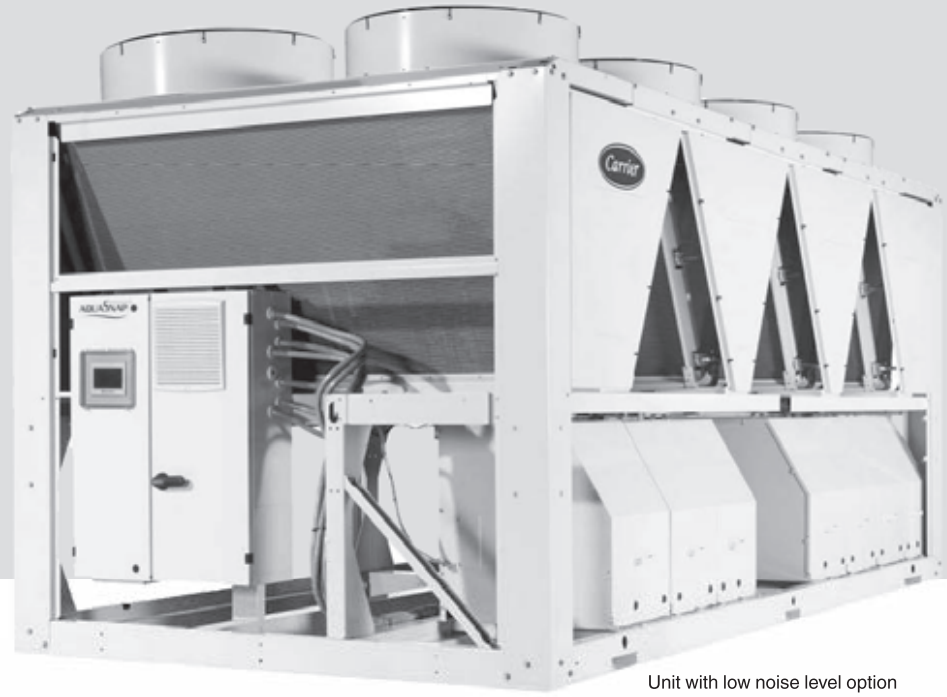
Carrier

United Technologies

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS



Unit with low noise level option

Air-Cooled Liquid Chillers

30RBM 160-520
30RBP 160-520

Nominal cooling capacity 164 - 528 kW 50 Hz

AQUASNAP™ greenspeed AQUASNAP

Translation of the original document 23539, 10.2016

CONTENTS

This manual applies to the following units:
- 30RBM: Standard unit
- 30RBP: Unit with variable speed fans

For the operation of the control please refer to 30RBM/30RBP control manual.

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

1 - INTRODUCTION

The units are intended to cool water for building air conditioning or for industrial processes.

They are designed to provide a very high level of safety and reliability, making installation, start-up, operation and maintenance easier and safer.

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

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

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

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

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

1.1 - Safety considerations related to protection devices

Do not obstruct any protective devices.

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

Classification and control:

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

	Safety accessories(1)	Over-pressure protection in case of an external fire(2)
Refrigerant side		
High-pressure switch	x	
External relief valve(3)		x
Rupture disk		x
Fuse plug		x
Heat transfer fluid side		
External relief valve	(4)	(4)

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

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

When the unit is subjected to fire, a safety device prevents rupture due to over-pressure by releasing the refrigerant. The fluid can then break down into toxic residues when in contact with flames:

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

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

The external relief valves must always be vented to outside if the units are installed in a closed space. 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 vented refrigerant. As the fluids can be diffused in the air, ensure that refrigerant is discharged away from building air intakes, or into a sufficient quantity of suitable absorbent material. The valves must be checked periodically.

If the relief valves are installed on a change-over valve, this is equipped with a relief valve on each of the two outlets. Only one of the two relief valves is in operation, the other one is isolated. Never leave the changeover switch in the intermediate position, i.e. with both circuits open (move the lever fully forwards or backwards depending on the output to be isolated). If a valve is removed for checking or replacement, make sure there is still a valve active on each of the changeover switches installed on the unit.

Provide a drain in vent line, close to each relief valve, to avoid an accumulation of condensate or rain water.

It is recommended to install an indicating device to check whether some of the fluid has leaked from the relief valve.

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

Protective device checks:

If no national regulations exist, check the protective devices on site in accordance with standard

EN 378: once a year for the high pressure switches, every five years for external relief valves.

The company or organisation that conducts a pressure switch test must establish and implement detailed procedures for:
- Safety measures,
- Measuring equipment,
- Values and tolerances for cut-off and discharge devices,
- Test stages,
- Recommissioning of the equipment.

The principle for performing a test without disassembly of the pressure switch is given here, however the manufacturer recommends contacting the Service for this type of test:
- Verify and record the set-points of pressure switches and external relief devices (valves and possible rupture discs),
- Be ready to switch off the main disconnect switch of the power supply if the pressure switch does not trigger (avoid overpressure or excess gas if there are valves on the high pressure side on the recovery air-cooled exchangers, for example),
- Connect a calibrated pressure differential gauge with integral damping (oil bath with pointer if mechanical); instantaneous reading gauges may give inaccurate readings because of the control's scanning delay,
- Carry out the HP quicktest built into the control (refer to the Service Guide).

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

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

Do not attempt to repair or recondition a valve if there has been any corrosion or build-up of foreign material (rust, dirt, scale, etc.) on the valve body or mechanism. In this case, it must be replaced.

Do not install relief valves in series or backwards.

1.2 - Refrigerant safety considerations

Use safety goggles and safety gloves.

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

If a leak occurs or if the refrigerant becomes contaminated (e.g by a motor short circuit or BPHE freeze-up), and before any intervention, remove the complete charge using a recovery unit and store the refrigerant in mobile containers. The compressors cannot transfer the whole refrigerant charge and can be damaged if used to pump-down. The refrigerant charge should not be transferred to the high-pressure side.

Repair the leak, detect and check the type of refrigerant in the unit and then recharge the unit/circuit with the total charge, as indicated on the unit nameplate. Do not top up the refrigerant charge. Only charge the liquid refrigerant given on the nameplate at the liquid line.

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

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

Do not siphon refrigerant.

Any accidental release of refrigerant, whether this is caused by a small leak or significant discharges following the rupture of a pipe or an unexpected release from a relief valve, may cause any personnel exposed to experience heart palpitations, faintness, frostbite and burns. Always take any such event seriously.

Installers, owners and especially service engineers for these units must:
- Create a procedure to ensure medical attention is sought before treating any symptoms;
- Provide first aid equipment, flush the eyes and skin immediately if splashed with refrigerant, and seek medical attention.

We recommend applying standard EN 378-3 Appendix 3.

Ensure there is sufficient ventilation if the unit is installed in an enclosed area. In gas form, refrigerant is heavier than air and, if allowed to accumulate in a confined area, it can reduce the quantity of oxygen in the air, causing respiratory issues.

The refrigerant used in units in this range is R410A, a high-pressure fluid (the operating pressure of the unit is greater than 40 bar).

Special equipment must be used when working on the refrigerating circuit (pressure gauge, charge transfer equipment, etc.).

Do not clean the unit with hot water or steam. This could pressurise the refrigerant.

NOTE:
If a liquid line valve is present, never leave refrigerant in liquid form between this closed valve and the expansion valve as the change in temperature may cause the liquid to expand, rupturing this section of the circuit. This valve is situated on the liquid line before the filter drier.

Never apply an open flame or pressurised steam to a refrigerant container. Dangerous overpressure can result. If it is necessary to heat the refrigerant, only use hot water.

The standard NF E29-795 describes the 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. If any damage is caused to the equipment, the refrigerant must be changed in accordance with this standard, or any analysis of the fluid must be performed by a specialist laboratory.

Any refrigerant transfer and recovery operations must be carried out using a transfer unit.

Service valves are positioned on the liquid, suction and discharge lines and are available on all units for connection to the transfer unit.

The units must never be modified to add refrigerant and oil charging, removal and purging devices. These units have the required openings. Refer to the certified dimensional drawings.

It is dangerous and illegal to re-use disposable (non-returnable) cylinders or attempt to refill them. When the cylinders are empty, evacuate the remaining gas pressure, fill out the relevant paperwork and hand them over to an approved recovery agency. Do not incinerate.

Operating checks:

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

Type of fluid: refer to the nameplate

Global Warming Potential (GWP): refer to the table below

- All interventions on this product's refrigerating circuit must be performed in accordance with applicable legislation. Within the European Union, this legislation notably includes regulation No. 517/2014, known as F-Gas.
- Ensure that refrigerant is never released to the atmosphere when the equipment is installed, maintained or sent for disposal.
- It is prohibited to deliberately release refrigerant into the atmosphere.
- If a refrigerant leak is detected, ensure that the leak is repaired quickly.
- Only certified, qualified personnel are permitted to install, service and perform sealing tests on the refrigerant, decommission the equipment and recover the refrigerant.
- The operator must ensure that any refrigerant recovered is recycled, regenerated or destroyed.
- The operator is bound by the obligation to perform sealing tests, or have these performed, at regular intervals.

Regulations within the European Union have set the following intervals:

System WITHOUT leakage detection		No test	12 months	6 months	3 months
System WITH leakage detection		No test	24 months	12 months	6 months
Refrigerant charge per circuit (equivalent CO_2)		< 5 tonnes	5 ≤ charge < 50 tonnes	50 ≤ charge < 500 tons	Charge > 500 tonnes(1)
Refrigerant charge per circuit (kg)	R134a (GWP 1430)	Charge < 3.5 kg	3.5 ≤ charge < 34.9 kg	34.9 ≤ charge < 349.7 kg	Charge > 349.7 kg
	R407C (GWP 1774)	Charge < 2.8 kg	2.8 ≤ charge < 28.2 kg	28.2 ≤ charge < 281.9 kg	Charge > 281.9 kg
	R410A (GWP 2088)	Charge < 2.4 kg	2.4 ≤ charge < 23.9 kg	23.9 ≤ charge < 239.5 kg	Charge > 239.5 kg
	HFOs: R1234ze	No requirement			

(1) From 01/01/2017, units must be equipped with a leak detection system.

- For all equipment subject to regular sealing tests, the operator must keep a log used to record the following: the quantities and types of fluids contained in the system (added and recovered), the quantity of fluid recycled, regenerated or destroyed, the date and results of the sealing tests, the details of the technician and of the company performing the work, etc.
- Contact your local dealer or installer if you have any questions.

Information on operating inspections given in EN 378 standard can be used when similar criteria do not exist in the national regulation.

Check regularly for leaks and repair immediately.

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.

Pressure equipment and components

These products include pressure equipment or components manufactured by the unit manufacturer or by other manufacturers. We recommend that you contact your professional body to find out which regulations affect you as the operator or owner of pressure equipment or components (declaration, re-qualification, re-testing, etc.).

The characteristics of this equipment/these components are given on the name plate or in the regulatory documentation supplied with the products.

These units comply with the European Pressure Equipment Directive.

The units are intended to be stored and operated in an environment where the ambient temperature does not drop below the minimum allowable temperature indicated on the nameplate.

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

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

- Follow regulations on the monitoring of pressure equipment.
- The user or operator is usually requested to create and maintain a monitoring and maintenance log.
- In the absence of any regulations, or in addition to the regulations, follow the guidance in EN 378.
- Follow the local professional recommendations, whenever they exist.
- Regularly monitor the surface of the components to detect cavernous corrosion. To do this, check an uninsulated part of the pressure vessel or at a joint in the insulation.
  Regularly check for the presence of any impurities (e.g. sand, grit) in the heat-transfer fluids. These impurities can cause wear and/or pitting corrosion.
  Filter the heat-transfer fluid and carry out internal inspections as described in EN 378
  The reports of the periodical checks by the user or the operator must be included in the monitoring and maintenance log.

Repair:

Any repair or modification, including replacement of removable parts:

- Must comply with local regulations and must be performed by qualified operators in accordance with qualified processes, including changing a wiring harness tube,
- Must be approved by the original manufacturer. Repairs and modifications which involve a permanent assembly (welding, soldering, expansion of tubes, etc.) must be performed by qualified operators following operating procedures,
- All modifications and repairs must be listed in the monitoring and maintenance register,
- Never attempt to repair or modify a plate heat exchanger.

Recycling:

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

1.4 - Maintenance safety considerations

The manufacturer recommends the following template for the maintenance log (the table below is only given as a guide and does not engage the manufacturer's liability).

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

(1) Maintenance

Any technician carrying out work on the electrical or refrigerating section must be authorised, with the relevant qualifications and certifications, including for soldering operations and for handling of the shut-off valve. He/she must have been trained and be familiar with the equipment and the installation.

The manual valves must only be manipulated when the unit is off. Do not forget to refit protective caps to prevent leaks.

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 energised.

Never work on any of the electrical components until the general power supply to the unit has been isolated and locked out.

Even if the unit has been shut down, the power circuit remains energized, as long as the unit or circuit disconnect switch is not open. Refer to the wiring diagram for further details. Follow the appropriate safety guidelines. When working in a fan area, specifically if the grilles have to be removed, isolate the power supply to the fans to prevent their operation.

Units equipped with the variable speed fan option, variable speed pump options and the power factor option are equipped with capacitor batteries which take 5 minutes to fully discharge once the power has been switched off.

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

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

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

Before opening a refrigerating circuit, purge and read the pressure indicators.

If the refrigerant circuit remains open after an intervention (such as a component replacement, etc.):
- Seal the openings if the duration is less than a day
- Beyond this time, charge the circuit with a dry, inert gas (nitrogen).

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

1.5 - Repair safety considerations

To prevent any damage or accidents, trained personnel must service the various parts of this unit and must resolve any malfunctions or leaks immediately.

Comply with the regulations and recommendations given in the safety standards for refrigerating systems and machines, such as: EN 378, ISO 5149, etc.

Risk of explosion:

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

Only use dry nitrogen for leak tests, 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 maximum permissible high and low test pressures by checking the instructions in this manual or the pressures given on the unit name plate.

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 attempt to remove components fitted to the refrigerant circuit or fittings while the unit is under pressure or while it is running. Make sure the circuit pressure is zero and that the unit has been shut down and de-energised before removing components or opening a circuit. When the refrigerant circuit is opened to repair, see the blanketing recommendations in the "Maintenance safety considerations" paragraph.

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

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

Do not climb on a unit. 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 if there is any risk of slipping or losing your balance.

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

Do not drain treated and/or added fluid from the heat-transfer circuit (e.g. antifreeze) without informing the site technical/ service department or other competent body first.

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

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

2 - RECEIPT OF GOODS

2.1 - Check equipment received

Check that the unit and the accessories have not been damaged during transport and that no parts are missing. If the unit and the accessories have been damaged or the shipment is incomplete, send a claim to the shipping company.

Compare the name plate data with the order.

The name plate is attached in two places to the unit:
- On one side of the unit exterior,
- On the inside of the electrical panel door.

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,
- Fluid used for transport,
- 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 tightness test pressure
- Voltage, frequency, number of phases,
- Maximum current,
- Maximum power input,
- Unit net weight.

3 - HANDLING AND POSITIONING

3.1 - Handling

It is strongly recommended that a specialised company is employed to unload the unit.

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

These units can be safely moved by trained personnel with a fork lift truck with the correct capacity for the dimensions and weight of the unit, as long as the forks are positioned in the location and direction shown on the unit.

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

Use slings with the correct capacity, and follow the lifting instructions on the certified dimensional drawings supplied.

Only attach slings to the clearly marked points on the unit provided for this purpose.

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 the unit more than 15°.

Safety when lifting can only be guaranteed if all these instructions are followed. Otherwise, there is a risk of equipment damage or injury to personnel.

3.2 - Positioning

The unit must be installed in a place that is inaccessible to the public or protected against access by non-authorised persons.

For extra-high units, the unit environment must permit easy access for maintenance operations.

For the centre of gravity coordinates, the position of the unit mounting holes, and the weight distribution points, refer to the certified dimensional drawings. Ensure the free space shown in the dimensional drawings is respected to facilitate maintenance and connection.

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

Before installing the device, check that:

- the permitted loading at the site is adequate or that appropriate strengthening measures have been taken.
- The unit is installed level on an even surface (maximum tolerance is 5 mm along both axes).
- If the support structure is sensitive to vibration and/or noise transmission it is advisable to insert anti-vibration mounts (elastomer mounts or metal springs) between the unit and the structure. Selection of these devices is based on the system characteristics and the comfort level required and should be made by technical specialists.
- There is adequate space above and around the unit for air to circulate and for access to the components (see dimensional drawings).
- the number of support points is adequate and that they are in the right places.
- the location is not subject to flooding.
- For outdoor applications, avoid installing the unit in a location where snow is likely to accumulate (in areas subject to long periods of sub-zero temperatures, the unit should be raised).
- Baffles may be necessary to deflect strong winds. These must not restrict the unit's air flow.

Before lifting the unit, check that all enclosure panels and grilles 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.

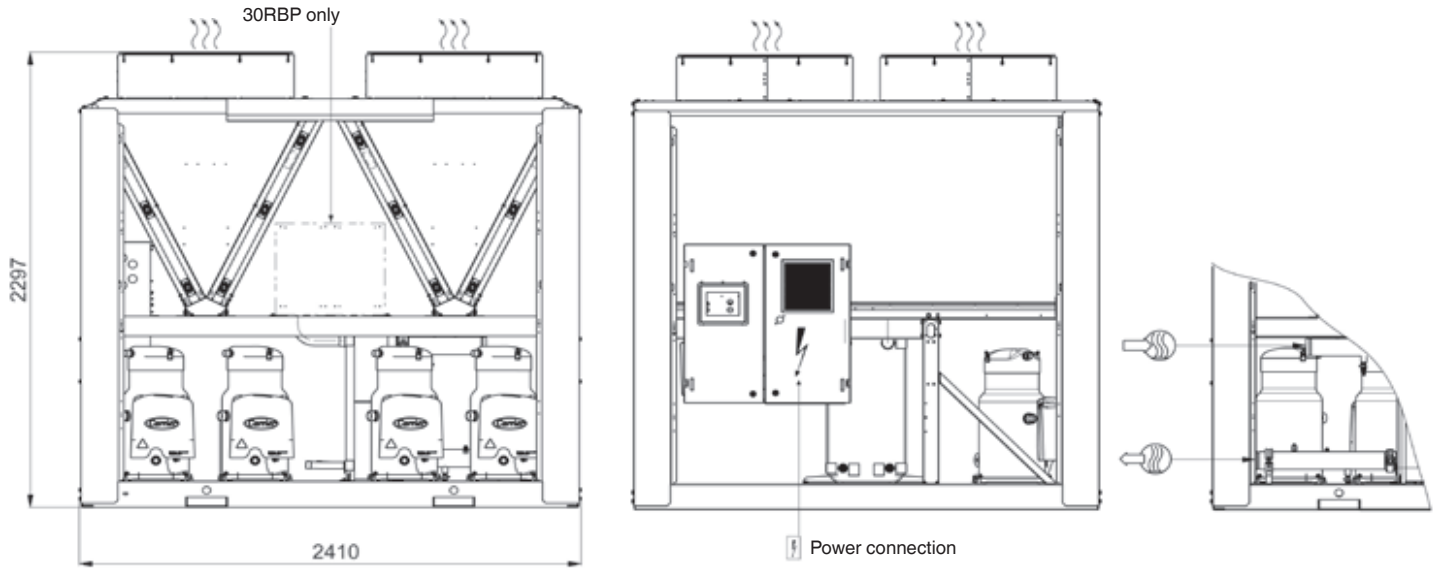
Never apply pressure or leverage to any of the unit's panels or uprights; only the base of the unit frame is designed to withstand such stresses. No force or effort must be applied to pressurised parts, especially via pipes connected to the water heat exchanger (with or without the hydronic kit if the unit is equipped with this).

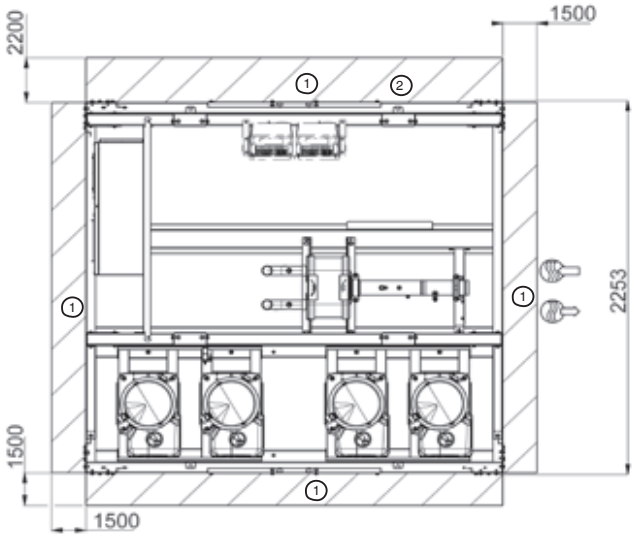
All welding operations (connection to the hydraulic network) must be performed by qualified welders. The Victaulic® connection or the counter-flange must be removed before welding as a matter of course.

4 - DIMENSIONS, CLEARANCES

4.1 - 30RBM/RBP 160-260

WITHOUT HYDRONIC MODULE





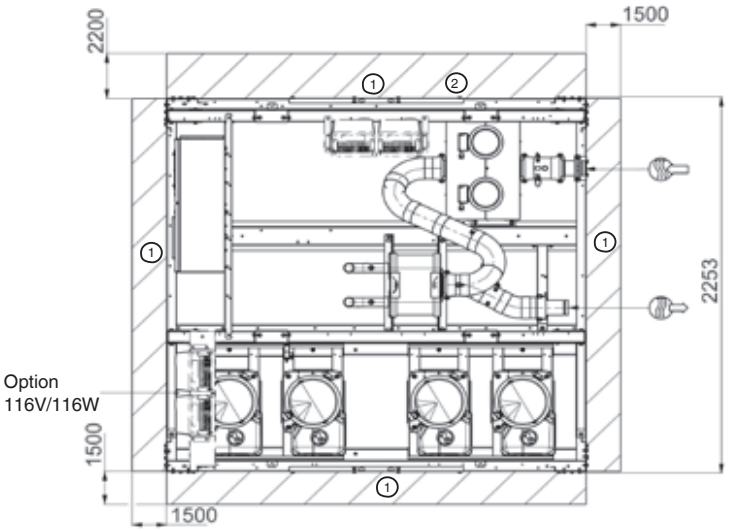
Legend:
All dimensions are in mm.

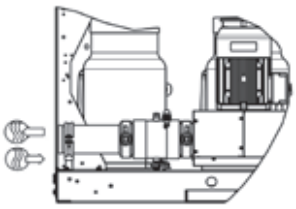
- (1) Clearances required for maintenance and air flow
- (2) Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Control box

NOTE: Non-contractual drawings.
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

