Heat Pump Performance Starts with Precision

THERMAL PRECISION CALCULATIONS

Your heat pump proposal

Thanks for choosing Thermal Precision Calculations for your heat pump design!

A heat pump will give you reliable, even and comfortable heating, will use much less energy than a boiler, and will greatly reduce your carbon footprint.

Please read the enclosed quote carefully. It covers in detail the components we will be installing, describes how the system works, shows how the system will meet the heating requirements of your property, and lists the costs for the work.

We're always happy to help answer questions, so please get in touch if there is anything you aren't sure about.

Elliot Hadfield
Thermal Precision Calculations

This proposal is for:

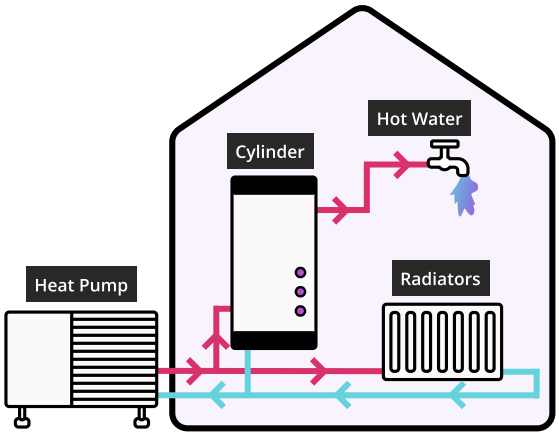
1
Imaginary Lane
AB12 3CD

Prepared	24 February 2026
Valid for	30 days

Contents

Your system

The system we propose includes a heat pump (Midea R290 6kW), a new hot water storage (Telford Tempest 200L Indirect Heat Pump Cylinder), and all the other components necessary to plumb the heat pump and hot water storage components into your heating system. We have also specified 5 additional radiators which will help your new system run more efficiently.



Midea R290 6kW

ENA Registration Number: GDMID/10047/V1/A2
Heating SCOP at 50°C: 3.95
Sound Power Level: 44.0 dB
Nominal Output: 6.20 kW
Proposed flow temperature: 50°C
Actual Output at 50°C*: 5.33 kW
*at outside design temperature of -3.5°C

Telford Tempest 200L Indirect Heat Pump Cylinder

Tempest Heat Pump hot water storage cylinders are designed for use with an air or ground source heat pump as the main heat source. They feature a purpose-designed coil with a 3.3m² surface area to allow maximum heat transfer of renewable energy into the stored water. Manufactured from Duplex stainless-steel, the cylinders are supplied with a factory-fitted 3 kW immersion heater to provide back-up heat.

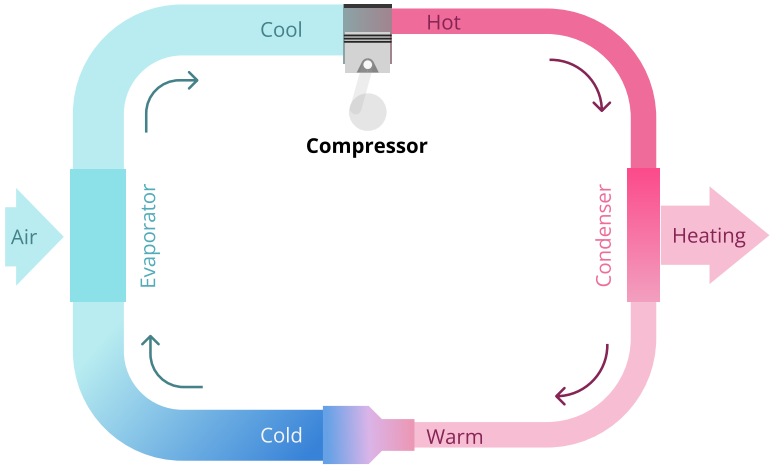
Nominal Capacity: 200ℓ
Dimensions: 554 × 554 × 1500 mm
Weight: 46 kg (empty), 240 kg (full)
Electric immersion heater size: 3 kW
Standing heat loss: 1.85 kWh/24h
ERP Band: C

Heat Pumps Explained

A heat pump uses electricity to move heat from the outside of a building to the inside. It works on the same principle as a fridge.

