AQUAFORCE®

30RQ

Air-to-Water Heat Pump

Nominal cooling capacity: 163-430 kW
Nominal heating capacity: 189-510 kW

In 1998, Time magazine named Dr. Carrier one of its 20 most influential builders and titans of the 20thcentury.

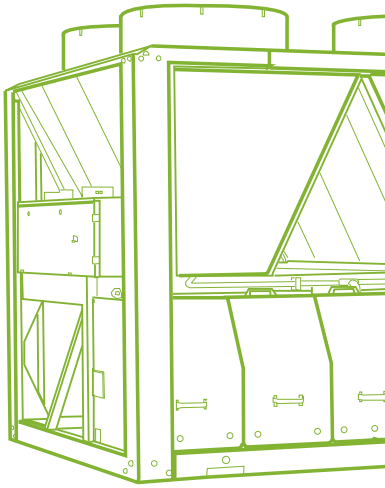
Carrier is a leading global provider of innovative HVAC, refrigeration, fire, security and building automation technologies. Supported by the iconic Carrier name, the company's portfolio includes industry-leading brands such as Carrier, Kidde, Edwards, LenelS2 and Automated Logic. Carrier's businesses enable modern life, delivering efficiency, safety, security, comfort, productivity and sustainability across a wide range of residential, commercial and industrial applications.

Features

- Air-to-water heat pumps are designed for commercial (air conditioning of villa, supermarket, office, hotel hospital etc.) or industrial (lowtemperature process chillers etc.) applications.

Benefits

- Standard unit with hydronic module including all necessary hydronic components, easy and fast installation to save time, space and money.
- Low operating sound with no intrusive low-frequency noise, creates a better working/living environment.
- Electronic expansion valve (EXV) utilization, several compressors connected in parallel lead to more economical operating cost.
- Exceptional endurance tests ensure superior reliability to minimize chiller down-time.



Environmental sound

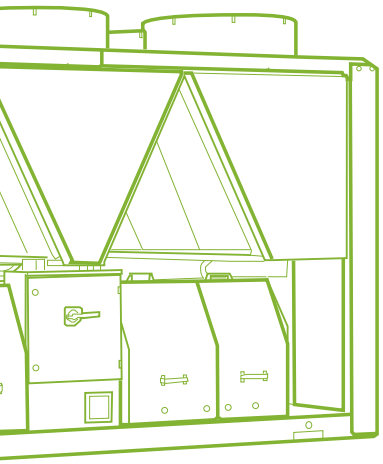
- HFC-410A refrigerant
  - Very efficient - gives an increased energy efficiency ratio.
- Leak-tight refrigerant circuit.
  - Brazed refrigerant connections for increased leaktightness.
  - Reduction of leaks as no capillary tubes and flare connections are used.
  - Verification of pressure transducers and temperature sensors without transferring refrigerant charge.

Easy and fast installation

- Integrated hydronic module
  - Centrifugal high or low-pressure water pump (as required).
  - Single or dual pump (as required) with operating time balancing and automatic changeover to the back-up pump if a fault develops.
  - Water filter protects the water pump against circulating debris.
  - High-capacity membrane expansion tank ensures pressurization of the water circuit.
  - Thermal insulation and anti-freeze protection down to -20^{o}C by using an electric resistance heater.
- Simplified electrical connections
  - A single power supply point without neutral.
  - Main disconnect switch with high trip capacity.
  - Transformer for safe 24 V control circuit supply included.
- Fast commissioning
  - Systematic factory operation test before shipment.
  - Quick-test function for step-by-step verification of the instruments, electrical components and motors.

Quiet operation

- Compressors
  - Low-noise scroll compressors with low vibration level.
  - The compressor assembly is installed on an independent chassis and supported by anti-vibration mountings.
  - Acoustic compressor enclosure reduces radiated noise emission (option).
- Condenser section
  - Condenser coils in V-shape with an open angle allows quieter air flow across the coil.
  - Low-noise Flying Bird fans enjoy quieter operation and never generate intrusive low-frequency noise.



Economical operation

- Increased energy efficiency at part load
  - The refrigerant circuit includes several compressors connected in parallel. At part load, around 99% of the operating time, only the compressors that are absolutely necessary operate.
  - The electronic expansion device (EXV) allows operation at a lower condensing pressure (EER and COP optimization).
  - Dynamic superheat management for better utilization of the evaporator heat exchange surface.
- Reduced maintenance costs
  - Maintenance-free scroll compressors.
  - Fast diagnosis of possible incidents and their history via the Pro-Dialog Plus control.
  - HFC-410A refrigerant is easier to use than other refrigerant blends.

