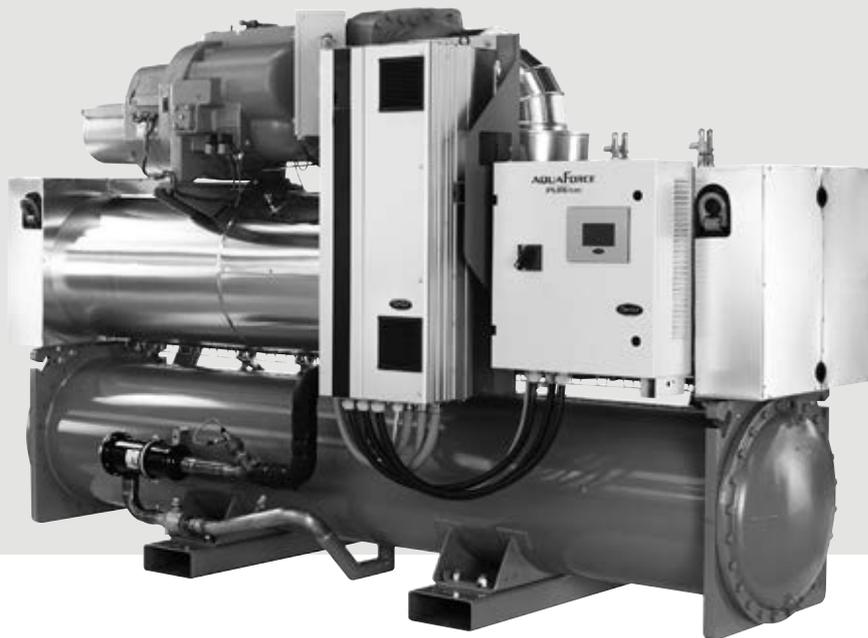




United Technologies



INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



Water-Cooled and heat pump variable speed Liquid Chillers AquaForce® PUREtec greenspeed with R1234ze (E) 30XW-VZE / 30XWHVZE 451-1301

AQUAFORCE^{greenspeed}
PUREtec

This manual applies to the following unit types:

- **30XW-VZE High-efficiency units**
- **30XWHVZE Heat Machine high-efficiency units**

For the operation of the control please refer to the Touch Pilot control manual.

The cover photograph is for illustrative purposes only and is not part of any offer for sale or contract.

CONTENTS

1 - INTRODUCTION	5
1.1 - Installation safety considerations	5
1.2 - Equipment and components under pressure	6
1.3 - Maintenance safety considerations	6
1.4 - Repair safety considerations	9
2 - ADDITIONAL GUIDELINES FOR SAFE USE OF R1234ZE(E) REFRIGERANT IN MACHINERY ROOM	10
2.1 - Machinery rooms	10
2.2 - Safety alarms	11
2.3 - Machine room ventilation and refrigerant sensors	11
3 - PRELIMINARY CHECKS	12
3.1 - Check equipment received	12
3.2 - Moving and sitting the unit	12
4 - DIMENSIONS, CLEARANCES	14
4.1 - 30XW-VZE/30XWHVZE 451-651	14
4.2 - 30XW-VZE/30XWHVZE 851-1301	15
5 - PHYSICAL AND ELECTRICAL DATA	16
5.1 - Physical data	16
5.2 - Electrical data	17
5.3 - Short-circuit stability current	18
5.4 - Compressor electrical data	18
5.5 - Compressor usage per circuit (A, B)	18
6 - ELECTRICAL CONNECTION	19
6.1 - Power supply	19
6.2 - Voltage phase imbalance (%)	19
6.3 - Power connection	19
6.4 - Recommended wire sections	19
6.5 - Power cable entry	19
6.6 - Field control wiring	19
6.7 - 24 and 230 V power reserve for the user	19
7 - APPLICATION DATA	20
7.1 - 30XW-VZE /30XWHVZE Operating limits	20
7.2 - Condenser-side installation recommendation	20
7.3 - Minimum chilled water flow	20
7.4 - Maximum chilled water flow	20
7.5 - Condenser water flow rate	20
7.6 - Standard and optional number of water passes	21
7.7 - Evaporator and condenser water flow rates	21
7.8 - Variable flow evaporator	21
7.9 - System minimum water volume	21
7.10 - Evaporator pressure drop curves	21
7.11 - Condenser pressure drop curves	22
8 - WATER CONNECTIONS	22
8.1 - Operating precautions	22
8.2 - Water connections	23
8.3 - Flow control	23
8.4 - Evaporator and condenser water box bolt tightening	23
8.5 - Operation of two units in master/slave mode	24
9 - HEAT PUMPS 30XWHVZE	24
9.1 - Physical data for heat pumps	24
9.2 - Electrical data for heat pumps	24
9.3 - Dimensions and clearances for heat pumps	24
9.4 - Operating range for heat pumps	24
9.5 - Operating modes for heat pumps	24

10 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA	24
10.1 - Compressor	24
10.2 - Oil filter	24
10.3 - Refrigerant	24
10.4 - Lubricant	24
10.5 - Oil supply solenoid valve.....	24
10.6 - Pressure vessels.....	25
10.7 - High-pressure safety switch	25
10.8 - Electronic expansion valve (EXV)	26
10.9 - Moisture indicator	26
10.10 - Filter drier	26
10.11 - Sensors.....	26
10.12 - Frequency variator	26
11 - OPTIONS AND ACCESSORIES.....	27
12 - STANDARD MAINTENANCE.....	28
12.1 - Level 1 maintenance	28
12.2 - Level 2 maintenance	28
12.3 - Level 3 (or higher) maintenance	28
12.4 - Tightening of the electrical connections	28
12.5 - Tightening torques for the main bolts and screws.....	29
12.6 - Evaporator and condenser maintenance.....	29
12.7 - Compressor maintenance.....	29
12.8 - Frequency variator maintenance	30
13 - START-UP CHECKLIST FOR 30XW-VZE LIQUID CHILLERS (USE FOR JOB FILE)	31

The illustrations on the front cover and inside this document are for illustrative purposes only and not part of any offer for sale or contract.

1 - INTRODUCTION

The 30XW-VZE / 30XWHVZE units are designed to cool or heat water (or brine) for the air conditioning of buildings and industrial processes.

Prior to the initial start-up of the 30XW-VZE / 30XWHVZE units, the people involved in the on-site installation, start-up, operation, and maintenance of this unit should be thoroughly familiar with these instructions and the specific project data for the installation site (Machine room, etc).

They are designed for an operating life of 15 years by assuming a 75% utilisation factor; that is approximately 100,000 operating hours.

This manual provides the necessary information to familiarize yourself with the control system before performing start-up procedures. The procedures in this manual are arranged in the sequence required for machine installation, start-up, operation and maintenance.

Always ensure that all required safety measures are followed, including those in this document, such as: wearing protective clothing (gloves, safety glasses and shoes) using appropriate tools, employing qualified and skilled technicians (electricians, refrigeration engineers) fully trained in the use of flammable refrigerants and following local regulations (see annexe E in EN 378-4-Guidelines for repairs of equipment using flammable refrigerants).

To find out, if these products comply with European directives (machine safety, low voltage, electromagnetic compatibility, equipment under pressure etc.) check the declarations of conformity for these products.

IMPORTANT INFORMATION REGARDING THE REFRIGERANT USED:

This product contains fluorinated greenhouse gas covered by the Kyoto protocol (1997) and subject to reporting obligations of substances listed in Annex II of European F-gas regulation N° 517/2014

- Refrigerant type: R1234ze(E)
- Global Warming Potential GWP: 1

This refrigerant is classified group 2 “non-dangerous” according to the criteria of Pressure Equipment Directive (PED) both 97/23/CE and 2014/68/CE.

According to ISO-819, R1234ze(E) is classified in safety group A2L: Lower flammability. One of the characteristic of this refrigerant is the absence of flammable mixture with air under 21°C of ambience and controlled humidity conditions. However when humidity or temperature goes up, this refrigerant can become flammable and can represent a potential danger if flammability risks are not properly mitigated within the machine room installation.

Local building codes and safety standards shall be followed. In absence of local codes and standards, please refer to EN-378 (2012) (Safety requirements for substances classified A2) or to ISO-5149 (2014)

(for substances classified A2L) as a guide. Customer shall obtain approval from the local building authorities.

Carrier also provides additional guidelines for the safe use of R1234ze(E) refrigerant that should be added to the requirements of safety standards and building codes to insure that the risks are minimised to acceptable levels. Refer to paragraph 2 “additional guidelines for safe use of R1234ze(E) refrigerant in machinery rooms”

For further details on physical properties, flammability & toxicity characteristics, hazards Identification, installation safety requirements, etc, refer to standards such as:

- ASHRAE 34, EN-378, ISO-817 and ISO-5149
- Safety Data Sheet (SDS) supplied by the refrigerant manufacturer
- European union’s REACH database (Registration, Evaluation, Authorisation and Restriction of Chemicals)

1.1 - Installation safety considerations

The 30XW-VZE / 30XWHVZE liquid chillers are classified as “indirect heat exchange system” and are designated to be installed in a special machinery room (Class C as per ISO-5149 and EN-378) where only authorized personnel have access, who are acquainted with general and special safety precautions of the establishment and are qualified and trained in monitoring and maintenance. The access limitation device must be installed by the customer (e.g. cut-off, enclosure).

The refrigerant R1234ze(E) falls into refrigerant safety group A2L in accordance to ISO-5149 and A2 in accordance to EN-378. No Charge limitations apply for the level of occupancy is ‘C’. Please refer to these standards for further details. This level needs to be confirmed by the customer.

Refer also to paragraph 2 for “Additional guidelines for safe use of R1234ze(E) refrigerant in machinery rooms”

After the unit has been received, when it is ready to be installed or reinstalled, and before it is started up, it must be inspected for damage. Check that the refrigerant circuit(s) is (are) intact, especially that no components or pipes have shifted (e.g. following a shock). If in doubt, carry out a leak tightness check and verify with the manufacturer that the circuit integrity has not been impaired. If damage is detected upon receipt, immediately file a claim with the shipping company.

Carrier strongly recommends employing a specialised company to unload the machine.

It is compulsory to wear personal protection equipment.

Do not remove the skid or the packaging until the unit is in its final position. These units can be moved with a fork lift truck, as long as the forks are positioned in the right place and direction on the unit.

The units can also be lifted with slings, using only the designated lifting points marked on the unit.

Use slings or lifting beams with the correct capacity, and always follow the lifting instructions on the certified drawings supplied with the unit. Do not tilt the unit more than 15°.

Safety is only guaranteed, if these instructions are carefully followed. If this is not the case, there is a risk of material deterioration and injuries to personnel.

Never cover any protection devices.

This applies to the relief valves in the refrigerant or heat transfer medium circuits, and the pressure switches.

Ensure that the valves are correctly installed, before operating the unit.

If the relief valves are installed on a change-over manifold, this is equipped with a relief valve on each of the two outlets. Only one of the two relief valves is in operation, the other one is isolated. Never leave the change-over valve in the intermediate position, i.e. with both ways open (locate the control element in the stop position). If a relief valve is removed for checking or replacement please ensure that there is always an active relief valve on each of the change-over valves installed in the unit.

All factory-installed relief valves are lead-sealed to prevent any calibration change.

The external relief valves are designed and installed to ensure damage limitation in case of a fire.

In accordance with the regulations applied for the design, the European directive on equipment under pressure and in accordance with the national usage regulations:

- These relief valves (and rupture disk if used) are not safety accessories but damage limitation accessories in case of a fire,
- The high pressure switches are the safety accessories.

The relief valve must only be removed if the fire risk is fully controlled and after checking that this is allowed by local regulations and authorities. This is the responsibility of the operator.

When the unit is subjected to fire, safety devices prevent rupture due to over-pressure by releasing refrigerant. The fluid may then be decomposed into toxic residues when subjected to the flame:

- Stay away from the unit
- Set up warnings and recommendations for personnel in charge to stop the fire.
- Fire extinguishers appropriate to the system and the refrigerant type must be easily accessible.

The external relief valves must be connected to discharge pipes for units installed in a room. Refer to the installation regulations, for example those of European standards EN-378.

These standards include a sizing method and examples for configuration and calculation. Under certain conditions they permit connection of several valves to the same discharge pipe.

These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. These fluids may be diffused in the air, but far away from any building air intake, or they must be discharged in a quantity that is appropriate for a suitably absorbing environment (Note that the R1234ze(E) refrigerant is heavier than air).

It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious.

The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid a nuisance tripping or leaks, replace or re-calibrate the valve.

Periodic check of the relief valves: See paragraph "Maintenance safety considerations".

Provide a drain in the discharge circuit, close to each relief valve, to avoid an accumulation of condensate or rain water.

Ensure good ventilation, as accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.

Inhalation of high concentrations of vapour is harmful and may cause heart irregularities, unconsciousness, or death. Vapour is heavier than air and reduces the amount of oxygen available for breathing. These products cause eye and skin irritation. Decomposition products are hazardous.

