

HOUSEPLANSDIRECT TECHNICAL GUIDES

AIR SOURCE HEAT PUMPS EXPLAINED

A complete guide to air-to-water systems, low-temperature heating and installation



Air-to-water heat pump serving hot water, radiators and underfloor heating in a coordinated home.

NINE-PART PUBLICATION EDITION

Heat loss · Emitters · Flow temperature · Noise · Siting · Hydraulics · Controls · Compliance · Inspection

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About this guide

This guide explains air source heat pumps for low-rise housing in England. It is intended for clients, designers, energy assessors, specifiers, installers and site teams who need to coordinate heat-loss calculations, heat-pump selection, emitters, domestic hot water, outdoor-unit siting, noise, hydraulics, controls, electrical supply and commissioning. It is general guidance: use the current regulations, MCS standards, planning rules, calculations and manufacturer information that apply to the individual project.

SCOPE Air source heat pump design is building-, climate-, product- and system-specific. Use a room-by-room heat-loss calculation, assessed design temperatures, verified heat-pump output, emitter schedule, acoustic assessment, hydraulic design and current product data. Do not size from floor area, boiler rating or headline nominal output alone.

Part 1 – Introduction: What Is an Air Source Heat Pump?

A refrigeration machine that transfers low-temperature heat from outdoor air into a building

An air source heat pump uses electricity to operate a vapour-compression cycle. Refrigerant absorbs heat from outdoor air at the evaporator, the compressor raises its pressure and temperature, and a condenser transfers useful heat to water or directly to indoor air. Air-to-water systems can serve space heating and a suitable hot-water cylinder; air-to-air systems deliver warm air. Performance depends on the whole building and distribution system, not the outdoor unit alone.



Figure 1 – Principal components of an air-to-water heat pump serving a domestic heating system.

1.1 Principal components

Component	Primary role
Outdoor evaporator / fan	Moves outdoor air across the coil and absorbs low-temperature heat.
Compressor / refrigerant circuit	Raises refrigerant temperature and transfers heat through the cycle.
Water-side heat exchanger	Transfers heat into the space-heating or hot-water circuit.
Emitters and pipework	Deliver the calculated room heat at the selected water temperatures.
Controls and sensors	Match output to weather, demand, hot water and safe operating limits.

1.2 Benefits and limitations

- Can deliver several units of useful heat for each unit of electricity under suitable conditions.
- Performs best with low heat loss, low flow temperatures and long steady operating periods.
- Output and efficiency fall as outdoor air becomes colder or required water temperature rises.
- Requires coordinated siting, noise control, condensate management, electrical capacity and maintenance.