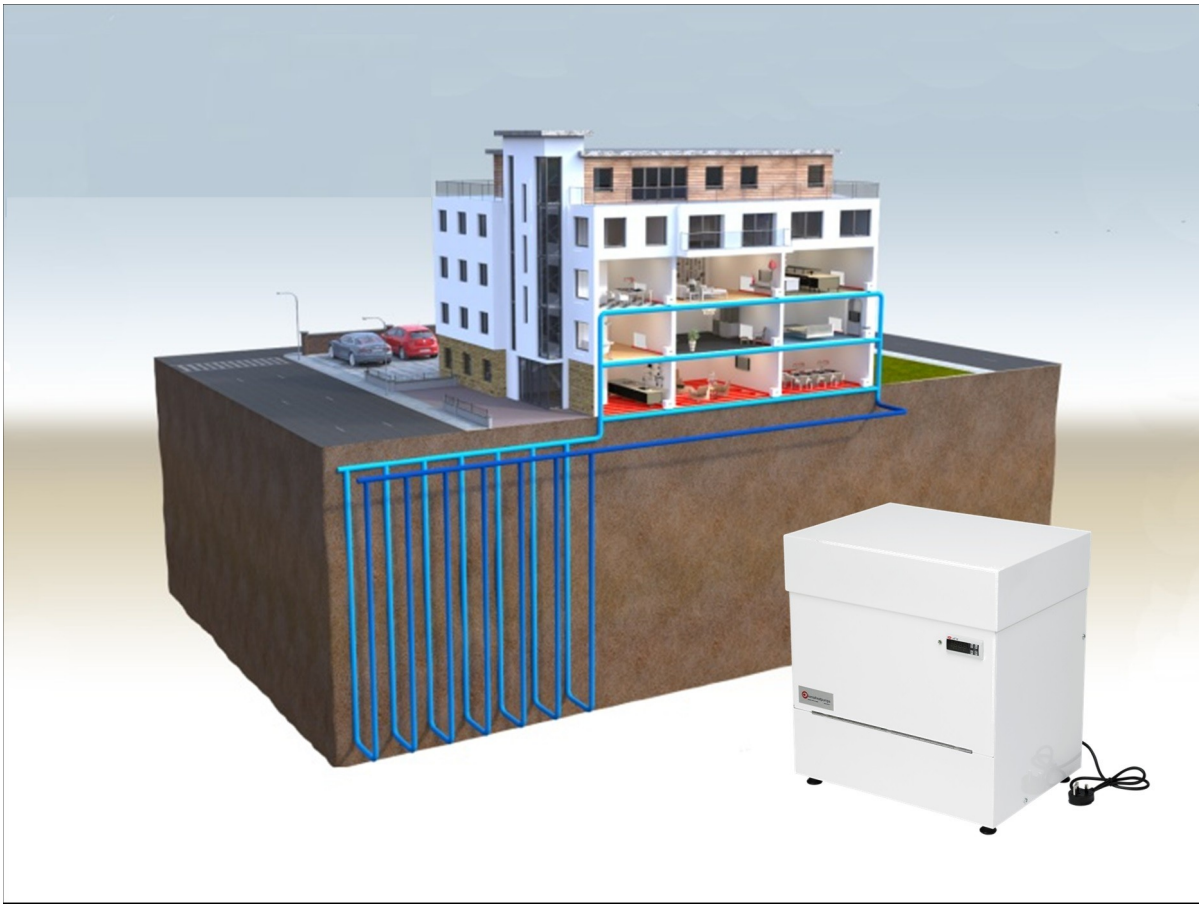
Kensa Heat Pumps
A KENSA GROUP COMPANY

Shoebox Heat Pump

User Manual



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1. Introduction—a message from the Managing Director

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
Managing director
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 01872 862140
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.

