



United Technologies

## Touch Pilot Junior

## INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



30RQS



30RQSY

For the operation of the control please refer to the  
Touch Pilot Junior Control manual for the 30RB/30RQ 017-160 series

Reversible Air-to-Water Heat Pumps

30RQS/30RQSY 039-160 "A"

Nominal cooling capacity 40-160 kW  
50 Hz

**AQUASNAP™**

Original instructions

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

## 1 - INTRODUCTION

Prior to the initial start-up of the 30RQS/30RQSY units, the people involved should be thoroughly familiar with these instructions and the specific project data for the installation site.

The 30RQS/30RQSY heat pumps are designed to provide a very high level of safety and reliability making installation, start-up, operation and maintenance easier and more secure. They will provide safe and reliable service when operated within their application range.

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

The procedures in this manual are arranged in the sequence required for machine installation, start-up, operation and maintenance.

Be sure you understand and follow the procedures and safety precautions contained in the instructions supplied with the machine, as well as those listed in this guide, such as: protective clothing such as gloves, safety glasses, safety shoes and appropriate tools, and suitable qualifications (electrical, air conditioning, local legislation).

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

### 1.1 - Specific aspects for 30RQSY units with variable available pressure

30RQSY units are designed for indoor installation in a plant room. For this type of installation cold or hot air leaving the air-cooled air heat exchangers is discharged by the fans to the outside of the building, using a duct system.

The suction air return can be outside or inside the room (see chapter 3.2 - "Duct connection").

The installation of a duct system at the air heat exchanger discharge line and in certain cases at the heat exchanger air suction side causes a pressure drop due to the resistance caused by the air flow.

Therefore more powerful fan motors than those used for the 30RQS units are installed in the units of this range. For each installation of a unit installed inside a plant room the duct pressure drops differ, depending on the duct length, duct section and direction changes.

30RQSY units equipped with fans with available pressure are designed to operate with air discharge ducts with maximum pressure drops of 160 Pa.

To compensate for these pressure drops 30RQSY units are equipped with variable-speed fans with a maximum speed of 19 r/s to ensure an optimised air flow rate.

In the cooling mode, the full-load or part-load speed is controlled by a patented algorithm that permanently optimises the condensing temperature to ensure the best unit energy efficiency (EER) whatever the operating conditions

and pressure drops of the system ductwork.

In the heating mode, the full-load or part-load speed of each circuit is fixed and at the configured maximum (range configurable from 12 r/s to 19 r/s) based on the constraints and characteristics of the installation site. The maximum configured speed applies to both the heating and cooling mode.

If required and for reasons that may apply at the installation site of the 30RQSY units a maximum fan speed can be set. To do this consult the 30RB/RQ Touch Pilot Junior control manual.

### 1.2 - Check equipment received

- Inspect the unit for damage or missing parts. If damage is detected, or if shipment is incomplete, immediately file a claim with the shipping company.
- Confirm that the unit received is the one ordered. Compare the name plate data with the order.
- The name plate is attached to the unit in two locations:
  - on the outside on one of the unit sides
  - on the control box door on the inside.
- The unit name plate must include the following information:
  - Model number - size
  - CE marking
  - Serial number
  - Year of manufacture and pressure and leak tightness test date
  - Refrigerant used
  - Refrigerant charge per circuit
  - PS: Min./max. allowable pressure (high and low pressure side)
  - TS: 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 drawn
  - Maximum power input
  - Unit net weight
- Confirm that all options ordered for on-site installation have been delivered, and are complete and undamaged.

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

### 1.3 - Installation safety considerations

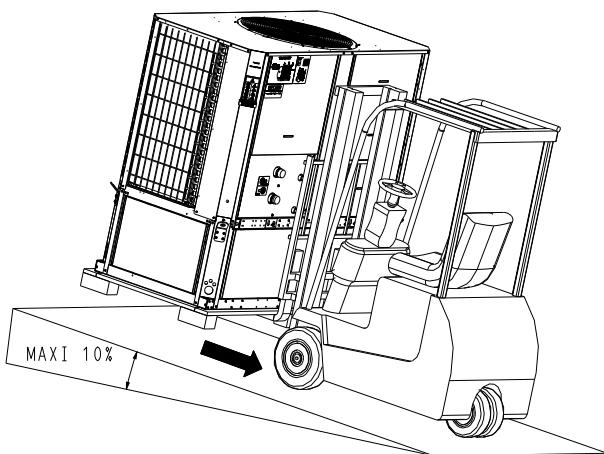
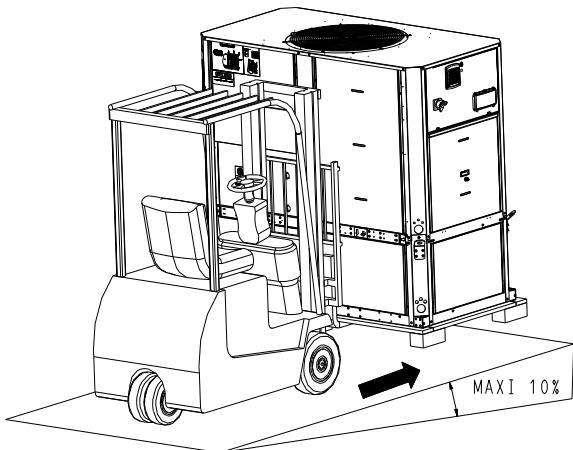
After the unit has been received, and before it is started up, it must be inspected for damage. Check that the refrigerant circuits are intact, especially that no components or pipes have shifted or been damaged (e.g. following a shock). If in doubt, carry out a leak tightness check. If damage is detected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

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

More particularly, units equipped with the optional buffer tank module can be handled by forklift in compliance with the instructions below:

- Pick up the load as close as possible to the mast (at the heel of the fork)
- The forks of the forklift must pass all the way under the load
- The load must be lowered down a slope in reverse, with the mast tilted backwards
- The load must be raised up a slope in forward gear, with the mast tilted backwards

In both cases, drive at low speed, applying the brakes gradually.



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

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

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

## **DO NOT COVER ANY PROTECTION DEVICES.**

**This applies to fuse plugs and relief valves (if used) in the refrigerant or heat transfer medium circuits. Check if the original protection plugs are still present at the valve outlets. These plugs are generally made of plastic and should not be used. If they are still present, please remove them. Install devices at the valve outlets or drain piping that 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 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 protection devices for these machines are classified as follows:**

	<b>Safety accessory*</b>	<b>Damage limitation accessory** in case of an external fire</b>
<b>Refrigerant side</b>		
High-pressure switch	x	
External relief valve***		x
Rupture disk		x
Fuse plug		x
<b>Heat transfer fluid side</b>		
External relief valve	****	****

\* Classified for protection in normal service situations.

\*\* Classified for protection in abnormal service situations.

\*\*\* The instantaneous over-pressure limited to 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.

\*\*\*\* The classification of these relief valves must be made by the personnel that completes the whole hydronic installation.

**Do not remove these valves and fuses, even if the fire risk is under control for a particular installation. There is no guarantee that the accessories are re-installed if the installation is changed or for transport with a gas charge.**

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

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

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

**The external relief valves must always be connected to drain pipes for units installed in a closed room (30RQSY). Refer to the installation regulations, for example those of European standard EN 378 and EN 13136.**

**These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. As the fluids can be diffused in the air, ensure that the outlet is far away from any building air intake, or that they are discharged in a quantity that is appropriate for a suitably absorbing environment.**

**Relief valves must be checked periodically. See paragraph "Repair safety considerations".**

**If the relief valves are installed on a reversing valve (changeover), 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 reversing valve in the intermediate position, i.e. with both ways open (locate the control element in the stop position). If a relief valve is removed for checking or replacement please ensure that there is always an active relief valve on each of the reversing valves installed in the unit.**

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

**All precautions concerning handling of refrigerant must be observed in accordance with local regulations.**

**Accumulation of refrigerant in an enclosed space can displace oxygen and cause asphyxiation or explosions.**

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

#### **1.4 - Equipment and components under pressure**

These products incorporate equipment or components under pressure, manufactured by Carrier or other manufacturers. We recommend that you consult your appropriate national trade association or the owner of the equipment or components under pressure (declaration, re-qualification, retesting, etc.). The characteristics of this equipment/these components are given on the nameplate or in the required documentation, supplied with the products. These units comply with the European Pressure Equipment Directive.

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

Do not introduce high static and dynamic pressure compared with the existing operating pressures - either service or test pressures - in the refrigerant circuit or in the heat transfer circuit, especially:

- limiting the elevation of the condensers or evaporators
- taking the circulating pumps into consideration.

#### **1.5 - Maintenance safety considerations**

Carrier recommends the following drafting for a logbook (the table below should not be considered as reference and does not involve Carrier responsibility):

Intervention		Name of the commissioning engineer	Applicable national regulations	Verification Organism
Date	Nature <sup>(1)</sup>			

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

Engineers working on the electric or refrigeration components must be authorized, trained and fully qualified to do so (e.g. electricians trained and qualified in accordance with IEC 60364 Classification BA4).

All refrigerant circuit work must be carried out by a trained person, fully qualified to work on these units. He must have been trained and be familiar with the equipment and the installation. All welding operations must be carried out by qualified specialists.

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 gauge, charge transfer, etc.).

**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 while this is done.**

**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 box.**

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

**Never work on a unit that is still energized. Never work on any of the electrical components, until the general power supply to the unit has been cut.**

**If any maintenance operations are carried out on the unit, lock the power supply circuit in the open position and secure the machine upstream with a padlock.**

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

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

**If any work is carried out in the fan area, specifically if the grilles or casings have to be removed, cut the power supply to the fans to prevent their operation.**

**It is recommended to install an indicating device to show if part of the refrigerant has leaked from the valve. The presence of oil at the outlet orifice is a useful indicator that refrigerant has leaked. Keep this orifice clean to ensure that any leaks are obvious. The calibration of a valve that has leaked is generally lower than its original calibration. The new calibration may affect the operating range. To avoid nuisance tripping or leaks, replace or re-calibrate the valve.**

#### **OPERATING CHECKS:**

Important information regarding the refrigerant used:  
This product contains fluorinated greenhouse gas covered by the Kyoto protocol.

Fluid type: R410A

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 check	12 months	6 months	3 months
System WITH leakage detection	No check	24 months	12 months	6 months
Refrigerant charge/circuit (CO <sub>2</sub> equivalent)	< 5 tons	5 ≤ charge < 50 tons	50 ≤ charge < 500 tons	charge > 500 tons*
Refrigerant charge (kg) (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
	R410A (GWP 2088)	Charge < 2.4 kg	2.4 ≤ charge < 23.9 kg	23.9 ≤ charge < 239.5 kg
HFO's : R1434ze	no requirement			> 239.5 kg

\* 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.

**Protection device checks:**

- **If no national regulations exist, check the protection 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 shall establish and implement a detailed procedure to fix:

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

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

- Verify and record the set-points of pressure switches and relief devices (valves and possible rupture discs)
- Be ready to switch-off the main disconnect switch of the power supply if the pressure switch does not trigger (avoid over-pressure or excess gas in case of valves on the high-pressure side with the recovery condensers)

- Connect a calibrated pressure gauge (the values displayed on the user interface may be inaccurate in an instant reading because of the scanning delay applied in the control)
- Activate the HP quick test included in the control procedure.

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

**At least once a year, visually inspect the protection devices (valves, pressure switches).**

**If the machine operates in a corrosive environment, inspect the protection devices more frequently.**

**Regularly carry out leak tests and immediately repair any leaks.**

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

**Before opening a refrigerant circuit, transfer the refrigerant to bottles specifically provided for this purpose and consult the pressure gauges.**

**Change the refrigerant after an equipment failure, following a procedure such as the one described in NF E29-795 or carry out a refrigerant analysis in a specialist laboratory.**

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

## 1.6 - Repair safety considerations

All installation parts must be maintained by the personnel in charge to avoid deterioration and injury. Faults and leaks must be repaired immediately. The authorized technician must have the responsibility to repair the fault immediately. After each unit repair check the operation of the protection devices and create a 100% parameter operation report.

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

### RISK OF EXPLOSION



**Never use air or a gas containing oxygen during leak tests to purge lines or to pressurise a machine. 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, possibly with an appropriate tracer gas.**

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

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

**Do not unweld or flame-cut the refrigerant lines or any refrigerant circuit component 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 can produce toxic gases.**

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

**Do not siphon refrigerant.**

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

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

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

**We recommend to apply standard EN 378-3 Annex 3.**

**Never apply an open flame (blowlamp) or overheated steam (high-pressure cleaner) to the refrigerant circuit. Dangerous overpressure can result.**

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

**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 refrigerant circuit components or fittings, while the machine is under pressure or while it is running. Be sure pressure is at 0 kPa and that the unit has been shut-down and de-energised before removing components or opening a circuit.**

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

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

**Do not step on refrigerant lines. The lines can break under the weight and release refrigerant, causing personal injury.**

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

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

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

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

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

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

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

**Always ensure you are using the correct refrigerant type before recharging the unit.**

**Charging any refrigerant other than the original charge type (R-410A) will impair machine operation and can even lead to a destruction of the compressors. The compressors operate with R-410A and are charged with a synthetic polyolester oil.**

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

## **2 - MOVING AND SITING THE UNIT**

### **2.1 - Moving**

**See chapter 1.3 - "Installation safety considerations".**

### **2.2 - Siting the unit**

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

**In case of extra-high units the machine environment must permit easy access for maintenance operations.**

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

**Typical applications of these units do not require earthquake resistance. Earthquake resistance has not been verified.**

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

Before siting the unit check that:

- the permitted loading at the site is adequate or that appropriate strengthening measures have been taken.
- if the unit has to operate as a heat pump in temperatures below 0°C it must be raised at least 300 mm from the ground. This is necessary to avoid ice build-up on the unit chassis and also to permit correct unit operation in locations where the snow level may reach this height.
- the unit is installed level on an even surface (maximum tolerance is 5 mm in both axes).
- there is adequate space above the unit for air flow and to ensure access to the components (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 installations, where heavy snowfall is likely and long periods of sub-zero temperatures are normal, provision has to be made to prevent snow accumulating by raising the unit above the height of drifts normally experienced. Baffles may be necessary to deflect strong winds. They must not restrict air flow into the unit.

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

If 30RQS/RQSY units are hoisted with rigging, it is advisable to protect coils against crushing while a unit is being moved. Use struts or a lifting beam to spread the slings above the unit. Do not tilt a unit more than 15°.

**WARNING: Never push or lever on any of the enclosure panels of the unit. Only the base of the unit frame is designed to withstand such stresses.**

### **2.3 - Checks before system start-up**

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

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

External visual installation checks:

- Ensure that the machine is charged with refrigerant. Verify on the unit nameplate that the 'fluid being transported' is R-410A and is not nitrogen.
- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.

- Check that all protection documents and equipment provided by the manufacturer (dimensional drawings, P&ID, declarations etc.) to comply with the regulations are present.
- Verify that the environmental safety and protection and devices and arrangements provided by the manufacturer to comply with the regulations are in place.
- Verify that all documents for pressure containers, certificates, name plates, files, instruction manuals provided by the manufacturer to comply with the regulations are present.
- Verify the free passage of access and safety routes.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases.
- Verify the installation of connections.
- Verify the supports and fixing elements (materials, routing and connection).
- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection against heat.
- Check the protection of moving parts.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation and of the vapour barriers.
- Ensure that the ventilation in the machine room is sufficient.
- Check the refrigerant detectors.

## **3 - INSTALLATION SPECIFICS FOR 30RQSY UNITS**

### **3.1 - General**

Each fan is controlled by a variable-speed controller. Therefore each circuit operates independently and must have a separate duct system to avoid any air recycling between the air heat exchangers of the different refrigerant circuits.

On the 30RQSY units each fan includes a factory-mounted connection frame interface for the connection to the duct network of the specific refrigerant circuit to which the fan belongs.

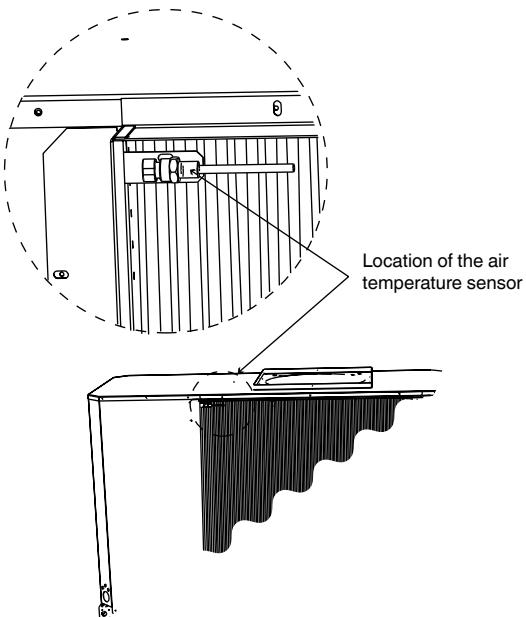
For the precise dimensions of this connection interface please refer to the dimensional drawings for the units.

### 3.2 - Duct connection

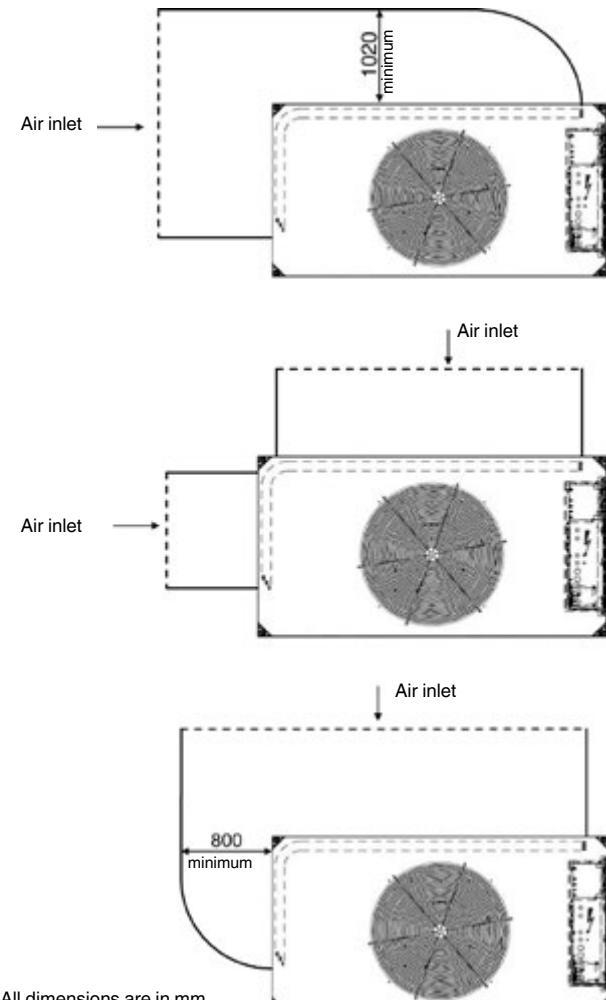
30RQSY units can be installed inside a building and connected to a air distribution duct network:

- Air heat exchanger side, at the fresh air suction side for 30RQSY 039 to 078 units
- Fan discharge side at the evacuation side of the treated air by the unit heat exchanger (30RQSY 039 to 160).

For the precise dimensions of this connection interface please refer to the dimensional drawings for the units.



### Specific connection precautions for sizes 30RQSY 050 to 078

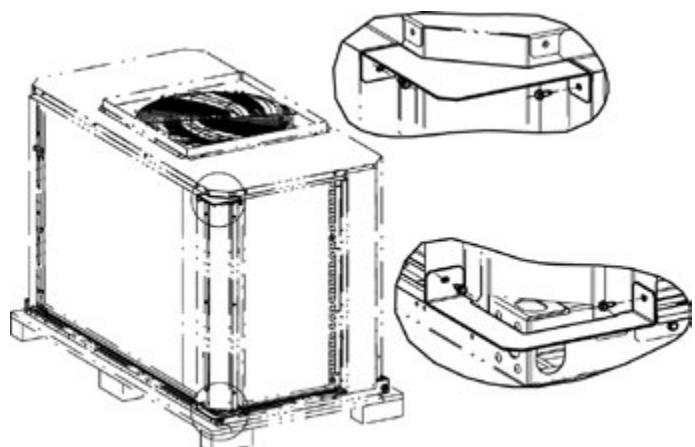


#### 3.2.1 - Standard unit suction connection

30RQSY 039 to 078 units are supplied with a sleeve that allows connection of an air heat exchanger suction duct. Provide a removable window on the suction duct to allow the maintenance of the sensor (see figure above).

For units 30RQSY 050 to 078 the air heat exchanger is on two unit sides. It is therefore necessary to install two additional brackets to allow connection of the heat exchanger suction duct.

These parts are inside the machine and fixed to the riser (as shown on the diagram below) with plastic collars.

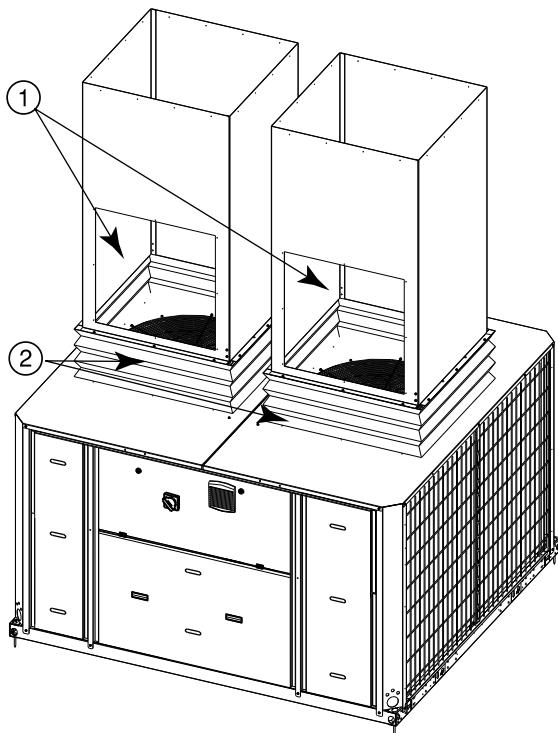


#### 3.2.2 - Fan discharge connection

A square flange is supplied mounted on the unit. An available standard round flange can easily be installed at the fan discharge, if the installer prefers the use of a round connection duct.

The unit is supplied with a grille on the discharge side. This grille has to be removed before connection to the duct system.

It is advisable to make the connection to the duct system with a flexible sleeve. If this recommendation is not observed, a lot of vibration and noise may be transmitted to the building structure.



**NOTE:** The discharge lines must be ducted separately.

- ① Fan motor access hatches (provide a 700 x 700 mm hatch) for each single and dual duct
- ② Connection bellows or sleeve

**IMPORTANT:** *The connection of the ducts to the units must not lead to a mechanical constraint on the decks supporting the fans. Use bellows or flexible sleeves to connect the ducts.*

*The fan protection grilles can be removed to increase the available pressure.*

*At the beginning of each duct provide an access hatch with minimum dimensions of 700 x 700 mm to allow motor replacement or removal of the fan scroll.*

### 3.3 - Electrical protection of the fan motors

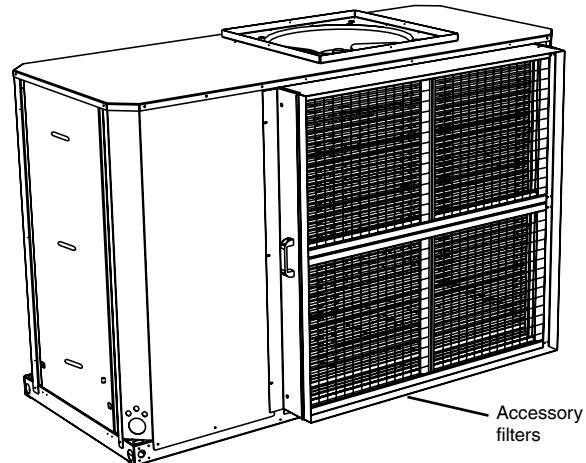
Each motor is controlled by its own variable-speed controller. Electrical protection is ensured by the variable-speed controller (in case of a locked rotor or overload).

If a fan does not operate, the variable-speed controller will automatically detect this and an alert will be sent to the Touch Pilot Junior display. For the specific alarms list of this option, please refer to the 30RB/RQ Touch Pilot Junior control manual.

