Kensa Heat Pumps
A KENSA GROUP COMPANY

Shoebox Heat Pump

User Manual

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1. Introduction—a message from the CEO

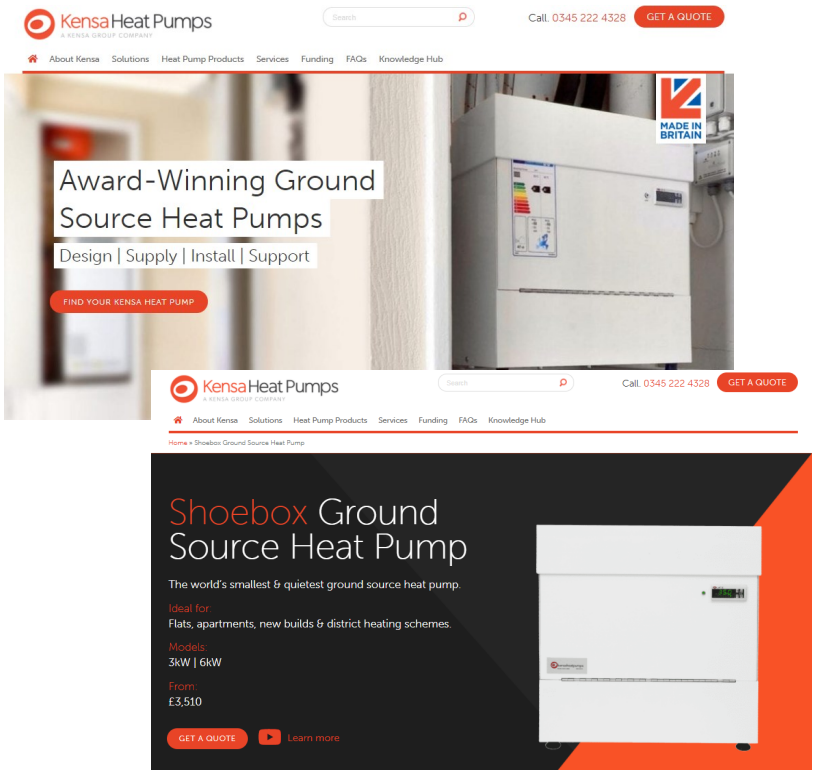
Thank you for choosing a Kensa Shoebox ground source heat pump for your project. Kensa Heat Pumps has been manufacturing ground source heat pumps since 1999 and have significant experience in providing heat pump systems in domestic and commercial applications.

Your Kensa heat pump will provide you with many years of low energy bills and maintenance free running while also reducing your carbon footprint. Kensa Shoebox heat pumps are designed for ease of operation and once set by your installer to provide the optimum flow temperature for your heating system should not require adjusting.

The purpose of this manual is to guide you through the operational aspects of living with a heat pump.

Finally, please feel free to contact Kensa should you have any questions, wish to consider ground source heat pumps for any future projects or even just to share your experiences of using a ground source heat pump with us.

Simon Lomax
CEO
Kensa Heat Pumps Ltd



For further information on ground source heat pumps and their application, please refer to www.kensaheatpumps.com

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

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 cause damage to the product, will invalidate the warranty, and may cause injury or fatality to personnel.

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.

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.

3. General Product Information

This manual explains how to operate a Kensa Shoebox 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.

Since 1999 the company has manufactured and installed over two thousand heat pumps of various types throughout Europe 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 CO2 emissions while reducing client's energy bills.

3.2 Product description

Heat pumps basically 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.

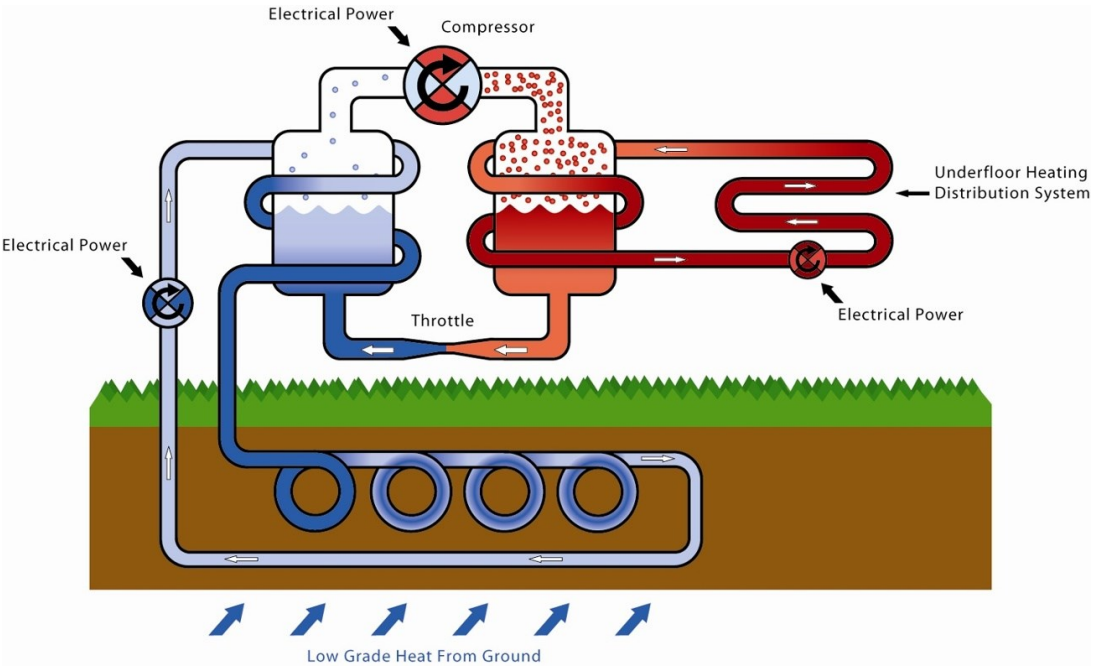


Fig 1. Heat pump Schematic

3.3 Kensa Shoebox Technical Details											
Nominal Thermal Output	Power supply rating	Max running Current	Typical running current	Typical starting current	Power supply cable cross sectional area (min)	Power input*	Nominal weight	Compressors	Dimensions	Connection size	Recommended minimum heat transfer area in DHW tank (not supplied)
kW	Amps	Amps	Amps	Amps	mm^2	kW	Kg	Number	HxWxD	mm OD	m^2
Single Phase—230 Volts AC 50 Hz											
3.0	13	7	4	30	2.5	0.8	60	Single	530x465x370	3/4" BSP Parallel with 22mm Adaptor valves	0.75
6.0	25	14	8	34	4.0	1.6	100	Twin	560x605x595		1.5

The figures above are based on a rating to BS EN14511, 0 deg C from the ground, 35 deg 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' 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 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.

