CHRE01 1946EN
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Installation and operation manual
ChillHeat RE 210 – RE 420

Read these instructions carefully before installation, use, or maintenance

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1 Introduction

1.1 Safety precautions

Read these instructions carefully before installation, commissioning, operation or maintenance of the device. The given instructions must be followed. Throughout this manual, the following three symbols are used to point out very important information:

DANGER !	Be careful. The DANGER symbol indicates a possible danger of bodily harm or lethal injury.

CAUTION	Pay attention. The CAUTION sign indicates a possible danger of damage to the device, components or surroundings.

! Note	Note indicates tips, hints, and other essential information.

Keep these instructions as well as the electrical diagrams available near the device.

Oilon products are manufactured according to general product standards and directives, and based on our best knowledge about product design, and technologies. Operation safety is one of the leading principles in our product development. However, it is wise to be prepared, and think about safety. Read the following principal safety warnings and instructions:

DANGER !	Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.

DANGER !	IN CASE OF FIRE OR OTHER EMERGENCY • Switch off the main switch. • Take appropriate actions. • Contact operation controller.

DANGER !	Connectors in control box are under voltage. Only authorized users may open safety cover.

DANGER !	Wear proper hearing protection and personal protective equipment, such as protection shoes and gloves when necessary.

DANGER !	Do not touch hot pipes or surfaces during operation or maintenance.

Disposal of refrigerant

The refrigerants used in Oilon heat pumps are in normal working conditions non-toxic and non-flammable. Read the following information always before starting any work on the appliance. Follow the instructions and take care of preventive safety measures. For more detailed information, see the Material Safety Data Sheet of the refrigerant manufacturer.

Data	Description
Product names	R-134A R-410A R-450A R-1234ze
Composition, R-134A Composition, R-410A	Tetrafluoroethane Difluoromethane Pentafluoroethane
Appearance	Clear, colourless liquid and vapour
Physical state	Gas at ambient temperatures
Classifications	• ANSI/ASHRAE 34 Safety Group – R-1234ze: A2L • HMIS Classification: Health – 1, Flammability – 1, Reactivity – 0 • NFPA Classification: Health – 2, Flammability – 1, Reactivity – 0 • US DOT HAZARD CLASS 2.2 • Canada – Listed on DSL • R-134A: EU – EINECS # 2065578 – HFC-125 • R-410A: EU - EINECS # 223770 • R-1234ze: A2L
Emergency overview	Colourless, volatile liquid with ethereal and faint sweetish odor. Non-flammable material. Overexposure may cause dizziness and loss of concentration. At higher levels, CNS depression and cardiac arrhythmia may result from exposure. Vapors displace air and can cause asphyxiation in confined spaces. At higher temperatures, (> 250 °C, 482 °F), decomposition products may include Hydrofluoric Acid (HF) and carbonyl halides.

Potential health hazards	First aid measures
SKIN: Irritation would result from a defatting action on tissue. Liquid contact could cause frostbite.	Promptly flush skin with water until all chemical is removed. If there is evidence of frostbite, bathe with lukewarm water. Do not use hot water, and do not rub. If water is not available, cover with a clean, soft cloth or similar covering. Get medical attention if symptoms persist. Treatment of overexposure should be directed at the control of symptoms and the clinical conditions.
EYES: Liquid contact can cause severe irritation and frostbite. Mist may irritate.	Immediately flush eyes with large amounts of water for at least 15 minutes. In case of frostbite, water should be lukewarm, not hot. Lift eyelids occasionally to facilitate irrigation. Get medical attention if symptoms persist.
INHALATION: The refrigerant is low in acute toxicity in animals. When oxygen levels in air are reduced to 12-14 % by displacement, symptoms of asphyxiation, loss of coordination, increased pulse rate and deeper respiration will occur. At high levels, cardiac arrhythmia may occur.	Immediately remove to fresh air. If breathing has stopped, give artificial respiration. Use oxygen as required, provided a qualified operator is available. Get medical attention immediately. DO NOT give epinephrine (adrenaline).
INGESTION: Ingestion is unlikely because of the low boiling point of the material. Should it occur, discomfort in the gastrointestinal tract from rapid evaporation of the material and consequent evolution of gas would result. Some effects of inhalation and skin exposure would be expected.	Ingestion is unlikely because of the physical properties and is not expected to be hazardous. DO NOT induce vomiting unless instructed to do so by a physician.
DELAYED EFFECTS: None known	Not applicable

Flammable properties	Fire fighting measures
Material itself is not flammable. Its autoignition temperature is 750 °C, 1,382 °F.	
UNUSUAL FIRE AND EXPLOSION HAZARDS: The refrigerant is not flammable at ambient temperatures and atmospheric pressure. However, this material will become combustible when mixed with air under pressure and exposed to strong ignition sources. Contact with certain reactive metals may result in formation of explosive or exothermic reactions under specific conditions (for example very high temperatures and/or appropriate pressures).	SPECIAL FIRE FIGHTING PRECAUTIONS AND INSTRUCTIONS: Firefighters should wear self-contained, NIOSH-approved breathing apparatus for protection against possible toxic decomposition products. Proper eye and skin protection should be provided. Use water spray to keep fire-exposed containers cool.

Risks	Preventive measures
EXPOSURE CONTROLS, PERSONAL PROTECTION, AND ACCIDENTAL RELEASE MEASURES	
IN CASE OF SPILL OR OTHER RELEASE:	Always wear recommended personal protective equipment. Evacuate unprotected personnel. Protected personnel should remove ignition sources and shut off leak, if without risk, and provide ventilation. Unprotected personnel should not return until air has been tested and determined safe, including low-lying areas. Spills and releases may have to be reported to federal and/or local authorities. Regarding reporting requirements refer to the Material Safety Data Sheet of the refrigerant manufacturer.
ENGINEERING CONTROLS:	Provide local ventilation at filling zones and areas where leakage is probable. Mechanical (general) ventilation may be adequate for other operating and storage areas.

Risks	Preventive measures
PERSONAL PROTECTIVE EQUIPMENT:	SKIN PROTECTION: Skin contact with refrigerant may cause frostbite. General work clothing and gloves (leather) should provide adequate protection. If prolonged contact with liquid or gas is anticipated, insulated gloves constructed of PVA, neoprene or butyl rubber should be used. Any contaminated clothing should be promptly removed and washed before reuse.
	EYE PROTECTION: For normal conditions, wear safety glasses. Where there is reasonable probability of liquid contact, wear chemical safety goggles.
	Where contact with liquid is likely, such as in a spill or leak, impervious boots and clothing should be worn.
DISPOSAL CONSIDERATIONS:	Not a hazardous waste WARNING: DO NOT vent to the atmosphere. To comply with provisions of the U.S. Clean Air Act, any residual must be recovered. Contains greenhouse gas which may contribute to global warming.

The refrigerant should not be mixed with air above atmospheric pressure for leak testing or any other purpose.

1.2 Transportation and storage

Transport and store the heat pump in a vertical position.

Be careful when lifting the heat pump. Use appropriate lifting tools.

Preparations for storage, transfer, and lifting

1. Check that the way is free from obstacles.
2. Use appropriate vehicle for transport.
3. At installation site check that you have proper means and resources for lifting and placing the pump.

Storage

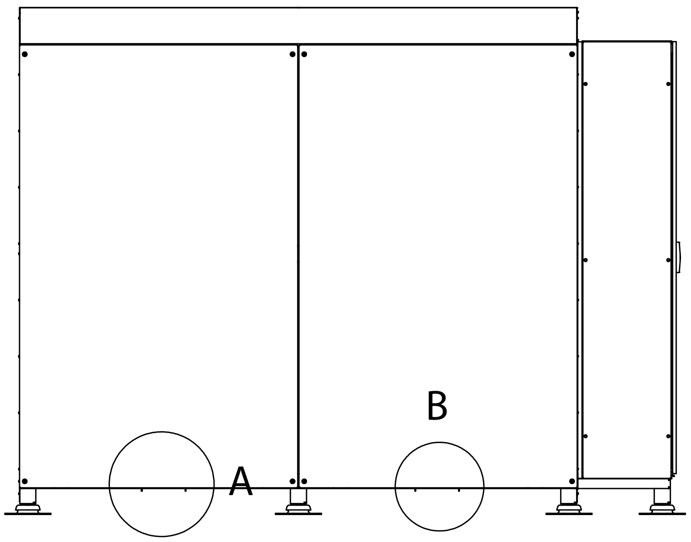
Before transporting to the final installation site and commissioning phase, the heat pump must not be stored longer than needed. If the heat pump must be stored longer than one month, the manufacturer must be informed. The heat pump must be stored in a dry place where the temperature is at least + 5 °C.

Transfer (models S, RE, P 220 - 450)

- Move the heat pump vertically with a forklift or two pallet jacks.
- When using pallet jacks place one to each side of the pump.

Lifting

Lifting supports are welded to the pump frame, see illustration.



Lifting brackets ver. 1

A and B, lifting supports

Use a forklift or a pallet jack to lift the heat pump according to the labeling on the device.

Do not transfer or lift the heat pump without any housing covers.

1.3 Delivery content, optional equipment and accessories

Standard delivery content

Heat pump standard delivery includes the following:
- heat pump
- 1 flow switch cabled
- installation and operation manual, electrical drawings
- installation, commissioning and warranty records
- maintenance sheets
- PI-diagram or flow diagram for the pipe connections
- preliminary work form for commissioning.

2 Technical data

2.1 Heat pump technical data

Dimensions and weight

Measurements without cover and extra legs	RE 210	RE 330	RE 420
Height (mm)	2056	2056	2056
Width (mm)	1550	2676	2676
Depth (mm)	900	900	900
Weight (kg)	1700	2400	2600

Connections

For information on pipe connections, see connection diagrams delivered with the ChillHeat pump.

	RE 210	RE 330	RE 420
Electrical connections	3 L / N / PE / 400 VAC 50 Hz, ask for other alternatives		
Compressor start-up current (A)	332	498	496
Compressor maximum operating current (A)	166	332	330
Fuse size (A)	3 x 200	3 X 400	3 x 400

Refrigerant circuit

! Note	The fill quantities according to the table below are normative. The amount of the refrigerant varies depending eg. on the heat pump exchanger option, other accessories and conditions. Always check the exact amount of the refrigerant from the heat pump's type plate.

	RE 210	RE 330	RE 420
Refrigerant	R410A	R410A	R410A
Refrigerant (kg)	25	2 x 25	2 x 25

Water or brine circuits: Minimum water/brine outlet temperature from the evaporator: -15 °C. Maximum water/brine inlet temperature to the evaporator: 50 °C.

3 Installation

3.1 Installation site requirements

DANGER !	Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.

CAUTION	The heat pump must be installed into a location that is not accessible to the general public.

CAUTION	The heat pump housing must be kept closed at all times. Only under maintenance and service occasions, to access the internal components, the heat pump housing can be opened.

CAUTION	The heat pump must not be installed on flammable material.

CAUTION	Follow local construction rules and regulations when installing the heat pump.

! Note	This device can be used by at least 8-year-old childen and other persons, whose physical, perceptual, or mental qualities are lowered or who do not have experience and knowledge, and they are guarded or they have been guided to use the device safely, and if they understand dangers related to the usage of the device. Children must not play with the device. Children must not to clean the device and they most not perform any maintenance tasks without surveillance.

! Note	The usage of this device is not intended to persons (including children), whose physical, perceptual, or mental qualities are lowered, or who do not have experience and knowledge unless they are guarded, or guided to use the device by the person responsible for the safety. Children must be controlled to make sure, that they do not play with the device.

General site requirements:

- Structural capacity of the installation site must be sufficient.
- Regard operating noise when choosing the installation location.
- The installation site has a floor drain.
- The maximum temperature for the site is 40 °C.

- The minimum temperature for the site is 10 °C.
- The heat pump installation surface is horizontal and even.
- All feet of the heat pump system are firmly attached to the floor, and that the load is evenly shared on all feet.
- The heat pump is properly protected from the rain and direct sunlight.
- The machine room is properly lit and ventilated. Machine room temperature should be 10-40 °C. The escape and route paths are unobstructed and the emergency lighting is functional.
- The maximun altitude for the installation site is 5000 m.

Refrigerant circulation site requirements

Refrigerant circulations are equipped with pressure relief valves. In fault situations they burst out the excess pressure from the circulations.

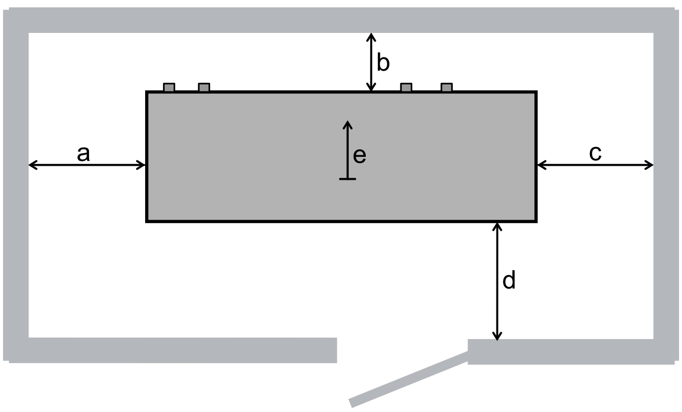
Make sure that a possible burst of the refrigerant circulations’ pressure relief valves does not endanger people or properties.

It is recommended that the safety valves are always piped out to a location where the discharge of the refrigerant does not pose a risk. Also check the requirements of local standards, laws, and other regulations concerning piping out.

Space requirements

For installation, operating and maintenance purposes, leave enough space on each side of the heat pump. The minimum space requirements are listed in the following.

By default, the electrical switchboard is attached to the right side of the heat pump. On request, the electrical switchboard can be attached to the left side of the heat pump.

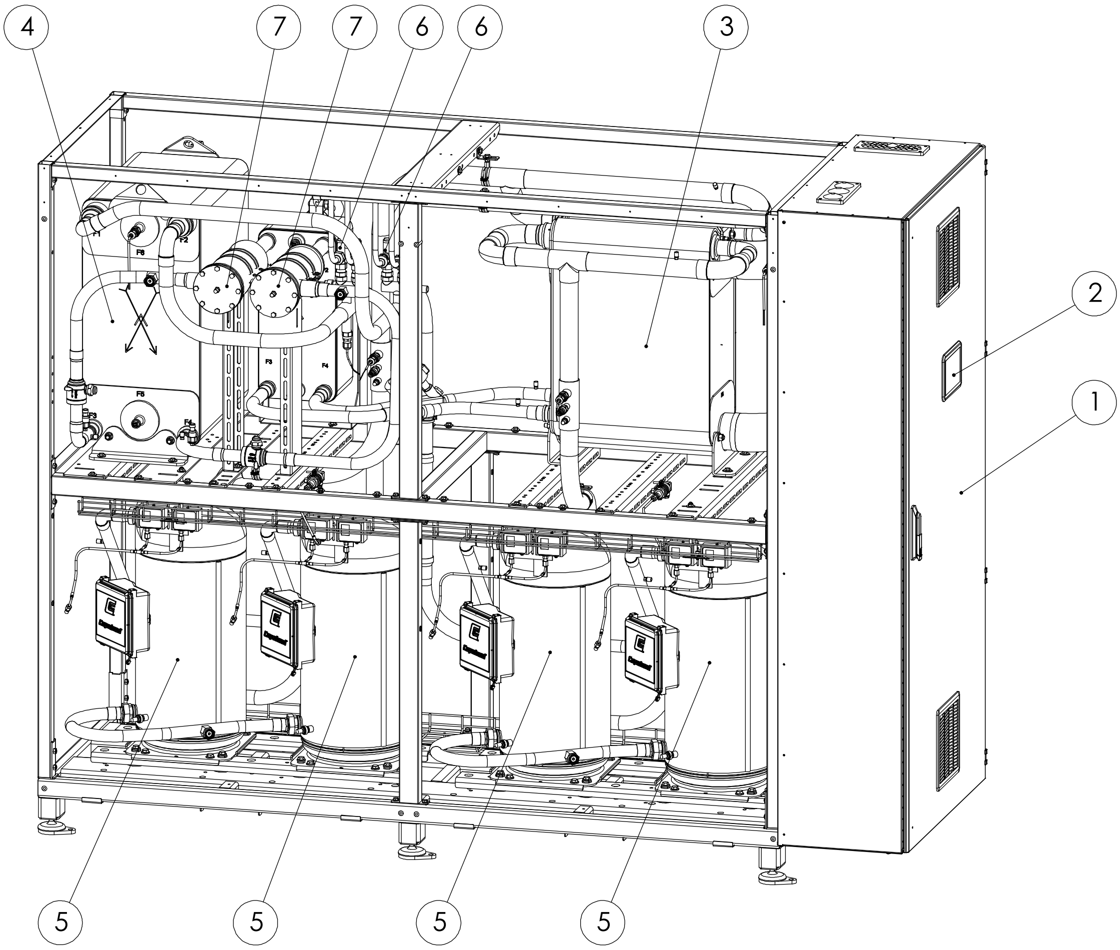


Space requirements ver. 1

Legend	mm
a (left)	800
b (back)	400
c (right)	800
d (front)	800
e (top)	400

3.2 Main parts

ChillHeat RE 210 – RE 420 main parts



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! Note	The assembly may vary depending on the scope of delivery.

Pos.	Part	Pos.	Part
1	Control cabin	5	Compressor
2	Control panel	6	Refrigerant pressure double relief valve with change valve
3	Evaporator	7	Dryer-filter
4	Condenser		

3.3 Dimensioning heat pump

The ChillHeat pump is always dimensioned to operate according to the operation conditions at each site. The customer defines the conditions for the site in question.

If the operation conditions change the original settings for the pump are not valid any more, and must be checked and changed accordingly.

