30RB/30RBY 039-160 “A”

Air-Cooled Liquid Chillers

Nominal cooling capacity 40-160 kW

50 Hz

PRO-DIALOG

30RB

30RBY

For the operation of the control please refer to the
Pro-Dialog+ Control manual for the 30RB/30RQ 017-160 series

Installation, operation and maintenance instructions

ISO9001 · ISO14001

Quality and Environment Management Systems Approval

CONTENTS

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 30RBS/30RBSY units, the people involved should be thoroughly familiar with these instructions and the specific project data for the installation site.

The 30RBS/30RBSY liquid chillers 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.

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 30RBSY units with variable available pressure

30RBSY units are designed for indoor installation in a plant room. For this type of installation the hot air leaving the air-cooled condensers 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 condenser 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 30RBS 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.

30RBSY 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 30RBSY units are equipped with variable-speed fans with a maximum speed of 19 r/s to ensure an optimised air flow rate.

The full-load or part-load speed of each circuit is controlled by an 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.

If required and for reasons that may apply at the installation site of the 30RBSY units a maximum fan speed can be set. To do this consult the 30RB/RQ 017-160 Pro-Dialog+ 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.

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 safety 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:

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

* 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 safety 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.

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

The external safety valves must always be connected to drain pipes for units installed in a closed room (30RBSY). 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.

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

If the safety relief valves are installed on a reversing valve (changeover), this is equipped with a safety relief valve on each of the two outlets. Only one of the two safety 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 safety valve is removed for checking or replacement please ensure that there is always an active safety valve on each of the reversing valves installed in the unit.

Provide a drain in the discharge circuit, close to each globe 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.

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

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 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.
  Refrigerant type: R-410A
  Global Warming Potential (GWP): 1975
  Periodic inspections for refrigerant leaks may be required depending on European or local legislation.
  Please contact your local dealer for more information.
- ***During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.***

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 safety valves.***

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

Regularly carry out leak tests and immediately repair any leaks.

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 authorised 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 flamecut the refrigerant lines or any refrigerant circuit component until all refrigerant (liquid and vapour) as well as the oil have been removed from the chiller. 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.

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 safety 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 polyol-ester 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 strenghtening measures have been taken.
- the unit is installed level on an even surface (maximum tolerance is 5 mm in both axes).
- there is adequate space above the unit for air flow and to ensure access to the components (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 30RBS/RBSY 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 378-2 as follows:

External visual installation checks:

- 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 30RBSY 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 condensers of the different refrigerant circuits.

On the 30RBSY 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.

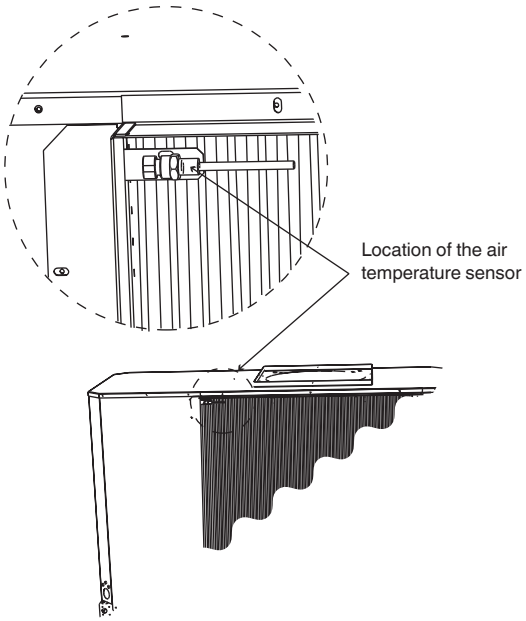
For the precise dimensions of this connection interface please refer to the dimensional drawings for the units.

3.2 - Duct connection

30RBSY 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 30RBSY 039 to 080 units
- Fan discharge side at the evacuation side of the treated air by the unit heat exchanger (30RBSY 039 to 160).

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

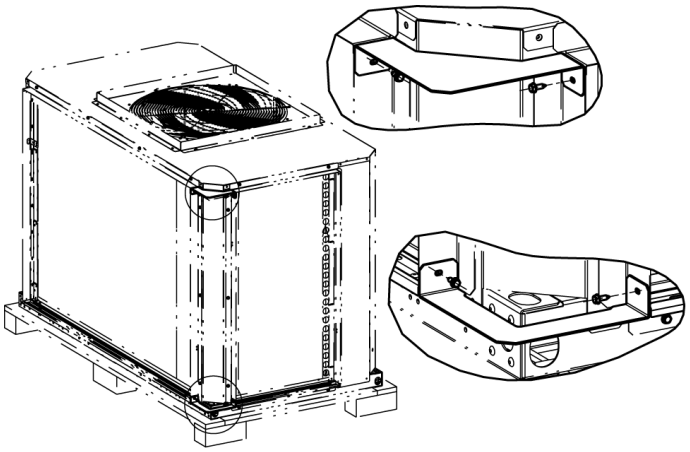


3.2.1 - Standard unit suction connection

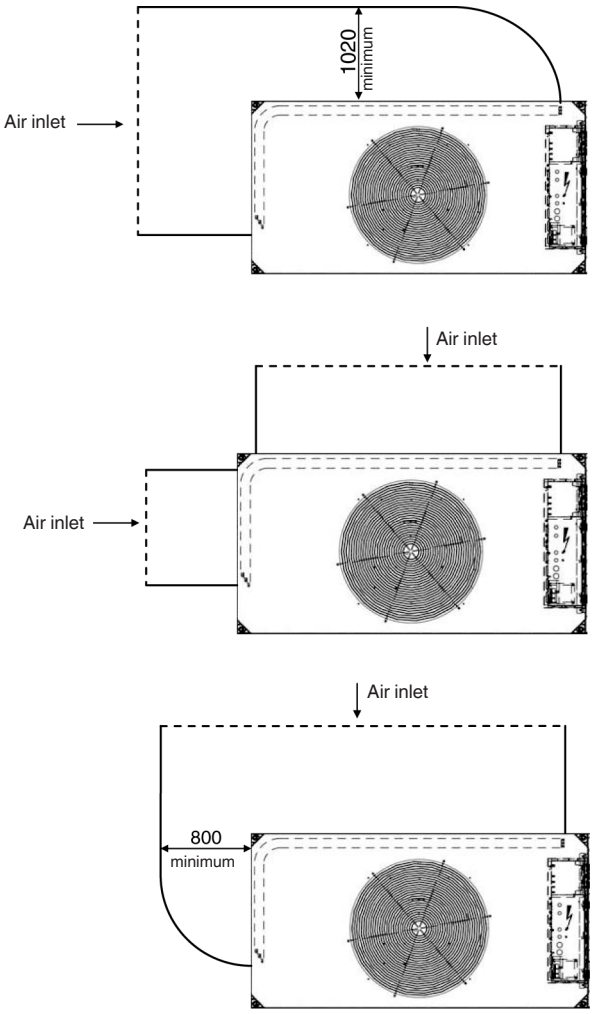
30RBSY 039 to 080 units are supplied with a sleeve that allows connection of a condenser suction duct. Provide a removable window on the suction duct to allow the maintenance of the sensor (see figure above).

For units 30RBSY 060 to 080 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 in the diagram below) with plastic collars.



Specific connection precautions for sizes 30RBSY 060 and 080



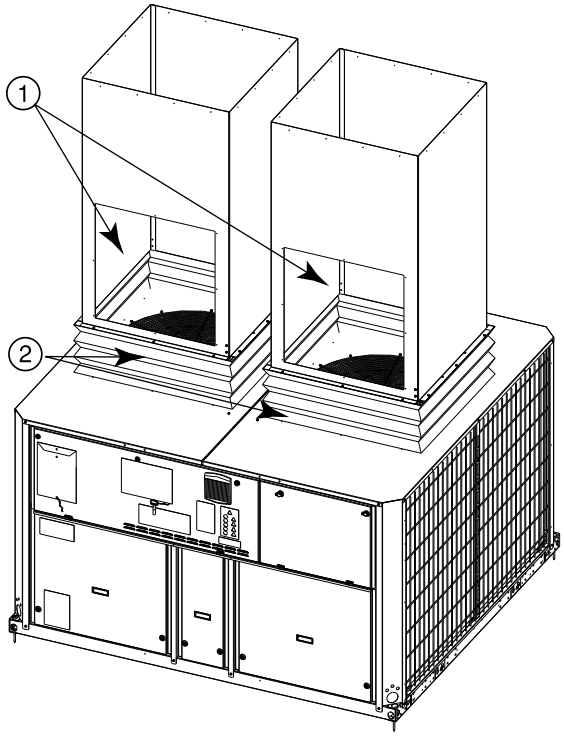
All dimensions are in mm.

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

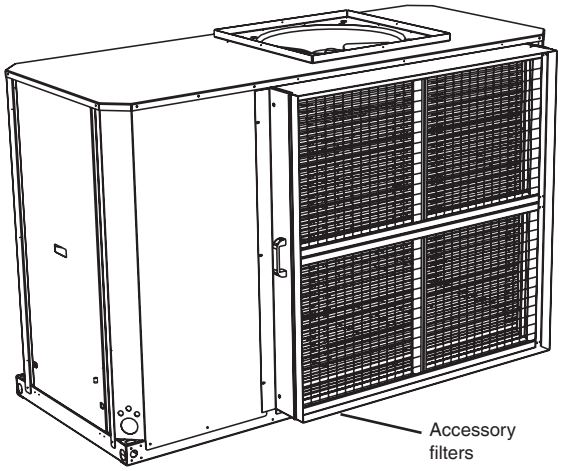
Each motor is controlled by its own variable-speed controller. Electrical protection is ensured by the variable-speed controller (in case of a locked rotor or overload).

If a fan does not operate, the variable-speed controller will automatically detect this and an alert will be sent to the Pro-Dialog display. For the specific alarms list of this option, please refer to the Pro-Dialog control manual.

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

This option is available for units 30RBSY 039 to 080. 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 sllide in their support.



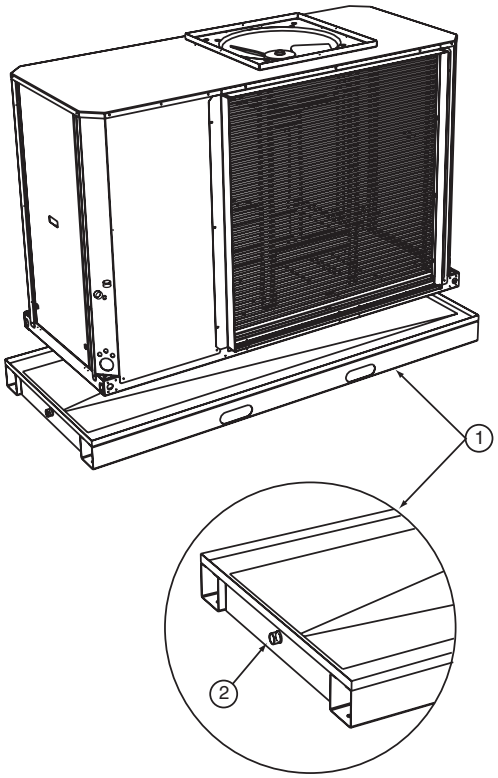
3.5 - Applicable rules for units incorporated into an air duct network

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 – (30RBSY 039 to 080)

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.



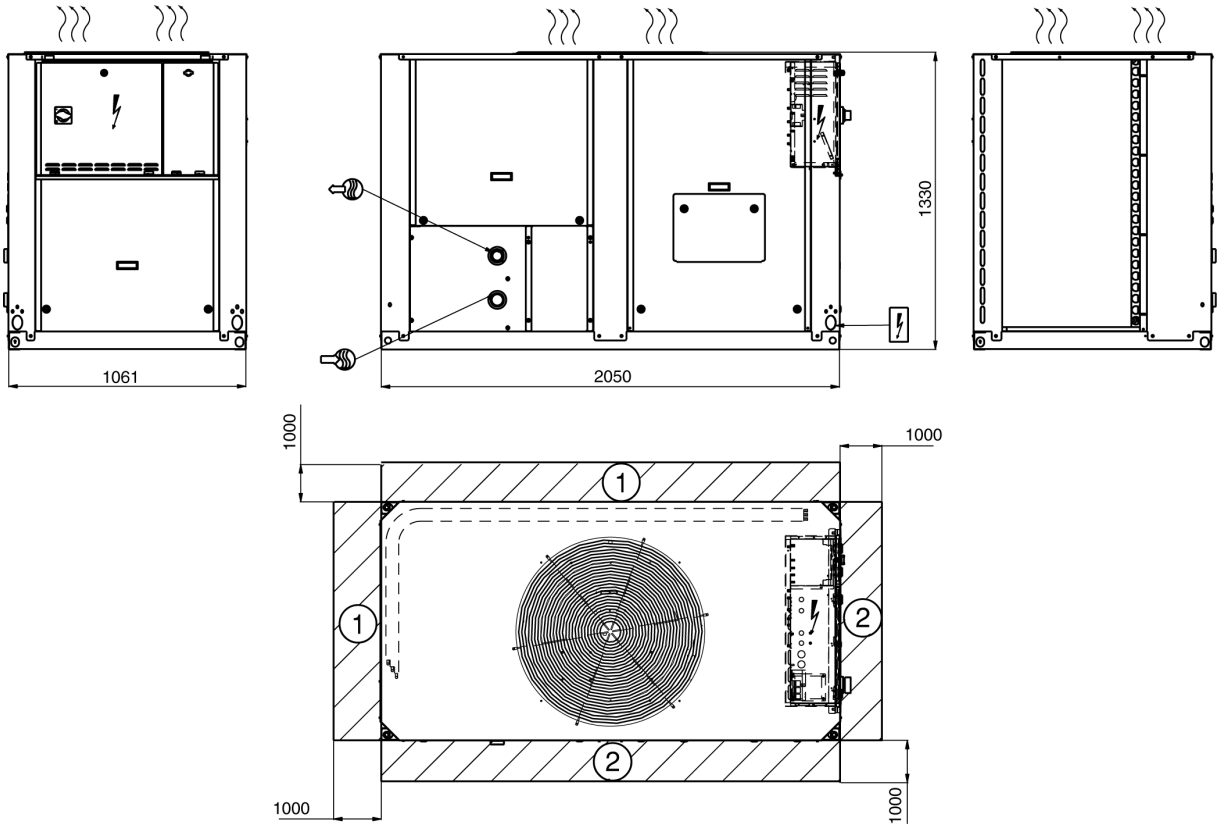
Legend

① Condensate collection pan
② Connection

4 - DIMENSIONS, CLEARANCES

4.1 - 30RBS 039-080, units with and without hydronic module

For units with fans with variable available pressure (30RBSY) 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:

