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IVT Optima

600 - 1700

User Guide

Art. no: 12313

Version 1.0

IVT HEAT PUMPS

Thank you for choosing a heating installation from IVT Industrier AB

We hope that our heating installation meets your expectations and gives you many years of energy saving. We want you and your family to enjoy a good economy at the same time as you actively safeguard the environment. We have taken today's demands on heating systems into consideration and believe that your Optima will give you many useful functions in the future. Your heating installation features an advanced control unit that monitors and controls the temperature in the house and contributes towards improved overall economy.

IVT is the leading heat pump manufacturer in the nordic countries. More than every second heat pump comes from IVT. We have worked with solutions to reduce energy consumption on the environment's terms for more than 30 years. Today we can present the widest range of heat pumps for efficient energy saving in all types of housing and properties.

Manual Heat pumps IVT Optima 600 - 1700
IVT Industrier AB, 2007/09
Article number: 12313
Version 1.0

Innehåll

For the user

Important information

IVT Optima is a family of heat pumps, that extract energy from outdoor air to produce water based heating and, if required, hot water for your house. The family consists of Optima 600, Optima 900, Optima 1100, Optima 1400 and Optima 1700, which cover different levels of output requirement.

Optima can be connected to an existing electric/oil-fired boiler or to an electric cassette, which provides a complete heating installation. In this case, a hot water heater is often connected so that the hot water is also managed by the installation. The electric/oil-fired boiler or electric cassette works as additional heat if the heat pump cannot manage all heating itself, e.g. if the outdoor temperature is too low.

The heating installation is controlled by a control unit, which is in a separate control cabinet. The control unit controls and monitors the total system using different settings for heating, hot water and other operations. The settings are made by the installer and the user via a control panel.

Optima 600-1100 can also be connected to electric boiler IVT 290 A/W to provide a complete installation for both heating and hot water as the electric boiler contains a hot water heater. The electric boiler functions as additional heat when necessary.
In this case the control unit is located in the electric boiler.

When the heat pump has been installed and started there are a number of points you should check regularly. This may concern an alarm triggering or performing basic maintenance actions. Initially you should perform these actions on your own. This manual describes each step in detail. If the problem remains you should contact your dealer.

This guide contains a description of Optima, what it consists of, maintenance, settings etc.
For information regarding use of the existing electric/oil-fired boiler, see the boiler's documentation.
Operating instructions for IVT 290 A/W are described in its own guide. Also read this if you have Optima 600-1100 with 290 A/W.

Note

It is important as the user that you read through this guide.
Under no circumstances may you make settings that are designed for the installer. This can cause serious malfunction of the heat pump.

Note

Only a trained and qualified technician may carry out repairs to this machine. Incorrect repairs can lead to serious risks to the user, and a reduction in savings.
Visits from an authorised Service representative to make corrections or adjustments after such a repair, cannot in such cases be carried out free of charge, not even during the warranty period.

How a heat pump works

The heat pump collects heat from the outdoor air

The Optima heat pump has been manufactured for easy and reliable use as well as to provide your house with inexpensive and environment friendly heating. The easiest way to describe how a heat pump works is to say it works like a refrigerator, however, the other way round. In a refrigerator heat is moved from the inside to the outside. In a heat pump the heat, in the outdoor air, is moved into the house. The heat pump is placed on the outside of your house. The heat that is in the air, even at temperatures below zero, is converted by the compressor, heat exchanger and condenser into hot water, which heats your house.

The heat pump can also produce domestic hot water. However, this requires a hot water heater to be connected. Electric boiler 290 A/W contains a hot water tank, which means that there is always hot water in the system (applies to Optima 600-1100 with 290 A/W). In this case, when the electric cassette or mixed additional heat, e.g. electric/oil-fired boiler is used, an external hot water heater can be connected.

The heat pump requires additional energy, e.g. at low outdoor temperatures. This is obtained from the electric cassette, existing electric/oil-fired boiler or from 290 A/W.
Electric boiler 290 A/W is available in two versions, 9 kW or 13.5 kW.

When Optima is used together with the electric cassette, the unit can be supplied with a power guard (option). The task of the power guard is to temporarily disconnect the electric additional heat when using other power demanding appliances so that the main fuse does not blow.
The power guard can also be used for Optima 600-1100 with 290 A/W.

Technology in and around the heat pump

The heat pump consists of four main parts:

1. **Evaporator**
   Evaporates the refrigerant to gas and at the same time transfers the heat from the air to the refrigerant circuit.
2. **Condenser**
   Condenses the gas to fluid again and releases the heat to the heating system.
3. **Expansion valve**
   Lowers the pressure of the refrigerant.
4. **Compressor**
   Increases the pressure of the refrigerant.

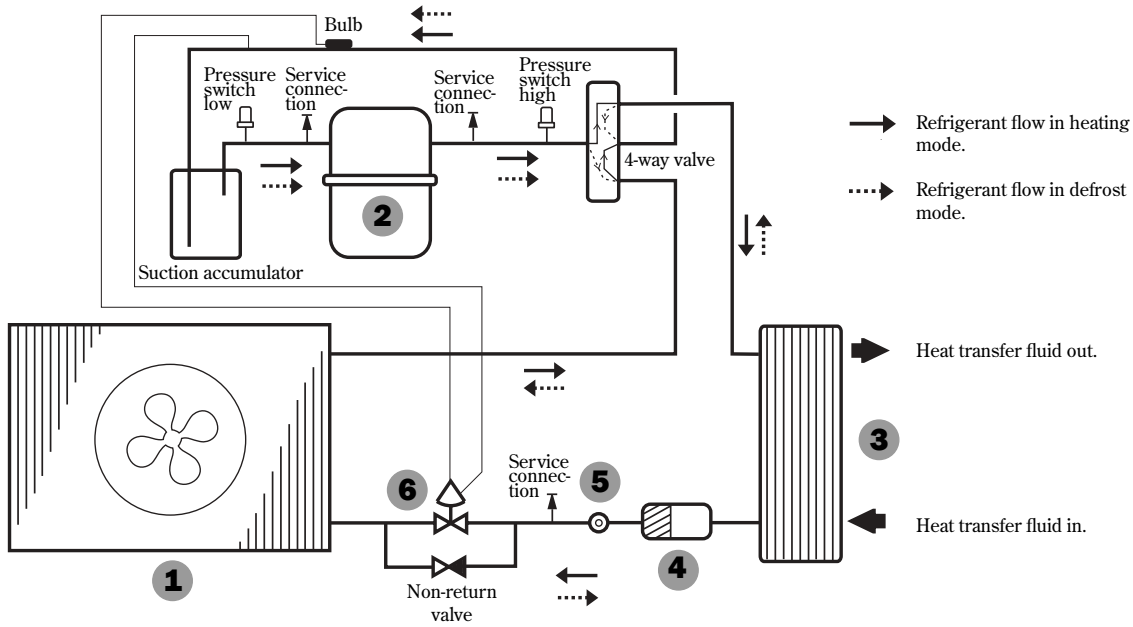
These four main parts are linked in two closed circuits. A refrigerant circulates in the heat pump, which in some parts of the circuit is in a liquid state and in other parts in a gas state. Read more about the properties of the refrigerant in the sidebar to the right.

See the detailed description of the technologies used in the heat pump on the next page.

Note

Boiling point in relation to the pressure

The boiling point of different liquids varies with pressure, the higher the pressure, the higher the boiling point. For example, water boils at +100°C at normal pressure. Double the pressure and water boils at +120°C. Half the pressure and water then boils at +80°C. The refrigerant in the heat pump acts in the same way, the boiling point changes when the pressure changes. However, the boiling point of the refrigerant is as low as approximately -40°C at atmospheric pressure. Consequently, it is also suitable for low heat source temperatures.



The route of the refrigerant through the heat pump in heating mode

1 The refrigerant meets the outdoor air in the **evaporator** (heat exchanger). The air is drawn through the evaporator by a fan located on top of the heat pump. The refrigerant, which was previously in a liquid state, will evaporate in this process. The pressure is low and heat is required. Heat is taken from the outdoor air. A sensor in the expansion valve (6) ensures the evaporator utilises as much of the "free energy" as possible before the refrigerant (in a gas state) is led into the compressor.

2 The **compressor** increases the pressure of the refrigerant. The temperature of the vapour reaches approximately +100°C. The warm gas is then led into the condenser.

3 **The condenser** is the heat pump's heat emitting part. In the condenser, which is a fully soldered heat exchanger in stainless steel, the refrigerant (gas state) meets the water from the heating system (radiators and floor coils). When the warm gas is cooled by the circulating heating water, it changes into a liquid state (condenses). Energy is emitted in this process to the heating system or the hot water. After the condenser, the refrigerant, which is now in liquid form, continues through a drying filter.