### 3.4 - Air heat exchanger suction filter kit (option 23b)

This option is available for units 30RQSY 039 to 078. The suction duct connection is made directly to the factory-mounted sleeve on the unit. Maintenance access to the filters is achieved by removing the four metric screws on the side of the sleeve.

The cover panel with a manoeuvring lever can now be removed. The filters are placed on a metal sheet that allows them to slide in their support.



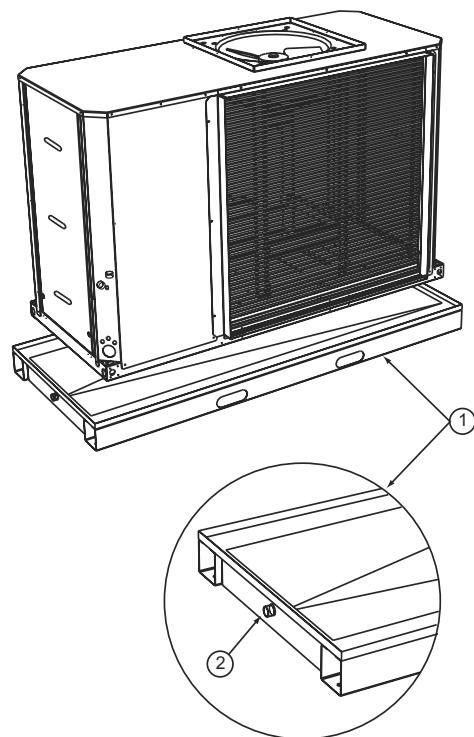
### 3.5 - Applicable rules for units incorporated into an air duct network

Ensure that the suction or discharge inlets are not accidentally obstructed by the panel positioning (e.g. low return or open doors etc.).

### 3.6 - Installation of the accessory condensate collection pan

Ref.: 30RY 900 032 EE – (30RQSY 039 to 078)

It may be necessary to remove water. Carrier can supply an accessory condensate collection pan for installation under the unit. The connection of this pan to the condensate collection network can be made using a 1" gas threaded pipe.



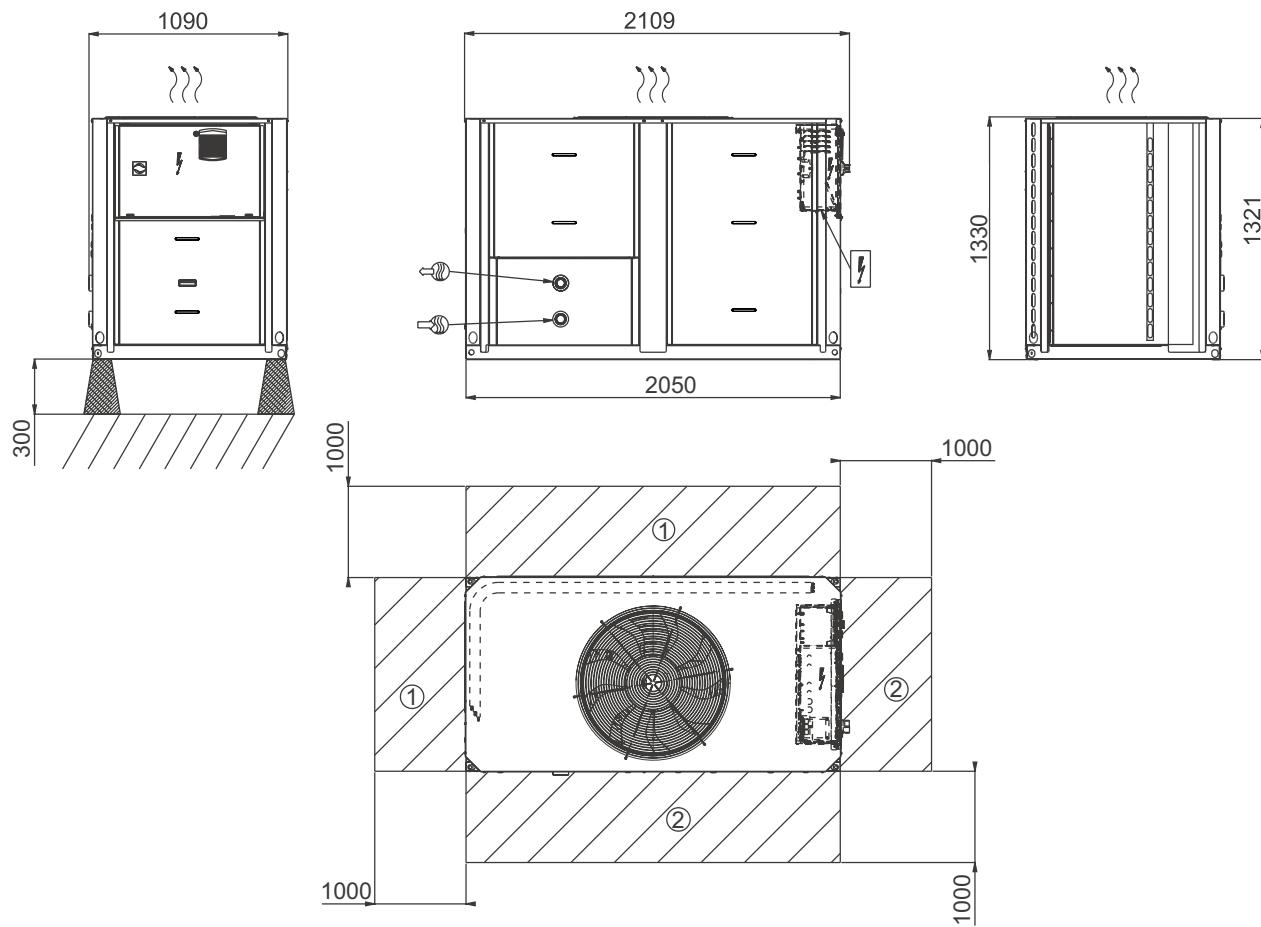
#### Legend

- ① Condensate collection pan
- ② Connection

## 4 - DIMENSIONS, CLEARANCES

### 4.1 - 30RQS 039 and 045-078, units with and without hydronic module

For units with fans with variable available pressure (30RQSY) please refer to the pages that follow.

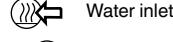


#### Legend:

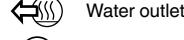
All dimensions are given in mm



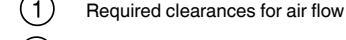
Control box



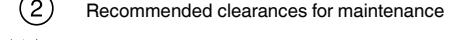
Water inlet



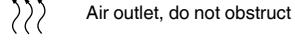
Water outlet



Required clearances for air flow



Recommended clearances for maintenance



Air outlet, do not obstruct



Power cable entry

#### NOTES:

##### A Non-certified drawings.

Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation.

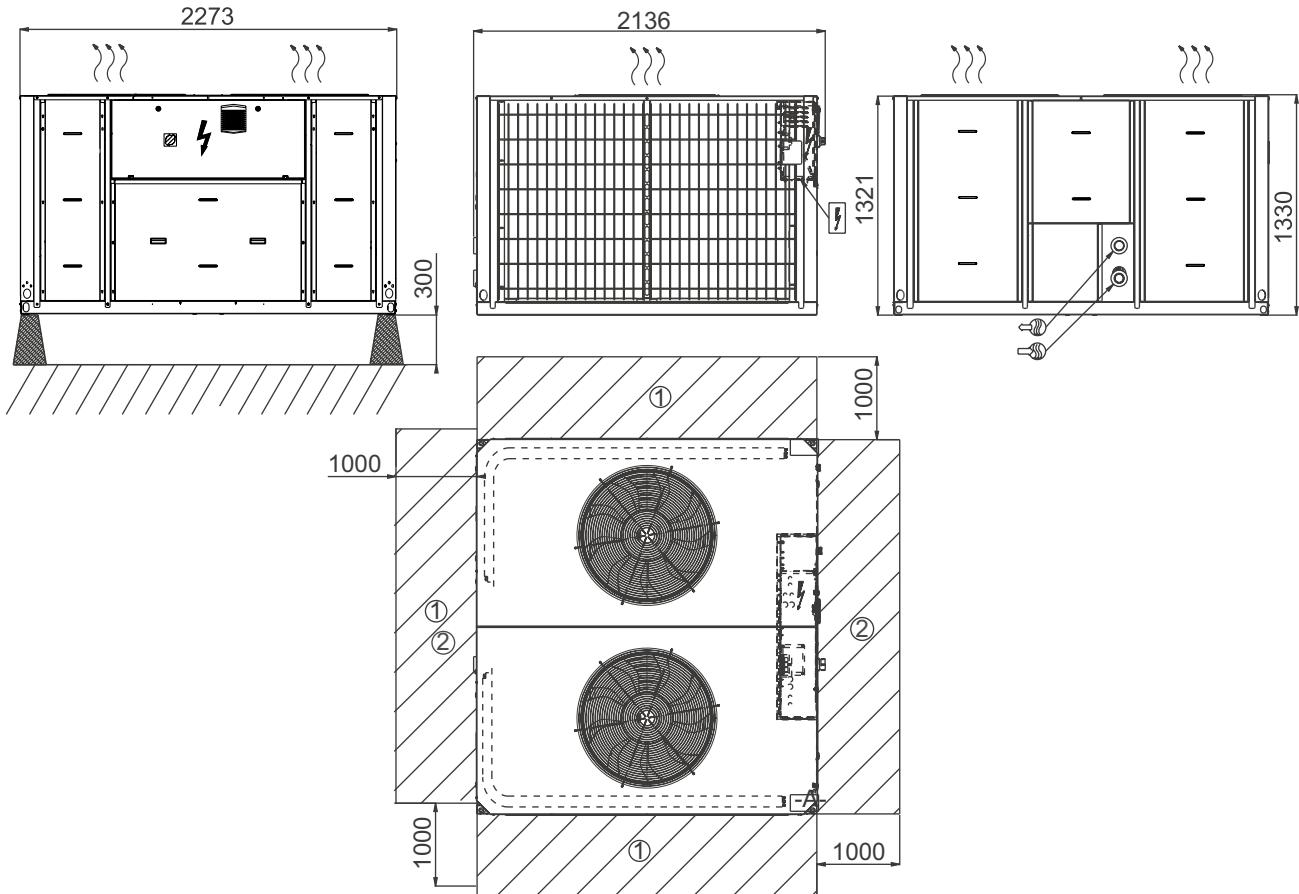
For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

##### B In multiple-unit installations (maximum four units), the side clearance between the units should be increased from 1000 to 2000 mm.

##### C The height of the solid surface must not exceed 2 m.

## 4.2 - 30RQS 080-160, units with and without hydronic module

For units with fans with variable available pressure (30RQSY) please refer to the pages that follow.



### Legend:

All dimensions are given in mm

- Control box
- Water inlet
- Water outlet
- (1) Required clearances for air flow
- (2) Recommended clearances for maintenance
- Air outlet, do not obstruct
- Power cable entry

### NOTES:

A Non-certified drawings.

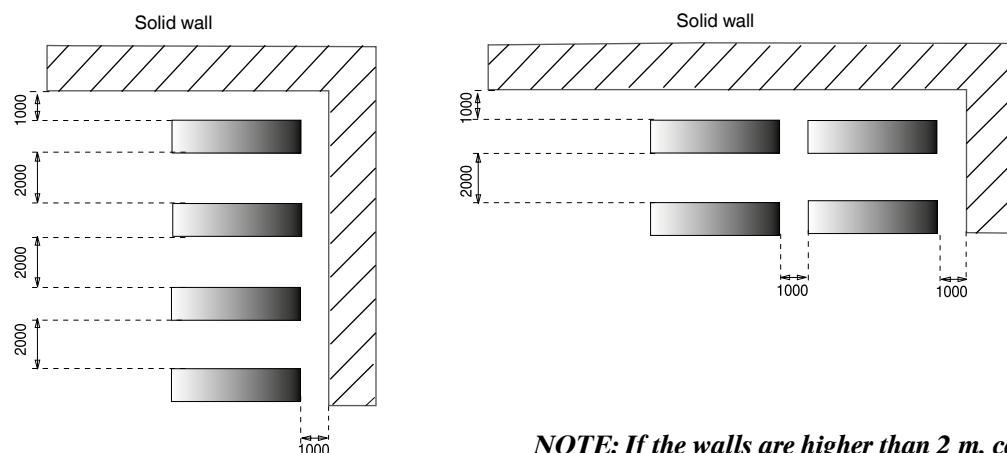
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation.

For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

B In multiple-unit installations (maximum four units), the side clearance between the units should be increased from 1000 to 2000 mm.

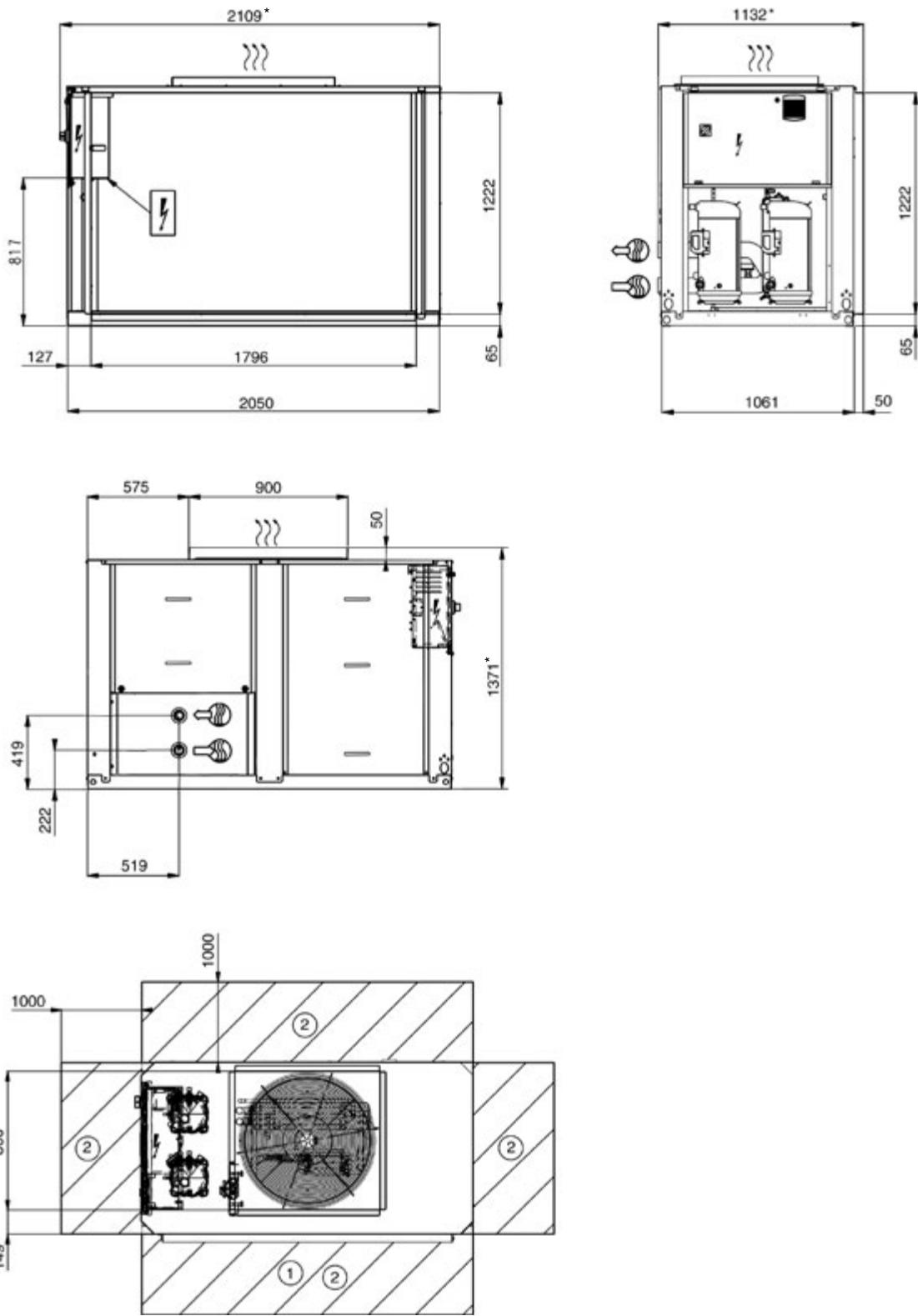
C The height of the solid surface must not exceed 2 m.

## Multiple unit installation



**NOTE: If the walls are higher than 2 m, contact the factory**

#### 4.3 - 30RQSY 039-045, units with and without hydronic module, without filter frame



##### Legend:

All dimensions are given in mm



Control box



Water inlet



Water outlet



① Required clearances for air flow



② Recommended clearances for maintenance



Air outlet, do not obstruct



Power cable entry

##### NOTES:

A Non-certified drawings.

Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

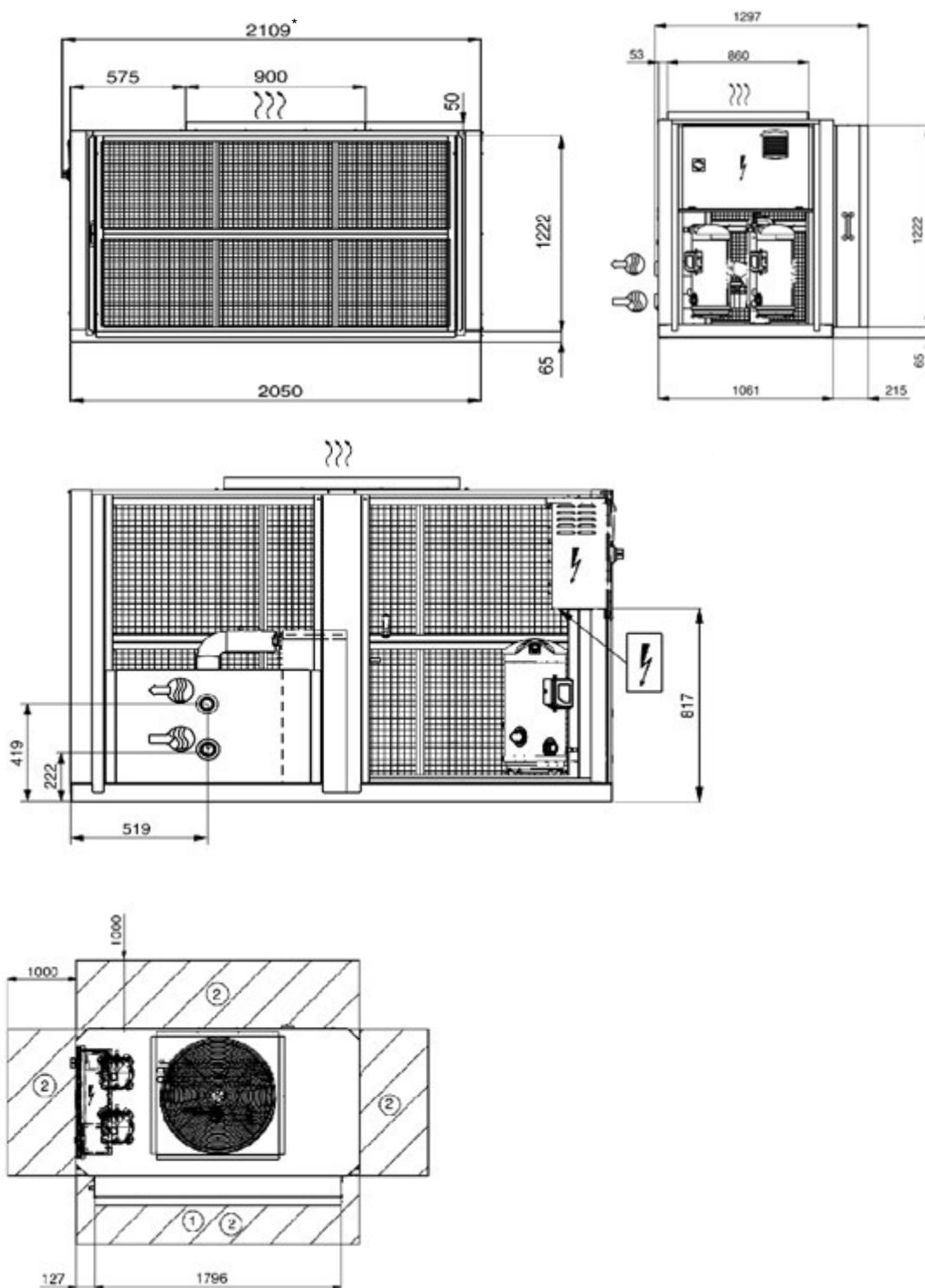
B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RQSY 039 to 078).

C The unit must be installed level (less than 2 mm per metre deviation in both axes).

D Units 30RQSY 039 to 078 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

\* Overall dimensions

#### 4.4 - 30RQSY 039-045, option 23B, units with and without hydronic module, with filter frame



##### Legend:

All dimensions are given in mm

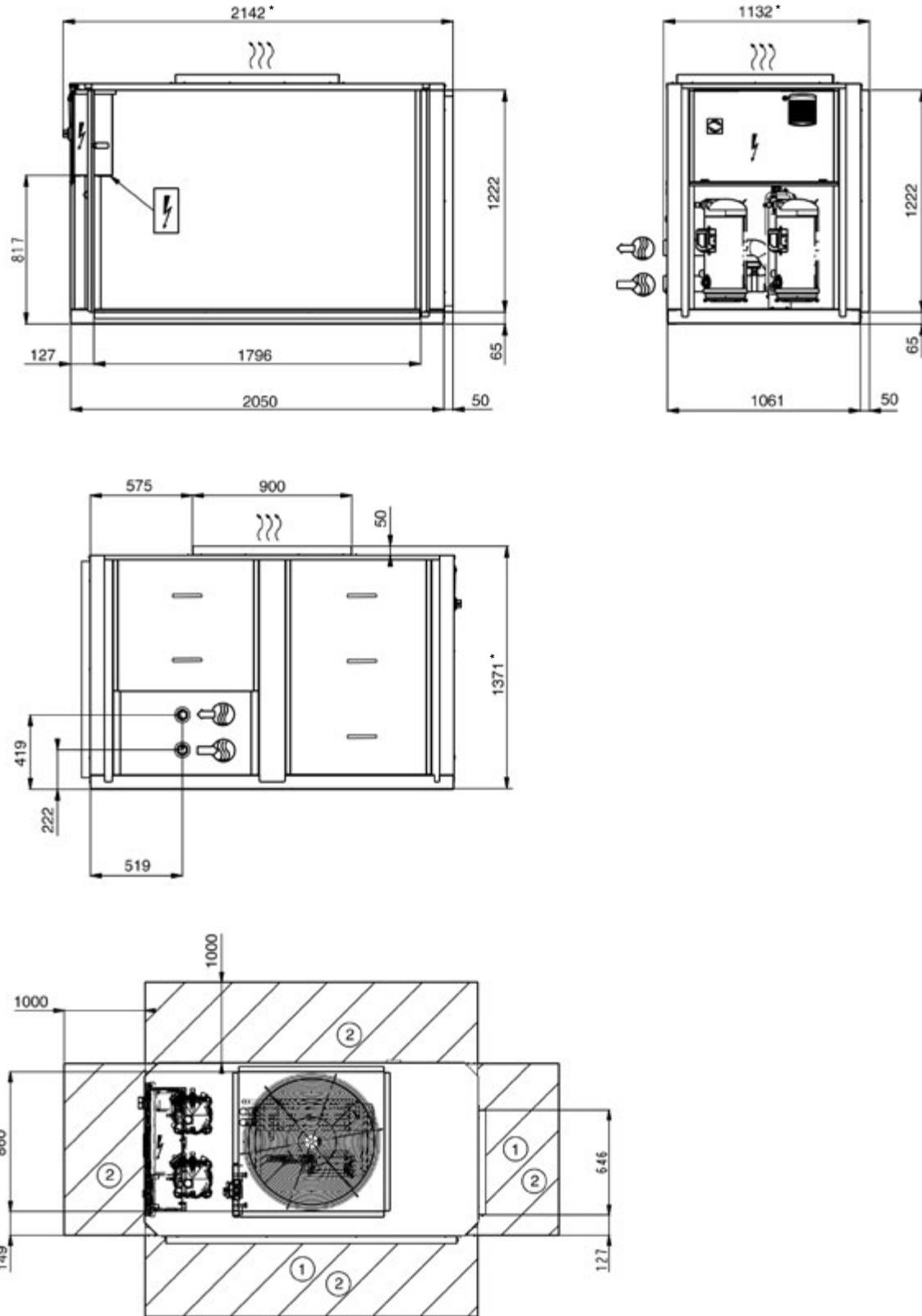
- Control box
- Water inlet
- Water outlet
- (1) Required clearances for air flow
- (2) Recommended clearances for maintenance
- Air outlet, do not obstruct
- Power cable entry