1.2 - Equipment and components under pressure

The units are intended to be stored and operate in an environment where the ambient temperature must not be less than the lowest allowable temperature indicated on the nameplate. See section "Pressure vessels".

1.3 - Maintenance safety considerations

Refer also to paragraph "Additional guidelines for safe use of R1234ze(E) refrigerant in machinery rooms"

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so.

Never clean the chiller with a fluid at a temperature higher than 45°C. An over temperature could generate an over pressure and make the relief valve discharge the refrigerant.

All refrigerant circuit repairs must be carried out by a trained person fully qualified to work on these units who must have been:

- Trained and be familiar with the equipment and the installation (including the refrigerant used).
- Informed of the risks of possible explosive atmospheres and can preventing them. They also have to be informed of the working procedure for preventing the risk of flammable refrigerant leaking into the atmosphere as much as possible

All welding operations must be carried out by qualified specialists

Maintenance operation have to be done according to national rules and regulations that apply to explosive atmospheres (e.g. reference to EN 1127-1)

When performing service on the refrigeration circuit, ventilate the area prior to performing any work and check for presence of refrigerant. During service operation, continue to ventilate the air using the machine room ventilation or temporary fans.

Before opening a refrigerant circuit, purge and consult the pressure gauges. Reclaim the refrigerant using a proper refrigerant reclaim device and reclaim cylinders. The refrigerant circuit should be pumped down and then purged with nitrogen before servicing.

During a brazing operation, the refrigerant circuit should be purged with nitrogen. Also when servicing the refrigerant circuit, all ignition sources should be disabled.

The insulation must be removed and heat generation must be limited by using a wet cloth. Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorised engineer. These procedures must be carried out with the unit shut-down.

NOTE: The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device (This valve is situated on the liquid line before the filter drier). In case of presence of a shut-off valve on the suction line (between evaporator and compressor -factory option n°92), never close at the same time the shut-off valve situated on the discharge line (between compressor and condenser). One exception can be made in case of compressor removal from the refrigerant circuit.

During any handling, maintenance and service operations the engineers working on the unit must be equipped with safety gloves, glasses, shoes, protective clothing.

Never work on a unit that is still energized.

Never work on any of the electrical components, until the general power supply to the unit has been cut using the disconnect switch(es) in the control box(es).

If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position ahead of the machine.

ATTENTION: The frequency variators used in the 30XW-VZE/30XWHVZE units are equipped with capacitor batteries with a discharge time of twenty (20) minutes after disconnecting the power. After disconnecting the power to the control box, wait twenty minutes before opening the control box.

If the work is interrupted, always ensure that all circuits are still deenergized before resuming the work.

ATTENTION: Even if the unit has been switched off, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Attach appropriate safety labels.

IMPORTANT information regarding the refrigerant used:

This product contains fluorinated greenhouse gas covered by the Kyoto protocol.

Fluid type: R1234ze(E)

Global Warming Potential (GWP): 1

CAUTION:

- Any handling of refrigerant contained in this product must comply with the F-Gas Directive N° 517/2014 and any other applicable local legislation.
- Ensure that the refrigerant is never released to the atmosphere during installation, maintenance or equipment disposal.
- The deliberate gas release into the atmosphere is strictly not allowed.
- If a refrigerant leak is detected, ensure that it is stopped and repaired as quickly as possible.
- Only a qualified and certified personnel can perform installation operations, maintenance, refrigerant circuit leak test as well as the equipment disposal and the refrigerant recovering.
- The gas recovery for recycling, regeneration or destruction is at customer charge.
- The customer has to carry out periodic leak tests

In the European Union, article 2 of regulation (EU) No. 517/2014 makes these mandatory and sets their frequency. The table below shows this frequency, as originally published in the regulation. Check whether an inspection frequency is also set by other regulations or standards applicable to your system (e.g. EN 378, ISO5149, etc.).

System WITHOUT leakage detection	No check	12 months	6 months	3 months
System WITH leakage detection	No check	24 months	12 months	6 months
Refrigerant charge/circuit (CO ₂ equivalent)	< 5 tonnes	5 ≤ charge < 50 tonnes	5 ≤ charge < 500 tonnes	charge > 500 tonnes*
Refrigerant charge/circuit (kg)	R134a (GWP 1430)	charge < 3.5 kg	3.5 ≤ charge < 34.9 kg	34.9 ≤ charge < 349.7 kg
	R407C (GWP 1774)	charge < 2.8 kg	2.8 ≤ charge < 28.2 kg	28.2 ≤ charge < 281.9 kg
	R410A (GWP 2088)	charge < 2.4 kg	2.4 ≤ charge < 23.9 kg	23.9 ≤ charge < 239.5 kg
	HFO's : R1234ze	no requirement		

- A logbook must be established for the systems that require a tightness check. It should contain the quantity and the type of fluid present within the installation (added and recovered), the quantity of recycled fluid/regenerated/destroyed, the date and output of the leak test, the designation of the operator and its belonging company, etc.
- Contact your local dealer or installer if you have any questions.

PROTECTION DEVICE CHECKS:

- Periodic inspections of the safety devices and external overpressure devices (external relief valves) must be carried out in accordance with national regulations.

The company or organisation that conducts a pressure switch test shall establish and implement a detailed procedure to fix:

- Safety measures
- Measuring equipment calibration
- Validating operation of protective devices
- Test protocols
- Recommissioning of the equipment.

Consult Carrier Service for this type of test. Carrier mentions here only the principle of a test without removing the pressure switch:

- Verify and record the set-points of pressure switches and relief devices (valves and possible rupture discs)
- Be ready to switch-off the main disconnect switch of the power supply if the pressure switch does not trigger (avoid over-pressure or excess gas in case of valves on the high-pressure side with the recovery condensers).
- Connect a calibrated pressure gauge (the values displayed on the user interface may be inaccurate in an instant reading because of the scanning delay applied in the control)
- Neutralise the HP soft value
- Cut the condenser water flow
- Check the cut-off value
- Reactivate HP soft value
- Reactivate manually HP switch.

CAUTION: If the test leads to replacing the pressure switch, it is necessary to recover the refrigerant charge, these pressure switches are not installed on automatic valves (Schraeder type).

At least once a year thoroughly inspect the protection devices (valves). If the machine operates in a corrosive environment, inspect the protection devices more frequently. Regularly carry out leak tests and immediately repair any leaks (follow local codes)

Ensure regularly that the vibration levels remain acceptable and close to those at the initial unit start-up.

Change the refrigerant when there are equipment failures, following a procedure such as the one described in NF E29-795 or carry out a refrigerant analysis in a specialist laboratory.

If the refrigerant circuit remains open for longer than a day after an intervention (such as a component replacement), the openings must be plugged and the circuit must be charged with nitrogen (inertia principle). The objective is to prevent penetration of atmospheric humidity and the resulting corrosion on the internal walls and on non-protected steel surfaces.

1.4 - Repair safety considerations

It is compulsory to wear personal protection equipment and a detector of explosive atmospheres.

The insulation must be removed and warming up must be limited by using a wet cloth.

Before opening the unit, always ensure that the circuit has been purged.

If work on the evaporator is required, ensure that the piping from the compressor is no longer pressurised (as the valve is not leaktight in the compressor direction.)

All installation parts must be maintained by the personnel in charge, in order to avoid material deterioration and injuries to people. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. Each time repairs have been carried out to the unit, the operation of the protection devices must be re-checked.

Comply with the regulations and recommendations in unit and HVAC installation safety standards, such as: EN-378, ISO-5149, etc.

If a leak occurs or if the refrigerant becomes contaminated (e.g. by a short circuit in a motor) remove the complete charge using a recovery unit and store the refrigerant in mobile containers.

Repair the leak detected and recharge the circuit with the total R1234ze(E) charge, as indicated on the unit name plate. Certain parts of the circuit can be isolated. Only charge liquid refrigerant R1234ze(E) at the liquid line.

Ensure that you are using the correct refrigerant type before recharging the unit.

Charging any refrigerant other than the original charge type R1234ze(E) will impair machine operation and can even lead to a destruction of the compressors. The compressors operating with this refrigerant type are lubricated with a specific synthetic polyolester oil.

Do not use oxygen to purge lines or to pressurize a machine for any purpose. Pressurised air mixtures or gases containing oxygen can be the cause of an explosion. Oxygen reacts violently with oil and grease. Nitrogen should be used to purge the system. It should also be used during brazing.

Never exceed the specified maximum operating pressures. Verify the allowable maximum high- and low-side test pressures by checking the instructions in this manual and the pressures given on the unit name plate.

Do not use air for leak testing. Use only refrigerant or dry nitrogen.

Do not unweld or flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) has been removed from chiller and the system has been purged with nitrogen. Traces of vapour should be displaced with dry air nitrogen. Refrigerant in contact with an open flame produces toxic gases.

The necessary protection equipment must be available, and appropriate fire extinguishers for the system and the refrigerant type used must be within easy reach.

Do not siphon refrigerant.

Avoid contact with liquid refrigerant on the skin or splashing it into the eyes. Use safety goggles. Wash any spills from the skin with soap and water. If liquid refrigerant enters the eyes, immediately and abundantly flush the eyes with water and consult a doctor.

The accidental releases of the refrigerant, due to small leaks or significant discharges following the rupture of a pipe or an unexpected release from a relief valve, can cause frostbites and burns to personnel exposed. Do not ignore such injuries. Installers, owners and especially service engineers for these units must:

- Seek medical attention before treating such injuries.
- Have access to a first-aid kit, especially for treating eye injuries.

We recommend to apply standard EN-378.

Never apply an open flame or live steam to a refrigerant container. Dangerous overpressure can result.

During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment are described in standard NF E29-795.

Any refrigerant transfer and recovery operations must be carried out using a transfer unit. A 1/2" SAE connector on the manual liquid line valve is supplied with all units for connection to the transfer station. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are provided with the units. Please refer to the certified dimensional drawings for the units.

Never use the compressor as a vacuum pump. It would damage the compressor.

Do not re-use disposable (non-returnable) cylinders or attempt to refill them. It is dangerous and illegal. Proper refrigerant cylinders designated and marked for R1234ze(E) should be used. When cylinders are empty, evacuate the remaining gas pressure, and move the cylinders to a place designated for their recovery. Do not incinerate.

ATTENTION: Only use refrigerant R1234ze(E), in accordance with AHRI 700-2014 (Air conditioning, Heating and Refrigeration Institute). The use of any other refrigerant may expose users and operators to unexpected risks.

Do not attempt to remove refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa and has been purged with nitrogen before removing components or opening a circuit.

Do not attempt to repair or recondition any safety devices when corrosion or build-up of foreign material (rust, dirt, scale, etc.) is found within the valve body or mechanism. If necessary, replace the device. Do not install relief valves in series or backwards.

ATTENTION: No part of the unit must be used as a walk-way, rack or support. Periodically check and repair or if necessary replace any component or piping that shows signs of damage.

The refrigerant lines can break under the weight and release refrigerant, causing personal injury.

Do not climb on a machine. Use a platform, or staging to work at higher levels.

Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components. For lighter components, use lifting equipment when there is a risk of slipping or losing your balance.

Use only original replacement parts for any repair or component replacement. Consult the list of replacement parts that corresponds to the specification of the original equipment.

Do not drain water circuits containing industrial brines, without informing the technical service department at the installation site or a competent body first.

Close the entering and leaving water shutoff valves and purge the unit water circuit, before working on the components installed on the circuit (screen filter, pump, water flow switch, etc.).

Do not loosen the water box bolts until the water boxes have been completely drained.

Periodically inspect all valves, fittings and pipes of the refrigerant and hydronic circuits to ensure that they do not show any corrosion or any signs of leaks.

It is recommended to wear ear defenders, when working near the unit and the unit is in operation.

2 - ADDITIONAL GUIDELINES FOR SAFE USE OF R1234ZE(E) REFRIGERANT IN MACHINERY ROOM

2.1 - Machinery rooms

- The following principles apply to machinery rooms when accommodating refrigerating systems:

- machinery rooms may serve for accommodating refrigerating equipment but need not serve exclusively for this equipment;
- refrigerant gas escaping from machinery rooms shall be prevented from entering neighboring rooms, staircases, courts, gangways or building draining systems and the escaping gas shall be vented outdoor without risk;
- it shall be possible to leave the machinery room immediately in case of danger;
- flammable materials, other than refrigerants and oil needed for servicing, shall not be stored in the machinery room;
- remote switch for stopping the refrigerating system shall be provided outside and near the machinery room door;
- Mechanical ventilation shall be provided with independent emergency control located outside the machinery room and near the machinery room door;
- exterior openings shall not be under emergency exit staircases;
- all piping and ducting passing through walls, ceilings and floors of machinery rooms shall be tightly sealed;
- adequate firefighting equipment have to be available;
- **alarms and refrigerant detectors must be installed.**
- If machinery rooms are occupied for significant periods, e.g. used as a building maintenance workspace, they shall be considered as occupied spaces under occupancy class C **“Occupancy with authorized access only”**. If the building owner or user ensures that access is permitted only to qualified and trained personnel doing the necessary maintenance to the machinery room or refrigerating system then the machinery room shall be considered unoccupied.
- When occupied for maintenance or repair, a duly authorized person, familiar with the use of the emergency protective equipment and emergency procedures, should be available near to the machinery room during such occupation in case of an emergency. During service the room should be ventilated using the machine room ventilation system or locally supplied fans.
- Provision shall be made to facilitate immediate exit from the machinery room in the event of an emergency.
- At least one of the emergency exits shall open directly to the open air, or it shall lead to an emergency exit passageway. The doors in the emergency exits shall be such that they can be opened manually from the inside (anti-panic system).
- Where refrigerating equipment and air compressors are located in the same machinery room, the air supply for the air compressors shall be ducted from outside in such a manner that refrigerant cannot enter the air supply.
- Naked flames shall not be permitted in machinery rooms or special machinery rooms, except for welding, brazing or similar activity provided the refrigerant concentration is monitored and adequate ventilation is ensured. Such open flames shall not be left unattended.
- Machinery rooms shall not be used for storage with the exception of necessary compressor oil. Any refrigerants, flammable or toxic materials shall be stored as required by national regulations.

