

# Installation, Operation and Maintenance Manual GEMINI Heat Pump



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LIITE 1: ELECTRICAL DIAGRAMS

LIITE 2: DECLARATION OF CONFORMITY

#### ALWAYS KEEP THE OPERATING MANUAL IN THE IMMEDIATE VICINITY OF THE DEVICE!

Carefully study the manual before installing, adjusting or maintaining the device. Observe the instructions provided. Request a technician to fill out the Commissioning and Warranty Protocoll, which must be returned to the device manufacturer. The protocoll is a requirement for maintaining the validity of the manufacturer's warranty.

Fill out the information below. This information must be available if the device experiences any failures.

Model:	Serial number:
HVAC company:	Name:
Date:	Tel.:
Electrician:	Name:
Date:	Tel.:

### **1 WARRANTY**

Gebwell Ltd.

#### Patruunapolku 5, 79100 LEPPÄVIRTA, tel 020 1230 800, info@gebwell.fi

issues the product,

#### **GEMINI** heat pump

a warranty regarding manufacturing and material faults, with the following contents.

#### Warranty period and start date

A two- (2) year warranty will be issued to this product, counting from the product delivery date.

Two copies of the commissioning and warranty protocol will be delivered with the heat pump. The installer / reseller of the heat pump fills the said protocol in and goes over it with the customer. Both Parties confirm they have gone over the protocol, and accept the terms of warranty with their signature. The customer's copy of the warranty protocol must be stored, and presented on request. The other copy must be delivered to the factory within 1 month from the product commissioning date. The warranty is not valid in case the commissioning and warranty protocol has not been filled in correctly, or if the factory copy has not been returned to the factory.

#### Warranty contents

The warranty extends to all manufacturing and raw material faults that have occurred in this product during the warranty period, as well as the direct expenses related to the changing of these devices.

The buyer is responsible for any device malfunctions caused by the storage conditions between the delivery and commissioning date (cf. installation, operating and maintenance manual; storage).

#### 5-year component warranty

In addition to the normal product warranty, a five- (5) year component warranty will be issued to the heat plate exchangers, starting from the product delivery date.

The component warranty does not extend to the direct or indirect expenses caused by the changing of a component. Otherwise, all terms and limitations of the product warranty apply for the component warranty, as well.

#### Warranty limits

The warranty does not extend to the expenses (travel, power consumption, etc.) caused by a malfunctioning device, the buyer's production loss, loss of earnings or other indirect expenses.

This warranty has been given on the condition that the product is working in normal operating conditions, and that the operating instructions are followed carefully. The liability of the guarantor is limited according to these terms and conditions, and the warranty does not extend to such damage as the product may cause to another item or person. The warranty does not extend to direct personal injuries or damage to property caused by the delivered product.

The warranty presupposes that the installation has followed all valid regulations, generally accepted methods of installation and installation instructions given by the manufacturer of the product.

The warranty does not extend to or is not valid in case the product is used in any other way than required by the sizing.

The customer is obliged to perform a visual check on the product before the installation, and it is not allowed to install a product that is clearly faulty

### The warranty does not cover malfunctions, which have been caused by

- the transportation of the product
- the carelessness of the product operator, the overload of the product, the failure of adhering to the operating instructions or maintenance
- circumstances beyond the guarantor's control, such as voltage fluctuations (the maximum range of voltage fluctuations is +/- 10%), lightning, fire or accidents other than those caused by the repair work, maintenance or structural changes done by authorised resellers
- product installation or positioning on the operating site, which is in contradiction with the installation, operating and maintenance manual, or otherwise incorrect.

The warranty does not extend to the repair of defects that are insignificant as far as the product's operating condition is concerned, such as surface scratches. The warranty does not extend to the normal adjustments of the product as outlined in the operating manual, operation training visits, maintenance and cleaning measures, or such work which is caused by the neglect of safety or installation regulations or the settlement of this on the installation site.

The warranty terms outlined in the joint recommendation of the Association of Finnish Metal and Engineering Industries and the Finnish Competition and Consumer Authority are observed to such an extent which has not been separately mentioned above.

#### The warranty becomes void, if the product is

- repaired or altered without Gebwell Ltd.'s permission
- used for a purpose, for which it has not been intended

• stored in a humid or otherwise unsuitable location (cf. installation, operating and maintenance manual).

#### What to do if a malfunction occurs

If a malfunction occurs during the warranty period, the customer must immediately (normally within 14 days) notify the authorised Gebwell reseller from whom the product was bought. The notification must include which product has malfunctioned (product model, serial number), the details of the malfunction in as much detail as possible, as well as the circumstances when the malfunction has developed and/or occurs. The warranty form, correctly filled in at the handover time must be submitted on request. Appealing to a warranty-period notification is not valid after the warranty period is over, unless the notification has been submitted in writing during the warranty period.

The notification must be submitted immediately after the malfunction has been discovered. If the notification is not submitted immediately once the buyer has noticed the malfunction, or when the buyer should have noticed the malfunction, the buyer loses the right to appeal to this warranty.

#### Maintenance service in Finland

Maintenance work for this product, during the warranty period and after the warranty period, is performed by the maintenance organization authorised by the manufacturer, throughout the entire estimated economic life of the heat pump.

#### How to submit a service request

All warranty repairs, service requests and orders for spare parts will primarily be submitted directly to the authorised Gebwell reseller that sold/delivered the product. Before submitting a service request, the following things must be taken into consideration:

- read the installation, operating and maintenance manual carefully and think whether you have used the device in accordance with the instructions in the manuals
- before submitting a warranty repair request, ensure that the warranty period is still valid, read the warranty terms carefully and find out the product's model and serial numbers
- all parts belonging to a device must be included when the device is returned
- the returned product must be closed in such a way, that handling it would not cause health or environmental hazards.

A device changed on the basis of the warranty is the property of the device manufacturer. Gebwell Ltd. reserves the right to decide how, where and who will perform the repair work or change that is at the manufacturer's responsibility.

Gebwell Ltd. is not liable for the breakdown of a wrongfully installed device.

The device can only be repaired by a professional. Incorrect repair work and settings can cause danger for the user, the malfunction of the device, and weaken the efficiency of the device. The visit of a retailer or a service agent is not free of charge even during the warranty period, in case the device has to be repaired due to incorrect installation, repair or adjustment.

### **2** INSTALLATION RECORD

The heating system must be inspected before commissioning following in-force regulations. Only qualified persons may conduct the inspection. The below installation record must be filled out before handing the device over to the end user. The completed installation record is also a condition for the validity of the warranty.

x	Description	Note:	Inspected by:	Date:
	Collector:			
	System pressure tested			
	System flushed			
	System vented			
	Brine			
	Expansion vessel			
	Mud separator			
	Safety valve			
	Shut-off valve			
	Collector loop 1, length			
	Collector loop 2, length			
	Collector loop 3, length			
	Collector loop 4, length			
	Collector loop 5, length			
	Collector loop 6, length			
	Collector loop 7, length			
	Collector loop 8, length			
x	Description	Note:	Inspected by:	Date:
	Heating system:			
	System pressure tested			
	System flushed			
	System vented			
	Safety valve			
	Diaphragm expansion vessel			
	Mud separator			
	Pressure gauge			
	Shut-off valve			
	Admission valve			
	Buffer reservoir			
x	Description	Note:	Inspected by:	Date:
	Domestic hot water:			
	System pressure tested			
	System flushed			
	Safety valve			
	Pressure gauge			
	Buffer reservoir			
X	Description	Note:	Inspected by:	Date:
	Electricity:			
	Property fuses			
	Heat pump fuses			
	Phase sequence			
	32A power socket			
	Outdoor temperature sensor			

# **3 HEAT PUMP OPERATING INSTRUCTIONS**

#### 3.1 General

Gebwell GEMINI is a perfect heat pump, which saves energy and offers efficient technical possibilities. A well-designed and appropriately dimensioned ground source heating system is affordable in terms of operating expenses and energy efficient. With a heat pump, you can efficiently heat both interior air and domestic hot water. In summer, the system can also be used to cool interior air in an environmentally friendly fashion.

#### 3.2 Ground source heat energy

A heat pump collects heat from the ground and transfers it inside the building. The heat can be collected using pipes sunk in a bored well, heat collection pipes installed near the ground surface or pipes anchored at the bottom of a water system.

Bored well as a heat source



Ground as a heat source



Water system as a heat source



More information on heat collection systems and their scaling can be found on the website of Gebwell Ltd. and the Finnish Heat Pump Association.

www.gebwell.com

www.sulpu.fi

#### 3.3 Ground source cooling

The cold temperature of the brine can also be used to cool dwellings. In summer, the free cooling energy can be transferred from the ground with just a circulation pump. The heat pump system can be connected to the convection heaters of the ventilation system or an underfloor heating/cooling system for cooling purposes.

#### 3.4 Heat pump's operating principle

The heat pump's refrigerant circuit includes four main components:

- Evaporator
- Compressor
- Condenser
- Expansion valve

The heat in the ground is absorbed into a liquid solution circulating in the heat collection pipes.

In the evaporator, the liquid comes into contact with the refrigerant that, when vaporised, binds heat energy from the liquid solution that circulates in the ground. The liquid solution returns to the ground about  $4^{\circ}$ C cooler than when coming out to the surface. The lowest permissible temperature for the liquid solution coming to the heat pump is -5°C.

The compressor increases the pressure and temperature of the refrigerant. The refrigerant also absorbs the heat energy generated by the compressor's operation.

The hot refrigerant is conveyed to the condenser, where the heat energy of the refrigerant is transferred to the water circulating in the building's heating system. The refrigerant condenses into liquid upon releasing heat energy.



The pressure of the refrigerant remains high when being transferred to the expansion valve. In the valve, the refrigerant's pressure decreases rapidly. From the expansion valve, the refrigerant passes on to the evaporator where it is once again evaporated. At this point, the refrigerant absorbs heat from the liquid solution circulating in the heat collection piping.

#### 3.5 Heating functions

#### DOMESTIC HOT WATER

The heat pump produces domestic hot water based on the B3 measurement sensor. The domestic hot water's switching differential is 5 degrees. The compressor is factory set to activate when the measurement value drops under  $+50^{\circ}$ C and deactivated when the value reaches  $+55^{\circ}$ C.

#### HEATING

The heat pump produces heating water directly into the building's heating network in accordance with the set point that is created from the outdoor temperature and the set heating curve. The control automation activates the charging on the basis of the calculated set point and return water measurement (B71) formed by the controller. The heat pump's *return water switching differential (2840)* setting defines the compressor's activation and deactivation points. When the return water measurement value is less than the set point by half of the *return water switching diffferential*, the compressor is activated. The compressor turns off when the return water measurement value reaches the set point + half of the *return water switching differential*. The automation reduces temperature rise in the return water set point above the condenser.

<u>Example:</u> Return water switching differential (2840) 6°C. Output water set point: 30°C. Condenser's temperature difference  $\Delta t$  6K.

The charging procedure is activated when the return water measurement value (B71) reaches 21°C. The charging ends, when the return water measurement value is 27°C. The heat pump's charging pump rotates whenever it is in heating mode.

#### **MIXING HEATING CIRCUIT:**

The heating circuit's output water set point is calculated in accordance with the outdoor temperature measurement and the set heating curve. The controller controls the 3-way mixing valve and keeps the heating circuit's output water temperature at the set point.

#### HEAT SUPPLY AND SOURCE PUMP:

In order for a heat pump to function at the best possible efficiency, the conditions of the heating system and collector must be ideal. The difference between the heating system's output and input temperatures must be  $6^{\circ}C-10^{\circ}C$  and the output and input temperature difference of the collector must be  $3^{\circ}C-4^{\circ}C$ . Efficiency and savings are reduced at temperature differences other than those described above.

Factory settings:

Charging pump: 7°C

Source pump: 4°C

#### 3.6 Tips for saving

The heat pump's function is to produce heat and domestic hot water according to your wishes. The system aims to fulfil these wishes by all means available, within the framework of the set values.

Important factors affecting the energy consumption are the interior temperature, hot water consumption, hot water temperature level, the insulation level of the real estate, as well as the desired level of comfort.

Please note the above points when making changes on the device for settings.

#### IMPORTANT!

Thermostats for floor heating and radiators can have a negative impact on energy consumption. They slow down the flow in the heating system and the heat pump will compensate this by raising the temperature of the network. This will affect the operation of your device consuming more electricity. Thermostats are designed to react only to control of so-called free-heat (sun, heat generated by people, fireplaces, etc. ...).

### 4 DELIVERY AND HANDLING

#### 4.1 Delivery contents

- Heat pump
- Outdoor temperature sensor
- Installation, operation and maintenance manual
- Spare seals
- Commissioning and warranty protocoll
- External source pump

#### 4.2 **Optional accessories**

- External source pump
- Spare valve
- Room sensor (wired)
- Room unit (wired)
- Collector valve group
- Pump heating circuit
- Heating control group
- Cooling control group
- SMS/WEB server, SMARTWEB
- Buffer reservoir for domestic hot water
- Buffer reservoir for heating
- Domestic hot water control group
- Charging package for domestic hot water
- Pool heating set
- Diaphragm expansion vessel for collector
- Diaphragm expansion vessel for heating
- Energy measurement (ONLY AS FACTORY IN-STALLATION, NO RETROFITS)
- Fixed fuel burner control
- Additional heat source control
- Cooling control
- Modbus communication module

#### 4.3 Storage

Before installation, the heat pump must be kept in its delivery package in a dry and warm location.

#### 4.4 Transport

The heat pump may be temporarily tilted, but it must not be left inclined for a long period of time, not even in transit. The heat pump's maximum tilt angle is 20°. It is not recommended to turn the pump on its side. However, if there is a need to turn the heat pump on its side, for transport purposes, for example, the compressor unit must be removed for the duration of transit. In any case the heat pump must not be transported on its back. If the heat pump has been tilted in transit, you must allow the pump to stand upright for at least two hours before activation so that the compressor's lubrication oil has time to reach the required locations. Only lift the heat pump by the pallet. The pump must be transported on the pallet all the way to the installation location.

## 4.5 Removal from package and transport to final installation location

The product is delivered without the upper device module being mounted. All products included in the delivery are packed on the same pallet.

NOTE! THE HEAT PUMP MUST NOT BE TRANSPORTED IF ONLY THE LOWER COMPRESSOR UNIT IS DE-TACHED FROM THE FRAME. IF THE HEAT PUMP HAS NOT BEEN ATTACHED, THE UPPER COMPRESSOR UNIT MUST ALWAYS BE DETACHED BEFORE DETACHING THE LOWER COMPRESSOR UNIT.



