Manual

Kensa Heat Pumps
A KENSA GROUP COMPANY

Evo Heat Pump

Installation and Commissioning Manual

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1. Introduction—a message from the Chief Executive Officer

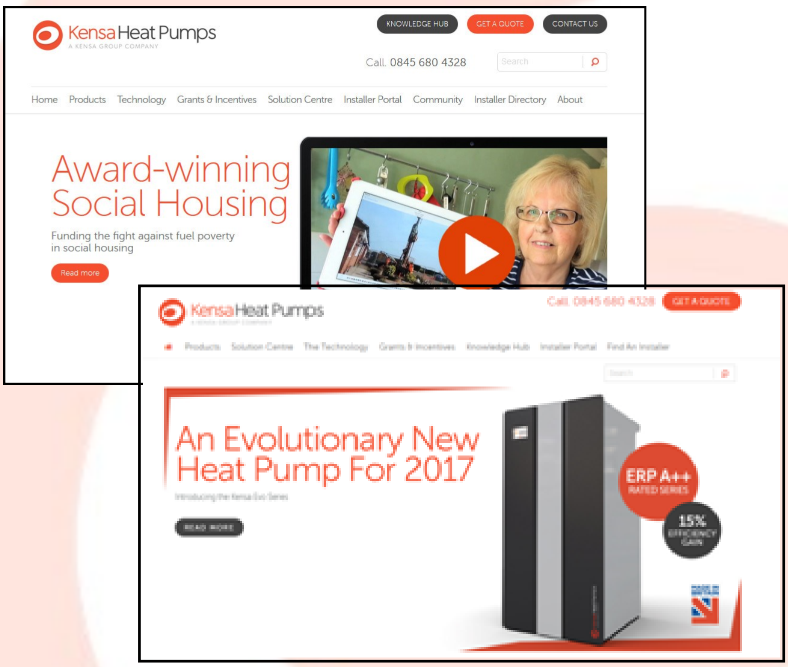
Kensa Heat Pumps has been manufacturing ground source heat pumps since 1999. In the early days, it was difficult to find contractors willing to consider the technology. As a consequence, Kensa made considerable efforts to simplify the installation process to allow any competent plumber to perform the 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.

Matt Trewhella
CEO
Kensa Heat Pumps Ltd



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

2. Safety information

Safe operation of this unit can only be guaranteed if it is properly installed and commissioned in compliance with the 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 and Egress

Ensure safe access and egress 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

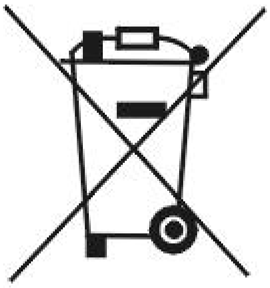
Many products are not self-draining. Take due care when dismantling or removing the product from an installation. Ensure product is fully electrically isolated before commencing any work on the product.

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.



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

3. General Product Information

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

The Evo Single Compressor Heat Pump is designed to provide a low cost renewable heat source for a buildings heating system. In addition, and if required, the Kensa Evo 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 Evo Single Compressor 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'

3.1 Equipment delivery and handling.

Factory shipment
Prior to shipment, the Kensa Evo Single Compressor 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. Evo heat pump

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3.2 Kensa Evo Technical Details—Single Compressor										
Nominal Thermal Output	Power supply rating	Max running Current	Typical running current	Typical starting current	Power input*	Nominal dry weight (Approx)	Compressors	Nominal Dimensions	Connection size	Recommended heat transfer area in DHW tank
kW	Amps	Amps	Amps	Amps	kW	Kg	Number	HxWxD	mm OD	m^2
Single Phase—230 Volts AC 50 Hz										
7	25	18.5	8.4	18.2	1.8	139	Single	1145x580x570	28	1.75
9	25	20.6	11.4	28.7	2.3	140	Single	1145x580x570	28	2.25
13	40	31.1	16	41.3	3.4	153	Single	1145x580x570	28	3.25
17	50	35	23	45	4.6	154	Single	1145x580x570	28	N/A
380-420V 50Hz										
15	16	11.8	7.3	44	3.8	153	Single	1145x580x570	28	3.75

