS

To modify the operating set-point, select one of the following icons from the command menu based on the active configurations and press ENTER:



- to change the air-conditioning utility set-point



- to change the domestic hot water set-point (DHW)



- to change utility and DHW set-points (if applicable)

Once you have entered the setting template:



1. Use the UP key to increase the set-point
2. Use the DOWN to decrease the set-point
3. Press ENTER to confirm the new value
4. Press ESC to quit without changing the set-point

WARNING

For supplementary functions to be applied to the set-point, see the specific paragraph of the microprocessor enclosed with the unit's documentation.

9.5 CHECKS DURING OPERATION

- Check the relay on the control board to verify whether the phases occur in the correct sequence: if they do not, disconnect the unit from power supply and reverse two phases of the three-core cable at the unit input. Never attempt to modify internal electrical connections: any undue modifications will render the warranty null and void.
- Check that the water temperature at the outlet of the gas cooler is close to the user pump set point (70 °C).
- Check that high and low pressure levels are stable and consistent with the application.
- Also check that the end-of-evaporation temperature shown on the pressure gauge is about 4 °C below the temperature of the water leaving the evaporator.
- Make sure the superheating of the refrigerant fluid is greater than 2 °C. To do this:
 - detect the temperature indicated by a contact thermometer placed on the compressor intake pipe;
 - read the temperature indicated on the scale of a pressure gauge likewise connected to the intake side.
- The degree of superheating is given by the difference between the temperatures thus determined.

ATTENTION

All the units of the series are loaded with R744 refrigerant. Any top-ups must be made using the same type of refrigerant and are part of the extraordinary maintainers conducted by qualified personnel.

DANGER

- CO₂ is an odourless and colourless gas and cannot be perceived directly in case of emission.
- Lost of consciousness and danger of suffocation by inhaling higher concentrations.
- Avoid CO₂ emission and uncontrolled deflating, particularly in closed rooms. The circuit safety valve must be conveyed to an outside environment.
- Liquid CO₂ evaporates quickly, cools down at the same time and forms dry ice : danger of cold burns and frost bites.
- When filling the system with CO₂, wear gloves and goggles.

If uncontrolled CO₂ emissions occur, take the following measures:

- When gas is emitted, leave the room immediately, warn people and guarantee a sufficient aeration.
- Do not enter the zone without a self-contained breathing apparatus as long as the harmlessness of the atmosphere has not been proven.
- Stay outdoors on the wind-facing side. Block the area.
- Replace the pressure relief valves of the compressors after deflating because the opening pressure may be reduced after this procedure.
- After the deflating, check the tightness of the safety valves and replace them, if necessary.

ATTENTION

the R744 refrigerant requires "PAG" oil of the type indicated on the compressor data plate. For no reason should a different type of oil be introduced into the oil circuit.

9.6 STOPPING THE UNIT

The unit can be stopped by pressing the "OFF" control on the front panel of the display on the switch-on mask.

ATTENTION

To stop the unit do not disconnect it using the main switch: this device must only be used to disconnect the unit from the power supply without current flow, i.e. when the unit is switched OFF.

10 ROUTINE MAINTENANCE AND CHECKS

Operating these units reduces itself to turning them on and off and to seasonal changeover between cooling and heating (if applicable).

All other operations are maintenance tasks and must be performed by qualified personnel who are able to operate according to the laws and regulations in force.

10.1 REQUIREMENTS

DANGER

The use of R744 refrigerant leads to higher temperatures and pressures in the circuit than traditional refrigerants. Therefore, even more attention should be paid to unit start-up, up to speed operations and maintenance. Maintenance and panels removal must only be carried out when the unit is OFF. This will prevent scalding hazards and explosion-related hazards due to the presence of pressurised circuits.

Maintenance and panels removal must only be carried out when the unit is OFF. This will prevent scalding hazards and explosion-related hazards due to the presence of pressurised circuits.

ATTENTION

All the operations described in this chapter MUST ALWAYS BE PERFORMED BY QUALIFIED PERSONNEL

WARNING

Before carrying out any work on the unit or accessing internal parts, make sure you have disconnected it from the mains power supply.

WARNING

The top part and the supply piping of the compressor are at high temperatures. Be especially careful when working close by with open panelling.

ATTENTION

After completing maintenance jobs, always replace the panels enclosing the units and secure them with the fastening screws provided.

10.2 MAINTENANCE TABLE

To make sure performance remains constant in time, it is recommended to respect the following maintenance and control schedule.

