

Ground source heat pump



What is a ground source heat pump?

Even in the coldest climates, geothermal heat is present in the ground resulting in a fairly constant temperature of 10°C at depth of five metres. This trapped energy represents a source of heat that the ground source heat pump at the heart of our system can tap into to heat the home.

Using either a ground probe or a surface collector just below the surface, a water/anti-freeze mixture called 'brine' is pumped round the circuit as a heat transfer medium. The brine then passes into the heat pump unit itself where the heat is transferred to a low evaporation point refrigerant that is compressed to produce heating or domestic hot water.

Why choose a ground source heat pump?

The simple answer is because it is more efficient than an air-to-water heat pump when the average winter ambient temperature drops below 3°C.

For example, as in the Oslo region more than 70% of heating occurs when the outdoor temperature is below 3°C, the ground source heat pump is the most efficient solution, thanks to having access to a stable energy source that is unaffected by the ambient temperature.

In addition, the Daikin Altherma ground source heat pump has very stable heating capacities at low ambient temperatures and there is no need for an outdoor unit. This delivers two major benefits: firstly, it is easier to install as there is no outdoor unit involved and so no refrigerant connections need to be made, and secondly, there is no de-frost cycle involved and this increases the total indoor comfort levels.

Making a difference

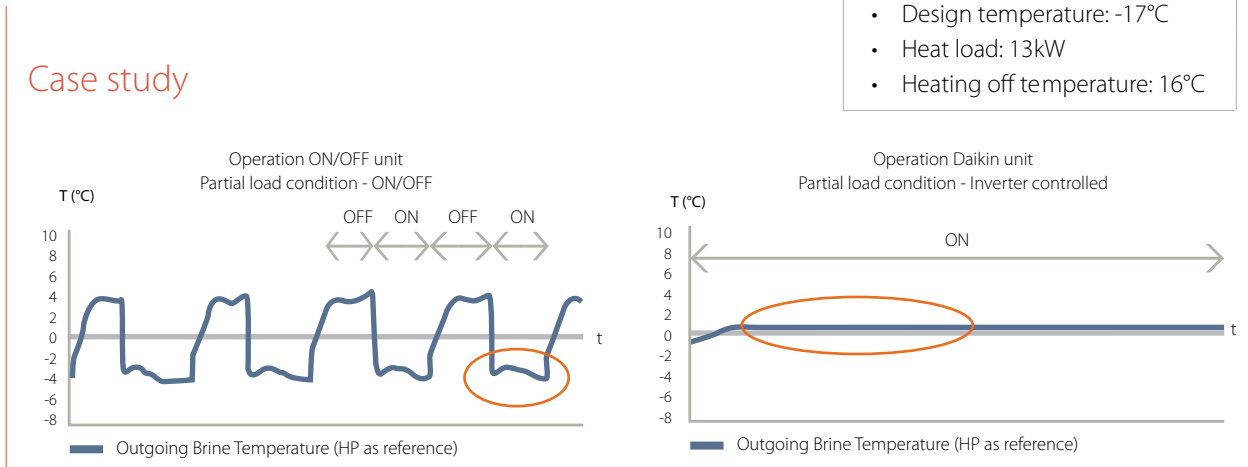
Due to high efficiencies resulting from our inverter technology, the Daikin Altherma ground source heat pump provides a leading edge performance in comparison to the on/off units that make up the majority of the market.

→ 1. HIGH SEASONAL EFFICIENCY THANKS TO OUR INVERTER HEAT PUMP TECHNOLOGY

The Daikin inverter heat pump technology has been shown to provide an increase in seasonal efficiency of up to 20% when compared to traditional on/off ground source heat pumps.

