MARKET LEADING DUAL-HEAT PUMP SYSTEM

ADLÅR

Our game-changing system:
A lot of heat pump companies are slowly transitioning from the boiler industry. Not us. We came fresh into the heat pump industry and are fully specialised in them. This means we understand the product to the core and don't install it as you would a gas boiler. Installing a heat pump in the same system as you would a boiler fails to understand the core principes of heat pumps. Read our technical details to understand why this is the case.

Adlår: Fjord I
The future of hot water

Specifically designed to handle hot water needs.

- **R290 Refridgerant** GWP = 3. Lowest environmental impact
- **PV & Solar Thermal** Smart connection with your solar
- **COP 3.8** Leaving the competition behind.
- **Electric Anode & SS** Highest water quality
- **APP Control** Remote access and ultimate control

Adlår: AURORA II
A+++ Efficiency

Only Tier 1 Components (Panasonic, Grundfos)

- **6, 10, 14 KW** Ask our specialists for size advise
- **Whisper Quiet** Patented Ultra Silent Cruise Technology
- **7 Year Warranty** incl. with Platinium package
- **5 Year Workmanship** Insurance backed guarantee
- **SCOP 4.89** 6kW AURORA II

Built to EU-norm 813/2013 Noise standard

1. Two Different Temperatures

Your domestic heating system heats two things, your heating and your hot water. These two sets of water need to be heated to different temperatures. In a heat pump system your heating temperature should vary depending on your home's requirements.

Generally, we want to design your system so the heating temperature can sit around or below 40 degrees. Whether this is possible will depend on your radiator situation, and the heat loss of your home which is determined through our heat loss survey.

Hot water in contrast should be a steady temperature, usually around 50 degrees.

A basic calculation below shows the cost comparison of heating to these two temperatures with a heat pump, assuming a constant temperature.

SCOP 50°	SCOP 40°
3.48	**4.15**
10,000kWh heating cost ~£862.00	10,000kWh heating cost ~£723.00

2. Indoor Air for High Temperature

Heat pump efficiencies are calculated and displayed as SCOP or COP values. SCOP stands for the seasonal coefficient of performance. In simple language, this means the heat pump's efficiency across a set variation of air temperatures and test conditions. This is done to attempt to represent the weather conditions the heat pump will experience throughout the year.

EN14825:2022 is the test standard used for heat pumps, and simulates the following conditions to establish the SCOP value. This example is to establish the SCOP at 35°C.

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

The final test lab SCOP value usually ends up around the COP result of test condition 2, which has an air temperature of **2° celcius.** This is the test condition for all outdoor heat pumps, and you can compare these results on the the MCS website.

Adlår's ASHP Cylinder draws air from internal air, not cold outdoor air, with a typical air temperature being closer to **17.5° celcius.** The lab test to establish the COP value for our ASHP Cylinder is EN16147:2017. The COP value is determined from a dry bulb/wet bulb air condition of **20°C/15°C** not 2°C.

3. SCOP Lab Data Comparison

The following comparison contrasts our dual-heat pump system with leading competitors. It considers only EN14825:2022 and EN16147:2017 lab results, and therefore doesn't consider any other losses which can include:

1. High loss during high heating capacity when switching from 40 degrees to 50 degrees
2. Losses in pipework
3. Losses in the low-loss header tank

The test conditions assumes 2,500kWh in hot water energy requirements and 10,000kWh in heating energy. The average UK household yearly consumption. It assumes a stable cost of energy of £0.30/kWh.

