



United Technologies

## PRODUCT SELECTION DATA



Unit with low noise option

- High full and part-load efficiency
- Compact and simple to install
  - Low sound level
- Very low refrigerant charge
  - Superior reliability

Air-Cooled Scroll Chillers with Greenspeed® Intelligence

# 30RBM/30RBP 160-520



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# 30RBM/30RBP 160-520

**Nominal cooling capacity 164-528 kW**

The Aquasnap liquid chillers are the best value solution for commercial and industrial applications where installers, consultants and building owners require reduced installed costs, optimal performances and maximum quality.

The new generation Aquasnap features two new versions:

- The Aquasnap (30RBM) version features a compact all-in-one package optimised for full-load applications where reduced investment cost (low Capex) is required. For cold or hot climates, the Aquasnap can be equipped with specific options to operate from -20 °C up to 52 °C.
- The Aquasnap Greenspeed® (30RBP) version features a compact all-in-one package optimised for part-load applications where high ESEER/IPLV are required. The Aquasnap Greenspeed® equipped with variable speed condenser fans and variable speed pump provides premium part load efficiency to reduce utility costs over the lifespan of the chiller. Additionally, the low sounds levels achieved at part load conditions can be very beneficial for sensitive acoustic applications. Besides operating efficiently and quietly, Aquasnap Greenspeed® operates from -20 °C up to 48 °C as standard.

The Aquasnap liquid chillers are designed to meet current and future Ecodesign and F-Gas European regulation requirements in terms of energy efficiency and reduced CO<sub>2</sub> emissions. They use the best technologies available today:

- Reduced refrigerant charge of ozone-friendly refrigerant R-410A
- Scroll compressors
- Greenspeed® variable-speed driven fans (30RBP models)
- Novation® micro-channel heat exchangers with new aluminum alloy
- Brazed plate heat exchangers with reduced water pressure drops
- Auto-adaptive microprocessor control with Greenspeed® intelligence
- Optional Touch Pilot control with web connectivity possibilities and colour touch screen user display
- Extra energy savings through multiple options: Direct-expansion free cooling system on one or two circuits, hydronic free-cooling system, partial or total heat recovery (Options available during 2015).

Both Aquasnap versions can be equipped with an integrated hydronic module, limiting the installation to straight-forward operations like connection of the power supply and the chilled water supply and return piping (plug & play), within the dimensions of the standard unit.

Recommended by Carrier, the Aquasnap can be equipped with one or two Greenspeed® variable-speed pumps to save significant pumping energy cost (more than two-thirds), ensure tighter water flow control, and improved overall system reliability.

For operation in the most stringent environments that cumulates high temperature, dusts and sand, the Aquasnap (30RBM) can be equipped with optional IP54 electrical box and cabinet fan to operate up to 52 °C outside air temperature.



## Features and benefits

### Very economical operation

- High unit full and part load energy efficiency and efficient design of the water side:
    - Eurovent energy efficiency class A or B
    - Standardised Eurovent values in accordance with EN 14511-3:2013 EER up to 3.1 and ESEER up to 4.35 (30RBP version)
    - Multiple scroll compressors equipped with a high-efficiency motor that permit exact matching of the cooling capacity to the load
    - Electronic expansion device permitting operation at a lower condensing pressure and improved utilisation of the evaporator heat exchange surface (superheat control)
    - Condenser with high-efficiency Novation® aluminum micro channel heat exchangers and Greenspeed® variable speed fans (30RBP version)
    - Low pressure drop brazed plate heat exchangers (pressure drops < 45 kPa at Eurovent conditions).
  - Specific control functions to reduce unit cooling energy use during occupied and unoccupied periods:
    - Internal time schedules clock: Permits chiller on/off control and operation at a second set point
    - Automatic water set-point offset based on outside air temperature or room air temperature via an option
    - Floating high-pressure management
    - Variable-speed fan control
    - Cooling demand limitation.
- Refer to control chapter for more information.

- Greenspeed® variable-speed pump to reduce pumping energy use up to 2/3 (option recommended by Carrier):
  - Elimination of the energy losses caused by the water flow control valve by the electronic setting of the nominal water flow
  - Energy savings during stand-by periods or part-load operation by automatic water pump speed reduction. Pump motor energy use varies as the cube of the speed so that only 40% speed reduction can reduce energy consumption by 80%
  - Improved unit part-load performance (SEER increased SEER value with variable water flow following EN14825).

Refer to hydronic option chapter for more information.



- Extra energy savings through multiple options:
  - Glycol free direct-expansion free cooling (Carrier patent) on one or two refrigerant circuits or hydronic free cooling (available in 2015)
  - Partial or total heat reclaim.
- Reduced maintenance costs
  - Fast diagnosis of possible incidents and their history via the control
  - R-410A refrigerant is easier to use than other refrigerant blends.

#### Low sound level

- Condenser section with fixed speed fans (30RBM models):
  - Optional low-speed fans (700 rpm) and compressor enclosure to reduce full load noise level by 6 to 7 dB(A)
  - Condenser coils in V-shape with an open angle, allowing quieter air flow across the coil
  - Low-noise 4<sup>th</sup> generation Flying Bird fans, made of a composite material (Carrier patent)
  - Rigid fan installation for reduced noise (Carrier patent).
- Condenser section with Greenspeed® variable-speed fans (30RBP models recommended by Carrier for even quieter operation):
  - Optional factory setting of the fan in low speed together with compressors enclosure to reduce full load noise level by 6 to 7 dB(A)
  - Exceptional acoustic signature during part-load operation through smooth fan speed variation.
- Specific control functions or features to reduce noise level during night or unoccupied periods:
  - Night time sound control with cooling capacity and fan speed limitation
  - Low-noise scroll compressors with low vibration level
  - The compressor assembly is installed on an independent chassis and supported by flexible anti-vibration mountings.

- Dynamic suction and discharge piping support, minimising vibration transmission (Carrier patent)
- Acoustic compressor enclosure, reducing radiated noise emissions (option).



#### Fast and easy installation

- Compact design
  - The Aquasnap units are designed to offer compact dimensions for easy installation.
  - With a length of approximately 4.8 m for 520 kW and a width of 2.25 m the units require minimum floor space.
- Integrated hydronic module (option)
  - Low or high-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 protecting the water pump against circulating debris
  - Pressure transducers for direct numerical display of the water flow rate and water pressures
  - Thermal insulation and frost protection down to -20 °C, using an electric resistance heater (option)
  - High-capacity membrane expansion tank (option).
- Integrated hydronic module with Greenspeed® variable-speed pump (option recommended by Carrier)
  - Easy and fast electronic setting of the nominal water flow at unit commissioning thus eliminating the water flow control valve adjustment
  - Automatic control of the pump speed based on constant speed, constant pressure difference or constant temperature difference.
- Simplified electrical connections
  - A single power supply point without neutral
  - Main disconnect switch with high trip capacity
  - 24 V control circuit without risk from a transformer included.
- Fast unit commissioning
  - Systematic factory test before shipment
  - Quick-test function for step-by-step verification of the instruments, electrical components and motor.

#### Reduced installation costs

- Optional Greenspeed® variable-speed pump with hydronic module (option recommended by Carrier)
  - Elimination of the water flow control valve cost
  - Water system design with variable primary flow (VPF) can provide significant installation cost savings compared with traditional constant primary-variable secondary systems; elimination of the secondary distribution pump, etc.
  - Water system design with fan coils fitted with 2-way valves instead of 3-way valves.
- Buffer tank elimination due to the advanced Carrier control algorithm
  - Minimum water loop volume reduced to 2.5 l/kW.

## Environmental responsibility

- R-410A ozone-friendly refrigerant
- Reduced direct warming potential (10% of total equivalent warming impact):
  - Low R410-A refrigerant charge below 0.14 kg/kW, through the use of Novation® micro-channel heat exchangers
  - Leak-tight refrigerant circuit with minimum brazed refrigerant connections
  - Qualified Carrier service people for refrigerant servicing
  - ISO 14001 manufacturing site.
- Reduced indirect warming potential (90% of total equivalent warming impact):
  - Reduced unit energy use (high full- and part-load efficiency)
  - Pumping energy use can be reduced up to 2/3 using Greenspeed® variable-speed pump.

## Superior reliability

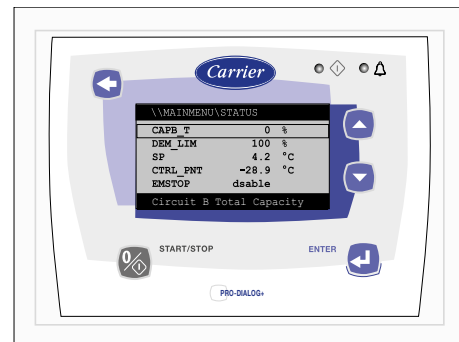
- State-of-the-art concept
  - Two independent refrigerant circuits; the second one automatically takes over, if the first one develops a fault, maintaining partial cooling under all circumstances
  - All compressor components are easily accessible on site minimising down-time
  - All-aluminum Novation® micro-channel heat exchanger (MCHE) with higher corrosion resistance than a conventional coil. The all-aluminum construction eliminates the formation of galvanic currents between aluminum and copper that are responsible for the coil corrosion in saline or corrosive atmospheres.
  - V-coil design to protect the coils against hail impact
  - Optional Enviro-shield anti-corrosion coil coating for use in moderately corrosive environments. Coating applied through conversion process which modifies the surface of the aluminum producing a coating that is integral to the coil. Complete immersion in a bath to ensure 100% coverage. No heat transfer variation, tested 4000 hours salt spray per ASTM B117.
  - Optional Super Enviro-shield anti-corrosion coil coating for use in extremely corrosive environments. Extremely durable and flexible epoxy polymer coating applied on micro channel heat exchangers by electro coating process with a final UV protective topcoat. Minimal heat transfer variation, tested 6000 hours constant neutral salt spray per ASTM B117, superior impact resistance per ASTM D2794.
  - Optional IP54 protection level of compressor control boxes and cabinet fan to guarantee safe operation in hot, dusty, sandy environments
  - Electronic flow switch. Auto-setting according to cooler size and fluid type.
- Auto-adaptive control
  - Control algorithm prevents excessive compressor cycling and permits reduction of the water quantity in the water loop (Carrier patent)
  - Automatic compressor unloading in case of abnormally high condensing pressure
  - Automatic fan speed adjustment in case of coil fouling (30RBP models)
  - Smooth fan start to increase unit lifetime (30RBP models).
- Exceptional endurance tests
  - Partnerships with specialised laboratories and use of limit simulation tools (finite element calculation) for the design of critical components
  - Transport simulation test on an endurance circuit based on a military standard.

## Pro-Dialog+ control (standard)

Pro-Dialog+ combines intelligence with operating simplicity. The control constantly monitors all machine parameters and precisely manages the operation of compressors, expansion devices, fans and of the evaporator water pump for optimum energy efficiency.

- Energy management
  - Internal time schedule clock: Controls chiller on/off times and operation at a second set-point
  - Set-point offset based on the outside air temperature
  - Master/slave control of two chillers operating in parallel with operating time equalisation and automatic change-over in case of a unit fault.
- Integrated features
  - Night mode: Capacity and fan speed limitation for reduced noise level
  - With hydronic module: Water pressure display and water flow rate calculation
- Intuitive and user-friendly Pro-Dialog + user interface.

The standard interface has five buttons that permit navigation via intuitive tree-structure menus. They are user-friendly and permit quick access to the principal operating parameters: Compressor operation, suction/discharge pressure, compressor operating hours, set point, air temperature, entering/leaving water temperature.



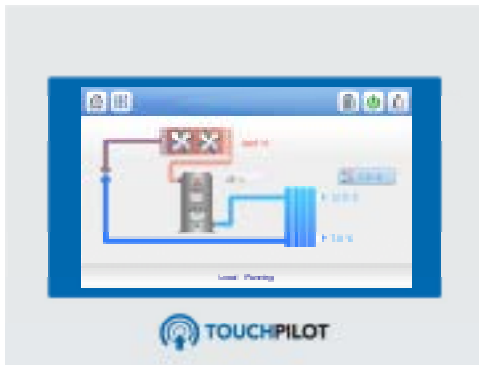
- The information is displayed clearly in English, French, German, Italian, Portuguese and Spanish (for other languages, please consult Carrier).
- The backlit LCD user interface includes a manual control potentiometer to ensure legibility under any lighting conditions.



### Touch Pilot control (option)

The Touch Pilot features a control with advanced communication technology over Ethernet (IP), user-friendly and intuitive user interface with 5 colour touch screen.

- Energy management
  - Monitoring of the cooling and pumping energy use on Touch Pilot user interface with optional electricity meter
- Integrated advanced communication features
  - Easy and high-speed communication technology over Ethernet (IP) to a building management system
  - Access to multiple unit parameters.
- 5 Touch Pilot user interface



- Intuitive and user-friendly 5 inch touch screen interface
- Concise and clear information is available in local languages
- Complete menu, customised for different users (end user, service personnel or Carrier engineers).

### 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.

The Aquasnap is equipped with an RS485 serial port that offers multiple remote control, monitoring and diagnostic possibilities. Carrier offers a vast choice of control products, specially designed to control, manage and supervise the operation of an air conditioning system. Please consult your Carrier representative for more information.

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

A connection terminal allows remote control of the Aquasnap by wired cable:

- Start/stop: Opening of this contact will shut down the unit
- Dual set-point: Closing of this contact activates a second set-point (example: unoccupied mode).
- Demand limit: Closing of this contact limits the maximum chiller capacity to a predefined value.
- Operation indication: This volt-free contact indicates that the chiller is operating (cooling load).
- Alarm indication: This volt-free contact indicates the presence of a major fault that has led to the shut-down of one or several refrigerant circuits.

### Energy Management Module (option)

The Energy Management Module offers extended remote control possibilities:

- Room temperature: Permits set-point reset based on the building indoor air temperature (with Carrier thermostat)
- 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 based on a 4-20 mA 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.
- Ice storage end: When ice storage has finished, this input permits return to the second set-point (unoccupied mode).
- 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.
- Boiler control: This on/off output controls an independant boiler to provide hot water.