4 **The drying filter** is used to collect any moisture in the system. After the filter, the refrigerant passes through a sight glass.

5 **The sight glass** is used to check the level in the system. There should be no bubbles in the sight glass during normal operations. However, there might be bubbles when the heat pump is started and stopped or during defrosting. After the sight glass, the refrigerant continues on to an expansion valve.

6 The refrigerant pressure is lowered in **the expansion valve**. This also causes the temperature to drop. When the refrigerant has left the valve and passes the evaporator it changes to vapour again. This completes the refrigerant circuit. The expansion valve is equipped with a sensor (bulb) just before the compressor. The sensor controls the amount of fluid entering the evaporator.

Component parts of the heat pump

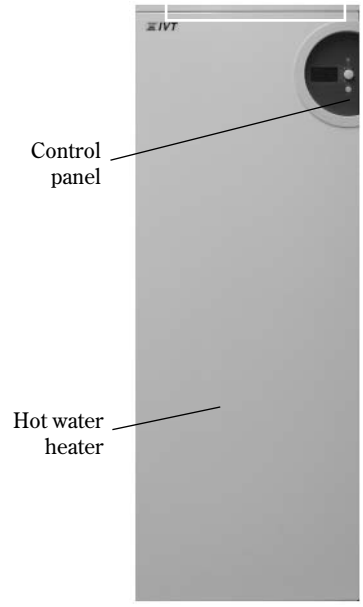
IVT Optima 600-1100

When the heat pump is combined with 290 A/W, the control unit is integrated in 290 A/W, which also includes a hot water heater.
The heat pump is installed outside, the electric boiler and any power guard are installed indoors.

When the heat pump is combined with electric cassette or existing electric/oil-fired boiler, a control cabinet is included. This is located indoors, normally in the same room as the electric cassette or electric/oil-fired boiler. The control unit is included in the control cabinet. The electric cassette or the optional unit for electric/oil-fired boiler is also included and located indoors. Hot water heater is available as an accessory. This must be equipped with electric element if electric/oil-fired boiler is used.

A power guard is available as accessory when electric cassette or 290 A/W is used.

290 A/W



Optima 600-1100

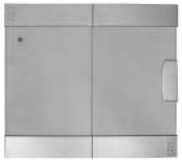
Power guard, option

Electric cassette, option

Hot water heater 300/160 with or without electric element, accessory

Hot water heater 200/90, accessory

Rego 800 control cabinet



Rego 800 option for Electric/oil-fired boiler

Operating mode	600-1100	290 A/W	Control cabinet	Electric cassette	Electric/oil-fired boiler	Power guard	200/90	300/160	300/160 with electric element
Optima with 290 A/W	•	•				•			
Optima with mixed additional heat	•		•		•				•
Optima with electric cassette	•		•	•		•	•	•	

Component parts of the heat pump

IVT Optima 1400-1700

When the heat pump is combined with electric cassette or existing electric /oil-fired boiler, a control cabinet is included. This is located indoors, normally in the same room as the electric cassette or electric/oil-fired boiler. The control unit is included in the control cabinet. The electric cassette or optional unit for electric/oil-fired boiler is also included and located indoors. Hot water heater is available as an accessory. This must be equipped with electric element if electric/oil-fired boiler is used.

A power guard is available as accessory when electric cassette is used.

Rego 800 control cabinet

Electric cassette, option

Rego 800 option for Electric/oil-fired boiler

Coil tank 302/502 with or without electric element, accessory

Power guard, option

Optima 1400-1700

Operating mode	1400	Control cabinet	Electric cassette	Electric/oil-fired boiler	Power guard	302	302 with electric element
Optima with mixed additional heat	•	•		•			•
Optima with electric cassette	•	•	•		•	•	•

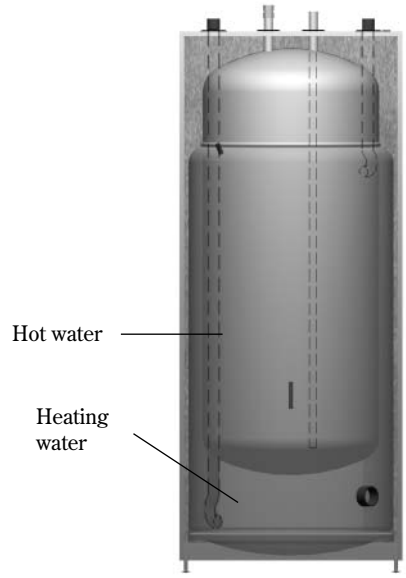
Operating mode	1700	Control cabinet	Electric cassette	Electric/oil-fired boiler	Power guard	502	502 with electric element
Optima with mixed additional heat	•	•		•			•
Optima with electric cassette	•	•	•		•	•	•

Control unit Rego 800

The control unit makes sure the heat pump gives the best energy savings and that it runs for many years. The control unit controls and monitors the heating and hot water supply in your house. The monitoring function is especially important, it shuts down the heat pump in the event of operational disturbances so that no critical parts are damaged.

Additional heat gives more output
Additional heating is required when the heat pump is unable to meet the heating requirements or when it has stopped due to an outdoor temperature that is too low. The additional heat is provided by an electric cassette, existing electric/oil-fired boiler or electric boiler 290 A/W (Optima 600-1100). Note that when the heat pump is running, the additional heat source only supplies the power that the heat pump cannot produce. When the heat pump is once more able to meet the heating demand, the additional heat is automatically switched off.

Hot water is given priority over heating water
In a house with water based heating a difference is made between heating water and hot water. The heating water is for radiators and underfloor coils and hot water is for showers and taps.
When electric boiler 290 A/W is included, hot water is heated in the electric boiler's hot water heater. When the electric cassette or existing electric/oil-fired boiler is included, an external hot water heater can be connected.
In both cases, there must be a sensor, which detects the temperature of the hot water. The heating water passes through the hot water cylinder's outer shell and heats up the hot water heater's inner tank. The control unit makes sure the heating of hot water is given priority over the heating of the heating water.



Automatic defrosting

Ice may form on the evaporator at outdoor temperatures below +10°C. When ice forms to an extent that it obstructs the air flow through the evaporator automatic defrosting starts. Defrosting is controlled by a four-way valve. The valve reverses the flow of the refrigerant in the circuit so that the hot gas melts the ice on the evaporator fins. See *Refrigerant flow in defrost mode* in the figure under the heading *How a heat pump works.*

There is also a fan defrost function, which means that hot air blows upwards through the fan to prevent it freezing solid.

The control unit's operating modes

When a heat pump is installed, it must be set-up for a specific operating mode. An operating mode relates to the heat pump's working situation which is dependent on the prevailing conditions, for example, whether an electric or oil-fired boiler is to be connected.

It is the task of the installer to adjust the heat pump with the correct settings for the relevant operating mode and other conditions.

Heat pump with electric cassette

When the heat pump is used with one (or two) electric cassettes, the control unit in the control cabinet sets itself for this operation. This means that the heat pump works with additional heat from the electric cassette and that hot water is produced in an external hot water heater, if connected. A sensor located on the outside of the house sends information about the outdoor temperature to the control unit. The control unit controls heating and hot water production based on the read off current values and the set values.

Heat pump with mixed additional heat, e.g. an existing electric/oil-fired boiler.

When the heat pump is used with an existing electric/oil-fired boiler, the control unit in the control cabinet sets itself for this operation. This means that the heat pump works with additional heat from the electric/oil-fired boiler and that hot water is produced in an external hot water heater, if connected. A sensor located on the outside of the house sends information about the outdoor temperature to the control unit. The control unit controls heating and hot water production based on the read off current values and the set values.

Heat pump with electric boiler 290 A/W

(Optima 600-1100)

When the heat pump is used with 290 A/W, the control unit sets itself for this operation. This means that the heat pump operates with additional heat from the electric boiler and that the hot water is produced in the electric boiler's hot water heater. A sensor located on the outside of the house sends information about the outdoor temperature to the control unit. The control unit controls heating and hot water production based on the read off current values and the set values.

The control unit's control method for heating

The control unit controls heating production based on an outdoor sensor or an outdoor sensor in combination with a room sensor.

Control with an outdoor sensor

Control with an outdoor sensor is the most common method used by the control unit to control the heat pump. A sensor is mounted on the external wall of the house (the wall that is the coldest and subjected to the least amount of sun). The sensor sends signals to the control unit in the heat pump. Control with an outdoor sensor means that the heat pump automatically regulates the heating in the house depending on the outdoor temperature.

You determine the temperature of the heating system, in relation to the outdoor temperature, with the help of a number of settings (curves) stored in the control unit. The curve indicates the flow temperature for heating water in relation to the outdoor temperature. Selecting a lower curve gives a lower flow temperature and therefore higher energy savings.

