PRODUCT SELECTION DATA

AIR-COOLED SCROLL CHILLERS WITH GREENSPEED® INTELLIGENCE



Unit with low noise level option

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

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 liquid chillers 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 is a compact all-in-one package optimised for part-load applications where high ESEER, SEPR and 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 sounds levels achieved at 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.

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Translation of the original document

FEATURES AND BENEFITS

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_2 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 a new aluminium alloy
- Brazed-plate heat exchangers with reduced 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, partial heat recovery.

Both Aquasnap versions can be equipped with a built-in hydraulic module, limiting the installation to conventional operations such as connection of the power supply and the supply and return piping (plug & play), according to the dimensions of the standard unit.

Recommended by Carrier, Aquasnap can be equipped with one or two Greenspeed® variable-speed pumps to significantly reduce energy costs linked to pumping (reduction of more than two-thirds), ensure optimum water flow rate control, and improve overall system reliability.

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.



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
  - $SEER_{12/7°C}$ of up to 4.52 (30RBP version) in line with the new Ecodesign 2016/2281 regulations
  - Multiple scroll compressors equipped with a high-efficiency motor which can exactly match the cooling capacity to the load required
  - Electronic expansion valve permitting operation at a lower condensing pressure and improved utilisation 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
  - Setpoint automatically offset based on the outside air temperature or room air temperature (via an option)
  - Floating high pressure management
  - Variable-speed fan control
  - Cooling demand limitation.

Refer to control chapter for more information.

- Greenspeed® variable-speed pump to reduce pumping energy 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 the hydraulic option chapter for more information.





- Extra energy savings through multiple options:
  - Direct expansion free-cooling without glycol (Carrier patented) on one or two refrigerating circuits
  - Partial heat recovery.
- Reduced maintenance costs:
  - Fast diagnosis of possible incidents and their history via the control
  - R-410A refrigerant is easier to use than other refrigerant blends.

FEATURES AND BENEFITS

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 4th 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 minimal 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 protects 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 (option).
- Built-in hydraulic module with Greenspeed® variable-speed pump (option recommended by Carrier):
  - Quick and easy electronic setting of the nominal water flow rate when the unit is commissioned, thus eliminating the need to adjust the water flow rate 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.

Environmentally responsible

- 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.

FEATURES AND BENEFITS

Superior reliability

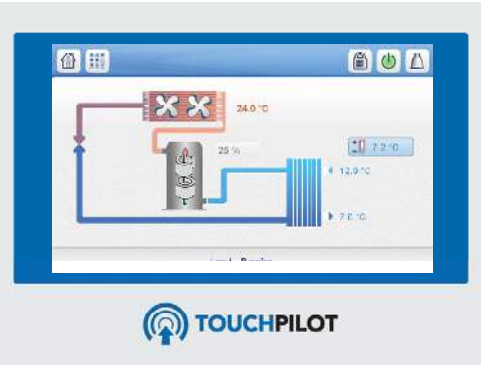
- State-of-the-art concept
  - Two independent refrigerant circuits; the second one automatically takes over, if the first one develops a fault, maintaining partial cooling under all circumstances
  - All compressor components are easily accessible on site minimising down-time
  - All-aluminum Novation®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

Touch Pilot control

The Touch Pilot control 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.

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
  - 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 runtime 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.
- Advanced communication features
  - Easy and high-speed 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
- 5-inch Touch Pilot user interface



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

FEATURES AND BENEFITS

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 allows remote control of the Aquasnap unit 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 several 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 necessity 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® is 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 concept significantly increases its corrosion resistance by eliminating the galvanic currents that are created when two different metals (copper and aluminium) come into contact in conventional 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). The MCHE can be cleaned very quickly using a high-pressure washer.

OPTIONS

Options	No.	Description	Advantages	Use
Medium-temperature brine solution	5B	Low temperature chilled water production down to 0°C with ethylene glycol and propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RBM/30RBP 160-520
Low-temperature brine solution	6B	Low temperature chilled water production down to -15°C with ethylene glycol and -12°C with propylene glycol.	Covers specific applications such as ice storage and industrial processes	30RBM/P 160-400 for chilled water down to -15°C
High pressure static fans	12	Unit 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.	Ducted fan discharge, optimised condensing temperature (or evaporating temperature on Heat pump version) control, based on the operating conditions and system characteristics	30RBP160-520
Low noise level	15	Aesthetic and sound absorbing compressor enclosure	Noise level reduction by 1 to 2 dB(A)	30RBM/30RBP 160-520
Very low noise level	15LS	Acoustic compressor enclosure and low-speed fans	Noise level reduction by 6 to 7 dB(A)	30RBM/30RBP 160-520
High ambient temperature	16	Unit equipped with electrical panel cooling fan	Extended unit part-load operation up to 52°C ambient temperature	30RBM 160-520
IP54 control box	20A	Increased leak tightness of the unit	Protects the inside of the control panel from dust, water and sand. As a rule, this option is recommended for installations located 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	Improves aesthetics, protection against intrusion to the unit interior, coil and piping protection against impacts.	30RBM/30RBP 160-520
Enclosure panels	23A	Side enclosure panels at each end of the coil	Improved aesthetics, coil and piping protection against impacts.	30RBM/30RBP 160-520
Soft starter	25	Electronic starter on each compressor	Reduced start-up current	30RBM/30RBP 160-520
Winter operation down to -20°C	28	Fan speed control of lead fan for each circuit using a variable frequency drive	Stable unit operation for outside air 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 temperature from 0°C down to -10°C	30RBM 160-520
Winter operation down to -10°C low speed	28C	Two Low speed fans on lead fan on each circuit	Reduces the noise level and enables stable unit operation for outside air temperatures down to -10°C	30RBM 160-520
Water exchanger frost protection	41	Electric heater on the water exchanger and the water piping	Water exchanger module frost protection between 0°C and -20°C outside air temperature	30RBM/30RBP 160-520
Exchanger & hydraulic frost protection	42A	Electric heater on the water exchanger hydraulic module and optional expansion tank	Water exchanger and hydraulic module frost protection between 0°C and -20°C outside air temperature	30RBM/30RBP 160-520
Partial heat recovery	49	Unit equipped with one desuperheater on each refrigerant circuit	Production of free high-temperature hot-water simultaneously with chilled water production (or hot water for Heat pump)	30RBM/30RBP 160-520
Shell and tube evaporator aluminium insulation	88	Evaporator covered with an aluminum sheet for thermal insulation protection	Improved resistance to aggressive climate conditions	30 RBM/RBP 160-260
Master/slave operation	58	Unit equipped with supplementary water outlet temperature sensor kit (to be field installed) allowing master/slave operation of two units connected in parallel	Optimised operation of two units connected in parrallel operation with operating time equalisation	30RBM/30RBP 160-520
Compressor suction and discharge valves	92A	Shut-off valves on the compressor suction and discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the cooler or condenser side during servicing	30RBM/30RBP 160-520
Compressor discharge valves	93A	Shut-off valves on the compressor common discharge piping	Simplified maintenance. Possibility to store the refrigerant charge in the condenser side during servicing	30RBM/30RBP 160-520
HP single-pump hydraulic module	116R	Single high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available.)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520

OPTIONS

Options	No.	Description	Advantages	Use
HP dual-pump hydraulic module	116S	Dual high-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included); Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
LP single-pump hydronic module	116T	Single low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
LP dual-pump hydraulic module	116U	Dual low-pressure water pump, water filter, electronic water flow control, pressure transducers. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play)	30RBM/30RBP 160-520
HP evap. variable-speed single-pump	116V	Single high-pressure water pump with variable speed drive (VSD), water filter, electronic water flow control, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play), significant pumping energy cost savings (more than two-thirds), tighter water flow control, improved sytem reliability	30RBM/30RBP 160-520
HP VSD dual-pump hydraulic mod.	116W	Dual high-pressure water pump with variable speed drive (VSD), water filter, electronic flow switch, pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter (expansion tank not included; Option with built-in safety hydraulic components available)	Easy and fast installation (plug & play), significant pumping energy cost savings , tighter water flow control, improved sytem 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	Bi-directional communication board complying with JBus protocol	Connects the unit by communication bus to a centralised building management system	30RBM/30RBP 160-520
Lon gateway	148D	Bi-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a centralised building management system	30RBM/30RBP 160-520
BACnet/IP	149	Bi-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system.Allows access to multiple unit parameters	30RBM/30RBP 160-520
Energy Management Module	156	EMM Control board with additional inputs/ outputs. See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, ice storage end, demand limits, boiler on/off command...)	30RBM/30RBP 160-520
Compliance with Russian regulations	199	EAC certification	Compliance with Russian regulations	30RBM/30RBP 160-519
Power factor correction	231	Capacitors for automatic regulation of power factor (cos phi) value to 0,95.	Reduction of the apparent electrical power, compliance with minimum power factor limit set by utilities	30RBM/30RBP 160-520
Enviro-Shield anti-corrosion protection	262	Coating by 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, salt spray resistance test for 4000 hours (ASTM B117)	Improved corrosion resistance, recommended for use in moderately corrosive environments	30RBM/30RBP 160-520

OPTIONS

Options	No.	Description	Advantages	Use
Super Enviro-Shield anti-corrosion protection	263	Extremely durable and flexible epoxy polymer coating applied on micro channel heat exchangers by electro coating process, final UV protective topcoat. Minimal heat transfer variation, tested 6000 hours constant neutral salt spray per ASTM B117, superior impact resistance per ASTM D2794	Improved corrosion resistance, recommended for use in extremely corrosive environments	30RBM/30RBP 160-520
Welded evaporator connection kit	266	Victaulic piping connections with welded joints	Easy installation	30RBM/30RBP 160-520
Shell and tubes heat exchanger	280	Brazed plate heat exchanger replaced by shell & tube heat exchanger	Extension of the water flow rate range, improved resistance to fouling	30RBM/RBP 160-260
230 V electric plug	284	230 VAC power supply source provided with plug socket and transformer (180 VA, 0.8 A)	Permits connection of a laptop or an electrical device during unit commissioning or servicing	30RBM/30RBP 160-520
Expansion tank	293	6-bar expansion tank integrated into the hydronic module (option 116 required)	Easy and fast installation (plug & play), & Protection of closed water systems from excessive pressure	30RBM/30RBP 160-520
Screwed water connection sleeve kit for DSH	303	DSH connections with screw connection sleeves	Easy installation.Allows unit connection to a screw connector	30RBM/30RBP 160-520
Welded water connection kit for DSH	304	DSH inlet/outlet welded connection sleeves	Easy installation	30RBM/30RBP 160-520
Set point adjustment by 4-20mA signal	311	Connections to allow a 4-20mA signal input	Easy energy managment, allow to adjust set point by a 4-20mA external signal	30RBM/30RBP 160-520
Free Cooling dry cooler management	313	Control & connections to a Free Cooling Drycooler 09PE or 09VE fitted with option FC control box	Easy system managment, Extended control capabilities to a dryccoler used in Free Cooling mode	30RBM/30RBP 160-520

