# Manual

# [Shoebox Heat Pump](#) (Slinkies)

# Installation and Commissioning Manual


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# 1. Introduction—a message from the CEO

Kensa Heat Pumps has been manufacturing ground source heat pumps since 1999. In the early days, it was difficult to find contractors willing to consider the technology. As a consequence, Kensa made considerable efforts to simplify the installation process to allow any competent plumber to perform the work. The company is now reaping its rewards as heat pumps become mainstream heating appliances.

The purpose of this manual is to guide you through the installation process. It is expected that all the required information has been provided to allow you to connect the heat pump. Critical instructions, aimed at ensuring you do not experience any difficulties, are highlighted on the 'Golden Rules' in the installation section.

Please note you will need  to speak to the Technical Support Team on 01392 367080 to receive the 'online commissioning' service, offered free-of-charge. Opening hours are 8.00am to 5.00pm .

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

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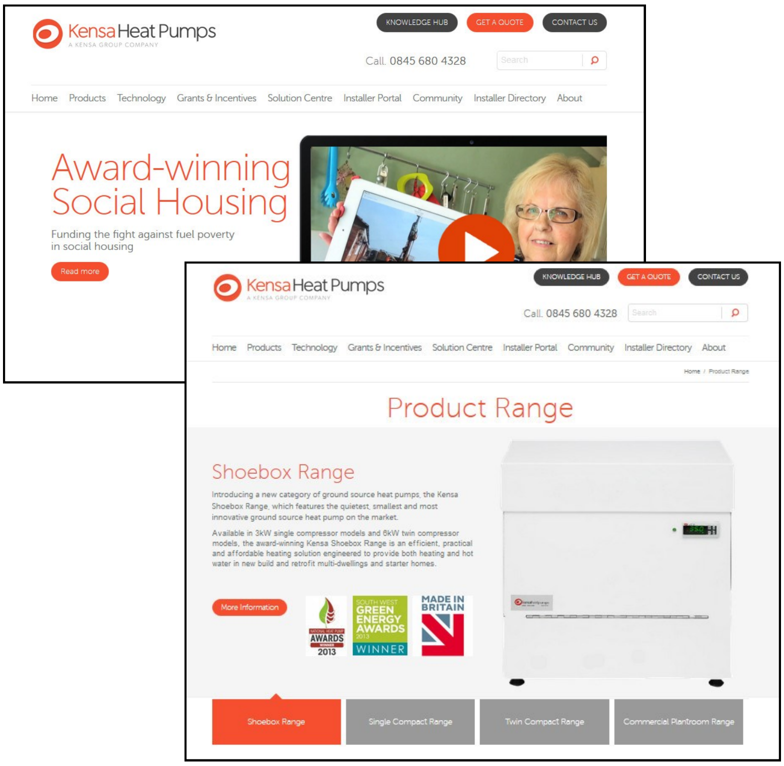


For further information on ground source heat pumps and their application, please refer to www.kensaheatpumps.com


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## 2. Safety information

Safe operation of this unit can only be guaranteed if it is properly installed and commissioned in compliance with the manufacturer's requirements. 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 Commissioning Instructions, could damage the product, will invalidate the warranty, and may cause injury or fatality to personnel.

### 2.1 Access

Ensure safe access before attempting to work on the product. Arrange suitable lifting gear if required.

### 2.2 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

### 2.3 Tools and consumables

Before starting work ensure that you have suitable tools and / or consumables available.

### 2.4 Handling

Manual handling of large and /or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

### 2.5 Residual hazards

Many products are not self-draining. Take due care when dismantling or removing the product from an installation.

### 2.6 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

### 2.7 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 available on request.

# 3. General Product Information

This manual explains how to install and commission a Kensa 'Shoebox' ground source heat pump.

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.

The Kensa 'Shoebox' Heat Pump is designed for straightforward installation and requires no specialist training to install. However the installation must conform to all relevant construction and electrical codes and comply with the requirements of the Microgeneration Certification Scheme (MCS) MIS3005 'Requirements for Contractors undertaking the Supply, Design, Installation, Set to Work Commissioning and Handover of Microgeneration Heat Pump Systems'. If linked to a communal ground array then specialist drillers/contractors should be used for the design and installation of the boreholes.

## 3.1 Equipment delivery and handling.

**Factory shipment**
Prior to shipment, the Kensa 'Shoebox' Heat Pump is tested, calibrated and inspected to ensure proper operation.

**Receipt of shipment**
Each pallet should be inspected at the time of delivery for possible external damage. Any visible damage should be recorded immediately on the carrier's copy of the delivery slip.
Each pallet should be unpacked carefully and its contents checked for damage.
If it is found that some items have been damaged or are missing, notify Kensa immediately and provide full details. In addition, damage must be reported to the carrier with a request for their on-site inspection of the damaged item and its shipping pallet.

**Storage**
If a Kensa Heat Pump is to be stored prior to installation, the environmental storage conditions should be at a temperature between 0°C and 70°C (32°F and 158°F), and between 10% and 80% relative humidity (non-condensing).

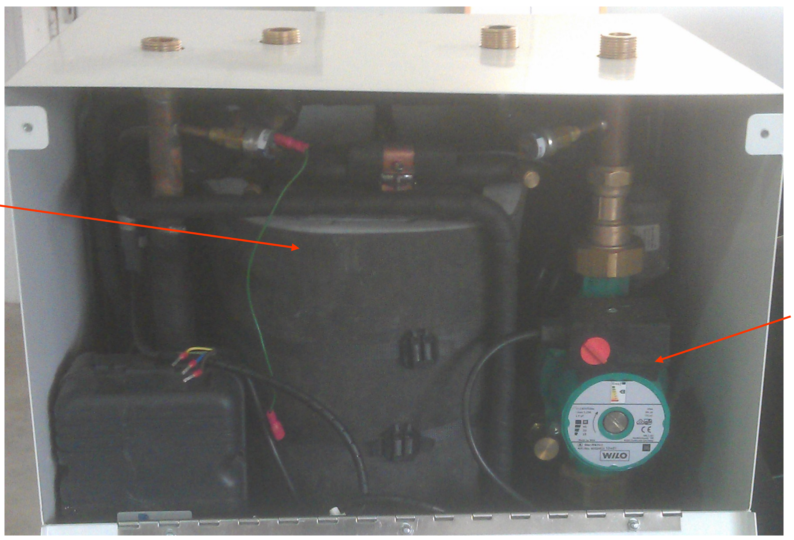


***Fig 1. The internals of a single compressor shoebox heat pump***


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## 3.2 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 | 530x475x370 | 3/4” BSP Parallel with 22mm Adaptor valves | 0.75 |
| 6.0 | 25 | 14 | 8 | 34 | 2.5 | 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 under-floor..
* 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. Installation

Note: Before actioning any installation observe the 'Safety information' in Section 1.

It is essential that the following installation guidelines are followed carefully.

The installation must conform to all relevant construction and electrical codes and comply with the requirements of the Microgeneration Certification Scheme (MCS) MIS3005 'Requirements for Contractors undertaking the Supply, Design, Installation, Set to Work Commissioning and Handover of Microgeneration Heat Pump Systems'

Any electrical work required to install or maintain this appliance should be carried out by a suitably qualified electrician in accordance with current IEE regulations.

Any plumbing work should be carried out to local water authority and WRC regulations.

## 4.1 The Golden Rules of Installing a Shoebox Heat Pump

1. Connect the heat pump using only plastic pipe or flexible piping.
2. Ensure a load side water pump is fitted externally to the heat pump and sized correctly.
3. Use the Kensa recommended purge pump for purging the ground arrays and heat pump.
4. On the under-floor heating manifold(s), remove the thermal mixing valve(s) if fitted.
5. On the under-floor heating manifold(s), don't fit electric actuators to more than 75% of the zones.
6. Remove the chrome screw on the water pump, and check that the pump is running, and moving water before turning on the compressor (See section 5.3).
7. Read this manual fully before commencing installation
8. Do not connect the heat pump to a thermal store without consulting Kensa first.
9. An electrical isolation switch should be fitted close to the heat pump.
10. Existing heating systems should be power flushed and inhibitors should be added.

## 4.2 Under-floor Heating Schematics

The following section includes typical schematics of how a heat pump can be connected. Only the load side is shown i.e. the heating distribution system. It is important to note that the schematics are only general arrangements and hence do not illustrate all required valves or fittings.

On the under-floor heating manifold(s) remove any thermal mixing valves, if fitted.

To avoid the heat pump from short cycling, it is important that a correctly sized buffer vessel is used. The buffer vessel should be sized so it is capable of accepting the minimum load from the heat pump. The use of a buffer vessel enables a fully controlled zone system to be used.

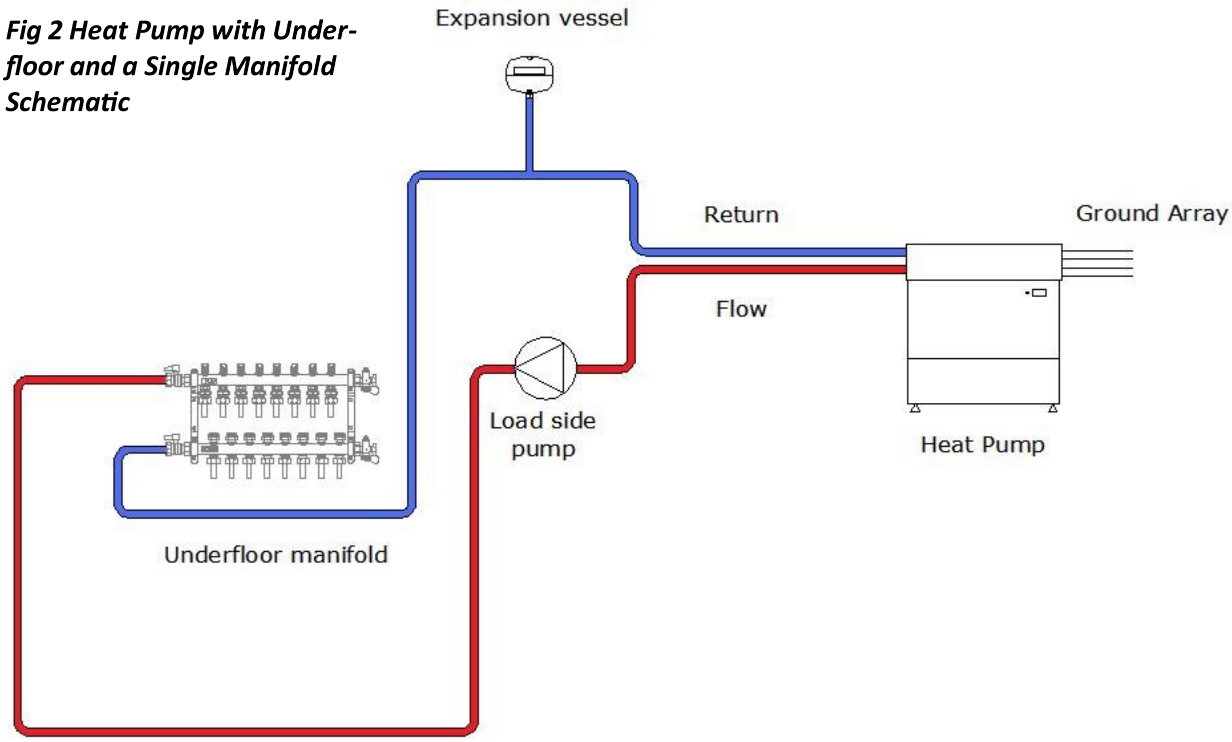
Alternatively if a fully controlled zone system is not required and the heating system is capable of absorbing the heat produced during the minimum heat pump runtime, the use of a buffer vessel is not required.

The easiest way to do this is simply to have some zones left "open" – i.e. without electric actuators. These zones will still require room thermostats so can call for heat when required. In houses, the best zones to chose are en-suite bathrooms, and hallways, neither of which are likely to be overheated.

To avoid short cycling of the heat pump the smallest actuator controlled zone (plus all the open zones on that manifold) should be capable of absorbing the minimum thermal load of the heat pump. This minimum load is approximately 25% .

