WCH-iZ

230 - 450

Manual
for installation
use and maintenance



R-1234ze

en

16127160008995-B 10-2026

Valid from -2020 (revision B/2026)

Dear Customer,

We congratulate you on choosing these product

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

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

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

Best regards and have a good read.

CLIVET Spa

The original instructions are written in Italian.

All other languages are translations of the original instructions.

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1. Safety considerations

1.1 Safety

Operate in compliance with safety regulations in force.

To carry out the operations use protection devices:

- gloves, goggles, hard hat, ear protection, protective knee pads.

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

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



Before any work read:

⚠ Share SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R1234ze



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.

1.2 Manual

The manual provides correct unit installation, use and maintenance.

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

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

1.3 Risk situations

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

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

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

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

1.4 Symbols

The symbols in the following chapter can be found in the manual and on the product, and provide quick and clear information for correct and safe use.

1.4.1 Safety symbols

⚠ Danger

This symbol indicates warnings, failure to comply may result in serious harm to health and fatal injuries.

⚠ Attention

This symbol indicates warnings, failure to comply may result in irreparable damage to the product or harm to the environment.

⛔ Prohibition

This symbol indicates operations that must never be carried out.

ⓘ Note

This symbol indicates important information.

1.5 Intended use

Use the unit only:

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

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

1.6 Installation

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

Comply with local safety regulations in all operations.

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

1.7 Maintenance

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

⚠ Turn the unit off before any operation.

1.8 Modification

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

1.9 Breakdown/Malfuction

Disable the unit immediately in case of breakdown or malfunction.

Contact a certified service agent.

Use original spares parts only.

Using the unit in case of breakdown or malfunction:

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

1.10 User training

The installer has to train the user on:

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

1.11 Data update

Continuous product improvements may imply manual data changes.

Visit manufacturer web site for updated data.

2. Indications for the User

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

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

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

2.1 In case of breakdown or malfunction:

Immediately deactivate the unit

Contact a service centre authorized by the manufacturer

2.2 The installer must train the user, particularly on:

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

2.3 Unit indentification

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

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

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

The matriculation plate must never be removed.

2.4 Serial number

It identifies uniquely each unit.

It must be cited when ordering spare parts.

2.5 Assistance request

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

3. Information on refrigerant gas

⚠ This product contains fluorinated greenhouse gases covered by the Kyoto protocol.

⛔ Do not discharge gas into air.

⚠ Refrigerant type: R1234ze

Characteristics of R1234ze refrigerant:

- minimum environmental impact thanks to the low Global Warming Potential GWP
- low flammability, class A2L according to ISO 817
- low combustion speed
- low toxicity

The refrigerant quantity is indicated on the unit plate

Size	Refrigerant (kg)	Equivalent CO^2 tons	
		AR5	AR6
230	210	0,21	0,28
270	210	0,21	0,28
300	225	0,22	0,30
350	225	0,22	0,30
380	310	0,31	0,42
420	310	0,31	0,42
450	330	0,33	0,45

Physical characteristics of the R1234ze refrigerant		
Safety class (ISO 817)	A2L	
LFL Low flammability limit	0.303	kg/m^3 @ 60°C
BV Burning velocity	0	cm/s
Boiling point	-19	°C
GWP	<1	AR5 100 yr ITH
GWP	1.37	AR6 100 yr ITH
Self-ignition temperature	368	°C

ⓘ The refrigerant quantity is indicated on the unit plate

4. Before installation

4.1 Reception

You have to check before accepting the delivery:

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

In case of damage or anomaly:

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

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

4.2 Storage

Observe external packaging instructions.

In particolar:

- minimum ambient temperature -15°C (possible components damages)
- maximum ambient temperature +49C (possible safety valve opening)
- maximum relative humidity 95% (possible damages to electrical components

4.3 Packaging removing

⚠ Be careful not to damage the unit.

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

4.4 Handling

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

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

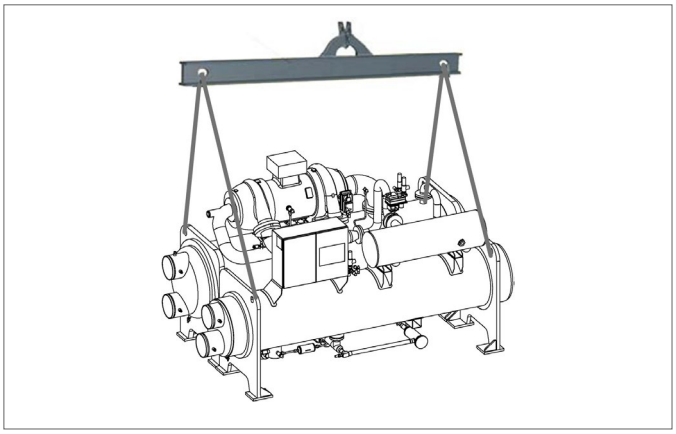
⚠ Observe all safety procedures in order to guarantee the safety of the personnel present and the of material.

⚠ Check the weight of the unit and the lifting capacity of the handling equipment.

⚠ Identify critical points during handling (disconnected routes, flights, steps, doors).

⚠ Suitably protect the unit to prevent damage.

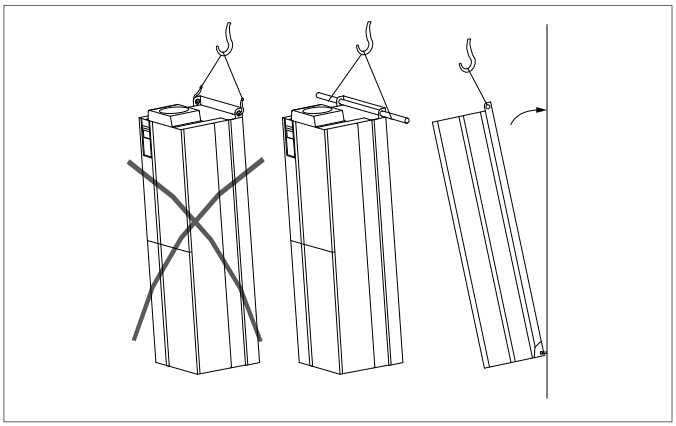
Lifting



Inverter lifting

Use the appropriate lifting eyes.

Use a lifting bar to avoid bending the eyelets.



Inverter weight		
Sizes	230 - 420	450
Weight Kg	125	300

5. Selecting the installation site

5.1 General

Installation must be in accordance with local regulations. If they do not exist, follow EN378 .

During positioning consider these elements:

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

5.2 Functional spaces

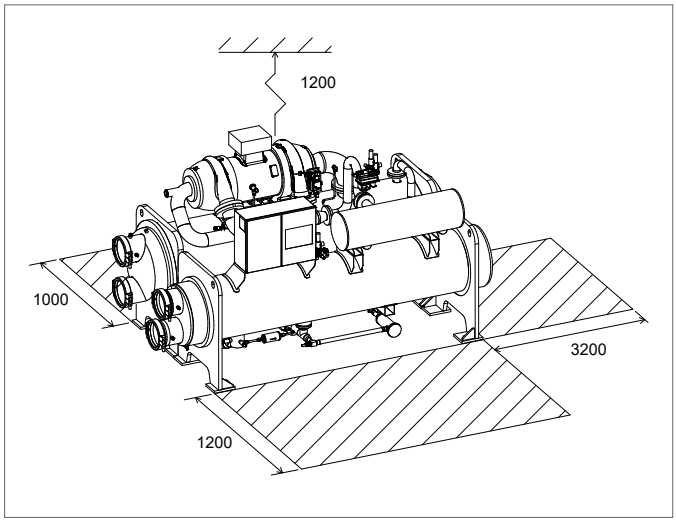
Functional spaces are designed to:

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

⚠ Respect the indicated functional spaces.

⚠ Double the functional spaces if several units are aligned.

⛔ Do not smoke or use open flames within this area



5.3 Positioning

Units are designed to be installed:

- inside of
- in fixed positions
- level

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

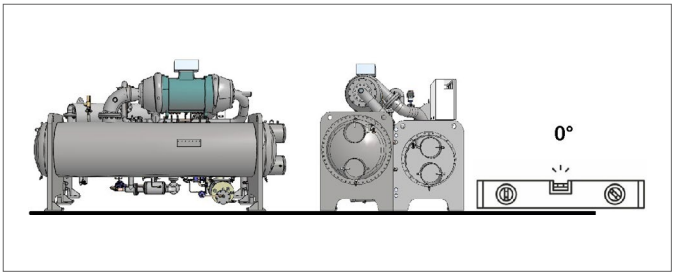
Choose the installation place according to the following criteria:

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

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

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

The unit is level



⚠ The unit must be level.

5.4 Saftey valve gas side

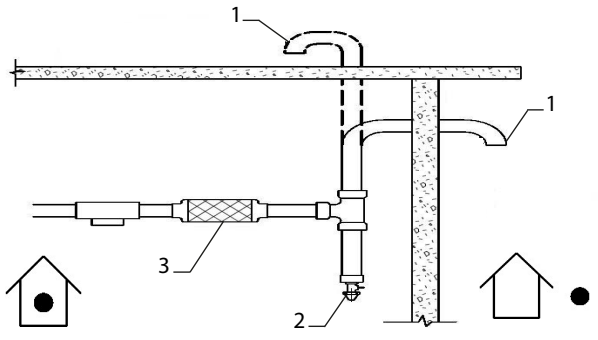
The safety valve is used to protect the unit: it opens when the pressure inside the evaporator or condenser exceeds the nominal discharge pressure.

With the loss of refrigerant, the pressure decreases.

ⓘ Follow local regulations (EN378)

Installation

- the exhaust pipe must be compatible with the R1234ze 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



1 Safety valve drain
2 Drain valve
3 Anti-vibration joint

5.5 Inverter

⚠ Ensure the cooling of the inverter.

See dimensions,

Only size 550: install the pedestal under the inverter.

Inverter air cooling air flow rate		
Sizes	230 - 420	450
Air flow m^3h	1044	1504

6. Water connections

6.1 Hydraulic system

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

Keep the following parameters to a minimum:

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

6.2 Water quality

The water quality must be checked by qualified personnel.

Water with inadequate characteristics can cause:

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

Water features:

- within the limits indicated by table

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

6.3 Cleanliness

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

6.4 New systems

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

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

6.5 Existing systems

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

The system must be drained before installing the new unit.

Dirt can be removed only with a suitable water flow.

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

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

An option to remove pollutants is to install a filter.