In a heat pump, a compressor is used to pressurise a refrigerant, making it hotter - in the same way that a bicycle pump generates heat when it compresses air. The hot refrigerant is passed through a heat exchanger that draws off the heat for use in your house.

The refrigerant (now much cooler) is then passed though an evaporator nozzle, which allows it to expand. As the pressure decreases the refrigerant cools even further - in the same way that aerosols get cold when compressed air is released from a can.



The beauty of heat pumps is that a relatively small electrically-driven compressor can move large amounts of heat. The ratio between the electrical energy input and the heat output is the coefficient of performance (CoP). This will vary over the course of a year: the heat pump will be more efficient in the summer when the difference between the inside and outside temperatures is less.

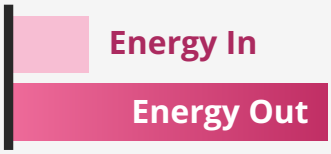
However, even in the winter the heat pump will use far less energy than a direct electrical heater or a gas boiler to produce a given amount of heat.

How efficient will my system be?

395%

From our model of your property, we expect your system to have a Seasonal Coefficient of Perfomance (SCoP) of 3.95.

That means for every kWh of electrical energy you put into the heat pump, you will on average get 3.95 kWh of heat.



Will I notice a difference?

Boilers typically run for short periods at very hot temperatures, and cycle rapidly on and off.

Heat pumps work more efficiently if they run at lower temperatures for longer periods, so your radiators will feel cooler than they used to but will be on for more of the time. We have based our calculations on a radiator temperature of 47.5 degrees.

You don't need to worry though - we've carefully sized your system so that you should always have enough heat to keep your house warm.

People who have heat pumps usually say they really like the more even heat that a heat pump system gives you compared with a gas boiler.

Sound check

Before your heat pump can be installed, we need to check that the noise it creates will not disturb your neighbours. Modern heat pumps are quiet, but are best not sited very close to doors or windows that may be open.

The sound check assesses how much sound from the heat pump will be transmitted to neighbouring properties. If the maximum sound level is less than 37dB then the installation can proceed without a planning application under the 'permitted development' rules.

Full details on the method used can be found in the MCS020 a) document on the MCS website.

Assessment point A
Rear of property

15db

Full | 5m between heat pump and assessment

MCS020 a) Sound Level Calculation
General data

Heat pump sound power level	**44dB**
Reflective surfaces	**2**
Sound pressure level	**Q4**

Quote

1
Imaginary Lane
AB12 3CD

Quote reference: 57852
Quote date: 24/02/2026
Quote by: Elliot Hadfield
Quote valid for: 30 days

Description of goods and services	Price
Goods	
Midea R290 6kW heat pump installation	
Goods total	**£13,500.00**
Services	
Services total	**£0.00**

Total Goods and Services	£13,500.00
Grant	-£7,500.00
Total before VAT	£6,000.00
VAT at 0%	£0.00
Total including VAT	**£6,000.00**

Order form

To proceed with this order please sign below to acknowledge that you have read and accept the information contained within this quote document and our terms and conditions.

Customer signature _____

Customer name _____

Date _____

Appendix

Inputs

Property Details

Year built	Pre 2000

Design Data

Outside Design Temp – ODT	-3.5°C
Degree Days (DD)	2668
Mean air temp – MAT	8.5°C
Altitude	83m

Building Requirements

Space Heating load	4824W
Total area of building	100.45m²
Average Watts per metre square heat loss	48W/m²

Appendix

Heating check

We have checked that every room in your property will still be warm enough after the installation of the heat pump.

We've surveyed every room to work out the total expected heat loss through the ventilation, roof, walls, floors, windows and doors, at the specified room temperature. We've then compared this with the heat that the heat emitters will produce to ensure that every room will be warm enough. Radiators that will be removed are displayed with a lighter shade.

