



United Technologies

## PRODUCT SELECTION DATA



Unit with low-noise option

- High full- and part-load efficiency
- Compact and simple to install
  - Low sound level
- 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

AquaSnap liquid chillers are the best solution for commercial and industrial applications where installers, engineering and design departments and building owners require reduced installation costs, optimal performance and the highest quality.

The new generation of AquaSnap heat pumps feature 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 a variable speed pump and fans, provides premium part-load efficiency to reduce maintenance costs over the lifespan of the chiller. Additionally, the low sound levels achieved under part-load conditions can be very beneficial for sensitive acoustic applications. Besides operating efficiently and quietly, the AquaSnap Greenspeed® operates from -20°C up to 48°C as standard.

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 fans (30RBP models)
- Novation® micro-channel heat exchangers with new aluminium alloy
- Brazed-plate heat exchangers with reduced water pressure drops
- Auto-adaptive microprocessor control with Greenspeed® intelligence
- Colour touch screen with web connectivity options
- 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; these significantly reduce pumping energy costs (by more than two-thirds), ensure optimal water flow control, and improve the overall reliability of the system.

For use in the harshest environments combining high temperatures, dust and sand, the AquaSnap (30RBM) can be equipped with an optional IP54 electrical box and cabinet fan enabling it to operate at outdoor air temperatures of up to 52°C.



### 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 which can exactly match the cooling capacity to the load required
    - Electronic expansion valve enabling operation at a lower condensing pressure and improved use of the evaporator heat exchange surface (superheat control)
    - Condenser with high-efficiency Novation® aluminium micro-channel heat exchangers and Greenspeed® variable-speed fans (30RBP version)
    - Low pressure drop brazed plate heat exchangers (< 45 kPa under Eurovent conditions).
  - Specific control functions to reduce unit cooling energy use during occupied and unoccupied periods:
    - Internal timer: switches the chiller on/off and controls operation at a second setpoint
    - Automatic water setpoint offset based on outside air temperature or room air temperature (via an option)
    - Floating high-pressure (HP) management
    - Variable-speed fan control
    - Cooling demand limitation.
- Refer to control chapter for more information.
- Greenspeed® variable-speed pump to reduce pumping energy consumption by up to two-thirds (option recommended by Carrier):
    - Eliminate energy losses through the water flow control valve by electronically setting the nominal water flow
    - Save energy during stand-by periods or part-load operation by automatically reducing the water pump speed. The energy consumption of the pump motor varies according to the cube of the speed, so that a reduction in speed of just 40% can reduce energy consumption by 80%
    - Improved unit part-load performance (Increased SEER value with variable water flow according to EN14825 standard).

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 recovery.
- Reduced maintenance costs:
  - The control enables quick diagnostics on possible incidents and their history
  - R-410A refrigerant is easier to use than other refrigerant blends.

### Low sound level

- Condenser 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 with Greenspeed® variable-speed fans (30RBP models recommended by Carrier for even quieter operation):
  - Optional factory setting of the fan to low speed, with compressor 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 the 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 mounts
  - Dynamic suction and discharge piping support, minimising vibration transmission (Carrier patent)
  - Acoustic compressor enclosure, reducing noise emissions (optional).



### Quick and easy installation

- Compact design:
  - AquaSnap units are designed with 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 (optional):
  - 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 a heater (optional)
  - High-capacity membrane expansion tank (optional).
- Integrated hydronic module with Greenspeed® variable-speed pump (option recommended by Carrier):
  - Quick and easy electronic setting of the nominal water flow when the unit is commissioned, thus eliminating the need to adjust the water flow control valve
  - 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 using an integrated transformer.
- Fast unit commissioning
  - Systematic factory test before shipment
  - Quick-test function for step-by-step verification of the sensors, electrical components and motors.

### Reduced installation costs

- Optional Greenspeed® variable-speed pump with hydronic module (option recommended by Carrier)
  - Cut costs relating to the water flow control valve
  - The design of the water system with variable primary flow (VPF) can provide significant installation cost savings compared with traditional constant primary systems with variable secondary circuits; elimination of the secondary distribution pump, etc.
  - Water system design with fan coils fitted with 2-way valves instead of 3-way valves.
- No buffer tank required thanks to Carrier's advanced 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 connections
  - Qualified Carrier maintenance personnel carry out refrigerant servicing operations
  - ISO14001-certified site of manufacture.
- Reduced indirect warming potential (90% of total equivalent warming impact):
  - Reduced unit energy use (high full- and part-load efficiency)
  - Pumping energy consumption can be reduced by up to 2/3 using Greenspeed® variable-speed pumps.

## 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-aluminium Novation® micro-channel heat exchanger (MCHE) with higher corrosion resistance than a conventional coil. The all-aluminium construction eliminates the formation of galvanic currents between aluminium 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 aluminium 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 to the outer surface of the coil using an electro-coating process with a final UV protective topcoat. Minimal variation in heat transfer, subjected to salt spray test for 6000 hours (ASTM B117), superior impact resistance (ASTM D2794)
  - Optional IP54 protection level for compressor control boxes and cabinet fans to guarantee safe operation in hot, dusty and sandy environments
  - Electronic flow switch. Auto-setting according to cooler size and fluid type.
- Auto-adaptive control
  - Control algorithm prevents excessive compressor cycling and reduces the quantity of water 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.

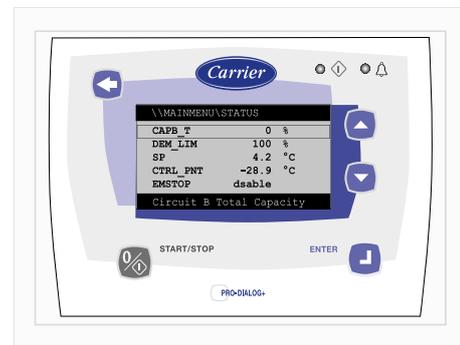
## Pro-Dialog+ control

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 timer: controls chiller on/off times and operation at a second setpoint
  - Setpoint offset based on the outside air temperature
  - Master/slave control of two chillers operating in parallel with operating time balancing and automatic changeover in case of a unit fault.

- Energy management configuration
  - Internal timer: Controls chiller on/off times and operation at a second setpoint
  - Setpoint offset based on the outside air temperature
  - Master/slave control of two chillers operating in parallel with operating time balancing and automatic changeover 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 enabling navigation via intuitive tree-structure menus. These user-friendly buttons enable quick access to the main operating parameters: Compressor operation, suction/discharge pressure, compressor operating hours, setpoint, air temperature, entering/leaving water temperature.



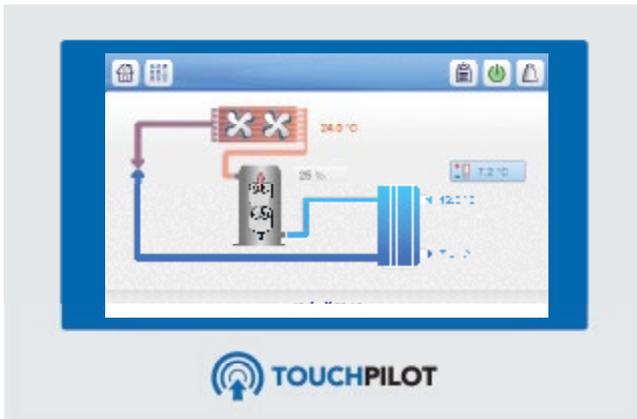
- The information is displayed clearly in English, French, German, Italian, Portuguese and Spanish (for other languages, please consult Carrier).
- The backlit LCD user interface includes a manual control potentiometer to ensure legibility under any lighting conditions.

## Touch Pilot control (standard)

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

- Energy management configuration
  - Monitoring of the cooling and pumping energy consumption via the user interface with optional electricity meter
- Advanced communication features
  - High-speed user-friendly communication technology over Ethernet (IP) to a centralised building management system
  - Access to multiple unit parameters.
- Maintenance functions
  - F-Gas regulation leak check reminder alert
  - Maintenance alert can be configured to days, months or hours of operation

## ■ Touch Pilot, 5-inch 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 centralised building management systems via optional communication gateways.

A connection terminal enables the AquaSnap to be controlled remotely by wired cable:

- Start/stop: Opening of this contact will shut down the unit
- Dual setpoint: closing of this contact activates a second setpoint (e.g.: 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 more refrigerant circuits.

### Energy Management Module (optional)

The Energy Management Module offers extended remote control possibilities:

- Room temperature: Enables the setpoint to be reset based on the indoor air temperature of the building (with Carrier thermostat).
- Setpoint reset: the cooling setpoint is reset based on a 4-20 mA signal.
- Demand limit: Enables the maximum chiller power to be limited 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 is used to return to the second setpoint (unoccupied mode).
- Timer override: Closing of this contact cancels the effects of the timer.
- 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 need to carry out a maintenance operation or the presence of a minor fault.
- Boiler control: This on/off output controls an independent 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 a new, extra-resistant aluminium alloy. Already used in the automotive and aeronautical industries for many years, the micro-channel heat exchanger (MCHE) on the AquaSnap is made entirely of aluminium. This one-piece design significantly increases its corrosion resistance by eliminating the galvanic currents that are created when two different metals (copper and aluminium) come into contact in traditional heat exchangers. Unlike traditional heat exchangers, MCHEs can be used in moderate marine and urban environments.

In terms of energy efficiency, MCHEs are approximately 10% more efficient than a traditional coil and enable a 40% reduction in the amount of refrigerant used in the chiller. The slim design of the MCHE reduces air pressure losses by 50% and, compared to a traditional coil, makes it less susceptible to fouling (e.g. by sand). It is very quick to clean the MCHE using a high-pressure washer.

