CZT

High efficiency air to water heat pumps ductables with E.V.I. compressors

The high efficiency CZT series heat pumps has been specifically designed for use with radiant floor heating systems or those applications where it is necessary to have maximum efficiency when heating.
They have been optimized on heating mode, are able to produce water up to 65°C and can operate down to -20°C ambient temperature.
The units have been designed for internal installation in plant rooms and are fitted with E.C. fans suitable for connection to ductwork.
CZT units are available in 2 pipe, 2+2 pipe and 4 pipe versions. Some versions can produce domestic hot water, in the P2S version through the activation of an external 3-way-valve and in the P4S version by means of a separate heat exchanger and hydraulic circuit for the domestic hot water.
All versions are supplied with reverse cycle valve used for winter defrost; the HH version is suitable for use in those countries that have support schemes for use of heat pump technology for heating. The RV versions are also able to produce cold water. The HH heating only versions is factory set and locked to operate only in heating mode whilst.
The noise is extremely low thanks to the use of a special floating vibration damping system which allows a noise reduction of about 10-12 dB(A).

Versions

HH	Heating only.
RV	Reversible heating/cooling.
XL	Super low noise.
P2U	2 pipe systems without domestic hot water production.
P2S	2 pipe systems with domestic hot water production by external 3 way valve.
P4U	4 pipe systems heating/cooling.
P4S	2+2 pipe systems with domestic hot water production.

Heating only version (HH)

XL/HH		252	302	452	502	602	752
Heating capacity (EN14511) [1]	kW	25,7	32,2	43,1	54,9	63,0	72,8
Total input power (EN14511)[1]	kW	6,2	7,8	10,5	13,2	15,3	17,7
COP (EN14511) [1]	W/W	4,15	4,12	4,10	4,15	4,12	4,11
Energy Class in low temperature [2]		A+	A+	A+	A+	A+	A+
SCOP low temperature [2]	kWh/kWh	3,54	3,68	3,46	3,62	3,49	3,60
ηs,h low temperature [2]	%	138,7	144,2	135,5	141,6	136,7	141,1
Energy Class in medium temperature [2]		A+	A+	A+	A+	A+	A+
SCOP medium temperature [2]	kWh/kWh	2,88	3,06	2,91	3,13	2,91	2,99
ηs,h medium temperature [2]	%	112,2	119,3	113,2	122,1	113,6	116,7
Power supply	V/Ph/Hz	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N
Max input current standard unit	A	20,9	24,6	34,9	40,5	45,5	55,7
Peak current standard unit	A	63,2	83,6	119,0	149,5	143,3	170,5
Peak current standard unit with soft starter (optional)	A	38,1	50,2	71,5	89,7	86,7	102,3
Max air flow in heating mode	m^3/h	11000	11000	22000	22000	33000	33000
Nominal available static pressure [4]	Pa	50	50	50	50	50	50
Maximum available static pressure [4]	Pa	150	150	150	150	150	150
Fans	n°	1	1	2	2	3	3
Compressors / Circuits	n°/n°	2/1	2/1	2/1	2/1	2/1	2/1
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088
Refrigerant charge	Kg	10,0	10,0	14,5	14,5	30,0	30,0
Equivalent CO_2 charge	t	20,9	20,9	30,3	30,3	62,6	62,6
Max sound power level in heating mode [5]	dB (A)	70	70	73	73	75	75
Max sound pressure level in heating mode [6]	dB (A)	38	38	41	41	43	43

Reversible heating/cooling version (RV)

