

# Design



## Design of heat exchanger

### 1.Counting the max heat power of the ground resource

After serious counting to determine the cooling load and the heat load of the building, then to count the heat exchange load in summer and winter, and finally to choose the max heat exchange amount as the heat exchange of the pipe.

### 2.To choose the horizontal type and vertical type.

2.1On the base of site investigation, considering the useful area, land type, cost of drill, then to decide whether to choose the horizontal type or vertical type of the heat exchanger. Generally, the vertical type is the common choice because the thermal performance of horizontal type is poorer than the vertical type, and also the horizontal type is limited by the useful area.

The U type heat exchanger are the best choice for the vertical type, including the single U type and double U type. The heat exchange amount of the double U type is 1.2-1.26 times of the single U type, reducing 16.7%-20% drill holes.

### 2.2Series and Parallel

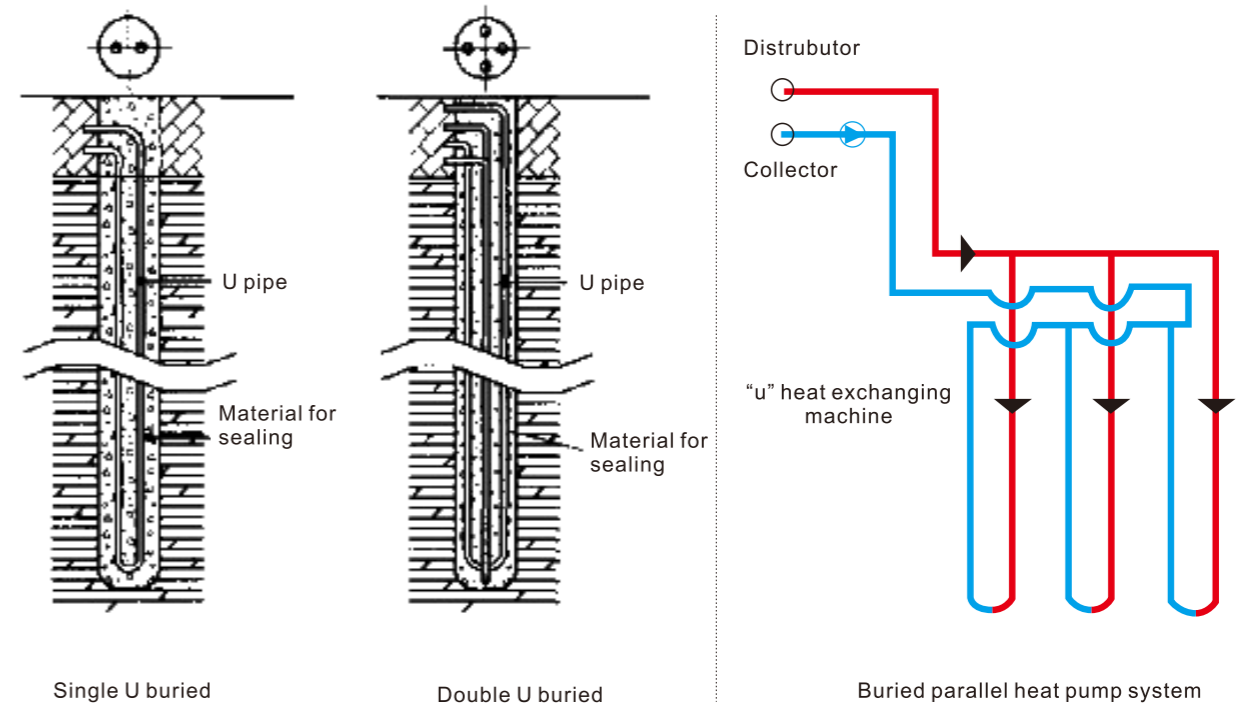
There are two types of liquid flow in the heat exchanger, that is series and parallel type. In the series type, the size of the pipe is larger, cost is higher and heat loss limits the performance of the system. In parallel, the size of the pipe is small, cost is low and usually the system is reversed return to keep the balance of the heat exchanger amount, and the head loss will in favor of the performance of the system. So the parallel reversed return system are the common choice.