# Options

Options	No.	Description	Advantages	Use
Medium-temperature brine solution	5B	Production of chilled water at low temperatures (down to 0°C) with ethylene glycol and propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RBM/30RBP 160-520
Low-temperature brine solution	6B	Low-temperature chilled water production down to -15°C with ethylene glycol and down to -12°C with propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RBM/P 160-400 for chilled water down to -15°C
High-static fans	12	Units are equipped with high-static, variable-speed fans (maximum 200 Pa), and each fan is equipped with a connection flange for connection to the ducting system.	Ducted fan discharge, optimised condensing temperature control (or evaporating temperature control on heat pump version), based on the operating conditions and system specifications	30RBP160-520
Low noise level	15	Sound absorbing compressor enclosure with a stylish design	Noise level reduction by 1 to 2 dB(A)	30RBM/30RBP 160-520
Very low noise level	15LS	Acoustic compressor enclosure and low-speed fans	Noise level reduction by 6 to 7 dB(A)	30RBM/30RBP 160-520
High ambient temperature	16	Unit equipped with electrical box cooling fan	Extended unit part-load operation up to ambient temperatures of 52°C	30RBM 160-520
IP54 control box	20A	Increased leak tightness of the unit	Protects the inside of the electrical box from dust, water and sand. In general, this option is recommended for installations in polluted environments	30RBM/30RBP 160-520
Grilles and enclosure panels	23	Metal grilles on the 4 sides of the unit, plus side enclosure panels at each end of the coil	Enhanced design; protection against intrusion to the interior of the unit; coil and piping protection against impacts.	30RBM/30RBP 160-520
Enclosure panels	23A	Side enclosure panels at each end of the coil	Enhanced design, coil and piping protection against impacts.	30RBM/30RBP 160-520
Electronic starter	25	Electronic starter on each compressor	Reduced start-up current	30RBM/30RBP 160-520
Winter operation down to -20°C	28	Lead fan speed control for each circuit using a variable frequency drive	Stable unit operation for outside air temperatures from 0°C down to -20°C in cooling mode	30RBM 160-520
Winter operation down to -10°C	28B	Two-speed lead fan for each circuit	Stable unit operation for outside air temperatures from 0°C down to -10°C	30RBM 160-520
Winter operation down to -10°C (low speed)	28C	Each circuit features 2 two-speed lead fans	Reduces the noise level and enables stable unit operation for outside air temperatures down to -10°C	30RBM 160-520
Water exchanger frost protection	41	Electric heater on the water-cooled heat exchanger and the water pipes	Water-cooled heat exchanger module frost protection for outdoor temperatures between 0°C and -20°C	30RBM/30RBP 160-520
Hydronic module and exchanger frost protection	42A	Electric heaters on the water-cooled heat exchanger, water pipes, hydronic module and expansion tank	Water-cooled heat exchanger and hydronic module frost protection at outdoor air temperatures down to -20°C	30RBM/30RBP 160-520
Partial heat recovery	49	Unit equipped with one desuperheater on each refrigerant circuit	Free high-temperature hot water production at the same time as chilled water production (or hot water for heat pump)	30RBM/30RBP 160-520
Master/slave operation	58	Unit equipped with an additional leaving water temperature sensor, to be installed on site, enabling Master/Slave operation of 2 units connected in parallel	Optimised operation of two units connected in parallel operation with operating time balancing	30RBM/30RBP 160-520
Compressor suction and discharge valves	92A	Shut-off valves on the compressor suction and discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the cooler or condenser side during servicing	30RBM/30RBP 160-520
Compressor discharge valves	93A	Shut-off valves on the compressor common discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the condenser side during servicing	30RBM/30RBP 160-520
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.)	Quick and easy installation (plug & play)	30RBM/30RBP 160-520
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.)	Quick and easy installation (plug & play)	30RBM/30RBP 160-520
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.)	Quick and easy installation (plug & play)	30RBM/30RBP 160-520
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.)	Quick and easy installation (plug & play)	30RBM/30RBP 160-520
HP evap. VSD single-pump	116V	Single high-pressure water pump with variable speed drive (VSD), water filter, electronic water flow control, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available.)	Quick and easy installation (plug & play), significant cost savings on pumping energy (more than two-thirds), precise water flow control, improved system reliability	30RBM/30RBP 160-520
HP VSD dual-pump.	116W	Dual high-pressure water pump with variable speed drive (VSD), water filter, electronic flow switch, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available.)	Quick and easy installation (plug & play), significant cost savings on pumping energy (more than two-thirds), precise water flow control, improved system reliability	30RBM/30RBP 160-520
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
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 winter (e.g. offices with a computer room, meeting rooms etc.)	30RBM/30RBP 160-520 Not available on 30RBP 360/400
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a centralised building management system	30RBM/30RBP 160-520
LON communication gateway	148D	Two-directional communication board complying with LonTalk protocol	Connects the unit by communication bus to a centralised building management system	30RBM/30RBP 160-520
BACnet/IP	149	Two-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy, high-speed connection by Ethernet line to a building management system. Allows access to multiple unit parameters	30RBM/30RBP 160-520
Energy Management Module	156	EMM Control board with additional inputs/outputs. See Energy Management Module option chapter	Extended remote control capabilities (e.g. setpoint reset, ice storage end, demand limits, boiler on/off control etc.)	30RBM/30RBP 160-520
Touch Pilot 5" user interface	158	Touch Pilot control supplied with a 5-inch colour touch screen user interface	Control with advanced communication technology over Ethernet (IP), user-friendly and intuitive user interface with 5" colour touch screen	30RBM/30RBP 160-520
Compliance with Russian regulations	199	EAC certification	Compliance with Russian regulations	30RBM/30RBP 160-519
Power factor correction	231	Capacitors for automatic correction 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

# Options

Options	No.	Description	Advantages	Use
Anticorrosion coating (Enviro-Shield)	262	Coating which uses a conversion process to alter the aluminium surface into a coating which forms an integral part of the coil. Complete immersion in a bath to ensure 100% coverage. No heat transfer variation, salt spray resistance test for 4000 hours (ASTM B117)	Improved corrosion resistance, recommended for use in moderately corrosive environments	30RBM/30RBP 160-520
Super Enviro-Shield anti-corrosion protection	263	Extremely durable and flexible epoxy polymer coating applied to micro-channel heat exchangers via an electro-coating process, with a final UV protective topcoat. Minimal variation in heat transfer, tested to withstand more than 6000 hours of constant neutral salt spray as per ASTM B117, superior impact resistance as per ASTM D2794	Improved corrosion resistance, recommended for use in extremely corrosive environments	30RBM/30RBP 160-520
Welded evaporator water connection kit	266	Victaulic piping connections with welded joints	Easy installation	30RBM/30RBP 160-520
230 V electric plug	284	230 VAC power supply source provided with plug socket and transformer (180 VA, 0.8 A)	Enables connection of a laptop or an electrical device during unit start-up or servicing	30RBM/30RBP 160-520
Expansion tank	293	6-bar expansion tank integrated into the hydronic module (option 116 required)	Easy, quick installation (ready to use), and closed circuit protection of hydraulic systems to counter excessive pressure	30RBM/30RBP 160-520
Screwed water connection sleeve kit for DSH	303	DSH connections with screw connection sleeves	Easy to install. Used to connect the unit to a screw connector	30RBM/30RBP 160-520
Welded water connection sleeve kit for DSH	304	DSH inlet/outlet welded connection sleeves	Easy installation	30RBM/30RBP 160-520
Set point adjustment by 4-20mA signal	311	Connections to allow a 4-20mA signal input	Easy energy management, allow to adjust set point by a 4-20mA external signal	30RBM/30RBP 160-520
Free-cooling mode drycooler management	313	Control and connections to a free-cooling drycooler 09PE or 09VE fitted with optional FC control box	Easy system management, control capabilities extended to a drycooler used in free cooling mode	30RBM/30RBP 160-520

## Brine options (Option 5B & Option 6B)

The medium-temperature brine solution option (5B) is used for production of chilled water at low temperatures down to 0°C.

Brine production from 0°C to -15°C is only possible with the low-temperature brine option (6B).

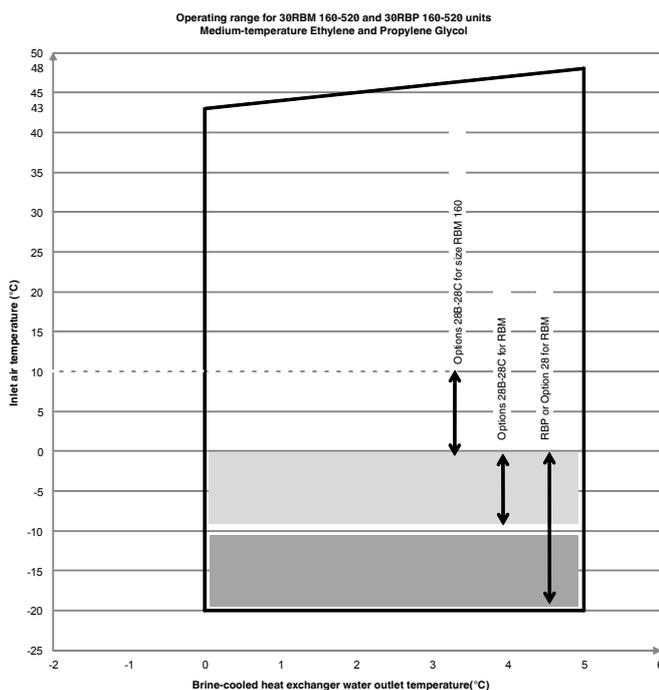
The unit is equipped with insulation on the intake pipes. The insulation is reinforced on the low-temperature brine solution option.

The operating range depends on:

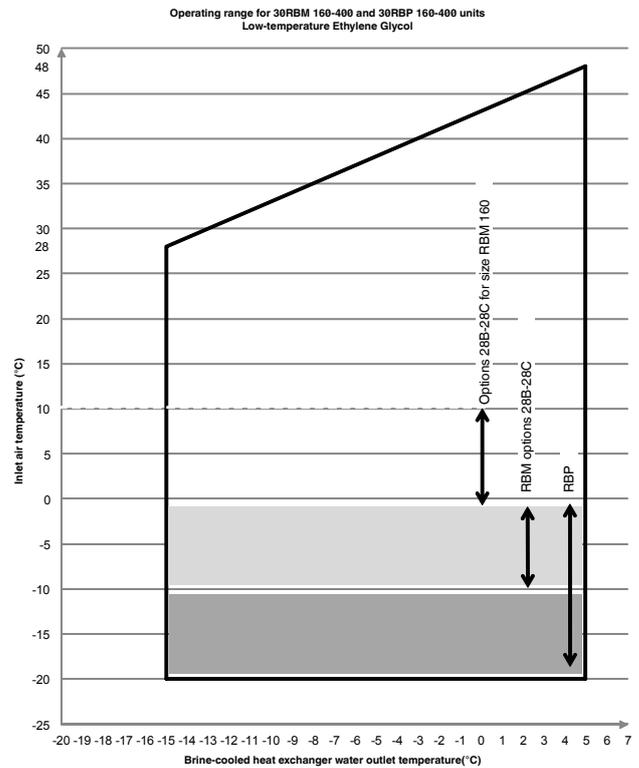
- the unit size,
- the glycol type,
- its concentration,
- the flow rate,
- the temperature of the glycol solution,
- the condensing pressure (ambient temperature).

### Operating range

#### ■ Medium-temperature brine solution



#### ■ Low-temperature brine solution



#### Notes

- Evaporator  $\Delta T = 5K$  (max.)
- Operating ranges are guidelines only. Check the operating range in the Carrier electronic catalogue.

#### Key

	30RBM or 30RBP brine operating range
	Operating range of 30RBM unit equipped with options 28 and 28C "Winter operation". Options 28B-28C (with two-speed lead fan for each circuit) enable operation at outdoor temperatures down to -10°C.
	RBP operating range or extension of the operating range, 30RBM unit equipped with option 28. Option 28 (with variable-speed lead fan for each circuit) enables operation at outdoor temperatures down to -20°C.

## Refrigerant charge for low-temperature brine solution option

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

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

## 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 ducting system that causes a pressure drop in the air circuit.

Therefore this option features more powerful fan motors than those fitted to standard units.

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

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. x 1.72).

The full-load or part-load speed is controlled by a patented algorithm that permanently optimises 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 performance levels (capacity, efficiency) depend on the speed of the fans, then on the duct pressure drop:

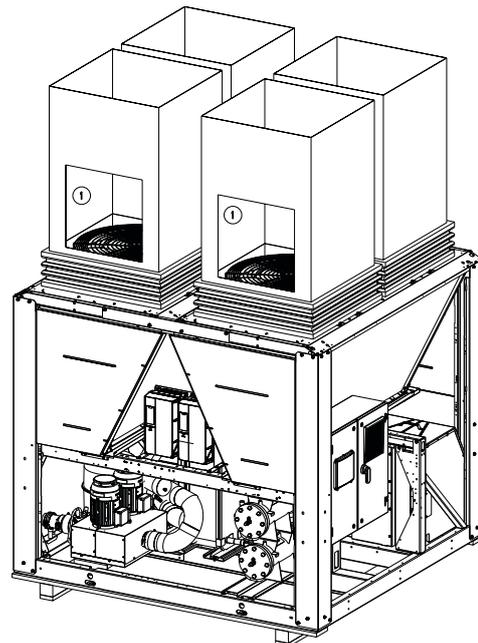
- Between 0 and 100 Pa, the unit performance is only slightly affected

- Between 100 and 200 Pa, the unit performance 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 catalogue to evaluate the impact of the estimated duct system on the operating conditions of the 30RBP unit.