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 pumps

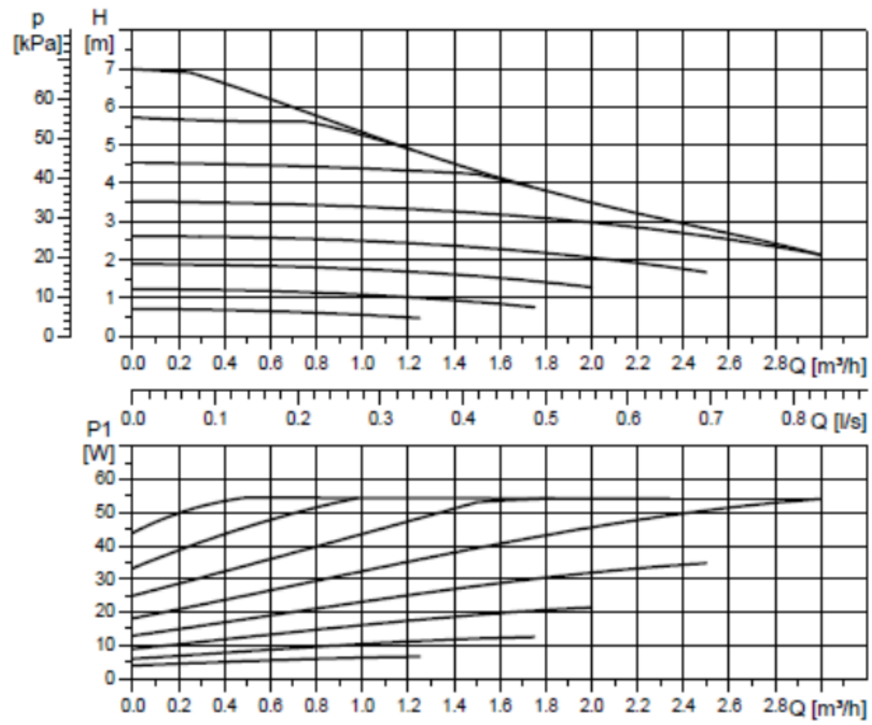
For clarification of starting currents and details on how these figures are calculated please contact Kensa.

3.3 Water pump curves

The following pump curves are for the water pumps fitted within the Evo range of Kensa Heat Pumps.

Heat Pump	Duty	Design Flowrate kg/min	Pressure drop kPa across heat pump @ design flowrate	Water pump Part Number
7kW Evo	Load based on 30 to 35C	22.4	3.98	30-001C
	Ground based on 0 to –4C	29.1	11.7	30-002C
9kW Evo	Load based on 30 to 35C	28.5	5.7	30-001C
	Ground based on 0 to –4C	28.4	11	30-002C
13kW Evo	Load based on 30 to 35C	37.9	10.1	30-002C
	Ground based on 0 to –4C	39.2	17.1	30-003D
17kW Evo	Load based on 30 to 35C	56.4	34	30-003D
	Ground based on 0 to –4C	52.3	29.3	30-003D
15kW Evo 3 Phase	Load based on 30 to 35C	45.9	13.6	30-002C
	Ground based on 0 to –4C	42.8	20.6	30-003D

