

## Installation instructions

DHP-AQ

If these instructions are not followed during installation and service, Danfoss A/S liability according to the applicable warranty is not binding. Danfoss A/S retains the right to make changes to components and specifications without prior notice.

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The Swedish language is used for the original instructions. Other languages are a translation of original instructions.  
(Directive 2006/42/EG)

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# 1 About documents and decals

## 1.1 Introduction

The following documents are available for this product:

- Installation instructions containing information to install and commission a heat pump installation, and information about the heat pump's function, accessories and technical data. Supplied with the heat pump on delivery.
- Service instructions that contain information about fault tracing. The service instructions are available for download as below.
- The electrical instructions that contain the wiring diagram for the heat pump intended for fault tracing and service. The electrical instructions are available for download as below.
- The maintenance instructions must handed over and gone through with the end customer. Supplied with the heat pump on delivery.
- Country specific instructions and forms are available where relevant. Supplied with the heat pump on delivery.
- Sheet with adhesive decals that will be used as translation for the existing English language type plates.

The Service instructions and Electrical instructions are available for download here:

[www.documentation.heatpump.danfoss.com](http://www.documentation.heatpump.danfoss.com)

## 1.2 Symbols in documents

The instructions contain different warning symbols, which, together with text, indicate to the user that there are risks involved with actions to be taken.

The symbols are displayed to the left of the text and three different symbols are used to indicate the degree of danger:



**DANGER!** Indicates an immediate danger that leads to fatal or serious injury if necessary measures are not taken.

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**Warning! Risk of personal injury!** Indicates a possible danger that can lead to fatal or serious injury if necessary measures are not taken.

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**Caution! Risk of installation damage.** Indicates a possible hazard that can lead to item damage if necessary measures are not taken.

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A fourth symbol is used to give practical information or tips on how to perform a procedure.










**Note!** Information regarding making the handling of the installation easier or a possible operational technical disadvantage.

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
## 1.3 Symbols on decals

The following symbols can occur on decals on the different parts of the heat pump. Which symbols are used depends on the heat pump model.

## Warning symbols


	Warning, danger!
	Read the documentation provided.
	Read the documentation provided.
	Warning, hazardous electrical voltage!
	Warning, hot surfaces!
	Warning, moving parts!
	Warning, risk of crushing injury!

## Electrical components









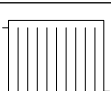
	Component, normal		Component, accessory
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3	Outdoor unit	362	Shunt valve
50	Outdoor sensor	363	Exchange valve hot water
54	Hot water sensor	365	Supply line sensor
55	Sensor hot-water top	366	Return line sensor
71	Flow sensor	406	Room sensor
304	Circulation pump	408	EVU
353	Drip tray	417	Defrost sensor

Example:

 406	Room sensor
---	-------------

## Pipe connections

	Bleeding
	Defrosting tank
	Expansion tank with safety valve, brine
	Brine
	Temperature and pressure relief valve
	Tap water
	Outdoor unit
	Water heater
	Heating system

## 1.4 Terminology

Term	Meaning
Heating system/Heat transfer fluid circuit	The circuit that generates heat to the property or to the water heater.
Supply line	The heating system's supply line with flow direction from the heat pump to radiators/under floor heating or water heater.
Return line	The heating system's return line with flow direction from radiators/under floor heating or water heater to the heat pump.
Circulation pump	Circulation pump for heating system.
Refrigerant circuit	The energy carrying circuit between the outdoor air and heating system.
Refrigerant	The gas/liquid that circulates in the refrigerant circuit.

## 2 Important information

### 2.1 General safety precautions



Warning! Risk of personal injury! Children are not permitted to play with the product.

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Caution! The heat pump must be installed by authorised installation engineers and the installation must follow the applicable local rules and regulations as well as these installation instructions.

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Caution! This product is not intended for persons (including children) with reduced physical, sensory or psychological capacity, or who do not have knowledge or experience, unless supervised or they have received instructions on how the apparatus functions from a safety qualified person.

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Caution! When cooling it is important to limit the lowest flow line temperature to prevent condensation.

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### 2.2 Refrigerant

#### 2.2.1 Fire risk

The refrigerant is not combustible or explosive in normal conditions.

#### 2.2.2 Toxicity

In normal use and normal conditions the refrigerant has low toxicity. However, although the toxicity of the refrigerant is low, it can cause injury (or be highly dangerous) in abnormal circumstances or where deliberately abused.

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Warning! Risk of personal injury! Spaces in which heavy vapour can collect below the level of the air must be well ventilated.

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Refrigerant vapour is heavier than air and, in enclosed spaces below the level of a door for example, and in the event of leakage, concentrations can arise with a resultant risk of suffocation due to a lack of oxygen.

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Warning! Risk of personal injury! Refrigerant exposed to a naked flame creates a poisonous irritating gas. This gas can be detected by its odour even at concentrations below its permitted levels. Evacuate the area until it has been sufficiently ventilated.

---

#### 2.2.3 Work on the refrigerant circuit



Caution! Work on the refrigerant circuit must only be carried out by a certified engineer!

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Caution! When repairing the refrigerant circuit, the refrigerant must not be released from the heat pump - it must be dealt with in the appropriate way.

---



Refilling must only be carried out using new refrigerant (for the amount and type of refrigerant see manufacturer's plate) through the service valves.

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Caution! All warranties from Danfoss are void if, when filling with refrigerant other than Danfoss A/S specified refrigerant, if there has not been written notification that the new refrigerant is an approved replacement refrigerant together with other remedies.

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#### 2.2.4 Scrapping

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Caution! When the heat pump is to be scrapped the refrigerant must be extracted for disposal. Local rules and regulations related to the disposal of refrigerant must be followed.

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### 2.3 Electrical connection

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**DANGER!** Hazardous electrical voltage! The terminal blocks are live and can be highly dangerous due to the risk of electric shock. All power supplies must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.

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Warning! Electrical installation may only be carried out by an authorised electrician and must follow applicable local and national regulations.

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Warning! The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using a multi-pole circuit breaker with a minimum contact gap of 3 mm.

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### 2.4 Water quality

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Caution! A normal heating system always contains a certain amount of corrosion particulates (rust) and sludge products from calcium oxide. This comes from acid that is naturally occurring in the fresh water that the system is filled with. It is not good practice to have to fill the heating system regularly which is why any leakage in the heating system should be repaired immediately. Normal filling should occur only once or twice a year. The water in the heating system should be as clean as possible, always position the dirt filter on the return line from the heating system to the heat pump, as close to the heat pump as possible.

---



Caution! Hard water; Normally it is not a problem installing a heat pump in areas with hard water because the normal operating temperature for the hot water does not exceed 60°C. In areas where there are exceptional prevailing conditions with the water one can install a softening filter, which softens the water, cleans any impurities and prevents the build up of calcification.

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## 2.5 Commissioning



Caution! The installation may only be commissioned if the heating system is filled and bled. Otherwise the circulation pump can be damaged.

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Caution! If the installation is only to operate using an auxiliary heater during the installation, ensure that the heating system is filled and bled and that the compressor cannot be started. This is carried out by setting the operating mode to AUX. HEATER.

---

## 3 Transport, unpacking and positioning

### 3.1 Transporting heat pump



Caution! The heat pump must always be transported and stored standing and in a dry environment. If the heat pump is laid on the incorrect side it may become seriously damaged as the oil in the compressor can run out in the pressure pipe and therefore prevent normal function.

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Caution! Always secure the heat pump so that it cannot tip over during transportation.

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### 3.2 Unpacking heat pump

#### 3.2.1 Delivery check

1. Check that there is no transport damage.
2. Remove the packaging and check that the delivery contains the following components.

Table 1. Supplied contents

Quantity	Name
1	Heat pump
1	Control unit
1	Document set
1	Package (1 x shut-off valve with filter, 1 x outdoor sensor)

### 3.3 Positioning the heat pump

#### 3.3.1 Recommended location

When positioning the heat pump, note the following:



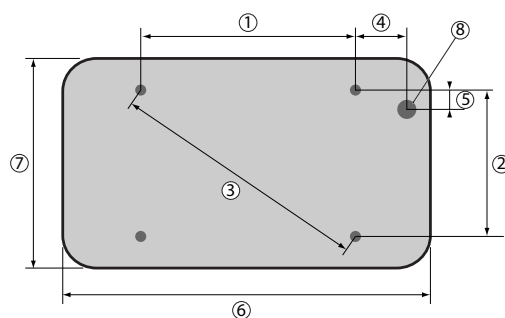
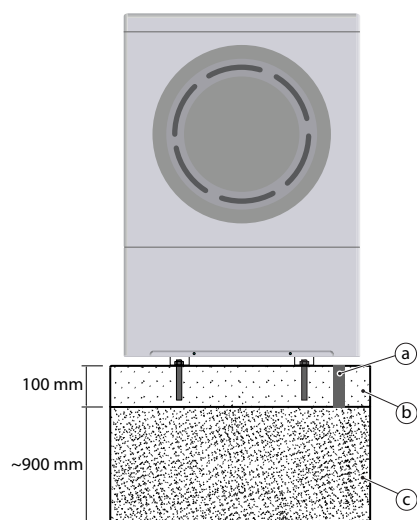
Caution! The heat pump must be positioned outdoors on a stable base. The floor must be able to support the gross weight of the heat pump. (see Technical data)

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Caution! The heat pump must be secured on a stable base, for example a cast foundation. All four mounting points must be secured to the base.

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Position	Description
a	Drainage hole
b	Foundation
c	Gravel

Measurements	6-9 kW	11-13 kW	16-18 kW
1	450 mm	470 mm	710 mm
2	424 mm	480 mm	480 mm
3	618 mm	672 mm	857 mm
4	130 mm	190 mm	145 mm
5	61 mm	65 mm	65 mm
6	~1,000 mm	~1,200 mm	~1300 mm
7	~650 mm	~720 mm	~720 mm
8	Ø 65 mm	Ø 65 mm	Ø 65 mm

Bolt size		
6-9 kW	11-13 kW	16-18 kW
M10 (4x)	M12 (4x)	M12 (4x)



Caution! A drip tray is installed with the purpose of gathering and draining away melt water during defrosting. Connect a hose or pipe along with a heat trace cable between the outlet of the drip tray and a drain or a free draining piece of ground. The heat cable must be connected to the terminal provided and is necessary to prevent ice blockage.

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Caution! Check with a spirit level that the heat pump is installed horizontally.

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Caution! Incorrect positioning of the heat pump risks reduction of performance.

---



Caution! The unit with water heater must be placed indoors, in an area with a floor drain.

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Caution! The unit with water heater must be placed indoors, on a stable surface. The floor must be able to support the gross weight of the unit with filled water tank (see Technical data).

---



Note! Avoid placing the heat pump near windows or walls to noise sensitive areas.

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Note! Ensure that there is sufficient distance to neighbouring properties so that they are not exposed to noise. Applicable local regulations must be followed.

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Note! The heat pump should not be enclosed.

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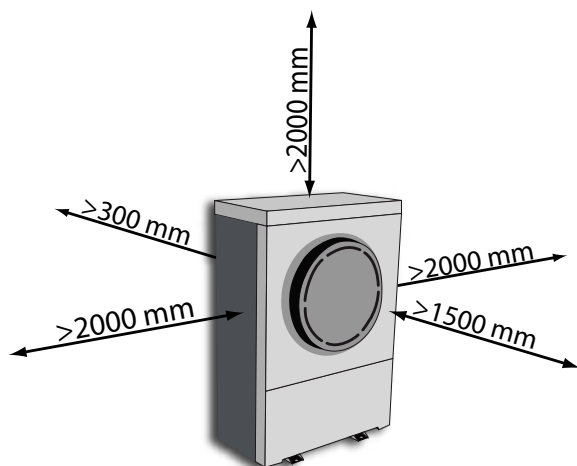
Note! Keep the heat pump and its immediate area free of snow, ice, leaves etc.

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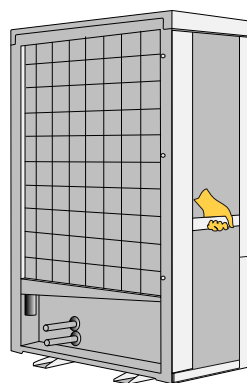
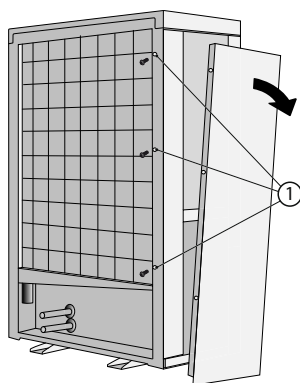
Note! Remember that the heat pump must have a certain amount of space in order to function and for servicing. Otherwise there is a risk that the air will recirculate from exhaust to intake. Avoid this by following the dimensions given below.

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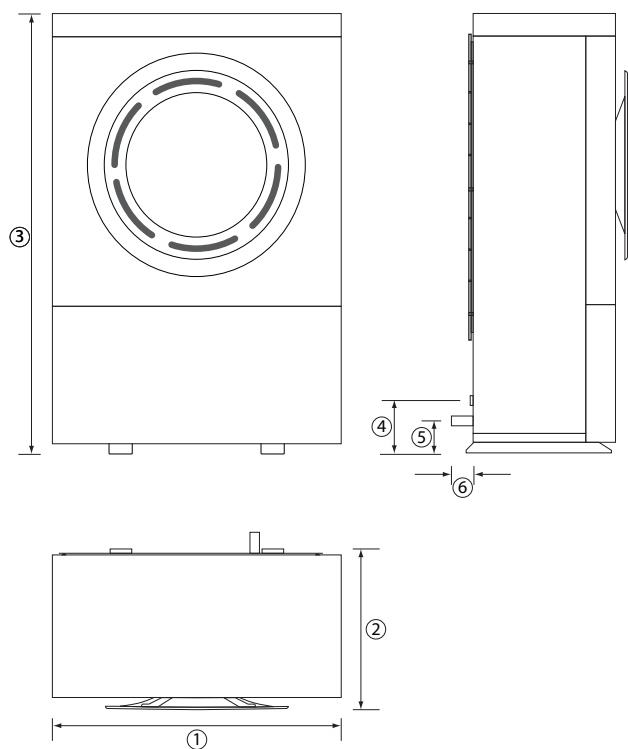
### 3.3.2 Lifting instructions

To lift the heat pump into position, unscrew the side plates by slackening off the screws (1). Then use the side members behind the side panels to lift and position the heat pump.



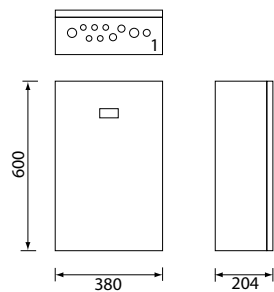
# 4     The heat pump

## 4.1   Dimensions and connections



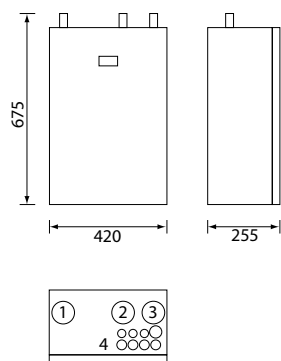
Position	Description	6-9 kW	11-13 kW	16-18 kW
1	Width	856 mm	1,016 mm	1,166 mm
2	Depth	510 mm	564 mm	570 mm
3	Height	1,272 mm	1,477 mm	1,557 mm
4	Height to supply line pipe, 28 mm Cu	155.5 mm		
5	Height to return line pipe, 28 mm Cu	96.5 mm		
6	Length max protruding pipe	30 mm		

### Control unit DHP-AQ Mini



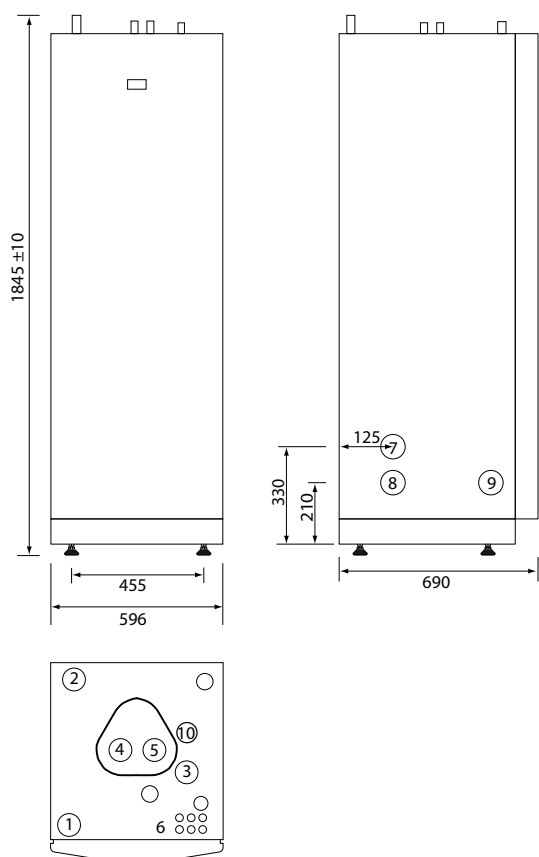
Position	Description
1	Lead-in for supply, sensor and communication cables

### Control unit DHP-AQ Midi



Position	Description
1	Supply line for heating system, 28 mm Cu
2	Supply line to water heater, 28 mm Cu
3	Supply line from heat pump, 28 mm Cu
4	Lead-in for supply, sensor and communication cables

### Control unitDHP-AQ Maxi



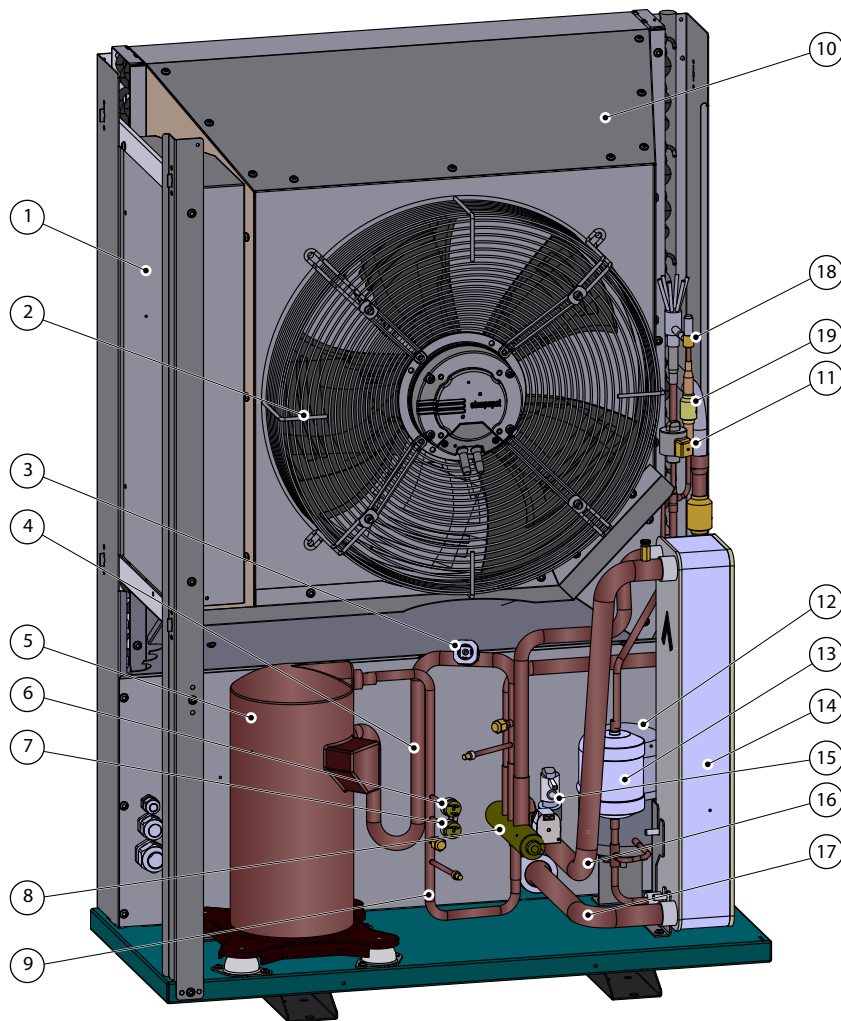
Position	Description
1	Supply line heating system, 28 mm Cu
2	Return line heating system, 28 mm Cu
3	Connection for bleed valve, 22 mm Cu
4	Hot water line, 22 mm Cu
5	Cold water line, 22 mm Cu
6	Lead-in for supply, sensor and communication cables
7	Supply or return line heat pump
8	Supply or return line heat pump
9	Extra knock-out
10	Safety valve for temperature and pressure (only applies to certain models)

Position 7 and 8 can be connected to either the left or right-hand side or bottom of the control unit.



