

# Shoebox NX Heat Pump

## User Manual



# Contents Page

| Description                                    | Page |
|--|------|
| Section 1 – Introduction                       | 4    |
| Section 2 – Safety Information                 | 5    |
| 2.1 Disposal/decommissioning                   | 5    |
| 2.2 Returning products                         | 5    |
| Section 3 – General Product Information        | 6    |
| 3.1 Kensa heat pumps                           | 6    |
| 3.2 Product description                        | 6    |
| 3.3 Kensa Shoebox NX technical details         | 7    |
| Section 4 – Operational Instructions           | 10   |
| 4.1 Maximising the efficiency of the heat pump | 10   |
| 4.2 DHW production                             | 10   |
| 4.3 Controller                                 | 11   |
| 4.4 Guide to home screen icons                 | 12   |
| 4.5 Main menu                                  | 13   |
| 4.5.1 Main menu icons                          | 13   |
| 4.6 Diagnostics menu                           | 14   |
| 4.6.1 Diagnostics – Temperatures               | 14   |
| 4.6.2 Diagnostics – Pressures                  | 15   |
| 4.6.3 Diagnostics – Pump parameters            | 16   |
| 4.6.4 Diagnostics – Compressor performance     | 16   |
| 4.6.5 Diagnostics – Pulse inputs               | 17   |
| 4.6.6 Diagnostics – Input voltage              | 17   |
| 4.6.7 Diagnostics – History log                | 18   |
| 4.6.8 Diagnostics – DHW and external immersion | 20   |
| 4.6.9 Diagnostics – Configurable relay         | 20   |
| 4.6.9.1 Open loop                              | 21   |
| 4.7 Main menu – Settings                       | 22   |
| 4.7.1 Display and sound                        | 23   |
| 4.7.2 Date and time                            | 23   |
| 4.7.3 Wi-Fi connection                         | 24   |

| Description                     |                                 | Page |
|---------------------------------|---------------------------------|------|
| Section 5 – My product          |                                 | 25   |
| Section 6 – Maintenance         |                                 | 26   |
| Section 7 – Fault finding       |                                 | 28   |
| Section 8 – Complaint procedure |                                 | 33   |
| Section 9 – Warranty            |                                 | 34   |
| 9.1                             | Terms and Condition             | 34   |
| 9.1.1                           | Persons covered by the Warranty | 34   |
| 9.1.2                           | Validity period of the Warranty | 34   |
| 9.1.3                           | Scope                           | 34   |
| 9.1.4                           | General exceptions              | 34   |
| 9.1.5                           | Care of duty                    | 35   |
| 9.1.6                           | In the event of damage          | 35   |
| 9.1.7                           | Replacement parts               | 35   |

# Section 1 – Introduction



## A message from the CEO

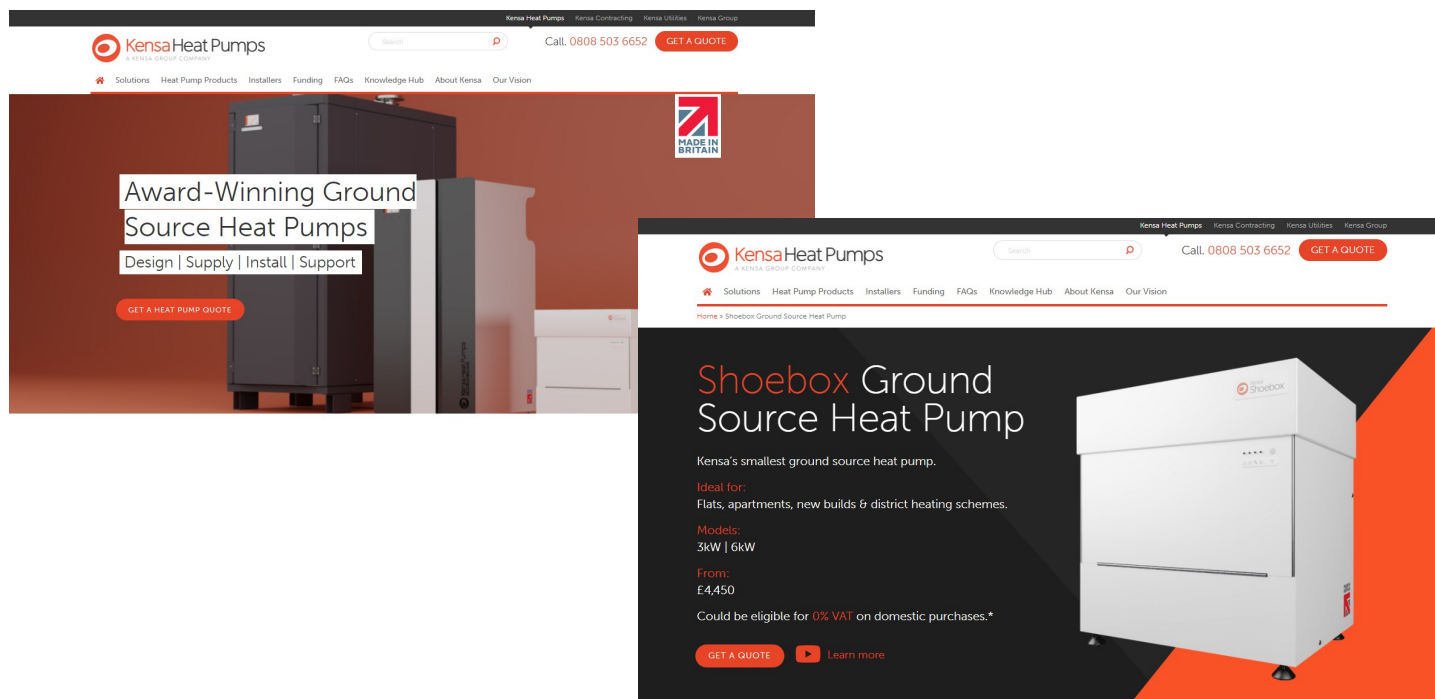
Kensa Heat Pumps has been manufacturing Ground Source Heat Pumps since 1999. Our mission is to enable mass decarbonisation of heat using our award-winning heat pumps.

A key part of the Kensa heat pump's design is simplifying the installation process to allow any competent plumber to perform the work rather than needing specialist skills. The purpose of this manual is to guide you through the installation process, and we've worked to ensure all the required information has been provided to allow you to connect the heat pump. Critical instructions to ensure you do not experience any difficulties are highlighted in the 'Golden Rules' in the installation section.

Please speak to the Technical Support Team on 0345 222 4328 to receive our free-of-charge 'online commissioning' service. Opening hours are 8.00 am to 5.00 pm.

Finally, we'd love to hear from you if you have any questions, wish to consider ground source heat pumps for any future projects, or even just to share your experiences of using ground source heat.

Tamsin Lishman  
CEO  
Kensa Group Ltd



For further information on ground source heat pumps and their application, please refer to [www.kensaheatpumps.com](http://www.kensaheatpumps.com)



## Section 2 – Safety Information

Safe operation of this unit can only be guaranteed if it is properly installed and commissioned in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

### Manufacturer

Kensa Heat Pumps, Mount Wellington Chacewater, Truro, Cornwall, TR4 8RJ  
Tel 0345 222 4328 | [www.kensaheatpumps.com](http://www.kensaheatpumps.com)

The product is designed and constructed to withstand the forces encountered during normal use. Use of the product for any other purpose, or failure to install the product in accordance with these Installation and Operation instructions, could damage the product, will invalidate the warranty, and may cause injury or fatality.

### 2.1 Disposal/Decommissioning

Kensa offer a life time decommissioning service for this product. This is available on a return to base basis (carriage at users' cost).

Disposal of any antifreeze water mix should follow the disposal instructions as laid out on the COSH Safety Data Sheet in the Installation Manual.



This symbol on the product indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the company where this product was purchased.

### 2.2 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Kensa Heat Pumps they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

## Section 3 – General Product Introduction

This manual explains how to operate a Kensa Shoebox NX ground source heat pump.

### 3.1 Kensa Heat Pumps

Kensa Heat Pumps is the leading UK manufacturer of a full range of ground source heat pumps. Kensa provides exceptional levels of expertise and advice on the use, design and application of heat pumps. Kensa have been active in the heat pump market since 1999 and remains a well-respected company, not only in the industry but also with all our customers and stakeholders.

Kensa has manufactured and installed over fifteen thousand heat pumps of various types across the world and manufacture ranges suitable for the domestic market and specifically designed for commercial applications.

Kensa are ISO9001 approved for the design and manufacture of heat pumps and hold an unique status as being accredited by Microgeneration Certification Scheme for both the manufacture and installation of ground source heat pumps. Kensa were also a founding member of the Ground Source Heat Pump Association and play a major role in helping to raise the profile of heat pumps and formulate Industry Standards.

Kensa's aim has always been to take the mystery and complexity out of heat pumps, designing systems that can be easily installed without any specialist training, making the product available to a larger market and helping to reduce CO<sub>2</sub> emissions while reducing client's energy bills.

### 3.2 Product description

Heat pumps extract solar energy stored in the ground, water courses and in the air and convert this to a higher temperature to use in a building's heating distribution system. They work in a similar manner to a fridge in reverse, where the inside of the fridge is the heat source and the grill at the back of the fridge is the heating system.