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 recovery using desuperheaters (option 49)

This option enables free hot water to be produced using heat recovery 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 heat exchanger coils on the compressor discharge line of each circuit.

## Physical data, 30RBM/30RBP units with partial heat recovery 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
	tCO <sub>2</sub> e	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
	tCO <sub>2</sub> e	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>													
		Victaulic											
Connection	in	2	2	2	2	2	2	2	2	2	2	2	2
External diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
<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 name plate.

## Operating limits

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

\* On start-up, the entering water temperature must not be below 25°C. For installations with lower temperatures, 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
Total heating capacity	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
Recovery capacity (45-55)	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 rate	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
Pressure drop, water	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
Recovery capacity (50-60)	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 rate	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
Pressure drop, water	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
Recovery capacity (55-65)	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 rate	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
Pressure drop, water	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

OAT condition: 35°C - Water: 12-7°C

# Hydronic module (option 116)

The new generation of Carrier hydronic module minimises 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, pressure 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 a Greenspeed® variable-speed pump, the display enables users to:

- Adjust the required pump speed
- Adjust the required available pressure at the unit outlet and the static system pressure, to the actual needs of the customer; this saves energy and dispenses with the need for a water flow control valve (used to create artificial pressure drops that waste energy).

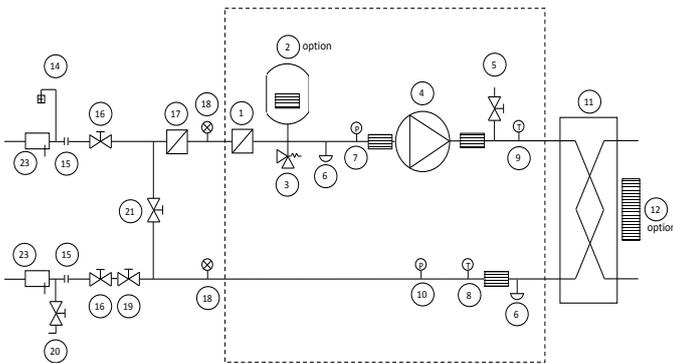
Several water pump types are available to suit any application:

- 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 for units with hydronic modules

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

## Hydronic module



### Key

#### 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:** provides suction pump pressure data
8. Temperature probe -  
**Note:** provides heat exchanger leaving temperature data
9. Temperature probe -  
**Note:** provides heat exchanger entering temperature data
10. Pressure sensor  
**Note:** provides unit leaving pressure data
11. Plate heat exchanger
12. Evaporator frost protection heater (option)

#### System 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 carrying out any operations.

# DX Free Cooling system (option 118A-118B)

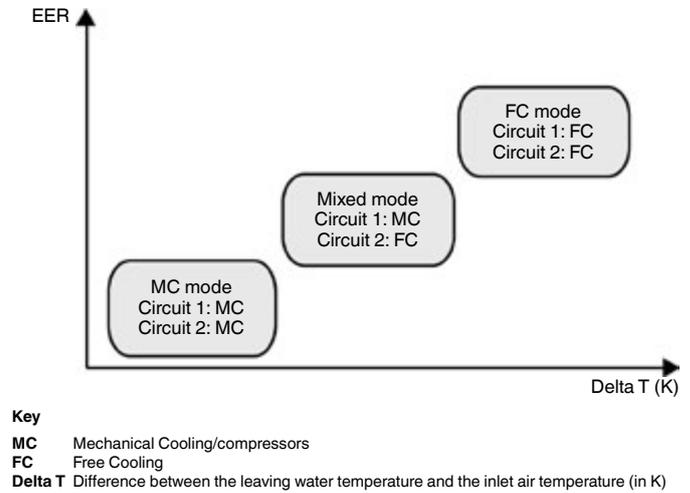
The DX Free Cooling option offers considerable energy savings for all cooling applications used in winter. In free cooling mode, the compressors are switched off and only the fans and a cooling micro-pump are in operation. The Touch Pilot control automatically switches from compressor cooling mode to free cooling mode depending on the cooler heat load and the temperature differential between the chilled water outlet and the ambient air.

**Important:** to optimise cooler performance, you are recommended to use the leaving water temperature setpoint offset function.

## Operating logic

Once the chilled water/air temperature differential exceeds a threshold value, the Touch Pilot control compares the instantaneous chiller capacity with the capacity available in free cooling. If the operating conditions permit operation in free cooling mode, the compressors are switched off and a three-way valve on the intake pipe connects the evaporator with the condenser, enabling refrigerant vapours to migrate towards the condenser. In condenser coils, the refrigerant condenses and the liquid is pumped to the evaporator using a cooling micro-pump. The cooling capacity in free cooling mode is controlled by the opening of an electronic expansion valve (EXV).

The unit can be operated in mixed mode which combines the FC (Free Cooling) and MC (mechanical cooling) modes on the two refrigerating circuits. This helps optimise Free Cooling operations while covering the system's cooling requirements.



## Advantages of the DX free cooling system

- **Operation without glycol**  
 The AquaSnap DX free cooling chiller operates on pure water, unlike traditional hydraulic free cooling systems which operate on brine. An (optional) electric heater provides frost protection for the evaporator down to temperatures of -20°C.
- **Low water pressure drops**  
 The AquaSnap DX free cooling liquid chiller does not feature either a three-way valve or a free cooling coil connected in series to the evaporator. The AquaSnap free cooling chiller has the water pressure drops as a standard chiller.
- **Weight increase and dimensions**
  - The DX free cooling option has little impact on the weight of the liquid chiller.
  - The AquaSnap free cooling has the same dimensions as a standard chiller.
- **High energy efficiency**
  - In free cooling mode, only the fans and cooling micro-pump are in operation. For example, with an air/water delta of 10 K, the energy efficiency ratio (EER) of the chiller is 15 (kW/kW).
  - In mechanical cooling mode, the use of brine does not adversely affect the thermal performance and energy efficiency of the chiller.
  - As the pressure drops in the hydraulic circuit are low, the water pumps are more energy efficient.

Depending on the requirements of the user, the AquaSnap DX free cooling is available with 2 performance levels

- 118A DX free-cooling on 2 circuits
- 118B DX free-cooling on 1 circuit

		160	180	200	220	260	300	330	360	400	430	470	520
<b>30RBM</b> Min. OAT -10°C (opt. 28B required)	<b>Opt_118A</b>	Not available			✓	✓	✓	✓	✓	✓	✓	✓	✓
	<b>Opt_118B</b>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	<b>Mixed mode</b>	Not available											
<b>30RBP</b> Min. OAT -20°C	<b>Opt_118A</b>	Not available			✓	✓	✓	✓	✓	✓	✓	✓	✓
	<b>Opt_118B</b>	✓	✓	✓	✓	✓	✓	✓	Not available		✓	✓	✓
	<b>Mixed mode</b>	✓	✓	✓	✓	✓	✓	✓	Not available		✓	✓	✓

## Physical properties of 30RB units with Free Cooling system

30RBM/30RBP option 118A (Free Cooling on 2 circuits)		160	180	200	220	260	300	330	360	400	430	470	520
<b>30RBM - Operating weight<sup>(1)</sup></b>													
Standard unit + option 118A	kg	-	-	-	1462	1483	1958	1994	2170	2226	2646	2664	2864
Unit with option 15 and option 118A	kg	-	-	-	1570	1591	2084	2120	2313	2370	2808	2827	3044
Unit with option 15 and option 116S + 118A	kg	-	-	-	1709	1745	2244	2324	2517	2573	3051	3068	3324
<b>30RBP - Operating Weight<sup>(1)</sup></b>													
Standard unit + option 118A	kg	-	-	-	1498	1520	1994	2030	2206	2263	2704	2722	2930
Unit with option 15 and option 118A	kg	-	-	-	1606	1628	2120	2156	2350	2407	2866	2884	3110
Unit with option 15 and option 116S + 118A	kg	-	-	-	1745	1782	2280	2360	2553	2610	3108	3125	3390
<b>30RBM/30RBP - Refrigerant</b>													
R410A													
Circuit A <sup>(1)</sup>	kg	-	-	-	13,9	14,6	16,7	17,6	24,8	24,3	27,5	25,5	31,6
	tCO <sub>2</sub> e	-	-	-	29,0	30,5	34,9	36,7	51,8	50,7	57,4	53,2	65,9
Circuit B <sup>(1)</sup>	kg	-	-	-	14,0	14,6	25,0	24,7	25,4	25,4	29,5	30,3	31,8
	tCO <sub>2</sub> e	-	-	-	29,2	30,5	52,2	51,6	53,0	53,0	61,6	63,3	66,3
<b>30RBM/30RBP option 118B (Free Cooling on 1 circuit)</b>													
<b>30RBM - Operating weight<sup>(1)</sup></b>													
Standard unit + option 118A	kg	1260	1301	1301	1431	1472	1929	1965	2133	2189	2608	2626	2824
Unit with option 15 and option 118A	kg	1343	1383	1384	1539	1580	2055	2091	2276	2333	2770	2789	3004
Unit with option 15 and option 116S + 118A	kg	1482	1523	1523	1678	1734	2215	2295	2480	2536	3013	3030	3284
<b>30RBP - Operating Weight<sup>(1)</sup></b>													
Standard unit + option 118A	kg	1296	1337	1337	1467	1489	1965	2001	2169	2226	2666	2684	2890
Unit with option 15 and option 118A	kg	1378	1420	1420	1575	1597	2091	2127	2313	2370	2828	2846	3070
Unit with option 15 and option 116S + 118A	kg	1517	1559	1560	1714	1751	2251	2331	2516	2573	3070	3087	3350
<b>30RBM/30RBP - Refrigerant</b>													
R410A													
Circuit A <sup>(1)</sup>	kg	8,4	10,9	10,9	12,6	13,1	14,7	15,4	20,3	21,1	23,5	23,5	26,8
	tCO <sub>2</sub> e	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 <sup>(1)</sup>	kg	14,0	14,1	13,7	14,0	14,6	25,0	24,7	25,4	25,4	29,5	30,3	31,8
	tCO <sub>2</sub> e	29,1	29,4	28,6	29,2	30,5	52,2	51,6	53,0	53,0	61,6	63,3	66,3

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

## Cooling capacities (Option 118A)

30RBM/30RBP 160-520 Free Cooling mode		Condenser inlet air temperature (°C)								
		-10			-5			0		
LWT (°C)		Qc kW	Unit kW	EER kW/kW	Qc kW	Unit kW	EER kW/kW	Qc kW	Unit kW	EER kW/kW
160	10	-	-	-	-	-	-	-	-	-
180		-	-	-	-	-	-	-	-	-
200		-	-	-	-	-	-	-	-	-
220		128	7,6	17,0	129	7,5	17,3	110	7,4	14,7
260		128	7,6	16,8	129	7,6	17,1	110	7,5	14,6
300		212	9,8	21,7	198	9,7	20,5	168	9,6	17,5
330		210	9,7	21,6	196	9,6	20,4	166	9,6	17,4
360		296	12,2	24,3	272	12,1	22,5	229	12,0	19,2
400		296	12,1	24,4	272	12,0	22,6	229	11,9	19,2
430		308	13,7	22,5	295	13,6	21,7	242	13,5	17,9
470		308	13,8	22,3	295	13,7	21,5	241	13,6	17,8
520		320	15,6	20,6	319	15,4	20,7	253	15,3	16,6

LWT Leaving Water Temperature  
 Qc Cooling capacity  
 Unit Unit power input (pumps, fans, control)  
 EER Energy efficiency

