PRODUCT SELECTION DATA

VARIABLE-SPEED SCREW LIQUID CHILLER WITH GREENSPEED™ INTELLIGENCE

Outstanding performance

Low sound levels

Intelligence and connectivity

Environmentally responsible

Wide range of applications

Simple installation and maintenance

30KAV 500-1100

Nominal cooling capacity 493-1079 kW

The AquaForce™ Vision 30KAV liquid chillers with Greenspeed™ Intelligence are the premium solution for commercial and industrial applications where installers, consultants and building owners require superior reliability and optimal performances, especially at part load.

The 30KAV units are designed to exceed European Ecodesign directive requirements in terms of energy efficiency, versatility and operating sound levels. This result is achieved through the optimised combination of proven best-in-class technologies that include:

- 2nd generation of high-efficiency variable-speed twin screw compressors with built in volume index control (Vi) valve for optimal full and part load performance and Integrated Resonator Array (IRA) for low sound operation
- 6th generation of Carrier Flying Bird™ fans with AC or EC motor depending on options.
- Carrier flooded shell-and-tube evaporator with new copper tubes for low pressure drops
- 3rd generation of "W" profile Carrier Novation™ microchannel heat exchangers with optional Enviro-Shield coatings.
- Carrier Touch Pilot® control with color touch screen user interface that includes 10 langages and new smart energy monitoring function.

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CUSTOMER BENEFITS

AquaForce™ Vision 30KAV liquid chillers with Greenspeed™ Intelligence adapt effortlessly to a wide range of applications. An extended operating range covering ambient temperatures from-20 to 55°C makes it ideal for all areas of activity. From high-end office buildings and hotels to healthcare facilities, data centers and industrial projects, 30KAV meets the most demanding expectations in terms of energy efficiency and savings, whatever the climate and wherever the location.

Furthermore, the advanced Touch Pilot™ intelligent control system displays operating parameters in real time, making it intuitive and particularly user-friendly. 30KAV also features innovative smart energy monitoring, providing users with smart data such as real time electric energy consumption, cooling capacity, and instantaneous and average seasonal energy efficiency ratios. For further energy savings, 30KAV can be monitored remotely by Carrier experts for energy consumption diagnosis and optimization.

The range is available in 4 efficiency levels.

- 30KAV standard unit

  The AquaForce™ 30KAV is equipped with variable-speed screw compressor and variable-speed fans with AC motors. The 30KAV is optimised to meet the most demanding technical and economic requirements while offering high seasonal energy efficiency levels.
  (Average SEER of 5.17, average EER of 3.0)

- 30KAV with EC fans (option 17)

  The 30KAV with EC fans option enhances the seasonal energy efficiency and offers state of the art EC fan technology as standard.
  (Average SEER of 5.23, average EER of 3.0)

- 30KAV with High Energy Efficiency (option 119)

  The 30KAV with High Energy Efficiency option is equipped with variable-speed fans with AC motor and additional heat exchange surface to deliver optimum performance at both full load and part load.
  (Average SEER of 5.35, average EER of 3.4)

- 30KAV with High Energy Efficiency+ (option 119+)

  The 30KAV with High Energy Efficiency+ option is equipped with EC fans and additional heat exchange surface to provide the highest possible seasonal energy efficiency.
  (Average SEER of 5.45, average EER of 3.4)

Outstanding energy performance

- The 30KAV with “High energy efficiency+” is designed for very high performance both at full and part load: average SEER 5.45, average EER 3.4 as per EN14825 & EN14511.
- The high energy efficiency is achieved through:
  - 2nd generation of Carrier high-efficiency variable-speed twin-screw compressors with built in volume index control (Vi) valve for both optimal full and part load performance
  - Variable-speed Flying Bird™ fans with EC motor minimising power consumption while delivering optimum air flow
  - Novation™ aluminum condenser with high-efficiency micro-channel coils technology
  - New Carrier flooded shell-and-tube evaporator with new copper tubes for low pressure drops
  - Electronic expansion device permitting operation at a lower condensing pressure and improved utilisation of the evaporator heat exchange surface (superheat control)
  - Economiser system with electronic expansion device for increased cooling capacity.
- Optimised electrical performance:
  - Negligible start-up current (value is lower than the maximum unit current draw)
  - High displacement power factor (above 0.98)
  - EMC compliance with Class 3 requirements of the EU standard EN61800-3 (Class 2 is possible as an option).
- Hydraulic module with variable-speed dual pump
  - Variable-speed, dual pumps which automatically adjust the water flow to match the needs of the building or process load variations.
  - 3 pump control modes available: constant water flow with possibility to reduce the pump speed when there is no cooling demand, variable water flow with constant delta T or constant delta P control.
- Smart energy monitoring
  - Innovative smart energy monitoring providing users with smart data such as real time electric energy consumption, cooling cooling capacity, and instantaneous and average seasonal energy efficiency ratios.
  - For further energy savings, 30KAV can be monitored remotely by Carrier experts for energy consumption diagnosis and optimization.

Built-in reliability and easy servicing

The 30KAV units offer enhanced performance as well as Carrier’s acclaimed product quality and reliability. Major components were chosen, selected and tested to minimise the possibility of failure.

- 2nd generation of variable-speed twin-screw compressors:
  - The screw compressors are industrial-type with oversized bearings and motor cooled by suction gas, with a proven failure rate lower than 0.1%.
  - Air-cooled compressor variable-speed drive (VSD) to ensure reliable operation and easy maintenance. (Glycol-cooled variable-speed drive (VSD) types are subject to higher failure rates due to glycol pump issue. Refrigerant-cooled variable-speed drive (VSD) types are subject to higher compressor vibration levels causing possible failures in the long term).
  - Compressor bearing life exceeding 100 000 hours
  - All components related to the compressor assembly are easily accessible on site minimising down-time.
- Variable-speed fans:
  - 30KAV is fitted with variable-speed asynchronous fan-motors as standard. One variable-speed drive (VSD) is sized to manage a group of fans per refrigerant circuit reducing first cost while ensuring high part-load efficiency.
  - 30KAV with High Energy Efficiency+ option is fitted with variable-speed EC fan-motors. Each EC fan is controlled independently ensuring continuous chiller operation in case of motor or drive failure.

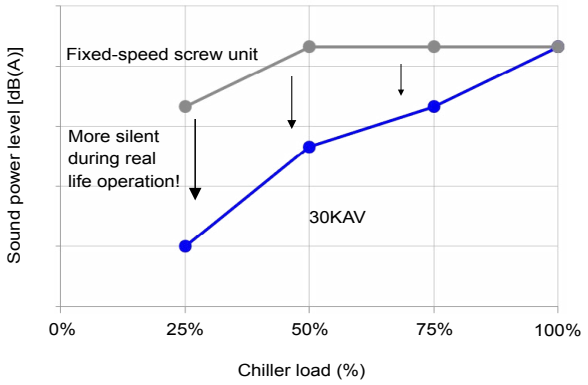
CUSTOMER BENEFITS

- Air-cooled condenser:
  - Novation™ aluminum micro-channel heat exchanger (MCHE) with high corrosion resistance. The all aluminum design eliminates the formation of galvanic currents between aluminum and copper that cause coil corrosion in saline or corrosive environments.
  - Enviro-shield™ coating for MCHE used in standard and mildly corrosive environments with superior durability confirmed through 5000 hours testing in constant neutral salt spray per ASTM B117 and superior heat transfer performances confirmed through 2000 hours testing per CM1 (Carrier proprietary testing).
  - Super Enviro-shield™ coating for MCHE used in highly corrosive environments (industry or marine applications) with superior durability confirmed through 5000 hours testing in constant neutral salt spray per ASTM B117 and superior heat transfer performances confirmed through 2000 hours testing per CM1 (Carrier proprietary testing).
- Evaporator:
  - Carrier designed flooded evaporator with mechanically cleanable water tubes
  - Electronic paddle-free flow switch to ensure prompt alarm in case of poor liquid flow rate
  - Thermal insulation with aluminum sheet finish (option) improved resistance to mechanical and UV damage.
- Refrigerant circuits:
  - Two independent refrigerant circuits to secure partial cooling, if one of the two develops a fault.
- Auto-adaptive control:
  - Control algorithm prevents excessive compressor cycling (Carrier patent)
  - Automatic compressor unloading in case of abnormally high condensing pressure. If condenser coil fouling or fan failure occurs, the Aquaforce continues to operate, but at reduced capacity.
- Exceptional endurance tests:
  - To design critical components and sub-assemblies to minimise the risk of failure on site, Carrier uses specialised laboratories and advanced dynamic simulation tools.
  - To ensure that the units reach customer sites in the same condition as they are when tested in the factory, Carrier tests the machine behavior while being moved along a 250 km trial. The test-route is based on a military standard and is the equivalent to 5000km by truck in a normal road.
  - To ensure coils corrosion resistance, salt mist corrosion resistance test are performed in UTC's laboratory.

In addition, to maintain unit performance throughout its operating life, whilst minimising maintenance costs, end users can access the “Carrier Connect” remote monitoring service.

Minimised operating sound levels

- The Greenspeed® Intelligence, featuring variable-speed screw compressors and condenser fans, minimises noise levels at part load operation. At ESEER conditions for example, noise at 25% load is up to 10 dB(A) lower than noise at full load.



- Standard unit features include:
  - The new generation of Carrier 06Z variable-speed twin screw compressor with integrated resonator array to reduce the noise level by 6 dB(A) compared with 06T twin screw compressor previous generation.
  - The 6th generation of silent Flying Bird™ fans with new fan blade design inspired by nature, help reduce airflow noise.
- 30KAV is available with 4 sound levels to match the most sensitive environments:
  - Standard: standard unit configuration with new generation of low sound screw compressor and fans
  - Low noise option: addition of high-performance compressor sound enclosure
  - Very low noise option: addition of high-performance compressor sound enclosure and fan operation at lower rotational speed.
  - Ultra low noise option: option under development (available during 2018).

Easy and fast installation

- Built-in variable speed pumps up to 800 kW
  - Full hydraulic module with dual pumps (low or high pressure as required) and optional expansion tank
  - Automatic nominal water flow adjustment through electronic control on the user display
- Compact units for easy transportation and installation.
  - Dimensions 25% smaller than the previous 30XAV generation
  - Similar dimensions as the old 30GX chillers for easy replacement of the installed base.
- Simplified electrical connections:
  - Main disconnect switch
  - Transformer supply to the integrated control circuit (400/24V)
  - Single electrical point of connection
- Simplified water connections:
  - Victaulic connections on the evaporator
  - Clearly identified entering and practical reference marks for entering and leaving water connections
  - Possibility to choose different evaporator configurations, 1 or 2 passes.
- Fast commissioning:
  - Systematic factory operating test before shipment
  - Functional test for main components, expansion devices, fans and compressors.

CUSTOMER BENEFITS

Environmental care

- The AquaForce™ Vision 30KAV liquid chillers with Greenspeed™ Intelligence is a boost for green cities and contributes to a sustainable future. Combining a reduced charge of R134a refrigerant and exceptional energy efficiency it significantly lowers energy consumption while reducing carbon dioxide emissions by 25% throughout its life cycle (compared to previous fixed-speed screw liquid chiller generation).
- The AquaForce™ Vision 30KAV liquid chiller is equipped with an automatic energy meter that provides estimated instantaneous and cumulative cooling energy output, instantaneous and cumulative electric energy consumption, instantaneous and average seasonal energy efficiency ratios (Accuracy: +/- 5% at nominal condition, +/-10% elsewhere) for unit performance monitoring and verification.
- To anticipate future HFC phase-out, 30KAV has been designed for easy retrofit with ultra-low GWP HFO R-1234ze.
- The AquaForce™ Vision 30KAVZE version with PUREtec™ refrigerant designed exclusively for HFO R-1234ze will be available during the course of 2018.
- R-134a: HFC refrigerant with zero ozone depletion potential
- 40% less refrigerant charge: The micro-channel technology used for condenser coils optimises heat transfer while minimising the refrigerant volume.
- Leak tight refrigerant circuits:
  - Reduction of leaks as no capillary tubes and flare connections are used
  - Verification of pressure transducers and temperature sensors without transferring refrigerant charge
  - Discharge line shut-off valve and liquid line service valve for simplified maintenance.
- Refrigerant leak alert: The AquaForce™ Vision 30KAV liquid chiller is equipped with an automatic refrigerant leak detection algorithm that can detect serious refrigerant loss at any point on the system (Sensitivity: 25% refrigerant charge loss per circuit, depending on the conditions). The automatic refrigerant leak detection system can help to achieve recognition within pollution prevention assessment programs, ideal for assisting in the design of sustainable buildings.
- Refrigerant leak detection: Available as an option, this additional dry-contact allows reporting of possible leaks. The leak detector (by others) should be mounted in the most likely leak location.

Designed to support Green Building Design

A green building is a building that is environmentally sustainable and has been designed, constructed and is operated to minimise the total impact on the environment.

The resulting building will be economical to operate, offer increased comfort and create a healthier environment for the people who live and work there, increasing productivity.

The air conditioning system can use between 30 and 40% of the annual building energy consumption. Selection of the right air conditioning system is one of the main aspects to consider when designing a green building. For buildings with a variable load throughout the year 30KAV units offer a solution to this important challenge.

A number of green building certification programs exist in the market and offer third-party assessment of green building measures for a wide variety of building types.

The following example looks at how Carrier's new 30KAV range helps customers involved in LEED® building certification.

30KAV and LEED® certification

The LEED® (Leadership in Energy and Environmental Design) green building certification programme is a preeminent programme to rate the design, construction and operation of green buildings with points assigned in seven credit categories:

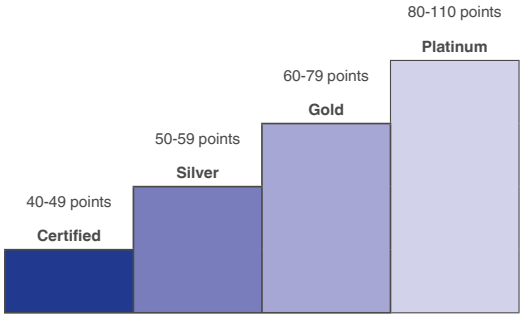
- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy & Atmosphere (EA)
- Materials & Resources (MR)
- Indoor Environmental Quality (IEQ)
- Innovation in Design (ID)
- Regional Priority (RP).

There are a number of different LEED® products.

While the strategies and categories assessed remain same, the point distribution varies to address different building types and application needs, for example according to New Construction, Schools, Core & Shell, Retail and Healthcare.

All programmes now use the same point scale:

110 Possible LEED® points



The majority of credits in LEED® rating systems are performance-based and achieving them is dependent on the impacts of each component or sub-system to the overall building.

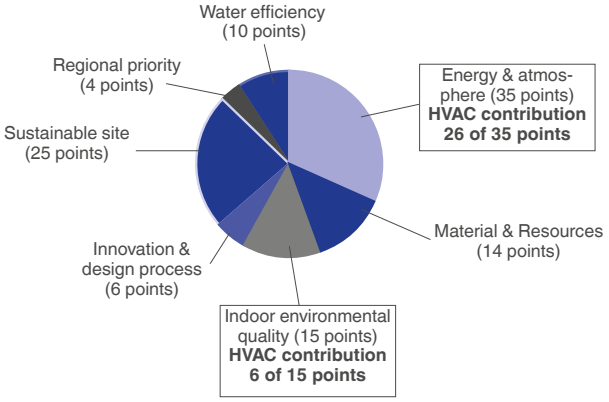
While the LEED® green building certification programs do not certify products or services, the selection of the right products, systems or service programs is critical to obtain LEED® certification for a registered project, because the right products or service programmes can help meet the goals of green construction and ongoing operation and maintenance.

The choice of heating, ventilating and air conditioning (HVAC) products in particular can have a significant impact on LEED® certification, as the HVAC system directly impacts two categories that together influence 40% of the available points.

