



Modular Ground Source Heat Pump

Shandong Vicot Air Conditioning Co., Ltd.



Shandong Vicot Air Conditioning Co., Ltd. is one of the major players in the Chinese air conditioning industry, specialized in central air conditioning products. Its new industrial park covers a total area of 140,000 m² including workshop area of 50,000 m².

There are 1000 people including 800 workers, 18 senior engineers, 5 doctors and masters, 40 engineers for R&D, and more than 55 technicians, etc.

There are five assembly lines, two condenser& evaporator production lines, one painting line, and many large equipments such as vertical tube expander, CNC guillotine shear (shearing machine), CNC tube bending machine and many auxiliary apparatus, laboratories, and online testing rooms. All of them can achieve the exact Control of production process and guarantee the product quality.



Chiller assembly line



Testing Lab.



Painting line



CNC machine

We have ISO9001 & ISO14001, CE, CCC certificates.





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Introduction

VWMN series ground source heat pump is a new generation of ground source heat pump product developed by Vicot with great efforts, and it represents these years of experience of design, production of ground source heat pump and modularizing and the combining of the newest advanced technology, the unit is suitable for various places, such as office blocks, hotels, hospitals, factories, houses, etc. It is a more fashion, adhering to the "efficient, reliable, energy saving, environmental protection," the design concept, become available to users of the newer and more economical outstanding products.

Features

1. Less investment

- Outdoor installation design (patent NO.ZL200620087478.3) no need of installation room, saves investment costs.
- Modular connection design facilitates the expansion of operation capacity; users can install the units according to the capacity required for construction in different time.

2. Optional built in reversing valve, easy installation

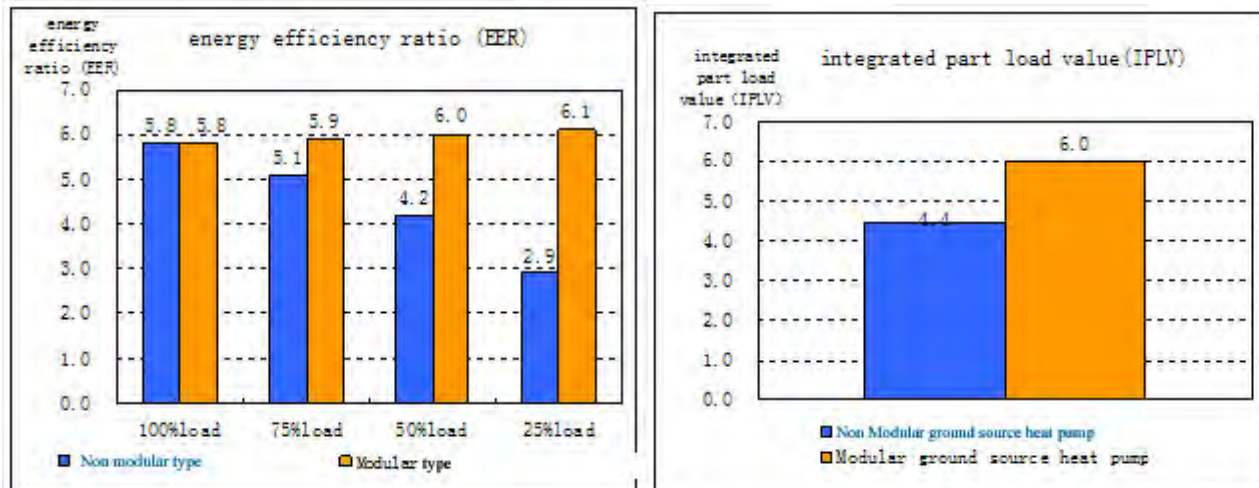
- There are two switch options of the cooling or heating for the modular heat pump, external switch and built in switch (reversing valve). When season is to be changed, for common traditional heat pump system, users have to switch the maintenance valve of external cooled water and cooling water system; for Modular Ground Source Heat Pump system, user can only need to press the key on the controller interface when having the optional built in reversing valve.
- Comparing with common traditional heat pump system, the Modular Ground Source Heat Pump system more economy: 8 cut-off valves, 4 water collector and distributor and large pipeline, greatly reducing the construction cost.

3. High efficiency, energy saving

- Modular parallel combination, compressor parallel design, not only provide a much larger operation capacity for unit, but also the closer match between output of capacity and cooling load, reduces idling energy consumption.



The energy efficiency comparison between Modular type and non modular ground source heat pump:



4. Quality components selection:

- Compressors and refrigeration accessories all chosen world-renowned brand products to ensure that the unit reached an excellent level of performance.
- Using the most advanced DAE / DAC efficient heat transfer pipe, heat transfer surface with internal ribbed tube makes the heat transfer coefficient substantially increased; the heat exchanger unique structural design, the best way of copper tube layout and precision of refrigerant control technology, greatly improved the efficiency of heat transfer.