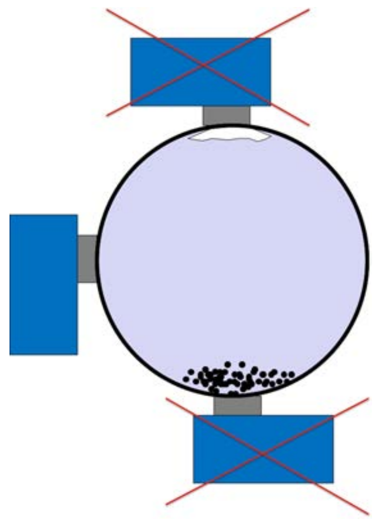
3.4 Connections and dimensions

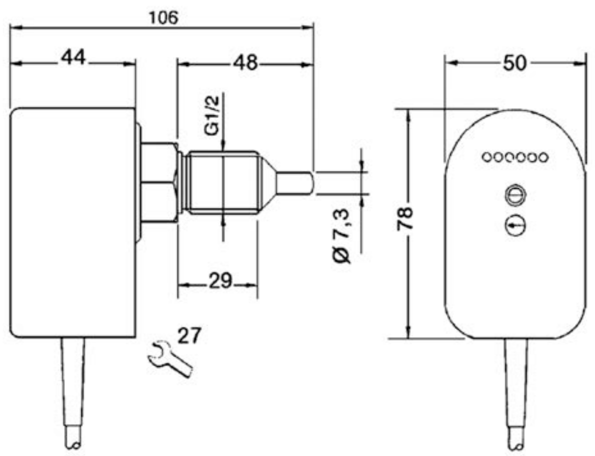
For information on connection positions and sizes, refer to the diagrams delivered with the ChillHeat pump.

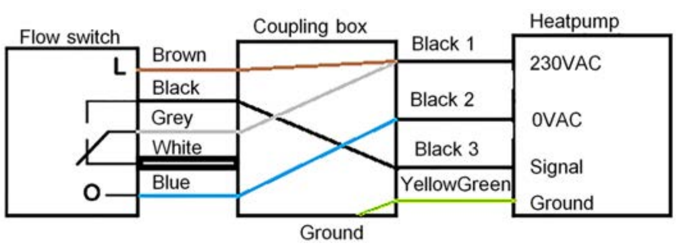
3.5 Installing flow switch

- Install the flow switch in the inlet pipe on the cold side.
- A straight pipe of 4 x D is required before the flow switch (the pipe length must be at least 4 x the pipe diameter).
- Place the switch on the side of the pipe, not on the bottom due to dirt, nor on the top due to air.
- The flow switch has to be installed in a G1/2 sleeve. The maximum lenght of the sleeve is 29mm.
- Electrical connection has to be made in accordance with the ChillHeat wiring diagrams.
- Water flow adjustment 1-150 cm/s, adjust according to the minimum flow of the site.
- During normal flow, all green leds should be active.
- Alarm delay adjustment 1-40 s. Adjust to minimum ~1 s.

Electrical connection 230 VAC. Note that the white wire has to be insulated.







3.6 Flow diagrams

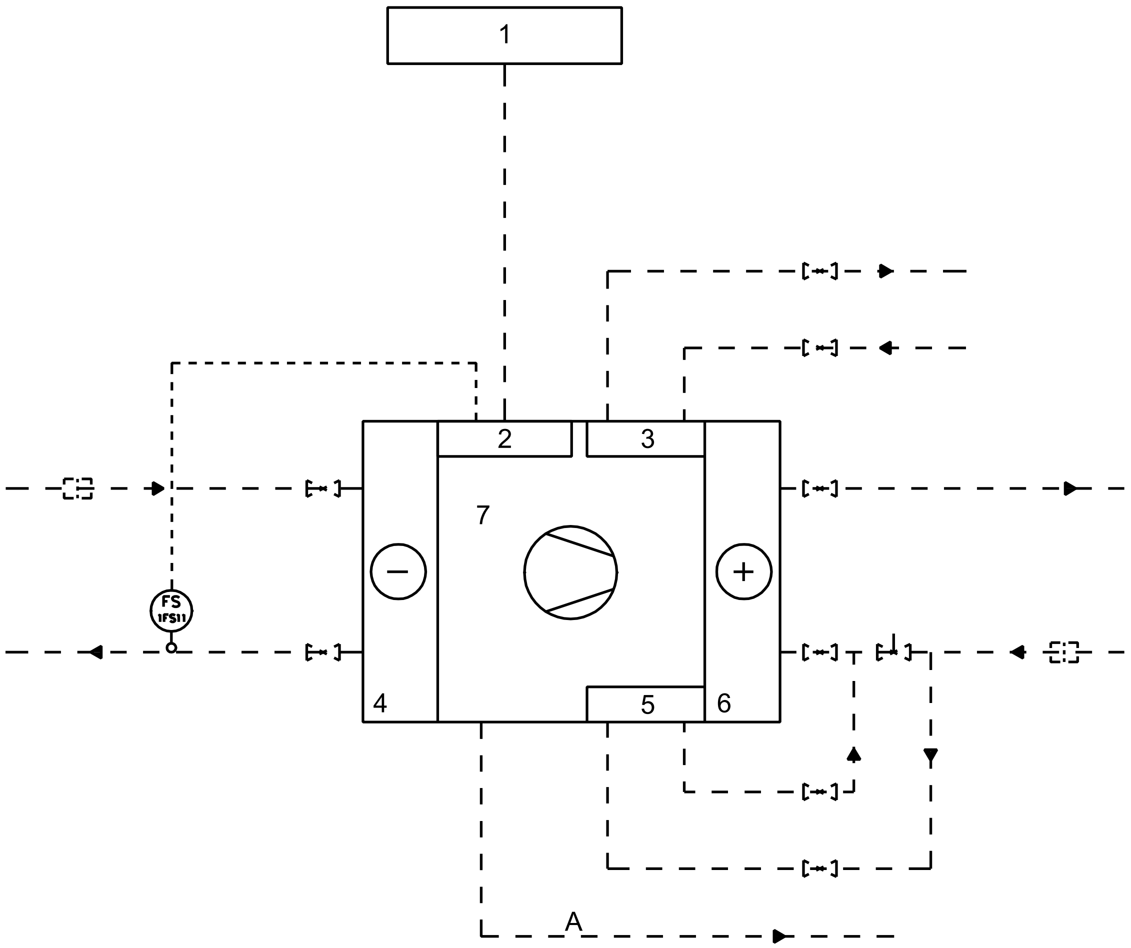
Examples of flow diagrams

! Note	The following flow diagrams are only examples of various connection principles. Always check the final connections from the diagrams delivered with the heat pump.

Legend

A	Safety valve piping to outside air
- — — — -	Customer delivery scope
- - - - - - - - -	Oilon Scancool delivery scope
	Recommended to use a filter.
	Balancing valve in customer delivery scope

One heat pump with one refrigerant circuit

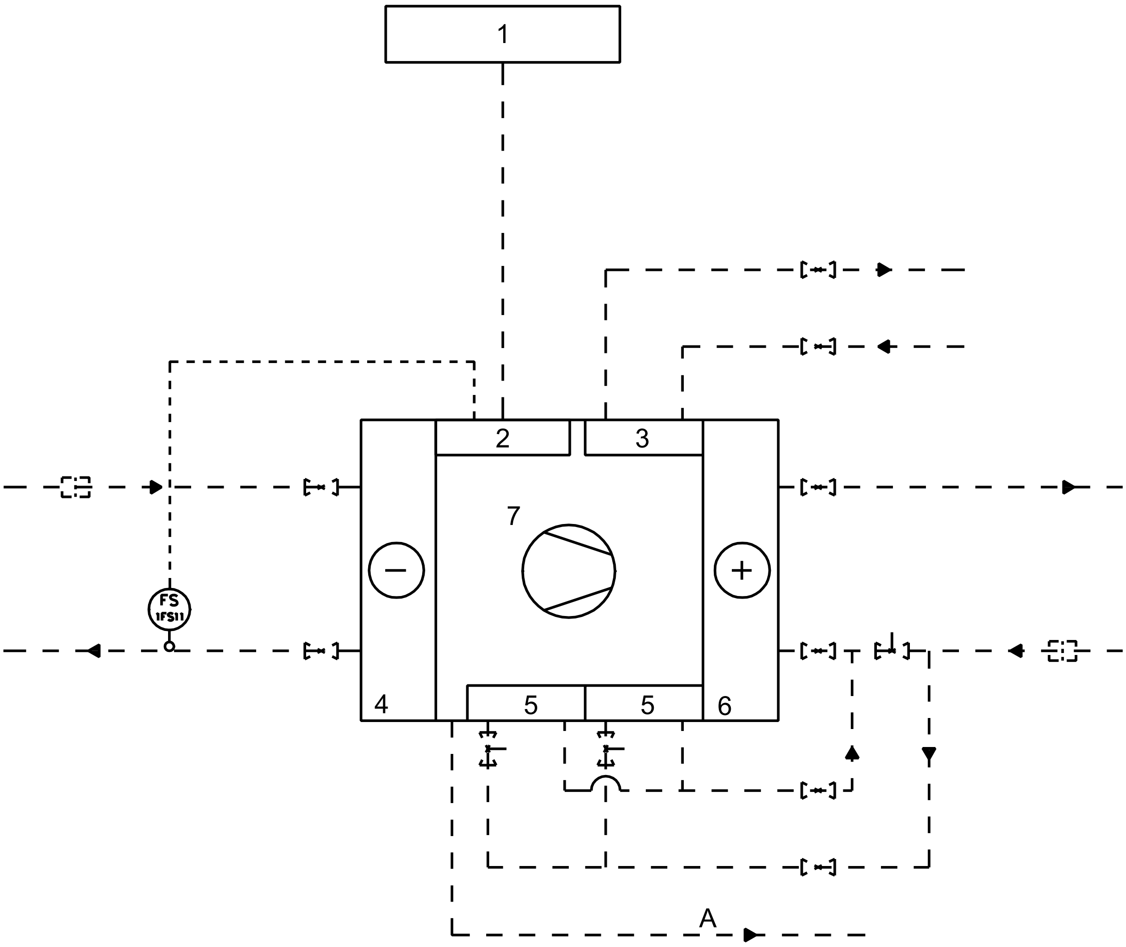


Flow diagram example 1xHP 1xref circuits ver. 2

Position	Description
1	Customer LV. switchgear
2	Control cabin
3	Desuperheater

Position	Description
4	Evaporator
5	Subcooler
6	Condenser
7	Compressor
1FS11	Flow switch

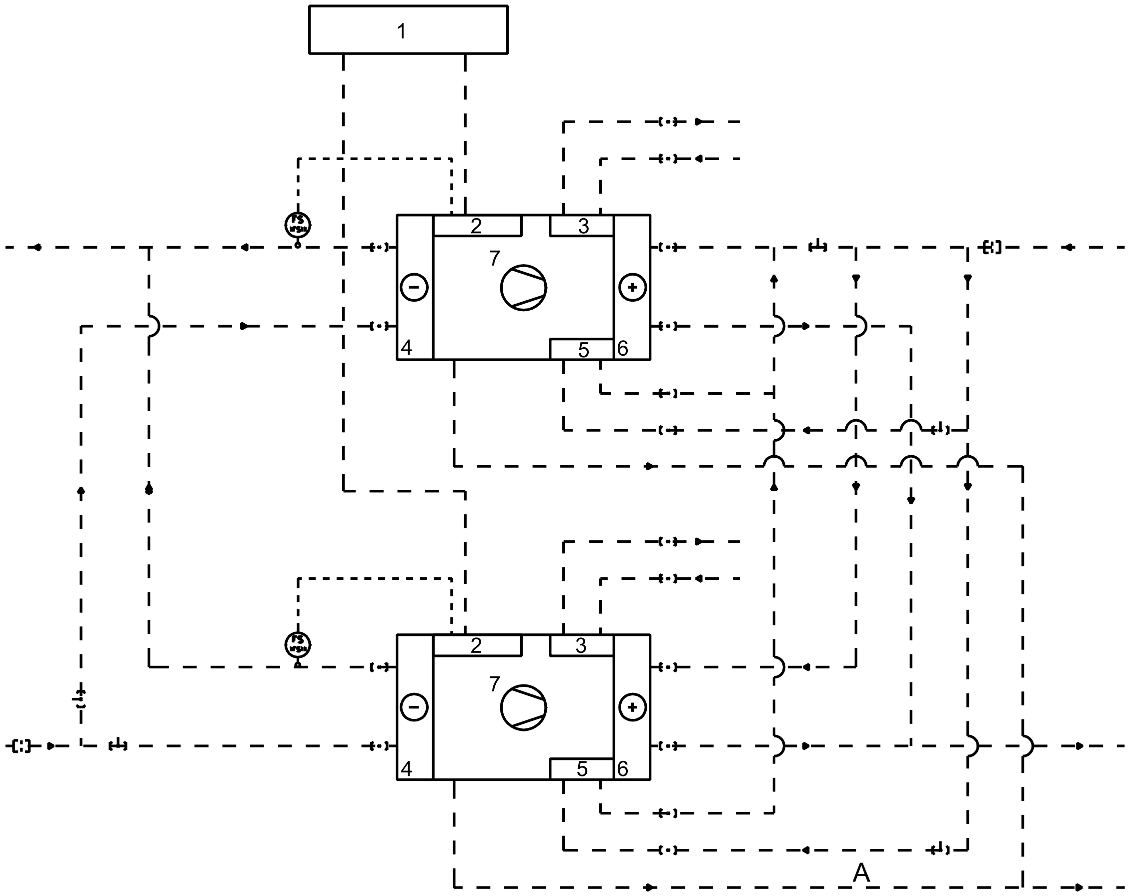
One heat pump with two refrigerant circuits



Flow diagram example 1xHP 2xref circuits ver. 1

Position	Description
1	Customer LV. switchgear
2	Control cabin
3	Desuperheater
4	Evaporator
5	Subcooler
6	Condenser
7	Compressor
1FS11	Flow switch

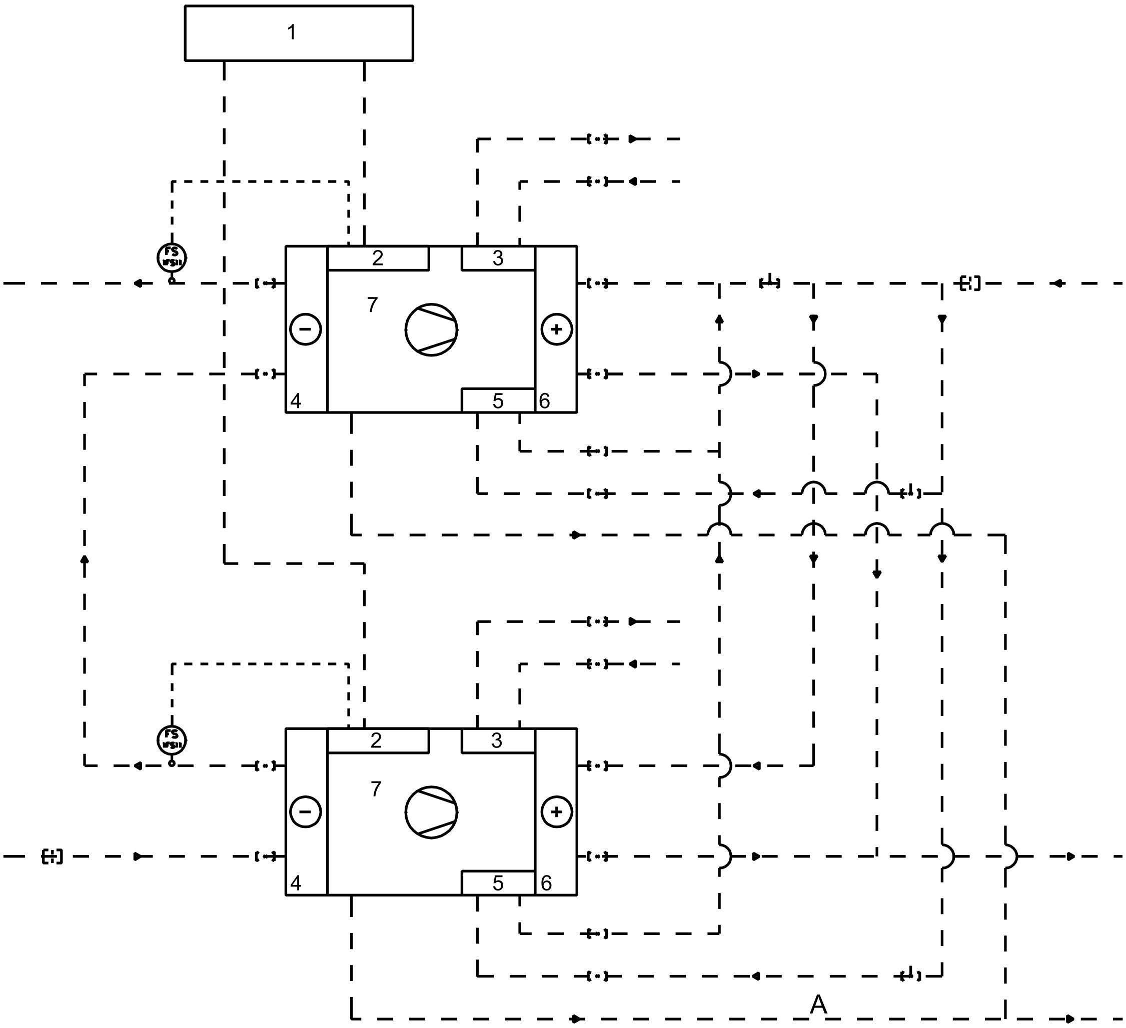
Two heat pumps, evaporators in parallel, and condensers in parallel



Flow diagram example 2xHP con_p eva_p ver. 2

Position	Description
1	Customer LV. switchgear
2	Control cabin
3	Desuperheater
4	Evaporator
5	Subcooler
6	Condenser
7	Compressor
1FS11	Flow switch

