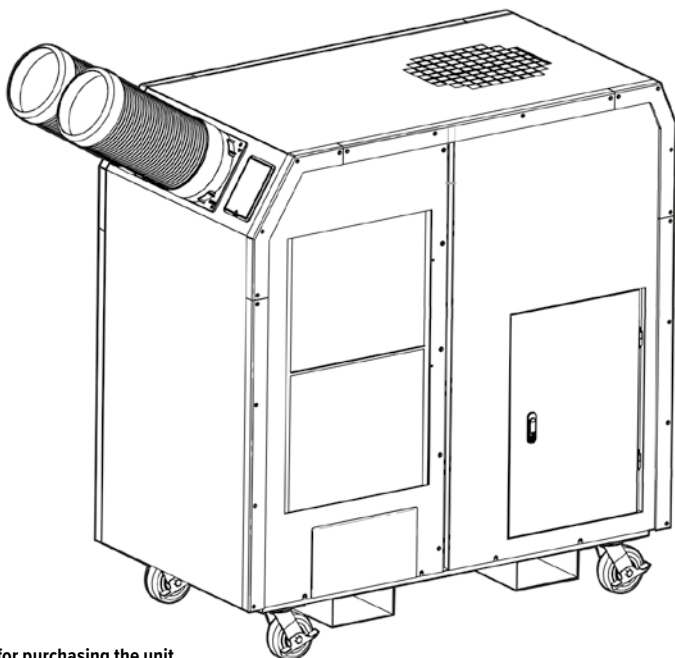




HEAT PUMP

REXNORDIC

REXNORDIC HP-60 Mobile Heat Pump



Thank you for purchasing the unit.
Before operation, please read this user's manual carefully.



INSTRUCTION
BOOK



OHJEKIRJA



BRUKSAN-
VISNING



INSTRUKSJONS-
BOK



INSTRUKTIONS-
BOG



BEDIENUNGS-
ANLEITUNG



INSTRUCTIE-
BOEK



MANUEL
D'INSTRUCTIONS



INSTRUKCJA
OBSŁUGI



MANUALE DI
ISTRUZIONI



MANUAL DE IN-
STRUCCIONES



MANUAL DE
INSTRUÇÕES



TABLE OF CONTENTS

SAFETY INSTRUCTIONS	3
SPECIFICATIONS, CONTROL PANEL FUNCTIONS	4-5
GENERAL ADVICE BEFORE USE	6
EXTERIOR DESCRIPTION	6
MODE CHANGING METHOD	6
HOW TO SET THE 'OFF' TIMER	7
TEMPERATURE CONTROL OPERATION	7
SELECTION	8
'ERROR' and WARNING INDICATORS	8
TROUBLE SHOOTING	9
CLEANING AND MAINTENANCE	10
USING MOBILE APPLICATION	11
WIRING DIAGRAM	14
THE INSTALLATION, SERVICE AND OPERATION MANUAL	15

Thank you for purchasing the unit.
Before operation, please read this user's manual carefully.

- The following instructions are to ensure user's safety and to prevent any physical injury or material damage. Please read carefully and follow all instructions. There are two sections to these instructions: **WARNING** and **CAUTION**.
- The appliance is not to be used by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction.
- Children being supervised not to play with the appliance.









► It is essential that you read 'SAFETY INSTRUCTIONS' carefully before use and follow them at all times.	► This unit is specified for use on the rated voltage power supply.
► Keep this manual on hand for reference.	► We have a policy of continual improving on our products. The contents (features and specifications) in this manual are therefore subject to change without notice.

The content of this manual, including the specifications and the design of the products may be modified without prior notice.






SAFETY INSTRUCTIONS

WARNING Keep this manual in a visible location near the unit for easy reference.

SYMBOLS:  **YOU MUST**  **YOU MUST NOT.**

-  Use a circuit breaker that fits the capacity. (It may cause fire and electric shock)
-  Before cleaning, disconnect the unit. (Otherwise risk of electric shock)
-  Do not use a damaged power cable. (Short, fire or shock hazard)
-  Do not use an extension lead unless of the approved type. (Risk of fire and / or electric shock)
-  Do not place anything on top of the machine. (This could cause electric shock, malfunction or injury)
-  Do not kink or sharply bend the power cable nor put any weight on it. (The insulation may be damaged causing fire or electric shock)
-  Check control panel after turn off circuit breaker first. (Risk of electric shock and / or malfunction)
-  Do not use this unit on unstable or inclined surfaces. Always use on solid flat floor. (Risk of falling causing injury, fire or malfunction)

CAUTION

-  Do not place this unit on uneven, unstable or inclined surface. (This could cause malfunction)
-  When storing this unit, keep it in a dry, cool place. (To prevent corrosion and malfunction)
-  If not being used for some time or if lightning is present, always disconnect power. (To prevent risk of electric shock, short circuit or fire)
-  Do not spray water onto this unit nor use solvents such as benzene, thinner or alcohol for cleaning. (There is a risk of electric shock and / or short circuit)
-  Designed for indoor use.

INSTALLATION

WARNINGS REGARDING PROPER LOCATION FOR INSTALLATION

WARNING

Do not use the unit in explosive environments or in areas where flammable gas leakage may occur.

Do not use the unit in areas where it will be exposed to rain or water.

Do not use the unit in a corrosive atmosphere.

Do not install the unit on uneven or sloping surface. The unit may roll or topple over even if the casters are set to the locked position.

MOVING THE UNIT

Unlock the casters and push the unit to a flat surface and set the caster brakes to the locked position.

PLUGGING IN THE UNIT

Check the prongs and surface of the power cord plug for dust/dirt. If dust and/or dirt are present, wipe off with a clean, dry cloth.

Check the power cord, plug and prongs for damage or overload.

If any damage or overload is found, contact a qualified repair technician or a qualified electrician to perform replacement or repair of the power cord, plug or prongs.

WARNING

If the power cord or plug is damaged, repair should only be performed by qualified electrical personnel.

WARNING

Do not connect/disconnect the power cord or attempt to operate buttons with wet hands. This could result in electrical shock.

