Carrier

Variable-Speed Water-Cooled Liquid Chillers/ Variable-Speed-Water-to-Water Heating Units

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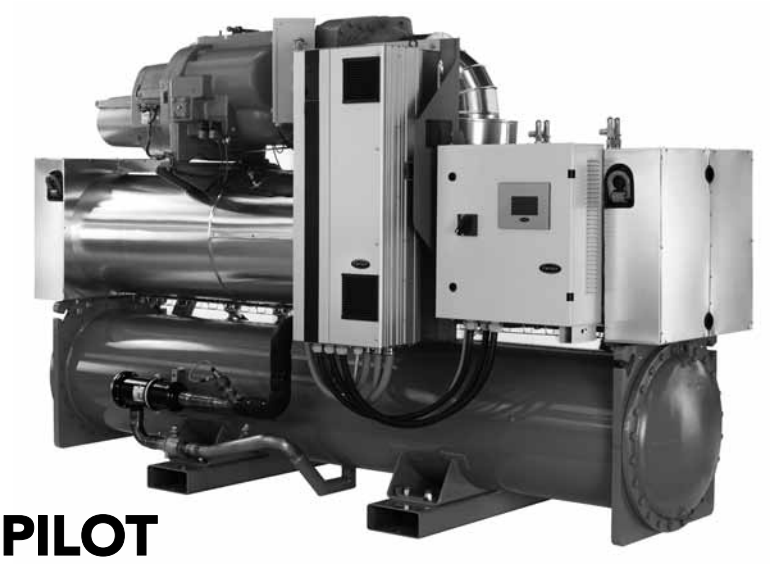


TOUCHPILOT

30XW-V/30XWHV

Nominal cooling capacity 587-858 kW
Nominal heating capacity 648-968 kW

The 30XW-V/30XWHV water-sourced units are the premium solution for industrial and commercial applications where installers, consultants and building owners require maximum quality and optimal performances, especially at part load.

The 30XW-V/30XWHV units are designed to meet current and future requirements in terms of energy efficiency, versatility and compactness. They feature exclusive inverter-driven screw compressors - an evolution of the proven traditional Carrier twin-rotor screw compressor design. Other features include:
- the new Touch Pilot control
- extremely efficient mechanically cleanable flooded evaporators
- refrigerant R-134a

The 30XW-V/30XWHV range is split into two versions:
- 30XW-V for air conditioning applications
- 30XWHV for heating applications

As standard, the unit can provide an evaporator leaving water temperature down to 3.3°C, and when operating as a heat pump, it can deliver up to 50°C on the condenser side.

Features and advantages

- Low energy consumption
- Designed to support green building design
- High reliability
- Easy and fast installation
- Minimised operating sound levels
- Touch Pilot control
- New inverter-driven Thunderbolt screw compressor
- Environmental care
- Remote management

Low energy consumption

- The 30XW-V/30XWHV was designed for high performance both at full load and at part load. Exceptional ESEER values set new benchmarks for low energy consumption.
  - Eurovent energy class A
  - Eurovent certified values per EN14511-3:2011: EER up to 5.4 and ESEER up to 8.0
  - EER up to 5.7 kW/kW and ESEER up to 9.5 kW/kW (gross adjusted performances, not taking into account the water pump and heat exchanger pressure drops, given as a reference for comparison).
- High energy efficiency
  - Inverter-driven twin-rotor screw compressors allow precise capacity matching of building load changes and significantly reduce unit power input, especially at part-load.
  - Flooded multi-pipe evaporator and condenser for increased heat exchange efficiency.
  - Electronic expansion device permits operation at a lower condensing pressure and improved utilisation of the evaporator heat exchange surface.
- Optimised electrical performance
  All 30XW-V/30XWHV units comply with class 3 of standard EN61800-3. Category C3 refers to industrial environments. With option 282 category C2 compliance is possible.
  - Inverter-driven motors ensure negligible start-up current (value is lower than the maximum unit current draw)

Designed to support green building design

- Design teams increasingly focus on designing “green buildings” to address today's energy efficiency and environmental sustainability needs. The air conditioning system uses between 30% and 40% of the annual building energy consumption. Selection of the right air conditioning unit is one the main aspects to consider when designing a green building. For buildings with a variable load throughout the year 30XW-V/30XWHV units offer the solution to this important challenge. For more details refer to page 4.

High reliability

- Inverter-driven screw compressors
  - Industrial-type screw compressors with oversized bearings and motor cooled by suction gas.
  - The inverter is optimised for each compressor motor to ensure reliable operation and easy maintenance.
  - All compressor components are easily accessible on site minimising down-time.
- Evaporator
  - Electronic paddle-free flow switch. Auto-setting according to cooler size and fluid type.
- Auto-adaptive control
  - Control algorithm prevents excessive compressor cycling
  - Automatic compressor unloading in case of abnormally high condensing pressure or discharge temperature.
- Exceptional endurance tests
  - Partnerships with specialised laboratories and use of limit simulation tools (finite element calculation) for the design of critical components.
  - Transport simulation test in the laboratory on a vibrating table and then on an endurance circuit (based on a military standard).

Easy and fast installation

- Compact design
  - The 30XW-V/30XWHV units are designed to offer compact dimensions for easy installation.
  - With a width of approximately 1.25 m up to 1000 kW the units can pass through standard door openings and only require minimum floor space in the plant room.
- Simplified electrical connections
  - Main disconnect switch with high trip capacity
  - Transformer supply to the integrated control circuit (400/24 V)
- Simplified water connections
  - Victaulic connections on the evaporator and condenser
  - Practical reference marks for entering and leaving water connections
  - Possibility to reverse the heat exchanger water inlet and outlet at the factory
  - Possibilty to modify the number of heat exchanger passes
- Fast commissioning
  - Systematic factory operation test before shipment
  - Quick-test function for step-by-step verification of the instruments, expansion devices and compressors.

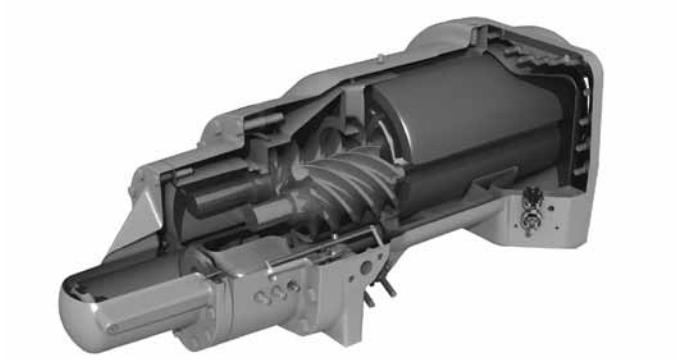
Minimised operating sound levels

- The inverter technology used for the compressor motors minimises noise levels at part load operation. At 50% of the maximum load the unit sound power level is reduced from 105 to 97 dB(A).
- Standard unit features include:
  - Silencers on the compressor discharge line.
  - Sound insulation on the components that are most subjected to radiated noise.
- Option 257 further reduces the global unit sound level.

