

Air Source Heat Pumps Frequently Asked Questions

Want additional information?

If you wish to find out more about any of the topics in this booklet or your question has not been answered then please contact us at GreenPower Energy Limited by;

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What are the benefits of Air Source Heat Pumps (ASHP) over Ground Source Heat Pumps (GSHP)?

There are a number of benefits when using an ASHP. Capital cost is lower as the ASHP's are normally self-contained units without additional heat transfer requirements such as ground pipe work. This also means that installation costs are lower as the ASHP simply needs siting in an appropriate position and connecting to the mains supply electricity and building wet system; whereas a GSHP will require significant ground works, either bore holes or deep furrows. This type of work is not always possible on existing buildings due to limited access and is always costly. New technology has enabled ASHP's to achieve similar seasonal efficiencies to those traditionally associated with GSHP's.

What issues are associated with installing ASHP's in existing properties?

If heat pumps are fitted as part of a completely new wet system there are no problems as everything will be designed to suit the heat pump. If it is replacing another heat source on an existing wet system then there may be issues that need attention.

Radiator systems

Existing radiator sizes should be checked to ensure that they are suitable to work with a supply temperature of 50°C. The system should be a pressurised sealed system with an appropriately sized expansion vessel. The old system should be thoroughly flushed and cleaned prior to connecting the heat pump and a cleanable filter should be added to the system.

Heat pumps should not be connected to a micro-bore system as there may be flow restrictions due to high water side pressure drops. A suitable inhibitor and anti-freeze should be added to protect the system down to the lowest expected outdoor temperature.

Check that the pipe insulation meets the current requirements of the Building Regulations.

Underfloor systems

These do not pose the same problems, as they will already be sized to work with a lower water temperature. If the heat pump is supplying the underfloor heating only (no domestic hot water requirement) then a mixing valve is not necessary, the heat pump will supply water at the required temperature.

The system should be zoned to prevent unnecessary usage.

The building itself should be assessed for suitability, as heat pumps will not work efficiently with all types of buildings. Heat losses should be kept to a minimum with building insulation and draught proofing better than current regulations if possible.

How many units can be fitted in parallel?

There is no absolute answer as it depends upon the size and type of system being installed. When connecting multiple units to a system it is advisable to connect them to a buffer tank or thermal store, although it is possible to connect the units straight into the heating system and use step control to switch units on demand. Pipe work should be designed to eliminate short cycling of the flow water.

The Green Power Energy Master / Slave control system will allow up to four units to be connected together and operated as a Master/Slave system with Auto Change-over, Lead/Lag and Run/Standby. It will also allow the water temperature to float between 35°C and 50°C depending upon demand for DHW.

All Green Power Energy heat pumps are fitted with a random start timer to prevent multiple units restarting simultaneously after a power failure.

What refrigerant is used in Green Power Energy heat pumps?

Green Power Energy use R407C in all of its products. This is an approved refrigerant with zero Ozone Depleting Potential and a low Global Warming Potential.

What is the best type of wet system to connect a heat pump to?

For optimum efficiency an underfloor system provides the best results, as it requires a lower flow temperature and the heat pump can be programmed to provide the water at the required temperature with no need for a mixing valve. Any system will benefit from using a thermal store rather than a direct feed which will allow the heat pump to raise the water to the correct operating temperature more quickly as there is no direct heat loss from the thermal store during the start up period.

What is the lower limit operating temperature?

-20°C is defined as the lower operating limit but the heat pump will not switch off at this temperature. If the heat pump is expected to operate below -5°C for long periods of time then a boost heater should be fitted to act as a back up. At -20°C the maximum supply water temperature will be 45°C.

What controls will the heat pump work with?

The heat pump is fitted with a controller that is pre-programmed with all of the operating set points and alarms and simply requires an input from an external time clock/thermostat. Any standard type of central heating controller will work with the heat pump but the best solution is to use a controller with a number of on/off options for each day to take advantage of any special off peak tariffs available.