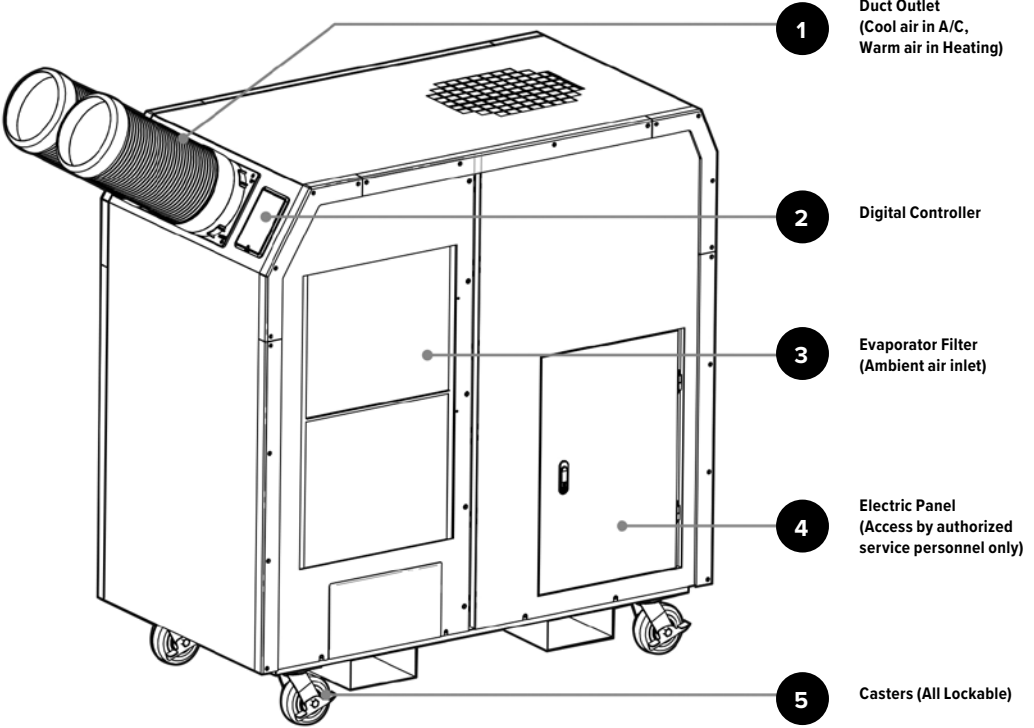


MOBILE HEAT PUMP

TECHNICAL INFORMATION REXNORDIC HP-60

Cooling/heating capacity	Btu/h	60,000	Weight	kg	296
	W	17,600		Noise level	dB
Electrical connection	380V 50Hz 3Ph		Operating Conditions		Cooling 18 ~ 45°C (40 ~ 60%)
Power consumption	kW	Cooling 8,8		Heating 5 ~ 27°C (50 ~ 60%)	
	kW	Heating 8,4		Dehumidification 18 ~ 45°C (40 ~ 60%)	
	A	Max. 14.8	Power Cord	Plug (5 m)	
Dehumidification	l/h	Max. 8.2	Fuse	250 V~, 10 A	
	l/h	Nom. 7,8			
Refrigerant	kg	R-454C (3,430)	Static pressure	inH2O	1,57
Dimensions (W x D x H)	cm	74 x 138 x 146		Pa	441

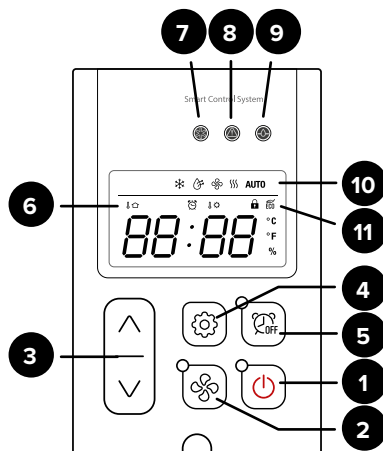
EXTERIOR DESCRIPTION FRONT VIEW





CONTROL PANEL FUNCTIONS

1	Power	Use to power on / off.
2	Fan Speed	Controls fan low / high speed.
3	▼▲ Button	Raises or lowers the setting temperature or sleep (off) time.
4	Mode	Use to select Cooling / Dehumidification / Fan / Heating / Auto mode
5	Off Timer	You can set the time to stop the unit. You can set 0~24 hours. Time intervals are 30 mins. up to 10 hours and then 1 hour between 10 and 24 hours.
6	Room	If the LCD is on, the displayed temperature is for room temp.
7	Comp	When the compressor is operating, the LED is on.
8	Error	Error signal.
9	Check	If water is full or Align drain tank needs to be checked, the LED is on.
10	Display	Display room temperature, and also the setting temperature and sleep time if they had been set.
11	ECO	When the compressor is not operating, the LED is on. The fan is not operating or very low speed.