XL/RV		252	302	452	502	602	752
Heating capacity (EN14511) [1]	kW	25,7	32,2	43,1	54,9	63,0	72,8
Total input power (EN14511)[1]	kW	6,2	7,8	10,5	13,2	15,3	17,7
COP (EN14511) [1]	W/W	4,15	4,12	4,10	4,15	4,12	4,11
Energy Class in low temperature [2]		A+	A+	A+	A+	A+	A+
SCOP low temperature [2]	kWh/kWh	3,54	3,68	3,46	3,62	3,49	3,60
ηs,h low temperature [2]	%	138,7	144,2	135,5	141,6	136,7	141,1
Energy Class in medium temperature [2]		A+	A+	A+	A+	A+	A+
SCOP medium temperature [2]	kWh/kWh	2,88	3,06	2,91	3,13	2,91	2,99
ηs,h medium temperature [2]	%	112,2	119,3	113,2	122,1	113,6	116,7
Cooling capacity (EN14511) [3]	kW	22,4	27,7	36,5	46,0	54,5	62,5
Total input power (EN14511)[3]	kW	7,6	9,7	13,3	17,0	18,5	21,2
EER (EN14511) [3]	W/W	2,93	2,85	2,75	2,70	2,95	2,94
Power supply	V/Ph/Hz	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N	400/3/50+N
Max input current standard unit	A	20,0	23,4	35,2	40,4	46,8	56,8
Peak current standard unit	A	62,3	82,5	120,2	149,8	143,8	170,8
Peak current standard unit with soft starter (optional)	A	38,1	50,2	71,5	89,7	86,7	102,3
Max air flow in heating mode	m^3/h	11000	11000	22000	22000	33000	33000
Nominal available static pressure [4]	Pa	50	50	50	50	50	50
Maximum available static pressure [4]	Pa	150	150	150	150	150	150
Fans	n°	1	1	2	2	3	3
Compressors / Circuits	n°/n°	2/1	2/1	2/1	2/1	2/1	2/1
Global warming potential (GWP)		2088	2088	2088	2088	2088	2088
Refrigerant charge	Kg	10,0	10,0	14,5	14,5	30,0	30,0
Equivalent CO_2 charge	t	20,9	20,9	30,3	30,3	62,6	62,6
Max sound power level in heating mode [5]	dB (A)	70	70	73	73	75	75
Max sound pressure level in heating mode [6]	dB (A)	38	38	41	41	43	43

Performances are obtained with available static pressure 50 Pa, at the following conditions:
(1) Heating: Ambient temperature 7°C DB, 6°C WB, water temperature 30/35°C.
(2) Cooling: ambient temperature 35°C, water temperature 12/7°C (RV versions Only).
(3) Average conditions, variable - Reg EU 811/2013
(4) Available static pressure obtained with oversized electric motor, for the technical data in this working condition please refer to the unit technical manual.
(5) Sound power level in accordance with ISO 3744.
(6) Sound pressure level at 10 mt from the unit in free field conditions in accordance with ISO 3744.

Frame

All CZT units are made from hot-galvanised sheet steel, painted with polyurethane powder enamel and stoved at 180°C to provide maximum protection against corrosion. The frame is self-supporting with removable panels. All screws and rivets used are made from stainless steel.
The standard colour of the units is RAL9018.

Refrigerant circuit

The refrigerant utilised is R410A. The refrigerant circuit is assembled using internationally recognised brand name components with all brazing and welding being performed in accordance with ISO 97/23. The refrigerant circuit includes: sight glass, filter drier, two thermal expansion valves (one for cooling mode, one for heating mode) with external equalizer, 4 way reversing valve, check valves, liquid receiver, Schrader valves for maintenance and control, pressure safety device (for compliance with PED regulations). The circuit also includes an AISI316 stainless steel heat exchanger that is used as an economizer plus an additional expansion valve for refrigerant vapour injection.