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

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 $CaCO_3$/1)	< 100
Total Hardness (mg $CaCO_3$/1)	< 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%

6.6 Risk of freezing

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

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

6.7 Anti-freeze solution

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

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

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

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

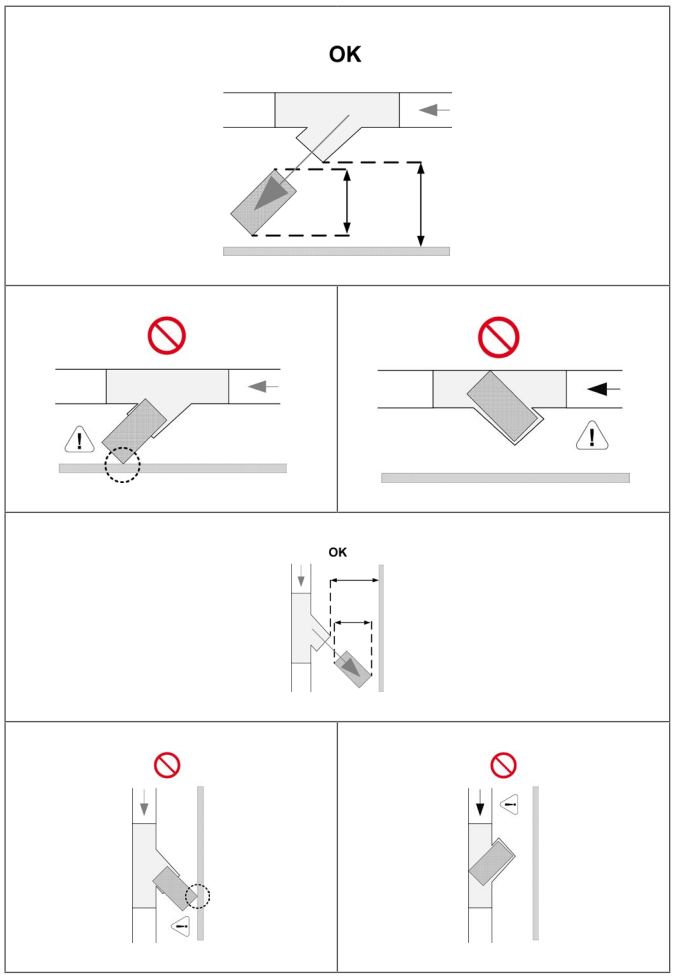
% GLYCOL ETHYLENE / PROPYLENE BY WEIGHT		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°C	-2	-3.9	-6.5	-8.9	-11.8	-15.6	-19.0	-23.4	-27.8	-32.7
Safety temperature	°C	3	1	-1	-4	-6	-10	-14	-19	-23.8	-29.4

6.8 Water filter

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

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

0,87 mm



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

6.9 Water flow-rate

The design water-flow must be:

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

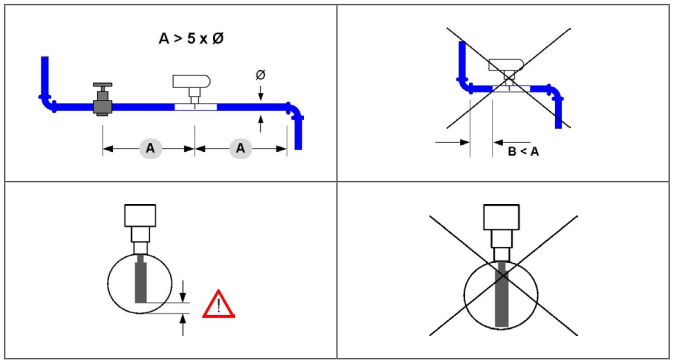
6.10 Minimum system water content

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

6.11 Flow Switch

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

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



Installation

- 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

6.12 Operation sequence

Before starting the unit pump:

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

2 close all drain shut-off valves in the low points of the unit's water circuit

- exchangers
- pumps
- collectors
- storage tanks

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

- fill and drain the system several times

4 apply additives to prevent corrosion, fouling, formation of mud and algae

5 fill the system

6 perform a leak test

7 isolate the pipes to avoid heat dispersions and formation of condensate

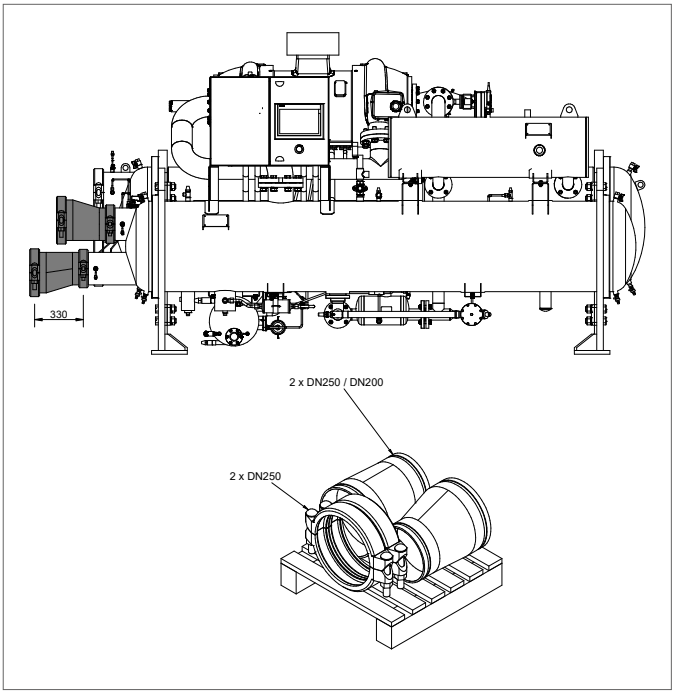
8 leave various service points free (wells, vents, etc).

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

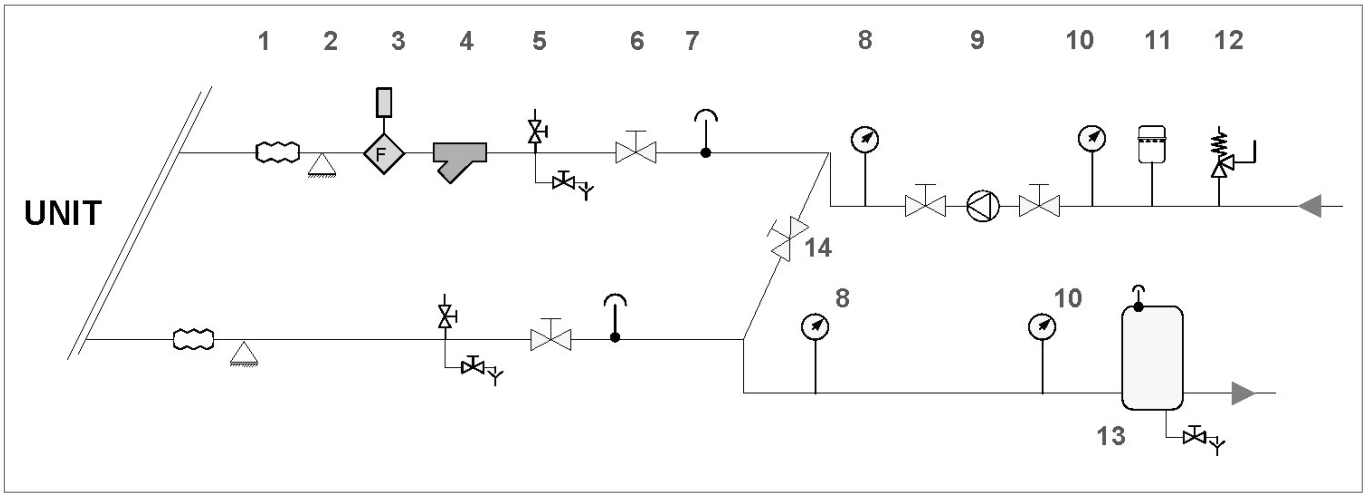
6.13 Condenser connection

Sizes -380-420

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

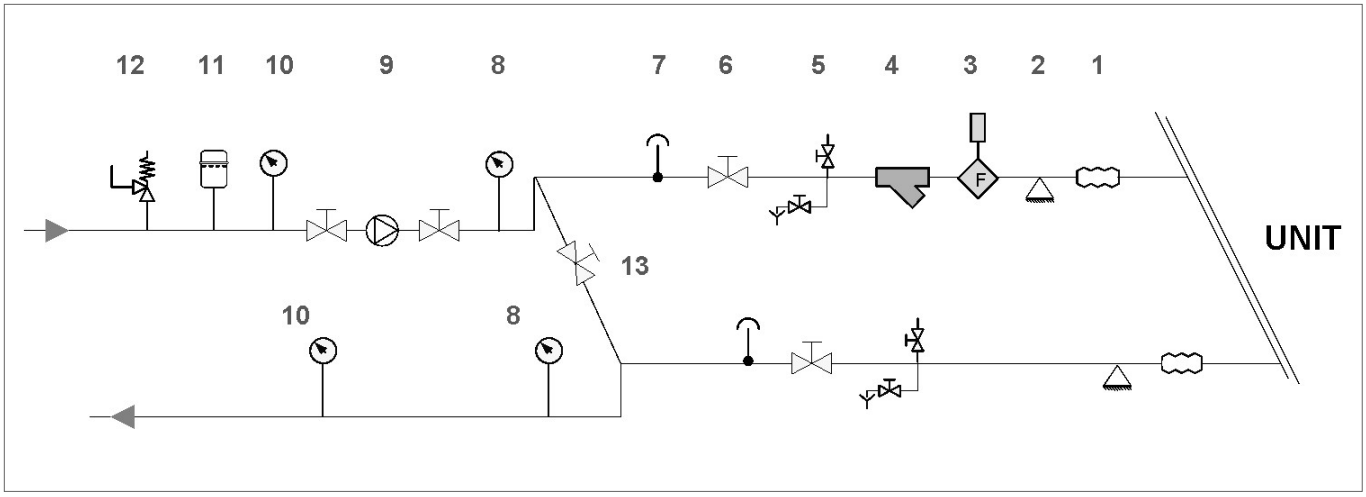


6.14 User side connection



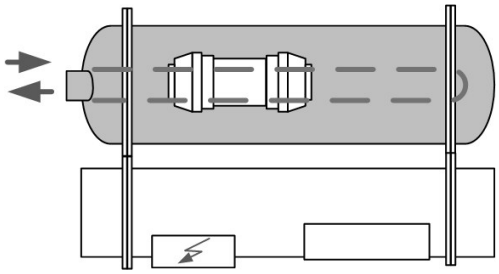
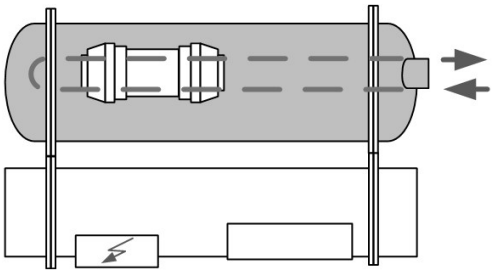
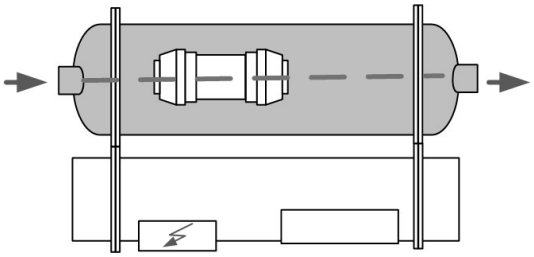
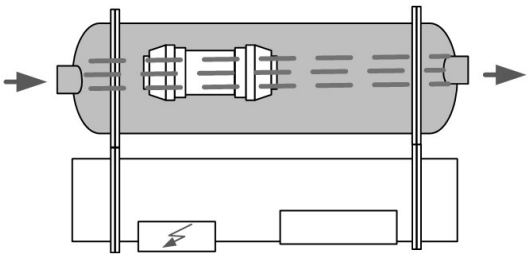
1 anti-vibration joints
2 piping supports
3 flow switch
4 filter
5 exchanger chemical washing valve + drain valve
6 shut-off valve
7 vent
8 pressure gauge
9 pumping group
10 thermometer
11 expansion vessel
12 safety valve
13 inertial tank
14 exchanger chemical washing valve

6.15 Source side connection

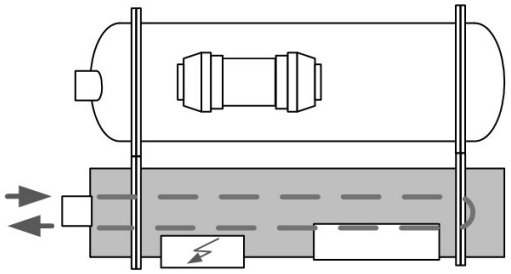
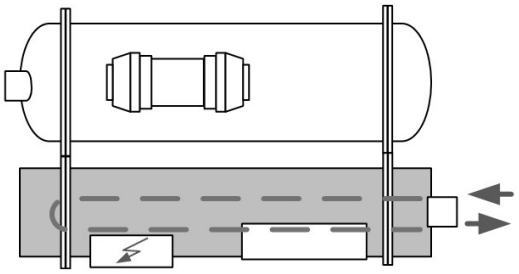
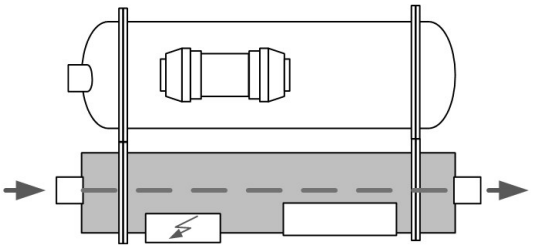
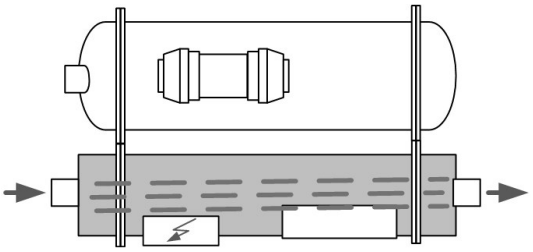