» Routine maintenance and checks

Activity	Frequency
Check the efficiency of all the control and safety devices.	Yearly
Check the terminals on the electric control board and compressor terminal boards to ensure that they are securely tightened. The movable and fixed contacts of the contactors must be periodically cleaned and replaced whenever they show signs of deterioration.	Yearly
Check the refrigerant level by means of the unit performance control.	Yearly
Check the oil levels through the indicators provided on the compressor crankcases.	Yearly
Check the water circuit for leaks.	Every 6 months
If the unit is to remain inactive for a long period of time, discharge the water from the piping and from the heat exchanger. This operation is of the utmost importance especially when there are periods while the unit is idle in which the temperature drops below the freezing point of the fluids used.	Yearly
Check that the water circuit is full.	Every 6 months
Check the efficient operation of the flow switch or differential pressure switch.	Yearly
Clean the external metal filters in the hydraulic lines.	Yearly

10.3 REPAIRING THE COOLING CIRCUIT

ATTENTION

While performing repairs on the cooling circuit or maintenance work on the compressors, make sure the circuit is left open for as little time as possible. Even if briefly exposed to air, ester oils tend to absorb large amounts of humidity, which results in the formation of weak acids.

If the refrigeration circuit has been repaired, the following operations must be carried out:

- leak test;
- refrigeration circuit vacuum and drying cycle;
- refrigerant charge

WARNING

If the system has to be drained, always recover the refrigerant present in the circuit using suitable equipment; the refrigerant should be handled exclusively in the liquid phase.

10.4 SEAL TEST

To carry out the seal test, it is necessary to:

1. fill the circuit with anhydrous nitrogen supplied from a tank with a pressure-reducing valve until the pressure rises to 80 bar, during this phase check that all valves are open.;
2. the sealing test must be done also on the high pressure side by closing the compressor delivery tap and the electronic expansion valves (refer to the attached cooling circuit scheme). In this case a pressure of 125 bar must be reached by pressing from a high pressure connection.

 **ATTENTION**

During the pressurisation phase, do not exceed the pressure setting of the safety valves; otherwise you will cause the latter to open.

The presence of any leaks must be determined using special leak detectors. Should any leaks be detected during the test, empty out the circuit before repairing the leaks with suitable alloys.

 **DANGER**

Do not use oxygen in the place of nitrogen as a test agent, since this could cause a risk of explosion as well as the certainty of extensive oxidisation in high-temperature areas.

11 RETIRING THE UNIT

When the unit has reached the end of its working life and needs to be removed and replaced, a series of operations should be carried out:

- the refrigerant gas it contains should be recovered by specialised personnel and sent to a waste collection facility;
- The lubricating oil in the compressors should also be recovered and sent to a waste collection facility;
- If the framework and components cannot be reused, they must be separated and scrapped according to the type of material: this applies especially for the considerable quantities of copper and aluminium present in the unit.

This will make the job of waste collection, disposal and recycling facilities easier and minimise the environmental impact of the dismantling.

ATTENTION

The unit, or a part of it, should be decommissioned. The parts liable to cause any hazard must be rendered harmless.

Special and toxic-harmful waste must be collected by authorised companies.

Disposal of special and toxic or harmful waste must be carried out in compliance with the law provisions in force in the user's country.

Dismantling, disposal and scrapping operations must be carried out by qualified personnel.

WARNING

Remember that whenever a part is replaced and the used part must be disposed of separately, always refer to the relative laws in force.

Please note that it is mandatory to record the loading and unloading of special and toxic-harmful waste.

Dismantle the unit according to the requirements imposed by law in force in the user's country. Before demolishing the unit, ask the relative Authority to perform an inspection and issue a report.

Lastly, scrap the unit in compliance with the applicable laws in the user's country.

11.1 Waste electrical and electronic equipment management

This product falls within the application scope of the Directive 2012/19/EU concerning the management of waste electrical and electronic equipment (WEEE).

ATTENTION

Equipment must not be disposed of with household waste as it is made of different materials that can be recycled at special facilities. Please inquire through your municipal authorities as to the location of the eco-friendly waste

management sites where waste can be received for disposal and its subsequent recycling as recommended.

Read the instructions carefully before using the equipment for the first time. It is strongly recommended not to use the product for any purpose other than that for which it was designed, to prevent the risk of electric shock if the product is used incorrectly.

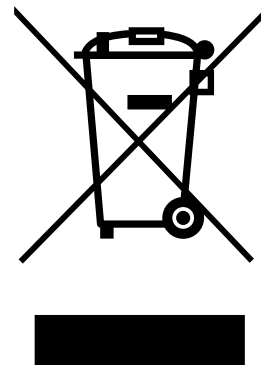
Furthermore, please note that, when an equivalent appliance is purchased, the seller is expected to collect free of charge the old product to be disposed of.

WARNING

The product is not potentially dangerous for human health and the environment, as it does not contain any harmful substances according to the Directive 2011/65/EU (RoHS), but if disposed of freely in the environment, it might adversely affect the ecosystem.

The crossed-out wheellie bin symbol on the equipment label indicates that the equipment is compliant with the Waste Electrical and Electronic Equipment (WEEE) Directive.