##### NOTES:

- A Non-certified drawings. Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.
- B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RQSY 039 to 078).
- C The unit must be installed level (less than 2 mm per metre deviation in both axes).
- D Units 30RQSY 039 to 078 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

\* Overall dimensions

#### 4.5 - 30RQSY 050-078, units with and without hydronic module, without filter frame



##### Legend:

All dimensions are given in mm

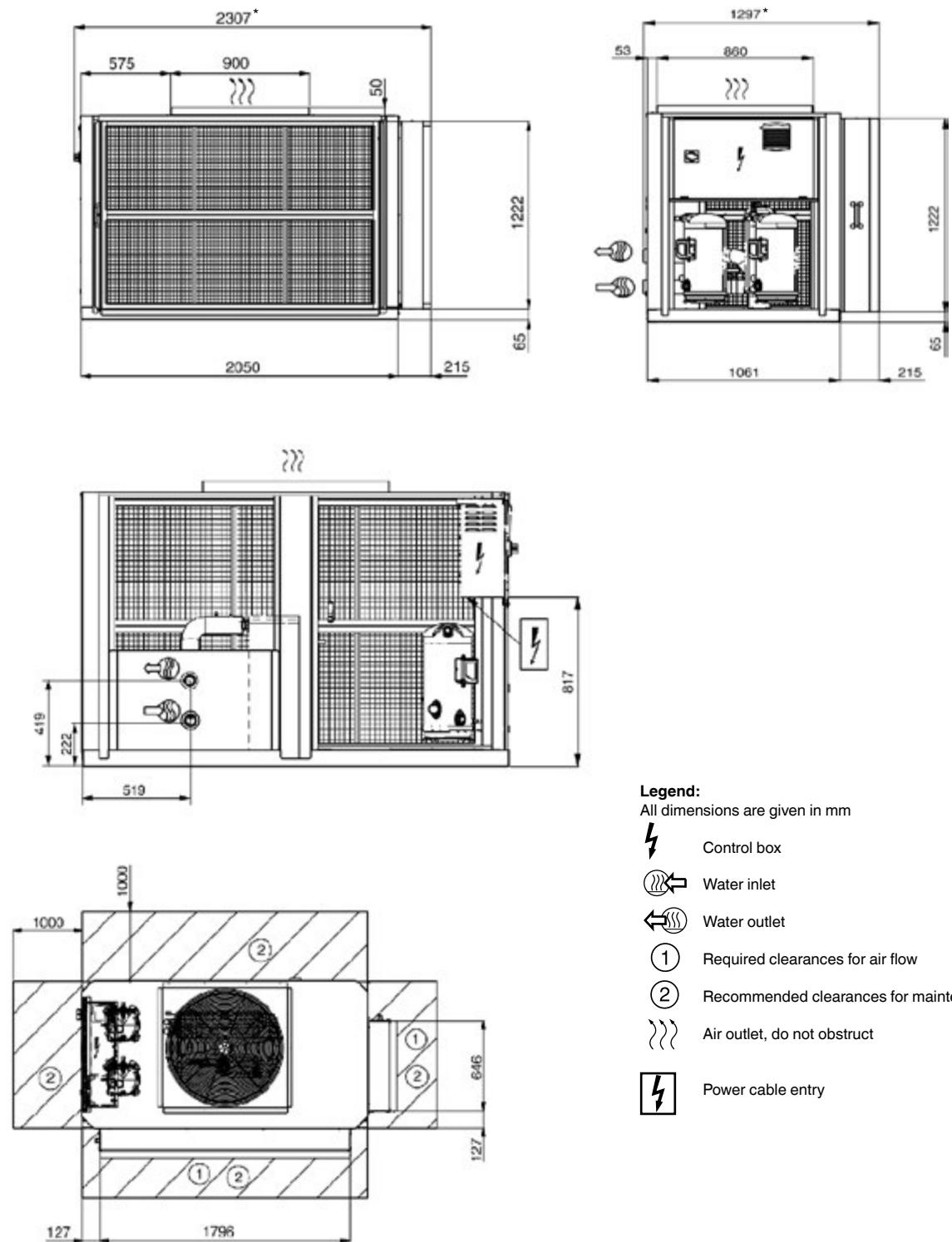
- Control box
- Water inlet
- Water outlet
- (1) Required clearances for air flow
- (2) Recommended clearances for maintenance
- Air outlet, do not obstruct
- Power cable entry

##### NOTES:

- A Non-certified drawings. Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.
- B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RQSY 039 to 078).
- C The unit must be installed level (less than 2 mm per metre deviation in both axes).
- D Units 30RQSY 039 to 078 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

\* Overall dimensions

#### 4.6 - 30RQSY 050-078 option 23B, units with and without hydronic module, with filter frame

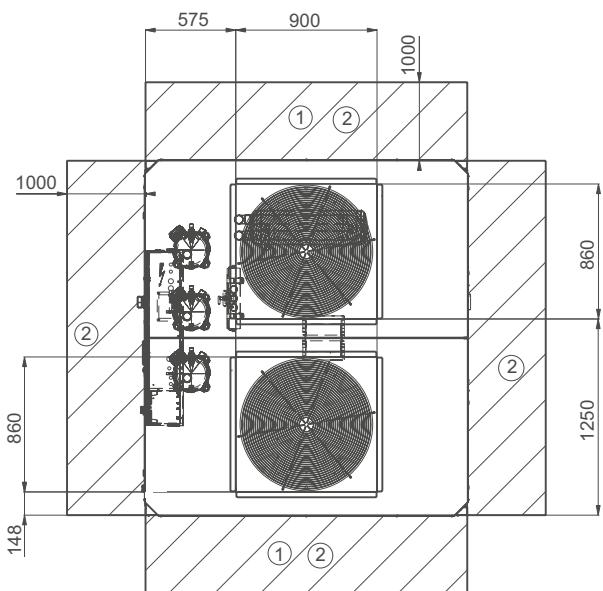
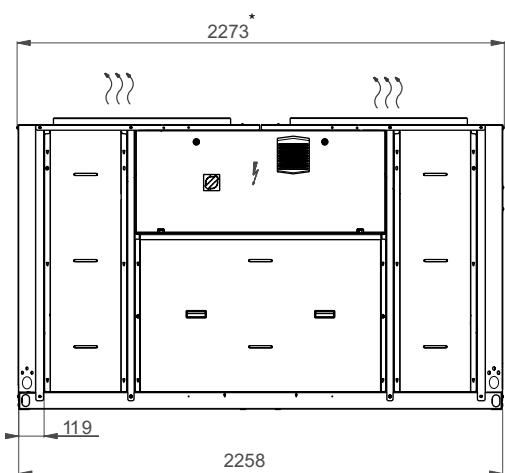
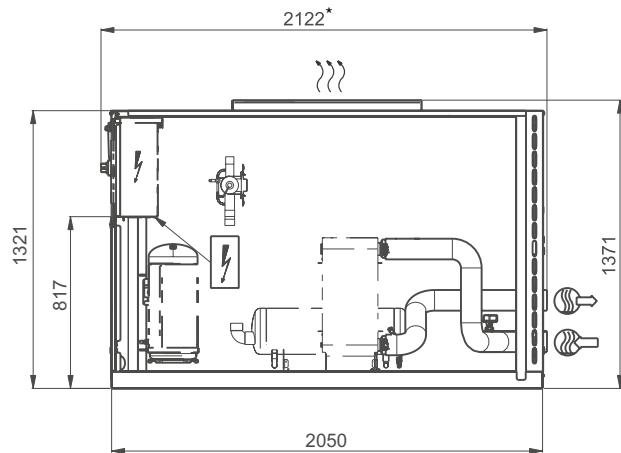
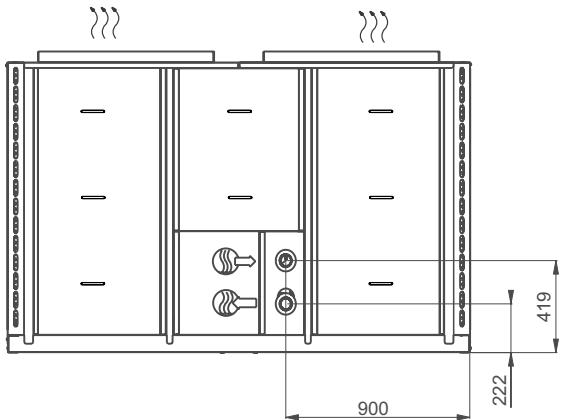


#### NOTES:

- A Non-certified drawings.  
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.
- B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RQSY 039 to 080).
- C The unit must be installed level (less than 2 mm per metre deviation in both axes).
- D Units 30RQSY 039 to 078 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

\* Overall dimensions

#### 4.7 - 30RQSY 080-120 units with and without hydronic module



##### Legend:

All dimensions are given in mm

- Control box
- Water inlet
- Water outlet
- (1) Required clearances for air flow
- (2) Recommended clearances for maintenance
- Air outlet, do not obstruct
- Power cable entry

##### NOTES:

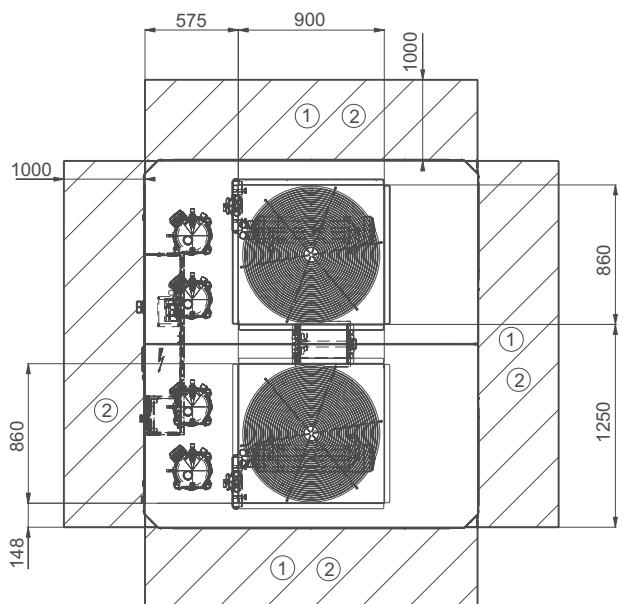
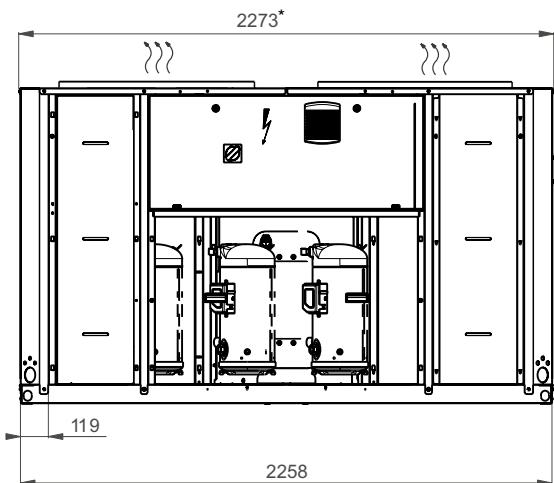
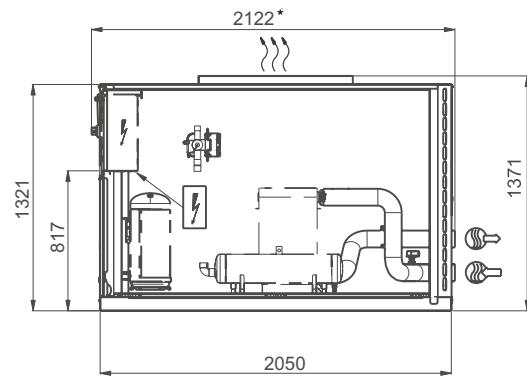
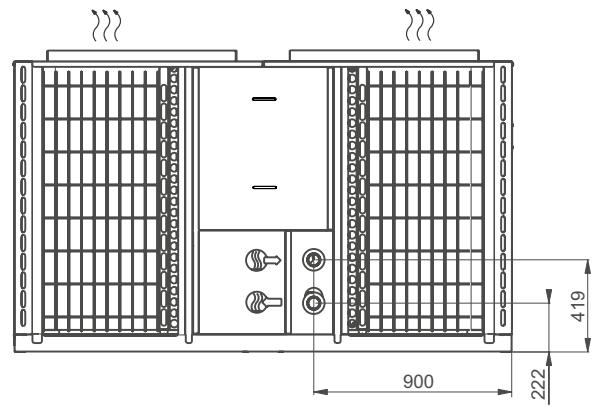
A Non-certified drawings.

Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

B The unit must be installed level (less than 2 mm per metre deviation in both axes).

\* Overall dimensions

#### 4.8 - 30RQSY 140-160 units with and without hydronic module



**Legend:**  
All dimensions are given in mm

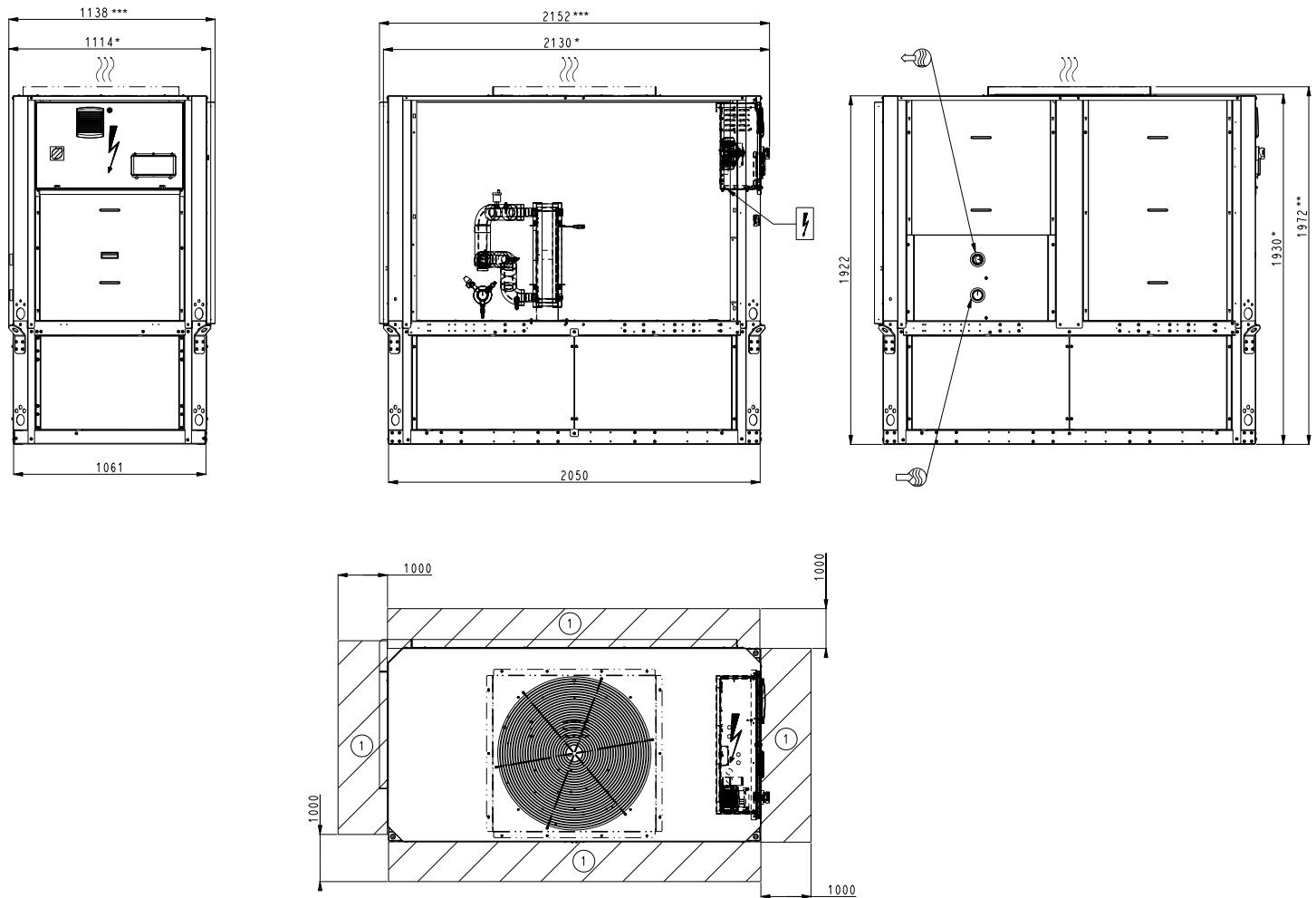
- Control box
- Water inlet
- Water outlet
- Required clearances for air flow
- Recommended clearances for maintenance
- Air outlet, do not obstruct
- Power cable entry

#### NOTES:

- A Non-certified drawings.  
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.
- B The unit must be installed level (less than 2 mm per metre deviation in both axes).

\* Overall dimensions

## 4.9 - 30RQS/RQSY 039-078 units with buffer tank module



### Legend:

All dimensions are given in mm

Control box

Water inlet

Water outlet

(1) Required clearances for air flow

(2) Recommended clearances for maintenance

Air outlet, do not obstruct

Power cable entry

### NOTES:

A Non-certified drawings.

Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

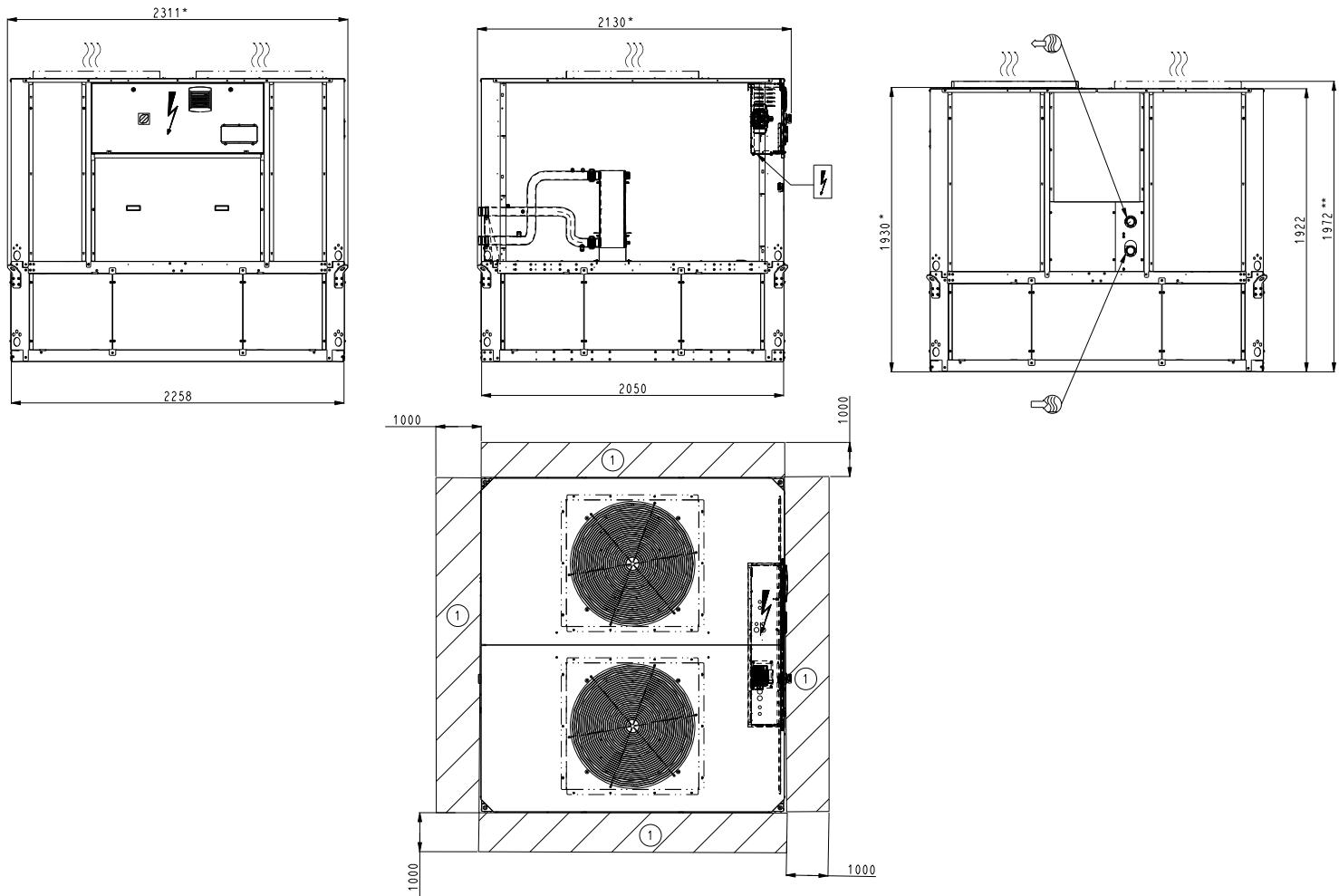
B The unit must be installed level (less than 2 mm per metre deviation in both axes).

\* Overall dimensions

\*\* RQSY

\*\*\* RQSY 050-060-070-078

## 4.10 - 30RQS/RQSY 080-160 units with buffer tank module



### Legend:

All dimensions are given in mm

Control box

Water inlet

Water outlet

(1) Required clearances for air flow

(2) Recommended clearances for maintenance

Air outlet, do not obstruct

Power cable entry

### NOTES:

A Non-certified drawings.

Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

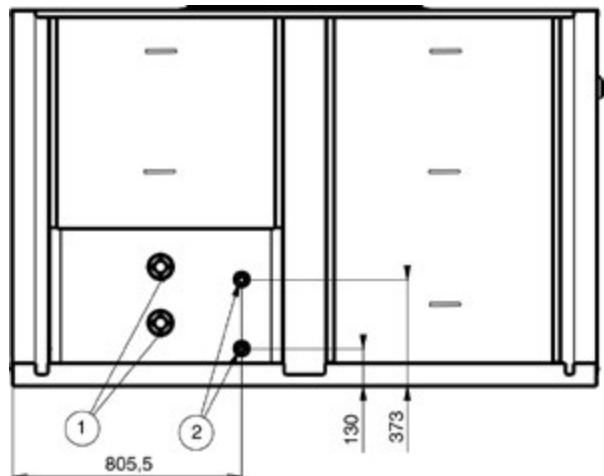
B The unit must be installed level (less than 2 mm per metre deviation in both axes).

\* Overall dimensions

\*\* RQSY

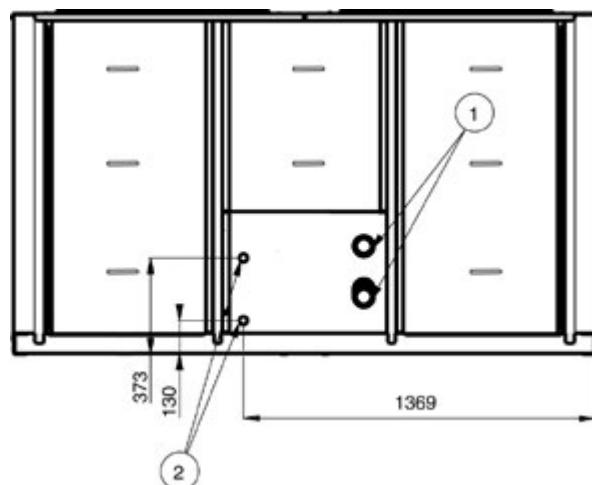
#### 4.11 - 30QBS/RQSY 039-080 units with desuperheater

Position of the desuperheater inlets and outlets



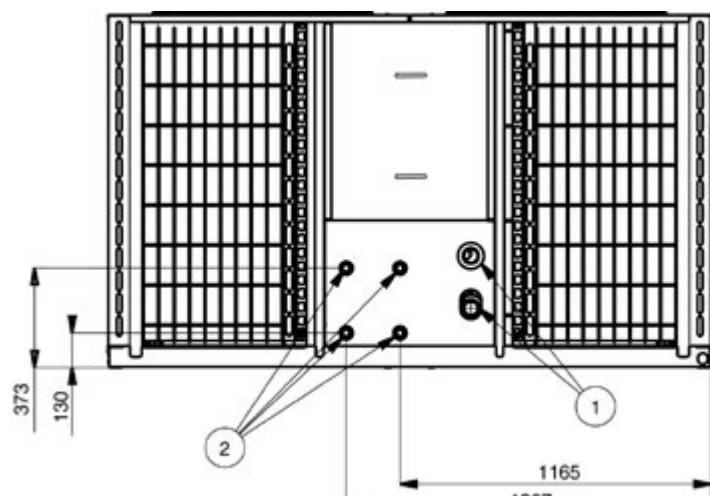
#### 4.12 - 30RQS/RQSY 090-120 units with desuperheater

Position of the desuperheater inlets and outlets



#### 4.13 - 30RQS/RQSY 140-160 units with desuperheater

Position of the desuperheater inlets and outlets



(1) Unit water inlet and outlet

(2) Water inlet and outlet, unit with option 49

## 5 - PHYSICAL DATA, 30RQS UNITS

For units with fans with variable available pressure (30RQSY 039-160) please refer to chapter 7.