### 4.2.1 Under-floor with a single manifold. Space heating only

***Fig 2 Heat Pump with Under-floor and a Single Manifold Schematic***




### 4.2.2 Under-floor with a multiple manifolds. Space heating only

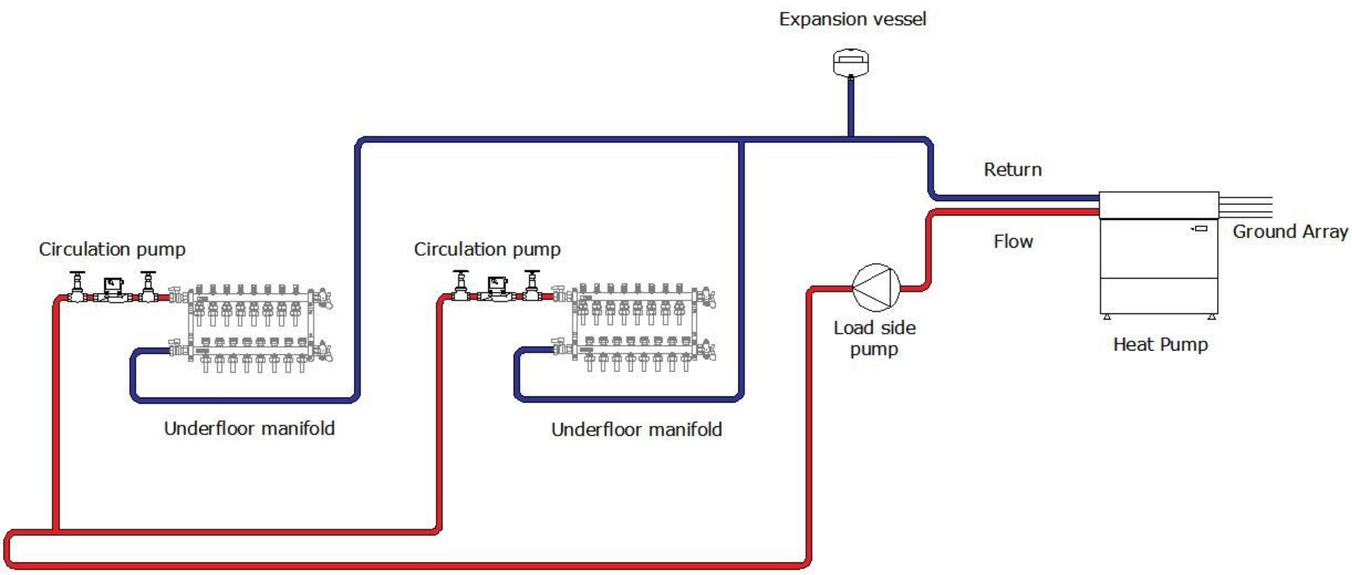



***Fig 3 Heat Pump with Under-floor and Multiple Manifolds Schematic***



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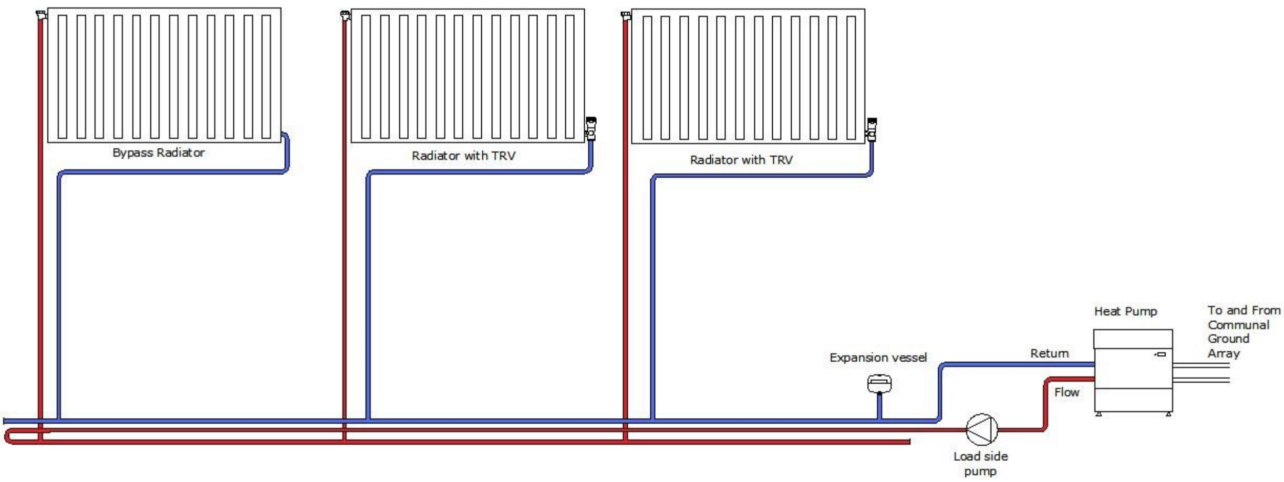
## 4.3 Radiators. Space heating only

The following section includes typical schematics of how a heat pump can be connected. Only the load side is shown i.e. the heating distribution system. It is important to note that the schematics are only general arrangements and hence do not illustrate all required valves or fittings. They are only a guide and should not be used as full installation plans.

When operated with radiators to avoid short circulating problems, one bypass radiator should be left 'open', i.e. any TRV is removed. This radiator can be positioned in areas such as halls or bathrooms.

Kensa would always recommend fitting an expansion vessel on the heating distribution circuit.

***Fig 4 Heat Pump with Radiators Schematic***




## 4.4 Domestic Hot Water (DHW) —Schematic

**The DHW option needs to be specified at time of ordering.**

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 should therefore be made to ensure the cylinder is pasteurised regularly.

Under normal conditions the heat pump will provide heat for the space heating distribution system at its design temperature (typically 35°C for under-floor and 45-50°C for radiators).

When the DHW time clock calls for production of DHW, the three-port valve diverts the flow from the heating distribution circuit into the indirect coil. The temperature of the water from the heat pump is raised to approximately 60-65°C.

When the DHW production time period ends, the three port valve switches back to the under-floor distribution and the temperature drops back to its space heating design temperature. The heat pump then reverts to space heating mode or switches off if no zones are calling for heat. The heat pump will not re-enter into DHW mode until 2 hours has passed.  Please contact Kensa if this time period needs to be adjusted .

The maximum DHW temperature that the heat pump can achieve will be approximately 60°C.

### 4.4.1 Type of DHW Tank

The larger the size of the coil within the tank, the better the heat transfer area and hence the better the DHW performance will be.(Refer to table 3.2)

### 4.4.2 DHW Tank Size

The tank will need to be carefully sized to meet the DHW demand, based on the number of occupants and should have an acceptable recovery rate. Due to the lower DHW temperature achieved by the heat pump, a tank 30% larger than normal is recommended. This is due to the higher demand on the tank, as less cold water is used at the point of use to mix the lower temperature DHW to an acceptable temperature.

### 4.4.3 Three Port Diverting Valve

If the DHW option is ordered, a 3 port diverting valve ('W' plan) is provided by Kensa and is used to divert the flow when the time clock calls for DHW production from space heating to the DHW tank. The valve's electrical connections are connected to the heat pump's internal wiring. Please note connection 'A' is DHW and 'B' is space heating. Please note the valve should be installed with the motor at any angle vertical to 30° above the horizontal plane .

### 4.4.4 Tank Thermostat

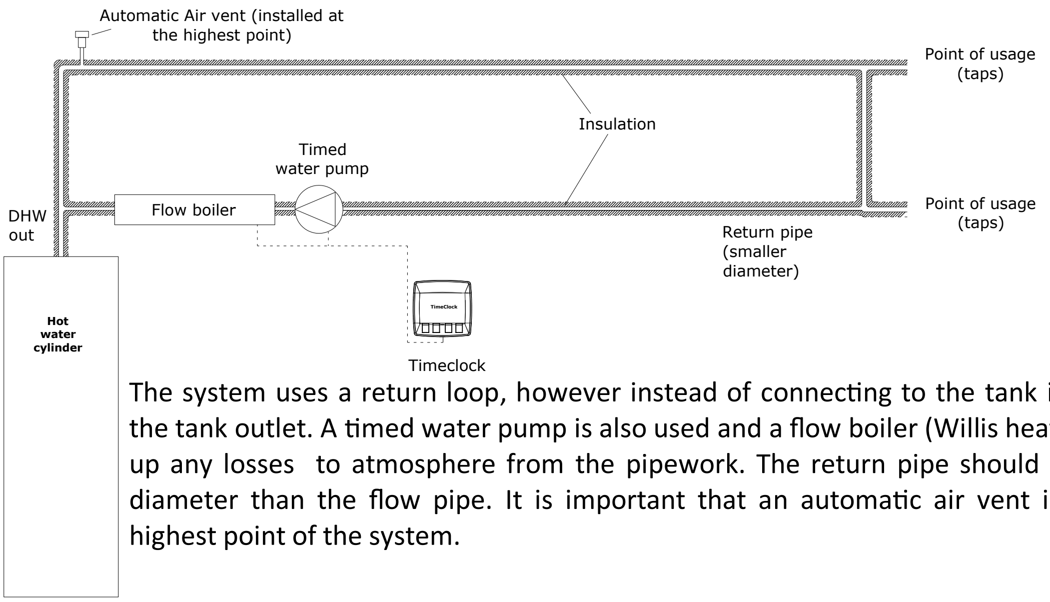
A tank thermostat is not required but maybe fitted and used as a tank safety stat if wired in series with the time clock. This should be set at not less than 65°C.

### 4.4.5 DHW time clock

A 24 hour time clock is required to control the production of DHW and is connected to the heat pump's internal wiring. (See section 4.6.4). This time clock is supplied by others.

### 4.4.6 Secondary Returns

In long DHW pipe runs, to avoid excessive water draw off before the water is up to temperature at the point of usage, it is common to install cylinders with a secondary return. This is not recommended for systems using heat pumps as it promotes mixing in the tank and a lower flow temperature off the cylinder.




For long pipe runs, to avoid excessive cold water draw offs it is recommend that a flow boiler is used and the pipe is well insulated.

The system uses a return loop, however instead of connecting to the tank it is connected to the tank outlet. A timed water pump is also used and a flow boiler (Willis heater), which makes up any losses to atmosphere from the pipework. The return pipe should also be a smaller diameter than the flow pipe. It is important that an automatic air vent is installed at the highest point of the system.

The operation of the water pump and flow boiler should be timed to a period/s around the time the most hot water is used, i.e. early morning and evening.