EXTERIOR DESCRIPTION

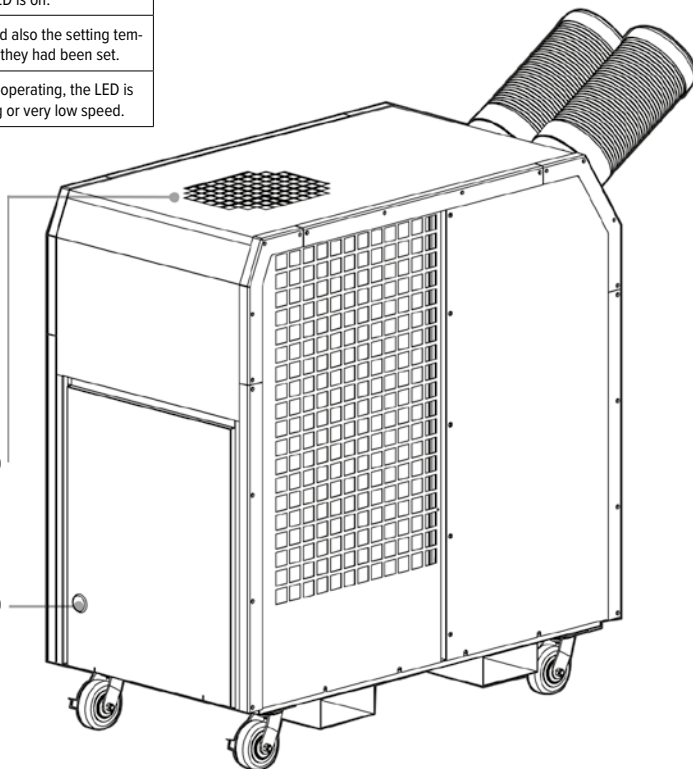
BACK & SIDE VIEW

Exhaust Air / Cold Air Outlet

1

Power Line Inlet

2




GENERAL ADVICE BEFORE USE

- Ensure the safety of the location in which the unit is to be used.
 - Ensure the floor or ground is smooth and flat.
 - Ensure at least 50 cm space side of the unit.
 - When in position, LOCK the casters to prevent rolling.
 - Never use the unit at more than 2° incline.
 - If you use condensate pump, connect it to the housing in the condensate tank.
 - You have to connect standard power cable.
- If the power cable is damaged, it must be replaced by its service agent or qualified person in order to avoid a hazard.

FOR MAXIMUM EFFICIENCY



- In airtight areas use vertical exhaust into ceiling.
 - If possible, send exhaust out through a window or door to outside.
- Note that the unit needs replacing airflow into the room.
- Ensure rated electricity supply.





Waste electrical and electronic products must be disposed separately from normal household waste. When you dispose of such products, please recycle where facilities exist. Follow the guidance of your local authority and/or ask the shop where you purchased the product.

Waste electrical and electronic products must be disposed separately from normal household waste.



MODE CHANGING METHOD



COOLING MODE
If you press the 'Mode' button. 'Cooling symbol' is displayed.



DEHUMIDIFICATION MODE
If you press the 'Mode' button when the 'cooling' is operating, 'dehumidification symbol' is displayed.


FAN MODE
If you press the 'Mode' button when the 'Dehumidification' is operating, 'Fan symbol' is displayed.

HEATING MODE
If you press the 'Mode' button when the 'fan' is operating, 'Heating symbol' is displayed.

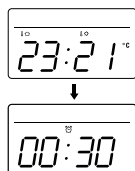
AUTO MODE
If you press the 'Mode' button when the 'heat' is operating, 'AUTO' is displayed.



HOW TO SET THE 'OFF' TIMER

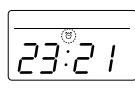
This function enables you to set the length of time you want the unit to operate.

1 STEP 1



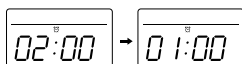
When unit is operating, press the 'Off Timer' button and set the length of time you want by pressing **▲** or **▼**. Each time you press the button you will increase the 'time to off' period by 30 mins. up to 10 hours, and 1 hour up to 24 hours. The display will show 0.5 for 30 min and 1 for an hour. One and half hours will show 1.5.

2 STEP 2



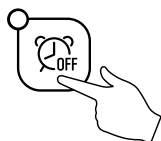
When you have finished setting the time period, the 'Off Timer' lamp will be on which indicates the unit is in sleep (Off Timer) mode.

3 STEP 3



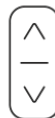
If you press the 'Off Timer' button during its operation, the remaining time will be shown.

CANCEL



To cancel 'Off Timer', press and hold 'Off Timer' button for 1 second. It will then switch the timer off automatically.

TEMPERATURE CONTROL OPERATION



- When you turn ON, the setting temperature is displayed.
- You can change setting temperature.

DISPLAY ROOM TEMPERATURE RANGE & SETTING RANGE

COOLING MODE

MODE	DISPLAY RANGE	SETTING RANGE
Room	0°C ~ 60°C	18°C ~ 30°C
Spot		1°C ~ 30°C

Cooling operates when room temperature is higher than set temperature.

Cooling stops when room temperature is lower than set temperature.

HEATING MODE

MODE	DISPLAY RANGE	SETTING RANGE
Room	0°C ~ 60°C	8°C ~ 27°C

Heating operates when room temperature is lower than set temperature.

Heating stops when room temperature is higher than set temperature.

AUTO MODE

MODE	DISPLAY RANGE	SETTING RANGE
Room	0°C ~ 60°C	18°C ~ 27°C

When room temperature is higher than set temperature, cooling operates and

when room temperature is lower than set temperature, heating operates automatically.

SELECTION

SPOT OR ROOM MODE



To change the temperature of the entire room, select 'Room mode'. For targeted cooling of machinery servers or people etc select 'Spot mode'. Applicable only when cooling mode.

- If you want to see room temperature, when unit is operated, push 'mode' and 'V' button simultaneously for 3 seconds.

- Light be on the 'Room LED' when room mode is set.

LOCK OR UNLOCK



- If you press 'V' for 5 seconds when the unit is turned off, you can control 'LOCK, UNLOCK' mode



- You can set 'UNLOCK' or 'LOCK' after pressing 'A' button.

TEMPERATURE UNIT



- If you want to change temperature unit °C ↔ °F, when the unit is stopped, push 'V' and 'A' button simultaneously for 3 seconds

ECO MODE



- If you press 'A' for 5 seconds when the unit is turned off, you can control 'ECO' mode.


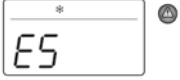






- You can select not operating the fan or very low speed.

'ERROR' AND WARNING INDICATORS

ERROR CODE	PROBLEM	CAUSE
	High pressure	Blocked COND filter. Blocked / kinked exhaust duct. Ambient temperature is too high.
CORRECTIVE ACTION Clean the COND filter. Ensure exhaust duct is not blocked / kinked. Do not use the air conditioner if ambient temperature is higher than		
	Low pressure	Verify Electrical. Refrigerant may be low or empty.
CORRECTIVE ACTION Verify Power (Voltage / Amps). Check refrigerant level and refrigerant leakage. Clean Filter and Coil. Check Evaporator Filter. Check Evaporator Coil.		
	AF1 sensor	If the AF1 sensor is shortcircuited or cut 'E3 A1' displayed and the 'Error' LED will be on.
CORRECTIVE ACTION Exchange AF1 sensor.		
	RT sensor	If the RT sensor is shortcircuited or cut 'E3 rt' displayed and the 'Error' LED will be on.
CORRECTIVE ACTION Exchange RT sensor in digital controller.		
	OT sensor	If the OT sensor is shortcircuited or cut 'E3 Ot' displayed and the 'Error' LED will be on.
CORRECTIVE ACTION Exchange OT sensor.		

