



User Guide

DHP-AT

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

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1 Foreword

Buying a heat pump from Danfoss is an investment in a better future.

A Danfoss heat pump is classed as a renewable energy source, which means that it is considerate of our environment. It is a safe and convenient solution that provides heating, hot water and in certain cases cooling, for your home at a low cost.

We thank you for the confidence that you have shown in us by buying a heat pump from Danfoss. We hope that you will benefit from it for many, many years to come.

With best wishes

Danfoss Heat Pumps

2 Safety precautions

2.1 Installation and maintenance

Danger

Only authorized installers may install, operate and perform maintenance and repair work on the unit.

Danger

Only authorized electricians may modify the electrical installation.

Danger

Only authorized refrigeration technicians may perform work on the refrigerant circuit.

2.2 System modifications

Only authorized installers are allowed to perform modifications on the following components:

- The heat pump unit
- Water and electrical installations
- The safety valve

Do not make any constructions / installations that may affect the operational safety of the heat pump.

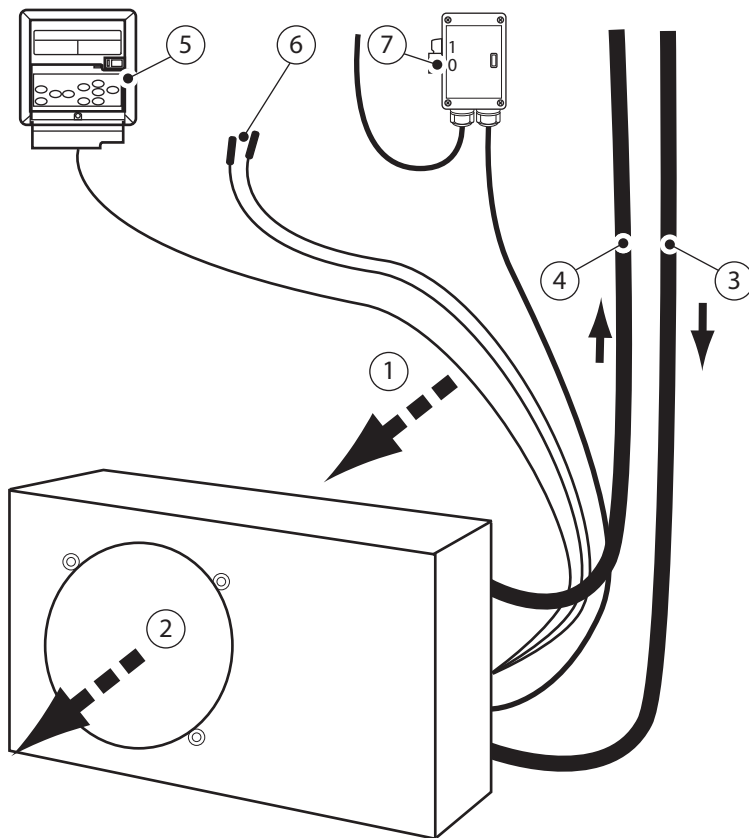
2.3 Safety valve

The following safety precautions apply to the safety valve in the hot water circuit and corresponding overflow pipe:

- Do not block the outlet on the overflow pipe from the safety valve.
- Water expands when it is heated, this means that a small amount of water is released from the system via the overflow pipe.
The water that exits the overflow pipe can be hot! Therefore, allow it to flow to a floor drain where there is no risk of burning yourself.

3 About your heat pump

3.1 Components



- 1 Air inlet
- 2 Air outlet
- 3 Return line
- 4 Supply line
- 5 Operator panel
- 6 Hot water tank sensor and buffer tank sensor
- 7 Power supply example (local and national regulations must be applied)

3.2 Main functions

The heat pump can provide the following functions:

- House heating for radiators or under-floor heating
- Domestic Hot Water (DHW)
- Cooling
- Defrosting in cold weather conditions
- Frost protection
- Legionella prevention

Most of these functions are automatically controlled by the control system according to the need from the household or ambient temperatures.