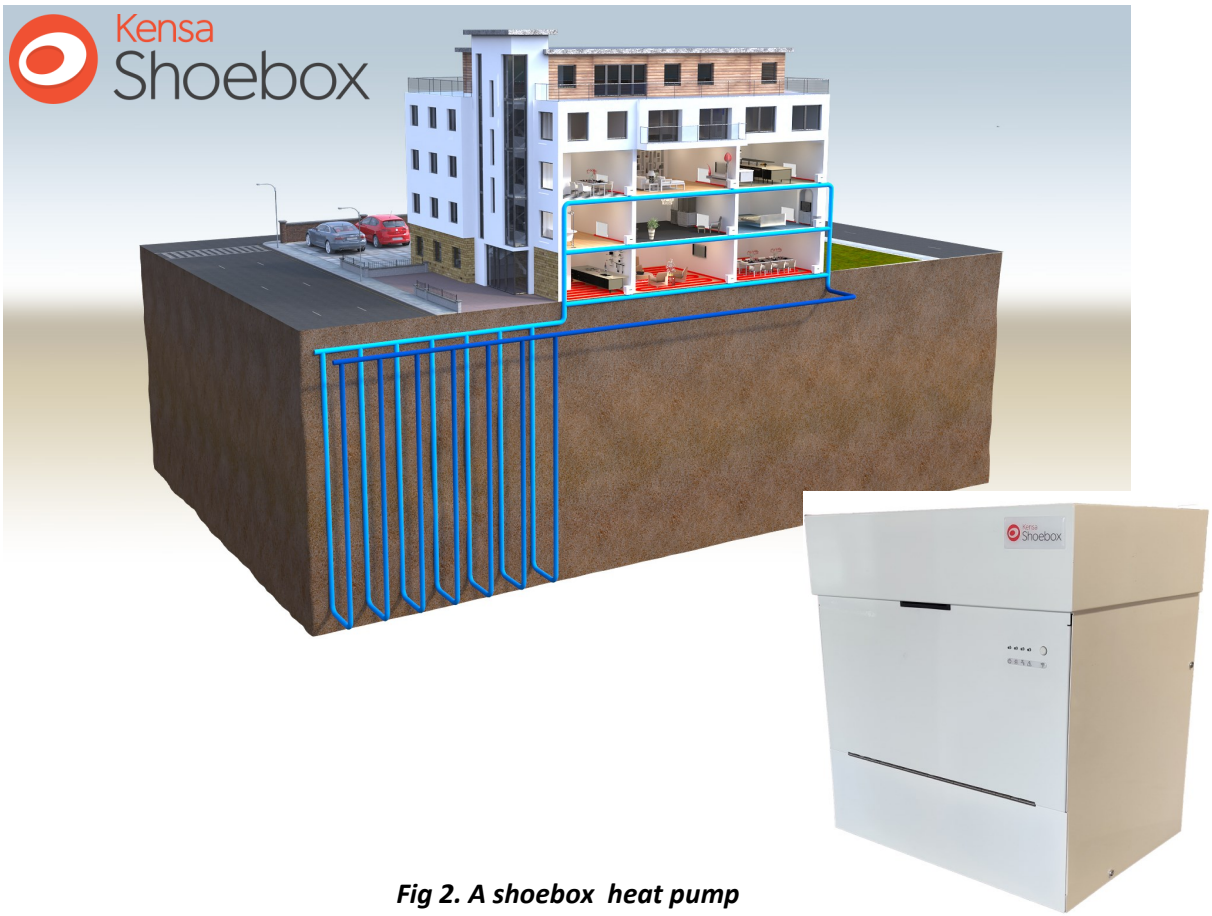


Fig 2. A shoebox heat pump

Fig 3. A shoebox single compressor heat pump

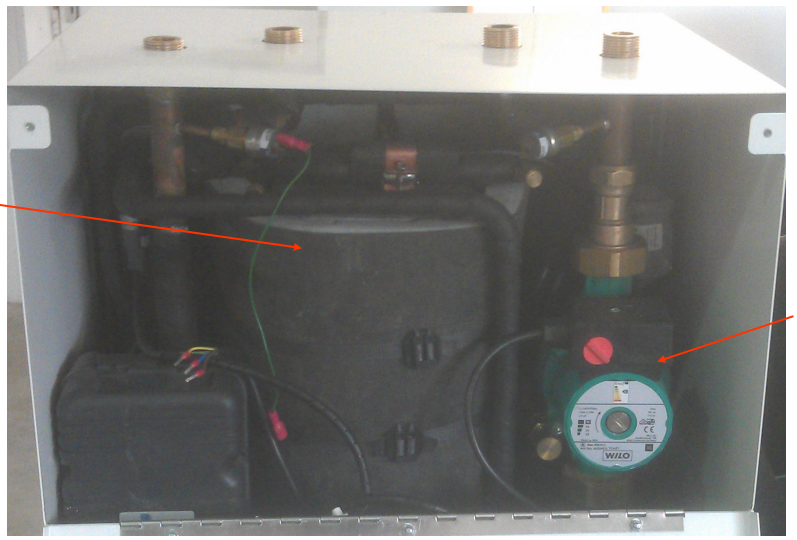


Fig 4. The internals of a single compressor shoebox heat pump

4. Operational 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.

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.

1. 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.
2. 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.
3. If in a well insulated building with underfloor mounted in screed throughout, consider running your heat pump on off-peak electricity tariffs such as Economy 10.
4. With underfloor systems, avoid the use of insulative coverings such as thick carpets and wooden floors.
5. 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.

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.

4.2 DHW Production

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.

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.

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, for example Economy 10.

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.