Cost:	Heat Pump:	SCOP 50	SCOP 40	Heating	Hot Water	Total
£	**AURORA II & FJORD I**	3.8	4.15	£723.00	£197.00	£920.00
£££	**Bosch (CS5800iAW 7 OR-S)**	3.62	4.25	£705.88	£207.00	£913.06
	Vaillant (aroTHERM Plus)	3.41	4.13	£726.39	£218.66	£946.33
	Daikin (EBLA06EV3)	3.43	4.04	£742.57	£218.66	£961.23
£	**Vaillant (aroTHERM)**	3.15	3.66	£819.67	£238.10	£1,057.77
	Samsung (AE066MXTPEH)	3.01	3.82	£785.34	£249.17	£1,034.51
	Daikin (EDLQ07CV3)	3.33	3.82	£785.34	£225.38	£1,010.57

4. Lab vs. Actual

These results show vary favourable results for our competitors. These SCOP values are based on the water temperature being held at a constant temperature and therefore doesn't take into account the energy needed to take the water from 40 to 50 degrees. In most systems the hot water demand puts the heat pump into overdrive to quickly get the water up to temperature and therefore uses a lot of energy to do so.

Our dual heat pump system in contrast runs constantly at the set temperature and doesn't need to go into high capacity mode in the same way during hot water demands.

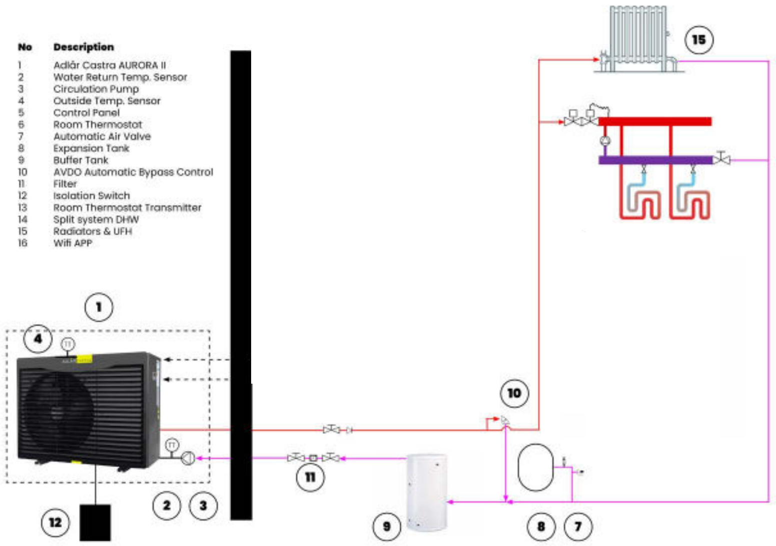
In reality then, our dual heat pump system should look to outperform even Bosch's top end model, which can cost a lot more than our system.

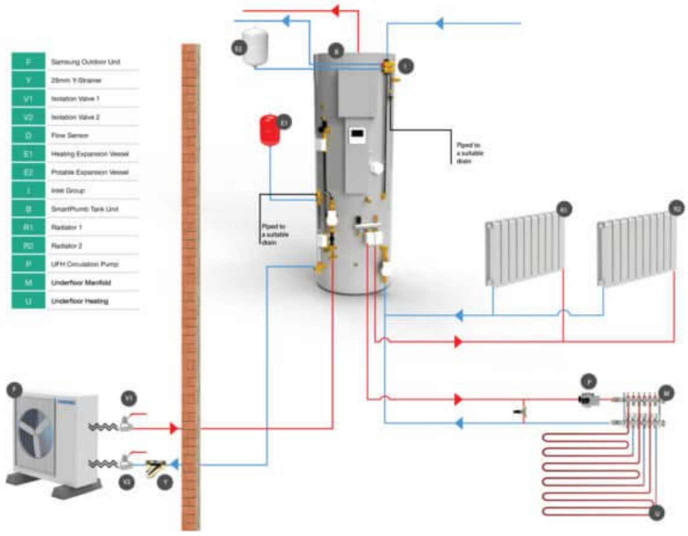
5. Inline System Design

In conventional systems a low-loss-header is used. In the diagram below right, you can see how the flow and return water goes through this low-loss header. A heat transfer occurs in the low-loss as cold water mixes with hot water.

This is fine when you have a boiler and your water temperature is 80 degrees, but because heat pumps work at lower temperatures, the heat loss in the low-loss-header makes a big difference to your felt comfort at your radiators or underfloor heating.