Fig 2 30-001C Pump Curve

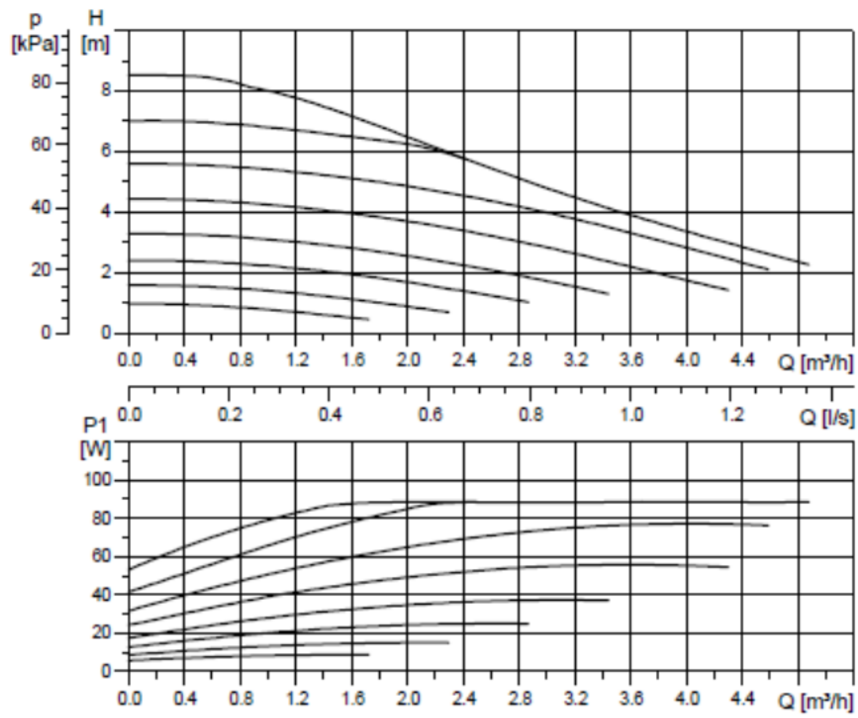


EEI ≤0.23

Electrical data, 1 x 230 V, 50 Hz

Speed	P1 [W]	$I_{1/1}$ [A]
Min.	3.9	0.05
Max.	54.5	0.46

Fig 3 30-002C Pump Curve

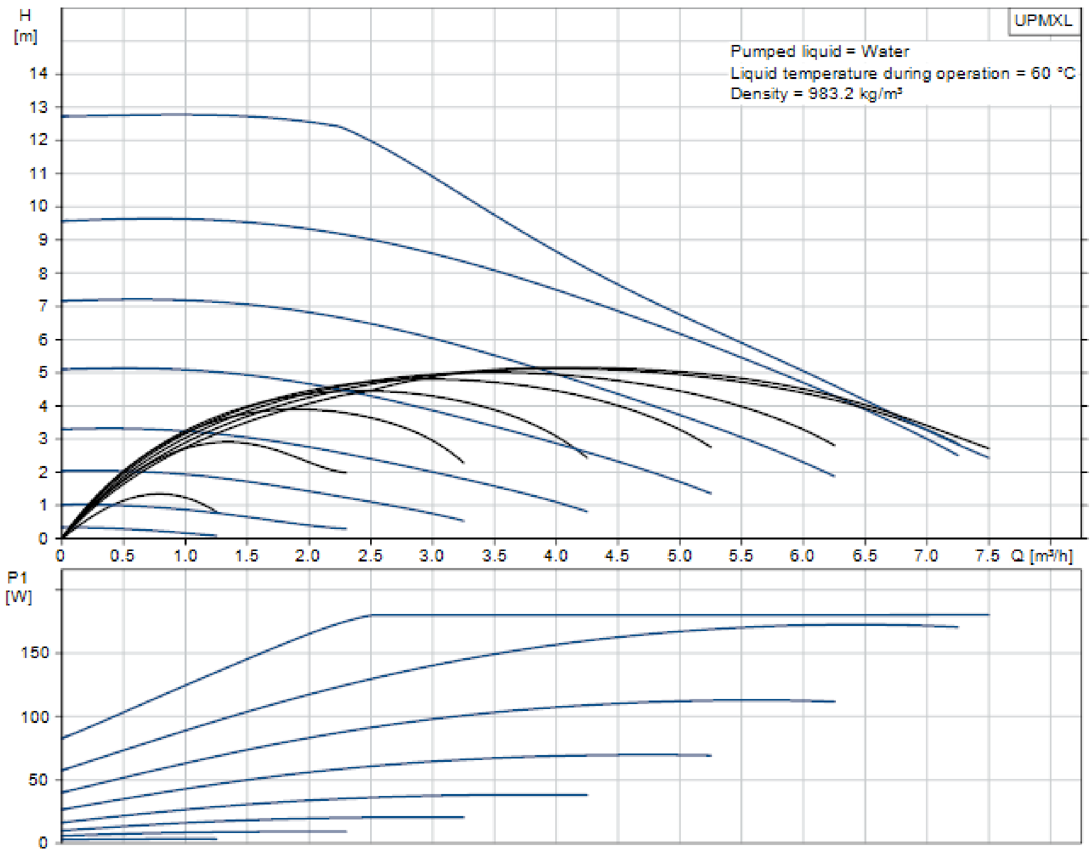


EEI ≤ 0.23

Electrical data, 1 x 230 V, 50 Hz

Speed	P1 [W]	$I_{1/1}$ [A]
Min.	5.7	0.06
Max.	87	0.71

Fig 3a 30-003D Pump Curve



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. All pole disconnection should be a minimum of 3mm.

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

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved. Children shall not play with the appliance. Cleaning and user maintenance shall not be made by children without supervision.

4.1 The Golden Rules of Installing a Heat Pump

1. A 'C' Type MCB should be used for the heat pumps power supply.
2. Remove the 4 transit bolts.
3. Use the Kensa recommended purge pump for purging the ground arrays and heat pump.
4. On the underfloor heating manifold(s), remove the thermal mixing valve(s) if fitted. (Unless a second space heating set point architecture is being used).
5. Ensure that there is enough volume in the distribution system to avoid short cycling of the heat pump. This can be achieved via an adequately sized buffer vessel or by leaving at least 25% of the heating zones 'open' i.e. without electric actuators on the manifolds.
7. Do not install the heat pump adjacent to or beneath bedrooms or noise sensitive areas.
8. Read this manual fully before commencing installation
9. Do not connect the heat pump to a thermal store without consulting Kensa first.
10. An electrical isolation switch should be fitted close to the heat pump.
11. Existing heating systems should be power flushed and inhibitors should be added.