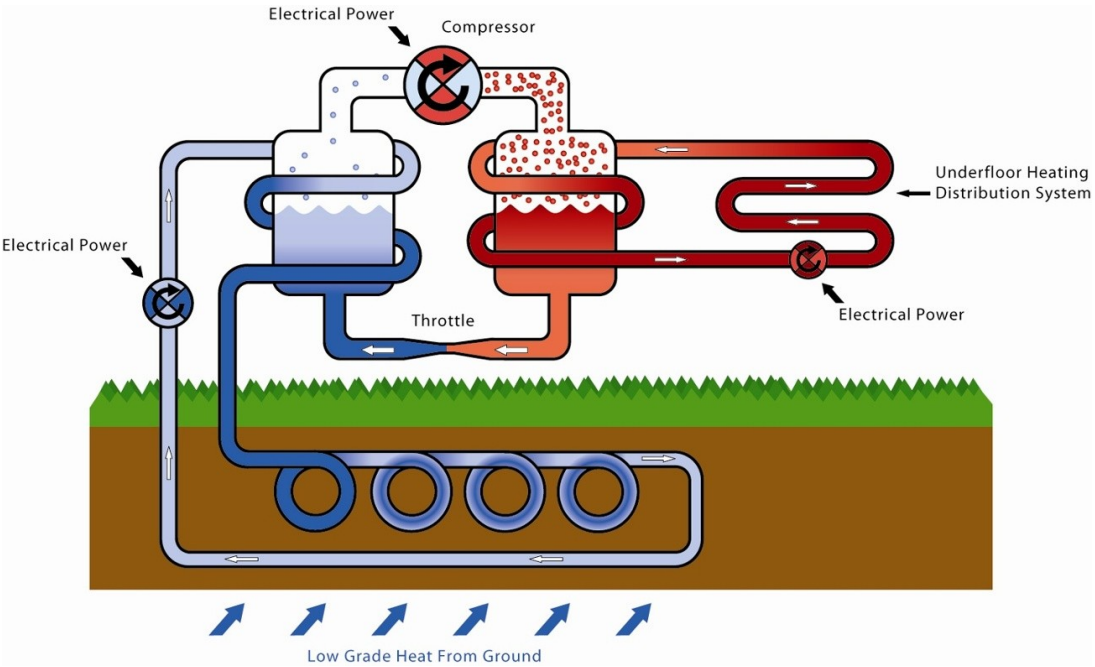

Fig 1. Heat pump Schematic

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.

