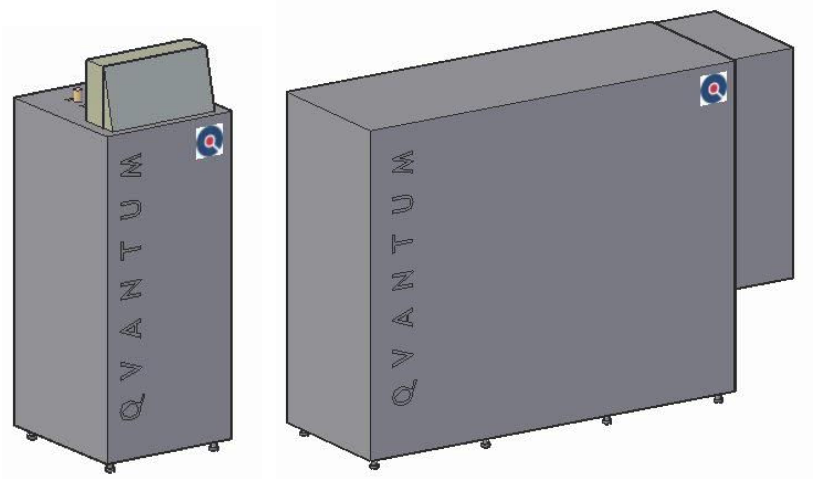
QVANTUM

HEAT PUMPS FOR SUSTAINABLE CITIES

QVANTUM LB4 –

Installation & user manual



Air/Water

41 – 165 kW

High efficiency
Economizer & Liquid injection
Noise reducing design
R407C

Heat pumps for air to water

Q48-192LB4

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1 QVANTUM V.I.P Q48-192LB4

The Qvantum LB4 is an air to water heat pump with an indoor compressor unit, resulting in a more silent outdoor air unit. The indoor and outdoor units are connected via a brine circuit, thus allowing for a more flexible installation of the outdoor air unit. Being equipped with both vapor injection and liquid injection, the LB4 covers a wide range of operating points as well as optimizing performance, even at very low outdoor temperatures.

1.1 Qvantum Vapor & Liquid Injection Power heat pump

Qvantum V.L.I.P. Series LB4 heat pump is equipped with EVI "two stage" compressor. The EVI compressor splits the compression phase into two parts. In the first step refrigerant gas from the evaporator enters the compressor in the same way as in a conventional compressor. In the second step, the compressed gas is supplemented by new cold gas from the economizer (sub cooler). This means that the emitted heat output is increased while also increasing the Coefficient of Performance (COP). The gas temperature during the compression process is reduced which results in a higher flow temperature being achieved. Even at very low temperatures of the brine, the unit can deliver up to 65 °C supply temperature. At extremely low outdoor temperatures the heat pump transitions to liquid injection to ensure safe operation of the compressor(s).

Benefits of VLIP economized heat pump

- Higher supply temperature can be achieved
- Higher heating capacity with increasing supply temperature
- Increased efficiency and coefficient of performance COP is obtained
- Continuous operation with low outdoor temperatures.

Below is the difference in the coefficient of performance, COP, and in heat release between a standard heat pump and V.I.P. heat pump:

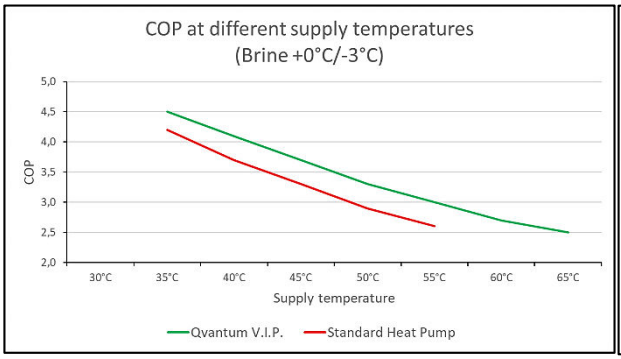


Figure 2 – Change in heat factor as function of flow temperatures, at brine +0°C/-3°C

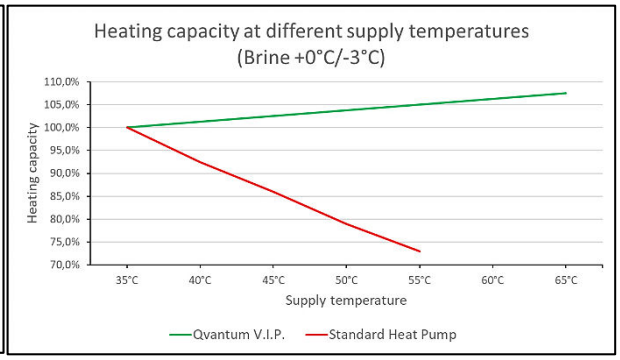


Figure 1 – Change in heat output as function of flow temperature, at brine +0°C/-3°C

1.2 ELECTRONIC EXPANSION VALVE

Qvantum V.L. I. P. heat pump Series LB4 is provided with two electronic expansion valves. One valve for the evaporator circuit and one valve for the economizer circuit. The expansion valves have a separate electronic control unit connected to the QLC showing the evaporation pressure, temperature, overheating, etc. of both circuits. Via modbus these variables can be transferred to a master control system. A magnetic valve operates the transition to liquid injection when needed in order to keep the compressors running despite very low brine temperatures.

1.3 Qvantum V.L.I.P Series LB4

Refrigerant:	R407C
Performance data:	See SPECIFICATIONS
Labelling:	The units are built acc. to Swedish Refrigeration Code

1.3.1 Description

The unit is built on a frame of galvanized square tubes and covered with a sound-absorbing enclosure, consisting of powder coated panels with sound absorbing material on the inside. The top plate is made of textured aluminium. The top and bottom are also covered with sound-absorbing materials. The frame stands on four or five adjustable rubber legs. All fittings and electrical connections are positioned on top of the unit for Q48LB4. The larger units have brine and heating connections on the backside. They are also equipped with an electrical cabinet on the side.

Conn.dim:	see Technical data	
Dimensions:	Q48LB	600x640x1665 mm (width x depth x height)
	Q65 - 144LB4	1500x640x1410 mm (width x depth x height)
	Q162 – 192LB4	2100x640x1410 mm (width x depth x height)
Weight:	See Technical data	
Color:	white side plates, zinc-plated frame, aluminium top	

1.3.2 Equipment

Compressor:	Hermetic EVI scroll compressor 3 phase, 400V	
	Q48LB4	- single compressor, single refrigerant circuit
	Q65- 96LB4	- dual compressors, single refrigerant circuit
	Q123-144LB4	- trippel compressors, single refrigerant circuit
	Q162-192LB4	-four compressors, two refrigerant circuits
Evaporator:	brazed plate heat exchangers, stainless steel, Armaflex isolated/circuit	
Condenser:	brazed plate heat exchangers, stainless steel /circuit	
Economizer:	brazed plate heat exchangers, stainless steel	
Defroster:	brazed plate heat exchangers, stainless steel	
Refrigerant circuit:	- Drying filter - Sight glass with moisture indicator - Solenoid valve with equipment for liquid injection power (L.I.P.) - Electronic expansion valves for refrigerant circuit and economizer (V.I.P.) - Pressure/temperature sensor - Control equipment with display (Modbus) for the main circuit - Pressure transmitter - High- and low-pressure switch, manual reset - Service valves for refrigerant pressure measurement	

	- Rotalock valves - Pressure protection equipment, high and low pressure
Electrical:	"Qvantum QLC" control system with 5" touch screen for control. The unit can be controlled according to selectable macros integrated into the system solution. Alarms and protective functions are also provided.
Electrical supply:	See Technical data
Electrical connections:	See Technical data
Testing:	The units are tested and adjusted at the factory.