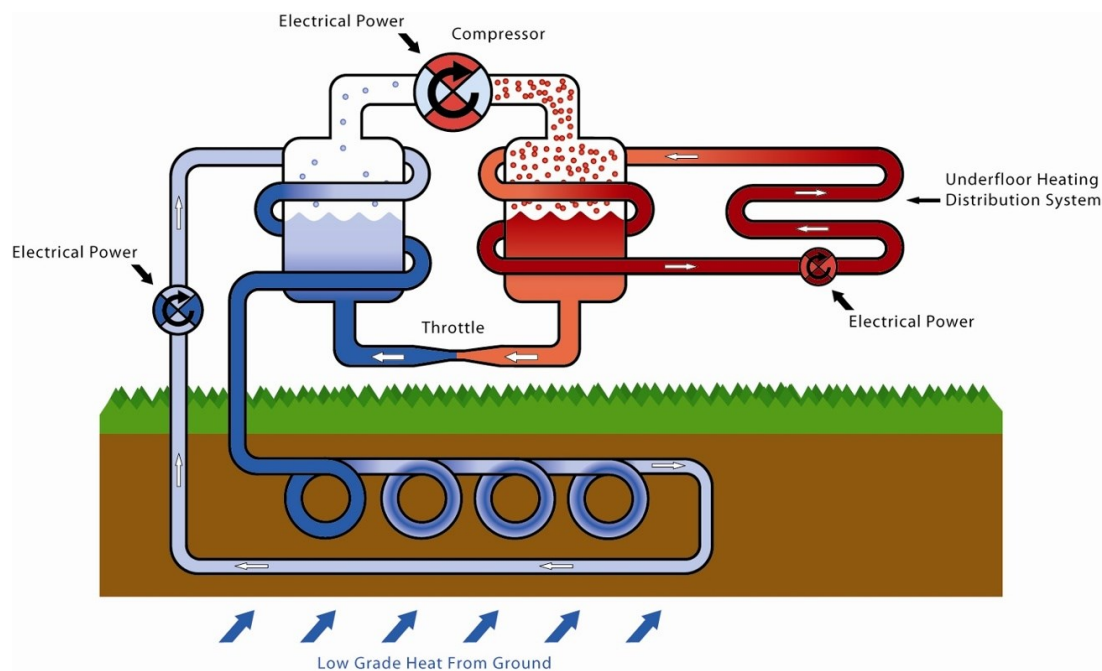


Fig 1. Heat pump schematic

### 3.3 Kensa Shoebox NX technical fiche

| Nominal thermal output            | Power supply rating | Power factor at 0-35 | Max. running current | Typical running current | Typical starting current | Power supply cable cross sectional area (min.) |
|-----------------------------------|---------------------|----------------------|----------------------|-------------------------|--------------------------|--|
| kW                                | Amps                | Amps                 | Amps                 | Amps                    | Amps                     | mm <sup>2</sup>                                |
| Single phase – 230 Volts AC 50 Hz |                     |                      |                      |                         |                          |  |
| 5.8                               | 16                  | 0.9                  | 11.6                 | 6.6                     | 12.2                     | 2.5  |

The figures above are based on a rating to BS EN14511, 0°C from the ground, 35°C flow to underfloor.

\*This figure includes the power consumption of the inbuilt water pump

For clarification of starting currents and details on how these figures are calculated please contact Kensa.

A ground source heat pump (GSHP) extracts heat from the ground by circulating a cold solution of water and antifreeze (brine) around pipes buried in the ground. As these pipes are buried below 1m in depth, where the temperature of the ground remains pretty constant (8 to 10°C), heat is absorbed from the ground into the fluid (approximately 5°C). This brine is then passed through one side of a heat exchanger (called the evaporator) and a refrigerant through the other. The refrigerant has a very low boiling point and by absorbing the energy in the brine this causes the refrigerant to evaporate.

The refrigerant gas is then passed through a compressor where its pressure is increased which in turn increases its temperature. This high pressure hot gas then flows around a second heat exchanger (called a condenser) with the heating distribution fluid passing through the other side of the heat exchanger. Energy is then transferred from the refrigerant into the heating distribution system; this in turn causes the refrigerant to condense.

This high pressure cold refrigerant is then passed through an expansion valve (or throttle) and the pressure is reduced. The whole cycle is then repeated.

GSHPs are an extremely energy efficient technology, with every unit of electricity used (to drive the pumps and compressor) producing between 3 and 4 units of heat.

The Kensa Shoebox NX heat pump is designed to provide a low cost renewable heat source for a buildings heating system. It is ideally suited to multi flat developments using a communal ground borehole field. In addition, and if required, the Kensa Shoebox NX can also provide domestic hot water. Heat pumps can provide lower running costs and will generate significantly lower carbon emissions compared with traditional fossil fuels.

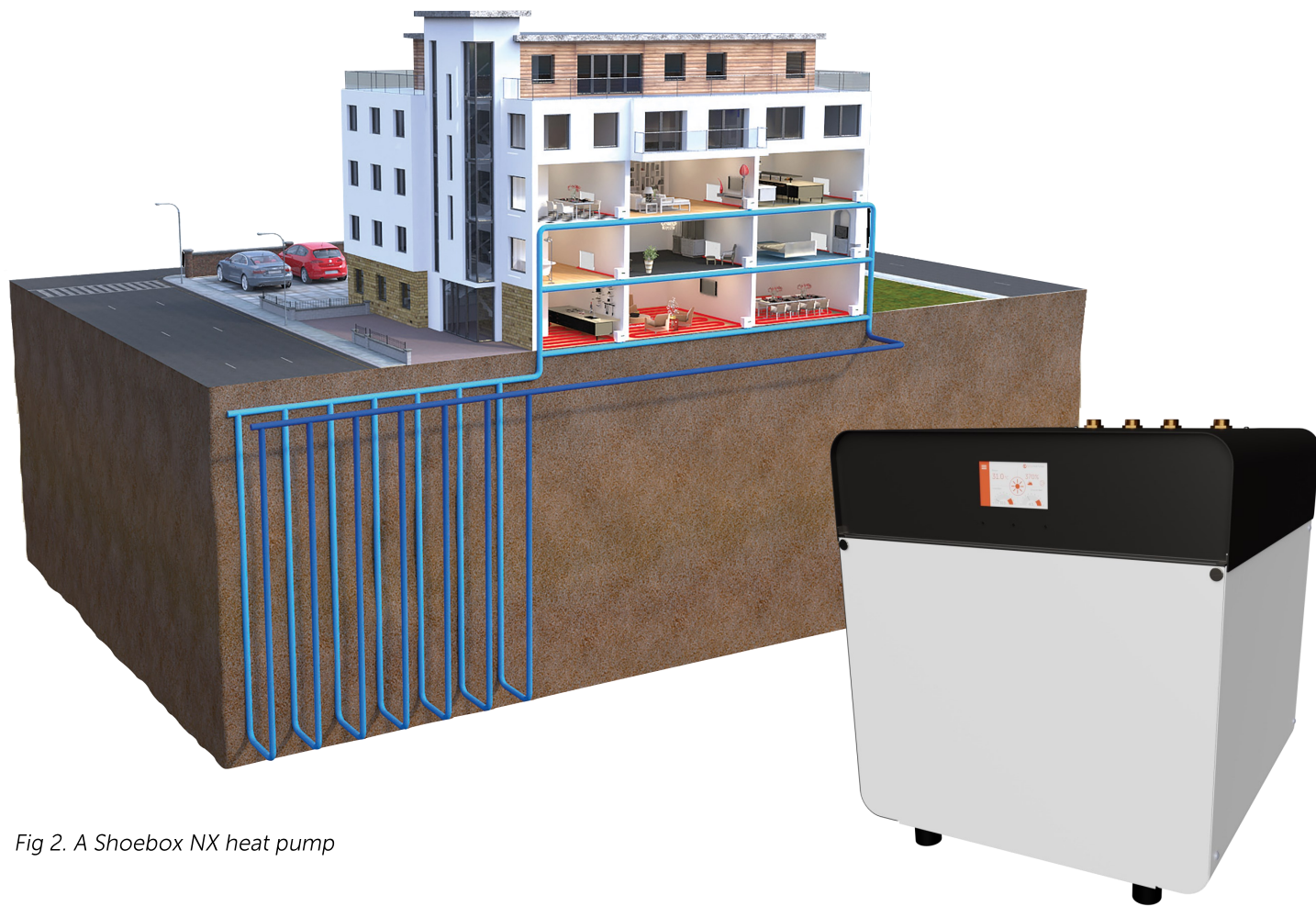


Fig 2. A Shoebox NX heat pump

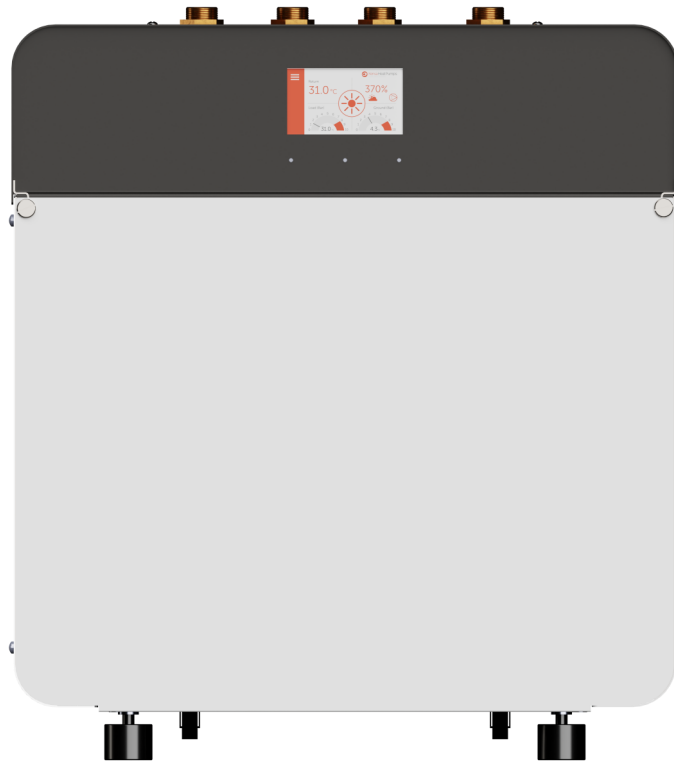
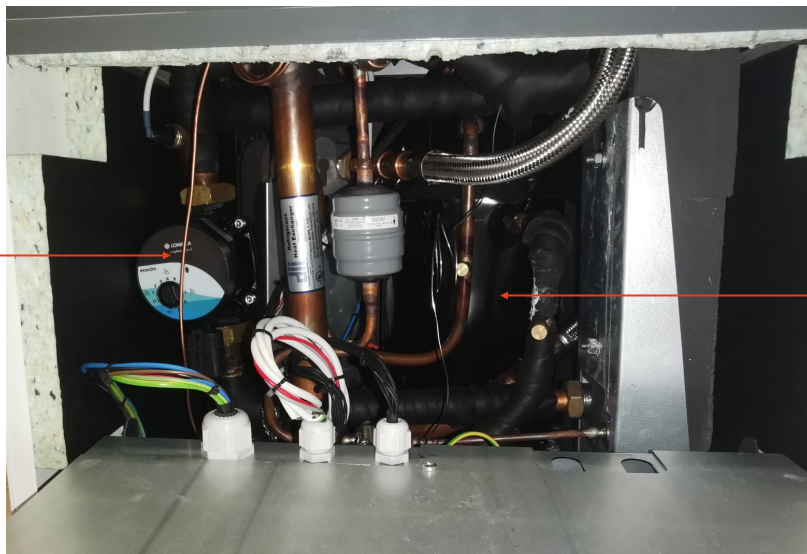


Fig 3. Shoebox NX

Ground Array  
Water Pump



Compressor

Fig 4. The internals Shoebox NX heat pump



## Section 4 – Operating Instructions

Always ensure that individuals using the appliance have read and fully understood the operation instructions.