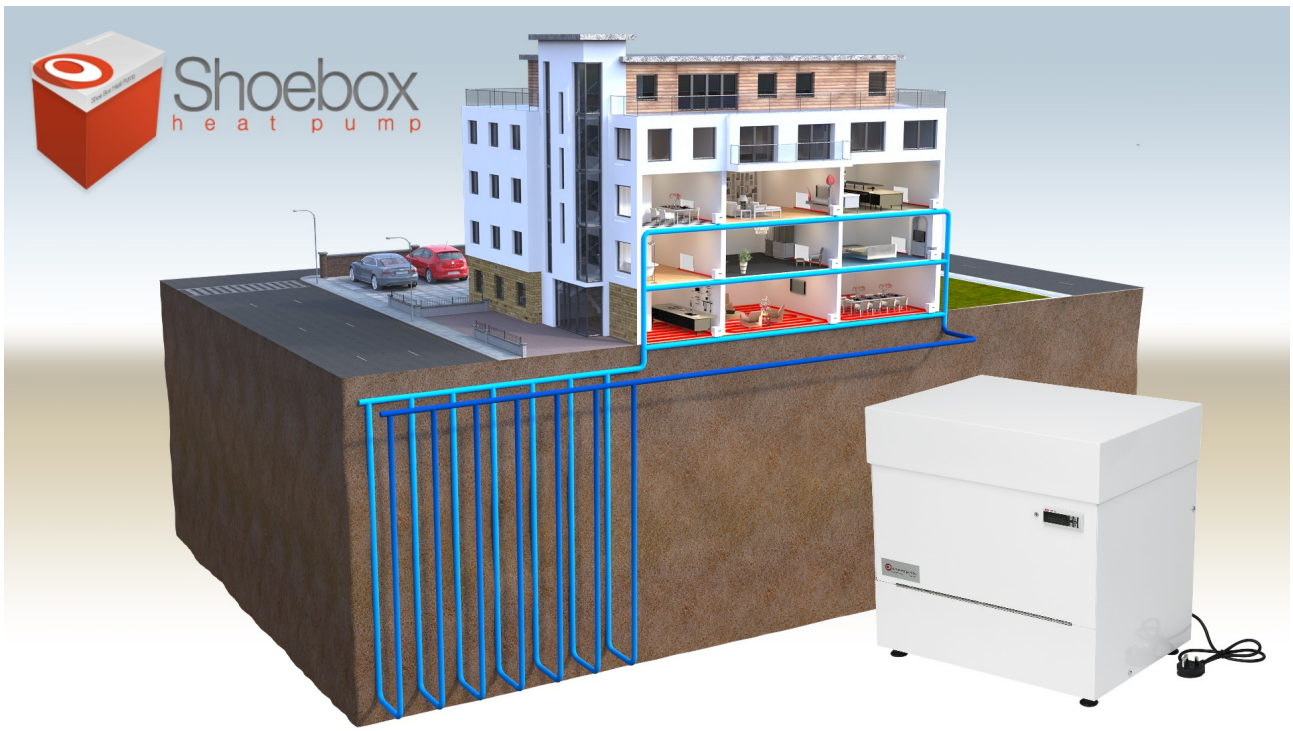

Fig 2. A shoebox heat pump

Fig 3. A shoebox single compressor heat pump

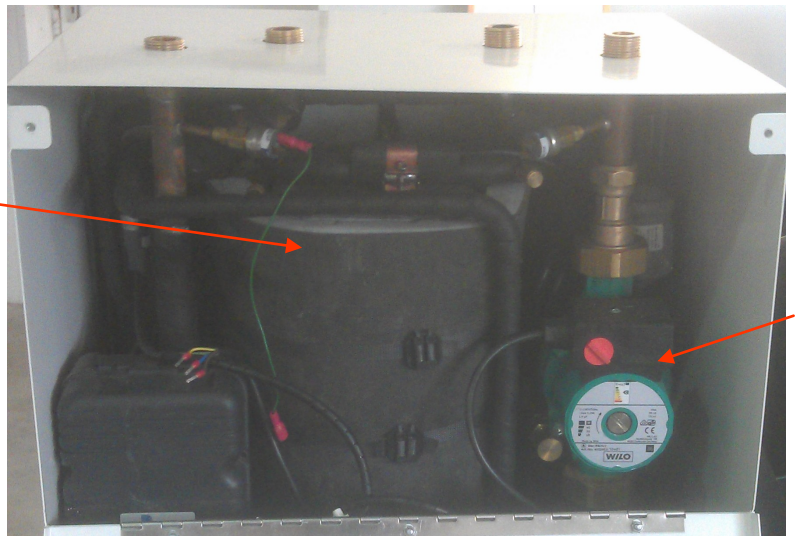

Fig 4. The internals of a single compressor shoebox heat pump

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3.3 Kensa Shoebox Technical Details—Single Compressor											
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	560x605x565		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.

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.

4.2 Display

Each heat pump has a dedicated display which can be interrogated to view various parameters, alter the heat pump outlet flow temperature and indicate faults/alarms.

n.b. the numbers above refer to the points below.

Fig 5 Heat Pump Display

The display normally reads the temperature of the water returning from the heating distribution system. The controller will turn the heat pump off once a pre-set temperature of water returning from the heating system has been achieved. This setting is normally 30°C for underfloor applications, which is a typical return temperature for an underfloor application. (In twin compressor units the left hand controller is set at 30°C the right hand at 31°C). For radiators this is generally set during commissioning at 45°C for standard units and 55°C for high temperature models.

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The Kensa Shoebox Range of heat pumps are delivered with the software pre-configured for a typical underfloor mounted in screed application.

1. The display on the controller indicates the return temperature of the underfloor circuit.
2. The left hand symbols, sun indicate heating (The shoebox is only available for heating applications.
3. A number"1" and/or "2" will appear in the top right of the controller this is to indicate the compressor number. If the number "1" and/or "2" is flashing the internal timer is activated and the compressor is waiting to run. When the compressors are running the number "1" and/or "2" and the compressor run symbol will be on.