2 DELIVERY AND INSTALLATION INSTRUCTIONS

2.1 Delivery and handling

The units are delivered ready to install and tested from fabric. Only the adjustable rubber feet are delivered separately. These are temporary attached to the top of the unit or inside the unit. The units are delivered with a plastic protection on a pallet. The units are easy to transport with a pallet truck. Before installation, the adjustable rubber feet must be mounted in the corner of the bottom frame. In this shape, the unit is easy to transport with a trolley. ***N.B. the tubes on the top, on some units at the back, must NOT be used as handles or broken in connection with the transport.*** Hold on to the frame of the unit when manoeuvring it. If necessary, the unit can be heavily leaned. In this case, lean it towards the back side to avoid oil transport in the refrigerant system. If the unit has been leaned heavily, it must not be started within 24 hours.

2.2 Arrangement

The unit must stand on a stable and levelled floor which does not deform from the load. (See weight in the *Technical Data*). A separate foundation is not necessary. The adjustable rubber feet must be mounted before the installation. These should be screwed in the bottom frame in the way that max. 10 - 15 mm of the thread is outside the frame. Take care that no rubber feet are screwed out to far. The unit must stand completely horizontal and be placed so that the front side is easy to access. All normal maintenance can be done when the front cover is removed. On the other sides there should be a free space of minimum 100 mm. Also, ensure safety distance in front of the electrical cabinet. At installations where noise/vibrations could be a problem, pieces of rubber carpet (vibration cloth) could be placed under the rubber feet to prevent eventual vibrations being transmitted through the floor.

2.3 Pipe connections

All pipe connections are placed on the top or back of the unit. The cooling and the heating system are to be connected to respective external system. Follow the notes on the connections. The dimensions are listed in the technical data. ***The unit must not carry the load from connecting pipes***. The pipes must be well supported so that the heat pump connections are not damaged. Neither breaking nor up/ down may occur. To prevent vibrations transmitting into the pipe system, flexible hoses or compensators can be installed between the unit and the external pipe system. Normally this is only needed in the heating system. The cooling system is normally leading direct out of the house. When using the flexible hose, this shall have at least one 90° elbow to be effective. All pipes should be insulated all the way to the top of the unit.

A strainer should normally be installed in both the cooling and the heating system before the unit. It is especially important that the cooling system is equipped with a filter with maximum hole width of 0.5 – 0.7 mm.

The brine system is to be fully fitted with condensation isolation and an expansion vessel customized for the specific system.

2.4 Brine system

The system requires **40 % ethylene glycol** in order to handle the low temperatures. The brine must be premixed when the system is filled.

2.5 Outdoor air units

Please see handling instructions in appendix 6.

The outdoor air unit should be placed horizontally and with a clearance allowing air to flow freely over the entire surface of the battery. When multiple air units are used, they should be placed with a minimum spacing according to instructions in appendix 6.

The underside of the battery must be elevated at least +700 mm above the surface beneath.

The unit are to be mounted on a firm surface or frame in a horizontal position. The ground underneath the unit ought to be a drainage layer.

Mounting of cable trays are not permitted bellow the marked line on the side of the unit.

If a fence or similar are installed nearby the unit, it should be of such type that it does not prohibit air flow to the unit.

2.6 Electrical connection

A main switch must be installed on the incoming line.

The unit contains a complete electrical system with power distribution, controls and alarm functions. All is finished internally. Only the heating- and the cooling- pumps must be connected to the electrical system according to the manual/instructions of the pumps.

An outdoor sensor is optional but required to use outdoor compensated temperature to the heating system. If mixing valve(s) are used in the heating system this outdoor sensor is used to control this valve(s). The outdoor sensor must be mounted on a northern facade. It is then connected to the electrical system according to the circuit diagrams.

Temperature sensors are mounted to the heating systems supply and return pipes. Temperature sensors must also be installed in domestic hot water boiler/accumulator tank.

If mixing valves are in use, these must be connected to the control system.

There is also possibility to connect wiring for control of the auxiliary heat, both a digital on/off and an analogue 0 -10V(DC) signal for capacity control. The electrical system also has the possibility for connection to an external control system, external on/off, export of alarm signals, running indication and Modbus communication. See separate instruction. See complete circuit diagrams in appendix 3.

Electric wiring to the outdoor unit is connected to the fans safety switch. The power supply could be 1~230V or 3~400V depending on model. The unit also needs a 0-10V DC signal from the compressor unit. There is a terminal box on the fan unit for this connection.

Attention! All electrical connections at the power supply system, inside the heat pump and external components, must be tightened after transport and a few months of running.

2.7 Start-up

See separate instructions for the start-up procedure. At the start-up it is very important that all preparations are carefully performed. A technician, authorized by QVANTUM shall be attendant by the start-up. The start-up protocol shall be completed and sent to QVANTUM.

3 START-UP INSTRUCTIONS Q48LB4 – 192LB4

A person authorized by Qvantum must be present at the start-up of these units. Proper commissioning is important for trouble-free operation.

3.1 Preparations

Before starting up, the positioning of the unit must be checked, making sure it is in a stable and horizontal position.

Check that all pipe connections and electrical connections are made correctly. Connecting pipes are not allowed to put weight on the heat pump, these must hang from the ceiling or equivalent.

Check that the motor protection for the compressor is set according to the data sheet.

Turn on the main switch for the electrical system and check that all fuses and motor protection switches are switched on. Also, make sure that the compressor crankcase heater is activated.

Check that the brine system is properly ventilated and that the pressure in the system is correct.

The circulating pump in the cooling system can now be tested, see section 4. The pump can be started on contactors set to manual mode.

Start and stop the pump repeatedly to really check that the system is vented. If frost preservatives are required, make sure it´s mixed in correct amount before commissioning.

Check that the heat transfer system is vented and that the pressure in the system is correct. The condenser pump can be run either in parallel with the compressor or continuous operation depending on the system solution in the controller. Heat transfer pump can be tested by setting the contactor to the manual position.

Make sure that all systems are completely tight. Also check inside the heat pump so that no damage / leaks have occurred.

3.2 Starting the unit

When the compressor crankcase has warmed up (approx. 30-40 °C), the unit is ready for start-up. Feel with your hand on the bottom of the compressor.

Check that there are no alarms and that the operating thermostat / regulator calls for start. If alarms are indicated, these must be reset; please see *Troubleshooting Instructions*, section 5. Start the pumps and make sure that the flowrates are correct. If Qvantum's control system is used, the pumps will start before the heat pump (compressor) starts.

Start the compressor on the controller. The unit is started by pressing AUTO / OFF buttons in the menu system (under OPERATING MODE). With Qvantum's control system, the compressor will start after a time delay (max. 5 min). Check that the outgoing heating water rises in temperature after starting. Observe, there is a restart delay of approx. 5 minutes.

NOTE! In the case of a scroll compressor, it must be checked that it is moving in the right direction. It is very important that this type of compressor has the correct phase sequence. If it is in the wrong direction, an abnormal noise will be heard at the same time as the compressor and will not deliver reasonable working pressures. Suction pressure should drop.