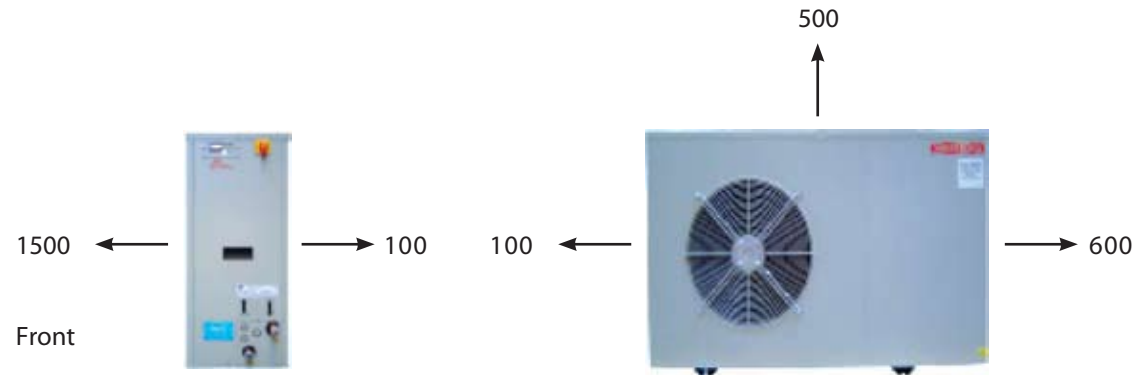
What are the main maintenance requirements?

The heat pump should be serviced once a year by a qualified technician and the following items checked;

- The unit structure for signs of corrosion or damage.
- Panels are securely fastened and vibration free.
- All electrical connections are secure and that there is no damage to any of the wiring.
- All water connections are tight and the system water pressure is correct.
- Pipe insulation has not deteriorated or come loose.
- The air path to and from the unit is clear.
- Condensate drain pan and pipe are clear and clean.
- Switch on the unit and check;
- The controls are working correctly.
- The water pump is free and operating correctly.
- The unit fan is operating.
- The unit raises the water to the correct operating temperature.

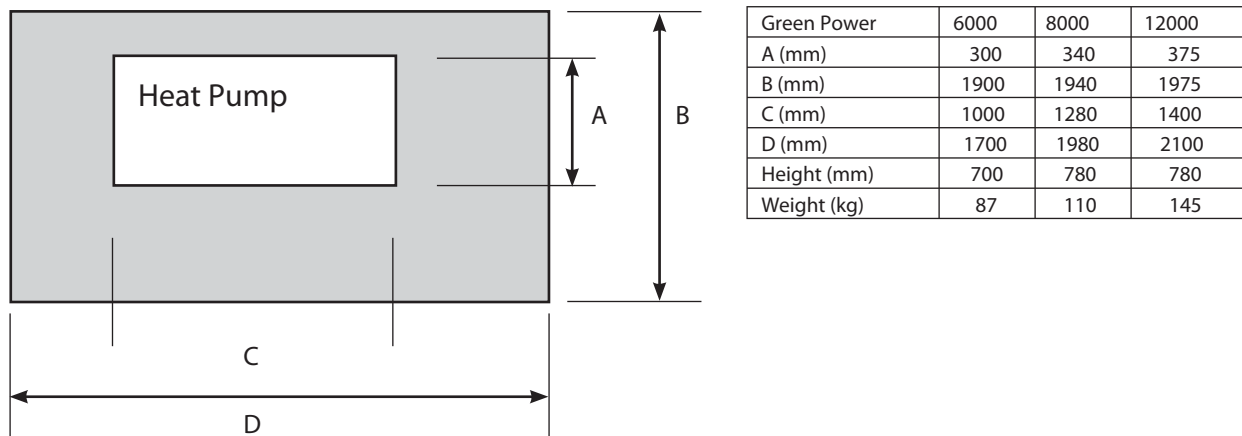
How should the unit be sited to ensure adequate airflow and access?

