

HIGH TEMPERATURE WATER-SOURCE HEAT PUMP



Renewable heat solution able to produce hot water up to 85°C

Multiple applications: district heating, space heating, process heating

Multiple renewable energy sources: waste heat from data centers, from industry, grey waters, ground source water

61XWHLZE
61XWH-ZE
61XWHHZE

AQUAFORCE
PUREtec

Nominal heating capacity 200 - 2500 kW

The AQUAFORCE PUREtec 61XWHZE water-source heat pumps are the premium solution for industrial and commercial heating applications where end users, consultants and building owners require optimal performances, very hot water temperature, environmental solution and maximum reliability.

The AQUAFORCE PUREtec 61XWHZE water-source heat pumps are designed to meet current and future requirements in terms of energy efficiency, flexibility of use and compactness.

They use the most reliable technologies available today:

- Twin-rotor screw compressors with a variable capacity valve
- R-1234ze refrigerant
- Touch Pilot control system
- Flooded heat exchangers that are mechanically cleanable

The 61XWHZE Aquaforce range is available into three versions:

- 61XWHLZE for low heat source temperatures
- 61XWH-ZE for medium heat source temperatures
- 61XWHHZE for high heat source temperatures



CARRIER participates in the ECP programme for LCP/HP
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www.eurovent-certification.com

INTRODUCTION

Forecasts indicate that 75% of the European citizens will live in urban areas in 2020 and that this share will increase to 84% by 2050. People in cities use three times as much energy as people who live in the country. This has tremendous implications for the environment today and in the future if we do nothing.

Recent European surveys have demonstrated that there is enough waste heat produced in the European Union to heat the entire building stock. Industrial waste heat, waste heat from grey waters, waste heat from process cooling, data centers... All this waste energy too frequently released into the air or into water bodies.

More and more, developers, consultants, cities, politics will need to imagine intelligent, sustainable cities with smart heating and cooling solutions. More and more industrial end users will need to imagine new solutions to value waste heat from industrial processes.

Heat pumps have been already used to such purpose for many years.

More recently CARRIER has supported customers across various markets on big projects like data centers, hospitals, schools, district heating with large heat-pumps using HFC 134a.

Higher with PUREtec

Now the combination of Carrier technology and HFO refrigerant enables to offer high temperature PUREtec heat pumps capable of delivering hot water up to 85°C!

The AQUAFORCE PUREtec 61XWHZE water-source heat pumps can recover, upgrade and value the waste heat for reuse in applications like local or district heating. Selecting the 61XWH-ZE, you can now have an alternative and complement as traditional boiler in applications such as district heating or industrial processes.

While the boilers are heating only, 61XWHZE heat-pumps can provide heating, cooling and transfer energy from waste energy with much higher energy efficiency performance ratios than boilers.

The AQUAFORCE PUREtec 61XWHZE water-source heat pumps are the premium solution for industrial and commercial heating applications where installers, consultants and building owners require optimal performances hot water temperature, environmental solution, maximum reliability and safety.

The AQUAFORCE PUREtec 61XWHZE water-source heat pumps are designed to meet current and future requirements in terms of energy efficiency, flexibility of use and compactness. They use the most reliable technologies available today:

- Twin-rotor screw compressors with a variable capacity valve
- R-1234ze refrigerant
- Touch Pilot control system
- Flooded heat exchangers that are mechanically cleanable

Customer Benefits

Renewable Heat Solution

- The perfect solution for district heating systems
 - The 61XWHZE contribute both towards the EU 2020 ambition of 27% energy mix coming from renewable sources and the expansion of district heating from the present level of around 12% to 50% in 2050 in EU.
 - Multiple 61XWHZE high temperature water-source heat pumps can be combined to reach the best efficiency and higher capacities.
 - The district heating networks using 61XWHZE high temperature water-source heat pumps are being illegible for financial incentives in many countries.
- The perfect solution for smart cities
 - The 61XWHZE high temperature water-source heat pumps can recover energy from industrial process wasted heat, IT cooling systems, grey waters, to produce very hot water up to 85°C to supply residential buildings, commercial buildings, hotels, hospitals, public offices, schools, industries located in the district.
- The perfect solution for process heating and facilities space heating
 - The 61XWHZE high temperature water-source heat pumps can be used in the industrial sector to recover, upgrade and value any water stream up to 55°C as a source to higher temperature levels of 85°C which make it attractive for several usages. Some examples are the heat removed from electrical motors, industrial machines, paper industry, steel industry, non-metallic industry (glass, cement, tile, brick, food, beverage), chemical industries or also facilities space heating.

Low energy consumption

- Renewable energy source to comply with EU 2020 targets (27% of renewable energy)
- No need for a gas network
- The heat pump technology is more efficient and sustainable than any fossil fuel combustion system.
- 61XWHZE achieves great Coefficient Of Performance (COP of 6 or more), with very low carbon impact when compared with traditional boilers.
- The high energy efficiency is reached through:
 - Twin-rotor screw carrier compressor equipped with a high-efficiency motor and a variable capacity valve that permits exact matching of the heating capacity to the load.
 - Flooded multi-pipe heat exchangers for increased heat exchange efficiency.
 - Electronic expansion device permitting improved utilisation of the evaporator heat exchange surface.
 - Economizer system with electronic expansion device for increased heating/cooling capacity.

Low sound level

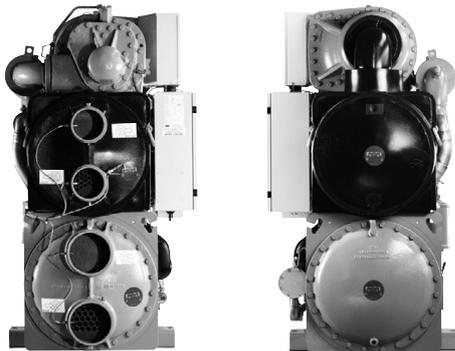
- Standard unit features include:
 - Silencers on the compressors discharge line.
 - Silencers on the economiser return line.
 - Acoustic insulation on the components that are most subjected to radiated noise.
 - Specific attenuation possible upon request.

INTRODUCTION

Easy and fast installation

- The 61XWHZE units just need an electrical connection and a water source.
- Compact design
 - The 61XWHZE water-source heat pumps are designed to offer the most compact dimensions on the market.
 - With a width of less than 1.4 m up to 2500 kW the units can pass through standard door openings and only require minimum floor space in the plant room.