CUSTOMER BENEFITS

Designed to support Green Building Design

Overview of LEED® for new construction and major renovations



The new 30KAV units from Carrier can assist building owners to earn LEED® points in particular in the Energy & Atmosphere (EA) credit category and help address the following prerequisites and credit requirements:

- EA prerequisite 2: Minimum energy Performance
  The 30KAV exceeds the energy efficiency requirements of ASHRAE 90,1-2007; therefore it complies with the presequisite standard.

- EA prerequisite 3: Fundamental Refrigerant Management
  The 30KAV does not use chlorofluorocarbon (CFC) refrigerants thus satisfying the prerequisite statement.

- EA credit 1: Optimise energy performance (1 to 19 points):
  Points for this credit are assigned depending on the energy cost reduction virtually achievable by the new building, compared to ASHRAE 90,1-2007 reference. The 30KAV, which is designed for high performance especially during part load operation, contributes to reducing the energy consumption of the building and therefore helps in gaining points within this credit. In addition, the Carrier HAP (Hourly Analyses Program) can be used as an energy analyses program complying with the modeling requirements for this credit and produce reports that are easily transferable to LEED® templates.

- EA credit 4: Enhanced refrigerant management (2 points):
  With this credit, LEED® awards systems that minimise the Ozone Depletion Potential (ODP) and Globlal Warming Potential (GWP) of the system. The 30KAV uses a reduced R134a charge and therefore contributes toward satisfying this credit under LEED®.

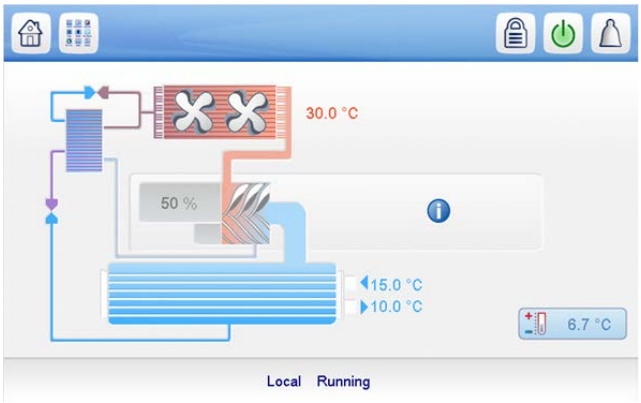
NOTE: This section describes the prerequisites and credit requirements in LEED® for New Construction and is directly related to the 30KAV. Other prerequisites and credit requirements are not directly and purely related to the air-conditioning unit itself, but more to the control of the complete HVAC system.

i-Vu®, Carrier's open control system, has features that can be valuable for:
- EA prerequisite 1: Fundamental commissioning of energy management system
- EA credit 3: Enhanced commissioning (2 points)
- EA credit 5: Measurements and verification (3 points).

NOTE: Products are not reviewed or certified under LEED®. LEED® credit requirements cover the performance of materials in aggregate, not the performance of individual products or brands. For more information on LEED®, visit www.usgbc.org.

TECHNICAL INSIGHTS

Touch Pilot control



- New innovative smart control features:
  - An intuitive and user-friendly, coloured, 7" interface
  - 10 languages available on choice: DE, EN, ES, FR, IT, NL, PT, TR, TU + one additional customer choice
  - Screen-shots with concise and clear information in local languages
  - Complete menu, customised for different users (end user, service personnel and Carrier-factory technicians)
  - Easy access to the controller box with inclined touch screen mounting to ensure legibility under any lighting conditions
  - Safe operation and unit setting: Password protection ensures that unauthorised people cannot modify any advanced parameters
  - Simple and "smart" intelligence uses data collection from the constant monitoring of all machine parameters to optimise unit operation
  - Night-mode: Cooling capacity management for reduced noise level.
- Energy management:
  - Innovative smart energy monitoring, providing users with smart data such as real time electric energy consumption, cooling capacity, and instantaneous and average seasonal energy efficiency ratios.
  - Internal time schedule clock controls chiller on/off times and operation at a second set-point
  - The DCT (Data Collection Tool) records the alarms history to simplify and facilitate service operations.

Remote management (standard)

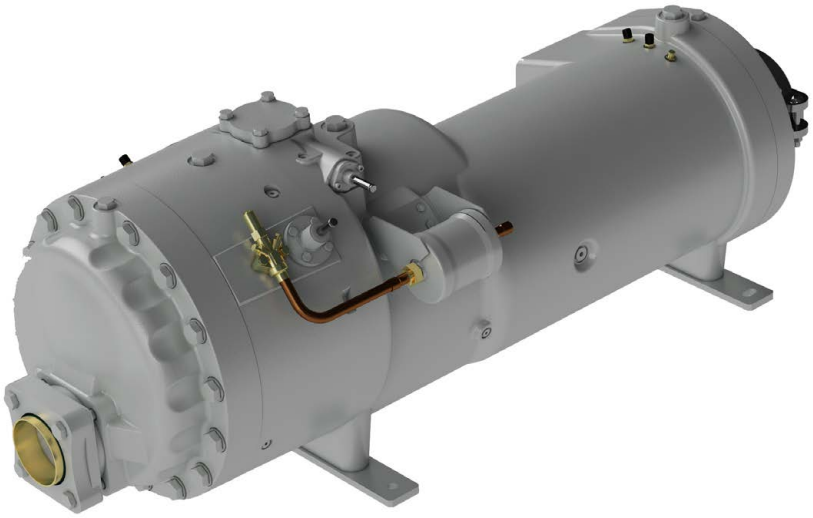
- Units with Touch Pilot control can be easily accessed from the internet, using a PC with an Ethernet connection. This makes remote control quick and easy and offers significant advantages for service operations.
- Aquaforce with Greenspeed® Intelligence is equipped with an RS485 serial port that offers multiple remote control, monitoring and diagnostic possibilities. When networked with other Carrier equipment through the CCN (Carrier Comfort Network - proprietary protocol), all components form a HVAC system fully-integrated and balanced through one of the Carrier's network system products, like the Chiller System Manager or the Plant System Manager (optional).
- The 30KAV also communicates with other building management systems via optional communication gateways (BACnet, LON or JBus).
- The following commands/visualisations are possible from remote connection:
  - Start/Stop of the machine
  - Dual set-point management: Through a dedicated contact is possible to activate a second set-point (example, unoccupied mode)
  - Demand limit setting: To limit the maximum chiller capacity to a predefined value
  - Water pump control: These outputs control the contactors of one/two evaporator water pumps.
  - Water pumps changeover (only with hydraulic module options): These contacts are used to detect a water pump operation fault and automatically change over to the other pump.
  - Operation visualisation: Indication if the unit is operating or if it is in stand-by (no cooling load)
  - Alarm visualisation.

Remote management (EMM option)

- The Energy Management Module (EMM) offers extended remote control possibilities:
  - Room temperature: Permits set-point reset based on the building indoor air temperature (if Carrier thermostats are installed)
  - Set-point reset: Allows reset of the cooling set-point based on a 4-20 mA or 0-10 V signal
  - Demand limit: Permits limitation of the maximum chiller capacity based on 0-10 V signal
  - Demand limit 1 and 2: Closing of these contacts limits the maximum chiller capacity to two predefined values.
  - User safety: This contact can be used for any customer safety loop; opening the contact generates a specific alarm.
  - Ice storage end: When ice storage has finished, this input permits return to the second set-point (unoccupied mode).
  - Time schedule override: Closing of this contact cancels the programmed time schedule.
  - Out of service: This signal indicates that the chiller is completely out of service.
  - Chiller capacity: This analogue output (0-10 V) gives an immediate indication of the chiller capacity.
  - Alert indication: This volt-free contact indicates the necessity to carry out a maintenance operation or the presence of a minor fault.
  - Compressors running status: Set of outputs (as many as the compressors number) indicating which compressors are running.

TECHNICAL INSIGHTS

New generation of Carrier 06Z variable-speed twin screw compressor



The new generation of 06Z variable-speed twin screw compressors benefits for Carrier's long experience in the development of twin-rotor screw compressors. The 06Z compressor design is based on the successful 06T screw compressor, core of the well-known Aquaforce series with a number of modifications to reduce noise level and improve the energy efficiency especially during part load operation.

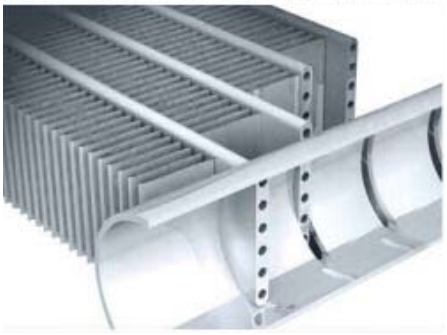
- New 06Z twin screw compressor optimized for variable speed operation: elimination of the slide valve, built in volume index control (Vi) valve for both optimal full and part load performance, high efficiency AC motor with stepless inverter control from 20% to 100%
- Separate air-cooled inverter drive for increased reliability
- New 06Z twin screw compressor design with Integrated Resonator Array (IRA) to reduce the sound level by up to 6 dB(A) when compared with previous 06T generation
- Integrated Check Valve for quiet shutdown
- Bearing life exceeding 100 000 hours.
- A dedicated oil separator is installed at the discharge of each compressor to ensure maximum oil return: Oil separates from refrigerant by gravity and returns to the low pressure side of the compressor without use of additional pumps.
- Volume index control (Vi) valve provides a reliable method of adjusting the compression ratio to better match system demand. It provides optimal performance regardless of operating condition
- Screw compressors work on the positive displacement principle to compress gas to a higher pressure. As a result, if there is an unusually high pressure in the condenser (due for example to coil fouling or operation in harsh climate) the compressor does not switch off, but continues operation at reduced capacity (unloaded mode).
- The silencer in the oil separator line (at the compressor outlet) considerably reduces discharge gas pulsations for much quieter operation.

TECHNICAL INSIGHTS

Novation® Heat Exchangers with Microchannel Coil Technology

Already utilised in the automobile and aeronautical industries for many years, the Novation™ Micro-Channel Heat Exchanger (MCHE) used in the Aquaforce is entirely made of aluminum. This one-piece concept significantly increases its corrosion resistance by eliminating the galvanic currents that are created when two different metals (copper and aluminum) come into contact in traditional heat exchangers.

- From the energy efficiency point-of-view the Novation® heat exchangers are approximately 10% more efficient than traditional coils and micro-channel coil technology allows a 40% reduction in the amount of refrigerant used in the chiller.
- The reduced depth of the Novation™ MCHE reduces air pressure losses by 50% and makes it much less susceptible to fouling (e.g. by sand). Cleaning of the Novation™ MCHE heat exchanger is very fast using a high pressure washer.
- To further enhance long-term performance, and protect coils from early deterioration, Carrier offers (as options) dedicated treatments for installations in corrosive environments.
  - The Novation™ MCHE with Enviro-Shield protection (option 262) is recommended for installations in moderately corrosive environments. The Enviro-Shield protection utilises corrosion inhibitors which actively arrest oxidation in case of mechanical damage.
  - The Novation™ MCHE with exclusive Super Enviro-Shield protection (option 263) is recommended for installations in corrosive environments. The Super Enviro-Shield protection consist of an extremely durable and flexible epoxy coating uniformly applied over all coil surfaces for complete isolation from the contaminated environment.
- After a total of more than 7,000 hours of testing following various test standards in UTC laboratories, the Carrier Novation® MCHE with Super Enviro-shield® coating appears to be the best-suited customer choice to minimize the harmful effects of corrosive atmospheres and ensure long equipment life.
  - Best corrosion resistance per ASTM B117/D610 test
  - Best heat transfer performance per Carrier Marine 1 test
  - Proven reliability per ASTM B117 test



Coil Types (ranked by performance)	Visual Corrosion Evaluation	Heat Transfer Performance Degradation	Time to Failure	Test Campaign Conclusions
Super Enviro-shield® Novation™ MCHE	Very good	Very good	No coil leak	Best
Super Enviro-shield® Cu/Al coil	Very good	Good	No coil leak	Very good
Enviro-shield® Novation™ MCHE	Very good	Good	No coil leak	Very good
Al/Al coil	Very good	Good	No coil leak	Very good
Novation™ MCHE	Good	Good	No coil leak	Good
Cu/Cu coil	Good	Good	Leak	Acceptable
Blygold® Cu/Al coil	Good	Good	No coil leak	Acceptable
Precoat Cu/Al coil	Bad	Bad	No coil leak	Bad
Cu/Al coil	Bad	Bad	No coil leak	Bad

TECHNICAL INSIGHTS

New generation of Flying Bird VI fans with EC motors

The 30KAV utilizes Carrier's the 6th generation Flying BirdTM fan technology, engineered for maximum efficiency, super low noise, and wide operating range. The fan includes Carrier patented rotating shroud technology and back-swept blades with a unique wave-serration trailing edge inspired from nature.

It was designed and optimized for the 30KAV air management system configuration and heat exchanger technology and is offered with induction and EC motor options. The fan meets the latest European eco-design requirements for fan efficiency. The fan uses Carrier's robust and proven injection molded composite-thermoplastic construction.

OPTIONS

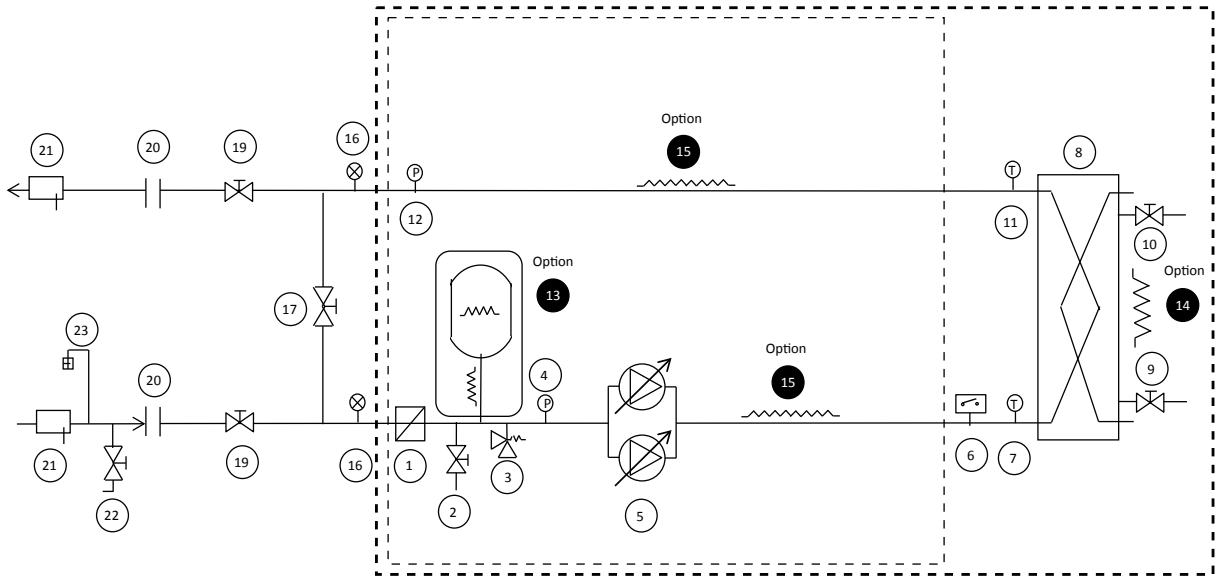
Options	No.	Description	Advantages	30KAV models
Low noise level	15	Sound absorbing & aesthetic compressor enclosure and oil separator acoustic treatment	Noise level reduction by 1 to 2 dB(A)	500-1100
Very low noise level	15LS	Sound absorbing & aesthetic compressor enclosure and oil separator, evaporator and suction line acoustic treatment, combined with low-speed fans	Noise level reduction in sensitive environments	500-1100
High ambient temperature	16	Electrical components sized for part load operation up to 55°C air ambient	Extended unit part-load operation up to 55°C ambient temperature	500-1100
EC fans	17	Unit equipped with EC fans	Enhances the unit energy efficiency	500-1100
IP54 control box	20A	Increased leak tightness of the unit	Protects the inside of the electrical box from dust, water and sand. In general this option is recommended for installations in polluted environments	500-1100
Grilles and enclosure panels	23	Metallic protection grilles and side enclosure panels	Improves aesthetics, protection against intrusion to the unit interior, coil and piping protection against impacts.	500-1100
Enclosure panels	23A	Side enclosure panels	Improves aesthetics and piping protection against impacts.	500-1100
Water exchanger frost protection	41A	Electric resistance heater on the water exchanger and discharge valve	water exchanger frost protection down to -20°C outside temperature	500-1100
Evaporator & hydraulic module frost protection	41B	Electric resistance heater on water exchanger, discharge valve and hydraulic module	Water exchanger and hydraulic module frost protection down to -20°C outside temperature	500-800
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 parallel operation with operating time equalisation	500-1100
Main disconnect switch with short-circuit protection	70D	Circuit breaker equipped with an external disconnect switch handle	Ensure protection of main disconnect switch and associated cables against short-circuits when building devices are not compliant	500-1100
Evap. and pumps with aluminum jacket	88A	Evaporator and pumps covered with an aluminum sheet for thermal insulation protection	Improved resistance to aggressive climate conditions	500-800
Service valve set	92	Liquid line valve (evaporator inlet), compressor suction and discharge line valves and economiser line valve	Allow isolation of various refrigerant circuit components for simplified service and maintenance	500-1100
Compressor discharge valves	93A	Shut-off valve on the compressor discharge piping	Simplified maintenance	500-1100
21 bar evaporator	104	Reinforced evaporator for extension of the maximum water-side service pressure to 21 bar (standard 10 bar)	Covers applications with a high water column evaporator side (typically high buildings)	500-1100
LP VSD dual-pump hydraulic mod.	116A	Dual low-pressure water pump with variable speed drive (VSD), pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter.	Easy and fast installation (plug & play), significant pumping energy cost savings, tighter water flow control, improved sytem reliability	500-800
HP VSD dual-pump hydraulic mod.	116W	Dual high-pressure water pump with variable speed drive (VSD), pressure transducers. Multiple possibilities of water flow control. For more details, refer to the dedicated chapter.	Easy and fast installation (plug & play), significant pumping energy cost savings, tighter water flow control, improved sytem reliability	500-800
High Energy Efficiency	119	Additional condenser coil to improve unit energy efficiency	Enhances the unit energy efficiency performance	500-1100
High Energy Efficiency+	119+	Additional condenser coil plus EC fans to improve unit energy efficiency	Enhances the unit energy efficiency performance	500-1100
J-Bus gateway	148B	Bi-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	500-1100
Lon gateway	148D	Bi-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	500-1100
Bacnet over 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	500-1100
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...)	500-1100
Refrigerant leak detection	159	One refrigerant leak detector per circuit	Minimises refrigerant loss	500-1100

