



# 30RQ 262-522

## Reversible Air-to-Water Heat Pumps with Integrated Hydronic Module

Nominal cooling capacity 240-465 kW  
Nominal heating capacity 270-560 kW

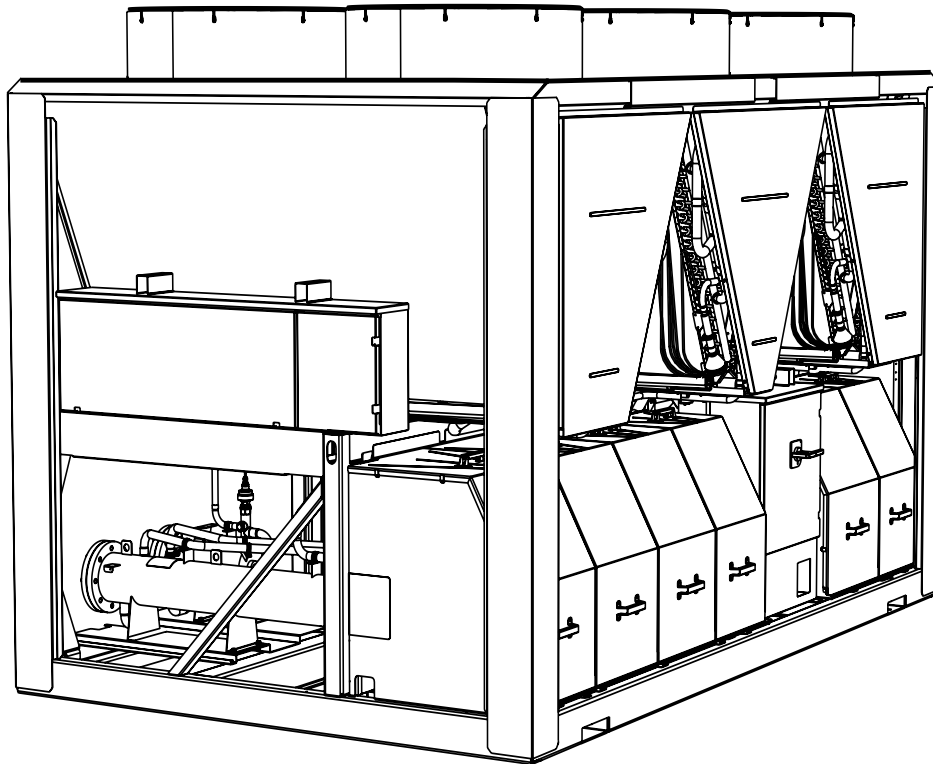
50 Hz

PRO-DIALOG PLUS

**AQUASNAP™**  
with PURON® refrigerant



Carrier is participating in the Eurovent Certification Programme. Products are as listed in the Eurovent Directory of Certified Products.



Unit with Euro Pack option shown

### Installation, operation and maintenance instructions



Quality Management System Approval



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

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## 1 - INTRODUCTION

Prior to the initial start-up of the 30RQ units, the people involved should be thoroughly familiar with these instructions.

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

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

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

### 1.1 - Check equipment received

- Confirm that the unit received is the one ordered. Compare the name plate data with the order. The nameplate is attached to the control box door on the inside.
- The unit name plate must include the following information:
  - Model number - size
  - CE marking
  - Serial number
  - Year of manufacture and pressure and leak tightness test date
  - Refrigerant used
  - Refrigerant charge per circuit
  - PS: Min./max. allowable pressure (high and low pressure side)
  - TS: Min./max. allowable temperature (high and low pressure side)
  - Globe valve cut-out pressure
  - Pressure switch cut-out pressure
  - Unit leak test pressure
  - Voltage, frequency, number of phases
  - Maximum current drawn
  - Maximum power input
  - Unit net weight
- Confirm that all accessories ordered for on-site installation have been delivered, and are complete and undamaged.

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

### 1.2 - Installation safety considerations

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

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

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

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

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

*Never cover any safety devices.*

*This applies to the globe valve in the water circuit and the globe valve(s) in the cooling circuit(s).*

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

*The globe stops are designed and installed to ensure protection against fire risk. Removing the globe stops is only permitted if the fire risk is fully controlled and the responsibility of the user.*

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

*The safety valves must be connected to discharge pipes for units installed in confined spaces. These pipes must be installed in a way that ensures that people and property are not exposed to refrigerant leaks. These fluids may be diffused in the air, but far away from any building air intake, or they must be discharged in a quantity that is appropriate for a suitably absorbing environment.*

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

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

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

### 1.3 - Equipment and components under pressure

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

These units comply with the European Pressure Equipment Directive.

## 1.4 - Maintenance safety considerations

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

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

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

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

*NOTE: The unit must never be left shut down with the liquid line valve closed, as liquid refrigerant can be trapped between this valve and the expansion device. This valve is situated on the liquid line before the filter drier box.*

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

*Never work on a unit that is still energized.*

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

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

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

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

*While working in the fan area, especially when grilles or casings are removed, disconnect the fan power supply to prevent their automatic restart.*

*Operating checks: During the life-time of the system, inspection and tests must be carried out in accordance with national regulations.*

*The information on operating inspections given in annex C of standard EN278-2 can be used if no similar criteria exist in the national regulations.*

*Safety device checks (annex C6 – EN378-2): The safety devices must be checked on site once a year (high-pressure switches), and every five years for external overpressure devices (safety globe valves).*

*Check manual “30RB/RQ Pro-Dialog Plus control” for a detailed explanation of the high-pressure switch test method.*

*At least once a year thoroughly inspect the protection devices (valves). If the machine operates in a corrosive environment, inspect the protection devices more frequently.*

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

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

*Before opening a refrigerant circuit, purge and consult the pressure gauges.*

*Change the refrigerant when there are equipment failures, following a procedure such as the one described in NFE 29-795 or carry out a refrigerant analysis in a specialist laboratory.*

*Plug all openings whenever the refrigerant circuit is opened for up to one day. For longer openings place a nitrogen charge in the circuit.*

## 1.5 - Repair safety considerations

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

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

*Do not use oxygen to purge lines or to pressurize a machine for any purpose. Oxygen gas reacts violently with oil, grease, and other common substances.*

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

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

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

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

*Do not siphon refrigerant.*

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

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

*During refrigerant removal and storage operations follow applicable regulations. These regulations, permitting conditioning and recovery of halogenated hydrocarbons under optimum quality conditions for the products and optimum safety conditions for people, property and the environment are described in standard NFE 29795.*

*Please refer to the certified dimensional drawings for the units.*

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

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

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

**ATTENTION:** *No part of the unit must use feet, racks or supports during operation. Periodically monitor and repair or if necessary replace any component or piping that shows signs of damage.*

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

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

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

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

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

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

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

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

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

### **2.1 - Moving**

*See chapter "Installation safety considerations".*

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

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

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

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

Before siting the unit check that:

- the permitted loading at the site is adequate or that appropriate strengthening measures have been taken.
- the unit is installed level on an even surface (maximum tolerance is 5 mm in both axes).
- there is adequate space above the unit for air flow and to ensure access to the components (see dimensional drawings).
- the number of support points is adequate and that they are in the right places.
- the location is not subject to flooding.
- for outdoor installations, where heavy snowfall is likely and long periods of sub-zero temperatures are normal, provision has to be made to prevent snow accumulating by raising the unit above the height of drifts normally experienced. Baffles may be necessary to deflect strong winds. They must not restrict air flow into the unit.

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

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

The unit includes service valves upstream and downstream of the EXV (facilitate servicing the EXV). Do not change the valve settings while the unit is in operation. The unit must not be stored with these valves closed.

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

### 2.3 - Checks before system start-up

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

During the installation test national regulations must be followed. If no national regulation exists, paragraph 9-5 of standard EN 378-2 can be used as a guide.

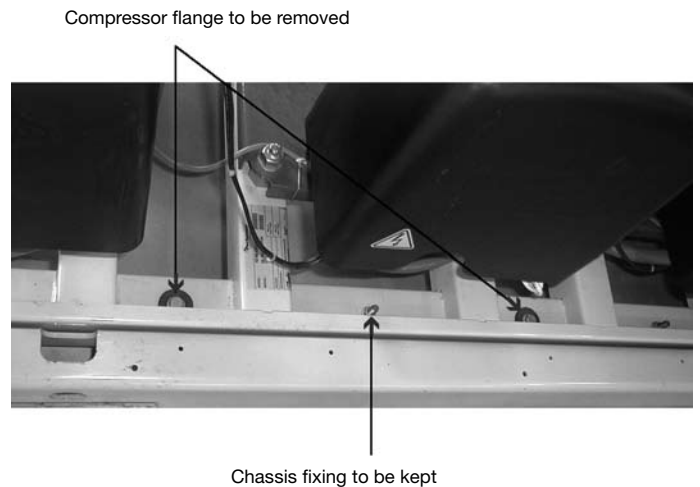
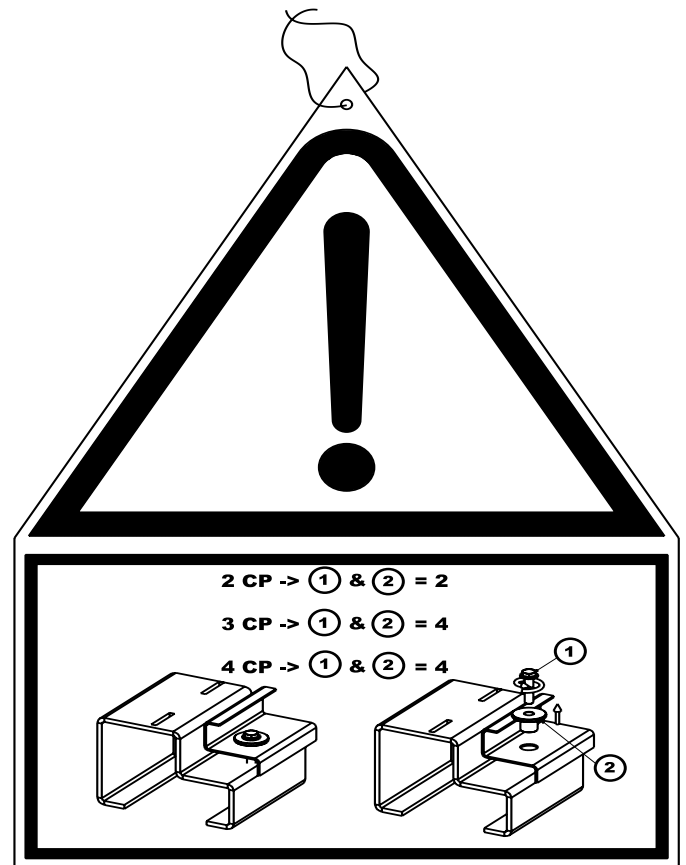
External visual installation checks:

- Compare the complete installation with the refrigeration system and power circuit diagrams.
- Check that all components comply with the design specifications.
- Check that all safety documents and equipments that are required by current European standards are present.
- Verify that all safety and environmental protection devices and arrangements are in place and comply with the current European standard.
- Verify that all document for pressure containers, certificates, name plates, files, instruction manuals that are required documents required by the current European standards are present.
- Verify the free passage of access and safety routes.
- Verify the instructions and directives to prevent the deliberate removal of refrigerant gases.
- Verify the installation of connections.
- Verify the supports and fixing elements (materials, routing and connection).
- Verify the quality of welds and other joints.
- Check the protection against mechanical damage.
- Check the protection against heat.
- Check the protection of moving parts.
- Verify the accessibility for maintenance or repair and to check the piping.
- Verify the status of the valves.
- Verify the quality of the thermal insulation.

**IMPORTANT:** The compressor assemblies are “floating” on rubber blocks between the unit chassis and the sub-assembly chassis (they are not visible). To protect the piping during transport, a flange is installed in the factory.

*This flange must be removed on site.*

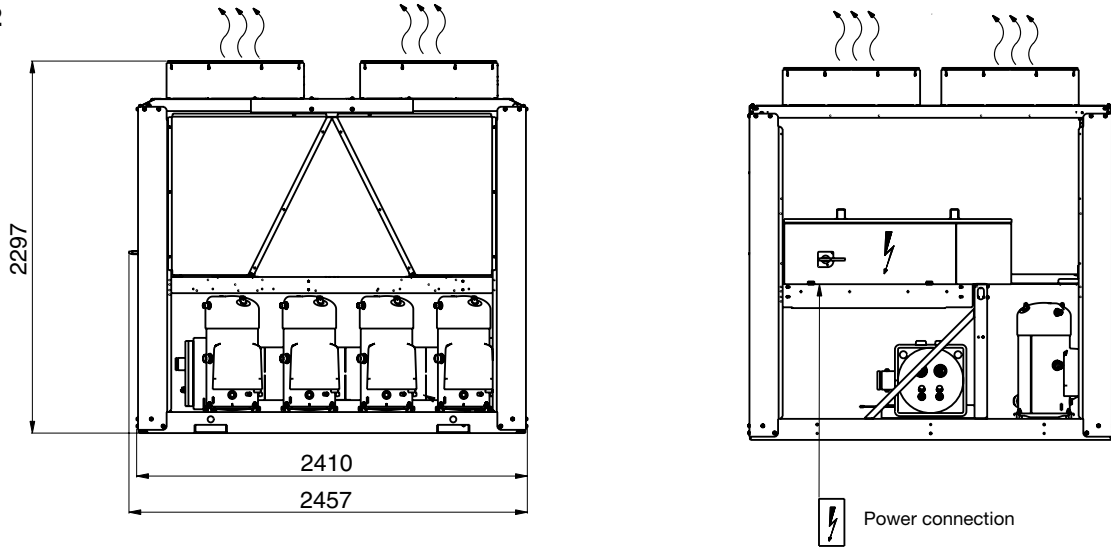
*The flange is identified by red rings. A label attached to the compressor sub-assembly warns the installer.*



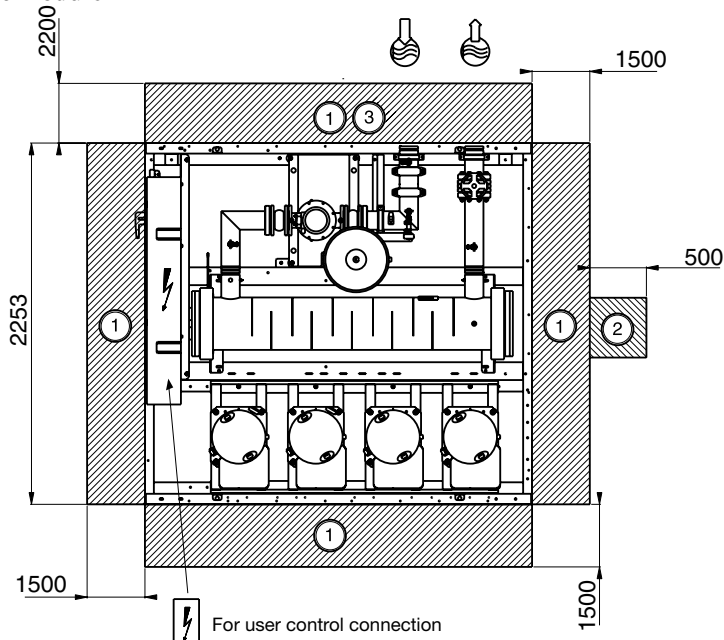
### 3 - DIMENSIONS, CLEARANCES

For desuperheater heat reclaim option see chapter 11.