Compressors

Units use scroll compressors that are equipped with E.V.I. technology, a versatile method of improving system capacity and efficiency. EVI stands for "Enhanced Vapour Injection." The technology involves injecting refrigerant vapour into the middle of the compression process, a procedure that significantly boosts capacity and efficiency. Each scroll compressor used in these units is similar to a two-stage compressor with built-in inter-stage cooling. The process begins when a portion of the condenser liquid is extracted and expanded through an expansion valve. The low temperature liquid/gas mixture produced is injected into a heat exchanger that operates as a sub cooler. Any liquid is evaporated and the vapour produced is superheated.
The superheated vapour is then injected into an intermediate port in the scroll compressor. This cold vapour reduces the temperature of the compressed gas thus enabling the compressor to raise the pressure to levels (and temperatures) beyond that possible with a single stage scroll. The additional sub cooling of the main volume of liquid refrigerant increases the evaporator capacity. This compressor technology generates a larger pressure ratio between condensing and evaporating pressures, with significant performance improvement. In all units the compressors are connected in tandem. The compressors are all supplied with a crankcase heater and thermal overload protection by a klixon embedded in the motor winding. They are mounted in a separate enclosure in order to be separated from the air stream thus enabling them to be maintained even if the unit is operating. Access to this enclosure is by the front panel of the unit. The crankcase heater is always powered when the compressor is in stand-by.

Source heat exchanger

The source heat exchanger is made from 3/8" copper pipes and 0,1mm thick aluminium fins with the tubes being mechanically expanded into the aluminium fins in order to maximise heat transfer. Furthermore, the design guarantees a low air side pressure drop thus enabling the use of low rotation speed (and hence low noise) fans.

User heat exchangers

The user heat exchanger is a braze welded, plate type heat exchanger, manufactured from AISI 316 stainless steel. The use of this type of exchanger results in a massive reduction of the refrigerant charge of the unit compared to a traditional shell-in-tube type. A further advantage is a reduction in the overall dimensions of the unit.
The exchangers are factory insulated with flexible close cell material and can be fitted with an antifreeze heater (accessory). Each exchanger is fitted with a temperature sensor on the discharge water side for antifreeze protection.

E.C. ductable fans

Axial fans with High available Static Pressure, supplied with Brushless DC electric motor electronically commutated (E.C. motors), directly coupled to the electric motor. The fan wheel and the scroll are made from hot galvanized thick sheet metal, painted with polyurethane powders, to ensure the best resistance against aggressive environments. The electric motor is a high efficiency DC brushless type with external rotor, to guarantee an ideal cooling of the windings and the absence of power lost due to pulleys and belt transmission. The fan is statically and dynamically balanced class 6,3 according to ISO1940. The electric motor has a separate electronic commuter (driver) and a speed modulation 0-10V, integrated PFC, "burn out" thermal protection (in case of considerable reduction of the power supply), protection degree IP54, serial interface card with modbus protocol RTU. The maximum available static pressure (ASP) is approximately 150 Pa at nominal air flow rate.

Microprocessors

All CZT units are supplied as standard with microprocessor controls. The microprocessor controls the following functions: control of the water temperature, antifreeze protection, compressor timing, compressor automatic starting sequence (For multiple compressors), alarm reset. The control panel is supplied with display showing all operational icons. The microprocessor is set for automatic defrost (when operating in severe ambient conditions) and for summer/ winter change over.
The control also manages the anti-legionella program, the integration with other heating sources (electric heaters, boilers, solar panels etc), the operation of a three port modulating valve (for diverting to DHW or heating) and both the heating circuit pump and the domestic hot water circuit pump. If required (available as an option), the microprocessor can be configured in order for it to connect to a site BMS system thus enabling remote control and management. The technical department can discuss and evaluate, in conjunction with the customer, solutions using MODBUS protocols.