30RQS	039	045	050	060	070	078	080	090	100	120	140	160
<b>Sound levels</b>												
<b>Standard unit</b>												
Sound power level <sup>(1)</sup>	dB(A)	80	81	81	86	87	87	84	84	84	90	90
Sound pressure level at 10 m <sup>(2)</sup>	dB(A)	49	49	49	55	55	55	52	52	52	58	58
<b>Standard unit + option 15LS</b>												
Sound power level <sup>(1)</sup>	dB(A)	79	80	80	80	80	80	83	83	83	83	83
Sound pressure level at 10 m <sup>(2)</sup>	dB(A)	48	48	48	48	48	48	51	51	51	51	51
<b>Dimensions</b>												
Length	mm	1090	1090	1090	1090	1090	1090	2273	2273	2273	2273	2273
Depth	mm	2109	2109	2109	2109	2109	2109	2136	2136	2136	2136	2136
Height without buffer tank module	mm	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330	1330
Height with buffer tank module	mm	1930	1930	1930	1930	1930	1930	1930	1930	1930	1930	1930
<b>Operating weight<sup>(3)</sup></b>												
<b>Standard unit without hydronic module</b>												
<b>Standard unit with hydronic module</b>												
Single high-pressure pump	kg	529	537	563	576	576	584	769	918	926	989	1093
Dual high pressure pump	kg	555	563	588	602	602	610	795	963	971	1037	1130
Single high-pressure pump + Buffer tank module option	kg	925	933	959	972	972	980	1202	1351	1359	1422	1526
Dual high pressure pump + Buffer tank module option	kg	951	959	984	998	998	1006	1228	1396	1404	1470	1563
<b>Compressors</b>												
Circuit A												
2	2	2	2	2	2	2	2	3	3	3	2	2
Circuit B												
-	-	-	-	-	-	-	-	-	-	-	2	2
No. of capacity steps	2	2	2	2	2	2	2	3	3	3	4	4
<b>Refrigerant charge<sup>(3)</sup></b>												
Circuit A												
R-410A	kg	12.5	13.5	16.5	17.5	18.0	16.5	21.5	27.5	28.5	33.0	19.0
teqCO <sub>2</sub>	kg	26.1	28.2	34.5	36.5	37.6	34.5	44.9	57.4	59.5	68.9	39.7
Circuit B												
kg	-	-	-	-	-	-	-	-	-	-	19.0	18.5
teqCO <sub>2</sub>	kg	-	-	-	-	-	-	-	-	-	-	39.7
<b>Oil charge</b>												
Circuit A												
POE SZ160 (EMKARATE RL-32-3MAF)	l	5.8	7.2	7.2	7.2	7.0	7.0	7.0	7.2	7.0	7.0	7.0
Circuit B												
l	-	-	-	-	-	-	-	-	-	-	7.0	7.0
<b>Capacity control type</b>												
Minimum capacity												
%	50	50	50	50	50	50	50	33	33	33	25	25
<b>Air heat exchangers</b>												
Fans												
Axial Flying Bird VI fans with rotating shroud												
Quantity	1	1	1	1	1	1	2	2	2	2	2	2
Maximum total air flow	l/s	3692	3690	3910	5285	5284	5282	7770	7380	7376	7818	10568
Maximum rotation speed	r/s	12	12	12	16	16	16	12	12	12	16	16
<b>Water heat exchanger</b>												
Direct-expansion plate heat exchanger												
Water volume	l	2.6	3.0	4.0	4.8	4.8	5.6	8.7	8.7	9.9	11.3	12.4
<b>Without hydronic module</b>												
Max. water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
<b>With hydronic module (option)</b>												
Single or dual pump (as selected)	Pump, Victaulic screen filter, relief valve, expansion tank, water + air purge valves, pressure sensors											
Expansion tank volume	l	12	12	12	12	12	12	35	35	35	35	35
Expansion tank pressure <sup>(4)</sup>	bar	1	1	1	1	1	1	1	1.5	1.5	1.5	1.5
Max. water-side operating pressure	kPa	400	400	400	400	400	400	400	400	400	400	400
<b>With Buffer tank module (option)</b>												
Single or dual pump (as selected)	Pump, Victaulic screen filter, relief valve, expansion tank, purge valves (water + air), pressure sensors											
Water volume	l	250	250	250	250	250	250	250	250	250	250	250
Expansion tank volume	l	18	18	18	18	18	18	35	35	35	35	35
Expansion tank pressure <sup>(4)</sup>	bar	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5
Max. water-side operating pressure	kPa	400	400	400	400	400	400	400	400	400	400	400
<b>Water connections with and without hydronic module</b>												
Connections												
inch	2	2	2	2	2	2	2	2	2	2	2	2
mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
<b>Chassis paint colour</b>												
Colour code RAL 7035												

<sup>(1)</sup> In dB ref=10<sup>-12</sup> 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.

<sup>(2)</sup> In dB ref 20 µPa, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). For information, calculated from the sound power level Lw(A).

<sup>(3)</sup> Weight shown is a guideline only. Please refer to the unit nameplate.

<sup>(4)</sup> When delivered, the standard pre-inflation of the tank is not necessarily the optimal value for the system. To permit changing the water volume, change the inflation pressure to a pressure that is close to the static head of the system. Fill the system with water (purging the air) to a pressure value that is 10 to 20 kPa higher than the pressure in the tank.

## 6 - ELECTRICAL DATA, 30RQS UNITS

For units with fans with variable available pressure (30RQSY 039-160) please refer to chapter 8.

30RQS - standard unit (without hydronic module)	039	045	050	060	070	078	080	090	100	120	140	160
<b>Power circuit</b>												
Nominal power supply	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
<b>Control circuit supply</b>												
<b>Maximum start-up current (Un)*</b>												
Standard unit	A	114	135	143	146	176	213	214	174	208	248	243
Unit with electronic starter option	A	75	87	94	96	114	140	140	125	150	176	186
<b>Unit power factor at maximum capacity**</b>												
<b>Maximum unit power input**</b>												
<b>Nominal unit current draw***</b>												
<b>Maximum unit current draw (Un)****</b>												
<b>Maximum unit current draw (Un-10%)†</b>												
<b>Customer-side unit power reserve</b>												
kW Customer reserve at the 24 V control power circuit												
<b>Short-circuit stability and protection</b>												
See table 9.1												

\* Maximum instantaneous start-up current at operating limit values (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

\*\* Power input, at the unit permanent maximum operating conditions (data given on the unit nameplate).

\*\*\* Standardised Eurovent conditions: water heat exchanger entering/leaving water temperature 12°C/7°C, outside air temperature 35°C.

\*\*\*\* Maximum unit current at 400 V, non permanent operating conditions (values given on the unit nameplate).

† Maximum unit operating current at 360 V, non permanent operating conditions.

## 7 - PHYSICAL DATA, 30RQSY UNITS

30RQSY	039	045	050	060	070	078	080	090	100	120	140	160	
<b>Sound levels</b>													
<b>Standard unit - for 160 Pa external static pressure</b>													
Sound power level at discharge <sup>(1)</sup>	dB(A)	84	84	84	87	87	87	87	87	87	90	90	
Sound pressure level radiated <sup>(1)</sup>	dB(A)	84	84	84	87	87	87	87	87	87	90	90	
Sound pressure level at 10 m <sup>(2)</sup>	dB(A)	53	53	53	55	55	55	56	56	56	58	58	
<b>Dimensions</b>													
Length	mm	2142/ 2307	2142/ 2307	2142/ 2307	2142/ 2307	2142/ 2307	2273	2273	2273	2273	2273	2273	
Width	mm	1132/ 1297	1132/ 1297	1132/ 1297	1132/ 1297	1132/ 1297	2122	2122	2122	2122	2122	2122	
Height without buffer tank module	mm	1371	1371	1371	1371	1371	1371	1371	1371	1371	1371	1371	
Height with buffer tank module	mm	1971	1971	1971	1971	1971	1971	1971	1971	1971	1971	1971	
<b>Operating weight<sup>(3)</sup></b>													
<b>Standard unit without hydronic module</b>													
<b>Standard unit with hydronic module</b>													
Single high-pressure pump	kg	542	549	582	596	597	604	783	952	962	1024	1123	1140
Dual high pressure pump	kg	568	575	608	622	623	630	809	997	1007	1072	1160	1177
Single high-pressure pump + Buffer tank module option	kg	938	945	978	992	993	1000	1216	1385	1395	1457	1556	1573
Dual high pressure pump + Buffer tank module option	kg	964	971	1004	1018	1019	1026	1242	1430	1440	1505	1593	1610
<b>Compressors</b>													
Hermetic scroll compressor 48.3 r/s													
Circuit A	2	2	2	2	2	2	2	3	3	3	2	2	
Circuit B	-	-	-	-	-	-	-	-	-	-	2	2	
No. of capacity steps	2	2	2	2	2	2	2	3	3	3	4	4	
<b>Refrigerant charge<sup>(3)</sup></b>													
R-410A													
Circuit A	kg	12.5	13.5	16.5	17.5	18.0	16.5	21.5	27.5	28.5	33.0	19.0	18.5
	teqCO <sub>2</sub>	26.1	28.2	34.5	36.5	37.6	34.5	44.9	57.4	59.5	68.9	39.7	38.6
Circuit B	kg	-	-	-	-	-	-	-	-	-	-	19	18.5
	teqCO <sub>2</sub>	-	-	-	-	-	-	-	-	-	-	39.7	38.6
<b>Oil charge</b>													
Circuit A	l	5.8	7.2	7.2	7.2	7.0	7.0	7.2	7.0	7.0	7.0	7.0	7.0
Circuit B	l	-	-	-	-	-	-	-	-	-	-	7.0	7.0
<b>Capacity control type</b>													
Touch Pilot Junior													
Minimum capacity	%	50	50	50	50	50	50	33	33	33	25	25	
<b>Air heat exchangers</b>													
Grooved copper tubes, aluminium fins													
<b>Fans</b>													
Axial Flying Bird VI fans with rotating shroud													
Quantity	1	1	1	1	1	1	2	2	2	2	2	2	
Maximum total air flow	l/s	3692	3690	3910	5278	4982	5267	7770	7380	7376	7818	9964	10534
Maximum speed	r/s	16	16	16	18	18	18	16	16	16	16	18	18
<b>Water heat exchanger (direct-expansion type)</b>													
Plate heat exchanger, max. water-side operating pressure without hydronic module 1000 kPa													
Water volume	l	2.6	3.0	4.0	4.8	4.8	5.6	8.7	8.7	9.9	11.3	12.4	14.7
<b>With hydronic module (option)</b>													
Single or dual pump (as selected)	Pump, Victaulic screen filter, safety valve, expansion tank, purge valves (water + air), pressure sensors												
Expansion tank volume	l	12	12	12	12	12	12	35	35	35	35	35	
Expansion tank pressure <sup>(4)</sup>	bar	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5	
Max. water-side operating pressure	kPa	400	400	400	400	400	400	400	400	400	400	400	
<b>With Buffer tank module (option)</b>													
Single or dual pump (as selected)	Pump, Victaulic screen filter, relief valve, expansion tank, purge valves (water + air), pressure sensors												
Water volume	l	250	250	250	250	250	250	250	250	250	250	250	
Expansion tank volume	l	18	18	18	18	18	18	35	35	35	35	35	
Expansion tank pressure <sup>(4)</sup>	bar	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5	
Max. water-side operating pressure	kPa	400	400	400	400	400	400	400	400	400	400	400	
<b>Water connections with / without hydronic module</b>													
Victaulic													
Connections	inch	2	2	2	2	2	2	2	2	2	2	2	
Outside diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	
<b>Chassis paint colour</b>													
Colour code RAL 7035													

(1) In dB ref=10<sup>-12</sup> 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.

(2) In dB ref 20 µPa, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3dB(A)). For information, calculated from the sound power level Lw(A).

(3) Weight shown is a guideline only. Please refer to the unit nameplate.

(4) When delivered, the standard pre-inflation of the tank is not necessarily the optimal value for the system. To permit changing the water volume, change the inflation pressure to a pressure that is close to the static head of the system. Fill the system with water (purging the air) to a pressure value that is 10 to 20 kPa higher than the pressure in the tank.

## 8 - ELECTRICAL DATA, 30RQSY UNITS

30RQSY - standard unit (without hydronic module)	039	045	050	060	070	078	080	090	100	120	140	160
<b>Power circuit</b>												
Nominal power supply	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
<b>Control circuit supply</b>		24 V, via internal transformer										
<b>Maximum start-up current (Un)*</b>												
Standard unit	A	116	137	145	148	176	213	219	179	213	253	244
Unit with electronic starter option	A	75	87	94	96	114	143	149	130	155	181	186
<b>Unit power factor at maximum capacity**</b>		0.83	0.81	0.81	0.83	0.81	0.83	0.83	0.83	0.81	0.79	0.81
<b>Maximum unit power input**</b>	kW	21	24	26	30	32	36	39	46	49	56	64
<b>Nominal unit current draw***</b>	A	28	32	36	39	43	53	59	61	67	83	86
<b>Maximum unit current draw (Un)****</b>	A	37	47	49	55	67	73	79	86	104	113	135
<b>Maximum unit current draw (Un-10%)†</b>	A	41	52	54	61	75	80	85	94	116	123	150
<b>Customer-side unit power reserve</b>	kW	Customer reserve at the 24 V control power circuit										
<b>Short-circuit stability and protection</b>		See table 9.1										

\* Maximum instantaneous start-up current at operating limit values (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

\*\* Power input, at the unit permanent maximum operating conditions (data given on the unit nameplate).

\*\*\* Standardised Eurovent conditions: water heat exchanger entering/leaving water temperature 12°C/7°C, outside air temperature 35°C.

\*\*\*\* Maximum unit current at 400 V, non permanent operating conditions (values given on the unit nameplate).

† Maximum unit operating current at 360 V, non permanent operating conditions.

## 9 - ELECTRICAL DATA, 30RQS AND 30RQSY UNITS

### 9.1 - Short-circuit stability current (TN system\*)

30RQS/RQSY	039	045	050	060	070	078	080	090	100	120	140	160
<b>Value with unspecified upstream protection</b>												
Short-term current at 1 s - Icw - kA rms	3.36	3.36	3.36	3.36	3.36	3.36	3.36	5.62	5.62	5.62	5.62	5.62
Admissible peak current - Ipk - kA pk	20	20	20	20	20	15	15	20	20	15	20	15
<b>Max. value with upstream protection (circuit breaker)</b>												
Conditional short-circuit current Icc - kA rms	40	40	40	40	40	40	40	40	40	40	30	30
Schneider circuit breaker - Compact series	NS100H	NS160H	NS160H	NS250H								
Reference number**	29670	29670	29670	29670	29670	29670	29670	29670	30670	30670	31671	31671

\* Earthing system type

\*\* If another current limitation protection system is used, its time-current and thermal constraint ( $I^2t$ ) trip characteristics must be at least equivalent to those of the recommended Schneider circuit breaker. Contact your nearest Carrier office.

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

### 9.2 - Electrical data, hydronic module

*The pumps that are factory-installed in these units comply with the European Ecodesign directive ErP. The additional electrical data required\* is as follows:*

#### Motors of single and dual low-pressure pumps (options 116T, 116U)

No.**	Description***	30RQS/RQSY												
		039	045	050	060	070	078	080	090	100	120	140	160	
1	Nominal efficiency at full load and nominal voltage	%	81,1	81,1	81,1	81,1	81,1	81,1	81,1	81,1	83,4	83,4	84,8	
1	Nominal efficiency at 75% rated load and nominal voltage	%	80,8	80,8	80,8	80,8	80,8	80,8	80,8	80,8	81,2	81,2	82,2	
1	Nominal efficiency at 50% rated load and nominal voltage	%	77,5	77,5	77,5	77,5	77,5	77,5	77,5	77,5	78,3	78,3	79	
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 name plates.											
4	Manufacturer's name and trademark, commercial registration number and place of manufacturer													
5	Product's model number													
6	Number of motor poles		2	2	2	2	2	2	2	2	2	2	2	2
7-1	Rated shaft power output at full load and nominal voltage (400 V)	kW	0,8	0,8	0,8	0,8	0,8	0,8	0,8	1,3	1,3	1,7	1,7	
7-2	Maximum power input (400 V)****	kW	1,1	1,1	1,1	1,1	1,1	1,1	1,1	1,6	1,6	2,4	2,4	
8	Rated input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	
9-1	Rated voltage	V	3 x 400											
9-2	Maximum current drawn (400 V)†	A	2,1	2,1	2,1	2,1	2,1	2,1	2,1	2,9	2,9	4,2	4,2	
10	Rated speed	rpm	2850	2850	2850	2850	2850	2850	2850	2890	2890	2870	2870	
		r/s	47	47	47	47	47	47	47	48	48	48	48	
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††											
	II - Ambient air temperature	°C	< 55											
	IV - Maximum air temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.											
	V - Potentially explosive atmospheres		Non-ATEX environment											

\* Required by regulation 640/2009 with regard to the application of directive 2009/125/EC on the eco-design requirements for electric motors

\*\* Item number imposed by regulation 640/2009, annex I2b.

\*\*\* Description given by regulation 640/2009, annex I2b.

\*\*\*\* To obtain the maximum power input for a unit with hydronic module add the maximum unit power input from the electrical data table to the pump power input.

† To obtain the maximum unit operating current draw for a unit with hydronic module add the maximum unit current draw from the electrical data table to the pump current draw.

†† Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.

## Motors of single and dual high-pressure pumps (option 116R, 116S, 116V, 116W)

No.** Description***		30RQS/RQSY													
		039	045	050	060	070	078	080	090	100	120	140	160		
1	Nominal efficiency at full load and nominal voltage	%	84,8	84,8	84,8	84,8	84,8	84,8	84,8	84,8	85,9	85,9	85,9	85,9	
1	Nominal efficiency at 75% rated load and nominal voltage	%	82,2	82,2	82,2	82,2	82,2	82,2	82,2	82,2	82,2	84	84	84	
1	Nominal efficiency at 50% rated load and nominal voltage	%	79	79	79	79	79	79	79	79	82,1	82,1	82,1	82,1	
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 name plates.												
4	Manufacturer's name and trademark, commercial registration number and place of manufacturer														
5	Product's model number														
6	Number of motor poles		2	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Rated shaft power output at full load and nominal voltage (400 V)	kW	1,7	1,7	1,7	1,7	1,7	1,7	1,7	1,7	2,2	2,2	2,2	2,2	2,2
7-2	Maximum power input (400 V)****	kW	2,4	2,4	2,4	2,4	2,4	2,4	2,4	2,4	2,9	2,9	2,9	2,9	2,9
8	Rated input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Rated voltage	V	3 x 400												
9-2	Maximum current drawn (400 V)†	A	4,2	4,2	4,2	4,2	4,2	4,2	4,2	4,2	5	5	5	5	5
10	Rated speed	rpm	2870	2870	2870	2870	2870	2870	2870	2870	2855	2855	2855	2855	2855
		r/s	48	48	48	48	48	48	48	48	48	48	48	48	48
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††												
II	- Ambient air temperature	°C	< 55												
IV	- Maximum air temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.												
V	- Potentially explosive atmospheres		Non-ATEX environment												

\* Required by regulation 640/2009 with regard to the application of directive 2009/125/EC on the eco-design requirements for electric motors

\*\* Item number imposed by regulation 640/2009, annex I2b.

\*\*\* Description given by regulation 640/2009, annex I2b.

\*\*\*\* To obtain the maximum power input for a unit with hydronic module add the maximum unit power input from the electrical data table to the pump power input.

† To obtain the maximum unit operating current draw for a unit with hydronic module add the maximum unit current draw from the electrical data table to the pump current draw.

†† Above 1000 m, a degradation of 3% for each 500 m should be taken into consideration.

## 9.3 - Compressor usage and electrical data for standard units

Compressor	I Nom	I Max (Un)	I Max (Un-10%)	LRA* A	LRA** A	Cosine phi max.	Circuit	30RQS/30RQSY							
								039	045	050	060	070	078	080	090
ZP90	11.4	16	17.6	95	57	0.82	A	2	-	-	-	-	-	-	-
							B	-	-	-	-	-	-	-	-
ZP103	13.1	21	23.1	111	67	0.84	A	-	2	-	-	-	-	-	-
							B	-	-	-	-	-	-	-	-
ZP120	15.1	22	24.3	118	71	0.84	A	-	-	2	-	-	-	-	-
							B	-	-	-	-	-	-	-	-
ZP137	16.6	25	27.8	118	71	0.86	A	-	-	-	2	-	-	3	-
							B	-	-	-	-	-	-	-	-
ZP154	18.7	31	34.9	140	84	0.85	A	-	-	-	-	2	-	-	3
							B	-	-	-	-	-	-	-	2
ZP182	23.9	34	37.3	174	104	0.84	A	-	-	-	-	2	2	-	3
							B	-	-	-	-	-	-	-	2
<b>Total circuit A</b>								2	2	2	2	2	2	2	2
<b>Total circuit B</b>								-	-	-	-	-	-	-	2

I Nom Nominal current draw at Eurovent conditions (see definition of conditions under nominal unit current draw), A

I Max Maximum operating current at 360 V, A

\* Locked rotor current at nominal voltage, A

\*\* Locked rotor current at nominal voltage, electronic starter

#### Electrical data and operating conditions notes:

- 30RQS/RQSY 039-160 units have a single power connection point located immediately upstream of the field power connections.
- The control box includes the following standard features:
  - Starter and motor protection devices for each compressor, the fans and the pump,
  - The control devices.
  - A main disconnect switch can be installed within the box with the option 70.
- Field connections:**  
All connections to the system and the electrical installations must be in full accordance with all applicable local codes.
- The Carrier 30RQS/RQSY units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60204-1 (machine safety - electrical machine components - part 1: general regulations - corresponds to IEC 60204-1) are specifically taken into account, when designing the electrical equipment\*.
- An auxiliary contactor is available with the QF breaker allowing a safety channel installation to ensure a feedback output about heater and board power supply status and then prevent evaporator from frosting when heaters and boards are off.

#### NOTES:

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60204-1 is the best means of ensuring compliance with the Machines Directive § 1.5.1.
- Annex B of EN 60204-1 describes the electrical characteristics used for the operation of the machines.
- The operating environment for the 30RQS/RQSY units is specified below:
- 1. Environment\*\* - Environment as classified in EN 60721 (corresponds to IEC 60721):
  - outdoor installation\*\*
  - ambient temperature range: -20°C to +48°C, class 4K4H

- altitude: ≤ 2000 m (see note for table 9.2 - Electrical data, hydronic module)
- presence of hard solids, class 4S2 (no significant dust present)
- presence of corrosive and polluting substances, class 4C2 (negligible)
- Power supply frequency variation: ± 2 Hz.
- The neutral (N) conductor must not be connected directly to the unit (if necessary use a transformer).
- Overcurrent protection of the power supply conductors is not provided with the unit.
- The factory-installed disconnect switch (option 70) is of a type suitable for power interruption in accordance with EN 60947.
- The units are designed for simplified connection on TN(s) networks (IEC 60364). For IT networks provide a local earth and consult competent local organisations to complete the electrical installation. Units delivered with speed drive (options 28 and 116V/W) are not compatible with IT network.
- Derived currents: If protection by monitoring of derived currents is necessary to ensure the safety of the installation, the control of the cut-out value must take the presence of leak currents into consideration that result from the use of frequency converters in the unit. A value of at least 150 mA is recommended to control differential protection devices.