Sufficient space is required for airflow into the machine and adequate clearance is needed at the front of the heat pump to prevent cold air re-circulation. Access is also needed for service and maintenance. If possible the unit should be sheltered from high winds to improve efficiency by reducing the fan power requirement. Units are best placed in a south facing aspect to gain maximum benefit from solar gains. Shown below are the minimum clearances (in mm) required for a Green Power Air Source Heat Pump.



What is the required footprint for each unit?

The overall footprint will be the size of the unit plus the free area around the unit for airflow and access.



What is the electric current rating for the units?

Each unit has a different mains power requirement as the compressor size differs from unit to unit and it is the compressor that draws most of the power. To minimise the peak starting current a soft start device is fitted to all single phase units. This device reduces the starting peak to a level acceptable to the electricity suppliers and also prevents possible interference with other electrical equipment. The table below compares the maximum start current for each unit, with and without a soft start device fitted.

Green Power	Start condition	Current draw (Amps)	Duration of peak (Msec)
6000	Hard start	75	230
	Soft start	18	200
8000	Hard start	95	280
	Soft start	29	240
12000	Hard start	113	290
	Soft start	34	243

What size of MCB should be fitted?

The Green Power 6000 & 8000 units require a 32A 'D' Type motor rated MCB. The Green Power 12000 unit requires a 40A 'D' Type motor rated MCB.

What size of cable should be used to connect the unit to the mains supply?

This will need to be calculated to suit an individual installation, as a number of variables need to be considered. The size of unit, the length of the cable run and the type of cable being used are all factors in determining cable size. Electrical installation work must be carried out by suitably qualified personnel, who should be able to provide the cable sizing once the position of the unit has been determined.

Is single or three phase best?

As the majority of dwellings in the UK are connected to a single phase supply, this is the only option for most domestic applications. If three phase is available either in domestic or commercial applications then it is better when considering the load on the mains supply as it spreads the starting and running load evenly. The compressors used in heat pumps also act differently for single and three phase supply. A three phase compressor will start when the system refrigeration pressures are unequal, this is not the case with single phase which require a delay to allow the system pressures to equalise prior to starting to prevent the compressor tripping out on its internal overload. This time delay is built into Green Power units as standard. The capacity of each type of unit is almost identical.

What is the most efficient return water temperature setting?

As with any form of heating the efficiency of a heat pump is directly related to the amount of work it has to do. Heat pumps are used with various heating systems and can operate over a range of return water temperatures of 30 to 50°C. The lower the return water temperature the less work the heat pump has to do and therefore the more efficient it will be. This has to be balanced out against the type of heating system the heat pump is attached to and the length of time the unit has to run to satisfy demand. Recommended operating temperature for an underfloor system is 35°C and 50°C for a radiator system.

What size should the radiators be?

Radiator manufacturers specify the capacity of radiators based upon a water temperature difference of 50°C between the room temperature and the supply water temperature. Assuming a room temperature of 20°C and a heat pump supply water temperature of 50°C the temperature difference will be 30°C. According to the factors in radiator manufacturers selection tables, a factor of 0.515 should be applied when selecting a radiator. This indicates that radiators operating at 50°C will be about double the size of a traditional radiator for a given heating capacity. Although this may appear to be a draw back it should be viewed in context with the recommendation in Part L of the Building Regulations to operate condensing boilers at a return water temperature of 55°C requiring a factor of 0.615 to be applied when selecting radiators.

How long does it take for radiators to get up to temperature?

This will depend upon a number of factors. A Heat pump will raise the water passing through it by between 5 and 10°C depending upon the water flow rate. Getting the radiators up to temperature will depend upon a combination of the rate of temperature rise across the heat pump, the amount of water in the system and the temperature of the standing water in the system when the unit switches on. As a rule of thumb the heat pump will raise the water temperature at a rate of 1°C per minute therefore the time taken to achieve the maximum operating temperature will be the difference between the standing temperature and the required operating temperature in minutes.

