Fact Sheet

Sizing Kensa Compact Heat Pumps

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.

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. Kensa do not make any deductions from the size of the heat pump because there is another heating appliance fitted, such as a wood burning stove – or an electric "flow boiler" or "immersion heater". The only exception is for *open-loop* systems, where the temperature of the ground loops will not fall as a result of excessive heat pump run time.

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. From a design perspective, the heat pump sits between the ground arrays and the building, but unlike the ground arrays, the heat pump is rated 24/7.

Heat pumps should always be sized to handle the peak space heating load as calculated in the SAP report required for all new build residential projects. 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.

The key figure is number 37, the 'heat loss coefficient' which should be multiplied by 24 (the difference between the 'worst case' external temperature—assumed to be -3C for most regions - and the required internal design temperature - assumed to be 21C.

If a SAP report has still to be produced, a useful 'rule of thumb' 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. It is therefore reasonably straightforward to calculate an approximate size of a space-heating appliance for a new UK building because in order to comply with the Part L of the current Building regulations.

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

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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%.

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 greatly depend on soil type – although different soil types will have different thermal conductivities.

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.