4.2 Underfloor 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.

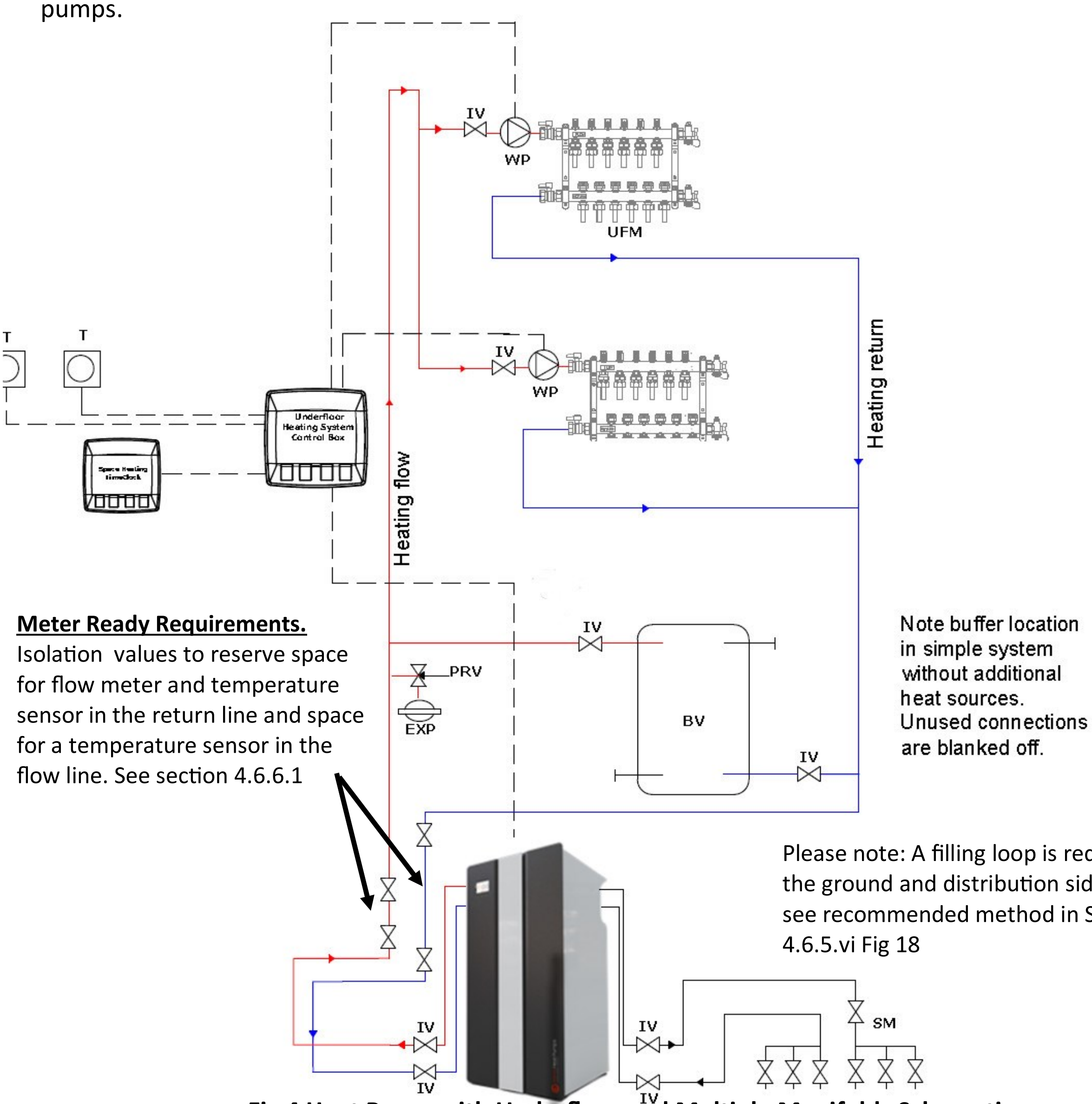
On the underfloor heating manifold(s) remove any thermal mixing valves, if fitted, unless a 2nd set point architecture is used.

To avoid the heat pump from short cycling, it is important that a buffer vessel is fitted or the underfloor is capable of accepting the minimum load from the heat pump.
The easiest way to do this is to install an appropriately sized buffer vessel (ideally a two connection buffer

vessel). This will mean full control of all heating zones. If there are no water pumps fitted on the underfloor manifolds, to improve efficiency, the buffer vessel can be connected to a bypass valve (ABV) 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. It is also possible to use a ABV if the DC05a relay is used within the Evo to stop the individual water pumps on the underfloor manifolds when the Evo goes into hot water mode.

As an alternative to a buffer vessel it is possible to have some zones left “open” – i.e. without electric actuators. These zones will still require thermostats so can call for heat when required. In houses, the best zones to chose are ensuite bathrooms, and hallways, neither of which are likely to be overheated.

If the “open” zone method is chosen, 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% for single compressor heat pumps.



Meter Ready Requirements.
Isolation values to reserve space for flow meter and temperature sensor in the return line and space for a temperature sensor in the flow line. See section 4.6.6.1

Please note: A filling loop is required on the ground and distribution side. Please see recommended method in Section 4.6.5.vi Fig 18

Fig 4 Heat Pump with Underfloor and Multiple Manifolds Schematic

Please Note : The above drawing is a schematic only and additional valves and fittings maybe required.