BRINE OPTIONS (OPTION 5B & OPTION 6B)

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

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

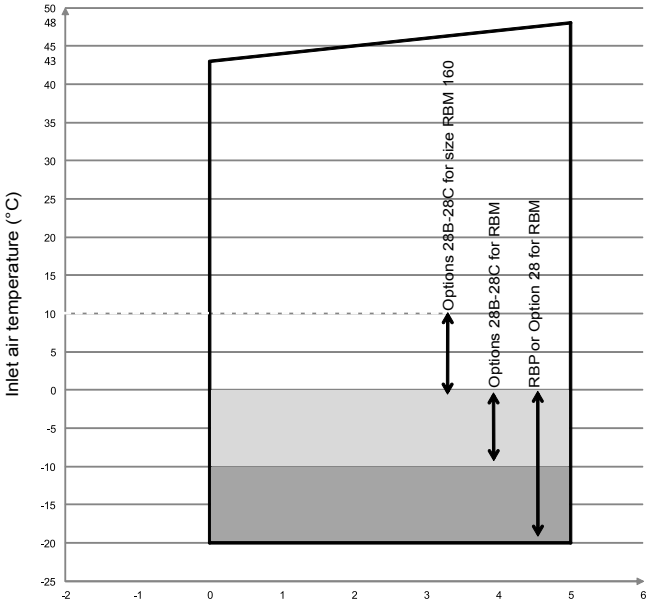
The unit is equipped with insulation on the suction pipes. The insulation is reinforced on the low-temperature brine solution option.

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

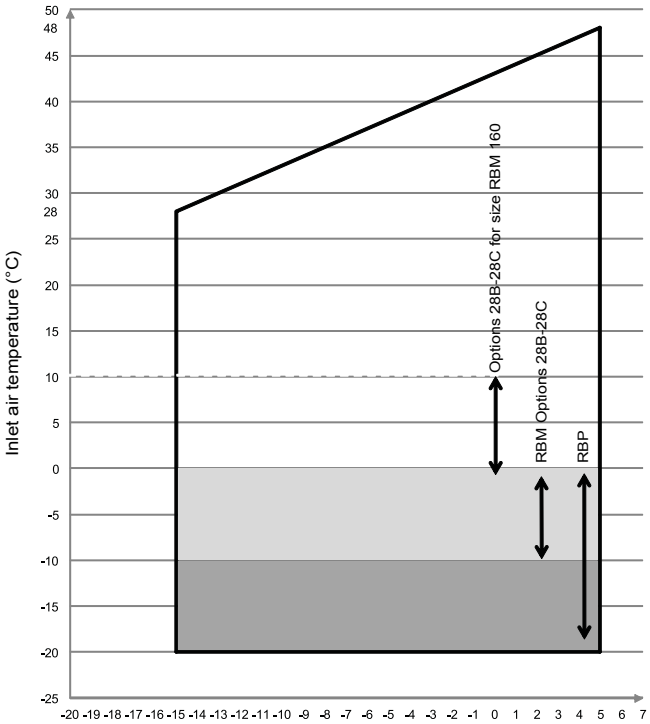
Operating range for 30RBM 160-520 and 30RBP 160-520 units, medium-temperature Ethylene and Propylene Glycol



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

■ Low-temperature brine solution

Operating range for 30RBM 160-520 and 30RBP 160-520 units, medium-temperature Ethylene and Propylene Glycol



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

Notes
- Evaporator ΔT = 5K max
- These operating ranges are guidelines only. Verify the operating range with 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 the low-temperature brine solution option

30RBM and RBP		160	180	200	220	260	300	330	360	400
Circuit A standard unit + option 6B(1)	kg	8,4	10,9	10,9	12,6	12,55	14,15	14,9	20,3	20,6
	tCO_2e	17,5	22,8	22,8	26,3	26,2	29,5	31,1	42,4	43
Circuit B standard unit + option 6B(1)	kg	12,25	12,6	12,05	12,7	12,55	20,2	19,7	19,9	21,7
	tCO_2e	25,6	26,3	25,2	26,5	26,2	42,2	41,1	41,6	45,3

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

UNITS WITH FANS WITH AVAILABLE PRESSURE FOR INDOOR INSTALLATION (OPTION 12 - STATIC HIGH PRESSURE FAN)

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

For this type of installation, the hot or cold air emerging from the air-cooled condensers is evacuated from the building by the fans by means of a ducting system, which causes pressure drops 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 direction changes.

30RBP units with option 12 are designed to operate with air discharge ducts with a 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 pressure drop in the ducts while maintaining an optimised 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.

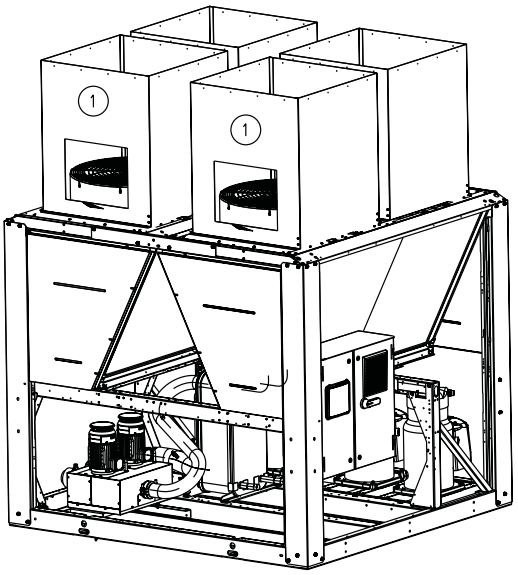
The performance levels (capacity, efficiency) depend on the speed of the fans, then on the duct pressure drop:

- 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 inside of the ductwork and radiated around the unit is also related to the pressure drop.

Please refer to the Carrier electronic catalogue to evaluate the estimated impact of the ducting 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 (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 as standard, with the air-cooled 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
Desuperheater in circuits A/B		Plate heat exchanger											
Water volume circuits A/B	l	2/3.75	2/3.75	2/3.75	3.75/3.75	3.75/3.75	3.75/3.75	3.75/5.5	5.5/5.5	5.5/5.5	5.5/7.5	5.5/7.5	7.5/7.5
Maximum water-side operating pressure	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Refrigerant													
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_2e	19,1	27,9	26,9	30,0	28,4	31,3	36,1	47,6	44,7	54,9	49,6	57,0
Circuit B	kg	13,5	14,3	13,3	14,5	13,6	22,8	21,1	20,9	22,4	27,4	27,3	27,5
	tCO_2e	28,1	30,0	27,7	30,2	28,4	47,6	44,1	43,7	46,8	57,1	57,1	57,4
Water connections		Victaulic											
Connection	in	2	2	2	2	2	2	2	2	2	2	2	2
External diameter	mm	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3	60.3
30RBM													
Operating weight [3]													
Standard unit + desuperheater option	kg	1269	1310	1311	1446	1467	1932	1968	2143	2201	2626	2643	2849
Unit with option 15 + desuperheater option	kg	1352	1393	1394	1554	1575	2058	2094	2287	2344	2788	2805	3029
Unit with option 15 and option 116S + desuperheater option	kg	1491	1533	1533	1693	1729	2218	2298	2491	2548	3032	3049	3309
30RBP													
Operating weight [3]													
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

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

PARTIAL HEAT RECOVERY USING DESUPERHEATERS (OPTION 49)

Operating limits

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

(1) On start-up, the water inlet temperature must not be below 25°C. For installations with a lower temperature a three-way valve is necessary.
(2) The maximum 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

HYDRAULIC MODULE (OPTION 116)

The new generation of Carrier hydraulic module minimises installation time. The heat pump is factory-equipped with the main components for the hydraulic system: Water pump, electronic flow switch, Victaulic screen filter, pressure sensors, water temperature sensors, pressures taps (2), relief valve, drain valve, air vent, water purge, optional hydraulic 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).

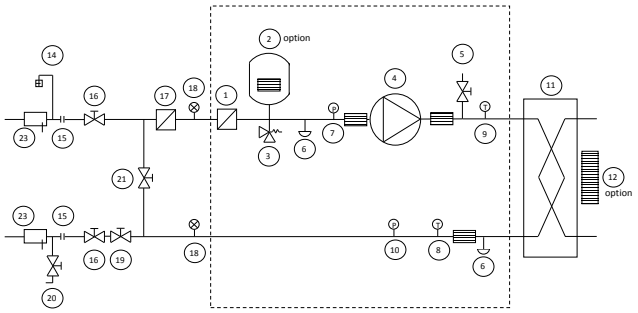
Several water pump types are available to suit any application:

- 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 hydraulic 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 hydraulic circuit diagram



Hydraulic module



Key

Components of the unit and hydronic module:

1. Screen filter (mesh opening 1.2 mm)
2. Expansion tank (option)
3. Relief 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 inlet 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 hydraulic 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

--- Hydraulic module (unit with hydraulic module)

Notes:

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

Electrical data, units with hydraulic modules

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

This regulation concerns the application of directive 2009/125/EC on the eco-design requirements for electric motors.

DX FREE COOLING SYSTEM (OPTION 118A-118B)

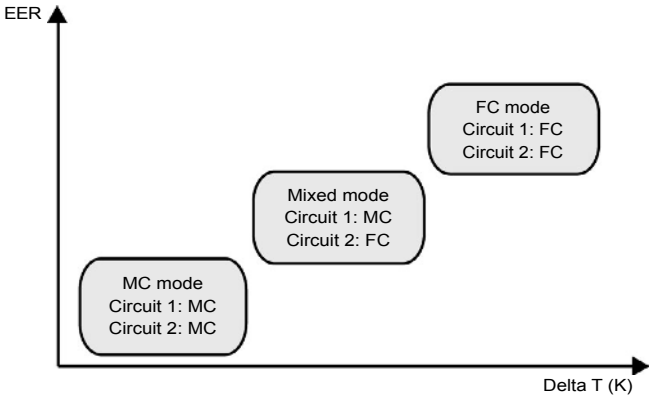
The DX Free Cooling option offers considerable energy savings for all cooling applications used in winter. In free cooling mode, the compressors are switched off and only the fans and a cooling micro-pump are in operation. The Touch Pilot control automatically switches from compressor cooling mode to 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 principle

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.