Let the compressor work for a few minutes and then feel with your hand on the compressor that it is still warm at the bottom (30-40 °C). The scroll compressor is warm all over the housing (NOTE, very hot at the top). It bubbles strongly in the sight glass for a short while after starting, but then decreases and should after approx. 2-3 min have completely disappeared. In units with refrigerant R407C, it might bubble a little all the time. Listen carefully for noise in the system. Check

temperatures in display on refrigerant and heat transfer medium in / out. Are the differences reasonable between flow and return? Fill in the protocol. For recommended values please see *Technical Data*.

Make sure the fans in the outdoor air unit starts when the brine pump starts. The fans turn of when in defrosting mode, this is an automated function pre-set from factory.

3.3 Alarm functions

When the unit has been in operation for a while and works steadily, alarm functions can be tested. (When unit with reversible option is installed, alarm functions should be tested in heat pump mode).

The high pressure pressostat is tested by decreasing (or shutting off) the flow of the heat carrier. When the outlet has reached approx. 67 °C (R407C) the compressor must stop, and the alarm "HIGH GAS PRESSURE" will be indicated. This setting is made at the factory and should not be changed.

The low pressure pressostat is tested by decreasing (or possibly shutting off) the flow in the cooling system.

The temperature at which the unit stops is different depending on the type of system.

Alarm "LOW GAS PRESSURE" must be indicated.

NOTE, for systems with fresh water in the brine circuit it is important to keep track of the suction pressure of the compressor (see display). Any fine adjustment of this pressure switch may only be done by a Qvantum authorized person.

The motor protection breaker for the compressor can´t be tested. The compressor motor can withstand much higher loads than normally expected within a unit.

Motor protection for 3-phase pumps can be tested by breaking off one phase. The release time should normally be approx. 10 sec. Precautions must be taken so that the engine does not burn. Preferably, the operating current should be measured with an ampere meter in the meantime.

In connection with alarm tests, precautions must be taken to ensure that all interlocks in the electrical system are correct. Please section 2.6.

3.4 Control functions

When the alarm functions have been tested, control signals must also be checked. The heat pump's control function is tested so that the compressor and possibly pumps stop as intended without triggering any alarms. Also check that the system starts as intended. Nothing in the unit is supposed to switch on and off repeatedly with short intervals in connection with start-up. The pumps (heat and cooling) shall start before the compressor.

3.5 Protocol

When the unit is in operation and all adjustments are complete, temperatures can be measured to complete Qvantum's *Start up Protocol*. **This protocol must always be completed by a technician and sent to the agent.** All remarks noted by the start-up must be cleared before the protocol is completed.

4 CONTROL SYSTEM (QLC) FUNCTIONAL DESCRIPTION

General

QLC stands for Qvantum Logic Controller and is the standard control unit for Qvantum heat pumps. In this chapter you will be guided through the menu system of our QLC. Do not use sharp objects such as screwdrivers, knifes etc when operating the panel as it is design to be used with blunt objects only, preferably your fingers.

Connection

The QLC communicates between the control unit and the HMI are Modbus using TCP/IP protocol, network cable. Both these units have a fixed IP address set from factory. These can be changes by authorized personnel.

Connect a network cable to the unit(s) switch/ethernet switch.

Default IP settings as follows:
Monitor:
IP: 192.168.0.20 (Web gate)
Mesh: 255.255.255.0
Gateway: 192.168.0.1

QLC:
IP: 192.168.0.10 (Modbus)
Mesh: 255.255.255.0
Gateway: 192.168.0.1

Web gate

If the heat pump is connected to a network, the monitors Web Gate can be accessed via a web browser simply by typing the HMI IP address when you are connected to your local network. This requires allowing an add-on to your browser. If you wish to connect to it from an external network, you will need to open port: 6001 for the web browser and port 6002 for the app. The apps name is Vijeo Design Air and are available on Appstore and google play.

Modbus

The QLC`s Modbus protocol is accessible when the heat pump is connected to a network. Connect to the QLC`s IP address. Please see appendix 2.

4.1 Start

At the start menu, select language (Currently available in Swedish and English). It also displays the outside temperature as monitored by the outdoor sensor.

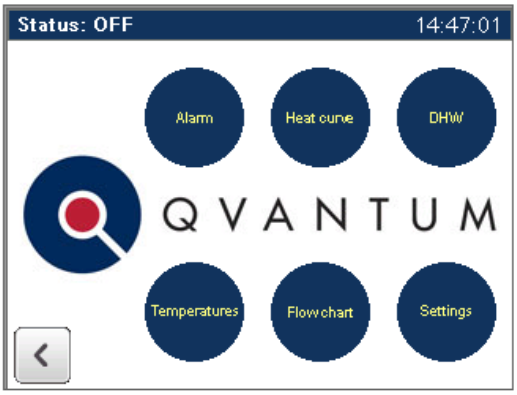
The arrow on the right-hand corner takes you to the main menu.

The current status of the heat pump is also displayed here.

5 different icons provide a quick overview of the status:

	Indicates the compressor is running.
	Indicates the heat pump is producing domestic hot water.
	Indicates that auxiliary heating has permission to start.
	Indicates defrosting process is active (only exhaust air heat pumps)
	Indicates electric heater in defrosting tank is active. This is always set manually.

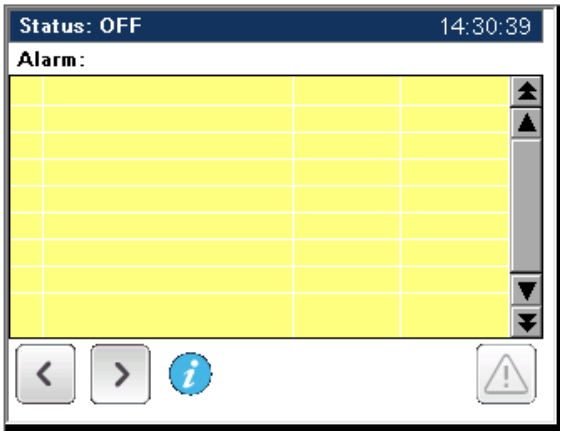
4.2 Main menu



In the main menu there are 6 icons to press:

- Alarms
- Heat curve
- DHW (Domestic hot water)
- Temperatures
- Flowchart
- Settings

4.3 Alarms



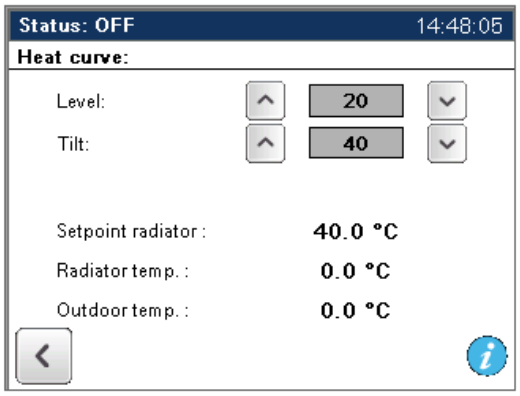
Active alarms listed with time/date of when triggered.

Reset alarms with button on lower right corner.

The arrow pointing to the right will take you to the alarm history. Please note that the history will reset when you cut the power to the QLC.

The info button provides a basic troubleshooting guide.