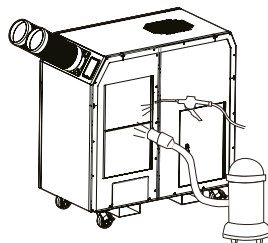
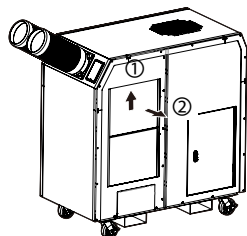
'ERROR' AND WARNING INDICATORS

ERROR CODE	PROBLEM	CAUSE
	AF2 sensor	If the AF2 sensor is shortcircuited or cut 'E3 A2' displayed and the 'Error' LED will be on.
CORRECTIVE ACTION Exchange AF2 sensor.		
	BLDC Motor	If BLDC motor is not operated, 'E5' displayed and the 'Error' LED will be on.
CORRECTIVE ACTION Check or change BLDC motor		
	Water full	Water tank is full.
CORRECTIVE ACTION Empty the water tank		
	Check condensate pump	Condensate pump is not working
CORRECTIVE ACTION Pump should have sewer connection.		
	Anti-Freezing alarm	Evaporator is below -2°C due to being used in a low ambient temperature area.
CORRECTIVE ACTION Do not use the unit in an ambient temperature less than 18°C. Check refrigerant level.		
	Phase order alarm	
CORRECTIVE ACTION If error rP appears, check/change phase order on main connection.		

TROUBLE SHOOTING

TROUBLE	CHECK	REMEDY
NOT WORKING	Power cable correctly connected.	Connect cable correctly.
	Power button "OFF".	Press POWER button to "ON".
	Fuse (supply) blown.	Exchange fuse in board.
	Breaker on switch board tripped.	Check load capacity and reset.
	Ambient temperature too high.	Check operating temperature range.
POOR COOLING	Filter blocked with dust.	Clean Filter.
	Dust in heat exchanger.	Clean heat exchanger.
	Obstacle against inlet side.	Remove and allow 50 cm clearance.

CLEANING AND MAINTENANCE

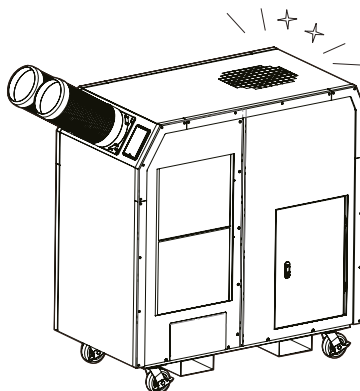


CLEANING THE AIR FILTERS

1 To remove filters, slide up a little **1** and pull towards you **2**.

2 Clean the filters with water or compressed air.

3 Clean evaporator and condenser units with a vacuum cleaner or compressed air.



MAINTENANCE

1 After cleaning, completely dry the inside of the unit by operating on 'Fan Mode'.

2 Turn "OFF" at control panel, remove plug from socket. Coil and store cable neatly.

3 Keep machine suitably covered to prevent damage by damp, humidity and dust.

USING MOBILE APPLICATION

INSTALLING APPLICATION

- 1 Start Google Play or App Store
- 2 Find Rex Nordic application
- 3 Install the application



REGISTER AS A USER TO APPLICATION

REXNORDIC
rexnordic.com

Sign In

E-mail

Password

[Forgot Password](#) | [Join](#)

- 1 On the login screen, press JOIN button to start a new user registration. If you already have an Rex Nordic account, sign in with your email and password.

Join

E-mail

Password

Confirm Password

- 2 Enter your e-mail and desired password twice and click JOIN button.

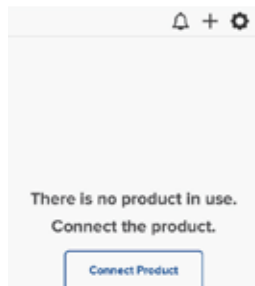
REXNORDIC
rexnordic.com

Waiting for your **E-mail Authentication**.

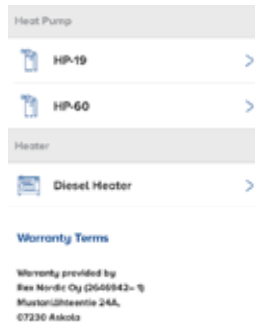
Please check your E-mail.

- 3 Check your email inbox and verify your email by clicking the button/link in your email.

CONNECTING HEATER TO APPLICATION



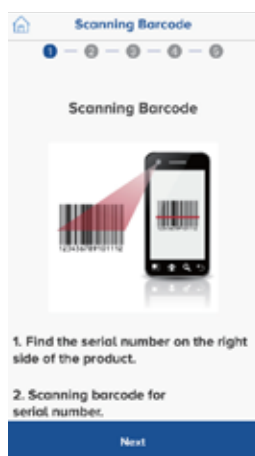
- 1 Press CONNECT PRODUCT button to start the connection process.



- 2 Choose Air Conditioner from the product options.



- 3 Please read all terms of service and accept them by clicking ACCEPT button.



- 4 Find the serial number on the right side of the heat pump. Scan the barcode with your camera to read to barcode. Press MANUAL to type the serial number manually.

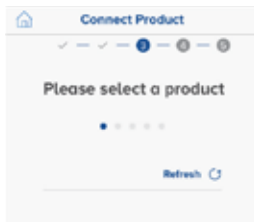
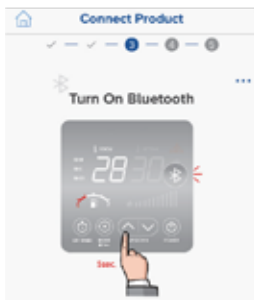
USING MOBILE APPLICATION

CONNECTING THE HEAT PUMP TO APPLICATION

Activate 3 years guaranteed
The official importer Rex Nordic Oy grants a 3 year guarantee for products imported by Rex Nordic Oy. For getting the 3 years guarantee, you need to activate your product in 4 weeks from purchase date. The guarantee activation needs to be done with this electronic form.