Control with an outdoor sensor and a room sensor

Control with an outdoor sensor supplemented with a room sensor (accessory) means that you also place a sensor in a central position inside the house. This is connected to the heat pump and provides the control unit with information about the current room temperature. The signal affects the heat curve's flow temperature. For example, it falls when the room sensor shows a higher temperature than the one set.

A room sensor is used when factors other than the outdoor temperature influence the indoor temperature of the house. For example, this can be when a stove or fan-assisted radiator is used in the house, or if the house is sensitive to the wind or exposed to direct sunlight.

Note

It is only the room where the room sensor is located that can influence regulation of the temperature.

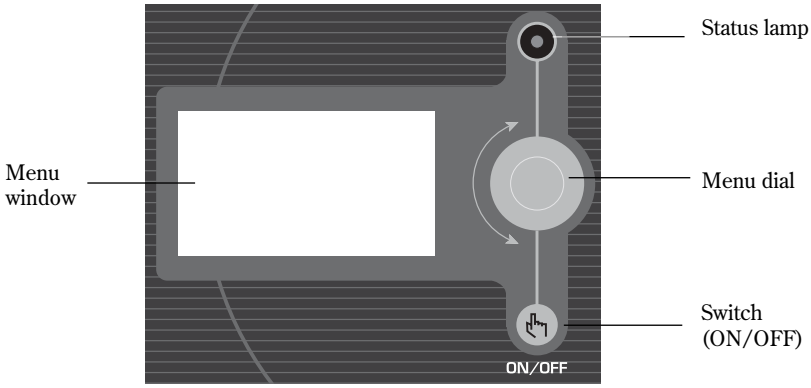
Control panel

All settings are made in the control panel and any alarms can be viewed in the panel. The control unit is controlled via the panel in accordance with your requirements.

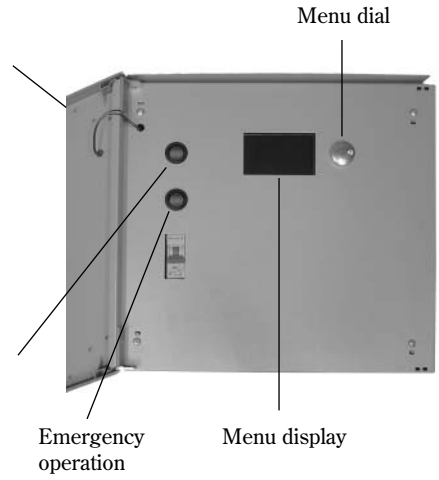
When the heat pump is combined with 290 A/W, the control panel and control unit are in 290 A/W.

When the heat pump is installed with electric cassette or electric/oil-fired boiler, the control panel and control unit are in the separate control cabinet.

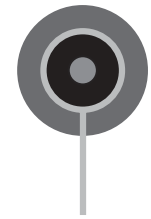
290 A/W



Control cabinet



Status lamp

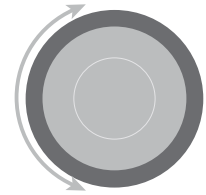


The control cabinet's status lamp is on the outside of the unit.

Lamp lights green:	Switch ON/OFF in ON position.
Lamp flashes green:	Switch ON/OFF in OFF position.
Lamp not lit:	No voltage to control unit.
Lamp flashes red:	An alarm has been triggered and the alarm has not been acknowledged. See section *What to do if a fault occurs.*
Lamp lights red:	A fault has occurred. Contact the installer. See section *What to do if a fault occurs.*

Menu dial

The menu dial is used to navigate between the menus and to confirm your selection. You also determine the values of different settings by using the dial. If, for example, you turn the menu dial clockwise the value will increase. Always press the menu dial to confirm your selection.



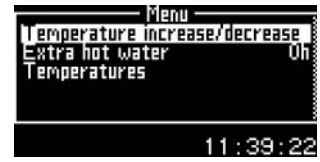
Power switch (ON/OFF)

You start and stop the heating installation using the power switch button.

Menu display

The menu display gives you information and several settings options. You can:

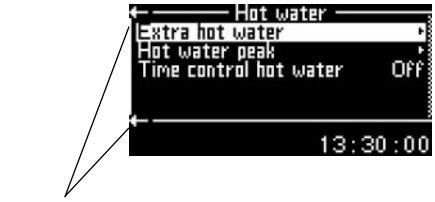
- Select different temperatures for heating and hot water (if hot water heater is fitted).
- Select time control settings (different heat at different times).
- See alarm causes and receive corrective instructions.



How to use the control panel

Navigate the menus using the menu dial. Turn the menu dial clockwise to move down through the menus. Turn the menu dial anti-clockwise to move up through the menus. When the desired row is marked, press the menu dial to confirm your selection.

Certain functions have longer names than available space in the menu window. In such cases, the row switches to show the different parts of the text. Example: *Room temperature setting*: First, *Room temperature... is displayed*, this then goes out and *...setting* is displayed for a few seconds, whereupon *Room temperature...* is displayed again. At the top and bottom of each sub menu there are back arrows that take you back to the previous menu. Press the menu dial when these are marked.



Back arrows

Symbol overview

Symbols for different functions and components that are in operation are displayed in the lower part of the menu window.


Compressor


Heating mode


Fan


Hot water mode


Hot water peak


Extra hot water


Timer Control


Holiday operation


Additional heat


Power guard


Alarm

Menu levels

The menus are divided into different levels for different purposes.

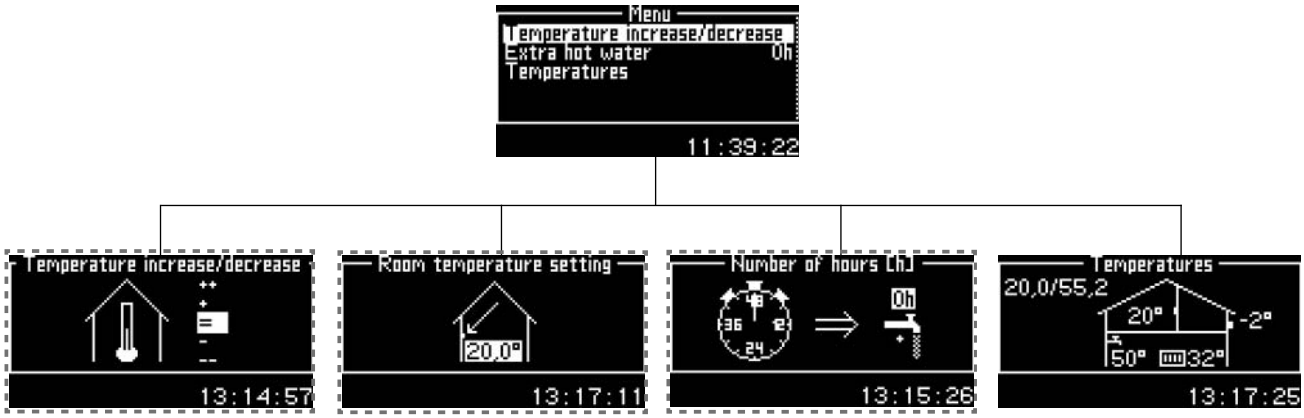
Menu	Customer level, here you will find the most common functions.
Advanced menu	Customer level, here you will find further functions.
Installer/Service	Installer/Service level, relevent settings are made here by the installer/service technician.

As a user of the heating installation, you only see what is available in the two customer levels.

Menu

The initial menu in the control unit is called *Menu*. Here you will find the functions most frequently used and the ones you have the most benefit of. The functions available in your heating installation are shown in *Menu*. For example, either *Temperature increase/decrease* or *Room temperature setting* (if you have a room sensor) is shown. *Extra hot water* is only displayed if you have a hot water heater connected.

Menu overview



= The menu display is only shown in combination with an extra sensor or in a specific operating mode.

Set the heating

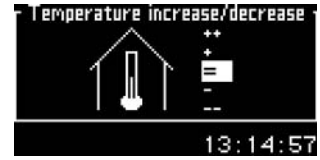
There are two ways to set the heating level depending on whether the heating installation is supplemented with a room sensor or not.

Setting the heating, room sensor not installed:

Select *Temperature increase/decrease* in the menu. Select one of the following alternatives:

++	Much warmer	(approximately +1°C)
+	Warmer	(approximately +0.5°C)
=	Unchanged temperature	
–	Colder	(approximately 0.5°C)
––	Much colder	(approximately -1°C)

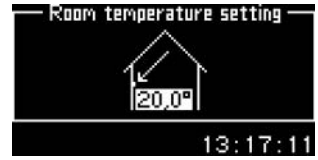
Then press the menu dial. Select *Save* to confirm your selection.