Key

MC	Mechanical Cooling/compressors
FC	Free Cooling
Delta T	Difference between the water outlet temperature and the water inlet temperature (in K)

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
30RBM Min. OAT -10°C (opt. 28B required)	**Opt_118A**	Not available			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Opt_118B	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Mixed mode	Not available											
30RBP Min. OAT -20°C	**Opt_118A**	Not available			✓	✓	✓	✓	✓	✓	✓	✓	✓
	Opt_118B	✓	✓	✓	✓	✓	✓	✓	Not available		✓	✓	✓
	Mixed mode	✓	✓	✓	✓	✓	✓	✓	Not available		✓	✓	✓

DX FREE COOLING SYSTEM (OPTION 118A-118B)

Physical properties of 30RB units with Free Cooling system

30RBM/30RBP option 118A (Free Cooling on 2 circuits)		220	260	300	330	360	400	430	470	520
30RBM - Operating weight(1)										
Standard unit + option 118A	kg	1462	1483	1958	1994	2170	2226	2646	2664	2864
Unit with option 15 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
30RBP - Operating weight(1)										
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
30RBM/30RBP - Refrigerant	R410A									
Circuit A(1)	kg	13,9	14,6	16,7	17,6	24,8	24,3	27,5	25,5	31,6
	tCO_2e	29,0	30,5	34,9	36,7	51,8	50,7	57,4	53,2	65,9
Circuit B(1)	kg	14,0	14,6	25,0	24,7	25,4	25,4	29,5	30,3	31,8
	tCO_2e	29,2	30,5	52,2	51,6	53,0	53,0	61,6	63,3	66,3

30RBM/30RBP option 118B (Free Cooling on 1 circuit)		160	180	200	220	260	300	330	360	400	430	470	520
30RBM - Operating weight(1)													
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
30RBP - Operating Weight(1)													
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
30RBM/30RBP - Refrigerant	R410A												
Circuit A(1)	kg	8,4	10,9	10,9	12,6	13,1	14,7	15,4	20,3	21,1	23,5	23,5	26,8
	tCO_2e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B(1)	kg	14,0	14,1	13,7	14,0	14,6	25,0	24,7	25,4	25,4	29,5	30,3	31,8
	tCO_2e	29,1	29,4	28,6	29,2	30,5	52,2	51,6	53,0	53,0	61,6	63,3	66,3

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

DX FREE COOLING SYSTEM (OPTION 118A-118B)

Cooling capacities (Option 118A)

30RBM/30RBP 160-520 Free Cooling mode

LWT (°C)		Condenser entering air temperature,°C								
		-10			-5			0		
		Qc	Unit	EER	Qc	Unit	EER	Qc	Unit	EER
		kW	kW	kW/kW	kW	kW	kW/kW	kW	kW	kW/kW
220	10	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 Water outlet 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

LWT (°C)		Condenser inlet air temperature (°C)								
		-10			-5			0		
		Qc	Unit	EER	Qc	Unit	EER	Qc	Unit	EER
		kW	kW	kW/kW	kW	kW	kW/kW	kW	kW	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(1)		147	8,0	18,4	135	7,9	17,0	114	7,9	14,5
400(1)		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

LWT Water outlet temperature
Qc Cooling capacity
Unit Unit power input (pumps, fans, control)
EER Energy efficiency
(1) Not available on 30RBP units

Operating limits

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

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

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

SHELL AND TUBE WATER TYPE HEAT EXCHANGER (OPTION 280)

The units equipped with this option have a direct expansion shell and tube evaporator (the refrigerant is evaporated inside a copper tube bundle, the water circulates inside the shell and tube exchanger), instead of the brazed-plate heat exchanger.

This can be cleaned by removing the tube sheets located at the ends of the shell, which provides access to the tube bundle.

Physical data, 30RBM/30RBP units with shell and tube water type heat exchanger (option 280)

30RBM/RBP + option 280		160	180	200	220	260
30RBM + option 280						
Operating weight(1)						
Standard unit	kg	1557	1598	1598	1728	1728
Unit + option 15	kg	1640	1681	1681	1836	1836
Unit + option 15 + option 116W	kg	1818	1859	1859	2014	2029
Unit + option 15 + option 116W + water buffer tank module	kg	2777	2818	2818	2973	2988
30RBP + option 280						
Operating weight(1)						
Standard unit	kg	1592	1634	1635	1764	1765
Unit + option 15	kg	1675	1717	1718	1872	1873
Unit + option 15 + option 116W	kg	1853	1895	1896	2050	2066
Unit + option 15 + option 116W + water buffer tank module	kg	2812	2854	2855	3009	3025
30RBM/P + option 280						
Refrigerant(1)		R410A				
Circuit A(1)	kg	9,80	12,60	12,60	13,60	13,60
	tCO_2e	20,5	26,3	26,3	28,4	28,4
Circuit B(1)	kg	13,80	13,80	13,80	13,80	13,80
	tCO_2e	28,8	28,8	28,8	28,8	28,8
Water type heat exchanger						
Water volume	l	92	92	92	92	92
Max. water-side operating pressure without hydraulic module	kPa	1000	1000	1000	1000	1000
Water connections without hydronic module		Victaulic® type				
Connections	inch	4	4	4	4	4
External diameter	mm	114,3	114,3	114,3	114,3	114,3
Water connections with hydronic module		Victaulic® type				
Connections	inch	3	3	3	3	3
External diameter	mm	88,9	88,9	88,9	88,9	88,9

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

Refrigerant charge for the combination of shell and tube water type heat exchanger and low-temperature brine solution options

30RBM/RBP + option 280						
Refrigerant(1)		R410A				
Circuit A	kg	9,80	12,10	12,10	13,10	13,10
	tCO_2e	20,5	25,3	25,3	27,4	27,4
Circuit B	kg	13,30	13,30	13,30	13,30	13,30
	tCO_2e	27,8	27,8	27,8	27,8	27,8

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

Operating range

The operating range for the unit with option 280 is similar to that of the standard unit for most configurations.

However, in combination with options 5B and 6B, the following limits must be respected:

- option 5B (medium-temperature brine solution), the shell and tube exchanger water outlet temperature is limited to 0°C (same as the brazed-plate heat exchanger).
- option 6B (low-temperature brine solution), the shell and tube exchanger water outlet temperature is limited to -12°C

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 rate control, and improve overall system reliability.



Carrier Variable Water Flow (VWF) is a hydraulic control function package that controls the water flow rate.

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

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

As Carrier VWF acts directly on the pump, the system no longer requires the control valve at the unit outlet. However, for applications with two-way valves a bypass system must be kept to guarantee the minimum flow rate.

Operating principle

■ 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
Cooling															
Standard unit Full load performances*	CA1	Nominal capacity	kW	168	181	198	216	261	300	331	365	397	430	464	523
		EER	kW/kW	3,04	3,12	2,98	2,97	2,90	2,97	2,92	2,95	2,90	2,94	2,90	2,90
		Eurovent class		B	A	B	B	B	B	B	B	B	B	B	B
	CA2	Nominal capacity	kW	216	247	263	297	336	393	428	475	510	556	593	676
		EER	kW/kW	3,6	3,89	3,59	3,7	3,37	3,53	3,4	3,47	3,37	3,45	3,34	3,38
		Eurovent class		C	A	C	B	D	C	D	D	D	D	E	D
Standard unit Seasonal energy efficiency**		**SEER $_{12/7°C}$ Comfort low temp.**	**kWh/kWh**	**4,15**	**4,18**	**4,10**	**4,09**	**4,10**	**4,15**	**4,19**	**4,21**	**4,16**	**4,15**	**4,12**	**4,10**
		ηs cool$_{12/7°C}$	**%**	**163**	**164**	**161**	**161**	**161**	**163**	**165**	**165**	**163**	**163**	**162**	**161**
		SEPR $_{12/7°C}$ Process high temp.	kWh/kWh	4,77	4,71	4,29	4,76	4,33	4,56	4,46	4,67	4,50	4,79	4,64	4,74
Unit + option 6 Seasonal energy efficiency**		**SEPR $_{-2/-8°C}$ Process medium temp. *** **	**kWh/kWh**	**2,81**	**3,08**	**3,14**	**2,99**	**3,13**	**3,05**	**3,04**	**2,76**	**3,23**	NA	NA	NA
Part Load integrated values		IPLV.SI	kW/kW	4,566	4,570	4,538	4,508	4,500	4,610	4,612	4,690	4,579	4,618	4,555	4,579
Sound levels															
Standard unit															
Sound power(3)			dB(A)	91	92	92	92	92	93	93	93	93	94	94	94
Sound pressure level at 10 m (4)			dB(A)	59	60	60	60	60	60	60	61	61	62	62	62
Standard unit + option 15(1)															
Sound power(3)			dB(A)	89	90	90	90	90	91	91	92	92	93	93	93
Sound pressure at 10 m(4)			dB(A)	57	58	58	58	58	59	59	60	60	61	61	61
Standard unit + option 15LS(1)															
Sound power(3)			dB(A)	85	85	85	86	86	86	86	87	87	88	88	88
Sound pressure at 10 m(4)			dB(A)	53	53	53	54	54	54	54	55	55	55	55	56
Dimensions - standard unit															
Length			mm	2410					3604				4797		
Width			mm	2253					2253				2253		
Height			mm	2297					2297				2297		
Operating weight(2)															
Standard unit			kg	1216	1257	1257	1387	1408	1865	1901	2069	2125	2545	2563	2761
Standard unit + option 15(1)			kg	1299	1339	1340	1495	1516	1991	2027	2212	2269	2707	2726	2941
Standard unit + option 15 + option 116S(1)			kg	1438	1479	1479	1634	1670	2151	2231	2416	2472	2950	2967	3221

*	In accordance with standard EN14511-3:2013.
**	In accordance with standard EN14825:2016
***	With EG 30%
CA1	Cooling mode conditions: evaporator water inlet/outlet temperature 12 °C/7 °C, outdoor air temperature 35 °C, evaporator fouling factor 0 m^2. k/W
CA2	Cooling mode conditions: evaporator water inlet/outlet temperature 23 °C/18 °C, outdoor air temperature 35 °C, evaporator fouling factor 0 m^2. k/W
ηs cool $_{12/7°C}$ & SEER $_{12/7°C}$	**Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Comfort application**
SEPR $_{12/7°C}$	Values calculated in accordance with EN14825:2016
SEPR $_{-2/-8°C}$	**Bold values compliant to Ecodesign regulation: (EU) No 2015/1095 for Process application**
NA	Not Authorised for the specific application for the CEE market
IPLV.SI	Calculations according to standard performances AHRI 551-591 (SI).
(1)	Options: 15 = Low noise level, 15LS = Very Low Noise level, 116S = High pressure dual-pump hydraulic module
(2)	Weights are guidelines only. Refer to the unit name plate.
(3)	In dB ref=10^{-12} 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
(4)	In dB ref 20µPa, (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 Lw(A).