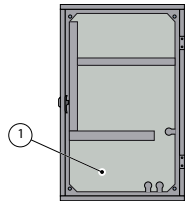
## 4.2 Components

### 4.2.1 Outdoor unit

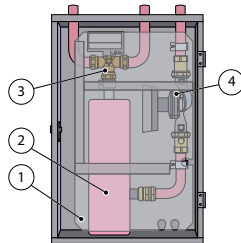


Position	Name	Position	Name
1	Electrical cabinet	11	Electronic expansion valve
2	Fan	12	Receiver
3	Pressure transmitter	13	Drying filter
4	Suction line	14	Heat exchanger
5	Compressor	15	Flow sensor
6	High pressure switch	16	Heating system supply line
7	Operating pressure switch	17	Return line heating system
8	Four-way valve	18	Solenoid
9	Discharge pipe	19	Non-return valve
10	Air heat exchanger		

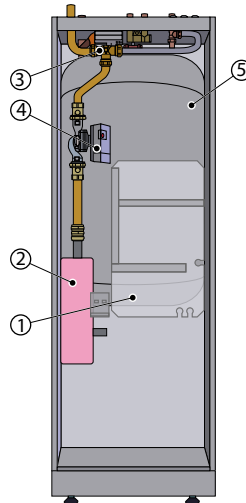
## 4.2.2 Indoor unit



DHP-AQ Mini



DHP-AQ Midi



DHP-AQ Maxi

Position	Description
1	Control module (transparent in image)
2	Immersion heater
3	Reversing valve
4	Circulation pump
5	Water heater

## 4.2.3 Speed controlled fan

The fan is operated by a permanent solenoid motor with great efficiency. The fan starts at a nominal speed, which differs depending on the size of output. The fan speed is adjusted up or down as required which is determined by the temperatures in the refrigerant circuit.

## 4.2.4 Electronic expansion valve

When the refrigerant passes the expansion valve the pressure and temperature of the refrigerant are reduced. In this way the energy in the outdoor air is available to the refrigerant circuit. By regulating the opening degree of the expansion valve one can optimise the flow in the refrigerant circuit in different operating conditions. Control of the electronic expansion valve is based on the measurements of temperatures and pressures in the refrigerant circuit and outside air.

## 4.2.5 Auxiliary heat

An auxiliary heater is included in DHP-AQ Midi and DHP-AQ Maxi and consists of an immersion heater, which is located on the supply line ahead of the reversing valve. An immersion heater is available for DHP-AQ Mini as an accessory. Also see System solution, Page 24, pos 114.

Immersion heaters in the DHP-AQ series intended for 400V supply voltage have three heating elements and can be controlled in five power stages. Products for 230V have two heating elements and are controlled in three power stages.

The parameter MAX STEP determines the number of power stages the immersion heater can be controlled to. The two stages 4 and 5 cannot be engaged when the compressor is in operation as opposed to stages +4 and +5 where it is possible.

With an internal immersion heater which is controlled by several power stages an external auxiliary heater, for example an electric boiler, can be controlled using the potential free output 101.8 – 101.16.

If an immersion heater of a different type is used that requires a start signal in DHP-AQ Mini (placed before the hot water reversing valve) the auxiliary heater is controlled from the potential free output 101.8 – 101.16. The parameter MAX STEP is set to "P".

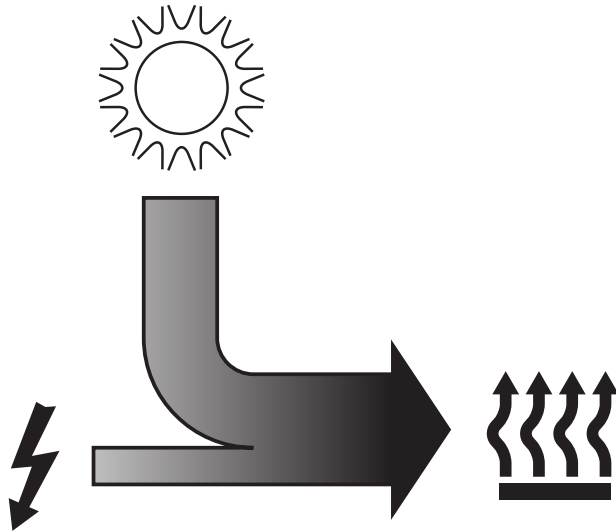
In the event of power cuts longer than three minutes, only a 6 kW output will be connected immediately after power has returned, the remaining output is delayed two hours.

#### 4.2.6 Compressor heater

The compressor heater runs in intervals when the outdoor temperature falls below 10°C. The compressor heater does not run at the same time as the compressor.

### 4.3 Principle description

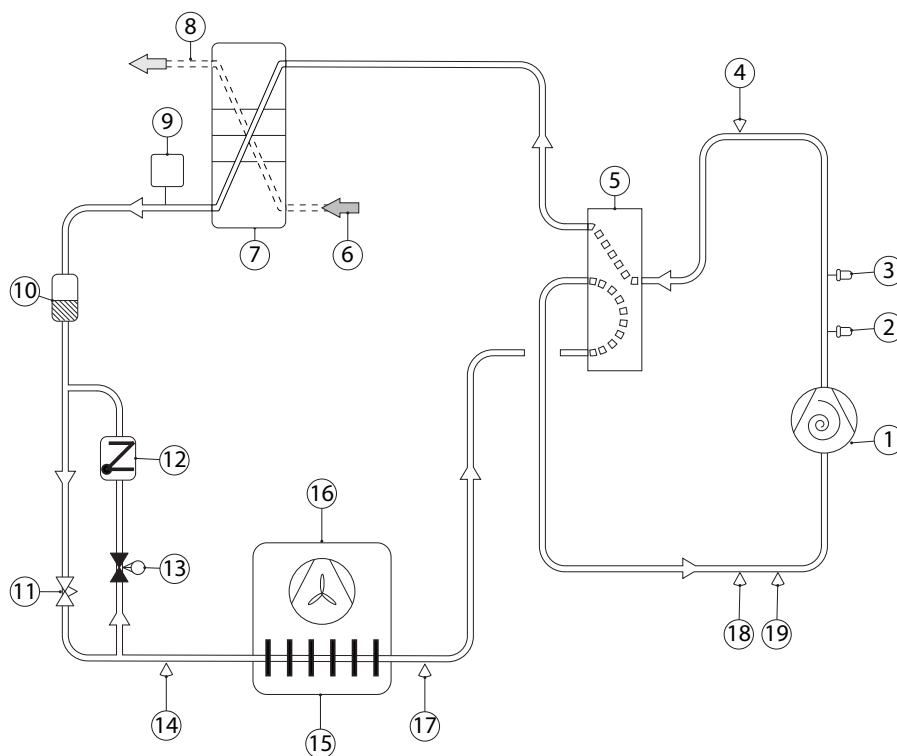
A heat pump utilises the renewable energy from the sun and that is also found in a natural heat source, such as rock, ground, lakes, ground water or air. The heat pump can be compared to a reversed refrigerator; in a refrigerator heat is transferred from the inside of the refrigerator to the outside, whereas in a heat pump, the solar energy that is stored in a heat source is transferred to the inside of the house. In both a refrigerator and heat pump the process is driven by an electrically powered compressor. The heat pump uses the solar energy in the heat source and gives off two to three times more heat energy than it uses in electrical energy. The heat pump is, therefore, a very environmentally friendly and economical way of heating a house.



### 4.4 Heating

The heat pump produces heating (see figure below).

When the compressor (1) receives a start signal the refrigerant is compressed in gas form via the 4 way valve (5) to the plate heat exchanger (7). The hot refrigerant gives off heat through the plate heat exchanger (7) to the heating system (8) and transfers to liquid phase. The refrigerant continues through the drying filter (10) and the electronic expansion valve (11) to the air exchanger (15). In the air exchanger (15) the refrigerant is heated to gas form by the hotter outdoor air. The gas continues via the 4 way valve (5) back to the compressor (1).



Position	Description	Position	Description
----------	-------------	----------	-------------

1	Compressor	11	Electronic expansion valve
---	------------	----	----------------------------

2	Operating pressure switch	12	Non-return valve
---	---------------------------	----	------------------

3	High pressure switch	13	Solenoid
---	----------------------	----	----------

4	Discharge pipe sensor	14	Refrigerant sensor 2
---	-----------------------	----	----------------------

5	Four-way valve	15	Air exchanger (evaporator)
---	----------------	----	----------------------------

6	Heating system (cold return line)	16	Fan
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7	Plate heat exchanger (condenser)	17	Refrigerant sensor 1
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8	Heating system ( hot supply line)	18	Pressure transmitter
---	-----------------------------------	----	----------------------

9	Receiver	19	Temperature transmitter
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10	Drying filter		
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The heat pump can produce heat for heating (house, pool), hot water and cooling. The hot water requirement is prioritised before the heating requirement and cooling requirement. The heating requirement is calculated from outdoor temperature and set heat curve.

For a fuller description of heat curves etc., see Important parameters, Page 39.

## 4.5 Hot water function

The water heater is equipped with a TWS coil (Tap Water Stratificator). The hot water is led from the heat pump through the water heater in the TWS coil from the top down. In this way the upper section of the water heater, where the hot water is tapped from, is always heated first.

Heating the hot water in the water heater is not stopped by the temperature but via the pressure in the refrigerant circuit of the heat pump unit. The operating pressure switch on the pressure pipe breaks at 28.5 bar. This means that heat pumps in different output classes may have slightly different peak temperatures for hot water. As a rule the peak temperature is between 54 – 58°C in a 180-litre water heater. Thanks to the design of the water heater and the TWS coil the hot water layers itself so that the hottest water is always at the top of the water heater and the cooler water at the bottom.

Two sensors indicate the present temperature of the hot water to the heat pump controls. A top water sensor that is located in the top of the water heater, and a hot water sensor located approx 50 cm up from the bottom of the water heater. Both the sensor values are "weighted" where the hot water sensor influence is 65 % (factory setting,

can be changed if necessary). This means that if the start value for hot water production is set to 40°C the heat pump need not necessarily start hot water production when the hot water sensor displays 40°C but also makes reference to what temperature the peak water sensor displays. If it is still very hot at the top of the water heater the start of hot water production will be delayed.

With anti-legionella operation, when the immersion heater heats the water heater to 60°C to prevent growth of legionella bacteria, the peak water sensor temperature has no impact, only the hot water sensor has control. Anti-legionella is factory set as top heating interval every 7th day.

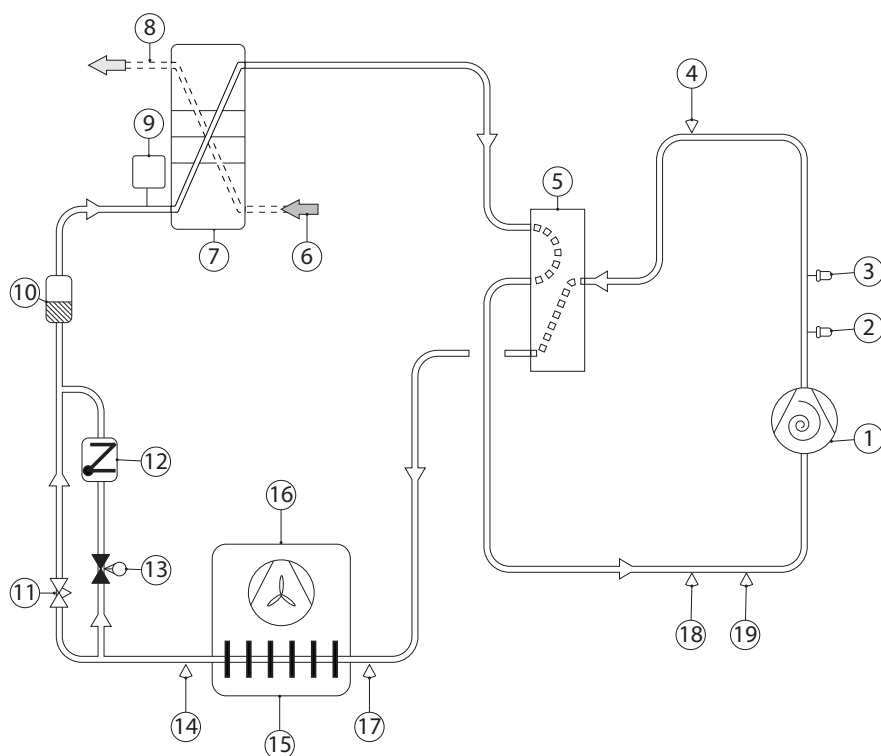
## 4.6 Defrost function

The heat pump defrosts (see figure below).



**Note!** The designations for condenser and evaporator are switched during the defrost function (like the cooling function) compared to the heating function, because the designations follow the cooling technical function that respective units have (evaporation respectively condensing).

When the compressor (1) receives a start signal the refrigerant is compressed in gas form via the 4 way valve (5) to the air exchanger (15). The hot refrigerant gives off heat to the air exchanger (15), shifts to liquid phase and continues to the plate heat exchanger (7). In the plate heat exchanger (7) the refrigerant is heated to gas form by the hotter heating system (6). The heating system is cooled. The refrigerant continues via the 4 way valve (5) back to the compressor (1).



### Position Description

1	Compressor
2	Operating pressure switch
3	High pressure switch
4	Discharge pipe sensor
5	Four-way valve
6	Heating system (hot return line)
7	Plate heat exchanger (evaporator)
8	Heating system ( cold supply line)

### Position Description

11	Electronic expansion valve
12	Non-return valve
13	Solenoid
14	Refrigerant sensor 2
15	Air exchanger (condenser)
16	Fan
17	Refrigerant sensor 1
18	Pressure transmitter

## Position Description

9	Receiver
10	Drying filter

## Position Description

19	Temperature transmitter
----	-------------------------

Defrosting is initiated by low temperature in the refrigerant circuit after the air exchanger and, among other things, is dependent on outdoor temperature, humidity and operating time. The length of defrosting varies depending on the extent of freezing of the air exchanger. Defrost continues until the air heat exchanger is free of ice and the temperature after the air exchanger has risen to the desired temperature. After completed defrosting the heat pump returns to the operating mode before defrosting.

During defrosting the heat pump retrieves energy from the house's heating system. The water volume in the heating system can be increased by installing a buffer tank. The buffer tank can also act as a surge tank.

## 4.7 Cooling function

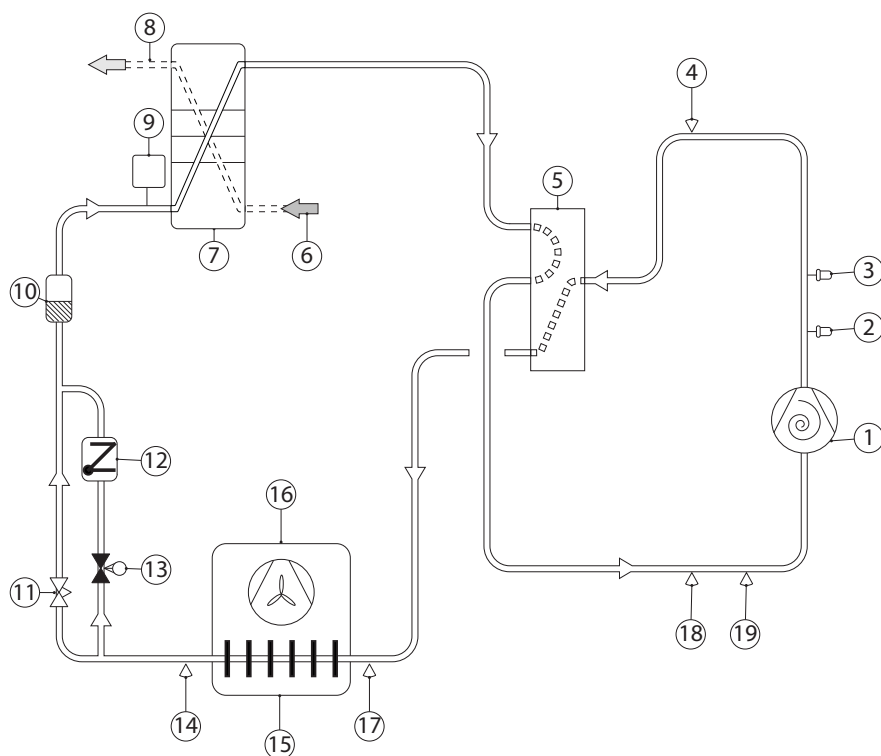
The heat pump produces cooling (see figure below).

The refrigerant process is similar to that at the defrosting function.



Note! The designations for condenser and evaporator are switched during the cooling function (like the defrosting function) compared to the heating function, because the designations follow the cooling technical function that respective units have (evaporation respectively condensing).

When the compressor (1) receives a start signal the refrigerant is compressed in gas form via the 4 way valve (5) to the air exchanger (15). The hot refrigerant gives off heat to the air exchanger (15), shifts to liquid phase and continues to the plate heat exchanger (7). In the plate heat exchanger (7) the refrigerant is heated to gas form by the hotter heating system (6). The heating system is cooled. The refrigerant continues via the 4 way valve (5) back to the compressor (1).



## Position Description

1	Compressor
2	Operating pressure switch
3	High pressure switch

## Position Description

11	Electronic expansion valve
12	Non-return valve
13	Solenoid

Position	Description
----------	-------------

4	Discharge pipe sensor
5	Four-way valve
6	Heating system (hot return line)
7	Plate heat exchanger (evaporator)
8	Heating system ( cold supply line)
9	Receiver
10	Drying filter

Position	Description
----------	-------------

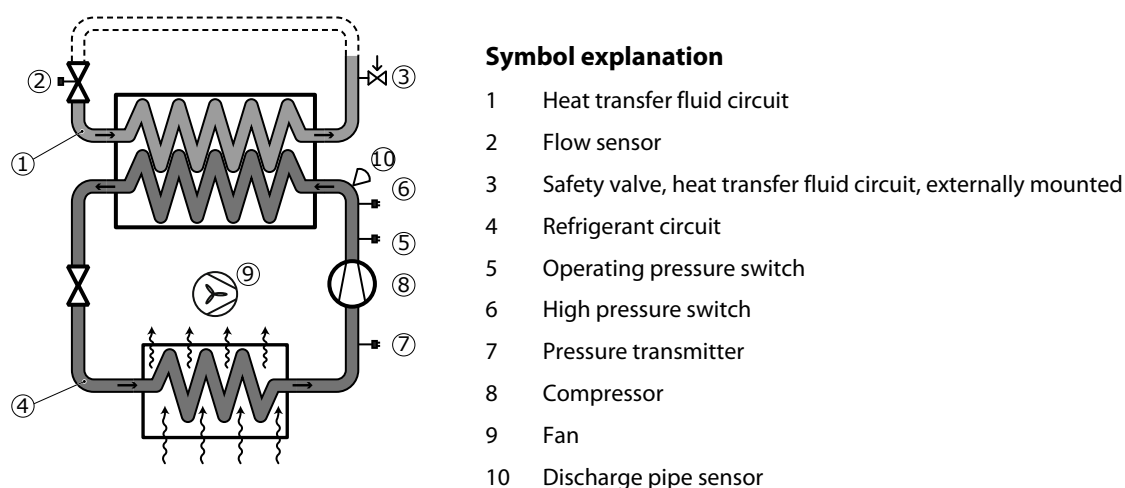
14	Refrigerant sensor 2
15	Air exchanger (condenser)
16	Fan
17	Refrigerant sensor 1
18	Pressure transmitter
19	Temperature transmitter

Cooling function is started by the heat pump control unit and is primarily temperature controlled. If the hot water heater is installed the control unit will alternate between cooling and hot water production with prioritisation for the hot water requirement.

## 4.8 Check and safety functions

The heat pump has a number of check and safety functions to protect the installation against damage during abnormal operating conditions.

The diagram below shows the heat pump's circuits with respective safety functions.



### Heat transfer fluid circuit (1)

If the flow in the heat transfer fluid circuit is below the permitted value at heat pump start and before the defrosting blocks the flow sensor (2) heat pump's normal operation, an alarm indicator on the control unit control panel flashes and a warning text appears in the display of the control panel. The alarm resets itself when the flow returns.

If the pressure in this circuit exceeds the opening pressure for the safety valve (3), the valve opens, releases the overpressure and closes again. The safety valve overflow pipe must have an open connection to the drain and visibly flow into this in a frost-free environment.

### Refrigerant circuit (4)

The refrigerant circuit's high pressure side is equipped with a high pressure switch (6) and an operating pressure switch (5). The operating pressure switch stops the compressor when the operating pressure is reached.

If the operating pressure switch does not work and the pressure continues to increase in the circuit, the high pressure switch activates when its break pressure is reached, whereupon the compressor stops and the heat pump's normal operation is blocked.

If the high pressure switch is activated an alarm indicator flashes on the control unit's control panel and a warning text appears in the display of the control panel. The blocked heat pump is reset by setting the operating mode to OFF and then back to the previously selected mode.