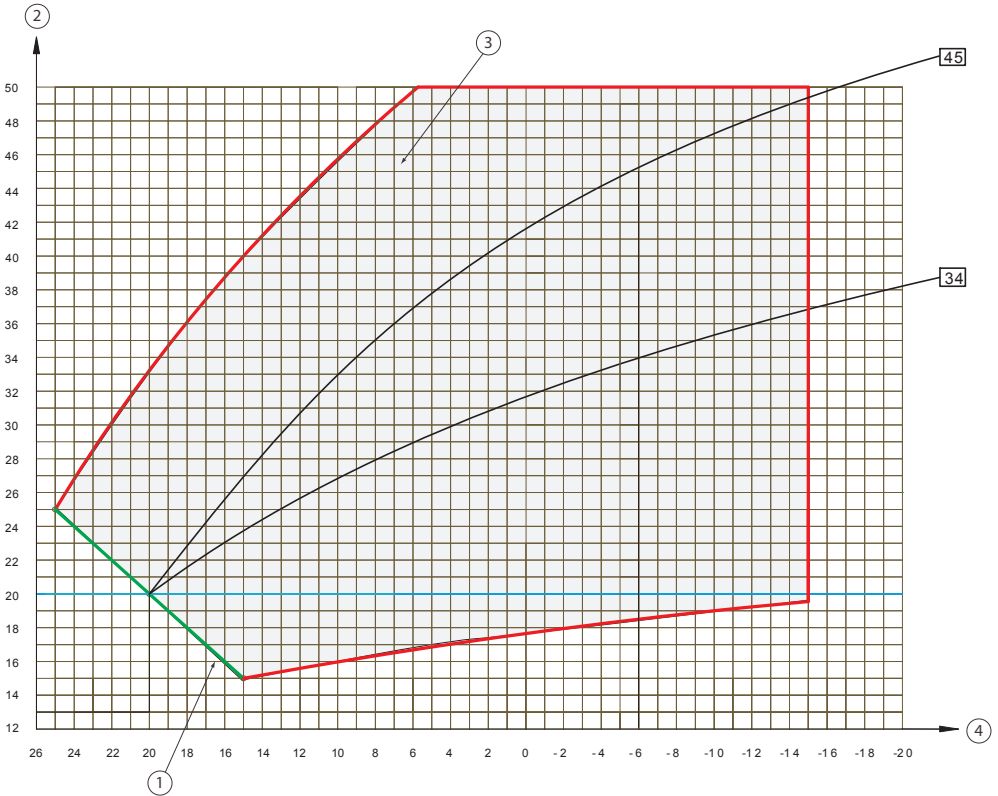
Cooling must be initiated manually from the key pad by the user. The heat pump behaviour is still automatically controlled by the control system.

The default function when starting the heat pump for the first time is house heating/DHW automatic mode. The production of hot water is prioritized. When the hot water temperature reaches the set point, the heat pump automatically switches to house heating or cooling depending on the user settings.

The heating system is normally configured for automatic house heating/DHW at commissioning. An appropriate heating curve and a desired room temperature are selected by the installer. The heat pump will adjust the house heating water temperature in accordance with the outside air temperature. The maximum water temperature for house heating is 50°C running on compressor only. If higher temperature is required, the external electrical heater is used to reach the set point. The AUTO mode is for both comfortable house heating and energy saving.

The heating function can be set to MANUAL mode, then the heat pump will produce a constant supply line temperature following the setting in the control system.

The picture below shows a simplified view of the recommended heating curves and the temperature working range in AUTO mode.



- 1 Initial supply line temperature
- 2 Supply line water temperature
- 3 Working range in AUTO mode
- 4 Outdoor ambient air temperature

The recommended heating curves for radiator heating are curves 43-45. The recommended heating curves for under-floor heating are curves 32-34.



The outside air temperature reference point for the heat curves is -6 °C.

Cooling

When the function is manually set to cooling, the machine will lower the indoor temperature. Note that the cooling capacity will decrease as the outdoor temperature increases.

Adjustable cooling supply line temperature range: 8-28°C. (Default cooling temperature is 12°C)

If the supply line water temperature drops below 2 °C in cooling mode the machine will stop. This is to prevent inside components from freezing. Error code 13 will be displayed.

