Hydro Solar
Innovative Energy

GEOTHERMAL LIQUID TO WATER DC INVERTER HEAT PUMPS

Multi-Applications Heat Pumps

DC inverter Liquid to Water Heat Pumps for Space Heating, Space Cooling, Domestic Hot Water Pre-Heating, Heat recovery, Hot Tub and Swimming Pools water heating and cooling.

GEO 040, 60, 80
V1LM SERIES

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Contents

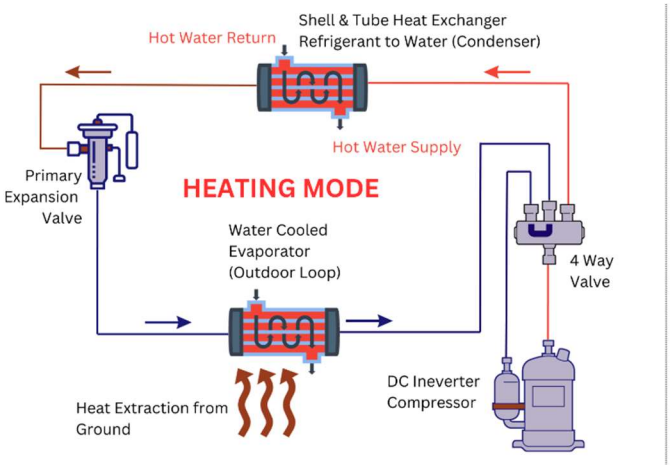
Introduction

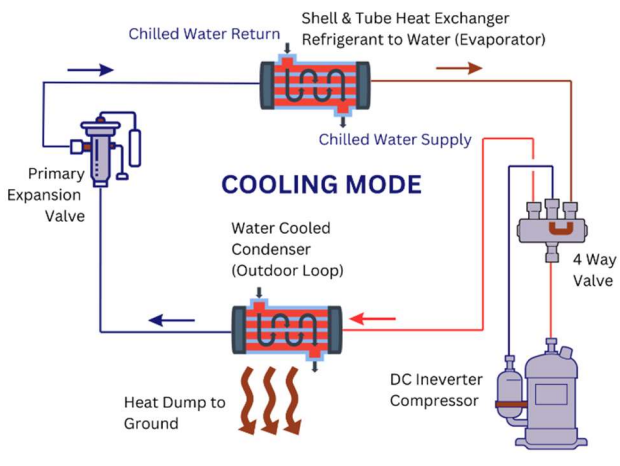
What Is Geothermal Liquid-to-Water Heat Pump?

Liquid to Water Heat Pump is a device that draws heat from one place (called heat source) and reject the drawn heat to another place (called heat sink). Unlike conventional air to air heat pumps, where generated thermal energy is used to cool/heat air, Liquid to Water Heat Pumps draw energy from the ground (geothermal heat exchanger) and use generated thermal energy to cool/heat water or water/glycol fluid mixture. Our Liquid to water heat pumps are equipped with DC inverter Compressor, which allows them to modulate and match their energy output with heating/cooling demand.

What Is a DC Inverter Compressor?

DC inverter compressors are variable speed compressors powered by direct current inverters. Speed is modulated via an external variable-frequency drive - to control the speed of the compressor. The refrigerant flow rate is changed by the change in the speed of compressor. The turndown ratio depends on the system configuration and manufacturer. It modulates from 15 or 25% up to 100% at full capacity. This means that heat pump operating with a DC inverter compressor can matches its capacity to the demand by simply modulating its compressor speed. Unlike conventional one or two stages compressors, Heat Pumps equipped with a DC inverter compressor do not cycle ON and OFF, they run most of the time at lower speed.





Depending on operating mode, the 4 Way Valve reverses refrigerant flow cycle, and instead of extracting energy from the ground (Heating Mode), it switches to dumping energy to the ground (cooling mode). Heat Sink and Heat Source can be altered. In Cooling mode, heat sink could be a swimming pool or a hot tub (please refer to the applications section for more information).

Why are Liquid-to-Water Heat Pumps becoming so popular?

Canadian/US Building Codes are becoming more demanding in terms of energy efficiency for both residential and commercial buildings. Canadian Federal Government is aiming to gradually increase the energy efficiency standard for both existing and new constructions by requiring that every new home in Canada be Net Zero Ready by 2025 and completely Net Zero by 2030.

Despite the advancement in air source heat pump technology, they still need to be installed with a backup heat source in the northern portion of the US and in most Canadian cities. When properly designed and sized, Liquid to Water Geothermal Heat Pumps can provide the necessary space heating/cooling demand without the need of a backup heating source. Thermal energy is extracted or dumped from the deep ground where the temperature is near the undisturbed ground temperature.

Features

General Specifications

1- Ground Loop Heat Exchanger is made from Titanium.
2- Ground Loop is a coaxial Heat Exchanger.
3- Heat Pump can be used in Open and Closed Loop Geothermal without the need of Cupro-Nickel Coating.
4- Indoor Loop heat Exchanger is made from copper.
5- Indoor Loop is a shell and tube heat exchanger.
6- Heat Pump uses R32 refrigerant.
7- Power Supply: 220-240V/1PH/60Hz.
8- Heat Pump uses Panasonic DC Inverter Twin Rotary Compressors (One compressor per Heat Pump).
9- Control Protocol: Modbus.
10- Control Main Board, Inverter Boards, EEV and other by Carel.
11- Hot/Chilled Water supply temperatures can be reset with Outdoor Temperature (Outdoor Temperature Sensor is supplied with the Heat Pump, it requires field installation and wiring).
12- Controller can display units in both IP and SI format.

13- Satin galvanized steel cabinet with powder coat finish
14- Acoustically insulated cabinet.
15- All connections located on same side.
16- 4-way reversing valve.
17- Electronic Expansion Valve (EEV).
18- Refrigerant high- and low-pressure sensors.
19- Suction line temperature sensor.
20- Temperature sensors on all 4 water lines.
21- PWM signal for modulating Indoor Loop Circulation Pump Speed and Flow.
22- Separate wired temperature sensor (T5) to measure Domestic Hot Water Pre-Heating tank temperature. When separate from space heating tank, HP allows the DHW Tank to be maintained at a separate temperature.

Optional Items

1. BMS interface card (Carel PCOS004850).
2. Hydronic Circulation pumps for indoor / ground loop.
3. Buffer Tanks
4. Backup Heaters

Ratings and Certifications

Testing and Certifications:

Heat Pumps are tested and certified as per UL 60335-1:2016, UL 60335-2-40: 2022 and CAN/CSA-C22.2 NO. 60335-1:16 (R2021), CSA C22.2 NO. 60335-2-40:22 at TUV Rheinland Laboratories.

Ratings List / Design Values

Model No.	Nominal Cooling Load (Btu/hr)	Power Supply	Electrical Power Input (KW)				
			Cooling Mode @ Ambient Dry Bulb: 40°C (104°F), Water inlet 12°C (53.6°F)	Heating Mode @ Ambient Dry Bulb: 21.1°C (70°F), Water inlet 50°C (122°F)	Cooling Load Max	Heating Load Max	Running Current (A) Max Load
GEO040V1LM	40 000	220-240VAC/1Ph/60Hz	4.0	4.9	4.0	5.0	23
GEO060V1LM	60 000	220-240VAC/1Ph/60Hz	4.9	5.5	5.0	6.0	28
GEO080V1LM	80 000	220-240VAC/1Ph/60Hz	6.3	8.3	6.5	8.5	39

Model No.	Water Flow (US GPM) – Min-Max	Water Pressure Drop @ Max Flow (feet of water)		Liquid Pipe Connection Indoor/Ground Loop	Refrigerant Type	Sound Level	Refrigerant Charge (KG)	Design Refrigerant Pressure (PSI)		MOP (A)	MCA (A)	Maximum Outlet Water Temperature (°C) / (°F)
		Indoor Loop	Ground Loop			dB(A)		Low	High			
GEO040V1LM	9-11	6.59-7.46	7.45-8.72	Ø1"/1" - FNPT	R32	48	1.45	305	609	51.75	28.75	55°C / 131°F
GEO060V1LM	11-17	5.25-11.75	8.88-13.29	Ø1"/1" - FNPT	R32	48	1.70	305	609	63.00	35.00	55°C / 131°F
GEO080V1LM	14-22	9.22-13.77	12.90-17.12	Ø1¼"/1½"- FNPT	R32	52	2.40	305	609	109.68	48.75	55°C / 131°F

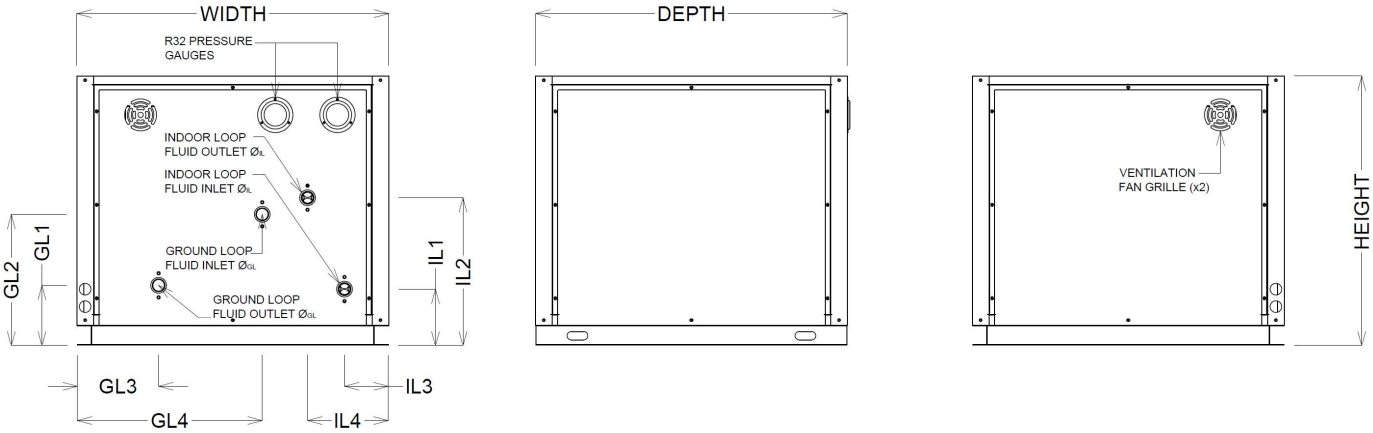
Remarks:

- The model GEO040V1LM equipped with Panasonic Compressor: 9VD330XAB21.
- The model GEO060V1LM equipped with Panasonic Compressor: 9KD420ZAA21.
- The model GEO080V1LM equipped with Panasonic Compressor: 9VD550XAA21.
- Maximum flow values correspond for required flow when compressor is running at 100% of its speed.

Note:

1. The refrigeration circuit of the above Heat Pumps uses R32 refrigerant which has Global Warming Potential (GWP) index of 675 which is one third of R410a GWP index of 2090. Installation of equipment with R32 refrigerant shall comply to CSA-B52 (Canada) and ASHRAE-34 and ASHRAE-15 (USA).
2. Ratings List values were measured when compressor was at 100% of speed and incoming and leaving fluid temperatures (Ground Loop Side) were the highest for cooling mode and lowest for heating mode.

Dimensions & Weights



OPERATING DIMENSIONS AND WEIGHTS

MODEL	WIDTH	DEPTH	HEIGHT	WEIGHT
GEO040V1LM	750mm / 30"	750mm / 30"	650mm / 26"	105 Kg / 231 Lb
GEO060V1LM	750mm / 30"	750mm / 30"	710mm / 28"	113 Kg / 249 Lb
GEO080V1LM	750mm / 30"	750mm / 30"	830mm / 33"	142 Kg / 313 Lb

SHIPPING DIMENSIONS AND WEIGHTS

MODEL	WIDTH	DEPTH	HEIGHT	WEIGHT
GEO040V1LM	780mm / 31"	780mm / 31"	780mm / 31"	113 Kg / 249 Lb
GEO060V1LM	780mm / 31"	780mm / 31"	840mm / 33"	122 Kg / 269 Lb
GEO080V1LM	780mm / 31"	780mm / 31"	960mm / 38"	150 Kg / 330 Lb

PIPING CONNECTIONS DIAMETERS

MODEL	IL1 / IL3	IL2 / IL4	GL1 / GL3	GL2 / GL4
GEO040V1LM	Ø1" FNPT	Ø1" FNPT	Ø1" FNPT	Ø1" FNPT
GEO060V1LM	Ø1" FNPT	Ø1" FNPT	Ø1" FNPT	Ø1" FNPT
GEO080V1LM	Ø1¼" FNPT	Ø1¼" FNPT	Ø1½" FNPT	Ø1½" FNPT

PIPING CONNECTIONS DISTANCES

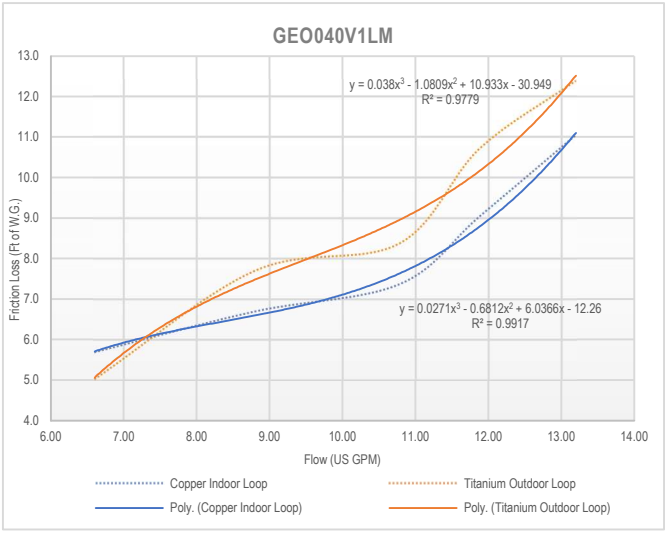
MODEL	IL1	IL2	IL3	IL4
GEO040V1LM	136.3 mm	358.1 mm	104.8 mm	194.5 mm
GEO060V1LM	137.2 mm	445.2 mm	104.8 mm	194.5 mm
GEO080V1LM	138.2 mm	533.2 mm	95 mm	185.0 mm

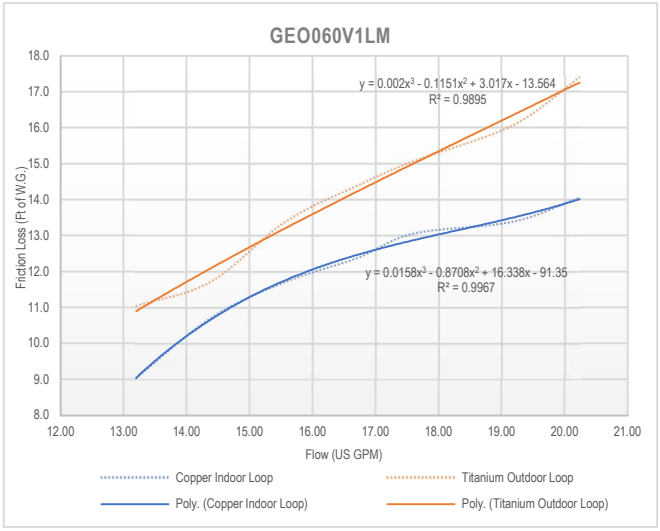
PIPING CONNECTIONS DISTANCES

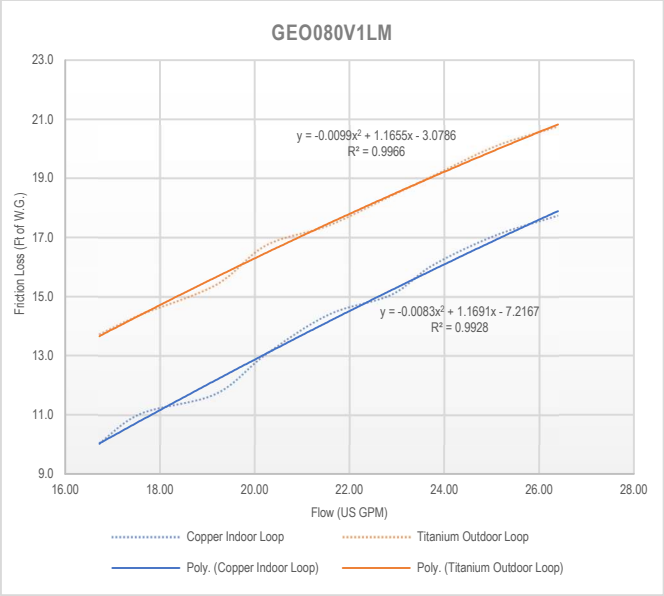
MODEL	GL1	GL2	GL3	GL4
GEO040V1LM	146.2 mm	317.2 mm	196 mm	446 mm
GEO060V1LM	146.2 mm	356.2 mm	200.8 mm	451 mm
GEO080V1LM	138.2 mm	363.2 mm	175.5 mm	425.5 mm

Friction Losses through Indoor / Ground Loop heat Exchangers

Heat transfer fluid on both sides of heat exchanger is pump with modulating speed pumps and friction loss increases and decreases with the flow.