- Do not operate the appliance with the cover removed.
- Do not operate the appliance in anything other than dry conditions.
- Do not exert any strain on electrical or pipe connections to the appliance.
- Do not put any foreign object into the appliance.
- Do not spill water or any other substance onto the appliance.

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 adult supervision.

### 4.1 Maximising the efficiency of the heat pump

In order to increase the efficiency of the heat pump and lower the overall energy costs of the building there are a number of simple steps that can be taken.

- i. Insulate the property as much as possible. This will reduce the heat loss from the building, which in turn will reduce running time of the heat pump and hence energy costs.
- ii. The lower the flow temperature from the heat pump the higher the efficiency so consider a heating system with a large heat emitting area such as underfloor.
- iii. If in a well insulated building with underfloor mounted in screed throughout, consider running your heat pump on off-peak electricity tariffs.
- iv. With underfloor systems, avoid the use of insulative coverings such as thick carpets and wooden floors.
- v. Consider the use of Solar Thermal for the production of the majority of DHW.

Heat pumps are generally controlled on the return temperature from the heating distribution system and work on a temperature differential of approximately 5 degrees, i.e. if the return temperature set point is 29°C to 30°C the actual flow temperature out of the heat pump is approximately 35°C.

### 4.2 DHW production

The outlet flow temperature of the heat pump determines the efficiency of the heat pump and should have been set for your particular heating system and application at commissioning. This is passcode protected to avoid unauthorised changes.

The most efficient way of producing Domestic Hot Water (DHW) is by using Solar Thermal, however DHW can be provided by most heat pumps. The installation and operation of a heat pump in DHW mode is more complex than space heating and needs careful design and installation. DHW should be produced at times of low cost electricity and times when the space heating demand is lower, ie during the period of 2am to 6am and 1pm to 4pm.

To simplify the production of DHW using a heat pump, Kensa has designed an industry leading and straightforward DHW option. The heat pump is designed to operate at the optimum temperature that provides DHW, at the maximum efficiency, without using any inbuilt direct electric heaters. The system does not need a tank thermostat or a software temperature setpoint.



**Warning** - when a heat pump is used for heating domestic hot water, it may not get the water hot enough to kill the dangerous Legionella that can breed in hot water cylinders. Alternative arrangements may therefore be made to ensure the cylinder is pasteurised regularly. The installer/end user should check if this pasteurisation is required by local regulations, bearing in mind that there are often different rules for installations in rented or commercial properties.

To get the most cost effective production of DHW (and space heating), it is advised that the system is used in conjunction with a low cost electricity tariff or if available an off-peak electricity tariff.

Using the in-built controls the heat pump will continue to produce DHW until the timeclock ceases to call for DHW or the controls automatically stop the heat pump. If the controls stop the production of DHW the heat pump will not restart for a period of approximately two hours as the number of compressor starts are limited in DHW mode for a given period of time. Please contact Kensa if this time period needs to be adjusted

Shoebox NX heat pumps are designed to provide higher outlet temperatures so will produce DHW at 60-65°C, however as with all heat pumps increasing the outlet temperature decreases the efficiency.

### 4.3 Controller

The heat pump controller fitted to the heat pump has been especially designed for the application. It uses clear and concise language to indicate faults and uses a logical and intuitive menu structure providing trouble free commissioning.



Genesis  
Installation Manual



Shoebox NX  
Installation Manual

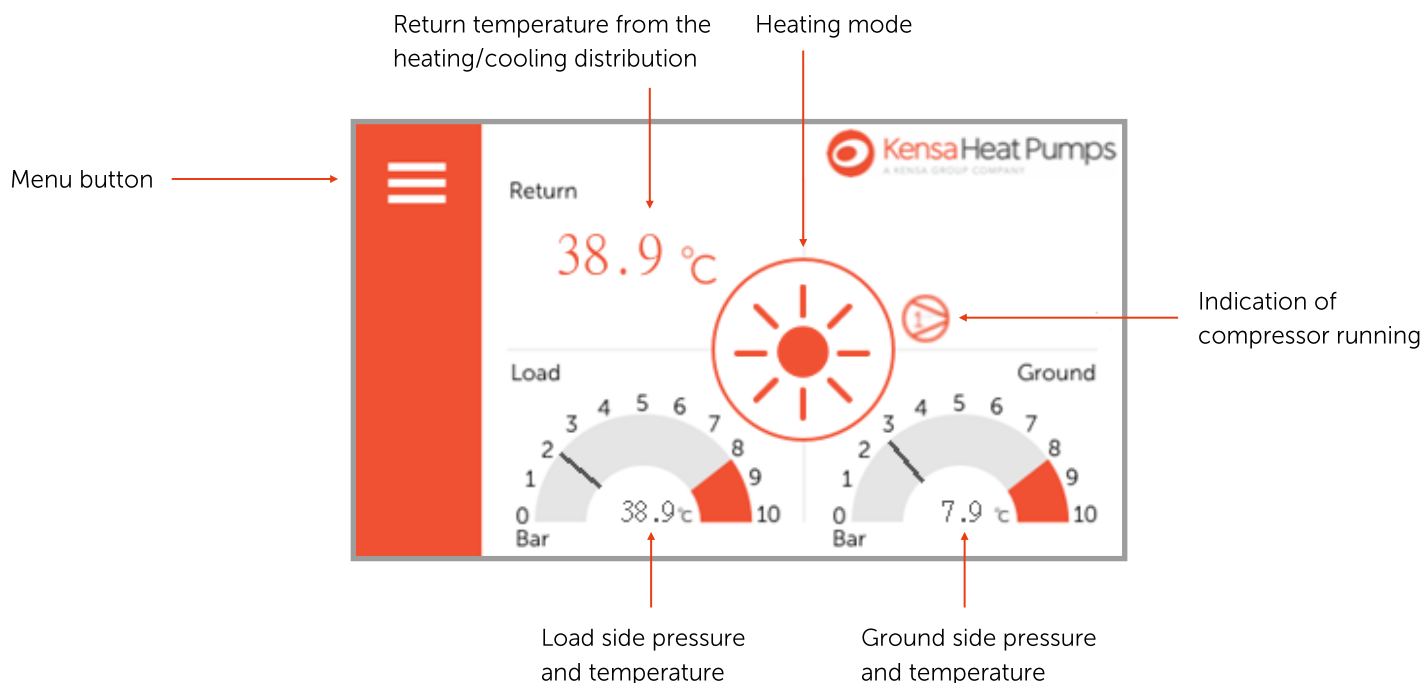


Fig 5. Start up screen icons

#### 4.4 Guide to home screen icons

| Icon | Description   |
|------|---|
|      | Menu Button—This provides access to the lower menus.  |
|      | Compressor Icon—This is lit when the compressor is running. If the icon is flashing, it indicates there is a call on the compressor, however the compressor has not had the required minimum stop period (6 minutes) since it was last operational.   |
|      | Twin Compressor Icon—This is lit when the compressor is running and the unit is a twin compressor unit. If the icon is flashing, it indicates there is a call on the compressor, however the compressor has not had the required minimum stop period (6 minutes) since it was last operational. |
|      | Unit is in heating mode.  |
|      | Unit is in heating mode operating the second temperature set point.   |
|      | Unit is in domestic hot water heating mode.   |
|      | Unit is in cooling mode.  |
|      | Unit is in passive cooling mode.  |
|      | Weather compensation is enabled.  |
|      | A warning has occurred. Pressing this icon will display the type of warning, possible reason and solution.  |
|      | A fault has occurred. Pressing this icon will display the type of fault, possible reason and solution.  |

## 4.5 Main menu

Pressing the menu button on the home screen provides access to the main menu.

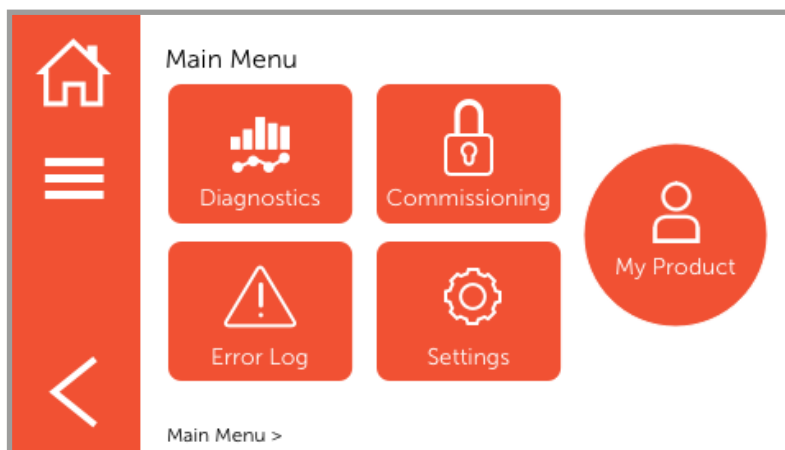









Fig 6. Main menu

### 4.5.1 Main menu icons

| Icon  | Description  |
|---|--|
|  | Home Icon—This will return the user to the home screen.  |
|  | Back Button— Returns the user back to the previous screen.   |
|  | Diagnostics—Enters the diagnostics menu displaying various readings such as temperatures and pressures to aid fault finding. |
|  | Commissioning— Enters the commissioning menu.  |
|  | Error Log—Logs every warning and fault that occurs and logs when they are cleared.   |
|  | Settings— Enters the settings menu where the date, time, display and sound can be changed.                                   |
|  | My Product—Contains details of product such as serial number, capacity, etc.   |