Electric enclosure

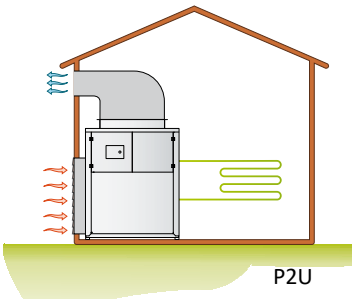
The enclosure is manufactured in order to comply with the requirements of the electromagnetic compatibility standards CEE EN60204. Access to the enclosure is achieved by removing the front panel of the unit. The following components are supplied as standard on all units: main switch, a sequence relay that disables the power supply in the event that the phase sequence is incorrect (scroll compressors can be damaged if they rotate in the wrong direction), thermal overloads (protection of pumps and fans), compressor fuses, control circuit automatic breakers, compressor contactors, fan contactors and pump contactors. The terminal board has volt free contacts for remote ON-OFF, Summer/ winter change over (heat pumps only) and general alarm.

Control and protection devices
All units are supplied with the following controls and protections: user water return temperature sensor, antifreeze protection temperature sensor installed on users water output, domestic hot water supply and return temperature sensors (only versions P4S and P4U), high pressure manual reset, low pressure automatic reset, compressor thermal protection, air fan, thermal protection, pressure transducer (used to optimize the defrost cycle and to adjust the fan speed depending on ambient conditions), flow switch. All units are also fitted with a temperature probe sensor with "Energy Saving" function, supplied in a separate plastic box, which can be used to stop the pump use during periods of stand-by, when the water temperature reaches the set point. Doing this the power consumption of the unit is strongly reduced. The probe sensor must be positioned in the hydraulic compensator present at the screening technique. The domestic hot water circuit (only versions P4S and P4U) is already equipped with this probe, but it must be installed in the user circuit.

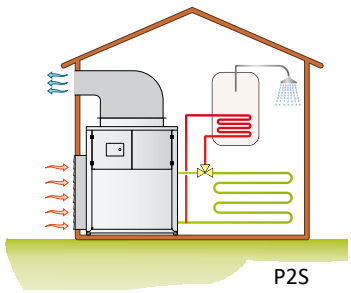
Versions

HH heating only versions are available in the P2U, P2S and P4S configuration only.

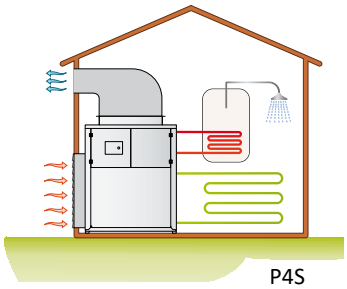
Version P2U
This is a two pipe version that can produce hot water for heating (HH heating only) and hot or cold water in the RV version. The RV is used with two pipe water based change-over systems. It is not able to produce domestic hot water.


P2U

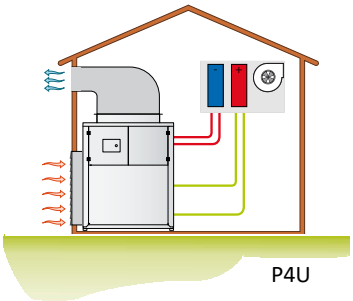
Version P2S
This is a two pipe version that can, in addition to producing hot water for heating (HH version) and hot and cold water in the RV version can also generate domestic hot water. The controller has dual heating set points (heating and DHW) and can also control a three port diverting valve that directs the DHW to the cylinder. DHW production has priority irrespective of the mode of operation of the unit. The unit is normally used with two pipe water based change-over systems.


P2S

Version P4S
This is a four pipe version that can produce hot water for heating (HH version), hot and cold water for cooling and domestic hot water (only RV versions) in all operational modes using an independent water circuit. When cooling, DHW generation is by heat recovery. This unit is normally used with two pipe water based change-over systems with the DHW circuit being separate.

