



Air Source Heat Pumps

Air Source Heat Pumps (ASHP) absorb heat from the outside air, using the same technology that is found in refrigerators. This heat can then be used to heat radiators, underfloor heating systems, or warm air convectors and hot water in your home. ASHP extracts heat from the outside air, even in temperatures as low as -15°C .

How it works

There are two main types of ASHP systems: Air-to-Water and Air-to-Air.

Heat pumps work in the same way as refrigerators, but instead of removing heat from a box in our kitchens and expelling it outside, heat pumps use heat from outside to warm our homes. The process has four stages: heat extraction, compression, heat rejection, expansion.

Heat extraction. Heat from the outside air is absorbed at low temperatures into a refrigerant fluid inside a pipe.

Compression. The refrigerant then passes through a compressor that raises it to a higher temperature.

Heat rejection. This heat contained in the refrigerant is exchanged with either air or water inside the home, depending on the ASHP system in place. An Air-to-Water system distributes heat either through a wet central heating system (i.e., large wall hung water-filled radiators) or underfloor piping. An Air-to-Air system instead produces warm air which is circulated by fans (i.e., warm air system) to heat the home.

Expansion. The cooled refrigerant returns outside where it absorbs further energy from the outdoor air in a continuous process, for as long as heating is required.

ASHP work at lower temperatures over longer periods of time compared with gas boilers. These systems work best in well-insulated and draught-proofed homes, particularly in homes with a high thermal mass.

Costs and savings

Installing an ASHP can cost £9,000 to £11,000 but could be higher. The running costs are low, however they depend on the size of the home and the existing insulation. The life expectancy of ASHP is about 20 years.

Existing System to be replaced:	Fuel Bill Savings by replacing the old system (£ per year):	Carbon Dioxide Savings by replacing the old system (kg/year):
Gas older (G-rated)	£395 – £425	4,450 – 4,750 kg/year
Gas newer (A-rated)	-£95 – -£100	2,150 – 2,250 kg/year
Oil older (G-rated)	£500 – £550	7,100 – 7,600 kg/year
Oil newer (A-rated)	-£80	3,650 – 3,900 kg/year
LPG older (G-rated)	£1,200 – £1,300	5,400 – 5,800 kg/year
LPG newer (A-rated)	£380 – £410	2,700 – 2,850 kg/year
Electric Storage Heaters (G-rated)	£920 – £1,000	3,450 – 3,750 kg/year
Electric Storage Heaters (A-rated)	£520 – £560	2,400 – 2,600 kg/year
Coal	£315 – £350	9,800 – 10,500 kg/year

<https://energysavingtrust.org.uk/advice/air-source-heat-pumps/>

A number of financial incentives can help with the cost of this technology. These include the Green Homes Grant Local Authority Delivery scheme and Renewable Heat Incentive. [Learn more about these options.](#)

Key considerations

- **Space.** ASHP are installed in an outside space, fitted to a wall or placed on the ground that has good air flow. A smaller indoor unit needs to be connected for circulation pumps and hot water.
- **Heating system.** ASHP perform well with underfloor heating systems or warm air heating systems. If you have radiators, you may be able to reuse these but some may require upsizing. This is because ASHP operate with lower temperatures than traditional boilers.
- **Air tightness and ventilation.** It is essential that your home is well insulated and draught proofed in order to minimise heat loss because of the lower operating temperatures. With reduced air leakage, you may need to add mechanical ventilation to your property.
- **Engineering calculations.** The heat pump must be sized correctly so that that a backup supply is not needed, which would significantly reduce efficiency and increase running costs.
- **Noise.** There will be some background noise from the ASHP but this can be reduced by adding baffles with a noise absorber, locating the system over grass or installing low noise devices from manufacturers.
- **Permissions.** Check with your local authority to determine if planning permission is needed prior to installing ASHP, as the system is likely to be visible.

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The Sustainability Centre

Droxford Road, East Meon, Petersfield, Hampshire. GU32 1HR

01730 823166 FAX 01730 823168

www.sustainability-centre.org