### Novation® Aluminium Micro Channel Heat Exchanger



The Novation® features the latest generation of Carrier Micro Channel Heat Exchanger (MCHE) with new extra resistant aluminum alloy. Already utilised in the automobile and aeronautical industries for many years, the MCHE is entirely made of aluminum. This one-piece concept significantly increases its corrosion resistance by eliminating the galvanic currents that are created when two different metals (copper and aluminum) come into contact in traditional heat exchangers. Unlike traditional heat exchangers the MCHE can be used in moderate marine and urban environments.

From an energy efficiency point-of-view the MCHE is approximately 10% more efficient than a traditional coil and allows a 40% reduction in the amount of refrigerant used in the chiller. The low thickness of the MCHE reduces air pressure losses by 50% and makes it less susceptible to fouling (e.g. by sand) than a traditional coil. Cleaning of the MCHE is very fast using a high-pressure washer.

# Options

Options	No.	Description	Advantages	Use	Availability
Unit equipped for air discharge ducting	12	Unit equipped with high static variable-speed fans (maximum 200 Pa), each fan equipped with a connection flange allowing the connection to the ducting system.	Ducted fan discharge, optimised condensing (or evaporating on Heat pump version) temperature control, based on the operating conditions and system characteristics	30RBP160-520	Available
Low noise level	15	Aesthetic and sound absorbing compressor enclosure	Noise level reduction by 1 to 2 dB(A)	30RBM/30RBP 160-520	Available
Very low noise level	15LS	Aesthetic and sound absorbing compressor enclosure associated with low-speed fans	Noise level reduction by 6 to 7 dB(A)	30RBM/30RBP 160-520	Available
High ambient temperature	16	Unit equipped with electrical panel cooling fan	Extended unit part-load operation up to 52°C ambient temperature	30RBM 160-520	Available
IP54 control box	20A	Increased leak tightness of the unit	Protects the inside of the electrical box from dusts, water and sand. In general this option is recommended for installations in polluted environments	30RBM/30RBP 160-520	Available
Grilles and enclosure panels	23	Metal grilles on the 4 unit sides, plus side enclosure panels at each end of the coil	Improves aesthetics, protection against intrusion to the unit interior, coil and piping protection against impacts.	30RBM/30RBP 160-520	Available
Enclosure panels	23A	Side enclosure panels at each end of the coil	Improves aesthetics, coil and piping protection against impacts.	30RBM/30RBP 160-520	Available
Soft Starter	25	Electronic starter on each compressor	Reduced start-up current	30RBM/30RBP 160-520	Available
Winter operation down to -20 °C	28	Fan speed control of lead fan for each circuit using a variable frequency drive	Stable unit operation for outside air temperature from 0 °C down to -20 °C	30RBM 160-520	Available
Winter operation down to -10 °C	28B	Two-speed lead fan for each circuit	Stable unit operation for outside air temperature from 0 °C down to -10 °C	30RBM 160-520	Available
Winter operation down to -10 °C low speed	28C	Two Low speed fans on lead fan on each circuit	Reduces the noise level and enables stable unit operation for outside air temperature down to -10 °C	30RBM 160-520	Available
Water exchanger frost protection	41	Electric heater on the water exchanger and the water piping	Water exchanger module frost protection between 0°C and -20°C outside air temperature	30RBM/30RBP 160-520	Available
Water exchanger and hydraulic mod. frost protection	42A	Electric heater on the water exchanger hydronic module and optional expansion tank	Water exchanger and hydronic module frost protection between 0°C and -20°C outside air temperature	30RBM/30RBP 160-520	Available
Partial heat recovery	49	Unit equipped with one desuperheater on each refrigerant circuit	Production of free high-temperature hot-water simultaneously with chilled water production (or hot water for Heat pump)	30RBM/30RBP 160-520	Available
Master/slave operation	58	Unit equipped with supplementary water outlet temperature sensor kit to be field-installed allowing master/slave operation of two units connected in parallel	Optimised operation of two units connected in master/slave operation with operating time equalisation	30RBM/30RBP 160-520	Available
Compressor suction and discharge valves	92A	Shut-off valves on the compressor suction and discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the cooler or condenser side during servicing	30RBM/30RBP 160-520	Available
Compressor discharge valves	93A	Shut-off valves on the compressor discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the condenser side during servicing	30RBM/30RBP 160-520	Available
HP single-pump hydronic module	116R	Single high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included. Option with built-in safety hydraulic components available.)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520	Available
HP dual-pump hydronic module	116S	Dual high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included) Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520	Available
LP single-pump hydronic module	116T	Single low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520	Available
LP dual-pump hydronic module	116U	Dual low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520	Available
HP variable-speed single-pump hydronic mod.	116V	Single high-pressure water pump with variable speed drive (VSD), water filter, electronic water flow control, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved system reliability	30RBM/30RBP 160-520	Available
HP variable-speed dual-pump hydronic mod.	116W	Dual high-pressure water pump with variable speed drive (VSD), water filter, electronic flow switch, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved system reliability	30RBM/30RBP 160-520	Available
Dx Free Cooling system on two circuits	118A	Patented Carrier free-cooling system with cooling micro-pump on both refrigerant circuits. Operation without glycol, no extra free-cooling coil. See Dx Free-cooling option chapter	Energy savings for applications with cooling demand throughout the entire year	30RBM/30RBP 220-520	2nd Quarter 2016
Dx Free Cooling system on one circuit	118B	Patented Carrier free-cooling system with cooling micro-pump on one refrigerant circuit. Operation without glycol, no extra free-cooling coil. See Dx Free-cooling option chapter	Energy savings for applications with reduced demand for cooling in the cold season (e.g. Office space with computer room, meeting rooms...)	30RBM/30RBP 160-520	2nd Quarter 2016
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	30RBM/30RBP 160-520	Available
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	30RBM/30RBP 160-520	Available
Bacnet over IP	149	Two-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system. Allows access to multiple unit parameters	30RBM/30RBP 160-520	Available
Energy Management Module	156	Control board with additional inputs/outputs. See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, ice storage end, demand limits, boiler on/off command...)	30RBM/30RBP 160-520	Available
Touch Pilot control, 5 user interface	158	Touch Pilot control supplied with a 5 inch colour touch screen user interface	Control with advanced communication technology over Ethernet (IP), user-friendly and intuitive user interface with 5 colour touch screen	30RBM/30RBP 160-520	Available
Compliance with Russian regulations	199	EAC certification	Conformance with Russian regulations	30RBM/30RBP 160-520	Available
Power factor correction	231	Capacitors for automatic regulation of power factor (cos phi) value to 0,95.	Reduction of the apparent electrical power, compliance with minimum power factor limit set by utilities	30RBM/30RBP 160-520	Available
Enviro-Shield anti-corrosion protection	262	Coating by conversion process which modifies the surface of the aluminum producing a coating that is integral to the coil. Complete immersion in a bath to ensure 100% coverage. No heat transfer variation, tested 4000 hours salt spray per ASTM B117	Improved corrosion resistance, recommended for use in moderately corrosive environments	30RBM/30RBP 160-520	Available

# Options

Options	No.	Description	Advantages	Use	Availability
Super Enviro-Shield anti-corrosion protection	263	Extremely durable and flexible epoxy polymer coating applied on micro channel heat exchangers by electro coating process, final UV protective topcoat. Minimal heat transfer variation, tested 6000 hours constant neutral salt spray per ASTM B117, superior impact resistance per ASTM D2794	Improved corrosion resistance, recommended for use in extremely corrosive environments	30RBM/30RBP 160-520	Available
Welded water exchanger connection kit	266	Victaulic piping connections with welded joints	Easy installation	30RBM/30RBP 160-520	Available
230V electrical plug	284	230V AC power supply source provided with plug socket and transformer (180 VA, 0.8 Amps)	Permits connection of a laptop or an electrical device during unit commissioning or servicing	30RBM/30RBP 160-520	Available
Expansion tank	293	6 bar expansion tank integrated in the hydraulic module (require option 116)	Easy and fast installation (plug & play), & Protection of closed water systems from excessive pressure	30RBM/30RBP 160-520	Available
Screwed DSH water connection kit	303	DSH connections with screwed joints	Easy installation. Allows unit connection to a screw connector	30RBM/30RBP 160-520	Available
Welded DSH water connection kit	304	DSH inlet/outlet welded connection sleeves	Easy installation	30RBM/30RBP 160-520	Available

## Units with fans with available pressure for indoor installation (Option 12-High Static Fan)

This option applies to 30RBP 160-520 units installed inside the building in a plant room.

For this type of installation, the hot air leaving the air condensers is discharged by the fans to the outside of the building, using a duct system that causes a pressure drop in the air path.

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

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

30RBP units with option 12 are designed to operate with air discharge ducts with maximum pressure drop of 200 Pa (units are equipped with variable-speed fans with a maximum speed of 19 r/s, instead of 15.8 r/s for standard units).

Use of variable speed up to 19 r/s can overcome the duct pressure drop while maintaining an optimized air flow per circuit. All fans in the same circuit, operating at the same time, have the same speed.

The fan power input for fans with a speed of 19 r/s is increased compared to that of standard fans with a speed of 15.8 r/s (the multiplier coefficient is the same as the cube of the speed ratio, i.e.  $\times 1.72$ ).

The full-load or part-load speed is controlled by a patented algorithm that permanently optimizes the condensing temperature to ensure the best unit energy efficiency (EER) whatever the operating conditions and pressure drop of the system ductwork.

If necessary for a specific installation, the maximum fan speed of 30RBP unit can be fixed between 13.3 and 19 r/s, using the Service Configuration menu. Consult the 30RBM/RBP Control manual for this modification.

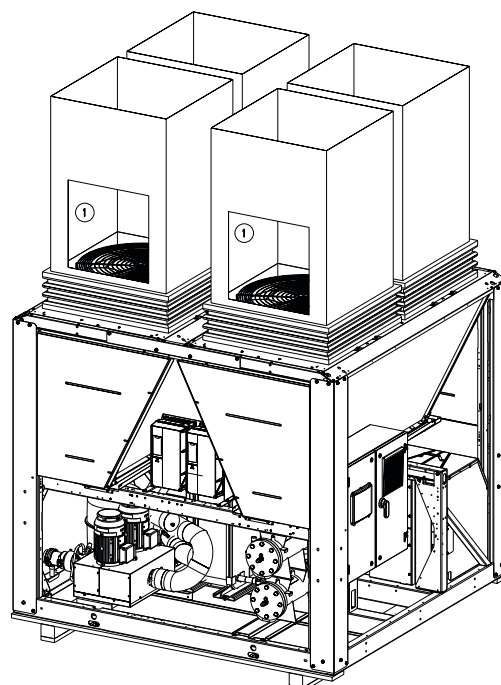
The performances (capacity, efficiency) depend on the speed of the fans, then on the duct pressure drop:

- between 0 and 100 Pa, the unit performances are only slightly affected
- between 100 and 200 Pa, the unit performances may vary considerably, depending on the operating conditions (outdoor air temperature and water conditions)

The noise level into the ductwork and radiated around the unit is also related to the pressure drop.

Please refer to the Carrier Electronic catalog to evaluate the impact of the estimated duct system on the 30RBP unit operating conditions.

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



1 Fan motor access hatches (provide a 700 x 700 mm hatch) for each single and dual duct

# Partial heat reclaim using desuperheaters (option 49)

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

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

## Physical data, 30RBM/30RBP units with partial heat reclaim using desuperheaters (option 49)

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
<b>Desuperheater in circuits A/B</b>		Plate heat exchanger											
Water volume circuits A/B	l	2/3.75	2/3.75	2/3.75	3.75/3.75	3.75/3.75	3.75/3.75	3.75/5.5	5.5/5.5	5.5/5.5	5.5/7.5	5.5/7.5	7.5/7.5
Max. water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
<b>Refrigerant</b>													
Circuit A	kg	9,1	13,4	12,9	14,3	13,6	15,0	17,3	22,8	21,4	26,3	23,7	27,3
	teqCO <sub>2</sub>	19,1	27,9	26,9	30,0	28,4	31,3	36,1	47,6	44,7	54,9	49,6	57,0
Circuit B	kg	13,5	14,3	13,3	14,5	13,6	22,8	21,1	20,9	22,4	27,4	27,3	27,5
	teqCO <sub>2</sub>	28,1	30,0	27,7	30,2	28,4	47,6	44,1	43,7	46,8	57,1	57,1	57,4
<b>Water connections</b>		Vitaallic											
Connection	in	2	2	2	2	2	2	2	2	2	2	2	2
Outside diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
<b>30RBM</b>													
<b>Operating weight***</b>													
Standard unit + desuperheater option	kg	1269	1310	1311	1446	1467	1932	1968	2143	2201	2626	2643	2849
Unit with option 15 + desuperheater option	kg	1352	1393	1394	1554	1575	2058	2094	2287	2344	2788	2805	3029
Unit with option 15 and option 116S + desuperheater option	kg	1491	1533	1533	1693	1729	2218	2298	2491	2548	3032	3049	3309
<b>30RBP</b>													
<b>Operating weight***</b>													
Standard unit + desuperheater option	kg	1305	1347	1347	1482	1504	1969	2004	2180	2237	2683	2700	2915
Unit with option 15 + desuperheater option	kg	1388	1430	1430	1590	1612	2095	2130	2323	2381	2845	2862	3095
Unit with option 15 and option 116S + desuperheater option	kg	1527	1569	1569	1729	1766	2254	2334	2528	2584	3089	3106	3375

\*\*\* Weights are guidelines only. Refer to the unit nemaplate.

## Operating limits

<b>Desuperheater</b>		Minimum	Maximum
Entering water temperature at start-up	°C	25*	75
Leaving water temperature during operation	°C	30	80
<b>Air condenser</b>		Minimum	Maximum
Outside operating temperature	°C	0**	46

\* The entering water temperature at start-up must not be lower than 25°C. For installations with a lower temperature a three-way valve is necessary.

\*\* The minimum outside temperature is 0°C. With the winter operation option it is -20°C.