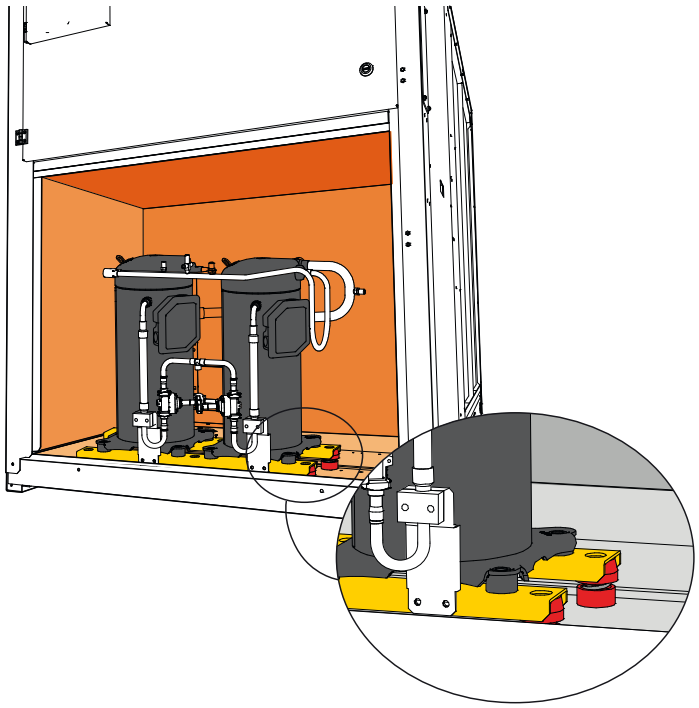

P4S

Version P4U
This is a four pipe version that provides a modern approach to four pipe water based systems. Instead of using a boiler and chiller, this unit can generate hot water in one circuit, cold water in the other circuit either individually or simultaneously. When operating in simultaneous mode the heating capacity is equal to the cooling duty plus the power input to the compressors. The operating efficiency in this mode is extremely high. Domestic hot water production for this version is not available.


P4U

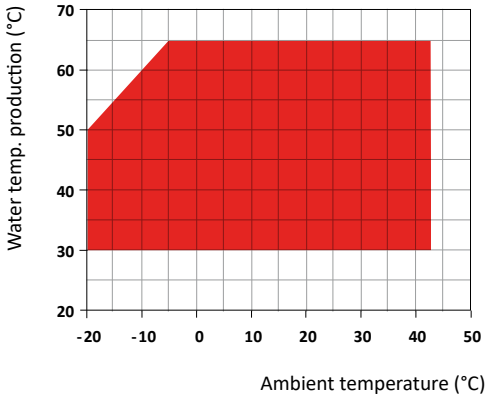
Noise reduction

All units are supplied, as standard, with the latest 'Floating Frame' technology that completely isolates the compressors from the main casing, thereby eliminating vibration and noise from this source. The 'Floating Frame' is a special vibration and acoustic damping system that consists of a base plate and acoustic enclosure that houses the compressors. The base plate is separated from the supporting frame of the unit by soft steel springs that have a high damping power. Within the enclosure, the compressors are mounted on rubber shock absorbers on the floating base plate. The enclosure is manufactured from galvanized steel sandwich panels that have a micro-perforated inner skin and a core of 50 mm thick, high density (40 kg/m^3) mineral wool. The entire arrangement provides a double damping system and acoustic attenuation. The compressor refrigerant pipes are connected to the refrigerant circuit through "anaconda" flexible connections. Flexible connections are also used on the water pipework within the unit. The combination of these systems results in an overall noise reduction in the region of 10-12 dB(A).

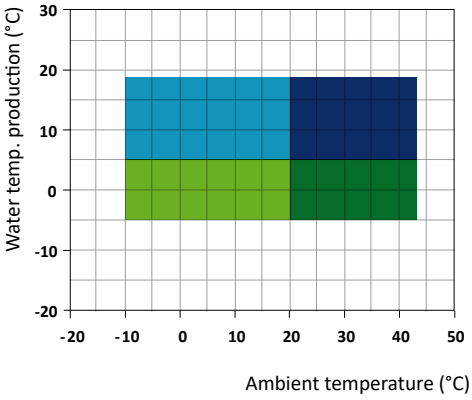


Operation limits

(All versions)



(RV versions Only)