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Valeurs certifiées Eurovent

PHYSICAL DATA, SIZES 160 TO 520

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
Compressors		Hermetic scroll 48,3 tr/s											
Circuit A		1	1	1	2	2	2	2	3	3	3	3	4
Circuit B		2	2	2	2	2	3	3	3	3	4	4	4
No. of control stages		3	3	3	4	4	5	5	6	6	7	7	8
Refrigerant(2) - Standard unit		R410A											
Circuit A	kg	8,40	10,90	10,90	12,60	13,10	14,70	15,40	20,30	21,10	23,50	23,50	26,75
	tCO_2e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B	kg	12,25	12,60	12,60	12,70	13,10	20,20	20,20	20,40	22,20	26,70	26,80	26,95
	tCO_2e	25,6	26,3	26,3	26,5	27,4	42,2	42,2	42,6	46,4	55,7	56,0	56,3
Capacity control		Pro-Dialog+ Control											
Minimum capacity	%	33	33	33	25	25	20	20	17	17	14	14	13
Condensers		Aluminium micro-channel coils (MCHE)											
Fans - Standard unit		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 rotation speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
Evaporator		Dual-circuit plate heat exchanger											
Water volume	l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Hydraulic module (option)		Pump, Victaulic screen filter, relief valve, water and air drain valve, pressure sensors, expansion tank (option)											
Pump		Centrifugal pump, monocell, 48,3 rps, low or high pressure (as required), single or dual (as required)											
Expansion tank volume	l	50	50	50	50	50	80	80	80	80	80	80	80
Max. water-side operating pressure with hydraulic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with or without hydraulic module		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
Casing paintwork		Colour code RAL 7035											

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

PHYSICAL DATA, SIZES 160 TO 520

30RBP				160	180	200	220	260	300	330	360	400	430	470	520
Cooling															
Standard unit Full load performances*	CA1	Nominal capacity	kW	168	180	197	216	261	300	331	365	397	430	464	523
		EER	kW/kW	3,04	3,12	2,98	2,97	2,90	2,97	2,92	2,95	2,90	2,94	2,90	2,90
		Eurovent class		B	A	B	B	B	B	B	B	B	B	B	B
	CA2	Nominal capacity	kW	216	247	263	297	336	393	428	475	510	556	593	676
		EER	kW/kW	3,6	3,89	3,59	3,7	3,37	3,53	3,4	3,47	3,37	3,45	3,34	3,38
		Eurovent class		C	A	C	B	D	C	D	D	D	D	E	D
Standard unit Seasonal energy efficiency**		**SEER $_{12/7°C}$ Comfort low temp.**	**kWh/kWh**	**4,32**	**4,29**	**4,18**	**4,25**	**4,20**	**4,52**	**4,40**	**4,52**	**4,37**	**4,45**	**4,53**	**4,40**
		ηs cool $_{12/7°C}$	**%**	**170**	**169**	**164**	**167**	**165**	**178**	**173**	**178**	**172**	**175**	**178**	**173**
		SEPR $_{12/7°C}$ Process high temp.	**kWh/kWh**	**5,43**	**5,61**	**5,32**	**5,56**	**5,16**	**5,60**	**5,24**	**5,62**	**5,32**	**5,50**	**5,38**	**5,26**
Unit + option 6 Seasonal energy efficiency**		**SEPR $_{-2/-8°C}$ Process medium temp. *** **	**kWh/kWh**	**3,03**	**3,40**	**3,38**	**3,33**	**3,22**	**3,40**	**3,06**	**3,47**	**3,42**	NA	NA	NA
Part Load integrated values		IPLV.SI	kW/kW	4,758	4,855	4,733	4,849	4,749	4,999	4,833	5,004	4,815	4,925	4,999	4,839
Sound levels															
Standard unit															
Sound power(3)			dB(A)	91	92	92	92	92	93	93	93	93	94	94	94
Sound pressure level at 10 m (4)			dB(A)	59	60	60	60	60	60	60	61	61	62	62	62
Standard unit + option 15(1)															
Sound power(3)			dB(A)	89	90	90	90	90	91	91	92	92	93	93	93
Sound pressure at 10 m(4)			dB(A)	57	58	58	58	58	59	59	60	60	61	61	61
Standard unit + option 15LS(1)															
Sound power(3)			dB(A)	85	85	85	86	86	86	86	87	87	88	88	88
Sound pressure at 10 m(4)			dB(A)	53	53	53	54	54	54	54	55	55	55	55	56
Dimensions - standard unit															
Length			mm	2410					3604				4797		
Width			mm	2253					2253				2253		
Height			mm	2297					2297				2297		
Operating weight(2)															
Standard unit			kg	1252	1293	1293	1423	1445	1901	1937	2105	2162	2603	2621	2827
Standard unit + option 15(1)			kg	1334	1376	1376	1531	1553	2027	2063	2249	2306	2765	2783	3007
Standard unit + option 15 + option 116S(1)			kg	1473	1515	1516	1670	1707	2187	2267	2452	2509	3007	3024	3287

*	In accordance with standard EN14511-3:2013.
**	In accordance with standard EN14825:2016
***	With EG 30%
CA1	Cooling mode conditions: evaporator water inlet/outlet temperature 12 °C/7 °C, outdoor air temperature 35 °C, evaporator fouling factor 0 m^2. k/W
CA2	Cooling mode conditions: evaporator water inlet/outlet temperature 23 °C/18 °C, outdoor air temperature 35 °C, evaporator fouling factor 0 m^2. k/W
ηs cool $_{12/7°C}$ & SEER $_{12/7°C}$	**Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Comfort application**
SEPR $_{12/7°C}$	**Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Process application**
SEPR $_{-2/-8°C}$	**Bold values compliant to Ecodesign regulation: (EU) No 2015/1095 for Process application**
NA	Not Authorised for the specific application for the CEE market
IPLV.SI	Calculations according to standard performances AHRI 551-591 (SI).
(1)	Options: 15 = Low noise level, 15LS = Very Low Noise level, 116S = High pressure dual-pump hydraulic module
(2)	Weights are guidelines only. Refer to the unit name plate.
(3)	In dB ref=10^{-12} 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
(4)	In dB ref 20µPa, (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 Lw(A).

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PHYSICAL DATA, SIZES 160 TO 520

30RBP		160	180	200	220	260	300	330	360	400	430	470	520
Compressors		Hermetic scroll 48,3 tr/s											
Circuit A		1	1	1	2	2	2	2	3	3	3	3	4
Circuit B		2	2	2	2	2	3	3	3	3	4	4	4
No. of control stages		3	3	3	4	4	5	5	6	6	7	7	8
Refrigerant(2) - Standard unit		R410A											
Circuit A	kg	8,40	10,90	10,90	12,60	13,10	14,70	15,40	20,30	21,10	23,50	23,50	26,75
	tCO_2e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B	kg	12,25	12,60	12,60	12,70	13,10	20,20	20,20	20,40	22,20	26,70	26,80	26,95
	tCO_2e	25,6	26,3	26,3	26,5	27,4	42,2	42,2	42,6	46,4	55,7	56,0	56,3
Capacity control		Pro-Dialog+ Control											
Minimum capacity	%	33	33	33	25	25	20	20	17	17	14	14	13
Condensers		Aluminium micro-channel coils (MCHE)											
Fans - Standard unit		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 rotation speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
Evaporator		Dual-circuit plate heat exchanger											
Water volume	l	15	15	15	15	19	27	35	33	42	44	47	53
Max. water-side operating pressure without hydronic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Hydraulic module (option)		Pump, Victaulic screen filter, relief valve, water and air drain valve, 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 hydraulic module	kPa	400	400	400	400	400	400	400	400	400	400	400	400
Water connections with/without hydraulic module		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
Casing paintwork		Colour code RAL 7035											

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

ELECTRICAL SPECIFICATIONS

30RBM		160	180	200	220	260	300	330	360	400	430	470	520
Power circuit													
Nominal voltage	V-ph-Hz	400 - 3 - 50											
Voltage range	V	360 - 440											
Control circuit supply		24 V via internal transformer											
Nominal unit current draw(1)													
Circuit A&B	A	100	110	124	133	161	180	201	221	242	261	282	322
Max. operating input power (2)													
Circuit A&B	kW	80	88	99	107	129	145	161	177	194	210	226	258
Cosine Phi unit at maximum power (2)		0,88	0,87	0,87	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88
Maximum unit current draw (Un-10%)(3)													
Circuit A&B	A	144	158	176	192	230	259	288	317	345	374	403	460
Maximum unit current draw (Un)(4)													
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
Maximum start-up current, standard unit (Un)†													
Circuit A&B	A	307	356	374	352	423	450	476	503	529	556	583	636
Max. start-up current, unit with soft starter (Un)†													
Circuit A&B	A	261	283	300	305	349	376	403	429	456	482	509	562