## Cooling capacity (Option 118B)

30RBM/30RBP 160-520 Free Cooling mode		Condenser inlet air temperature (°C)								
		-10			-5			0		
LWT (°C)		Qc kW	Unit kW	EER kW/kW	Qc kW	Unit kW	EER kW/kW	Qc kW	Unit kW	EER kW/kW
160	10	64	3,9	16,6	65	3,8	16,8	55	3,8	14,4
180		64	3,9	16,2	65	3,9	16,5	55	3,9	14,1
200		64	4,1	15,7	64	4,0	15,9	55	4,0	13,6
220		64	4,2	15,3	64	4,2	15,2	54	4,1	13,2
260		64	4,3	14,9	64	4,2	15,2	54	4,2	12,9
300		148	6,4	23,1	135	6,3	21,2	112	6,3	17,9
330		146	6,4	23,0	134	6,3	21,2	111	6,3	17,8
360 <sup>(1)</sup>		147	8,0	18,4	135	7,9	17,0	114	7,9	14,5
400 <sup>(1)</sup>		147	8,0	18,4	135	7,9	17,0	114	7,9	14,5
430		160	8,1	19,7	159	8,0	19,8	126	8,0	15,8
470		159	8,2	19,3	159	8,2	19,5	126	8,1	15,6
520		159	8,5	18,7	159	8,5	18,8	126	8,4	15,0

(1) Not available on 30RBP units

LWT Leaving Water Temperature  
 Qc Cooling capacity  
 Unit Unit power input (pumps, fans, control)  
 EER Energy efficiency

## Operating limits

Cooling Mode			
<b>Evaporator (water)</b>			
Water inlet temperature at start-up	°C	8	40
Water outlet temperature during operation	°C	5	20
<b>Condenser (air)</b>			
Ambient temperature (outdoors) 30RBM <sup>(1)</sup>	°C	-10	45
Ambient temperature (outdoors) 30RBP	°C	-20	45
Available static pressure	Pa	0	0

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

Free Cooling Mode			
<b>Evaporator (water)</b>			
Water inlet temperature at start-up	°C	8	40
Water outlet temperature during operation	°C	5	26
<b>Condenser (air)</b>			
Ambient temperature (outdoors) 30RBM <sup>(1)</sup>	°C	-10	20
Ambient temperature (outdoors) 30RBP	°C	-20	20
Available static pressure	Pa	0	0

# 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 costs (more than two-thirds), ensure tighter water flow control, and improve overall system reliability.

Carrier Variable Water Flow (VWF) is a hydronic control



function package that controls the water flow rate.

The Carrier VWF ensures control at full-load and, moreover, 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 setpoint:

The flow rate at full load is controlled by the interface, which reduces 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 energy consumption of the pump is reduced by the same proportion, 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 setpoint (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 moulding, 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	
<b>Standard unit</b>	C1	Nominal capacity	kW	168	181	198	216	261	300	331	365	397	430	464	523	
Full-load performance <sup>(1)</sup>	C1	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	
	C1	Eurovent class cooling	B	A	B	B	B	B	B	B	B	B	B	B	B	
Full-load performance <sup>(2)</sup>	C1	Gross nominal capacity	kW	168	182	199	216	262	301	331	366	398	431	465	524	
	C1	Gross 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	
Seasonal efficiency <sup>(1)</sup>		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	
Seasonal efficiency <sup>(2)</sup>		Gross 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	
Integrated Part Load Values		IPLV		4,57	4,57	4,54	4,51	4,50	4,61	4,61	4,69	4,58	4,62	4,55	4,58	
<b>Sound levels</b>																
<b>Standard unit</b>																
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	
<b>Standard unit + option 15*</b>																
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	
<b>Standard unit + option 15LS*</b>																
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	
<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	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	
<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>																
Circuit A																
			kg	8.40	10.90	10.90	12.60	13.10	14.70	15.40	20.30	21.10	23.50	23.50	26.75	
			tCO <sub>2</sub> e	17.5	22.8	22.8	26.3	27.4	30.7	32.2	42.4	44.1	49.1	49.1	55.9	
Circuit B																
			kg	12.25	12.60	12.60	12.70	13.10	20.20	20.20	20.40	22.20	26.70	26.80	26.95	
			tCO <sub>2</sub> e	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																
			%	33	33	33	25	25	20	20	17	17	14	14	13	
<b>Condensers</b>																
Aluminium micro-channel coils (MCHE)																
<b>Fans - Standard unit</b>																
FLYING BIRD 4 axial fans with rotating impeller																
Quantity				3	4	4	4	4	5	5	6	6	7	7	8	
Maximum total air flow			l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111	
Maximum rotational speed			r/s	16	16	16	16	16	16	16	16	16	16	16	16	
<b>Evaporator</b>																
Dual-circuit plate heat exchanger																
Water content			l	15	15	15	15	19	27	35	33	42	44	47	53	
Max. water-side operating pressure without hydronic module			kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	
<b>Hydronic Module (option)</b>																
Pump																
Centrifugal pump, monocell, 48.3 r/s, low- or high-pressure (as required), single or dual (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	
External diameter			mm	88.9	88.9	88.9	88.9	88.9	114.3	114.3	114.3	114.3	114.3	114.3	114.3	
<b>Chassis paintwork</b>																
Colour code: RAL 7035																

(1) In accordance with EN14511-3:2013.

(2) Not compliant with EN14511-3:2013.

C1 Conditions in cooling mode: Temperature of water entering/leaving evaporator 12°C/7°C, outdoor air temperature 35°C. Evaporator fouling factor 0 m<sup>2</sup>. kW

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

Cooling mode conditions: Evaporator water inlet/outlet 12°C/7°C, outdoor air temperature 35°C. Evaporator fouling factor 0 m<sup>2</sup>. kW

†† Gross performance, not in accordance with EN14511-3:2013. These performance levels 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. Temperature of water entering/leaving evaporator 12°C/7°C, outdoor air temperature 35°C. Evaporator fouling factor 0 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 name plate.

\*\*\* In dB ref=10<sup>-12</sup> W, (A) weighting. Declared dual-number 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 dual-number 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>Standard unit</b>	C1	Nominal capacity	kW	168	180	197	216	261	300	331	365	397	430	464	523
Full-load performance <sup>(1)</sup>	C1	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
	C1	Eurovent class cooling		B	A	B	B	B	B	B	B	B	B	B	B
Full-load performance <sup>(2)</sup>	C1	Gross nominal capacity	kW	168	181	198	216	262	301	331	366	398	431	465	524
	C1	Gross 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
Seasonal efficiency <sup>(1)</sup>		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
Seasonal efficiency <sup>(2)</sup>		Gross 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
Integrated Part Load Values		IPLV		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***			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
<b>Standard unit + option 15*</b>															
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
<b>Standard unit + option 15LS*</b>															
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
<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
			tCO <sub>2</sub> e	17.5	22.8	22.8	26.3	27.4	30.7	32.2	42.4	44.1	49.1	49.1	55.9
Circuit B			kg	12.25	12.60	12.60	12.70	13.10	20.20	20.20	20.40	22.20	26.70	26.80	26.95
			tCO <sub>2</sub> e	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>															
				Pro-Dialog+ Control											
Minimum capacity			%	33	33	33	25	25	20	20	17	17	14	14	13
<b>Condensers</b>															
				Aluminium micro-channel coils (MCHE)											
<b>Fans - Standard unit</b>															
				FLYING BIRD 4 axial fans with rotating impeller											
Quantity				3	4	4	4	4	5	5	6	6	7	7	8
Maximum total air flow			l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111
Maximum rotational speed			r/s	16	16	16	16	16	16	16	16	16	16	16	16
<b>Evaporator</b>															
				Dual-circuit plate heat exchanger											
Water content			l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module			kPa	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200	3200
<b>Hydronic Module (option)</b>															
				Pump, Victaulic screen filter, safety valve, water valve and air purge, pressure sensors, expansion tank (option)											
Pump				Centrifugal pump, monocell, 48.3 r/s, low- or high-pressure (as required), single or dual (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/without hydronic module</b>															
				Victaulic type											
Diameter			inch	3	3	3	3	3	4	4	4	4	4	4	4
External diameter			mm	88.9	88.9	88.9	88.9	88.9	114.3	114.3	114.3	114.3	114.3	114.3	114.3
<b>Chassis paintwork</b>															
				Colour code: RAL 7035											

(1) In accordance with EN14511-3:2013.

(2) Not compliant with EN14511-3:2013.

C1 Conditions in cooling mode: Temperature of water entering/leaving evaporator 12°C/7°C, outdoor air temperature 35°C. Evaporator fouling factor 0 m<sup>2</sup>. k/W

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

‡ Cooling mode conditions: Evaporator water inlet/outlet 12°C/7°C, outdoor air temperature 35°C. Evaporator fouling factor 0 m<sup>2</sup>. k/W

†† Gross performance, not in accordance with EN14511-3:2013. These performance levels 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. Temperature of water entering/leaving evaporator 12°C/7°C, outdoor air temperature 35°C. Evaporator fouling factor 0 m<sup>2</sup>. k/W

\* 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 name plate.

\*\*\* In dB ref=10<sup>-12</sup> W, (A) weighting. Declared dual-number 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 dual-number 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 specifications

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
<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>Cosine Phi unit at maximum power**</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 entering/leaving 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 name plate).

\*\*\* 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 name plate).

† 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; In-rush current 20 A; Power input: 1.75 kW.

30RBP		160	180	200	220	260	300	330	360	400	430	470	520
<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>Cosine Phi unit at maximum power**</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 entering/leaving 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 name plate).

\*\*\* 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 name plate).

† 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 of the variable speed drive at Eurovent equivalent conditions and motor ambient air temperature of 50°C at 400 V: Current 3.0 A; Starting current 20 A; Power input: 1.75 kW.

## 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>cw</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 (gL/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 specifications and operating conditions for 30RBM/30RBP units – Notes

- 30RBM/30RBP units have a single power connection point located immediately upstream of the main switch
  - **The control box includes:**
    - A main disconnect switch,
    - Start-up and motor protection devices for each compressor, plus fans and pumps,
    - Control devices.
  - **Customer connections:** All connections to the system and the electrical installations must be in accordance with all applicable codes.
  - Carrier 30RBM/30RBP units are designed and built to ensure compliance 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:
1. **Physical environment\***  
The classification of environment is specified in standard EN 60364:
    - Outdoor installation\*,
    - Ambient temperature range: from -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 solids: Class AE3 (no significant dust present)\*,
    - Presence of corrosive and polluting substances, class AF1 (negligible),
    - Capability of persons: BA4 ("Instructed").
  2. **Compatibility for low-frequency conducted disturbances according to class 2 levels as per standard IEC61000-2-4:**
    - Power supply frequency variation: +2 Hz
    - Phase imbalance : 2%
    - Total Harmonic Distortion Voltage (THDV): 8%
  3. The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
  4. Overcurrent protection of the power supply conductors is not provided with the unit.
  5. The factory installed disconnect switch(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947-3 (corresponds to IEC 60947-3).
6. The units are designed for connection to TN networks (IEC 60364). In IT networks 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 for use in domestic/residential and industrial environments:  
Machines that are not equipped with variable frequency drives comply with the standard regulations.
    - 61000-6-3: General standards - Standard emission for residential, commercial and light industrial environments.
    - 61000-6-2: General standards - Immunity for industrial environments.
 Machines that are equipped with variable frequency drive(s) (RBP, options: 28, 116V, 116W) comply with standard EN61800 - 3 Electric 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 which may require additional mitigation measures.**
- 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 shall be reinforced-immunity protection devices with 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 certain aspects of an existing 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 in the first environment: commercial and residential buildings.  
- Example of installations in the second environment: industrial zones, machine rooms powered by a dedicated transformer.