1 anti-vibration joints
2 piping supports
3 flow switch
4 filter
5 exchanger chemical washing valve + drain valve
6 shut-off valve
7 vent
8 pressure gauge
9 pumping group
10 thermometer
11 expansion vessel
12 safety valve
13 exchanger chemical washing valve

6.16 Configuration of hydraulic connections EVAPORATOR

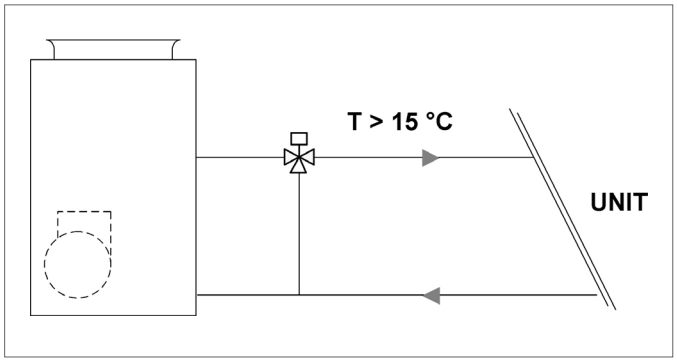
Water flow-rate	Number of passes	Water fittings	Scheme
Standard DT = 5°C	2	Left (Std)	
		Right (option)	
High DT < 4°C	1	Opposed	
Low DT > 7°C	2	Opposed	

6.17 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	2	Opposed	

6.18 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.

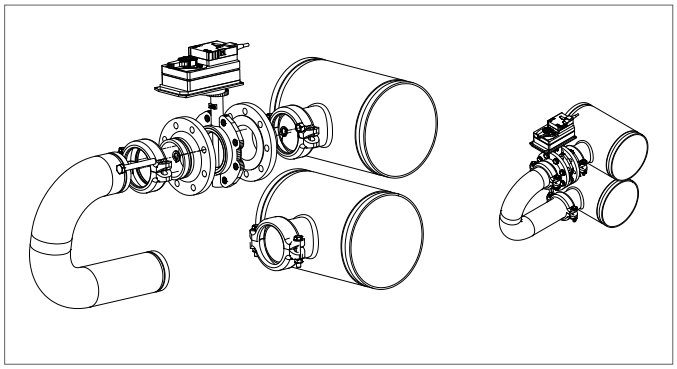


6.19 Bypass valve condenser

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

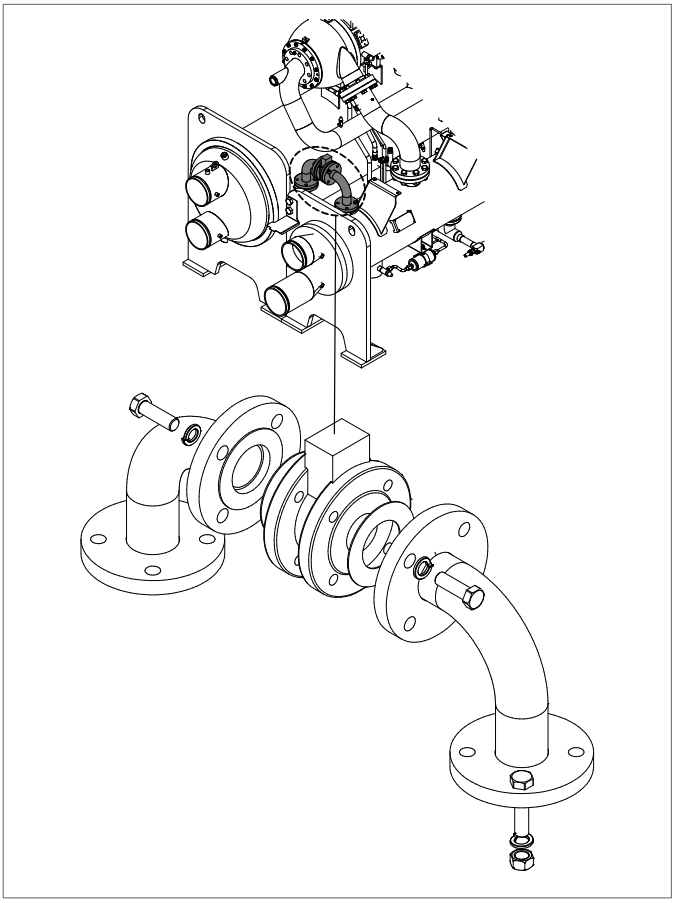
6.20 Hot gas by pass

Option

It is a motorized ball valve, positioned on the refrigerant side between the evaporator and the condenser.

It has the function of bypassing a part of the refrigerant, in the event that a capacity reduction is required below that allowed by the standard machine.

It also provides additional protection against the surge, if the temperature of the condensation water is outside the operating limits.



7. Electrical connections

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

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

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

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

Operate in compliance with safety regulations in force.

⚠ There is a risk of electric shock

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

7.1 Electrical data

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

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

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

Voltage

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 wiringdiagram Nr.

7.2 Connections

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

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

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

4 Ensure correct earth connection.

5 Ensure cables are suitably protected.

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

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

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

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

10 Do not drill holes in the electrical panel.

11 Alternatively, restore the IP rating with watertight systems.

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

7.3 Power supply network requirements

1 The short circuit capacity of the line must be less than 15 kA

2 The units can only be connected to TN, TT distribution systems

3 Voltage 400-3-50 +/-10%

4 Phase unbalance < 2%

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

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

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

8 Earth cable as specified in the table:

Cross-section of the line conductors (mm^2)	Minimum cross-section of the protective conductor (PE) (mm^2)
S ≤ 16	S
16 < S ≤ 35	16
S > 35	S/2

7.4 Signals / data lines

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

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

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

Do not lay the cables parallel to other cables, cable

crossings are possible, only if laid at 90°.

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

A 3-pole shielded bus cable is required.

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

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

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

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

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

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

Do not use cable lugs on the communication bus.

7.5 Power wiring kit

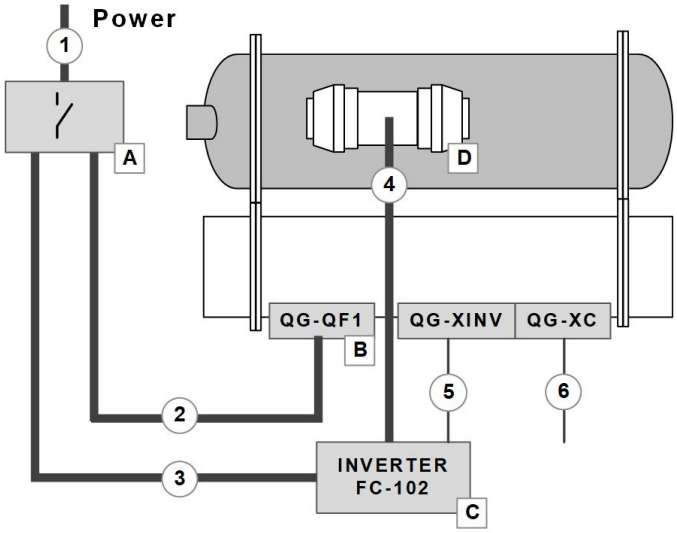
Options

A Panel with general isolator (option QSGX)

1 Cables from general disconnector to panel on-board unit (CCSQX option)

2 Cables from general disconnecting switch to inverter (CCSQX option)

3 Cables from inverter to compressor (CSIC option)



7.6 Cable section

	A		
Grandezze	**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. bar section (mm^2)	nd	nd	2x30x5
Max. bar width Cu (mm^2)	32	40	50
Tightening torque (Nm)	20	20	20

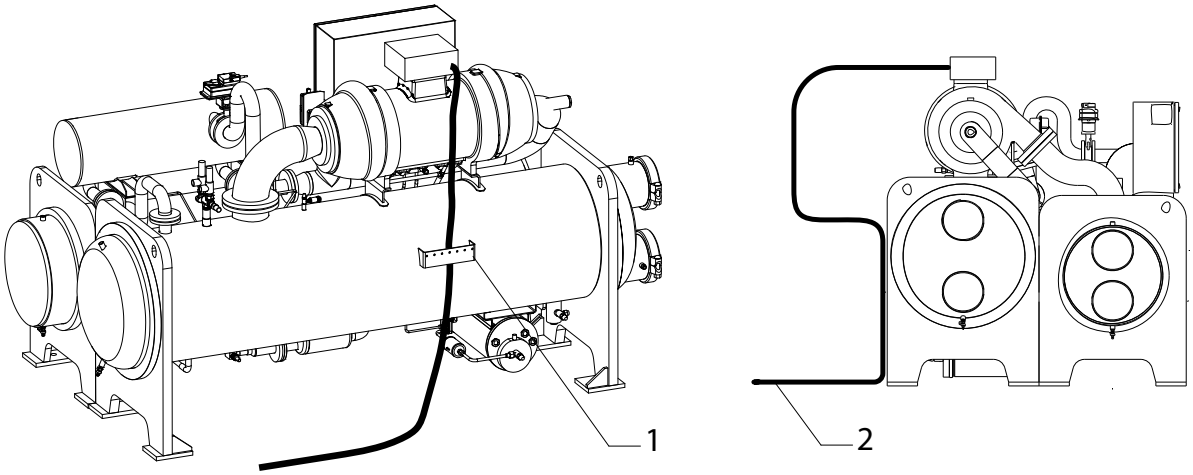
	B	C		D
Grandezze	**230....450**	**230....420**	**380-420-450**	**230-450**
Max connection section mm^2	25	2 x 185	5 x 240	= C
Bolt	-	M10	M10 - M12	M16
Tightening torque (Nm)	2,5 - 3	19 - 40	19 (M10) 35 (M12)	60-70

7.7 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: 10m.



