

Quick Start Guide:

NBE HEAT PUMP & PHOENIX PELLET BOILER HYBRID SYSTEM

Only for SKU: 95100550, 95100850, 95161400, 95301400, 95302000



PELLET HEAT PUMP HYBRID- THE BEST OF BOTH WORLDS

Thank you for selecting the NBE Phoenix Pellet Boiler and Heat Pump Hybrid System. This guide is designed to provide you with all the necessary information to successfully setup and operate the combined system. Please refer to the corresponding sections in the table of contents for detailed guidance and to the accompanied installation manuals for both the pellet boiler and heat pump.

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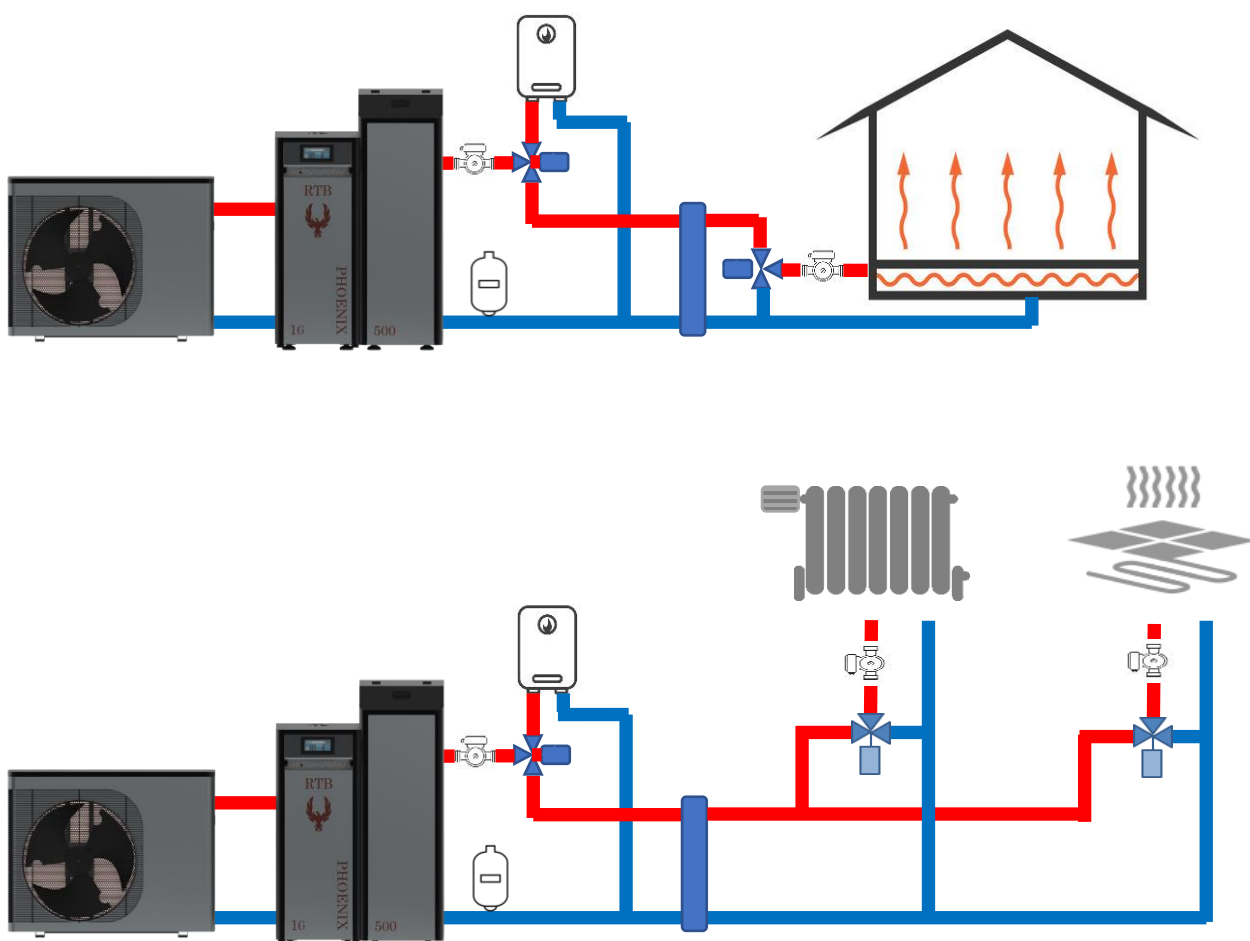
PELLET HEAT PUMP HYBRID- THE BEST OF BOTH WORLDS

