



United Technologies

PRODUCT SELECTION DATA



- Low energy consumption
- Built in reliability and easy servicing
- Minimised operating sound levels
- Improved electrical performance

Variable-Speed Air-Cooled Screw Chillers

30XAV 500 - 1150



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30XAV 500 - 1150

Nominal cooling capacity 504-1138 kW

Introduction

The Aquaforce 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 units are designed to operate up to 50 °C outside air temperature*.

The 30XAV units are designed to meet current and future 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:

- Exclusive high-efficiency variable-speed screw of the proven traditional Carrier twin-screw compressor design
- New Touch Pilot™ control
- Variable-speed condenser fans
- Mechanically cleanable flooded evaporator
- Novation® heat exchanger with micro-channel coil technology.

As standard, the unit can provide an evaporator leaving temperature down to 3.3 °C with proven operation for outdoor air temperatures ranging from -20 °C to 50 °C*.

Furthermore, with 30XAV, Carrier offers its unique expertise and know-how to take care of the machine long after the sale. With the new "CARRIER CONNECT" system in fact, energy and facility managers and end-users in general can rely on the most qualified remote monitoring services.

Customer benefits

Low energy consumption

- The 30XAV is designed for high performance both at full and part load: ESEER up to 4,9 and EER up to 3,4.
- The high energy efficiency is reached through:
 - Inverter-driven twin-rotor screw compressors allowing precise capacity control and reducing unit power input, especially at part-load
 - Inverter-driven fan motors minimising power consumption while granting optimum air flow
 - All aluminum condenser with high-efficiency micro-channel coils technology
 - Flooded shell-and-tube evaporator characterised by high efficiency of heat exchange
 - 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 compliancy with Class 3 requirements of the EU standard EN61800-3 (Class 2 is possible as an option).

Built-in reliability and easy servicing

The 30XAV units offer increased global performance as well as Carrier's acclaimed product quality and reliability. Major components are selected and tested to minimise failures possibility, as well as many design choices have been taken in this perspective.

- Screw compressors with Greenspeed® Intelligence:
 - The screw compressors are industrial-type with oversized bearings and motor cooled by suction gas, with a proven failure rate lower than 0.1%.
 - The inverter is specifically sized for each compressor motor to ensure reliable operation and easy maintenance.
 - All components related to the compressor assembly are easily accessible on site minimising down-time.
- Fans with Greenspeed® Intelligence:
 - 4th generation of Flying Bird fans equipped with inverter-driven asynchronous motors
 - The inverter is sized to manage a group of fan motors reducing first cost while ensuring optimum air flow management.
 - The inverters for fan speed control are easily accessible on site for easy servicing.
- Air condenser:
 - All 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.

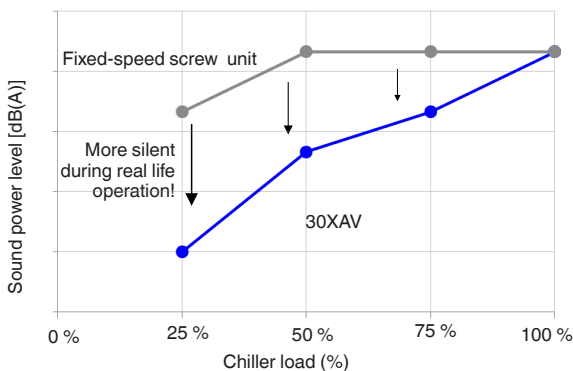
* At full load or part load depending on the evaporator leaving water temperature set point.

- **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) for perfect resistance to external aggression (mechanical and UV protection).
- **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 subassembly minimising 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 shape as they are when tested in the factory, Carrier tests the machine behavior while being moved along a 250 km trial. The test is based on a military standard and equal 5000 km by truck in a normal road.
 - To ensure coils corrosion resistance, salt mist corrosion resistance test are performed in Carrier's laboratory.

In addition, to secure the same performance level is kept along the years and to optimise maintenance costs, with "CARRIER CONNECT" the end-user access to most-qualified remote monitoring services.

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:**
 - Discharge dampers integrated in the oil separator (Carrier patent)
 - Silencer on the economizer return line
 - Condenser coils in V-shape with an open angle, allowing quieter air flow across the coil
 - Low-noise IV generation Flying Birds fans, made of a composite material (Carrier patent) which do not generate intrusive low frequency noise
 - Rigid fan mounting preventing start-up noise (Carrier patent).
- Multiple options are available to further reduce the global sound level up to 6 dB(A).

Easy and fast installation

- **Simplified electrical connections:**
 - Main disconnect switch
 - Transformer supply to the integrated control circuit (400/24 V)
 - Single electrical point of connection (optional for sizes 800 to 1150)
 - Factory installed main disconnect fuses (optional for sizes 600 to 1150).
- **Simplified water connections:**
 - Victaulic connections on the evaporator
 - Practical reference marks for entering and leaving water connections
 - Possibility to choose different evaporator configurations, 1 or 2 passes.
- **Fast commissioning:**
 - Systematic factory operation test before shipment
 - Functional test for main components, expansion devices, fans and compressors.

Environmental care

- R134a: HFC refrigerant with zero ozone depletion potential
- 30% 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 leaks alarm:** Available as an option, this additional dry-contact allows reporting of possible leaks. The leak detector shall be mounted (at customer care) where, refrigerant leaks most likely to happen. Contact Carrier for more details.

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 underlying principles of this approach: 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 30XAV units offers 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 30XAV range helps customers involved in LEED® building certification.

30XAV and LEED® certification

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

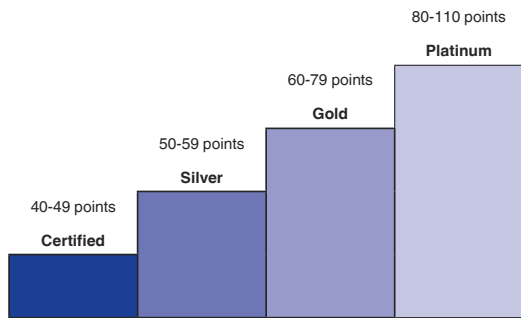
- Sustainable Sites (SS)
- Water Efficiency (WE)
- Energy & Atmosphere (EA)
- Materials & Resources (MR)
- Indoor Environmental Quality (IEQ)
- Innovation in Design (ID)
- Regional Priority (RP).

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

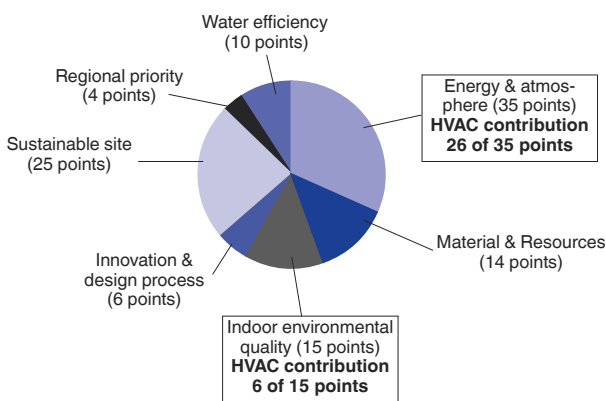


The majority of credits in LEED® rating systems are performance-based and achieving them is dependent on the impacts of each component or sub-system to the overall building.

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.

Overview of LEED® for new construction and major renovations



The new 30XAV 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 30XAV exceeds the energy efficiency requirements of ASHRAE 90.1-2007; therefore it complies with the prerequisite standard.
- **EA prerequisite 3: Fundamental Refrigerant Management**
The 30XAV 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 30XAV, which is designed for high performance especially during part load operation, contributes reducing the energy consumption of the building and therefore helps 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 Global Warming Potential (GWP) of the system. The 30XAV 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 30XAV. 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.