If the water pipe is well insulated and the system is timed, the amount of energy this system will use is minimal. It is also possible to use trace heating tape, this removes the additional cost of installation of the secondary return and water pump and the associated running costs of this equipment.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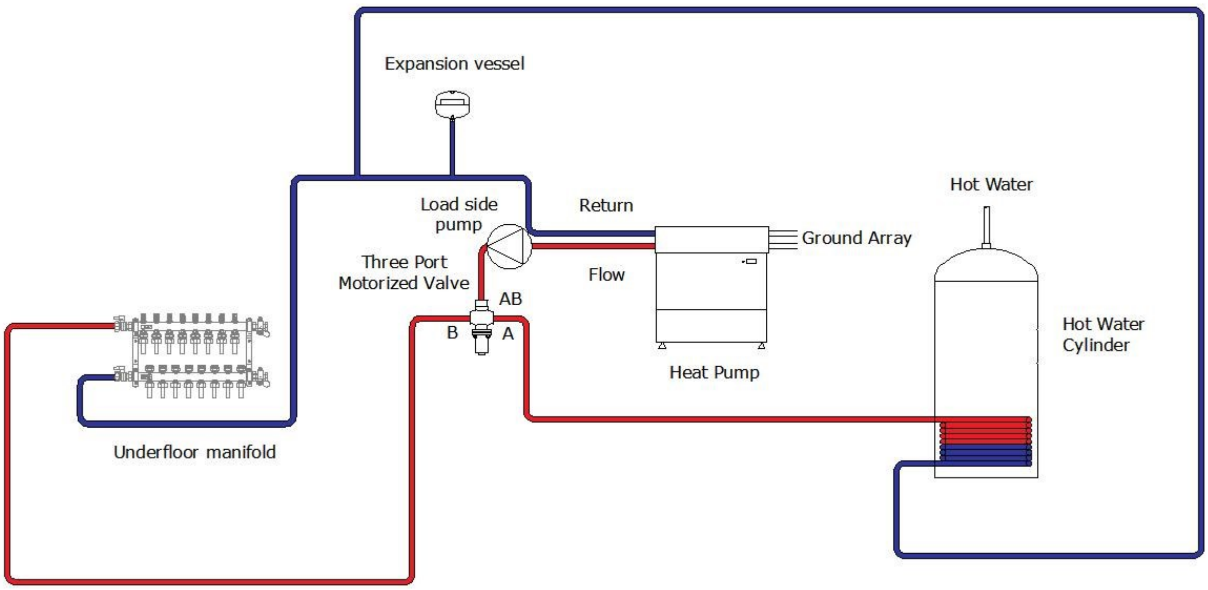


***Fig 5 Under-floor with a single manifold and DHW Schematic***

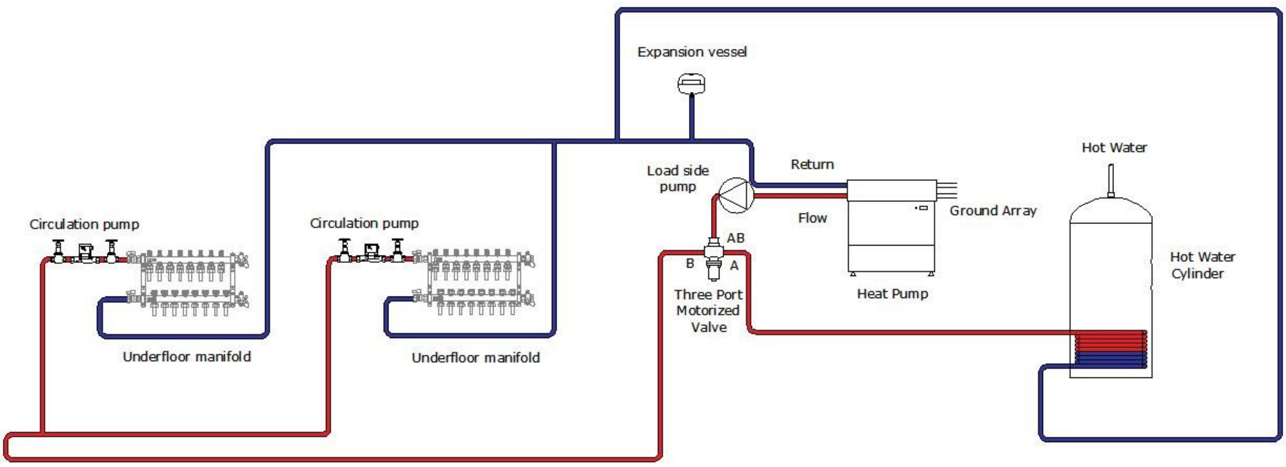


***Fig 6 Under-floor with multiple manifolds and DHW Schematic***

Note: Additional circulation pumps with multiple manifolds depends on the system design.



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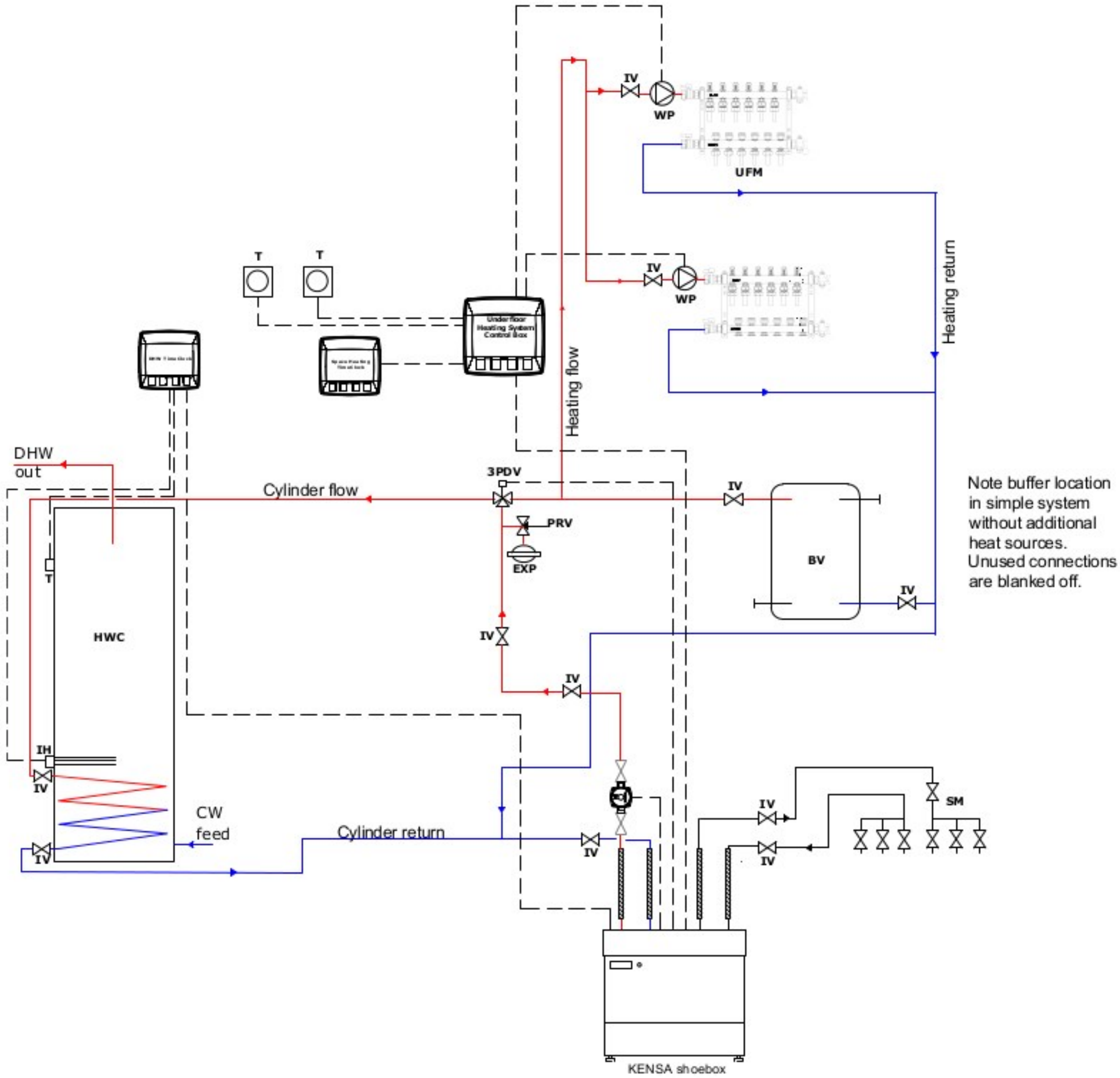



***Fig 7 DHW Schematic with Buffer vessel***

The above schematic shows how a buffer vessel can be incorporated into the shoebox installation without the need of a second water pump.

The buffer vessel allows all radiators or under-floor zones to be fully controlled and prevents the shoebox from short cycling, hence removing the need for 'open' zones.

If there are no water pumps on the underfloor manifolds to improve efficiency, the buffer vessel can be connected to a bypass valve which is set at 0.4 bar. As the heating zones throttle down due to the heating requirement being satisfied, the pressure in the heating circuit increases. Once this pressure increases above 0.4 bar, the bypass valve opens, diverting the flow through the buffer vessel maintaining a load on the heat pump and avoiding it from short cycling.

## 4.5 Mechanical Installation

### 4.5.1 Locating the Heat Pump

Decide on a suitable location for the Heat Pump. For the 3kW single compressor version this can be in a kitchen cupboard with a minimum width of 600mm. Alternatively both units can be fitted within an utility room. Take into account the "Recommended Clearances" when finalising the location. It will be necessary if installed in a kitchen cupboard that a slot is cut into the cupboard to accept the minimum dimensions of the shoebox to enable the unit to stand on the floor.

Check the appliance for transport damage. Under no circumstances should a damaged appliance be operated or installed.
Position the appliance on a firm, level and substantial concrete base that will absorb vibration well away from any occupied rooms. Ensure that the appliance does not stand on the electrical supply cable. If the supply cable is damaged, it must be replaced.

Ensure all pipes and wires are adequately supported where necessary, pipes are properly insulated and concentrations of inhibitor (where added) are correct. The appliance and any metal pipes should be properly earthed.

A water treatment device should be provided in hard water areas.
External fill loops to the ground array and heating system should be installed and ideally pressure gauges.

Do not use the appliance as a shelf.

### 4.5.2 Dimensions


**Dimensions in brackets are for the twin 6kW version.**

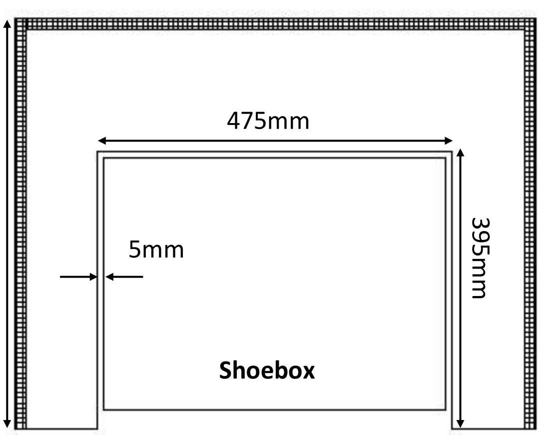


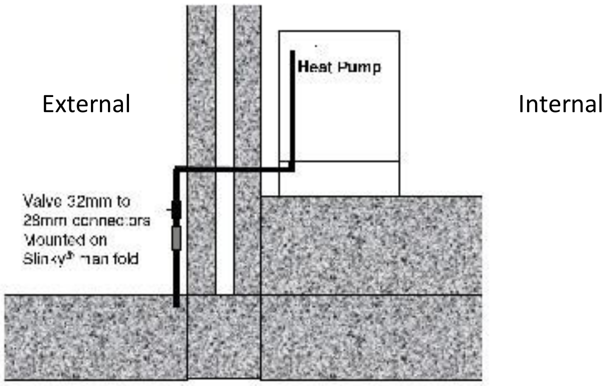

***Fig 8 Heat Pump clearances and cupboard cut out details for single compressor model.***

### 4.5.3 Installation of the heat pump

Ideally the heat pump should be placed next to an external wall allowing easy access to the externally mounted ground array manifold. Any ground pipes internal to the building must be insulated with vapour barrier insulation such as Armaflex. It is not recommended that the ground array manifold is installed within a building due to condensation and difficulty in lagging the manifold to overcome this.

It is also possible to use underground chambers and Kensa can supply suitable units if required.

***Fig 9 Positioning of Heat Pump and Manifold***



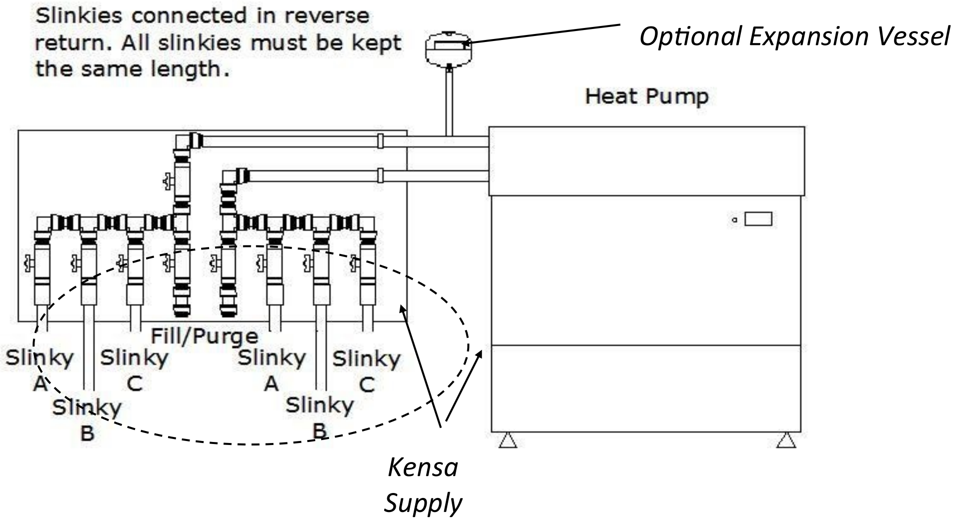




***Fig 10 Manifold Slinky connections***

i. Remove the top of the shoebox heat pump. This is connected via magnets so a short sharp pull of the top forward and up will release this.