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

4.3 LEDs on the Shoebox

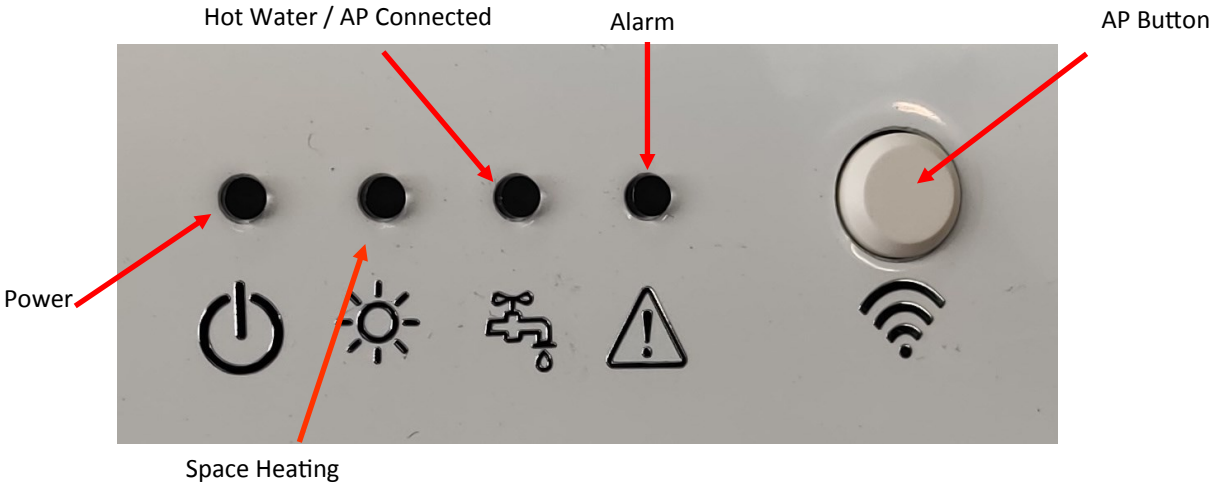


Fig 5 LED positions and meanings

Symbol	Colour	Status	Description
Power	Green	solid	Heat Pump controls are powered
Sun	Yellow	solid	Space heating - zone 1
Sun	Yellow	Flashing	Space heating - zone 2
Tap	White	Solid	Domestic Hot water mode
Tap	Blue	Flashing	Access Point connection is open
Tap	White & Blue	Both flashing	Function Test mode
Error	Red	Flashing	Number of flashes represent error code
WiFi	Button		Press for 3 second until blue LED is flashing to enable AP mode

4.4 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. For the Shoebox heat pump the controller and heat pump settings are accessed via an application for android devices downloadable using the QR code below.

Genesis Installation Manual

Shoebox Installation Manual

QR Code for Kensa Android App

The app replicates a display for the shoebox on your chosen device.

4.4.1 Location of Shoebox AP button.

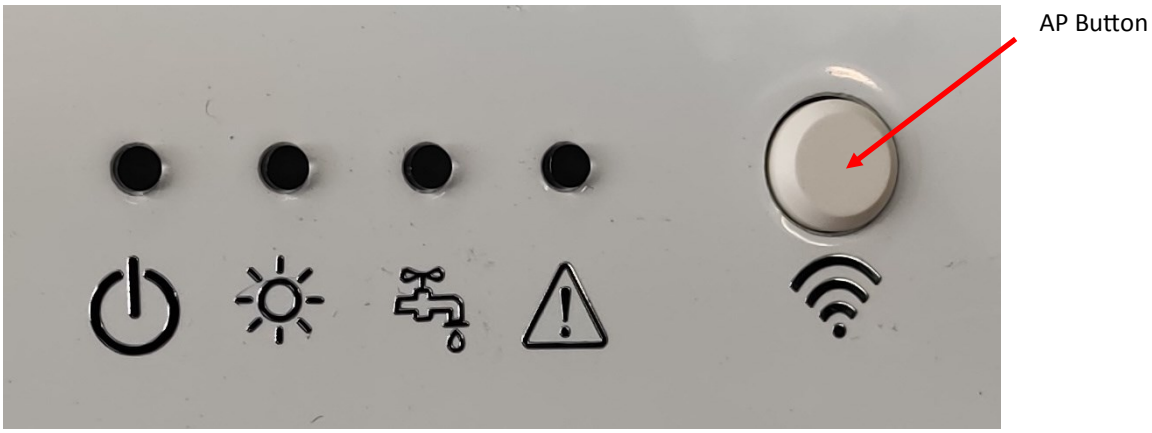


Fig 6 Location of the Shoebox AP button.

4.4.2 Setting the shoebox communication link up.

I. Download the app to your chosen android device and open it.
II. Press the AP button (Access point) button on the front of the shoebox.
III. The hot water LED on the front of the shoebox should flash blue confirming that the shoebox is in AP mode.
IV. On the app, select the network name [kensa…] of the heat pump you wish to connect to.
V. If the desired network is not showing, press the AP button on the front of the heat pump again.