Setting the heating, room sensor installed:

1. Select *Room temperature setting* in the menu.
2. Enter the desired room temperature. Min = +10°C, max = +35°C.
3. Select *Save* to save the change or *Cancel* to return without saving.

Under *Advanced menu* you can change how much the room sensor is to affect the heating system, see *Set the desired room temperature*.



Note

You should wait at least twenty-four hours when increasing or decreasing the heating before making a new adjustment.

Extra hot water

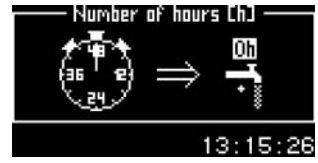
When a hot water heater is installed, you can temporarily increase the temperature of the hot water to approximately 65°C, via the function *Extra hot water*. A higher water temperature gives more hot water when, for example, several people wish to shower. The heat pump uses the additional heat to increase the temperature to 65°C.

In *Extra hot water* you choose how long the function should be active. This is what to do:

Select *Extra hot water* in the menu. Turn the dial clockwise to increase the number of hours and reduce by turning it anti-clockwise.

Select *Save* to save the setting or *Cancel* to return without saving.

To find out how much time remains until the *Extra hot water* function switches off, go to *Timers* under *Advanced menu*. You can also change the number of hours during an ongoing *Extra hot water* function.



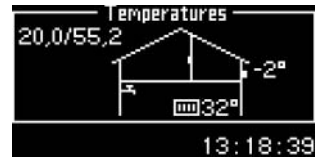
Temperatures

There are several different temperature sensors connected to the heating installation. Each sensor plays an important part in the heat pump's daily operations. The current temperatures for the sensors which are most important for controlling heating and hot water production are given under *Temperatures*.

Select *Temperatures* in the menu.

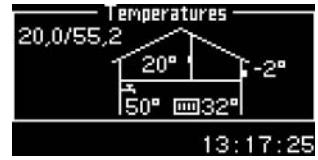
The menu display shows the current temperatures for the following temperature sensors:

Flow sensor (T1)
Shows the temperature in the heating unit's flow temperature, i.e. the temperature of the heating water that is fed into the heating system.
In the example, the sensor shows 32°C.



Outdoor sensor (T2)
Shows the outdoor temperature. Some deviation may occur due to thermal radiation from the house to the installed outdoor sensor.
In the example, the sensor shows -2°C.

Hot water sensor (T3)
Only shown when there is a hot water heater installed. The sensor shows the temperature in the lower section of the outer container in the hot water heater. The temperature is approximately 5°C lower than the temperature of the hot water inside the inner container.
In the example, the sensor shows 50°C.



Room sensor (T5)
Only shown if a room sensor is installed. The menu shows the temperature in the room where the sensor is installed.
In the example, the sensor shows 20°C.

Note

The values for V and H are also displayed in the window. In the example, V is 20.0°C and H 55.2°C. V and H are described under *Set the heating*.

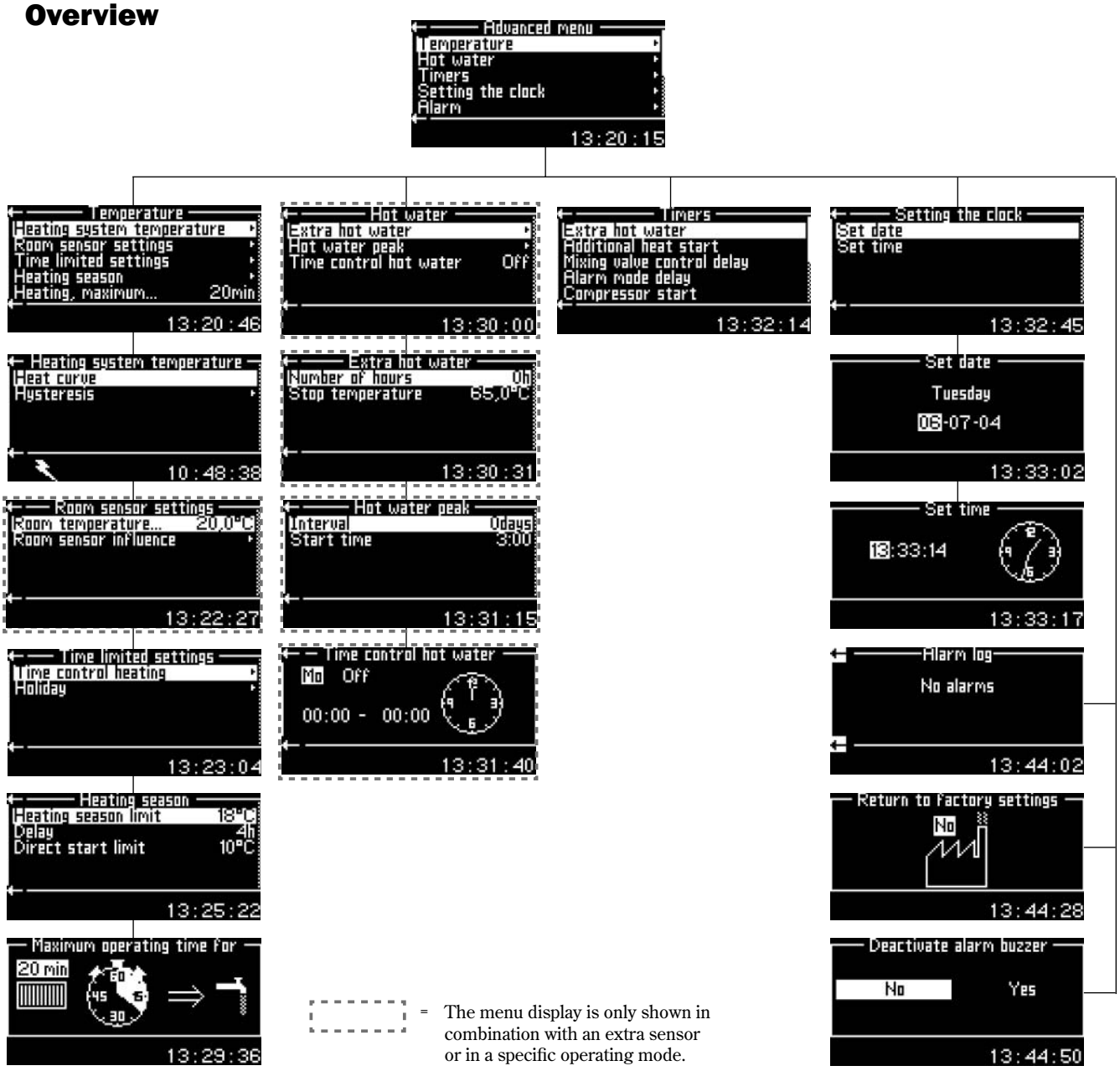
Advanced menu

The initial menu in the control unit is called *Menu*. In this menu you will find the functions most frequently used and the ones you have the most benefit of. In addition, there are extra functions that can be used to affect your heating installation. These are provided in the *Advanced menu*. To the right you will find all functions under *Advanced menu*.

To access *Advanced menu* press the menu dial and keep it pressed in for at least 5 seconds.

Advanced menu
- Temperature
- Hot water
- Timers
- Setting the clock
- Alarm
- Access level
- Return to factory settings
- Deactivate alarm buzzer
- Program version

Overview



Set the heating

The simplest way to set the heating has been described earlier under the heading *Menu*. There is a more controlled way of setting the heating. However, before we explain how to do this it is important to understand the relation between the outdoor temperature and flow temperature . The easiest way to explain the relation is by a *Heat curve*.

Heat curve

You use the heat curve to help set the desired indoor temperature. The heat pump is controlled by the outdoor temperature. When the weather becomes colder the heat pump ensures more heating is produced automatically.

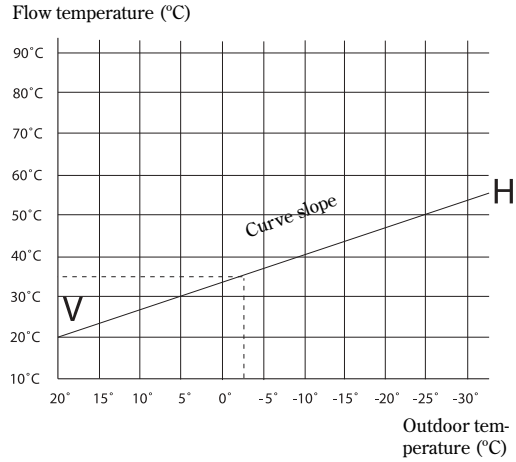
The following example shows that an outdoor temperature of –2.5ºC gives a flow temperature of 35ºC at the current heat curve.