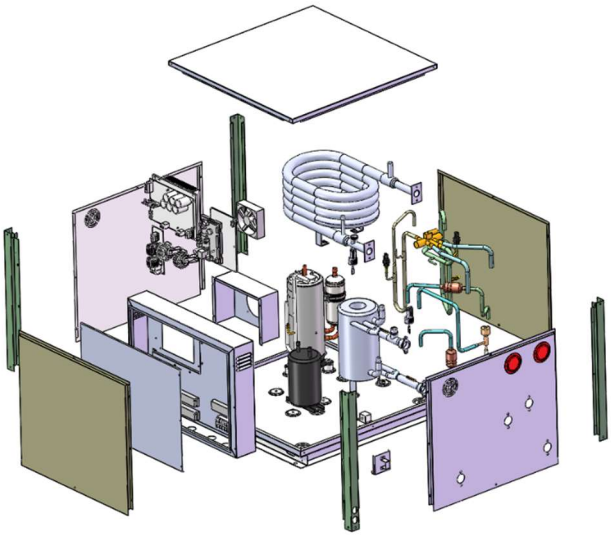




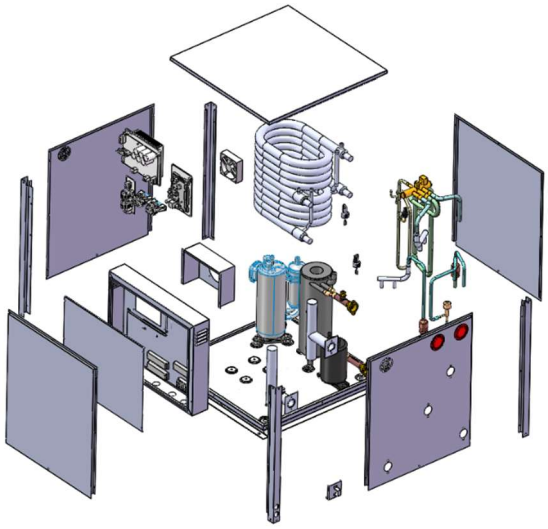


Exploded Pictures

GEO040V1LM & GEO060V1LM



GEO080V1LM



Heating / Cooling Performances:

GEO040V1LM

HEATING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Absorbed		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heating Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
23	-5.00	8.8	10.56	17.0	-8.3	6.0	3.3	18,799	5.51	3.79	2.5	104	40	4.84	7.04	113.0	45.0	9.0	5.0	31,730	9.3
25	-3.89	8.8	10.56	18.4	-7.5	6.6	3.6	21,938	6.43	3.77	2.7	104	40	5.28	7.48	113.3	45.1	9.3	5.1	34,800	10.2
30	-1.11	8.8	10.56	23.0	-5.0	7.0	3.9	24,804	7.27	3.63	3.0	104	40	5.72	8.37	112.9	44.9	8.9	4.9	37,189	10.9
32	0.00	8.8	10.56	24.4	-4.3	7.7	4.3	29,000	8.5	3.4	3.5	104	40	6.16	8.81	113.2	45.1	9.2	5.1	40,600	11.9
35	1.67	8.8	10.56	27.0	-2.8	8.0	4.4	30,877	9.05	3.35	3.7	104	40	6.16	9.25	113.1	45.1	9.1	5.1	42,306	12.4
40	4.44	8.8	10.56	31.6	-0.2	8.4	4.7	33,060	9.69	3.33	3.9	104	40	6.60	9.69	113.1	45.1	9.1	5.1	44,422	13.02
45	7.22	8.8	10.56	36.2	2.3	8.8	4.9	35,483	10.4	3.25	4.2	104	40	7.04	10.13	113.2	45.1	9.2	5.1	46,571	13.65
50	10.00	8.8	10.56	41.0	5.0	9.0	5.0	36,984	10.84	3.18	4.4	104	40	7.48	10.57	113.0	45.0	9.0	5.0	47,833	14.02
55	12.78	8.8	10.56	45.8	7.7	9.2	5.1	38,553	11.3	3.05	4.7	104	40	7.93	10.57	113.2	45.1	9.2	5.1	48,959	14.35
60	15.56	8.8	10.56	50.5	10.3	9.5	5.3	40,396	11.84	2.94	5.0	104	40	7.93	10.57	113.5	45.3	9.5	5.3	50,426	14.78

HEATING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Absorbed		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heating Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
23	-5.00	8.8	10.56	18.1	-7.7	4.9	2.7	10,679	3.13	4.47	1.7	122	50	3.52	5.72	131.0	55.0	9.0	5.0	25,930	7.6
25	-3.89	8.8	10.56	19.8	-6.8	5.2	2.9	13,101	3.84	4.26	1.9	122	50	3.96	6.16	130.9	55.0	8.9	5.0	27,636	8.1
30	-1.11	8.8	10.56	24.4	-4.2	5.6	3.1	15,490	4.54	4.16	2.1	122	50	4.40	6.60	130.9	55.0	8.9	5.0	29,683	8.7
32	0.00	8.8	10.56	25.9	-3.4	6.1	3.4	18,321	5.37	4.13	2.3	122	50	4.84	7.04	131.2	55.1	9.2	5.1	32,412	9.5
35	1.67	8.8	10.56	28.7	-1.8	6.3	3.5	19,515	5.72	4.08	2.4	122	50	5.28	7.48	130.9	54.9	8.9	4.9	33,436	9.8
40	4.44	8.8	10.56	33.4	0.8	6.6	3.7	22,143	6.49	3.81	2.7	122	50	5.72	7.93	130.8	54.9	8.8	4.9	35,142	10.3
45	7.22	8.8	10.56	38.1	3.4	6.9	3.8	23,951	7.02	3.68	2.9	122	50	5.72	7.93	131.2	55.1	9.2	5.1	36,506	10.7
50	10.00	8.8	10.56	42.8	6.0	7.2	4.0	26,441	7.75	3.45	3.2	122	50	6.16	8.37	131.1	55.1	9.1	5.1	38,212	11.2
55	12.78	8.8	10.56	47.6	8.7	7.4	4.1	27,806	8.15	3.35	3.4	122	50	6.60	8.81	130.9	54.9	8.9	4.9	39,236	11.5
60	15.56	8.8	10.56	52.5	11.4	7.5	4.2	28,830	8.45	3.25	3.6	122	50	6.60	8.81	131.0	55.0	9.0	5.0	39,918	11.7

COOLING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Rejected		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Cooling Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
55	12.78	8.8	10.56	66.1	18.9	11.1	6.15	41,692	12.22	2.58	5.7	53.6	12	8.37	11.01	44.5	6.9	9.1	5.1	50,495	14.8
60	15.56	8.8	10.56	69.2	20.7	9.2	5.1	39,884	11.69	2.61	5.5	53.6	12	8.37	11.01	44.8	7.1	8.8	4.9	48,789	14.3
65	18.33	8.8	10.56	73.9	23.3	8.9	5.0	38,485	11.28	2.62	5.3	53.6	12	7.93	10.57	44.7	7.0	8.9	5.0	47,424	13.9
70	21.11	8.8	10.56	78.5	25.8	8.5	4.7	36,029	10.56	2.64	5.0	53.6	12	7.48	10.13	44.7	7.1	8.9	4.9	45,036	13.2
75	23.89	8.8	10.56	83.2	28.5	8.2	4.6	34,766	10.19	2.61	4.9	53.6	12	7.04	9.69	44.6	7.0	9.0	5.0	43,671	12.8
80	26.67	8.8	10.56	88.0	31.1	8.0	4.5	33,402	9.79	2.71	4.6	53.6	12	7.04	9.69	44.8	7.1	8.8	4.9	42,648	12.5
85	29.44	8.8	10.56	92.8	33.8	7.8	4.4	31,730	9.3	2.9	4.2	53.6	12	6.60	9.25	44.6	7.0	9.0	5.0	41,624	12.2
90	32.22	8.8	10.56	97.6	36.5	7.6	4.2	30,331	8.89	2.96	4.0	53.6	12	6.16	8.81	44.5	6.9	9.1	5.1	40,430	11.85

GEO060V1LM

HEATING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Absorbed		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heating Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
23	-5.00	11.44	15.84	17.0	-8.3	6.0	3.3	28,659	8.4	5.6	2.5	104	40	7.5	10.6	113.0	45.0	9.0	5.0	47,765	14
25	-3.89	11.44	15.84	18.7	-7.4	6.3	3.5	32,003	9.38	5.42	2.7	104	40	7.9	11.4	112.8	44.9	8.8	4.9	50,495	14.8
30	-1.11	11.44	15.84	23.3	-4.8	6.7	3.7	35,380	10.37	5.23	3.0	104	40	8.4	11.9	112.9	45.0	8.9	5.0	53,224	15.6
32	0.00	11.44	15.84	24.4	-4.2	7.6	4.2	43,364	12.71	5.09	3.5	104	40	9.7	13.6	112.9	44.9	8.9	4.9	60,730	17.8
35	1.67	11.44	15.84	27.1	-2.7	7.9	4.4	46,128	13.52	4.98	3.7	104	40	10.1	14.1	112.9	45.0	8.9	5.0	63,118	18.5
40	4.44	11.44	15.84	31.7	-0.2	8.3	4.6	49,062	14.38	4.92	3.9	104	40	10.6	15.0	112.8	44.9	8.8	4.9	65,848	19.3
45	7.22	11.44	15.84	36.2	2.3	8.8	4.9	53,702	15.74	4.86	4.2	104	40	11.0	15.4	113.1	45.0	9.1	5.0	70,283	20.6
50	10.00	11.44	15.84	41.0	5.0	9.0	5.0	55,715	16.33	4.77	4.4	104	40	11.4	15.9	113.0	45.0	9.0	5.0	71,989	21.1
55	12.78	11.44	15.84	45.8	7.7	9.2	5.1	57,898	16.97	4.53	4.7	104	40	11.4	15.9	113.2	45.1	9.2	5.1	73,354	21.5
60	15.56	11.44	15.84	50.7	10.4	9.3	5.2	60,014	17.59	4.21	5.2	104	40	11.4	15.9	113.3	45.2	9.3	5.2	74,377	21.8

HEATING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Absorbed		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heating Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
23	-5.00	11.44	15.84	18.5	-7.5	4.5	2.5	14,739	4.32	6.18	1.7	122	50	4.8	7.9	131.0	55.0	9.0	5.0	35,824	10.5
25	-3.89	11.44	15.84	20.0	-6.7	5.0	2.8	18,765	5.5	6.1	1.9	122	50	5.7	8.8	130.9	55.0	8.9	5.0	39,577	11.6
30	-1.11	11.44	15.84	24.6	-4.1	5.4	3.0	22,723	6.66	6.04	2.1	122	50	6.6	9.7	130.9	54.9	8.9	4.9	43,330	12.7
32	0.00	11.44	15.84	26.3	-3.1	5.7	3.1	25,281	7.41	5.79	2.3	122	50	6.6	9.7	131.3	55.1	9.3	5.1	45,036	13.2
35	1.67	11.44	15.84	29.2	-1.5	5.8	3.2	26,885	7.88	5.62	2.4	122	50	7.0	10.1	131.1	55.0	9.1	5.0	46,059	13.5
40	4.44	11.44	15.84	34.0	1.1	6.0	3.4	30,297	8.88	5.22	2.7	122	50	7.5	10.6	131.1	55.0	9.1	5.0	48,106	14.1
45	7.22	11.44	15.84	38.7	3.7	6.3	3.5	32,344	9.48	5.12	2.9	122	50	7.9	11.0	131.0	55.0	9.0	5.0	49,812	14.6
50	10.00	11.44	15.84	43.4	6.4	6.6	3.6	35,926	10.53	4.77	3.2	122	50	8.4	11.4	131.1	55.0	9.1	5.0	52,201	15.3
55	12.78	11.44	15.84	48.3	9.1	6.7	3.7	37,769	11.07	4.53	3.4	122	50	8.8	11.9	130.9	55.0	8.9	5.0	53,224	15.6
60	15.56	11.44	15.84	53.2	11.8	6.8	3.8	39,202	11.49	4.41	3.6	122	50	8.8	11.9	131.1	55.0	9.1	5.0	54,248	15.9

COOLING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Rejected		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Cooling Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
55	12.78	11.44	15.84	64.8	18.2	9.8	5.4	91,675	26.87	4.02	5.7	53.6	12	12.3	17.2	44.6	7.0	9.0	5.0	77,960	22.85
60	15.56	11.44	15.84	69.5	20.8	9.5	5.3	89,423	26.21	4.06	5.5	53.6	12	11.9	16.7	44.6	7.0	9.0	5.0	75,571	22.15
65	18.33	11.44	15.84	74.2	23.4	9.2	5.1	87,240	25.57	4.12	5.2	53.6	12	11.4	16.3	44.7	7.0	8.9	5.0	73,183	21.45
70	21.11	11.44	15.84	78.9	26.1	8.9	4.9	85,022	24.92	4.17	5.0	53.6	12	11.0	15.9	44.7	7.1	8.9	4.9	70,795	20.75
75	23.89	11.44	15.84	83.8	28.8	8.8	4.9	84,203	24.68	4.18	4.9	53.6	12	11.0	15.4	44.6	7.0	9.0	5.0	69,942	20.5
80	26.67	11.44	15.84	88.3	31.3	8.3	4.6	80,416	23.57	4.22	4.6	53.6	12	10.6	14.5	44.6	7.0	9.0	5.0	66,018	19.35
85	29.44	11.44	15.84	92.8	33.8	7.8	4.3	76,731	22.49	4.29	4.2	53.6	12	9.7	13.6	44.5	7.0	9.1	5.0	62,095	18.2
90	32.22	11.44	15.84	99.4	37.5	9.4	5.2	75,162	22.03	4.38	4.0	53.6	12	10.6	13.2	44.5	7.0	9.1	5.0	60,218	17.65

GEO080V1LM

HEATING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Absorbed		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heating Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
23	-5.00	15.84	21.12	17.0	-8.3	6.0	3.3	38,076	11.16	7.44	2.5	104	40	8.4	14.1	113.0	45.0	9.0	5.0	63,459	18.6
25	-3.89	15.84	21.12	18.7	-7.4	6.3	3.5	41,556	12.18	7.32	2.7	104	40	9.2	15.0	112.8	44.9	8.8	4.9	66,530	19.5
30	-1.11	15.84	21.12	23.0	-5.0	7.0	3.9	49,881	14.62	7.28	3.0	104	40	11.0	16.7	112.9	44.9	8.9	4.9	74,718	21.9
32	0.00	15.84	21.12	24.4	-4.3	7.7	4.3	57,966	16.99	6.81	3.5	104	40	12.3	18.1	113.0	45.0	9.0	5.0	81,201	23.8
35	1.67	15.84	21.12	27.1	-2.7	7.9	4.4	61,276	17.96	6.64	3.7	104	40	12.8	18.5	113.0	45.0	9.0	5.0	83,930	24.6
40	4.44	15.84	21.12	31.9	-0.1	8.1	4.5	64,210	18.82	6.48	3.9	104	40	13.6	19.4	112.9	44.9	8.9	4.9	86,319	25.3
45	7.22	15.84	21.12	36.4	2.4	8.6	4.8	69,669	20.42	6.38	4.2	104	40	15.0	20.7	112.8	44.9	8.8	4.9	91,436	26.8
50	10.00	15.84	21.12	41.0	5.0	9.0	5.0	74,173	21.74	6.36	4.4	104	40	15.4	21.1	113.0	45.0	9.0	5.0	95,872	28.1
55	12.78	15.84	21.12	45.8	7.7	9.2	5.1	76,834	22.52	6.08	4.7	104	40	15.9	21.1	113.2	45.1	9.2	5.1	97,577	28.6
60	15.56	15.84	21.12	50.7	10.4	9.3	5.2	79,666	23.35	5.55	5.2	104	40	15.9	21.1	113.3	45.2	9.3	5.2	98,601	28.9

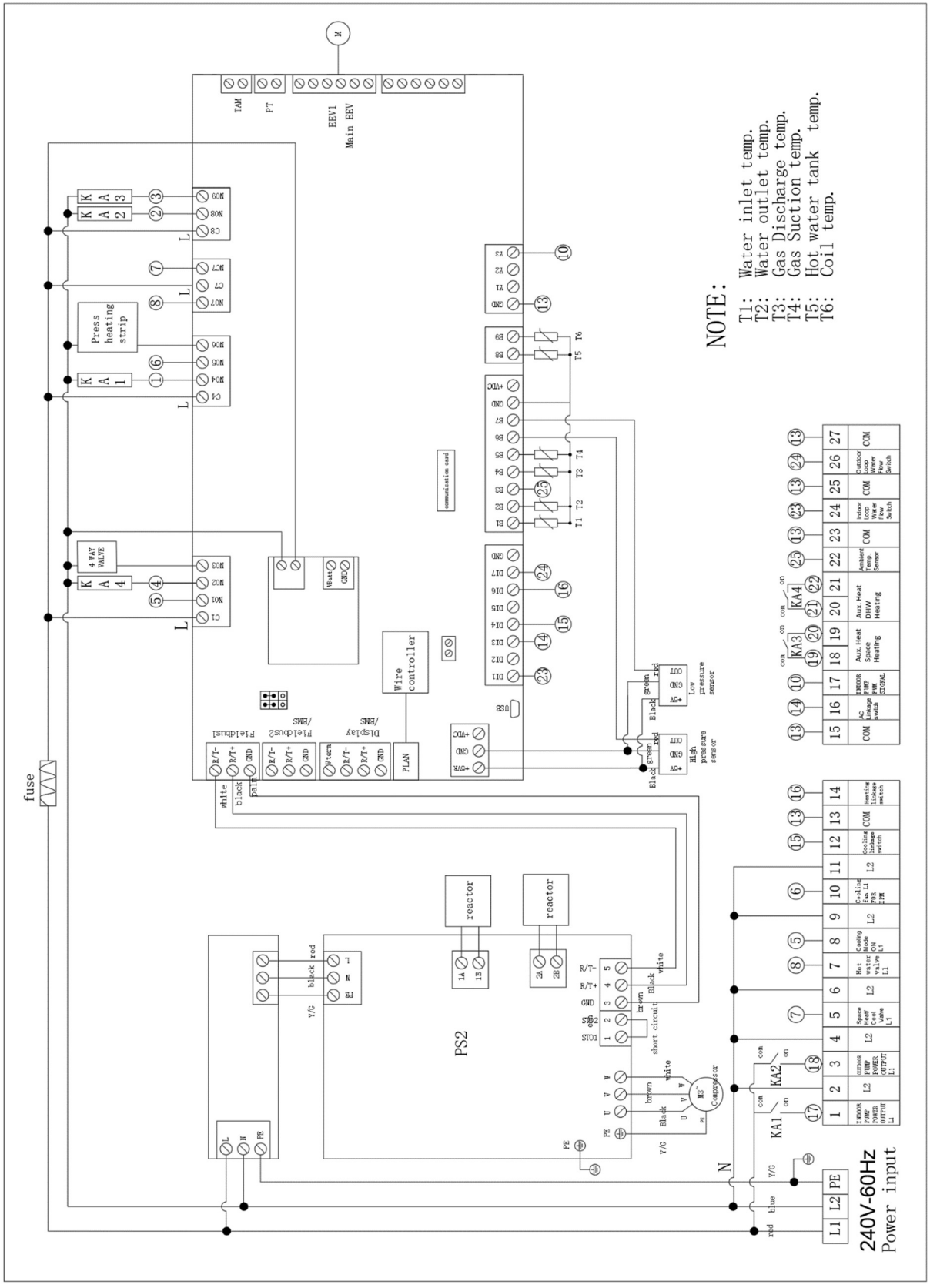
HEATING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Absorbed		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heating Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
23	-5.00	15.84	21.12	17.6	-8.0	5.4	3.0	27,704	8.12	8.68	1.9	122	50	8.4	12.8	130.9	55.0	8.9	5.0	57,318	16.8
25	-3.89	15.84	21.12	19.3	-7.0	5.7	3.1	31,081	9.11	8.49	2.1	122	50	8.8	13.2	131.1	55.0	9.1	5.0	60,048	17.6
30	-1.11	15.84	21.12	24.1	-4.4	5.9	3.3	34,084	9.99	8.41	2.2	122	50	9.2	13.6	131.2	55.1	9.2	5.1	62,777	18.4
32	0.00	15.84	21.12	25.8	-3.4	6.2	3.4	37,803	11.08	8.12	2.4	122	50	10.1	14.5	131.0	55.0	9.0	5.0	65,507	19.2
35	1.67	15.84	21.12	28.5	-1.9	6.5	3.6	41,658	12.21	7.89	2.5	122	50	10.6	15.0	131.1	55.1	9.1	5.1	68,577	20.1
40	4.44	15.84	21.12	33.3	0.7	6.7	3.7	45,411	13.31	7.39	2.8	122	50	11.0	15.4	131.1	55.1	9.1	5.1	70,624	20.7
45	7.22	15.84	21.12	38.1	3.4	6.9	3.9	49,130	14.4	7.2	3.0	122	50	11.9	16.3	131.0	55.0	9.0	5.0	73,695	21.6
50	10.00	15.84	21.12	42.8	6.0	7.2	4.0	52,781	15.47	7.03	3.2	122	50	12.3	16.7	131.1	55.1	9.1	5.1	76,766	22.5
55	12.78	15.84	21.12	47.7	8.7	7.3	4.1	54,930	16.1	6.7	3.4	122	50	12.8	17.2	131.0	55.0	9.0	5.0	77,789	22.8
60	15.56	15.84	21.12	52.5	11.4	7.5	4.1	57,318	16.8	6.4	3.6	122	50	13.2	17.6	130.9	55.0	8.9	5.0	79,154	23.2