(1) Conditions equivalent to the standardised Eurovent conditions (evaporator water input-output temperature = 12 °C/7 °C, outside air temperature = 35 °C)
(2) Power input, compressors and fans, at the unit operating limits (saturated suction temperature 15°C, saturated condensing temperature 68.3°C) and nominal voltage of 400 V (data given on the unit nameplate).
(3) Maximum unit operating current at maximum unit input power and 360 V.
(4) Maximum unit operating current at maximum unit input power and 400 V (values given on the unit's nameplate).
† Maximum instantaneous start-up current at operating limits (maximum operating current of the smallest compressor(s) + current of the fan(s) + 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
Power circuit													
Nominal voltage	V-ph-Hz	400 - 3 - 50											
Voltage range	V	360 - 440											
Control circuit supply		24 V via internal transformer											
Nominal unit current draw(1)													
Circuit A&B	A	97	107	121	130	158	176	197	216	237	255	276	316
Cosine Phi unit at maximum power (2)													
Circuit A&B	kW	81	88	99	108	129	145	162	178	194	210	226	259
Cosine Phi unit at maximum power (2)		0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88	0,88
Maximum unit current draw (Un-10%)(3)													
Circuit A&B	A	142	154	173	189	227	255	284	312	340	369	397	454
Maximum unit current draw (Un)(4)													
Circuit A&B - Standard Unit	A	131	142	160	174	209	235	262	287	314	340	366	419
Circuit A&B - Unit with option 231	A	98	108	123	131	161	178	201	219	241	259	281	321
Maximum start-up current, standard unit (Un)†													
Circuit A&B	A	305	353	371	349	420	446	472	498	525	550	577	629
Max. start-up current, unit with soft starter (Un)†													
Circuit A&B	A	259	279	297	302	346	372	399	424	451	477	503	556

(1) Conditions equivalent to the standardised Eurovent conditions (evaporator water input-output temperature = 12 °C/7 °C, outside air temperature = 35 °C)
(2) Input power, compressors + fans, at the unit operating limits (saturated suction temperature: 15°C, saturated condensing temperature: 68.3°C) and nominal voltage of 400 V (data given on the unit nameplate).
(3) Maximum unit operating current at maximum unit input power and 360 V.
(4) Maximum unit operating current at maximum unit input power and 400 V (values given on the unit's nameplate).
† Maximum instantaneous start-up current at operating limits (maximum operating current of the smallest compressor(s) + current of the fan(s) + locked rotor current of the largest compressor).

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

ELECTRICAL SPECIFICATIONS

Short-circuit withstand current (TN system)(1)

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

(1) Type of system earthing
IT system: The short circuit 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 disconnect switch
- **The control panel contains:**
  - Main disconnect switch
  - Start-up equipment and motor protection devices for each compressor, the fans, and the pumps,
  - The control devices.
- **Field 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 (corresponding to IEC 60204-1) (Safety of machinery- Electrical equipment of machines - part 1: General requirements) 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 regulations.
- Compliance with standard 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.
- The operating conditions of 30RBM/30RBP units are described below:
  1. Environment(1)
     The classification of environment is specified in standard EN 60364:
     - Outdoor installation(1),
     - Ambient temperature range: from -20 °C to +48 °C(2),
     - Altitude: AC1 lower than or equal to 2000 m (for hydraulic module, see paragraph 4.7 in the IOM)
     - Presence of solid foreign bodies: Class AE3 (no significant dust present)(1),
     - Presence of corrosive and polluting substances, class AF1 (negligible),
     - Competence of personnel: BA4 (trained personnel).
  2. Compatibility for low-frequency conducted disturbances according to class 2 levels as per standard IEC61000-2-4:
     - Power supply frequency variation: +-2Hz
     - Phase imbalance : 2%
     - Total Voltage Harmonic Distortion (THDV): 8%
  3. The neutral wire (N) 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-fitted disconnect switch(es)/circuit breaker(s) 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 filters integrated into the frequency inverter(s) prevents the machines from fulfilling their intended purpose. In addition, the equipment characteristics in case of insulation failure are modified. Provide a local earth; consult competent local organisations to complete the electrical installation.
     30RBM/30RBP machines are designed for use in domestic/residential and industrial environments:
     Machines that are not equipped with variable speed drives comply with the standard regulations.
- 61000-6-3: Generic standards - Emission standard for residential, commercial and light-industrial.
- 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 Adjustable speed electrical power drive systems - part 3: EMC requirements and specific test methods for the following classifications:
- Use in the first and second environments(3).
- 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. The presence of these capacitors must be considered during the electrical study prior to the start-up.

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

(1) 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.
(2) The maximum ambient temperature allowed for machines equipped with option 231 is +40°C.
(3) - Example of first environment installations: commercial and residential buildings.
- Example of second environment installations: industrial zones, technical rooms powered from 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** (**i**ntegrated **p**art **l**oad **v**alue) is used to evaluate the average energy efficiency using four operating conditions defined by the AHRI (Air Conditioning, Heating and Refrigeration Institute). The **IPLV** is the average of the cooling coefficient of performance (**COP_R**) under the different operating conditions, weighted by the operating time.

IPLV (Integrated Part Load Value)

Load %	Air temperature°C	Energy efficiency	Operating time %
100	35	COP_{R1}	1
75	26.7	COP_{R2}	42
50	18.3	COP_R	45
25	12.8	COP_{R4}	12
IPLV = COP_{R1} x 1% + COP_{R2} x 42% + COP_{R3} x 45% + COP_{R4} x 12%			

SEER for comfort applications (in accordance with the EU ECODESIGN regulations)

The (**S**easonal **E**nergy **E**fficiency **R**atio) (**SEER**) measures the seasonal energy efficiency of liquid chillers **for comfort applications** by calculating the ratio between the annual cooling demand of the building and the chiller's annual energy demand. It takes into account the energy efficiency for each outdoor temperature weighted by the number of hours observed for each of these temperatures, using actual climate data.

The **SEER** is a new way of measuring the energy efficiency of liquid chillers for **comfort applications** over an entire year. The new indicator provides a more realistic overview of the cooling system's energy efficiency and its actual impact on the environment (Ecodesign regulation 2016/2281).

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 seasonal energy efficiency, calculated at several operation points that are representative of use of the unit.

SEPR for process applications (in accordance with the EU ECODESIGN regulations)

The (**S**easonal **E**nergy **P**erformance **R**atio) (**SEPR**) measures the seasonal energy efficiency of liquid chillers for **process applications** by calculating the ratio between the annual process cooling demand and the chiller's annual energy demand. It takes into account the energy efficiency at each outdoor temperature for the average European climate weighted by the number of hours observed for each of these temperatures.

The **SEPR** is a new way of measuring the energy efficiency of liquid chillers for **process applications** over an entire year. The new indicator provides a more realistic overview of the cooling system's energy efficiency and its actual impact on the environment (Ecodesign regulation 2015/1095).

SOUND SPECTRUM

30RBM/30RBP - Standard unit

		Octave bands, Hz(1)						Sound power(2)	
		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^{-12} W, as a guideline. Measured in accordance with ISO 9614-1.
(2) in dB ref=10^{-12} W, weighting (A), with uncertainty +/-3 dB. Measured in accordance with ISO 9614-1 and certified by Eurovent.

30RBM/30RBP - Standard unit + option 15LS(3)

		Octave bands, Hz(1)						Sound power(2)	
		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^{-12} W, as a guideline. Measured in accordance with ISO 9614-1.
(2) in dB ref=10^{-12} 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(3)

		Octave bands, Hz(1)						Sound power(2)	
		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^{-12} W, as a guideline. Measured in accordance with ISO 9614-1.
(2) in dB ref=10^{-12} 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)(1)	Maximum flow rate (l/s)(2)
160	2.9	17.5
180	3.2	17.5
200	3.6	17.5
220	3.8	17.5
260	4.6	21.8
300	5.2	29.8
330	5.9	35.2
360	6.3	33.8
400	7.1	38.9
430	7.6	40.4
470	8.2	41.6
520	9.4	43.4

(1) Minimum flow rate for the maximum permitted water temperature difference conditions (10 K) at the minimum water outlet temperature value (5°C)
(2) 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)(1)		Maximum flow rate (l/s)	
	Single	Dual	Single	Dual
160	2.8	3.2	12.2	10.3
180	2.8	3.2	12.2	10.3
200	2.8	2.5	12.2	12.2
220	2.8	2.5	12.2	12.2
260	4	2.7	14.3	15
300	3.1	3.7	20.2	20.2
330	3.4	3.7	20.2	20.2
360	3.7	3.8	20.2	20.2
400	9.5	4.1	25	22.9
430	9.5	8	25	25
470	9.5	8	25	25
520	5.4	5.4	26.6	26.5

(1) Minimum water flow rate, factory-set according to pump type

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

	Minimum flow rate (l/s)(1)		Maximum flow rate (l/s)	
	Single	Dual	Single	Dual
160	2.5	2.6	11.7	11.7
180	2.5	2.6	11.7	11.7
200	2.5	2.6	11.7	11.7
220	2.5	2.6	11.7	11.7
260	5.2	2.9	16.1	15.5
300	6.4	3.5	16.1	15.5
330	3.6	3.4	26.5	26.5
360	3.7	3.7	26.5	26.5
400	4.1	4.1	26.5	26.5
430	4.4	4.4	26.7	29.2
470	4.8	4.8	26.7	29.2
520	5.4	5.4	26.7	35

(1) Minimum water flow rate, factory-set according to pump type

Unit operating limits

30RBM 160-520 units

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

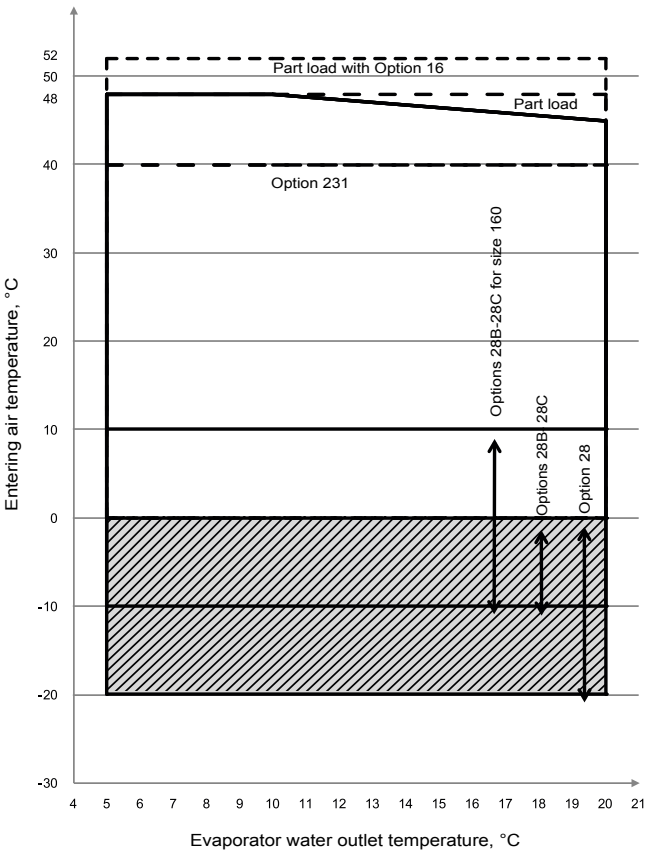
30RBP 160-520 units

Water-cooled heat exchanger		Minimum	Maximum
Entering water temperature at start-up	°C	8(1)	40
Leaving water temperature during operation option 5B	°C	0(2)	20(3)
Leaving water temperature during operation option 6B	°C	-15(6)	20(3)
Condenser		**Minimum**	**Maximum**
Outdoor ambient operating temperature			
Standard unit	°C	-20	48
Available static pressure			
Standard unit (outdoor installation)	Pa	0	0