4.4 Heat curve



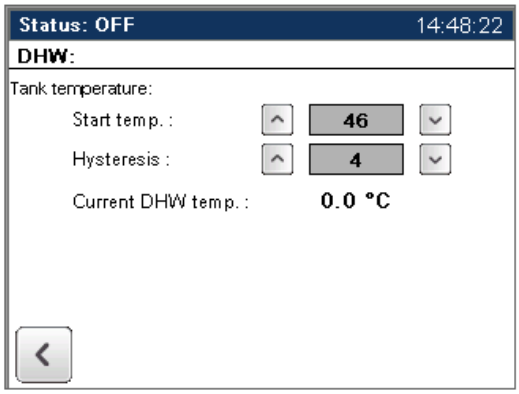
4.4.1.1 Level

Parallel offsets the curve up/down independent of outside temperature.

4.4.1.2 Tilt

Supply temperature @ 0 °C outdoor.

4.5 Domestic hot water



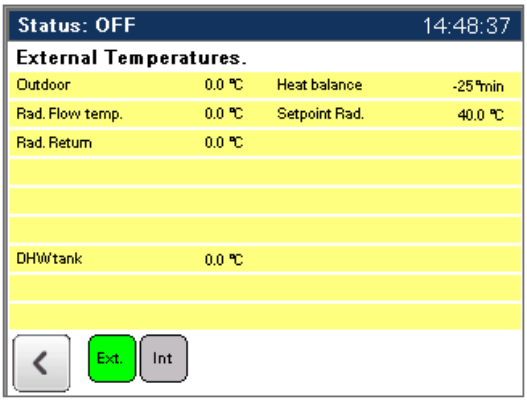
4.5.1.1 Start temp.

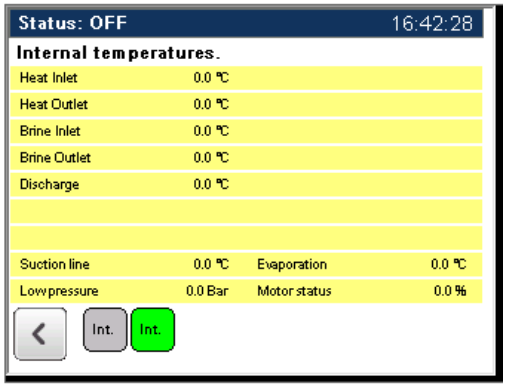
Sets start temperature for hot water production.

4.5.1.2 Hysteresis

Stop diff. for hot water production.

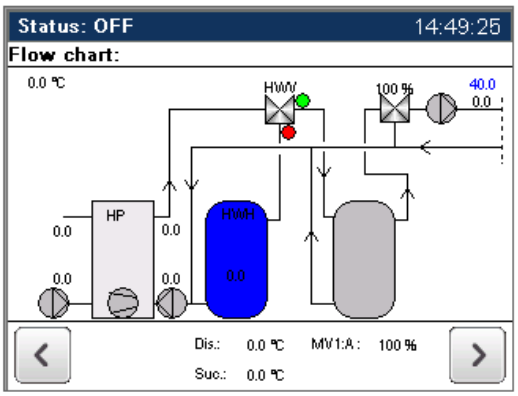
4.6 Temperatures





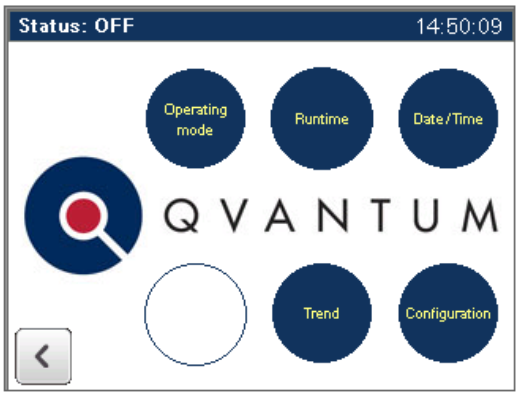
Shows current temperatures in the heat pump.

4.7 Flow chart



Displays a simplified flow chart of how the heat pump regulates your heating system. This image changes depending on how you pose into the function in the heat pump.

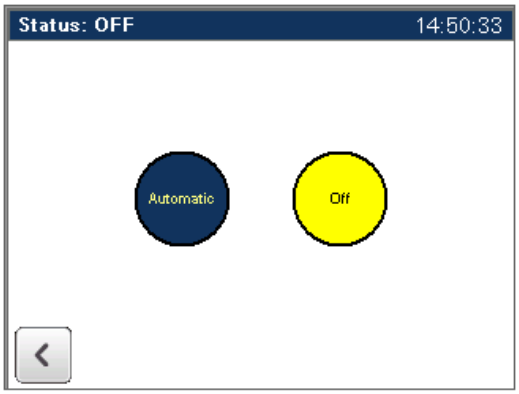
4.8 Settings



Pressing on *Settings* in the main menu gives access to:

- Operating mode
- Runtime
- Date/time
- Trend
- Configuration

4.9 Operating Mode



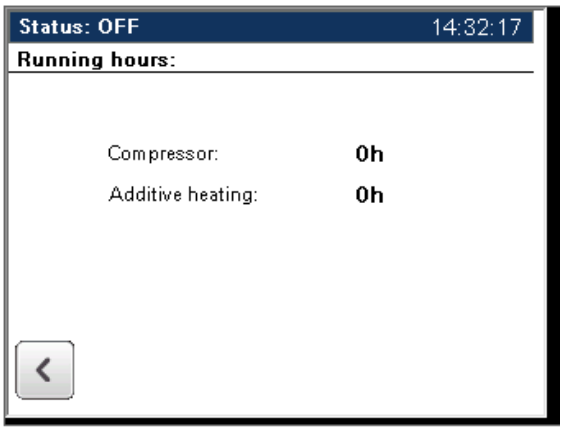
Automatic

Regulates the heating system by demand.

Off

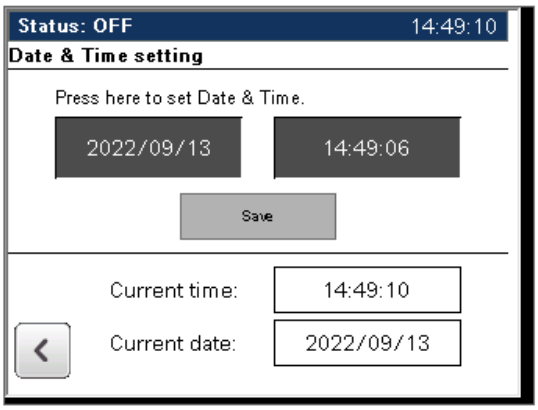
Stops the heat pump and all associated pumps

4.10 Runtime



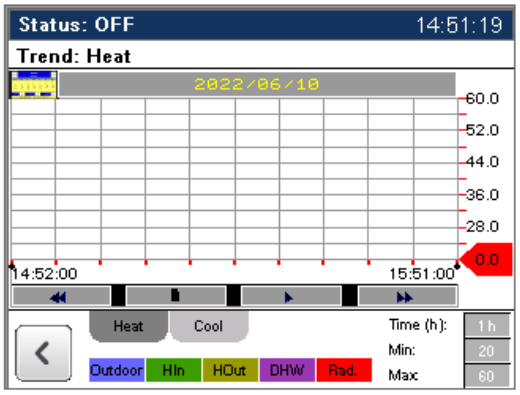
Displays hours of runtime for the compressor and auxiliary heat source.

4.11 Date/time



Date & time settings for the QLC. It automatically changes between summer/wintertime.