- Ensure that you have received the correct products with the correct accessories.
- Remove the packaging material, and inspect the heat pump for any transport damage. Notify any damage discovered to the transport company.
- Move the heat pump close to the planned installation location.
- Lift the heat pump off the pallet.
- Adjust the heat pump so that it is horizontally and vertically level and stands firmly on the adjustable legs.
- Ensure that the frame, with the exception of the adjustable legs, is not in contact with any building structures.
- Lift the upper compressor unit in place.

#### 4.6 Safety instructions

The following safety instructions are to be taken into account when handling, installing and using the equipment.

- Turn off the device's main switch before any maintenance procedures
- Never compromise safety by bypassing safety devices

- Only qualified personnel should conduct maintenance / repair measures on the cooling unit of the equipment
- The heat pump is not to be flushed with water
- Keep all the shell plates in place to prevent water splashing on the electronic components of the equipment.

#### 4.7 Heat pump's location

A variety of matters related to safety, comfort of use and maintenance must be considered when positioning the heat pump.

The temperature of the location must be between  $+5^{\circ}$ C and  $+30^{\circ}$ C. The room must be sufficiently ventilated. If the humidity in the room is high, water condenses on the cold pipe sections of the collector.

The heat pump compressor generates noise that may be conveyed to other spaces via the building's structures. It is recommended to use flexible parts in the pipe connections. The heat pump must be positioned in a way that the sound does not disturb any living areas. If necessary, soundproofing of the wall structures between the room in which the pump is located and the living areas can be reinforced and extra rubber pads installed under the pump's legs. We recommend placing the heat pump in a separate technical room. The sound transmitted through structures can be limited with the floor structures of the pump room and other solutions. A separate cast floor cut off from the building's other spaces prevents noise from being carried to living areas through the floor.

Reserve at least 700 mm of maintenance space in front of the pump so that the compressor unit can be taken out for maintenance. For the same reason, do not install the pump below the floor surface.

## 4.8 Mounting and unmounting the upper compressor unit

For ease of installation Gebwell Gemini is delivered without the upper compressor unit being mounted. The upper compressor unit must be mounted only after the heat pump has been placed on a solid installation platform and adjusted in a horizontally and vertically level position.

- 1. Detach the front panel by opening the screws on top of the device.
- 2. Detach the mounting plate of the user terminal display by opening the screws in the frame support rails. Place the display on top of the device for the duration of installation.

NOTE! The display cable can be unconnected from the back of the user terminal if necessary.

- 3. Lift the compressor unit up to the mounting level by means of a vertically adjustable table.
- 4. Position the unit gently in place by pushing from the front while pulling it from the lifting loops at the

back.



- 5. Attach the compressor unit to the frame support rails using the fixtures included in the delivery.
- 6. Put the gaskets (in a bag taped to the piping) in place and tighten the nuts.
- 7. Connect the mains plugs.
- Attach the user terminal display to the frame, and connect the display cable if you unconnected it. Insulate the connecting points of the collector in order to prevent condensation during use. Insulation is found in the equipment bag.

### **5 HEAT PUMP STRUCTURE**



#### 5.1 GEMINI structure

- A. Control centre
- B. Electrical switches
- C. Charge output device 1
- D. Charge return device 1
- E. Condenser device 1
- F. Charging pump Q9.1
- G. Conderser drain
- H. Charge output device 2
- I. Charge return device 2
- J. Condenser device 2
- K. Charging pump Q9.2
- L. Condenser drainM. Adjustable feet
- N. Lifting loops
- O. User terminal controller 2
- P. Brine out device 1
- Q. Brine in device 1
- R. Soft-starter / compressor's motor protection switch device 1 (F1)
- S. User terminal controller 1 (Master device)
- T. Compressor1
- U. Expansion valve 1
- V. Brine out device 2
- W. Brine in device 2
- X. Soft-starter / compressor's motor protection switch device 2 (F2)
- Y. Compressor 2
- Z. Expansion valve 2

#### 5.2 Sensors

|--|

B81	Hot gas sensor
B91	Collector's inlet sensor
B92	Collector outlet sensor
B21	Heat pump output water sensor
B71	Heat pump return water sensor
External sensors	<u></u>
B9	Outdoor sensor
B10	Common output water sensor
Reservoir sensor	<u>rs:</u>
B3	Domestic hot water
B4	Additional reservoir 1 (upper)
B41	Additional reservoir 2 (lower)
B42	Additional reservoir 3 (middle)
Heating circuit s	sensors:
B1	Output water temperature sensor 1
B12	Output water temperature sensor 2
B14	Output water temperature sensor 3
Room sensors:	
В5	Room sensor 1
B52	Room sensor 2
В53	Room sensor 3
Other sensors:	
B13	Pool sensor
B16	Cooling output water sensor
B22	Fixed fuel burner sensor
B38	Domestic hot water consumption sensor

### 5.3 Pumps

Inside the heat p	ump:
Q9	Charging pump
External pumps of	of the system:
Q8	Source pump (collector)
Heating circuit p	umps:
Q2	Heating circuit pump 1
Q6	Heating circuit pump 2
Q20	Heating circuit pump 3
Domestic hot wa	ter pumps:
Q4	Domestic hot water circulating pump
Q34 pump	Domestic hot water exchanger's charging
Other pumps:	
Q10	Fixed fuel burner pump
Q19	Pool pump
Q24	Cooling circuit pump
5.4 Contro	ol valves
Y1 / Y2	Heating circuit 1 (open / closed)
Y5 / Y6	Heating circuit 2 (open / closed)
Y11 / Y12	Heating circuit 3 (open / closed)
Y23 / Y24	Cooling circuit (open / closed)
Y33 / Y34	Domestic hot water (open / closed)
5.5 Other	controls
Q3	Domestic hot water change-over valve
Y21	Cooling change-over valve
Y28	Cooling pump/change-over valve
Y28	Jäähdytyksen pumppu/vaihtoventtiili

### 6 DIMENSIONS AND PIPE CONNECTIONS

#### 6.1 Heat pump connections



### 6.2 Pipe connections



1	Charge output	Ø 35mm
2	Charge return	Ø 35mm
3	Brine in	Ø 35mm
4	Brine out	Ø 35mm

### 7 PIPE INSTALLATION

#### 7.1 Collector

When viewing from the front, the heat pump's collector pipes are at the right edge of the device.

NOTE! In GEMINI devices the source pump must be installed externally. The pump is delivered in conjunction with the equipment delivery. It is recommended that the pump is installed vertically to the line from the ground. In this way, air does not accumulate inside the pump. External source pump is controlled by leading heat pump's controller.

- In the collector/brine, only use connection parts that are intended for cold conditions.
- Install shut-off valves in the pipe connections as close as possible to the heat pump.
- A dirt separator (filter) must be installed to the collector's line coming from the ground in accordance with connection diagrams.
- Use supports insulated with rubber to support the pipes.
- Ensure that water does not spill on the pump or in the electrical devices during operation.
- The collector must be pressure tested at a pressure of 3bar and the test pressure must be maintained for at least 30 min.
- Insulate all of the building's source/brine pipes with closed-cell insulation in order to prevent water condensation.
- Rinse the pipes of any installation debris prior to installing the heat pump

When measuring the collection circuit, the geographical location, soil type, heat pump's efficiency and the property's heating needs must be taken into consideration.

#### When 40x4.2 PN6.3 PEM hoses are used

Device	Recommended length of collec- tion piping (m)	Recommended active drilling depth (m)
GEMINI 40kW	4x500 - 6x500	4x170 - 5x200
GEMINI 52kW	5x500 - 8x500	5x170 - 7x200
GEMINI 64kW	6x500 - 10x500	6x170 - 9x200

The table values are examples intended to be guidelines. Before beginning installation, accurate calculations of the building's heat requirements must be prepared.

The maximum length for a single collector loop is 500 m. If there is a need to install more piping, the piping must be divided into two loops that are connected in parallel. The connection must be conducted so that the loop flow can be balanced.

The collection piping must rise constantly towards the heat pump in order to prevent air pockets. If this is not possible, venting mechanisms must be installed at the high points.



## EXAMPLE CONNECTION OF COLLECTION CIRCUIT, 1-DEVICE CONFIGURATION

The collection circuit must be equipped with module-specific line flow control valves as shown in the figure. The line flow control valves must be adjusted device-specifically in order to ensure optimal operation.



- 5. Brine in (from the ground)
- 6. Brine out (into the ground)

## EXAMPLE CONNECTION OF COLLECTION CIRCUIT, 2-DEVICE CONFIGURATION



- 5. Brine in (from the ground)
- 6. Brine out (into the ground)

## INSTALLATION OF AN EXTERNAL SOURCE PUMP

The source pump is included in the equipment delivery. Pump capacity is to be determined for each heating system entity separately. The electronic controller of the source pump is connected to the leading device, i.e. the master unit. Install the external source pump to the source riser as shown in the figure in accordance with the installation instructions included in the delivery.

#### 7.2 Charging circuit

See the charging circuit's connection in the connection options below or the site-specific diagram. Note separate returning water lines for domestic hot water and heating accumulator when connecting charging circuit.

- Charging circuit is connected at the back of the device.
- Install the required protective devices, mud separator (strainer) as well as the shut-off and check valves.
- Residual installation impurities must be flushed from the building's heating system pipes before installing the heat pump.
- It is recommended to perform the installation to a closed heating system with a diaphragm expansion vessel.
- Ensure that water does not spill on the pump or in the electrical devices during operation.
- The product must be protected against overpressure with a safety valve. The safety valve's maximum opening pressure must be 2.5 bar, and the valve must be installed in the heating system's return pipe. It is recommended to lead the overflow pipe of the safety valves to the nearest floor drain. Install the overflow pipe so that the water can flow out of the pipe without obstructions.
- A connection to a system equipped with thermostats requires a bypass valve to be installed in all the radiators or that a few thermostats be removed to ensure sufficient flow. Refer to Technical specifications table for pump's minimum flow
- The heating system must have the device's minimum flow, refer to the Technical specifications table for the minimum flow

#### Connection of charging circuit, heating/domestic hot water

Note that, when connecting the charging circuit, a dedicated heating line must be brought from the domestic hot water heating accumulator to the leading compressor unit controlling the heat pump, and a common heating line from the heating network to both compressor units. A faulty return water connection mixes the domestic hot water and heating flows and may cause problems in the operation of the system!

The heat pump must be equipped with a non-return valve, as shown in the figure, in order to secure proper operation. The equipment cannot be operated without a non-return valve.

The devices have internal heating line pumps, one for each compressor unit.

Install dedicated filters for both compressor units in the heating circuit as shown in the figure.

- 1. Charging output, to the domestic hot water heating accumulator (master unit)
- 2. Charging return, from the domestic hot water heating accumulator (master unit)
- 3. Charging output, to the heating network
- 4. Charging return, from the heating network



#### Connection of charging circuit, heating

In the example figure, the heat pump produces heating only for the building heating system. If connected as shown in figure, the device does not produce heating for domestic hot water.

- 3. Charging output, to the heating network
- 4. Charging return, from the heating network



#### Connection of charging circuit, 2-device configuration

In the example figure, the upper compressor unit of the leading device produces heating for domestic hot water, and all four compressor units together produce heating for the building heating system.

- 1. Charging output, to the domestic hot water accumulator (master unit)
- 2. Charging return, from the domestic hot water accumulator (master unit)
- 3. Charging output, to the heating network
- 4. Charging return, from the heating network



#### CONNECTION TO THE DOMESTIC HOT WATER AND HEATING ACCUMULA-TOR



CONNECTION TO THE DOMESTIC HOT WATER ACCUMULATOR AND DI-RECTLY TO THE BUILDING HEATING NETWORK



INSTALLATION OF CHANGE-OVER VALVE

Install the change-over valve in accordance with the instructions included in the product package. Exercise great care when positioning the actuator to the valve arbour. An incorrectly installed actuator can cause equipment failure.

A. Charging, domestic hot water (Esbe, square)

B. Charging, heating (Esbe, triangle)

AB. Charging from the heat pump (Esbe, circle)



## 7.3 Connections of an additional heat source

Connection of an additional heat source to the heating circuit

The additional heat source can be an oil-fired boiler, natural gas, district heating or an electric boiler.

The additional heat source affects the pipe connection; the correctness of the connection should be confirmed with the equipment supplier or representative. The example connection is presented as a diagram with an oil-fired boiler. Connecting the additional heat source in series with the heat pump is recommended. The series connection enables optimal operation of the heat pump with the additional heat source. In the series connection, the heat pump acts as the primary heat source, after which the additional heat source compensates for the heat deficit of the supply pipe by starting to operate. The additional heat source requires commissioning the regulator.

The additional heat source control **does not include** a power supply for the actuator. The complete additional heat source control package LVLLO1B includes a power supply for the actuator.

The flow sensor B10 is included in the standard heat pump delivery.

If a 3-way mixer valve is used to regulate the additional heat source, the valve must be dimensioned and selected based on the heating system.

The actuator and valve are not included in the LVLLO1B package

#### 7.4 Extraction air heat recovery

The extraction air heat recovery system circulates brine to an extraction air radiator without any need for a collection circuit. Observe the manufacturer's instructions when installing the extraction air radiator. The capacity of the heat pump is to be determined on the basis of the capacity of the extraction air radiator and the cooling output capacity of the heat pump. Example of extraction air heat recovery connection



#### 7.5 Connections for external fixed fuel burners

#### Burner control

Burner control refers to any uncontrolled heat source such a wood burner or a burner equipped with water circulation. The optional accessory Burner control (KPAKO1A) enables the integration of a wood burner in the heating system. Heating distribution is to be implemented by means of separate control groups in order to control output water temperature. In the example connection shown below, the heat pump controller commands the burner charging pump Q10 in accordance with the programmed temperature set points on the basis of temperature measurement output from the accumulator and the wood burner.



#### 7.6 Connecting of domestic hot water system

The domestic hot water system must be equipped with a safety valve (max 10bar) installed in the cold water line as shown in the figure. It is recommended to lead the overflow pipe of the safety valves to the nearest floor drain. Install the overflow pipe so that the water can flow out of the pipe without obstructions.

The domestic hot water safety valve may leak nearly every time higher consumption of warm domestic hot water ceases. The overflow is caused by the thermal expansion of cold water and pressure shocks. The safety valve leak can be prevented by installing an expansion vessel in domestic hot water network. The vessel evens out the pressure changes and prevents pressure shocks.