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

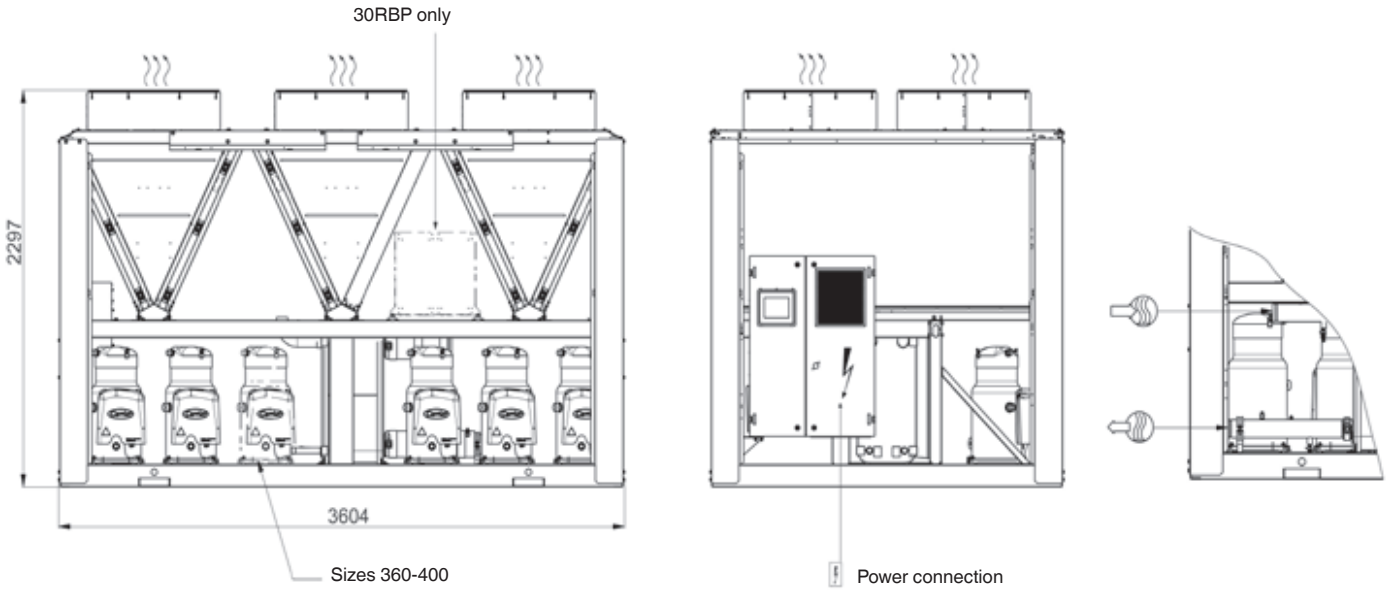
WITH HYDRONIC MODULE

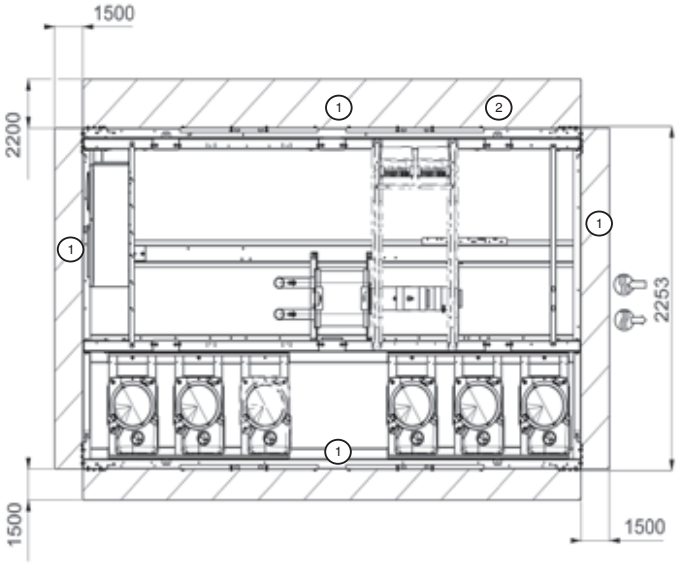




4.2 - 30RBM/RBP 300-400

WITHOUT HYDRONIC MODULE





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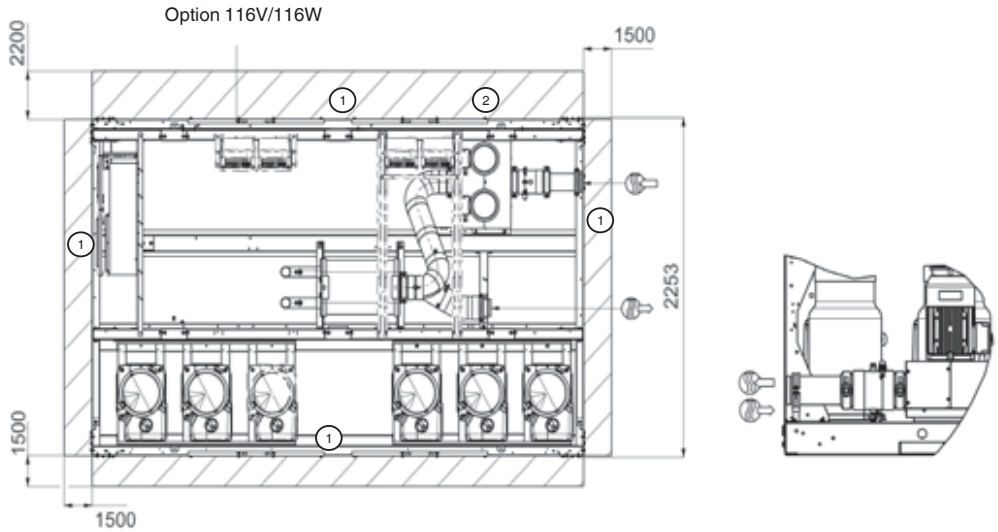
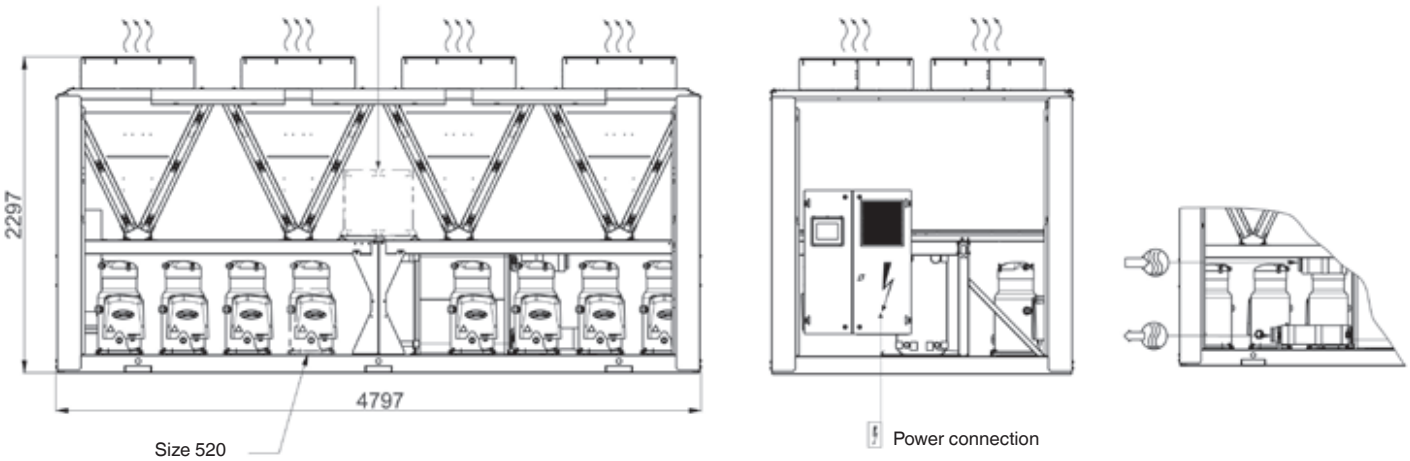
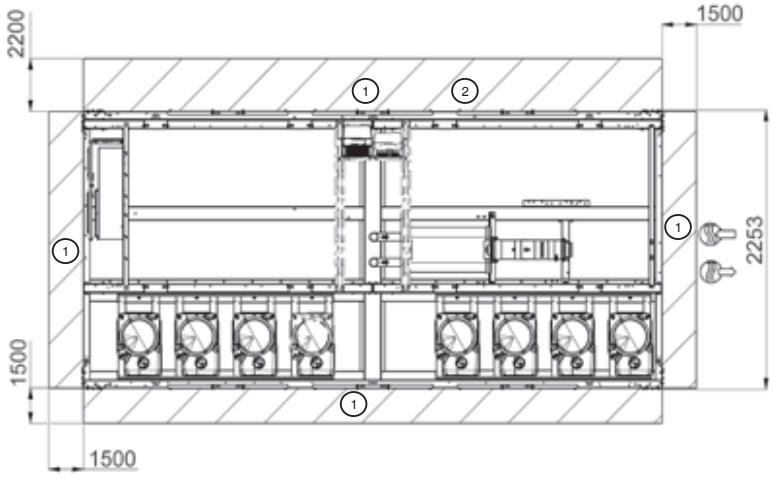


4.3 - 30RBM/RBP 430-520

WITHOUT HYDRONIC MODULE

30RBP only





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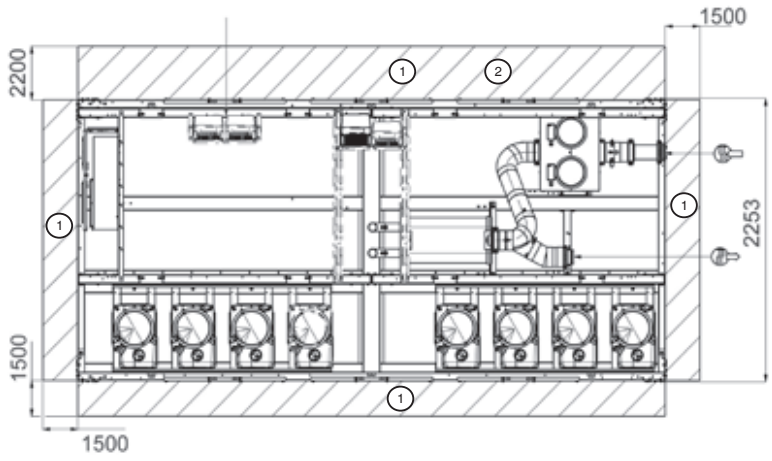
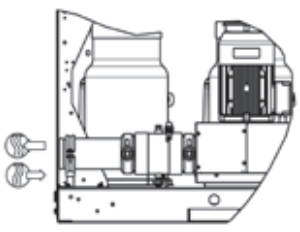
WITH HYDRONIC MODULE

Option 116V/116W

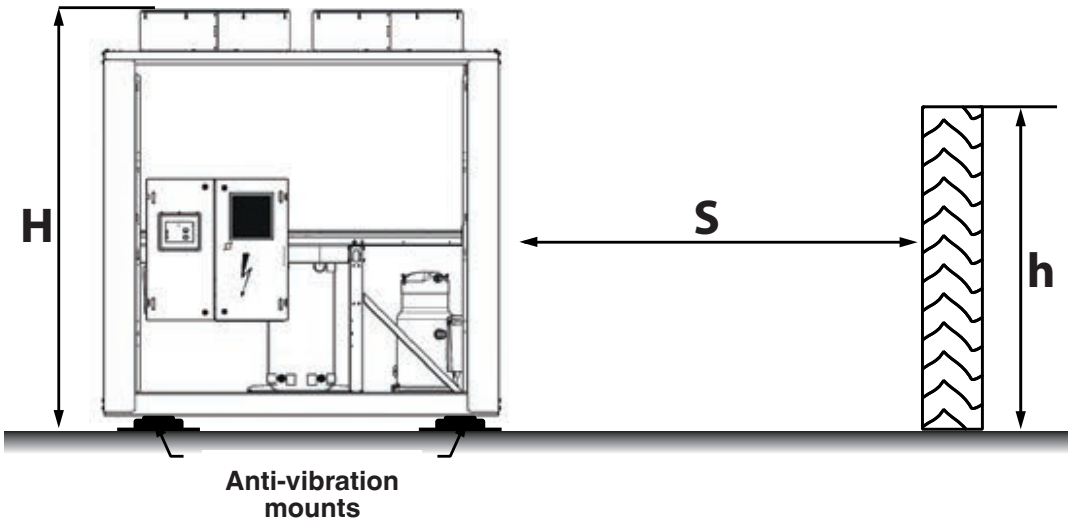




4.4 - Installing several units

It is recommended to install units in a single row, arranged as shown in the example below, to avoid recycling hot air between the units.

4.5 - Distance to the wall



To guarantee correct operation in most cases:
If h < H, S minimum = 3 m
If h > H or S < 3 m, contact your distributor to assess the various installation options.

5 - PHYSICAL AND ELECTRICAL DATA FOR THE UNITS

5.1 - Physical data 30RBM 160-520

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
Sound levels													
Standard unit													
Sound power(3)	dB(A)	91	92	92	92	92	93	93	93	93	94	94	94
Sound pressure at 10 m(4)	dB(A)	59	60	60	60	60	60	60	61	61	62	62	62
Standard unit + option 15(1)													
Sound power(3)	dB(A)	89	90	90	90	90	91	91	92	92	93	93	93
Sound pressure at 10 m(4)	dB(A)	57	58	58	58	58	59	59	60	60	61	61	61
Standard unit + option 15LS(1)													
Sound power(3)	dB(A)	85	85	85	86	86	86	86	87	87	88	88	88
Sound pressure at 10 m(4)	dB(A)	53	53	53	54	54	54	54	55	55	55	55	56
Dimensions - Standard unit													
Length	mm	2410					3604				4797		
Width	mm	2253					2253				2253		
Height	mm	2297					2297				2297		
Operating weight(2)													
Standard unit	kg	1216	1257	1257	1387	1408	1865	1901	2069	2125	2545	2563	2761
Standard unit + option 15(1)	kg	1299	1339	1340	1495	1516	1991	2027	2212	2269	2707	2726	2941
Standard unit + option 15 + option 116S(1)	kg	1438	1479	1479	1634	1670	2151	2231	2416	2472	2950	2967	3221
Compressors		Hermetic Scroll 48.3 rps											
Circuit A		1	1	1	2	2	2	2	3	3	3	3	4
Circuit B		2	2	2	2	2	3	3	3	3	4	4	4
No. of power stages		3	3	3	4	4	5	5	6	6	7	7	8
Refrigerant(2)		R410A											
Circuit A	kg	8,40	10,90	10,90	12,60	13,10	14,70	15,40	20,30	21,10	23,50	23,50	26,75
	tCO_2e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B	kg	12,25	12,60	12,60	12,70	13,10	20,20	20,20	20,40	22,20	26,70	26,80	26,95
	tCO_2e	25,6	26,3	26,3	26,5	27,4	42,2	42,2	42,6	46,4	55,7	56,0	56,3
Control		Pro-Dialog+ Control											
Minimum capacity	%	33%	33%	33%	25%	25%	20%	20%	17%	17%	14%	14%	13%
Condensers		Aluminium micro-channel coils (MCHE)											
Fans - Standard unit		Axial Flying Bird 4 fans with rotating shroud											
Quantity		3	4	4	4	4	5	5	6	6	7	7	8
Maximum total air flow	l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111
Maximum rotational speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
Evaporator		Dual-circuit plate heat exchanger											
Water content	l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module	kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
Hydronic module (option)		Pump, Victaulic screen filter, safety relief valve, water and air drain valve, pressure sensors, expansion tank (option)											
Pump		Centrifugal pump, monocell, 48.3 rps, low or high pressure (as required), single or dual (as required)											
Expansion vessel volume	l	50	50	50	50	50	80	80	80	80	80	80	80
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with/without hydronic module		Victaulic® type											
Connections	inches	3	3	3	3	3	4	4	4	4	4	4	4
External diameter	mm	88,9	88,9	88,9	88,9	88,9	114,3	114,3	114,3	114,3	114,3	114,3	114,3
Casing paint		Colour code RAL 7035											

(1) Options: 15 = low noise level, 15LS = very low noise level, 116S = High-pressure dual-pump hydronic module.
(2) Values are guidelines only. Refer to the unit name plate.
(3) in dB ref=10^{-12} W, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). Measured in accordance with ISO 9614-1 and certified by Eurovent.
(4) In dB ref 20µPa, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). For information, calculated from the sound power Lw(A).

5.2 - Physical data 30RBP 160-520

30RBP		160	180	200	220	260	300	330	360	400	430	470	520
Sound levels													
Standard unit													
Sound power[3]	dB(A)	91	92	92	92	92	93	93	93	93	94	94	94
Sound pressure at 10 m[4]	dB(A)	59	60	60	60	60	60	60	61	61	62	62	62
Standard unit + option 15[1]													
Sound power[3]	dB(A)	89	90	90	90	90	91	91	92	92	93	93	93
Sound pressure at 10 m[4]	dB(A)	57	58	58	58	58	59	59	60	60	61	61	61
Standard unit + option 15LS[1]													
Sound power[3]	dB(A)	85	85	85	86	86	86	86	87	87	88	88	88
Sound pressure at 10 m[4]	dB(A)	53	53	53	54	54	54	54	55	55	55	55	56
Dimensions - Standard unit													
Length	mm	2410					3604				4797		
Width	mm	2253					2253				2253		
Height	mm	2297					2297				2297		
Operating weight[2]													
Standard unit	kg	1252	1293	1293	1423	1445	1901	1937	2105	2162	2603	2621	2827
Standard unit + option 15[1]	kg	1334	1376	1376	1531	1553	2027	2063	2249	2306	2765	2783	3007
Standard unit + option 15 + option 116S[1]	kg	1473	1515	1516	1670	1707	2187	2267	2452	2509	3007	3024	3287
Compressors		Hermetic Scroll 48.3 rps											
Circuit A		1	1	1	2	2	2	2	3	3	3	3	4
Circuit B		2	2	2	2	2	3	3	3	3	4	4	4
No. of power stages		3	3	3	4	4	5	5	6	6	7	7	8
Refrigerant[2]		R410A											
Circuit A	kg	8,40	10,90	10,90	12,60	13,10	14,70	15,40	20,30	21,10	23,50	23,50	26,75
	tCO_2e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B	kg	12,25	12,60	12,60	12,70	13,10	20,20	20,20	20,40	22,20	26,70	26,80	26,95
	tCO_2e	25,6	26,3	26,3	26,5	27,4	42,2	42,2	42,6	46,4	55,7	56,0	56,3
Control		Pro-Dialog+ Control											
Minimum capacity	%	33%	33%	33%	25%	25%	20%	20%	17%	17%	14%	14%	13%
Condensers		Aluminium micro-channel coils (MCHE)											
Fans - Standard unit		Axial Flying Bird 4 fans with rotating shroud											
Quantity		3	4	4	4	4	5	5	6	6	7	7	8
Maximum total air flow	l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111
Maximum rotational speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
Evaporator		Dual-circuit plate heat exchanger											
Water content	l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module	kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
Hydronic module (option)		Pump, Victaulic screen filter, safety relief valve, water and air drain valve, pressure sensors, expansion tank (option)											
Pump		Centrifugal pump, monocell, 48.3 rps, low or high pressure (as required), single or dual (as required)											
Expansion vessel volume	l	50	50	50	50	50	80	80	80	80	80	80	80
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with/without hydronic module		Victaulic® type											
Connections	inches	3	3	3	3	3	4	4	4	4	4	4	4
External diameter	mm	88,9	88,9	88,9	88,9	88,9	114,3	114,3	114,3	114,3	114,3	114,3	114,3
Casing paint		Colour code RAL 7035											

(1) Options: 15 = low noise level, 15LS = very low noise level, 116S = High-pressure dual-pump hydronic module.
(2) Values are guidelines only. Refer to the unit name plate.
(3) in dB ref=10^{-12} W, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). Measured in accordance with ISO 9614-1 and certified by Eurovent.
(4) In dB ref 20µPa, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). For information, calculated from the sound power Lw(A).

5.3 - Electrical data 30RBM 160-520

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
Power circuit													
Nominal voltage	V-ph-Hz	400 - 3 -50											
Voltage range	V	360 - 440											
Control circuit supply		24 V via internal transformer											
Nominal unit current draw(1)													
Circuit A&B	A	100	110	124	133	161	180	201	221	242	261	282	322
Max. operating input power(2)													
Circuit A&B	kW	80	88	99	107	129	145	161	177	194	210	226	258
Cosine Phi unit at maximum power (2)		0,88	0,87	0,87	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88
Maximum unit current draw (Un-10%)(3)													
Circuit A&B	A	144	158	176	192	230	259	288	317	345	374	403	460
Circuit A&B - Standard unit	A	133	146	163	177	212	239	266	292	319	345	372	425
Circuit A&B - Unit + option 231	A	100	110	125	133	163	181	204	222	244	262	285	326
Maximum start-up current, standard unit (Un)(5)													
Circuit A&B	A	307	356	374	352	423	450	476	503	529	556	583	636
Maximum start-up current, unit with soft starter (Un)(5)													
Circuit A&B	A	261	283	300	305	349	376	403	429	456	482	509	562

(1) Conditions equivalent to the standardised Eurovent conditions (water type heat exchanger water input/output temperature = 12°C/7°C, outdoor air temperature = 35°C).
(2) Power input, compressors and fans, at the unit operating limits (saturated intake temperature 15°C, saturated condensation temperature 68.3°C) and nominal voltage of 400 V (data given on the unit name plate).
(3) Maximum unit operating current at maximum unit power input and 360 V.
(4) Maximum unit operating current at maximum unit power input and 400 V (values given on the unit name plate).
(5) Maximum instantaneous starting current at operating limits (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).
Fan motor electrical data: at Eurovent equivalent conditions and motor ambient air temperature of 50 °C at 400 V: 3.8 A, start-up current 20 A, power input 1.75 kW.

5.4 - Electrical data 30RBP 160-520

30RBP		160	180	200	220	260	300	330	360	400	430	470	520
Power circuit													
Nominal voltage	V-ph-Hz	400 - 3 -50											
Voltage range	V	360 - 440											
Control circuit supply		24 V via internal transformer											
Nominal unit current draw(1)													
Circuit A&B	A	97	107	121	130	158	176	197	216	237	255	276	316
Max. operating input power(2)													
Circuit A&B	kW	81	88	99	108	129	145	162	178	194	210	226	259
Cosine Phi unit at maximum power (2)		0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88
Maximum unit current draw (Un-10%)(3)													
Circuit A&B	A	142	154	173	189	227	255	284	312	340	369	397	454
Maximum unit current draw (Un)(4)													
Circuit A&B - Standard unit	A	131	142	160	174	209	235	262	287	314	340	366	419
Circuit A&B - Unit + option 231	A	98	108	123	131	161	178	201	219	241	259	281	321
Maximum start-up current, standard unit (Un)(5)													
Circuit A&B	A	305	353	371	349	420	446	472	498	525	550	577	629
Maximum start-up current, unit with soft starter (Un)(5)													
Circuit A&B	A	259	279	297	302	346	372	399	424	451	477	503	556

(1) Conditions equivalent to the standardised Eurovent conditions (water type heat exchanger water input/output temperature = 12°C/7°C, outdoor air temperature = 35°C).
(2) Power input, compressors and fans, at the unit operating limits (saturated intake temperature 15°C, saturated condensation temperature 68.3°C) and nominal voltage of 400 V (data given on the unit name plate).
(3) Maximum unit operating current at maximum unit power input and 360 V.
(4) Maximum unit operating current at maximum unit power input and 400 V (values given on the unit name plate).
(5) Maximum instantaneous starting current at operating limits (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).
Fan motor electrical data reported upstream of the variable speed drive at Eurovent equivalent conditions and motor ambient air temperature of 50°C at 400 V: current 3.0 A; starting current 20 A; power input: 1.75 kW.

5.5 - Short circuit stability current

Short circuit stability current (TN system(1))

30RBM/30RBP		160	180	200	220	260	300	330	360	400	430	470	520
Short time (1s) assigned current Icw / Peak current Ipk													
Circuits A&B	kA/kA	8/30	8/30	8/30	8/30	8/30	8/30	8/30	15/65	15/65	15/65	15/65	20/80
With fuses upstream – maximum fuse values assigned (gL/gG)													
Circuits A & B	A	200	200	200	200	250	250	250	315	400	400	400	630
With fuses upstream – assigned conditional short-circuit current Icc/Icf													
Circuits A & B	kA	50	50	50	50	50	50	50	50	50	50	50	50

(1) Type of system earthing

IT system: ***the short-circuit holding current values given above for the TN system are not valid for IT; modifications are required.***

5.6 - Electrical data for the hydronic module

The pumps fitted to these units have motors which meet efficiency class IE2 for motors < 7.5kW and IE3 for motors > 7.5kW. The additional electrical data required[1] is as follows:

For the low-pressure single pump motors of 30RBM/RBP 160-520 units (option 116T)

No.[2]	Description[3]	Units	30RBM/30RBP											
			160	180	200	220	260	300	330	360	400	430	470	520
1	Nominal efficiency at full load and nominal voltage	%	85,7	85,7	85,7	85,7	85,7	87,5	87,5	87,5	89,9	89,9	89,9	89
1	Nominal efficiency at 75% of full load and nominal voltage	%	86,9	86,9	86,9	86,9	86,9	88,2	88,2	88,2	90,4	90,4	90,4	90
1	Nominal efficiency at 50% of full load and nominal voltage	%	86,4	86,4	86,4	86,4	86,4	87,5	87,5	87,5	89,6	89,6	89,6	89,7
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Company name or trademark, commercial registration number and head office of manufacturer	-	Same as above											
5	Product model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	2,2	2,2	2,2	2,2	2,2	3	3	3	4	4	4	5,5
7-2	Maximum input power (400 V)[4]	kW	2,80	2,80	2,80	2,80	2,80	3,81	3,81	3,81	4,96	4,96	4,96	6,80
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 X 400											
9-2	Maximum current drawn (400 V)[5]	A	4,92	4,92	4,92	4,92	4,92	6,81	6,81	6,81	8,27	8,27	8,27	11,30
10	Nominal speed	rps - rpm	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000[6]											
	II - Ambient air temperature	°C	< 40											
	IV - Maximum operating 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											

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

For the low-pressure dual pump motors of 30RBM/RBP 160-520 units (option 116T)

No.[2]	Description[3]	Units	30RBM/30RBP											
			160	180	200	220	260	300	330	360	400	430	470	520
1	Nominal efficiency at full load and nominal voltage	%	84,9	84,9	85,7	85,7	87,5	87,5	87,5	87,5	89,9	89,9	89,9	89
1	Nominal efficiency at 75% of full load and nominal voltage	%	86,4	86,4	86,9	86,9	88,2	88,2	88,2	88,2	90,4	90,4	90,4	90
1	Nominal efficiency at 50% of full load and nominal voltage	%	85,9	85,9	86,4	86,4	87,5	87,5	87,5	87,5	89,6	89,6	89,6	89,7
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Company name or trademark, commercial registration number and head office of manufacturer	-	Same as above											
5	Product model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	1,5	1,5	2,2	2,2	3	3	3	3	4	4	4	5,5
7-2	Maximum input power (400 V)[4]	kW	1,94	1,94	2,80	2,80	3,81	3,81	3,81	3,81	4,96	4,96	4,96	6,80
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 X 400											
9-2	Maximum current drawn (400 V)[5]	A	3,41	3,41	4,92	4,92	6,81	6,81	6,81	6,81	8,27	8,27	8,27	11,30
10	Nominal speed	rps - rpm	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000(6)											
	II - Ambient air temperature	°C	< 40											
	III - Maximum operating temperature	°C	Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs.											
	V - Potentially explosive atmospheres	-	Non ATEX environment											

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

For the high-pressure single and dual-pump motors of 30RBM/RBP 160-520 units (options 116R, 116S, 116V, 116W)

No.[2]	Description[3]	Units	30RBM/30RBP											
			160	180	200	220	260	300	330	360	400	430	470	520
1	Nominal efficiency at full load and nominal voltage	%	87,5	87,5	87,5	87,5	89,9	89,9	89	89	89	89,6	89,6	89,6
1	Nominal efficiency at 75% of full load and nominal voltage	%	88,2	88,2	88,2	88,2	90,4	90,4	90	90	90	90,8	90,8	90,8
1	Nominal efficiency at 50% of full load and nominal voltage	%	87,5	87,5	87,5	87,5	89,6	89,6	89,7	89,7	89,7	90,8	90,8	90,8
2	Efficiency level	-	IE3											
3	Year of manufacture	-	This information varies depending on the manufacturer and model at the time of incorporation. Please refer to the motor nameplates.											
4	Company name or trademark, commercial registration number and head office of manufacturer	-	Same as above											
5	Product model number	-	Same as above											
6	Number of motor poles	-	2	2	2	2	2	2	2	2	2	2	2	2
7-1	Nominal shaft power output at full load and nominal voltage (400 V)	kW	3	3	3	3	4	4	5,5	5,5	5,5	7,5	7,5	7,5
7-2	Maximum input power (400 V)[4]	kW	3,81	3,81	3,81	3,81	4,96	4,96	6,80	6,80	6,80	9,16	9,16	9,16
8	Nominal input frequency	Hz	50	50	50	50	50	50	50	50	50	50	50	50
9-1	Nominal voltage	V	3 X 400											
9-2	Maximum current drawn (400 V)[5]	A	6,81	6,81	6,81	6,81	8,27	8,27	11,30	11,30	11,30	15,30	15,30	15,30
10	Nominal speed	rps - rpm	48 - 2900											
11	Product disassembly, recycling or disposal at end of life	-	Disassembly using standard tools. Disposal and recycling using an appropriate company.											
12	Operating conditions for which the motor is specifically designed													
	I - Altitudes above sea level	m	< 1000[6]											
	II - Ambient air temperature	°C	< 40											
	III - Maximum operating temperature	°C	"Please refer to the operating conditions given in this manual or in the specific conditions in the Carrier selection programs."											
	V - Potentially explosive atmospheres	-	Non ATEX environment											

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

5.7 - Electrical data notes for the compressors

Cp	I Nom	I Max Un	I Max Un-10 %	LRA Un	Cosinus Phi Max
00PSG001961100A	30	41	44	215	0,89
00PSG001748000A	37	50	54	260	0,89

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

5.8 - Distribution of compressors per circuit

Cp	Circuit	160	180	200	220	260	300	330	360	400	430	470	520
00PSG001961100A	A	1	-	-	2	-	-	-	3	-	3	-	-
	B	2	2	-	2	-	3	-	-	-	-	-	-
00PSG001748000A	A	-	1	1	-	2	2	2	-	3	-	3	4
	B	-	-	2	-	2	-	3	3	3	4	4	4

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

5.9 - Electrical data notes

Electrical data for 30RBM/30RBP units:

- 30RBM/30RBP units have a single power connection point located immediately upstream of the main switch.
- **Control box includes:**
  - Main disconnect switch,
  - Start-up and motor protection devices for each compressor, fans and pumps,
  - Control devices.
- **Field connections:**
  All connections to the system and the electrical installations must be in accordance with all applicable codes.
- 30RBM/30RBP units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60204-1 (corresponds to IEC 60204-1) (machine safety - electrical machine components - part 1: general regulations) are specifically taken into account, when designing the electrical equipment.