## Performance

30RBM/P		160	180	200	220	260	300	330	360	400	430	470	520
THR	kW	223,2	239,2	264,3	288,8	351,8	401,0	444,2	489,4	534,3	576,9	624,3	703,5
Heat cap. (45-55°C)	kW	49,8	53,3	59,6	69,1	78,9	108,1	120,5	132,4	144,7	156,5	169,6	191,4
% reclaim	%	22,3%	22,3%	22,6%	23,9%	22,4%	27,0%	27,1%	27,1%	27,1%	27,1%	27,2%	27,2%
Water flow	l/s	1,2	1,3	1,4	1,7	1,9	2,6	2,9	3,2	3,5	3,8	4,1	4,6
WPD	kPa	4,6	5,2	6,4	8,4	10,7	10,9	13,4	8,4	9,9	11,5	13,3	16,8
Heat cap. (50-60°C)	kW	42,9	45,8	51,2	57,4	68,0	89,9	100,3	110,4	120,6	125,6	136,0	153,6
% reclaim	%	19,2%	19,1%	19,4%	19,9%	19,3%	22,4%	22,6%	22,6%	22,6%	21,8%	21,8%	21,8%
Water flow	l/s	1,0	1,1	1,2	1,4	1,7	2,2	2,4	2,7	2,9	3,0	3,3	3,7
WPD	kPa	3,4	3,9	4,7	5,8	8,0	7,7	9,4	5,8	6,9	7,4	8,6	10,9
Heat cap. (55-65°C)	kW	33,6	35,9	40,2	45,4	53,3	70,7	78,8	86,6	94,6	97,9	106,1	119,7
% reclaim	%	15,1%	15,0%	15,2%	15,7%	15,1%	17,6%	17,7%	17,7%	17,7%	17,0%	17,0%	17,0%
Water flow	l/s	0,8	0,9	1,0	1,1	1,3	1,7	1,9	2,1	2,3	2,4	2,6	2,9
WPD	kPa	2,1	2,4	3,0	3,7	5,0	4,8	5,9	3,6	4,3	4,6	5,3	6,7

Condition OAT : 35°C - Water : 12-7°C



# Hydronic module (option 116)

The new generation of Carrier hydronic module saves a lot of installation time. The chiller is factory-equipped with the main components for the hydronic system: Water pump, electronic flow switch, Victaulic screen filter, pressure transducers, water temperature sensors, pressures taps (2), safety valve, drain valve, air vent, water purge, optional hydronic module heater and optional expansion tank.

The pressure transducers allow the control to:

- Display the available pressure at the unit outlet and the static system pressure
- Calculate the instantaneous flow rate, using an algorithm that integrates the unit characteristics
- Integrate the system and water pump protection devices (lack of water, water pressure, water flow rate, etc.).

On units fitted with Greenspeed variable-speed pump, the user display enables to:

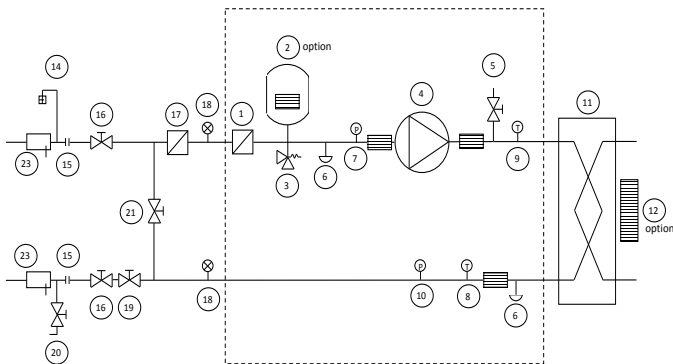
- Adjust the required pump speed
- Adjust the required available pressure at the unit outlet and the static system pressure, to real customer needs thus saving energy: no need any more for a water flow control valve used for creating artificial pressure drops that are wasting energy.

Several water pump types are available to suit any application:

- Single or dual low-pressure pump or single or dual high-pressure pump
- Greenspeed variable-speed single or dual high-pressure pump.

If necessary increased frost protection down to -20 °C is possible by adding the heater option to the hydronic module piping (see options 42A). The hydronic module option is integrated into the chiller without increasing its dimensions and saves the space normally used for the water pump.

## Typical hydronic circuit diagram



## Electrical data, units with hydronic modules

The pumps that are factory-installed in these units have motors with efficiency class IE3. The additional electrical data required by regulation 640/2009 is given in the installation, operation and maintenance manual.

## Hydronic module



### Legend

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

1. Screen filter (mesh opening 1.2 mm)
2. Expansion tank (option)
3. Safety valve
4. Available pressure pump (single pump or dual pump)
5. Air purge
6. Water drain valve
7. Pressure sensor  
**Note:** Gives pump suction pressure information
8. Temperature probe -  
**Note:** Gives heat exchanger leaving temperature information
9. Temperature probe -  
**Note:** Gives heat exchanger entering temperature information
10. Pressure sensor  
**Note:** Gives unit leaving pressure information
11. Plate heat exchanger
12. Evaporator frost protection heater (option)

#### Installation components

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

#### Notes:

- The installation must be protected against frost.
- The hydraulic module and unit evaporator are protected (option 42A, factory installed) against frost with electric heaters (item 12 + ).
- The pressure sensors are installed at connections without Schraeder valves. Depressurise and drain the system before any intervention.

# Variable Water Flow system (VWF) 30RBM/30RBP 160-520

## Carrier Variable Water Flow

Recommended by Carrier, the Aquasnap can be equipped with one or two variable-speed pumps to save significant pumping energy cost (more than two-thirds), ensure tighter water flow control, and improved overall system reliability.



Carrier Variable Water Flow (VWF) is a hydronic control function package that permits control of the water flow rate.

The Carrier VWF not only ensures control at full load, a specific Carrier algorithm linked to an electronic frequency converter also continuously modulates the flow rate to minimise pump consumption at full load as well as part load.

The Carrier hydronic module includes pressure transducers that permit intelligent measurement of the water flow rate and real-time display on the Pro-Dialog+ or Touch Pilot user interface. All adjustments can be made directly on the interface, speeding up start-up and maintenance.

As Carrier VWF acts directly on the pump, the system no longer requires the control valve at the unit outlet.

However, for applications with two-way valves a bypass system must be kept to guarantee the minimum flow rate.

### Operating logic

#### ■ Full-load set point

The flow rate control at full load uses the Pro-Dialog+ or Touch Pilot user interface, reducing the pump speed. This first control saves energy that would normally be dissipated in the control valve. For example, if the pressure supplied by the pump is reduced by 20% the power consumption of the pump is reduced by the same ratio, compared to a traditional installation.



#### ■ Operating mode at part load

Pro-Dialog+ includes three part-load operating modes:

- Fixed speed control
- Constant delta P control
- Constant delta T control.

#### 1 - Fixed speed

The control continuously ensures a constant pump speed based on compressor capacity.

When the compressor capacity is equal to zero, the pump speed can be automatically reduced to a second set-point (adjustable down to 60%) to save energy during low occupancy periods.

This solution is suitable for traditional installations with constant water flow and terminal units equipped with three-way valves. This solution reduces pumping energy costs especially when the flow can be reduced during night-time periods.

#### 2 - Constant delta P control

The control continuously acts on the pump speed to ensure a constant delta P.

This solution is suitable for installations with two-way valves. When these close, the water speed will accelerate in the system branches that are still open. For a fixed-speed pump this results in an unnecessary increase of the pressure at the pump outlet.

The constant delta P control mode ensures that each circuit branch always has a uniform supply, without unnecessary energy waste.

In industrial processes such as plastic injection molding, this solution ensures that each terminal unit has the correct pressure supply.

#### 3 - Constant delta T control

The VWF algorithm maintains a constant delta T no matter what the unit load, reducing the flow rate to the minimum. It is suitable for the majority of comfort applications.

# Physical data, sizes 160 to 520

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
Air conditioning application as per EN14511-3:2013† - standard unit													
Nominal cooling capacity	kW	168	181	198	216	261	300	331	365	397	430	464	523
ESEER	kW/kW	4.00	4.07	4.01	4.00	4.00	4.07	4.08	4.10	4.05	4.07	4.04	4.03
EER	kW/kW	3.04	3.12	2.98	2.97	2.90	2.97	2.92	2.95	2.90	2.94	2.90	2.90
Eurovent class cooling	B	A	B	B	B	B	B	B	B	B	B	B	B
Air conditioning application††- standard unit													
Nominal cooling capacity	kW	168	182	199	216	262	301	331	366	398	431	465	524
ESEER	kW/kW	4.12	4.20	4.16	4.17	4.16	4.20	4.19	4.24	4.17	4.19	4.17	4.17
EER	kW/kW	3.07	3.16	3.02	3.01	2.93	3.00	2.94	2.98	2.93	2.97	2.93	2.93
IPLV	kW/kW	4.57	4.57	4.54	4.51	4.50	4.61	4.61	4.69	4.58	4.62	4.55	4.58
Sound levels													
Standard unit													
Sound power level***	dB(A)	91	92	92	92	92	93	93	93	93	94	94	94
Sound pressure level at 10 m****	dB(A)	59	60	60	60	60	60	60	61	61	62	62	62
Standard unit + option 15*													
Sound power level***	dB(A)	89	90	90	90	90	91	91	92	92	93	93	93
Sound pressure level at 10 m****	dB(A)	57	58	58	58	58	59	59	60	60	61	61	61
Standard unit + option 15LS*													
Sound power level***	dB(A)	85	85	85	86	86	86	86	87	87	88	88	88
Sound pressure level at 10 m****	dB(A)	53	53	53	54	54	54	54	55	55	55	55	56
Dimensions - standard unit													
Length	mm	2410					3604				4797		
Width	mm	2253					2253				2253		
Height	mm	2297					2297				2297		
Operating Weight **													
Standard unit	kg	1216	1257	1257	1387	1408	1865	1901	2069	2125	2545	2563	2761
Standard unit + option 15*	kg	1299	1339	1340	1495	1516	1991	2027	2212	2269	2707	2726	2941
Standard unit + option 15 + option 116S*	kg	1438	1479	1479	1634	1670	2151	2231	2416	2472	2950	2967	3221
Compressors													
		Hermetic scroll 48.3 tr/s											
Circuit A		1	1	1	2	2	2	2	3	3	3	3	4
Circuit B		2	2	2	2	2	3	3	3	3	4	4	4
No. of control stages		3	3	3	4	4	5	5	6	6	7	7	8
Refrigerant** - Standard unit													
		R410A											
Circuit A	kg	8.40	10.90	10.90	12.60	13.10	14.70	15.40	20.30	21.10	23.50	23.50	26.75
	teqCO <sub>2</sub>	17.5	22.8	22.8	26.3	27.4	30.7	32.2	42.4	44.1	49.1	49.1	55.9
Circuit B	kg	12.25	12.60	12.60	12.70	13.10	20.20	20.20	20.40	22.20	26.70	26.80	26.95
	teqCO <sub>2</sub>	25.6	26.3	26.3	26.5	27.4	42.2	42.2	42.6	46.4	55.7	56.0	56.3
Capacity control													
Minimum capacity	%	Pro-Dialog+ Control											
		33	33	33	25	25	20	20	17	17	14	14	13
Condensers													
		All-aluminium micro-channel heat exchanger (MCHE)											
Fans - Standard unit													
		Axial Flying Bird 4 with rotating shroud											
Quantity		3	4	4	4	4	5	5	6	6	7	7	8
Maximum total air flow	l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111
Maximum rotation speed	tr/s	16	16	16	16	16	16	16	16	16	16	16	16
Evaporator													
		Twin-circuit plate heat exchanger											
Water content	l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module	kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
Hydronic Module (option)													
		Pump, Victaulic screen filter, safety valve, water valve and air purge, pressure sensors, expansion tank (option)											
Pump		Centrifugal, monocell, 48.3 r/s, low or high pressure (as required), single or dual pump (as required)											
Expansion tank volume	l	50	50	50	50	50	80	80	80	80	80	80	80
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with or without hydronic module													
		Victaulic type											
Diameter	inch	3	3	3	3	3	4	4	4	4	4	4	4
Outside tube diameter	mm	88.9	88.9	88.9	88.9	88.9	114.3	114.3	114.3	114.3	114.3	114.3	114.3
Chassis paint colour													
		Colour code RAL 7035											

† Eurovent-certified performances in accordance with standard EN14511-3:2013.

Cooling mode conditions: Evaporator water entering/leaving temperature 12 °C/7 °C, outside air temperature 35 °C. Evaporator fouling factor 0.00 m<sup>2</sup>. kW

†† Gross performances, not in accordance with EN14511-3:2013. These performances do not take into account the correction for the proportional heating capacity and power input generated by the water pump to overcome the internal pressure drop in the heat exchanger. Evaporator water entering/leaving temperature 12 °C/7 °C, outside air temperature 35 °C. evaporator fouling factor 0.00 m<sup>2</sup>. kW

\* Options: 15 = Low noise level, 15LS = Very low noise level, 116S = High Pressure dual-pump hydronic module

\*\* Weights are guidelines only. Refer to the unit nameplate.

\*\*\* In dB ref=10<sup>-12</sup> W, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3 dB(A)). Measured in accordance with ISO 9614-1 and certified by Eurovent.