Absolute reliability

- State-of-the-art concept
  - Cooperation with specialist laboratories and use of limit simulation tools (finite element calculations) for the design of the critical components, e.g. motor supports,suction/ discharge piping etc.
- Exceptional endurance tests
  - Corrosion resistance tests in salt mist in the laboratory.
  - Accelerated ageing test on components that are submitted to continuous operation: compressor piping,fan supports.
  - Transport simulation test in the laboratory on a vibrating table.

Carrier® SmartVu™ Control

General Features

New innovative smart control features:

- An intuitive and user-friendly,colored,4.3 inch interface
- Direct access to the unit's technical drawings and the main service documents
- Screen-shots with concise and clear information in local languages
- Complete menu, customized for different users (end user, service personnel and Carrier-factory technicians)
- Easy access to the controller box with inclined touch screen mounting to ensure legibility under any lighting conditions
- Safe operation and unit setting: password protection ensures that unauthorized people cannot modify any advanced parameters
- Simple and "smart" intelligence uses data collection from the constant monitoring of all machine parameters to optimise unit operation
- Night mode

Energy management:

- Internal time schedule clock controls chiller on/off times and operation at a second set-point
- The DCT (Data Collection Tool) records the alarms history to simplify and facilitate service operations

Remote Management (Standard)

Units with Touch Pilot control can be easily accessed from the internet, using a PC with an Ethernet connection. This makes remote control quick and easy and offers significant advantages for service operations

Aquaforce is equipped with an RS485 serial port that offers multiple remote control, monitoring and diagnostic possibilities. When networked with other Carrier equipment through the CCN (Carrier Comfort Network - proprietary protocol), all components form a HVAC system fully-integrated and balanced through one of the Carrier's network system products, like the Chiller System Manager or the Plant System Manager (optional).

The 30RQ also communicates with other building management systems via optional communication gateways.

The following commands/visualizations are possible from remote connection:

- Start/Stop of the machine
- Dual set-point management: Through a dedicated contact is possible to activate a second set-point (example: unoccupied mode)
- Demand limit setting: To limit the maximum chiller capacity to a predefined value
- Water pump control: These outputs control the contactors of one/two evaporator water pumps
- Water pumps on reversal (only with options 116C/116G):These contacts are used to detect a water pump operation fault and automatically change over to the other pump
- Operation visualization: Indication if the unit is operating or if it's in stand-by (no cooling load)
- Alarm visualization

Remote Management (EMM option)

The Energy Management Module (EMM) offers extended remote control possibilities:

- Room temperature: Permits set-point reset based on the building indoor air temperature (if Carrier thermostat are installed)
- Set-point reset: Ensures reset of the cooling set-point based on a 4-20 mA or 0-10 V signal
- Demand limit: Permits limitation of the maximum chiller power or current based on 0-10 V signal
- Demand limit 1 and 2: Closing of these contacts limits the maximum chiller power or current to two predefined values
- User safety: This contact can be used for any customer safety loop; opening the contact generates a specific alarm
- Time schedule override: Closing of this contact cancels the time schedule effects
- Out of service: This signal indicates that the chiller is completely out of service
- Chiller capacity: This analogue output (0-10 V) gives an immediate indication of the chiller capacity
- Alert indication: This volt-free contact indicates the necessity to carry out a maintenance operation or the presence of a minor fault
- Compressors running status : Set of outputs (as many as the compressors number) indicating which compressors are running