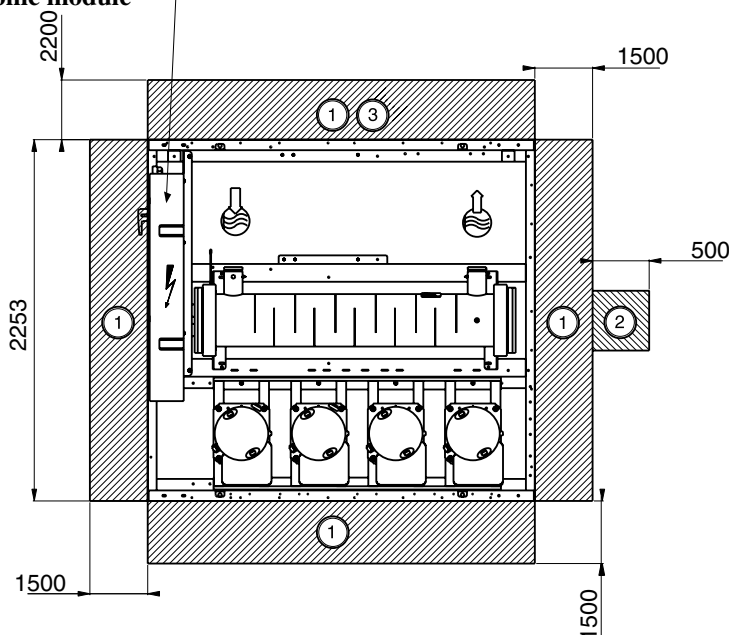
#### 3.1 - 30RQ 262



#### With hydronic module



#### Without hydronic module



#### Legend:

- ① Clearances required for maintenance and air flow
- ② Clearances recommended for heat exchanger tube removal
- ③ Clearances recommended for heat exchanger removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct

#### NOTE: Non-contractual drawings.

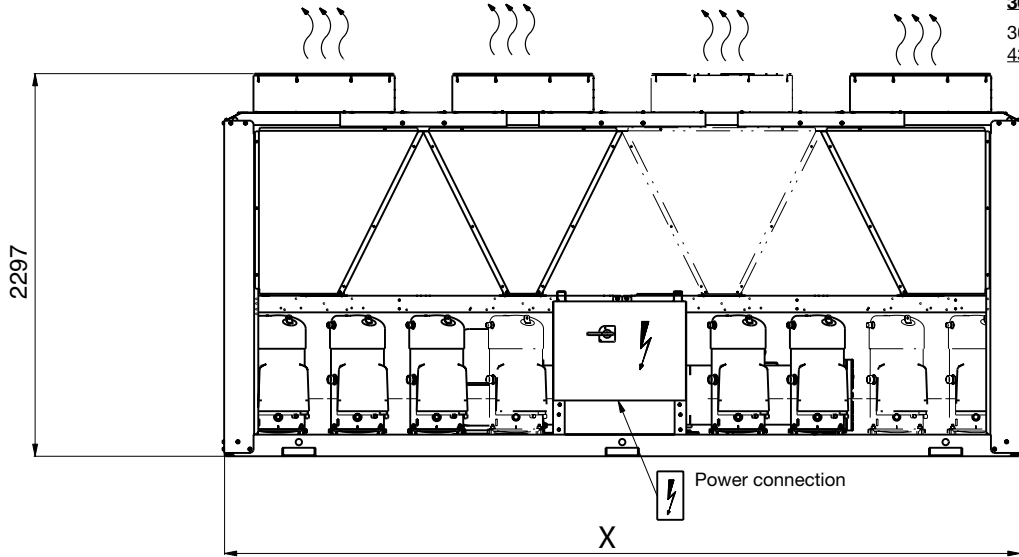
When designing an installation, refer to the certified dimensional drawings, available on request.

For the positioning of the fixing points, weight distribution and centre of gravity coordinates.

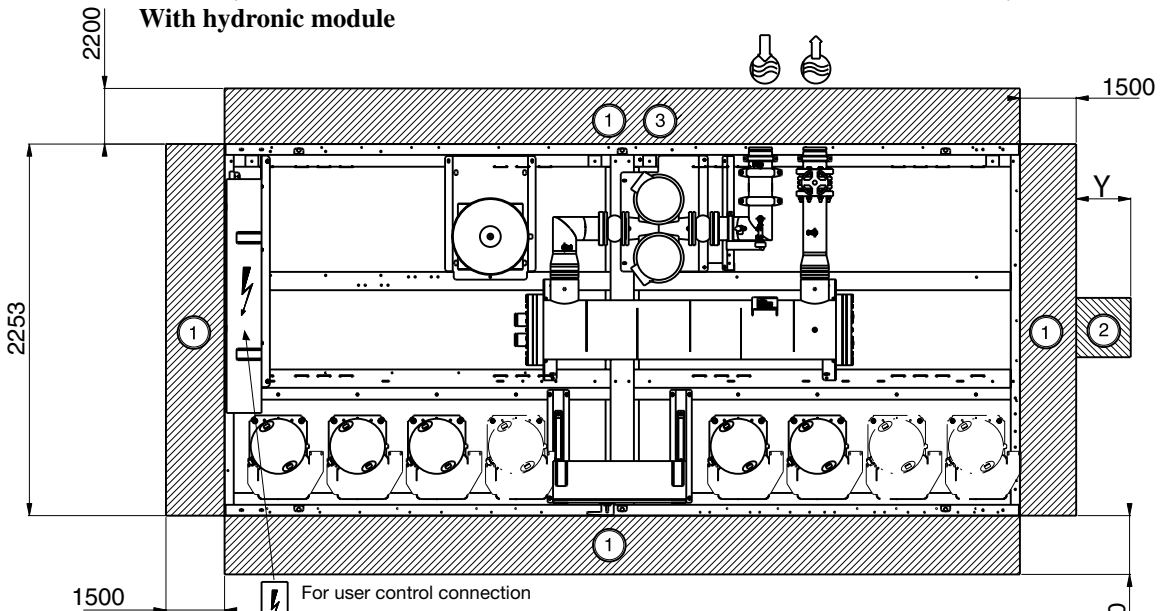
All dimensions are in mm



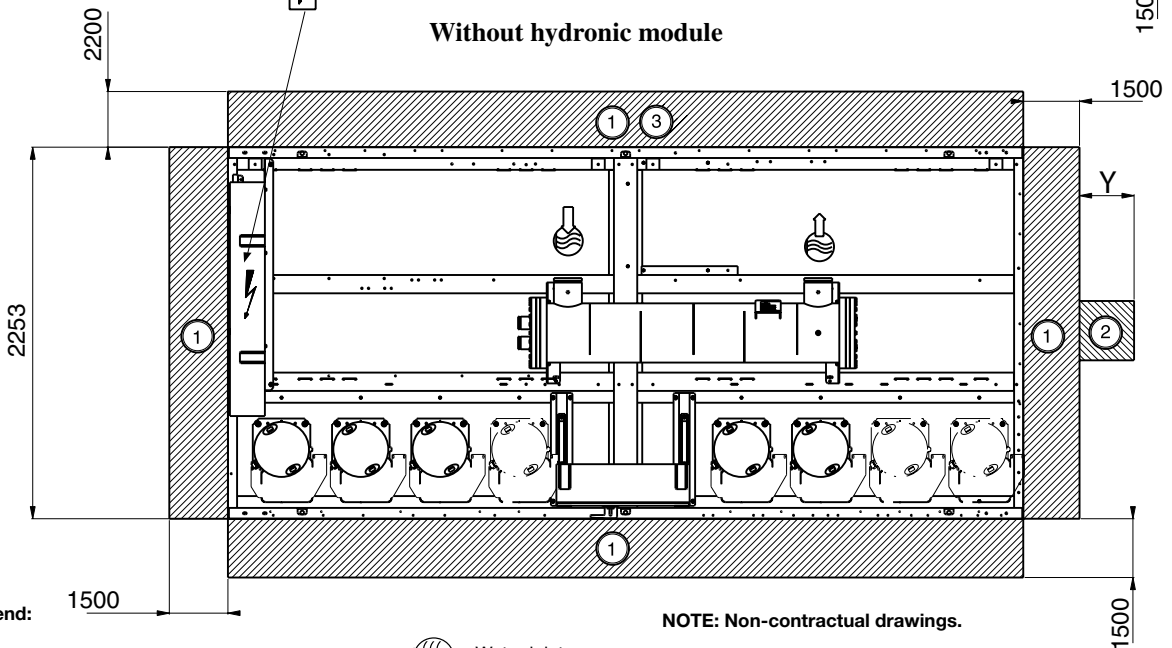
30RQ	X	Y
302-402	3604	200
432-522	4798	0






With hydronic module



Without hydronic module



Legend:

- ① Clearances required for maintenance and air flow
- ② Clearances recommended for heat exchanger tube removal
- ③ Clearances recommended for heat exchanger removal
-  Water inlet
-  Water outlet
-  Air outlet, do not obstruct

NOTE: Non-contractual drawings.

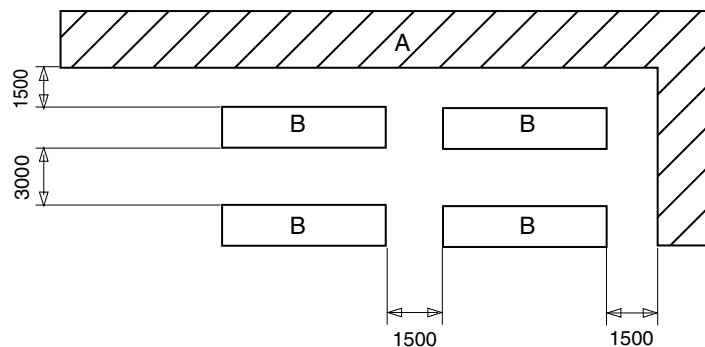
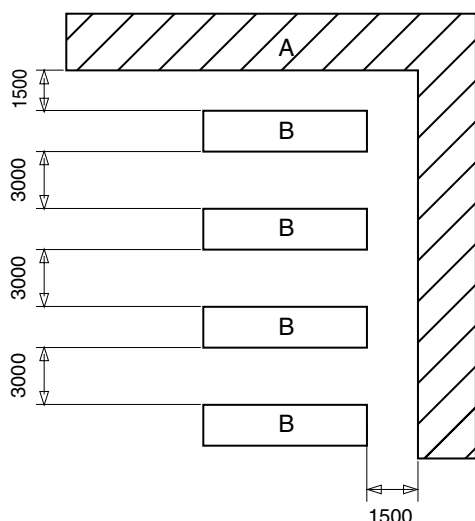
When designing an installation, refer to the certified dimensional drawings, available on request.

For the positioning of the fixing points, weight distribution and centre of gravity coordinates.

All dimensions are in mm

### 3.3 - Multiple heat pump installation

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



In case of multiple heat pumps (up to four units), the respective clearance between them should be increased from 1500 to 3000 mm for the side space requirement.

If necessary, add the required clearances for water heat exchanger tube or coil removal.

### 4 - PHYSICAL DATA - 30RQ

30RQ		262	302	342	372	402	432	462	522
<b>Nominal cooling capacity*</b>	kW	243	275	310	331	366	389	430	465
<b>Total power input, cooling mode*</b>	kW	98	106	122	125	146	150	166	192
<b>Nominal heating capacity**</b>	kW	273	307	344	364	413	450	510	560
<b>Total power input, heating mode**</b>	kW	95	110	123	126	148	158	180	201
<b>Sound levels 10<sup>-12</sup> W†</b>	<b>dB(A)</b>								
Unit with Euro Pack option		89	90	90	91	91	92	92	92
Standard unit		91	92	92	93	93	94	94	94
<b>Operating weight***</b>									
Standard unit with Euro Pack option	kg	2619	3285	3481	3544	3718	4328	4530	4704
Standard unit with Euro Pack option and high-pressure dual-pump hydronic module option	kg	2864	3590	3786	3889	4063	4673	4945	5119
Unit without options****	kg	2429	3045	3241	3284	3458	4028	4210	4384
<b>Refrigerant</b>		R-410A							
Circuit A	kg	27	41	41	53	54	54	53	54
Circuit B	kg	27	27	27	32	32	47	53	53
<b>Compressors</b>		Hermetic scroll 48.3 r/s							
Circuit A		2	3	3	4	4	4	4	4
Circuit B		2	2	2	2	2	3	4	4
No. of control stages		4	5	5	6	6	7	8	8
Minimum capacity	%	25	18	20	15	17	13	11	13
<b>Control</b>		PRO-DIALOG Plus							
<b>Air heat exchangers</b>		Grooved copper tubes and aluminium fins							
<b>Fans</b>		Axial FLYING BIRD 4 with rotating shroud							
Quantity		4	5	5	6	6	7	8	8
Total air flow	l/s	18056	22569	22569	27083	27083	31597	36111	36111
r/s		15.7	15.7	15.7	15.7	15.7	15.7	15.7	Speed
<b>Water heat exchangers</b>		Direct-expansion, two circuits, shell-and-tube							
Water volume	l	110	110	125	113	113	113	113	113
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000
<b>Hydronic module (option)</b>		Pump, Victaulic screen filter, safety valve, expansion tank, pressure gauge, purge valves (water and air) and water flow control valves							
Water pump		Centrifugal, monocell, 48.3 r/s, low or high pressure (as required), single or dual pump							
Quantity		1	1	1	1	1	1	1	1
Expansion tank volume	l	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
<b>Water connections without hydronic module</b>		Victaulic							
Connections	in.	4	4	4	6	6	6	6	6
Outside tube diameter	mm	114.3	114.3	114.3	168.3	168.3	168.3	168.3	168.3
<b>Water connections with hydronic module</b>		Victaulic							
Connections	in.	4	4	4	5	5	5	5	5
Outside tube diameter	mm	114.3	114.3	114.3	139.7	139.7	139.7	139.7	139.7

\* Standardised Eurovent conditions: water heat exchanger entering/leaving water temperature 12°C/7°C, outside air temperature 35°C, water heat exchanger fouling factor 0.000018 m<sup>2</sup> K/W (rounded values, for information only).

\*\* Standardised Eurovent conditions: water heat exchanger entering/leaving water temperature 40°C/45°C, outside air temperature 7°C, 87% rh (rounded values, for information only).

\*\*\* Weights are for guidance only. To find out the unit refrigerant charge, please refer to the unit name plate.

\*\*\*\* Standard unit: Base unit without Euro Pack option and hydronic module.

† In accordance with ISO 9614-1 and Eurovent certified (rounded values, for information only).

## 5 - ELECTRICAL DATA - 30RQ

30RQ		262	302	342	372	402	432	462	522
<b>Power circuit</b>									
Nominal power supply	V-ph-Hz	400-3-50							
Voltage range	V	360-440							
<b>Control circuit supply</b>									
24 V, via internal transformer									
<b>Nominal unit current draw*</b>									
Circuit A + B (one power supply)	A	167	185	209	219	251	269	302	334
<b>Maximum unit power input**</b>									
Circuit A + B (one power supply)	kW	127	140	159	166	191	204	229	255
<b>Unit power factor at max. capacity**</b>									
		0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
<b>Maximum unit current draw (Un-10%***)</b>									
Circuit A + B (one power supply)	A	239	263	299	311	359	383	430	478
<b>Max. operating current (Un)****</b>									
Circuit A + B (one power supply)	A	219	241	274	285	329	351	394	438
<b>Max. start-up current, standard unit (Un)†</b>									
Circuit A + B†	A	426	448	481	492	536	558	601	645
<b>Max. start-up current, unit with soft starter (Un)†</b>									
Circuit A + B†	A	356	378	411	433	466	489	521	575

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

\*\* Power input of the compressor(s) + fan(s) at maximum unit operating conditions saturated suction temperature 10°C, saturated condensing temperature 65°C at 400 V nominal voltage (Values given on the unit name plate).

\*\*\* Maximum unit operating current at maximum unit power input and 380 V.

\*\*\*\* Maximum unit operating current at maximum unit power input and 400 V (Values given on the unit name plate).