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



Eurovent certified values

# Physical data, sizes 160 to 520

30RBP		160	180	200	220	260	300	330	360	400	430	470	520
<b>Air conditioning application as per EN14511-3:2013<sup>†</sup> - standard unit</b>													
Nominal cooling capacity	kW	168	180	197	216	261	300	331	365	397	430	464	523
ESEER	kW/kW	4.18	4.21	4.14	4.18	4.15	4.37	4.28	4.37	4.26	4.36	4.44	4.30
EER	kW/kW	3.04	3.12	2.98	2.97	2.90	2.97	2.92	2.95	2.90	2.94	2.90	2.90
Eurovent class cooling		B	A	B	B	B	B	B	B	B	B	B	B
<b>Air conditioning application<sup>††</sup> - standard unit</b>													
Nominal cooling capacity	kW	168	181	198	216	262	301	331	366	398	431	465	524
ESEER	kW/kW	4.31	4.36	4.29	4.37	4.32	4.53	4.41	4.53	4.39	4.50	4.60	4.48
EER	kW/kW	3.07	3.16	3.03	3.01	2.93	3.00	2.94	2.98	2.93	2.97	2.93	2.93
IPLV	kW/kW	4.76	4.85	4.73	4.85	4.75	5.00	4.83	5.00	4.81	4.92	5.00	4.84
<b>Sound levels</b>													
<b>Standard unit</b>													
Sound power level <sup>***</sup>	dB(A)	91	92	92	92	92	93	93	93	93	94	94	94
Sound pressure level at 10 m <sup>****</sup>	dB(A)	59	60	60	60	60	60	60	61	61	62	62	62
<b>Standard unit + option 15*</b>													
Sound power level <sup>***</sup>	dB(A)	89	90	90	90	90	91	91	92	92	93	93	93
Sound pressure level at 10 m <sup>****</sup>	dB(A)	57	58	58	58	58	59	59	60	60	61	61	61
<b>Standard unit + option 15LS*</b>													
Sound power level <sup>***</sup>	dB(A)	85	85	85	86	86	86	86	87	87	88	88	88
Sound pressure level at 10 m <sup>****</sup>	dB(A)	53	53	53	54	54	54	54	55	55	55	55	56
<b>Dimensions - standard unit</b>													
Length	mm	2410					3604				4797		
Width	mm	2253					2253				2253		
Height	mm	2297					2297				2297		
<b>Operating Weight **</b>													
Standard unit	kg	1252	1293	1293	1423	1445	1901	1937	2105	2162	2603	2621	2827
Standard unit + option 15*	kg	1334	1376	1376	1531	1553	2027	2063	2249	2306	2765	2783	3007
Standard unit + option 15 + option 116S*	kg	1473	1515	1516	1670	1707	2187	2267	2452	2509	3007	3024	3287
<b>Compressors</b>													
		Hermetic scroll 48.3 tr/s											
Circuit A		1	1	1	2	2	2	2	3	3	3	3	4
Circuit B		2	2	2	2	2	3	3	3	3	4	4	4
No. of control stages		3	3	3	4	4	5	5	6	6	7	7	8
<b>Refrigerant** - Standard unit</b>													
		R410A											
Circuit A	kg	8.40	10.90	10.90	12.60	13.10	14.70	15.40	20.30	21.10	23.50	23.50	26.75
	teqCO <sub>2</sub>	17.5	22.8	22.8	26.3	27.4	30.7	32.2	42.4	44.1	49.1	49.1	55.9
Circuit B	kg	12.25	12.60	12.60	12.70	13.10	20.20	20.20	20.40	22.20	26.70	26.80	26.95
	teqCO <sub>2</sub>	25.6	26.3	26.3	26.5	27.4	42.2	42.2	42.6	46.4	55.7	56.0	56.3
<b>Capacity control</b>													
Minimum capacity	%	Pro-Dialog+ Control											
		33	33	33	25	25	20	20	17	17	14	14	13
<b>Condensers</b>													
		All-aluminium micro-channel heat exchanger (MCHE)											
<b>Fans - Standard unit</b>													
		Axial Flying Bird 4 with rotating shroud											
Quantity		3	4	4	4	4	5	5	6	6	7	7	8
Maximum total air flow	l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111
Maximum rotation speed	tr/s	16	16	16	16	16	16	16	16	16	16	16	16
<b>Evaporator</b>													
		Twin-circuit plate heat exchanger											
Water content	l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module	kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
<b>Hydronic Module (option)</b>													
		Pump, Victaulic screen filter, safety valve, water valve and air purge, pressure sensors, expansion tank (option)											
Pump		Centrifugal, monocell, 48.3 r/s, low or high pressure (as required), single or dual pump (as required)											
Expansion tank volume	l	50	50	50	50	50	80	80	80	80	80	80	80
Max. water-side operating pressure with hydronic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
<b>Water connections with or without hydronic module</b>													
		Victaulic type											
Diameter	inch	3	3	3	3	3	4	4	4	4	4	4	4
Outside tube diameter	mm	88.9	88.9	88.9	88.9	88.9	114.3	114.3	114.3	114.3	114.3	114.3	114.3
<b>Chassis paint colour</b>													
		Colour code RAL 7035											

† Eurovent-certified performances in accordance with standard EN14511-3:2013.

Cooling mode conditions: Evaporator water entering/leaving temperature 12 °C/7 °C, outside air temperature 35 °C. Evaporator fouling factor 0.00 m<sup>2</sup>. kW

†† Gross performances, not in accordance with EN14511-3:2013. These performances do not take into account the correction for the proportional heating capacity and power input generated by the water pump to overcome the internal pressure drop in the heat exchanger. Evaporator water entering/leaving temperature 12 °C/7 °C, outside air temperature 35 °C. evaporator fouling factor 0.00 m<sup>2</sup>. kW

\* Options: 15 = Low noise level, 15LS = Very low noise level, 116S = High Pressure dual-pump hydronic module

\*\* Weights are guidelines only. Refer to the unit nameplate.

\*\*\* In dB ref=10<sup>-12</sup> W, (A) weighting. Declared dualnumber noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3 dB(A)). Measured in accordance with ISO 9614-1 and certified by Eurovent.

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



Eurovent certified values

# Electrical data

<b>30RBM</b>		<b>160</b>	<b>180</b>	<b>200</b>	<b>220</b>	<b>260</b>	<b>300</b>	<b>330</b>	<b>360</b>	<b>400</b>	<b>430</b>	<b>470</b>	<b>520</b>
<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	A	100	110	124	133	161	180	201	221	242	261	282	322
<b>Cosine Phi unit at maximum power**</b>													
Circuit A&B	kW	80	88	99	107	129	145	161	177	194	210	226	258
<b>Cosinus Phi unité à puissance maximale**</b>		0,88	0,87	0,87	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88
<b>Maximum unit current draw (Un-10%)*</b>													
Circuit A&B	A	144	158	176	192	230	259	288	317	345	374	403	460
<b>Maximum unit current draw (Un)****</b>													
Circuit A&B - Standard Unit	A	133	146	163	177	212	239	266	292	319	345	372	425
Circuit A&B - Unit with option 231	A	100	110	125	133	163	181	204	222	244	262	285	326
<b>Maximum start-up current, standard unit (Un)†</b>													
Circuit A&B	A	307	356	374	352	423	450	476	503	529	556	583	636
<b>Max. start-up current, unit with soft starter (Un)†</b>													
Circuit A&B	A	261	283	300	305	349	376	403	429	456	482	509	562

\* Conditions equivalent to the standardised Eurovent conditions (evaporator water input-output temperature = 12 °C/7 °C, outside air temperature = 35 °C)

\*\* Power input, compressors and fans, at the unit operating limits (saturated suction temperature 15 °C, saturated condensing temperature 68.3 °C) and nominal voltage of 400 V (data given on the unit nameplate).

\*\*\* Maximum unit operating current at maximum unit power input and at 360 V.

\*\*\*\* Maximum unit operating current at maximum unit power input and at 400 V (values given on the unit nameplate).

† Maximum instantaneous start-up current at operating limits (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

Fan motor electrical data reported upstream the variable speed drive at Eurovent equivalent conditions and motor ambient air temperature of 50 °C at 400 V: Current 3.8 A; Start-up current 20 A; Power input: 1.75 kW.

<b>30RBP</b>		<b>160</b>	<b>180</b>	<b>200</b>	<b>220</b>	<b>260</b>	<b>300</b>	<b>330</b>	<b>360</b>	<b>400</b>	<b>430</b>	<b>470</b>	<b>520</b>
<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	A	97	107	121	130	158	176	197	216	237	255	276	316
<b>Cosine Phi unit at maximum power**</b>													
Circuit A&B	kW	81	88	99	108	129	145	162	178	194	210	226	259
<b>Cosinus Phi unité à puissance maximale**</b>		0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88
<b>Maximum unit current draw (Un-10%)*</b>													
Circuit A&B	A	142	154	173	189	227	255	284	312	340	369	397	454
<b>Maximum unit current draw (Un)****</b>													
Circuit A&B - Standard Unit	A	131	142	160	174	209	235	262	287	314	340	366	419
Circuit A&B - Unit with option 231	A	98	108	123	131	161	178	201	219	241	259	281	321
<b>Maximum start-up current, standard unit (Un)†</b>													
Circuit A&B	A	305	353	371	349	420	446	472	498	525	550	577	629
<b>Max. start-up current, unit with soft starter (Un)†</b>													
Circuit A&B	A	259	279	297	302	346	372	399	424	451	477	503	556

\*Conditions equivalent to the standardised Eurovent conditions (evaporator water input-output temperature = 12 °C/7 °C, outside air temperature = 35 °C)

\*\* Power input, compressors and fans, at the unit operating limits (saturated suction temperature 15 °C, saturated condensing temperature 68.3 °C) and nominal voltage of 400 V (data given on the unit nameplate).

\*\*\* Maximum unit operating current at maximum unit power input and at 360 V.

\*\*\*\* Maximum unit operating current at maximum unit power input and at 400 V (values given on the unit nameplate).

† Maximum instantaneous start-up current at operating limits (maximum operating current of the smallest compressor(s) + fan current + locked rotor current of the largest compressor).

Fan motor electrical data reported upstream the variable speed drive at Eurovent equivalent conditions and motor ambient air temperature of 50 °C at 400 V: Current 3.0 A; Start-up current 20 A; Power input: 1.75 kW.



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

30RBM/30RBP	160	180	200	220	260	300	330	360	400	430	470	520
<b>Short time (1s) assigned current I<sub>cn</sub> / Peak current I<sub>pk</sub></b>												
Circuits A&B kA/kA	8/30	8/30	8/30	8/30	8/30	8/30	8/30	15/65	15/65	15/65	15/65	20/80
<b>With fuses upstream – maximum fuse values assigned (gG/gG)</b>												
Circuits A&B A	200	200	200	200	250	250	250	315	400	400	400	630
<b>With fuses upstream – assigned conditional short-circuit current I<sub>cc</sub>/I<sub>cf</sub></b>												
Circuits A&B kA	50	50	50	50	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 not valid for IT, modifications are required.

### Electrical data notes for 30RBM/30RBP units:

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

#### Notes

- Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation regulation.
  - Conformance with EN 60204-1 is the best means of ensuring compliance (§1.5.1) with the Machinery Directive.
  - Appendix B of standard EN 60204-1 specifies the electrical features used for the operation of the machines.
  - Operating conditions of 30RBM/30RBP units are described below:
- Physical environment\*  
The classification of environment is specified in standard EN 60364:
    - Outdoor installation\*,
    - Ambient temperature range: Minimum temperature -20 °C up to +48 °C\*\*,
    - Altitude: AC1 Lower than or equal to 2000 m (for hydronic module, see paragraph 4.7 in the IOM)
    - Presence of hard solid: Class AE3 (no significant dust present)\*,
    - Presence of corrosive and polluting substances, class AF1 (negligible),
    - Competence of persons: BA4 (Persons wise).
  - Compatibility for low-frequency conducted disturbances according to class 2 levels per IEC61000-2-4 standard:
    - Power supply frequency variation : +2Hz
    - Phase imbalance : 2%
    - Total Voltage Harmonic Distortion (THDV) : 8%
  - 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(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947-3 (corresponds to IEC 60947-3).

- The units are designed for connection to TN networks (IEC 60364). In IT networks the use of noise filters integrated into the variable frequency drive(s) make machine use unsuitable. In addition, the short-circuit holding current characteristics have been modified. Provide a local earth, consult competent local organisations to complete the electrical installation. 30RBM/30RBP machines are designed to use for domestic / residential and industrial environments:  
Machines that are not equipped with variable frequency drive(s) are in accordance with the standards codes.
    - 61000-6-3: General standards - Standard emission for residential, commercial and light industry.
    - 61000-6-2: General standards - Immunity for industrial environments.
- Machines that are equipped with variable frequency drive(s) (RBP, options: 28, 116V, 116W) are in accordance with standard EN61800 - 3 electric power variable speed drives - part 3: EMC requirements and specific test methods for the following classifications:
- Use in the first and second environments\*\*\*.
  - Category C2 applicable in the first environment, on stationary devices designed to be installed and commissioned by a professional.

**Warning: In a residential environment, this product may cause radio interference in which case additional mitigation measures could be required.**

- Leakage currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of additional leakage currents introduced by the use of variable frequency drive(s) in the unit must be considered. In particular these protection devices shall be of reinforced immunity types and have a threshold not lower than 150 mA.
- Capacitors that are integrated as part of the option 231 can generate electrical disturbances in the installation the unit is connected to. Presence of these capacitors must be considered during the electrical study prior to the start-up.

**Note: If particular aspects of an actual installation do not conform to the conditions described above, or if there are other conditions which should be considered, always contact your local Carrier representative.**

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

\*\* The maximum ambient temperature allowed for machines equipped with option 231 is +40°C

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

## Part load performances

With the rapid increase in energy costs and the care about environmental impacts of electricity production, the power consumption of air conditioning equipment has become an important topic. The energy efficiency of a liquid chiller at full load is rarely representative of the actual performance of the units, as on average a chiller works less than 5% of the time at full load.

### IPLV (in accordance with AHRI 550/590)

The IPLV (integrated part load value) allows evaluation of the average energy efficiency based on four operating conditions defined by the AHRI (Air Conditioning, Heating and Refrigeration Institute). The IPLV is the average weighted value of the energy efficiency ratios (EER) at different operating conditions, weighted by the operating time.