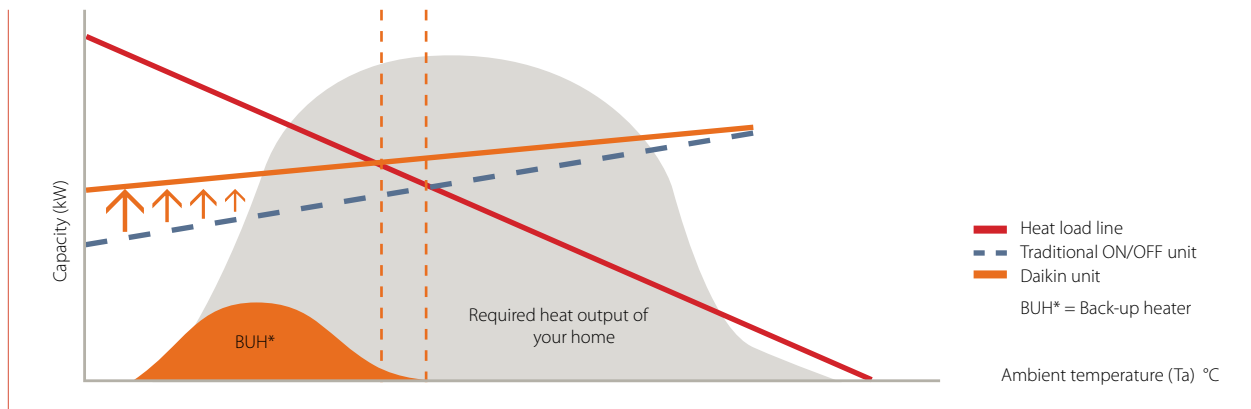
- The brine, a water/anti-freeze mixture that operates as heat transfer medium between the ground and the heat pump, is kept at a higher stable temperature
- Back up operation is reduced to a minimum
- High operating efficiencies of the compressor are reached at partial load operation, i.e. when no full capacity of the unit is required.
- This results in **reduced running costs** and a **faster return on investment**.

Higher brine temperatures during continuous compressor operation, in partial load conditions



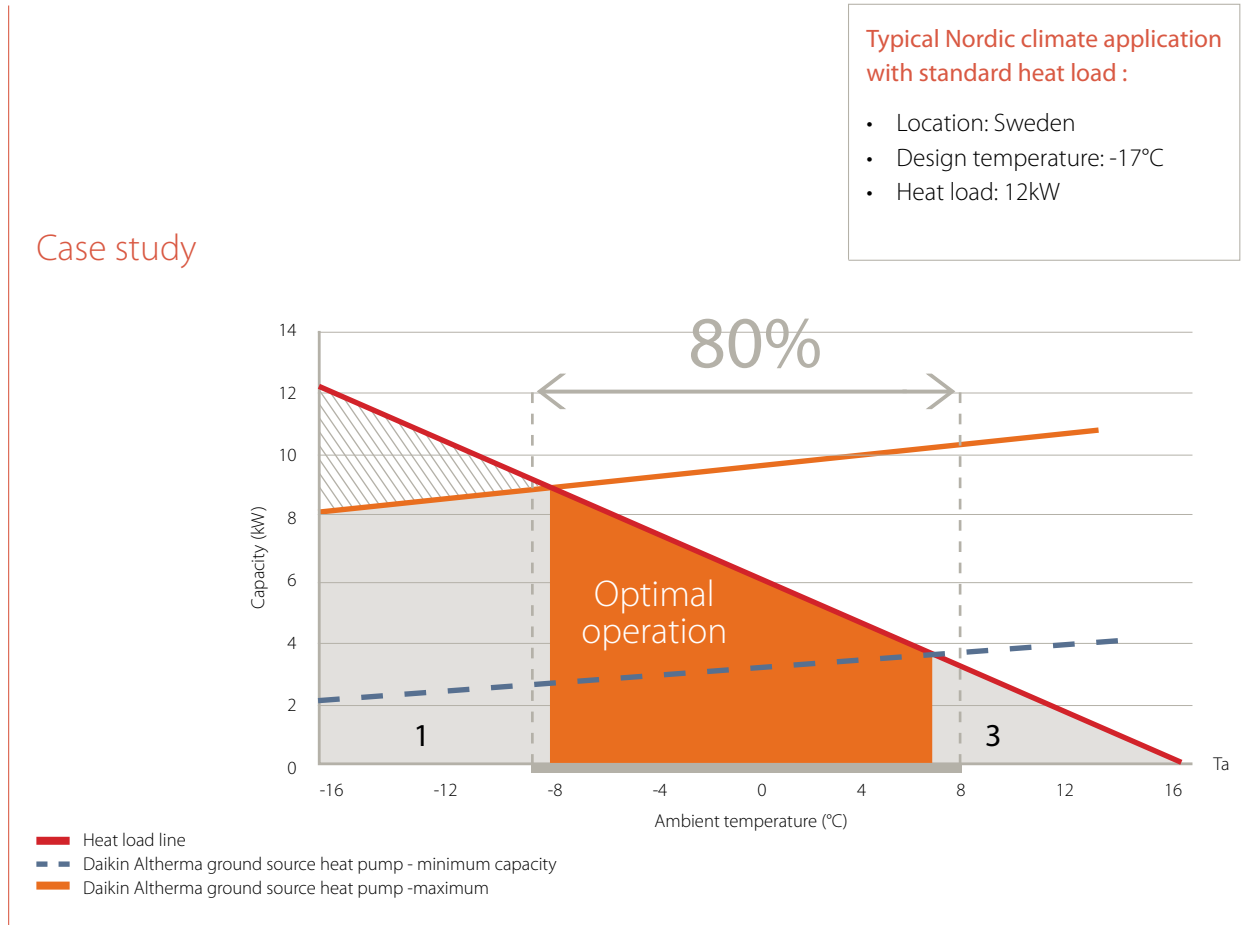
When no full capacity is required of the system the compressor works in partial load. In partial load conditions, a traditional on/off ground source heat pump sequentially switches ON and OFF, whereby the brine temperature decreases down to -4°C when the unit is operating. Daikin's inverter technology results in a stable outgoing brine temperature of around 0°C. This increased stability in brine temperature results in a higher and more constant evaporating temperature which leads to higher operating efficiencies.