COOLING PERFORMANCE

Outdoor Loop										Electrical		Indoor Loop									
Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Heat Rejected		Power Input	Coefficient of Performance	Entering Liquid Temperature		Flow (USGPM)		Leaving Liquid Temperature (@ Max Flow)		Delta T		Cooling Capacity	
(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW	KW	COP	(° F)	(°C)	Min	Max	(° F)	(°C)	(° F)	(°C)	Btu/Hr	KW
55	12.78	15.84	21.12	64.1	17.8	9.1	5.0	113,442	33.25	5.05	5.6	53.6	12	15.9	21.1	44.5	7.0	9.1	5.0	96,213	28.2
60	15.56	15.84	21.12	68.8	20.4	8.8	4.9	110,815	32.48	5.08	5.4	53.6	12	15.4	20.7	44.6	7.0	9.0	5.0	93,483	27.4
65	18.33	15.84	21.12	73.6	23.1	8.6	4.8	108,871	31.91	5.11	5.2	53.6	12	15.0	20.3	44.6	7.0	9.0	5.0	91,436	26.8
70	21.11	15.84	21.12	78.5	25.8	8.5	4.7	107,199	31.42	5.12	5.1	53.6	12	14.5	19.8	44.6	7.0	9.0	5.0	89,730	26.3
75	23.89	15.84	21.12	83.2	28.4	8.2	4.6	104,606	30.66	5.16	4.9	53.6	12	14.1	19.4	44.7	7.0	8.9	5.0	87,001	25.5
80	26.67	15.84	21.12	88.0	31.1	8.0	4.4	103,002	30.19	5.39	4.6	53.6	12	13.6	18.9	44.7	7.1	8.9	4.9	84,613	24.8
85	29.44	15.84	21.12	92.7	33.7	7.7	4.3	101,706	29.81	5.71	4.2	53.6	12	13.2	18.5	44.7	7.1	8.9	4.9	82,224	24.1
90	32.22	15.84	21.12	97.7	36.5	7.6	4.2	101,501	29.75	5.95	4.0	53.6	12	12.8	18.1	44.6	7.0	9.0	5.0	81,201	23.8

Controls


NOTE:
T1: Water inlet temp.
T2: Water outlet temp.
T3: Gas Discharge temp.
T4: Gas Suction temp.
T5: Hot water tank temp.
T6: Coil temp.
EEV1
Main EEV
Press heating strip
4 WAY VALVE
Wire controller
communication card
Low pressure sensor
High pressure sensor
reactor
reactor
PS2
Compressor
fuse
240V-60Hz
Power input

1	2	3	4	5	6	7	8	9	10	11	12	13	14
INDOOR PUMP POWER OUTPUT L1	L2	OUTDOOR PUMP POWER OUTPUT L1	L2	SPACE/ HEAT COOL VALVE L1	L2	HOT WATER VALVE L1	COOL MODE ON L1	L2	COOLING FAN FOR IPM L1	L2	Cooling linkage switch	COM	Heating linkage switch

Terminal	Function	Type
1-2: INDOOR LOOP'S PUMP POWER OUTPUT	Power Supply for Heat Pump Circulation Pump of the indoor loop (Pump not included)	220-240V/1Ph/60Hz
3-4: OUTDOOR LOOP'S PUMP POWER OUTPUT	Power Supply for Heat Pump Circulation Pump of the outdoor loop (Pump not included)	220-240V/1Ph/60Hz
5-6-7: THREE WAY VALVE POWER OUTPUT	Power Supply for Floating Type 3 Way Valve, Switches between DHW tank and Space Heating/Cooling Tank	220-240V/1Ph/60Hz
8-9: TWO WAY VALVE POWER SUPPLY	Power Supply for Cooling Mode Signal – ON when Heat Pump is in cooling mode (Used in 2 tanks Hot/Chilled Configuration)	220-240V/1Ph/60Hz
10-11: INTERNAL FAN	Power Supply for integrated Cooling Fan (not to be wired by installer)	220-240V/1Ph/60Hz
12-13: COOLING LINKAGE	Changes Heat Pump Operating Mode to Cooling. Heat Pump must be turned off before changing operating mode.	Dry Contact (can be configured NO or NC from Carel Controller)
13-14: HEATING LINKAGE	Changes Heat Pump Operating Mode to Heating. Heat Pump must be turned off before changing operating mode.	Dry Contact (can be configured NO or NC from Carel Controller)

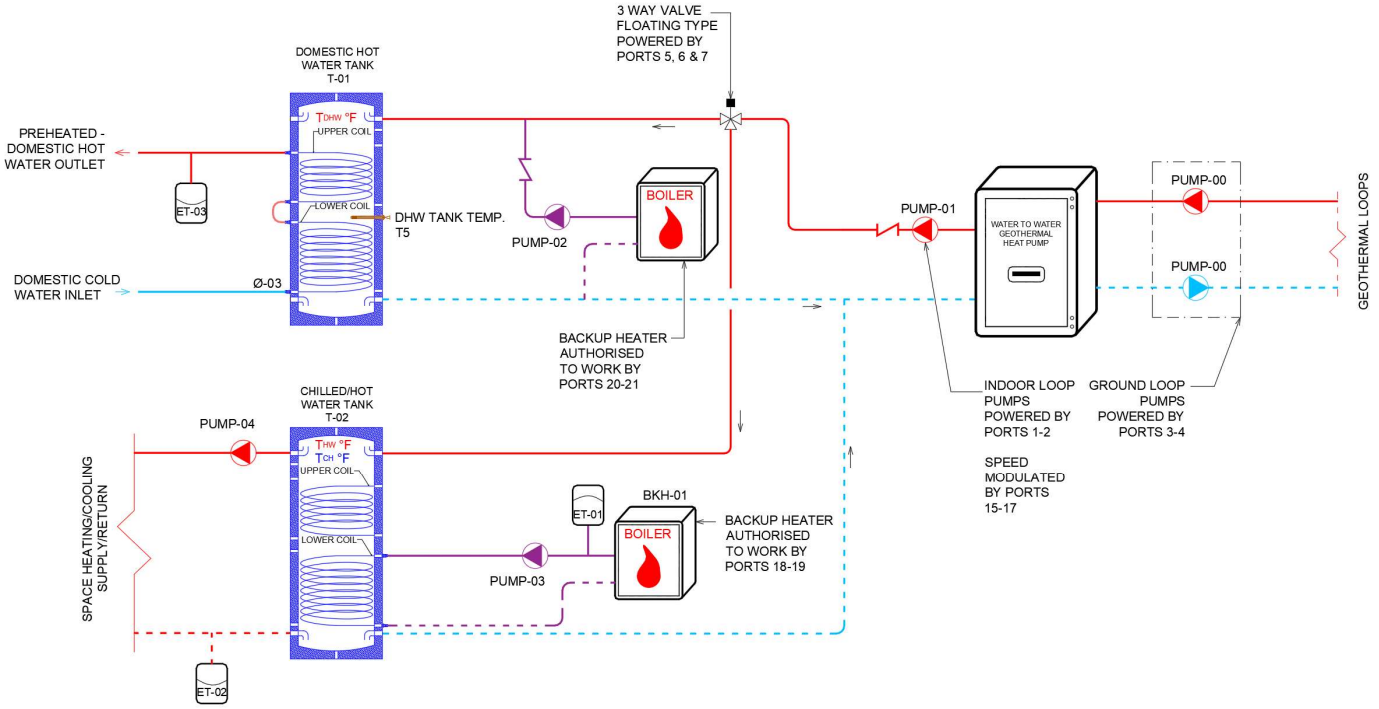
15	16	17	18	19	20	21	22	23	24	25	26	27
COM	AC Linkage switch	INDOOR PUMP PWM SIGNAL	Aux. Heat Space Heating		Aux. Heat DHW Heating		Ambient Temp. Sensor	COM	Indoor Loop Water Flow Switch	COM	Outdoor Loop Water Flow Switch	COM

Terminal	Function	Type
15-16: HEAT PUMP ON/OFF LINKAGE	Switches Heat Pump ON or OFF	Dry Contact (can be configured NO or NC from Carel Controller)
15-17: INDOOR LOOP PUMP MODULATION	Modulates the speed of indoor loop circulation Pump (optional)	PWM (Pulse Width Modulation)
18-19: AUXILIARY HEAT FOR SPACE HEATING	Enables the operation of the backup heater for space heating	Dry Contact (NO)
20-21: AUXILIARY HEAT FOR DHW HEATING	Enables the operation of the backup heater for Domestic Hot Water Heating	220-240V/1Ph/60Hz
22-23: AMBIENT TEMPERATURE SENSOR	Connection for ambient temperature sensor (Optional for outdoor reset of Heat Pump supply temperatures in heating and cooling modes)	1000 Ohms Resistance
23-24: FLOW SWITCH FOR INDOOR LOOP	Closes when indoor loop pump is turned ON by the controller of the Heat Pump	Dry Contact (can be configured NO or NC from Carel Controller)
25-26: FLOW SWITCH FOR OUTDOOR LOOP	Closes when outdoor loop pump is turned ON by the controller of the Heat Pump	Dry Contact (can be configured NO or NC from Carel Controller)

Applications

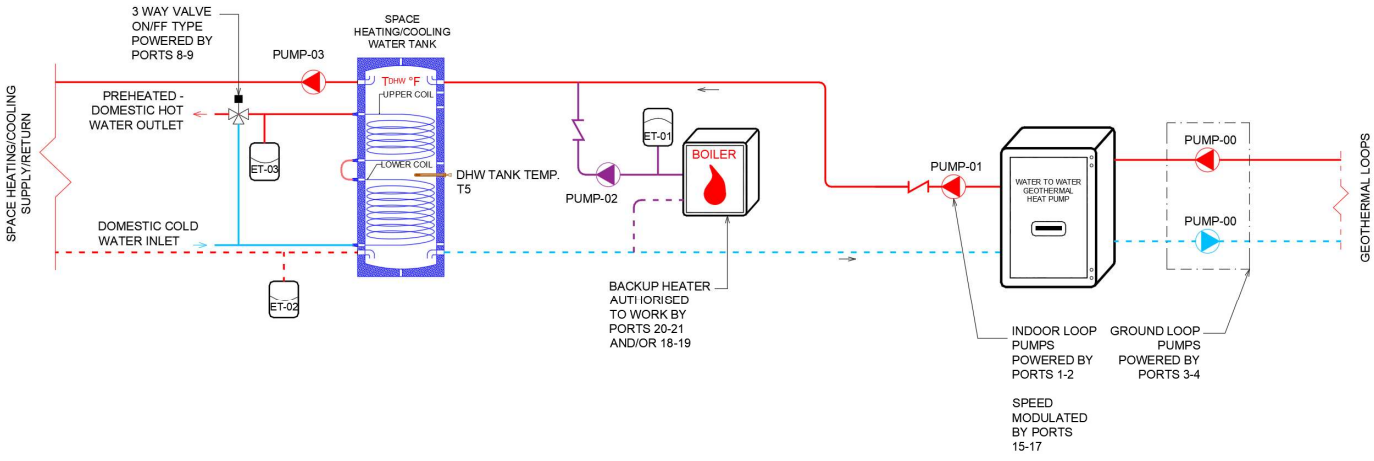
Space Heating or Cooling and Domestic Hot Water Pre-Heating (DHW)-2T3AP1T

In this configuration, Heat Pump is connected to two separate buffer tanks: one dedicated for DHW Preheating and the other tank dedicated for either space heating in winter or space cooling in the summer. In this operating mode, priority for tank T-01 and T-02 can be set up via the control interface of the heat pump.



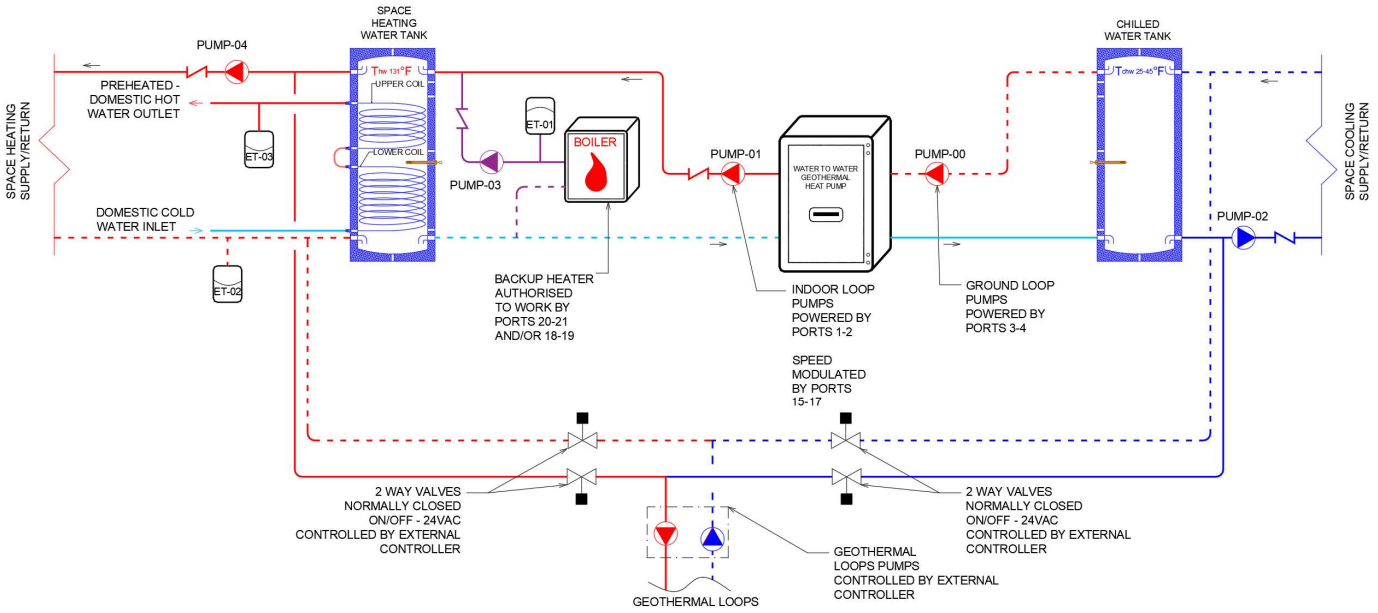
Space Heating and Domestic Hot Water Pre-Heating (DHW) or Space Cooling-1T3AP1T

In this configuration, Heat Pump is connected to only one buffer tank with an indirect coil: the indirect coil will be used to preheat DHW when HP is in heating mode (when in cooling mode, indirect coil will be bypassed via the three-way valve). Tank will be heated in heating mode and cooled in cooling mode.



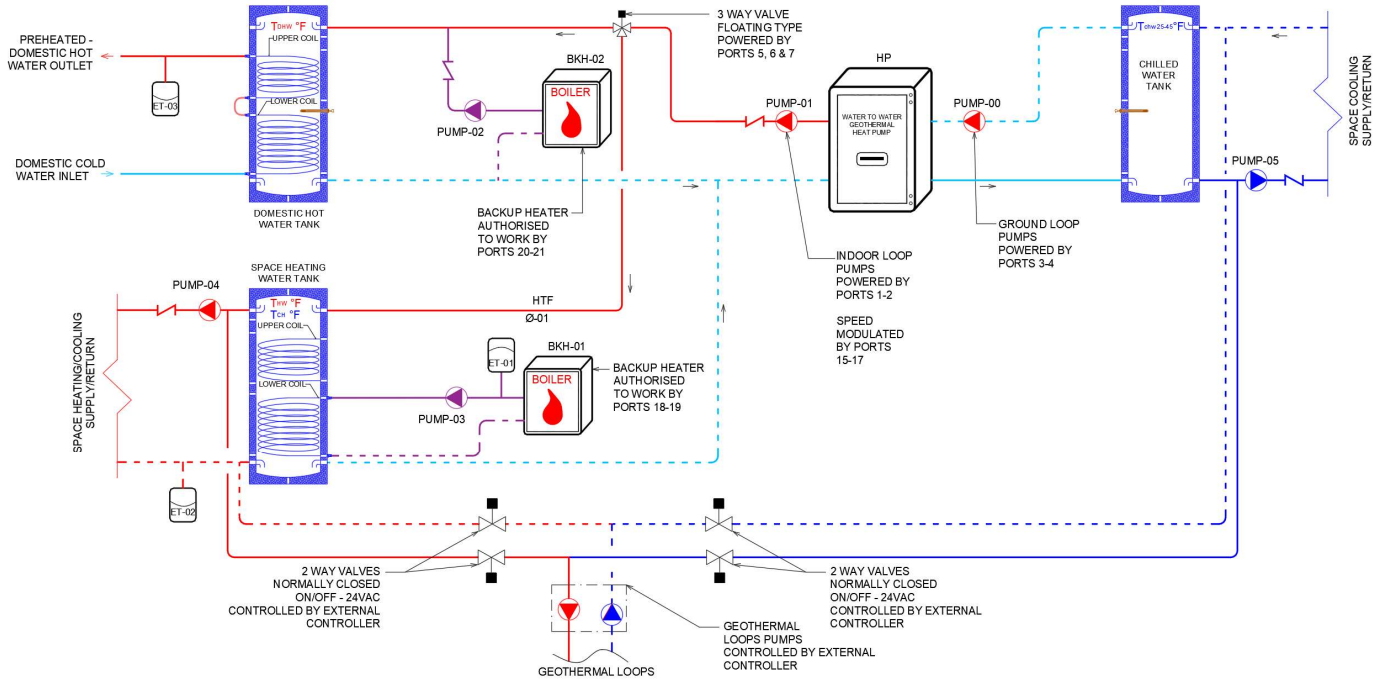
Simultaneous Heating and Cooling and/or Domestic Hot Water Pre-Heating (DHW)-2T3AP3T

In this configuration, Heat Pump works in heating mode only, extracting heat from the chilled water tank and dumping that heat into the hot water tank. Hot Water tank shall have an indirect coil if used to preheat DHW beside space heating.