† Maximum instantaneous starting current at operating limit values (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

Fan motor electrical data: current draw used in the tables above – units at Eurovent conditions and 50°C ambient air temperature around the motor at 400 V: 3.8 A, start-up current 20 A, power input 1.75 kW. These values are indicated on the motor name plate.

### 5.1 - Short-circuit stability current

Short-circuit stability current (TN system)*		262	302	342	372	402	432	462	522
<b>Unit without main disconnect</b>									
<b>With fuses upstream - maximum fuse values assigned</b>									
Circuits A and B	A gL/gG	500	500	500	500	500	630/500	630/500	630/500
<b>With fuses upstream - rms value</b>									
Circuits A and B	kA	70	70	70	70	70	60/70	60/70	60/70
<b>Unit with optional main disconnect without fuse</b>									
<b>Without fuse - short-time current (1s) rms value/peak</b>									
Circuits A and B	kA/kA	13/26	13/26	13/26	13/26	13/26	15/30	15/30	15/30
<b>With fuses upstream - maximum fuse values assigned</b>									
Circuits A and B	gL/gG A	400	400	400	400	400	500	630	630
<b>With fuses upstream - rms value</b>									
Circuits A and B	kA	50	50	50	50	50	50	50	50
<b>Unit with optional main disconnect with fuse</b>									
<b>Short-circuit stability current increased with fuses - maximum fuse values assigned</b>									
Circuits A and B	gL/gG A kA	250	315	315	400	400	400	630	630
<b>Short-circuit stability current increased with fuses - rms value</b>									
Circuits A and B	gL/gG A kA	50	50	50	50	50	50	50	50

\* Type of system earthing

#### IT system:

The short circuit current stability values given above for the TN system are also valid for IT for units 30RQ 302 to 522. For units 30RQ 262 modifications are required.

## 5.2 - Electrical data, hydronic module

30RQ		262	302	342	372	402	432	462	522
<b>Single and dual low-pressure pump</b>									
Shaft power	kW	2.2	3	3	4	4	4	5.5	5.5
Power input*	kW	2.7	3.6	3.6	4.6	4.6	4.6	6.3	6.3
Nominal current draw	A	4.5	6.0	6.0	7.6	7.6	7.6	10.3	10.3
Maximum current draw at 400 V**	A	4.7	6.4	6.4	8.2	8.2	8.2	11.2	11.2
<b>Single and dual high-pressure pump</b>									
Shaft power	kW	4	5.5	5.5	7.5	7.5	7.5	11	11
Power input*	kW	4.7	6.4	6.4	8.5	8.5	8.5	12.2	12.2
Nominal current draw	A	7.6	10.3	10.3	13.9	13.9	13.9	19.5	19.5
Maximum current draw at 400 V**	A	8.2	11.2	11.2	15.2	15.2	15.2	21.2	21.2

**Note:** The water pump power input values are given for guidance only.

\* To obtain the maximum power input for a unit with hydronic module add the maximum unit power input from the electrical data table in section 5 to the pump power input\* in the table above.

\*\* 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 in section 5 to the pump current draw\*\* in the table above.

## 5.3 - Compressor usage and electrical data

Compressor	I Nom	I Max (Un)	I Max (Un-10%)	LRA (Un)	Cosine Phi (max.)	Circuit	262	302	342	372	402	432	462	522
SH240	30	40	44	215	0.86	A	-	3	-	4	-	-	4	-
						B	-	-	-	-	3	-	-	
SH300	38	51	56	260	0.86	A	2	-	3	-	4	4	-	4
						B	2	2	2	2	2	-	4	4

### Legend

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

I Max Maximum operating current at 360 V, A

LRA Locked rotor current, A

## 5.4 - Electric power user reserve

There are only power reserves on the units without hydronic modules. The reserve is the value corresponding to the high pressure pump capacity (see information in the hydronic module data table).

### Control circuit power reserve:

The TC transformer with all possible options connected makes 1A available for 24 V, 50 Hz.

For the same TC transformer the 230 V, 50 Hz circuit with connection ribbon only permits supply to the battery chargers for portable computers, 0.8 A at 230 V maximum.

**IMPORTANT: Only connect doubly-insulated class II apparatus to these ribbons.**

## 6 - APPLICATION DATA

### 6.1 - Unit operating range

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

**Notes:**

Do not exceed the maximum operating temperature.

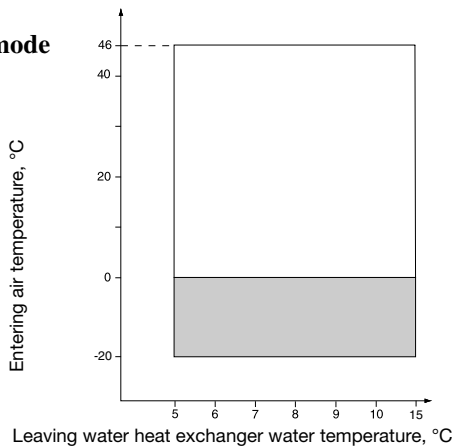
\* For applications requiring a temperature below 6.8°C, please contact Carrier.

\*\* For operation down to -20°C the unit must be equipped with option 28 (winter operation). In addition the unit must either be equipped with the frost protection option or the water loop must be protected by the installer by adding a frost protection solution.

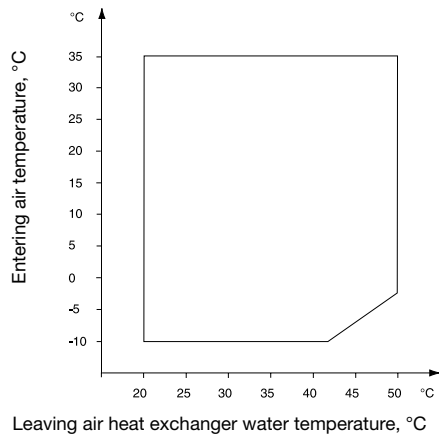
**Maximum outside temperatures:** During storage and transport the minimum and maximum temperatures must not exceed -20°C and +48°C. It is recommended to observe these temperatures during transport by container.

#### Operating range 30RQ

#### Cooling mode



#### Heating mode



**Note:** Water heat exchanger and air heat exchanger  $\Delta T = 5\text{ K}$

**Legend:**

Standard unit operating at full load.

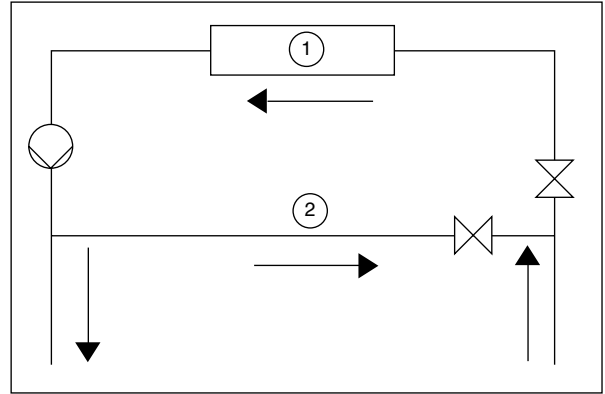
Operating range for units equipped with option 28 "Winter operation": Moreover the unit must either be equipped with the water heat exchanger frost protection option or the water loop must be protected against frost by the installer, using an anti-freeze solution.

**ATTENTION: Option 28 "Winter operation"**

If the outside temperature is below -10°C and the unit has been switched off for more than 4 hours, it is necessary to wait 2 hours after the unit has been switched on again to allow the frequency converter to warm up.

### 6.2 - Minimum chilled water flow (units without hydronic module)

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



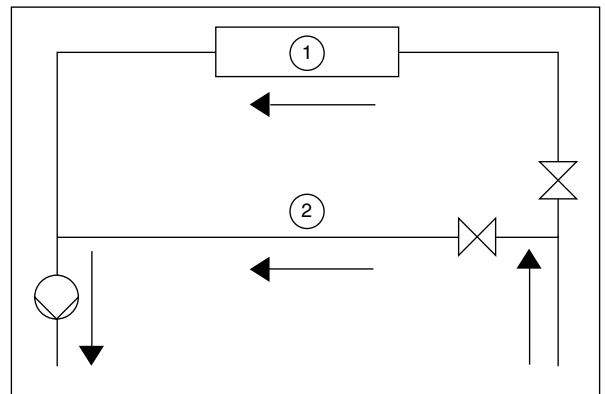
**Legend**

- 1 Water heat exchanger
- 2 Recirculation

### 6.3 - Maximum chilled water flow (units without hydronic module)

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

#### For maximum chilled water flow rate



**Legend**

- 1 Water heat exchanger
- 2 Bypass

## 6.4 - Variable flow water heat exchanger

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

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

## 6.5 - Minimum system water volume

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

$$\text{Capacity} = \text{Cap (kW)} \times \text{N Litres}$$

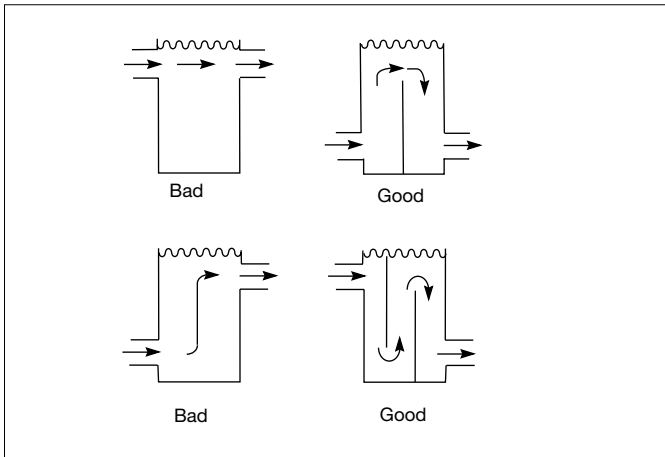
Application	N
Normal air conditioning	2.5
Process type cooling	6.5

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

This volume is necessary for stable operation.

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

### Connection to a buffer tank



## 6.6 - Maximum system water volume

Units with hydronic module incorporate an expansion tank that limits the water volume. The table below gives the maximum loop volume for pure water or ethylene glycol with various system concentrations, as well as the static pressures. If the maximum volume is insufficient, compared to the minimum system water loop volume, an additional expansion tank must be added to the system.

### Maximum water loop volume, litres

30RQ	262			302-522				
	Static pressure	bar	1	2	2.5	1	2	2.5
Pure water			2400	1600	1200	3960	2640	1980
EG 10%			1800	1200	900	2940	1960	1470
EG 20%			1320	880	660	2100	1400	1050
EG 30%			1080	720	540	1740	1160	870
EG 40%			900	600	450	1500	1000	750

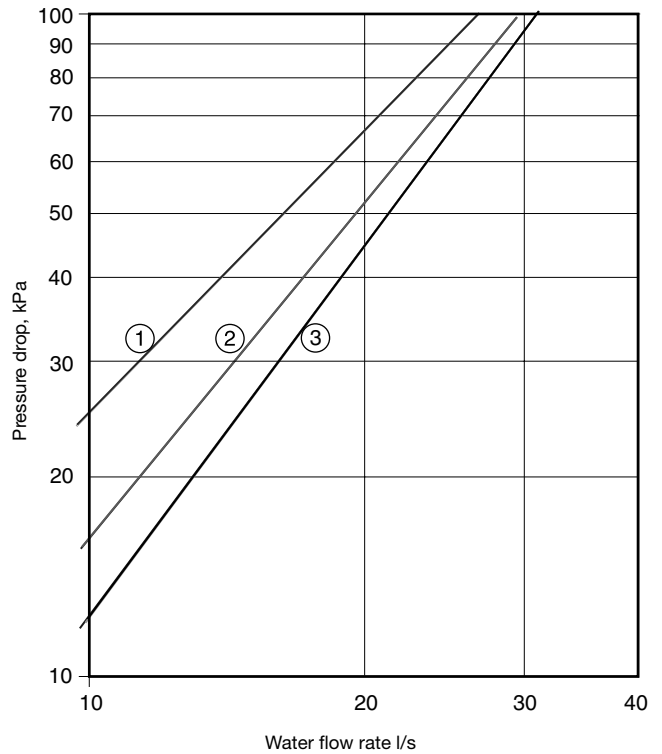
EG - Ethylene glycol

## 6.7 - Water heat exchanger flow rate

30RQ	Water flow rate, l/s	
	Minimum	Maximum*
262	3.5	26.7
302	3.9	26.7
342	4.4	29.4
372	4.9	31.1
402	5.2	31.1
432	5.8	31.1
462	6.1	31.1
522	6.9	31.1

\* The maximum flow rate corresponds to a pressure loss of 100 kPa (heat exchanger without hydronic module).

### Water heat exchanger pressure drop curves, standard units



#### Legend

- 1 30RQ 262-302
- 2 30RQ 342
- 3 30RQ 372-522

## 7 - ELECTRICAL CONNECTION

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

### 7.1 - Power supply

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

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

### 7.2 - Voltage phase imbalance (%)

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

#### Example:

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

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

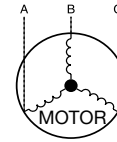
$$\begin{aligned} \text{Average voltage} &= (406 + 399 + 394)/3 = 1199/3 \\ &= 399.7 \text{ say } 400 \text{ V} \end{aligned}$$

Calculate the maximum deviation from the 400 V average:

$$(AB) = 406 - 400 = 6$$

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

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



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

$$100 \times 6/400 = 1.5 \%$$

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

### 7.3 - Power connection/disconnect switch

	Connection points	Disconnect switch	Disconnect switch fuse
<b>Standard unit</b>			
30RQ 262-522	1	-	-
<b>Unit with option 70</b>			
30RQ 262-522	1	X	-
<b>Unit with option 70D</b>			
30RQ 262-522	1	X	X

#### Electrical data notes for 30RQ units:

- The control box includes the following standard features:
  - Starter and motor protection devices for each compressor and the fan(s)
  - Control devices
- Field connections:**  
All connections to the system and the electrical installations must be in full accordance with all applicable local codes.
- The Carrier 30RQ units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60 204-1 (corresponds to IEC 60204-1) (machine safety - electrical machine components - part 1: general regulations) are specifically taken into account, when designing the electrical equipment.
- Electrical reserves:**  
Circuit A has disconnect switches and branch sections, designed to supply the water heat exchanger pump power input.

#### IMPORTANT:

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60 204 is the best means of ensuring compliance with the Machines Directive § 1.5.1.
  - Annex B of EN 60204-1 describes the electrical characteristics used for the operation of the machines.
- The operating environment for the 30RQ units is specified below:
    - Environment\* - Environment as classified in EN 60721 (corresponds to IEC 60721):
      - outdoor installation\*
      - ambient temperature range: -20°C to +48°C, class 4K3\*
      - altitude: ≤ 2000 m
      - presence of hard solids, class 4S2 (no significant dust present)
      - presence of corrosive and polluting substances, class 4C2 (negligible)
      - vibration and shock, class 4M2
    - Competence of personnel, class BA4\* (trained personnel - IEC 60364)

- Power supply frequency variation: ± 2 Hz.
- The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
- Overcurrent protection of the power supply conductors is not provided with the unit.
- The factory-installed disconnect switch/circuit breaker is of a type suitable for power interruption in accordance with EN 60947-3 (corresponds to IEC 60947-3).
- The units are designed for simplified connection on TN(s) networks (IEC 60364). For IT networks derived currents may interfere with network monitoring elements, and it is recommended to create an IT type divider for the system units that require this and/or a TN type divider for Carrier units. Please consult the appropriate local organisations to define the monitoring and protection elements and to complete the electrical installation.
- 30RQ units comply with the requirements of general standard EN 61000-6-3 (residential, commercial and light industrial applications).

**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 IP43B (according to reference document IEC 60529). All 30RQ units are protected to IP44CW and fulfil this protection condition.