#### IPLV (integrated part load value)

Load %	Air temperature °C	Energy efficiency	Operating time %
100	35	EER <sub>1</sub>	1
75	26.7	EER <sub>2</sub>	42
50	18.3	EER <sub>3</sub>	45
25	12.8	EER <sub>4</sub>	12
ESEER = EER <sub>1</sub> x 1% + EER <sub>2</sub> x 42% + EER <sub>3</sub> x 45% + EER <sub>4</sub> x 12%			

#### Part load performances

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
IPLV	kW/kW	4.57	4.57	4.54	4.51	4.50	4.61	4.61	4.69	4.58	4.62	4.55	4.58
ESEER	kW/kW	4.00	4.07	4.01	4.00	4.00	4.07	4.08	4.10	4.05	4.07	4.04	4.03

30RBP		160	180	200	220	260	300	330	360	400	430	470	520
IPLV	kW/kW	4.76	4.85	4.73	4.85	4.75	5.00	4.83	5.00	4.81	4.92	5.00	4.84
ESEER	kW/kW	4.18	4.21	4.14	4.18	4.15	4.37	4.28	4.37	4.26	4.36	4.44	4.30

**ESEER** Calculations according to standard performances (in accordance with EN14511-3:2011) and certified by Eurovent.  
**IPLV** Calculations according to standard performances (in accordance with AHRI 550-590).

The heat load of a building depends on many factors, such as the outside air temperature, the exposure to the sun and the building occupancy.

Consequently it is preferable to use the average energy efficiency, calculated at several operating points that are representative for the unit utilisation.

### ESEER (in accordance with EUROVENT)

The ESEER (European seasonal energy efficiency ratio) permits evaluation of the average energy efficiency at part load, based on four operating conditions defined by Eurovent. The ESEER is the average value of energy efficiency ratios (EER) at different operating conditions, weighted by the operating time.

#### ESEER (European seasonal energy efficiency ratio)

Load %	Air temperature °C	Energy efficiency	Operating time %
100	35	EER <sub>1</sub>	3
75	30	EER <sub>2</sub>	33
50	25	EER <sub>3</sub>	41
25	20	EER <sub>4</sub>	23
ESEER = EER <sub>1</sub> x 3% + EER <sub>2</sub> x 33% + EER <sub>3</sub> x 41% + EER <sub>4</sub> x 23%			

## Sound spectrum

30RBM/30RBP									
		Octave bands, Hz						Sound power levels	
		125	250	500	1k	2k	4k		
160	dB	92	89	90	86	81	77	dB(A)	91
180	dB	93	90	91	87	81	78	dB(A)	92
200	dB	93	90	91	87	81	78	dB(A)	92
220	dB	93	91	91	87	82	78	dB(A)	92
260	dB	93	91	91	87	82	78	dB(A)	92
300	dB	93	91	92	88	82	79	dB(A)	93
330	dB	93	91	92	88	82	79	dB(A)	93
360	dB	94	92	92	89	83	79	dB(A)	93
400	dB	94	92	92	89	83	79	dB(A)	93
430	dB	95	92	93	89	84	80	dB(A)	94
470	dB	95	92	93	89	84	80	dB(A)	94
520	dB	95	92	93	89	84	80	dB(A)	94

# Operating limits

## Evaporator water flow rate

30RBM/30RBP 160-520 without hydronic module		
	Minimum flow rate (l/s)*	Maximum flow rate (l/s)**
160	2.9	17.5
180	3.2	17.5
200	3.6	17.5
220	3.8	17.5
260	4.6	21.8
300	5.2	29.8
330	5.9	35.2
360	6.3	33.8
400	7.1	38.9
430	7.6	40.4
470	8.2	41.6
520	9.4	43.4

\* Minimum flow rate for the conditions of permissible maximum water delta (10K) to the value of minimum leaving water temperature (5 °C)

\*\* The maximum flow rate corresponds to a pressure drop of 100 kPa in the heat exchanger plate

30RBM/30RBP 160-520 with low pressure hydronic module				
	Minimum flow rate (l/s)*		Maximum flow rate (l/s)	
	Single	Dual	Single	Dual
160	2.8	3.2	12.2	10.3
180	2.8	3.2	12.2	10.3
200	2.8	2.5	12.2	12.2
220	2.8	2.5	12.2	12.2
260	4	2.7	14.3	15
300	3.1	3.7	20.2	20.2
330	3.4	3.7	20.2	20.2
360	3.7	3.8	20.2	20.2
400	9.5	4.1	25	22.9
430	9.5	8	25	25
470	9.5	8	25	25
520	5.4	5.4	26.6	26.5

\* Minimum water flow setting done in factory according to pump type

30RBM/30RBP 160-520 with high pressure hydronic module				
	Minimum flow rate (l/s)*		Maximum flow rate (l/s)	
	Single	Dual	Single	Dual
160	2.5	2.6	11.7	11.7
180	2.5	2.6	11.7	11.7
200	2.5	2.6	11.7	11.7
220	2.5	2.6	11.7	11.7
260	5.2	2.9	16.1	15.5
300	6.4	3.5	16.1	15.5
330	3.6	3.4	26.5	26.5
360	3.7	3.7	26.5	26.5
400	4.1	4.1	26.5	26.5
430	4.4	4.4	26.7	29.2
470	4.8	4.8	26.7	29.2
520	5.4	5.4	26.7	35

\* Minimum water flow setting done in factory according to pump type

## Unit operating limits

Units 30RBM 160-520			
Evaporator		Minimum	Maximum
Entering water temperature at start-up	°C	8*	40
Leaving water temperature during operation	°C	5**	20***
Condenser		Minimum	Maximum
Outdoor ambient operating temperature			
Standard unit	°C	0****/10	48†
Unit with options 28B, 28C (winter operation)	°C	-10	48†
Unit with option 28 (winter operation)	°C	-20	48†
Unit with option 16 (high ambient operation)	°C	0/10	52
Available static pressure			
Standard unit (outdoor installation)	Pa	0	0

Units 30RBP 160-520			
Evaporator		Minimum	Maximum
Entering water temperature at start-up	°C	8*	40
Leaving water temperature during operation	°C	5**	20***
Condenser		Minimum	Maximum
Outdoor ambient operating temperature			
Standard unit	°C	-20	48
Available static pressure			
Standard unit (outdoor installation)	Pa	0	0

\* For application requiring operation at less than 8 °C, contact Carrier for unit selection using the Carrier electronic catalog.

\*\* Use of antifreeze protection is required if the leaving water temperature is below 5 °C

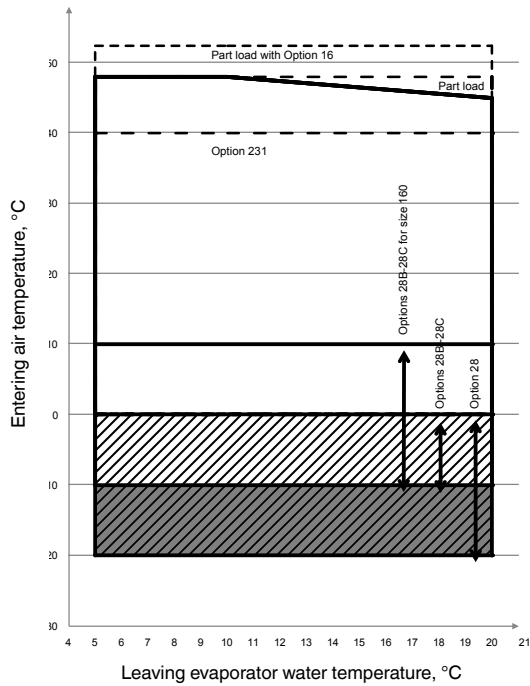
\*\*\* For applications requiring operation up to 20 °C leaving water temperature, contact Carrier for the selection of the unit using Carrier electronic catalog.

\*\*\*\* For operation from 0°C to -10°C the units must be equipped with option 28B-28C "Winter operation". For operation from 0°C to -20°C the units must be equipped with option 28 "Winter operation". For both options the unit must either be equipped with the evaporator frost protection option (for units without hydronic module option) or the evaporator and hydronic module frost protection option (for units with hydronic module option) or the water loop must be protected against frost by the installer, using an anti-freeze solution.

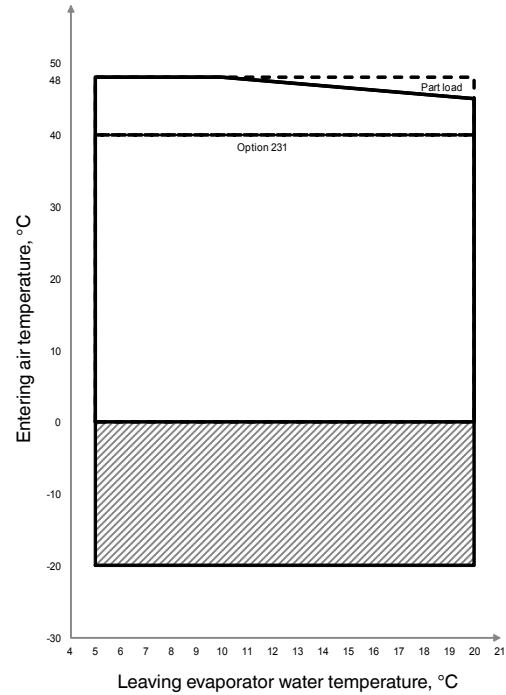
† The maximum ambient temperature allowed for machines equipped with option 231 is +40°C.

Maximum ambient temperature: in case of 30RBM/30RBP units storage and transport, minimum and maximum ambient temperatures to respect are -20°C and +52°C. These temperature limits shall be considered in case of container shipment.

## Operating range - 30RBM 160-520



## Operating range - 30RBP 160-520







### Notes:

Evaporator  $\Delta T = 5$  K

Operating ranges are guidelines only. Verify operating range with the Carrier electronic catalog.

### Legend:

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

# Available static system pressure

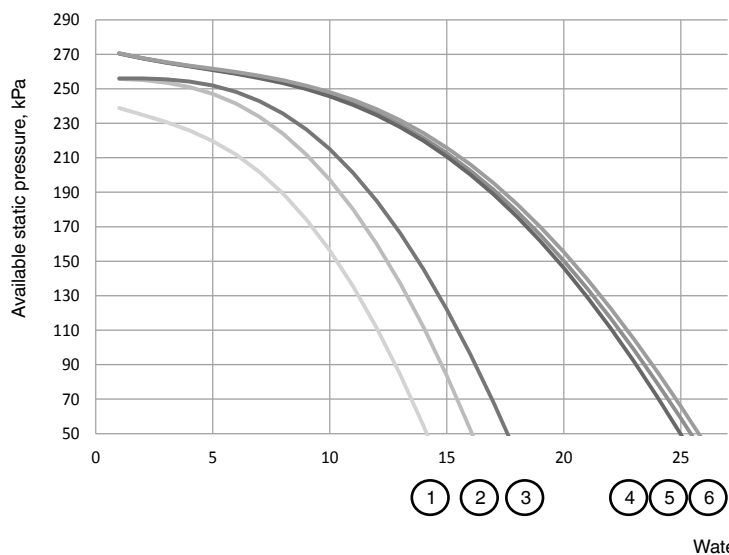
Data applicable for:

- Fresh water 20 °C
- Refer to the paragraph Evaporator water flow rate for maximum water flow values.
- In case of use of the glycol, the maximum water flow rate is reduced.

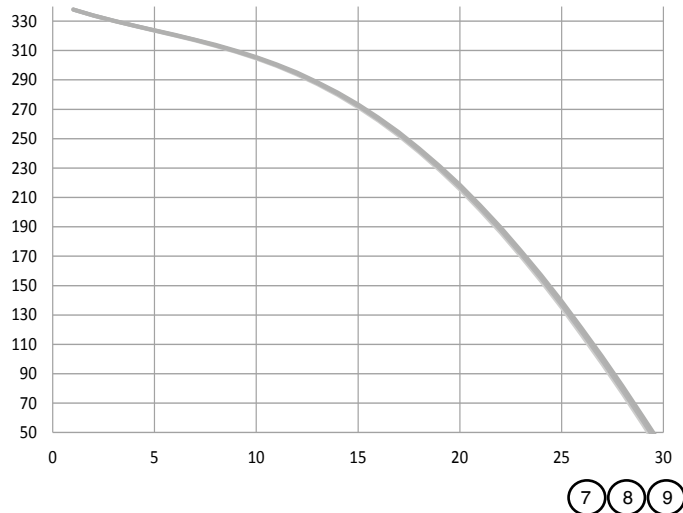
## Units 30RBM/30RBP high-pressure pumps (fixed speed or variable speed at 50Hz)

### Single pumps

#### Sizes 160-400



#### Sizes 430-520

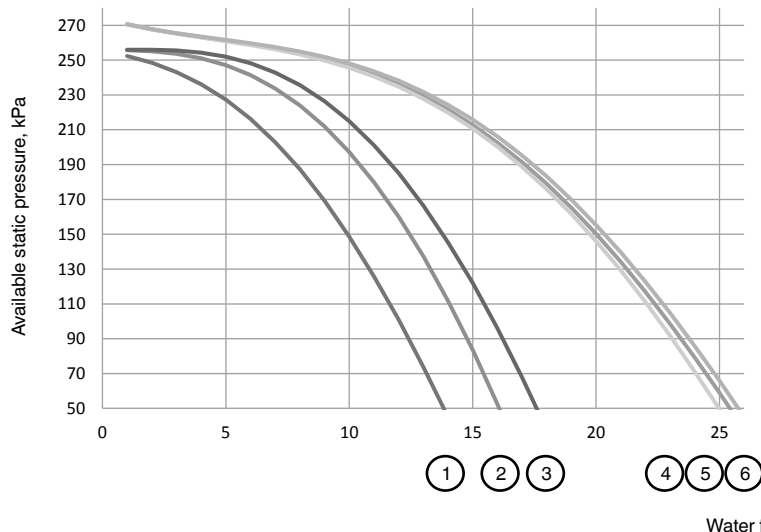


1. 30RBM-30RBP 160 to 220
2. 30RBM-30RBP 260
3. 30RBM-30RBP 300
4. 30RBM-30RBP 360
5. 30RBM-30RBP 330
6. 30RBM-30RBP 400

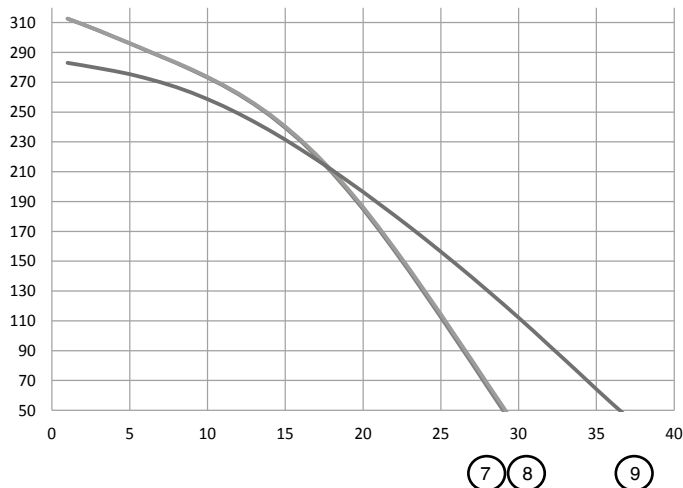
7. 30RBM-30RBP 430
8. 30RBM-30RBP 470
9. 30RBM-30RBP 520