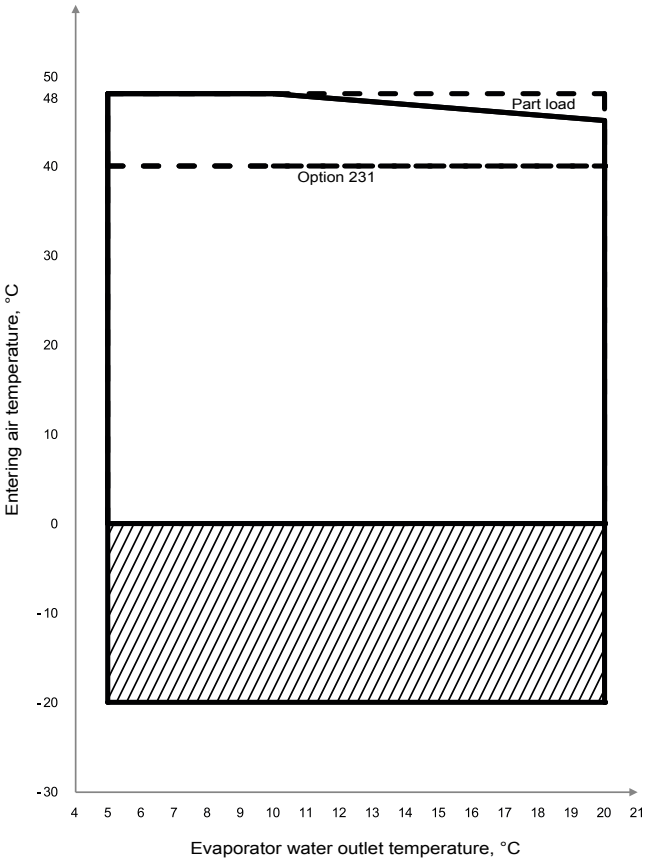
(1) For applications requiring operation at less than 8°C, contact Carrier to select a unit using the Carrier electronic catalogue.
(2) Use of antifreeze is obligatory if the water outlet temperature is below 5°C.
(3) For applications requiring operation at a water outlet temperature exceeding 20°C, contact Carrier to select a unit using the Carrier electronic catalogue.
(4) "For applications requiring operation from 0°C to -10°C, the unit must be equipped with options 28B-28C "Winter operation"". For operation from 0°C to -20°C, the unit must be equipped with option 28 "Winter operation".
For both options, the unit must either be equipped with the evaporator frost protection option (for units without hydraulic module option), or the evaporator and hydraulic module frost protection option (for units with hydraulic module option), or the water loop must be protected against frost by the installer, using an antifreeze solution.
(5) 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.
(6) If using ethylene glycol and for RBM 160-400 or RBP 160-400.

OPERATING LIMITS

Operating range - 30RBM 160-520



Operating range - 30RBP 160-520



Notes:

Evaporator ΔT = 5 K

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

Key:

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
an outside temperature of -10°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°C outside temperature.

In addition to the options 28, 28B or 28C for 30RBM units, or for operation at an air temperature below 0°C for 30RBP, the unit must either be equipped with the evaporator frost protection option (for units without hydraulic module option), or the evaporator and hydraulic module frost protection option (for units with hydraulic module option), or the water loop must be protected by the installer by adding an antifreeze solution.

AVAILABLE STATIC SYSTEM PRESSURE

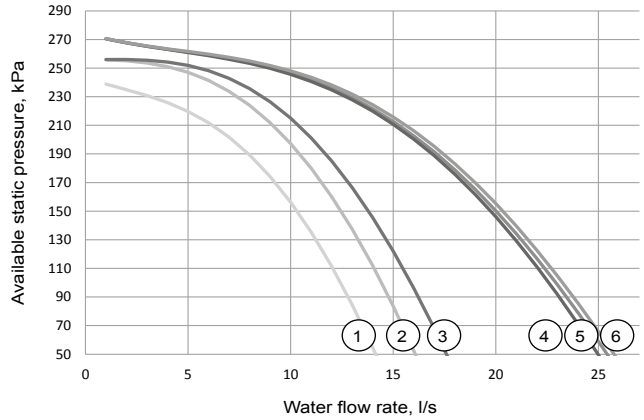
Data applicable for:

- Pure water at 20°C.
- Refer to the chapter ‘‘Evaporator flow rate’’ for the maximum water flow values.
- If glycol is used, the maximum water flow is reduced.

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

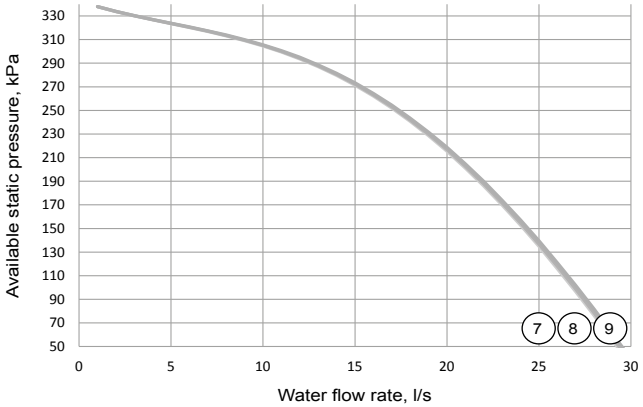
Single pumps

Sizes 160-400



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

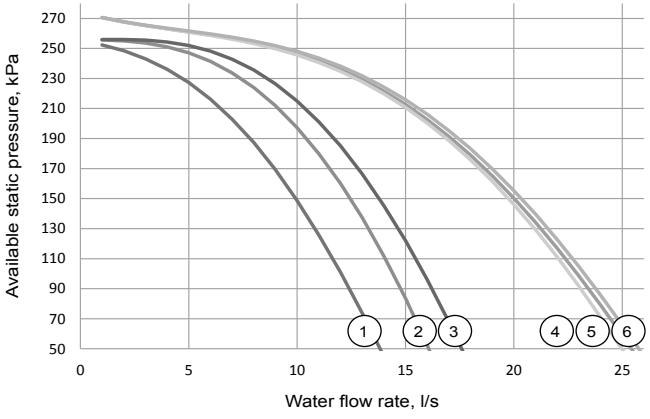
Sizes 430-520



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

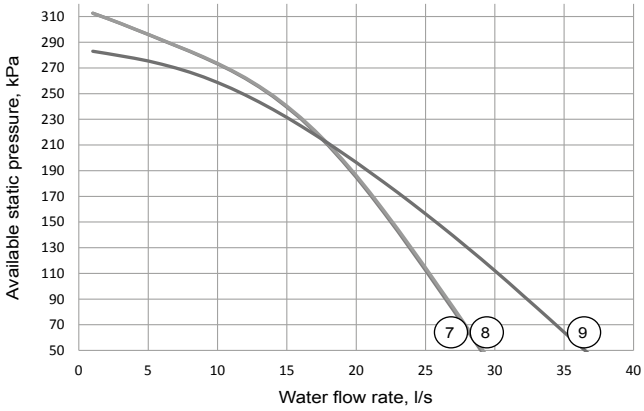
Dual pumps

Sizes 160-400



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

Sizes 430-520



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

AVAILABLE STATIC SYSTEM PRESSURE

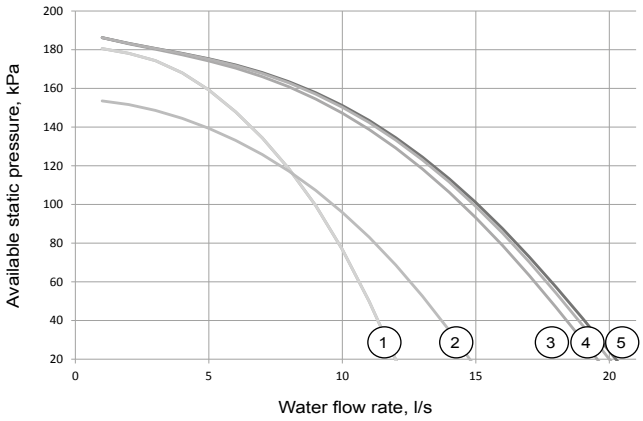
Data applicable for:

- Pure water at 20°C.
- Refer to the chapter ‘‘Evaporator flow rate’’ for the maximum water flow values.
- If glycol is used, the maximum water flow is reduced.