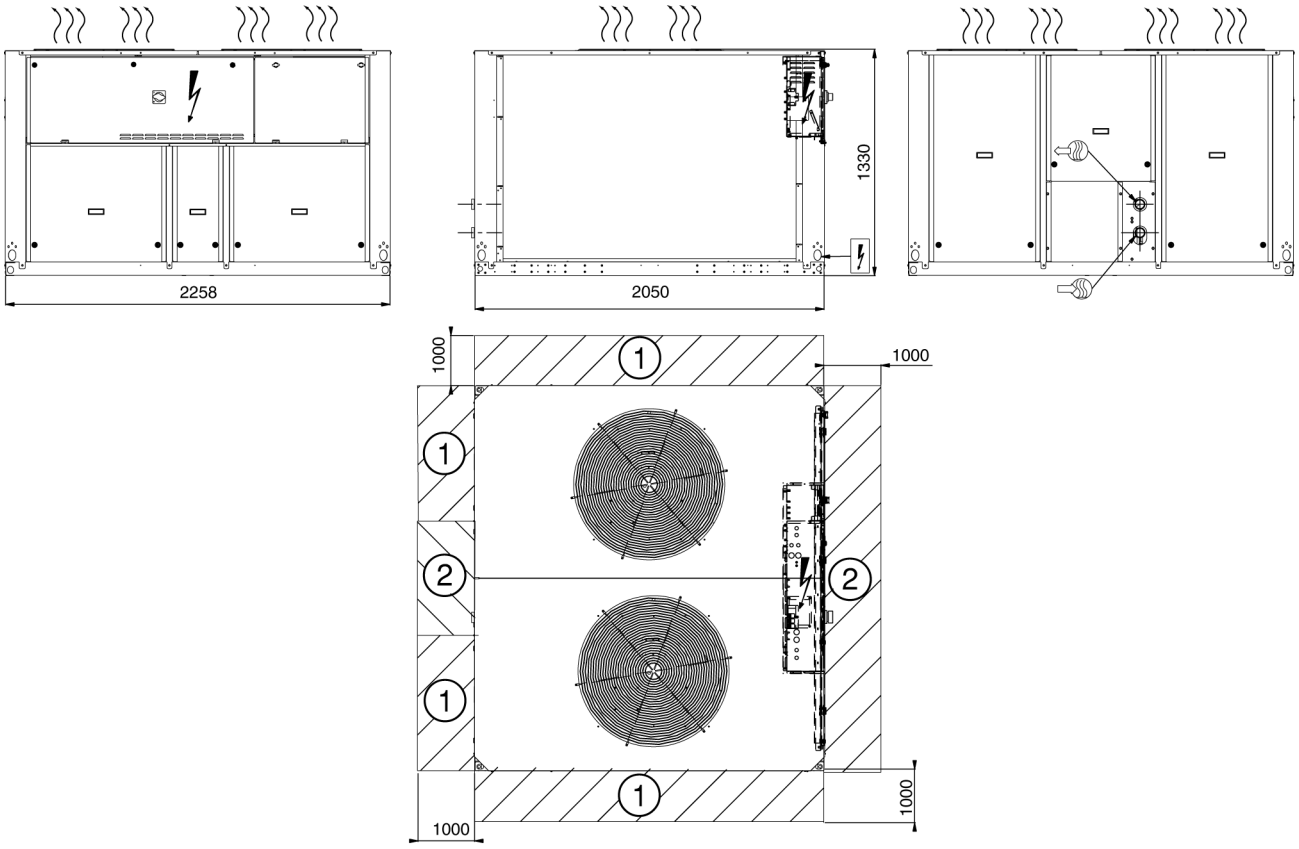
A Non-certified drawings.
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

B In multiple-chiller 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 - 30RBS 090-160, units with and without hydronic module

For units with fans with variable available pressure (30RBSY) 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:

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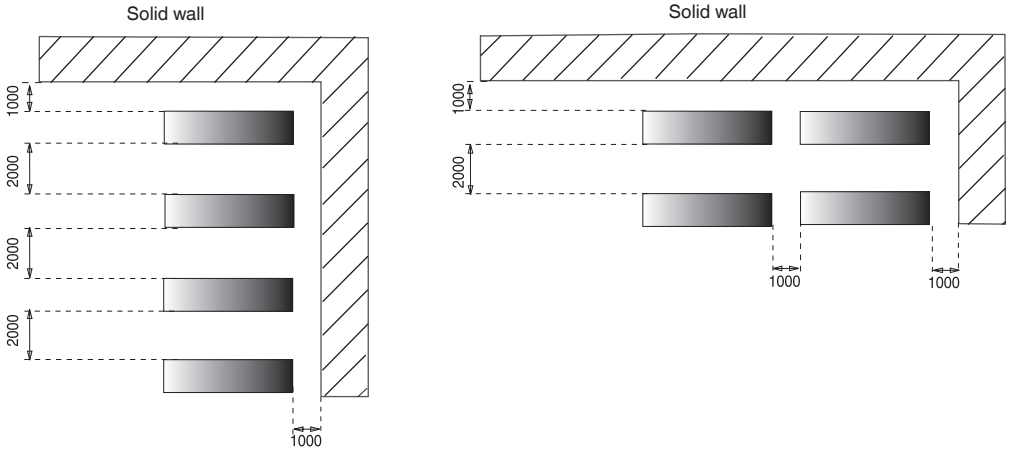
B In multiple-chiller installations (maximum four units), the side clearance between the units should be increased from 1000 to 2000 mm.

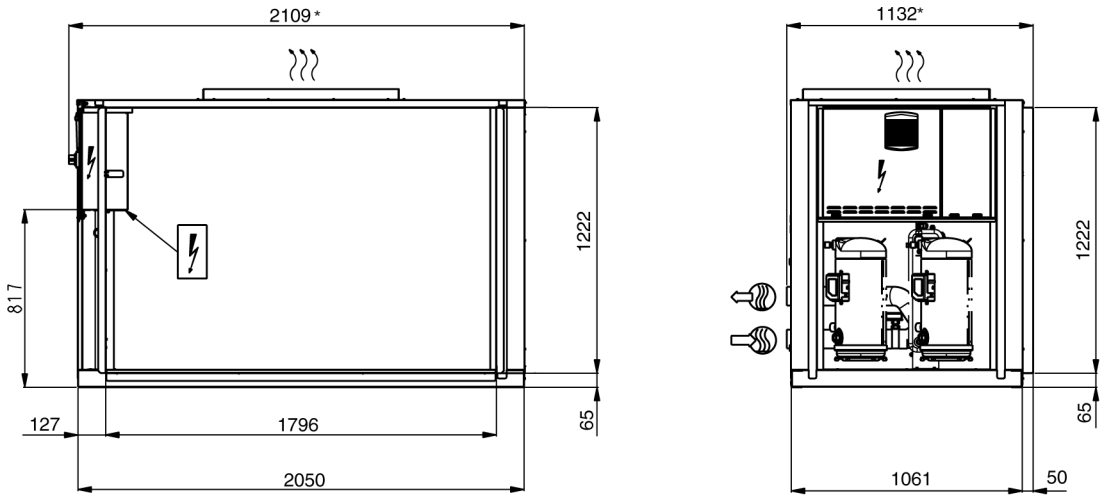
C The height of the solid surface must not exceed 2 m.

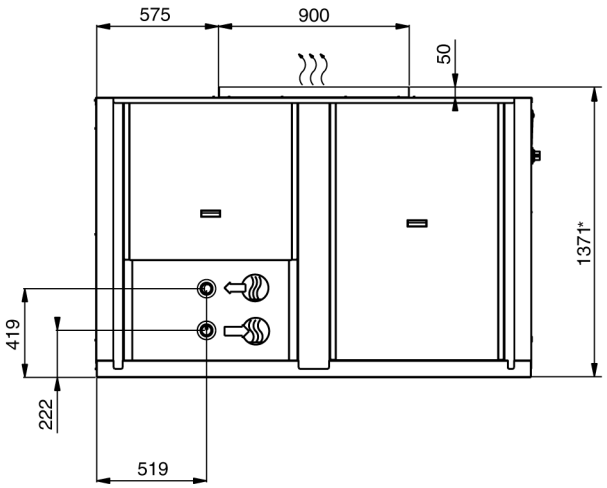
Multiple chiller installation

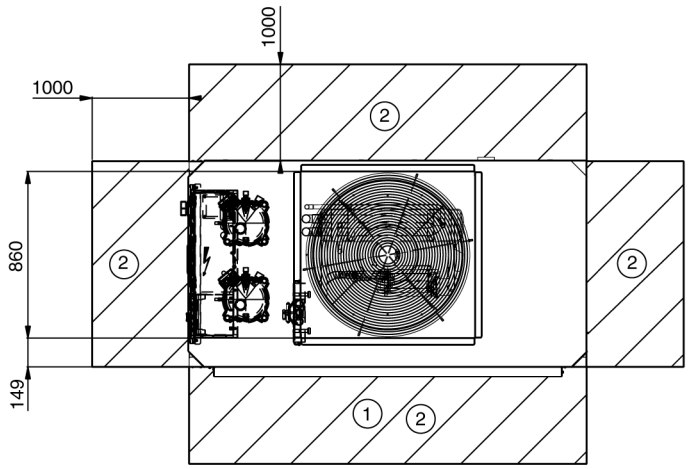
NOTE: If the walls are higher than 2 m, contact the factory



4.3 - 30RBSY 039-050 and 070, 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.

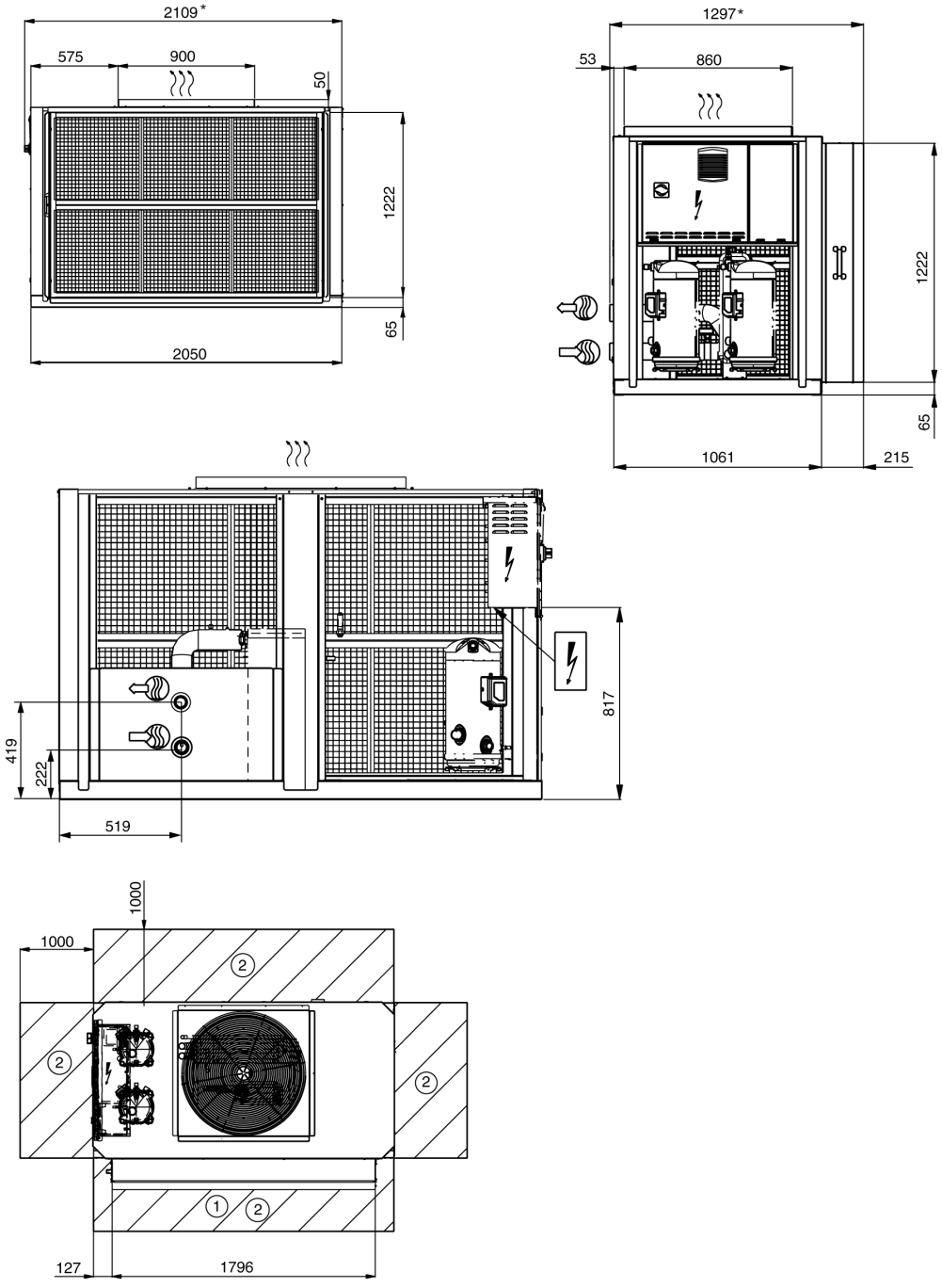
B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RBSY 039 to 080).

