

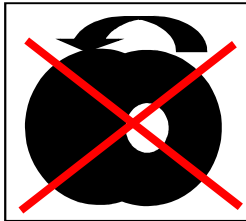
Installation instructions

FRANK geothermal probes PE 100-RC

General information

- FRANK geothermal probes made of quality PE 100-RC, SDR 11 are completely factory assembled and monitored by the MPA Darmstadt (State Materials Testing Institute Darmstadt) in accordance with VDI 4640 and SKZ Directive HR 3.26.
- Each probe is marked with its own probe number. You can enter the probe number at www.frank-gmbh.de to access the test certificate.
- The geothermal probe pipes have length markings. The marking includes "Total probe length – running metre", starting at the probe foot.
- The geothermal probes must be installed professionally according to the corresponding state of the technology and according to the applicable guidelines (e.g. VDI 4640 and DVGW W-120).
- The particular guidelines of each country for use of geothermal energy and the requirements of the approving authorities must be taken into consideration.

Unloading, transport, inspection:



- FRANK geothermal probes are delivered shrink-wrapped on a pallet. The serial number is indicated on a label on the probe foot and affixed on the packaging.
- The probe pallet must be unloaded using a crane or fork-lift truck.
- Coiled bundles must be checked for transport damage.
- The probes must be stored on pallets on the site.
- To avoid damaging the probe, it is not permitted to transport the coiled bundles by pulling or rolling them over the ground.
- To make the probes easier to transport or to use them as a single probe, the probe can be divided into two halves. To do so, loosen the connecting screw on the probe foot.

Preparation for installation:



- Check the geothermal probe for signs of damage prior to installation.
- To differentiate between the supply pipe and return pipe, each circuit on the probe is marked with a blue and a red end cap.
- Carry out a pressure test before inserting the probe.
- Place the geothermal probe on the coiler (Haspel).
- For fixing of the weights, assemble the FRANK insertion tool on the probe foot. (See assembly instructions for the insertion tool).
- An insertion rod can be centred over the bushing at the upper end of the insertion tool.
- Attach the filling pipe above the probe foot.

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Installation:

- Geothermal probes must be inserted immediately after drilling each single hole.
- To prevent the probe from floating in the borehole that is filled with water and when backfilling the borehole, fill the probe with water and load it with a weight.
- If you are using insertion rod, you must insert the probe manually.
- If you have long probe lengths and boreholes without or with a low water level, the maximum permitted internal pressure must not be exceeded with the water filling.
- It is essential to adjust the water filling in the probe to the water line in the borehole or to the filling level of the injection suspension.

Spacers:

- To reduce the mutual thermal influence of the probe pipes, we recommend using spacers.
- To separate the pipes well, use spacers at a distance of 1.5–2 m apart.

Filling the borehole:

- Before filling the borehole, the geothermal probe must be filled with water and closed so that it is pressure-tight.
- The annular space must be filled professionally and completely using a suitable suspension (according to VDI 4640) from the probe foot to the top of the borehole. The injection must ensure a durable, physical and chemical strong bonding in the surrounded stones.
- It may be necessary to fill the probe with water according to the progress of the injection to avoid exceeding the permitted internal pressure of the probe if you have a dry borehole with a long probe.
- If pipes are not closed, the maximum permitted buckling pressure for the probe pipe must not be exceeded by the injection pressure.

Permitted outer over pressure (buckling pressure) for FRANK geothermal probes d 32 mm and d 40 mm PE 100-RC

Temperature 10°C	Temperature 30°C
8.8 bar	6.5 bar

* The increase in temperature during the hardening process depends on the filling material used. Interim values may be interpolated.

Pressure and functional test:

- Immediately after filling the borehole, a pressure and flow test must be carried out for each probe according to VDI 4640.
- Testing conditions according to VDI 4640, sheet 2: min. test pressure 6 bar, preload 30 min., test time 60 min., tolerated pressure loss 0.2 bar.
- The data must be recorded in a pressure testing and acceptance report.
- Before start-up, the overall system must be pressure tested with 1.5 times the operating pressure according to the requirements of VDI 4640.
- To avoid polluting the brine circuits, all probe pipes must be closed tight until further pipe connection.
- The pressure tests for the geothermal probes and for the overall system must be carried out according to VDI 4640, section 5.2.3 and 5.2.7, as well as the DVGW Worksheet W400-2 or DIN EN 805.

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Pipeline connection

- Geothermal probes must be connected individually to a manifold/manhole according to VDI 4640.
- The connection to the horizontal connecting pipes can be made using electro fusion fittings or press fittings.
- If the probe pipes are shifted from a vertical to a horizontal direction, the permitted bending radius must be observed to avoid snapping the pipe line.
- We recommend welding connections and elbow fittings or multi bends.
- The probe pipes must be cut at right angles using a suitable tool.
- To prepare for welding, the probe pipes must be peeled using a rotational scraper.
- The welding connections must be produced in accordance with the applicable DVS and DVGW guidelines for welding of plastic pipes.
- The manufacturer's processing information for the parts used must be observed in all cases.

Flushing, ventilation:

- The individual probe circuits must be flushed and ventilated until no air remains.
- The individual geothermal probes must be adjusted to the same flow rates on the manifold.