### Dual pumps

#### Sizes 160-400



#### Sizes 430-520



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

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



# Available static system pressure

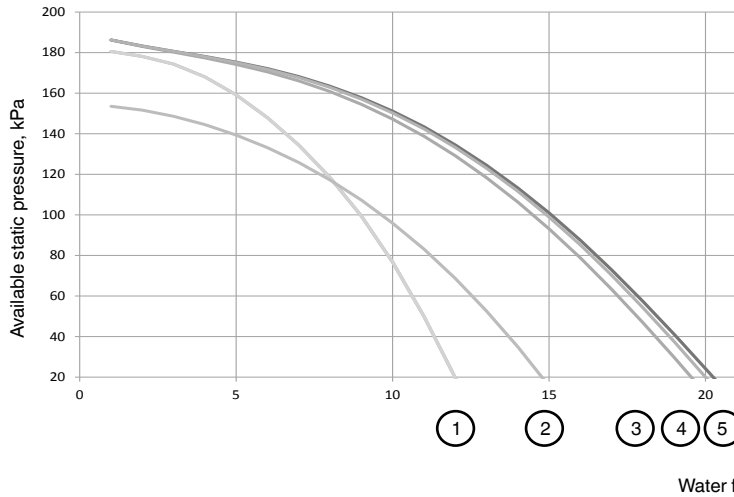
Data applicable for:

- Fresh water 20 °C
- Refer to the paragraph Evaporator water flow rate for maximum water flow values.
- In case of use of the glycol, the maximum water flow rate is reduced.

## Units 30RBM/30RBP low-pressure pumps (fixed speed)

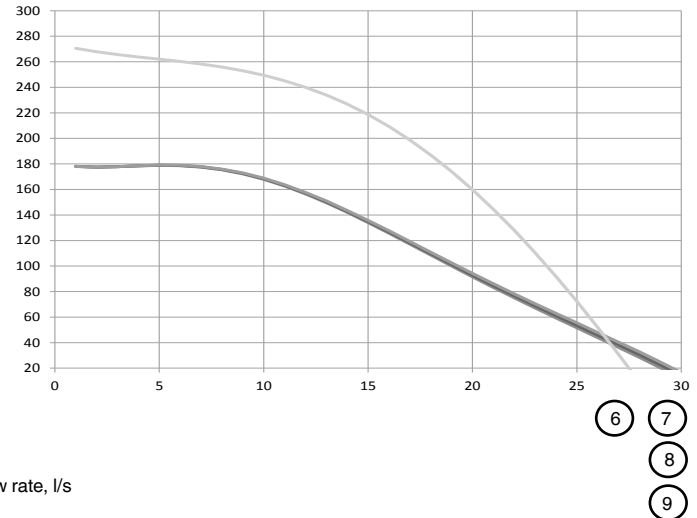
### Single pumps

#### Sizes 160-360



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

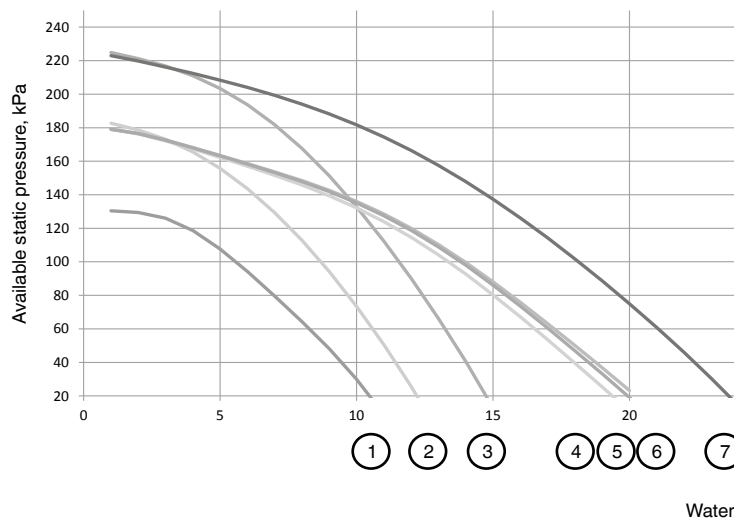
#### Sizes 400-520



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

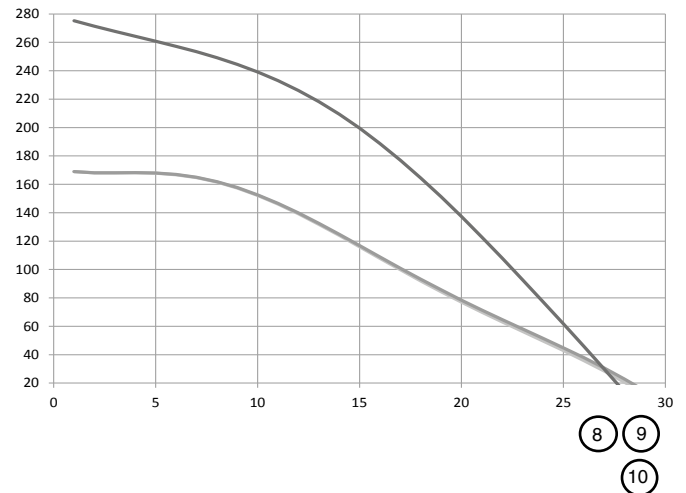
### Dual pumps

#### Sizes 160-400



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

#### Sizes 430-520

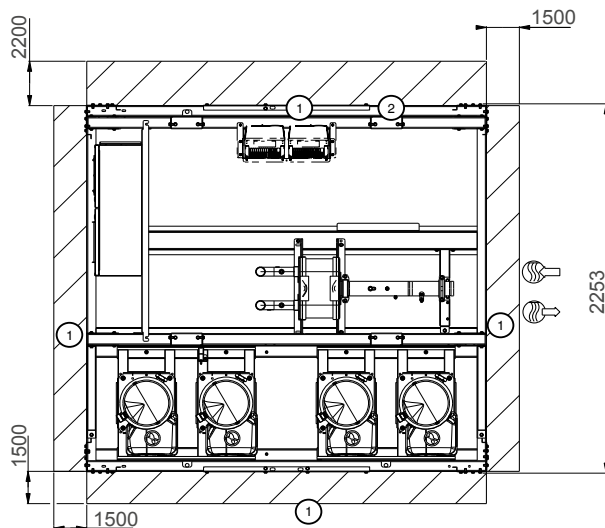
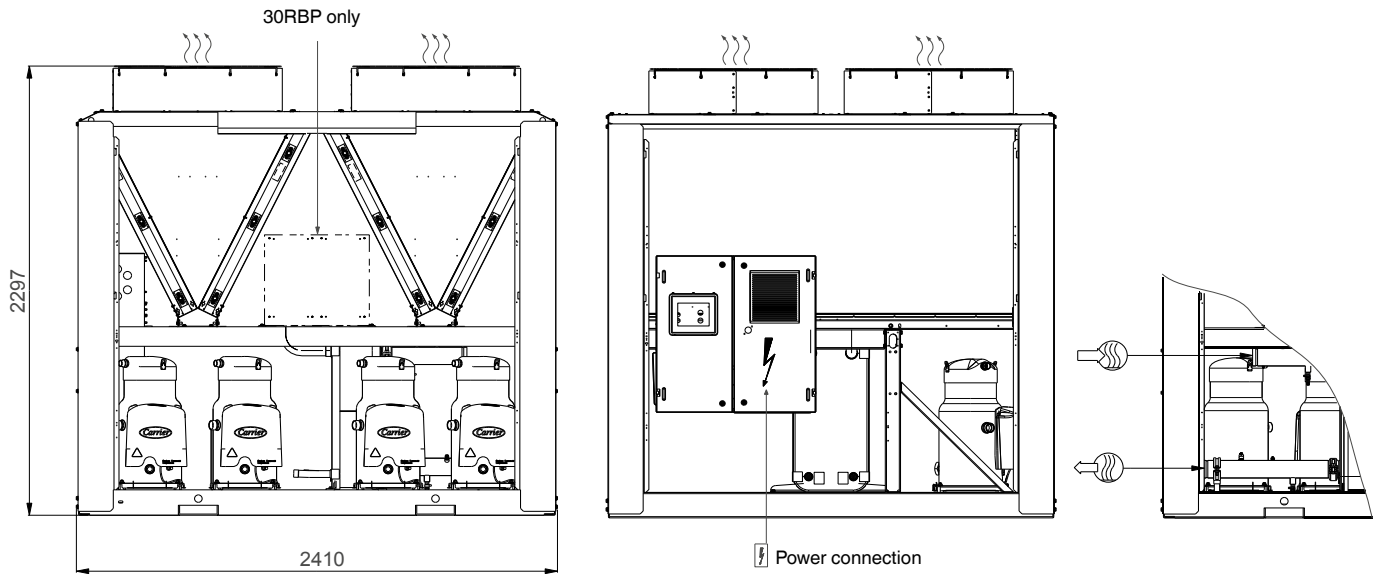


8. 30RBM-30RBP 520
9. 30RBM-30RBP 430
10. 30RBM-30RBP 470

# Dimensions/clearances

## 30RBM/30RBP 160-260 (with and without hydronic module)

### Unit without hydronic module



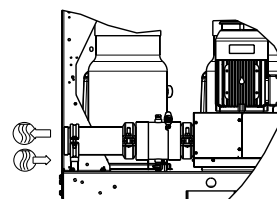
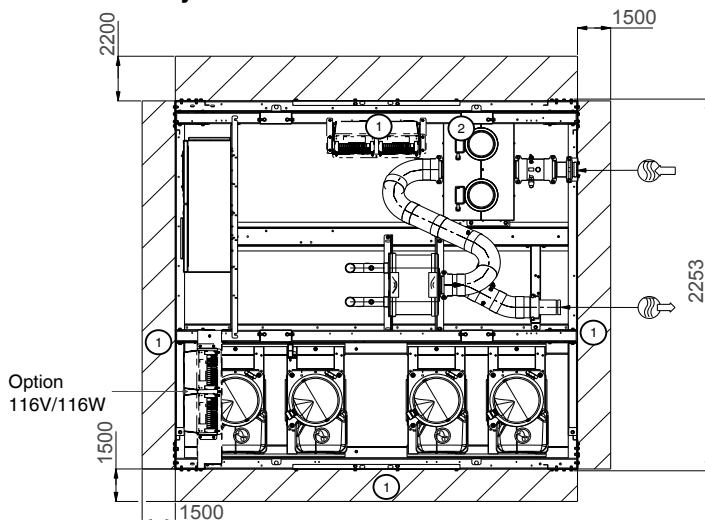
#### Legend:

All dimensions are in mm.

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

**Note:** Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.

### Unit with hydronic module

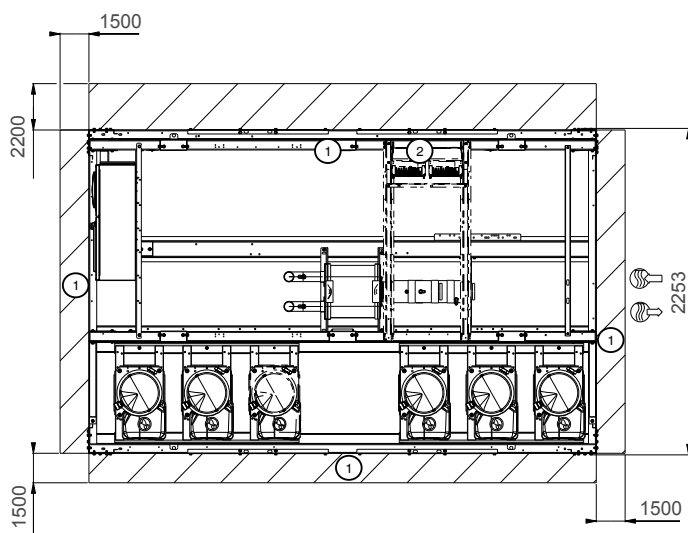
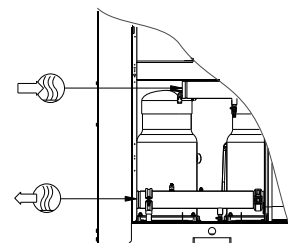
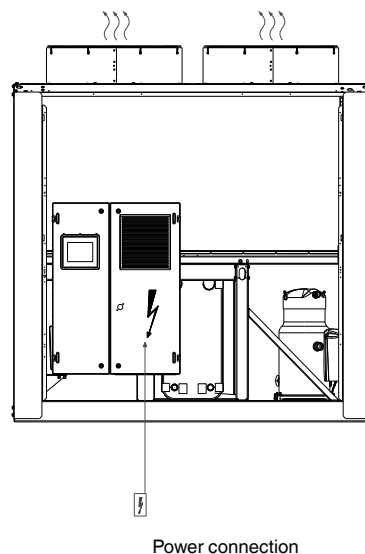
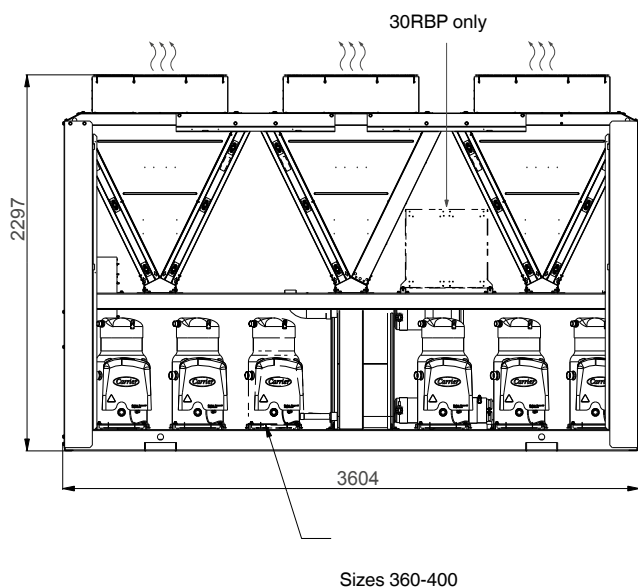


For the positioning of the fixing points, weight distribution points and centre of gravity coordinates please refer to the dimensional drawings.