## 7.4 - Recommended wire sections

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

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

The calculations are based on the maximum machine current (see electrical data tables).

For the accessory system the following standardised installation methods are used, in accordance with IEC 60364, table 52C:

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

The calculation is based on PVC or XLPE insulated cables with copper or aluminium core. The maximum temperature is 48°C. The given wire length limits the voltage drop to < 5%.

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

**The current values used are given for a unit equipped with a hydronic kit operating at maximum current.**

### 7.4.1 - Power cable entry

The power cables can enter the 30RQ control box from below or from the unit side.

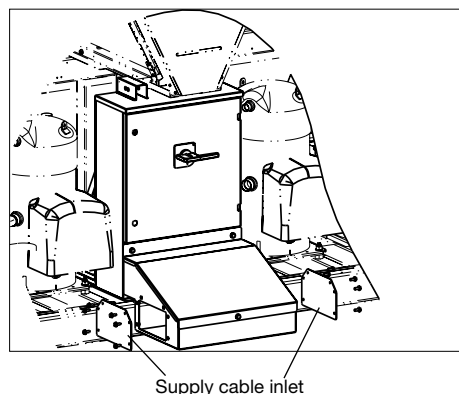
1. Unit raised from the ground (e.g. installation on support rails): It is recommended to enter the power cables from below the control box. A removable aluminium plate below the control box allows introduction of the cables.
2. Unit placed on the ground (e.g.on a concrete base): It is recommended to enter the power cables from the control box side. An aluminium plate on the control box face allows introduction of the cables.

It is important to check that the power cable bend radius is compatible with the connection space available in the control box. Refer to the certified dimensional drawing for the unit.

### 7.4.2 - Connection extension box

This accessory permits stripping the power cables before they enter the control box, and it must be used when the cable bend radius is not compatible with the connection space available in the control box. The accessory connection extension box ensures mechanical protection of the stripped cable, before it enters the control box. It must be used in the following cases:

- Unit placed on the ground and use of power cables with protective metallic armour.
- Unit placed on the ground and use of power cables with a section > 250 mm<sup>2</sup>.



## 7.5 - Field control wiring

Refer to the 30RB/RQ Pro-Dialog Plus Controls IOM and the certified wiring diagram supplied with the unit for the field control wiring of the following features:

- Customer interlock (safety chain)
- Water heat exchanger pump interlock (mandatory)
- Remote on/off switch
- Remote heat/cool switch
- Demand limit external switch 1
- Remote dual set point
- Alarm report by circuit
- Water heat exchanger pump control
- Remote set point reset or outside air temperature sensor reset (0-10 V)
- Various interlocks on the Energy Management Module (EMM) board (accessory or option)

## 7.6 - Power supply

After the unit has been commissioned, the power supply must only be disconnected for quick maintenance operations (one day maximum). For longer maintenance operations or when the unit is taken out of service and stored (e.g. during the winter or if the unit does not need to generate cooling) the power supply must be maintained to ensure supply to the compressor oil crankcase heaters.

**Table of minimum and maximum wire sections for connection to 30RQ units**

30RQ	Max. connectable section	Min. wire section			Max. wire section		
	Section (mm <sup>2</sup> )	Section (mm <sup>2</sup> )	Max. length (m)	Wire type	Section (mm <sup>2</sup> )	Max. length (m)	Wire type
262	1 x 240 or 2 x 150	1 x 95	178	XLPE Cu	2 x 95	260	XLPE AI
302	2 x 240	1 x 120	197	XLPE Cu	2 x 120	280	XLPE AI
342	2 x 240	1 x 120	185	XLPE Cu	2 x 150	300	XLPE AI
372	2 x 240	1 x 150	188	XLPE Cu	2 x 185	315	XLPE AI
402	2 x 240	1 x 185	190	XLPE Cu	2 x 240	330	XLPE AI
432	3 x 240	1 x 185	190	XLPE Cu	2 x 240	330	XLPE AI
462	3 x 240	1 x 240	205	XLPE Cu	3 x 185	395	XLPE AI
522	3 x 240	2 x 95	190	XLPE Cu	3 x 240	415	XLPE AI

**NOTE:** The current values used are given for a unit equipped with a hydronic kit operating at maximum current.



## 8 - WATER CONNECTIONS

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

The piping must not in any way lead to mechanical constraints on the heat exchangers.

### 8.1 - Operating precautions

#### 8.1.1 - General

The fluid to be cooled (often water) must meet the criteria below.

The hydraulic circuit must be equipped with filters, purges, vents and unit shut-off valves.

The essential points to verify are:

- Comply with the water inlet and outlet connections shown on the unit.
- Install manual or automatic air purge valves at all high points in the circuit.
- Use an expansion device to maintain pressure in the circuit.
- Install a safety valve as well as an expansion tank (included with the hydronic module option).
- Install thermometers in both the entering and leaving water connections (recommendation).
- Install drain connections at all low points to allow the whole circuit to be drained.
- Install stop valves, close to the entering and leaving water connections.
- Use flexible connections to reduce the transmission of vibrations.
- Insulate all pipework, after testing for leaks to prevent condensation.
- A screen filter must be installed in the water circuit (included with the hydronic module option). The mesh size of the filter must be 1.2 mm (see 'Typical water circuit' diagram on the right).
- Before the system start-up verify that the water circuits are connected to the appropriate heat exchangers.
- Do not introduce any significant static or dynamic pressure into the heat exchange circuit (with regard to the design operating pressures).
- Before any start-up verify that the heat exchange fluid is compatible with the materials and the water circuit coating.
- In case additives or other fluids than those recommended by Carrier are used, ensure that the fluids are not considered as a gas, and that they belong to class 2, as defined in directive 97/23/EC.

#### 8.1.2 - Carrier recommendations on heat exchange fluids

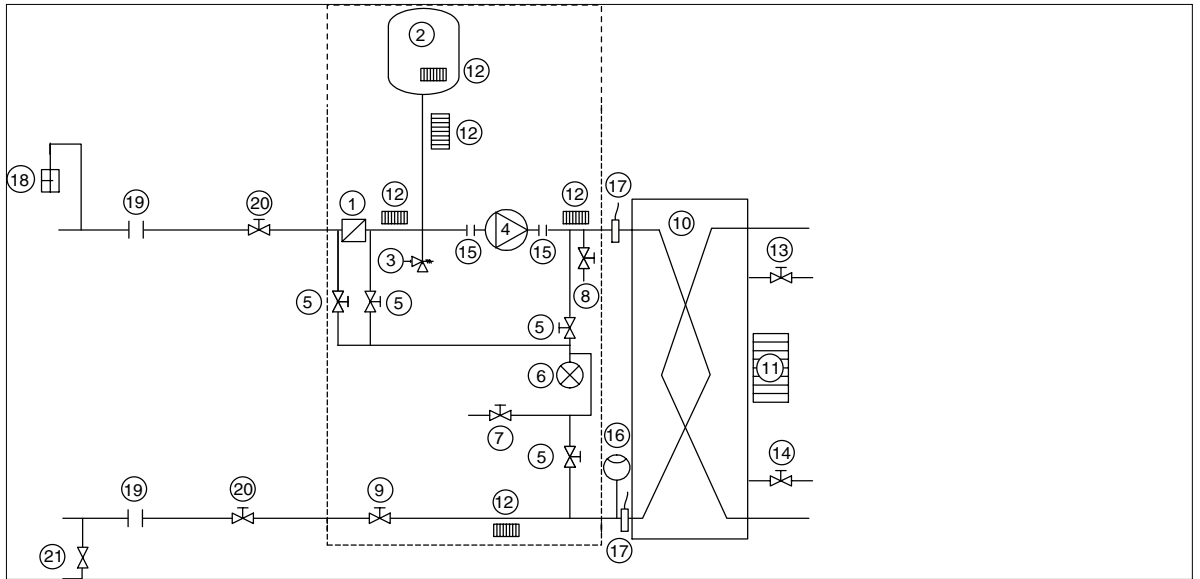
The water supply must be analysed and appropriate filtering, treatment and control devices built in to suit the application and prevent corrosion, fouling and deterioration of the pump fittings.

Consult either a water treatment specialist or appropriate literature on the subject.

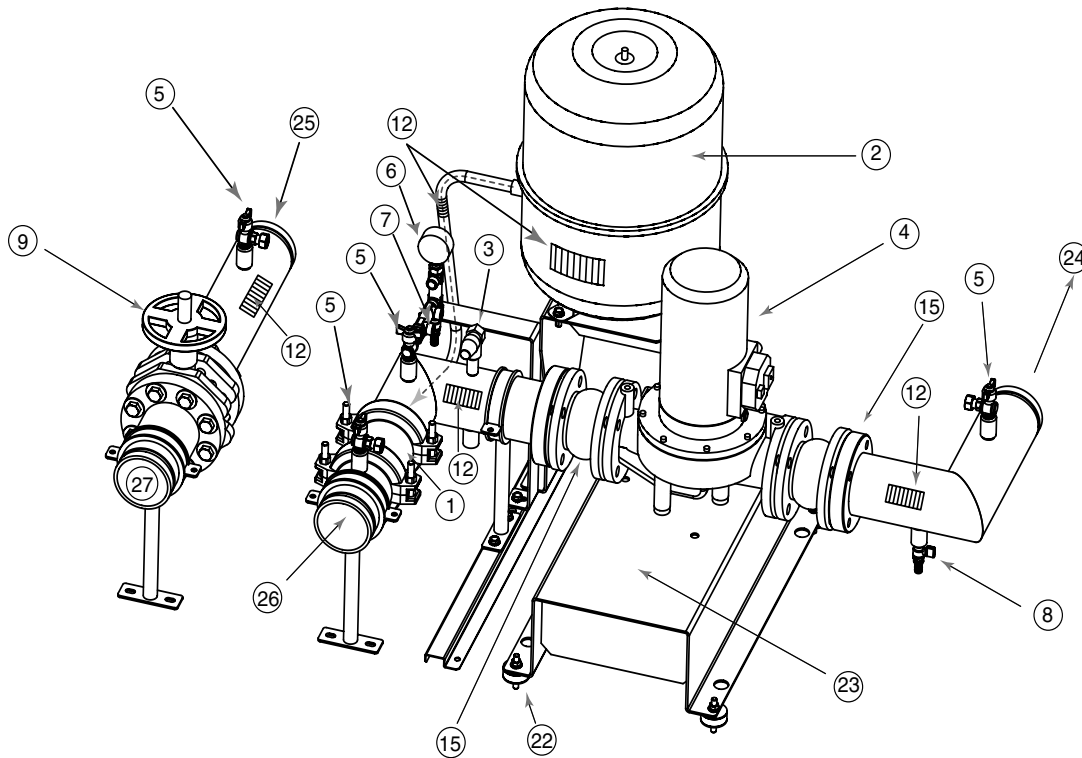
1. No  $\text{NH}_4^+$  ammonium ions in the water, they are very detrimental for copper. This is one of the most important factors for the operating life of copper piping. A content of several tenths of mg/l will badly corrode the copper over time. If required, use sacrificial anodes.
2.  $\text{Cl}^-$  Chloride ions are also detrimental for copper with a risk of perforations by corrosion by puncture. If possible keep at a level below 10 mg/l.
3.  $\text{SO}_4^{2-}$  sulphate ions can cause perforating corrosion, if their content is above 30 mg/l.
4. No fluoride ions (<0.1 mg/l).
5. No  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  ions with non negligible levels of dissolved oxygen must be present. Dissolved iron < 5 mg/l with dissolved oxygen < 5 mg/l.
6. Dissolved silicon: silicon is an acid element of water and can also lead to corrosion risks. Content < 1mg/l.
7. Water hardness: TH >5 °F. Values between 10 and 25 can be recommended. This will facilitate scale deposit that can limit corrosion of copper. TH values that are too high can cause piping blockage over time. A total alkalimetric titre (TAC) below 100 is desirable.
8. Dissolved oxygen: Any sudden change in water oxygenation conditions must be avoided. It is as detrimental to deoxygenate the water by mixing it with inert gas as it is to over-oxygenate it by mixing it with pure oxygen. The disturbance of the oxygenation conditions encourages destabilisation of copper hydroxides and enlargement of particles.
9. Specific resistance – electric conductivity: the higher the specific resistance, the slower the corrosion tendency. Values above 3000 Ohm/cm are desirable. A neutral environment favours maximum specific resistance values. For electric conductivity values in the order of 200-6000 S/cm can be recommended.
10. **pH: Ideal case pH neutral at 20-25°C**  
**7 < pH < 8**
  - If the water circuit must be emptied for longer than one month, the complete circuit must be placed under nitrogen charge to avoid any risk of corrosion by differential aeration.
  - Charging and removing heat exchange fluids should be done with devices that must be included on the water circuit by the installer. Never use the unit heat exchangers to add heat exchange fluid.

## 8.2 - Hydronic connections

### 8.2.1 - Unit equipped with hydronic module option



This diagram illustrates a typical hydronic installation.



#### Legend

##### Components of the unit and hydronic module

- 1 Victaulic screen filter
- 2 Expansion tank
- 3 Safety valve
- 4 Available pressure pump
- 5 Pressure tap
- 6 Pressure gauge to measure the component pressure drop
- 7 Pressure gauge system drain valve
- 8 Drain valve
- 9 Flow control valve
- 10 Heat exchanger
- 11 Water heat exchanger defrost heater
- 12 Hydronic module defrost heater
- 13 Air vent (water heat exchanger)
- 14 Water drain (water heat exchanger)
- 15 Expansion compensator (flexible connections)
- 16 Flow switch
- 17 Water temperature

##### Installation components

- 18 Air vent
- 19 Flexible connection
- 20 Check valve
- 21 Charge valve
- 22 Anti-vibration mounting
- 23 Pump support
- 24 Water heat exchanger inlet
- 25 Water heat exchanger outlet
- 26 Customer water inlet connection
- 27 Customer water outlet connection

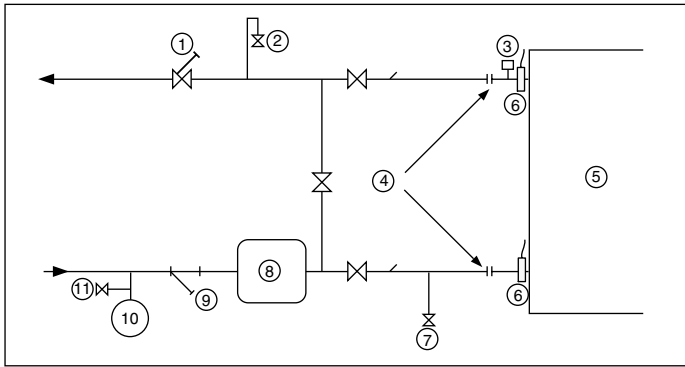
--- Hydronic module (unit with hydronic module)

##### Note:

- The system is protected against frost (anti-freeze solution or electric heater).
- The hydronic module is protected against frost by electric heaters (item 12).
- The unit water heat exchanger is protected against frost by a factory-installed electric heater ('water heat exchanger frost protection' option)

## 8.2.2 - Unit without hydronic module option

### Typical water circuit diagram - without hydronic module



#### Legend

- 1 Control valve
- 2 Air vent
- 3 Flow switch for the water heat exchanger (supplied)
- 4 Flexible connection
- 5 Heat exchanger
- 6 Temperature sensor (supplied)
- 7 Drain
- 8 Buffer tank (if needed)
- 9 Filter (mesh size: 1.2 mm = 20 mesh)
- 10 Expansion tank
- 11 Fill valve

## 8.3 - Flow control

All units are equipped with a factory-set flow switch, as standard. The unit must be interlocked with the chilled-water pump, if the unit is not equipped with the hydronic option module.

Terminals 34 and 35 are provided for field installation of the chilled water pump interlock (auxiliary contact for pump operation to be wired on site).