**Caution: 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 absence of main power disconnect switch on standard machines is an exception that must be taken in account at field installation level.

\*\* The required protection level for this class is IP43BW (according to reference document IEC 60529). All 30RQS/RQSY units fulfil this protection condition:
 

- Closed electrical box is IP44CW
- Open electrical box (when accessing to interface) is IPxxB

## 10 - APPLICATION DATA

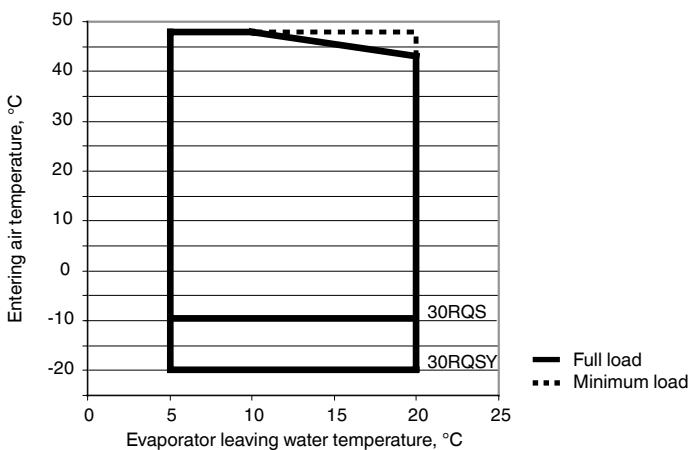
### 10.1 - Operating range, standard units - cooling mode

Evaporator	Minimum	Maximum
Entering water temperature at start-up	°C 7.5*	30
Leaving water temperature during operation	°C 5**	20
Entering/leaving water temperature difference	K 3	10
Condenser	Minimum	Maximum
Entering air temperature 30RQS***	°C -10	48
Entering air temperature 30RQSY***	°C -20	48
Hydronic module****		
Entering air temperature		
Kit without pump	°C -20	-
Kit with pump (option 116x)	°C 0	-
Kit with (option 116x) et frost protection option to -20°C (option 42)	°C -20	-
Kit with buffer tank (option 307)	°C 0	-
Kit with buffer tank (option 307) and frost protection option to -20°C (option 42B)	°C -20	-

**Note:** Do not exceed the maximum operating temperature.

- For entering water temperatures below 7.5°C at start-up, contact Carrier.
- For low-temperature applications, where the leaving water temperature is below 5°C, a frost protection solution must be used.
- For transport and storage of the 30RQS/30RQSY units the minimum and maximum allowable temperatures are -20°C and +48°C. It is recommended that these temperatures are used for transport by container.
- Defines the frost-free temperature of the hydronic components for use without glycol.

### 30RQS/RQSY - cooling mode



**NOTE: This operating range applies up to 130 Pa static pressure without suction air duct for sizes 060, 070 and 078 and 140-160, and up to 240 Pa for all other sizes.**

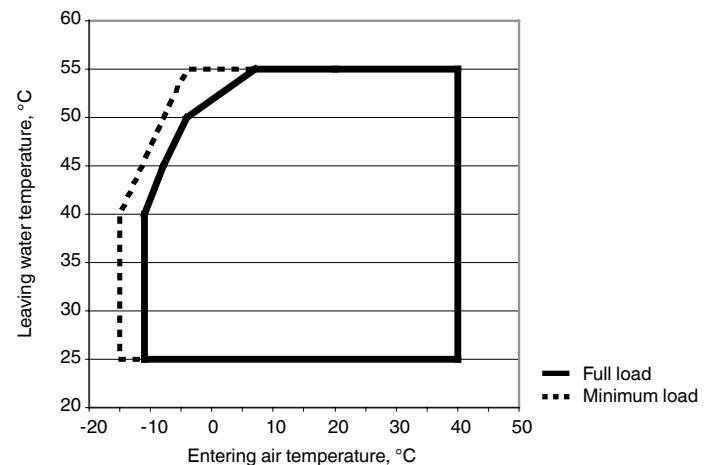
### 10.2 - Operating range, standard units - heating mode

Condenser	Minimum	Maximum
Entering water temperature at start-up	°C 8	45
Leaving water temperature during operation	°C 25	55
Entering/leaving water temperature difference	K 3	10
Evaporator	Minimum	Maximum
Air temperature	°C -15	40
Hydronic module*		
Entering air temperature		
Kit without pump	°C -20	-
Kit with pump (option 116x)	°C 0	-
Kit with (option 116x) et frost protection option to -20°C (option 42)	°C -20	-
Kit with buffer tank (option 307)	°C 0	-
Kit with buffer tank (option 307) and frost protection option to -20°C (option 42B)	°C -20	-

**Note:** Do not exceed the maximum operating temperature.

\* Defines the frost-free temperature of the hydronic components for use without glycol.

### 30RQS/RQSY - heating mode



## 10.3 - Water heat exchanger water flow rate

30RQS/ RQSY	Flow rate, l/s			
	Minimum	Maximum*	Maximum dual pump** Low pressure***	High pressure***
039	0.9	3.0	2.9	3.4
045	0.9	3.4	3.2	3.8
050	0.9	4.2	3.7	4.4
060	0.9	5.0	4.1	5.0
070	1.0	5.0	4.1	5.0
078	1.2	5.5	4.4	5.2
080	1.2	6.8	5.1	6.2
090	1.3	6.8	5.1	6.2
100	1.5	7.7	6.3	6.5
120	1.7	8.5	6.5	8.0
140	2.0	10.6	7.9	8.7
160	2.3	11.2	8.2	8.9

\* Maximum flow rate at a pressure drop of 100 kPa in the plate heat exchanger (unit without hydronic module).

\*\* Maximum flow rate at an available pressure of 20 kPa (unit with low-pressure hydronic module) or 50 kPa (high-pressure module).

\*\*\* Maximum flow rate with single pump is 2 to 4% higher, depending on the size

## 10.4 - Minimum water flow rate

If the installation flow rate is below the minimum flow rate, there is a risk of excessive fouling.

## 10.5 - Maximum water heat exchanger water flow rate

This is limited by the permitted water heat exchanger pressure drop. Also, a minimum water heat exchanger  $\Delta T$  of 2.8 K must be guaranteed, which corresponds to a water flow rate of 0.09 l/s per kW.

## 10.6 - Water loop volume

### 10.6.1 - Minimum water loop volume

The minimum water loop volume, in litres, is given by the following formula:

Volume (l) = CAP (kW) x N, where CAP is the nominal cooling capacity at nominal operating conditions.

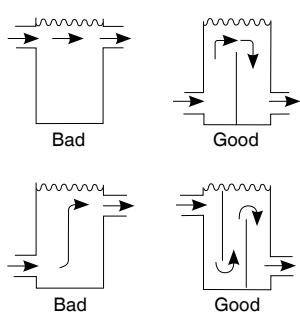
Application	N
Air conditioning	2.5*
Industrial process cooling	(See note)

\* For sizes 039 to 120, N can be increased up to 4 depending on the size of the hot-water loop to prevent a water temperature drop during the defrost cycle.

**NOTE:** For industrial process cooling applications, where high stability of the water temperature levels must be achieved, the values above must be increased.

This volume is required to obtain temperature stability and precision. To achieve this volume, it may be necessary to add a storage tank to the circuit. This tank should be equipped with baffles to allow mixing of the fluid (water or brine). Please refer to the examples below.

For the Buffer Tank Module option, the tank volume must be taken into account: 250 litres.



### 10.6.2 - Maximum water loop volume

Units with hydronic module incorporate an expansion tank that limits the water loop volume. The table below gives the maximum loop volume for pure water or ethylene glycol with various concentrations.

30RQS/RQSY		039-078 without buffer tank			080-160 without buffer tank		
Static pressure	bar	1	2	3	1	2	3
Pure water	litres	597	398	199	1741	1161	580
10% ethylene glycol	l	471	314	157	1373	915	458
20% ethylene glycol	l	389	259	130	1135	757	378
30% ethylene glycol	l	348	232	116	1014	676	338
40% ethylene glycol	l	289	193	96	843	562	281

30RQS/RQSY		039-078 with buffer tank			080-160 with buffer tank		
Static pressure	bar	1	2	3	1	2	3
Pure water	litres	896	597	299	1741	1161	580
10% ethylene glycol	l	706	471	235	1373	915	458
20% ethylene glycol	l	584	389	195	1135	757	378
30% ethylene glycol	l	522	348	174	1014	676	338
40% ethylene glycol	l	434	289	145	843	562	281

If the total system volume is higher than the values given above, the installer must add another expansion tank, suitable for the additional volume.

**Note:** Take into account the buffer tank volume (250 litres)

## 11 - ELECTRICAL CONNECTION

### 11.1 - Control box

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

### 11.2 - 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 the certified dimensional drawings.

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

### 11.3 - Voltage phase imbalance (%)

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

#### Example:

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

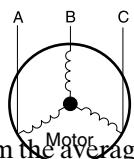
$$AB = 406 \text{ V}; BC = 399 \text{ V}; AC = 394 \text{ V}$$

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

Calculate the maximum deviation from the 400 V average:  $(AB) = 406 - 400 = 6$

$$(BC) = 400 - 399 = 1$$

$$(CA) = 400 - 394 = 6$$



The maximum deviation from the average is 6 V. The greatest percentage deviation is:  $100 \times 6/400 = 1.5\%$

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

#### 11.4 - 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 ensure easy connection and define any modifications necessary on site.

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

The calculations are based on the maximum machine current (see electrical data tables), and standard installation practices, in accordance with IEC 60364, table 52C have been applied (30RQS units are installed outside):

- No. 17: suspended aerial lines,
- No. 61: buried conduit with a derating coefficient of 20.

The calculation is based on PVC or XLPE insulated cables with copper core. A maximum ambient temperature of 46°C has been taken into consideration. The given wire length limits the voltage drop to < 5% (length L in metres - see table below).

**IMPORTANT:** Before connection of the main power cables (L1 - L2 - L3) on the terminal block, it is imperative to check the correct order of the 3 phases before proceeding to the connection.

#### Power cable entry

The power cables can enter the control box from below or

from the side of the unit, at the bottom of the angle iron. Pre-punched holes facilitate the entry. Refer to the certified dimensional drawing for the unit. A removable aluminium plate below the control box allows introduction of the cables.

#### 11.5 - Field control wiring

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

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

Refer to the 30RB/30RQ Touch Pilot Junior control manual and the certified wiring diagram supplied with the unit for the field control wiring of the following features:

- Water heat exchanger pump interlock (mandatory)
- Remote on/off switch
- Demand limit external switch
- Remote dual set point
- Alarm, alert and operation report
- Heating/cooling selection

#### 11.6 - Power supply

**ATTENTION:** After the unit has been commissioned, 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 and stored (e.g. during the winter or if the unit does not need to generate cooling) the power supply must be maintained to ensure supply to the heaters (compressor oil crankcase heaters, unit frost protection).

After all possible options have been connected, the transformer ensures the availability of a usable 24 VA or 1 A power reserve for the control circuit on site.

Minimum and maximum connectable wire sections (per phase) for 30RQS units								
30RQS/ RQSY	Standard (without disconnect switch)		With disconnect switch (option 70)		Connectable wire			
	Max. connection capacity		Minimum calculated section			Maximum calculated section		
	Section, mm <sup>2</sup>	Section, mm <sup>2</sup>	Section, mm <sup>2</sup>	Max. length, m	Wire type	Section, mm <sup>2</sup>	Max. length, m	Wire type
039	1 x 95	1 x 95	1 x 16	165	XLPE Cu	1 x 25	300	PVC Cu
045	1 x 95	1 x 95	1 x 16	165	XLPE Cu	1 x 25	300	PVC Cu
050	1 x 95	1 x 95	1 x 16	165	XLPE Cu	1 x 25	300	PVC Cu
060	1 x 95	1 x 95	1 x 25	210	XLPE Cu	1 x 35	305	PVC Cu
070	1 x 95	1 x 95	1 x 35	220	XLPE Cu	1 x 50	350	PVC Cu
078	1 x 95	1 x 95	1 x 35	220	XLPE Cu	1 x 70	380	PVC Cu
080	1 x 95	1 x 95	1 x 35	220	XLPE Cu	1 x 70	380	PVC Cu
090	1 x 95	1 x 95	1 x 35	220	XLPE Cu	1 x 70	380	PVC Cu
100	1 x 95	1 x 95	1 x 70	280	XLPE Cu	1 x 95	410	PVC Cu
120	1 x 95	1 x 95	1 x 70	280	XLPE Cu	1 x 95	410	PVC Cu
140	1 x 185	1 x 185	1 x 95	305	XLPE Cu	1 x 185	465	PVC Cu
160	1 x 185	1 x 185	1 x 120	320	XLPE Cu	1 x 185	465	PVC Cu

Note: Power supply cable section (see the wiring diagrams supplied with the unit)

## 12 - WATER CONNECTIONS

For size and position of the unit water inlet and outlet connections refer to the certified dimensional drawings supplied with the unit. The water pipes must not transmit any radial or axial force to the heat exchangers nor any vibration.

The water supply must be analysed and appropriate filter-ing, treatment, control devices, shut-off and bleed valves and circuits built in, to prevent corrosion (example: damage to the protection of the tube surface if the fluid is polluted), fouling and deterioration of the pump fittings.

Before any start-up verify that the heat exchange fluid is compatible with the materials and the water circuit coating.

In case additives or other fluids than those recommended by Carrier are used, ensure that the fluids are not considered as a gas, and that they belong to class 2, as defined in directive 2014/68/EU.

The pumps in the hydronic module are compatible with 40% propylene glycol and 40% ethylene glycol. But if these fluids are used, the pump fittings need to be replaced more frequently (every 15000 operating hours instead of 25000 hours for an applicacation using water).

### Carrier recommendations on heat exchange fluids:

- No  $\text{NH}_4^+$  ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.
- $\text{Cl}^-$  Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 125 mg/l.
- $\text{SO}_4^{2-}$  sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  ions with non negligible levels of dis-solved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1mg/l.
- Water hardness: >0.5 mmol/l. Values between 1 and 2.5 mmol/l can be recommended. This will facilitate scale deposit that can limit corrosion of copper. Values that are too high can cause piping blockage over time. A total alkalimetric titre (TAC) below 100 is desirable.
- Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encou-rages destabilisation of copper hydroxides and enlarge-ment of particles.
- Electric conductivity: 0.001-0.06 S/m (10-600  $\mu\text{S}/\text{cm}$ ).
- pH: Ideal case pH neutral at 20-25°C (7 < pH < 8).

**ATTENTION: Charging, adding or draining fluid from the water circuit must be done by qualified personnel, using air vents and materials suitable for the products. Water circuit charging devices are field-supplied. Charging and removing heat exchange fluids should be done with devices that must be included on the water circuit by the installer. Never use the unit heat exchangers to add heat exchange fluid.**

### 12.1 - Operating precautions and recommendations

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

- Comply with the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit.
- Use a pressure reducer to maintain pressure in the circuit(s) and install a safety valve as well as an expansion tank. Units with the hydronic module include a safety valve and an expansion tank.
- Install thermometers in both the entering and leaving water connections.
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install stop valves,close to the entering and leaving water connections.
- Use flexible connections to reduce vibration transmission.
- Insulate all pipework, after testing for leaks, both to reduce thermal leaks and to prevent condensation.
- Wrap the insulations with a demisting screen.
- If the external unit water pipes are in an area where the ambient temperature is likely to fall below 0°C, they must be protected against frost (frost protection solution or electric heaters).
- The use of different metals on hydraulic piping could generate eletrolytic pairs and consequently corrosion. It could be needed to add sacrificial anodes.

**NOTE: For units not equipped with a hydronic module a screen filter must be installed. This must be installed on the water entering pipes upstream of the pressure gauge and close to the unit heat exchanger. It must be located in a position that is easily accessible for removal and cleaning. The mesh size of the filter must be 1.2 mm.**

**The plate heat exchanger can foul up quickly at the initial unit start-up, as it complements the filter function, and the unit operation will be impaired (reduced water flow rate due to increased pressure drop).**

**Units with hydronic module are equipped with this type of filter.**

**Do not introduce any significant static or dynamic pressure into the heat exchange circuit (with regard to the design operating pressures).**

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

**ATTENTION: Use of units in an open loop is forbidden.**

## 12.2 - Hydronic connections

The hydronic circuit diagram shows a typical hydronic installation. When charging the water circuit use air vents to evacuate any residual air pockets.

## 12.3 - Frost protection

The plate heat exchangers, the piping and the hydronic module pump can be damaged by frost, despite the built-in anti-freeze protection of the units.

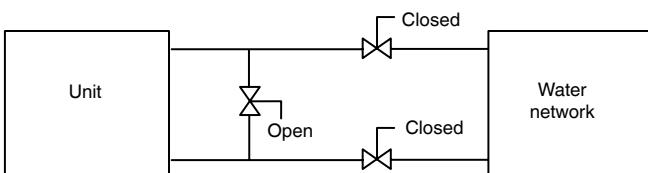
Frost protection of the plate heat exchanger and all hydronic circuit components is guaranteed:

- Down to -20°C by electric heaters (heat exchanger and internal piping) that have an automatic supply (units without hydronic module),
- Down to 0°C by an electric heater on the heat exchanger that has an automatic supply and by pump cycling (units with hydronic module with or without buffer tank),
- Down to -20°C by electric heaters (heat exchanger, internal piping and buffer tank module if present) that have an automatic supply and by pump cycling (units with hydronic module and “Reinforced frost protection” option).

Never switch off the water heat exchanger and hydronic circuit heaters or the pump, otherwise frost protection cannot be guaranteed. For this reason the main unit or customer circuit disconnect switch as well as the auxiliary protection switch for the heaters must always be left closed.

To ensure frost protection of the units with hydronic module water circulation in the water circuit must be maintained by periodically switching on the pump. If a shut-off valve is installed, a bypass must be included as shown below.

**Winter position**



**IMPORTANT: Depending on the atmospheric conditions in your area you must do the following when switching the unit off in winter:**

- Add ethylene glycol or propylene glycol with an adequate concentration to protect the installation up to a temperature of 10 K below the lowest temperature likely to occur at the installation site.
- If the unit is not used for an extended period, it should be drained, and ethylene glycol or propylene glycol should be charged in the heat exchanger as a safety precaution, using the water inlet purge valve connection.
- At the start of the next season, refill the unit with water and add an inhibitor.
- For the installation of auxiliary equipment, the installer must comply with basic regulations, especially for minimum and maximum flow rates, which must be between the values listed in the operating limit table (application data).

- To prevent corrosion by differential aeration, the complete drained heat transfer circuit must be charged with nitrogen for a period of one month. If the heat transfer fluid does not comply with the Carrier regulations, the nitrogen charge must be added immediately.

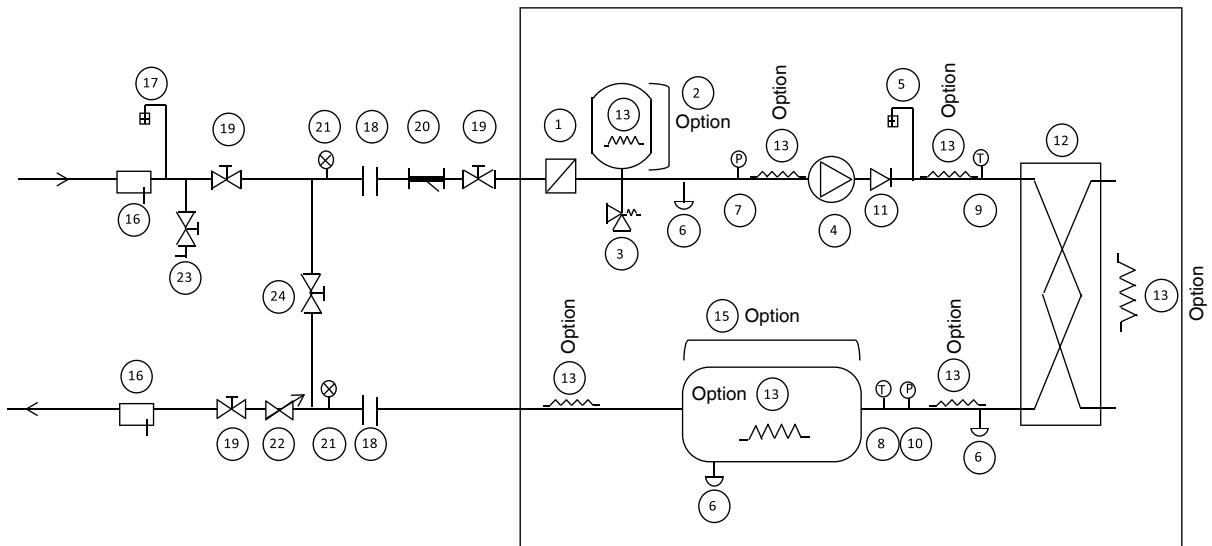
## 12.4 - Protection against cavitation (option 116)

To ensure the durability of the pumps in the integrated hydronic modules, the control algorithm of the 30RQS/RQSY units incorporates anti-cavitation protection.

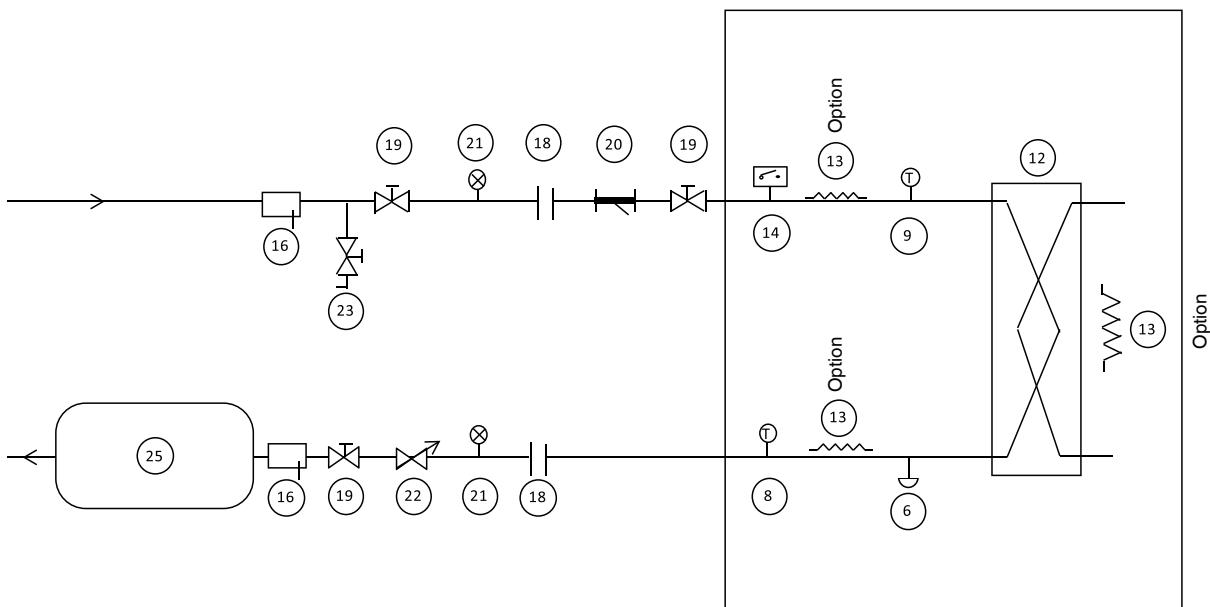
It is therefore necessary to ensure a minimum pump entering pressure of 60 kPa (0.6 bar) during operation and at shut-down. A pressure below 60 kPa will prohibit unit start-up or cause an alarm with the unit shutting down. In order to obtain sufficient pressure, it is recommended:

- to pressurise the hydronic circuit between 100 kPa and 400 kPa (1 and 4 bar) maximum on the suction side of the pump,
- to clean the hydronic circuit before charging water (see chapters 13.2, 13.3 and 13.4),
- to regularly clean the screen filter,

## Typical hydronic circuit diagram with hydronic module



## Typical hydronic circuit diagram without hydronic module



### Legend

#### Components of the unit and hydronic module

- 1 Screen filter (Mesh1.2 mm)
- 2 Expansion tank (option)
- 3 Discharge valve
- 4 Available pressure pump (single pump, or dual pump)
- 5 Air purge
- 6 Water drain valve
- 7 Pressure sensor
- 8 Temperature probe
- 9 Temperature probe
- 10 Pressure sensor
- 11 Check valve (If dual pump)
- 12 Plate heat exchanger
- 13 Heater or tracer for frost protection (Option)
- 14 Flow sensor for water heat exchange
- 15 Buffer tank module (option)

#### Installation components

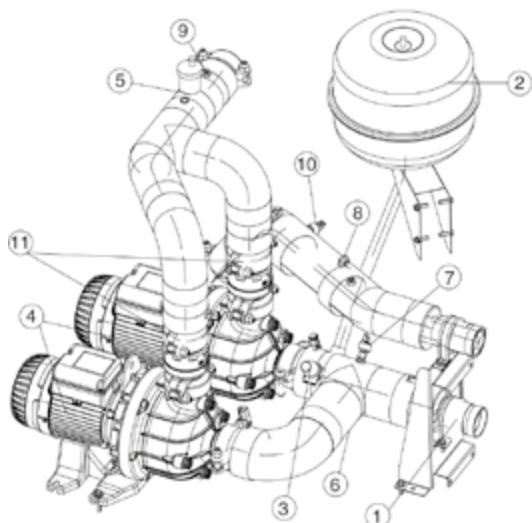
- 16 Thermowell
- 17 Air purge
- 18 Flexible connexion
- 19 Shut-off valve
- 20 Screen filter (obligatory for a unit without hydronic module)
- 21 Pressure gauge
- 22 Water flow control valve
- 23 Charge valve
- 24 Frost protection bypass valve (when shut-off valves (19) are closed during winter)
- 25 Buffer tank (if necessary)

--- Hydronic module (unit with hydronic module)

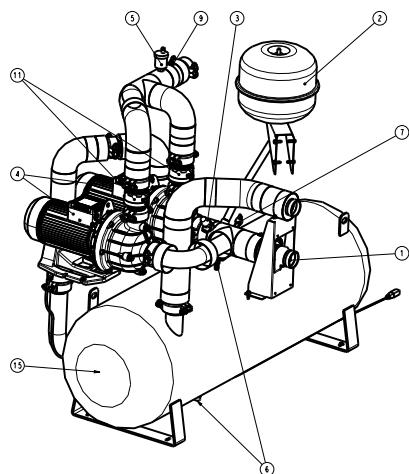
#### Notes:

- The system must be protected against frost.
- The hydronic module of the unit and the exchanger can be protected (option factory installed) against frost with electric heaters and tracers (13).
- The pressure sensors are installed at connections without Schraeder valves. Depressurise and drain the system before any intervention.