Touch Pilot control

- New innovative smart control for variable-drive screw-compressor chillers. With the ultimate touch screen interface the Touch Pilot includes:
  - An intuitive and user-friendly interface. Concise and clear information is available in local languages.
  - Complete menu, customised for different users (end user, service personnel or Carrier engineers).
  - Safe operation and unit setting: password protection ensures that unauthorised people cannot modify any advanced parameters.
  - General access without password to the most important operating parameters.
  - Touch Pilot combines intelligence with operating simplicity. For optimum energy efficiency the control constantly monitors all machine parameters and precisely manages the operation of compressors, electronic expansion devices and of the evaporator and condenser water pumps.
- Energy management
  - Internal time schedule clock: controls chiller on/off times and operation at a second set-point
  - Set-point reset based on the return water temperature
  - The DCT (Data Collection Tool) records the alarms history to simplify and facilitate service operations.

New 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 compressors.
- 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.
- Other advantages:
  - If a fault occurs e.g. if the condenser is fouled or at very high water temperature, the compressor does not switch off, but continues operation at reduced capacity (unloaded mode).
  - The silencer in the discharge line considerably reduces discharge gas pulsations for much quieter operation.
  - The condenser includes an oil separator that minimises the amount of oil in circulation in the refrigerant circuit and re-directs it to the compressor function.

Environmental care

- R-134a refrigerant
  - HFC-refrigerant with zero ozone depletion potential
- Leak-tight refrigerant circuit
  - 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.

Remote management (standard)

Units with Touch Pilot control can be easily accessed from the internet, using a PC with an Ethernet connection. This makes remote control quick and easy and offers significant advantages for service operations.

The 30XW-V/30XWHV is equipped with an RS485 serial port that offers multiple remote control, monitoring and diagnostic possibilities. Carrier offers a vast choice of control products, specially designed to control, manage and supervise the operation of an air conditioning system. Please consult your Carrier representative for more information.

The 30XW-V/30XWHV also communicates with other building management systems via optional communication gateways.

A connection terminal allows remote control of the 30XW-V/30XWHV by wired cable:
- Start/stop: opening of this contact will shut down the unit
- Dual set-point: closing of this contact activates a second set-point (example: unoccupied mode)
- Demand limit: closing of this contact limits the maximum chiller capacity to a predefined value
- Operation indication: this volt-free contact indicates that the chiller is operating (cooling load) or that it is ready to operate (no cooling load)
- Alarm indication: this volt-free contact indicates the presence of a major fault that has led to the shut-down of one or several refrigerant circuits.

Remote management (EMM option)

The Energy Management Module offers extended remote control possibilities:
- Room temperature: permits set-point reset based on the building indoor air temperature (with Carrier thermostat)
- 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 power or current based on a 0-10 V signal
- Demand limit 1 and 2: closing of these contacts limits the maximum chiller power or current to two predefined values
- User safety: this contact can be used for any customer safety loop; opening the contact generates a specific alarm
- Ice storage end: when ice storage has finished, this input 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.

Carrier products and green building certification

- Introduction
  Energy usage and costs combined with increasing concerns to reduce CO_2 emissions are among the most important environmental challenges in today's world. New and existing buildings are one area where energy efficiency and the conservation of natural resources is a high priority.
- Green building design
  Design teams increasingly focus on designing "green buildings" to address today's energy efficiency and environmental sustainability needs. A green building is a building that is environmentally sustainable and has been designed, constructed and is operated to minimise the total impact of 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 main strategies* adopted to achieve a green building design include:
  - Sustainable Sites (SS)
  - Water Efficiency (WE)
  - Energy & Atmosphere (EA)
  - Materials & Resources (MR)
  - Indoor Environmental Quality (IEQ)
  - Innovation in Design (ID)
- Green building certification
  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. Some examples of existing programs include:
  - LEED (Leadership in Energy & Environmental Design)
  - BREEAM
  - ESTIDAMA PEARL
  - NABERS (National Australian Built Environment Rating System)
- HVAC products and systems
  Carrier HVAC products are built to high energy efficiency and indoor air quality standards. They assist building designers and owners by offering high-performance heating, ventilation, and air conditioning (HVAC) systems and products with reduced energy consumption and enhanced indoor air quality for the occupants, contributing to optimised green building performance.

  Each certification program may address and prioritise different green building design strategies according to local and regional needs and legislation. The following example looks at how Carrier's new 30XW-V/30XWHV range helps customers involved in LEED building certification.

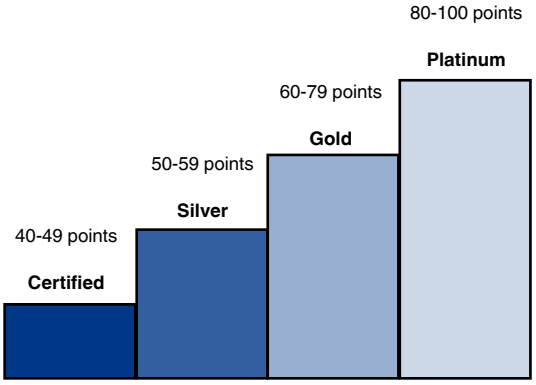
* Source USGBC: LEED

Example: 30XW-V/30XWHV 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. Whilst the strategies and categories assessed remain the 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

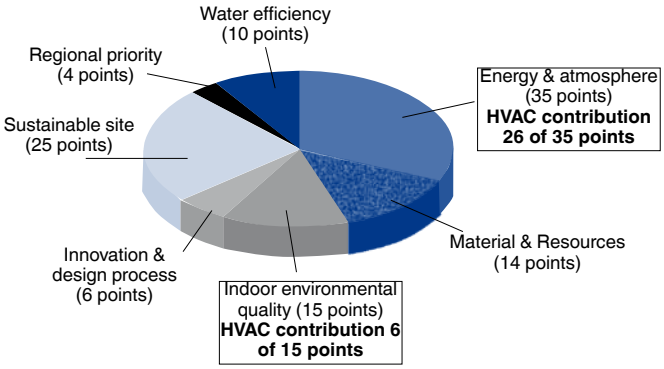


The majority of credits in LEED® rating systems are performance-based and achieving them is dependent on the impacts to the overall building. The contribution any product or system may make to the points achieved depends on how it impacts the entire building and its operations.

Whilst the LEED® green building certification programme does not certify products or services, the selection of products or service programmes is critical to obtaining 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 30XW-V/30XWHV units from Carrier can assist building owners to earn LEED® points in the Energy & Atmosphere (EA) credit category and help address the following prerequisites and credit requirements:

- **EA prerequisite 2: Minimum Energy Performance**
  The 30XW-V exceeds the energy-efficiency requirements of ASHRAE 90.1-2007; therefore it complies with the prerequisite standard.
- **EA prerequisite 3: Fundamental Refrigerant Management**
  The 30XW-V/30XWHV does not use chlorofluorocarbon (CFC) refrigerants satisfying the prerequisite statement
- **EA credit 1: Optimise energy performance (1 to 19 points)**
  One component for this credit requires the energy cost reduction of the proposed building compared to ASHRAE 90.1-2007 minimum tables and beyond the performance level required to meet EA prerequisite 2.

