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GEOTHERMAL ENERGY

Sustainable into the future

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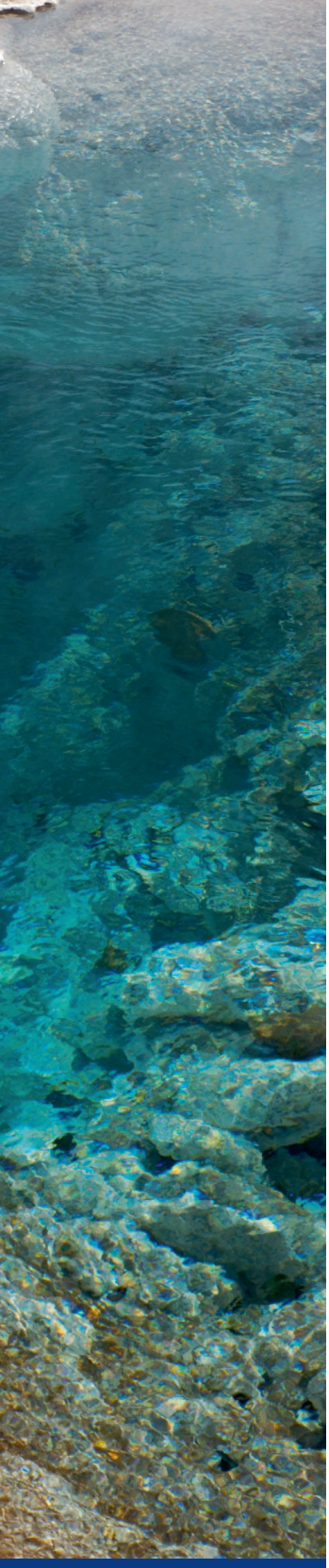
PIPELIFE

always part of your life

Geothermal heating and cooling solutions provide efficient and environmentally friendly systems for building facilities of all sizes. To support the increasing demand for renewable energy, we offer various geothermal solutions and ground collector systems according to market needs. With pipes and collector loops buried in the ground, they need to be robust and durable, which is why our geothermal piping materials are made from of high-density (HD)polyethylene, to provide excellent hydraulic and corrosion resistance properties.



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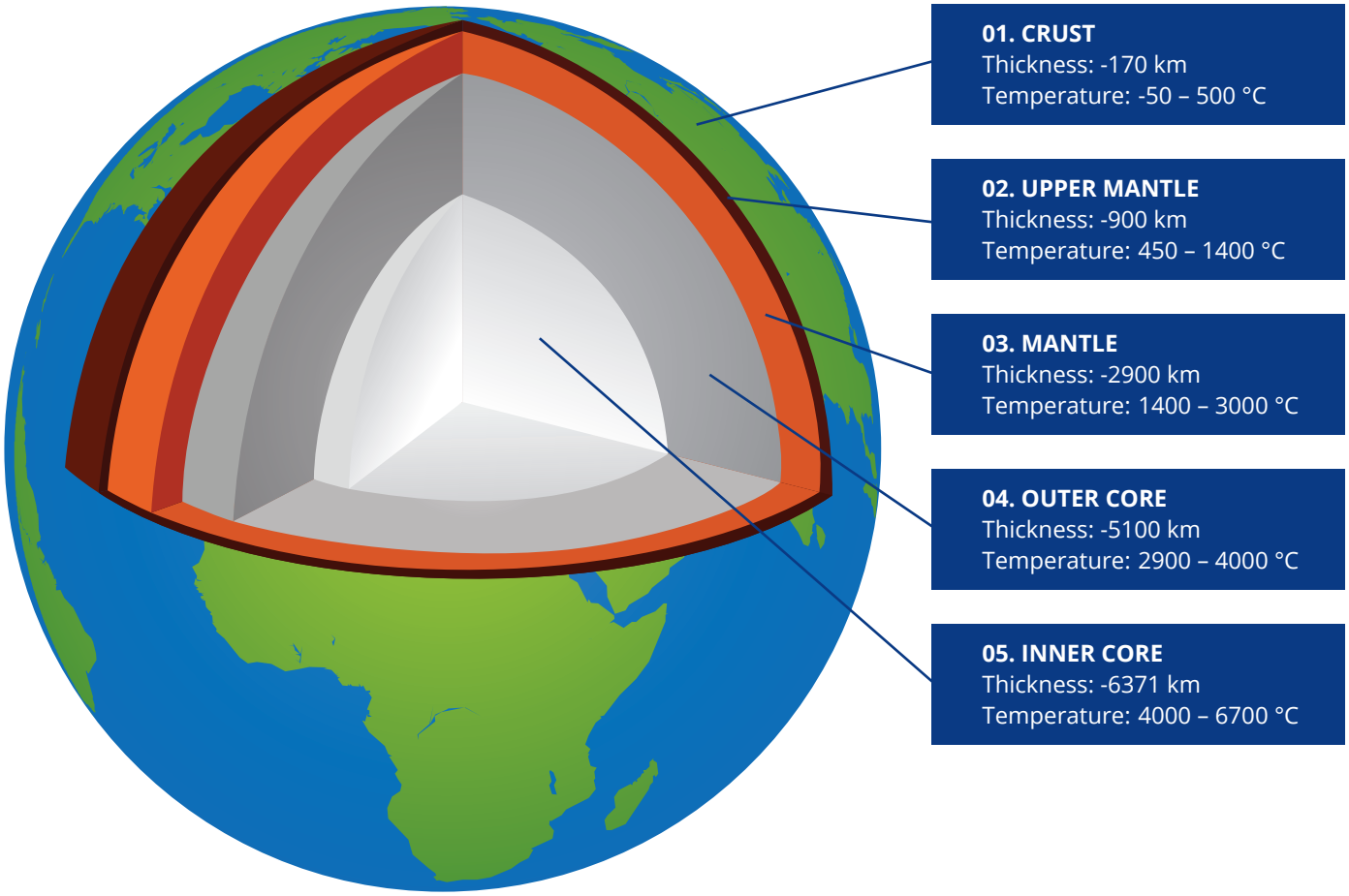
GEOTHERMAL ENERGY – THE ENERGY SOURCE FOR FUTURE GENERATIONS

Fossil fuels such as oil, coal or natural gas are finite resources that have been created by natural processes in our earth over millions of years. Once exploited, they cannot be replaced. As over the last hundred years our society has become increasingly dependent on these types of energy, pollution and exploitation of our planet progress with rapid strides. And this drives and underlines the need for renewable and environmentally friendly energy sources.

Due to this fact, renewable energy sources like solar or geothermal energy gain more and more importance.

The earth acts as a natural heat reservoir and especially the use of energy derived from it offers a variety of advantages:

- environmentally friendly: no pollution of the environment
- renewable: geothermal energy is constantly available 24/7/365
- multi-purpose: not only heating, but also cooling
- ideal energy source for modern trend of surface heating systems
- economical due to low operating costs; savings of up to 75% are possible
- versatile: can be used for small family houses, big office buildings or industrial complexes
- various systems available depending on given local conditions and regulations



WHAT IS GEOTHERMAL ENERGY?

Generally speaking, geothermal energy is thermal energy generated and stored in the accessible part of the earth's crust. This energy can be extracted and – among others – be used to cool in summer, heat in winter or keep the ground snow and ice free. „Geo" originates from the Greek word „gaia" and means earth, „thermal" comes from the Greek word „therme" and means heat.

Geothermal energy originates from the heat retained within the earth since the original formation of the planet, from radioactive decay of minerals, and from solar energy absorbed at the surface.

The crust of the earth in comparison to the diameter of the earth of about 12,750 km is only a very thin layer. Nevertheless, already in the crust quite high temperatures of up to 500°C exist. The higher the depth is, the higher the temperature. The center of the earth, the so called „inner core", reaches temperatures of over 6,000°C.