# Part-load performance

With the rapid increase in energy costs and growing awareness of the environmental impacts of electricity production, the power consumption of air conditioning equipment is becoming an increasingly 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%

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 of unit use.

## ESEER (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 - Standard unit

	Octave bands, Hz <sup>(1)</sup>							Sound power <sup>(2)</sup>
		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

- (1) in dB ref=10<sup>-12</sup> W, as a guideline. Measured in accordance with ISO 9614-1.
- (2) in dB ref=10<sup>-12</sup> W, weighting (A), with uncertainty +/-3 dB. Measured in accordance with ISO 9614-1 and certified by Eurovent.

## 30RBM/30RBP - Standard unit + option 15LS<sup>(3)</sup>

	Octave bands, Hz <sup>(1)</sup>							Sound power <sup>(2)</sup>
		125	250	500	1k	2k	4k	
160	dB	83	86	83	80	76	69	dB(A) 85
180	dB	84	85	83	80	76	69	dB(A) 85
200	dB	84	85	83	80	76	69	dB(A) 85
220	dB	85	87	84	81	77	70	dB(A) 86
260	dB	85	87	84	81	77	70	dB(A) 86
300	dB	84	87	84	81	77	70	dB(A) 86
330	dB	84	87	84	81	77	70	dB(A) 86
360	dB	85	88	85	82	78	71	dB(A) 87
400	dB	85	88	85	82	78	71	dB(A) 87
430	dB	86	88	86	82	79	72	dB(A) 88
470	dB	86	88	86	82	79	72	dB(A) 88
520	dB	87	89	86	83	79	72	dB(A) 88

- (1) in dB ref=10<sup>-12</sup> W, as a guideline. Measured in accordance with ISO 9614-1.
- (2) in dB ref=10<sup>-12</sup> W, weighting (A), with uncertainty +/-3 dB. Measured in accordance with ISO 9614-1 and certified by Eurovent.
- (3) Options: 15 = low noise level, 15LS = very low noise level.

## 30RBM/30RBP - Standard unit + option 15<sup>(3)</sup>

	Octave bands, Hz <sup>(1)</sup>							Sound power <sup>(2)</sup>
		125	250	500	1k	2k	4k	
160	dB	91	88	87	85	79	76	dB(A) 89
180	dB	92	89	88	86	80	77	dB(A) 90
200	dB	92	89	88	86	80	77	dB(A) 90
220	dB	92	89	88	86	80	77	dB(A) 90
260	dB	92	89	88	86	80	77	dB(A) 90
300	dB	93	90	89	87	81	78	dB(A) 91
330	dB	93	90	89	87	81	78	dB(A) 91
360	dB	94	91	90	88	82	79	dB(A) 92
400	dB	94	91	90	88	82	79	dB(A) 92
430	dB	95	92	91	88	83	80	dB(A) 93
470	dB	95	92	91	88	83	80	dB(A) 93
520	dB	95	92	91	88	83	80	dB(A) 93

- (1) in dB ref=10<sup>-12</sup> W, as a guideline. Measured in accordance with ISO 9614-1.
- (2) in dB ref=10<sup>-12</sup> W, weighting (A), with uncertainty +/-3 dB. Measured in accordance with ISO 9614-1 and certified by Eurovent.
- (3) Options: 15 = low noise level, 15LS = very low noise level.

# 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 (10 K) at the value of minimum leaving water temperature (5°C)

\*\* Maximum flow rate for a pressure drop of 100 kPa in the plate heat exchanger

### 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 rate factory-set 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 factory-set according to pump type

## Unit operating limits

### 30RBM 160-520 units

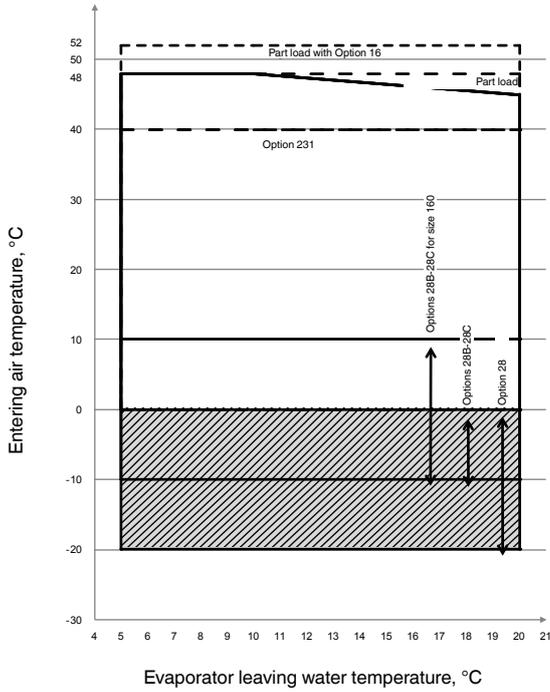
Water-cooled heat exchanger		Minimum	Maximum
Water inlet temperature at start-up	°C	8 <sup>(1)</sup>	40
Leaving water temperature during operation option 5B	°C	0 <sup>(2)</sup>	20 <sup>(3)</sup>
Leaving water temperature during operation option 6B	°C	-15 <sup>(6)</sup>	20 <sup>(3)</sup>
Air-cooled exchanger		Minimum	Maximum
Outdoor ambient operating temperature			
Standard units	°C	0 <sup>(4)</sup> /10	48 <sup>(5)</sup>
Units with options 28B-28C (winter operation)	°C	-10	48 <sup>(5)</sup>
Units with option 28 (winter operation)	°C	-20	48 <sup>(5)</sup>
Unit with option 16 (high ambience operation)	°C	0/10	52
Available static pressure			
Standard units (outdoor installation)	Pa	0	0

### 30RBP 160-520 units

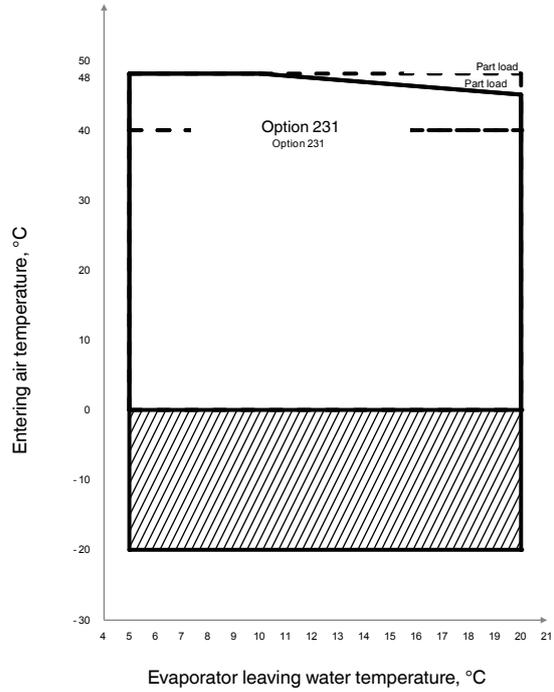
Water-cooled heat exchanger		Minimum	Maximum
Water inlet temperature at start-up	°C	8 <sup>(1)</sup>	40
Leaving water temperature during operation option 5B	°C	0 <sup>(2)</sup>	20 <sup>(3)</sup>
Leaving water temperature during operation option 6B	°C	-15 <sup>(6)</sup>	20 <sup>(3)</sup>
Condenser		Minimum	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 to select a unit using the Carrier electronic catalogue.
- Use of antifreeze is obligatory if the water outlet temperature is below 5°C.
- For applications requiring operation with a leaving water temperature of up to 20°C, contact Carrier to select a unit using Carrier electronic catalogue.
- "For applications requiring operation from 0°C to -10°C, the unit must be equipped with options 28B-28C "Winter operation". For operation from 0°C to -20°C, the unit must be equipped with option 28 "Winter operation".  
For both options, the unit must either be equipped with the evaporator frost protection option (for units without hydronic module option) or the evaporator and hydronic module frost protection option (for units with hydronic module option) or the water loop must be protected against frost by the installer, using an anti-freeze solution.
- The maximum ambient temperature allowed for machines equipped with option 231 is +40°C.  
Maximum ambient temperature: if storing and transporting 30RBM/30RBP units, the minimum and maximum ambient temperatures to be respected are -20°C and +52°C. These temperature limits shall be considered in case of container shipment and temperatures over 52°C.
- If using ethylene glycol and for RBM 160-400 or RBP 160-400.

### Operating range - 30RBM 160-520



### Operating range - 30RBP 160-520



**Notes:**

Evaporator  $\Delta T = 5 \text{ K}$

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

**Legend:**

- Standard 30RBM or 30RBP unit operating at full load.
- Operating range, 30RBM unit is equipped with options 28, 28B and 28C Winter operation. Options 28B, 28C (with two-speed lead fan on each circuit) enabling operation down to outside temperatures of  $-10^{\circ}\text{C}$ .
- 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  $-20^{\circ}\text{C}$  outside temperature.
- In addition to the options 28, 28B, or 28C for 30RBM units or for operation at air temperatures below  $0^{\circ}\text{C}$  for 30RBP units, the machine 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.

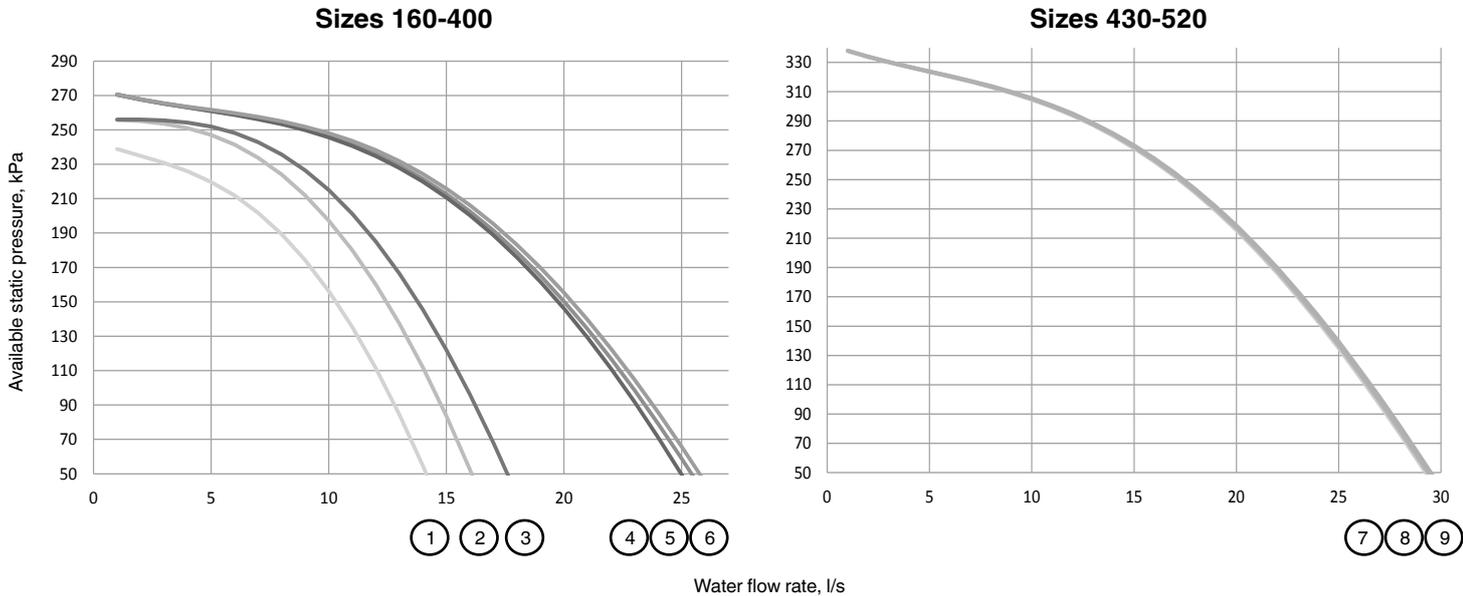
# Available static system pressure

Data applicable for:

- Pure water at 20°C.
- Refer to the chapter “Evaporator flow rate” for the maximum water flow values.
- If using glycol, the maximum water flow is reduced.