OPTIONS

Options	No.	Description	Advantages	30KAV models
Dual relief valves on 3-way valve	194	Three-way valve upstream of the relief valves on the evaporator and the oil separator	Valve replacement and inspection facilitated without refrigerant loss. Comforms to European standard EN378/BGVD4	500-1100
Compliance with Swiss regulations	197	Additional tests on the water heat exchangers: supply (additional of PED documents) supplementary certificates and test certifications	Conformance with Swiss regulations	500-1100
Compliance with Russian regulations	199	EAC certification	Conformance with Russian regulations	500-1100
Compliance with Australian regulations	200	Unit approved to Australian code	Conformance with Australian regulations	500-1100
Insulation of the evap. in/out ref.lines	256	Thermal insulation of the evaporator entering/leaving refrigerant lines with flexible, UV resistant insulation	Prevents condensation on the evaporator entering/leaving refrigerant lines	500-1100
Enviro-Shield anti-corrosion protection	262	Coating by conversion process which modifies the surface of the aluminum producing a coating that is integral to the coil. Complete immersion in a bath to ensure 100% coverage. No heat transfer variation, tested 4000 hours salt spray per ASTM B117	Improved corrosion resistance, recommended for use in moderately corrosive environments	500-1100
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	500-1100
Welded evaporator connection kit	266	Victaulic piping connections with welded joints	Easy installation	500-1100
Evaporator with aluminum jacket	281	Evaporator covered with an aluminum sheet for thermal insulation protection	Improved resistance to aggressive climate conditions	500-1100
EMC class. C2, as per EN 61800-3	282	Additional RFI filters on the unit power line	Reduces electromagnetic interference. Increase the variable frequency drive (VFD) immunity level according to first environment (so called, residential environment) requirements and allows compliance with emissions level required in category C2	500-1100
230V electrical plug	284	230V AC power supply source provided with plug socket and transformer (180 VA, 0,8 Amps)	Permits connection of a laptop or an electrical device during unit commissioning or servicing	500-1100
Expansion tank	293	6 bar expansion tank integrated in the hydraulic module (requires hydraulic module option)	Easy and fast installation (plug & play), & Protection of closed water systems from excessive pressure	500-800
Carrier Connect link (only European distributor company)	298	3G router board NOTE 1: require option 149 NOTE 2: when more than one machine is installed on site, only one of them shall be equipped with option 298 while all of them must be equipped with option 149 NOTE 3: if the Carrier® PlantCTRL™ is on site, option 298 shall be integrated in the Carrier® PlantCTRL™ while option 149 is still mandatory for each single unit.	Enabler for Carrier Connect service offer	500-1100
Variable Water Flow control	299	hydraulic control function package that permits control of the water flow rate based on different possible logics (at customer choice): constant ΔT, constant outlet pressure and "fixed-speed" control	When variable-speed pumps on the primary circuit, the VWF control modulates flow rate through the evaporator, minimising pump consumption while ensuring safe/optimised chiller operation	500-1100
Compliance with UAE regulation	318	Additional label on the unit with rated power input, rated current and EER following AHRI 550/590	Compliance with ESMA standard UAE 5010-5 :2014.	500-1100
Compliance with Qatar regulation	319	Specific nameplate on the unit with power supply 415 V+/-6%	Compliance with KAHRAMAA regulation in Qatar.	500-1100

HYDRAULIC MODULE

Typical water circuit diagram



Legend

Components of the unit and hydronic module

1. Screen filter (particle size of 1.2 mm)
2. Water drain tap
3. Relief valve
4. Pressure sensor
   NOTE: Provides pressure information for the pump inlet (see Control manual)
5. Variable-speed dual pump (low or high pressure)
6. Water exchanger flow rate sensor
7. Temperature probe
   NOTE: Provides temperature information for the water exchanger inlet (see Control manual)
8. Heat exchanger
9. Water purge (evaporator)
10. Air bleed (evaporator)
11. Temperature probe
    NOTE: Provides temperature information for the water exchanger outlet (see Control manual)
12. Pressure sensor
    NOTE: Provides pressure information for the water exchanger outlet (see Control manual)

⊘ 13. Expansion tank (Option 293)
⊘ 14. Electric resistance heater for heat exchanger frost protection (option 41A & 41B)
⊘ 15. Electric resistance heater for hydraulic module frost protection(option 41B)

System components

16. Pressure gauge
17. Bypass valve for frost protection (if shut-down valves (item 19) are closed in winter)
18. Water flow control valve
19. Shut-off valve
20. Sleeve
21. Flexible connection
22. Charge valve
23. Air bleed

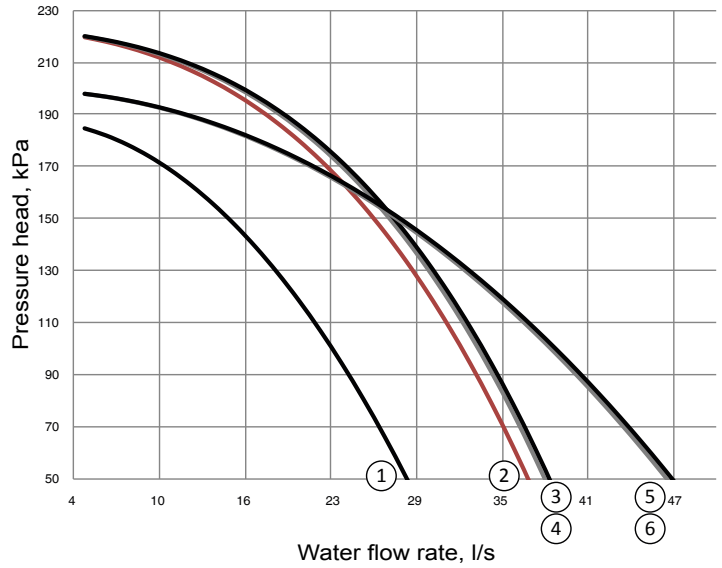
…….. Included with the unit
- - - - - Hydronic Module (unit with hydronic module option (116A & 116W))

NOTES:

- The system must be protected against frost.
- The unit's hydronic module and the water heat exchanger may be protected against freezing using electric heaters and heat trace cables (factory-fitted options 41A & 41B)
- The pressure sensors are assembled on connections without Schrader. Depressurise and drain the system before any work.

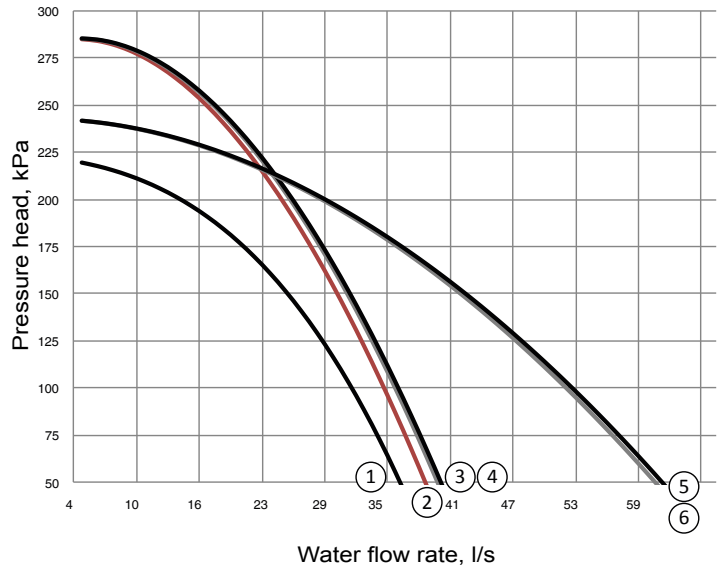
AVAILABLE STATIC PRESSURE (OPTIONS 116A, 116W)

Low-pressure variable-speed dual pump
(Hydraulic module option 116A)



1 30KAV500
2 30KAV550
3 30KAV600
4 30KAV650
5 30KAV720
6 30KAV800

High-pressure variable-speed dual pump
(Hydraulic module option 116W)



1 30KAV500
2 30KAV550
3 30KAV600
4 30KAV650
5 30KAV720
6 30KAV800

PHYSICAL DATA

Standard units and Units with EC fans option (17)

30KAV				500	550	600	650	720	800	900	1000	1100
Cooling												
Standard unit Full load performances(*)	CA1	Nominal capacity	kW	493	537	600	636	723	791	892	975	1079
		EER	kW/kW	3,00	2,91	3,14	2,98	3,19	3,03	3,07	2,98	3,05
		Eurovent class		B	B	A	B	A	B	B	B	B
Standard unit Seasonal energy efficiency		SEER $_{12/7°C}$ Comfort low temp.	kWh/kWh	4,97	4,95	5,23	5,21	5,34	5,15	5,24	5,13	5,27
		ηs cool $_{12/7°C}$	%	196	195	206	205	211	203	207	202	208
		SEER $_{23/18°C}$ Comfort medium temp.	kWh/kWh	6,25	6,28	6,73	6,70	6,96	6,30	6,66	6,47	6,81
		SEPR $_{12/7°C}$ Process high temp.	kWh/kWh	5,81	5,77	6,49	6,37	6,54	5,63	6,17	5,70	6,03
		ESEER	kW/kW	4,76	4,77	4,98	5,00	5,15	4,93	5,07	4,93	5,04
Unit + option 17 Seasonal energy efficiency		SEER $_{12/7°C}$ Comfort low temp.	kWh/kWh	5,02	5,00	5,29	5,27	5,42	5,21	5,32	5,20	5,35
		ηs cool $_{12/7°C}$	%	198	197	209	208	214	205	210	205	211
		SEER $_{23/18°C}$ Comfort medium temp.	kWh/kWh	6,34	6,36	6,84	6,80	7,08	6,39	6,78	6,59	6,94
		SEPR $_{12/7°C}$ Process high temp.	kWh/kWh	5,86	5,81	6,55	6,43	6,62	5,69	6,25	5,76	6,10
		ESEER	kW/kW	4,80	4,81	5,05	5,07	5,24	4,99	5,15	4,99	5,12
Sound levels												
Standard unit												
Sound power(1)			dB(A)	95	95	96	98	99	98	99	98	100
Sound pressure at 10 m(2)			dB(A)	63	63	64	65	66	65	67	65	67
Unit + option 15(3)												
Sound power(1)			dB(A)	94	94	94	96	97	96	97	97	98
Sound pressure at 10 m(2)			dB(A)	62	62	61	64	64	63	65	64	65
Unit + option 15LS(3)												
Sound power(1)			dB(A)	90	90	90	92	94	92	94	93	94
Sound pressure at 10 m(2)			dB(A)	57	58	58	59	61	60	62	60	61
Dimensions												
Standard unit												
Length			mm	4350	4350	5540	5540	6735	6735	7925	7925	9120
Width			mm	2253	2253	2253	2253	2253	2253	2253	2253	2253
Height			mm	2297	2297	2297	2297	2297	2297	2297	2297	2297
Unit + options 116A/116W(3)												
Length			mm	5540	5540	5540	5540	6735	6735	-	-	-
Operating weight(4)												
Standard unit			kg	4800	4813	5197	5223	5705	6127	6604	7057	7484
Unit + options 116A/116W(3)			kg	5314	5428	5623	5649	6261	6682	-	-	-
Compressors				Inverter driven 06Z twin screw compressor with AC motor								
Circuit A			Quantity	1	1	1	1	1	1	1	1	1
Circuit B			Quantity	1	1	1	1	1	1	1	1	1
Unit minimum capacity(5)			%	13	12	11	10	10	10	10	11	10
Refrigerant(4)				R134a (GWP=1430, ODP=0)								
Circuit A			kg	51	51	56	63	70	79	95	89	99
			teqCO_2	73	73	80	90	100	113	136	127	142
Circuit B			kg	52	52	57	64	71	61	75	90	100
			teqCO_2	74	74	82	92	102	87	107	129	143

* In accordance with standard EN14511-3:2013.

CA1 Cooling mode conditions: Evaporator water entering/leaving temperature 12°C/7°C, outside air temperature 35°C, evaporator fouling factor 0 m².K/W

ηs cool$_{12/7°C}$ & SEPR$_{12/7°C}$ Applicable Ecodesign regulation: (EU) No 2016/2281

(1) in dB ref=10^{-12} W, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). Measured in accordance with ISO 9614-1 and certified by Eurovent.

(2) In dB ref 20µPa, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). For information, calculated from the sound power Lw(A).

(3) Options: 15=Low noise level ; 15LS=Very low noise level ; 116A=LP VSD dual-pump hydraulic mod. ; 116W=HP VSD dual-pump hydraulic mod.

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

(5) For standard conditions. Depending on operating conditions, unit might have a different minimum capacity or cycle.

