Dual Heat Pump

Technical Understanding

DUAL HEAT PUMP

At Adlår, we install a dual heat pump system because we believe this is the best — and only — way heat pumps should be installed. Our approach addresses one of the biggest challenges with heat pumps: meeting high hot water demands efficiently and reliably.

WHAT IS A HEAT PUMP

A heat pump is a sustainable system that extracts energy from the outside air to heat (or cool) your home. Instead of generating heat directly, it transfers it using a refrigerant and compressor, delivering effi-ciencies up to four times greater than traditional heating systems. That means lower energy use, lower costs, and reduced CO2 emissions.

WHY CHOOSE A HEAT PUMP

A heat pump is more than just an efficient heating and cooling solution — it's a smart, future-proof in-vestment. By harnessing natural energy sustainably, a heat pump increases comfort, reduces your energy bills, and helps protect the environment. With Adlår, you can enjoy modern living while contributing to a greener future for gen-erations to come.

KEY ADVANTAGES

Separate heat pumps covering the two water temperatures.

- High temperature hot water from warmer climate
- Reduced network heat losses
- Innovative in-line system design
- Heating always available — no compromise on comfort

UNIQUE FEATURES

- Air conditioning
- Solar PV Thermal Battery
- Solar PV Smart Connect
- Solar Thermal Compatibility
- Quiet Outdoor Space

Air Cooling:
A unique benefit of air source heat pumps is that their byproduct is cold air. With our ASHP cylinder, we can cleverly redirect this cool air during summer months — or on demand — to recirculate it into your living spaces, providing a natural cooling effect for added comfort.

Table of Contents

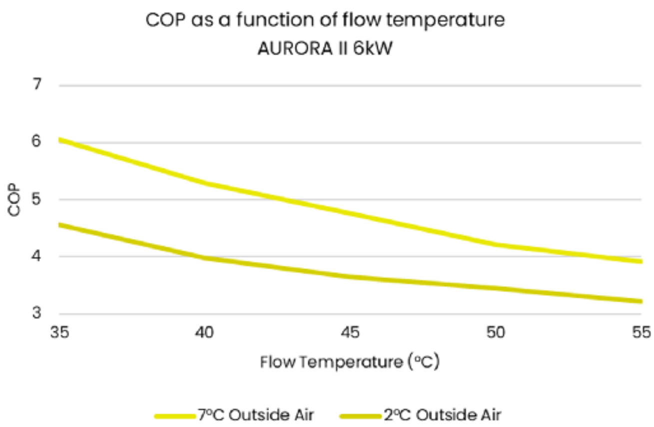
TWO DIFFERENT TEMPERATURES

Your domestic heating system serves two distinct purposes: heating water for your home and supplying hot water for taps and showers. These require different temperatures — typically around 50°C for hot water, while heating temperatures should vary depending on factors like outdoor conditions, your home's heat loss, and whether you use radiators or underfloor heating.

Adlår's system is designed to manage these two demands efficiently, ensuring optimal comfort and performance at all times.

The efficiency of heat pumps increases dramatically under two key factors:

1. **Air Temperature:** The warmer the air the heat pump draws from, the more efficient.
2. **Water Temperature:** The lower the temperature the heat pump needs to heat



MCS SCoP is a theoretical measure of a heat pump's expected efficiency over a year, based on standard climate data across Europe. It reflects how much heat energy is produced (output) for every unit of electricity consumed (input) — and, unlike ErP SCoP, it also accounts for efficiency losses from controls. As a guide, a heat pump with an MCS SCoP of 3 produces 3 kWh of heat for every 1 kWh of electricity used. For the AURORA II 6kW heat pump, the SCoP at 50°C and 40°C flow temperatures are shown below.

SCOP 50°C

3.48

10,000kWh of heating @ £0.28/kWh = £862.00

SCOP 40°C

4.15

10,000kWh of heating @ £0.28/kWh = £723.00

As shown, the lower your heating system's flow temperature, the lower your running costs — making it preferable to keep flow temperatures as low as possible for heating.

As noted earlier, your hot water system must consistently maintain 50°C, so an SCoP at 50°C should be used when calculating efficiency for hot water demand.

