

WCH-iZ

230 - 450

MANUAL

FOR INSTALLATION,
USE AND MAINTENANCE



MOCN00004-00 - 09-20

R1234ze

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

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Manual

The manual allows a correct unit installation, use and maintenance.

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

Follow the instructions given to avoid damage to things or persons.

Preliminaries

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

Risk situations

The unit has been designed and created to prevent injuries 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.

Intended use

Use the unit only:

- cooling water or a water and glycol mix for air-conditioning
- 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.

Installation

Internal installation

Provide a mechanical ventilation system sized in accordance with local regulations in force according to the type of installation.

The operation of this system must take place as indicated by these safety regulations.

In particular, refer to standard EN 378-3.

The location, the hydraulic system, the refrigerator, the electrical system and the air ducts must be established by the plant designer in accordance with the local legislation in force.

Follow local safety regulations.

Check that the characteristics of the electrical network comply with the data on the unit's data plate.

Maintenance

Plan periodic inspections and maintenance to avoid and limit repair costs.

Remove power before each operation.

Pay particular attention to:

⇒ warnings / prohibitions / danger indicating particularly important operations or information, operations that cannot be done, which compromise the functionality of the unit or which may cause damage to things or persons.

Before any work read:

⇒ Chapter. MAINTENANCE SAFETY
WARNINGS FOR OPERATIONS ON
UNITS CONTAINING R1234ze



Internal installation

1 SAFETY CONSIDERATIONS

Modification

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

Breakdown/Malfunction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

Use original spares parts only.

Using the unit in case of breakdown or malfunction:

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

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.

Data update

Continual product improvements may imply manual data changes.

Visit manufacturer web site for updated data.

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.

In case of breakdown or malfunction

- Immediately deactivate the unit
- Contact a service centre authorized by the manufacturer

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

Unit identification

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

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

- unit type
- serial number (12 characters)
- year of manufacture
- wiring diagram number
- electrical data
- type of refrigerant
- refrigerant charge
- manufacturer logo and address

The matriculation plate must never be removed.

It contains fluorinated greenhouse gases.

Serial number

It identifies uniquely each unit.

Must be quoted when ordering spare parts.

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.

Series
Size
Serial number
Year of manufacture
Number of electrical wiring diagram

Physical characteristics of the R1234ze refrigerant

Safety class (ISO 817)	A2L	
LFL Low flammability limit	0.303	kg/m ³ @T>30°C
BV Burning velocity	0	cm/s
Boiling point	-19	°C
GWP	7	100 yr ITH
GWP	<1	AR5 - 100 yr ITH
Self-ignition temperature	368	°C

Check on arrival

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:

- Immediately make a note of the found damage on the transport document and write the wording: "Accepted subject to checking due to evident shortages/damages due to transport".
- Contact by fax and registered mail with advice of receipt to supplier and the carrier.

⇒ Complaints must be made within 8 days of receipt, reports after this deadline are not valid.

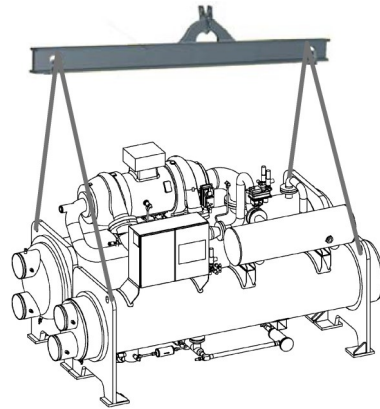
Storage

Respect the indications on the outside of the pack.

Handling

- ⇒ Verify unit weight and handling equipment lifting capacity .
- ⇒ Identify critical points during handling (disconnected routes, ramps, steps, doors).
- ⇒ Suitably protect the unit to prevent damage.
- ⇒ Align the barycenter to the lifting point
- ⇒ Gradually bring the lifting belts under tension, making sure they are positioned correctly.
- ⇒ Before starting the movement, make sure that the unit is in stable equilibrium.

Unit lifting



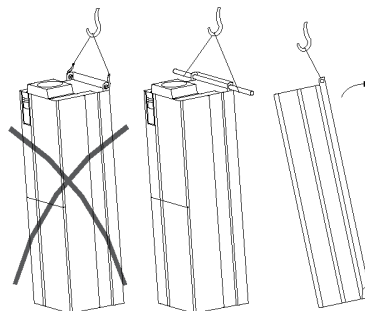
Inverter lifting

Use the appropriate lifting eyes.

Use a lifting bar to avoid bending the eyelets.

Control

Control
primary
acc
con



Control

Control
arrival
to
di
et
la
segna:
• Che
l'unità non
abbia subito
danni nel
trasporto
• Che il
materiale

Inverter weight		
Size	230 / 420	450
Weight kg	125	300

In positioning, consider these elements:

- Technical spaces required by the machine
- Electrical connections
- Hydraulic connections
- Functional spaces

Functional spaces

Functional clearances have the purpose of:

- Guarantee the proper functioning of the unit
- Allow maintenance operations
- Safeguard authorized operators and exposed persons

⇒ Respect the indicated functional spaces.

⇒ Double the functional spaces if several units are aligned.

Positioning

Units are designed to be installed:

- inside of
- In a fixed position
- Flat

Limit the transmission of vibrations:

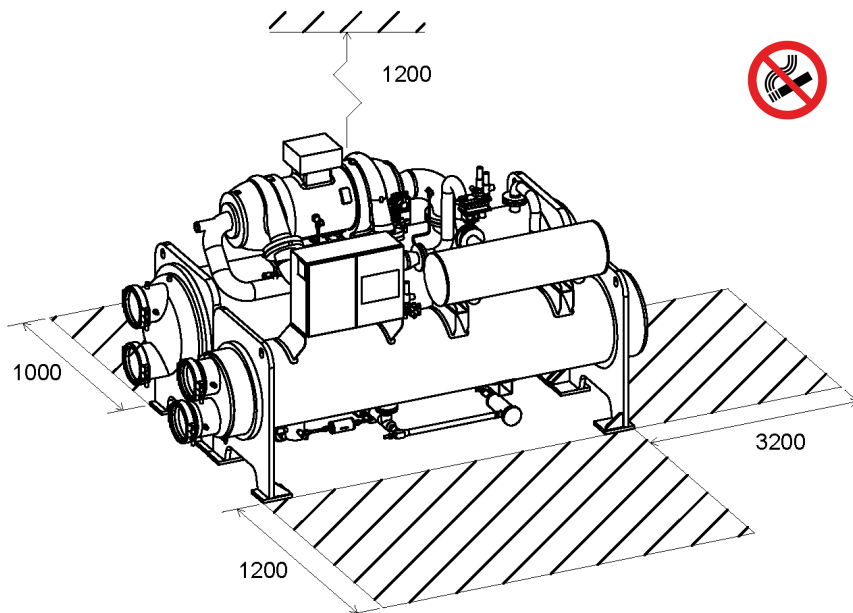
- Use antivibration or neoprene strips on the support points of the unit
- Install flexible joints on the hydraulic connections

Installation criteria:

- Customer approval
- Location accessible in safety
- Technical spaces required by the unit
- Maximum distance allowed by electrical connections
- Install the unit off the ground
- Check unit weight and bearing points
- Check that the support points are aligned and level
- Avoid places that may be subject to flooding
- A correct circulation of the air is mandatory to guarantee the good unit operating.

Avoid therefore:

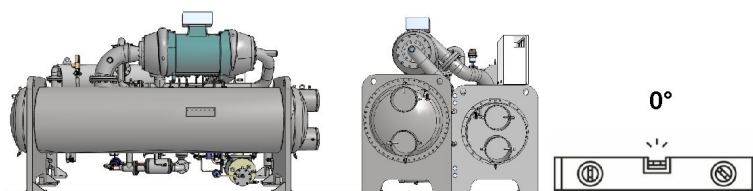
- obstacles to the airflow
- exchange difficulties



Caution:

Do not smoke or use open flames within this area

⇒ The unit must be positioned flat



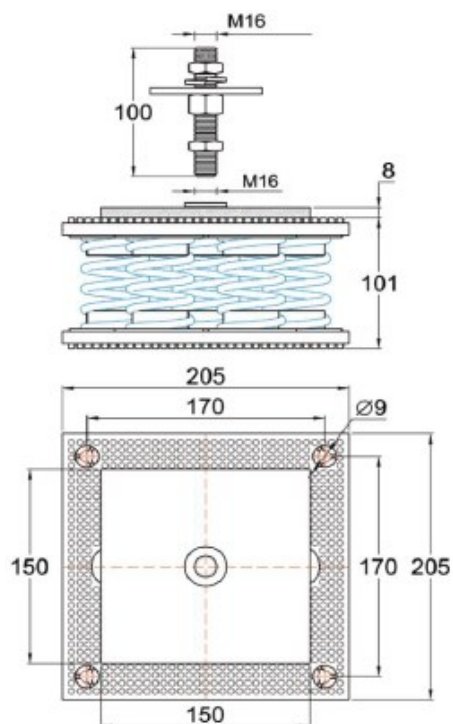
3 POSITIONING

ANTIVIBRATION - Option

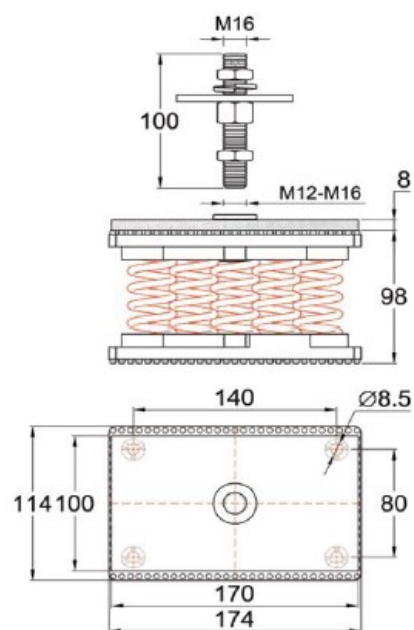


Spring loaded	PECL00013	PECL00014
Size	230 - 270 - 300 - 350	380 - 420 - 450
W1 = W2 = W3 = W4	RZ524-X207P	GvR433-245-147P

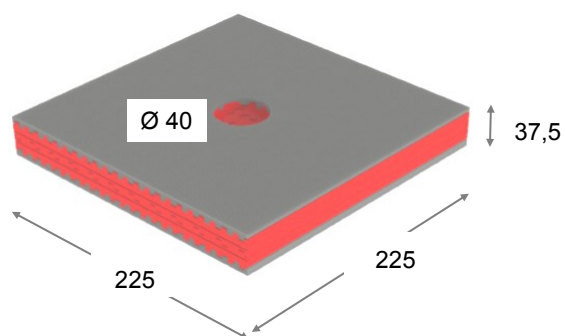
RZ524-X207P



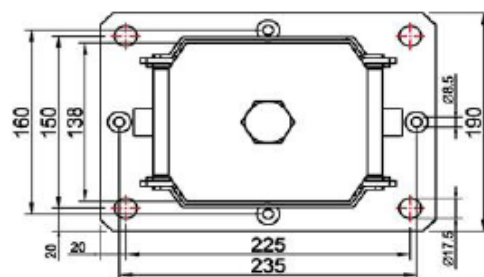
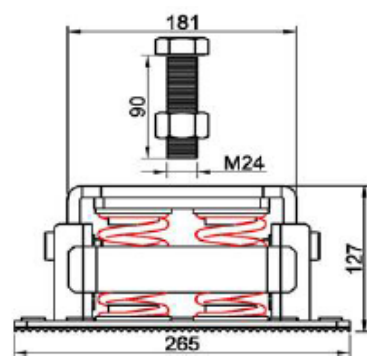
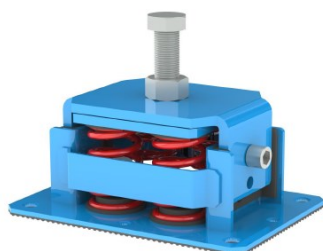
GvR433-245-147P



Rubber	PECL00028
Size	230 - 450
W1 = W2 = W3 = W4	45ShA



Anti-seismic	PECL00015	PECL00016
Size	230 - 270 - 300 - 350	380 - 420 - 450
W1 = W2 = W3 = W4	LaLV 448	LaLV 455



Inverter

⇒ Ensure the cooling of the inverter.

See dimensions page 40

Only size 550: install the pedestal under the inverter.

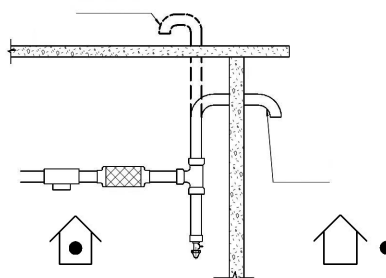
Inverter air cooling air flow rate		
Size	230 / 420	450
air flow m3h	1044	1504

Pressure relief valve gas side

The safety valve is used to protect the unit: it opens when the pressure inside the evaporator or condenser exceeds the nominal discharge pressure.

With the loss of refrigerant, the pressure decreases.