## High-pressure pumps (fixed speed or variable speed at 50 Hz) on 30RBM/30RBP units

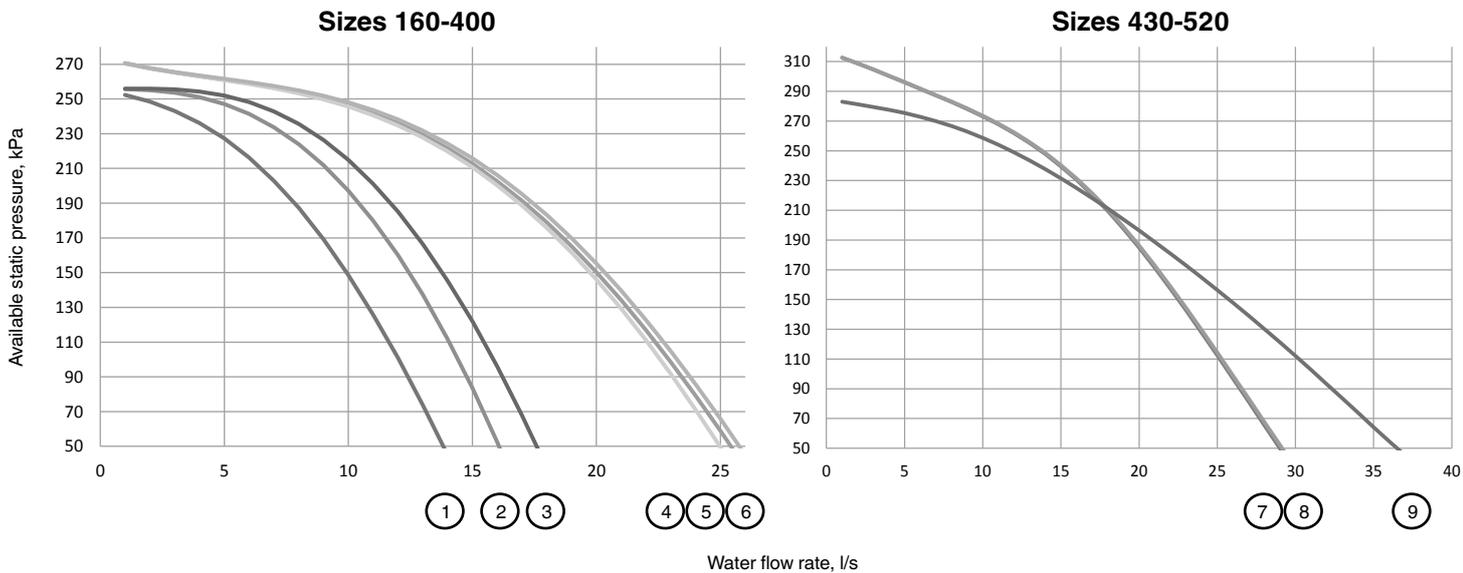
### Single pumps



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



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

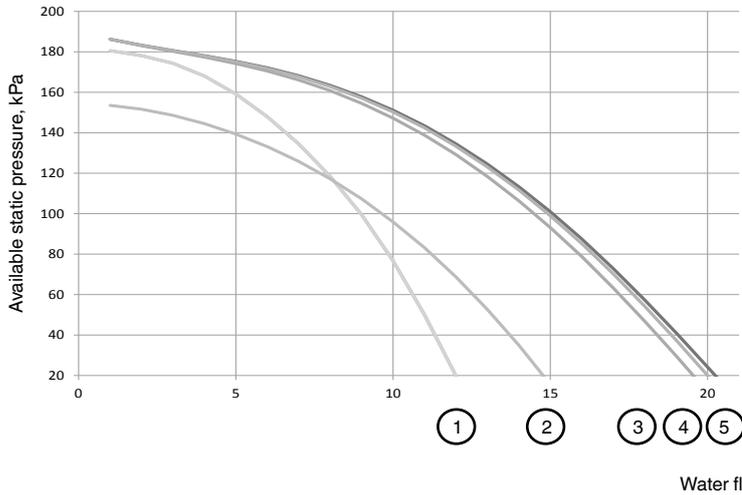
Data applicable for:

- Pure water at 20°C.
- Refer to the chapter “Evaporator flow rate” for the maximum water flow values.
- If using glycol, the maximum water flow is reduced.

## Low-pressure pumps (fixed speed) on 30RBM/30RBP units

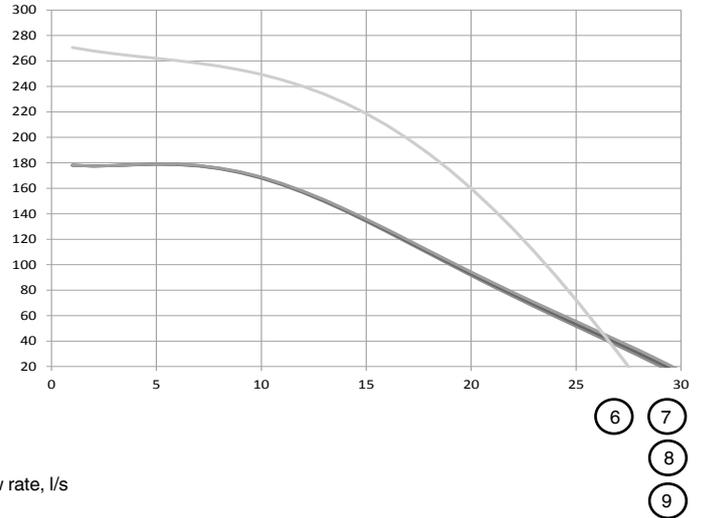
### Single pumps

**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

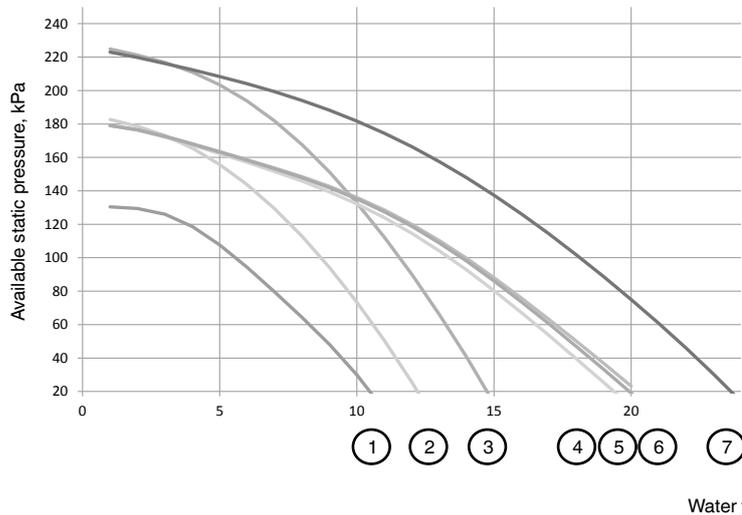
**Sizes 400-520**



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

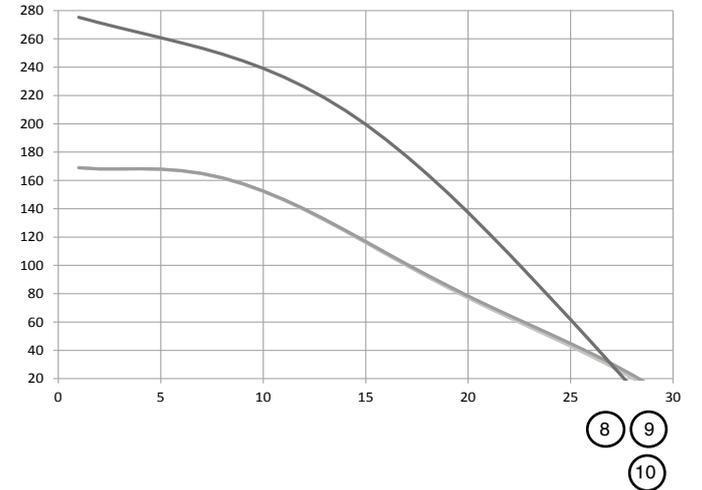
### Dual pumps

**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**

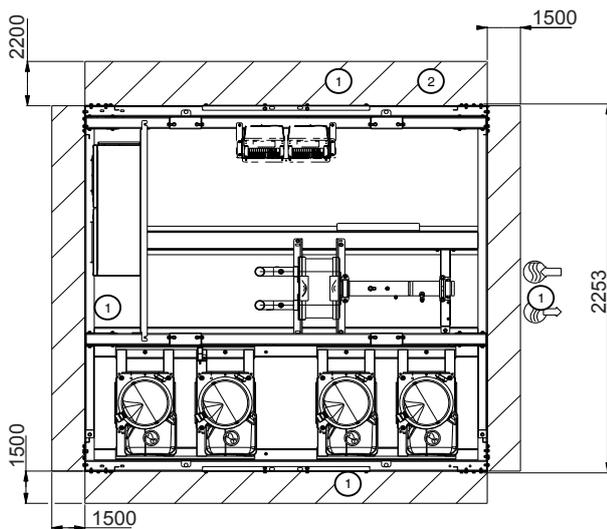
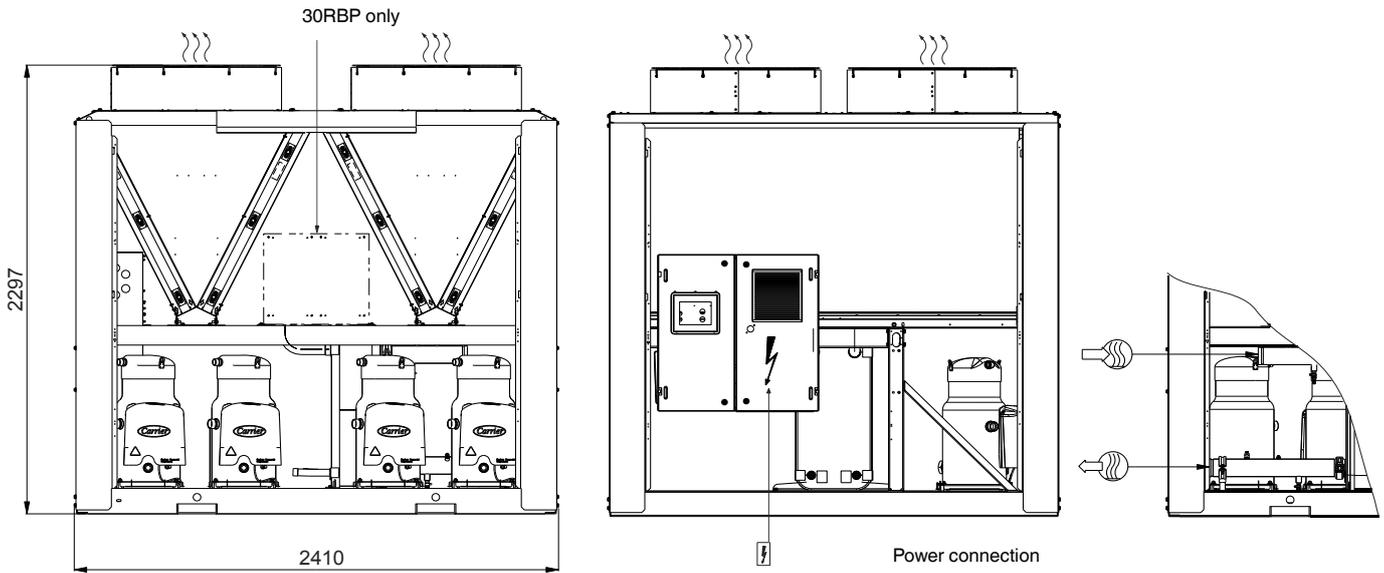