Notes

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation regulation.
- Conformance with EN 60204-1 is the best means of ensuring compliance (§1.5.1) with the Machinery Directive.
  Annex B of standard EN 60204-1 specifies the electrical features used for the operation of the units.
- Operating conditions of 30RBM/30RBP units are described below:

1. Physical environment*
   The classification of environment is specified in standard EN 60364:
   - Outdoor installation*,
   - Ambient temperature range: minimum temperature -20°C to +48°C**,
   - Altitude: AC1 of 2000 m or less (for the hydronic module, see the paragraph "Electrical data for the hydronic module"),
   - Presence of hard solid: Class AE3 (no significant dust present)*,
   - Presence of corrosive and polluting substances, class AF1 (negligible),
   - Competence of persons: BA4 (Persons wise).
2. Compatibility for low-frequency conducted disturbances according to class 2 levels per IEC61000-2-4 standard:
   - Power supply frequency variation: +- 2Hz
   - Phase imbalance : 2%
   - Total Voltage Harmonic Distortion (THDV): 8%
3. The neutral (N) line 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(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947-3 (corresponds to IEC 60947-3).
6. The units are designed for connection to TN networks (IEC 60364). In IT networks, if noise filters are integrated into the variable frequency drive(s), this will render the units unsuitable for their intended purpose. In addition, the equipment characteristics in case of insulation failure are modified. Provide a local earth; consult competent local organisations to complete the electrical installation.
   "30RBM/30RBP units are designed to use for domestic / residential and industrial environments:
   Units that are not equipped with variable frequency drive(s) are in accordance with the standards codes.
   - 61000-6-3: General standards - Standard emission for residential, commercial and light industry,
   - 61000-6-2: General standards - Immunity for industrial environments
   Units equipped with variable frequency drive(s) (RBP, options: 28, 116V, 116W) are in accordance with standard EN61800 - 3 electric power variable speed drives - part 3: EMC requirements and specific test methods for the following classifications:-:
   Use in the first and second environments***.
   - Category C2 applicable in the first environment, to stationary devices designed to be installed and commissioned by a professional.
   Warning: In a residential environment, this product may cause radio interference in which case additional mitigation measures could be required.

- Leakage currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of additional leakage currents introduced by the use of variable frequency drive(s) in the unit must be considered. In particular, the reinforced immunity protection type and/or a control value not lower than 150 mA are recommended when selecting differential protection devices.
- Capacitors integrated as part of option 231 can generate electrical disturbances in the installation the unit is connected to. The presence of these capacitors must be considered during the electrical study prior to the start-up.
  Note: If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local Carrier representative.

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

** The maximum allowable ambient temperature for units equipped with the Power factor correction option is +40°C

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

6 - ELECTRICAL CONNECTION

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

6.1 - Power supply

The power supply must meet the specification on the unit's nameplate.

The supply voltage must be within the range specified in the electrical data table.

For connections, refer to the wiring diagrams and certified dimensional drawings.

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

After the unit has been started up, the power supply must only be disconnected for quick maintenance operations (one day maximum). For longer maintenance operations or when the unit is placed in storage (for example, during winter when the unit does not need to generate cooling) the power supply of the unit must be maintained permanently

6.2 - Voltage phase imbalance (%)

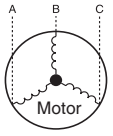
$$\frac{100 \times \text{max. deviation from average voltage}}{\text{Average voltage}}$$

Example:
On a 400 V - 3 ph - 50 Hz supply, the individual phase voltages were measured with the following values:

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 therefore acceptable.

6.3 - 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 engage the manufacturer's liability.

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

The connections provided as standard for the customer's power supply cables are designed for the number and type of sections listed in the table below.

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

The study includes the standardised installation cases according to IEC 60364: cables with PVC (70°C) or XLPE (90°C) insulation with copper core; routing in accordance with table 52C of the standard.

The maximum length mentioned is calculated to limit the voltage drop to 5 %.

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

Table of minimum and maximum cable sections (per phase) for connection to the units

	Max. connectable section(1)			Calculation of favourable case: - Suspended overhead line (standardised routing no. 17) - Cable with XLPE insulation			Calculation of unfavourable case: - Conductors in ducts or multi-conductor cables in closed conduits (standardised routing no. 41) - Cable with PVC insulation, if possible		
30RBM/ 30RBP	**Standard lug**	**Narrow lug**	**Recommended max lug width**	**Section(2)**	**Max length for a voltage drop < 5%**	**Cable type(3)**	**Section(2)**	**Max length for a voltage drop < 5%**	**Cable type(3)**
	mm² (per phase)	**mm² (per phase)**	**mm**	**mm² (per phase)**	**m**	**-**	**mm² (per phase)**	**m**	**-**
160	2x70	2x95	21	1 x 50	180	XLPE Copper	2 x 50	350	PVC Copper
180	2x70	2x95	21	1 x 50	170	XLPE Copper	2 x 50	320	PVC Copper
200	2x70	2x95	21	1 x 70	205	XLPE Copper	2 x 70	380	PVC Copper
220	2x70	2x95	21	1 x 70	190	XLPE Copper	2 x 70	350	PVC Copper
260	2x70	2x95	21	2 x 50	220	XLPE Copper	2 x 70	300	XLPE Copper
300	2x70	2x95	21	2 x 50	200	XLPE Copper	2 x 70	270	XLPE Copper
330	2x70	2x95	21	2 x 70	240	XLPE Copper	2 x 95	310	XLPE Copper
360	2x95	2x185	24,5	2 x 70	220	XLPE Copper	2 x 95	280	XLPE Copper
400	2x95	2x185	24,5	2 x 70	200	XLPE Copper	2 x 120	310	XLPE Copper
430	2x95	2x185	24,5	2 x 95	240	XLPE Copper	2 x 150	340	XLPE Copper
470	2x240	2x240	37	2 x 95	220	XLPE Copper	2 x 150	320	XLPE Copper
520	2x240	2x240	37	2 x 120	240	XLPE Copper	2 x 185	330	XLPE Copper

NOTES:
(1) Connection capacities actually available for each unit. These are defined according to the connection terminal size, the electrical box access opening dimensions and the available space inside the electrical box.
(2) Selection simulation result considering the hypotheses indicated.
(3) If the maximum calculated section is for an XLPE cable type, this means that a selection based on a PVC cable type can exceed the connection capacity actually available. Special attention must be given to selection.
The protection against direct contact at the electrical connection point is compatible with the addition of fanout cables. The installer must determine whether these are necessary based on the cable sizing calculation.

6.4 - Power cable entry

The power cables for devices are routed into the electrical box from underneath the unit,

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

It is important to check that the power cable bend radius is compatible with the connection space available inside the electrical cabinet.

Refer to the certified dimensional drawing for the unit.

Connection expansion box

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

It is recommended to use this accessory in the following cases:
- Unit placed on the ground and the use of steel wired armoured (SWA) cables.
- Unit placed on the ground and use of rigid power cables with a section > 250 mm^2

6.5 - Field control wiring

IMPORTANT:
Connecting the interface circuits on-site creates certain safety risks; any modification to the electrical box must ensure the equipment remains compliant with local regulations. In particular, precautions must be taken to prevent accidental electrical contact between the circuits supplied by different sources:
- ***The choice of routing and/or insulation characteristics of the conductors ensures double electrical insulation.***
- ***The conductors should be fixed together inside the electrical box to prevent contact between the end of the conductor and a live part in case of accidental disconnection.***

See the control manual and the certified electric wiring diagram supplied with the unit for the field control wiring of the following devices:
- Device automatic operation control,
- Setpoint 1/Setpoint 2 switching,
- Power limitation,
- Operational fault reporting
- Locking switch (safety chain),
- Customer pump switch control (on/off),
- Setpoint adjustable by 4-20 mA signal,
- Power limitation adjustable by 4-20 mA signal,
- Second power limitation level,
- End of storage cycle signal,
- User fault reporting
- Time schedule override,
- Partial heat recovery activation control,
- Power indication on analogue output (0-10V),
- Unit shutdown general fault reporting,
- Minor alert signalling,
- Partial heat recovery pump On/Off control,
- Free cooling drycooler management.

6.6 - Electric power reserve for the user

Control circuit power reserve:

After all possible options have been connected, the CT transformer ensures the availability of 1 A of power for the control cabling on-site on 24 V, 50 Hz.

With the electrical plug option, this CT transformer provides a 230V, 50Hz circuit to power laptop battery chargers only, maximum current of 0.8 A at 230 V

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

6.7 - Power connection/disconnect switch

The power connection of the unit is carried out at a single point upstream of the unit’s disconnect switch.

7 - APPLICATION DATA

7.1 - Operating range

30RBM 160-520 units

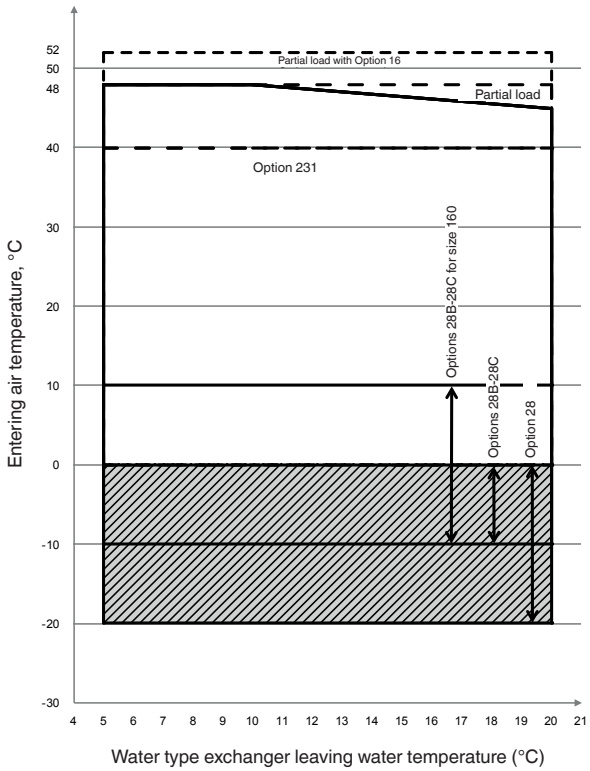
Water type heat exchanger		Minimum	Maximum
Entering water temperature at start-up	°C	8(1)	40
Leaving water temperature during operation	°C	5(2)	20(3)
Air-cooled exchanger		**Minimum**	**Maximum**
Outdoor ambient operating temperature			
Standard units	°C	0(4)/10	48(5)
Units with options 28B-28C (winter operation)	°C	-10	48(5)
Units with option 28 (winter operation)	°C	-20	48(5)
Units with option 16 (high ambiance operation)	°C	0/10	52
Available static pressure			
Standard units (outdoor installation)	Pa	0	0

30RBP 160-520 units

Water type heat exchanger		Minimum	Maximum
Entering water temperature at start-up	°C	8(1)	40
Leaving water temperature during operation	°C	5(2)	20(3)
Air-cooled exchanger		**Minimum**	**Maximum**
Outdoor ambient operating temperature			
Standard units	°C	-20	48
Available static pressure			
Standard units (outdoor installation)	Pa	0	0

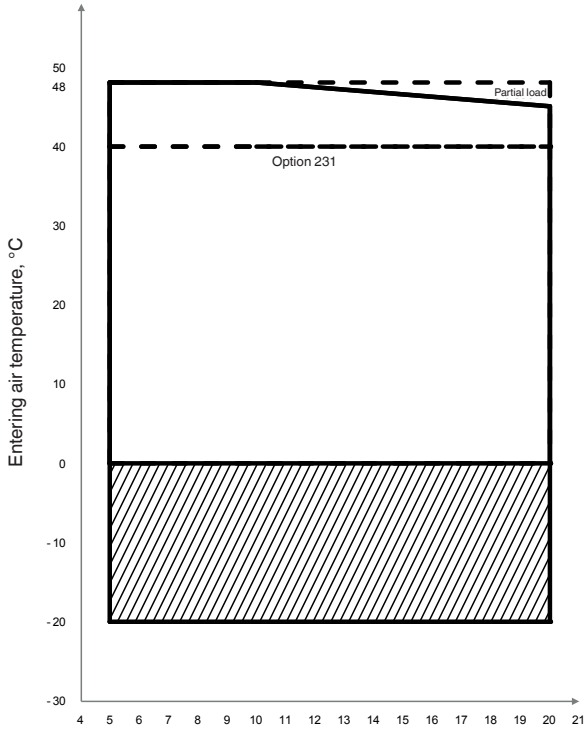
(1) For applications requiring operation at less than 8°C, contact Carrier for unit selection using the Carrier electronic catalogue.
(2) Use of antifreeze is obligatory if the leaving water temperature is below 5°C.
(3) For applications requiring operation exceeding 20°C leaving water temperature, contact Carrier for unit selection using the Carrier electronic catalogue.
(4) For applications requiring operation from 0°C to -10°C, the unit must be equipped with options 28B-28C (winter operation). For operation from 0°C to -20°C, the unit must be equipped with option 28 (winter operation). For both options, the unit must either be equipped with the evaporator frost protection option (for units without hydronic module option), or the evaporator and hydronic module frost protection option (for units with hydronic module option), or the water loop must be protected against frost by the installer, using an antifreeze solution.
(5) The maximum allowable ambient temperature allowed for units equipped with option 231 is +40°C. Maximum ambient temperature: in case of 30RBM/30RBP units storage and transport, minimum and maximum ambient temperatures to respect are -20°C and +52°C. These temperature limits shall be considered in case of container shipment.

Operating range 30RBM 160-520 units



Water type exchanger leaving water temperature (°C)

Operating range 30RBP 160-520 units



Water type exchanger leaving water temperature (°C)

NOTES

- The evaporator is protected against frost down to -20 °C (with frost protection option 41 or option 42A if the hydronic module or loop is protected by an antifreeze solution for outdoor temperatures < 0°C)
- These operating ranges are guidelines only. Verify the operating range with the Carrier electronic catalogue.

Legend

- 30RBM or 30RBP standard unit operating range
- Operating range for 30RBM unit equipped with options 28, 28B and 28C (winter operation). Options 28B-28C (with two-speed lead fan for each circuit) allows operation down to -10 °C outside temperature.
- Extension of the operating range, 30RBM unit equipped with option 28. Option 28 (with variable-speed lead fan for each circuit) allows operation down to -20°C outside temperature.
- In addition to the options 28, 28B or 28C for 30RBM units, or for operation at an air temperature below 0°C for 30RBP, the unit must either be equipped with the evaporator frost protection option (for units without hydronic module option), or the evaporator and hydronic module frost protection option (for units with hydronic module option), or the water loop must be protected by the installer by adding an antifreeze solution.

NOTE:
Units equipped with speed regulators
If the air temperature is below -10°C and the unit has been de-energized for more than 4 hours, it is necessary to wait two hours after the unit has been switched on again to allow the regulator to warm up.

Pure water operating range.

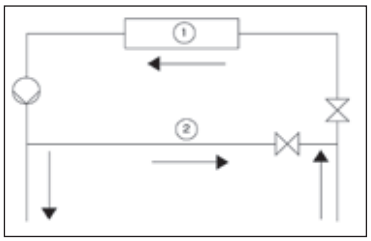
For operation with brine solution, see "Brine option (Options 5B and 6B)"

7.2 - Minimum heat-transfer fluid flow rate (units without factory-fitted hydronic module)

The minimum heat-transfer fluid flow rate is given in the paragraph "Water exchanger min. water volume and flow rate".

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

For a minimum heat-transfer fluid flow rate



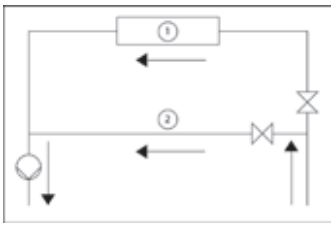
Legend
1 Water heat exchanger
2 Recirculation

If the system flow rate is less than the minimum flow rate, there may be a high fouling risk.

7.3 - Maximum heat-transfer fluid flow rate (units without factory-fitted hydronic module)

The minimum heat-transfer fluid flow rate is given in the paragraph "Water exchanger min. water volume and flow rate". If the system's flow exceeds the unit's maximum value, it can be bypassed as shown in the diagram.

For a maximum heat-transfer fluid flow rate



Legend
1 Water heat exchanger
2 Recirculation

It is limited by the allowable pressure drop for the water exchanger.

Furthermore, it must ensure a minimum ΔT in the water exchanger of 2.8 K, which corresponds to a flow rate of 0.09 l/s per kW.

7.4 - Variable flow evaporator (units without factory-fitted hydronic module)

A variable water heat exchanger flow can be used in standard units. The flow rate must be higher than the minimum flow given in the table of permissible flow rates and must not vary by more than 10% per minute.

If the flow rate changes more rapidly, the system should contain a minimum of 6.5 litres of water per kW instead of 2.5 l/kW.

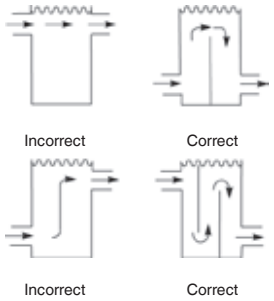
7.5 - System minimum water volume

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

Volume = Cap (kW) x N litres

Application	N
Normal air conditioning	2.5
Process type cooling	6.5

Connection to a buffer tank



7.6 - System maximum water volume

Units with a hydronic module may include an expansion vessel which limits the volume in the water loop.

The table below gives the maximum loop volume compatible with the expansion vessel (for pure water or ethylene glycol depending on the system's various concentrations and static pressures). If this volume is less than the volume of the installed loop, then it is necessary to add an extra expansion vessel within the system.

Maximum water loop volume (litres)						
30RBM/30RBP	**160-260**			**300-520**		
Static pressure (bar)	1	2	2,5	1	2	2,5
Pure water	2400	1600	1200	3960	2640	1980
10% EG	1800	1200	900	2940	1960	1470
20% EG	1320	880	660	2100	1400	1050
30% EG	1080	720	540	1740	1160	870
40% EG	900	600	450	1500	1000	750

EG: Ethylene Glycol

7.7 - Water type heat exchanger water flow rate

Data applicable for pure water.

30RBM/30RBP 160-520 units without hydronic module

30RBM/30RBP	Minimum flow rate (l/s)(1)	Maximum flow rate(2) (l/s)
160	2,9	17,5
180	3,2	17,5
200	3,6	17,5
220	3,8	17,5
260	4,6	21,8
300	5,2	29,8
330	5,9	35,2
360	6,3	33,8
400	7,1	38,9
430	7,6	40,4
470	8,2	41,6
520	9,4	43,4

(1) Minimum flow rate for maximum allowable water temperature difference conditions (10K) under Eurovent conditions

(2) Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger

30RBM/30RBP 160-520 units with low-pressure hydronic module

30RBM/30RBP	Minimum flow rate (l/s)(1)		Maximum flow rate (l/s)	
	Single	Dual	Single	Dual
160	2,8	3,2	12,2	10,3
180	2,8	3,2	12,2	10,3
200	2,8	2,5	12,2	12,2
220	2,8	2,5	12,2	12,2
260	4	2,7	14,3	15
300	3,1	3,7	20,2	20,2
330	3,4	3,7	20,2	20,2
360	3,7	3,8	20,2	20,2
400	9,5	4,1	25	22,9
430	9,5	8	25	25
470	9,5	8	25	25
520	5,4	5,4	26,6	26,5

(1) Minimum factory flow rate setting according to the type of pump

30RBM/30RBP 160-520 units with high-pressure hydronic module

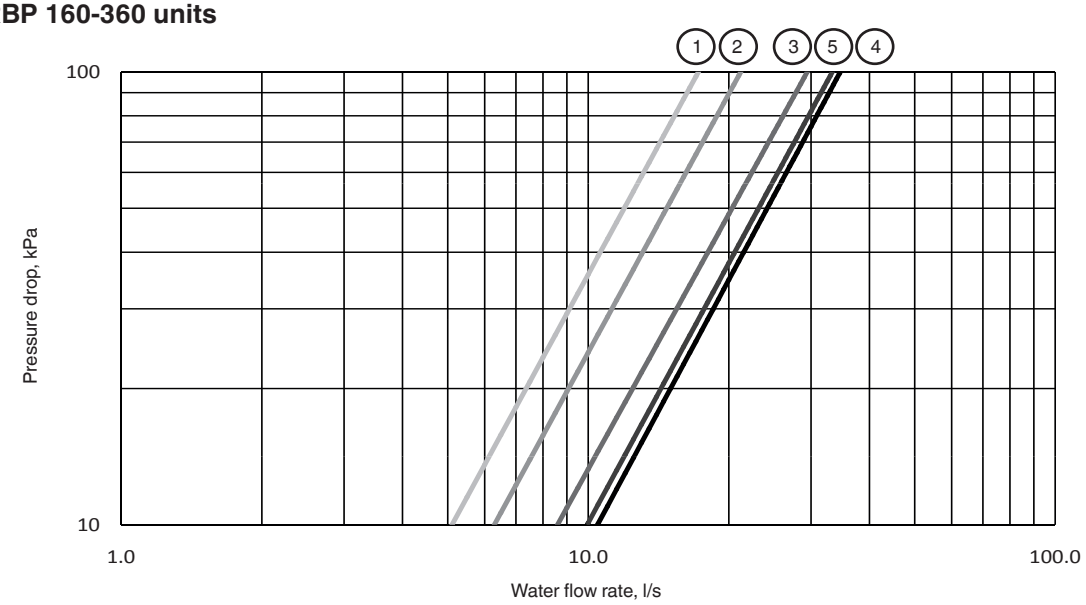
30RBM/30RBP	Minimum flow rate (l/s)(1)		Maximum flow rate (l/s)	
	Single	Dual	Single	Dual
160	2,5	2,6	11,7	11,7
180	2,5	2,6	11,7	11,7
200	2,5	2,6	11,7	11,7
220	2,5	2,6	11,7	11,7
260	5,2	2,9	16,1	15,5
300	6,4	3,5	16,1	15,5
330	3,6	3,4	26,5	26,5
360	3,7	3,7	26,5	26,5
400	4,1	4,1	26,5	26,5
430	4,4	4,4	26,7	29,2
470	4,8	4,8	26,7	29,2
520	5,4	5,4	26,7	35

(1) Minimum factory flow rate setting according to the type of pump

7.8 - Pressure drop curves for the water type heat exchanger and standard water inlet/outlet piping

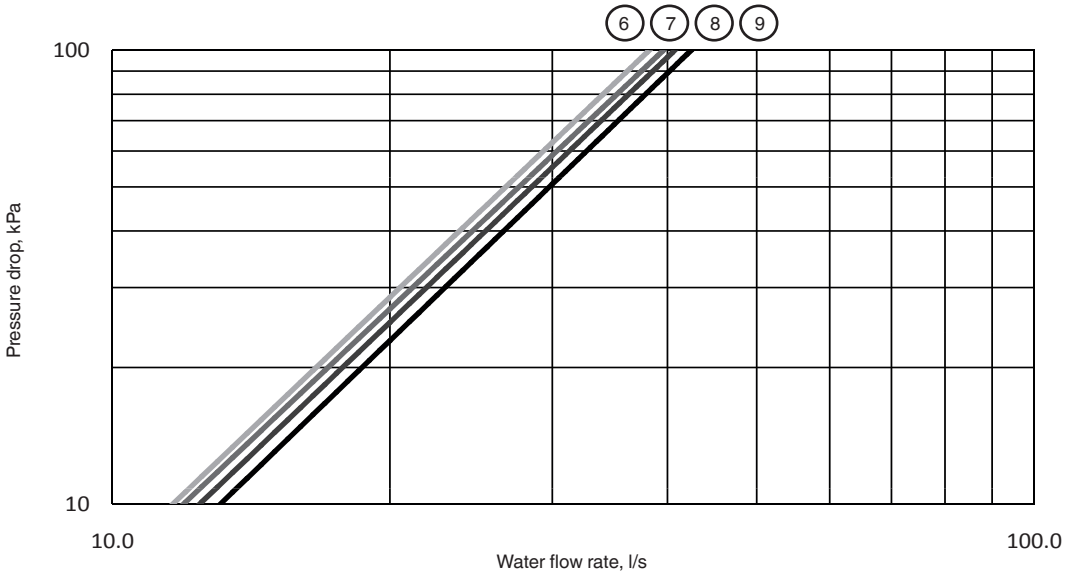
Data applicable for pure water at 20°C.

30RBM/30RBP 160-360 units



1 30RBM/30RBP 160-20
2 30RBM/30RBP 260
3 30RBM/30RBP 300
4 30RBM/30RBP 330
5 30RBM/30RBP 360

30RBM/30RBP 400-520 units



6 30RBM/30RBP 400
7 30RBM/30RBP 430
8 30RBM/30RBP 470
9 30RBM/30RBP 520

8 - WATER CONNECTIONS

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

The piping must not transmit any axial or radial force to the exchangers, or any vibrations.

The water supply must be analysed and the circuit created must include the required water treatment elements: filters, additives, intermediate exchangers, bleed devices, vents, shut-off valves, etc., according to the results, to prevent corrosion (for example, damage to the tube protective surface if there is contamination in the fluid), fouling and deterioration of the pump lining

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

Manufacturer's recommendations concerning heat-transfer fluids:

- No NH_4^+ ammonium ions in the water - these are very harmful to copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time.
- Cl- Chloride ions are also harmful to copper with a risk of perforating corrosion. Keep at a level below 125 mg/l.
- SO_4 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 < 1 mg/l.
- Water hardness: >0.5 mmol/l. Values between 1 and 2.5 are recommended. This will facilitate scale deposit that can limit corrosion of copper. Values that are too high can cause piping blockage over time. A total alkalimetric titre (TAC) below 100 mg/l is desirable.
- Dissolved oxygen: Avoid any sudden change in water oxygenation conditions. 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 destabilization of copper hydroxides and the release of particles.
- Electrical conductivity 10-600 µS/cm.
- pH: Ideal case pH neutral at 20-25°C (7.5 < pH < 9).

Filling, topping up or emptying of the water circuit must be carried out by qualified personnel using the air bleed devices and tools and equipment suitable for the products.

The heat-transfer fluid should be filled and drained using devices fitted to the water circuit by the installer. Never use the unit heat exchangers to add heat-transfer fluid.

8.1 - Operating precautions and recommendations

Before the system start-up, make sure the hydronic circuits are connected to the appropriate heat exchangers.

The water circuit must have as few bends and horizontal sections at different levels as possible.

Main points to be checked for the connection:

- Observe the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit.
- Maintain the pressure of the circuit(s) with pressure reducers and install a safety relief valve and an expansion tank. Units supplied with a hydronic module include a valve. The expansion vessel is supplied as an option.
- Install thermometers in both the water inlet and outlet pipes.
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install shut-off valves close to the water inlet and outlet connections.
- Use flexible connections to reduce the transmission of vibrations.
- Insulate the cold water pipework, after testing for leaks, to prevent heat transmission and condensation.
- Cover the insulation with a vapour barrier. If the water pipes outside the unit pass through an area where the ambient temperature is likely to fall below 0°C, it must be protected against frost (antifreeze solution or electric heaters)
- If there are particles in the fluid which are liable to foul the exchanger, a screen filter must be installed upstream of the pump. The mesh size of this filter must be 1.2 mm (see Typical hydronic installation diagram).

NOTE:

A screen filter must be installed for units supplied without a hydronic module. This must be installed on the unit's water inlet pipe, as close as possible to the unit heat exchanger. It must be located somewhere easily accessible to enable disassembly and cleaning.

If the filter is missing, the plate heat exchanger can quickly become fouled during the first start-up, as it will trap any debris in the system, and correct unit operation will be affected (reduced water flow rate due to the increased pressure drop).