If the pressure transmitter (7) registers too low pressure in the refrigerant circuit, the heat pump's normal operation is blocked, an alarm indicator on the heat pump's control panel flashes and a warning text appears in the display of the control panel. The blocked heat pump is reset by setting the operating mode to OFF and then back to the previously selected mode. The pressure transmitter is also used to monitor temperature and pressure at compressor start. Deviations are handled in the same way as low pressure.

### **Compressor (8)**

The compressor is equipped with a thermal over current relay to protect the compressor against over current.

If the over current relay (see figure below) is activated, the heat pump's normal operation is blocked, an alarm indicator on the control unit's control panel flashes and a warning text appears in the display of the control panel.

The blocked heat pump is reset by setting the operating mode to OFF and then back to the previously selected mode.

The compressor is also equipped with an internal protector that stops the compressor if it risks becoming overheated. The internal protector cannot be reset manually, the compressor must cool before it can be restarted. No alarm connected to this protector.

The discharge pipe sensor (10) stops the compressor at too high pressurised gas temperature. This is indicated in the display by a square. The stop is ceased when the temperature becomes normal.

### **Fan (9)**

The fan motor is equipped with motor protection. If this is activated, the heat pump's normal operation is blocked, an alarm indicator on the control unit's control panel flashes and a warning text appears in the display of the control panel.

Alarms can be caused by objects sticking in the fan or the fan having frozen solid. Rectify the cause of the alarm and reset the heat pump by setting the operating mode to OFF and then back to the previously selected mode.

### **Speed (rpm) controlled circulation pump**

The circulation pump has an internal overload protector, which is reset automatically after cooling.

The overload protector also activates the alarm for the circulation pump and blocks the heat pump's normal operation. Indication occurs by the alarm indicator flashing on the control unit's control panel and a warning text appears in the display of the control panel. The circulation pump will attempt to start for 45 seconds every 5 minutes to try to acknowledge the alarm automatically. If the function is not normal after 5 start attempts the heat pump is constantly blocked and must be reset by setting the operating mode to OFF and then back to the previously selected mode.

### **Alarm mode**

If an alarm that affects the heat pump's normal operation is activated this will be indicated in the control panel's display window. In order to further attract attention, the heat pump will not produce hot water.

The heat pump will initially try to meet the heat demand using the compressor. If this is not possible, the built-in electric heating element engages.

### **Immersion heater**

The auxiliary heater consists of an electric heating element mounted on the heating system supply line. It has an overheat protector that switches off the electric heating element if it is at risk of becoming overheated. The overheat protector's control panel is located in the control unit (see the image below).

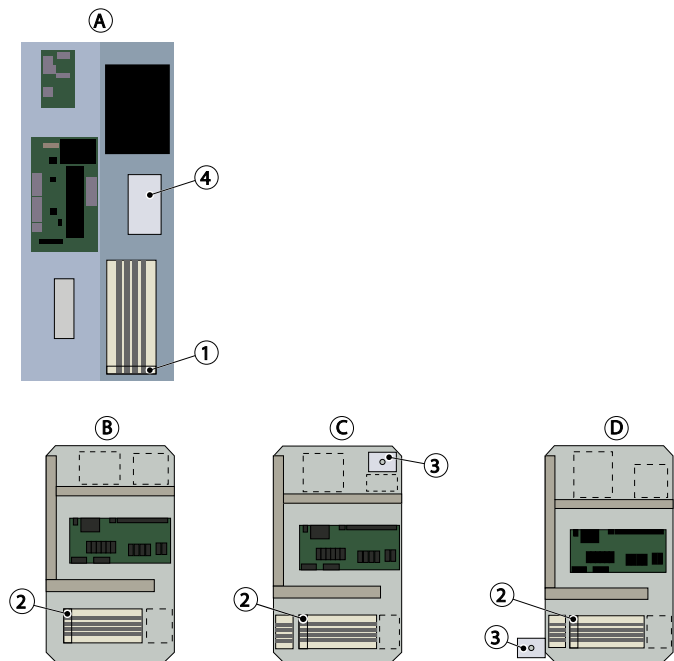
If the overheat protector is activated an alarm indicator flashes on the heat pump's control panel and a warning text appears.

The overheat protector is reset by pushing the reset button, which is on the overheat protector.

### **Electrical system**



The heat pump control and control unit are fused with fuses F1 and F2 (see figures below).



Symbol explanation	
A	Heat pump
B	Control unit DHP-AQ Mini
C	Control unit DHP-AQ Midi
D	Control unit DHP-AQ Maxi

1	Fuse F1
2	Fuse F2
3	Overheating protection
4	Overcurrent protection

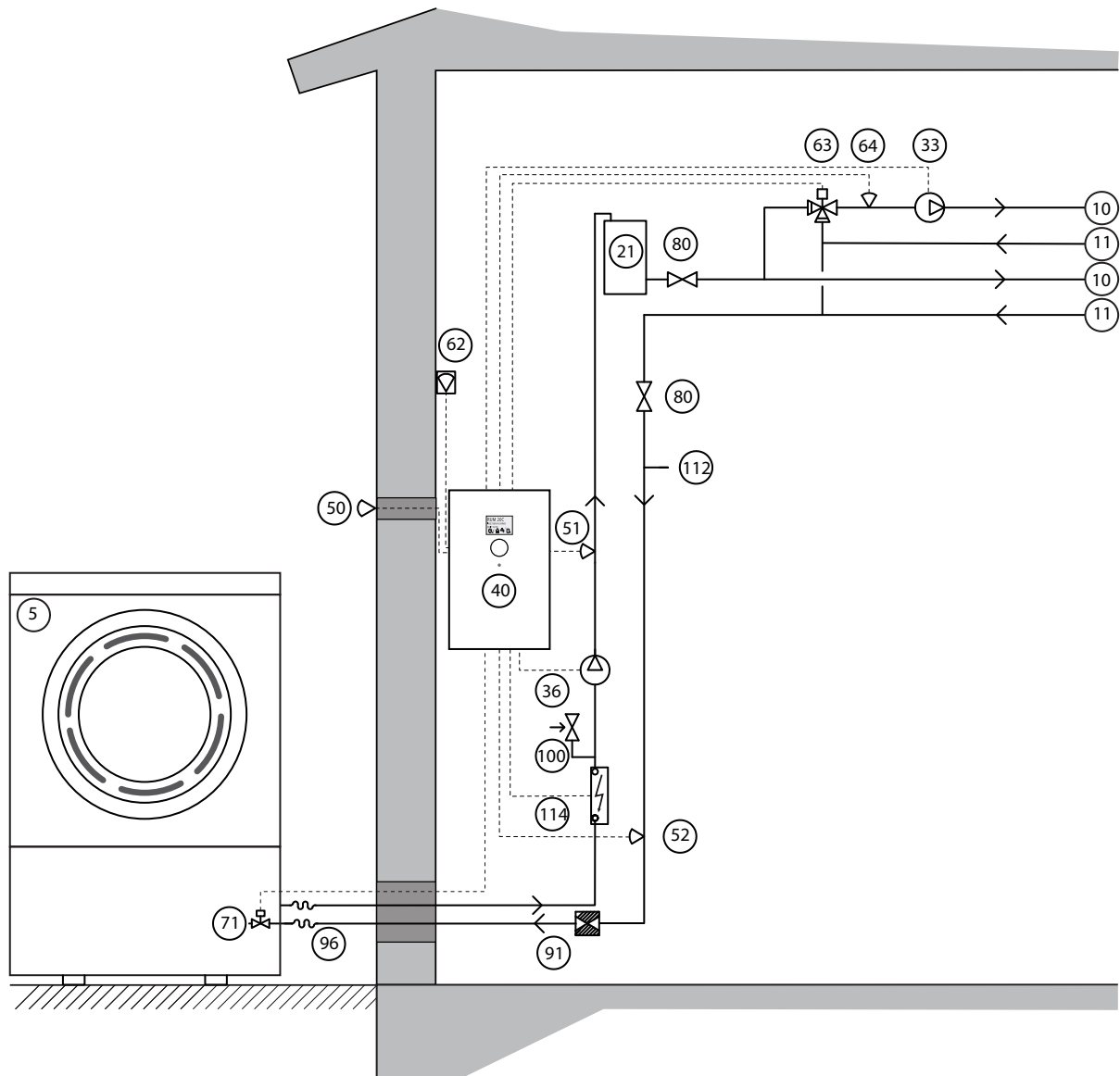
## 5 System solution

Explanations for the positions are given after the images of the system solution.

### 5.1 System solution DHP-AQ Mini

DHP-AQ Mini includes the control module with supply and return line sensors. The heat pump produces only heat or cooling. Two heating circuits can be connected, one using a shunt. The shunt is controlled by the heat pump control system. The flow line temperature is controlled with reference to the outside temperature following a set heat curve. The additional heater starts automatically on demand.

Buffer tank is installed for equalisation of the temperature for the heating system and to guarantee sufficient energy when defrosting. The buffer tank volume must be 20 l/kW heat pump output (for systems without water heaters). DHP-AQ Mini does not contain a water heater. Water heater is available as an accessory for DHP-AQ Midi and is included in DHP-AQ Maxi.

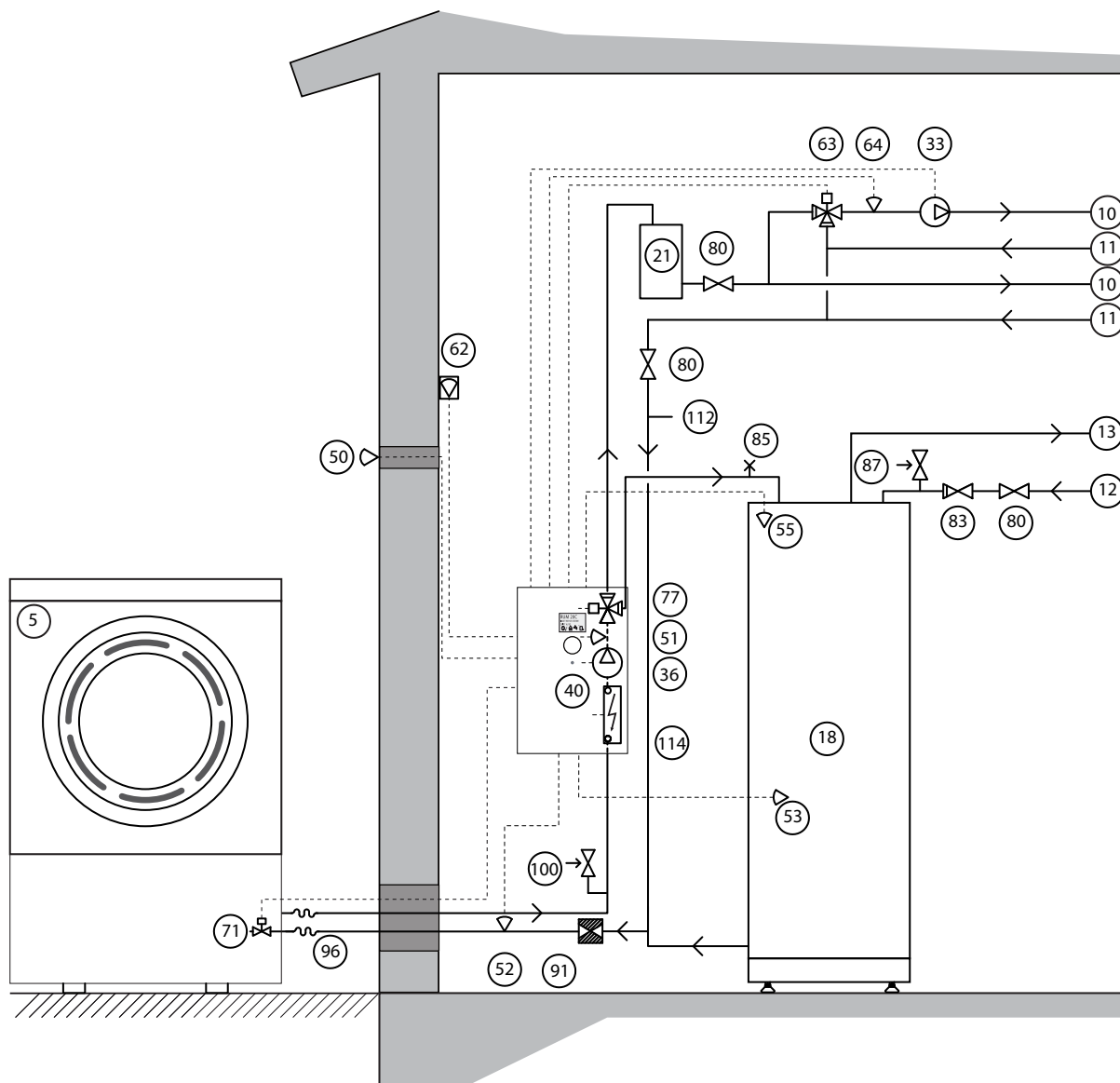


### 5.2 System solution DHP-AQ Midi

DHP-AQ Midi includes the control module with supply and return pipe sensors, circulation pump, 3-way valve and electric auxiliary heater. The heat pump produces heat, cooling and hot water. Production of heating and hot water cannot occur at the same time because the exchange valve for heating and hot water is positioned after the heat pump and the auxiliary heater. Hot water production is prioritised ahead of heat and cooling. Two heating circuits can be connected, one using a shunt. The shunt is controlled by the heat pump control system. The flow line temperature is controlled with reference to the outside temperature following a set heat curve. The additional

heater starts automatically on demand. The auxiliary heater carries out peak heating charging (anti-legionella function) in those operating modes that permit auxiliary heat.

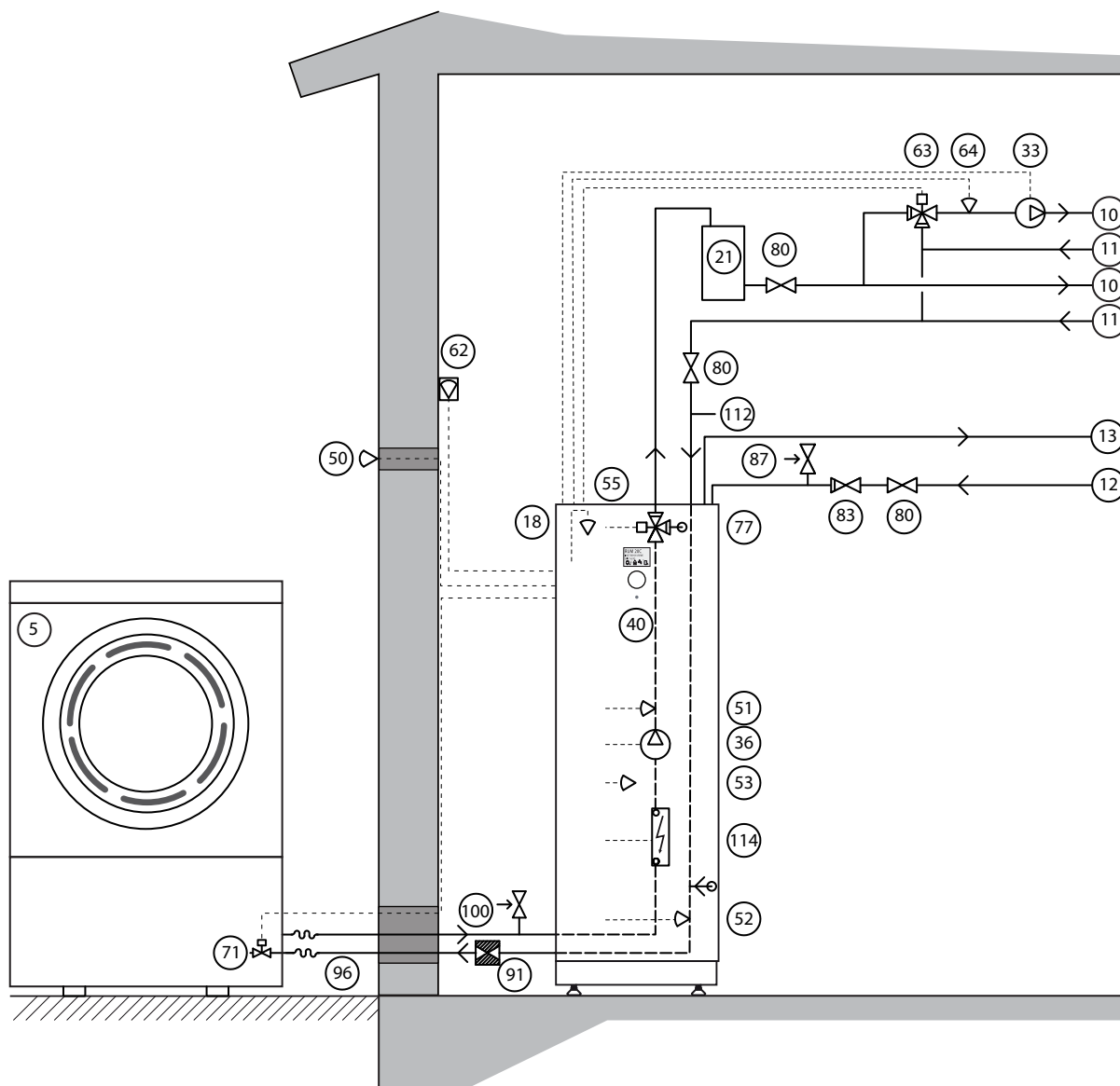
Buffer tank is installed for equalisation of the temperature for the heating system and to guarantee sufficient energy when defrosting. The buffer tank volume must be 10 l/kW heat pump output (for systems with water heaters). Water heater is available as an accessory.



### 5.3 System solution DHP-AQ Maxi

DHP-AQ Maxi includes the control module with supply and return pipe sensors, circulation pump, 3-way valve, electric auxiliary heater and water heater. The heat pump produces heat, cooling and hot water. Production of heating and hot water cannot occur at the same time because the exchange valve for heating and hot water is positioned after the heat pump and the auxiliary heater. Hot water production is prioritised ahead of heat and cooling. Two heating circuits can be connected, one using a shunt. The shunt is controlled by the heat pump control system. The flow line temperature is controlled with reference to the outside temperature following a set heat curve. The additional heater starts automatically on demand. The auxiliary heater carries out peak heating charging (anti-legionella function) in those operating modes that permit auxiliary heat.

Buffer tank is installed for equalisation of the temperature for the heating system and to guarantee sufficient energy when defrosting. The buffer tank volume must be 10 l/kW heat pump output (for systems with water heaters).



# **Position Name**

5	Heat pump unit
10	Supply line
11	Return line
12	Cold water
13	Hot water
18	Water heater
21	Buffer tank
33	Circulation pump shunt group
36	Circulation pump
40	Control unit
50	Outdoor sensor
51	Supply line sensor
52	Return line sensor

# **Position Name**

62	Room sensor
63	Shunt valve
64	Supply line sensor shunt group
71	Flow sensor
77	Switching valve for hot water
80	Shut-off valve
83	Non-return valve
85	Bleed valve
87	Safety valve (9 bar)
91	Strainer
96	Flexible hose
100	Safety valve (1.5 bar)
112	Expansion vessel, closed

Position	Name	Position	Name
53	Hot water sensor	114	Auxiliary heat
55	Peak temperature sensor		

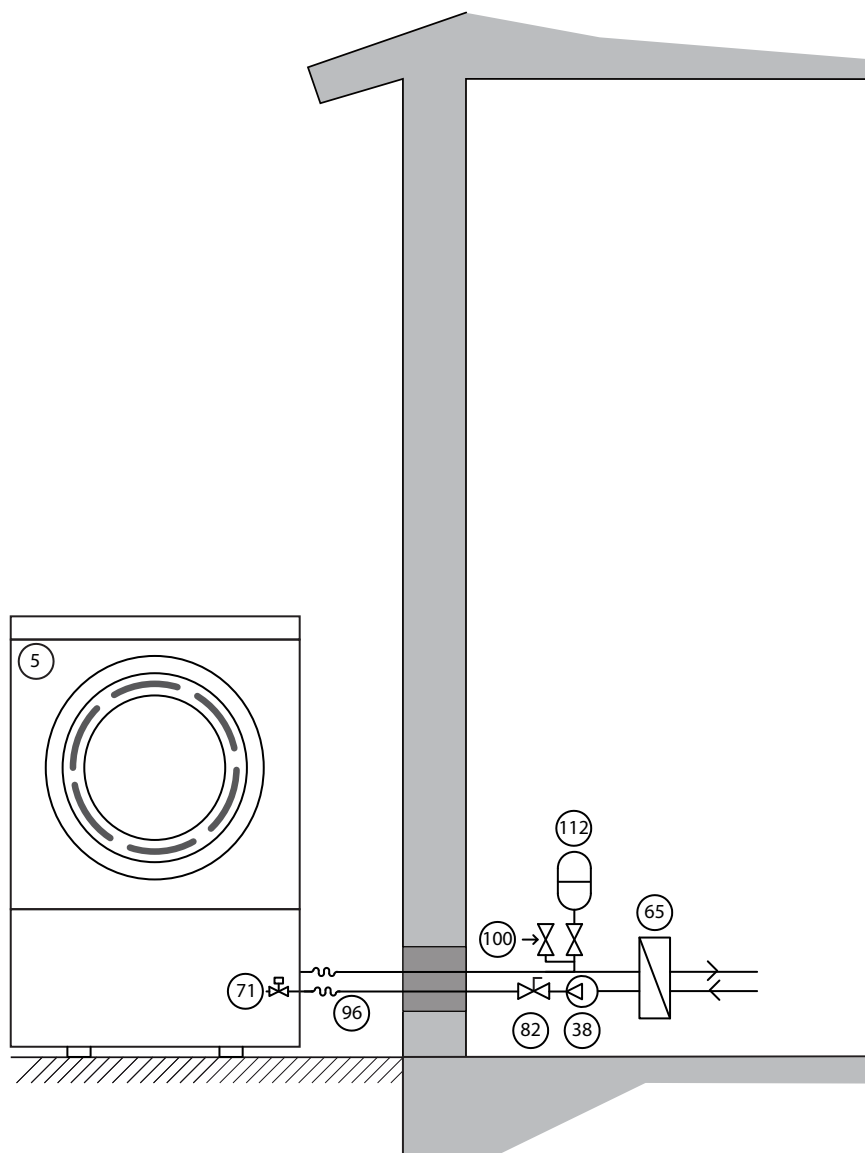
## 5.4 System solution intermediate exchanger

To safeguard against the pipes freezing an intermediate exchanger can be installed indoors. In such cases one must use glycol intended for refrigerant applications in the circuit to the heat pump unit and an extra circulation pump. Follow the supplier's instructions for mixing, but if none is given 35% is the lowest concentration recommended. To order and for more information about the intermediate exchanger and the circulation pump, contact Danfoss.