With current technologies only the upper part of the earth crust can be explored economically. And if we speak about upper crust, we still distinguish between different types of energy collectors, namely deep geothermal energy and geothermal energy close to ground, also referred to as Ground Energy.

GEOTHERMAL SYSTEMS

DEEP GEOTHERMAL ENERGY (“GEOTHERMAL ENERGY”)

Geothermal energy can be further divided into different systems: petrothermal and hydrothermal systems.

Petrothermal energy

Petrothermal systems use the hot rock that exists at depths of three to six kilometers to produce energy. In contrast to hydrothermal geothermics there are no or only insufficient thermal water resources available at such depths. By means of hydraulic and chemical methods the rock is cracked. This creates or increases the water permeability and acts like an artificial heat exchanger. Water is then injected into the rock under high pressure through the injection well. It is heated by the hot rock and then flows via the extraction well back to the surface.

Hydrothermal energy

Hydrothermal geothermics uses existing hot thermal water (approx. 100-150 °C) at depths between two and four km to produce electricity and heat. The naturally existing thermal water resources, referred to as hot water aquifers, are tapped and the hot water is brought to the surface of the earth via an extraction well. After use the cooled thermal water is fed via an injection well back into the deep where it heats up again.

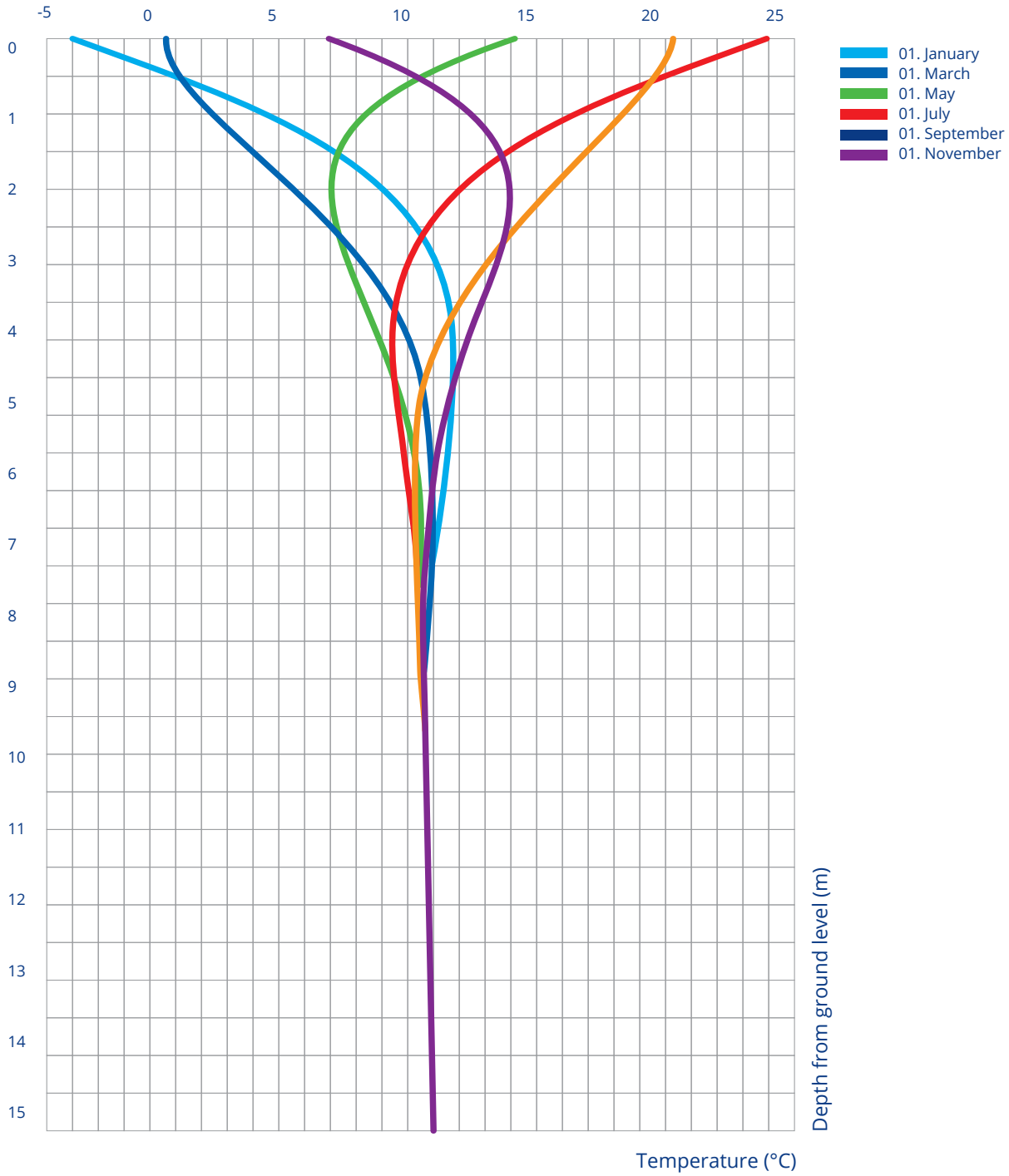
GEOTHERMAL ENERGY CLOSE TO EARTH’S SURFACE (“GROUND ENERGY”)

Ground energy is latent thermal energy stored within the top approximately 400m of the earth‘s surface. On average, the temperature increases by 3°C every 100meters.

Unlike deep geothermal energy, the ground energy does not provide energy directly in the form of usable heat. The temperature of the liquid circulating through the pipe loops buried in the ground needs to be increased for heating purposes by means of a heat pump.

The closer to the surface, the more the earth temperature is influenced by the outside weather conditions, esp. the amount of sun radiation. Despite the fact that weather conditions vary significantly during the different seasons of the year, the temperature in a few meters depth remains relatively constant. Already in approximately 6 meters depth an average temperature of 8-10°C is existing, independently of the weather or outside air temperature.

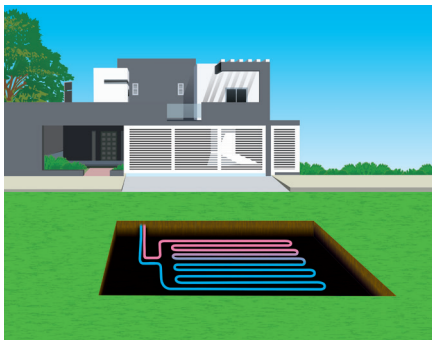
In order to extract the energy from the ground, a pipe system must be installed. Generally, there are two main systems: closed loops and open loops. Closed loops usually contain a mixture of water and anti-freeze (propylene glycol, denatured alcohol or methanol) to transport the energy extracted from the ground (heat) to the heat pump. Open loops pump natural water from a well or body of water (lake, river)



into a heat exchanger inside the heat pump and then return the water back to the water source. The supply and return lines must be placed far enough apart to ensure thermal recharge of the source.