Compact, accessible unit - side view



- Simplified electrical connections
 - Main disconnect switch with high trip capacity
 - Transformer to supply the integrated control circuit (400/24 V)
- Simplified hydronic 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
 - Possibility 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.

Environmental care



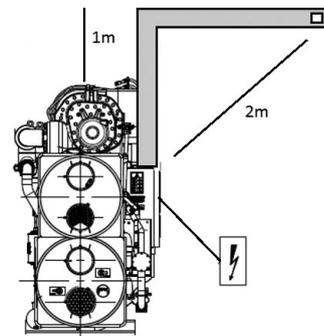
- R-1234ze long-term refrigerant solution
 - HFO refrigerant with nearly zero global warming potential (GWP < 1) and zero ozone depletion potential (ODP = 0).
 - Not impacted by the HFC phase-down plan in Europe (79% HFC reduction in EU member states at 2030 horizon)
 - Compliant with refrigerant regulation in Switzerland that bans the use of HFC refrigerant in large capacity air-conditioning equipment.
- 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.

High reliability and easy servicing

- The 61XWHZE water-source heat pumps offer increased global performance as well as Carrier's acclaimed product quality and reliability.
- Major components are selected and tested with R-1234ze refrigerant to minimize failures possibility, as well as many design choices have been taken in this perspective.
- Screw compressors
 - Industrial-type screw compressors with oversized bearings and motor cooled by suction gas.
 - All compressor components are easily accessible on site minimising down-time.
- Refrigerant circuit
 - One or two independent refrigerant circuits the second one automatically takes over, if the first one develops a fault, maintaining partial cooling under all circumstances.
- Evaporator
 - Electronic paddle-free flow switch. Auto-setting according to cooler size and fluid type.
- Auto-adaptive control
 - Control algorithm prevents excessive compressor cycling (Carrier patent)
 - Automatic compressor unloading in case of abnormally high condensing pressure.
- 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).

Safe Design Carrier

- Specific compressor gaskets compatible with HFO-1234ze, tested and validated.
- New relief valves designed for operation with HFO-1234ze and high temperature
- Specific electrical box with increased tightness and integrated blower that maintains positive air pressure to avoid any risk of ignition.
- New control algorithms
- Specific documentation that contains all the installation, operation, maintenance and safety Instructions.

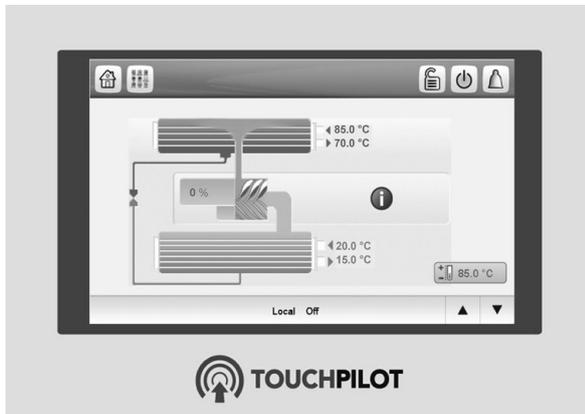


INTRODUCTION

Technical insights

Touch Pilot Control

Touch Pilot control, 5" user interface



- New innovative smart control features:
 - An intuitive and user-friendly, coloured, 5" interface (7" optional)
 - 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.
- Energy management:
 - Internal time schedule clock controls heat pump 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)

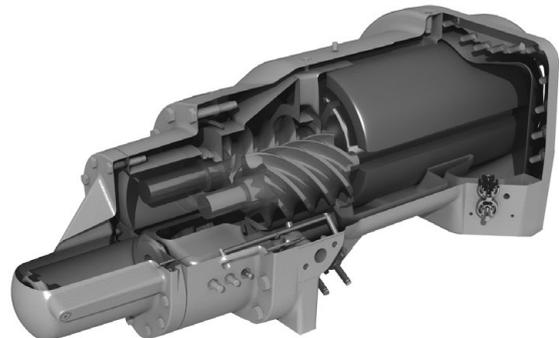
- Units with Touch Pilot control can be easily accessed from the internet, using a PC with an Ethernet connection. This makes remote control quick and easy and offers significant advantages for service operations.
- The 61XWHZE also communicates with other building management systems via optional communication gateways.
- The 61XWHZE 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 following commands/visualisations are possible from remote connection:
 - Condenser pumps control: a digital input allows verification of condenser water flow (the flow switch must be supplied by the installer)
 - Start/stop of the machine

- Dual set-point management: through a dedicated contact it is possible to activate a second set-point (example: unoccupied mode)
- Demand limit setting: to limit the maximum heat pump capacity to a predefined value
- Operation visualization: indication if the unit is operating or if it's in stand-by no heating load
- alarm visualization.

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 heating set-point based on a 4-20 mA signal
 - Demand limit: permits limitation of the maximum heat pump power or current based on a 4-20 mA signal
 - Demand limit 1 and 2: closing of these contacts limits the maximum heat pump power or current to two predefined values
 - User safety: this contact can be used for any customer safety loop; opening of the contact generates a specific alarm
 - Time schedule override: closing of this contact cancels the time schedule effects
 - Out of service: this signal indicates that the heat pump is completely out of service
 - Heat pump capacity: this analogue output (0-10 V) gives an immediate indication of the heat pump capacity
 - Alert indication: this volt-free contact indicates the necessity to carry out a maintenance operation or the presence of a minor fault.

06T screw compressor



The Carrier 06T screw compressor designed for operation with HFO-1234ze refrigerant benefits from Carrier's long experience in the development of twin-rotor screw compressors. The compressor is equipped with bearings with oversized rollers, oil pressure lubricated for reliable and durable operation, even at maximum load.

A variable control valve controlled by the oil pressure permits infinitely variable cooling capacity. This system allows optimal adjustment of the compressor heating capacity and ensures exceptionally high stability of the hot water leaving temperature.

Among the 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 with a reduced capacity (unloaded mode).

The silencer in the discharge line considerably reduces discharge gas pulsations for much quieter operation.