Company

First name *



Select a network to connect.

Wi-Fi

Password

☒ Using Password

Next

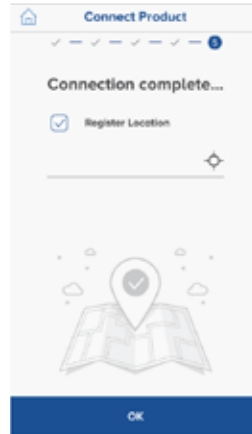
5 Fill in the Rex Nordic 3 years warranty form. Remember to fill in all information.

6 Turn the HEATPUMP power off and press the up button + Timer button for 5 seconds. Then the bluetooth icon flashes. Press NEXT button in the application.

7 Choose the product to connect from the bluetooth list provided.

8 Choose your Wi-Fi network by pressing the Wi-Fi selection. After choosing your Wi-Fi, fill in the correct Wi-Fi password in the password field. Press NEXT to connect your heater to your own Wi-Fi.

CONNECTING HEATPUMP TO APPLICATION



- Wi-Fi light blinking twice
Searching for Wi-Fi network you entered.



- Wi-Fi light blinking once
Connected to Wi-Fi, but not to the IoT Server.



Wi-Fi normal connection status



- Wi-Fi light on
Connected to Wi-Fi and the IoT Server.

Wi-Fi incorrect connection status
Please check the Internet or settings of the Wi-Fi for correct connection to the IoT Server.

9 Press the location cursor to provide location information to the application. If you don't want to register your HP location, uncheck the register location box.

TIPS FOR USING THE MOBILE APPLICATION

• You can refresh the screen by swiping down with one finger.

• When the Heatpump is turned off you can reset the wifi and Bluetooth settings by pressing UP and TIMER button for 5 seconds.

REBOOTING THE HEATPUMP

1. Push Power button "POWER OFF"
2. Push UP and MODE button at the same time approx. 5 sec (beeps and memory resets)
3. Push TIMER and MODE button at the same time approx. 5 sec (beeps and wifi signal disappears)

NOTICE! New registration is needed, follow instructions in this manual.

USING MOBILE APPLICATION

USING THE MOBILE APPLICATION

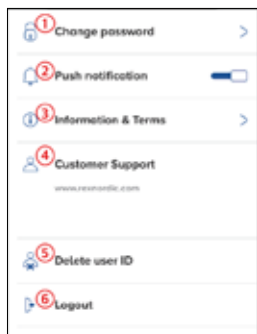


APPLICATION DASHBOARD

The mobile application works the same way with the normal control panel. Please refer to the operating instructions in this user manual to understand what each button does.

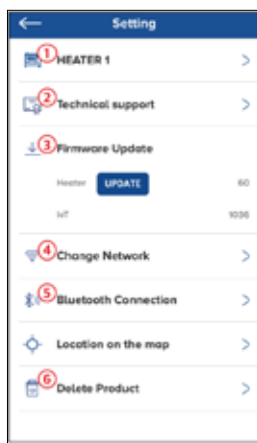
1. Push notifications
2. Add new product
3. Application settings menu
4. Product name
5. Product settings menu
6. Product operating status
7. Turn off HP
8. Swipe down for reloading product status

APPLICATION SETTINGS



1. You are automatically always logged in after signing up. You can logout if necessary.
2. If you want to change your password click this button. You will receive an email with instructions to change the password.
3. Select to turn push notifications on / off.
4. Here you can read License information, Terms of Service and Privacy information.
5. You can see the customer support website.
6. To delete user id you need to delete all products first. Then contact the importer to delete your user information.

PRODUCT SETTINGS



1. Modify the name of the product
2. View product service information
3. Update IoT firmware
4. Change the Wi-Fi network
5. Connect bluetooth (used only for changing the Wi-Fi information)
6. Remove the product from the application

NOTICE WHEN USING MOBILE APPLICATION

- Wireless router and LAN cable are separate purchases. Each must be installed separately.

- REXNORDIC heat pump uses WPA2 Security method to connect to the router.

- REXNORDIC heat pump supports only 4GHz of Wi-Fi Frequency. It doesn't support 5GHz.

- REXNORDIC uses Bluetooth v4.2 and BLE. BLE connection is used only for initial searching and connection between the smartphone and the product. The connection will be maintained by Wi-Fi network. If you want to change the network of the product, you must reconnect the BLE.

- Rex Nordic mobile application supports Android version 5.1and later. For iPhone the application supports iOS version 10 and later and iPhone 7 or later.

- Install a wireless router close to the product. Depending on the location or distance between the product and the wireless router, the RSSI (strength of the wireless network signal) may vary, and the transmission time and data rate in receiving may also differ.