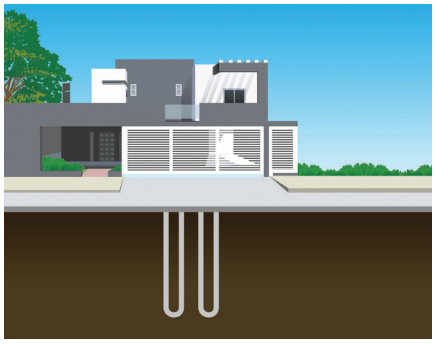
Most important closed systems:

- horizontal collector loops
- vertical collector loops
- trench or basket collector loops



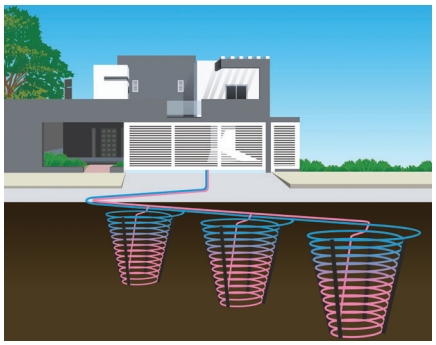
Horizontal collectors

Horizontal collectors are the most commonly used method to transfer ground energy into heating/cooling source. They consist of horizontally buried pipes, in approximately 1.5 meters depth. Due to its closeness to the surface, the performance of horizontal collectors varies with seasonality. Although the investment is relatively low, as quite a large space – depending on the required heat output and soil conditions, approximately 30m^2 collector space is needed per kw heat load of the building – might be needed, installation of horizontal loops might not be possible everywhere. The heat extraction per m^3 of soil of the horizontal collectors is relatively low.



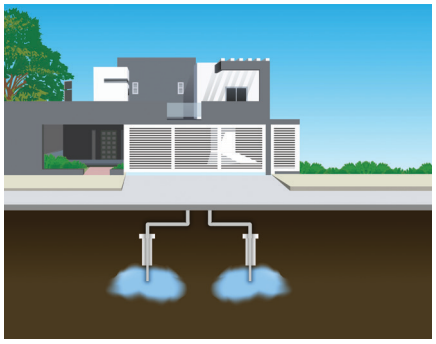
Vertical collectors

In case the required space needed to install the horizontal collector system is not available, vertical collectors can provide the optimal solution. Vertical collectors consist of one or more return and supply pipes that are installed vertically into the ground, approximately 100 meters, however greater depths are as well possible. Vertical collectors can be used in almost all types of landscape or ground and soil conditions.



Basket or trench collectors

In the case of basket collectors, the pipes are installed in forms of baskets few meters below ground. Trench collector pipes are buried horizontally, but in contrast to real horizontal collectors where pipes are laid next to each other, parallel on top of each other. Burying depth is approximately two to three meters. This collector method can be used if not enough surface is available to install the horizontal system.



Ground water, lake or river collector loops

Open loops pump natural water from a well or body of water (lake, river) into a heat exchanger inside the heat pump and then return the water back to the water source. The supply and return lines must be placed far enough apart to ensure thermal recharge of the source.

General

Although the initial investment of a geothermal heating system is higher compared to conventional heating, the heating costs of a heat pump system are significantly below traditional sources. Therefore, depending on the size and properties of the system, the higher initial investment pays off in a couple of years.

When planning a heating system by means of geothermal energy it is necessary to accurately calculate the building's heat loss, its respective energy consumption profile and the hot water requirements. Only then proper sizing of the required heat pump system can be performed, which is important, as oversizing will not only result in higher installation costs, but also in unused energy. Undersizing, however, might lead to the fact that not enough energy can be provided to fulfill the building's need. Due to this, a design expert shall be consulted to carry out the planning work for you.

Pipelife can help you to find the experts close to you.

Maximum specific energy extraction of horizontal ground collectors

SOIL	max. specific energy extraction	
	at 1,800 hours/year	at 2,400 hours/year
Dry soil	10 W/m² and 5W/m pipe	8 W/m² and 4W/m pipe
Cohesive soil, wet	20-30 W/m² and 15W/m pipe	16-24 W/m² and 12 W/m pipe
Saturated gravel, saturated sand	40 W/m² and 20 W/m pipe	32 W/m² and 16 W/m pipe

(source: VDI 4640)

Maximum specific energy extraction of vertical ground collectors

SOIL	max. specific energy extraction	
	at 1,800 hours/year	at 2,400 hours/year
GENERAL GUIDING VALUES		
weak soil (dry sediment, λ <1.5 W/m.K)	25W/m	20W/m
Solid rock with saturated sediment (λ = 1.5 - 3.0 W/m.K)	60W/m	50W/m
Solid Rock with high thermal conductivity (λ > 3.0 W/m.K)	84W/m	70W/m
ROCK TYPES		
Dry gravel, dry sand	< 25W/m	< 20W/m
Saturated gravel, saturated sand	65-80W/m	55-65W/m
Wet clay	35-50W/m	30-40W/m
Compact lime	55-70W/m	45-60W/m
Sandstone	65-80W/m	55-65W/m
Acid eruptive rock (e.g. granite, gneiss)	65-85W/m	55-70W/m
Basic eruptive rock (e.g. basalt)	40-65W/m	35-55W/m

(source: VDI 4640)

These values are approximate values and can vary due to local conditions.

In case of operating time longer than stipulated in the table (e.g. due to domestic hot water supply or heating of a swimming pool), the above mentioned extraction output has to be lowered not to exceed the calculated maximum yearly extraction amount to avoid freezing of the ground. It has to be noted here that local laws and regulations might be different and need to be taken into account when planning a geothermal system.

