Carrier

United Technologies

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Unit with low-noise option

Reversible air-to-water heat pump

30RQM 160-520
30RQP 160-520

Nominal heating capacity 170 - 540 kW
Nominal cooling capacity 160 - 510 kW

AQUASNAP™ AQUASNAP greenspeed

CONTENTS

This manual applies to the following units:

- 30RQM: Standard reversible heat pump.
- 30RQP: Reversible heat pump with variable speed fan.

For controls operation, please refer to the 30RQM/30RQP control manual.

The cover photograph is for illustrative purposes only and is not legally binding. The manufacturer reserves the right to update information at any time, without prior warning.

1 - INTRODUCTION

Prior to the initial start-up of the 30RQM/30RQP units, everyone involved in the works should be thoroughly familiar with these instructions and with the characteristics of the installation site, and ensure these are respected.

30RQM/30RQP heat pumps are designed to provide a very high level of safety and reliability, making installation, start-up, operation and maintenance easier and safer.

They will provide safe and reliable service if used within their application ranges.

They are designed to offer a service life of 15 years, assuming a utilisation factor of 75%, which corresponds to approximately 100,000 operating hours.

The procedures in this manual are arranged in the sequence required for installation, start-up, operation and maintenance of the units. Ensure that you follow all the required safety precautions, including those listed in this guide, such as: wearing personal protective equipment (gloves, safety glasses, safety shoes), having the appropriate tools, skills and qualifications (electrical, air conditioning, local legislation).

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

1.1 - Specific features of 30RQP units

The 30RQP units differ from the 30RQM units by introducing variable speed drives on all of the fans and optimising the overall energy efficiency of the unit depending on the operating conditions (air temperature, circuit capacity). This improves the seasonal efficiency (SCOP and ESEER).

All fans in the same refrigerant circuit are controlled by a single variable speed drive. Therefore, they operate together at the same rotational speed. The rotational speed of each circuit is controlled by an algorithm that continuously optimises the condensing temperature in cooling mode or the evaporating temperature in heating mode. This ensures optimal energy efficiency of the units (EER and COP) whatever the operating conditions.

1.2 - Installation safety considerations

After the unit has been received, and before it is started up, it must be visually inspected for damage. Check that the refrigerant circuits are intact, taking care to check that no components or pipes have shifted or been damaged (following an impact, for example). If in doubt, carry out a leak tightness check. If damage is detected upon receipt, file a claim with the shipping company immediately.

Do not remove the skid or the packaging until the unit is in its final position.

These units can be safely moved with a fork lift truck, as long as the forks are positioned in the location and direction shown on the unit.

The units can also be lifted with slings, using only the designated lifting points marked on the unit (labels on the chassis and label with the unit handling instructions, attached to the unit).

Use slings with the correct capacity, and follow the lifting instructions given on the certified drawings for the unit.

Safety can only be guaranteed if these instructions are carefully followed. Failure to do so may result in damage to the equipment and physical injury.

DO NOT OBSTRUCT THE PROTECTIVE DEVICES.

This applies to any valves fitted on the refrigerant or heat transfer fluid circuits. Check whether the original protection plugs are still present at the valve outlets. These plugs are generally made of plastic and must be removed before operation. If they are still present, please remove them. Fit devices at the valve or drain piping outlets to prevent the penetration of foreign bodies (dust, building debris, etc.) and atmospheric agents (water can form rust or ice). These devices, as well as the drain piping, must not impair operation and must not lead to a pressure drop that is higher than 10% of the control pressure.

Classification and control:

In accordance with the Pressure Equipment Directive and national usage monitoring regulations in the European Union, the protective devices fitted to these machines are classified as follows:

	Safety accessory(1)	Accessory for limitation of damage in the event of an external fire (2)
Refrigerant side		
High pressure switch	X	
External relief valve(3)		X
Rupture disk		X
Fuse plug		X
Heat transfer fluid side		
External relief valve	(4)	(4)

(1) Classified for protection in normal service situations.
(2) Classified for protection in abnormal service situations. These accessories are sized for fires with a thermal flow of 10kW/m^2. No combustible matter should be placed within 6.5 m of the unit.
(3) The instantaneous over-pressure limitation of 10% of the operating pressure does not apply to this abnormal service situation.
The control pressure can be higher than the service pressure. In this case, either the design temperature or the high-pressure switch ensures that the service pressure is not exceeded in normal service situations.
(4) The selection of these relief valves must be made by the personnel responsible for completing the hydraulic installation.

Do not remove these valves under any circumstances, even if the fire risk is under control for a particular system. There is no guarantee that the accessories have been re-installed if the system is changed or for transport with a gas charge. When the unit is subjected to fire, a safety device prevents rupture due to over-pressure by releasing the refrigerant. The fluid can then break down into toxic residues when in contact with flames:

- ***Stay away from the unit;***
- ***Ensure the personnel in charge of extinguishing the fire are duly warned and issued with recommendations;***
- ***Fire extinguishers appropriate to the system and the refrigerant type must be easily accessible.***

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

The external relief valves must always be piped to a safe, external location if the units are installed in a enclosed space. Refer to the installation regulations, for example those of European standard EN 378 and EN 13136. Discharge ductwork must be installed in a way that ensures that people and property are not exposed to vented refrigerant. As the fluids can be diffused in the air, ensure that refrigerant is discharged away from building air intakes or that it is discharged into a sufficient quantity of suitable absorbent material. Relief valves must be checked periodically (See the paragraph on "Maintenance safety considerations").

If the relief valves are installed on a change-over valve, 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 (Bring the actuator in abutment,

front or back according to the outlet to isolate). 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.

Provide a drain in the discharge duct, close to each valve, to avoid an accumulation of condensate or rain water. All precautions concerning handling of refrigerant must be observed in accordance with local regulations.

1.3 Pressure equipment and components

These products incorporate equipment or components under pressure, manufactured by Carrier or other manufacturers. We recommend that you contact your professional body to find out which regulations affect you as the operator or owner of pressure equipment or components (declaration, re-qualification, re-testing, etc.).The characteristics of this equipment/these components are given on the name plate or in the regulatory documentation supplied with the products.

These units comply with the European Pressure Equipment Directive.

The units are intended to be stored and operated in an environment where the ambient temperature is always within the allowable temperature range indicated on the nameplate.

Do not introduce significant static or dynamic pressure with regard to the operating pressures used during operation, or for tests in the refrigerant circuit or heat exchange circuits.

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

- ***Follow regulations on the monitoring of pressure equipment.***
- ***The user or the operator is usually required to create and maintain a monitoring and maintenance register.***
- ***In the absence of any regulations, or in addition to the regulations, follow the guidance in EN 378.***
- ***Follow the local professional recommendations, whenever they exist.***
- ***Regularly inspect the surface of the components for signs of corrosion. To do this, check an uninsulated part of the component or check for an accumulation of rust at the insulation joints.***
- ***Regularly check for the presence of any impurities (e.g. sand, grit) in the heat transfer fluids. These impurities can cause wear and/or pitting corrosion.***
- ***Install filters in the heat transfer fluid piping.***
- ***The reports from the regular checks carried out by the user or operator must be included in the monitoring and maintenance register.***

Repair:
Any repair or modification of a pressurised container is prohibited.
Only the replacement of the container with an original manufacturer component is authorised. In this case, the replacement must be carried out by a qualified operator.
The replacement of the vessel must be entered in the monitoring and maintenance register.

Recycling:
The pressure equipment can be recycled in whole or in part. After use, they may contain refrigerant vapours and oil residue. Some parts are painted.

1.4 - Maintenance safety considerations

Carrier recommends the following table as a guide to completing the monitoring and maintenance register (logbook) required by EN 378-2:

Intervention		Name of the commissioning engineer	Applicable national regulations	Verified by (organisation)
Date	Nature (1)			

(1) Maintenance, repairs, regular verifications (EN 378), leakage, etc.

Engineers working on the electrical or refrigeration components must be authorised, trained and fully qualified to do so. All work on the refrigerant circuit must be carried out by a trained person, fully qualified to work on these units. He/she must have been specifically trained on this equipment and system. All welding operations must be carried out by qualified specialists.

30RQM/30RQP units use high pressure R-410A refrigerant (the unit operating pressure is above 40 bar; the pressure at an air temperature of 35°C is 50% higher than for R-22). Special equipment must be used when working on the refrigerant circuit (pressure measurement, charge transfer, etc.).

Do not clean the unit with hot water or steam. This may cause the refrigerant pressure to rise.

Any manipulation (opening or closing) of a shut-off valve must be carried out by a qualified and authorised engineer, observing applicable standards (e.g. during draining operations). The unit must be switched off during maintenance.

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 and lead to the risk of a pressure increase. This valve is situated on the liquid line before the filter drier.

During any handling, maintenance and service operations, the technicians working on the unit must be equipped with safety gloves, glasses, shoes and insulated 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 isolated.

Lock the power supply circuit upstream of the unit in the open position during maintenance interventions.

If work is interrupted for any reason, check that all circuits are powered off before resuming work.

CAUTION: Even if the unit has been shut down, the power circuit remains energized, unless the unit or circuit disconnect switch is open. Refer to the wiring diagram for further details. Follow the appropriate safety guidelines. When working on the fan deck, particularly if the discharge grilles have been removed, isolate the power supply to the fans to prevent their operation.

CAUTION: The option Power factor (231) and the variable frequency drives (VFD) fitted to the 30RQP units and the units with options 116V, 116W or 28 have capacitor banks whose discharge time is five (5) minutes after disconnecting the power supply.

After disconnecting the power supply to the electrical box, wait for 5 minutes before accessing the electrical box or variable drives.

Before any intervention, verify that there is no voltage present on any accessible conducting parts of the power circuit.

It is recommended that an indicating device be installed to check if any refrigerant has leaked from the relief 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 nuisance tripping or leaks, replace or re-calibrate the valve.

CAUTION: If refrigerant circuit service valves are installed, ensure the protective caps are fitted in order to avoid leakages.

OPERATING CHECKS:

- ***IMPORTANT INFORMATION REGARDING THE REFRIGERANT USED:***
  This product contains fluorinated greenhouse gas covered by the Kyoto protocol.
  Refrigerant type: R-410A
  Global Warming Potential (GWP): 2088

CAUTION:

1. ***Any intervention on the refrigerant circuit of this product should be performed in accordance with the applicable legislation. In the EU, the regulation is called F-Gas, N°517/2014.***
2. ***Ensure that the refrigerant is never released to the atmosphere during installation, maintenance or equipment disposal.***
3. ***The deliberate gas release into the atmosphere is not allowed.***
4. ***If a refrigerant leak is detected, ensure that it is stopped and repaired as quickly as possible.***
5. ***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.***
6. ***The gas recovery for recycling, regeneration or destruction is at customer charge.***
7. ***Periodic leak tests have to be carried out by the customer or by third parties. The EU regulation set the periodicity here after:***

System WITHOUT leakage detection		No verification	12 months	6 months	3 months
System WITH leakage detection		No verification	24 months	12 months	6 months
Refrigerant charge/circuit (CO_2 equivalent)		< 5 tonnes	5 ≤ charge < 50 tonnes	50 ≤ 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	Charge > 349.7 kg
	R407C (GWP 1774)	Charge < 2.8 kg	2.8 ≤ charge < 28.2 kg	28.2 ≤ charge < 281.9 kg	Charge > 281.9 kg
	R410A (GWP 2088)	Charge < 2.4 kg	2.4 ≤ charge < 23.9 kg	23.9 ≤ charge < 239.5 kg	Charge > 239.5 kg
	HFO: R1234ze	No requirement			

* From 01/01/2017, units must be equipped with a leakage detection system.

8. ***A logbook must be established for equipments subject to periodic leak tests. It should contain the quantity and the type of fluid present within the installation (added and recovered), the quantity of recycled fluid, regenerated or destroyed, the date and output of the leak test, the designation of the operator and its belonging company, etc.***
9. ***Contact your local dealer or installer if you have any questions.***

PROTECTIVE DEVICE CHECKS:

- ***If no national regulations exist, check the protective devices on site in accordance with standard EN378: once a year for the high pressure switches, every five years for external relief valves.***

The company or organisation that conducts a pressure switch test must establish and implement detailed procedures for:

- Safety measures,
- Measuring equipment,
- Values and tolerances for cut-off and discharge devices,
- Test stages,
- Recommissioning of the equipment.

Please contact Carrier Service for this type of test. The test principle set out here by Carrier does not involve removal of the pressure switch:

- Verify and record the nominal values for activation of the pressure switches and external relief devices (pressure relief valves or 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 if there are valves on the high pressure side on the recovery air exchangers, for example),
- Connect a pressure gauge protected against pulsations (filled with oil with maximum pointer if mechanical), preferably calibrated (the values displayed on the user interface may be inaccurate in an instant reading because of the scanning delay applied in the control)
- Complete an HP Test as provided by the software (refer to the Control IOM for details).

CAUTION: If the test results in the replacement of the pressure switch, it is necessary to recover the refrigerant charge; these pressure switches are not installed on Schrader type automatic valves.

Visually inspect the protective devices (relief valves, pressure switches) at least once a year.

If the machine operates in a corrosive atmosphere, inspect the devices more frequently.

Check regularly for leaks and, if detected, have these repaired immediately.

Regularly check that the vibration levels remain acceptable and close to those at the initial machine start-up.

Before opening a refrigerant circuit, drain and consult the pressure indicators.

After an equipment failure, replace the refrigerant in accordance with a procedure such as that described in NF E29-795, or have a refrigerant analysis carried out at a specialist laboratory.

If the refrigerant circuit remains open after an intervention (such as a component replacement, etc.):

- ***Seal the openings if the duration is less than a day;***
- ***If more than one day, charge the circuit with a dry, inert gas (e.g. nitrogen)***

The objective is to prevent penetration of atmospheric humidity and the resulting corrosion of the unprotected internal steel walls.

1.5 - Repair safety considerations

All parts of the system must be maintained by the personnel responsible for such maintenance, in order to avoid any damage or accidents. Faults and leaks must be repaired immediately. An authorised technician must remedy the fault immediately. After each repair of the unit, check the operation of all protective devices and record operating readings for all parameters.

Comply with the regulations and recommendations given in the safety standards for refrigerant systems and machines, 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 or freezing of the BPHE), remove the complete charge using a recovery unit and store the refrigerant in mobile containers. The compressors cannot transfer the whole refrigerant charge and can be damaged if used to pump-down. The refrigerant charge should not be transferred to the high-pressure side.

Detect and repair the leak, and recharge the circuit with the full charge of R410A indicated on the unit's nameplate. Do not top up the refrigerant charge. Only charge liquid refrigerant R-410A at the liquid line.

Check the type of refrigerant before adding the full charge to the machine.

Charging any refrigerant other than the original type (R410A) will impair machine operation and can even cause irreparable damage to the compressors. The compressors operating with this refrigerant type are lubricated with a synthetic polyolester oil.

Before any intervention on the refrigerant circuit, the complete refrigerant charge must be recovered.

RISK OF EXPLOSION: 

Never use air or a gas containing oxygen during leak tests to purge ductwork or to pressurise a unit. Pressurised air mixtures or gases containing oxygen can be the cause of an explosion. Oxygen reacts violently with oil and grease.

Only use dry nitrogen for leak tests, with an appropriate tracer gas if necessary.

If the recommendations above are not observed, this can have serious or even fatal consequences and damage the installations.

Never exceed the specified maximum operating pressures.

Check the maximum permissible test pressures on the high and low pressure sides, consulting the instructions in this manual and the pressures indicated on the unit's nameplate.

Do not unweld the refrigerant ductwork or any refrigerant circuit component or cut these with a torch until all refrigerant (liquid and vapour) as well as the oil have been removed from the heat pump. Traces of vapour should be displaced with dry nitrogen. Refrigerant in contact with an open flame produces toxic gases.

The necessary protective 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 spilling liquid refrigerant on skin or splashing it into the eyes. Use safety goggles and safety gloves. Wash any fluid spills from the skin with soap and water.

If refrigerant enters the eyes, immediately flush the eyes thoroughly with water and consult a doctor.

Any accidental release of refrigerant, whether this is caused by a small leak or significant discharges following the rupture of a pipe or an unexpected release from a safety valve, can cause frostbites and burns to personnel exposed. Do not ignore such injuries. Installers, owners and especially service engineers for these units must:

- ***Create a procedure to ensure medical attention is sought before treating such injuries;***
- ***Provide first-aid equipment, including equipment for treating eye injuries.***

We recommend that standard EN 378-3 Annex 3 is applied.

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

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 suitable transfer unit. 3/8" SAE connectors on the liquid, suction and discharge lines are available on all units for connection to the transfer unit. The units must never be modified to add refrigerant and oil charging, removal and purging devices. All these devices are factory fitted on the units. Please refer to the certified dimensional drawings for the units.

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

Do not attempt to remove components fitted to the refrigerant circuit or fittings while the machine is under pressure or while it is running. Check that there is zero pressure in the circuit and that the unit has been shut down and deenergized before removing components or opening a circuit. When the refrigerant circuit is opened to carry out a repair, see the blanketing recommendations in the paragraph on "Maintenance safety considerations".

Do not attempt to repair or recondition a valve if there has been any corrosion or build-up of foreign material (rust, dirt, scale, etc.) on the valve body or mechanism. If necessary, replace the device.

Do not install relief valves in series or backwards.

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

The ducts can break under the pressure and release refrigerant, causing injuries.

Do not climb on a machine. Use a platform to work at height. Use mechanical lifting equipment (crane, hoist, winch, etc.) to lift or move heavy components.

For lighter components, use lifting equipment if there is any 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 original equipment's specifications.

Do not drain the heat transfer fluid circuit without informing the installation site technical maintenance department or other competent body first.

Close the shut-off valves on the water inlet and outlet and drain the unit's hydraulic circuit before working on the components installed on the circuit (screen filter, pump, water flow sensor, etc.).

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

It is recommended that ear defenders are worn when working near the unit if it is running.

2 - PRELIMINARY CHECKS

2.1 - Check equipment received

- Check that the unit has not been damaged during transport and that no parts are missing. If the unit has been damaged or the shipment is incomplete, send a claim to the shipping company.
- Check the unit's nameplate to ensure it matches the model ordered. The nameplate is attached in two places to the unit:
  - On the outside of one of the unit frames,
  - On the inside of the electrical panel door.
- The unit nameplate must include the following information:
  - Model number - size
  - CE marking
  - Serial number
  - Year of manufacture and pressure and leak tightness test date
  - Fluid used for transport
  - Refrigerant used
  - Refrigerant charge per circuit
  - OP: Min./max. allowable pressure (high and low pressure side)
  - OT: Min./max. allowable temperature
  - (high and low pressure side)
  - Pressure switch cut-out pressure
  - Unit leak test pressure
  - Voltage, frequency, number of phases
  - Maximum current
  - Maximum input power
  - Unit net weight
- Confirm that all accessories ordered for field installation have been delivered in perfect working order.

The unit must be checked periodically, if necessary removing the insulation (thermal, acoustic), throughout its service life to ensure that nothing has damaged the unit (handling equipment, tools, etc.). If necessary, damaged parts must be repaired or replaced. See also the section on "Maintenance".

2.2 - Handing and positioning

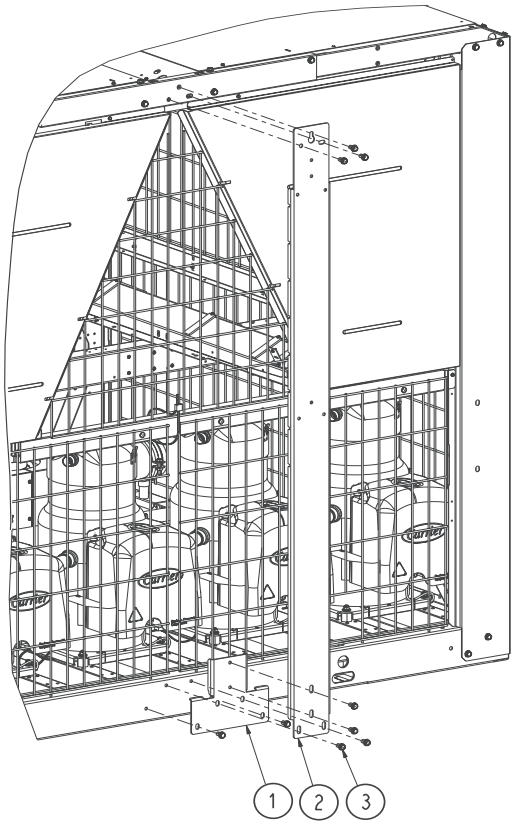
2.2.1 - Handling

See the section on "Installation safety considerations".

In some cases, uprights are added for transporting and handling the unit. The uprights must be removed if necessary for access or connection.

Important: follow the disassembly procedure indicated in the disassembly instructions.

- Undo the bolt (3).
- Remove the upright (2).
- Remove the plate (1).



Keep the uprights following start-up and refit them when moving the unit.

2.2.2 - Positioning within the installation area

The machine must be installed in a place that is not accessible to the public or protected against access by non-authorised persons.

If the unit is to be raised, ensure the machine's surroundings permit easy access for maintenance operations.

Always refer to the "Dimensions and clearances" section to confirm that there is adequate space for all connections and maintenance 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.

The typical applications of these units are heating and cooling, which do not require earthquake resistance. Earthquake resistance has not been verified.

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

Before positioning the unit, check that:

- The chosen location can support the weight of the unit, or that appropriate reinforcement measures have been taken.
- The unit is installed level on an even surface (maximum tolerance is 5 mm along both axes).

- If the support structure is sensitive to vibration and/or noise transmission it is advisable to insert anti-vibration mounts (elastomeric mounts or metal springs) between the unit and the structure. Selection of these devices is based on the system characteristics and the comfort level required and should be made by a qualified design engineer.
- There is adequate space above and around the unit for air to circulate and for access to the components (see dimensional drawings).
- The number of support points is adequate and that they are in the right places.
- The location is not subject to flooding.
- For outdoor applications, avoid installing the unit in a location where snow is likely to accumulate (in areas subject to long periods of sub-zero temperatures, the unit should be raised).
- Baffles may be necessary to protect the unit from strong prevailing winds. These must not restrict air flow into the unit.

CAUTION: Before lifting the unit, check that all casing panels and grilles are securely fixed in place. Lift and set down the unit with great care. Tilting and jarring can damage the unit.

If 30RQM/30RQP units are hoisted with slings, it is advisable to protect coils from accidental impacts. Use sleeves or a lifting beam to spread the slings above the unit. Do not tilt a unit by more than 15°.

CAUTION: Never apply pressure or leverage to any of the unit's panels or uprights; only the base of the unit frame is designed to withstand such stresses. No force or effort must be applied to pressurised parts, especially via pipes connected to the water heat exchanger. If a unit includes a hydraulic module (options 116R, S, T, U, V, W), the hydraulic module and pump piping must be installed in a way that does not submit it to any strain. The hydraulic module pipes must be fitted so that the pump does not support the weight of the pipes.

2.3 - Checks before system start-up

Before the start-up of the heat pump, the complete system, including the heat pump, must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams and the wiring diagrams. Heat transfer fluid temperatures above the maximum recommended can lead to an increase in the refrigerant pressure and can cause a loss of refrigerant due to the relief valve discharge.

National regulations must be followed during these checks. If the national regulation does not specify any details, refer to standard EN 378 as follows:

External visual checks of the installation:

- Ensure that the machine is charged with refrigerant. Verify on the unit nameplate that the 'fluid transported' is that recommended for operation, and is not nitrogen.
- Compare the complete system with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all protection equipment and documents provided by the manufacturer (dimensional drawings, Pipe and instrument diagram (PID), declarations, etc.) to comply with the regulations are present.
- Verify that the environmental protection and safety devices and arrangements provided by the manufacturer to comply with the regulations are in place and compliant.
- Verify that all documents for pressure containers, certificates, name plates, register, instruction manuals and documentation provided by the manufacturer to comply with the regulations are present.
- Verify that access and safety routes are unobstructed.
- Verify the instructions and guidelines to prevent the deliberate discharge of refrigerant.
- 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.
- Check the condition of 400 V cable insulation.

2.4 - Actual start-up

Always ensure you have read and fully understood the operating instructions for the units before starting up the heat pump, and ensure the following precautions have been taken:

- Check the water circulation pumps, the air handling equipment and any other device connected to the water heat exchanger.
- Refer to the manufacturer's instructions.
- Refer to the wiring diagram supplied with the heat pump.
- Ensure that there is no refrigerant leak.
- Check the tightening of fixing clamps on all pipes.
- Check the power supply at the main connection point and the order of phases.
- Check that the compressor crankcase heaters, and the compressor head heaters if applicable, have been energized for 6 hours before starting up the system.
- Open the suction shut-off valves on each circuit.

IMPORTANT: Commissioning and start-up must be supervised by a qualified engineer.

- ***Start-up and operating tests must be carried out with a thermal load applied and water circulating in the water heat exchanger.***
- ***All setpoint adjustments and control tests must be carried out before the unit is started up.***
- ***Refer to the Service guide.***

Start up the heat pump.

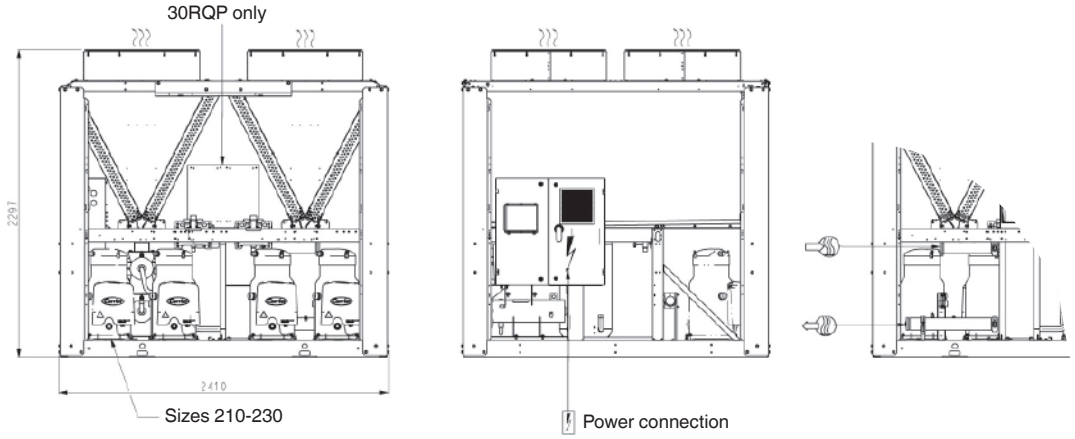
Ensure that all safety devices are operational, checking specifically that the high pressure switches are activated and that any alarms have been cleared.

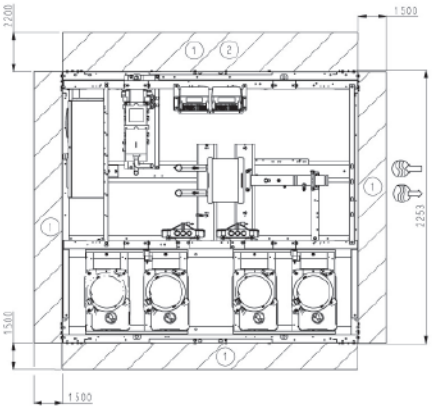
NOTE: If Carrier's recommendations (power and water connections and installation) are not observed, then no claims can be made under the warranty.

3 - DIMENSIONS AND CLEARANCES

3.1 - 30RQM/30RQP 160-230

WITHOUT HYDRAULIC MODULE





Key:
All dimensions are in mm.

1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Control box

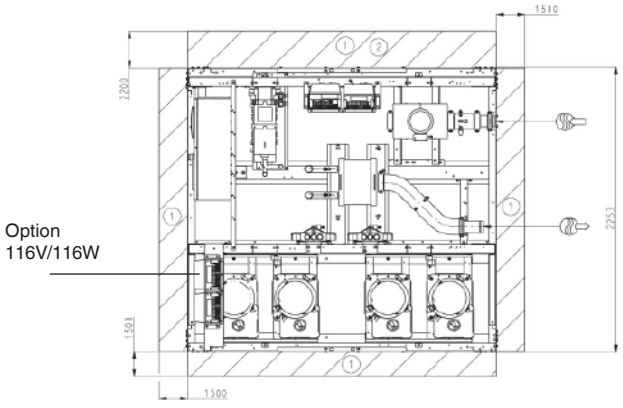
NOTE:

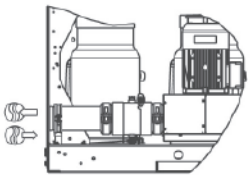
Non-contractual drawings.