Domestic hot water

The prioritized function is Domestic Hot Water (DHW). When the water temperature reaches the set point, the heat pump automatically switches to house heating. The maximum water temperature for DHW is 55°C running on compressor only. If higher temperature is required, the DHW tank electrical heater is used to reach the set point. Maximum DHW temperature is 60°C. (Default DHW temperature is 50°C)

Defrosting

The heat pump will calculate and process the best defrosting programme depending on data collected from the temperature sensors.

During defrosting, components will start and stop at intervals (this is normal behaviour).

Defrosting can also be activated manually, this is only recommended when AUTO defrosting is not sufficient. This usually happens in the temperature interval -5 to +5 °C and when outside air humidity is high. Under these conditions can heavy icing occur.

Legionella prevention**DHW tank with built-in electrical heater**

There is an automatic legionella prevention when the heat pump function is set to DHW. The automatic legionella prevention runs at 00:00 every 7:th day of operation. The maximum water temperature for DHW is 55°C running on compressor only. The water in the hot water tank will be heated to 65 °C for 15 minutes, using the hot water tank electrical heater. This will kill any possible legionella bacteria inside the hot water tank.

DHW tank without built-in electrical heater

There is an automatic legionella prevention when the heat pump function is set to DHW. The automatic legionella prevention runs at 00:00 every 7:th day of operation. The water in the hot water tank will be heated to 55 °C for 3 hours then returns back to previous operating mode.

3.3 Internal electrical heater

The internal electrical heater is used in situations when the heating from the heat pump is insufficient due to low air temperature or when the heat pump itself has stopped.

The electrical heater will start in the following conditions:

- The system discovers insufficient heating from the heat pump.
- The heat pump stops (for protection) due to a failure, and at the same time, the water temperature has not reached the set point.
- The heat pump is in defrosting mode.
- During freezing protection, step 2.
- Manually started by user

3.4 Freeze protection

As long as there is power supplied to the heat pump, an automatic freeze protection function will prevent inside components from freezing.

When this protective function is triggered, the controller will display either "Err 18" or "Err 19" depending on the temperature in the system, this is not a fault. The unit will automatically recover once the conditions in the control system is met.

4 Control system

The heat pump has an integrated control system which automatically calculates the heat or cooling demands in the house to ensure desired temperature.

The operator panel has a keypad (4) for user interaction and the information is presented in a display (1) above the keypad (4) and by the indicator (2) beside the power ON/OFF button (3).

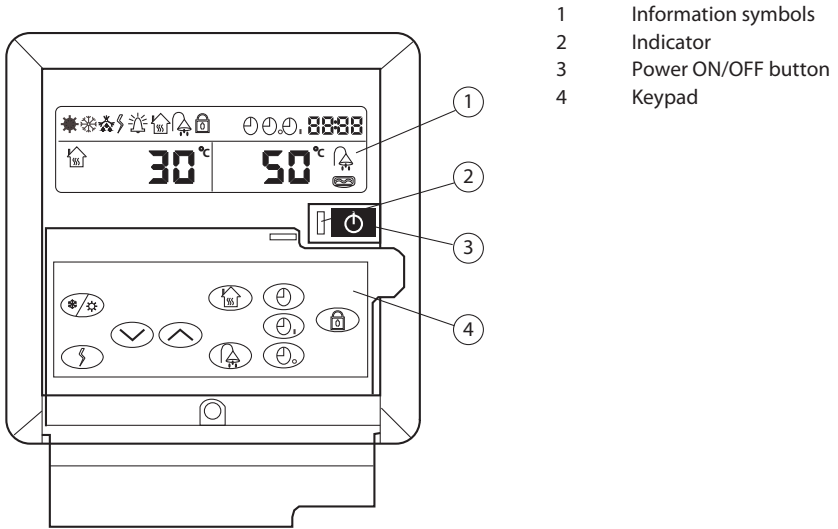


Fig. 1: Operator panel

4.1 Keypad

The keypad is used to navigate through the different menus, to select features and lock / unlock the user settings