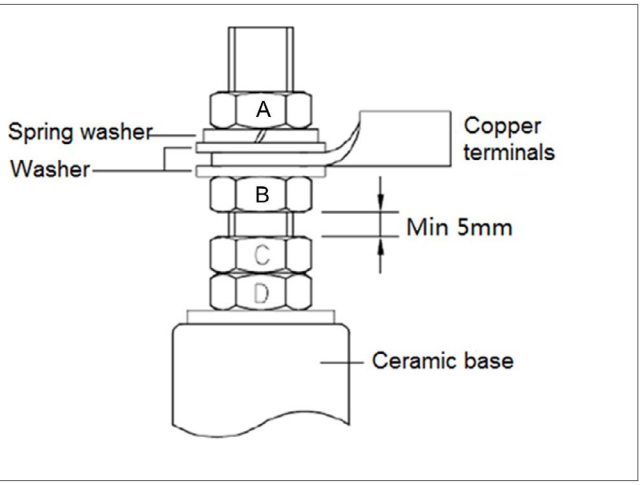
1 Support bracket

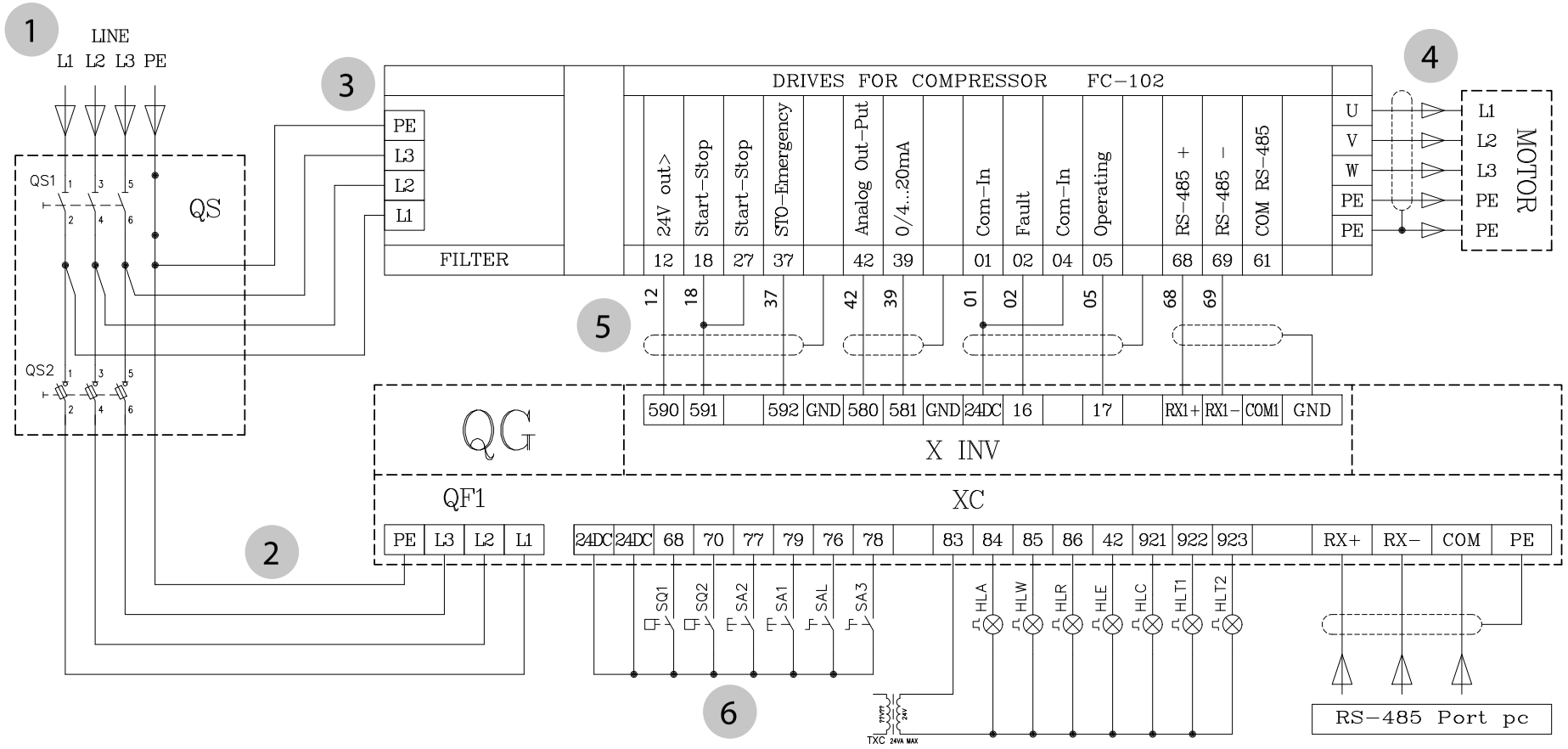
2 Power supply cables

Compressor terminals

Tightening:

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





QS	**quadro di distribuzione a parete** distribution board for wall mounting tableau de distribution sur paroi Wandverteiler cuadro de distribución de pared	SA1	**Pulsante per ON da remoto** Remote ON push-button Bouton ON déporté ON-Taste Fern Botón de ON remota	SQ1	**Flussostato evaporatore** evaporator flow débit d'évaporateur Verdampfers fließen flujo del evaporador	HLR	**Lampada di segnalazione circuito in ON** Signal lamp circuit in ON Signal circuit de la lampe en ON Signal-Lampe-Schaltung in ON Circuito de la lámpara de señales en ON
QS1	**sezionatore generale** main isolator switch sectionneur général hauptschalter interruptor general	SA2	**Pulsante per OFF da remoto** Remote OFF push-button Bouton OFF déporté OFF-Taste Fern Botón de OFF remota	SQ2	**Flussostato condensatore** flow condenser condenseur d'écoulement Kondensator fließen condensador de flujo	HLE	**contattore di comando pompa evaporatore** evaporator pump control contactor contacteur évaporateur de commande de pompe Verdampferpumpe Steuerschütz contactor de control de la bomba del evaporador
QS2	**Sezionatore fusibilato per quadro di comando** main isolator switch with fuses for the control panel Sectionneur avec des fusibles pour le panneau de commande Trenner mit Sicherungen für das Bedienfeld Seccionador general con fusibles para el panel de control	SAL	**Selettore blocco unità** Unit block selector Sélecteur de bloc d'unité Blockwähler der Einheit Selector de bloque de unidad	HLA	**segnalazione blocco cumulativo** cumulative fault signal signalisation alarme Sammelstörmeldung señalización bloqueo cumulativo	HLC	**contattore di comando pompa condensatore** condenser pump control contactor contacteur de commande pompe condenseur Schütz Verflüssigerpumpe contactor de accionamiento bomba condensador
QG	**quadro di comando** control panel tableau de commande Steuertafel quadro di comando	SA3	**selettore locale/remoto** local/remote selector sélecteur local/déporté lokaler/fernwahlschalter selector local/remoto	HLW	**segnalazione allarme lieve** warning signalling signalisation alarme mineure leichter Alarmsignalisierung señalización alarma ligera	HLT1-2	**relè comando pompa torre di raffreddamento** Cooling tower pump relay commandé du relais de la pompe à tour de refroidissement Relaissteuerung Kühlturmpumpe relé de torre de refrigeración de la bomba

connections performed by customer
collegamenti a cura del cliente
raccordements à la charge du client
Kundenseitige Anschlüsse
conexiones a cargo del cliente

8. Description of the unit

8.1 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.

8.2 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.

8.3 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.

8.4 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.

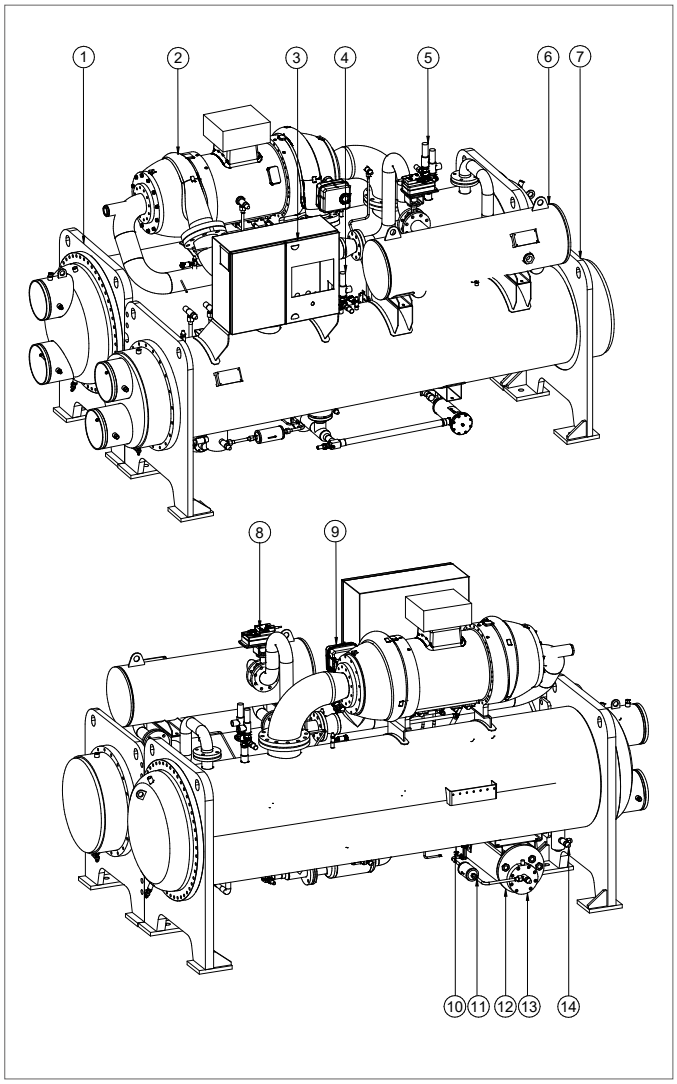
8.5 Refrigeration circuit

The cooling circuit is made of steel and copper.

Is composed by :

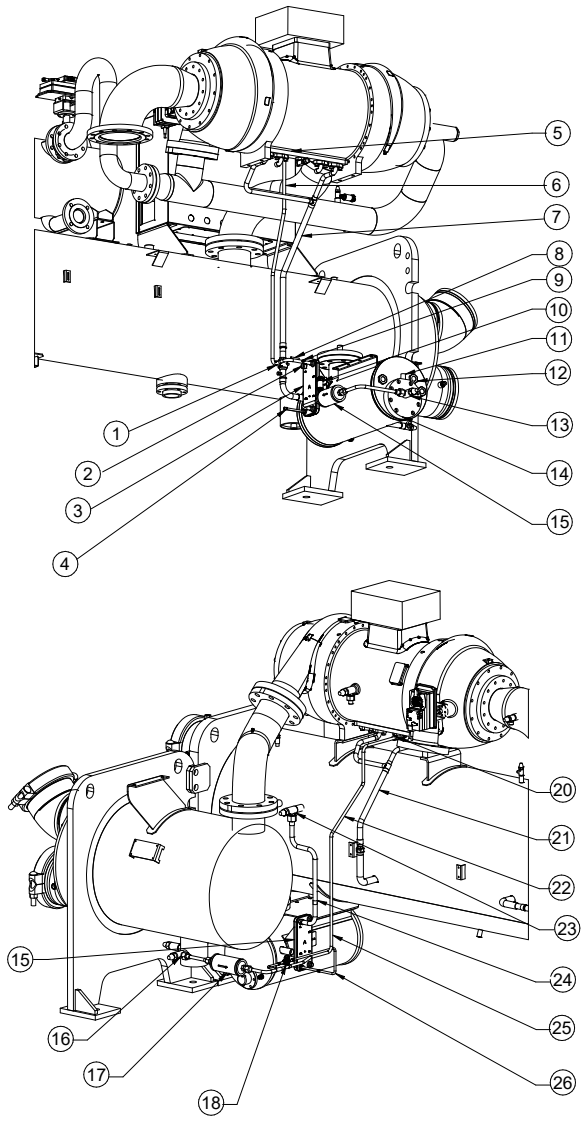
- metal mesh filter complete with connection for rapid refrigerant charge
- high pressure safety pressure switch
- high and low pressure transducer
- coolant temperature probes
- electronic expansion valve
- high pressure side safety valve
- low pressure side safety valve
- (double safety valve with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

8.6 **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

8.7 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

9. **Start-up**

⚠ Before power up the unit, carry out a leakage test.

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

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

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

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

Before checking, please verify the following:

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

⚠ After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.

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

9.1 Start-up sequence

For details refer to the different manual sections.

	Unit OFF power supply
1	safety access
2	functional spaces
3	air cooling inverter
4	structure integrity
5	unit on vibration isolators
6	insulation integrity
7	refrigerant circuit visual check

	Hydraulic system
1	filter • installed in suction pumps • meshes 0.87 mm
2	flow switch • installed in horizontal • in straight line
3	pumps • installed in horizontal • in straight line
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 • IN-OUT temperature difference • free circulation of air
6	non-return valve out of pumps
7	balancing valves on uses
8	flexible joints • in and out of the pumps • in and out of the chiller • 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	cleaned system
13	loaded plant + possible glycol solution + corrosion inhibitor
14	pressurized system
15	vented system

	Electrical system
1	earthing connection
2	compressor insulation test before wiring
3	check electrical connections • supply • signals
4	compressor insulation test after wiring

9.2 Start-up sequence

For details refer to the different manual sections.