Flow temperature:
The flow temperature is the temperature of the water that is fed into the heating system.

Outdoor temperature:
The outdoor temperature determines how much heating the heat pump should produce. The outdoor sensor sends signals to the control unit, which then affects the heat pump.

Curve slope:
By offsetting the left (V) and /right (H) end points, the slope of the heat curve can be altered. Use the left end point to adjust the flow temperature at high outdoor temperatures and the right end point to adjust the flow temperature at low temperatures.

Adjusting a single value:
You can also adjust a single value on the curve up or down every fifth outdoor degree. You can, for example, create an increase in the heat curve at 0ºC.



Note

On delivery of the heat pump, the curve slope is set at V=20, H=55.2.

Curve slope:
V=22, H=30: Normal basic setting for underfloor heating in concrete.

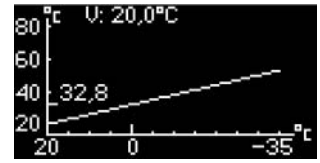
V=22, H=35: Normal basic setting for underfloor heating in wooden joists.

V=20, H=55: Normal basic setting for radiators.

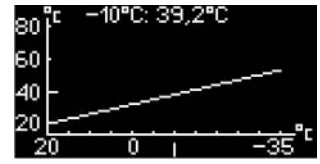
V=20, H>65: Abnormal high setting.

Set the heat curve

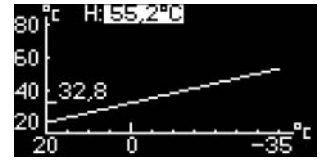
1. Select *Heat curve* in the menu *Heating system temperature*. The current curve is shown here. The value 32.8 is the flow temperature at 0°C.



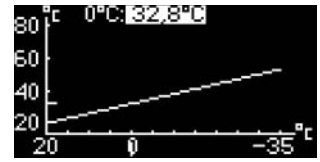
2. Start by finding the value you wish to change. It can be V, H or some other value. To find the correct value, turn the dial clockwise or anti-clockwise. At the top of the display, various outdoor temperatures with corresponding flow values on the curve are shown, at the bottom, a dash can be seen that shows the position on the outdoor temperature axis. Continue turning the dial and you will eventually find the H value. Continue turning the dial even when you see a back arrow.



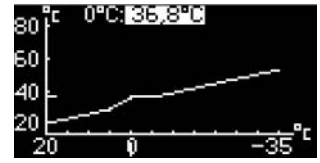
3. The most common adjustment is to increase the H value slightly to obtain more heating in cold weather. In the display you will see that the H value has been located and then marked by pressing the dial. The H value can now be changed by turning the dial. When you are happy with the H value, press the dial and select *Save*.



4. It may also be necessary to change a specific value on the curve, e.g. to increase the heating at temperatures around 0°C. Turn the dial to find the value at 0°C and press the dial to mark the value.

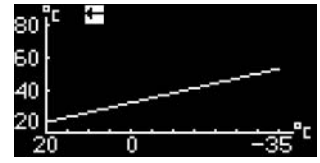


In the example to the right, the value at 0°C has been changed to 36.8°C, i.e. the flow temperature has been increased by four degrees. The dial has been pressed and *Save* has been marked. The changed curve is now saved by pressing the dial.



Recommended values: Increase by 4°C at outdoor temperature of 0°C and by 2°C at outdoor temperature of +5°C.

5. To exit the *Heat curve* function turn the dial until you see a back arrow. Press the dial.

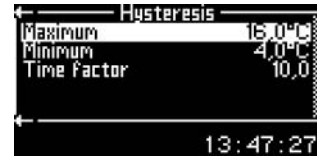


Note

You should wait at least twenty-four hours when increasing or decreasing the heating before making a new adjustment. Only change one value at a time until you are happy with your temperature settings.

Hysteresis

Hysteresis settings can be made under *Heating system temperature*. The hysteresis determines when the heat pump (compressor) is to start/stop in relation to the heat curve's value. The compressor continues slightly longer than according to the curve and starts again when the flow temperature has dropped somewhat below the value of the curve. In this way, the heat pump is prevented from starting and stopping continuously.

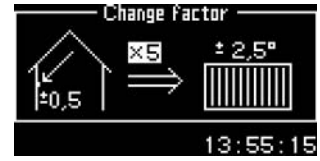


There is usually no reason to adjust the hysteresis factory settings or those having been set by the installer.

Set the desired room temperature

If you have a room sensor connected to the heat pump you can set the required temperature in the room from the *Room sensor settings* menu. This is carried out in the same way as in *Menu* (initial menu).

You can also set how much the sensor is to affect the heating system by selecting *Room sensor influence* and adjusting the *Change factor*. Min = 0, max = 10. A higher factor gives a greater influence from the room sensor.



After a heat lowering period, e.g. time control or holiday, the room sensor influence is blocked for a set time, factory setting is 4 hours. Min = 0 and max = 24 hours. The function *Blocking time* is under *Room sensor influence* and means that the heat pump is given time to increase the flow temperature more slowly than if the room sensor is allowed to influence.

Time limited settings

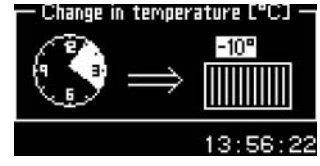
Time control

The *Time control heating* function can be used to lower or increase the temperature on different week days at chosen times.

Note

Time control is not recommended in normal conditions as it can affect consumption negatively.

1. Select *Time control heating* in the menu *Time limited settings* under *Temperature*.
2. Select *Day and time*.
3. Enter the week day and the time at which time control is to occur. Select *On*.
4. Select *Save* to save the change or *Cancel* to return without saving.
5. Select *Change in temperature* and set the desired value. Min = -20°C, max = +20°C.
6. Select *Save* to save the change or *Cancel* to return without saving.



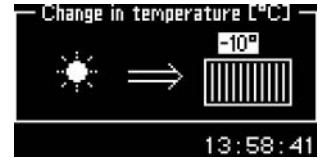
To remove a time control setting, find the desired setting and select *Off*.

Holiday

Using the *Holiday* function, you can reduce (or increase) the temperature between two set dates.

1. Select *Holiday* in the menu *Time limited settings* under *Temperature*.
2. Select the start date and end date according to year-month-day.

3. Select *Save* to save the change or *Cancel* to return without saving.
4. Select *Change in temperature* and set the desired value. Min = -20°C, max = +20°C.



5. Select *Save* to save the change or *Cancel* to return without saving.

To cancel the function and remove a time setting, go to *Holiday* and change the end date.

Heating season

The *Heating season* function means that the heat pump only produces heating water when the outdoor temperature drops below a preset temperature. The preset temperature, *Heating season limit*, can be adjusted (factory setting 18°C, min = 10°C, max = 35°C), as can the delay before activation (factory setting 4 hours, min = 0, max = 24 hours). The delay means that the heat pump does not need to switch off and on as often when the outdoor temperature is close to the limit value.
By increasing the value to above 35°C the heat pump is set to continuous heating season mode.

There is also an adjustable *Direct start limit* (factory setting 10°C, min = 5°C, max = 17°C) that means that the delay is ignored. Heating production starts immediately when the temperature drops below the set value.

Note

If base heat is required, e.g. in cellars, it may be suitable to increase the *Heating season limit* value.

Heating, maximum operating time at hot water requirement

This function is provided to satisfy hot water requirement during heat production, when a hot water heater is fitted. The factory setting is 20 minutes, min = 0 and max = 60 minutes.

Hot water settings

The menus for hot water settings are only displayed when a hot water heater is installed.

Extra hot water

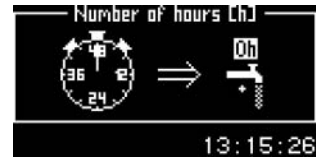
You can obtain extra hot water by temporarily increasing the temperature of the water in the hot water cylinder. A higher water temperature gives more hot water when, for example, several people wish to shower. The heat pump uses additional heat to increase the temperature to the desired value, see point 5. The function *Extra hot water* (number of hours) is also available under *Menu*.

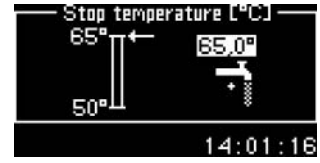
Note

When the set time has elapsed you must repeat the setting to get extra hot water again. You can also increase the number of hours during an ongoing *Extra hot water* period.

This is what to do:

1. Select *Hot water* in the advanced menu.
2. Select *Extra hot water.*
3. Set the number of hours that the function is to be active.
4. Select *Save* to save the change or *Cancel* to return without saving.
5. Set the desired *Stop temperature*.
6. Select *Save* to save the change or *Cancel* to return without saving.





Read off the remaining time of *Extra hot water* by going to*Timers*.