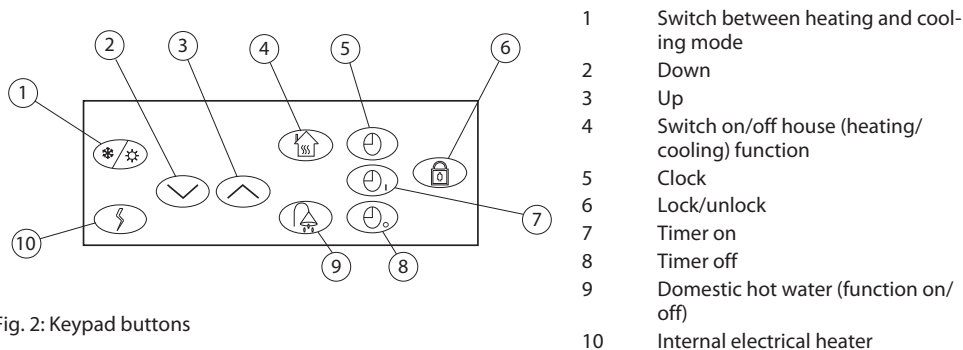


Fig. 2: Keypad buttons

4.2 Indicator

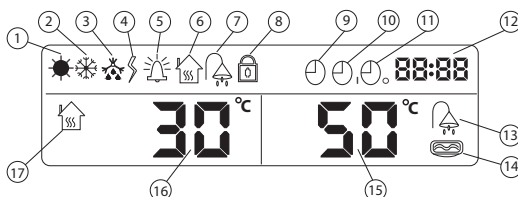
The indicator next to the power ON/OFF button on the operator panel is lit green when power is supplied and the operator panel is connected to the heat pump. When the heat pump is started (using the power button), it is confirmed by a symbol on the display.

4.3 Display

During normal operation, the upper part of the display shows the currently active functions.

The bottom part of the display shows the temperatures in the buffer tank and the hot water tank. If house heating/cooling or DHW has been turned off, this part of the display will be empty. If the menu system is entered using the keypad or if an error occurs, the appearance of the display will change.

The following information is available:



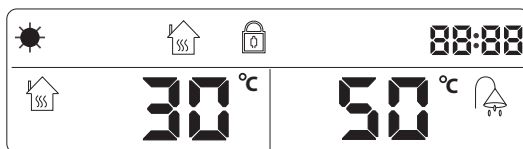
1	Heating	9	Clock
2	Cooling	10	Timer on
3	Defrosting	11	Timer off
4	Internal electrical heater	12	Current time
5	Alarm	13	Indicator for DHW function
6	House heating	14	Indicator for hot water tank electrical heater
7	Domestic Hot Water (DHW)	15	Hot water tank temperature
8	Interface locked	16	Buffer tank water temperature
		17	Indicator for house heating/cooling function

The display shows the available menus and the default or configured settings.

5 Menu information




The control system has 30 menus, numbered 00-29. Parameters 00 to 19 in the menu have a default adjustable value, depending on if the operating mode is AUTO or MANUAL. Menus 20 to 29 displays measured values.

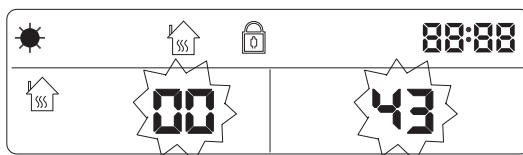
When the heat pump is in house heating/DHW automatic operation, the information is presented as in the picture below.



Viewing other settings


Other settings in the control system can be reviewed by navigating through the 30 available menus.

1. To enter a menu, press  for 5 seconds. The menu and parameter digits start to flash.
2. Before the flashing stops, press the  or  buttons to navigate between the menus.



The current parameter value for a menu setting is displayed in the right-hand side of the window. The default value can be found further on in this user guide.

6 Turning power ON/OFF

The heat pump is normally started by the installer when installing and commissioning the system. If it is necessary to start or stop the heat pump, use the power ON/OFF button,  (3) on the keypad.

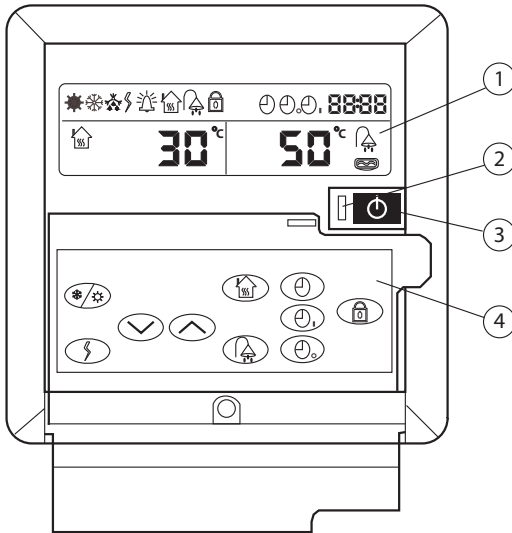
The heat pump is connected to the mains via a safety switch (circuit breaker).