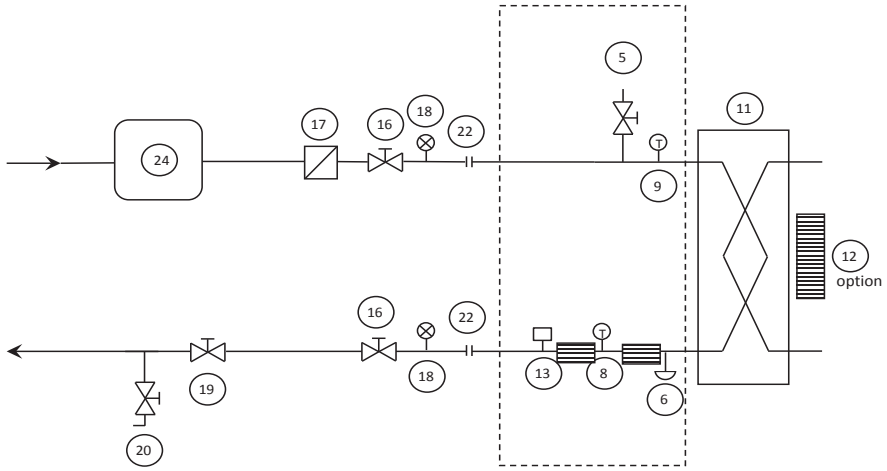
- Do not introduce any excessive static or dynamic pressure into the heat exchange circuit (with regard to the design operating pressures).
- Products used for thermal insulation of recipients during hydronic connection must be chemically neutral to the surfaces on which they are applied. All original materials supplied by the manufacturer comply with this requirement.

8.2 - Hydronic connections

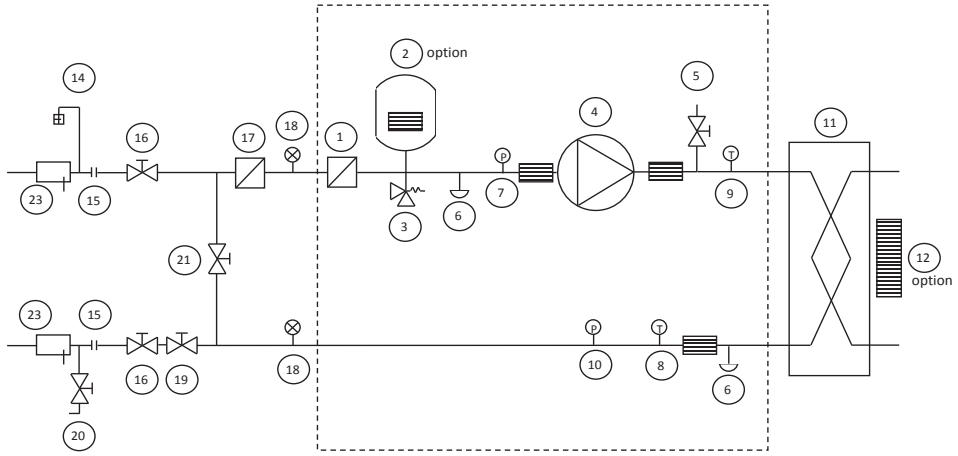
The hydronic module options are only compatible with closed loops.

The use of the hydronic module on open systems is prohibited.

Schematic diagram of the hydronic circuit without hydronic module



Schematic diagram of the hydronic circuit with hydronic module



Legend:

Components of the unit and hydronic module

1 Screen filter (mesh opening 1.2 mm = 20 mesh)
2 Expansion tank (option)
3 Safety valve
4 Water pump (single of dual pump)
5 Air purge
6 Water drain valve
7 Pressure sensor
Note: Provides information of pressure at the suction of the pump
8 Temperature probe
Note: Provides information of temperature at the heat exchanger outlet
9 Temperature probe
Note: Provides information of temperature at the heat exchanger inlet
10 Pressure sensor
Note: Provides information of pressure at unit outlet
11 Plate heat exchanger
12 Evaporator heater for frost protection (option)
13 Flow rate sensor for the evaporator (provided)

System components

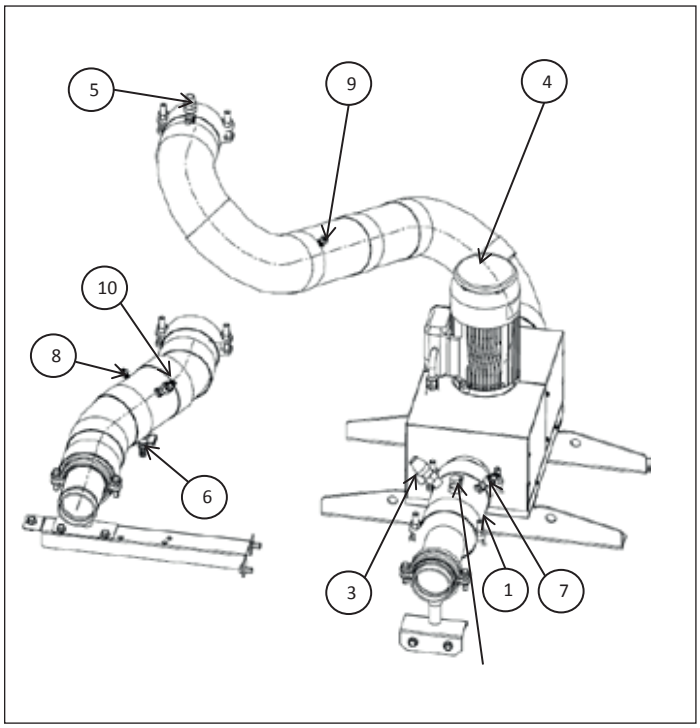
14 Air purge
15 Flexible connection
16 Shut-off valve
17 Screen filter (mandatory in the case of a unit without hydronic module)
18 Pressure gauge
19 Water flow control valve
Note: Not required if hydronic module with variable speed pump
20 Charge valve
21 Bypass valve for frost protection (if shut-off valves are closed (item 16) during winter)
22 Flexible connection
23 Thermowell
24 Buffer tank (if required)
---- Hydronic module (unit with hydronic module option)/Components delivered with chiller (unit without hydronic module option)

Notes:

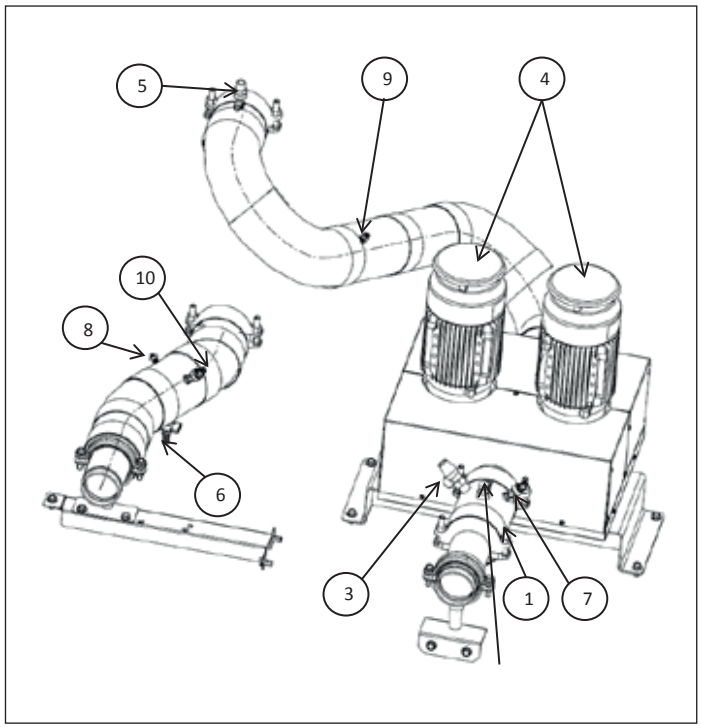
- The system must be protected against frost.
- The hydronic module of the unit and the evaporator are protected (option 42 A installed in the factory) against frost with electric heaters (item 12 + ▤) (unit with hydronic module option).
- The evaporator and the water outlet pipes are protected (option 41 installed in the factory) against frost with electric heaters (item 12 + ▤) (unit without hydronic module option).
- The pressure sensors are assembled on connections without Schrader. Depressurise and drain the system before any work.

Water connections with hydronic module

Example: Single pump

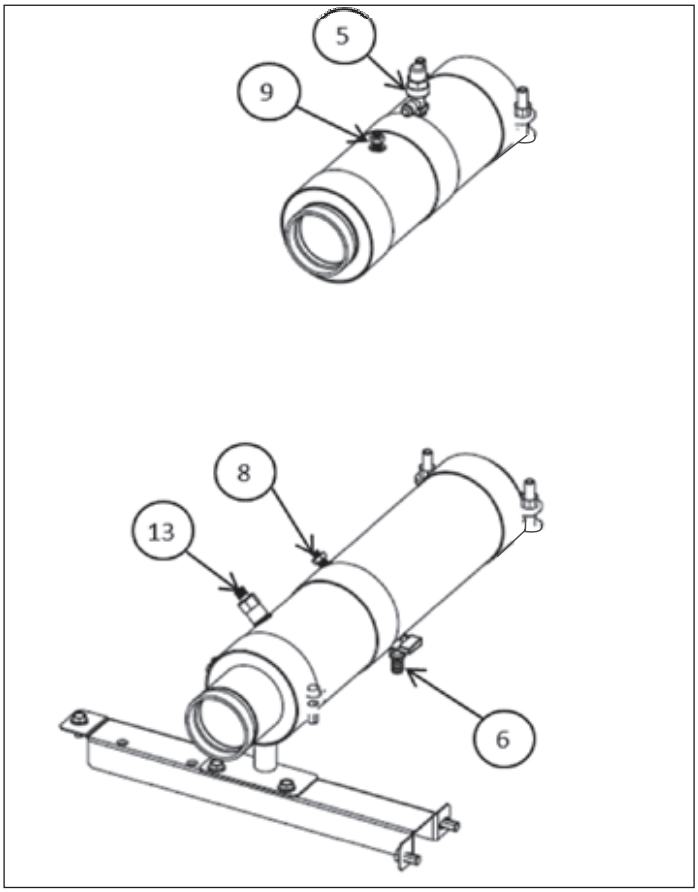


Example: Single pump



See legend on the previous page.

Water connections without hydronic module



See legend on the previous page.

8.3 - Cavitation protection (with hydronic option)

To ensure the durability of pumps fitted on the integrated hydronic modules, the control algorithm of units in the range includes protection against cavitation.

It is therefore necessary to ensure a minimum pressure of 60 kPa (0.6 bar) at the pump inlet both when shut down and during operation.

A pressure below 60 kPa will prevent unit start-up, or will cause an alarm and shut-down.

A pressure below 100 kPa will trigger an alert on the user interface.

To obtain an adequate pressure, it is recommended:
- To pressurise the hydronic circuit between 100 kPa (1 bar) and 400 kPa (4 bar) maximum at the pump inlet;
- To clean the hydraulic circuit during water filling or after any modifications are made;
- To regularly clean the screen filter.

8.4 - Water flow rate detection

Standard unit

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

The heat-transfer fluid pump must be servo-controlled by the assembly if the unit is not equipped with the hydronic module option. Dedicated terminals are provided for installing the heat-transfer fluid pump servo control (to be wired on site).

Unit with hydronic module (option)

The "flow rate detection" functionality is handled by the option via the pressure sensors.

8.5 - Frost protection

Damage caused by frost is not covered by the warranty.

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

The plate heat exchanger and all the components of the water circuit can be protected against freezing by draining the entire unit completely, checking that there are no retention points.

If this is not possible, the plate heat exchanger and all the components of the water circuit can be protected against freezing:
- Down to -20°C by heaters and heat trace cables (fitted as an option on the exchanger and internal pipe system) supplied automatically (for units without the hydronic module)
- Down to -20°C by heaters and heat trace cables (fitted as an option on the water type heat exchanger and internal pipe system) supplied automatically and pump circulation (for units with the hydronic module)

Never power off the heaters for the water exchanger and the water circuit or pump, as they will no longer be providing frost protection.

To ensure they continue to receive power, the main switch for the unit or the customer's circuit and the auxiliary circuit breaker for the heaters must be left closed (see the wiring diagram for the location of these components).

To protect units with a hydronic module from freezing, water must be circulated in the water circuit by the pump, which is activated at regular intervals.

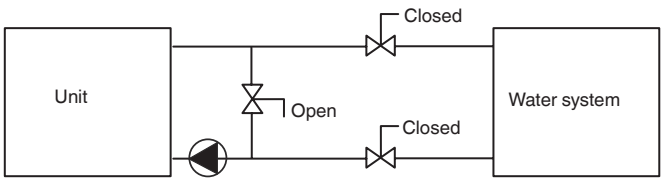
Combination of options for the periods when the unit is in standby mode.

Ambient unit temperature range	30RBM/30RBP 160-520	
	without option 116	with option 116
> 0°C to 48°C	-	-
-20°C to 0°C	Option 41 or Suitable antifreeze solution (glycol, for example)	Option 42A(1) or Suitable antifreeze solution (glycol, for example)(1)

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

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

Winter position



IMPORTANT:

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

- Add an appropriate antifreeze solution (maximum of 45%) to protect the system down to a temperature of 10 K below the lowest temperature likely to occur locally.
- For extended shut-downs, drain and add an anti-freeze solution to the heat exchanger (use the drain valve located at the water inlet).
- To prevent corrosion due to differential aeration, if the system is to be empty for more than 1 month, the heat-transfer fluid circuit should be protected with a blanket of dry, inert gas. (0.5 bar maximum). If the heat-transfer fluid does not meet the recommendations, a nitrogen blanket must be applied immediately.
- At the commencement of the next season, fill the system with water treated with appropriate corrosion inhibitors.
- For installation of auxiliary equipment, the installer must comply with the basic rules, especially by complying with the minimum and maximum flows which must be between the values mentioned in the operating limits tables (application data).
- If frost protection is dependent on electric heaters, never de-energize the unit when frost protection is required. To ensure protection, the main unit disconnect switch and the auxiliary heater protection circuit breaker must be energized (see wiring diagram to locate these components). If it is not to be used in freezing conditions, or during a prolonged period without power (whether or not this is scheduled), the water type heat exchanger and external pipes must be drained immediately
- In case of prolonged non-usage, the hydraulic circuits must be protected by circulating a passivating solution. (Consult a specialist).
- The heat exchanger temperature sensors are an essential frost protection element: if piping trace heaters are used, ensure the external heaters do not affect the measurements provided by these sensors.
- If auxiliary equipment is installed in the system, the installer must ensure that the resultant flow rates are still within the minimum and maximum values indicated in the operating limits table (application data).

9 - NOMINAL SYSTEM WATER FLOW RATE CONTROL

Refer to the schematic diagram in the "Water connections" paragraph for all item references in this chapter.

The water circulation pumps of the units in the range have been sized to allow the hydronic modules to operate in all possible configurations based on the specific system conditions, i.e. at a range of temperature differences between the water inlet and outlet at full load from 3 to 10 K.

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

In particular, collect the data to be used for setting the installation flow rate:

- For a unit without hydronic module: nominal pressure drop at the unit terminals (plate heat exchanger + internal water pipe). This is measured with pressure differential gauges that must be installed at the unit's inlet and outlet (item 21).
- Units with fixed speed pumps: nominal flow rate. The pressure of the fluid is measured by sensors installed at the inlet of the pump and outlet of the unit (items 7 and 10). The system calculates the flow rate associated with this differential pressure. The flow rate can be read directly on the user interface (refer to the control manual for the range).
- Units with variable speed pumps - control on pressure differential: pressure differential at the hydronic module terminals,
- Units with variable speed pumps - control on temperature difference: nominal temperature delta at the exchanger.

If this information is not available when activating the system, contact the design office responsible for the installation to obtain it.

This data can be obtained either from the performance tables included in the technical documentation (for cases where the water type heat exchanger temperature delta is 5 K) or from the "Electronic Catalogue" selection program for all other applicable temperature delta in the range of 3 to 10 K.

9.1 - Units without hydronic module

General information

The nominal flow rate of the system will be set using a manual valve that should be installed on the water outlet pipe (item 22 on the water circuit schematic diagram).

Due to the pressure drop it generates on the hydronic network, this flow control valve is used to set the network pressure/flow rate curve to the pump pressure/flow rate curve, to obtain the nominal flow rate at the desired operating point.

This is checked by reading the pressure drop on the unit (plate heat exchanger + internal piping).

As the exact total system pressure drop is not known upon commissioning, it is necessary to adjust the water flow rate with the control valve to obtain the installation's specific flow rate.

Hydronic circuit cleaning procedure

- Open all control valves completely (item 22).
- Start up the system pump.
- Read the pressure drop of the plate heat exchanger using the pressure differential gauge to find the difference between the unit inlet and outlet (item 21).
- Let the pump run for 2 hours continuously to clean up the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading.
- Compare this value to the initial value.
- A reducing value of the flow indicates that the filters on the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 19) and remove the filters (items 20 and 1) after draining the hydronic part of the unit (items 6).
- Remove the air from the circuit (items 5 and 17).
- Repeat until all fouling is removed from the filter.

Water flow rate adjustment procedure

Once the circuit has been decontaminated, read the pressures on the pressure gauges (water inlet pressure - outlet pressure) to determine the pressure drop across the unit terminals (plate heat exchanger + internal pipework).

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

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

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

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

To reduce the system's hydronic network pressure drop:

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

9.2 - Units with hydronic module and fixed speed pump

General information

See the paragraph on "Units without hydronic module"

Hydronic circuit cleaning procedure

- Open all control valves completely (item 22).
- Start up the unit's pump.
- Read the value of the flow on the user interface.
- Let the pump run for 2 hours continuously to clean up the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading.
- Compare this value to the initial value.
- A reducing value of the flow indicates that the filters on the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 19) and remove the filters (items 20 and 1) after draining the hydronic part of the unit (items 6).
- Remove the air from the circuit (items 5 and 17).
- Repeat until all fouling is removed from the filter

Water flow rate adjustment procedure

Once the circuit has been decontaminated, read the flow rate on the user interface and compare the value obtained with the theoretical selection value.

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

In this case, close the control valve (item 22) and read the new flow rate value.

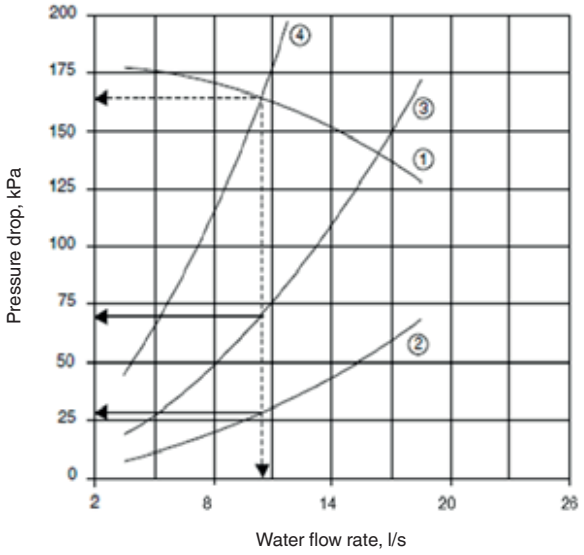
Repeat as necessary, closing the control valve (item 22) until the system's specific pressure drop corresponding to the unit's design flow rate is achieved.

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

To reduce the system's hydronic network pressure drop:

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

Example: Unit with specific nominal flow 10.6 l/s



Legend

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

9.3 - Units with hydronic module and variable speed pump – Pressure differential control

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

The flow rate will be adjusted, by varying the pump speed, to maintain a system pressure differential value defined by the user.

This is checked by the pressure sensor at the water exchanger outlet (item 10 on the main water circuit diagram).

The system calculates the measured pressure difference, compares it with the setpoint value set by the user and then modulates the pump speed module, resulting in:

- an increase in the flow rate if the measurement is below the setpoint,
- a decrease in the flow rate if the measurement exceeds the setpoint.

This modulation is limited only by the maximum and minimum flow rates for the unit and by the maximum and minimum allowable pump speeds.

The maintained pressure difference value may, in certain cases, differ from the setpoint value:

- if the setpoint value is too high (obtained for a flow rate higher than the maximum value or a frequency greater than the maximum value), the system will stop once it reaches the maximum flow rate or maximum frequency, which will result in a pressure difference below the setpoint,
- if the setpoint value is too low (obtained for a flow rate lower than the minimum value or a frequency less than the minimum value), the system will stop once it reaches the minimum flow rate or minimum frequency, which will result in a pressure difference greater than the setpoint.

Contact the manufacturer's service department to implement the procedures described below

Hydronic circuit cleaning procedure

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

- Start up the unit pump by using the override command.
- Control the frequency to the maximum value to generate a higher flow.
- If there is a "Maximum flow exceeded" alarm, reduce the frequency until an acceptable value is reached.
- Read the value of the flow on the user interface.
- Let the pump run for 2 hours continuously to clean up the system's hydraulic circuit (presence of contaminating solids).
- Perform another reading of the flow and compare this value with the initial value. A reducing value of the flow indicates that the filters on the system need to be removed and cleaned. In this case, close the shut-off valves on the water inlet and outlet (item 19) and remove the filters (items 20 and 1) after draining the hydronic part of the unit (items 6).
- Remove the air from the circuit (items 5 and 17).
- Repeat until all fouling is removed from the filter

Procedure for controlling the pressure differential setpoint

Once the circuit is cleaned, place the water circuit in the configuration for which the unit selection was performed (generally, this will be all valves open and all cooling coils active)

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

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

Repeat until you obtain the flow rate corresponding to the nominal flow rate at the unit's requisite operating point.

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

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

The unit's default factory configuration is the minimum speed (frequency: 30 Hz).

NOTE:
If during adjustment, the low or high frequency limits are reached before reaching the specified flow rate, keep the pressure differential value at its lower or higher limit as the control parameter value.
If the user knows in advance the pressure differential value at the unit outlet to be maintained, this value can be entered directly as data to be declared. You should not, however, omit the water circuit cleaning sequence

9.4 - Units with hydronic module and variable speed pump – Temperature differential control

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

The flow rate will be adjusted, by varying the pump speed, to maintain a heat exchanger temperature differential value defined by the user.

This is checked by the temperature sensors at the water exchanger inlet and outlet (items 8 and 9 on the main water circuit diagram).

The system reads the measured temperature values, calculates the corresponding temperature delta, compares it with the setpoint value set by the user and then modulates the pump speed module.

- This results in an increase in the flow rate if the temperature delta exceeds the setpoint.
- This results in a decrease in the flow rate if the temperature delta is less than the setpoint.

This modulation is limited only by the maximum and minimum flow rates for the unit and by the maximum and minimum allowable pump speeds.

The maintained temperature delta may, in certain cases, differ from the setpoint value:

- if the setpoint value is too high (obtained for a flow rate lower than the minimum value or a frequency less than the minimum value), the system will stop once it reaches the minimum flow rate or minimum frequency, which will result in a temperature delta below the setpoint,
- if the setpoint value is too low (obtained for a flow rate higher than the maximum value or a frequency greater than the maximum value), the system will stop once it reaches the maximum flow rate or maximum frequency, which will result in a temperature delta above the setpoint.

Contact the manufacturer's service department to implement the procedures described below.

Hydronic circuit cleaning procedure

Refer to the hydronic circuit cleaning procedure.

Procedure for controlling the temperature delta setpoint

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

Modify the control parameters:

- Water flow rate control method (temperature differential)
- Set the value of the required differential temperature.

The unit's default factory configuration is the minimum speed (frequency: 30 Hz).

9.5 - Units with hydronic module and variable speed pump – Setting a fixed flow rate for the system

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

Contact the manufacturer's service department to implement the procedures described below

Hydronic circuit cleaning procedure

Refer to the hydronic circuit cleaning procedure.

Procedure for controlling the flow rate

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

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

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

The unit's default factory configuration is the minimum speed (frequency: 30 Hz).

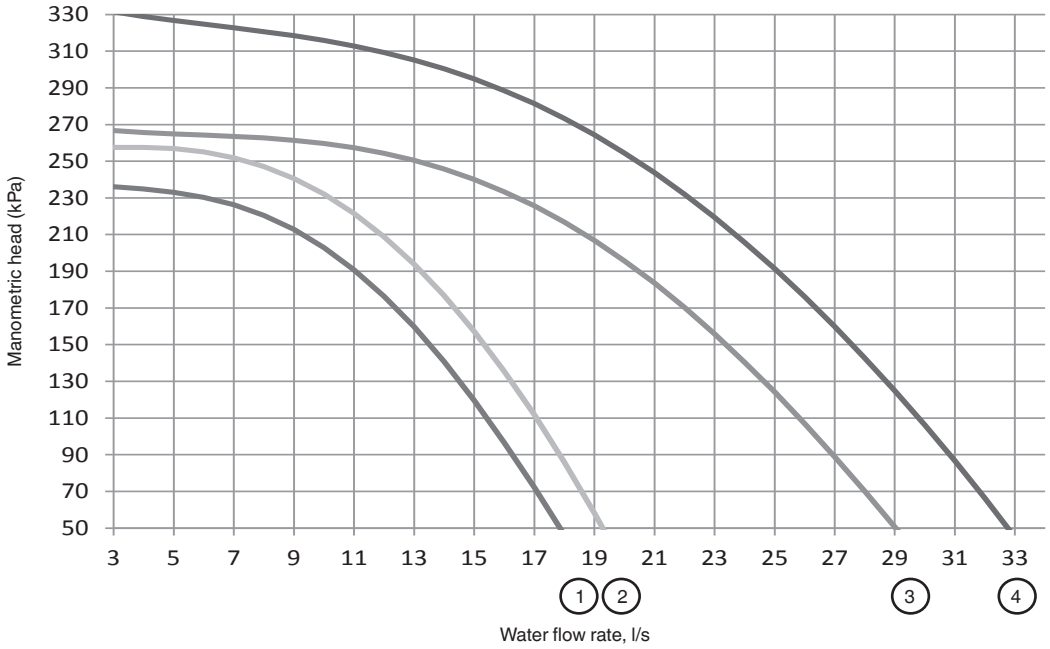
9.6 - Pump pressure/flow rate curves

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

Data applicable for:
- Pure water at 20°C.
- Refer to the paragraph on "Water exchanger min. water volume and flow rate" for the maximum water flow rate values.
- If ethylene glycol is used, the maximum flow rate is reduced.