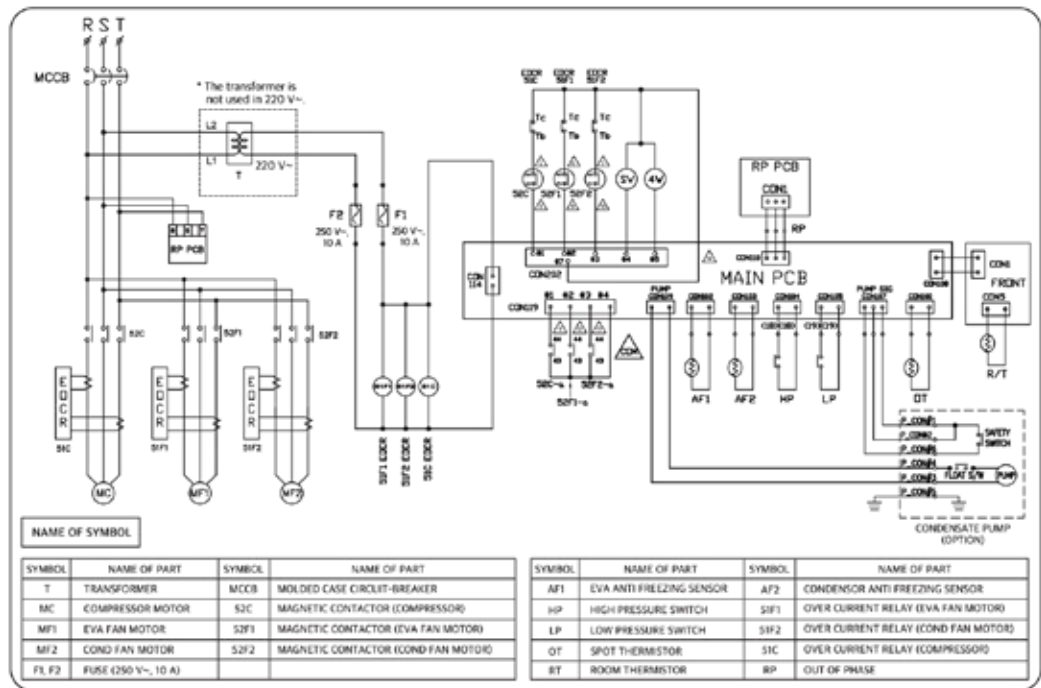
- Check to set your SSID (wireless router ID or name) to a combination of English and numeric. If you see special characters, the information might not be properly transferred to the product modem and might not be connected.

- You might not be able to connect depending on your network settings or connection status. If you are not connected or have problems setting up your network, contact your network service provider.



- Other SSID (wireless router name) in your neighborhood can be detected when you search for a wireless network. It is illegal to use another user's network. There might be legal sanctions upon detection if you break the law. Be sure to connect to a network (router) that you have permission to use.

- Details of description can be different, depending on the version of the application. Things may be changed in part without notification to the user.

WIRING DIAGRAM



THE INSTALLATION, SERVICE AND OPERATION MANUAL

	WARNING : Flammable materials.
	WARNING : Low burning velocity material.

WARNING

- Do not use means to accelerate the defrosting process or to clean, other than those recommended by the manufacturer.
- The appliance shall be stored in a room without continuously operating ignition sources (for example: open flames, an operating gas appliance or an operating electric heater).
- Do not pierce or burn.
- Be aware that refrigerants may not contain an odour.
- This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.
- Children shall not play with the appliance.
- Cleaning and user maintenance shall not be made by children without supervision.

1. Installation, Unventilated areas

–a WARNING that the non-FIXED APPLIANCE shall be stored in a room without continuously operating open flames (for example an operating gas appliance) or other POTENTIAL IGNITION SOURCES (for example an operating electric heater, hot surfaces)

– non-duct connected appliances containing A2L refrigerants with the supply and return air openings in the conditioned space may have the body of the appliance may be installed in open areas such as false ceilings not being used as return air plenums, as long as the conditioned air does not directly communicate with the air of the false ceiling.

2. Service

2.1. Competence of service personnel

- Information of procedures additional to usual information for refrigerating appliance installation, repair, maintenance and decommission procedures is required when an appliance with FLAMMABLE REFRIGERANTS is affected.
- The training of these procedures is carried out by national training organisations or manufacturers that are accredited to teach the relevant national competency standards that may be set in legislation.
- The achieved competence should be documented by a certificate.

2.2 Information and training

- The training should include the substance of the following:
- Information about the explosion potential of FLAMMABLE

REFRIGERANTS to show that flammables may be dangerous when handled without care.

- Information about POTENTIAL IGNITION SOURCES, especially those that are not obvious, such as lighters, light switches, vacuum cleaners, electric heaters.
- Information about the different safety concepts:
Ventilated enclosure – (see Clause GG.4) Safety of the appliance depends on ventilation of the housing. Switching off the appliance or opening of the enclosure has a significant effect on the safety. Care should be taken to ensure sufficient ventilation before.
- Information about refrigerant detectors:
 - Principle of function, including influences on the operation.
 - Procedures, how to repair, check or replace a refrigerant detector or parts of it in a safe way.
 - Procedures, how to disable a refrigerant detector in case of repair work on the refrigerant carrying parts.

Information about the concept of sealed components and sealed enclosures according to IEC 60079-15:2010.

Information about the correct working procedures

a) Commissioning

- Ensure that the floor area is sufficient for the REFRIGERANT CHARGE or that the ventilation duct is assembled in a correct manner.
- Connect the pipes and carry out a leak test before charging with refrigerant.
- Check safety equipment before putting into service.

b) Maintenance

- Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with FLAMMABLE REFRIGERANTS.
- Ensure sufficient ventilation at the repair place.
- Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that won't cause any spark. The standard procedure to short circuit the capacitor terminals usually creates sparks.
- Reassemble sealed enclosures accurately. If seals are worn, replace them.
- Check safety equipment before putting into service.

c) Repair

- Portable equipment shall be repaired outside or in a workshop specially equipped for servicing units with FLAMMABLE REFRIGERANTS.
- Ensure sufficient ventilation at the repair place.
- Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
- Discharge capacitors in a way that won't cause any spark.
- When brazing is required, the following procedures shall be carried out in the following order:
 - Safely remove the refrigerant following local and national regulations. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building;

- Purge the refrigerant circuit with oxygen free nitrogen;
- Evacuate the refrigerant circuit;
- Purge the refrigerant circuit with nitrogen for 5 min (not required for A2L refrigerants).
- Evacuate again (not required for A2L refrigerants).
- Remove parts to be replaced by cutting or brazing.
- Purge the braze point with nitrogen during the brazing procedure required for repair.
- Carry out a leak test before charging with refrigerant.

d) Decommissioning

- If the safety is affected when the equipment is putted out of service, the REFRIGERANT CHARGE shall be removed before decommissioning.
 - Ensure sufficient ventilation at the equipment location.
 - Be aware that malfunction of the equipment may be caused by refrigerant loss and a refrigerant leak is possible.
 - Discharge capacitors in a way that won't cause any spark.
 - Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger.
- In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.
- When **FLAMMABLE REFRIGERANTS** except A2L REFRIGERANTS are used,
 - Evacuate the refrigerant circuit.
 - Purge the refrigerant circuit with nitrogen for 5 min.
 - Evacuate again.
 - Fill with nitrogen up to atmospheric pressure.
 - Put a label on the equipment that the refrigerant is removed.

e) Disposal

- Ensure sufficient ventilation at the working place.
- Remove the refrigerant. If the recovery is not required by national regulations, drain the refrigerant to the outside. Take care that the drained refrigerant will not cause any danger. In doubt, one person should guard the outlet. Take special care that drained refrigerant will not float back into the building.