### 3.Choosing pipe

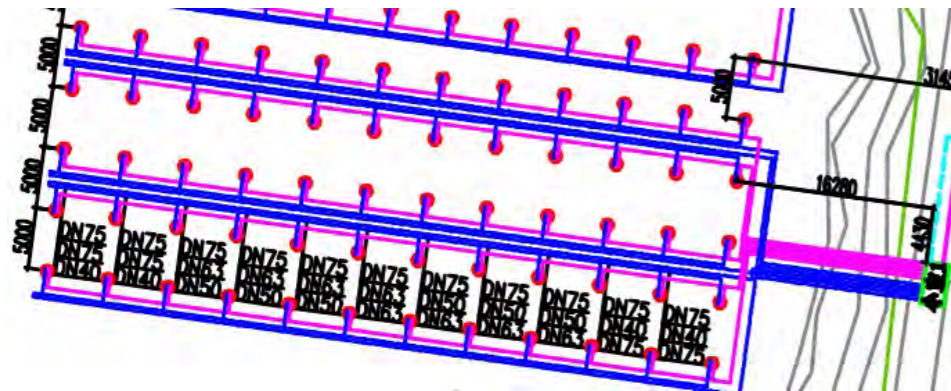
In generally, once the heat exchanger is buried in the ground, there is no need to fix or replace, so it is required that the buried pipe be of the excellent chemical performance and anti-corrosion ability. Generally, PE 100 SDR 11 PE pipe which can bear 1.6 Mpa and the heat conductivity coefficient more than 0.42W/mo. is the recommend choice. Electro fusion joint is safe and can be used for 50 years.

### 4.Determining the dimension of the pipe

The common dimension of the pie are DN32 and DN25, the flow rate in the pipe is 0.4 – 0.6m/s.



Heat Exchanger



**5.Counting the length of the buried pipe**

The length of the pipe are determined by the heat exchanger performance of pipe.

The heat exchanger performance of the U type are determined by the flow rate, heat difference between water and soil, the thermal conductivity of the soil and backfill, the depth of the drill and the spacing of the drills. The thermal conductivity of U type pipe has low affect with the heat exchange per length.

In engineer projects, the heat exchange of unit drill is determined by the Geotechnical thermal response test and formula calculating and according to the project engineer, and then to determine the length of the vertical pipe by the max heat exchange amount in the building.

**6.Determine the vertical type drill and the gaps**

The number of the vertical drill are determined by the length of pipe and the depth of the drill.

The depth of vertical type drill is normally 60-120M, according to the cost of drill and the buried area.

The bigger the gap between vertical, the smaller the interference is, which benefit to the heat exchange is. But because of the limited buried area, it's not possible to expand the gaps between drills, so the gap is normally 4-6 meter.

**7.Check the pressure ability of the buried pipe**

The max pressure of the system should be less than the pipe.

**8.Calculate the head loss**

In the reverse return system, choose the max head loss of the heat pump unit as the worst resistance.

Characteristic of Kingbull System



**The advantages of KINGBULL ground-resource heat pump**

**Reliable performance**

- ◎PE100 grade pipe raw materials
- ◎Third part certificates.
- ◎Pressure bearing 1.6 Mpa, working life for 50 years.



**Advanced equipment and scientific producing process**

- ◎Equipments are imported from Germany
- ◎Applying the BM screw and KV feeding system.
- ◎Scientific producing process to ensure the low temperature extrusion and finally to transfer the good performance to the pipe.



**State recognized LAB**

- ◎Strict quality control system, to ensure the traceability of the pipe.
- ◎Advanced the ISO 9001 and ISO14001 management system, three class quality control system to ensure the products 100% qualified.
- ◎Cutting-edge test equipment to make sure that all the test report are reliable.