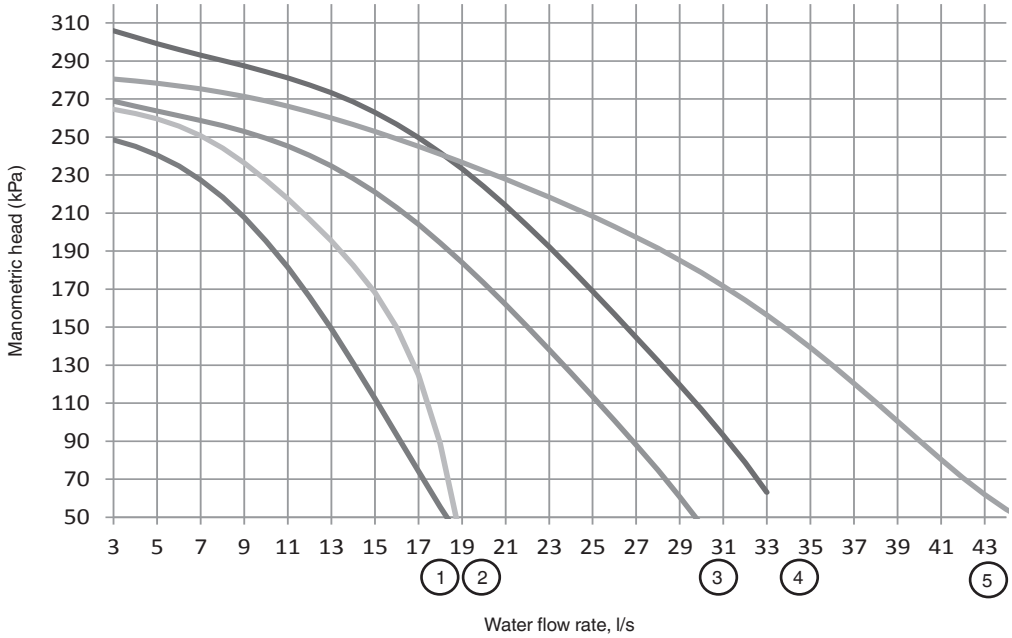
High pressure pumps

Single pumps



1 30RBM-30RBP 160 to 220
2 30RBM-30RBP 260 to 300
3 30RBM-30RBP 330 to 400
4 30RBM-30RBP 430 to 520

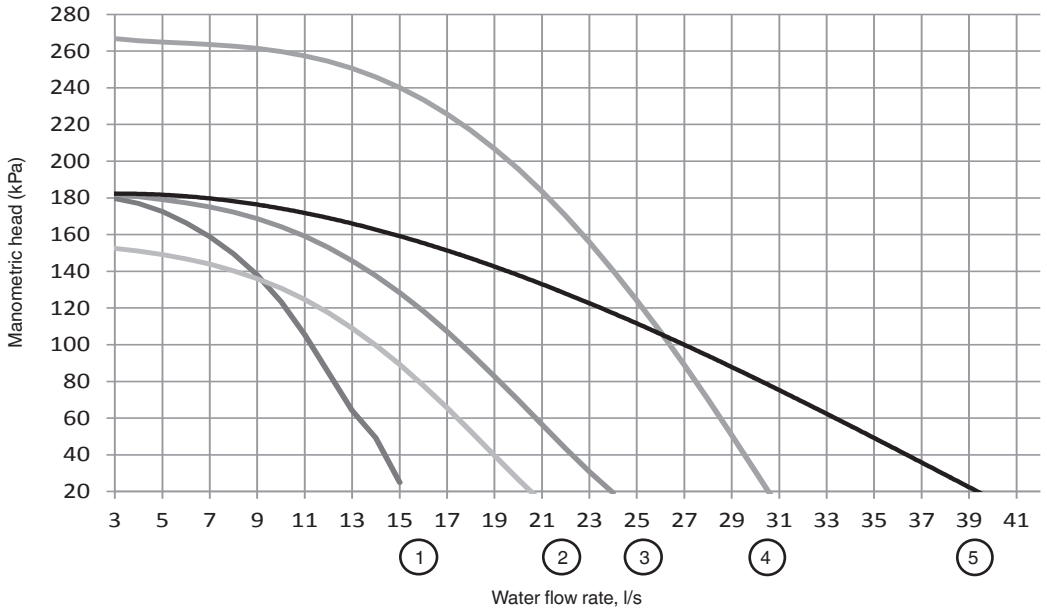
Dual pumps



1 30RBM-30RBP 160 to 220
2 30RBM-30RBP 260 to 300
3 30RBM-30RBP 330 to 400
4 30RBM-30RBP 430 to 470
5 30RBM-30RBP 520

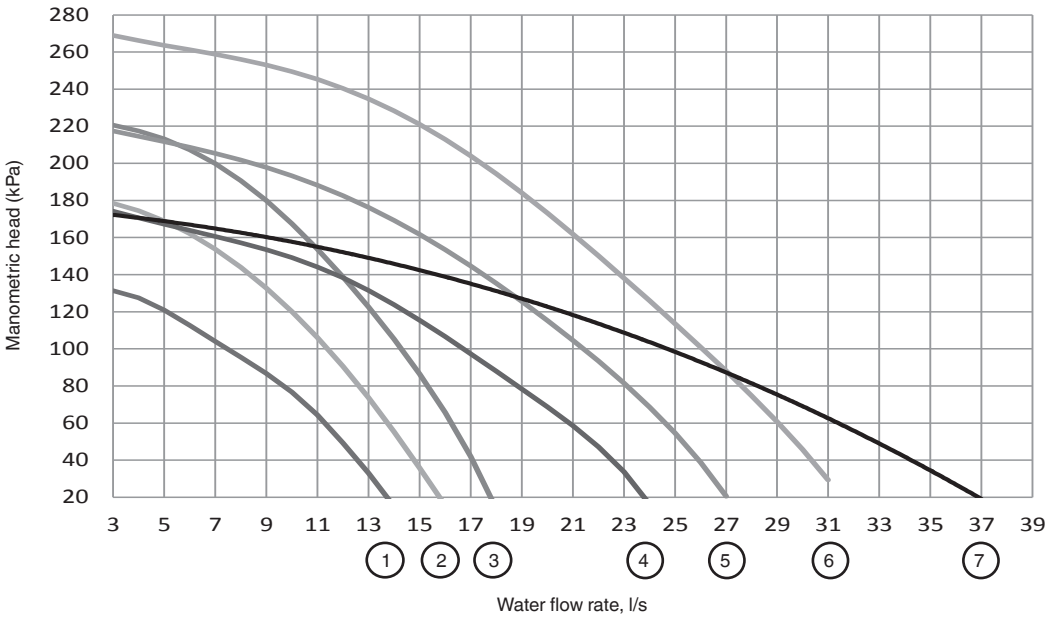
Low pressure pumps

Single pumps



1 30RBM-30RBP 160 to 220
2 30RBM-30RBP 260
3 30RBM-30RBP 300 to 360
4 30RBM-30RBP 520
5 30RBM-30RBP 400 to 470

Dual pumps



1 30RBM-30RBP 160 to 180
2 30RBM-30RBP 200 to 220
3 30RBM-30RBP 260
4 30RBM-30RBP 300 to 360
5 30RBM-30RBP 400
6 30RBM-30RBP 520
7 30RBM-30RBP 430 to 470

9.7 - Available static system pressure

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

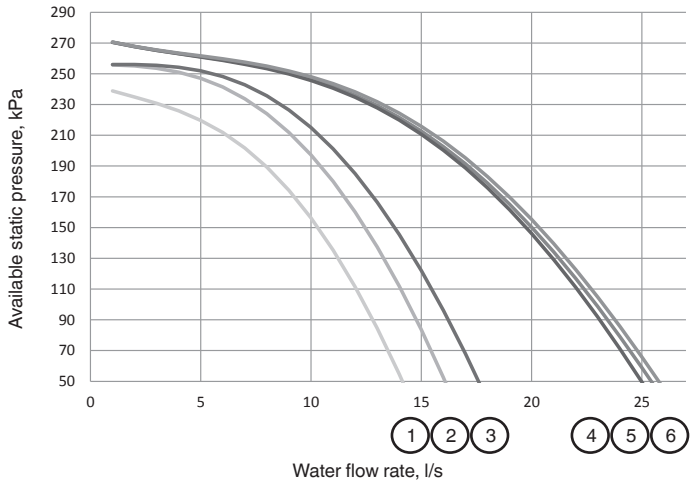
Data applicable for:

- Pure water at 20°C.
- Refer to the "Water exchanger water flow" section for the maximum water flow values.
- If ethylene glycol is used, the maximum flow rate is reduced.

High pressure pumps

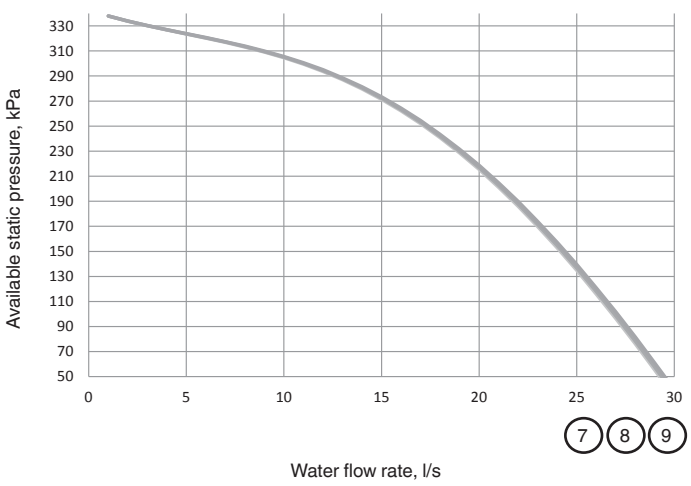
Single pumps

Sizes 160-400



1 30RBM-30RBP 160 to 220
2 30RBM-30RBP 260
3 30RBM-30RBP 300
4 30RBM-30RBP 360
5 30RBM-30RBP 330
6 30RBM-30RBP 400

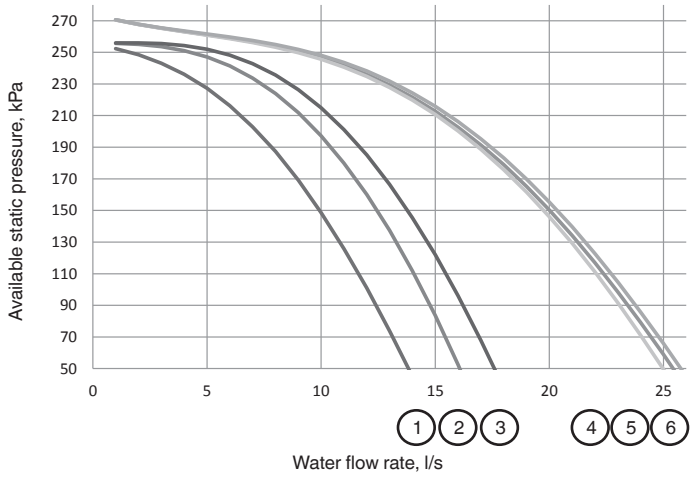
Sizes 430-520



7 30RBM-30RBP 430
8 30RBM-30RBP 470
9 30RBM-30RBP 520

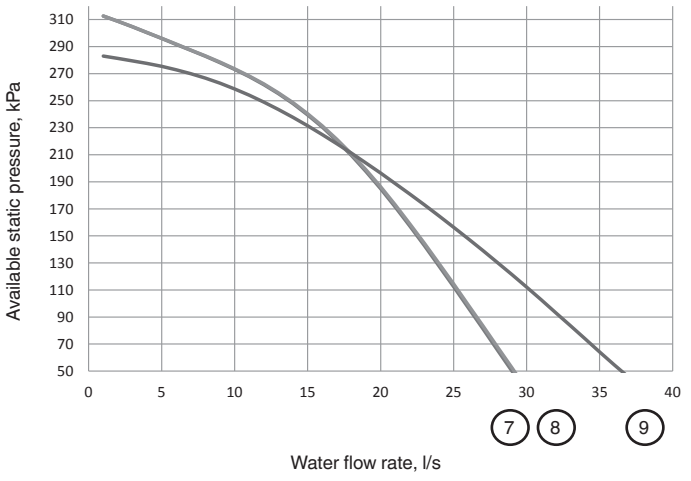
Dual pumps

Sizes 160-400



1 30RBM-30RBP 160 to 220
2 30RBM-30RBP 260
3 30RBM-30RBP 300
4 30RBM-30RBP 360
5 30RBM-30RBP 330
6 30RBM-30RBP 400

Sizes 430-520

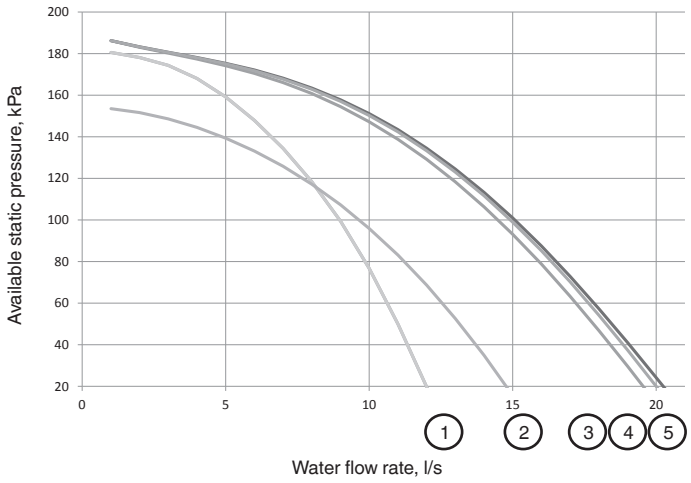


7 30RBM-30RBP 430
8 30RBM-30RBP 470
9 30RBM-30RBP 520

Low pressure pumps

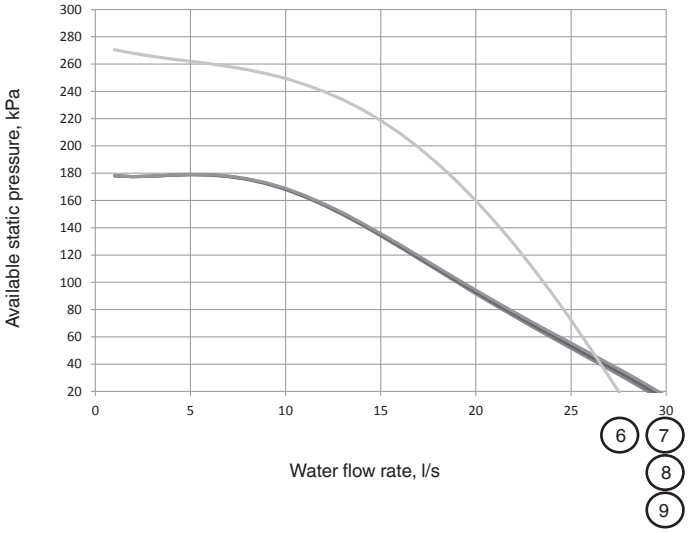
Single pumps

Sizes 160-360



1 30RBM-30RBP 160 to 220
2 30RBM-30RBP 260
3 30RBM-30RBP 300
4 30RBM-30RBP 360
5 30RBM-30RBP 330

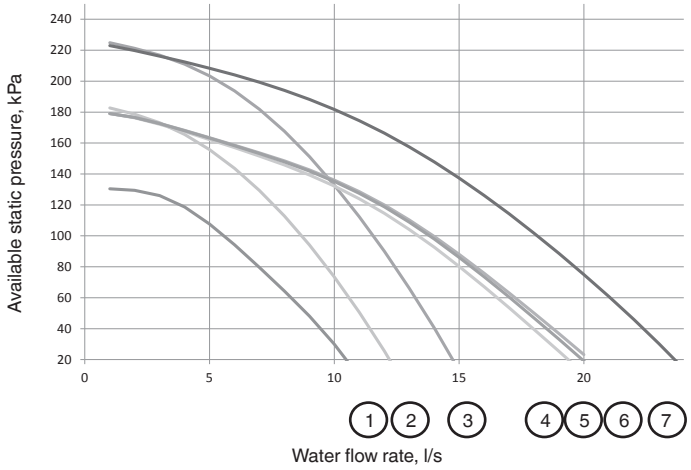
Sizes 400-520



6 30RBM-30RBP 520
7 30RBM-30RBP 400
8 30RBM-30RBP 430
9 30RBM-30RBP 470

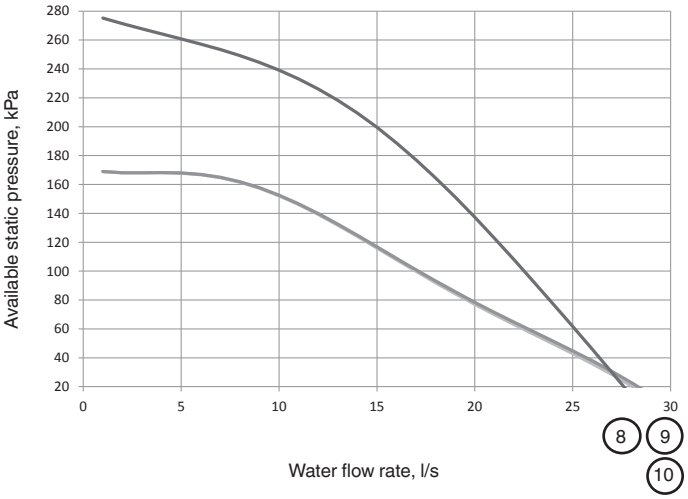
Dual pumps

Sizes 160-400



1 30RBM-30RBP 160 to 180
2 30RBM-30RBP 200 to 220
3 30RBM-30RBP 260
4 30RBM-30RBP 300
5 30RBM-30RBP 330
6 30RBM-30RBP 360
7 30RBM-30RBP 400

Sizes 430-520



8 30RBM-30RBP 520
9 30RBM-30RBP 430
10 30RBM-30RBP 470

10 - SYSTEM START-UP

10.1 - Checks before system start-up

Before starting up the thermodynamic system, the complete system, including the thermodynamic system, must be verified against the installation drawings, dimensional drawings, system piping and instrumentation diagrams and the wiring diagrams.

All measures must be taken to ensure that the pressure and temperature limits, which are specifically those listed on the nameplates, are not exceeded during operation, maintenance and recirculation.

Heat exchange fluid temperatures above the maximum recommended can lead to an increase in the refrigerant pressure and can cause a loss of refrigerant due to the relief valve discharge.

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

External visual installation checks:

- Ensure that the unit is charged with refrigerant. Verify on the unit nameplate that the 'fluid transported' is that recommended for operation, and is not nitrogen.
- Compare the complete system with the refrigeration system and power circuit diagrams.
- Check that all documents provided by the manufacturer (dimensional drawings, pipe and instrument diagram (PID), declarations, etc.) to comply with the regulations are present. If any documentation is missing, order a replacement.
- Make sure the environmental safety and protection devices and arrangements provided by the manufacturer to comply with the regulations are in place.
- Make sure all declarations of conformity for the pressure containers, identification plates and documentation required to comply with local regulations are present.
- Make sure access and safety routes are unobstructed.
- Check the instructions and directives to prevent the deliberate removal of refrigerant fluids.
- 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 accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation.
- Check the condition of 400 V cable insulation.

IMPORTANT:

If the compressors are equipped with mounts, check whether these mounts have clamping mechanisms. If they do, the clamping mechanisms must be removed before system start-up. Clamping mechanisms are identified by red collars and signalled by a label affixed to the compressor sub-assembly.

10.2 - Commissioning

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

- Check the heat-transfer fluid circulation pumps, the air handling equipment, and any other equipment connected to the heat exchangers.
- Refer to these instructions.
- Refer to the electrical diagram delivered with the unit.
- Make sure there are no refrigerant leaks.
- Check the tightness of the fixing clamps on all pipes.
- Check the power supply at the main connection point and the order of phases.
- Open the suction shut-off valves on each circuit for the corresponding units.
- For units without the factory-fitted hydronic module option, the installer is responsible for heat protection and the connections relating to the system pump.
- Check the operation of the compressor oil crankcase heaters 6 hours before starting up the system.

IMPORTANT:

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

- ***The system must have a heat load and water flowing in the exchangers when it is started up and tested.***
- ***All setpoint adjustments and control tests must be carried out before the unit is started up.***
- ***Refer to the Service guide.***

Proceed with the unit commissioning.

Make sure all safety devices are operational, and especially that the high pressure switches are engaged and that any alarms have been cleared.

NOTE:

If the manufacturer's recommendations (system, water and power connections) are not observed, no claims made under the warranty will be accepted.

10.3 - Essential points to check

- **Compressors**

Ensure that each compressor is rotating in the correct direction, checking that the discharge temperature rises quickly, the HP increases and the LP drops. If it is rotating in the wrong direction, the electric power supply is incorrectly wired (reversed phases). To ensure rotation in the correct direction, swap the two power supply phases.

- Check the compressor discharge temperature with a contact sensor
- Check the input current; it should be normal
- Check all safety devices to make sure they operate correctly

- **Hydraulics**

The exact total drop in system pressure will not be known at commissioning. It will therefore be necessary to adjust the flow of water with the control valve until the desired nominal rate is obtained.

By causing the pressure in the water system to drop, this control valve aligns the system pressure/flow curve with that of the pump so that the nominal flow rate corresponding to the desired operating point is obtained. The pressure drop in the water exchanger (read using the pressure gauge placed on the exchanger inlet and outlet) is the reference to be used to check and adjust the nominal flow rate of the system.

Follow the procedure described below:

- Open the control valve completely
- Let the pump run for two hours to flush out any solid particles in the circuit
- Read the pressure drop in the water exchanger when the pump is turned on and then two hours afterwards
- If the pressure drop has decreased, this means that the screen filter is clogged. It must be removed and cleaned
- Repeat until the filter is completely clean
- If the system pressure drops far below the available static pressure delivered by the pump, the resulting water flow rate will be reduced and the difference in temperature between the exchanger inlet and outlet will be too high. This is why pressure drops must be minimised. Make sure this difference is within the values on the curve (refer to the chapter "Water exchanger water flow")

- **Refrigerant charge**

Each unit is shipped with an exact charge of refrigerant.

11 - MAIN COMPONENTS OF THE UNIT AND OPERATING CHARACTERISTICS

11.1 - Compressors

The units use hermetically sealed scroll compressors.

Each compressor is equipped with a crankcase oil heater, as standard.

There is no heater fault detection.

Each compressor sub-assembly has:

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

11.2 - Lubricant

The compressors installed on the units have an oil charge, ensuring good lubrication under all operating conditions.

The oil level check can be done:

- On the system: the oil levels must be greater than or equal to half of the sight glass.
- A few minutes after the sub-function has come to a complete stop: the oil levels must be visible in the sight glasses.

If this is not the case, there might be a leak or an oil trap in the circuit.

If there is an oil leak, find and repair it, then refill with refrigerant and oil.

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

Damage caused by frost is not covered by the warranty.

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

Polyolester oils are completely incompatible with mineral oils.
Only use the oils specified by the manufacturer.

11.3 - Air-cooled exchanger

The units are equipped with coils:

- Micro-channel made entirely from aluminium (MCHE).

11.4 - Fans

Each fan motor assembly is equipped with a high-performance impeller made from recyclable composite material.

The motors are three-phase, with lifetime lubricated bearings and class F insulation (IP55 level).

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

Product		**30RBM/30RBP**					
Option		**Standard or option 28**	**Option 12**	**Option 15LS**	**Option 28B***	**Option 28C****	**30RBP (VFD duty)**
Overall efficiency	%	39,3	40,9	35,9	38	36,6	41
Measurement category		A	A	A	A	A	A
Efficiency category		static	static	static	static	static	static
Target efficiency level ERP2015		N(2015) 40	N(2015) 40	N(2015) 40	N(2015) 40	N(2015) 40	N(2015) 40
Efficiency level at optimum efficiency point		43,9	44,2	42,4	42,3	43,3	45,7
Variable speed drive		NO	YES upstream of the motor	NO	NO	NO	YES upstream of the motor
Year of manufacture		See label on the unit	See label on the unit	See label on the unit	See label on the unit	See label on the unit	See label on the unit
Fan manufacturer		Simonin	Simonin	Simonin	Simonin	Simonin	Simonin
Motor manufacturer		Leroy Somer	Leroy Somer	Leroy Somer	AOS/ Regal Beloit	AOS/ Regal Beloit	Leroy Somer
Fan PN		00PSG000000100A	00PSG000000100A	00PSG000000100A	00PSG000000100A	00PSG000000100A	00PSG000000100A
Motor PN		00PPG000478400A	00PPG000480800A	00PPG000478500A	00PPG000464600A	00PPG000464500	00PPG000494700A
Nominal power of the motor	kW	1,85	2,97	0,83	2,09	0,88	1,84
Flow rate	m^3/s	4,28	5,31	3,12	4,07	3,59	4,15
Pressure at optimum energy efficiency	Pa	170	216	95	195	90	170
Nominal Speed	rpm	954	1127	712	966	710	950
Specific ratio		1,002	1,002	1,002	1,002	1,002	1,002
Relevant information to facilitate the disassembly, recycling or removal of the product at the end of life		See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual
Relevant information to minimise the impact on the environment		See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual	See the Maintenance manual

* Only for two-speed fans [1 per circuit/the others are Standard]
** Only for two-speed fans [1 per circuit/the others are Option 15LS]

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

Product		**30RBM/30RBP**					
Option		**Standard or option 28**	**Option 12**	**Option 15LS**	**Option 28B***	**Option 28C****	**30RBP (VFD duty)**
Motor type		Asynchronous	Asynchronous	Asynchronous	Dual-speed asynchronous	Dual-speed asynchronous	Asynchronous
Number of poles		6	6	8	6	8	6
Nominal input frequency	Hz	50	60	50	50	50	50
Nominal voltage	V	400	400	400	400	400	400
Number of phases		3	3	3	3	3	3
Motor included in the application domain of the regulation 640/2009 and amendment 4/2014		NO	NO	NO	NO	NO	NO
Rationale for exemption		Article 1.2.c).(ii)	Article 1.2.c).(ii)	Article 2.1	Article 2.1	Article 2.1	Article 1.2.c).(ii)
Ambient air temperature for which the motor is specifically designed	°C	70	70	70	68,5	68,5	70

* Only for two-speed fans [1 per circuit/the others are Standard]
** Only for two-speed fans [1 per circuit/the others are Option 15LS]

11.5 - Electronic expansion valve (EXV)

The EXV has a stepper motor and a sight glass which can be used to check the mechanism movement and the presence of the liquid gasket.

11.6 - Moisture indicator

Located on the EXV, enables 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.

11.7 - Filter drier

The role of the filter drier is to keep the circuit clean and moisture free.

The moisture indicator shows, when it is necessary to change the element.

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

11.8 - Water type heat exchanger

Brazed plate water type heat exchanger comprising two refrigerating circuits.

The hydraulic connections of the heat exchanger are Victaulic connections.

The water heat exchanger is thermally insulated with 19 mm of foam rubber.

As an option it can be protected against frost by an electric heater (water exchanger frost protection option).

Any products used for thermal insulation of recipients during hydronic connection must be chemically neutral to the surfaces on which they are applied. All original materials supplied by the manufacturer comply with this requirement.

NOTE - ***Monitoring in operation***

- ***Follow local regulations on the monitoring of pressure equipment***
- ***The user or operator is usually requested to create and maintain a monitoring and maintenance log.***
- ***In the absence of any regulations, or in addition to the regulations, follow the guidance in the EN 378 standard.***
- ***Follow the local professional recommendations, whenever they exist.***
- ***Regularly check for the presence of any impurities (e.g. sand, grit) in the heat-transfer fluids. These impurities can cause wear and/or pitting corrosion.***
- ***The reports of the periodical checks by the user or the operator must be included in the monitoring and maintenance log.***

11.9 - Refrigerant

Units running with R410A.

11.10 - High-pressure safety pressostat

The units are equipped with high-pressure safety pressostats with automatic reset.

These pressure switches are located at the discharge of each circuit.