  The 30XW-V/30XWHV is designed for efficient part-load performance and therefore satisfies this LEED® credit. In addition, the Carrier HAP (Hourly Analysis Program) can be used in the energy analysis component of this credit. The HAP program can run analysis programs that comply 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 30XW-V/30XWHV 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 30XW-V/30XWHV. 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 systems
  - 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.

Options

Options	No.	Description	Advantages
Condenser insulation	86	Thermal condenser insulation	Allows configuration with special installation criteria (hot parts insulated).
Service valve set	92	Valve set consisting of liquid line valve (evaporator inlet) and compressor suction line valve to isolate the various refrigerant circuit components.	Simplified service and maintenance
Evaporator with one pass	100C	Evaporator with one pass on the water-side. Evaporator inlet and outlet on opposite sides.	Quick and easy installation. Reduced evaporator pressure losses.
Condenser with one pass	102C	Condenser with one pass on the water-side. Condenser inlet and outlet on opposite sides.	Quick and easy installation. Reduced condenser pressure losses.
21 bar evaporator	104	Reinforced evaporator for extension of the maximum water-side service pressure to 21 bar	Covers applications with a high water column (high buildings)
21 bar condenser	104A	Reinforced condenser for extension of the maximum water-side service pressure to 21 bar	Covers applications with a high water column (high buildings)
Reversed evaporator water connections	107	Evaporator with reversed water inlet/outlet	Simplification of the water piping
Reversed condenser water connections	107A	Condenser with reversed water inlet/outlet	Simplification of the water piping
JBus gateway	148B	Two-directional communications board, complies with JBus protocol	Easy connection by communication bus to a building management system
BacNet gateway	148C	Two-directional communications board, complies with BacNet protocol	Easy connection by communication bus to a building management system
LON gateway	148D	Two-directional communications board, complies with LON protocol	Easy connection by communication bus to a building management system
Condensing temperature limitation	150B	Limitation of the maximum condenser leaving water temperature to 45°C. Modification on the unit name plate to reflect the reduced power input and current values.	Avoids oversizing of the protection elements and the power cables.
Control for low condensing temperature systems	152	Output signal (0-10 V) to control the condenser water inlet valve.	Used for applications with cold water at condenser inlet (well water). In this case the valve controls the water entering temp. to maintain an acceptable condensing pressure.
Energy Management Module EMM	156	Remote control module. Additional contacts for an extension of the unit control functions.	Easy connection by wired connection to a building management system
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 correction
Code compliance for Switzerland in addition to PED code	197	Additional tests on the water heat exchangers. Additional supply of PED documents, supplementary certificates and test certificates.	Conformance with Swiss regulations
Code compliance for Australia	200	Heat exchanger approved in accordance with the Australian code.	Conformance with Australian regulations
Low noise level (-3 dB(A) compared to standard unit)	257	Evaporator sound insulation	3 dB(A) quieter than a unit without this option
Welded evaporator water connection kit	266	Victaulic piping connections with welded joints.	Easy installation
Welded condenser water connection kit	267	Victaulic piping connections with welded joints.	Easy installation
Flanged evaporator water connection kit	268	Victaulic piping connections with flanged joints.	Easy installation
Flanged condenser water connection kit	269	Victaulic piping connections with flanged joints.	Easy installation
Thermal compressor insulation	271	Thermal compressor insulation	Prevents condensation forming on the compressor (due to the ambient air)
EMC classification according to IEC 61800-3 - class C2	282	Frequency variator with RFI filter class C2.	Reduces the risk of electromagnetic interference, if the unit is installed in a residential environment

Physical data, 30XW-V units

30XW-V		580	630	810	880
Air conditioning application - as per EN14511-3 : 2011					
Cooling capacity*	kW	587	652	812	858
Power input*	kW	108	123	155	169
EER*	kW/kW	5.44	5.31	5.25	5.07
Eurovent class, cooling		A	A	A	A
ESEER part-load performances*	kW/kW	7.80	7.60	8.04	7.76
Air conditioning application					
Cooling capacity**	kW	588	654	814	861
Power input**	kW	104	118	149	163
EER**	kW/kW	5.67	5.56	5.46	5.29
ESEER part-load performances**	kW/kW	9.03	9.04	9.52	9.25
Cooling floor application - as per EN14511-3 : 2011					
Cooling capacity***	kW	791	846	1022	970
Power input***	kW	114	130	164	172
EER***	kW/kW	6.96	6.50	6.22	5.63
Eurovent class, cooling		A	A	A	A
Cooling floor application					
Cooling capacity******	kW	794	850	1026	973
Power input *****	kW	106	121	155	164
EER********	kW/kW	7.50	7.03	6.62	5.93
Sound levels, standard units					
Sound power level††	dB(A)	105	105	105	105
Sound pressure level at 1 m‡	dB(A)	87	87	87	87
Sound levels, units with option 257					
Sound power level††	dB(A)	102	102	102	102
Sound pressure level at 1 m‡	dB(A)	84	84	84	84
Dimensions					
Length x depth x height	mm	3059 x 1087 x 1743	3059 x 1087 x 1743	3290 x 1237 x 1950	3290 x 1237 x 1950
Operating weight†	kg	3152	3190	4157	4161
Compressors		Semi-hermetic 06T screw compressor, 60 r/s			
Circuit A		1	1	1	1
Refrigerant charge†		R-134a			
Circuit A	kg	130	130	180	175
Oil charge		SW220			
Circuit A	l	32	32	36	36
Capacity control		Touch Pilot, inverter-driven compressor, electronic expansion valve (EXV)			
Minimum capacity	%	20	20	20	20
Evaporator		Multi-tube type flooded			
Net water volume	l	106	106	154	154
Water connections		Victaulic			
Inlet/outlet	inch	6	6	8	8
Drain and purge (NPT)	inch	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000
Condenser		Multi-tube type			
Net water volume	l	112	112	165	165
Water connections		Victaulic			
Inlet/outlet	inch	6	6	8	8
Drain and purge (NPT)	inch	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000