- follow local regulations (EN378)
- the exhaust pipe must be compatible with the R134a refrigerant.
- The diameter of the pipe depends on the size of the safety valve.
single valve: 25 mm
valves in parallel: 35 mm
- remove the safety valve cap.
- connect the safety valve to the drain pipe using the threaded connection.
- provide a liquid drain valve
- install an anti-vibration joint
- position the exhaust outlet of the external safety valve as shown in the figure.
- the exhaust outlet must be far from the building's external air inlets.



Preliminary information

Selection and installation of the system components must be carried out by the installer.

Risk of frost

If the unit or its hydraulic 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

Anti-freeze solutions

Consider that the use of anti-freeze solution determines an increase in a pressure drop.

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

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

Water flow-rate

The design water flow-rate must be:

- within the limits of use of the exchangers (see chapter TECHNICAL INFORMATION)
- guaranteed also with variable system conditions (for example, in systems where some circuits are bypassed in particular situations)

Minimum system water content

The minimum water volumes of the system are shown in the 'General technical data' section and must be respected to avoid continuous switching on and off of the compressors.

Water filter

It must be installed immediately at the entrance of the unit, in an easily accessible position for cleaning.

Degree of filtration: 0.87 mm

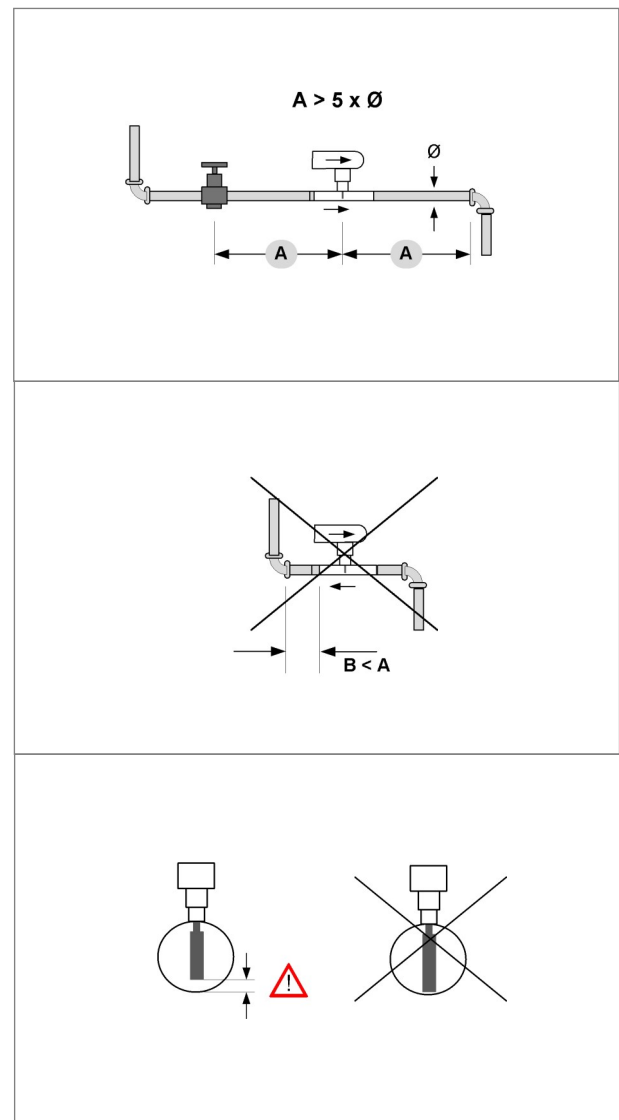
⇒ The filter must never be removed, the operation will void the warranty.

Flow

⇒ The flow switch must be designed to ensure the unit stops in the event of lack of water circulation.

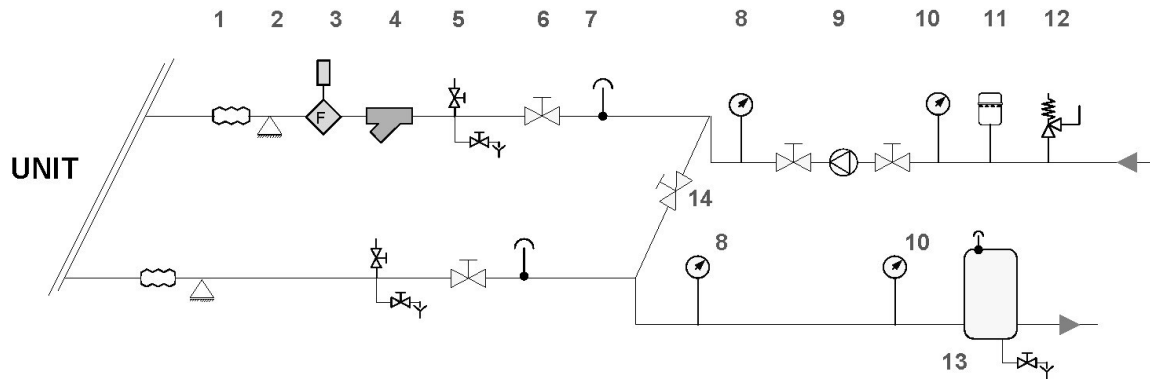
It must be installed in a straight section of the pipes, not near curves that generate harmful turbulence.

- installed near the entrance
- in a straight line, as shown in fig.
- check the mounting direction indicated by the arrow on the flow switch body
- calibrated at 50/60% of the nominal capacity of the unit
- connected to the electrical input on the unit



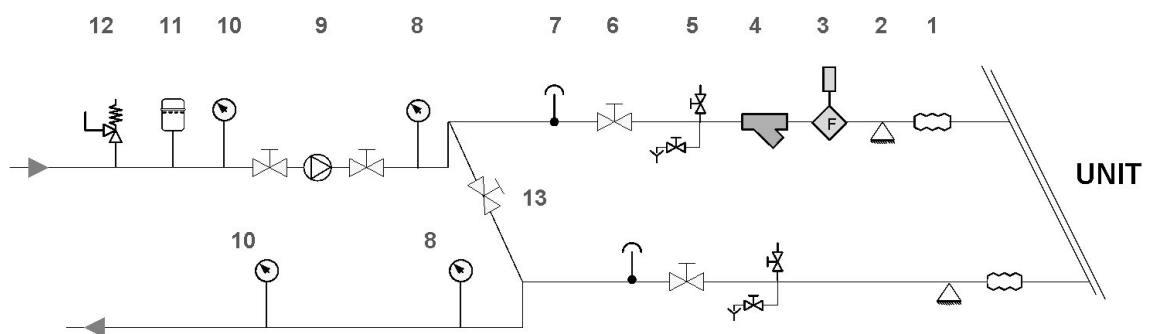
4 HYDRAULIC CONNECTIONS

USER SIDE CONNECTION



- | | |
|---|-------------------------------------|
| 1 anti-vibration joints | 8 pressure gauge |
| 2 piping supports | 9 pumping group |
| 3 water flow switch | 10 thermometer |
| 4 filter | 11 expansion vessel |
| 5 exchanger chemical washing valve
+ drain valve | 12 safety valve |
| 6 shut-off valve | 13 inertial accumulation |
| 7 vent | 14 exchanger chemical washing valve |

SOURCE SIDE CONNECTION



- | | |
|---|-------------------------------------|
| 1 anti-vibration joints | 7 vent |
| 2 piping supports | 8 pressure gauge |
| 3 water flow switch | 9 pumping group |
| 4 filter | 10 thermometer |
| 5 exchanger chemical washing valve
+ drain valve | 11 expansion vessel |
| 6 shut-off valve | 12 safety valve |
| | 13 exchanger chemical washing valve |

Water quality

Water features:

- confirming to local regulations
- within the limits indicated by table

The quality of the water can be verified by specialized personnel.

Water with inadequate characteristics can cause:

- pressure drop increase
- energy efficiency decrease
- increase in corrosive phenomena

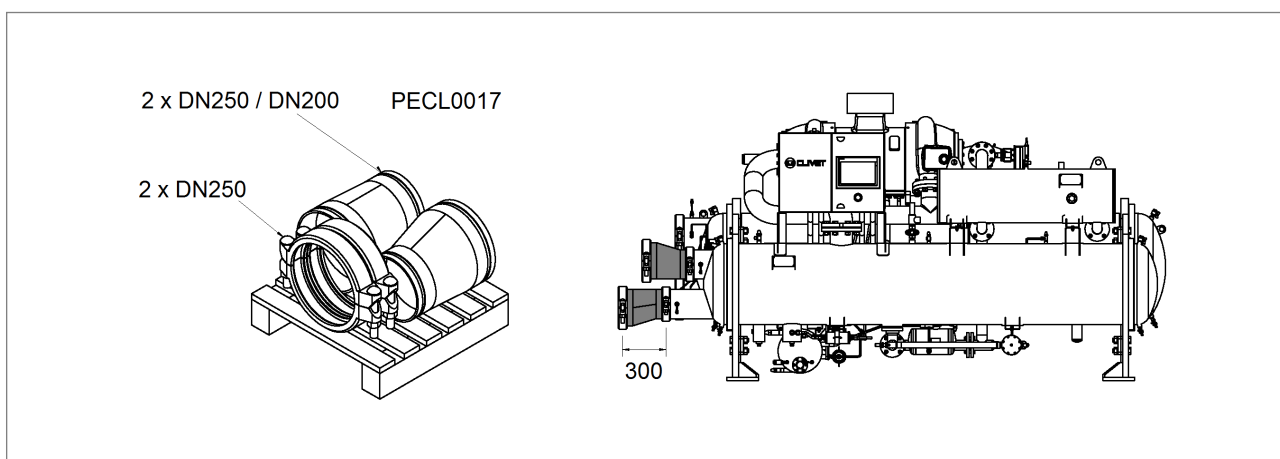
⇒ Provide a water treatment system if values fall outside the limits.

⇒ The warranty does not include damages deriving from limestone formations, incrustations and impurities from the water supply and / or from the failure to clean the systems.

Acceptable values of water quality	
pH (25°C)	6.8 - 9.0
Electrical conductivity (μS/cm) (25°C)	< 800
Chloride ion (mg Cl ⁻ /l)	< 150
Chlorine molecular (mg Cl ₂ /l)	< 5
Sulphate ion (mg SO ₄ ⁻ /l)	< 100
Sodium nitrate (mg NaNO ₃ /l)	< 100
Alkalinity (mg CaCO ₃ /l)	< 100
Total Hardness (mg CaCO ₃ /l)	< 200
Iron (mg Fe/l)	< 1.0
Copper (mg Cu/l)	< 1.0
Sulphide ion (S ⁻ /l)	none
Ammonium ion (mg NH ₄ ⁺ /l)	< 1.0
Silica (mg SiO ₂ /l)	50
Maximum particle size to pass (filtration limit) through heat exchanger (mm)	0.87
Total dissolved solids (mg/l)	< 1500
Max Ethylene, Propylene glycol	50%

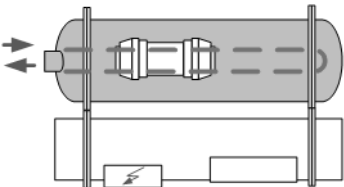
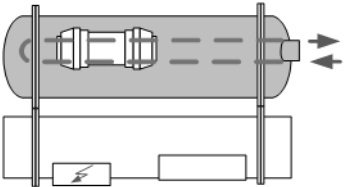
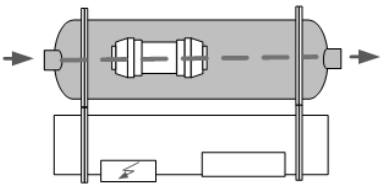
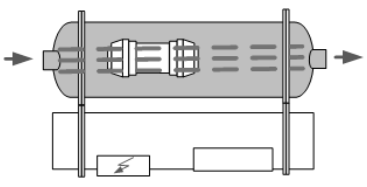
Size of condenser connection 380 - 420

Install the reductions DN 250 > DN 200 supplied with the unit

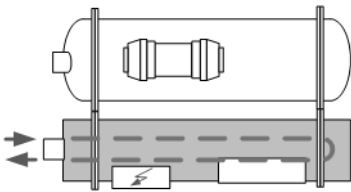
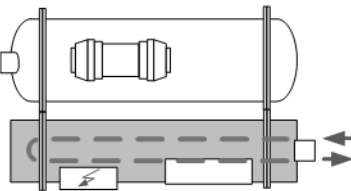
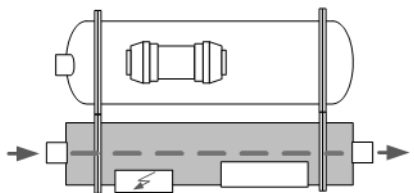
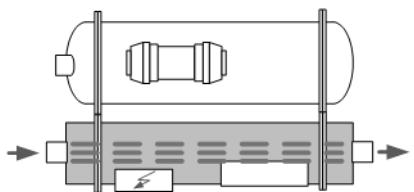


4 HYDRAULIC CONNECTIONS

Configuration of hydraulic connections EVAPORATOR

Water flow-rate	Number of passes	Water fittings	scheme
Standard DT = 5°C	2	Left (Std)	
		Right (option)	
High DT <4 ° C	1	opposed	
Low DT > 7 ° C	3	opposed	

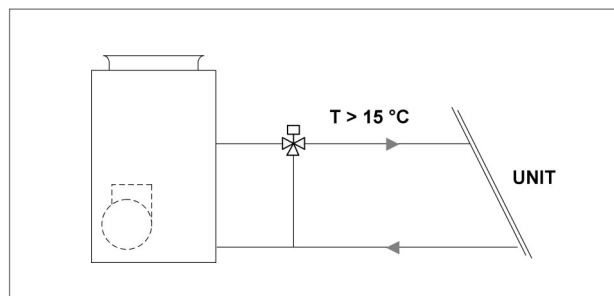
Configuration of hydraulic connections CONDENSER

Water flow-rate	Number of passes	Water fittings	scheme
Standard DT = 5°C	2	Left (Std)	
		Right (option)	
High DT < 4 ° C	1	opposed	
Low DT > 7 ° C	3	opposed	

4 HYDRAULIC CONNECTIONS

Evaporative tower connection

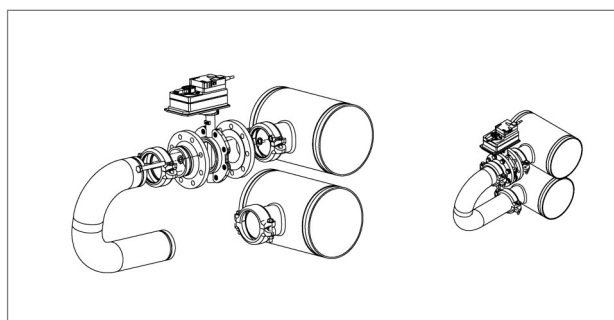
If the unit is used with low outdoor temperatures, provide a bypass circuit in order to keep the condenser inlet temperature above 15 °C.