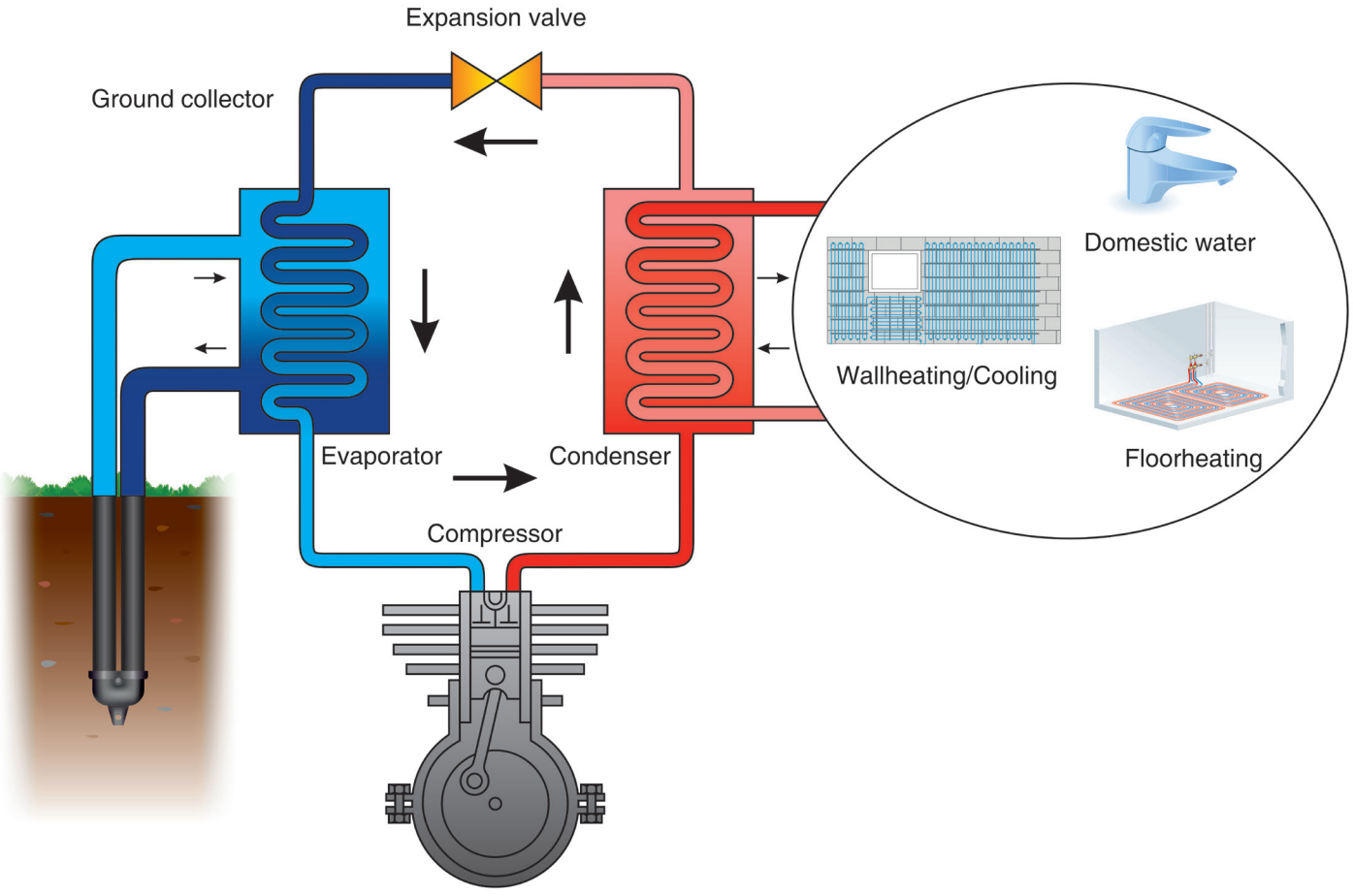
GEOTHERMAL ENERGY 9

FUNCTIONALITY OF A GEOTHERMAL SYSTEM

Geothermal systems usually consist of a collector loop which is horizontally or vertically buried in the ground, a heat pump which transforms the from the earth extracted energy into usable energy for heating or cooling and a low temperature heating or cooling system, i.e. surface heating or low temperature radiator heating.

The collector loop is filled with an anti-freezing liquid that warms up (or cools down) when travelling through the buried piping system, adapting to the earth's temperature. As usually the return temperature of the fluid of 3-8°C is not enough for direct heating, a heat pump is used to transfer the generated heat into usable heat for heating (or vice versa for cooling in summer).

In the heat pump a substance called a refrigerant carries the heat from one area to another. The refrigerant evaporates already at low temperatures and the evaporated refrigerant is fed into a compressor and becomes a high-pressure, high temperature vapor. On the discharge side of the compressor, the now hot and highly pressurized vapor is cooled in a heat exchanger, which passes on the heat of the vapor to the heating circuit, e.g. a floor or low temperature radiator heating system. The cooled and expanded vapor becomes liquid and the process starts over again. In summer, the process is reversed. The buried piping loop draws excess heat from the house and allows it to be cooled down.



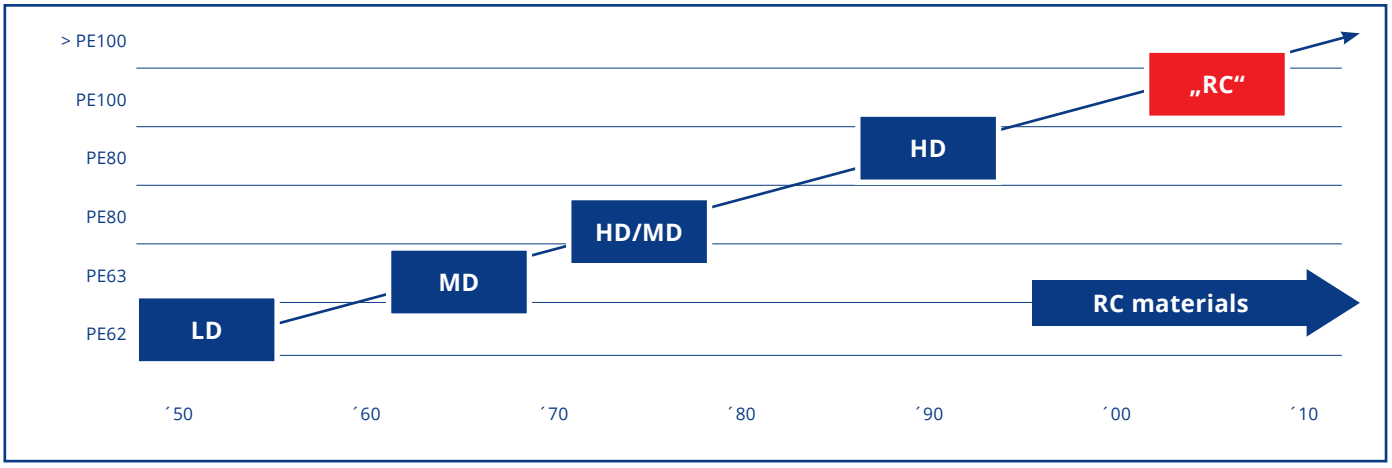
THE PIPE

The material used for the pipes that form the collector loops affects service life time, maintenance costs, required pumping energy, capital cost and heat pump performance. It is important to use high quality materials for buried ground collectors of all types.

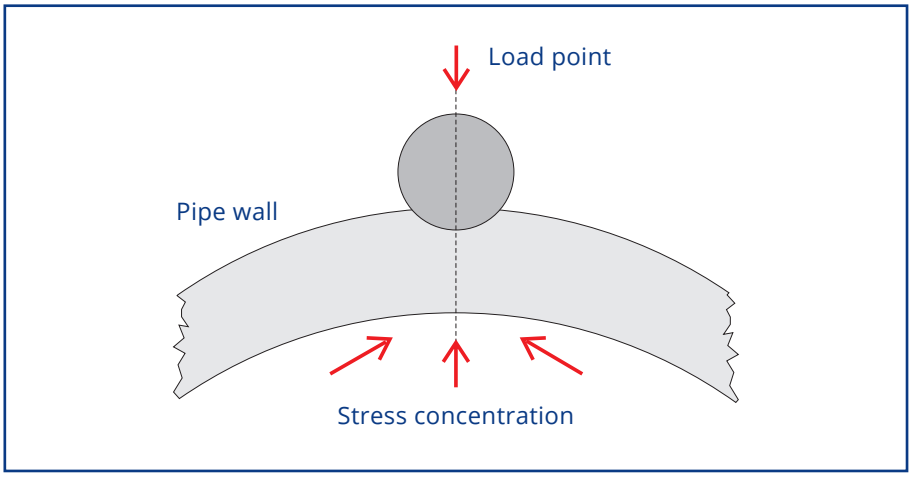
Already for a while, the industry has been taking advantage of plastic pipes, especially made of high density (HD) polyethylene. The unchallenged benefits of plastic pipes are their durability, corrosion resistance, hardiness, excellent hydraulic properties and a long life time. Professionals and environmentalists also appreciate the simple transport and installation, as well as the relatively low energy intensity of production which is a significant environmental benefit.

Along with this technological development, also the chemical industry now offers advanced solutions for this application. In recent times, the so called RC-PE ("resistant to crack polyethylene"), is the perfect raw material for manufacture of pipes for all types of ground collectors.