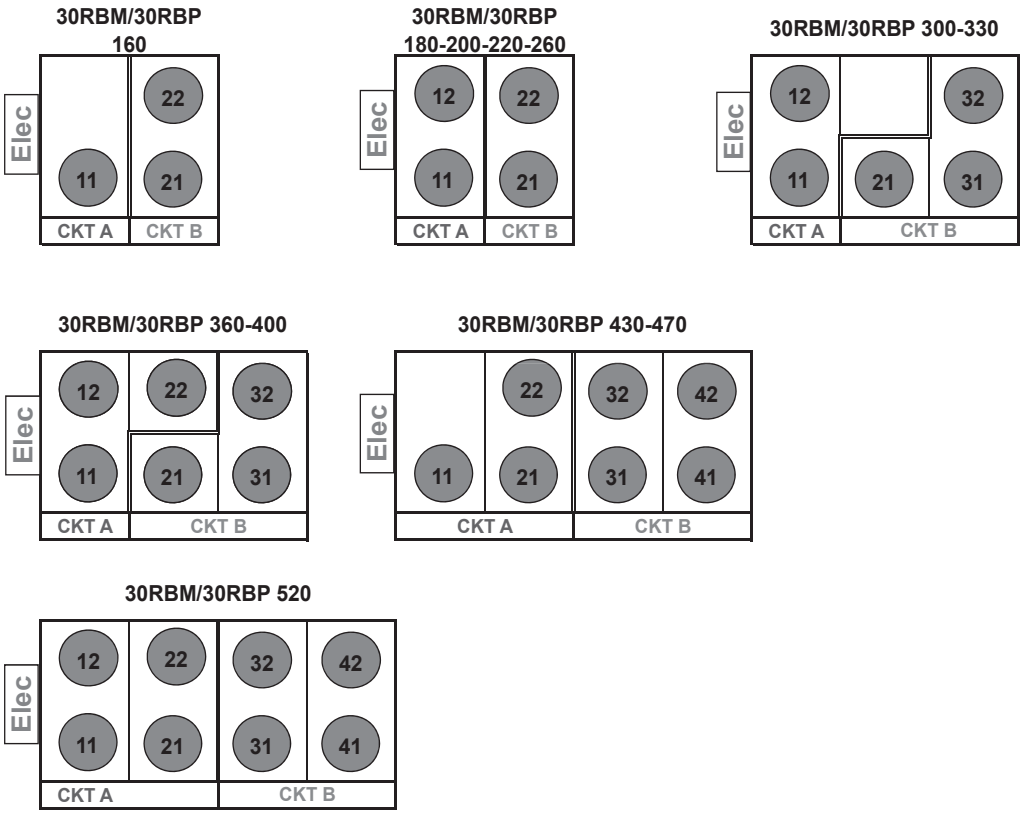
11.11 - Variable frequency drive

The units are equipped with variable frequency drives to control the fan speed within the fmin-fmax frequency range (standard, fmin=5 Hz and fmax=50 Hz).

All fans on the same refrigerating circuit are controlled by a single variable frequency drive. Fan speed is changed by generating a controlled waveform in which frequency and voltage are varied (Pulse Width Modulation).

Fan start-up/shut-down and the working range frequency setpoint are controlled by the Controller through RS485 communication using the LEN Protocol.

11.12 - Fan arrangement



11.13 - Fan stages

30RBM standard	Circuit	Stage 1	Stage 2	Stage 3	Stage 4	Variable frequency drive on 30RBP	Variable frequency drive on Option 28	Two-speed fan on Options 28B and 28C
160	**A**	EV11				EV11	EV11	EV11
	B	EV21	EV21+EV22			EV21+EV22	EV21	EV21
180-200-220-260	**A**	EV11	EV11+ EV12			EV11+ EV12	EV11	EV11
	B	EV21	EV21+ EV22			EV21+ EV22	EV21	EV21
300-330	**A**	EV11	EV11 + EV12			EV11 + EV12	EV11	EV11
	B	EV31	EV31+EV21	EV31+EV21+EV32		EV31+EV21+EV32	EV31	EV31
360-400	**A**	EV11	EV11+ EV12	EV11 + EV12 + EV22		EV11 + EV12 + EV22	EV11	EV11
	B	EV31	EV31+ EV32	EV31+ EV32 + EV21		EV31+ EV32 + EV21	EV31	EV31
430-470	**A**	EV21	EV21+EV11	EV21+EV11+EV22		EV21+EV11+EV22	EV21	EV21
	B	EV31	EV31+EV41	EV31+EV41+EV32	EV31+EV41+EV32+EV42	EV31+EV41+EV32+EV42	EV31	EV31
520	**A**	EV11	EV11 + EV21	EV11 + EV21 + EV12	EV11 + EV21 + EV12 + EV22	EV11 + EV21 + EV12 + EV22	EV11	EV11
	B	EV31	EV31 + EV41	EV31 + EV41 + EV32	EV31 + EV41 + EV32 + EV42	EV31 + EV41 + EV32 + EV42	EV31	EV31

11.14 - Variable speed ventilation

The variable speed drives on the fans are used to optimise the efficiency of the unit depending on the conditions of use (air temperature, circuit capacity) and hence improve the seasonal efficiency (ESEER and SCOP).

All fans in the same refrigerant circuit are controlled by a single variable speed drive.

Therefore, they operate together at the same rotational speed.

All variable-speed fans are controlled by the unit controller.

Each variable-speed fan is equipped with its own variable-speed drive.

The speed is controlled independently for each refrigerating circuit,

This rotation speed at full load or partial load for each circuit is controlled by an algorithm that continuously optimises the condensation temperature to obtain the best unit energy efficiency (EER and COP) whatever the operating conditions.

11.15 - Fan motor electrical protection

The motors of a same circuit are electrically protected by the variable frequency drive in case of short-circuit, locked rotor or general overload.

Each variable frequency drive follows a variable current characteristic, based on the frequency from 5 to 50 Hz and the number of fans controlled.

In case of fan failure (e.g. motor disconnected) the variable frequency drive will detect this problem and an alert will be sent to the user interface.

Refer to the unit's control manual for the list of alarms.

12 - OPTIONS

12.1 - Tables of options

Options	No.	Description	Advantages	Use
Medium-temperature brine solution	5B	Low temperature chilled water production down to 0°C with ethylene glycol and propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RBM/30RBP 160-520
Low-temperature brine solution	6B	Low temperature chilled water production down to -15°C with ethylene glycol and -12°C with propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RBM/P 160-400 down to CW -15°C
High Static fans	12	Unit equipped with high static variable-speed fans (maximum 200 Pa), each fan equipped with a connection flange allowing the connection to the ducting system.	Ducted fan discharge, optimised condensing (or evaporating on Heat pump version) temperature control, based on the operating conditions and system characteristics	30RBP160-520
Low noise level	15	Aesthetic and sound absorbing compressor enclosure	Noise level reduction by 1 to 2 dB(A)	30RBM/30RBP 160-520
Very low noise level	15LS	Acoustic compressor enclosure and low-speed fans	Noise level reduction by 6 to 7 dB(A)	30RBM/30RBP 160-520
High ambient temperature	16	Unit equipped with electrical panel cooling fan	Extended unit part-load operation up to 52°C ambient temperature	30RBM 160-520
IP54 control box	20A	Increased leak tightness of the unit	Protects the inside of the electrics box from dust, water and sand. In general, this option is recommended for installations in polluted environments	30RBM/30RBP 160-520
Grilles and enclosure panels	23	Metal grilles on the 4 unit sides, plus side enclosure panels at each end of the coil	Improves aesthetics, protection against intrusion to the unit interior, coil and piping protection against impacts.	30RBM/30RBP 160-520
Enclosure panels	23A	Side enclosure panels at each end of the coil	Improves aesthetics, coil and piping protection against impacts.	30RBM/30RBP 160-520
Soft Starter	25	Electronic starter on each compressor	Reduced start-up current	30RBM/30RBP 160-520
Winter operation down to -20°C	28	Fan speed control of lead fan for each circuit using a variable frequency drive	Stable unit operation for outside air temperature from 0°C down to -20°C in cooling mode	30RBM 160-520
Winter operation down to -10°C	28B	Two-speed lead fan for each circuit	Stable unit operation for outside air temperature down to -10°C	30RBM 160-520
Winter operation down to -10°C at low speed	28C	Two Low speed fans on lead fan on each circuit	Reduces the noise level and enables stable unit operation for outside air temperature down to -10°C	30RBM 160-520
Water exchanger frost protection	41	Electric heater on the water exchanger and the water piping	Water exchanger module frost protection between 0°C and -20°C outside air temperature	30RBM/30RBP 160-520
Exchanger & hydraulic frost protection	42A	Electrical heaters on the water type heat exchanger, water pipes, hydronic module and optional expansion	Water exchanger and hydronic module frost protection down to -20°C outside air temperature	30RBM/30RBP 160-520
Partial heat recovery	49	Unit equipped with one desuperheater on each refrigerant circuit	Production of free high-temperature hot-water simultaneously with chilled water production (or hot water for Heat pump)	30RBM/30RBP 160-520
Master/slave operation	58	Unit equipped with an additional leaving water temperature sensor, to be installed on site, enabling Master/Slave operation of 2 units connected in parallel	Optimised operation of two units connected in parallel operation with operating time equalisation	30RBM/30RBP 160-520
Compressor suction and discharge valves	92A	Shut-off valves on the compressor suction and discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the cooler or condenser side during servicing	30RBM/30RBP 160-520
Compressor discharge valves	93A	Shut-off valves on the compressor discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the condenser side during servicing	30RBM/30RBP 160-520
Hydronic module Single HP pump	116R	Single high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included.Option with built-in safety hydraulic components available.)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
Hydronic module Dual HP pump	116S	Dual high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
Hydronic module Single LP pump	116T	Single low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
Hydronic module Dual LP pump	116U	Dual low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
HP evap. variable-speed single pump.	116V	Single high-pressure water pump with variable speed drive (VSD), water filter, electronic water flow control, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play),significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved system reliability	30RBM/30RBP 160-520
HAP variable-speed dual pump.	116W	Dual high-pressure water pump with variable speed drive (VSD), water filter, electronic flow switch, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play),significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved system reliability	30RBM/30RBP 160-520
Free Cooling Dx system on 2 circuits	118A	Patented Carrier free-cooling system with cooling micro-pump on both refrigerant circuits. Operation without glycol, no extra free-cooling coil. See Dx Free-cooling option chapter	Energy savings for applications with cooling demand throughout the entire year	30RBM/30RBP 220-520
Free Cooling Dx system on 1 circuit	118B	Patented Carrier free-cooling system with cooling micro-pump on one refrigerant circuit. Operation without glycol, no extra free-cooling coil. See Dx Free-cooling option chapter	Energy savings for applications with reduced demand for cooling in the cold season (e.g. Office space with computer room, meeting rooms…)	30RBM/30RBP 160-520 Except size 360/400 on 30RBP
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	30RBM/30RBP 160-520
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	30RBM/30RBP 160-520
Bacnet over IP	149	Two-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by Ethernet line to a BMS. Access to multiple unit parameters	30RBM/30RBP 160-520
Energy Management Module	156	EMM Control board with additional inputs/outputs. See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, ice storage end, demand limits, boiler on/off command...)	30RBM/30RBP 160-520
Touch Pilot control, 5" user interface	158	Touch Pilot control supplied with a 5 inch colour touch screen user interface	Control with advanced communication technology over Ethernet (IP), user-friendly and intuitive user interface with 5" colour touch screen	30RBM/30RBP 160-520
Compliance with Russian regulations	199	EAC certification	Conformance with Russian regulations	30RBM/30RBP 160-520
Power factor correction	231	Capacitors for automatic regulation of power factor (cos phi) value to 0.95.	Reduction of the apparent electrical power, compliance with minimum power factor limit set by electricity suppliers	30RBM/30RBP 160-520
Enviro-Shield anti-corrosion protection	262	Coating which uses a conversion process to alter the aluminium surface into a coating which forms an integral part of the coil. Complete immersion in a bath to ensure 100% coverage. No heat transfer variation, tested 4000 hours salt spray per ASTM B117	Improved corrosion resistance, recommended for use in moderately corrosive environments	30RBM/30RBP 160-520

Options	No.	Description	Advantages	Use
Super Enviro-Shield anti-corrosion protection	263	Extremely durable and flexible epoxy polymer coating applied to micro-channel heat exchangers via an electro-coating process, with a final UV protective topcoat. Minimal variation in heat transfer, tested to withstand more than 6000 hours of constant neutral salt spray as per ASTM B117, superior impact resistance as per ASTM D2794	Improved corrosion resistance, recommended for use in extremely corrosive environments	30RBM/30RBP 160-520
Welded evaporator water connection kit	266	Victaulic piping connections with welded joints	Easy installation	30RBM/30RBP 160-520
230 V electric plug	284	230 VAC power supply source provided with plug socket and transformer (180 VA, 0.8 A)	Enables connection of a laptop or an electrical device during unit start-up or servicing	30RBM/30RBP 160-520
Expansion tank	293	6-bar expansion tank integrated into the hydronic module (option 116 required)	Easy, quick installation (ready to use), and closed circuit protection of hydraulic systems to counter excessive pressure	30RBM/30RBP 160-520
Screwed water connection sleeve kit for DSH	303	DSH connections with screw connection sleeves	Easy to install. Used to connect the unit to a screw connector	30RBM/30RBP 160-520
Welded water connection sleeve kit for DSH	304	DSH inlet/outlet welded connection sleeves	Easy installation	30RBM/30RBP 160-520
Set point adjustment by 4-20mA signal	311	Connections to allow a 4-20mA signal input	Easy energy managment, allow to adjust set point by a 4-20mA external signal	30RBM/30RBP 160-520
Free-cooling mode drycooler management	313	Control and connections to a free-cooling drycooler 09PE or 09VE fitted with optional FC control box	Easy system management, control capabilities extended to a drycooler used in free cooling mode	30RBM/30RBP 160-520

12.2 - Description

12.2.1 - Touch Pilot Control (option 158)

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

- It is a colour interface.
- It is intuitive and user-friendly. Clear and concise information is presented in the local language (8 available).
- The complete menu can be adapted to the various users (end customer, maintenance personnel, manufacturer),
- Unit use and configuration are secure. Password protection prevents non-authorized access to advanced settings.
- No password is required to access the most important operating parameters.

12.2.2 - Hydronic module without variable speed (options 116R, 116S, 116T, 116U)

The hydronic module is composed of the system's main hydronic components: factory-fitted screen filter, relief valve and water pump.

The fixed speed operating pressure pump provides the nominal flow rate for the system water loop.

Several types of water pump are available to suit all applications:

- Single or dual low pressure pumps
- Single or dual high pressure pumps.

The nominal flow rate of the system should be adjusted using a manual control valve provided by the customer.

The relief valve placed on the water inlet pipes at the pump inlet limits the pressure to 400 kPa (4 bar).

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

Additional options can be ordered if necessary:

- Protection of the hydronic module in outdoor temperatures of down to -20°C.
- Expansion vessel.

The use of the hydronic module on open systems is prohibited.

12.2.3 - Hydronic module with variable speed (Options 116V, 116W)

The composition of the hydronic module with variable speed is similar to that of the hydronic module without variable speed.

In this case, the pump is controlled by a variable frequency drive that allows adjustment of the pump's nominal flow rate according to the chosen control mode (constant pressure or temperature differential or fixed speed) and the system operating conditions.

The use of the hydronic module on open systems is prohibited.

12.2.4 - Partial heat recovery (Option 49)

This option enables free hot water to be produced through heat recovery by desuperheating the compressor outlet gas. The option is available across the entire range.

A water-cooled heat exchanger is installed as standard with air-cooled exchangers on the compressor discharge line on each circuit.

The control is configured for the partial heat recovery option in the factory (see the section on Control configuration with the desuperheater option).

The installer must protect the water type heat exchanger against the risk of frost.

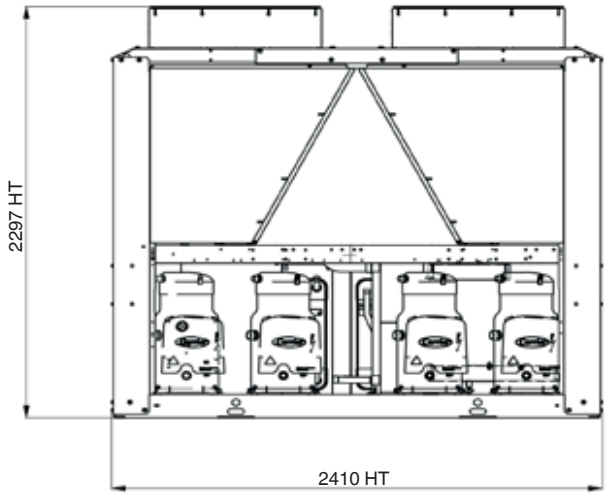
12.2.4.1 - Physical properties of units with partial heat recovery using desuperheaters

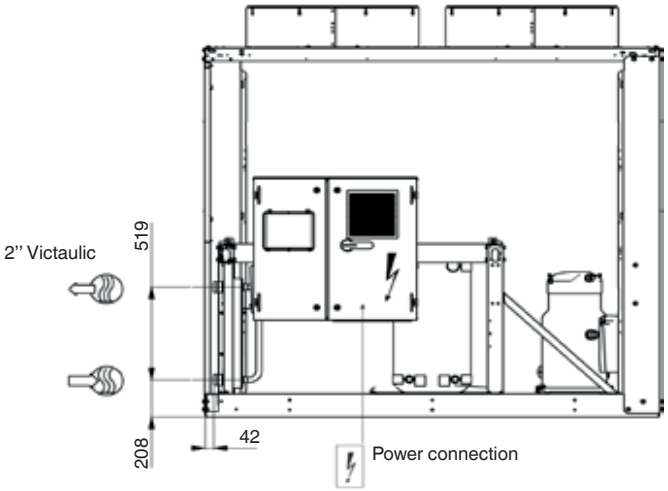
30RBM/30RBP		160	180	200	220	260	300	330	360	400	430	470	520
Desuperheater in circuits A/B		Plate heat exchanger											
Water volume circuits A/B	l	2/3.75	2/3.75	2/3.75	3.75/3.75	3.75/3.75	3.75/5.5	3.75/5.5	5.5/5.5	5.5/5.5	5.5/7.5	5.5/7.5	7.5/7.5
Maximum operating pressure, water side	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Refrigerant													
Circuit A(1)	kg	9,1	13,4	12,9	14,3	13,6	15,0	17,3	22,8	21,4	26,3	23,7	27,3
	tCO_2e	19,1	27,9	26,9	30,0	28,4	31,3	36,1	47,6	44,7	54,9	49,6	57,0
Circuit B(1)	kg	13,5	14,3	13,3	14,5	13,6	22,8	21,1	20,9	22,4	27,4	27,3	27,5
	tCO_2e	28,1	30,0	27,7	30,2	28,4	47,6	44,1	43,7	46,8	57,1	57,1	57,4
Water connections		Victaulic											
Connection	in	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"
External diameter	mm	60,3	60,3	60,3	60,3	60,3	60,3	60,3	60,3	60,3	60,3	60,3	60,3
30RBM													
Operating weight(1)													
Standard unit + desuperheater option	kg	1269	1310	1311	1446	1467	1932	1968	2143	2201	2626	2643	2849
Unit with option 15 + desuperheater option	kg	1352	1393	1394	1554	1575	2058	2094	2287	2344	2788	2805	3029
Unit with option 15 and option 116S + desuperheater option	kg	1491	1533	1533	1693	1729	2218	2298	2491	2548	3032	3049	3309
30RBP													
Operating weight(1)													
Standard unit + desuperheater option	kg	1305	1347	1347	1482	1504	1969	2004	2180	2237	2683	2700	2915
Unit with option 15 + desuperheater option	kg	1388	1430	1430	1590	1612	2095	2130	2323	2381	2845	2862	3095
Unit with option 15 and option 116S + desuperheater option	kg	1527	1569	1569	1729	1766	2254	2334	2528	2584	3089	3106	3375

* Weights are guidelines only. Refer to the unit name plate.

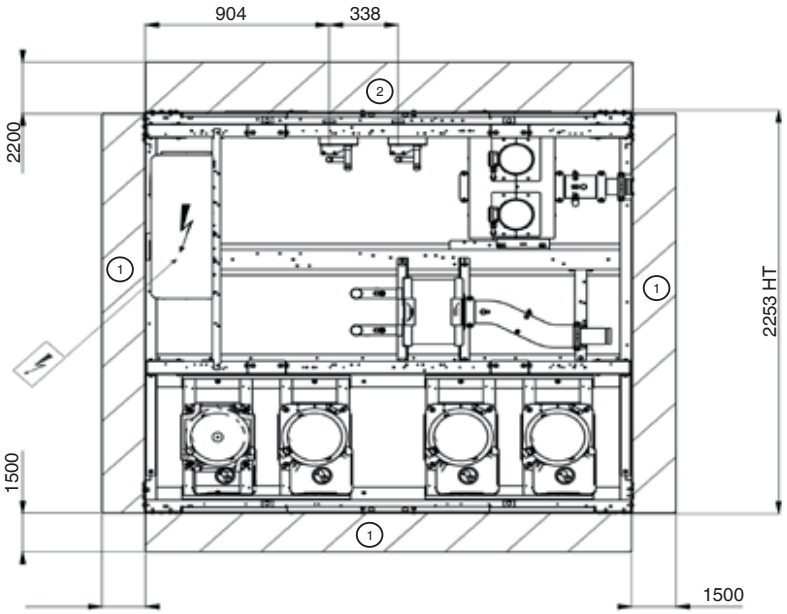
Dimensions, clearances

30RBM/RBP 160-520





Unit With hydronic module



Legend:
All dimensions are in mm.

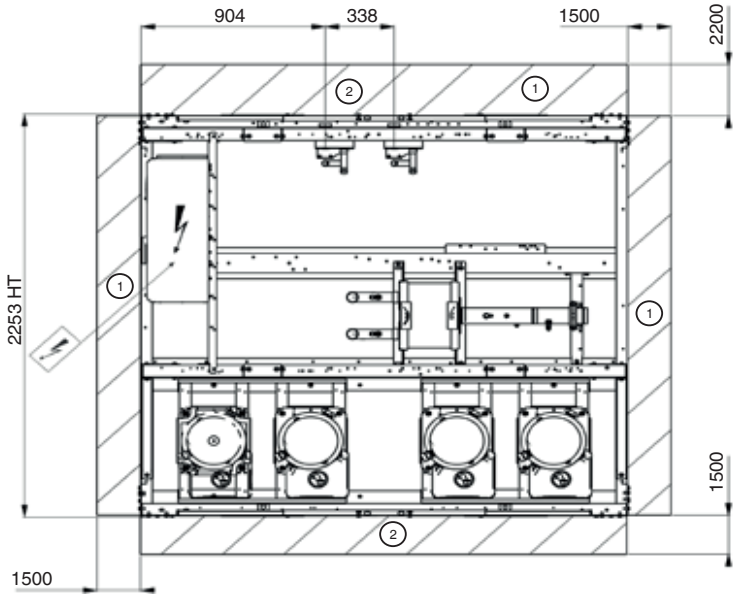
- (1) Clearances required for maintenance and air flow
- (2) Clearance recommended for coil removal
- Water inlet
- Water outlet
- Control box

NOTE: Non-contractual drawings.

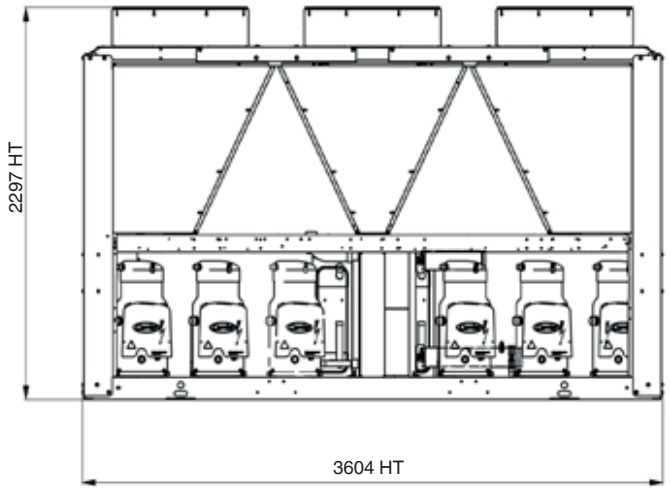
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

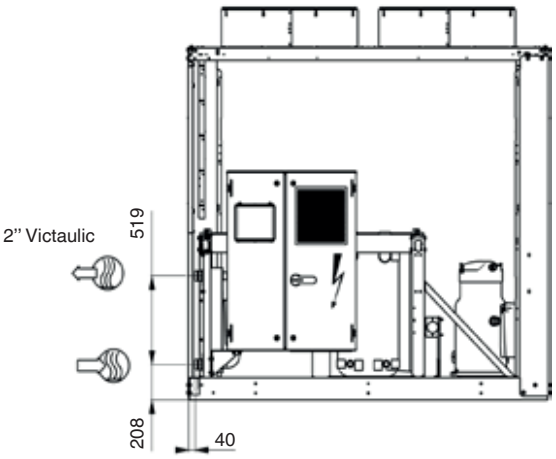
For the location of fixing points, weight distribution and coordinates of the centre of gravity, refer to the certified dimensional drawings.

Unit Without hydronic module

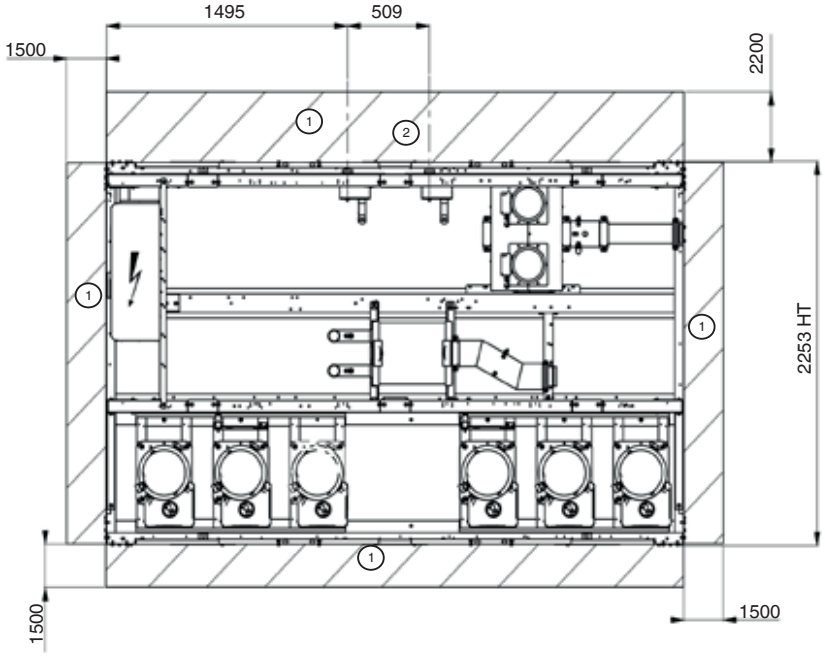


30RBM/RBP 300-400





Unit With hydronic module



Legend:
All dimensions are in mm.

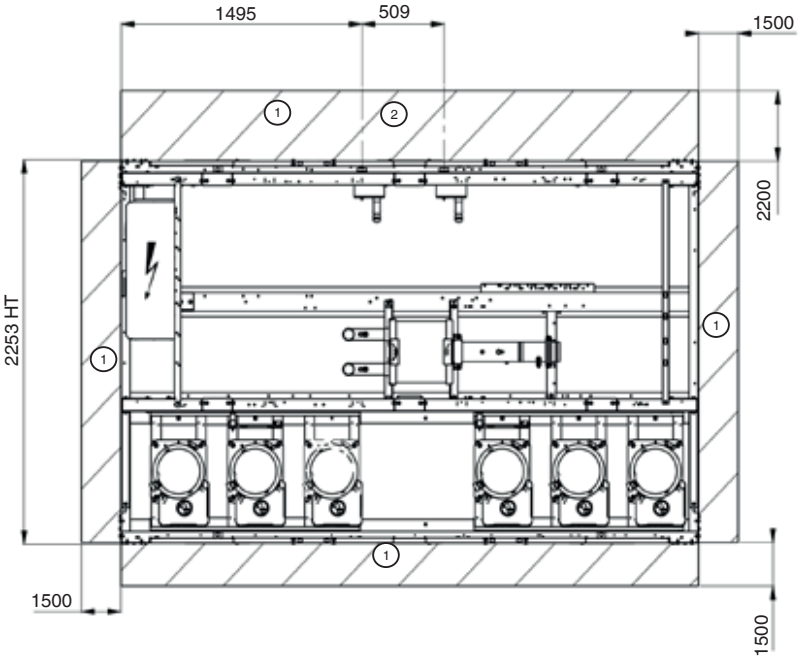
- (1) Clearances required for maintenance and air flow
- (2) Clearance recommended for coil removal
- Water inlet
- Water outlet
- Control box

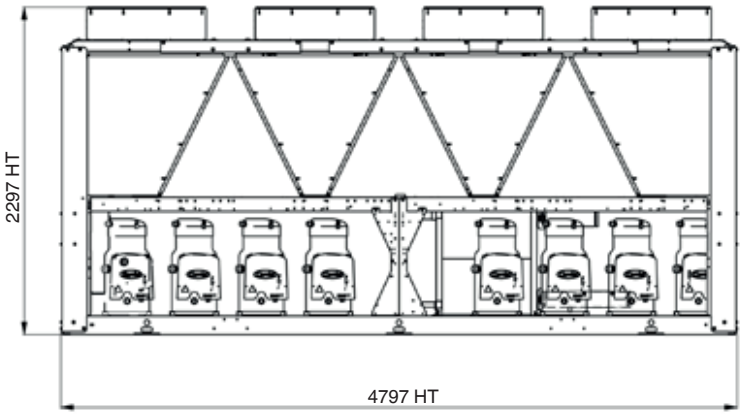
NOTE: Non-contractual drawings.