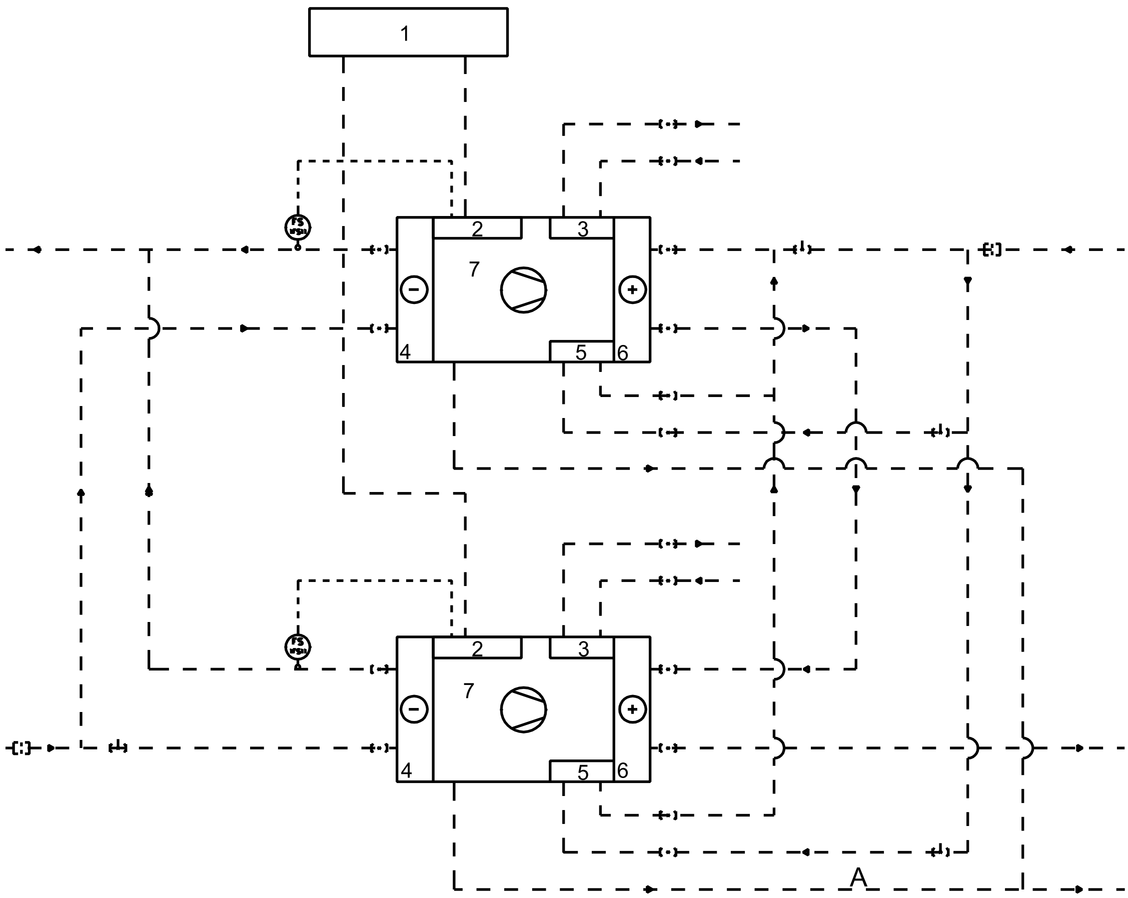
Two heat pumps, condensers in parallel, and evaporators in series



Flow diagram example 2xHP con_p eva_s ver. 2

Position	Description
1	Customer LV. switchgear
2	Control cabin
3	Desuperheater
4	Evaporator
5	Subcooler
6	Condenser
7	Compressor
1FS11	Flow switch

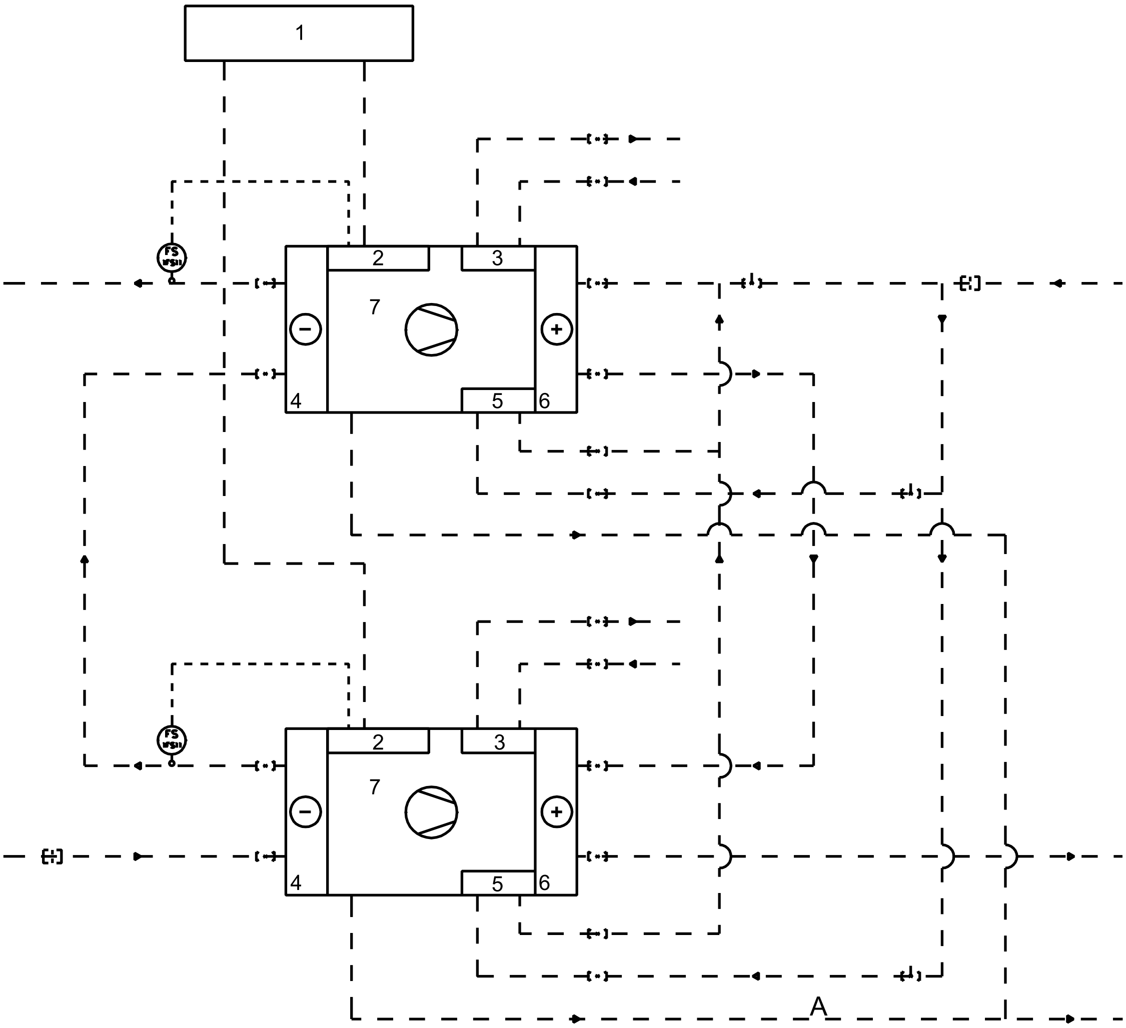
Two heat pumps, condensers in series, and evaporators in parallel



Flow diagram for 2xHP con_s eva_p ver. 2

Position	Description
1	Customer LV. switchgear
2	Control cabin
3	Desuperheater
4	Evaporator
5	Subcooler
6	Condenser
7	Compressor
1FS11	Flow switch

Two heat pumps, evaporators in series, and condensers in series



Flow diagram f2xHP con_s eva_s ver. 2

Position	Description
1	Customer LV. switchgear
2	Control cabin
3	Desuperheater
4	Evaporator
5	Subcooler
6	Condenser
7	Compressor
1FS11	Flow switch

! Note	The customer determines final pipe sizes.

! Note	Flow switch is in Oilon Scancool delivery scope, but customer takes care of installation.

3.7 Electrical connections

A general description of the needed electrical connections is given in this section. The actual connections should be made according to the wiring diagrams delivered with the heat pump.

CAUTION

Do not connect devices that draw over 2 A of current directly to the controller. Use a contactor instead.

Recommended cable sizes

Model	Cable size
RE 210	2 x (4 x 50Cu/25Cu) 1 x (4 x 120Cu/70Cu)
RE 330	2 x (4 x 120Cu/70Cu) 1 x (4 x 300Cu/150Cu)
RE 420	2 x (4 x 120Cu/70Cu) 1 x (4 x 300Cu/150Cu)

4 Commissioning

4.1 Prerequisites for commissioning

DANGER !	Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.

The person commissioning the system must:
- have qualification and competence for installing high pressure devices
- have expert knowledge about heating and cooling systems
- be familiar with the heat pump control system

! Note	It is recommended that an Oilon expert performs commissioning.

Tasks to be completed before commissioning:
- connect the electrical supply to the heat pump
- fill and vent the pipe lines
- connect the feed cables and sensors
- connect the safety valve pipeline to outside air
- check the refrigerant level
- connect the pipings correctly according to the PI diagram or according to the instructions in section *Installation site requirements*.
- check that the shut-off valve of the liquid line open.

In low ambient temperatures, to avoid freezing, liquid systems should be protected using insulation tape, trace heating cables and a suitable antifreeze liquid. To make sure that the liquid circulates, when the ambient temperature is close to the freezing point, pumps must be used. Also heat exchanger nozzles must be insulated.

DANGER !	Do not touch any liquid without protection. Operating liquid contact may cause frostbite. Always immediately inform operating staff about leakage.

! Note	Before commissioning, check that the shut-off valve of the liquid line is open.

! Note	Do not start any circulation pumps before the circuits have been filled. Otherwise pump shaft seal gets damaged.

4.2 Checking hot circuit

1. Check that condensers and subcoolers are correctly connected. Make sure that the flow direction is correct.
   Use the latest PI or flow diagram for reference.
2. Make sure that all transmitters in the hot water system are installed and connected.
3. Check that the component identification labels correspond to the PI diagram and component tag list.
   Mark off with green in the PI diagram.
4. Check that pressure relief valves have been installed in both condensers' and subcoolers' liquid circuits to prevent increasing pressure when trapped liquid is heated.
5. Check that all valves and other components displayed in the PI diagram have been correctly installed.
   Make sure that the valves can be operated at 0 – 100 %.
6. Check and note selected filter mesh size.
   The recommended mesh size is 0.8 mm in closed circuits, and 0.08 mm in open circuits.
7. Check that all flange and/or welded connections to the heat pump are properly made and tightened.
8. Check the pipe insulation.
9. Make sure that all pipes are properly supported.
   No stress must be transferred to the heat exchanger connections of the heat pump.
10. Make sure that the pipes are vented.

4.3 Checking cold circuit

1. Check that the evaporators are correctly connected. Make sure that the flow direction is correct.
   Use the latest PI or flow diagram for reference.
2. Make sure that all transmitters in cold water system are installed and connected.
3. Check that the component identification labels correspond to the PI diagram and component tag list.
   Mark off with green in the PI diagram.
4. Check that all valves and other components displayed in the PI diagram have been correctly installed.
   Make sure that the valves can be operated at 0 – 100 %.
5. Check and note selected filter mesh size.
   The recommended mesh size is 0.8 mm in closed circuits, and 0.08 mm in open circuits.
6. Check that all flange and/or welded connections to the heat pump are properly made and tightened.
7. Check the pipe insulation.
8. Make sure that all pipes are properly supported.
   No stress must be transferred to the heat exchanger connections of the heat pump.
9. Start the circulation pump and adjust the possible flow switch limit to approximately 50 % of the nominal flow.
   If several heat pumps are connected, adjust the valves to achieve the specified flow distribution.
10. Make sure that the pipes are vented.

4.4 Checking refrigerant circuit

1. Make sure that nothing was damaged or loosened during transport.
2. Check screws and flange connections.
3. Check oil and refrigerant levels and make sure that there are no leaking connections.

   Use an electronic sniffer, but note that they usually react on all kinds of chemicals.
4. To ensure that no moisture is inside the system, check the sight glass.

   Green indicates a dry and healthy system.
5. Check the set pressures on the high and low pressure switches.

4.5 Checking electrical connections and control cabinet

1. Turn all switches, fuses, and breakers into the **OFF** position.

   Use adequate pad lock devices to the breakers to improve occupational safety so that an outsider can not switch on electricity during work.
2. Refer to the electrical diagrams and visually inspect the electrical cabinets and connection cables.
3. To check that the cables are firmly connected, pull them randomly. Check that the connections are secured using a screw driver.

   Verify that all components are correctly installed, tagged, and without damage. Make notes with a green marker in the circuit diagram.
4. Check and retighten the compressor cables to the following torques.
   - P-series: 10 Nm
   - S-series: 40 Nm
5. Check conductor protection circuit.
6. Verify the correct phase sequence of the electrical supply.
7. Check the power supply voltage, and compare to the measured values marked in the *Pre-commissioning certificate*.
8. Switch on the power.
9. Check the voltage on the DC supply.
10. Check the cooling fan and filters for the electrical cabinet and for possible frequency converters.
11. To start the cooling fan, change the temperature set point inside the cabinet.

    Reset and note down the initial setting.
12. Check that the communication interface is connected and correctly set up.

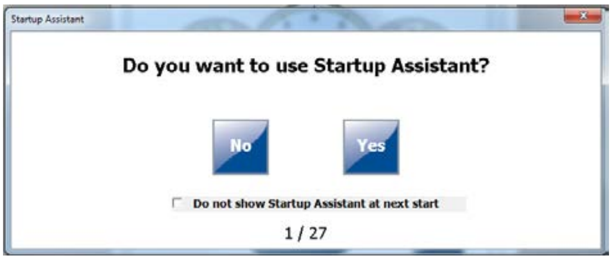
    Refer to the instructions and settings in the Modbus communication list.
13. Check the settings of overcurrent protective devices.

4.6 First start-up

Make sure that oil has been heated to an adequate level before starting the heat pump compressors. Oil heater must be on at least 6 hours.

1. When starting the unit for the first time, select the language, region, and date and time.

2. To move to the next screen, press the **Next** button.
3. To use the **Startup Assistant** to commission the heat pump, press **Yes**.



   If you want to start the unit without the **Startup Assistant**, press **No**.
4. Continue by following the given instructions.
5. Check flow readings on both hot and cold water circuit, if flow meter is available.
   Compare to the specified flow rates.
6. Check that no alarms are visible.
   Reset possible alarms.
7. To set the system in **Local mode**, press the **Local** button.
8. Select the desired control mode for the system. The options are **Heat** and **Chill**.
9. Adjust the desired set point.
   a. In the **Chill** mode, set the set point below the actual temperature reading value.
   b. In the **Heat** mode, set the set point above the actual temperature reading value.
10. To start the heat pump, press **Start/Stop**.
    Check that:
    a. Suction pressure drops
    b. High pressure increases
11. To stop the heat pump, press **Start/Stop**.
    Repeat this above mentioned procedure 3 times to distribute the refrigerant inside the system.
    Run for 30–40 s every time, and leave the system to rest for 2–3 minutes between the start-ups.
    If the suction pressure drops too low, it indicates that the refrigerant has not yet been properly transferred to the evaporator.
12. Leave the heat pump system running at its local set point for a couple of minutes, and then stop the system.
13. If the heat pump system is controlled remotely, switch to remote control and press **Start/Stop**.
    Check that the heat pump responds to requests from its remote signal.

4.7 Commissioning the system

Carry out commissioning tasks according to this check list. Pay special attention to the leakage test.

- Measure compressor current.
- Control superheating temperature.
- Check and trim expansion valve functionality.
- Define overcurrent protection device settings.
- Perform thermal protection device functional test.
- Inspect running restrictions, evaporator and condenser side temperature settings, and delays in restart.
- Inspect suction and discharge pressure switch, bars.
- Perform compressor load control functional test.
- Test electrical cabin fan and filter, also for possible variable frequency drives.
- Check refrigerant and oil quantity.
- Perform moisture check.
- Check compressor and piping installation.
- Inspect cable shoe and terminal block connections also with a thermal camera.
- Perform leakage test and repair possible leakages. Perform the leakage test according to the *Heat pump leakage check* list of the *Commissioning report*.

Verifying certificates, documents, and approvals

- Make sure that the pre-commissioning certificate is completely filled and signed by the person responsible for the installation.
- All required control documents regarding the installation are in order, including leak and pressure test of water piping, and electrical supply certificate.
- Electrical feed approved by the customer to be taken into operation.
- Hot and cold water systems approved by the customer for operation.
- Ethernet communication, if any, approved to be used.
- Site manager/customer approval for start of commissioning.

! Note	Once installation and commissioning are complete, fill out the installation and warranty reports.

4.8 Adjusting controllers to ensure continuous operation

Adjust the following controllers:

- *Speed and capacity controller* adjusts the cooling and heating capacity of the heat pump.
- *Suction pressure limit controller* ensures that the compressor suction pressure is not allowed to drop too low, by reducing the compressor capacity/speed.
- *Discharge pressure limit controller* ensures that the compressor discharge pressure is not allowed to rise too high, by reducing the compressor capacity/speed.
- *Evaporator temperature limit controller* ensures that the evaporator liquid temperature is not allowed to drop too low, by reducing the compressor capacity/ speed.
- *Condenser temperature limit controller* ensures that the condenser liquid temperature is not allowed to rise too high, by reducing the compressor capacity/ speed.

To set up and adjust controllers:

1. To test the controller, change the set point.
   Evaluate that the response is good enough.

- Evaluate that the time to reach the set point is short enough.
- Evaluate that the temperature is stable at its set point, and does not oscillate around the set point.

2. To adjust the controller, adjust the P and I values of the controller as follows.
    a. To speed up the response, increase P or decrease I.
    b. To stabilize the controller, decrease P or increase I.

4.9 Setting up parallel units

1. Start the circulation and open up all throttling valves to the fully open position.
    If the circuit is capacity-controlled, make sure the system is running at the maximum flow.
2. Measure the individual flows and compare to the specified flows.
    Measured total flow: m3/h or kg/s.
    If the flow notably deviates from the specified flow, search for the reason for this deviation. Possible reasons can be the pump, filter, valves, pipe length, air, gas, or dirt in the system.
3. To distribute the flow, start by reducing the flow, where necessary.
    - Measure and adjust all individual flows until correct distribution is achieved.
    - Keep at least one throttling valve fully open, unless the pressure drop is required to feed a subcooler or other equipment.