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

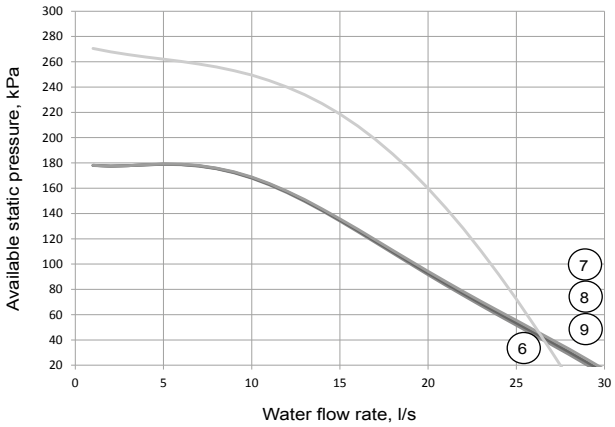
Single pumps

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

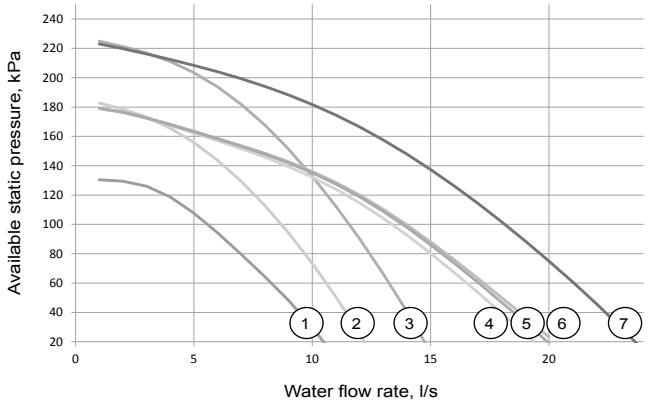
Sizes 400-520



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

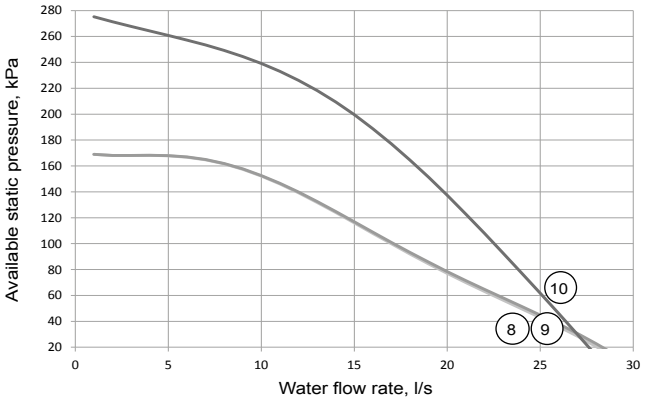
Dual pumps

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

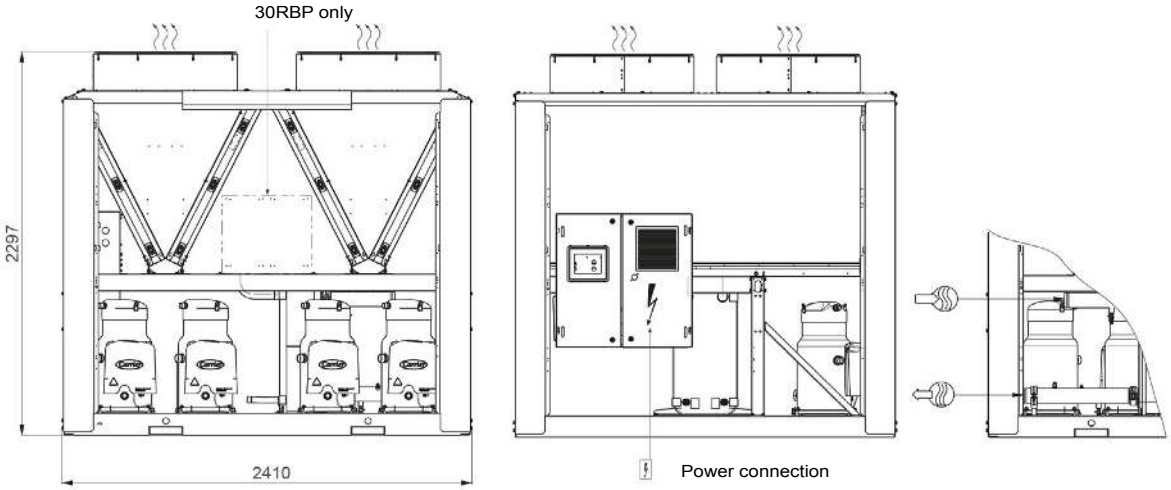


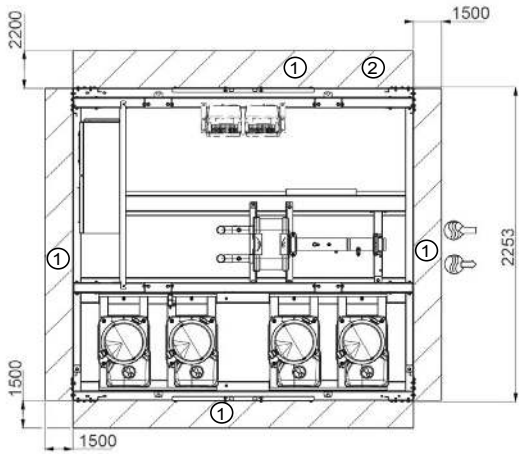
8. 30RBM-30RBP 520
9. 30RBM-30RBP 430
10. 30RBM-30RBP 470

DIMENSIONS/CLEARANCES

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

Without hydraulic module





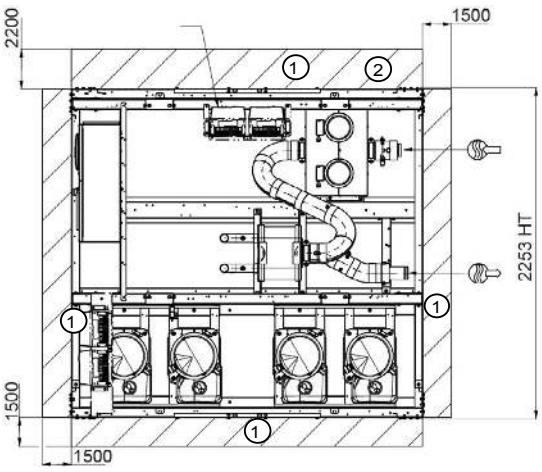
Key:
All dimensions are in mm.

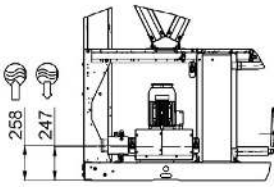
- (1) Clearances required for maintenance and air flow
- (2) Clearance recommended for coil removal
- Water inlet
- Water outlet
- Air outlet, do not obstruct
- Electrical cabinet

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

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

With hydraulic module

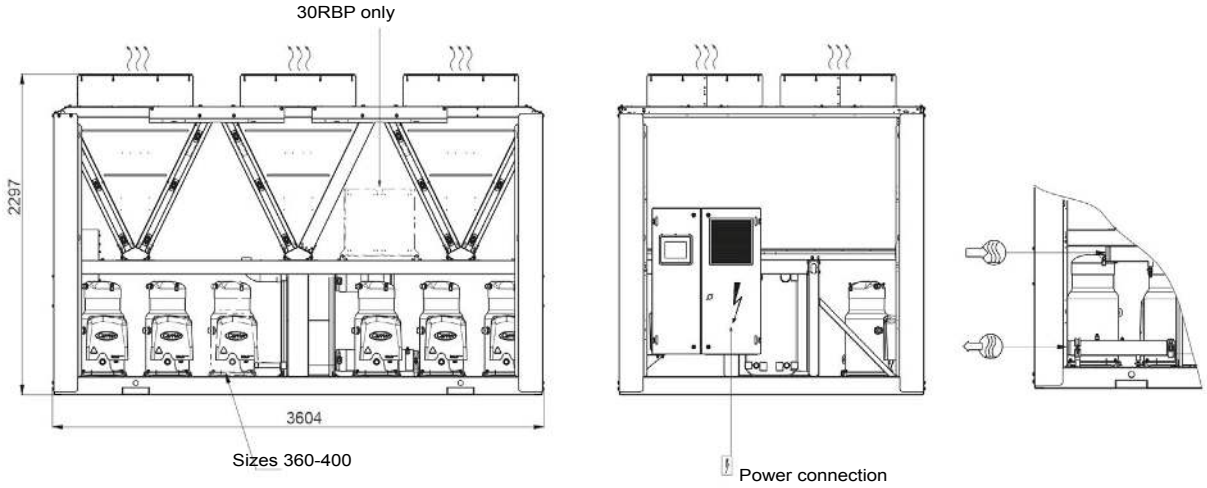


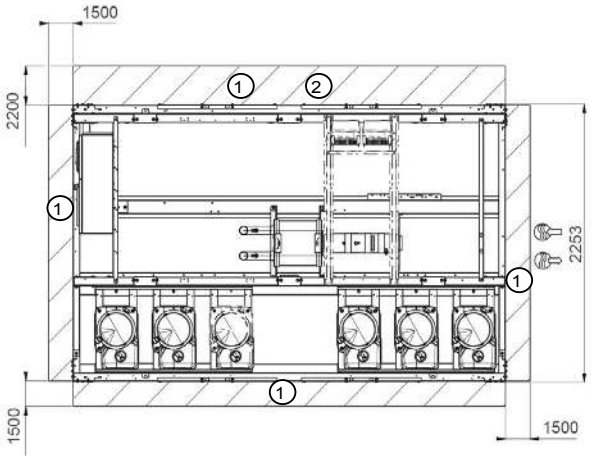


DIMENSIONS/CLEARANCES

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

Without hydraulic module





Key:
All dimensions are in mm.

