

Users Guide to the 'Alphacheck Heat pump Calculator'

Section One – Building

Building Data

Customer Data

'Responsible person' - Input your name.

'Project' – Input the project name.

'Place name' – select the closest town from the drop-down list. This sets the standard outdoor temperature for that area.

Temperature Data

'Standard Outdoor temperature' - If the place of your project is not listed in the 'Place name' or you wish to change the outdoor temperature, input your own (+8°C to -36°C).

'Flow temperature' - Input your heating system flow temperature (30°C to 55°C)

'Return temperature' - Input your heating system return temperature (20°C to 52°C). Maximum 10°C ΔT .

'Heating limit temperature' - Select the external temperature that you would like the heating to shut off. The greater the building insulation the lower the outdoor value.

'Indoor Temperature' – Select your required indoor temperature. If you have multiple temperatures select the most relevant for the building.

Domestic Hot Water

'Type of domestic hot water service' - there are several options:

'Without domestic hot water' – select this option if the heat pump is not being used for DHW generation.

'With space-heating heat pump' – select this option if the heat pump is being used as the DHW primary source.

'With 2nd heat source' - select this option if the heat pump is being used as the DHW primary source with a gas boiler etc.

'Electrically' - select this option if the heat pump is being used as the DHW primary source with immersion heaters etc.

'Number of persons' - Select the number of people that the DHWS will serve.

'Target temperature' - Input the target DHWS Storage temperature. If the ASHP is not capable of reaching the desired setpoint a second energy source should be included in your system.

Heating Power

This can be calculated using various methods:

'No approximate calculation' – Insert your calculated 'Heating load' in KW.

'Calculate from gas consumption' – Insert your annual gas consumption in m³ for space heating and DHW and your gas boiler efficiency. This will approximate the 'Heating load'.

'Calculate from oil consumption' – Insert your annual oil consumption in Litres for space heating and DHW and your oil boiler efficiency. This will approximate the 'Heating load'.

'Calculate from pellets consumption' – Insert your annual pellet consumption in Kgs for space heating and DHW and your pellet boiler efficiency. This will approximate the 'Heating load'.

'Calculate from Power consumption' – Insert your annual power consumption in KWh for space heating and DHW. This will approximate the 'Heating load'.

'Calculate from house area' – Insert your heated living/work space for the building in m² and specific heating load in W/m². Typically for New Build to Part L – 35W/m², 1980 to 1995 and a good level of insulation 50 – 60 W/m² and Post 1920 to 1980 with standard cavity insulation and double glazing – 60-90 W/m². This will approximate the 'Heating load'.

'Calculate from other energy source' – Insert your annual energy consumption in KWh for space heating and DHW and your energy source efficiency. This will approximate the 'Heating load'.

Section 2 - Heat Source

Heat Source Data

Heat Source

'Type of Heat Source' – Select Air

Section 3 – Dimensioning

Dimensioning of heating system

Heat Pump

'Shutdown times DSR' – N/A in the UK, select 0 hrs/day.

'Location of heat pump' – select indoors or outdoors.

'Mode of operation' – there are several options to choose:

'Monovalent' –the heat pump covers the entire heat requirement without an additional heat source. Only applicable to Brine Heat Pumps

'Monoenergetic (partly parallel)' – The heat pump works in combination with an electric heating element (included or external). In the partly parallel operating mode, the heat demand above the bivalence point is covered only by the heat pump. If the outside air temperature falls below the bivalence set point, the heat pump is supported by the electrical heating element. At a set point below the bivalence temperature the heat pump switches off and the electrical heating element is solely responsible for heating.

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‘Monoenergetic (alternative)’ – The heat pump works in combination with an electric heating element (included or external). In the alternative operating mode, the heat demand above to the bivalence point is covered only by the heat pump. If the outside air temperature falls below the bivalence set point, the heat pump switches off and the electrical heating element is solely responsible for heating.