## 4.6 Diagnostics menu

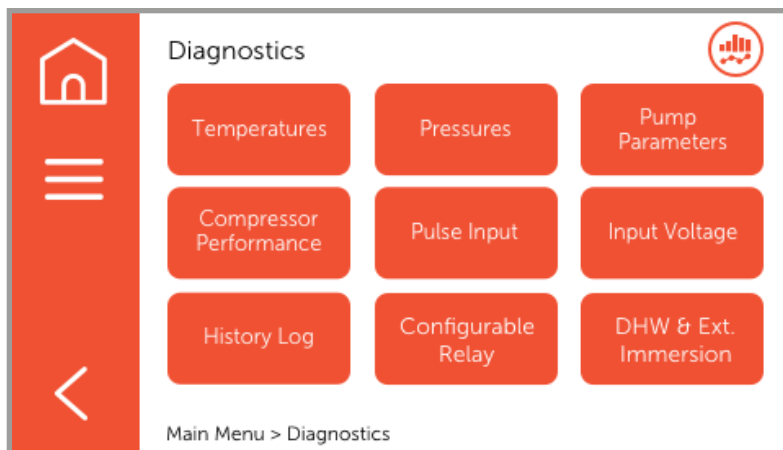


Fig 7. Diagnostics menu

### 4.6.1 Diagnostics – Temperature menu

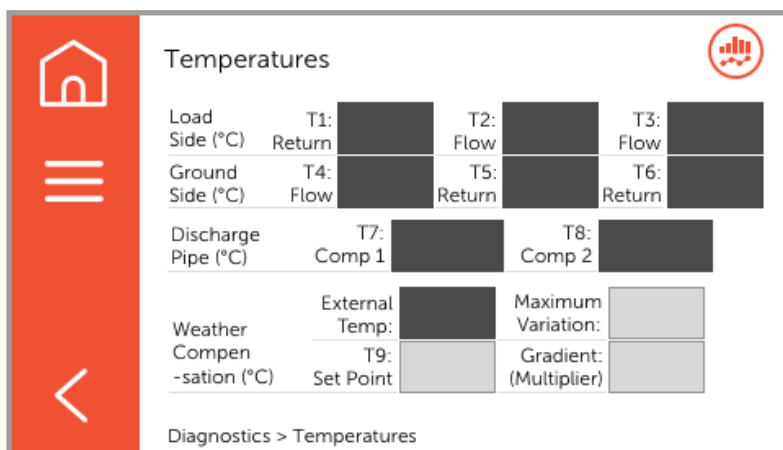


Fig 8. Diagnostics menu – Temperature menu

The temperature screen shows the current temperature measured within the system.

#### Load side

- T1 – Temperature of the heating/cooling distribution fluid returning to the heat pump.
- T2 – Temperature of the heating/cooling distribution fluid leaving the heat pump.
- T3 – Temperature of the heating/cooling distribution fluid leaving the heat pump. (This is only displayed for twin compressor units.)

#### Ground side

- T4 – Temperature of the thermal transfer fluid returning to the heat pump from the ground.
- T5 – Temperature of the thermal transfer fluid leaving the heat pump to the ground.
- T6 – Temperature of the thermal transfer fluid leaving the heat pump to the ground. (This is only displayed for twin compressor units.)

#### Discharge Pipe

- T8 – Temperature of the refrigerant in the discharge pipe of the compressor (right hand side compressor, only displayed for twin compressors units). The temperature screen shows the current temperature measured within the system.

## Weather compensation

- T9 – Weather compensation set point, i.e. the external temperature at which the weather compensation starts to operate.
- Multiplier – This is the multiplier of the number of degrees that the water set point rises for each degree change sensed in the outdoor temperature. Ideally this should be a value between 1.0 and 1.5 which would suit most properties.
- Maximum Variation – This is the maximum amount of positive deviation that is allowed by the weather compensation.

## 4.6.2 Diagnostics – Pressures

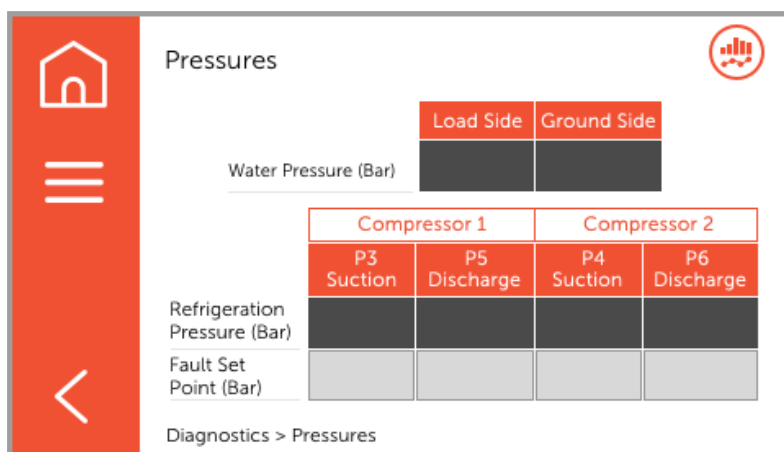


Fig 9. Diagnostics – Pressure menu

The pressure screen shows the current pressures measured within the system.

- Load Current Pressure – pressure in the heating system.
- Ground Current Pressure – pressure within the ground arrays.
- Suction LP P3 – Current pressure measured within the suction pipe of the left hand compressor in a twin unit or single compressor model. The fault set point is shown below.
- Discharge HP P5 – Current pressure measured within the discharge pipe of the left hand compressor in a twin unit or single compressor model. The fault set point is shown below.
- Suction LP P4 – Current pressure measured within the suction pipe of the right hand compressor in a twin unit. The fault set point is shown below.
- Discharge HP P6 – Current pressure measured within the discharge pipe of the right hand compressor in a twin unit. The fault set point is shown below.

### 4.6.3 Diagnostics – Pump parameters

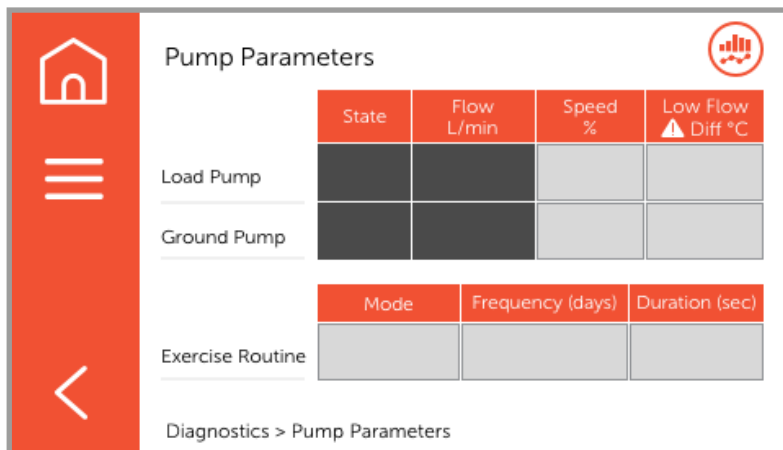


Fig 10. Diagnostics – Pump parameters menu

The pumps parameter screen shows the current information of the water pumps within the heat pump.

- State – Indicates whether the pump is running or not.
- % - Real time feedback from the pump indicating power consumption of the pump and its electrical performance
- Exercise Mode – Whether the pump exercise mode is enabled. This mode spins the pumps at a defined frequency and is used to avoid the water pumps 'sticking' in times of non-operation.
- Exercise Frequency – The frequency of the exercise mode in days.

### 4.6.4 Diagnostics – Compressor performance

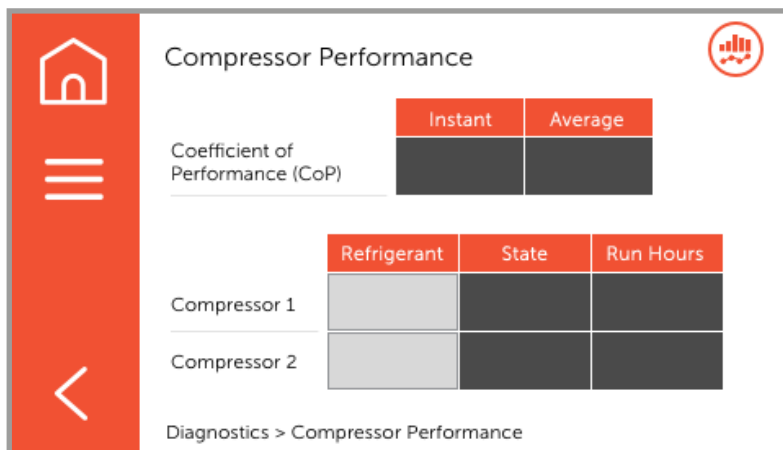


Fig 11. Diagnostics – Compressor performance menu

The Compressor Performance screen provides information on how the compressor is operating.

- Coefficient of Performance – This provides an indication of the COP of the compressor only. It is not the system or heat pump COP, SCoP or SPF, but should provide a good indication into how the compressor is performing. For an accurate COP, electrical meters and heat meters need to be fitted to the heat pump.

Both the instant and average value are shown.

- Refrigerant – Type of refrigerant used in the compressor.
- State – Indicates whether the compressor is running or not.
- Run hours – The number of hours the compressor has run. This is not resettable.



## 4.6.5 Diagnostics – Pulse input

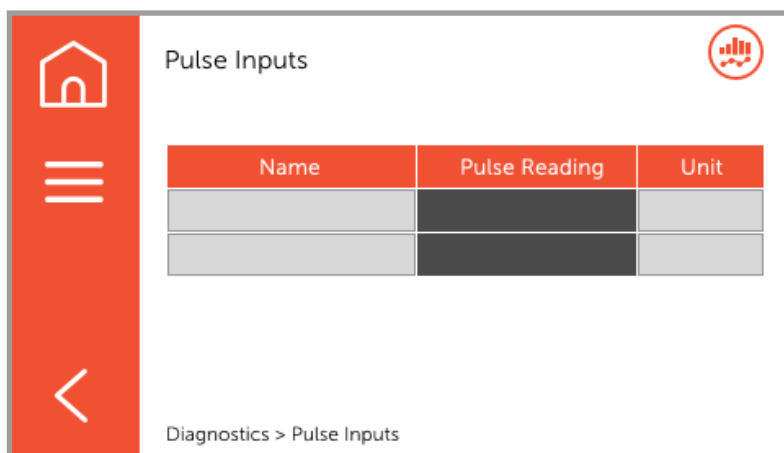


Fig 12. Diagnostics – Pulse input menu

The Pulse Input screen displays the number of pulses detected of any device connected to the heat pump. Devices such as electricity meters, heat meters, etc. The display only shows the number of pulses detected, for example if a single pulse was an indication of 100 units, it would only register 1 pulse and to get the true reading the number of pulses needs to be multiplied by 100 (or whatever the single pulse is meant to represent).