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4.3 Radiators—Schematic. Space heating only

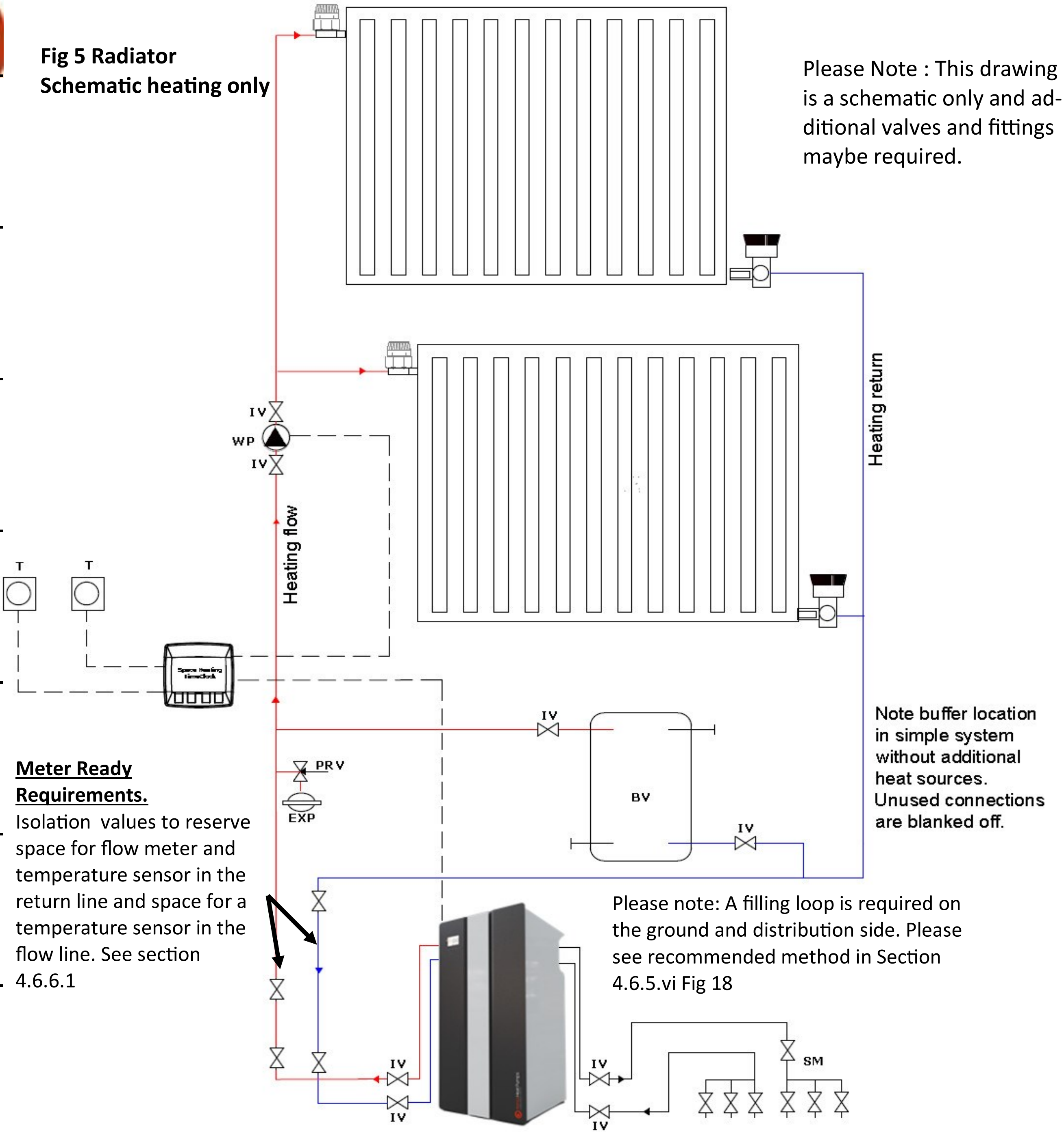
The following section includes typical schematics of how a heat pump can be connected. Only the load side is shown i.e. the heating distribution system. It is important to note that the schematics are only general arrangements and hence do not illustrate all required valves or fittings. They are only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

When operated with radiators to avoid short circulating problems, either a buffer vessel needs to be fitted or 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 5 Radiator Schematic heating only

Please Note : This drawing is a schematic only and additional valves and fittings maybe required.