4.12 Trend

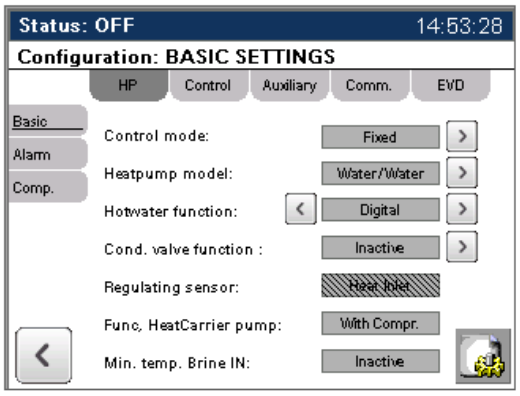


Displays temperatures over time in the heat pump.

Scale in diagram can be manually changed.

Both condenser and evaporator side can be displayed.

4.13 Configuration



N.B. – Requires password for access.

Settings for the heat pump and heating system.

Don´t change settings in this tab without knowledge of the consequences.

4.13.1 Basic settings

4.13.1.1 Control mode:

Choose between four different modes on how the heat pump is operating.

- Solid condensation
- Liquid condensation
- External control

4.13.1.2 Heat pump model

Chose which model is in question:

- AIR/WATER (LB4, KVP)
- WATER/WATER (RS/2, RSe, VS)
- Reversible

4.13.1.3 Min. temp. brine IN

Sets if thermostat function is used on the cooling side.

4.13.1.4 Compressor type

Digital or analogue compressor.

Analogue compressor is only available with floating or external control mode. Please note that the heat pump must be built with a speed-controlled compressor.

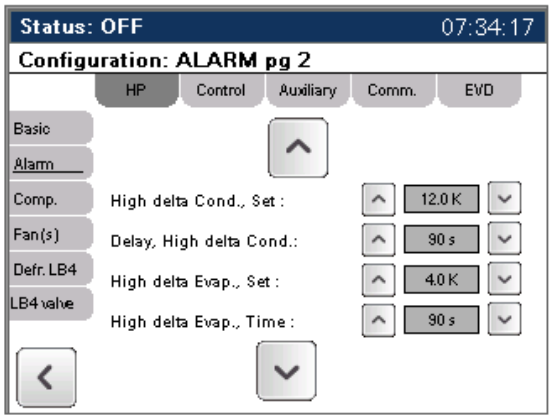
4.13.1.5 Domestic hot water function

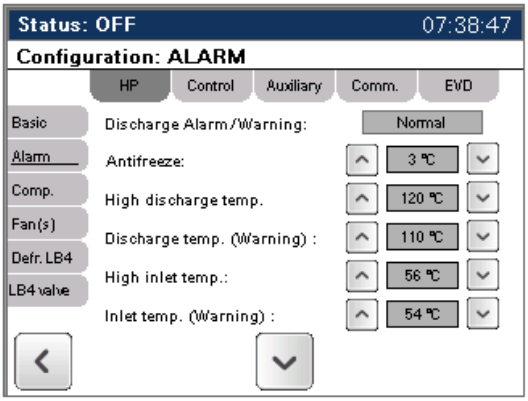
Chose if there is a 3-way control valve with switching actuator.

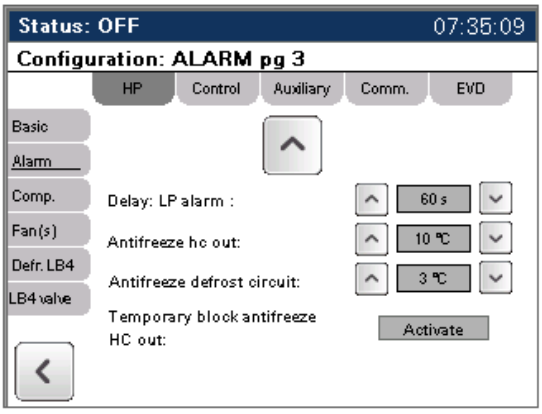
4.13.1.6 Func. heat carrier pump

Chose if pump runs continuously or only when compressor is running. Please note that with the pump will stop if the operating mode is set to off.

4.13.2 Alarm settings







Please have in mind if the setpoints are changed it could have serious consequences and may affect your warranty.

4.13.2.1 Discharge alarm/warning

Manual blocking of hot gas alarm/warning.

4.13.2.2 Freeze protection

Alarm level for antifreeze thermostat on brine return.

Stops compressor in case of triggered alarm.

LB4 uses active defrosting by utilising energy from the heat carrier. Therefore, there is a built in freeze protection on the heat carrier side. This function can be blocked temporarily.

4.13.2.3 High temp. Discharge

Alarm level for discharge temperature.

Stops compressor in case of triggered alarm.

4.13.2.4 High temp. Discharge (Warning)

Warning level for discharge temperature.

4.13.2.5 High Inlet temperature

Alarm for high temperature on Heat carrier supply.

Stops compressor in case of triggered alarm.

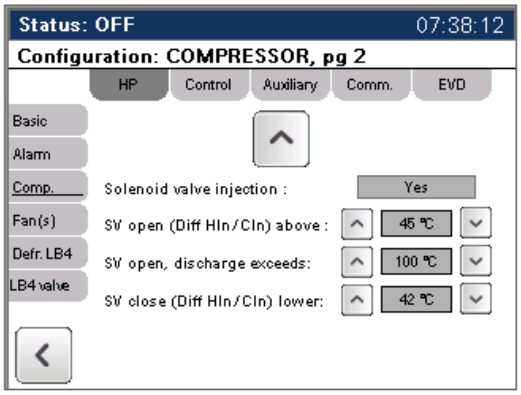
4.13.2.6 High inlet temp. (Warning)

Warning level for high temperature on Heat carrier supply.

4.13.2.7 Delay LP Alarm

Set the delay (in seconds) for the low-pressure pressostat alarm to stop the compressor.

4.13.3 Compressor settings



4.13.3.1 Power on delay

Set the delay time for compressor start.

4.13.3.2 Restart delay, Off-on

Set the rest time for compressor from stop till it is allowed to start again. This should not be any lower than 5 min.

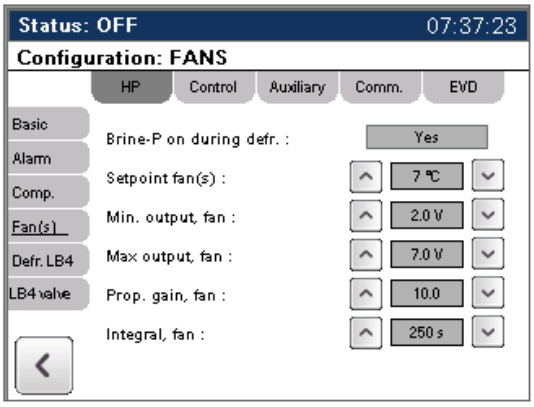
4.13.3.3 Start delay, pump-comp.

Set time the pumps start before the compressor.

4.13.3.4 Solenoid settings

Adjustable settings for when the heat pump transitions from V.I.P to L.I.P.