* Calculations in accordance with standard performances (as per EN14511-3 : 2011) and certified by Eurovent.
Conditions in cooling mode: evaporator water entering/leaving temperature 12°C/7°C, condenser water entering/leaving temperature 30°C/35°C, evaporator/condenser fouling factor = 0
** Conditions in cooling mode: evaporator water entering/leaving temperature 12°C/7°C, condenser water entering/leaving temperature 30°C/35°C, evaporator/condenser fouling factor = 0. Gross adjusted performances, not taking into account the water pump and heat exchanger pressure drops, that are not certified by Eurovent for 2012, but used for the 2011 gross declaration and given as a reference for comparison.
*** Calculations in accordance with standard performances (as per EN14511-3 : 2011) and certified by Eurovent.
Conditions in cooling mode: evaporator water entering/leaving temperature 23°C/18°C, condenser water entering/leaving temperature 30°C/35°C, evaporator/condenser fouling factor = 0
**** Conditions in cooling mode: evaporator water entering/leaving temperature 23°C/18°C, condenser water entering/leaving temperature 30°C/35°C, evaporator/condenser fouling factor = 0. Gross adjusted performances, not taking into account the water pump and heat exchanger pressure drops, that are not certified by Eurovent for 2012, but used for the 2011 gross declaration and given as a reference for comparison.
† Weights are guidelines only. The refrigerant charge is given on the unit nameplate.
†† 10^{-12} W in accordance with ISO 9614-1.
‡ In a free field at full load (ref. 2 x 10^{-5} Pa)

Physical data, 30XWHV units

30XWHV		580	630	810	880
Air conditioning application - as per EN14511-3 : 2011					
Heating capacity*	kW	648	719	890	968
Power input*	kW	140	159	195	219
Coefficient of performance (COP)*	kW/kW	4.64	4.53	4.56	4.41
Eurovent class, heating		A	A	A	B
Air conditioning application					
Heating capacity**	kW	646	716	887	965
Power input**	kW	133	151	187	209
Coefficient of performance (COP)**	kW/kW	4.84	4.75	4.75	4.61
Heating floor application - as per EN14511-3 : 2011					
Heating capacity***	kW	687	767	956	1021
Power input***	kW	112	128	160	176
Coefficient of performance (COP)***	kW/kW	6.15	5.98	5.96	5.81
Eurovent class, heating		A	A	A	A
Heating floor application					
Heating capacity****	kW	684	763	953	1017
Power input****	kW	104	118	149	163
Coefficient of performance (COP)****	kW/kW	6.59	6.49	6.39	6.25
Sound levels, standard units					
Sound power level††	dB(A)	105	105	105	105
Sound pressure level at 1 m‡	dB(A)	87	87	87	87
Sound levels, units with option 257					
Sound power level††	dB(A)	102	102	102	102
Sound pressure level at 1 m‡	dB(A)	84	84	84	84
Dimensions					
Length x depth x height	mm	3059 x 1087 x 1743	3059 x 1087 x 1743	3290 x 1237 x 1950	3290 x 1237 x 1950
Operating weight†	kg	3152	3190	4157	4161
Compressors		Semi-hermetic 06T screw compressor, 60 r/s			
Circuit A		1	1	1	1
Refrigerant charge†		R-134a			
Circuit A	kg	130	130	180	175
Oil charge		SW220			
Circuit A	l	32	32	36	36
Capacity control		Touch Pilot, inverter-driven compressor, electronic expansion valve (EXV)			
Minimum capacity	%	20	20	20	20
Evaporator		Multi-tube type flooded			
Net water volume	l	106	106	154	154
Water connections		Victaulic			
Inlet/outlet	inch	6	6	8	8
Drain and purge (NPT)	inch	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000
Condenser		Multi-tube type			
Net water volume	l	112	112	165	165
Water connections		Victaulic			
Inlet/outlet	inch	6	6	8	8
Drain and purge (NPT)	inch	3/8	3/8	3/8	3/8
Maximum water-side operating pressure	kPa	1000	1000	1000	1000

* Calculations in accordance with standard performances (as per EN14511-3 : 2011) and certified by Eurovent.
Conditions in heating mode: condenser water entering/leaving temperature 40°C/45°C, evaporator water entering/leaving temperature 10°C/7°C, evaporator/condenser fouling factor = 0

** Conditions in heating mode: condenser water entering/leaving temperature 40°C/45°C, evaporator water entering/leaving temperature 10°C/7°C, evaporator/condenser fouling factor = 0. Gross adjusted performances, not taking into account the water pump and heat exchanger pressure drops, that are not certified by Eurovent for 2012, but used for the 2011 gross declaration and given as a reference for comparison.

*** Calculations done in accordance with standard performances (as per EN14511-3 : 2011) and certified by Eurovent.
Conditions in heating mode: condenser water entering/leaving temperature 30°C/35°C, evaporator water entering/leaving temperature 10°C/7°C, evaporator/condenserfouling factor = 0

**** Conditions in heating mode: condenser water entering/leaving temperature 30°C/35°C, evaporator water entering/leaving temperature 10°C/7°C, evaporator/condenser fouling factor = 0. Gross adjusted performances, not taking into account the water pump and heat exchanger pressure drops, that are not certified by Eurovent for 2012, but used for the 2011 gross declaration and given as a reference for comparison.

† Weights are guidelines only. The refrigerant charge is given on the unit nameplate.

†† 10^{-12} W in accordance with ISO 9614-1.

‡ In a free field at full load (ref. 2 x 10^{-5} Pa)

Electrical data

30XW-V/30XWHV		580	630	810	880
Power circuit					
Nominal power supply	V-ph-Hz	400-3-50			
Voltage range	V	360-440			
Control circuit		24 V via the built-in transformer			
Start-up current*	A	Negligible (lower than maximum current drawn)			
Power factor					
At nominal capacity**		0.89	0.90	0.89	0.90
At maximum capacity***		0.92	0.92	0.92	0.92
Cosine phi		>0.98	>0.98	>0.98	>0.98
Total harmonic distortion****	%	40	40	40	40
Maximum power input****	kW	155	193	222	246
Eurovent current draw**	A	175	200	240	265
Maximum current draw (Un)****	A	245	300	346	383
Maximum current draw (Un -10%)****	A	270	330	380	421
Dissipated power***	W	3000	4200	4700	5300

* Instantaneous start-up current
** Eurovent unit operating conditions: evaporator entering/leaving water temperature = 12°C/7°C, condenser entering/leaving water temperature = 30°C/35°C.
*** 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.

Notes, electrical data and operating conditions - 30XW-V/30XWHV units

- The control box includes the following standard features:
  - One main disconnect switch per circuit
  - Anti-short cycle protection devices
  - Control devices
- **Field connections:**
  All connections to the system and the electrical installations must be in full accordance with all applicable codes.
- The Carrier 30XW-V/30XWHV units are designed and built to ensure conformance with local 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*.
- Annex B of EN 60204 1 describes the electrical characteristics used for the operation of the machines. The ones described below apply to 30XW-V/30XWHV units and complement other information in this document:

1. Physical environment**: Environment as classified in EN 60721 (corresponds to IEC 60721):
   - indoor installation
   - ambient temperature range: minimum temperature +5°C to +42°C, class AA4
   - altitude: lower than or equal to 2000 m
   - presence of water: class AD2 (possibility of water droplets)
   - presence of hard solids, 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 frequency variator(s) make machine use unsuitable. In addition, the short-circuit holding current characteristics have been modified. Provide a local earth, consult competent local organisations to complete the electrical installation.
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†

- Due to the harmonic currents the integrated frequency variator in the 30XW-V/30XWHV units is 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.
  Note: The evaluation of the compatibility level of harmonic interference on the public low-voltage power distribution system can be done using technical report IEC61000-3-4. In this document the THDI rate of the 30XW-V/30XWHV units permits a stage 2 connection procedure for any Rsce value above 300: the connection is based on the system data and the material.
- Derived currents: If protection by monitoring the leakage currents is necessary to ensure the safety of the installation, the presence of derived currents introduced by the use of frequency variators in the unit must be considered. In particular the choice the detection type and a control value not lower than 150 mA are recommended to control differential protection devices.