Hot water peak

Recurring increase in the hot water temperature

The *Hot water peak* menu is used to set the interval for a recurring increase in the hot water temperature. If, for example, you set the value seven days, the temperature is increased once a week to approximately 65°C. You can also specify *Start time* for when the temperature increase is to start, factory setting is 03:00.

Time control hot water

The *Time control hot water* function means that you can choose to completely disable hot water heating to save energy. This is primarily effective when peak tariffs are charged. This is done in the same way as other heat pump time controls.

Note

Time control hot water can impair hot water production.

Timers

There are a number of timers in the control unit. The statuses for these are shown in the menu *Timers*. You can only view the timers that are running, i.e. are counting down. Most timers are only of interest to installers and service technicians.

Extra hot water
Displays the remaining time for requested extra hot water.

Additional heat start
Displays the countdown of the timer for additional heat delay.

Mixing valve control delay
Displays the time that the mixing valve function is delayed after the additional heat timer has counted down. Does not apply to electric cassette.

Alarm mode delay
Displays the remaining time until the additional heat is activated when an alarm is triggered.

Compressor start
Displays the remaining time of compressor start delay.

Delay before defrost
Displays the remaining time before defrost is permitted.

Heating, maximum operating time at hot water requirement
Displays the remaining time before the maximum time in heating mode is reached if there is a simultaneous hot water requirement.

Hot water, maximum operating time at heating requirement
Displays the remaining time before the maximum time for hot water production is reached if there is a simultaneous heating requirement.

Hot water peak interval
Displays the time remaining to the next hot water peak.

Setting the clock

The heat pump has functions that are dependent on both the time and date. Thus it is important that these are correct. To set date and time:

1. Select *Setting the clock* in the advanced menu.

2. Select *Set date* to adjust the setting if it is not correct. The date is set using the menu dial in the order, Year-Month-Day.

3. Select *Set time* to adjust the setting if it is not correct. The time is set using the menu dial.

Alarm log

You can easily see any alarms and warning windows that may have occurred, see section *What to do if a fault occurs*. The menu provides information about the alarm type and when the alarm occurred. If there is an alarm symbol in the menu window this means the alarm is still active, and some form of action is required. Select *Alarm log* in the advanced menu to access the function.

Access level

The access level is 0 as standard. This level gives you access to all customer functions within *Menu* and *Advanced menu*.

Return to factory settings

If you want to restore the factory settings on the heating installation you can easily reset all the settings you have made.

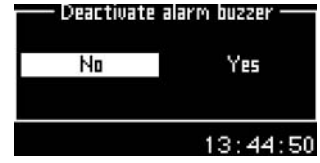
Select *Return to factory settings*. Select *Yes* and then *Save* to save the setting or *Cancel* to return without saving.

When restoring the factory settings while in any of the customer levels, the settings made by the installer in the Installer/Service level are not affected (see *Menu levels*).

Deactivate alarm buzzer

When an alarm occurs, an alarm window is displayed and a warning signal sounds. This warning signal is muted if the alarm is acknowledged or if the alarm cause disappears, see section *What to do if a fault occurs*.

The function of the warning signal is to alert the user about a triggered alarm. The function can be deactivated by selecting *Deactivate alarm buzzer.* Select *Yes* and *Save* to save the change or *Cancel* to return to the menu without saving.



Program version

The program version of the control unit is displayed. Keep this information to hand if you need to contact the installer or dealer.

Maintenance

Your heat pump requires a minimum of maintenance, however, we still recommend some servicing to get optimal performance from your heat pump. Check the following items a few times during the first year. You should then check them once or twice a year:

- Remove dirt and leaves
- Particle filter
- Protective covers
- Evaporator

Warning

For reasons of safety the main power supply must be disconnected before working on the heat pump.

Only an accredited refrigeration company is permitted to work on the refrigerant circuit.

Unscrew the protective covers

You must unscrew the outer covers to access some of the maintenance areas.

To remove the covers from the heat pump:

1. Turn the screws on top of the heat pump a few turns.
2. Rest the cover against your body.
3. Lift the cover upwards to release the lower edge.

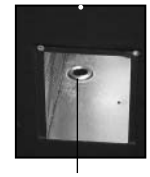
Remove the covers by loosening the screws on top of the heat pump.

Remove dirt and leaves

Over time leaves and other dirt can enter the heat pump. You can easily remove any dirt through the inspection hatch on the side of the heat pump. Unscrew the left side plate (seen from the front) and use a brush to remove the dirt. Check that the drainage hole is not blocked. Exercise care around the thin aluminium fins. They are fragile and you can injure yourself if careless. The plate and drainage hole can be rinsed with water if necessary.

Optima 600-1100

Inspection hatch



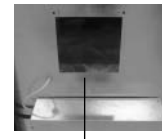
Drainage hole

Protective covers

Over time dust and other dirt will collect on the heat pump. You should wipe the outside with a damp cloth if necessary. Scratches and damage to the outer plates should be touched up using an anti corrosive rust-inhibitor. Use normal car polish to protect the paint.

Optima 1400-1700

Inspection hatch

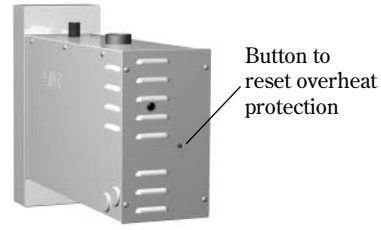


Drainage hole

Overheat protection electric cassette

The button for resetting the electric cassette's overheat protection is in the electric cassette. This is a protection that should normally not be deployed. If, however, this does deploy, reset it by pressing in the button with some force. If the overheat protection device deploys frequently, call a service engineer to establish the cause.
Overheat protection is also available for the electric element in 290 A/W, see the user guide for 290 A/W.

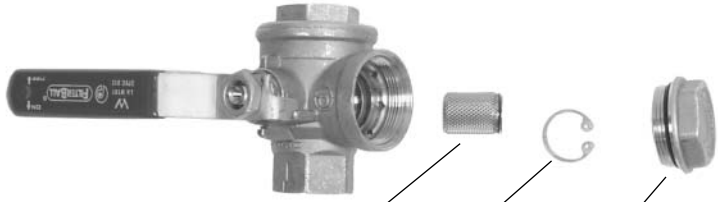
Electric cassette



Particle filter

It is the particle filter (dirt filter) that ensures no particles or dirt enter the heat pump. Over time the filter can become clogged and must be cleaned. To clean the filter:

1. Shut down the heat pump using the ON/OFF button.
2. Close the valve and unscrew the sealing cap.
3. Loosen the circlip holding the screen in the valve. Use the supplied circlip pliers.
4. Lift out the screen from the valve and wash clean with water.
5. Refit the screen, the circlip and sealing cap.
6. Open the valve and start the heat pump using the ON/OFF button.



Note

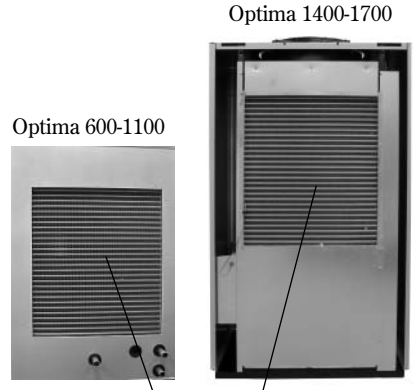
The particle filter is installed on the return pipe.

Evaporator

When you notice a coating (for example dust or dirt) on the surface of the evaporator (coil fins), you should wipe it off. The fins are extremely sensitive. Never wipe, e.g. with a cloth, directly on the delicate fins. Use protective gloves to protect your hands from cuts.

This is what to do:

1. Shut down the heat pump using the ON/OFF button.
2. **Optima 600-1100:** Unscrew the screws and remove the protective grille from the reverse of the heat pump.
   O**ptima 1400-1700:** Here you will find an evaporator on the front and rear sides. Detach the covers as described in *Unscrew the protective covers*. The rear cover can only be tilted outwards because the pipes are connected here.
3. Spray a degreasing agent on the fins of the evaporator.
4. Rinse off the coating and degreasing agent with water. Do not expose the fins to too high a water spray pressure as this can damage them. When the evaporator is extremely dirty you can rinse the coil from inside the inspection hatch. Any cleaning agent is collected in the drainage hose.



Clean the dirt from the coil fins using a degreasing agent and water.

Snow and ice

In some locations during periods of snow, snow can accumulate inside the protective grille on the rear side (Optima 600-1100). Remove the grille and carefully brush away the snow without damaging the fins. It is not necessary to refit the grille. If snow attaches/sticks to the holes of the protective covers, brush it off (all Optimas).