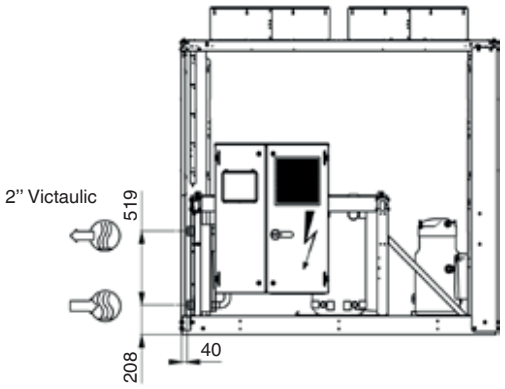
When designing a system, refer to the certified dimensional drawings provided with the unit or available on request.

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

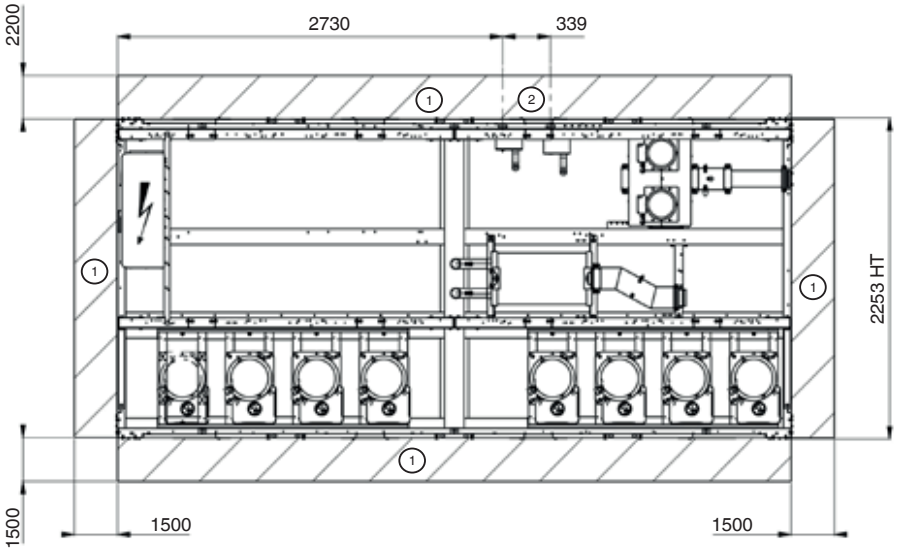
Unit Without hydronic module







Unit With hydronic module



Legend:
All dimensions are in mm.

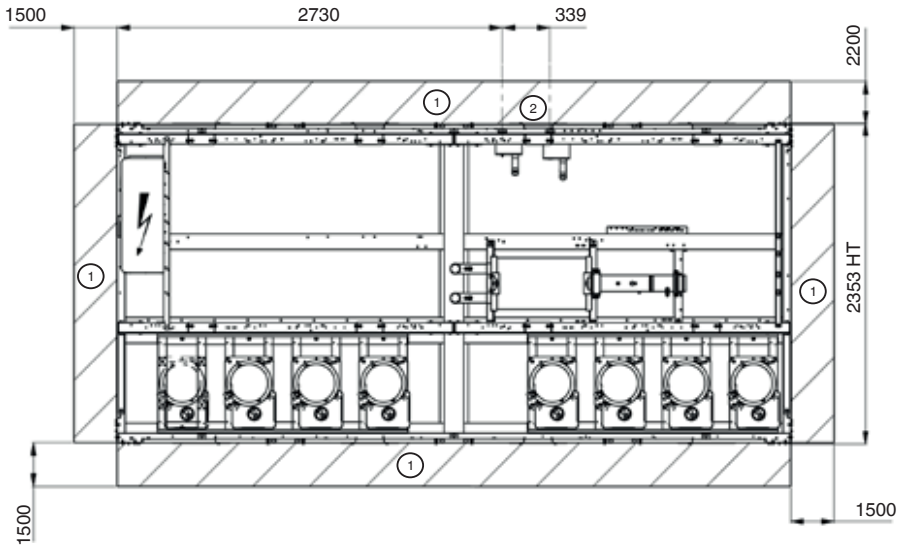
- (1) Clearances required for maintenance and air flow
- (2) Clearance recommended for coil removal
- Water inlet
- Water outlet
- Control box

NOTE: Non-contractual drawings.

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

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

Unit Without hydronic module



NOTE: ***For units with other options, refer to the certified dimensional drawings.***

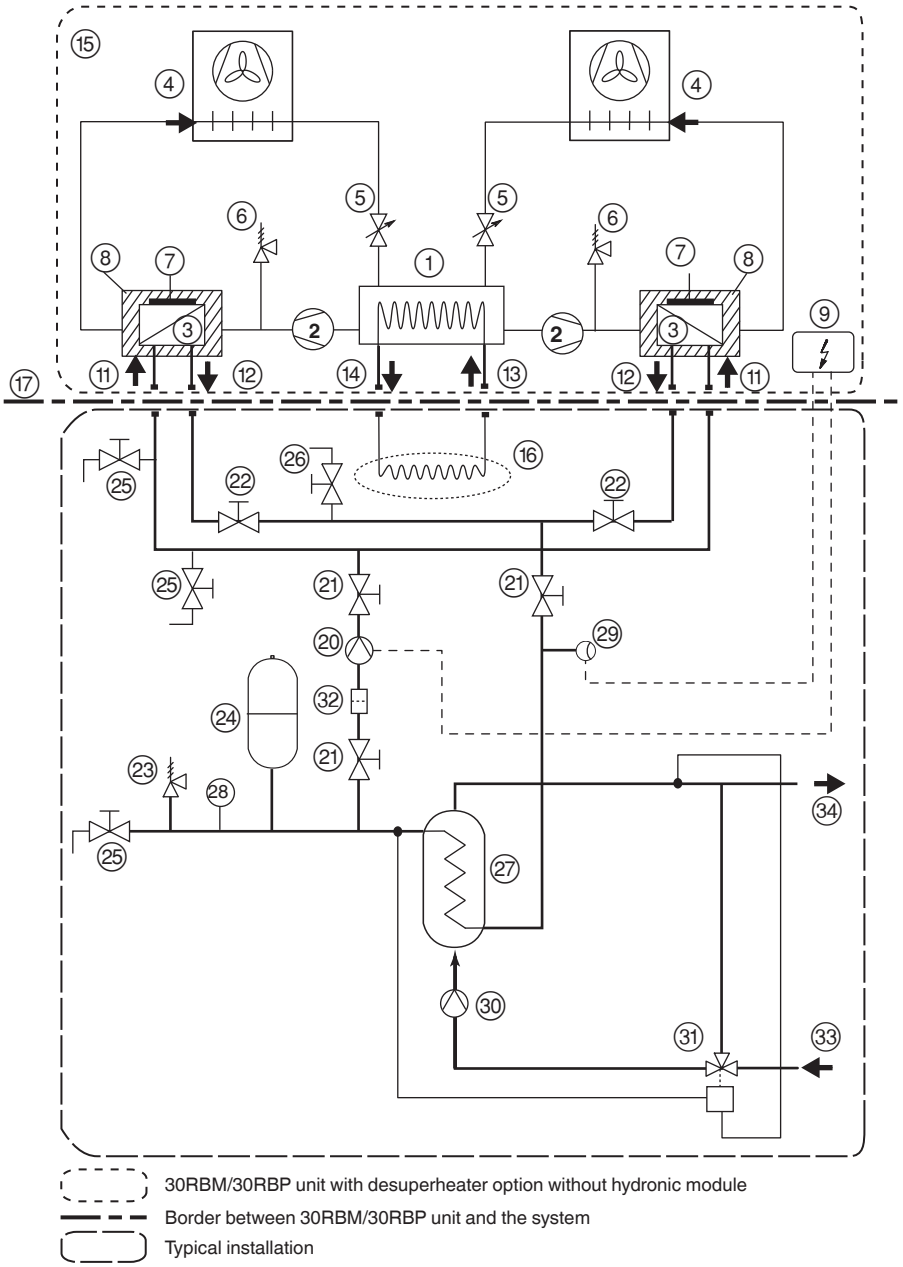
12.2.4.2 - Installation and operation of the heat recovery with desuperheater option

Units with the desuperheater option are delivered with a plate heat exchanger for each refrigerating circuit.

When installing the unit, the heat recovery plate heat exchangers must be insulated and protected against frost if required.

Refer to the main diagram below for the main components or functions associated with a unit with desuperheater option in a standard system.

Typical installation diagram of units with the desuperheater option



Legend

30RBM/30RBP unit components

1 Evaporator
2 Compressor
3 Desuperheater (plate heat exchanger)
4 Air condenser (coils)
5 Expansion valve (EXV)
6 Damage limitation accessory 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 30RBM/30RBP 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 accessory 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 (sanitary hot water circuit)
31 Three-way valve + controller
32 Filter to protect the pump and the desuperheaters
33 District water supply
34 Sanitary hot water outlet

12.2.4.3 - Installation

The hydraulic supply for each desuperheater is delivered in parallel.

The hydraulic connection on the desuperheater water inlet and outlets must not generate any local mechanical stress on the exchangers. If necessary, install flexible couplings.

Fit water flow rate balancing and control valves at the exchanger outlet.

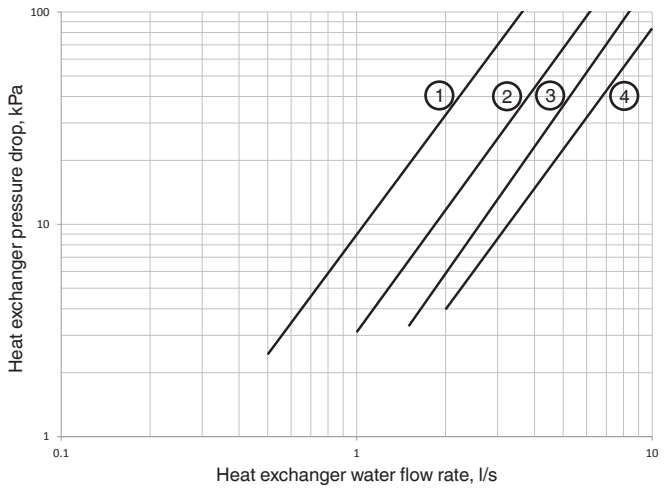
Balancing and control of the flow rates may be performed by reading the pressure drop in the exchangers.

The pressure drop on each of these must be identical to the total water flow rate given by the selection programme.

To adjust the balancing valves before starting up the system, refer to the pressure drop curves below.

It is possible to fine-tune the water flow rate settings for each desuperheater when the unit is running at full load by trying to obtain leaving water temperatures which are strictly identical for each of the circuits.

Desuperheater (plate heat exchanger pressure drop curves)



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

12.2.4.3 - Operation

The desuperheater water circuit pump (see standard diagram – item 20, in the section on "Installation and operation of the heat recovery with desuperheater option") can be operated in conjunction with:

- Start-up of the first unit compressor: terminal 37/38
- Heating water requirement: output DO-01, terminal 491/492, on the EMM board.

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

The volume of the desuperheater circuit water loop must be as low as possible to be able to rapidly increase the temperature during warm-up.

The minimum desuperheater entering water temperature is 25°C.

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

It is essential for the desuperheater water loop to comprise a valve and an expansion vessel which must be selected to take the volume of the water loop and the maximum possible temperature into account

(120°C), in the event that pump (item 20) stops running.

12.2.4.4 - Operating limits

Desuperheater		Minimum	Maximum
Entering water temperature at start-up	°C	25(1)	75
Leaving water temperature during operation	°C	30	80
Air condenser		**Minimum**	**Maximum**
Outside operating temperature	°C	0(2)	46

(1) 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.
(2) The minimum outside temperature is 0°C; -20°C with the winter operation option.

12.2.4.5 - Control configuration with the desuperheater option

This configuration enables the user to enter a setpoint relating to the minimum condensation temperature (default value = 30°C) to increase the heating capacity recovered for the desuperheaters, if required.

In fact, the recovered heating capacity percentage in relation to the total capacity released by the air-cooled exchanger increase based on the saturated condensation temperature.

Refer to the control manual for adjustment of the minimum saturated condensation temperature setpoint.

Other parameters directly affect the effective capacity recovered from the desuperheater, which are mainly:

- The unit's load rate, which governs whether it runs at full load (100%) or at part load (depending on the number of compressors the unit has per circuit).
- The entering water temperature in the desuperheater, depending on the unit's "Heating" or "Cooling" operating modes:
  - in "Heating" mode, the entering water temperature in the water type heat exchanger
  - in "Cooling" mode, the ambient temperature at the air-cooled exchanger air inlet.

12.2.5 - Operation of 2 Master/Slave units (Option 58)

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

All parameters required for Master/Slave operation must be configured by the Service configuration menu.

All remote controls of the Master/slave assembly (start/stop, setpoint, load shedding, etc.) are managed by the unit configured as the Master and must only be applied to the Master unit.

Units supplied with hydronic module

Master/Slave operation is possible only when the units are installed in parallel:

- The Master/Slave assembly is controlled on the water inlet without any additional sensors (standard configuration) (see example 1).
- Control on the water outlet is also possible by adding two extra sensors in the common supply pipe work (see example 2).

Each unit controls its own water pump.

Units supplied without hydronic module

In the case of units installed in parallel, and if there is only one common pump installed by the installer, isolating valves must be installed on each unit. These should be controlled (opened and closed) using the control for the relevant unit (valves for each unit can be controlled using the unit water pump control outputs). Refer to the control manual for the connections.

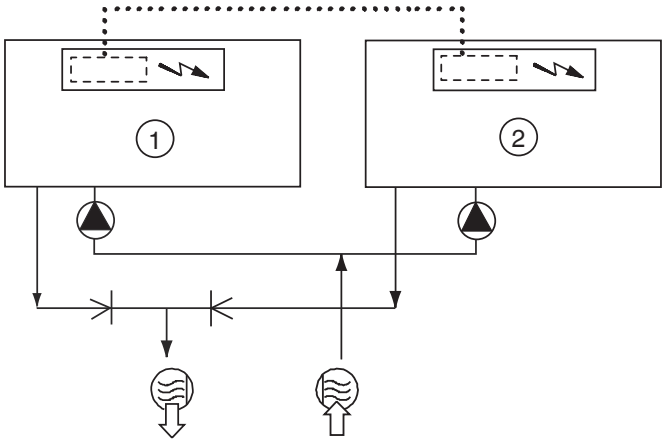
In this case, a variable-speed pump must be controlled by the unit via the 0-10 V dedicated output of the Master unit (control on Delta T° only).

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

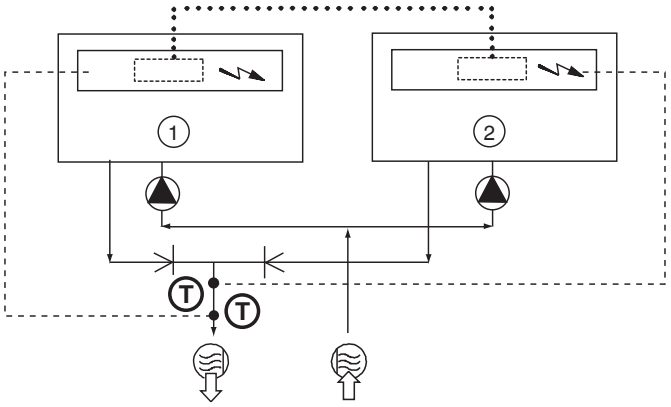
- The operation of the pump will be controlled by the Master unit.
- The Master/Slave assembly is controlled on the water outlet without additional sensor.
- Installation must only be carried out according to the diagram in example 3.

IMPORTANT:
Both of the units must be equipped with an option to allow Master-Slave operation.
If one or both units is equipped with the variable-speed pump option, it is strongly recommended not to set the control mode on the pressure differential. The same setpoint is recommended for configuring the temperature differential mode.

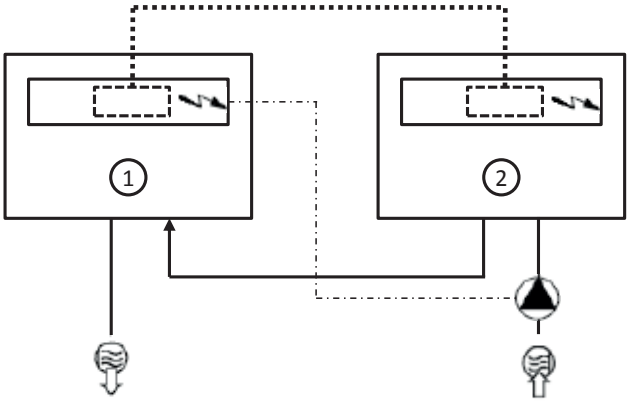
Example 1: operation in parallel - control on water inlet for a hydronic kit



Example 2: operation in parallel - control on water inlet for a hydronic kit



Example 3: operation in series - control on water outlet for a unit assembly



Legend:
All dimensions are in mm.

- (1) Master Unit
- (2) Slave unit
- Water inlet
- Water outlet
- Control boxes for the master and slave units
- Water pumps for each unit (normally included in the units with hydronic module)
- (T) Additional sensor for water outlet control, to be connected to channel 1 of the slave boards of each master and slave unit
- CCN communication bus
- Connection of two additional sensor
- Non-return valve

12.2.6 - Brine option (Options 5B and 6B)

The 5B medium-temperature brine solution option is used to produce low temperature chilled water down to 0°C.

Production of brine solution from 0°C to -15°C is only possible with the 6B low-temperature brine solution.

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

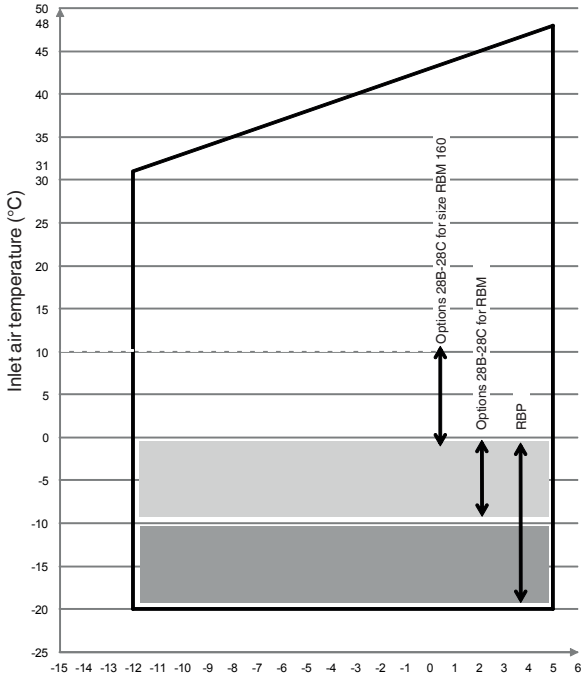
The operating range depends on:

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

Operating range

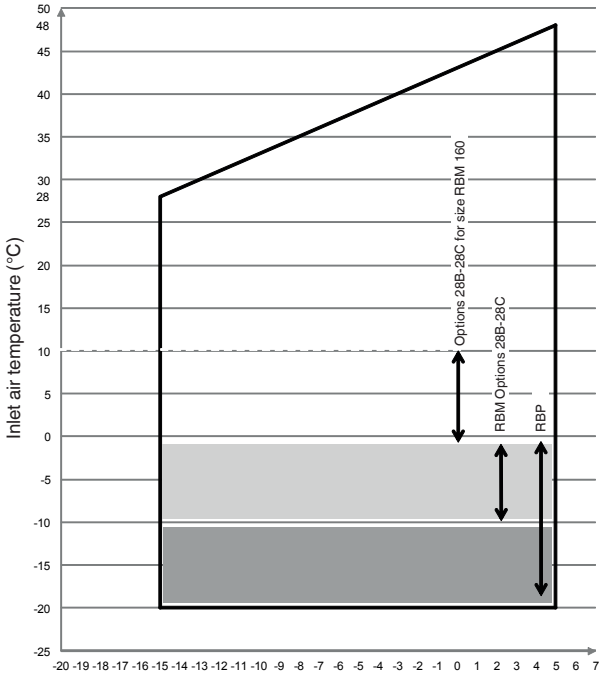
- Low-temperature brine solution

30RBM 160-400 and 30RBP 160-400
Low-temperature Propylene Glycol



Brine solution mix type heat exchanger leaving water temperature (°C)

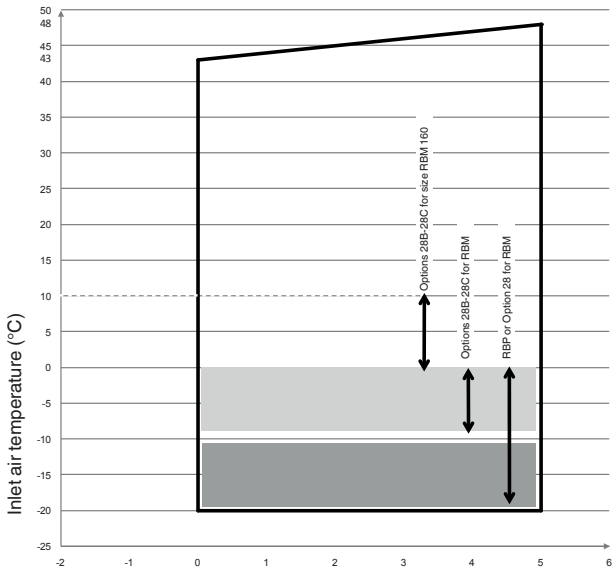
30RBM 160-400 and 30RBP 160-400
Low-temperature Ethylene Glycol



Brine solution type heat exchanger leaving water temperature (°C)

- Medium-temperature brine solution

30RBM 160-520 and 30RBP 160-520
Medium-temperature Ethylene and Propylene Glycol



Brine solution mix type heat exchanger leaving water temperature (°C)

NOTES

- Evaporator ΔT = 5K max
- These operating ranges are guidelines only. Verify the operating range with the Carrier electronic catalogue.

Legend

Operating range for 30RBM or 30RBP brine solution unit

Operating range for 30RBM unit equipped with options 28B and 28C (winter operation). Options 28B-28C (with two-speed lead fan for each circuit) allows operation down to -10 °C outside temperature.

RBP operating range or extension of the operating range, 30RBM unit equipped with option 28. Option 28 (with variable-speed lead fan for each circuit) allows operation down to -20°C outside temperature.

Refrigerant charge for the low-temperature brine solution option

30RBM and RBP		160	180	200	220	260	300	330	360	400
Circuit A standard unit + option 6B(1)	kg	8,40	10,90	10,90	12,60	12,55	14,15	14,90	20,30	20,60
	tCO_2e	17,5	22,8	22,8	26,3	26,2	29,5	31,1	42,4	43,0
Circuit BA standard unit + option 6B(1)	kg	12,25	12,60	12,05	12,70	12,55	20,20	19,70	19,90	21,70
	tCO_2e	25,6	26,3	25,2	26,5	26,2	42,2	41,1	41,6	45,3

(1) Options: 6B Low-temperature brine solution.

Frost protection

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

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

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

Refer to the manufacturer data to define the antifreeze protection, dependent on the measured concentration level.

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

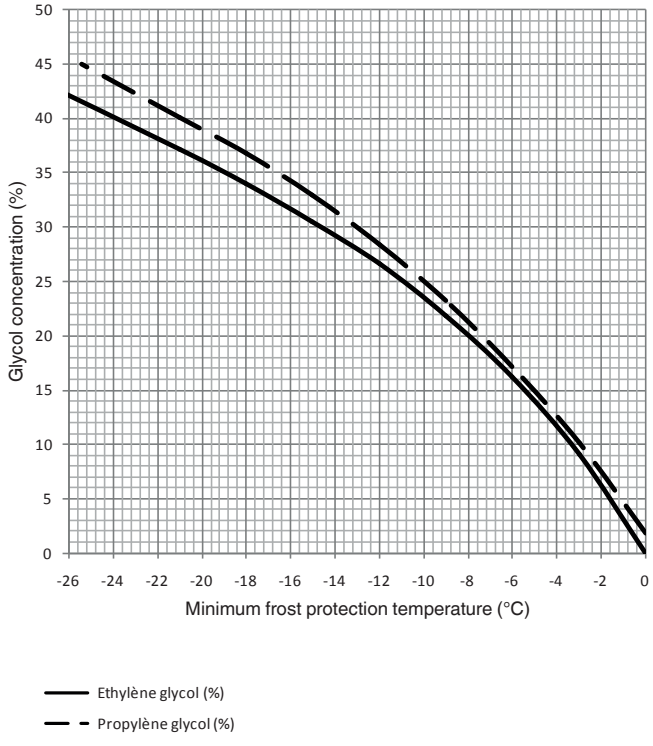
This value will be used to define the following limits:
1. Evaporator antifreeze protection.
2. Low-pressure protection.

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

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

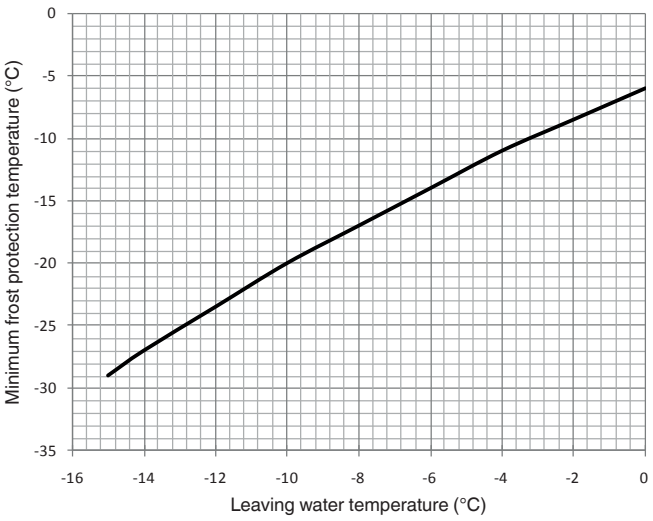
Glycol concentration required

Ethylene and Propylene glycol freezing curve



Minimum frost protection temperature to be observed based on the leaving water temperature.

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



For example, based on the above curves, if the ethylene glycol mass concentration measured in the loop is 35%, the frost protection temperature value of -19.1°C must be entered in the software. This corresponds to a minimum leaving water temperature of -9°C. The control point must be added as a result.