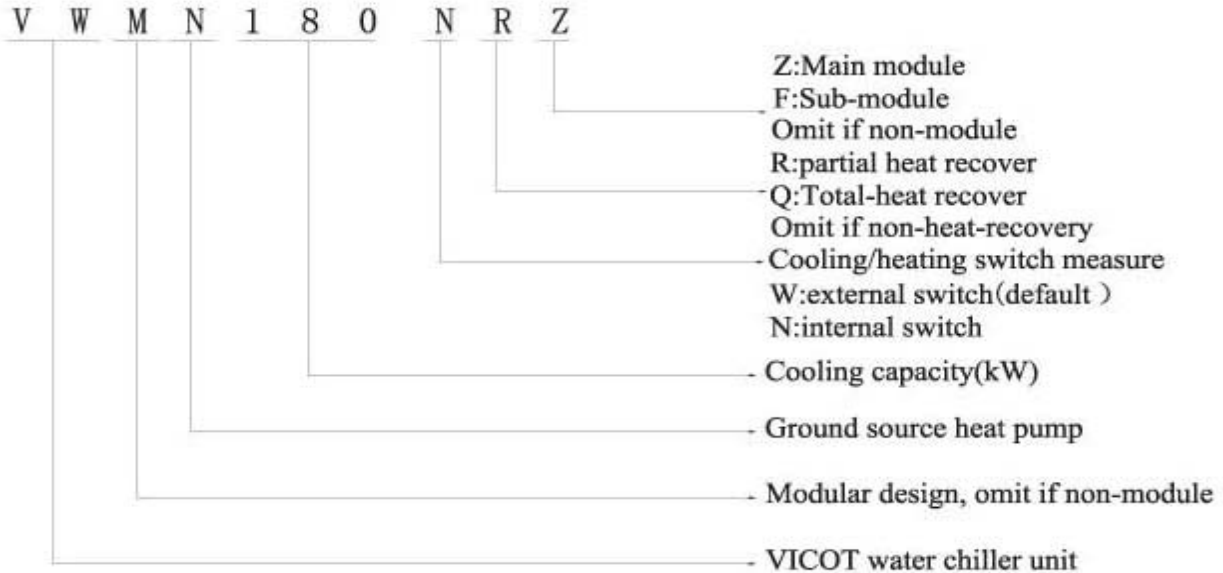
5. Noise reduction, environment friendly

- Completely closed mute design makes operation quietly, reduce noise pollution.
- Optional allocation of environmental friendly refrigerants.

6. Safe and convenient

- Small size, light weight, easy for installation, transfer and maintenance, can be put into use just make water pipes and the power supply cable be connected at the site.
- The modules start one by one, starting current greatly reduced, effectively improve the safety performance.
- Independent of each module, when any one of those modules failure or in need of maintenance, the other module can still run as usual, without any impact.
- All the components covered with casing, keeps damages to cooling and electrical system away.
- Advanced microcomputer automatic control system, with protection of high and low pressure, overload, low voltage, phase lack, and low temperature etc., with terminal for the external pumps, and displays and alarms malfunction.

Nomenclature



Optional accessories/function

1. Heat recovery
2. Low noise type
3. Soft starter
4. PLC Controller
5. Wooden package
6. R407c Refrigerant
7. R134a Refrigerant
8. R410a Refrigerant
9. Rubber vibration absorber
10. Spring vibration absorber
11. Remote control cabinet
12. Cooling or heating capacity can be extended to lower capacities, such as 20KW, 30KW, 38KW or 50KW.

Modular Ground Source Heat Pump



Specification

MODEL		VWMN80 VWMN80N	VWMN120 VWMN120N	VWMN180 VWMN180N	VWMN280 VWMN280N	VWMN380 VWMN380N	
Cooling capacity (R22)	kW	80	120	171	274	376	
	BTU/h	273,000	410,000	584,000	935,000	1,283,000	
	TR	23	34	49	78	107	
Cooling power input (R22)	kW	14.5	22	31	50	68	
Heating capacity (R22)	kW	92	138	195	315	440	
	BTU/h	314,000	471,000	666,000	1,075,000	1,502,000	
	TR	26	39	55	90	125	
Heating power input (R22)	kW	18.5	27.5	39	62	86	
Cooling capacity (R407C)	kW	76	114	163	261	366	
	BTU/h	259,000	389,000	556,000	891,000	1,249,000	
	TR	22	32	46	74	104	
Cooling power input (R407C)	kW	15	23	32	52	73	
Heating capacity (R407C)	kW	88	131	186	300	419	
	BTU/h	300,000	447,000	635,000	1,024,000	1,430,000	
	TR	25	37	53	85	119	
Heating power input (R407C)	kW	19	29	41	64	89	
Max. operating current	A	40	60	80	120	160	
Compressor type		Full-Hermetic scroll					
Power supply	V/Ph/Hz	380/3/50					
Refrigerant		R22/R407C					
Refrigerant charge amount		kG	14	21	29	42	56
Condenser water flow	Cooling (cooling water)	m ³ /h	7	11	16	25	35
	Heating (hot water)	m ³ /h	13	20	29	46	63
evaporator water flow	Cooling (cooled water)	m ³ /h	13	20	29	46	63
	Heating (cooled water)	m ³ /h	7	11	16	25	35
Condenser water pressure drop	cooling	kPa	22	22	30	30	30
	heating	kPa	50	50	65	65	65
Evaporator water pressure drop	cooling	kPa	50	50	65	65	65
	heating	kPa	22	22	30	30	30
Optional heat recovery	Capacity	kW	16	24	34	55	77
		BTU/h	55,000	82,000	116,000	188,000	263,000
		TR	5	7	10	16	22
	Hot Water flow	m ³ /h	3	4	6	9	12
	water pressure drop	kPa	28	32	35	38	40

Total heat recovery capacity	kW	90	130	190	300	410
	BTU/h	307,000	444,000	648,000	1,024,000	1,399,000
	TR	26	37	54	85	117
Total heat recovery water flow	m ³ /h	15	22	32	51	71
Total heat recovery hot water pressure drop	kPa	115	115	69	69	68
Cooling water and cooled water connection pipe dimensions		DN65	DN65	DN65	DN100	DN100
Length	mm	1730	1730	1880	2250	2250
Width	mm	950	1200	1200	1700	1700
Height	mm	1450	1450	1450	2090	2090
Transport weight	kG	520	720	950	1600	2100
Operating weight	kG	550	750	1000	1720	2300

- Note:**
- 1) Standard cooling work condition: cooled water inlet temp.12 °C, cooled water outlet temp.7 °C
cooling water inlet temp.18 °C, cooling water outlet temp.29 °C。
 - 2) Standard heating work condition : Heating water inlet 40 °C,cooled water inlet 15 °C。
 - 3) Heat recovery device is optional, water inlet temp. is 40 °C,water outlet temp. 45 °C。
 - 4) Water system max, bearing pressure: 1.0MPa.
 - 5) The data above is subject to change without prior notice.