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.

* 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 IP21B or IPX1B (according to reference document IEC 60529). All 30XW-V/30XWHV have IP23 units 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 its occupation.

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 ARI 550/590-03)

The IPLV (integrated part load value) allows evaluation of the average energy efficiency based on four operating conditions defined by the ARI (American 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 %	Condenser entering water 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

IPLV = EER_1 x 1% + EER_2 x 42% + EER_3 x 45% + EER_4 x 12%

ESEER (European seasonal energy efficiency ratio)

Load %	Condenser entering water temperature, °C	Energy efficiency	Operating time, %
100	30	EER_1	3
75	26	EER_2	33
50	22	EER_3	41
25	18	EER_4	23

ESEER = EER_1 x 3% + EER_2 x 33% + EER_3 x 41% + EER_4 x 23%

Sound spectra

30XW-V/30XWHV units

%		Octave bands, Hz 125	250	500	1k	2k	4k	Sound power levels	
100	dB(A)	72	94	102	100	95	85	dB(A)	105
75*	dB(A)	72	88	98	100	96	85	dB(A)	103
50*	dB(A)	75	87	91	94	88	87	dB(A)	97
25*	dB(A)	75	87	91	94	88	87	dB(A)	97

30XW-V/30XWHV - units with option 257**

%		Octave bands, Hz 125	250	500	1k	2k	4k	Sound power levels	
100	dB(A)	69	91	99	97	92	82	dB(A)	102
75*	dB(A)	69	85	95	97	93	82	dB(A)	100
50*	dB(A)	72	84	88	91	85	84	dB(A)	94
25*	dB(A)	72	84	88	91	85	84	dB(A)	94

* Values for information only and not contractually binding.
** Evaporator equipped with acoustic insulation.

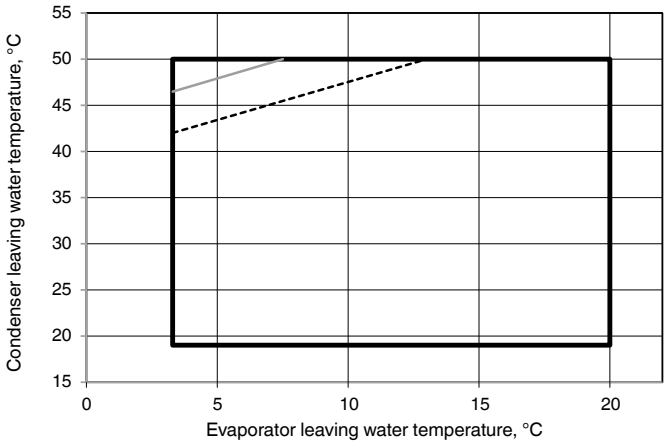
Operating limits and operating ranges

30XW-V/30XWHV	Minimum	Maximum
Evaporator		
Entering temperature at start-up	-	35.0°C
Leaving temperature during operation	3.3°C*	20.0°C
Entering/leaving temperature difference at full load	2.8 K	11.1 K
Condenser		
Entering temperature at start-up	13.0°C**	-
Leaving temperature during operation	19.0°C**	50.0°C
Entering/leaving temperature difference at full load	2.8 K	11.1 K

* Options 5/6 not available
** For lower condenser temperatures, a water flow control valve must be installed at the condenser (two-way or three-way). Please refer to option 152 to ensure the correct condensing temperature.

Notes:
Ambient temperatures: During storage and transport of the units (including by container) the minimum and maximum permissible temperatures are -20°C and 72°C (and 65°C for option 200).

For more precise details refer to the unit selection program.

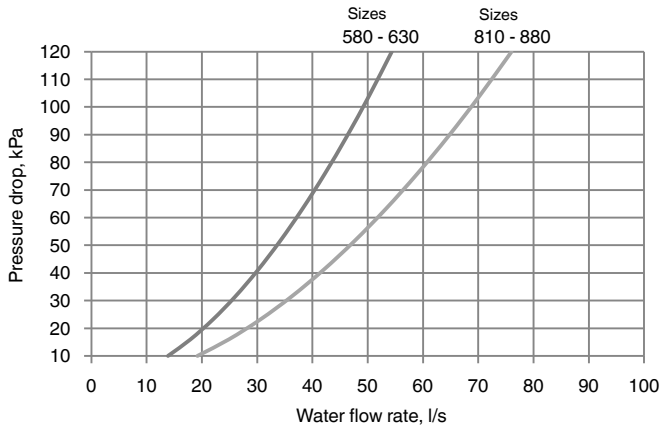


From approx. 50% to full load
Part load limit approx. 50%
Minimum load limit approx. 20%

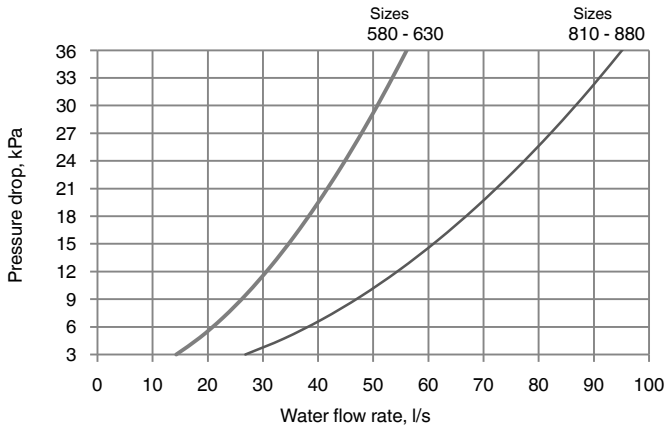
For more precise details please refer to the unit selection program.