OPTIONS

Options	No.	Description	Advantages	Use for 61XWH range
Star / delta start	25A	Star / Delta start on each compressor	Reduced start-up current	3-5, 10
Master/slave operation	58	Unit equipped with supplementary water outlet temperature sensor kit to be field-installed allowing master/slave operation of two units connected in parallel	Optimised operation of two units connected in parrallele operation with operating time equalisation	3-17
Single power connection point	81	Unit power connection via one main supply connection	Quick and easy installation	10-17
No disconnect switch	82A	Unit without disconnect switch, but with short-circuit protection device	Permits an external electrical disconnect system for the unit (field-supplied), while ensuring unit short circuit protection	3-17
Evap. single pump power/control circuit	84	Unit equipped with an electrical power and control circuit for one pump evaporator side	Quick and easy installation: the control of fixed speed pumps is embedded in the unit control	3-10 Not available on 61XWHHZE
Evap. dual pumps power/control circuit	84D	Unit equipped with an electrical power and control circuit for two pumps evaporator side	Quick and easy installation: the control of fixed speed pumps is embedded in the unit control	3-10 Not available on 61XWHHZE
Cond. single pump power/control circuit	84R	Unit equipped with an electrical power and control circuit for one pump condenser side	Quick and easy installation: the control of fixed speed pumps is embedded in the unit control	3-10 Not available on 61XWHHZE
Evaporator with one pass more	100A	Evaporator with one pass more on the water side	Optimise chiller operation when the chilled water circuit is designed with low waterflows (high delta T evaporator inlet/outlet)	3-17
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	3-17
Condenser with one pass more	102A	Condenser with three passes on the water side. Condenser inlet and outlet on opposite sides.	Adapted to sites where larger temperature differences and smaller water flow rates are required	3-17
Condenser with one pass less	102C	Condenser with one pass on the water side. Condenser inlet and outlet on opposite sides.	Easy to install, depending on site. Reduced pressure drops	3-17
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)	3-17
21 bar condenser	104A	Reinforced condenser for extension of the maximum water-side service pressure to 21 bar (standard 10 bar)	Covers applications with a high water column condenser side (typically high buildings)	3-17
Reversed evaporator water connections	107	Evaporator with reversed water inlet/outlet	Easy installation on sites with specific requirements	3-17
Reversed condenser water connections	107A	Condenser with reversed water inlet/outlet	Easy installation on sites with specific requirements	3-17
J-Bus gateway	148B	Two-directional communication board complying with JBus protocol	Connects the unit by communication bus to a building management system	3-17
Lon gateway	148D	Two-directional communication board complying with Lon Talk protocol	Connects the unit by communication bus to a building management system	3-17
Bacnet over IP	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	3-17
Control for low cond. temperature	152	Output signal (0-10 V) to control the condenser water inlet valve	Simple installation: for applications with cold water at condenser inlet (ex. ground-source, groundwater-source, superficial water-source applications) the signal permits to control a 2 or 3-way valve to maintain condenser water temperature (and so condensing pressure) at acceptable values	3-17
Energy Management Module	156	EMM Control board with additional inputs/outputs. See Energy Management Module option chapter	Extended remote control capabilities (Set-point reset, ice storage end, demand limits, boiler on/off command...)	3-17
7" user interface	158A	Control supplied with a 7 inch colour touch screen user interface	Enhanced ease of use.	3-17
Compliance with Swiss regulations	197	Additional tests on the water heat exchangers: supply (additional of PED documents) supplementary certificates and test certifications	Conformance with Swiss regulations	3-17
Low noise level	257	Evaporator sound insulation	3 dB(A) quieter than standard unit	5-17

OPTIONS

Options	No.	Description	Advantages	Use for 61XWH range
Welded evaporator connection kit	266	Victaulic piping connections with welded joints	Easy installation	3-17
Welded condenser water connection kit	267	Victaulic piping connections with welded joints	Easy installation	3-17
Flanged evaporator water connection kit	268	Victaulic piping connections with flanged joints	Easy installation	3-17
Flanged condenser water connection kit	269	Victaulic piping connections with flanged joints	Easy installation	3-17
Carrier Connect link (only European distributor company)	298	3G router board NOTE 1: require option 149 NOTE 2: when more than one machine is installed on site, only one of them shall be equipped with option 298 while all of them must be equipped with option 149 NOTE 3: if the Carrier® PlantCTRL™ is on site, option 298 shall be integrated in the Carrier® PlantCTRL™ while option 149 is still mandatory for each single unit.	Enabler for Carrier Connect service offer	3-17

PHYSICAL DATA

61XWHLZE/61XWH-ZE/61XWHHZE		Model	3	5	7	10	14	15	17
61XWH-ZE (Heating performances*)	Nominal capacity**	kW	300	484	727	967	1453	1468	1570
Dimensions - 61XWHLZE/61XWH-ZE									
Length		mm	2724	3059	3290	4730	4730	4790	4790
Width		mm	981	1041	1079	1125	1148	1399	1399
Height		mm	1594	1745	1968	2002	2070	2305	2305
Dimensions - 61XWHHZE									
Length		mm	2724	3059	3290	4730	-	4790	-
Width		mm	981	1041	1079	1125	-	1417	-
Height		mm	1594	1745	1968	2002	-	2305	-
Operating weight ⁽¹⁾		kg	2054	2942	4147	7265	8031	9519	9519
Compressors									
Semi-hermetic 06T screw compressors, 50 r/s									
Circuit A		-	1	1	1	1	1	1	1
Circuit B		-	-	-	-	1	1	1	1
Refrigerant - 61XWHLZE ⁽²⁾									
R1234ze									
Circuit A		kg	107	168	237	154	176	237	226
		teq CO ₂	0,7	1,2	1,7	1,1	1,2	1,7	1,6
Circuit B		kg	-	-	-	154	187	237	231
		teq CO ₂	-	-	-	1,1	1,3	1,7	1,6
Refrigerant - 61XWH-ZE ⁽²⁾									
R1234ze									
Circuit A		kg	97	153	215	140	160	215	205
		teq CO ₂	0,7	1,1	1,5	1,0	1,1	1,5	1,4
Circuit B		kg	-	-	-	140	170	215	210
		teq CO ₂	-	-	-	1,0	1,2	1,5	1,5
Refrigerant - 61XWHHZE ⁽²⁾									
R1234ze									
Circuit A		kg	88	138	195	140	-	195	-
		teq CO ₂	0,6	1,0	1,4	1,0	-	1,4	-
Circuit B		kg	-	-	-	140	-	195	-
		teq CO ₂	-	-	-	1,0	-	1,4	-
Oil - standard unit									
HATCOL4496									
Circuit A		l	20	20	25	20	25	25	25
Circuit B		l	-	-	-	20	25	25	25
Capacity control									
Touch Pilot, electronic expansion valves (EXV)									
Minimum capacity		%	50	50	50	25	25	25	25
Evaporator									
Multi-pipe flooded type									
Water volume		l	61	101	154	293	321	354	354
Water connections (Victaulic)		in	5	6	8	8	8	8	8
Drain and vent connections (NPT)		in	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water-side operating pressure		kPa	1000	1000	1000	1000	1000	1000	1000
Condenser									
Multi-pipe flooded type									
Water volume		l	55	103	148	316	340	426	426
Water connections (Victaulic)		in	5	6	8	8	8	8	8
Drain and vent connections (NPT)		in	3/8	3/8	3/8	3/8	3/8	3/8	3/8
Max. water-side operating pressure		kPa	1000	1000	1000	1000	1000	1000	1000

* In accordance with standard EN14511-3:2013.