PE development stages



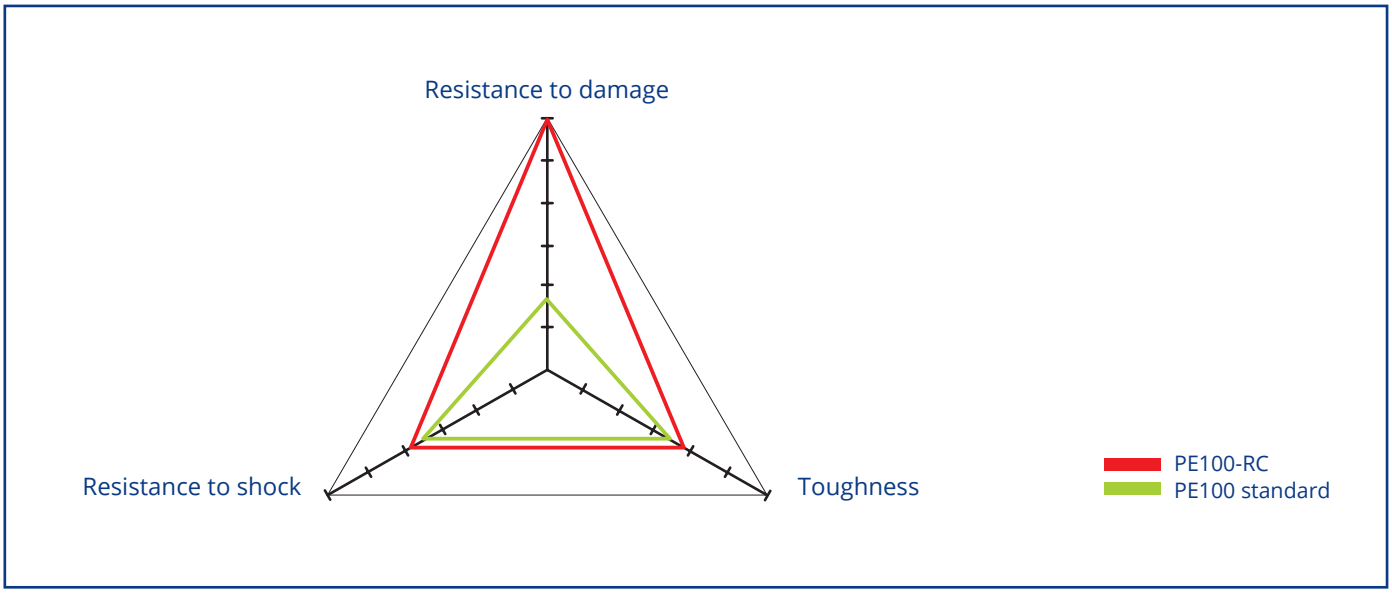
Point Load Test (PLT)



Pipelife pipes manufactured of RC material are stronger and therefore more reliable compared to conventional polyethylene. The RC material brings higher resistance to point loads and generally less risk of damage to the pipe during the process of installation and operation.

In order to be classified as "Resistant to Crack", the PE raw material must withstand the "Point Load Test" requirements according to the German technical rule PAS 1075 - no less than 8,760 hours.

Properties of „PE100 RC“ material in comparison with standard PE 100



Benefits of PE100RC pipe

- Long-term tightness
- Excellent resistance to slow crack growth
- Excellent resistance to stress corrosion
- High resistance to abrasion
- Lightweight
- Flexibility, unbreakable, frost resistance
- High bioavailability and corrosion resistance
- Excellent and stable hydraulic properties
- Ideal connection with the soil
- Great lengths without joints
- Environmental friendliness

The properties of RC-grade material notably enhance the wear behavior of pipes, both in terms of point load and crack growth. Simply speaking, the RC pipe ignores the effects of low-quality bedding material. Material and pipe test findings allow the use of bedding material without limitations as to the grain size (no-sand installation). RC pipes may also be used for easier no-dig installation techniques, such as ploughing, relining and similar.

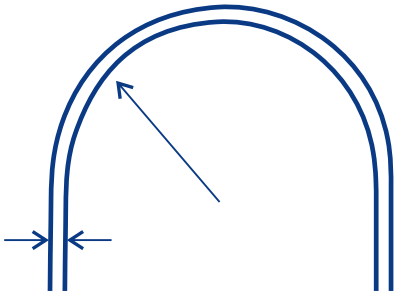
It is not necessary to replace soil for sand (dry sand is not very suitable because of low heat conductivity) during installation of PE-RC pipes, practically it is possible to use almost any kind of excavated soil. RC material saves users time and money during installation.

Although RC pipes are not susceptible to point load stress, during horizontal laying procedure it is advisable to remove larger stones, because due to the uneven contact in the given section the thermal conductivity of the soil will be worse, which can reduce heat transfer efficiency. In such event the pipe section could be squeezed which, in worst case, could significantly increase the hydraulic resistance. When backfilling the collector space, any formation of air pockets has to be avoided, as included air creates unnecessary thermal resistance, reducing the thermal conductivity and therefore the efficiency of the system.

Do not strew the soil on the pipe from high altitude to avoid damaging or squeezing the cross section or puncturing the pipe with sharp stones.

Handling notes for pipes: Although RC material has a higher damage resistance than ordinary PE, the pipes must be protected from unnecessary damage, for example from scratching or cutting when uncoiling the pipes from the reel on the construction site or from pulling pipes on the ground over sharp rocks. Proper bending must be carried out smoothly not to break the pipe, otherwise broken pieces must be cut out, which results in unwanted joints.

At 20°C air temperature the bending radius of the pipe must not be less than 20 times of the outer diameter



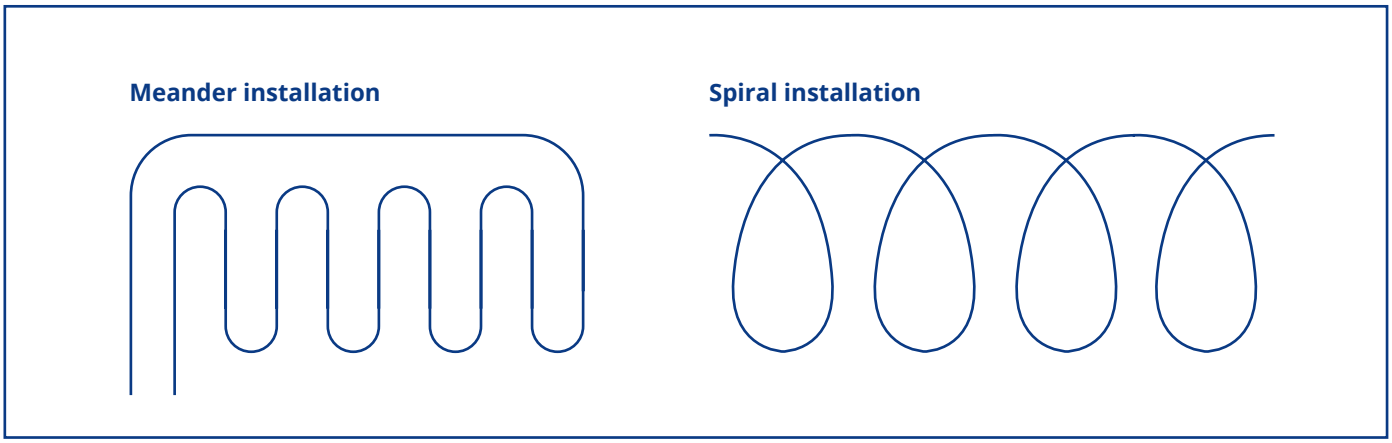
T°C	R
20	20 x D
10	30 x D
0	50 x D

Pipelife PE-RC pipes are suitable for horizontal and vertical ground collector applications, operating with most of the well known heat transfer fluids (containing antifreezers). In case of using special liquids please contact us and the producer of the fluid to ensure compatibility with the pipe.

THE HORIZONTAL GROUND COLLECTOR

Although different pipe diameters are used for horizontal collector installations the Pipelife PE100 RC collector pipe in dia 32 has proven to be the efficient solution for such applications. To keep the heat conductivity resistance as low as possible, pipes with lower wall thickness are preferred (PE 100). However, in order to properly connect the collector by means of electrofusion, the pipe has to be class SDR11 or lower.

Commonly, the collector pipe is installed in parallel (meander) loops with 100 to 200 meters length each, but other lengths are possible as well. In some cases, the collectors are also installed in spiral from. To ensure uniform flow, all collector loops within the same system should ideally have an equal pipe length. However, sometimes due to local circumstances or constructional reasons, loops with a different length need to be installed. In such case it has to be taken care that the maximum deviation of the lengths of the collector loops does not exceed 10%.