TEST CRITERIA

All certified heat pumps are tested under EN14825:2022 to determine their SCoP performance at different temperatures. This test simulates a range of outdoor conditions to establish the SCoP at 35°C water temperature:

1. Air temperature -7° / Water temp. 34°
2. Air temperature 2° / Water temp. 30°
3. Air temperature 7° / Water temp. 27°
4 Air temperature 12° / Water temp. 24°
5. Air temperature 10° / Water temp. 35°

The final lab SCoP value typically reflects the COP at test condition 2 (air temperature 2°C) — this is the standard reference point for all outdoor heat pumps and can be compared across manufacturers on the MCS website.

However, Adlår's cylinder heat pump is tested under EN16147:2017, a standard specific to indoor air source heat pumps. Since our cylinders are located inside your home, they operate in much warmer ambient conditions than outdoor units.

Instead of using ~2°C air temperatures for testing, the cylinder's COP is established from these two conditions:

1. Dry bulb/wet bulb: 7°C/6°C / Water 53°C
2. Dry bulb/wet bulb: 20°C/15°C / Water 53°C

Under these conditions, the Adlår 300L Fjord I cylinder achieves:

1. COP: 3.113
2. COP: 3.802

The following comparison highlights the performance of our Fjord I system versus leading competitors, using only EN14825:2022 and EN16147:2017 lab results at 53°C, with all other assumptions held constant and no additional system losses included.

HEAT PUMP	EN14825:2022	EN16147:2017
Adlår Fjord I 300L		**3.802**
Bosch (CS5800iAW 7 OR-S)	3.42	
Vaillant (aroTHERM Plus 12kW)	3.74	
Daikin (EBLA06EV3)	3.27	
Vaillant (aroTHERM 12kW)	3.44	
Samsung (AE066MXTPEH)	2.73	
Daikin (EDLQ07CV3)	3.2	

As shown here, the Fjord I — operating at a 20°C / 15°C air temperature — outperforms most heat pumps on the market. This reflects real-world conditions, as typical indoor air temperatures range from 18°C to 22°C.

SCOP LAB RESULTS VS REAL-WORLD CONDITIONS

SCoP lab results don't always reflect real-world performance, especially for hot water heating at 50°C. This is because hot water is treated as a priority in single heat pump systems, forcing them to operate at maximum output to quickly switch back to space heating.

As a result, single heat pump systems can experience additional inefficiencies not captured in SCoP calculations, including:

1. Pipework Losses:

In single heat pump systems, hot water must travel through pipework between the outdoor unit and the hot water cylinder, often spanning 10–20 meters in a typical home.
When there's a hot water demand, a 3-port valve diverts heated water from the heating system into the cylinder — but the length of this pipework leads to heat losses that aren't present in dual heat pump systems.

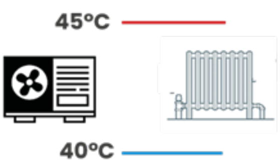
2. Temperature Differences:

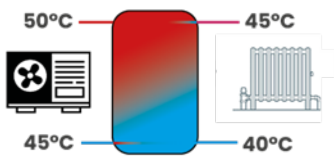
Most of the time, your heating circuit operates at lower temperatures than hot water (e.g., 35°C for underfloor heating or modern radiator systems).
When a hot water demand occurs, cooler water initially enters the cylinder. In some cases — particularly in efficient homes (EPC C and above) — if only a small amount of hot water has been used, the system can actually cool the cylinder further before it begins heating it up (e.g., a cylinder at 40°C receiving 35°C flow water).

This means it may take several minutes before effective reheating begins, reducing real-world efficiency further — a challenge that Adlår's dual heat pump system is specifically designed to overcome.

SCOP LAB RESULTS VS UNIQUE CONDITIONS

In conventional systems, a low-loss header is typically used. As shown in the diagram below, flow and return water passes through this header, where heat transfer occurs as cold water mixes with hot water.

