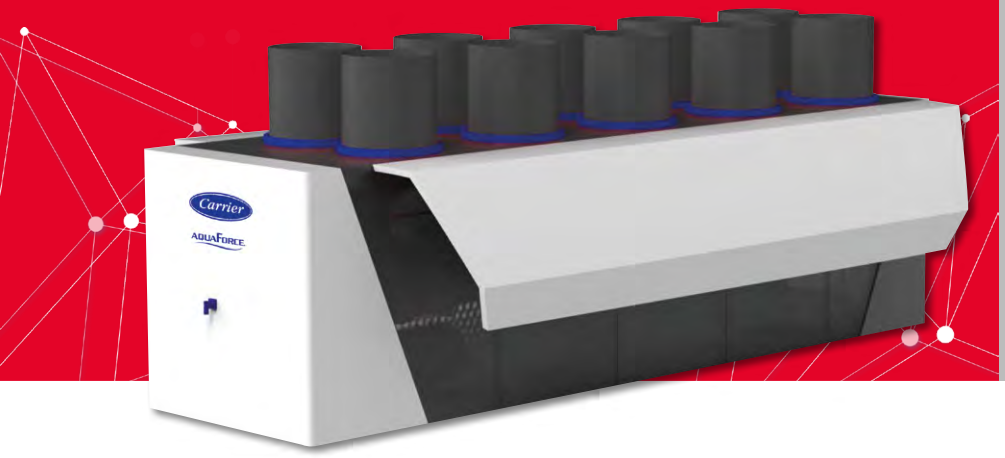
PRODUCT SELECTION DATA

HIGH TEMPERATURE SERIES AIR SOURCE HEAT PUMP



61CA

AQUAFORCE®

UP TO 82°C

HFO R-1234yf

Nominal heating capacity 410 kW

APPLICATION RANGES

- Heating and cooling
- Large buildings, local and district heating networks
- Outside air temperature from -20°C to +35°C
- Heat source: air

DESIGN

- Ultra low GWP R1234yf refrigerant
- Compact design
- Speed controlled fans
- Robust shell and tube heat exchanger as condenser

OUTPUT RANGE

- Heating output of 410 kW at A2/W82

TECHNICAL INSIGHT

Compressor

The CARRIER industrial heat pump is equipped with a semi-hermetic, two-stage compact screw compressor specially designed for the given, extended operating conditions. With a newly developed, asymmetrical high-performance profile, these twin-shaft rotary displacement machines achieve the highest efficiency levels and maximum service life in continuous operation. They have no oscillating components and thus run with low vibration and virtually no wear. The roller bearings are dimensioned for an extremely long service life. The special design allows extended application limits to the lowest external air temperatures and high heating flow temperatures.

Maximum operational reliability is ensured by forced lubrication without an oil pump, as well as an external oil separator on the pressure side and an oil heater. The necessary lubricant flow is automatically ensured by the pressure difference between the high-pressure and low-pressure sides of the refrigerant circuit. An oil heater ensures the lubricity of the oil even after longer downtimes.

The compressor casing includes a three phase asynchronous motor. The rotor of the motor is arranged on the shaft of the main screw rotor. Cooling is by cold refrigerant vapor. The screw compressor is equipped as standard with star-delta switching to reduce the starting current.

Capacity control

The capacity is controlled by means of a control spool in the compressor at constant motor speed. A hydraulically operated control slide varies the refrigerant charge of the compressor screws according to the power requirement. In contrast to electronic speed control, no additional energy losses are caused by frequency converters. According to the specified temperature setpoint, the heat pump control calculates the required power stage for efficient and safe operation. The power control takes the form of a stepped power control (50%, 75%, 100%).

Condenser

The condenser is designed as an amply dimensioned shell-and-tube heat exchanger using the counterflow principle. Shell-and-tube heat exchangers ensure safety and robust operation even under difficult conditions. The design of the heat exchangers has been optimized to ensure the highest possible transfer capacity - with the lowest possible pressure loss and smallest possible space requirement. The heat exchangers are insensitive to fouling and pressure shock resistant due to their cylindrical shape.

The condenser is equipped with Victaulic quick connectors.