- 5. Cold water
- 6. Domestic hot water
- 7. Domestic hot water circulation





## **RESERVOIR TANK FOR THE DOMESTIC HOT** WATER SYSTEM

If the consumption of domestic hot water is high, the heat pump can be supplemented with an electrically heated additional reservoir. The heat pump heats the cold water in the internal reservoir, after which the water is led to the external buffer reservoir. The electric resistance of the external reservoir maintains the temperature at the desired level. The system uses the external reservoir to prepare for spikes in the consumption of heat energy. If there are radiators in the circulation of hot water, the connection must be confirmed by an HV engineer.

### 8 ELECTRICAL CONNEC-TIONS

#### 8.1 General

Electrical installations and possible services may only be carried out under the supervision of an authorised electrician. The heat pump's power supply is brought through the opening at the back of the device. The device is connected to a power grid of 400V (50Hz).

The heat pump's power supply may not be switched on before the heat pump's heating network has been filled with water. This may cause the electrical heater, overheat protector, pumps or compressor to get damaged.

- The heat pump must be disconnected before insulation measurement.
- The heat pump wiring diagram can be found in Appendix *Electrical diagram*.
- If a circuit breaker is used for the heat pump, it should be of type C (slow). Check the correct fuse size on *Technical specifications*
- Cabling of the heat pump's electrical accessories should be made through the lead-through of control centre on the back of the heat pump.
- The heat pump's internal circulation pumps, automation and their cabling are protected with automatic fuses.

#### 8.2 **Power supply**

The power supply is connected to connectors (2) L1, L2, L3 through the cable opening (1). Pay attention to the correct phase sequence to ensure correct rotation direction of the compressor.

## 8.3 Compressor's motor protection switches (F1 and F2)

The compressor's motor protection cuts off the power supply to the compressor, and acts as the operating switch for the compressor.

Reset: Reset the compressor's motor protection (F1 upper compressor unit / F2 lower compressor unit) by holding down the green button (ON position)

Motor protection setting:

Gemini 40: 19A Gemini 52: 24A Gemini 64: 28A

#### 8.4 Phase sequence / soft starter

Heat pump's compressor has a three-phase motor. It is important that the phase sequence be connected correctly. Pump notifies of incorrect phase sequence on the controller screen with the text *Soft starter E25 failure*. The compressor's motor protection must be in ON position, so that the phase notice can be reviewed. If the motor protection switch is in the OFF position, the controller will always give a notice: *Soft starter E25 failure*. The soft starter notifies all interferences with a red LED light on the front panel of the soft starter. The amount of LED light flashes indicates the failure. See soft starter failures in section *Failures / soft starter failures* 

#### 8.5 Connection of temperature sensors

Outdoor temperature sensors are connected to the heat pump RVS controller. The sensors are included in the delivery of the heat pump control centre. For the placement of the sensors, see the HW diagram included in the delivery and the wiring diagram on the inside of the control centre lid.

Outdoor sensors are always connected to the master unit. If the heating system has more than one mixing heating circuits, the output water flow sensor of Heating circuit 2 must be connected to device unit 2.



#### **OUTDOOR SENSOR (B9)**

The outdoor temperature sensor (B9) is already wired to the control centre.

Position the sensor in a shaded location on the north or northeast wall. Do not place the sensor near windows or doors.

Connection: connector k, BX9/M

#### **COMMON FLOW SENSOR B10**

The common flow sensor of the heat pump is the control sensor of the cascade system. Place the sensor in accordance with the HW diagram included in the delivery. If any external heat sources controlled by the heat pump are connected to the heating system, sensor B10 is the control sensor of such external heat sources.

Connection, connector u, BX2/M

## DOMESTIC HOT WATER FLOW SENSOR B3 (ACCUMULATOR)

The domestic hot water flow sensor B3 is the control sensor of

domestic hot water production. Sensor B3 is placed in the sensor pocket of the domestic hot water accumulator in accordance with the HW diagram.

Connection, connector h, BX8/M

#### **HEATING CIRCUIT FLOW SENSOR B1**

Mixing heating circuit flow sensor B1 is the control sensor of the heating network. Sensor B1 is placed on the heating circuit output line at a distance of approx. 1 m from the 3-way mixing valve.

Connection, connector p, BX11/M

#### **HEATING CIRCUIT FLOW SENSOR B12**

Mixing heating circuit flow sensor B12 is the control sensor of the heating network. Sensor B12 is placed on the heating circuit output line at a distance of approx. 1 m from the 3-way mixing valve.

Connection: Controller 2, connector p, BX11/M

If the first heating circuit (Heating circuit 1) of the heating system is a pump heating circuit (i.e. not equipped with a 3-way mixing valve), the flow sensor of Heating circuit 2 must be connected to controller 1.

Connection: Controller 1, connector p, BX11/M

## 8.6 Connection of the domestic hot water charging package (HWExE)

The domestic hot water charging package is connected to the GW extension module (Domestic hot water). The domestic hot water charging package requires a circuit for hot water circulation. If the heating system is not equipped for such a circuit, the jump wire (H21/M) is to be replaced by a domestic hot water flow switch.

Domestic hot water flow sensor B38, BX21/M







#### 8.7 Connection of domestic hot water mixing valve (HWEx)

The domestic hot water mixing valve is connected to the GW extension module (Domestic hot water). The domestic hot water mixing valve requires a circuit for hot water circulation. If the heating system is not equipped for such a circuit, the jump wire (H21/M) is to be replaced by a domestic hot water flow switch.

Domestic hot water flow sensor B38, BX21/M



Domestic hot water mixing valve Y33/Y34, QX21/QX22/N



#### 8.8 Control of electric heaters in the accumulator / sequence controlled additional heating

The heat pump can be used for controlling electric heaters in the accumulator or another sequence controlled heat source. There are several different control modes for the electric heaters. The electric heaters must be programmed site-specifically according to the pertinent plant diagrams. For programming, see section *Site-specific definition / Programming of electric heaters*.

Power supply to domestic hot water charge pump 230VAC,  $QX23\ /\ N\ /PE$ 

#### NOTE! The resistor controls are connected to controller 2!

The thermostat and overheat protector combination, included in the delivery of the accumulator electric heater, must be connected to each electric heater. The thermostats must be adjusted at a value greater than the maximum set point defined for the heat pump.

Connecting electric heaters directly to the group distribution board can cause excessive power consumption. We recommend installing always a separate automatic transfer switch for controlling the electric heaters.



Control relays of electric heaters:

Controller 2:

QX1 Connector W	<sup>V/GR</sup> <sub>Y/GR</sub> Electric heater of output water K25 Control 230VAC
Controller 2:	
QX2 Connector W	Electric heater of output water K26 Control 230VAC
Controller 2:	
QX3 Connector X	Electric heater of domestic hot water K6 Control 230VAC

If both of the Gemini compres  $_{WH}$  in a cascade system have been connected to produce domes  $_{BLU}^{BR}$  ot water, the heating resistor control is to be connected to  $_{BLU}^{UR}$  irst device that only produces heating. In that case, the resistors must also be programmed to the QX relay outputs of said controller.

#### 8.9 Change-over valve(s)

Change-over valves are connected to the heat pump control centre's row connectors Q3, N and L10. In a cascade system, the connection is ALWAYS made to the master device.

Q3 = black (control 230VAC)

N = blue

L10 = brown (continuous 230VAC)

Actuator connection:



#### 8.10 Heating circuits

Three heating circuits can be controlled with the heat pump controller. The circuits can be pump or mixing circuits. Note that when connecting the heating group's pump, the control's maximum current is 0,7 A. If the pump's current is greater than the maximum current permitted for the controller, the pump must have a separate pump control centre.

#### MIXING HEATING CIRCUIT

The heat pump's controller can be used to control one heating control group and one pump heating circuit. The heating's first control group is always connected to the heat pump's controller. If there are more than one control groups, the heat pump must be equipped with a GW-extension module.

Mixing heating circuit:

3X11	Output water sensor
Connector p	ntc10k
2X10	3-way valve open
2X11	3-way valve closed
Connector T	Control 230VAC, 3-point
2X9	Mixing heating circuit's pump
Connector S	Control 230VAC, max 1,5A





#### PUMP HEATING CIRCUIT

The pump heating circuit's circulation pump is connected to the heat pump's controller.

QX12 Pump heating circuit's pump

Connector U Control 230VAC, max 0,7A



#### 8.11 Domestic hot water's circulation pump

The domestic hot water's circulation pump can be connected to the heat pump's controller.

QX13 Domestic hot water's circulation pump

Connector V Control 230VAC, max 0,7A



#### 8.12 Connection of external source pump

Connect external source pump according to the instructions delivered with the pump.

The source pump must be programmed in connection with commissioning. Refer to section *commissioning* for instructions, or the quick guide delivered with the source pump.

Set the pump to a standard curve/fixed speed so that the devicespecific flows can be adjusted to the correct values.

See adjustment instructions in the manual delivered with the pump.



#### 8.13 Connection of room unit, QAA74

Room unit is connected to controllers BSB-bus on connector b.



#### 8.14 Room sensor (acceossory) QAA55.

Room sensor is connected to controller's bus. Connection instruction below



#### 8.15 Alarm forwarding

The possible heat pump alarms can be forwarded e.g. to building automation or a modem. The alarm forwarding is connected to the fault relay K10 on the control centre. Closing alarm information (NO) is received from connectors 11/14 and opening alarm information (NC) from connectors 11/12. Use a 2-pole cable with a cross-sectional area of 0,5mm<sup>2</sup> at the minimum.



#### 8.16 Call for heating 0-10V

The heat pump can be controlled by using an external heat request. A 0-10 V regulation message can be used to set a set point for the output of the heat pump into the heating system. In that case, the heat pump is slaved to the upper-level automation



The function should be activated on the heat pump's menu. If the heat pump is equipped with energy meters, the function requires a GW expansion module.

Refer to section Site-specific definition / Call for heating

H3 / M Consumer's call VK2 10V

Connector e Control message 0 - 10V

#### 8.17 External prevention of activation / release signal

The heat pump can be given a prevention message for activation with an external potential free switch. In this case, the compressor and electrical heaters are locked. The heat pump will return to normal functioning once the message has been removed. The function can be used, for example, if there is a lot of simultaneous electrical load at the property. With this function, the activation of the heat pump can be prevented. Käynnistyksen esto tulee tehdä kaikkiin säätimiin.

Prevention of activation must be done to all controllers.



#### 8.18 Tariff control

The electric utility's low tariff message can be received via the EX3 input. The external control must be a potential free closing switch. The control activates the forced charging of the heating reservoir.



#### 8.19 Installation of extension module

The extension module is delivered in conjunction with a separate control centre. The control centre is equipped with a mains plug (230V, 50Hz). The extension module is connected to the heat pump controller with a BSB bus. Connect the bus cable to inlet b (cl+/cl-) as shown in the figure. If several modules are being installed to the heat pump, the addresses must be set at the dip switches.



\*Dip switches



#### 8.20 Connection of a cascade connection

Several heat pumps (Gebwell T, GEMINI and Taurus-series) can be connected to one cascade system. The system's main device is defined as the master device (controller 1). There can be 15 slave devices (controllers). Device addresses must be specified for the devices in the LPB system menu.

Connect the data cables in accordance with the image between the devices. The cable is delivered with the device (5m/device).

Use 2-pole cable with cross-sectional area of  $0.5 \mathrm{mm}^2$  at minimum.



#### 8.21 Connection of additional heat source

The additional heat source is controlled with an on/off (K27) control, and the supply water temperature is adjusted according to the B10 measurement with a 0-10 V regulation message.

If an actuator is used to make the adjustment, the heat pump must be equipped with the accessory LVLLO1B, which includes a 24V power supply for the actuator as well as a K27 on/off start relay for the control.

The controller controls the K27 relay with a 230V voltage control, and the K27 relay has a voltage free contact for the control. 0-10 V regulation message for the heat source from the controller's connector z (UX1/M).

Circuit diagrams attached.

### 9 FILLING AND VENTING

#### 9.1 Heating system

The heating system is filled with water up to the required pressure, and vented.

- Vent the system carefully before activating the compressor. Air in the heating system may trigger alarms in the system.
- Ensure that the system pressure is appropriate for operation. The pressure must be 0.5 bar during filling and approximately 0.5–1.0 bar once the reservoir has warmed up. Check the pressure once the reservoir is warm.
- The system must be equipped with an expansion vessel and a safety valve in accordance with the HV plan.

#### 9.2 Filling the collector, non-pressurised

Fill the collector with a mixture of water and brine that can withstand a temperature of at least -15°C. We recommend bioethanol, a liquid which is environmentally friendly.

Valves C and D are used for filling a filling group. Valve A must be closed for the duration of the filling and venting operation.

Fill the system with purified brine. Ensure that any solids present at the bottom of the vessel do not rise into the intake pipe. When circulating liquid with an external filling/venting pump, ensure that no foam is produced when liquid is pumped into the system. Where necessary, use two large vessels in order to prevent micro bubbles from entering the collection circuit. The removal of foam or liquid containing micro bubbles from the system can be difficult. Micro bubbles can cause equipment failure.

The collection circuit is pressurised using an external booster pump (K) The pump is connected to valves C and D as shown in the figure. When increasing the pressure of the collection circuit, close valve A. Ensure that any solids present at the bottom of the vessel do not rise into the intake pipe. Monitor the circuit's pressure gauge I. The pressure must not rise above 2 bar.

Clean the filter before activating the heat pump. Close valves A and B, and open filter E. Rinse the screen under running water. Close the filter, and open valves A and B.

#### 9.3 Pressure test of the collector

Perform a pressure test on the filled collector as follows: Increase the pressure to 2bar and check the pressure in 30 minutes. The system has a leak if the pressure has dropped during this time. Repair any leaks and repeat the pressure test. Enter the pressure test as completed in the *Commissioning and warranty protocol* after a successful test. Remember to release the high pressure after the test.

## 9.4 Venting of the collector's horizontal piping



When venting the collector, the horizontal piping must be vented separately by closing the wells out of the venting loop. This prevents air from being circulated via the wells, and thus the air bubble resulting from pumping does not end up in the well. When you have vented the horizontal piping by circulating liquid in both directions, and the liquid is completely clear (not foamy), you can open the wells for the activation of the ground heat source pump.



#### 9.5 Cleaning the collector filter

Check filter E by first closing valves A and B, and opening the filter's cover. After cleaning the filter, open valve A first, in which case air exits the filter's nest to the expansion vessel F. Open valve B.



### 10 ACTIVATING THE HEAT PUMP

Upon delivery, all the pump's motor protection switches and circuit breakers are in the **0** position.