Bypass valve CONDENSER - option

The by-pass valve is supplied separately and must be installed between the water inlet and outlet on the condenser side.

If the source water temperature falls below the unit operating limits (<19 °C in input) it is possible to use the by-pass valve to reduce the effective water flow to the condenser by raising the condensing pressure and keeping the unit running.



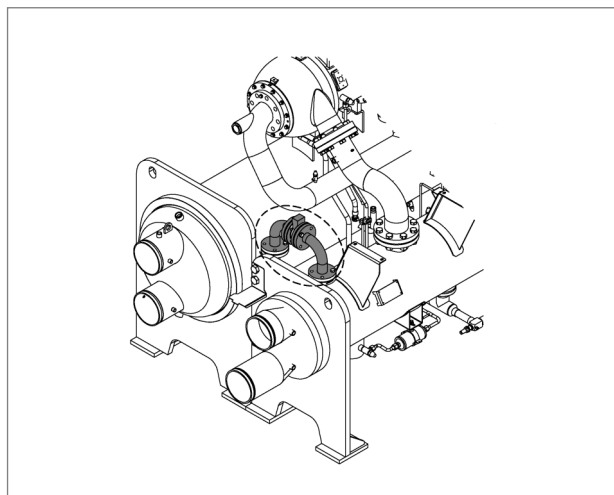
Size	Code
230	PECL00008
270	PECL00009
300-350	PECL00010
380-420	PECL00011
450	PECL00012

Hot gas by pass - opzione

Si tratta di una valvola a sfera motorizzata, posizionata sul lato refrigerante tra evaporatore e condensatore.

Ha la funzione di bypassare una parte del refrigerante, nel caso in cui sia richiesta una parzializzazione della capacità al di sotto di quella consentita dalla macchina standard.

Fornisce inoltre una protezione aggiuntiva contro il surge, nel caso in cui la temperatura dell'acqua di condensazione sia al di fuori dei limiti di funzionamento.



Operations sequence

Close all the vents at the high points of the hydraulic circuit of the unit.

Close all drain cocks present at the low points of the hydraulic circuit of the unit:

- Exchangers, pumps, manifolds, storage tanks
 - 1 Accurately wash the system with clean water: fill and drain the system several times.
 - 2 Apply additives to prevent corrosion, fouling, formation of mud and algae.
 - 3 Fill the system
 - 4 Perform a leak test.
 - 5 Isolate the pipes to avoid heat dispersions and formation of condensate.
 - 6 Leave various service points free (wells, vents, etc).
- ⇒ Neglecting washing will require numerous interventions to clean the filter and in the worst cases it can lead to damage to exchangers and other components.

The characteristics of the lines must be determined by personnel authorized to design electrical systems, complying with the regulations in force.

The protective equipment of the unit supply line must be able to shut-off the presumed short circuit current, which value must be determined in accordance with the system features.

The power cable and 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 requirements envisaged by the regulations in force and informed about the risks relevant to these activities.

Operate in compliance with the safety regulations in force.

Electric data

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

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

The label reports the indications envisaged by regulations, in particular:

Voltage

F.L.A.: full load ampere, absorbed current at maximum admitted conditions

F.L.I.: full load input, full load power input at max. admissible condition

Electrical wiring diagram No.

Connections

Refer to the unit's electrical diagram (the number of the diagram is shown on the serial number label)

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

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

Ensure correct earth connection.

Ensure cables are suitably protected.

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

Signal s / data lines

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

Lay the cables away from power lines, with different voltages, or emitting disturbances of electromagnetic origin.

Avoid laying cables near equipment that can cause electromagnetic interference.

Avoid laying in parallel with other cables, any crossings with other cables are allowed only if at 90 °.

The screen must be connected to a noise-free earth.

Guarantee the continuity of the screen during the entire extension of the cable.

Respect the indications concerning impedance, capacity, attenuation.

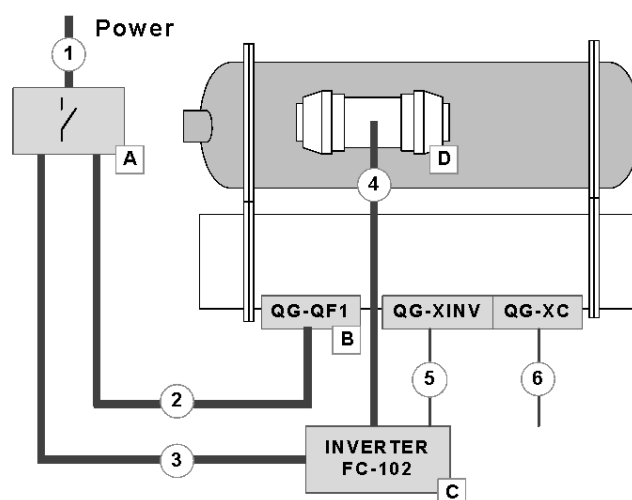
⇒ !! There is a risk of electric shock

⇒ !! The unit includes inverters that generate higher harmonics and can increase ground dispersion

Power wiring kit

Options

- A Panel with general isolator (option QSGX)
- 2 Cables from general disconnecter to panel on-board unit (CCSQX option)
- 3 Cables from general disconnecting switch to inverter (CCSQX option)
- 4 Cables from inverter to compressor (CSIC option)



	A		
Size	230 - 270	300 - 350	380 - 420 - 450
min cable section Cu mm ²	1x150	1x240	2x150
max cable section Cu mm ²	1x240	1x240	2x300
min Cu bar section mm ²	nd	nd	2x30x5
max width of Cu bar mm	32	40	50
tightening torque Nm	20	20	20

	B	C		D
Size	230 ... 450	230 ... 420	450	230 - 450
max connection section mm ²	25	2 x 185	5 x 240	= C
bolt	-	M10	M10 - M12	M16
tightening torque Nm	2,5 - 3	19 - 40	19 (M10) 35 (M12)	60-70

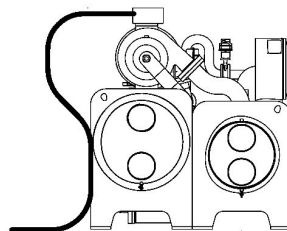
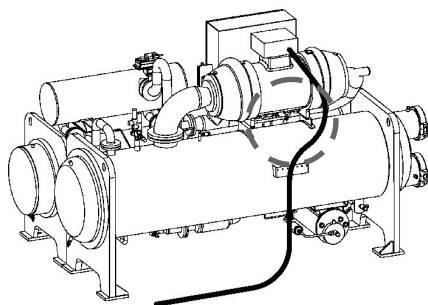
5 ELECTRICAL CONNECTIONS

Compressor power cables

Connect the cables so as not to stress the compressor terminals.

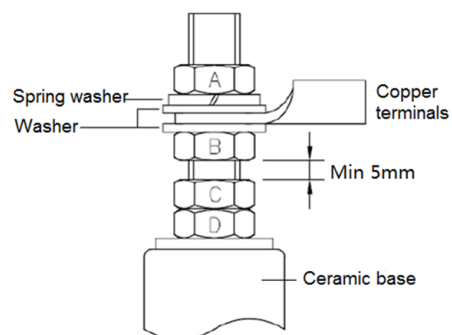
Secure the cables to the support bracket.

Maximum distance between inverter and compressor: 10mt



Compressor terminals

- lock nut B with a wrench
- tighten the nut A with another key



DESCRIPTION OF THE UNIT

Compressor

The compressor is a double-stage centrifugal type, semi-hermetic with a double impeller.

The compressor motor is driven directly by inverter at a speed between 13000-18000 rpm.

The compressor is equipped with variable inclination blades (IGV) to direct the flow of refrigerant to the inlet of the first impeller. The bolt of the IGV modifies the flow as the rotation speed changes. The movement of the IGV is controlled by an electric actuator that follows the refrigeration load on the evaporator.

The compressor is capable of modulating capacity from 100% to 15% in order to maintain the temperature of the water exiting the usage side constant.

Compressor bearing lubrication system

The lubrication system consists of an oil accumulation external to the compressor, an oil pump, an oil cooling exchanger connected by an oil circulation line.

There are also: oil filters, protection against low oil pressure, oil heater with built-in thermostat, oil level indicator, pressure gauges, thermometer, pressure transducers and temperature probe.

Evaporator

The evaporator is a tube bundle with falling film technology: the water passes inside the copper tubes; the refrigerant drops from the top onto the tubes, creating continuous turbulence.

The heat exchange is comparable to a flooded: evaporation at 6 ° C, superheat near 0 K, water at outlet at 7 ° C. All without the risk of liquid returning to the compressor.

The heads are removable to allow cleaning and maintenance of the exchanger.

Maximum operating pressure of the water side of the exchanger: 10 bar.

Condenser

The condenser is a tube bundle.

The heads are removable to allow cleaning and maintenance of the exchanger.

Maximum operating pressure of the water side of the exchanger: 10 bar.

Cooling circuit

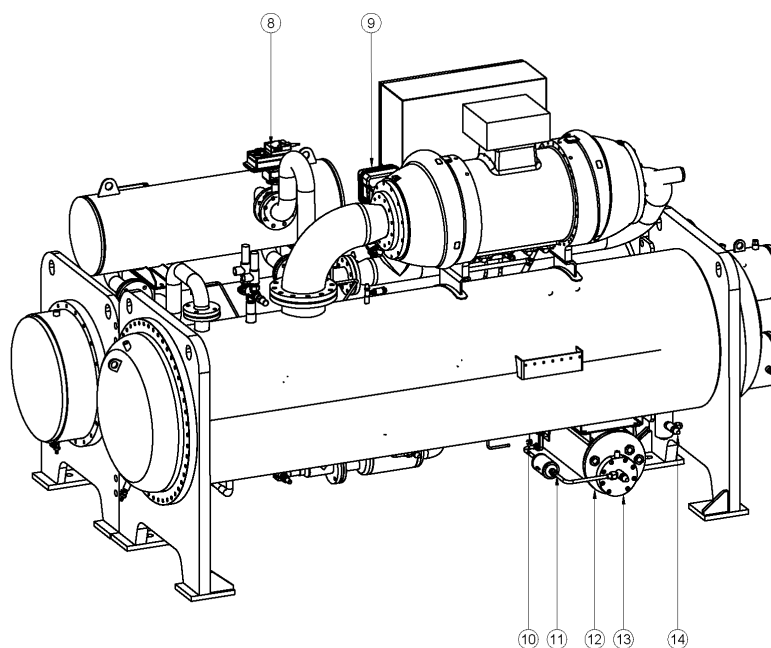
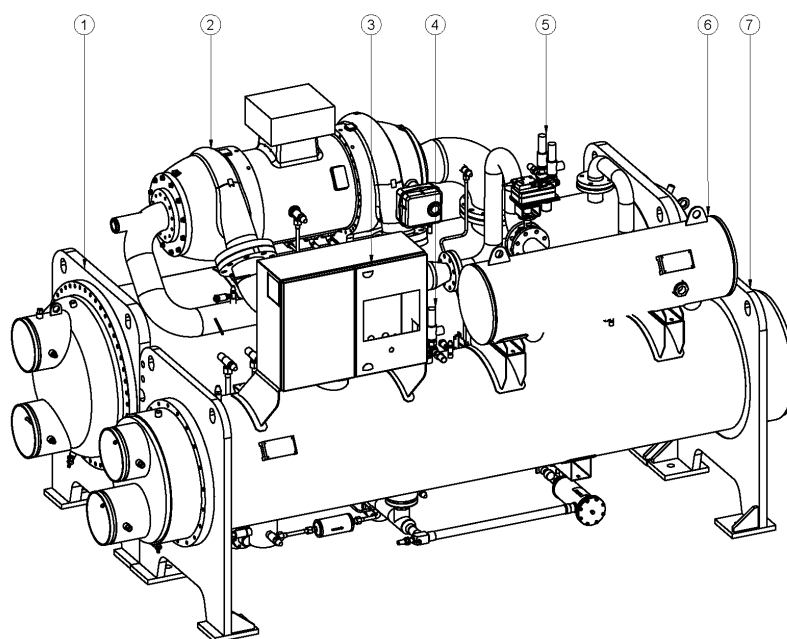
The cooling circuit is made of steel and copper.