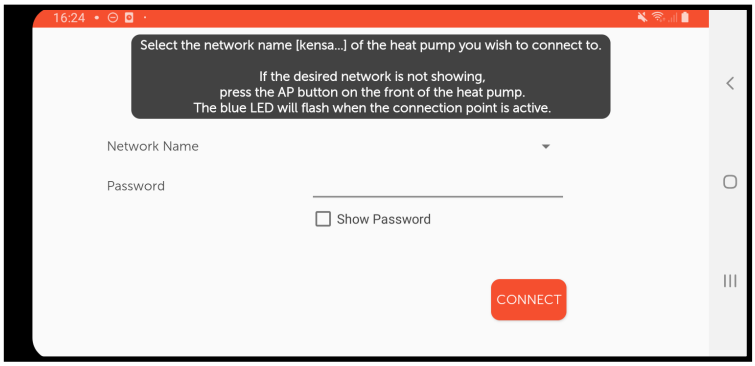


Fig 7 AP connection screen on android app

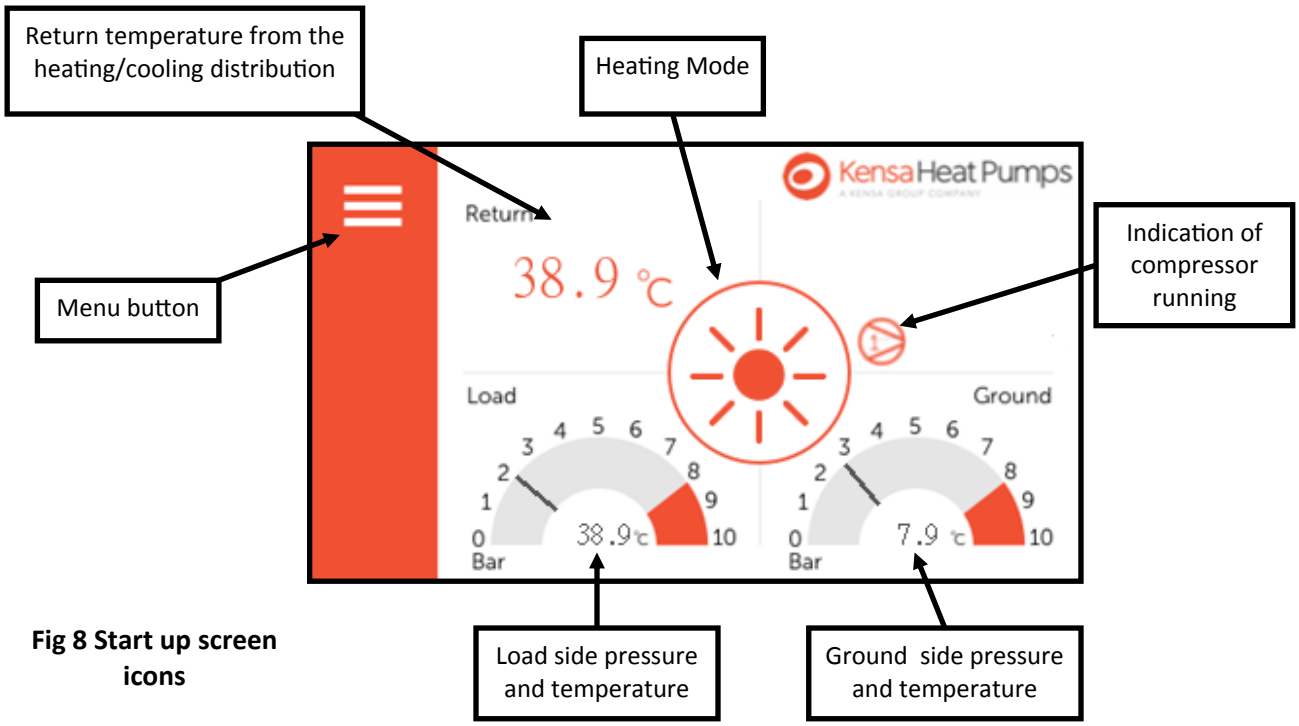


Fig 8 Start up screen icons

4.5 Guide to Home Screen icons

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.

4.6 Main Menu

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

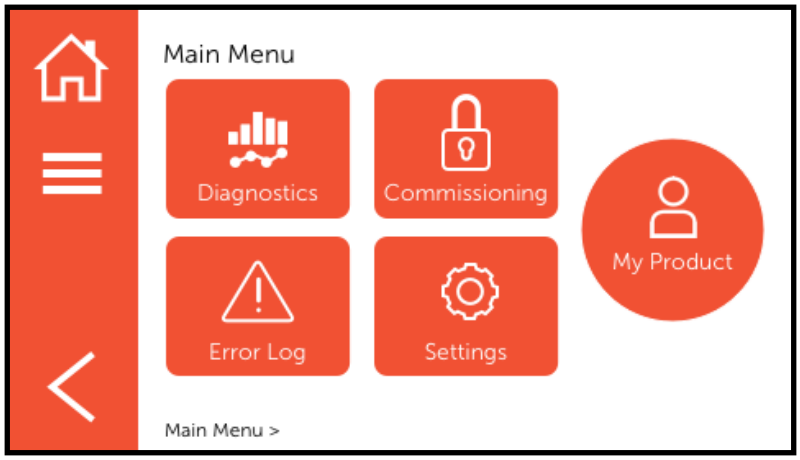


Fig 9 Main menu

4.6.1 Main Menu Icons


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.

4.7 Diagnostics Menu

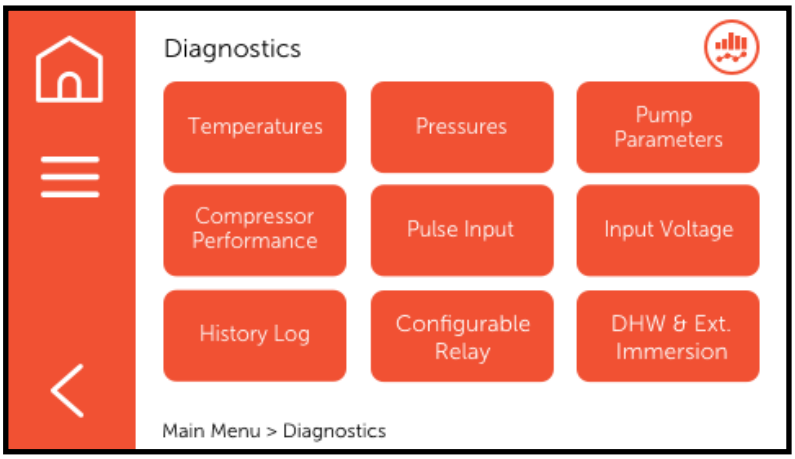


Fig 10 Diagnostics Menu

4.7.1 Diagnostics—Temperature Menu

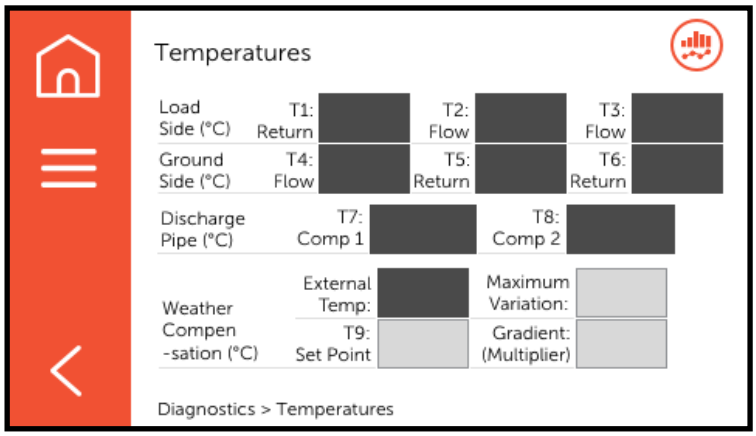


Fig 11 Diagnostics—Temperature Menu

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

- T7—Temperature of the refrigerant in the discharge pipe of the compressor (left hand side compressor for twin units).
- 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.