## 4.6.6 Diagnostics – Input voltage

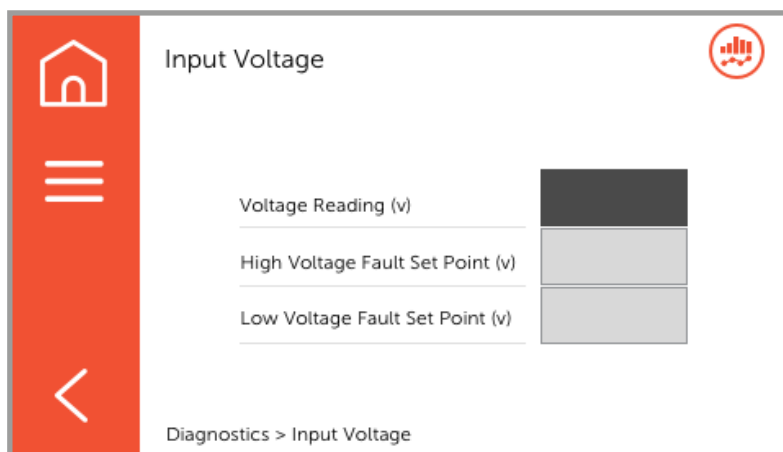


Fig 13 Diagnostics – Input voltage menu

This screen indicates the measured voltage connected to the heat pump. It is an indication of the approximate voltage with a tolerance of +/- 10%. It also indicates the voltage at which a fault is indicated and registered.

## 4.6.7 Diagnostics – History log

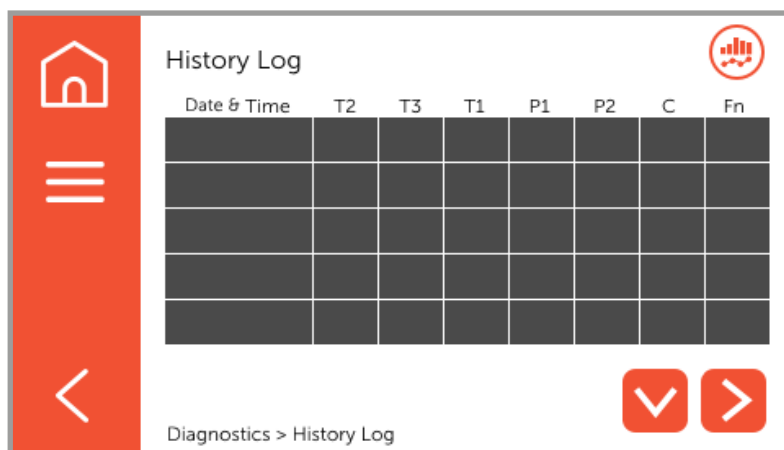


Fig 14. Diagnostics – History log menu

The history log records various readings from the heat pump every 15 minutes. It stores data over the last 37 hours and is a useful tool to help with intermittent fault finding. The unit itself holds data further back which can be accessed only by a Kensa Engineer.

The readings recorded are:-

- T2 – Temperature of the heating/cooling distribution fluid leaving the heat pump.
- T3 – Temperature of the heating/cooling distribution fluid leaving the heat pump. (This is only displayed for twin compressor units.)
- T1 – Temperature of the heating/cooling distribution fluid returning to the heat pump.
- P1 – Pressure of the heating/cooling distribution fluid circuit.
- P2 – Pressure of the ground loop circuit.
- C – Compressor
- Fn – Heat pump function, ie. Secondary heating, DHW, etc.

Using the arrows further information can be interrogated or early periods of time.

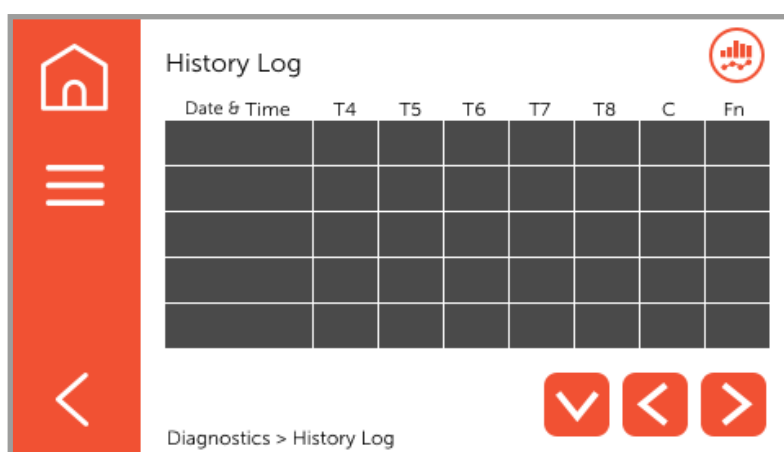


Fig 15. Diagnostics – History log menu 2nd page

- T4 – Temperature of the thermal transfer fluid returning to the heat pump from the ground.
- T5 – Temperature of the thermal transfer fluid leaving the heat pump to the ground.
- T6 – Temperature of the thermal transfer fluid leaving the heat pump to the ground. (This is only displayed for twin compressor units.)
- T8 – Temperature of the refrigerant in the discharge pipe of the compressor (right hand side compressor, only displayed for twin compressors units).

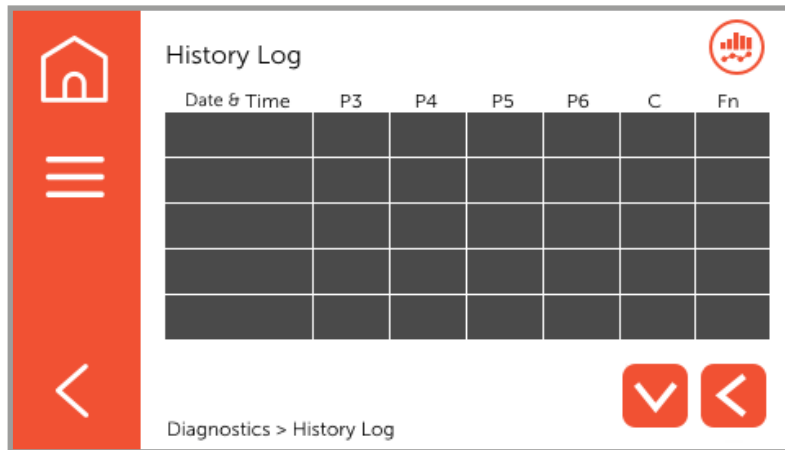


Fig 16. Diagnostics – History log menu 3rd page

- P3 – Current pressure measured within the suction pipe of the left hand compressor in a twin unit or single compressor model.
- P4 – Current pressure measured within the suction pipe of the right hand compressor in a twin unit. The fault set point is shown below. (This is only displayed for twin compressor units.)
- P5 – Current pressure measured within the discharge pipe of the left hand compressor in a twin unit or single compressor model.
- P6 – Current pressure measured within the discharge pipe of the right hand compressor in a twin unit. (This is only displayed for twin compressor units.)

## 4.6.8 Diagnostics – DHW and external immersion

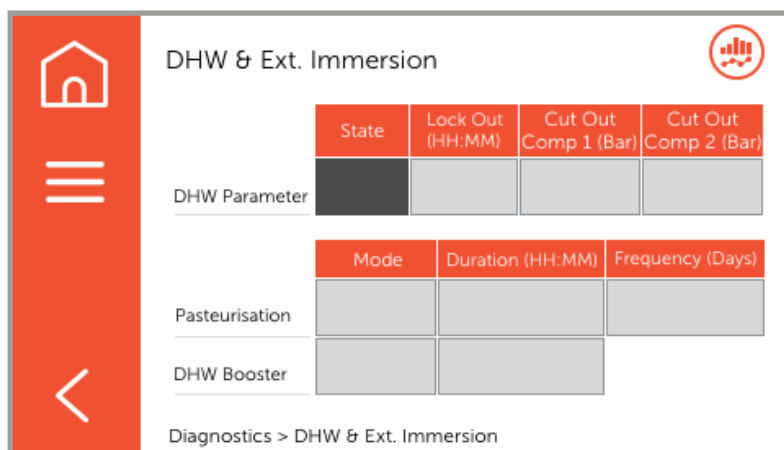


Fig 17. Diagnostics – DHW and external immersion menu

### DHW

- State – Whether the DHW cycle is currently running..
- Lock Out (HH,MM) - Amount of time before a second DHW cycle is allowed to restart following a completed DHW cycle.
- Cut Out (bar) - Comp 1 – The pressure at which the pressure transducer switch terminates the DHW cycle on a single compressor model.

### Ext. Immersion

- Mode – This indicates whether a pasteurisation cycle is enabled on the controller or not. During a pasteurisation a call signal is sent to an external relay to operate the immersion heater on a separate supply voltage.
- Duration (HH,MM) - Duration of the pasteurisation cycle.
- Frequency (Days) - How often the controller calls for a pasteurisation cycle.

## 4.6.9 Diagnostics – Configurable relay

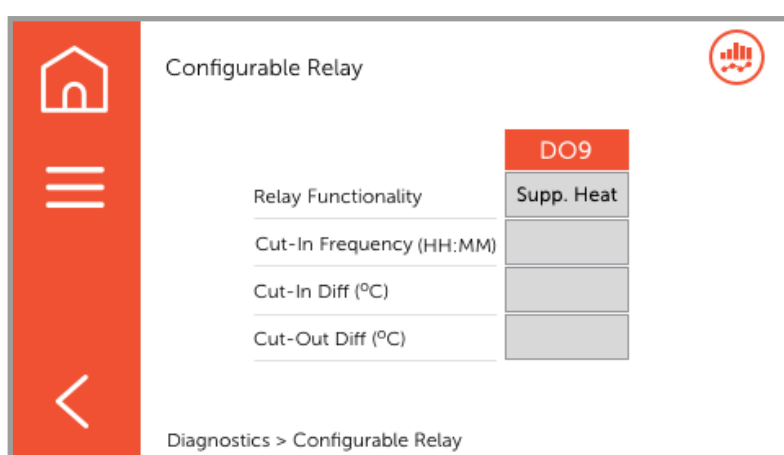


Fig 18. Diagnostics – Configurable relay menu (supplementary heating)

Supplementary heat provides a signal to a secondary heat source when the heat pump detects it cannot maintain or reach target temperatures. It does not monitor the external ambient temperature, but monitors the heat pump return temperature from the heating system. If it detects that the return temperature is not increasing above a settable differential for a settable period of time it activates a relay to activate a supplementary heat source on a separate supply voltage. The call for supplementary heating will cancel once the return temperature increases to within the settable cut out differential.