***Fig 11 Shoebox heat pump top panel***

ii. This will now expose the pipe connections and front panel to access the shoebox electronics (See below Fig 12).

iii. Position the appliance on a firm, level and substantial concrete base that will absorb vibration .

iv. Using the adjustable feet, level the unit.

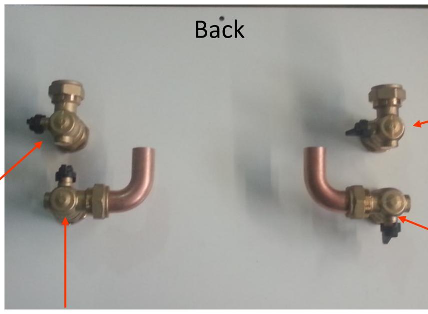
v. Ensure the heating distribution system has been thoroughly purged of any debris.

vii. Connect the ground feed & return pipes and feed & return pipes from the under-floor heating manifold ,(which must be connected the correct way round) according to the Illustration below. Flexible hoses are provided with the shoebox to aid in the installation. These hoses should not be directly connected to the connections on the heat pump but used between rigid pipe (i.e. an elbow) connected at the heat pump and the distribution systems (see Fig 13). The flexible pipes can be fitted in any orientation and work best when slightly curved. The reason for using flexible pipe is that the heat pump is suspended on anti-vibration mounts, so the connections must also be flexible. Ensure there are no kinks within the flexible pipe. Using the stickers provided ensure the flow and return connections are indicated on the manifold.

viii. Thread the time clock/room thermostat wires into the back of the 'Shoebox' and connect them to the terminals required, ( see electrical installation section ).

***Fig 12 Shoebox heat pump connections (from the front of the unit.)***

vii.




Return from ground array system to heat pump 3/4" parallel BSP thread

Flow to heating system from heat pump

Flow to ground array system 3/4" parallel BSP thread

Return from heating system to heat pump 3/4" parallel BSP thread

ix. For applications where [Domestic Hot Water]() has been specified a 3 port diverting valve ('W' plan) is provided by Kensa and when the time clock calls for DHW production is used to divert the flow from space heating to an indirect coil in the DHW tank, (See DHW schematic, Section 4.4). The diverting valve should be the first connection in the heat pumps flow line, before any under-floor heating manifolds. The valve's electrical connections are connected to the heat pump's internal wiring. (See 4.6.4)

x. Check and rectify any leaks that may be in the plumbing system.

xi. The appliance should be left for 12 hours after installation before it is turned on, to allow the refrigerant to settle. The area where the heat pump is installed must be dry and rodent free.

**Fig 13 Shoebox with flexi connections**

**Fig 14 90 degree valves shown open (handle points down)**



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### 4.5.4 Meter Installations

The government has introduced the Renewable Heat Incentive (RHI) to support renewable heat generation in the domestic sector. The scheme will offer tariff payments for supported technologies which include MCS (or equivalent)-certified solar thermal systems, ground source heat pumps, air source heat pumps and biomass boilers or stoves with back boilers for use in the domestic sector.

It is good practice that RHI installations should be made meter-ready. In addition, in some cases, applicants will require metering for payment in order for their systems to be RHI-compliant, whilst in other cases, applicants could be paid extra for monitoring of system performance.

MCS guidelines make three distinct types of meter installation

Meter-ready– It is good practice all RHI installations should be meter-ready for BEIS's own metering to be fitted to the site if selected.

Metering for payment- Where a heat pump or biomass boiler is installed alongside certain other heating systems or where the installer is advised that the property is a second home, then the renewable heating system shall be metered in order to receive payment under the RHI.

Metering and Monitoring Service Packages- A Customer may install an optional metering and monitoring service package for either a pellet biomass boiler or a heat pump for which they will receive a financial uplift. The specifications for installation of meters as part of these packages are detailed in this section along with any other requirements in order for the package to be installed in a form that is compliant with the RHI.

For information on Metering for payment and Metering and Monitoring Service Packages it is recommended that the MCS document *MCS Domestic RHI Metering Guidance V1.0* is consulted. The section below covers 'meter ready' installations only.

#### 4.5.4.1 Meter Ready Installations

Some installations incentivised through the RHI will have BEIS's own metering fitted where the metering data may then be used to allow BEIS to evaluate the effectiveness of the policy and data may be shared with MCS.

BEIS may install meters to monitor the heat output from a renewable heating system, the energy consumed by those same heat sources, and the heat output from any back-up fossil fuel systems. This could require engineers, appointed by BEIS, to install a number of heat meters, electricity meters or other energy meters, depending on the specific heating system and manner of installation. In addition, BEIS will install a number of temperature sensors to develop an understanding of the behaviour of a range of heating systems, for example temperature measurement of space heating flow and domestic hot water flow. The sensor outputs will be connected to a logger that will store all readings and regularly transmit them to a centralized secure data source.

It is good practice that all RHI-compliant renewable heating installations should be made meter-ready. MCS installers should:

1) **Leave sufficient space for appropriate meters to be fitted in defined locations; Heat pumps**
The flow meter and return temperature sensor of the heat meter(s) take up the most space and need to be situated on the return pipe-work between the circulation pump and the distribution

| Pipe Diameter (mm) | Total length of straight pipe-work required in return pipe (mm) | Total length of straight pipe-work required in the flow pipe (mm) |
|---|---|---|
| 15 | 300 | 175 |
| 22 | 440 | 175 |
| 28 | 560 | 175 |
| 35 | 700 | 175 |
| 42 | 840 | 175 |

system. The required length of straight pipe-work between isolation valves is 20 times the pipe diameter to enable BEIS's chosen metering to be installed on the return pipe-work. The table above shows the length of straight pipe required for a number of standard pipe sizes.

For each location where a heat meter is required, a section of pipe of 175 mm should be left for the heat meter temperature sensor in the flow pipe-work. This should be no more than 2 m from the flow meter.

**2. Install low pressure-drop isolation valves to avoid the need to drain systems when fitting heat meters;**

These should be installed at each point where heat metering is required. Heat metering installed between the isolation valves should be able to record the total heat output from the heating system (excluding individual room heaters and immersion heating, the latter of which will be monitored through electricity sensors). Therefore, if there are several return pipes connected to a renewable heating installation, then each one will need to be heat metered, and each one will need to be fitted with isolation valves with sufficient separation to allow heat meters to be installed.

**3. Leave sufficient pipe-work accessible, i.e. not boxed in or under floor boards, to enable meters to be fitted;**

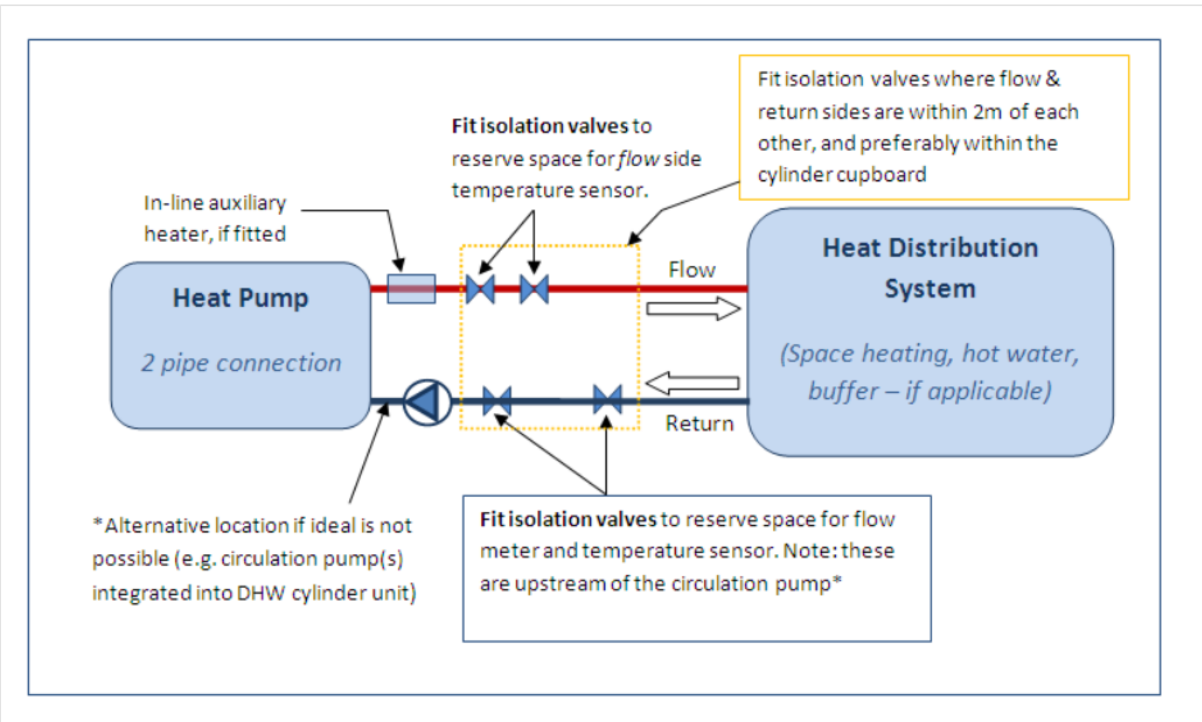


Fig 15 Typical 2 Pipe Heat Meter Installation

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Fault Finding

Warranty

Heat Pump settings sheet

**Notes on making an installation 'meter ready'**

Heat meters that have been used by BEIS in their metering programmes in the past have required a mains electricity connection.  Therefore, at the same time as installing isolation valves for the heat meters, installers should consider the placement of an easily-accessible electricity supply to power the heat meters.

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## 4.6 Electrical Installation

The Kensa 'Shoebox' heat pump range is available in single phase power supply versions and the single compressor is fitted with fly lead.

Any electrical work required to install or maintain this appliance should be carried out by a suitably qualified electrician in accordance with current IEE regulations

To access the wiring terminals :-

i. remove the top of the shoebox with a short sharp pull forwards and up.

ii. Unscrew the 2 pozi screws on either side of the front panel.

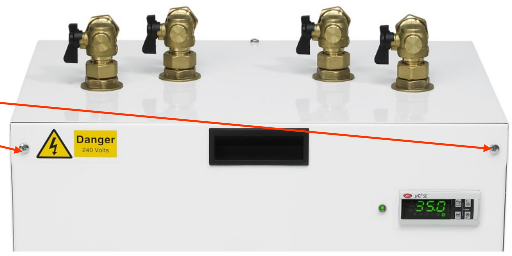


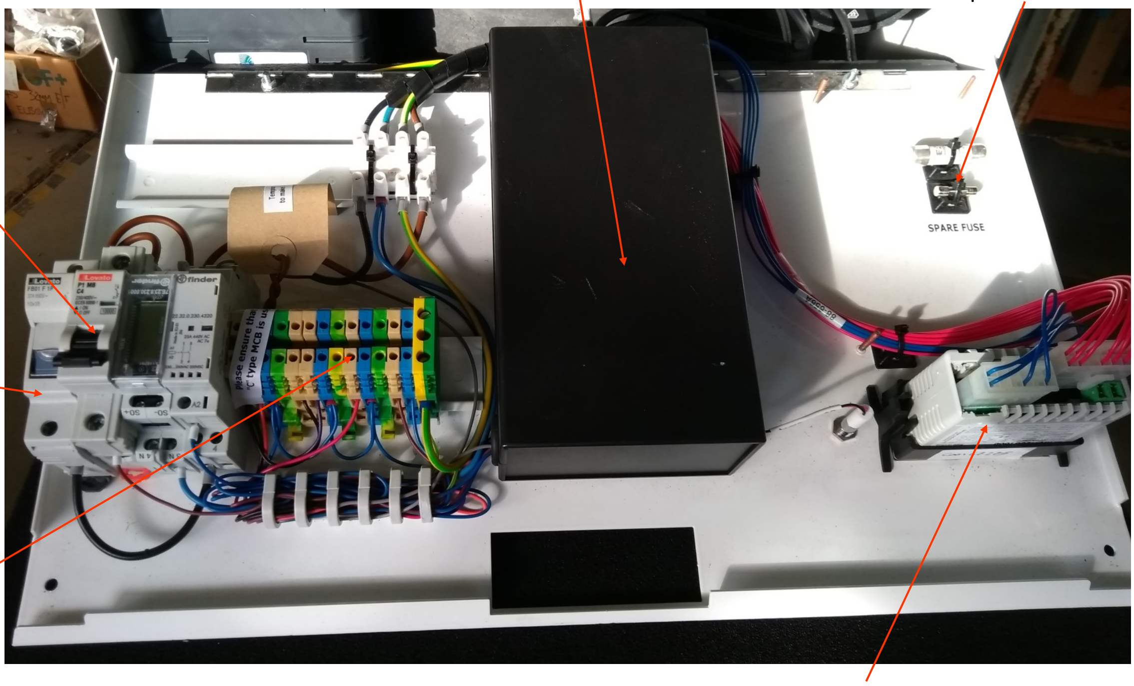

***Fig 16 Position of cross head screws on the Electronics cover Plate***

iii. Pull the front cover down using the handle.

iv. The wiring terminals will now be exposed.