Is composed by :

- metal mesh filter complete with connection for rapid refrigerant charge;
- high pressure safety pressure switch;
- high and low pressure transducer;
- coolant temperature probes;
- electronic expansion valve;
- high pressure side safety valve (double safety valve with exchange tap);
- low pressure side safety valve (double safety valve with exchange tap);
- interception taps on the liquid line;
- economizer with butterfly flow control valve;
- auxiliary lines for engine cooling and oil recovery.

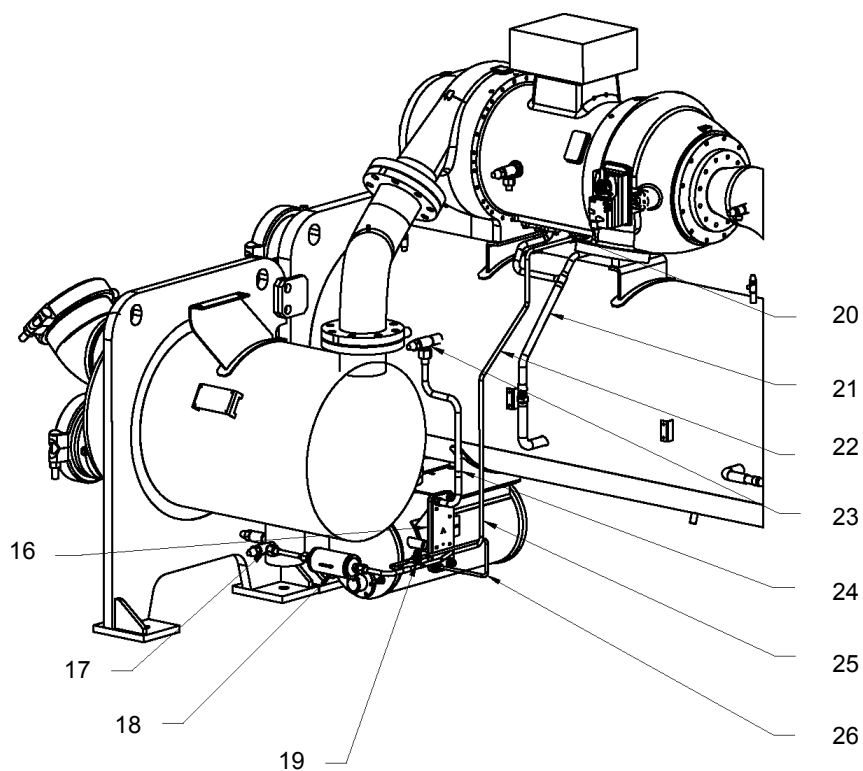
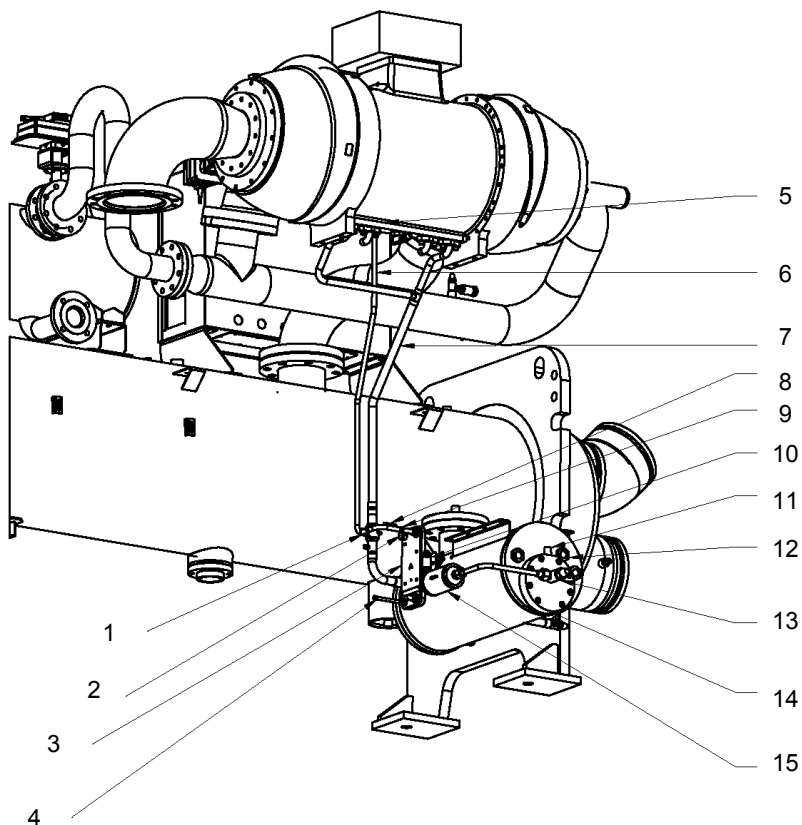
MAIN COMPONENTS

1	evaporator
2	compressor
3	electrical cabinet
4	condenser safety valves
5	evaporator safety valves
6	economizer
7	condenser
8	throttle valve actuator
9	IGV actuator
10	oil cooler exchanger
11	oil filter
12	oil tank
13	oil pump
14	refrigerant charge valve



Compressor lubrication and cooling

1	interception tap
2	oil cooling refrigerant outlet
3	oil cooler exchanger
4	oil coolant inlet
5	oil inlet shut-off valve on the compressor
6	oil delivery
7	oil return
8	temperature probe
9	transducer pressure socket
10	pressure transducer
11	oil pressure regulation valve
12	oil level indicators
13	oil delivery shut-off valve
14	oil pump
15	oil filter
16	oil cooler exchanger
17	interception tap
18	refrigerant filter
19	oil cooling adjustment tap
20	refrigerant inlet regulation tap
21	coolant return from the engine
22	refrigerant supply
23	interception tap
24	refrigerant return from oil exchanger
25	coolant delivery pipe to the engine
26	coolant delivery pipe to the exchanger



General information on goodwill

⇒ Before power up the unit, carry out a leakage test. The operations indicated must be carried out by qualified technicians with specific training on the product.

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

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

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

For details, please refer to the different manual sections.

Before checking, please verify the following :

- the unit is installed in a workmanlike manner and in compliance with what is reported in this manual
- the power supply line of the unit is sectioned at the start
- the line sectioning device is open, locked and equipped with the appropriate warning sign
- the unit is not live

After removing the voltage, wait at least 5 minutes before accessing the electrical panel or any other electrical component.

Before accessing check with a multimeter that there are no residual stresses.

External unit inspection

- 1 secure access
- 2 functional spaces
- 3 air cooling inverter
- 4 structure integrity
- 5 units on vibration dampers
- 6 insulation integrity
- 7 visual check of the refrigerant circuit

Hydraulic system inspection

- 1 filter
 - installed in suction pumps
 - meshes 0.87 mm
- 2 water flow switch
 - installed in horizontal
 - in straight line
- 3 pumps
 - flow
 - prevalence
 - absorption
- 4 evaporative tower
 - flow
 - working environment temperature
 - IN-OUT temperature difference
 - free circulation of air
- 5 shut-off valves
 - in and out of the pumps
 - in and out of the chiller

- 6 non-return valve out of pumps
- 7 balancing valves on uses
- 8 flexible joints
 - in and out of the chiller
 - in and out of the pumps
 - in and out uses
- 9 pressure gauges and thermometers
 - in and out of the pumps
 - in and out of the chiller
 - in and out uses
- 10 expansion vessel
- 11 vents at high points
- 12 plant washed
- 13 loaded plant + possible glycol solution + corrosion inhibitor
- 14 pressurized system
- 15 vented system

Electrical system inspection

- 1 grounding connection
- 2 compressor insulation test before wiring
- 3 check electrical connections
 - supply
 - signals
- 4 compressor insulation test after wiring

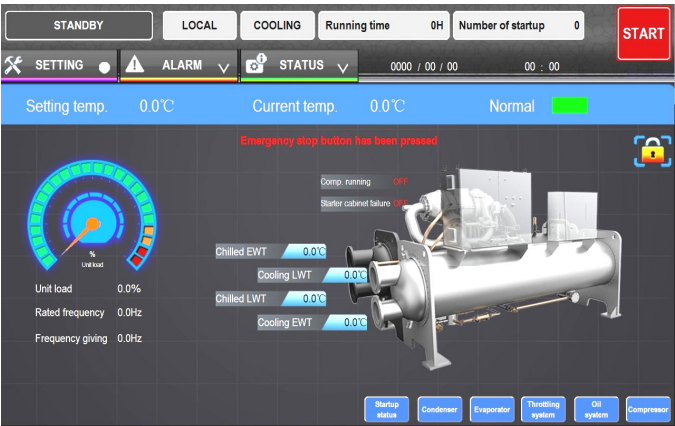
Start-up sequence

- 1 Execute leakage test.
- 2 Unit power supply ON
- 3 no-load voltage measurement
- 4 phase sequence control
- 5 manual pump start and flow rate check
- 6 cooling circuit taps opening
- 7 ON united
- 8 IGV test: manual control
- 9 oil pump test: manual control
- 10 start unit
- 11 water delivery and return temperature measurement
- 12 superheat and subcooling measurement
- 13 oil pressure measurement
- 14 liquid spy check
- 15 measurement of load voltages and absorptions
- 16 check for abnormal vibrations
- 17 set-point customization
- 18 scheduling customisation
- 19 complete and available machine documentation

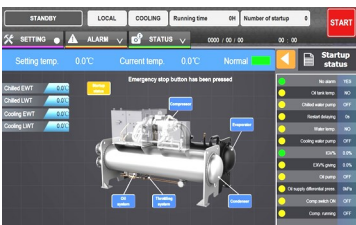
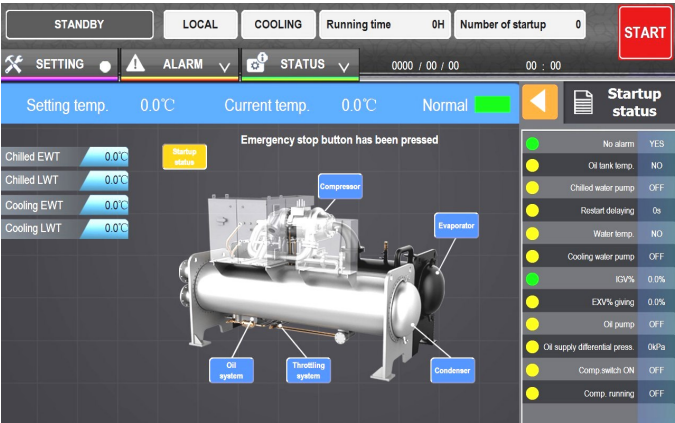
7 REGULATION



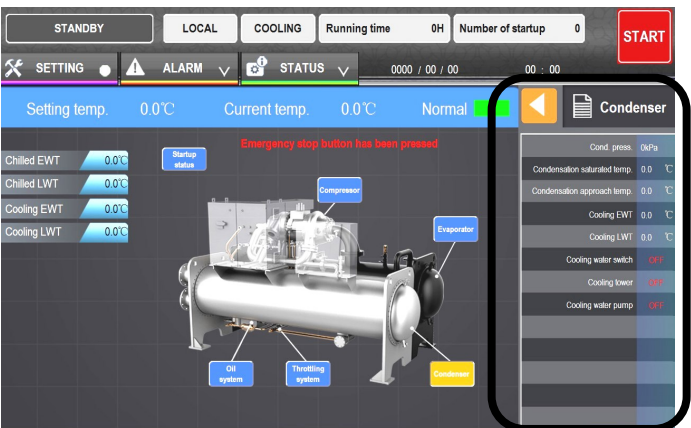
Press
Setting

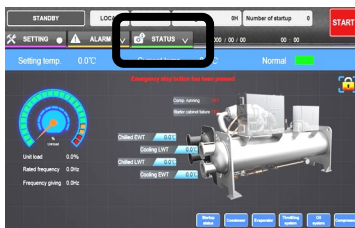


Press
Startup status



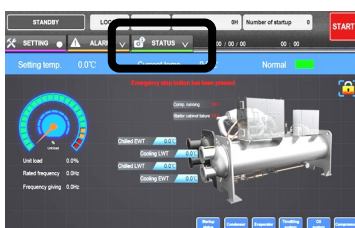
Press
Compressor
Evaporator
and so on.