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

D Units 30RBSY 039 to 080 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

* Overall dimensions

4.4 - 30RBSY 039-050 and 070, 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

* Overall dimensions

NOTES:

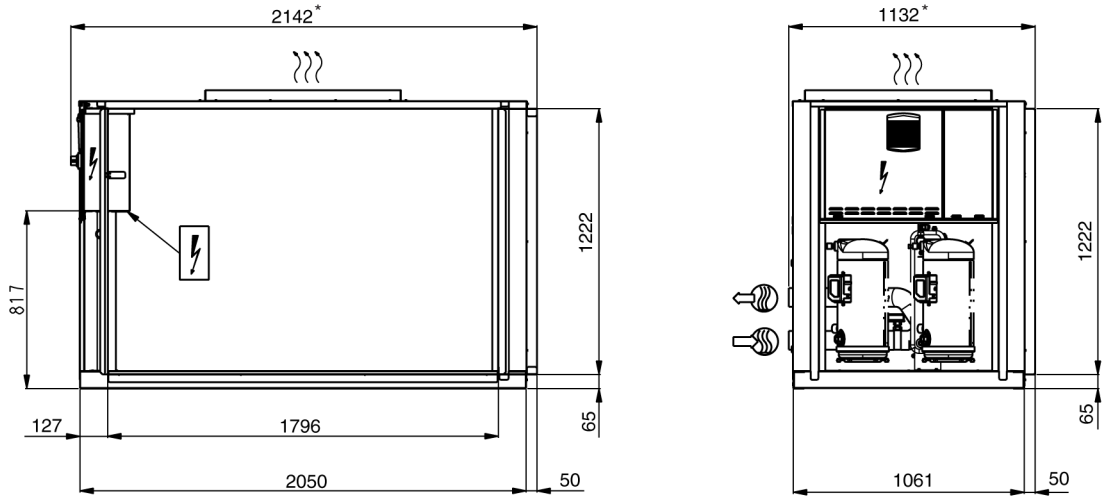
A Non-certified drawings.
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

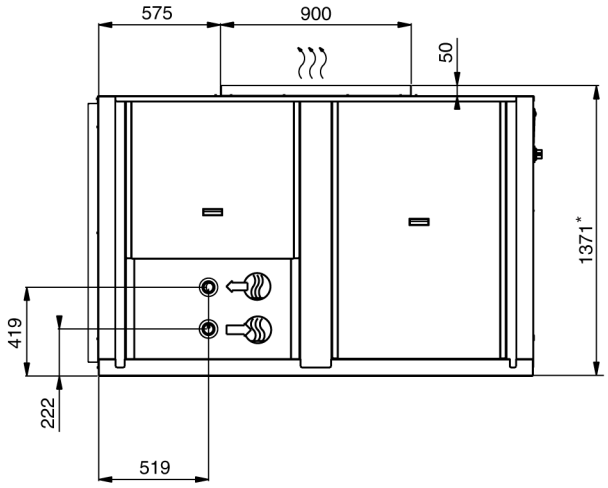
B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RBSY 039 to 080).

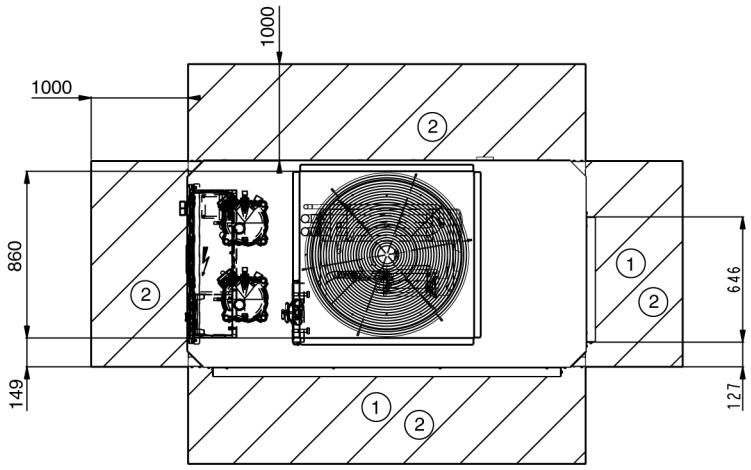
C The unit must be installed level (less than 2 mm per metre deviation in both axes).

D Units 30RBSY 039 to 080 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

4.5 - 30RBSY 060 and 080, 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.

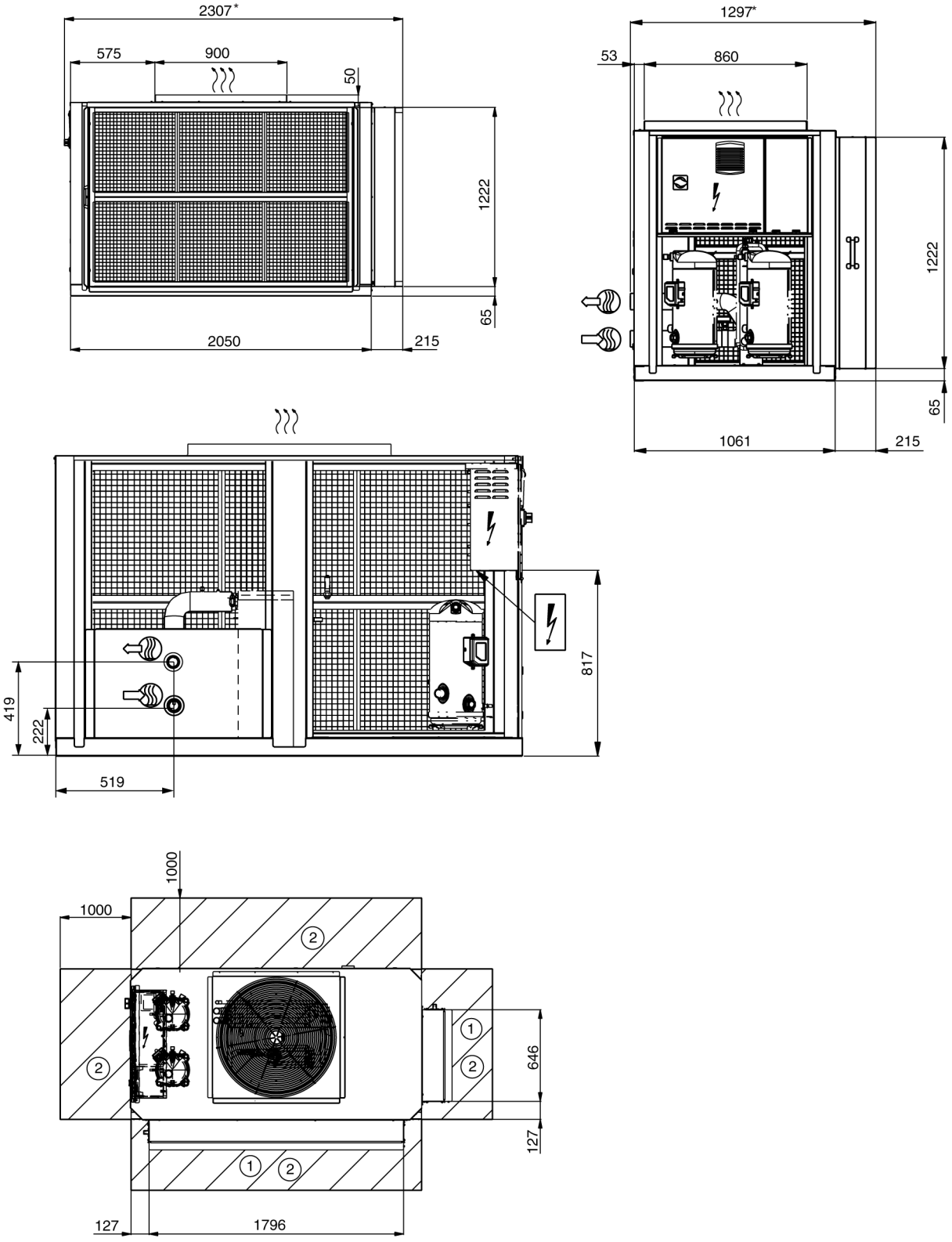
B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RBSY 039 to 080).

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

D Units 30RBSY 039 to 080 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

* Overall dimensions

4.6 - 30RBSY 060 and 080 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.

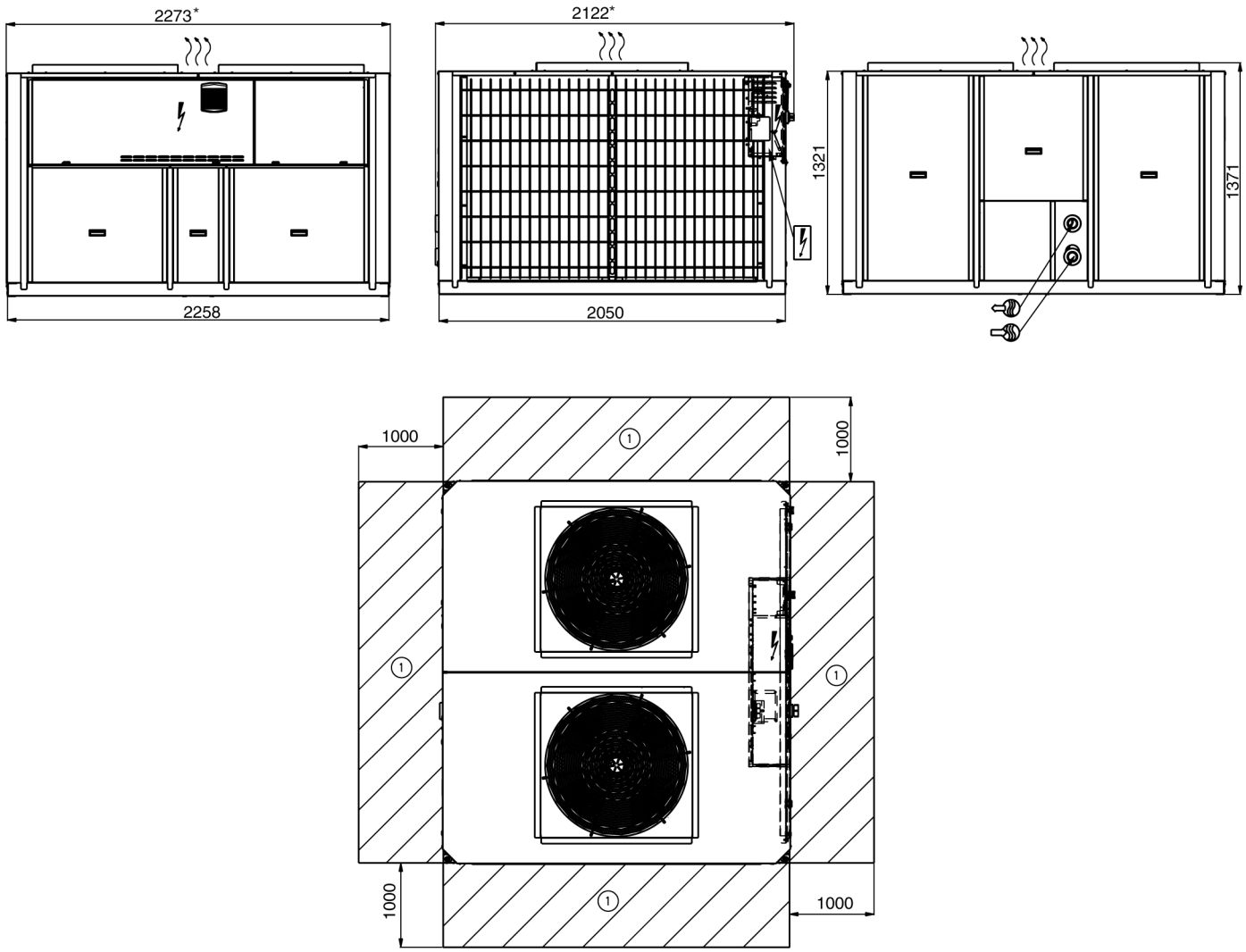
B Provide a gutter around the unit to collect the condensate water or install the accessory condensate collection pan (30RBSY 039 to 080).

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

D Units 30RBSY 039 to 080 are equipped with a sleeve on the air heat exchanger side to allow connection of a suction air frame.

* Overall dimensions

4.7 - 30RBSY 090-160 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:

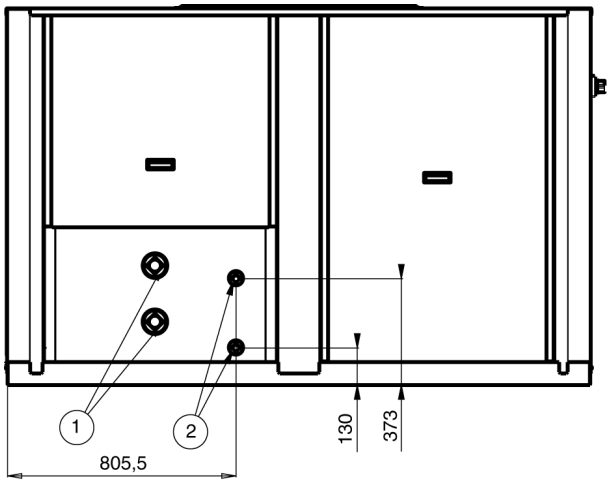
A Non-certified drawings.
Refer to the certified dimensional drawings supplied with the unit or available on request, when designing an installation. For the location of fixing points, weight distribution and coordinates of the centre of gravity refer to the certified dimensional drawings.