- Relay – Whether the supplementary heat function is enabled or disabled.
- Time Delay (HH:MM) - The period of time in hours that the return temperature stays below the set point temperature minus the cut in differential. i.e. If the cut in differential is 10oC and the set point is 45°C, the amount of continuous compressor run time while the return temperature is below 35oC before the supplementary heat is called for.
- Cut-In Diff (°C) - The set difference between the return temperature from the heating distribution system and the point where the period of continuous compressor operation (Time Delay) is measured.
- Cut-Out Diff (°C) - The set difference between the return temperature from the heating distribution system and the point at where the supplementary heat call is cancelled.

#### 4.6.9.1 Open loop

The configurable relay can also be set for an Open Loop system. In this mode the relay will close simultaneously with the ground pump's relay.

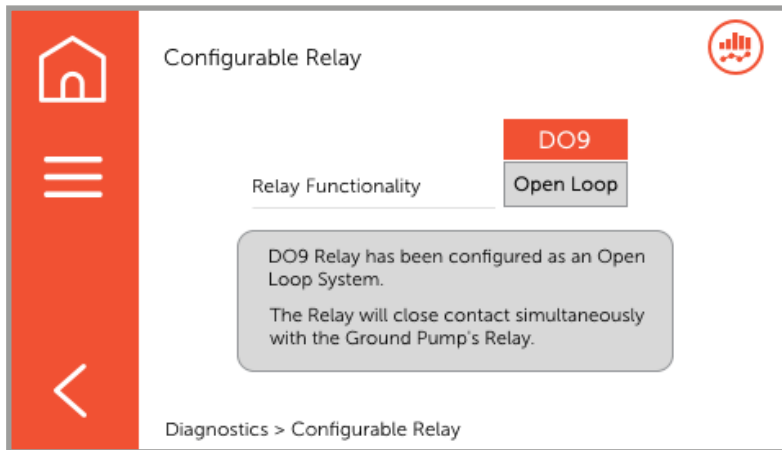


Fig 19. Diagnostics – Configurable relay menu (open loop)

## 4.7 Main menu – Settings

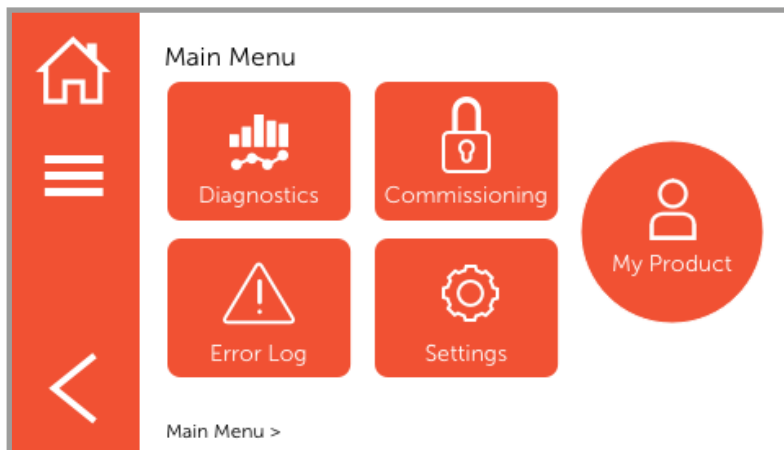


Fig 20. Main menu

The settings menu allows the controllers standard functions to be set.

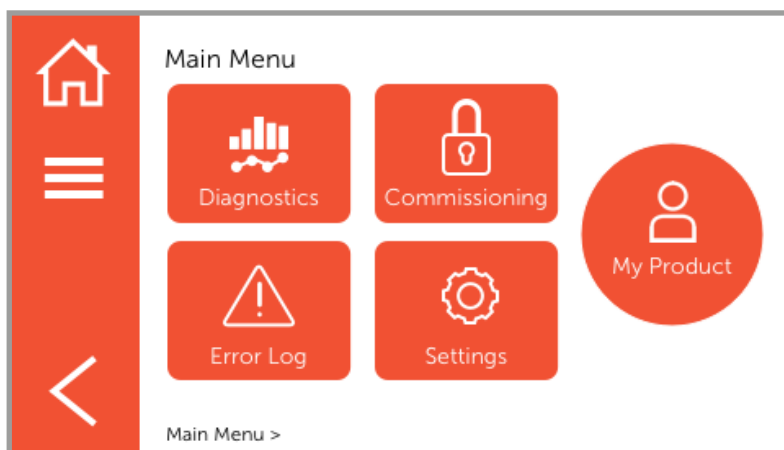


Fig 21. Main menu – Settings

The settings screen allows some customisation of the controller. This includes the wi-fi set up and date and time. If the Wi-Fi symbol is not shown then the heat pump is not internet ready.



## 4.7.1 Display and sound

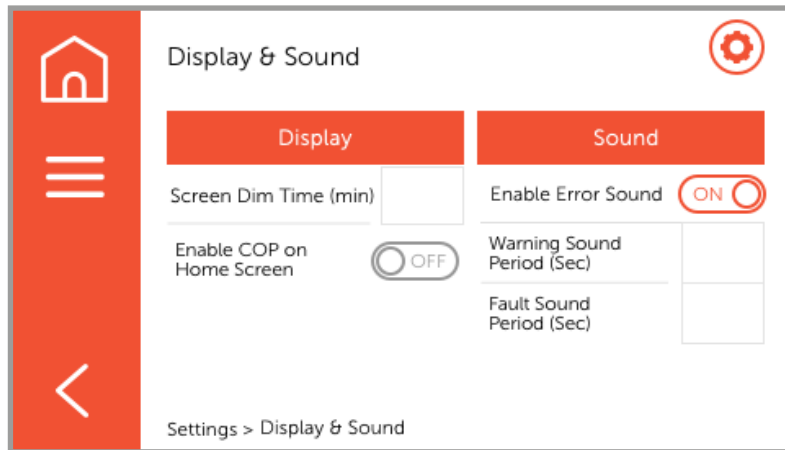


Fig 22. Settings – Display and sound

The Display and Sound page selects whether the COP is displayed on the home page and whether the error sound is enabled. It also allows the duration of the warning and fault sound to be set to be able to distinguish between a warning and an actual fault.

This also allows the time taken for the screen to dim to be set in minutes.

## 4.7.2 Date and time

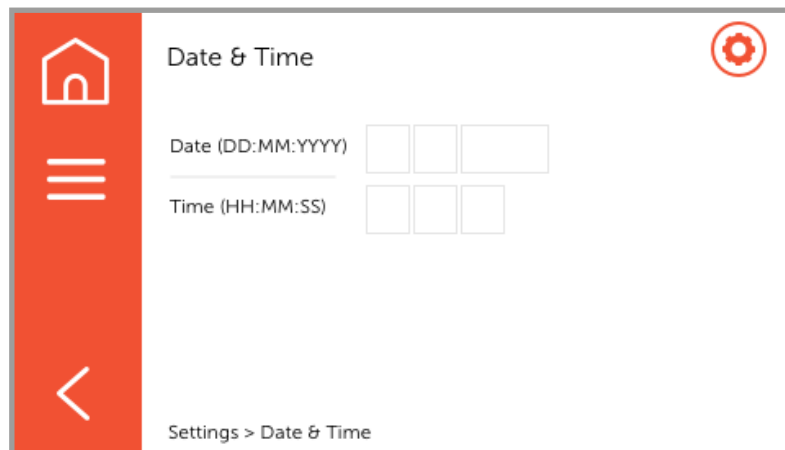


Fig 23 Settings – Date and time

This screen allows the date and time to be set. The date and time will also be updated when/if the Wi-Fi connection is made.

### 4.7.3 Wi-Fi connection

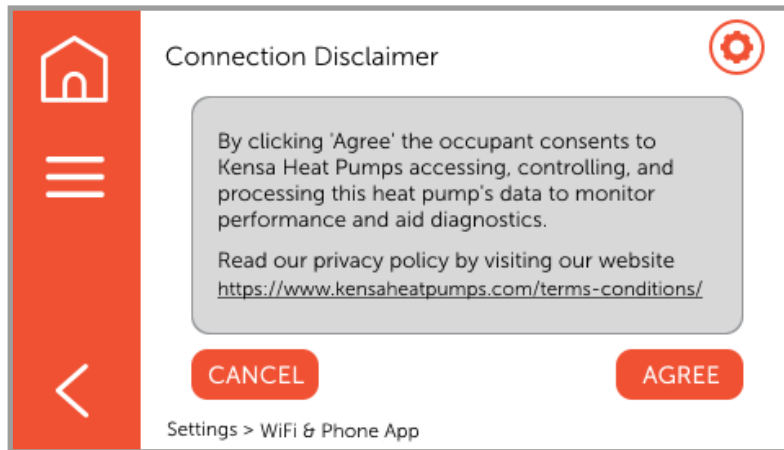


Fig 24. Settings – Wi-Fi and phone app disclaimer



Fig 25. Settings – Wi-Fi and phone app connection

From this screen it is also possible to enable the access point (AP) where the unit will create its own Wi-Fi hot spot allowing connection of the unit to a mobile device (android).

## Section 5 – My Product

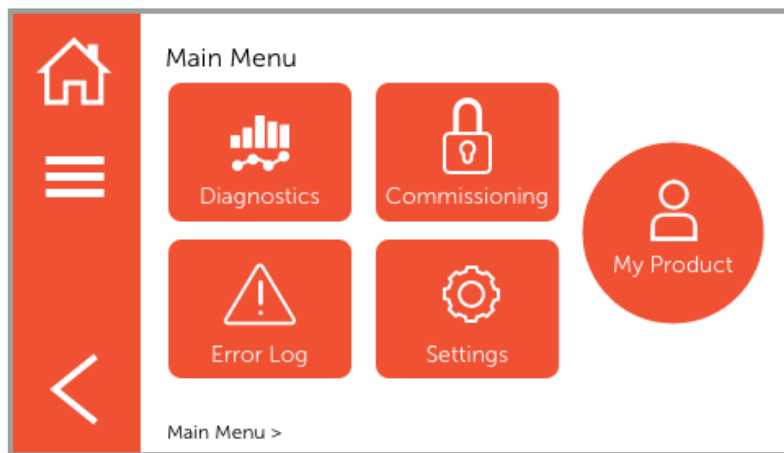


Fig 26. Main menu

My Product provides information regarding the unit.