When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

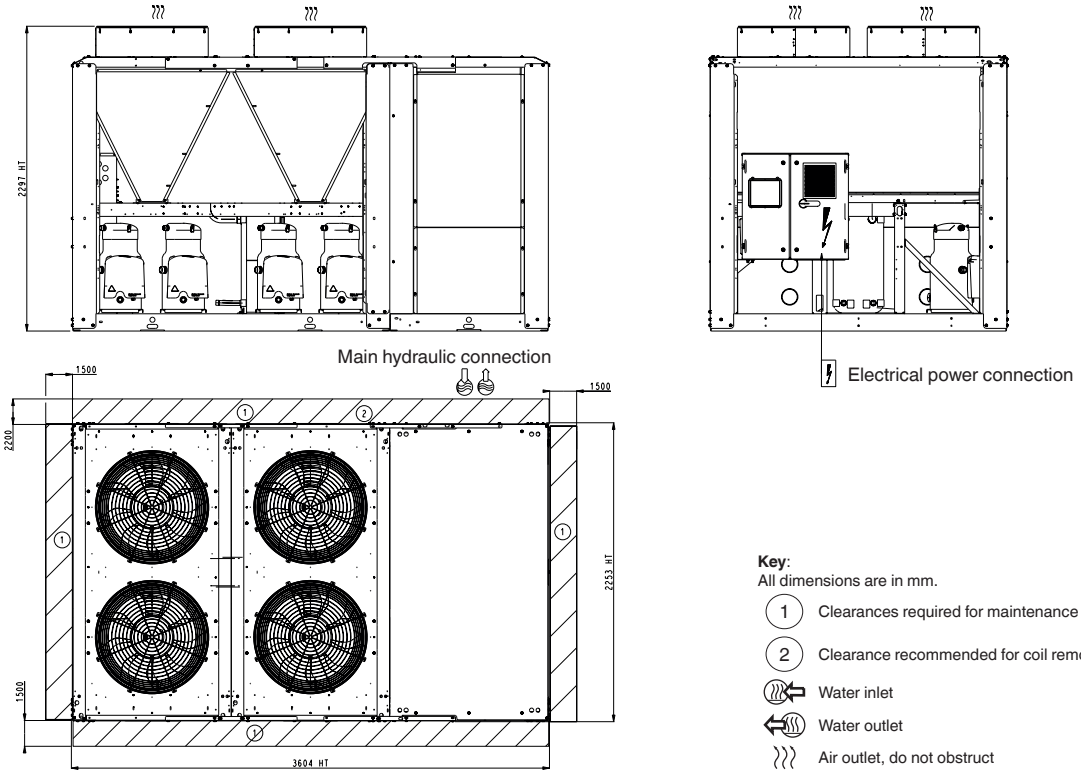
Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

WITH HYDRAULIC MODULE





WITH WATER BUFFER TANK MODULE



Key:
All dimensions are in mm.

1 Clearances required for maintenance and air flow

2 Clearance recommended for coil removal

Water inlet

Water outlet

Air outlet, do not obstruct

Control box

NOTE:

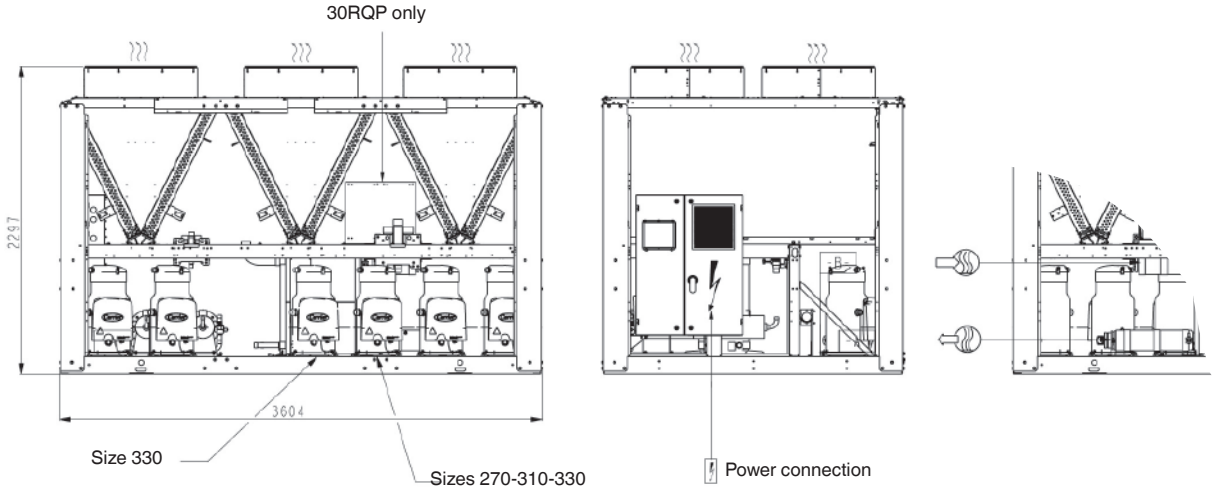
Non-contractual drawings.

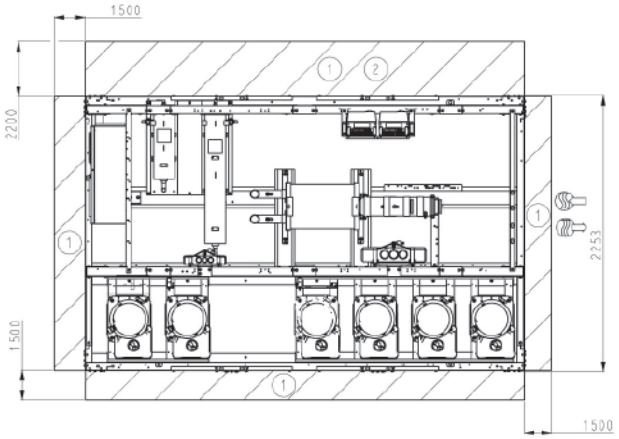
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

3.2 - 30RQM/30RQP 240-330

WITHOUT HYDRAULIC MODULE





Key:
All dimensions are in mm.

1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Control box

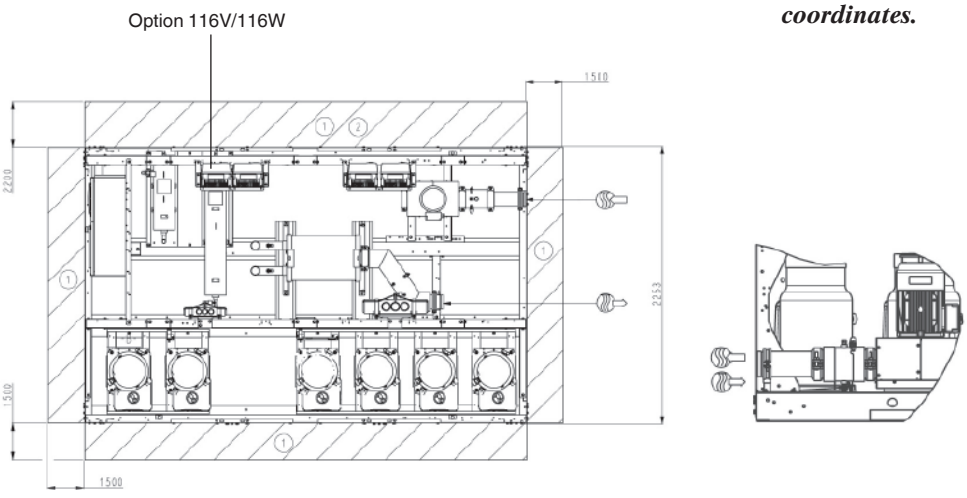
NOTE:

Non-contractual drawings.

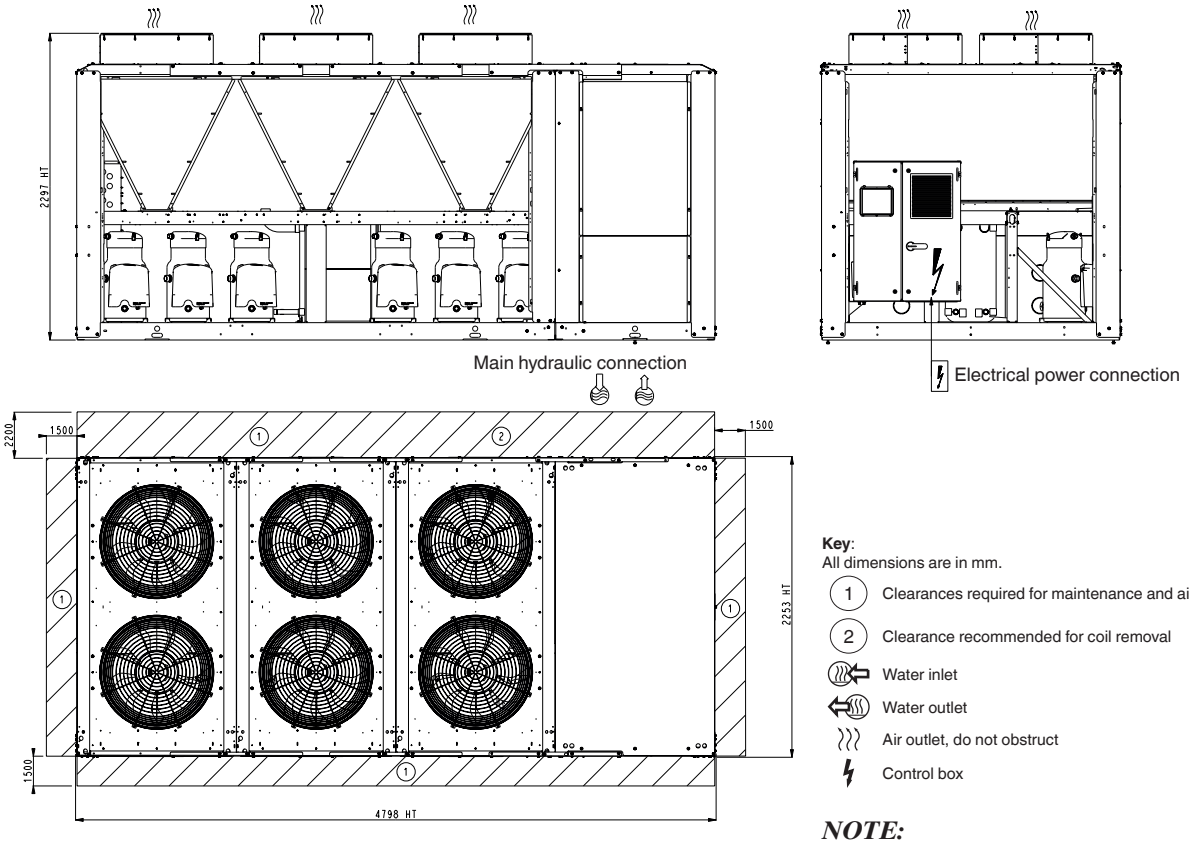
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

WITH HYDRAULIC MODULE



WITH WATER BUFFER TANK MODULE



Key:
All dimensions are in mm.

1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Control box

NOTE:

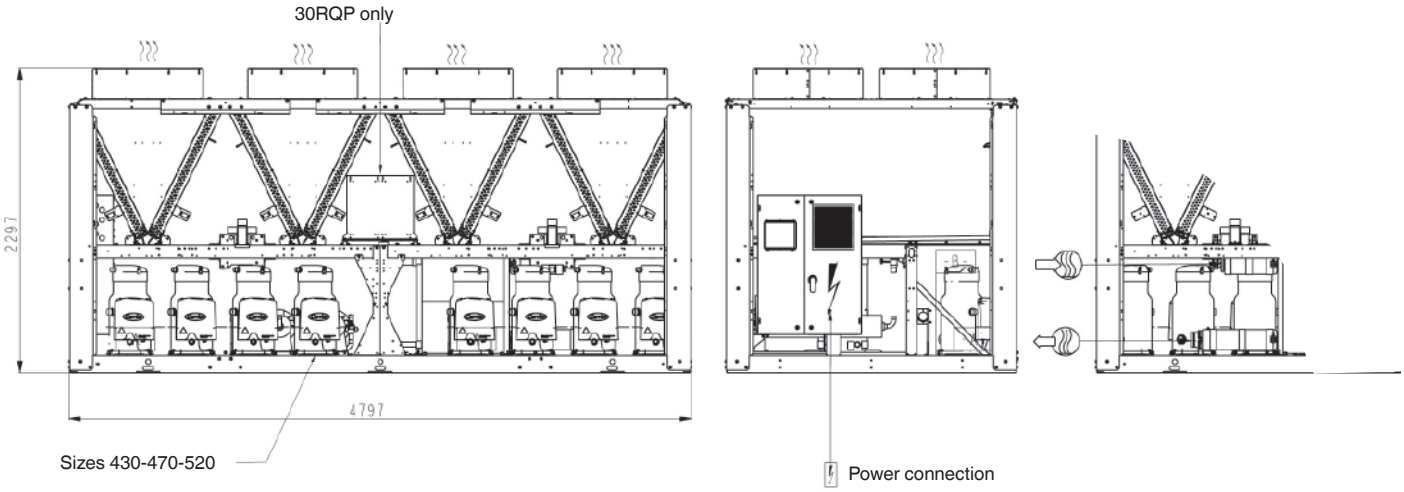
Non-contractual drawings.

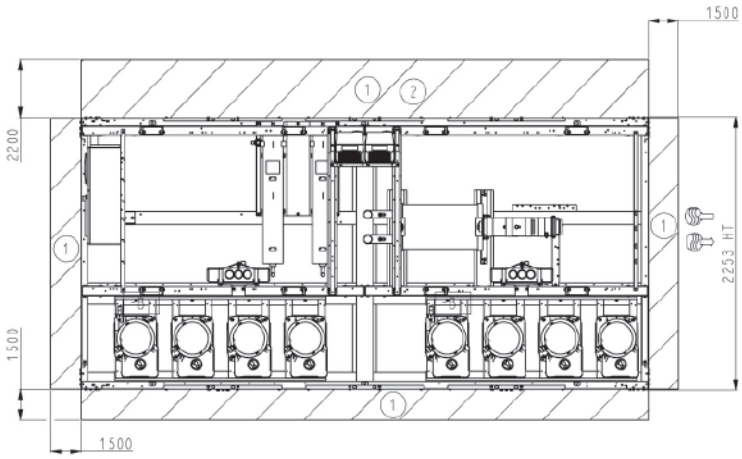
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

3.3 - 30RQM/30RQP 380-520

WITHOUT HYDRAULIC MODULE





Key:
All dimensions are in mm.

1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Control box

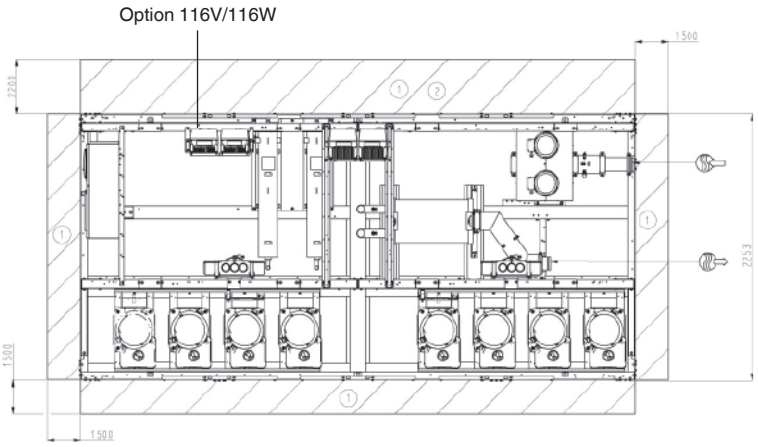
NOTE:

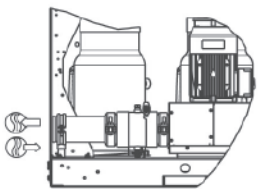
Non-contractual drawings.

When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

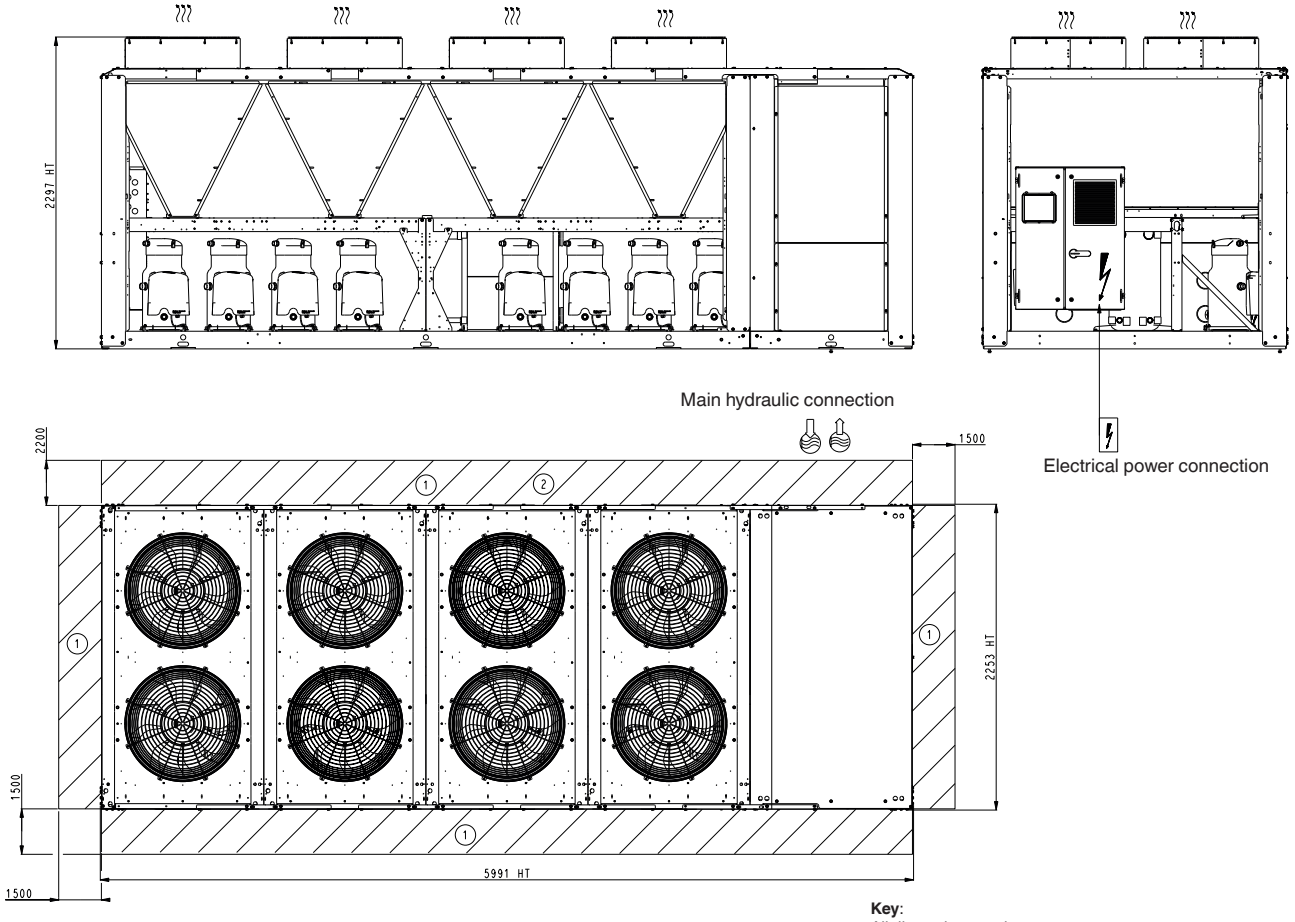
Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

WITH HYDRAULIC MODULE





WITH WATER BUFFER TANK MODULE



Key:
All dimensions are in mm.

1 Clearances required for maintenance and air flow

2 Clearance recommended for coil removal

Water inlet

Water outlet

Air outlet, do not obstruct

Control box

NOTE:

Non-contractual drawings.

When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

3.4 - Installation of multiple heat pumps

It is recommended to install multiple heat pumps in a single row, arranged as shown in the example below, to avoid recycling of air from one unit to another.

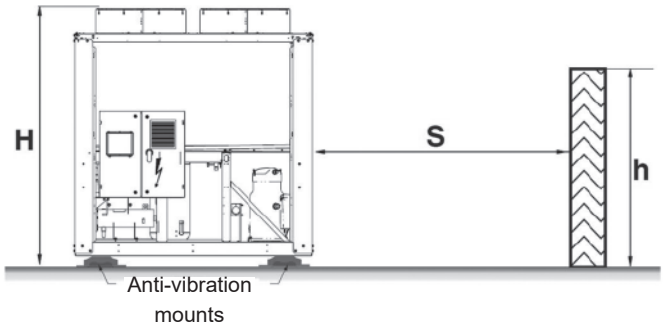
If the floor space does not allow this arrangement, contact your Carrier distributor to assess the various installation options.

3.5 - Distance to the wall

To guarantee correct operation in most cases:

If h < H, S minimum = 3 m

If h > H or S < 3 m, contact your Carrier distributor to assess the various installation options.



4 - PHYSICAL AND ELECTRICAL DATA FOR 30RQM AND 30RQP UNITS

4.1 - Physical data 30RQM 160-520

30RQM		160	180	210	230	240	270	310	330	380	430	470	520
Sound levels													
Standard unit													
Sound power(1)	dB(A)	90	91	91	91	92	92	93	93	94	94	94	94
Sound pressure at 10 m(2)	dB(A)	58	59	59	59	60	60	61	61	62	62	62	62
Standard unit + option 15(3)													
Sound power(1)	dB(A)	89	90	90	90	91	91	91	92	92	93	93	93
Sound pressure at 10 m(2)	dB(A)	57	58	58	58	59	59	59	60	60	61	61	61
Dimensions													
Length	mm	2410				3604				4797			
Width	mm	2253				2253				2253			
Height	mm	2297				2297				2297			
Unit length with water buffer tank module opt	mm	3604				4798				5991			
Operating weight(4)													
Standard unit	kg	1426	1505	1633	1656	2068	2216	2341	2572	3040	3289	3302	3342
Standard unit + option 15	kg	1509	1588	1741	1764	2176	2342	2467	2716	3202	3470	3482	3522
Standard unit + option 15 + option 116W(3)	kg	1649	1728	1893	1915	2337	2551	2685	2920	3407	3715	3764	3803
Unit + option 15 + option 116W + Water buffer tank module	kg	2608	2687	2852	2874	3296	3510	3644	3879	4366	4674	4723	4762
Compressors		Hermetic Scroll 48.3 r/s											
Circuit A		1	1	2	2	2	2	2	2	3	4	4	4
Circuit B		2	2	2	2	2	3	3	4	4	4	4	4
No. of control stages		3	3	4	4	4	5	5	6	7	8	8	8
Refrigerant(4)		R-410A											
Circuit A charge	kg	14,5	22,0	23,0	24,0	27,0	27,0	30,0	33,0	42,0	53,0	54,0	56,0
	tCO_2e	30,3	45,9	48,0	50,1	56,4	56,4	62,6	68,9	87,7	110,7	112,8	116,9
Circuit B charge	kg	23,0	23,0	23,0	24,0	35,0	36,0	48,5	53,0	53,0	53,0	54,0	56,0
	tCO_2e	48,0	48,0	48,0	50,1	73,1	75,2	101,3	110,7	110,7	110,7	112,8	116,9
Control		Touch Pilot Control											
Minimum capacity	%	33%	33%	25%	25%	25%	20%	20%	17%	14%	13%	13%	13%
Air heat exchanger		Grooved copper tubes and aluminum fins											
Fans		Axial Flying Bird 4 with rotating shroud											
Quantity		3	4	4	4	5	5	6	6	7	8	8	8
Maximum total air flow	l/s	13542	18056	18056	18056	22569	22569	27083	27083	31597	36111	36111	36111
Maximum rotation speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
Water heat exchanger		Dual-circuit plate heat exchanger											
Water volume	l	15	15	15	19	27	27	35	44	44	44	47	53
Max. water-side operating pressure without hydraulic module	kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
Hydraulic module (option)		Pump, Victaulic screen filter, relief valve, water and air drain valve, pressure sensors, expansion tank (option)											
Pump		Centrifugal pump, monocell, 48.3 rps, low- or high-pressure (as required), single or dual (as required)											
Expansion vessel volume	l	50	50	50	50	80	80	80	80	80	80	80	80
Max. water-side operating pressure with hydraulic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with or without hydraulic module		Victaulic type											
Connections	inch	3	3	3	3	4	4	4	4	4	4	4	4
External diameter	mm	88.9	88.9	88.9	88.9	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3
Chassis paintwork		Colour code: RAL 7035											

(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 at nominal conditions EN14511 - cooling mode.
(2) In dB ref 20µPa, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). For information, calculated from the sound power Lw(A).
(3) Options: 15 = low noise level, 116W = Variable speed high pressure dual-pump hydraulic module.
(4) Values are guidelines only. Refer to the unit nameplate.

Eurovent certified values

4.2 - Physical data 30RQP 160-520

30RQP		160	180	210	230	240	270	310	330	380	430	470	520
Sound levels													
Standard unit													
Sound power(1)	dB(A)	90	91	91	91	92	92	93	93	94	94	94	94
Sound pressure at 10 m(2)	dB(A)	58	59	59	59	60	60	61	61	62	62	62	62
Standard unit + option 15(3)													
Sound power(1)	dB(A)	89	90	90	90	91	91	91	92	92	93	93	93
Sound pressure at 10 m(2)	dB(A)	57	58	58	58	59	59	59	60	60	61	61	61
Standard unit + option 15LS(3)													
Sound power(1)	dB(A)	84	85	86	86	86	87	87	87	88	89	89	89
Sound pressure at 10 m(2)	dB(A)	52	53	54	54	54	55	55	55	56	57	57	57
Dimensions													
Length	mm	2410				3604				4797			
Width	mm	2253				2253				2253			
Height	mm	2297				2297				2297			
Unit length with water buffer tank module opt	mm	3604				4798				5991			
Operating weight(4)													
Standard unit	kg	1462	1542	1670	1693	2105	2252	2378	2608	3076	3347	3359	3408
Standard unit + option 15 /15LS	kg	1545	1624	1778	1801	2213	2378	2504	2752	3239	3527	3539	3588
Standard unit + option 15/15LS + option 116W(3)	kg	1685	1764	1930	1952	2373	2587	2722	2957	3443	3772	3821	3870
Unit + option 15 + option 116W + Water buffer tank module	kg	2644	2723	2889	2911	3332	3546	3681	3916	4402	4731	4780	4829
Compressors		Hermetic Scroll 48.3 r/s											
Circuit A		1	1	2	2	2	2	2	2	3	4	4	4
Circuit B		2	2	2	2	2	3	3	4	4	4	4	4
No. of control stages		3	3	4	4	4	5	5	6	7	8	8	8
Refrigerant(4)		R-410A											
Circuit A charge	kg	14.5	22.0	23.0	24.0	27.0	27.0	30.0	33.0	42.0	53.0	54.0	56.0
	tCO_2e	30.3	45.9	48.0	50.1	56.4	56.4	62.6	68.9	87.7	110.7	112.8	116.9
Circuit B charge	kg	23.0	23.0	23.0	24.0	35.0	36.0	48.5	53.0	53.0	53.0	54.0	56.0
	tCO_2e	48.0	48.0	48.0	50.1	73.1	75.2	101.3	110.7	110.7	110.7	112.8	116.9
Control		Touch Pilot Control											
Minimum capacity	%	33%	33%	25%	25%	25%	20%	20%	17%	14%	13%	13%	13%
Air heat exchanger		Grooved copper tubes and aluminium fins											
Fans		Axial Flying Bird 4 with rotating shroud											
Quantity		3	4	4	4	5	5	6	6	7	8	8	8
Maximum total air flow	l/s	13542	18056	18056	18056	22569	22569	27083	27083	31597	36111	36111	36111
Maximum rotation speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
Water heat exchanger		Dual-circuit plate heat exchanger											
Water volume	l	15	15	15	19	27	27	35	44	44	44	47	53
Max. water-side operating pressure without hydraulic module	kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
Hydraulic module (option)		Pump, Victaulic screen filter, safety relief valve, water and air bleed valve, pressure sensors, expansion vessel (option)											
Pump		Centrifugal pump, monocell, 48.3 rps, low- or high-pressure (as required), single or dual (as required)											
Expansion vessel volume	l	50	50	50	50	80	80	80	80	80	80	80	80
Max. water-side operating pressure with hydraulic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with or without hydraulic module		Victaulic type											
Connections	inch	3	3	3	3	4	4	4	4	4	4	4	4
External diameter	mm	88.9	88.9	88.9	88.9	114.3	114.3	114.3	114.3	114.3	114.3	114.3	114.3
Chassis paintwork		Colour code: RAL 7035											

(1) In dB ref=10^{-12} W, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). Measurements according to ISO 9614-1 under nominal operating conditions EN14511 - cooling mode.
(2) In dB ref 20µPa, weighting (A). Declared dual-number noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). For information, calculated from the sound power Lw(A).
(3) Options: 15 = low noise level, 15LS = very low noise level, 116W = variable speed high-pressure dual-pump hydraulic module.
(4) Values are guidelines only. Refer to the unit nameplate.