- A remote switch for stopping the refrigerating system shall be provided outside the room, near to the machinery room door. A similar acting switch shall be located at a suitable location inside the room. The switches shall meet the requirements for emergency switches.
- Exterior openings shall not be situated near within 2 m of the building emergency exit staircases or other building openings, e.g. windows, doors, ventilation inlets.
- Machinery rooms shall have doors opening outward and sufficient in number to ensure freedom for persons to escape in an emergency.
- The doors shall be tight fitting, self-closing and so designed that they can be opened from inside (anti-panic system).
- The doors shall have at least a one-hour fire resistance construction, using materials and construction tested in accordance with EN 1634. There shall be no openings that permit unintended passage of escaping refrigerant, vapors, odors and all other gases to other parts of the building.
- Access to outside shall be provided for all special machinery rooms where the refrigerant charge is above the practical limit for the volume of the room and the refrigerant is R1234ze(E). The special machinery room shall have a door that either opens directly to the outside air or through a dedicated vestibule equipped with self-closing, tight-fitting doors.
- Combustion equipment shall not be installed in a machinery room containing an R1234ze(E) refrigerating system.
- Hot surfaces shall not reach a temperature within 100 K of the auto-ignition temperature of the refrigerant.
- Provision shall be made for a sufficient supply of outside replacement air and a good distribution of that air over the (special) machinery room avoiding dead zones.
- Openings for outside air shall be positioned to avoid re-circulation into the room.
- Normal Operation Ventilation – Ventilation shall be in accordance with National regulations with a **MINIMUM OF FOUR AIR EXCHANGES PER HOUR** when the machinery room is occupied.
- The machinery room shall be located in accordance with local and National regulations;
- The emergency exhaust ventilation fan shall be either:
 - with the motor outside the airflow or rated for hazardous areas as required in EN-378 (2012).
 - the fan shall be located to avoid pressurization of the exhaust ductwork in the machinery room.
 - the fan shall not cause sparks to occur if it contacts the duct material.
- The outlet from the exhaust ventilation shall be in accordance to national regulations. The outlet shall not be restricted but have means of keeping rubbish, leaves and birds from entering. The bottom of any rising ductwork open to the outside shall have a drain with a trap for rainwater and with access for inspection.

Emergency ventilation:

CARRIER recommends a ventilation rate to be AT LEAST 300 m³ PER MINUTE.

The emergency mechanical ventilation system shall be activated by a detector(s), located in the machinery room. Mechanical ventilation shall also be provided with two independent emergency controls one located outside the machinery room and the other inside. It should be initiated by the refrigerant detector and include proof of airflow. When initiated the system should also be interlocked with the chiller and stop the operation of the chiller as well as initiate the mandatory EN-378 alarm systems.

All machine rooms should include at least one refrigerant sensor located where the likely highest leak will occur. The sensor should include internal self-checking diagnostics and should be interlocked with the chiller and alarm system to prevent operation of the chiller and enable the alarm if it fails or is disconnected.

All the installed sensors shall have a high respond time <15 seconds (the sensor shall strip within 15 seconds when exposed to FCL) and shall be positioned near the chiller below 0,5 m from the floor.

The sensor should be set at the lowest value from FCL (Flammable Concentration Limit) or 50% of PL (Practical Limit) as defined by EN-378.

For R-1234ze(E), the different limits are defined as follow:

OEL - Occupational Exposure Limit	= 800 ppm
ATEL - Acute Toxicity Exposure Limit	= 59,000 ppm
ODL - Oxygen Deprivation Limit	= 140,000 ppm
LFL - Lower Flammability Limit	= 65,000 ppm

2.2 - Safety alarms

- The alarm shall be turned on by the signal from the detector. The alarm shall also alert an authorized person to take appropriate action.
- In cases where an alarm system is installed the power source of the alarm system shall be independent from the power source of the mechanical ventilation.
- The alarm system shall warn both audibly and visibly such as both a loud buzzer (15 dBA above the background level) and a flashing lamp. The alarm system shall warn both inside and outside of the machinery room or at least inside the space where used in an occupied space. For hotels and similar establishments the alarm system shall also warn at a supervised location such as the night porters location as well as the occupied space. The outside alarm may be installed in a watch room or other supervised location.

2.3 - Machine room ventilation and refrigerant sensors

- The ventilation of machinery rooms shall be sufficient both for normal operating conditions and emergencies.
- Machinery rooms shall be vented outdoors using mechanical ventilation in case of a release of refrigerant due to leaks or rupture of components. This ventilation system shall be independent of any other ventilation system on the site.

- FCL - Flammable Concentration Limit equal 25% of the LFL = 16,000 ppm
- RCL - Refrigerant Concentration Limit determined from the lowest value from ATEL; ODL & FCL = 16,000 ppm
- PL - Practical Limit = 13,094 ppm

CARRIER recommends the following setpoints depending on the sensor configurable number of setpoints & distance from the chiller.

If the sensor is less than TWO meters (2 m) from the unit:

	Caution (Display only)	Warning (display, horn, strobe)	Full Alarm (Display, horn, strobe & exhaust)
Single Setpoint Sensor	-	-	Below 6547 (50%PL)
Dual Setpoint Sensor	-	<3000	<6547
Triple Setpoint Sensor	<OEL=800	<3000	<6547

If the sensor is more than TWO meters (2 m) from the unit

	Caution (Display only)	Warning (display, horn, strobe)	Full Alarm (Display, horn, strobe & exhaust)
Single Setpoint Sensor	-	-	Below 800 (OEL)
Dual Setpoint Sensor	-	<300	<800
Triple Setpoint Sensor	<100	<300	<800

Periodic inspections:

The ventilation system, refrigerant sensor and alarm system should be routinely inspected as part of the building fire system inspection procedures at least on an annual basis. For example, a bump test with 3500 ppm gas can be performed every year in order to make sure the sensors and mitigation respond as designed (make sure the sensors work; make sure the alarm system works; make sure the ventilation system turns on and exhausts the correct amount of air).

WARNING, NOTICES AND DOCUMENTATIONS

- Machinery rooms or special machinery rooms shall be clearly marked as such on the entrances to the room, together with warning notices indicating that unauthorized persons shall not enter and that smoking, naked light or flames are prohibited. The notices shall also state that, in the event of an emergency, only authorized persons conversant with emergency procedures shall decide whether to enter the machinery room. Additionally, warning notices shall be displayed prohibiting unauthorized operation of the system
- The owner / operator shall keep an updated logbook of the refrigerating system.
- In the logbook the following information shall be recorded:
 - details of all maintenance and repair work;
 - quantities and kind of (new, reused or recycled) refrigerant which have been charged on each occasion, and the quantities of refrigerant which have been transferred from the system on each occasion;
 - analysis of a reused refrigerant, if available, the results of which shall also be kept in the log-book;
 - source of the reused refrigerant;

- changes and replacements of components of the system;
- results of all periodic routine tests;
- record of significant periods of non-use.
- The log-book shall either be kept by the owner / operator and in the machinery room, or the data shall be stored in a computer with a printout in the machinery room, in which case the information shall be accessible to the competent person when servicing or testing.

3 - PRELIMINARY CHECKS

3.1 - Check equipment received

- Inspect the unit for damage or missing parts. If damage is detected, or if shipment is incomplete, immediately file a claim with the shipping company.
- Confirm that the unit received is the one ordered. Compare the name plate data with the order.
- The unit name plate must include the following information:
 - Version number
 - Model number
 - CE marking
 - Serial number
 - Year of manufacture and test date
 - Fluid being transported
 - Refrigerant used and refrigerant class
 - Refrigerant charge per circuit
 - Containment fluid to be used
 - PS: Min./max. allowable pressure (high and low pressure side)
 - TS: Min./max. allowable temperature (high and low pressure side)
 - Pressure switch cut-out pressures
 - Unit leak test pressure
 - Voltage, frequency, number of phases
 - Maximum current drawn
 - Maximum power input
 - Unit net weight
- Confirm that all accessories ordered for on-site installation have been delivered, and are complete and undamaged.

The unit must be checked periodically during its whole operating life to ensure that no shocks (handling accessories, tools etc.) have damaged it. If necessary, the damaged parts must be repaired or replaced. See also chapter "Standard maintenance".

3.2 - Moving and sitting the unit

3.2.1 - Moving

See chapter "Installation safety considerations".

CAUTION: Only use slings at the designated lifting points which are marked on the unit.

3.2.2 - Sitting the unit

Always refer to the chapter “Dimensions and clearances” to confirm that there is adequate space for all connections and service operations. For the centre of gravity coordinates, the position of the unit mounting holes, and the weight distribution points, refer to the certified dimensional drawing supplied with the unit.

Typical applications of these units are in refrigeration systems, and they do not require earthquake resistance. Earthquake resistance has not been verified.

Before siting the unit check that:

- the permitted loading at the site is adequate or that appropriate strengthening measures have been taken.
- the unit is installed level on an even surface (maximum tolerance is 5 mm in both axes).
- there is adequate space above the unit for air flow and to ensure access to the components.
- the number of support points is adequate and that they are in the right places.
- the location is not subject to flooding.

CAUTION: Lift and set down the unit with great care. Tilting and jarring can damage the unit and impair unit operation.

3.2.3 - Checks before system start-up

Before the start-up of the refrigeration system, the complete installation, including the refrigeration system must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams and the wiring diagrams.

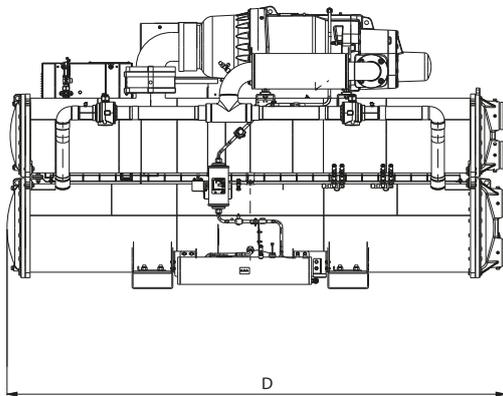
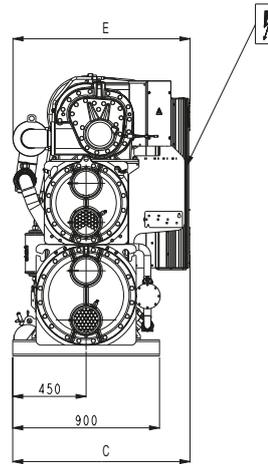
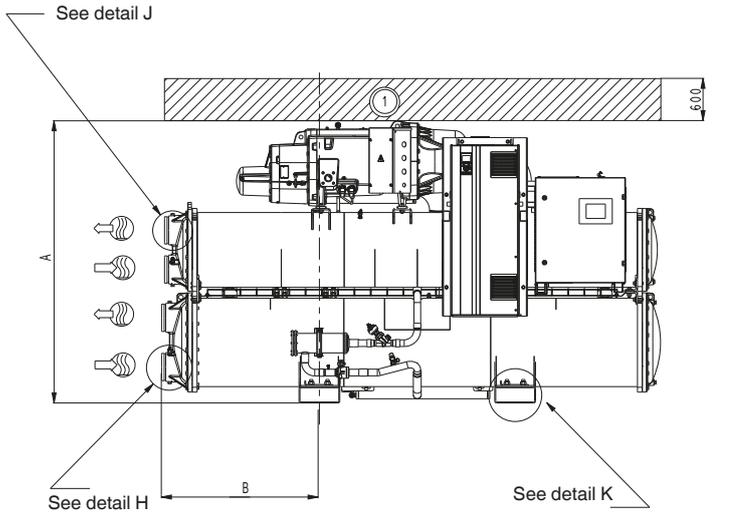
During the installation test national regulations must be followed. If no national regulation exists, standards such EN-378 or ISO-5149 can be used as a guide.