Combining a heat pump and a pellet boiler in a heating system offers a synergistic and highly efficient solution that maximizes the benefits of both technologies. This hybrid approach capitalizes on the strengths of each component, resulting in a system that is not only environmentally friendly but also economically advantageous. Here are several reasons why this combination is a good idea:

1. **Versatility:** Heat pumps are effective in moderate climates, while pellet boilers excel in extreme cold, creating a system adaptable to varying weather conditions for year-round comfort.
2. **Environmental Friendliness:** Heat pumps emit minimal emissions by relying on electricity, while pellet boilers burn renewable biomass, collectively reducing reliance on fossil fuels and lowering greenhouse gas emissions.
3. **Load Management:** During peak demand, a hybrid system distributes the load between components, increasing their lifespans and preventing overburdening.
4. **Energy Cost Savings:** Dual heating sources enable choosing cost-effective energy based on fluctuations in electricity and pellet prices, potentially leading to savings.
5. **Redundancy:** A hybrid system provides reliability; if one component fails, the other takes over, ensuring uninterrupted heating.
6. **Government Incentives:** Combining technologies might qualify for a wider range of incentives, rebates, or benefits from governments promoting renewable energy adoption. *Check with your local authorities.*

PELLET HEAT PUMP HYBRID- INSTALLATION DIAGRAM

The following installation diagrams provides a simple recommendation on how to install the heat pump with the pellet boiler. The following installations are suitable for the simultaneous and independent operation of both the heat pump and pellet boiler.



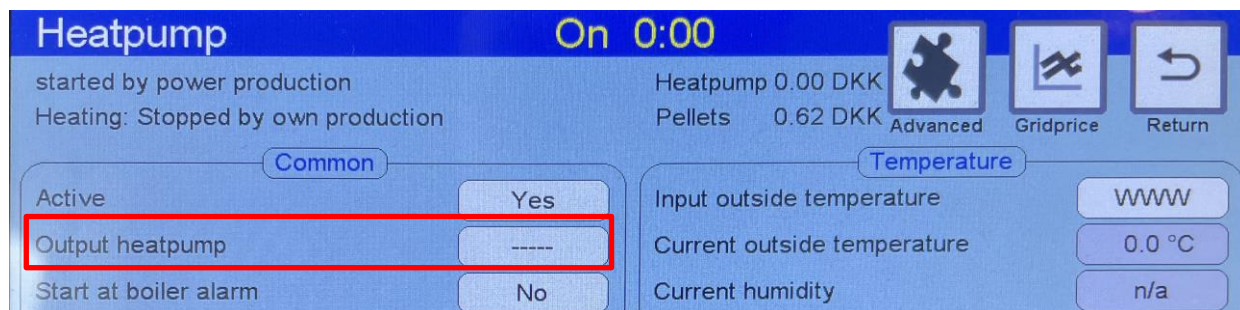
Note: Management of up to 4 heating zones is possible with the v16 controller and extension board

SETTING UP COMMUNICATION CONTACT BETWEEN V16 CONTROLLER AND HEAT PUMP:

The communication between the pellet boiler and heat pump is performed through an ON/OFF remote contact that signals the start and stop of operation of the heat pump. Wanted forwarding temperature for the heat pump must be performed on the heat pump controller itself (see Heat Pump Manual). The v16 controller will only manage the operation ON/OFF of the heat pump.

Setup communication between the boiler and heat pump is performed as followed:

1. **Connect signal contact from REMOTE ON/OFF (heat pump) to RELAY.**
 - Open the electrical panel on the heat pump and make sure that the REMOTE ON/OFF 1 & 2 are connected to COM and N.O. on the RELAY respectively. **Note:** *This connection may have already been completed if you have purchased the Phoenix Boiler and Heat Pump as a packaged product.*
2. **CONNECT RELAY: Coil and Coil to V16 controller output L and N**
 - Make sure an electrical connection between RELAY and V16 Controller From RELAY: Connect COIL and COIL to available Output L and N, respectively on the V16 controller. **Note:** *When purchased as a packaged product, the cable is pre-connected to the heat pump, requiring only a connection to the chosen output on the v16 controller.*
3. **Assign the Output for the Heat Pump contact**
 - On the V16 controller, go to the HEAT PUMP menu/OUTPUT HEAT PUMP and specify the output where you have connected the contact lines to the v16 controller