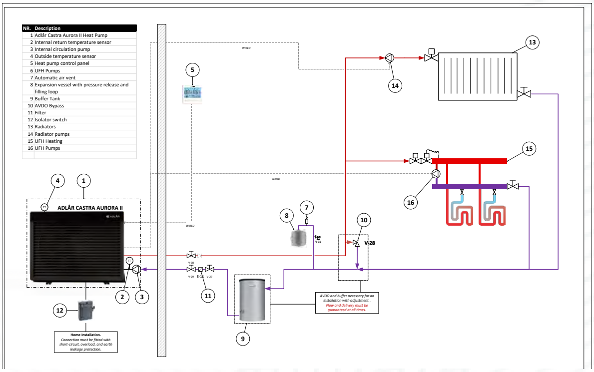




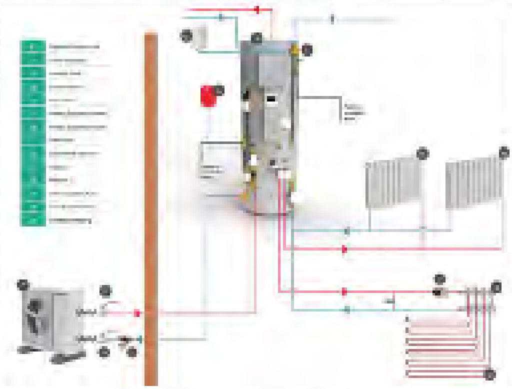
This arrangement works adequately with a boiler operating at 80°C, where the heat loss in the header has minimal impact. But heat pumps operate at much lower temperatures, so this heat loss becomes significant — reducing the comfort you feel at your radiators or underfloor heating.

At Adlår, we eliminate this inefficiency with an "inline" system design, where water flows directly from the heat pump to your emitters. This ensures no unnecessary heat loss, delivering better efficiency and consistent, reliable warmth throughout your home.

Adlår Dual Heat Pump In-Line Heating



Single Heat Pump Low Loss Header



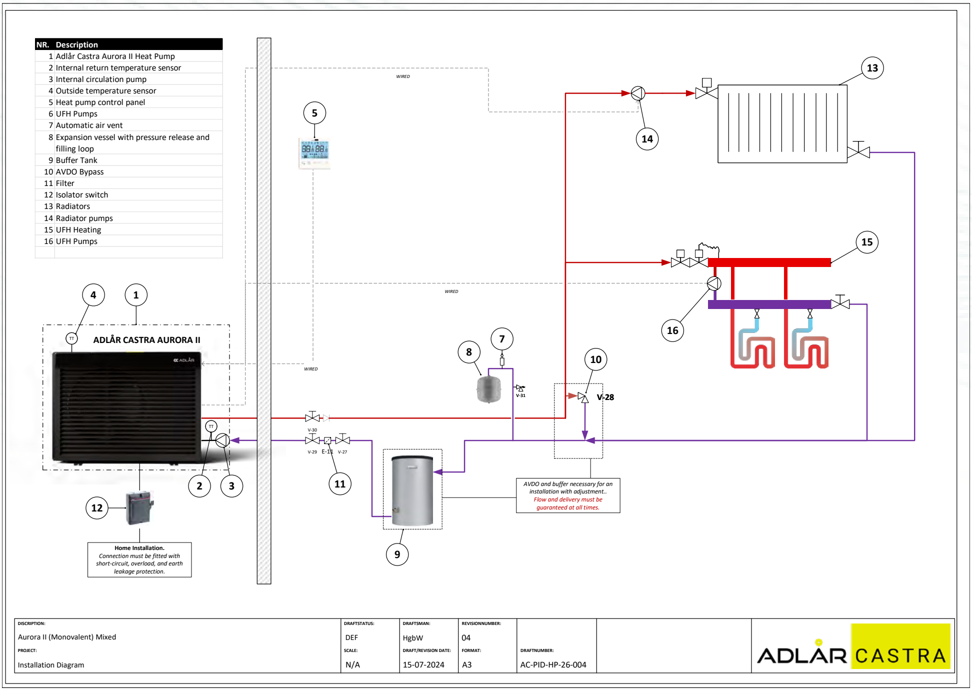
This doesn't just affect the comfort you feel at a given output temperature — it also drives up costs. Because heat pump efficiency curves aren't linear, even a 1°C increase in output temperature has a disproportionately large impact on the heat pump's COP (Coefficient of Performance), reducing efficiency and increasing running costs.

	Emitter Temp.	ASHP Temp.	SCOP	Cost (10k kWh)
In-Line System	50°C	50°C	3.48	£862.07
Low Loss Header	50°C	53°C	3.28	£914.64

COST SAVING %AGE Δ

5.75%

SCHEMA - AURORA II INLINE-SYSTEM



DEMANDS WITH SINGLE HEAT PUMPS

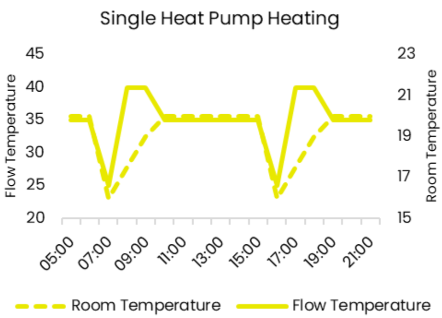
In Section 2, we highlighted the differences in COP/SCoP between the Fjord system and conventional single heat pumps, based on lab test data following EN16147:2017. But as we know, real-world performance can differ significantly from lab results.