External visual installation checks:

- Ensure that the machine is charged with refrigerant. Verify on the unit nameplate that the ‘fluid being transported’ is R1234ze(E) and is not nitrogen.
- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all protection documents and equipment provided by the manufacturer (dimensional drawings, P&ID, declarations etc.) to comply with the regulations are present.
- Verify that the environmental safety and protection and devices and arrangements provided by the manufacturer to comply with the regulations are in place.
- Verify that all document for pressure containers, certificates, name plates, files, instruction manuals provided by the manufacturer to comply with the regulations are present.
- Verify the free passage of access and safety routes.
- Check that ventilation in the plant room is adequate.
- Check that refrigerant detectors are present.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases that are harmful to the environment.
- Verify the installation of connections.
- Verify the supports and fixing elements (materials, routing and connection).
- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection against heat.
- Check the protection of moving parts.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation and of the vapour barriers
- Check the condition of the insulation of the 400 V cables.

4 - DIMENSIONS, CLEARANCES

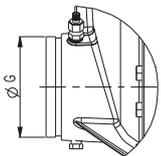
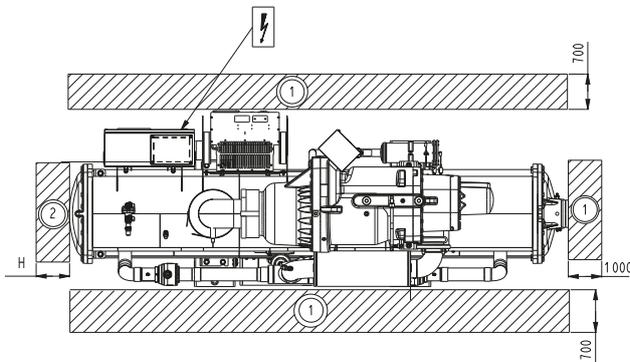
4.1 - 30XW-VZE/30XWHVZE 451-651



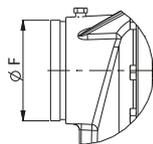
Legend

All dimensions are given in mm

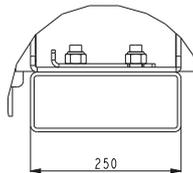
-  Services clearances required
-  Space required to remove cooler tubes
-  Inlet water
-  Outlet water
-  Electrical supply entry



Detail H



Detail J



Detail K

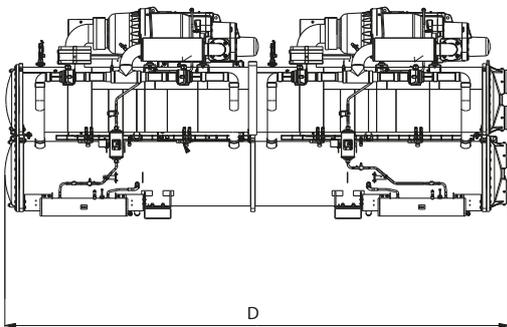
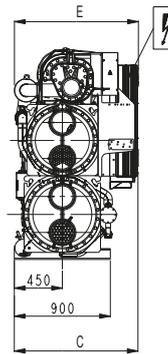
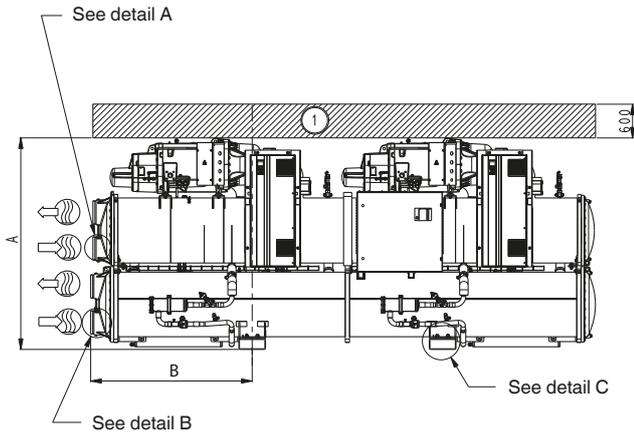
NOTES:

- Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.
- For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings.

Dimensions in mm

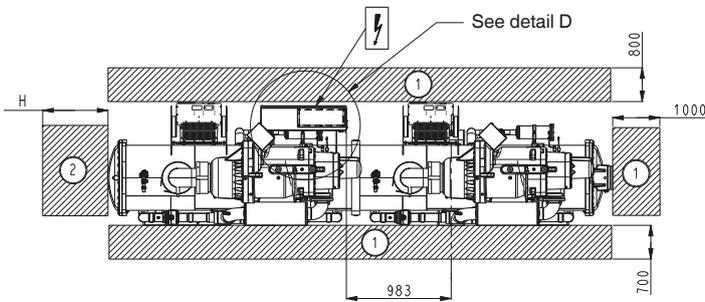
	A	B	C	D	E	F	G	H
30XW-VZE/30XWHVZE								
451	1743	968	1087	3059	1086	168.3	168.3	2800
501	1743	968	1087	3059	1086	168.3	168.3	2800
601	1948	1083	1137	3290	1237	219.1	219.1	3100
651	1948	1083	1137	3290	1237	219.1	219.1	3100

4.2 - 30XW-VZE/30XWHVZE 851-1301



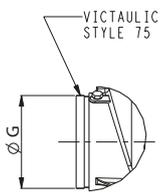
Legend
All dimensions are given in mm

- ① → Services clearances required
- ② → Space required to remove cooler tubes
- Inlet water
- Outlet water
- Electrical supply entry

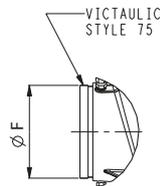


NOTES:

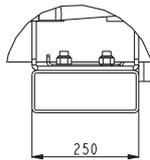
- Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.
- For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings.



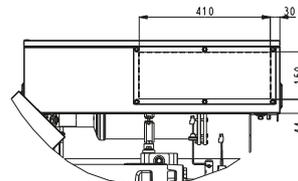
Detail A



Detail B



Detail C



Detail D

Dimensions in mm

	A	B	C	D	E	F	F	H
30XW-VZE/30XWHVZE								
851	1998	1514	1164	4730	1162	219.1	219.1	4500
1001	1998	1514	1164	4730	1162	219.1	219.1	4500
1101	2051	1514	1164	4730	1264	219.1	219.1	4500
1201	2051	1514	1164	4730	1264	219.1	219.1	4500
1301	2051	1514	1164	4730	1264	219.1	219.1	4500

5 - PHYSICAL AND ELECTRICAL DATA

5.1 - Physical data

30XW-VZE/30XWHVZE		451	501	601	651	851	1001	1101	1201	1301
Sound levels - standard unit										
Sound power level(1)	dB(A)	103	103	103	103	104	104	104	104	104
Sound pressure level at 1 m(2)	dB(A)	85	85	85	85	85	85	85	85	85
Sound levels - standard unit + option 257(3)										
Sound power level(1)	dB(A)	100	100	100	100	101	101	101	101	101
Sound pressure level at 1 m(2)	dB(A)	82	82	82	82	82	82	82	82	82
Dimensions - standard unit										
Length	mm	3059	3059	3290	3290	4730	4730	4730	4730	4730
Width	mm	1087	1087	1237	1237	1164	1164	1264	1264	1264
Height	mm	1743	1743	1948	1948	1997	1997	2051	2051	2051
Operating weight(4)	kg	3223	3261	4263	4267	7477	7553	7731	7932	7970
Compressors										
Semi-hermetic 06T screw compressors, 60 r/s										
Circuit A	-	1	1	1	1	1	1	1	1	1
Circuit B	-	-	-	-	-	1	1	1	1	1
Oil - standard unit										
RAX 14012										
Circuit A	l	20	20	25	25	20	20	25	25	25
Circuit B	l	-	-	-	-	20	20	20	25	25
Refrigerant - standard unit										
R1234ze (E)										
Circuit A	kg	130	130	180	175	120	120	115	115	110
teq CO ₂ circuit A	tonnes	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Circuit B	kg	-	-	-	-	120	120	120	115	110
teq CO ₂ circuit B	tonnes	-	-	-	-	0.1	0.1	0.1	0.1	0.1
Capacity control										
Touch Pilot, inverter-driven compressor, electronic expansion valve (EXV)										
Minimum capacity	%	20	20	20	20	10	10	10	10	10
Evaporator										
Multi-pipe flooded type										
Water volume	l	106	106	154	154	297	297	297	297	297
Water connections (Victaulic)	in	6	6	8	8	8	8	8	8	8
Drain and vent connections (NPT)	in	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000
Condenser										
Multi-pipe flooded type										
Water volume	l	112	112	165	165	340	340	340	340	340
Water connections (Victaulic)	in	6	6	8	8	8	8	8	8	8
Drain and vent connections (NPT)	in	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000

- (1) In dB ref=10-12 W, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). Measured in accordance with ISO 9614-1 and certified by Eurovent.3dB(A)). Measured in accordance with ISO 9614-1 and certified by Eurovent.
- (2) In dB ref 20μPa, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). For information, calculated from the sound power level Lw(A).
- (3) Option 257 = Low noise level.
- (4) Weight shown is guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate.

5.2 - Electrical data

30XW-VZE /30XWHVZE		451	501	601	651	851	1001	1101	1201	1301
Power circuit										
Nominal power supply	V-ph-Hz	400-3-50								
Voltage range	V	360-440								
Control circuit										
24 V via the built-in transformer										
Start-up current*	A	Negligible (lower than maximum current drawn)								
Maximum power factor**		0.91-0.93	0.91-0.93	0.91-0.93	0.91-0.93	0.91-0.93	0.91-0.93	0.91-0.93	0.91-0.93	0.91-0.93
Cosine phi		> 0.98	> 0.98	> 0.98	> 0.98	> 0.98	> 0.98	> 0.98	> 0.98	> 0.98
Harmonic distortion rate***	%	35-45	35-45	35-45	35-45	35-45	35-45	35-45	35-45	35-45
Maximum power input****										
Circuit A	kW	135	157	189	208	135	157	189	189	208
Circuit B	kW	-	-	-	-	135	157	157	189	208
Eurovent current draw†										
Circuit A	A	129	148	180	197	129	149	180	180	197
Circuit B	A	-	-	-	-	129	149	149	180	197
Maximum current draw (Un)****										
Circuit A	A	210	245	295	325	210	245	295	295	325
Circuit B	A	-	-	-	-	210	245	245	295	325
Maximum current draw (Un -10%)***										
Circuit A	A	220	260	313	345	220	260	313	313	345
Circuit B	A	-	-	-	-	220	260	260	313	345
Maximum power input with option 150B****										
Circuit A	kW	114	134	161	177	114	134	161	161	177
Circuit B	kW	-	-	-	-	114	134	134	161	177
Maximum current draw (Un) with option 150B****										
Circuit A	A	180	213	257	283	180	213	257	257	283
Circuit B	A	-	-	-	-	180	213	213	257	283
Dissipated power***	W	3000	4200	4700	5300	6000	8400	8900	9400	10600

* Instantaneous start-up current.

** May vary, based on the short-circuit current/max. current draw ratio of the system transformer. Values obtained at operation with maximum unit power input.

*** Values obtained at operation with maximum unit power input.

**** Values obtained at operation with maximum unit power input. Values given on the unit name plate.

† Eurovent unit operating conditions: evaporator entering/leaving water temperature = 12°C/7°C, condenser entering/leaving water temperature = 30°C/35°C. Gross performances, not in accordance with EN14511-3:2013. These performances do not take into account the correction for the proportional heating capacity and power input generated by the water pump to overcome the internal pressure drop in the heat exchanger.

5.3 - Short-circuit stability current

	451	501	601	651	851	1001	1101	1201	1301
Value with unspecified upstream protection									
Short-term current at 1s-lcw-kA rms	5.0	6.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0
Admissible peak current - Ipk-kA pk	7.1	8.5	8.5	8.5	7.1	8.5	8.5	8.5	8.5
Max. value with upstream protection (circuit breaker)									
Conditional short-circuit current Icc-kA rms	50	50	50	50	50	50	50	50	50
Reference number**	NSX400-630-	NSX630-	NSX630-	NSX630-	NSX400-630-	NSX630-	NSX630-	NSX630-	NSX630-

* Earthing system type

** If another current limitation protection system is used, its time-current and thermal constraints (I²t) trip characteristics must be at least equivalent to those of the recommended Schneider circuit breaker.

The short circuit stability current values above are in accordance with TN system.

5.4 - Compressor electrical data

Compressor nominal voltage/frequency: 380V/60Hz

Compressor	I Nom (A)*	I Max (A)**	MHA (A)	LRDA (A)	Cosine phi nom.*	Cosine phi max.**
06TUX483	134	227	240	1537	0.88	0.90
06TUX554	154	265	280	1537	0.88	0.90
06TVX680	184	304	322	2179	0.88	0.90
06TVX753	195	336	356	2179	0.88	0.90

* Value at standard Eurovent conditions: evaporator entering/leaving water temperature 12°C/7°C, condenser entering/leaving water temperature 30°C/35°C.