When commissioning, the controller's settings must be accessed at *Expert* level.

SIE	MENS	14:42
-	Regional settings Special operations Settings	
di G	Expert	

Commissioner's menu:



#### **10.1 Before activation**

Before activating the heat pump, ensure that

- the collector has been filled with heat transfer liquid
- the collector has been vented carefully
- the collector's filter has been cleaned after venting
- all the collector's valves have been opened
- the programming of external source pump has been carried out
- the heating system has been filled with water
- the heating system has been vented
- the heating system's water temperature should be <20°C
- the domestic hot water system must be filled
- the outdoor sensor has been connected
- the heating sensors have been connected
- the electrical connections are correct
- the compressor's motor protection switch (F1) is in the OFF position
- electricity is lead to source pump
- the source pump's line protection switch F4 is in OFF position.

#### 10.2 Activation

1. Set the heat pump's main switch to (Q1) position I.

2. Set the controllers' line protection F10 and F11 to position I.

The controller updates the information

3. Turn the domestic hot water off from the user terminal.

- Operating mode: Stop

- Set *Simulation* on from the user terminal, +30°C. With this function, the call for heating is switched off and the symbol appears on the display.
- 5. Start the venting of the collector and heating network with the device's own circulation pumps. (Refer to section *VENTING: Venting of collector and Venting of charging circuit)*

NOTE! The commissioning of the external source pump must be carried out prior to venting and activating the compressor. Refer to *Commissioning of external source pump* for instructions.

SIE	MENS	14:42
-	Special operations	(1/5)
٢	Reset HP	
		No
	Emergency operation	Off
ılı	Pumping off refrigerant	Off
*		Back

- 6. In connection with venting the heating network, check on page 2/27 of the user terminal's *Source* menu that the heat pump's return water temperature and the input water temperature correspond to the heating system's water temperature. This indicates that the charging circuit's liquid is flowing.
- 7. In connection with venting the collector, check on page 17/27 and 18/27 of the user terminal's *Source* menu that the *source's input temperature* (row 8427) and the *source's output temperature* (8429) correspond to the ground temperatures. This indicates that the collector's liquid is flowing.
- 8. Set the compressor's motor protection F1 to ON position
- 9. Reset the heat pump from the *Special operations* menu
- 10. Set the *Simulation* heating mode from the user terminal to a temperature of -20°C.
- If a change-over valve(s) have been installed to the device, it (they) should turn to position B (flow to heating network)
- 12. Source and charging pumps activate 1 minute before the compressor.
- 13. When the compressor has activated, monitor the temperatures of the ground and charging circuits in the *Source* menu. The controller automatically sets the condenser's temperature difference to 7 degrees and the evaporator to 4 degrees.
  - Heat pump's return water temp. (2/27)

- Heat pump's output water temp. (2/27)
- Condenser's temp. difference (16/27)
- Source's input temperature (17/27)
- Source's output temperature (18/27)
- Evaporator's temp. difference (16/27)

Let the heat pump run for about 10-15 mins.

14. Set the domestic hot water on via the *Domestic Hot Water* menu in the *Commissioner menu*.

Operating mode: On

- Change-over valve(s) turn to position A
- Let the temperature of the domestic hot water rise to the set point.
- 0

NOTE! The compressor may not be reactivated more often than 1 activation / 10 mins.

In connection with activating, there is often a "Soft starter failure E25" failure message. When the motor protection is in ON position, this usually indicates an error in the phase sequence. By turning the input's phase sequence, the heat pump activates normally.

The heat pump does not register all alarms as alarms after the first notice, but instead as status data. If the compressor does not activate and a symbol appears on the display, check the current limitation's cause in Error history. Troubleshooting information can be found in the user manual in section TROUBLESHOOTING/ALARMS.



#### 10.3 Venting

The collector must be vented extremely thoroughly. Even a small amount of air in the brine collector will prevent the pump from functioning normally and can cause it to break down.

In order to facilitate commissioning and troubleshooting, the controller features an input and output test function. You must be on the "*Expert*" level to use this function. The source and charging pumps can be vented using this function.

#### Venting the collector

Venting the collector circuit is carried out using controller 2 of the leading device. Display on the inside of the door.

- 1. Turn on the power supply of the source pump
- Set the source pump's manual switch S8 to position I.
   → The source pump activates to the minimum rotation speed.

- 3. If you hear noise, such as gurgling/bubbling, which indicates the presence of air in the circuit, shut down the source pump from the S8 switch.
- 4. Let the air rise to the highest point of the collector and open the vent valve. Ensure that the system's expansion vessel has a sufficient amount of liquid.
- 5. When the venting is complete, continue rotating the source pump (P1) and repeat until all air has been removed from the system.
- 6. You can leave the source pump on while venting the charging pump.

NOTE! Pumping at excessively high power will disperse the air in the brine in the form of microbubbles. This may trigger alarms during the operation of the device. Therefore, you should begin the venting in short cycles after which you drain the air out of the vent valves.

Venting the collector with stronger pumping can be done with the *Input/output test* function:



3. Switch the Relay test off in section *Input/output testing*, (*No test*)

#### 10.4 Venting the heat supply circuit

Venting the heat supply circuit must be carried out controllerspecifically. (The both of GEMINI's charging pumps)

- 1. Set the charging pump's (LP/Q9) line protection switch to position I.
- 2. Select *Output test UX2* in the *Input/output test* menu
- 3. Set the desired rotation speed for the heat line pump. Let pump rotate for a few minutes.
- 4. Turn off the pump by setting the *Output test UX2* to 0%.
- 5. Let the air rise to the highest point of the system and ensure that the vent valves are open.
- 6. Ensure that the heating system's pressure is at a sufficient level, so that air can exit through the automatic vent valves.
- 7. When the venting is complete, continue rotating the pump and repeat until the air has been removed from the system.
- 8. Finally, switch off the Output test UX1 "---"

#### Return to the activation of the heat pump in section 8.

## **10.5** Use without a collector and use during construction site

The heat pump can be used for heating already before connecting the collector. In this case, all the heat is produced with direct electric energy. All the control functions of heating and domestic hot water are, however, available. Note that the heating and domestic hot water circuits must be connected and vented, and the electric connections must be fully completed.

If the heat pump is wished to be used for heating at a construction site, the device must be set to *emergency operation* mode, which ensures that the compressor (K1) and source pump (MLP/Q8) are not activated. In this way, the heat pump makes sure that the domestic hot water and heating is done with an electric heater.

When the display is in basic mode:

- 1. Roll the navigation roller to the 🏶 symbol.
- 2. Select Special operations
- 3. Select *Emergency operation* and set the function on by pressing the navigation roller and rolling the setting to the ON mode. Accept by pressing the navigation roller.

SIE	MENS	14:42
•	Special operations	(1/2)
•	Reset HP Emergency operation	No
	[	On
•		Back.

#### 10.6 Activation of a cascade system

Carry out the activation of cascade devices according to normal activation. The activation of slave devices takes place by setting the master device to *Emergency operation* mode. The domestic hot water button is not significant in the activation of slave devices. If heating circuits have been connected to the slave devices, carry out a site-specific definition. (Refer to *Site-specific definition*  $\rightarrow$ *Heating circuit*)

### **11 HEAT PUMP OPERATION**

#### 11.1 User interface

All the usual settings are made from the heat pump's user terminal, and the wishes regarding comfort that the heat pump should implement, are determined. The heat pump's optimal utilisation requires that certain basic settings are in force according to instructions. Refer to section *Basic settings* 



Q1: Main switch

F4.1: Line protection automation

Charging pump (LP1) Upper compressor unit

F4.2: Line protection automation

Charging pump (LP2) Lower compressor unit

F10: Line protection automation

Controller 1 (control)

F11: Line protection automation

Controller 2 (control)

S8: Source pump's manual use

I = Manual

0 = Automatic

#### 11.2 User terminal

AVS74 user terminal



#### 11.3 Display symbols

Rights, user and expert levels:		
♠	Home, property details	
4	Temperatures, heating/cooling	
-	Domestic hot water settings	
.lı	Info pages: <ul> <li>Notifications (alarms, events)</li> <li>Property details</li> <li>Energy monitoring</li> </ul>	
*	Service/settings: • Setting changes • Special operations • *Expert menu	
* For experts password:	s only, maintenance companies, requires a	
~	Diagnostics pages	
¥	Settings/maintenance: • Access to all parameters	
Ą	Alarm	
<b>X</b>	Alarm acknowledgment/requires maintenance	
Ę	Notification	
1	Manual	
8	Usage rights (1-3)	
5	Heat source in process (e.g. oil/gas burner, heat pump)	

#### 11.4 User levels

The controller features specified user levels, which enables that only corresponding user groups can change settings. The device is mainly used on *End user* –level. The mechanic installing the heat pump uses device on *Expert* –level. Different user levels can be accessed from Service/settings –menu.

SIE	MENS	14:42
•	Regional settings Special operations Settings	
di	Expert	
٥		+

#### 11.5 Heating settings

The room temperature is dependent of several factors. During warn seasons, the heat reflected from the sun, and heat given off by people and various devices, often is enough to keep the room temperature at a sufficient level. When the air cools down, a heating system is needed. The colder it is outside, the warmer the water is that circulates in the heating system. For the room temperature to be at the right level, the basic settings must be correct.

#### ADJUSTING WITH A HEATING CURVE

The starting point of the heating curve is the heat pump's *damped outdoor temperature* (average temperature of 15h) and the heating system's measured output water temperature. The slope of the automation's curve can be seen at the intersection point of the two values. This is separately set for each heating area.

The settings are made in the Maintenance/settings menu





NOTE! The heating curve setting is based on a room temperature of 20°C. If the room temperature set point is changed, the heating curve is changed automatically according to the new value.

Example values for adjusting the slope of the heating curve:

Factory setting: 0,5

Floor heating: 0,3 - 0,5

Radiator heating: 0,5 - 1,0

Air heating: 0,5 - 1,0

Room temperature change

If you would like to decrease or increase the room temperature either temporarily or permanently, do this by changing the *Comfort set point*.



**NOTE!** Floor heating or radiator heating thermostats may limit the room temperature rise, so that they must also be adjusted higher.

Readjusting the default settings

If the desired room temperature is not obtained, it is necessary to re-adjust.

Cold weather:

- If the room temperature is too low, increase the *heating curve slope* value.

- If the room temperature is too high, decrease the *heat-ing curve slope* value.

Warm weather:

- If the room temperature is too low, turn the roller to *Comfort set point, heating* clockwise  $0.5^{\circ}$ C, and press the OK button.

- If the room temperature is too high, turn the roller to *Comfort set point, heating* counter-clockwise to  $0.5^{\circ}$ C, and press the OK button.

**NOTE**! Wait one day between settings so that temperatures have time to settle down.

#### 11.6 Selecting heating mode

The heat pump can be used with different operating modes. The difference between the operating modes are the temperatures. The operating mode is changed in the *Operating mode* menu

SIE	MENS		14:42
A	Temperature	Area 1	
ð A	Operating mode Temporary	Automatic	
	Comfort setpoint	22.0°C	
	Time program		-,

#### Automatic operation

In automatic operation the room temperature is adjusted according to a time program. Automatic operation's features:

- Heating mode according to time program.
- Temperature set points according to the heating mode type "comfort set point" or "reduced set point".
- Protection operations are always active
- Automatic summer/winter mode switch connection activate.

#### Continuous comfort or reduced operation

In continuous operation, the temperature is continuously kept at a selected level.

Features of continuous operation:

- Heating mode without time program
- Protection operations active
- Automatic summer/winter mode switch connection is out of use.

#### Protection operation

In protection operation the heating system is turned off. Its frost protection is, however, active (frost protection temperature), provided that the voltage supply is not cut off.

Features of protection operation:

- Heating areas off
- Temperature according to frost protection temperature
- Protection operations active

Summer/winter mode switch automation is active.

#### 11.7 Domestic hot water settings

The heat pump produces domestic hot water with the changeover valve. The change-over valve turns the water flow to the domestic hot water reservoir, in which case heat is not charged to the property.

The domestic hot water reservoir's water temperature varies between the set points (nominal set point – switching differential  $5^{\circ}$ C).

The domestic hot water temperature is set in the 4 menu:

SIE	MENS	14:42
A	Domestic hot water	
1	Operating mode On	
\$	Temporary	
5	Nominal setpoint 55 °C	
h	Time program 🔒	
۰		+

Factory setting: 55°C

The domestic hot water heating can be switched on and off by pressing the *Operation mode Off* 

When the domestic hot water's charging operation is active (Operation mode On), the domestic hot water is heated according to the selected set point. When the charging operation is switched off (Operation mode Off), the domestic hot water's charging is not on.

The manual charging of domestic hot water can be activated by setting the *Temporary* setting on the user terminal or room unit to *"Recharge"*. This operation activates charging and charges the domestic hot water to the set point.



#### 11.8 Heat pump's Reset function

The heat pump's active failure messages from the *Regional settings* menu. The preset activation delay is not taken into consideration, so undesired delays are avoided during commissioning and troubleshooting. This operation should not be used during normal use. Refer to the maintenance instructions in the troubleshooting table before resetting the device, and record the alarm to the maintenance record.

SIE	MENS	14:42
A	Special operations	(1/2)
	Reset HP	
-		No
-	Emergency operation	
		Off
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*		Back

### 12 SITE-SPECIFIC DEFINI-TION

#### 12.1 Time and date

The controller features a year clock that indicates the time, weekday and date. The time and date must be set correctly for the heating programme to function properly.

The time is set in Regional settings 1/3-menu

SIE	MENS	14:42
•	Regional settings	(1/3)
4	Time	
		14:42
-	Date	01.01.2014
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#### 12.2 Summer/winter switch connection

The dates set for moving to summer and winter time ensure that on the first Sunday after such date, the time is automatically changed from 02:00 (winter time) to 03:00 (summer time) or from 03:00 (summer time) to 02:00 (winter time).

#### 12.3 Language selection

There are several language options for the user terminal. You can change the language in **Regional settings 3/3** –menu.

#### 12.4 Time programs

Various time programs are available for the heating circuits and domestic hot water production. They are enabled in the "*Automatic*" mode and control the switching between the temperature levels (and the related set points) according to the set activation times.

Factory settings: 06:00 - 22:00 comfort operation

22:00 - 06:00 reduced operation

#### 12.5 Heating area (Heating circuit)

The site-specific definition of heating areas is done in *Expert* level. A site-specific definition must be made for each area. The heating areas to be used must be switched on at the user terminal in the *parameter list* menu. When they have been switched on the output water sensor's (B1/B12/B14) connection to the controller activates the heating circuit. Heating circuit 1 has been pre-activated at the factory.