Also remove any snow or ice from the grille on top of the heat pump. The pump is supplied with defrost functions which can be set by the installer. In the event of any problems, these may need adjusting. Contact your dealer.

Warning

During fan defrost, ice can detach from the fan grille and be thrown at high velocity. Do not stand too close and do not look directly into the fan during defrost.

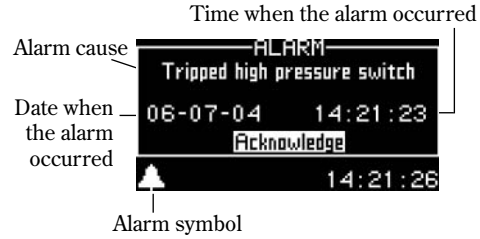
What to do if a fault occurs

The control unit has an advanced monitoring system that gives alarms if anything unforeseen happens. Most alarms correct themselves. There is never a risk of affecting something when you reset an alarm once or twice. In the event of recurring alarms, contact your dealer/service technician.

Example of an alarm:

When an alarm is triggered, an alarm window is displayed and a warning signal sounds. The alarm window displays the alarm cause and the time and date that the alarm occurred.

When you press the menu dial and *Acknowledge* is marked, the alarm symbol disappears from the menu window and the alarm log, and the warning signal is muted. The heat pump starts again within 15 minutes if heating is required. If the fault has not been rectified the lamp will remain lit and the status lamp will stop flashing red and will light red continuously. Should several alarms have occurred on the heat pump, view the alarm log where all alarms are listed. For active alarms, the alarm symbol is lit.



Note

If you have deactivated the alarm buzzer under *Advanced menu* no warning signal is heard.

Dimmed menu display

Possible cause 1: Blown fuse in the house's fuse box/distribution box.
Action:
1. Check the fuses in the house's fuse box.
2. Replace the fuse / reset the circuit breaker if necessary.
3. The heat pump automatically returns to operating mode within 15 minutes after the fault has been rectified.

Possible cause 2: Glass fuse in the control cabinet or in electric boiler 290 A/W has blown.
Action:
1. Contact your dealer.

Emergency operation

On the inside of the control cabinet (in case of electric cassette or mixed additional heat) there is a switch that lights green during normal operation. If a fault occurs in the control unit and heating production stops, emergency operation can be activated manually using the switch, which then goes out. Emergency operation can also be activated automatically (and then the switch lights anyway).
Emergency operation is also available for the electric element in 290 A/W, see the user guide for 290 A/W.

Additional heat takes over the heating production during emergency operation. Heating can therefore be obtained until the dealer or authorised service technician has remedied the fault.

This function must not be confused with Alarm mode, which means that the compressor stops, for safety, due to an active alarm. Heating production is still controlled by the control unit.

All alarms and warning windows

An alarm can sometimes occur temporarily due to various reasons. However, there is never a risk involved in resetting an alarm. All the alarms that can appear in the menu display are described in this section. The descriptions give you an idea about the nature of the alarm and what you can do to rectify it.

The alarm log (see *Advanced menu*) shows the alarms and warnings that have occurred.

List of all alarms:

- Tripped low pressure switch
- Tripped high pressure switch
- Sensor failure / short circuit
- Faulty function in 4-way valve
- T6 High hot gas temperature
- Error on electric additional heat (290 A/W, electric cassette)
- Fault on additional heat for heating system (electric/oil-fired boiler)
- T8 High flow temperature
- Low temperature in condenser
- Tripped motor cut-out compressor
- Tripped motor cut-out fan

List of all warning windows:

- Is the heat pump fused for this output? (290 A/W)
- High temperature difference heat transfer fluid
- The heat pump is now working at its highest permitted temperature
- Additional heat is now working at its highest permitted temperature

Alarm window

Tripped low pressure switch

Possible cause 1: **The evaporator is clogged.**
Action:
1. Clean the evaporator. See *Maintenance.*
2. Select *Acknowledge*.
3. Wait for the heat pump to start.
4. If the fault returns, contact your dealer.

Possible cause 2: **Blocked fan.**
Action:
1. Remove any items that are blocking the fan.
2. Select *Acknowledge*.
3. Wait for the heat pump to start.
4. If the fault returns, contact your dealer.

Possible cause 3: **Lack of refrigerant in the refrigerant circuit.**
Action:
1. Select *Acknowledge*.
2. Wait for the heat pump to start.
3. If the fault returns, contact your dealer.

Possible cause 4: **Fault in the automatic defrost system or fan motor.**
Action:
1. Select *Acknowledge*.
2. Wait for the heat pump to start.
3. If the fault returns, contact your dealer.

Possible cause 5: **Fault in the expansion valve.**
Action:
1. Select *Acknowledge*.
2. Wait for the heat pump to start.
3. If the fault returns, contact your dealer.

Tripped high pressure switch

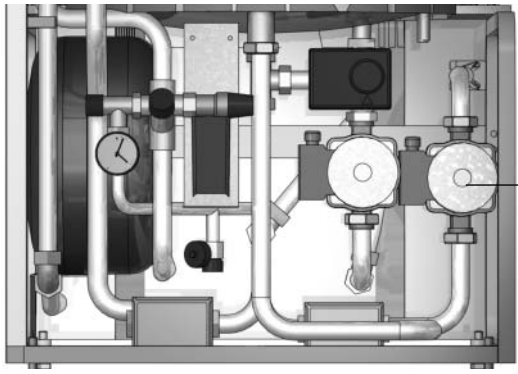
Possible cause 1: Air in the heating system.
Action:
1. Select *Acknowledge*.
2. Check whether there is air in the radiators.
3. Fill the heating system and vent if necessary.

Possible cause 2: Particle filter is clogged.
Action:
1. Select *Acknowledge*.
2. Check the filter.
3. Clean the filter if necessary, see *Maintenance*.

Possible cause 3: Not enough flow over the heat pump.
Action:
1. Select *Acknowledge*.
2. Check that the heat carrier pump has not stopped. If an existing electric/oil-fired boiler is connected, the heat carrier pump is on one of the pipes.
3. Check that all the valves are open. In heating systems with thermostat valves these should be fully open and in underfloor heating systems at least half of the coils should be fully open.
4. Possibly increase the pump speed.
5. Contact your dealer.

Note

Increase the speed of the heat carrier pump:
Use a screwdriver or a coin to increase the speed of the heat carrier pump. Turn one step anti-clockwise.



Heat carrier pump (290 A/W)

Sensor failure / short circuit

All sensors connected to the heating installation can give an alarm in the event of a fault. In the example to the right it is sensor T3, hot water, which has given an alarm. All sensors give alarms in the same way.

Possible cause 1: Temporary error.
Action:
1. Wait and see.

Possible cause 2: Defective sensor or incorrect connection.
Action:
1. Contact your dealer.

Faulty function in 4-way valve

Possible cause 1: **Four-way valve does not work properly.**
Action:
1. Select *Acknowledge*.
2. Contact your dealer at repeated alarms.

T6 High hot gas temperature

Possible cause 1: **The working temperature of the compressor is too high.**
Action:
1. Select *Acknowledge*.
2. Contact your dealer at repeated alarms.

Possible cause 2: **Intermittent temperature rise due to abnormal operating conditions.**
Action:
1. Select *Acknowledge*.
2. Wait and see. Contact your dealer at repeated alarms.

Fault on electric additional heat (290 A/W, electric cassette)

Possible cause 1: **Additional heat overheat protection has tripped.**
Action:
1. Select *Acknowledge*.
2. Reset the overheat protection on the additional heat.
3. Contact your dealer at repeated alarms.

Fault on additional heat for heating system (electric/oil-fired boiler)

Possible cause 1: **Additional heater overheat protection has tripped.**
Action:
1. Select *Acknowledge*.
2. Reset the overheat protection on the additional heat.
3. Contact your dealer at repeated alarms.

T8 High flow temperature

There is a sensor, T8, in the heat pump, which for reasons of safety, stops the compressor if the flow temperature becomes higher than the set value.

Possible cause 1: **Not enough flow over the heat pump.**
Action:
1. Check that the heat carrier pump has not jammed (see *Tripped high pressure switch*).
2. Check that all the valves are open. In heating systems with thermostat valves these should be fully open and in underfloor heating systems at least half of the coils should be fully open.

Possible cause 2: **Particle filter is clogged.**
Action:
1. Clean the particle filter, see *Maintenance*.

Low temperature in condenser

The alarm is due to low temperature in the heat pump. A warning window is initially displayed. After 4 repeated warnings (within 2 hours), an alarm is given.

Possible cause 1: **Air in the heating system.**
Action:
1. Select *Acknowledge*.
2. Check whether there is air in the radiators.
3. Fill the heating system and vent if necessary.