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Eurovent certified values

4.3 - Electrical data 30RQM 160-520

30RQM		160	180	210	230	240	270	310	330	380	430	470	520
Power circuit													
Nominal voltage	V-ph-Hz	400 - 3 -50											
Voltage range	V	360 - 440											
Control circuit supply		24 V via internal transformer											
Nominal unit current draw (1)													
Circuit A&B	A	100	110	133	147	151	166	191	199	233	266	294	322
Maximum unit input power (2)													
Circuit A&B	kW	80	88	107	118	120	134	152	161	188	215	236	258
Cosine Phi unit at maximum power (2)		0,88	0,87	0,88	0,88	0,87	0,88	0,87	0,88	0,88	0,88	0,88	0,88
Maximum unit current draw (Un-10%) (3)													
Circuit A&B	A	144	158	192	211	215	241	273	289	337	385	422	460
Maximum unit current draw (Un) (4)													
Circuit A&B - Standard Unit	A	133	146	177	195	199	222	252	266	310	354	390	425
Circuit A&B - Unit with option 231	A	100	110	133	148	151	166	192	200	233	266	296	326
Maximum start-up current, standard unit (Un) (5)													
Circuit A&B	A	307	356	352	406	409	396	462	440	485	529	600	636
Max. start-up current, unit with soft starter (Un) (5)													
Circuit A&B	A	261	283	305	332	336	350	389	394	438	482	527	562

(1) Conditions equivalent to the standardised Eurovent conditions (evaporator water input-output temperature = 12 °C/7 °C, outside air temperature = 35 °C).
(2) Power input, compressors and fans, at the unit operating limits (saturated suction temperature 15 °C, saturated condensing temperature 68.3 °C) and nominal voltage of 400 V (data given on the unit nameplate).
(3) Maximum unit operating current at maximum unit power input and at 360 V.
(4) Maximum unit operating current at maximum unit power input and at 400 V (values given on the unit nameplate).
(5) Maximum instantaneous starting current at operating limits (maximum operating current of the smallest compressor(s) + current of the fan(s) + locked rotor current of the largest compressor). Fan motor electrical data reported upstream of the variable drive at Eurovent equivalent conditions and motor ambient air temperature of 50 °C at 400 V: Current 3.8 A; Start-up current 20 A; Power input: 1.75 kW.

4.4 - Electrical data 30RQP 160-520

30RQP		160	180	210	230	240	270	310	330	380	430	470	520
Power circuit													
Nominal voltage	V-ph-Hz	400 - 3 -50											
Voltage range	V	360 - 440											
Control circuit supply		24 V via internal transformer											
Nominal unit current draw (1)													
Circuit A&B	A	97	107	130	144	147	162	186	195	227	260	288	316
Cosine Phi unit at maximum power (2)													
Circuit A&B	kW	81	88	108	118	120	134	153	161	188	215	237	259
Cosinus Phi unité à puissance maximale (2)		**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**	**0,88**
Maximum unit current draw (Un-10%) (3)													
Circuit A&B	A	142	154	189	208	211	237	268	284	331	378	416	454
Maximum unit current draw (Un) (4)													
Circuit A&B - Standard Unit	A	131	142	174	192	195	218	247	261	305	348	383	419
Circuit A&B - Unit with option 231	A	98	108	131	146	148	164	188	197	230	262	291	321
Maximum start-up current, standard unit (Un) (5)													
Circuit A&B	A	305	353	349	402	405	392	458	436	479	523	594	629
Max. start-up current, unit with soft starter (Un) (5)													
Circuit A&B	A	259	279	302	329	332	346	384	389	433	476	520	556

(1) Conditions equivalent to the standardised Eurovent conditions (evaporator water input-output temperature = 12 °C/7 °C, outside air temperature = 35 °C).
(2) Power input, compressors and fans, at the unit operating limits (saturated suction temperature 15 °C, saturated condensing temperature 68.3 °C) and nominal voltage of 400 V (data given on the unit nameplate).
(3) Maximum unit operating current at maximum unit power input and at 360 V.
(4) Maximum unit operating current at maximum unit power input and at 400 V (values given on the unit nameplate).
(5) Maximum instantaneous starting current at operating limits (maximum operating current of the smallest compressor(s) + current of the fan(s) + locked rotor current of the largest compressor). Fan motor electrical data reported upstream of the variable drive at Eurovent equivalent conditions and motor ambient air temperature of 50 °C at 400 V: Current 3.8 A; Start-up current 20 A; Power input: 1.75 kW.

4.5 - Short circuit stability current

Short circuit stability current (TN system(1))

30RQM/30RQP		160	180	210	230	240	270	310	330	380	430	470	520
Rated Short-Time Withstand Current (Icw), (1s) rms value/peak Ipk													
Circuits A & B	kA/kA	8/30	8/30	8/30	8/30	8/30	8/30	15/65	15/65	15/65	15/65	20/80	20/80
With fuses upstream - maximum fuse values assigned (gL/gG)													
Circuits A & B	A	200	200	200	250	250	250	315	315	400	400	630	630
With fuses upstream - Conditional Short-Circuit Current (Icc)/Icf													
Circuits A & B	kA	50	50	50	50	50	50	50	50	50	50	50	50

(1) Type of system earthing

IT system: The short circuit current stability values given above for the TN system are not valid for IT, modifications are required.

4.6 - Electrical data notes for the hydraulic module

The pumps that are factory-installed in these units have motors with efficiency class IE3. The additional electrical data required[1] is as follows:

For the low pressure single pump motors for 30RQM/30RQP 160-520 units (option 116T)

No.[2]	Description[3]	Units	30RQM/30RQP											
			160	180	210	230	240	270	310	330	380	430	470	520
1	**Nominal efficiency at full load and nominal voltage**	%	86.4	86.4	86.4	86.4	87.5	87.5	87.5	89.6	89.6	89.6	89.7	89.7
1	**Nominal efficiency at 75% full load and nominal voltage**	%	86.9	86.9	86.9	86.9	88.2	88.2	88.2	90.4	90.4	90.4	90.0	90.0
1	**Nominal efficiency at 50% full load and nominal voltage**	%	85.7	85.7	85.7	85.7	87.5	87.5	87.5	89.9	89.9	89.9	89.0	89.0
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Manufacturer's name or trademark, commercial registration number and registered address	-	Same as above											
5	Product's model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	2.2	2.2	2.2	2.2	3	3	3	4	4	4	5.5	5.5
7-2	Maximum input power (400 V)[5]	kW	2.80	2.80	2.80	2.80	3.81	3.81	3.81	4.96	4.96	4.96	6.80	6.80
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 x 400											
9-2	Maximum current drawn (400 V)[6]	A	4.92	4.92	4.92	4.92	6.81	6.81	6.81	8.27	8.27	8.27	11.30	11.30
10	Nominal speed	r/s - r/min	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000[4]											
	II - Ambient air temperature	°C	< 40											
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.											
	IV - Potentially explosive atmospheres	-	Non ATEX environment											

(1) Additional electrical data required by regulation No. 640/2009 concerning the application of directive 2005/32/EC on the eco-design requirements for electric motors.
(2) Item number imposed by regulation No. 640/2009, annex I2b.
(3) Description given by regulation No. 640/2009, annex I2b.
(4) Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.
(5) To obtain the maximum input power for a unit with hydraulic module, add the maximum unit input power from the electrical data table to the pump power input.
(6) To obtain the maximum unit operating current draw for a unit with hydraulic module add the maximum unit current draw from the electrical data table to the pump current draw.

For the low pressure dual-pump motors for 30RQM/30RQP 160-520 units (option 116U)

No.[2]	Description[3]	Units	30RQM/30RQP											
			160	180	210	230	240	270	310	330	380	430	470	520
1	Nominal efficiency at full load and nominal voltage	%	85.9	86.4	87.5	87.5	87.5	87.5	87.5	89.6	89.6	89.6	89.7	89.7
1	Nominal efficiency at 75% full load and nominal voltage	%	86.4	86.9	88.2	88.2	88.2	88.2	88.2	90.4	90.4	90.4	90.0	90.0
1	Nominal efficiency at 50% full load and nominal voltage	%	84.9	85.7	87.5	87.5	87.5	87.5	87.5	89.9	89.9	89.9	89.0	89.0
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Manufacturer's name or trademark, commercial registration number and registered address	-	Same as above											
5	Product's model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	1.5	2.2	3	3	3	3	3	4	4	4	5.5	5.5
7-2	Maximum input power (400 V)[5]	kW	1.94	2.80	3.81	3.81	3.81	3.81	3.81	4.96	4.96	4.96	6.80	6.80
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 x 400											
9-2	Maximum current drawn (400 V)[6]	A	3.41	4.92	6.81	6.81	6.81	6.81	6.81	8.27	8.27	8.27	11.30	11.30
10	Nominal speed	r/s - r/min	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000[4]											
	II - Ambient air temperature	°C	< 40											
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.											
	IV - Potentially explosive atmospheres	-	Non ATEX environment											

(1) Additional electrical data required by regulation No. 640/2009 concerning the application of directive 2005/32/EC on the eco-design requirements for electric motors.
(2) Item number imposed by regulation No. 640/2009, annex I2b.
(3) Description given by regulation No. 640/2009, annex I2b.
(4) Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.
(5) To obtain the maximum input power for a unit with hydraulic module, add the maximum unit input power from the electrical data table to the pump power input.
(6) To obtain the maximum unit operating current draw for a unit with hydraulic module add the maximum unit current draw from the electrical data table to the pump current draw.

For the high pressure single and dual-pump motors for 30RQM/30RQP 160-520 units (options 116R and 116V)

No.[2]	Description[3]	Units	30RQM/30RQP											
			160	180	210	230	240	270	310	330	380	430	470	520
1	Nominal efficiency at full load and nominal voltage	%	87.5	87.5	89.6	89.6	89.6	89.7	89.7	89.7	89.7	90.8	90.8	90.8
1	Nominal efficiency at 75% full load and nominal voltage	%	88.2	88.2	90.4	90.4	90.4	90.0	90.0	90.0	90.0	90.8	90.8	90.8
1	Nominal efficiency at 50% full load and nominal voltage	%	87.5	87.5	89.9	89.9	89.9	89.0	89.0	89.0	89.0	89.6	89.6	89.6
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Manufacturer's name or trademark, commercial registration number and registered address	-	Same as above											
5	Product's model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	3	3	4	4	4	5.5	5.5	5.5	5.5	7.5	7.5	7.5
7-2	Maximum input power (400 V)[5]	kW	3.81	3.81	4.96	4.96	4.96	6.80	6.80	6.80	6.80	9.16	9.16	9.16
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 x 400											
9-2	Maximum current drawn (400 V)[6]	A	6.81	6.81	8.27	8.27	8.27	11.30	11.30	11.30	11.30	15.30	15.30	15.30
10	Nominal speed	r/s - r/min	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000[4]											
	II - Ambient air temperature	°C	< 40											
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.											
	IV - Potentially explosive atmospheres	-	Non ATEX environment											

(1) Additional electrical data required by regulation No. 640/2009 concerning the application of directive 2005/32/EC on the eco-design requirements for electric motors.
(2) Item number imposed by regulation No. 640/2009, annex I2b.
(3) Description given by regulation No. 640/2009, annex I2b.
(4) Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.
(5) To obtain the maximum input power for a unit with hydraulic module, add the maximum unit input power from the electrical data table to the pump power input.
(6) To obtain the maximum unit operating current draw for a unit with hydraulic module add the maximum unit current draw from the electrical data table to the pump current draw.

For the high pressure single- and dual-pump motors for 30RQM/30RQP 160-520 units (options 116S and 116W)

No.[2]	Description[3]	Units	30RQM/30RQP											
			160	180	210	230	240	270	310	330	380	430	470	520
1	Nominal efficiency at full load and nominal voltage	%	87.5	87.5	89.6	89.6	89.6	89.7	89.7	89.7	90.8	90.8	90.8	90.8
1	Nominal efficiency at 75% full load and nominal voltage	%	88.2	88.2	90.4	90.4	90.4	90.0	90.0	90.0	90.8	90.8	90.8	90.8
1	Nominal efficiency at 50% full load and nominal voltage	%	87.5	87.5	89.9	89.9	89.9	89.0	89.0	89.0	89.6	89.6	89.6	89.6
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Manufacturer's name or trademark, commercial registration number and registered address	-	Same as above											
5	Product's model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	3	3	4	4	4	5.5	5.5	5.5	5.5	7.5	7.5	7.5
7-2	Maximum input power (400 V)[5]	kW	3.81	3.81	4.96	4.96	4.96	6.80	6.80	6.80	6.80	9.16	9.16	9.16
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 x 400											
9-2	Maximum current drawn (400 V)[6]	A	6.81	6.81	8.27	8.27	8.27	11.30	11.30	11.30	11.30	15.30	15.30	15.30
10	Nominal speed	r/s - r/min	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000[4]											
	II - Ambient air temperature	°C	< 40											
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.											
	IV - Potentially explosive atmospheres	-	Non ATEX environment											

(1) Additional electrical data required by regulation No. 640/2009 concerning the application of directive 2005/32/EC on the eco-design requirements for electric motors.
(2) Item number imposed by regulation No. 640/2009, annex I2b.
(3) Description given by regulation No. 640/2009, annex I2b.
(4) Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.
(5) To obtain the maximum input power for a unit with hydraulic module, add the maximum unit input power from the electrical data table to the pump power input.
(6) To obtain the maximum unit operating current draw for a unit with hydraulic module add the maximum unit current draw from the electrical data table to the pump current draw.

4.7 - Compressor usage and electrical data

Cp	I Nom	I Max Un	I Max Un-10 %	LRA Un	Cosinus Phi Max	Circuit	160	180	210	230	240	270	310	330	380	430	470	520
00PSG001961100A	30	41	44	215	0.89	A	1	-	2	2	2	2	2	2	3	4	4	-
						B	2	2	2	-	-	3	-	4	4	4	-	-
00PSG001748000A	37	50	54	260	0.89	A	-	1	-	-	-	-	-	-	-	-	-	4
						B	-	-	-	2	2	-	3	-	-	-	4	4

I Nom Nominal current draw (A) at standardised Eurovent equivalent conditions (see definition of conditions under nominal unit current draw)
I Max Maximum operating current (A)
LRA Locked rotor current (A)
Cos phi Max @I Max, 400 V, 50 Hz

5 - ELECTRICAL CONNECTION

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

5.1 - Power supply

The power supply must conform to the specification on the heat pump nameplate. The supply voltage must be within the range specified in the electrical data table. For connections, refer to the wiring diagrams and certified dimensional drawings.

WARNING: Operation of the heat pump with an incorrect supply voltage or excessive phase imbalance constitutes misuse 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 heat pump is not switched on until corrective measures have been taken.

After the unit has been installed, the power supply must only be disconnected for quick maintenance operations (one day maximum). For longer maintenance operations or when the unit is taken out of service, the power supply of the unit must be maintained permanently (the crankcase heaters must be energised). Otherwise, the suction shut-off valves on each circuit must be closed.

5.2 - 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 with the following values:

AB = 406 V; BC = 399 V; AC = 394 V

Average voltage = (406 + 399 + 394)/3 = 1199/3

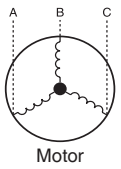
= 399.7 (rounded up to 400 V)

Calculate the maximum deviation from the 400 V average:

(AB) = 406 - 400 = 6

(BC) = 400 - 399 = 1

(CA) = 400 - 394 = 6



The maximum deviation from the average is 6 V. The greatest percentage deviation is:

100 x 6/400 = 1.5 %

This is less than the permissible 2% and therefore acceptable.

5.3 - Power connection/disconnect switch

The power supply for the unit is connected at a single point upstream of the unit's disconnect switch.

Electrical data notes for 30RQM/30RQP units:

- 30RQM/30RQP units have a single power connection point located immediately upstream of the main switch.
- **Control box includes:**
  - A main disconnect switch,
  - Start-up and motor protection devices for each compressor, plus fans and pumps,
  - Control devices.
- **Field connections:**
  All connections to the system and the electrical installations must be in accordance with all applicable codes.
- The Carrier 30RQM/30RQP units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60204-1 (corresponds to IEC 60204-1) (Safety of Machinery - Electrical Equipment of Machines - part 1: General requirements) are specifically taken into account when designing the electrical equipment.

Notes

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation regulation.
- Conformance with EN 60204-1 is the best means of ensuring compliance (§1.5.1) with the Machinery Directive.
  Appendix B of standard EN 60204-1 specifies the electrical features used for the operation of the machines.
- The operating conditions for 30RQM/30RQP units are described below:
  1. Physical environment*
  The classification of environment is specified in standard EN 60364:
     - Outdoor installation*,
     - Ambient temperature range: Minimum temperature -20 °C up to +48 °C**, Altitude: AC1 Lower than or equal to 2000 m (for hydraulic module, see paragraph 4.7 in the IOM),
     - Presence of hard solid: Class AE3 (no significant dust present)*,
     - Presence of corrosive and polluting substances, class AF1 (negligible),
     - Competence of persons: BA4 (Persons wise).
  2. Compatibility for low-frequency conducted disturbances according to class 2 levels per IEC61000-2-4 standard:
     - Power supply frequency variation : +-2Hz
     - Phase imbalance : 2%
     - Total Voltage Harmonic Distortion (THDV) : 8%
  3. The neutral wire (N) must not be connected directly to the unit (if necessary use a transformer).
  4. Overcurrent protection of the power supply conductors is not provided with the unit.
  5. The factory-fitted disconnect switch(es) and circuit breaker(s) are of a type suitable for power interruption in accordance with EN 60947-3 (corresponds to IEC 60947-3).
  6. The units are designed for connection to TN networks (IEC 60364). In IT networks the use of noise filters integrated into the variable frequency drive(s) make machine use unsuitable. In addition, the short-circuit holding current characteristics have been modified. Provide a local earth, consult competent local organisations to complete the electrical installation.
  30RQM/30RQP machines are designed to use for domestic / residential and industrial environments:
  Machines that are not equipped with Variable speed drives comply with the standard regulations.
  - 61000-6-3: General standards - Standard emission for residential, commercial and light industry.
  - 61000-6-2: General standards - Immunity for industrial environments.
  Machines that are equipped with variable frequency drive(s) (RQP, options: 28, 116V, 116W) are in accordance with standard EN61800 - 3 electric power variable speed drives - part 3: EMC requirements and specific test methods for the following classifications:-
  - Use in the first and second environments***.
  - Category C2 applicable in the first environment, to stationary devices designed to be installed and commissioned by a professional.
  Warning: In a residential environment, this product may cause radio interference in which case additional mitigation measures could be required.
- Leakage currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of additional leakage currents introduced by the use of variable frequency drive(s) in the unit must be considered. In particular these protection devices shall be of reinforced immunity types and have a threshold not lower than 150 mA.
- Capacitors that are integrated as part of the option 231 can generate electrical disturbances in the installation the unit is connected to. Presence of these capacitors must be considered during the electrical study prior to the start-up.

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.

* The required protection level for this class is IP43BW (according to reference document IEC 60529). All 30RQM/30RQP units are IP44CW and fulfil this protection condition.

** The maximun ambiant temperature allowed for mahines equipped with option 231 is +40°C

** - Example of installations of the first environment: Commercial and residential buildings.
- Example of installations of the second environment: Industrial zones, technical premises powered from a dedicated transformer.

5.4 - 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 Carrier in any way liable. After wire sizing has been completed, using the certified dimensional drawing, the installer must verify the appropriate means of connection and define any modifications necessary on site.

The connections provided as standard for the customer-supplied power supply cables are designed for the number and type of wires, listed in the table below.

The calculations of favourable and unfavourable cases are performed by using the maximum possible current for each unit fitted with a hydraulic kit (see the tables of electrical data notes for the unit and the hydraulic module).

The study includes the standardised installation cases according to IEC 60364: cables with PVC (70°C) or XLPE insulation (90°C) with copper core; routing in accordance with table 52C of the standard. The maximum ambient temperature is 45°C. The maximum length mentioned is calculated to limit the voltage drop to 5 %.

IMPORTANT: Before connecting the main power cables (L1 - L2 - L3), always check 3 phases are in the correct order (clockwise) before proceeding to the connection on the main disconnect switch.

Table of minimum and maximum cable sections (per phase) for connection to 30RQM/30RQP units

	Max. connectable section(1)			Calculation of favourable case: - Suspended overhead line (standardised routing no. 17) - Cable with XLPE insulation			Calculation of unfavourable case: - Conductors in ducts or multi-conductor cables in closed conduits (standardised routing no. 41) - Cable with PVC insulation		
30RQM/ 30RQP	**Standard lug**	**Narrow lug**	**Recommended max lug width**	**Section(2)**	**Max length for a voltage drop < 5%**	**Cable type(3)**	**Section(2)**	**Max length for a voltage drop < 5%**	**Cable type(3)**
	mm² (per phase)	**mm² (per phase)**	**mm**	**mm² (per phase)**	**m**	**-**	**mm² (per phase)**	**m**	**-**
160	2x70	2x95	21	1 x 50	200	XLPE Copper	2 x 50	388	PVC Copper
180	2x70	2x95	21	1 x 50	180	XLPE Copper	2 x 50	358	PVC Copper
210	2x70	2x95	21	1 x 70	210	XLPE Copper	2 x 70	380	PVC Copper
230	2x70	2x95	21	1 x 70	190	XLPE Copper	2 x 70	350	PVC Copper
240	2x70	2x95	21	1 x 70	180	XLPE Copper	2 x 70	350	PVC Copper
270	2x70	2x95	21	2 x 35	160	XLPE Copper	2 x 95	400	PVC Copper
310	2x95	2x185	21	2 x 50	200	XLPE Copper	2 x 120	430	PVC Copper
330	2x95	2x185	24.5	2 x 50	190	XLPE Copper	2 x 150	490	PVC Copper
380	2x95	2x185	24.5	2 x 70	220	XLPE Copper	2 x 150	420	PVC Copper
430	2x95	2x185	24.5	2 x 70	190	XLPE Copper	2 x 185	430	PVC Copper
470	2x240	2x240	37	2 x 95	230	XLPE Copper	2 x 240	470	PVC Copper
520	2x240	2x240	37	2 x 95	210	XLPE Copper	2 x 240	430	PVC Copper

Notes:

(1) Connection capacities actually available for each machine. These are defined according to the connection terminal size, the electrical box access opening dimensions and the available space inside the electrical box.

(2) Selection simulation result considering the hypotheses indicated.

(3) If the maximum calculated section is for an XLPE cable type, this means that a selection based on a PVC cable type can exceed the connection capacity actually available. Special attention must be given to selection.

The protection against direct contact at the electrical connection point is compatible with the addition of terminals extension. The installer must determine whether these are necessary based on the cable sizing calculation.

5.5 - Power cable access routing

The power cables are routed into the electrics box on 30RQM/30RQP units from underneath.

A removable aluminium plate on the base of the electrical cabinet provides access for the power cables.

It is important to check that the power cable bend radius is compatible with the connection space available inside the electrical cabinet. Refer to the certified dimensional drawing for the unit.

Connection expansion box

This accessory is used to strip the power cable before it is routed inside the unit's electrical cabinet, and must be used when the cable bend radius is not compatible with the space available inside the electrical cabinet. The "connection expansion box" accessory provides mechanical protection for the stripped cable before it is routed inside the electrical cabinet.

The use of this accessory is recommended in the following cases:

Unit placed on the ground and use of a steel wired armoured power cable.

Unit placed on the ground and use of a rigid power cable with a section > 250 mm2.

5.6 - Field control wiring

IMPORTANT: Field connection of interface circuits carries safety risks: any modifications to the electrical box must ensure that the equipment remains compliant with local regulations. In particular, precautions must be taken to prevent accidental electrical contact between the circuits supplied by different sources:

The choice of routing and/or insulation characteristics of the conductors ensures double electrical insulation.

The conductors should be fixed together inside the electrical box to prevent contact between the end of the conductor and a live part in case of accidental disconnection.

See the 30RQM/30RQP control manual and the certified electric wiring diagram supplied with the unit for the field control wiring of the following devices:

- Customer interlock (safety chain)
- Remote on/off switch
- Remote heat/cool switch
- Capacity limit external switch 1
- Remote dual setpoint
- Operating and alarm feedback
- Water heat exchanger pump control
- Various interlocks on the Energy Management Module (EMM) board (option 156).

5.7 - Electric power reserve for the user

Control circuit power reserve:

After all possible options have been connected, the TC transformer ensures the availability of 1 A on 24 V, 50 Hz.

With option 284, this CT transformer provides a 230V/50Hz circuit designed to power laptop battery chargers only (maximum current of 0.8 A at 230 V).

IMPORTANT: Only connect class I and II equipment to this power socket.

6.1 - Operating range

30RQM/30RQP 160-520 units, cooling mode

Water heat exchanger		Minimum	Maximum
Water inlet temperature at start-up	°C	8(1)	40
Water outlet temperature during operation	°C	5(2)	20(3)
Leaving water temperature during operation low-temperature brine solution option	°C	-8(8)	20(3)
Air heat exchanger			
Ambient operating temperature - 30RQM	°C	0(4)(6)	48(7)
Ambient operating temperature - 30RQM option 28 or 30RQP	°C	-20(4)(6)	48(7)
Available static pressure			
Standard unit (for outdoor installation)	Pa	0	0

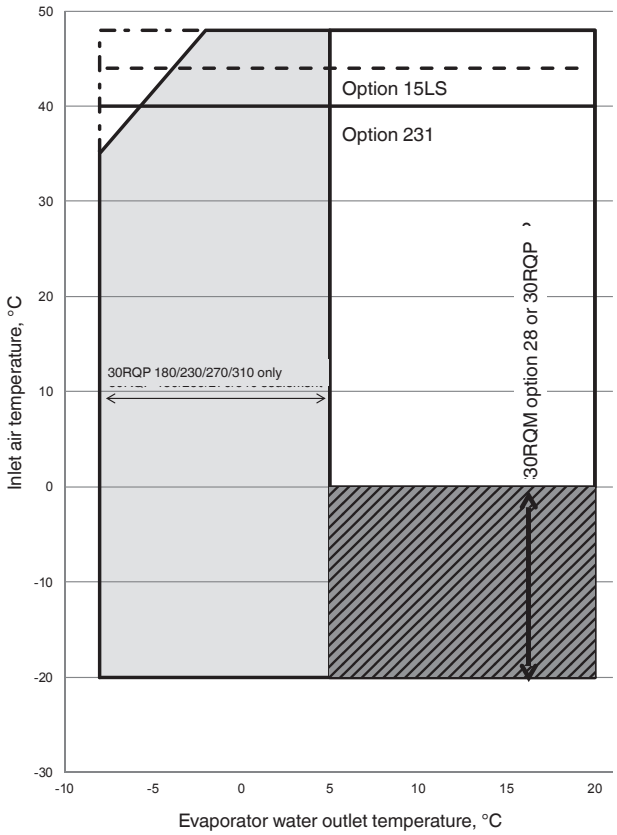
30RQM/30RQP 160-520 units, heating mode

Water heat exchanger		Minimum	Maximum
Water inlet temperature at start-up	°C	8(1)	50
Water outlet temperature during operation	°C	20	55
Air heat exchanger			
Outdoor ambient operating temperature	°C	-10(5)(6)	35
Available static pressure			
Standard unit (for outdoor installation)	Pa	0	0

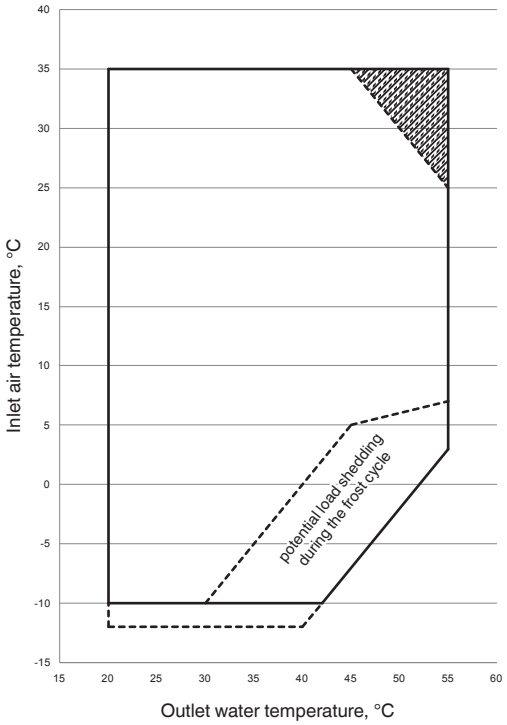
(1) For an application requiring start-up at less than 8°C, contact Carrier to select a unit using the Carrier electronic catalogue.
(2) The use of antifreeze protection is required if the water outlet temperature is below 5°C
(3) For applications requiring operation above a water outlet temperature of 20°C, contact Carrier to select a unit using the Carrier electronic catalogue.
(4) For operation at an ambient temperature of 0°C down to -20°C (cooling mode), the heat pump must be a 30RQM unit equipped with option 28 "Winter operation" or a 30RQP unit.
(5) For operation at an ambient temperature of 0°C down to -10°C (heating mode), the heat pump must be equipped with option 252 "Coil defrost heater"
(6) For operation at an ambient temperature below 0°C (cooling mode and heating mode), the unit must either be equipped with the water heat exchanger frost protection option (for units without hydraulic module option) or the water heat exchanger and hydraulic module frost protection option (for units with hydraulic module option) or the water loop must be protected against frost by the installer, using an anti-freeze solution.
(7) The maximun ambiant temperature allowed for mahines equipped with option 231 is +40°C
(8) Operation with low temperature brine for 30RQP 180/230/270/310 only

Maximum ambient temperature: in case of 30RQM/30RQP units storage and transport, minimum and maximum ambient temperatures to respect are -20°C and +52°C. These temperature limits shall be considered in case of container shipment.

30RQM/30RQP 160-520 units - Cooling mode



30RQM/30RQP 160-520 units - Heating mode



Notes
1 Evaporator ΔT = 3K
2 The unit must be equipped with the water heat exchanger frost protection option (for units without hydraulic module option) or the water heat exchanger and hydraulic module frost protection option (for units with hydraulic module option) or the water loop must be protected against frost using an anti-freeze solution for outdoor air temperatures below 0°C
3 Operating ranges are guidelines only. The operating range must be checked with the selection software

Key

Operating range at full load, 30RQM unit or 30RQP unit

Extended operating range in cooling mode: 30RQM unit, option 28 "Winter operation" down to outdoor temperatures of -20°C or 30RQP unit. The water heat exchanger must be protected against frost (see note 2).