Heatpump		On 0:00	
started by power production		Heatpump 0.00 DKK	
Heating: Stopped by own production		Pellets 0.62 DKK	
Common		Temperature	
Active	Yes	Input outside temperature	WWW
Output heatpump	----	Current outside temperature	0.0 °C
Start at boiler alarm	No	Current humidity	n/a

PELLET BOILER AND HEAT PUMP OPERATIONS

The **v16 controller** fitted on the Phoenix pellet boilers is ideal for economically and efficiently managing the operations of both the pellet boiler and the heat pump based on:

- Electricity Price Changes
- Outdoor Temperature and Humidity
- Surplus Electricity from Own Electricity Production
- Operation of Heat Pump during Boiler Alarm

Operations based on Electricity Prices:

The controller will start the heat pump and/or the boiler, depending on the current and future electricity grid prices. The grid prices are read from the internet and are normally available for the present day and the next 0 to 24 hours. You are able to view the electricity prices in the HEAT PUMP/GRID PRICE menu (See image below).

Grid price today	Grid price tomorrow
0:00 - 1:00: 0.71	0:00 - 1:00: n/a
1:00 - 2:00: 0.68	1:00 - 2:00: n/a
2:00 - 3:00: 0.68	2:00 - 3:00: n/a
3:00 - 4:00: 0.67	3:00 - 4:00: n/a
4:00 - 5:00: 0.65	4:00 - 5:00: n/a
5:00 - 6:00: 0.68	5:00 - 6:00: n/a
6:00 - 7:00: 0.78	6:00 - 7:00: n/a
7:00 - 8:00: 1.05	7:00 - 8:00: n/a
8:00 - 9:00: 0.95	8:00 - 9:00: n/a
9:00 - 10:00: 0.85	9:00 - 10:00: n/a
10:00 - 11:00: 0.72	10:00 - 11:00: n/a
11:00 - 12:00: 0.68	11:00 - 12:00: n/a
12:00 - 13:00: 0.67	12:00 - 13:00: n/a
13:00 - 14:00: 0.65	13:00 - 14:00: n/a
14:00 - 15:00: 0.64	14:00 - 15:00: n/a
15:00 - 16:00: 0.64	15:00 - 16:00: n/a
16:00 - 17:00: 0.66	16:00 - 17:00: n/a
17:00 - 18:00: 0.74	17:00 - 18:00: n/a
18:00 - 19:00: 0.88	18:00 - 19:00: n/a
19:00 - 20:00: 1.10	19:00 - 20:00: n/a
20:00 - 21:00: 1.03	20:00 - 21:00: n/a
21:00 - 22:00: 0.93	21:00 - 22:00: n/a
22:00 - 23:00: 0.79	22:00 - 23:00: n/a
23:00 - 24:00: 0.72	23:00 - 24:00: n/a

Under the parameter **START WHEN GRID PRICE IS UNDER** you are able to specify the max price you will allow for the heat pump to run. If the electricity price goes above this threshold, the heat pump will not run and the boiler will run instead; as long as there is still a heat demand.

OPERATIONS BASED ON ELECTRICITY PRICES: Explaining Pre-stop boiler period

When there is an expected period when the heat pump will run according to low electricity prices (i.e. below the START WHEN GRID PRICE IS UNDER value), the pellet boiler can be stopped for a number of hours before the heat pump begins operation in order to reduce the pellet consumption and maximize the cost-effectiveness of the cheaper electricity price. The number of hours allowed to stop the boiler before the heat pump starts is called the **PRE-STOP PERIOD** and is calculated as the length of time of the next consecutive operating period of the heat pump multiplied by the **PRE-STOP FACTOR**. The boiler stop period; however, cannot exceed what is specified under **PRE-STOP BOILER MAXIMUM**; which is the maximum time the boiler is allowed to stop prior to the operation of the heat pump.