Technical Specifications

Performance data

30RQ		162C	202C	232C	302C	372C	432C	462C
Nominal cooling capacity*	kW	163	195	221	275	331	389	430
Compressor power input	kW	48.8	65.8	70.8	98.1	115.8	139.1	153.6
EER	kW/kW	3.0	2.7	2.9	2.6	2.6	2.6	2.6
Nominal heating capacity*	kW	173	217	234	307	364	450	510
Compressor power input	kW	50.8	68.8	71.8	102.1	116.8	147.1	167.6
COP	kW/kW	3.0	2.9	3.0	2.8	2.9	2.8	2.8
Operating weight								
Unit with high-pressure single pump hydronic module	kg	2231	2425	2431	3245	3558	4268	4454
Unit without hydronic module	kg	2041	2235	2241	3045	3284	4028	4210
Refrigerant		HFC-410A						
Circuit A	kg	26.0	26.0	27.0	41.0	54.0	54.0	54.0
Circuit B	kg	26.0	26.0	27.0	27.0	32.0	47.0	53.0
Compressor		Hermetic scroll compressors						
Circuit A		1	1	2	3	4	4	4
Circuit B		2	2	2	2	2	3	4
Number of capacity stages		3	3	4	5	6	7	8
Minimum capacity	%	33	33	25	20	17	14	13
Control		Carrier® SmartVu™						
Air heat exchanger		Grooved copper tubes and aluminium fins						
Fans		Axial Flying Bird IV with rotating shroud						
Quantity		4	4	4	5	6	7	8
Total air flow	l/s	18056	18056	18056	22569	27083	31597	36111
Speed	rpm	950	950	950	950	950	950	950
Water heat exchanger		Direct expansion shell-and-tube						
Water volume	l	110	110	110	110	113	113	113
Nominal water flow rate, cooling mode	l/s	7.9	9.4	10.3	13.6	16.4	19.3	21.7
Nominal water flow rate, heating mode	l/s	8.2	10.5	10.9	15.2	18.0	22.3	25.7
Unit internal water pressure drop, cooling mode	kPa	22	23	26	39	31	41	51
Unit internal water pressure drop, heating mode	kPa	24	27	28	45	37	54	71
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000
Hydronic module		Pump,victaulic screen gilter,safety valve,expansion tank,purge valves etc.						
Water pump		Centrifugal pump						
Water head external to chiller								
Single pump at nominal water flow rate, cooling mode	kPa	185	173	211	183	225	198	245
Single pump at nominal water flow rate, heating mode	kPa	179	162	203	164	205	152	178
Expansion tank	l	50	50	50	80	80	80	80
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400
Water connection		Victaulic						
Diameter (with hydronic module)		DN100	DN100	DN100	DN100	DN125	DN125	DN125
Diameter (without hydronic module)		DN100	DN100	DN100	DN100	DN150	DN150	DN150
Electrical data								
Main power supply		400V-3Ph-50Hz						
Control power supply		Via internal transformer						
Nominal unit operating current draw	A	113	137	143	195	233	282	322
Maximum operating current draw	A	143	176	183	251	299	364	414
Maximum start-up current	A	316	383	356	459	507	573	623
Fan and control power	kW	6.2	6.2	6.2	7.9	9.2	10.9	12.4
Pump power input (high pressure single pump)	kW	4.2	4.7	4.7	6.4	8.5	8.5	12.2

* Nominal cooling mode - evaporator entering/leaving water temperature 12/7 ℃, outside air temperature 35 ℃;
Nominal heating mode - water heat exchange entering/leaving water temperature 40/45 ℃, outside air temperature 7 ℃;
Water heat exchanger fouling factor 0.018m²K/kW.

Operating Range, 30RQ 162C- 462C

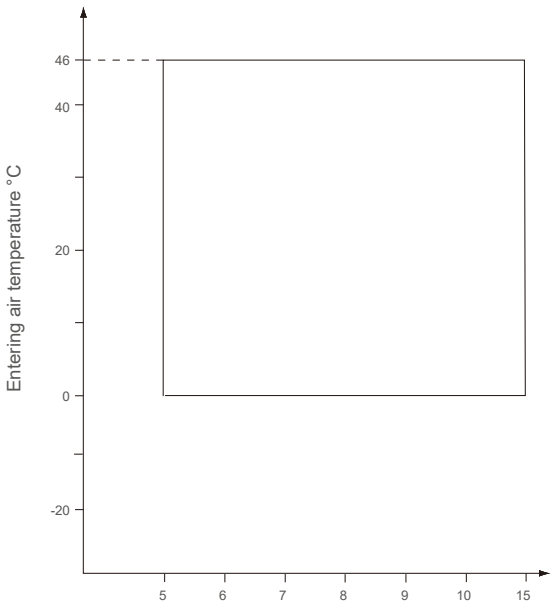
Cooling mode

Water heat exchanger (evaporator)	Minimum	Maximum
Entering water temperature at start-up	6.8 °C	30 °C
Leaving water temperature during operation	5 °C	15 °C
Entering water temperature at shut-down	-	60 °C
Air heat exchanger (condenser)	**Minimum**	**Maximum**
Outdoor air temperature	0 °C	46 °C

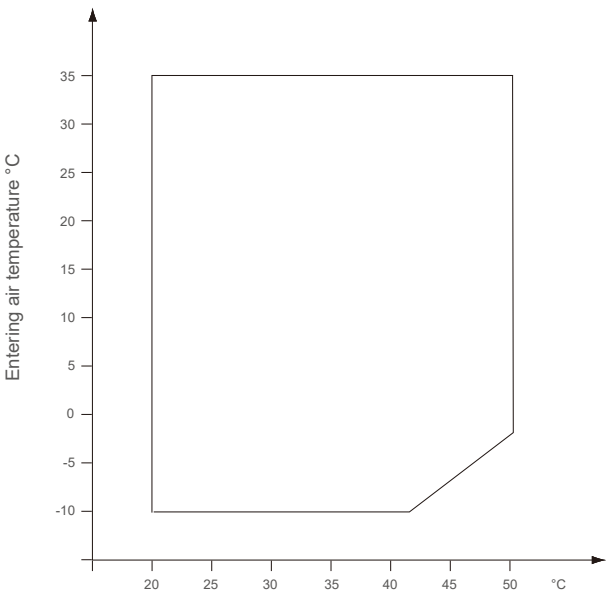
Heating mode

Water heat exchanger (condenser)	Minimum	Maximum
Entering water temperature at start-up	3.4 °C	45 °C
Leaving water temperature during operation	20 °C	50 °C
Entering water temperature at shut-down	3 °C	60 °C
Air heat exchanger (evaporator)	**Minimum**	**Maximum**
Outdoor air temperature	-10 °C	35 °C