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

Eurovent certified values

PHYSICAL DATA

Standard units and Units with EC fans option (17)

30KAV		500	550	600	650	720	800	900	1000	1100
Oil		SW220								
Circuit A	l	20	20	20	20	20	20	20	20	20
Circuit B	l	20	20	20	20	20	20	20	20	20
Unit control		Touch Pilot with 7 inch coloured touch screen interface								
Languages		10 languages (DE, EN, ES, FR, IT, NL, PT, TR, TU + one on customer choice)								
Smart energy metering		Standard feature								
Wireless connectivity		Option								
Expansion valve		Electronic expansion valve								
Air heat exchanger		Novation™ Micro Channel Heat Exchanger								
Fans										
Standard unit		Inverter driven Flying Bird™ VI fans with AC motor								
Unit + option 17		Inverter driven Flying Bird™ VI fans with EC motor								
Quantity		6	6	8	8	10	10	12	12	14
Maximum total air flow	l/s	35580	35580	47440	47440	59300	59300	71160	71160	83020
Maximum rotation speed	r/s	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0
Maximum total air flow + option 15LS(3)	l/s	28920	26100	41600	43200	56000	50000	67200	57840	72800
Maximum rotation speed + option 15LS(3)	r/s	13,2	12,0	14,2	14,7	15,2	13,7	15,2	13,2	14,2
Water heat exchanger		Flooded shell and tube heat exchanger								
Water volume	l	83	88	96	100	115	126	144	165	183
Max. water-side operating pressure without hydraulic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000
Hydraulic module (option)		Double pump, screen filter, relief valve, water drain valve, pressure sensors, expansion tank (option), heaters (option)								
Pump		Inverter driven dual pumps with AC motor								
Expansion vessel volume	l	80	80	80	80	80	80	-	-	-
Max. water-side operating pressure	kPa	400	400	400	400	400	400	-	-	-
Water connections		Victaulic® type								
Without options 116A/116W(3)										
Connections	pouces	5	5	6	6	6	6	8	8	8
Outside tube diameter	mm	141,3	141,3	168,3	168,3	168,3	168,3	219,1	219,1	219,1
With options 116A/116W(3)										
Connections	pouces	5	5	5	5	5	5	-	-	-
Outside tube diameter	mm	141,3	141,3	141,3	141,3	141,3	141,3	-	-	-
Casing paint		Colour code RAL 7035								

(3) Options: 15=Low noise level ; 15LS=Very low noise level ; 116A=LP VSD dual-pump hydraulic mod. ; 116W=HP VSD dual-pump hydraulic mod.
(5) For standard conditions. Depending on operating conditions, unit might have a different minimum capacity or cycle.

PHYSICAL DATA

Units with High energy efficiency option (119) and High energy efficiency+ option (119+)

30KAV options 119/119+				500	550	600	650	720	800	900	1000	1100
Cooling												
Unit + option 119+ Full load performances(*)	CA1	Nominal capacity	kW	517	575	611	661	731	819	907	1010	1097
		EER	kW/kW	3,49	3,41	3,42	3,32	3,37	3,35	3,29	3,30	3,25
		Eurovent class		A	A	A	A	A	A	A	A	A
Unit + option 119 Seasonal energy efficiency		SEER $_{12/7°C}$ Comfort low temp.	kWh/kWh	5,32	5,32	5,40	5,38	5,44	5,36	5,31	5,29	5,33
		ηs cool $_{12/7°C}$	%	210	210	213	212	215	212	209	209	210
		SEER $_{23/18°C}$ Comfort medium temp.	kWh/kWh	6,94	6,97	7,03	7,00	7,15	6,76	6,84	6,74	6,94
		SEPR $_{12/7°C}$ Process high temp.	kWh/kWh	7,03	6,92	6,97	6,83	6,87	6,58	6,55	6,49	6,47
		ESEER	kW/kW	5,11	5,13	5,15	5,13	5,25	5,15	5,11	5,09	5,08
Unit + option 119+ Seasonal energy efficiency		SEER $_{12/7°C}$ Comfort low temp.	kWh/kWh	5,43	5,43	5,50	5,47	5,53	5,47	5,41	5,40	5,43
		ηs cool $_{12/7°C}$	%	214	214	217	216	218	216	213	213	214
		SEER $_{23/18°C}$ Comfort medium temp.	kWh/kWh	7,12	7,15	7,19	7,16	7,32	6,92	6,99	6,92	7,12
		SEPR $_{12/7°C}$ Process high temp.	kWh/kWh	7,14	7,03	7,07	6,94	6,98	6,68	6,66	6,60	6,57
		ESEER	kW/kW	5,22	5,23	5,25	5,24	5,36	5,26	5,21	5,19	5,19
Sound levels												
Unit + option 119+												
Sound power(1)			dB(A)	96	96	97	98	99	98	100	98	100
Sound pressure at 10 m(2)			dB(A)	63	63	64	66	66	65	67	65	67
Unit + options 15 + 119+(3)												
Sound power(1)			dB(A)	95	95	94	96	97	96	98	98	98
Sound pressure at 10 m(2)			dB(A)	62	62	62	64	64	64	65	65	65
Unit + options 15LS + 119+(3)												
Sound power(1)			dB(A)	90	91	91	92	94	92	94	93	94
Sound pressure at 10 m(2)			dB(A)	57	58	58	59	61	60	61	60	61
Dimensions												
Unit + option 119/119+												
Length			mm	6735	6735	6735	6735	7925	9120	9120	10305	10305
Width			mm	2253	2253	2253	2253	2253	2253	2253	2253	2253
Height			mm	2297	2297	2297	2297	2297	2297	2297	2297	2297
Unit + option 119/119+ + options 116A/116W(3)												
Length			mm	6735	6735	6735	6735	7925	9120	-	-	-
Operating weight(4)												
Unit + option 119+			kg	5570	5583	5606	5632	6075	6879	7026	7813	7875
Unit + options 116A/116W(3) + 119+			kg	5979	6093	6081	6107	6678	7524	-	-	-
Compressors				Inverter driven 06Z twin screw compressor with AC motor								
Circuit A			Quantity	1	1	1	1	1	1	1	1	1
Circuit B			Quantity	1	1	1	1	1	1	1	1	1
Unit minimum capacity(5)			%	13	12	11	10	10	10	10	11	10
Refrigerant(4)				R134a (GWP=1430, ODP=0)								
Circuit A			kg	65	65	63	70	74	93	102	103	106
			teqCO_2	93	93	90	100	106	133	146	147	152
Circuit B			kg	66	66	64	71	75	75	82	104	107
			teqCO_2	94	94	92	102	107	107	117	149	153

* In accordance with standard EN14511-3:2013.

CA1 Cooling mode conditions: Evaporator water entering/leaving temperature 12°C/7°C, outside air temperature 35°C, evaporator fouling factor 0 m².K/W

ηs cool$_{12/7°C}$ & SEPR$_{12/7°C}$ Applicable Ecodesign regulation: (EU) No 2016/2281

(1) in dB ref=10^{-12} W, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). Measured in accordance with ISO 9614-1 and certified by Eurovent.

(2) In dB ref 20µPa, 'A' weighted. Declared dual-number noise emission values in accordance with ISO 4871 with an associated uncertainty of +/-3dB(A). For information, calculated from the sound power Lw(A).

(3) Options: 15=Low noise level ; 15LS=Very low noise level ; 116A=LP VSD dual-pump hydraulic mod. ; 116W=HP VSD dual-pump hydraulic mod.

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

(5) For standard conditions. Depending on operating conditions, unit might have a different minimum capacity or cycle.

EUROVENT CERTIFIED PERFORMANCE www.eurovent-certification.com

Eurovent certified values

PHYSICAL DATA

Units with High energy efficiency option (119) and High energy efficiency+ option (119+)

30KAV options 119/119+		500	550	600	650	720	800	900	1000	1100
Oil		SW220								
Circuit A	l	20	20	20	20	20	20	20	20	20
Circuit B	l	20	20	20	20	20	20	20	20	20
Unit control		Touch Pilot with 7 inch colored touch screen interface								
Languages		10 languages (DE, EN, ES, FR, IT, NL, PT, TR, TU + one on customer choice)								
Smart energy metering		Standard feature								
Wireless connectivity		Option								
Expansion valve		Electronic expansion valve								
Air heat exchanger		Novation™ Micro Channel Heat Exchanger								
Fans										
Unit + option 119		Inverter driven Flying Bird™ VI fans with AC motor								
Unit + option 119+		Inverter driven Flying Bird™ VI fans with EC motor								
Quantity		10	10	10	10	12	14	14	16	16
Maximum total air flow	l/s	59300	59300	59300	59300	71160	83020	83020	94880	94880
Maximum rotation speed	r/s	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0	16,0
Maximum total air flow + option 15LS(3)	l/s	44700	43500	52000	52000	64800	67480	75600	74080	83200
Maximum rotation speed + option 15LS(3)	r/s	12,3	12	14,2	14,2	14,7	13,2	14,7	12,7	14,2
Water heat exchanger		Flooded shell and tube heat exchanger								
Water volume	l	83	88	96	100	115	126	144	165	183
Max. water-side operating pressure without hydraulic module	kPa	1000	1000	1000	1000	1000	1000	1000	1000	1000
Hydraulic module (option)		Double pump, screen filter, relief valve, water drain valve, pressure sensors, expansion tank (option), heaters (option)								
Pump		Inverter driven dual pumps with AC motor								
Expansion vessel volume	l	80	80	80	80	80	80	-	-	-
Max. water-side operating pressure	kPa	400	400	400	400	400	400	-	-	-
Water connections		Victaulic® type								
Without options 116A/116W(3)										
Connections	pouces	5	5	6	6	6	6	8	8	8
Outside tube diameter	mm	141,3	141,3	168,3	168,3	168,3	168,3	219,1	219,1	219,1
With options 116A/116W(3)										
Connections	pouces	5	5	5	5	5	5	-	-	-
Outside tube diameter	mm	141,3	141,3	141,3	141,3	141,3	141,3	-	-	-
Casing paint		Colour code RAL 7035								

(3) Options: 15=Low noise level ; 15LS=Very low noise level ; 116A=LP VSD dual-pump hydraulic mod. ; 116W=HP VSD dual-pump hydraulic mod.
(5) For standard conditions. Depending on operating conditions, unit might have a different minimum capacity or cycle.

ELECTRICAL DATA

Standard units

30KAV		500	550	600	650	720	800	900	1000	1100
Power circuit supply										
Nominal voltage	V-ph-Hz	400-3-50								
Voltage range	V	360-440								
Control circuit supply		24 V via internal transformer								
Maximum operating input power(1)										
Standard unit	kW	230	251	281	295	329	370	416	458	502
Unit + option 16	kW	248	270	300	315	352	402	451	502	551
Power factor at maximum power(1) (2)		0.91-0.93								
Displacement Power Factor (Cos Phi)		>0.98								
Total harmonic distortion (THDi)(1) (2)	%	35-45								
Nominal operating current draw(3)										
Standard unit	A	265	297	316	340	362	422	468	524	564
Maximum operating current draw (Un)(1)										
Standard unit	A	358	390	436	459	511	575	646	712	780
Unit + option 16	A	385	420	466	490	546	625	701	781	856
Maximum operating current draw (Un-10%)										
Standard unit	A	392	426	477	502	545	629	688	779	831
Unit + option 16	A	422	459	510	537	582	684	747	855	912
Start-up current		Not Applicable (less than the operating current)								

(1) Values obtained at operation with maximum operating power input (data given on the unit nameplate)
(2) May vary depending on short-circuit ratio of the installation
(3) Standardised EUROVENT conditions, water-cooled exchanger water inlet/outlet = 12°C/7°C, outdoor air temperature = 35°C.

Units with option High energy efficiency (119) and option High energy efficiency+ (119+)

30KAV options 119/119+		500	550	600	650	720	800	900	1000	1100
Power circuit supply										
Nominal voltage	V-ph-Hz	400-3-50								
Voltage range	V	360-440								
Control circuit supply		24 V via internal transformer								
Maximum operating input power(1)										
Unit + option 119	kW	228	254	264	286	319	362	401	446	484
Unit + option 119+	kW	226	252	261	283	316	359	397	442	479
Unit + option 119 + option 16	kW	245	273	283	306	342	394	436	490	533
Unit + option 119+ + option 16	kW	243	271	280	303	339	391	432	486	528
Power factor at maximum power(1) (2)		0.91-0.93								
Displacement Power Factor (Cos Phi)		>0.98								
Total harmonic distortion (THDi)(1) (2)	%	35-45								
Nominal operating current draw(3)										
Unit + option 119	A	228	260	285	318	346	374	441	466	535
Unit + option 119+	A	225	257	281	314	341	369	435	460	528
Maximum operating current draw (Un)(1)										
Unit + option 119	A	355	395	410	445	495	563	623	693	752
Unit + option 119+	A	352	392	406	441	490	558	617	687	745
Unit + option 119 + option 16	A	382	425	440	476	530	613	678	762	828
Unit + option 119+ + option 16	A	379	422	436	472	525	608	672	756	821
Maximum operating current draw (Un-10%)										
Unit + option 119	A	387	425	448	485	533	614	673	757	811
Unit + option 119+	A	384	422	444	481	528	609	667	751	804
Unit + option 119 + option 16	A	417	458	481	520	570	669	732	833	892
Unit + option 119+ + option 16	A	414	455	477	516	565	664	726	827	885
Start-up current		Not Applicable (less than the operating current)								

(1) Values obtained at operation with maximum operating power input (data given on the unit nameplate)
(2) May vary depending on short-circuit ratio of the installation
(3) Standardised EUROVENT conditions, water-cooled exchanger water inlet/outlet = 12°C/7°C, outdoor air temperature = 35°C.

ELECTRICAL DATA

Compressor electrical data

Compressor	I Max (A) (1) Standard	I Max (A) (1) Option 16	F max (Hz) (2)	Inverter type (3)
06ZCE1H3AA06013	185	200	82	D3h
06ZCE1T3AA06013	233	250	105	D3h
06ZFC2T3AA06013	358	395	95	D4h

(1) Maximum compressor operating current draw over the entire range when powered at rated voltage. May be lower depending on the unit size.
(2) Maximum compressor frequency other the entire range. This frequency can be limited to a lower value depending on the unit size.
(3) Mechanical inverter type : defines inverter weight and dimensions.

Distribution of compressors per circuit

Compressor	Circuit	500	550	600	650	720	800	900	1000	1100
06ZCE1H3AA06013	A	1	1	-	-	-	-	-	-	-
	B	1	1	-	-	-	-	-	-	-
06ZCE1T3AA06013	A	-	-	1	1	1	-	-	-	-
	B	-	-	1	1	1	1	1	-	-
06ZFC2T3AA06013	A	-	-	-	-	-	1	1	1	1
	B	-	-	-	-	-	-	-	1	1

Electrical notes

- 30KAV 0500 to 1100 units have a single power connection point located immediately upstream of the main disconnect switch.
- The two electrical cabinets contain:
  - A supply disconnecting component.
  - All or part of the equipment protecting the circuits inside the machine from short circuits.(1)
  - Frequency inverters for the compressors, fans, and pumps,
  - The switching equipment for the heaters and fans for the electrical equipment
  - The control devices.
- Connections to the building installation:
  Electrical installation and all the connections to the network must be carried out in compliance with all standards applicable to the installation location. Generally, the recommendations of the International Electrotechnical Commission document (IEC60364) are accepted as compliance with the requirements of the installation guidelines. 30KAV units are designed and built to ensure compliance with these guidelines. The European standard EN 60204-1 (corresponds to IEC 60204-1: Machine safety - Electrical equipment of machines - Part 1: General requirements) was specifically taken into account when the electrical equipment was designed.

NOTES

- The standard EN60204-1 enables the requirements of the Machinery Directive to be met.
- Annex B of standard EN 60204-1 is intended to define the electrical characteristics used for the operation of the machines. Those described below apply alongside the other information provided in this document:

1. Environment
   The classification of the environment is specified in standard IEC60364:
   - Outdoor installation(2),
   - Ambient temperature range for the standard machine: from -20°C to +44°C (48°C)(3),
   - Ambient temperature range for the machine with option 16: from -20°C to +48°C (55°C)(3),
   - Altitude: up to 1000 m (2000m)(4)
   - Presence of solid foreign bodies: Class AE3 (no significant dust present)(2),
   - 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 IEC61000-2-4 standard:
   - Power supply frequency variation: +-1Hz
   - 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 is of a type suitable for power interruption in compliance with EN 60947-3 (equivalent 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's short-circuit holding current characteristics have been modified. Provide a local earth, consult competent local organisations to complete the electrical installation.
7. Electromagnetic environment: the classification of the electromagnetic environment is described in the standard EN61800-3 (equivalent to IEC 61800-3):
   - Immunity to external interference defined by the second environment(5)
   - Interference emission as defined in category C3(6)

- The frequency inverters integrated into 30KAV machines have harmonic currents which are a source of interference. An analysis may be required to verify if this interference exceeds the compatibility limits of the other devices connected to the same power supply network. The compatibility levels inside an electrical installation, that must be met at the in-plant coupling point (IPC) to which other loads are connected, are described in standard IEC 61000-2-4.
- Leakage currents: if protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of additional derived currents introduced by the use of frequency inverters in the unit must be considered. In particular the reinforced immunity protection types and a control value not lower than 150 mA are recommended when selecting control differential protection devices.