## 8.4 - Frost protection

The standard unit does not include any particular frost protection when it has shut down. It is therefore essential to check that there is no risk of the water in the hydronic circuit freezing during winter temperature conditions. If this may be the case it is essential to add an appropriate anti-freeze solution to protect the hydronic circuit down to the minimum temperature minus 10 K.

Another solution consists of draining the hydronic circuits exposed to temperatures below 0°C. If the unit is not used for an extended period, protect it by circulating a protective solution. Please consult a specialist.

A third solution is to order the 'water heat exchanger frost protection' option (factory-installed - an electric heater on the water heat exchanger).

Anti-freeze solutions and heaters can be combined. If the hydronic module option is installed, frost protection of this module is included (electric heater).

If protection by electric heater is used, do not switch off the power supply to the unit.

**IMPORTANT: The main unit disconnect switch, the auxiliary heater protection switch as well as the control circuit switch must always remain closed (to locate the components, please refer to the wiring diagram).**

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

For this type of operation the 'Twinning' option must be ordered. The units supplied are then equipped with an additional sensor connected to the electronic board and located in the control box. This sensor must be used when master/slave assembly control at the water outlet is used (it is not required for entering water control).

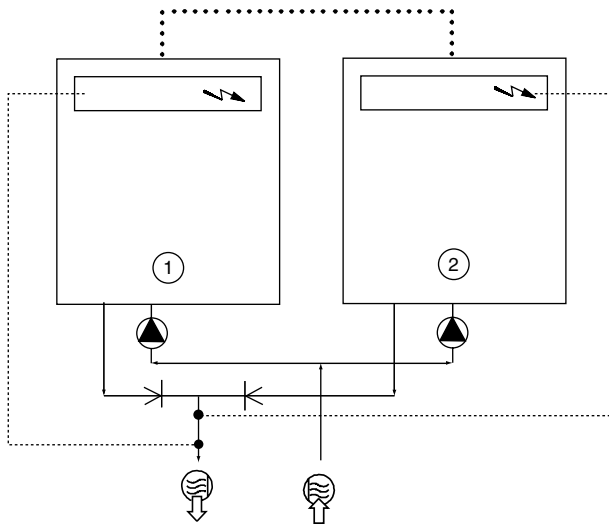
The customer must connect the two units via a communication bus (0.75 mm<sup>2</sup>, twisted and shielded). Consult the 30RB/RQ Pro-Dialog Plus control manual for the connection addresses.

Master/slave operation is only possible, when the units are installed in parallel. It is not possible, if the units are installed in series.

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

Each unit controls its own water pump. If there is only one common pump, in cases with variable flow, isolation valves must be installed on each unit. They will be activated at the opening and closing by the control of each unit (in this case the valves are controlled using the dedicated water pump outputs). See the 30RB/RQ Pro-Dialog Plus Control IOM for a more detailed explanation.

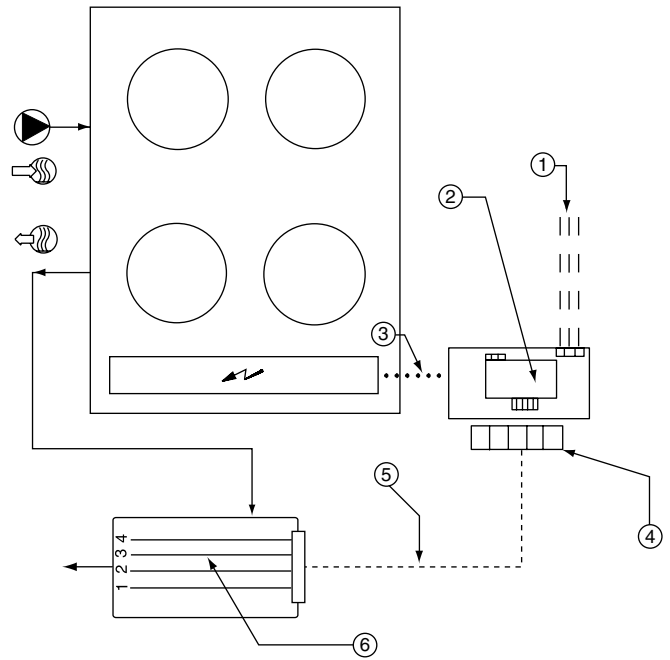
### 30RQ with configuration: leaving water control



#### Legend

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

### Typical accessory installation diagram



#### Legend

- 1 Electric heater power supply 400 V-3 ph-50 Hz
- 2 Accessory control board for four additional electric heaters
- 3 Internal communication bus
- 4 Heater stage control contactors
- 5 Power supply for additional heaters
- 6 Supplementary electric resistance heaters

### 8.6 - Supplementary electric resistance heaters

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

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

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

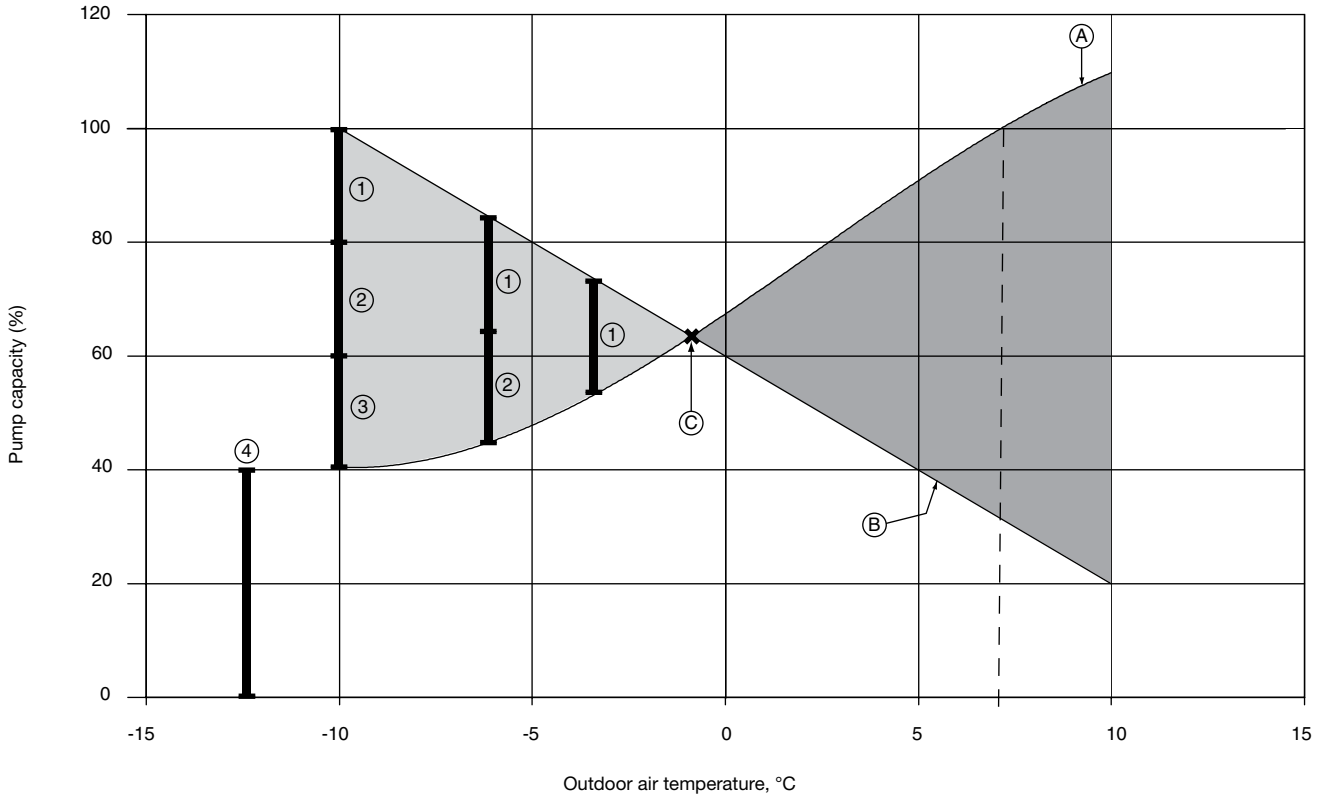
These outputs are configurable to obtain a choice of two, three or four stages. The last stage will only be activated after a shut-down of the heat pump following a fault condition (safety device).

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

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

For the required configuration of the stages consult the 30RB/RQ Pro-Dialog Plus Control IOM.

### Example of additional electric heaters



**Legend**

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

## 9 - NOMINAL SYSTEM WATER FLOW CONTROL

The water circulation pumps of the 30RQ units have been sized to allow the hydronic modules to cover all possible configurations based on the specific installation conditions, i.e. for various temperature differences between the entering and the leaving water ( $\Delta T$ ) at full load, which can vary between 3 and 10°C.

This required difference between the entering and leaving water temperature determines the nominal system flow rate. It is above all absolutely necessary to know the nominal system flow rate to allow its control via a manual valve provided in the water leaving piping of the module (item 9 in the typical hydronic circuit diagram).

With the pressure loss generated by the control valve in the hydronic system, the valve is able to impose the system pressure/flow curve on the pump pressure/flow curve, to obtain the desired operating point. The pressure drop reading in the heat exchanger is used to control and adjust the nominal system flow rate.

Use this specification for the unit selection to know the system operating conditions and to deduce the nominal air flow as well as the heat exchanger pressure drop at the specified conditions. If this information is not available at the system start-up, contact the technical service department responsible for the installation to get it.

These characteristics can be obtained from the technical literature using the unit performance tables for a  $\Delta T$  of 5 K at the water heat exchanger or with the Electronic Catalogue selection program for all  $\Delta T$  conditions other than 5 K in the range of 3 to 10 K.

### 9.1 - Water flow control procedure

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

#### Proceed as follows:

Open the valve fully (approximately 22 turns counter-clockwise).

Start-up the pump using the forced start command (refer to the controls manual) and let the pump run for two consecutive hours to clean the hydronic circuit of the system (presence of solid contaminants).

Read the filter pressure drop by taking the difference of the readings of the pressure gauge connected to the filter inlet and outlet, using valves (see typical hydronic circuit diagrams), and comparing this value after two hours of operation.

If the pressure drop has increased, this indicates that the screen filter must be removed and cleaned, as the hydronic circuit contains solid particles. In this case close the shutoff valves at the water inlet and outlet and remove the screen filter after emptying the hydronic section of the unit.

Renew, if necessary, to ensure that the filter is not contaminated. Purge the air from the circuit using the purge valves in the hydronic circuit and the system (see typical hydronic circuit diagram).

When the circuit is cleaned, read the pressures at the pressure gauge (entering water pressure - leaving water pressure), expressed in bar and convert this value to kPa (multiply by 100) to find out the water heat exchanger pressure drop.

Compare the value obtained with the theoretical selection value.

It is essential to carry out systematic filter cleaning at the initial start-up, as well as after any modification in the hydronic circuit.

**ATTENTION: It is essential to keep the pressure gauge purge valve open after measuring the pressure (risk of freezing during winter).**

If the pressure drop measured is higher than the value specified this means that the flow rate in the water heat exchanger (and thus in the system) is too high. The pump supplies an excessive flow rate based on the global pressure drop of the application. In this case close the control valve one turn and read the new pressure difference.

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

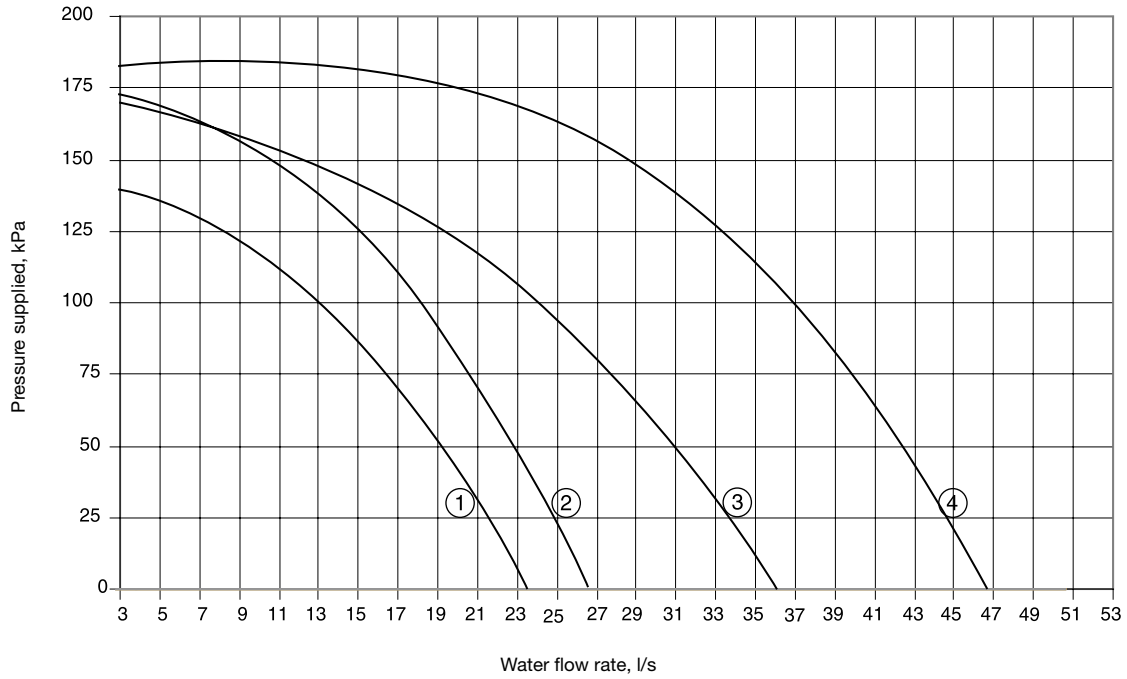
- If the system has an excessive pressure drop in relation to the available static pressure provided by the pump, the resulting water flow rate will be reduced and the difference between entering and leaving water temperature of the hydronic module will be increased.