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

* Overall dimensions

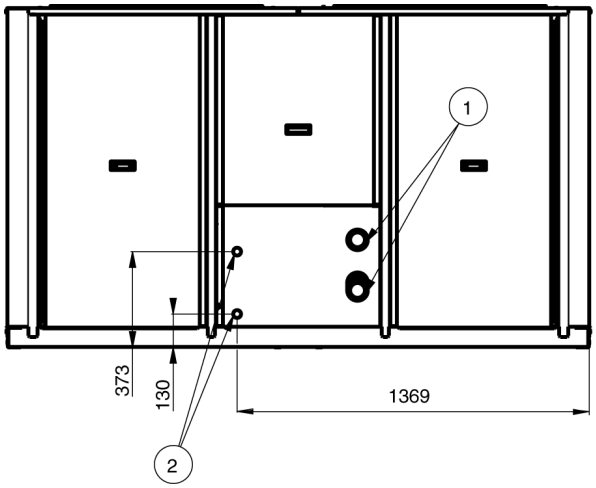
4.8 - 30RBS/RBSY 039-080 units with desuperheater

Position of the desuperheater inlets and outlets



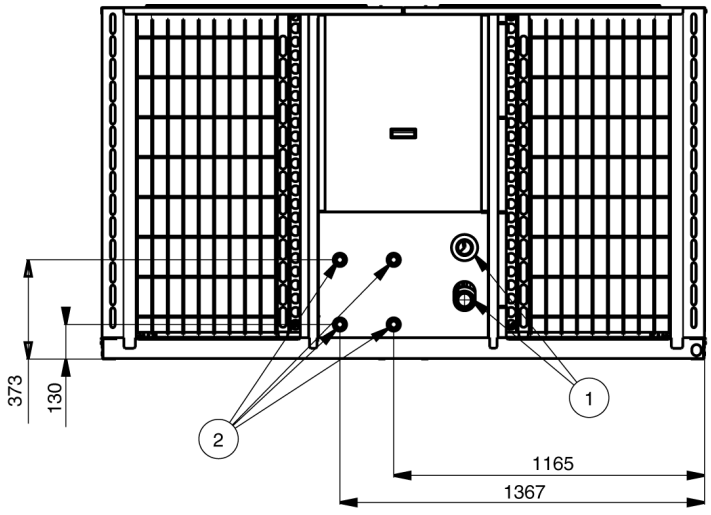
4.9 - 30RBS/RBSY 090-120 units with desuperheater

Position of the desuperheater inlets and outlets



4.10 - 30RBS/RBSY 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, 30RBS UNITS

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

30RBS		039	045	050	060	070	080	090	100	120	140	160
Operating weight with MCHE coils*												
Standard unit without hydronic module	kg	434	442	445	451	458	470	766	776	789	894	919
Standard unit with hydronic module option												
Single high-pressure pump	kg	464	472	475	481	487	499	798	808	825	933	958
Dual high-pressure pump	kg	490	498	501	507	513	525	843	853	873	970	995
Sound levels												
Sound power level 10^{-12}W**	dB(A)	80	81	81	81	87	87	84	84	84	90	90
Sound pressure level at 10 m***	dB(A)	49	49	49	49	55	55	52	52	52	58	58
Compressors		Hermetic scroll compressor 48.3 r/s										
Circuit A		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	3	3	3	4	4
Refrigerant charge, units with MCHE coils*	kg	R-410A										
Circuit A		4.7	5.3	5.9	6.7	6.2	7.3	10.7	10.8	11.4	6.5	7.4
Circuit B		-	-	-	-	-	-	-	-	-	6.5	7.4
Oil charge		POE SZ160 (EMKARATE RL 32-3MAF).										
Circuit A	l	5.8	7.2	7.2	7.2	7.0	7.0	10.8	10.5	10.5	7.0	7.0
Circuit B	l	-	-	-	-	-	-	-	-	-	7.0	7.0
Control type		PRO-DIALOG+										
Minimum capacity	%	50	50	50	50	50	50	33	33	33	25	25
Condensers		All-aluminium microchannel heat exchanger (MCHE)										
Fans		Axial Flying Bird 4 fans with rotating shroud										
Quantity		1	1	1	1	1	1	2	2	2	2	2
Total air flow	l/s	3800	3800	3800	3800	5300	5300	7600	7600	7600	10600	10600
Speed	r/s	12	12	12	12	16	16	12	12	12	16	16
Evaporator		Direct-expansion welded plate heat exchanger										
Water volume	l	2.6	3.0	3.3	4.0	4.8	5.6	8.7	9.9	11.3	12.4	14.7
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Hydronic module (option)												
Single or dual pump (as selected)		Pump, Victaulic screen filter, safety 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****	bar	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400	400	400	400	400
Water connections (with and without hydronic module)		Victaulic										
Diameter	inch	2	2	2	2	2	2	2	2	2	2	2
Outside tube diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
Chassis paint colour		Colour code: RAL7035										

* Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate.
** In accordance with ISO 9614-1 and certified by Eurovent. The values have been rounded and are for information only and not contractually binding
*** For information, calculated from the sound power level Lw(A)
**** When delivered, the pre-inflation of the tank keeps the plated membrane in the upper part of the tank. 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, 30RBS UNITS

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

30RBS - Standard unit (without hydronic module)		039	045	050	060	070	080	090	100	120	140	160
Power circuit												
Nominal power supply	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
Control circuit supply		24 V, via internal transformer										
Maximum start-up current (Un)*	A											
Standard unit		113.8	134.8	142.8	145.8	176.0	213.0	173.6	207.6	247.6	243.0	286.0
Unit with electronic starter option		74.7	86.5	93.8	96.2	114.4	139.8	-	-	-	-	-
Unit power factor at maximum capacity**		0.83	0.81	0.81	0.83	0.81	0.78	0.83	0.81	0.79	0.81	0.78
Maximum unit power input**	kW	19.5	22.3	24.5	27.9	31.2	35.8	42.3	45.6	52.5	62.4	71.6
Nominal unit current draw***	A	25.6	29.0	33.0	36.0	42.4	52.8	55.4	61.7	77.3	84.8	105.6
Maximum unit current draw (Un)******	A	34.8	44.8	46.8	52.8	67.0	73.0	80.6	98.6	107.6	134.0	146.0
Maximum unit current draw (Un-10%)†	A	38.0	49.2	51.4	58.4	74.8	79.6	89.0	110.3	117.5	149.6	159.2
Customer-side unit power reserve	kW	Customer reserve at the 24 V control power circuit										
Short-circuit stability and protection		See table 8.2										

* 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, compressors and fans, at the unit operating limits (saturated suction temperature 10°C, saturated condensing temperature 65°C) and nominal voltage of 400 V (data given on the unit nameplate).
*** Standardised Eurovent conditions: evaporator entering/leaving water temperature 12°C/7°C, outside air temperature 35°C.
**** Maximum unit operating current at maximum unit power input and 400 V (values given on the unit nameplate).
† Maximum unit operating current at maximum unit power input and 360 V.

7 - PHYSICAL DATA, 30RBSY UNITS

30RBSY		039	045	050	060	070	080	090	100	120	140	160
Operating weight with MCHE coils*												
Standard unit without hydronic module	kg	450	458	461	473	473	491	771	780	793	899	923
Standard unit with hydronic module option												
Single high-pressure pump	kg	480	488	491	503	503	521	803	812	829	938	962
Dual high-pressure pump	kg	506	513	516	528	529	547	848	857	878	975	999
Sound levels												
Sound power level 10^{-12} W**	dB(A)	87	88	88	88	90	90	90	91	91	93	93
Sound pressure level at 10 m***	dB(A)	56	56	56	56	59	59	59	59	59	61	61
Compressors		Hermetic scroll compressor 48.3 r/s										
Circuit A		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	3	3	3	4	4
Refrigerant charge, units with MCHE coils*		R-410A										
Circuit A	kg	4.7	5.3	5.9	6.7	6.2	7.3	10.7	10.8	11.4	6.5	7.4
Circuit B	kg	-	-	-	-	-	-	-	-	-	6.5	7.4
Oil charge		POE SZ160 (EMKARATE RL 32-3MAF).										
Circuit A	l	5.8	7.2	7.2	7.2	7.0	7.0	10.8	10.5	10.5	7.0	7.0
Circuit B	l	-	-	-	-	-	-	-	-	-	7.0	7.0
Control type		PRO-DIALOG +										
Minimum capacity	%	50	50	50	50	50	50	33	33	33	25	25
Condensers		All-aluminium microchannel heat exchanger (MCHE)										
Fans		Axial Flying Bird 4 fans with rotating shroud										
Quantity		1	1	1	1	1	1	2	2	2	2	2
Total air flow	l/s	3800	3800	3800	3800	5300	5300	7600	7600	7600	10600	10600
Speed	r/s	16	16	16	18	18	18	16	16	16	16	16
Evaporator		Direct-expansion welded plate heat exchanger										
Water volume	l	2.6	3.0	3.3	4.0	4.8	5.6	8.7	9.9	11.3	12.4	14.7
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Hydronic module (option)												
Single or dual pump (as selected)		Pump. Victaulic screen filter. safety 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****	bar	1	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400	400	400	400	400
Water connections (with and without hydronic module)		Victaulic										
Diameter	inch	2	2	2	2	2	2	2	2	2	2	2
Outside tube diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
Chassis paint colour		Colour code: RAL7035										

* Weight shown is a guideline only. To find out the unit refrigerant charge, please refer to the unit nameplate.
** In accordance with ISO 9614-1 and certified by Eurovent. The values have been rounded and are for information only and not contractually binding
*** For information, calculated from the sound power level Lw(A)
**** When delivered, the pre-inflation of the tank keeps the plated membrane in the upper part of the tank. 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, 30RBSY UNITS

30RBS - Standard unit (without hydronic module)		039	045	050	060	070	080	090	100	120	140	160
Power circuit												
Nominal power supply	V-ph-Hz	400-3-50										
Voltage range	V	360-440										
Control circuit supply		24 V, via internal transformer										
Maximum start-up current (Un)*												
Standard unit	A	116.4	137.4	145.4	148.4	176.4	213.4	178.8	212.8	252.8	243.8	286.8
Unit with electronic starter option	A	74.7	86.5	93.8	96.2	114.4	139.8	-	-	-	-	-
Unit power factor at maximum capacity**		0.83	0.81	0.81	0.83	0.81	0.78	0.83	0.81	0.79	0.81	0.78
Maximum unit power input**	kW	21.2	24.0	26.2	29.6	31.8	36.4	45.7	49.0	55.9	63.6	72.8
Nominal unit current draw***	A	28.2	31.6	35.6	38.6	42.8	53.2	60.6	66.9	82.5	85.6	106.4
Maximum unit current draw (Un)****	A	37.4	47.4	49.4	55.4	67.4	73.4	85.8	103.8	112.8	134.8	146.8
Maximum unit current draw (Un-10%)†	A	40.6	51.8	54.0	61.0	75.2	80.0	94.2	115.5	122.7	150.4	160.0
Customer-side unit power reserve	kW	Customer reserve at the 24 V control power circuit										
Short-circuit stability and protection		See table 8.2										

* 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, compressors and fans, at the unit operating limits (saturated suction temperature 10°C, saturated condensing temperature 65°C) and nominal voltage of 400 V (data given on the unit nameplate).
*** Standardised Eurovent conditions: evaporator entering/leaving water temperature 12°C/7°C, outside air temperature 35°C.
**** Maximum unit operating current at maximum unit power input and 400 V (values given on the unit nameplate).
† Maximum unit operating current at maximum unit power input and 360 V.

9 - ELECTRICAL DATA, 30RBS AND 30RBSY UNITS

9.1 - Short-circuit stability current (TN system*) - standard unit (with main disconnect without fuse)

30RBS/30RBSY	039	045	050	060	070	080	090	100	120	140	160
Value with unspecified upstream protection											
Short-term current at 1 s - Icw - kA rms	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	20	20	15	20	15
Max. value with upstream protection (circuit breaker)											
Conditional short-circuit current Icc - kA rms	40	40	40	40	40	40	40	40	40	30	30
Schneider circuit breaker - Compact series	NS100H	NS100H	NS100H	NS100H	NS100H	NS100H	NS100H	NS160H	NS160H	NS250H	NS250H
Reference number**	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 have motors with efficiency class IE2. The additional electrical data required* is as follows:

Motors of single and dual low-pressure pumps (options 116F, 116G)

No.**	Description***		30RBS/RBSY										
			039	045	050	060	070	080	090	100	120	140	160
1	Nominal efficiency at full load and nominal voltage	%	79.5	79.5	79.5	79.5	79.5	79.5	79.5	82.3	82.3	81.9	81.9
1	Nominal efficiency at 75% rated load and nominal voltage	%	78.2	78.2	78.2	78.2	78.2	78.2	78.2	81.8	81.8	81.8	81.8
1	Nominal efficiency at 50% rated load and nominal voltage	%	74.5	74.5	74.5	74.5	74.5	74.5	74.5	79.7	79.7	79.1	79.1
2	Efficiency level		IE2										
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
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	1.25	1.25	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	1.5	1.5	2.3	2.3
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	2.3	2.3	2.3	2.3	2.3	2.3	2.3	3.1	3.1	4.3	4.3
10	Rated speed	rpm	2838	2838	2838	2838	2838	2838	2838	2892	2892	2863	2863
		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 2005/32/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 (options 116B, 116C, 116J and 116K)

No.**	Description***		30RBS/RBSY										
			039	045	050	060	070	080	090	100	120	140	160
1	Nominal efficiency at full load and nominal voltage	%	81.9	81.9	81.9	81.9	81.9	81.9	81.9	81.9	84.3	84.3	84.3
1	Nominal efficiency at 75% rated load and nominal voltage	%	81.8	81.8	81.8	81.8	81.8	81.8	81.8	81.8	84	84	84
1	Nominal efficiency at 50% rated load and nominal voltage	%	79.1	79.1	79.1	79.1	79.1	79.1	79.1	79.1	81.8	81.8	81.8
2	Efficiency level		IE2										
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
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
7-2	Maximum power input (400 V)****	kW	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	3	3	3
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	4.3	4.3	4.3	4.3	4.3	4.3	4.3	4.3	5.8	5.8	5.8
10	Rated speed	rpm	2863	2863	2863	2863	2863	2863	2863	2863	2865	2865	2865
		r/s	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 2005/32/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	30RBS/30RBSY										
								039	045	050	060	070	080	090	100	120	140	160
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	-	2	-
							B	-	-	-	-	-	-	-	-	-	2	-
ZP182	23.9	34	37.3	174	104	0.84	A	-	-	-	-	-	2	-	-	3	-	2
							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, A

Electrical data and operating conditions notes:

- 30RBS/30RBSY 039-160 units have a single power connection point located immediately upstream of the main disconnect switch/circuit breaker.
- The control box includes the following standard features:
  - a main disconnect switch,
  - starter and motor protection devices for each compressor, the fans and the pump,
  - the control devices.
- **Field connections:**
  All connections to the system and the electrical installations must be in full accordance with all applicable local codes.
- The Carrier 30RBS/30RBSY 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.

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 30RBS/30RBSY 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)
2. Power supply frequency variation: ± 2 Hz.
3. The neutral (N) conductor must not be connected directly to the unit (if necessary use a transformer).
4. Overcurrent protection of the power supply conductors is not provided with the unit.
5. The factory-installed disconnect switch is of a type suitable for power interruption in accordance with EN 60947.
6. 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 116J/K/V/W) are not compatible with IT network.
7. 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 required protection level for this class is IP43BW (according to reference document IEC 60529). All 30RBS/30RBSY units are protected to IP44CW and fulfil this protection condition.