4.13.4 Fans



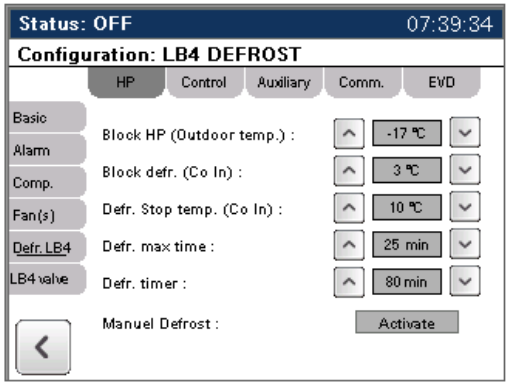
4.13.4.1 Set point fans

Set point for the fans, brine IN.

4.13.4.2 Min/Max output signal fans

Allows user to set min/max rpms on fans.

4.13.5 Defrosting LB4



4.13.5.1 Block HP

Lowest outdoor temp for the heat pump to operate.

4.13.5.2 Block defrost

Start temperature for defrosting program. If temperature on brine IN is higher than set value the defrosting function is blocked.

4.13.5.3 Defr. Stop temp

Stop temperature for the defrosting function.

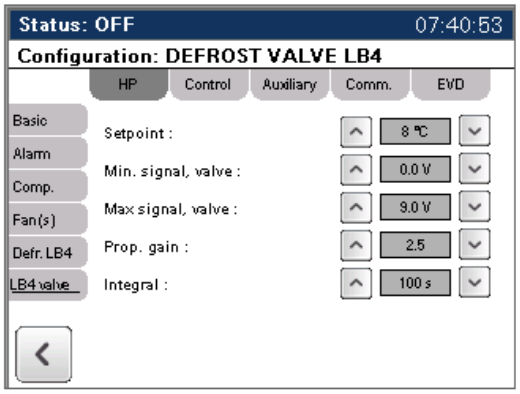
4.13.5.4 Defr. Max time

Maximum allowed time for defrosting cycle.

4.13.5.5 Manual defrost

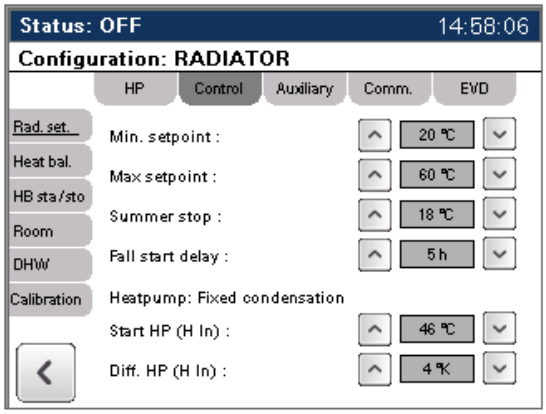
Triggers a defrosting cycle.

4.13.6 LB4 valve



The LB4 valve regulates the temperature over the defrosting plate heat exchanger in order to avoid risk of freezing. These settings must therefore be regulated with precautions.

4.13.7 Rad. Settings



Min and max setpoints here overrides values from heat curve and outdoor temperature.

4.13.7.1 Min. setpoint

Set lowest possible outgoing temperature to the radiators.

4.13.7.2 Max. setpoint

Set highest possible outgoing temperature to the radiators.

4.13.7.3 Summer stop

Set at what outdoor temperature the heating system is off. This does not apply to DHW.

4.13.7.4 Fall start delay

Set the number of hours the outdoor temperature must be below set temperature before heat system is allowed to start.

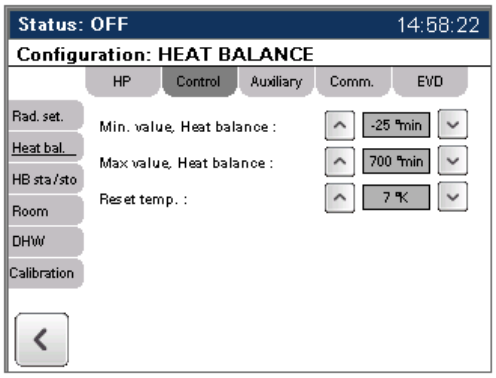
4.13.7.5 Start HP

Set value for compressor to start on heat carrier IN temperature. If value is below set point the compressor starts. (Only applies if Return temp. is set as control in *basic settings*)

4.13.7.6 Diff HP

Differential stop for compressor on heat carrier temperature IN. (Only applies if Return temp. is set as control in *basic settings*)

4.13.8 Heat balance



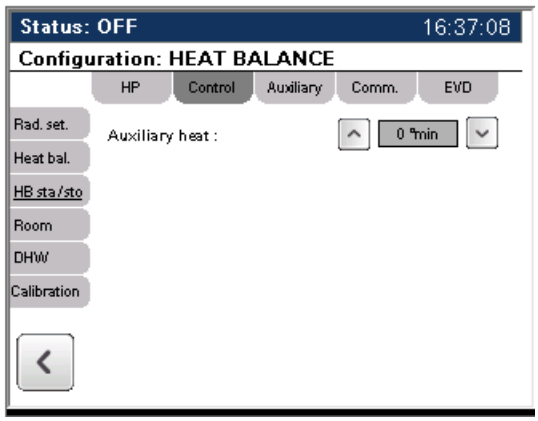
4.13.8.1 Min/Max. value Heat balance

Set points in which between the heat balance are allowed to operate. This prevents the heat balance going of too much in one direction, creating an imbalance in the heating system.

4.13.8.2 Reset temp

Resets the heat balance when the difference between setpoint and actual value differs more than set value.

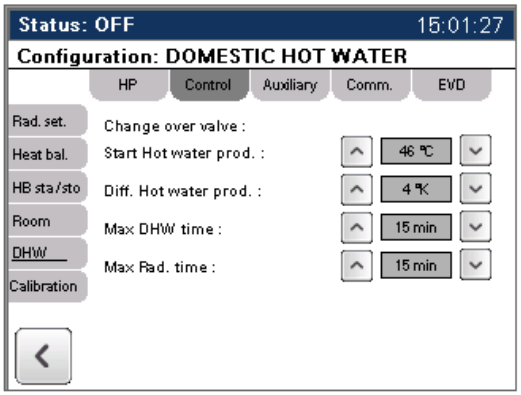
4.13.9 Heat Balance start/stop



4.13.9.1 Auxiliary heat

Set number of minutes x degrees Celsius before auxiliary heat start.

4.13.10 DHW



These settings are used when a switching valve has been selected in *Basic settings*.

4.13.10.1 Start Domestic Hot Water prod.

Starting temperature in tank for DHW. When actual value falls short of setpoint the switching valve turns to domestic hot water production.

4.13.10.2 Diff Domestic Hot Water prod.

Stopping temperature for DWH production (Start temp. + diff.).

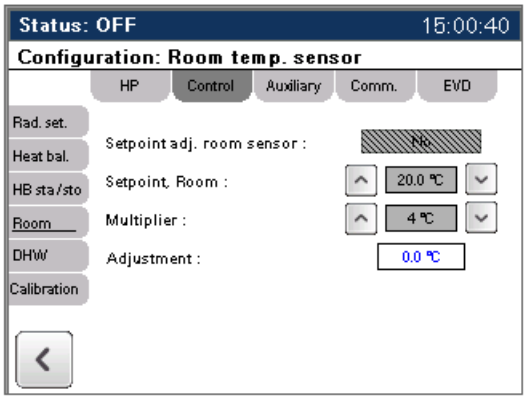
4.13.10.3 Max Domestic Hot Water time

Set maximum time hot water production is allowed before needing to switch back to heating mode.

4.13.10.4 Max Rad. Time

Set maximum time in heating mode before allowed to switch back to DHW production.