Operating range at part load for 30RQM/30RQP 310 unit. Other sizes operate at full load.

Potential offloading during the de-frost cycle depending on the humidity conditions. Refer to the manufacturer's electronic catalogue.

Low temperature brine solution option

Partial charge for low-temperature brine solution option

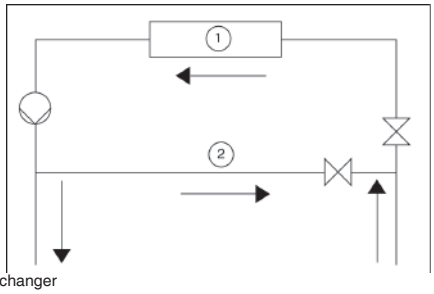
CAUTION: 30RQP units, option 28 and options 116V and 116W.

If the air temperature is below -10°C and the unit has been deenergised for more than 4 hours, it is necessary to wait two hours after the unit has been switched on again to allow the variable drive to warm up.

6.2 - Minimum water flow (units without hydraulic module)

The minimum water flow is shown in the table on the next page. If the system flow is less than the unit's minimum flow, the exchanger flow can be recirculated, as shown in the diagram.

For minimum water flow

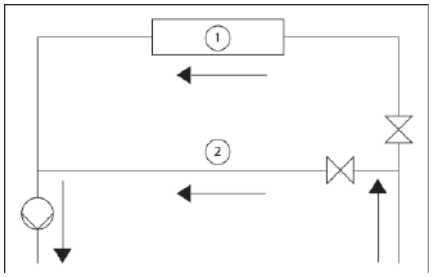


1 Water heat exchanger
2 Recirculation

6.3 - Maximum water flow (units without hydraulic module)

The maximum water flow is shown in the table on the next page. If the system's flow exceeds the unit's maximum value, it can be bypassed as shown in the diagram.

For maximum water flow



1 Water heat exchanger
2 Bypass

6.4 - Variable flow water heat exchanger (units without hydraulic module)

A variable water heat exchanger flow can be used in standard heat pumps. The 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 litres of water per kW instead of 2.5 l/kW.

6.5 - System minimum water volume

Whichever the system, the water loop minimum capacity is given by the formula: Volume = Cap (kW) x N Litres

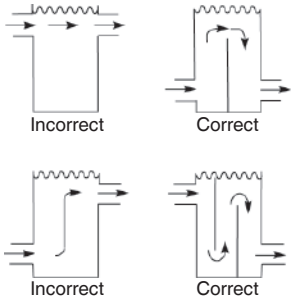
Application	N
Air conditioning – cooling	2.5
Air conditioning – heating	3.0 - 8.0(1)
Industrial process type cooling	6.5

(1) Depending on the unit capacity - minimum water loop volume 1300 l

Where "Cap" represents the rated cooling capacity of the circuit (kW) under the installation's rated operating conditions. This volume is necessary for stable operation. It may be neccesary to add a water buffer tank to the circuit to obtain 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.

CAUTION: Minimum water volume to be guaranteed between the unit and any customer valves outside of the machine.

Connection to a buffer tank



6.6 - Maximum system water volume

Units supplied with a hydraulic module may include an expansion tank which limits the volume in the water loop (option 293).

The table below gives the maximum loop volume for pure water or ethylene glycol depending on the system's various concentrations and static pressures. If the maximum volume is insufficient, compared to the minimum system water loop volume, an additional expansion tank vessel must be added to the system.

Maximum water loop volume (litres)						
30RQM/30RQP	160-230			240-520		
Static pressure (bar)	1	2	2.5	1	2	2.5
Pure water	2400	1600	1200	3960	2640	1980
10% EG	1800	1200	900	2940	1960	1470
20% EG	1320	880	660	2100	1400	1050
30% EG	1080	720	540	1740	1160	870
40% EG	900	600	450	1500	1000	750

EG: ethylene glycol

6.7 - Exchanger water flow

Data applicable for pure water.

30RQM/30RQP 160-520 units without low pressure hydraulic module

30RQM/30RQP	Minimum flow rate(1) (l/s)	Maximum flow rate(2) (l/s)
160	2.9	17.5
180	3.1	17.5
210	3.8	17.5
230	4.1	21.8
240	4.2	29.8
270	4.8	29.8
310	5.5	35.2
330	5.8	40.4
380	6.7	40.4
430	7.8	40.4
470	8.4	41.6
520	9.2	43.4

(1) Minimum flow rate for the maximum permitted water temperature difference conditions (10 K) at the minimum water outlet temperature value (5°C)
(2) Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger

30RQM/30RQP 160-520 units with low pressure hydraulic module

30RQM/30RQP	Minimum flow rate(1) (l/s)	Maximum flow rate (l/s)	
		Single	Dual
160	2,9	12,2	10,3
180	3,1	12,2	12,2
210	3,8	14,3	14,0
230	4,1	14,3	14,0
240	4,2	20,3	20,2
270	4,8	20,3	20,2
310	5,5	20,3	20,2
330	8,0	25,0	25,0
380	8,0	25,0	25,0
430	8,0	25,0	25,0
470	8,4	28,6	26,5
520	9,2	28,6	28,6

(1) Minimum flow rate for the maximum permitted water temperature difference conditions (10 K) at the minimum water outlet temperature value (5°C)

30RQM/30RQP 160-520 units with high pressure hydraulic module

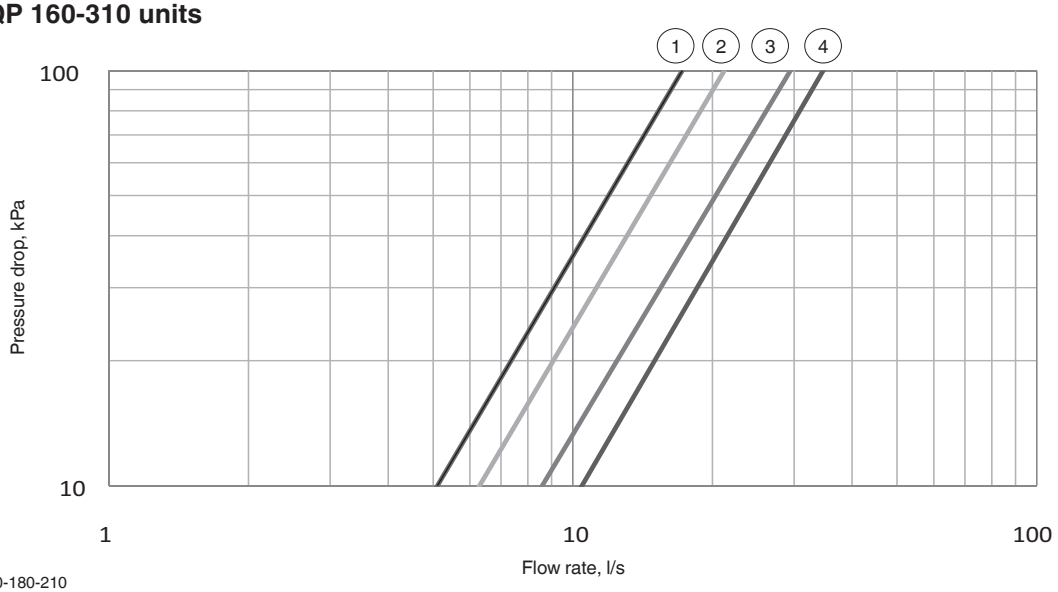
30RQM/30RQP	Minimum flow rate(1) (l/s)	Maximum flow rate (l/s)	
		Single	Dual
160	2,9	11,7	10,8
180	3,1	11,7	10,8
210	3,8	16,1	15,5
230	4,1	16,1	15,5
240	4,2	16,1	15,5
270	4,8	26,5	26,5
310	5,5	26,5	26,5
330	5,8	26,5	26,5
380	6,7	26,5	29,2
430	7,8	26,7	29,2
470	8,4	26,7	30,0
520	9,2	30,0	30,0

(1) Minimum flow rate for the maximum permitted water temperature difference conditions (10 K) at the minimum water outlet temperature value (5°C)

6.8 - Pressure drop curves for the exchanger and standard water inlet/outlet piping

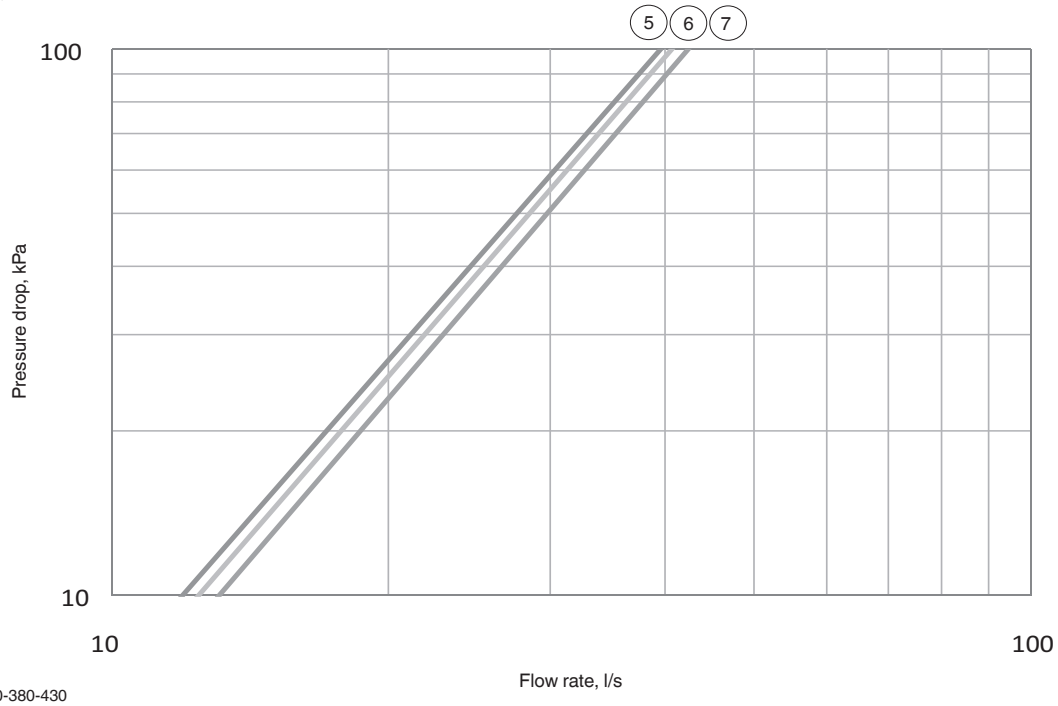
Data applicable for pure water at 20°C.

30RQM/30RQP 160-310 units



1 30RQM/30RQP 160-180-210
2 30RQM/30RQP 230
3 30RQM/30RQP 240-270
4 30RQM/30RQP 310

30RQM/30RQP 330-520 units



5 30RQM/30RQP 330-380-430
6 30RQM/30RQP 470
7 30RQM/30RQP 520

7 - WATER CONNECTIONS

When connecting units to the water distribution pipe work, refer to the certified dimensional drawings supplied with the unit for the dimensions and position of the water inlet and outlet connections.

The pipes and tubes should not transmit any axial or radial forces to the exchangers or any vibrations.

The water must be analysed and the circuit must include provision of any necessary water treatment: filters, additives, intermediate exchangers, bleed valves, vents, shut-off valves, etc. depending on the results, in order to prevent corrosion (e.g. damage to the surface of the tubes due to impurities in the fluid), fouling and deterioration of the pump lining.

Before any start-up, check that the heat transfer fluid is compatible with the hydraulic circuit materials. Where additives or other fluids than those recommended by Carrier are used, ensure that these are not considered gases, and that they are class 2, as defined in directive 2014/68/EU.

Carrier's recommendations concerning heat transfer fluids:

- No NH_4^+ ammonium ions in the water - these are very harmful to 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 also harmful to copper with a risk of perforating corrosion. Keep at a level below 125 mg/l.
- SO_4^{2-} sulphate ions can cause perforating corrosion if their content is above 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No Fe^{2+} and Fe^{3+} ions if non-negligible levels of dissolved oxygen are 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 mmol/l are 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: Avoid any sudden change in water oxygenation conditions. Deoxygenating the water by mixing it with inert gas and over-oxygenating it by mixing it with pure oxygen are both equally harmful. The disturbance of oxygenation conditions encourages destabilisation of copper hydroxides and precipitation of particles.
- Electric conductivity 10-600 µS/cm.
- pH: Ideal case pH neutral at 20-25°C (7.5 < pH < 9).

CAUTION: Filling, topping up or emptying the water circuit must be carried out by qualified personnel using tools and equipment suitable for the products. The heat transfer fluid should be filled using devices fitted to the hydraulic circuit by the installer.

7.1 - Operating precautions and recommendations

Before any system start-up, verify that the hydraulic circuits are connected to the appropriate heat exchangers. The water circuit should be designed to have the least number of elbows and and changes in elevation; the main points to be checked for the connection are listed below.

- Ensure the water outlet and inlet connections match those marked on the unit.
- Install manual or automatic air purge valves at all high points in the circuit.
- Maintain the pressure of the circuit(s) with pressure reducers and install a safety relief valve and an expansion tank. Units supplied with a hydraulic module include a valve. Units supplied with option 293 include an expansion tank.
- Install thermometers in both the water inlet and outlet pipes.
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install shut-off valves close to the water inlet and outlet connections.
- Use flexible connections to reduce the transmission of vibrations.
- Insulate the pipework, after testing for leaks, to prevent heat transmission and condensation.
- Cover the insulation with a vapour barrier. If the water pipes outside the unit pass through an area where the ambient temperature is likely to fall below 0°C, it must be protected against frost (anti-freeze solution or electric heaters).
- The use of different metals in the hydraulic system may create galvanic couples and lead to corrosion. Verify then the need to install sacrificial anodes.
- Do not introduce significant static or dynamic pressure, as compared to the stated operating pressures, into the heat transfer fluid circuit.
- Products used for thermal insulation must be chemically neutral to the surfaces on which they are applied. All original materials supplied by Carrier comply with this requirement.

NOTE: A screen filter must be installed for units supplied without a hydraulic module. This must be installed on the unit's water inlet pipe, upstream of the pressure differential gauge and close to the unit heat exchanger. It must be located somewhere easily accessible to enable disassembly and cleaning. The mesh size of the filter must be no more than 1.2 mm. If the filter is missing, the plate heat exchanger can quickly become fouled during the first start-up, as it will trap any debris in the system, and correct unit operation will be affected (reduced water flow rate due to the increased pressure drop).

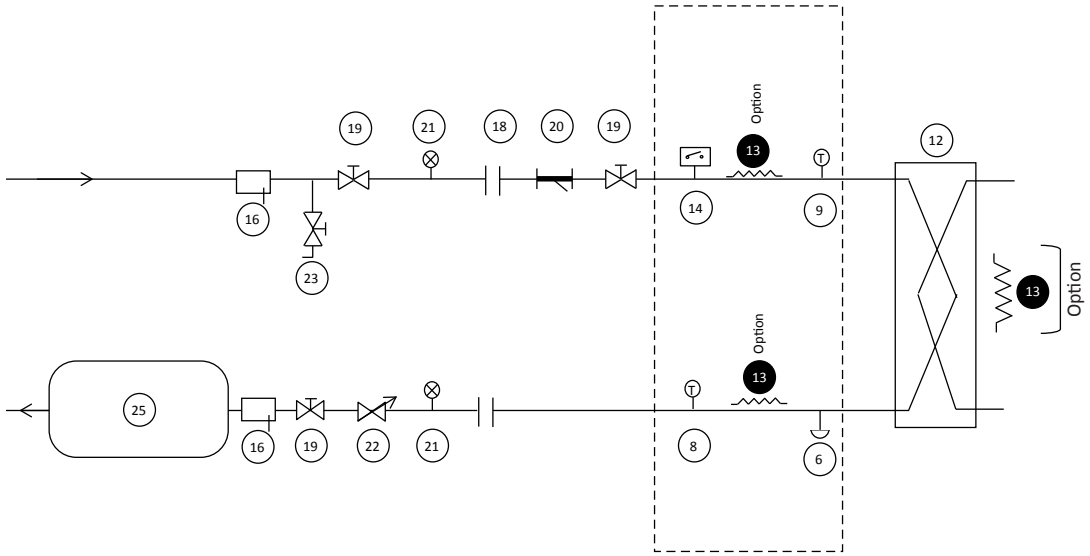
Units with a hydraulic module are equipped with this type of filter.

7.2 - Hydraulic connections

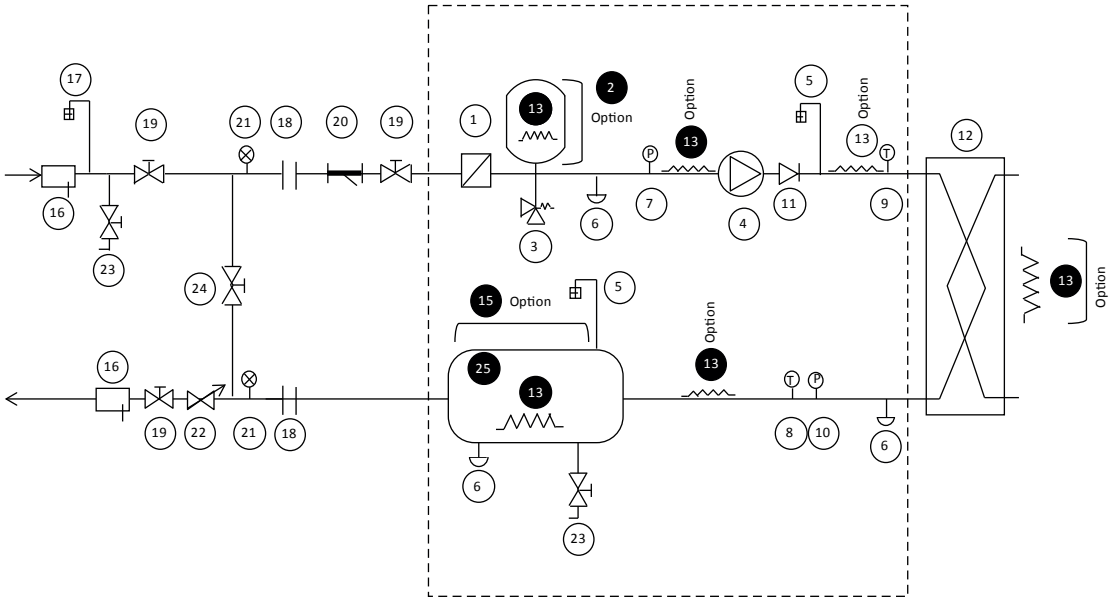
The hydraulic module options are only compatible with closed heat transfer fluid loops.

The use of the hydraulic kit on open loop systems is prohibited.

Schematic diagram of the water circuit without the hydraulic module



Schematic diagram of the water circuit with the hydraulic module



Key

Components of the unit and hydraulic module

1 Screen filter (particle size of 1.2 mm)
2 Expansion tank (option)
3 Relief valve
4 Circulating pump (single or dual)
5 Air bleed
6 Water drain tap
7 Pressure sensor
Note: Provides pressure information for the pump inlet (see Control manual)
8 Temperature probe
Note: Provides temperature information for the water exchanger outlet (see Control manual)
9 Temperature probe
Note: Provides temperature information for the water exchanger inlet (see Control manual)
10 Pressure sensor
Note: Provides pressure information for the water exchanger outlet (see Control manual)
11 Check valve (if dual pump)
12 Plate heat exchanger
13 Heater or heat trace cable for frost protection (Option)
14 Water type heat exchanger flow rate sensor
15 Buffer Tank Module (Option)

System components

16 Pocket
17 Air bleed
18 Flexible connection
19 Shut-off valve
20 800 µm screen filter (Option - mandatory in the case of a unit without hydraulic module)
21 Pressure gauge
22 Water flow control valve
Note: not required if hydraulic module with variable speed pump
23 Charge valve
24 Bypass valve for frost protection (if shut-off valves are closed (item 19) during winter)
25 Buffer tank (if required)

---- Hydraulic module (unit with hydraulic module option)

Notes:

- The system must be protected against frost.
- The unit's hydraulic module and the water heat exchanger may be protected (factory-fitted option) against freezing using electric heaters and heat trace cables (13)
- The pressure sensors are assembled on connections without Schrader. Depressurise and drain the system before any work.

Figure 1: Water connections without hydraulic module

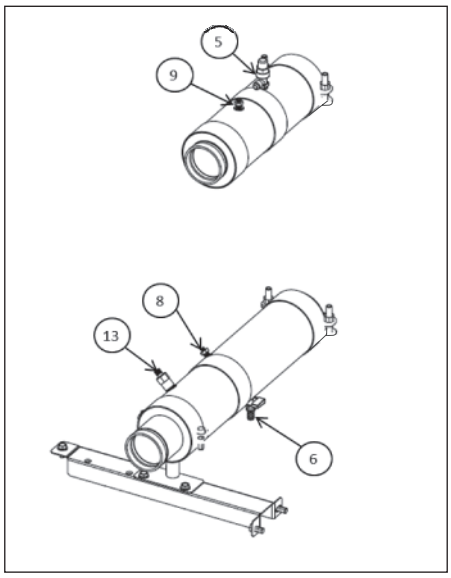
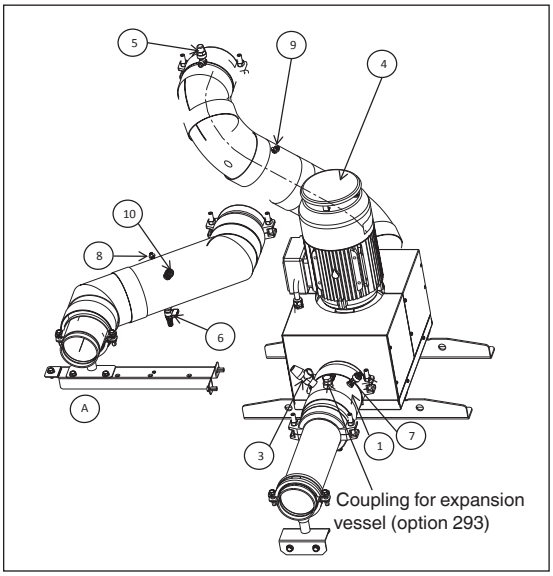
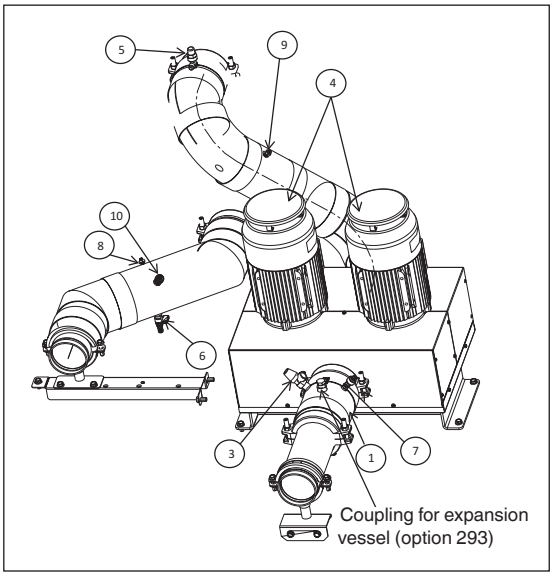


Figure 2: Water connections with hydraulic module

Example: Single-pump

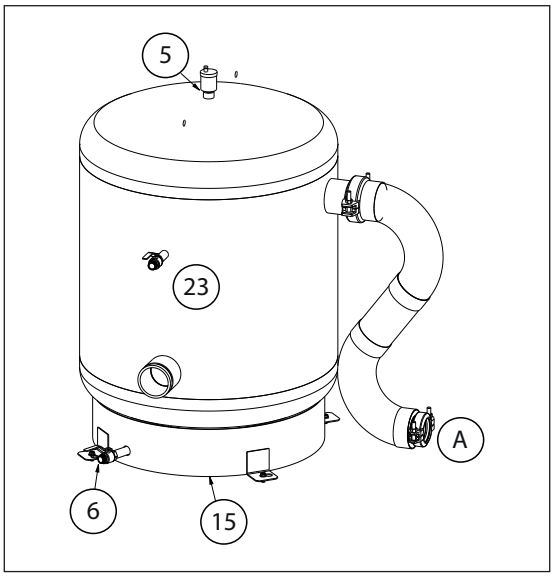


Example: Dual-pump



See legend on the previous page.

Figure 3: Water connections with hydraulic module and with buffer tank module option



7.3 - Water flow detection

7.3.1 - Standard unit

All units are equipped with a factory-set flow switch. It cannot be adjusted on site.

A water pump operating interlock must be wired to the unit if no hydraulic module is fitted. Terminals 34 and 35 are provided for connection of the water pump interlock (to be wired on site).

7.3.2 - Unit with hydraulic module (options 116)

The "water flow detection" functionality is handled by the option (via pressure sensors).

7.4 - Frost protection

CAUTION: Damage caused by frost is not covered by the warranty.

The plate heat exchanger, the pipes and the hydraulic module pumps can be damaged by frost. The components of the unit (heat exchanger, pipes, hydraulic module) will be protected by following the recommendations below. Protection of the remainder of the system is the responsibility of the installer.

7.4.1 - Standard unit

If the chiller or the water pipes are in an area where the ambient temperature can drop below 0°C, it is recommended that one of the three following strategies is applied to protect the unit and the water pipes down to a temperature 10 K below the lowest temperature likely to occur locally:

1. Add an anti-freeze solution (45% maximum);
2. Drain the hydraulic circuits exposed to negative temperatures;
3. Solution with heaters: Order (factory-installed) option 41 (electric heaters on the water heat exchanger and exchanger water outlet pipes) in order to protect the exchanger down to -20°C. If option 266 (water heat exchanger connection sleeves) is also ordered, it is necessary to install a heater on each extension in order to protect the water pipes down to outdoor temperatures of -20°C. The anti-freeze and heater solutions can be combined.

7.4.2 - Unit with hydraulic module

The recommendations from the previous chapter (points 1 and 2) are applicable to the machines with hydraulic module and protect them against frost.

For the solution with heaters, order (factory-installed) option 42A (electric heaters on the water heat exchanger and various components of the hydraulic module including the expansion tank) to ensure protection of the entire unit down to -20°C. The anti-freeze and heater solutions can be combined.

Frost protection of units with hydraulic modules require that water be circulated in the hydraulic circuit. The pump will periodically start automatically.

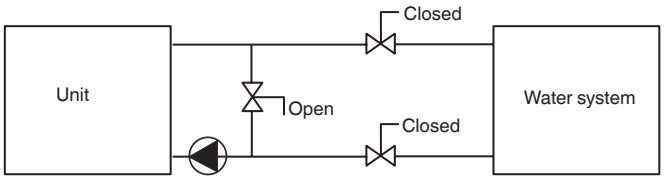
Combination of options for the periods when the machine is in standby mode.

Ambient unit temperature range	30RQM/30RQP 160-520	
	without option 116	**with option 116**
> 0°C to 48°C	-	-
-20°C to 0°C	Option 41	Option 42A(1)
	or	or
	Appropriate anti-freeze solution (for example glycol)	Appropriate anti-freeze solution (for example glycol)(1)

(1) Allow the pumps to circulate. If there is a valve, install a bypass (see diagram for winter position).

If the system is isolated by a valve, it is imperative to install a bypass as indicated below.

Winter position



IMPORTANT REMINDERS: Depending on the atmospheric conditions in your region, you need to:

- ***Add an appropriate anti-freeze solution to protect the system down to a temperature of 10 K below the lowest temperature likely to occur locally.***
- ***For extended shut-downs, drain and add an anti-freeze solution to the heat exchanger (use the drain valve located at the water inlet).***
- ***To prevent corrosion due to differential aeration, if the system is to be empty for more than 1 month, the heat transfer fluid circuit should be protected with a blanket of dry, inert gas. (0.5 bar maximum). If the heat transfer fluid does not meet Carrier's recommendations, a nitrogen blanket must be applied immediately.***
- ***In case of prolonged non-usage, the hydraulic circuits must be protected by circulating a passivating solution. (Consult a specialist).***
- ***At the commencement of the next season, fill the system with water treated with appropriate corrosion inhibitors.***
- ***If auxiliary equipment is installed in the system, the installer must ensure that the resultant flow rates are still within the minimum and maximum values indicated in the operating limits table (application data).***
- ***If frost protection is dependent on electric heaters, never deenergize the unit when frost protection is required. To ensure protection, the main unit disconnect switch, auxiliary heater circuit and the control circuit must be energized (see wiring diagram to locate these components). If it is not to be used in freezing conditions, or during a prolonged power failure (planned or unplanned), the water heat exchanger and external pipes must be drained without delay. Damage caused by frost is not covered by the warranty.***
- ***The heat exchanger temperature sensors are part of its frost protection: If piping trace heaters are used, ensure the external heaters do not affect the measurements provided by these sensors.***

7.5 - Protection against cavitation (with option 116)

To ensure the durability of pumps fitted on the integrated hydraulic modules, the control algorithm of 30RQM/30RQP units includes protection against cavitation. It is therefore necessary to ensure a minimum pressure of 60 kPa (0.6 bar) at the pump inlet both when shut down and during operation. A pressure below 60 kPa will prevent unit start-up, or will cause an alarm and shut-down. A pressure below 100 kPa will trigger an alert on the user interface.