⚠ Before powering the unit, carry out a leak test with suitable instrumentation



	Unit ON power supply
1	unit ON
2	off-load voltage measure
3	phase sequence check
4	pump manual start-up and flow check
5	cooling circuit taps opening
6	IGV test: manual control
7	oil pump test: manual control
8	verify the lack of bubbles in the liquid light
9	start unit
10	measure return and supply water temperature
11	measure super-heating and sub-cooling
12	oil pressure measurement
13	measurement of load voltages and absorptions
14	check no anomalous vibrations are present
15	climatic curve personalization
16	scheduling customisation
17	complete and available unit documentation

9.3 Refrigeration circuit

1 Check carefully the refrigeration circuit: the presence of oil stains can mean leakage caused by transportation, movements or other).

2 Verify that the refrigeration circuit is in pressure: Using the unit manometers, if present, or service manometers.

3 Make sure that all the service outlets are closed with proper caps; if caps are not present a leak of refrigerant can be possible.

4 Open the valves of the refrigeration circuit, if there are any.

9.4 Electric Circuit

1 Verify that the unit is connected to the ground plant.

2 Check the conductors are tightened as the vibrations caused by handling and transport might cause these to come loose.

3 Connect the unit by closing the sectioning device, but leave it on OFF.

4 Check the voltage and line frequency values which must be within the limits: 400-3-50 +/-10%

5 Check and adjust the phase balance as necessary: it must be lower than 2%

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

9.5 Water circuit

1 Before realising the unit connection make sure that the hydraulic system has been cleaned up and the clearing water has been drained.

2 Check that the hydraulic circuit has been filled and pressurised.

3 Check that the shut-off valves in the circuit are in the “OPEN” position.

4 Check that there isn’t air in the circuit, if required, evacuate it using the air bleed valve placed in the system high points.

5 When using antifreeze solutions, make sure the glycol percentage is suitable for the type of use envisaged.

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

9.6 Voltages

Check that the air and water temperatures are within the operating limits.

Start the unit.

With unit operating in stable conditions, check:

- Power supply voltage
- Total absorption of the unit
- Absorption of the single electric loads

9.7 Start-up report

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

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

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

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

9.8 2014/68/UE PED directive

DIRECTIVE 2014/68/UE PED gives instructions for installers, users and maintenance technicians as well.

Refer to local regulations; briefly and as an example, see the following:

Compulsory verification of the first installation:

- only for units assembled on the installer's building site (for ex. Condensing circuit + direct expansion unit)

Certification of setting in service:

- for all the units

Periodical verifications:

- to be executed with the frequency indicated by the Manufacturer (see the "maintenance inspections" paragraph)

10. Control



Press

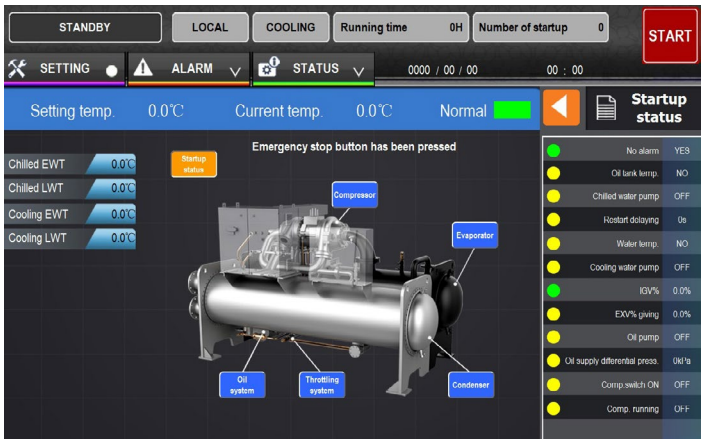
Setting





Press

Startup status





Press

Compressor

Evaporator

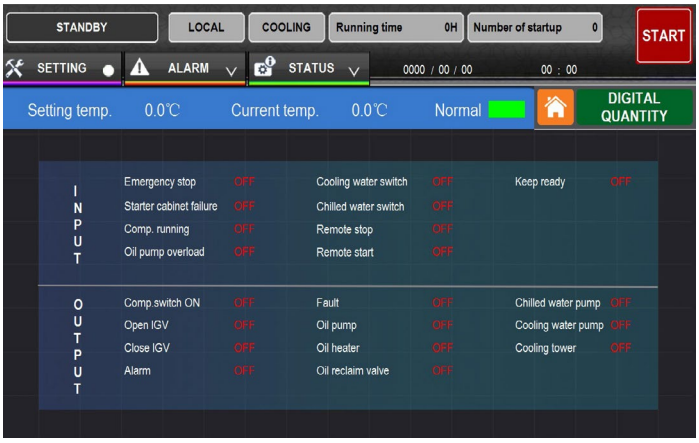
and so on..





Press

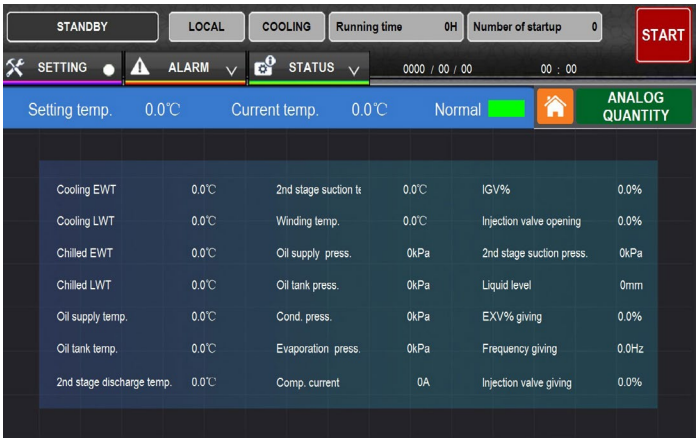
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Press

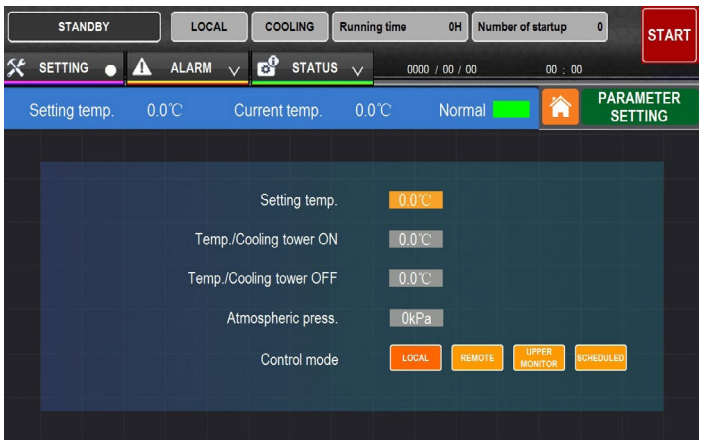
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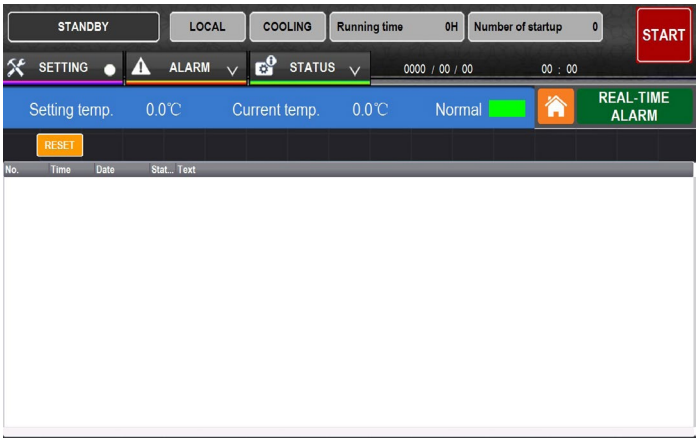
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Parameter Setting







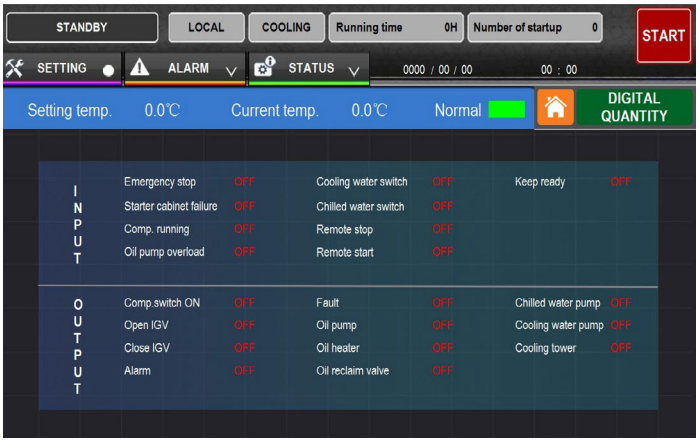


To choose

Alarm > Real time

To choose

Alarm > History



10.1 Alarm list

ⓘ Before resetting an alarm, identify and remove its cause.

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

N°	Description
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

N°	Description
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

10.2 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	Cause
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 Worn bearing 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
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

Symptom	Cause
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. 2 Operate the oil heater during shutdown to increase the oil temperature. 3 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. 4 The Venturi nozzle or filter is clogged, oil does not return to the tank. Remove the Venturi and filter 5 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. 2 Adjust the oil temperature control valve.
High oil level during shutdown	1 Low oil temperature, refrigerant mixed in oil. 2 Make sure the oil heating circuit is properly connected. 3 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.
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. 2 See symptom "Condensing pressure too high". 3 Evaporating pressure too low. 4 See symptom "Evaporating pressure too low". 5 Both previous cases occur.
Compressor in surge during manual start-up	1 Over-opening compressor adjustment flaps. 2 Adjust the aperture using the power adjustment.

10.3 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.

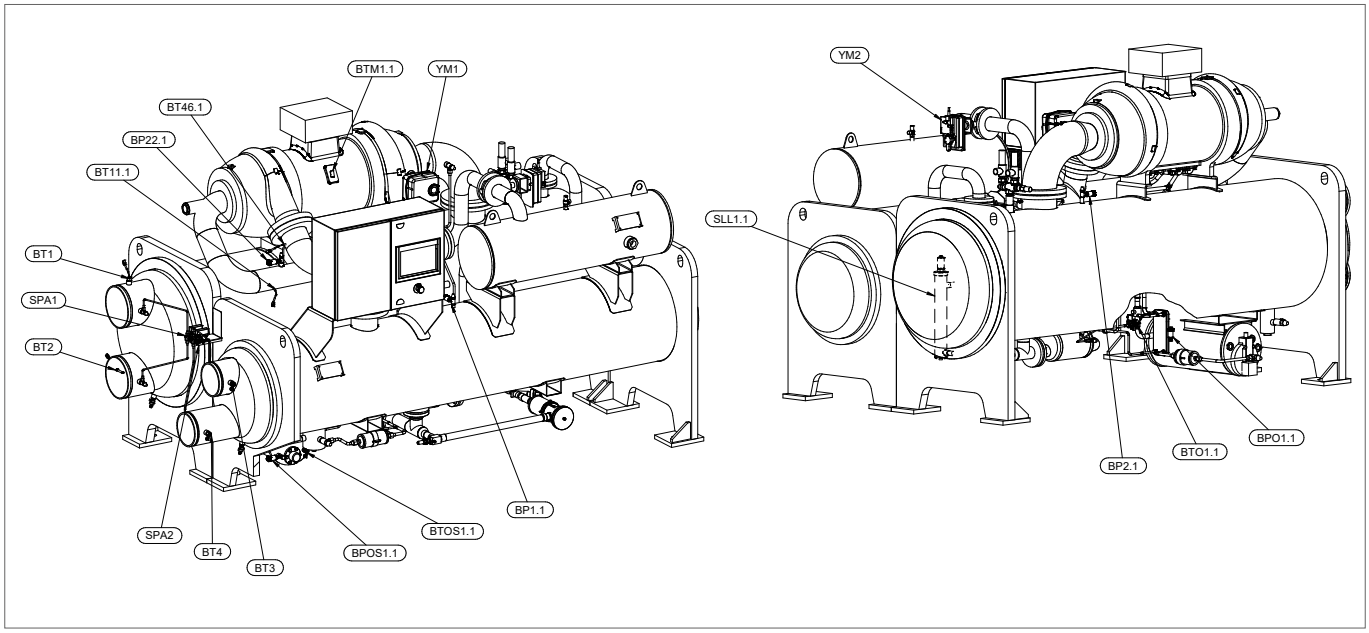
Note 1: motor anomalies and main causes:

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.