‘Bivalent (partly parallel)’ – Heat Pump works in combination with a boiler, gas heater or oil heating (Everything except the electric heat element). In the partly parallel operating mode, the heat demand above the bivalence point is covered only by the heat pump. If the outside air temperature falls below the bivalence set point, the heat pump is supported by the alternative heat source. At a set point below the bivalence temperature the heat pump switches off and the alternative heat source is solely responsible for heating.

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‘Bivalent temperature set by user’ – Select yes or no.

‘Bivalent temperature’ – If previous setting selection is yes input your required temperature from the list below:

Standard outdoor temperature	Bivalence temperature
≤-18°C	-5°C to -8°C
≤-16°C	-4°C to -7°C
≤-14°C	-3°C to -6°C
≤-12°C	-2°C to -5°C
≤-10°C	-1°C to -4°C
>-10°C	0°C to -3°C

‘Heat pump cascade’ – Select no if you only require one heat pump or yes if require more than one.

Click the ‘Find suitable heat pumps’ button.

Single Heat Pump

‘Select heat pump’ – Select the heat pump you want to use.

The heat pump selection takes into account additions for shut-off times and DHW, the temperature dependency of the heat load and of the needed forward temperature, the heat source temperature and the performance data of the heat pump.

The values right of the heat pump name are degree of heat load coverage at design outdoor temperature or at user-provided bivalent temperature; bivalent temperature at which heat pump can provide the necessary heat load.

Heat Pump Cascade

‘Select heat pump and number’ – Select the number of heat pumps of the same size in the cascade (1 to 4) then select the heat pump most suited to your building.

You can select heat pumps of differing sizes within a cascade system. Select the number of heat pumps of the same size in the cascade then select the heat pump. Repeat this process on the lower rows until you have your desired combination.

When using a cascade, the heat pumps are switched on in the sequence of their selection.

Further Data

‘Power of heating element’ – Input the electric power of the heating element used in KW.

‘Power of heat source circulator’ – Input the power of the heating circulator in W.

If set to 0 the pre-planning factor is used for calculations as per VDI 4650. For simulation results the power of the pump(s) is necessary.

Section 4 - Seasonal C.O.P

Seasonal C.O.P.s

This section lists the Seasonal performance factors for heating, DHW only (50°C), heating & DHW. All with heating elements included if applicable. It also shows the annual running time of the heat pump for space heating and DHW.

Section 5 – Operational Costs

Operational Costs

Costs of electrical power with heat pump rate

Insert your relevant electricity tariff (p/KWh) and any service and standing charges (£/yr).

Bivalent operation and comparison costs

Select the ‘Second energy source’.

Basic costs, Fuel costs, Maintenance and other costs

Insert the relevant costs for calculating the comparison between the various fuels.

Calculated cost of operation

Shows the calculated running costs of each fuel type.

Section 6 – Investment cost

Investment cost

Common data, Life expectancy, Investment cost of heat pump, Investment cost of second heat source

Insert the relevant costs for calculating the Investment cost.

Investment cost results

Shows the calculated investment costs from the above input information.

Section 7 – CO2 savings

CO2 savings

Specific CO2 emissions

Insert the relevant fuel emissions (Kg/KWh).

CO2 savings by heat pump(s)

Show the calculated savings compared with alternative fuels.

Section 8 – Report

Report creation

Report results

Click on the 'Create report' button which opens a PDF report showing the selected heat pump, savings etc.

Description of selected heat pump

Click on the 'ErP-Label/Data sheets' a second web page will open. Click on the Union Flag for a list of heat pumps. Scroll down to you selected heat pump model and click on the relevant code number or document icon. A PDF document will open with the ErP label and technical data of the heat pump.

Section 9 – Preferences

Report preferences

Select whether running cost and investment costs appear on the report

Calculation settings

Select how the 'Internal and solar gains' are calculated.

'Full load hours' – The full load hours contain typical solar and internal gains of the building and correspond to the typical value of the location London at 20°C room temperature and 15°C heating limit temperature. For other cities the value is calculated by using climate data.

The full load hours do not contain DHW heating.

'Subtract internal gains in heat pump design' – Select whether the program should consider the internal gains when selecting the heat pump.