Pressure drop curves, 30XW-V/30XWHV units

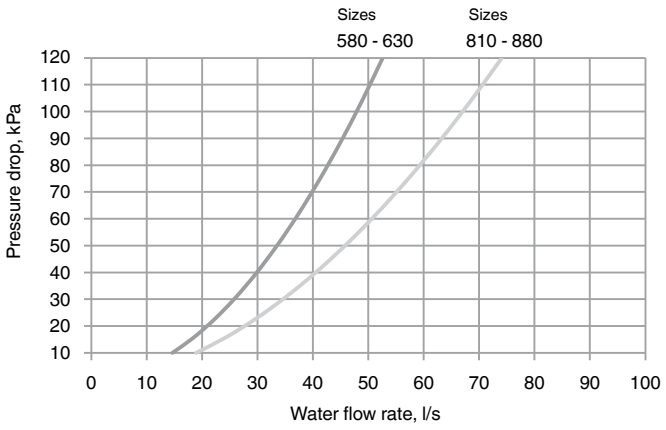
Units with two evaporator passes (standard)



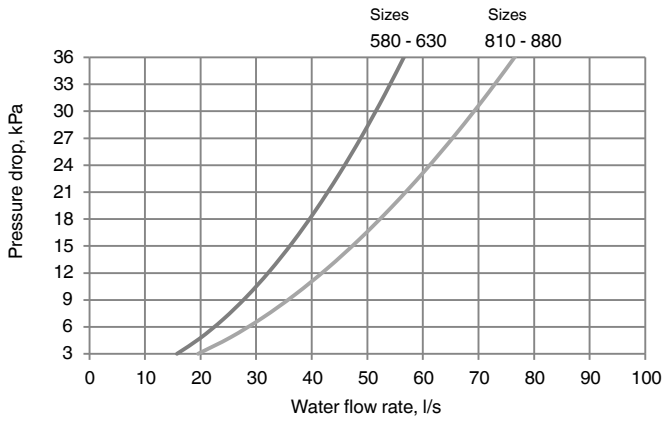
Units with one evaporator pass (option 100C)



Units with two condenser passes (standard)

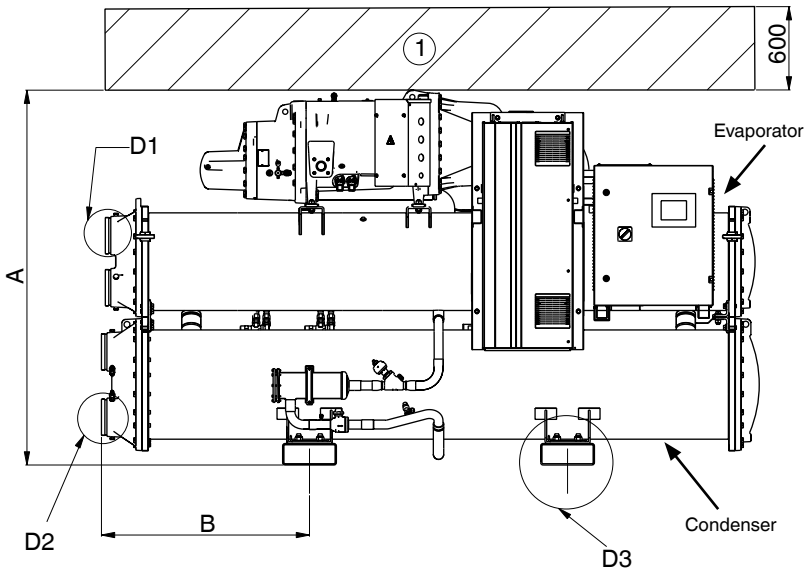


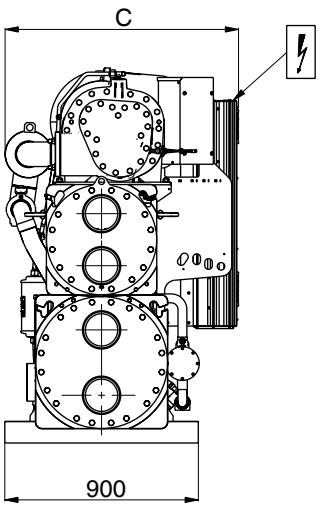
Units with one condenser pass (option 102C)

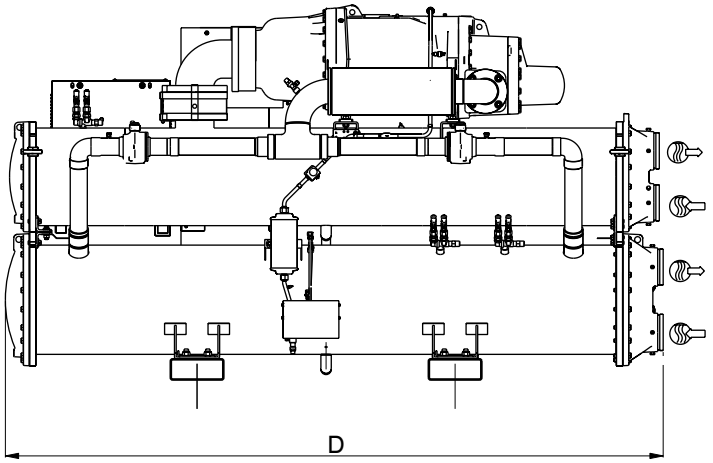


Dimensions / clearances

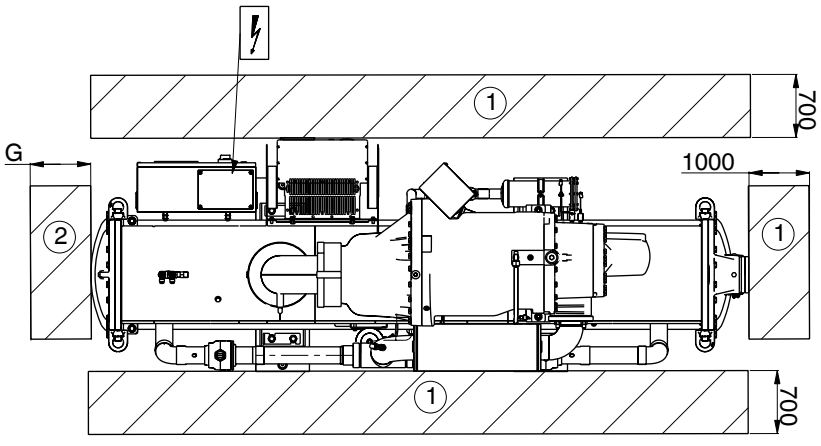
30XW-V/30XWHV 580-880







Dimensions in mm							
	A	B	C	D	E	F	G
30XW-V/30XWHV							
580	1743	968	1087	3059	168,3	168,3	2900
630	1743	968	1087	3059	168,3	168,3	2900
810	1950	1083	1237	3290	219,1	219,1	3100
880	1950	1083	1237	3290	219,1	219,1	3100



Legend:

All dimensions are in mm.