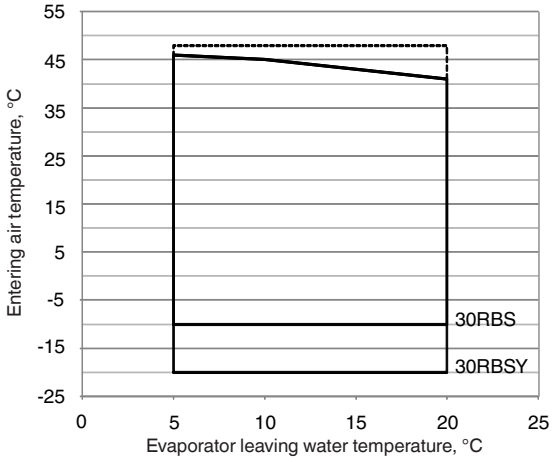
10 - APPLICATION DATA

10.1 - Unit operating range

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, full load*** (30RBS)	°C	-10	46
Entering air temperature, part load*** (30RBS)	°C	-10	48
Entering air temperature, full load (30RBSY)	°C	-20	46
Entering air temperature, part load (30RBSY)	°C	-20	48
Hydronic module**			
Entering air temperature			
Kit without pump	°C	-20	-
Kit with pump (option 116x)	°C	-10	-
Kit with pump (option 116x) and frost protection option to -20°C (option 42)	°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.
*** Maximum outside temperature: Please refer to option 28 for low-temperature applications (< -10°C). For transport and storage of the 30RBS/30RBSY 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



Full load
Minimum load

NOTE: This operating range applies up top 130 Pa static pressure without suction air duct for sizes 070 and 080 and 140-160, and up to 240 Pa for all other sizes.

10.2 - Evaporator water flow

30RBS/ 30RBSY	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
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.

10.3 - Minimum water flow rate

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

10.4 - Maximum evaporator water flow rate

This is limited by the permitted evaporator pressure drop. Also, a minimum evaporator ΔT of 2.8 K must be guaranteed, which corresponds to a water flow rate of 0.09 l/s per kW.

10.5 - Water loop volume

10.5.1 - Minimum water loop volume

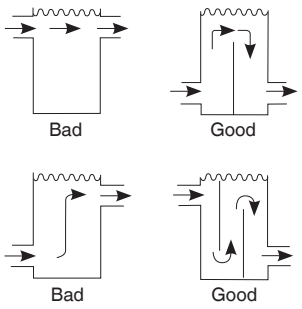
The minimum water loop volume, in litres, is given by the following formula:
Volume (l) = CAP (kW) x N, where CAP is the nominal cooling capacity at nominal operating conditions.

Application	N
Air conditioning	
30RBS/RBSY 039 to 160	2.5
Industrial process cooling	
30RBS/RBSY 039 to 160	(See note)

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.



10.5.2 - 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.

30RBS/RBSY		039-080			090-160		
Static pressure	bar	1	2	3	1	2	3
Pure water	litres	600	400	200	1680	1120	560
10% ethylene glycol	l	450	300	150	1260	840	420
20% ethylene glycol	l	330	220	110	930	620	310
30% ethylene glycol	l	270	180	90	750	500	250
40% ethylene glycol	l	225	150	75	630	420	210

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

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 chiller nameplate. The supply voltage must be within the range given in the electrical data table. For connections refer to the wiring diagrams and the certified dimensional drawings.

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

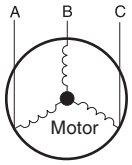
11.3 - Voltage phase imbalance (%)

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

Example:
On a 400 V-3 ph-50 Hz supply, the individual phase voltages were measured to be: AB = 406 V; BC = 399 V; AC = 394 V

Average voltage = (406 + 399 + 394)/3 = 1199/3
= 399.7 say 400 V

Calculate the maximum deviation from the 400 V average:
(AB) = 406 - 400 = 6
(BC) = 400 - 399 = 1
(CA) = 400 - 394 = 6



The maximum deviation from the average is 6 V. The greatest percentage deviation is: 100 x 6/400 = 1.5% This is less than the permissible 2% and 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 to the general disconnect/isolator switch 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 (30RBS 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 on the main disconnect/isolator switch.

Power cable entry
The power cables can enter the 30RB 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.

Table of minimum and maximum wire sections (per phase) for connection to 30RBS/RBSY units

30RBS/ 30RBSY	Disconnect switch	Connectable wire					
	Max. connectable section	Min. calculated wire section			Max. calculated wire section		
	Section, mm²	Section, mm²	Max. length, m	Wire type	Section, mm²	Max. length, m	Wire type
039	1 x 95	1 x 16	165	XLPE Cu	1 x 25	300	PVC Cu
045	1 x 95	1 x 16	165	XLPE Cu	1 x 25	300	PVC Cu
050	1 x 95	1 x 16	165	XLPE Cu	1 x 25	300	PVC Cu
060	1 x 95	1 x 25	210	XLPE Cu	1 x 35	305	PVC Cu
070	1 x 95	1 x 35	220	XLPE Cu	1 x 50	350	PVC Cu
080	1 x 95	1 x 35	220	XLPE Cu	1 x 70	380	PVC Cu
090	1 x 95	1 x 35	220	XLPE Cu	1 x 70	380	PVC Cu
100	1 x 95	1 x 70	280	XLPE Cu	1 x 95	410	PVC Cu
120	1 x 95	1 x 70	280	XLPE Cu	1 x 95	410	PVC Cu
140	1 x 185	1 x 95	305	XLPE Cu	1 x 185	465	PVC Cu
160	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)

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 017-160 Pro-Dialog+ Controls IOM and the certified wiring diagram supplied with the unit for the field control wiring of the following features:

- Evaporator pump interlock (mandatory)
- Remote on/off switch
- Demand limit external switch
- Remote dual setpoint
- Alarm, alert and operation report
- Heating/cooling selection

11.6 - Power supply

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).

11.7 - 24 V user power reserve

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

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 filtering, 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 97/23/EC.

Carrier recommendations on heat exchange fluids:

- No 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.
- Cl^- Chloride ions are detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep below 10 mg/l.
- SO_4^{2-} sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
- No fluoride ions (<0.1 mg/l).
- No Fe^{2+} and Fe^{3+} ions with non negligible levels of dissolved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.
- Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 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 encourages destabilisation of copper hydroxides and enlargement of particles.
- Electric conductivity: 0.001-0.06 S/m.
- 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. The 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).

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 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.

12.2 - Hydronic connections

The diagram on the following page 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.

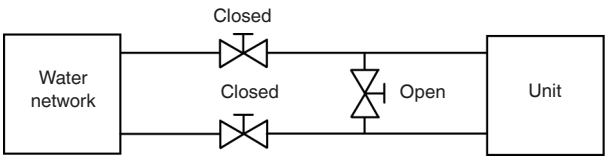
Frost protection of the plate heat exchanger and all hydronic circuit components is guaranteed:
- Down to -20°C by electric heaters (heat exchanger and internal piping) that have an automatic supply (units without hydronic module),
- Down to -10°C by an electric heater on the heat exchanger that has an automatic supply and by pump cycling (units with hydronic module),
- Down to -20°C by electric heaters (heat exchanger and internal piping) that have an automatic supply and by pump cycling (units with hydronic module and "Reinforced frost protection" option).

Never switch off the evaporator and hydronic circuit heaters or the pump, otherwise frost protection cannot be guaranteed.

For this reason the main unit disconnect switch as well as the auxiliary protection switch for the heaters must always be left closed (for the location of these components see the wiring diagram).

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 is recommended to drain it, and as a safety precaution introduce ethylene glycol or propylene glycol in the heat exchanger, using the water entering 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)

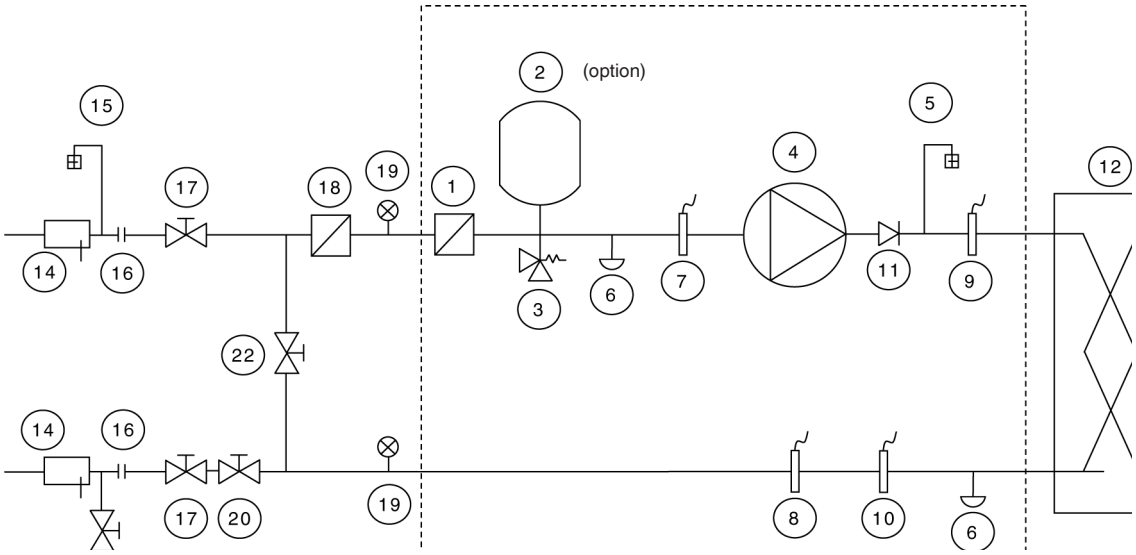
To ensure the durability of the pumps in the integrated hydronic modules, the control algorithm of the 30RBS units incorporates anti-cavitation protection.

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,

ATTENTION: The use the integrated hydronic kits for an open loop is prohibited.

Typical hydronic circuit diagram with hydronic module



Legend

Components of the unit and hydronic module

1 Victaulic screen filter
2 Expansion tank (option)
3 Safety valve
4 Available pressure pump - Note: x 1 for a single pump, x 2 for a dual pump
5 Air purge
6 Water drain valve
Note: A second valve is located on the heat exchanger leaving piping
7 Pressure sensor
Note: Gives pump suction pressure information (see installation manual)
8 Temperature probe - Note: Gives heat exchanger leaving temperature information (see installation manual)
9 Temperature probe - Note: Gives heat exchanger entering temperature information (see installation manual)
10 Pressure sensor
Note: Gives unit leaving pressure information (see installation manual)
11 Check valve - Note: x 2 for a dual pump, not provided for a single pump
12 Plate heat exchanger
13 Evaporator frost protection heater

Installation components

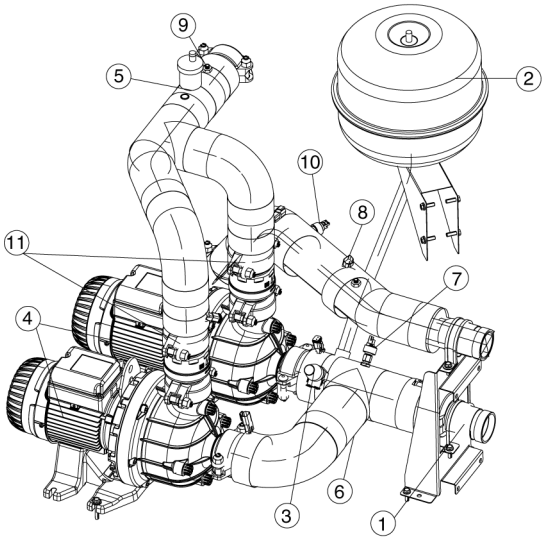
14 Temperature probe well
15 Air vent
16 Flexible connection
17 Shut-off valve
18 Screen filter (obligatory for a unit without hydronic module)
19 Pressure gauge
20 Water flow control valve
Note: Not necessary for a hydronic module with a variable-speed pump
21 Charge valve
22 Frost protection bypass valve (when shut-off valves [17] are closed during winter)

--- Hydronic module (unit with hydronic module)

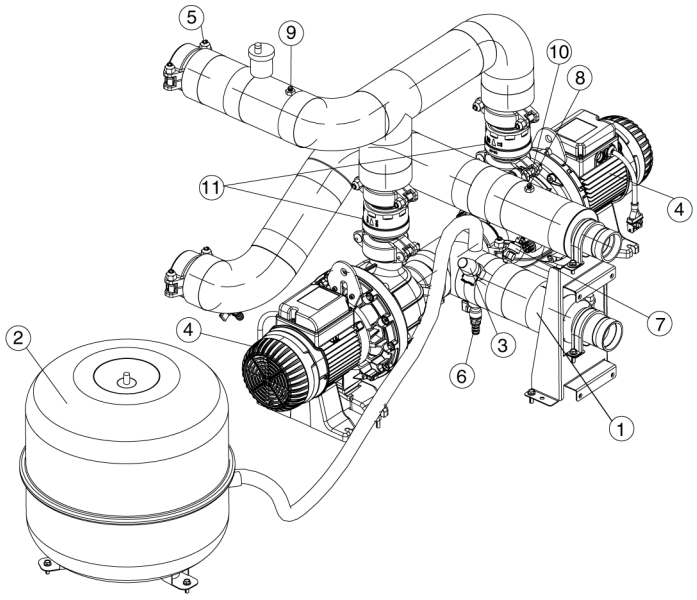
Notes:

- Units without hydronic module are equipped with a flow switch and two temperature sensors (8 and 9).
- The pressure sensors are installed at connections without Schraeder valves. Depressurise and drain the system before any intervention.

Hydronic module, sizes 039-080 - dual pump shown



Hydronic module, sizes 090-160 - dual pump shown



13 - NOMINAL SYSTEM WATER FLOW CONTROL

The water circulation pumps of the 30RBS/RBSY units have been sized to allow the hydronic modules to cover all possible configurations based on the specific installation conditions, i.e. for various temperature differences between the entering and the leaving water (ΔT) at full load, which can vary between 3 and 10 K. This required difference between entering and leaving water temperature determines the nominal system flow rate. Use this specification for the unit selection to find the system operating conditions.

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

- Unit without a hydronic module: nominal unit pressure drop (plate heat exchanger + internal piping),
- Unit with fixed-speed pump: nominal flow rate,
- Unit with variable-speed pump, controlled by the unit leaving pressure: nominal flow rate,
- Unit with variable-speed pump, controlled by the heat exchanger temperature difference: nominal temperature difference at the heat exchanger.

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

These characteristics can be obtained from the technical literature using the unit performance tables for a ΔT of 5 K at the evaporator or with the Electronic Catalogue selection program for all ΔT conditions other than 5 K in the range of 3 to 10 K.

13.1 - Units without hydronic module

The nominal system flow rate is controlled by a manual valve that must be on the water leaving piping of the system (item 20 in the typical hydronic circuit diagram).

Due to the pressure drop it generates in the hydronic system this flow control valve permits adjustment of the pressure/system flow rate curve according to the pump pressure/flow rate curve to obtain the nominal flow rate at the required operating point (see example for unit size 30RBS 080).

The pressure drop reading in the unit (plate heat exchanger + internal piping) is used as means of control. This reading can be taken with pressure gauges that must be installed at the unit inlet and outlet (item 19).