** Heating mode conditions: Evaporator entering/leaving water temperature 20°C/15°C, condenser entering/leaving water temperature 70°C/75°C, evaporator and condenser fouling factor 0 m². kW

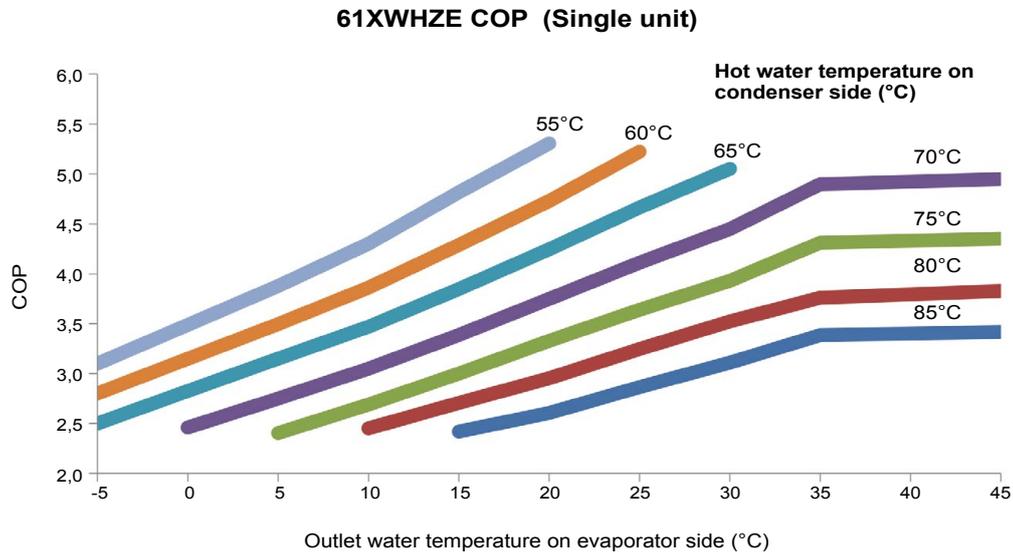
(1) Weight shown is guideline only. Please refer to the unit nameplate

(2) Refrigerant charge shown is guideline only. Charge may differ according to options. Please refer to the unit nameplate

COP OF 61XWHZE HEAT-PUMPS IN SINGLE AND MULTIPLE UNITS CONFIGURATION

61XWHZE COP gain in a single unit configuration (temperature difference effect)

The COP of 61XWHZE heat-pump will vary depending on the temperature difference between the heat source (evaporator side) and the heat sink (condenser side). The work done (lift) by each compressor is reduced when this temperature difference is low thus significantly improving the efficiency of the heat-pump.



61XWHZE COP gain in a multiple unit configuration (System effect)

61XWHZE units may be configured in various combinations including series, parallel, and series-counter flow on both the evaporator and/or the condenser side to improve the COP.

In a series counterflow arrangement with multiple 61XWHZE heat pumps heating system efficiency is maximized. The work done (lift) by each compressor is reduced, which significantly improves the efficiency of the heat-pumps at full and part load conditions. Such series counter flow arrangement using 2, 3 or 4 units can improve system efficiency by as much as 40% depending on the temperature difference on the condenser side.

ΔT on the condenser side	One unit	Two units	Three units	Four units
ΔT 10 K	0%	4-7%	5-9%	6-10%
ΔT 20 K	0%	9-15%	11-19%	14-23%
ΔT 30 K	0%	15-24%	19-31%	23-40%

ELECTRICAL DATA

61XWHLZE / 61XWH-ZE	Model	3	5	7	10	14	15	17
Power circuit								
Nom. power supply	V-ph-Hz	400-3-50						
Voltage range	V	360-440						
Control circuit								
24 V via the built-in transformer								
Maximum start-up current⁽¹⁾ - Standard unit								
Circuit A	A	1210	1828	1919	1828	1919	1919	1919
Circuit B	A	-	-	-	1828	1919	1919	1919
Option 81	A	-	-	-	2158	2425	2425	2407
Maximum start-up current - Star/delta start option⁽²⁾								
Circuit A	A	388	587	-	587	-	-	-
Circuit B	A	-	-	-	587	-	-	-
Transient (< 150ms)	A	1210	1828	-	1828	-	-	-
Option 81	A	-	-	-	943	-	-	-
Transient (< 150ms)	A	-	-	-	2158	-	-	-
Cosine phi								
Nominal		0,70	0,80	0,81	0,80	0,81	0,81	0,83
Maximum ⁽²⁾		0,89	0,89	0,89	0,89	0,89	0,89	0,89
Total harmonic distortion ⁽²⁾	%	Closed to 0% (negligible)						
Maximum power input⁽³⁾								
Circuit A	kW	137	203	312	203	312	312	301
Circuit B	kW	-	-	-	203	312	312	301
Option 81	kW	-	-	-	406	624	624	602
Maximum current drawn (Un)⁽³⁾								
Circuit A	A	222	330	506	330	506	506	488
Circuit B	A	-	-	-	330	506	506	488
Option 81	A	-	-	-	660	1012	1012	976
Maximum current drawn (Un -10%)⁽²⁾								
Circuit A	A	240	356	546	356	546	546	527
Circuit B	A	-	-	-	356	546	546	527
Option 81	A	-	-	-	712	1092	1092	1054

(1) Instantaneous start-up current for star connection (maximum operating current of the smallest compressor(s) + locked rotor current or reduced start-up current of the largest compressor). Values obtained at operation with maximum unit power input.

(2) Values obtained at operation with maximum unit power input.

(3) Values obtained at operation with maximum unit power input. Values given on the unit name plate.