**Perfect system support- ensure the quality of projects**

- ◎Professional fitting
- ◎Cutting-edge electro-fitting and electric machine
- ◎Same raw material to ensure the joints quality between pipe and fittings
- ◎Produce pipe according the requirements of customs
- ◎Professional people to make sure the pipe and fitting are qualified.



## Performance and Specification

**Executive standard:** GB/T 13663-2000 CJ/T 317-2009

**Color:** Black with blue (flow in), red (flow out) lines.

### Pipe Performance (PE 100)

Hydraulic	20°C, 12.4Mpa, 100h, No crack, No leakage 80°C, 5.5Mpa, 165h, No crack, No leakage 80°C, 5.0Mpa, 1000h, No crack, No leakage
Flow rate (MFR, 190°C, 5Kg)	Deviation of Pipe MFR < +_20% of Raw Material
Tensile at break	≥350%
Longitudinal reversion rate (110°C)	≤3%
OIT (OIT, 200°C)	≥20min
Thermal conductivity	≥0.42W/(m.k)

### Straight pipe

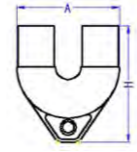
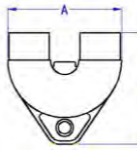
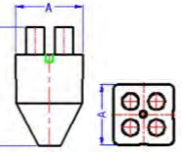
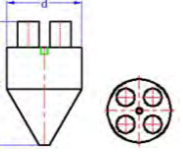
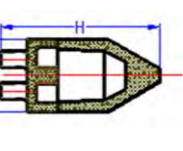
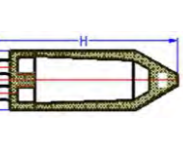
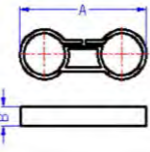
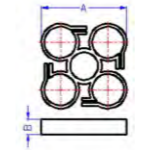
Length (m)	PN1.6(MPa)		PN1.25(MPa)		PN1.0(MPa)	
	Nominal out diameter (mm)		Nominal out diameter (mm)		Nominal out diameter (mm)	
6	dn63*5.8		dn63*4.7		dn75*4.5	
	dn75*6.8		dn75*5.6		dn110*6.6	
	dn110*10		dn110*8.1			

### Coil pipe

Buried heat exchanging pipe PE100 PN1.6MPa		Spec.(mm)
		25*2.3
		32*3.0

Horizontal pipe(coil) PE100		PN1.6(MPa)	PN1.25(MPa)
		Spec.(mm)	Spec.(mm)
		32*3.0	32*2.4
		40*3.7	40*3.0

## Ground Source Heat Pump Fitting

Single-short U Joint (electro-thermo)		Spec.(mm)	A(mm)	H(mm)	Package (Pcs/Ctn)
		dn25	70	99	60
		dn32	82	105	40
Single-short U Joint (Socket)		Spec.(mm)	A(mm)	H(mm)	Package (Pcs/Ctn)
		dn25	96	93.5	25
		dn32	103	100	30
Square Double U Flow-free Joint		Spec.(mm)	A(mm)	H(mm)	Package (Pcs/Ctn)
		dn25	95	165	4
		dn32	90	159	4
Round Double U Flow-free Joint		Spec.(mm)	d(mm)	H(mm)	Package (Pcs/Ctn)
		dn25	98	146	4
		dn32	114	186	4
Hollow-short Double U Joint		Spec.(mm)	d(mm)	H(mm)	Package (Pcs/Ctn)
		dn25	98	169	4
		dn32	98	173	4
Long Double U Joint		Spec.(mm)	d(mm)	H(mm)	Package (Pcs/Ctn)
		dn25	112	360	6
		dn32	110	400	6
Single U Clamp		Spec.(mm)	A(mm)	B(mm)	Package (Pcs/Ctn)
		dn25	91	15	60
		dn32	98	15	40
Four ends Clamp		Spec.(mm)	A(mm)	B(mm)	Package (Pcs/Ctn)
		dn25	75	15	60
		dn32	86	15	40

Notice: All product information are taken latest "Kingbull product price-list" as final