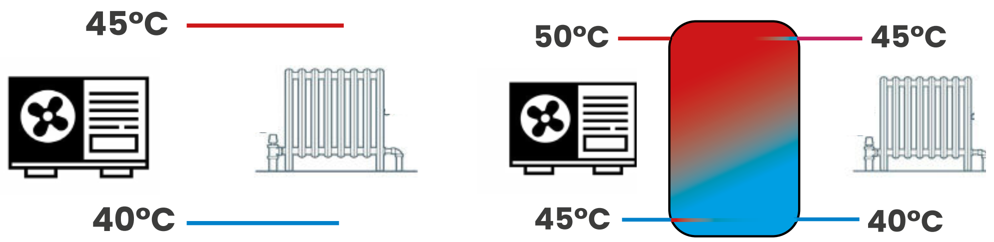
In Adlår's system we arrange the heatpump in what is called an "inline" setup. This means the water goes straight from the heat pump into your emitters without a heat loss. You can see the system comparison and low-loss header heat loss on the following page.





As you can see below, in the low loss header the return water also becomes warmer, which means (in this example) there is still only a 5°C temperature difference on the heat pump itself. However, as heat pumps work more efficiently at lower temperatures, heating 5°C to a lower temperature is more efficient than heating 5°C to a higher temperature.

	Radiator Temp.	ASHP Temp.	SCOP	Cost (10,000kWh)
In-line System	50°C	53°C	3.48	**£862.07**
Low Loss Header	50°C	50°C	3.28	**£914.64**
			Difference	**£52.57**



6. Network Losses

Another consideration on the efficiency of our system versus a conventional one heat pump system is the pipework.

In conventional systems a 3-port valve directs the water between your hot water and your heating. This is usually situated where the low loss header is, which could be multiple meters away from your heat pump, for example in a loft or airing cupboard.

Having multiple meters of pipework between your heat pump and the 3-port valve means anytime a hot water demand happens there will be significant losses in this pipework. As an example, your heating is running at 40 degrees, and a hot water demand comes on (perhaps from running a tap or shower). The heat pump will then start wanting to heat the water in your cylinder to 50 degrees. Before it gets up to temperature however, the 3-port valve will open and 40 degree water will start entering your hot water tank.

It will take several minutes, if not longer, to get the water temperature up from 40 degrees to 50 degrees if the heat pump is running in an efficient mode. During that time, the hot water tank will be filling with this colder water. The heat pump will then have to continue to work much longer and harder in order to refill your hot water tank with 50 degree water, first displacing the cold water that entered it, and then heating the whole water tank up to 50 degrees. This is a massively inefficient process.

7. Real World Example

"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!"

8. Real World Example Breakdown

Conditions: 3 Bedroom Detached House. EPC D 60. 115m^2 Floor Area. 24/7 Heating.

61% consumption reduction

1.68kWh Peak with AURORA II from 4.29kWh peak with competing brand conventional system

Considering the large outdoor temperature differences (8.57°C average difference) between the test dates, the reduction in consumption could even be up to **100% more efficient.**

9. Additional: Stronger system, less high-failure parts

From the images on page 3, you can get an idea of the extra connections required between a conventional system and our split-inline system. As a summary of those components and the disadvantages of them:

Extra Parts in Conventional System

Part	Disadvantage	Why Needed
Water Pump(s)	High failure point Additional operation cost	As there additional valves and the water goes through a low loss header a pump is required to increase water pressure and water flow.
2-port Valve(s)	High failure point	This is needed to control the flow into the heating water system from the low loss header.
3-port Valve(s)	High failure point	This is needed to control the flow between hot water and heating.
Electrical connections	Additional cost and install time	To control the above devices requires a lot of additional wiring.
Water connections	Additional cost and install time	A lot more piping is required to route all the water systems between the valves and their flows.

ADLÅRCASTRA

Heat Pump Experts