When flammable refrigerants are used,

- evacuate the refrigerant circuit.
- purge the refrigerant circuit with oxygen free nitrogen.
- evacuate again. (not required for A2L refrigerants); and
- cut out the compressor and drain the oil.

Cut out the compressor and drain the oil.

Checks to the area

Prior to beginning work on systems containing **FLAMMABLE REFRIGERANTS**, safety checks are necessary to ensure that the risk of ignition is minimized. For repair to the **REFRIGERATING SYSTEM**, 1. to 5. shall be completed prior to conducting work on the system.

1. Work procedure

Work shall be undertaken under a controlled procedure so as to minimize the risk of a flammable gas or vapour being present while the work is being performed.

2. General work area

All maintenance staff and others working in the local area shall be instructed on the nature of work being carried out. Work in confined spaces shall be avoided.

3. Checking for presence of refrigerant

The area shall be checked with an appropriate refrigerant detector prior to and during work, to ensure the technician is aware of potentially toxic or flammable atmospheres. Ensure that the leak detection equipment being used is suitable for use with all applicable refrigerants, i.e. non-sparking, adequately sealed or intrinsically safe.

4. Presence of fire extinguisher

If any hot work is to be conducted on the refrigerating equipment or any associated parts, appropriate fire extinguishing equipment shall be available to hand. Have a dry powder or CO2 fire extinguisher adjacent to the charging area.

5. No ignition sources

No person carrying out work in relation to a **REFRIGERATING SYSTEM** which involves exposing any pipe work shall use any sources of ignition in such a manner that it may lead to the risk of fire or explosion. All possible ignition sources, including cigarette smoking, should be kept sufficiently far away from the site of installation, repairing, removing and disposal, during which refrigerant can possibly be released to the surrounding space. Prior to work taking place, the area around the equipment is to be surveyed to make sure that there are no flammable hazards or ignition risks. "No Smoking" signs shall be displayed.

Checks to the refrigerating equipment

Where electrical components are being changed, they shall be fit for the purpose and to the correct specification. At all times the manufacturer's maintenance and service guidelines shall be followed.

If in doubt, consult the manufacturer's technical department for assistance.

The following checks shall be applied to installations using FLAMMABLE REFRIGERANTS:

- the actual **REFRIGERANT CHARGE** is in accordance with the room size within which the refrigerant containing parts are installed;
 - the ventilation machinery and outlets are operating adequately and are not obstructed;
 - if an indirect refrigerating circuit is being used, the secondary circuit shall be checked for the presence of refrigerant;
 - marking to the equipment continues to be visible and legible.
- Markings and signs that are illegible shall be corrected;
- refrigerating pipe or components are installed in a position where they are unlikely to be exposed to any substance which may corrode refrigerant containing components, unless the components are constructed of materials which are inherently resistant to being corroded or are suitably protected against being so corroded.

Checks to electrical devices

Repair and maintenance to electrical components shall include initial safety checks and component inspection procedures. If a

fault exists that could compromise safety, then no electrical supply shall be connected to the circuit until it is satisfactorily dealt with. If the fault cannot be corrected immediately but it is necessary to continue operation, an adequate temporary solution shall be used. This shall be reported to the owner of the equipment so all parties are advised.

Initial safety checks shall include:

- that capacitors are discharged: this shall be done in a safe manner to avoid possibility of sparking;
- that no live electrical components and wiring are exposed while charging, recovering or purging the system;
- that there is continuity of earth bonding.

Repairs to sealed components

- During repairs to sealed components, all electrical supplies shall be disconnected from the equipment being worked upon prior to any removal of sealed covers, etc. If it is absolutely necessary to have an electrical supply to equipment during servicing, then a permanently operating form of leak detection shall be located at the most critical point to warn of a potentially hazardous situation.

- Particular attention shall be paid to the following to ensure that by working on electrical components, the casing is not altered in such a way that the level of protection is affected. This shall include damage to cables, excessive number of connections, terminals not made to original specification, damage to seals, incorrect fitting of glands, etc.

Repair to intrinsically safe components

Do not apply any permanent inductive or capacitance loads to the circuit without ensuring that this will not exceed the permissible voltage and current permitted for the equipment in use. Intrinsically safe components are the only types that can be worked on while live in the presence of a flammable atmosphere. The test apparatus shall be at the correct rating.

Replace components only with parts specified by the manufacturer. Other parts may result in the ignition of refrigerant in the atmosphere from a leak.

NOTE The use of silicon sealant can inhibit the effectiveness of some types of leak detection equipment. Intrinsically safe components do not have to be isolated prior to working on them.

Cabling

Check that cabling will not be subject to wear, corrosion, excessive pressure, vibration, sharp edges or any other adverse environmental effects.

The check shall also take into account the effects of aging or continual vibration from sources such as compressors or fans.

Detection of flammable refrigerants

Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks. A halide torch (or any other detector using a naked flame) shall not be used. The following leak detection methods are deemed acceptable for all refrigerant systems.

Electronic leak detectors may be used to detect refrigerant leaks

but, in the case of FLAMMABLE REFRIGERANTS, the sensitivity may not be adequate, or may need re-calibration.

(Detection equipment shall be calibrated in a refrigerant-free area.) Ensure that the detector is not a potential source of ignition and is suitable for the refrigerant used. Leak detection equipment shall be set at a percentage of the LFL of the refrigerant and shall be calibrated to the refrigerant employed, and the appropriate percentage of gas (25 % maximum) is confirmed.

NOTE Examples of leak detection fluids are

- bubble method,
- fluorescent method agents.