Evaporator

The evaporator unit consists of sets of coils arranged at an angle to optimize defrosting. Furthermore, it consists of speed-controlled fans with a large diameter to minimize power consumption and noise emission. Defrost control is demand-driven via micro-compressor to minimize any defrost losses.

Frost protection

Electric frost protection heating with activation of circulation pump. Minimum temperature for start-up phase to be ensured on the system side.

Economizer operation

For economizer operation, an additional circuit is used to increase efficiency. With this design, a partial flow steam injection is used to increase both the heating or cooling capacity and the coefficient of performance. Improved performance data is achieved at high condensing temperatures.

The screw compressors used in CARRIER heat pumps are already designed for economizer operation in the standard version.

Oil cooling system

An oil cooling system consisting of a gear pump and an oil/refrigerant heat exchanger is provided in order to reach the operating limits and for long-term stability of the rotating elements.

Refrigeration circuit/refrigerant

The refrigerant circuit is filled with a non-toxic fluid (R1234yf) that is only slightly flammable (A2L). The refrigerant used is CFC-free and has a zero-ozone depletion potential and a GWP of 4, making it sustainable. The refrigerant charge is optimized for the highest possible coefficient of performance (COP). The refrigerant circuit is leak-tested using helium or forming gas. The standard unit is equipped with a refrigerant leak detector including a visual and acoustic alarm.

Electronic expansion valves

Control of the optimum superheat of the refrigerant at each operating point is achieved by a total of 2 independently controlled electronic expansion valve systems in the main refrigeration circuit and in the economizer circuit. To ensure the highest possible efficiency in heating, defrosting and cooling operation. This further optimizes the coefficient of performance (COP) of the heat pump at each operating point.

Safety equipment

To maximize the service life of the system, special attention is paid to the operational safety of the heat pump and to the protection of the compressor.

Compressor protection device

CARRIER industrial heat pumps include a protective device for the screw compressor as standard equipment. The protection device is installed in the compressor terminal box and is hard-wired.

It monitors:

- Motor and oil temperatures
- Direction of rotation
- Phase failure

Additional safety equipment

- Motor protection relay for the compressor
- Overpressure safety valve in the refrigerant circuit
- High and low pressure sensors in the refrigerant circuit for permanent monitoring of the operating limits
- Oil level monitor
- Double high and low pressure pressostat
- Hot gas sensor / monitoring of compressor discharge temperature
- Differential pressure switch on the heat transfer medium side of the evaporator during cooling operation

Electrical control cabinet

The electrical cabinet of the heat pump is mounted on the frame of the heat pump and contains the power and control section. The customer receives a completely wired and ready-to-operate electrical installation according to the international standard. Design in protection class IP54. The heat pump requires a connection of 3x400V, without neutral conductor.

The power unit includes:

- Switching devices for the compressor: Contactors for star/delta start, optional soft start device with additional phase monitoring
- Contactors for fan and sink circulation pump, overcurrent protection devices, motor protection devices, lockable main switch, transformer for 24 V control circuit, control of solenoid valves and expansion valves, designated terminal strips with inputs and outputs for connection to the BMS (outputs potential-free)