4.7.2 Diagnostics—Pressures

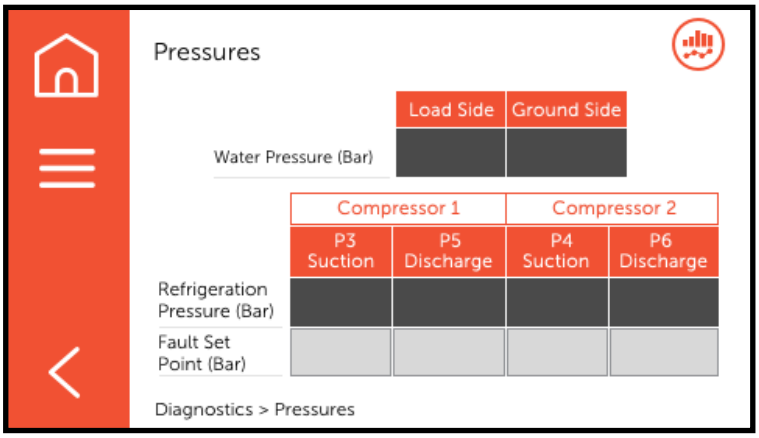


Fig 12 Diagnostics—Pressure Menu

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.

4.7.3 Diagnostics—Pump Parameters

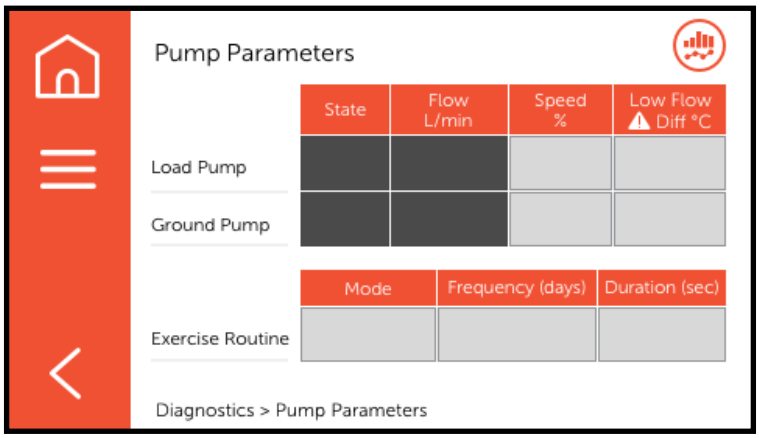


Fig 13 Diagnostics—Pump Parameters Menu

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.

4.7.4 Diagnostics—Compressor Performance

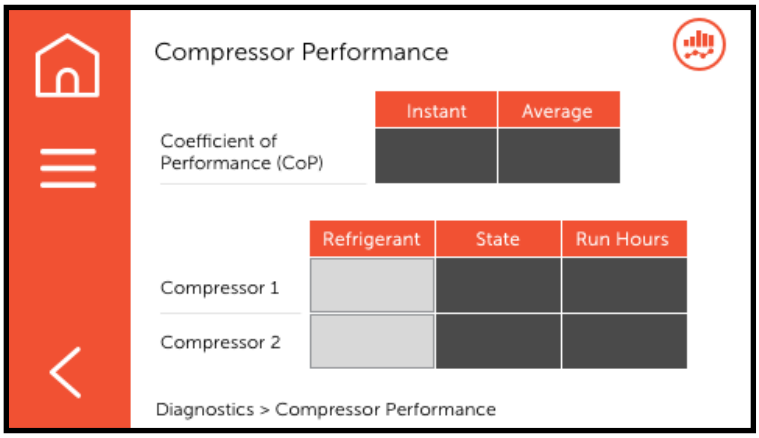


Fig 14 Diagnostics—Compressor Performance Menu

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. Compressor 2 is only shown for twin compressor models
- State— Indicates whether the compressor is running or not.
- Run hours—The number of hours the compressor has run. This is not resettable.

4.7.5 Diagnostics—Pulse Input

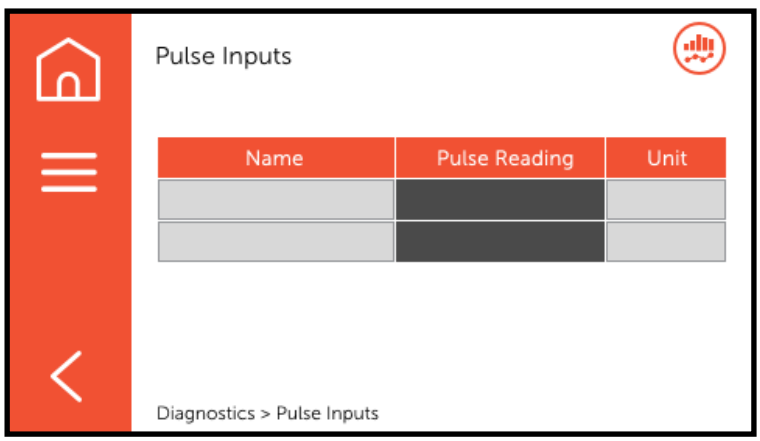


Fig 15 Diagnostics—Pulse Input Menu

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).

4.7.6 Diagnostics—Input Voltage

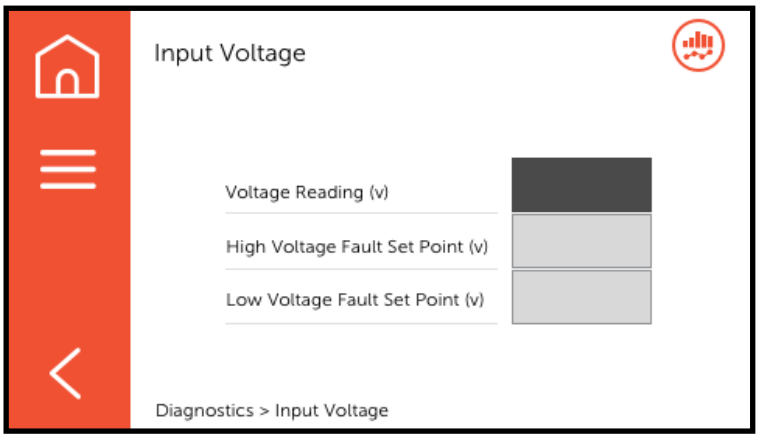


Fig 16 Diagnostics—Input Voltage Menu

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.