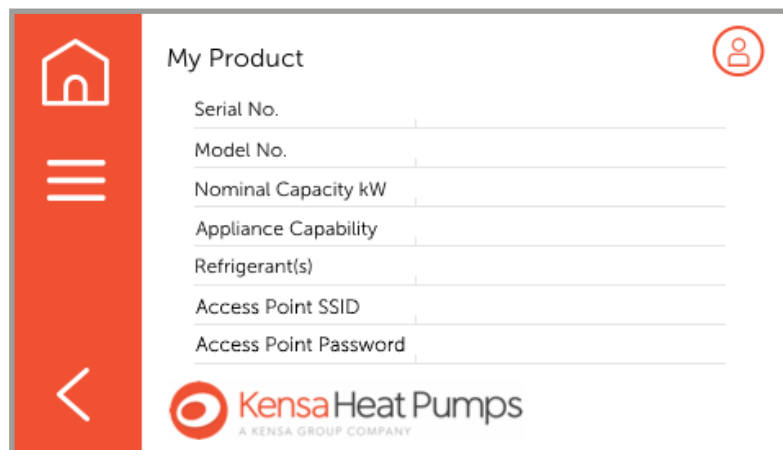


Fig 27 My product menu

## Section 6 – Maintenance

While there are no real maintenance requirements for a Kensa Ground Source Heat Pump, it is wise to run some pre-heating season checks to ensure everything is running smoothly. These are minor checks and can easily be carried by the owner of the system. Most of the checks are via the controller.

1. **Check fluid pressure.** Check both the ground side and the heating side pressures using the pressures screen within the diagnostics function on the controller. The heating distribution side should be above 1.5 bar and the ground side 2 bar based on default values. You can top up the pressures up by the filling loops installed by the installer. Typically there will be a filling loop somewhere near the expansion vessel. Filling loops should be disconnected to comply with WRAS regulations when not in use.
2. **Bleed air.** Bleed the heating and ground side using any valves that may have been installed by the original plumber (e.g. radiator valves, underfloor heating valve or air vents at high points in the pipework). You may need to top the pressure up again (see above) once the system has been bled.
3. **Check pumps.** Turn the heating system on (using the heating system timer and/or thermostats). Check on the pump parameters screen within diagnostics on the controller that the pumps are running.
4. **Test anti-freeze.** When the system was installed, the antifreeze concentration should have been checked but if that wasn't done or if large amounts of mains water have been added into the system since installation the antifreeze may not have enough concentration. If you suspect this then you should check the concentration. Take a sample and test with a refractometer to ensure the system is protected down to -10°C or lower. If you do not have a refractometer then we will be happy to test your anti-freeze sample and can provide sample tubes on request. A small sample of Thermal Transfer fluid can be obtain from the ground pump bleed screw or from the system ground array manifold.
5. **Run compressor.** Check that the compressor is running via the Compressor Performance screen within diagnostics on the controller that the compressor is running. You should also be able to hear the compressor running.
6. **Check temperature readings using the Temperatures menu in Diagnostics.** The temperature screen shows the current temperature measured within the system.

### Load side

- T1—Temperature of the heating/cooling distribution fluid returning to the heat pump.
- T2—Temperature of the heating/cooling distribution fluid leaving the heat pump.
- T3—Temperature of the heating/cooling distribution fluid leaving the heat pump. (This is only displayed for twin compressor units.)

### Ground side

- T4—Temperature of the thermal transfer fluid returning to the heat pump from the ground.
- T5—Temperature of the thermal transfer fluid leaving the heat pump to the ground.
- T6 - Temperature of the thermal transfer fluid leaving the heat pump to the ground.

T1-T2 and T4-T5 should be between 5-7°C. The difference should not be higher than 10°C. The temperatures should stabilise after around a few minutes of running.

If T5 continues to drop it indicates that there is no or very little flow through the ground side. This will need investigating and correcting for the heat pump to operate correctly.

If T2 continues to drop it indicates that there is no or very little flow through the load side. This will need investigating and correcting for the heat pump to operate correctly.

**If further help is required then telephone our helpline on 01872 862140 or send an email to [technical@kensaheatpumps.com](mailto:technical@kensaheatpumps.com)**

Before cleaning, always switch off the appliance at the electrical isolator and ensure the unit is isolated. Use only soap and a damp cloth; do not use solvents

## Section 7 – Fault finding

| Error code   | Error level      | Error message  | Action   |
|--|------------------|--|--|
| Blank display on the software controller                             | No error         | No power supply  | Check wall mounted electrical isolator switch or call electrician  |
|  |                  | Controls MCB tripped   | Call electrician to investigate cause  |
|  |                  | There is no call from the time-clock or thermostat for heat pump operation   | Programme time-clock according to manufacturer's instructions  |
|  |                  | Dimmed display – no error  | Display will wake up on touch  |
| Compressor not running but display reading temperature near setpoint | No error         | Heat pump is up to temperature. T1 displayed is close to set point.  | No fault   |
| A1   | Fault or warning | Ground return temperature T5 is below the Heating Mode Anti-freeze Limit.<br><br>For single or left hand compressors.  | Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure.<br><br>Check Antifreeze concentration.<br><br>Compressor 1 will not operate until T5 rises above the lower limit and the fault has cleared to prevent heat exchanger damage. |
| A2   | Fault or warning | Ground return temperature T6 is below the Heating Mode Anti-freeze Limit.<br><br>For twin right hand compressors only. | Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure.<br><br>Check Antifreeze concentration.<br><br>Compressor 2 will not operate until T6 rises above the lower limit and the fault has cleared to prevent heat exchanger damage. |
| TPL  | Fault or warning | Pressure in distribution side is below the low pressure load side limit. (P1)  | Top up the load water pressure to clear error. Check water pressure setup, load side. The fault should clear by raising the pressure above 1.5 bar based on default values.  |
| TPG  | Fault or warning | Pressure in ground side is below the low pressure ground side limit. (P2)  | Top up the ground pressure to clear error. Check water pressure setup, ground side. The fault should clear by raising the pressure above 2 bar based on default values.  |
| HP1  | Fault            | High refrigeration pressure in discharge gas pipe. (P5)  | Check for flow restriction on load side - usually accompanied with FLH1 (FLC1 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1.   |
| HP2  | Fault            | High refrigeration pressure in discharge gas pipe. (P6) Twin compressor only.  | Check for flow restriction on load side - usually accompanied with FLH2 (FLC2 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1.   |
| DI5  | Fault            | High pressure Switch is open circuit.  | Check for flow restriction on load side - usually accompanied with FLH1 (FLC1 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1.   |



| Error code | Error level | Error message   | Action   |
|------------|-------------|---|--|
| DI6        | Fault       | High pressure Switch is open circuit.<br>(Twin Compressor Only)   | Check for flow restriction on load side - usually accompanied with FLH2 (FLC2 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1.   |
| FLH1       | Warning     | Temperature differential T2-T1 (load temperature leaving the heat pump – low temperature entering the heat pump) is greater than low flow differential.   | Check load pump speed<br>Check load flow<br>Check for flow restrictions in distribution system<br>Check set low flow differentials   |
| FLH2       | Warning     | Temperature differential T3-T1 (load temperature leaving the heat pump - load temperature entering the heat pump) is greater than low flow differential.<br>(For twin compressors only)   | Check load pump speed<br>Check load flow<br>Check for flow restrictions in distribution system<br>Check set low flow differentials   |
| FGH1       | Warning     | Temperature differential T4-T5 (temperature of the thermal transfer fluid returning to the heat pump from the ground – temperature of the thermal transfer fluid leaving the heat pump to the ground) is greater than set point.  | Check ground pump speed<br>Check ground flow<br>Check for flow restrictions on ground side<br>Check set low flow differentials   |
| FGH2       | Warning     | Temperature differential T4-T6 (Temperature of the thermal transfer fluid returning to the heat pump from the ground – temperature of the thermal transfer fluid leaving the heat pump to the ground.(2nd compressor) is greater than set point.<br>(For twin compressors only) | Check ground pump speed<br>Check ground flow<br>Check for flow restrictions on ground side<br>Check set low flow differentials   |
| LP1        | Fault       | Low refrigeration pressure in suction gas pipe P3.  | Check for flow restriction on ground side - usually accompanied with FGH1 (FGC1 if in cooling). Check Ground Anti-freeze limit, if T5 reading bellow the setpoint, unit might be frozen - allow heat pump to defrost - add correct anti-freeze quantity. This fault could briefly trigger LPS1 fault. Fault may occur on first run or unit has not run for a long time. Fault maybe caused by ground pump failure. |
| LP2        | Fault       | Low refrigeration pressure in suction gas pipe P4.<br>(For twin compressors only)   | Check for flow restriction on ground side - usually accompanied with FGH2 (FGC2 if in cooling). Check Ground Anti-freeze limit, if T6 reading bellow the setpoint, unit might be frozen - allow heat pump to defrost - add correct anti-freeze quantity. This fault could briefly trigger LPS2 fault. Fault may occur on first run or unit has not run for a long time. Fault maybe caused by ground pump failure. |