NOTE: if particular aspects of an installation require different specifications to those listed above (or which are not listed), always contact your Carrier representative.

(1) With the exception of machines equipped with option 70D, a part of the short circuit protection is not provided and must be carried out on the installation, in compliance with the instructions given in this document.
(2) The required protection level for this class is IP43BW (according to the reference standard IEC 60529). All 30KAV units are classified as IP44CW, and fulfil this protection condition.
(3) The values in brackets correspond to operation with degraded thermal performances.
(4) Above 1000m, the maximum temperature must be reduced by 0.5K for every additional 100m up to 2000m (for the hydronic module, see the section on "Electrical data notes for the hydronic module"),
(5) - Example of installations included in the first environment: commercial and residential buildings.
- Example of installations included in the second environment: industrial zones, technical premises powered from a dedicated transformer.
(6) Category C3 is suitable for use in an industrial environment and is not designed for use in a public low-voltage system that supplies residential locations. As an option, conformity with category C2 permits this type of installation.

PART LOAD PERFORMANCES

ESEER (in accordance with EUROVENT)

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

ESEER (European seasonal energy efficiency ratio)

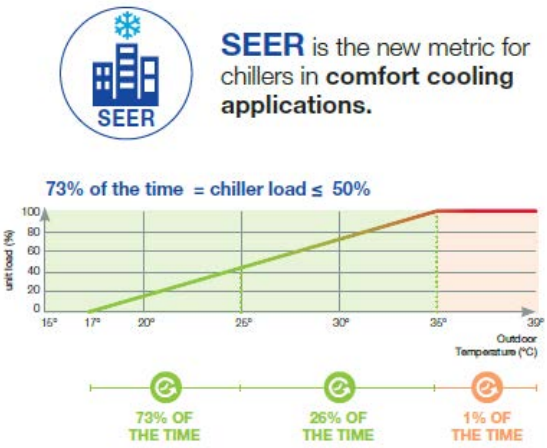
Load %	Air temperature °C	Energy efficiency	Operating time %
100	35	EER_1	3
75	30	EER_2	33
50	25	EER_3	41
25	20	EER_4	23
ESEER = EER_1 x 3% + EER_2 x 33% + EER_3 x 41% + EER_4 x 23%			

NOTE: Constant leaving water temperature 7 °C.

SEER for comfort chillers (in accordance with EU ECODESIGN)

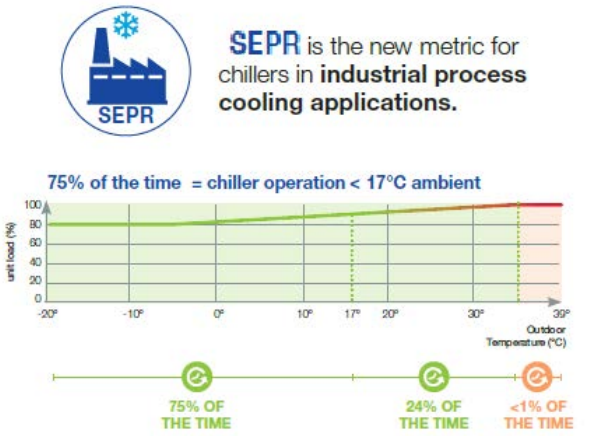
The SEER (Seasonal energy efficiency ratio) permits the evaluation of the average energy efficiency of comfort chillers, based on multiple operating conditions (load variation from 0% to 100%). From 1st January 2018, Tier 1 and from 1st January 2021, Tier 2, European member states will impose minimum SEER values to meet the requirements of Eco-design directive for ENER Lot 21 comfort cooling chillers. The Ecodesign Directive aims at minimizing the environmental impact of energy-related products under consideration of their full lifecycle.

EU ECODESIGN MEPS(*) for air-cooled chillers		Tier 1 (from 01/01/2018)	Tier 2 (from 01/01/2021)
SEER for comfort Chillers < 400 kW	kWh/ kWh	3,80	4,10
SEER for comfort Chillers > 400 kW	kWh/ kWh	4,10	4,55



SEPR for process chillers (in accordance with EU ECODESIGN)

The SEPR (Seasonal energy performance ratio) permits the evaluation of the average energy efficiency of process chillers, based on multiple operating conditions (load variation from 80% to 100%). From 1st January 2018, Tier 1 and from 1st January 2021, Tier 2, European member states will impose minimum SEPR values for process chillers to meet the requirements of Eco-design directive for ENER Lot 21 for high temperature process chillers (7°C to 12°C) and from 1st July 2018, for ENER Lot 1 for low temperature process chillers (-25°C to -8°C) and medium temperature process chillers (-8°C to 7°C). The Ecodesign Directive aims at minimizing the environmental impact of energy-related products under consideration of their full lifecycle. All process chillers marked with a CE label must meet the determined SEPR (Seasonal Energy Performance Ratio) value stipulated in EU Directive.



EU ECODESIGN MEPS(*) for air-cooled chillers		Tier 1 (from 01/07/2016)	Tier 2 (from 01/07/2018)
SEPR for medium temperature chillers < 300 kW	kWh/ kWh	2,24	2,58
SEPR for medium temperature chillers > 300 kW	kWh/ kWh	2,80	3,22

EU ECODESIGN MEPS(*) for air-cooled chillers		Tier 1 (from 01/01/2018)	Tier 2 (from 01/01/2021)
SEPR for high temperature Process Chillers < 400 kW	kWh/ kWh	4,50	5,00
SEPR for high temperature Process Chillers > 400 kW	kWh/ kWh	5,00	5,50

(*) Minimum Efficiency Performance Standards set by EU member states to comply with EU Ecodesign directive.

SOUND SPECTRUM

Acoustic spectrum and power of the standard unit

30KAV Standard unit		Octave bands (Hz) (1)							Sound power (2)	
		125	250	500	1k	2k	4k	8k		
500	dB	86	87	90	92	85	83	83	dB(A)	95
550	dB	86	86	92	92	86	80	82	dB(A)	95
600	dB	88	89	91	94	87	84	79	dB(A)	96
650	dB	90	90	96	90	92	86	81	dB(A)	98
720	dB	90	87	95	91	95	83	78	dB(A)	99
800	dB	90	93	97	91	91	84	80	dB(A)	98
900	dB	90	95	99	92	93	84	80	dB(A)	99
1000	dB	90	94	98	92	89	81	78	dB(A)	98
1100	dB	90	98	101	92	91	84	82	dB(A)	100

(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.

Acoustic spectrum and power of the unit + option 15 (Low noise level)

30KAV Unit + option 15		Octave bands (Hz) (1)							Sound power (2)	
		125	250	500	1k	2k	4k	8k		
500	dB	88	87	89	92	83	79	80	dB(A)	94
550	dB	87	87	92	90	85	78	81	dB(A)	94
600	dB	89	88	92	91	83	80	78	dB(A)	94
650	dB	89	88	97	88	88	81	78	dB(A)	96
720	dB	93	89	95	90	91	82	77	dB(A)	97
800	dB	91	89	94	91	87	84	80	dB(A)	96
900	dB	93	91	94	93	90	87	82	dB(A)	97
1000	dB	93	92	92	94	88	88	83	dB(A)	97
1100	dB	94	93	93	95	89	89	85	dB(A)	98

(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.

Acoustic spectrum and power of the unit + option 15LS (Very low noise level)

30KAV Unit + option 15LS		Octave bands (Hz) (1)							Sound power (2)	
		125	250	500	1k	2k	4k	8k		
500	dB	85	85	85	86	81	78	82	dB(A)	90
550	dB	79	83	86	88	78	72	81	dB(A)	90
600	dB	82	87	88	87	80	78	77	dB(A)	90
650	dB	85	87	90	86	85	79	79	dB(A)	92
720	dB	93	90	89	90	85	84	79	dB(A)	94
800	dB	86	89	90	87	84	81	79	dB(A)	92
900	dB	93	91	90	91	85	83	80	dB(A)	94
1000	dB	88	91	90	89	82	83	80	dB(A)	93
1100	dB	85	91	91	90	83	83	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.

SOUND SPECTRUM

Acoustic spectrum and power of units with option 119 (High energy efficiency) or option 119+ (High energy efficiency+)

30KAV Unit + option 119/119+		Octave bands (Hz) (1)							Sound power (2)	
		125	250	500	1k	2k	4k	8k		
500	dB	88	88	91	93	86	84	83	dB(A)	96
550	dB	88	88	93	93	87	80	82	dB(A)	96
600	dB	89	89	92	94	87	84	79	dB(A)	97
650	dB	91	90	97	91	92	86	81	dB(A)	98
720	dB	90	88	95	92	95	83	78	dB(A)	99
800	dB	91	93	98	92	91	84	80	dB(A)	98
900	dB	90	95	99	92	93	84	81	dB(A)	100
1000	dB	91	95	99	93	89	82	78	dB(A)	98
1100	dB	91	98	101	93	91	84	82	dB(A)	100

(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.

Acoustic spectrum and power of units with option 15 (Low noise level) and option 119 (High energy efficiency) or option 119+ (High energy efficiency+)

30KAV Unit + option 15 + option 119/119+		Octave bands (Hz) (1)							Sound power (2)	
		125	250	500	1k	2k	4k	8k		
500	dB	90	89	90	93	84	80	81	dB(A)	95
550	dB	89	88	93	91	86	79	81	dB(A)	95
600	dB	89	88	92	91	84	81	78	dB(A)	94
650	dB	90	88	97	89	88	81	78	dB(A)	96
720	dB	93	90	95	91	91	82	77	dB(A)	97
800	dB	92	90	95	92	88	84	80	dB(A)	96
900	dB	94	92	94	93	90	87	82	dB(A)	98
1000	dB	93	92	93	94	89	88	83	dB(A)	98
1100	dB	94	93	93	95	90	89	85	dB(A)	98

(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.

Acoustic spectrum and power of units with option 15LS (Very low noise level) and option 119 (High energy efficiency) or option 119+ (High energy efficiency+)

30KAV Unit + option 15LS + option 119/119+		Octave bands (Hz) (1)							Sound power (2)	
		125	250	500	1k	2k	4k	8k		
500	dB	82	85	86	86	81	78	82	dB(A)	90
550	dB	81	84	87	88	79	72	81	dB(A)	91
600	dB	83	87	88	87	81	78	78	dB(A)	91
650	dB	85	87	90	86	85	79	79	dB(A)	92
720	dB	92	90	89	90	85	84	79	dB(A)	94
800	dB	89	90	90	88	84	81	80	dB(A)	92
900	dB	90	91	90	90	84	83	80	dB(A)	94
1000	dB	85	91	90	89	82	83	80	dB(A)	93
1100	dB	86	91	91	90	84	83	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.

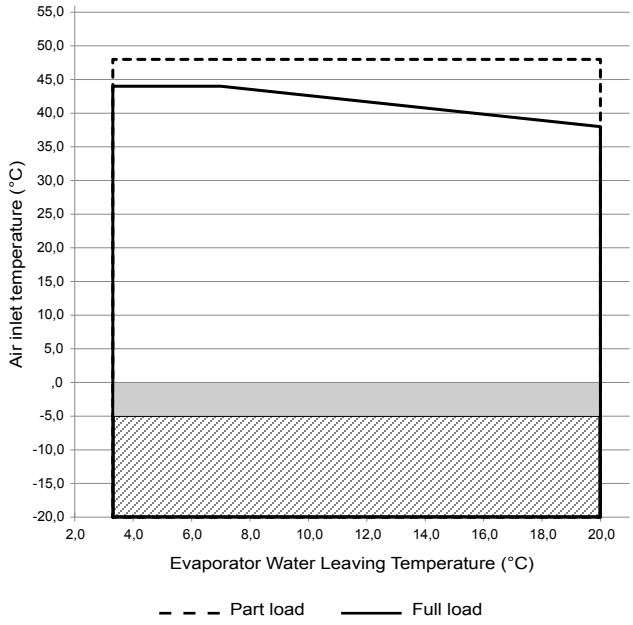
OPERATING RANGE

Evaporator water temperature		Minimum	Maximun
Entering temperature at start-up	°C	-	45(1)
Entering temperature during operation	°C	6,8	25
Leaving temperature during operation	°C	3.3(2)	20
Condenser air temperature		**Minimum**	**Maximun**
Storage	°C	-20	68
Operation			
Standard unit	°C	-20(4)	48(1)
Unit + option 16(3)	°C	-20(4)	55(1)

NOTES:
- The use of brine or antifreeze protection option is required if the water outlet temperature is below 4 °C.
- If the air temperature is below 0 °C, a glycol/water solution or the freeze protection option must be used.

(1) Operating at partial load
(2) According to the type of installation and air temperature
(3) Option 16 = High ambient temperature
(4) Option 41A mandatory for start-ups below -5 °C

Standard Unit



NOTES:
- Evaporator ΔT = 5K.
- These ranges are given for indicative purpose. Check the operating range from Carrier electronic catalogue.

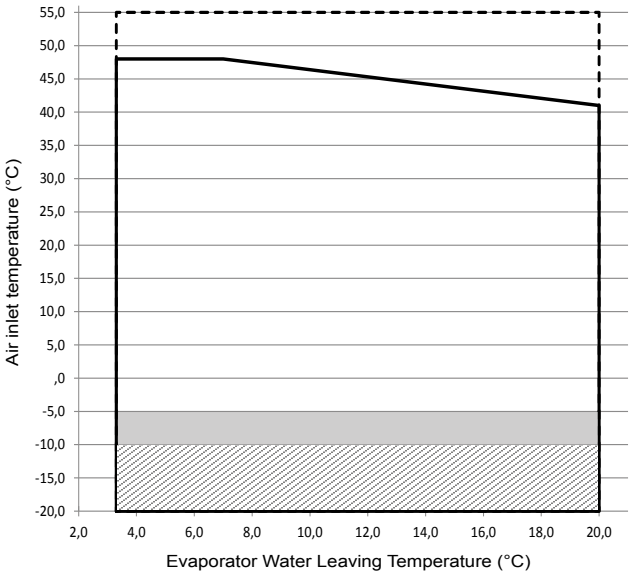
Legend

Operating range, standard units

Below 0 °C air temperature the unit must either be equipped with the evaporator frost protection option 41A, or the water loop must be protected against frost by using a frost protection solution (by the installer).

For start-ups with air temperature below -5 °C, the machine must be equipped with option 41A.

Unit with opt. High ambient temperature (opt. 16)



NOTES:
- Evaporator ΔT = 5K.
- These ranges are given for indicative purpose. Check the operating range from Carrier electronic catalogue.