The lateral installation distance between the pipes depends on the dimension of the collector pipe and the soil conditions. The more moistly the soil, the bigger installation distance can be used. As a guiding value, the following distances can be applied:

Pipe diameter 40 - 80cm
Pipe diameter 32 - 70cm
Pipe diameter 25 - 40cm
Pipe diameter 20 - 30cm

Collector loops in dimension 20 and 25 are mainly used in case of soil with low thermal conductivity.

When installing the pipes, the minimum bending radius of 20x the outer pipe diameter (at 20°C) shall not be undercut.

Due to the RC material of the pipe, special bedding of the collectors is not necessary, however the placing of the pipes on sharp stones shall be avoided. Moistly ground and loamy soil are most ideal for proper heat extraction. In case of gravel soil, it is recommended to use a back-filling with fine soil approximately 10cm around the pipes to overcome the bad heat transfer of gravel and to ensure proper heat extraction from the soil to the collector loop.

The usual installation depth is between 1 and 1.5 meters. Higher depths are only recommended, in case the collector then can be placed in geothermal more favorable conditions, e.g. groundwater. Installation depths of more than 2 meters are generally not recommended, as the surrounding soil needs more time to regenerate. A minimum distance of 1m to cold and waste water discharge installations as well as to the base of buildings is recommended. The collector shall ideally be placed completely horizontally. In case due to local circumstances this is not possible, great care has to be taken to enable proper air release.

THE VERTICAL GROUND COLLECTOR

The vertical ground collector usually consists of one or two piping loops, made of polyethylene material through which the carrier fluid circulates. As these PE pipes cannot be bent in such a small radius to fit into the borehole and form a loop, they are connected by a U-piece at the bottom of the borehole. In case two loops (a double loop) are installed, the U-pieces are usually connected by screws or other fixing material to form a stable unit.

The installation process starts by drilling a borehole with mobile drilling equipment, which is often installed on a truck or trailer and therefore needs only minimum space. The diameter of the borehole depends on the diameter of the selected piping system, the number of loops and the diameter of the U-piece. Usually the diameter of the borehole is somewhere between 110 and 180mm. Drilling has to be done by professional companies. Pipelife can assist you to find the nearest driller to you.

Before inserting the vertical collector it has to be filled with water in order to avoid buoying upwards, caused by the specific gravity difference of the plastic pipe and the ground water. Depending on the market characteristics, there are two main ways to support inserting the collector loop: by attaching weights to the U-pieces or by using a pushing rod. This pushing rod is then often also used for filling the borehole with ideally thermally conductive grout, in case feasible and required. For this, Pipelife offers special grouting material.

To enable optimal heat transfer from the soil to the collector loop, distance holders are fixed to the piping loops in certain intervals to prevent the pipes from touching each other and to keep them as close as possible to the borehole's edge.

When selecting the place for drilling the borehole, local laws and regulations need to be taken into account, for example regarding the minimum distance from other boreholes or the property boundary. Additionally it might be necessary to obtain a geological expertise of the soil. During the drilling procedure soil samples have to be taken from various depths and a drilling protocol or drilling log has to be drawn up in which process data regarding ground water, drilling fluid circulation loss, drill head changes etc. have to be documented.

The vertical collector is the geothermal energy solution with the highest investment costs and also requirement for detailed planning and calculation. Additionally it frequently also requires approval form the respective authorities, depending on the local geographical conditions. On the other hand, the areas of application reach from single family homes to office buildings and large industrial constructions.

Within Pipelife we offer two vertical systems:

DUETA™

The DUETA™ collector loop consists of a 40mm PE 100 pipe with a wall thickness of 2.4mm, a butt-welded U-piece and an integrated weight. The supply and return pipes in this loop are connected by a 40mm flexible bridge (distance holder) on the complete length of the loop to ensure optimal heat transfer from the soil. Various loop lengths up to 300m and different weights can be ordered. This collector loop can currently not be extended to a 4 pipe system. We are happy to provide more technical information whenever required.

DUETA pipe,
bottom part with integrated weight

DUETA coil

To ensure highest quality, all Pipelife collectors are fully factory produced and especially the connection of pipe and U-piece is done with great care. Constant quality control ensures premium quality and performance of our products.

Within Pipelife we offer
two vertical systems:

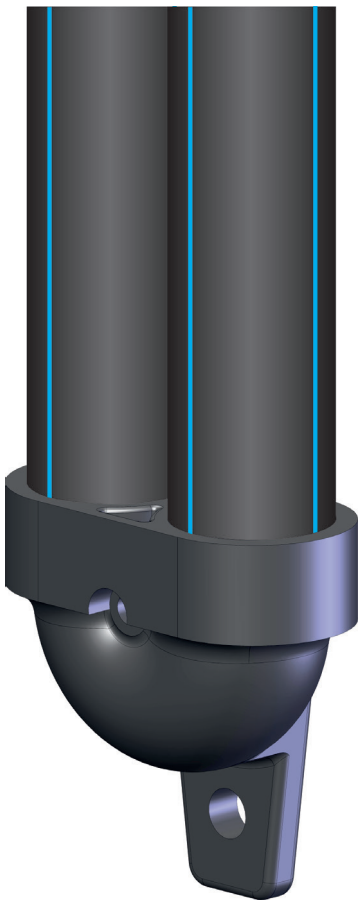
GEOLIFE®

The GEOLIFE® collector loop consists of a 32mm PE-RC pipe with a wall thickness of 3mm, a butt-welded U-piece and an external weight. Two of these collector loops can be connected to form a four pipe collector loop, which is used in many countries across Europe. To ensure perfect heat transfer from the soil, distance holders are inserted when the pipe is fed into the bore hole.

The U-shaped end piece is injection-molded, made of PE material. It is characterized by a very low flow resistance in the baffle section and offers high impact protection and compensation for the pipe end. On the bottom there is a fixing hole to screw two U-pieces together to form a four pipe collector loop.

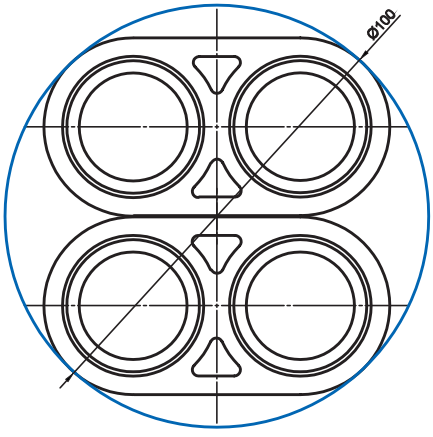
The hole on the bottom is also the connection point for the weight, which is a very important element of the system, supporting the installation procedure. In a few markets a pushing rod is used, but generally the simplest way to insert the collector loop is by sinking it with the help of a weight.

Another unique property of the GEOLIFE® ground collector is its small overall diameter. The four pipe DN32 collector including the weight can theoretically fit to a diameter 100mm borehole, due to the specially bended fixing plate for the weight. But in practice, we recommend a diameter 120mm drill for a smooth insertion of the collector loop. As there can be significant price differences for the drilling work depending on the diameter, having a smaller borehole can also contribute to save costs.

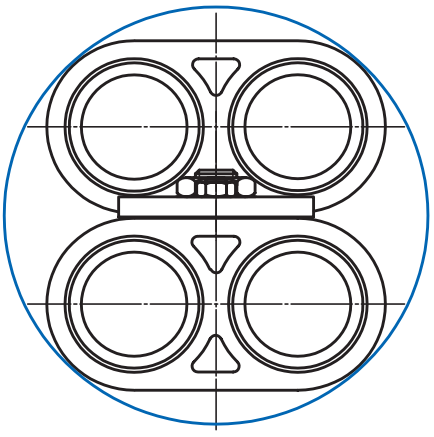


U-shaped end piece of the collector

Fixation of the weight



Top view without weight



Top view with weight

SPIRAL GROUND COLLECTORS

The „Bachner Energiesäule“ spiral ground collector comprises helical PE pipes made by Pipelife, which measure dia 25mm and are filled with a mixture of water and anti-freeze liquid (brine). The temperature gradient that is created between the brine and the ground surrounding is warmed by the brine.