10.4 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.

10.5 **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

11. Safety warnings for operations on units containing R1234ze

11.1 Area checks

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

11.2 Work procedures

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

11.3 General work area

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

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

11.4 Check the presence of refrigerant

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

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

11.5 Presence of the fire extinguisher

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

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

11.6 No ignition source

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

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

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

11.7 Ventilated area

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

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

11.8 Cooling equipment checks

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

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

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

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

11.9 Electrical device checks

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

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

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

Initial safety checks must include:

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

- That the earth conductor is continuous

11.10 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.

⚠ 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.

11.11 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.

11.12 Wires

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

11.13 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).

11.14 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.

11.15 Removal and evacuation

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

- remove the refrigerant;
- 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 issuitable ventilation.

11.16 Charging operations

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

- When using charging equipment, make sure that the various refrigerants are not contaminated. Flexible tubes or conduits must be as short as possible to reduce to the minimum the quantity of refrigerant contained.
- 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.

11.17 Dismantling

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

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

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

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

Before attempting the procedure, check that:

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

11.18 Labelling

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

Labels must be dated and signed.

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

11.19 Recovery

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

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

Make sure enough tanks are used.

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

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

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

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

11.20 **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.

12. Maintenance

12.1 Safety

⚠ Operate in compliance with safety regulations in force.

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

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

To carry out the operations use protection devices:

- gloves, goggles, hard hat, ear protection, protective knee pads.



12.2 General

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

The maintenance allows to:

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

Before checking, please verify the following:

⚠ the electrical power supply line should be isolated at the beginning

⚠ the unit isolator is open, locked and equipped with the suitable warning

⚠ make sure no voltage is present

⚠ After turning off the power, wait at least 5 minutes before accessing to the electrical panel or any other electrical component.

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

12.3 Inspections frequency

The frequency, however, depends on the use.

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

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

⚠ Before performing any work, please read carefully:
SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R1234ze



12.4 Unit booklet

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

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

Report on the booklet:

- date
- intervention description
- carried out measures etc.

12.5 Standby mode

If a long period of inactivity is foreseen:

- turn off the power
- avoid the risk of frost (empty the system or add glycol)
- turn off the power to avoid electrical hazards or damage due to lightning

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

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

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

12.6 **Recommended periodical checks**

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		
	Pressure relief 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

12.7 System drain

The system must be drained only if necessary.

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

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

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

Before start-up, wash the system.

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

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

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

12.8 Water 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.

12.9 Water quality control

See the chapter 'Hydraulic connections'

If necessary contact the water treatment company.

12.10 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.

12.11 Water filter

Check that no impurities prevent the correct passage of water.

12.12 Flow Switch

- check operation
- remove scale from the blade

12.13 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.

12.14 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).

12.15 Insulations

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

12.16 Pressure relief valve

The pressure relief valve must be replaced:

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

12.17 Structure

Check the state of the parts constituting the structure.

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

Check fastening of the unit external panelling.

Bad fastening give rise to anomalous noises and vibrations.

12.18 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.

12.18.1 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.

12.18.2 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			≤L 1.0
Density		g/cm^3	0.965 - 0975
Adhesion	40°C	mm^2/s	64.6 - 71.4
	100°C	mm^2/s	8.0 - 9.4
Acid		mgKOH/g	≤0.1
Water		ppm	≤50

12.18.3 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 bronze
Impurity			metal abrasion dust or unsolved pollution
Odor			Strong odor
Adhesion	40°C	mm^2/s	≤54.9
	100°C	mm^2/s	≤6.8
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.

12.18.4 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.

12.19 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.

12.20 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.

12.21 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.

12.22 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.

12.23 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.

12.24 Safety valve control

The pressure relief valve must be replaced:

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

⚠ 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.

12.25 Electrical system maintenance

⚠ Disconnect the unit power supply before performing maintenance

12.26 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.

12.27 Refrigerant leak detector

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

Maintenance

ⓘ The inspection must be carried out by qualified servicing personnel.

- Check correct operation of the LEDs.
- Check correct operation of the buzzer and relay.
- Check signal transmission to the BMS / central

controller, if connected.

- Calibrate the sensor or contact the manufacturer to exchange the sensor with a factory-calibrated one.

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

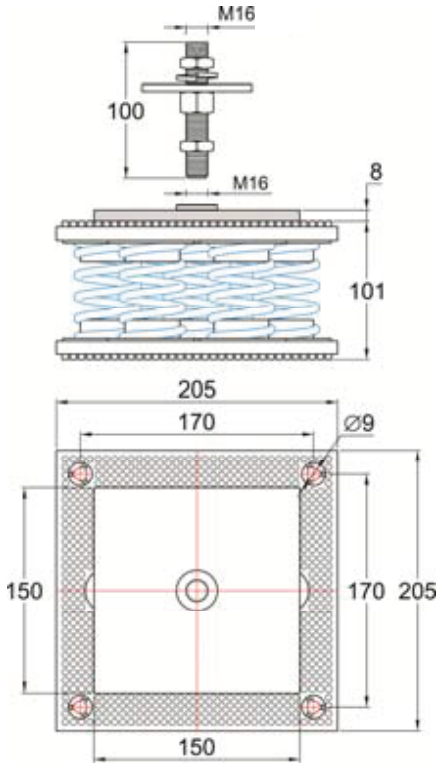
⚠ Sensors must be checked after exposure to significant gas concentrations, which can reduce the duration of the sensor and/or reduce its sensitivity.

13. **Anti-vibration mounts**

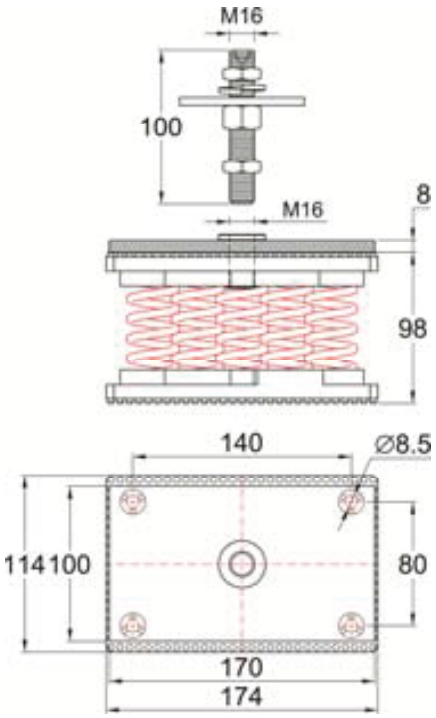
Option



RZ524-X207P

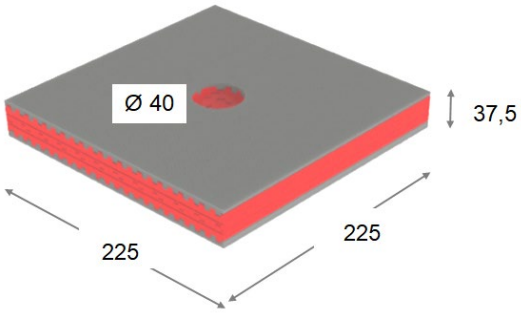


GVr433-245-147P

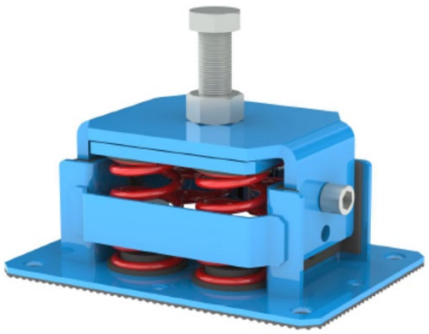


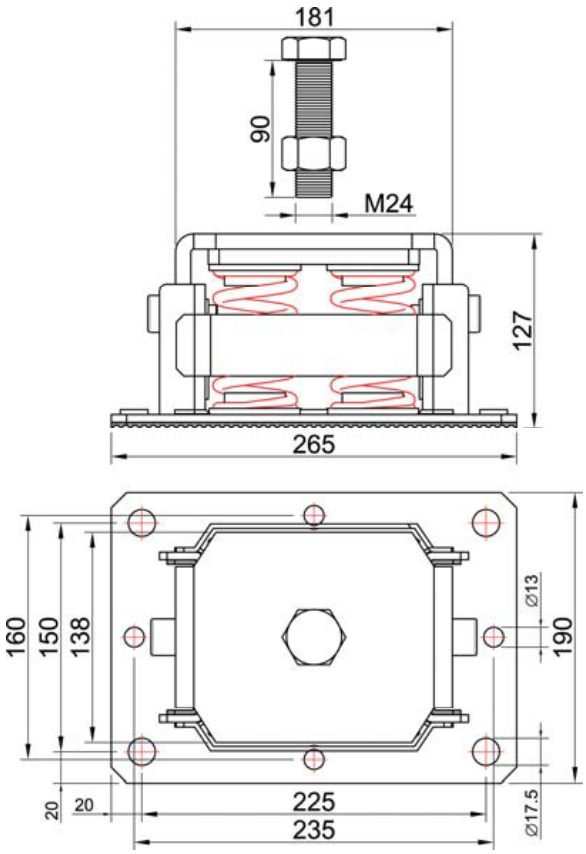
Spring loaded	PECL00013	PECL00014
Sizes	230 - 270 - 300 - 350	380 - 420 - 450
W1 = W2 = W3 = W4	RZ524-X207P	GVr433-245-147P

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



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





14. Decommissioning

14.1 Disconnection

⚠ Before performing any work, carefully read: SAFETY WARNINGS FOR OPERATIONS ON UNITS CONTAINING R1234ze

Avoid leak or spills into the environment.

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

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

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

14.2 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 wheelie bin mark must be disposed of separately at the end of its life cycle to prevent damage to human health and to the environment.

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

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

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

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 refrigeration 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.



14.3 WEEE disposal procedure (Italian market)

14.4 WEEE Disposal Procedure (German Market)

14.5 WEEE Disposal Procedure (Croatian Market)

15. Residual risks

15.1 General

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

15.2 Danger zone

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

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

15.3 Handling

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

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

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

15.4 Installation

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

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

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

Carefully check the positioning of the unit.

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

Carefully check the positioning and the anchoring of the unit.

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

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

15.5 General risks

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

Electrically isolate the unit (yellow-red isolator).

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

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

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

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

Always contact the qualified assistance centre.

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

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

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

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

15.6 Electric parts

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

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

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

Always fix the unit cover properly.

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

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

Contact with parts under voltage accessible inside the unit after the removal of the guards can cause electric

shocks, burns and electrocution.

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

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

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

15.7 Moving parts

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

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

Contact with the fans can cause injury.

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

15.8 Refrigerant

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

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

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

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

Do not place any heat source inside the danger zone.