8. 30RBM-30RBP 520
9. 30RBM-30RBP 430
10. 30RBM-30RBP 470

# Dimensions/clearances

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

### Unit without hydronic module



#### Legend:

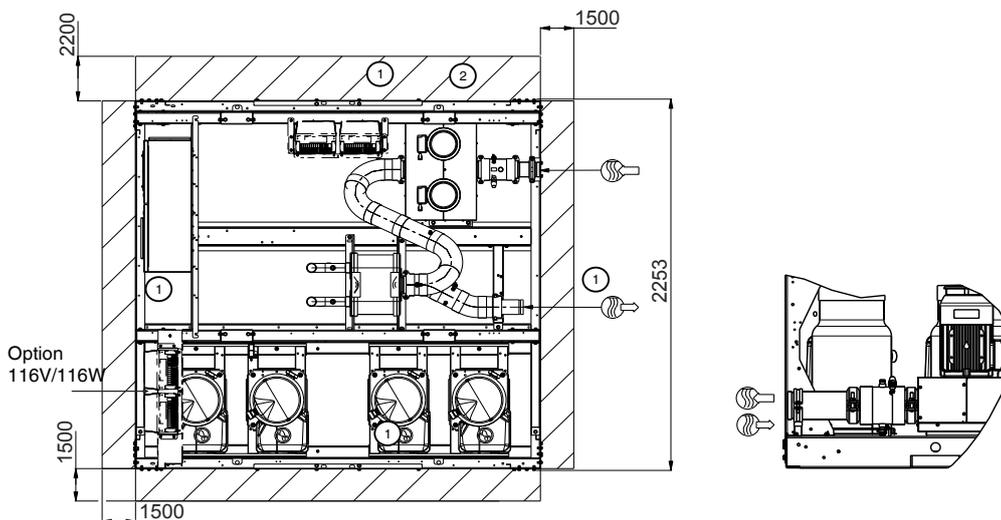
All dimensions are in mm.

- ① Clearances required for maintenance and air flow
- ② Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Electrical cabinet

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

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

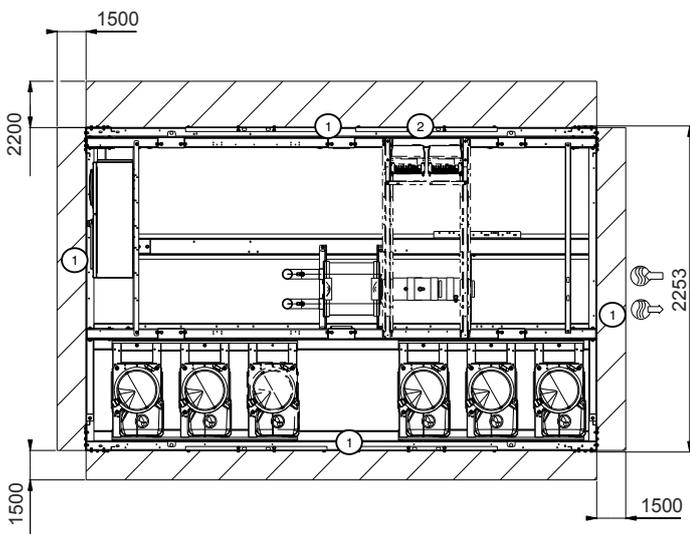
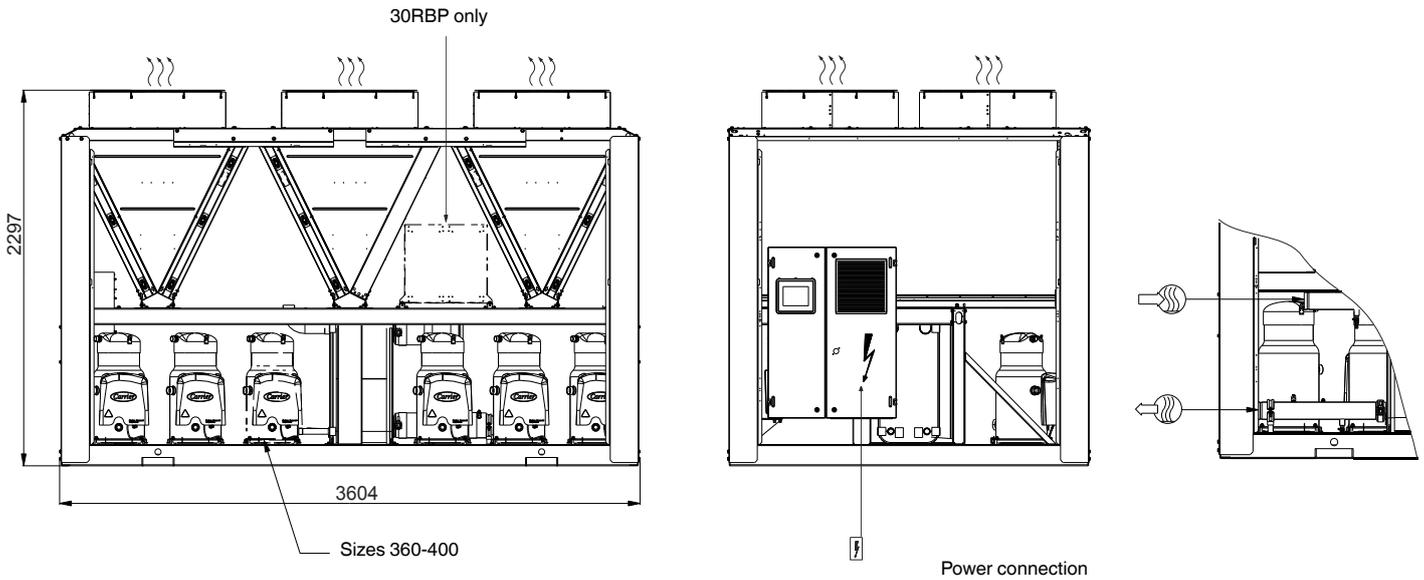
### Unit with hydronic module



# Dimensions/clearances

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

### Unit without hydronic module



**Legend:**

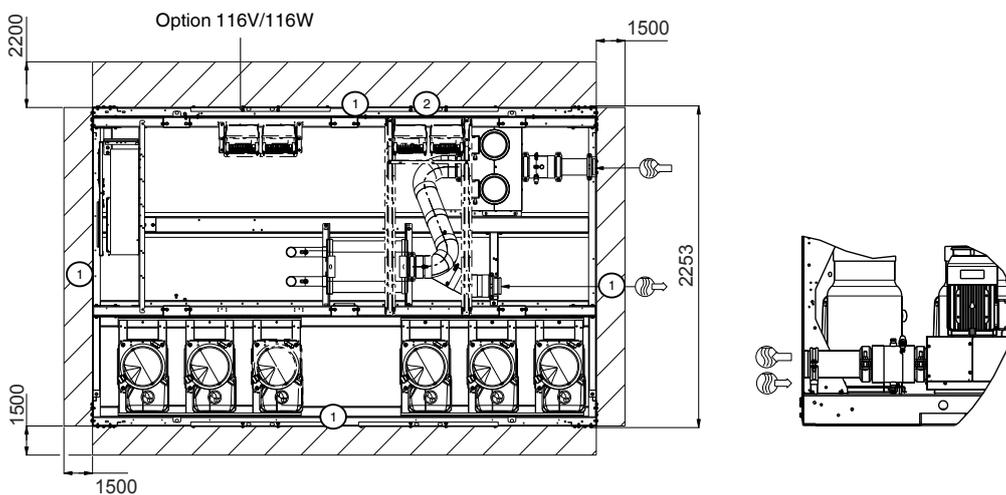
All dimensions are in mm.

- ① Clearances required for maintenance and air flow
- ② Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Electrical cabinet

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

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

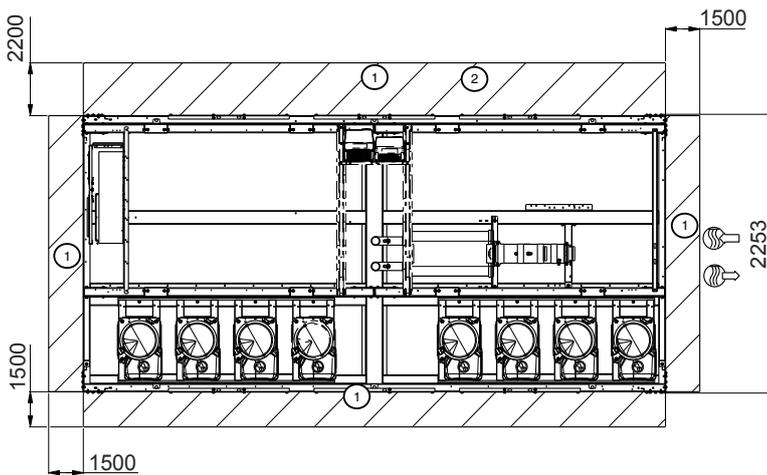
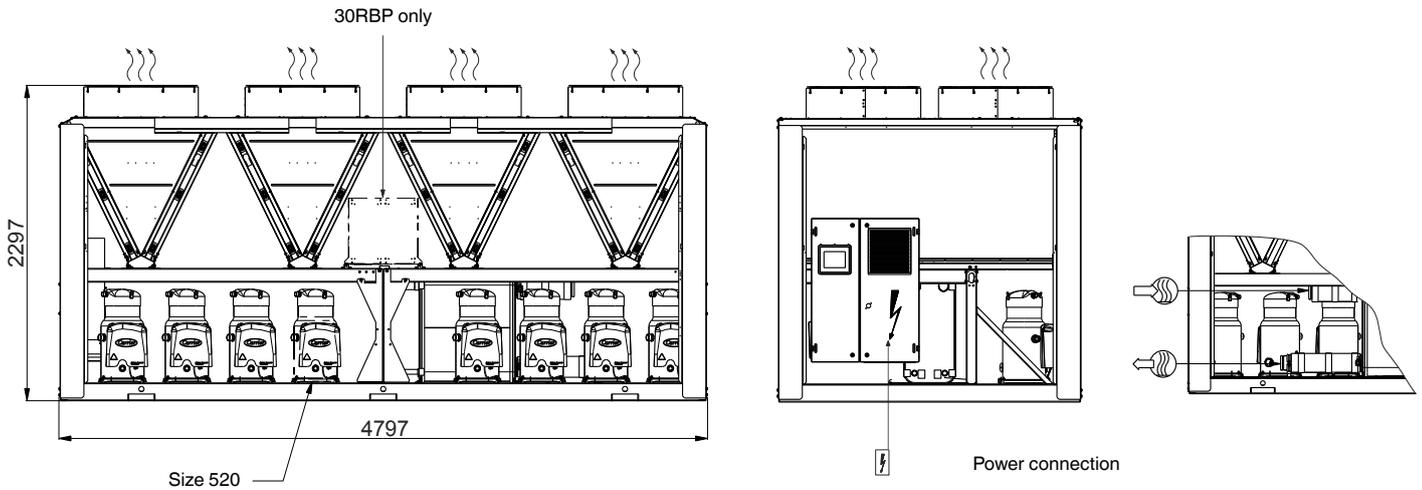
### Unit with hydronic module