Legend

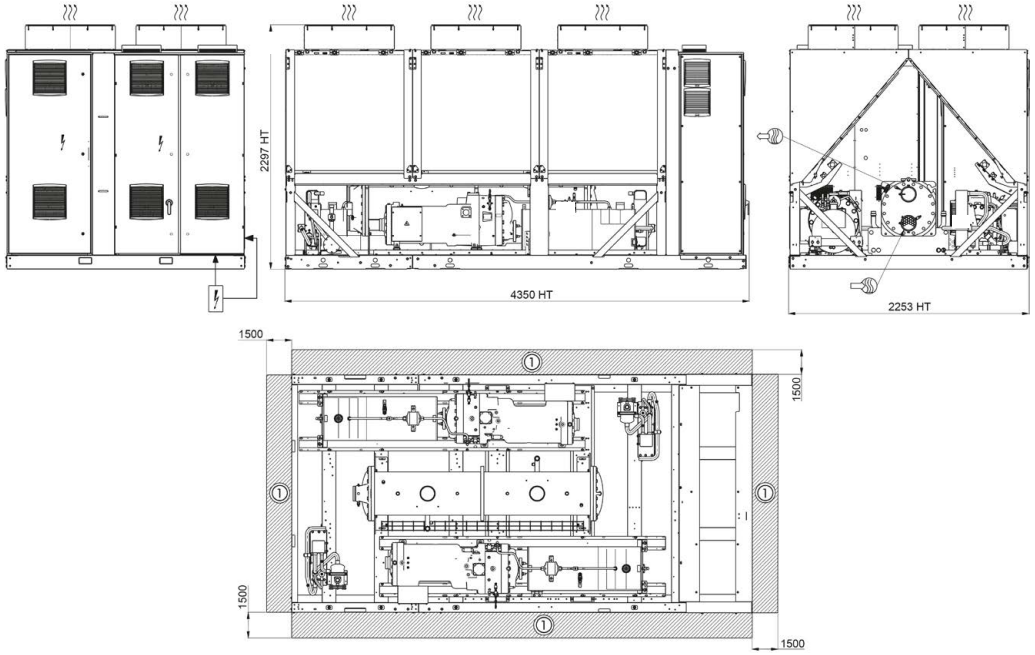
Operating range, standard units

Below 0 °C air temperature the unit must either be equipped with the evaporator frost protection option 41A, or the water loop must be protected against frost by using a frost protection solution (by the installer).

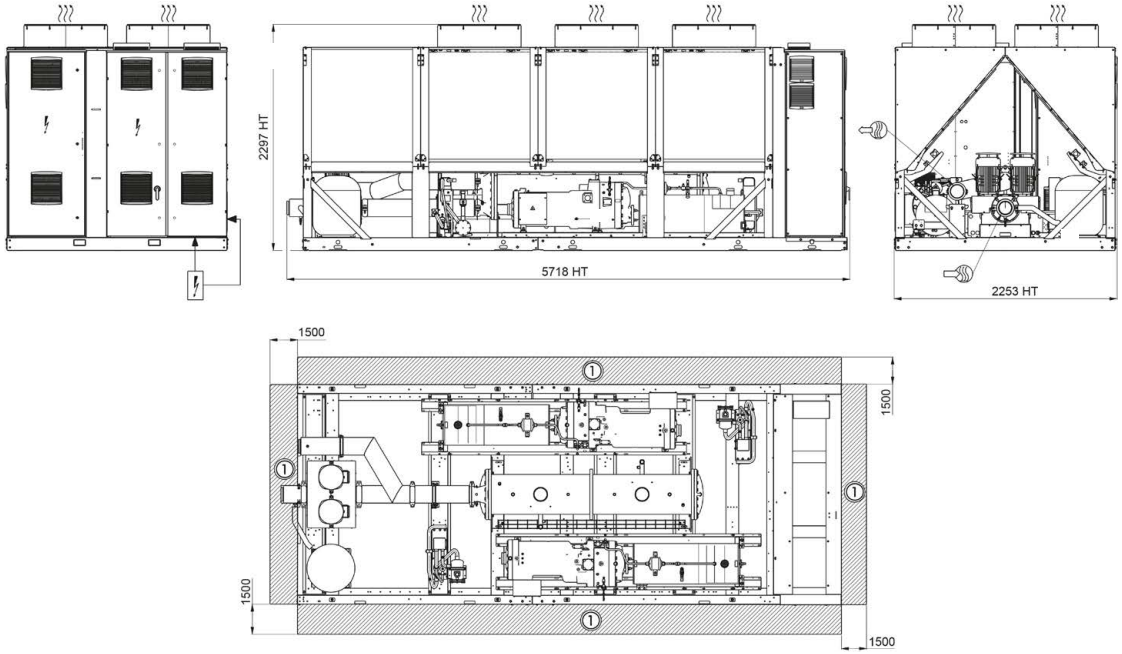
For start-ups with air temperature below -5 °C, the machine must be equipped with option 41A.

DIMENSIONS/CLEARANCES

30KAV 500 & 550 without Hydraulic module



30KAV 500 & 550 with Hydraulic module



Legend

All dimensions are given in mm.

- ① Required clearances for maintenance (see note)
- Water inlet for standard unit
- Water outlet for standard unit
- Air outlet – do not obstruct
- Power electrical connection

NOTES:

Drawings are not contractually binding.

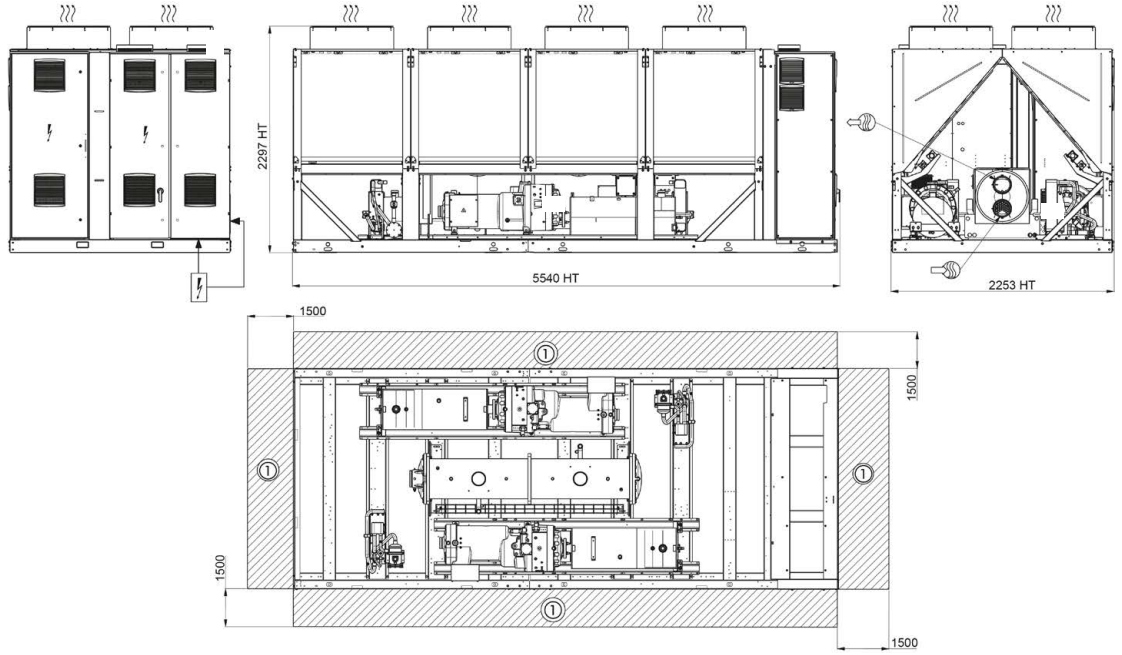
Before designing an installation, consult the certified dimensional drawings, available on request.

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

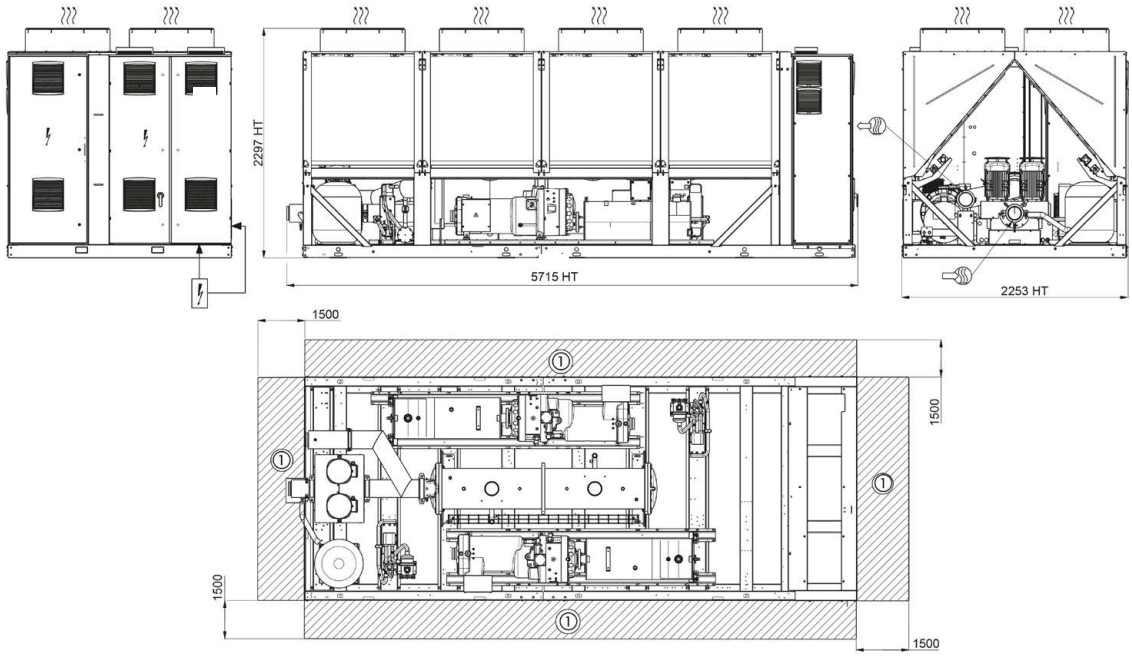
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required.

DIMENSIONS/CLEARANCES

30KAV 600 & 650 without Hydraulic module



30KAV 600 & 650 with Hydraulic module



Legend

All dimensions are given in mm.

- ① Required clearances for maintenance (see note)
- Water inlet for standard unit
- Water outlet for standard unit
- Air outlet – do not obstruct
- Power electrical connection

NOTES:

Drawings are not contractually binding.

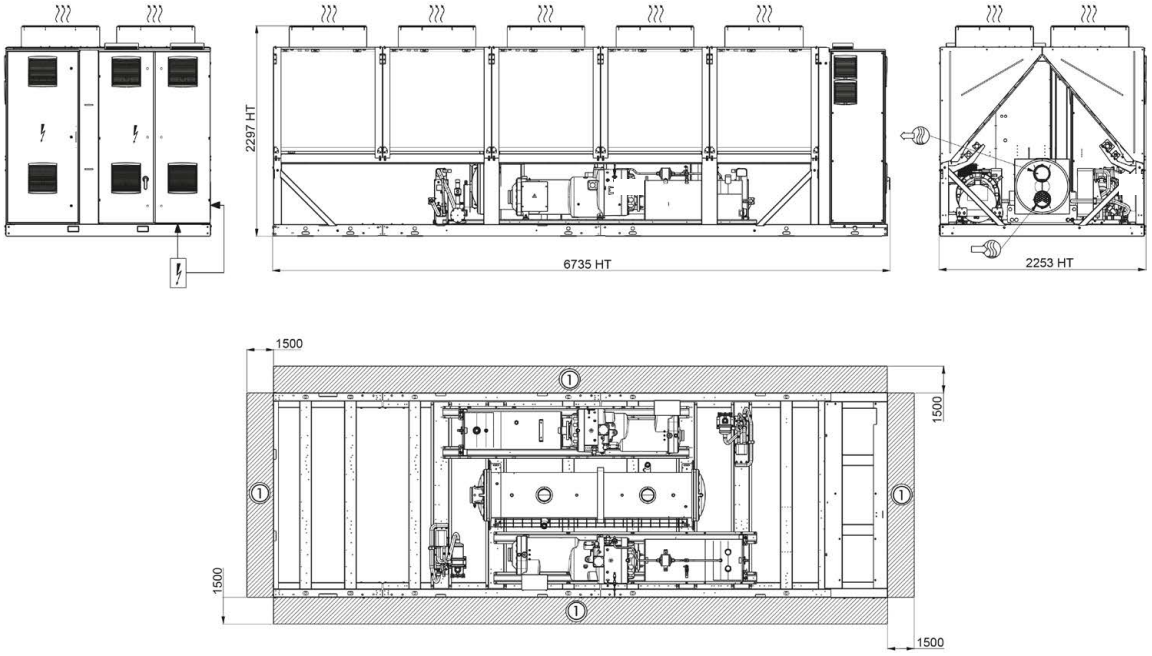
Before designing an installation, consult the certified dimensional drawings, available on request.

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

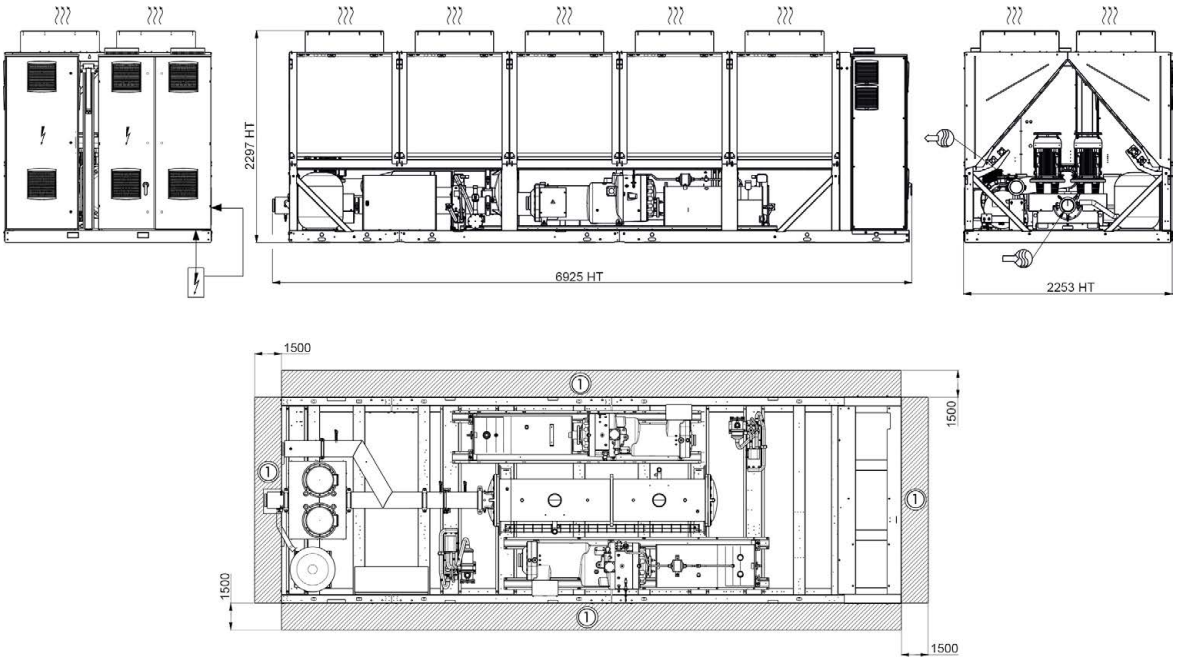
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required.

DIMENSIONS/CLEARANCES

30KAV 500, 550, 600 & 650 opt. 119/119+ 30KAV 720 & 800 without Hydraulic module



30KAV 500, 550, 600 & 650 opt. 119/119+ & 30KAV 720 & 800 with Hydraulic module



Legend

All dimensions are given in mm.

- ① Required clearances for maintenance (see note)
- Water inlet for standard unit
- Water outlet for standard unit
- Air outlet – do not obstruct
- Power electrical connection

NOTES:

Drawings are not contractually binding.