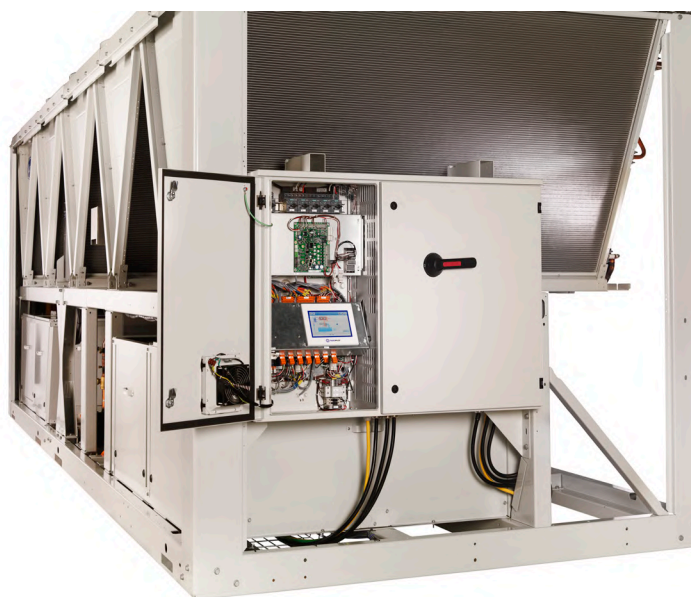
i-Vu®, Carrier's open control system, has features that can be valuable for:

- 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
- Direct access to the unit's technical drawings and the main service documents
- 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:

- 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 30XAV also communicates with other building management systems via optional communication gateways.
- 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 on reversal (only with options 116S/116U): 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)

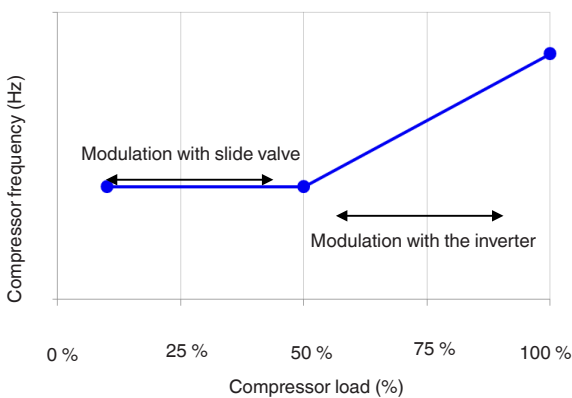
- The Energy Management Module (EMM) offers extended remote control possibilities:
 - Room temperature: Permits set-point reset based on the building indoor air temperature (if Carrier thermostat are installed)
 - Set-point reset: Ensures reset of the cooling set-point based on a 4-20 mA or 0-10 V signal
 - Demand limit: Permits limitation of the maximum chiller 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 time schedule effects
 - Out of service: This signal indicates that the chiller is completely out of service.
 - Chiller capacity: This analogue output (0-10 V) gives an immediate indication of the chiller capacity.
 - Alert indication: This volt-free contact indicates the necessity to carry out a maintenance operation or the presence of a minor fault.
 - Compressors running status: Set of outputs (as many as the compressors number) indicating which compressors are running.

Inverter-driven Thunderbolt screw compressor



The new generation of Carrier inverter-driven screw compressors benefits from Carrier's long experience in the development of twin-rotor screw compressors. The design of the Thunderbolt compressors is based on the successful 06T screw compressor, core of the well-known Aquaforce series.

- A dedicated oil separator is installed at the discharge of each compressor to ensure maximum oil return: Oil separates from refrigerant per gravity and returns to the low pressure side of the compressor without use of additional pumps.
- Advanced control algorithms combine inverter frequency output with motor input logic to minimise mechanical part stress, resulting in best compression performance and high chiller reliability. The compressor is equipped with bearings with oversized rollers, oil pressure lubricated for reliable and durable operation, even at maximum load.



- Screw compressors use positive displacement principle to compress gases at higher pressure. As a result, in case of exceptional high temperature condenser side (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.

Novation® Heat Exchangers with Microchannel Coil Technology

Already utilised in the automobile and aeronautical industries for many years, the Micro-Channel Heat Exchanger (MCHE) used in the Aquaforce with Greenspeed® technology 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 30% reduction in the amount of refrigerant used in the chiller.
- The low thickness of the MCHE reduces air pressure losses by 50% and makes it susceptible to very little fouling (e.g. by sand). Cleaning of the MCHE heat exchanger is very fast using a high pressure washer.
- To ensure constant level of performance during time and protect coils from early deterioration or, in worse case, refrigerant leaks, Carrier offers (as options) dedicated treatments for installations in corrosive environments.
 - The Novation® heat exchangers with Enviro-Shield® protection (option 262) are 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® heat exchangers with exclusive Super Enviro-Shield protection (option 263) are recommended for installations in corrosive environments. The Super Enviro-Shield protection consist in an extremely durable and flexible epoxy coating uniformly applied over all coil surfaces for complete isolation from the contaminated environment.



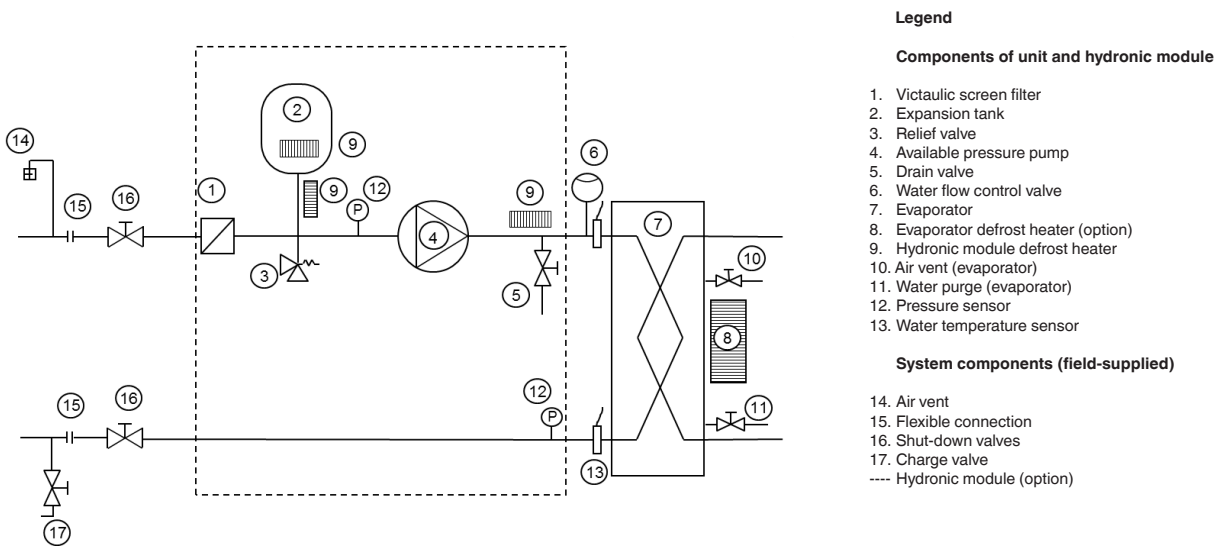
Options

Options	No.	Description	Advantages	Utilisation
IP54 control box	20A	Increased leak tightness of control boxes	Protects the inside of the electrical box from dusts and sand. In general this option is recommended for installations in polluted environments	500-1150
Grilles and enclosure panels	23	Metal grilles on the 4 unit sides, plus side enclosure panels at each end of the coil	Improves aesthetics, protection against intrusion to the unit interior, coil and piping protection against impacts.	500-1150
Enclosure panels	23A	Side enclosure panels at each end of the coil	Improves aesthetics, coil and piping protection against impacts.	500-1150
Evaporator frost protection	41A	Electric resistance heater on the evaporator and discharge valve	Evaporator frost protection down to -20°C outside temperature	500-1150
Evap.and hydraulic mod. frost protection	41B	Electric resistance heater on evaporator, discharge valve and hydronic module	Evaporator and hydronic module frost protection down to -20°C outside temperature	Sizes 500/600 only
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 chillers connected in parallel with operating time equalisation	500-1150
Fuses on main disconnect switch	70D	Factory installed additional fuses, one per each phase, to protect main switch and associated cables from over-current flow (Note: frequency drives and electronic boards are protected as standard by dedicated fuses. Option 70D recommended when compliant protection devices on field not present)	No need for separate fuse box. Save time and money on site installation and avoid additional space requirement	600-1150 (standard on size 500)
Single power connection point	81	Unit power connection via one main supply connection (include option 70D)	Quick and easy installation	800-1150
Evaporator and Pump/s with aluminium jacket	88A	Evaporator and Pumps covered with an aluminium sheet for thermal insulation protection	Improved resistance to aggressive climate conditions	Sizes 500/600 only
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	500-1150
Compressor discharge valves	93A	Shut-off valve on the compressor discharge piping	Simplified maintenance	500-1150
Evaporator with one pass less	100C	Evaporator with one pass on the water side. Evaporator inlet and outlet on opposite sides.	Easy to install, depending on site. Reduced pressure drops	500-1150
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)	500-1150
Reversed evaporator water connections	107	Evaporator with reversed water inlet/outlet	Easy installation on sites with specific requirements	Sizes 500/600/950/1050/1150 only
HP single-pump hydronic module	116R	Complete hydronic module equipped with water filter, relief valve, one high pressure pump and drain valve. For more details, refer to the dedicated chapter (expansion tank not included)	Easy and fast installation (plug & play)	Sizes 500/600 only
HP dual-pump hydronic module	116S	Complete hydronic module equipped with water filter, relief valve, two high pressure pumps and drain valve. For more details, refer to the dedicated chapter (expansion tank not included)	Easy and fast installation (plug & play). Increased system reliability	Sizes 500/600 only
LP single-pump hydronic module	116T	Complete hydronic module equipped with water filter, relief valve, one low pressure pump and drain valve. For more details, refer to the dedicated chapter (expansion tank not included)	Easy and fast installation (plug & play)	Sizes 500/600 only
LP dual-pump hydronic module	116U	Complete hydronic module equipped with water filter, relief valve, two low pressure pumps and drain valve. For more details, refer to the dedicated chapter (expansion tank not included)	Easy and fast installation (plug & play). Increased system reliability	Sizes 500/600 only
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	500-1150
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	500-1150
Bacnet over IP gateway	149	Two-directional high-speed communication using BACnet protocol over Ethernet network (IP)	Easy and high-speed connection by ethernet line to a building management system. Allows access to multiple unit parameters	500-1150
Energy Management Module	156	Control board with additional inputs/outputs. See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, ice storage end, demand limits, boiler on/off command...)	500-1150
Leak detection	159	0-10 V signal to report any refrigerant leakage in the unit directly on the controller (the leak detector itself must be supplied by the customer)	Immediate customer notification of refrigerant losses to the atmosphere, allowing timely corrective actions	500-1150
Dual relief valves installed w/ 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	500-1150
Compliance with Russian regulations	199	GOST certification	Conformance with Russian regulations	500-1150
Compliance with Australian regulations	200	Unit approved to Australian code	Conformance with Australian regulations	500-1150