4.7.7 Diagnostics—History Log

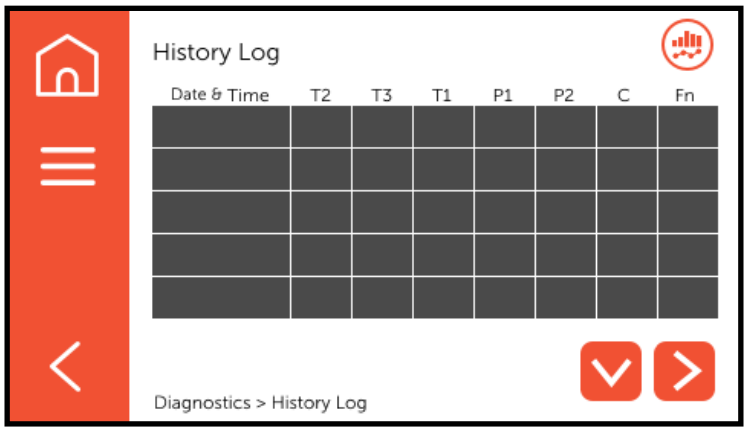


Fig 17 Diagnostics—History Log Menu

The history log records various readings from the heat pump every 15 minutes. It stores data over the last 37hours 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

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

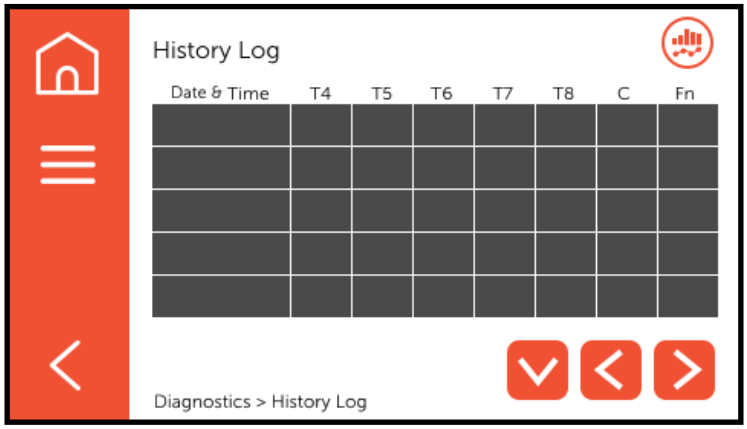


Fig 18 Diagnostics—History Log Menu 2nd page

- 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.)
- T7—Temperature of the refrigerant in the discharge pipe of the compressor (left hand side compressor for twin units).
- T8—Temperature of the refrigerant in the discharge pipe of the compressor (right hand side compressor, only displayed for twin compressors units).

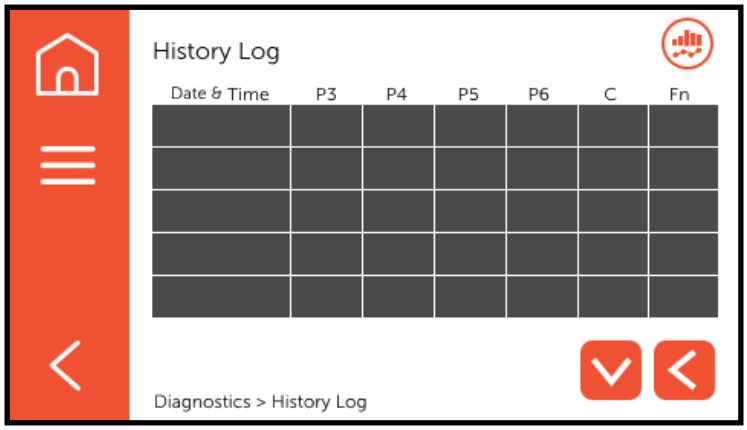


Fig 19 Diagnostics—History Log Menu 3rd page

- 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.)

4.7.8 Diagnostics—DHW and External Immersion

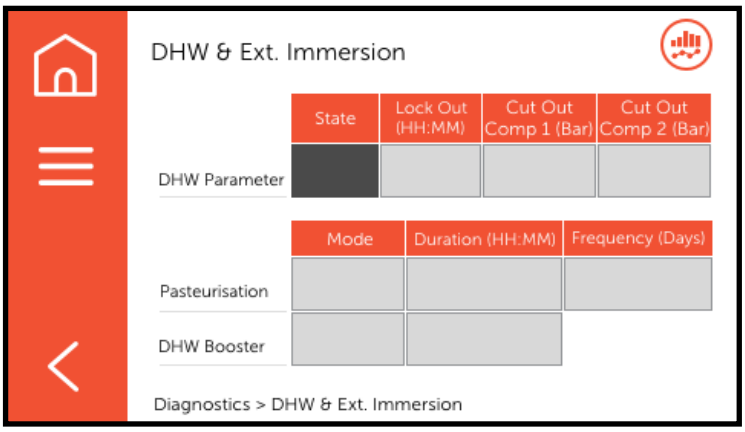


Fig 20 Diagnostics—DHW and external immersion menu

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 or the left hand compressor of a twin.
  Comp 2—The pressure at which the pressure transducer switch terminates the DHW cycle on the right hand compressor of a twin.

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.

4.7.9 Diagnostics—Configurable Relay

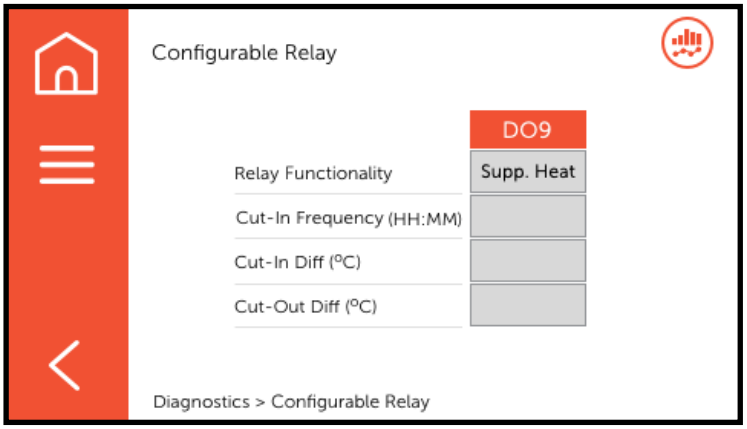


Fig 21 Diagnostics—Configurable Relay Menu (Supplementary Heating)

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 10°C and the set point is 45°C, the amount of continuous compressor run time while the return temperature is below 35°C 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.

4.7.9.1`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.

