

## AIR-COOLED SCROLL CHILLERS WITH GREENSPEED® INTELLIGENCE



- 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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Check ongoing validity of certificate:  
[www.eurovent-certification.com](http://www.eurovent-certification.com)

## 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<sub>2</sub> emissions. They use the best technologies available today:

- Reduced refrigerant charge of ozone-friendly refrigerant R-410A
- Scroll compressors
- Greenspeed® variable-speed fans (30RBP models)
- Novation® micro-channel heat exchangers with 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<sub>12/7°C</sub> 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 4<sup>th</sup> generation Flying Bird fans, made of a composite material (Carrier patent)
  - Rigid fan installation for reduced noise (Carrier patent).
- Condenser with Greenspeed® variable-speed fans (30RBP models recommended by Carrier for even quieter operation):
  - Optional factory setting of the fan to low speed, with compressor enclosure to reduce full-load noise level by 6 to 7 dB(A)
  - Exceptional acoustic signature during part-load operation through smooth fan speed variation.
- Specific control functions or features to reduce noise level during the night or unoccupied periods:
  - Night-time sound control with cooling capacity and fan speed limitation
  - Low-noise scroll compressors with low vibration level
  - The compressor assembly is installed on an independent chassis and supported by flexible anti-vibration mounts
  - Dynamic suction and discharge piping support, minimising vibration transmission (Carrier patent)
  - Acoustic compressor enclosure, reducing noise emissions (optional).



### Quick and easy installation

- Compact design:
  - AquaSnap units are designed with compact dimensions for easy installation.
  - With a length of approximately 4.8 m for 520 kW and a width of 2.25 m, the units require 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

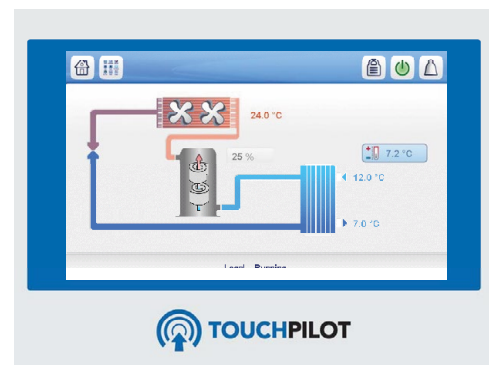
- State-of-the-art concept
  - Two independent refrigerant circuits; the second one automatically takes over, if the first one develops a fault, maintaining partial cooling under all circumstances
  - All compressor components are easily accessible on site minimising down-time
  - All-aluminum Novation<sup>®</sup> 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

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### 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.

# PHYSICAL DATA, SIZES 160 TO 520

30RBP			160	180	200	220	260	300	330	360	400	430	470	520	
<b>Cooling</b>															
<b>Standard unit</b> 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
<b>Standard unit</b> Seasonal energy efficiency**	<b>SEER<sub>12/7°C</sub> Comfort low temp.</b>		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
	<b>ηs cool<sub>12/7°C</sub></b>		%	170	169	164	167	165	178	173	178	172	175	178	173
	<b>SEPR<sub>12/7°C</sub> Process high temp.</b>		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
<b>Unit + option 6</b> Seasonal energy efficiency**	<b>SEPR<sub>-2/-8°C</sub> Process medium temp.***</b>		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	
<b>Sound levels</b>															
<b>Standard unit</b>															
Sound power <sup>(3)</sup>		dB(A)	91	92	92	92	92	93	93	93	93	94	94	94	
Sound pressure level at 10 m <sup>(4)</sup>		dB(A)	59	60	60	60	60	60	60	61	61	62	62	62	
<b>Standard unit + option 15<sup>(1)</sup></b>															
Sound power <sup>(3)</sup>		dB(A)	89	90	90	90	90	91	91	92	92	93	93	93	
Sound pressure at 10 m <sup>(4)</sup>		dB(A)	57	58	58	58	58	59	59	60	60	61	61	61	
<b>Standard unit + option 15LS<sup>(1)</sup></b>															
Sound power <sup>(3)</sup>		dB(A)	85	85	85	86	86	86	86	87	87	88	88	88	
Sound pressure at 10 m <sup>(4)</sup>		dB(A)	53	53	53	54	54	54	54	55	55	55	55	56	
<b>Dimensions - standard unit</b>															
Length		mm	2410			3604			4797						
Width		mm	2253			2253			2253						
Height		mm	2297			2297			2297						
<b>Operating weight<sup>(2)</sup></b>															
Standard unit		kg	1252	1293	1293	1423	1445	1901	1937	2105	2162	2603	2621	2827	
Standard unit + option 15 <sup>(1)</sup>		kg	1334	1376	1376	1531	1553	2027	2063	2249	2306	2765	2783	3007	
Standard unit + option 15 + option 116S <sup>(1)</sup>		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<sup>2</sup>. 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<sup>2</sup>. k/W  
**ηs cool<sub>12/7°C</sub> & SEER<sub>12/7°C</sub>** **Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Comfort application**  
**SEPR<sub>12/7°C</sub>** **Bold values compliant to Ecodesign regulation: (EU) No 2016/2281 for Process application**  
**SEPR<sub>-2/-8°C</sub>** **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<sup>-12</sup> W, (A) weighting. Declared dual-number noise emission values in accordance with ISO 4871 (with an associated uncertainty of +/-3 dB(A)). Measured in accordance with ISO 9614-1 and certified by Eurovent  
 (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).