Options	No.	Description	Avantages	Utilisation
Insulation of the evap. in/out ref. lines	256	Thermal insulation of the evaporator entering/leaving refrigerant lines with flexible, anti-UV insulant	Prevents condensation on the evaporator entering/leaving refrigerant lines	500-1150
Low noise level	257	Sound insulation of main noise sources combined with fans speed management (includes option 279)	6 to 10 dB(A) quieter than standard unit (depending model and size). Refer to the physical data table for detailed values	500-1150
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	500-1150
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	500-1150
Welded evaporator water connection kit	266	Victaulic piping connections with welded joints	Easy installation	500-1150
Compressor enclosure	279	Compressor sound enclosure	3 dB(A) quieter than standard unit	500-1150
Evaporator with aluminium jacket	281	Evaporator covered with an aluminium sheet for thermal insulation protection	Improved resistance to aggressive climate conditions	500-1150
EMC classification C2, as per EN 61800-3	282	Additional RFI filters on the unit power line	Reduces electromagnetic interferences. Increase the variable frequency drive (VFD) immunity level according to first environment (so called, residential environment) requirements and allow its compliancy with emissions level required in category C2	500-1150
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	500-1150
Expansion tank	293	6 bar expansion tank in the hydraulic module (require option 116)	Protects closed hydronic circuit from excessive pressure	Sizes 500/600 only
Fast Capacity Recovery	QM295	New software algorithms to allow quick restart and fast loading while preserving unit-reliability	Full capacity recovery in less than 5 minutes after power failure. Matches requirements of typical critical missions applications	500-1150
Carrier Connect link (BSS regions only)	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	500-1150
Variable Water Flow control	299	Hydronic 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	500-1150

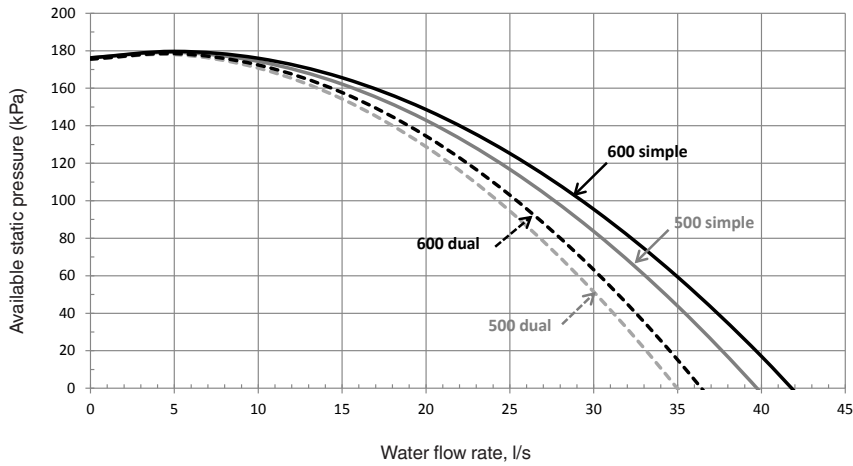
Hydronic module (options 116R, S, T, U)

Typical water circuit diagram

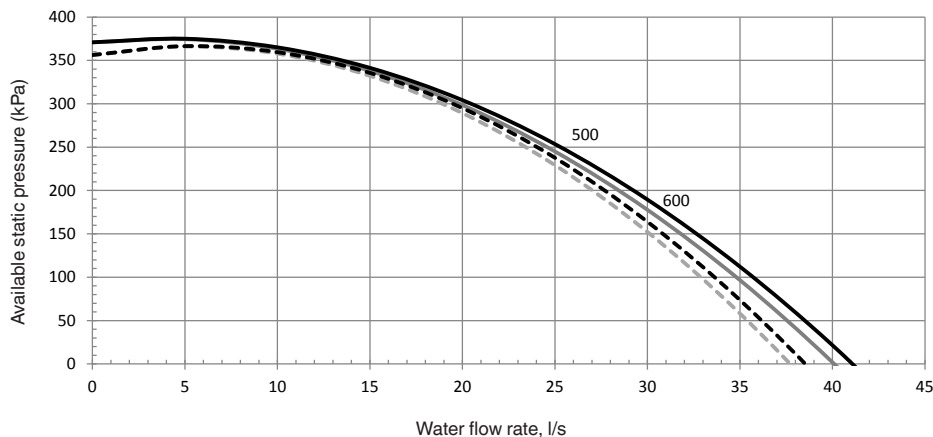


Available static pressure (options 116R, S, T, U)

Low-pressure pump (hydronic module option 116T/116U)



High-pressure pump (hydronic module option 116R/116S)



Physical data, sizes 500 to 1150

30XAV		500	600	700	800	950	1050	1150
Air conditioning application as per EN14511-3:2013[†] - standard unit with option 279*								
Nominal cooling capacity	kW	504	607	687	803	910	1041	1138
ESEER	kW/ kW	4.59	4.67	4.79	4.90	4.72	4.68	4.84
EER	kW/ kW	3.22	3.23	3.29	3.28	3.12	3.08	3.1
Eurovent class cooling		A	A	A	A	A	B	A
Air conditioning application^{††}- standard unit with option 279*								
Nominal cooling capacity	kW	506	609	689	806	912	1044	1141
ESEER	kW/ kW	4.88	4.97	5.16	5.15	4.94	4.91	5.05
EER	kW/ kW	3.25	3.26	3.34	3.32	3.16	3.12	3.14
IPLV	kW/ kW	5.20	5.21	5.51	5.57	5.33	5.29	5.50
Sound levels								
Standard unit								
Sound power level ^{***}	dB(A)	102	103	103	103	105	106	106
Sound pressure level at 10 m ^{****}	dB(A)	70	70	70	70	72	73	73
Standard unit + option 279*								
Sound power level ^{***}	dB(A)	99	100	100	100	102	103	103
Sound pressure level at 10 m ^{****}	dB(A)	67	68	68	67	69	70	70
Standard unit + option 257*								
Sound power level ^{***}	dB(A)	96	97	97	97	99	100	100
Sound pressure level at 10 m ^{****}	dB(A)	63	65	64	64	66	67	67
Dimensions - standard unit								
Length	mm	6092	6092	7186	8380	9573	10767	11962
Width	mm	2253	2253	2253	2253	2253	2253	2253
Height	mm	2297	2297	2297	2297	2297	2297	2297
Operating Weight **								
Standard unit	kg	4831	5219	5767	6420	6806	7687	8076
Compressors								
Circuit A		1	1	1	1	1	1	1
Circuit B		1	1	1	1	1	1	1
Refrigerant** - Standard unit								
	R134a							
Circuit A	kg	50	52	56	64	79	80	84
	teqCO2	71.5	74.4	80.1	91.5	113.0	114.4	120.1
Circuit B	kg	43	54	58	67	71	82	87
	teqCO2	61.5	77.2	82.9	95.8	101.5	117.3	124.4
Capacity control								
Minimum capacity	Touch Pilot control %	10	10	10	10	10	10	10
Condensers								
"Micro Channel Heat Exchanger" aluminium coil								
Fans - Standard unit								
	Axial Flying Bird IV fans with rotating shroud							
Quantity		9	10	12	14	16	18	20
Total air flow		40608	45120	54144	63168	72192	81216	90240
Rotation speed	r/s	15.7	15.7	15.7	15.7	15.7	15.7	15.7
Evaporator								
	Flooded multi-pipe type							
Water content	l	75	90	90	110	120	134	146
Max. water-side operating pressure		1000	1000	1000	1000	1000	1000	1000
Water connection								
	Victaulic							
Diameter	inch	5	6	6	6	6	8	8
Outside tube diameter	mm	141.3	168.3	168.3	168.3	168.3	219.1	219.1
Chassis paint colour								
	Colour code: RAL7035							