    If the total flow deviates by 10 % from the specification, all individual flows shall deviate to the same extent.

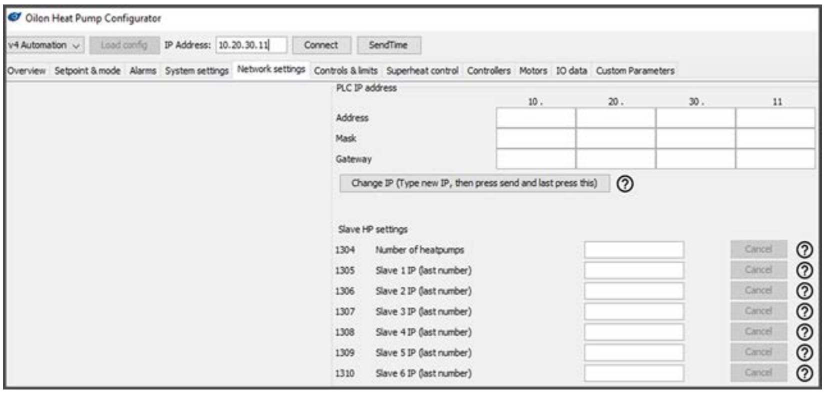
! Note	Note down all set and measured flows into a copy of the PI diagram.

4. For joint control of heat pumps, use OHPC to set it up, first change the IP addresses of heat pumps so they differ from each other.

Recommended: 10.20.30.11 for the master, 10.20.30.21 for the first slave, 10.20.30.31 for the second slave etc. The first 3 rows (10.20.30) must be the same. You can choose which will be the master. We recommend the one making the hottest water for heating, or the one making the coolest water for cooling.

Then connect the heat pumps to each other with a LAN cable between heat pump tosiboxes, insert a LAN cable in LAN1, LAN2, or LAN3 port.

Then in the master heat pump, set “the number of heat pumps” according to how many additional heat pumps are being controlled, and set the IP addresses for them.



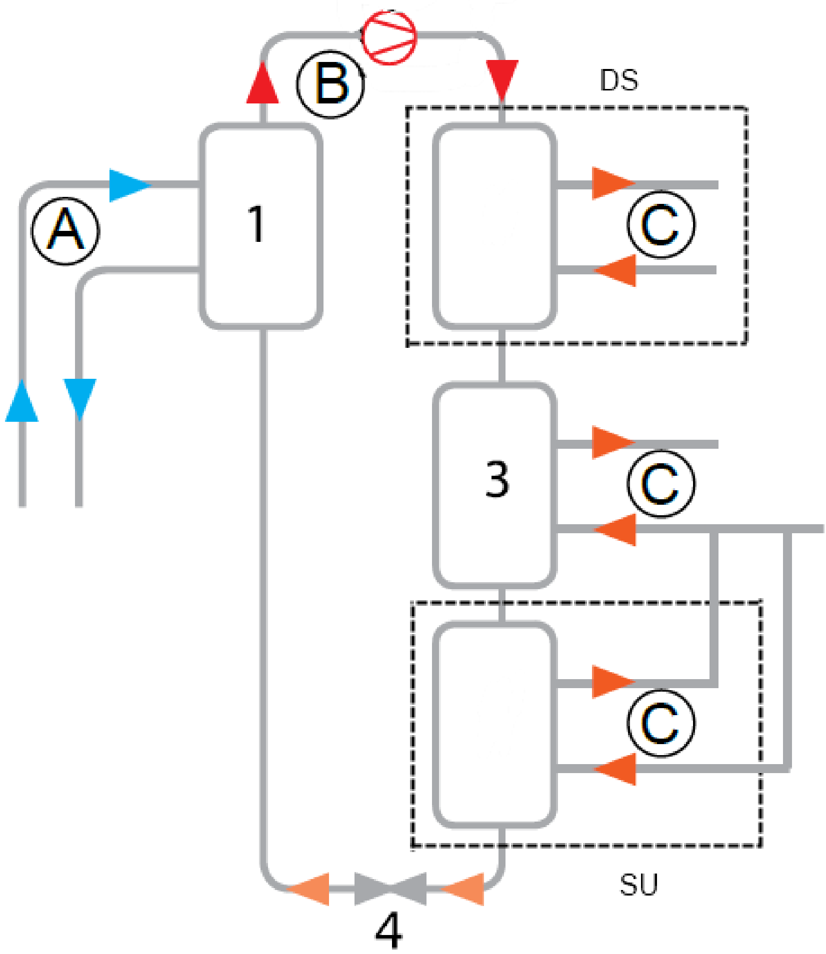
4.10 Setting up distribution condenser/subcooler

1. Start the circulation and open up all throttling valves to the fully open position.
   If the circuit is capacity controlled, make sure the system is running at the maximum flow.
2. Measure the individual flows and compare to the specified flows.
   Measured total flow: m3/h or kg/s
   If the flow notably deviates from the specified flow, search for the reason for this deviation. Possible reasons can be pump, filter, valves, pipe length, air, gas, or dirt in the system.
3. If the system has several condensers in parallel, follow the steps in section *Setting up parallel units* to distribute the water correctly between all condensers.
   Keep the throttling valve for the subcoolers fully open.
4. Measure the flow through the subcoolers and throttle the inlet valves to the condensers until the specified flow is reached to each subcooler.
5. For several parallel units, check again the distribution.
   Follow the steps in section *Setting up parallel units*.
6. Repeat until the specified flow is reached.
7. In case of higher flow than specified, throttle the condenser inlet more to increase the flow in subcooler.

Note down all set and measured flows into a copy of the PI diagram.

5 Operation

5.1 Main features



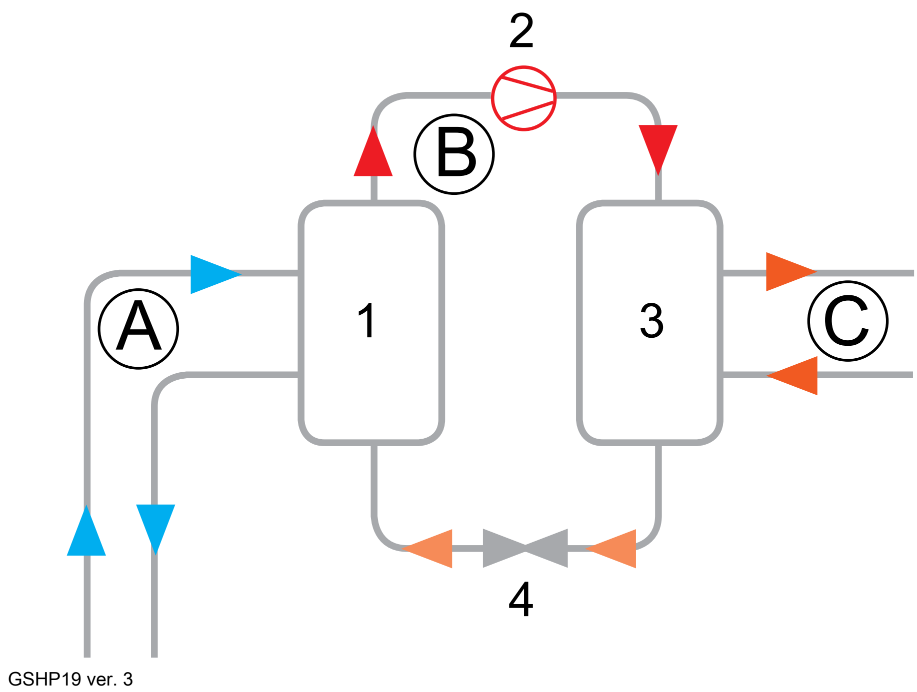
Main features ver. 2

1	Evaporator	A	Cooling circuit
3	Condenser	B	Refrigerant circuit
4	Expansion valve	C	Condenser circuit
		DS	Desuperheater, optional
		SU	Subcooler, optional

One of the underlying ideas in the design of the Oilon ChillHeat product family has been to use a single machine both for cooling and heating. All ChillHeat products are well suited for heating and cooling applications, either as dedicated cooling or heating solutions or as a combined solution.

It is possible to connect several ChillHeat heat pumps connected in series for an even higher capacity heating or cooling solution. Automation is an important feature in all ChillHeat products. A versatile automation system enables energy-efficient and easy ChillHeat operation.

5.2 Operating principle



1	Evaporator	A	Cooling circuit
2	Compressor	B	Refrigerant circuit
3	Condenser	C	Heating circuit
4	Expansion valve		

There are three closed circuits running within or through the heat pump:

- cooling circuit
- refrigerant circuit
- heating circuit.

The ChillHeat pump's operation is based on the vaporisation and condensation of the refrigerant circulating within the pump.

The cooling circuit is used for collecting heat energy. As the fluid travels along the circuit, it collects heat energy, which causes the fluid temperature to rise. The fluid completes its circuit by returning to the evaporator and releasing the heat energy into the refrigerant, which circulates between the evaporator and the condenser.

When the refrigerant is in the evaporator, it is colder than the secondary refrigerant, so the heat energy transfer from fluid into refrigerant can take place. The heat transfer raises the temperature of the refrigerant up to the point where it becomes gaseous.

The gaseous refrigerant is then led into a compressors, which compresses it into a high pressure. As the pressure of the gaseous refrigerant increases, so does its temperature.

The high-pressure gaseous refrigerant is led into the condenser, where it releases its heat energy into the water that circulates between the ChillHeat pump and the heat sink. As the refrigerant releases its heat energy and its temperature drops, it condenses to liquid form again.

The liquid refrigerant is then led into an expansion valve, where the pressure and temperature are lowered further. The refrigerant completes its circuit by returning back to the evaporator, where it receives heat energy from the cooling circuit.

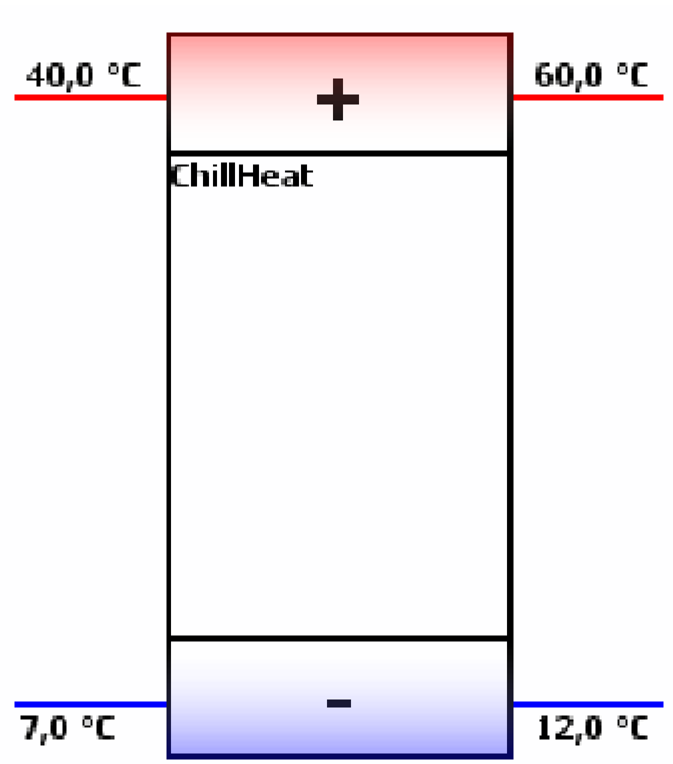
5.3 Heating and cooling

A single ChillHeat heat pump can be used for both heating and cooling at the same time, without any extra machinery involved. When using the heat pump to cool down one part of a process, heat is generated as a by-product. The generated heat can be used effectively in another process which requires heat. The typical coefficient of performance (COP) in these applications can vary between 5 and 8.

Example of a combined solution

An example of a combined solution is a data center. A data center usually consists of an office area and a large server room. The server room requires powerful air conditioning to keep the temperature down at an acceptable level.

At the same time, especially in countries with colder climate, the office area of the data center requires heating. Both of these – air conditioning and heating – can be handled with one ChillHeat unit. In the following figure, a single ChillHeat unit is used to produce cold water used in air conditioning while at the same time the unit produces hot water used for heating the office area.



Heating and cooling ver. 1

In this example, water is cooled down to 7 °C, and the energy taken from the water is used to heat up heating network water to 60 °C.

Collecting heat

The Oilon ChillHeat heat pumps can use various heat sources for collecting heat, for example:

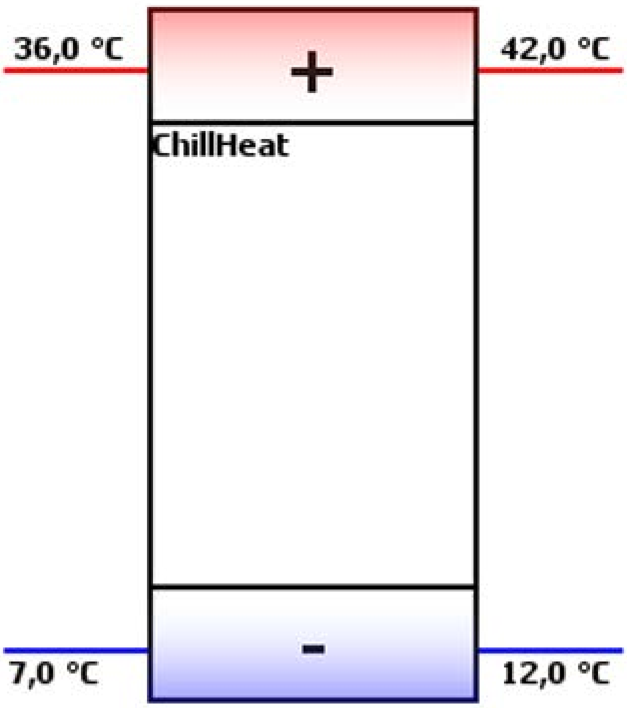
- recovered waste heat at refrigeration plants to generate hot water, thereby substituting valuable primary energy
- outdoor air, together with an outdoor cooling unit
- recovered waste heat from municipal or industrial waste waters
- industrial process waters
- flue gases from power plant and central heating plant boilers
- heat from ground or waters.

The recovered heat can, for example, be channelled into the district heating network, improving the efficiency of the plant and increasing the total heat output. The free heat sources can be put to use for heating spaces and producing hot water, among other things. The ChillHeat heat pumps can utilize these heat sources and produce valuable heating energy for industrial processes or to be sold out.

Under the operation period, the heat source circuit fluid warms up during circulation. The collected heat is used to vaporise the refrigerant in the heat pump unit.

Cooling

The ChillHeat products provide an energy-efficient cooling solution for air conditioning, for cooling computer server rooms, and in industrial processes. The ChillHeat products can provide energy-efficient refrigeration for industrial applications, ice rinks, or supermarkets.



Cooling ver. 1

5.4 Coefficient of performance

Heat pump efficiency ratios are measured by the coefficient of performance (COP) and cooling coefficient of performance (COPc) values.

COP indicates the amount of heat energy produced by the heat pump divided by the energy consumed by the heat pump.

COP depends largely on heat source and heating network temperatures. The higher the heat source temperature and the lower the supply water temperature, the better the efficiency ratio.

5.5 Control system

The heat pump is equipped with an automatic control system. The system manages the ChillHeat function for generating both heating and cooling either separately or concurrently. The control system includes a built-in automation system, sensors attached to it, and a control panel. The control panel is used for monitoring and changing system settings. Also error notifications are browsed and reset on the control panel.

The automation solutions support the most common field bus protocols. The control program has the following features:

- Clear, easy-to-use graphical user interface and reliable, programmable industrial controller enable controlling multiple ChillHeat units.
- Modbus and Profibus protocols available
- Remote monitoring and programming

Control system user interface

The user interface is based on different screens for different operations. The screens and views can be entered from the touch screen panel. In addition to the basic screens, you can access certain screens and views by logging in as **User** or **Expert**.