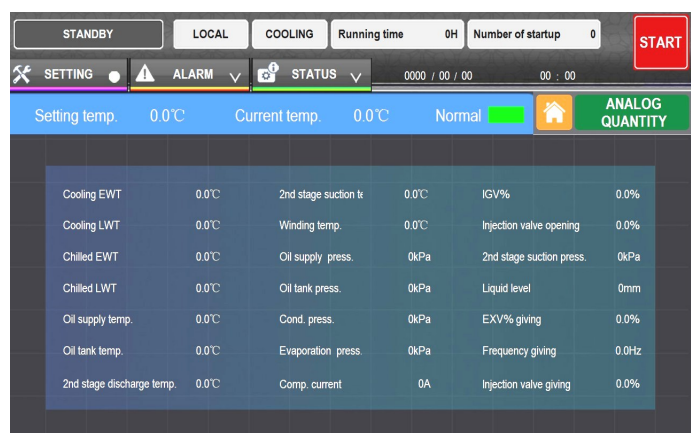
To choose

Status > Digitali



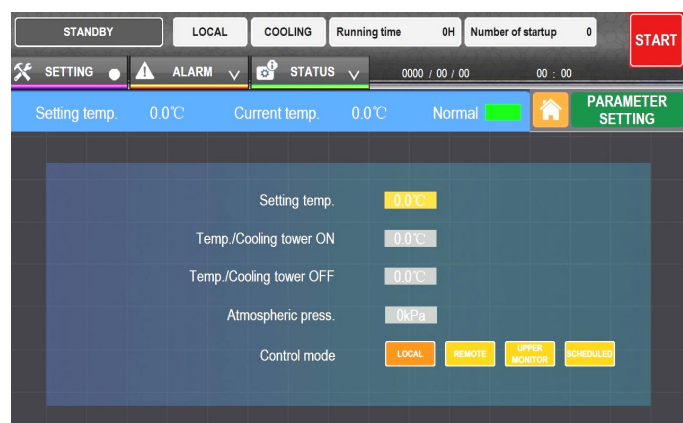
To choose

Status > Analogici

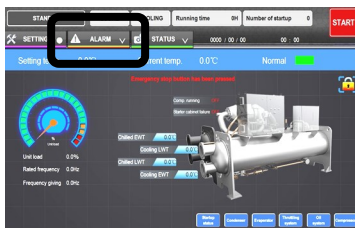


Press

Parameter Setting

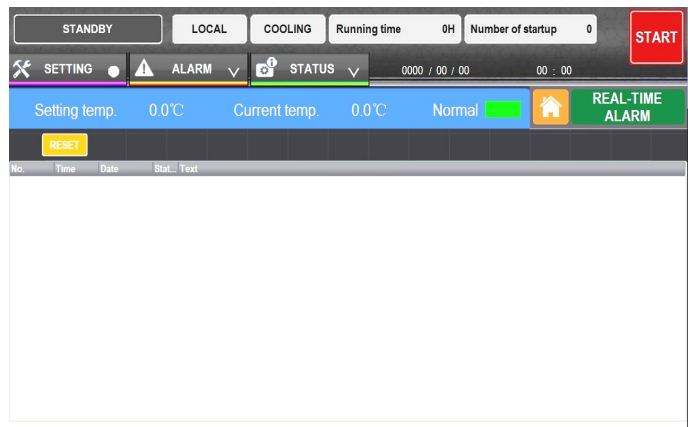


7 REGULATION



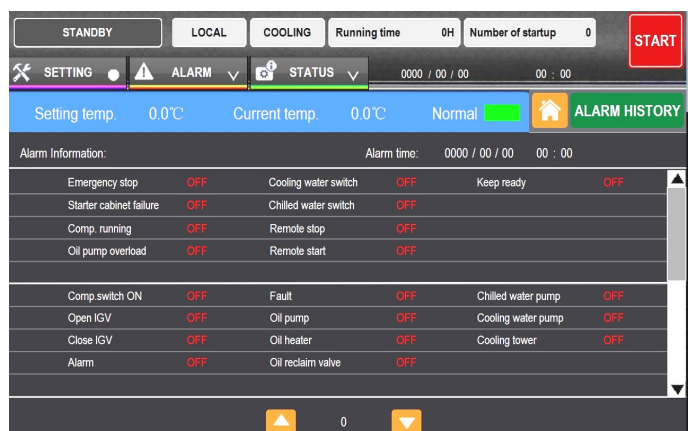
To choose

Alarm > Real time



To choose

Alarm > History



SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R1234ze

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.

Work procedures

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

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.

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.

If a leak is detected, do not electrically disconnect the unit by the main isolator switch before removing the leak source.

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.

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.

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.

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 performed 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.

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 condensers 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.

Repairing sealed components

- During the reparation operations of sealed components, disconnect all the equipment before removing sealed casings etc. If, during operations, it is absolutely necessary for the equipment to remain connected, a leak detection device must be placed in the most critical point so as to report any potentially-dangerous situation.
- Pay particular attention to what follows to guarantee that, while intervening on electrical components, the housing is not altered in a way so as to affect the level of protection. This includes damage to cables, an excessive number of connections, terminals not compliance with the original specifications, damage to gaskets, an unsuitable installation of gaskets, etc.
- Make sure the device is installed safely.
- Check that the seals or sealing materials are not altered in such a way that they no longer the impede the entry of flammable environments. Spare parts must comply with manufacturer specifications.

NOTE:

⇒ Using silicone sealants may inhibit the effectiveness of a few types of leak detection equipment. It is not necessary to isolate intrinsically safe components before performing operations on them.

Reparation of intrinsically safe components

Do not apply permanent inductive or capacitive loads to the circuit without making sure that they do not exceed the admissible voltage and current allowed for equipment in use.

Intrinsically safe components are the only component type on which operations can be performed in a flammable atmosphere. The testing device must show a correct value. Replace components only with the parts specified by the manufacturer.

Following a leak, other parts could lead to the combustion of the refrigerant in the atmosphere.

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 time 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).

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.

Removal and evacuation

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

- remove the refrigerant;
- purge the circuit with inert gas;
- evacuate;
- Purge again with inert gas;
- Interrupt the circuit with interruption or brazing.

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

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

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

brazing operations on the pipes.

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

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.

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.

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.

Recovery

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

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

Make sure enough tanks are used.

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

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

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

Recovery equipment must be perfectly functioning with the respective instruction booklets at hand and they must be suitable to recover flammable refrigerants. A series of perfectly-functioning calibrated scales must also be available.

Flexible tubes must be equipped with leak-proof disconnection fittings in good condition. Before using the recovery machine, make sure it is in good condition, maintained and that all associated electrical components are sealed to avoid combustion in case of a refrigerant leak. Please contact the manufacturer in case of doubt.

The refrigerant recovered must be taken to the supplier in suitable recovery tanks and with the relative waste transfer note suitably filled in.

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

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

The electric resistance must be used with the compressor body only to accelerate this process.

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

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.

8 MAINTENANCE

Check frequency

Frequency	Controls		Freq. 1st year	ref
Day	Operating status of the unit	U		
	Unit start / stop (check every start / stop)	U		
Week	Oil level	U	Day	
	Lubricating oil appearance	U	Day	
	Water flow	U		
	Operating data	U		
Month	Oil recovery system	U	Week	
	Water quality	S		
	Cleaning electrical cabinet dust	U		
	Coolant level in the evaporator	U	Week	
3 months	Dirt exchangers	U		
	Safety valve	U	Month	
	Refrigerant circuit filter	U		
	White circuit electrical test	U		
	Compressor partialization (IGV)	U	Month	
	Replacement of electrical panel dehumidifiers	U		
Year	Exchanger cleaning	U / C		
	Lubricating oil analysis	S		
	Oil filter replacement	C		
	Compressor insulation to ground	C		
	Refrigerant analysis	S		
	Checking for leaks	U		
	Coolant filter replacement	C		
3 years	Replacement of the oil recycling circuit filter	C	Year	
	Check exchanger pipe leaks	U		
	Lubricating oil replacement	C	Year	

Check by:

U = user, S = specialist, C = Clivet trained / authorized technician

Freq. 1st year: check to be carried out with a close frequency in the first year of operation

Generality

- ⇒ !! All electrical operations must be carried out by personnel in possession of the requirements provided for by the regulations in force, instructed on the risks related to these operations.
- ⇒ !! Operate in compliance with the safety regulations in force.
- ⇒ !! There is a risk of electric shock

Maintenance allows you to:

- maintain the efficiency of the unit
- reduce the speed of deterioration to which each piece of equipment is subject over time
- collect information and data to understand the unit's state of efficiency and prevent possible failures

Unit booklet

Foresee a unit schedule to keep trace of the interventions made on the unit.

In this way, it will be easier to adequately schedule the various interventions and facilitate any troubleshooting.

On the schedule note:

- date
- type of intervention carried out
- intervention description
- measurements made etc.

Setting aside

If foreseen a long period of inactivity:

- turn off the power to avoid electrical hazards or damage due to lightning
- drain the water to prevent the risk of freezing
- protect the exchangers and the system from the air to avoid oxidation and fouling
- empty the system
- empty the exchanger use all the taps and grains present
- blow the exchanger with compressed air
- dry the exchanger with hot air for greater safety, insert a glycol solution in the exchanger
- protect the exchanger from the air
- take the drain caps off the pumps

Before starting, flush the system.

It is advisable that the start-up after the standstill period is carried out by a qualified technician, especially after seasonal stops or during seasonal changeover.

Upon start-up, follow that indicated in the START-UP section.

Plan in advance the technician intervention to prevent misunderstandings and be able to use the system when required

Hydraulic circuit

Check the water quality on a monthly basis.

Check the water flow on a weekly basis.

Clean the evaporator and condenser on an annual basis.

Water quality control

See table on page 14

If necessary contact the water treatment company.

Water filter

Check that no impurities prevent the correct passage of water.

Water flow control

The water flow rate in the exchangers is strictly related to the corrosion of the internal pipes.

Stay below 3.5 - 4 m / s.

Check the load losses between the inlet and outlet of the exchangers.

Evaporator cleaning

Check and clean the evaporator on an annual basis.

The evaporator must be cleaned when the evaporation pressure drops by more than 15 kPa compared to the pressure detected during the first start-up (with the same leaving water temperature).

Contact a professional cleaning company or contact the CLIVET after-sales service.

Condenser cleaning

Check and clean the condenser on an annual basis.

If the water quality is low, increase the control frequency.

The condenser must be cleaned when the condensation pressure rises by more than 20 kPa compared to the pressure detected during the first start-up (with the same leaving water temperature).

Flow

- controls the operations
- remove incrustations from the palette

Insulations

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

LUBRICATION CIRCUIT

► Oil with conforming to the specifications may cause the unit to malfunction.

► Only maintenance personnel recognized by CLIVET can maintain the lubrication circuit.

Visual inspection of lubricating oil

The check must be carried out with the unit in operation.

Check the lubricating oil through the sight glass on the compressor body. If the light is insufficient, illuminate the light.

The lubricating oil under normal conditions is transparent, clean, light yellow. Over time it may darken slightly.

Air bubbles in the lubricating oil are normal during unit operation.

No solid particles or other impurities should be present.

If the lubricating oil darkens, becomes dense or black or has obvious impurities, contact CLIVET for replacement.

Oil quality analysis LUBRICANT

To remove the lubricating oil follow the procedure indicated in the following chapter.

The sample must be analyzed by a specialized company.

Oil requirements:

Check Item	Unit	Standard Value
Color		≤L1.0
Density	g/cm ³	0.965~0.975
Adhesion	40°C	mm ² /s
	100°C	mm ² /s
Acid	mgKOH/g	≤0.1
Water	ppm	≤50

Lubricating oil replacement

The following table lists the situations in which the lubricating oil must be replaced.

Check Item	Unit	Criteria for Replacement
Color		The transparency drops and the color turns into orange red or bronzing.
Impurity		Metal abrasion dust or unsolved pollution
Odor		Strong odor
Adhesion	40°C	mm ² /s
	100°C	mm ² /s
Acid	mgKOH/g	0.3~0.45
Water	ppm	> 100

Oil replacement procedure:

1. Check that the oil tank temperature is above 35 ° C
2. Remove power from the unit
3. Connect a copper pipe DN8 (thickness: 1.5 mm, length: 4 m) to the oil drain valve. Connect the

other end to the waste oil collection container.

4. Slowly rotate the drain valve stem clockwise for three turns to drain the lubricating oil.
5. Close the drain valve when gas appears in the expelled oil.
6. Connect the oil loading device with a copper pipe. If an electric pump is used for the load, make sure that the head is at least 800 kPa.
7. Before charging the oil, loosen the connection between the copper pipe and the tank and bleed. Then fix the connection and open the filling valve to load the oil.
8. Finish filling when the oil level reaches the top of the glass.

After replacing, mark the new oil level.

► Disposal of used lubricating oil must comply with local regulations.

Replacing the oil filter

The oil filter must be replaced once a year or when the unit is disassembled for repair.

Procedure:

1. Disconnect the unit's power supply.
2. Close the taps upstream and downstream of the filter.
3. Loosen the fittings on both ends of the filter to collect the oil that comes out of the container.
4. After draining the oil, remove the fittings to remove the oil filter.

► The filter contains residual oil.
Pour the oil into a container.

5. Install a new filter and tighten the fittings on both ends of the filter.
6. Partially open the upstream tap and loosen the fittings on the downstream tap to fill the tubing with lubricating oil.
7. When oil starts to come out, tighten the fittings downstream.
8. Open both taps and check for leaks.

Other parts.