Operating range – cooling mode



Operating range – heating mode

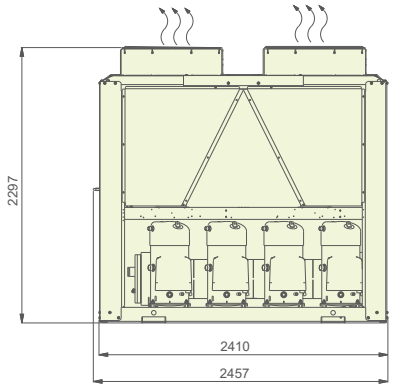


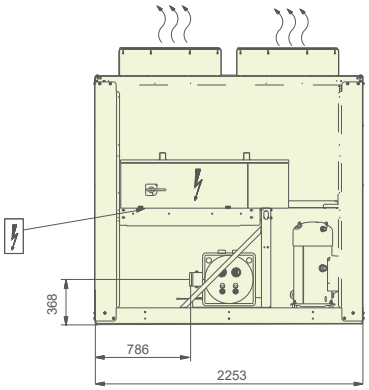
Note: Water heat exchanger and air heat exchanger Δt = 5 K

Operating range, standard unit

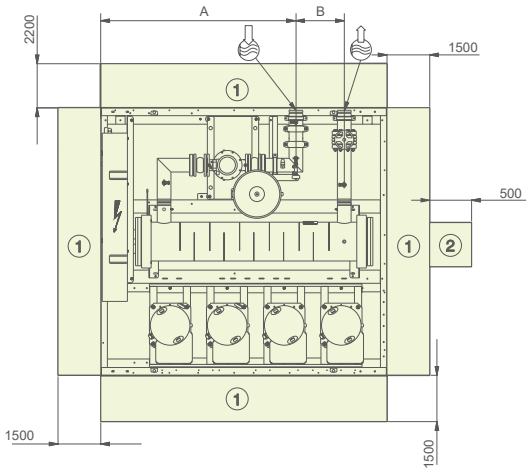
Dimensions/Clearances

30RQ162C~232C



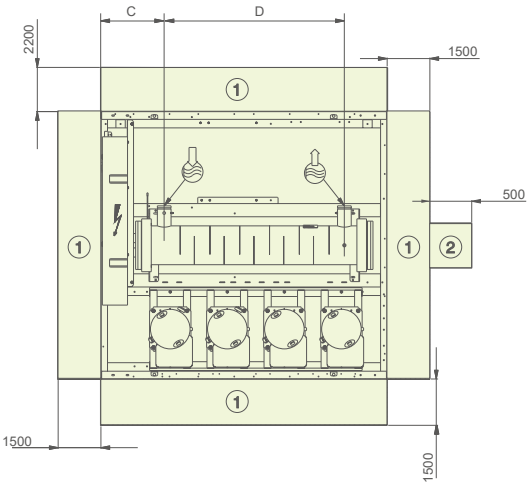


Standard unit with high pressure single pump hydronic module*



30RQ	A	B	C	D
162C~232C	1643	393	543	1493

Unit without hydronic module



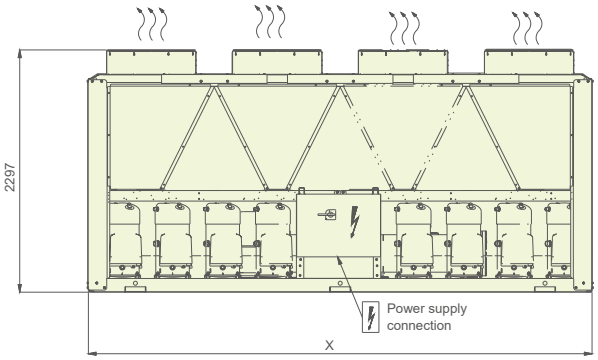
Legend:
All dimensions are given in mm.