As the total system pressure drop is not known exactly at the start-up, the water flow rate must be adjusted with the control valve to obtain the specific flow rate for this system.

Hydronic circuit cleaning procedure

- Open the valve fully (item 20).
- Start-up the system pump.
- Read the plate heat exchanger pressure drop by taking the difference of the readings of the pressure gauge connected to the unit inlet and outlet (item 19).
- Let the pump run for two consecutive hours to clean the system hydronic circuit (presence of solid contaminants).
- Take another reading.
- Compare this value to the initial value.
- If the pressure drop has decreased, this indicates that the screen filter must be removed and cleaned, as the hydronic circuit contains solid particles. In this case close the shut-off valves at the water inlet and outlet (item 17) and remove the screen filter (item 18) after emptying the hydronic section of the unit (item 6).
- Purge the air from the circuit (items 5 and 15).
- Renew, if necessary, to ensure that the filter is not contaminated.

Water flow control procedure

When the circuit is cleaned, read the pressures at the pressure gauges (entering water pressure - leaving water pressure), to find out the unit pressure drop (plate heat exchanger + internal water piping).

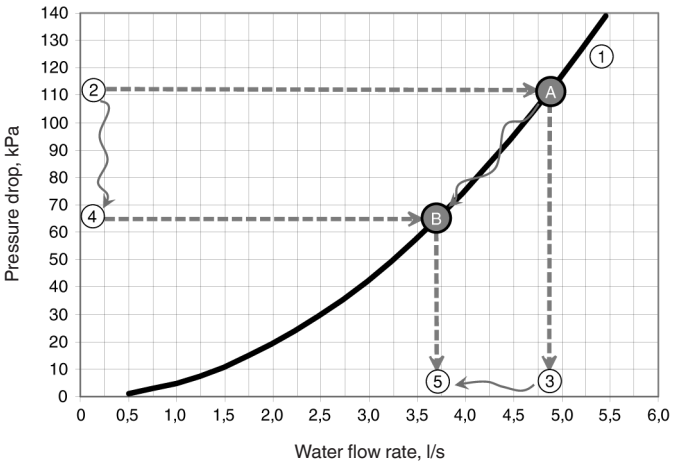
Compare the value obtained with the theoretical selection value. If the pressure drop measured is higher than the value specified this means that the unit flow rate (and thus system flow rate) is too high. The pump supplies an excessive flow rate based on the global pressure drop of the application. In this case close the control valve and read the new pressure difference. Proceed by successively closing the control valve until you obtain the specific pressure drop that corresponds to the nominal flow rate at the required unit operating point.

NOTE: If the system has an excessive pressure drop in relation to the available static pressure provided by the system pump the nominal water flow rate cannot be obtained (the resulting flow rate is lower) and the temperature difference between the evaporator entering and leaving water will increase.

To reduce the pressure drops of the hydronic system, it is necessary:

- to reduce the individual pressure drops as much as possible (bends, level changes, options, etc.).
- to use a correctly sized piping diameter.
- to avoid hydronic system extensions, wherever possible.

Example: 30RBS 080 at Eurovent conditions of 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 Wih 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

The nominal system flow rate is controlled by a manual valve that must be on the water leaving piping of the system (item 20 in the typical hydronic circuit diagram).

Due to the pressure drop it generates in the hydronic system this flow control valve permits adjustment of the pressure/system flow rate curve in accordance with the pump pressure/flow rate curve to obtain the nominal flow rate at the required operating point. The flow rate reading in the hydronic module is used as means of control.

The pressure of the transported fluid is measured by sensors installed in the pump suction line and at the unit outlet (items 7 and 10) and the system calculates the flow rate associated with the differential pressure.

Direct access to the flow rate reading is possible via the user interface (please refer to the control manual).

As the total system pressure drop is not known exactly at the start-up, the water flow rate must be adjusted with the control valve to obtain the specific flow rate for this system.

Hydronic circuit cleaning procedure

- Open the valve fully (item 20).
- Start-up the system pump.
- Read the plate heat exchanger pressure drop by taking the difference of the readings of the pressure gauge connected to the unit inlet and outlet (item 19).
- Let the pump run for two hours to clean the hydronic circuit of the system (presence of solid contaminants).
- Take another reading.
- Compare this value to the initial value.
- If the flow rate has decreased, this indicates that the screen filter must be removed and cleaned, as the hydronic circuit contains solid particles. In this case close the shut-off valves at the water inlet and outlet (item 17) and remove the screen filter (item 1) after emptying the hydronic section of the unit (item 6).
- Purge the air from the circuit (items 5 and 15).
- Renew, if necessary, to ensure that the filter is not contaminated.

Water flow control procedure

When the circuit is cleaned, read the flow rate at the user interface and compare the value obtained with the theoretical selection value. If the flow rate measured is higher than the value specified this means that the total system pressure drop is too low compared to the available static pressure generated by the pump. In this case close the control valve and read the new flow rate.

Proceed by successively closing the control valve until you obtain the specific pressure drop that corresponds to the nominal flow rate at the required unit operating point.

NOTE: If there is an excessive system pressure drop in relation to the available static pressure provided by the unit pump, the nominal water flow rate cannot be obtained (resulting flow rate is lower) and the temperature difference between evaporator entering and leaving water will increase.

To reduce the pressure drops of the hydronic system:

- reduce the individual pressure drops as much as possible (bends, level changes, options, etc.).
- use a correctly sized piping diameter.
- avoid hydronic system extensions, wherever possible.

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

The system flow rate is not controlled by a nominal value. It is adjusted by the system (pump speed variation) to maintain the user-selected pressure level at the unit outlet. The pressure sensor at the unit outlet (item 10 in the typical hydronic circuit diagram) is used as the means of control.

The system reads the measured pressure value, compares it with the user-selected setpoint value and modulates the pump speed as necessary:

- If a lower value than the setpoint is measured, the flow rate is increased.
- If a higher value than the setpoint 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 pressure value maintained can in certain cases be different from the setpoint value:

- If the setpoint 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 than the setpoint.
- If the setpoint value is too low (achieved for a lower flow rate that 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 than the setpoint.

Hydronic circuit cleaning procedure

First of all any possible pollution in the hydronic circuit must be eliminated.

- Start-up the pump using the forced start command (refer to the controls manual).
- Set the frequency to the maximum value to achieve a higher flow rate.
- If a “maximum flow rate exceeded” alarm occurs, decrease the frequency until the correct value is found.
- Read the flow rate at the user interface (refer to the controls manual).
- Let the pump run for two hours to clean the hydronic circuit of the system (presence of solid contaminants).
- Repeat the flow rate reading and compare this value with the initial value.
- If the flow rate has decreased, this indicates that the screen filter must be removed and cleaned, as the hydronic circuit contains solid particles. In this case close the shut-off valves at the water inlet and outlet (item 17) and remove the screen filter (item 1) after emptying the hydronic section of the unit (item 6).
- Purge the air from the circuit (items 5 and 15).
- Renew, if necessary, to ensure that the filter is not contaminated.

Pressure setpoint control procedure
Once the circuit has been cleaned, select the hydronic circuit configuration for which the unit selection has been made (in general, all receivers are open and all emitters are in the on-state).

Read the flow rate on the user interface and compare the value obtained to the theoretical selection value:
- If the flow rate reading is higher than the specified value, decrease the pump supply frequency to decrease the flow rate value (consult the control manual).
- If the flow rate reading is lower than the specified value, increase the pump supply frequency to increase the flow rate value (consult the control manual).

Continue this procedure until the nominal flow rate at the required unit operating point is reached.

Read the pressure value at the unit outlet that corresponds to the operating point reached (consult the control manual).

Stop the forced operation of the pump and proceed with the configuration of the unit for the required control mode (consult the control manual).

Adjust the control parameters (refer to the control manual):
- Water flow rate control method (pressure)
- Pressure value to be controlled

The unit default configuration is fixed speed, 50 Hz.

NOTES:
- ***If the low or high frequency limits are reached before the specified flow rate is reached, keep the frequency control within the low or high limit and read the pressure value at the unit outlet.***
- ***If the user knows the unit outlet pressure value to be maintained in advance, this can be entered directly as the correct parameter. The hydronic circuit cleaning procedure must not be left out.***

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

The system flow rate is not controlled by a nominal value. It is adjusted by the system (pump speed variation) to maintain the user-selected temperature difference value (delta T) at the heat exchanger.

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, calcu-lates the corresponding temperature difference, compares it with the user-selected setpoint value and modulates the pump speed as necessary:
- If a higher delta T value than the setpoint is measured, the flow rate is increased.
- If a lower delta T value than the setpoint 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 setpoint value:
- If the setpoint 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 setpoint.
- If the setpoint value is too low (achieved for a higher flow rate that 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 setpoint.

Hydronic circuit cleaning procedure
Please refer to the hydronic circuit cleaning procedure described in chapter 13.3.

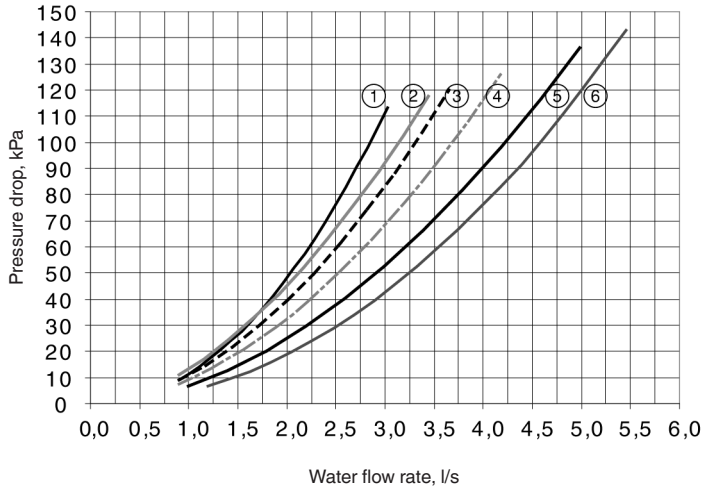
Delta T setpoint control procedure
Once the circuit has been cleaned, stop the forced operation of the pump and proceed with the configuration of the unit for the required control mode (consult the control manual). There is no particular control, except the control used for the unit control parameters of the delta T to be controlled.

Adjust the control parameters (refer to the control manual):
- Water flow rate control method (delta T)
- Delta T value to be controlled

The unit default configuration is fixed speed, 50 Hz.

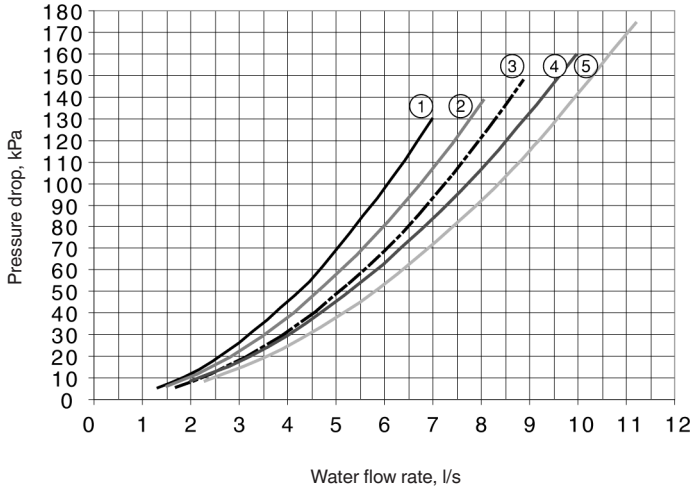
13.5 - Plate heat exchanger pressure drop (including internal piping) - units without hydronic module

30RBS/30RBSY 039-080



Legend
1. 30RBS/30RBSY 039
2. 30RBS/30RBSY 045
3. 30RBS/30RBSY 050
4. 30RBS/30RBSY 060
5. 30RBS/30RBSY 070
6. 30RBS/30RBSY 080

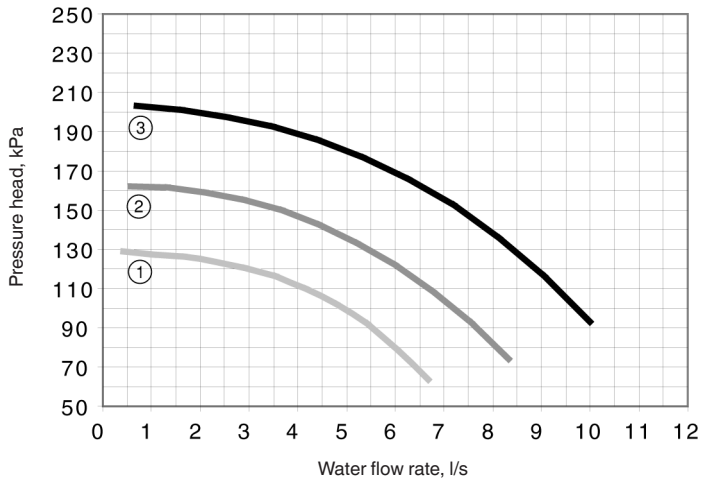
30RBS/30RBSY 090-160



Legend
1. 30RBS/30RBSY 090
2. 30RBS/30RBSY 100
3. 30RBS/30RBSY 120
4. 30RBS/30RBSY 140
5. 30RBS/30RBSY 160

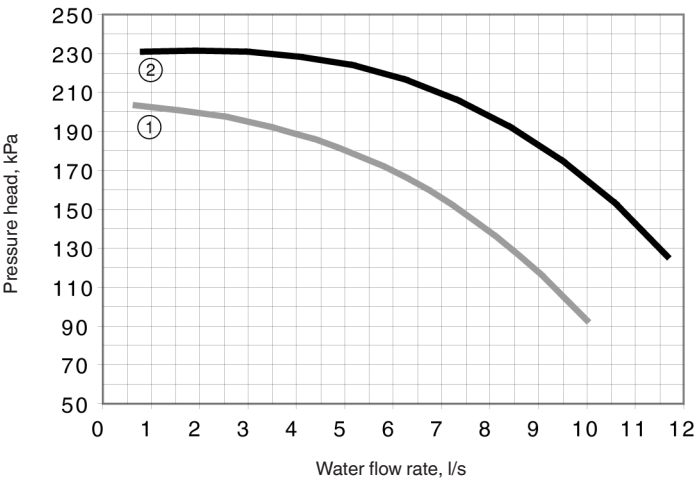
13.6 - Pump pressure/flow rate curve – units with hydronic module (fixed-speed or variable-speed pump, 50 Hz)