To obtain an adequate pressure, it is recommended:

- To pressurise the hydraulic circuit between 100 kPa (1 bar) and 400 kPa (4 bar) maximum at the pump inlet;
- To clean the hydraulic circuit during water filling or after any modifications are made;
- To regularly clean the screen filter.

7.6 - Operation of two units in Master/Slave mode (option 58)

The customer must connect both units with a communication bus in 0.75 mm² twisted, shielded cable (contact Carrier Service for the installation).

All the parameters required for the master/slave function must be configured using the Service configuration menu. All remote controls of the Master/slave assembly (start/stop, setpoint, load shedding, etc.) are managed by the unit configured as the Master and must only be applied to the Master unit.

7.6.1 - Units delivered with the hydraulic kit

Operation in Master-Slave mode is only possible when the units are installed in parallel:

- The master-slave assembly is controlled on the water inlet without any additional sensors (system return) (see example 1).
- Control of Master and Slave on the water outlet is possible by adding two additional sensors in the common supply pipe work (see example 2).

Each unit controls its own water pump.

7.6.2 - Units delivered without the hydraulic kit

In the case of units installed in parallel and if there is only one common pump installed by the installer, isolating valves must be installed on each unit. These should be controlled (opened and closed) using the control for the relevant unit (in this case, valves will be controlled using the dedicated water pump outputs). Consult the 30RQM/30RQP controller manual for details of the connections.

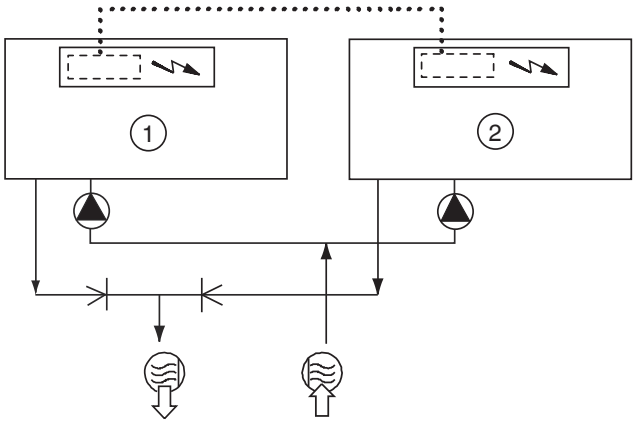
The control of a variable speed pump must be, in this case, carried out by the unit via the 0-10 V dedicated output of the Master unit (control on Delta T° only).

An installation in series is only possible with a fixed speed pump (example 3):

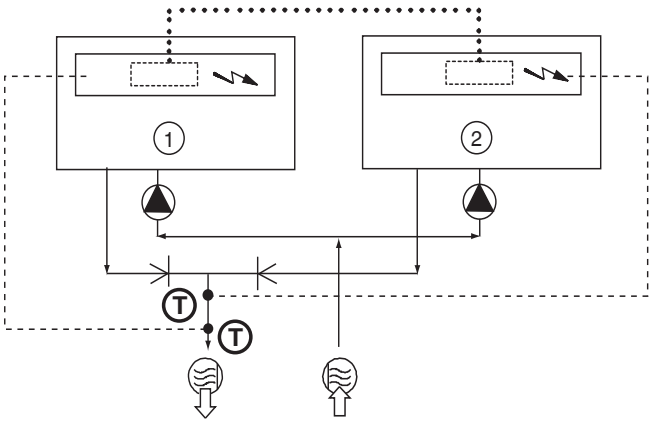
- The operation of the pump will be controlled by the Master unit.
- The Master-Slave assembly is controlled on the water outlet without additional sensor.
- The installation must be carried out only according to the diagram given in the example 3.

IMPORTANT:
Both of the units must be equipped with option 58 to allow master/slave operation.

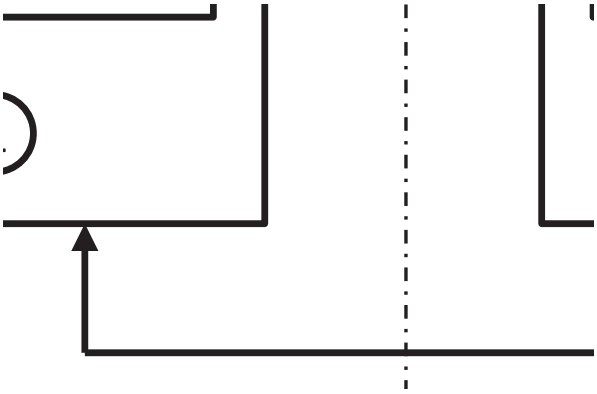
Example 1: Operation in parallel - control on water inlet for a hydraulic kit



Example 2: Operation in parallel - control on water outlet for a hydraulic kit



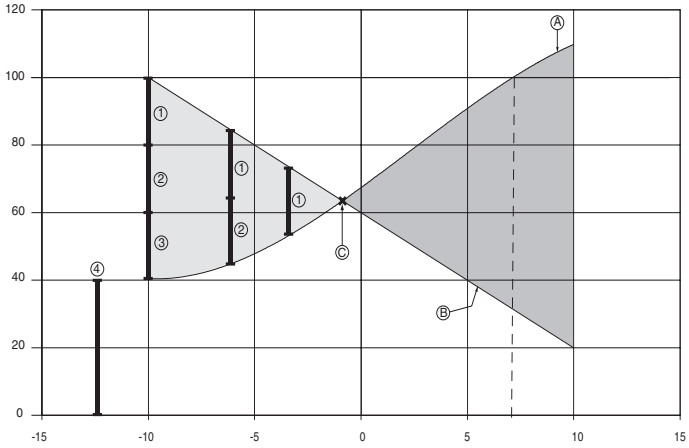
Example 3: operation in series - control on water outlet for a combination of units



Key

- (1) Master unit
- (2) Slave unit
- Electrical boxes for Master and Slave units
- Water inlet
- Water outlet
- Water pumps for each unit (included in units with hydraulic module)
- (T) Additional sensors for the control of the leaving water temperature to be connected on channel 1 of the slave boards of each Master and Slave unit
- •••• CCN communication bus
- ····· Connection of two additional sensors
- Non-return valve

Example of additional electric heaters



- Operating range for which the heat pump output is less than the building thermal load
- Operating range for which the heat pump output is greater than the building thermal load

1 Stage 1
2 Stage 2
3 Stage 3
4 Stage 4 (safety)
A Variation of the heat pump output with air temperature
B Building thermal load
C Point of equilibrium between the heat pump output and the building thermal load

7.7 - Auxiliary electric heaters

To compensate for the reduction in the heat pump's output at low ambient temperatures, which changes significantly as shown in the graph below, it is possible to install auxiliary electric heaters on the unit's water outlet.

These heaters (not supplied) can be controlled via option 156.

Four outputs are available to control the switches (not supplied) on the auxiliary electric heaters, allowing gradual compensation of the heat pump output reduction.

These outputs are configurable to allow for two, three or four stages as required. The last stage is only activated in case of shut-down due to a fault on the heat pump (emergency).

In the graph below, the power of the four heaters equals the capacity of the heat pump at an outdoor air temperature of 7°C.

8 - NOMINAL SYSTEM WATER FLOW CONTROL

Refer to the diagram in the "Hydraulic connections" section for all references points mentioned in this chapter.

The water circulation pumps of 30RQM/30RQP units have been designed to allow the hydraulic modules to operate over a range of possible configurations based on specific installation conditions, i.e. with temperature differences between the water inlet and outlet (Delta T) at full load from 3 to 10 K.

This temperature difference required between the water inlet and outlet determines the system's nominal flow.

Use the specification provided while selecting the unit to determine the system's operating conditions.

In particular, collect the data to be used for the control of the system flow rate:

- Units without hydraulic module: the nominal pressure drop at the unit connections (plate heat exchanger + internal water pipe work). This is measured with pressure differential gauges that must be installed at the inlet and outlet connections of the unit (item 18).
- Units with fixed speed pumps: nominal flow rate. The pressure of the fluid is measured by sensors installed at the inlet of the pump and outlet of the unit (items 7 and 10). The system calculates the flow rate associated with this differential pressure. The flow rate can be read directly on the user interface (refer to the 30RQM/30RQP control manual).
- Units with variable speed pumps - control on pressure differential: pressure differential at the hydraulic module terminals.
- Units with variable speed pumps - control on temperature difference: heat exchanger T° Delta.
- Units with variable speed pump – controlling a fixed system flow: nominal flow rate (see units with fixed speed pumps).

If this information is not available when the system is started up, contact the technical service department responsible for the system to obtain it.

These data can be obtained either from the performance tables included in the technical documentation (for cases where the DT is 5 K) or from the Carrier Electronic Catalogue selection program for all other applicable DT's.

8.1 - Units without hydraulic module

8.1.1 - General information

The nominal flow of the system will be set using a manual valve that should be installed on the water outlet pipe (item 19 on the hydraulic circuit schematic diagram).

By causing the pressure in the water system to drop, this flow control valve aligns the system pressure/flow curve with that of the pump so that the nominal flow rate corresponding to the desired operating point is obtained.

As the exact total system pressure drop is not known at start-up, it is necessary to adjust the water flow with the control valve to obtain the system's specific flow.

8.1.2 - Cleaning procedure for the water circuit

- Open the valve completely (item 19).
- Start-up the system pump.
- Read the pressure drop of the plate heat exchanger, using the pressure differential gauge to find the difference between the unit inlet and outlet (item 18).
- Let the pump run for 2 hours continuously to clean up the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading.
- Compare this value to the initial value. A decrease in the pressure drop value indicates that the filters in the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 16) and remove the filters (item 17) after draining the hydraulic part of the unit (item 6).
- Remove the air from the circuit (item 5).
- Repeat until all fouling is removed from the filter.

8.1.3 - Procedure for controlling the water flow

Once the circuit is cleaned, read the pressures on the pressure differential gauges (water inlet and outlet pressure) to determine the pressure drop within the unit (plate heat exchanger + internal pipe work).

Compare the value obtained with the design value predicted by the selection software.

If the pressure drop reading is above the specified value, this indicates that the flow rate at the terminals of the unit (and therefore within the installation) is too high. In this case, close the control valve and read the new difference in pressure.

Repeat as necessary until the specific pressure drop corresponding to the unit's design flow rate is achieved.

NOTE:
If the network has an excessive pressure drop in relation to the available static pressure delivered by the system's pump, the nominal water flow cannot be obtained (lower resulting flow) and the difference in temperature between the water inlet and outlet of the water heat exchanger will be increased.

To reduce the system's hydraulic network pressure drop:

- Reduce the pressure drops of individual components (bends, level changes, options, etc.) as much as possible;
- Use the correct pipe diameter
- Do not extend the hydraulic systems.

8.2 - Units with hydraulic module and fixed speed pump

8.2.1 - General information

See chapter 8.1.1 "Units without hydraulic module"

8.2.2 - Cleaning procedure for the water circuit

- Open the valve completely (item 19).
- Start up the unit's pump.
- Read the flow value on the user interface.
- Let the pump run for 2 hours continuously to clean up the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading of the flow and compare this value with the initial value.

  A decrease in the flow value indicates that the filters in the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 16) and remove the filters (items 17 and 1) after draining the hydraulic part of the unit (item 6).
- Remove the air from the circuit (items 5 and 14).
- Repeat until all fouling is removed from the filter.

8.2.3 - Procedure for controlling water flow

Once the circuit is cleaned, read the flow value on the user interface and compare it to the theoretical selection value.

If the value of the flow is greater than the specified value, this indicates that the overall pressure drop in the system is too low compared to the available static pressure generated by the pump.

In this case, close the control valve and read the new flow rate value.

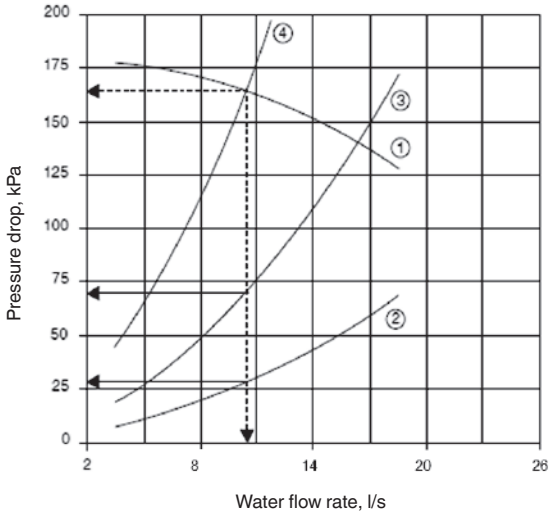
Repeat as necessary, closing the control valve until the system's specific pressure drop corresponding to the unit's design flow rate is achieved.

NOTE:
If the network has an excessive pressure drop in relation to the available static pressure delivered by the unit pump, the nominal water flow cannot be obtained (lower resulting flow) and the difference in temperature between the water inlet and outlet of the water heat exchanger will be increased.

To reduce the system's hydraulic network pressure drop:

- Reduce the pressure drops of individual components (bends, level changes, options, etc.) as much as possible;
- Use the correct pipe diameter;
- Do not extend the hydraulic systems.

Example: Unit with specified nominal flow rate of 10.6 l/s



Key

1 Unit pump curve
2 Pressure drop in the hydraulic kit (to be measured on the pressure gauge installed on the water inlet and outlet)
3 Pressure drop in the installation with wide open control valve
4 Pressure drop in the installation after setting the valve to obtain the specified nominal flow rate.

8.3 - Units with hydraulic module and variable speed pump – Pressure differential control

The installation flow rate is not set at a nominal value.

It will be adjusted by the system, by varying the pump speed, to maintain a constant available pressure differential value defined by the user. This variation in flow rate is limited by the maximum and minimum permissible flow rate values for the unit and by the maximum and minimum pump supply frequency values.

Contact Carrier Service to discuss the implementation of the procedures set out below.

8.3.1 - Cleaning procedure for the water circuit

Before proceeding, it is advisable to remove any possible contamination from the hydraulic circuit.

- Start up the unit pump by using the forced start command.
- Control the frequency to the maximum value to generate a higher flow.
- If there is a "Maximum flow exceeded" alarm, reduce the frequency until an acceptable value is reached.
- Read the value of the flow on the user interface.
- Let the pump run for 2 hours continuously to clean up the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading of the flow and compare this value with the initial value. A decrease in the flow value indicates that the filters in the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 16) and remove the filters (items 17 and 1) after draining the hydraulic part of the unit (item 6).
- Remove the air from the circuit (items 5 and 14).
- Repeat until all fouling is removed from the filter.

8.3.2 - Procedure for controlling the pressure differential setpoint

Once the circuit has been decontaminated, place the water circuit in the configuration chosen when the unit was selected (in general, all valves open and all transmitters in on-state).

Read the value of the flow on the user interface and compare it with the theoretical value of the range:

- If the value read is greater than the specified value, reduce the pressure differential setpoint on the user interface to reduce the flow value;
- If the value of the flow is lower to the specified value, increase the pressure differential setpoint on the user interface to increase the value of the flow.

Repeat until the unit's design flow rate is achieved.

Stop the forced operation of the pump and proceed to the configuration of the unit for the required control mode. Modify the control parameters:

- Set water flow control to 'pressure differential'
- Set the value of the required pressure differential.

By default, the unit is configured at the minimum speed (frequency: 30 Hz).

NOTE:
If during adjustment, the low or high frequency limits are reached before reaching the specified flow rate, keep the pressure differential value at its lower or higher limit as the control parameter value.

If the user already knows the pressure differential value to be maintained at the unit outlet, this may be entered directly as a parameter. The decontamination sequence for the water circuit must not be used.

8.4 - Units with hydraulic module and variable speed pump – Temperature differential control

The installation flow rate is not set at a nominal value.

The flow rate will be adjusted, by varying the pump speed, to maintain a heat exchanger temperature differential value defined by the user. This variation in flow rate is limited by the maximum and minimum permissible flow rate values for the unit and by the maximum and minimum pump supply frequency values.

Contact Carrier Service to discuss the implementation of the procedures set out below.

8.4.1 - Cleaning procedure for the water circuit

Refer to the cleaning procedure for the water circuit in section 8.3.1.

8.4.2 - Procedure for controlling the Delta T° setpoint

Once the circuit is cleaned, stop the forced start of the pump and proceed to the configuration of the unit for the required control mode.

Modify the control parameters:

- Set water flow control to 'temperature differential'
- Set the value of the required differential temperature.

By default, the unit is configured at the minimum speed (frequency: 30 Hz).

8.5 - Units with hydraulic module and variable speed pump – Setting a fixed flow for the system

The flow will be set to a nominal value. This value shall remain constant, and will not be dependent on variations in the installation's load.

Contact Carrier Service to discuss the implementation of the procedures set out below.

8.5.1 - Cleaning procedure for the water circuit

Refer to the cleaning procedure for the water circuit in section 8.3.1.

8.5.2 - Procedure for controlling the flow

Once the circuit is cleaned, set the required water flow by adjusting the pump frequency on the user interface.

Stop the forced operation of the pump and configure the unit for the required control mode.

Modify the control parameters:

- Water flow control method (fixed speed).
- Constant frequency value.

By default, the unit is configured at the minimum speed (frequency: 30 Hz).

8.6 - Pump pressure/flow rate curves

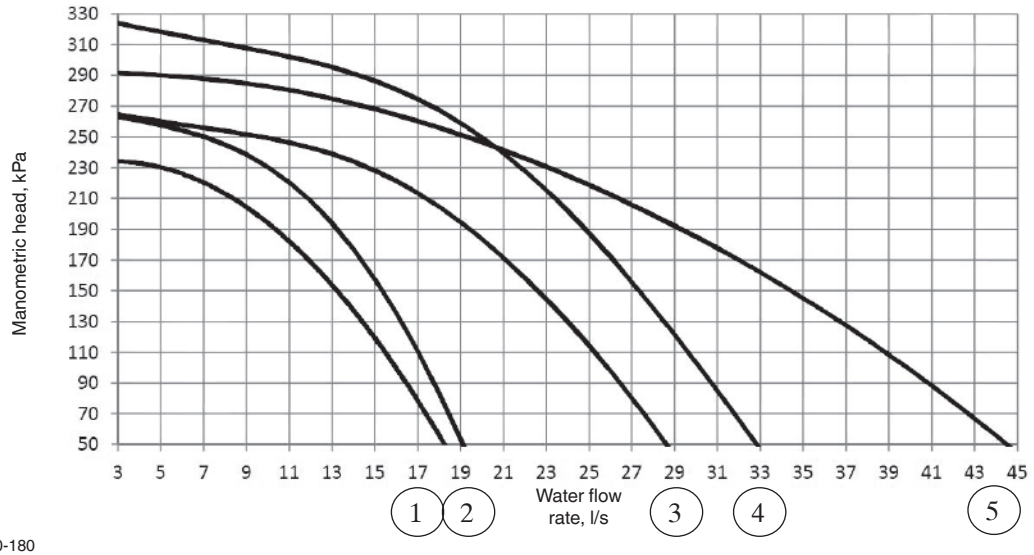
Units with hydraulic module (fixed speed pump or variable speed pump at 50 Hz)

Data applicable for:

- Fresh water at 20°C.
- Refer to the chapter "Exchanger water flow" for the maximum water flow values.
- In case of use of ethylene-glycol, the maximum flow rate is reduced.

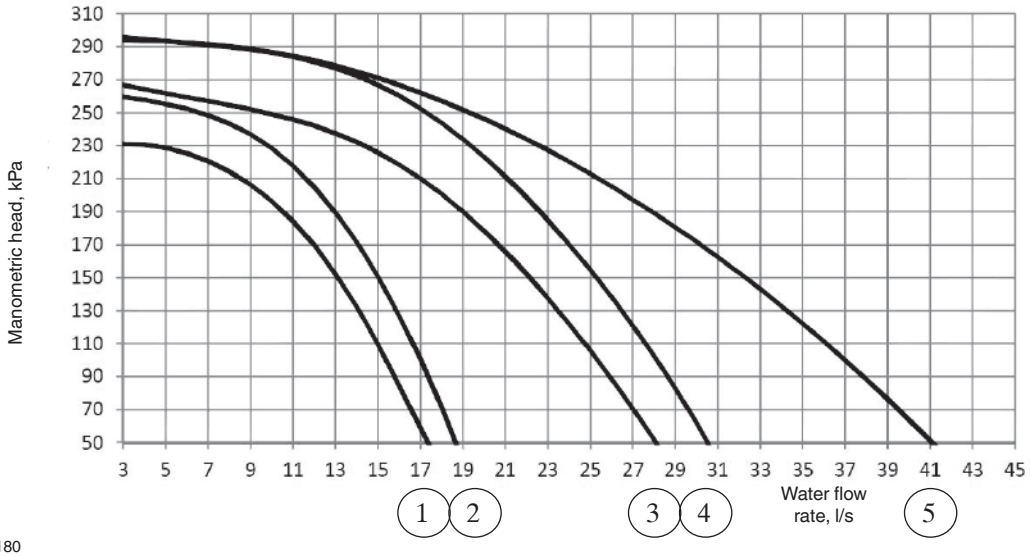
8.6.1 - 30RQM/30RQP high pressure pumps

Single pumps



1 30RQM/30RQP 160-180
2 30RQM/30RQP 210-230-240
3 30RQM/30RQP 270-310-330-380
4 30RQM/30RQP 430-470
5 30RQM/30RQP 520

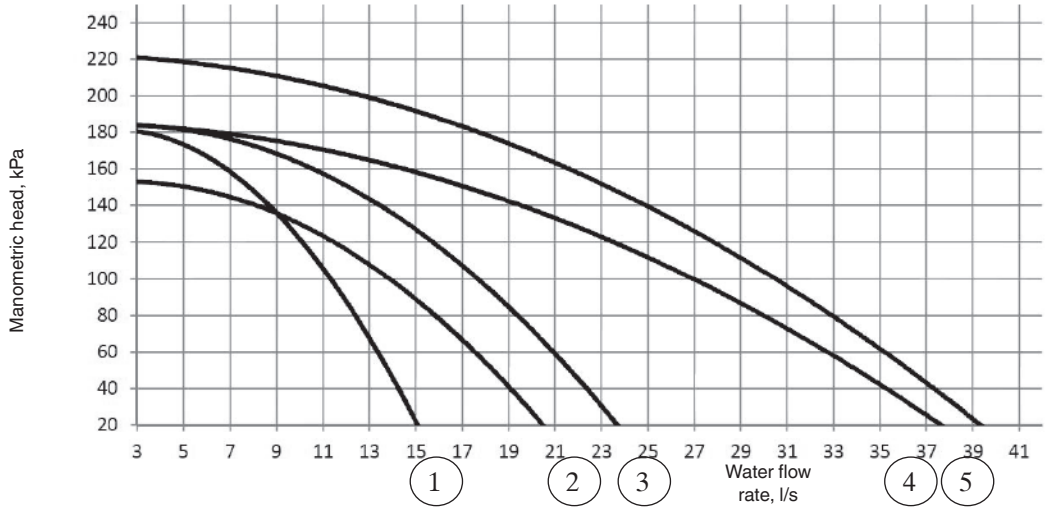
Dual pumps



1 30RQM/30RQP 160-180
2 30RQM/30RQP 210-230-240
3 30RQM/30RQP 270-310-330
4 30RQM/30RQP 380-430
5 30RQM/30RQP 470-520

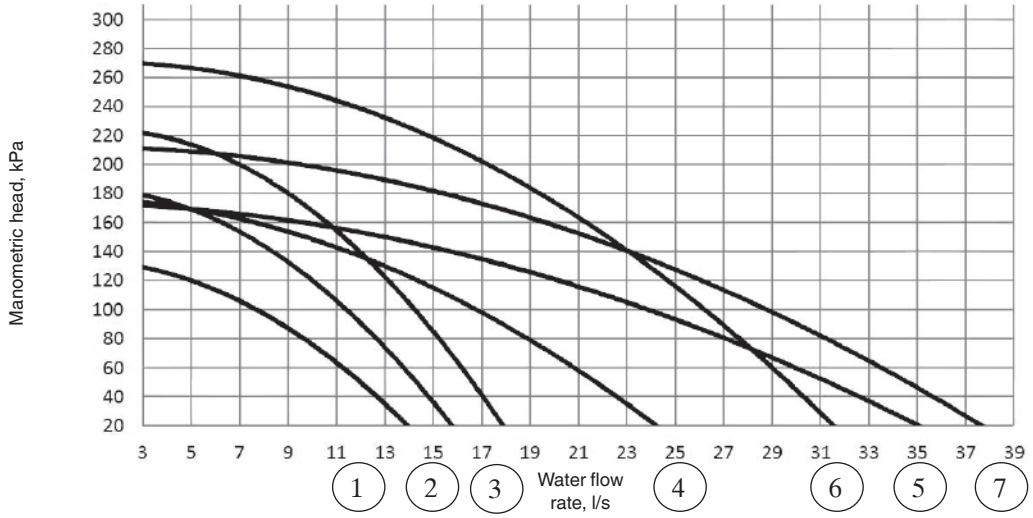
8.6.2 - 30RQM/30RQP low pressure pumps

Single pumps



1 30RQM/30RQP 160-180
2 30RQM/30RQP 210-230
3 30RQM/30RQP 240-270-310
4 30RQM/30RQP 330-380-430
5 30RQM/30RQP 470-520

Dual pumps



1 30RQM/30RQP 160
2 30RQM/30RQP 180
3 30RQM/30RQP 210-230
4 30RQM/30RQP 240-270-310
5 30RQM/30RQP 330-380-430
6 30RQM/30RQP 470
7 30RQM/30RQP 520

8.7 - Available static system pressure

Units with hydraulic module (fixed speed pump or variable speed pump at 50 Hz)

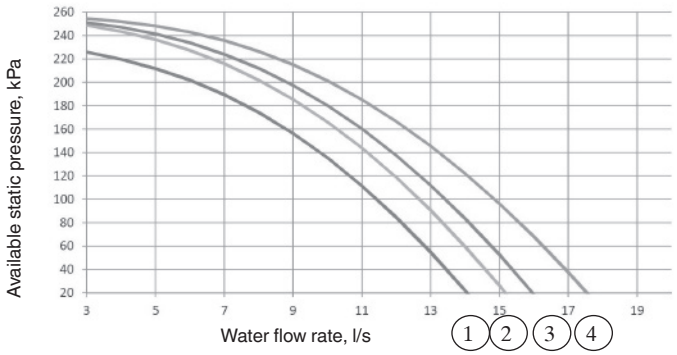
Data applicable for:

- Fresh water at 20°C.
- Refer to the chapter "Water exchanger water flow" for the maximum water flow values.
- In case of use of ethylene-glycol, the maximum flow rate is reduced.