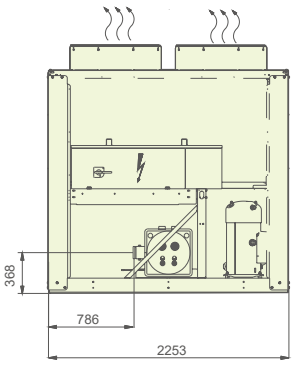
- ① Required clearances for maintenance and air flow
- ② Recommended space for evaporator tube removal
- Water inlet
- Water outlet
- Power supply connection
- Air outlet - do not obstruct

*Please contact local Carrier operation for other integrated hydronic module options

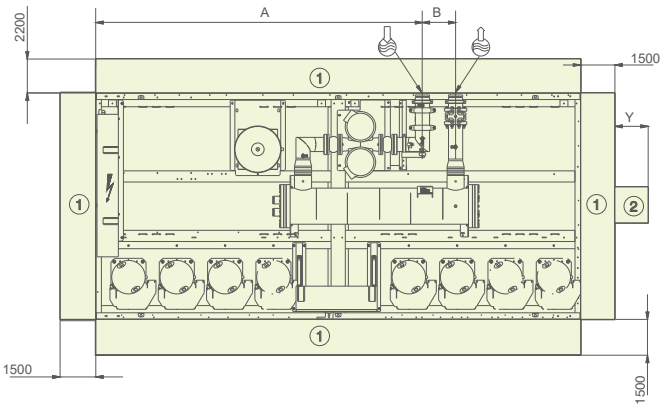
Dimensions/Clearances

30RQ302C~462C

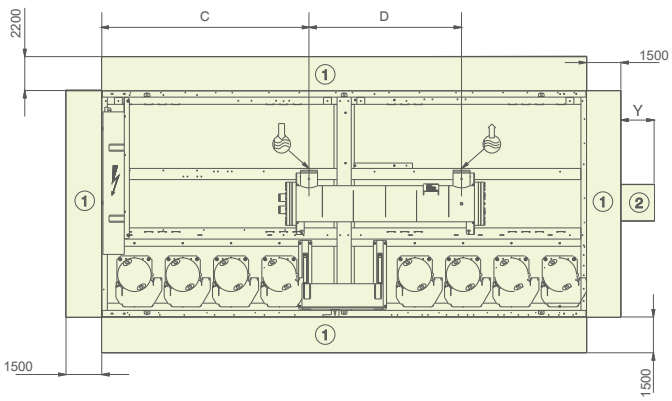




Standard unit with high pressure single pump hydronic module*



Unit without hydronic module



Legend:
All dimensions are given in mm.

① Required clearances for maintenance and air flow

② Recommended space for evaporator tube removal

Water inlet

Water outlet

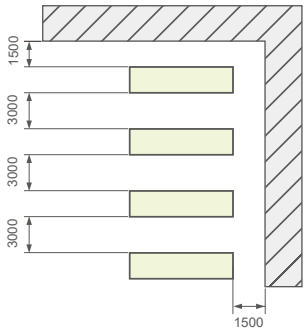
Power supply connection

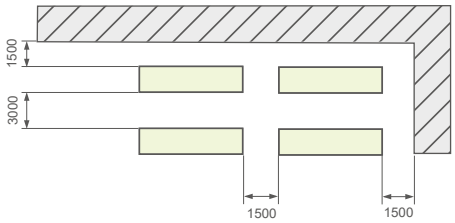
Air outlet - do not obstruct

30RQ	A	B	C	D	X	Y
302C	2745	314	1566	1493	3604	200
372C	2742	317	1566	1493	3604	200
432C~462C	3218	327	2042	1493	4798	0

*Please contact local Carrier operation for other integrated hydronic module options

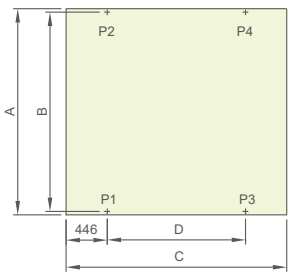
Multiple Chiller Installation



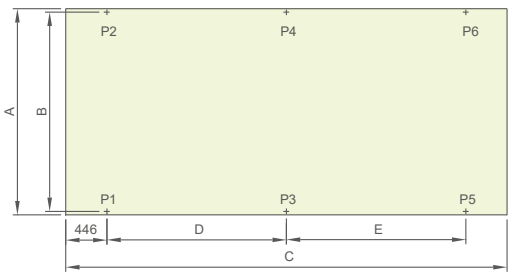


Note: If the height of wall exceeds 2m, please contact local Carrier Sales & Service Corporation.