** Value at maximum capacity and nominal voltage.

Legend

MHA - Maximum compressor operating current, limited by the unit (current given for maximum capacity at 342 V)

LRDA - Locked rotor current for delta connection

5.5 - Compressor usage per circuit (A, B)

30XW-VZE/30XWHVZE	451	501	601	651	851	1001	1101	1201	1301
06TUX483	A	-	-	-	AB	-	-	-	-
06TUX554	-	A	-	-	-	AB	B	-	-
06TVX680	-	-	A	-	-	-	A	AB	-
06TVX753	-	-	-	A	-	-	-	-	AB

Electrical data notes and operating conditions, 30XW-VZE / 30XWHVZE units

- The unit has one connection point per circuit.
- The main switch disconnecter and the main short circuit protection are not included in the electrical cabinet.
- Field connections: All connections to the system and the electrical installations must be in full accordance with all applicable codes.
- The unit is designed and built to ensure conformance with local codes. The recommendations of European standard EN 60204-1 (corresponds to IEC 60204-1) (machine safety - electrical machine components - part 1: general regulations) are specifically taken into account, when designing the electrical equipment*.
- The absence of the main disconnect switch is an exception that shall be considered at the building installation level.
- Compliance of the installation to 1999/92/CE directive on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres: The electrical equipment is not designed for compliance to 2014/34/EU directive for equipment and protective systems intended for use in potentially explosive atmospheres. The compliance of the building installation with article 3 Prevention of and protection against explosions shall be achieved by all necessary measures in the installation for prevention of the formation of explosive atmospheres
- Annex B of EN 60204 1 describes the electrical characteristics used for the operation of the machines. The ones described below apply to 30XW-VZE / 30XWHVZE units and complement other information in this document:

The operating environment for the units is specified below:

- Environment as classified in EN 60721 (corresponds to IEC 60721)**:
 - indoor installation
 - ambient temperature range: minimum temperature +5°C to +42°C, class AA4
 - altitude: lower than or equal to 2000 m
 - presence of water: class AD2 (possibility of water droplets)
 - presence of hard solids, class 4S2 (no significant dust present)
 - presence of corrosive and polluting substances, class 4C2 (negligible)
- Power supply frequency variation: ± 2 Hz.
- The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
- Overcurrent protection of the power supply conductors is not provided with the unit.
- The unit is designed for connection to TN systems (IEC 60364). For IT systems the earth connection must not be at the network earth. Provide a

local earth, consult competent local organisations to complete the electrical installation.

- Electromagnetic environment: classification of the electromagnetic environment is described in standard EN 61800-3 (corresponds to IEC 61800-3):
 - Immunity to external interference defined by the second environment***
 - Interference emission as defined in category C3†
- Due to the harmonic currents the integrated frequency variator in the unit is a source of interference. An analysis may be required to verify if these interferences exceed the compatibility limits of the other devices connected to the same power supply network. The compatibility levels inside an electrical installation, that must be met at the in-plant coupling point (IPC) to which other loads are connected are described in standard 61000-2-4. Two characteristics are required for this analysis:
 - The short-circuit ratio (Rsce) of the installation calculated at the in-plant coupling point (IPC).
 - The total harmonic current distortion rate (THDI), calculated for the machine at maximum capacity.
- Derived currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of derived currents introduced by the use of frequency variators in the unit must be considered. In particular the reinforced immunity protection types and a control value not lower than 150 mA are recommended to control differential protection devices.

NOTE: If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local Carrier representative.

* Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60204-1 is the best means of ensuring compliance with the Machinery Directive.

** The required protection level for this class is IP21B or IPX1B (according to reference document IEC 60529). All 30XW-VZE/30XWHVZE have IP23 units fulfil this protection condition.

*** Example of installations of the second environment: industrial zones, technical locations supplied from a dedicated transformer.

† Category C3 is suitable for use in an industrial environment and is not designed for use in a public low-voltage system that supplies residential locations. As an option, conformity with category C2 permits this type of installation.

6 - ELECTRICAL CONNECTION

Please refer to the certified dimensional drawings, supplied with the unit.

6.1 - Power supply

The power supply must conform to the specification on the unit nameplate. The supply voltage must be within the range specified in the electrical data table. For connection details refer to the wiring diagrams.

WARNING: Operation of the unit with an improper supply voltage or excessive phase imbalance constitutes abuse which will invalidate the Carrier warranty. If the phase imbalance exceeds 2% for voltage, or 10% for current, contact your local electricity supplier at once and ensure that the unit is not switched on until corrective measures have been taken.

6.2 - Voltage phase imbalance (%)

$$\frac{100 \times \text{max. deviation from average voltage}}{\text{Average voltage}}$$

Example:

On a 400 V - 3 ph - 50 Hz supply, the individual phase voltages were measured to be:

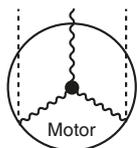
$$AB = 406 \text{ V}; BC = 399 \text{ V}; AC = 394 \text{ V}$$

$$\text{Average voltage} = (406 + 399 + 394)/3 = 1199/3 = 399.7 \text{ say } 400 \text{ V}$$

Calculate the maximum deviation from the 400 V average:

The maximum deviation from the average is 6 V. The greatest percentage deviation is: $100 \times 6/400 = 1.5 \%$. This is less than the permissible 2% and is therefore acceptable.

$$\begin{aligned}(AB) &= 406 - 400 = 6 \\(BC) &= 400 - 399 = 1 \\(A) &= 400 - 394 = 6\end{aligned}$$



6.3 - Power connection

Units with one compressor have one connection point
Units with two compressors have two connection pointst

6.4 - Recommended wire sections

Wire sizing is the responsibility of the installer, and depends on the characteristics and regulations applicable to each installation site. The following is only to be used as a guideline, and does not make in any way liable. After wire sizing has been completed, using the certified dimensional drawing, the installer must ensure easy connection and define any modifications necessary on site.

The maximum connectable wire section is $2 \times 240 \text{ mm}^2$ per phase.

6.5 - Power cable entry

The power cables can enter the unit control box from above the unit. A removable aluminium plate on the upper part of the control box face allows introduction of the cables. Refer to the certified dimensional drawing for the unit.

6.6 - Field control wiring

IMPORTANT: Field connection of interface circuits may lead to safety risks: any control box modification must maintain equipment conformity with local regulations. Precautions must be taken to prevent accidental electrical contact between circuits supplied by different sources:

- The routing selection and/or conductor insulation characteristics must ensure dual electric insulation.
- In case of accidental disconnection, conductor fixing between different conductors and/or in the control box prevents any contact between the conductor ends and an active energised part.

Refer to the Touch Pilot Control manual and the certified wiring diagram supplied with the unit for the field control wiring of the following features:

- Customer interlock
- Remote on/off switch
- Demand limit external switch
- Remote dual set point
- Alarm, alert and operation report
- Evaporator pump control
- Condenser pump control signal (This does not control condenser pump operation (for this function add option 156 and flow switch).
- Heating/cooling change-over
- Refrigerant leak detection
- Water valve control (option)
- Various interlocks and reports on the Energy Management Module board (option)

CCN bus connection

- The permanent connection to the system CCN bus is made at the terminal provided for this purpose inside the control box.
- The connection of the CCN service tool is possible at a socket under the control box, accessible from outside.

6.7 - 24 and 230 V power reserve for the user

Control circuit reserve:

After all required options have been connected, the TC transformer includes a power reserve of 1 A at 24 V a.c. that can be used for the field control wiring.

A second TCA transformer supplies the 230 V, 50 Hz circuit to charge a battery for a portable computer at 0.63 A maximum at 230 V. The connection is via an EEC 7/16 type socket (2 poles without earth) located on the inside front of the control box and accessible from outside.

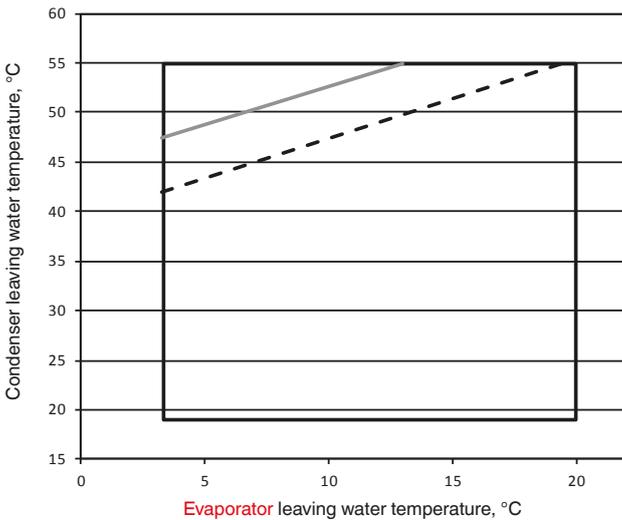
Only devices with class II double insulation can be connected at this socket.

7 - APPLICATION DATA

7.1 - 30XW-VZE /30XWHVZE Operating limits

30XW-VZE/30XWHVZE	Minimum	Maximum
Evaporator		
Entering temperature at start-up	-	35.0°C
Leaving temperature during operation	3.3°C*	20.0°C
Entering/leaving temperature difference at full load	2.8 K	11.1 K
Condenser		
Entering temperature at start-up	13.0°C**	-
Leaving temperature during operation	19.0°C**	55.0°C
Entering/leaving temperature difference at full load	2.8 K	11.1 K

* For low-temperature applications, where the leaving water temperature is below 3.3°C, a frost protection solution must be used. Please refer to option 8
 ** For lower condenser temperatures a water flow control valve must be used at the condenser (two or three-way valve). Please refer to option 152 to ensure the correct condensing temperature.



— From approx. 60% to full load
 - - - Part load limit approx. 50%
 . . . Minimum load limit 20%

Note: Ambient temperatures: These units are dedicated for indoor environment. The external temperature at chiller start up should be at least 5°C. For such low ambient, option 152 is recommended. During storage and transport of the 30XW-VZE/30XWHVZE units (including by container) the minimum and maximum permissible temperatures are -20°C and 70°C.

7.2 - Condenser-side installation recommendation

To ensure unit start-up at low condenser water temperature conditions, a specific installation may be necessary. Please refer to the table below:

	0 < t < 20min	20 < t < 40min	40 < t < 60min	t > 60min
15°C < x	1			2
13 < x < 15°C	1			2
11 < x < 13°C		3		4
8 < x < 11°C				4
x < 8°C				4

x Condenser water temperature before start-up
 t Time required to reach a temperature of 19°C at the condenser outlet

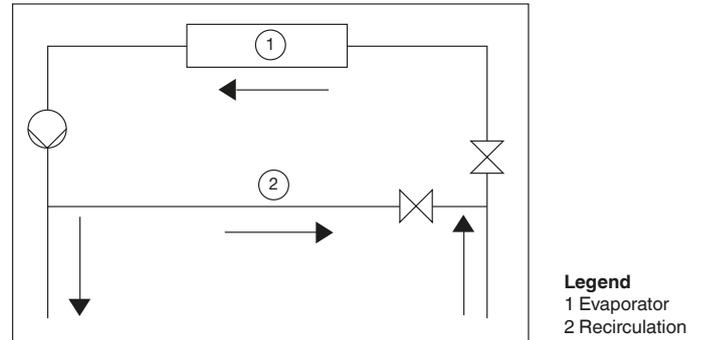
- "The unit can start without the use of a two- or three-way valve, but operation will be more reliable with the control valve."
- "The use of a two- or three-way valve is strongly recommended."
- "The use of a two- or three-way valve is compulsory."
- The use of a two- or three-way valve is compulsory and the use of variable speed pumps is strongly recommended.

7.3 - Minimum chilled water flow

The minimum chilled water flow is shown in the table in chapter 7.7.

If the system flow is less than the minimum unit flow rate, the evaporator flow can be recirculated, as shown in the diagram.

For minimum chiller flow rate



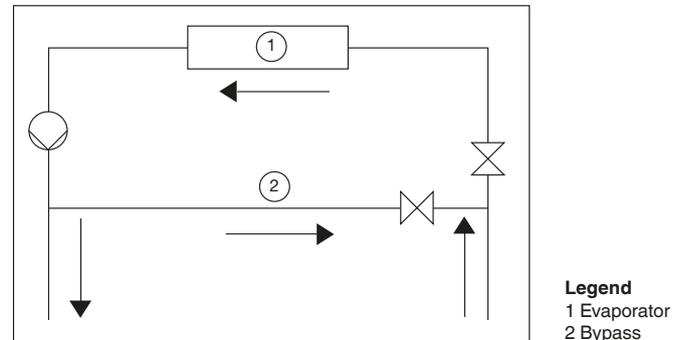
Legend
 1 Evaporator
 2 Recirculation

7.4 - Maximum chilled water flow

The maximum chilled water flow is limited by the permitted pressure drop in the evaporator. It is provided in the table in chapter 7.7.