Capacities/Power input in different conditions

Cooling capacity correction coefficient:

Outlet Chilled water Temp. °C	Inlet cooling water temp. °C (condenser)												
	13	14	15	16	17	18	19	20	21	22	23	24	25
5°C	1.01	1.00	0.99	0.97	0.96	0.95	0.94	0.92	0.91	0.90	0.89	0.88	0.87
7°C	1.07	1.05	1.04	1.03	1.01	1.00	0.99	0.97	0.96	0.95	0.94	0.92	0.91
9°C	1.12	1.11	1.09	1.08	1.07	1.05	1.04	1.03	1.01	1.00	0.99	0.97	0.96
11°C	1.18	1.17	1.15	1.14	1.12	1.11	1.09	1.08	1.07	1.05	1.04	1.03	1.01
13°C	1.25	1.23	1.21	1.20	1.18	1.17	1.15	1.14	1.12	1.11	1.09	1.08	1.07
15°C	1.31	1.29	1.28	1.26	1.25	1.23	1.21	1.20	1.18	1.17	1.15	1.14	1.12



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Cooling power input correction coefficient:

Outlet Chilled water Temp. °C	Inlet cooling water temp. °C (condenser)												
	13	14	15	16	17	18	19	20	21	22	23	24	25
5°C	0.863	0.886	0.910	0.934	0.959	0.985	1.011	1.037	1.064	1.092	1.120	1.149	1.179
7°C	0.877	0.900	0.924	0.949	0.974	1.000	1.026	1.053	1.080	1.108	1.137	1.166	1.197
9°C	0.890	0.913	0.938	0.963	0.989	1.015	1.041	1.068	1.096	1.125	1.154	1.184	1.215
11°C	0.903	0.927	0.952	0.977	1.003	1.030	1.057	1.084	1.113	1.142	1.171	1.202	1.233
13°C	0.917	0.941	0.966	0.992	1.018	1.046	1.073	1.101	1.129	1.159	1.189	1.220	1.251
15°C	0.930	0.955	0.981	1.007	1.034	1.061	1.089	1.117	1.146	1.176	1.207	1.238	1.270

Heating capacity correction coefficient:

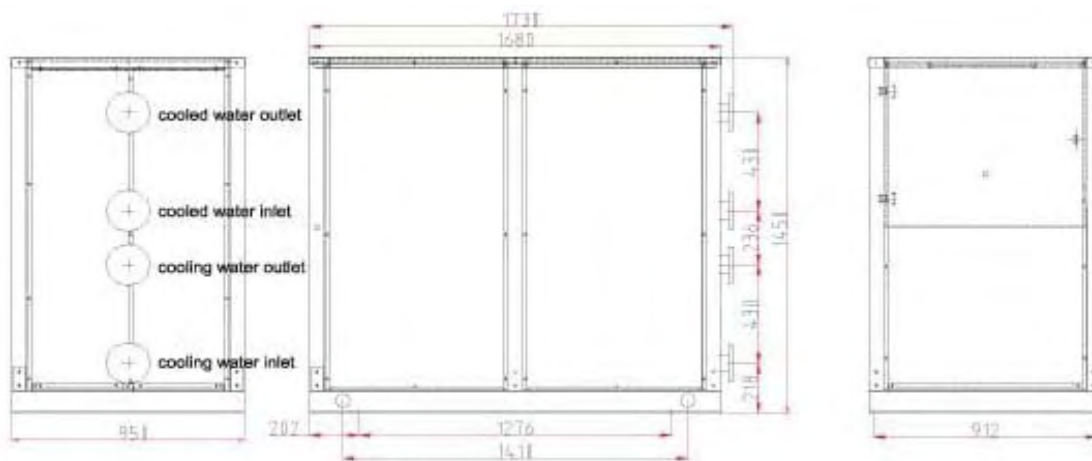
Outlet hot water Temp. °C	Inlet Cooled water Temp. °C (Evaporator)											
	10	11	12	13	14	15	16	17	18	19	20	
39°C	0.946	0.972	0.997	1.024	1.051	1.080	1.108	1.136	1.166	1.196	1.227	
42°C	0.911	0.935	0.960	0.986	1.012	1.039	1.066	1.094	1.122	1.151	1.181	
45°C	0.877	0.900	0.924	0.949	0.974	1.000	1.026	1.053	1.080	1.108	1.137	
48°C	0.842	0.865	0.888	0.912	0.936	0.961	0.986	1.012	1.038	1.065	1.093	

Heating power input correction coefficient:

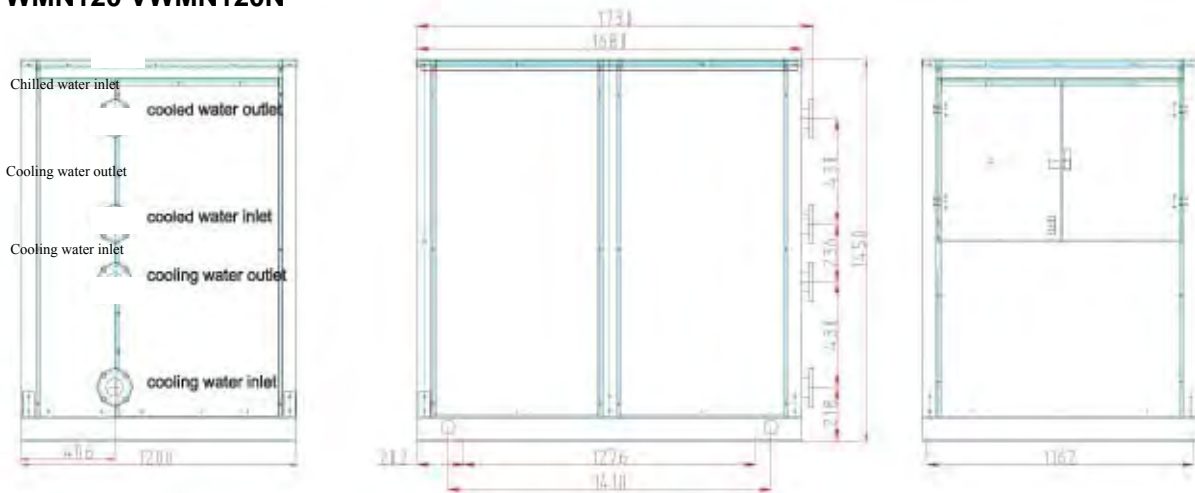
Outlet hot water Temp. °C	Inlet Cooled water Temp. °C (Evaporator)											
	10	11	12	13	14	15	16	17	18	19	20	
39°C	1.119	1.128	1.136	1.145	1.153	1.162	1.171	1.180	1.188	1.197	1.206	
42°C	1.038	1.046	1.054	1.062	1.070	1.078	1.086	1.094	1.102	1.111	1.119	
45°C	0.963	0.970	0.978	0.985	0.993	1.000	1.008	1.015	1.023	1.030	1.038	
48°C	0.888	0.895	0.901	0.908	0.915	0.922	0.929	0.936	0.943	0.950	0.957	

Dimension

1. VWMN80 VWMN80N



2. VWMN120 VWMN120N



3. VWMN180 VWMN180N



4. VWMN280/ VWMN280N/ VWMN380/ VWMN380N



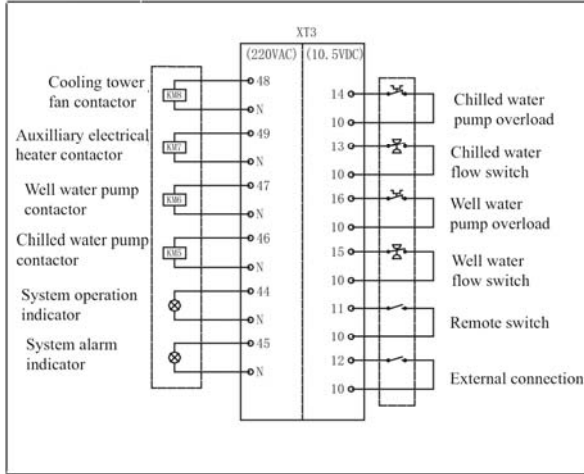


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Wiring connection at site

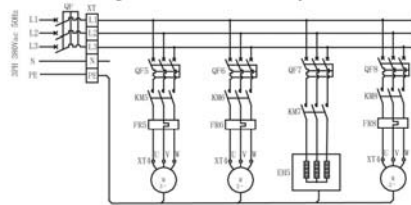
Power supply connection and internal wiring should be done at site:

Control terminal wiring



The user should provide the items in broken line.

Wiring diagram for power distribution box for chilled water pump, well water pump, cooling tower fan motor, auxiliary electrical heater.



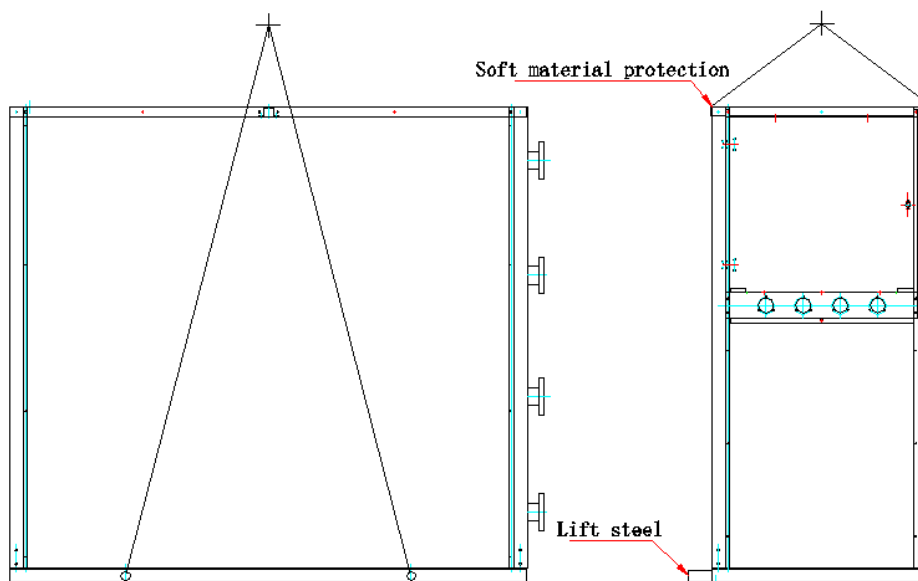
Notes: This diagram is only for reference, the wiring should be different according to actual device's start up way.

Installation and Maintenance

1. The preparation

- 1) After arriving the installation site, check all the items of the unit carefully according to the packing list if there are damage, lack of parts or damage during transport, notify the sales department.
- 2) The user must provide a rigid nondeforming foundation or concrete footings, based on the size of the unit four positioning hole; the foundation of the unit can also be framework structure, framework should be placed on main beam or column, and be capable of bearing the weight 150% heavier than the unit. The horizontal level should have no slope.