(1) Required clearance for maintenance

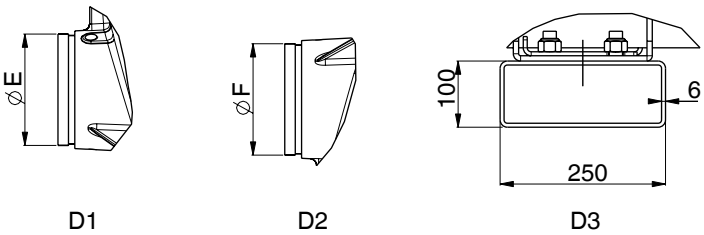
(2) Recommended clearance for tube removal

Water inlet

Water outlet

Power supply connection

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



D1 D2 D3

30XW-V/ 30XWHV	LWT, °C	Condenser leaving water temperature, °C																											
		30									35										40								
		Qc kW	Qh kW	P kW	EER kW/kW	COP kW/kW	Cool l/s	Cool kPa	Cond l/s	Cond kPa	Qc kW	Qh kW	P kW	EER kW/kW	COP kW/kW	Cool l/s	Cool kPa	Cond l/s	Cond kPa	Qc kW	Qh kW	P kW	EER kW/kW	COP kW/kW	Cool l/s	Cool kPa	Cond l/s	Cond kPa
580	5	570	660	95.7	5.95	6.90	27.2	32.8	31.6	45.0	540	641	107	5.03	5.98	25.8	29.7	30.7	42.0	509	623	121	4.22	5.17	24.3	26.8	29.9	39.2
630		634	737	109	5.80	6.74	30.3	40.6	35.3	54.9	601	717	123	4.88	5.83	28.7	36.8	34.4	51.3	565	696	138	4.09	5.04	27.0	32.9	33.4	47.8
810		791	922	138	5.72	6.66	37.8	36.6	44.1	44.9	749	895	154	4.86	5.81	35.8	33.2	42.9	41.7	702	865	172	4.09	5.04	33.5	29.5	41.6	38.4
880		810	950	147	5.50	6.45	38.7	37.5	45.5	46.7	812	971	168	4.82	5.77	38.8	37.7	46.5	47.6	762	941	189	4.03	4.97	36.4	33.6	45.2	44.1
580	7	613	704	96.9	6.33	7.27	29.3	37.1	33.7	50.2	581	684	109	5.35	6.30	27.8	33.7	32.8	46.8	549	664	122	4.50	5.45	26.2	30.3	31.9	43.7
630		680	784	110	6.18	7.13	32.5	45.7	37.5	60.9	645	763	124	5.21	6.15	30.9	41.5	36.5	56.9	608	740	139	4.37	5.32	29.1	37.2	35.5	52.9
810		829	961	139	5.95	6.90	39.6	39.4	46.0	48.4	805	952	156	5.18	6.12	38.5	37.4	45.7	46.7	756	920	173	4.37	5.32	36.1	33.3	44.2	42.9
880		835	976	148	5.63	6.57	39.9	39.2	46.7	49.1	854	1015	170	5.01	5.96	40.8	40.8	48.6	51.5	819	1001	192	4.27	5.22	39.2	37.9	48.0	49.3
580	10	674	767	98.4	6.85	7.80	32.3	43.4	36.7	57.8	647	752	111	5.86	6.80	31.0	40.3	36.0	54.8	613	730	124	4.94	5.88	29.3	36.5	35.0	51.1
630		745	851	112	6.66	7.61	35.7	53.1	40.7	69.8	716	836	126	5.66	6.61	34.3	49.4	40.0	66.2	676	810	142	4.77	5.71	32.4	44.4	38.8	61.6
810		879	1013	141	6.22	7.17	42.1	43.1	48.5	53.3	860	1009	158	5.45	6.40	41.2	41.4	48.4	51.8	840	1007	177	4.75	5.70	40.2	39.7	48.3	50.5
880		874	1017	150	5.81	6.76	41.9	41.9	48.7	52.9	892	1055	172	5.19	6.14	42.7	43.5	50.5	55.2	899	1083	194	4.62	5.57	43.1	44.1	52.0	56.8
580	18	772	867	101	7.67	8.61	37.1	53.4	41.5	71.0	776	884	114	6.78	7.73	37.3	53.9	42.3	71.8	780	903	130	5.99	6.94	37.5	54.4	43.3	72.8
630		866	976	116	7.48	8.43	41.7	67.1	46.6	87.7	841	965	132	6.39	7.34	40.5	63.6	46.2	84.3	794	934	148	5.38	6.33	38.2	57.2	44.7	78.0
810		1009	1148	147	6.88	7.83	48.5	53.1	54.9	66.8	1003	1159	165	6.08	7.03	48.2	52.6	55.5	66.5	993	1169	186	5.34	6.29	47.7	51.6	56.1	66.2
880		932	1076	153	6.10	7.05	44.8	45.2	51.5	58.6	961	1126	174	5.53	6.48	46.2	47.8	53.9	62.2	982	1167	196	5.01	5.96	47.2	49.7	56.0	65.0

30XW-V/ 30XWHV	LWT, °C	Condenser leaving water temperature, °C																	
		45									50								
		Qc kW	Qh kW	P kW	EER kW/kW	COP kW/kW	Cool l/s	Cool kPa	Cond l/s	Cond kPa	Qc kW	Qh kW	P kW	EER kW/kW	COP kW/kW	Cool l/s	Cool kPa	Cond l/s	Cond kPa
580	5	478	607	136	3.51	4.46	22.8	23.9	29.2	36.8	446	593	155	2.88	3.82	21.3	21.1	28.6	34.8
630		527	674	156	3.39	4.33	25.1	29.0	32.4	44.4	486	653	176	2.76	3.71	23.2	25.1	31.5	41.3
810		654	835	191	3.41	4.36	31.2	25.9	40.2	35.3	603	805	214	2.81	3.76	28.8	22.4	38.8	32.5
880		711	913	214	3.32	4.26	33.9	29.6	43.9	41.0	658	889	244	2.69	3.64	31.4	25.7	42.8	38.3
580	7	516	646	138	3.75	4.69	24.7	27.1	31.1	40.9	482	630	156	3.09	4.03	23.1	24.0	30.4	38.5
630		568	716	156	3.64	4.58	27.1	32.9	34.4	49.1	525	692	176	2.98	3.92	25.1	28.5	33.3	45.6
810		704	886	192	3.66	4.61	33.7	29.3	42.6	39.3	651	853	214	3.04	3.98	31.1	25.4	41.1	36.1
880		765	969	216	3.54	4.49	36.6	33.4	46.6	45.6	709	941	245	2.89	3.83	33.9	29.1	45.3	42.5
580	10	577	709	140	4.13	5.08	27.6	32.7	34.1	47.7	540	690	158	3.42	4.37	25.9	29.0	33.2	44.7
630		633	783	159	3.98	4.93	30.3	39.4	37.6	57.0	583	752	179	3.25	4.20	34.3	49.3	36.2	52.4
810		784	969	196	4.01	4.95	37.6	35.0	46.6	46.3	726	931	217	3.34	4.29	34.8	30.5	44.9	42.3
880		850	1056	218	3.90	4.84	40.7	39.8	50.8	53.3	789	1022	246	3.21	4.15	37.8	34.8	49.2	49.3
580	18	728	865	145	5.01	5.96	35.0	47.9	41.5	66.5	645	798	161	4.00	4.94	31.0	38.4	38.4	57.0
630		693	846	162	4.28	5.23	33.3	44.7	40.6	65.0	587	756	179	3.29	4.24	28.2	33.0	36.4	52.8
810		926	1121	205	4.51	5.46	44.5	45.5	53.8	60.1	858	1072	226	3.80	4.74	41.3	39.6	51.6	54.5
880		929	1139	145	4.18	5.13	44.7	44.9	54.8	61.0	802	1035	246	3.26	4.20	38.5	34.4	49.8	50.5

Legend:

LWT	Leaving water temperature, evaporator
Qc kW	Cooling capacity
Qh kW	Heating capacity
P kW	Power input
EER kW/kW	Energy efficiency ratio
COP kW/kW	Coefficient of performance
Cool l/s	Evaporator water flow rate
Cool kPa	Evaporator pressure drop
Cond l/s	Condenser water flow rate
Cond kPa	Condenser pressure drop

Application data:
Standard units, refrigerant R-134a
Evaporator and condenser water temperature rise: 5 K
Evaporator and condenser fluid: water
Fouling factor: 0.18 x 10-4 (m^2 K)/W

Performances in accordance with EN 14511.