61XWHHZE	Model	3	5	7	10	14	15	17
Maximum start-up current⁽¹⁾ - Standard unit								
Circuit A	A	1210	1828	1919	1828	-	1919	-
Circuit B	A	-	-	-	1828	-	1919	-
Option 81	A	-	-	-	2188	-	-	-
Maximum start-up current - Star/delta start option⁽²⁾								
Circuit A	A	388	587	-	587	-	-	-
Circuit B	A	-	-	-	587	-	-	-
Transient (< 150ms)	A	1210	1828	-	1828	-	-	-
Option 81	A	-	-	-	947	-	-	-
Transient (< 150ms)	A	-	-	-	2188	-	-	-
Maximum power input⁽⁴⁾								
Circuit A		148	222	334	222	-	334	-
Circuit B		-	-	-	222	-	334	-
Option 81	%	-	-	-	444	-	-	-
Maximum current drawn (Un)⁽⁴⁾								
Circuit A	kW	241	360	543	360	-	543	-
Circuit B	kW	-	-	-	360	-	543	-
Option 81	kW	-	-	-	720	-	-	-
Maximum current drawn (Un -10%)⁽³⁾								
Circuit A	A	260	389	586	389	-	586	-
Circuit B	A	-	-	-	389	-	586	-
Option 81	A	-	-	-	778	-	-	-

(1) Instantaneous start-up current for delta connection (maximum operating current of the smallest compressor(s) + locked rotor current or reduced start-up current of the largest compressor).

(2) Both Max start-up current and transient peak to be considered for installation

(3) Values obtained at operation with maximum unit power input.

(4) Values obtained at operation with maximum unit power input. Values given on the unit name plate.

ELECTRICAL DATA

Electrical data notes and operating conditions, 61XWHZE units

- 61XWHZE 3 to 7 units have a single power connection point located immediately upstream of the main disconnect switch.
61XWHZE 10 to 17 units have two connection points located immediately upstream of the main disconnect switches.
- The control box includes the following standard features:
 - One main disconnect switch per circuit
 - Starter and motor protection devices for each compressor
 - Antishort 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 unit is 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.
- Compliance of the installation to 1999/92/CE directive on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres : The electrical equipment is not designed for compliance to 2014/34/EU directive for equipment and protective systems intended for use in potentially explosive atmospheres. The compliance of the building installation with article 3 Prevention of and protection against explosions shall be achieved by all necessary measures in the installation for prevention of the formation of explosive atmospheres

Notes:

- 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 Machines Directive.
- Annex B of EN 60204 1 describes the electrical characteristics used for the operation of the machines.

The operating environment for the units is specified below:

1. Environment⁽¹⁾ 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 unit is designed for connection to TN networks (IEC 60364). For IT networks the earth connection must not be at the network earth. Provide a local earth, consult competent local organisations to complete the electrical installation.

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

- (1) The required protection level for this class is IPX1B (according to reference standard IEC 60529). The unit fulfils this protection condition. In general the casings fulfil class IPX3B

OPERATING LIMITS AND OPERATING RANGES

61XWHLZE / 61XWH-ZE units

61XWH-ZE / 61XWHLZE	Minimum	Maximum
Evaporator		
Entering temperature at start-up	-	Up to 35.0°C
Leaving temperature during operation	3.3°C ⁽¹⁾	Up to 25.0°C
Condenser		
Entering temperature at start-up	13.0°C ⁽²⁾	-
Leaving temperature during operation	35.0°C ⁽²⁾	Up to 85.0°C ⁽³⁾

- (1) Use of antifreeze protection is required if the leaving temperature is below 3.3°C (61XWHLZE range).
- (2) For lower condenser temperatures a water flow control valve must be used at the condenser (two or three-way valve). Please refer to option 152 to ensure the correct condensing temperature.
- (3) Limited to 75°C for model 17

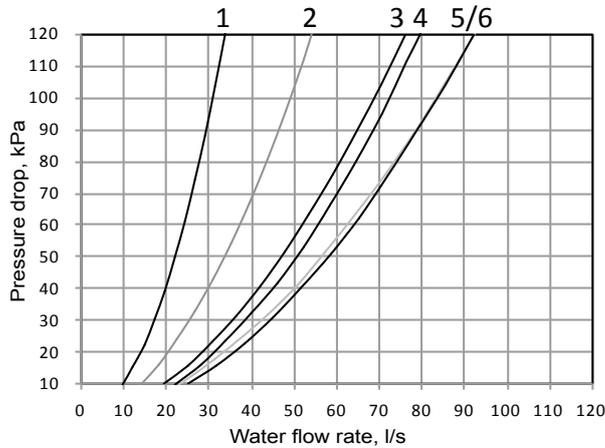
61XWHHZE units

61XWHHZE	Minimum	Maximum
Evaporator		
Entering temperature at start-up	-	Up to 60.0°C
Leaving temperature during operation	20.0°C	Up to 55.0°C
Condenser		
Entering temperature at start-up	13.0°C ⁽¹⁾	-
Leaving temperature during operation	35.0°C ⁽¹⁾	Up to 85°C

- (1) For lower condenser temperatures a water flow control valve must be used at the condenser (two or three-way valve). Please refer to option 152 to ensure the correct condensing temperature.

EVAPORATOR PRESSURE DROP CURVES

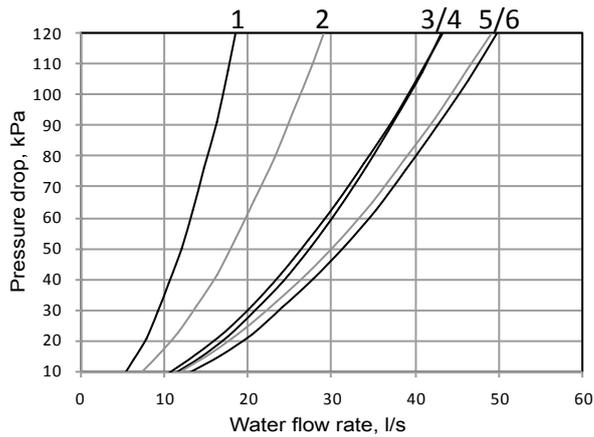
Units with two evaporator passes (standard):



Legend

1	Model 3	4	Model 10
2	Model 5	5	Model 14
3	Model 7	6	Model 15, 17

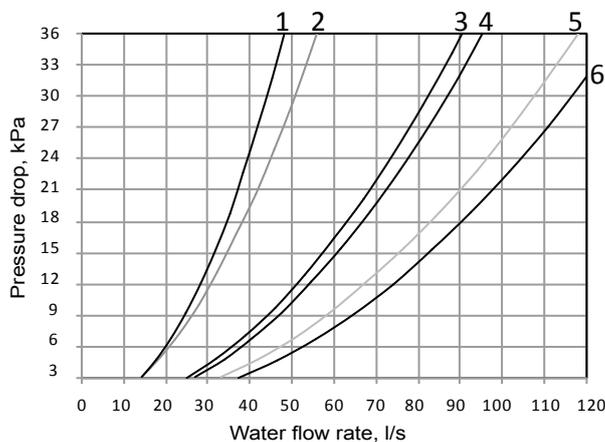
Units with three evaporator passes (option 100A):