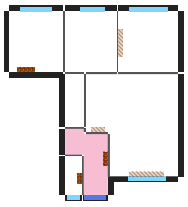
The output power of each radiator is calculated using:

The proposed flow temperature	**50°C**
The dT	**5°C**
The mean water temperature	**47.5°C**

Ground floor

Hall

Area: 4.15 m² Heat loss: 73 W/m² Design Temp: 18°C Air changes: 2/hr



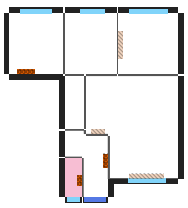
✓ Sufficient heating 425 W / 303 W

P+ As Surveyed

W640 x H600 mm 425 W

Cloak/WC

Area: 1.34 m² Heat loss: 78 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Sufficient heating 252 W / 105 W

P+ As Surveyed

W480 x H450 mm 252 W

Assumptions

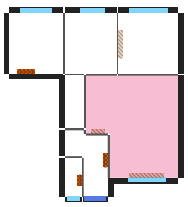
We have assumed an outside design temp of **-3.5**°C. This is based on tables of typical minimum winter temperatures in the UK.

We have used different design temperatures for different types of room. Bathrooms are typically kept warmer than living spaces such as lounges, kitchens and bedrooms for example, while utility spaces can be kept at a lower temperature. Kitchens and bathrooms also have more ventilation than other rooms, so we have allow for more heat loss through air exchange to these rooms.

Most heat loss from a property is through the building fabric however. We have provided a floorplan with a list of the materials we have used for the model along with a measure (U-value) of their insulating properties.

Living room

Area: 17.79 m² Heat loss: 70 W/m² Design Temp: 21°C Air changes: 1.5/hr

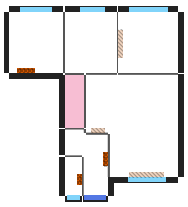


✓ Sufficient heating 1265 W / 1239 W

K1	Removed	
W1600 x H600 mm		692 W
K1	Removed	
W640 x H600 mm		277 W
P+	New	
W1600 x H600 mm		920 W
P+	New	
W600 x H600 mm		345 W

Cupboard

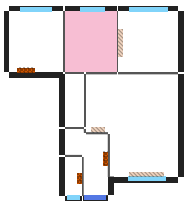
Area: 2.10 m² Heat loss: 2 W/m² Design Temp: 16°C Air changes: 1/hr



✓ Overridden: Non habitable space 0 W / 4 W

Kitchen

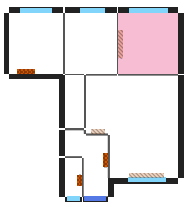
Area: 6.64 m² Heat loss: 48 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Overridden: Deficit covered by ground floor surplus 0 W / 319 W

Dining

Area: 7.69 m² Heat loss: 96 W/m² Design Temp: 21°C Air changes: 1.5/hr



✓ Sufficient heating 1005 W / 738 W

K1 Removed

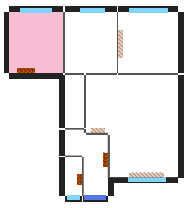
W1270 x H600 mm 549 W

K2 New

W1200 x H700 mm 1005 W

Utility

Area: 6.89 m² Heat loss: 102 W/m² Design Temp: 18°C Air changes: 3/hr



✓ Overridden: Deficit covered by ground floor surplus 532 W / 705 W

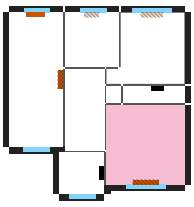
P+ As Surveyed

W800 x H600 mm 532 W

First floor

Bedroom 1

Area: 12.21 m² Heat loss: 32 W/m² Design Temp: 18°C Air changes: 1/hr



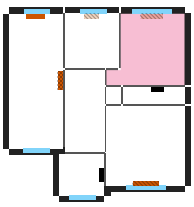
✓ Sufficient heating 556 W / 391 W

K1 As Surveyed

W1120 x H600 mm 556 W

Bedroom 2

Area: 9.36 m² Heat loss: 33 W/m² Design Temp: 18°C Air changes: 1/hr



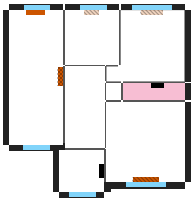
✓ Sufficient heating 665 W / 312 W

K1 Removed
W960 x H450 mm 370 W

P+ New
W1000 x H600 mm 665 W

Ensuite

Area: 1.99 m² Heat loss: 91 W/m² Design Temp: 21°C Air changes: 2/hr

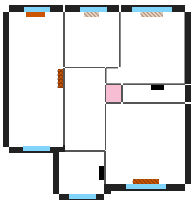


✓ Sufficient heating 216 W / 180 W

Cast iron towel rail As Surveyed
W570 x H950 mm 216 W

Cup

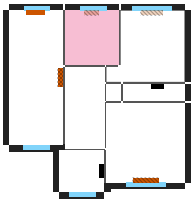
Area: 0.47 m² Heat loss: -54 W/m² Design Temp: 16°C Air changes: 1/hr



