Heat Pump Operating Temperatures

The higher the output flow temperature from a heat pump, the more energy the heat pump will use, and the higher the running cost will be. Equally well, the better insulated a building, the lower the flow temperature required into the heating system to achieve target temperatures. The test point for heat pumps (EN14511-2) is usually quoted as 0°C coming in from the ground arrays, and 35°C for the flow temperature into an underfloor heating system.

All Kensa heat pumps are shipped with the *return water temperature setpoint* set at 30°C, which is ideal for underfloor systems mounted in screed. This corresponds to an approximate flow temperature of about 35°C. This is only approximate as the flow rate changes (as zones open or close) and the *delta t* (or difference between feed and return temperatures from the distribution system) also changes. A flow temperature of 35°C should be more than sufficient to heat a *well-insulated* building using underfloor mounted in screed, to its Part L design temperatures. If the building is not well insulated then a higher flow temperature would be required reducing the efficiency of the heat pump.

If the underfloor is not mounted in screed (i.e. the first floor construction is joisted) then it maybe required to run the heat pump at slighter higher temperatures to drive the heat through the floorboards and any floor coverings. This can be achieved by reprogramming the control following the instructions within the manuals. If the heating distribution system is radiators then the flow temperature again will need to be raised higher. However if the return temperature setpoint is raised too high (above 50°C), either because the occupants want a to exceed Part L design temperatures, or the building is not well insulated - then the heat pump will not just run less efficiently, it also means that the heat pump will run for longer. This will extract more heat from the ground arrays than their design intended (cooling them down further). There is also a danger that even if the heat pump can provide the correct power to the system, due to the low flow temperatures, the heating distribution system will not be able to provide the heat into the building.

The ground is used as a battery. If too much energy is taken in the first half of the winter from the ground or by running the heat pump for too long, then the output will fall later in the winter as the ground arrays get colder and colder. In extreme situations, the ground arrays will get so cold that the antifreeze protection (generally down to –10°C) will be insufficient. Simply adding more antifreeze would not cure the problem, as the viscosity would increase, and the specific heat capacity of the fluid would decrease, so a larger ground circulation pump could also be required.

Facts at a glance:

Poorly Insulated Buildings

These will require higher flow temperatures meaning the heat pump will run for longer and at a lower efficiency. Due to the low flow temperatures compared to oil or gas boilers in very poorly insulated buildings the heating system might not be able to provide the required heat into the building even if the heat pump is sized correctly.