| Error code | Error level      | Error message  | Action   |
|------------|------------------|--|--|
| LPS1       | Fault            | Refrigeration pressure is too low. P3  | Fault may occur on units stored in a cold environment before installation and first run. If accompanied with LP1 follow action in LP1 section. Potential loss of refrigerant, refer to Kensa Technical Support Department. |
| LPS2       | Fault            | Refrigeration pressure is too low. (For twin compressors only) P4  | Fault may occur on units stored in a cold environment before installation and first run. If accompanied with LP2 follow action in LP2 section. Potential loss of refrigerant, refer to Kensa Technical Support Department. |
| HTPL       | Fault            | Pressure in distribution side exceeds the high pressure load side limit. P1  | Release pressure to clear error– check Water Pressures in commissioning mode. (Load side)  |
| HTPG       | Fault            | Pressure in ground side exceeds the high pressure ground side limit. P2  | Release pressure to clear error– check Water Pressures in commissioning mode. (Ground side)  |
| DHT1       | Fault or warning | Refrigerant temperature T7 in discharge gas pipe exceeds the allowable high limit (set at the factory)   | Error may occur if compressor is over heating - accompanied with HP1. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.  |
| DHT2       | Fault or warning | Gas temperature T8 in discharge gas pipe exceeds the allowable high limit (set at the factory)   | Error may occur if compressor is over heating - accompanied with HP2. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.  |
| HGT1       | Fault or warning | Ground return temperature T5 is higher than Cooling Mode Upper Limit.  | Check Ground Cooling Mode Upper Limit settings. Ensure adequate flow in ground side. Error maybe caused by ground pump failure. Compressor 1 will not run until T5 falls below the upper limit and the fault has cleared.  |
| HGT2       | Fault or warning | Ground return temperature T6 is higher than Cooling Mode Upper Limit. (Twin Compressor only)   | Check Ground Cooling Mode Upper Limit settings. Ensure adequate flow in ground side. Error maybe caused by ground pump failure. Compressor 2 will not run until T6 falls below the upper limit and the fault has cleared.  |
| FLC1       | Warning          | Temperature differential T1-T2 (load temperature entering the heat pump – load temperature leaving the heat pump) is greater than low flow differential. (Cooling applications only) | Check load pump speed<br>Check load flow<br>Check for flow restrictions in distribution system<br>Check set low flow differentials (Cooling)   |

| Error code | Error level | Error message  | Action  |
|------------|-------------|--|---|
| FLC2       | Warning     | Temperature differential T1-T3 (load temperature entering the heat pump – load temperature leaving the heat pump (2nd compressor)) is greater than low flow differential. (Cooling applications and twin compressors only)   | <p>Check load pump speed</p> <p>Check load flow</p> <p>Check for flow restrictions in distribution system</p> <p>Check set low flow differentials (Cooling)</p> |
| FGC1       | Warning     | Temperature differential T5-T4 (temperature of the thermal transfer fluid leaving the heat pump to the ground – temperature of the thermal transfer fluid returning to the heat pump from the ground) is greater than set point. (Cooling applications only)                 | <p>Check ground pump speed</p> <p>Check ground flow</p> <p>Check flow restrictions on ground side</p> <p>Check set low flow differentials (Cooling)</p>         |
| FGC2       | Warning     | Temperature differential T6-T4 (Temperature of the thermal transfer fluid leaving the heat pump to the ground – Temperature of the thermal transfer fluid returning to the heat pump from the ground.(2nd compressor) is greater than set point. (Cooling applications only) | <p>Check ground pump speed</p> <p>Check ground flow</p> <p>Check for flow restrictions on ground side</p> <p>Check set low flow differentials</p>               |
| HV         | Fault       | Supplied voltage is greater than high voltage limit.   | Call electrician to investigate cause   |
| LV         | Fault       | Supplied voltage is less than low voltage limit.   | Call electrician to investigate cause   |
| DHWER      | Warning     | Heat pump has been operating in DHW mode for longer than designated time.  | Hot water demand might be too high<br>Check DHW Excessive running time setting in commissioning.  |
| HCE        | Fault       | Simultaneous call for Heating and Cooling.   | <p>Check time clock operation on both cooling and heating systems.</p> <p>Refer to Kensa Technical department</p>   |
| SSFC       | Fault       | Soft Start Fault   | <p>Check soft start fault code list.</p> <p>Refer to Kensa Technical department</p>   |
| E1         | Fault       | T1 Temperature Probe Error   | T1 (load return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.  |
| E2         | Fault       | T2 Temperature Probe Error   | T2 (flow return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.  |
| E3         | Fault       | T3 Temperature Probe Error   | T3 (flow twin return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.   |
| E4         | Fault       | T4 Temperature Probe Error   | T4 (ground flow) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.  |

| Error code | Error level | Error message                                       | Action   |
|------------|-------------|---|--|
| E5         | Fault       | T5 Temperature Probe Error                          | T5 (ground return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.             |
| E6         | Fault       | T6 Temperature Probe Error                          | T6 (ground twin return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.        |
| E7         | Fault       | T7 Temperature Probe Error                          | T7 (discharge pipe) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.            |
| E8         | Fault       | T8 Temperature Probe Error                          | T8 (discharge twin pipe) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.       |
| E9         | Fault       | T9 Temperature Probe Error                          | T9 (weather compensation) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.      |
| S1         | Fault       | P1 Pressure Sensor Error                            | P1 (load side) pressure sensor is faulty or disconnected. Refer to Kensa Technical Department.                   |
| S2         | Fault       | P2 Pressure Sensor Error                            | P2 (ground side) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.         |
| S3         | Fault       | P3 Pressure Sensor Error                            | P3 (suction pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.        |
| S4         | Fault       | P4 Pressure Sensor Error.<br>(Twin Compressor Only) | P4 (suction twin pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.   |
| S5         | Fault       | P5 Pressure Sensor Error                            | P5 (discharge pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.      |
| S6         | Fault       | P6 Pressure Sensor Error.<br>(Twin Compressor Only) | P6 (discharge twin pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department. |

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## Section 8 – Complaint Procedure

The expertise of members and the assurance provided by the Renewable Energy Consumer Code make sure that micro renewable technology supplied and installed under the scheme are free from manufacturing or installation faults. Occasionally, however, problems can develop.

If you want to complain about the quality of the equipment, the installation, the advice given, the standard of service or any other aspect of the contract between Kensa and yourself, the following procedure should be used.

Any complaint should be notified to Kensa Heat Pumps within three months of first noticing the problem.

- a. If the complaint cannot be rectified remotely, Kensa or a representative on its behalf will arrange to inspect the system, within 20 working days from receiving the complaint.
- b. If the complaint is about under-performance, you should make evidence available to Kensa.
- c. Kensa will consider the details of the complaint and report the findings clearly to the consumer within seven working days from any inspection.
- d. Kensa will try to find an agreed course of action to solve the complaint to the consumer's satisfaction.
- e. Kensa will co-operate fully with local consumer advisers or any other person that you consult when making a complaint.
- f. If a complaint cannot be sorted out through the above procedure, you or Kensa can use the conciliation service offered by the Renewable Energy Consumer Code. (Please see [www.recc.org.uk](http://www.recc.org.uk)).

# Section 9 – Warranty

The Kensa Shoebox NX Ground Source heat pump is designed and built to the highest standard and as such is warranted for 5 years for parts from the date of commissioning or 5 ½ years from the date of manufacture (excluding the internal water pumps and electrical components), whichever is shorter. Internal water pumps (ground side) and electrical components are warranted for 2 years for parts from the date of commissioning or 2 ½ years from the date of manufacturer, whichever is shorter.

## 9.1 Terms and Conditions

### 9.1.1 Persons covered by the Warranty

The Warranty applies to the original purchaser and any subsequent owner of the item.

### 9.1.2 Validity period of the Warranty

The warranty period (excluding the water pumps and electrical components) is five years calculated from the commissioning date stated on the commissioning certificate or 5 ½ years from the date of manufacture, whichever is shorter. For the water pumps and electrical components it is 2 years from the commissioning date stated on the commissioning certificate or 2 ½ years from the date of manufacture, whichever is shorter. We recommend a central heating inhibitor is added to the heating water in the heating distribution circuit.

### 9.1.3 Scope

Kensa Heat Pumps Ltd warrants to the original purchaser and any subsequent owner of the it (“Buyer”) that all parts (“Parts”) of the Kensa Shoebox NX Ground Source Heat Pump, excluding accessories, shall be merchantable and free from defects in materials and workmanship appearing under normal working conditions.

Kensa Heat Pumps Ltd will, at its option and without charge to the Buyer, replace or repair any Parts which cause the Kensa Shoebox NX Ground Source Heat Pump to be inoperable; however, if Kensa Heat Pumps Ltd elects to provide replacement Parts, it shall not be obligated to install such replacement Parts and the Buyer shall be responsible for all other costs, including, but not limited to, shipping fees and expenses.

The warranty applies to faults originating inside the item.

### 9.1.4 General exceptions

Compensation is not provided for:

- Consequential losses
- Damage caused by normal wear and tear, inadequate maintenance or care
- Damage caused by freezing
- Damage of the unit due to non-approved or incorrect quantities of antifreeze being used in the ground side, incorrect flowrates or air in the system
- Damage caused by power surges, incorrect supply voltage or lightning strikes.
- Cost of inspecting, adjusting or cleaning the item, unless this relates to damage that is eligible for compensation
- Minor damage (e.g. scratches and marks) that does not affect the operation of the item
- Damage covered by insurance
- Indirect damage
- Loss or damage caused by gross negligence or intent, misappropriation, fraud or similar crime against property, breach of trust or fraudulent conversion.
- Products that have been: altered; subject to misuse, negligence, accidental damage, abnormal use or service; operated or installed in a manner contrary to Kensa Heat Pumps Ltd published or written instructions.
- Products subjected to abrasion or corrosion
- Products operated in connection with any liquid source that contains impurities which are corrosive to copper
- Products operated in a temperature range inconsistent with Kensa Heat Pumps Ltd’s published or written recommendations

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### **9.1.5 Care of duty**

The product must be handled with normal care and attention to minimise the risk of damage or loss.

### **9.1.6 In the event of damage**

The installing contractor ("Contractor"), or, if the installing Contractor is not available, Kensa Heat Pumps Ltd must be notified of any damage immediately and no later than six months after you first became aware of the damage. The commissioning certificate received on installation should be appended to the claim. If a claim for compensation is made after the deadline specified above or if a commissioning certificate cannot be produced, the warranty shall not apply.

### **9.1.7 Replacement parts**

Kensa Heat Pumps Ltd's warranty obligations with respect to replacement parts are identical to those with respect to original parts; provided, however, in no event shall the warranty term for such replacement parts extend beyond the term established by the commencement date (i.e. commissioning date) of the warranty under which Kensa Heat Pumps Ltd was obligated to provide such replacement parts. Kensa Heat Pumps Ltd shall have the right to retain possession or dispose of any parts replaced by it.

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Call [0345 222 4328](tel:03452224328) | Email [enquiries@kensaheatpumps.com](mailto:enquiries@kensaheatpumps.com)  
Visit [www.kensaheatpumps.com](http://www.kensaheatpumps.com)