Single pumps



Legend
1. 30RBS/30RBSY 039-090
2. 30RBS/30RBSY 100-120
3. 30RBS/30RBSY 140-160

Dual pumps

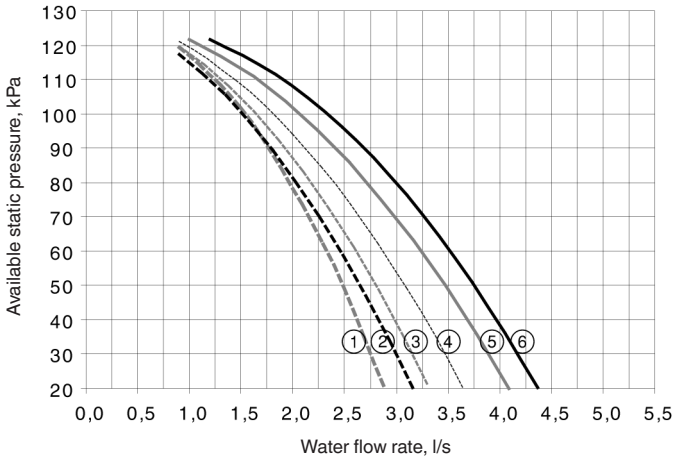


Legend
1. 30RBS/30RBSY 039-100
2. 30RBS/30RBSY 120-160

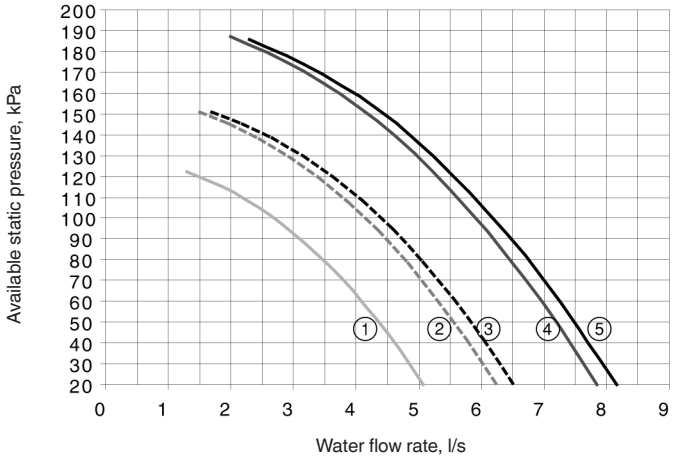
13.7 - Available external static pressure - units with hydronic module (fixed-speed or variable-speed pump, 50 Hz)

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

Low pressure

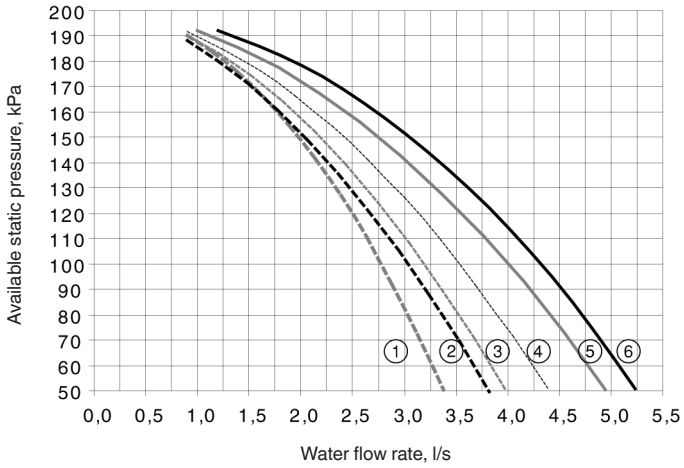


1. 30RBS/30RBSY 039
2. 30RBS/30RBSY 045
3. 30RBS/30RBSY 050
4. 30RBS/30RBSY 060
5. 30RBS/30RBSY 070
6. 30RBS/30RBSY 080

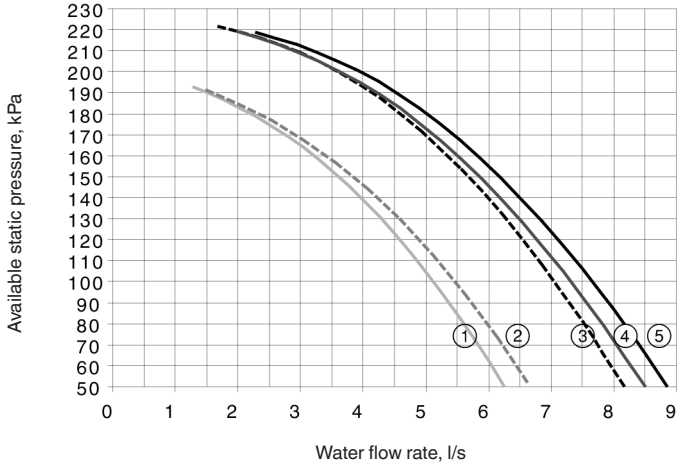


1. 30RBS/30RBSY 090
2. 30RBS/30RBSY 100
3. 30RBS/30RBSY 120
4. 30RBS/30RBSY 140
5. 30RBS/30RBSY 160

High pressure



1. 30RBS/30RBSY 039
2. 30RBS/30RBSY 045
3. 30RBS/30RBSY 050
4. 30RBS/30RBSY 060
5. 30RBS/30RBSY 070
6. 30RBS/30RBSY 080



1. 30RBS/30RBSY 090
2. 30RBS/30RBSY 100
3. 30RBS/30RBSY 120
4. 30RBS/30RBSY 140
5. 30RBS/30RBSY 160

14 - START-UP

14.1 - Preliminary checks

Never be tempted to start the chiller 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 evapo-rator.
- 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 the the electrical connections are secure.

14.2 - Actual start-up

IMPORTANT:

- ***Commissioning and start-up of the chiller 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 evaporator.***
- ***All setpoint adjustments and control tests must be carried out before the unit is started up.***
- ***Please refer to the 30RB/30RQ 017-160 Pro-Dialog+ 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.

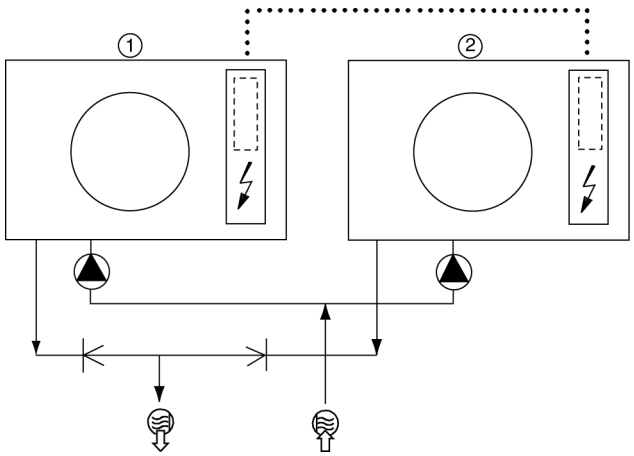
14.3 - Operation of two units in master/slave mode

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, setpoint, 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).

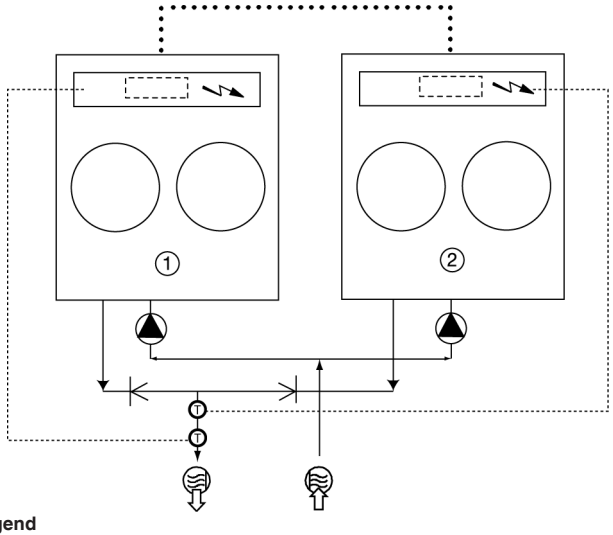
Standard configuration: return water control



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)
T	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

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)
T	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

15 - MAJOR SYSTEM COMPONENTS

15.1 - Compressors

30RBS/RBSY 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.

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

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

15.3 - Condensers

The 30RBS/RBSY coils are microchannel condensers made entirely of aluminium. Please note that some options are supplied with RTPF coils.

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. A difference in temperature between the filter inlet and outlet shows that the element is dirty.

15.8 - Evaporator

The evaporator is a plate heat exchanger with one or two refrigerant circuits. The water connection of the heat exchanger is a Victaulic connection.

The evaporator shell has a thermal insulation of 19 mm thick polyurethane foam.

As standard the evaporator is equipped with frost protection.

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

30RBS/RBSY units operate with refrigerant R-410A.

15.10 - High-pressure safety switch

30RBS/RBSY units are equipped with automatically reset safety pressure switches on the high-pressure side. For the alarm acknowledgements refer to the 30RB/RQ 017-160 Pro-Dialog+ control manual).

The table below gives the necessary additional information for eco-design requirements (European directive 2009/125/EC).

Product/option		30RBS standard* or with option 15LS	30RBS standard**	30RBSY standard or 30RBS standard with option 28
Global fan efficiency	%	32.2	34.0	40.4
Measurement category		A	A	A
Efficiency category		Static	Static	Static
Energy efficiency target N(2013)		N(2013) 36	N(2013) 36	N(2013) 36
Efficiency level at the optimal energy efficiency point		38.7	37.4	44.3
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	A.O. Smith	A.O. Smith
Fan reference		00PSG000000100A	00PSG000000100A	00PSG000000100A
Motor reference		00PPG000464500A	00PPG000464600A	00PPG000464700A
Nominal motor capacity	kW	0.95	2.84	2.46
Flow rate	m^3/s	3.20	4.27	5.12
Pressure	Pa	97	172	248
Speed	r/s (rpm)	12 (713)	16 (950)	19 (1140)
Specific ratio		1.002	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 039-060 and 090-120

** Only for sizes 070-080 and 140-160

16 - OPTIONS

Options	No.	Description	Advantages	Use
Condenser with anti-corrosion post-treatment	2B	Coils with factory-applied Blygold Polual treatment	Improved corrosion resistance, recommended for urban, industrial and rural environments	30RBS/30RBSY 039-160*
Condenser with pre-treated fins	3A	Fins made of pre-treated aluminium (polyurethane and epoxy)	Improved corrosion resistance, recommended for marine environments	30RBS/30RBSY 039-160*
Low temperature glycol solution	5B	Low temperature chilled water production down to 0°C with ethylene glycol and propylene glycol. Note: With option 5B the units are equipped with traditional coils (Cu/Al).	Covers specific applications down to 0°C	30RBS 039-160
Very low temperature glycol solution	6B	Low temperature chilled water production down to -15°C with ethylene glycol and -12°C with propylene glycol. Note: With option 6B the units are equipped with traditional coils (Cu/Al).	Covers specific applications such as ice storage and industrial processes	30RBS 039-160
Very low noise level	15LS	Acoustic compressor enclosure and low-speed fans	Noise emission reduction at reduced fan speed	30RBS/30RBSY 050-160
Protection grilles	23	Metallic protection grilles	Coil protection against possible shocks	30RBS / RBSY 39-160
Suction filter	23B	Washable G2 efficiency filter in accordance with EN 779	Prevents pollution of the air heat exchanger	30RBSY 039-080
Soft starter	25	Electronic compressor starter	Reduced compressor start-up current	30RBS/30RBSY 039-080
Winter operation**	28	Fan speed control via frequency converter	Stable unit operation when the air temperature is between -10°C and -20°C	30RBS 039-160
Frost protection down to -20°C	42	Electric heater on the hydronic module	Hydronic module frost protection at low outside temperatures	30RBS/30RBSY 039-160
Partial heat reclaim	49	Partial heat reclaim by desuperheating of the compressor discharge gas. Note: With option 49 the units are equipped with traditional coils (Cu/Al).	Free high-temperature hot-water production simultaneously with chilled and hot-water production	30RBS/RBSY 039-160
Master/slave operation	58	Unit equipped with an additional field-installed leaving water temperature sensor, allowing master/slave operation of two units connected in parallel	Operation of two units connected in parallel with operating time equalisation	30RBS/RBSY 039-160
High-pressure single-pump hydronic module	116B	Single high-pressure water pump, water filter, expansion tank, temperature and pressure sensors. See hydronic module option.	Easy and fast installation	30RBS/30RBSY 039-160
High-pressure dual-pump hydronic module	116C	Dual high-pressure water pump, water filter, expansion tank, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, operating safety	30RBS/30RBSY 039-160
Low-pressure single-pump hydronic module	116F	Single low-pressure water pump, water filter, expansion tank, temperature and pressure sensors. See hydronic module option.	Easy and fast installation	30RBS/30RBSY 039-160
Low-pressure dual-pump hydronic module	116G	Dual low-pressure water pump, water filter, expansion tank, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, operating safety	30RBS/30RBSY 039-160
High-pressure variable-speed single-pump hydronic module	116J	Single high-pressure water pump, water filter, expansion tank, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, reduced power consumption of the water circulation pump	30RBS/30RBSY 039-160
High-pressure variable-speed dual-pump hydronic module	116K	Dual high-pressure water pump, water filter, expansion tank, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, operating safety, reduced power consumption of the water circulation pump	30RBS/30RBSY 039-160
High-pressure single-pump hydronic module without expansion tank	116R	Single high-pressure water pump, water filter, temperature and pressure sensors. See hydronic module option.	Easy and fast installation	30RBS/RBSY 039-160
High-pressure dual-pump hydronic module without expansion tank	116S	Dual high-pressure water pump, water filter, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, operating safety	30RBS/RBSY 039-160
Low-pressure single-pump hydronic module without expansion tank	116T	Single low-pressure water pump, water filter, temperature and pressure sensors. See hydronic module option.	Easy and fast installation	30RBS/RBSY 039-160
Low-pressure dual-pump hydronic module without expansion tank	116U	Dual low-pressure water pump, water filter, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, operating safety	30RBS/RBSY 039-160
High-pressure variable-speed single-pump hydronic module without expansion tank	116V	Single high-pressure water pump, water filter, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, reduced power consumption of the water circulation pump	30RBS/RBSY 039-160
High-pressure variable-speed dual-pump hydronic module without expansion tank	116W	Dual high-pressure water pump, water filter, temperature and pressure sensors. See hydronic module option.	Easy and fast installation, operating safety, reduced power consumption of the water circulation pump	30RBS/RBSY 039-160
JBus gateway	148B	Two-directional communications board, complies with JBus protocol	Easy connection by communication bus to a building management system	30RBS/30RBSY 039-160
Bacnet gateway	148C	Two-directional communications board, complies with Bacnet protocol	Easy connection by communication bus to a building management system	30RBS/30RBSY 039-160
LonTalk gateway	148D	Two-directional communications board, complies with LonTalk protocol	Easy connection by communication bus to a building management system	30RBS/30RBSY 039-160
Enviro-Shield anti-corrosion protection for microchannel heat exchangers (MCHE)	262	Carrier factory treatment of the MCHE heat exchanger for applications in standard and moderately corrosive environments	Improved corrosion resistance, recommended for moderately corrosive marine and industrial environments.	30RBS/RBSY 039-160
Super Enviro-Shield anti-corro-sion protection for microchannel heat exchangers (MCHE)	263	Carrier factory treatment of the MCHE heat exchanger for applications in corrosive environments	The Super Enviro-Shield option was developed to extend the application range of MCHE heat exchangers in very corrosive environmental conditions.	30RBS/RBSY 039-160
Water heat exchanger screw connection sleeves	264	Inlet/outlet screw connection sleeves	Permit connection of the unit to a screw connection	30RBS/30RBSY 039-160
Welded water heat exchanger connection sleeves	266	Welded inlet/outlet connection sleeves	Permit connection of the unit to a connection other than a Victaulic connection	30RBS/30RBSY 039-160
Remote Interface	275	Remotely installed user interface (communication bus)	Remote chiller control up to 300 m	30RBS/30RBSY 039-160

* 30RBS/RBSY 039-160 with option 49 or 30RBS 0039-160 with option 6B.