4.13.11 Room sensor



4.13.11.1 Setpoint adj. room sensor

Activates function for room temperature compensation on the heat curve.

4.13.11.2 Setpoint room

Setpoint for the room temperature sensor.

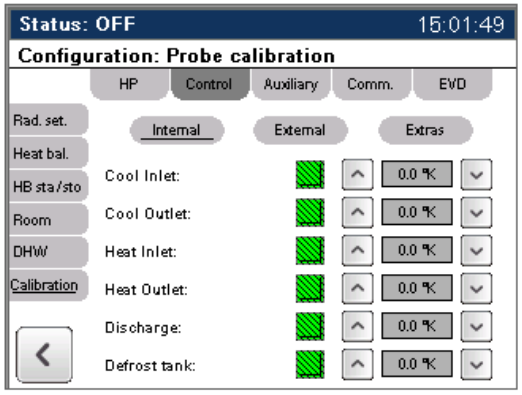
4.13.11.3 Multiplier

Factor for calculating compensation of heat carrier temperature.

4.13.11.4 Adjustment

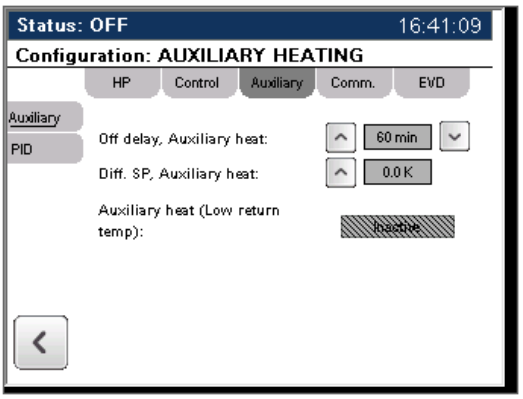
Offsets temperature on room temperature sensor.

4.13.12 Calibration



Sensor calibration is rarely needed but might be of value if the connecting sensor cable is very long. Green buttons activates sensor and the values can be offset with the adjacent fields. Please have in mind that the sensor value is not linear, but the calibration is.

4.13.13 Auxiliary heat



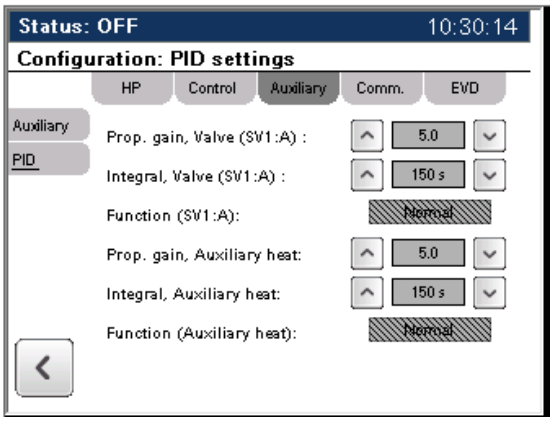
4.13.13.1 Off delay, auxiliary heating

Set delay time for auxiliary heat to switch off after demand has ended.

4.13.13.2 Auxiliary heat at low return:

Activates the function for control of auxiliary heat based on heat carrier return temp. (Only when Return temp is set as control in basic settings).

4.13.14 PID settings



4.13.14.1 Prop gain, Valve

Control parameter for the control signal.

4.13.14.2 Integral, Valve

Control parameter for the control signal.

4.13.14.3 Prop gain, Auxiliary heating

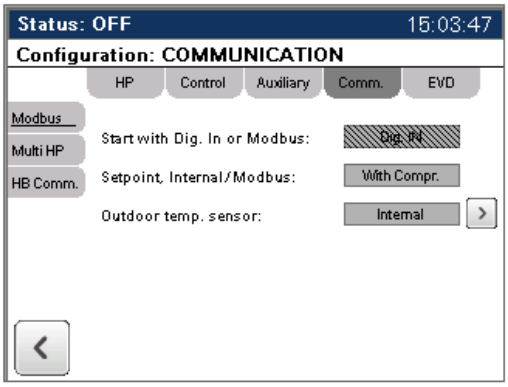
Control parameter for the control signal.

4.13.14.4 Integral, Auxiliary heat

Control parameter for the control signal.

4.14 Communication

4.14.1 Modbus



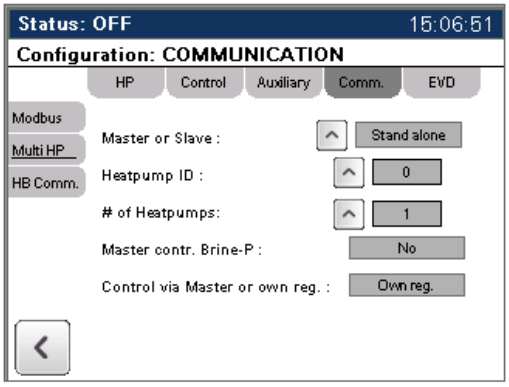
4.14.1.1 Start with Dig. In or Modbus

Chose if using a digital starting signal or Modbus object for start/stop/blocking the heat pump.

4.14.1.2 Setpoint, Internal/Modbus

Chose if an internal calculated heat curve should be used or importing through Modbus.

4.14.2 Multi HP



4.14.2.1 Master or Slave

If multiple heat pumps are used, one is set as master and the rest as slaves. The master controls start/stops of slaves using heat balance. It also evens out runtime between the heat pumps in the system.

Each slave can produce domestic hot water individually, either by its own temperature sensor in the tank or by way of the master.

4.14.2.2 Heat pump ID

Each heat pump is required an individual ID. The masters ID is always 0. Please note that this will require custom settings in software of the QLC and it must be done by Qvantum technician.

4.14.2.3 Number of heat pumps

This tells the master how many heat pumps there are available. Number includes the master itself.

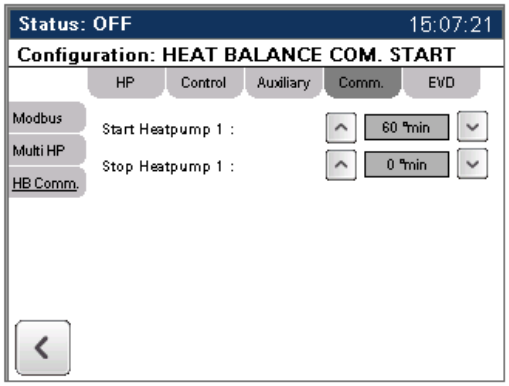
4.14.2.4 Master contr. Brine-P

In some cases there is only one Brine pump. In this case the alarms for this are connected through the master, shutting of all heat pumps in case of alarm.

4.14.2.5 Control via master or own reg.

Set if heat pump is controlled via communication protocol or internal regulator. (Only affects if the heat pump is set as master, the others will be automatically set to communication protocol).

4.14.2.6 Start/stop value multiple heat pumps



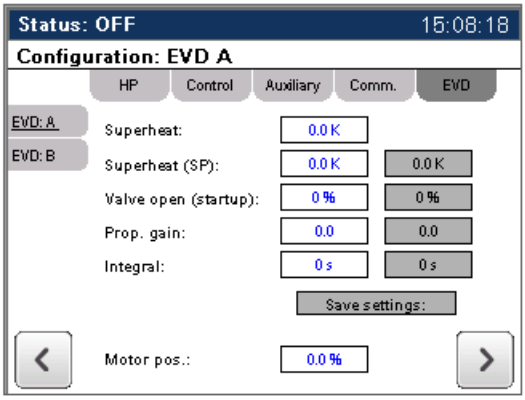
This tab is used when multiple heat pumps are a part of the system and controlled from a master. All heat pumps are controlled with heat balance from the master.

