

Fact Sheet

Page (s) █ █

Facts at a glance:

Space Heating Load

Kensa recommend 100% of the space heating load is met by the heat pump. This approach has been adopted by the Heat Pump Association.

Sizing the Heat Pump

Heat pumps should be sized using a SAP report, as an initial estimate for a new build property a heat loss of 40W/m² can be used.

Domestic Hot Water

This is more complicated to size and depends on a number of factors. The heat pump size does not generally need to be increased in size, however due to the additional load on the ground the ground arrays do need to be increased in size and quantity.

Slinky Ground Arrays

For every 10m of slinky results in 1kW of energy being produced at the heat pump.

Boreholes

Boreholes are more dependant on ground conditions and a 100m borehole will produce around 3-5kW of energy.

Older Properties

Sizing heat pumps for older properties is more complicated as the insulation figures are generally not known. A SAP report is therefore required as well as a survey of the heating distribution system.

SAP

A SAP report will calculate an energy efficiency rating of the building by considering factors such as fabric insulation and air permeability specifications.

Sizing Kensa Compact Heat Pumps

Kensa always recommend that Compact heat pumps be sized to match the full heat losses of a building and this approach has now been adopted by the Heat Pump Association.

If a SAP report has still to be produced, a useful 'rule of thumb' for all new build applications, is to multiply the floor area by **40W/m²** to produce an estimated peak heat loss for a building which is insulated to current Building Regulations.

For insulated retrofit applications, a 'rule of thumb' is to multiply the floor area by **50W/m²**. Even with a well insulated retrofit project, retrofit projects will generally have a higher heat loss than a new build project.

The heat loss of an un-insulated building will range from 60–100W/m². These buildings should be carefully considered with regards to ground source heat pumps, as they may struggle to be heated adequately via the lower floor temperature associated with heat pumps.

A SAP report is required for all new build residential projects as part of the building regulations process. Kensa would recommend a SAP report is also provided for retrofit properties to ensure the heat pump is accurately sized. In brief, a SAP report will calculate an energy efficiency rating of the building by considering factors such as fabric insulation and air permeability specifications, the efficiency and control set-up of the heating system and the property's solar gain characteristics.

For SAP2005, the key figure found on line number 37 of the SAP worksheet, is the 'heat loss coefficient' which should be multiplied by 24°C (the difference between the 'worst case' external temperature—assumed to be -3°C for most regions - and the required internal design temperature - assumed to be 21°C.)

For SAP2009, the heat loss coefficient is split by month, and is now found on line 39. To size the heat pump simply take the highest figure, usually January, and multiply by the design temperature as above.

The domestic hot water load is more complicated to calculate as this depends on many factors such as occupancy, usage, recovery times and client expectations. However as the heat pump can either be in space heating or DHW mode, there is no need to increase the output of the heat pump for normal DHW usage. Although as the DHW load is all year round, this puts an additional load on the ground and the size of the ground arrays need to be increased by approximately 30%.

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Sizing Kensa Compact Heat Pumps

Most ground source heat pumps use a *closed-loop* ground array system, such as Slinky's or boreholes, which use the ground as a solar battery. This is an exhaustible source of heat energy that needs to be recharged, for example, every time it rains, and through the warmer summer months. The design of *closed-loop* systems must match the heating requirements of the building.

For space heating, the figure presently used in the UK is **10 metres of horizontal Slinky trench for every 1kW** of heat delivered from the heat pump, and for vertical systems, one 100 metre borehole should deliver between 3 and 5 kW of heat delivered from the borehole which means a single borehole is often sufficient for smaller properties.



Care must be taken to ensure the correct borehole depth is specified and Kensa partners with the country's leading thermo-geologists to provide bespoke designs based either on desk evaluation or thermal response tests .

As a product manufacturer, Kensa does not provide a borehole contracting service but has developed relationships with leading companies who have extensive experience and a wide range of rigs to suit all conditions. In most cases, the drilling contractor takes responsibility for provision of the ground probe, the thermal grout and trenches back to the property to leave a pair of tails adjacent to the manifold location for the installation contractor.

For horizontal ground arrays, the amount of solar radiation landing at any point on the earth's surface depends on latitude and climate – not soil type. So, the amount of energy available from a horizontal slinky ground array does not vary greatly depend on soil type – although different soil types will have different thermal conductivities. Generally, wetter ground is preferred as this improves thermal transfer.

Maximum use of off-peak electricity is advised, by starting the heat pump at the beginning of the off-peak period and running through until the thermostat is satisfied or the off-peak period ends. At times where the heat pump may have to run outside of these off-peak periods, many people prefer to light a wood burning stove using this as supplementary heating and avoid turning the heat pump on during peak electricity periods. However, even in these circumstances, the heat pump/ground arrays must still be sized to meet 100% of the heating requirement of the property.

For older properties, it is more difficult to calculate how much heat is required due to the lack of details on the insulation levels of the property. Once again a SAP report would be required for an existing building and a specialist SAP assessor who is trained in producing SAP's for existing buildings should be sort. Many existing buildings will also be heated using radiators, this will lower the efficiency of the system due to the higher flow temperature required and even at these higher temperatures the radiators may be undersized to provide the required heat into the building. A radiator survey from a heating engineer is recommended to ensure that the radiators are of sufficient size.