Caution! No glycol mixtures may be used in systems with hot zinc dipped pipes or components.

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#### Position Name

5	Heat pump unit
38	Circulation pump
65	Intermediate exchanger
71	Flow sensor

#### Position Name

82	Adjustment valve
96	Flexible hose
100	Safety valve (1.5 bar)
112	Expansion vessel, closed

## 6 Piping installation

### 6.1 Pipe connection



Caution! Piping installation must be carried out in accordance with applicable local rules and regulations. The hot water tank must be equipped with an approved safety valve.

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Caution! There is a risk of the pipes to the heat pump freezing when water circulation through the heat pump stops when outdoor temperatures fall below freezing. Normally the integrated flow sensor gives an alarm if there is low flow (assumes that there is current to the heat pump), for example when the radiator pump has stopped. In the event of longer flow stops, for example in case of power failure or if the plant is OFF, there is however an obvious risk of freezing. By installing a stop cock on the inside of the house wall it is possible to drain the part of the system that goes out to the heat pump if necessary. Another way of ensuring against freezing is to install an intermediate exchanger indoors. In such cases one must use glycol intended for refrigerant applications in the circuit to the heat pump unit and an extra circulation pump, see System solution intermediate exchanger. Another option is to fill the heating system with anti-freeze.

---



Caution! To prevent leaks, ensure that there are no stresses in the connecting pipes!

---



Caution! It is important that the heating system is bled after installation. Bleed valves must be installed where necessary.

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Caution! Heating systems with closed expansion tanks must also be supplied with approved pressure gauges and safety valves.

---



Caution! Cold and hot water pipes and overflow pipes from safety valves must be made of heat resistant and corrosion-resistant material, e.g. copper. The safety valve overflow pipes must have an open connection to the drain and visibly flow into this in a frost-free environment.

---



Caution! The connecting pipe between the expansion tank and the safety valve must slope continuously upwards. A continuous upwards slope means that the pipe must not slope downwards from the horizontal at any point.

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Note! Ensure that the pipe installation is carried out in accordance with the dimensions and connection diagrams.

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### 6.2 Connecting cold and hot water lines

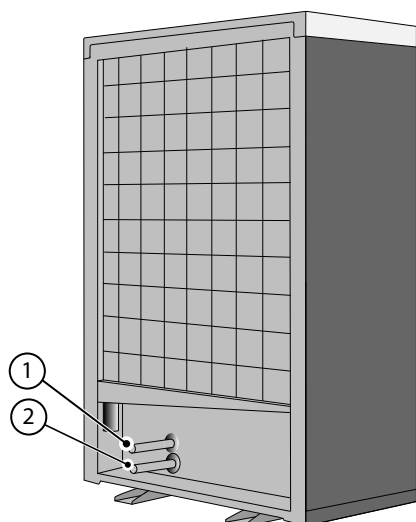
If necessary, connect the cold water and hot water pipes with all the necessary components, see System solution, Page 24.

### 6.3 Connecting the heating system supply and return lines

Connecting the heating system supply and return lines, see System solution, Page 24.

For information on how flexible hoses should be installed, see Flexible hoses, Page 30.

1. Connect the supply pipe with a flexible hose connection and with all the necessary components.
2. Connect the return pipe with a flexible hose connection and with all the necessary components including a filter.
3. Insulate the supply and return lines all the way to the heat pump.



Position	Description
1	Supply line 28 mm copper pipe
2	Return line 28 mm copper pipe

## 6.4 Noise and vibrations

### 6.4.1 Installation of the heat pump

To prevent disturbing noise from the heat pump the following recommendations should be observed:

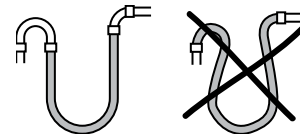
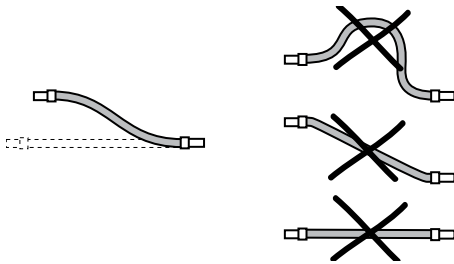
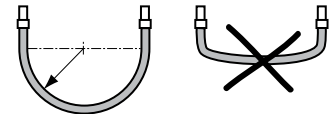
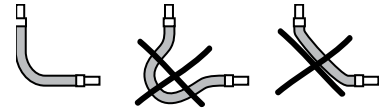
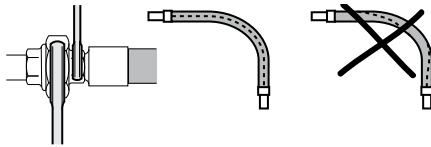
- In the event the heat pump is positioned on a vibration sensitive base, vibration dampers should be used. The vibration dampers must be correctly dimensioned with regard to the heat pump's weight so that static spring depression of at least 2 mm is obtained in all mounting components. Vibration dampers are available to purchase as accessories.
- Connection of the heat transfer fluid to the heat pump must be made using a flexible hose to prevent transmission of vibration to building construction and the pipe system, see Flexible hoses, Page 30.
- Ensure that pipes at lead-ins are not lying against the walls.
- Ensure that the electrical supply cable does not provide a path for vibration because it is overstretched.

### 6.4.2 Flexible hoses

All pipes should be routed in such a way that vibrations cannot be transmitted from the heat pump through the piping and out into the building. This also applies to the expansion pipe. We recommend that flexible hoses are



used for all pipe connections to avoid the transmission of vibrations. Flexible hoses are available to purchase as accessories. The figures below show how appropriate and inappropriate installations look using this type of hose.



# 7 Electrical Installation



**DANGER!** Hazardous electrical voltage! The terminal blocks are live and can be highly dangerous due to the risk of electric shock. All power supplies must be isolated before electrical installation is started. The heat pump is connected internally at the factory, for this reason electrical installation consists mainly of the connection of the power supply.



**Warning!** Electrical installation may only be carried out by an authorised electrician and must follow applicable local and national regulations.



**Warning!** The electrical installation must be carried out using permanently routed cables. It must be possible to isolate the power supply using a multi-pole circuit breaker with a minimum contact gap of 3 mm.

## 7.1 Control centre

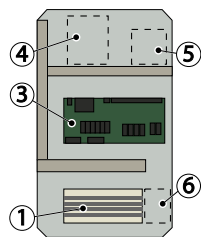
### 7.1.1 Installation



**Caution!** The control centre must be installed in a frost-free environment.

The control centre contains the necessary components for voltage supply, control systems and operation.

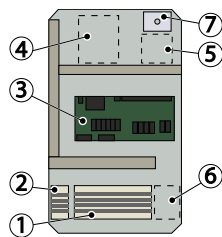
### 7.1.2 DHP-AQ Mini electrical components in the control centre



#### Symbol explanation

- |   |   |
|---|---|
| 1 | Terminal block  |
| 3 | Hub card  |
| 4 | Space for expansion card (accessory)                    |
| 5 | Space for communications card (accessory)               |
| 6 | Space for terminal block for expansion card (accessory) |

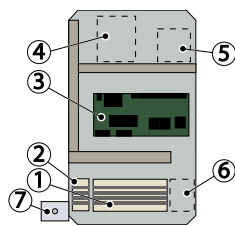
### 7.1.3 DHP-AQ Midi electrical components in the control centre



#### Symbol explanation

- |   |  |
|---|--|
| 1 | Terminal block   |
| 2 | Terminal block for internal electrical auxiliary heater (IH) |
| 3 | Hub card   |
| 4 | Space for expansion card (accessory)                         |
| 5 | Space for communications card (accessory)                    |
| 6 | Space for terminal block for expansion card (accessory)      |
| 7 | Overheating protection                                       |

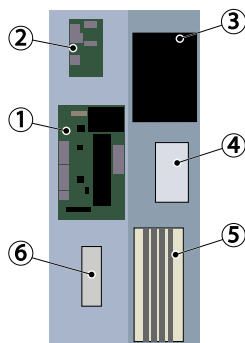
### 7.1.4 DHP-AQ Maxi electrical components in the control centre



#### Symbol explanation

- |   |  |
|---|--|
| 1 | Terminal block   |
| 2 | Terminal block for internal electrical auxiliary heater (IH) |
| 3 | Hub card   |
| 4 | Space for expansion card (accessory)                         |
| 5 | Space for communications card (accessory)                    |
| 6 | Space for terminal block for expansion card (accessory)      |
| 7 | Overheating protection                                       |

## 7.2 Electrical cabinet in heat pump



#### Symbol explanation

- |   |                              |
|---|------------------------------|
| 1 | Heat pump card               |
| 2 | Expansion valve card         |
| 3 | Soft starter                 |
| 4 | Overcurrent protection       |
| 5 | Terminal block               |
| 6 | Capacitor (only for 230V 1N) |

## 7.3 Cable connection

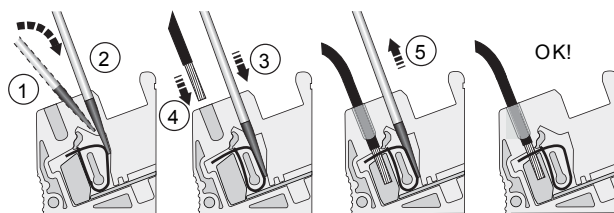


Note! Laying electrical wiring can also cause noise so this installation must be carried out appropriately. An appropriate installation is where there is approximately 300 mm free cable between the heat pump and the building. It is inappropriate to bolt trunking between the heat pump and the wall. This is because vibrations can then be transmitted from the heat pump through the trunking to the walls of the house.

UV resistant cable must be used for outdoor power cables. Cable choice must follow applicable local and national regulations.

UV resistant, twinned pair data/telephone cable must be used for outdoor communication cables. The cable must be screened with the one end of the screening (it does not matter which end) earthed in a ground block. The cable section area must be a minimum of 0.25 mm<sup>2</sup>.

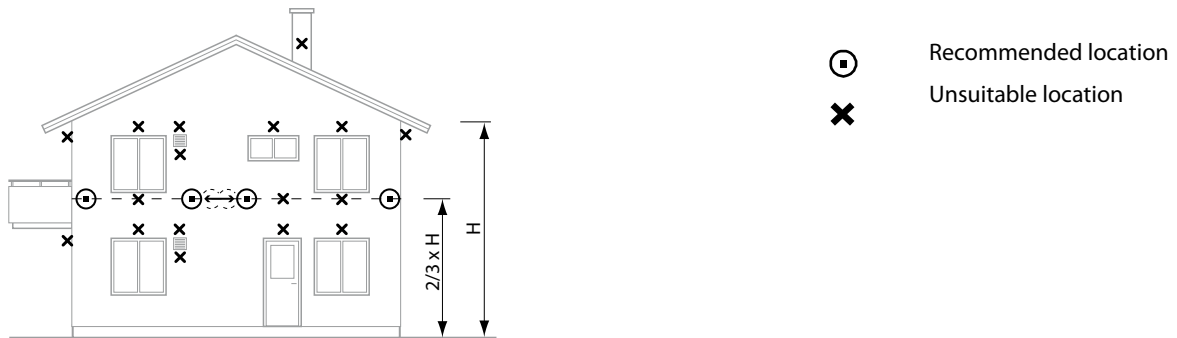
When the power cable is connected to the terminal block a screwdriver is used to open the terminal block.



1. Insert the screwdriver.
2. Straighten the screwdriver.
3. Push the screwdriver down to release the cable lock.

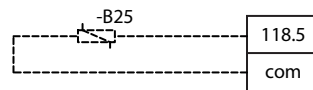
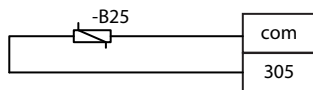
4. Insert the cable and hold it in place.
5. Pull the screwdriver out.
6. Check that the cable is secured by carefully pulling on the cable.

## 7.4 Position and connect outdoor sensors



- Position the outdoor sensor on the north or north west side of the house.
- For higher buildings, the sensor should be positioned between the second and third storeys. Its location must not be completely protected from the wind but not in a direct draft. The outdoor sensor should not be placed on reflective panel walls.
- The sensor must be positioned at least 1 m from openings in the walls that emit hot air.
- If the sensor cable is connected through a pipe, the pipe must be sealed so that the sensor is not affected by outgoing air.

The outdoor sensor is connected by a two core cable. A maximum cable length of 50 m applies for a cross section of 0.75 mm<sup>2</sup>. For greater lengths a cross section of 1.5 mm<sup>2</sup> is used, up to a maximum of 120 m. Then connect the sensor to the heat pump (outdoors) or the heat pump's control centre (indoors).

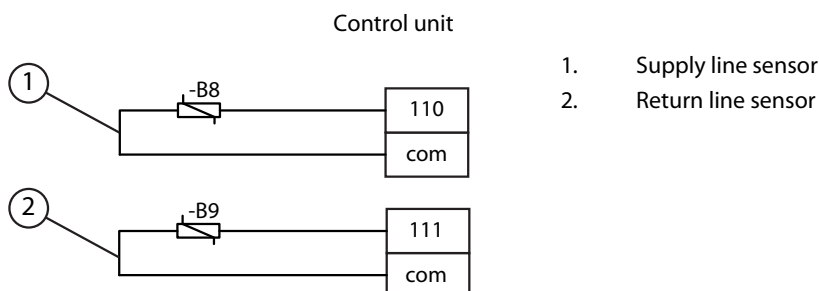


## 7.5 Connecting supply and return pipe sensors

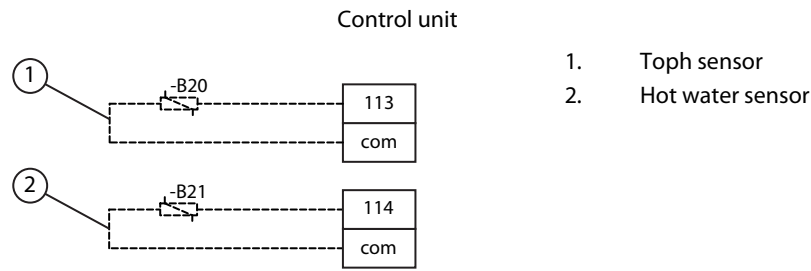
DHP-AQ Mini - no sensors connected upon delivery.

DHP-AQ Midi - supply line sensor connected upon delivery.

DHP-AQ Maxi - both sensors connected upon delivery.

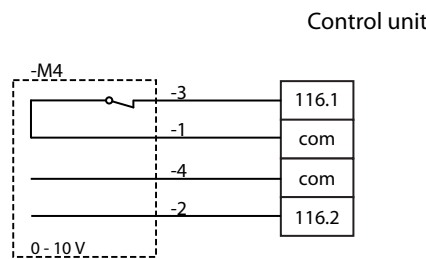
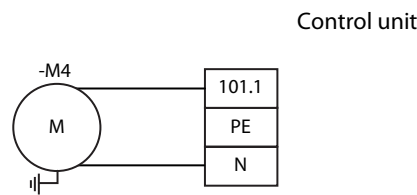


7.6 Connect hot water sensor to external heater

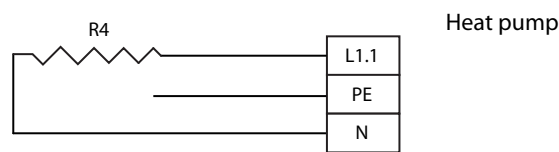


7.7 Connecting circulation pump

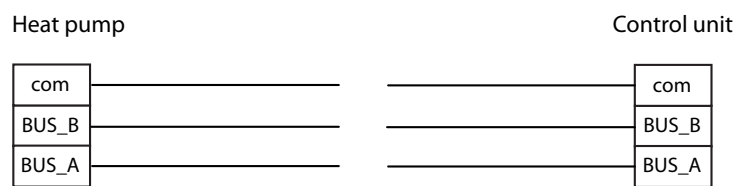
Connecting circulation pump for DHP-AQ Mini When installing further circulation pumps, see electrical instructions.



7.8 Connect heating cable driptray



7.9 Connect the communication cable



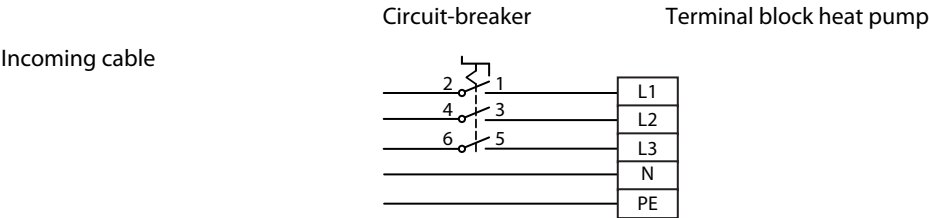
7.10 Connecting the power supply

Connect power cable to heat pump unit and to terminal block in control centre as below.

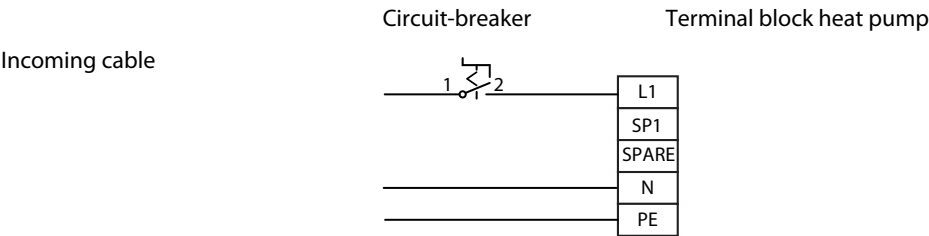


**DANGER!** Electrical current! The power cable may only be connected to the terminal block intended for this purpose. No other terminal blocks may be used!

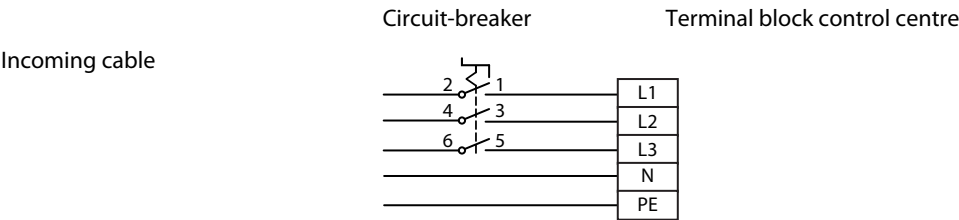
7.10.1 Connection heat pump 400 V, 3-N



7.10.2 Connection heat pump 230 V, 1-N



7.10.3 Connection control centre 400 V, 3-N (DHP-AQ Midi and DHP-AQ Maxi)



## 8 Operator panel

### 8.1 Manage operator panel

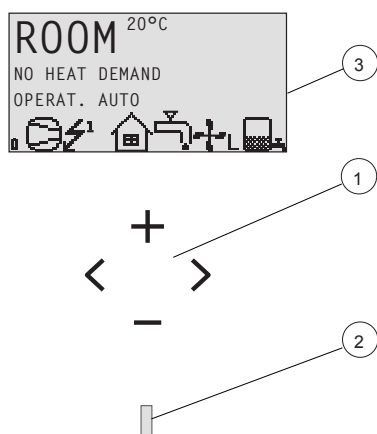
The heat pump has an integrated control system which automatically calculates the heat demand in the house to ensure that the correct amount of heat is produced and emitted where necessary.