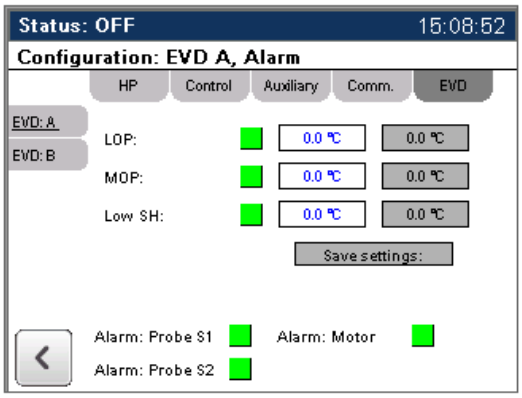
Depending on the number of heat pumps chosen previously, a corresponding number of start/stops will appear in this tab.

4.14.3 EVD

The EVD Controls the expansion valve. There is to EVD (A and B) if the heat pump is fitted with an economiser. If no economiser is present the tab for EVD:B is not accessible.

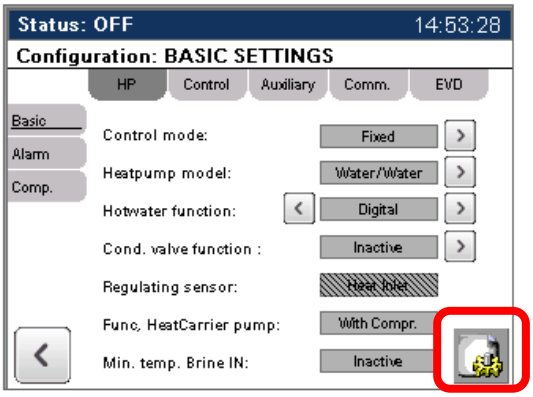
4.14.3.1 EVD:A





This section is showing an overview of the expansion valves different setpoints and actual values.

4.15 Extra settings



By pressing the icon on the lower right corner, under Heat pump Basic settings, additional settings are accessed. Here the user can reset values too factory settings or back-up settings, settings for energy meters, manual override of digital outputs (use with caution).

5 TROUBLESHOOTING INSTRUCTIONS

The following instructions are a diagram for locating faults in the heat pump. The heat pump controller QVANTUM QLC is located in the front panel and indicates which fault has occurred. This is shown by the display turning red and the alarm appearing in clear text in the alarm panel. The following alarms are indicated:

High pressure pressostat

The temperature is too high in the heat carrier circuit. This might also depend on insufficient flow on the heat carrier pump. Check that the heat carrier pump works. The operating thermostat / temperature control in the controller may be set too high. The maximum permissible outgoing temperature on the heat carrier depends on the setting of the pressure switch. For standard units type RS/2, this temperature is approx. 67 °C. The compressor and brine pump stop. Acknowledge alarms in the controller display.

Low pressure pressostat

Too low temperature or insufficient flow in the brine circuit. Check the function of the brine pump. The low pressure pressostat can also indicate a lack of refrigerant in the unit. Check the sight glass for deviations such as bubbles which could indicate a shortage of refrigerant. The compressor, fan and brine pump stop. Acknowledge alarms in the controller display.

Motor circuit breaker compressor or brine/heat carrier pump

Tripped motor circuit breaker / overcurrent relay. Electrical fault, check that there is no phase missing. Check for loose or burnt contacts. Compressor and brine pump stop. Reset the manually triggered motor protection switch in the electrical equipment (black button pressed) and acknowledge the alarm in the controller. In the event of further stops, contact an electrician to check the electric motor, cables and electrical components.

Freeze protection thermostat

The outgoing temperature on the brine has been too low. The minimum permissible brine temperature after the unit is set in the controller. The setpoint is depending on the source, see appendix 1. This function prevents the unit from running the brine temperature too low. This may be due to either low flow on the brine pump or outgoing brine temperature being too low. Check the function of the brine pump and filter. Compressor and brine pump stops. Acknowledge the alarm in the controller. Current brine temperatures in and out can be read in DISPLAY under MENU1, Temperatures.

High return temperature heat carrier

The heat carrier inlet temperature has been too high. In the controller, the maximum permissible heat carrier temperature is set. Normally this is set to 56 °C. Check the function of the pump and filter. This function prevents the unit from running with too high a liquid temperature on the hot side. Acknowledge the alarm in the controller.

Discharge thermostat

The discharge temperature from the compressor has been too high. The maximum permissible discharge temperature allowed for the compressor to operate is set in the controller. Normal setting + 120°C. Acknowledge alarm in the controller. Current discharge temperature can be read in DISPLAY under MENU1, Temperatures.

Sensor error temperature sensor

In the event of a temperature sensor error, this will be indicated by showing -39.1 °C in the display at the same time as the alarm text appears. This may be due to sensor failure or loose contact in cables.

Sensors in this system depending on the settings:

Internal temperature sensors:

GT1	Brine IN
GT2	Brine OUT
GT3	Heat carrier IN
GT4	Heat carrier OUT
GT5	Discharge compressor

Suction gas sensor connected to EVD.

External temperature sensors (Optional)

GT7	Outdoor sensor
GT8	Heating system flow
GT9	Heating system return
GT10	Accumulator tank/system tank

6 SUPERVISION AND MAINTENANCE

Normally the units do not need maintenance. The following schedule is a template for supervision that can be followed to obtain the best energy exchange and avoid unnecessary and unplanned downtime. Regarding refrigerant work, this is recorded and reported in accordance with local requirements in your country.

To be checked as often as possible:

P1. Any alarms present on the controller. In case of alarms, please see troubleshooting instructions.

P2. Temperature level on brine and heat carrier side, are they reasonable?

To be checked each quarter:

P3. Sight glass. There should be no or only few bubbles visible in the sight glass. An excess of bubbles could indicate a shortage of refrigerant. After 2-3 minutes of runtime these bubbles should vanish in full liquid.

P4. Scroll compressors are very hot on top and cooler in the middle and bellow.

P5. Check pressure in the brine and heat carrier system.

P6. Check for leaks on all systems, specially pumps and valves.

P7. Check heat pump for abnormal sound and vibrations.

P8. Read values from runtime counter.

P9. Check the outdoor unit, make sure there is nothing obstructs the air flow underneath the battery.

In general:

A1. All electric cables must be re tightened directly after install and once more after a few months of operation

A2. Keep it clean and tidy in the plant room. This facilitates supervision and maintenance, leaks etc. are more easily detected.

A3. To ensure good efficiency, the fins in the outdoor air unit must be clean. Check once a year and rinse with water or compressed air if necessary. Do not use detergents that are aggressive to copper or aluminium. Leaf and other debris stuck in the fan unit are to be removed.

Solution and Heat Pump Experts

Qvantum was founded 1993 with a vision to develop innovative high quality heat pumps. Today Qvantum continues on this path developing the solutions needed for decarbonization of our cities.

Qvantum is also a company with leading experts in the design of the next generation (5th) district heating and cooling solutions for dense urban areas.

By combining these competence areas, Qvantum can provide solutions that will make it easier for Engineering consultants, Installers, Project developers and Utilities, to decarbonize the heating and cooling of our cities.

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