Lifting unit diagram

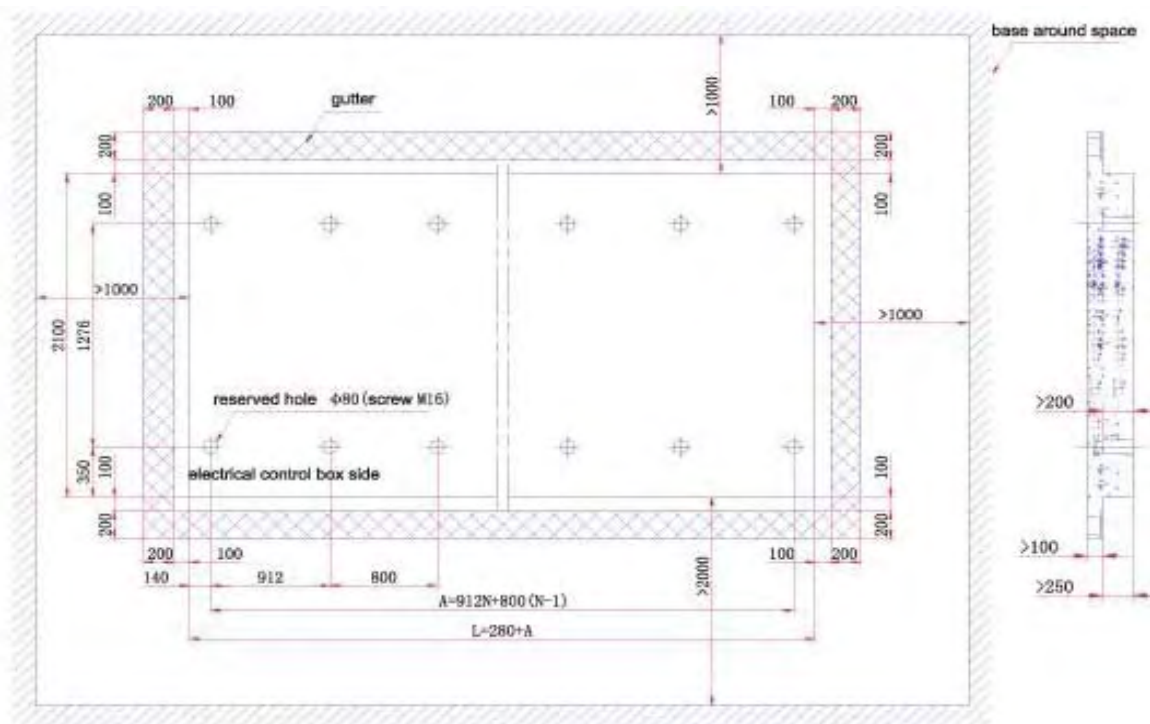


- 3) For easy handling, users should use the crane, the machine should properly protected by soft material on the point of force applied, and also be in balanced status during handling to avoid possible damage.
- 4) Choose the Installation Place
Units can be installed indoor or outdoor, should consider the following factors:
 - a) Installation place should be capable of bearing the weight 150% heavier than the unit. The horizontal level should have no slope.
 - b) Should keep enough space surrounding and on the top of the machine for access of maintenance.
 - c) Should have drain in the surrounding of the machine for release the water for seasonal stop of machine.
- 5) Foundation reference
Note:
 - a) The foundation should be concreted structure or frame of steel, with a plane surface
 - b) 10-20mm isolator for shock absorption should be placed between the unit and foundation.
 - c) Foundation design can be based on the machine net weight.
 - d) Fix the unit with $\phi 16$ foundation bolt
 - e) Foundation diagram



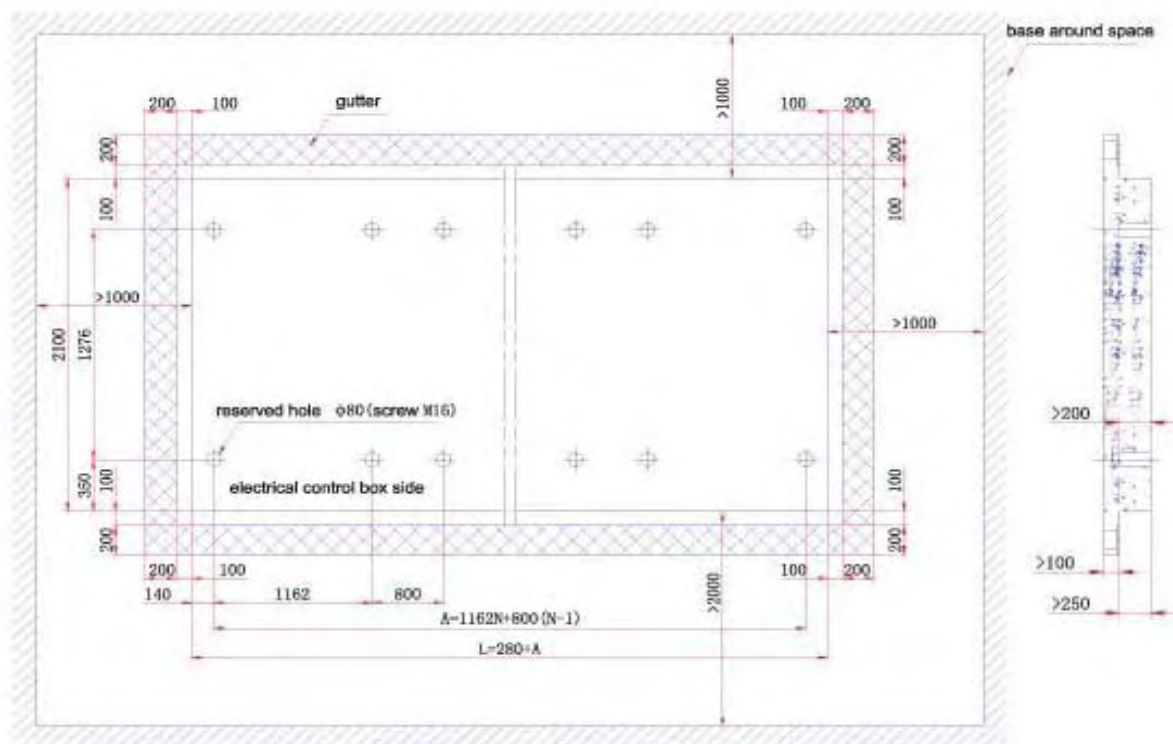
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1) Foundation Diagram of VWMN80/VWMN80N