8.7.1 - 30RQM/30RQP high pressure pumps

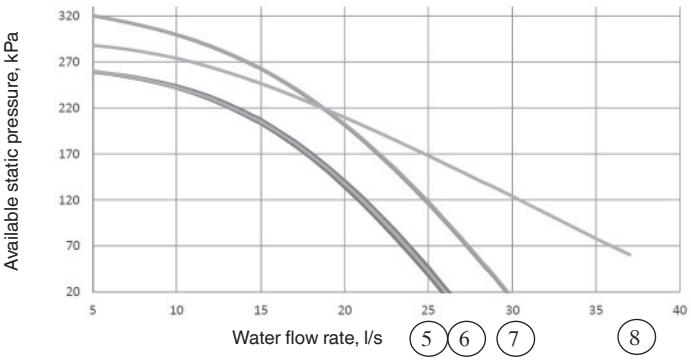
Single pumps

Sizes 160-240



1 30RQM/30RQP 160-180
2 30RQM/30RQP 210
3 30RQM/30RQP 230
4 30RQM/30RQP 240

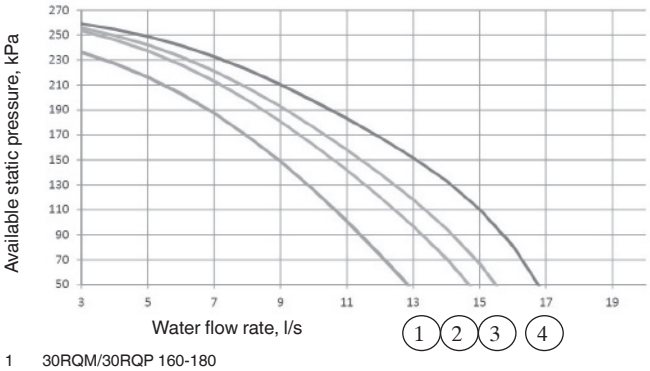
Sizes 270-520



5 30RQM/30RQP 270-310
6 30RQM/30RQP 330-380
7 30RQM/30RQP 430-470
8 30RQM/30RQP 520

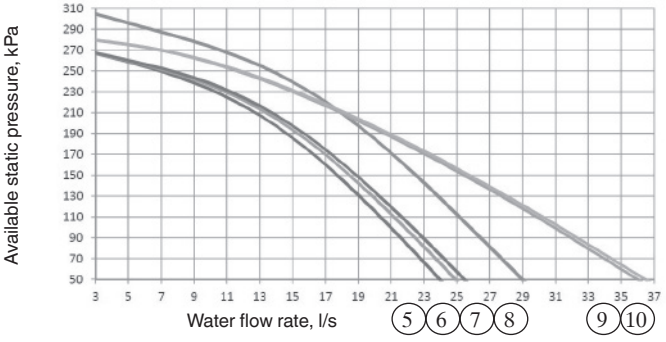
Dual pumps

Sizes 160-240



1 30RQM/30RQP 160-180
2 30RQM/30RQP 210
3 30RQM/30RQP 230
4 30RQM/30RQP 240

Sizes 270-520

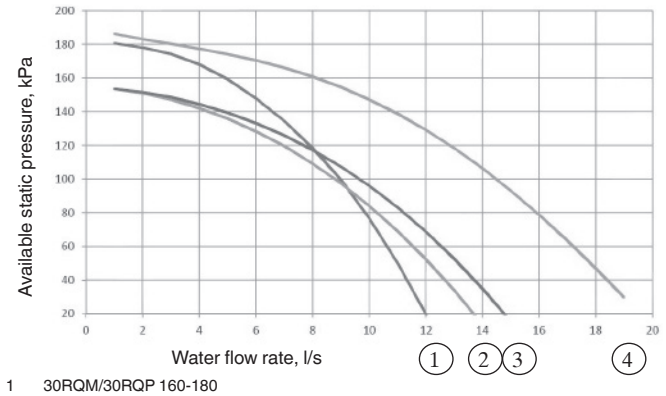


5 30RQM/30RQP 270
6 30RQM/30RQP 310
7 30RQM/30RQP 330
8 30RQM/30RQP 380-430
9 30RQM/30RQP 470
10 30RQM/30RQP 520

8.7.2 - 30RQM/30RQP low pressure pumps

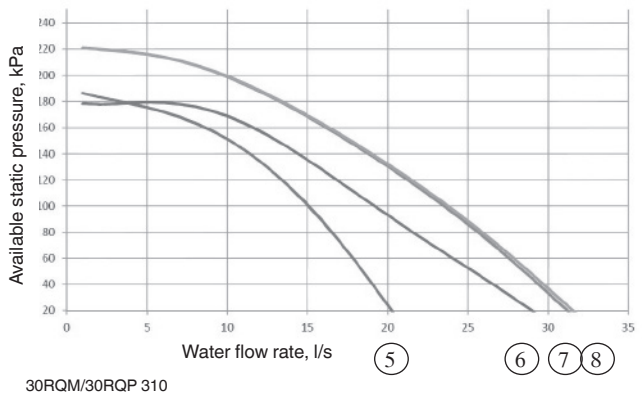
Single pumps

Sizes 160-270



1 30RQM/30RQP 160-180
2 30RQM/30RQP 210
3 30RQM/30RQP 230
4 30RQM/30RQP 240-270

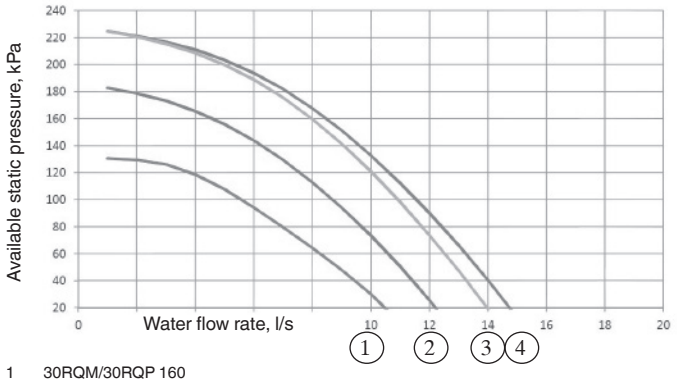
Sizes 310-520



5 30RQM/30RQP 310
6 30RQM/30RQP 330-380-430
7 30RQM/30RQP 470
8 30RQM/30RQP 520

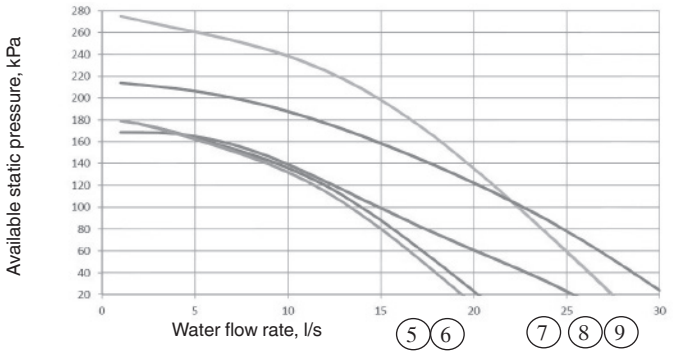
Dual pumps

Sizes 160-230



1 30RQM/30RQP 160
2 30RQM/30RQP 180
3 30RQM/30RQP 210
4 30RQM/30RQP 230

Sizes 240-520



5 30RQM/30F
6 30RQM/30RQP 310
7 30RQM/30RQP 330-380-430
8 30RQM/30RQP 470
9 30RQM/30RQP 520

9 - MAIN COMPONENTS OF THE UNIT AND OPERATING CHARACTERISTICS

9.1 - Compressors

30RQM/30RQP units use hermetic scroll compressors. Each compressor is equipped as standard with a crankcase oil heater, and with a head heater for certain configurations. There is no heater fault detection.

Each compressor sub-assembly has:

- Anti-vibration mountings between the unit chassis and the chassis of the compressor sub-assembly,
- Restrictors (not visible) on the suction pipes (for 3 and 4 compressor modules) to ensure oil level equalisation between all compressors,
- A safety pressure switch at the discharge line of each circuit,
- Pressure and temperature sensors at the common suction line and a pressure sensor at the common discharge line,
- A suction shut-off valve.

9.2 - Lubricant

The compressors installed on the units have an oil charge of 6.9 l, ensuring good lubrication under all operating conditions. The oil level check can be performed:

- Upon installation: The oil level must be greater than or equal to half of the sight glass.
- Within a few minutes of the shut-down of a compressor sub-assembly: oil must be visible in the sight glass.

If this is not the case, there might be a leak or an oil trap in the circuit. If there is an oil leak, find and repair it, then refill with refrigerant and oil.

See the Service Guide for the oil removal and refill procedures.

CAUTION: Too much oil in the circuit can cause the unit to malfunction.

NOTE: Only use oils which have been approved for the compressors. Never use oils which have been exposed to air.

CAUTION: R-22 oils are absolutely not compatible with R-410A oils and vice versa.

9.3 - Air coils

The coils on 30RQM/30RQP units are composed of aluminium fins crimped onto internally grooved copper tubes. Their construction ensures optimal subcooling in cooling mode.

9.4 - Fans

The fan motors are axial Flying Bird fans equipped with a rotating shroud and made of composite recyclable material. Each motor is fixed with transverse supports. The motors are three-phase, with permanently lubricated bearings and class F insulation.

For detailed information, refer to the table below:

According to the Regulation No. 327/2011 implementing Directive 2009/125/EC with regard to eco-design requirements for fans driven by motors with an electric input power between 125 W and 500 kW.

Product		**30RQM**	**30RQM**	**30RQP**	**30RQP**
Option		**Standard**	**Option 28(1)**	**Standard**	**Option 12**
Overall efficiency	%	39.3	41	41	40.9
Measurement category		A	A	A	A
Efficiency category		Static	Static	Static	Static
Target efficiency level ERP2015		N(2015) 40	N(2015) 40	N(2015) 40	N(2015) 40
Efficiency level at optimum efficiency point		43.9	45.7	45.7	44.2
Variable speed drive		NO	YES	YES	YES
Year of manufacture		See label on the unit	See label on the unit	See label on the unit	See label on the unit
Fan manufacturer		Simonin	Simonin	Simonin	Simonin
Motor manufacturer		Leroy Somer	Leroy Somer	Leroy Somer	Leroy Somer
Fan PN		00PSG000000100A	00PSG000000100A	00PSG000000100A	00PSG000000100A
Motor PN		00PPG000478400A	00PPG000478400A	00PPG000494700A	00PPG000480800A
Nominal power of the motor(2)	kW	1.85	1.84	1.84	2.97
Flow rate(2)	m^3/s	4.28	4.15	4.15	5.31
Pressure at optimum energy efficiency (2)	Pa	170	170	170	216
Nominal speed(2)	rpm	954	950	950	1127
Specific ratio		1.002	1.002	1.002	1.002
Relevant information to facilitate the disassembly, recycling or removal of the product at the end of life		See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual
Relevant information to minimise impact on the environment		See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual

(1) Only for the lead fan on each circuit; the other fans are Standard
(2) Aerodynamic tests carried out in a laboratory on the fan motor assembly only, in accordance with regulation No. 327/2011

In accordance with regulation No. 640/2009 and amendment 4/2014 implementing Directive 2005/32/EC concerning eco-design requirements for electric motors

Product		30RQM	30RQM	30RQP	30RQP
Option		Standard	Option 28(1)	Standard	Option 12
Motor type		Asynchronous	Asynchronous	Asynchronous	Asynchronous
Number of poles		6	6	6	6
Nominal input frequency	Hz	50	50	50	60
Nominal voltage	V	400	400	400	400
Number of phases		3	3	3	3
Motor included in the application domain of the regulation 640/2009 and amendment 4/2014		NO	NO	NO	NO
Justification for exemption		Article 2.1	Article 2.1	Article 2.1	Article 2.1
Ambient air temperature for which the motor is specifically designed	°C	70	70	70	70

(1) Only for the lead fan on each circuit; the other fans are Standard

9.5 - Electronic expansion valve (EXV)

The EXV has a stepper motor (2785 to 3690 steps depending on the model), and a sight glass that enables verification of the mechanism movement and the presence of the liquid gasket.

9.6 - Moisture indicator

Located on the EXV, this enables control of the unit charge and indicates moisture in the circuit.

The presence of bubbles in the sight glass in cooling mode 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 (from green to yellow).

9.7 - Refrigerant accumulator with built-in filter drier

The refrigerant charge required in cooling mode is greater than the permissible refrigerant charge in heating mode. The accumulator is used to store the excess charge in heating mode.

A removable element and metal filter keep the refrigerant circuit clean and free from moisture, by capturing solid contaminants.

When the moisture indicator turns yellow, it is necessary to change the element. When the unit is operating in cooling mode, a difference in temperature between the accumulator inlet and outlet indicates fouling of the element and/or filter.

9.8 - Water heat exchanger

The exchanger is a brazed plate heat exchanger with two refrigerant circuits. It has been tested and stamped for a maximum operating pressure of 4520 kPa on refrigerant side and of 3200 kPa on the water side. The water connections of the heat exchanger are Victaulic connections.

The water heat exchanger is thermally insulated with 19 mm of nitrile foam rubber (elastomer). As an option it can be protected against frost by an electric heater (option 41: water heat exchanger frost protection).

9.9 - Refrigerant

30RQM/30RQP units operate with R-410A.

9.10 - High-pressure safety pressostat

30RQM/30RQP units are equipped with high pressure safety switches with automatic reset on the HP side. These pressure switches are located at the discharge of each circuit.

9.11 - Variable frequency drive

30RQP units are equipped with variable frequency drives to control the fan speed within the fmin-fmax frequency range (for the standard 30RQP, fmin=5 Hz and fmax=50 Hz). All fans on the same refrigerating circuit are actuated and controlled by a single variable frequency drive. Fan speed is changed by generating a controlled waveform in which frequency and voltage are varied (Pulse Width Modulation). Fan start-up/shut-down and the working range frequency setpoint is controlled by the Carrier Controller through RS485 communication using the LEN Protocol.

9.12 - Power factor correction capacitors (option 231)

The power factor correction is active for all of the machine's operating conditions.

A power factor performance of 0.95 is guaranteed when the unit is running in conditions which require a power supply that exceeds the Eurovent standard condition.

A capacitor bank is controled by a regulator which read the current draw by the unit and ajust the power factor with a set up at 0,95.

The capacitors are dry type: no risk of leakage or fire.

They are selected for each unit according to the table below:

Unit size RQM/P		160	180	210	230	240	270	310	330	380	430	470	520
Capacitors Capacity (kVAR)		30	30	40	40	40	50	50	60	70	80	80	80
Capacitor 1	Capacity (kVAR)	10	10	10	10	10	10	10	20	10	20	20	20
	Ir(A)	14	14	14	14	14	14	14	29	14	29	29	29
Capacitor 2	Capacity (kVAR)	20	20	10	10	10	20	20	20	20	20	20	20
	Ir(A)	29	29	14	14	14	29	29	29	29	29	29	29
Capacitor 3	Capacity (kVAR)	-	-	20	20	20	20	20	20	40	40	40	40
	Ir(A)	-	-	29	29	29	29	29	29	58	58	58	58

Caution: Operation of the unit without capacitors results in current raising

9.13 - Low temperature brine solution option (Option 6B)

Brine solution production from 0°C to -8°C is only possible with the low-temperature brine solution option (6B).

The unit is equipped with insulation on the suction tubes. The insulation is reinforced on the low-temperature brine solution option.

The operating range depends on:

- the unit size,
- the glycol type,
- its concentration,
- the flow rate,
- the temperature of the glycol solution,
- the condensing pressure (ambient temperature).

9.13.1 Frost protection

The low-pressure and frost protection thresholds of the evaporator depend on the antifreeze level in the water loop.

The evaporator pinch (LWT – SST) and the antifreeze protection threshold depend on this level.

It is therefore essential, when first activating the unit, to check the antifreeze level in the loop (circulate for 30 minutes to ensure good mixing homogeneity before sampling).

Refer to the manufacturer or supplier data to define the freezing temperature according to the measured concentration level.

The minimum frost protection temperature must be entered in the unit controller's parameters.

This value will be used to configure the following protection:

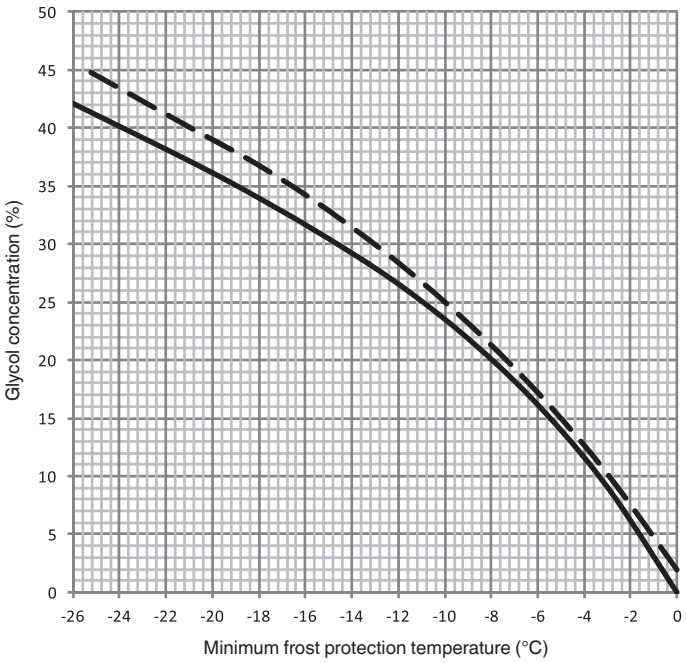
1. Evaporator antifreeze protection.
2. Low-pressure protection.

For information, for the different antifreezes used in our laboratory, the protection values given by our supplier are as follows (these values may change depending on the suppliers).

It is therefore recommended that a medium or low temperature installation be commissioned by the manufacturer.

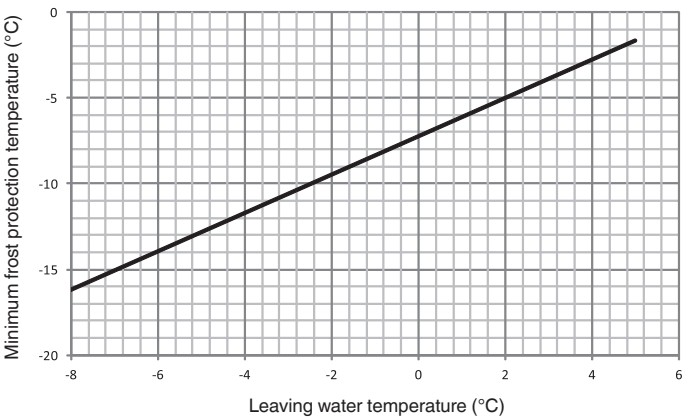
9.13.2 - Required glycol concentration

Ethylene and Propylene glycol freezing curve



Ethylene glycol (%)
Propylene glycol (%)

Minimum frost protection temperature based on the leaving water temperature (example)



For example, based on the above curves, if the ethylene glycol mass concentration measured in the loop is 30%, the frost protection temperature value of -14.8°C must be entered in the software. This corresponds to a minimum leaving water temperature of -6.7°C. The control point must be adjusted as a result.

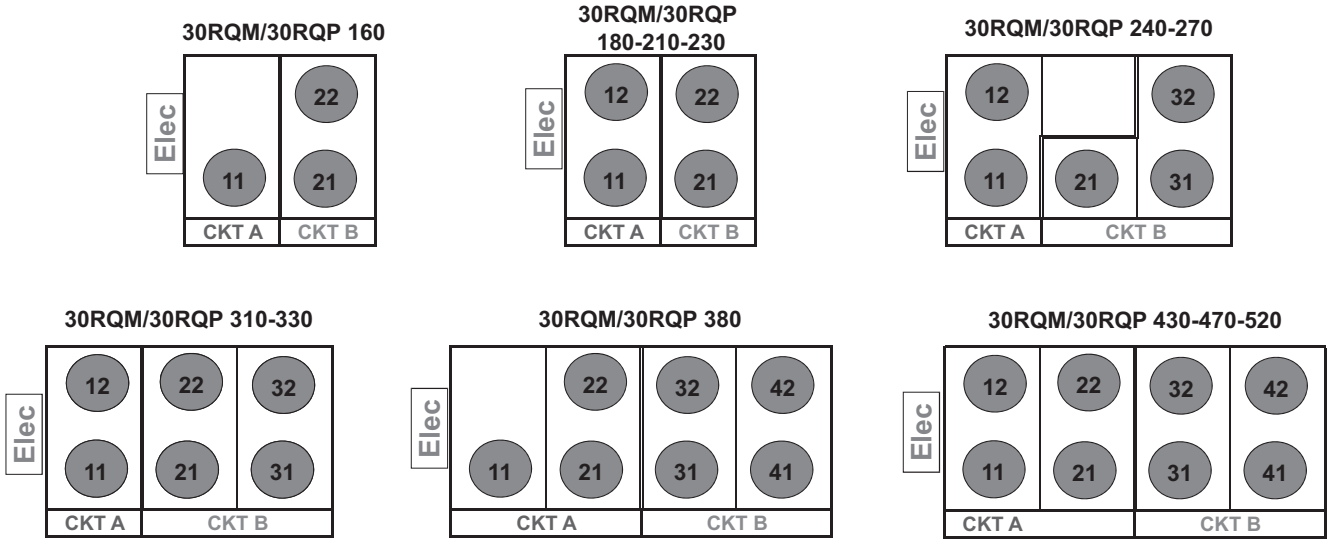
IMPORTANT:

- ***It is vital to perform a (minimum) annual inspection of the glycol level and adjust the software's frost protection based on the measured level.***
- ***This procedure must be systematic when topping up with water or antifreeze solution.***
- ***Observe the minimum frost protection temperature based on the leaving water temperature.***

NOTE:

- ***In the case of frost protection of the unit by low air temperature, the percentage of glycol must be evaluated accordingly.***
- ***The maximum glycol level in the case of units equipped with a hydraulic module is 45%.***
- ***In order to facilitate maintenance operations, it is recommended to install isolation valves upstream and downstream of the machine***

9.14 - Fan arrangement



9.15 - Fan stages (30RQM units only)

30RQM standard unit	Circuit	Stage 1	Stage 2	Stage 3	Stage 4	Variable drive on 30RQP	Variable drive on Option 28
160	**A**	EV11				EV11	EV11
	B	EV21	EV21+EV22			EV21+EV22	EV21
180-210-230	**A**	EV11	EV11+ EV12			EV11+ EV12	EV11
	B	EV21	EV21+ EV22			EV21+ EV22	EV21
240-270	**A**	EV11	EV11 + EV12			EV11 + EV12	EV11
	B	EV31	EV31+EV21	EV31+EV21+EV32		EV31+EV21+EV32	EV31
310-330	**A**	EV11	EV11+ EV12			EV11+ EV12	EV11
	B	EV21	EV21+EV31	EV21+EV31+EV22	EV21+EV31+EV22+EV32	EV21+EV31+EV22+EV32	EV21
380	**A**	EV21	EV21+EV11	EV21+EV11+EV22		EV21+EV11+EV22	EV21
	B	EV31	EV31+EV41	EV31+EV41+EV32	EV31+EV41+EV32+EV42	EV31+EV41+EV32+EV42	EV31
430-470-520	**A**	EV11	EV11 + EV21	EV11 + EV21 + EV12	EV11 + EV21 + EV12 + EV22	EV11 + EV21 + EV12 + EV22	EV11
	B	EV31	EV31 + EV41	EV31 + EV41 + EV32	EV31 + EV41 + EV32 + EV42	EV31 + EV41 + EV32 + EV42	EV31

9.16 - Variable speed ventilation (30RQP units only)

30RQP units differ from the 30RQM units by the introduction of variable speed drives on the fans to optimise the efficiency of the unit depending on the conditions of use (air temperature, circuit capacity) and thereby improve the seasonal efficiency (ESEER and SCOP).

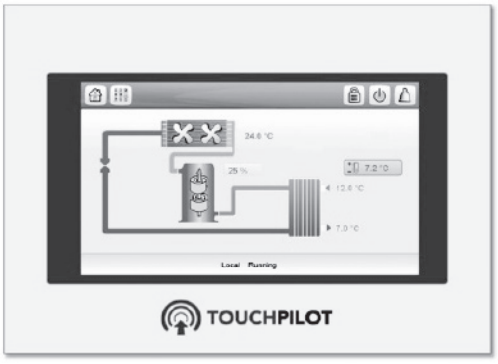
All fans in the same refrigerant circuit are controlled by a single variable speed drive. Therefore, they operate together at the same rotational speed. The rotational speed at full load or part load of each circuit is controlled by an algorithm that continuously optimises the condensing temperature in cooling mode or the evaporation temperature in heating mode to obtain the best energy efficiency of the units (EER and COP) whatever the operating conditions.

Fan motor electrical protection

The motors of a same circuit are electrically protected by the variable frequency drive in case of short-circuit, locked rotor or general overload. Each variable drive follows a variable current curve, based on the frequency from 5 to 50 Hz and the number of fans controlled.

In case of fan failure (e.g. motor disconnected) the variable drive will detect this problem and an alert will be sent to the user interface. Refer to the 30RQM/30RQP control manual for the list of alarms.

9.17 - Touch Pilot control



The interface of the "Touch Pilot Control" has the following characteristics:

- It has a 5-inch colour screen.
- It is intuitive and user-friendly. Clear and concise information is presented in the local language (choice of 8 languages).
- The screen menus can be adapted for different users (end client, maintenance personnel, Carrier engineer).
- Unit setting and use are secure. Password protection prevents unauthorised access to advanced parameters.
- No password is required to access the most important operating parameters.

10.1 - Hydraulic module without variable speed (options 116R, 116S, 116T, 116U)

The hydraulic module is composed of the system's main hydraulic components: factory-fitted screen filter, safety relief valve and water pump. The fixed speed operating pressure pump provides the nominal flow rate for the installation's water loop.

Several types of water pump are available to suit all applications: single or dual low pressure pump, single or dual high pressure pump. The nominal flow of the system should be adjusted using a manual control valve provided by the client. The safety valve placed on the water inlet pipes at the pump inlet limits the pressure to 400 kPa (4 bar).

A screen filter that can be easily removed is placed at the pump inlet and protects the pump and the plate heat exchanger against solid particles that are greater than 1.2 mm.

Supplementary options can be ordered if necessary:

- Option 42A: Protection of the water heat exchanger and hydraulic kit down to outdoor temperatures of -20°C.
- Option 293: Expansion tank for water circulation system.

CAUTION: The use of the hydraulic kit on open loop systems is prohibited.

10.2 - Hydraulic module with variable speed (options 116V, 116W)

The composition of the hydraulic kit is similar to that in the previous section (§10.1). In this case, the pump is controlled by a variable frequency drive that allows adjustment of the pump's nominal flow according to the chosen control mode (constant pressure or temperature differential, fixed flow) and the system operating conditions.

CAUTION: The use of the hydraulic kit on open loop systems is prohibited.

10.3 - Units with fans with operating pressure for indoor installation (Option 12 - Fan with high static pressure)

This option applies to 30RQP 160-520 units installed inside the building in a plant room. For this type of installation, the cold or hot air leaving the air heat exchangers is discharged by the fans to the outside of the building, using a duct system that causes a pressure drop in the air path.

Therefore this option features more powerful fan motors than those fitted to standard units.

For each installation, the duct pressure drops differ, depending on the duct length, the duct section and the direction changes. 30RQP units with option 12 are designed to operate with air discharge ducts with maximum pressure drop of 200 Pa (units are equipped with variable-speed fans with a maximum speed of 19 r/s, instead of 15.8 r/s for standard units).

Use of variable speed up to 19 r/s can overcome the duct pressure drop while maintaining an optimized air flow per circuit. All fans in the same circuit, operating at the same time, have the same speed.

The power supply for fans with a speed of 19 rps is increased compared to that of standard fans with a speed of 15.8 rps (the multiplier coefficient is the same as the cube of the speed ratio, i.e. x 1.72).

In the cooling / heating mode, the full-load or part-load speed is controlled by a patented algorithm that permanently optimizes the condensing / evaporating temperature to ensure the best unit energy efficiency (EER / COP) whatever the operating conditions and pressure drop of the system ductwork.

If necessary for a specific installation, the maximum fan speed of 30RQP unit can be fixed between 13.3 and 19 r/s, using the Service Configuration menu. Consult the 30RQM/RQP Touch Pilot Control manual for this modification. The maximum configured speed applies to both the cooling and heating modes.

The performances (capacities, efficiencies) depend on the speed of the fans, then on the duct pressure drop:

- Between 0 and 100 Pa, the unit performance is only slightly affected
- Between 100 and 200 Pa, the unit performance may vary considerably, depending on the operating conditions (outdoor air temperature and water conditions).

The noise level into the ductwork and radiated around the unit is also related to the pressure drop.

Please refer to the Carrier Electronic catalog to evaluate the impact of the estimated duct system on the 30RQP unit operating conditions.

10.4 - Installation

IMPORTANT: When the 30RQP units operate in heating mode, dehumidification of the room air and defrosting of the air heat exchangers generate a large amount of condensate that must be evacuated from the unit installation site.

The 30RQP units must be installed on waterproof base that allow efficient drainage and the evacuation of the condensate from the heat exchangers.

At low ambient temperature, when the air heat exchangers form frost, the defrost water must be collected to ensure that there is no risk of flooding of the area where the 30RQP heat pumps are installed.

All the fans on the same refrigeration circuit are controlled by a variable speed drive and therefore run at the same spped.

Each refrigerant circuit (A and B) must have a separate ducting system to prevent any air recycling between the air heat exchangers of the different refrigerant circuits.

Each fan of the 30RQP unit with option 12 is equipped with a factory-installed connection interface, allowing the connection to the ductwork.

Please refer to the unit dimensional drawings for the exact dimensions of the connection interface.

Please refer to the section 9.12 - "Fan arrangements" to affect each fan to its own circuit.