Cables should enter the unit from the back using the cable entry ports provided.

***Fig 17 Electrics panel folded down***




The following sections detail the wiring connections for various applications.



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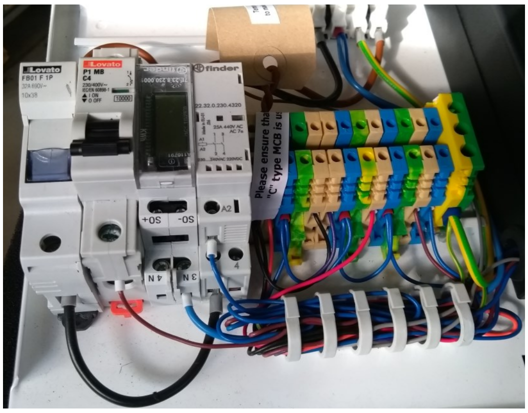
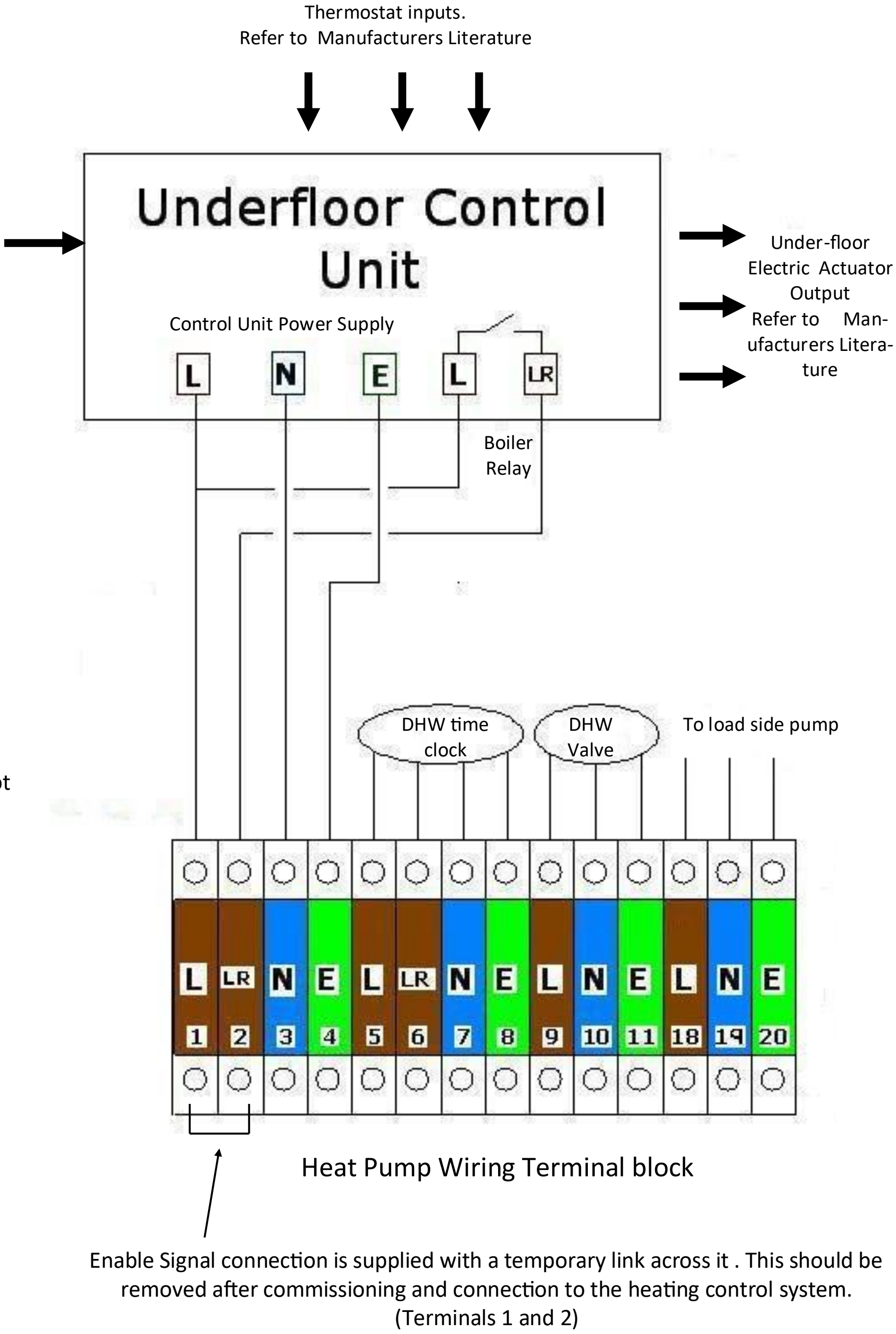
***Fig 18 Shoebox heat pump wiring loom***



### 4.6.1 Single Under-floor Control Unit




**Heat Pump Enable Signal**
No Call 0-50V
Call >120V
50V < Call voltages < 120V are not permitted

230 Vac 50Hz power supply ( a fly lead is fitted and should be connected to a suitable isolator)

***Fig 19 Shoebox wiring—Single Under-floor Manifold***

### 4.6.2 Multiple Under-floor Control Units

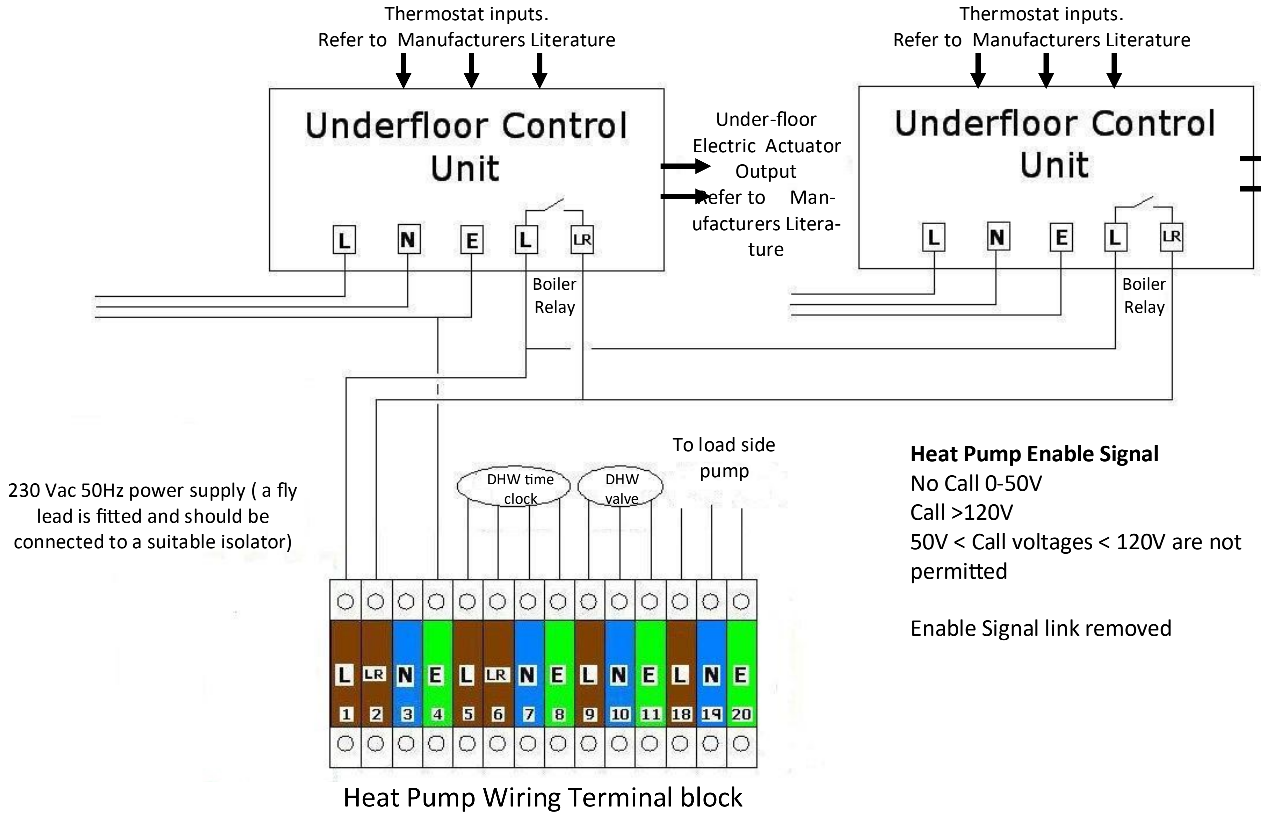
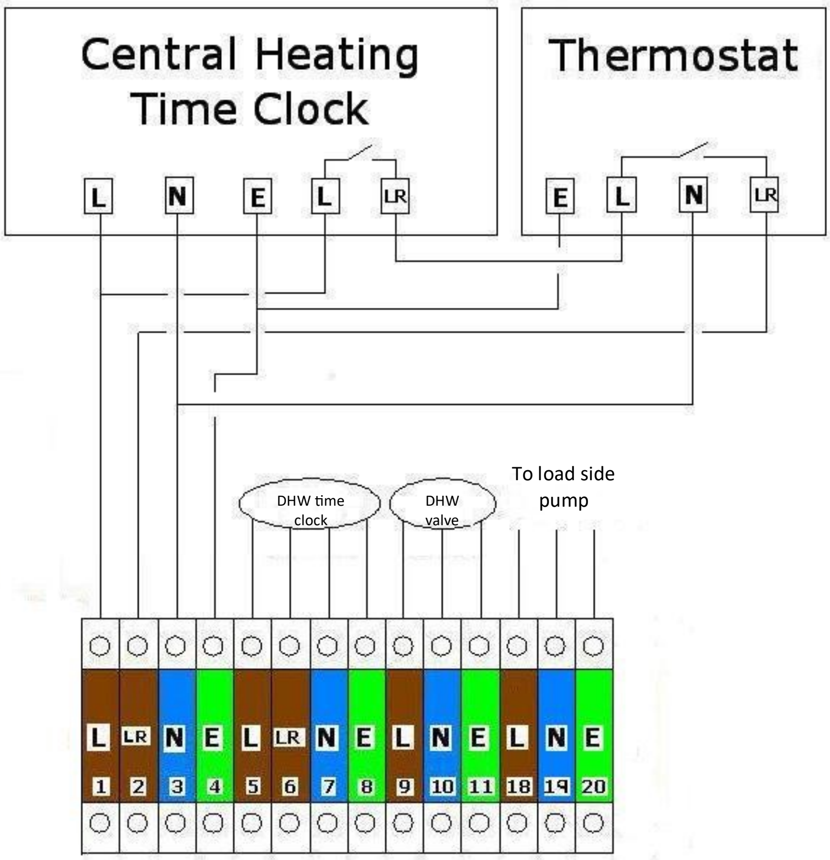