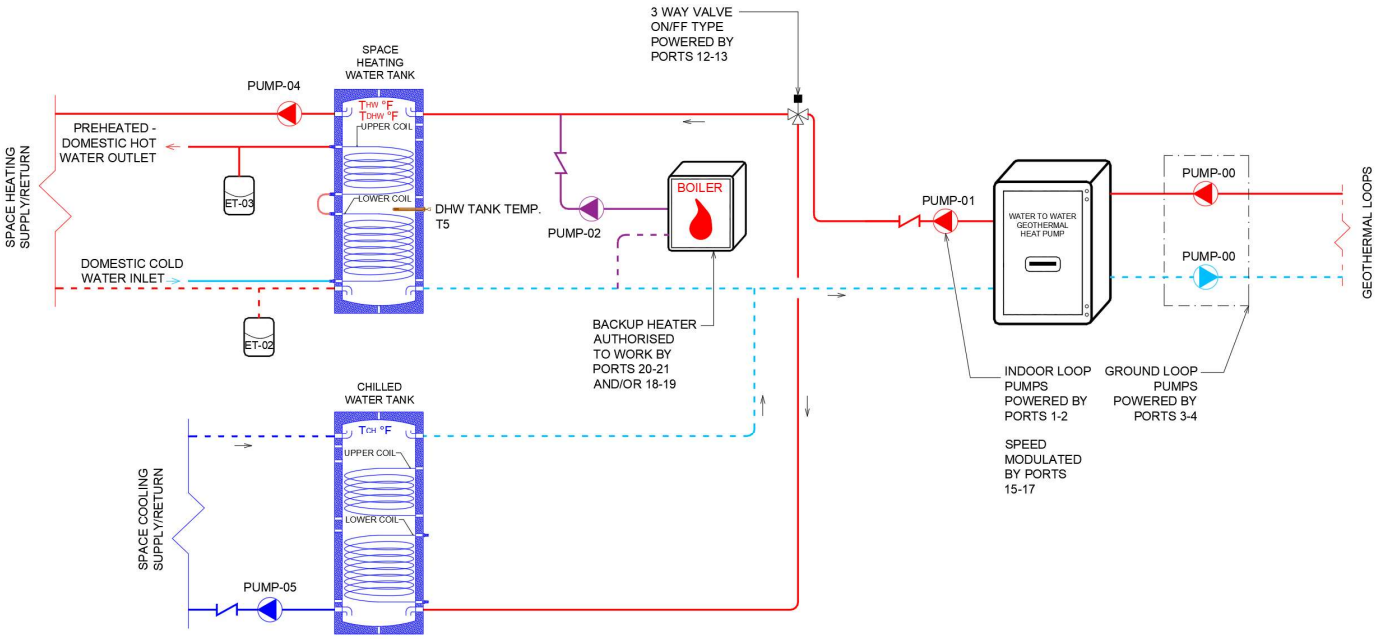
Simultaneous Heating and Cooling and Domestic Hot Water Pre-Heating (DHW)-3T3AP3T

In this configuration, Heat Pump works in heating mode only, extracting heat from the chilled water tank and dumping that heat into either the space heating tank or DHW preheating tank.



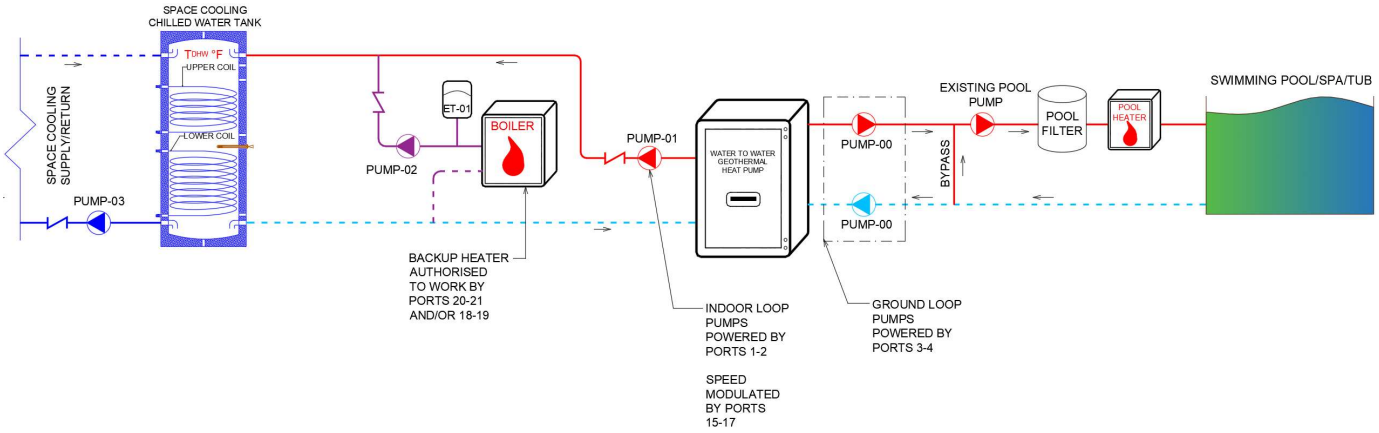
Heating and Cooling or Domestic Hot Water Pre-Heating (DHW)-2T3AP2T

In this configuration, Heat Pump is connected to two separate buffer tanks: one dedicated for space heating hot water and the other dedicated for space cooling chilled water. In this operating mode, priority for tank T-01 and T-02 can be set up via the control interface of the heat pump.



Space Cooling and Swimming Pool Heating (DHW)-1T2AP1T

In this configuration, Heat Pump is connected to one buffer tank used for space cooling on the indoor loop side. The outdoor loop side will be hooked up to swimming pool directly with a hydraulic separator or by-pass (the nominal flow on the ground loop side might be lower than the nominal flow of the swimming pool pump).



The maximum entering ground loop temperature is 90°F (32.22°C). This configuration works if the temperature of the water pumped from the pool to the ground loop side of the HP is less or equal than 90°F (32.22°C).

Operation

Check List before Startup

Introduction:
Engineering and quality control is built into every geothermal unit. Good performance depends on proper application and correct installation. This geothermal heat pump provides heated water and chilled water as well as optional domestic water heating capability.

Notices, Cautions, Warnings, & Dangers:
"NOTICE" Notification of installation, operation, or maintenance information, which is important, but which is NOT hazard related.

"CAUTION" Indicates a potentially hazardous situation or an unsafe practice which, if not avoided, COULD result in minor or moderate injury or product or property damage.

"WARNING" Indicates potentially hazardous situation which, if not avoided, COULD result in death or serious injury.

"DANGER" Indicates an immediate hazardous situation which, if not avoided, WILL result in death or serious injury.

Inspection:
Upon receipt of any equipment, carefully check the shipment against the packing slip and the freight company bill of lading. Verify that all units and packages have been received. Inspect the packaging of each package and each unit for damages. Ensure that the carrier makes proper notation of all damages or shortage on all bill of lading papers. Concealed damage should be reported to the freight company within 5 days. If not filed within 5 days the freight company can deny all claims.

***Note**: Notify Aqua Solanor Inc. shipping department of all damages within five (5) days. It is the responsibility of the purchaser to file all necessary claims with the freight company.*

Unpackaging:
Aqua Solanor Inc. GEO Series are mounted to wooden pallets for easy handling during shipment and installation. Units are protected during shipment with durable cardboard corner posts, top and air coil panels. Shrink wrap is applied covering the entire unit and attachment to the pallet.
Upon receipt of the unit, carefully remove the shrink wrap. Using a box cutter, slit the shrink wrap on the cardboard top and corner posts. Use caution to not damage the finished surface of the unit. Keep all cardboard or other packaging material for safe storage and transport to the job site prior to installation.
Remove the front service panel to locate technical documents; manuals, bulletins or instructions and accessory items; Control Display, WIFI Adapter and other accessories.

⚠ NOTICE ⚠
AQUA SOLANOR INC. REQUIRES THAT A STRAINER BE INSTALLED ON THE INLET OF SOURCE AND LOAD SIDE OF SHELL AND TUBE HEAT EXCHANGERS WHEN INCOMING FLUID CONTAINS MATERIALS THAT CAN REDUCE HEAT EXCHANGE BETWEEN REFRIGERANT AND HEAT TRANSFER FLUID.

⚠ CAUTION ⚠
DO NOT OPERATE THE GEOTHERMAL HEAT PUMP UNIT DURING BUILDING CONSTRUCTION PHASE.

⚠ WARNING ⚠
FAILURE TO FOLLOW THIS CAUTION MAY RESULT IN PERSONAL INJURY. USE CARE AND WEAR APPROPRIATE PROTECTIVE CLOTHING, SAFETY GLASSES, AND GLOVES WHEN SERVICING UNIT OR HANDLING PARTS.

Unit Protection:
Protect units from damage and contamination due to plastering (spraying), painting and all other foreign materials that may be used at the job site.

Keep all units covered on the job site with either the original packaging or equivalent protective covering. Cap or recap unit connections and all piping until unit is installed. Precautions must be taken to avoid physical damage and contamination which may prevent proper start-up and may result in costly equipment repair.

Storage:
All geothermal units should be stored inside in the original packaging in a clean, dry location. Units should be always stored in an upright position. Units should not be stacked unless specially noted on the packaging.

Removal and Disposal:
All Geothermal units removed from service should have all components, oils, antifreeze, and refrigerants properly disposed of according to local and national environmental recycling codes, regulations, local by-laws, standards, and rules.

Pre-Installation Checks:
Before you fully install the geothermal equipment, it is recommended you do the following:

a. Fully inspect the unit after unpacking.
b. Compare the electrical data on the unit nameplate with packing slip and ordering information to verify that the correct unit has been shipped.
c. Inspect all electrical connections and wires. Connections must be clean and tight at the terminals, and wires should not touch any sharp edges or copper pipe.
d. Verify that all refrigerant tubing is free of dents and kinks. Refrigerant tubing should not be touching other unit components.
e. Before unit start-up, read all manuals and become familiar with unit components and operation. Thoroughly check the unit before operating.
f. Locate the Unit Start-Up Form from this manual and have it available as the unit installation proceeds.

Equipment Installation:
All units should be installed in an indoor area where the ambient temperature will remain above 45°F and should be placed in a way that piping and ductwork or other permanently installed fixtures do not have to be removed for servicing the unit.

Installation shall leave enough clearances for accessing all components of the heat pump.

⚠ CAUTION ⚠
GEOTHERMAL EQUIPMENT IS DESIGNED FOR INDOOR INSTALLATION ONLY. DO NOT INSTALL OR STORE UNIT IN A CORROSIVE ENVIRONMENT OR IN A LOCATION WHERE TEMPERATURE AND HUMIDITY ARE SUBJECT TO EXTREMES. EQUIPMENT IS NOT CERTIFIED FOR OUTDOOR APPLICATIONS. SUCH INSTALLATION WILL VOID ALL WARRANTIES.

⚠ CAUTION ⚠

BEFORE DRILLING OR DRIVING ANY SCREWS INTO CABINET, CHECK TO BE SURE THE SCREW WILL NOT HIT ANY INTERNAL PARTS OR REFRIGERANT LINES.

Unit Placement:
When installing a geothermal heating and cooling unit, there are items the installer should consider before placing the equipment.

1. Service Access: Is there enough space for service access? A general rule of thumb is at least 2 feet in the front and 2 feet on at least one side.
2. Unit Air Pad: All geothermal heating and cooling equipment should be placed on a high-density rubber pad, a formed plastic air pad, or a high density, closed cell polystyrene pad. This helps eliminate vibration noise that could be transmitted through the floor.
3. Unit Racking: If units are being placed on racking, the unit must be placed on a solid foundation covering the full base of the unit. Also, utilize a foam pad between the unit and the rack.
4. The installer must verify that all applicable wiring, piping, and accessories are correct and on the job site.

Electrical:
All wiring, line, and low voltage should comply with the manufacturer's recommendations, The National Electrical Code, and all local codes and ordinances.

Thermostat or External Controllers:

Thermostats should be installed approximately 54 inches off the floor on an inside wall in the return air pattern and where they are not in direct sunlight at anytime.

Loop Pumping Modules / or Individual Pumps:

Must be wired to the heat pump's electric control box. When pumps amperage draw exceeds 5-amp, a pump module connection block (connected to the master contactor) and a properly sized circuit breaker shall be provided (by installer) to connect the Pump Module wiring.

Hydronic Piping and Pumps design:

The type and diameter of hydronic fluid piping (on both indoor and ground loop sides) shall be appropriate for the operating conditions of the heat pump.

Pumps and pipe diameters shall be properly sized for the minimum and maximum operating flows of the heat pumps. Proper sizing is the responsibility of the installer or his client or whoever they hire for the design (such as engineers, technologist of other).

Improperly designing the hydronic pipes connected to this heat pump in a way that might cause damage to the heat pump, will void the warranty.

Hydronic Piping Accessories

Proper fittings and accessories shall be installed on the hydronic closed loop network. Accessories such as automatic air vents, air separators, expansion tanks, water hammer arrestors and any other accessories required for a healthy operation of the heat Pump.

Components:

Master Contactor: Energizes Compressor and Hydronic Pumps.

Logic Board: Logic Board operates the compressor and protects unit by locking out when safety switches are engaged. It also provides fault indicator(s).

Dry Contacts: Provides connection to a third-party controller (or thermostat) or other accessories to the low voltage circuit.

Inverter Boards: Converts incoming AC voltage to DC voltage and modulate compressor speed (there is 2 smaller inverter boards for Fan and Indoor loop circulation Pump)

Reversing Valve: Controls the cycle of the refrigerant system (heating or cooling). Energized in cooling mode.

High Pressure Switch: Protects the refrigerant system from high refrigerant pressure by locking unit out if pressure exceeds setting.

Low Pressure Switch: Protects the refrigerant system from low suction pressure if suction pressure falls below setting.

Flow Switch (Freeze Protection Device): Protects the water heat exchanger from freezing by shutting down compressor if water flow decreases.

Compressor: Pumps refrigerant through the heat exchangers and pressurizes the refrigerant, which increases the temperature of the refrigerant.

Consumer Instructions

Dealer should instruct the consumer in proper operation, maintenance, filter replacements, thermostat and indicator lights. Also provide the consumer with the manufacturer's Owner's Manual for the equipment being installed.

Aqua Solanor Inc. (ASI) D-I-Y Policy

ASI's geothermal heat pumps and system installations may include electrical, refrigerant and/or water connections. Federal, state and local codes and regulations apply to various aspects of the installation. Improperly installed equipment can lead to equipment failure and health/ safety concerns. For these reasons, only qualified technicians should install an Aqua Solanor Inc. built geothermal system.

Because of the importance of proper installation, Aqua Solanor Inc. does sell equipment direct to homeowners, however warranty is only granted when homeowner submit a proof that installation was done by a professional certified technician.

Certification of technician shall comply with local state or provincial applicable trade law.

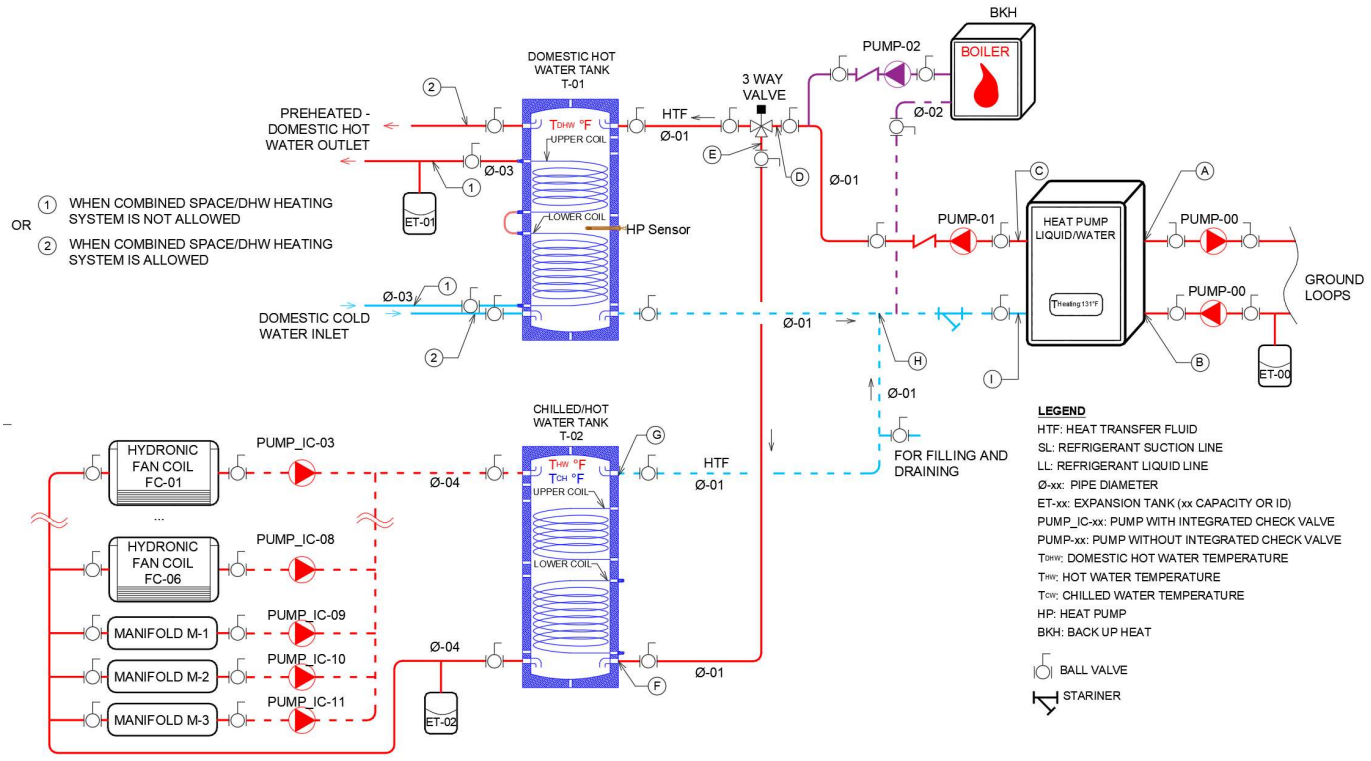
Homeowners are supposed to register the warranty of the installed heat pump. Registration entitles the submittal of installer license certificate as well as a startup and commissioning report.

Registration form is only available online on www.hydrosolar.ca website

Flow Requirements:

For a healthy operation of the heat pump, circulation pumps (on both indoor and ground loop sides) shall be properly sized for the available friction loss between Indoor Loop of heat Pump and Buffer Tank or between the incoming and outgoing fluid ports of the ground loop heat exchanger. Circulation Pumps shall be sized for the maximum operating flow of the Heat Pump.

ALL HYDRONIC CLOSED LOOPS SHALL CONTAIN HEAT TRANSFER FLUID ONLY AND SHALL BE FREE FROM AIR OR ANY OTHER MATERIALS THAT CAN OBSTRUCT THE FLOW OF FLUID BACK AND FORTH. AUTOMATIC AIR VENTS OR AIR SEPARATORS SHALL BE INSTALLED AT THE HIGHEST POINTS IN THE HYDRAULIC CIRCUIT. FAILURE TO DO SO, WILL SHORTEN THE LIFESPAN OF THE COMPRESSOR AND VOID THE WARRANTY.