Sun symbol—heating mode

Compressor running

A flashing error code may appear if there is a fault with the heat pump, the most common will be: -

Alarm	Description
TP	Low water pressure (ground or heating distribution)
HP	High gas pressure, caused by low or no flow on the heating distribution circuit.
LP	Low gas pressure fault (can occur temporarily on first start up). Call Kensa Technical Department.
A1	Anti freeze alarm, ground getting to cold / insufficient anti freeze/ unit not commissioned correctly / low flow around ground arrays.

(See Fault Finding Section 5 for further details)

4.2.1 To read flow temperatures and refrigerant pressures

Using the display it is possible to interrogate the heat pump to read flow temperatures and refrigerant pressures.

To read flow temperatures and refrigerant pressures: -

1 Press and hold SEL until -/- is displayed
2 Press the UP arrow until -b- is displayed
3 Press SEL and b01 is displayed
4 Press SEL
5 Temperature of water returning from the underfloor is displayed = b01
6 Press SEL
7 Press the UP arrow once until b02 is displayed
8 Press SEL
9 Temperature of water returning from ground arrays is displayed = b02
10 Press SEL
11 Press the UP arrow once until b03 is displayed
12 Press SEL
13 Temperature of water going out to the ground arrays is displayed = b03
14 Press SEL
15 Press the UP arrow once until b04 is displayed
16 Press SEL
17 Refrigerant pressure (in Bar) is displayed = b04
18 Press SEL
19 Press PRG twice until S-P is displayed
20 Press and hold PRG until the display returns to normal

4.2.2 To change the heat pump return flow temperatures.

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.

If for any reason that the heat pump return flow needs to be changed, please contact Kensa Heat Pumps's Technical Department on 01872 862140.

4.3 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.

4.3.1 DHW Operation

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 .

4.4 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 01872 862140 or send an email to technical@kensaheatpumps.com

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

5. Fault Finding

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.

Symptom	Possible Cause	Action
Blank display on software controller	No power supply	Check Fuse in plug and replace if necessary. 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
Compressor not running but display reading temperature near setpoint	Heat pump is up to temperature	No fault
Display flashes fault code tP	Low water pressure in the ground or heating system side due to pipe relaxation or other pressure loss.	The pressures should be between 1 and 2 bar. If below this, the pressure needs to be increased above 1.8 bar To increase the pressure in either circuit, the cold fill valve will need to be opened.
Display flashes fault code HP	Overheat warning. No or low flow around heating distribution circuit because of air in water pump, or stuck water pump impellor, or heating distribution system valves/ actuators closed. HP can also be temporarily displayed when the heat pump reverts from DHW to space heating mode.	Check that the water pumps are operational and spin the impellors. (See section 6.3) No action
Display flashes fault code LP	Low gas pressure in machine. Can occur simultaneously with an A1 alarm. Can occur temporarily on first start up when unit is new or after a long period out of use. Insufficient antifreeze added and heat pump frozen.	Check that the water pump is operational and spin the impellors (see section 6.3) If symptom persists outside of the two listed circumstances, contact Kensa Technical department. No action Allow heat pump to defrost and add the correct antifreeze quantity.
Display flashes fault code A1	Freeze protection system activated. Low or no water flow on the ground (cold) side of the machine. Can also occur after many months of running in very cold weather.	Check antifreeze has been added and unit commissioned correctly. Check that the water pump is operational and spin the impellors (see section 6.3) Ensure no flow restrictions and wait approximately 4 hours (with the machine turned off) for automatic reset.
Display flashes fault code E1, E2, E3 or E4	Loss of contact with probes inside heat pump. E4 could be loss of contact with weather compensation sensor	Refer to Kensa Technical department

6. 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)

7. 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 manufacturer, whichever is shorter.

7.1 Terms and Conditions.

7.1.1 Persons covered by the Warranty

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

7.1.2 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.

7.1.3 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.

7.1.4 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

7.1.5 Care of Duty

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

7.1.6 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.

7.1.7 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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