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

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

†† Gross performances, not in accordance with EN14511-3:2013. These performances do not take into account the correction for the proportional heating capacity and power input generated by the water pump to overcome the internal pressure drop in the heat exchanger. Evaporator water entering/leaving temperature 12 °C/7 °C, outside air temperature 35 °C. evaporator fouling factor 0 m² kW

* Options: 257 = low noise level, 279 = compressor enclosure.

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

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

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



Eurovent certified values

Electrical data, sizes 500 to 1150

Standard unit or with option 81

30XAV		500	600	700	800	950	1050	1150
Power circuit								
Voltage range	V-ph-Hz	400-3-50 ± 10%						
Control circuit supply								
Start-up current*		Not Applicable (less than the operating current)						
Power factor**								
Maximum***		0.91-0.93						
Cosine phi		>0.98						
Total harmonic distortion***	%	35-45						
Maximum unit power input****								
Circuit 1†	kW	223	255	293	186	231	231	255
Circuit 2†	kW	-	-	-	186	186	231	255
Option 81	kW	-	-	-	373	417	461	510
Nominal unit current draw††								
Circuit 1†	A	260	306	346	218	264	264	293
Circuit 2†	A	-	-	-	218	218	264	293
Option 81	A	-	-	-	436	482	528	586
Maximum unit current draw (Un)****								
Circuit 1	A	352	400	458	290	362	362	402
Circuit 2	A	-	-	-	290	290	362	402
Option 81	A	-	-	-	580	652	724	804
Maximum unit current draw (Un – 10%)****								
Circuit 1†	A	373	424	484	304	387	387	430
Circuit 2†	A	-	-	-	304	304	387	430
Option 81	A	-	-	-	608	691	774	860

* Instantaneous start-up current

** This can vary as a function of the short-circuit current/maximum current ratio of the system transformer.

*** Values obtained at operation with maximum unit power input

**** Values obtained at operation with maximum unit power input. Values given on the unit name plate.

† When the machines are equipped with two power supplies, circuit 1 is dedicated for supplying refrigerant circuit A, and circuit 2 is dedicated for supplying refrigerant circuit B.

†† Values obtained at the normalized Eurovent operating point of the unit: air 35 °C, water 12/7 °C.

- 30XAV 0500 to 0700 units have a single power connection point located immediately upstream of the main switch(es). Standard units 0800 to 1150, have two power connection points located in the immediate upstream of the main switches.
- With the exception of size 0500 and the units that are equipped with 81 and 70D options, anti short-circuits device is not provided as standard. It must be installed at the facility in accordance with the instructions given in this document.
- The compressor and condenser fan motors are controlled and protected by variable frequency drives installed on the machine frame.
- **The electrical control box contains:**
 - A main disconnect switch for the entire machine for 0600 and 0700 sizes. A disconnect switch for each refrigeration circuit for 0500 and 0800 to 1150 sizes.
 - All or part of the protection equipment against short-circuits for the circuits inside the machine*
 - Switch gear and protection for heaters and hydraulic pumps
 - Control devices.
- **Field connections:**
- All connections to the system and the electrical installations must be in accordance with all applicable codes.
- The Carrier 30XV units are designed and built to ensure conformance with these codes. The recommendations of European standard EN 60204-1 (corresponds to IEC 60204-1) (machine safety - electrical machine components - part 1: General regulations) are specifically taken into account, when designing the electrical equipment**.
- Appendix B of standard EN 60204-1 specifies the electrical characteristics used for the operation of the machines. Those specified below are applied to 30XAV units in addition to other information given in this document:
 1. Physical environment***; The classification of the environment is specified in standard EN 60721 (equivalent to IEC 60721):
 - Outdoor installation
 - Ambient temperature range: Minimum temperature -20 °C up to +48 °C.
 - Altitude: Lower than or equal to 2000 m
 - Presence of hard solid: Class 4S2 (no significant dust present)
 - Presence of corrosive and polluting substances, class 4C2 (negligible)
 2. Power supply frequency variation: ± 2 Hz
 3. The neutral (N) line must not be connected directly to the unit (if necessary use a transformer).
 4. Overcurrent protection of the power supply conductors is not provided with the unit.
 5. The factory installed disconnect switch(es)/circuit breaker(s) is (are) of a type suitable for power interruption in accordance with EN 60947-3 (corresponds to IEC 60947-3).
 6. The units are designed for connection to TN networks (IEC 60364). In IT networks the use of noise filters integrated into the variable frequency

- drive(s) makes machine use unsuitable. In addition, the short-circuit holding current characteristics are modified. Provide a local earth, consult competent local organisations to complete the electrical installation.
- 7. Electromagnetic environment: Classification of the electromagnetic environment is described in standard EN 61800-3 (corresponds to IEC 61800-3):
 - Immunity to external interference defined by the second environment****
 - Interference emission as defined in category C3†
- The harmonic currents generated by the variable frequency drives integrated in the 30XAV unit are a source of interference. An analysis may be required to verify if these interferences exceed 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 61000-2-4.
- Two characteristics are required for this analysis:
 - The short-circuit ratio (Rsce) of the installation calculated at the in-plant coupling point (IPC).
 - The total harmonic current distortion rate (THDI), calculated for the machine at maximum capacity.
- Leakage currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of additional leakage currents introduced by the use of variable frequency drives in the unit must be considered. In particular these protection devices shall be of reinforced immunity types and have a threshold not lower than 150 mA.

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

* Depending on the size or options selected for the machine

** Generally the recommendations of IEC 60364 are accepted as compliance with the requirements of the installation directives. Conformance with EN 60204-1 is the best means of ensuring compliance with the Machinery Directive.

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

**** Example of installations of the second environment: Industrial zones, technical locations supplied from a dedicated transformer

† 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

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

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

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

IPLV (in accordance with AHRI 550/590)

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

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.

IPLV (integrated part load value)

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

NOTE: Constant leaving water temperature 6.67 °C (44 °F).

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.

30XAV		500	600	700	800	950	1050	1150
Standard unit								
IPLV	kW/kW	5.20	5.21	5.51	5.57	5.33	5.29	5.50
ESEER	kW/kW	4.59	4.67	4.79	4.90	4.72	4.68	4.84

ESEER Calculations according to standard performances (in accordance with EN14511-3:2013) and certified by Eurovent.