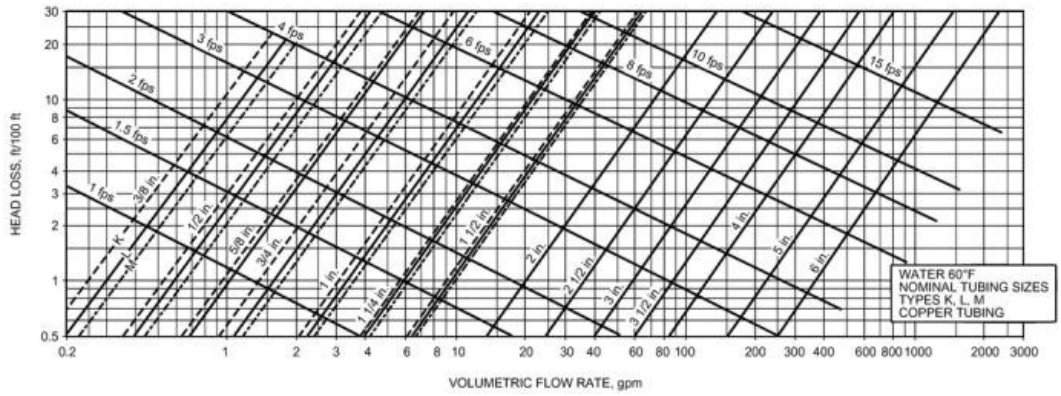


Indoor loop pump friction losses shall consider the fluid path at the outlet of the heat pump (C), to the three-way valve (D and E), to the tank (F) and back to the heat Pump G, H &I). Ground loop friction losses shall consider the fluid path from point A to the ground Loops and back to Point B

Pressure drop on the above two paths, is divided into four categories: Straight pipe runs, Fittings (Elbows, Tees, etc…), Heat Pump internal heat exchanger friction loss and accessories (such as Ball valves, Strainer, check valves, 3-way valves etc.…).

Straight Pipe Runs:

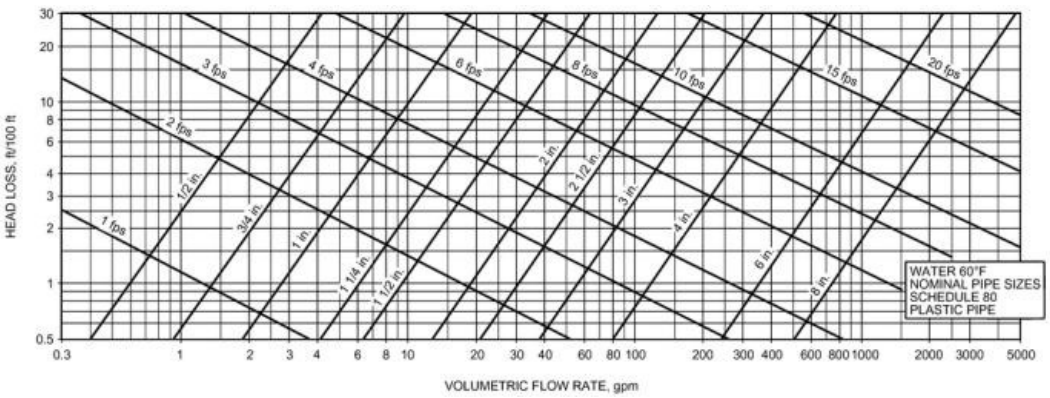
We recommend using either copper, stainless steel or plastic pipes on both ground and indoor loops. Black stee pipe can be used when heat transfer fluid contains enough anti-corrosion inhibitor to prevent corrosion. When using black steel pipes, install dielectric connectors between pipes and heat pump since internal parts of the heat pump contain copper.



Friction Loss Curve for Copper Pipes Type K, L and M.

Recommended linear friction loss 4 ft / 100 Linera feet of straight runs.

Recommended Fluid velocity inside pipes is 4 ft/s (never exceed 6 ft/s).



Friction Loss Curve for Schedule 80 Plastic Pipes (could be PVC, HDPE, PEX, etc.)

Recommended linear friction loss 4 ft / 100 Linera feet of straight runs.

Recommended Fluid velocity inside pipes is 4 ft/s (never exceed 6 ft/s).

Fittings and Accessories Pressure Drop:

The friction loss through any type of fittings is a K factor multiplier times the velocity pressure of the fluid. Velocity pressure is 0.5 x ρ x V² (ρ is the fluid density in Kg/m³ or Lb/ft³ and V is the fluid velocity in m/s or ft/s)

Table 3 *K* Factors: Threaded Steel Pipe Fittings

Nominal Pipe Dia., in.	90° Standard Elbow	90° Long-Radius Elbow	45° Elbow	Return Bend	Tee- Line	Tee-Branch	Globe Valve	Gate Valve	Angle Valve	Swing Check Valve	Bell Mouth Inlet	Square Inlet	Projected Inlet
3/8	2.5	—	0.38	2.5	0.90	2.7	20	0.40	—	8.0	0.05	0.5	1.0
1/2	2.1	—	0.37	2.1	0.90	2.4	14	0.33	—	5.5	0.05	0.5	1.0
3/4	1.7	0.92	0.35	1.7	0.90	2.1	10	0.28	6.1	3.7	0.05	0.5	1.0
1	1.5	0.78	0.34	1.5	0.90	1.8	9	0.24	4.6	3.0	0.05	0.5	1.0
1 1/4	1.3	0.65	0.33	1.3	0.90	1.7	8.5	0.22	3.6	2.7	0.05	0.5	1.0
1 1/2	1.2	0.54	0.32	1.2	0.90	1.6	8	0.19	2.9	2.5	0.05	0.5	1.0
2	1.0	0.42	0.31	1.0	0.90	1.4	7	0.17	2.1	2.3	0.05	0.5	1.0
2 1/2	0.85	0.35	0.30	0.85	0.90	1.3	6.5	0.16	1.6	2.2	0.05	0.5	1.0
3	0.80	0.31	0.29	0.80	0.90	1.2	6	0.14	1.3	2.1	0.05	0.5	1.0
4	0.70	0.24	0.28	0.70	0.90	1.1	5.7	0.12	1.0	2.0	0.05	0.5	1.0

Source: Engineering Data Book (Hydraulic Institute 1990).

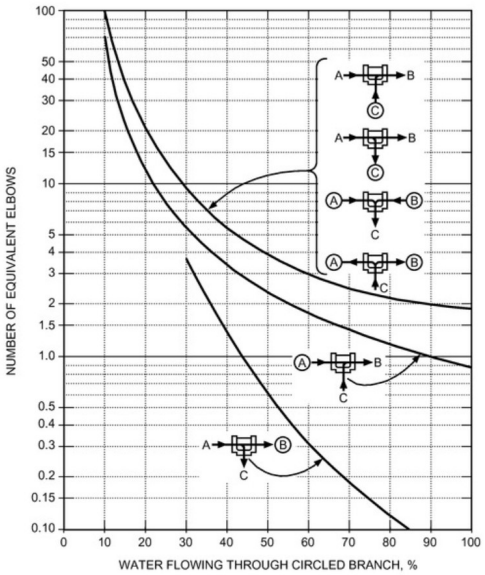
Table 4 *K* Factors: Flanged Welded Steel Pipe Fittings

Nominal Pipe Dia., in.	90° Standard Elbow	90° Long-Radius Elbow	45° Long- Radius Elbow	Return Bend Standard	Return Bend Long-Radius	Tee- Line	Tee- Branch	Globe Valve	Gate Valve	Angle Valve	Swing Check Valve
1	0.43	0.41	0.22	0.43	0.43	0.26	1.0	13	—	4.8	2.0
1 1/4	0.41	0.37	0.22	0.41	0.38	0.25	0.95	12	—	3.7	2.0
1 1/2	0.40	0.35	0.21	0.40	0.35	0.23	0.90	10		3.0	2.0
2	0.38	0.30	0.20	0.38	0.30	0.20	0.84	9	0.34	2.5	2.0
2 1/2	0.35	0.28	0.19	0.35	0.27	0.18	0.79	8	0.27	2.3	2.0
3	0.34	0.25	0.18	0.34	0.25	0.17	0.76	7	0.22	2.2	2.0
4	0.31	0.22	0.18	0.31	0.22	0.15	0.70	6.5	0.16	2.1	2.0
6	0.29	0.18	0.17	0.29	0.18	0.12	0.62	6	0.10	2.1	2.0
8	0.27	0.16	0.17	0.27	0.15	0.10	0.58	5.7	0.08	2.1	2.0
10	0.25	0.14	0.16	0.25	0.14	0.09	0.53	5.7	0.06	2.1	2.0
12	0.24	0.13	0.16	0.24	0.13	0.08	0.50	5.7	0.05	2.1	2.0

Source: Engineering Data Book (Hydraulic Institute 1990).

The graph on the right shows an alternative method for calculating friction loss through tees as a function of elbow equivalent.

This Graph can not be used for 3-way valves since friction loss of 3-way valves has to be taken from manufacturer test data.



The below table can be used for elbows. Once velocity is known, pressure drop is calculated and tabulated as below:

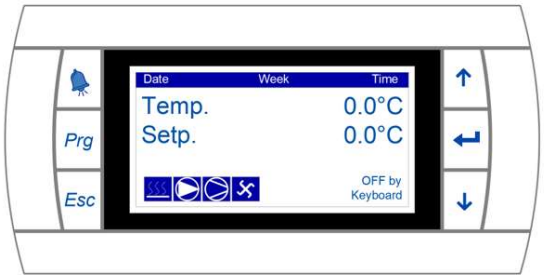
Table 27 Equivalent Length in Feet of Pipe for 90° Elbows

	Pipe Size														
Velocity, fps	1/2	3/4	1	1 1/4	1 1/2	2	2 1/2	3	3 1/2	4	5	6	8	10	12
1	1.2	1.7	2.2	3.0	3.5	4.5	5.4	6.7	7.7	8.6	10.5	12.2	15.4	18.7	22.2
2	1.4	1.9	2.5	3.3	3.9	5.1	6.0	7.5	8.6	9.5	11.7	13.7	17.3	20.8	24.8
3	1.5	2.0	2.7	3.6	4.2	5.4	6.4	8.0	9.2	10.2	12.5	14.6	18.4	22.3	26.5
4	1.5	2.1	2.8	3.7	4.4	5.6	6.7	8.3	9.6	10.6	13.1	15.2	19.2	23.2	27.6
5	1.6	2.2	2.9	3.9	4.5	5.9	7.0	8.7	10.0	11.1	13.6	15.8	19.8	24.2	28.8
6	1.7	2.3	3.0	4.0	4.7	6.0	7.2	8.9	10.3	11.4	14.0	16.3	20.5	24.9	29.6
7	1.7	2.3	3.0	4.1	4.8	6.2	7.4	9.1	10.5	11.7	14.3	16.7	21.0	25.5	30.3
8	1.7	2.4	3.1	4.2	4.9	6.3	7.5	9.3	10.8	11.9	14.6	17.1	21.5	26.1	31.0
9	1.8	2.4	3.2	4.3	5.0	6.4	7.7	9.5	11.0	12.2	14.9	17.4	21.9	26.6	31.6
10	1.8	2.5	3.2	4.3	5.1	6.5	7.8	9.7	11.2	12.4	15.2	17.7	22.2	27.0	32.0

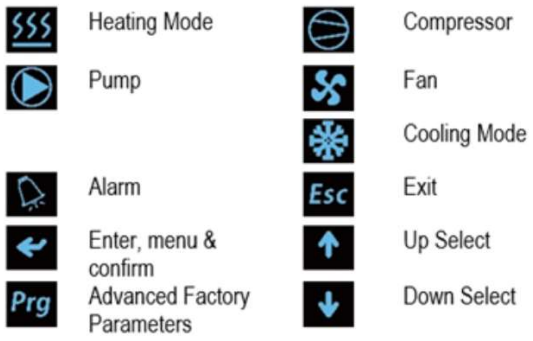
Machine Startup:

Use arrows to switch pages, press to change parameters when cursor is next to the setting, then use to switch the value. Press to confirm selection.

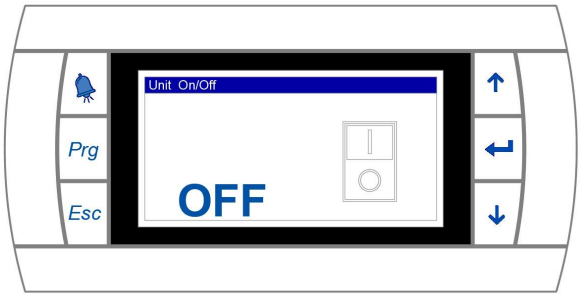
Initial Settings



When no user is interacting with the heat pump, Carel screen shows fluid temperature and temperature set point as well as the logo of the operating components (Fan, Pump, Compressor, etc..) and operating mode (cooling, heating or DHW heating).



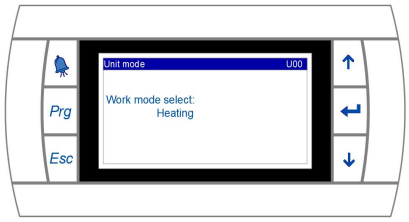
This control allows user access to the ON/OFF switch of the heat pump. Press to access the below digital ON/OFF button.



Use arrows to switch Heat Pump between ON and OFF mode. Please turn OFF HP before changing operating settings.

M03 menu allows user to enter operating set points of the heat pumps.

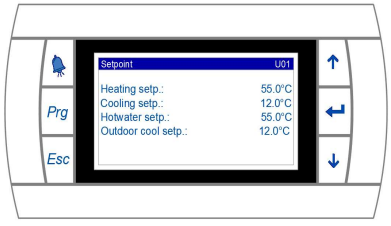
Please turn off heat Pump before changing important settings.



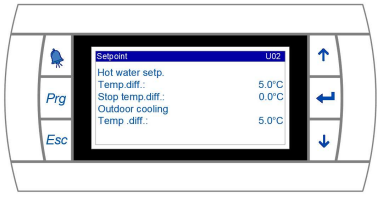
This control allows user to select which mode the unit is operating in:

Heating, Cooling, hot water, and cool recycle (Heat Recovery Mode). Hybrid modes are also allowed Hot water + Heating and Hot Water + Cooling.

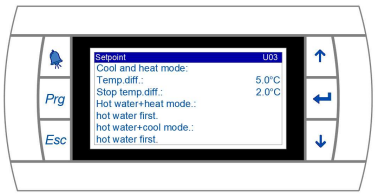
If unit defaults back to another work mode, verify ambient switch settings or cooling/heating linkages.



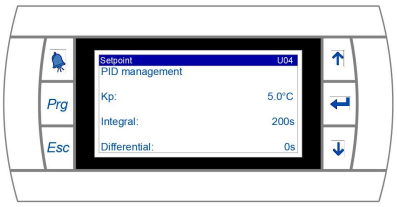
This control allows the selection of temperature settings for various operating modes.
Heating setpoint: Allows user to input water temperature setting for heating mode.
Cooling setpoint: Allows user to input water temperature setting for cooling mode.
Hot water setpoint: Allows user to input water temperature for hot water mode.
Outdoor cooling setpoint: Allows user to input the chilled water temperature when HP is in heat recovery "Cool Recycle" mode.



Temperature differential: Allows user to set temperature differential to allow compressor to turn on in DHW mode.
Stop temperature differential: Allows user to set temperature that allows compressor to turn off in DHW mode.
Outdoor cooling temperature differential: Allows user to set the temperature differential for the heat recovery mode.



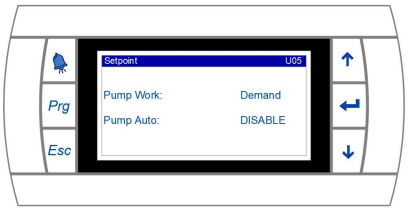
Defines temperature differential and priorities setpoints and dead band of space heat/cool mode.
If setpoint for heating is set to 40.0°C and the start temperature differential is set to 5.0°C; The unit will only turn on the compressor when the return temperature from the tank is 34.9°C It will heat the tank until the return temperature reaches 40.0°C if the stop temperature is set to 0.0°C.
In the case that the stop temperature is set to 2.0°C; the unit will shut down when return temperature is 2.0°C above setpoint.



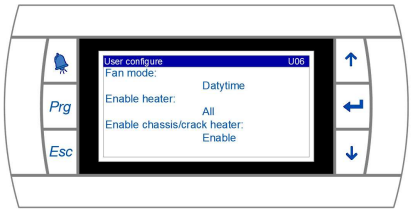
Specifications of PID control loop. PI loop is used to modulate compressor, fan and pump speeds.
KP: Allows user to set temperature differential that compressor modulates around.
Integral: Allows user to set time required to let compressor ramp up to full capacity.
Differential: Allows user to set delay time.
N.B: Please note that these settings can affect the performance, longevity, and warranty on the units. It is not recommended to adjust these settings without confirming prior with your installer.

N.B:

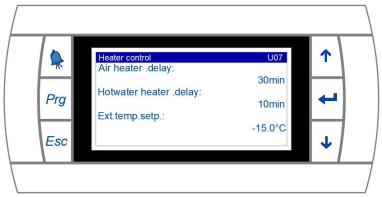
1. If **Outdoor cooling setp**. (U01) was set to 12°C and that **Outdoor cooling Temp.diff.** was set to 5°C (U02) and that HP is set to work in "**Cool Recycle**" mode. HP will be turned ON when the temperature in the chilled water tank (installed on the ground loop side) drops below 12°C and will be turned OFF when temperature in the chilled water tank reaches 12-5 = 7°C.
2. To change work mode, the unit must be turned off. Work modes include Heating, cooling, domestic hot water*, Heating + hot water*, cooling + hot water*, Cool recycle (*: Unit must be equipped with a 3-way valve).



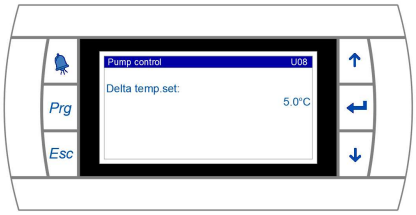
Pump work: Allows user to select between having the pump run all the time (normal), on interval or on demand.
Pump Auto: Allows heat pump to control the pump on/off.
In order to use the pump on demand mode, it must either receive an external demand (by using heating, cooling or A/C linkage or when the unit is in domestic hot water mode; by using the temperature probe in a DHW reservoir).



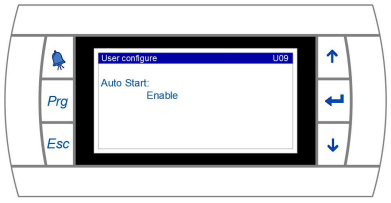
Fan mode: Allows user to switch between day mode and night, eco mode on the fan speed.
Enable heater: Allows user to select which demand (heating or DHW or both) allows for the backup heater to turn on.
Enable Chassis/Crack Heater: Allows user to select if they want the external unit to be able to enable its own heaters (only available on air to water models).



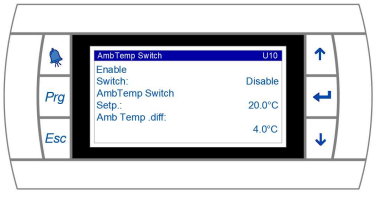
Air Heater Delay: Allows user to set minimum required time before unit can turn on the backup space heater.
Hot Water Heater Delay: Allows user to set minimum required time before unit can turn on the backup domestic hot water heater (Option not available on all units).
Exterior temperature Setpoint: Allows user to set maximum exterior temperature to enable the backup heater (meaning backup can only function if it is colder than this setting + time delay requirement is also met).