Valeurs certifiées Eurovent

## PHYSICAL DATA, SIZES 160 TO 520

30RBP	160	180	200	220	260	300	330	360	400	430	470	520	
<b>Compressors</b>	Hermetic scroll 48,3 tr/s												
Circuit A	1	1	1	2	2	2	2	3	3	3	3	4	
Circuit B	2	2	2	2	2	3	3	3	3	4	4	4	
No. of control stages	3	3	3	4	4	5	5	6	6	7	7	8	
<b>Refrigerant<sup>(2)</sup> - Standard unit</b>	R410A												
Circuit A	kg	8,40	10,90	10,90	12,60	13,10	14,70	15,40	20,30	21,10	23,50	23,50	26,75
	tCO <sub>2</sub> e	17,5	22,8	22,8	26,3	27,4	30,7	32,2	42,4	44,1	49,1	49,1	55,9
Circuit B	kg	12,25	12,60	12,60	12,70	13,10	20,20	20,20	20,40	22,20	26,70	26,80	26,95
	tCO <sub>2</sub> e	25,6	26,3	26,3	26,5	27,4	42,2	42,2	42,6	46,4	55,7	56,0	56,3
<b>Capacity control</b>	Pro-Dialog+ Control												
Minimum capacity	%	33	33	33	25	25	20	20	17	17	14	14	13
<b>Condensers</b>	Aluminium micro-channel coils (MCHE)												
<b>Fans - Standard unit</b>	FLYING BIRD 4 axial fans with rotating impeller												
Quantity		3	4	4	4	4	5	5	6	6	7	7	8
Maximum total air flow	l/s	13542	18056	18056	18056	18056	22569	22569	27083	27083	31597	31597	36111
Maximum rotation speed	rps	16	16	16	16	16	16	16	16	16	16	16	16
<b>Evaporator</b>	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
<b>Hydraulic module (option)</b>	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
<b>Water connections with/without hydraulic module</b>	Victaulic type												
Diameter	inch	3	3	3	3	3	4	4	4	4	4	4	4
External diameter	mm	88,9	88,9	88,9	88,9	88,9	114,3	114,3	114,3	114,3	114,3	114,3	114,3
<b>Casing paintwork</b>	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
<b>Power circuit</b>													
Nominal voltage	V-ph-Hz	400 - 3 - 50											
Voltage range	V	360 - 440											
<b>Control circuit supply</b>													
24 V via internal transformer													
<b>Nominal unit current draw<sup>(1)</sup></b>													
Circuit A&B	A	100	110	124	133	161	180	201	221	242	261	282	322
<b>Max. operating input power<sup>(2)</sup></b>													
Circuit A&B	kW	80	88	99	107	129	145	161	177	194	210	226	258
<b>Cosine Phi unit at maximum power<sup>(2)</sup></b>													
0,88 0,87 0,87 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88													
<b>Maximum unit current draw (Un-10%)<sup>(3)</sup></b>													
Circuit A&B	A	144	158	176	192	230	259	288	317	345	374	403	460
<b>Maximum unit current draw (Un)<sup>(4)</sup></b>													
Circuit A&B - Standard Unit	A	133	146	163	177	212	239	266	292	319	345	372	425
Circuit A&B - Unit with option 231	A	100	110	125	133	163	181	204	222	244	262	285	326
<b>Maximum start-up current, standard unit (Un)†</b>													
Circuit A&B	A	307	356	374	352	423	450	476	503	529	556	583	636
<b>Max. start-up current, unit with soft starter (Un)†</b>													
Circuit A&B	A	261	283	300	305	349	376	403	429	456	482	509	562