Legend

1	Model 3	4	Model 10
2	Model 5	5	Model 14
3	Model 7	6	Model 15, 17

Units with one evaporator pass (option 100C):

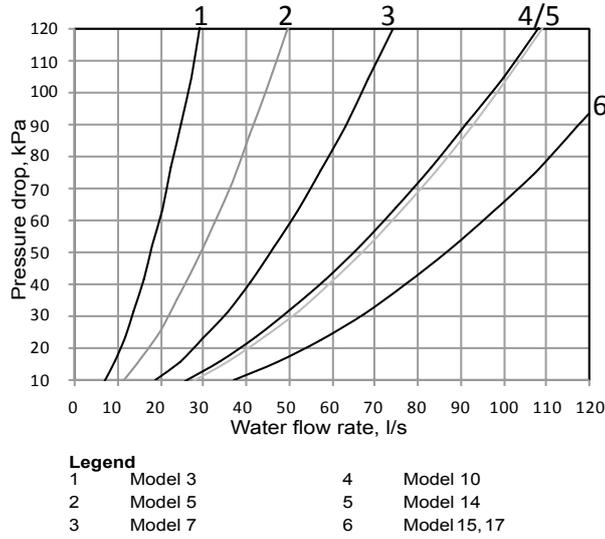


Legend

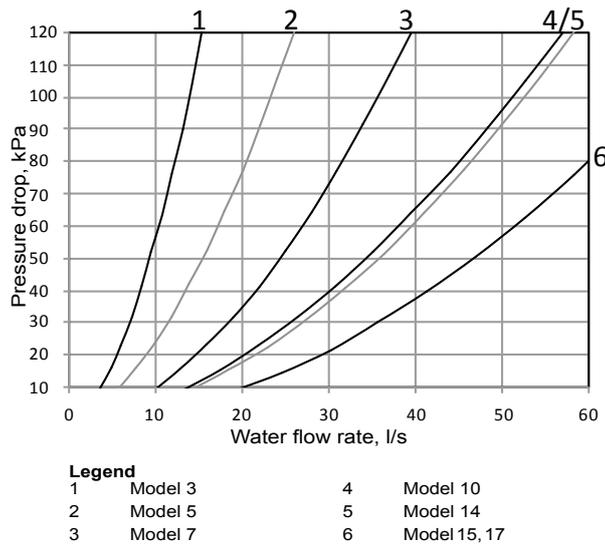
1	Model 3	4	Model 10
2	Model 5	5	Model 14
3	Model 7	6	Model 15, 17

CONDENSER PRESSURE DROP CURVES

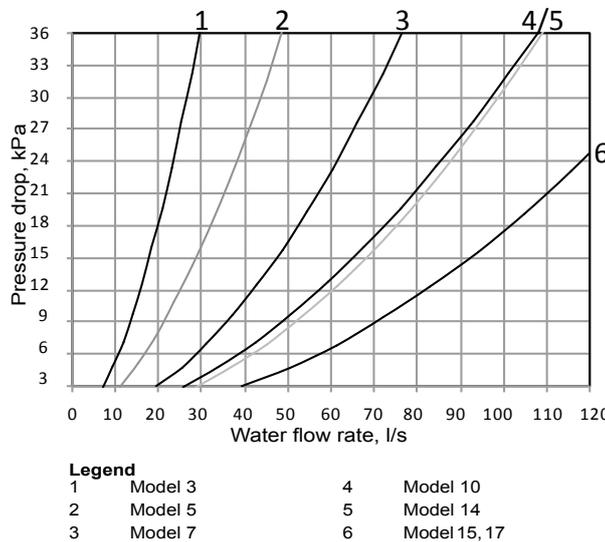
Units with two condenser passes (standard):



Units with three condenser passes (option 102A):

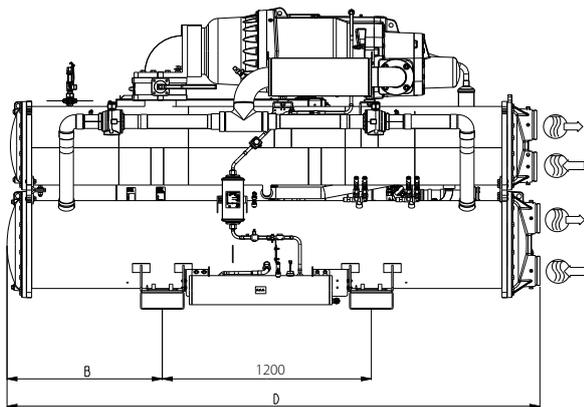
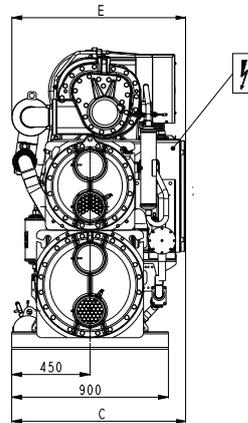
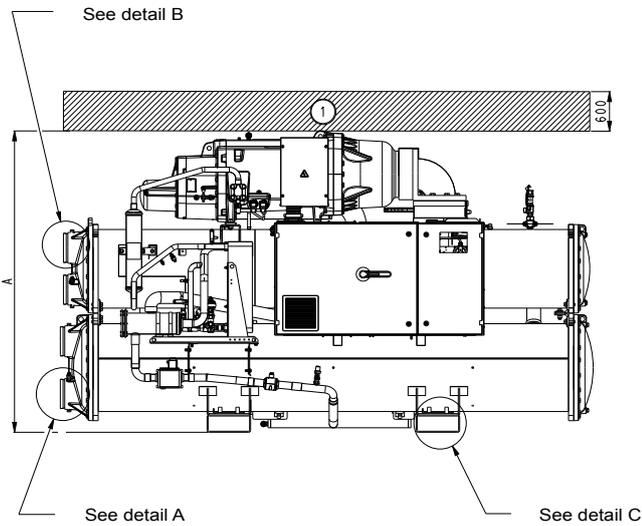