Warning



If the power supply is switched on, the unit is in so called standby mode even if it is turned OFF on the keypad. In standby mode, the unit may still operate if it enters freeze protection mode. To completely turn off the heat pump, the mains safety switch must be switched off.

The indicator (2) on the operator panel is lit green when the operator panel is powered on and connected to the control system. If the heat pump is turned off, only current time is displayed. When the heat pump is turned on from the operator panel (3), the current operation and status will be displayed.



7 Settings and adjustments

By default, the heat pump function is set to automatic house heating/DHW. The default heat curve is 43 and the desired room temperature is 20 °C.

The factory configured mode and parameter settings in the control system can be adjusted to fit the current system solution and different customer requirements.







There is no reset function. If the default factory settings (parameter values) are changed, the only way to return to the default settings is to manually set the values presented in section **Default settings**.

7.1 Lock/unlock user interface

To lock or unlock the user interface, press  for 5 seconds.

7.2 Changing operation mode

To change the default operation mode, from house heating/DHW AUTO to cooling, press  on the key pad. Navigate to **Menu 01** and select the desired room temperature using the  or  buttons.

In the default house heating/DHW AUTO mode, pressing  on the keypad more than 5 seconds stops the DHW production and puts the heat pump in house heating operational mode.






The value shown in the display is the present tap water temperature. Press the symbol for less than 5 seconds and the preset temperature is shown.

If pressing the  button for more than 5 seconds, the house heating function is turned off.



The value shown in the display is the present supply line/buffer tank temperature. Press the symbol for less than 5 seconds and the preset temperature is shown.








7.3 Adjusting DHW temperature

1. To change the default setting of the DHW tank temperature, press . The temperature setting starts to flash.
2. Use the  or  buttons to change the temperature.
3. Wait 5 seconds (the figures stop flashing) for the temperature value to be set.







7.4 Changing heat curve and desired room temperature

Changing heat curve and desired room temperature is only available in AUTO mode.








Heat curve

1. To select another heating curve, press  for 5 seconds.
2. Use  or  buttons to navigate to **Menu 00**.
3. Press  again.
4. Use  or  buttons to select a new heating curve (range is 24-50).
5. Press  again and wait 5 seconds.

Desired room temperature

1. To select the initial desired room temperature, press  for 5 seconds.
2. Use  or  buttons to navigate to **Menu 01**.
3. Press  again.
4. Use  or  buttons to select the initial desired room temperature.
5. Wait 5 seconds for the change to be saved.








7.5 Setting current time

1. To change the default time setting, press .
2. While the symbols are flashing adjust the default hour setting by using the  or  buttons.
3. Press  again.
4. Use  or  buttons to change the default minute setting.
5. Before the flashing stops, press  again or wait 5 seconds to save the settings.








7.6 Timer settings

The heat pump can start and stop according to timer settings in the control system.




Setting Timer ON

1. To set Timer ON, press .
2. Use  or  buttons to change the default hour setting for Timer ON.
3. Press  again.
4. Use  or  buttons to change the default minute setting for Timer ON.
5. Press  before the flashing stops or wait 5 seconds.








Setting Timer OFF

1. To set Timer OFF, press .
2. Use  or  buttons to change the default hour setting for Timer OFF.
3. Press .
4. Use  or  buttons to change the default minute setting for Timer OFF.
5. Press  before the flashing stops or wait 5 seconds.

Cancelling Timer settings

1. To cancel timer settings, press either  or .
2. Press  before the flashing stops.

7.7 Changing mode from AUTO to MANUAL

1. To change from AUTO to MANUAL mode, press  for 5 seconds.
2. Press  or  to navigate to **Menu 02**.
3. Press the  again.
4. Press  to select value 0 for MANUAL mode.
5. Press  again or wait 5 seconds.
6. To lock the mode, press  for 5 seconds.