PHYSICAL DATA

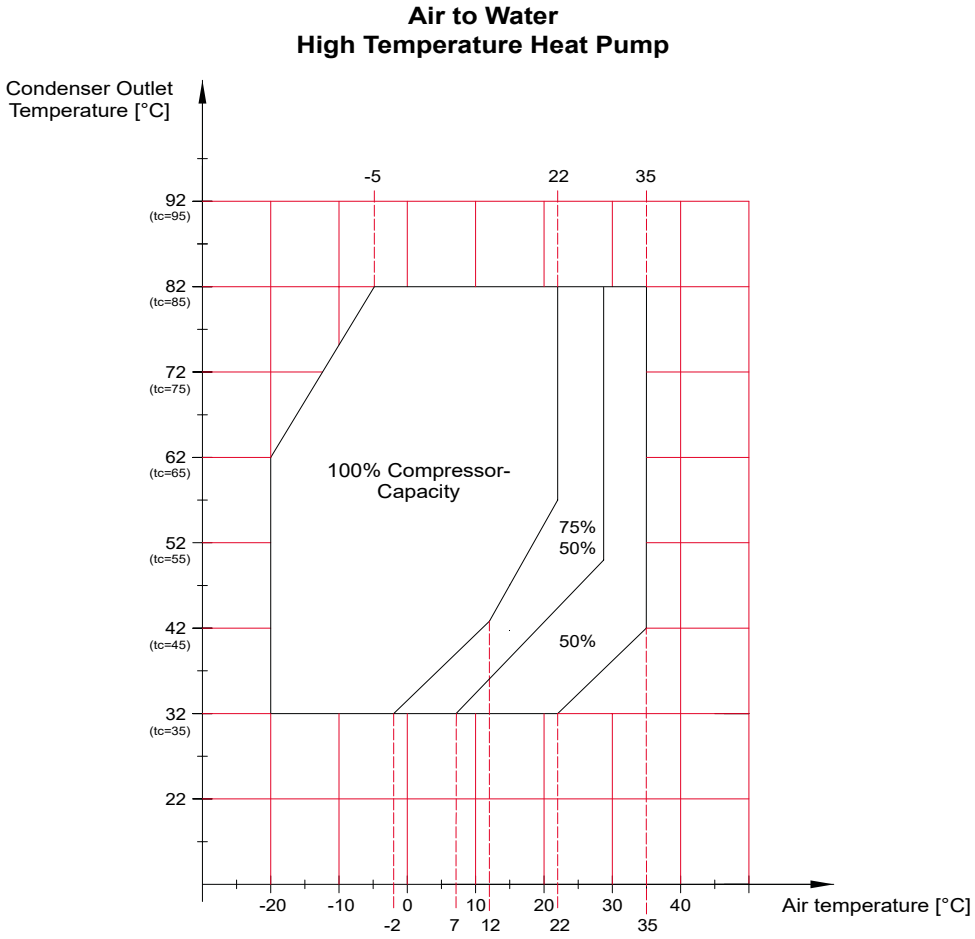
Air to Water - High Temperature Heat Pump

Unit			61CA-Y380
Performance data(1)			
Heating Capacity	A2/ W82	kW	412,0
Cooling Capacity		kW	204,0
Power Consumption		kW	216,0
Coefficient of Performance		-	1,9
Drawn Current		A	354,0
Heating Capacity	A-17/ W45	kW	256
Cooling Capacity		kW	159
Power Consumption		kW	108,0
Coefficient of Performance		-	2,4
Drawn Current		A	169
Technical data			
Dimensions (LxWxH)(2)		mm	8100 x 2420 x 2753
Weight(2)		kg	10700
Refrigerant		-	R1234yf (GWP=4 following AR4, ODP=0)
Refrigerant charge(2)		kg	225
		$teqCO_2$	0,9
Oil charge		l	61
Voltage/ Frequency		V/Hz	400/50
Rotor starting current Y/Δ		A	875/2625
Max. Operating current		A	450
Compressor			
Quantity		-	1
Type		-	Fixed-speed screw compressor
Evaporator			
Type			Fin / Tube
Material			Copper / Aluminium
Temperature difference(3)		K	6
Air flow(3)		m^3/h	150000,0
Fluid type		-	Air
Operating range - Air temperature(3)		°C	-20/+35
Condenser			
Type		-	Tube Bundle
Temperature difference(3)		K	5
Water flow(3)		m^3/h	72,8
Internal pressure drop(3)		mbar	125,0
Fluid type		-	Water
Operating range - Outlet temperature(3)		°C	+32/+82
Min. operating pressure(3)		bar	1,0
Max. operating pressure(3)		bar	10,0