# Dimensions/clearances

## 30RBM/30RBP 300-400 (with and without hydronic module)

### Unit without hydronic module



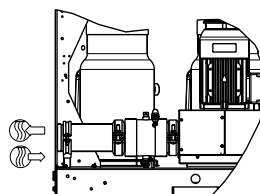
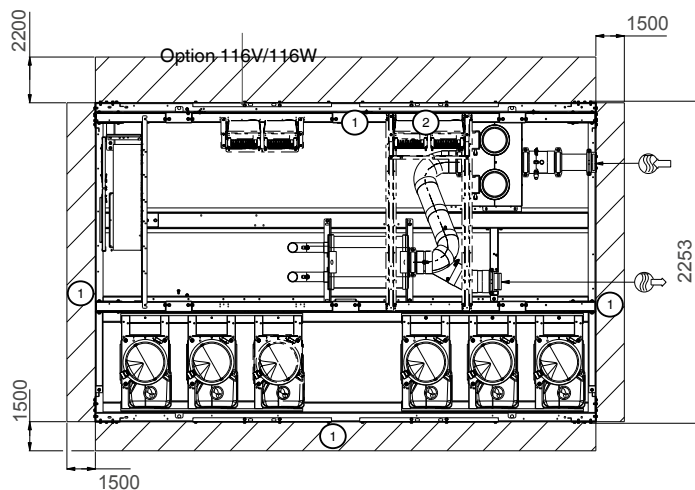
#### Legend:

All dimensions are in mm.

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

**Note:** Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.

### Unit with hydronic module

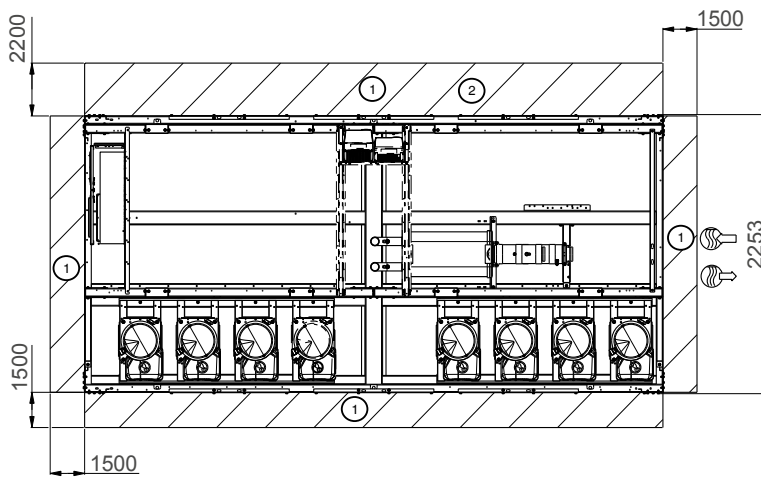
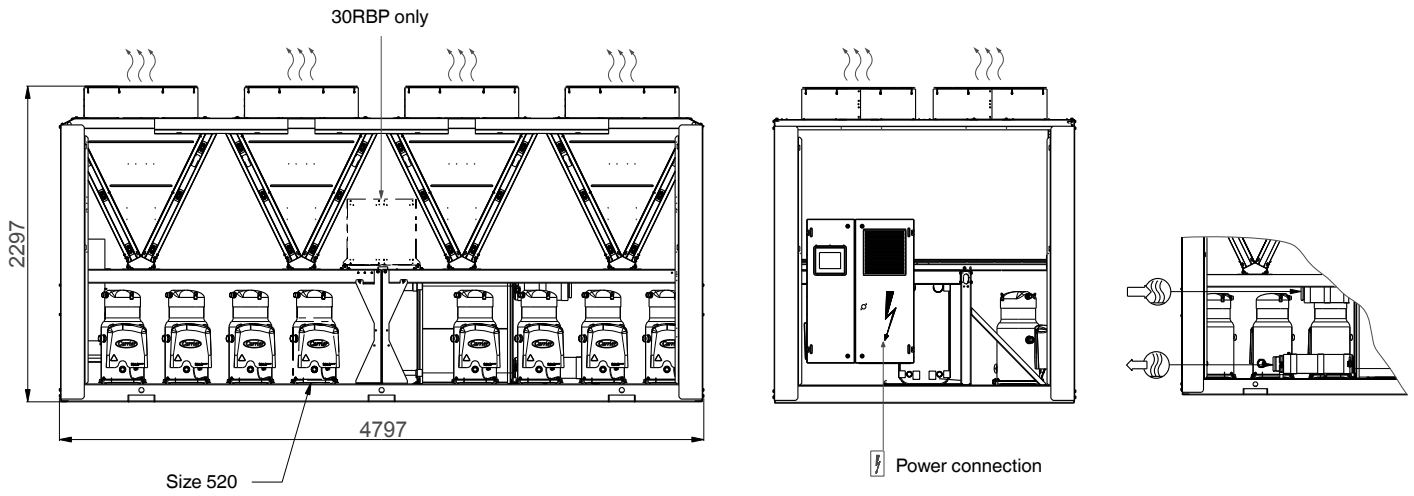


For the positioning of the fixing points, weight distribution points and centre of gravity coordinates please refer to the dimensional drawings.

# Dimensions/clearances

## 30RBM/30RBP 430-520 (with and without hydronic module)

### Unit without hydronic module



#### Legend:

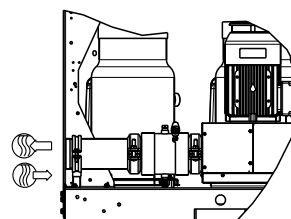
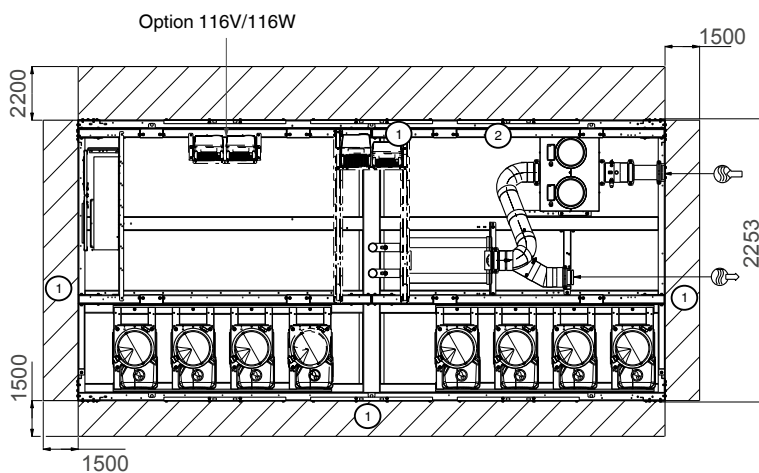
All dimensions are in mm.

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

**Note:** Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings, available on request.

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

### Unit with hydronic module



# Specification guide - 30RBP

## System description

Factory assembled, air-cooled liquid chiller utilising scroll compressors, low sound *Greenspeed® variable-speed fans* and optional hydronic pump module. The unit shall include all necessary wiring, piping, initial charge of R410A refrigerant, microprocessor controls and user display.

**Note:** Hydronic pump module shall be available with fixed-speed or Greenspeed® variable-speed driven pump(s).

## Quality assurance

Unit shall be rated in accordance with EN14511-3 Standard, latest revision and unit performances shall be *certified by independent Eurovent certification body*. Unit without independent Eurovent certification shall be excluded.

Unit construction shall comply with European directives:

- Commission regulation (EU) N°327/2011 implementing Directive 2009/125/EC with regards to Eco-design requirements for industrial fans
- Commission regulation (EU) N°640/2009 implementing Directive 2009/125/EC with regards to Eco-design requirements for electric motors
- From 1<sup>st</sup> January 2015, commission regulation (EU) N°547/2012 implementing Directive 2009/125/EC with regards to Eco-design requirements for water pumps (unit equipped with hydronic module option)
- Pressurised equipment directive (PED) 97/23/EC
- Machinery directive 2006/42/EC, modified
- Low voltage directive 2006/95/EC, modified
- Electromagnetic compatibility directive 2004/108/EC, modified, and the applicable recommendations of European standards
- Machine safety: Electrical equipment in machines, general requirements, EN 60204-1
- Electromagnetic emission and immunity EN 61800-3 'C3'.

Unit shall be manufactured in a facility registered to ISO 9001 Manufacturing Quality Standard and to ISO 14001 Environmental Management System. Unit shall be tested at the factory.

## Design performance data

- Cooling capacity (kW): .....
- Unit power input (kW): .....
- Part load energy efficiency, ESEER following EN14511:3 2013 (kW/kW): ..... *certified by Eurovent independent body (mandatory)*.
- Full load energy efficiency, EER following EN14511:3 2013 (kW/kW): .....
- Evaporator entering/leaving water temperature (°C): ..... / .....
- Fluid type: .....
- Fluid flow rate (l/s): .....
- Evaporator pressure drops (kPa): .....
- Outdoor air temperature (°C): .....
- Sound power level at full load (dB(A)): .....
- Sound power level during night\* (dB(A)): .....
- Refrigerant type: ..... (ODP ... / GWP ....)
- Refrigerant charge: ..... kg, teqCO<sub>2</sub>.....(.... kg/kW)
- Dimensions, length x depth x height (mm): ..... x ..... x .....
- Unit operating weight: ..... kg

\* Night sound power level is given for unit demand limit 50% capacity and 25 °C outside ambient temperature.

## Unit construction

- Frame shall be of heavy-gage, painted galvanised steel.
- Electrical Cabinet shall be galvanised steel casing painted in oven-baked polyester powder paint (light grey, RAL7035).

## Compressor assembly

Fully hermetic scroll type compressors, each equipped with:

- Two-pole electric motor (Direct on line 400 V, 2900 rpm at 50 Hz) cooled by suction gas and protected by internal temperature sensors.
- Initial oil charge of synthetic polyolester oil
- Integral oil level sight glass
- Electric crankcase heater to minimise oil dilution and refrigerant migration
- Electronic over temperature motor protection
- Optional soft starter to minimise compressor starting current with phase loss protection.

Low noise level and low vibration level shall be guaranteed by:

- Flexible anti-vibration mounts to isolate compressor assembly from unit chassis
- Suction and discharge piping designed to prevent the transmission of vibrations to the unit chassis
- Optional acoustic compressor enclosure, easily removable with 1/4 turn fasteners.

## Cooler

- Asymmetric brazed plate heat exchanger, direct expansion
- Design shall incorporate a minimum of two independent direct-expansion refrigerant circuits.
- Plate exchangers shall be made of AISI 316L stainless steel, copper brazed type.
- Exchangers shall be thermally insulated with 19 mm closed cell foam type insulation with a maximum K factor of 0.28.
- Shall be equipped with Victaulic-type fluid connections
- Cooler shall be tested and stamped in accordance with European PED 97/23/EC Code.
- *Cooler pressure drop shall not exceed 45 kPa under Eurovent conditions.* Cooler with higher pressure drops shall be excluded.
- Cooler shall be provided with a factory-installed *electronic flow switch*.

## Condenser

- *Coil shall be air-cooled Novation® micro channel heat exchanger (MCHE).*
- Coil construction shall consist of new generation of high resistant aluminium alloy in combination with an optional corrosion-resistant coating.
- Coil shall have a series of flat tubes containing a series of multiple, parallel flow micro channels layered between the refrigerant manifolds.
- Coils shall consist of a two pass arrangement.
- *Coil design shall adopt a V-shape for coil protection against hail damage.* Vertical coils shall be excluded.
- Assembled condenser coils shall be 100% leak tested and pressure tested at 45 bars.



## Fans

- All fans on the unit shall have variable speed drive (with Greenspeed® intelligence) to provide higher part load efficiency and reduced acoustic levels.
- All fans shall be automatically controlled (Greenspeed® intelligence) to achieve higher part load efficiency, winter operation down to -20 °C outside air temperature as standard, automatic fan speed adjustment in case of coil fouling, floating condensing pressure, smooth fan start to increase unit lifetime and eliminate start/stop noise for sensitive acoustic applications.
- Each refrigerant circuit shall have a factory-installed, independent variable speed drive. Variable speed drives shall be rated IP 55 enclosures and CE compliant.
- Condenser fans shall have a minimum overall efficiency higher than the minimum efficiency target to comply with commission regulation (EU) N°327/2011 implementing Directive 2009/125/EC with regards to Eco-design requirements for industrial fans.
- Condenser fans shall be direct-driven, 9-blade airfoil cross-section, reinforced polymer construction with inherent corrosion resistance, axial type, statically and dynamically balanced.
- Air shall be discharged vertically upward.
- Fans shall be protected by coated steel wire safety guards.
- Winter operation down to -20 °C outside air temperature as standard.

## Refrigerant

- HFC R410-A refrigerant
- Total unit refrigerant charge shall not exceed 0.14 kg/kW of cooling capacity at Eurovent conditions. Units with higher refrigerant charge shall be excluded.

## Refrigerant components

Refrigerant circuit components shall include:

- Replaceable-core filter drier
- Moisture indicating sight glass
- Electronic expansion device
- Liquid line service valves
- Complete operating charge of refrigerant R-410A and compressor oil.

## Electric features

- Unit shall operate on 400 V, 3-phase, 50 Hz +/-10% power supply without neutral.
- Control voltage shall be supplied by a factory-installed transformer.
- Unit shall be supplied with factory-installed main circuit breaker, also acting as electrical disconnect/isolator.