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

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

## 9.2 - Pump pressure/flow rate curves

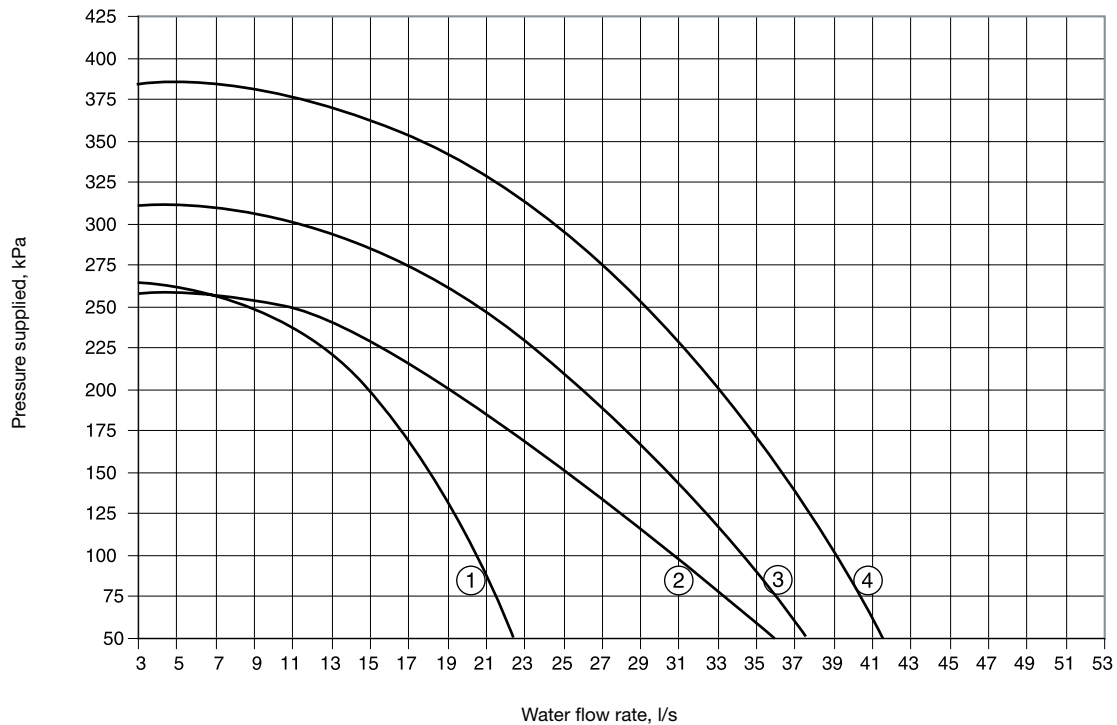
### Low-pressure pumps



#### Legend

- 1 30RQ 262
- 2 30RQ 302-342
- 3 30RQ 372-402-432
- 4 30RQ 462-522

### High-pressure pumps

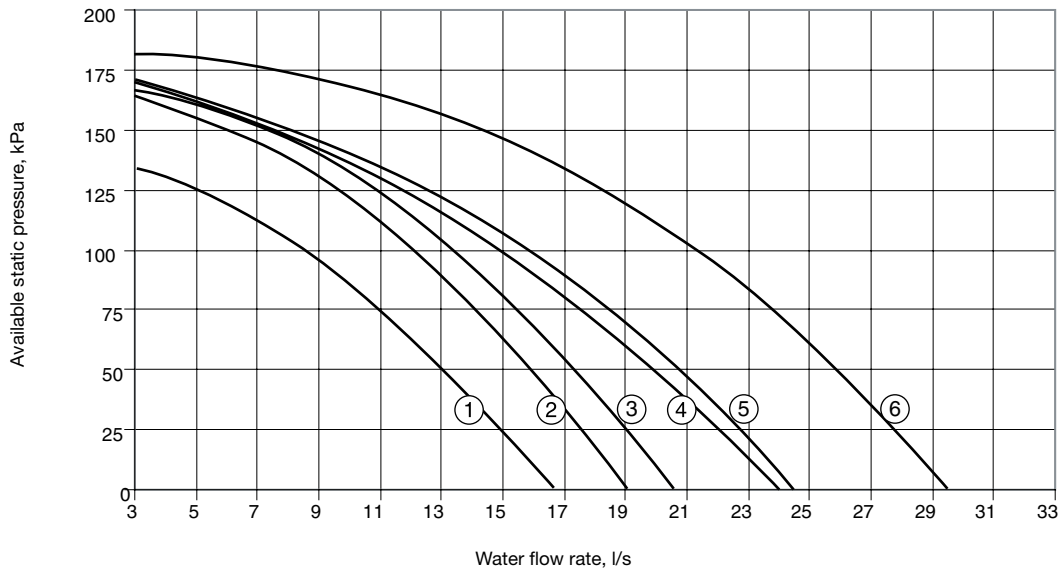


#### Legend

- 1 30RQ 262
- 2 30RQ 302-342
- 3 30RQ 372-402-432
- 4 30RQ 462-522

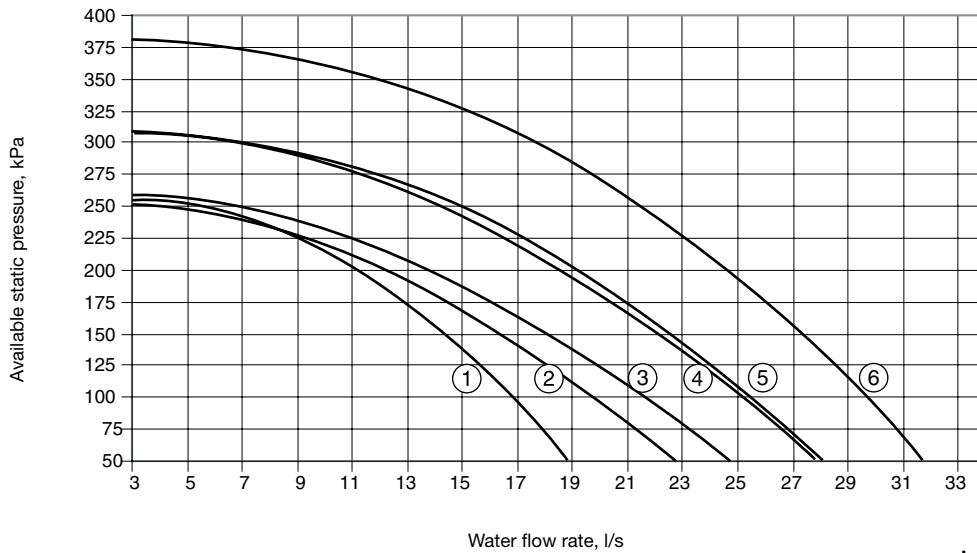
### 9.3 - Available static system pressure

#### Low-pressure pumps



- Legend**
- 1 30RQ 262
  - 2 30RQ 302
  - 3 30RQ 342
  - 4 30RQ 372
  - 5 30RQ 402-432
  - 6 30RQ 462-522

#### High-pressure pumps



- Legend**
- 1 30RQ 262
  - 2 30RQ 302
  - 3 30RQ 342
  - 4 30RQ 372
  - 5 30RQ 402-432
  - 6 30RQ 462-522



## 10 - MAJOR SYSTEM COMPONENTS

### 10.1 - Compressors

30RQ units use hermetic scroll compressors.

Each compressor is equipped with a crankcase oil heater, as standard, complete with a safety device that prevents compressor start-up if there is a fault at the heater.

As standard, each compressor is equipped with a discharge valve. As an option each compressor can be equipped with a suction valve (option No. 92).

Each compressor sub-function is equipped with:

- Anti-vibration mountings between the unit chassis and the chassis of the compressor sub-function.
- Suction piping equipped with openings (not visible) to ensure an even oil level between all compressors.
- A non-return valve at the discharge of all compressors.
- A pressure safety switch at the discharge of all compressors, located between the compressor and the valve.

### 10.2 - Lubricant

The compressors installed in these units have an oil charge of 6.7 l to ensure their correct operation.

The oil level check must be done with the unit switched off, when then suction and discharge pressures are equalised. The oil level must not be visible in the sight glass (level below the sight glass). If this is not the case, there is an oil leak in the circuit. Search and repair the leak, then recharge oil, so that it reaches a high sight glass level, when the unit is recharged with refrigerant. The refrigerant dissolved in the oil raises the level - do not add any more oil.

**ATTENTION:** *Too much oil in the circuit can cause a unit defect.*

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

**CAUTION:** *R22 oils are absolutely not compatible with R410A oils and vice versa.*

### 10.3 - Air heat exchangers (condensers in cooling mode, evaporators in heating mode)

The 30RQ air heat exchangers are air-cooled condensers in cooling mode with integrated sub-coolers and internally finned copper tubes with aluminium fins.

### 10.4 - Fans

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

### 10.5 - Electronic expansion valve (EXV)

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

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

### 10.6 - Moisture indicator

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

### 10.7 - Refrigerant storage tank with integrated filter drier

This component has three system functions. It permits storing the excess refrigerant in the heating mode of heat pumps. The optimised maximum unit charge volume for 30RQ units is determined in the cooling mode (see physical data table).

The refrigerant storage tank prevents flooding of the shell-and-tube heat exchanger in the heating mode.

A metallic filter and a removable dehydrating filter element keep the refrigerant circuit dry and clean by retaining solid polluting particles.

The moisture indicator integrated into the EXV indicates when it is necessary to change the removable filter element.

### 10.8 - Water heat exchanger

The water heat exchanger is a shell-and-tube type with two refrigerant circuits. It has been tested and stamped in accordance with applicable pressure codes for a maximum operating pressure of 4500 kPa refrigerant-side and 1000 kPa water-side. The seamless copper tubes are finned on the refrigerant side and expanded into the tube sheets. The water connection of the heat exchanger is a Victaulic connection.

The heat exchanger has a thermal insulation of 19 mm thick rubber foam, and is equipped with a water drain and purge. An option with an aluminium jacket is also available.

As an option the heat exchanger is available with frost protection ('water heat exchanger frost protection' option).

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

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

- Follow the regulations on monitoring pressurised equipment.
- It is normally required that the user or operator sets up and maintains a monitoring and maintenance file.
- Follow the control programmes of EN 378-2, annexes A, B, C and D.
- If they exist follow local professional recommendations.
- Regularly inspect the condition of the coating (paint) to detect blistering resulting from corrosion. To do this, check a non-insulated section of the container or the rust formation at the insulation joints.
- Regularly check for possible presence of impurities (e.g. silicon grains) in the heat exchange fluids. These impurities maybe the cause of the wear or corrosion by puncture.
- Filter the heat exchange fluid check and carry out internal inspections as described in EN 378-2, annex C.
- In case of re-testing take possible maximum pressure differences, as indicated in (2) above into consideration.
- The reports of periodical checks by the user or operator must be included in the supervision and maintenance file.

**Repair**

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

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

**Recycling**

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

**Operating life**

This unit is designed for:

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

**Excess corrosion thickness**

Gas side: 0 mm

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

**10.9 - Refrigerant**

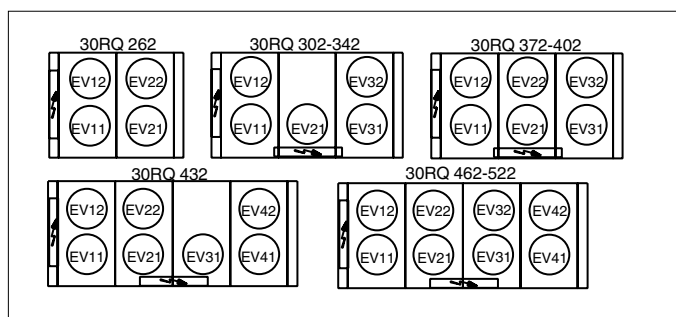
30RQ units operate with refrigerant R-410A.

**10.10 - High-pressure safety switch**

30RQ units are equipped with high-pressure safety switches, calibrated to 4170 kPa.

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

**10.11 - Fan arrangements**



**10.12 - Fan stages**

Standard unit 30RQ		Stage 1	Stage 2	Stage 3	Stage 4	Option 28 Variable on
262	Circuit A	EV11	EV11 + EV12			EV11
	Circuit B	EV21	EV21 + EV22			EV21
302-342	Circuit A	EV11	EV11 + EV21	EV11 + EV21 + EV12		EV11
	Circuit B	EV31	EV31 + EV32			EV31
372-402	Circuit A	EV11	EV11 + EV21	EV11 + EV21 + EV12	EV11 + EV21 + EV12 + EV22	EV11
	Circuit B	EV31	EV31 + EV32			EV31
432	Circuit A	EV11	EV11 + EV21	EV11 + EV21 + EV12	EV11 + EV21 + EV12 + EV22	EV11
	Circuit B	EV41	EV41 + EV31	EV41 + EV31 + EV42		EV41
462-522	Circuit A	EV11	EV11 + EV21	EV11 + EV21 + EV12	EV11 + EV21 + EV12 + EV22	EV11
	Circuit B	EV31	EV31 + EV41	EV31 + EV41 + EV32	EV31 + EV41 + EV32 + EV42	EV31

## 11 - OPTIONS AND ACCESSOIRES

### 11.1 - Heat reclaim option using desuperheaters

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

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

The control configuration for the desuperheater option is factory assembled (see chapter 11.1.6 - Control configuration).

#### 11.1.1 - Physical data, 30RQ units with desuperheater option

30RQ option No. 49		262	302	342	372	402	432	462	522
Cooling capacity*	kW	249	275	307	326	366	389	430	465
Heating capacity, reclaimed at the desuperheater in cooling mode	kW	77	84	95	100	113	119	131	145
Unit power input*		97	103	120	124	142	145	161	187
Energy efficiency ratio*	kW	2,58	2,68	2,55	2,63	2,58	2,68	2,68	2,49
Heating capacity, condenser + desuperheater in cooling mode**	kW/kW	276	302	335	366	407	445	505	552
<b>Operating weight***</b>									
Standard unit + desuperheater option	kg	2510	3140	3330	3340	3560	4140	4300	4520
Unit with Euro Pack + desuperheater option	kg	2700	3380	3570	3650	3820	4440	4530	4830
Unit with Euro Pack + desuperheater + hydronic module options with high-pressure dual pump	kg	2890	3580	3780	3870	4040	4650	4770	5110
<b>Desuperheater in circuits A/B</b>		Plate heat exchangers							
Water volume circuit A	l	3,75	5,5	5,5	7,5	7,5	7,5	7,5	7,5
Water volume circuit B	l	3,75	3,75	3,75	3,5	3,5	5,5	7,5	7,5
Max. water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000
<b>Water connections</b>		Cylindrical, male gas thread							
Connection	in	2	2	2	2	2	2	2	2
Outside diameter	mm	60,3	60,3	60,3	60,3	60,3	60,3	60,3	60,3

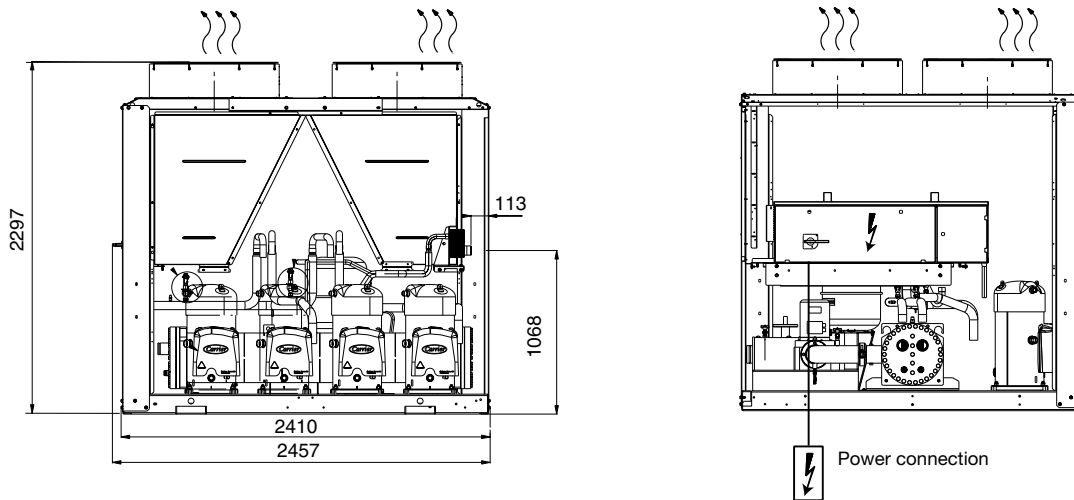
\* Nominal conditions:  
Evaporator entering and leaving water temperature = 12°C/7°C  
Desuperheater entering and leaving water temperature = 50°C/60°C  
Outside air temperature = 35°C

\*\* Nominal conditions  
Condenser entering and leaving water temperature = 40°C/ 45°C  
Desuperheater entering and leaving water temperature = 50°C / 60°C  
Outside air temperature = 7 °C, rh = 87 %