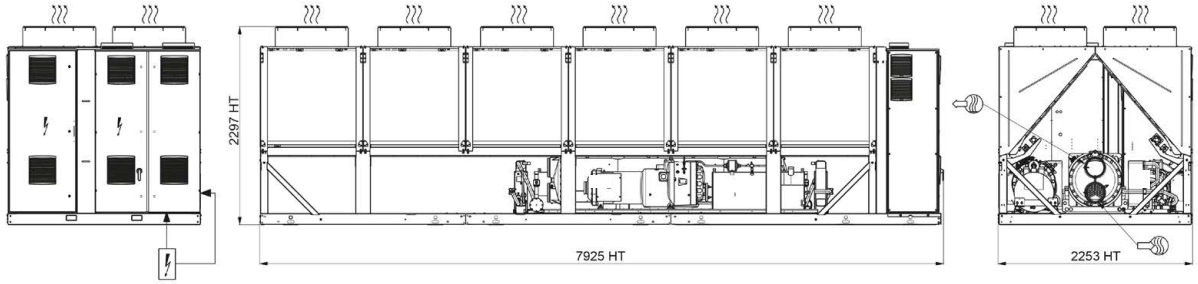
Before designing an installation, consult the certified dimensional drawings, available on request.

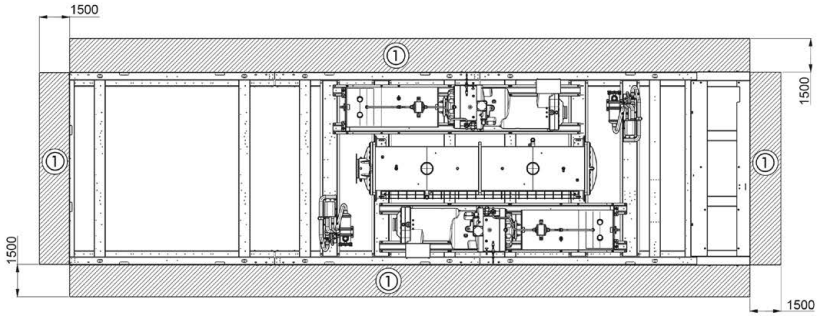
For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings.

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required.

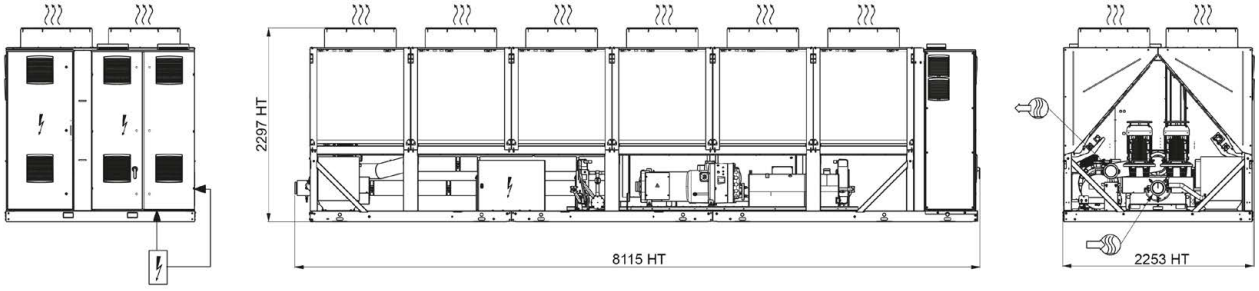
DIMENSIONS/CLEARANCES

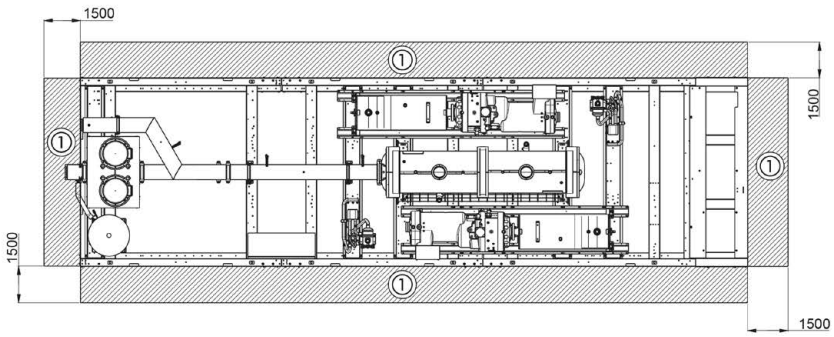
30KAV 720 opt. 119/119+ 30KAV 900 & 1000 without Hydraulic module





30KAV 720 opt. 119/119+ with Hydraulic module





Legend

All dimensions are given in mm.

- ① Required clearances for maintenance (see note)
- Water inlet for standard unit
- Water outlet for standard unit
- Air outlet – do not obstruct
- Power electrical connection

NOTES:

Drawings are not contractually binding.

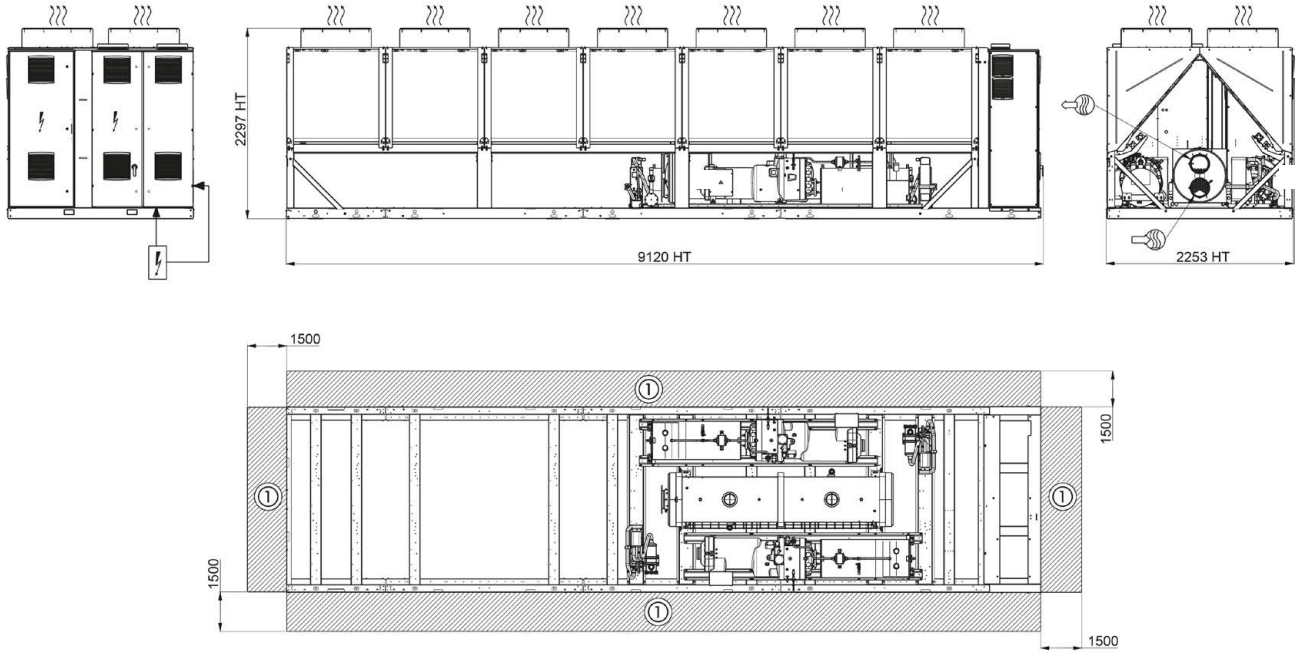
Before designing an installation, consult the certified dimensional drawings, available on request.

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

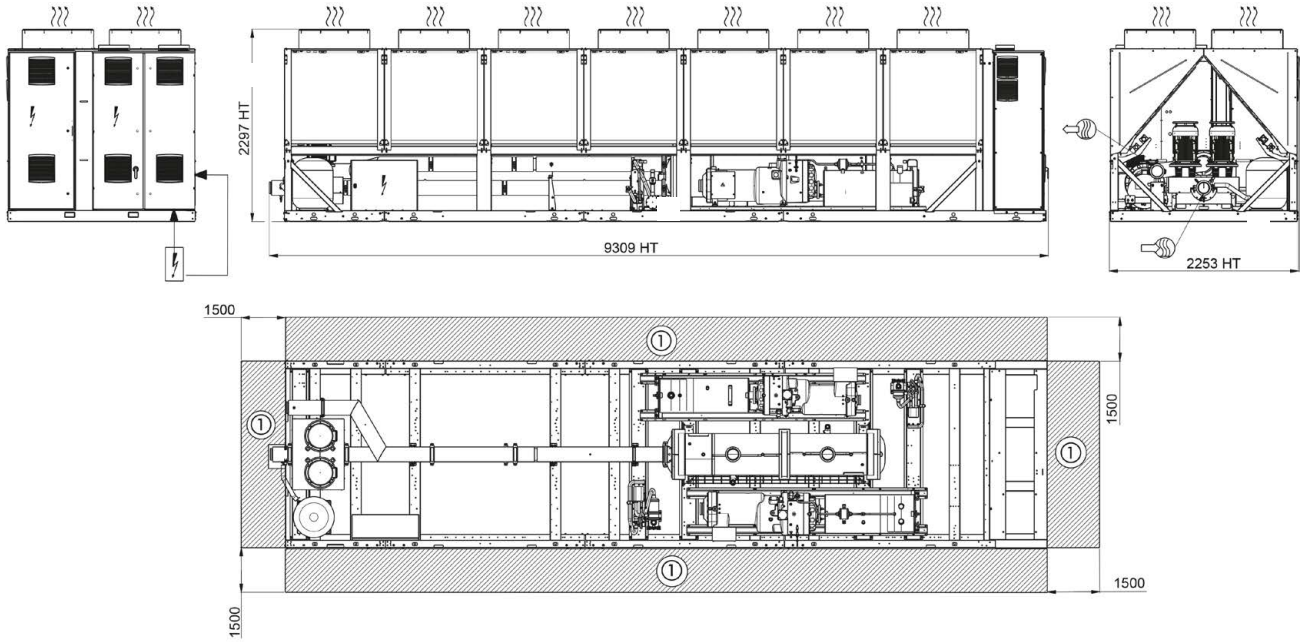
If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required.

DIMENSIONS/CLEARANCES

30KAV 800 & 900 opt. 119/119+ 30KAV 1100, without Hydraulic module



30KAV 800 opt. 119/119+ with Hydraulic module



Legend

All dimensions are given in mm.

- ① Required clearances for maintenance (see note)
- Water inlet for standard unit
- Water outlet for standard unit
- Air outlet – do not obstruct
- Power electrical connection

NOTES:

Drawings are not contractually binding.

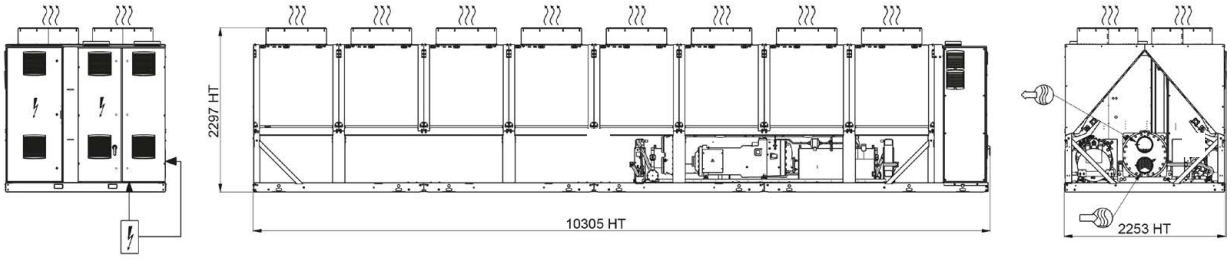
Before designing an installation, consult the certified dimensional drawings, available on request.

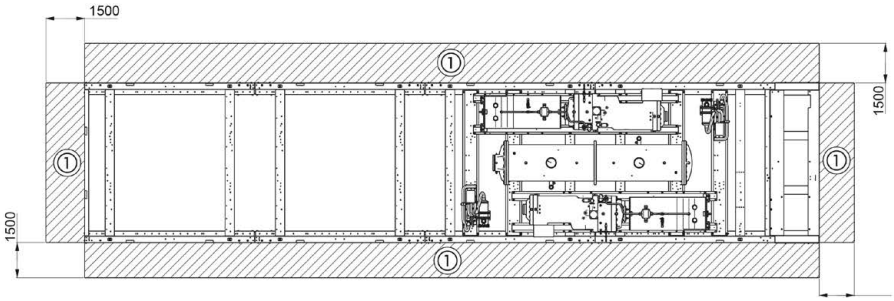
For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings.

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required.

DIMENSIONS/CLEARANCES

30KAV 1000 & 1100 opt. 119/119+





Legend

All dimensions are given in mm.

① Required clearances for maintenance (see note)

Water inlet for standard unit

Water outlet for standard unit

Air outlet – do not obstruct

Power electrical connection

NOTES:

Drawings are not contractually binding.

Before designing an installation, consult the certified dimensional drawings, available on request.

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

If any unit(s) are close to walls, please refer to chapter "Distance to the wall" of this document to determine the space required.

Multiple chiller installation

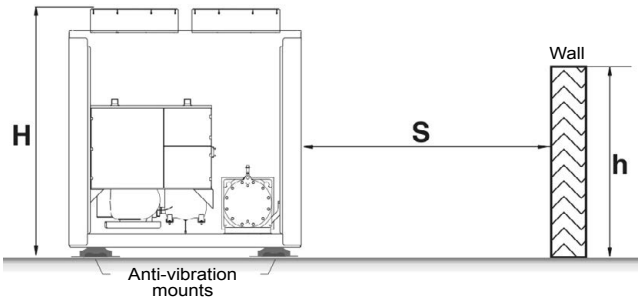
It is recommended to install multiple chillers in a single row, arranged as shown in the example below, to avoid recycling of warm air from one unit to another.

If the situation at the site does not permit this arrangement, contact your Carrier distributor to evaluate the various possible arrangements. In certain situations an accessory (supplied loose at the time of purchase) can be added.

Distance to the wall

To ensure correct operation for most cases:

- If h < H (2,3 m), S minimum = 3 m
- If h > H ou S < 3 m, contact your Carrier distributor to evaluate the various possible arrangements. In certain situations an accessory (supplied loose at the time of purchase) can be added.



SPECIFICATION GUIDE

General description

Factory assembled single piece air-cooled chiller, shall include all factory wiring, piping, controls, refrigerant charge (R134a), completely independent refrigerant circuits, variable-speed twin screw compressors, variable-speed fans or EC fans, flooded shell and tube evaporator, electronic expansion valves, smart energy monitoring (Estimated measure of cooling capacity, electrical power input and unit energy performance, instantaneous and cumulative).

The unit performances shall be certified by Eurovent or AHRI independent testing laboratory.

The unit shall operate at full load up with ambient temperatures ranging from -20°C to 48°C (with high ambient option) without tripping and without the use of additional adiabatic systems

Quality assurance

Unit shall be rated in accordance with EN14511, EN14825 and AHRI 550/590 standards, latest revisions, and unit performances shall be AHRI and Eurovent certified by independent certification body.

Unit without independent Eurovent or AHRI certification shall be excluded.

Unit construction shall comply with European directives:

- From 1st January 2018, commission regulation (EU) N°2016/2281 implementing Directive 2009/125/EC with regards to Eco-design requirements for ENER Lot 21 comfort cooling chillers
- Commission regulation (EU) N°640/2009 implementing Directive 2009/125/EC with regards to Eco-design requirements for electrical motors
- From 1st January 2015, commission regulation (EU) N°547/2012 implementing Directive 2009/125/EC with regards to Eco-design requirements for water pumps (unit equipped with Hydraulic module option)
- Pressurised equipment directive (PED) 97/23/EC
- Machinery directive 2006/42/EC, modified
- Low voltage directive 2006/95/EC, modified
- Electromagnetic compatibility directive 2004/108/EC, modified, and the applicable recommendations of European standards
- Machine safety: Electrical equipment in machines, general requirements, EN 60204-1
- Electromagnetic compatibility emission EN 61800-3, Category C3
- Electromagnetic compatibility immunity EN61000-6-2
- Directive 2009/125/EC with regard to ecodesign requirements for fans driven by motors with an electric input power between 125 W and 500 kW
- Directive 2005/32/EC with regard to ecodesign requirements for electric motors
- (if pumps on board) Directive 2009/125/EC with regard to ecodesign requirements for water pumps
- (Carrier option 282) Electromagnetic compatibility emission EN61800-3, Category C2.