#### **ACTIVATION OF HEATING CIRCUITS**

The heating circuit must be activated in the configuration menu. Set the chosen circuit to ON mode and install the output water sensor, which will activate your selection.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Configuration  $\rightarrow 1/43 \rightarrow 5710$  Heating circuit 1

Configuration  $\rightarrow 2/43 \rightarrow 5715$  Heating circuit 2

Configuration  $\rightarrow 3/43 \rightarrow 5721$  Heating circuit 3

The heating areas must be marked with stickers in order to facilitate the definition of areas and possible maintenance work.

Site-specific definition is carried on in the menu Parameter list  $\rightarrow$  Heating circuit 1 / Heating circuit 2 / Heating circuit 3

#### **DEFINITION OF THE HEATING CURVE**

The heating curve's starting point is the controller's *damped outdoor temperature measurement* (15h average temperature) and the heating system's measured output water temperature. The automation's curve slope is seen at the intersection of these two values. This is defined for each heating area separately.

The greater the slope of the heating curve, the more the output water temperature changes as the outdoor temperature drops. In other words, if the room temperature is incorrect at low outdoor temperatures, but correct at higher temperatures, the inclination must be changed.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

*Heating circuit*  $1 \rightarrow 2/13 \rightarrow 720$ 

*Heating circuit*  $2 \rightarrow 2/13 \rightarrow 1020$ 

*Heating circuit*  $3 \rightarrow 2/13 \rightarrow 1320$ 

Factory setting: 0,5



#### SUMMER / WINTER HEATING LIMIT

The summer/winter heating limit activates or deactivates the heating according to annual temperature differences. In *Automatic* operation, this switch is performed automatically without the user having the turn the heating on or off. The annual periods can be shortened or lengthened by changing the set values.

- The display shows "Savings"
- In order to take in to account the building's heat insulation capacity, the damped outdoor temperature is used

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Heating circuit  $1 \rightarrow 3/13 \rightarrow 730$ 

Heating circuit  $2 \rightarrow 3/13 \rightarrow 1030$ 

*Heating circuit*  $3 \rightarrow 3/13 \rightarrow 1330$ 

NOTE! In case there are heating areas that one wishes not to deactivate during summers (damp spaces), the heating limit of that particular circuit is to be set not in use (---).

Summer/winter heating limit follows the "damped outdoor temperature". Damped outdoor temperature is average temperature of 15 hours.

#### SETTING THE OUTPUT WATER TEMPERA-TURE LIMITS

This setting defines the limit values for the output water temperature set point range. If the output water temperature set point requested by the heating circuit reaches the corresponding limit value, the set point remains at the maximum or minimum limit as the heat demand increases or decreases.

If the building features underfloor heating, it is important to set the maximum and minimum temperatures for the output line. If the building has underfloor heating and a parquet floor, the output water temperature must not exceed the floor manufacturer's recommendations.

Menu: Expert→ Parameter list

Heating circuit  $1 \rightarrow 4/13 \rightarrow 740$  (min), 741 (max)

Heating circuit  $2 \rightarrow 4/13 \rightarrow 1040 / 1041$ 

Heating circuit  $3 \rightarrow 4/13 \rightarrow 1340/1341$ 

Heating system, output water minimum temperature:

Adjustment range: 8-45°C

Factory setting: 12°C

Heating system, output water maximum temperature

Adjustment range: 12-95°C

Factory setting: 45°C

Separate minimum and maximum set points must be determined for each heating circuit.

NOTE! When using a pump mixing circuit (not mixing valve), the maximum set point is to be set in menu Parameter list  $\rightarrow$  Heating pump  $\rightarrow 11/23 \rightarrow 2855$  "Maximum switch-of-temperature heating". As flow sensor B21 measurement reaches the value set on 2855, the compressor comes to a halt.

NOTE! The minimum set point for the output water can be increased if the building's underfloor heating is intended to be on in summertime. For this feature, you must take the "Summer/winter heating limit" into account.

#### 12.6 Domestic hot water

The site-specific definition of domestic hot water is done in *Expert* level.

The heat pump charges domestic hot water according to the fixed temperature limit.

You can affect the domestic hot water operation with the following settings.

#### DOMESTIC HOT WATER SET POINTS

Domestic hot water is adjusted according to various set points. These set points are activated according to the selected mode of operation, and result in the desired temperature in the domestic hot water reservoir.

Factory settings:

Nominal set point 55°C

Reduced set point 45°C

#### DOMESTIC HOT WATER RELEASE

The release amount determines when the domestic hot water charging takes place.

Menu: Expert  $\rightarrow$  Parameter list Domestic hot water  $\rightarrow 2/6 \rightarrow 1620$ Factory setting: 24h/day

24h/day

The domestic hot water temperature is adjusted independently of time programs, all the time, according to the domestic hot water temperature's nominal set point.

Time program 4 / domestic hot water

The controller's time program 4 is complied with in the heating of domestic hot water. In this case, switch connections are made during the set operation times between the nominal set point and the reduced set point.

## DOMESTIC HOT WATER'S LEGIONELLA FUNCTION

The controller has an elaborately adjustable legionella function, which prevents the growth of legionella in the reservoir. The function can be programmed on in the domestic hot water menu. All the legionella definitions are made in *Expert* level.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Domestic hot water  $\rightarrow 2/6 \rightarrow 1640$  (On / Stop)

Factory setting: Off

*Legionella function set point (1645)* Factory setting: 55°C

Legionella function circulation pump (1647)

If a DHW circulation pump is connected it can be activated during the period of time the legionella function is performed.

Factory setting: OFF

## SWITCHING DIFFERENTIAL OF DOMESTIC HOT WATER CHARGING

Domestic hot water is produced to the reservoir with the heat pump with the change-over valve. When charging the domestic hot water, the size of the reservoir and the power of the heat pump is significant when the compressor is activated. The compressor should run as long period as possible to ensure long service life. With the switching differential of activation, you can affect the running times of the compressor during domestic hot water charging. Note that by increasing the set point, the amount of domestic hot water to be consumed is reduced. This affects the sufficiency of domestic hot water in connection with consumption.

Menu: Expert → Parameter list

Domestic hot water reservoir  $\rightarrow 3/11 \rightarrow 5024$ 

Factory setting: 5°C

If the domestic hot water temperature is lower than the current set point by the switching differential set here, the domestic hot water charging will be activated.

The domestic hot water charging shall end, when the temperature reaches the set point.

Example: The domestic hot water's charging is activated when the domestic hot water's measurement sensor BR is under the nominal set point (1610)  $55^{\circ}$ C – switching differential (5024)  $5^{\circ}$ C.

- By increasing the *Switching differential* set point, the compressor runs for a longer time to prepare the domestic hot water.
- By reducing the set point, the compressor runs for a shorter time

#### 12.7 Domestic hot water circulation pump

A time program can be defined for DHW circulation pump or the pump can follow the time program 4 set on domestic hot water. If you want to use these functions, the circulation pump is to be connected to the control automation.

## RELEASING THE HOT WATER CIRCULATION PUMP

With this setting you can define the function of hot water circulation pump

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Domestic hot water  $\rightarrow 5/6 \rightarrow 1660$ 

Factory setting: DHW release

#### Domestic hot water release

The circulation pump runs when DHW heating is released.

Time program 4 / DHW

The circulation pump follows the time program 4. In this case, the circulation pump is switched on (ON) when time program is released and off (OFF) when the time program is not released.

#### 12.8 Cooling circuit

Use of the cooling circuit requires the *Control extension for cooling circuit* (JPLPO1A) extension module sold as an accessory. The heat pump can control three cooling circuits.

The site-specific definition of cooling circuits is done in *Expert*level. A circuit-specific definition must be made for each circuit. The cooling circuits coming into use must be switched on the *Configuration* -menu of the controller. When the switch is complete, the connection of the flow sensor to the controller will activate the cooling circuit.

When the cooling operation is released, a bar will appear under the symbol on the display. The cooling operation is selected by pressing the cooling operation button. The cooling operation is not active, when the heating operation's bar is not visible.

Features of cooling operation:

- Cooling operation according to time program
- Temperature set point according to "Comf. Set point, cooling" setting
- Protection operations active
- Cooling limit according to outdoor temperature

#### COMMISSIONING OF COOLING CIRCUITS

The commissioning of the cooling circuits must be carried out at the Expert –level in Configuration –menu. Set the circuit to "4pipe system cooling" mode and install the output water sensor, which will activate your selection.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Configuration  $\rightarrow 2/43 \rightarrow 5711$  Cooling circuit 1

Configuration  $\rightarrow 3/43 \rightarrow 5716$  Cooling circuit 2

Configuration  $\rightarrow 4/43 \rightarrow 5722$  Cooling circuit 3

#### **OPERATING MODE**

Menu: Expert → Parameter list

*Cooling circuit*  $1 \rightarrow 1/11 \rightarrow 901$ 

Cooling circuit  $2 \rightarrow 1/11 \rightarrow 1201$ 

Factory setting: Automatic

The operating mode can be determined with the operating mode button on the room unit, or via the control row mentioned above.

OFF:

The cooling function is off.

Automatic:

In automatic mode the room temperature is adjusted according to time program between *Comfort* and *Reduced* set points.

#### SET POINTS

Set the set points in the *Cooling circuit* menu. When the cooling operation is in use with *Automatic* mode, the control uses the *Comfort* and *Reduced* set points.

Menu: Expert  $\rightarrow$  Parameter list

Cooling circuit  $1 \rightarrow 1/11 \rightarrow 902$ 

*Cooling circuit*  $1 \rightarrow 1/11 \rightarrow 1202$ 

#### Comfort operation set point

During cooling operation, the room temperature is adjusted in accordance with the comfort operation set point specified here. The comfort set point for cooling can also be changed using the knob on the room unit.

Factory setting: 23°C

#### Reduced set point

The room temperature is controlled during cooling mode according to the recuced setpoint defined here.

Factory setting: 25°C

#### COOLING NOMINAL CURVE

The controller utilises outdoor temperature value to define the output water set point required for cooling curve. The cooling curve is determined by specifying two fixed points (output set point at the temperatures of  $25^{\circ}$ C and  $35^{\circ}$ C).

#### Output water set point in outdoor temperature +25°C:

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Cooling circuit  $1 \rightarrow 2/11 \rightarrow 908$ 

Cooling circuit  $2 \rightarrow 2/11 \rightarrow 1208$ 

#### Output water set point in outdoor temperature +35°C:

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Cooling circuit  $1 \rightarrow 3/11 \rightarrow 909$ 

Cooling circuit  $2 \rightarrow 3/11 \rightarrow 1209$ 

Output water set point/ET 25 °C

This defines the output water temperature required for cooling at a mixed outdoor temperature of 25°C without taking summer compensation into account.

Factory setting: 21°C

Output water set point/ET 35 °C

This defines the output water temperature required for cooling at a mixed outdoor temperature of 35°C without taking summer compensation into account.

Factory setting: 18°C





TAgem Mixed outdoor temperature

The set cooling curve is based on the room temperature set point of  $25^{\circ}$ C. If the room temperature set point is changed, the cooling curve is changed automatically according to the new value.

Cooling limit at ET:

If the mixed outdoor temperature is above the cooling limit, the cooling is released. If the mixed outdoor temperature is at least 0.5K below the cooling limit, cooling is prevented.

Factory setting: 20°C

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Cooling circuit  $1 \rightarrow 3/11 \rightarrow 912$ 

Cooling circuit  $2 \rightarrow 3/11 \rightarrow 1212$ 

*Heating / cooling lock time:* 

The lock time between heating and cooling operation. When summer heating operation is engaged, cooling is disabled during the reference value set here.

Factory setting: 24h

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Cooling circuit  $1 \rightarrow 3/11 \rightarrow 913$ 

Cooling circuit  $2 \rightarrow 3/11 \rightarrow 1213$ 

#### **OUTPUT WATER SET POINT LIMITS**

A lower limit can be determined for the output water temperature used for cooling. The limit curve can be defined by setting two fixed points. In addition, a lower limit of 5°C is set for the resulting output water set point.

*Output water min set point/ET 25 °C* 

This setting defines the lowest permissible output water temperature at a mixed outdoor temperature of 25°C.

Factory setting: 18°C

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Cooling circuit  $1 \rightarrow 5/11 \rightarrow 923$
Cooling circuit  $2 \rightarrow 5/11 \rightarrow 1223$ 

Output water min set point/ET 35 °C

This setting defines the lowest permissible output water temperature at a mixed outdoor temperature of 35°C.

If an acceptable outdoor temperature value is not available, the controller will use the setting of parameter "Output water min set point/ET 35°C".

Factory setting: 18°C

Menu: Expert  $\rightarrow$  Parameter list

Cooling circuit  $1 \rightarrow 5/11 \rightarrow 924$ 

Cooling circuit  $2 \rightarrow 5/11 \rightarrow 1224$ 

#### **ROOM SENSOR EFFECT**

If a room temperature sensor is used in the system, the controller can be defined a room compensation effect.

Room effect:

The more the room temperature is wished to effect the cooling's output water temperature, the higher the set point is determined.

Adjustment range: 0 - 100%

Factory setting: 80%

Menu: Expert → Parameter list

Cooling circuit  $1 \rightarrow 6/11 \rightarrow 928$ 

*Cooling circuit*  $2 \rightarrow 6/11 \rightarrow 1228$ 

## 12.9 Heat pump settings

#### **CHARGING PUMP'S SPEED LIMITS**

The heat pump's charging pump (Q9 / LP) is speed controlled. When the compressor is running, the pump operates between the minimum and maximum rotation figures, keeping the charging temperature difference at the set point. This function enables the heat pump to work at the best possible efficiency.

The pump also rotates when the compressor is off, in this case the controller drives the pump at the minimum rotation speed. When setting the pump's rotation speed, the heat pump's modelspecific minimum flow must be taken into account. The charging flow must not be lower than the heat pump's minimum flow. This may cause functional failures in the device. Refer to section *Technical specifications* for model-specific minimum flows.

Menu: Expert  $\rightarrow$  Parameter list

Heat pump  $\rightarrow 3/23 \rightarrow 2792$  minimum rotation figure

Heat pump  $\rightarrow 3/23 \rightarrow 2793$  maximum rotation figure

Pump's minimum rotation figure, 2792:

Permitted adjustment range: 40-70%

Factory setting: 50%

Pump's maximum rotation figure, 2793:

Permitted adjustment range: 70-100%

Factory setting: 100%

NOTE! When reducing the maximum rotation figure, use a flow meter to check the minimum flow at the charging line control valve.