- Select the option with one water pass less that will allow a higher maximum water flow rate (see option 100C in the table in chapter 6.6 "Number of passes").
- Bypass the evaporator as shown in the diagram to obtain a lower evaporator flow rate.

For maximum chiller flow rate



Legend
 1 Evaporator
 2 Bypass

7.5 - Condenser water flow rate

The minimum and maximum condenser water flow rates are shown in the table in chapter 7.7 "Evaporator and condenser water flow rates".

If the system flow is higher than the maximum unit flow rate, select the option with one pass less that will allow a higher maximum water flow rate. Please refer to option 102C in the table in chapter 7.6 "Number of passes".

7.6 - Standard and optional number of water passes

30XW-VZE/30XWHVZE	451	501	601	651	851	1001	1101	1201	1301
Evaporator									
Standard	2	2	2	2	2	2	2	2	2
Option 100C	1	1	1	1	1	1	1	1	1
Condenser									
Standard	2	2	2	2	2	2	2	2	2
Option 102C	1	1	1	1	1	1	1	1	1

7.7 - Evaporator and condenser water flow rates

These below values are given for standard units. For options 100C and 102C, please refer to the unit selection program.

30XW-V/30XWHV	451	501	601	651	851	1001	1101	1201	1301
Evaporator water flow rate, l/s									
Minimum	6	6	8	8	15	15	15	15	15
Maximum	54	54	76	76	170	170	170	170	170
Condenser water flow rate, l/s									
Minimum	6	6	8	8	15	15	15	15	15
Maximum	52	52	74	74	170	170	170	170	170

Notes

- Minimum evaporator flow rate based on a water velocity of 0,3 m/s.
- Minimum condenser flow rate based on a water velocity of 0,3 m/s.

7.8 - Variable flow evaporator

Variable evaporator flow can be used. The controlled flow rate must be higher than the minimum flow given in the table of permissible flow rates and must not vary by more than 10% per minute.

If the flow rate changes more rapidly, the system should contain a minimum of 6.5 liters of water per kW instead of 3.25 l/kW.

7.9 - System minimum water volume

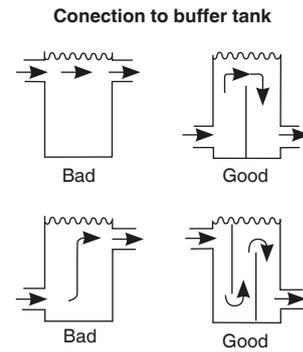
Whichever the system, the water loop minimum volume is given by the formula:

$$\text{Volume} = \text{Cap (kW)} \times \text{N litres}$$

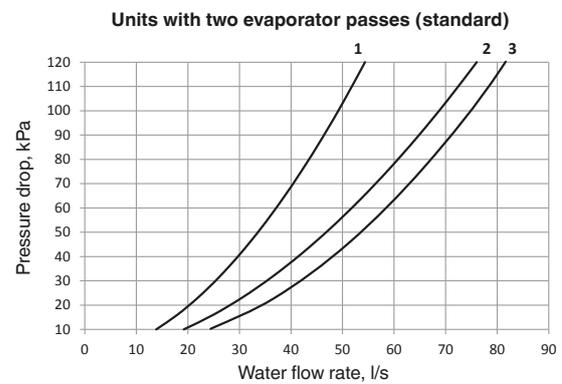
Application	N
Normal air conditioning	3.25
Process type cooling	6.5

Where Cap is the nominal system cooling capacity (kW) at the nominal operating conditions of the installation.

This volume is necessary for stable operation. It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must itself be internally baffled in order to ensure proper mixing of the liquid (water or brine). Refer to the examples below.

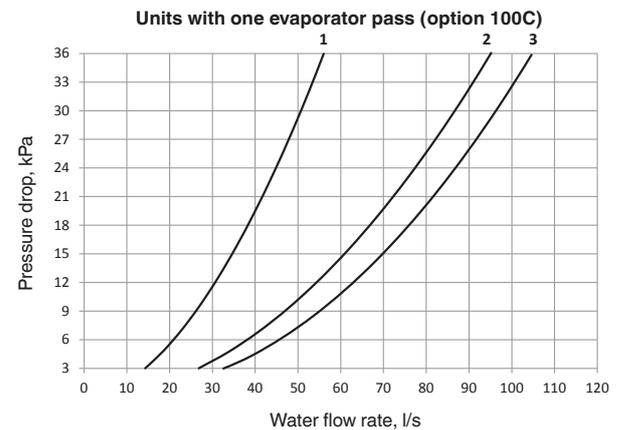


7.10 - Evaporator pressure drop curves



Legend

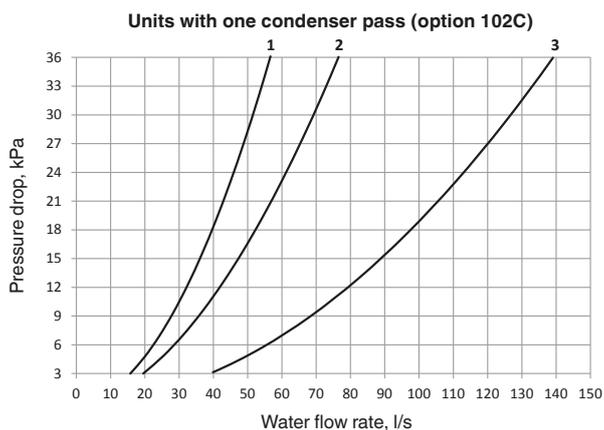
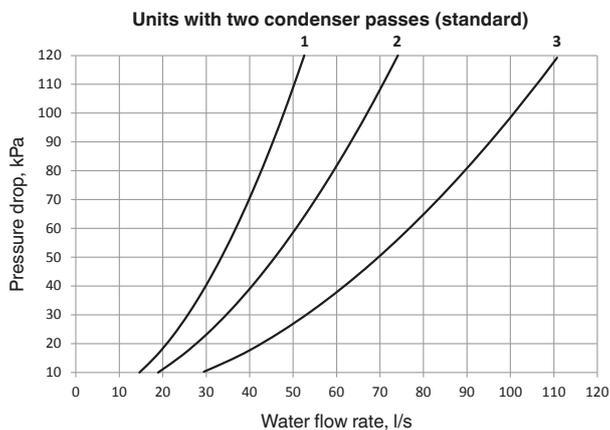
- 1 451, 501
- 2 601, 651
- 3 851, 1001, 1101, 1201, 1301



Legend

- 1 451, 501
- 2 601, 651
- 3 851, 1001, 1101, 1201, 1301

7.11 - Condenser pressure drop curves



Legend

- 1 451, 501
- 2 601, 651
- 3 851, 1001, 1101, 1201, 1301

8 - WATER CONNECTIONS

ATTENTION: Before carrying out any water connections install the water box purge plugs (one plug per water box in the lower section supplied in the control box).

For size and position of the heat exchanger water inlet and outlet connections refer to the certified dimensional drawings supplied with the unit.

The water pipes must not transmit any radial or axial force to the heat exchangers nor any vibration.

The water supply must be analysed and appropriate filtering, treatment, control devices, isolation and bleed valves and circuits built in, to prevent corrosion, fouling and deterioration of the pump fittings. Consult either a water treatment specialist or appropriate literature on the subject

8.1 - Operating precautions

The water circuit should be designed to have the least number of elbows and horizontal pipe runs at different levels. Below the main points to be checked for the connection:

- Comply with the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit(s).
- Use a pressure reducer to maintain pressure in the circuit(s) and install a safety valve as well as an expansion tank.
- Install thermometers in both the entering and leaving water connections.
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install stop valves, close to the entering and leaving water connections.
- Use flexible connections to reduce the transmission of vibrations.
- Insulate all pipework, after testing for leaks, both to reduce heat gains and to prevent condensation.
- Cover the insulation with a vapour barrier
- If there are particles in the fluid that could foul the heat exchanger, a screen filter should be installed ahead of the pump. The mesh size of the filter must be 1.2 mm.
- Before the system start-up verify that the water circuits are connected to the appropriate heat exchangers (e.g. no reversal between evaporator and condenser).
- Do not introduce any significant static or dynamic pressure into the heat exchange circuit (with regard to the design operating pressures).
- Before any start-up verify that the heat exchange fluid is compatible with the materials and the water circuit coating.
- The use of different metals on hydraulic piping could generate electrolytic pairs and consequently corrosion. It could be needed to add sacrificial anodes.
- In case additives or other fluids than those recommended by Carrier are used, ensure that the fluids are not considered as a gas, and that they belong to class 2, as defined in directive 97/23/EC.

Carrier recommendations on heat exchange fluids:

- No NH₄⁺ ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.
- Cl⁻ Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 125 mg/l.
- SO₄²⁻ sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.

- No fluoride ions (<0.1 mg/l).
- No Fe²⁺ and Fe³⁺ ions with non negligible levels of dissolved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1 mg/l.
- Water hardness: > 0.5 mmol/l. Values between 1 and 2.5 can be recommended. This will facilitate scale deposit that can limit corrosion of copper. Values that are too high can cause piping blockage over time. A total alkalimetric titre (TAC) below 100 mg/l is desirable.
- Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.

- Electric conductivity 10-600µS/cm.
- pH: Ideal case pH neutral at 20-25°C 7 < pH < 8

When the water circuit must be emptied for longer than one month or immediately if the water does not comply with the above description, the circuit must be either totally dried or placed under 0.5 bar maximum nitrogen charge. This is done to avoid any damage of the exchanger copper tubes with corrosion by differential aeration. In case of nitrogen charge, the circuit must be equipped with relief valves to avoid overpressure due to refrigerant leakage.

CAUTION: Filling, completing and draining the water circuit charge must be done by qualified personnel, using the air purges and materials that are suitable for the products.

Charging and removing heat exchange fluids should be done with devices that must be included on the water circuit by the installer. Never use the unit heat exchangers to add heat exchange fluid.

8.2 - Water connections

The water connections are Victaulic type connections. The inlet and outlet connection diameters are identical.

Inlet/outlet diameters

Evaporator 30XW-V/30XWHV		451	501	601	651	851	1001	1101	1201	1301
Units without option 100C										
Connection	in	6	6	8	8	8	8	8	8	8
Outside diameter	mm	168.3	168.3	219.1	219.1	219.1	219.1	219.1	219.1	219.1
Units with option 100C										
Connection	in	6	6	8	8	8	8	8	8	8
Outside diameter	mm	168.3	168.3	219.1	219.1	219.1	219.1	219.1	219.1	219.1
Condenser 30XW-V/30XWHV										
Units without option 102C										
Connection	in	6	6	8	8	8	8	8	8	8
Outside diameter	mm	168.3	168.3	219.1	219.1	219.1	219.1	219.1	219.1	219.1
Units with option 102C										
Connection	in	8	8	8	8	8	8	8	8	8
Outside diameter	mm	219.1	219.1	219.1	219.1	219.1	219.1	219.1	219.1	219.1

8.3 - Flow control

Evaporator flow switch and chilled water pump interlock

IMPORTANT: The unit water flow switch must be energised, and the chilled water pump interlock must be connected. Failure to follow this instruction will void the Carrier guarantee.

The water flow switch is installed on the evaporator water inlet and adjusted by the control. If adjustment is necessary, it must be carried out by qualified personnel trained by Carrier Service.

8.4 - Evaporator and condenser water box bolt tightening

The evaporator (and condenser) are of the shell and tube type with removable water boxes to facilitate cleaning. Re-tightening or tightening must be done in accordance with the illustration in the example below.

NOTE: Before this operation we recommend draining the circuit and disconnecting the pipes to be sure that the bolts are correctly and uniformly tightened

Water box tightening sequence



Legende

- 1 Sequence 1: 1 2 3 4
Sequence 2: 5 6 7 8
Sequence 3: 9 10 11 12
Sequence 4: 13 14 15 16
- 2 Tightening torque
Bolt size M 16 - 171 - 210 Nm

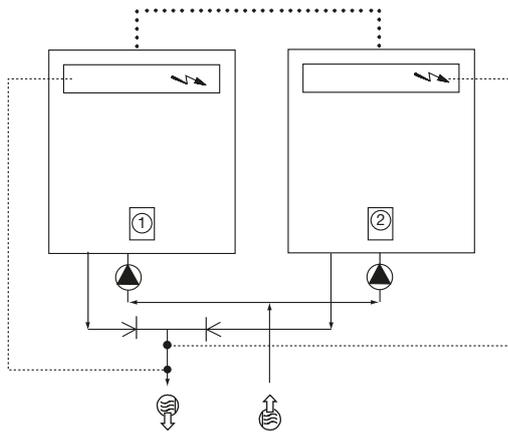
8.5 - Operation of two units in master/slave mode

The control of a master/slave assembly is in the entering water and does not require any additional sensors (standard configuration). It can also be located in the leaving water. In this case two additional sensors must be added on the common piping.

All parameters, required for the master/slave function must be configured using the MST_SLV menu. All remote controls of the master/slave assembly (start/stop, set point, load shedding etc.) are controlled by the unit configured as master and must only be applied to the master unit.