If a leak is suspected, all naked flames shall be removed/ extinguished.

If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut off valves) in a part of the system remote from the leak. Removal of refrigerant shall be according to Clause DD.9.

Charging procedures

In addition to conventional charging procedures, the following requirements shall be followed.

- Ensure that contamination of different refrigerants does not occur when using charging equipment. Hoses or lines shall be as short as possible to minimise the amount of refrigerant contained in them.
- Cylinders shall be kept in an appropriate position according to the instructions.
- Ensure that the REFRIGERATING SYSTEM is earthed prior to charging the system with refrigerant.
- Label the system when charging is complete (if not already).
- Extreme care shall be taken not to overfill the REFRIGERATING SYSTEM.

Decommissioning

Before carrying out this procedure, it is essential that the technician is completely familiar with the equipment and all its detail. It is recommended good practice that all refrigerants are recovered safely. Prior to the task being carried out, an oil and refrigerant sample shall be taken in case analysis is required prior to re-use of recovered refrigerant. It is essential that electrical power is available before the task is commenced.

- Become familiar with the equipment and its operation.
- Isolate system electrically.
- Before attempting the procedure, ensure that:
 - mechanical handling equipment is available, if required, for handling refrigerant cylinders;
 - all personal protective equipment is available and being used correctly;
 - the recovery process is supervised at all times by a competent person;
 - recovery equipment and cylinders conform to the appropriate standards.
- Pump down refrigerant system, if possible.
- If a vacuum is not possible, make a manifold so that refrigerant can be removed from various parts of the system.
- Make sure that cylinder is situated on the scales before recovery

takes place.

- g) Start the recovery machine and operate in accordance with instructions.
- h) Do not overfill cylinders (no more than 80 % volume liquid charge).
- i) Do not exceed the maximum working pressure of the cylinder, even temporarily.
- j) When the cylinders have been filled correctly and the process completed, make sure that the cylinders and the equipment are removed from site promptly and all isolation valves on the equipment are closed off.
- k) Recovered refrigerant shall not be charged into another REFRIGERATING SYSTEM unless it has been cleaned and checked.

Labelling

Equipment shall be labelled stating that it has been de-commissioned and emptied of refrigerant.
The label shall be dated and signed.
For appliances containing **FLAMMABLE REFRIGERANTS**, ensure that there are labels on the equipment stating the equipment contains **FLAMMABLE REFRIGERANT**.

Recovery

When removing refrigerant from a system, either for servicing or decommissioning, it is recommended good practice that all refrigerants are removed safely.
When transferring refrigerant into cylinders, ensure that only appropriate refrigerant recovery cylinders are employed. Ensure that the correct number of cylinders for holding the total system charge is available. All cylinders to be used are designated for the recovered refrigerant and labelled for that refrigerant (i.e. special cylinders for the recovery of refrigerant). Cylinders shall be complete with pressure-relief valve and associated shut-off valves in good working order. Empty recovery cylinders are evacuated and, if possible, cooled before recovery occurs.
The recovery equipment shall be in good working order with a set of instructions concerning the equipment that is at hand and shall be suitable for the recovery of the flammable refrigerant. If in doubt, the manufacturer should be consulted. In addition, a set of calibrated weighing scales shall be available and in good working order. Hoses shall be complete with leak-free disconnect couplings and in good condition.
The recovered refrigerant shall be processed according to local legislation in the correct recovery cylinder, and the relevant waste transfer note arranged. Do not mix refrigerants in recovery units and especially not in cylinders.

If compressors or compressor oils are to be removed, ensure that they have been evacuated to an acceptable level to make certain that flammable refrigerant does not remain within the lubricant. The compressor body shall not be heated by an open flame or other ignition sources to accelerate this process. When oil is drained from a system, it shall be carried out safely.

3. Transportation, marking and storage

3.1. Transportation

Attention is drawn to the fact that additional transportation regulations may exist with respect to equipment containing flammable gas.

The maximum number of pieces of equipment or the configuration of the equipment permitted to be transported together will be determined by the applicable transport regulations.

3.2. Marking

Signs for similar appliances used in a work area are generally addressed by local regulations and give the minimum requirements for the provision of safety and/or health signs for a work location.

All required signs are to be maintained and employers should ensure that employees receive suitable and sufficient instruction and training on the meaning of appropriate safety signs and the actions that need to be taken in connection with these signs.

The effectiveness of signs should not be diminished by too many signs being placed together.

Any pictograms used should be as simple as possible and contain only essential details.

3.3. Storage

The storage of the appliance should be in accordance with the applicable regulations or instructions, whichever is more stringent.
Storage of packed (unsold) equipment

Storage package protection should be constructed in such a way that mechanical damage to the equipment inside the package will not cause a leak of the **REFRIGERANT CHARGE**.

The maximum number of pieces of equipment permitted to be stored together will be determined by local regulations.



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REXNORDIC

REXNORDIC
rexnordic.com

FINLAND 

Rex Nordic Oy

ASIAKASPALVELU

+358 40 180 1111

info@rexnordic.com

SWEDEN 

Rex Nordic AB

KUNDTJÄNST

+46 72 200 2222

info@rexnordic.com

NORWAY 

Rex Nordic AS

KUNDESERVICE

+47 40 006 616

norge@rexnordic.com

DENMARK 

Rex Nordic A/S

KUNDESERVICE

+45 22 119 897

+45 29 112 231

dk@rexnordic.com

UNITED KINGDOM 

Rex Nordic UK LTD

CUSTOMER SERVICE

+44 13 553 773 70

uk@rexnordic.com

NEDERLAND 

Rex Nordic B.V.

KLANTENSERVICE

+31 639 625 904

nl@rexnordic.com

GERMANY 

Rex Nordic GmbH

KUNDENDIENST

+49 171 4006 002

de@rexnordic.com

POLAND 

Rex Nordic Sp z o.o.

OBSŁUGA KLIENTA

+48 88 620 9018

pl@rexnordic.com

FRANCE 

Rex Nordic SAS

SERVICE À

LA CLIENTÈLE

+33 680 785 095

fr@rexnordic.com