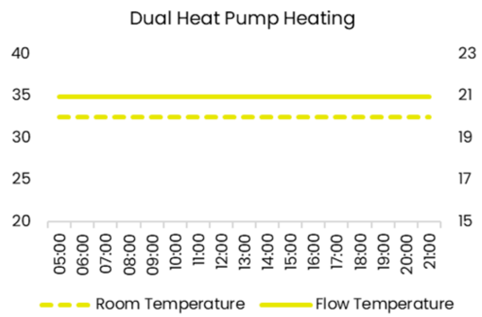
In practice, single heat pump systems rarely achieve their published SCoP values during hot water cycles — or even afterward, when recovering room temperature on the heating side. In some cases, immersion heaters may even activate, further reducing efficiency.

This happens because single heat pump systems are designed to minimise the time spent on hot water production to limit disruption to the heating system. As a result, they seldom operate at their rated SCoP values. In a typical home, hot water demand occurs over approximately 1 hour per day — during which time the heating is paused.

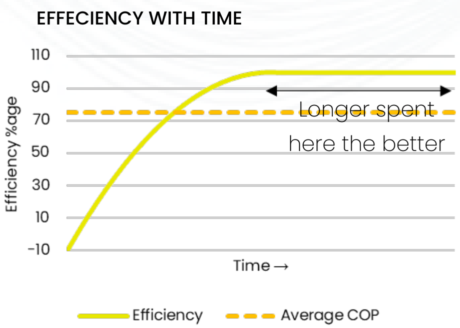
The graph below illustrates this challenge:

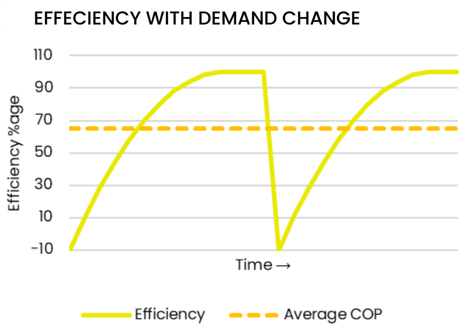
- During a hot water cycle, room heating stops, leading to a gradual drop in indoor temperature.
- When the system switches back to heating, the heat pump often operates at a higher flow temperature to compensate and "catch up."
- Instead of achieving an efficient SCoP at 35°C, it effectively operates at a higher temperature (e.g., 40°C or more), reducing efficiency and increasing costs.





Additionally, heat pump efficiency is at its best when maintaining a constant temperature with long, steady cycles. By contrast, ramping the compressor's frequency and temperature up for hot water production — and then back down for heating — significantly reduces overall efficiency. The graph below further illustrates this inefficiency: during ramp-up, efficiency is not only reduced but can actually start off negative, before stabilising.





CUSTOMER OVERIVEW:

“What an amazing difference in running costs between the Adlår Castra Aurora and the Husky ASHP to achieve the same level of heat in the house. The Aurora has a peak consumption of 1.68kw in eco mode with output temp set to 42 degrees. Looking back at records for Monday 13 November, the Husky was peaking at 4.29kw. The lower power usage on the Aurora means we can time shift more effectively on our energy tariff (Octopus Cosy) within the limitations of our 3.6kw inverter [from our solar system.

Splitting the DHW heating demand to the Fjord has relaxed the Aurora allowing it to heat the house effectively with a 60% reduction in power. We are running the Fjord for 3 hours a day in the afternoon low tariff which is charging the water storage with sufficient for 10 showers or 4 baths the following morning.
The figures will change when the bedroom fan coils are fitted in January, but at the moment we are enjoying heat and DHW for a 3 bedroom detached house, heating on all day for us in our retirement, for an average of 25.8kw per day and, using time shifting, at a cost of 22p per kWh.”

Thank you, you guys are brilliant!”

CONDITIONS:

- 3 Bedroom Detached House.
- EPC D 60.
- 115m2 Floor Area.
- 24/7 Heating.

RESULT:

61% consumption reduction

- Peak consumption reduced from 4.29kW (Husky ASHP) to 1.68kW (AURORA II)
- Despite an 8.57°C average difference in outdoor temperatures between test dates, performance was so efficient that consumption reductions could equate to up to 100% improved efficiency under comparable conditions.efficient.

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