Each unit controls its own water pump. If there is only one common pump, in cases with variable flow, isolation valves must be installed on each unit. They will be activated at the opening and closing by the control of each unit (in this case the valves are controlled using the dedicated water pump outputs). See the Touch Pilot Control IOM for a more detailed explanation.

Unit with configuration: leaving water control



Legend

- | | | | |
|------|--|-----|--|
| ① → | Master unit | • | Additional sensors for leaving water control, to be connected to channel 1 of the slave boards of each master and slave unit |
| ② → | Slave unit | ⋯⋯⋯ | CCN communication bus |
| ⚡ → | Control boxes of the master and slave units | ⋯⋯⋯ | Connection of two additional sensors |
| ↶ | Water inlet | | |
| ↷ | Water outlet | | |
| ⚙️ → | Water pumps for each unit (included as standard for units with hydronic) | | |

9 - HEAT PUMPS 30XWHVZE

9.1 - Physical data for heat pumps

The physical data for 30XWHVZE for heat pumps are the same as for the 30XW-VZE units. Please refer to chapter 5.1.

9.2 - Electrical data for heat pumps

The electrical data for 30XWHVZE for heat pumps are the same as for the 30XW-VZE units. Please refer to chapter 5.2.

9.3 - Dimensions and clearances for heat pumps

The dimensions and clearances are the same as for the 30XW-VZE units. Please refer to chapter 4.

9.4 - Operating range for heat pumps

The operating limits are the same as for the 30XW-VZE units. Please refer to chapter 7.1.

9.5 - Operating modes for heat pumps

9.5.1 - Cooling mode

This operating mode is the same as that for 30XW-VZE units. The unit controls on the cooling setpoint.

9.5.2 - Heating mode

Unlike in the cooling mode, the unit uses the heating setpoint in this configuration. The evaporator leaving water control (lowest setpoint taken into consideration) is still maintained to prevent operation at very low temperatures.

10 - MAJOR SYSTEM COMPONENTS AND OPERATION DATA

10.1 - Compressor

- 30XW-VZE/30XWHVZE units use 06T geared twin-screw compressors equipped with a variable capacity slide valve and controlled by a speed variator.
- Compressor capacity control is ensured by successive use of speed variation (using a frequency variator) and swept volume variation at the screws (using the slide valve).
- The combination of these two control modes permits fine control of the unit capacity between 20% and 100%.
- The 06T compressor models used are: 06TUX483, 06TUX554, 06TVX680, 06TVX753

10.2 - Oil filter

The 06T screw compressor has an independent oil filter.

10.3 - Refrigerant

The unit is a liquid chiller operating only with refrigerant R1234ze(E).

10.4 - Lubricant

The 06T screw compressor is approved for use with the following lubricant: CARRIER MATERIAL SPEC PP 47-38.

10.5 - Oil supply solenoid valve

An oil supply solenoid valve is installed on the oil return line as standard to isolate the compressor from oil flow when the compressor is not operating. The oil solenoid valve is field replaceable.

10.6 - Pressure vessels

General

Monitoring during operation, re-qualification, re-testing and re-testing dispensation:

- Follow the regulations on monitoring pressurised equipment.
- It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.
- If no regulations exist or to complement regulations, follow the control programs of EN 378.
- If they exist follow local professional recommendations.
- Regularly inspect the condition of the coating (paint) to detect blistering resulting from corrosion. To do this, check a non-insulated section of the container or the rust formation at the insulation joints.
- Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities maybe the cause of the wear or corrosion by puncture.
- Filter the heat exchange fluid. Check and carry out internal inspections as described in EN 378, annex C.
- In case of re-testing please refer to the maximum operating pressure given on the unit nameplate.
- The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.
- Filter the coolant and carry out internal inspections as described in EN 378.
- In case of re-testing please refer to the maximum operating pressure given on the unit nameplate.
- The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.

Repair

Any repair or modification, including the replacement of moving parts:

- must follow local regulations and be made by qualified operators and in accordance with qualified procedures, including changing the heat exchanger tubes.
- must be made in accordance with the instructions of the original manufacturer. Repair and modification that necessitate permanent assembly (soldering, welding, expanding etc.) must be made using the correct procedures and by qualified operators.
- An indication of any modification or repair must be shown in the monitoring and maintenance file.

Recycling

The unit is wholly or partly recyclable. After use it contains refrigerant vapours and oil residue. It is coated by paint.

Operating life

The evaporator and oil separator are designed for:

- prolonged storage of 15 years under nitrogen charge with a temperature difference of 20K per day.
- 452000 cycles (start-ups) with a maximum difference of 6 K between two neighbouring points in the vessel, based on 6 start-ups per hour over 15 years at a usage rate of 57%.

Corrosion allowances

Gas side: 0 mm

Heat exchange fluid side: 1 mm for tubular plates in lightly alloyed steels, 0 mm for stainless steel plates or plates with copper-nickel or stainless steel protection.

Evaporator

30XW-VZE/30XWHVZE chillers use a flooded multi-tube evaporator. The water circulates in the tubes and the refrigerant is on the outside in the shell. One vessel is used to serve both refrigerant circuits. There is a center tube sheet which separates the two refrigerant circuits. The tubes are 3/4" diameter copper with an enhanced surface inside and out. There is just one water circuit with two water passes.

The evaporator shell has a polyurethane foam thermal insulation and a water drain and purge.

It has been tested and stamped in accordance with the applicable pressure codes. The maximum standard relative operating pressure is 2100 kPa for the refrigerant side and 1000 kPa for the water-side. These pressures can be different depending on the code applied. The water connection of the heat exchanger is a Victaulic connection.

The products that may be added for thermal insulation of the containers during the water piping connection procedure must be chemically neutral in relation to the materials and coatings to which they are applied. This is also the case for the products originally supplied by Carrier.

Condenser and oil separator

The 30XW-VZE/30XWHVZE chiller uses a heat exchanger that is a combination condenser and oil separator. It is mounted below the evaporator. Discharge gas leaves the compressor and flows through an external muffler to the oil separator, which is the upper portion of the heat exchanger. It enters the top of the separator where oil is removed, and then flows to the bottom portion of the vessel, where gas is condensed and subcooled. One vessel is used to serve both refrigerant circuits. There is a center tube sheet which separates the two refrigerant circuits. The tubes are 3/4" or 1" diameter internally and externally finned copper tubes.

There is just one water circuit with two water passes. For the Heat Machine units the condenser shell can have a polyurethane foam thermal insulation (option 86) and a water drain and purge.

It has been tested and stamped in accordance with applicable pressure codes. The maximum standard relative operating pressure is 2100 kPa for the refrigerant side and 1000 kPa for the water-side. These pressures can be different depending on the code applied. The water connection of the heat exchanger is a Victaulic connection.

10.7 - High-pressure safety switch

The unit is equipped with high pressure safety switches.

In accordance with the applicable code the high pressure switches with manual reset, called PZH (former DBK), may be backed up by high pressure switches that require resetting with a tool. The high pressure switches that require resetting with a tool are called PZHH (former SDBK). If a PZHH cuts out, the corresponding PZH in the same compressor is faulty and must be replaced. The PZHH must be reset with a blunt tool with a diameter of less than 6 mm. Insert this tool into the opening on the pressure switch and push the reset button in this location.

These pressure switches are located at the discharge of each compressor. The pressure switch tap does not include a Schrader valve.

10.8 - Electronic expansion valve (EXV)

The EXV is equipped with a stepper motor (2785 to 3690 steps, depending on the model) that is controlled via the EXV board.

The EXV is also equipped with a sightglass that permits verification of the mechanism movement and the presence of the liquid gasket.

10.9 - Moisture indicator

Located on the EXV, permits control of the unit charge and indicates moisture in the circuit. The presence of bubbles in the sight-glass indicates an insufficient charge or non-condensables in the system. The presence of moisture changes the colour of the indicator paper in the sight-glass.

10.10 - Filter drier

The role of the filter drier is to keep the circuit clean and moisture free. The moisture indicator shows, when it is necessary to change the element. A difference in temperature between the filter inlet and outlet shows that the element is dirty.

10.11 - Sensors

The unit uses thermistors to measure the temperature, and pressure transducers to control and regulate system operation (see Touch Pilot Control IOM for a more detailed explanation).

10.12 - Frequency variator

The unit is equipped with a frequency variator that permits compressor capacity adjustment by varying the motor speed in the 30-60 Hz frequency range. The compressor drive uses power supply waveform generation with variable frequency and voltage, generated by pulse width modulation (PWM). Compressor start-up and stopping and the frequency setting for the operating range is only by RS485 communication in the LEN protocol via the Carrier controller. One of the other frequency variator functions is to ensure the unit safety stop function using wired pressure switches at the digital drive inputs.

The safety stop function of the pressure switches acts on the IGBT bridge module and stops the variator output in accordance with standard EN ISO 13849-1, complying with the requirements of the pressure equipment directive (PED).

11 - OPTIONS AND ACCESSORIES

Options	N°	Description	Advantages	Use for 30XW-VZE range
Light-brine solution, down to -3°C	8	Implementation of new algorithms of control to allow chilled brine solution production down to -3°C when ethylene glycol is used (0°C with propylene glycol)	Matches with most application requirements for ground-sourced heat pumps and fits with many industrial processes requirements	451-1301 (see dedicated paragraph)
Master/slave operation	58	Unit equipped with supplementary water outlet temperature sensor kit to be field-installed allowing master/slave operation of two units connected in parallel	Optimised operation of two units connected in parallel operation with operating time equalisation	451-1301
Condenser insulation	86	Thermal condenser insulation	Minimizes thermal dispersions condenser side (key option for heat pump or heat recovery applications) and allows compliancy with special installation criteria (hot parts insulated)	451-1301
Service valve set	92	Liquid line valve (evaporator inlet) and compressor suction line valve	Allow isolation of various refrigerant circuit components for simplified service and maintenance	451-1301
Evaporator with one pass less	100C	Evaporator with one pass on the water side. Evaporator inlet and outlet on opposite sides.	Easy to install, depending on site. Reduced pressure drops	451-1301
Condenser with one pass less	102C	Condenser with one pass on the water side. Condenser inlet and outlet on opposite sides.	Easy to install, depending on site. Reduced pressure drops	451-1301
21 bar evaporator	104	Reinforced evaporator for extension of the maximum water-side service pressure to 21 bar (standard 10 bar)	Covers applications with a high water column evaporator side (typically high buildings)	451-1301
21 bar condenser	104A	Reinforced condenser for extension of the maximum water-side service pressure to 21 bar (standard 10 bar)	Covers applications with a high water column condenser side (typically high buildings)	451-1301
Reversed evaporator water connections	107	Evaporator with reversed water inlet/outlet	Easy installation on sites with specific requirements	451-1301
Reversed condenser water connections	107A	Condenser with reversed water inlet/outlet	Easy installation on sites with specific requirements	451-1301
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	451-1301
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	451-1301
Bacnet over IP	149	Two-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system. Allows access to multiple unit parameters	451-1301
Condensing temperature limitation	150B	Limitation of the maximum condenser leaving water temperature to 45°C	Reduced maximum power input and current absorption: power cables and protection elements can therefore be downsized	451-1301
Control for low cond. temperature systems	152	Output signal (0-10 V) to control the condenser water inlet valve	Simple installation: for applications with cold water at condenser inlet (ex. ground-source, groundwater-source, superficial water-source applications) the signal permits to control a 2 or 3-way valve to maintain condenser water temperature (and so condensing pressure) at acceptable values	451-1301
Energy Management Module	156	EMM Control board with additional inputs/outputs. See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, ice storage end, demand limits, boiler on/off command...)	451-1301
Compliance with Swiss regulations	197	Additional tests on the water heat exchangers: supply (additional of PED documents) supplementary certificates and test certifications	Conformance with Swiss regulations	451-1301
Compliance with Australian regulations	200	Unit approved to Australian code	Conformance with Australian regulations	451-1301
Low noise level	257	Evaporator sound insulation	3 dB(A) quieter than standard unit	451-1301
Welded evaporator connection kit	266	Victaulic piping connections with welded joints	Easy installation	451-1301
Welded condenser water connection kit	267	Victaulic piping connections with welded joints	Easy installation	451-1301
Flanged evaporator water connection kit	268	Victaulic piping connections with flanged joints	Easy installation	451-1301
Flanged condenser water connection kit	269	Victaulic piping connections with flanged joints	Easy installation	451-1301
Thermal compressor insulation	271	The compressor is covered with a thermal insulation layer	Prevents air humidity to condensate on the compressor surface	451-1301
EMC classification C2, as per EN 61800-3	282	Additional RFI filters on the unit power line	Reduces electromagnetic interferences. Increase the variable frequency drive (VFD) immunity level according to first environment (so called, residential environment) requirements and allow its compliancy with emissions level required in category C2	451-1301
Fast Capacity Recovery	QM295	New software algorithms to allow quick restart and fast loading while preserving unit-reliability	Full capacity recovery in less than 5 minutes after power failure. Matches requirements of typical critical missions applications	451-1301
Carrier Connect link (BSS regions only)	298	3G router board NOTE 1: require option 149 NOTE 2: when more than one machine is installed on site, only one of them shall be equipped with option 298 while all of them must be equipped with option 149 NOTE 3: if the Carrier® PlantCTRL™ is on site, option 298 shall be integrated in the Carrier® PlantCTRL™ while option 149 is still mandatory for each single unit.	Enabler for Carrier Connect service offer	451-1301

12 - STANDARD MAINTENANCE

Air conditioning equipment must be maintained by professional technicians, whilst routine checks can be carried out locally by specialised technicians. See the standard EN 378-4.