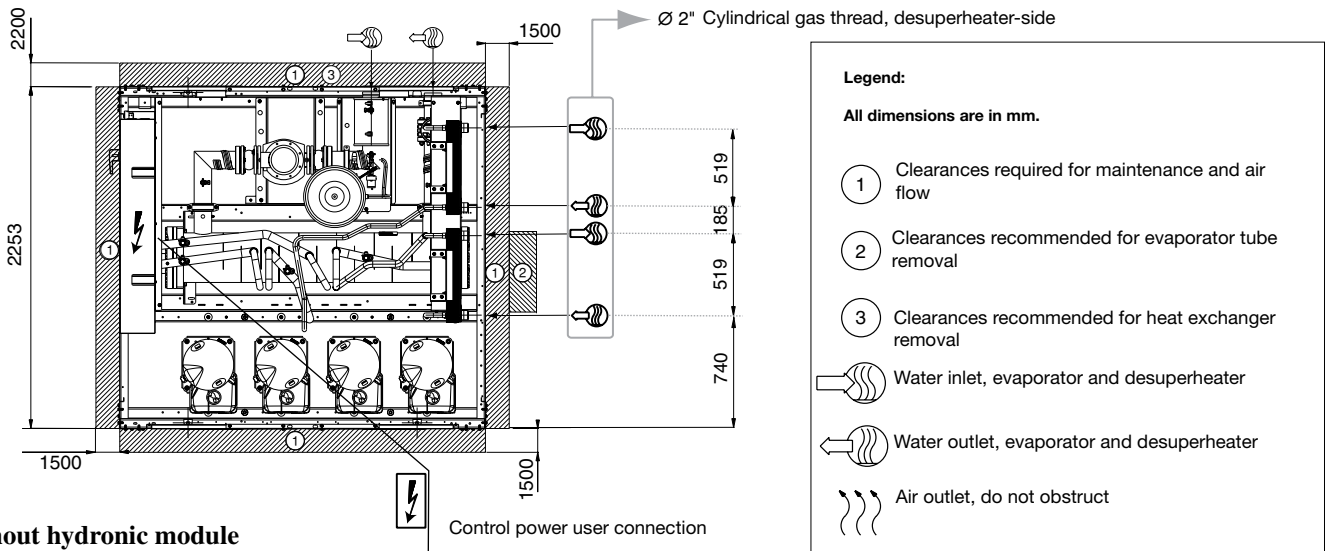
\*\*\* Weights shown are a guideline only

## 11.1.2 - Dimensional drawings for units equipped with the desuperheater option

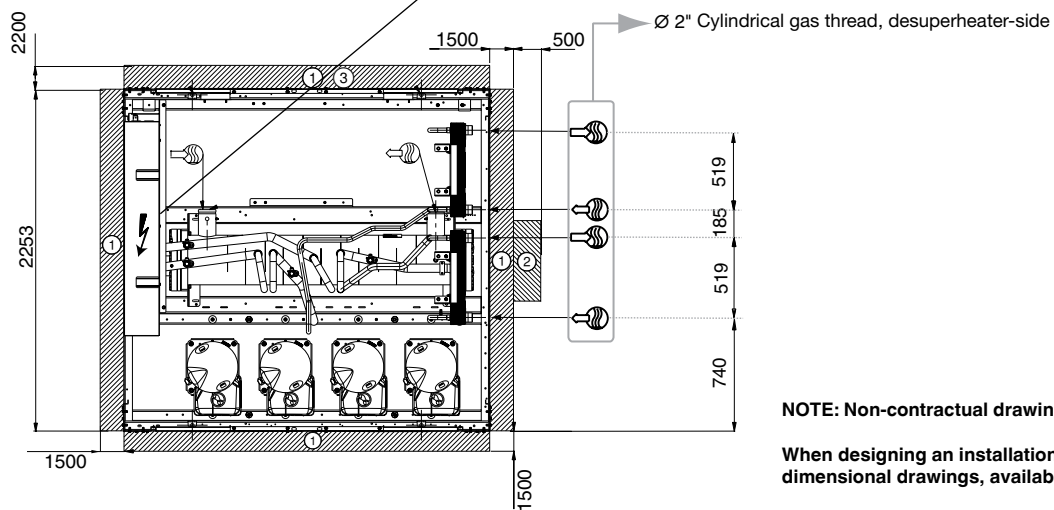
30RQ 262



### Unit with hydronic module



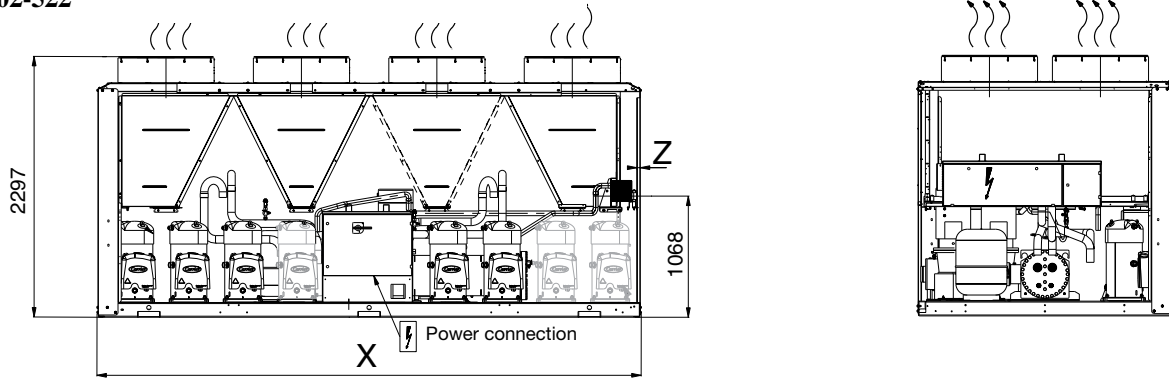
### Unit without hydronic module



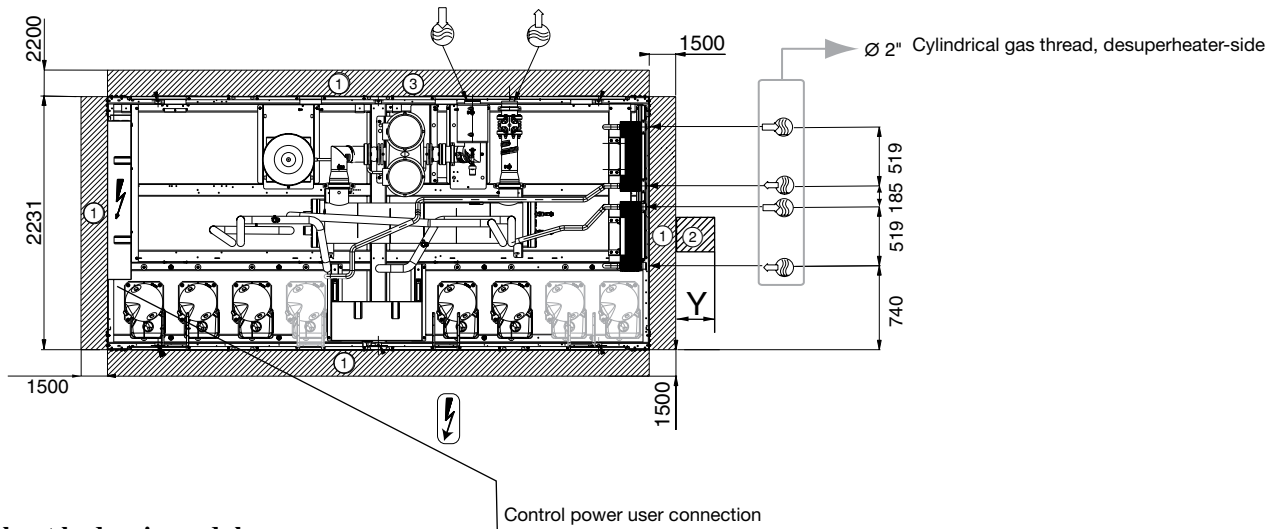
**NOTE: Non-contractual drawings.**

When designing an installation, refer to the certified dimensional drawings, available on request.

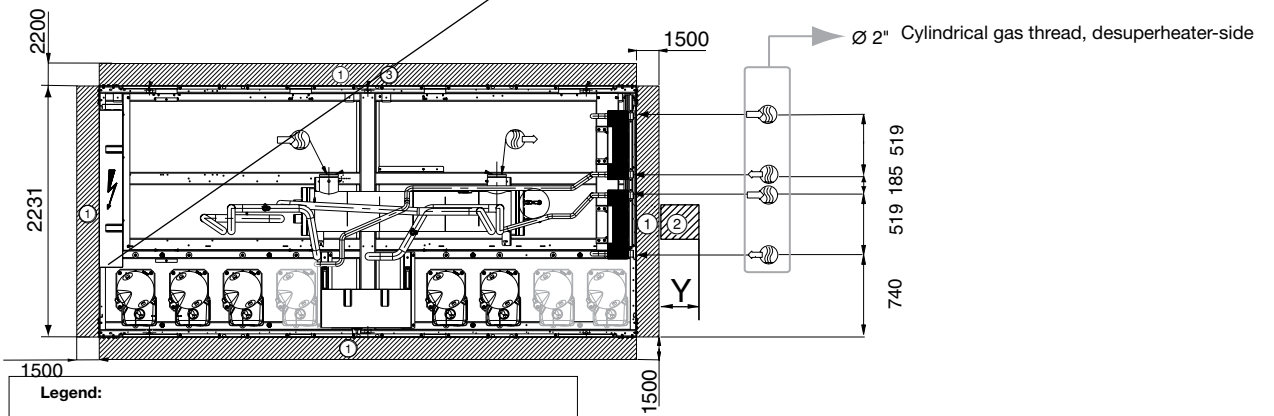
For the positioning of the fixing points, weight distribution and centre of gravity coordinates.



**Unit with hydronic module**



**Unit without hydronic module**



**Legend:**

- ① Clearances required for maintenance and air flow
- ② Clearances recommended for evaporator tube removal
- ③ Clearances recommended for heat exchanger removal
- Water inlet, evaporator and desuperheater
- Water outlet, evaporator and desuperheater
- Air outlet, do not obstruct
- Additional compressor(s), depending on the unit size

30RQ	X	Y	Z
302-402	3604	200	76
432-522	4798	0	30

**NOTE: Non-contractual drawings.**

**When designing an installation, refer to the certified dimensional drawings, available on request.**

**For the positioning of the fixing points, weight distribution and centre of gravity coordinates.**

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

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

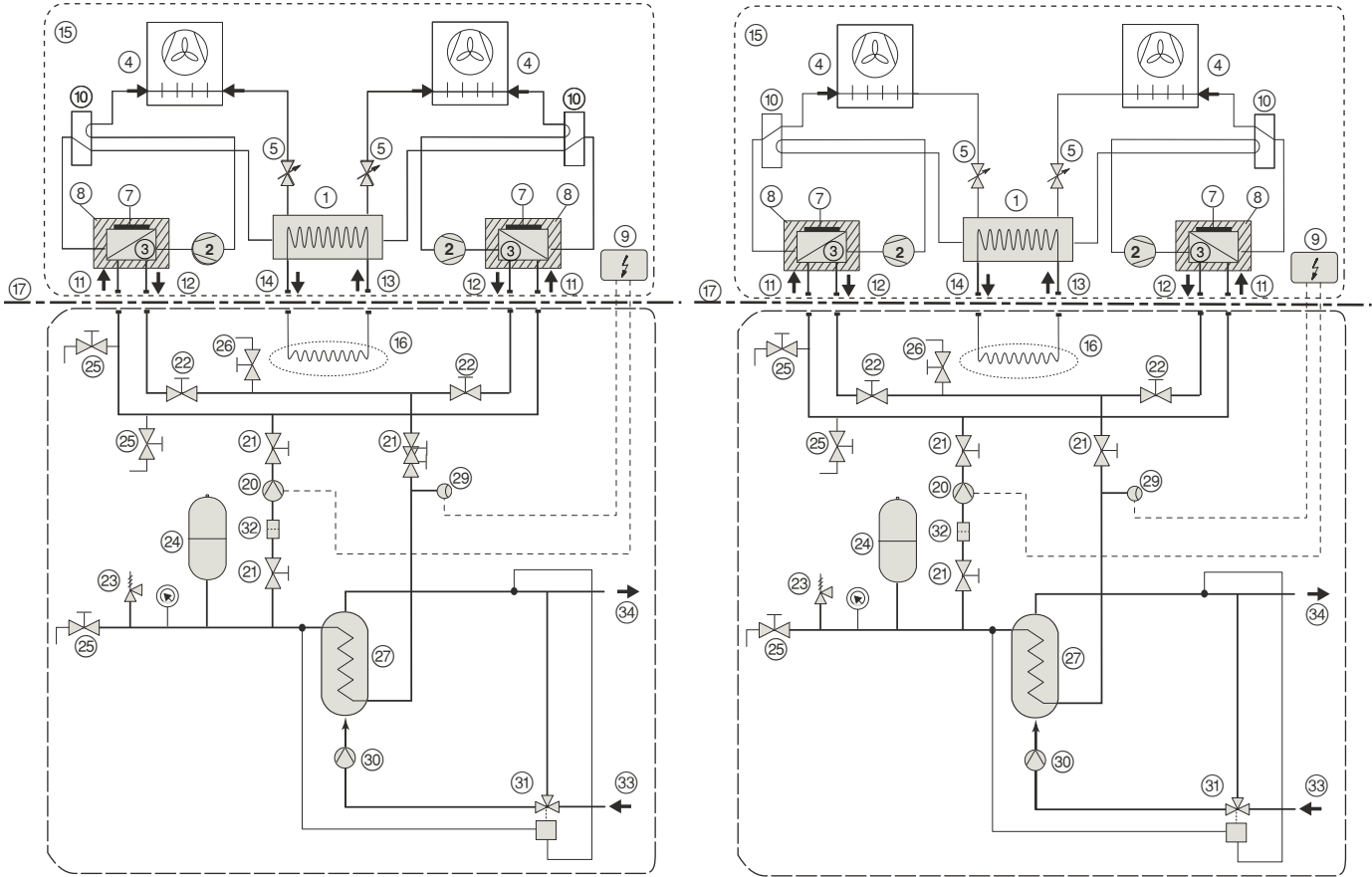
*During the unit installation the heat reclaim plate heat exchangers must be insulated and frost protected, if required.*

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

#### Typical unstallation diagram of units with the desuperheater option

##### Heating mode

##### Cooling mode



- 30RQ unit with desuperheater option without hydronic module
- Border between 30RQ unit and the system
- Typical installation

#### Legend

##### 30RQ unit components

- 1 Heat exchanger (multi-pipe type)
- 2 Compressor
- 3 Desuperheater (plate heat exchanger)
- 4 Air heat exchanger (coils)
- 5 Expansion valve (EXV)
- 6 Safety valve
- 7 Electric heater to protect the desuperheater against frost (not supplied)
- 8 Desuperheater insulation (not supplied)
- 9 Units control box
- 10 Heating/cooling cycle four-way reversing valve
- 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 30RQ unit and the typical installation

##### Installation components (installation example)

- 20 Pump (hydronic circuit of the desuperheater loop)
- 21 Check valve
- 22 Desuperheater water flow balancing and control valve
- 23 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

### 11.1.4 - Installation

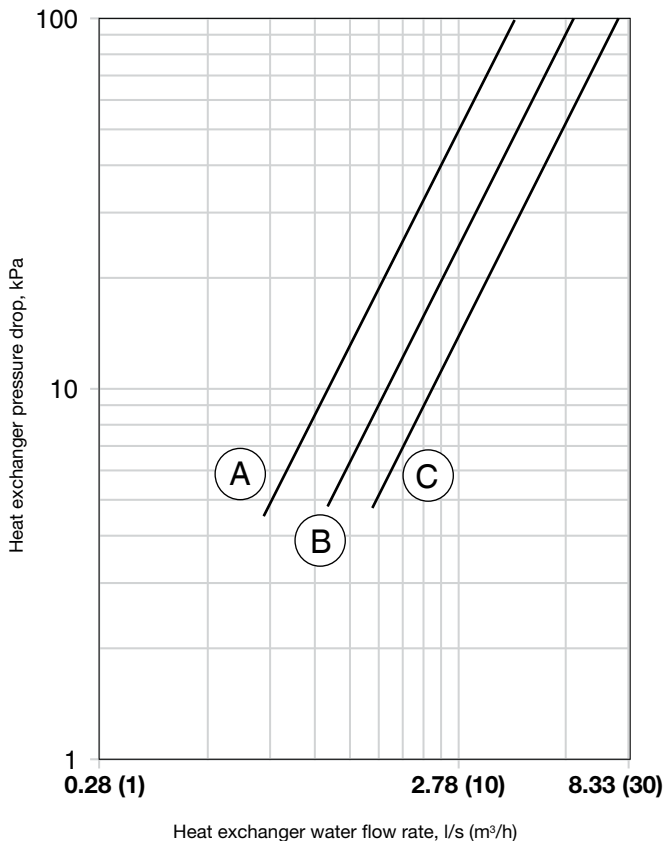
The water supply of each desuperheater is arranged in parallel.