Less back up heater operation thanks to the boosting of the inverter compressor frequency



Compared to a traditional On/Off unit, the requirement for support from the back up heater is much lower for the Daikin Altherma ground source heat pump, thanks to the boosting effect of our inverter compressors, also this leads to lower running costs.

Big partial load operation at relevant ambient conditions



- 1 Full load operation with additional electric assistance (if required): the heat load is higher than the maximum heating capacity
- 2 Partial load operation: the heat load is lower than the maximum heating capacity and higher than the minimum heating capacity. This is the optimal operation zone. The compressor will reduce its operating frequency to deliver the exact required capacities with high operating efficiencies.
- 3 On/Off operation: The heat load is below the minimum heating capacity, therefore the unit will go into On/Off mode to deliver the required capacity.

In a Nordic climate, around 80% of the required heat output has to be delivered in an ambient temperature range between -9°C and 8°C, indicated by the orange zone.

To deliver a high seasonal Coefficient of Performance (COP), it is crucial to have high operating efficiencies for this ambient temperature range as the majority of the required heat has to be delivered within this temperature range. As you will see, thanks to its wide modulating range, the Daikin Altherma ground source heat pump almost completely covers the relevant ambient temperature range whilst in partial load operation, which is the optimal operational zone of the unit. This is, of course, a major benefit compared to traditional On/Off compressors.



→ 2. QUICK AND EASY INSTALLATION INCLUDING A DOMESTIC HOT WATER TANK

To keep things simple, the domestic hot water tank is factory-fitted, thus reducing the installation time and with the pipework connections on the top of the unit it is very easy to connect.

The overall weight of the unit is reduced to facilitate ease of shipping and installation.

→ 3. COMPACT INDOOR UNIT WITH PLEASING DESIGN

- The full integration of heat pump module and domestic hot water tank keeps the footprint very compact
- High quality design helps the unit blend in with other household units

The footprint of the integrated unit is 728mm x 600mm - about the same as a normal household appliance - and at 1800mm high, it fits neatly in any standard room. A further benefit to both the installer and the user is that only 10mm side clearance is required and all the pipework connections are on top of the heat pump unit.





→ 4. NEW USER INTERFACE

- Quick commissioning: the installer can program all the settings for an installation on a laptop computer and then simply upload them to the controller during commissioning. This not only reduces on-site time, but allows the installer to use similar setting on similar installations.
- User-friendly room thermostat functionality: the user can raise or lower water temperature as a function of the actual room temperature, resulting in a more stable room temperature and higher comfort levels.
- Energy management functionality: the controller displays both the output and input energy of the unit allowing the user to manage their energy consumption more accurately.
- Easy servicing: the controller records the time, date and nature of the last 20 Error occurrences enabling quicker diagnostics and maintenance.