***Fig 20 Heat Pump Wiring—Multiple Under-floor Control Units***

### 4.6.3 Radiator with Thermostat

***Fig 21 Heat Pump Wiring—Radiators with Thermostat***




230 Vac 50Hz power supply ( a fly lead is fitted and should be connected to a suitable isolator)

**Heat Pump Enable Signal**
No Call 0-50V
Call >120V
50V < Call voltages < 120V are not permitted

Enable Signal link removed

Heat Pump Wiring Terminal block

### 4.6.4 DHW time clock and 3 way diverting valve wiring

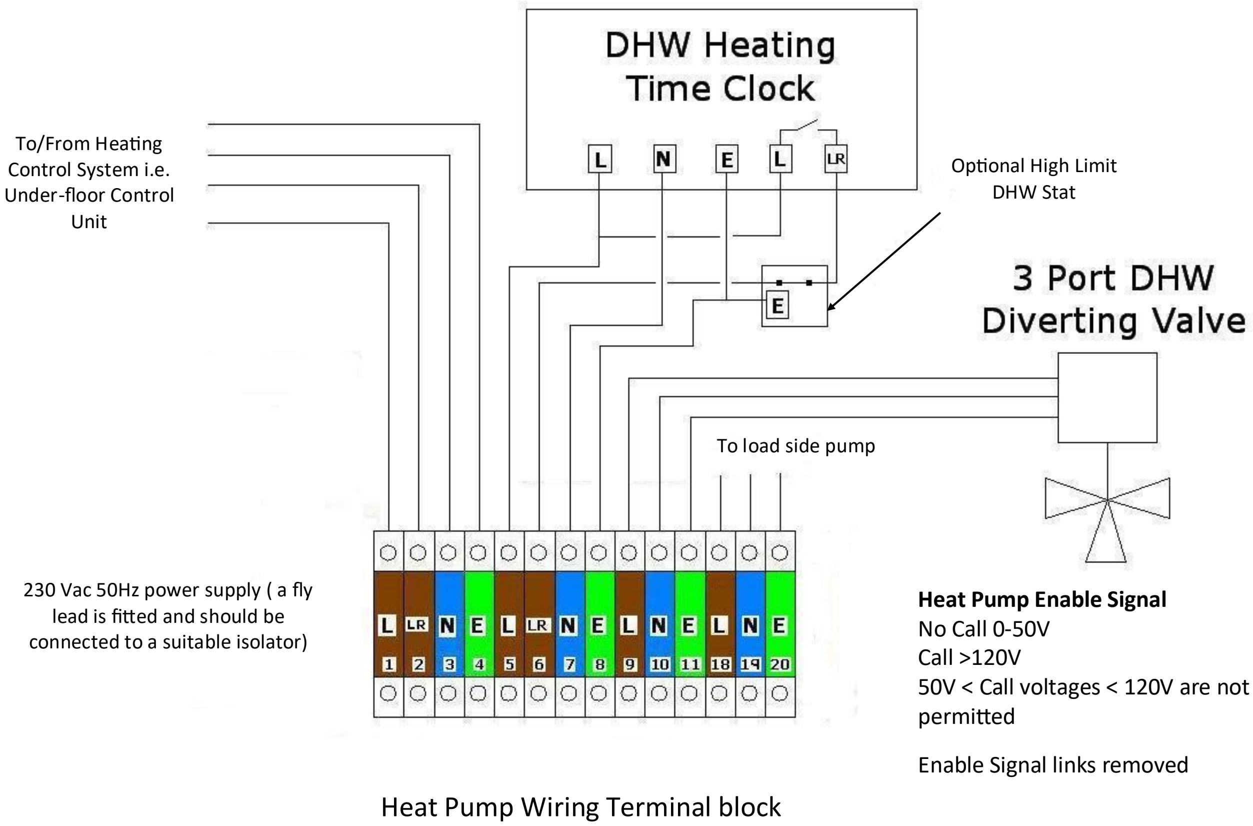



***Fig 22 Heat Pump Wiring—DHW***

Note: The hot water cylinder high limit stat maybe required to be wired into the live return from the DHW Heating Time Clock.



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# 5. Commissioning

After all mechanical and electrical work has been completed, the following commissioning instructions should be followed.

## 5.1 Purging the ground array of air.

It is important for correct operation that all the air is removed from the ground arrays. Slinkies consist of a large number of 1 metre diameter loops of 32mm OD pipe and air can collect at the top of these loops. Even vertical (i.e. drilled) arrays can have trapped air and should be purged.

To remove the air from ground arrays, a suitable pump will be required. For slinkies, the longest slinky trench is 50 metres, which will contain a total of approx. 300 metres of pipe. To achieve the minimum velocity required to remove the air, a minimum pump power in excess of 1 kW is required. In addition, the pump needs to have a flow of at least 60 litres per minute against a pressure of at least 1 bar. To achieve this, a multi-stage pump is required.

A normal rising cold water main in a building has insufficient flow to force out this air. Mains water is also "aerated", so should not be used.

The recommended purge pump is the Clarke SPE1200SS (part no. 051012200). The pump is supplied ready to take a 1" BSP fitting. Two x 1" BSP male to 28 mm compression fittings are required to enable the pump to be connected to the slinky manifold using 28 mm "Speedfit" or similar pipe and elbows. These are readily available from plumbing merchants.

*Fig 23 Clarke SPE1200SS Purge Pump*


The Clarke SPE1200SS can achieve as much as 5 bar pressure against a closed valve, so ensure the connections to the pump and manifold are robust.

### 5.1.1 Purging Procedure for Multiple slinkies (for single slinkies, see section 5.1.2)

i. Remove the plastic blanking plugs, and connect the purge pump to the fill and purge ports on the Slinky manifold, see diagram over leaf. Keep the isolating valve to the heat pump closed. The purge ports have to be connected for the correct orientation as shown in figure 12 due to internal non-return valves within the shoebox.

ii. Connect the purge pump to draw from an 80 litre dustbin half filled with clean water. This pump must be capable of circulating 60 litres per minute against a pressure of 1 bar. If the pump's electrical rating is less than 1 kW, then it is unlikely to be suitable. Kensa only recommend the use of the Clarke SPE1200SS pump as above. The water level in the dustbin will need to be topped up constantly during the following process. The pump may need priming by pouring water into its priming port until it overflows.

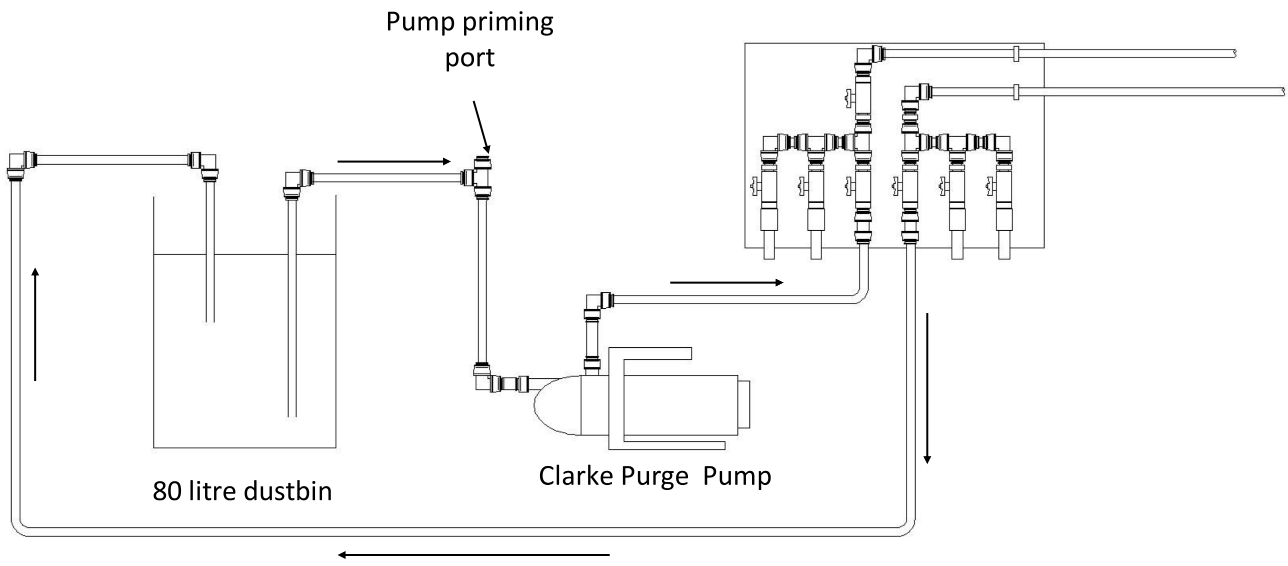


*Fig 24 Slinky purging kit connected to a manifold*

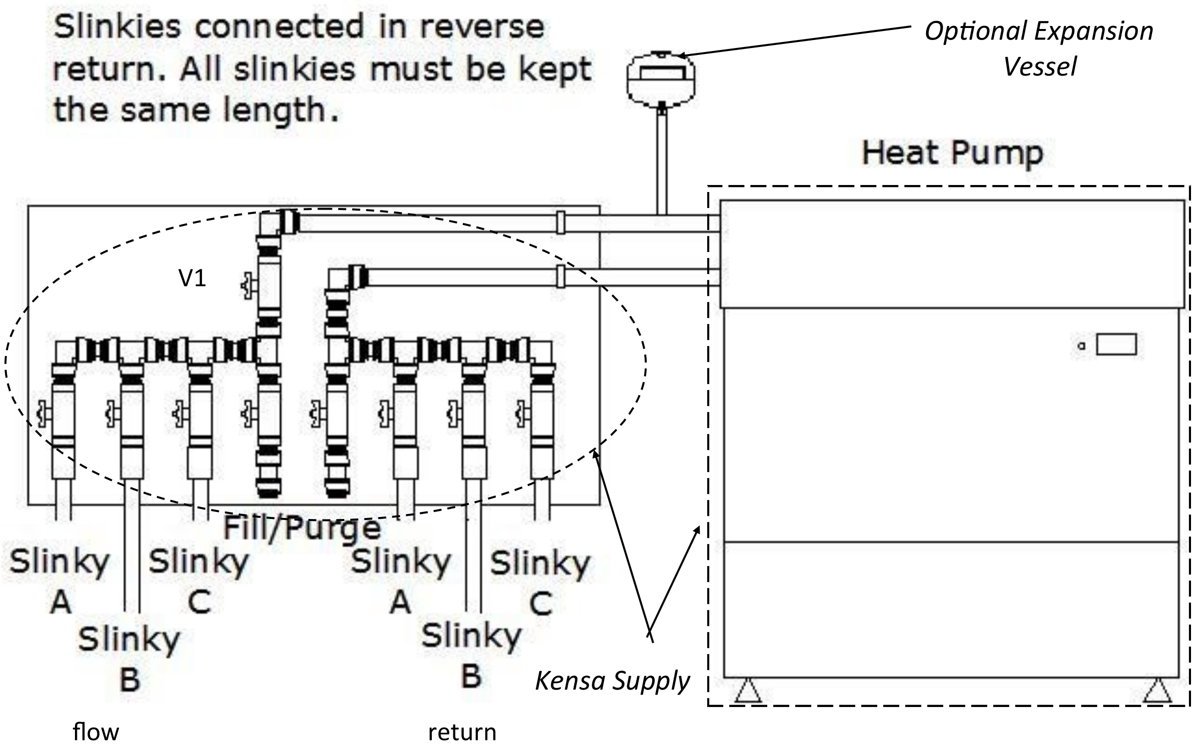


*Fig 25 Slinky manifold connections*

iii. Place a filter such as a kitchen sieve over the pipe returning water to the dustbin so any debris will be captured. Ensure all valves are closed including the heat pump valve V1. Open the valves on the manifold in the following order (refer to above diagram Fig 25) :-

a. Open $A_{return}$
b. Open $A_{flow}$
c. Open both purge valves

Start the purge pump, being careful that the water pipe returning water to the dustbin is secure.

iv. If the water level in the dustbin does not start to drop, then repeat the pump priming. No water should be flowing through the heat pump or through the other slinkies. The flow rate should be in excess of 30 litres per minute. This can be checked simply by holding a 10 litre bucket to collect water returning from the slinky, and ensuring that it fills in less than 20 seconds. If the flow is less than this, sufficient velocity is not being achieved to displace the air at the tops of the slinky coils.