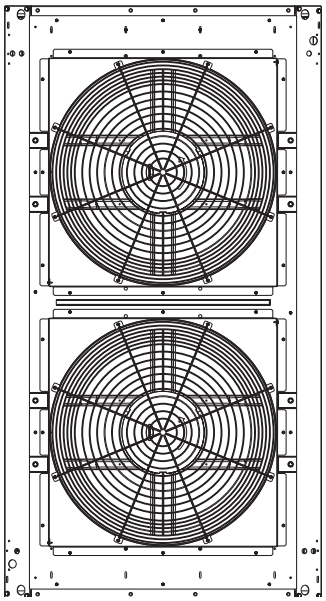
10.5 - Nominal and maximum air flows per circuit (A and B) for 30RQP sizes

30RQP	Circuit A Nominal/maximum air flow (l/s)	Circuit B Nominal/maximum air flow (l/s)
160	4514 / 5417	9028 / 10833
180-230	9028 / 10833	9028 / 10833
240-270	9028 / 10883	13542 / 16250
310-330	9028 / 10883	18056 / 21667
380	13542 / 16250	18056 / 21667
430-520	18056 / 21667	18056 / 21667

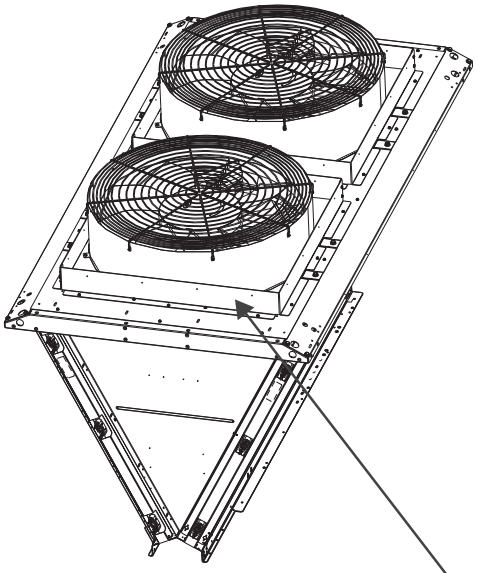
10.6 - Factory-installed duct connection interface on each fan

V-shaped air heat exchangers

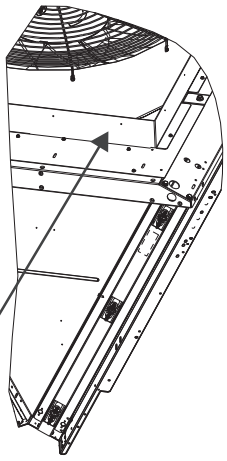
Top view



Side view



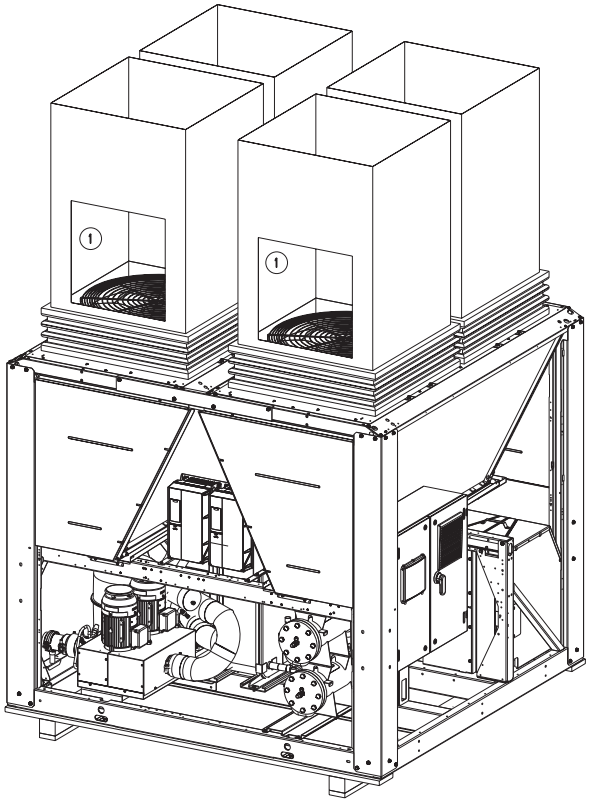
Detail of the duct connection interface frame



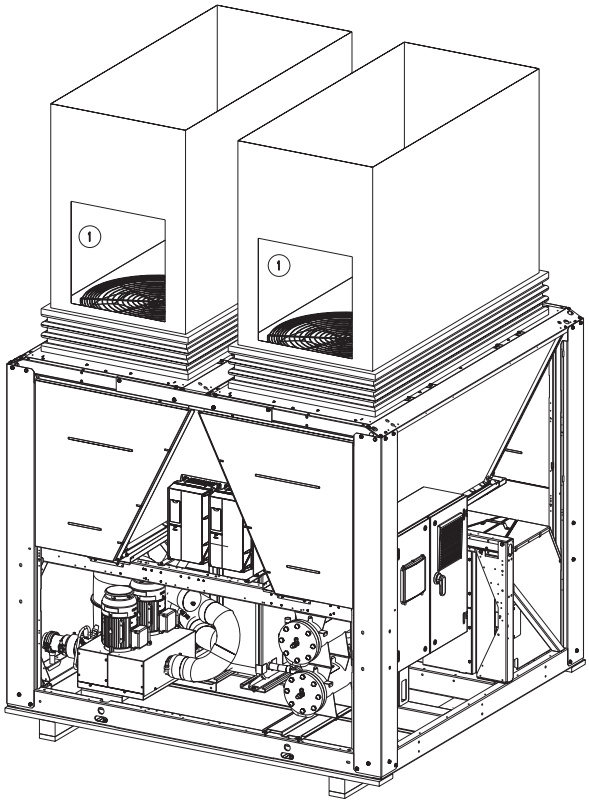
Size of the duct connection frame 860x860x100mm

Principle of the installation of the ducts

Solution 1
each fan has its own duct



Solution 2
2 fans can used the same duct



(1) Fan motor access hatches (provide a 700 x 700 mm hatch) for each single and dual duct

Rules for a correct ductwork

- Each duct must serve a maximum of 2 fans – DO NOT EXCEED this limit
- In case of multiple fans in the same duct, they must belong to the same refrigerant circuit and to the same V-shape system – DO NOT MIX refrigerant circuit or V-shape system in the same duct

IMPORTANT: The unit duct connection must not create any mechanical constraint on the fan support deck.

The fan housings and the fan protection grilles must always remain in their position inside the ducts.

Use bellows or flexible sleeves for the duct connection.

At the outlet of each duct, provide an access hatch with a minimum size of 700 x 700 mm to allow motor replacement and disassembly of the fan impeller.

Fan motor electrical protection

In case of a locked rotor or an overload, the motors of each circuit are electrically protected by the circuit variable frequency drive.

Each drive follows a variable current characteristic, based on the frequency from 10 to 60 Hz and the number of controlled fans.

If a fan is not operating correctly, the drive automatically detects the problem and sends an alert to the Touch Pilot display.

Please refer to the 30RQM/RQP Touch Pilot Control manual for the list of specific alarms for this option.

10.7 - Partial heat reclaim using desuperheaters (option 49)

This option permits the production of free hot water using heat reclaim by desuperheating the compressor discharge gases. The option is available for the whole 30RQM/30RQP range.

A plate heat exchanger is installed in series with the air heat exchanger coils on the compressor discharge line of each circuit.

The control configuration for the desuperheater option is factory assembled (see chapter 10.7.8 "Control configuration").

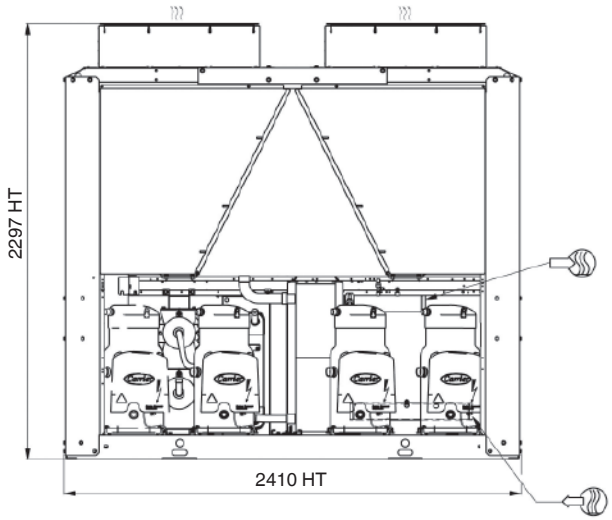
The installer must protect the heat exchanger against frost.

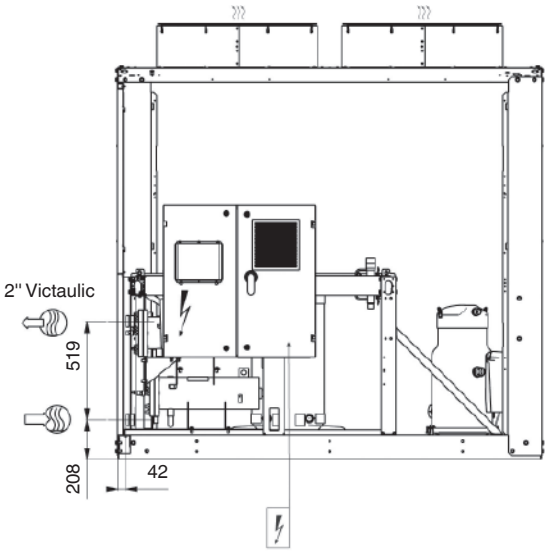
10.7.1 - Physical data, 30RQM/30RQP units with partial heat reclaim using desuperheaters (option 49)

30RQM/30RQP		160	180	210	230	240	270	310	330	380	430	470	520
Desuperheater in circuits A/B		Plate heat exchanger											
Water volume circuits A/B		2/3.75	2/3.75	3.75/3.75	3.75/3.75	3.75/3.75	3.75/5.5	3.75/5.5	3.75/7.5	5.5/7.5	7.5/7.5	7.5/7.5	7.5/7.5
Max. water-side operating pressure		1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Refrigerant													
Circuit A	kg	16.0	22.2	23.7	25.5	29.2	29.2	32.8	36.8	46.2	55.2	56.7	59.2
	tCO_2e	33.4	46.4	49.5	53.2	61.0	61.0	68.5	76.8	96.5	115.3	118.4	123.6
Circuit B	kg	23.7	23.7	23.7	25.5	37.1	38.5	49.7	55.2	55.2	55.2	56.7	59.2
	tCO_2e	49.5	49.5	49.5	53.2	77.5	80.4	103.8	115.3	115.3	115.3	118.4	123.6
Water connections		Connection											
Victaulic		2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"
Outside diameter		60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
30RQM													
Operating weight *													
Standard unit + desuperheater option	kg	1484	1553	1696	1719	2131	2289	2413	2648	3126	3380	3392	3433
Unit with option 15 + desuperheater option	kg	1567	1636	1804	1827	2239	2415	2539	2792	3288	3561	3573	3613
Unit with option 15 and option 116S + desuperheater option	kg	1707	1776	1956	1978	2400	2624	2757	2997	3533	3806	3855	3894
30RQP													
Operating weight *													
Standard unit + desuperheater option	kg	1520	1589	1733	1755	2168	2326	2449	2685	3162	3438	3450	3499
Unit with option 15 + desuperheater option	kg	1603	1672	1841	1863	2276	2452	2575	2829	3324	3618	3630	3679
Unit with option 15 and option 116S + desuperheater option	kg	1742	1812	1992	2015	2437	2660	2793	3034	3570	3863	3912	3960

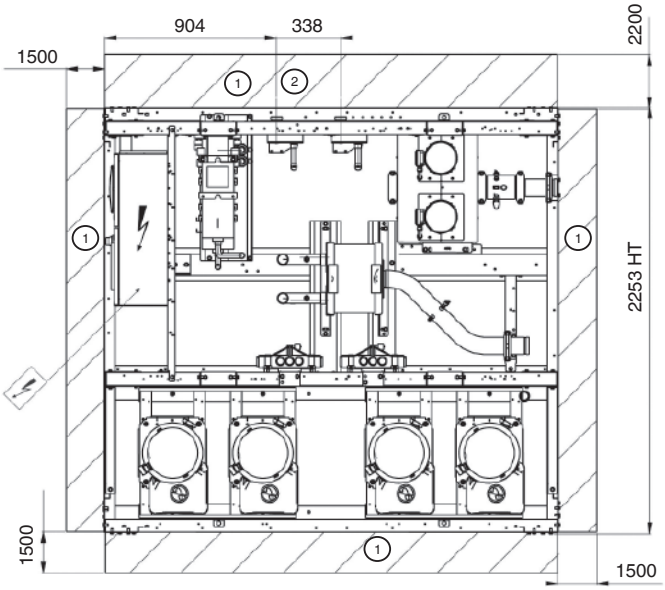
* Weigths are guidelines only. Refer to the unit nameplate.

10.7.2 - 30RQM/30RQP 160-230 (equipped with desuperheater option 49)





UNIT WITH HYDRAULIC MODULE



Key:
All dimensions are in mm.

1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
- Water inlet
- Water outlet
- Control box

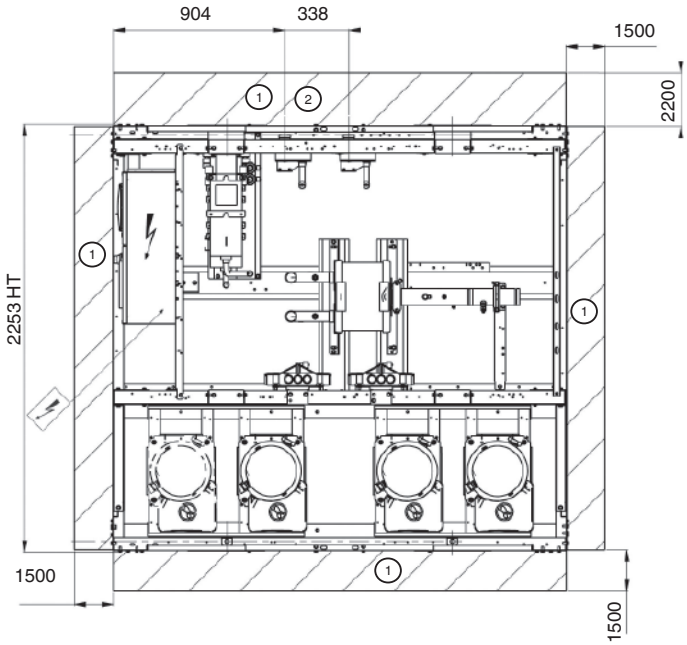
NOTE:

Non-contractual drawings.

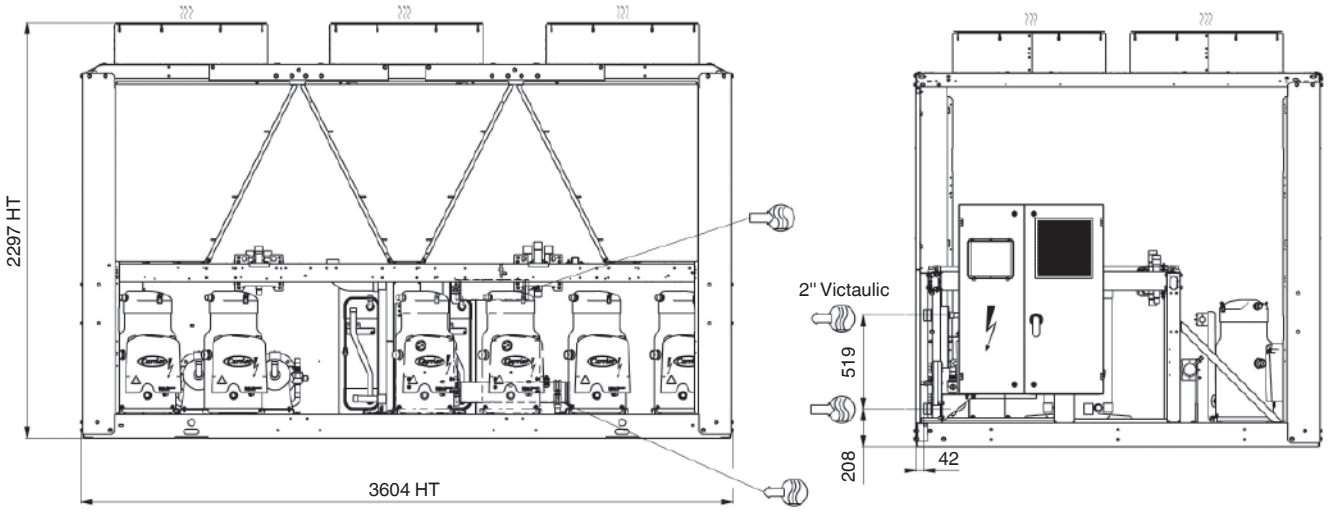
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

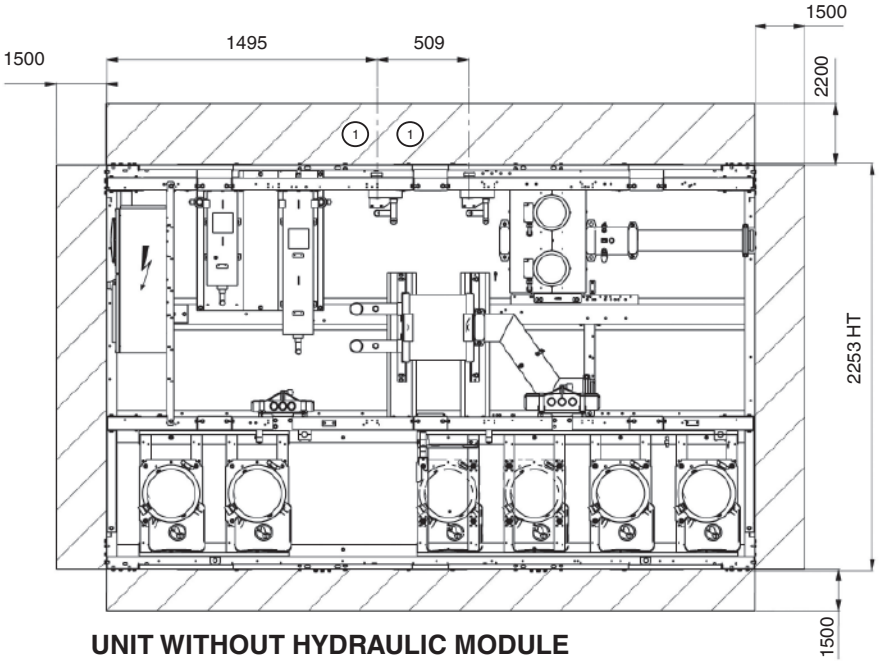
UNIT WITHOUT HYDRAULIC MODULE



10.7.3 - 30RQM/30RQP 240-330 (equipped with desuperheater option 49)



UNIT WITH HYDRAULIC MODULE



UNIT WITHOUT HYDRAULIC MODULE

Key:
All dimensions are in mm.

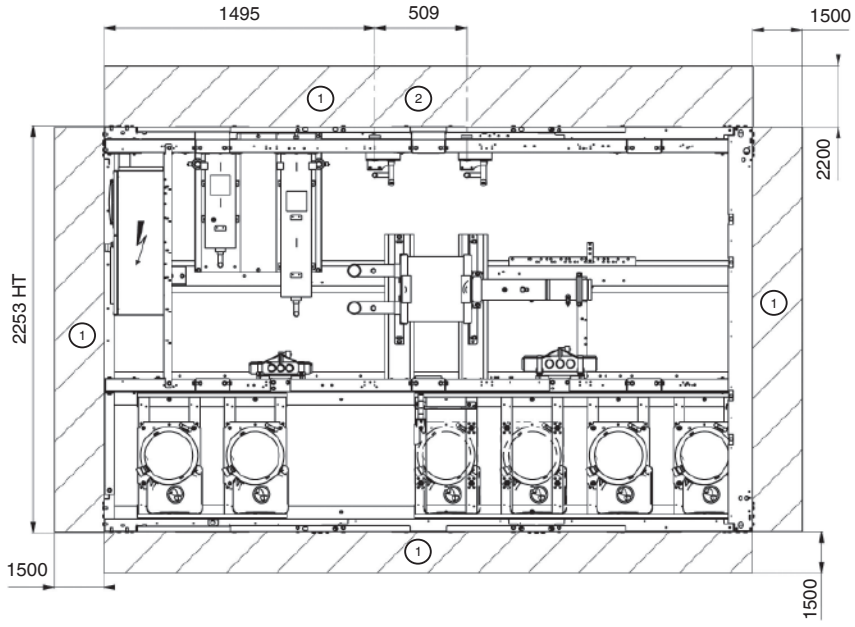
1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
3. Water inlet
4. Water outlet
5. Control box

NOTE:

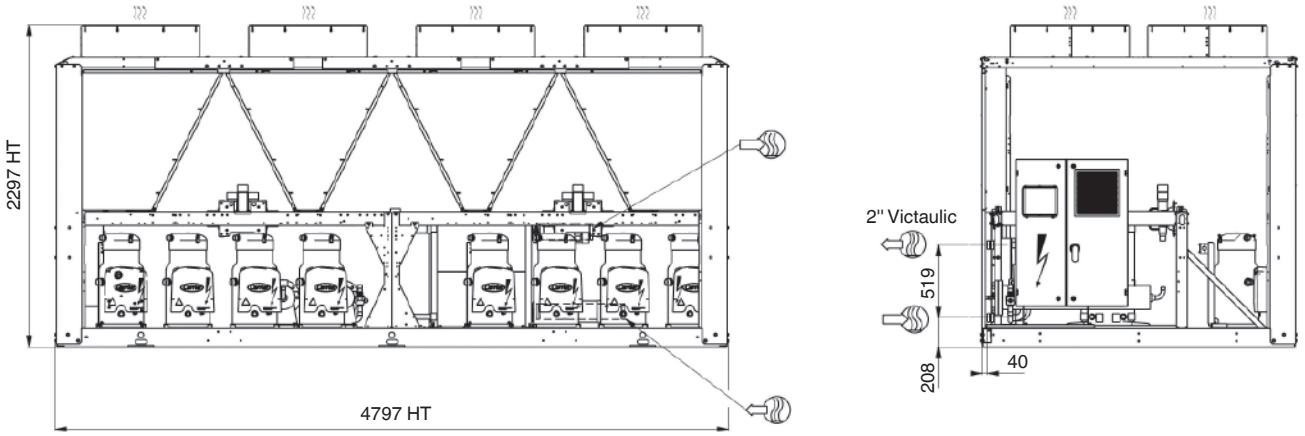
Non-contractual drawings.

When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

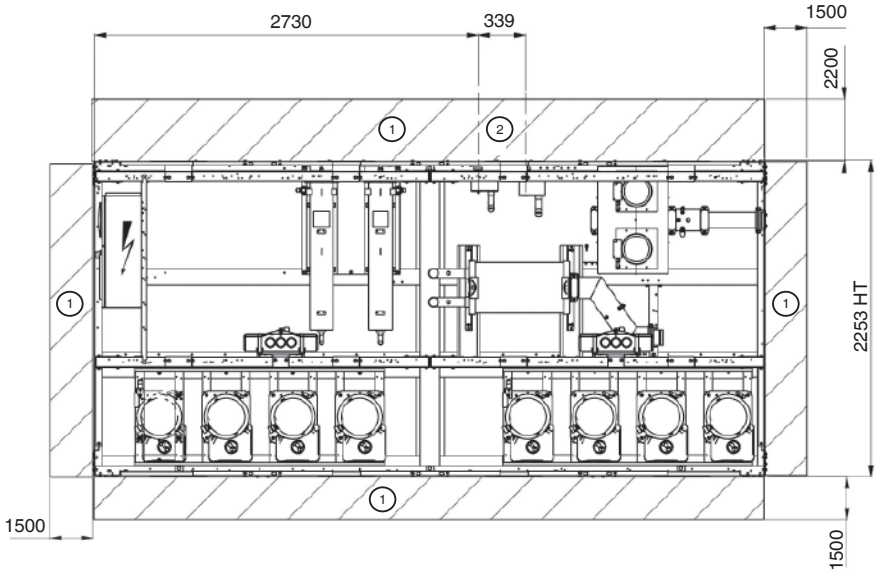
Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.



10.7.4 - 30RQM/30RQP 380-520 (equipped with desuperheater option 49)



UNIT WITH HYDRAULIC MODULE



Key:
All dimensions are in mm.

1. Clearances required for maintenance and air flow
2. Clearance recommended for coil removal
- Water inlet
- Water outlet
- Control box

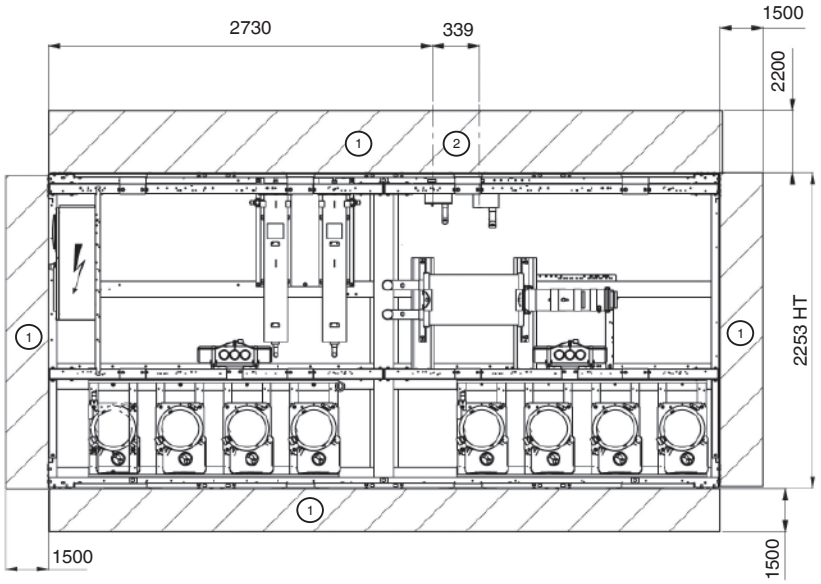
NOTE:

Non-contractual drawings.

When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

Please refer to the certified dimensional drawings for the positioning of the fixing points, weight distribution points and centre of gravity coordinates.

UNIT WITHOUT HYDRAULIC MODULE



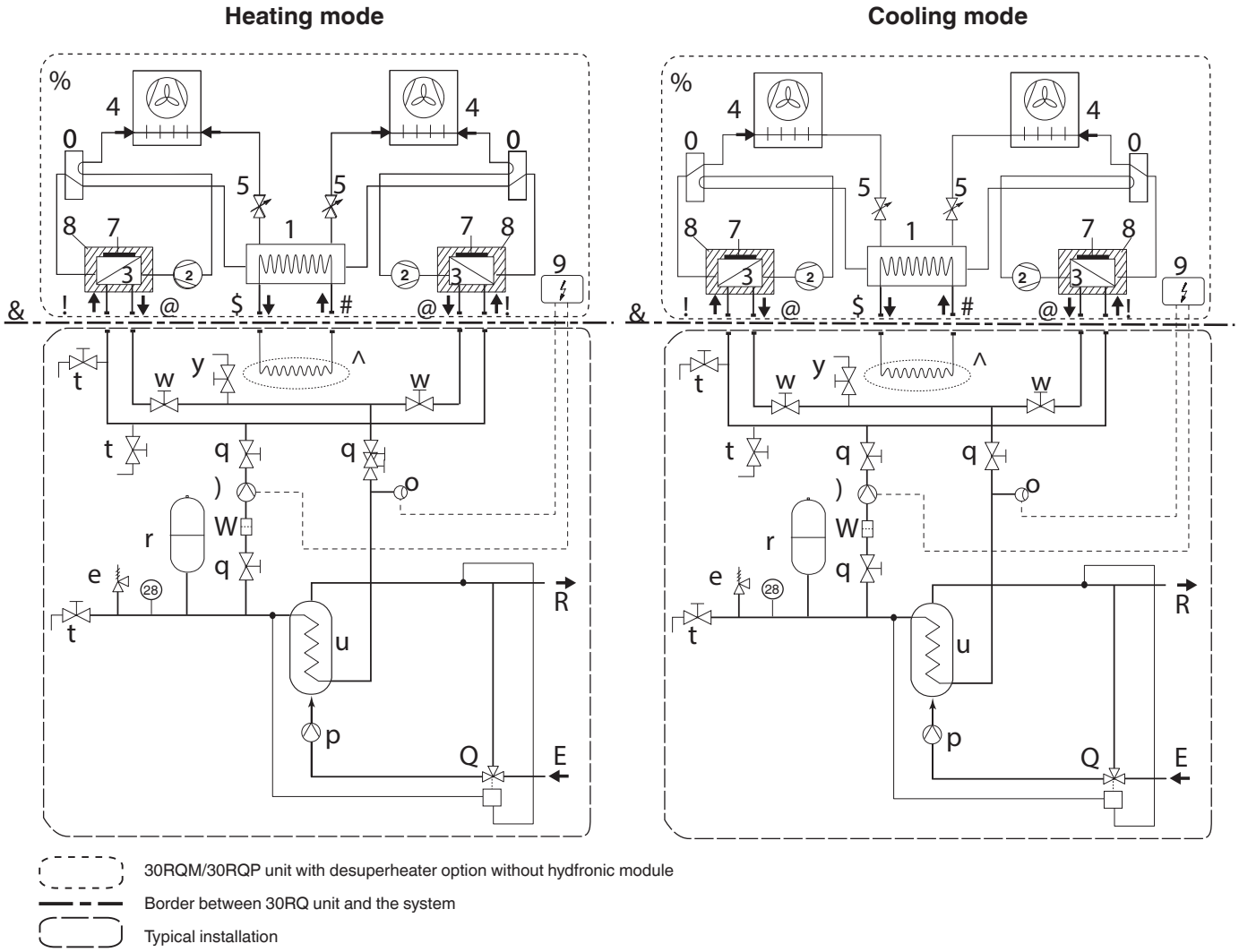
10.7.5 - Installation and operation of the heat reclaim with desuperheater option

The 30RQM/30RQP units with the desuperheater option (No. 49) are supplied with one heat exchanger per refrigerant circuit.

During the unit installation the heat reclaim plate heat exchangers must be insulated and frost protected, if required.

Please refer to the typical installation diagram below for the main components and functions of the 30RQM/30RQP units with the desuperheater option.