Generally, the oil pump and exchanger have no operational problems. It is possible to disassemble and check them during the disassembly of the unit. If it is necessary to replace these parts, contact CLIVET.

Cooling circuit

Filter

The filter should be replaced at least once a year.

After the first start-up of the unit, check the temperature difference before and after the filter. Next, check the filter on a quarterly basis. An increase in the temperature difference indicates the presence of impurities in the filter and the filter must be replaced.

Procedure:

- 1 Disconnect the unit's power supply.
 - 2 Close the taps upstream and downstream of the filter.
 - 3 Loosen the fittings on both ends of the filter to drain the refrigerant into the pipe.
- ⇒ Wear gloves when loosening the filter screws. Keep your hands away from the fittings. Otherwise, the expelled coolant may cause freezing burns.
- 1 Remove the filter.
 - 2 Install a new filter and tighten the fittings on both ends of the filter.
 - 3 Partially open the upstream tap and loosen the fittings on the downstream tap so as to fill the piping with refrigerant gas.
 - 4 When gas starts to leak, tighten the fittings downstream.
 - 5 Open both taps and check that there are no leaks using soapy water or a foaming agent.

Oil recovery system

Mark the oil level before putting the unit into operation for the first time. Keep track of changes to the oil level on the unit.

Check through the sight glass.

If the oil recovery system is working properly, you see refrigerant evaporate. Furthermore the temperature of the pipes should be low.

If the oil level changes (by more than half of the sight glass), check the oil recovery system.

Refrigerant level in the evaporator

Record the coolant level on the evaporator sight glass:

- 1 before the unit is started
- 2 after the unit has been started and is running at full speed

These two levels will be the reference for subsequent checks.

Checking for leaks

Check the leaks once a year: apply a foaming agent or soapy water to the junction points.

The control of losses on the exchangers can be performed once every three years. If the water quality is low, increase the control frequency.

Refrigerant analysis

The purity of the refrigerant has a significant impact on the efficiency of the unit.

The analysis of the refrigerant must be performed once a year before the season of use.

Safety valve control

The safety valve must be replaced:

- if it has intervened
- if there is oxidation
- based on the date of manufacture, in compliance with local regulations.

Check the valves at least once every six months.

Remove the exhaust pipe connected to the valve and check for rust, erosion, dust, scale or leakage.

If present, replace the safety valve with a certified safety valve.

Check if the air around the unit is corrosive. If so, increase the frequency of checks.

Electrical system maintenance

⇒ Disconnect the unit power supply before performing maintenance

Inverter and control electrical panels

Remove dust from the electrical panels once a month.

Check the fixing of the power and control cables.

If the unit remains unused for a long time, take measures to prevent dust and moisture.

Inadequate temperature and humidity affect operational safety and reduce the life cycle of electrical components.

It is advisable to replace the dehumidifiers in electrical panels on a quarterly basis. If temperature and humidity are high, reduce the replacement cycle.

⇒ Replace any rusty wiring terminals.

Alarm list

Before resetting an alarm, identify and remove the cause that generated it.
Repeated resets can cause irreversible damage.

1	Condenser inlet water temperature sensor
2	Condenser water outlet temperature sensor
3	Evaporator inlet water temperature sensor
4	Evaporator outlet water temperature sensor
5	Supply temperature sensor failure
6	Oil tank temperature sensor
7	Discharge temperature sensor
8	IGV opening error
9	Acquisition error from the host
10	Condensing pressure sensor
11	Evaporation pressure sensor
12	Oil supply pressure sensor
13	Oil tank pressure sensor
14	Oil differential pressure error at start
15	Oil differential pressure protection - 2
16	Oil differential pressure protection - 1
17	Low oil tank temperature
18	High temperature oil supply protection - 2
19	High temperature oil supply protection - 1
20	Oil pump protection
21	Evaporator flow
22	Condenser flow
23	The host current is too low
24	Current host with high protection 2
25	Host high current protection 1

26	Start time too long
27	Compressor motor overheating
28	Starting panel failure
30	Low evaporation pressure - 2
32	High condensing pressure - 2
33	Antifreeze protection
34	IGV error
35	Compression ratio protection
36	High overheating of the exhaust
38	Emergency stop of the unit
39	High oil cooling temperature difference
40	The frequency of overvoltages is too high
41	Frequency error
42	Inverter communication error
43	Communication error of the PLC module
44	High condensing pressure - 3
45	Low evaporation pressure - 3
46	Suction temperature sensor
47	Suction pressure sensor
48	Level sensor
49	Low suction overheating
50	Low overheating of the exhaust
51	Surge protection
52	Water protection for heat recovery
53	Fault in the heat recovery water inlet temperature sensor
54	Heat recovery water temperature sensor failure

Common mistakes

If a status other than the normal one is detected, consult the table to identify the cause.

Restore normal operation as soon as possible ..

Contact the CLIVET after-sales service if error symptoms other than those indicated in the table are detected.

Symptom	reason
Compressor doe not start	1. lack of power 2. disconnection due to over-absorption (supply voltage out of limits) 3. one of the start conditions is not satisfied (an alarm is present, oil pump thermal, condenser / evaporator flow switch) 4. high / low pressure refrigerant pressure switch intervention
Evaporating pressure too low	1. insufficient chilled water flow 2. insufficient heat load 3. dirty evaporator 4. insufficient refrigerant charge
Condensing pressure too high	1. insufficient water flow to the condenser 2. insufficient cooling tower capacity 3. the return water temperature is high 4. presence of non-condensables in the refrigeration circuit 5. dirty condenser
Low oil pressure delta	1. dirty oil filter 2. excessive opening of the oil pressure control valve 3. insufficient amount of oil leaving the pump; check the pump 4. worn bearing 5. faulty oil supply pressure sensor 6. too much refrigerant present in the oil (bubbles during start-up); start the oil heater after stopping the unit (check the operation of the oil heater)
Excessive oil temperature	1. insufficient cooling capacity of the oil cooler (calibrate refrigerant flow with oil temperature control valve) 2. insufficient amount of refrigerant for the oil cooler; dirty coolant filter 3. worn bearing
Compressor motor overload	1. phase unbalance in the power supply 2. insufficient supply voltage 3. gas sucked in by the compressor contains liquid 4. high cooling water temperature or insufficient flow rate 5. high chilled water temperature due to high thermal load

Symptom	reason
Evaporating pressure too high	1. the temperature of the chilled water increases due to an abnormal increase in the thermal load; the scenario is normal
Condensing pressure too low	1. water outlet temperature from the condenser too low 2. water flow to the condenser too high 3. Insufficient cooling capacity due to insufficient refrigerant in the evaporator
Low oil level during operation	1. refrigerant mixed in oil. The refrigerant evaporates during start-up and generates bubbles, consequently the compressor sucks up the oil. Operate the oil heater during shutdown to increase the oil temperature. 2. Excessive amount of oil to the compressor from the equalizer tube. Check that the oil level is within the specified range during operation; discharge excess oil. 3. The Venturi nozzle or filter is clogged, oil does not return to the tank. Remove the Venturi and filter 4. oil pressure during operation set too high; set between 120 and 220 kPa
High oil level during operation	1. Low oil temperature, refrigerant mixed in oil. Adjust the oil temperature control valve.
High oil level during shutdown	1. Low oil temperature, refrigerant mixed in oil. Make sure the oil heating circuit is properly connected. Operate the oil heater during shutdown.
Oil pressure fluctuations	1. The compressor is in surge. 2. The oil pressure control valve is unstable.
High oil pressure during start-up and operation	1. Oil pressure control valve not set correctly. Adjust the valve 2. High lubricating oil viscosity. Use oil with the indicated characteristics. 3. Oil temperature too low. Adjust oil temperature control valve; check oil heating cycle.
Abnormal compressor noise	1. Rotating parts come into contact with fixed parts. Stop the unit, remove the compressor. 2. Damaged bearing. Stop the unit, remove the compressor.

Symptom	reason
Abnormal vibrations	1. Aged rubber antivibration mounts. Proceed with replacement 2. Balancing of the damaged rotor. Disassemble clean perform dynamic balancing. 3. Worn bearing. Proceed with replacement 4. Foundation damaged. Repair 5. Main engine in abnormal operation. (Note 1) 6. Compressor in surge.
Compressor in surge	1. Condensing pressure too high. See symptom "Condensing pressure too high" 2. Evaporating pressure too low. See symptom "Evaporating pressure too low" 3. Both previous cases occur.
Compressor in surge during manual start-up	1. Over-opening compressor adjustment flaps. Adjust the aperture using the power adjustment.

Surge

SURGE is an unstable operating condition of each CENTRIFUGE compressor.

Together with the lack of lubrication it is the greatest danger to the integrity of the compressor.

SURGE occurs when the compressor fails to provide the pressure increase necessary to overcome the Δp required by the system (condensation pressure / evaporation pressure).

The higher the compression ratio, the higher the risk of SURGE ($rp_{max} = 3.1$)

In the surge phase the refrigerant flow inside the impeller is interrupted, with a temporary inversion of the refrigerant flow which tends to return to the low pressure at high pressure

The surge is easily recognizable by the increase in compressor noise, vibrations and sudden changes in the current absorbed.

Machine electronics continuously prevent the surge by measuring the compression ratio and adjusting the inverter and IGV.

The protection is managed with the monitoring of the absorbed current.

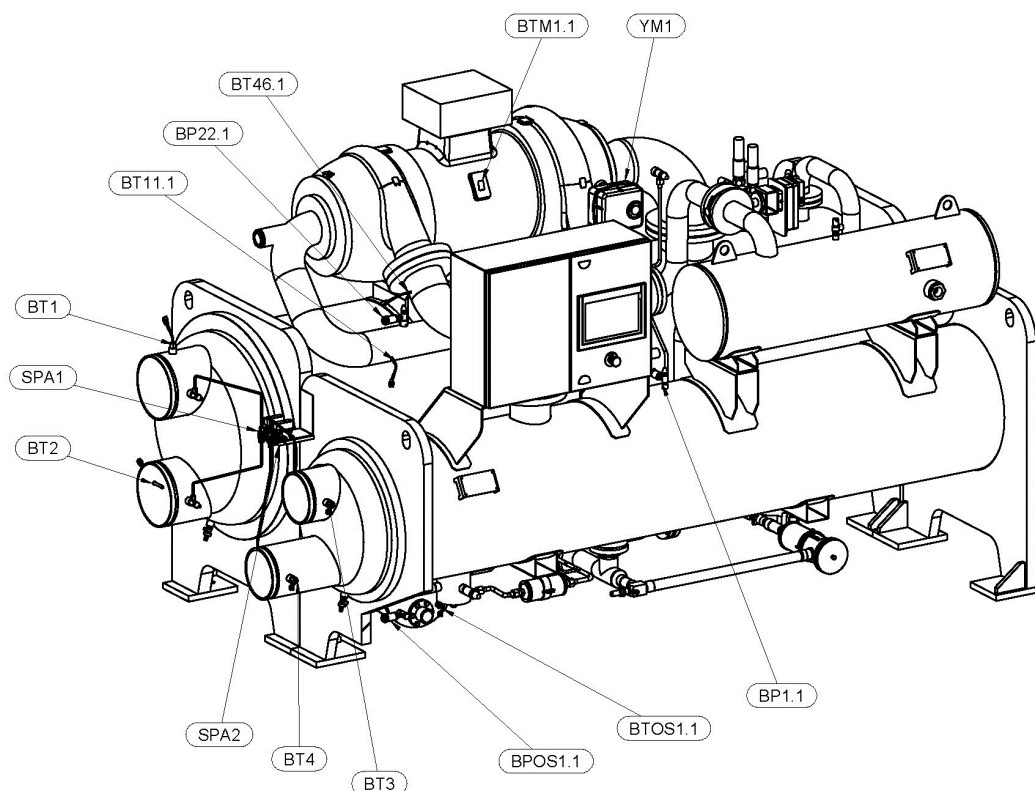
Note 1: motor anomalies and main causes:

- 1 Motor vibration: the motor rotor and stator are not aligned or the air gap is not uniform. The motor installation is not correct, the main shaft is deformed, the bearing is worn, motor vibration due to mechanical vibration of the compressor.
- 2 Startup failure: the power supply cable is not connected correctly, the start line or device is defective, the supply voltage or frequency is out of limits, the load torque is too high.
- 3 Engine overheating: insufficient engine cooling, engine supply voltage out of limits, winding insulation is damaged.