7.8 Adjusting the indoor temperature in MANUAL mode

In MANUAL mode, the control system can only adjust the water out temperature which in turn will affect the room temperature.

1. To change the water temperature, press and adjust the temperature with the or buttons.
2. Press again to save the settings.

7.9 Manual defrosting

Manual defrosting should only be initiated when the automatic defrosting function is not sufficient (heavy icing on the outdoor unit).

To start a manual defrosting cycle, press and simultaneously for 5 seconds. If all defrost conditions are fulfilled, the defrost symbol will be displayed in the information window. An air temperature below 15°C is required and the compressor must have been running for at least 10 minutes.



If the defrost symbol disappears almost immediately, the defrosting criteria are not met and defrosting will not start.

When the defrosting cycle is finished, the symbol will disappear from the information window.

7.10 Default settings

The default DHW temperature is set to 50°C.

The following table shows the other default settings in the control system:

Menu	Description	Default value	Range
00	Auto heating curve (value 43 relates to the number of the curve and has no units of measure, A indicates that it is in automatic mode only)	A43	A24—50
01	Initial (desired) room temperature	20 °C	15—25 °C
02	House heating mode	1	1=Auto 0=Manual
03	Defrosting cycle	40 min	30—90 min
04	Coil temperature threshold for starting defrosting	-6 °C	From -20 °C to +5 °C
05	Coil temperature threshold for stopping defrosting	13 °C	1—30 °C
06	Maximum defrosting period	12 min	1—12 min

Menu	Description	Default value	Range
07	Domestic hot water hysteresis setting (i.e. number of degrees below set point where the DHW will start again)	5 °C	1—20 °C
08	Heating hysteresis setting (i.e number of degrees below set point where the heating will start again)	2 °C	1—20 °C
09	Overheating of electronic expansion valve in heating mode	2 °C	From -20 °C to +20 °C
10	Overheating of electronic expansion valve in cooling mode	3 °C	From -20 °C to +20 °C
11	Time delay for compressor start-up after power-up (for example, after a power cut-off)	1 min*	1—10 min
12	Circulation pump operation mode	1	1=Switched off when heating temperature has been reached. 0=Continuous operation
13	Internal electrical heater operation during defrosting	1	1= Turned on 0=Turned off
14	Automatic legionella protection function	1	1=Activated 0=Deactivated
15	Internal electrical heater start option	0	0=Auto 1=Air-temperature condition set in menu 16 2=Water temperature condition set in menu 17 3= Conditions 1 and 2 must be met
16	Air temperature restriction for when internal electrical heater can manually be started, that is, must be lower than this value.	-5 °C	From -15 °C to +7 °C
17	Additional hysteresis in relation to menu 08 for when internal electrical heater can manually be started.	2 °C	0—13 °C
18	Additional temperature hysteresis for hot water tank electrical heater in relation to menu 07 for when the electrical heater will start.	5 °C	0—20 °C
19	Hot water tank electrical heater startup delay	30 min	30—90 min
20	Return water temperature	Measured value	From -30 °C to +99 °C
21	Supply water temperature	Measured value	From -30 °C to +99 °C
22	Coil temperature in heating mode (T7)	Measured value	From -30 °C to +99 °C
23	Coil temperature in cooling mode (T8)	Measured value	From -30 °C to +99 °C

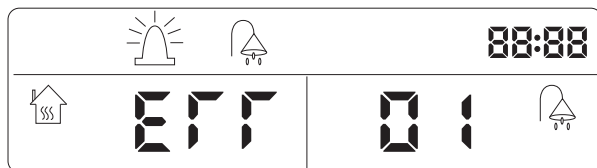
Menu	Description	Default value	Range
24	Air temperature (T1)	Measured value	From -30 °C to +99 °C
25	Hot water tank temperature (T3)	Measured value	From -30 °C to +99 °C
26	Buffer tank temperature (T2)	Measured value	From -30 °C to +99 °C
27	Return gas temperature of compressor (T5)	Measured value	From -30 °C to +99 °C
28	Exhaust gas temperature of compressor (T4)	Measured value	From -30 °C to +99 °C
29	Shows the number of the operation steps for the expansion valve	Measured value	100—480 steps

* Should not be modified.