Guide specification

- 30XW-V Water-cooled liquid chillers with inverter-driven screw compressor
- 30XWH-V Water-sourced heating units with inverter-driven screw compressor
  Cooling capacity range: 586 - 872 kW
  Heating capacity range: 688-1033 kW

- General description
  Factory-assembled single-piece water-sourced units, shall include all factory wiring, piping, controls, refrigerant charge (HFC-134a), refrigerant circuits, inverter-driven screw compressors, electronic expansion valves and equipment required prior to field start-up.
- Performances
  - Cooling capacity: …….. kW
  - Unit power input: …… kW
  - Full load energy efficiency (EER kW/kW): ……..
  - Part load energy efficiency (ESEER kW/kW):…....
  - Evaporator entering/leaving water temperature: …/…°C Fluid……..
  - Condenser entering/leaving water temperature: …/…°C
  - Fluid……..
  - Sound power level: …….dB(A)

  Unit shall be rated Eurovent class A in accordance with EN14511 and certified by Eurovent.

- Quality assurance
  Unit construction shall comply with European directives:
  - Pressure 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 emission and immunity EN 61800-3 ‘C3’ (‘C2’ as option)

  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.

Product features

- Compressors
  - Unit shall have semi-hermetic inverter-driven twin-screw compressors with internal relief valve and check valve to avoid reverse rotation on shut down.
  - Each compressor shall be equipped with a discharge shut-off valve.
  - The discharge shall also be equipped with a muffler to reduce discharge gas pulsations.
  - Capacity control shall be provided by an inverter motor capable of reducing compressor capacity down to 20% of maximum capacity.
  - Compressor shall start in unloaded condition.
  - Motor shall be cooled by suction gas and protected by internal winding temperature sensors. Compressor bearings shall be designed for a minimum 73000 hours at maximum operating conditions.
  - Lubrication oil system shall include pre-filter and external filter capable of filtration to 5 µm.
- Evaporator
  - Unit shall be equipped with a single evaporator.
  - Evaporator shall be manufactured, 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 water-side pressure will be 1000 kPa (2100 kPa as an option).
  - The evaporator shall be a 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.
  - The evaporator shall incorporate an active refrigerant level control system to ensure optimum heat transfer performance under all load conditions.
  - Design shall incorporate either one or two independent refrigerant circuits
  - Chiller shall have only one water inlet and outlet connection with Victaulic couplings to avoid vibration transmission and accept a small misalignment (water connection kit on demand).
  - Evaporator shall be fitted with an electronic self-setting water flow switch. Paddle switches or differential pressure switches shall not be acceptable.
- Condenser
  Unit shall be equipped with a single condenser.
  - Condenser shall be manufactured, 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 water-side pressure will be 1000 kPa (2100 kPa as an option).
  - The condenser shall be a 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.
  - Design shall incorporate either one or two independent refrigerant circuits and the oil separator.
  - The condenser shall have a drain and vent in each head.
  - The unit shall have only one water inlet and outlet connection with Victaulic couplings to avoid vibration transmission and accept a small misalignment (water connection kit on demand).
- Refrigerant circuit
  - Refrigerant circuit components shall include compressor, oil separator, high and low- side pressure relief devices, compressor discharge shut-off valves, filter driers, moisture indicating sight glasses, long-stroke electronic expansion device, and a complete operating charge of refrigerant HFC-134a and compressor oil.
  - To facilitate service and maintenance and avoid refrigerant charge transfers, it must be possible to isolate the following components and systems independently: filter driers, oil filters, expansion devices and compressor (with service valve option).
- Controls:
  - Unit controls shall include as a minimum: microprocessor with non-volatile memory, picture-guided unit/operator interface, the Local/Off/Remote/CCN selector and a coloured touch-screen display with multiple-language capability.
  - Pressure sensors shall be installed to measure suction, discharge, and oil pressure.
  - Temperature probes shall be installed to measure cooler entering and leaving temperatures (cooler and condenser side).

Unit shall be capable of performing the following functions:
- EXV control, based on pinch control, shall optimise evaporator charging
- Capacity control based on leaving chilled fluid temperature with return fluid temperature sensing
- Limitation of the chilled-fluid temperature pull-down rate at start-up to an adjustable range of 0.1 K to 1.1 K per minute to prevent excessive demand spikes at start-up.
- Reset enable of leaving chilled-water temperature based on the return water temperature or via a 0-10 V signal.
- Provision of a dual set point for the leaving chilled water temperature activated by a remote contact closure signal or by the built in time clock
- Enabling a 2-level demand limit control (between 0 and 100%) activated by remote contact closure or by the built-in time clock
- Water pump control, safety pumps (if installed), on both condenser and cooler side
- Allowing two time scheduling programs to enable unit start-up control, demand limit and set-point changes.

■ Diagnostics
- Display module shall be capable of displaying set points, system status including temperatures, pressures, current for each compressor, run time and percent loading.
- The control system shall allow a quick test of all machine elements to verify the correct operation of every switch, circuit breaker, contactor etc. before the chiller is started.

■ Safety devices

Unit shall be equipped with all necessary components, and in conjunction with the 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
- Automatic compressor unloading in case of excessive condensing temperature
- High pressure
- Electrical overload
- Loss of phase.

Control shall provide a separate general alert (minor incident) and alarm (circuit shut-down) remote indication.

■ Operating characteristics
- Unit shall be capable of starting with 19°C entering water temperature to the condenser, down to 13°C with condenser head pressure control option.
- Unit shall be capable of starting with 35°C entering water temperature to the evaporator.

■ Electrical characteristics
- Unit shall operate on three-phase power supply without neutral.
- Control voltage shall be supplied by a factory-installed transformer.
- Unit shall be supplied with factory-installed main circuit breaker, also acting as electrical disconnect/isolator.
- The inverter-driven motor shall provide a unit soft charge, with negligible start-up current. Unit power factor correction at full load should be higher than 0.92.
- The unit shall be certified for limited electromagnetic distortion, in accordance with EN61800-3, category C3.

Quality and Environment
Management Systems
Approval

Order No.13473-20, 10.2012. Supersedes order No. 13473-20, 05.2012.

Manufactured by: Carrier SCS, Montluel, France.
Printed in the European Union.