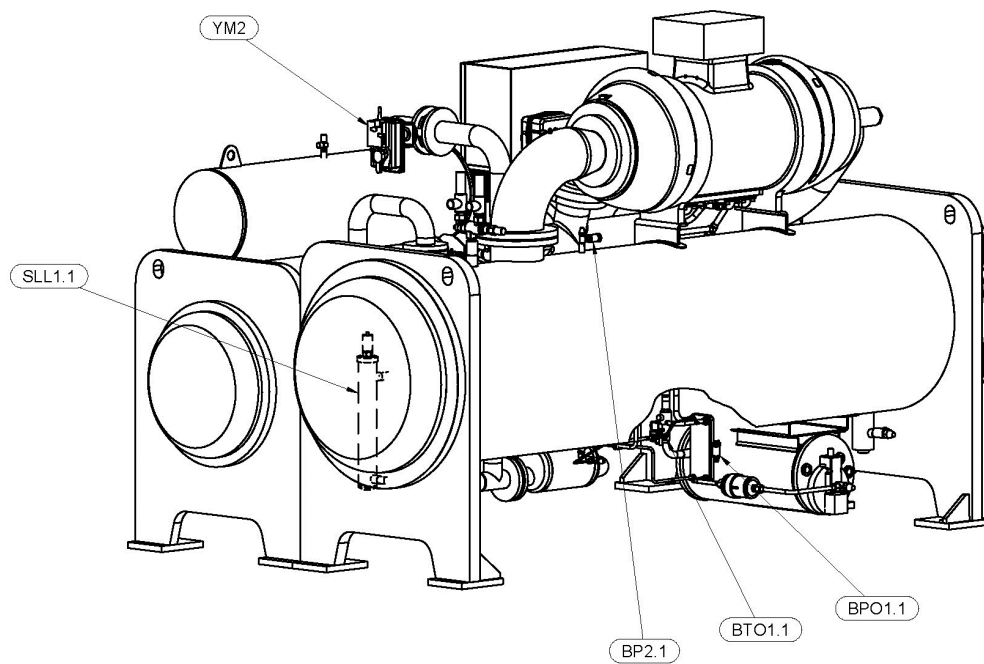
Vacuum operation - Frost risk

If it is necessary to evacuate the refrigerant, keep the water circulating in the exchangers so as to prevent the refrigerant from evaporating from freezing frozen water.

Probes and transducers



BP1.1	high pressure transducer
BP22.1	suction line pressure transducer
BPOS1.1	tank oil pressure transducer
BT1	aqua evaporator inlet temperature probe
BT2	aqua evaporator outlet temperature probe
BT3	water temperature probe condenser inlet
BT4	aqua condenser outlet temperature probe
BT11.1	coolant temperature probe
BT46.1	compressor flow temperature probe
BTM1.1	engine temperature probe
BTOS1.1	oil tank temperature probe
SPA1	evaporator differential pressure switch
SPA2	condenser differential pressure switch
YM1	IGV positioning control



BP2.1	low pressure transducer
BPO1.1	oil pressure transducer
BTO1.1	oil temperature probe
YM2	economizing valve
SLL1.1	check liquid level

Disconnection

WARNING

⇒ Before any intervention, read the warnings indicated in the Maintenance chapter.

⇒ Risk of fire - Flammable materials

Disconnection operations must be carried out by qualified technicians.

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.

WEEE INFORMATION

The manufacturer is registered on the EEE National Register, in compliance with implementation of Directive 2012/19/EU and relevant national regulations on waste electrical and electronic equipment.

This Directive requires electrical and electronic equipment to be disposed of properly.

Equipment bearing the crossed-out wheellie 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.

In this regard, here is the definition of household WEEE and professional WEEE:

WEEE from private households: WEEE originating from private households and WEEE which comes from commercial, industrial, institutional and other sources which, because of its nature and quantity, is similar to that from private households. Subject to the nature and quantity, where the waste from EEE was likely to have been by both a private household and users of other than private households, it will be classed as private household WEEE;

Professional WEEE: all WEEE which comes from users other than private households.

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.



Generality

This section indicates the most common situations which, since they cannot be controlled by the manufacturer, could give rise to situations of risk for things or people.

Dangerous area

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

The dangerous area is the internal area of the units, accessible only by deliberate removal of the fairings or parts of them.

Handling

The handling operations, if carried out without all the necessary safety measures and without due prudence, can cause the unit to fall or roll over with consequent damage, even very serious, to property, people and the unit itself.

Handle the unit following the instructions on the packaging, in this manual, and according to the local regulations in force.

In case of refrigerant gas leak refer to the refrigerant "Safety Data Sheet".

Installation

Incorrect installation of the unit may cause water leakage, condensation build-up, refrigerant leakage, electric shock, fire, malfunction or damage to the unit.

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 flammable gas leaks are possible, even sporadically, and the consequent accumulation of these gases in the area surrounding the unit itself can cause explosions and fires.

Carefully check the positioning of the unit.

The installation of the unit in a place that is not suitable for supporting its weight and / or ensuring adequate anchorage may cause it to fall and / or overturn, with consequent damage to property, persons or the unit itself.

Carefully check the positioning and anchors of the unit.

The easy accessibility to the unit by children, unauthorized persons or animals can be the cause of accidents and even serious injuries.

Install the unit in places accessible only by authorized personnel and / or provide protection against intrusions in the hazardous area.

General risks

Burning odor, smoke, or other signs of serious anomalies can indicate the emergence of situations that could cause damage to property, people or the unit itself.

Electrically isolate the unit (yellow-red isolator).

Contact the authorized service center to identify and resolve the problem at the origin of the anomaly.

Accidental contact with exchange batteries, compressors, delivery pipes or other components can cause injuries and / or burns.

Always wear appropriate clothing that includes protective gloves for operations within the hazardous area.

Maintenance and repair operations carried out by unqualified personnel can cause damage to property, people or the unit itself.

Always contact a qualified service center.

Failure to close the unit panels, or failure to check correct tightening of all panel fixing screws may cause damage to property, persons or the unit itself.

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

In the event of a fire, the temperature of the refrigerant can reach such values as to bring the pressure beyond the safety value with consequent possible projections of the refrigerant itself or explosions of the parts of the circuit that remain isolated from the closure of the taps.

Do not stand near the safety valves and never leave the cooling system taps closed.

Electric part

A connection line to the electricity grid that is not complete and / or with incorrectly sized cables, and / or with inadequate protection devices can cause electric shock, poisoning, damage to the unit or fire.

Perform all work on the electrical system, referring to the wiring diagram and this manual, ensuring the use of a dedicated system.

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 fasten the cover securely to the unit.

The metallic masses of the unit, when they are under voltage and are not correctly connected to the earthing system, can cause shock by electric shock or death by electrocution.

Pay particular attention to the connection to the earth system.

Contact with live parts accessible inside the unit after removal of guards can cause electric shock, burns or death by electrocution.

Open and padlock the general disconnecter before removing the guards, and report the work in progress with the appropriate sign.

Contact with parts that could become live due to the start-up of the unit can cause electric shock, burns or death by electrocution.

When it is not necessary to have voltage on the circuits, open the disconnecter located on the connection line of the unit itself, padlock it and equip it with the appropriate warning sign.

Moving parts

Contact with transmissions or fan extraction can cause injury.

Before accessing the unit, open the disconnect on the connection line of the unit, lock it and equip it with the appropriate signaling sign.

Contact with the fans can cause injury.

Before removing the protection grilles or the fans, open the disconnecting switch located on the connection line of the unit itself, padlock it and equip it with the appropriate warning sign.

Refrigerant

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

Always wear appropriate clothing and protective goggles for operations within the hazardous area.

In case of refrigerant gas leak refer to the refrigerant "Safety Data Sheet".

Contact between free flames or heat sources with the refrigerant, or heating of the pressurized gas circuit (eg during welding operations) may cause explosions or fires.

Do not place any heat source inside the hazardous area.

Maintenance or repair operations requiring welding must be carried out with the system unloaded.

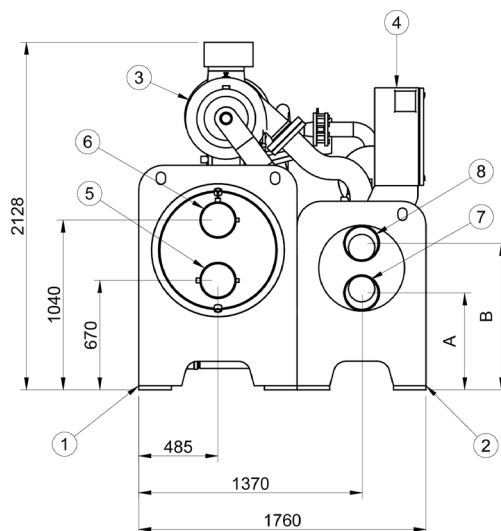
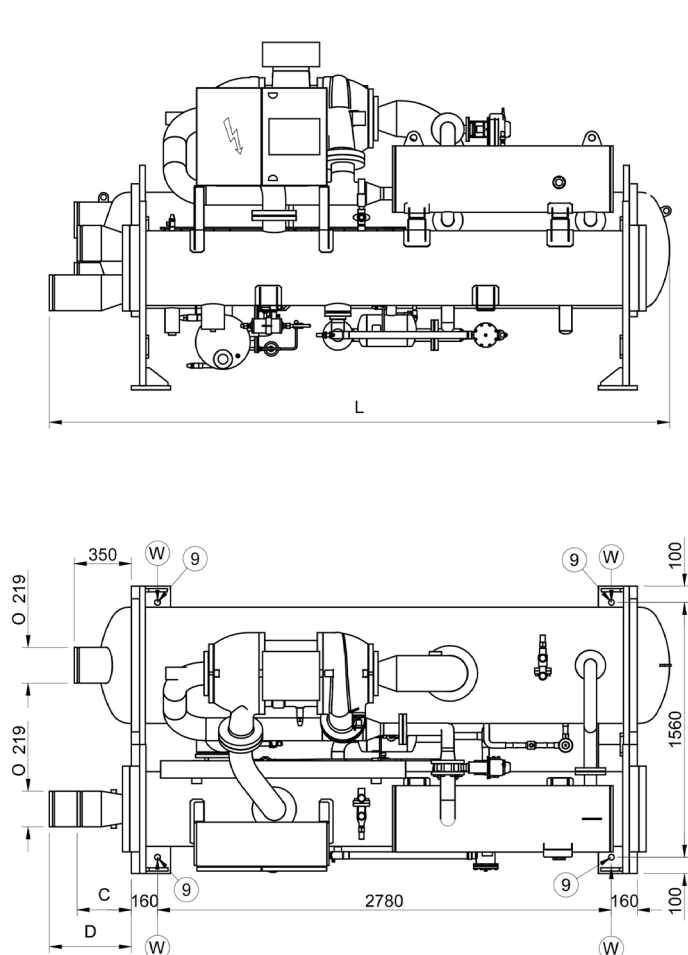
Hydraulic part

Faults in pipes, connections or interception devices can cause water leaks or projections with consequent damage to property or short circuits of the unit.

Dimensional unit

SIZE 230 - 270

DAACN0001_00
Data/Date 10/07/2020



1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes Ø35

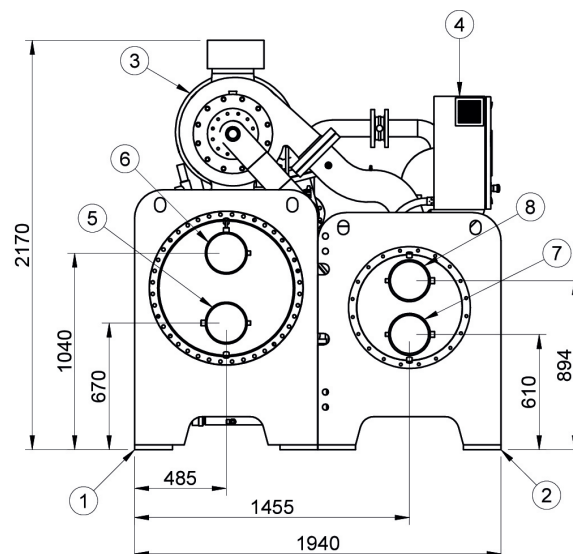
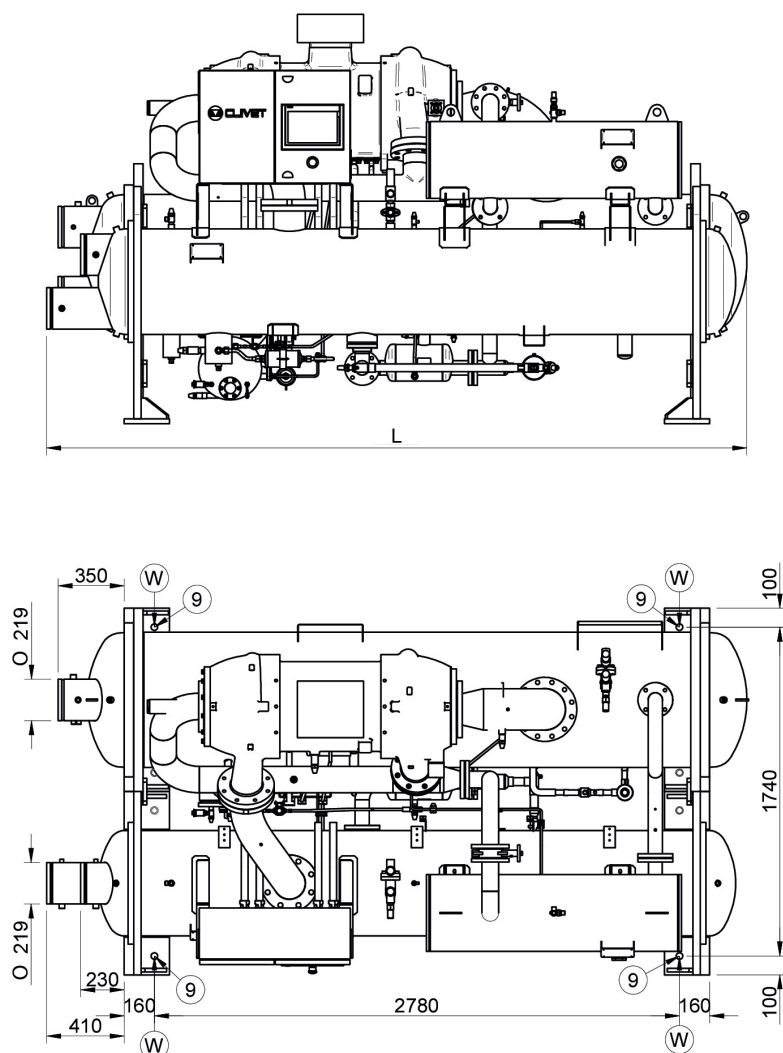
SIZE		230	270
Lenght	mm	3820	3870
Depth	mm	1760	1760
Height	mm	2128	2128
Operating weight	kg	5700	5785
Shipping weight	kg	5185	5185