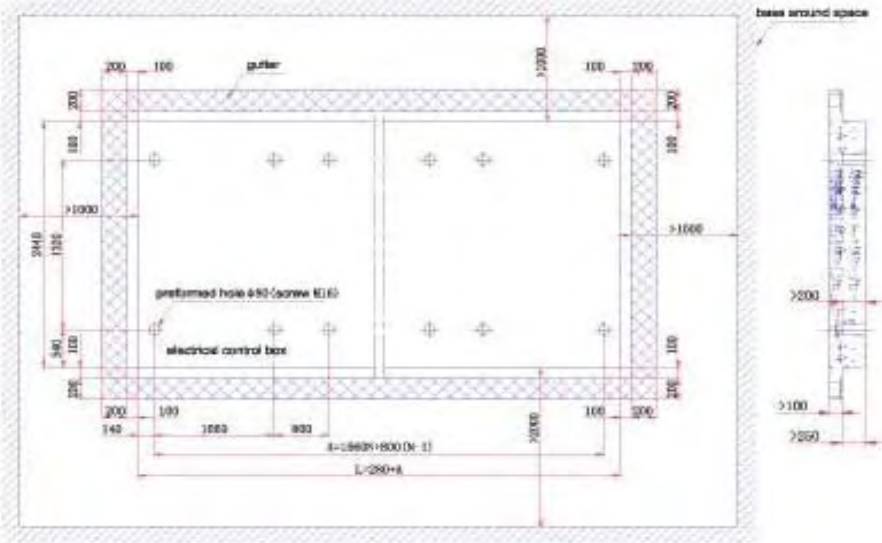
Note: “N” is the total number of VWMN180 & VWMN180N modular.

2) Foundation Diagram of VWMN120/VWMN120N/VWMN180/VWMN180N



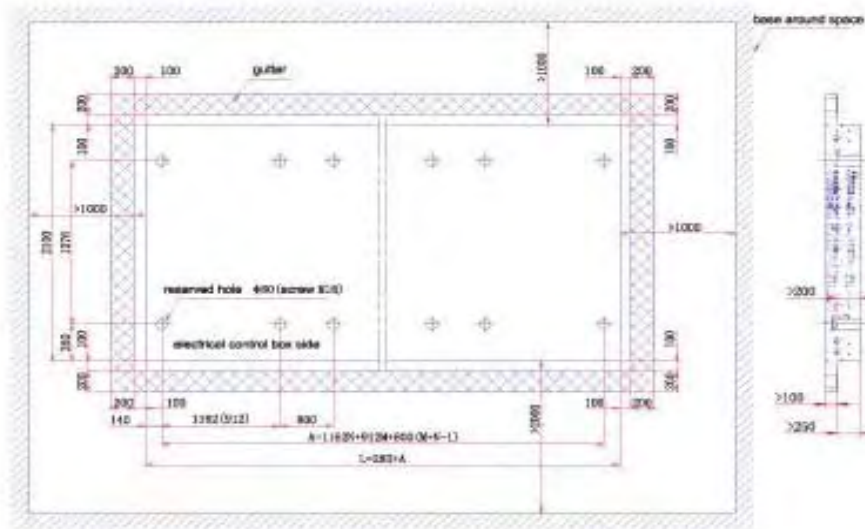
Note: “N” is the total number of VWMN120, VWMN120N, VWMN180 and VWMN180N modular.

3) Foundation Diagram of VWMN280/VWMN280N/VWMN380/ VWMN380N



Note: "M" is the number of VWMN280, VWMN280N, VWMN380 and VWMN380N.

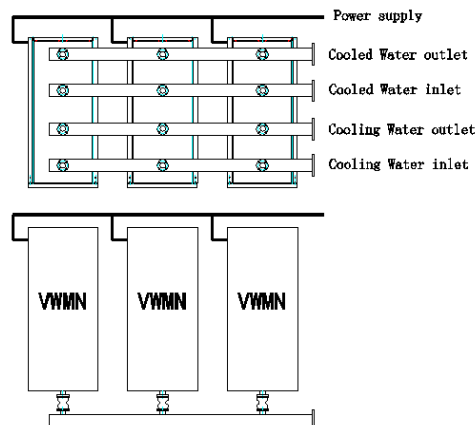
4) Foundation Diagram of VWMN80/VWMN80N/VWMN120/VWMN120N/VWMN180/VWMN180N



Note: "M" is the number of VWMN80 modular and VWMN80N, and "N" is the total number of VWMN 120/VWMN120N/VWMN180 and VWMN180N.

2. Typical multi-modules connection

VWMN modular can be extended up to seven modules as one group, connection method as below: (with example of three modules)