✓ Sufficient heating 0 W / -25 W

Study

Area: 5.71 m² Heat loss: 75 W/m² Design Temp: 21°C Air changes: 1.5/hr



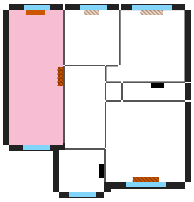
✓ Sufficient heating 458 W / 427 W

K1 Removed
W640 x H450 mm 215 W

P+	New
W700 x H700 mm	458 W

Bedroom 3

Area: 14.11 m² Heat loss: 59 W/m² Design Temp: 18°C Air changes: 1/hr



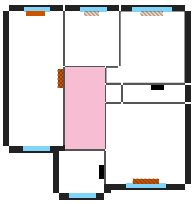
✓ Sufficient heating	1219 W / 838 W

K2	As Surveyed
W800 x H600 mm	688 W

P+	As Surveyed
W800 x H600 mm	532 W

Landing

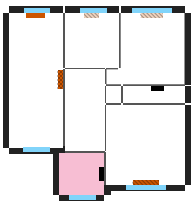
Area: 6.30 m² Heat loss: 30 W/m² Design Temp: 18°C Air changes: 2/hr



✓ Overridden: Deficit covered by first floor surplus	0 W / 187 W

Bath

Area: 3.70 m² Heat loss: 135 W/m² Design Temp: 22°C Air changes: 3/hr



✓ Overridden: Deficit covered by first floor surplus	169 W / 498 W

Towel rail	As Surveyed
W600 x H800 mm	169 W

Why do I need new radiators?

Heat pumps work more efficiently at low flow temperatures - but at low temperatures small radiators may not have enough surface area to adequately heat a room.

With new, larger radiators you will use less energy to heat your property than if you used existing smaller radiators but had to run your heat pump at a higher temperature.

Appendix

Heat Pump Check

Your heat pump: Midea R290 6kW

Total heat loss	**4824 W**
Area of building	**100.45 m^2**
Average heat loss	**48.03 W/m^2**
Output power of **Midea R290 6kW** at the ODT and proposed flow temperature	**5330 W**

Heat pump meets demand

At the ODT -3.5 and proposed flow temperature 50°C, the total heat loss is less than the output power of the heat pump.

Appendix

Materials

The list of materials surveyed in the building. Radiators that will be removed are displayed with a lighter shade. Floors, intermediate floors, roofs, roof glazing and dormers are not shown in the drawings but are displayed in the material list.

Ground floor

First floor

Window

PVC Double Glazed
U-value: 2.8

Door

PVC-U door double glazed
U-value: 2.8

Radiator

P+ - two panels, one fins

K1 - one panel, one fins

K2 - two panels, two fins

Towel rail

Cast iron towel rail

External Wall

Brick 102mm, mineral wool slab in cavity 50mm, 100mm standard aerated block (k=0.17), 13mm plaster
U-value: 0.45
Thickness: 275 mm

Internal Wall

Plasterboard 12.5mm, studding 75mm, plasterboard 12.5mm
U-value: 1.72
Thickness: 100 mm

Floor

Solid floor with 0mm of insulation

Suspended floor with 0mm of insulation

Intermediate Floor

Intermediate floors, boarding 19mm, airspace between joists, 9.5mm plasterboard

U-value: (up) 1.73, (down) 1.41

Roof

Pitched roof - Slates or tiles, sarking felt, ventilated air space, 200mm insulation between rafters, 9.5 mm plasterboard

U-value: 0.18

Appendix

Hot Water Calculations

Heat pumps are able to produce heat energy for both your heating system and your domestic hot water (DHW). However, they are not capable of producing instantaneous DHW for your taps, baths and showers and so a thermal store is required.

Guidance states that this thermal store should be a minimum of 45ℓ per occupant. Based on this, we have selected a 200ℓ DHW store for your property and the details of the storage temps, reheat times and energy consumption are given below.