There are three user levels in the system, which enable the following features:

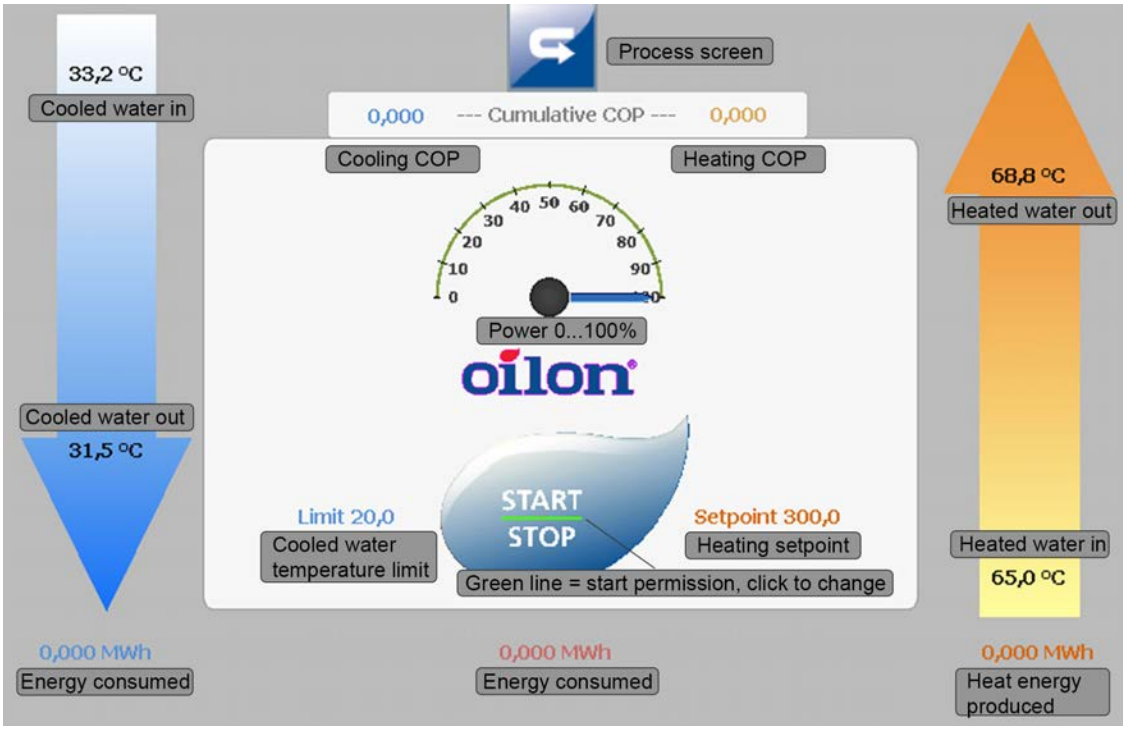
- **User** – enables access to basic settings, local or remote control, chill or heat mode, trends, and date and time settings
- **Expert** – in addition to the above-mentioned features, enables access to alarm min. and max. times, and compressor measurement values in advanced settings
- **OEM** – this user level is only available for manufacturer, and it enables access to factory settings of the heat pump

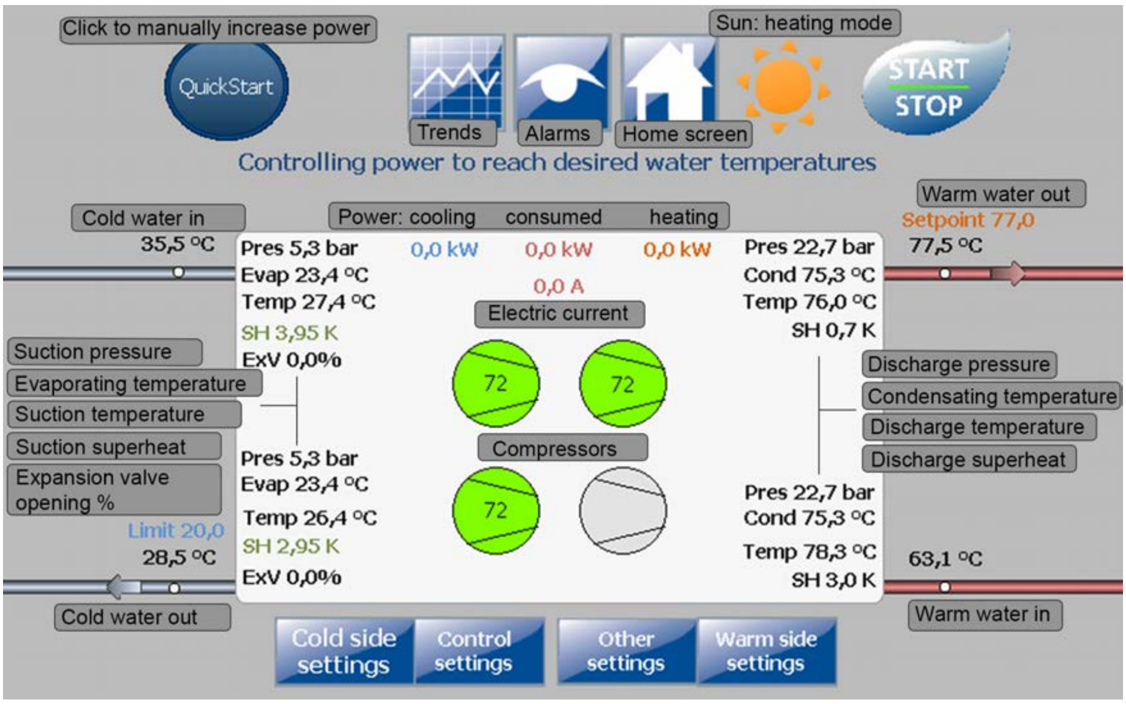
As normal user, you can access certain features without logging in. You can change set point values, start and stop the heat pump, acknowledge alarms, and view trends.

In the following sections, the different screens and functions are described in more detail.

5.6 Control panel

The **Home** screen is the main screen of the heat pump user interface. It enables you to have an overview of the heat pump, and to turn it on or off.





Compressors: power percentage as number, colors:

Grey: not ready to start

White: ready to start

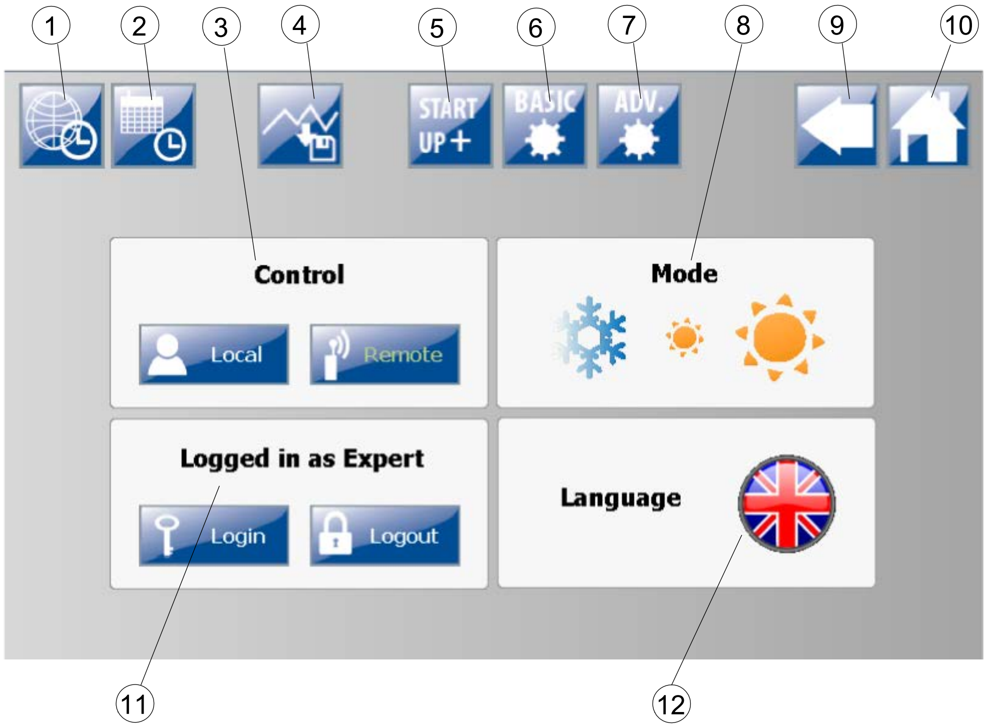
Green: running

Blinking red: alarm

5.7 Changing settings

Settings

The **Settings** screen enables you to make changes to the various settings, such as the operation mode and language. For details, see the following illustration and table.

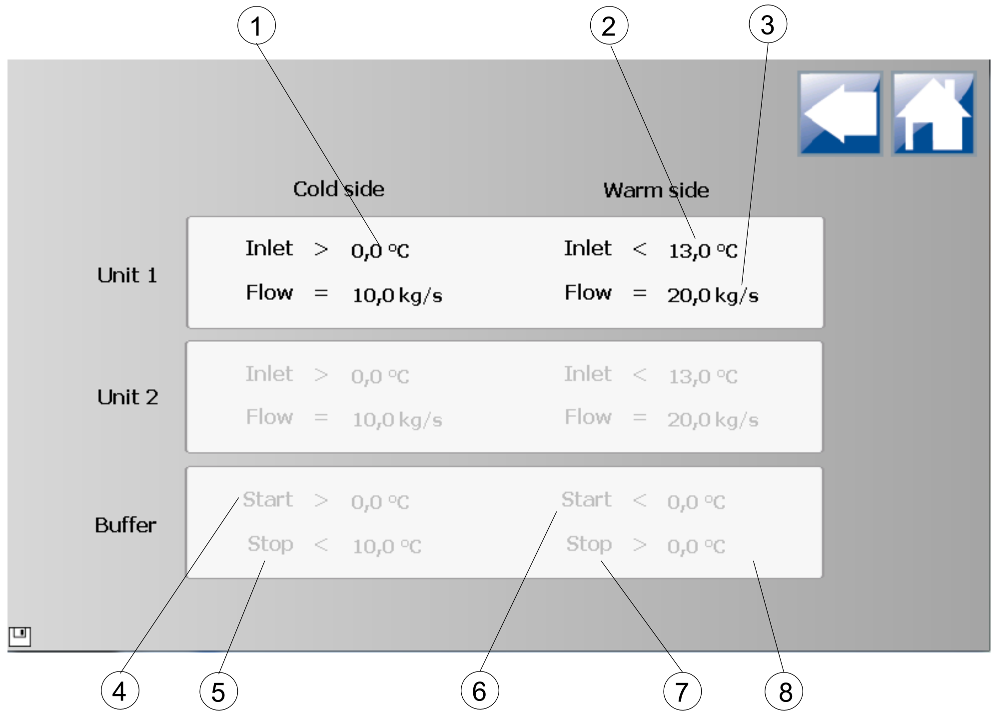


Settings screen ver. 3

Position	Item	Description
1	Time zone and region button	Setting of time zone, region, and daylight saving.
2	Time and date button	Setting of date and time.
3	Control selection	Setting of control location to **Local** or **Remote**.
4	Trend export button	Opens a **Select Datalog and Destination** dialog box, from which you can export the datalog to a SD card or a USB stick.
5	Startup Assistant button	Opens the **Startup Assistant**, which is used for starting the heat pump unit(s) for the first time.
6	Basic Settings button	Opens the **Basic Settings** screen (*User*).
7	Advanced Settings button	Opens the **Advanced Settings** screen (*Expert*).
8	Mode selection	Setting of the control mode Chill or Heat.
9	Back button	Return to the previous screen.
10	Home button	Opens the **Home** screen.
11	Logged in as view	Displays the logged in user and includes the **Login** and **Logout** options.
12	Language selection	Displays the current user interface language, and provides setting of the language.

Basic Settings

The **Basic Settings** screen enables you to view and change the unit basic settings as *User*. You can change the values that are shown in black on the screen by tapping on the values. Values that are shown in gray are read-only, and cannot be changed.

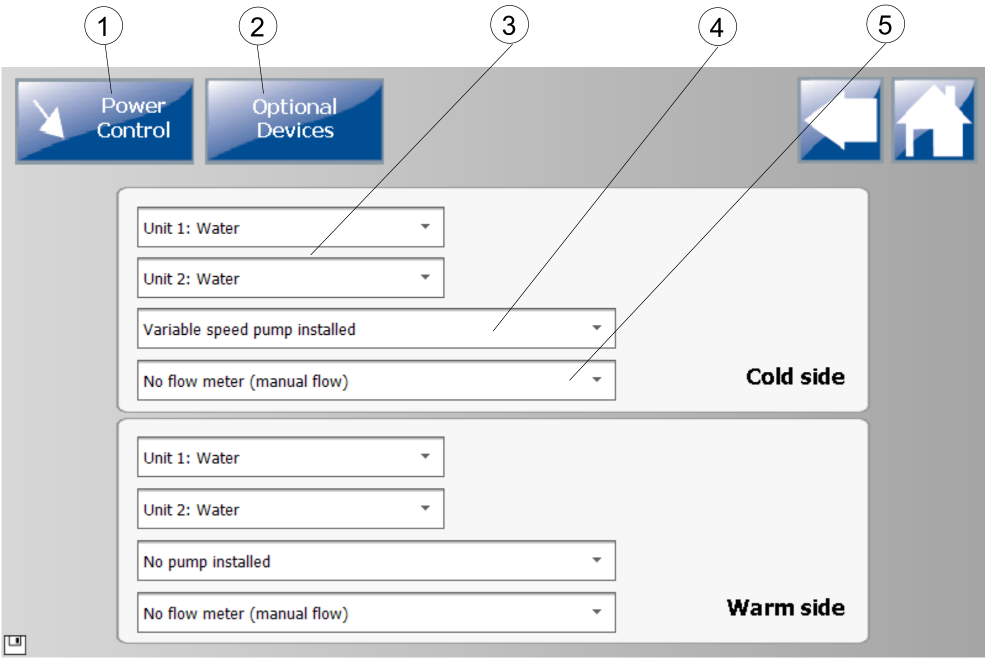


Basic Settings screen ver. 2

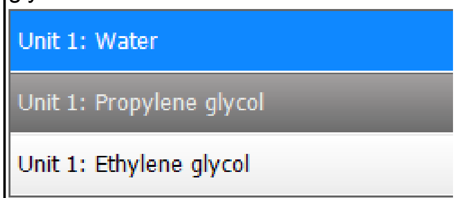
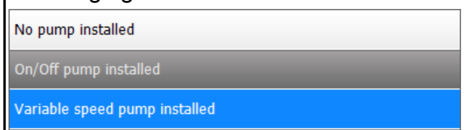
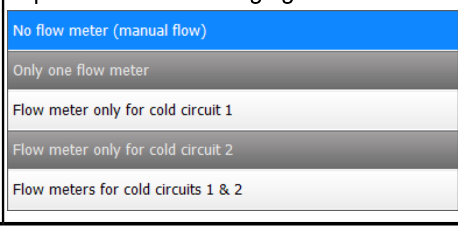
Position	Item	Description
1	Unit 1 cold side inlet value	Unit will not start unless the inlet value is over this value.
2	Unit 1 warm side inlet	Unit will not start unless the inlet value is under this value.
3	Liquid flow	If the value is shown in gray, it comes straight from the flow meter. If the value is shown in black, manual input is required.
4	Buffer start value	The heat pump starts after the high-level sensor is below the value.
5	Buffer stop value	The heat pump stops after the low-level sensor is above the value.
6	Buffer start value	The heat pump starts after the low-level sensor is above the value.
7	Buffer stop value	The heat pump stops after the high-level sensor is below the value.
8	Buffer variables	If the value is shown in gray, the buffer is not in use and the value is not needed. If the value is shown in black, the buffer is in use.

Advanced Settings

The **Advanced Settings** screen enables you to make changes to the advanced operational settings as *Expert* user.

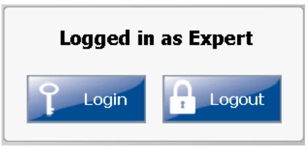


Advanced settings screen ver. 3

Position	Item	Description
1	Power Control	Opens the power control pop-up window, in which you can select, of which controller or limiter PID view you want to view.
2	Optional Devices	Optional devices include selection of buffer tank, 3-way valve pump, or cooler.
3	Liquid selection	Liquid selection list, in which the options are water and glycol. 
4	Pump type selection	Pump type selection list. The options are depicted in the following figure. 
5	Flow/energy meter selection	Flow/energy meter selection list. The options are depicted in the following figure. 

5.8 Changing user level

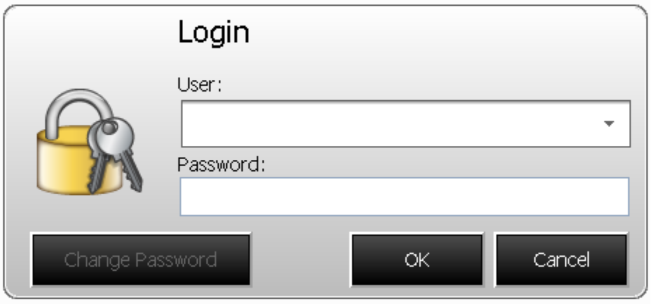
You can log in as a certain user on the **Settings** screen. The **Logged in as** section displays the logged-in user.



Logged-in user ver. 1

1. To change the user level and log in, press


.
   The **Login** view opens.



Login screen ver. 2

2. Select the user level from the **User** drop-down list, enter password in the **Password** field, and press **OK**.
   The user levels are **User**, **Expert**, and **OEM**.
3. To log out as the current user, press **Logout**.

5.9 Setting language

On the **Settings** screen, the current user interface language is shown with the corresponding flag icon in the **Language** section.

Language selection ver. 1

1. To change the language, press the flag icon.
   The **Language Selection** dialog box opens.

Language screen ver. 2

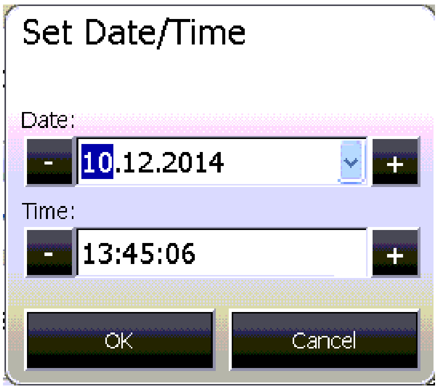
2. To change the user interface language, press the desired flag icon.

When selecting any other language than Simplified Chinese, the user interface language is immediately changed. Simplified Chinese requires restarting of the panel to get the changes in effect.

5.10 Setting time and date

You can change date and time on the **Settings** screen. For entering the **Settings** screen, you need to log in as **User**.

1. On the **Settings** screen, press the **Time and date** button.
   The **Set Date/Time** dialog box opens.

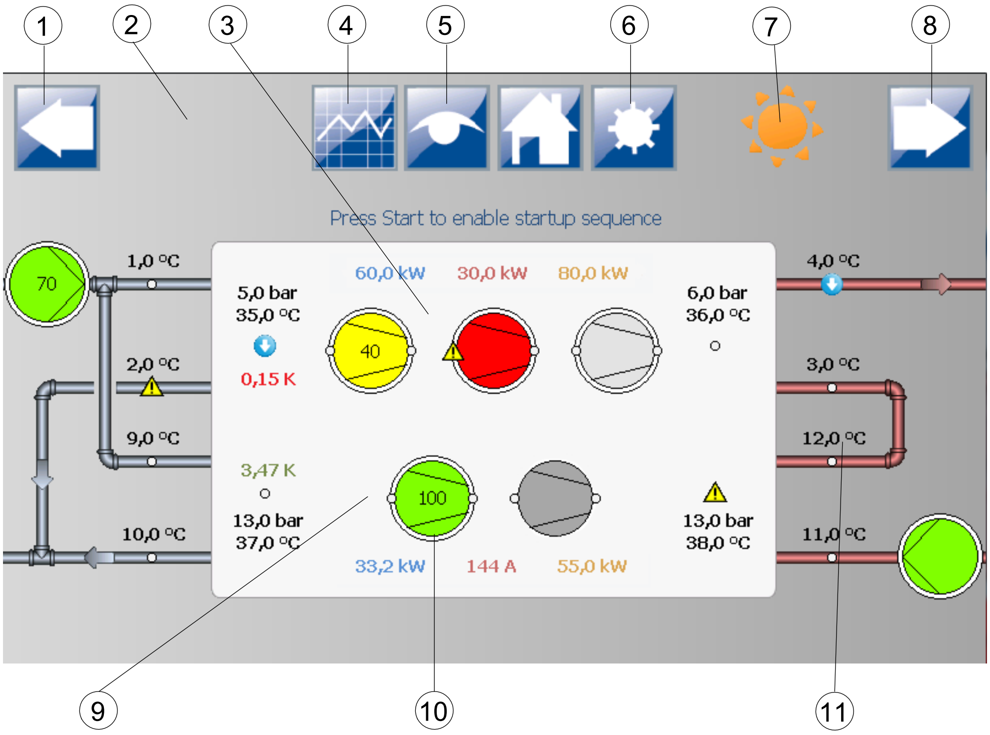


Date and time setting ver. 1

2. To set the date, select the date from the drop-down list, or use the minus and plus signs.
3. To set the time, enter the time or use the minus and plus signs.
4. To save the settings, press **OK**.