#### **RETURN WATER SWITCHING DIFFERENTIAL**

With this set point the values of the heat pump start-up limits are defined in return water controlled system. By return water controlled system is meant a facility where there are no heating reservoir measurements. This setting does not affect systems, which have heating reservoir measurements.

The compressor switches on and off according to the return water temperature (B71) and the return water temperature switching differential.

- By increasing the set point, the compressor runs for a longer operating period in heating mode.
- By lowering the set point, the compressor runs for a shorter operating period in heating mode.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

*Heat pump*  $\rightarrow$  9/23  $\rightarrow$  2840 *Return water temp. connection difference* 

Adjustment range: 1°C - 20°C

Factory setting: 6°C



•	•

OFF Switching off point

ON Switching on point

TRLw	Return water temperature set point
К	Compressor

Once the return water temperature rises above set point by a half of switching differential, the compressor comes to a halt. Once the return water temperature drops below the set point by a half of switching differential, the controller will turn on the compressor.

If return water temperature drops below 30°C, the switching differential is reduced so that switching on point comes closer to set point. Return water set point being 20°C the switching on point is the same as return water set point.



Т	Heat pump return water temperature
OFF	Switching off point

ON Switching on point Ta Outdoor temperature

## 12.10 Programming the reservoir's resistors and output water's electrical heaters

The heating system's resistors can be controlled with the heat pump's controller. The resistors' functions have several different operations. When programming, you must know the resistors' intended operation. Should the resistors function only in failure situations, in connection with the use of the compressor for producing domestic hot water and heating, in the legionella function, in connection with charging or in connection with heating. As a factory setting, the resistors have been programmed to function in failure situations, not together with the compressor. If the resistor is programmed to work simultaneously with the compressor (in addition), the property's power sufficiency must be ensured.

The controller has three relay controls for managing the resistors. The relay controls must be programmed to correspond to the connection. If the relay input is not connected to a control, the control row must be programmed to "None".

*Output water's electrical heater K25 (relay input QX1)* 

*Menu: Expert*  $\rightarrow$  *Parameter list* 

 $Configuration \rightarrow 11/43 \rightarrow 5890$ 

*Output water's electrical heater K26 (relay input QX2)* 

Menu: Expert  $\rightarrow$  Parameter list Configuration  $\rightarrow 11/43 \rightarrow 5891$ Domestic hot water's electrical heater K6 (relay input QX3) Menu: Expert  $\rightarrow$  Parameter list Configuration  $\rightarrow 12/43 \rightarrow 5892$ 

#### **RESISTOR CONTROL, K25/K26 OPERATION**

Resistor control (K25/K26) functions according to the factory setting *Replacement* function. In this case the resistor does not activate simultaneously with the compressor. The operation can be changed in the user terminal's menu. The change is made in *Expert* level.

Use electric output water

Menu: Expert  $\rightarrow$  Parameter list

Heat pump  $\rightarrow 13/23 \rightarrow 2880$ 

Factory setting: Replacement

**Replacement**: The electric heater control is only used in failure situations.

**Heat pump full operation:** The electric heater control is used to supplement the compressor in heating use.

**DHW full operation:** The electric heater control is used to supplement the compressor is DHW use. In heating use, the resistor functions according to the *Replacement* operation.

**Heating and DHW operation.:** The electric heater control is used to supplement the compressor in both heating and DHW use

**Legionella function:** The electric heater functions as in the Replacement operation, in addition wo which the control is active in legionella use.

**NOTE!** In connection with activating the legionella function, it must be considered whether the output water heater can implement the heating of DHW hydraulically. If the output water heaters are connected to the heating line, the heating must be done with a K6 resistor.

#### Electric output water prevention time

The electric heater control is allowed to start no earlier than the prevention time set with this parameter has elapsed from the activation of the compressor (K1).

The prevention time is taken into consideration only when the control is used to supplement the compressor use. If the electrical heating's setting is "Replacement", the prevention time is not taken into account.

Menu: Expert  $\rightarrow$  Parameter list

Heat pump  $\rightarrow 13/23 \rightarrow 2881$ 

Adjustment range: 0 - 255min

Factory setting: 30min

*Electric output water release integral* 

When a two- or three-phase flow-through resistor is used, the phases are released in accordance with the release and return integral (2882 and 2883).

*Menu: Expert*  $\rightarrow$  *Parameter list* 

*Heat pump*  $\rightarrow$  13/23  $\rightarrow$  2882

Adjustment range: 0 - 500°Cmin

Factory setting: 250°Cmin

Electric output water return integral

If the actual value is higher than the activation point, the controller switches the most recently activated (controlling) step off and begins to form a release integral based on the potential heat excess.

Then, once the heat excess reaches the set release integral (2883), the lower step is switched off.

For a new release, the release integral must be met again.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

Heat pump  $\rightarrow 14/23 \rightarrow 2883$ 

Adjustment range: 0 - 500°Cmin

Factory setting: 20°Cmin

#### Electric output water below ET

This setting is taken into account only when the resistor control is used to supplement the compressor use (2880). At the "Replacement" setting, the electric heater is always released.

The electric heater is only released when the damped outdoor temperature is below the temperature set here.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

*Heat pump*  $\rightarrow$  14/23  $\rightarrow$  2884

*Adjustment range:* (---)\*\* -30 - +30°C

Factory setting: ---\*\*No release temperature defined

#### ELECTRIC HEATER CONTROL, K6 (DHW) OP-ERATION

# NOTE! ALL ELECTRIC HEATERS MUST BE EQUIPPED WITH THERMOSTATS!

The electric heater control K6 functions according to the factory setting *Replacement* function. In this case the resistor does not activate simultaneously with the compressor. The operation can

be changed in the user terminal's menu. The change is made in *Expert* level.

*Menu: Expert*  $\rightarrow$  *Parameter list* 

DHW reservoir  $\rightarrow 5/11 \rightarrow 5060$ 

Factory setting: Replacement

**Replacement:** The electric heater control ensures the charging of domestic hot water, if the heat pump fails.

**Summer:** When all the heating circuits have switched to summer mode, the electric heater control ensures the charging of domestic hot water from the following day.

In heating use, the resistor functions according to the *Replacement* operation.

Always: Domestic hot water is always charged with the electric heater.

**Cooling operation:** When the heat pump is in cooling operation, the domestic hot water is charged with the electric heater. In heating use, the resistor functions according to the *Replacement* operation.

**Legionella function:** If the legionella function is programmed to the heat pump, the operation is carried out with the K6 electric heater control.

#### SETTING THE ELECTRIC HEATERS' THERMO-STATS

The electric heaters installed in the reservoir must always be equipped with thermostats. The resistor's thermostats must be set to such a high set point, so that the heat pump can finish the charging. In the heating reservoir, the thermostat's set point must be set according to the highest heating circuit.

Example, domestic hot water:

Domestic hot water set point defined to the heat pump  $+55^{\circ}$ C. The thermostat must be set to  $+65^{\circ}$ C.

This ensures that the heat pump can charge the domestic hot water to the nominal set point.

#### Example, radiator heating:

The *output water maximum set point* defined for the radiator heating circuit is  $+60^{\circ}$ C. The thermostat must be set to  $+70^{\circ}$ C.

#### Example, floor heating:

The *output water maximum set point* defined for the floor heating circuit is +40 °C. The thermostat must be set to +45 °C.

#### 12.11 Control of additional heat source

Additional heat sources can be commissioned at the *Expert*level. Select the settings in accordance with the instructions below; after this, select the device-specific settings.

#### *Menu:* Expert $\rightarrow$ Parameter list $\rightarrow$ Configuration

#### Configuration:

- 5894 Triac output ZX4 >> Heat request K27
- 6070 Output UX1 operation >> Power request

When control of additional heat sources has been selected for the heat pump, device-specific settings should be selected in the Additional source menu.

*Menu:* Expert  $\rightarrow$  Parameter list  $\rightarrow$  Additional source

**Increasing set point main source (3690):** When the additional heat source is released, the heat pump's set point is increased by the set value.

Adjustment range: 0°C - 10°C

Factory setting: 0°C

Main producer's power limit: Setting is not in use.

**In DHW charging (3692):** The additional heat source's operation in the production of domestic hot water.

NOTE! Before changing the setting, it must be ensured that charging hydraulically is possible.

Factory setting: Depending on the plant diagram

**Outdoor temperature limit DHW charging (3694):** If the additional heat source is *locked* to the production of domestic hot water, this parameter can be used to bypass the mode according to the outdoor temperature limit.

#### Factory setting: Notice

**Release below outdoor temperature (3700):** The additional heat source is only released when the damped outdoor temperature is below the temperature set here.

Factory setting: ---

**Release above the outdoor temperature (3701):** The additional heat source is only released when the damped outdoor temperature is above the temperature set here.

Factory setting: ---

After-run (3705): The setting defines how long K27 control is kept running, when the B10 measurement achieves the set point.

Factory setting: 5min

**Connection integral (3720):** When relay control K32 is used for the control of temperature, the relay is released and returned according to the set integral value.

Factory setting: 50°Cmin



TVxSch	Common output water temperature (B10)		
TVwSch	Common output water set point		
+Int	Return integral (3720)		
-Int	Release integral (3720)		
t1 / t2	After-run time		
K27	Release of additional source K27		
K32	Adjustment K32		

**Switching difference Off (3722):** If the common output water temperature exceeds the switching difference set here, the additional heat source is turned off immediately, regardless of other factors.

Factory setting: 5°C

**Prevention time (3723):** When the common output water temperature is below the set point, the controller calculates a prevention time, after which activates the additional heat source control.

Factory setting: 30min

### 12.12 Control of solid fuel burner

A fixed fuel burner refers to a heating device that operates in connection with the heat pump system, and the production of heat is not controlled, such as, for example, a wood burner or fireplace. The heat pump requires an extension module *Control* extension for solid fuel burner (KPAKO1A). The module includes the control extension, burner measurement sensor (B22) and a reservoir measurement sensor (B4). Burner control has been pre-programmed at the factory. The site-specific definition must be made in connection with commissioning.

**Prevents other heat sources (4102):** When the fixed fuel burner heats up, the heat pump is locked. Locking occurs as soon as the rise in the burner's temperature is noted.

Factory setting: On

**Minimum set point (4110):** The burner's charging pump (Q10) is activated when the measurement sensor B22 reaches the minimum set point. The temperature must, however, be higher than the temperature of the reservoir.

Factory setting: 35°C

## 12.13 Call for heating (VAK control)

The heat pump can be controlled with a higher level automation system, with the *Call for heating* control message. The control

message (0-10V) is provided to the heat pump's Hx switch, which must be programmed as active in the *Configuration* menu. When the heat pump is controlled with a 0-10V Call for heating control, all the secondary network's settings and controls must be in the control of the building automation system.

 $0V = 0^{\circ}C$ 

 $10V = 60^{\circ}C^{**}$ 

\*\* 10V value can be changed on control row 5956

**Consumer call VK2 10V:** The heat pump receives a call for heating, which the device produces to the heating network according to the output water sensor's B10 measurement.

**NOTE!** When controlling the heat pump with an external call for heating message, the control of the heating circuits must be implemented with building automation. The heating circuits must be placed into OFF mode from the heat pump when using the message. Refer to section *Commissioning heating circuits* for the heating circuits' settings.

## 12.14 ModBus communication

ModBus communication connection (MODBUS350) enables the device's temperatures, status data, set points and failures to be read with a higher level automation system. With the ModBus 350 connection, the heat pump can be set a set point as a temperature, according to which the heat pump produces heat to the reservoir or heating network. The ModBus 350 communication connection is delivered with separate instructions for installation and programming.

## **13 SYSTEM INFO**

The heat pump operating status can be seen from the operating terminal. On the basic view of the operating terminal displays the *Heat pump status*. If the heat pump is connected to the room sensor, the operating terminal displays the current indoor temperature. All the status information displaying on the display are not alerts. You can browse heat pump status information and historical data at the *Expert* level in *Mode* or *Info*—menu.

## 13.1 Special situations

In exceptional situation, the display of the basic unit shows one of the following symbols.

Failure notifications

If this symbol appears on the display, the device is suffering from a failure. Refer to the info page for the **the** failure notice.

Maintenance or deviating behaviour

If this symbol appears on the display, the device has issued a maintenance notification or is operating in an abnormal way.

Refer to the info page for the **I** failure notice and read more.

## 13.2 Heat pump status

The heat pump status will tell the current operation status of the heat pump.

#### HEAT PUMP STATUS:

OFF: The heat pump is turned on, but the call for heating is not active

STOP: The heat pump is turned on, but the call for heating is not active. A newer language version.

HEATING: The call for heating is active and the compressor is on. Compressor is heating the property or hot water.

LIMITATION OF ACTIVE TIME: Call for heating is on, but the compressor minimum idle time prevents the compressor from starting. The compressor starts after the minimum idle time has expired.

EMERGENCY OPERATION: The heat pump has gone to emergency operation operating mode due to malfunction or the heat pump has been set to emergency operation operating mode. The heat pump heats the property with the electric heaters. The operating terminal displays alarm clock symbol.

OFF THE MAXIMUM LIMIT: Call for heating is active, but the compressor charging is interrupted as the output water has reached the maximum set point limit. The charging process starts again after the minimum idle time.

COMPRESSOR LOCKED: The compressor is locked due to too high or too low temperature of the collector or charging circuit. The compressor will return to normal mode once the temperatures return to the correct temperature range. PASSIVE COOLING USE: The heat pump is switched to cooling mode. Source pump is running. The compressor is not used for passive cooling.

## 13.3 Heating circuits' status information

Heating circuit status indicates the current status of the heating circuit operation.

COMFORT HEATING: The heating circuit operates according to Comfort set point.

REDUCED HEATING: The heating circuit operates according to reduced set point.

PROTECTIVE USE: The heating circuit operates according to Protective set point.

HEATING LIMITED USE: The heating circuit is limited during hot water charging. Heating circuit returns to the set heating operation mode after the domestic hot water charging is complete.

SUMMER USE: The heating circuit is switched off due to summer operation mode. Heating circuit returns to the set heating mode as the damped outdoor temperature drops below the summer / winter heating limit.

OFF: The heating circuit is turned off.

## **13.4** Domestic hot water status information

CHARGED: Hot water is charged to nominal value.

CONSUMPTION: Hot water function is active. An electric control valve is connected to hot domestic hot water or the hot domestic hot water is produced in a heat exchanger.