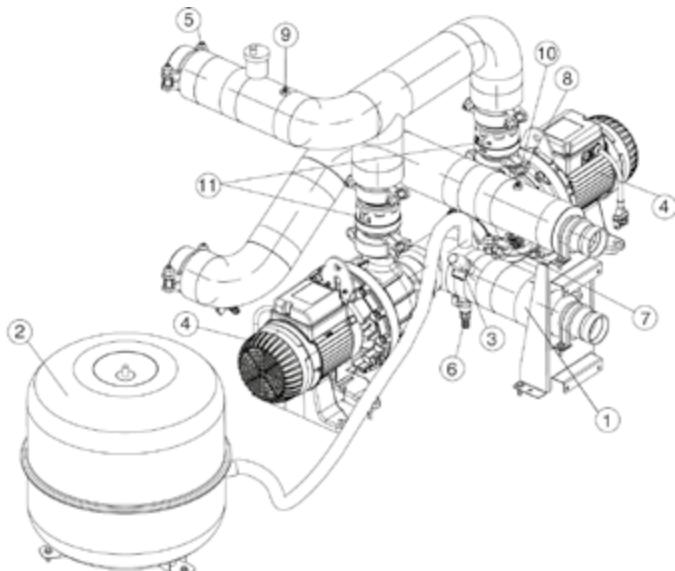
**Hydronic module - sizes 039-078**  
Dual pump shown



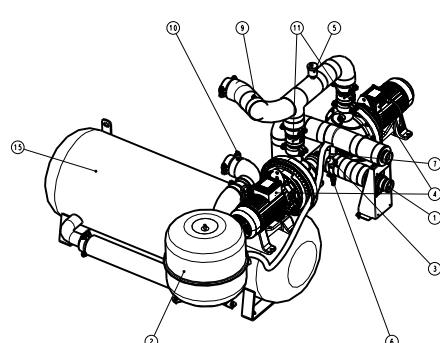
**Hydronic module - sizes 039-080**  
Dual pump and buffer tank shown



**Hydronic module - sizes 080-160**  
Dual pump shown



**Hydronic module - sizes 090-160**  
Dual pump and buffer tank shown



## 13 - NOMINAL SYSTEM WATER FLOW CONTROL

Refer to the chapter "Water connections" for all references points mentioned in this chapter.

The water circulation pumps of unit range have been designed to allow the hydronic modules to operate at each possible conditions, i.e. with chilled water temperature differences at full load from 3 to 10 K.

This temperature difference required between the water inlet and outlet determines the nominal flow of the system. Use the specification provided while selecting the unit to determine the operating conditions of the system.

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

- Units without hydronic module : the nominal unit pressure drop. This is measured with pressure gauges that must be (field) installed at the inlet and outlet of the unit (item 21).
- Units with fixed speed pumps : nominal flow rate. The pressure of the fluid is measured by sensors at the inlet of the pump and outlet of the unit (items 7 and 10). The controls then calculate the flow rate associated with this pressure difference and display the result on the user interface. (refer to unit control manual).
- Units with variable speed pumps : the constant pressure differential control based on readings at the hydronic module inlet and outlet. The buffer tank module option is not taken into account.
- Units with variable speed pumps : the control on temperature difference measured at the heat exchanger inlet and outlet.

If this information is not available at the start-up of the system, contact the technical service department responsible for the installation to obtain them .

These data can be obtained either from the technical document with unit performance tables for a Delta T° of 5 K at the evaporator, or with the help of the "Electronic Catalog" selection program for all conditions of Delta T° different from 5 K in the range of 3 to 10 K.

### 13.1 - Units without hydronic module

#### 13.1.1 - General information

The nominal flow of the unit will be set using a manual valve that should be installed on the outlet of the unit (item 19 on the schematic hydronic circuit). Changing the pressure drop of the valve allows adjustment of the system flow rate to achieve the design flow rate.

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

#### 13.1.2 - Procedure for cleaning the hydronic circuit

- Open the valve completely (item 22).
- Start-up the system pump.
- Read the pressure drop of the plate heat exchanger as the difference between the unit inlet and outlet pressures (item 21).
- Let the pump run for 2 hours consecutively to clean up the hydronic circuit of the system (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 19) and remove then clean the filters (items 20 and 1) after draining the hydronic part of the unit (item 6).
- Remove the air from the circuit (items 5 and 17).
- Repeat until the filter remains clean.

#### 13.1.3 - Procedure for controlling the water flow

Once the circuit is cleaned, read the pressures on the pressure gauges (water inlet and outlet pressure) 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.

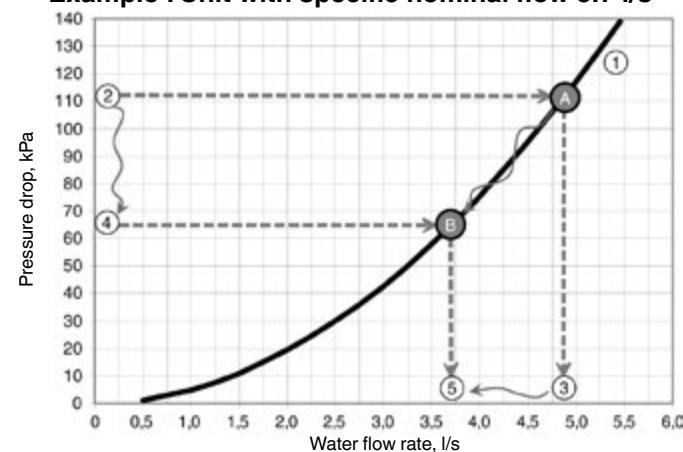
If the pressure drop reading is above the specified value, this indicates that the flow at the terminals of the unit (and hence in the system) is too high. In this case, close the control valve and read the new difference in pressure. Repeat as necessary until the pressure drop corresponding to the design flow rate is achieved.

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

To reduce the hydraulic system pressure drop:

- Reduce the pressure drops of individual components (bends, level changes, valves etc.) as much as possible
- Use the correct pipe diameter
- Do not extend the piping system.

#### Example : Unit with specific nominal flow 3.7 l/s



#### Legend

- 1 "Unit pressure drop (including internal water piping)/flow rate" curve
- 2 With the valve open the pressure drop read (111 kPa) gives point A on the curve.  
**A** Operating point reached with the valve open.
- 3 With the valve open the flow rate achieved is 4.8 l/s: this is too high, and the valve must be closed again.
- 4 If the valve is partially closed, the pressure drop read (65 kPa) gives point B on the curve.  
**B** Operating point reached with the valve partially closed.
- 5 With the valve partially closed the flow rate achieved is 3.7 l/s: this is the required flow rate and the valve is in an adequate position.

## 13.2 - Units with hydronic module and fixed-speed pump

### 13.2.1 - General information

See chapter "Units without hydronic module".

### 13.2.2 - Procedure for cleaning the hydronic circuit

- Open all valves completely (item 19).
- Start-up the system pump.
- Let the pump run for 2 hours consecutively to clean up the hydronic circuit of the system (presence of contaminating solids).
- Perform another reading.
- Compare this value to the initial value.

A reducing value of the flow indicates that the filters on the system need to be removed and cleaned. In this case, close the Shut-off valves on the water inlet and outlet (item 19) and remove the filters (items 20 and 1) after draining the hydronic part of the unit (item 6).

- Remove the air from the circuit (items 5 and 14).
- Repeat until the filter remains clean.

### 13.2.3 - Procedure for controlling water flow

Once the circuit is cleaned, read the flow value on the user interface and compare it with design value for the system. 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 against the available static pressure generated by the pump.

In this case, close the control valve and read the flow value. Repeat as necessary until the pressure drop corresponding to the 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 evaporator will be increased.**

To reduce the hydraulic system pressure drop:

- Reduce the pressure drops of individual components (bends, level changes, valves etc.) as much as possible
- Use the correct pipe diameter
- Do not extend the piping system.

## 13.3 - Units with hydronic module and variable-speed pump - pressure differential control

The system flow is not controlled to a fixed value. The flow rate will be adjusted, by varying the pump speed, to maintain a system pressure differential value defined by the user. The pressure sensor at the unit outlet (item 10 in the typical hydronic circuit diagram) is used as the means of control. The system calculates the measured pressure differential value, compares it with the user-selected set point value and modulates the pump speed as necessary. The result is:

- an increased flow rate, if a lower value than the set point is measured,
- an decreased flow rate, if a higher value than the set point is measured.

This flow rate variation is realised, observing the minimum and maximum admissible unit flow rates as well as the minimum and maximum pump supply frequency values.

The pressure differential value maintained can in certain cases be different from the set point value:

- If the set point value is too high (achieved for a higher flow rate than the maximum value or a higher frequency than the maximum value), the system settles at the maximum flow rate or maximum frequency and this results in a lower pressure differential than the set point.
- If the set point value is too low (achieved for a lower flow rate than the minimum value or a lower frequency than the minimum value), the system settles at the minimum flow rate or minimum frequency and this results in a higher pressure differential than the set point.

See with Carrier Service to implement the procedures described below.

### 13.3.1 - Procedure for cleaning the hydronic circuit

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

- Start-up the system 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 consecutively to clean up the hydronic circuit of the system (presence of contaminating solids).
- Perform another reading of the flow and compare this value with the initial value. A reducing value of the flow indicates that the filters on the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 19) and remove the filters (items 12 and 1) after draining the hydronic part of the unit (item 6).
- Remove the air from the circuit (items 5 and 14).
- Repeat if required the filter remains clean.

### 13.3.2 - Procedure for controlling the pressure differential setpoint

Once the circuit is cleaned, place the hydronic circuit in the configuration for which the unit selection was performed generally (all valves open and all cooling coils active). Read the value of the flow on the user interface and compare it with the theoretical value of the range:

- If the value of the flow is greater than the specified value, reduce the pressure differential setpoint on the user interface to reduce the value of the flow.
- 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 design pressure drop / 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 differential pressure

By default, the unit is configured at the maximum speed (frequency: 50 Hz).

**NOTES:**

*If during controlling, the low or high frequency limits are reached before reaching the specified flow, keep the pressure differential value to its lower or higher limit to enter in the control parameters.*

*If the user knows in advance the pressure differential value at the unit outlet to be maintained, this value can be entered directly as data to be declared. You should not, however, avoid the sequence of cleaning the hydronic circuit.*

#### **13.4 - Units with hydronic module and variable-speed pump - temperature difference control**

The temperature probes at the heat exchanger inlet and outlet (items 8 and 9 in the typical hydronic circuit diagram) are used as means of control.

The system reads the measured temperature values, calculates the corresponding temperature difference, compares it with the user-selected set point value and modulates the pump speed as necessary:

- If a higher delta T value than the set point is measured, the flow rate is increased.
- If a lower delta T value than the set point is measured, the flow rate is decreased.

This flow rate variation is realised, observing the minimum and maximum admissible unit flow rates as well as the minimum and maximum pump supply frequency values.

The delta T value maintained can in certain cases be different from the set point value:

- If the set point value is too high (achieved for a lower flow rate than the minimum value or a lower frequency than the minimum value), the system settles at the minimum flow rate or minimum frequency and this results in a lower delta T value than the set point.
- If the set point value is too low (achieved for a higher flow rate than the maximum value or a higher frequency than the maximum value), the system settles at the maximum flow rate or maximum frequency and this results in a higher delta T value than the set point.

See with Carrier Service to implement the procedures described below.

##### **13.4.1 - Procedure for cleaning the hydronic circuit**

Refer to the procedure for cleaning the hydronic circuit from chapter 13.3.1

##### **13.4.2 - Procedure for controlling the Delta T° setpoint**

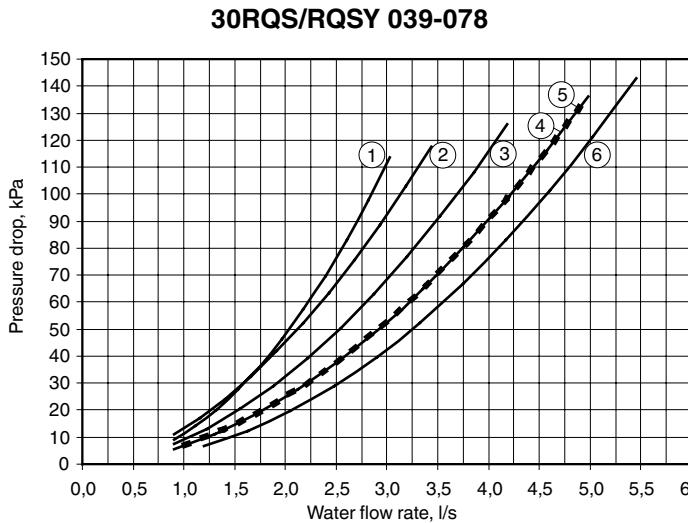
Once the circuit is cleaned, stop the forced start of the pump and proceed to the configuration of the unit for the required control mode.

Modify the control parameters:

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

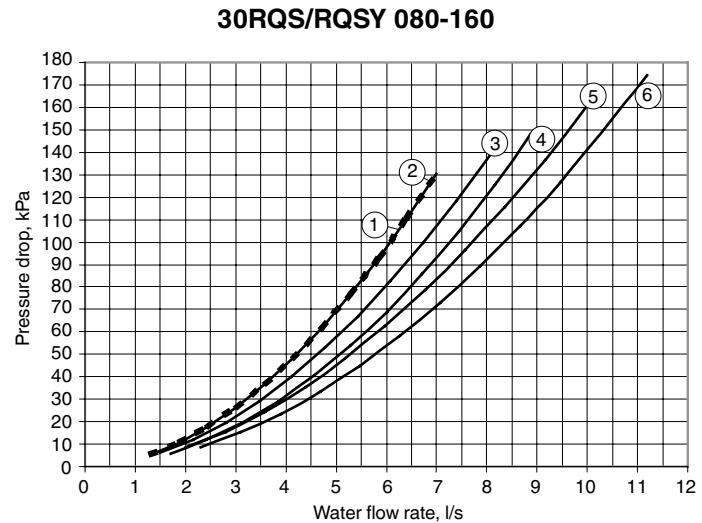
By default, the unit is factory configured at the minimum speed (frequency: 50 Hz).

### 13.5 - Plate heat exchanger pressure drop (including internal piping) - units without hydronic module



#### Legend

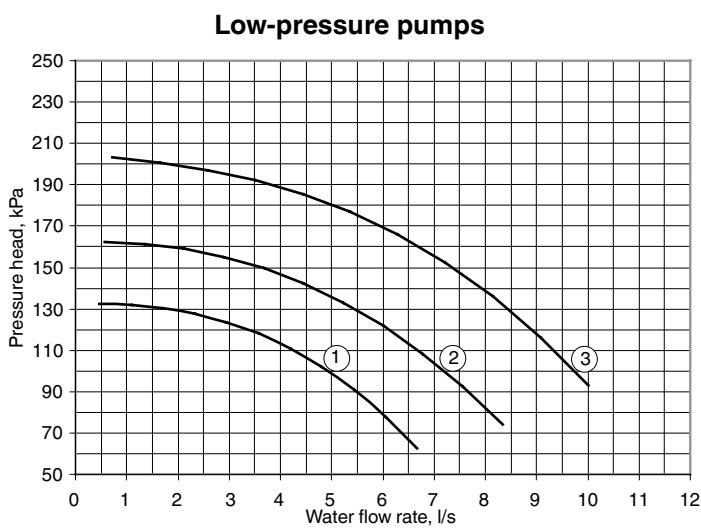
1. 30RQS/30RQSY 039
2. 30RQS/30RQSY 045
3. 30RQS/30RQSY 050
4. 30RQS/30RQSY 060
5. 30RQS/30RQSY 070
6. 30RQS/30RQSY 078



#### Legend

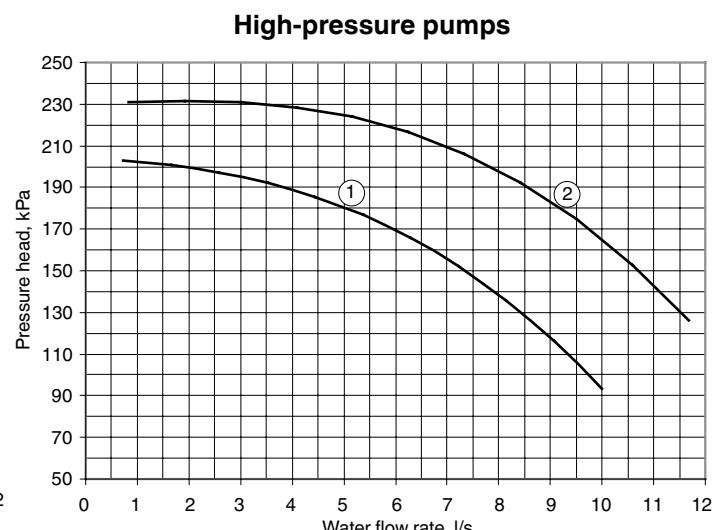
1. 30RQS/30RQSY 080
2. 30RQS/30RQSY 090
3. 30RQS/30RQSY 100
4. 30RQS/30RQSY 120
5. 30RQS/30RQSY 140
6. 30RQS/30RQSY 160

### 13.6 - Pump pressure/flow rate curve - units with hydronic module (fixed-speed or variable-speed pump, 50 Hz)



#### Legend

1. 30RQS/30RQSY 039-090
2. 30RQS/30RQSY 100-120
3. 30RQS/30RQSY 140-160



#### Legend

1. 30RQS/30RQSY 039-100
2. 30RQS/30RQSY 120-160

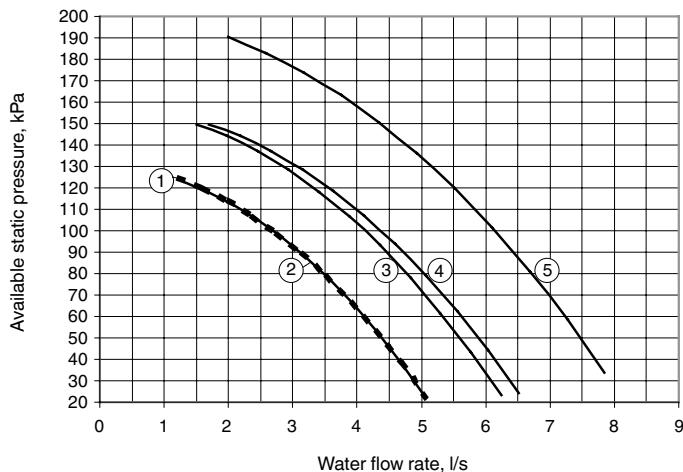
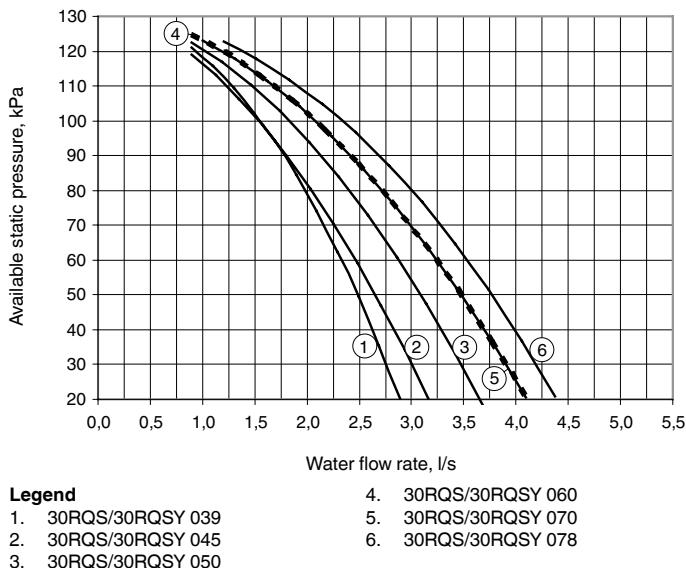
### 13.7 - Available external static pressure - units with hydronic module (fixed-speed or variable-speed pump, 50 Hz)

Data applicable for:

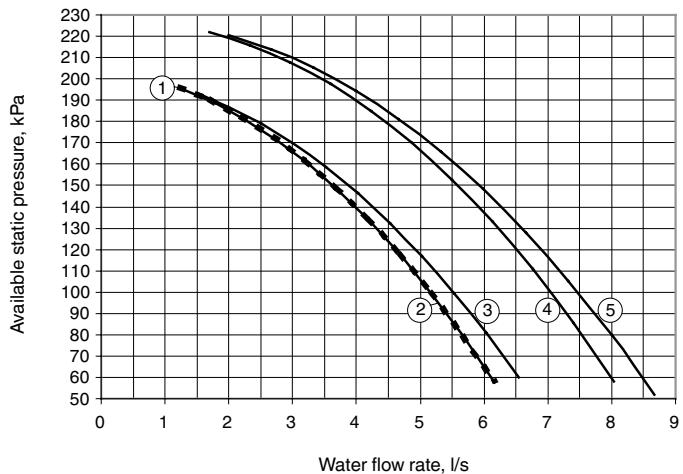
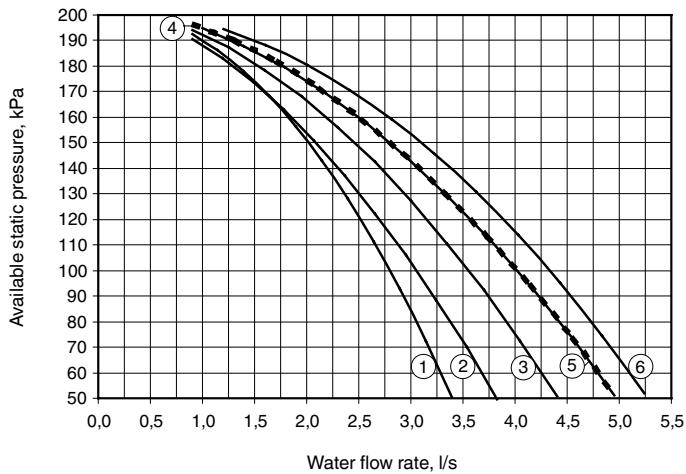
- Fresh water 20 °C
- In case of use of the glycol, the maximum water flow is reduced.