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

15.9 Hydraulic parts

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

16. **Technical information**

Performance

SIZES			230	270	300	350	380	420	450
Cooling									
Cooling capacity	(1)	kW	809	950	1070	1230	1354	1477	1600
Compressor power input	(1)	kW	139	162	178	204	218	239	262
Total power input	(2)	kW	140	164	179	205	220	241	263
EER	(1)	-	5,77	5,80	5,97	6,00	6,17	6,14	6,07
Water flow-rate user side/cold	(1)	l/s	38,6	45,3	51,0	58,6	64,6	70,4	76,3
User side pressure drop/cold	(1)	kPa	40,7	54,1	48,1	47,4	44,6	52,1	49,5
Water flow-rate source side/hot	(1)	l/s	45,3	53,1	59,6	68,4	75,1	81,9	88,9
Source side pressure drop/hot	(1)	kPa	39,4	39,5	28,4	36,4	35,0	40,9	40,2
Cooling capacity (EN14511:2018)	(3)	kW	808	949	1069	1229	1353	1476	1599
Total power input (EN 14511:2018)	(3)	kW	144	169	184	211	226	249	272
EER (EN 14511:2018)	(3)	-	5,61	5,61	5,81	5,82	5,99	5,93	5,88
SEER	(4)	-	8,00	8,49	8,49	8,90	9,30	9,48	9,64
SEPR	(5)	-	8,72	8,62	9,22	9,28	9,59	9,52	9,48
Cooling capacity (AHRI 550/590)	(6)	kW	809	950	1070	1230	1354	1477	1600
Total power input (AHRI 550/590)	(6)	kW	138	162	177	203	218	239	262
COPR	(6)	-	5,85	5,86	6,05	6,06	6,22	6,19	6,11
IPLV	(6)	-	9,11	9,50	9,37	9,80	10,23	10,47	10,61

The Product is compliant with the Erp (Energy Related Products) European Directive. It includes the Commission delegated Regulation (EU) No 2016/2281, also known as Ecodesign LOT21.
Contains fluorinated greenhouse gases (GWP 7)

1. Data referred to the following conditions: Evaporator water temperature = 12/7 °C. Condenser water temperature = 30/35°C. Evaporator fouling factor = 0.44 x 10^(-4) m2 K/W
2. The Total Power Input value does not take into account the part related to the pumps and required to overcome the pressure drops for the circulation of the solution inside the exchangers.
3. Data compliant to Standard EN 14511:2018 referred to the following conditions: Evaporator water temperature = 12/7 °C. Condenser water temperature = 30/35 °C
4. Data calculated in compliance with EN 14825:2018.
5. Data compliant according to EU regulation 2016/2281
6. Data compliant to Standard AHRI 550/590 referred to the following conditions: Evaporator water temperature =12,22 °C / 6,7 °C. Water flow-rate 0,043 l/s per kW. Condenser water temperature 29,44 °C /34,61 °C. Evaporator fouling factor = 0.18 x 10^(-4) m2 K/W

Construction

SIZES			230	270	300	350	380	420	450
Compressor									
Compressor type	(1)					CFGI			
Refrigerant						R-1234ze			
No. of compressors		Nr				1			
Nominal capacity		HP	268	268	375	375	375	375	422
Std capacity control steps	(2)		15%-100%	15%-100%	15%-100%	15%-100%	15%-100%	15%-100%	15%-100%
Oil charge		l	40	40	40	40	40	40	40
Refrigerant charge		kg	210	210	225	225	310	310	330
Refrigerant circuits		Nr				1			
Internal exchanger / Evaporator									
Type of exchanger	(3)					FF			
No. of exchangers		Nr				1			
Water content		l	240	240	270	300	370	370	400
Minimum system water content		l	4700	5500	6100	7100	7800	8500	9100
External exchanger/ Condenser									
Type of exchanger	(4)					S&T			
No. of exchangers		Nr				1			
Water content		l	249	317	349	433	515	558	650
Connections									
Evaporator water connections		-	8"	8"	8"	8"	10"	10"	10"
Condenser water connections		-	8"	8"	10"	10"	10"	10"	10"
Power supply									
Power supply		V	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50	400/3/50

1. CFGi = Centrifugal compressor regulated by inverter
2. Modulation refers to the conditions: Evaporator water temperature = 12/7°C, condenser water temperature = 30/35°C, with option HGBP.
3. FF = falling film exchanger
4. S&T = shell and tube exchanger

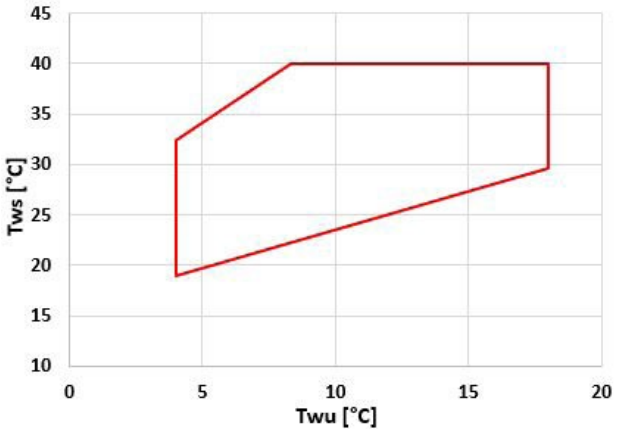
Sound levels

SIZES	Sound power level								Sound Power Level	Sound Pressure Level
	Octave band (Hz)									
	63	125	250	500	1000	2000	4000	8000	DB(A)	DB(A)
230	79	78	82	84	85	92	96	84	79	99
270	82	89	86	89	90	93	98	86	82	101
300	78	81	82	81	82	90	96	83	79	99
350	79	78	82	84	84	92	95	84	79	99
380	82	88	86	89	90	93	98	86	82	101
420	80	87	85	87	88	92	97	84	80	100
450	81	87	85	88	89	92	97	85	81	100

Sound levels refer to full load units, in test nominal conditions. The sound pressure level refers to 1 m. from the standard unit outer surface operating in open field.
Measurements are carried out in compliance with UNI EN ISO 9614-1
The sound power data is not certified by Eurovent.
Data referred to the following conditions: Evaporator water temperature= 12/7°C; Condenser water temperature = 30/35°C.

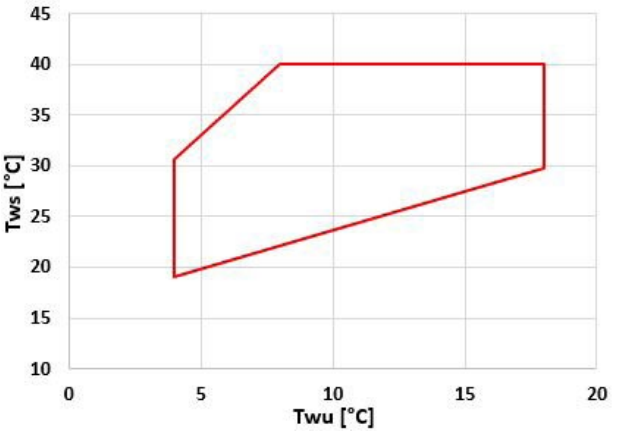
Operating range

Sizes - 230 - 270



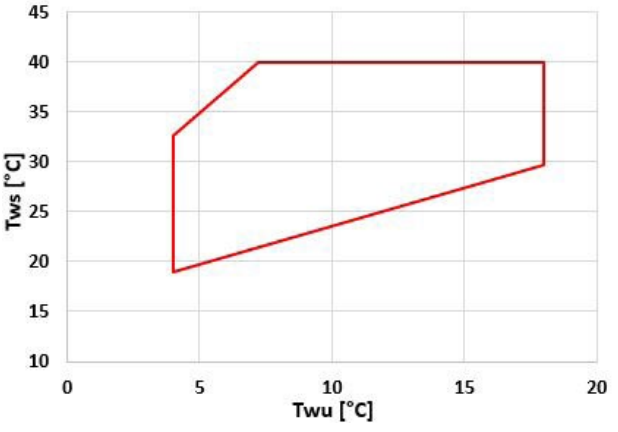
Twu [°C] = Evaporator leaving water temperature
Tws [°C] = Condenser leaving water temperature

Sizes - 300 - 350 - 380 - 420



Twu [°C] = Evaporator leaving water temperature
Tws [°C] = Condenser leaving water temperature

Size - 450



Twu [°C] = Evaporator leaving water temperature
Tws [°C] = Condenser leaving water temperature

Correction factors for glycol use

ETHYLENE GLYCOL WEIGHT %		5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Freezing temperature	°C	-2,0	-3,9	-6,5	-8,9	-11,8	-15,6	-19	-23,4	-27,8	-32,7
Safety temperature	°C	3	1	-1	-4	-6	-10	-14	-19	-23,8	-29,4
Evaporator cooling Capacity Factor	-	0,995	0,989	0,983	0,977	0,971	0,964	0,956	0,949	0,941	0,933
Internal exchanger compressor power input Factor	-	0,998	0,997	0,995	0,994	0,992	0,990	0,989	0,987	0,986	0,984
Evaporator pressure drop Factor	-	1,041	1,085	1,131	1,180	1,231	1,285	1,341	1,400	1,461	1,525
Condenser cooling Capacity Factor	-	0,998	0,996	0,994	0,992	0,990	0,988	0,986	0,984	0,982	0,980
Condenser compressor power input Factor	-	1,003	1,006	1,009	1,012	1,015	1,018	1,021	1,024	1,027	1,030
Condenser pressure drop Factor	-	1,037	1,077	1,118	1,162	1,208	1,257	1,307	1,360	1,415	1,473

Scaling correction factors

SIZE	Internal exchanger (evaporator)		Internal exchanger (evaporator)	
M2 C / W	F1	FK1	F2	FK2
0.44 X 10 (-4)	1,0	1,0	1,0	1,0
0.88 X 10 (-4)	0,97	0,99	0,97	1,08
1.76 X 10 (-4)	0,94	0,98	0,92	1,05

F1 = Cooling capacity correction factor
FK1 = Power absorbed by the compressors correction factor
F2 = Cooling power correction factor
FK2 = Compressor power input correction factor

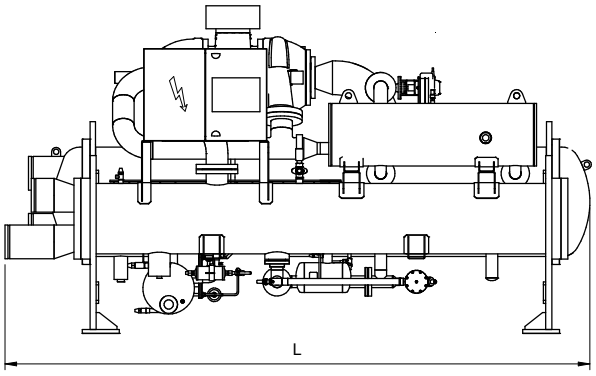
Protections and controls settings

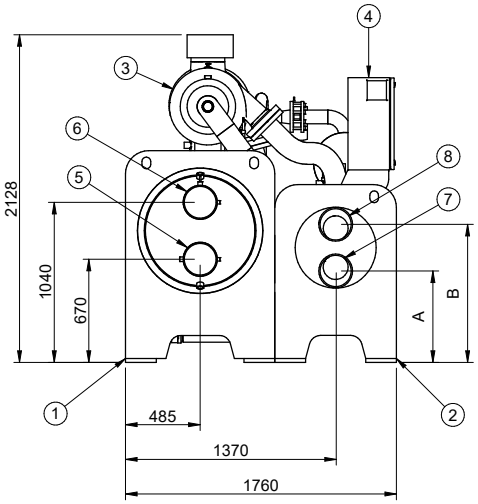
		Intervention	Reset	Value
Higt pressure alarm (gas side)	kPa	730	-	-
Low pressure alarm (gas side)	kPa	140	-	-
Antifreeze protection	°C	-	-	3
High pressure safety valve (gas side)	kPa	-	-	1280
Low pressure safety valve (gas side)	kPa	-	-	1280
Max no. of compressor start-ups per hour	n°	-	-	4
Differential pressure switch	kPa	13	18	-
Max pressure (water side)	kPa	-	-	1000