Example: Required operating temperature 50 °C; Standing temperature 10°C
50 – 10 = 40 minutes

For best results, fitting a thermal store will improve efficiency, allowing the heat pump to raise the temperature in the thermal store to the required operating condition before water is distributed around the heating system.

What is the maximum number of radiators per heat pump system?

The number of radiators is less significant than the total capacity of all of the radiators added together. This should not exceed the expected heat pump output at the design condition; i.e. if the heat pump output is 6kW at the design outdoor condition then the radiator capacity should be 6kW based upon the water supply temperature of 50°C.

Can radiator and underfloor systems be combined?

Yes, but if used in this way the heat pump return water temperature should be set to suit the radiator system and a mixing valve used to reduce the underfloor supply to the design temperature.

What is the Design Outdoor Temperature (DOT)?

This is the lowest normally expected temperature in the area where the heat pump is to be installed. The DOT will vary from region to region, being lower in the North of Scotland and gradually increasing moving south. Local information on weather patterns should be used to determine the correct DOT to use. The building heat load and the capacity of the heat pump should be calculated using this temperature.

How often should the water temperature be boosted to raise it to its operating temperature?

In most conditions the heat pump will start and raise the water temperature as expected. In periods of very cold weather where there is going to be significant reduction in the system standing water temperature to below 15°C then a boost heater should be fitted in the return water side to help the heat pump start up and to prevent it from going straight into de-frost. This will work automatically when required.

Can the heat pump raise the water temperature to 65°C?

No, the standard heat pump will raise the supply water temperature to 50°C as set by the controller. If applying the Green Power 12000i heat pump, water temperatures of 60°C+ will be possible but the higher the water temperature the lower the overall unit efficiency.

How should Domestic Hot Water be heated?

The heat pump should be used to pre-heat the water before additional heating is added to raise the water to the desired temperature. If connected in parallel with a Solar heating system the heat pump should be set to operate if the Solar cannot provide adequate heating. DHW systems should be designed to comply with current regulations.

How often does the heat pump go into de-frost and what is the effect?

Heat pumps de-frost on demand and the frequency is relative to the operating conditions. It is reasonable to expect a heat pump to defrost once an hour when indoor temperatures are low, but not for it to de-frost once above 5°C. The unit controls prevent de-frost initiating more frequently than every 45 minutes and limits the maximum length of any de-frost to 10 minutes. An average de-frost will last for about 3-4 minutes and during this time the system water temperature will be reduced by a few degrees.

Can units be hidden behind fences, bushes, etc.?

Units may be installed behind barriers or even inside enclosures, garages or sheds. The important consideration is ensuring that adequate airflow is available and that the discharge air cannot be re-circulated back onto the inlet as this will result in a continual lowering of the air temperature reducing the efficiency of the unit.

How does the heat pump noise level compare with other heating appliances?

Sound levels inside the house are generally lower than those that would be expected from a gas or oil boiler with a fan assisted flue and will not cause a nuisance provided the installation guidelines have been followed correctly. Noise levels outside may be 2-3 dB higher than those expected from a condensing boiler flue and this should be considered when selecting the position of the heat pump.

Can the heat pump cool as well as heat?

Green Power Green Power heat pumps are supplied for heating only. However if cooling is required an alternative range of units is available to provide both heating and cooling. Cooling may be used with underfloor heating or with fan coil units but it is not recommended with radiators as even though the minimum water temperature can be controlled, on certain days, depending upon conditions, the radiators could sweat and cause water damage to carpets or flooring.

Will the heat pump switch between heating and cooling automatically?

No, this has to be done manually on the controller to prevent cycling between the two demands.

What is the minimum water content in the system?

15 litres. A normal system will contain much more than this and the lower the water volume the more the unit will cycle on and off.