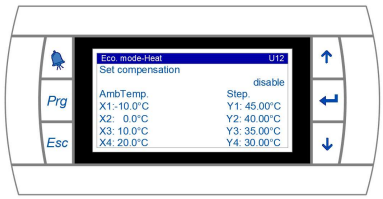
Delta temperature setting for the pump: Allows pump to modulate flow via PWM (if equipped) to maintain the temperature delta



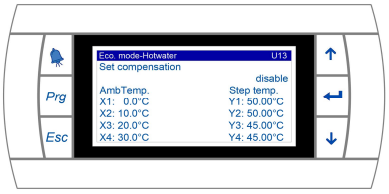
Auto Start: Enables the heat pump to start automatically when it detects a load. External controller is required (modbus, BMS, etc) when this function is disabled



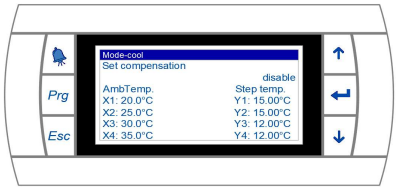
This Control allows user to enable/disable heat pump operating modes (mainly Space Heating and Cooling) based on outdoor temperature. When outdoor temperature is above "AmbTem Switch Setp." assigned value, Heat Pump goes into cooling mode (default 20°C). When outdoor temperature drops below "AmbTem Switch Setp." (20°C) – "Amb Temp.diff"(4°C), Heat Pump goes into heating mode.



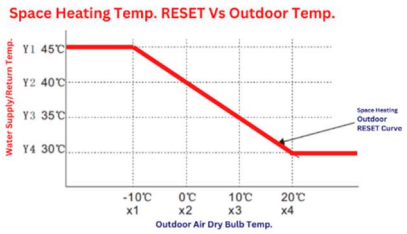
Space Heating mode outdoor temperature reset settings.

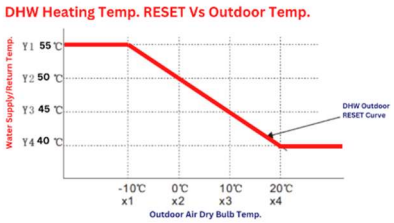


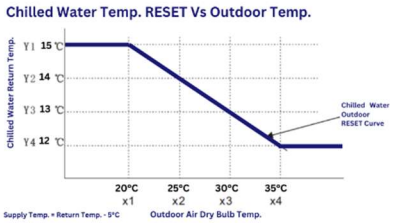
DHW Heating mode outdoor temperature reset settings.



Space Cooling mode outdoor temperature reset settings.

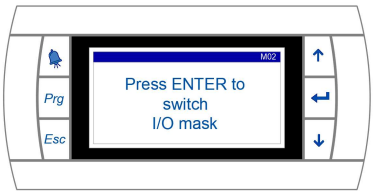




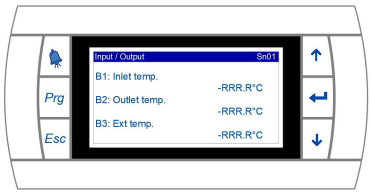


Enable Antilegionella: Allows user to enable anti legionella protection/sanitizing cycle.
Temp Setpoint: Allows user to set a setpoint for the temperature required.
Timer: Allows user to set time and date when the anti legionella function is operating.
N.B: The anti-legionella setting uses the backup external boilers/heaters to reach these temperatures.

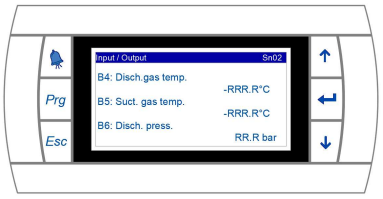
Reading Machine Inputs / Outputs (real values)



M02:
Allows user access the **input and output** of the equipment. This is a **READ ONLY** Submenu.
Press ↵ to access the I/O mask pages.

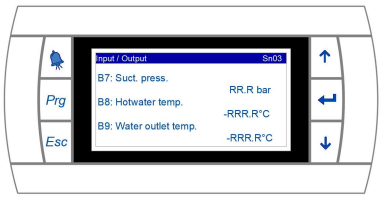


Sn01:
Use arrows ↑ ↓ to switch pages.
B1: Inlet temperature: readout of temperature coming into the heat exchanger.
B2: Outlet temperature: readout of temperature coming out of the heat exchanger.
B3: Ext temp: readout of outdoor ambient temperature.

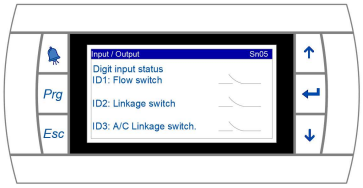


Sn02:
Use arrows ↑ ↓ to switch pages.
B4: Discharge gas temperature: readout of temperature of refrigerant exiting the compressor.
B5: Suction gas temperature: readout of temperature of refrigerant entering the compressor.
B6: Discharge gas pressure: readout of refrigerant pressure in **BAR** exiting the compressor.

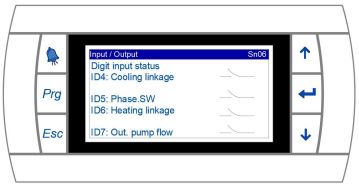
N.B: Geothermal HP requires outdoor ambient temperature sensor to be wired outside to properly read B3.



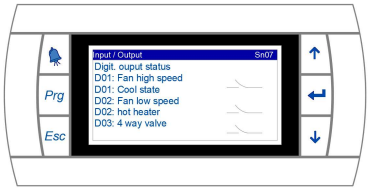
Sn03:
Use arrows ↑ ↓ to switch pages.
B7: Suction pressure: readout of refrigerant pressure in **BAR** entering the compressor.
B8: Hotwater temperature: readout of the temperature that the DHW temperature probe is reading. Acts like inlet water temperature into the heat exchanger when in DHW mode.
B9: Water outlet temp: readout of the water temperature coming out of heat exchanger when in DHW mode.



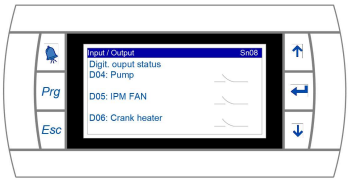
Sn05:
Use arrows ↑ ↓ to switch pages.
ID1: Flow switch contact position (open or closed).
ID2: Linkage switch contact position (open or closed).
ID3: AC linkage switch contact position (open or closed).



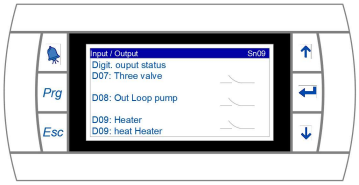
Sn06:
Use arrows ↑ ↓ to switch pages.
ID4: Cooling linkage contact position (open or closed).
ID5: Phase switch contact position (open or closed).
ID6: Heating linkage contact position (open or closed).
ID7: Outdoor pump flow switch (open or closed)



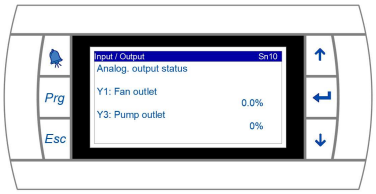
Sn07:
Use arrows ↑ ↓ to switch pages.
D01: FAN HIGH SPEED / COOL STATE
Shows contact position (open or closed)
D02: FAN LOW SPEED / HOT HEATER
Shows contact position (open or closed)
D03: 4 WAY VALVE
Shows contact position (open or closed)



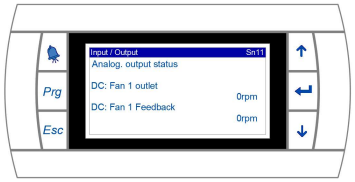
Sn08:
Use arrows ↑ ↓ to switch pages.
D04: PUMP
Shows contact position (open or closed)
D05: IPM FAN
Shows contact position (open or closed)
D06: CRANK HEATER
Shows contact position (open or closed)



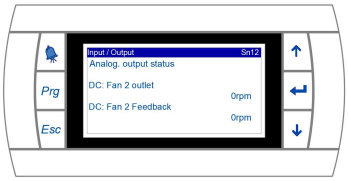
Sn09:
Use arrows ↑ ↓ to switch pages.
D07: THREE WAY VALVE
Shows contact position (open or closed)
D08: OUTDOOR LOOP PUMP
Shows contact position (open or closed)
D09: HEATER/ heat HEATER
Shows contact position (open or closed)



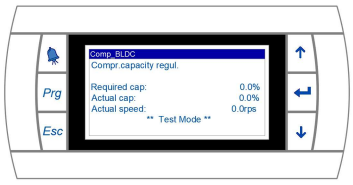
Sn010:
Use arrows to switch pages
Y1: Fan output: readout of required fan output
Y3: Pump outlet : readout of required pump output



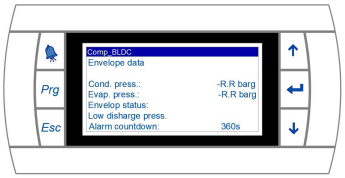
Sn11:
Use arrows to switch pages
DC Fan 1 Output: Readout in RPM of required fan speed
DC Fan 1 Feedback: readout in RPM of actual fan speed



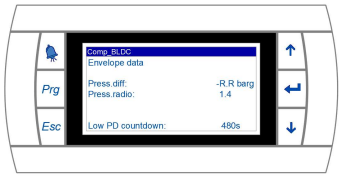
Sn12:
Use arrows to switch pages
DC Fan 2 Output: Readout in RPM of required fan speed
DC Fan 2 Feedback: readout in RPM of actual fan speed



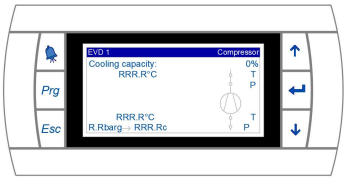
COMP BLDC 1
Use arrows to switch pages
Required Capacity: Shows required compressor capacity in **%**
Actual Capacity: Shows actual compressor capacity in **%**
Actual speed: Shows actual compressor speed in **RPS**



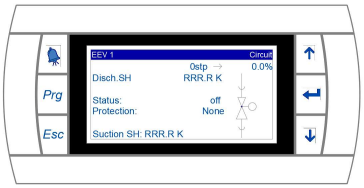
COMP BLDC 2
Use arrows to switch pages
Condenser pressure: readout of condenser pressure in **BAR**
Evaporator pressure: readout of evaporator pressure in **BAR**
Envelop Status: readout showing if unit is on/off/error
Alarm countdown: time remaining on alarm before self-reset



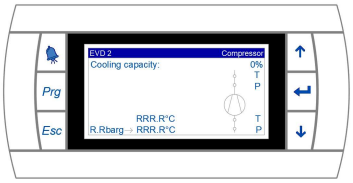
COMP BLDC 3
Use arrows to switch pages
Pressure differential: readout showing pressure difference between sensors
Pressure ratio: readout showing ratio of suction vs discharge pressure.
Low PD countdown: readout showing pressure differential countdown timer.



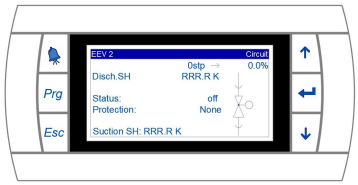
EVD 1 COMPRESSOR
Use arrows to switch pages
Cooling capacity: Shows provided cooling or heating capacity (calculated)
*Shows temperatures and pressures before and after the compressor.



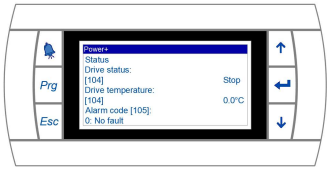
EVD 1 CIRCUIT
Use arrows to switch pages
Discharge Superheat: readout showing discharge superheat in **Kelvin.**
Status: readout showing status of the EVD circuit
Protection: readout showing if any alarms are triggered
Suction Superheat: readout showing suction superheat in **Kelvin**



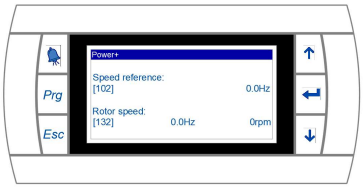
EVD 2 COMPRESSOR
Use arrows to switch pages
Cooling capacity: Shows provided cooling or heating capacity (calculated)
*Shows temperatures and pressures before and after the compressor.



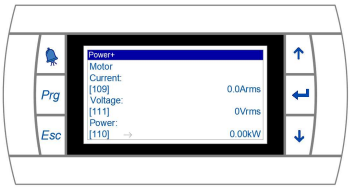
EVD 2 CIRCUIT
Use arrows to switch pages
Discharge Superheat: demonstrates discharge superheat in **Kelvin.**
Status: readout showing status of the EVD circuit
Protection: readout showing if any alarms are triggered
Suction Superheat: readout showing suction superheat in **Kelvin**



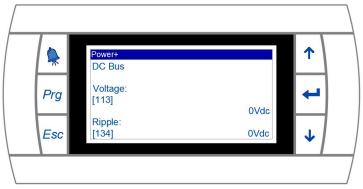
Power + 1
Use arrows to switch pages
Drive Status: Displays status of the variable frequency drive
Drive Temperature: displays temperature of the drive
Alarm code: displays if any alarms are present



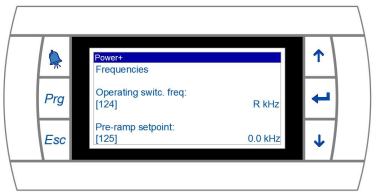
Power + 2
Use arrows to switch pages
Speed reference: Displays frequency of unit in **Hz**
Rotor Speed: Displays frequency of the rotor (**Hz)** and its speed in **RPM**



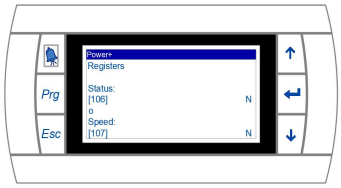
Power + 3
Use arrows to switch pages
Current: readout of current entering the unit
Voltage: readout of voltage entering the unit
Power: readout of consumption in KW of unit.



Power + 4
Use arrows to switch pages
DC BUS
Voltage: readout of DC voltage exiting the inverter board
Ripple: readout of voltage ripple exiting the inverter board.



Power + 5
Use arrows to switch pages
Operating Switch Frequency: readout of frequency inverter board is operating under
Pre-Ramp setpoint: readout of the pre-ramp frequency of the board.



Power + 6
Use arrows to switch pages
Registers
Status: readout of status of the registers
Speed: readout of speed of the registers

Information
Use arrows to switch pages
Code: Current code used in board
Version: Current version of code
Date: release date of software update
OS: OS version used in software

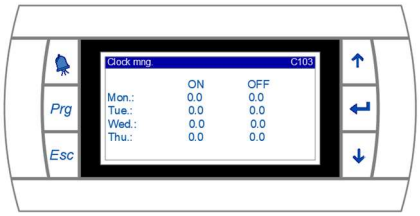
Schedule / TimeZone

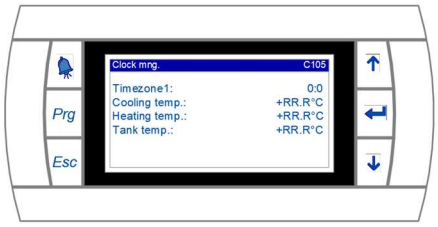
Press ↵ to access menu， press↑↓botton to select TimeZone/CLOCK , then press ↵ to confirm， Press↑↓Botton to change the setting, and press ↵ to confirm.

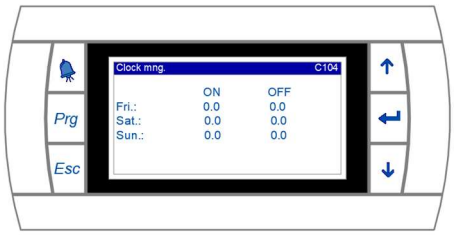
M03 menu allows user to set heat pump ON/OFF schedules and assign different temperature setpoints values to each schedule.

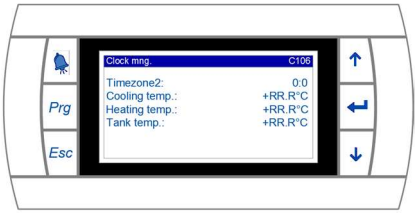
M03/C101 submenu, allows user to change date/time/day.
Enabling the Timezone on/off and the Timezone setpoint unlocks multiple pages that allow the unit to be programmed to run during certain hours of the day and to set specific temperatures for those hours of operation if required.

Timezone On/Off: Enable or disable unit operation using specific times of the day.
Timezone Setpoint: Set specific temperature for cooling, heating and DHW during the on times as set by previous setting.





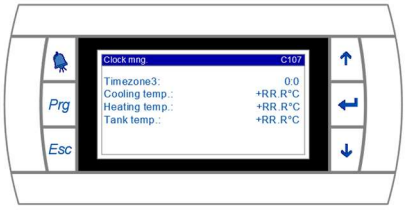




C103 & 104: Schedule setup interface. Heat Pump is authorized to work when time reaches “ON” time of the day, and it’s turned off when time reaches “OFF” time of the day.

C105, 106, 107 & 108; Timezone1 is the start time of the first period, Timezone2 is the cut-off time of the first period and the start time of the second period, and so on (Timezone 3 and 4).

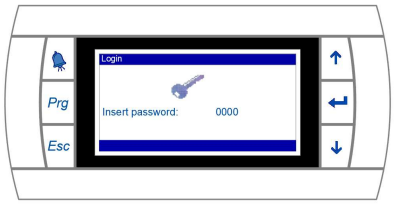
“Cooling temp.”, “Heating temp.” and “Tank temp.” Set temperatures for cooling, heating, and domestic hot water for the corresponding period.



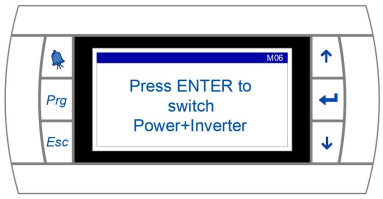
Advanced Settings

The following settings require pressing **the Program button (PRG**) and inputting the password that was supplied by the manufacturer.

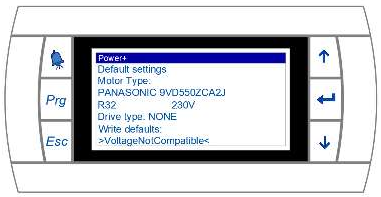
Notice: it is not recommended to alter these settings without full knowledge and understanding of them. These settings can void the warranty, cause equipment failure as well as cause serious injuries or death.



Use arrows ↑ ↓ to switch values. Press ↵ to change to the next value, then use ↑ ↓ to switch the next value. Until the correct password is displayed on the screen. Press ↵ to enter the next page.



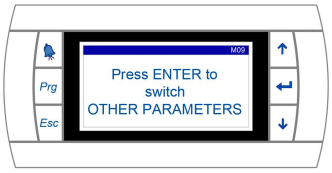
M05 BLDC COMPRESSOR: Allows to view the settings of the compressor, alarm timeouts and alarm limits. Altering these settings is not recommended without prior approval by the manufacturer.