IPLV Calculations according to standard performances (in accordance with AHRI 550-590)

Sound spectrum

Standard unit

30XAV 500 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	89	98	93	97	90	86	dB(A) 102
75% dB							dB(A) 100
50% dB							dB(A) 98
25% dB							dB(A) 94

30XAV 600 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	89	98	95	97	93	89	dB(A) 103
75% dB							dB(A) 101
50% dB							dB(A) 99
25% dB							dB(A) 95

30XAV 700 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	89	98	95	97	93	89	dB(A) 103
75% dB							dB(A) 101
50% dB							dB(A) 99
25% dB							dB(A) 95

30XAV 800 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	89	98	95	97	93	89	dB(A) 103
75% dB							dB(A) 101
50% dB							dB(A) 99
25% dB							dB(A) 95

30XAV 950 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	81	99	100	100	94	88	dB(A) 105
75% dB							dB(A) 102
50% dB							dB(A) 97
25% dB							dB(A) 95

30XAV 1050 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	82	100	101	101	95	89	dB(A) 106
75% dB							dB(A) 103
50% dB							dB(A) 98
25% dB							dB(A) 96

30XAV 1150 - standard unit

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	83	102	102	99	93	88	dB(A) 106
75% dB							dB(A) 103
50% dB							dB(A) 98
25% dB							dB(A) 96

Unit with option 279*

30XAV 500 - unit with option 279

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	84	89	94	95	91	86	dB(A) 99
75% dB							dB(A) 96
50% dB							dB(A) 92
25% dB							dB(A) 89

30XAV 600 - unit with option 279

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	83	91	94	96	93	86	dB(A) 100
75% dB							dB(A) 97
50% dB							dB(A) 93
25% dB							dB(A) 90

30XAV 700 - unit with option 279

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	83	91	94	96	93	86	dB(A) 100
75% dB							dB(A) 97
50% dB							dB(A) 93
25% dB							dB(A) 90

30XAV 800 - unit with option 279

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	83	91	94	96	93	86	dB(A) 100
75% dB							dB(A) 97
50% dB							dB(A) 93
25% dB							dB(A) 90

30XAV 950 - unit with option 279

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	81	93	98	97	90	85	dB(A) 102
75% dB							dB(A) 98
50% dB							dB(A) 93
25% dB							dB(A) 92

30XAV 1050 - unit with option 279

Load	Octave bands, Hz						Sound power level
	125	250	500	1k	2k	4k	
100% dB	82	94	99	98	91	86	dB(A) 103
75% dB							dB(A) 99
50% dB							dB(A) 94
25% dB							dB(A) 93

30XAV 1150 - unit with option 279

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		84	97	100	95	90	86		dB(A) 103
75%									dB(A) 99
50%									dB(A) 94
25%									dB(A) 93

Unit with option 257**

30XAV 500 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		80	91	90	90	86	77		dB(A) 96
75%									dB(A) 94
50%									dB(A) 92
25%									dB(A) 89

30XAV 600 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		78	91	92	92	86	82		dB(A) 97
75%									dB(A) 95
50%									dB(A) 93
25%									dB(A) 90

30XAV 700 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		78	91	92	92	86	82		dB(A) 97
75%									dB(A) 95
50%									dB(A) 93
25%									dB(A) 90

30XAV 800 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		78	91	92	92	86	82		dB(A) 97
75%									dB(A) 95
50%									dB(A) 93
25%									dB(A) 90

30XAV 950 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		70	93	94	93	88	83		dB(A) 99
75%									dB(A) 97
50%									dB(A) 91
25%									dB(A) 90

30XAV 1050 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		70	92	97	94	87	80		dB(A) 100
75%									dB(A) 96
50%									dB(A) 92
25%									dB(A) 91

30XAV 1150 - unit with option 257

Load	dB	Octave bands, Hz						Sound power level	
		125	250	500	1k	2k	4k		
100%		75	98	94	90	86	81		dB(A) 100
75%									dB(A) 96
50%									dB(A) 92
25%									dB(A) 91

* Option 279 = compressor enclosure
 ** Option 257 = low noise level

NOTE: -Noise level at part load are for guidelines only and refer to typical ESEER part load conditions.
 -Octave band sound spectrum : contact Carrier

Operating range

Evaporator water temperature, °C	Minimum	Maximum
Water entering temperature at start-up	-	45*
Water entering temperature during operation	6.8	21
Water leaving temperature during operation	3.3*	15
Condenser air temperature, °C		
Storage		
Ambient outdoor operating temperature:		
Standard unit	-20***	50**

Evaporator water flow rate (l/s)*		
30XAV	Minimum	Maximum**
500	6.6	47.9
600	8.2	58.7
700	8.2	58.7
800	10.4	68.0

* Standard evaporators with water as the heat transfer fluid.

** The maximum water flow rate corresponds to a pressure drop of 100 kPa.

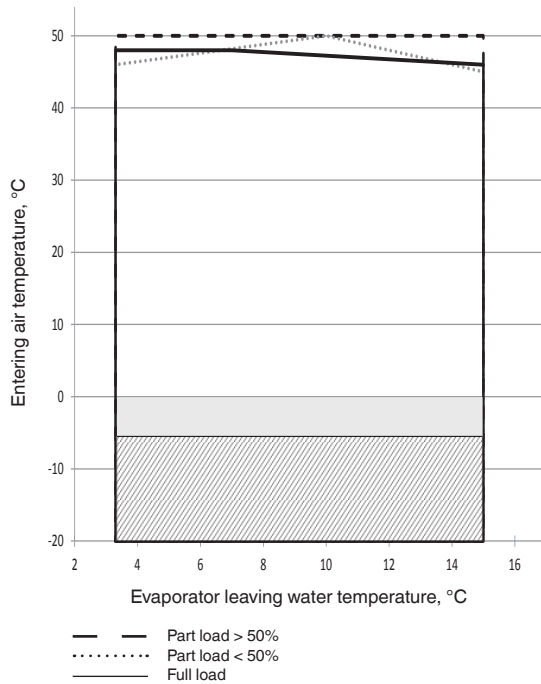
NOTE: If the air temperature is below 0 °C, a glycol/water solution or the frost protection option must be used.

* According to the type of installation and air temperature

** Operating at partial load.

*** Option 41A mandatory for start-ups below -5 °C.

Standard Unit 30XAV 500-800



NOTES:

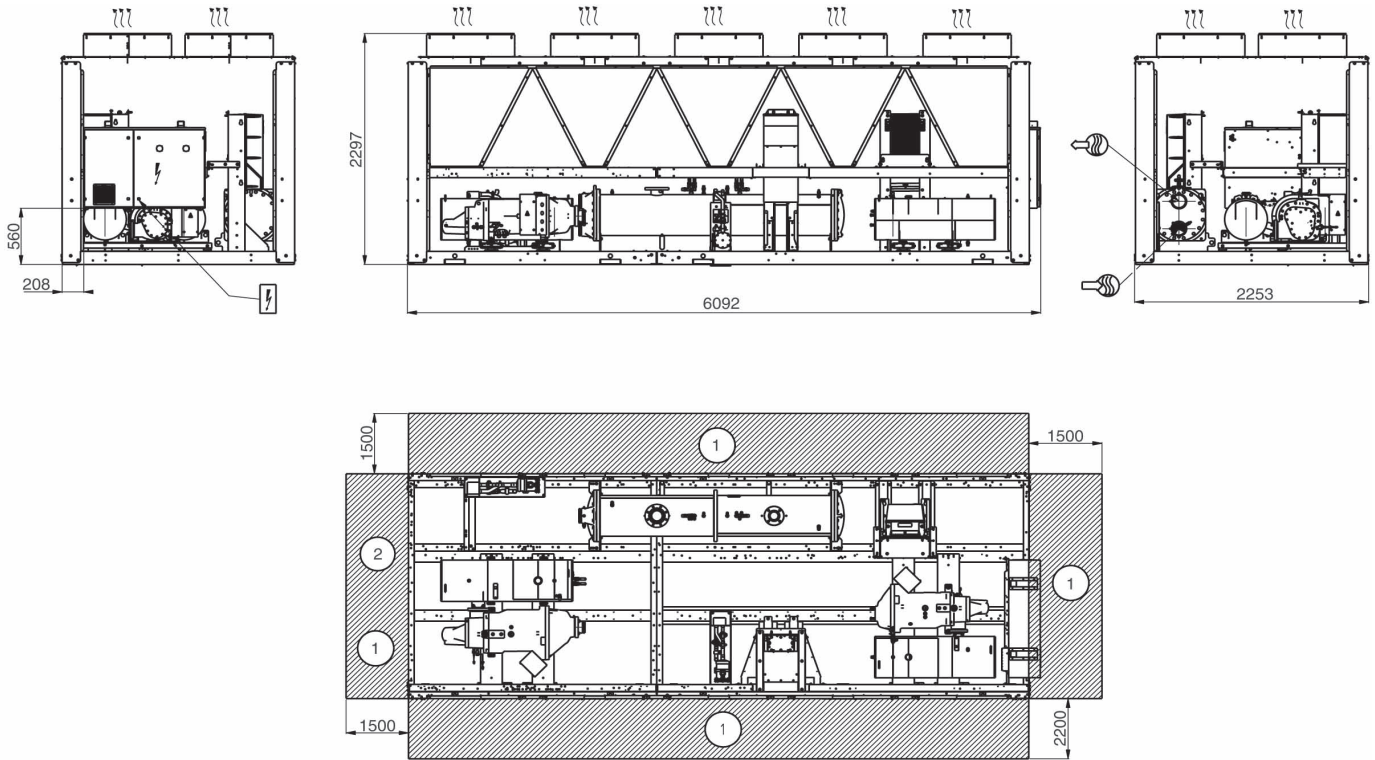
- Evaporator $\Delta T = 5K$.
- These ranges are given by way of indication. Verify the operating range from the Carrier electronic catalogue.