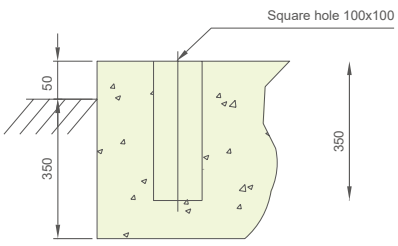
Weight Distribution



30RQ202C~372C



30RQ432C~462C



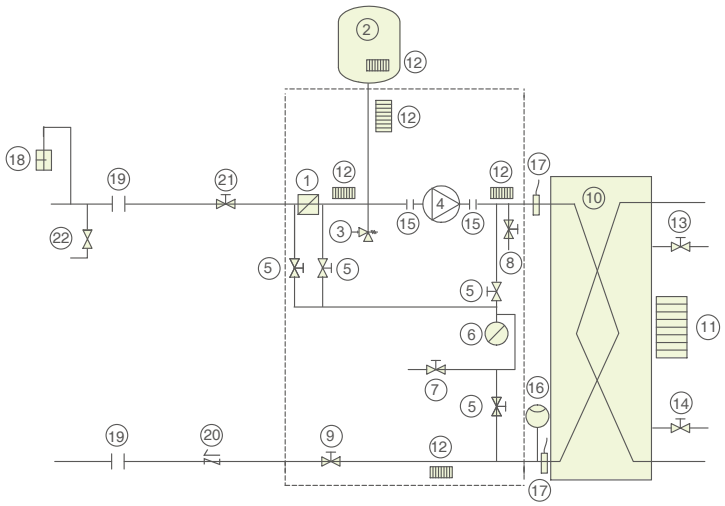
Section F-F

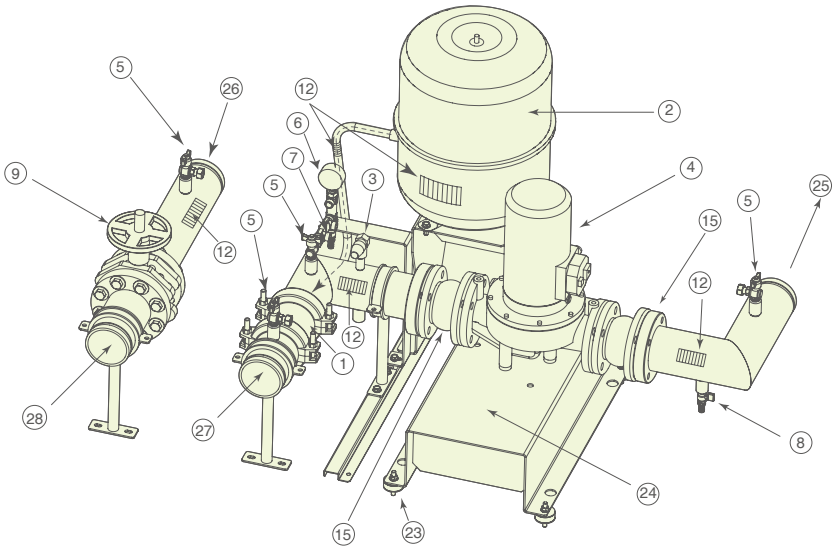
Note: Foot screws M20x300

Models	Dimensions (mm)							Weight distribution (kg)										Operating weight
	A	B	C	D	E	F	G	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	
30RQ162C	2231	2157	2388	1496	-	-	-	532	500	619	582	-	-	-	-	-	-	2231
30RQ202C	2231	2157	2388	1496	-	-	-	579	518	702	628	-	-	-	-	-	-	2425
30RQ232C	2231	2157	2388	1496	-	-	-	530	656	556	691	-	-	-	-	-	-	2431
30RQ302C	2231	2157	3582	2690	-	-	-	901	755	865	724	-	-	-	-	-	-	3245
30RQ372C	2231	2157	3582	2690	-	-	-	952	759	1029	818	-	-	-	-	-	-	3558
30RQ432C	2231	2157	4776	1942	1942	-	-	648	526	1059	811	683	541	-	-	-	-	4268
30RQ462C	2231	2157	4776	1942	1942	-	-	676	549	1106	847	713	565	-	-	-	-	4454

Hydronic Connections

Standard unit with integrated high pressure single pump hydronic module





Legend:

Components of the unit and hydronic module

1. Victaulic screen filter
2. Expansion tank
3. Safety valve
4. Water pump
5. Shut-off valve
6. Pressure gauge
7. Air vent
8. Drain valve
9. Water flow control valve
10. Shell-and-tube heat exchanger
11. Evaporator heater
12. Hydronic module heater
13. Air vent (evaporator)
14. Water purge (evaporator)
15. Flexible connections
16. Electronic flow switch
17. Water temperature sensor