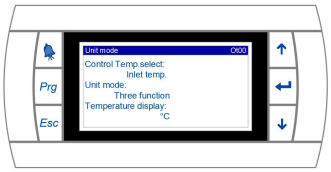
This page allows the user to input the type of compressor, voltage and refrigerant type of the unit as well as change them. This page also allows to allow the unit to over-write the defaults.

N.B:

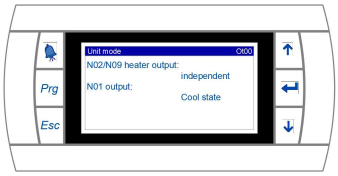
- The remainder of the POWER+ pages should be used only to read and verify details. Changing and altering these settings can cause equipment failure, it is not recommended to alter these settings without prior approval by the manufacturer.
- M07 EVO- ON BOARD: Allows to view the type and settings of the EVO board, as well as settings and process logic/ramp curves of the unit. Altering these settings is not recommended without prior approval by the manufacturer.
- M08: MANUAL CONTROLS: Allows the technician to manually operate the heat pump and its individual components. Primarily used for diagnostics and unit should not be used in manual mode for prolonged periods of time.



M09
Allows user access the **OTHER PARAMETERS** of the equipment.
Press ↵ to access the OTHER PARAMETERS pages.

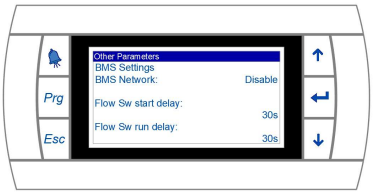


OT00
Control Temperature select: Allows to choose between inlet and outlet water temperature control.
Unit mode: Allows to choose between two function and three function.
Temperature Display: Allows to choose between Celsius and Fahrenheit.
** Note: These settings are not available on all units.



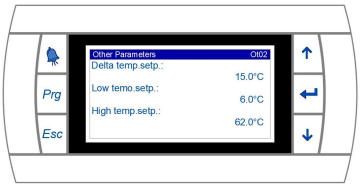
OT00
N02/N09 Heater output: Allows user to configure backup heater as combined or independent.
N01 Output: Allows user to configure between cool state and fan high speed.
** Note: These settings are not available on all units.

N.B: It is recommended to switch the unit to two functions when 3-way diverting valve is not installed.



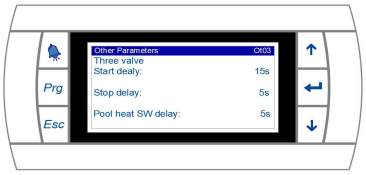
OT00

BMS NETWORK: Allows user to enable BMS network.
Flow switch start delay: Allows user to change delay time that flow switch requires before causing a flow switch alarm.
Flow switch run delay: Allows user to change delay time flow switch remains running

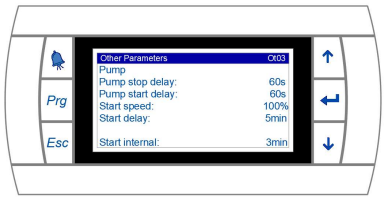


OT02

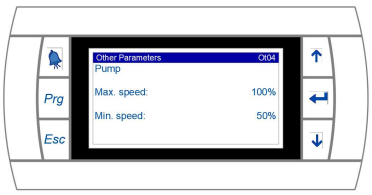
Delta temperature setpoint: Allows user to configure delta temperature.
Low temperature setpoint: Allows user to configure low temp setpoint.
High Temperature Setpoint: Allows user to configure high temperature setpoint.



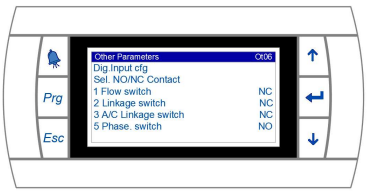
OT03
Three way diverting valve
Start delay: Allows user to configure time delay to start 3-way valve
Stop delay: Allows user to configure time delay to stop 3-way valve
Pool heater switch delay: Allows user to configure pool heater switch time delay.



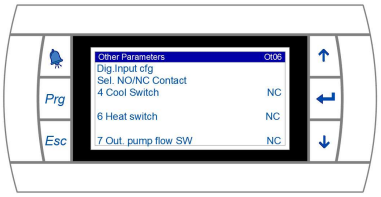
OT03
Pump stop delay: Allows user to adjust stop time delay of circulator pump
Pump Start delay: Allows user to adjust start time for circulator pump
Start speed: Allows user to adjust pump flow speed (if equipped with pwm pump)
Start delay: Adjust delay timer
Start internal: Start interval time delay



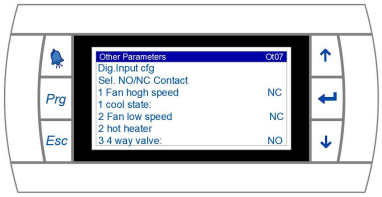
OT04
Pump Maximum speed: Allows user to input maximum circulator pump speed (if equipped with PWM pump)
Pump Minimum speed: Allows user to input minimum circulator pump speed



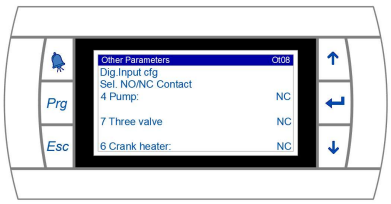
OT06
1.Flow Switch: Allows configuration between Normally Closed and Normally Open
2.Linkage Switch: Allows configuration between Normally Closed and Normally Open
3.A/C Linkage Switch: Allows configuration between Normally Closed and Normally Open
5.Phase Switch: Allows configuration between Normally Closed and Normally Open



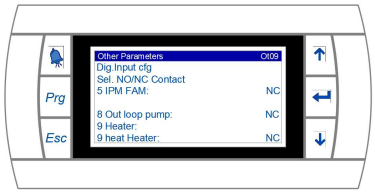
OT06
4. Cool Switch: Allows configuration between Normally Closed and Normally Open
6. Heat Switch: Allows configuration between Normally Closed and Normally Open
7. Outdoor Pump Flow switch*: Allows configuration between Normally Closed and Normally Open (Only applicable to geothermal units)



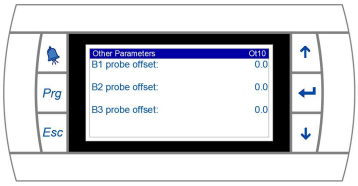
OT07
1.Fan high speed: Allows configuration between Normally Closed and Normally Open
2.Fan low speed: Allows configuration between Normally Closed and Normally Open
3. 4Way valve: Allows configuration between Normally Closed and Normally Open



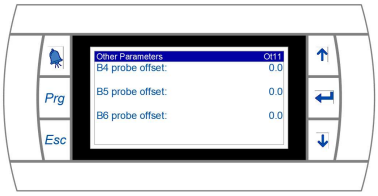
OT08
4. Pump: Allows configuration between Normally Closed and Normally Open
7. Three way valve: Allows configuration between Normally Closed and Normally Open
6. Crank heater: Allows configuration between Normally Closed and Normally Open



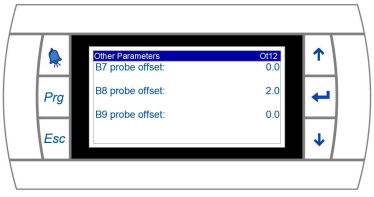
OT09
5.IPM fan: Allows configuration between Normally Closed and Normally Open
8.Outdoor Loop Pump*: Allows configuration between Normally Closed and Normally Open
9.Heater: Allows configuration between Normally (Only available on geothermal units) Closed and Normally Open
9.(hot water) Heater: Allows configuration between Normally Closed and Normally Open



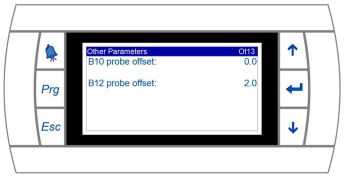
OT10
B1 Probe Offset: Offset probe reading in case of accuracy issues.
B2 Probe Offset: Offset probe reading in case of accuracy issues.
B3 Probe Offset: Offset probe reading in case of accuracy issues.



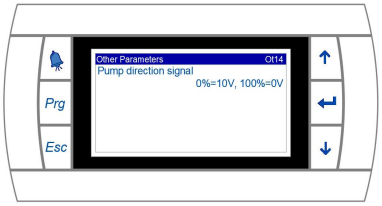
OT11
B4 Probe Offset: Offset probe reading in case of accuracy issues.
B5 Probe Offset: Offset probe reading in case of accuracy issues.
B6 Probe Offset: Offset probe reading in case of accuracy issues.



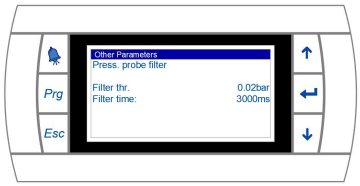
OT12
B7 Probe Offset: Offset probe reading in case of accuracy issues.
B8 Probe Offset: Offset probe reading in case of accuracy issues.
B9 Probe Offset: Offset probe reading in case of accuracy issues.



OT13
B10 Probe Offset: Offset probe reading in case of accuracy issues.
B12 Probe Offset: Offset probe reading in case of accuracy issues.



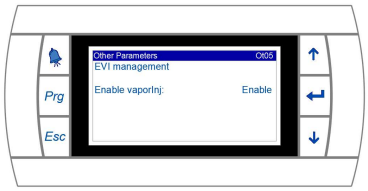
OT14
Pump Directional flow: Allows user to adjust PWM pump percentage (if equipped)



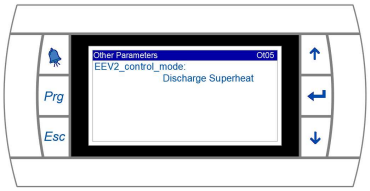
OT14
Filter threshold: Allows user to adjust filter threshold on the pressure probe
Filter time: Allows user to adjust filter time on the pressure probe

OT14
S1 Alarm delay: Adjustable delay time for S1 EEV alarm
Min: Minimum Pressure for evap probe
Max: Maximum Pressure for evap probe

OT15
Min: Minimum pressure for discharge pressure probe
Max: Maximum pressure for discharge pressure probe

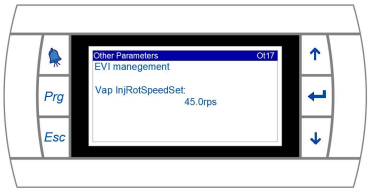


OT05
Enable/Disable Enhanced Vapor Injection

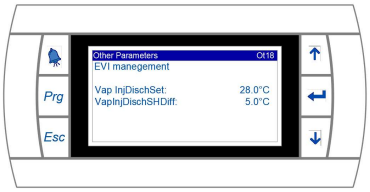


OT05
EEV2 Control mode: Discharge superheat or suction superheat

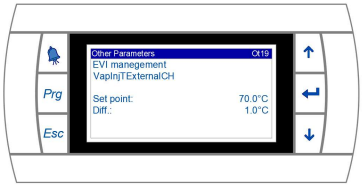
OT16
Evaporator pressure probe Minimum and maximum



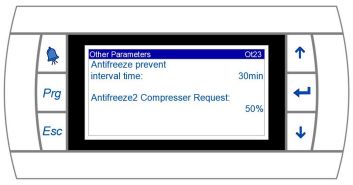
OT17
Enhanced Vapor Injection rotor speed setting



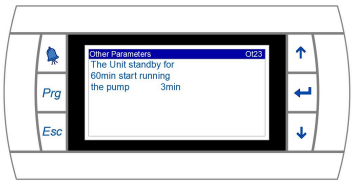
OT18
Enhanced Vapor Injection discharge super heat setting & Discharge Superheat differential



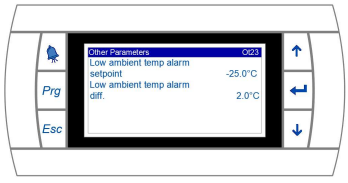
OT19
Enhanced Vapor Injection External Channel Setpoint and differential



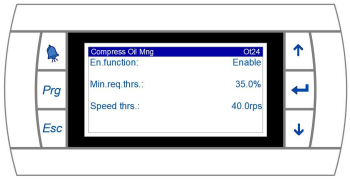
OT23
Interval time for antifreeze protection



OT23
Circulator pump protection with unit on standby

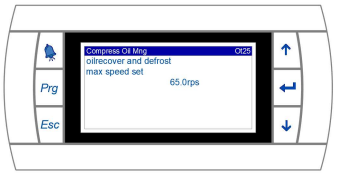


OT23
Low ambient alarm setpoint

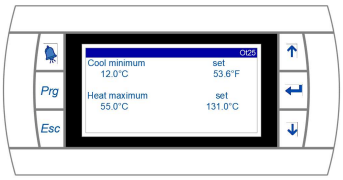


OT24
Compressor oil management settings

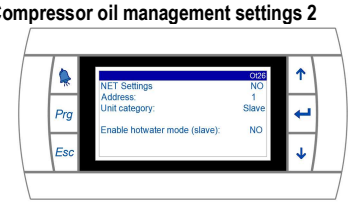
OT25
Compressor oil management settings 2



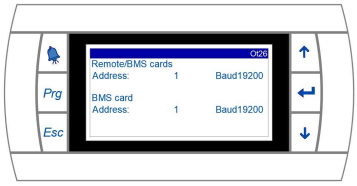
OT25
Oil recovery and defrost settings



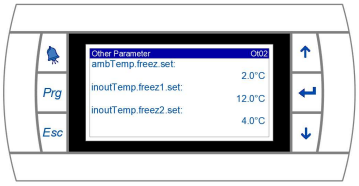
OT25
Maximum and minimum return temperatures



OT26
Control Settings

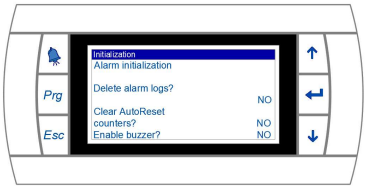


OT26
Remote BMS settings

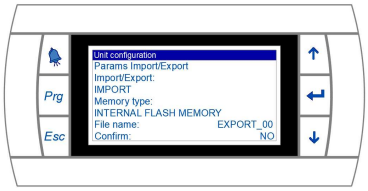


OT02
Ambient temperature freeze protection settings

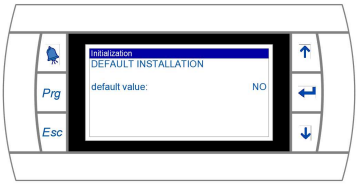
LANGUAGE
Language selection settings



INITIALIZATION
Alarm logging and reset settings



UNIT CONFIGURATION
Parameter import and export settings



INITIALIZATION
Initialization/default settings

Installation of WIFI Adapter

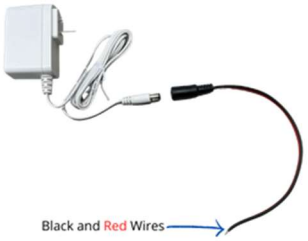
While the Wi-fi adapter is not required to the functioning of the unit; it allows for faster diagnosis as well as remote diagnosis and monitoring. The application is designed in a way to be significantly more user-friendly to the client when compared to the Carel controller and reduces time. Technicians will be able to troubleshoot the equipment without going on site.

Hardware Installation & Connection:

The WIFI adapter kit is shipped inside the Heat Pump and has the following components:

Wires Signal (pre-connected to Main Board)

Power Supply Adapter

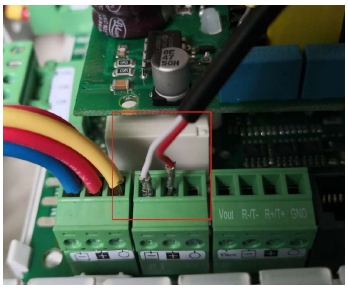


Wi-Fi Adapter connection Kit

WIFI Module

*****please note that the pictured equipment, wiring is subject to change without prior notice and will be supplemented with revision sheets if required*****

The signal cable has 2 wires: one red and one white.



On the **control board** of the Heat Pump outdoor unit:

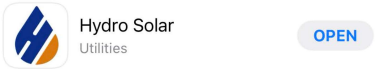
1- Check that **white** wire of the signal line is connected to the Minus (**-**) port .
2- Check that **red** wire of the signal line is connected to the Plus (**+**) port.

On the **Green Plug** of the WIFI Cable:

1- Connect the **white** wire of the signal line to the **B** port.
2- Connect the **red** wire of the signal line to the **A** port.
3- Connect the **Black/White** wire of the Power Supply Adapter to the **plus (+)** port.
4- Connect the **Black** wire of the Power Supply Adapter to **the minus (-)** port.
5- Connect the power supply adapter to a 110-240VAC power supply plug.

Please strictly follow the above wires connection instructions or else WIFI module will not work.

Application downloads and setup:

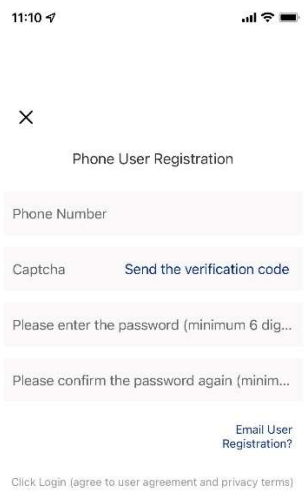


Heat Pump application is called **Hydro Solar** and is available for Apple and Android devices. Go to the application stores of your smart phone and download the **free Heat Pump Pro** App. After downloading Heat Pump's application look for the application icon on your smartphone screen and click on it. Register your device as shown below:

When logging in for the first time, you will need to create an account. You could do so by clicking on **User Register** icon.

Once clicked the screen on the right will appear, where you have the option of either registering by phone or by email.

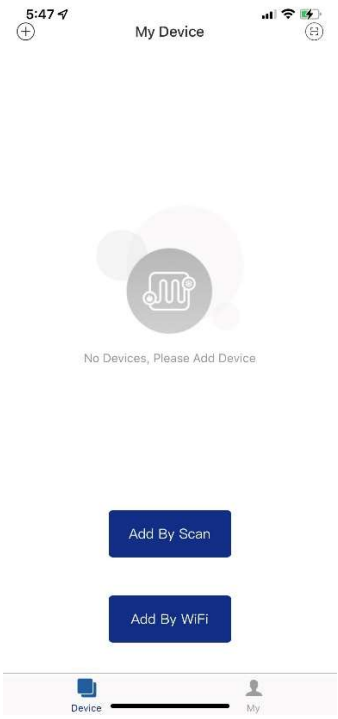
We do recommend email registration.



To register by phone, please enter your phone number and click on Send the verification code. Once code is received enter it below and go the next screen.