Meter Ready Requirements.
Isolation values to reserve space for flow meter and temperature sensor in the return line and space for a temperature sensor in the flow line. See section 4.6.6.1

Please note: A filling loop is required on the ground and distribution side. Please see recommended method in Section 4.6.5.vi Fig 18

4.4 2nd Set point Architecture

Fig 5 shows a schematic of a system architecture that can utilise the second set point function in the Evo. See section 6.5.2.1. The system uses two different emitters which generally require two different temperatures, both systems use a different timeclock, however the higher temperature set point is given priority within the Evo. Please note to provide simultaneous heating thermostatic mixing values are required on the underfloor manifold(s).

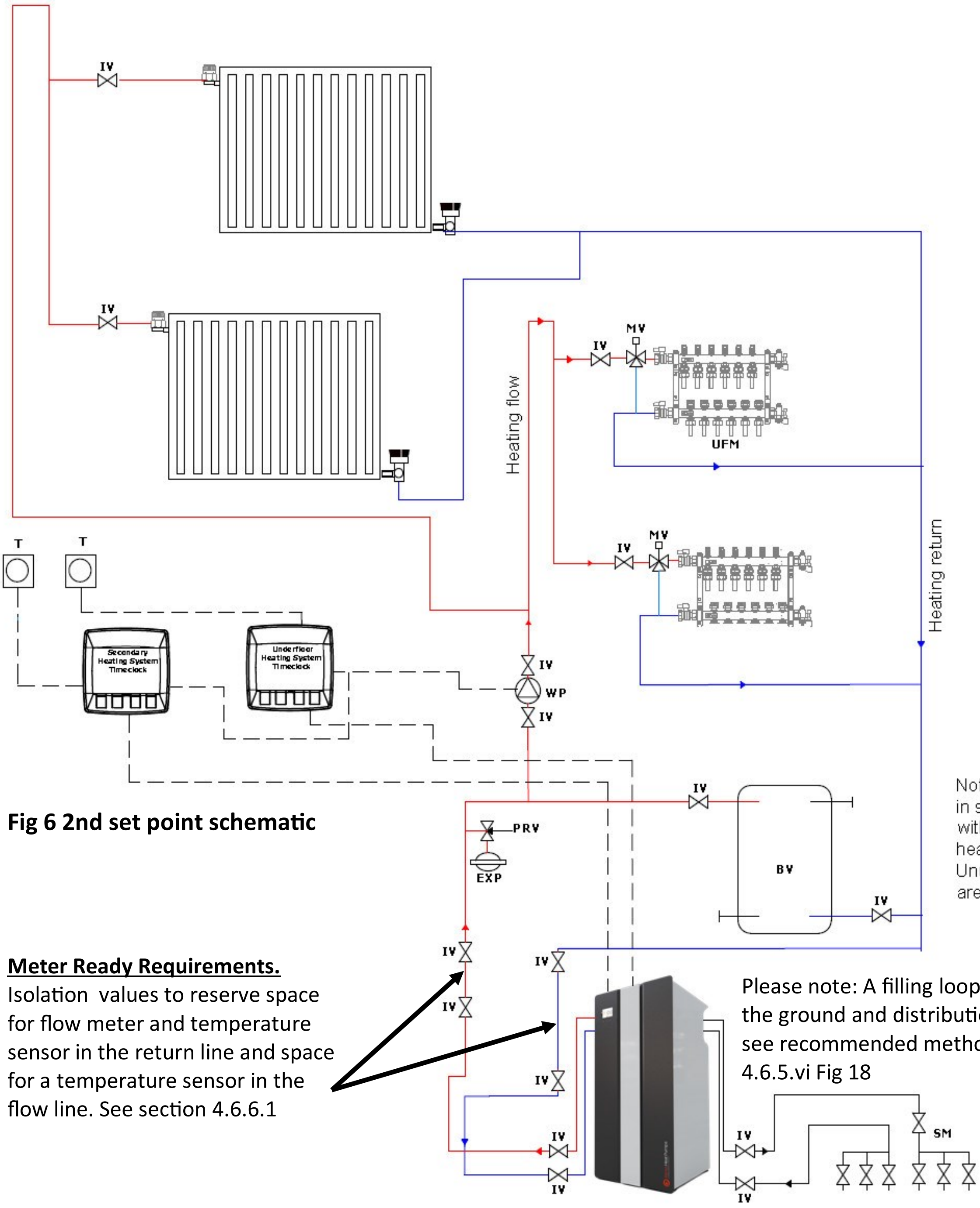


Fig 6 2nd set point schematic

Note buffer location in simple system without additional heat sources. Unused connections are blanked off.

<u>Meter Ready Requirements.</u>
Isolation values to reserve space for flow meter and temperature sensor in the return line and space for a temperature sensor in the flow line. See section 4.6.6.1

Please note: A filling loop is required on the ground and distribution side. Please see recommended method in Section 4.6.5.vi Fig 18

Please Note : The above drawing is a schematic only and additional valves and fittings maybe required.

4.5 Domestic Hot Water (DHW) —Schematic

The DHW option needs to be specified at time of ordering. The 17kW Evo is designed for Space Heating only and not DHW unless specified and agreed.

Under normal conditions the heat pump will provide heat for the space heating distribution system at its design temperature (typically 35°C for underfloor 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 63°C. The controller indicates when DHW production is operational.

When the DHW production time period ends, the three port valve switches back to the underfloor 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. This time period can be adjusted via the controller if required.

The maximum DHW temperature that the heat pump can achieve at the cylinder will be approximately 60°C. (Excluding the 17kW which is designed for space heating only). If 65°C is required all year round, it is recommended that an immersion heater is linked to Evo and the Evo is programmed to operate the immersion heater for a period immediately following the DHW production. This means that the majority of the heating load for the DHW is produced at a lower cost using the heat pump, as opposed to using only the direct immersion heater.