Possible cause 2: **Particle filter is clogged.**
Action:
1. Select *Acknowledge*.
2. Check the filter.
3. Clean the filter if necessary.

Possible cause 3: **Faulty heat carrier pump.**
Action:
1. Check that the heat carrier pump has not stopped (see *Tripped high pressure switch*).
2. Contact your dealer.

Possible cause 4: **Not enough/no flow over the heat pump.**
Action:
1. Check that the heat carrier pump has not stopped.
2. Check that all the valves are open. In heating systems with thermostat valves these should be fully open and in underfloor heating systems at least half of the coils should be fully open.

Possible cause 5: **Insufficient water level in the house's heating system.**
Action:
1. Contact your dealer.

Tripped motor cut-out compressor

Possible cause 1: **Intermittent fault or overload on the power supply.**
Action:
1. Select *Acknowledge*.
2. Wait for the heat pump to start.
3. If the fault returns, contact your dealer.

Possible cause 2: **Current level (A) on the motor cut-out is set too low. The current drawn by the compressor varies during summer/winter operations.**
Action:
1. Contact your dealer.

Possible cause 3: **Contactor or cut-out faulty, or loose electrical connections to the compressor.**
Action:
1. Contact your dealer.

Possible cause 4: **Compressor error.**
Action:
1. Contact your dealer.

Tripped motor cut-out fan (Optima1000/1300)

Possible cause 1: **Intermittent fault or overloading of the fan motor.**
Action:
1. Select *Acknowledge*.
2. Wait for the heat pump to start.
3. If the fault returns, contact your dealer.

Possible cause 2: **Current level (A) on the motor cut-out is set too low.**
Action:
1. Contact your dealer.

Possible cause 3: **Contactor or cut-out faulty, or loose electrical connections to the fan motor.**
Action:
1. Contact your dealer.

Possible cause 4: **Faulty fan motor.**
Action:
1. Contact your dealer.

Warning windows

High temperature difference heat transfer fluid

This warning window is displayed when the temperature difference between sensors T8 and T9 becomes too high.

Possible cause 1: **Not enough flow over the heat pump.**
Action:
1. Check that the heat carrier pump has not jammed.
2. Check that all the valves are open. In heating systems with thermostat valves these should be fully open and in underfloor heating systems at least half of the coils should be fully open.

Possible cause 2: **Particle filter is clogged.**
Action:
1. Clean the particle filter.

The heat pump is now working at its highest permitted temperature

There is a sensor T9 in the heat pump, which for reasons of safety, stops the compressor if the temperature of the return water from the heating system becomes too high. The limit lies at approximately 59°C.

Possible cause 1: **The heat setting is set so high that the heating system's return temperature is too high.**
Action:
1. Reduce the heat curve setting.

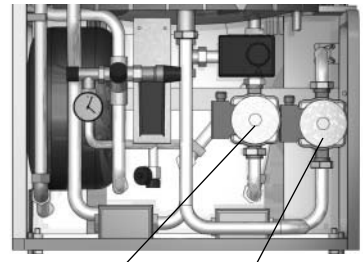
Possible cause 2: **The hot water temperature is set too high.**
Action:
1. The warning is given in hot water mode. Contact the installer to adjust the hot water temperature.

Possible cause 3: **The underfloor heating or radiator valves are closed.**

Action:
1. Open the valves.

Possible cause 4: **The flow across the heat pump is greater than the flow in the heating system.**

Action:
1. Reduce the speed of the heat carrier pump (see *Tripped high pressure switch*) or increase the speed of the circulation pump for the heating system. Contact your dealer for help.



Circulation pump for the heating system (290 A/W)

Heat carrier pump (290 A/W)

Additional heat is now working at its highest permitted temperature

There is a sensor T9 in the heat pump, which for reasons of safety, stops the compressor and limits the additional heat to the heat pump if the temperature of the return water from the heating system becomes too high. The limit for additional heat lies at approximately 48°C.

Possible cause 1: **The heat setting is set so high that the heating system's return temperature is too high.**

Action:
1. Reduce the heat curve setting.

Technical information

Factory settings

The table displays the factory values (F value) of the settings that you, as a customer, (K) can change via the customer menus *Menu* and *Advanced menu*.

Menu	Level	F value
Temperature increase/decrease	K	= (no change)
Room temperature setting	K	20°C
Extra hot water	K	0 h

Read the table as follows:
To find the settings for *Holiday* go to the *Advanced menu*, select *Temperature*, then select *Time limited settings* and then *Holiday*.

Advanced menu	Level	F value
Temperature		
Heating system temperature		
—"—\Heat curve	K	V=20,0°C H=55,2°C
—"—\Hysteresis		
—"—\—"—\Maximum	K	16°C
—"—\—"—\Minimum	K	4°C
—"—\—"—\Time factor	K	10
Room sensor settings (T5)		
—"—\Room temperature setting	K	20°C
—"—\Room sensor influence		
—"—\—"—\Change factor	K	5
—"—\—"—\Blocking time	K	4 h
Time limited settings		
—"—\Time control heating	K	Off
—"—\—"—\Day and time	K	
—"—\—"—\Change in temperature	K	-10°C
—"—\Holiday	K	Off
—"—\—"—\Date	K	
—"—\—"—\Change in temperature	K	-10°C
Heating season		
—"—\Heating season limit	K	18°C
—"—\Delay	K	4 h
—"—\Direct start limit	K	10°C
Heating, maximum operating time at hot water requirement	K	20 min

Advanced menu	Level	F value
Hot water (T3)		
Extra hot water		
—"—\Number of hours	K	0
—"—\Stop temperature	K	65°C
Hot water peak		
—"—\ Interval	K	0 days
—"—\Start time	K	03:00
Time control hot water	K	Off
Setting the clock		
Set date	K	
Set time	K	
Alarm		
Alarm log		
—"—\Delete alarm log?	K	No
Access level	K	0
Return to factory settings	K	No
Deactivate alarm buzzer	K	No
Program version	K	xx.xx.x

Technical information

Model IVT Optima		600	900	1100	1400	1700
Emitted/Supplied output at +7/35°	kW	5,5 / 1,4	7,2 / 2,0	8,9 / 2,3	12,9 / 3,3	14,3 / 3,9
Emitted/Supplied output at +7/45°	kW	5,1 / 1,7	7,0 / 2,4	8,6 / 2,8	12,5 / 4,0	14,1 / 4,7
Heat carrier flow nominal	l/s	0,19	0,29	0,34	0,47	0,55
Internal pressure drop heat carrier	kPa	5	6	7	7	8
Air flow	m³/h	2200	2200	2200	5500	5500
Electrical consumption fan	A	0,44	0,44	0,44	0,7A (400V N3)	0,7A (400V N3)
Electrical supply		400V 3N~ 50Hz				
Fuse size	AT	10			16	
Compressor		Scroll				
Highest outgoing heat carrier temperature	°C	65				
Refrigerant filling R-407C	kg	2,5	2,6	2,7	3,4	3,5
HTF connection, clamping ring	mm	Hose 1 inch internal thread			external 1 inch	
Defrost system		Hot gas with four-way valve				
Dimensions (WxDxH) [1]	mm	820x640x1190			920x705x1660	
Weight	kg	140	145	155	160	165
Colour		Champagne				
Outer casing		Galvanised enamelled plate				

Output data at +7/35° and +7/45° are stated according to the European standard EN 14511.
[1] Dimensions excl. feet, supplied min 20 mm - max 30 mm depending on adjustment.

Sound levels

The table describes the sound levels stated in sound pressure level.

Sound pressure level:
Sound pressure level is defined as the sound level, which at an ear level of 1.8 metres, is perceived one metre from the heat pump. Measured in a sound measurement room without echo at an outdoor temperature of +7°C and 50°C flow temperature.

Heat pump	Sound pressure level Lp - ear (dBa)
Optima 600	53
Optima 900	53
Optima 1100	53
Optima 1400	59
Optima 1700	59

Example:
When the heat pump is installed outside with free sound propagation the sound level drops by 6dBa with each doubling of distance.

Example	Optima 900	Optima 1400
Distance	Lp - ear (dBa)	Lp - ear (dBa)
1 metres	53	59
2 metres	47	53
4 metres	41	47
8 metres	35	41

Sensor table

The table shows all sensor resistance at different temperatures.

Temperature (ºC)	kΩ
-40	154.300
-35	111.700
-30	81.700
-25	60.400
-20	45.100
-15	33.950
-10	25.800
-5	19.770
0	15.280
5	11.900
10	9.330
15	7.370
20	5.870
25	4.700
30	3.790
35	3.070
40	2.510
45	2.055
50	1.696
55	1.405
60	1.170
65	0.980
70	0.824
75	0.696
80	0.590
85	0.503
90	0.430

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