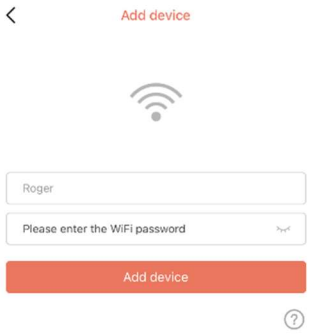
For email registration click on **Email User Registration?**

Once **Email User Registration?** is clicked, the below screen will appear



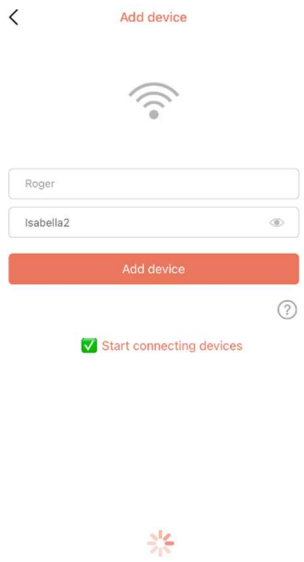
To add the heat pump, you could either click on **Add by WIFI** or **Add by Scan:**

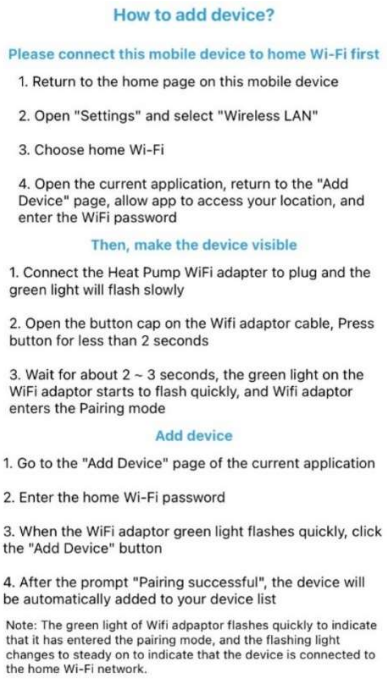
Simply scan the barcode on your heat pump (add by scan option)



Add By WIFI:

Choose your WIFI network from the list and enter the password below.





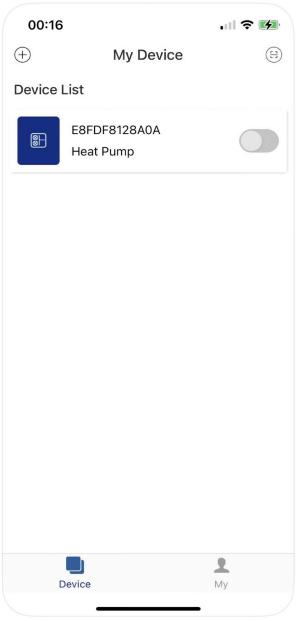
To pair the application with heat pump WIFI adapter,
Simply open the button's black cap as shown below

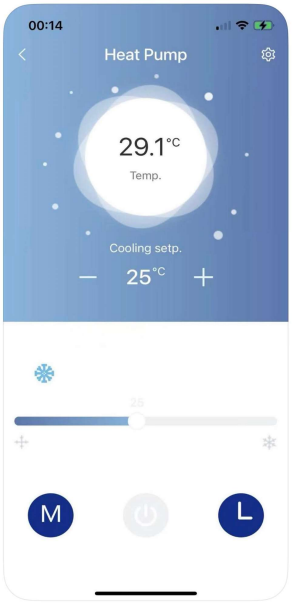
And gently press the button for 2-3 seconds as described on the left instructions.

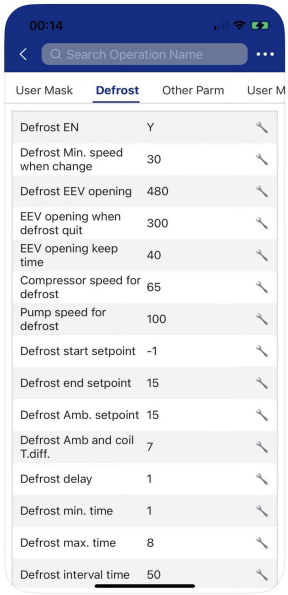
You could connect more than one heat pump to the app. Simply click on add device and repeat the above steps again.

Device List Windows:

- The device list displays the device (Heat Pumps) associated with this user and shows the device's online and offline status. When the device is offline, the device icon is gray, and the device is online color.
- The switch on the right side of each device row indicates whether the device is currently turned on.
- The user can disconnect the device or modify the device name. When swiping to the left, the delete and edit buttons appear on the right side of the device row. Click Edit to modify the device name, and click Delete to disconnect the device and delete it from the application, as shown below:







Application usage guide:

1. Click a device in the device list to enter this page.
2. The background color of the bubble indicates the current operating state of the device:

a. Gray indicates that the device is in the shutdown state, at this time, you can change the working mode, set the mode temperature, set the timing, or you can press the key to switch on and off.
b. Multicolor indicates that the device is turned on, each working mode corresponds to a different color, orange indicates heating mode, red indicates hot water mode, and blue indicates cooling mode。
c. When the device is in the power-on state, you can set the mode temperature, set the timer, press the key to switch on and off, but you cannot set the working mode (that is, the working mode can only be set when the device is off)

3. The bubble shows the current temperature of the device.
4. Below the bubble is the set temperature of the device in the current operating mode.
5. Set the temperature is about ✙, ═ button , each click adds or subtracts 1 to the set point value to the device.
6. Below the bottom left, of set point temperature window, is the Fault and Alert. When the device starts to alarm, the specific Alert.
7. Fault or alarm's reason will be displayed next to the yellow warning icon. In case of device Fault or Alert, the Fault and Alert content will be displayed in the bottom right of the set point temperature window. Click this area to jump to the details of the Error.

Main Components List

Item No.	Object/part no.	Manufacturer/ Trademark	Type/Mode l	Technical Data	Standard	Mark(s) of Conformity
1	Fan	SHENZHEN SANJU ELECTRIC MACHINERY CO LTD	SJ1238HA 2	220V-240VAC, 50/60Hz, 0.13A. IMPEDANCE PROTECTED.	UL 507, CSA-C22.2 No. 113	cURus E314698
2	Control PCB- 1 (Compressor control)	CAREL INDUSTRIES SPA	PS200252 3D100	Input: 200-240Vac, 50/60Hz, 40-57A; AC output: 0-240V, 25- 30A, DC output: 385V, 1500W. Software: Class B.	UL 60730-1, CSA- E60730-1	cURus E198839
3	PFC choke	SHANGHAI CII ELECTRONIC CO., LTD	09C747A0 08	4.5uH, 50A. For connecting to Control PCB-1.	–	Tested in appliance
4	Control PCB- 2 (Operating control)	CAREL INDUSTRIES SPA	UP3A0220 0T3S0	Input: 24Vac/dc, 50/60Hz, 28W; 100-240Vac, 50/60Hz, 28W; 36-72Vdc, 28W.	UL 60730-2- 9, CSA- E60730-2-9	cURus E198839
5	Fuse	DONGGUAN BETTER ELECTRONICS TECHNOLOGY CO LTD	524 Series	250V, 3.15A. For connecting to Control PCB-2.	UL 248-1, CSA-C22.2 No. 248.1	cURus E300003
6	Fuse holder	Honyone Electrical Co Ltd	FH15	250V, 15A. For connecting to Control PCB-2.	UL 4248-1, CSA-C22.2 No. 4248.1	cURus E343685
7	Relay	XIAMEN HONGFA ELECTROACOUST IC CO LTD	HF105F-4	240VAC, 30A. For connecting to Control PCB-1.	UL 60947-1, UL 60947-4- 1, SA- C22.2 No. 0947-1, CSA-C22.2 No. 60947- 4-1	cURus E134517
8	Terminal block 1	HUANGZHONG ELECTRICAL EQUIPMENT CO LTD OF SHUNDE FOSHAN	ET1001	660V, 32A.	UL 1059, CSA-C22.2 No. 158	cURus E225297
9	Terminal block 2	HUANGZHONG ELECTRICAL EQUIPMENT CO LTD OF SHUNDE FOSHAN	TC1-1	250V, 20A.	UL 1059, CSA-C22.2 No. 158	cURus E225297
10	Internal wire for compressor connection	Various	Various	AWM, min. 10AWG, min. 300V, min. 105°C, VW-1.	UL 758, CSA-C22.2 No. 210	cURus
11	Internal wire for signal connection	Various	Various	AWM, min. 22AWG, min. 300V, min. 105°C, VW-1.	UL 758, CSA-C22.2 No. 210	cURus
12	Internal wire for other electrical connection	Various	Various	AWM, 16-12AWG, min. 300V, min. 105°C, VW-1.	UL 758, CSA-C22.2 No. 210	cURus
13	Four-way valve	ZHEJIANG SANHUA CLIMATE & APPLIANCE CONTROLS GROUP CO LTD	SHF-11H- 45D1	220-240VAC, 50/60Hz. For model GEO040V1LM.	UL 429, CSA-C22.2 No. 139	cURus MH25894
			SHF-20D- 46A-04	220-240VAC, 50/60Hz. For model GEO060V1LM, GEO080V1LM.	UL 429, CSA-C22.2 No. 139	cURus MH25894
14	Expansion valve	CAREL INDUSTRIES SPA	E2V18FSA C1	12V, 50Hz, 40Ω±10%. For models GEO040V1LM,	UL 429, CSA-C22.2 No. 139	cURus E304579
			E2V24FSA C1	12V, 50Hz, 40Ω±10%. For models GEO060V1LM, GEO080V1LM.	UL 429, CSA-C22.2 No. 139	cURus E304579
15	Pressure sensor- 1	BRIDGEPORT Srl	SPKT0033 P0	4.5-5.5Vdc, -40~120°C, pressure 15~515PSIG, limit 1030 PSIG.	UL 60730-2- 6, CSA- E60730-2-6	cURus E485918
16	Pressure sensor 2	BRIDGEPORT Srl	SPKT00B6 P0	4.5-5.5Vdc, -40~120°C, pressure 15~667PSIG, limit 1335 PSIG.	UL 60730-2- 6, CSA- E60730-2-6	cURus E485918
17	Heating element Cover on Compressor	Changzhou match- well pressure sensor Co Ltd	JRD series	Rated 220Vac, 35+7%W, 1424±7%Ω (20°C).	UL/CSA 60335-1, UL/CSA 60335-2-89	cURus SA44356
18	NTC cover on water tube	CAREL INDUSTRIES - Headquarters	NTC030W H	-50~105°C, 10kΩ at 25°C	–	Tested in appliance
19	Heat exchanger 1	Foshan Shunguan Heat Exchanger Co., Ltd.	WYA-TTG- 4.0P-C8-08	Refrigerant Titanium sleeve, 12.7mm diameter, 0.75mm thickness. For model GEO040V1LM.	–	Tested in appliance
		Foshan Shunguan Heat Exchanger Co., Ltd.	WYA-TTG- 4.0P-C8-08	Refrigerant Titanium sleeve, 12.7mm diameter, 0.75mm thickness. For model GEO040V1LM.	–	Tested in appliance

Item No.	Object/part no.	Manufacturer/ Trademark	Type/Mode l	Technical Data	Standard	Mark(s) of Conformity
		Foshan Shunguan Heat Exchanger Co., Ltd.	WYA-TTG- 6.0P-C8-08	Refrigerant Titanium sleeve, 15.88mm diameter, 0.8mm thickness. For model GEO060V1LM.	–	Tested in appliance
		Foshan Shunguan Heat Exchanger Co., Ltd..	WYA-TTG- 8.0P-C8-08	Refrigerant Titanium sleeve, 19.05mm diameter, 1.0mm thickness. For model GEO080V1LM.	–	Tested in appliance
20	Heat exchanger-2	Foshan Shunguan Heat Exchanger Co., Ltd.	WYA- BPDWLRS - 4.0P-C10- GS118	Refrigerant brass tube, 15.88mm diameter, 1.0mm thickness. For model GEO040V1LM.	–	Tested in appliance
		Foshan Shunguan Heat Exchanger Co., Ltd.	WYA- BPDWLRS - 6.0P-C10- GS118	Refrigerant brass tube, 15.88mm diameter, 1.0mm thickness. For model GEO060V1LM.	--	Tested in appliance
		Foshan Shunguan Heat Exchanger Co., Ltd.	WYA- BPDWLRS - 8.0P-C10- GS118	Refrigerant brass tube, 15.88mm diameter, 1.0mm thickness. For model GEO080V1LM.	--	Tested in appliance
21	Compressor- 1	Panasonic Wanbao Appliance Compressor (Guangzhou) Co., Ltd	9VD330XA B21	Rated 280Vdc, 3450RPM. Brushless motor, 4pole, Rated output 1.7KW. Refrigerant type R32. For model GEO040V1LM.	EN 60335-1, EN 60335-2- 34	TUV 50483203 001
22	Compressor- 2	Panasonic Wanbao Appliance Compressor (Guangzhou) Co., Ltd	9KD420ZA A21	Rated 280Vdc, 3450RPM. Brushless motor, 6pole, Rated output 3.0KW. Refrigerant type R32. For model GEO060V1LM.	EN 60335-1, EN 60335-2-34	TUV 50537034 001
23	Compressor- 3	Panasonic Wanbao Appliance Compressor (Guangzhou) Co., Ltd	9VD550XA A21	Rated 520Vdc, 3600RPM. Brushless motor, 6pole, Rated output 3.8KW. Refrigerant type R32. For model GEO080V1LM.	EN 60335-1, EN 60335-2-34	TUV 50483203 001
24	Glass fiber sleeving	Various	Various	600V, 200°C, VW-1.	UL 1441, CSA-C22.2 No. 198.3	cURus

Warranty (Limited Residential Warranty)

Aqua Solanor Inc (Owner of ***Hydro Solar Innovative Energy***) warrants that the heat pumps supplied by it shall be free from defects in materials and workmanship for a period of **Five *(5) Five YEARS*** after the date of installation or for a period ***(5) Five YEARS*** AND **(30) THIRTY DAYS** after the date of shipment, whichever occurs first.

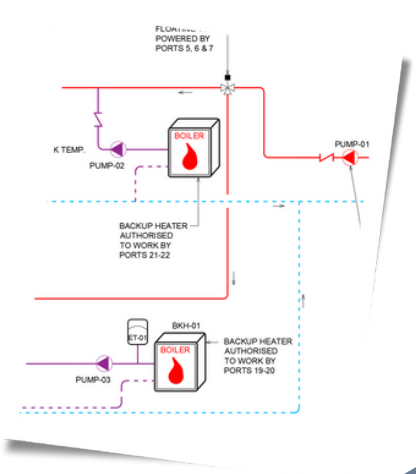
Aqua Solanor Inc shall, at its option repair or replace any part or parts covered by this warranty which shall be returned to **Aqua Solanor Inc**, transportation charges prepaid (by customer), which, upon examination proves to be defective in materials or workmanship.

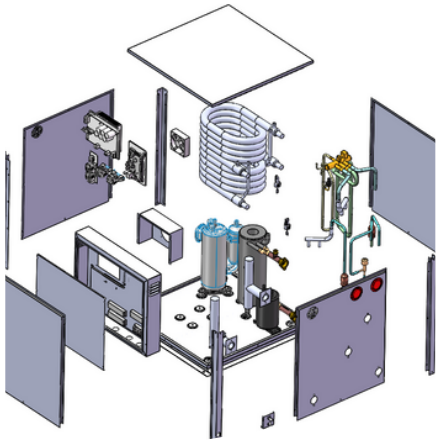
Replacement or repaired parts and components are warranted only for the remaining portion of the original warranty period.

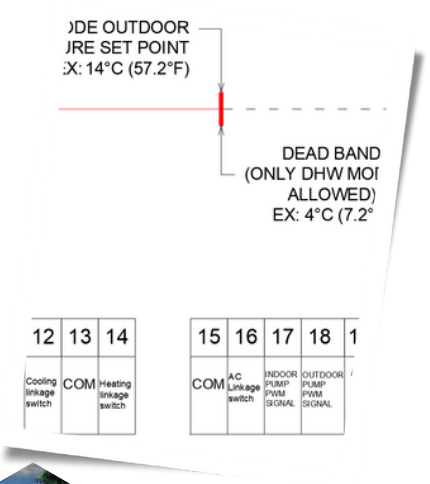
This warranty is subject to the following conditions:

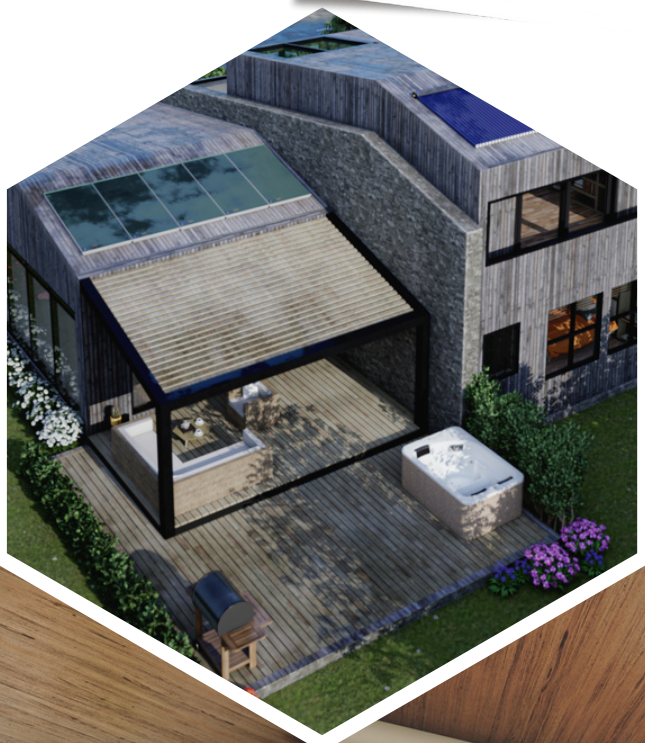
1. The **Hydro Solar Innovative Energy** heat pump must be properly installed and maintained in accordance with this installation and maintenance document and in compliance with Federal, Provincial, Municipal, and local codes and regulations.
2. The installer must be a certified qualified heat pump installer in the province/state where the heat pump is installed. Failure to comply with this requirement will void this warranty.
3. The installer must complete an installation and commissioning report have it endorsed by the owner and return it to **Hydro Solar Innovative Energy** within 21 days of installation of the unit. The installer must fill up the Heat Pump Warranty Registration Form which will provide them with a Warranty Unique ID. To make a warranty claim, the buyer must present a valid Warranty Unique ID.
4. It is the responsibility of the building or general contractor to supply temporary heat to the structure prior to occupancy. These heat pumps are designed to provide heat only to the finished and insulated structure. Start-up of the unit shall not be scheduled prior to completion of construction and final Duct/Pipe installation for validation of this warranty.
5. It is the customer's responsibility to supply the proper quantity and quality of water.

If the heat pump, supplied by **Aqua Solanor Inc**, fails to conform to this warranty, **Aqua Solanor Inc** 's sole and exclusive liability shall be, at its option, to repair or replace any part or component which is returned by the customer during the applicable warranty period set forth above, provided that (1) **Aqua Solanor Inc** is promptly notified in writing upon discovery by the customer that such part or component fails to conform to this warranty. (2) The customer returns such part or component to **Aqua Solanor Inc**, transportation charges prepaid, within (30) thirty days of failure, and (3) **Aqua Solanor Inc**'s examination of such component shall disclose to its satisfaction that such part or component fails to meet this warranty and the alleged defects were not caused by accident, misuse, neglect, alteration, improper installation, repair, or improper testing.









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