For example if:

- the START WHEN GRID PRICE IS UNDER = 0.80 DKK
- PRE-STOP BOILER FACTOR = 2
- PRE STOP BOILER MAXIMUM =12 hours

The following operation ON and PRE-STOP boiler schedule will result:

Heatpump

On

started by power production

Heating: Stopped by own production

Common

Active

Yes

Output heatpump

L15

Start at boiler alarm

No

Start when grid price is under

0.80 DKK

Pre stop boiler factor

2

Pre stop boiler maximum

12 h

Boiler and heatpump together?

No

Allow boiler for outside temp. below

0.0 °C

Start boiler if not reaching

0 °C

Timeout for reaching boiler temp.

0 min

Weekly schedule settings

Week plan

Grid price today	Grid price tomorrow
0:00 - 1:00: 0.70	0:00 - 1:00: 0.66
1:00 - 2:00: 0.68	1:00 - 2:00: 0.63
2:00 - 3:00: 0.68	2:00 - 3:00: 0.67
3:00 - 4:00: 0.67	3:00 - 4:00: 0.68
4:00 - 5:00: 0.68	4:00 - 5:00: 0.68
5:00 - 6:00: 0.71	5:00 - 6:00: 0.76
6:00 - 7:00: 0.89	6:00 - 7:00: 0.91
7:00 - 8:00: 0.93	7:00 - 8:00: 1.05
8:00 - 9:00: 0.88	8:00 - 9:00: 0.88
9:00 - 10:00: 0.72	9:00 - 10:00: 0.72
10:00 - 11:00: 0.65	10:00 - 11:00: 0.66
11:00 - 12:00: 0.61	11:00 - 12:00: 0.61
12:00 - 13:00: 0.53	12:00 - 13:00: 0.55
13:00 - 14:00: 0.55	13:00 - 14:00: 0.54
14:00 - 15:00: 0.55	14:00 - 15:00: 0.56
15:00 - 16:00: 0.61	15:00 - 16:00: 0.61
16:00 - 17:00: 0.65	16:00 - 17:00: 0.68
17:00 - 18:00: 0.76	17:00 - 18:00: 0.78
18:00 - 19:00: 0.96	18:00 - 19:00: 1.08
19:00 - 20:00: 1.37	19:00 - 20:00: 1.41
20:00 - 21:00: 1.15	20:00 - 21:00: 1.23
21:00 - 22:00: 0.90	21:00 - 22:00: 0.91
22:00 - 23:00: 0.80	22:00 - 23:00: 0.78
23:00 - 24:00: 0.71	23:00 - 24:00: 0.71

Note: Operation schedule in relation to grid price and settings is viewed under HEATPUMP/GRID PRICE

OPERATIONS BASED ON TEMPERATURE AND HUMIDITY

A heat pump is most efficient in moderate temperatures – typically above 5° C. The COP value of a heat pump in general will get exponentially worse the colder the temperatures get outside. As such, you are able to stop the heat pump at a given temperature threshold and allow the pellet boiler to produce the heat instead. This can be set under the parameter **ALLOW BOILER FOR OUTSIDE TEMP. BELOW**. (See image outline in **RED**)

Heatpump
On 0:00

started by power production
Heating: Stopped by own production

Heatpump 0.00 DKK
Pellets 0.62 DKK

Advanced
Gridprice
Return

Common

Active
Yes

Output heatpump

Start at boiler alarm
No

Start when grid price is under
0.00 DKK

Pre stop boiler factor
0

Pre stop boiler maximum
0 h

Boiler and heatpump together?
No

Allow boiler for outside temp. below
0.0 °C

Start boiler if not reaching
0 °C

Timeout for reaching boiler temp.
0 min

Weekly schedule settings
Week plan

Temperature

Input outside temperature
WWW

Current outside temperature
0.0 °C

Current humidity
n/a

Stop at 80% humidity, outside temp. <
0.0 °C

Stop at 20% humidity, outside temp. <
0.0 °C

Stopped at outside temperature <
0.0 °C

Own production

Energy meter
800 p/kWh

Start at own production over
0 W

Minimum running time
1 h

Current production
0 W

Operation based on Humidity

Humidity impacts heat pump efficiency by altering air properties, causing condensation, and affecting dehumidification. This can lead to airflow challenges and frost buildup, lowering performance. Our controller offers the ability for you to deactivate the heat pump during suboptimal humidity and temperature conditions, optimizing its operation. See highlighted area **Blue** above. A good rule of thumb is to set **STOP AT 80% HUMIDITY, OUTSIDE TEMP < 5 °C** and **STOP AT 20% HUMIDITY, OUTSIDE TEMP < 1 °C**.