(1) Technical data with tolerance ±10%
(2) Reference values
(3) Data at A2/W82

OPERATING MAP

Operating limits

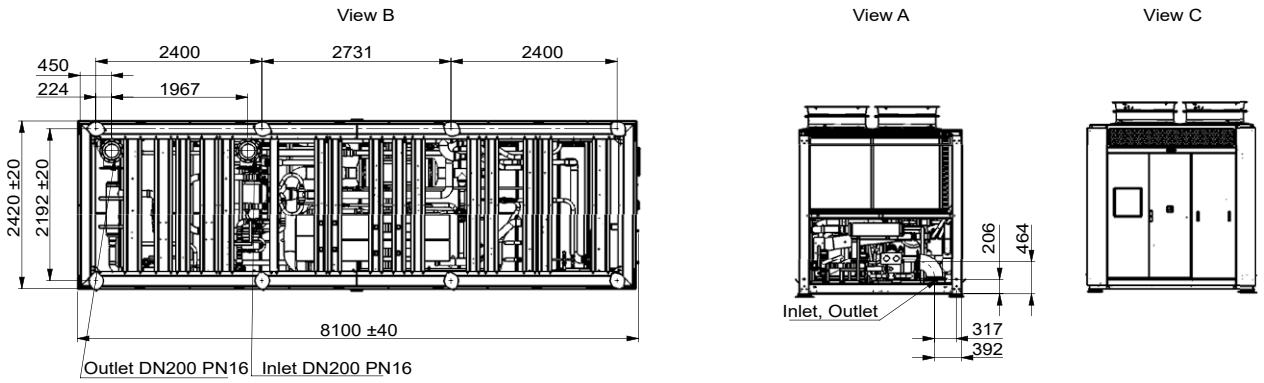


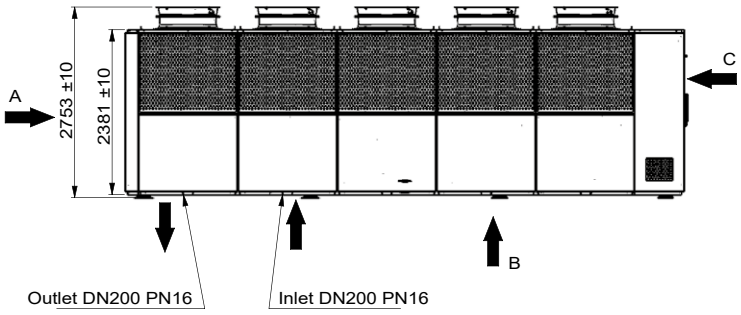
The limits of use defined in the operating map above represents the switch-off values of the heat pump.
We recommend a maximum hot water set-point 2°C below the switch-off value for optimized heat pump operation.

OPTIONS

Options	N°	Description	Advantages	Aquaforce 61CA
Modbus interface (RS 485)	149B	Unit control compatible with the bus interface RS485 Modbus RTU. Other bus interfaces on request	The heat pump control unit with communication capability is easily integrated into the building management system	380
Remote access	275	The touchscreen has two 10/100 Mbit Ethernet ports (RJ45) with an integral switch. Using an Ethernet patch cable, the touchscreen can be connected to the customer company network. The operator/customer must provide a secure VPN tunnel to the customer network.	Allow remote control & Check of the unit and its operating parameters from anywhere in the world and to change/ optimise any settings.	380
Electric energy meter	294	Display of energy consumption of the unit, instantaneous (U, V, I) and cumulated (kWh) of the unit	Permits the acquisition & monitoring of energy used.	380

DIMENSIONAL DRAWINGS





COMPLETE CARRIER RANGES OF HIGH TEMPERATURE HEAT PUMP FOR COMMERCIAL APPLICATIONS UP TO 82°C

AquaSnap 61CG

High temperature water source heat pumps
30 to 130 kW
Hot water up to 82°C

AquaSnap 61WG

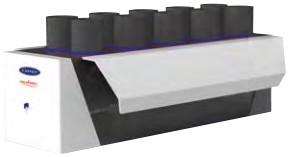
High temperature water source heat pumps
20 to 190 kW
Hot water up to 65°C

AquaSnap 61AF

High temperature air source heat pumps
22 to 105 kW
Hot water up to 65°C

COMPLETE CARRIER RANGES OF HIGH TEMPERATURE INDUSTRIAL HEAT PUMP FOR DISTRICT HEATING AND PROCESS APPLICATIONS UP TO 120°C

AQUAFORCE 61CA



High temperature air source heat pumps
410 kW
Hot water up to 82°C

AQUAFORCE 61XWHZE

High temperature water source heat pumps
300 to 1570 kW
Hot water up to 85°C

AQUAFORCE 61CW-Z

Very high temperature water source heat pumps
410 kW to 735 kW
Hot water up to 92°C

AQUAFORCE 61CWD

Ultra high temperature water source heat pumps
110 kW to 540 kW
Hot water up to 120°C