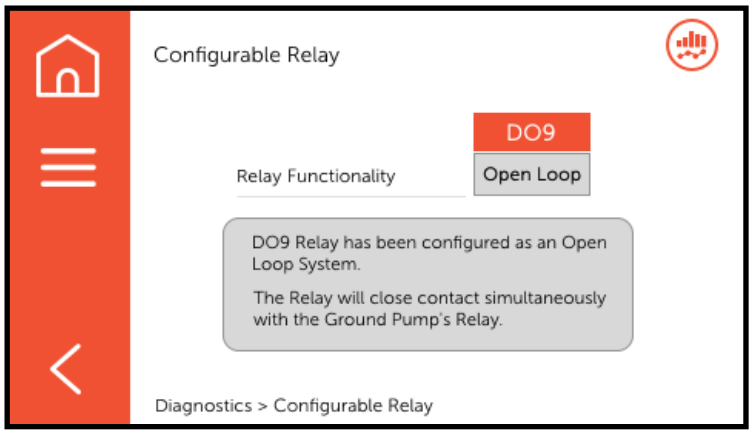


Fig 22 Diagnostics—Configurable Relay Menu (Open Loop)

4.8 Main Menu—Settings

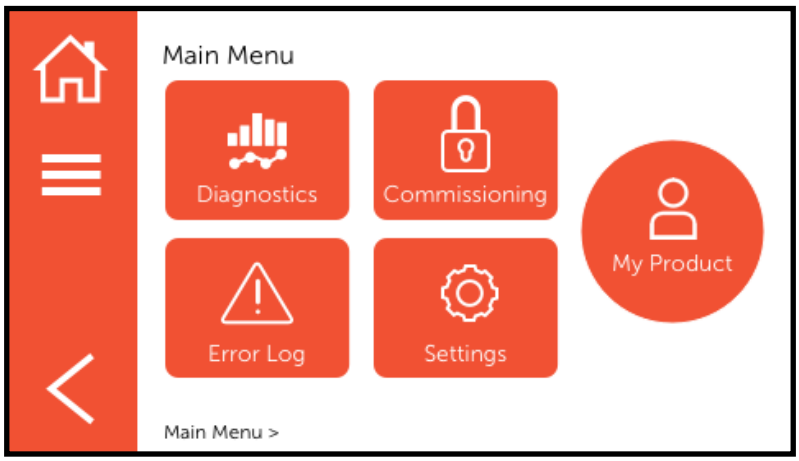
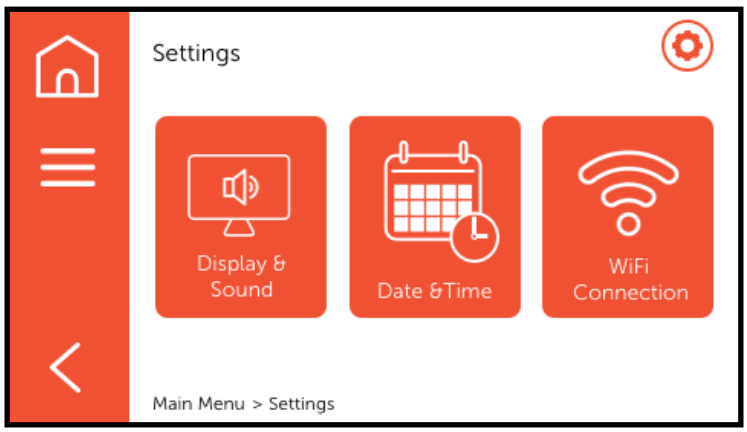


Fig 23 Main Menu



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

Fig 24 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.

4.8.1 Display and Sound

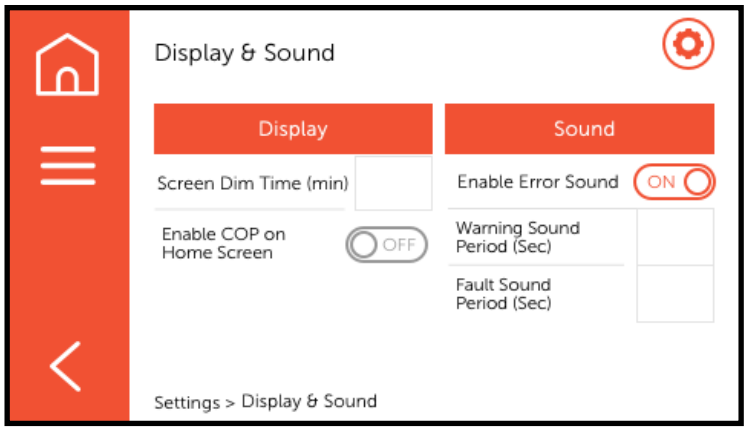


Fig 25 Settings— Display and sounds

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.

4.8.2 Date and Time

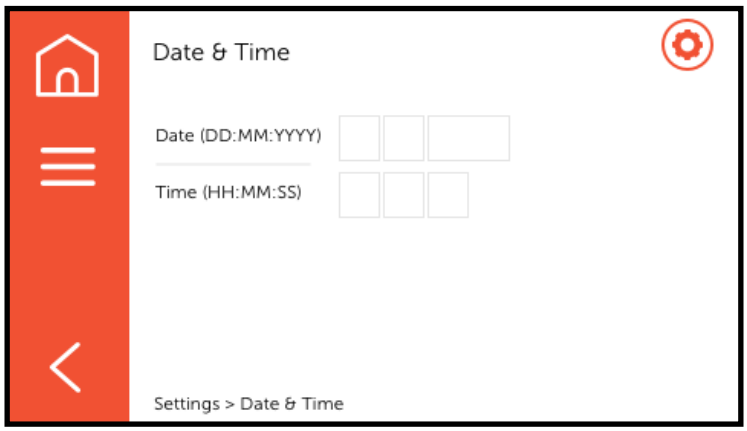


Fig 26 Settings— Date and Time

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.

4.8.3 **Wi-Fi Connection**

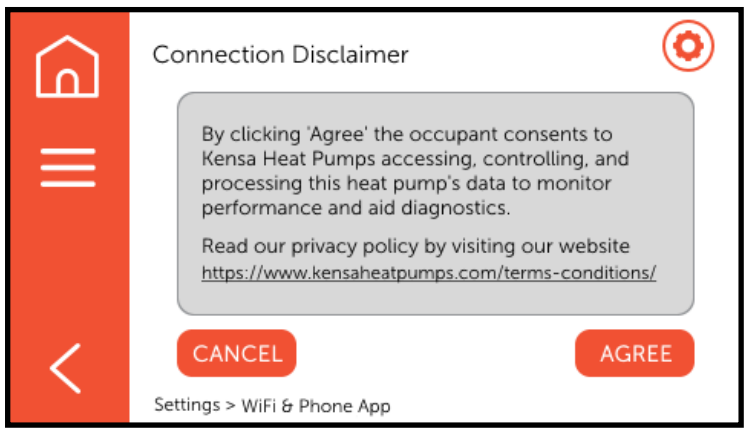


Fig 27 Settings— Wi-Fi and phone App disclaimer

To allow connection to the Wi-Fi the connection disclaimer has to be agreed to by the occupant. The WI-Fi allows Kensa Heat Pumps to access the heat pumps data remotely to aid with diagnostics and performance monitoring.