Legend

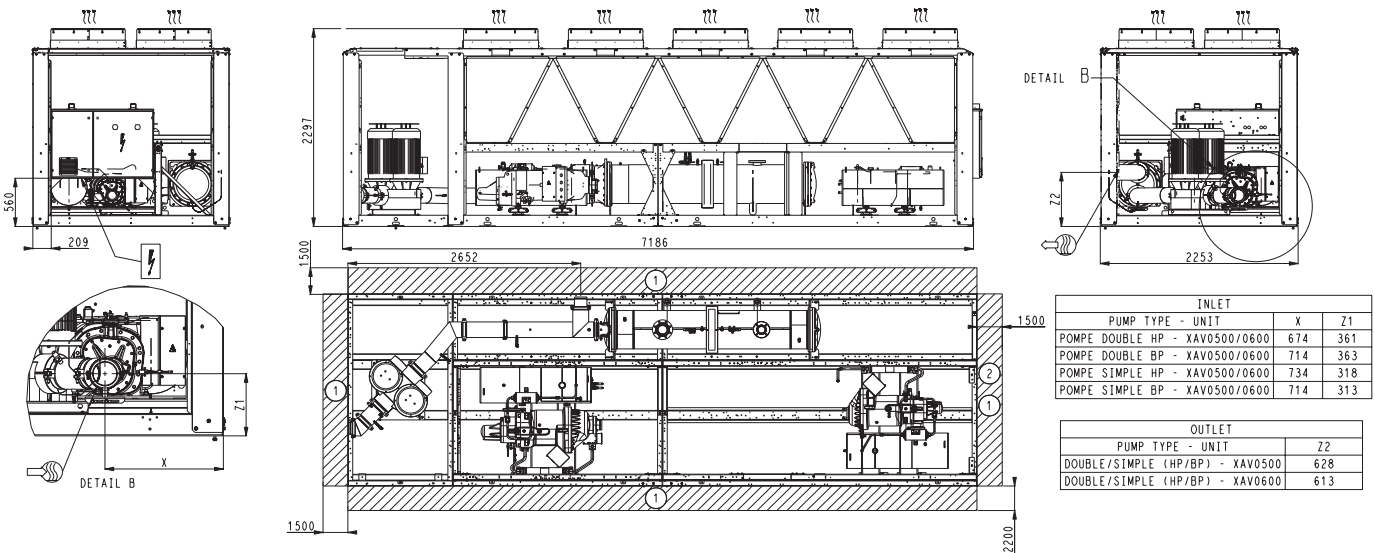
- Operating range of standard unit 30XAV
- Below 0 °C air temperature the unit must either be equipped with the evaporator frost protection option 41A, or the water loop must be protected against frost by using a frost protection solution (by the installer).
- For start-ups with air temperature below -5 °C, the machine must be equipped with option 41A.

Dimensions/clearances

30XAV 500-600 without hydronic kit



30XAV 500-600 with hydronic kit



Legend

All dimensions are given in mm.

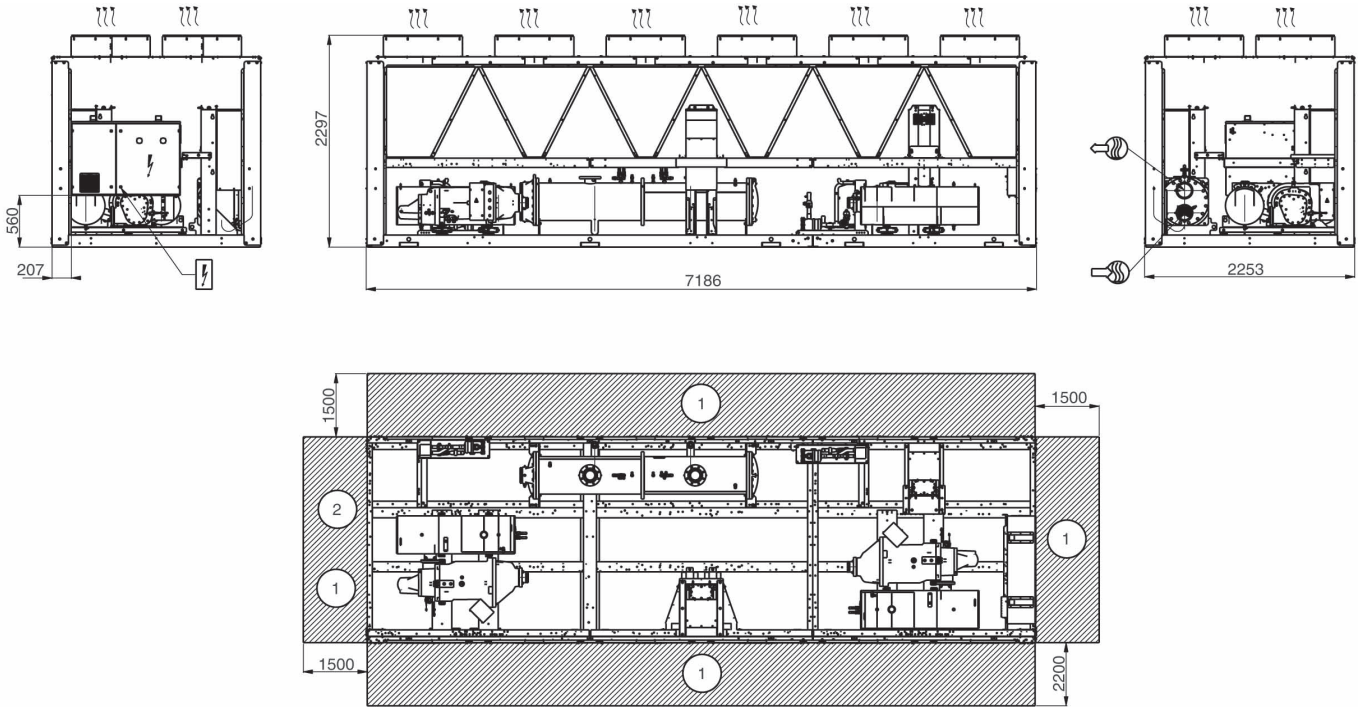
- ① Required clearances for maintenance (see note)
- ② Recommended space for evaporator tube removal
- Water inlet for standard unit - for options 100C and 107 refer to the certified drawing.
- Water outlet for standard unit - for options 100C and 107 refer to the certified drawing.
- ⋈ Air outlet – do not obstruct
- Power supply and control connection

NOTES:

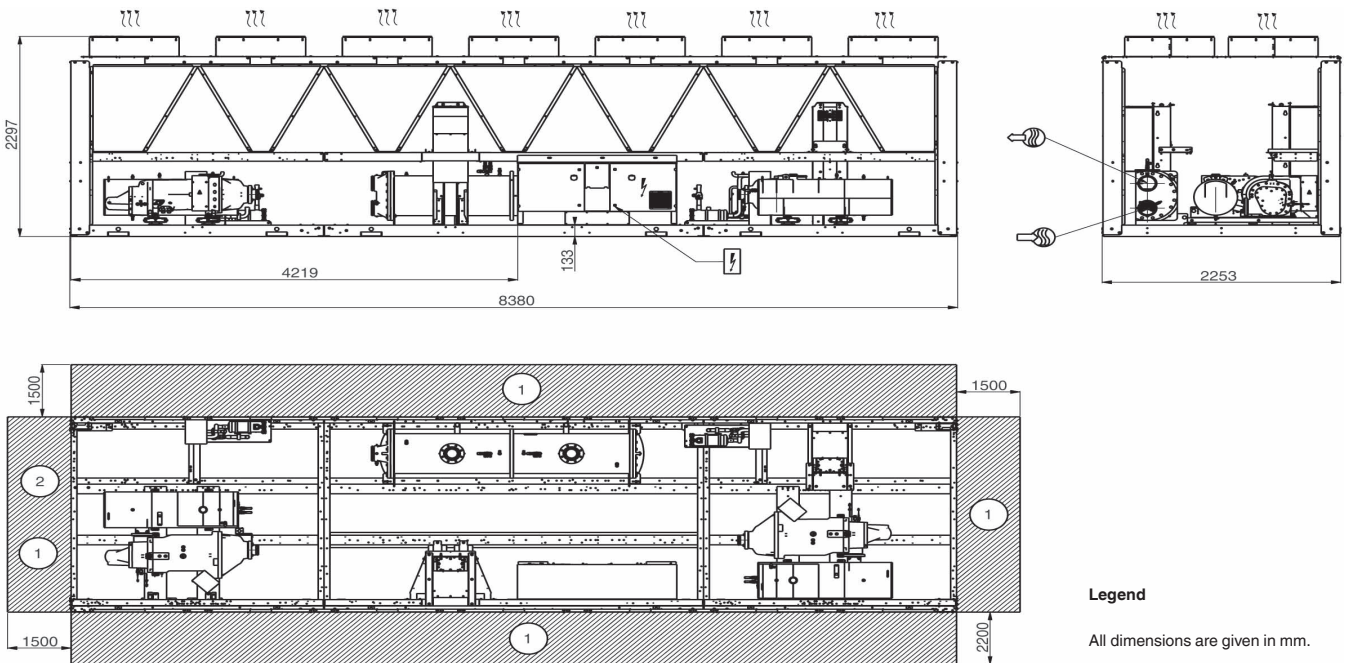
- Drawings are not contractually binding.
- Before designing an installation, consult the certified dimensional drawings, available on request.
- If the installation includes several units or if this (these) is (are) close to walls, please refer to chapters 3.4 - "Multiple chiller installation" and 3.5 - "Distance to the wall" of the installation manual to determine the space required.

Dimensions/clearances

30XAV 700







30XAV 800



Legend

All dimensions are given in mm.

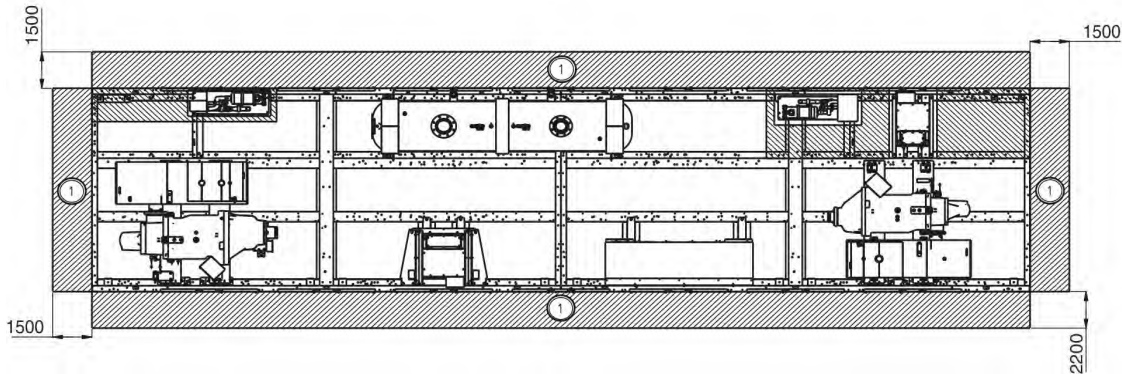
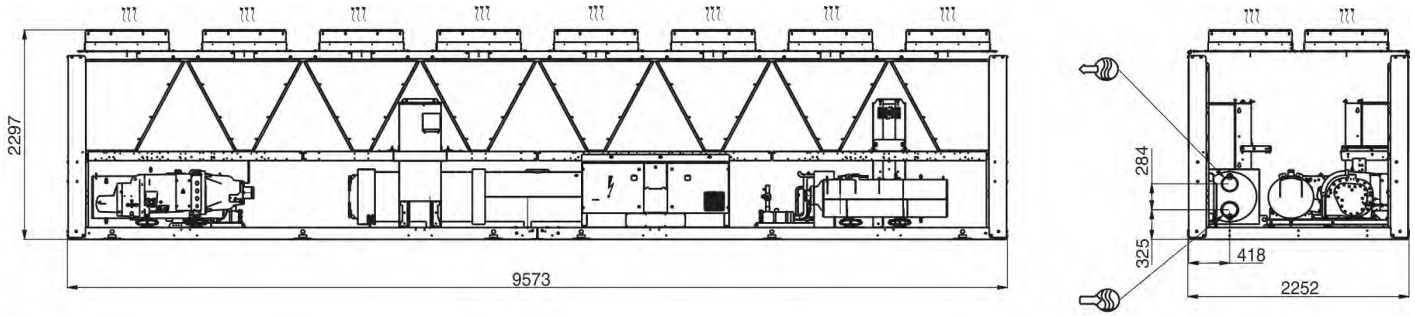
- ① Required clearances for maintenance (see note)
- ② Recommended space for evaporator tube removal
-  Water inlet for standard unit - for options 100C and 107 refer to the certified drawing.
-  Water outlet for standard unit - for options 100C and 107 refer to the certified drawing.
-  Air outlet – do not obstruct
-  Power supply and control connection

NOTES:

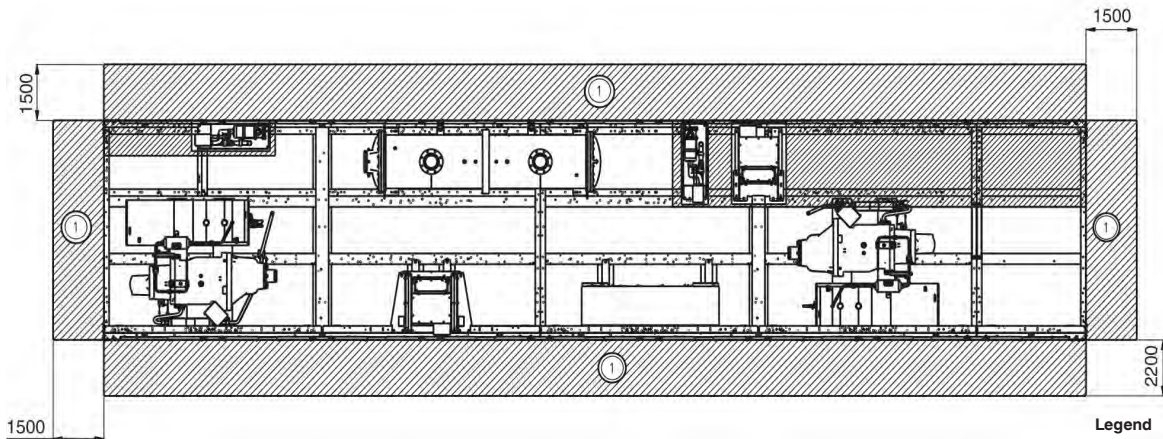
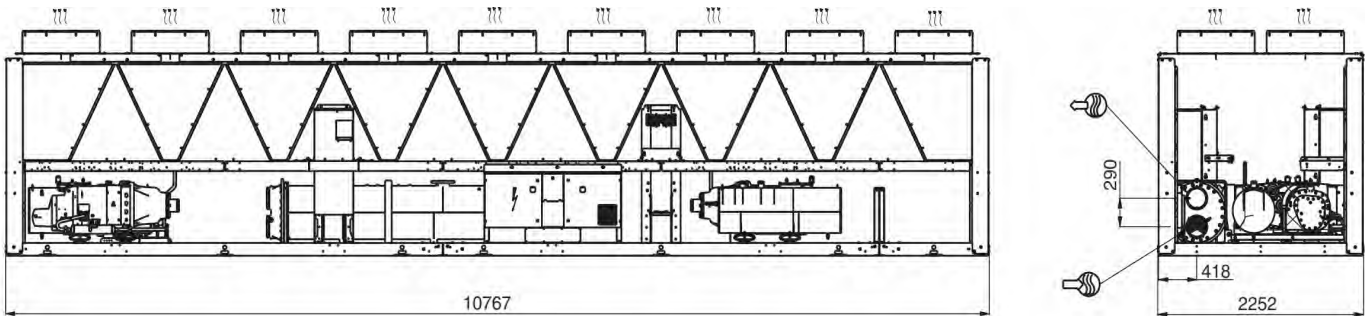
- Drawings are not contractually binding.
- Before designing an installation, consult the certified dimensional drawings, available on request.
- If the installation includes several units or if this (these) is (are) close to walls, please refer to chapters 3.4 - "Multiple chiller installation" and 3.5 - "Distance to the wall" of the installation manual to determine the space required.