## Pro-dialog+ controls, safeties and diagnostics

Unit controls shall include the following minimum components:

- Microprocessor with non-volatile memory
- Power transformer to serve all controllers, relays, and control components
- LCD user display
- Remote control by contact or CCM
- Replaceable controller boards
- Pressure sensors to measure suction and discharge pressure
- Thermistors to measure cooler entering and leaving fluid temperatures, outside air temperature and refrigerant suction temperature
- Programmable flow switch or water pressure transducers to protect against low water flow situation.

## Controls features

- Automatic circuit lead/lag
- Refrigerant parameters control (suction superheat, condensing pressure control)
- Capacity control based on leaving (or entering) chilled fluid temperature and compensated by rate of change of return-fluid temperature
- Leaving or entering chilled fluid temperature reset from outside air temperature, differential chilled water temperature or via a 0-10 V signal
- Provision of a dual set point for the leaving chilled water temperature activated by a remote contact closure signal or by the built in time clock
- Chilled fluid temperature pull-down rate at start-up adjustable range from 0.11 °C to 1.1 °C per minute to prevent excessive demand spikes at start-up
- Programmable seven-day time schedule. Up to 14 holiday period definitions
- Night time sound control through demand limit and fan speed control to reduce the sound of the machine by a user-defined schedule
- Equal run time rotation of compressors and pumps
- Demand limit control (configurable from 0% to 100%) activated by remote contact closure
- Remote system interlock
- Alarm and Running outputs
- Installation, Operation and Maintenance manual, and machine spares part list shall be available in electronic format and easy accessible by connecting a laptop to the control panel
- Chilled water pump start/stop control
- Water flow and external static pressure electronic calculation
- Electronic setting of the water pump speed and the water flow (unit equipped with variable-speed pump hydronic module)
- Start/Stop command of external water pump (up to 2)
- Variable speed command of one external water loop pump by 0-10 V signal
- Low ambient protection to energise cooler and hydronic system trace heating (optional)
- Periodic pump start to ensure pump seals are properly maintained during off-season periods.

## Pro-Dialog+ user interface

The control panel shall include, as standard, a user interface that provides:

- Multi-language display capability (English, French, German, Dutch, Italian, Spanish or Portuguese)
- Status reading of all internal values such as pressures and temperatures
- Current operating mode and control point
- Water flow and external static pressure electronic readings
- Unit Configuration
- On-board time schedule configuration
- Three access levels for Standard, User and Service
- Text-based alarm, diagnostic and alarm history messages
- Red and green LEDs for easy status check.

User interface shall have back light and contrast adjustment for easy viewing in bright sunlight or night conditions.

## Control diagnostics

Unit control display shall include the following information for fault diagnostics:

- Compressor lockout
- Protection against loss of charge
- Low fluid flow
- Cooler freeze protection
- Thermistor and transducer malfunction
- Entering and leaving-fluid temperature
- Evaporator and condenser pressure
- Chiller starts number and run hours
- Compressor starts number and run hours
- Fan starts number and run hours
- Pump starts number and run hours
- Quick test shall verify operation of every switch, fan, pump and compressor before chiller is started. Diagnostics shall include the ability to view the list of the 10 alarms currently active with clear language descriptions of the alarm event.
- Two alarm history buffers shall allow the user to store no less than 50 alarm events with clear language descriptions, time and date stamp event entry. One alarm history shall be dedicated to general alarms while the other shall only display major failures.
- The control system shall allow software upgrade without the need for new hardware modules.

## Safeties

Unit shall be equipped with thermistors/transducers and all other control devices to protect from the following:

- Reverse rotation or wrong electrical power connection
- Low chilled fluid temperature
- Thermal overload
- High Pressure (software control override + pressure switch) made by software to avoid mechanical protection by pressure gauge opening
- Low suction pressure
- Electrical overload
- Loss of phase
- Low voltage power supply failure
- Low water flow rate.

## Operating characteristics

Unit shall be capable of starting and running at outdoor ambient temperatures from -20°C to 48°C.

Unit shall be capable of starting up with 40°C entering fluid temperature to the cooler.

## Electrical characteristics

- Unit shall be supplied with main on/off disconnect switch without fuse.
- Single point power connection
- Unit shall operate on 3-phase power at the voltage shown in the equipment schedule.
- Control points shall be accessed through terminal block.
- Unit shall be shipped with factory control and power wiring installed.

## Chilled water circuit

Chilled water circuit shall be rated for 10 bars maximum working pressure. Units with optional pump package are rated for 4 bars maximum working pressure.

## Options

The following options can be fitted to the unit, as required.

## Hydronic module

- The hydronic module shall be integrated in the chiller chassis without increasing its dimensions and include the following elements: Easily removable strainer, water pump with three-phase motor, *accurate and reliable electronic water flow control* (flow switch with paddle shall not be accepted), safety relief valve calibrated to 4 bar. *Water flow and external static pressure electronic readings* shall be available through operator user interface. Additional pressure/temperature taps (2) shall be factory installed to measure the pressure differential across the hydronic module.
- From 1st January 2015, water pump shall comply with Commission regulation (EU) N°547/2012 implementing Directive 2009/125/EC with regards to Eco-design requirements.
- Pump motors shall be totally enclosed single speed, 3-phase type with permanently lubricated bearings, Class F insulation. Pump motors shall be IE3 efficiency level rated.
- Each pump shall be 100% factory tested per Hydraulic Standards.
- The pump shall be protected against cavitation through electronic pressure control at pump inlet.
- Pump casing shall be of cast iron with cataphoresis coating.
- The impeller shall be of AISI 316L stainless steel laser technology welded.
- A choice of 6 hydronic modules shall be available:
  - High-pressure single-pump hydronic module
  - High-pressure dual-pump hydronic module
  - Low-pressure single-pump hydronic module
  - Low-pressure dual-pump hydronic module
  - High-pressure variable-speed single-pump hydronic module
  - High-pressure variable-speed dual-pump hydronic module
- Dual pump hydronic module shall have two independent electric motors and two independent impellers to ensure reliable operation
- Cast iron body strainer with 1.2 mm mesh screen
- The water piping shall be protected against corrosion and equipped with drain and vent plugs.
- The piping and the water pump shall be fully insulated to prevent condensation (pump insulation using polyurethane foam and painted steel casing).
- Frost protection down to -20°C shall be guaranteed by optional electric trace-heating (24 volt) and the water pump shall be automatically started by the controller safety logic in case of a risk of frost formation.
- The customer connections shall be Victaulic connections.

## Additional specifications for variable-speed pump hydronic module

- Hydronic module with variable-speed single pump shall be equipped with one VFD (variable frequency drive) to save energy.
- Hydronic module with variable-speed dual pump shall be equipped with two VFDs (variable frequency drive) for full redundancy and to save energy.
- VFD drive along with Greenspeed® intelligence shall be able to vary the pump motor speed in the 30-50 Hz frequency range.
- Nominal unit water flow shall be established through electronic setting of the pump speed to achieve energy savings. Use of a regulating valve to set nominal water flow shall not be accepted.
- Water flow control based on compressor usage, constant system pressure difference or constant system temperature difference shall be available on choice.

**Evaporator frost protection**

Trace heating provides protection against cooler, water piping freezing between 0 °C and -20 °C outside air temperature.

**Evaporator and hydronic module frost protection**

Trace heating provides protection against cooler, water piping and hydronic module freezing between 0 °C and -20 °C outside air temperature.

**Expansion tank**

Expansion tank shall be supplied with the hydraulic module to protect closed water systems from excessive pressure.

**Welded evaporator water connection kit**

Victaulic connection adapter for easy water piping connection.

**Low noise level**

Aesthetic and sound absorbing compressor enclosure to reduce noise level by 1 to 2 dB(A).

**Very low noise level**

Aesthetic and sound absorbing compressor enclosure associated with low-speed fans to reduce noise level by 6 to 7 dB(A).

**Compressor discharge valves**

Shut-off valves on the compressor suction and discharge piping for simplified maintenance (possibility to store the refrigerant charge in the cooler or condenser side during servicing).

**Compressor suction and discharge valves**

Shut-off valves on the compressor discharge piping for simplified maintenance (possibility to store the refrigerant charge in the condenser side during servicing).

**Enclosure panels**

Side enclosure panels at each end of the coil to improve aesthetics, to protect coil and piping against impacts.

**Grilles and enclosure panels**

Metal grilles on the 4 unit sides, plus side enclosure panels at each end of the coil to protect against intrusion to the unit interior, to improve aesthetics while protecting coil and piping protection against impacts.

**Partial Heat Recovery**

Unit equipped with one desuperheater on each refrigerant circuit in order to produce free high-temperature hot-water simultaneously with chilled water production

**High Static Fan**

Unit equipped with high static variable-speed fans (maximum 200 Pa), each fan being equipped with a connection flange allowing the connection to the ducting system.

**Enviro-Shield® anti-corrosion protection**

- Enviro-Shield® shall provide microchannel coils protection against many corrosive atmospheres. Enviro-Shield shall be a nano-scale conversion coating, 100-200 nm thick, which uniformly covers the entire surface of the coil. Non conversion coating treatments shall not be accepted.
- *The coating process shall include immersion in a coating bath.* The coating shall be applied by an autocatalytic conversion process which shall modify the surface of the aluminum producing a coating that is integral to the coil. Complete immersion shall ensure that 100% of the surface is coated, forming a continuous and even film. Spray coating process shall not be accepted.
- The coating shall be integral to the MCHE and shall not flake or lose adhesion with cross hatch adhesion of 5B per ASTM D3359.
- The thin coating shall have no variation in heat transfer or air flow per ARI 410.
- Enviro-Shield® shall utilise corrosion inhibitors which actively arrest damage due to environmental or mechanical damage. *Corrosion durability of coated micro channel coils shall be confirmed through testing to no less than 4000 hours constant neutral salt spray per ASTM B117*

**Super Enviro-Shield® anti-corrosion protection**

- Super Enviro-Shield® coated aluminum microchannel coil shall have a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers. Super Enviro-Shield coils shall provide superior protection in the most severe environments.
- *The coating process shall be an electro coating process with immersion in a coating bath and a final UV protective topcoat to shield the finish from ultraviolet degradation and to ensure coating durability and long life.* Spray coating and non-electrocoating process shall not be accepted.
- Coating process shall ensure complete coil encapsulation, including all exposed fin edges. Super Enviro-Shield® coating shall have a uniform thickness of 20 to 40 µm with top coat having a dry film thickness from 25 to 50 µm on all external coil surface areas including fin edges.
- The coating shall have minimal variation in heat transfer or air flow (<1%) per ARI 410.
- Super Enviro-Shield® coated coils shall have superior hardness characteristics of 2H per ASTM D3363 and cross hatch adhesion of 4B-5B per ASTM D3359. Impact resistance shall be up to 100 in./lb (ASTM D2794).
- *Corrosion durability of coated micro channel coils shall be confirmed through testing to no less than 6000 hours constant neutral salt spray per ASTM B117*

**Soft starter**

Electronic starter on each compressor to reduce the start-up current.

**Power Factor Correction (PFC)**

Integrate additional capacitors to ensure a power factor (Cos phi) of 0.95 at full load.

### Master/slave operation

- Two units connected by CCN shall cooperate to assure system water temperature.
- The master unit shall be the only interface to control the operation of both chillers.
- Up to 5 possible water loop configuration (parallel, common or dedicated pumps, series, etc.).
- Three balance modes: Disabled, only on failure, according to run times.
- Common pump management (external pump and units provided with flow switch only) or dedicated pump management (internal pump can be used).

### Energy management module

Shut-off valves on the compressor suction and discharge piping for simplified maintenance (possibility to store the refrigerant charge in the cooler or condenser side during servicing).

Communication board with additional inputs/outputs

- Input contacts:
  - Set-point reset by indoor air temperature sensor (10 kOhms) or by a 4 to 20 mA signal
  - Time schedule override
  - End of ice production (ice storage)
  - One additional demand limit volt-free input
  - Demand limitation by 0-10 V signal.
- Output contacts:
  - Instantaneous chiller capacity by 0-10 V signal
  - Alert indicator
  - Complete shut-down due to a chiller fault
  - Boiler on/off command during winter season (heat mode by changeover or manual configuration).

### CCN to J-Bus gateway

Unit shall be supplied with factory-installed two-directional communication board to interface the unit with a JBUS Local Area Network (JBUS, ModBUS). Field programming for customisation is possible.

### CCN to Lon gateway

Unit shall be supplied with factory-installed two-directional communication board to interface the unit with a LonWorks® Local Area Network (LON, i.e., LonWorks FT-10A ANSI/ EIA-709.1). Field programming shall be required.

### Electrical plug

- 230 V/0.8 A AC power supply source provided with plug socket for connections of laptops.

### Touch Pilot control

The Touch Pilot Control shall include advanced communication technology over Ethernet (IP), user-friendly and intuitive user interface with 5 colour touch screen.

### Advanced controls features

- Web connectivity
- Fast BACnet IP connectivity (with BACnet® IP Communication option)
- Wireless IP connectivity (with Carrier Connect option - availability during 2014)
- Energy monitoring and trending capabilities (with Electric energy meter option)
- Alarm notification through emails
- Trending capability (display by Web Browser only).

### Touch Pilot, 5 user interface

- Modern and intuitive 5 inch colour screen
- Finger or pencil touch capable
- All local interaction accessible (Quick test, Start/Stop, Operating mode, etc.)
- Trending display
- Synoptic screen with current operating status and physical values
- Eight unicode languages supported including Chinese
- Possibility to load a custom translation file
- Access to the interface through Web Browser.

### BACnet/IP gateway (compatibility with Touch Pilot control only)

Unit shall be supplied with factory-installed two-directional high-speed communication using BACnet protocol over Ethernet network (IP). This option shall allow unit integration with BACnet building automation system using Internet Protocol. This new generation of BACnet IP communication shall allow high speed communications with building management systems, no limitation in reading/writing controller points and shall use standardised alarm codes as defined with BACnet protocol. Field programming may be required.

**Note:** 30RBM Specification Guide is also available. Please contact Carrier representative for more information.



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Quality and Environment  
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