CHARGING ACTIVE: The heat pump produces hot water.

ELECTRIC HEATER CHARGING: Hot domestic hot water charging is active with the help of electric heater.

## 13.5 Measurements

To access the comprehensive measurement menus, log into the controller at the *Expert* level. The source menu allows you to read the following status and temperature information.

*NOTE!* Not all measurements are shown in all applications. Some of the measurements will require additional equipment.



Row num- ber	Control row	Unit/status
8006	State heat pump	On/Off
8400	Compressor 1	On/Off
8402	El imm heater 1 flow	On/Off *
8403	El imm heater 2 flow	On/Off
8456	Hours run el flow Reset	h
8457	Start counter el flow Reset	pcs
8404	Source pump	On/Off
8405	Source pump revolutions	%
8406	Condenser pump	On/Off
8407	Speed condenser pump	%
8460	Heat pump throughput	l/min
8410	Heat pump return temp	°C
8411	Setpoint HP	°C
8412	Flow temp HP	°C
8415	Hot gas temperature	°C
8425	Condenser temperature differ- ence	°C
8426	Temp diff evaporator	°C
8427	Source inlet temp	°C
8428	Source inlet temp min	°C
8429	source outlet temp	°C
8430	Source outlet temp min	°C
8440	Port 1 min idle time remaining	min
8442	Remain stage 1 on time min	min
8450	Hours run compressor 1	h

Row num- ber	Control row	Unit/status
8451	Compressor 1 start-up coun- ter	pcs
3110	Heat delivered	kWh
3113	Energy brought in	kWh
3116	Performance factor	
8395	Generated thermal power	kW
8397	Energy consumption	kW
8398	Power ratio	

While at the *Expert* level, you can read the following information in the *Consumer* menu:

To activate the header row, press the button (dark background) and select the desired measurement.



Row num- ber	Control row	Unit/status
8700	Outside temp	°C
8701	Outside temp min	°C
8702	Outside temp max	°C
8703	Outside temp attenuated (6h average temperature)	°C
8704	Outside temp composite	°C
8730–8735	Actuators of heating circuit 1	*
8740	Room temp 1	°C
8740	Room setpoint 1	°C

Row num- ber	Control row	Unit/status
8743	Flow temp 1	**
8743	Flow temp setpoint 1	°C
8770	Room temp 2	°C
8770	Room setpoint 2	°C
8773	Flow temp 2	°C
8773	Flow temp setpoint 2	°C
8827	Instantaneous water heater's pump (Q34) revolutions	%
8830	DHW temp 1 (B3)	°C
8832	DHW temp 2 (B31)	*
8840	Hours run DHW pump	h
8841	DHW pump start-up counter	pcs
8852	DHW consumption temp (B38)	°C
8853	DHW temp setpoint for instan- taneous water heater	°C
8950	Common flow temp (B10)	°C
8951	Common flow temp setpoint	°C

# **14 FAILURES**

In most cases, the controller detects a malfunction of the heating system and indicates this with a failure notification appearing on the display. When failure notification displays on the display, record the alert exactly to the service book to facilitate the maintenance operations.

## 14.1 Alerts

When the alert is active, the symbol appears on the heat pump's display.

More information about the alert can be found on the info page. Always try first to find out for yourself the malfunction with the help of the trouble shooting table. If you cannot detect the malfunction, contact a qualified technician.

## 14.2 Troubleshooting

If failures are not displayed on the screen, follow the instructions below.

#### **Basic measures:**

- 1. Check all switches
- 2. Inspect the house as well as the heat pump fuses
- 3. Check the fault current circuit breaker

#### Room temperature too low:

- 15. Heat pump in incorrect operating mode
- 16. Set the heat pump heating functions into the right mode.
- 17. Thermostats of radiators / floor heating are switched off
- 18. Turn on the thermostats in so many rooms as possible
- *19.* Adjust the room temperature on the menu *Heating circuit* instead of switching off the thermostats
- 20. The automatic set point is too low:
- 21. Raise the Comfort set point on the menu *Heating circuit* 
  - Increase the heating curve slope set point on the menu *Heating circuit*
  - Set the maximum output water set point sufficiently high on the menu *Heating circuit*
- Program for heating circuit is switched on
  - Go to menu *Time program heating circuit* and adjust the time program to wanted level
- Air in the heating system
  - Vent the heating system
- Valves closed between the accumulator and the heating circuit
  - Open the valves
- External switch for the room temperature drop activated
  - Check any external switches

#### Room temperature too high:

• Heating circuit setting values are too high

- If the room temperature is too high only in cold weather, decrease the heating curve slope.
- If the room temperature is too high on warm weather, decrease comfort set point.

#### Domestic hot water too cold:

- Domestic hot water function is not active
  - Pres the domestic hot water selection button so that a black bar appears below the tap.
- Domestic hot water consumption is too high
  - Wait until the water has warmed up. Temporarily at beginning of the higher consumption, you can choose the forced charging of domestic hot water by pressing the terminal's domestic hot water button for 3 seconds.
- Set point too low
  - Go to menu *Domestic hot water* and increase the set point for domestic hot water
  - The feed mixing valve adjusted too low
    - o Open the valve

### The compressor will not start:

- No need for heat
  - Check heat pump's status on the Menu Info
- Compressor minimum idle time is active
  - Wait for 20 minutes and check if the compressor will start
- Heat pump failure
  - Check *Info* menu for the reason for the failure and make the adjustments needed according to the trouble shooting table.

### Soft starter failure notification

Failure in soft starter shows as Soft starter E25 failure notification on controller's display. The amount of flashes of the red LED light on soft starter indicates the failure.

Number of flashes, red LED	Failure	Operation
2	Incorrect phase se- quence	Changing the phase se- quence
3	Incorrect volt- age	Automatic restart 5 min after the failure
4	Incorrect fre- quency	Automatic restart 5 min after the failure
5	Rotor is not spinning	Automatic restart 5 min after the failure
6	Start time > 1 s	Automatic restart 5 min after the failure
7	Overheating	Automatic restart 5 min after the failure
8	Over current after start-up	Automatic restart 5 min after the failure
9	Asymmetrical input voltage	Automatic restart 5 min after the failure, if all phases are connected

# 14.3 Troubleshooting table

No: Failure message	Sensor	Description	Cause	Measure	Measure
10: Outdoor sensor	В9	The outdoor sensor is damaged or it is not connected.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
25: Fixed fuel burner sen- sor	B22	Failure in the burner's sensor.	Failure in the electrical system	Contact a qualified technician.	Check that the sensor is intact and correctly connected. If necessary, contact Gebwell service.
26: Common output wa- ter sensor	B10	Failure in the common output water sensor of charging	Failure in the electrical system	Contact a qualified technician.	Check that the sensor is intact and correctly connected. If necessary, contact Gebwell service.
30: Output water sensor 1	B1	Failure in heating circuit 1's output water sensor	Failure in the electrical system	Contact a qualified technician.	Check that the sensor is intact and correctly connected. If necessary, contact Gebwell service.
31: Output water sensor cooling 1	B16	The output water sensor for cooling is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
32: Output water sensor 2	B12	The mixed heating cir- cuit sensor is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
33: Heat pump output water sensor	B21	The heat pump's flow sensor is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
35: Source input sensor	B91	The inlet sensor in the heat pump's collection circuit is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
36: Hot gas sensor 1	B81	Hot gas sensor is dam- aged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
44: Heat pump return wa- ter sensor	B71	The sensor in the heat pump's return water is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
45: Source outlet sensor	B92	The outlet sensor in the collection loop is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
50: Domestic hot water sensor 1	B3	The hot water sensor is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the connecter is intact and correctly connected. If neces- sary, contact Gebwell service.
60: Room sensor 1		The room sensor is damaged.	Failure in the electrical system	Contact a qualified technician.	Check that the room sensor is con- nected and not externally damaged. If necessary, contact a qualified technician.
70: Additional reservoir's sensor l	B4	Failure in the heating res- ervoir's upper sensor	Failure in the electrical system	Contact a qualified technician.	Check that the sensor is intact and correctly connected. If necessary, contact Gebwell service.
71: Additional reservoir's sensor 2	B41	Failure in the heating res- ervoir's lower sensor	Failure in the electrical system	Contact a qualified technician.	Check that the sensor is intact and correctly connected. If necessary, contact Gebwell service.
81: LPB short circuit		Cascade system's inter- nal bus has short-cir- cuited.	Failure in the electrical system	Contact a qualified technician.	Check that the bus cable is intact and correctly connected.
82: LPB address duplica- tion		There are several heat pumps with the same de- vice address in the cas- cade system	Failure in the control sys- tem	Contact a qualified technician.	Check the device addresses. Master device = 1, Device 2 = 2 etc (LPB system)

No: Failure message	Sensor	Description	Cause	Measure	Measure
98: Extra module 1		The controller cannot de- tect the extra module 1 from the channel.	Failure in the electrical system	Contact a qualified technician.	Check the fastening of the flat cable between controllers. Check that the extra module is connected to power supply (green light).
99: Extra module 2		The controller cannot de- tect the extra module 2 from the channel.	Failure in the electrical system	Contact a qualified technician.	Check the fastening of the flat cable between controllers. Check that the extra module is connected to power supply (green light).
100: 2 time masters		There are two time mas- ters in the cascade sys- tem	Failure in the control system	Contact a qualified technician.	Check in the LPB system that only the master device has been defined as master (LPB system)
102: Clock not running reserve		The battery on the con- troller's operating moni- tor is running out.	Failure in the electrical system	Contact a qualified technician.	Check that the flat cable is fastened properly both to the controller and the display.
105: Maintenance notifi- cation		A maintenance notice is programmed on the con- troller.		Contact a qualified technician.	Perform annual maintenance of the equipment.
106: Source temp too low		The incoming tempera- ture from the collector is lower than set in the menu. The controller will restore the situation auto- matically in 4 hours.	Too low flow in the collector.	Check that the shut- off valves on the col- lector are open. Check the strainer on the collector. If neces- sary, contact a quali- fied technician.	Check the functioning of the collec- tor.
107: Hot gas, compr. 1		Alarm goes off, when hot gas sensor shows 130°C. 3 alarms per 8 hours are allowed with automatic restoring.		Contact a qualified technician.	Check the functioning of the cool- ing unit.
127: Legionella tempera- ture		The heat pump has not been able to maintain the requested temperature in the legionella function. The controller will retry charging after minimum idle time.	Domestic hot water has been used during raising operation.		
222: Heat pump pressure	E10	High pressure switch has tripped.	Too low a flow in charg- ing / heat supply circuit. Radiator or floor heating valves are shut off or set too low. Air in the heating system. The heating sys- tem pressures are too low. A clogged strainer.	Open radiator/floor heating thermostats. Vent the heating net- work. Check the net- work pressure. Clean the strainer. Check that the charging pump is running. If necessary, contact a qualified technician.	Check the functioning of the heat supply network.
223: Heating circuit start- up pressure	E10	High pressure switch has tripped in connection with the start-up of heat- ing.	Too low a flow in charg- ing / heat supply circuit. Radiator or floor heating valves are shut off or set too low. Air in the heating system. The heating sys- tem pressures are too low. A clogged strainer.	Open radiator/floor heating thermostats. Vent the heating net- work. Check the net- work pressure. Clean the strainer. Check that the charging pump is running. If necessary, contact a qualified technician.	Check the functioning of the heat supply network.
224: Hot water start-up pressure	E10	High pressure switch has tripped in connection with the start-up of do- mestic hot water heating.	Too low a flow in charg- ing circuit. Air in the heat- ing system. A clogged strainer.	Vent the heating net- work. Check the net- work pressure. Clean the strainer. Check that the charging pump is running. If necessary, contact a qualified technician.	Check the functioning of the change-over valves. Check the functioning of the charging circuit.

No: Failure message	Sensor	Description	Cause	Measure	Measure
225: Under pressure	E9	Under pressure switch has tripped.	Too low a flow in collec- tor. The shut-off/balanc- ing valves in the collec- tion loop are shut off. A clogged strainer. Too lit- tle liquid on the collection loop. The water in the heating system is too cold (under 15°C)	Clean the strainer on the collector. Add more liquid in the col- lector if needed. If necessary, contact a qualified technician.	Check the functioning of the collec- tor. Check the functioning of the source pump.
226: Compressor 1 over load	E11	Compressor motor pro- tection has tripped.	The compressor has tripped the motor protection.	Set compressor motor protection (F1) on ON-position. If nec- essary, contact a qual- ified electrician.	Check the power supply of the heat pump. Check the functioning of the compressor.
243: Swimming pool sensor	B13		Failure in the electrical system		
324: BX, same sensors		The sensors with same marking are connected to BX entries.	Failure in the electrical system	Contact a qualified technician.	Change the correct sensor ad- dresses.
324: BX/extramod. same sensors		The sensors with same marking are connected to BX entries.	Failure in the electrical system	Contact a qualified technician.	Change the correct sensor ad- dresses.
357: Cool.circuit l output water temp.		The temperature of the output water of cooling circuit is too low.	The control valve is in manual mode. Incorrectly set value.	Check the minimum temperature level of the cooling circuit.	
358: Soft starter	E25	Soft starter has given an alarm.	Heat pump motor protec- tion is turned off. The heat pump's power supply phases are reversed. In- stantaneous power failure. Power supply is missing a phase. The fuse is blown.	Check that the motor protection is on. Change the phase se- quence on the plug. Check that the heat pump's fuses are in- tact. Contact a quali- fied technician.	

# 15 MAINTAINING AND SER-VICING THE HEATPUMP

In order to ensure your heat pump's long service life and uninterrupted operation, the following inspections must be conducted a few times a year, and more frequently during the first year. Remember to also maintain and inspect the accessories in accordance with their instructions.

## 15.1 Maintenance notice

Maintenance functions can be used as a method of early prevention on periodical control. To make it easier to remember the equipment maintenance, the controller can be programmed to give a maintenance notice. Maintenance notice will appear on the display of the controller on selected intervals, disappears by pressing the *Reset* button.

This operation is carried out at the "Expert" level.

- 1. Press the OK button to access the menu.
- Select Service/special operations, press the OK button.
- 3. Select control row 7070, Heat pump's interval.
- 4. Scroll to the row interval in months.
- 5. Return to the start with the ESC button.

## 15.2 Inspections

Servicing must only be completed by a person with the required competency.

The refrigerant circuit must only be maintained by an authorised refrigerating equipment technician

#### General appearance and leaks

Check the interior and exterior of the heat pump for liquid leaks, oil and other deviations from normal operation. The safety valves expel some water due to pressure changes as part of their normal operation.