Dimensions/clearances

30XAV 950



30XAV 1050



Legend

All dimensions are given in mm.

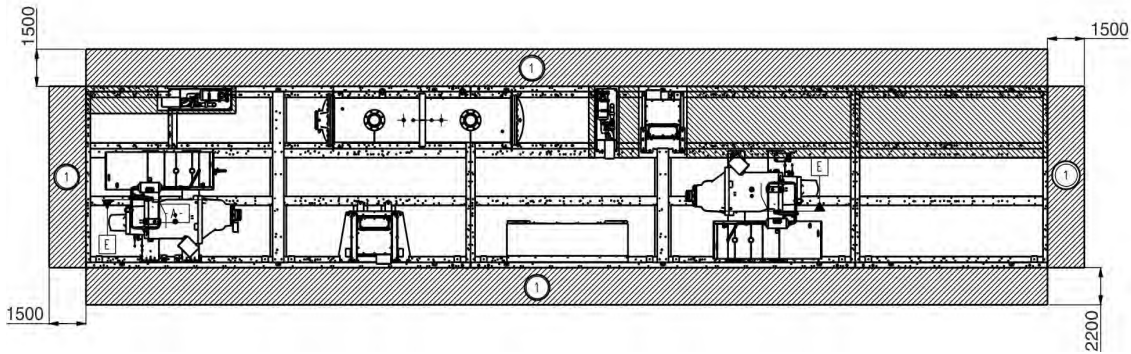
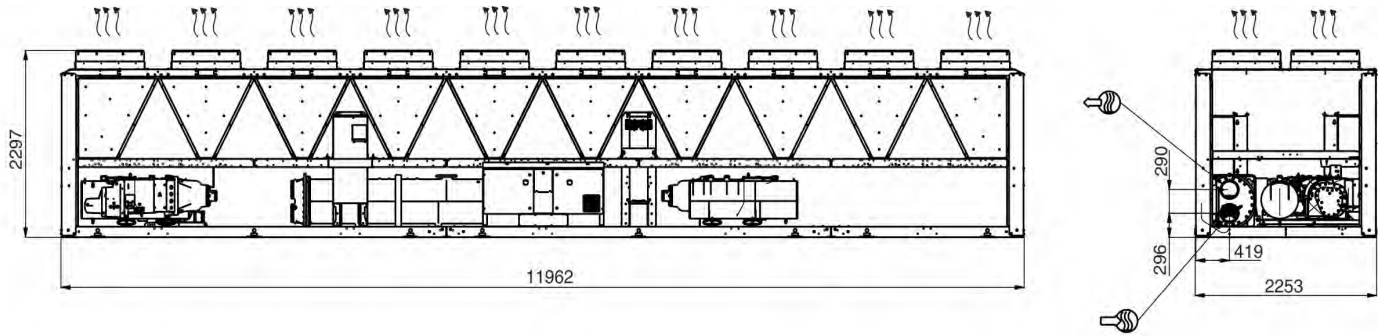
- ① Required clearances for maintenance (see note)
- ② Recommended space for evaporator tube removal
- Water inlet for standard unit - for options 100C and 107 refer to the certified drawing.
- Water outlet for standard unit - for options 100C and 107 refer to the certified drawing.
- Air outlet – do not obstruct
- Power supply and control connection

NOTES:

- Drawings are not contractually binding.
- Before designing an installation, consult the certified dimensional drawings, available on request.
- If the installation includes several units or if this (these) is (are) close to walls, please refer to chapters 3.4 - "Multiple chiller installation" and 3.5 - "Distance to the wall" of the installation manual to determine the space required.





Dimensions/clearances

30XAV 1150



Legend

All dimensions are given in mm.

- ① Required clearances for maintenance (see note)
- ② Recommended space for evaporator tube removal
-  Water inlet for standard unit - for options 100C and 107 refer to the certified drawing.
-  Water outlet for standard unit - for options 100C and 107 refer to the certified drawing.
-  Air outlet – do not obstruct
-  Power supply and control connection

NOTES:

- Drawings are not contractually binding.
- Before designing an installation, consult the certified dimensional drawings, available on request.
- If the installation includes several units or if this (these) is (are) close to walls, please refer to chapters 3.4 - "Multiple chiller installation" and 3.5 - "Distance to the wall" of the installation manual to determine the space required.

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, inverter-driven screw compressors, electronic expansion valves and equipment required prior to field start-up.

Quality assurance

Unit construction shall comply with European directives:

- 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

- Cooling capacity (kW):
- Unit power input (kW):
- Part load energy efficiency, ESEER (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 with EN14511-3:2013 and certified by Eurovent.

Sound power level at 75%, 50% and 25% load (at typical ESEER conditions) shall be declared by the manufacturer.

The unit shall operate at full load with ambient temperatures ranging from -20 °C to 46 °C without use of additional adiabatic cooler systems, with evaporator leaving liquid temperature between 3.3 and +15 °C.

The machine shall continue to operate (at reduced capacity) in ambient temperatures up to 50 °C.

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 the four vertical faces. Coils refrigerant connections shall be covered by side panels of galvanised sheet steel, for enhanced aesthetic and safety during transportation.
- (Carrier option 23A) Coils refrigerant connections shall be covered by side panels of galvanised sheet steel, for enhanced aesthetic and safety during transportation.

Compressor

- Unit shall have semi-hermetic inverter-driven twin-screw compressors with internal relief valve and check valve to avoid reverse rotation on shutdown.
- Unit shall be equipped with a muffler to reduce discharge gas pulsations.
- Compressor bearings shall be designed for minimum 73000 hours at maximum operating conditions.
- Capacity control shall be provided by an inverter motor acting in combination with slide valve.
- 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 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 option 93A) Each compressor shall be equipped with a discharge shut-off valve.
- (Carrier option 279) Each compressor and oil separator 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 vibrations 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 designed to ensure sub-cooling of the liquid refrigerant.
- Condenser coils shall be V-shaped with a minimum open angle of 50° to ensure optimum air distribution.
- Coils shall be entirely made of aluminium alloy, micro-channels type.
- Coils shall consist of a two-pass arrangement.
- Coils shall be leak-tested at 15.5 bar with 100% He.
- 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 fans discharges shall be protected by polyethylene-coated steel wire grilles.
- 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.
- (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 4000 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 6000 hours constant neutral salt spray per ASTM B117.

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 option 93A) Each compressor shall be equipped with a discharge shut-off valve.
- (Carrier option 257) Compressor and oil separator sub-assembly and refrigerant gas suction line shall be acoustically insulated.

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 (Carrier option 81 for sizes from 800 to 1150).
- The inverter driven compressor motors start up current shall be less than the full load operating current.
- Displacement 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 powered 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 grant safe operation for installations in polluted environment.
- (Carrier option 70D) The power control box shall integrate additional fuses dedicated to the protection of main switch and associated cables from over current flow.

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 multiple language capability.
- 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).
- Control shall store technical documentation, drawings and spare parts list specific to each particular unit.
- 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 two-directional communication board shall allow plug and play interfacing of the machine with any BMS using the J-Bus protocol.
- (Carrier option 148D) A two-directional communication board shall allow plug and play interfacing of the machine with any BMS using the LonTalk protocol.

- (Carrier option 149) Machine shall be supplied with factory-installed two-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 shall be required
- (Carrier option 298) Machine shall be accessible via wireless connection for remote monitoring with the scope of 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 enable 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 (if installed)
- (Carrier option 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.

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 black box function which permit to store data set of 20 variables with interval of 5 seconds, during 14 minutes preceding the alarm and 1 minute following the alarm event. The black box recording capability shall permit recording for 20 events and once the threshold is reached new data shall over-write the oldest ones.

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 option 116R/S/T/U) A choice of different pump types and configuration shall be available:
 - Single high-pressure pump
 - Dual high-pressure pumps
 - Single low-pressure pump
 - Dual low-pressure pumps

In case dual pumps configuration, the unit control shall automatically manage the change-over and cycling of pumps to equalize running hours and number of starts

- The hydronic module shall include the following elements:
 - removable screen filter
 - centrifugal monocoil water pump with three-phase motor equipped with internal over-temperature protection
 - electronic water flow switch without paddle
 - safety relief valve calibrated to 4 bar
 - long stroke flow control valve
 - pressure gauge and valve set for differential pressure measurement
- The water pump shall be isolated from the chiller structure and water piping by anti-vibration mountings and expansion compensators, 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 pumps 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.



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Quality and Environment
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