The control panel is operated using a keypad and information is shown in a display and by an indicator.



Note! The information in the display and menus will vary depending on the heat pump model and connected accessories.

---



1. Keypad
2. Indicator
3. Display

- + Plus sign used to scroll up a menu and increase the values.
- Minus sign used to scroll down a menu and reduce the values.
- > Right arrow used to select a value or open a menu.
- < Left arrow to cancel selection or exit a menu.

The indicator at the bottom of the control panel has three modes:

- Not lit, means that the heat pump is not powered.
- When the green light shines continuously, the heat pump has power and is ready to produce heat or hot water.
- Flashing green, means an active alarm.



Caution! During a service that consists of replacing the display card, all heat pump settings are reset to factory settings. Therefore note current settings before replacement.

---

The control system is divided into the following two main menus:



- INFORMATION
- SERVICE

The INFORMATION menu is opened by pressing the left or right buttons.

For installation and service, the SERVICE menu is used, which is opened by pressing the left button for five seconds.











## 8.2 Operating modes

Table 2. Shows the set operating mode of the heat pump.

Operating mode	Meaning
 (OFF)	<p>The installation is fully switched off. This mode is also used to acknowledge certain alarms.</p> <hr/> <p> <b>Caution!</b> If the operating mode OFF or HOT WATER is to be used for long periods during the winter, the water in the heating system in the heating system must be drained, otherwise there is a risk of frost damage.</p> <p>Alternatively the system solution with intermediate exchanger should be used.</p> <hr/>
<b>AUTO</b>	The heat pump regulates automatic compressor operation and auxiliary heater.
<b>COMPRESSOR</b>	The control system is controlled so that only the heat pump unit (compressor) is allowed to operate. In this operating mode peak heating charging (anti-legionella function) of the hot water will not run because the auxiliary heater is not used.
<b>AUX. HEATER</b>	The control system only permits the auxiliary heater to be in operation.
<b>HOT WATER</b>	In this mode the heat pump only produces hot water, no heat goes to the heating system.
<b>MANUAL TEST</b>	Operating mode MANUAL TEST is selected. Used to test different functions, for example circulation pump.

## 8.3 Symbols

Table 3. Symbols shown in the display.

Symbol	Meaning
 COMPRESSOR	Indicates that the compressor is in operation.
 LIGHTNING	Indicates that the auxiliary heater is in operation. The number indicates what additional step is activated.
 HOUSE	Indicates that the heat pump produces heat for the heating system.
 TAP	Indicates that the heat pump produces heat for the water heater.
F FLOW SENSOR	Indicates that the flow sensor is active (there is flow).
 CLOCK	Indicates that tariff control is active.
 TANK	Indicates the level of hot water in the water heater. When hot water is produced for the water heater, this is indicated by a flashing icon for the tank. A lightning symbol by the symbol indicates peak heating charging (anti-legionella function).
 SQUARE	Either indicates that the operating pressure switch has deployed, or that the pressure pipe temperature has reached its maximum temperature.
 DEFROST	Displayed when defrosting is active.
 FAN	Displayed when the fan is active.
 COOLING	Displayed if cooling is produced. A = Active cooling.



## 8.4 Operational information

The following operating information may also appear:

Message	Meaning
ROOM	Shows the set ROOM value. Standard value: 20°C. If the accessory room sensor is installed it shows the actual temperature and the desired indoor temperature is shown within brackets.
START	Indicates that there is a need for heat production or hot water and that the heat pump will start.
EVU STOP	Indicates that the additional function EVU is active. EVU is used to switch off the heat pump during high energy tariffs.
NO HEAT DEMAND	Indicates that there is no heating or hot water production demand.
NO COOLING DEMAND	Indicates that there is no cooling demand.
COMPRESSOR START --XX	Indicates that there is a need for heat, hot water or cooling and that the heat pump will start in XX minutes.
COMPRESSOR+IMM.HEAT	Indicates that heat production is active with both compressor and auxiliary heater.
START_MIN	Indicates that there is a demand for heating or hot water production but that a start delay is active.
AUX. HEATER	Indicates that there is an auxiliary heater demand.
ACT COOLING	Displayed if cooling is active.
DEFROST X(Y)	Displayed when defrosting is active. X shows the actual reached temperature. Y shows at what temperature defrost is complete.

## 8.5 Important parameters

### 8.5.1 Heat production - calculating

The indoor temperature is adjusted by changing the heat pump's heat curve, which is the control system's tool for calculating what the supply temperature should be for water that is sent out in the heating system. The heat curve calculates the supply temperature depending on the outdoor temperature. The lower the outdoor temperature, the higher the supply temperature. The difference between the desired and actual supply temperature is the basis for calculation of the heating requirement.

The heat curve will be adjusted in connection with installation. It must be adapted later on, however, to obtain a pleasant indoor temperature in any weather conditions. A correctly set heat curve reduces maintenance and gives energy efficient operation.

### 8.5.2 CURVE

The control computer shows the value for CURVE by means of a graph in the display. The heat curve can be changed by adjusting the CURVE value. The value for the CURVE indicates which value on the supply temperature is required in relation to the outdoor temperature.

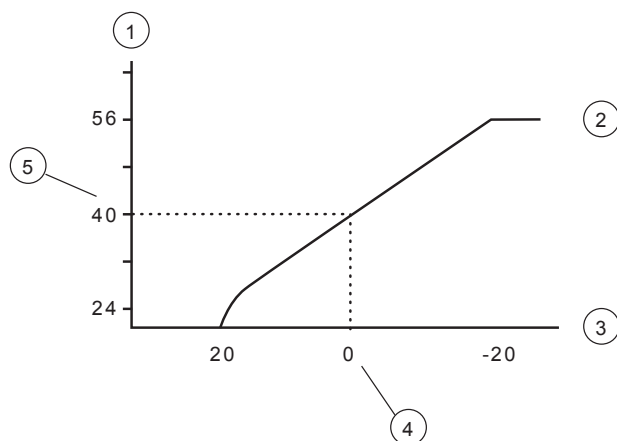


Figure 1. Graph showing the set value 40 for CURVE.

Position	Description
1	Supply temperature (°C)
2	Maximum supply temperature
3	Outdoor temperature (°C)
4	0°C
5	Value for CURVE is 40°C

In the event of outdoor temperatures below 0°C, a higher setpoint value is calculated and in the event of outdoor temperatures greater than 0°C, a lower setpoint value is calculated.

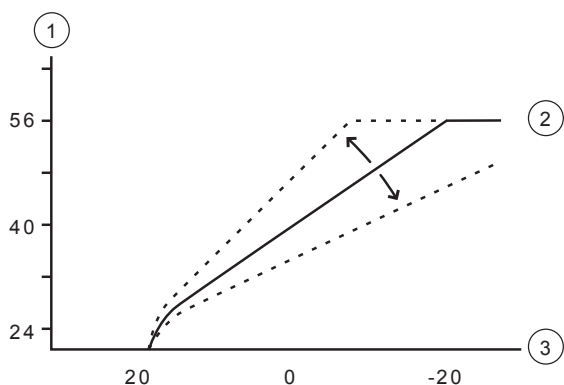


Figure 2. Increasing or reducing the CURVE changes the slope of the curve.

Position	Description
1	Supply temperature (°C)
2	Maximum supply temperature
3	Outdoor temperature (°C)

If the CURVE value is increased, the heat curve will become steeper and if the value is reduced, it will become flatter.

The most energy efficient and cost effective setting is achieved by changing the CURVE value to adjust the temperature in the house to an even and constant temperature. For a temporary increase or reduction, adjust the ROOM value instead.

### 8.5.3 ROOM

If you wish to increase or reduce the indoor temperature, change the ROOM value. The difference between changing the ROOM value and the CURVE value is as follows:

- When changing the ROOM value, the angle of the curve on the system's heat curve does not change, instead the entire heat curve is moved by 3°C for every degree change of the ROOM value. The reason that the curve is adjusted 3°C is that an approximate 3°C increase in supply temperature is usually needed to increase the indoor temperature 1°C.
- When changing the CURVE value, the angle of the curve on the system's heat curve changes.

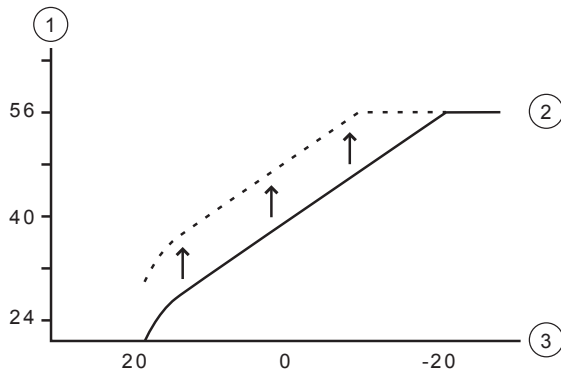


Figure 3. Changing the ROOM value changes the heat curve upwards or downwards.

Position	Description
1	Supply temperature (°C)
2	Desired supply temperature
3	Outdoor temperature (°C)

The relationship of the supply temperature to the outdoor temperature will not be affected. The supply temperature will be increased or reduced by the same number of degrees all along the heat curve. I.E. The entire heat curve rises or drops instead of the curve gradient changing.

This method of adjusting the indoor temperatures can be used for a temporary raise or drop. For long term increases or reductions of the indoor temperature, the heat curve should be adjusted.

### 8.5.4 Adjusting the heat curve at -5°C, 0°C and 5°C

Sometimes, at outdoor temperatures between -5°C and +5°C, part of the heat curve may need adjusting if the indoor temperature is not constant. For this reason, the control system includes a function which only adjusts the heat curve at three outdoor temperatures: -5°C, 0°C and +5°C. This function will allow one to increase or reduce the setpoint value for the supply line temperature, without affecting the rest of the heat curve, at three specific outdoor temperatures. If, for example, the outdoor temperature is -5°C, the supply temperature will change gradually between 0°C and -10°C, maximum adjustment being reached at -5°C. The figure below shows the adjusted CURVE -5. The adjustment can be seen in the graph in the form of a bump.

Choose to adjust the heat curve individually at three specified outdoor temperatures: -5°C, 0°C and +5°C. The supply temperature can be changed by plus/minus 5°C.

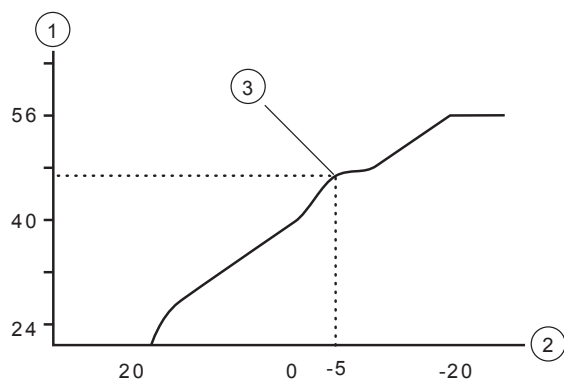


Figure 4. The adjusted curve at -5°C

Position	Description
1	Supply temperature (°C)
2	Outdoor temperature (°C)
3	Local higher supply temperature at -5°C

### 8.5.5 HEAT STOP

The HEAT STOP function automatically stops all production of radiator heat when the outdoor temperature is equal to, or higher than, the value entered for heat stop.

When the heat stop function is activated, the circulation pump will be turned off - except when hot water is being produced. The circulation pump will be "exercised" for one minute per day. The factory set value for activating heat stop is an outdoor temperature of 17°C. If the heat stop function is active, the outdoor temperature must drop 3°C when setting, before the heat stop stops.

### 8.5.6 MIN and MAX

The MIN and MAX values are the lowest, respectively highest set point values that are allowed for the supply temperature.

Adjusting the minimum and maximum supply temperatures is particularly important if under floor heating is used.



Note! MIN and MAX temperatures do not limit the actual temperature on the supply line.

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Caution! For under floor heating under a parquet floor or stone floor, too high a supply temperature can damage the floor.

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If your house has a basement, the MIN value should be adjusted to a suitable temperature for the basement in summer. A condition for maintaining the heat in the basement in the summer is that all radiators have thermostat valves that switch off the heat in the rest of the house. It is extremely important that the heating system and the radiator valves are trimmed correctly. As it is usually the end customers themselves who have to carry out trimming, remember to inform them how to carry it out correctly. Also remember that the value for HEAT STOP needs adjusting upwards for summer heating.

### 8.5.7 TEMPERATURES

The heat pump can show a graph of the history of the temperatures of the different sensors. The graph shows how the temperature has changed during the last 60 measurement points. The time interval between the measurement points can be adjusted between one minute and one hour, factory setting is one minute.

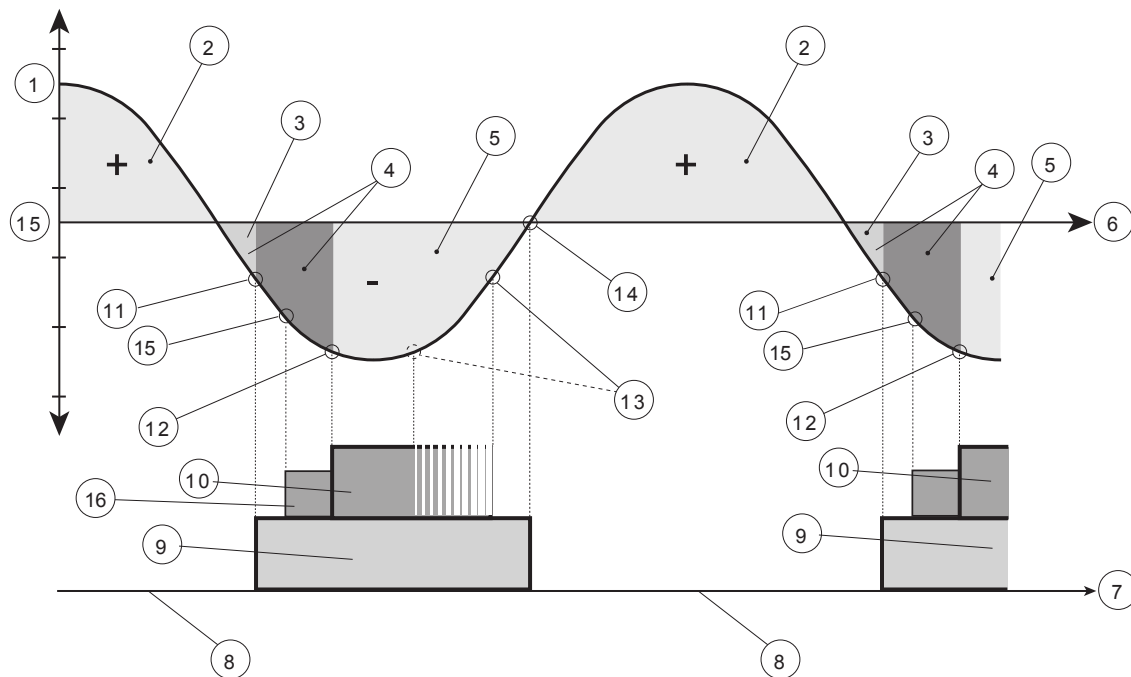
History is available for all sensors, but only the set value is shown in the display for the room sensor. The integral value that may appear is the heating system's energy balance.

### 8.5.8 INTEGRAL

The heat demand in the house depends on the season and weather conditions and is not constant. The heat demand can be expressed as temperature difference over time and can be calculated giving an integral value as a result (heat demand). To calculate the integral value, the control system uses several parameters.

A heat deficit is needed to start the heat pump, and there are two integral values, A1 (default value = -60), which starts the compressor and A2, (factory set = -600), which starts the auxiliary heater and A3 (user-defined value), which starts the external auxiliary heater. External auxiliary heater operation is activated when the integral passes the value for INTEGRAL A3. During heat production, the deficit reduces and when the heat pump stops, the inertia in the system causes a surplus of heat.

The integral value is a measurement of the area under the time axis and is expressed in degree minutes. The figure below shows the factory settings for the integral values that the heat pump has. When the integral value has reached the set value for INTEGRAL A1, the compressor starts and if the integral value does not drop but continues to rise, the auxiliary heater starts when the integral value has reached the set value for INTEGRAL A2.



Position	Description
1	Integral
2	Heat surplus
3	INTEGRAL A1
4	INTEGRAL A2
5	Heating deficit
6	Time
7	Heat pump operation
8	No operation
9	Compressor
10	Aux. heat. + ext. aux. heater
11	Compressor start (A1)
12	Auxiliary heater start (A2)
13	Aux. heater stop (latest by A1)
14	Compressor stop (=0)

Position	Description
15	INTEGRAL A3
16	External auxiliary heater (INTEGRAL A3 < INTEGRAL A2)

The calculation of the integral value does not stop during hot water production or when pool heating is produced.

#### 8.5.9 HYSTERESIS

In order to start the heat in advance during sudden changes of the heat demand, there is a value, HYSTERESIS, which controls the difference between the actual supply temperature,  $t_1$  and the calculated supply temperature,  $t_2$ . If the difference is equal to or greater than the set HYSTERESIS value (x), i.e. there is a heat demand, or the heat demand disappears, quicker than the usual integral calculation, the integral value is forced to either the start value (-60) INTEGRAL A1 or to the stop value (0).

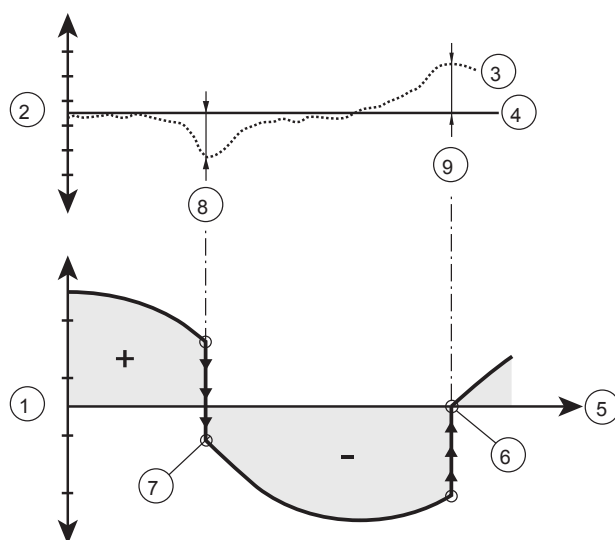


Figure 5. Conditions for HYSTERESIS to force the integral value to change.

Position	Description
1	Integral
2	Supply temperature
3	$t_1$
4	$t_2$
5	Time
6	Compressor stop (0)
7	Compressor start (-60)
8	Hysteresis ( $\Delta t \geq x$ )
9	Hysteresis ( $\Delta t \geq x$ )

#### 8.5.10 DEFR CURVE

During operation the air heat exchanger is cooled by the energy exchange, at the same time the humidity causes it to become covered in frost at low outdoor temperatures. DHP-AQ has an automatic function to defrost the air heat exchanger using the energy from the house's heating system.

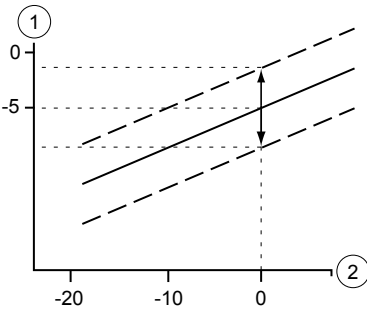
Defrosting is initiated by low temperature in the refrigerant circuit after the air heat exchanger and, among other things, is dependent on outdoor temperature, humidity and operating time. The length of defrosting varies depending on the extent of freezing of the air heat exchanger. Defrost continues until the air heat exchanger is free of ice and the temperature in the refrigerant circuit after the air exchanger has risen to the desired temperature. After completed defrosting the heat pump returns to the operating mode before defrosting.

To start defrosting the control system makes a calculation using the temperature of the refrigerant sensor1 and the outdoor temperature. The calculation is based on a defrost curve that can be set so that the heat pump works optimally. The defrost sequence starts when the temperature of refrigerant sensor 1 falls to the set parameter value for the defrost curve at an outdoor temperature somewhere along the set defrost curve.

The defrost curve is adjusted using the parameter DEFROST CURVE that moves the defrost curve in parallel. Negative value moves the defrost curve down which means that it takes a longer time before defrosting starts. Positive value moves the defrost curve up which means that it takes a shorter time before defrosting starts.

The value for DEFROST CURVE is shown by means of a graph in the display.

The value for DEFROST CURVE is the temperature that refrigerant sensor 1 reaches when a defrost must start at different outdoor temperatures.



Position	Description
1	Refrigerant sensor1
2	Outdoor temperature

### 8.5.11 Cooling

When the cooling function is activated cooling will be permitted when the outdoor temperature exceeds the set value for COOLINGMODE ACTIVE. The cooling function is primarily temperature controlled and starts when the return line sensor reaches the set value for START. Cooling is interrupted when the supply line sensor reaches the set value for STOP. If the hot water heater is installed the control unit will alternate between cooling and hot water production with prioritisation for the hot water requirement.