Units with one condenser pass (option 102C):



DIMENSIONS/CLEARANCES

61XWHLZE/61XWH-ZE/61XWHHZE 03-05-07

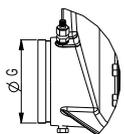
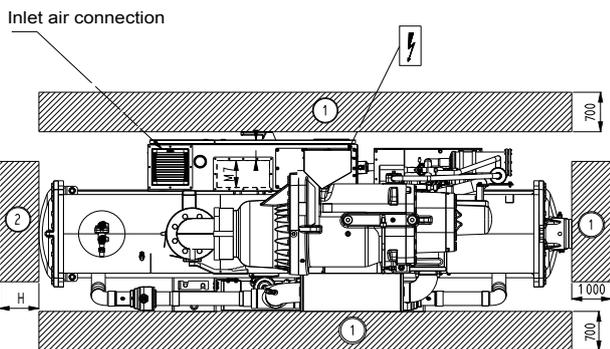


61XWHLZE/61XWH-ZE/61XWHHZE								
	A	B	C	D	E	F	G	H
Model	Dimensions in mm							
3	1594	723	981	2724	982	141,3	141,3	2600
5	1745	891	1041	3059	1039	168,3	168,3	2900
7	1968	1007	1079	3290	1170	219,1	219,1	3100

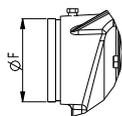
Legend

All dimensions are given in mm

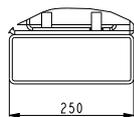
- Services clearances required
- Space required to remove cooler tubes
- Inlet water
- Outlet water
- Electrical supply entry



Detail A



Detail B



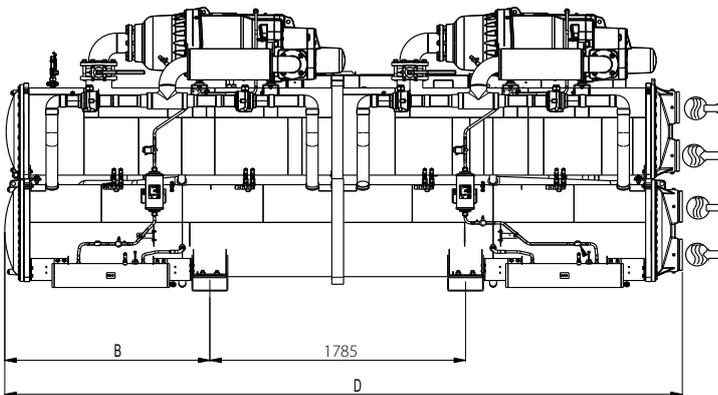
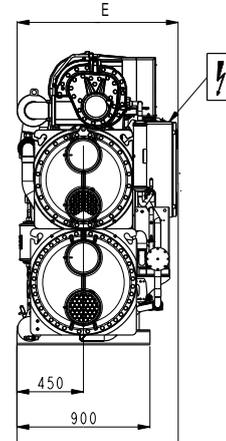
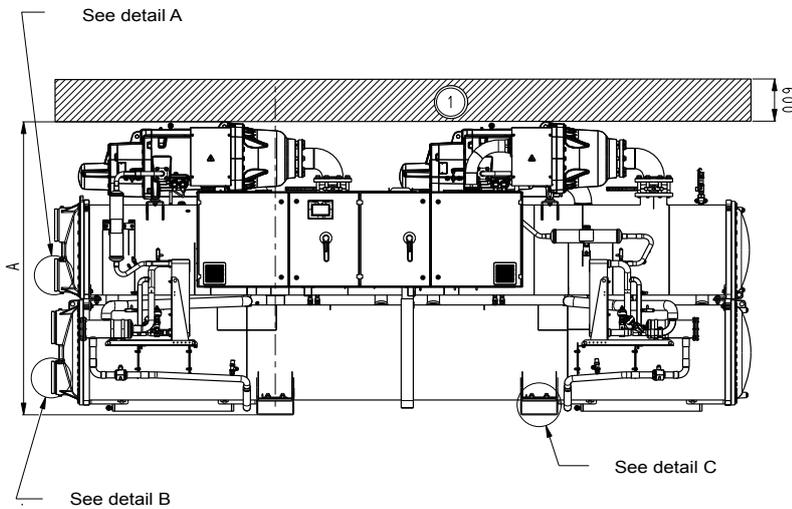
Detail C

NOTES:

- Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.
- For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings.

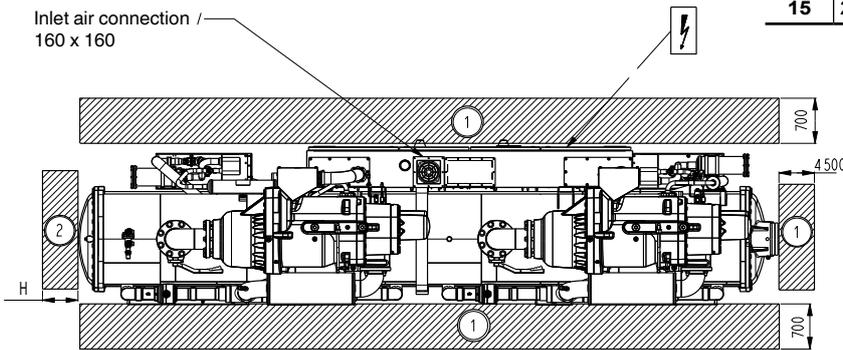
DIMENSIONS/CLEARANCES

61XWHLZE/61XWH-ZE 10-14-15-17; 61XWHHZE 10-15



61XWHLZE/61XWH-ZE								
	A	B	C	D	E	F	G	H
Model	Dimensions in mm							
10	2002	1432	1124	4730	1124	219,1	219,1	4500
14	2070	1432	1148	4730	1237	219,1	219,1	4500
15	2305	1458	1399	4790	1264	219,1	219,1	4500
17	2305	1458	1399	4790	1264	219,1	219,1	4500

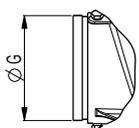
61XWHHZE								
	A	B	C	D	E	F	G	H
Model	Dimensions in mm							
10	2002	1432	1124	4730	1124	219,1	219,1	4500
15	2305	1458	1417	4790	1282	219,1	219,1	4500



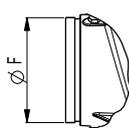
Legend

All dimensions are given in mm

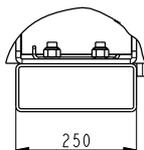
-  → Services clearances required
-  → Space required to remove cooler tubes
-  → Inlet water
-  → Outlet water
-  → Electrical supply entry



Detail A



Detail B



Detail C

NOTES:

- Drawings are not contractually binding. Before designing an installation, consult the certified dimensional drawings supplied with the unit or available on request.
- For the positioning of the fixing points, weight distribution and centre of gravity coordinates please refer to the dimensional drawings.