**Warning :** With the buffer tank module option, the curves below do not take the pressure drops for this component into account. If necessary, refer to the buffer tank characteristic curves to correct the data below.

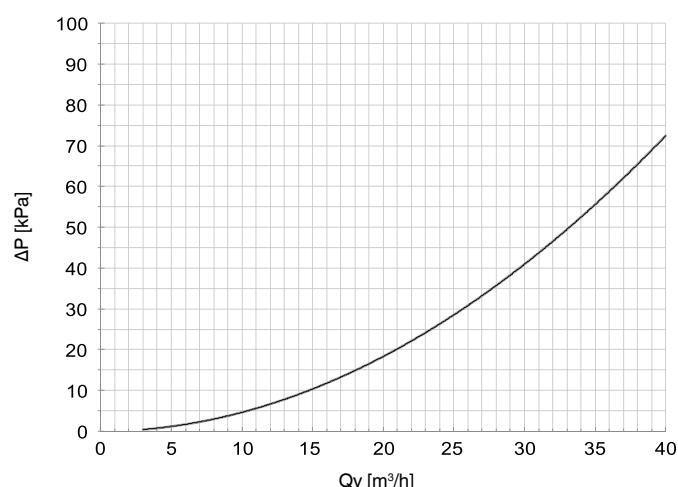
#### Low pressure pumps



#### High pressure pumps



#### Buffer tank pressure drop curve



## 14.1 - Preliminary checks

Never be tempted to start the heat pump without reading fully, and understanding, the operating instructions and without having carried out the following pre-start checks:

- Check the chilled water circulation pumps, air handling units and all other equipment connected to the evaporator.
- Refer to the manufacturer's instructions.
- For units without hydronic module, the water pump overheat protection device must be connected in series with the pump contactor power supply.
- Refer to the wiring diagram supplied with the unit.
- Ensure that there are no refrigerant leaks.
- Confirm that all pipe securing bands are tight.
- Confirm that the electrical connections are secure.

## 14.2 - Actual start-up

### IMPORTANT:

- *Commissioning and start-up of the heat pump must be supervised by a qualified refrigeration engineer.*
- *Start-up and operating tests must be carried out with a thermal load applied and water circulating in the water heat exchanger.*
- *All set point adjustments and control tests must be carried out before the unit is started up.*
- *Please refer to the 30RB/30RQ Touch Pilot Junior control manual.*

The unit should be started up in Local ON mode.

Ensure that all safety devices are operational, especially that the high pressure switches are switched on and that the alarms are acknowledged.

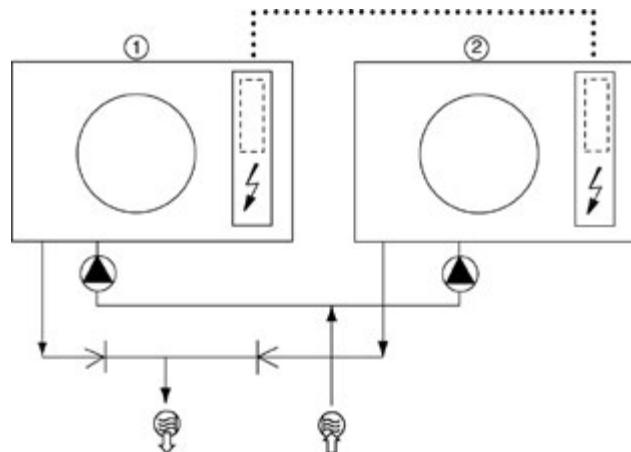
## 14.3 - Operation of two units in master/slave mode

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

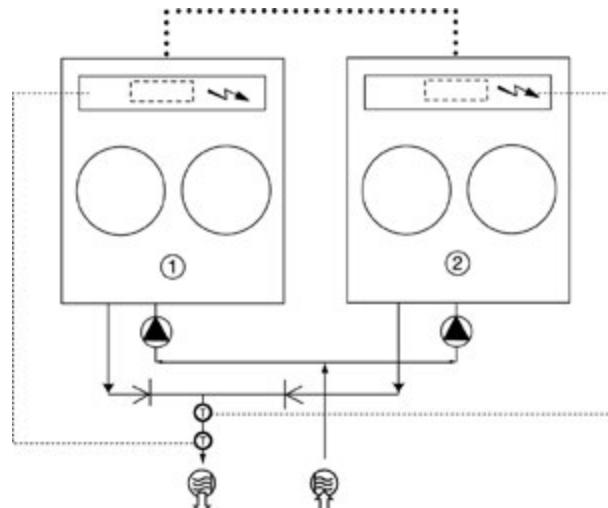
All parameters, required for the master/slave function must be configured using the Service Configuration menu. All remote controls of the master/slave assembly (start/stop, set point, load shedding, etc.) are controlled by the unit configured as master and must only be applied to the master unit.

Depending on the installation and control type, each unit can control its own water pump. If there is only one common pump for the two units, the master unit can control this. In this case shut-off valves must be installed on each unit. They will be activated at the opening and closing by the control of each unit (and the valves will be controlled using the dedicated water pump outputs).

### Standard configuration: return water control



### Configuration: leaving water control



#### Legend

- 1 Master unit
- 2 Slave unit
- [ ] Additional CCN board (one per unit, with connection via communication bus)
- Control boxes of the master and slave units
- Water inlet
- Water outlet
- Water pumps for each unit (included as standard for units with hydronic module)
- Additional sensors for leaving water control, to be connected to channel 1 of the slave boards of each master and slave unit
- .... CCN communication bus
- ..... Connection of two additional sensors
- Check valve

## 14.4 - Supplementary electric resistance heaters

To permit staging of the capacity reduction of the heat pump at low ambient temperatures, as shown in the diagram below, it is possible to install supplementary electric heaters in the leaving water line. Their capacity can compensate for the capacity drop of the heat pump.

These heaters can be controlled via an electronic card mounted on a board (option).

Four outputs are available to control the heater contactors (not supplied with the board), permitting gradual compensation of the heat pump capacity reduction.

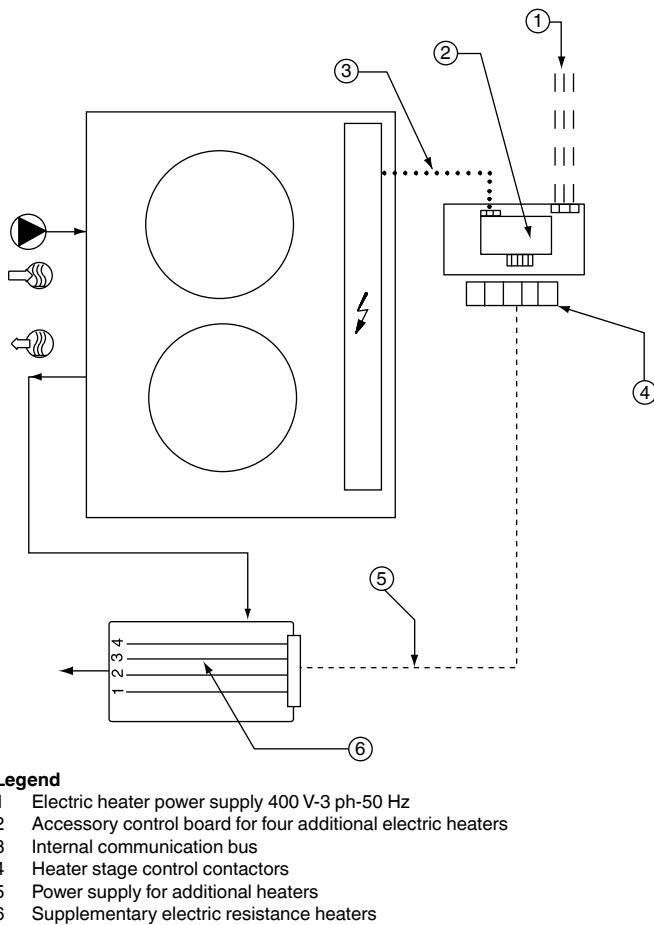
These outputs are configurable to obtain a choice of two, three or four stages. The last stage will only be activated after a shut-down of the heat pump following a fault condition (safety device).

In the diagram below "example of additional electric heaters" the capacity of the four heaters is the same as the capacity of the heat pump at 7°C outdoor air temperature.

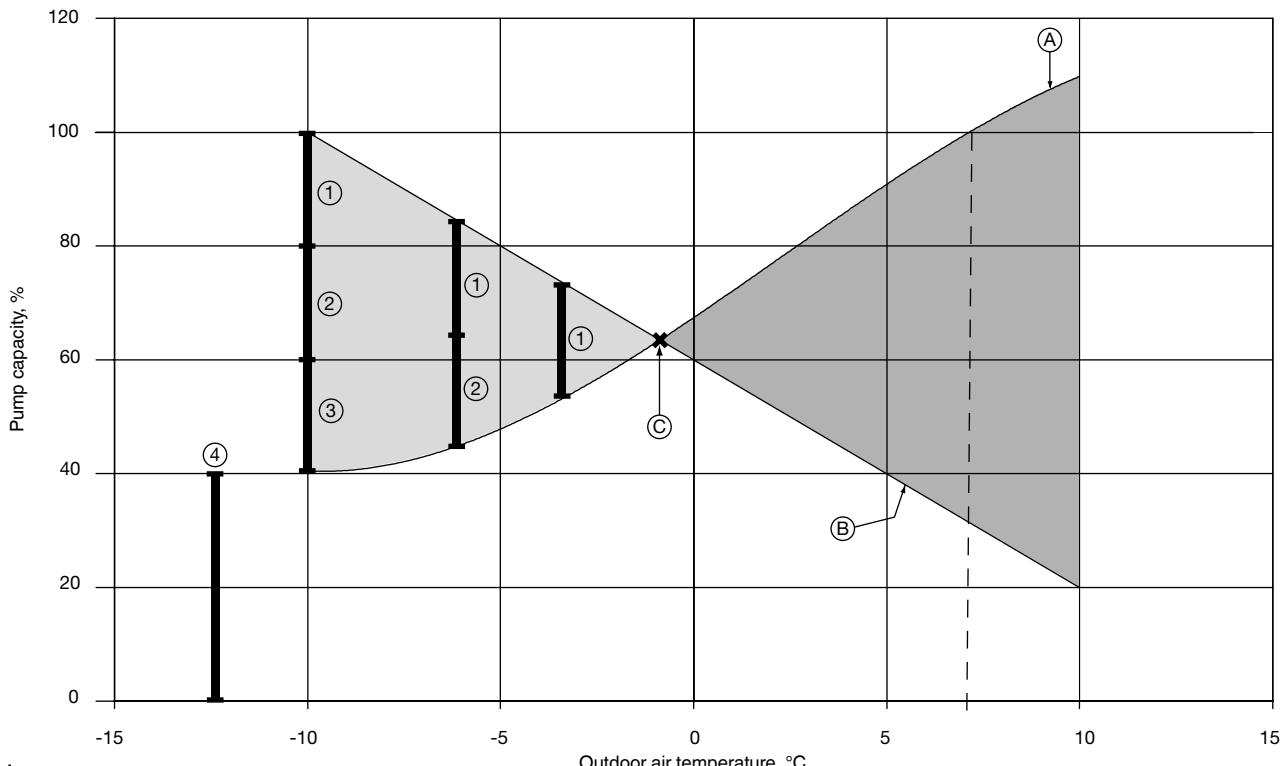
This requires only a 400 V-3 ph-50 Hz power supply source, as well as a connection to the unit via a communication bus.

For the required configuration of the stages consult the 30RB/RQ Touch Pilot Junior Control IOM.

## Typical accessory installation diagram



## Example of additional electric heaters



### Legend

- 1 Stage 1
- 2 Stage 2
- 3 Stage 3
- 4 Stage 4
- A Heat pump capacity variation as a function of the air temperature
- B Building thermal load
- C Balance point between the capacity supplied by the heat pump and the thermal load of the building
- Operating range, in which the heat pump capacity is lower than the building thermal load
- Operating range, in which the heat pump capacity is higher than the building thermal load

## 15 - MAJOR SYSTEM COMPONENTS

### 15.1 - Compressors

30RQS/RQSY units use hermetic scroll compressors. Each compressor is equipped with a crankcase oil heater, as standard.

Each compressor sub-function is equipped with:

- Anti-vibration mountings between the unit chassis and the chassis of the compressor sub-function.
- A single pressure safety switch at the discharge.

### 15.2 - Lubricant

The compressors installed in these units have a specific oil charge, indicated on the name plate of each compressor.

The oil level check must be done with the unit switched off, when then suction and discharge pressures are equalised. The oil level must be visible and above the middle of the sight-glass in the oil equalisation line. If this is not the case, there is an oil leak in the circuit. Search and repair the leak, then recharge oil, so that it reaches a level between the middle and three quarters of the sight-glass (unit in vacuum).

**ATTENTION: Too much oil in the circuit can cause a unit defect. R-22 oils are absolutely not compatible with R-410A oils and vice versa.**

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

### 15.3 - Air evaporator/condenser

The 30RQS/RQSY coils are heat exchangers with internally grooved copper tubes with aluminium fins. To prevent ice formation at the bottom of the coils, electric heaters are installed under the sheet metal base. They are switched on, based on the outside temperature.

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

Product/option	30RQS standard* or with option 15LS	30RQS standard**	30RQSY standard or 30RQS standard with option 42
Global fan efficiency	%	36.6	38.0
Measurement category		A	A
Efficiency category	Static	Static	Static
Energy efficiency target N(2015)	N(2015) 40	N(2015) 40	N(2015) 40
Efficiency level at the optimal energy efficiency point	43.3	37.4	43.7
Variable frequency drive	No	No	Yes
Year of manufacture	See label on unit	See label on unit	See label on unit
Fan manufacturer	Simonin	Simonin	Simonin
Motor manufacturer	A.O. Smith/Regal Beloit	A.O. Smith/Regal Beloit	A.O. Smith/Regal Beloit
Fan reference	00PSG000000100A	00PSG000000100A	00PSG000000100A
Motor reference	00PPG000464500A	00PPG000464600A	00PPG000464700A
Nominal motor capacity	kW	0.88	2.41
Flow rate	m <sup>3</sup> /s	3.59	5.11
Pressure at optimum energy efficiency	Pa	90	248
Speed	rpm	710	1137
Specific ratio		1.002	1.002
Product disassembly, recycling or disposal at end of life	See service manual	See service manual	See service manual
Information about minimising environmental impact	See service manual	See service manual	See service manual

\* Only for sizes 039-050 and 080-120

\*\* Only for sizes 060-078 and 140-160

### 15.4 - Fans

The fans are axial Flying Bird fans equipped with rotating shroud and made of composite recyclable material. The motors are three-phase, with permanently lubricated bearings and insulation class F. See table below.

### 15.5 - Electronic expansion valve (EXV)

The EXV is equipped with a stepper motor (2625 + 160 / - 0 steps) that is controlled via the EXV board.

### 15.6 - Moisture indicator

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

### 15.7 - Filter drier

This is a one-piece, brazed filter drier, located in the liquid line. The role of the filter drier is to keep the circuit clean and moisture-free. The moisture indicator shows when it is necessary to change the filter drier. The filter drier is a bi-flow device, that means that it filters and dehydrates in both operating modes. The pressure drop is much higher in the heating mode. A difference in temperature between the filter inlet and outlet shows that the element is dirty.

According to the Regulation No. 640/2009 and amendment 4/2014 implementing Directive 2005/32/EC with regard to ecodesign requirements for electric motors.

Product/option	30RQS standard* or with option 15LS	30RQS standard**	30RQSY standard or 30RQS standard with option 42
Motor type	Dual-speed asynchronous	Dual-speed asynchronous	Asynchronous
Number of poles	8	6	6
Nominal input frequency	Hz	50	60
Nominal voltage	V	400	400
Number of phases		3	3
Motor included in the application domain of the regulation 640/2009 and amendment 4/2014	No	No	No
Sales leaflet for exemption	Article 2.1	Article 2.1	Article 1.2.c.(ii)
Ambient air temperature for which the motor is specifically designed	°C	68.5	68.5

\* Only for sizes 039-050 and 080-120

\*\* Only for sizes 060-078 and 140-160

## 15.8 - Water evaporator/condenser

The evaporator/condenser is a plate heat exchanger with one or two refrigerant circuits. The water connection of the heat exchanger is a Victaulic connection. It has a thermal insulation of 19 mm thick polyurethane foam and includes frost protection, as standard.

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

### NOTES - Monitoring during operation:

- **Follow the regulations on monitoring pressurised equipment.**
- **It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.**
- **If there are no regulations or to complement them follow the control programmes of EN 378.**
- **If they exist follow local professional recommendations.**
- **Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities maybe the cause of the wear or corrosion by puncture.**
- **The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.**

## 15.9 - Refrigerant

30RQS/RQSY units operate with refrigerant R-410A.

## 15.10 - High-pressure safety switch

30RQS/RQSY units are equipped with automatically reset safety pressure switches on the high-pressure side. For the alarm acknowledgements refer to the 30RB/RQ Touch Pilot Junior control manual).

## 15.11 - Storage tank

30RQS/RQSY units are equipped with mechanically welded storage tanks that permit storing the excess charge when the unit operates in heating mode.

## 15.12 - Four-way valve

This permits reversal of the cycle for operation in cooling and heating mode and during defrost cycles.

## 15.13 - Control box

The control box of the 30RQS/RQSY units is equipped with electric heaters to prevent condensation during operation at low outside temperatures. They are installed on the top of the control box on the outside, and are covered by a thermal insulation layer. These heaters are switched on, based on the outside temperature.

## 16 - 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	30RQS/RQSY 039-160
Medium-temperature brine solution	5B	Low temperature chilled water production down to 0°C with ethylene glycol and propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RQS/RQSY 039-160
Low-temperature brine solution	6B	Low temperature chilled water production down to -15°C with ethylene glycol and -12°C with propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RQS/RQSY 039-160
Very low noise level	15LS	Acoustic compressor enclosure and low-speed fans	Noise emission reduction at reduces fan speed	30RQS 039-160
Very low noise level	15LS	Acoustic compressor enclosure	Compressor noise emission reduction	30RQSY 039-160
Suction filter	23B	Washable G2 efficiency filter in accordance with EN 779	Prevents pollution of the air-heat exchanger	30RQSY 039-078
Soft Starter	25	Electronic starter on each compressor	Reduced start-up current	30RQS/RQSY 039-080
Winter operation down to -20°C*	28	Fan speed control via frequency converter	Stable unit operation when the air temperature is between -10°C and -20°C.	30RQS 039-160
Frost protection down to -20°C	42	Electric heater on the hydronic module	Hydronic module frost protection at low outside temperatures	30RQS/RQSY 039-160
Partial heat recovery	49	Unit equipped with one desuperheater on each refrigerant circuit. Note: In this configuration the units are equipped with traditional coils (Cu/Al).	Production of free high-temperature hot-water simultaneously with chilled water production (or hot water for Heat pump)	30RQS/RQSY 039-160
Master/slave operation	58	Unit equipped with supplementary water outlet temperature sensor kit to be field-installed allowing master/slave operation of two units connected in parallel	Optimised operation of two units connected in parallel operation with operating time equalisation	30RQS/RQSY 039-160
Main disconnect switch without fuse	70	Factory-installed main electric disconnect switch in the control box	Ease-of-installation and compliance with local electrical regulations	30RQS/RQSY 039-160
HP single-pump hydronic module	116R	Single high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included). Option with built-in safety hydraulic components available.)	Easy and fast installation (plug & play)	30RQS/RQSY 039-160
HP dual-pump hydronic module	116S	Dual high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RQS/RQSY 039-160
LP single-pump hydronic module	116T	Single low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RQS/RQSY 039-160
LP dual-pump hydronic module	116U	Dual low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RQS/RQSY 039-160
HP variable-speed single-pump hydronic 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. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved system reliability	30RQS/RQSY 039-160
HP variable-speed dual-pump hydronic 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. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved system reliability	30RQS/RQSY 039-160
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	30RQS/RQSY 039-160
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	30RQS/RQSY 039-160
Bacnet over IP	149	Two-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system. Allows access to multiple unit parameters	30RQS/RQSY 039-160
External boiler management	156a	Control board factory-installed on the unit to control a boiler	Extended remote control capabilities to a boiler on/off command. Permits easy control of a basic heating system	30RQS/RQSY 039-160
Electric heaters management	156b	Control board factory-installed on the unit with additional inputs/outputs in order to manage up to 4 externals heating stage (electrical heaters...)	Extended remote control capabilities to up to 4 electrics heaters. Permits easy control of a basic heating system	30RQS/RQSY 039-160
Compliance with Russian regulations	199	EAC certification	Conformance with Russian regulations	30RQS 039-160
Evaporator screw connection sleeves	264	Evaporator inlet/outlet screw connection sleeves	Allows unit connection to a screw connector	30RQS/RQSY 039-160
Welded evaporator water connection kit	266	Victaulic piping connections with welded joints	Easy installation	30RQS/RQSY 039-160
Reinforced ECM filtration for fan VFD	282A	Fan variable frequency drive compliance to IEC 61800-3 C1 class	Allows unit installation in domestic residential environment by reducing electromagnetic interferences	30RQS 039-160 with option 5B, 6B or 28 30RQSY 039-160
Reinforced ECM filtration for pump VFD	282B	Pump variable frequency drive compliance to IEC 61800-3 C1 class	Allows unit installation in domestic residential environment by reducing electromagnetic interferences	30RQS/RQSY 039-160 with option 116V or 116W 30RQSY 039-160
Expansion tank	293	6 bar expansion tank integrated in the hydraulic module (require option 116)	Easy and fast installation (plug & play), & Protection of closed water systems from excessive pressure	30RBS/RQSY 039-160
Set point adjustment by 4-20mA signal	311	Connections to allow a 4-20mA signal input	Easy energy management, allow to adjust set point by a 4-20mA external signal	30RQS/RQSY 039-160

\* Winter operation option: This option allows operation of the unit down to -20°C outside air temperature due to the optimised control of the condensing temperature. One fan is equipped with a frequency converter.

## 17 - SPECIFIC DETAILS FOR UNITS WITH A FAN WITH AVAILABLE STATIC PRESSURE (30RQSY)

### Selection based on the pressure drop

The cooling and heating capacities are given for an available pressure of 160 Pa and for a unit without filter.

To calculate the performances at other pressure drops please use the correction factors below.

### Cooling mode

#### 30RQSY 039-050/30RQSY 080-120

Duct pressure drop	Fan speed, r/s	Power input coefficient	Cooling capacity coefficient
0	12.00	0.943	1.019
50	13.33	0.962	1.012
100	14.66	0.980	1.006
130	15.46	0.990	1.003
160	16.26	1.000	1.000
200	17.31	1.012	0.998
240	18.36	1.023	0.996

#### 30RQSY 060-078/30RQSY 140-160

Duct pressure drop	Fan speed, r/s	Power input coefficient	Cooling capacity coefficient
0	15.83	0.929	1.018
50	16.81	0.944	1.016
100	17.78	0.964	1.014
130	18.36	0.978	1.011
160	18.36	1.000	1.000
180	18.36	1.019	0.991

### 18 - PARTIAL HEAT RECLAIM USING DESUPER-HEATERS (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 30RQS/30RQSY range.