**Caution!** When cooling it is important to limit the lowest flow line temperature to prevent condensation. To avoid condensation a dewpoint sensor can be installed (accessory). The dewpoint sensor senses when condensation starts to form and cooling is then stopped automatically.

If the shunt group is installed the setting for cooling should be made according to the section DISTRIBUTION CIRCUIT 1 - 2, Page 48 in the Information menu.

### 8.5.12 Concrete drying

When drying concrete up to ten points can be entered which define the curve that is desired when drying concrete. Each point is given with day number from the set date and a temperature. A straight line is drawn between each point. This line gives the setpoint value for concrete drying.



**Note!** Concrete drying continues with the latest set setpoint until the program is cancelled.

Stop concrete drying by selecting another operating mode.

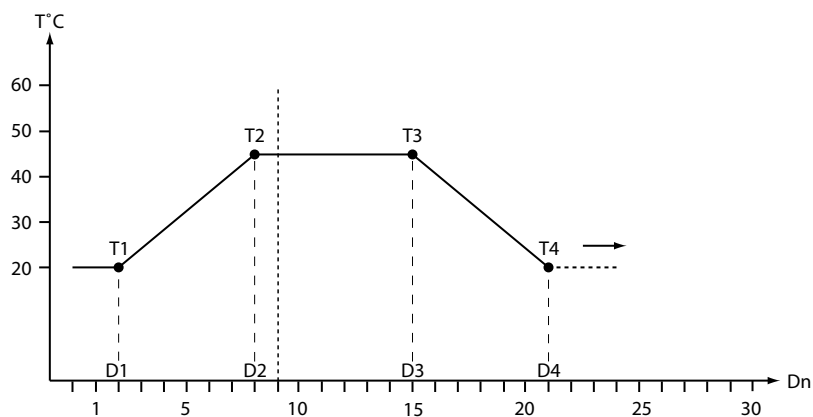
DAY X/Y. Displays day number X out of a total Y days.

START: day-month-year, CLOCK: hours:minutes.

HYSTERESIS. If the temperature of the setpoint value falls by more than the value of the HYSTERESIS the auxiliary heater and the external auxiliary heater start.

Factory setting: 2°C, range: 1°C – 4°C

### Example concrete drying



Day: 9/21  
Hysteresis: 2°C

No. of points: 4

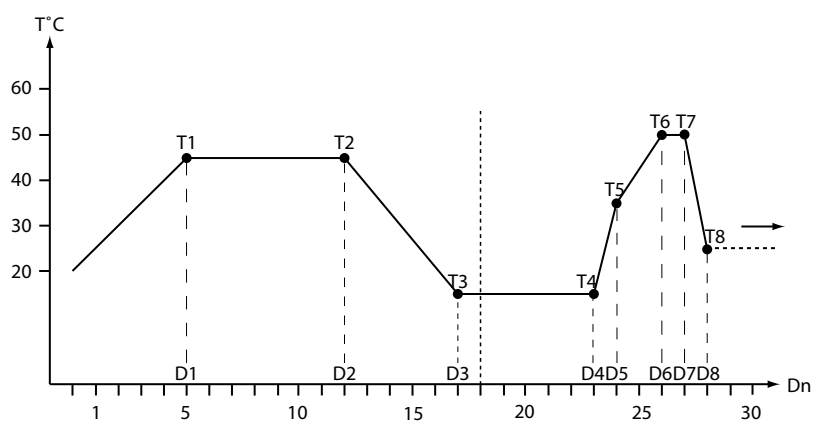
Point settings:

Point 1: T1 20°C, D1 2

Point 2: T2 45°C, D2 8

Point 3: T3 45°C, D3 15

Point 4: T4 20°C, D4 21



Day: 18/28  
Hysteresis: 2°C

No. of points: 8

Point settings:

Point 1: T1 45°C, D1 5

Point 2: T2 45°C, D2 12

Point 3: T3 15°C, D3 17

Point 4: T4 15°C, D4 22

Point 5: T5 35°C, D1 5

Point 6: T6 50°C, D2 12

Point 7: T7 50°C, D3 17

Point 8: T8 25°C, D4 22




## 9 Information menu

### 9.1 Menu overview

- OPERAT.
- HEATING
- DISTRIBUTION CIRCUIT1
- DISTRIBUTION CIRCUIT2
- HOT WATER
- COOLING
- POOL
- BUFFER TANK
- OP. DATA
- OPERAT. TIME
- DEFROST
- CALENDAR
  - CLOCK
  - HOT WATER
  - EVU
  - SILENT MODE
  - TEMP.REDUCTION
  - CONCRETE DRYING PROG.
- ALARM
- LANGUAGE

### 9.2 OPERAT.

Parameter	Meaning
 (OFF)	The installation is fully switched off. This mode is also used to acknowledge certain alarms. To select OFF as operating mode, press the minus sign once to scroll down one step and press the right arrow once. Press CANCEL to return to the starting point without changing.
<b>AUTO</b>	Automatic operation with both heat pump and auxiliary heater permitted. If the number of power stages for auxiliary heating are set to zero (SERVICE -> AUX. HEATER -> MAX STEP) only AUTO or COMPRESSOR can be selected as operating mode.
<b>COMPRESSOR</b>	Operation with only compressor permitted.
<b>AUX. HEATER</b>	Operation with only auxiliary heater permitted.
<b>HOT WATER</b>	Operation with heat pump for hot water production and auxiliary heater during peak heating charging (anti-legionella function).
<b>MANUAL TEST</b>	Only displayed when the value for MANUAL TEST is set to 2 in The SERVICE menu. Outputs that control components are activated manually.

### 9.3 HEATING

Parameter	Meaning
<b>CURVE</b>	Calculated supply temperature at 0°C outdoor temperature. Shown as a graphic curve. The curve will be limited by the set values of MIN and MAX.  Factory setting: 40°C (for under floor heating 30°C), range: 22°C – 56°C
<b>MIN</b>	Minimum permitted supply temperature, if the temperature for heat stop has been reached and the heat pump has stopped.  Factory setting: 10°C, range: 10°C – 50°C

Parameter	Meaning
<b>MAX</b>	Maximum calculated setpoint value of the supply temperature.  Factory setting: 55°C (for under floor heating 45°C), range: 40°C – 85°C
<b>CURVE +5</b>	Local increase or reduction of CURVE at an outdoor temperature of +5°C. Shown in the graph for CURVE.  Factory setting: 0°C, range: -5°C – 5°C
<b>CURVE 0</b>	Local increase or reduction of CURVE at an outdoor temperature of 0°C. Shown in the graph for CURVE.  Factory setting: 0°C, range: -5°C – 5°C
<b>CURVE -5</b>	Local increase or reduction of CURVE at an outdoor temperature of -5°C. Shown in the graph for CURVE.  Factory setting: 0°C, range: -5°C – 5°C
<b>HEAT STOP</b>	Maximum outdoor temperature when heat production is permitted. If HEAT STOP applies, the outdoor temperature must drop 3°C below the setting before HEAT STOP stops.  Factory setting: 17°C, range: 0°C – COOLINGMODE ACTIVE -3°C
<b>CONSTANT TEMP</b>	The temperature that the shunt wishes to retrieve from the buffer tank and distribute to the house. Only applies when the buffer tank is activated and with shunt group connected.  Factory setting: 18°C, range: 10°C – 30°C
<b>SETBACK TEMP</b>	The temperature that will apply at temperature setback. Temperature setback is activated via the calendar function. When the function is activated ROOM is the temperature that is set here.  Factory setting: 18°C, range: 10°C – 30°C
<b>ROOM FACTOR</b>	Only displayed if an accessory Room temperature sensor is installed.  Determines how great an impact the room temperature is to have when calculating the supply temperature. For under floor heating it is recommended that ROOM FACTOR is set to 1, 2 or 3. For radiator heating it is recommended that ROOM FACTOR is set to 2, 3 or 4.  Impact: 0 = no impact, 4 = large impact.  Factory setting: 2, range: 0 – 4





## 9.4 DISTRIBUTION CIRCUIT 1 - 2

Only appears if the function is activated in menu SERVICE -> INSTALLATION - SYSTEM -> SHUNT GROUP.



Parameter	Meaning
<b>CURVE</b>	Calculated supply temperature at 0°C outdoor temperature. Shown as a graphic curve. The curve will be limited by the set values of MIN and MAX.  Factory setting: 40°C (for under floor heating 30°C), range: 22°C – 56°C
<b>MIN</b>	Minimum permitted supply temperature, if the temperature for heat stop has been reached and the heat pump has stopped.  Factory setting: 10°C, range: 10°C – 50°C
<b>MAX</b>	Maximum calculated setpoint value of the supply temperature.  Factory setting: 55°C (for under floor heating 45°C), range: 15°C – 70°C

Parameter	Meaning
<b>CURVE +5</b>	Local increase or reduction of CURVE at an outdoor temperature of +5°C. Shown in the graph for CURVE.  Factory setting: 0°C, range: -5°C – 5°C
<b>CURVE 0</b>	Local increase or reduction of CURVE at an outdoor temperature of 0°C. Shown in the graph for CURVE.  Factory setting: 0°C, range: -5°C – 5°C
<b>CURVE -5</b>	Local increase or reduction of CURVE at an outdoor temperature of -5°C. Shown in the graph for CURVE.  Factory setting: 0°C, range: -5°C – 5°C
<b>DURING COOLING</b>	During production of cooling the shunt group can be adjusted.  Factory setting: AUTO, range: AUTO, OPEN, CLOSED
<b>CONSTANT TEMP</b>	Controlling the shunt group against a constant temperature is an alternative to the control using a heat curve given above. Control using constant temperature is selected using the parameter CONSTANT TEMP in the Service menu.  Factory setting: 18°C, range: 10°C – 30°C
<b>SETBACK TEMP</b>	The temperature the shunt group works with when the temperature reduction is activated in the menu CALENDAR.  Factory setting: 18°C, range: 10°C – 30°C

## 9.5 HOT WATER

Parameter	Meaning
<b>HOT WATER</b>	Allows hot water production.  Factory setting:  , range:  – ON
<b>TOP-UP</b>	Forced hot water production with compressor and aux. heater.  Factory setting:  , range:  – ON


## 9.6 COOLING

Parameter	Meaning
<b>COOLING</b>	Allows production of cooling.  Factory setting:  , range:  – ON
<b>START</b>	Temperature on the return sensor for start of cooling production.  Factory setting: 25°C, range: STOP + 5°C – MAX START TEMP

Parameter	Meaning
<b>STOP</b>	Temperature on the supply line sensor for stop of cooling production.  Factory setting: 16°C, range: MIN STOP – START - 5°C
<b>COOLINGMODE ACTIVE</b>	With stated or higher outdoor temperatures cooling production is permitted.  Factory setting: 25°C, range: HEAT STOP + 3°C – 50°C





## 9.7 POOL

Only appears if the function is activated in menu SERVICE -> INSTALLATION - SYSTEM -> POOL.

Parameter	Meaning
<b>POOL TEMP</b>	Temperature from separate pool sensor where the heat production for the pool is stopped.  Factory setting: 20°C, range:  , 5°C – 40°C
<b>POOL HYSTERESIS</b>	When the temperature in the pool falls below the value of POOL TEMP minus the value of POOL HYSTERESIS the production of heating for the pool is started.  Factory setting: 2°C, range: 1°C – 10°C

## 9.8 BUFFER TANK

The menu only appears if the function is activated in menu SERVICE -> INSTALLATION - SYSTEM -> BUFFER TANK.

Parameter	Meaning
<b>TANK TEMP</b>	Indicates desired temperature for buffer tank. The temperature is controlled dependent on the selection made in the Service menu. Standard setting is AUTO if at least one circuit is set to be controlled by the option HEAT CURVE IN SERVICE -> BUFFER TANK, and that all configured circuits out from the tank are shunted (i.e. not open circuits). AUTO means that the temperature in the tank follows the settings for the heat curve. At CONFIGURATION = TANK CONTROL and all configured circuits are set to shunt at constant temperatures, the lowest of the temperatures calculated by the system as a standard setting is set. AUTO mode is not available in this selection.  Factory setting: AUTO, range: AUTO, 20°C – 55°C
<b>OVERCHARGE</b>	The temperature of the buffer tank can be raised so that it exceeds the heat curve temperature. Can only be used when TANK TEMP = AUTO.  Factory setting: 0°C, range: 0°C – 5°C
<b>TOPH. TANK</b>	Activate high temperature mode when the external auxiliary heater is selected. The external auxiliary heater will heat the tank to the highest permitted tank temperature.  Factory setting:  , range:  – ON
<b>RED. TANK TEMP</b>	The function permits a reduction of the temperature in the tank when the temperature reduction is set to active in the CALENDAR menu. The temperature that is set in the tank is calculated by the system when the function has been activated. The function is only active at CONFIGURATION = TANK CONTROL and all configured circuits are set to shunt at constant temperatures.  Factory setting:  , range:  – ON

## 9.9 OP. DATA

Parameter	Meaning
<b>OUTD</b>	Shows the temperature on the outdoor sensor.
<b>ROOM</b>	Shows the temperature on the room sensor.
<b>SUPPLY LINE</b>	Shows the temperature on the supply line sensor. The calculated supply temperature to the heating system group is within brackets.
<b>RETURN LINE</b>	Shows the temperature on the return line sensor. The stop temperature, MAX RETURN is within brackets.
<b>SYSTEM SUPPLY</b>	Displays the temperature of the system supply line sensor at the buffer tank system or if the external auxiliary heater is activated.
<b>DISTRIBUTION CIRCUIT 1</b>	Shows the temperature on the distr. cir. 1 sensor. The calculated supply temperature for the shunt group is within brackets.
<b>DISTRIBUTION CIRCUIT 2</b>	Shows the temperature on the distr. cir. 2 sensor. The calculated supply temperature for the shunt group is within brackets.
<b>BUFFER TANK</b>	Shows the temperature on the sensor for the buffer tank.
<b>HOT WATER</b>	Displays the temperature on the hot water sensor on the condition that hot water production is permitted.
<b>INTEGRAL</b>	Shows the actual calculated value for the integral.
<b>REFR 1</b>	Shows the temperature at refrigerant sensor 1.
<b>REFR 2</b>	Shows the temperature at refrigerant sensor 2.
<b>POOL</b>	Displays the temperature on the pool sensor on the condition that pool operation is permitted.
<b>CURRENT</b>	Displays the current consumption in Amperes. The set value for MAX CURRENT is shown in brackets. Only appears if CURRENT LIMITER is selected in the Service menu.
<b>DISCH. PIPE</b>	Shows the temperature at the discharge pipe sensor.
<b>SUCTION GAS</b>	Shows the temperature of the suction gas.
<b>EVAP. PRESSURE</b>	Shows the pressure of the suction gas pipe. Measured in bar atmospheric pressure, bar (a).
<b>DEFR SENSOR</b>	Shows the temperature of the defrost sensor.

## 9.10 OPERAT. TIME

Parameter	Meaning
<b>COMPRESSOR</b>	Operating time for compressor.
<b>COMPRESSOR SL</b>	Operating time for compressor SLAVE.
<b>HEATING</b>	Operating time for heating.
<b>COOLING</b>	Operating time for cooling.
<b>HOT WATER</b>	Operating time for hot water with compressor.
<b>AUX. HEAT 1</b>	OPERAT. TIME AUX. HEATER 1.
<b>AUX. HEAT 2</b>	OPERAT. TIME AUX. HEATER 2.
<b>AUX. HEAT 3</b>	OPERAT. TIME AUX. HEATER 3.
<b>EXT.AUX.HEATER</b>	Operating time external auxiliary heater.

## 9.11 DEFROST

Parameter	Meaning
<b>DEFROSTS</b>	Total number of defrosts carried out.
<b>BETW. 2 DEFR</b>	The operating time of the compressor in minutes between the two last defrosts.
<b>TIME LAST DEFR</b>	The operating time of the compressor in minutes since last defrost.
<b>DEFROST CURVE</b>	Used to change the angle of the defrost curve using + or- (Change the start temperature for defrost).  Factory setting: -7°C, range: -10°C – -4°C
<b>MANUAL DEFR</b>	Used to perform a manual defrost. Started using + or -.  Factory setting: 0, range: 0 – 1

## 9.12 CALENDAR

Parameter	Meaning
<b>CLOCK</b>	Indicate day's date and time. Used in the calendar function and in the log at the alarm.  DATE: day-month-year, example: 01-jan-2011 CLOCK: hours:minutes, example: 20:30
<b>HOT WATER</b>	To block hot water production. Up to eight calendar settings can be defined.  Under CALENDAR SETTING first select the menu TIME FUNCTION if blocking should be over a continuous time period (DATE) or be recurring (DAYS / WEEK). Then start and stop times are selected in the TIME SETTING menu.
<b>EVU</b>	EVU stops the heat pump and is a function that is used in certain countries to control electrical consumption. Up to eight calendar settings can be defined.  Under CALENDAR SETTING first select the menu TIME FUNCTION if stop should be over a continuous time period (DATE) or be recurring (DAYS / WEEK). Then start and stop times are selected in the TIME SETTING menu.
<b>SILENT MODE</b>	Function where the noise level of the heat pump fan is reduced. Up to eight calendar settings can be defined.  Under CALENDAR SETTING first select the menu TIME FUNCTION if reduction should be over a continuous time period (DATE) or be recurring (DAYS / WEEK). Then start and stop times are selected in the TIME SETTING menu.
<b>TEMP. REDUCTION</b>	Function for reduction of temperatures. The new setpoints are those values that are stated for heat curve, shunt groups and buffer tank in the information menu. Up to eight calendar settings can be defined.  Under CALENDAR SETTING first select the menu TIME FUNCTION if reduction should be over a continuous time period (DATE) or be recurring (DAYS / WEEK). Then start and stop times are selected in the TIME SETTING menu.
<b>CONCRETE DRYING PROG.</b>	See description in the section Concrete drying, Page 45.

## 9.13 ALARM

Parameter	Meaning
NAME ALARM	Displays information about up to 10 alarms and alarm times.  NAME: Name of the alarm, example: AUX. HEATER TIME: hours:minutes, example 20:45 DATE: day-month-year, example 13-jan-11

## 9.14 LANGUAGE

Parameter	Meaning
LANGUAGE	State which language is to be used in the menu system.  SVENSKA ENGLISH DEUTSCH NEDERLANDS FRANÇAIS ESPAÑOL ITALIANO NORSK DANSK SUOMI EESTI POLSKI ČEŠTINA

## 10 Service menu

### 10.1 Menu overview

- HOT WATER
- HEATING
- COOLING
- AUX. HEATER
- MANUAL TEST
- INSTALLATION
  - SYSTEM
    - HEAT SOURCE
    - POOL
    - DISTRIBUTION CIRCUIT 1-2
    - BUFFER TANK
    - OPTIMUM
    - CURRENT LIMITER
    - START UP CHECK
  - SERVICE TIME
  - FACTORY SET
  - RESET OPER. TIME
  - SENSOR CALIBRATION
  - VERSION
  - LOG TIME
- DEFROST
- OPTIMUM
- BUFFER TANK



### 10.2 HOT WATER

Parameter	Meaning
<b>START</b>	Start temperature for hot water production. Shows the actual weighted hot water temperature and the value within brackets indicates the start temperature. (⏻ = no hot water production)  Factory setting: 40°C, range: ⏻, 30°C – 55°C
<b>HOT WATER TIME</b>	Time for hot water production during combined hot water demand and heating or cooling demand, in minutes.  Factory setting: 20M, range: 5M – 40M
<b>TOPH. INTERVAL</b>	Time interval between peak heating chargings (anti-legionella function) in days. Operating mode that permits auxiliary heater must be selected.  Factory setting: 7D, (range: ⏻, 1D – 90D)
<b>TOPH. TIME</b>	Time in hours that the legionella demand is to be fulfilled for peak heating charging to be considered complete.  Factory setting: ⏻, range: ⏻, 1H – 10H
<b>TOPH. STOP</b>	Stop temperature for peak heat charging. Operating mode that permits auxiliary heater must be selected.  Factory setting: 60°C, range: 50°C – 65°C







Parameter	Meaning
<b>INFL. H.W SENSOR.</b>	Hot water sensor's influence compared with the peak sensor's at start of water heating.  Factory setting: 65%, range: 0% – 100%
<b>TOPH SENSOR</b>	Shows the actual temperature at the top of the water heater provided that this sensor is engaged.
<b>HOT WATER SENSOR</b>	Shows the actual temperature approx 1/3 from the bottom of the hot water sensor.