Unit shall be designed, manufactured and tested in a facility with a quality management system certified ISO 9001 and environmental management system ISO 14001.

Unit shall be run tested at the factory.

Design performance data following European EN14825 & EN14511 standards

- Cooling capacity (kW): ……
- Unit power input (kW): ……
- Part load energy efficiency, SEER 12/7 (kW/kW): ……
- Part load energy efficiency, SEPR 12/7 (kW/kW): ……
- Full load energy efficiency, EER (kW/kW): ……
- Eurovent class: .....
- Evaporator entering/leaving water temperature (°C): … /
- Fluid type: ……
- Fluid flow rate (l/s): ……
- Evaporator pressure drops (kPa): ……
- Outdoor air temperature (°C): ……
- Sound power level at full load (dB(A)): ……
- Dimensions, length x depth x height (mm): … x … x ...

Performance shall be declared in accordance either with EN14511 or EN14825 and certified by Eurovent, or to AHRI 550/590 standard and certified by AHRI.

Sound power level at 75%, 50% and 25% load shall be available on demand from the manufacturer.

The unit shall operate at full load with ambient temperatures ranging from -20 °C to 44°C or 48°C (with high ambient option) without use of additional adiabatic cooler systems, with evaporator leaving liquid temperature between 3.3 and +20 °C.

The machine shall continue to operate (at reduced capacity) in ambient temperatures up to 48°C as standard and up to 55°C with high ambient option.

Frame

- Machine frame and enclosure shall be made of galvanised sheet steel.
- Frame and enclosure shall be painted in oven-baked polyester powder paint in light grey colour (RAL 7035).
- Removable panels and electrical panel doors shall be accessible by 1/4-turn screws.
- (Carrier option 23) Machine shall be protected from foreign bodies through the use of metal grilles factory-mounted on three vertical faces. Coil refrigerant connections shall be covered by side panels of galvanised sheet steel, for enhanced aesthetics and safety during transportation.
- (Carrier option 23A) Coil refrigerant connections shall be covered by side panels of galvanised sheet steel, for enhanced aesthetics and safety during transportation.

SPECIFICATION GUIDE

Compressor

- Unit shall have semi-hermetic variable-speed driven twin-screw compressors with internal relief valve and check valve to avoid reverse rotation on shutdown.
- Compressor shall be equipped with an integrated resonator array to reduce discharge gas pulsations.
- Compressor bearings shall be designed for minimum 100 000 hours.
- Capacity control shall be provided by air-cooled variable-speed drive for maximum reliability.
- Compressor capacity control shall be stepless from 100% to 20% load.
- Compressor shall start in unloaded condition.
- Motor shall be cooled by suction gas and protected through a dedicated electronic board against the following: Thermal overload by internal winding temperature sensors, electrical overload and short circuit by dedicated fuses (one per phase), reverse rotation, loss of phase and undervoltage and power supply failure.
- Lubrication oil system shall include pre-filter and external filter capable of filtration to 5 microns .
- The oil filter line shall be equipped with service shut off valves for easy filter replacement.
- The oil separator, separated from the compressor, shall not require an oil pump and shall include an internal muffler to reduce discharge gas pulsations.
- The oil separator shall be designed for 2100 kPa working pressure.
- The oil separator shall include a temperature actuated heater and an oil level safety switch.
- Compressors shall be installed on flexible anti-vibration mounts and isolated from the main unit chassis.
- (Carrier opton 93A) Each compressor shall be equipped with a discharge shut-off valve.
- (Carrier option 15 or 15LS) Each compressor shall be installed within an insulated acoustic enclosure with removable panels to facilitate service access.

Evaporator

- Unit shall be equipped with a single flooded evaporator.
- Evaporator shall be manufactured by the chiller manufacturer.
- Evaporator shall be tested and stamped in accordance with the European directive for pressurised equipment 97/23/EC.
- The maximum refrigerant-side operating pressure will be 2100 kPa, and the maximum waterside pressure will be 1000 kPa (2100 kPa as an option).
- The evaporator shall be mechanically cleanable, shell-and-tube type with removable heads.
- Tubes shall be internally and externally grooved, seamless-copper, and shall be rolled into tube sheets.
- Shell shall be insulated with 19 mm closed-cell foam with a maximum K factor of 0.28. Evaporator thermal insulation shall be factory fitted.
- The evaporator shall have a drain and vent in each head.
- Chiller shall have only one water inlet and outlet connection with Victaulic couplings to avoid vibration transmission and to accommodate minor pipework misalignment (Victaulic adapter kit shall be available on demand).
- Evaporator shall be fitted with electronic auto setting water flow switch. Paddle switches or differential pressure switches shall not be acceptable.
- (Carrier option 281) Unit shall be fitted with a cooler jacket to protect the insulation from the long-term effects of UV radiation.

Condenser

- Condenser coils shall be W-shaped to ensure compact dimensions.
- Coils shall be entirely made of aluminium alloy, micro-channels type.
- Coils shall be leak-tested at 15.5 bar.
- (Carrier option 262) Coils shall be suitable for installations in moderately corrosive environment. The protection shall consist on a nano-scale conversion coating, 100 to 200 nm thick, which uniformly covers the entire surface of the coil. Non conversion coating shall not be accepted. The coating process shall include immersion in a coating bath. The coating shall be applied by an autocatalytic conversion process which shall modify the surface of the aluminum producing a coating that is integral to the coil. Complete immersion shall ensure that 100% of the surface is coated, forming a continuous and even film. Spray coating process shall not be accepted. The coating shall be integral to the MCHE and shall not flake or loose adhesion with cross hatch adhesion of 5B per ASTM D3359. The thin coating shall have no variation in heat transfer on air flow per ARI 410. The coating shall utilize corrosion inhibitors which actively arrest damage due to environmental or mechanical damage. Corrosion durability of coated microchannel coils shall be confirmed through testing to no less than 5000 hours constant neutral salt spray per ASTM B117.
- (Carrier option 263) Coils shall be suitable for installations in the most severe environments. The protection shall consist on a flexible epoxy polymer coating uniformly applied to all coil external surface areas without material bridging between fins and louvers. The coating process shall be an electrocoating process with immersion in a coating bath and a final UV protective topcoat to shield the fins from ultraviolet degradation and to ensure coating durability and long life. Spray coating and non-electrocoating shall not be accepted. Coating process shall ensure complete coil encapsulation, including all exposed fin edges. The coating shall have a uniform thickness of 20 to 40 µm on all external coil surface areas including fin edges. The coating shall have minimal variation (<1%) in heat transfer on air flow per ARI 410. The coating shall have superior hardness characteristics of 2H per ASTM D3363 and cross hatch adhesion of 4B-5B per ASTM D3359. Impact resistance shall be up to 100 in/lb (ASTM D2794). Corrosion durability of coated microchannel coils shall be confirmed through testing to no less than 5000 hours constant neutral salt spray per ASTM B117.

SPECIFICATION GUIDE

Fans

- (30KAV, 30KAV with option 119) Fans shall be variable-speed AC fans with one or more variable-speed drive per refrigerant circuit.
- (30KAV with option 17 or 119+) Fans shall be variable-speed EC fans,
- Fans shall be direct-drive, equipped with an impeller with 9 aerodynamic blades and a rotating shroud to ensure optimal leak-tightness between the blades and the fan housing.
- Fans impellers shall be of one-piece and made of a corrosion-resistant composite material, and statically and dynamically balanced.
- The three-phase electric motors shall have isolation class F, IP 55 protection and a minimum efficiency of 80%. They shall have individual overload protection via a disconnect switch.

Refrigerant circuit

- Chillers shall have 2 independent refrigerant circuits
- Refrigerant circuit components shall include: Compressor, oil separator, high and low side pressure relief devices, economizer, filter driers, moisture indicating sight glasses, long stroke electronic expansion device, and complete operating charge of both refrigerant R134a and compressor oil.
- (Carrier option 92) For each refrigerant circuit, a compressor suction and discharge line shut off valve, an evaporator inlet valve and economizer line valve, shall be mounted to isolate all main components (filter drier, oil filter, expansion device and compressor) and allow refrigerant to be safely stored during service operation.
- (Carrier opton 93A) Each compressor shall be equipped with a discharge shut-off valve.

Power control boxes

- Unit shall operate at 400 Volts (+/- 10%), 3-phases, 50 Hertz power supply without neutral.
- Unit shall be designed for simplified connection on TN(s) networks.
- Control circuit voltage shall be 24 V maximum, supplied by a factory-installed transformer.
- Unit shall be supplied with factory-installed main circuit breaker/isolator.
- Unit shall have single point power connection.
- The inverter driven compressor motors start up current shall be less than the full load operating current.
- Displaclement power factor at full load should be higher than 0.97.
- The unit shall be certified for EMC compliance, in accordance with EN61800-3, category C3 (industrial unrestricted environment).
- (Carrier option 282) The unit shall be certified for EMC compliance, in accordance with EN61800-3, category C2 (residential restricted environment).
- Power control box is powder painted with hinged and gasket sealed doors and is protected to IP44CW.
- (Carrier option 20A) The power control box shall be protected to IP54 to ensure safe operation for installations in polluted environment.

Controls

- Unit control shall include as a minimum: Microprocessor with non-volatile memory, picture guided unit/operator interface, the LOCAL/OFF/REMOTE/CCN selector and a 7 inches coloured touch-screen display with 10 language capability. German, English, Spanish, French, Italian, Dutch, Portuguese, Turkish, Russian and one additional language on customer choice (downloadable on job site)
- Unit control shall have an IP port to permit user connection via web browser, allowing same level of access to control menus as unit mounted interface (excluding start/stop and alarm reset capabilities).
- Pressure sensors shall be installed to measure suction, discharge, and oil pressure.
- Temperature probes shall be installed to read cooler entering and leaving temperatures and outdoor air temperature.
- (Carrier option 148B) A bi-directional communication board shall allows plug and play interfacing of the machine with any BMS using the J-Bus protocol.
- (Carrier option 148D) A bi-directional communication board shall allows plug and play interfacing of the machine with any BMS using the LonTalk protocol.
- (Carrier option 149) Machine shall be supplied with factory-installed bi-directional high-speed communication using BACnet protocol over Ethernet network (IP-connection). The BACnet over-IP communication shall have no limitation in reading/writing controller points and shall use standardised alarm codes as defined with BACnet protocol (Filed programming may be required).
- (Carrier option 298) Machine shall be accessible via wireless connection for remote monitoring to facilitate preventive maintenance.

Unit shall be capable of performing the following functions:

- Electronic expansion valve control optimising evaporator refrigerant charge while ensuring minimum refrigerant superheat and optimum subcooling at condenser outlet
- Capacity control based on leaving chilled fluid temperature
- Limitation of the chilled fluid-temperature pull-down rate at start-up to an adjustable range of 0.1 °C to 1.1 °C per minute to prevent excessive demand spikes at start-up
- Automatic change-over and cycling of compressors to equalise running hours and number of starts
- Reset of leaving chilled-water temperature based on the outdoor air temperature or via 0-10 V signal (as option)
- Dual set point management for the leaving chilled water temperature activated by a remote contact closure signal or by the built in time clock
- 2-level demand limit control (between 0 and 100%) activated by remote contact closure or by the built in time clock
- Time scheduling management to enable unit start-up control, demand limit and set-point changes
- Trending of main variables (accessible by web browser only)
- (Carrier option 58) lead/lag type control of two chillers running in series or parallel
- (Carrier option 116) Evaporator pump control, including additional safety pump

- (Carrier opton 156) The following inputs contacts shall be available on the unit control board:
  - Setpoint reset by indoor air temperature sensor
  - Cooling setpoint reset by 4-20 mA
  - Time schedule override
  - Ice storage input
  - Demand limit
  - Unit shut down

  The following outputs contacts shall be available on the unit control board:
  - Instantaneous chiller capacity by 0-10 V signal
  - Complete shut-down due to a chiller fault
  - Compressor operation indication.

Smart energy monitoring

Control interface shall be capable of displaying the following smart data for energy monitoring in real-time:

- Cooling capacity (kW and kWh)
- Energy consumption (kW and kWh)
- EER value (kW/kW)
- Integrated EER (kWh/kWh)

Refrigerant leak alert

The liquid chiller shall be equipped as standard with an automatic refrigerant leak detection algorithm:

- Indicates serious refrigerant loss detection at any point on the system.
- Sensitivity: 25% refrigerant charge loss per circuit (depending on the conditions).

Refrigerant leak detection (option 159)

Available as an option, an additional dry-contact shall allow reporting of possible leaks. The leak detector (by others) should be mounted in the most likely leak location.

Diagnosis

- Control interface shall be capable of displaying set points, system status including temperatures, pressures, current for each compressor, run time and percent loading.
- Control interface shall perform trending of up to 10 preselected variables.
- Control system shall allow a quick test of all the machine elements to verify the correct operation of every switch, circuit breaker, contactor, etc. before the chiller is started.
- In case of alarm, the control system shall send an email to specific mail box set by the user during machine commissioning.
- Control shall have a black box function capable of storing a data set of 20 variables, at intervals of 5 seconds, for 14 minutes preceding the alarm and 1 minute after the alarm. The black box shall be able to record 20 events. Once this threshold is reached, new data shall over-write the oldest record.

Safeties

Control system shall provide the unit with protection against the following:

- Reverse rotation
- Low chilled water temperature
- Low oil pressure (per compressor)
- Current imbalance
- Compressor thermal overload
- High pressure (with automatic compressor unloading in case of excessive condensing temperature)
- Electrical overload and short circuit
- Loss of phase, undervoltage and power supply failure
- Control shall provide separate general alert (minor incident) and alarm (circuit down) remote indication.

Hydraulic module

Carrier 30KAV sizes 500 to 800 with option 116, unit shall be equipped with variable-speed dual pumps to provide energy savings and pump redundancy. Each pump motor shall be driven by a dedicated variable-speed drive for true pump redundancy.

A choice of different variable-speed dual pumps for digital water flow control shall be available:

- Dual high-pressure variable-speed pumps
- Dual low-pressure variable-speed pumps

3 pump control modes shall be available:

- Constant water flow with possibility to reduce the pump speed when there is no cooling demand
- Variable water flow with constant delta T control
- Variable water flow with constant delta P control

The nominal water flow control shall be done electronically through the unit user interface. Manual water flow control with a water regulating valve is not recommended to avoid excessive pump energy consumption.

The unit control shall automatically manage the change-over and cycling of pumps to equalize running hours and number of starts.

The hydraulic module shall include the following elements:

- Removable screen filter
- Centrifugal monocell dual water pump with three-phase motor equipped with internal over-temperature protection
- Each pump motor shall be driven by a dedicated variable-speed drive for true pump redundancy.
- Electronic water flow switch without paddle
- Pressure transducers for water pressure electronic readings and digital nominal water flow setting on user display
- Relief valve set at 4 bar
- The water pump shall be isolated from the chiller structure and water piping by anti-vibration mountings and and flexible connections, in order to limit vibration and noise transmission
- The water piping shall be protected against corrosion and equipped with drain and purge plugs.
- The hydraulic connections shall be Victaulic type
- Both pump and piping shall be fully insulated with polyurethane foam
- Piping frost protection shall be guaranteed down to -20°C by automatic pump activation when liquid temperature falls below a safety limit
- (Carrier option 41B) Pumps frost protection shall be guaranteed down to -20°C by electric resistance heaters
- (Carrier option 88A) Pumps shall be covered with an aluminum jacket to protect the insulation from the long-term effects of UV radiation
- (Carrier option 293) The hydraulic module shall include an expansion tank designed for 6 bar maximum pressure.

Quality and Environment
Management Systems
Approval

Order No.: 10202, 10.2017. Supersedes order No.: New.
Manufacturer reserves the right to change any product specifications without notice.

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