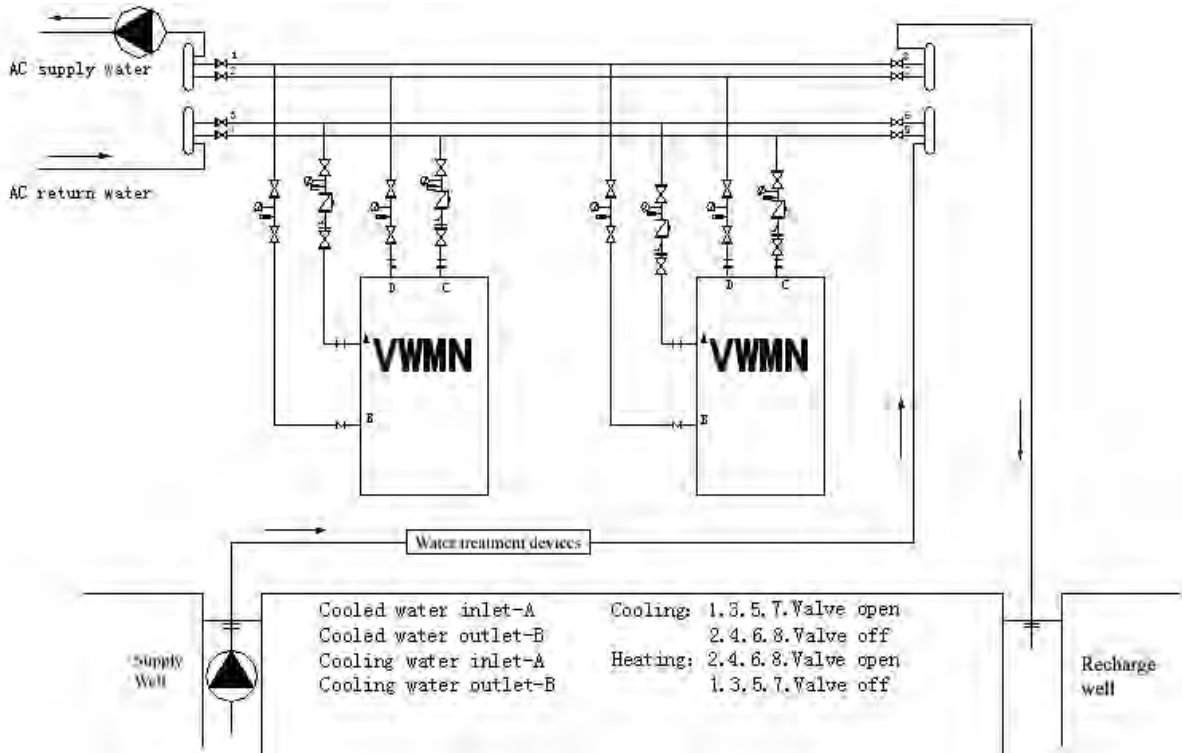




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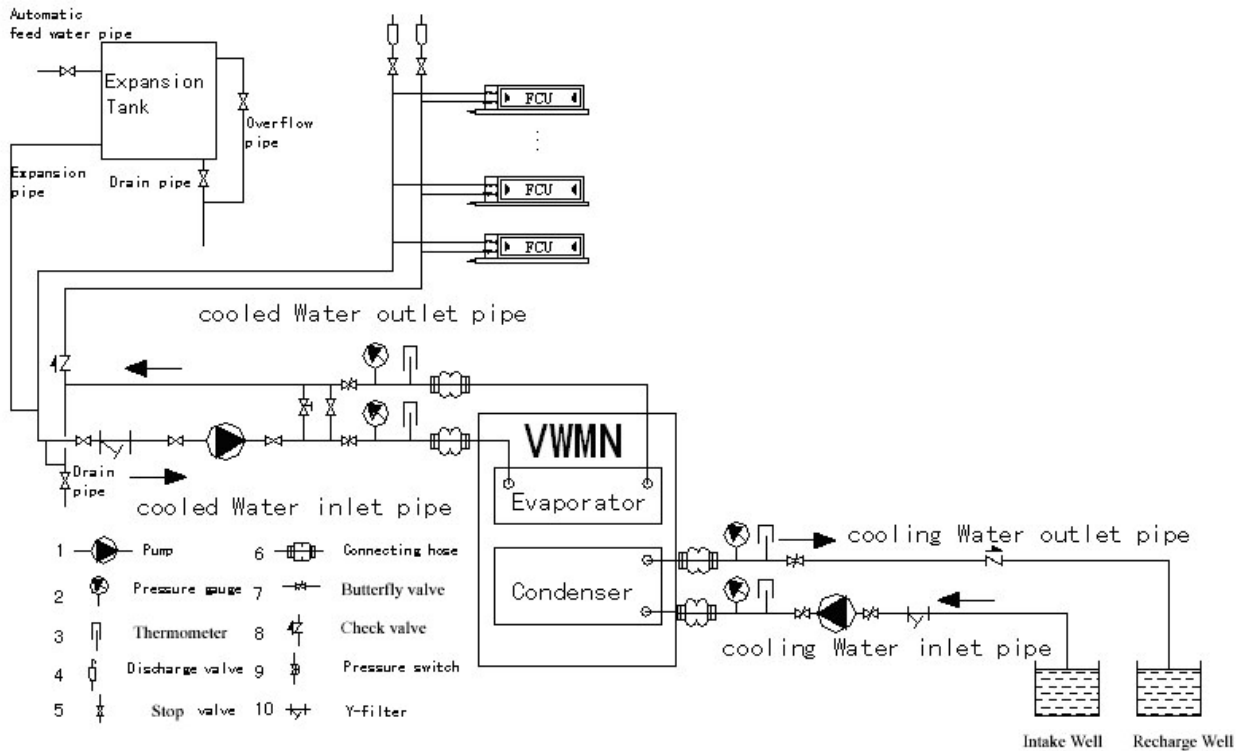
3. Modular ground source heat pump system diagram