- (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
<b>Power circuit</b>													
Nominal voltage	V-ph-Hz	400 - 3 - 50											
Voltage range	V	360 - 440											
<b>Control circuit supply</b>													
24 V via internal transformer													
<b>Nominal unit current draw<sup>(1)</sup></b>													
Circuit A&B	A	97	107	121	130	158	176	197	216	237	255	276	316
<b>Cosine Phi unit at maximum power<sup>(2)</sup></b>													
Circuit A&B	kW	81	88	99	108	129	145	162	178	194	210	226	259
<b>Cosine Phi unit at maximum power<sup>(2)</sup></b>													
0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88 0,88													
<b>Maximum unit current draw (Un-10%)<sup>(3)</sup></b>													
Circuit A&B	A	142	154	173	189	227	255	284	312	340	369	397	454
<b>Maximum unit current draw (Un)<sup>(4)</sup></b>													
Circuit A&B - Standard Unit	A	131	142	160	174	209	235	262	287	314	340	366	419
Circuit A&B - Unit with option 231	A	98	108	123	131	161	178	201	219	241	259	281	321
<b>Maximum start-up current, standard unit (Un)†</b>													
Circuit A&B	A	305	353	371	349	420	446	472	498	525	550	577	629
<b>Max. start-up current, unit with soft starter (Un)†</b>													
Circuit A&B	A	259	279	297	302	346	372	399	424	451	477	503	556

- (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.

## PART-LOAD PERFORMANCE

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

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

The **IPLV** (integrated part load value) 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<sub>R</sub>**) 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 <sub>R1</sub>	1
75	26.7	COP <sub>R2</sub>	42
50	18.3	COP <sub>R</sub>	45
25	12.8	COP <sub>R4</sub>	12

$$IPLV = COP_{R1} \times 1\% + COP_{R2} \times 42\% + COP_{R3} \times 45\% + COP_{R4} \times 12\%$$

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

The **(Seasonal Energy Efficiency Ratio) (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 **(Seasonal Energy Performance Ratio) (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 <sup>(1)</sup>						Sound power <sup>(2)</sup>	
		125	250	500	1k	2k	4k		
<b>160</b>	dB	92	89	90	86	81	77	dB(A)	91
<b>180</b>	dB	93	90	91	87	81	78	dB(A)	92
<b>200</b>	dB	93	90	91	87	81	78	dB(A)	92
<b>220</b>	dB	93	91	91	87	82	78	dB(A)	92
<b>260</b>	dB	93	91	91	87	82	78	dB(A)	92
<b>300</b>	dB	93	91	92	88	82	79	dB(A)	93
<b>330</b>	dB	93	91	92	88	82	79	dB(A)	93
<b>360</b>	dB	94	92	92	89	83	79	dB(A)	93
<b>400</b>	dB	94	92	92	89	83	79	dB(A)	93
<b>430</b>	dB	95	92	93	89	84	80	dB(A)	94
<b>470</b>	dB	95	92	93	89	84	80	dB(A)	94
<b>520</b>	dB	95	92	93	89	84	80	dB(A)	94

(1) in dB ref=10<sup>-12</sup> W, as a guideline. Measured in accordance with ISO 9614-1.

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

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

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

(1) in dB ref=10<sup>-12</sup> W, as a guideline. Measured in accordance with ISO 9614-1.

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

(3) Options: 15 = low noise level, 15LS = very low noise level.

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

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

(1) in dB ref=10<sup>-12</sup> W, as a guideline. Measured in accordance with ISO 9614-1.

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

(3) Options: 15 = low noise level, 15LS = very low noise level.