8 Regular checks

8.1 Checking operation

During normal operation, the alarm indicator is hidden to show that everything is OK. When an alarm is triggered, the alarm indicator flashes and at the same time an error code is shown in the display.



Check the alarm indicator regularly to ensure that the appliance is working correctly. In the event of an alarm the heat pump will, if possible, supply heating to the house, primarily with the compressor, secondarily with the internal electrical heater. The hot water production will stop to indicate that something noteworthy has occurred.

Error code	Description
00	Communication failure
01	Return water sensor (T9) failure
02	Supply water sensor (T8) failure
03	Water flow switch protection
04	Phase sequence error (only applies to 3-phase models)
05	Excessive temperature difference between supply and return water (>13°C)
06	Internal electrical heater overheat protection (>85°C)
07	Condenser overheat protection
08	Hot water tank sensor (T3) failure
09	Buffer tank sensor (T2) failure
10	High pressure protection
11	Low pressure protection
12	Supply water temperature too high
13	Supply water temperature too low (cooling mode only)
14	Return gas temperature sensor (T5) failure
15	Exhaust gas temperature sensor (T4) failure
16	Exhaust gas temperature overheat protection
17	Null
18	Frost protection, step 2 (non-fault)
19	Frost protection, step 1 (non-fault)
20	Air temperature sensor (T1) failure
21	Heating coil sensor (T7) failure

Error code	Description
22	Cooling coil sensor (T6) failure
23	Exceeded operation range warning (non-fault)

8.2 Check the water level in the heating circuit

The line pressure of the installation must be checked once a month. The external manometer (if available) must show a value between 1-1.5 bar. If the value is below 0.8 bar, when the water in the heating system is cold, the water must be topped up (applies in the event of an empty expansion tank). Ordinary tap water can be used when topping up the heating system. In certain exceptional cases, the water quality may be poor (for example very hard water) and is not suitable for filling the heating system. If unsure, contact your installer.



The closed expansion tank contains an air filled bladder that absorbs variations in the heating system's volume. Under no circumstances may it be drained of air.

8.3 Checking safety valves

Warning



If the safety valves are not checked regularly, the water tank might be damaged.

Both safety valves must be checked at least four times a year to prevent lime deposits clogging the mechanism.

Both safety valves is checked by turning the cap a quarter of a turn clockwise until the valve lets out some water through the overflow pipe. If a safety valve does not work properly, it must be replaced. Contact your installer.

The safety valve in the water tank protects the enclosed heater against over pressure in the water tank. It is mounted on the cold water inlet line, its outlet opening is facing downwards. The safety valve lets out small amounts of water when the water tank is being charged, especially if a lot of hot water was used previously. This is a normal behaviour.

The opening pressure of the safety valves is not adjustable.

9 References

9.1 Checklist

Positioning

- Surface adjustment
- Drainage (avoiding water on pedestrian crossings)

Pipe installation

- Pipe connections in accordance with the diagram
- Flexible hoses
- Bleeding
- Strainer
- Pipe insulation
- Open radiator valves
- Leak test

Electrical Installation

- Circuit-breaker
- Fuse

Commissioning

- Bleeding
- Settings control system
- Manual test components
- Manual test different operating conditions
- Noise check
- Function test safety valve
- Function test mixer valve
- Trimming the heating system

Customer information

- Contents of this manual

- Safety precautions
- Control computer, function
- Settings and adjustments
- Regular checks
- Reference to service requirement
- Warranties and insurances

10 Installation protocol

General	
Heat pump model	
Serial number	
Type of collector	
Volume of brine (litres)	

Pipe installation	
Company	
Contact person	
Telephone number	

Electrical installation	
Company	
Contact person	
Telephone number	

Commissioning	
Company	
Contact person	
Telephone number	
Date final inspection	

11 Service Sheet

To achieve the best performance and service life, we recommend that the heat pump is maintained at 12 month intervals.

Service company*	Service technician's signature*
Date (year-month-day)*	Customer's signature*
Comments*	

Service company*	Service technician's signature*
Date (year-month-day)*	Customer's signature*
Comments*	

Service company*	Service technician's signature*
Date (year-month-day)*	Customer's signature*
Comments*	

Service company*	Service technician's signature*
Date (year-month-day)*	Customer's signature*
Comments*	

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