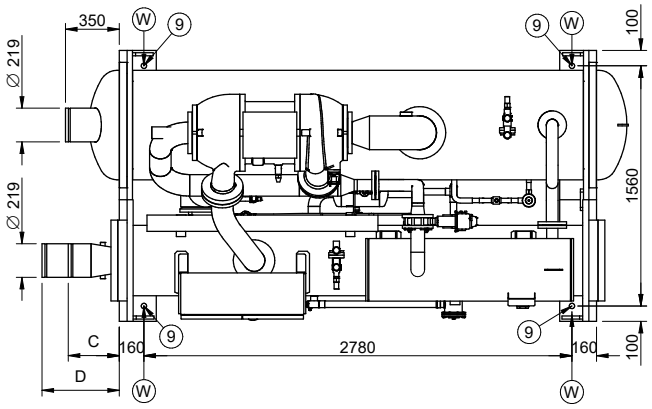
Dimensional drawings

Sizes - 230 - 270

DAACN0001_00
Data/Date 10/07/2020







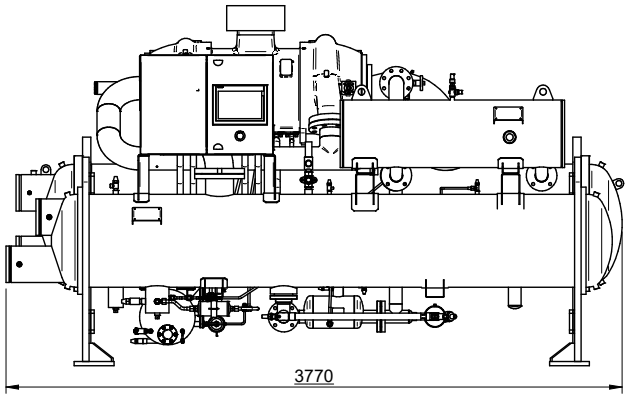
1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes Ø35

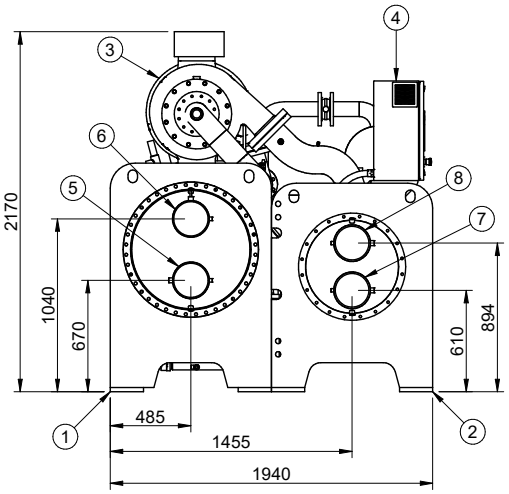
SIZES		230	270
Length	mm	3820	3870
Depth	mm	1760	1760
Height	mm	2128	2128
Operation weight	kg	5700	5785
Shipping weight	kg	5185	5185

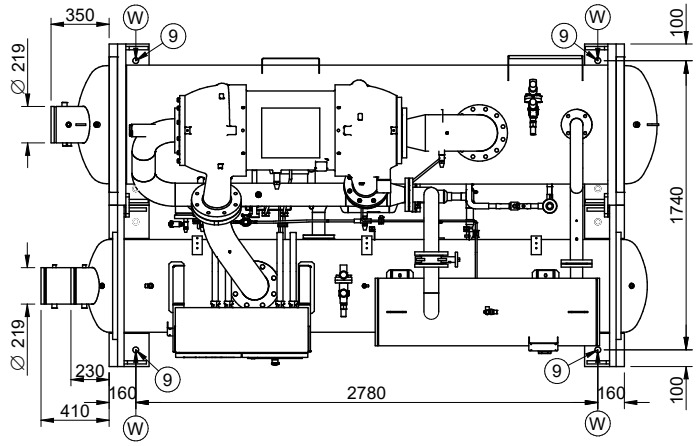
The presence of optional accessories may result in significant variation of the weights indicated

Sizes - 300 - 350

DAACN0002_00
Data/Date 10/07/2020







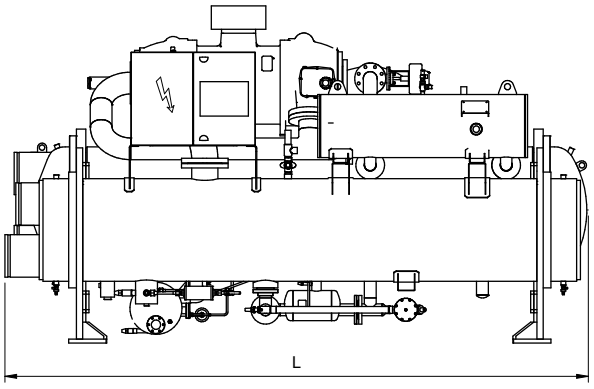
1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes Ø35

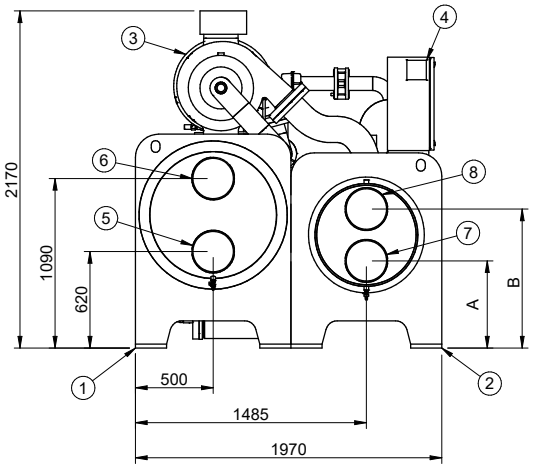
SIZES		300	350
Length	mm	3770	3770
Depth	mm	1940	1940
Height	mm	2170	2170
Operation weight	kg	6269	6469
Shipping weight	kg	5600	5700

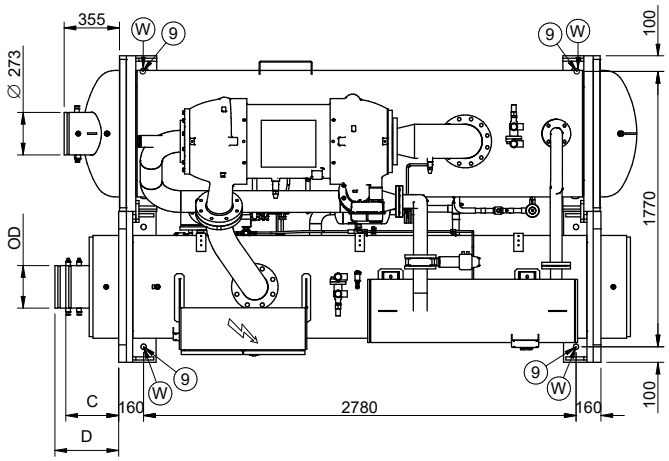
The presence of optional accessories may result in significant variation of the weights indicated

Sizes - 380 - 420 - 450

DAACN0003_00
Data/Date 10/07/2020







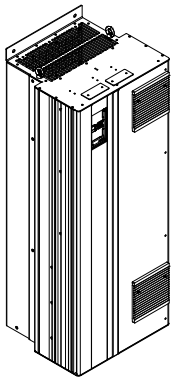
1. Evaporator
2. Condenser
3. Compressor
4. Electrical panel
5. Water inlet user side
6. Water outlet user side
7. Water inlet source side
8. Water outlet source side
9. Unit fixing holes Ø35

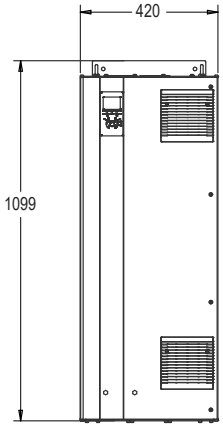
SIZES		380	420	450
OD	mm	219.1	219.1	219.1
Length	mm	3770	3810	3810
Depth	mm	1970	1970	1970
Height	mm	2170	2170	2170
Operation weight	kg	7546	7546	7648
Shipping weight	kg	6853	6853	6925

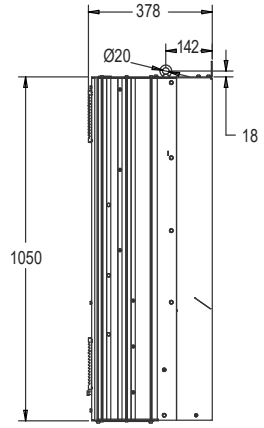
The presence of optional accessories may result in significant variation of the weights indicated

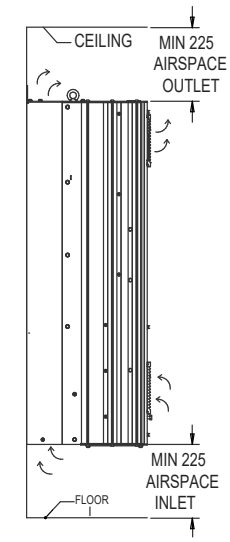
Dimensional inverter

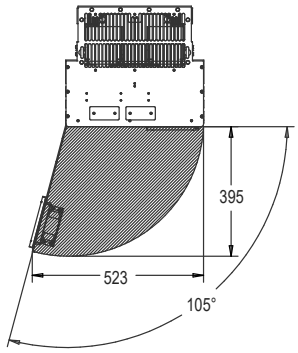
Sizes - 230 - 270 - 300 - 350 - 380 - 420







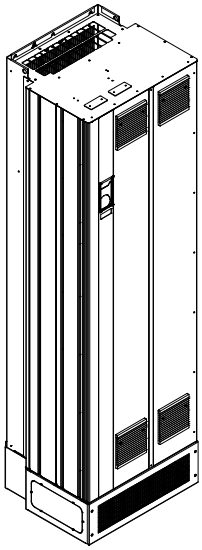


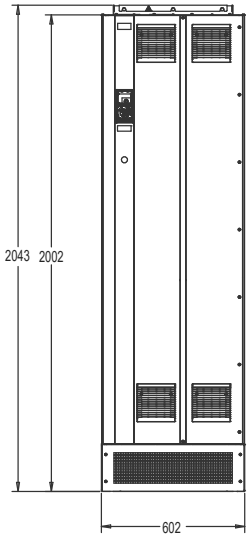


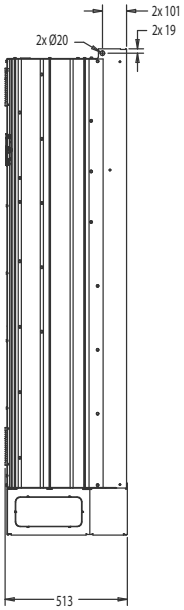
SIZES		230	270	300	350	380	420
Length	mm	420	420	420	420	420	420
Depth	mm	378	378	378	378	378	378
Height	mm	1100	1100	1100	1100	1100	1100
Operation weight	kg	125	125	125	125	125	125

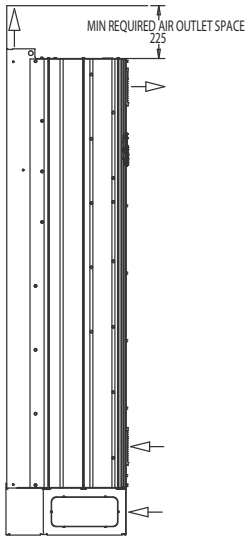
The presence of optional accessories may result in significant variation of the weights indicated

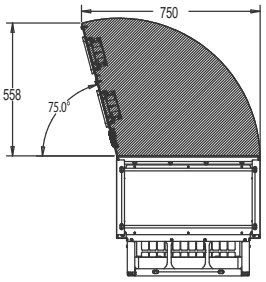
Sizes - 450











SIZES		450
OD	mm	602
Length	mm	514
Depth	mm	2043
Height	mm	300
Operation weight	kg	7546

The presence of optional accessories may result in significant variation of the weights indicated

Notes

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