Technical details:

Material: Pressure pipe made of PE 80, PN 12.5,
tested to Austrian standard ÖNORM EN12201
Pipe diameter: OD 25mm, thickness of pipe wall 2.3mm
External diameter: approx. 500mm
Fitted lengths available: 3.0m, 5.0m and 10.5m
Pipe length: 85m (3.0m), 150m (5.0m) and 300m (10.5m)
Pipe volume: 27.78l (3.0m), 49.02l (5.0m), 98.05l (10.5m)

Benefits:

- In comparison to flat plate collectors, ground probes take up less space and are therefore ideal for smaller spaces.
- Contrary to deep drilling, no special permission is required for ground probes.
- The spiral ground collector is simple to install and convenient to operate.
- There is a range of different installation options available, which can be used both to heat and to cool buildings.
- First class raw materials ensure a long life.

In normal conditions, standard construction machines can be used to install the 3.0m long ground probe. This can be dug into stable ground using a deep trench and an auger drill. 5.0m and 10.5m long ground probes can only be installed by professional drilling companies.

The extraction power achieved by the Bachner Energiesäule ground collector depends on the structure of the ground. Extraction ranges can be seen from the table below.

Length of collector probe (m)	3.0m	5.0m	10.5m
Extraction power (W)*	460 - 690	760 - 1,140	1,600 - 2,400

* depending on the soil structure and conditions

The calculation of extraction power is based on an annual average external temperature of 9 to 10° C, which corresponds to an average ground temperature in Central Europe at an altitude of up to 400m.

For more detailed information please contact us.

CHAMBERS AND DISTRIBUTORS

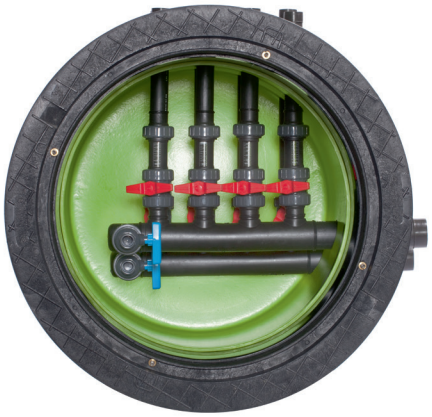
Depending on the size of the geothermal installation, collector loops of any kind of system are merged by means of a distributor, split into return and supply part. For single family homes, usually a distributor with 2-6 loop connections is sufficient. For bigger constructions, e.g. offices buildings or other commercial facilities, usually several distributors are combined, or a special industrial distributor is used.

To ensure proper ventilation the distributors shall be placed slightly higher than the collector installation. In case this is not possible due to constructional circumstances, a ventilation possibility (valve) has to be foreseen on the highest point of every collector loop. The distributor can be mounted in the house next to the heat pump, or outside the house in a collector chamber. To minimize condensation and also the amount of wall ducts needed to be installed we recommend placing the distributor into a chamber outside the house.

In Pipelife we offer various distributor possibilities for all types of collector loops:

- Two different PE distributor sets applying to any need, consisting of dia 63mm body with air vent, depending on type either 6/4" male thread or welding connection and PVC ball valves in supply and/or return side are available. The PVC ball valves have a 1" thread connection for the direct jointing with the collector loop, or, if required, for the connection to a flow meter. These distributors can be mounted into any chamber, e.g. our Pipelife manifold chamber. These distributors are also available with brass or plastic flowmeters. Mounting brackets not included.

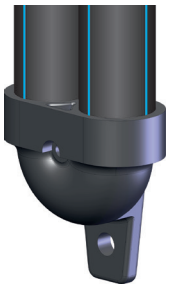
- A complete solution consisting of a distributor including ball valves on the supply side and plastic flowmeters on the return side mounted in a chamber with a walkable cover. On request brass flowmeters and a trafficable cover can be supplied. The whole set is already assembled and completely welded. The return and supply pipes in dia 32mm are premounted and jut out of the chamber ready for connection. These connections can easily be welded to the installed collector loops. Complex and time consuming mounting of the distributor and inevitable sealing of the pipe penetration through the chamber is inapplicable. This decreases installation time significantly. On request, the supply and return pipes and can be delivered in 40mm diameter. The chambers are available with 2-8 loop connections. More technical information can be obtained from the respective data sheets.



For connecting the distributor with the heat pump PE pipes in SDR11 or lower shall be used. Connection of the pipes shall be done by electrofusion or polyfusion welding.

GEOTHERMAL PRODUCT RANGE

HORIZONTAL COLLECTOR LOOP		
	100SDR11032EN100RC 100SDR11032EN200RC	GEOLIFE® collector loop; 100m or 200m; PE-RC pipe, dia 32x3mm

HORIZONTAL COLLECTOR LOOP		
	GL32X3-104M	GEOLIFE® collector loop completed with butt welded U-fitting. PE-RC material. Pressure tested and delivered under pressure. 104 meters, other lengths availbale on request.
	GL-DUE40x2,4-100	100m DUETA™ collector loop completetd with butt welded U-fitting and integrated weight. PE 100 material. Various lenghts and different weights. In some markets only available on request.

MANIFOLD		
	FK-V32/2 FK-V32/3 FK-V32/4 FK-V32/5 FK-V32/6	GEOLIFE PE manifold with Ø63mm body, stainless steel airvent, 6/4“ male connection, PVC ball valves on the supply and return and brackets. Mounting set not included and separately available.

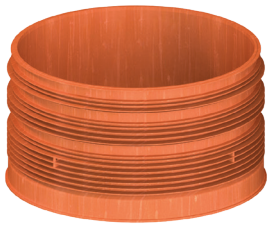
MANIFOLD W. FLOWMETER		
	FK-V32/2FL FK-V32/3FL FK-V32/4FL FK-V32/5FL FK-V32/6FL	GEOLIFE PE distributor consisting of dia 63mm body with air vent, with either 6/4“ male thread or welding connection and PVC ball valves on the supply and plastic (or brass) flowmeters on the return side. Mounting set not included and separately available.

FLOWMETER - BRASS		
	FLM-838	Brass flowmeter with 1“ male connections and shut off ball valve. Flowrate: 8-38l/min.

FLOWMETER - PLASTIC		
	FLM-540PL	Plastic flowmeter with 1“ male on one side and a 1“ female connection on the other side; Flowrate: 5-40l/min, other flow rate ranges available on request; more information available in the respective data sheet.

BALL VALVE		
	GCSPVCBM32X1“ GCSPVCBM40X5/4“ GCSPVCBM50X6/4“ GCSPVCBM63X2“	INTERNAL SCREW 1“ D 32 MM INTERNAL SCREW 5/4“ D 40 MM INTERNAL SCREW 6/4“ D 50 MM INTERNAL SCREW 2“ D 63 MM

PE ADAPTER FOR BALL VALVE		
	PE100SDR1132TOLDAT PE100SDR1140TOLDAT PE100SDR1150TOLDAT PE100SDR1163TOLDAT	PE adapter dia 32 PE adapter dia 40 PE adapter dia 50 PE adapter dia 63

CHAMBER FOR MANIFOLD, Dia 800mm		
	800BAZISFENEK1 8M500 DW800MUA-FEDEL RS8AKNATOMITES	Base ring, D800mm, H460mm Riser ring, D800mm, H500mm Cover, step resistant Rubber seal for riser ring

DISTRIBUTOR CHAMBER SET GEOEASY		
	GL-EASY2 GL-EASY3 GL-EASY4 GL-EASY5 GL-EASY6 GL-EASY7 GL-EASY8	Complete solution consisting of distributor and chamber. Assembled and completely welded. Pre-mounted return and supply pipes. 2-8 loop configurations available. Connection in dia 40mm available on request. More information on the technical data sheet.