Fig 28 Settings— Wi-Fi and phone App connection

The heat pump will detect the available networks and the desired network should be selected and the password entered.

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). The unit will download its settings and diagnostics to the mobile device which will upload to the Kensa server when a Wi-Fi connection becomes available.

The connection to the Access Point takes priority over a standard Wi-Fi connection and the standard Wi-FI connection will only open when the Access Point is cancelled.

5. My Product

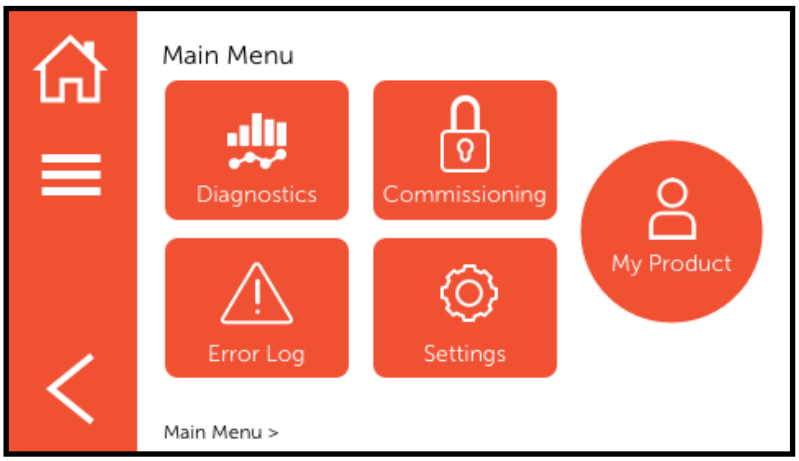


Fig 29 Main menu

My Product provides information regarding the unit.

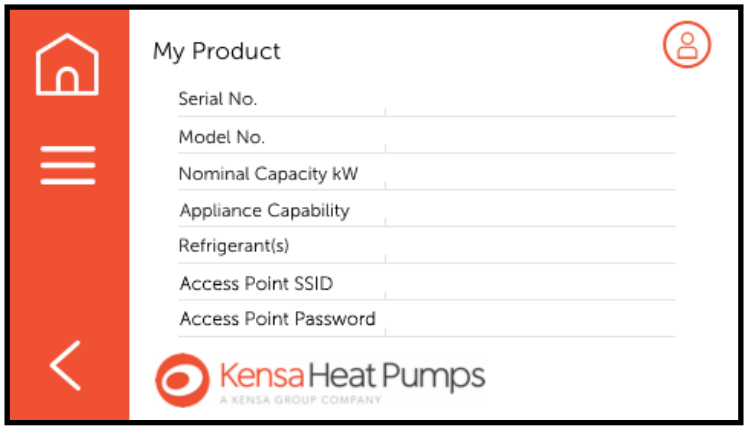


Fig 30 My product menu

6.Maintenance

No routine maintenance is required to Kensa Shoebox Heat Pumps, and there are no user serviceable components inside. If further help is required then telephone our helpline on 0345 222 4328 or send an email to technical@thekensagroup.com

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

7. Fault Finding

Error Code	Error Level	Error Message	Action
Blank display on 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 . For single or left hand compressors.	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. 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 For twin right hand compressors only.	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. 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
DI6	Fault	High pressure Switch is open circuit. (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 Check load flow Check for flow restrictions in distribution system 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. (For twin compressors only)	Check load pump speed Check load flow Check for flow restrictions in distribution system 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 Check ground flow Check for flow restrictions on ground side Check set low flow differentials

Error Code	Error Level	Error Message	Action
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. (For twin compressors only)	Check ground pump speed Check ground flow Check for flow restrictions on ground side 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. (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.
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 Check load flow Check for flow restrictions in distribution system Check set low flow differentials (Cooling)
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)	Check load pump speed Check load flow Check for flow restrictions in distribution system Check set low flow differentials (Cooling)

Error Code	Error Level	Error Message	Action
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)	Check ground pump speed Check ground flow Check for flow restrictions on ground side Check set low flow differentials (Cooling)
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)	Check ground pump speed Check ground flow Check for flow restrictions on ground side Check set low flow differentials
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 Check DHW Excessive running time setting in commissioning.
HCE	Fault	Simultaneous call for Heating and Cooling.	Check time clock operation on both cooling and heating systems. Refer to Kensa Technical department
SSFC	Fault	Soft Start Fault	Check soft start fault code list. Refer to Kensa Technical department
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.
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. (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. (Twin Compressor Only)	P6 (discharge twin pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.

7.1 Fault Finding (shoebox LED Flashes)

Many faults which occur on commissioning are found to be due to incorrect wiring or setting up, therefore it is recommended that a thorough check is carried out should there be a problem.

The alarm LED will flash a number of times indicating what the issue is.

LED flashes	Error	Action
0	Clear	None
1	A1: Antifreeze limit (Heating)	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. Compressor 1 will not operate until T5 rises above the lower limit and the fault has cleared to prevent heat exchanger damage.
2	A2: Antifreeze limit (Heating)	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. Compressor 2 will not operate until T6 rises above the lower limit and the fault has cleared to prevent heat exchanger damage.
3	TPG: Low Ground Pressure	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.
4	TPL: Low Load Pressure	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.
5	HP1: High Gas Pressure	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
6	HP2: High Gas Pressure	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
7	LP1: Low Gas Pressure	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.
8	LP2: Low Gas Pressure	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.
9	DHT1: High Discharge Temp	Error may occur if compressor is over heating - accompanied with HP1. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.
10	DHT2: High Discharge Temp	Error may occur if compressor is over heating - accompanied with HP2. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.

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)

9. Warranty

The Kensa Shoebox Ground Source heat pump is designed and built to the highest standard and as such is guaranteed 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 guaranteed for 2 years for parts from the date of commissioning or 2 ½ years from the date of manufacture, 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 guarantee 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.

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 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 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

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 guarantee 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.