Disposing of the equipment freely in the environment or illegally disposing of the equipment are punishable by law.



11.2 Environment protection

The law implementing the regulations [reg. EEC 2037/00] which govern the use of ozone-depleting substances and greenhouse gases bans the dispersal of refrigerant gases in the environment and requires whoever is in their possession to recover them and, at the end of their useful life, either to return them to the dealer or take them to a suitable waste disposal facility.

The refrigerant, although not harmful to the ozone layer, is listed among the substances responsible for the greenhouse effect and must therefore be used in compliance with the above obligations.

ATTENTION

Therefore, special care should be taken when carrying out maintenance work to minimise refrigerant leaks.

11.3 Packaging disposal

The QR Code below is shown on a label on the packaging of the machine, which allows the user to identify the nature of the packaging used in order to follow the correct disposal procedure.



ATTENTION

For disposal of packaging, always refer to local laws that implement Directives 2018/851/UE and 2018/852/UE.

12 TROUBLESHOOTING

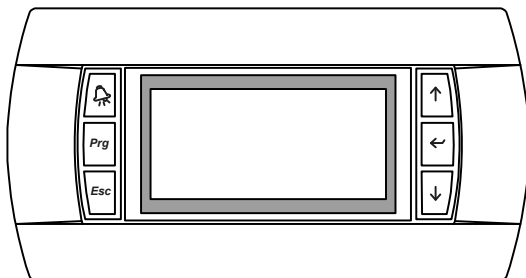
12.1 UNIT ALARM

ATTENTION

IF AN ALARM IS TRIGGERED AND THE ALARM BUTTON (THE BELL) LIGHTS UP, DO NOT PRESS THE ALARM BUTTON TO RESET THE ALARM AND IMMEDIATELY CONTACT OUR AFTER SALES SERVICE. FOR THE FULL LIST OF ALARMS, REFER TO THE DOCUMENTATION ENCLOSED WITH THE UNIT.



ALARM KEY -



» Troubleshooting

FAULT	ANALYSIS OF POSSIBLE CAUSES	CORRECTIVE ACTIONS
The unit does not start	No electrical power supply.	Check its presence both on the primary and auxiliary circuit.
	The circuit board is not powered.	Check the fuses.
	There are alarms present.	Check the microprocessor panel for the presence of alarms, eliminate their cause and restart the unit.
Faulty high pressure	BP (Back Pressure) valve 100% open.	Unit too loaded, discharge circuit.
	Clogged thermostatic valve and /or filter. Such faults may occur in the presence of low pressure.	Check the temperature upstream and downstream the valve and filter and have them replaced, if necessary.
	Insufficient water flow rate if heat pump is operating.	Check the pressure drops of the water circuit and/or the correct operation of the pump [rotation direction].
Low pressure on the high pressure side	Faulty transducers.	Check the transducers and the correct operating of the depressor on the Schrader valves to which they are connected.
	Low water temperature if heat pump is operating.	Make sure the thermal load is adequate for the power of the unit.
Low evaporation pressure	Low water flow rate.	Check the correct rotation of the pumps. Check for load losses on the hydraulic circuit. Check the tightness of the one-way valve of the pump unit (optional).
	Inlet water temperature on the user side too high	Check that the inlet water temperature on the user side is below 45 °C.
	Low water flow rate on the user side	Check that the difference between user inlet water temperature on user side and outlet temperature at the gas cooler is < 10 K.
	Low level of refrigerant	Check the charge by measuring the approach between the evaporator temperature and the outlet water temperature on the source side. It must be < 8 K.

12.2 TROUBLESHOOTING

The most common causes that can block the heat pump or cause a malfunction are listed in the following pages. They are listed according to the easily identifiable symptoms.

WARNING

Be very careful when carrying out the various recommended problem-solving operations: overconfidence can cause serious injuries for unskilled persons. It is therefore recommended to contact the manufacturer or a qualified technician after having identified the cause.

The compressor does not start	The internal thermal protection has tripped.	Check the status of the thermal contact in models equipped with protection modules. Identify the causes after restarting.
	Tripping of circuit breakers or fuses in line after short circuit.	Check the cause by measuring the resistance of the individual coils and the isolation towards the chassis before re-connecting the power.
	Intervention of HP or LP switches.	Check on the microprocessor, eliminate the causes.
	The phases in the distribution cabin have been inverted.	Check the phase sequence relay.

 **WARNING**

For complete and detailed information on the identification of unit faults and on the search for possible causes and solutions, please refer to the attachment "List of alarm variables".

This document contains the complete list of alarm codes, providing for each item the description and possible actions to be taken to resolve or understand the cause of the problem.

13 SAFETY DATA SHEET OF REFRIGERANT

For refrigerant fluid safety data sheet, please refer to the documents supplied with the unit.



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