1) External switch style

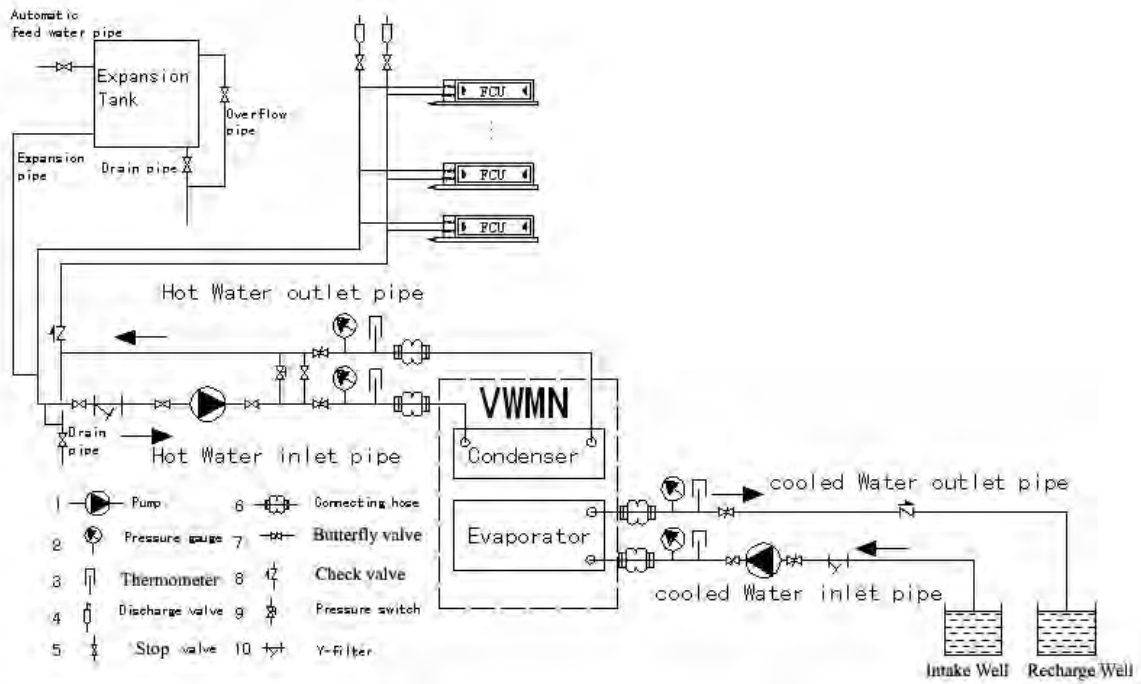


2) Internal switch style

2.1) Internal switch style—cooling in summer



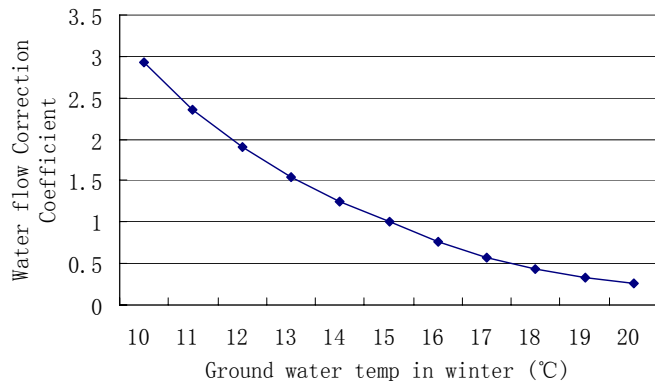
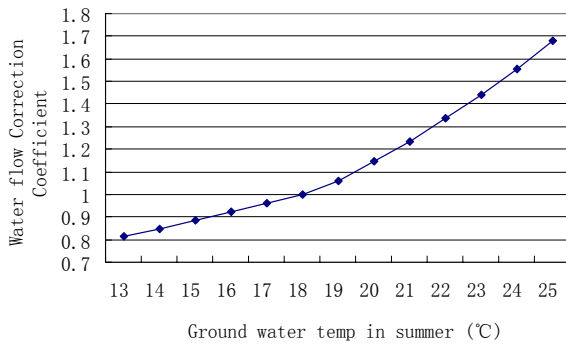
2.2) Internal switch style——heating in winter



4. Requirements of underground water

1) For getting enough heating capacity in winter, when underground water temp. varies, water amount must be changed, i.e. the lower the underground water temp., the more the water flow is needed. When underground water is used as condensing water in system, the higher the underground water temp. is the more underground water flow is needed.

2) The water flow correction coefficient as referred in following table:



3) The actual required underground water flow amount is the figure that correction coefficient times water flow amount in cooling/heating mentioned in specification.

4) When the underground water flow is uncertain, then select the unit model according to the cooling/heating capacity required, and then calculate the underground water flow according to the unit specification and local underground water temp, and then finalize the exploitation method of the underground water.

5) In addition with underground temperature and flow amount, its corrosion situation on copper, steel report should be prepared, so as to have special treatment on heat exchanger and water system when necessary.

6) If the temp. of the underground water or of the other cooling/heating source is beyond the range mentioned in the diagram, nonstandard products should be adopted, please contact us.

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Modular Ground Source Heat Pump



5. water quality standard

Items	Evaporator side water	Condenser side water
PH	6.5—8.5	6.0—8.0
Conductivity	$\leq 200 \mu\text{S/cm}$ (25°C)	$\leq 200 \mu\text{S/cm}$ (25°C)
chloride ion	$\leq 50 \text{ppm}$	$\leq 200 \text{ppm}$
Sulfate ion	$\leq 50 \text{ppm}$	$\leq 200 \text{ppm}$
Total content of iron	$\leq 0.3 \text{ppm}$	$\leq 0.5 \text{ppm}$
Alkali ion	$\leq 50 \text{ppm}$	$\leq 100 \text{ppm}$
Total hardness of water	$\leq 50 \text{ppm}$	$\leq 100 \text{ppm}$
Sand	$\leq 30 \text{ppm}$	$\leq 50 \text{ppm}$

6. Power connection

- 1) Wire selection and connection should be carried out strictly according to requirement.
- 2) Should have earthing well done, no earthing to gas pipe, water pipe, telephone line, to avoid electric shock caused by improper earthing.
- 3) Ensure the phase sequence is correct, to avoid not running.

Maintenance

- 1) The qualified technician is required for the maintenance; all the protection devices and controller must be checked before restart.
- 2) Regular and correct maintenance is required for stability and good performance. Chilled and cooling water must be complete drained when long time no use to avoid possible freezing.

7. Notice

- 1) Antifreezer should be added in chilled water if water temp.set below zero or near zero.
- 2) Clean water system regularly.
- 3) Pay attention to antifreeze when ambient temp. is around 0°C in winter.
- 4) Antifreezer or other antifreeze measure must be used in bad ambient (under 0°C outdoor).