Typical installation diagram of units with the desuperheater option



Key

30RQM/30RQP unit components

1 Heat exchanger (multi-pipe type)
2 Compressor
3 Desuperheater (plate heat exchanger)
4 Air heat exchanger (coils)
5 Expansion valve (EXV)
6 Damage limitation accessory in case of a fire
7 Electric heater to protect the desuperheater against frost (not supplied)
8 Desuperheater insulation (not supplied)
9 Unit control box
10 Heating/cooling cycle four-way reversing valve
11 Desuperheater water inlet
12 Desuperheater water outlet
13 Water heat exchanger water inlet
14 Water heat exchanger water outlet
15 Unit with desuperheater option without hydraulic module
16 System heat load
17 Border between the 30RQM/30RQP unit and the typical installation

Installation components (installation example)

20 Pump (hydraulic circuit of the desuperheater loop)
21 Shut-off valve
22 Desuperheater water flow balancing and control valve
23 Damage limitation accessory in case of a fire
24 Expansion tank
25 Charge or drain valve
26 Air bleed
27 Heat exchange coil or plate heat exchanger
28 Pressure gauge
29 Flow switch
30 Pump (sanitary hot water circuit)
31 Three-way valve + controller
32 Filter to protect the pump and the desuperheaters
33 District water supply
34 Sanitary hot water outlet

10.7.6 - Installation

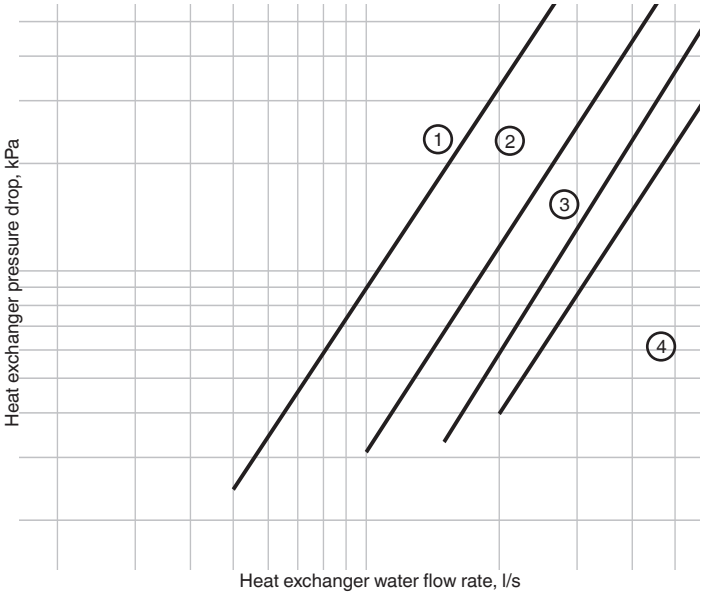
The water supply of each desuperheater is arranged in parallel.

The water connections on the desuperheater water inlets and outlets must not cause any mechanical local constraint at the heat exchangers. If necessary, install flexible connection sleeves.

Install water flow control and balancing valves at the heat exchanger outlet. Water flow control and balancing can be done by reading the pressure drop in the heat exchangers. This pressure drop must be identical on all of them with the total water flow rate given by the "Electronic catalogue" selection program.

Refer to the pressure drop curves below to perform the adjustment of the balancing valves before starting up the installation. It is possible to fine-tune the variable water flow control for each desuperheater when the unit is running at full load, attempting to obtain outlet water temperatures which are completely identical on each circuit.

Desuperheater
(plate heat exchanger pressure drop curves)



1 Circuit with 1 compressor
2 Circuit with 2 compressors
3 Circuit with 3 compressors
4 Circuit with 4 compressors

Operation of the pump (see typical diagram - item 20 of chapter 10.7.5) of the desuperheater water circuit can be linked to:

1- The start-up of the first compressor of the unit : terminal block 37/38
2- The heat water need : Output DO-01 terminal block n°491/492 of the EMM board (option 156)

A dedicated flow switch (item 29) can also be installed to generate an alarm if there is a problem with the pump (customer control system).

The volume of the desuperheater circuit water loop must be as low as possible so that the temperature can increase rapidly when the unit is started up. The minimum entering water temperature at the desuperheater is 25°C. A three-way valve (item 31) may be necessary with a controller, as the sensor controlling the minimum temperature requires water at the inlet.

The desuperheater water loop must include a damage limitation accessory in case of a fire and an expansion tank. When selecting these, consider the water loop volume and the maximum temperature (120°C) when pump operation is stopped (item 20).

10.7.7 - Operating range

Cooling mode		Minimum	Maximum
Water heat exchanger (evaporator)			
Entering water temperature at start-up*	°C	6.8*	30
Leaving water temperature during operation	°C	5	15
Entering water temperature at shut-down	°C	-	60
Desuperheater			
Entering water temperature at start-up**	°C	25	60
Leaving water temperature during operation	°C	30	80
Entering water temperature at shut-down	°C	3	60
Air heat exchanger (condenser)			
Entering air temperature***	°C	0	46
Available static pressure	Pa	0	0
Heating mode		**Minimum**	**Maximum**
Water heat exchanger (condenser)			
Entering water temperature at start-up	°C	8	45
Leaving water temperature during operation	°C	20	50
Entering water temperature at shut-down	°C	3	60
Desuperheater			
Entering water temperature at start-up**	°C	25	60
Leaving water temperature during operation	°C	30	80
Entering water temperature at shut-down	°C	3	60
Air heat exchanger (evaporator)			
Entering air temperature	°C	-10	35
Available static pressure	Pa	0	0

Note: Do not exceed the maximum operating temperature.

* For an application that requires operation below 6.8°C, contact Carrier.
** The entering water temperature at start-up must not be lower than 25°C. For installations with a lower temperature a three-way valve is necessary.
*** For operation down to -20°C the unit must be equipped with option 28 (winter operation). In addition the unit must either be equipped with the frost protection option or the water loop must be protected by the installer by adding a frost protection solution.

Maximum outside temperatures: During storage and transport of the 30RQM/30RQP units the minimum and maximum temperatures must not exceed -20°C and +48°C. It is recommended to observe these temperatures during transport by container.

10.7.8 - Control configuration with the desuperheater option

This configuration allows the user to enter a setpoint that is relative to the minimum condensing temperature (default = 30°C) to increase the heating capacity reclaimed at the desuperheaters, if required. The percentage of the reclaimed heating capacity compared with the total capacity rejected by the air heat exchanger increases in proportion to the saturated condensing temperature.

For the control of the setpoint of the minimum saturated condensing temperature please refer to the Pro-Dialog control manual for the 30RQM/30RQP units.

Other parameters directly affecting the effective capacity reclaimed at the desuperheater are principally:

- The unit load rates, that decide whether the unit operates at full load (100%) or part load (depending on the number of compressors per unit circuit).
- The water entering temperature in the desuperheater and depending on the unit heating or cooling opera-ting mode:
  - In heating mode the water heat exchanger entering water temperature
  - In cooling mode the air heat exchanger entering air temperature.

10.8 - Other options

Options	No.	Description	Advantages	Use
Corrosion protection, traditional coils	3A	Fins made of pre-treated aluminium (polyurethane and epoxy)	Improved corrosion resistance, recommended for moderate marine and urban environments	30RQM/30RQP 160-520
Low-temperature brine solution	6B	Low temperature chilled water production down to -8°C with ethylene or propylene glycol	Covers specific applications such as ice storage and industrial processes	30RQP 180-230-270-310
Unit equipped for air discharge ducting	12	Unit equipped with high static variable-speed fans (maximum 200 Pa), each fan equipped with a connection flange allowing the connection to the ducting system.	Ducted fan discharge, optimised condensing or evaporating temperature control, based on the operating conditions and system characteristics	30RQP 160-520
Low noise level	15	Aesthetic and sound absorbing compressor enclosure	Noise level reduction by 1 to 2 dB(A)	30RQM/30RQP 160-520
Very low noise level	15LS	Aesthetic and sound absorbing compressor enclosure associated with low-speed fans	Noise level reduction for sensible site	30RQP 160-520
IP54 control box	20A	Increased leak tightness of electrical box	Protects the inside of the electrical box from dusts and sand. In general this option is recommended for installations in polluted environments	30RQM/30RQP 160-520
Protection grilles	23	Metallic protection grilles	Coil protection against possible shocks	30RQM/30RQP 160-520
Enclosure panels	23A	Side enclosure panels at each end of the coil	Improves aesthetics, coil and piping protection against impacts.	30RQM/30RQP 160-520
Soft Starter	25	Electronic starter on each compressor	Reduced start-up current	30RQM/30RQP 160-520
Winter operation down to -20°C	28	Fan speed control of lead fan for each circuit using a variable frequency drive	Stable unit operation for outside air temperature from 0°C down to -20°C in cooling mode	30RQM 160-520
Water exchanger frost protection	41	Electric heater on the water exchanger and the water piping	Water exchanger module frost protection between 0°C and -20°C outside air temperature	30RQM/30RQP 160-520
Exchanger & hydraulic frost protection	42A	Electric heater on the water exchanger hydronic module and optional expansion tank	Water exchanger and hydraulic module frost protection between 0°C and -20°C outside air temperature	30RQM/30RQP 160-520
Partial heat recovery	49	Partial heat recovery by desuperheating of the compressor discharge gas.	Free high-temperature hot-water production simultaneously with chilled and hot-water production	30RQM/30RQP 160-520
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 heat-pumps connected in parallel with operating time equalisation	30RQM/30RQP 160-520
Compressor discharge valves	93A	Shut-off valve on the compressor discharge piping	Simplified maintenance	30RQM/30RQP 160-520
HP single-pump hydronic module	116R	Single high-pressure water pump, water filter, electronic water flow control, pressure transducers. See hydraulic module option chapter	Easy and fast installation (plug & play)	30RQM/30RQP 160-520
HP dual-pump hydronic module	116S	Dual high-pressure water pump, water filter, electronic water flow control, pressure transducers. See hydraulic module option chapter	Easy and fast installation (plug & play)	30RQM/30RQP 160-520
LP single-pump hydronic module	116T	Single low-pressure water pump, water filter, electronic water flow control, pressure transducers. See hydraulic module option chapter	Easy and fast installation (plug & play)	30RQM/30RQP 160-520
LP dual-pump hydronic module	116U	Dual low-pressure water pump, water filter, electronic water flow control, pressure transducers. See hydraulic module option chapter	Easy and fast installation (plug & play)	30RQM/30RQP 160-520
HP variable-speed single-pump hydraulic mod.	116V	Single high-pressure water pump with variable speed drive (VSD), water filter, electronic water flow control, pressure transducers. Multiple possibilities of water flow control. See hydraulic module option chapter	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved sytem reliability	30RQM/30RQP 160-520
HP variable-speed dual-pump hydraulic mod.	116W	Dual high-pressure water pump with variable speed drive (VSD), water filter, electronic flow switch, pressure transducers. Multiple possibilities of water flow control. See hydraulic module option chapter	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved sytem reliability	30RQM/30RQP 160-520
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	30RQM/30RQP 160-520
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	30RQM/30RQP 160-520
Bacnet over IP gateway	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	30RQM/30RQP 160-520
Energy Management Module	156	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...)	30RQM/30RQP 160-520
Conformance with Russian regulations	199	EAC certification	Conformance with Russian regulations	30RQM/30RQP 160-520
Compliance with Australian regulations	200	Unit approved to Australian code	Conformance with Australian regulations	30RQM/30RQP 160-520
Coil defrost resistance heaters	252	Electric heaters under the coils and the condensate pans	Prevents frost formation on the coils; compulsory in the heating mode, if the outdoor is below 0°C	30RQM/30RQP 160-520
Welded water exchanger connection kit	266	Victaulic piping connections with welded joints	Easy installation	30RQM/30RQP 160-520
230V electrical plug	284	230V AC power supply source provided with plug socket and transformer (180 VA, 0,8 Amps)	Permits connection of a laptop or an electrical device during unit commissioning or servicing	30RQM/30RQP 160-520
Safety hydraulic components, evap. side	293	Screen filter, expansion tank and relief valve integrated in the evaporator hydronic module	Easy and fast installation, operating safety	30RQM/30RQP 160-520
Welded desuperheater BPHE water connection kit	303	Victaulic piping connections with welded joints for the desuperheater exchanger	Easy installation	30RQM/30RQP 160-520
Screwed desuperheater BPHE water connection kit	304	Victaulic piping connections with screwed joints for the desuperheater exchanger	Easy installation	30RQM/30RQP 160-520
Set point adjustment by 4-20mA signal	311	Connections to allow a 4-20mA signal input	Easy energy managment, allow to adjust set point by a 4-20mA external signal	30RQM/30RQP 160-520

11 - STANDARD MAINTENANCE

To ensure optimal efficiency and reliability of the equipment and all its functions, we recommend establishing a maintenance contract with your local Carrier Service organisation. This contract will include regular inspections by Carrier Service specialists so that any malfunction is detected and corrected quickly, ensuring that no serious damage can occur. A Carrier Service maintenance contract is the best way to ensure the maximum operating life for your equipment and, through the expertise of Carrier's qualified personnel, provides the ideal way to manage your system energy consumption effectively.

The refrigeration equipment must be sericed by professionals; however, routine checks may be carried out locally by specially-trained technicians. See the standard EN 378-4.

All refrigerant charging, removal and recovery operations must be carried out by a qualified technician and with the correct equipment for the unit. Any inappropriate handling can lead to uncontrolled fluid or pressure leaks.

IMPORTANT: Before performing any work on the machine ensure it is deenergized. If a refrigerant circuit is opened, it must be evacuated, recharged and tested for leaks. Before any operation on a refrigerating circuit, it is necessary to evacuate the refrigerant charge from the device using a charge transfer unit.

Simple preventive maintenance will allow you to get the best performance from your heat pump:

- Improved refrigerating performance,
- Reduced electricy consumption,
- Accidental breakge of components prevented,
- Prevention of major time-consuming and costly interventions,
- Protection of the environment.

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

NOTE: Any deviation from or failure to adhere to these maintenance criteria will render the warranty conditions for the heat pump null and void, and release the manufacturer, Carrier SCS, from any liability.

11.1 - Level 1 maintenance

These simple procedures can be carried out by the user:

- Visual check for traces of oil (indicates a refrigerant leak),
- Check for leaks in the hydraulic circuit (monthly),
- Clean the air heat exchangers (see chapter 11.6 Air coil - Level 1 cleaning),
- Check that the protective grilles are present and in good condition, and that the doors and covers are properly closed,
- Check the unit's alarm report (see 30RQM/30RQP control manual),
- Verify the refrigerant charge in the liquid line sight glass,
- Verify the chilled water temperature difference at the heat exchanger outlet is correct,
- Check for any general signs of deterioration,
- Check the anti-corrosion coatings.

11.2 - Level 2 maintenance

This level requires specific expertise in electrical, hydraulic and mechanical systems. This expertise may be available locally: maintenance service, industrial site, specialist subcontractor.

The frequency of this maintenance may be monthly or annual, depending on the type of check.

In these cases, the following maintenance operations are recommended:

Carry out all level 1 operations, then:

Electrical checks (annual checks):

- At least once a year tighten the electrical connections for the power supply circuits (see tightening torques table),
- Check and tighten all control connections, if required,
- Check the labelling of the system and instruments, re-apply the missing labels if required,
- Remove the dust and clean the interior of the electrical boxes. Be careful not to blow dust or debris into components; use a brush and vacuum wherever possible,
- Clean the insulators and bus bar supports (dust combined with moisture reduces the insulation gaps and increases current leakage between phases and from phase to ground),
- Check the presence, condition and operation of electrical protective devices,
- Check the presence, condition and operation of control components,
- Check that all heaters are operating correctly,
- Replace the fuses every 3 years or every 15000 hours (ageing),
- Check that no water has penetrated into the electrical box,
- On the electrical box and for units equipped with a variable frequency drive, regularly check the cleanliness of the filter media to maintain the correct air flow.
- Check the correct operation of the capacitor (power factor correction option 231)

Mechanical:

- Check the tightness of the fan sub-assemblies, fan, compressor and electrical box fixing bolts.

Hydraulic:

- When working on the hydraulic circuit, take care not to damage the adjacent air heat exchanger,
- Verify the hydraulic connections,
- Check the condition of the expansion tank (presence of corrosion or loss of gas pressure) and replace it if required,
- Drain the hydraulic circuit,
- Clean the water filter,
- Replace the gland packing of the pump after 20000 hours of operation and the bearings after 17500 hours,
- Check the operation of the low water flow safety device,
- Check the condition of pipe thermal insulation,
- Check the concentration of the anti-freeze protection solution (ethylene glycol or propylene glycol),
- Check the water flow using the heat exchanger pressure difference,
- Check the condition of the heat transfer fluid or the water quality,
- Check for corrosion of the steel pipe work.

Refrigerant circuit checks:

- Clean the air heat exchangers (see chapter 11.6 Air coil - Level 2 cleaning),
- Check the unit operating parameters and compare them with the previous values,
- Check the operation of high pressure switches. Replace as necessary.
- Check the fouling of the filter drier. Replace it if required.
- Keep an up-to-date service booklet attached to the heat pump in question.

Ensure all adequate safety measures are taken for all these operations: use appropriate PPE (personal protective equipment), comply with all industry and local regulations, use common sense.

11.3 - Level 3 (or higher) maintenance

Maintenance at this level requires specific skills, qualifications, tools and expertise. Only the manufacturer, his representative or authorised agent are permitted to carry out this work.

This maintenance work relates to the following:

- Replacement of major components (compressor, water heat exchanger),
- Operations on the refrigerant circuit (handling refrigerant),
- Modification of factory-set parameters (change of application),
- Moving or dismantling the heat pump,
- Any operation due to proven lack of maintenance,
- Any operation covered by the warranty.

To reduce waste, the refrigerant and the oil must be transferred in accordance with applicable regulations, using methods that limit refrigerant leaks and pressure drops and with materials that are suitable for the products.

Any leaks detected must be repaired immediately.

The compressor oil that is recovered during maintenance contains refrigerant and must be treated accordingly.

Pressurised refrigerant must not left open to purge.

For a period of up to one day, cap all openings. If open for longer, blanket the circuit with an inert gas (e.g. nitrogen) for longer durations.

11.4 - Tightening torques for the main electrical connections

Component	Designation in the unit	Value (N.m)
Welded screw PE, customer connection (earth connection)	-	40
Screw terminal, fuse holder	FU1, FU2, FU3, FU4	10
Screw terminal, fuse holder	FU100	0,8-1,2
Screw terminal, compressor contactor	KM1-->KM12	3 - 4,5
Brass screw M6, compressor ground	EC-	5
M6 screw, compressor connection	EC-	5
Screw terminal, circuit breakers	QM-, QF-	2
Screw terminal, pump contactor	KM90, KM90A	2,5
M8 screw customer connection (size 160-270)	QS100	15 - 22
M10 screw customer connection (size 310-430)	QS100	30 - 44
M12 screw customer connection (size 470-520)	QS100	50 - 75
Screw terminal, circuit breakers(taille 160-330)	QF100	3,2-3,7
Screw terminal, circuit breakers (taille 380-520)	QF100	8-10
Screw terminal, fuse holder 32A (opt231)	Fu-	2,5
Screw terminal, fuse holder 100A (opt231)	Fu-	3,5 - 4

11.5 - Tightening torques for the main bolts and screws

Screw type	Use	Value (N.m)
Metal screw D=4.8	Air coil sub-assembly, casing, supports	4.2
Taptite M10 screw	Air coil sub-assembly, chassis-structure, electrical box fixing, plate heat exchanger and pump	30
Taptite M6 screw	Pipe supports, enclosure, variable frequency drive supports	7
H M6 screw	Pipe clip	10
H M10 nut	Compressor chassis, Compressor fixing	30
Oil equalisation screw	Oil equalisation line	145
M16 screw	Refrigerant accumulator tank flange	180

11.6 - Air coil

We recommend that coils with fins are inspected regularly to check the degree of cleanliness. This depends on the environment where the unit is installed, in particular urban and industrial sites, and for units installed near trees that shed their leaves.

Recommendations for maintenance and cleaning of RTPF coils:

- Regularly cleaning the coil surface is essential for correct unit operation.
- Eliminating contamination and removal of harmful residue will increase the operating life of the coils and the unit.
- Specific recommendation in case of snow: For long term storage, regularly check that no snow has accumulated on the coil.
- Use appropriate PPE including safety glasses and/or mask, waterproof clothes and safety gloves. It is recommended that clothing that covers the whole body is worn.

Level 1 cleaning

- Remove all foreign objects or fragments/debris attached to the coil surface or wedged between the chassis and the supports.
- Use a low pressure dry air jet to remove all traces of dust from the coil, or use a brush in a careful, vertical motion.

Level 2 cleaning

- Carry out the level 1 cleaning operations.
- Clean the coil using suitable products.

Specific Carrier-approved products for cleaning RTPF coils with untreated fins are available from the Carrier spare parts network. The use of any other product is strictly prohibited. After the cleaning product is applied, rinsing with water is mandatory (see Carrier standard RW01-25).

IMPORTANT: Never use a pressure water spray without a large diffuser. Concentrated and/or rotating water jets are strictly prohibited.

Never use a fluid with a temperature above 45°C to clean the air heat exchangers.

Correct and frequent cleaning (approximately every three months) will prevent two-thirds of corrosion problems. Protect the electrics box during cleaning operations.

11.7 - Water heat exchanger maintenance

Check that:

- The insulation has not been detached or torn during operations,
- The heaters and probes are operating and correctly positioned in their support,
- The water-side connections are clean and show no sign of leakage,
- The period inspections required by the local regulations have been carried out.

11.8 - Variable frequency drive maintenance

CAUTION: Before any work on the variable drive, ensure that the circuit is isolated and there is no voltage present (reminder: capacitor discharge time: approximately 5 minutes after the circuit breaker is opened). Only appropriately qualified personnel are authorised to work on the variable frequency drive.

In case of any alarm or persistent problem related to the variable frequency drive, contact Carrier Service.

The variable drives fitted on 30RQM/30RQP units do not require a dielectric test, even if being replaced: they are systematically verified before delivery. Moreover, the filtering components installed in the variable drive can falsify the measurement and may even be damaged. If it is necessary to test the insulation of the unit components (fan motors and pumps, cables, etc.), the variable frequency drive must be disconnected from the power circuit.

11.9 - Characteristics of R-410A

See the table below.

Saturated temperatures based on the gauge pressure (in kPa)							
Saturated Temp.	Pressure gauge	Saturated Temp.	Pressure gauge	Saturated Temp.	Pressure gauge	Saturated temp.	Pressure gauge
-20	297	**4**	807	**28**	1687	**52**	3088
-19	312	**5**	835	**29**	1734	**53**	3161
-18	328	**6**	864	**30**	1781	**54**	3234
-17	345	**7**	894	**31**	1830	**55**	3310
-16	361	**8**	924	**32**	1880	**56**	3386
-15	379	**9**	956	**33**	1930	**57**	3464
-14	397	**10**	987	**34**	1981	**58**	3543
-13	415	**11**	1020	**35**	2034	**59**	3624
-12	434	**12**	1053	**36**	2087	**60**	3706
-11	453	**13**	1087	**37**	2142	**61**	3789
-10	473	**14**	1121	**38**	2197	**62**	3874
-9	493	**15**	1156	**39**	2253	**63**	3961
-8	514	**16**	1192	**40**	2311	**64**	4049
-7	535	**17**	1229	**41**	2369	**65**	4138
-6	557	**18**	1267	**42**	2429	**66**	4229
-5	579	**19**	1305	**43**	2490	**67**	4322
-4	602	**20**	1344	**44**	2551	**68**	4416
-3	626	**21**	1384	**45**	2614	**69**	4512
-2	650	**22**	1425	**46**	2678	**70**	4610
-1	674	**23**	1467	**47**	2744		
0	700	**24**	1509	**48**	2810		
1	726	**26**	1596	**49**	2878		
2	752	**25**	1552	**50**	2947		
3	779	**27**	1641	**51**	3017		

Aquasnap units use high pressure R-410A refrigerant (the unit operating pressure is above 40 bar, the pressure at 35°C air temperature is 50% higher than for R-22). Special equipment must be used when working on the refrigerant circuit (pressure measurement, charge transfer, etc.).

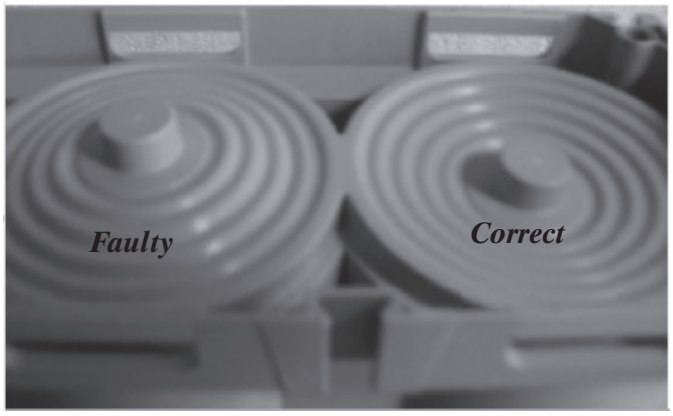
11.10 - Check of power factor correction capacitors

The verification consists in measuring input current of each capacitor bank. Check shall be done using a true RMS meter reading:

Check per phase current delivered by each capacitor and compare it to nominal values. In case of capacitance losses or unbalance, the capacitors must be replaced.

Ensure that the current through the capacitor doesn't exceed 1.3xIr. A higher value may indicate heavy presence of harmonics, that will impact the lifetime of the capacitor.

Absence of current despite capacitor is energized is an indication that there is a defect. Confirmation shall be done by removing the capacitors and checking the underside



12 - UNIT START-UP CHECKLIST FOR INSTALLERS PRIOR TO CONTACTING CARRIER SERVICE

(USE FOR MACHINE FILE)

Preliminary information

Job name: .....
Location: .....
Installing contractor: .....
Distributor: .....
Start-up performed by: ..... Date: .....

Equipment

Model 30RQM/30RQP: ..... Serial number .....

Compressors

Circuit A	**Circuit B**
1. Model #	1. Model # .....
Serial number	Serial number .....
2. Model #	2. Model # .....
Serial number	Serial number .....
3. Model #	3. Model # .....
Serial number	Serial number .....
4. Model #	4. Model # .....
Serial number	Serial number .....

Air handling equipment

Manufacturer .....
Model # ..... Serial number .....

Supplementary air handling units and accessories .....
.....

Preliminary equipment check

Is there any shipping damage? ..... If so, where? .....
.....
Will this damage prevent unit start-up? .....

☐ The unit is installed level
☐ The power supply corresponds to the unit nameplate
☐ The electrical circuit wiring has been sized and installed properly
☐ The unit ground wire has been connected
☐ The electrical circuit protection has been sized and installed properly
☐ All terminals are tight
☐ All cables and thermistors have been inspected for crossed wires
☐ All plug assemblies are tight

Check of the air handling systems

☐ All air handling units are operating
☐ All chilled water valves are open
☐ All fluid piping is connected properly
☐ All air has been vented from the system
☐ The chilled water pump is operating with the correct rotation. Amperage: Nominal..... Actual.....

Unit start-up

☐ The chilled water pump contactor has been correctly cabled with the chiller
☐ The oil level is correct
☐ The unit has been checked for leaks (including couplings)
☐ Locate, repair, and report any refrigerant leaks

.....
.....
.....

Check voltage imbalance: AB..... AC..... BC.....
Average voltage = ... (see installation instructions)
Maximum deviation = ... (see installation instructions)
Voltage imbalance = ... (see installation instructions)

☐ Voltage imbalance is less than 2%

WARNING
Do not start the chiller if the voltage imbalance is greater than 2%. Contact your local power company for assistance.

☐ All incoming power voltage is within the nominal voltage range
☐ The compressor crankcase heaters have been running for 6 hours

Check of the evaporator water loop

Water loop volume ..... = ... (litres)
Calculated volume ..... = ... (litres)

☐ Correct loop volume established
☐ Correct loop corrosion inhibitor included ..... litres of.....
☐ Correct loop frost protection included (if required) .... litres of.....
☐ Water pipes have been fitted an electric heater for trace heating up to the evaporator
☐ Return water piping is equipped with a screen filter with a mesh size of 1.2 mm

Checking the pressure drop across the evaporator (without hydraulic module) or ESP* (with hydraulic module)

Evaporator inlet = ... (kPa)
Evaporator outlet = ... (kPa)
Pressure drop (Inlet - Outlet) = ... (kPa)

*ESP: External Static Pressure

WARNING
Plot the pressure drop on the evaporator flow/pressure drop curve to determine the flow rate in l/s at the nominal operating conditions for the system.
If necessary use the control valve to adjust the flow rate to the desired value.
For units with hydraulic module, an indication of the flow is displayed by the unit control (see the 30RQM/30RQP control manual).

☐ Flow rate from the pressure drop curve, l/s = ...
☐ Nominal flow rate, l/s = ...
☐ The flow rate in l/s is higher than the minimum unit flow rate
☐ The flow rate in l/s corresponds to the specification of ..... (l/s)

Carry out the QUICK TEST function (Consult Carrier Service):

Check and log on to the user menu configuration

Load sequence selection .....
Capacity ramp loading selection .....
Start-up delay .....
Pump control .....
Setpoint shift mode .....
Night mode capacity limitation .....

Re-enter the setpoints

To start up the cooler

WARNING
Be sure that all service valve sets are open, and that the pump is on before attempting to start this machine. Once all checks are complete, start up the unit.
The unit starts and operates correctly

Temperatures and pressures

WARNING
Once the machine has been operating for a while and the temperatures and pressures have stabilised, record the following:
Evaporator water inlet .....
Evaporator water outlet .....
Ambient temperature .....
Circuit A suction pressure .....
Circuit B suction pressure .....
Circuit A discharge pressure .....
Circuit B discharge pressure .....
Circuit A suction temperature .....
Circuit B suction temperature .....
Circuit A discharge temperature .....
Circuit B discharge temperature .....
Circuit A liquid duct temperature .....
Circuit B liquid duct temperature .....

NOTES:
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Quality and Environment
Management Systems
Approval

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