IMPORTANT:

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

NOTE:

- ***In the case of frost protection of the unit by low air temperature, the percentage brine must be evaluated accordingly.***
- ***The maximum glycol level in the case of units equipped with a hydronic module is 45%.***
- ***The maximum recommended temperature differential is 5K.***
- ***In order to facilitate maintenance operations, it is recommended to install isolation valves upstream and downstream of the unit***

12.2.7 - Units with variable operating pressure fans (Option 12)

Ductable units are intended to be ducted on the fan discharge, and can be installed inside a machine room.

For this type of installation, the hot or cold air produced by the air-cooled exchangers is evacuated from the building by the fans by means of a ductwork system, which causes pressure drops in the air circuit.

Installing a ductwork system on the fan discharge generates a pressure drop due to the air flow resistance.

The intake air can be recovered either inside or outside the room.

Therefore, more powerful fan motors are installed in this option than on the standard units.

For each installation, the duct pressure drops differ, depending on the duct length, the duct section and the direction changes.

Ductable units equipped with this option are designed to operate with ducts whose air evacuation generates a maximum pressure drop of 200 Pa.

Using a speed variation up to 19 rps enables the system to overcome the pressure drops in the ducts while maintaining an optimised air flow in each circuit.

All the fans in the same circuit run at the same time at the same speed.

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

If required by a specific installation, the unit's maximum fan speed can be configured in the Service Configuration menu. For this modification, consult the control manual.

The maximum configured speed applies to both the cooling and heating modes.

The performances (capacity, efficiency, noise level) depend on the fan speed. Please refer to the manufacturer's electronic catalogue to evaluate the estimated impact of the duct system on the unit's operating conditions.

12.2.7.1 - Specific installation on ductable units

IMPORTANT:
In units which are ductable in heating mode, dehumidification of ambient air, as well as defrosting of the air-cooled exchangers, produces a large volume of condensates which must be dealt with on the unit installation site.

Ductable units must be installed on a waterproof base enabling efficient drainage and evacuation of the condensate from the heat exchangers.

Similarly, in case of low outdoor temperatures when air-cooled exchangers freeze, the water from defrosting must be collected so as to prevent any risk of flooding the rooms where the heat pumps are installed.

Each fan is controlled by a variable speed drive. Therefore each circuit operates independently.

Each refrigerating circuit must have an independent ductwork system so as to prevent any air recycling between the air-cooled exchangers of different refrigerating circuits.

On ductable units, each fan is equipped with a factory-fitted connection interface frame providing a link between the ductwork itself and the refrigerating circuit to which the fan belongs.

Refer to the dimensional plans of the units for the precise dimensions of this connection interface.

Please refer to the "Fan arrangement" paragraph to allocate each fan to its own circuit.

12.2.7.2 - Nominal and maximum air flow rate per circuit and per unit type

30RBP	Circuit A	Circuit B
	Nominal/maximum air flow rate (l/s)	Nominal/maximum air flow rate (l/s)
160	5200 / 6240	10400 / 12480
180-230	10400 / 12480	10400 / 12480
240-270	10400 / 12480	15600 / 18720
310-330	15600 / 18720	15600 / 18720
380	15600 / 18720	20800 / 24960
430-520	20800 / 24960	20800 / 24960

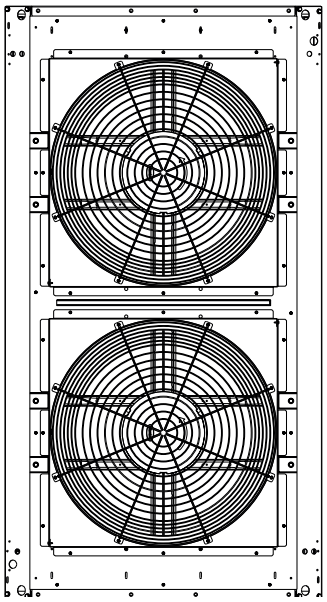
12.2.7.3 - Air connection on discharge

Refer to the dimensional plans of the units for the precise dimensions of the connection interface.

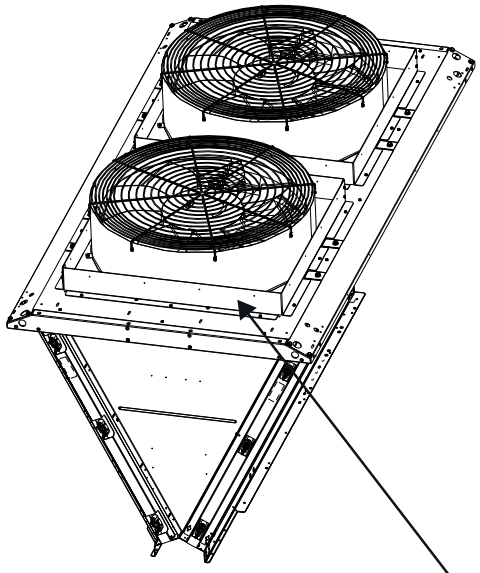
12.2.7 - Factory-installed duct connection interface on each fan

V-shaped air heat exchangers

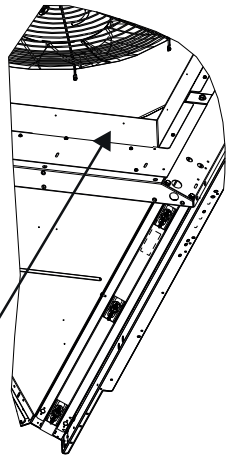
View from above



Side view



Detail of the duct connection interface frame

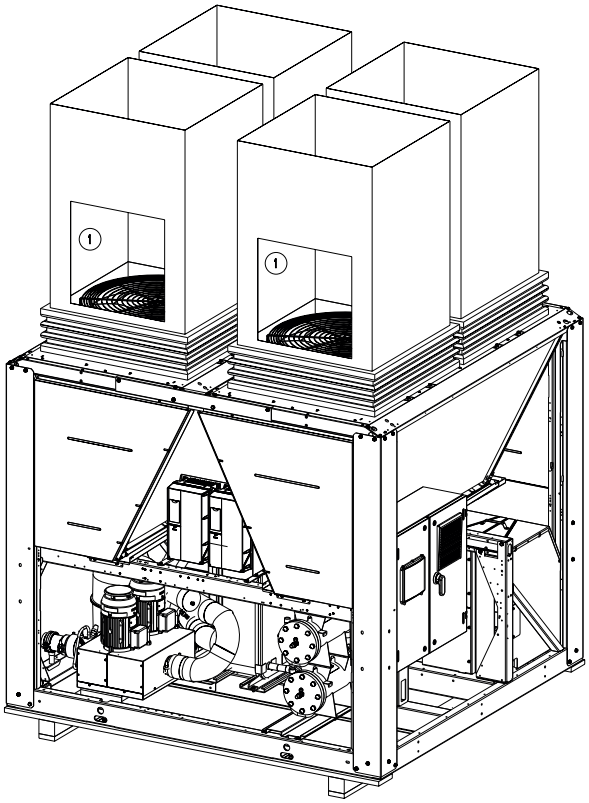


Size of the duct connection frame 860x860x100mm

12.2.7 - Duct installation principle

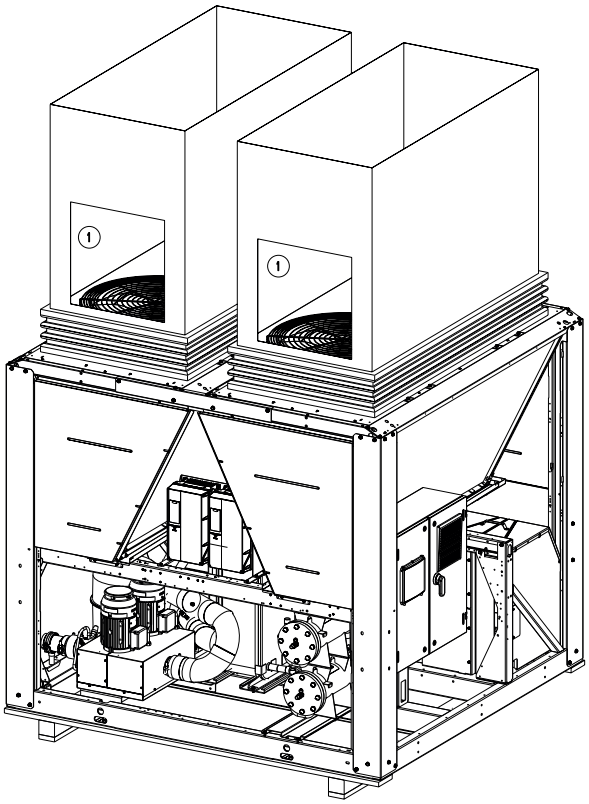
Solution 1

each fan has its own duct



Solution 2

2 fans can used the same duct



Rules for a correct ductwork

- each duct must serve a maximum of 2 fans – DO NOT EXCEED this limit
- in case of multiple fans in the same duct, they must belong to the same refrigerating circuit and to the same coil system – DO NOT MIX several refrigerating circuits or coil systems in the same duct

IMPORTANT:
The duct connections on the units must not generate any mechanical stress on the fan supporting structure.
The fan impellers and protection grilles must always remain in their position inside the ducts.
Use bellows or flexible sleeves for the duct connection.
Install an access hatch of at least 700 x 700 mm at each duct outlet to allow the ventilation components to be replaced.

Fan motor electrical protection

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

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

If a fan stops working, the drive automatically detects the malfunction.

Refer to the control manual for the list of alarms specific to this option.

12.2.7 - Power factor correction (Option 231)

The power factor correction is active for any operating condition of the unit.

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

A capacitor battery is controlled by a controller which reads the current draw by the unit and adjusts the power factor to a setting of 0.95.

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

The capacitors are selected for each unit as per below table:

Unit size RBM/P			**160**	**180**	**200**	**220**	**260**	**300**	**330**	**360**	**400**	**430**	**470**	**520**
Capacitor capacity		kVAR	30	30	30	40	40	50	50	60	60	70	70	80
Capacitor 1	Capacity	kVAR	10	10	10	10	10	10	10	20	20	10	10	20
	Ir	A	14	14	14	14	14	14	14	29	29	14	14	29
Capacitor 2	Capacity	kVAR	20	20	20	10	10	20	20	20	20	20	20	20
	Ir	A	29	29	29	14	14	29	29	29	29	29	29	29
Capacitor 3	Capacity	kVAR	-	-	-	20	20	20	20	20	20	40	40	40
	Ir	A	-	-	-	29	29	29	29	29	29	58	58	58

WARNING: ***Operation of the unit without capacitors raises the current.***

12.2.8 - DX Free Cooling option (Options 118A and 118B)

The DX Free Cooling option is used to produce chilled water when the ambient air temperature is lower than the temperature of the water to be cooled, without activating the compressors [the compressors can be used for a few seconds during a Free Cooling cycle to transfer the refrigerant charge to the Free Cooling circuit – see Operation].

Only the unit fans and a low power pump that circulates the refrigerant in the Free Cooling circuit operate to generate cooling power.

This ensures particularly high efficiency during operation in Free Cooling mode.

Option 118A (Free Cooling on both circuits) is available for units from size 220.

Option 118B (Free Cooling on one circuit) is available across the entire range.

12.2.8.1 - Physical properties of units with the Free Cooling option

30RBM/30RBP option 118A (Free Cooling on 2 circuits)		**160**	**180**	**200**	**220**	**260**	**300**	**330**	**360**	**400**	**430**	**470**	**520**
30RBM - Operating weight(1)													
Standard unit + option 118A	kg	-	-	-	1462	1483	1958	1994	2170	2226	2646	2664	2864
Unit with option 15 + option 118A	kg	-	-	-	1570	1591	2084	2120	2313	2370	2808	2827	3044
Unit with option 15 + option 116S + 118A	kg	-	-	-	1709	1745	2244	2324	2517	2573	3051	3068	3324
30RBP - Operating weight(1)													
Standard unit + option 118A	kg	-	-	-	1498	1520	1994	2030	2206	2263	2704	2722	2930
Unit with option 15 + option 118A	kg	-	-	-	1606	1628	2120	2156	2350	2407	2866	2884	3110
Unit with option 15 + option 116S + 118A	kg	-	-	-	1745	1782	2280	2360	2553	2610	3108	3125	3390
30RBM/30RBP - Refrigerant	R410A												
Circuit A(1)	kg	-	-	-	13,9	14,6	16,7	17,6	24,8	24,3	27,5	25,5	31,6
	tCO_2e	-	-	-	29,0	30,5	34,9	36,7	51,8	50,7	57,4	53,2	65,9
Circuit B(1)	kg	-	-	-	14,0	14,6	25,0	24,7	25,4	25,4	29,5	30,3	31,8
	tCO_2e	-	-	-	29,2	30,5	52,2	51,6	53,0	53,0	61,6	63,3	66,3

30RBM/30RBP option 118B (Free Cooling on 1 circuit)													
30RBM - Operating weight(1)													
Standard unit + option 118B	kg	1260	1301	1301	1431	1472	1929	1965	2133	2189	2608	2626	2824
Unit with option 15 + 118B	kg	1343	1383	1384	1539	1580	2055	2091	2276	2333	2770	2789	3004
Unit with option 15 + option 116S + 118B	kg	1482	1523	1523	1678	1734	2215	2295	2480	2536	3013	3030	3284
30RBP - Operating weight(1)													
Standard unit + option 118B	kg	1296	1337	1337	1467	1489	1965	2001	2169	2226	2666	2684	2890
Unit with option 15 + 118B	kg	1378	1420	1420	1575	1597	2091	2127	2313	2370	2828	2846	3070
Unit with option 15 + option 116S + 118B	kg	1517	1559	1560	1714	1751	2251	2331	2516	2573	3070	3087	3350
30RBM/30RBP - Refrigerant	R410A												
Circuit A(1)	kg	8,4	10,9	10,9	12,6	13,1	14,7	15,4	20,3	21,1	23,5	23,5	26,8
	tCO_2e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B(1)	kg	14,0	14,1	13,7	14,0	14,6	25,0	24,7	25,4	25,4	29,5	30,3	31,8
	tCO_2e	29,1	29,4	28,6	29,2	30,5	52,2	51,6	53,0	53,0	61,6	63,3	66,3

(1) Weights are guidelines only. Refer to the unit name plate.

12.2.8.2 - Operation

Switching between Free Cooling and Cooling modes is controlled automatically (it is possible to disable switching in Free Cooling by configuring - see the control manual).

The parameters (configurable) for switching are as follows:
- the ambient air temperature (OAT)
- the leaving water setpoint (LWTstp)

Once the LWTstp – OAT difference is greater than 5K, a current capacity calculation in Cooling mode is performed (cooling requirement) and compared to the theoretical Free Cooling power (cooling possibility). This comparison authorises or disables switching in Free Cooling mode.

When switching from a circuit in Free Cooling mode, all of its compressors and fans are shut down and the three-way valve changes position, establishing the evaporator/condenser connection (the compressor function is bypassed).

Once the valve has switched, a vacuum is produced on the compressors to transfer the refrigerant charge remaining in the compressors to the Free Cooling system, then the circuit ventilation is restarted and the Free Cooling pump starts up.

This logic takes around 10 minutes to switch the two circuits in Free Cooling mode.

Given this timing, only one Cooling/Free Cooling switch per hour is permitted.

If the power in Free Cooling mode is not sufficient (setpoint not reached), the circuit automatically returns to Cooling mode.

Therefore, depending on the operating conditions and the cooling requirements, the unit may operate either in full Cooling or Free Cooling mode, or in Mix Mode (one circuit operates in Cooling mode and one in Free Cooling mode).

To optimise operation in Free Cooling mode, it is strongly recommended to use the setpoint reset function (increases the capacity in Free Cooling mode and encourages switching to this mode).

IMPORTANT:
The volume of air supplied to the condensation coils is an essential parameter for the correct operation of the Free Cooling system and the function's stability.
It is vital not to degrade the unit configuration as defined.
Hence, be sure not to install devices and/or accessories on the unit that may alter the volume of air generated by the fans and/or modify its distribution to the various heat exchangers.

IMPORTANT:
During operation in Free Cooling mode, the compressors are not used. However, depending on the operating conditions and the monitored pressure limits, the system may be required to start them to create a vacuum on the compressor function (recovery of refrigerant charge in the compressors and transfer for use in the Free Cooling circuit). This may occur regularly and is a normal operating condition.

12.2.8.3 - Operating limits

Cooling mode			
Evaporator (water)		**Minimum**	**Maximum**
Entering water temperature at start-up	°C	8	40
Leaving water temperature during operation	°C	5	20
Condenser (air)		**Minimum**	**Maximum**
30RBM outside ambient temperature (1)	°C	-10	45
30RBP outside ambient temperature	°C	-20	45
Available static pressure	Pa	0	0

Free Cooling mode			
Evaporator (water)		**Minimum**	**Maximum**
Entering water temperature at start-up	°C	8	40
Leaving water temperature during operation	°C	5	26
Condenser (air)		**Minimum**	**Maximum**
30RBM outside ambient temperature (1)	°C	-10	20
30RBP outside ambient temperature	°C	-20	20
Available static pressure	Pa	0	0

(1) The unit must be equipped with option 28B.

13 - STANDARD MAINTENANCE

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

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

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

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

Simple preventive maintenance will allow you to get the best performance from your HVAC unit:
- Optimisation of energy 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.

NOTE: Any deviation from or failure to comply with these maintenance criteria will render the guarantee conditions for the refrigeration unit null and void, and will release the manufacturer from its liability.

13.1 - Level 1 maintenance

These simple procedures can be carried out by the user:
- Check for traces of oil (indicates a refrigerant leak),
- Check for leaks in the circuit (monthly),
- Clean the air-cooled exchangers (see the dedicated chapter),
- Check that the protective grilles are present and in good condition, and that the doors and covers are properly closed,
- Check the unit's alarm report (see the control manual),
- Verify the refrigerant charge in the liquid line sight glass,
- Verify the temperature difference at the heat exchanger inlet and outlet is correct,
- Check for any general signs of deterioration,
- Check the anti-corrosion coatings.

13.2 - Level 2 maintenance

This level requires specific expertise in electrical, hydraulic and mechanical systems. it is possible that this expertise may be available locally; there may be a maintenance service, industrial site or specialist subcontractor in the area.

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

In these cases, the following maintenance operations are recommended:

Carry out all level 1 operations, then:

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

Mechanical:
- Check the tightness of the ventilation sub- assembly, fan, compressor and electrics box fixing bolts

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

Refrigerant circuit checks:

- The unit is subject to F-gas tight regulatory checks. Please refer to the table in the introduction.
- Check the unit operating parameters and compare them with the previous values,
- Check the operation of the high pressure switches. Replace as necessary,
- Check the fouling of the filter drier. Replace it if necessary,
- Keep an up-to-date service booklet specific to the refrigeration unit in question.

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

13.3 - Level 3 maintenance

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

This maintenance work relates to the following:

- Replacement of major components (compressor, water heat exchanger),
- Operations on the refrigerant circuit (handling refrigerant),
- Modification of factory-set parameters (change of application),
- Movement or disassembly of the refrigeration unit,
- Any operation due to proven lack of maintenance,
- Any operation covered by the warranty,
- One or two leak detection operations per year performed by qualified personnel using a certified leak detector.
- 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 vented to the open air.
- If the refrigerating circuit must be opened, cap all openings for a period of up to one day. If open for longer, blanket the circuit with a dry, inert gas (e.g. nitrogen).

13.4 - Tightening of the electrical connections

Component	Designation in the unit	Value (N.m)
Welded screw PE, customer connection	-	40
Screw terminal, fuse holder	FU1, FU2, FU3, FU4	10
Screw terminal, fuse holder	FU100	0.8-1.2
Screw terminal, compressor contactor	KM1-->KM12	3-4.5
Brass screw M6, compressor ground	EC-	5
M6 screw, compressor connection	EC-	5
Screw terminal, circuit breakers	QM-	2
Screw terminal, pump contactor	KM90 - KM90A	2,5
M8 screw customer connection (size 160-220)	QS100	15 to 22
M10 screw customer connection (size 260-400)	QS100	30 to 44
M12 screw customer connection (size 430-520)	QS100	50 to 75
Screw terminal, circuit breakers (size 160-400)	QF100	3.2-3.7
Screw terminal, circuit breakers (size 430-520)	QF100	8-10
Screw terminal, fuse holder 32A (opt231)	Fu-	2,5
Screw terminal, fuse holder 100A (opt231)	Fu-	3.5 - 4

13.5 - Tightening torques for the main fastenings

Screw type	Use	Value (N.m)
Metal screw D=4.8	Condensing module, Casing, Supports	4,2
Taptite M10 screw	Air coil sub-assembly, chassis-structure, electrical box fixing, plate heat exchanger and pump	30
Taptite M6 screw	Pipe supports, enclosure, variable frequency drive supports	7
Oil equalisation screw	Oil equalisation line	145
H M6 screw	Pipe clip	10
H M10 nut	Compressor chassis, Compressor fixing	30

13.6 - Air-cooled exchanger

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

Recommendations for maintenance and cleaning of micro-channel coils (MCHE):

- Regularly cleaning the coil surface is essential for correct unit operation.
- Eliminating contamination and removal of harmful residue will increase the operating life of the coils and the unit.
- The maintenance and cleaning procedures below are part of the regular maintenance to increase the operating life of coils.
- Specific recommendation in case of snow: For long term storage, regularly check that no snow has accumulated on the coil.
- Clean the surface of the coil by spraying the coil regularly and uniformly from bottom to top, orienting the water jet at right angles to the surface. Do not exceed a water pressure of 6200 kPa (62 bar) or an angle of 45° to the coil. The nozzle must be at least 300 mm away from the coil surface.
- Clean the connections with tap water at a pressure of 2/3 bar and a distance of 30 cm. Scrub with a flexible Nylon, PolyPro® or Tynex®brush.

Level 1 cleaning:

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

Level 2 cleaning:

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

Use appropriate PPE including safety glasses and/or mask, waterproof clothes and safety gloves. It is recommended to wear clothing that covers the whole body.

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

IMPORTANT:
Never use a pressure water spray without a large diffuser.
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 electrics box during cleaning operations.

13.7 - Water type heat exchanger

Check that:

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

13.8 - Variable frequency drive

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

In case of any alarm or persistent problem related to the variable frequency drive, contact the manufacturer's service.

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

13.9 - Refrigerant volume

It is essential to run the unit in cooling mode to find out whether the charge is correct; this is done by checking the actual subcooling.

Following a slight leak, it will be possible to feel a drop in the refrigerant charge from the initial charge, and this will affect the subcooling value obtained at the air-cooled exchanger outlet; it cannot, however, be felt in heating mode.

IMPORTANT:

it is therefore not possible to optimise the charge in heating mode following a leak. The unit must be run in cooling mode if the charge needs topping up.

13.10 - Refrigerant properties

Properties of R410A

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

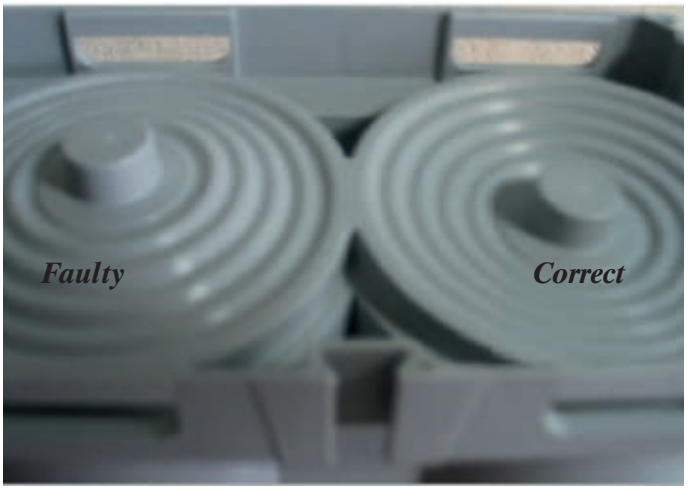
13.11 - Power factor correction

The check involves measuring the input current of each capacitor battery. The check must be carried out using a true RMS meter reading:

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

Make sure the current through the capacitor does not exceed 1.3 x Ir. A higher value may indicate a strong presence of harmonics, which will impact the lifetime of the capacitor.

The absence of current despite the capacitor being energized indicates a fault. This defect is confirmed by removing the capacitors and checking the underside.



14 - FINAL SHUTDOWN

14.1 - Shutting down

Separate the units from their energy sources, allow them to cool then drain them completely.

14.2 - Recommendations for disassembly

Use the original lifting equipment.

Sort the components according to their material for recycling or disposal, in accordance with regulations in force.

Check whether any part of the unit can be recycled for another purpose.

14.3 - Fluids to be recovered for treatment

- Refrigerant
- Heat-transfer fluid: depending on the installation, water, brine solution, etc.
- Compressor oil

14.4 - Materials to be recovered for recycling

- Steel
- Copper
- Aluminium
- Plastics
- Polyurethane foam (insulation)

14.5 - Waste Electrical and Electronic Equipment (WEEE)

At the end of its life, this equipment must be disassembled and contaminated fluids removed by professionals and processed via approved channels for electrical and electronic equipment (WEEE).

15 - UNIT START-UP CHECKLIST FOR INSTALLERS PRIOR TO CONTACTING THE MANUFACTURER

Preliminary information
Job name: .....
Location: .....
Installing contractor: .....
Distributor: .....
Commissioning performed by: ..... Date: .....

Equipment
Model 30RBM/30RBP: ..... Serial number .....

Compressors

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

Air handling equipment
Manufacturer .....
Model # ..... Serial number .....

Additional air handling units and accessories .....
.....

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

☐ Unit is level in its installation
☐ Power supply agrees with the unit 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 current: Assigned: .....Actual .....

Unit start-up

☐ Chilled water pump starter has been properly interlocked with the chiller
☐ Oil level is correct
☐ Unit has been leak checked (including couplings)
☐ Locate, repair, and report any refrigerant leaks

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

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

☐ Voltage imbalance is less than 2%

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

☐ All incoming power voltage is within nominal voltage range
☐ Compressor crankcase heaters have been activated for 6 hours

Check evaporator water loop

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

☐ 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 on the evaporator (without hydronic module) or ESP* (with hydronic module)

Entering evaporator = ...(kPa)
Leaving evaporator = ...(kPa)
Pressure drop (Inlet - Outlet) = ...(kPa)

* ESP : External Static Pressure

WARNING: plot the pressure drop on the evaporator flow/pressure drop curve to determine the flow rate in l/s at the nominal operating conditions for the system. For units with hydronic module, an indication of the flow is displayed by the unit control device (see the 30RBM/30RBP control manual).

If necessary use the control valve to adjust the flow rate to the desired value.

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

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

Check and log on to the user menu configuration

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

Re-enter the setpoints

To start the chiller

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

The unit starts and operates properly

Temperatures and pressures

WARNING: Once the unit has been operating for a while and the temperatures and pressures have stabilised, record the following:

Evaporator water inlet .....
Evaporator water outlet .....
Ambient temperature .....
Circuit A suction pressure .....
Circuit B suction pressure .....
Circuit A discharge pressure .....
Circuit B discharge pressure .....
Circuit A suction temperature .....
Circuit B suction temperature .....
Circuit A discharge temperature .....
Circuit B discharge temperature .....
Circuit A liquid line temperature .....
Circuit B liquid line temperature .....

NOTES:
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www.eurovent-certification.com
www.certiflash.com

Order No: 13539, 10.2016 - Supersedes order No: 23539-76, 08.2016.

Manufacturer: Carrier SCS, Montluel, France.
Printed in the European Union.