DHW calculations are based on the parameters given below. Actual energy consumption will vary with usage habits, variation in system settings and outdoor conditions.

DHW Storage Details	
Make	**Telford**
Model	**TSMI200/HP**
Nominal Capacity	**200ℓ**
Electric Immersion	**3 kW**
Dimension (L × W × H)	**554 × 554 × 1500 mm**
DHW System Details	
Hot water storage temperature	**50°C**
Supply water temperature	**10°C**
Flow temperature whilst providing hot water	**55°C**
Pipework efficiency	**80%**
Heat pump capacity output @ 55°C	**5.22 kW**
Number of occupants	**3**
Water consumption per person per day	**50ℓ**
DHW Calculations	
Hot water storage reheat time	**134 min**
DHW Energy demand excluding Legionella	**2555 kWh/yr**
DHW Energy demand including Legionella	**2676 kWh/yr**
Mixed water volume @40°C	**267 ℓ**
Legionella Details	
Legionella purge	**yes**
Legionella purge frequency	**weekly**
Legionella heat source	**immersion**
Legionella purge energy demand	**121 kWh/yr**

Legionella

Legionella is an aquatic pathogen that thrives in warm stagnant water, and can cause diseases such as Legionnaires' when inhaled. In order for Legionella to multiply and grow to dangerous levels, it requires stagnant water and a temperature of between 20°C and 40°C. Eliminating either of these conditions will prevent it from growing and using most of your DHW capacity each day will likely prevent growth to dangerous levels. If you do store water at optimum growth conditions, then an anti-Legionella cycle (Legionella purge) will kill off any bacteria that might have formed by sterilising the water at a high temperature (70°C = instantly kills, 65°C = 100% in 2 mins, 60°C =100% in 30 mins).

Appendix

Performance Estimate

We have since completed a BS EN 12831 calculation and have provided the below performance estimate based on its results.

Your Energy Requirements

Energy required for space heating	**17346 kWh**
Demand to be supplied by the heat pump	**17346 kWh**
Energy required for hot water	**2555 kWh**
Demand to be supplied by the heat pump	**2555 kWh**

Your Property

Your postcode prefix	**AB**
Total property floorspace (not property footprint)	**100.45 m²**
Average watts per square metre	**52 W / m²**

Note: W/m² is a measure of your property's thermal efficiency.
0-30W/m² is very low heat loss and 120-150W/m² is very high heat loss.

Proposed System

Heat pump capacity	**5.28 kW**
Heat pump type	**Air source heat pump**
System is proposed to provide	**Space heat and hot water**
Proposed heating system will be	**Mostly upgraded radiators**
The proposed flow temperature will be	**50 °C**

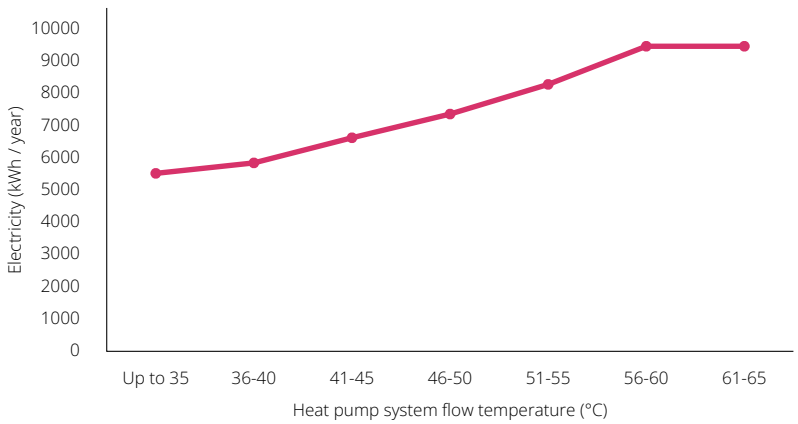
Performance

The seasonal performance factor is calculated to be:	**3.1**

	High estimate	Low estimate
Estimate of energy consumption of the proposed heat pump	**7942 kWh**	**6498 kWh**

Note: you can convert these figures to approximate running costs.

Graph of system performance



Important note

This is not a detailed system design. It offers a reasonable estimate of likely performance and a description of the likely design.

Applicable warning notes

Success

There are no notes from your performance calculations. Everything is good.