***Fig 26 Purging the Slinkies of Air***

***Fig 27 Slinkies Purged of Air***

v. After water has circulated for about ten minutes, and no more debris has collected in the sieve, place the return pipe below the water level in the dustbin to ensure all the air has also been expelled (Fig 27). Stop the purge pump and then the valves on the first slinky can then be closed, again ensure that the return pipe into the dustbin is secure. At this stage, the valve to the heat pump should still be closed.
   c. Close $A_{flow}$
   d. Close $A_{return}$

Repeat the above procedure (steps iii to v) for the next slinky (i.e. slinky B on the diagram).

vi. When all the slinkies have been purged, change the connections around and re-purge in the opposite direction as per MCS guidelines.

vii. Following this, the valve to the heat pump can be opened, which will purge the heat pump of air - this is likely to be very quick, and great care should be taken that the hose discharging into the dustbin is secure, as any air in the heat pump will be rapidly expelled.
   e. Close all valves to the slinky pipes.
   f. Open V1

vii. Continue purging the heat pump until all the air has been expelled. (No more bubbles are expelled from the return pipe. Fig 27)

viii. After the air has been removed it is advisable that **before** the antifreeze is added the system is leak tested to BS805 Section 11.3.3.4. (See 5.1.2.2), if this didn't occur when the slinkies were installed.

### 5.1.2 Adding Antifreeze for Multiple Slinkies

The antifreeze provides protection to the heat pump by preventing the circulating ground fluid from freezing in the heat exchanger. If not added in sufficient quantities the heat pump can freeze and cease working. All antifreeze provided with the order should be added and it is recommended that the quantity is roughly divided between the number of slinkies. This amount of antifreeze is the minimum required for a standard system. If the heat pump and manifold are a distance apart this quantity may need to be increased. Please contact Kensa for further details.

**It is very important to purge all the air from the system before adding the antifreeze as it is very difficult to remove the air with the antifreeze in the system due to the higher viscosity of the mixture.**

Once the purging of all the air within the slinkies and heat pump has been completed the antifreeze needs to be added.

i. Open the flow and return valves to one of the slinkies and with the purge pump running, empty some of the water out of the dustbin via the return pipe to the dustbin. This is fresh water and hence can be discharged to drain. The level needs to drop to about 200 to 250mm. Take care that the suction pipe remains covered with water to stop any air being admitted into the system.



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ii. Turn the purge pump off and close both the flow and return valves on the slinky.
iii. Carefully pour a drum of antifreeze into the dustbin using appropriate handling protection as outlined in the COSH. Allow the solution to settle for a few moments to allow any trapped air to escape.
iv. Ensure the valves on the shoebox ground array connections are open. Open the valve V1 to the heat pump and start the purge pump to circulate the antifreeze around the system. Leave the pump running until antifreeze is seen returning to the dustbin. The amount of time this will take depends upon the length of the header pipe.
v. Close the valve to the heat pump and turn the purge pump off.
vi. Open the first slinky flow and return valve and with the return pipe inside of the dustbin start the purge pump. Once the return discharge runs clear, i.e. It's discharging fresh water, move the return pipe out of the dustbin and discharge this fresh water to drain until the antifreeze level within the dustbin drops to approximately 200-250mm. Take care that the suction pipe remains covered with water to stop any air being admitted into the system. (Depending on the length of header pipe additional antifreeze might be required to be added at this stage). The discharge pipe can then be placed back into the dustbin and the purge pump should be run for about 5-10mins and then turned off.
vii. Close the slinky valves; add the next quantity of antifreeze to the dustbin and repeat the above steps vi and vii for each individual slinky.

**5.1.2.1 Pressurising the system.**

i. Open all valves EXCEPT THE DISCHARGE PURGE CONNECTION. Keep a close eye on the level of water in the dustbin and start the purge pump. This should pressurise the whole system. A fitted expansion vessel can cause the level of water to significantly drop. If the level of water drops significantly and no expansion vessel has been fitted on the ground array, this indicates the system hasn't been correctly purged of air and needs to be re-purged.
ii. Close the fill purge valve on the slinky manifold with the pump running, so that the ground array is left under pressure.
iii. Most purge pumps will attain around 5 bar, and the circuit should be left at this pressure for a minimum of 15 mins, as any leaks will become immediately apparent. The pressure will slowly fall as the pipes in the ground arrays slowly expand in the coming months, and may need topping up using the cold fill system provided.
iv. Remove the purging equipment. Replace the plastic blanking plugs in the slinky manifold purge connections.

There should be approximately 200-250mm of water/antifreeze mix within the dustbin which can be poured back into an empty drum and disposed off according to the disposal instructions in section 8 or retained for topping up the system.
To mix the antifreeze around the ground arrays thoroughly, it is advised that the ground array circulation pump is turned on via the heat pump. (Note DO NOT TURN THE COMPRESSOR ON). This ground array circulation pump should be left running for two to three hours to ensure the antifreeze is mixed in all the slinkies and the heat pump. (Note: - the floor pump will also run.)

### 5.1.2.2 Pressure Testing in accordance to BS805 Section 11.3.3.4

In accordance with MCS Guidelines, leak tightness (pressure) testing has to follow the EN 805 prescriptions in section 11.3.3.4. This test should be carried out after the ground arrays have been purged but before the antifreeze is added. For polyethylene (PE) tubes, the pressure testing has to be carried out as a 'compression test'. An overpressure (inside-outside) is applied to the pipe over the whole length. This step inflates slightly the PE pipe over its whole length. Then a sudden pressure drop of around 10% of the testing pressure is applied. This pressure drop allows the pipe to compress again. If the pipe is tight, a pressure increase is measured. This test should only be carried out on the ground arrays with the heat pump isolated from the test.

To perform such a test, the following equipment is needed:

- A high-pressure pump or a manually operated pump
- 2 stop valves
- 1 manometer 0 -16 bar
- A de-aeration device (if any point of the ground array is at a high point where air can collect)

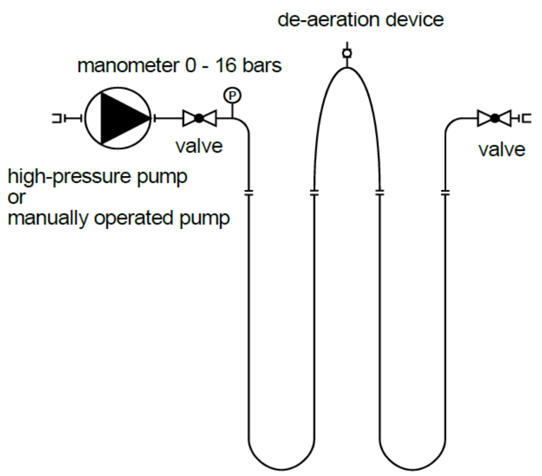


***Fig 28 Leak Tightness Configuration***

Test procedure in detail (Fig. 29):

- 1 h Idle period. No overpressure is applied to the tube . ①
- Apply the test pressure. For PE100/PN16/SDR11 ground arrays this should be > 7.5 barg. If the heat pump is within the pressure test this should be less than 8 barg. For other materials follow the manufacturer's specification ②
- 10 min Keep up pressure test ③
- 1 h Idle period. The tube is going to expand over the whole length
- Pressure measurement. The pressure drop may not exceed the manufacturer's specifications ④
- Sudden pressure drop of at least 10% of the test pressure ⑤
- 10 mins. First pressure measurement ⑥ A
- 20 mins. Second pressure measurement ⑥ B
- 30 mins. Third and final pressure measurement ⑥C


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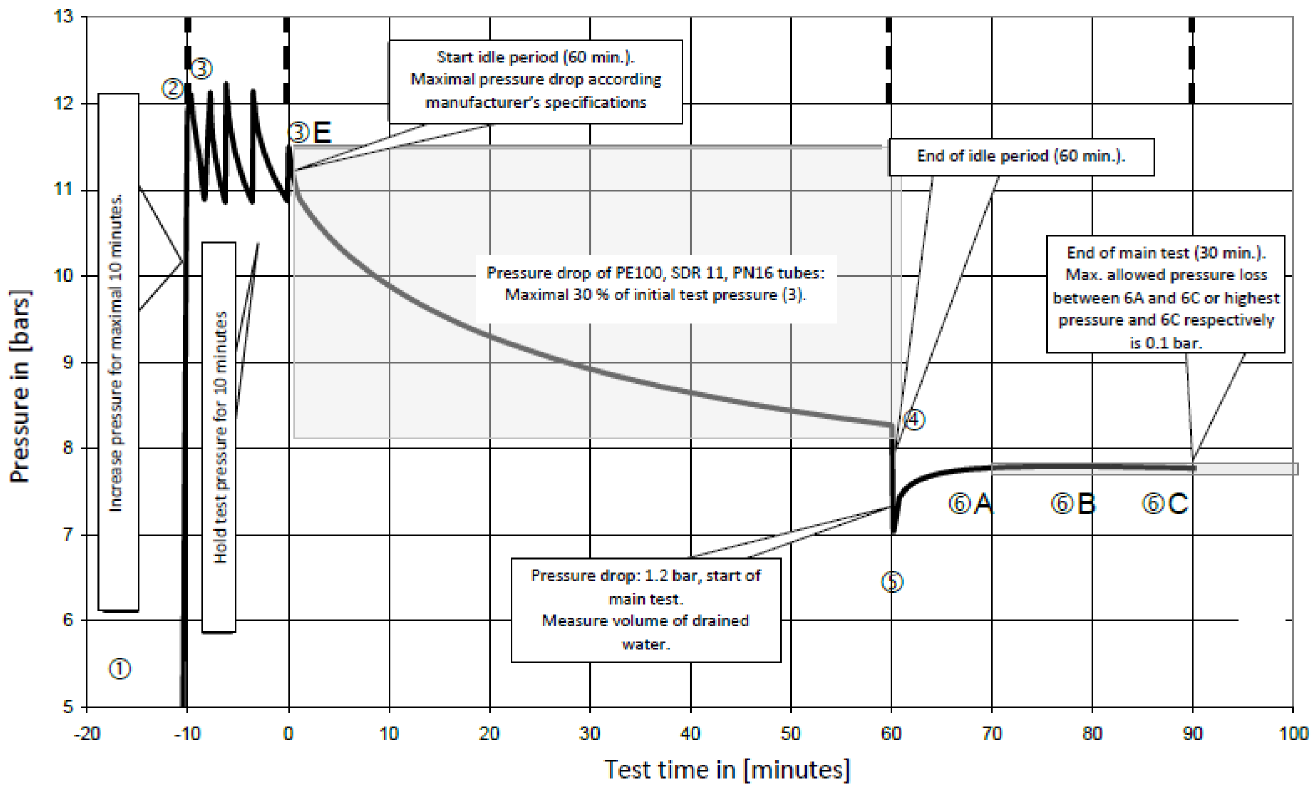



*Fig 29 Graphical Test Procedure*

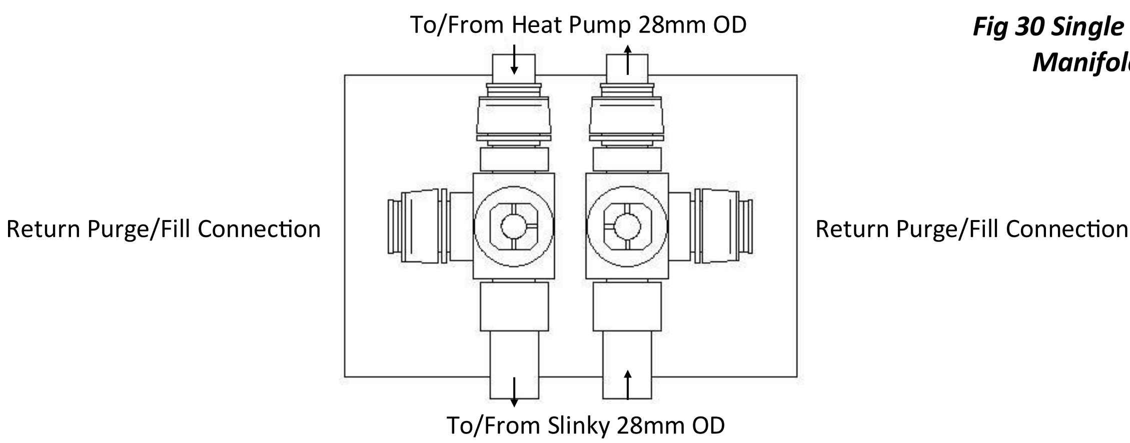
The ground array has passed the test if the pressure difference (pressure drop) between (6)C and (6)A does not exceed 0.1 bar.