# OPERATING LIMITS

## Evaporator water flow rate

### 30RBM/30RBP 160-520 without hydronic module

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

### 30RBP 160-520 units

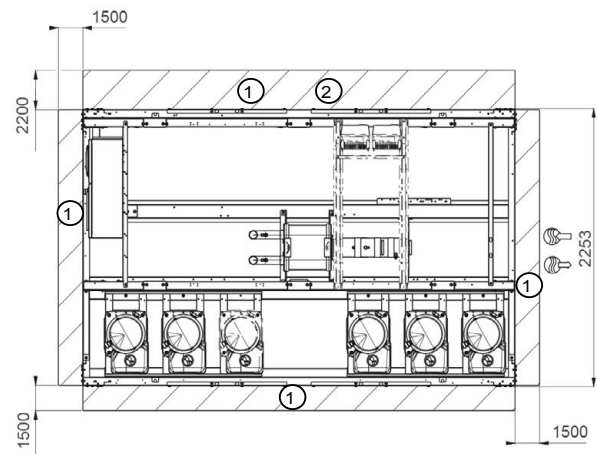
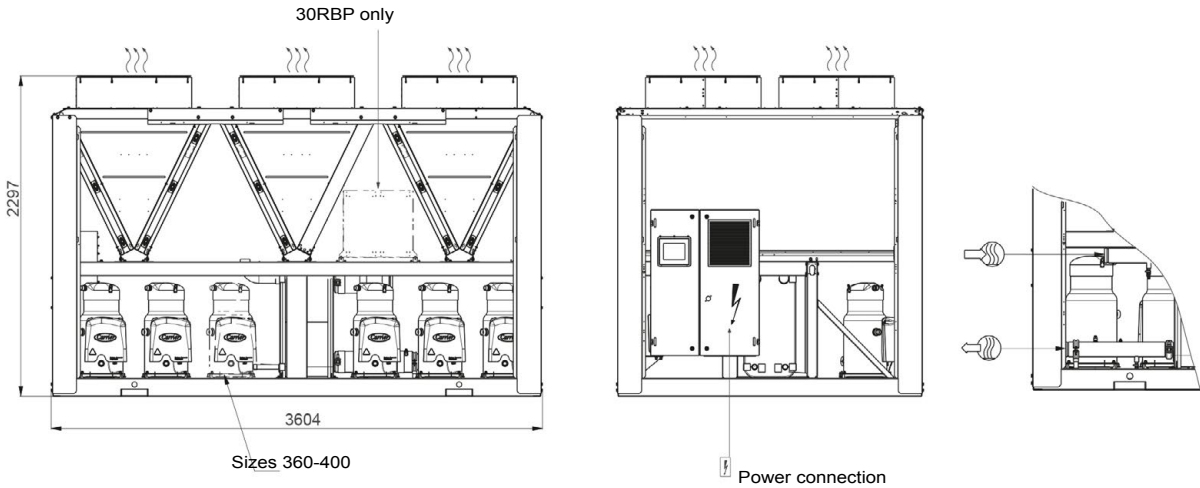
Water-cooled heat exchanger	Minimum	Maximum
Entering water temperature at start-up °C	8 <sup>(1)</sup>	40
Leaving water temperature during operation option 5B °C	0 <sup>(2)</sup>	20 <sup>(3)</sup>
Leaving water temperature during operation option 6B °C	-15 <sup>(6)</sup>	20 <sup>(3)</sup>
Condenser	Minimum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

- (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.

# DIMENSIONS/CLEARANCES

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

### Without hydraulic module

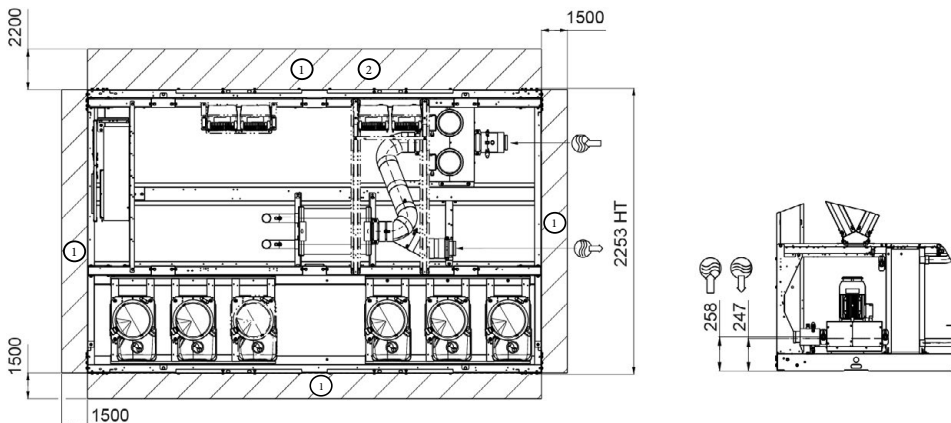


- Key:**  
**All dimensions are in mm.**
- ① Clearances required for maintenance and air flow
  - ② Clearance recommended for coil removal
  - Water inlet
  - Water outlet
  - Air outlet, do not obstruct
  - Electrical cabinet

**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



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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<sub>12/7°C</sub> 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<sup>(1)</sup> (dB(A)): .....
- Refrigerant type: ..... (ODP ... / GWP .....)
- Refrigerant charge: ..... kg, tCO<sub>2</sub>e....(..... kg/kW)
- Dimensions, length x depth x height (mm): ..... x ..... x .....
- Unit operating weight: ..... kg

(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

## SPECIFICATION GUIDE - 30RBP

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- 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 cathaphoretic 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.