Simple preventive maintenance will allow you to get the best performance from your HVAC unit:

- improved cooling performance
- reduced power consumption
- prevention of accidental component failure
- prevention of major time consuming and costly interventions
- protection of the environment

There are five maintenance levels for HVAC units, as defined by the AFNOR X60-010 standard.

12.1 - Level 1 maintenance

See note below.

Simple procedure can be carried out by the user:

- Visual inspection for oil traces (sign of a refrigerant leak)
- Check for removed protection devices, and badly closed doors/covers
- Check the unit alarm report when the unit does not work (see report in the Touch Pilot control manual).

General visual inspection for any signs of deterioration.

12.2 - Level 2 maintenance

This level requires specific know-how in the electrical, hydronic and mechanical fields. It is possible that these skills are available locally: existence of a maintenance service, industrial site, specialised subcontractor.

In these cases, the following maintenance operations are recommended.

Carry out all level 1 operations, then:

- At least once a year tighten the power circuit electrical connections (see tightening torques table).

- Check and re-tighten all control/command connections, if required (see tightening torques table).
- Check the differential switches for correct operation every 6 months.
- Remove the dust and clean the interior of the control boxes, if required. Check the filter condition.
- Check the presence and the condition of the electrical protection devices.
- Replace the fuses every 3 years or every 15000 hours (age-hardening).
- Check the water connections.
- Purge the water circuit (see chapter 7 “Water connections”).
- Clean the water filter (see chapter 7 “Water connections”).
- Check the unit operating parameters and compare them with previous values.
- Keep and maintain a maintenance sheet, attached to each HVAC unit.

All these operations require strict observation of adequate safety measures: individual protection garments, compliance with all industry regulations, compliance with applicable local regulations and using common sense.

12.3 - Level 3 (or higher) maintenance

The maintenance at this level requires specific skills/ approval/tools and know-how and only the manufacturer, his representative or authorised agent are permitted to carry out these operations. These maintenance operations concern for example:

- A major component replacement (compressor, evaporator)
- Any intervention on the refrigerant circuit (handling refrigerant)
- Changing of parameters set at the factory (application change)
- Removal or dismantling of the HVAC unit
- Any intervention due to a missed established maintenance operation
- Any intervention covered by the warranty

NOTE: Any deviation or non-observation of these maintenance criteria will render the guarantee conditions for the HVAC unit nul and void, and the manufacturer, Carrier France, will no longer be held responsible

12.4 - Tightening of the electrical connections

12.4.1 - Tightening torques for the main electrical connections

Screw type	Designation in the unit	Torque value, N·m
Customer connection		
Screw-nut M12 at phase decks	L1/L2/L3	50
Nut on earth terminal	PE	81
Downstream power connections in the control box		
Screw M10 at downstream main disconnect deck (QS10)*	L1/L2/L3	50
Earth terminal M10		50
Power connections in the variator		
M10 nut on the phase pin	GS-	19-40
M10 nut on the earth pin		19-40
Compressor phase connection terminals		
M12	1/2/3/4/5/6 on EC-	23
M16	1/2/3/4/5/6 on EC-	30
Compressor earth connection		
	Gnd on EC-	25
Control disconnect connections		
Upstream and downstream screws at terminals	QF	2

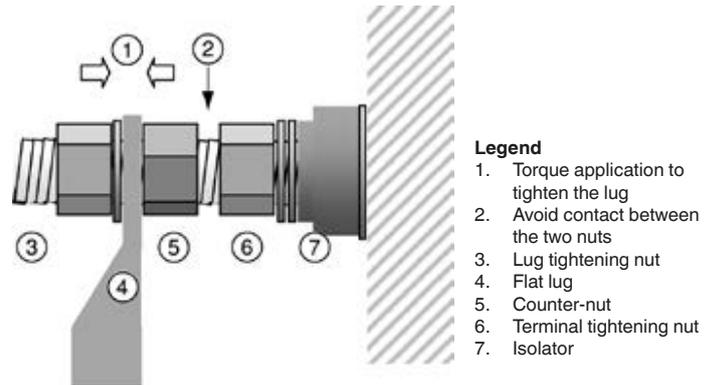
ATTENTION: The tightening of the connections at the compressor terminals requires special precautions. Please refer to the chapter below.

12.4.2 - Connection precautions for the compressor power terminals

These precautions must be applied during an intervention that requires the removal of the power conductors connected to the compressor supply terminals.

The tightening nut of terminal (6) supporting the isolator (7) must never be loosened, as it ensures terminal tightness and compressor leak tightness.

The tightening of phase lug (4) must apply the torque between counter nut (5) and tightening nut (3): during this operation a counter-torque must be applied at counter nut (5). Counter-nut (5) must not be in contact with the tightening nut of terminal (6).



12.5 - Tightening torques for the main bolts and screws

Screw type	Used for	Torque value, N-m
M20 nut	Chassis	190
M20 nut	Heat exchanger side-side connection	240
M16 nut	Compressor fixing	190
H M16 screw	Heat exchanger water boxes, structure	190
H M16 screw	Compressor suction flanges	190
H M20 screw	Compressor suction flanges TU & TV	240
M16 nut	Compressor discharge line TU	190
M20 nut	Compressor discharge line TV	240
H M8 screw	Drier cover	35
1/8 NPT connection	Oil line	12
TE nut	Compressor oil line	24,5
7/8 ORFS nut	Oil line	130
5/8 ORFS nut	Oil line	65
3/8 ORFS nut	Oil line	26
H M6 screw	Stauff collar	10
Taptite screw M6	Oil line collar	7
Metric screw M6	Plate fixing, control box, terminal box	7
Taptite screw M10	Oil filter, control box fixing	30

ATTENTION: The tightening of the connections at the compressor terminals requires special precautions. Please refer to the chapter above.

12.6 - Evaporator and condenser maintenance

Check that:

- the insulating foam is intact and securely in place,
- the sensors and flow switch are correctly operating and correctly positioned in their support,
- the water-side connections are clean and show no sign of leakage.

12.7 - Compressor maintenance

12.7.1 - Oil filter change schedule

As system cleanliness is critical to reliable system operation, there is a filter in the oil line at the oil separator outlet. The oil filter is specified to provide a high level of filtration (5 µm) required for long compressor life.

The filter should be checked after the first 500 hours of operation, and every subsequent 2000 hours. The filter should be replaced at any time when the pressure differential across the filter exceeds 2 bar.

The pressure drop across the filter can be determined by measuring the pressure at the discharge port (at the oil separator) and the oil pressure port (at the compressor). The difference in these two pressures will be the pressure drop across the filter, check valve, and solenoid valve. The pressure drop across the check valve and solenoid valve is approximately 0.4 bar, which should be subtracted from the two oil pressure measurements to give the oil filter pressure drop.

12.7.2 - Compressor rotation control

Correct compressor rotation is one of the most critical application considerations. Reverse rotation, even for a very short duration, damages the compressor and can even destroy it.

The reverse rotation protection scheme must be capable of determining the direction of rotation and stopping the compressor within one second. Reverse rotation is most likely to occur whenever the wiring at the compressor terminals has been modified.

To minimise the opportunity for reverse rotation, the following procedure must be applied. Rewire the power cables to the compressor terminal pin as originally wired. Apply a counter-torque at the lower nut at the supply cable terminal during installation.

For replacement of the compressor, a low pressure switch is included with the compressor. This low pressure switch should be temporarily installed as a hard safety on the high pressure part of the compressor. The purpose of this switch is to protect the compressor against any wiring errors at the compressor terminal pin. The electrical contact of the switch would be wired in series with the high pressure switch. The switch will remain in place until the compressor has been started and direction of rotation has been verified; at this point, the switch will be removed. The switch that has been selected for detecting reverse rotation is Carrier part number HK01CB001. This switch opens the contacts when the pressure falls below 7 kPa.

The switch is a manual reset type that can be reset after the pressure has once again risen above 70 kPa. It is critical that the switch be a manual reset type to preclude the compressor from short cycling in the reverse direction.

12.8 – Frequency variator maintenance

ATTENTION: Before any intervention at the frequency variator, ensure that the disconnect/isolator switch is open and that no voltage is present (reminder: the capacitor discharge time is approximately 20 minutes).

Only a well-qualified person is allowed to replace or modify the components inside the frequency variator.

During periodic inspections, check the ventilation grilles at the frequency variator door; ensure that they are not pierced, damaged or obstructed.

Replace the fan, if a “replace fan” alert/warning is displayed in the alarm list.

For any other alarm or problem at the frequency variator, contact the Carrier service department.

The frequency variators do not require a dielectric test, even if they are replaced parts: they are systematically checked before delivery. Otherwise the filtering components installed in the frequency variator can falsify the measurement and may even be damaged.

If it is necessary to test the insulation of a component (e.g. compressor, cables) the frequency variator must be disconnected at the power circuit.

13 - START-UP CHECKLIST FOR 30XW-VZE LIQUID CHILLERS (USE FOR JOB FILE)

Preliminary information

Job name:.....
Location:.....
Installing contractor:.....
Distributor:.....

Unit

Model:

Compressors

Circuit A

Model number.....
Serial number.....
Motor number.....

Circuit B

Model number.....
Serial number.....
Motor number.....

Frequency variator

Model number (circuit A/B).....
Serial number (circuit A/B).....

Evaporator

Model number.....
Serial number.....

Condenser Section

Model number.....
Serial number.....

Additional optional units and accessories

Preliminary equipment check

Is there any shipping damage? If so, where?

Will this damage prevent unit start-up?.....

- Unit is level in its installation
- Power supply agrees with the unit nameplate
- Electrical circuit wiring has been sized and installed properly
- Unit ground wire has been connected
- Electrical circuit protection has been sized and installed properly
- All terminals are tight
- All chilled water valves are open
- All chilled water piping is connected properly
- All air has been vented from the chilled water circuit
- The unit is switched off again, after the pump test has been completed
- Chilled water pump (CWP) is operating with the correct rotation. Check the phase sequence of the electrical connection.
- Circulate chilled water in the water circuit for at least two hours, then remove, clean and replace the screen filter.
- The unit is switched off again, after the pump test has been completed.
- Carry out a general visual inspection with particular attention to the ventilation grilles (that must not be pierced or obstructed) and ensure that the wiring is not damaged/cut.
- Inlet piping to cooler includes a 20 mesh strainer with a mesh size of 1.2 mm.

Unit start-up

- Oil level is correct (sight glass on oil line)
- All discharge and liquid line valves are open
- Locate, repair and mark all refrigerant leaks
- All suction valves are open, if used
- All oil line valves and economizer valves (if used) are open
- Checks have been carried out for any possible leaks. Unit has been leak checked (including fittings)
 - on the whole unit
 - at all connectionsLocate, repair, and report any refrigerant leaks.....
.....
.....
- Check voltage imbalance: AB..... AC..... BC.....
 - Average voltage = V
 - Maximum deviation = V
 - Voltage imbalance = %
- Voltage imbalance is less than 2%

WARNING: Operation of the chiller with an improper supply voltage or excessive phase imbalance constitutes abuse which will invalidate the Carrier warranty. If the phase imbalance exceeds 2% for voltage, or 10% for current, contact your local electricity supplier at once and ensure that the chiller is not switched on until corrective measures have been taken.

Check cooler water loop

- Water loop volume = litres
- Calculated volume = litres
- 3.25 litres/nominal kW capacity for air conditioning
- 6.5 litres/nominal kW capacity for process cooling
- Proper loop volume established
- Proper loop corrosion inhibitor included.....litres of.....
- Proper loop freeze protection included (if required) litres of.....
- Piping includes electric heater tape, if exposed to temperatures below 0°C
- Inlet piping to cooler includes a 20 mesh strainer with a mesh size of 1.2 mm

Check pressure drop across the cooler

- Entering cooler = kPa
- Leaving cooler = kPa
- Leaving - entering = kPa

WARNING: Plot cooler pressure drop on performance data chart (in product data literature) to determine total litres per second (l/s) and find unit's minimum flow rate.

- Total = l/s
- Nominal kW = l/s
- Total l/s is greater than unit's minimum flow rate
- Total l/s meets job specified requirement of..... l/s

WARNING: Once power is supplied to the unit, check for any alarms (refer to the Touch Pilot Control IOM for the alarm menu).

Note all alarms:.....
.....
.....
.....



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Manufacturer reserves the right to change any product specifications without notice.

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