HEAT PUMP OPERATIONS BASED ON SURPLUS ELECTRICITY FROM OWN ELECTRICITY PRODUCTION

If you are producing your own electricity, for example via, photovoltaic panels, windmill etc, you are able to utilize the excess production of electricity and call your heat pump to run.

Heatpump

On 0:00

Heatpump 0.00 DKK

Pellets 0.62 DKK

Advanced

Gridprice

Return

started by power production

Heating: Stopped by own production

Common

Temperature

Active

Yes

Output heatpump

Start at boiler alarm

No

Start when grid price is under

0.00 DKK

Pre stop boiler factor

0

Pre stop boiler maximum

0 h

Boiler and heatpump together?

No

Allow boiler for outside temp. below

0.0 °C

Start boiler if not reaching

0 °C

Timeout for reaching boiler temp.

0 min

Weekly schedule settings

Week plan

Input outside temperature

WWW

Current outside temperature

0.0 °C

Current humidity

n/a

Stop at 80% humidity, outside temp.<

0.0 °C

Stop at 20% humidity, outside temp.<

0.0 °C

Stopped at outside temperature <

0.0 °C

Own production

Energy meter

800 p/kWh

Start at own production over

0 W

Minimum running time

1 h

Current production

0 W

This function requires the installation of an External electricity kWh meter (sku:) connected onto P and P3 under PULSE in the v16 printboard.

At the parameter **START AT OWN PRODUCTION OVER** you are able to specify the number of WATTS required to begin running the heat pump. The heat pump will run according to the minimum amount of time specified under the parameter **MINIMUM RUNNING TIME** (see above).

Heat Pump Operation During Boiler Alarm

Under the parameter **START AT BOILER ALARM** you are able to enable the system to call on the operation of the heat if the pellet boiler goes into an ALARM state. This is to ensure that despite being in an alarm stop state, your system will nonetheless continue to produce heat.

OVERVIEW OF HEAT PUMP AND PELLET BOILER OPERATIONS

The heat pump will be started in these cases:

- when an own electric power production is measured and exceeds the value entered in the setup field “Start at own production over”.
- when started by own electric power production and the minimum running time specified in the setup field “Minimum running time” has not been reached.
- when there is a boiler alarm present and the value in the setup field “Start at boiler alarm” is YES.
- when the grid price is under the value in the setup field “Start when the grid price is under”.
- when not stopped by timer, as specified in the setup field “Weekly schedule settings”.
- when not stopped by a combination of low outside temperature and high outside humidity, as specified by the setup fields “Stop at 80% humidity, outside temp.<” and “Stop at 20% humidity, outside temp.<”. If humidity is not available, the heatpump is stopped for outside temperature below the value in the setup field “Stop at 80% humidity, outside temp.<”.

The boiler will be started in these cases, when there is a demand for heat:

- when the heatpump is stopped
- when not in a pre-stop condition
- when allowed to run together with the heat pump, specified by the value in the setup field “Boiler and heatpump together” = YES
- when the outside temperature is below the value in the setup field “Allow boiler for outside temp. below”.
- when the temperature specified in the setup field “Start boiler if not reaching” is not reached within the time specified in the setup field “Timeout for reaching boiler temp.”.

COMPARING THE HEAT PRODUCTION PRICE FOR BOILER AND HEAT PUMP

The current price for producing 1 kWh is constantly calculated for the heat pump using the grid power, if the necessary parameters are measured or received directly from the heat pump (only the latest heatpump).

The current price for producing 1 kWh with the boiler using wood pellets is received from Stokercloud on the internet.

These values, and the calculations behind, are shown on the page “Advanced” in the “Heatpump” menu.

The values are only for information, they are not used for regulation.

MISCELLANEOUS FUNCTIONS- ACTIVATING AN OUTPUT BASED ON ELECTRICITY PRICES

Totally independent of the heatpump start/stop, the controller is able to activate an output when the gridprice is lowest. This output could be used to heat a swimming pool.

The number of hours where the output is active is specified in the setup field “Active period”.

If the value in the setup field “Continuous period” is YES, the hours will be the cheapest continuous period. If the value is NO, the absolute cheapest hours in the current day is selected.

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