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

Dimensional unit

SIZE 300 - 350

DAACN0002_00
Data/Date 10/07/2020



1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes Ø35

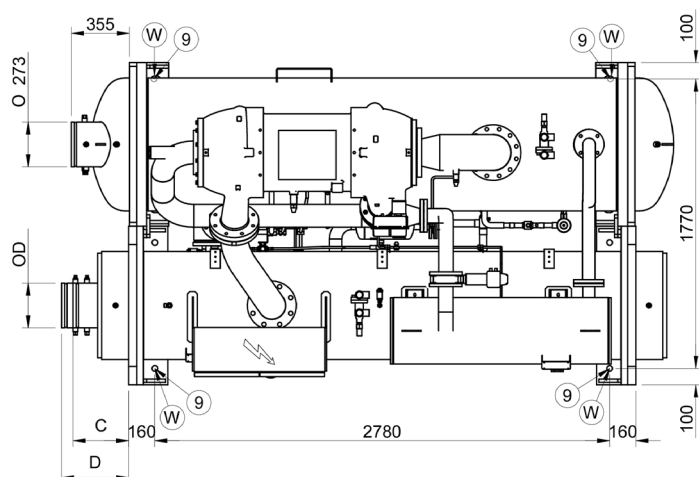
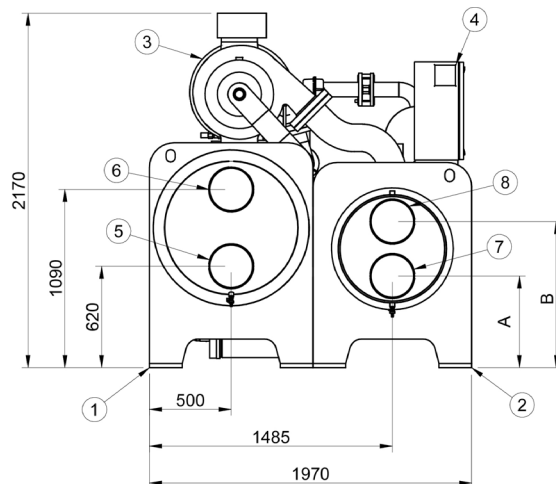
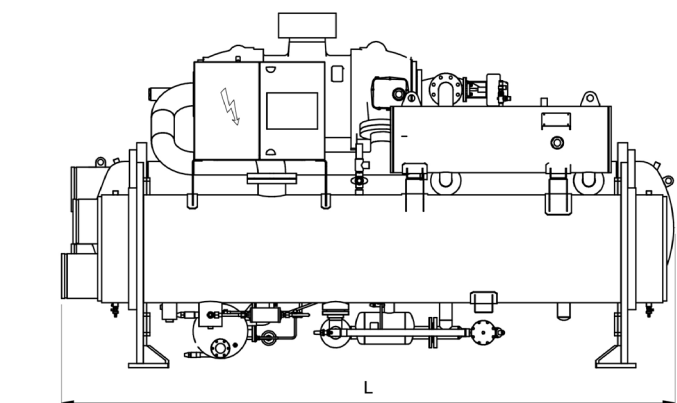
SIZE		300	350
Lenght	mm	3770	3770
Depth	mm	1940	1940
Height	mm	2170	2170
Operating weight	kg	6269	6469
Shipping weight	kg	5600	5700

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

Dimensional unit

SIZE 380 - 420 - 450

DAACN0003_00
Data/Date 10/07/2020



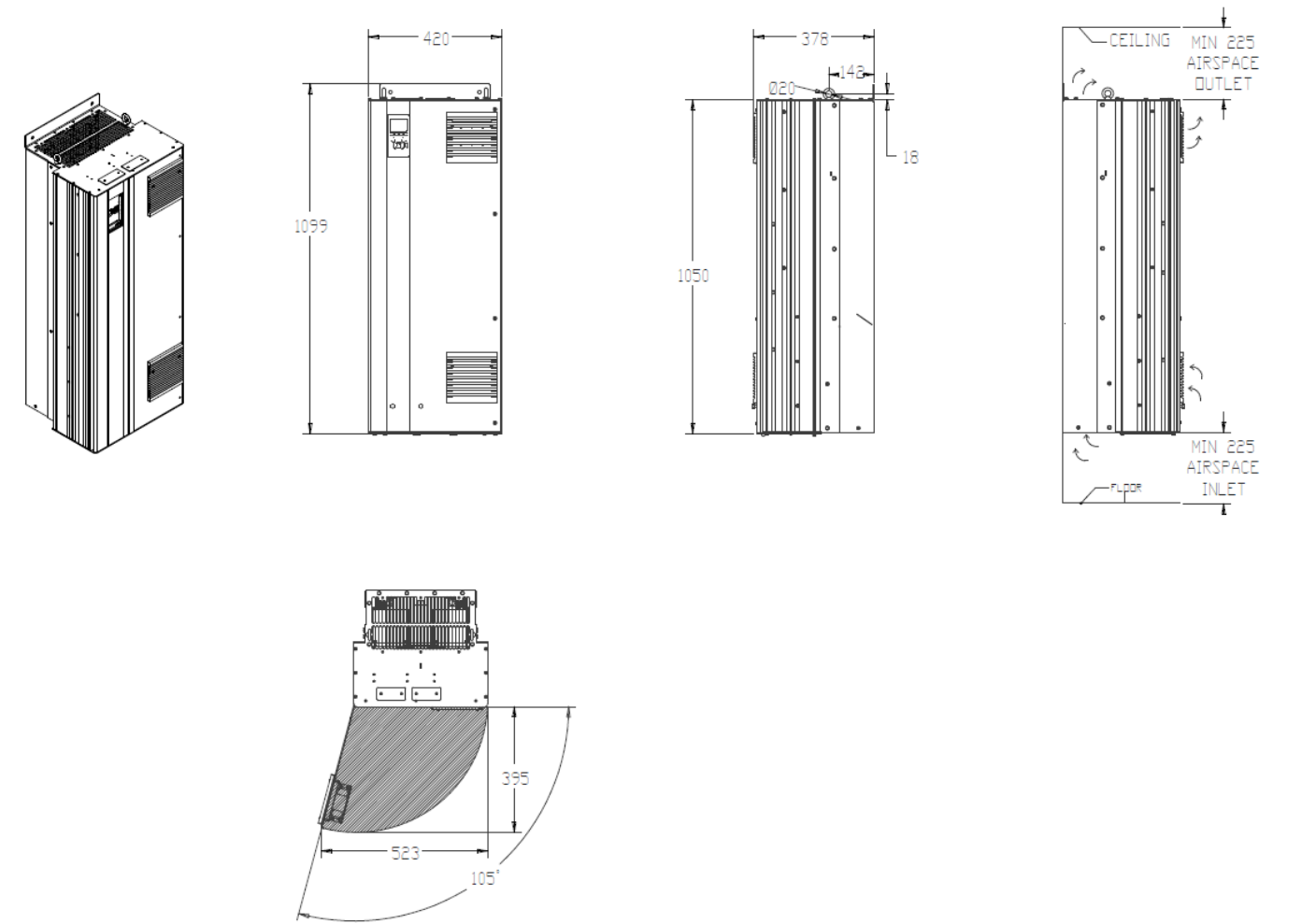
1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes Ø35

SIZE		380	420	450
Lenght	mm	3770	3810	3810
Depth	mm	1970	1970	1970
Height	mm	2170	2170	2170
Operating weight	kg	7546	7546	7648
Shipping weight	kg	6853	6853	6925

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

Dimensional inverter

SIZE 230 - 270 - 300 - 350 - 380 - 420

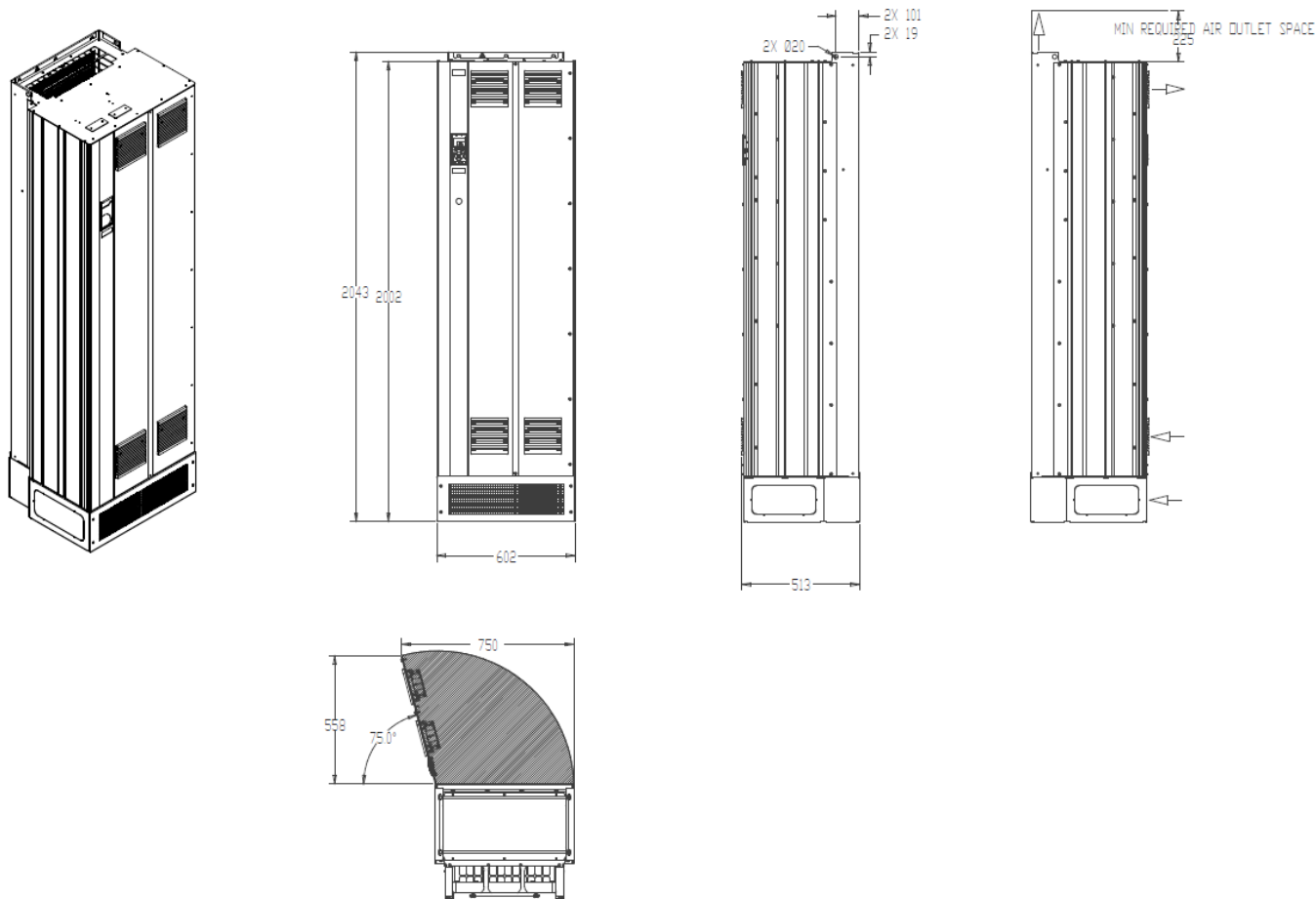


SIZE		230	270	300	350	380	420
Lenght	mm	420	420	420	420	420	420
Depth	mm	378	378	378	378	378	378
Height	mm	1100	1100	1100	1100	1100	1100
Operating weight	kg	125	125	125	125	125	125

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

Dimensional inverter

SIZE 450



SIZE		450
Lenght	mm	602
Depth	mm	514
Height	mm	2043
Operating weight	kg	300

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



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OFFERING SOLUTIONS TO ENSURE
SUSTAINABLE COMFORT AND THE
WELL-BEING OF PEOPLE AND THE
ENVIRONMENT



sales and assistance



CLIVET SPA

Via Camp Lonc 25, Z.I. Villapaiera
32032 Feltre (BL) - Italy

Tel. +39 0439 3131 - Fax +39 0439 313300
info@clivet.it

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