5.11 Viewing heat pump details

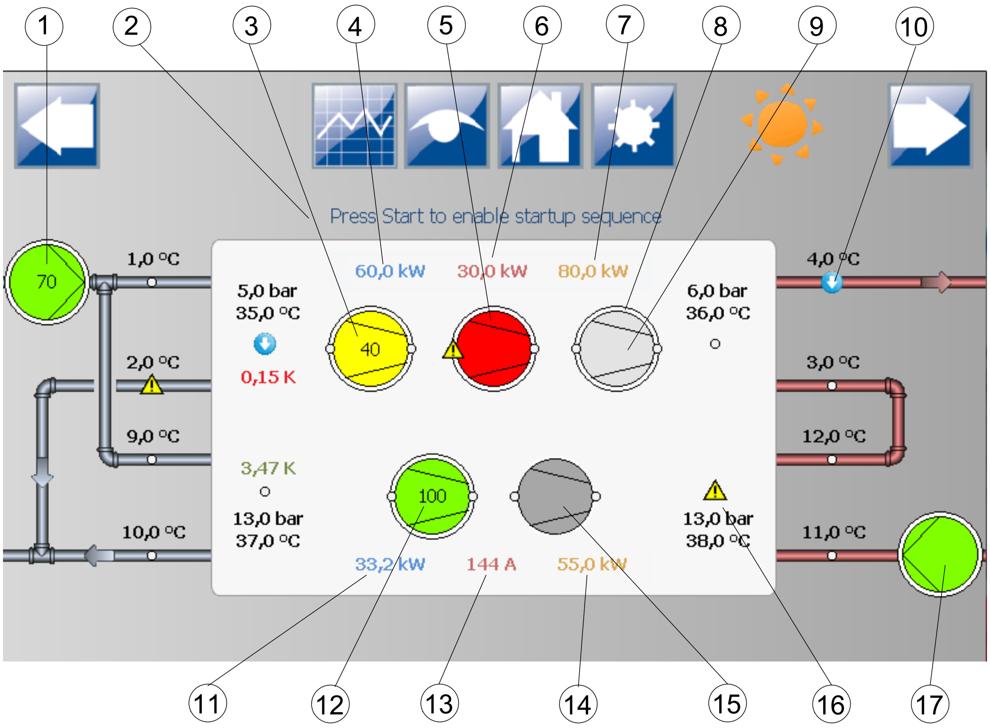
On this screen you can have a detailed view of the operation of the heat pump, and you can access the **Active Messages**, **Trend**, and **Settings** screens. For details, see the following illustrations and tables.



Unit Heat Mode ver. 2

Position	Item	Description
1	Evaporator buffer screen	Opens the evaporator buffer screen.
2	Chill mode (inactive)	Currently the heat mode is active. If chill mode was selected, the chill mode icon would be shown here.
3	Unit 1 compressors	Displays the status of each compressor of unit 1. The background color indicates the status of the compressor.
4	Trend selection	Opens the **Trend** screen.
5	Messages	Opens the **Active Messages** screen.
6	Settings	Opens the **Settings** screen.
7	Heat mode (active)	Currently the heat mode is active and the heat mode icon is shown here.
8	Condenser buffer screen	Opens the condenser buffer screen.
9	Unit 2 compressors	Displays the status of each compressor of unit 2. The background color indicates the status of the compressor.
10	Motor	Opens the motor status pop-up window.
11	Measurement	Opens the measurement pop-up window.

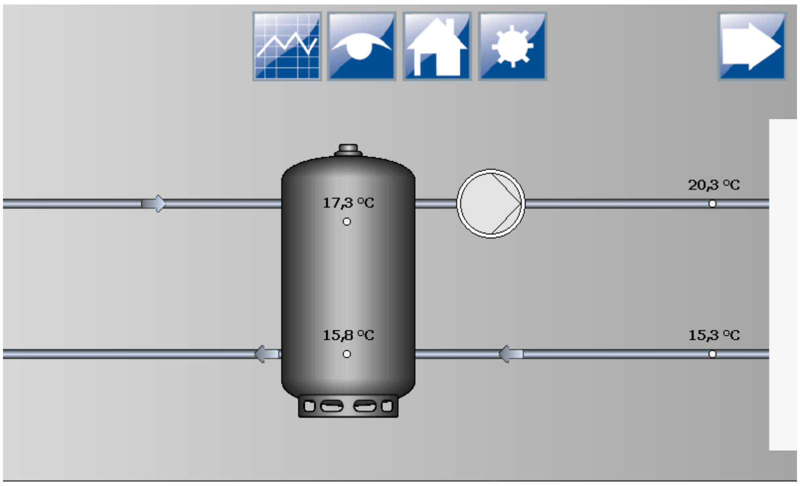
The following figure and table give more details of the units.



Unit ver. 2

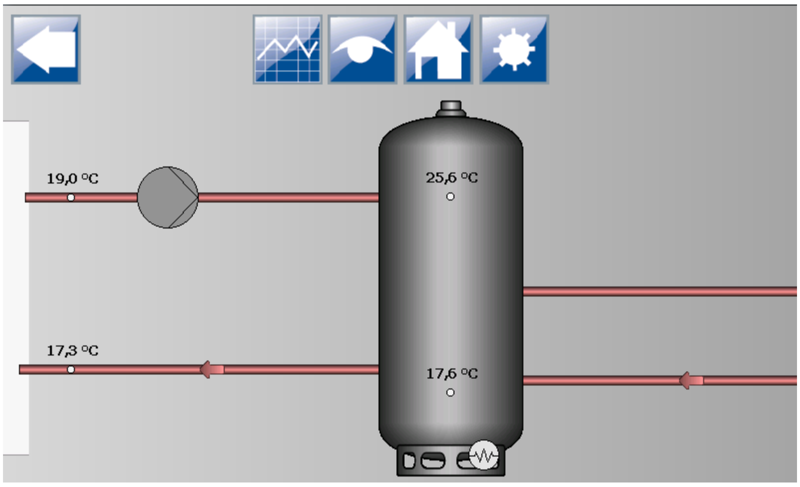
Position	Item	Description
1	Compressor status display	If a number is visible, it means that the motor is controlled by speed or power.
2	Information message	Information at start of the machine. The message is visible only if something is wrong.
3	Compressor status display	Yellow means that the compressor is controlled but not running.
4	Cold power (unit 1)	Displays the unit 1 cold power.
5	Compressor status display	Red means that there is an alarm and the compressor has stopped.
6	Consumed power display	Displays the consumed power.
7	Heat power (unit 1)	Displays the unit 1 heat power.
8	Compressor status display	White circle means that the compressor is in manual control. If there is no circle, the compressor is in automatic control.
9	Compressor status display	Light gray means that the compressor is in normal state but not running.
10	Limiting activated	Power limiting has been activated.
11	Cold power (unit 2)	Displays the unit 2 cold power.
12	Compressor status display	Green means that the compressor is running.
13	Current	Displays the current.
14	Heat power (unit 2)	Displays the unit 2 heat power.
15	Compressor status display	Gray means that the motor is disabled because of an alarm or a warning, or is waiting for permission to start.
16	Alarm or warning icon	The alarm icon indicates that something is wrong.
17	Compressor status display	If no number is visible, it means that the compressor is on/off-controlled.

Evaporator buffer screen



Evaporator ver. 1

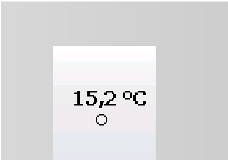
Condenser buffer screen



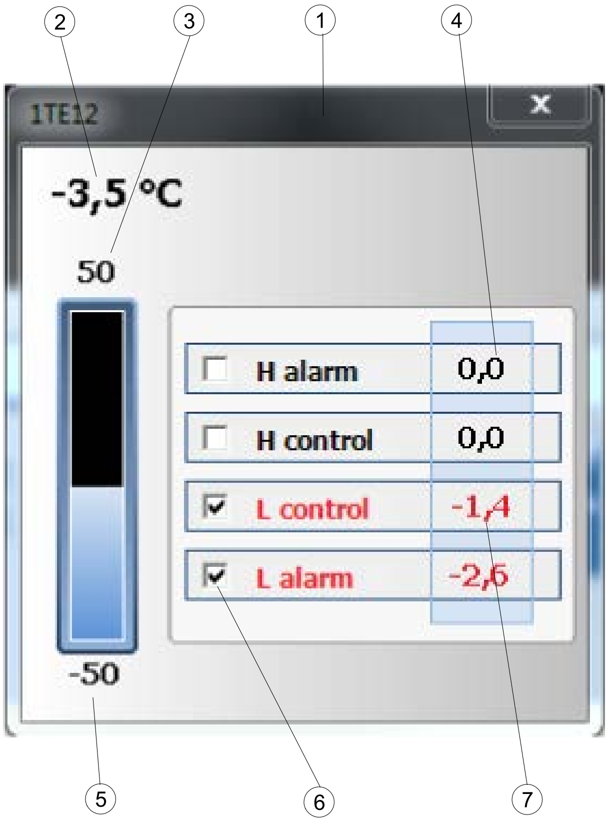
Condenser ver. 2

5.12 Viewing measured values and adjusting alarms

Open the measurement pop-up window in the unit details view by pressing the respective value.



In the measurement pop-up window you can view the measured value and adjust alarms as the *Expert* user.



Measurement ver. 2

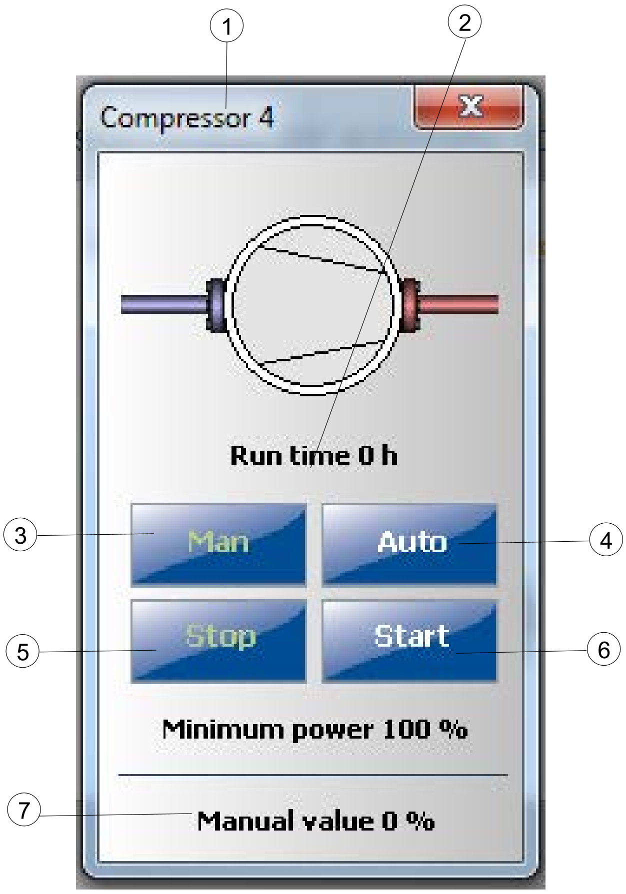
Position	Item	Description
1	Measurement	Measurement pop-up window
2	Current value	Displays the current measured value.
3	Upper value	Displays the upper limit of the measurement scaling.
4	Alarm setpoint value	Alarm setpoint value
5	Lower value	Displays the lower limit of the measurement scaling.
6	Setpoint enabled	Enabled setpoint for the alarm. The alarm is based on the value shown to the right of the button.
7	Power limiting setpoint	Power limiting setpoint is active.

5.13 Viewing motor status

Open the motor pop-up window in the unit details view by pressing the respective compressor icon.

In the motor pop-up window you can view the motor status.

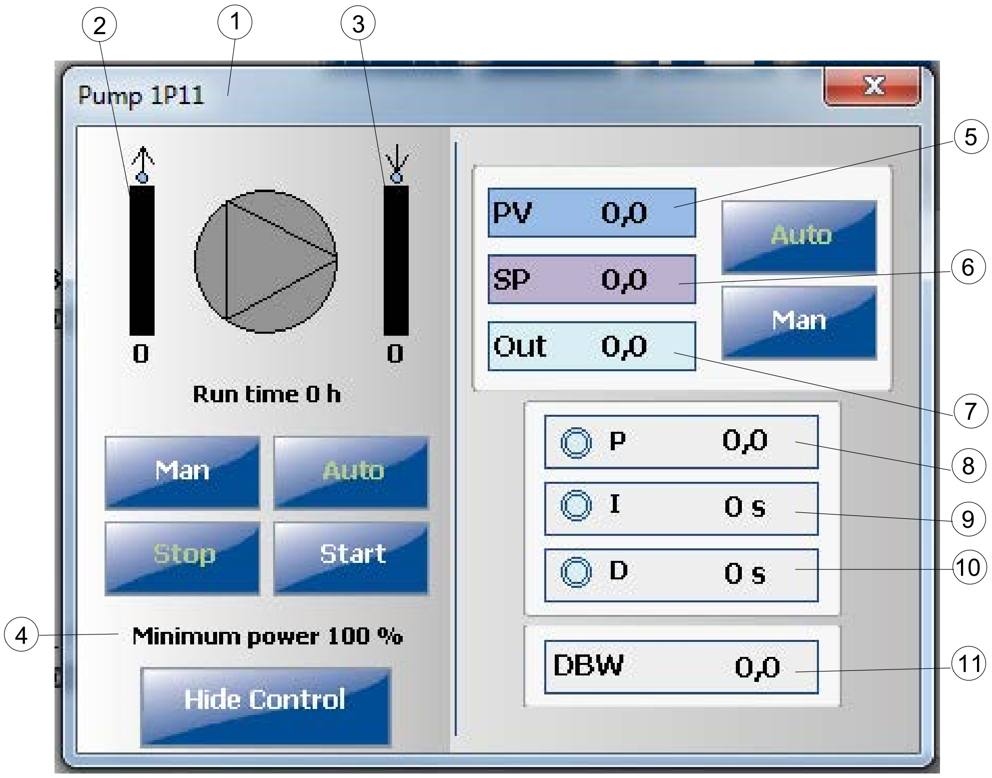
Viewing on/off-controlled motor



Motor On Off ver. 2

Position	Item	Description
1	Motor status pop-up window	On/off-controlled motor pop-up window. Displays the current motor status.
2	Run time value	Displays the running hours for the motor
3	Manual control	Sets the motor in manual control
4	Automatic control	Enables the automatic control of the motor
5	Stop	Stop when manual
6	Start	Start when manual
7	Control value input	Displays the control value input when in manual control. Gray when not in use.

Viewing speed-controlled motor



Motor speed ver. 2

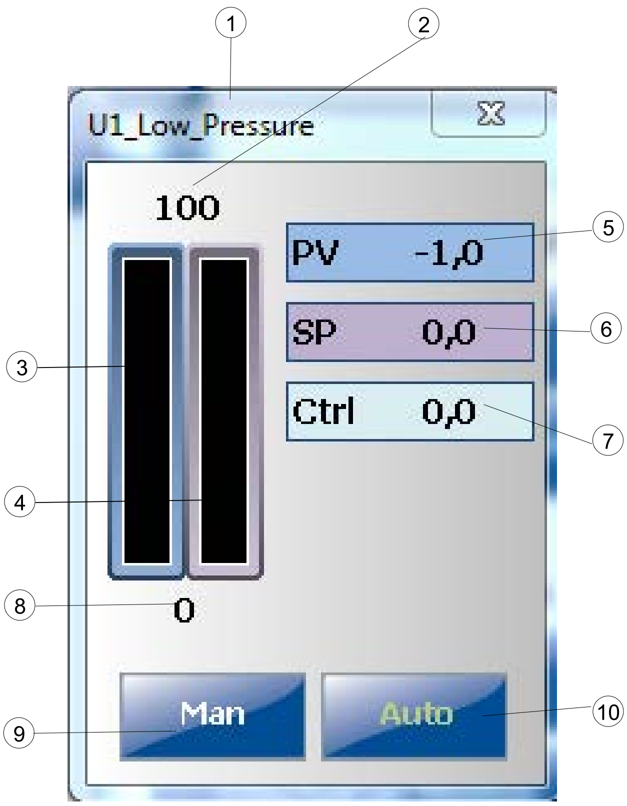
Position	Item	Description
1	Motor status pop-up window	Speed-controlled motor pop-up window. Displays the current motor status.
2	Control value	Displays the control value.
3	Measured value	Displays the measured value.
4	Minimum power	Displays the minimum power of motor.
5	Controlled PV	Displays the controlled process value.
6	SP for measurement	Displays the set point for measurement.
7	Control value	Displays the control value In / Out.
8	Proportional gain	Displays the gain value of PID controller.
9	Integration time	Displays the integration value of PID controller.
10	Derivation time	Displays the derivation value of PID controller.
11	Deadbandwidth	Displays the deadbandwidth value of PID controller.