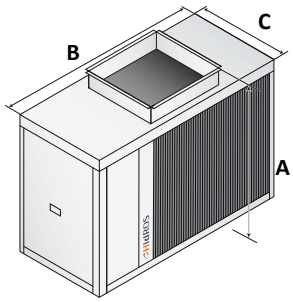
- Heating mode
- Cooling with head pressure control
- Cooling with head pressure control
- Cooling with head pressure control and glycol
- Cooling with head pressure control and glycol

HIdROS

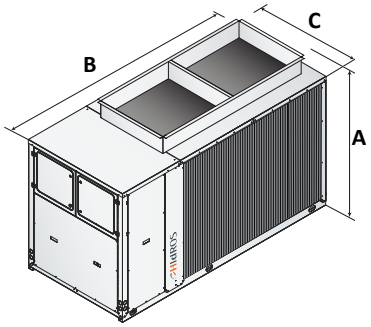
CZT		252	302	452	502	602	752
Flow switch		●	●	●	●	●	●
User water strainer		●	●	●	●	●	●
Evap/cond.press. control by transducer and fan speed control	DCCI	●	●	●	●	●	●
Fresh air temperature probe for set-point compensation	SOND	●	●	●	●	●	●
Specific software for operation priorities		●	●	●	●	●	●
Remote ON/OFF digital input		●	●	●	●	●	●
Summer/Winter digital input		●	●	●	●	●	●
Floating frame technology		●	●	●	●	●	●
Condensate discharge drip tray with antifreeze heater	BRCA	●	●	●	●	●	●
High static pressure E.C. fans	VECC	●	●	●	●	●	●
Cascade control system via RS485	SGRS	O	O	O	O	O	O
Unit performance optimizer	SODP	O	O	O	O	O	O
Hydraulic kit with one pump with tank - user circuit	A1ZZU	O	O	O	O	O	O
Hydraulic kit with two pumps with tank - user circuit	A2ZZU	–	–	O	O	O	O
Hydraulic kit with one pump without tank - user circuit	A1NTU	O	O	O	O	O	O
Hydraulic kit with two pumps without tank - user circuit	A2NTU	–	–	O	O	O	O
Hydraulic kit with one pump without tank - recovery circuit	A1NTR	O	O	O	O	O	O
Hydraulic kit with two pumps without tank - recovery circuit	A2NTR	–	–	O	O	O	O
User and recovery heat exchanger antifreeze kit	RAEV2/4	●	●	●	●	●	●
Rubber anti-vibration mountings	KAVG	O	O	O	O	O	O
Hydraulic circuit antifreeze kit	KP	O	O	O	O	O	O
Electronic Soft starter	DSSE	O	O	O	O	O	O
Remote control panel	PCRL	O	O	O	O	O	O
Serial interface card RS485 with MODBUS protocol	INSE	O	O	O	O	O	O
Electronic thermostatic valve	VTEE	O	O	O	O	O	O

● Standard, O Optional, – Not available.

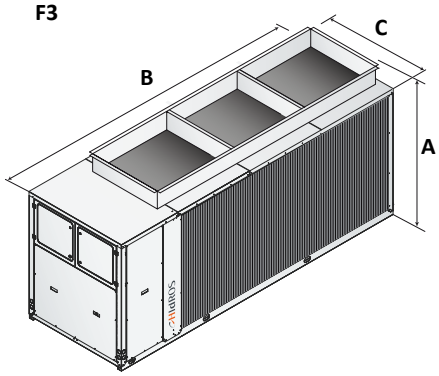
F1



F2



F3



Mod.	Frame	Fans	A (mm)	B (mm)	C (mm)	Kg
252/XL	F1	1	1485	1900	880	550
302/XL	F1	1	1485	1900	880	560
452/XL	F2	2	1878	2900	1150	750
502/XL	F2	2	1878	2900	1150	775
602/XL	F3	3	1878	3900	1150	970
752/XL	F3	3	1878	3900	1150	1020