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

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

Please refer to the pressure drop curves below to carry out the control of the balancing valves before starting up the installation. It is possible to refine the water flow control of each desuperheater when the unit operates at full load by trying to obtain leaving water temperatures that are absolutely identical for each circuit.

**Desuperheater (plate heat exchanger pressure drop curves)**



- A Circuit with two compressors
- B Circuit with three compressors
- C Circuit with four compressors

Operation of the pump (see typical diagram - item 20 of chapter 11.1.3) of the desuperheater water circuit can be linked to the start-up of the first unit compressor. This requires the installation of an additional electronic board in the control box: option 156, Energy Management Module.

Output No. 25 of the additional board of this option allows control of the pump operation - the pump will start up when the unit starts.

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

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

The desuperheater water loop must include a safety valve and an expansion tank. When selecting these, consider the water loop volume and the maximum temperature (120°C) when pump operation is stopped (item 20).

### 11.1.5 - Operating range

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

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

- \* For an application that requires operation below 6.8°C, contact Carrier.
  - \*\* The entering water temperature at start-up must not be lower than 25°C. For installations with a lower temperature a three-way valve is necessary.
  - \*\* For operation down to -20°C the unit must be equipped with option 28 (winter operation). In addition the unit must either be equipped with the frost protection option or the water loop must be protected by the installer by adding a frost protection solution.
- Maximum outside temperatures:** During storage and transport of the 30RQ units the minimum and maximum temperatures must not exceed -20°C and +48°C. It is recommended to observe these temperatures during transport by container.

### 11.1.6 - Control configuration with the desuperheater option

This configuration allows the user to enter a setpoint that is relative to the minimum condensing temperature (default = 30°C) to increase the heating capacity reclaimed at the desuperheaters, if required.

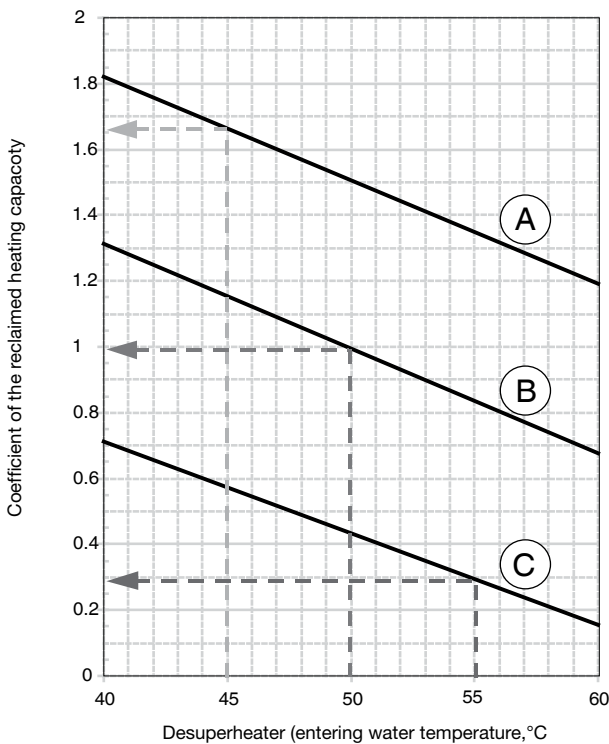
The percentage of the reclaimed heating capacity compared with the total capacity rejected by the condenser increases in proportion to the saturated condensing temperature.

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

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

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

#### Coefficient of the heating capacity reclaimed at the desuperheater based on the entering water temperature at the desuperheater and the condenser entering air temperature



- A Entering air temperature = 45 °C
- B Entering air temperature = 35 °C
- C Entering air temperature = 20 °C

Nominal conditions corresponding to coefficient = 1  
Evaporator entering/leaving temperature = 12/7°C  
Desuperheater entering/leaving temperature = 50/60°C  
Condenser entering air temperature = 35°C (curve B)

### 11.2 - Option 241

During transport in a closed container the refrigerant charge must be transferred to the air heat exchanger. This prevents that the pressure in the water heat exchanger reaches the valve calibration pressure during transport (if this happened, the charge would be evacuated to the atmosphere and the unit would be empty when it arrives on site).

For this reason the charge is transferred to and stored in the air heat exchanger, and the liquid and discharge line valves are closed.

The following precautions must be taken during installation:

1. Ensure that there is sufficient water flow in the water heat exchanger.
2. Energise the unit.
3. Open the liquid line valves.
4. Open the EXV to return the charge to the water heat exchanger; pressure equalisation must be verified by a quick test procedure.
5. Open the discharge line valve.



### 11.3 - Other options and accessories

Options	No.	Description	Advantages	Use
Condenser with pre-treated fins*	3A	Pre-treated aluminium fins (polyurethane and epoxy)	Improved corrosion resistance, recommended for marine environments	30RQ 262-522
Low noise level	15	Sound absorbing compressor enclosure	Noise emission reduction	30RQ 262-522
IP54 protection	20A	Increased leak tightness of control boxes	Recommended for dusty operating environments	30RQ 262-522
Grilles	23	Metallic grilles on all four unit faces	Improved aesthetics	30RQ 262-522
Enclosure panels	23A	Side panels on each end of the coils	Improved aesthetics	30RQ 262-522
Electronic starter	25	Electronic starter on each compressor	Reduced start-up current	30RQ 262-522
Winter operation*	28	Fan speed control via frequency converter	Stable unit operation when the air temperature is between 0°C and -20°C	30RQ 262-522
Evaporator frost protection	41	Resistance heater on the evaporator	Evaporator frost protection for low outside temperatures	30RQ 262-522
Partial heat reclaim	49	See chapter 11.1 - Heat reclaim option	Free hot water production at high temperature by desuperheating of discharge gas, simultaneously with chilled or hot water production in heat pump mode	30RQ 262-522
Twinning	58	Unit equipped with an additional field-installed leaving water temperature sensor, allowing master/slave operation of two chillers connected in parallel	Operation of two chillers connected in parallel with operating time equalisation	30RQ 262-522
Main disconnect switch without fuse	70	Factory-installed main electric disconnect switch in the control box	Ease-of-installation and compliance with local electrical regulations	30RQ 262-522
Main disconnect switch with fuse	70D	Factory-installed main electric disconnect switch with fuse in the control box	Same advantage as main disconnect switch and reinforced anti-short circuit protection	30RQ 262-522
Evaporator with aluminium jacket	88	Evaporator thermal insulation protection by aluminium sheets	Improved resistance to climatic aggression	30RQ 262-522
Evaporator and hydronic module with aluminium jacket	88A	Evaporator and water piping thermal insulation protection by aluminium sheets	Improved resistance to climatic aggression	30RQ 262-522
Low-pressure single-pump hydronic module	116	See hydronic module chapter	Easy and fast installation	30RQ 262-522
Low-pressure dual-pump hydronic module	116A	See hydronic module chapter	Easy and fast installation, operating safety	30RQ 262-522
High-pressure single-pump hydronic module	116B	See hydronic module chapter	Easy and fast installation	30RQ 262-522
High-pressure dual-pump hydronic module	116C	See hydronic module chapter	Easy and fast installation, operating safety	30RQ 262-522
JBus gateway	148B	Two-directional communications board, complies with JBus protocol	Easy connection by communication bus to a building management system	30RQ 262-522
LonTalk gateway	148D	Two-directional communications board, complies with LonTalk protocol	Easy connection by communication bus to a building management system	30RQ 262-522
Energy Management Module EMM	156	See the 30RB/RQ controls manual	Easy wired connection to a building management system	30RQ 262-522
Euro Pack	221	This option includes the options enclosure panels, evaporator frost protection, main disconnect switch and low noise level	Aesthetics, ease-of-installation and low operating noise	30RQ 262-522
<b>Accessories</b>		<b>Description</b>	<b>Advantages</b>	<b>Use</b>
Connection sleeve	-	Piping to be welded with Victaulic connection	Ease-of-installation	30RQ 262-522
Energy Management Module EMM	-	See the 30RB/RQ controls manual	Easy connection by wired connection to a building management system	30RQ 262-522
Scrolling Marquee Interface	-	Remotely installed user interface (communication bus)	Remote chiller control up to 300 m	30RQ 262-522
Power cable connection side extension	-	Side extension on the power control to allow a reduced cable bend radius	Use of thicker power cables	30RQ 262-522

\* Winter operation option: This option permits unit operation down to -20°C outside temperature due to optimised control of the condensing temperature. One fan is therefore equipped with a frequency converter. Nevertheless for operation below 0°C outside temperature this option must be used together with either the water heat exchanger frost protection option or with a frost protection method of the water loop supplied by the installer.

## 12 - STANDARD MAINTENANCE

Air conditioning equipment must be maintained by professional technicians, whilst routine checks can be carried out locally by specialised technicians.

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

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

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

### 12.1 - Level 1 maintenance (see note)

Simple procedure can be carried out by the user:

- Visual inspection for oil traces (sign of a refrigerant leak),
- Air heat exchanger (condenser) cleaning - see chapter 'Air heat exchanger coil - level 1',
- Check for removed protection devices, and badly closed doors/covers,
- Check the unit alarm report when the unit does not work\*.

General visual inspection for any signs of deterioration.

### 12.2 - Level 2 maintenance (see note)

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

In these cases, the following maintenance operations are recommended.

Carry out all level 1 operations, then:

- At least once a year tighten the power circuit electrical connections\*\*,
- Check the correct operation of the differential switches every six months
- Check and retighten all control/command connections, if required\*\*,
- Remove the dust and clean the interior of the control boxes, if required,
- Check the presence and the condition of the electrical protection devices,
- Check the correct operation of all heaters,
- Replace the fuses every 3 years or every 15000 hours (age-hardening),
- Check the water connections,
- Purge the water circuit (see chapter 'Water flow control procedure'),
- Clean the water filter (see chapter 'Water flow control procedure'),
- Fully clean the air heat exchangers with a low-pressure jet and a bio-degradable cleaner (counter-current cleaning - see chapter 'Air heat exchanger coil - level 2),
- Replace the stuffing box packing of the pump after 10000 hours of operation,

- Check the unit operating parameters and compare them with previous values,
- Keep and maintain a maintenance sheet, attached to each HVAC unit.

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

### 12.3 - Level 3 (or higher) maintenance (see note)

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

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

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

### 12.4 - Tightening torques for the main electrical connections

Component	Designation in the unit	Value (Nm)
M12 screw on bus bar, customer connection		80
Soldered screw PE, customer connection		80
Tunnel terminal screw, fuse holder	Fu-	3-3.5
Tunnel terminal screw, compressor contactor	KM1-->KM12	3-4.5
Brass screw M6, compressor earth	EC-	5
Screw M6, compressor connection	EC-	5
Tunnel terminal screw, disconnects	QM-	0.8-1.2
Screw M6, earth power distribution		10

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

Screw type	Used for	Value (Nm)
Metal screw D=4.8	Air heat exchanger, housing supports	4.2
Screw H M8	Air heat exchanger, compressor fixing	18
Taptite screw M10	Air heat exchanger, chassis - structure fixing	30
Taptite screw M6	Piping support, cowling	7
Screw H M8	Piping clip	12
Screw H M6	Piping clip	10
Nut H M10	Compressor chassis	30

\* See report in the 30RB/RQ Pro-Dialog Plus control manual

\*\* See table with tightening torques

## 12.6 - Air heat exchanger

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

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

### Level 1

- If the air heat exchangers are fouled, clean them gently in a vertical direction, using a brush.
- Only work on air heat exchangers with the fans switched off.

*For this type of operation switch off the HVAC unit if service considerations allow this.*

Clean air heat exchangers guarantee optimal operation of your HVAC unit. This cleaning is necessary when the air heat exchangers begin to become fouled. The frequency of cleaning depends on the season and location of the HVAC unit (ventilated, wooded, dusty area, etc.).

### Level 2

- Clean the coil, using appropriate products.

We recommend TOTALINE products for coil cleaning:

Part No. P902 DT 05EE: traditional cleaning method

Part No. P902 CL 05EE: cleaning and degreasing.

These products have a neutral pH value, do not contain phosphates, are not harmful to the human body, and can be disposed of through the public drainage system.

Depending on the degree of fouling both products can be used diluted or undiluted.

For normal maintenance routines we recommend using 1 kg of the concentrated product, diluted to 10%, to treat a coil surface of 2 m<sup>2</sup>. This process can either be carried out using a high-pressure spray gun in the low-pressure position. With pressurised cleaning methods care should be taken not to damage the coil fins. The spraying of the coil must be done:

- in the direction of the fins
- in the opposite direction of the air flow direction
- with a large diffuser (25-30°)
- at a minimum distance of 300 mm from the coil.

The two cleaning products can be used for any of the following coil finishes: Cu/Al, Cu/Al with Italcoat protection.

It is not necessary to rinse the coil, as the products used are pH neutral. To ensure that the coil is perfectly clean, we recommend rinsing with a low water flow rate. The pH value of the water used should be between 7 and 8.

**WARNING: Never use pressurized water without a large diffuser. Do not use high-pressure cleaners!**

**Concentrated and/or rotating water jets are strictly forbidden.**

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

**Correct and frequent cleaning (approximately every three months) will prevent 2/3 of the corrosion problems.**

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

## 12.7 - Water heat exchanger maintenance

Check that:

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

## 12.8 - Characteristics of R-410A

See the table below.

**Saturated temperatures (°C) based on the relative pressure (kPa).**

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

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

**13 - LIST OF CHECKS TO BE CARRIED OUT BY THE INSTALLER BEFORE CALLING CARRIER SERVICE FOR UNIT MAINTENANCE**

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

.....

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

.....

- Unit is level in its installation
- Power supply agrees with the unit nameplate
- Electrical circuit wiring has been sized and installed properly
- Unit ground wire has been connected
- Electrical circuit protection has been sized and installed properly
- All customer connection terminals (power) are tight
  
- All chilled water valves are open
- The chilled water pipes are correctly connected
- The air present in the chilled-water circuit has been purged
- The chilled-water pump uses the correct rotation direction. Check the phase sequence of the electrical connection. If the unit is equipped with a hydronic module, use the pump test function (refer to the 30RB/RQ Pro-Dialog Plus control manual). After the pump test has been completed, switch the unit off again.
- Circulate chilled water in the water circuit for at least two hours, then remove, clean and replace the screen filter. After the pump test has been completed, switch the unit off again
- Inlet piping to water heat exchanger includes a 20 mesh strainer with a mesh size of 1.2 mm
- The compressor flange has been removed

**Unit start-up**

- Never energise the unit before the intervention of Carrier service personnel (except for the pump rotation direction check, see previous chapter)
- The chilled-water pump contactor has been correctly connected to the heat pump (unit without hydronic module)

**Check water heat exchanger water loop**

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

Calculated volume = ..... (litres)

3.25 litres/nominal kW capacity for air conditioning

6.5 litres/nominal kW capacity for process cooling

- Proper loop volume established
- Proper loop corrosion inhibitor included.....litres of .....
- Proper loop freeze protection included (if required) .....litres of .....
- The system piping is equipped with strip heaters, if exposed to temperatures below 0°C

**NOTES:**

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