5.14 Viewing PID controller values

Open the PID pop-up window by pressing the desired controller or limiter in the **Power Control** dialog box. You can access the dialog box from the **Advanced Settings** screen.

Power Control pop-up window ver. 1

In the PID pop-up window you can view the PID controllers.



PID ver. 2

Position	Item	Description
1	PID pop-up window	PID (proportional integral derivative) pop-up window
2	Maximum value	Displays the maximum value.
3	PV value	Displays the process variable value.
4	SP value	Displays the set point value.
5	Controlled PV	Displays the controlled process value.
6	SP for measurement	Displays the set point for measurement.
7	Control value	Displays the control value In / Out.
8	Minimum value	Displays the minimum value.
9	Man	Manual control
10	Auto	Automatic control

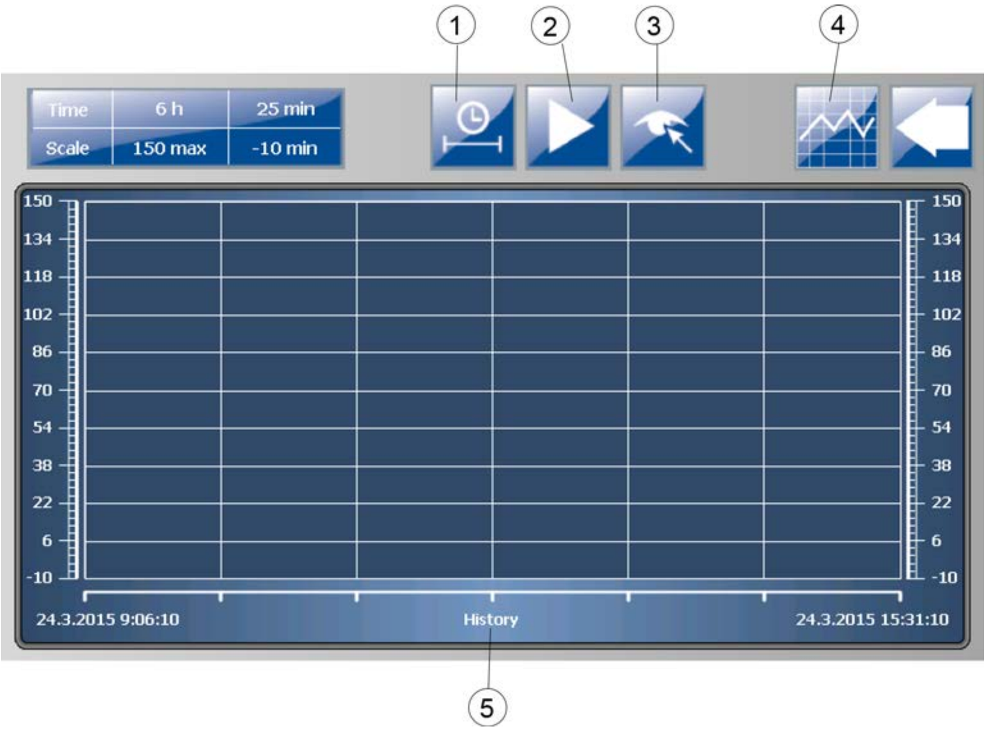
5.15 Viewing measured data history

The **Trend** screen displays the history of measured data.

You can access the **Trend** screen in the unit details view by pressing the **Trend selection** button.

The **Trend Selection** dialog box opens, in which you can select the trend type.

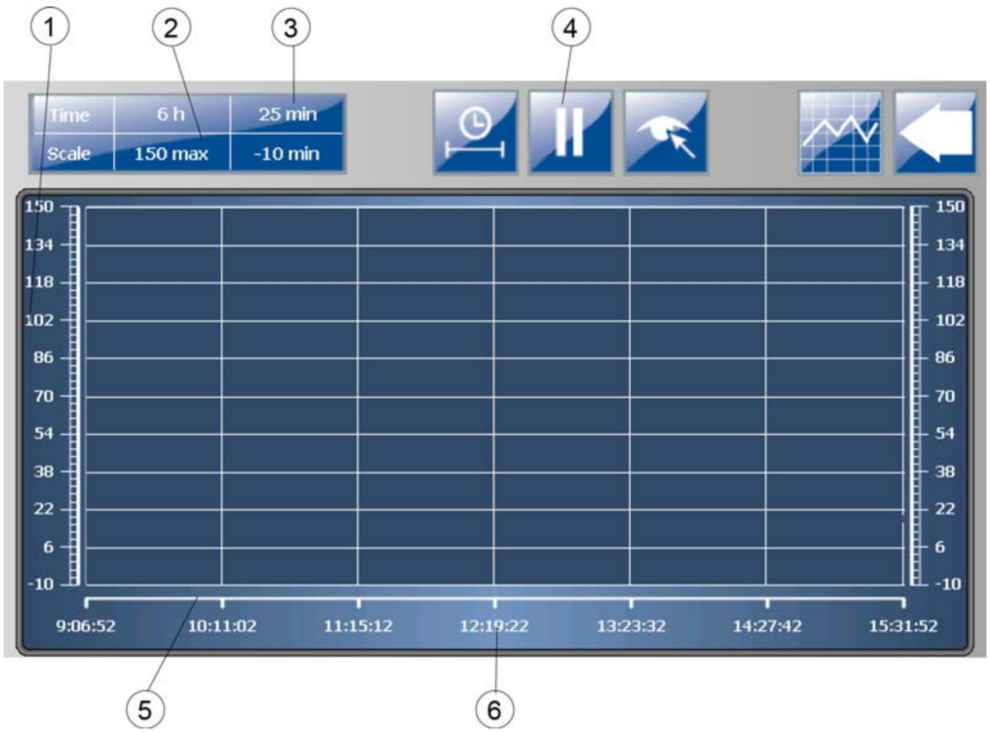
Trend Selection ver. 3



Trend history mode ver. 3

Position	Item	Description
1	Time selection	Selects the amount of time displayed in the time axis.
2	Exit	Exit the history mode.
3	Open trend legend	Displays the trend legend.
4	Back to trend selection	Goes back to the **Trend Selection** dialog box.
5	Mode	Displays the trend mode (History).

In the following figure, the normal mode is described.

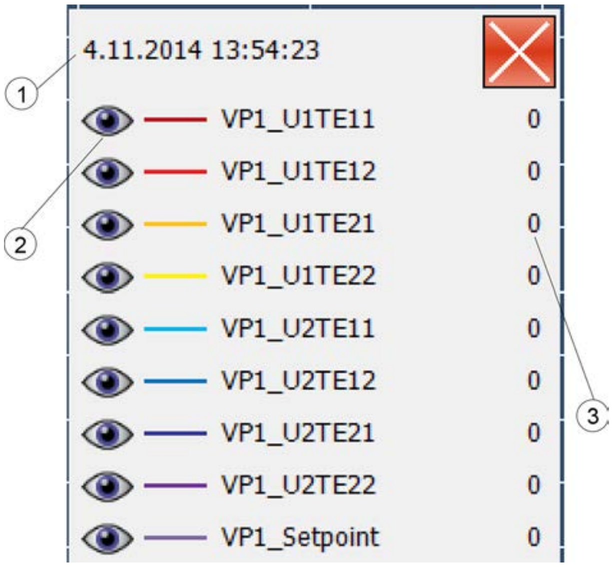


Trend normal mode ver. 3

Position	Item	Description
1	Trend scales	Selects the scale of trend on the vertical axis.
2	Scale selection	Simple scale selection
3	Time selection	Simple time selection
4	Mode selection	Change to history mode.
5	Time axis	Time axis of trends
6	Mode	Displays the trend mode (Normal).

Viewing trend legend

The trend legend displays the description of each curve currently displayed in the view. The description contains the color of the curve, name of the measurement instrument, unit, and real-time value of the measurement.



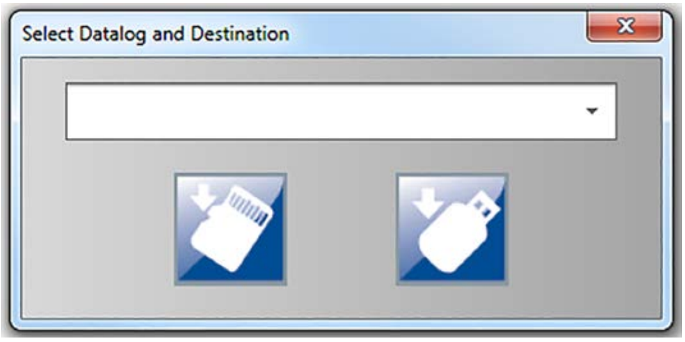
Legend ver. 3

Position	Item	Description
1	Trend legend	The trend legend dialog box.
2	Selection of trends displayed	Hides or shows the selected measurement curve.
3	Current value	Real-time value of the measurement.

5.16 Exporting trend

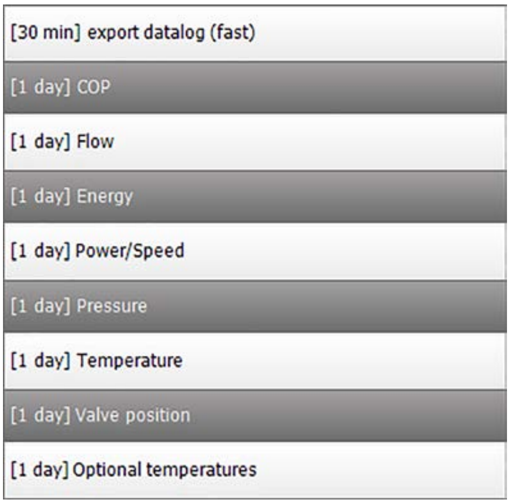
To export the trend datalog to an SD card or a USB stick, go to the **Settings** screen.

1. Press the **Trend export** button.
   The **Select Datalog and Destination** dialog box opens.



Select Datalog and Destination ver. 2

2. Select the data export option from the drop-down list.
   The options are the following:



Data export selection ver. 3

3. Select the destination for the datalog.
   The options are SD card (first icon) and USB stick (second icon).

5.17 Using ChillHeat with MobileDrive

The fixed control panel is optional on ChillHeat machines. It can be replaced with an Android application, that can be downloaded from www.oilon.com/MobileDrive. The device can be a smartphone or a tablet. However standard deliveries also include a tablet with the application.

MobileDrive can be used either locally through own wifi network of the ChillHeat unit or via the Tosibox router's VPN tunnel. A separate Tosibox application is required to create a remote access. A possibility for remote access is sold as a separate option. Application can be dowloaded fromwww.oilon.com/MobileDrive. However standard deliveries also include a tablet with the application.

Mobile device must connect MobileDrive to wifi network. Wifi network name is MobileDrive. Wifi password is 0il0nm0bile (0 = zero).

5.18 Using MobileDrive

HOME

Cards with upper right corner turned indicates that there are more pages behind this card (SETPOINT and HEATING).

DEVICE STATUS: Gives unit´s operation permit. Displays heatpumps status information.

SETPOINT: Displays unit setpoints and control mode. Click the card to access Basic settings page.

COOLING: Displays temperatures and flow if available.

HEATING: Displays temperatures and flow if available.

PUMP: Blue background for cold side pump. Yellow background for warm side pump. Click the card for more options, such as manual start.

COP: Displays the current ratio of cooling and heating.

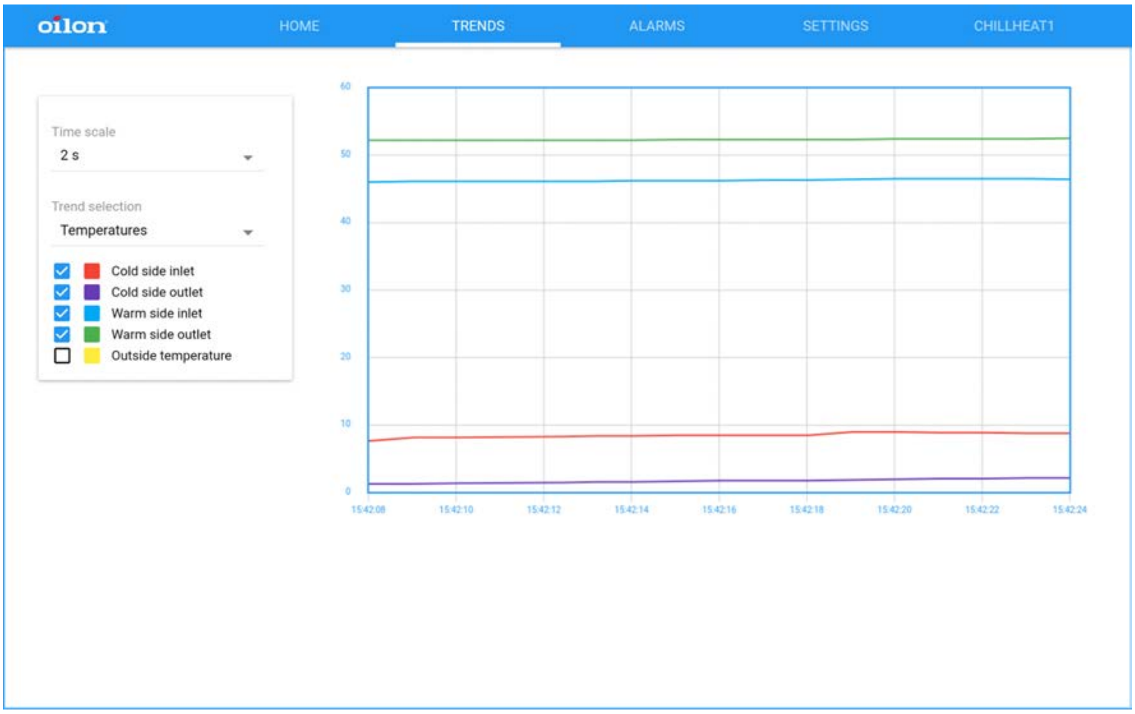
COOLING OUTPUT: Displays the current cooling output and combined cooling energy.

HEATING OUTPUT: Displays the current heating output and combined heating energy.

CONSUMPTION: Displays the current consumed electrical power and total consumed electrical energy.

POWER OUTPUT: Suction and hot gas pressure measurements and alarm limits for unit´s refrigerant circuit can be read and set from the card.

TRENDS



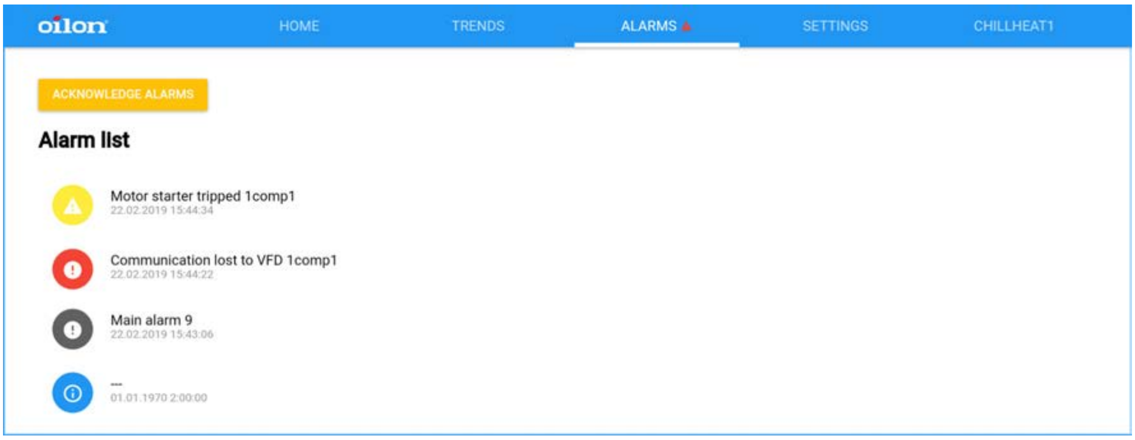
All unit measurements can be read from the Trend menu.

- Temperatures
- Efficiency
- Power

Measurements can be read in real time.

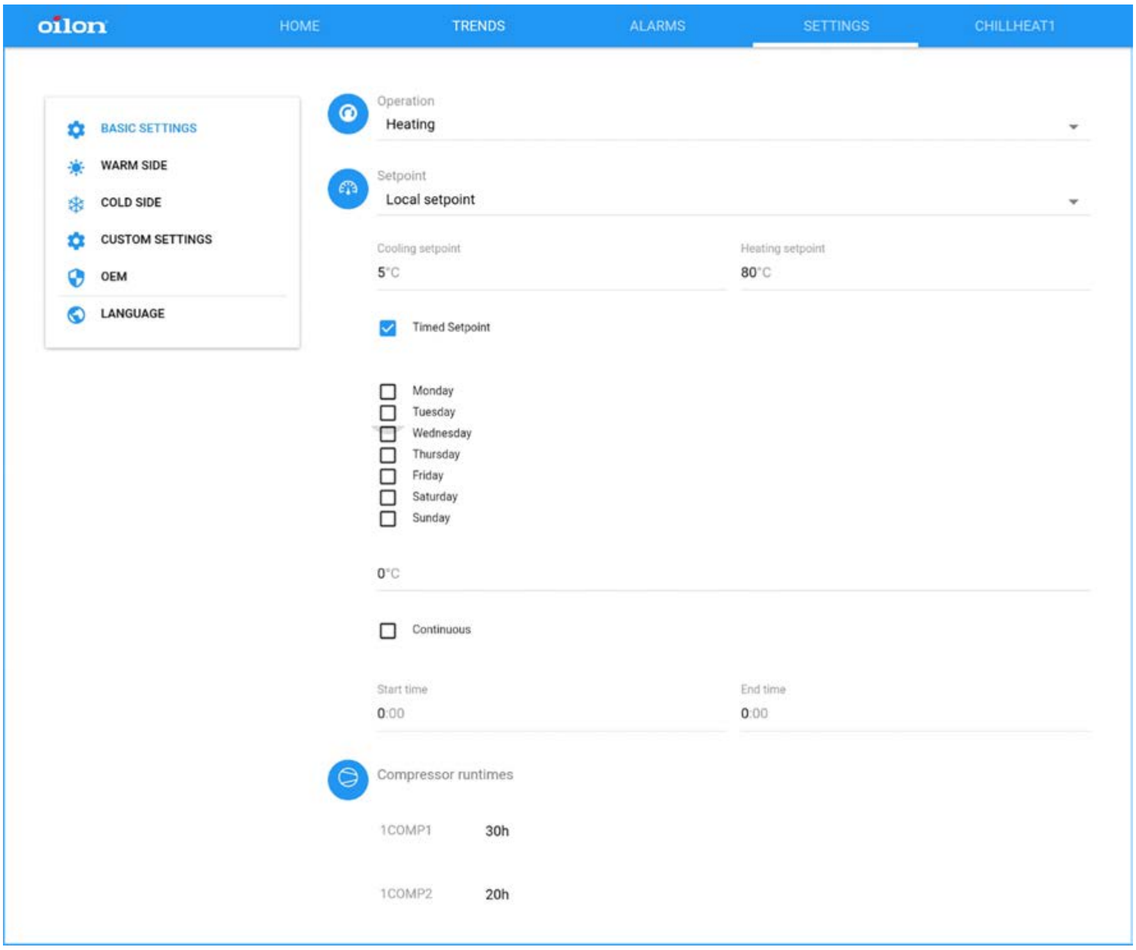
The desired measurement curve can be hidden or displayed.