## 10.3 HEATING





Parameter	Meaning
<b>INTEGRAL A1</b>	The integral's value (in degree minutes) for starting the heat pump. See INTEGRAL, Page 43 for more information.  Factory setting: -60 min, range: -250°min – -5°min
<b>HEATING TIME</b>	When the heat pump must alternate between different demands for example heating, hot water, pool heating and cooling, heating will be produced longest according to the set number of minutes.  Factory setting: 20M, range: 5M – 40M
<b>HYSTERESIS</b>	If the difference between the actual supply temperature and the calculated supply temperature is too great either the integral value is set to start value A1 (the heat pump starts) or the value is set to 0 (stops the heat pump).  Factory setting: 12°C, range: 1°C – 15°C
<b>MAX RETURN</b>	Stop temperature at high return from the heating system.  Factory setting: 55°C, range: 30°C – 70°C
<b>START INTERVAL</b>	Minimum time interval between two heat pump starts in minutes.  Factory setting: 20M, range: 10M – 30M
<b>OUTDOOR STOP</b>	Lowest outdoor temperature when the outdoor sensor stops the compressor and heating or hot water are instead produced by the auxiliary heater. Operating mode that permits auxiliary heater must be selected.  Factory setting: -20°C, range: -20°C – -1°C
<b>FACTOR HP</b>	Activation of room sensor function for blocking or resetting of the integral calculation.  Factory setting:  , range:  – ON
<b>RS HYST.LOW</b>	Integral calculation is blocked if the temperature of the room sensor exceeds the setpoint value minus RS HYST.LOW.  Factory setting: 1°C, range: 0°C, 5°C – 5°C
<b>RS HYST.HIGH</b>	Integral calculation is reset and the heat pump stops if the temperature of the room sensor exceeds the setpoint value plus RS HYST.HIGH.  Factory setting: 1°C, range: 0°C – 5°C

## 10.4 COOLING

Parameter	Meaning
<b>COOLING</b>	Activates the cooling function.  Factory setting:  , range:  , ACTIVE COOLING, INTEGRATED IN HP
<b>COOLING TIME</b>	When the heat pump must alternate between different demands for example heating, hot water, pool heating and cooling, cooling will be produced longest according to the set number of minutes.  Factory setting: 20M, range: 5M – 40M
<b>MAX START TEMP</b>	Highest settable temperature for START parameter in INFORMATION -> COOLING.  Factory setting: 30°C, range: COOLING->START – 55°C
<b>MIN STOP TEMP</b>	Lowest settable temperature for STOP parameter in INFORMATION -> COOLING.  Factory setting: 16°C, range: 5°C – COOLING->STOP
<b>ROOM SENSOR</b>	Activation of room sensor function for influencing cooling production.  Factory setting:  , range:  – ON
<b>COOL.HYST.RS LOW</b>	Compressor is stopped if the temperature from the room sensors falls below the desired temperature minus COOL.HYST.RS LOW
<b>COOL.HYST.RS HIGH</b>	Compressor is not permitted to start if the criteria are not met.

## 10.5 AUX. HEATER

Parameter	Meaning
<b>MAX STEP</b>	Maximum number of permitted steps for auxiliary heating.  = no auxiliary heating permitted (Means that only AUTO, HEAT PUMP or [SYMBOL] can be selected and that no anti-legionella operation is possible.) P = the potential free output controls an immersion heater connected before the hot water reversing valve and not an external auxiliary heater as normal.  Factory setting:  , range:  – 5, P
<b>INTEGRAL A2</b>	Two conditions must be fulfilled in order to start the auxiliary heater: the integral's value to start must be less than integral A2, and the supply temperature must be 2°C lower than the calculated temperature. See INTEGRAL, Page 43 for more information.  Factory setting: -600°min, range: -990°min – A1 - 10°min
<b>HYSTERESIS</b>	If the difference between the actual supply temperature and the calculated supply temperature is too great (see Important parameters), either the integral value is set to start value A2 (starts the auxiliary heater) or to 0 (stops the auxiliary heater ).  Factory setting: 20°C, range: 5°C – 30°C
<b>MAX CURRENT</b>	Refers to main fuse in the unit, in amperes. An expansion card must be connected for current measurement.  Factory setting: 20A, range: 16A – 35A
<b>HOT WATER STOP</b>	Stop temperature for hot water during AUX. HEATER. The value is read off by the hot water sensor.  Factory setting: 60°C, range: 50°C – 65°C



<b>START DELAY</b>	<p>Gives the time that the start of the auxiliary heater is delayed after a temperature reduction or EVU stop.</p> <p>Factory setting: 30M, range: 0M – 120M</p>
<b>EXT.AUX.HEATER</b>	<p>Activates the function for external auxiliary heater and states how it should be configured.</p> <p>EXT.AUX.HEATER: Switch the external auxiliary heater off and on. Factory setting: , range:  – ON</p> <p>INTEGRAL A3: Indicates the value of the integral when external auxiliary heater is connected. Factory setting: -300, range: -990 – A1 - 10°min</p> <p>TURN OFF DELAY: Indicates how long the external auxiliary heater must continue to be active after its demand is no longer needed. Factory setting: 0M, range: 0M – 180M</p> <p>REV.V. HOT WATER: Indicates whether the reversing valve for hot water is located before or after the external auxiliary heater. (Determines whether the external auxiliary heater may produce hot water. Factory setting: INT, range: INT – EXT</p> <p>TOPH. EXT. Indicates whether the external auxiliary heater can be used for anti-legionella. The reversing valve must be positioned after the external auxiliary heater. Factory setting: , range:  – ON</p> <p>SHUNTTIME EXT.: Indicates the shortest permitted interval between control signals to the shunt. Factory setting: 60S, range: 10S – 99S</p>











## 10.6 MANUAL TEST

Parameter	Meaning
<b>MANUAL TEST</b>	<p>0 = deactivate manual test 1 = activate manual test</p> <p>2 = activate manual test with option of navigating from the SERVICE menu to check that the temperatures rise for example.</p>
<b>COMPRESSOR</b>	<p>0 = stop compressor 1 = start compressor</p>
<b>CIRC. PUMP SYSTEM</b>	<p>0 = stop circulation pump system 1 = start circulation pump system</p>
<b>CIRC. PUMP</b>	<p>0-10V for test of speed controlled circulation pump. Depending on type and number of connected circulation pumps this parameter will contain different information.</p> <p>In the event of pumps with fixed speed the selection 0 = stop and 1 = start are available</p>
<b>FAN</b>	0-10V for test of the speed controlled fan
<b>FOUR-WAY VALVE</b>	<p>0 = four way valve is set for heating 1 = four way valve is set for defrosting/cooling</p>
<b>EXPANSION VALVE</b>	0 - 100% for test of electronic expansion valve.
<b>SOLENOID</b>	<p>0 = closed solenoid 1 = open solenoid</p>
<b>COMPR.HE</b>	<p>0 = compressor heater off 1 = compressor heater on</p>

Parameter	Meaning
<b>DRIP TRAY</b>	0 = drip tray heater off 1 = drip tray heater on
<b>REV.V. HOT WATER</b>	0 = reversing valve in heating mode 1 = reversing valve in hot water mode
<b>AUX. HEAT 1</b>	0 = stop of internal immersion heater power stage 1 1 = start of internal immersion heater power stage 1
<b>AUX. HEAT 2</b>	0 = stop of internal immersion heater power stage 2 1 = start of internal immersion heater power stage 2
<b>AUX. HEAT 3</b>	0 = stop of internal immersion heater power stage 3 1 = start of internal immersion heater power stage 3
<b>EXT.AUX.HEATER</b>	0 = stop external heat source (230V) 1 = start external heat source (230V)
<b>POT.FREE</b>	0 = potential free output for control of auxiliary heater open 1 = potential free output for control of auxiliary heater closed
<b>CIRC. PUMP DiCi.1</b>	0 = stop circulation pump in discharge circuit 1 1 = start circulation pump in discharge circuit 1
<b>SHUNT DiCi.1</b>	- = closes shunt in discharge circuit 1 0 = shunt unaffected + = opens shunt in discharge circuit 1
<b>CIRC. PUMP DiCi.2</b>	0 = stop circulation pump in discharge circuit 2 1 = start circulation pump in discharge circuit 2
<b>SHUNT DiCi.2</b>	- = closes shunt in discharge circuit 2 0 = shunt unaffected + = opens shunt in discharge circuit 2
<b>SYSTEM SHUNT</b>	- = closes shunt 0 = shunt unaffected + = opens shunt
<b>RET.LINE HP SHUNT</b>	- = closes return line shunt in systems with buffer tank 0 = shunt unaffected + = opens shunt in systems with buffer tank
<b>REV. V. POOL</b>	0 = reversing valve in normal mode 1 = reversing valve in pool mode
<b>ALARM</b>	0 = no voltage on output 201.6 External alarm 1 = 230V on output 201.6 External alarm
<b>DIGITAL OUT</b>	0 = no voltage on output 204.1 1 = 5V (2mA) on output 204.1

## 10.7 INSTALLATION




Parameter	Meaning
<b>HEAT SOURCE</b>	Selecting heat pump type for configuration of control. Outdoor air with direct evaporation and four-way valve.
<b>POOL</b>	Activates the pool function.  Factory setting:  , range:  – ON

Parameter	Meaning
<b>DISTRIBUTION CIRCUIT 1 - 2</b>	<p>Activates the shunt group function and indicates if the shunt group is to be controlled by the heat curve or by a constant temperature.</p> <p>Factory setting: , range:  – HEAT CURVE – CONSTANT TEMP</p> <p>SHUNT TIME - Indicates the shortest permitted interval between control signals to the shunt.</p> <p>Factory setting: 60S, range: 10S – 99S</p>
<b>BUFFER TANK</b>	<p>Activates the buffer tank function.</p> <p>Factory setting: , range:  – ON</p>
<b>OPTIMUM</b>	<p>Activates the Optimum function, makes use of a speed controlled circulation pump possible.</p> <p>Factory setting: , range:  – ON</p>
<b>CURRENT LIMITER</b>	<p>Activates the current limiting function. An expansion card must be installed for current measurement.</p> <p>Factory setting: , range:  – ON</p>
<b>START UP CHECK</b>	<p>Activation of the function for checking temperature and pressure at compressor start. If deviations are found this is indicated by an alarm.</p> <p>Factory setting: ON, range:  – ON</p>
<b>SERVICE TIME</b>	<p>-----</p> <p> Note! Only used for test operation. The heat pump counts 60 times as fast, which means that the waiting times are eliminated during test operation.</p> <p>-----</p> <p>0 = deactivates SERVICE TIME  1 = activates SERVICE TIME, which speeds up the control system's integral calculation and start delay by 60 times.</p> <p>Factory setting: 0, range 0 – 1</p>
<b>FACTORY SET</b>	<p>Indicates if resetting to factory settings must be done.</p> <p>CANCEL: Starting point, no changes made.</p> <p>RADIATOR: Reset factory settings for radiator system</p> <p>FLOOR: Reset factory settings for underfloor heating.</p>
<b>RESET OPER. TIME</b>	<p>Used to reset operating times.</p> <p>0 = no reset of operating times</p> <p>1 = reset of operating times to zero</p> <p>Factory setting: 0, range 0 – 1</p>


Parameter	Meaning
<b>SENSOR CALIBRATION</b>	<p>OUTD SYSTEM SUPPLY SUPPLY LINE RETURN LINE HOT WATER HOT WATER TOP REFR 1 REFR 2 DISCH. PIPE DEFR SENSOR BUFFER TANK DISTRIBUTION CIRCUIT 1 DISTRIBUTION CIRCUIT 2 POOL SUCTION GAS Factory setting: 0, range: -5°C – 5°C</p> <p>EXTERNAL FACTOR: Affects sensors that are installed inside the heat pump. Factory setting: 0, range: 0°C – 20°C</p>
<b>VERSION</b>	<p>Indicates the version number of the software in the control.</p> <p>DISPLAY HUB HP (heat pump card) EXP (expansion card) EXV (expansion valve card)</p>
<b>LOG TIME</b>	<p>Time interval between collection points of temperature history in minutes. The history graphs always show the 60 last collection points, which means that the graphs can display history from 1 hour up to 60 hours ago. (The function is not active if there is an active alarm).</p> <p>Factory setting: 1M, range: 1M – 60M</p>


## 10.8 DEFROST

Parameter	Meaning
<b>DEFR OFFSET</b>	<p>Adjusting the defrost curve. Negative value moves the defrost curve down which means that it takes a longer time before defrosting starts. Positive value moves the defrost curve up which means that it takes a shorter time before defrosting starts.</p> <p>Factory setting: 0°C, range: -20°C – 20°C</p>
<b>STOP DEFR</b>	<p>The temperature that refrigerant sensor 2 must reach to complete a defrost.</p> <p>Factory setting: 38°C, range: 7°C – 60°C</p>

Parameter	Meaning
<b>BELOW 5°C DEFR</b>	Safety defrosting occurs when the outdoor temperature has been below 5°C for a set number of days.  Factory setting: 7D, range:  , 1D – 14D
<b>MAX TIME DEFR</b>	Longest permitted time for a defrost.  Factory setting: 10M, range: 3M – 20M
<b>BETW. 2 DEFR</b>	Indicates minimum time between two defrosts.  Factory setting: 45M, range: 20M – 60M
<b>MIN RAD STMP</b>	Lowest permitted supply temperature on the heating circuit during defrost before electrical auxiliary heater starts.  Factory setting: 20°C, range: 16°C – 30°C
<b>FAN START</b>	The fan starts when the temperature on refrigerant sensor 1 reaches the set value. If FAN START is set to ON, the fans starts and stops at the same time as the compressor and the FAN STOP parameter is inactive.  Factory setting: 10°C, range: ON, -5°C – FAN STOP -3°C
<b>FAN STOP</b>	The fan stops when the temperature on refrigerant sensor 1 reaches the set value.  Factory setting: 25°C, range: FAN START + 3°C – 30°C
<b>FAN SPEED.</b>	To control the fan speed. In AUTO mode the fan speed is controlled automatically depending on demand. At a setting between 60% – 100% the fan speed is locked in the set value.  Factory setting: AUTO, range: AUTO, 60% – 100%
<b>FAN MAX</b>	Fan may increase speed to set value as maximum. The value can be lowered to reduce noise level at the cost of performance.  Factory setting: Depending on compressor size, range: 6-7V – 8-9V
<b>DEFR HP STOP</b>	Defrosting is initiated earlier when heat pump is stopped.  Factory setting:  , range:  , 5°C – 7°C

## 10.9 OPTIMUM




Parameter	Meaning
<b>TEMP DIFF CIRC.</b>	Desired temperature difference between supply and return line for the heating system.  Factory setting: 8°C, range: 0°C – 15°C, 
<b>START FLOW CIRC.</b>	Setting the speed a speed controlled circulation pump must start with. Check using MANUAL TEST -> CIRC. PUMP which speed gives sufficient flow. This is indicated by "F" in the display (flow sensor closed). The start flow is maintained one minute before control goes to speed control the circulation pump.  Factory setting: 7V, range: 3V – 10V

Parameter	Meaning
<b>CONST. FL. CIRC.</b>	<p>If TEMP DIFF CIRC. is set to  the flow is continuous with this value in the heating system. Value indicated in Volts.</p> <p>Factory setting: 7V, range: 3V – 10V</p>
<b>MIN FLOW CIRC.</b>	<p>Lowest permitted voltage (speed) of the circulation pump in the heating system.</p> <p>Factory setting: 3V, range: 3V – 10V</p>
<b>MAX H.W CHARGE HW</b>	<p>Highest supply temperature during water heating.</p> <p>Factory setting: 55°C, range: 45°C – 65°C</p>
<b>MIN CHARGE. HW</b>	<p>Lowest desired supply temperature during water heating.</p> <p>Factory setting: 50°C, range: 30°C – 65°C</p>

## 10.10 BUFFER TANK

Parameter	Meaning
<b>CONFIGURATION</b>	<p>With integral control heating is produced according to the house's heating demand. With tank control a fixed value is stated for the buffer tank.</p> <p>Factory setting: INTEGRAL CONTROL, range: INTEGRAL CONTROL – TANK CONTROL</p>
<b>RET. LINE. HP SHUNT</b>	<p>When the heat pump is inactive the heat is shunted from the buffer tank to the heat pump at set temperature.</p> <p>Factory setting: 25°C, range: 20°C – 30°C</p> <p>SHUNT TIME RET.</p> <p>Indicates shortest permitted time between control signals to the return line shunt.</p> <p>Factory setting: 30S, range: 10S – 99S</p>
<b>TANK HYST. HP</b>	<p>Indicates the number of degrees from the desired buffer tank temperature when the heat pump must start to heat the buffer tank. A condition is that CONFIGURATION = TANK CONTROL.</p> <p>Factory setting: 4°C, range: 2°C – 20°C</p>
<b>TANK HYST. IMM</b>	<p>Indicates the number of degrees from the desired buffer tank temperature when the immersion heater must start to heat the buffer tank. A condition is that CONFIGURATION = TANK CONTROL.</p> <p>Factory setting: 7°C, range: 2°C – 20°C</p>
<b>TANK HYST. EXT</b>	<p>Indicates the number of degrees from the desired buffer tank temperature when the external auxiliary heater must start to heat the buffer tank. A condition is that CONFIGURATION = TANK CONTROL.</p> <p>Factory setting: 10°C, range: 2°C – 20°C</p>



Parameter	Meaning
<b>SYSTEM CIRCUIT</b>	<p>Indicates if the system shunt group must be controlled by a heat curve or by a constant temperature. Conditions are that CONFIGURATION = TANK CONTROL and the external auxiliary heater is not configured.</p> <p>Factory setting: HEAT CURVE, range: HEAT CURVE – CONSTANT TEMP - OPEN CIRCUIT. At the selection OPEN CIRCUIT, the shunt outputs are not active, but the temperature for system supply is displayed in the OP.DATA menu. The menu only appears if external auxiliary heater is not selected.</p> <p>SHUNT TIME SYS. Indicates shortest permitted time between control signals to the system shunt.</p> <p>Factory setting: 60S, range: 10S – 99S</p> <p>SYS.PUMP COOL Indicates whether the system's circulation pump must be used for cooling. Not displayed if external auxiliary heater is selected.</p> <p>Factory setting: ON, range:  – ON</p>
<b>DISTRIBUTION CIRCUIT 1 - 2</b>	<p>Indicates if the shunt group must be controlled by a heat curve or by a constant temperature.</p> <p>Factory setting: HEAT CURVE, range: HEAT CURVE – CONSTANT TEMP - OPEN CIRCUIT. At the selection OPEN CIRCUIT, the shunt outputs are not active, but the temperature for shunt group is displayed in the OP.DATA menu. Open circuit cannot be used in connection with CONFIGURATION = TANK CONTROL or if external auxiliary heater is configured. The option  (OFF) deactivates the shunt group function fully. The menu only appears if SHUNT GROUP sensor is connected</p> <p>SHUNT TIME DC1 - 2 Indicates shortest permitted time between control signals to the shunt.</p> <p>Factory setting: 60S, range: 10S – 99S</p> <p>DISTR. 2 PUMP COOL Indicates whether the circulation pump for shunt group must be used for cooling.</p> <p>Factory setting: ON, range:  – ON</p>
<b>HEAT STOP DEPENDENT.</b>	<p>indicates if heating the buffer tank is to be influenced by HEAT STOP. A condition is that CONFIGURATION = TANK CONTROL.</p> <p>Factory setting: YES, range: NO – YES</p>

Parameter	Meaning
<b>POOL CIRCUIT</b>	<p>Used to indicate where the reversing valve for pool is located. The system supply circuit cannot be used if external auxiliary heater is configured.</p> <p>Factory setting: SYSTEM SUPPLY, range: SYSTEM SUPPLY - DISTRIBUTION CIRCUIT 1 - DISTRIBUTION CIRCUIT 2</p> <p>MAX TIME POOL determines the longest permitted pool heating time at non-integral controlled circuit.</p> <p>Factory setting: 40M, range 1M – 210M</p>
<b>MAX TANK TEMP</b>	<p>Maximum permitted temperature in the buffer tank. Fixed value 55°C is used if no external auxiliary heater is configured. At external auxiliary heater the temperature can be set between 55°C – 80°C.</p> <p>Factory setting: 55°C, range: 55°C – 80°C</p>

# 11 Commissioning



Note! Read the safety instructions!

## 11.1 Filling and bleeding the hot water heater and heating system

1. Fill the water heater with cold water by opening the filler valve that is on the valve pipe.
2. Bleed by opening one of the hot water taps.
3. Then fill the water heater coil and the heating system with water through the filling valve to a pressure of approximately 1 bar.
4. Open all radiator valves fully.
5. Bleed all radiators.
6. Refill the heating system to a pressure of approximately 1 bar.
7. Repeat the procedure until all air has been removed.
8. Check the system for leakage.
9. Leave the radiator valves fully open.