SPECIFICATION GUIDE

General description

61XWHZE factory assembled single piece water-source heat pump chiller, shall include all factory wiring, piping, controls, refrigerant charge (HFO-1234ze), refrigeration circuits, screw compressors, electronic expansion valves and equipment required prior to field start-up.

Quality assurance

Unit construction shall comply with European directives:

- Commission Regulation (EU) N° 813/2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to Ecodesign requirements for space heaters and combination heaters
- Pressurized 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 EN61000-6-4
- Electromagnetic compatibility immunity EN61000-6-2

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

- Heating capacity (kW):
- Full load energy efficiency, COP (kW/kW):
- Fluid type: R1234ze (GWP < 1)
- Condenser entering/leaving water temperature (°C):
- Condenser fluid type:
- Condenser fluid flow rate (l/s):.....
- Condenser pressure drops (kPa):.....
- Evaporator entering/leaving water temperature (°C):
- Evaporator fluid type:
- Evaporator fluid flow rate (l/s):.....
- Evaporator pressure drops (kPa):.....
- 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.

The 61XWHZE water-source heat pump shall be capable to produce 85°C hot water with very wide heat water temperature source range.

Frame

- Machine frame shall include heat exchangers and compressors in a self-supporting structure
- Electrical panel doors shall be accessible by 1/4-turn screws

Compressor

- Unit shall have semi-hermetic 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
- Compressor bearings shall be designed for minimum 73000 hours at maximum operating conditions
- Capacity control shall be provided by a slide valve
- 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, 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 shall include an oil level safety switch.

Condenser

- Unit shall be equipped with a single condenser
- Condenser shall be manufactured by the heat pump manufacturer
- Condenser shall be tested and stamped in accordance with the European directive for pressurized equipment 97/23/EC
- Single pass or 2-passes design shall be possible
- The maximum refrigerant-side operating pressure will be 2100 kPa, and the maximum waterside pressure will be 1000 kPa (2100kPa as an option)
- The condenser 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
- The condenser shall have a drain and vent in each head
- Heat pump shall have only one water inlet & outlet connection with Victaulic couplings to avoid vibrations transmission and to accommodate minor pipework misalignment (Victaulic adapter kit shall be available on demand)
- Design shall incorporate either 1 or 2 independent refrigerant circuits and the oil separator.

Evaporator

- Unit shall be equipped with a single flooded evaporator
- Evaporator shall be manufactured by the heat pump manufacturer
- Evaporator shall be tested and stamped in accordance with the European directive for pressurized equipment 97/23/EC
- The maximum refrigerant-side operating pressure will be 2100 kPa, and the maximum waterside pressure will be 1000 kPa (2100kPa 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
- Unit shall have only one water inlet & outlet connection with Victaulic couplings to avoid vibrations transmission and to accommodate minor pipework misalignment (Victaulic adapter kit shall be available on demand)
- The evaporator shall incorporate an indirect refrigerant level control system (based on the continuous measurement of the approach value) to ensure optimum heat transfer performance under all load conditions
- Design shall incorporate either 1 or 2 independent refrigerant circuits
- Evaporator shall be fitted with electronic auto setting water flow switch. Paddle switches or differential pressure switches shall not be acceptable.

SPECIFICATION GUIDE

Refrigerant circuit

- Refrigerant circuit components shall include: compressor, oil separator, high and low side pressure relief devices, liquid injection, economizer, filter driers, moisture indicating sight glasses, long stroke electronic expansion device, and complete operating charge of both refrigerant R-1234ze and compressor oil
- A compressor suction and discharge line shut off valve, an evaporator inlet valve and economizer line valve, is 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 257) Evaporator and refrigerant gas suction line shall be acoustically insulated.

Power control box

- Unit shall be supplied with specific electrical box with increased tightness, integrated blower and fresh air duct connection to maintain positive air pressure to avoid any risk of ignition.
- 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 801/1101)
- Unit shall have a factory installed star/delta starter as standard to limit electrical inrush current
- Power control box is powered painted with hinged and gasket sealed doors and is protected to IP23.

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 5 inches 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 read cooler/condenser entering and leaving temperatures.
- (Carrier option 158A) 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
- (Carrier option 148B) A two-directional communication board shall allows plug and play interfacing of the machine with any BMS using the J-Bus protocol
- (Carrier option 148D) A two-directional communication board shall allows plug and play interfacing of the machine with any BMS using the LonTalk protocol
- (Carrier option 149) Machine shall be supplied with factory-installed 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 standardized 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 optimizing evaporator refrigerant charge while ensuring minimum refrigerant superheat and optimum subcooling at condenser outlet
- Capacity control based on leaving hot fluid temperature
- Automatic change-over and cycling of compressors to equalize running hours and number of starts
- Reset enable of leaving hot-water temperature based on the outdoor air temperature or via a 4-20 mA signal (as option)
- Dual set point management for the leaving hot 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
- (Carrier option 58) lead/lag type control of two heat pumps running in series or parallel
- (Carrier option 84) Water pump control, safety pumps (if installed) on both condenser and cooler side
- (Carrier option 156) The following inputs contacts shall be available on the unit control board:
 - Setpoint reset by indoor air temperature sensor
 - Heating setpoint reset by 4-20 mA
 - Time schedule override
 - Demand limit
 - Unit shut down

The following outputs contacts shall be available on the unit control board:

- Instantaneous heat pump capacity by 0-10 V signal
- Complete shut-down due to a heat pump fault
- Compressor operation indication.
- Sometimes the customer need to recover the cooling production in parallel than the main use heating. In this case, a cooling setpoint could be preferred than standard heating setpoint.

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 machine elements to verify the correct operation of every switch, circuit breaker, contactor etc. before the heat pump is started
- In case of alarm, control system shall send an email to specific mail box set by 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 preceeding 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.

SPECIFICATION GUIDE

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.



Order No.: 10191, 09.2018. Supersedes order No.: New.
Manufacturer reserves the right to change any product specifications without notice.
The illustrations in this document are for illustrative purposes only and not part of any offer for sale or contract. The manufacturer reserves the right to change the design at any time without notice.

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



Quality and Environment
Management Systems
Approval