ALARMS



All active alerts, warnings and alarms are displayed on the Active notification page. On this page you can also reset alarms. Yellow alert is a warning, red is an alarm, grey is deactivated and blue is info.

SETTINGS



BASIC SETTINGS

! Note	Device does not start if remote stop command is active from terminal block or modbus.

Operation: Heating, Cooling

Heating, The compressor power is controlled by outgoing hot water.

Cooling, The compressor power is controlled by outgoing cold water.

! Note	When heat pump equipped with frequency converter, ChilHeat function is always on.

Setpoint: Local, Dynamic, Remote

Local, the setpoint is given from the Mobile Drive user interface.

Dynamic, the setpoint is given from the Mobile Drive user interface. The setpoint is determined by the outside temperature curve.

Remote, the setpoint is given either to the terminal blocks or through Modbus. There is no need to select from the panel from where the control comes from, the program itself can make the selection.

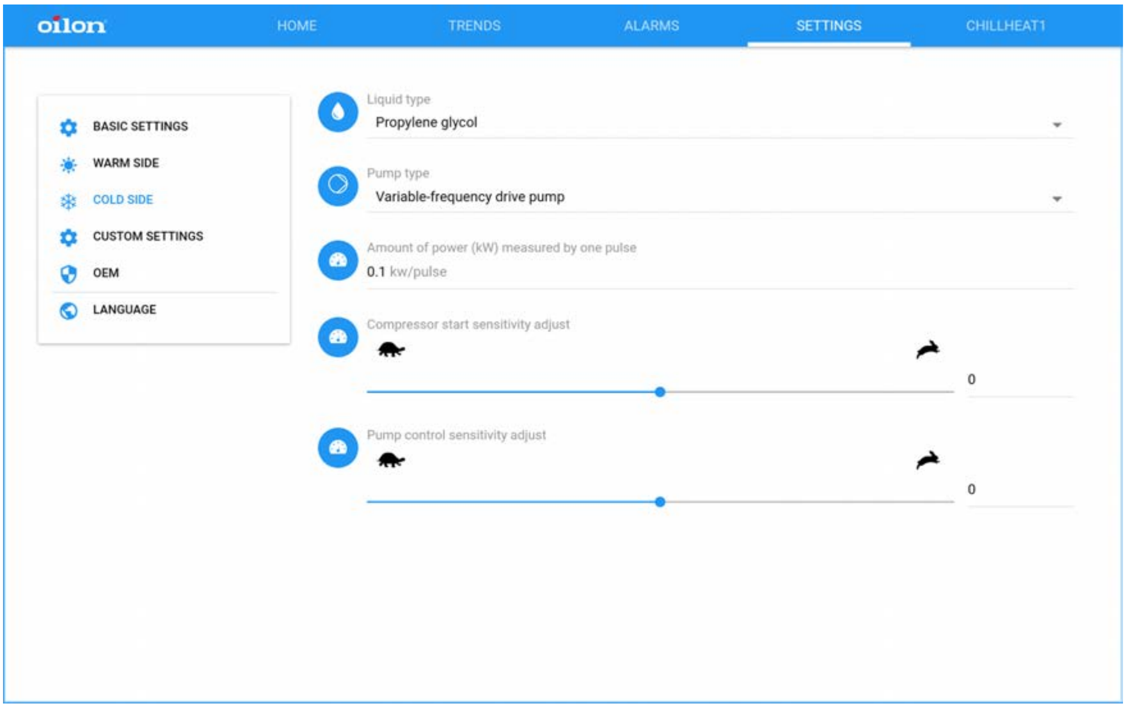
Timed Setpoint:

Choose weekdays and times when the device is active.

Compressor runtimes:

Displays running hours at 10 hour accuracy. Digit only visible when compressor has operated over 10 hours.

WARM SIDE / COLD SIDE



Liquid type:

A brine type for the warm side can be selected from the Warm side page. Water, Propylene glycol, Ethylene glycol and Ethanol. Is it on/off or VFD.

Pump type:

A brine pump can be added, and its type can be selected.

Amount of power (kw) measured by one pulse

If a gauge is connecte, kw/pulse is shown.

Compressor start sensitivity adjust:

Adjust with slider.

Pump control sensitivity adjust:

Adjust with slider.

CUSTOM SETTINGS

If the heat pump has special features, parameters can be changed here.

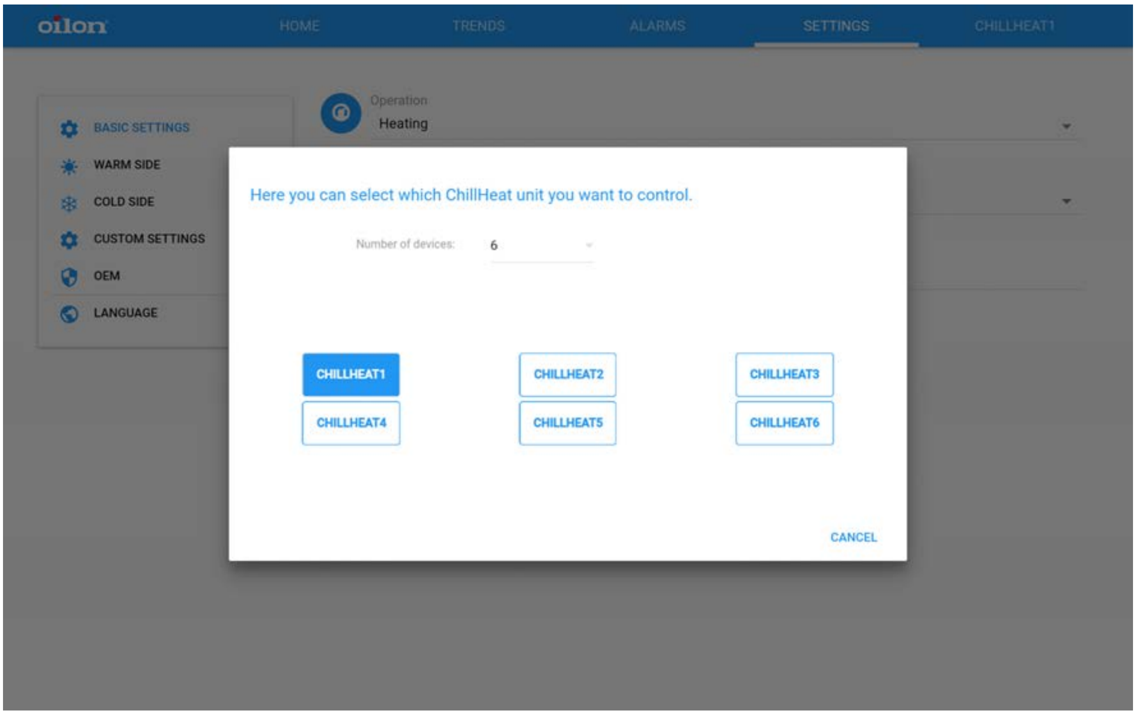
OEM SETTINGS

Only experts can access OEM window. Window contains measurements for trouble shooting and other technical data.

LANGUAGE

Select a language.

CHILLHEAT



From the ChillHeat top menu you can select which unit to connect.

6 Maintenance

6.1 Regular check and maintenance

CAUTION	When maintaining the heat pump, note that adding and purging of a liquid refrigerant from the evaporator with standing water can cause a frost damage.

DANGER !	Installation, commissioning, or service of the appliance is to be carried out by authorized and trained personnel only, adhering to all local regulations and requirements.

DANGER !	Do not touch any liquid without protection. Operating liquid contact may cause frostbite. Always immediately inform operating staff about leakage.

Heat pumps check and maintenance must comply with the European Union's Regulation No 517/2014 and follow the attached table. CO2 equivalent of refrigerant can be calculated by multiplying the refrigerant charge by the refrigerant GWP value.

The amount of refrigerant in the device	Normal maintenance interval	Maintenance interval with the leak detector
5 – 50 ton CO2 equiv.	12 months	24 months
50 – 500 ton CO2 equiv.	6 months	12 months
Over 500 ton CO2 equiv.	3 months	6 months

Follow the check and task list of the *Maintenance tasks and programs* report to carry out annual maintenance.

Each time an annual maintenance is performed, the service provider must fill out a form in the maintenance sheets delivered with the heat pump. Also a sticker informing about the next required annual maintenance should be placed. The sticker should be located in a visible place of the heat pump.

6.2 Troubleshooting

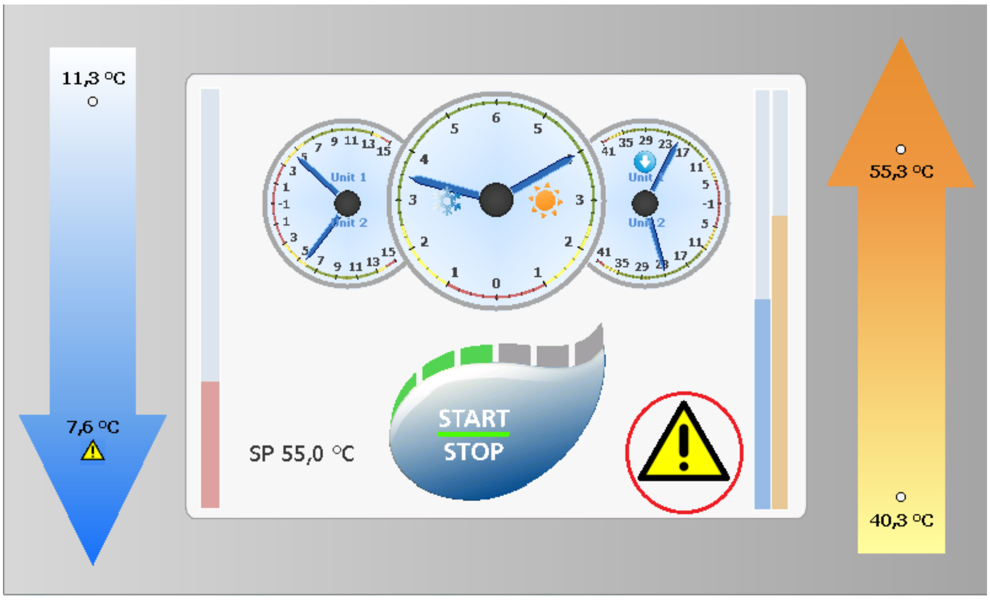
Failure codes

Device failures are displayed on the **Active Messages** screen on the control panel.

Failure	Probable cause	Recommended actions
Refrigerant gas detected	Gas leak indicator has detected gas. Machine unit leaks refrigerant or there is external gas in the engine room (for example due to painting work).	Try resetting alarm, if it resets and heat pump starts again there is no leak. If it stays on and no outside cause, contact oilon service.
No cold water flow	Problem with pump, a closed valve, air in pipes, lack of water, flow switch adjusted incorrectly.	Check them.
Electrical supply phase fault	Wrong phase order in electricity supply, wire loose, or fuse gone.	Check fuses, if ok then contact oilon service.
Suction pressure low	Cooling water too cold or too low flow causing ice in evaporator, problem with expansion valve, or refrigerant leaked out.	Check operating conditions, if not near freezing point, contact oilon service.
evaporator temperature low	Cooling water too cold or too low flow causing ice in evaporator, problem with expansion valve, or refrigerant leaked out. If enough refrigerant, evaporating and condensing temperatures should be within 10C of water temperatures 10min after stop.	Check operating conditions, if not near freezing point, contact oilon service.
Discharge pressure high	Heating water too hot or too low flow in condenser, or too high refrigerant fill. If refrigerant fill is correct, condensing temperature should be within 5C of temperature of water out when running (unless very low or very high flow).	Check warm water flow, check warm water temperature compared to maximum.
Condensing temperature high	Heating water too hot or too low flow in condenser, or too high refrigerant fill. If refrigerant fill is correct, condensing temperature should be within 5C of temperature of water out when running (unless very low or very high flow).	Check warm water flow, check warm water temperature compared to maximum.
Hot gas temperature high	Compressor overheated, too high difference between evaporating and condensing temperature and too low power in compressor.	If minimum power of compressor below 60%, try raising it, otherwise contact oilon service.
Suction superheat low	Expansion valve control problem.	Contact oilon service.
Motor starter tripped	Too high current.	If VFD, check VFD for alarm, else check motor overcurrent protection device in electrical cabinet.
Communication lost to VFD	Fieldbus communication problem between controller and VFD.	Check wiring, contact oilon service.
Discharge pressure high, pressure switch	Heating water too hot or too low flow in condenser.	Check warm water flow, check warm water temperature compared to maximum.
Protection device alarm	If it resets automatically within an hour then compressor motor overheating protection, motor gets hotter when warm water temperature is warmer, and cold water temperature colder. If not, then oil alarm.	Reset from button in oil alarm device attached to compressor. Try increasing compressor minimum power to improve oil flow.
Control on, but running signal off	Electrical problem, either contactor or wiring.	Check wiring, contact oilon service.
Control off, but running signal on	Electrical problem, either contactor or wiring.	Check wiring, contact oilon service.

Monitoring alarms

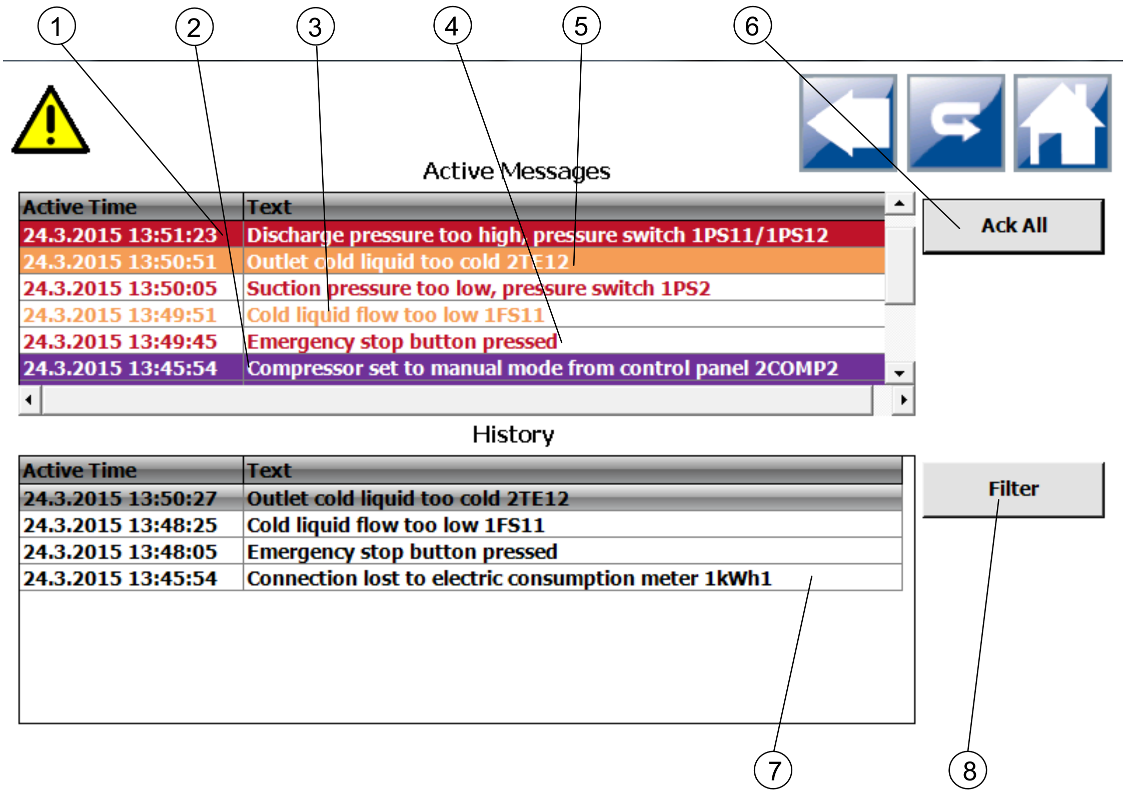
If the alarm icon is displayed on the **Home** screen, pressing on the icon opens the **Active Messages** screen.



Alarm active ver. 2

The **Active Messages** screen displays all active alarms and warnings, and allows you to acknowledge them.

The **History** section displays the history of all occurred alarms.



Active Messages screen ver. 3

Position	Item	Description
1	Line with red background	Active alarm, waiting for acknowledging
2	Line with violet background	Active information message
3	Line with orange text	Acknowledged warning

Position	Item	Description
4	Line with red text	Acknowledged alarm
5	Line with orange background	Active warning
6	Ack All button	Acknowledge alarm button
7	Line with white background	The alarm has been acknowledged and removed from the active messages list and stored to the alarm history.
8	Filter button	Filtering of messages

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