** 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 (30RBSY)

Selection based on the pressure drop

The cooling 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.

30RBSY 039-060/30RBSY 090-120

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

Notes:
Pressure drop, clean filter = 6 Pa
Pressure drop, dirty filter = 12 Pa

30RBSY 070-080/30RBSY 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 30RBS/30RBSY range.

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

The control configuration for the desuperheater option is factory assembled.

18.1 - Physical data, 30RBS/30RBSY units with partial heat reclaim using desuperheaters (option 49)

30RBS/RBSY partial heat reclaim mode		039	045	050	060	070	080	090	100	120	140	160
Operating weight 30RBS units with RTPF coils*												
Standard unit without hydronic module	kg	467	475	498	524	512	543	849	859	890	1010	1074
Standard unit with hydronic module option												
Single high-pressure pump	kg	497	505	528	554	541	572	881	891	926	1049	1113
Dual high-pressure pump	kg	523	531	554	580	567	598	926	936	974	1086	1150
Operating weight 30RBSY units with RTPF coils*												
Standard unit without hydronic module	kg	474	482	505	534	518	552	854	863	894	1015	1078
Standard unit with hydronic module option												
Single high-pressure pump	kg	504	512	535	564	548	582	886	895	930	1054	1117
Dual high-pressure pump	kg	530	537	560	589	574	608	931	940	979	1091	1154
Refrigerant charge, units with RTPF coils		R410A										
Circuit A	kg	8.0	9.0	12.5	15.0	12.5	15.0	19.0	20.0	23.0	12.5	16.0
Circuit B	kg	-	-	-	-	-	-	-	-	-	12.5	16.0
Condensers		Grooved copper tubes, aluminium fins										
Desuperheaters on circuits A and B		Plate heat exchangers										
Water volume	l	0.549	0.549	0.549	0.549	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
Water connections		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.

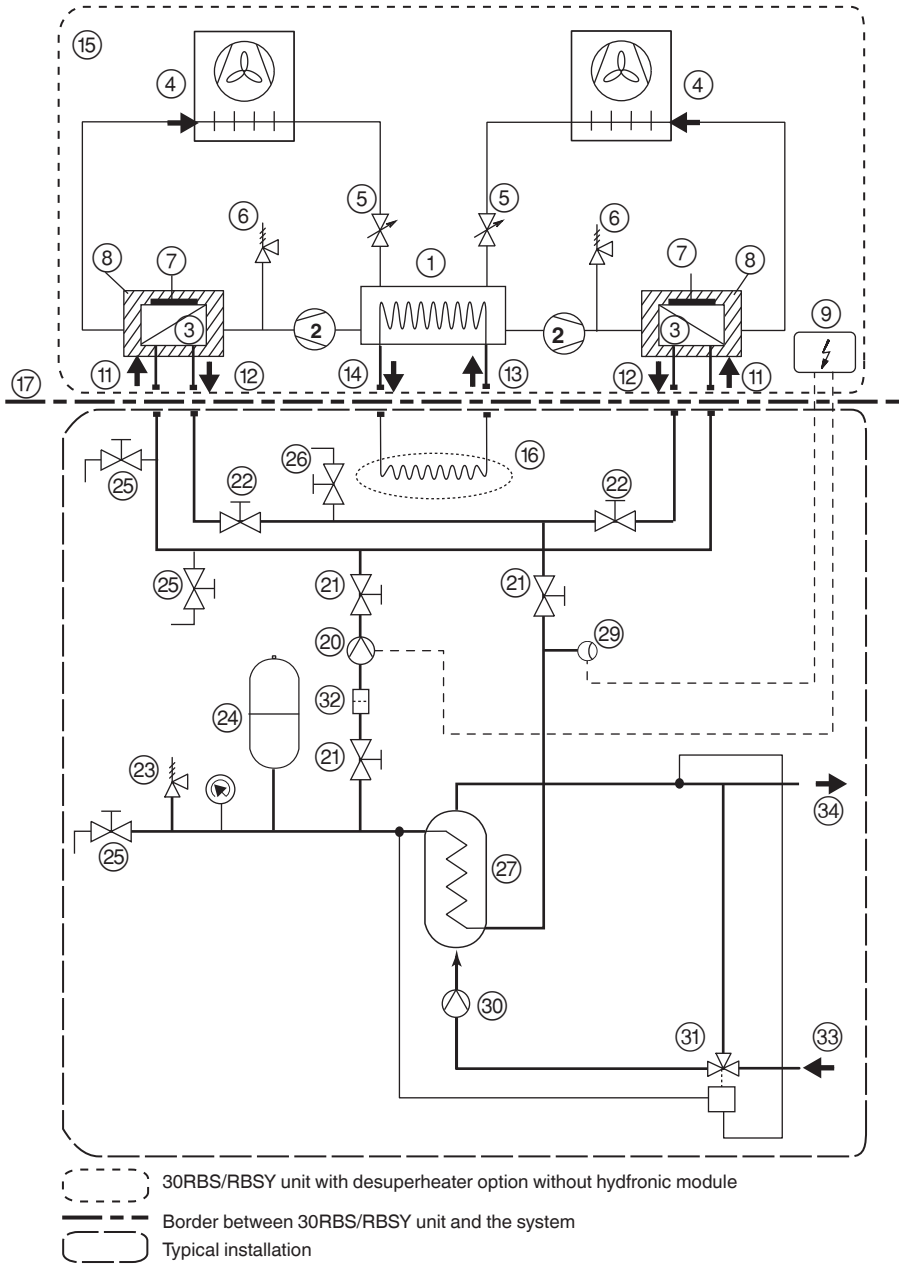
18.2 - Installation and operation of the heat reclaim with desuperheater option

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

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

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

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



Legend

30RBS/RBSY 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 (safety 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 30RBS/RBSY 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 (safety 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 safety 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.

18.4.2 - Reclaim priority mode
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 30RBSY 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 017-160 Pro-Dialog+ 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.

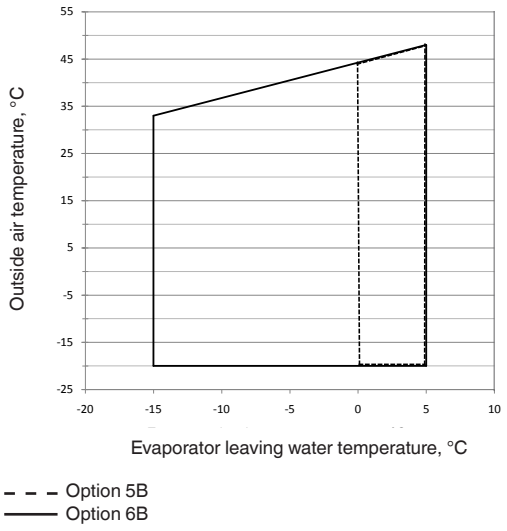
19 - BRINE OPTION (OPTION 5B & OPTION 6B)

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).

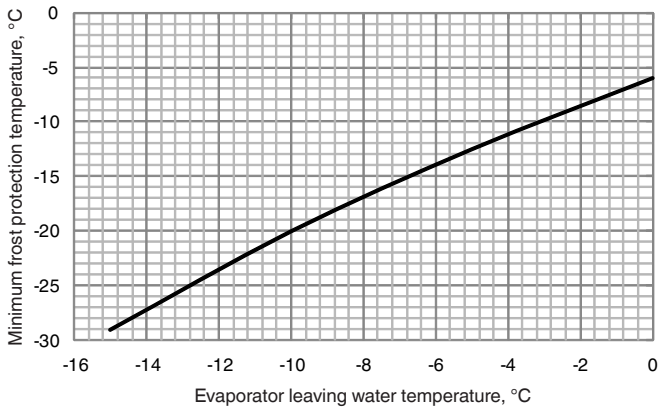
% by weight, glycol	Freeze point, °C ethylene glycol	Freeze point, °C propylene glycol
10	-3.8	-2.6
15	-6.1	-4.3
20	-8.8	-6.6
25	-11.8	-9.6
30	-15.2	-13
35	-19.1	-16.7
40	-23.6	-20.7
45	-29	-25.3

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 agressive 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.

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 'Condenser coil - level 1',
- Check for removed protection devices, and badly closed doors/covers,
- Check the unit alarm report when the unit does not work (refer to the 30RB/30RQ 017-160 Pro-Dialog+ control manual),
- General visual inspection for any signs of deterioration,
- Verify the charge in the sight-glass,
- Check that the 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 corro-sion 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 stuffing box packing of the pump 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 condensers with a low-pressure jet plus a bio-degradable cleaner for RTPF coils.
- For MCHE coils, clean the condenser face by spraying the coil evenly and in a stable manner from bottom to top, directing the water jet at right angles to the coil. Do not exceed 6200 kPa (62 bar) or an angle of 45° related to the coil. The diffuser must be at least 300 mm away from the coil surface. It is essential to control the pressure and to be careful not to damage the fins.
- Check the unit operating parameters and compare them with previous values.
- Carry out an oil contamination test. Replace the oil, if necessary.
- 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.

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 nul 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)
Soldered screw (PE) customer connection		
M8	PE	14.5
Screw on switch inlet zones		
Switch - MG 28908	QS_	8
Switch - MG 28910		8
Switch - MG 28912		8
Switch - MG 31102		15
Tunnel terminal screw, compressor contactor		
Contactor LC1D12B7	KM*	1.7
Contactor LC1D18B7		1.7
Contactor LC1D25B7		2.5
Tunnel terminal screw, compressor circuit breaker		
Circuit breaker 25507	QM*	3.6
Circuit breaker 25508		
Circuit breaker 25509		
Tunnel terminal screw, control power transformer		
Transformer - 40958E	TC	0.6
Transformer - 40959E		
Transformer - 40888E		
Transformer - 40894E		
Compressor earth terminal in the power wiring control box		
M6	Gnd	5.5
Compressor earth connection		
M8	Gnd	2.83
Tunnel terminal screw, disconnect switch (fan, pump)		
Disconnect switch GV2ME08	QM_	1.7
Disconnect switch GV2ME10		
Disconnect switch GV2ME14		
Tunnel terminal screw, contactor (fan, pump)		
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
Taptite screw M6	Fan support	7
Taptite screw M8	Fan motor fixing	13
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 - Condenser coil

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:

20.6.1 - Recommendations for maintenance and cleaning of round tube plate fin (RTPF) condenser coils

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

20.6.2 - Recommendations for maintenance and cleaning of microchannel (MCHE) condenser coils

- Regular cleaning of the coil surface is essential for correct unit operation. Eliminating contamination and removal of harmful residue will increase the operating life of the coils and the unit.
- The maintenance and cleaning procedures below are part of the regular maintenance and will prolong the life of the coils.
- Specific recommendations for snow: for longer unit storage regularly check that no snow has collected on the coil.

Specific products for MCHE coils without treatment, qualified by Carrier, are available via the Carrier spare parts network on request. All other products are strictly forbidden. After application of the product rinsing with water is obligatory (Carrier standard reference RW01-25).

- Remove foreign objects and debris attached to the coil surface or wedged between the chassis and the supports.
- Use a low-pressure dry air jet to remove all traces of dust from the coil.

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

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.

Protect the control box during cleaning operations.

20.7 - Evaporator 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 - 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 30RBS/30RBSY LIQUID CHILLERS (USE FOR JOB FILE)

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

Equipment
Model 30RBS/30RBSY: ..... S/N .....

Compressors

Circuit A	**Circuit B**
1. Model No.	1. Model No. .....
Serial No.	Serial No. .....
2. Model No.	2. Model No. .....
Serial No.	Serial No. .....
3. 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
☐ Chilled water pump control has been properly interlocked with the chiller
☐ 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 chiller if voltage imbalance is greater than 2%. Contact local power company for assistance.

☐ All incoming power voltage is within rated voltage range

Check evaporator 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 evaporator
☐ Return water piping is equipped with a screen filter with a mesh size of 1.2 mm

Check pressure drop across unit evaporator (without hydronic module) or the external static pressure (with hydronic module)
Entering evaporator = ... (kPa)
Leaving evaporator = ... (kPa)
Pressure drop (entering - leaving) = ... (kPa)

WARNING (unit without hydronic module): Plot the pressure drop on the evaporator flow/pressure drop curve to determine the flow rate in l/s at the nominal operating conditions for the installation. For units with hydronic module, a flow rate indication is displayed by the unit control (consulter the 30RB/30RQ 017-160 Pro-Dialog+ 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 30RB/30RQ 017-160 Pro-Dialog+ control manual):

Check and log on to the user menu configuration
Load sequence selection.....
Capacity ramp loading selection.....
Start-up delay.....
Burner section.....
Pump control.....
Setpoint reset mode.....
Night-time capacity setback .....

Re-enter the setpoints (see controls section)
To start up the chiller

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:

Evaporator entering water	Evaporator 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 .....

NOTES: .....
.....

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