The test should not be conducted in cold weather, when there is a risk of freezing.

### 5.1.3 Purging Procedure and adding antifreeze for single slinkies

The single slinky manifold consists of two three port diverting valves, one for flow and one for the return. The manifold allows the slinky to be filled and purged.

*Fig 30 Single Slinky Manifold*

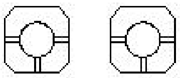


The sequence of valve operation for a single manifold is slightly different from larger manifolds. Each slinky is connected to a three port diverting valve as above. The slots machined on the front of each valve indicate which connection is open. The previous drawing (Fig 28) is set for normal operation, i.e. both purge connections are closed and the flow and return from the slinky to the heat pump are open.

i. Remove the plastic blanking plugs, and connect the purge pump to the fill and purge ports on the Slinky manifold, see Fig 28. The purge ports need to be connected in the correct flow orientation as shown in Fig 12.

ii. Connect the purge pump to draw from an 80 litre dustbin half filled with clean water. This pump must be capable of circulating 60 litres per minute against a pressure of 1 bar. If the pump's electrical rating is less than 1 kW, then it is unlikely to be suitable. Kensa only recommend the use of the Clarke SPE1200SS pump for this. The water level in the dustbin will need to be topped up constantly during the following process. The pump may need priming by pouring water into its priming port until it overflows.

iii. Place a filter such as a kitchen sieve over the pipe returning water to the dustbin so any debris will be captured. To move the position of the valve an adjustable spanner can be used. Open the valves on the manifold to the following position:-



*Both purge connections are now open to ground array*

Start the purge pump, being careful that the return pipe to the dustbin is secure.

iv. If the water level in the dustbin does not start to drop, then you need to repeat the pump priming. The flow rate should be in excess of 30 litres per minute. This can be checked simply by holding a 10 litre bucket to collect water returning from the slinky, and ensuring that it fills in less than 20 seconds. If the flow is less than this, sufficient velocity is not being achieved to displace the air at the tops of the slinky coils.

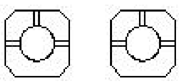
***Fig 31 Purging the Slinky of Air***

v. After water has circulated for about ten minutes, and no more debris has collected in the sieve, place the return pipe below the water level in the dustbin to ensure all the air has also been expelled.

***Fig 32 Slinky Purged of Air***

vi. When the slinky has been purged, change the connections around and re-purge in the opposite direction as per MCS guidelines.

vii. Turn the pump off and move the valves on the manifold to the positions below, again ensure that the return pipe into the dustbin is secure.



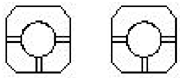
*Both slinky connections are now closed. Purge ports open to heat pumps.*

Start the pump and purge the heat pump of air.

vii. After the air has been removed it is advisable that **before** the antifreeze is added the system is leak tested to BS EN805.(See 5.1.2.2), if this didn't occur when the slinkies were installed.

vi. When all the air has been removed reduce the level of water in the bin to 200-250mm by removing fresh water from the system (via the pump discharge pipe). Do not uncover the suction pipe. Add 1 drum of antifreeze to dustbin and using pump circulate around heat pump.

vii. Move the valves to the position below



*Both purge connections are now open to slinky.*

viii Add 1 drum of antifreeze to the dustbin

ix. Start purge pump

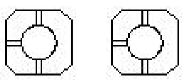
x. When the return pipe to the dustbin runs with clean water (after a few seconds) discharge this water to waste until the level in the dustbin is approx 200-250mm. **Do not uncover the suction pipe.**

xi. Place the return pipe back into the bin.

xii. Purge for 5 to 10 mins to ensure that the antifreeze is mixed.

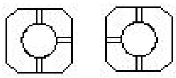
viii. With the purge pump running move the return valve to the position below to close off the return purge connection and pressurize the heat pump using the purge pump.

*Flow* *Return*



*One purge connection is closed the other open.*

ix. With the purge pump still running move the flow valve back to the normal run position.



*Both purge connections are now closed.*

There should be approximately 200-250mm of water/antifreeze mix within the dustbin which can be poured back into an empty drum and disposed off according to the disposal instructions in section 8 or retained for topping up the system.

To mix the antifreeze around the ground arrays thoroughly, it is advised that the ground array circulation pump is turned on via the 4 amp MCB on the heat pump. (Note DO NOT TURN THE COMPRESSOR MCB ON). This ground array circulation pump should be left running for two to three hours to ensure the antifreeze is mixed in all the slinkies and the heat pump. (Note: - the floor pump will also run)

### 5.1 .4 Testing of Antifreeze Concentration

It is important that the concentration of the antifreeze within the ground arrays should be a minimum of a protection level of $-10^{o}$C (minimum 22% by volume, Refractive Index 1.356). Concentrations below this could cause an A1 alarm and the heat pump to cease operation during severe prolonged cold weather.

The antifreeze concentration should be tested with a refractometer .

The concentration of antifreeze is required for the commissioning certificate and it is advised that this figure is noted in the settings table. To comply with MCS guidelines two random samples of anti-freeze concentration should be taken when the unit is commissioned.

### 5.1 .5 Heating distribution and load side purging

i. Find the cold fill for the heating system and open the valve on the heating system to allow water into the heating system and the Shoebox.
ii. Ensure a load side water pump is fitted and operational.
iii. Follow the manufacturer's procedures for purging the heating system.

We recommend a central heating inhibitor is added to the heating water in the heating distribution circuit.

### 5.1.6 Reassembling the Heat Pump

i. Ensure all tools and materials are removed from the inside of the unit.
ii. Reposition the front panel
iii. Using the 2 x 5mm cross headed screws secure the front cover in place.
iv. Replace the top of the unit.

### 5.2 Heat Pump  Operation

Prior to use: -

i. Turn off the power supply at the local isolator
ii. Unscrew the 2 pozi screws on either side of the front panel. Lower the front panel.
iii. Check that the ground pressure is at least 0.6 bar. If the pressure is lower than this, find the ground array cold water supply valve (fitted by others, outside the case) and pressurise the system fully until the pressure is at least 1.8 bar, at which point a “click” will be heard. Close the mains cold water supply valve fully.
iv. Check that the heating distribution system pressure is at least 0.6 bar. If the pressure is lower than this, find the mains cold water supply valve and pressurize the system until the pressure is at least 1.8 bar, at which point a “click” will be heard. Close the mains cold water supply valve fully. Reassemble the front panel taking care to ensure that the 2 x cross head screws are located correctly. A purge pump can achieve pressures of 5 bar and it is acceptable that the ground arrays are left at this pressure.
v. Turn on the power supply at the local isolator and program the external time clock / thermostat.

### 5.3 Turning the Heat Pump on for the first time.

i. Make sure the impellor in the ground water pump is free to turn by removing the stainless steel screw in the centre of each water pump and inserting a flat-bladed screwdriver to spin the impellor. Do not try to spin the impellor with the power on.

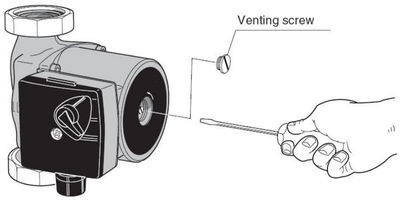



***Fig 33 Spinning the pump***

ii. Disconnect the fuse to the compressor (as shown on Fig 14) Turn the Shoebox on to enable the controls and water pumps to operate. **DO NOT operate the compressor fuse until Kensa Heat Pumps has been contacted and flow has been confirmed around the system.** Failure to do this could cause the unit to freeze and may invalidate the warranty. Once flow has been confirmed, turn the power off and replace the compressor fuse. Turn the power back on.
iii. The controller display will read the temperature of the water returning from the heating system. If the error Tp is displayed, then the heat pump will not run until both heating distribution and ground circuits are above 1.8 bar pressure.
iv. The commissioning of the heat pump will be carried out remotely (via phone) by a Kensa commissioning engineer and a heat pump commissioning certificate and checklist issued on completion. Please contact Kensa Heat Pumps to book a commissioning call.
v. After commissioning and connection to the heating control system (with the power isolated) remove the enable link between terminals 1 and 2 and replace with building control system.

## 5.4 Altering the flow temperature from the heat pump

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.

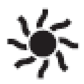

n.b. the numbers above refer to the points below.

***Fig 34 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 Deg C , which is a typical return temperature for an under-floor application.

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

1. The display on the controller indicates the return temperature of the under-floor circuit.
2. The left hand symbols, sun indicate heating (The shoebox is only available for heating applications.)



Sun symbol—heating mode

Compressor running

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.

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

(See Fault Finding Section 6 for further details)

| 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 too cold / insufficient anti freeze/ unit not commissioned correctly/ low flow around ground array |

**5.4.1 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 under-floor 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 PRG twice until S-P is displayed
16 Press and hold PRG until the display returns to normal

**5.4.2 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 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.

For under-floor systems mounted in screed a flow temperature of 35°C is generally suitable, therefore the return temperature should be set at 30°C. However for joisted systems or systems with insulative floor coverings then a higher flow temperature may be required and hence the return flow temperature set point may need to be increased.

For radiator systems a flow temperature of 50°C is generally required. This means the return flow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temperature set point should be set to approximately 45°C

**Warning :- Increasing the outlet flow temperature of the heat pump will result in the unit operating at a lower efficiency with higher fuel bills.**

**Warning :- for under-floor systems do not increase the outlet flow temperature until the screed that the under-floor is mounted in is fully dry.**

**Programming can be carried out on the controller**

Changing the flow temperatures is protected by a passcode to prevent unauthorised changes. This passcode is 11 and not changeable.

1 Press and hold PRG and SEL until 00 is displayed.
2 Using the UP arrow increase the displayed number to 11
3 Press SEL (S-P is displayed)
4 Press SEL and -/- is displayed
5 Press the UP arrow until -r- is displayed
6 Press SEL and r01 is displayed
7 Press the UP arrow until r03 is displayed
8 Press SEL
9 The return water temperature set point is displayed
10 Press the UP or DOWN arrows to change the set point
11 Press SEL
12 Press PRG twice until S-P is displayed
13 Press and hold PRG until the display returns to normal

It is advised that any settings that are changed are noted within Section 9 'Heat Pump Settings Sheet' page 40.

# 6. 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 wall mounted electrical isolator switch or call electrician<br>Check the fuse in the plug and replace if necessary |
| | 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 set point | 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<br>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.<br><br>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 5.3 )<br><br>No action |
| Display flashes fault code LP | Low gas pressure in machine. Can occur simultaneously with an A1 alarm.<br><br>Can occur temporarily on first start up when unit is new or after a long period out of use.<br><br>Insufficient antifreeze added and heat pump frozen. | Check that the water pump is operational and spin the impellors (see section 5.3)<br>If symptom persists outside of the two listed circumstances, contact Kensa Technical department.<br><br>No action<br><br>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.<br>Check that the water pump is operational and spin the impellors (see section 5.3)<br><br>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 |

# 7. Warranty

The Kensa Compact 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 or subsequent owner of the item (“Buyer”) that all parts (“Parts”) of the Kensa Compact 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 Compact 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 flow rates 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.

## 8. Heat Pump Settings Sheet

| | | |
|---|---|---|
| Type of ground arrays | | |
| Ground Arrays purged | | |
| Ground arrays leak tested according to BS805 Section 11.3.3.4 | Yes / No | |
| Antifreeze quantity | | |
| Antifreeze concentration | Sample 1 | Sample 2 |
| Serial Number | | |
| Visual Inspection | | |
| Feet level on floor | | |
| Visual check of site wiring | | |
| Software operating | | |
| Software errors | | |
| Heating Status | | |
| Ground water pressure | | |
| Under-floor water pressure | | |
| Make of under-floor heating | | |
| Manifolds | | |
| Any UFH water pumps | | |
| Control philosophy | | |
| B01 under-floor return temperature | | |
| B02 ground return temperature | | |
| B03 ground feed temperature | | |

Comments:

Installed by:-

Date:-

Tel:-



Kensa Heat Pumps
A KENSA GROUP COMPANY