#### Liquid level and strainers of the collector

Check the liquid level of the collector and add more liquid if necessary. After commissioning, it may be necessary to add liquid over the course of a few days. Having to add a few litres is normal. If the liquid level is too low, allow the pump to run normally, open the admission valve and fill the tank with heat transfer liquid. If you need to repeatedly add liquid, contact an installation or maintenance company. The liquid level in the tank should drop slightly when the pump is activated and rise when the pump is stopped. Diverging behaviour is a sign of air, incorrect circulation direction or a blocked strainer.

Check and clean the collector strainer. The strainer should be checked several times immediately after commissioning. However, avoid unnecessary opening of the collector.

#### Checking the safety valves

Check the operation of the valves twice a year by turning the cap. Ensure that water comes out of the overflow pipe.

## 15.3 Nominal curves of sensors

NTC10k (all sensors of the device, excluding the outdoor sensor)

T [°C]	R [ohm]	T [°C]	R [ohm]	T [°C]	R [ohm]
-30,0	175 203	50,0	3 605	130,0	298
-25,0	129 289	55,0	2 989	135,0	262
-20,0	96 360	60,0	2 490	140,0	232
-15,0	72 502	65,0	2 084	145,0	206
-10,0	55 047	70,0	1 753	150,0	183
-5,0	42 158	75,0	1 481	155,0	163
0,0	32 555	80,0	1 256	160,0	145
5,0	25 339	85,0	1 070	165,0	130
10,0	19 873	90,0	915	170,0	117
15,0	15 699	95,0	786	175,0	105
20,0	12 488	100,0	677	180,0	95
25,0	10 000	105,0	586	185,0	85
30,0	8 059	110,0	508	190,0	77
35,0	6 535	115,0	443	195,0	70
40,0	5 330	120,0	387	200,0	64
45,0	4 372	125,0	339		

NTC1k (outdoor sensor)

T [°C]	R [ohm]	T [°C]	R [ohm]	T [°C]	R [ohm]
-30,0	13 034	0,0	2 857	30,0	827
-29,0	12 324	1,0	2 730	31,0	796
-28,0	11 657	2,0	2 610	32,0	767
-27,0	11 031	3,0	2 496	33,0	740
-26,0	10 442	4,0	2 387	34,0	713
-25,0	9 889	5,0	2 284	35,0	687
-24,0	9 369	6,0	2 186	36,0	663
-23,0	8 880	7,0	2 093	37,0	640
-22,0	8 420	8,0	2 004	38,0	617
-21,0	7 986	9,0	1 920	39,0	595
-20,0	7 578	10,0	1 840	40,0	575
-19,0	7 193	11,0	1 763	41,0	555
-18,0	6 831	12,0	1 690	42,0	536
-17,0	6 489	13,0	1 621	43,0	517
-16,0	6 166	14,0	1 555	44,0	500
-15,0	5 861	15,0	1 492	45,0	483
-14,0	5 574	16,0	1 433	46,0	466
-13,0	5 303	17,0	1 375	47,0	451
-12,0	5 046	18,0	1 320	48,0	436
-11,0	4 804	19,0	1 268	49,0	421
-10,0	4 574	20,0	1 218	50,0	407
-9,0	4 358	21,0	1 170		
-8,0	4 152	22,0	1 125		
-7,0	3 958	23,0	1 081		
-6,0	3 774	24,0	1 040		
-5,0	3 600	25,0	1 000		
-4,0	3 435	26,0	962		
-3,0	3 279	27,0	926		
-2,0	3 131	28,0	892		
-1,0	2 990	29,0	859		

## 15.4 Testing inputs and outputs

Here we assist on how you can test the operations of devices connected to the controller. The input/output test suspends all the controller's normal control operations. Turn off the compressor before starting the test, by switching the F1 motor protection to OFF position.

In order to carry out the input/output test, you must be in *Expert* level.

SIE	MENS	14:42
•	Regional settings Special operations Settings	
di Col	Expert	

### SOURCE PUMP TEST

Source pump test is carried out on user terminal 1 of the leading heat pump.



- 1. Move to *Expert* level,
- 2. Select Input/output test
- 3. Select row *Relay output QX5*, accept with button
- 4. Next select *Output UX 1/4* control row 7710 (Output test UX1)
- 5. Set the source pump's desired rotation speed on the row. (50-100%)
- Ensure the pump's operation by feeling the pump, reducing the shut-off valve of the collector (pipe makes a sound), and by checking the temperatures of the collector. The temperatures should settle between 0-7°C.
- 7. End the source pump's test by setting row 7710 --- and switch off relay test (No test).

### **CHARGING PUMP TEST**

Each compressor module has a charging pump. Test must be carried out for each charging pump separately.

- 1. Select Input/output test in menu Output UX 2/4
- 2. Select control row 7716 (Output test UX2)
- 3. Set the charging pump's desired rotation speed on the row. (50-100%)
- 4. Ensure the pump's operation by feeling the pump, reducing the shut-off valve of the charging circuit (pipe makes a sound), and by checking the temperatures of the charging circuit. The temperatures should have settled at the heating network's temperatures.
- 5. End the charging pump's test by setting to control row 7716 ---.

#### CHANGE-OVER VALVE TEST

Change-over valve test is carried out on user terminal 1 of the

leading heat pump.

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX8*, accept with button. The change-over valve turns to the DHW charging position A. (red triangle points to A)
- 3. Select to row *Stop all*. The change-over valve turns to the heating charging position B. (red triangle points to B)
- 4. End the test by setting to control row No test.

### HEATING CIRCUIT MIXING VALVE TEST

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX10*, accept with button. The mixing valve runs open.
- 3. Select to row *Relay output QX11*, accept with button. The mixing valve runs closed.
- 4. End the test by setting to control row *No test*.

## MIXING HEATING CIRCUIT PUMP TEST

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX9*, accept with button. The mixing heating circuit's pump is activated.
- 3. End the test by setting to control row *No test*.

### PUMP HEATING CIRCUIT PUMP TEST

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX12*, accept with button. The pump heating circuit pump is activated.
- 3. End the test by setting to control row *No test*.

### HOT WATER CIRCULATING PUMP TEST

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX13* accept with OK button. The hot water circulating pump is activated.
- 3. End the test by setting to control row *No test*.

### ELECTRIC HEATER CONTROLS TEST

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX1*, accept with button. K25 resistor control is activated.
- 3. Select to row *Relay output QX2*, accept with button. K26 resistor control is activated.
- 4. Select to row *Relay output QX3*, accept with button. K6 domestic hot water resistor control is activated.
- 5. End the test by setting to control row No test.

### ALARM FORWARDING TEST

- 1. Select Input/output test in menu Relay test (7700)
- 2. Select to row *Relay output QX6*, accept with button. The alarm relay is activated. The K10 further alarm relay receives control.
- 3. End the test by setting to control row *No test*.

# **16 TECHNICAL SPECIFICATIONS**

Gebwell GEMINI		40	52	64		
Power information						
0/35						
Output power	kW	45.0	61.0	69.2		
Cooling power	kW	35.0	48.0	54.8		
Input power	kW	10.0	13.0	14.4		
СОР		4.5	4.7	4.8		
0/55						
Output power	kW	40.6	54.6	61.8		
Cooling power	kW	25.6	35.2	40.2		
Input power	kW	15.0	19.4	21.6		
СОР		2.7	2.8	2.9		
5/35						
Output power	kW	52.4	71.6	80.6		
Cooling power	kW	42.2	58.2	65.8		
Input power	kW	10.2	13.4	14.8		
СОР		5.1	5.3	5.4		
5/55						
Output power	kW	46.4	62.4	70.6		
Cooling power	kW	31.4	42.8	48.8		
Input power	kW	15.0	19.6	21.8		
COP		3.1	3.2	3.2		
System's energy efficiency class, intermediate climate conditions, underfloor heating			A+++			
Number of compressor units		2	2	2		
Electrical information	1	1				
Rated voltage/electrical connection	V	400V 50Hz				
Recommended fuse size	А	3 x 40	3 x 50	3 x 63		
Max. supply current (incl. control systems and pumps)	(A <sub>rms</sub> )	34.5	42.0	51.4		
Start-up current	(A <sub>rms</sub> )	51.9	63.2	84.2		
Charging pump power	W 6-175					
Source pump power W 17-608			608	23-762		
IP classification		IP21				

Gebwell GEMINI		40	52	64
Refrigerant circuit				
Contains fluorinated greenhouse gases yes				
Hermetically sealed			yes	
Refrigerant			R410A	
GWP (Global Warming Potential)			2088	
Refrigerant volume per compressor unit	kg	3.8	3.4	3.4
CO <sup>2</sup> equivalence	ton CO <sup>2</sup> e	15.869	14.198	14.198
Cut-off, overpressure	bar		42.0	
Difference, overpressure	bar		-8	
Cut-off, under pressure	bar		3.2	
Difference, under pressure	bar		2	
Collector				
Energy class, source pump			low energy (A)	
Integrated source pump			No	
Maximum pressure	bar		4	
Minimum flow	l/s	1.42	2.00	2.48
Rated flow	l/s	1.66	2.36	3.00
Max external pressure loss at rated flow	kPa	81	70	100
Minimum brine output temperature	°C		-5	
Maximum brine output temperature	°C	20		
Charging circuit				
Energy class, charging pump			low energy (A)	
Integrated charging pump			Yes	
Maximum pressure	bar		4	
Minimum flow per compressor unit / charging pump	l/s	0.69	0.97	1.04
Rated flow per compressor unit / charging pump	l/s	0.97	1.21	1.45
Max external pressure loss at rated flow	kPa	72	50	43
Max heating water's output temperature	°C		68	
Sound power level	dB(A)	42	42	43.5
Dimensions and weights	-			
Width	mm		600	
Height	mm		1895	
Depth **	mm	875		
Weight	kg	400	400	400
Pipe connections	-			
Brine	G	1 1/4"		
Charging	mm	35		
Controller		Gebwell Albatros <sup>2</sup>		
Compressor			Scroll	
** Depth dimension does not take into account connection from rear.				

# **17 CONNECTION POINTS, CONTROLLER 1:**

## 17.1 Sensors



## 17.2 Controls



# 18 SETPOINT EXAMPLES FOR HEAT PUMP ADJUSTMENTS IN DIFFERENT HEATING NETWORKS

Set points of the heating circuits:

Row nu	ımber		Control row	Factory setting	Under floor beating	Radiator heat-	Air heating
HC1*	HC2*	НС3*			nearing	mg	
700	1000	1300	Opearating mode	Automatic			
710	1010	1310	Comfort set point	20			
712	1012	1312	Reduced set point	19			
714	1014	1314	Frost protection set point	15			
720	1020	1320	Heating curve slope	0,5	0,5	0,8	0,8
					(0,3-0,5)	(0,5-1,2)	(0,5-1,2)
740	1040	1340	Flow temp setpoint min	12	12	12	12
741	1041	1341	Flow temp setpoint max	45	45	55	55
					(35-45)	(45-60)	(45-60)
750	1050	1350	Room sensor compensation	20 %			
730	1030	1330	Summer/winter heating limit	16			

\*HC = Heating circuit

Domestic hot water set points:

Row number	Control row	Factory setting
1600	Operating mode	On
1610	Nominal set point	50°C

Heat pump's set points:

Row number	Control row	Factory setting	Underfloor heating	Radiator heat- ing	Air heating
2840	Return water temperature switching differen- tial	6	6	8 (8-10)	10

# **19 MAINTENANCE RECORD**

Date:	Measure:	*Fault code:	Performed by:	Nature of mainte- nance:
				R= repair
				M = maintenance
				S = change of set- tings

\*Fault code: If the device fails, enter the fault code issued by the controller in this column.

# **20 ENERGY LABELS**





A+++

#11/2013























A muutos B muutos C muutos V Z T Sigio Legio verso C Patrumopoliku Sigio		<u>د エ</u> ה ۳ m	D muutos
ELECTRIC HEATER CONVECTION PARTS LIS CONTACTOR K25 LC CONTACTOR K26 LC CONTACTOR K26 LC CIRCUIT BREAKER F2 NE WORK ON EXPOSURE BUTEDN SS TERMINAL BLOCK PE.N. L1,L2,L3 60 TERMINAL BLOCK 2,3,4 2, THERMOSTAT T1 S			
ST CIKIG10P7 9A CIKIG10P7 16A BI 3P CI6 9AC230 mm2 TB 90-110C LSI 7025 TB 90-110C LSI 7025 MLK GEMINI 40-64KW PART LIST SIEMENS RVS	GEMINI 64   NAME SDFT   STARTER AI   AUXILIARY CONTACTAI   AUXILIARY CONTACTAI   AUXILIARY CONTACTAI   AUXILIARY CONTACTAI   TECHNICAL DATA   TECHNICAL DATA   GEMINI 40KV   1. SUPPLY   2. CURRENT   3. OF ANNITE   4. IP-CLASS   IP-CLASS IP   5. MAX	S0-64 COMP SUPPLY X7, X27 GEMINI 40 NIMIKE SDFT STARTER AI AUXILIARY CONTACIAI AUXILIARY CONTACIAI AUXILIARY CONTACIFI AUXILIARY CONTACIAI GEMINI 52 NAME SDFT STARTER AI AUXILIARY CONTACIAI AUXILIARY CONTACIAI AUXILIARY CONTACIFI	CC C3 C4 <
SCHNEIDER 1 SCHNEIDER 1 CHINT 1 PHENIX 5 PHENIX	CABLES 4 PCS, GUIDE, BAG HNICAL DATA INI 52-64 KW INI 52-64 KW UPPLY VOLTAGE Un 400 V URRENT In 50-63A HURENT UN 200 V P-CLASS IP 20 IAX TEMPERATURE 35°C		







# **Declaration of Conformity**

We, Gebwell Ltd, hereby declare under our sole responsibility that the product

Aries Qi T<sup>2</sup> Gemini E-Flex Taurus

to which this declaration relates is in conformity with the

### LOW VOLTAGE DIRECTIVE 2006/95/EC ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 2004/108/EC

and the following harmonised standards and technical specifications have been applied:

LVD:EN 61439-1:2011<br/>EN 61439-2:2011<br/>EN 61439-3:2012EMCD:EN 61439-1 Annex J, Point J.9.4.2HD:60364 Low-voltage electrical installations<br/>384 Electrical installations of buildings

Commission Delegated Regulation (EU) No 811/2013 on energy labelling

Products are provided with a  $\mathsf{C}\mathsf{E}$  marking of conformity.

Tuure Stenberg Managing Director

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