1 Clearances required for maintenance and air flow

2 Clearance recommended for coil removal

Water inlet

Water outlet

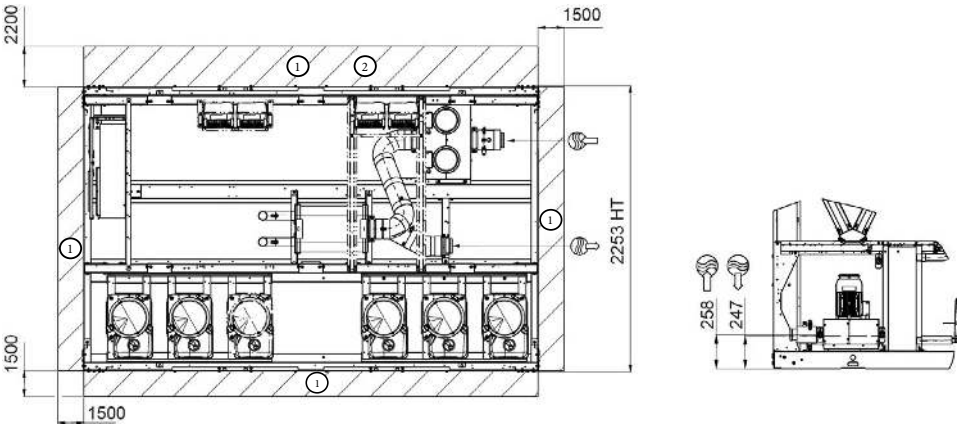
Air outlet, do not obstruct

Electrical cabinet

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

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

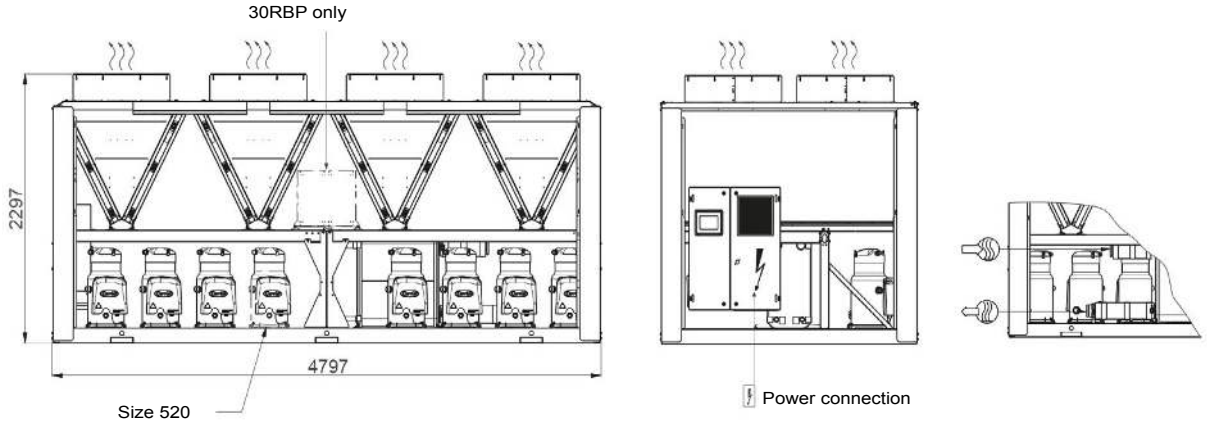
With hydraulic module

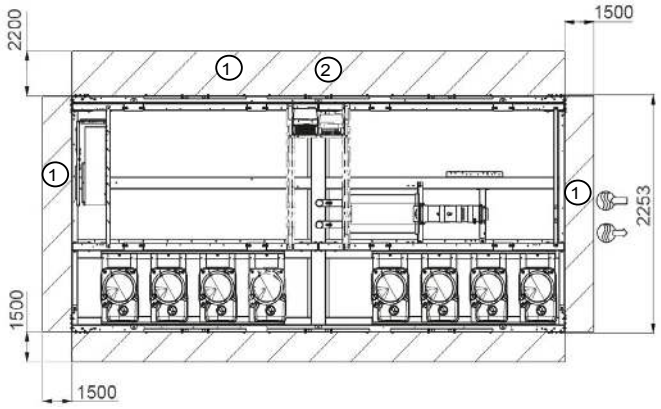


DIMENSIONS/CLEARANCES

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

Without hydraulic module





Key:
All dimensions are in mm.

1 Clearances required for maintenance and air flow

2 Clearance recommended for coil removal

Water inlet

Water outlet

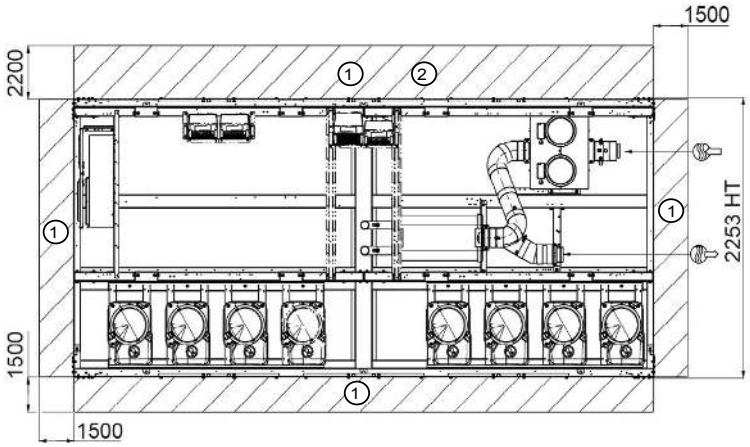
Air outlet, do not obstruct

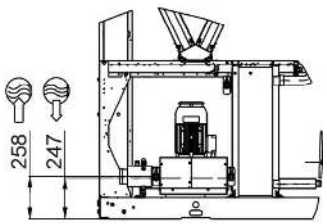
Electrical cabinet

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

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

With hydraulic module





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System description

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

Note: the hydraulic pump module is available with one/two fixed-speed or Greenspeed® variable-speed driven pump(s).

Quality assurance

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

Unit construction shall comply with European directives:

- Commission regulation (EU) 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 1st January 2015, commission regulation (EU) No. 547/2012 implementing Directive 2009/125/EC with regards to Ecodesign requirements for water pumps (unit equipped with hydraulic 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 from European standards.
- Machine safety: Electrical equipment in machines, general requirements, EN 60204-1.
- Electromagnetic emission and immunity EN 61800-3 'C3'.

The unit shall be manufactured in a facility certified as compliant with the ISO 9001 manufacturing quality standard and the ISO 14001 environmental management system standard. Unit shall be tested at the factory.

Design performance data

- Cooling capacity (kW): ……
- Unit power input (kW): ……
- Seasonal energy efficiency, $SEER_{12/7°C}$ in accordance with the applicable Ecodesign regulation (EU) No. 2016/2281: .....
- Evaporator water inlet/outlet 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(1) (dB(A)): ……
- Refrigerant type: ……. (ODP … / GWP ….)
- Refrigerant charge: …….. kg, tCO_2e....(…. kg/kW)
- Dimensions, length x depth x height (mm): …… x …… x ……
- Unit operating weight: ….. kg

(1) The night sound power level is given for a demand of 50% of the unit capacity and an 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 the compressor assembly from the unit casing.
- Suction and discharge piping designed to prevent the transmission of vibrations to the unit casing.
- Optional acoustic compressor enclosure, easily removable with 1/4 turn fasteners

Evaporator

- Asymmetric brazed plate heat exchanger, direct expansion
- The design shall incorporate a minimum of two independent direct expansion refrigerant circuits.
- The plate heat 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 code 2014/68/EU.
- The pressure drop at the evaporator terminals 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 sensor.

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Condenser

- Coil shall be 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 Ecodesign 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.

Controls features

- Automatic management of master/slave circuits (lead/lag).
- Control of the refrigerant parameters (suction superheating, condensing pressure control).
- Capacity control based on chilled water inlet (or outlet) temperature and compensated by the return temperature rate of exchange.
- Temperature setpoint shift according to the outside air temperature, or differential water inlet/outlet temperature or via a 0-10 V signal.
- Provision of a dual setpoint for the chilled water outlet temperature activated by a remote dry contact type signal or by the built-in timer program.
- Chilled water temperature pull-down rate at start-up in a range which can be adjusted 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 runtimes for the compressors and pumps.
- Demand limit control (configurable from 0% to 100%) activated by remote contact closure.
- Remote system interlock (customer servo).
- Operating status 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 system.
- Water pump on/off control.
- *Water flow and external static pressure electronic calculation.*
- *Electronic setting of the water pump speed and the water flow rate* (unit equipped with a hydraulic module, variable-speed pump).
- On/off control for external water pump (up to 2).
- Control for one external variable-speed pump via a 0-10 V signal.
- Low-temperature protection to activate the chiller and water circuit heating system (optional).
- The pump starts up periodically to ensure that the pump seals are properly maintained during periods of inactivity.

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 characteristics

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 inlet temperature in 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 setpoint offset 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.

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Options

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

Hydraulic module

- The hydraulic module shall be integrated in the chiller casing without increasing its dimensions, and shall include the following elements: easily removable filter, water pump with three-phase motor, accurate and reliable water flow control (a paddle-type flow switch shall not be accepted), relief valve calibrated to 4 bar. The water flow rate and external static pressure electronic readings shall be available via a user interface. Additional pressure/temperature taps (2) shall be factory installed to measure the pressure differential across the hydraulic 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 Ecodesign 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 the pump inlet.
- The pump casing shall be of cast iron with cataphoretic 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 hydraulic module.
  - High-pressure dual pump hydraulic module.
  - Low-pressure single pump hydraulic module.
  - Low-pressure dual pump hydraulic module.
  - High-pressure variable-speed single pump hydraulic module.
  - High-pressure variable-speed dual pump hydraulic module.
- The dual pump hydraulic 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 and vent plugs.
- The piping and the water pump shall be fully insulated to prevent condensation (pump insulation using polyurethane foam and painted steel casing).
- Frost protection down to -20°C shall be guaranteed by optional electric trace-heating (24 volt) and the water pump shall be automatically started by the controller safety logic in case of a risk of frost formation.
- The customer connections shall be Victaulic connections.

Additional specifications for variable-speed pump hydronic module

- The hydraulic module with variable-speed single pump shall be equipped with one VFD (variable frequency drive) to save energy.
- The hydraulic 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 protects the evaporator and water circuits from freezing at outside air temperatures of 0 °C to - 20 °C.

Evaporator & hydraulic module frost protection

Trace heating protects the evaporator, water circuits and the hydraulic module from freezing at outside air temperatures of 0 °C to -20 °C.

Expansion tank

A buffer tank shall be supplied with a hydraulic module to protect the water circuits from excessive pressure.

Welded evaporator connection sleeve

Victaulic connection adapter for easy connection to the water mains.

Low noise level

Stylish sound absorbing compressor enclosure to reduce the 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.

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Very low noise level

Stylish sound absorbing compressor enclosure combined with low-speed fans to reduce the 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 condenser during maintenance).

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 maintenance).

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

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

High static pressure 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 its 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® shall utilise corrosion inhibitors which actively arrest damage due to environmental or mechanical causes. 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 louvres.
- 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 processes shall not be accepted.
- The coating process shall ensure complete coil encapsulation, including all exposed fin edges. Super Enviro-Shield® coating shall have a uniform thickness of 20 to 40 µm with top coat having a dry film thickness from 25 to 50 µm on all external coil surface areas including fin edges.
- The coating shall have minimal variation in heat transfer or air flow (<1%) 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)

Additional capacitors are integrated to ensure a power factor (Cos phi) of 0.95 at full load.

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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 a communication bus shall work in tandem to maintain the water temperature of the system.
- The master unit shall be the only interface to control the operation of both cooling units.
- Up to 5 possible water circuit configurations (parallel, common or dedicated pumps, series, etc.).
- Three balancing modes: disabled, only on failure, runtime balancing.
- 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 maintenance).

Communication board with additional inputs/outputs

- Input contacts:
  - Setpoint offset by an ambient 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 contact).
  - Demand limitation by 0-10 V signal
- Output contacts:
  - Instantaneous chiller capacity by 0-10 V signal.
  - Alert indicator on the chiller.
  - Complete shutdown due to a chiller fault.
  - Boiler on/off command during the 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 socket

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), and 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).

5-inch Touch Pilot user interface

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

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

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

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



Quality and Environment
Management Systems
Approval

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