## 11.2 Checking the pipes and electrical installation

Before manual test operation, check that the following points have been correctly carried out:

### 11.2.1 Piping installation, heating system

- Pipe connections in accordance with the connection diagram, see System solutions.
- Flexible hoses on the supply and return lines
- Pipe insulation
- Strainer on return line
- The heating system has been bled
- All radiator valves fully open
- Expansion tank heating system (not included in the delivery)
- Safety valve for expansion tank
- Filler cock with non-return valve heating system (not included in the delivery)
- Safety valve for cold water (not included in the delivery)

If a water heater is installed, also check:

- Exchange valve (included in DHP-AQ Midi and DHP-AQ Maxi)
- Bleed valve (not included in the delivery)

### 11.2.2 Electrical Installation

- Circuit-breaker (not included in the delivery)
- Fuse protection
- Positioning of the outdoor sensor
- Communication cable between heat pump and control centre.

If an external water heater is installed, also check:

- Exchange valve (included in DHP-AQ Midi and DHP-AQ Maxi)

## 11.3 Configuration of control system



Note! Room sensors do not affect the set point for the shunt group.

Further information about parameters in the control system are in the Information menu, Page 47 and Service menu, Page 54 chapter. The system solutions are described in the System solution, Page 24 chapter.

### 11.3.1 Default settings

- If necessary; change language in the INFORMATION -> LANGUAGE menu. Select language with + or -
- State what the output size of the heat pump is in the menu SERVICE -> INSTALLATION -> SYSTEM -> HEAT SOURCE -> AIR -> DIRECT EVAP.
- Make a factory setting and select heating system with the parameters FLOOR or RADIATOR in the menu SERVICE -> INSTALLATION -> FACTORY SET
- Make settings depending on which system solution has been selected according to the following.

### 11.3.2 System solution DHP-AQ Mini

If optimum pump is used, set the value on OPTIMUM to ON. Activated in SERVICE -> INSTALLATION -> SYSTEM.

To activate the electric additional heater the value MAX STEP must be set to P. Activated in SERVICE -> AUX HEATER. Potential free outputs must be used, see electrical instructions.

To activate shunt group 1 the value of SHUNT GROUP 1 must either be set to HEAT CURVE or to CONSTANT TEMP. Activated in SERVICE -> INSTALLATION -> SYSTEM.

- When HEAT CURVE is selected, the shunt group controls to the set heat curve.
- When CONSTANT TEMP is selected, shunt group controls a constant temperature regardless of outdoor temperature. Enter the constant temperature for SHUNT GROUP 1 by giving the temperature for CONSTANT TEMP in INFORMATION -> SHUNT GROUP 1.
- When cooling the value of WHEN COOLING is set to AUTO or OPEN. Activated in INFORMATION -> SHUNT GROUP 1.

### 11.3.3 System solution DHP-AQ Midi

If optimum pump is used, set the value on OPTIMUM to ON. Activated in SERVICE -> INSTALLATION -> SYSTEM.

To activate the electric auxiliary heater for 230V, 1-N (max 9 kW) the value MAX STEP must be set to ≤ 3 (3 is highest setting). Activated in SERVICE -> AUX. HEATER.

To activate the electric auxiliary heater for 400V, 3-N (max 15 kW) the value MAX STEP must be set to ≤ 5 (5 is highest setting). Activated in SERVICE -> AUX. HEATER.

To activate shunt group 1 the value of SHUNT GROUP 1 must either be set to HEAT CURVE or to CONSTANT TEMP. Activated in SERVICE -> INSTALLATION -> SYSTEM.

- When HEAT CURVE is selected, the shunt group controls to the set heat curve.
- When CONSTANT TEMP is selected, shunt group controls a constant temperature regardless of outdoor temperature. Enter the constant temperature for SHUNT GROUP 1 by giving the temperature for CONSTANT TEMP in INFORMATION -> SHUNT GROUP 1.
- When cooling the value of WHEN COOLING is set to AUTO or OPEN. Activated in INFORMATION -> SHUNT GROUP 1.

To activate hot water production, set the HOT WATER value to ON. Activated in INFORMATION -> HOT WATER. The start value for hot water production is factory set to 40°C. The value of START can be changed in SERVICE -> HOT WATER.

### 11.3.4 System solution DHP-AQ Maxi

If optimum pump is used, set the value on OPTIMUM to ON. Activated in SERVICE -> INSTALLATION -> SYSTEM.

To activate the electric auxiliary heater for 230V, 1-N (max 9 kW) the value MAX STEP must be set to ≤ 3 (3 is highest setting). Activated in SERVICE -> AUX. HEATER.

To activate the electric auxiliary heater for 400V, 3-N (max 15 kW) the value MAX STEP must be set to ≤ 5 (5 is highest setting). Activated in SERVICE -> AUX. HEATER.

To activate shunt group 1 the value of SHUNT GROUP 1 must either be set to HEAT CURVE or to CONSTANT TEMP. Activated in SERVICE -> INSTALLATION -> SYSTEM.

- When HEAT CURVE is selected, the shunt group controls to the set heat curve.
- When CONSTANT TEMP is selected, shunt group controls a constant temperature regardless of outdoor temperature. Enter the constant temperature for SHUNT GROUP 1 by giving the temperature for CONSTANT TEMP in INFORMATION -> SHUNT GROUP 1.
- When cooling the value of WHEN COOLING is set to AUTO or OPEN. Activated in INFORMATION -> SHUNT GROUP 1.

To activate hot water production, set the HOT WATER value to ON. Activated in INFORMATION -> HOT WATER. The start value for hot water production is factory set to 40°C. The value of START can be changed in SERVICE -> HOT WATER.

## 11.4 Manual test



Caution! The installation may only be commissioned if the heating system and water heater have been filled and bled. Otherwise the circulation pump can be damaged.

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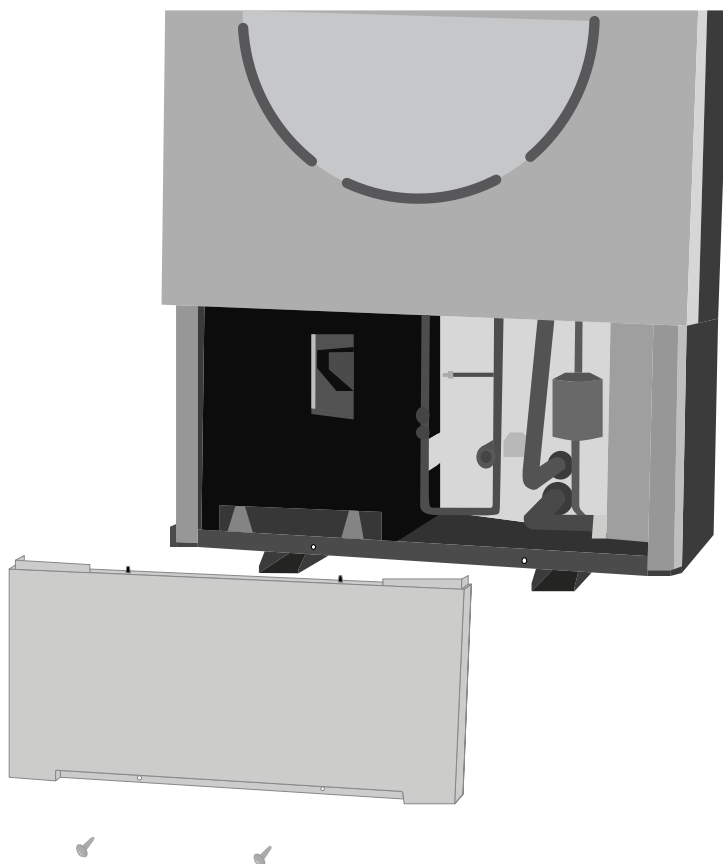


Caution! Any alarms that may occur in connection with the installation must be fault-traced.

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Test operate and at the same time check the function of the components. If necessary remove the lower front hatch, see instruction below

### 11.4.1 Remove the lower front hatch



1. Unscrew the screws and washers in the lower edge of the front hatch.
2. Pull the front hatch down so that the front hatch is released from the two catches.

#### 11.4.2 Activate MANUAL TEST

1. Ensure that the main circuit breaker is on.
2. Select operating mode , in the menu INFORMATION -> OPERAT.-> 
3. Open the SERVICE menu by pressing and holding < in for five seconds.
4. Set the value for MANUAL TEST to 2.



Note! Set MANUAL TEST to 2 to navigate away from the menu during ongoing test operation.

#### 11.4.3 Test the circulation pump

1. Start the heating system circulation pump by setting a value between 30% and 100%. (1 at constant speed circulation pump).
2. Check that the circulation pump is running by carrying out the following:
  - Listen
  - Place a hand on the pump
  - Listen for air
3. If there is air in the heating system, bleed, see Filling and bleeding the water heater and heating system.
4. When using a speed controlled circulation pump it is important to check which speed gives sufficient flow in the system. Sufficient flow is indicated by an "F" in the main part of the display. Increase the speed of the circulation pump until safe flow is achieved. Read off the value in %. This value (described as a control current in Volts, for example 60% = 6V) is then used in SERVICE -> OPTIMUM -> START FLOW CIRC. For circulation pump with constant speed the pump setting is checked in the same way.
5. Stop the circulation pump by setting the CIRC. PUMP value to 0.

#### 11.4.4 Test exchange valve for hot water (if installed)

1. Activate the reversing valve by setting the value REV.V. HOT WATER to 1.
2. Check that the indicator on the exchange valve's upper side changes position.

#### 11.4.5 Test the compressor

1. Start the circulation pump by setting the value CIRC.PUMP to 1.
2. Start the compressor by setting the value COMPRESSOR to 1.
3. Check that there are no strange noises.
4. If it sounds abnormal refer to the Service instructions.
5. Stop the compressor by setting the COMPRESSOR value to 0.
6. Stop the circulation pump by setting the CIRC. PUMP value to 0.

#### 11.4.6 Test the auxiliary heater

1. Start the circulation pump by setting the value CIRC.PUMP to 1.
2. Start the auxiliary heater by setting the value of present AUX. HEAT to 1.
3. Check that the auxiliary heater works by exiting the MANUAL TEST menu. Enter the INFORMATION -> OP. DATA menu and check that the temperature of SUPPLY LINE rises.
4. Return to the menu MANUAL TEST and stop the auxiliary heater by setting AUX. HEATER value to 0.
5. Stop the circulation pump by setting the CIRC. PUMP value to 0.

#### 11.4.7 Test the fan

1. Start the fan by setting the value FAN to between 0 - 10V. Check whether that the fan is running.
2. Stop the fan by setting the FAN value to 0.

#### 11.4.8 Checking the four-way valve

1. Start the circulation pump.
2. Start the compressor.
3. Start the fan.
4. Check the temperature on the supply line (INFORMATION -> OP. DATA) after a few minutes.
5. Switch the four way valve (FOUR-WAY VALVE = 1).
6. Check that the temperature of the supply line falls.
7. Reset the four-way valve, fan, compressor and circulation pump

#### 11.4.9 Checking sensors

Check the defrost sensor temperature so that it corresponds to the actual outdoor temperature.

#### 11.4.10 Exit test operation

Set the value for MANUAL TEST to 0.

#### 11.4.11 Reinstall the lower front hatch.

After completed checks and tests the lower front hatch must be reinstalled on the heat pump.

### 11.5 Start-up and commissioning

#### 11.5.1 Adaptation to the heating system

If the circulation pump is used with a fixed pump speed the heat pump settings must be adjusted to the applicable heating system, for instance an underfloor heating or radiator system. The delta temperature (the difference between the supply line and return line) should be 7–10°C. If this is not reached, the flow of the circulation pump may need adjusting depending on the applicable heating system.

#### 11.5.2 Select operating mode

Set the heat pump to the desired operating mode in the menu INFORMATION -> OPERAT. If necessary, set certain parameters in the control system, such as ROOM and CURVE.

#### 11.5.3 Noise check

During transportation and installation there is a certain risk that the heat pump can be damaged, components may move or get bent and this can cause noise. Because of this it is important to check the heat pump when it has been installed and is ready to be commissioned to ensure that everything is in order. Test operate the heat pump in both heating and hot water modes to ensure that there is no abnormal noise. While doing this, check that there is no abnormal noise in other parts of the house because unwanted noise can occur in rooms other than the one where the heat pump is located.

Noise is produced from the heat pump when the fan is in operation, check during manual operation that there is no disturbance in your own home as well as none caused to any neighbours.

#### 11.5.4 After start up



Note! Remember that it takes time for the heat pump to heat a cold house. It is best to let the heat pump work at its own pace and NOT raise or alter any values in the control system to try to heat it up more rapidly.



Caution! If there is an alarm in conjunction with installation it usually means that there is air in the system.



Caution! In the event of longer periods of downtime and risk of ice build-up in the system, the heat pump must be drained of water.

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### 11.5.5 Trimming the heating system

To obtain a heating system balance and obtain an even and comfortable indoor temperature, the heating system must be adjusted according to the example below.



Note! Adjust the heating system during the winter to obtain the greatest possible output.



Note! Trimming must be carried out over a few days as the inertia in the heating system causes the indoor temperature to change slowly.

1. Choose one of the house's rooms as a reference room for the indoor temperature, where the highest temperature is required, 20-21°C.
2. Place a thermometer in the room.
3. Open all the heating system's radiator valves fully.
4. Leave the heat pump's ROOM value set at 20°C. See ROOM for more information.
5. Note the temperature in the reference room at different points in time over a 24 hour period.
6. Adjust the ROOM value so that the reference room reaches your required indoor temperature of 20-21°C. Remember that other rooms will have different temperatures during trimming, but these are adjusted later.
7. If the ROOM value must be adjusted more than 3°C upwards or downwards the CURVE value must be adjusted instead. See CURVE for more information.
8. If the indoor temperature varies several degrees despite trimming, a specific part of the heat curve may need adjusting. Check at what outdoor temperature the variation is greatest and adjust the curve at the corresponding value (CURVE 5, CURVE 0, CURVE -5). See Adjusting the heat curve at -5°C, 0°C and 5°C for more information.
9. When the reference room has an even temperature of 20 - 21°C over a 24 hour period, you can adjust the radiator valves in the other rooms so that their indoor temperatures are the same temperature or lower than the reference room.

### 11.6 Installation protocol

Fill in the Installation protocol in the Maintenance instructions.

### 11.7 Customer information

After installation and test operation, the customer must be informed about their new heat pump installation. In the Maintenance instructions there is a checklist regarding the information that the installer must give the customer.



Note! The serial number must always be given for warranty matters. The serial number is on the type plate, which is attached to the heat pump and control unit.



## 12 Technical data

Table 4. Technical data

DHP-AQ			6	9	11	13	16	18
Type			Air/water					
Refrigerant	Type		R407C					
	Amount	kg	4,0	4,3	5,0	5,1	5,7	6,0
	Test pressurisation	MPa	3,4					
	Design pressure	MPa	3,1					
Compressor	Type		Scroll					
	Oil		POE					
Electrical data 3-N 50Hz heat pump	Mains power supply	V	400					
	Rated output, compressor	kW	2,2	2,9	3,3	4,2	5	6,1
	Rated output, fan	kW	0,18			0,28		0,72
	Start current <sup>10</sup>	A	12	10	18	17		18
	Fuse	A	10		16			
Electrical data 3-N, 50Hz control unit	Mains power supply	V	230/400					
	Rated output, circ. pump <sup>8</sup>	kW	0,07				0,14	
	Auxiliary heater, 5 step <sup>8</sup>	kW	3/6/9/12/15					
	Fuse	A	10 <sup>12</sup> /16 <sup>13</sup> /16 <sup>14</sup> /20 <sup>15</sup> /25 <sup>16</sup>					
Electrical data 1-N 50Hz heat pump	Mains power supply	V	230					
	Rated output, compressor	kW	2,4	2,8	3,6	4,3	5,5	-
	Rated output, fan	kW	0,18			0,28		-
	Start current <sup>10</sup>	A	11	21	26	28		-
	Fuse	A	20	20	32	32	32	-
Electrical data 1-N, 50Hz control unit	Mains power supply	V	230					
	Rated output, circ. pump <sup>8</sup>	kW	0,07				0,14	
	Auxiliary heater, 3 step <sup>8</sup>	kW	3/6/9					
	Fuse	A	16 <sup>17</sup> /30 <sup>18</sup> /40 <sup>19</sup>					
Performance <sup>11</sup>	COP <sup>1</sup>		3,26	3,40	3,44	3,38	3,21	3,10
	Heat factor <sup>1</sup>	kW	4,73	6,22	7,68	9,10	11,40	13,26
	Incoming power <sup>1</sup>	kW	1,45	1,83	2,23	2,69	3,56	4,28
	COP <sup>2</sup>		4,32	4,38	4,54	4,35	4,12	3,97
	Heat factor <sup>2</sup>	kW	6,49	8,59	10,64	12,30	15,21	17,59
	Incoming power <sup>2</sup>	kW	1,50	1,96	2,34	2,83	3,69	4,42
	COP <sup>3</sup>		4,73	4,73	5,01	4,67	4,61	4,25
	Heat factor <sup>3</sup>	kW	6,87	8,81	10,91	12,64	15,88	18,58
	Incoming power <sup>3</sup>	kW	1,45	1,86	2,18	2,70	3,44	4,37
	EER <sup>4</sup>		2,23	2,35	2,55	2,41	2,29	2,33
	Cooling output <sup>4</sup>	kW	4,21	5,85	7,52	8,85	10,39	13,16

DHP-AQ			6	9	11	13	16	18
	Incoming power <sup>4</sup>	kW	1,88	2,49	2,95	3,67	4,53	5,65
Nominal flow <sup>5</sup>	Heating circuit	l/s	0,165	0,215	0,263	0,308	0,372	0,43
External available pressure <sup>9</sup>	Heating circuit	kPa	60,7	59,8	58,7	56,7	96,8	95,9
Pressure switches / pressure transmitter	Low pressure (pressure transmitter)	MPa	0,05					
	Operation	MPa	2,85					
	High pressure	MPa	3,1					
Water volume	Water heater <sup>6</sup>	l	180					
	Condenser	l	1,6	2,1	2,7	2,7	3,2	4,3
Number of units			2					
Heat pump	Dimensions L x W x H	mm	856x510x1272		1016x564x1477		1166x570x1557	
	Weight (empty)	kg	125	131	150	155	191	185
	Noise output level: normal operation <sup>7</sup>	dB(A)	61,3	61,0	61,0	62,4	66,2	74,5
	Noise output level: silent operation <sup>7</sup>	dB(A)	60,1	59,2	59,6	61,0	64,0	70,6
	Fan speed min/max	rpm	500/745	500/745	425/620	465/690	625/805	770/1000
Control unit DHP-AQ Mini	Dimensions L x W x H	mm	380x204x600					
	Weight	kg	18					
Control unit DHP-AQ Midi	Dimensions L x W x H	mm	420x255x675 <sup>20</sup>					
	Weight	kg	21					
Control unit DHP-AQ Maxi	Dimensions L x W x H	mm	596x690x1845 <sup>21</sup>					
	Weight (empty)	kg	106					
	Weight (filled)	kg	286					

Measurements are carried out on a limited number of circulation pumps, which can give variations in results. Tolerances in the measurement methods can also give variations.

1) At A2/W35 in accordance with EN14511 (incl. circulation pump, fan and defrosting for DHP-AQ Midi and DHP-AQ Maxi).

2) At A7/W35 in accordance with EN14511 (incl. circulation pump and fan for DHP-AQ Midi and DHP-AQ Maxi).

3) At A7/W35 Δ10K hot side in accordance with EN 255.

4) At A35/W7 according to EN 14511.

5) Nominal flow: heating circuit Δ10K.

6) Only applies to DHP-AQ Maxi.

7) Sound power level measured according to EN ISO 3741 at A7W45 and frost-free evaporator.

8) Only applies to DHP-AQ Midi and DHP-AQ Maxi.

9) The pressure that must not be exceeded outside the heat pump without falling below the nominal flow.

11) The values apply to new heat pumps with clean heat exchangers.

12) Heat pump with 3 kW additional heater.

13) Heat pump with 6 kW additional heater.

14) Heat pump with 9 kW additional heater.

15) Heat pump with 12 kW additional heater.

16) Heat pump with 15 kW additional heater.

17) Heat pump with 3 kW additional heater.

18) Heat pump with 6 kW additional heater.

19) Heat pump with 9 kW additional heater.

10) According to IEC61000.

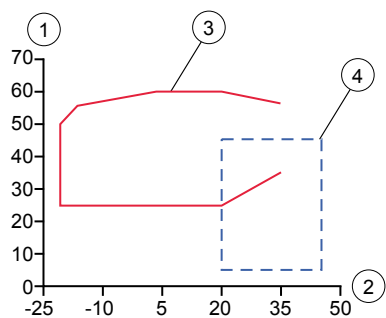
20) Including pipe connection

21) Including pipe connection and  $\pm 10$  mm for foot adjustment

## 12.1 Working range compressor operation

Lowest and highest temperatures for production of hot water, heating and cooling.

The control unit controls the heat pump operating range.



Position	Description
1	Water temperature °C
2	Air temperature °C
3	Heating
4	Cooling

VMGFD102