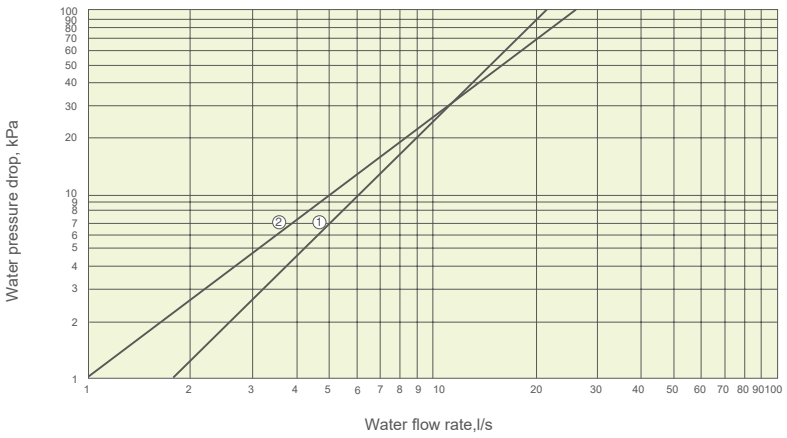
Installation components

18. Air vent
19. Flexible connections
20. Check valve
21. Shut-off valve
22. Water charge valve
23. Anti-vibration pad
24. Water pump support

Water flow directions

25. Evaporator water inlet
26. Evaporator water outlet
27. Hydronic module water inlet
28. Hydronic module water outlet

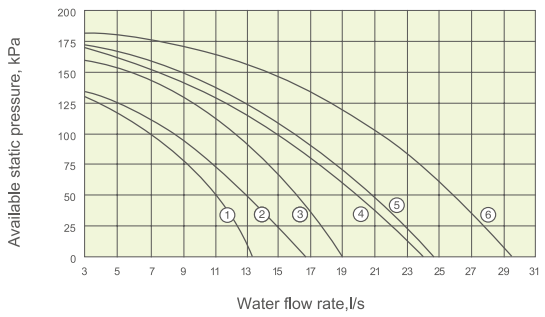
Heat Exchanger Water Pressure Drop



① 30RQ162C~302C
② 30RQ372C~462C

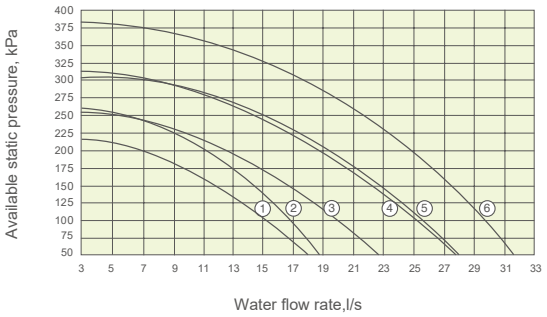
Available Static Pressure

Low pressure pump



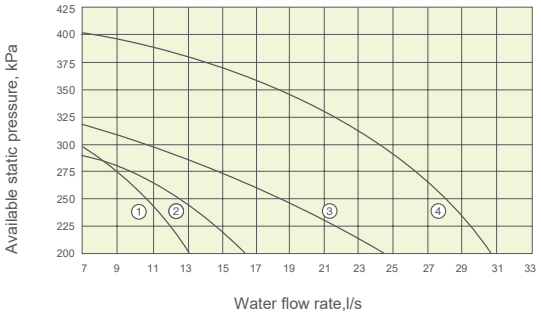
① 30RQ162C~202C
② 30RQ232C
③ 30RQ302C
④ 30RQ372C
⑤ 30RQ432C
⑥ 30RQ462C

High pressure pump



① 30RQ162C~202C
② 30RQ232C
③ 30RQ302C
④ 30RQ372C
⑤ 30RQ432C
⑥ 30RQ462C

Super high pressure pump



① 30RQ162C~232C
② 30RQ302C
③ 30RQ372C/30RQ432C
④ 30RQ462C

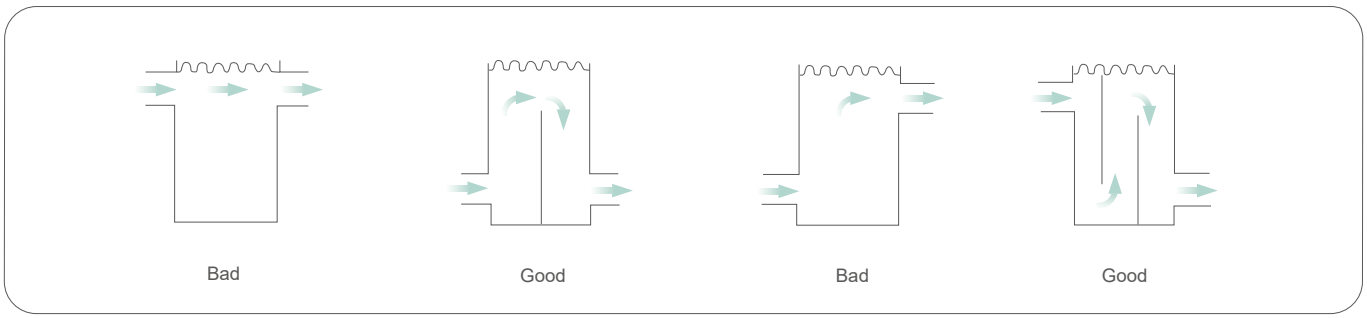
Minimum Water Loop Volume

For better control of leaving water temperature, the water loop minimum capacity is given by the formula:

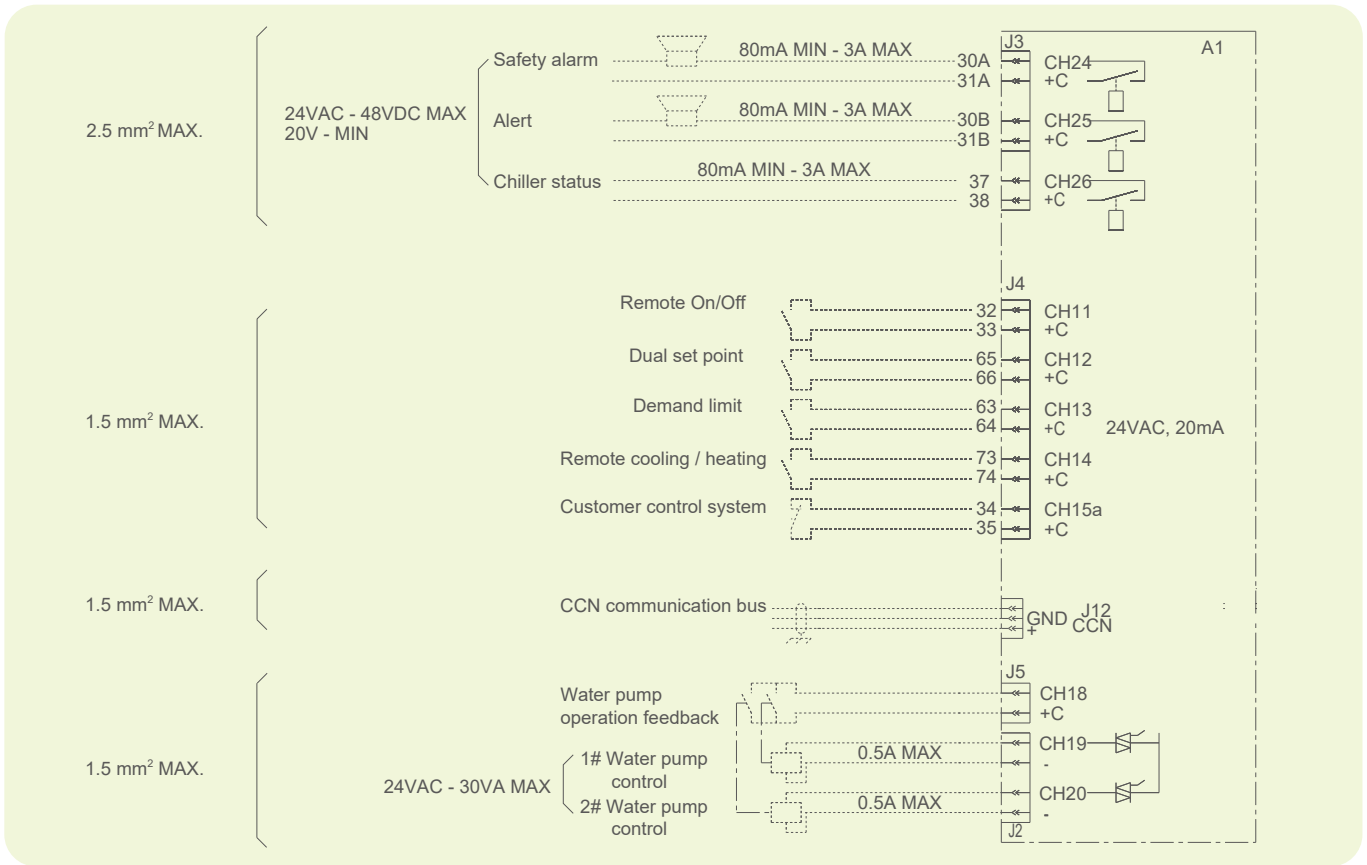
Capacity = CAP (kW) × N Liters

Application		N
Normal air conditioning	30RQ162C~462C	3.5
Process cooling	30RQ162C~462C	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 and accurate temperature control.
It is often necessary to add a buffer water tank to the circuit in order to achieve the required volume. The tank must be internally baffled in order to ensure proper mixing of the liquid (water or brine).Refer to the examples below.



Field Control Wiring



improve buildings™

Carrier improves the world around us; Carrier improves people's lives; our products and services improve building performance; our culture of improvement will not allow us to rest when it comes to the environment.

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