### Heating mode

#### 30RQSY 039-050/30RQSY 080-120

Duct pressure drop	Fan speed, r/s	Power input coefficient	Heating capacity coefficient
0	18.36	0.990	1.016
50	18.36	0.990	1.012
100	18.36	0.990	1.009
130	18.36	1.000	1.005
160	18.36	1.000	1.000
200	18.36	1.000	0.994
240	18.36	1.010	0.981

#### 30RQSY 060-078/30RQSY 140-160

Duct pressure drop	Fan speed, r/s	Power input coefficient	Heating capacity coefficient
0	18.36	1.000	1.026
50	18.36	1.000	1.020
100	18.36	1.000	1.011
130	18.36	1.000	1.007
160	18.36	1.000	1.000
180	18.36	1.001	0.993

#### Note:

Pressure drop, clean filter = 6 Pa

Pressure drop, dirty filter = 12 Pa

### 18.1 - Physical data, 30RQS/30RQSY units with partial heat reclaim using desuperheaters (option 49)

30RQS/RQSY partial heat reclaim mode	039	045	050	060	070	078	080	090	100	120	140	160
<b>Operating weight 30RQS units with RTPF coils*</b>												
<b>Standard unit without hydronic module</b>	kg	507	514	542	555	556	563	749	896	904	962	1073
<b>Standard unit with hydronic module option</b>												1091
Single high-pressure pump	kg	563	544	572	585	585	593	779	928	936	998	1112
Dual high pressure pump	kg	562	570	597	611	611	619	805	973	981	1046	1149
Single high-pressure pump + Buffer tank module option	kg	959	940	968	981	981	989	1212	1361	1369	1431	1545
Dual high pressure pump + Buffer tank module option	kg	958	966	993	1007	1007	1015	1238	1406	1414	1479	1582
<b>Operating weight 30RQSY units with RTPF coils*</b>												
<b>Standard unit without hydronic module</b>	kg	519	526	560	574	574	581	763	931	940	998	1103
<b>Standard unit with hydronic module option</b>												1120
Single high-pressure pump	kg	549	556	589	603	604	611	793	962	972	1034	1142
Dual high pressure pump	kg	575	582	615	629	630	637	918	1007	1017	1082	1179
Single high-pressure pump + Buffer tank module option	kg	945	952	985	999	1000	1007	1226	1395	1405	1467	1575
Dual high pressure pump + Buffer tank module option	kg	971	978	1011	1025	1026	1033	1351	1440	1450	1515	1612
<b>Refrigerant charge, units with RTPF coils</b>												
R410A												
Circuit A	kg	12.5	13.5	16.5	17.5	18	16.5	21.5	27.5	28.5	33	19
Circuit B	kg	-	-	-	-	-	-	-	-	-	-	18.5
<b>Condensers</b>												
Grooved copper tubes, aluminium fins												
<b>Desuperheaters on circuits A and B</b>												
Plate heat exchangers												
Water volume	l	0.549	0.549	0.549	0.732	0.732	0.732	0.976	0.976	0.976	0.732	0.732
Water volume	l	-	-	-	-	-	-	-	-	-	0.732	0.732
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
<b>Water connections</b>												
Cylindrical, male gas thread												
Connections	in	1	1	1	1	1	1	1	1	1	1	1
Outside diameter	mm	42	42	42	42	42	42	42	42	42	42	42

\* Weights shown are a guideline only.

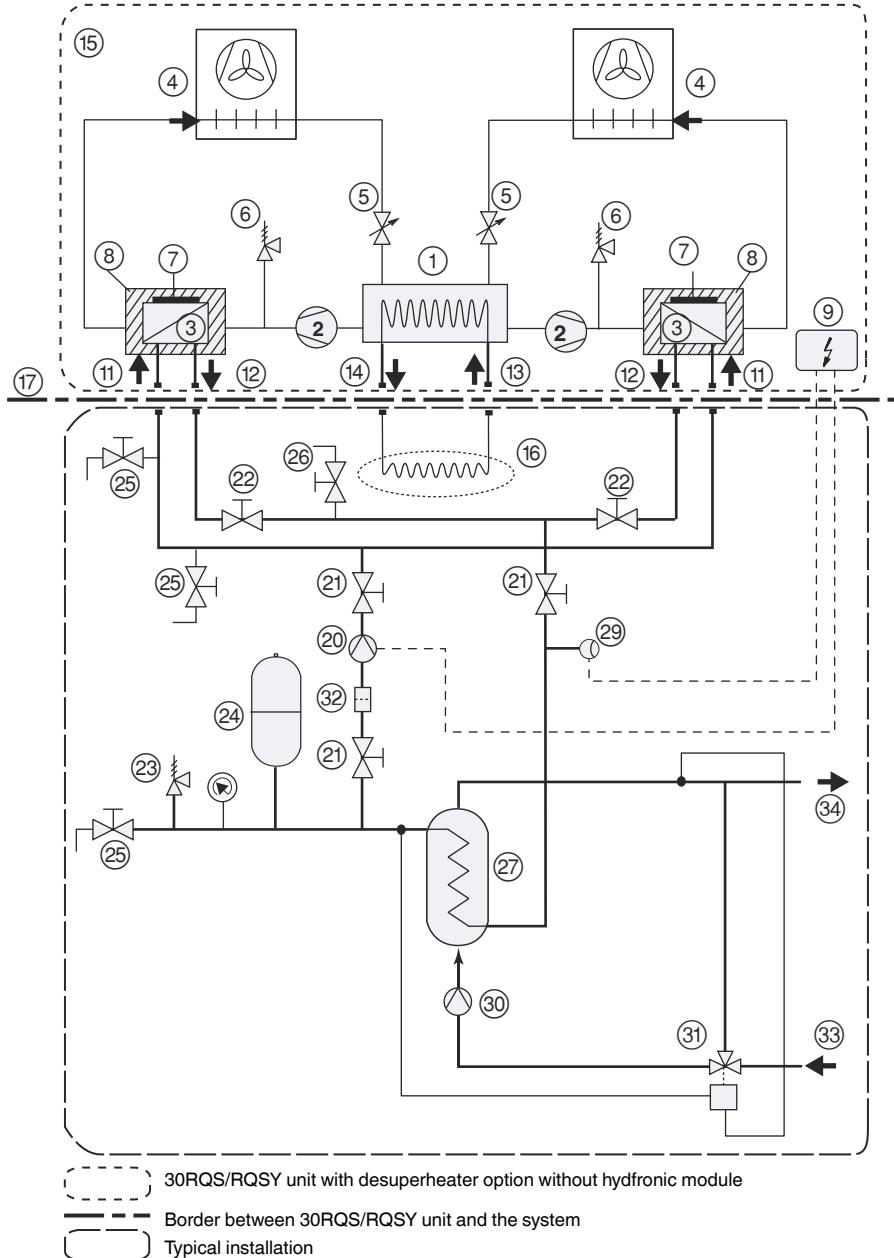
## 18.2 - Installation and operation of the heat reclaim with desuperheater option

The 30RQS/RQSY units with the desuperheater option 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 30RQS/RQSY units with the desuperheater option.

**Typical installation diagram of twin-circuit units with the desuperheater option**



### Legend

#### 30RQS/RQSY unit components

- 1 Evaporator
- 2 Compressor
- 3 Desuperheater (plate heat exchanger)
- 4 Air condenser (coils)
- 5 Expansion valve (EXV)
- 6 Damage limitation option in case of a fire (relief valve)
- 7 Electric heater to protect the desuperheater against frost (not supplied)
- 8 Desuperheater insulation (not supplied)
- 9 Unit control box
- 10 NA
- 11 Desuperheater water inlet
- 12 Desuperheater water outlet
- 13 Evaporator water inlet
- 14 Evaporator water outlet
- 15 Unit with desuperheater option without hydronic module
- 16 System heat load
- 17 Border between the 30RQS/RQSY unit and the typical installation

#### Installation components (installation example)

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

## 18.3 - Installation

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.

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. This requires the use of a three-way valve (item 31 in the diagram), with a controller and the sensor controlling the minimum required entering water temperature.

The desuperheater water loop must include a relief valve and an expansion tank. When selecting these, consider the water loop volume and the maximum temperature (90°C) when pump operation is stopped (item 20 in the diagram).

## 18.4 - Control configuration with the desuperheater option

The unit can operate in two modes.

### 18.4.1 - Efficiency priority mode (standard)

In this mode unit control optimises unit efficiency. Heat reclaim is based on the saturated condensing temperature. The percentage of the reclaimed heating capacity compared with the total capacity rejected by the condenser increases in proportion to the saturated condensing temperature. This temperature is directly linked to the condenser entering air temperature (entering air temperature in cooling mode and water temperature in heating mode).

### 18.4.2 - Reclaim priority mode

In cooling mode only this configuration allows the user to enter a setpoint that is relative to the minimum condensing temperature (default = 40°C) to increase the heating capacity reclaimed at the desuperheaters, if required. This configuration is only effective if the desuperheater contact is activated on the control board (user connection block). This function is not available for 30RQSY units.

For setpoint control of the minimum saturated condensing temperature and to find the position of the connection block on the board refer to the 30RB/RQ Touch Pilot Junior control manual.

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.
- The water entering temperature in the desuperheater as well as the condenser entering air temperature.

## 18.5 - Operating limits

Desuperheater	Minimum	Maximum
Entering water temperature at start-up	°C 25*	60
Leaving water temperature during operation	°C 30	65
Air condenser	Minimum	Maximum
Outside operating temperature	°C -10	46

\* 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.

## 19 - BRINE OPTION (OPTION 5B & OPTION 6B)

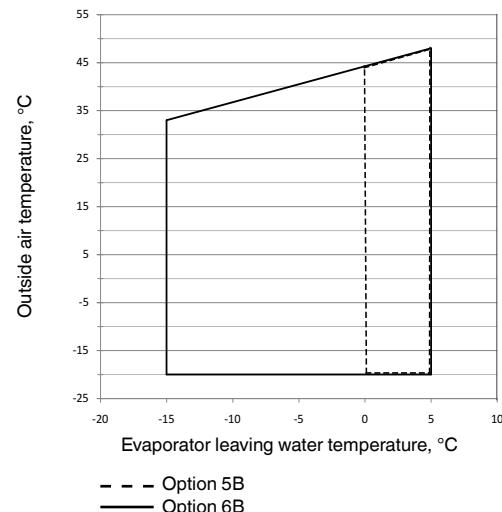
This option allows production of brine down to 0°C (option 5B) / -15°C (option 6B). The unit is equipped with suction pipe insulation (option 6B only) and a fan frequency converter.

The operating range is a function of the suction pressure, which in turn is a function of:

- the brine type,
- the brine concentration,
- the flow rate,
- the brine temperature,
- the condensing pressure (ambient temperature).

Example: For operation with ethylene glycol at 45% and a brine temperature of -15°C (entering temperature -10°C), the maximum outside operating temperature will be around 33°C.

### Operating range with 45% ethylene glycol



### 19.1 - Frost protection

The evaporator low pressure and frost protection depends on the amount of antifreeze added to the water circuit. The evaporator approach (LWT - SST) as well as frost protection are based on this amount).

It is therefore essential to control the amount of antifreeze in the water loop at the first start-up (circulate for 30 minutes to ensure good homogeneity of the mixture before taking the sample). Refer to the manufacturer's data to define the frost protection, based on the concentration rate measured.

The frost protection temperature must be used in the unit software parameters.

This value will allow the definition of the following limits:

1. Evaporator frost protection
2. Low pressure protection

It is recommended that the commissioning of a brine system is done by Carrier.

For information: The protection values given by our supplier, based on the antifreeze solutions used in the Carrier Montluel laboratory, are as follows: (these values can change for different suppliers).

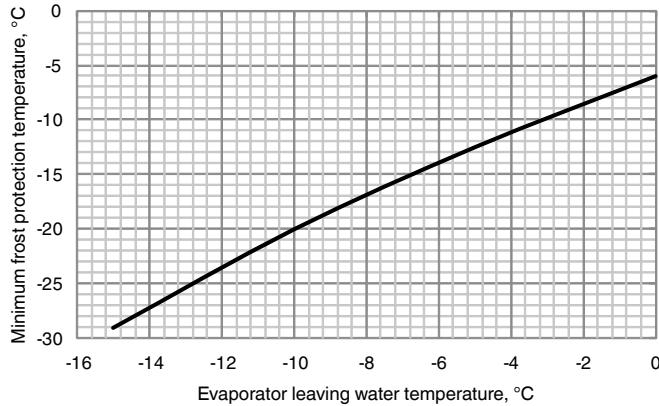
% by weight, glycol	Freeze point, °C ethylene glycol	Freeze point, °C propylene glycol
10	-3.8	-2.6
15	-6.1	-4.3
20	-8.8	-6.6
25	-11.8	-9.6
30	-15.2	-13
35	-19.1	-16.7
40	-23.6	-20.7
45	-29	-25.3

Based on the table above, if the ethylene glycol concentration by weight in the water loop is 35% the value of -19.1°C must be used in the software.

It is essential to carry out an annual check (minimum) of the amount of glycol, and adjust the frost protection value in the software based on the rate measured. This procedure must be systematic, if water or antifreeze solution is added.

The curve below shows the minimum frost protection temperature that must be observed, based on the leaving water temperature.

**Minimum frost protection temperature**



#### NOTES:

- For unit frost protection at low air temperature, the brine percentage must be evaluated.
- The maximum glycol rate for units with hydronic kit (options 116) is 45%.
- The temperature of -15°C brine can only be obtained with ethylene glycol at 45%.
- The maximum recommended temperature difference is 5 K.

**IMPORTANT:** For glycol concentrations below 20% a corrosion inhibitor suitable for the application must be used to avoid corrosion due to the aggressive nature of brine.

**The presence of glycol reduces the life of the pump fittings.**

**It is recommended to change the fittings or the pump:**

- every 40 000 hours for applications with water,
- every 15 000 hours for applications with glycol concentrations above 30%.

**To facilitate maintenance operations, it is recommended to install shut-off valves upstream and downstream of the unit.**

## 20 - STANDARD MAINTENANCE

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

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

**WARNING: Before doing any work on the machine ensure that the power is switched off. If a refrigerant circuit is opened, it must be evacuated, recharged and tested for leaks. Before any operation on a refrigerant circuit, it is necessary to remove the complete refrigerant charge from the unit with a refrigerant charge recovery group.**

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

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

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

### 20.1 - Level 1 maintenance

*See note in chapter 20.3.*

Simple procedures, can be carried out by the user on a weekly basis:

- Visual inspection for oil traces (sign of a refrigerant leak),
- Air heat exchanger (condenser) cleaning - see chapter 'Air heat exchanger - level 1',
- Check for removed protection devices, and badly closed doors/covers,
- Check the unit alarm report when the unit does not work (see the 30RB/30RQ Touch Pilot Junior control manual),
- General visual inspection for any signs of deterioration,
- Verify the charge in the sight-glass,
- Check that the water temperature difference between the heat exchanger inlet and outlet is correct.

## 20.2 - Level 2 maintenance

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

The frequency of this maintenance level can be monthly or annually depending on the verification type.

In these conditions, the following maintenance operations are recommended.

Carry out all level 1 operations, then:

### Electrical checks

- At least once a year tighten the power circuit electrical connections (see table with tightening torques).
- Check and retighten all control/command connections, if required (see table with tightening torques).
- Remove the dust and clean the interior of the control boxes, if required.
- Check the status of the contactors, disconnect switches and capacitors.
- Check the presence and the condition of the electrical protection devices.
- Check the correct operation of all heaters.
- Check that no water has penetrated into the control box.
- For units equipped with a variable-speed drive regularly check the cleanliness of the filter media to maintain the correct air flow.

### Mechanical checks

- Check the tightening of the fan tower, fan, compressor and control box fixing bolts.

### Water circuit checks

- Always take care when working on the water circuit to ensure that the condenser close by is not damaged.
- Check the water connections.
- Check the expansion tank for signs of excessive corrosion or gas pressure loss and replace it, if necessary.
- Purge the water circuit (see chapter 'Water flow control procedure').
- Clean the water filter (see chapter 'Water flow control procedure').
- Replace the pump fittings after 15000 hours of operation with defrost solution or after 25000 hours of operation with water.
- Check the operation of the low water flow rate safety device.
- Check the status of the thermal piping insulation.
- Check the concentration of the anti-freeze protection solution (ethylene glycol or propylene glycol).

### Refrigerant circuit

- Fully clean the air heat exchangers with a low-pressure jet and a bio-degradable cleaner.
- Check the unit operating parameters and compare them with previous values.
- Carry out an oil contamination test. Replace the oil, if necessary.
- Check and if necessary re-tighten the Rotalock connections in the oil balancing line to the specified torque value.
- Check the operation of the high-pressure switches. Replace them if there is a fault.
- Check the fouling of the filter drier. Replace it if necessary.
- Keep and maintain a maintenance sheet, attached to each HVAC unit.

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

## 20.3 - Level 3 (or higher) maintenance

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

- A major component replacement (compressor, evaporator),
- Any intervention on the refrigerant circuit (handling refrigerant),
- Changing of parameters set at the factory (application change),
- Removal or dismantling of the HVAC unit,
- Any intervention due to a missed established maintenance operation,
- Any intervention covered by the warranty.
- One to two leak checks per year with a certified leak detector and carried out by a qualified person.

*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 detected leaks must be repaired immediately.*

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

*Refrigerant under pressure must not be purged to the open air.*

*If a refrigerant circuit is opened, plug all openings, if the operation takes up to one day, or for longer periods charge the circuit with nitrogen.*

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

## 20.4 - Tightening torques for the main electrical connections

Component/screw type	Designation in the unit	Value (N·m)
<b>Soldered screw (PE) customer connection</b>		
M8	PE	14.5
<b>Screw on terminal inlet board</b>		
Terminal 56.395.0055.0	X100	10
Terminal 56.398.0055.0		14
<b>Screw on switch inlet zones (option 70)</b>		
Switch - MG 28908	QS_	8
Switch - MG 28910		8
Switch - MG 28912		8
Switch - MG 31102		15
<b>Tunnel terminal screw, compressor contactor</b>		
Contactor LC1D12B7	KM*	1.7
Contactor LC1D18B7		1.7
Contactor LC1D25B7		2.5
<b>Tunnel terminal screw, compressor circuit breaker</b>		
Circuit breaker 25507	QM*	3.6
Circuit breaker 25508		
Circuit breaker 25509		
<b>Tunnel terminal screw, control power transformer</b>		
Transformer - 40958E	TC	0.6
Transformer - 40959E		
Transformer - 40888E		
Transformer - 40894E		
<b>Compressor earth terminal in the power wiring control box</b>		
M6	Gnd	5.5
<b>Compressor earth connection</b>		
M8	Gnd	2.83
<b>Tunnel terminal screw, disconnect switch (fan, pump)</b>		
Disconnect switch GV2ME08	QM_	1.7
Disconnect switch GV2ME10		
Disconnect switch GV2ME14		
<b>Tunnel terminal screw, contactor (fan, pump)</b>		
Contactor LC1K0610B7	KM	0.8 to 1.3
Contactor LC1K09004B7		
Contactor LC1K0910B7		
Contactor LC1K0901B7		

## 20.5 - Tightening torques for the main bolts and screws

Screw type	Used for	Torque (N·m)
Compressor strut	Compressor support	30
M8 nut	BPHE* fixing	15
M10 nut	Compressor mounting	30
M16 nut	Compressor fixing	30
Oil nut	Oil equalisation line	75
Taprite screw M6	Fan support, storage tank fixing	7
Taprite screw M8	Fan motor fixing	13
Taprite screw M10	Four-way valve fixing	30
H M8 screw	Fan scroll fixing	18
Metal screw	Sheet metal plates	4.2
H M6 screw	Stauff clamps	10
Earth screw	Compressor	2.8

\* BPHE = Brazed plate heat exchanger

## 20.6 - Air heat exchanger

We recommend, that finned coils are inspected regularly to check the degree of fouling. This depends on the environment where the unit is installed, and will be worse in urban and industrial installations and near trees that shed their leaves.

For coil cleaning, two maintenance levels are used, based on the AFNOR X60-010 standard:

- If the air heat exchangers are fouled, clean them gently in a vertical direction, using a brush.
- Only work on air heat exchangers with the fans switched off.
- For this type of operation switch off the HVAC unit if service considerations allow this.
- Clean air heat exchangers guarantee optimal operation of your HVAC unit. This cleaning is necessary when the air heat exchangers begin to become fouled. The frequency of cleaning depends on the season and location of the HVAC unit (ventilated, wooded, dusty area, etc.).

**WARNING: Never use pressurised water without a large diffuser. Do not use high-pressure cleaners for Cu/Cu and Cu/Al coils.**

**Concentrated and/or rotating water jets are strictly forbidden. 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 2/3 of the corrosion problems.**

**Clean block fitting with tap water at a pressure of 2/3 bar and at distance of 30cm. Rub with a soft Nylon, PolyPro® or Tynex® brush**

**Protect the control box during cleaning operations.**

## 20.7 - Water heat exchanger maintenance

Check that:

- the insulating foam is intact and securely in place.
- the cooler heaters are operating, secure and correctly positioned.
- the water-side connections are clean and show no sign of leakage.

## 20.8 - Refrigerant volume

The unit must be operated in cooling mode to find out, if the unit charge is correct, by checking the actual subcooling.

Following a small refrigerant leak a loss of refrigerant, compared to the initial charge will be noticeable in the cooling mode and affect the subcooling value obtained at the air heat exchanger (condenser) outlet, but it will not be noticeable in the heating mode.

***IMPORTANT: It is therefore not possible to optimise the refrigerant charge in the heating mode after a leak. The unit must be operated in the cooling mode to check, if an additional charge is required.***

## 20.9 - Characteristics of R-410A

Saturated temperatures (°C) based on the relative pressure (in kPa)							
Saturat. temp.	Relative pressure	Saturat. temp.	Relative pressure	Saturat. temp.	Relative pressure	Saturat. temp.	Relative pressure
-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 gauge, charge transfer, etc.).

## 21 - START-UP CHECKLIST FOR 30RQS/30RQSY HEAT PUMPS (USE FOR JOB FILE)

### Preliminary information

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

### Equipment

Model 30RQS/RQSY: ..... S/N .....

### Compressors

#### Circuit A

1. Model No. .....  
Serial No. .....  
2. Model No. ....  
Serial No. ....  
3. Model No. ....  
Serial No. ....

#### Circuit B

1. Model No. ....  
Serial No. ....  
2. Model No. ....  
Serial No. ....

### Air handling equipment

Manufacturer.....  
Model No. .... Serial No. ....

Additional air handling units and options .....

### Preliminary equipment check

Is there any shipping damage? ..... If so, where? .....

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

- Unit is level in its installation
- Power supply agrees with the unit name plate
- Electrical circuit wiring has been sized and installed properly
- Unit ground wire has been connected
- Electrical circuit protection has been sized and installed properly
- All terminals are tight
- All cables and thermistors have been inspected for crossed wires
- All plug assemblies are tight

### Check air handling systems

- All air handlers are operating
- All chilled water valves are open
- All fluid piping is connected properly
- All air has been vented from the system
- Chilled water pump is operating with the correct rotation. CWP amperage: Rated:..... Actual:.....

### Unit start-up

- Water pump control has been properly interlocked with the heat pump
- Oil level is correct
- Compressor crankcase heaters have been energised for 12 hours
- Unit has been leak checked (including fittings)
- 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 unit if voltage imbalance is greater than 2%. Contact local power company for assistance.***

- All incoming power voltage is within rated voltage range

**Check water heat exchanger water loop**

Water loop volume = ..... (litres)  
Calculated volume = ..... (litres)  
3.25 litres/nominal kW capacity for air conditioning  
6.5 litres/nominal kW capacity for process cooling

- Proper loop volume established
- Proper loop corrosion inhibitor included ..... litres of .....
- Proper loop freeze protection included (if required) ..... litres of .....
- Water piping includes electric tape heater up to the water heat exchanger
- Return water piping is equipped with a screen filter with a mesh size of 1.2 mm

**Check pressure drop across water heat exchanger (no hydronic module) or the external static pressure (with hydronic module)**

Entering water heat exchanger = ..... (kPa)  
Leaving water heat exchanger = ..... (kPa)  
Pressure drop (entering - leaving) = ..... (kPa)

**WARNING (unit without hydronic module): Plot the pressure drop on the water heat exchanger flow/pressure drop curve to determine the flow rate in l/s at the nominal operating conditions for the installation. For units with hydronic module, a flow rate indication is displayed by the unit control (consulter the 30RB/30RQ Touch Pilot Junior 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 (see RB/30RQ Touch Pilot Junior control manual):****Check and register the configuration of the following parameters:**

Load sequence selection .....  
Capacity ramp loading selection .....  
Start-up delay .....  
Burner section .....  
Pump control .....  
Set point reset mode .....  
Night-time capacity setback .....

**Re-enter the set points (see controls section)****To start up the heat pump**

**WARNING: Be sure that all service valves are open, and that the pump is on before attempting to start this machine. Once all checks have been made, start the unit in the "LOCAL ON" position.**

Unit starts and operates properly.

**Temperatures and pressures**

**WARNING: When the unit has run for a while and temperatures and pressures have stabilised, record the following:**

Water heat exchanger entering water .....	Water heat exchanger leaving water .....
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 line temperature .....	Circuit B liquid line temperature .....
Circuit A suction superheat .....	Circuit B suction superheat .....
Circuit A electronic expansion device position .....	Circuit B electronic expansion device position .....

**NOTES:** .....  
.....