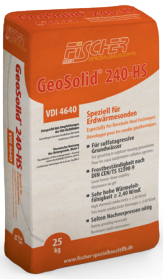
DISTRIBUTOR CHAMBER SET GEOTERRA		
	GL- TERRA2 GL- TERRA3 GL- TERRA4	Complete solution consisting of distributor and chamber. Assembled and completely welded. Pre-mounted return and supply pipes. 2-4 loop configurations available. Connection in dia 40mm available on request. More information on the technical data sheet.

DISTRIBUTOR CHAMBER SET GEOBASIC		
	GL-BASIC2 GL-BASIC3 GL-BASIC4	Complete solution consisting of distributor and chamber. Assembled and completely welded. Pre-mounted return and supply pipes. 2-4 loop configurations available. Connection in dia 40mm available on request. More information on the technical data sheet.

Y-PIECE		
	TMU40/32/32	Socket welded PE Y-piece for uniting two Ø32mm collector pipes.

DISTANCE HOLDER		
	GL32-SP	Distance holder for providing fixed gap between collector pipe supply and return side. Accomodates 4 pipes and a grouting pipe in the middle.

SINKING WEGHT		
	GL32-WT	Sinking weight for the GEOLIFE collector loop, 17kg.

GROUTING MATERIAL		
	GL-GEO235	GeoSolid® 235 is especially designed for the grouting of borehole collectors in sulphate-bearing groundwater and incorporates all favourable characteristics in one product. It can be used for all kind of grouting and soil solidifcation; enhanced thermal performance with a thermal conductivity ≥ 2,35 W/mK.
	GL-GEO240	GeoSolid® 240HS is especially designed for the grouting of borehole collectors in sulphate-bearing groundwater.It can be used for all kind of grouting and soil solidifcation; enhanced thermal performance with a thermal conductivity ≥ 2,40 W/mK; resistant to seawater and dissolved carbon dioxide.

COMPRESSION FITTINGS

COUPLER		
	PEM032X032U PEM040X040U PEM050X050U PEM063X063U PEM075X075U	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

COUPLER WITH EXTERNL (MALE) THREAD		
	PEMGA32X3/4“U PEMGA32X1“U PEMGA32X5/4“U PEMGA40X1“U PEMGA40X5/4“U PEMGA40X3/2“U PEMGA40X2“U PEMGA50X3/2“U PEMGA50X2“U PEMGA63X3/2“U PEMGA63X2“U PEMGA75X2“U PEMGA75X5/2“U PEMGA75X3“U	Dia 32, 3/4“ connection Dia 32, 1“ connection Dia 32, 5/4“ connection Dia 40, 1“ connection Dia 40, 5/4“ connection Dia 40, 3/2“ connection Dia 40, 2“ connection Dia 50, 3/2“ connection Dia 50, 2“ connection Dia 63, 3/2“ connection Dia 63, 2“ connection Dia 75, 2“ connection Dia 75, 5/2“ connection Dia 75, 3“ connection

ELBOW 90°		
	PEW90F032X032U PEW90F040X040U PEW90F050X050U PEW90F063X063U PEW90F075X075U	Elbow 90°, dia 32 Elbow 90°, dia 40 Elbow 90°, dia 50 Elbow 90°, dia 63 Elbow 90°, dia 75

COUPLER WITH INTERNAL (FEMALE) THREAD

PEMGI32X3/4“U	Dia 32, 3/4“ connection
PEMGI32X1“U	Dia 32, 1“ connection
PEMGI32X5/4“U	Dia 32, 5/4“ connection
PEMGI40X5/4“U	Dia 40, 5/4“ connection
PEMGI40X3/2“U	Dia 40, 3/2“ connection
PEMGI50X3/2“U	Dia 50, 3/2“ connection
PEMGI50X2“U	Dia 50, 2“ connection
PEMGI63X3/2“U	Dia 63, 3/2“ connection
PEMGI63X2“U	Dia 63, 2“ connection
PEMGI75X2“U	Dia 75, 2“ connection
PEMGI75X5/2“U	Dia 75, 5/2“ connection

REDUCER

PER32X20U	Reducer 32x20
PER32X25U	Reducer 32x25
PER40X25U	Reducer 40x25
PER40X32U	Reducer 40x32
PER50X25U	Reducer 50x25
PER50X32U	Reducer 50x32
PER50X40U	Reducer 50x40
PER63X32U	Reducer 63x32
PER63X40U	Reducer 63x40
PER63X50U	Reducer 63x50
PER75X32U	Reducer 73x32
PER75X40U	Reducer 75x40
PER75X50U	Reducer 75x50
PER75X63U	Reducer 75x63

T-PIECE

PET90F032U	Dia 32
PET90F040U	Dia 40
PET90F050U	Dia 50
PET90F063U	Dia 63
PET90F075U	Dia 75

REDUCTION T-PIECE		
	PETR32X25X32U PETR40X32X40U PETR50X40X50U PETR63X50X63U PETR75X63X75U	Dia 32x25x32 Dia 40x32x40 Dia 50x40x50 Dia 63x50x63 Dia 75x63x75

END PIECE		
	PEK032U PEK040U PEK050U PEK063U PEK075U	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

SADDLE		
	PE-ABO63X3/4“U4 PE-ABO63X1“U4 PE-ABO63X11/2“U4 PE-ABO75X3/4“U4 PE-ABO75X1“U4 PE-ABO75X11/2“U4 PE-ABO75X2“U4	Dia 63, 3/4“ connection Dia 63, 1“ connection Dia 63, 3/2“ connection Dia 75, 3/4“ connection Dia 75, 1“ connection Dia 75, 3/2“ connection Dia 75, 2“ connection

ELECTROFUSION FITTINGS

EF COUPLER PE100 SDR11		
	K032PE100SDR11 K040PE100SDR11 K050PE100SDR11 K063PE100SDR11 K075PE100SDR11	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

EF ELBOW 45° PE100 SDR11		
	W3245PE100SDR11 W4045PE100SDR11 W5045PE100SDR11 W6345PE100SDR11 W7545PE100SDR11	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

EF ELBOW 90° PE100 SDR11		
	W3290PE100SDR11 W4090PE100SDR11 W5090PE100SDR11 W6390PE100SDR11 W7590PE100SDR11	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

EF T-PIECE PE100 SDR11		
	T32PE100SDR11 T40PE100SDR11 T50PE100SDR11 T63PE100SDR11 T75PE100SDR11	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

EF END-PIECE PE100 SDR11		
	PE100K032SDR11 PE100K040SDR11 PE100K050SDR11 PE100K063SDR11 PE100K075SDR11	Dia 32 Dia 40 Dia 50 Dia 63 Dia 75

EF REDUCER PE100 SDR11		
	PESZ-E040-032 PESZ-E050-032 PESZ-E050-040 PESZ-E063-032 PESZ-E063-040 PESZ-E063-050	Reducer, dia 40x32 Reducer, dia 50x32 Reducer, dia 50x40 Reducer, dia 63x32 Reducer, dia 63x40 Reducer, dia 63x50

EF SADDLE PE100 SDR11		
	PEMECSH063-63 PEMECSH075-63	Saddle, dia 63x63 Saddle, dia 75x63

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