# Dimensions/clearances

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

### Unit without hydronic module



#### Legend:

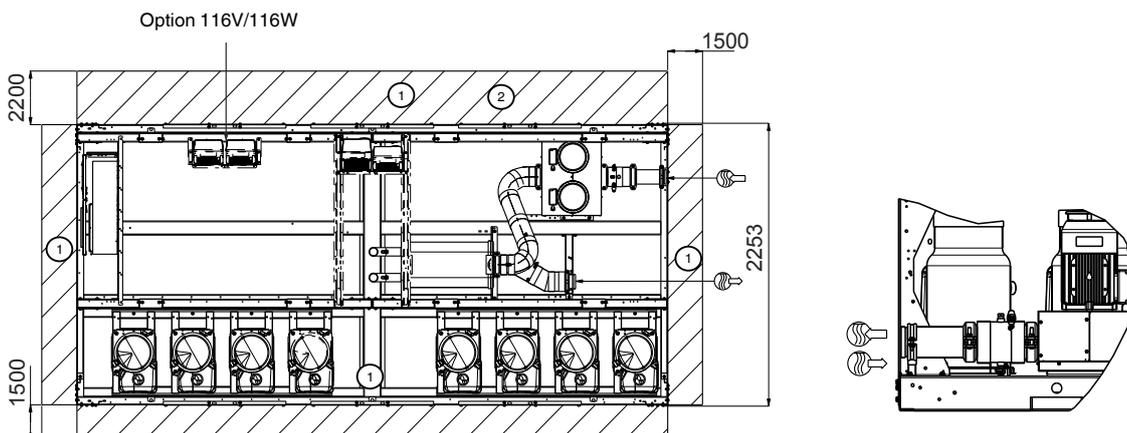
All dimensions are in mm.

- ① Clearances required for maintenance and air flow
- ② Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Electrical cabinet

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

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

### Unit with hydronic module



# Specification guide - 30RBP

## System description

Factory assembled, air-cooled liquid chiller using 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:** the hydronic pump module is available with one/two *Greenspeed® variable-speed* or fixed-speed 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) No. 327/2011 implementing Directive 2009/125/EC with regards to Eco-design requirements for industrial fans.
- Commission regulation (EU) No. 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) No. 547/2012 implementing Directive 2009/125/EC with regards to Eco-design requirements for water pumps (unit equipped with hydronic module option).
- Pressure Equipment Directive (PED) 2014/68/EU
- Machinery directive 2006/42/EC, modified.
- Low voltage directive 2014/35/EU, modified.
- Electromagnetic compatibility directive 2014/30/EU, 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 the night\* (dB(A)): .....
- Refrigerant type: ..... (ODP ... / GWP ...)
- Refrigerant charge: ..... kg, tCO<sub>2</sub>e....(.... kg/kW)
- Dimensions, length x depth x height (mm): ..... X ..... X .....
- Unit operating weight: ..... kg

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

## 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 in-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
- Integrated oil level sight glass.
- Electric crankcase heater to minimise oil dilution and refrigerant migration.
- Electronic protection against motor overheating.
- 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

## Evaporator

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

## Condenser

- The coil shall be an air-cooled Novation® micro-channel heat exchanger (MCHE).
- The coil construction shall consist of a highly resistant aluminium alloy combined with an optional corrosion-resistant coating.
- The coil shall have a series of flat tubes containing a series of multiple, parallel flow micro-channels layered between the refrigerant manifolds.
- The 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.
- The assembled condenser coils shall be 100% leak tested and pressure tested at 45 bar.

## Fans

- All fans on the unit shall be equipped with variable-speed drive (with Greenspeed® intelligence) to provide higher part-load efficiency and reduced acoustic levels.
- All fans shall be automatically controlled (via Greenspeed® intelligence) to achieve higher part-load efficiency; winter operation at outside air temperatures as low as -20°C (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.
- The condenser fans shall have a minimum overall efficiency higher than the minimum efficiency target to comply with (EU) regulation No. 327/2011 implementing Directive 2009/125/EC with regard to Eco-design requirements for industrial fans.
- The fans shall be direct-drive, 9-blade airfoil cross-section, reinforced polymer construction with inherent corrosion resistance, axial type, statically and dynamically balanced.
- Air shall be discharged vertically upward.
- The fans shall be protected by polyethylene-coated steel wire safety guards.
- Winter operation at outside air temperatures as low as -20°C as standard.

## Refrigerant

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

## Refrigerant circuit components

The 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.

## Electrical specifications

- 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.

## Checks, safety and diagnostics

The unit controls shall include the following components as a minimum:

- Microprocessor with non-volatile memory
- Power transformer to serve all controllers, relays, and control components
- LCD user display
- Remote control by contact or CCN
- 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.

## Control features

- Automatic management of master/slave circuits (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 in return fluid temperature.
- Temperature setpoint shift according to outside air temperature, or differential water inlet/outlet temperature or via a 0-10 V signal.
- Provision of a dual setpoint for the leaving chilled water temperature activated by a remote dry contact signal or by the built-in timer.
- Chilled fluid temperature pull-down rate at start-up in an adjustable range from 0.11°C to 1.1°C per minute to prevent excessive demand spikes on 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. Can be configured via a user-defined schedule.
- Balanced operating times for compressors and pumps.
- Demand limit control (configurable from 0% to 100%) activated by remote contact closure.
- Remote system interlock (customer servo).
- Operating statuses and alarm outputs.
- The 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.
- Water pump on/off 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).
- On/off control for external water pump (up to 2).
- Variable-speed control for one external water pump using 0-10 V signal.
- Low-temperature protection to activate the cooler and water circuit heating system (optional).
- Periodic pump start-up 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.

The user interface shall feature backlight and contrast adjustment for easy viewing in bright sunlight or night-time conditions.

## Control diagnostics

The control display on the unit 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
- Number of pump start-ups and hours of operation
- 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.

## Safety devices

The unit shall be equipped with thermistors/transducers and all other control devices to protect it from the following faults:

- 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 specifications

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

The unit shall be capable of starting up when the water entering temperature to the evaporator is 40°C.

## Electrical specifications

- The unit shall be supplied with main on/off disconnect switch without fuse.
- Single point power connection.
- The unit shall operate on 3-phase power.
- The control points shall be accessed via a terminal block.
- The unit shall be shipped with a factory-fitted controller.

## 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 shall include the following components: Easily removable filter, water pump with three-phase motor, accurate and reliable electronic water flow control (paddle-type flow switches shall not be accepted), safety valve calibrated to 4 bar. The external static pressure and water flow may be read electronically via user interface. Additional pressure/temperature taps (2) shall be factory-fitted to measure the pressure differential across the hydronic module.
- From 1st January 2015, the water pump shall comply with Commission regulation (EU) No. 547/2012 implementing Directive 2009/125/EC with regard to Eco-design requirements.
- The pump motors shall be totally enclosed, 3-phase type motors with permanently lubricated bearings and Class F insulation. The pump motors shall be IE3 efficiency level rated.
- Each pump shall be 100% factory tested according to hydraulic standards.
- The pump shall be protected against cavitation through electronic pressure control at pump inlet.
- The pump casing shall be of cast iron with cataphoresis coating.
- The impeller shall be designed using laser technology and made of AISI 316L stainless steel.
- 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.
- The dual-pump hydronic module shall have two independent electric motors and two independent impellers to ensure reliable operation.
- Cast iron body filter with 1.2-mm mesh screen.
- The water piping shall be protected against corrosion and equipped with drain plug.
- The water pump and piping 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 two variable-speed pumps shall be equipped with two VFDs (variable frequency drives) 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 the evaporator and water circuits freezing at outside air temperatures from 0°C to -20°C.

### Evaporator and hydronic module frost protection

Trace heating provides protection against the evaporator, water circuits and hydronic module freezing at outside air temperatures from 0°C to -20°C.

### Expansion tank

The expansion tank shall be supplied with a hydraulic module to protect the water systems from excessive pressure.

### Welded evaporator water connection sleeve kit

Victaulic connection adapter for easy connection to the water mains.

### Low noise level

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

### Medium-temperature brine solution

The unit enables production of chilled water at low temperatures (down to 0°C) with ethylene glycol and propylene glycol.

### Low-temperature brine solution

The unit enables chilled water production at very low temperatures down to -15°C with ethylene glycol and -12°C with propylene glycol.

### Very low noise level

Stylish sound absorbing compressor enclosure combined 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 (the refrigerant charge can be stored in the evaporator or the condenser during servicing).

### Compressor suction and discharge valves

Shut-off valves on the compressor discharge piping for simplified maintenance (the refrigerant charge can be stored in the condenser during servicing).

### Enclosure panels

Side enclosure panels at each end of the coil offer an enhanced design, and protect the coil and piping against impacts.

### Grilles and enclosure panels

The four sides of the unit feature metal grilles, plus side enclosure panels at each end of the coil to protect against intrusion to the interior of the unit, offering an enhanced design while protecting the coil and piping against impacts.

### Partial heat recovery

The unit is equipped with one desuperheater on each refrigerant

circuit in order to produce free high-temperature hot-water and chilled water simultaneously.

### High static fan

The unit is equipped with high-pressure static variable-speed fans (maximum 200 Pa), each fan being equipped with a connection flange for connection to the ducting system.

### Enviro-Shield® anti-corrosion protection

- Enviro-Shield® protects the micro-channel coils in corrosive atmospheres. Enviro-Shield is 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 aluminium 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 as per ASTM D3359.
- The thin coating shall have no variation in heat transfer or air flow as per ARI 410.
- Enviro-Shield® uses corrosion inhibitors which actively stop damage due to environmental or mechanical factors. The corrosion resistance of the coated micro-channel coils shall be confirmed by at least 4000 hours of constant neutral salt spray testing as per ASTM B117.

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

- (Option 263) coated aluminium micro-channel coils are suited to the harshest environments, and feature a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins or louvers.
- 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.
- The coating process shall ensure complete coil encapsulation, including all exposed fin edges. The Super Enviro-Shield® coating shall have a uniform thickness of 20 to 40 µm with the topcoat 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%) as 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).
- The corrosion resistance of the coated micro-channel coils shall be confirmed by at least 6000 hours of constant neutral salt spray testing as per ASTM B117.

### Soft starter

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

### Power Factor Correction (PFC)

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

### DX Free Cooling

The unit shall provide cooling in free-cooling mode without the use of brine, with no increase in the hydraulic pressure drop and no impact on the standard unit dimensions. One or two circuits can be equipped with free-cooling mode.

### Master/slave operation

- Two units connected by communication bus shall cooperate to maintain the water temperature of the system.
- The master unit shall be the only interface to control the operation of both chillers.
- Up to 5 possible water loop configurations (parallel, common or dedicated pumps, series, etc.).
- Three balancing 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 (the refrigerant charge can be stored in the evaporator or condenser during servicing).

Communication board with additional inputs/outputs

- Input contacts:
  - Setpoint 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 on cooler.
  - 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.

### Electric plug

230 V/0.8 A AC power supply for connecting a laptop.

### Touch Pilot Control

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

### Advanced control features

- Web connectivity.
- Fast BACnet IP connectivity (with BACnet® IP Communication option).
- Alarm notification via email.
- Track trending values (Web Browser display only).

### Touch Pilot 5-inch 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 (only compatible with Touch Pilot control)

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





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