The EVO can be programmed to raise the temperature to 65°C once a week to provide pasteurisation.
Warning - when a heat pump solely is used for heating domestic hot water, it may not get the water hot enough to kill the dangerous Legionella that can breed in hot water cylinders. Alternative arrangements may therefore be required to ensure the cylinder is pasteurised regularly. The installer/end user should check if this pasteurisation is required by local regulations, bearing in mind that there are often different rules for installations in rented or commercial properties.

4.5.1 Type of DHW Tank

The larger size 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). Please ensure that the tank is suitable for the water supply otherwise the warranty may become void.

4.5.2 DHW Tank Size

The tank will need to be carefully sized to meet the DHW demand (including showers, baths, taps, etc), 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.

4.5.3 Immersion Heater

Although not required by Building Regulations, it is generally advised that to provide legionella protection the tank is raised to about 65°C at least once a week. To provide this we would recommend that a 3 kW electric immersion heater is fitted to the bottom of the tank, and the EVO controller programmed to provide immersion control. If DHW is required higher than 60°C then it is advisable that the immersion heater is programmed to operate for a period following the heat pump operation period to raise the temperature. This avoids the immersion heater taking all of the load.

4.5.4 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 timeclock 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. Failure to do so will invalidate the 3 port diverting valve warranty.

4.5.5 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.

4.5.6 DHW timeclock

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 4.6.3.4). This timeclock is supplied by others.

4.5.7 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, which makes up any losses to atmosphere from the pipework. It is important that the flow boiler is installed in its correct orientation as per it's supplied instructions. 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. As an alternative to the separate flow boiler and timeclock an integrated unit such as a 'Plug and Glow' unit can be used. Please contact Kensa for further details.

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. The pump and flow boiler must be timed to run together.

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.

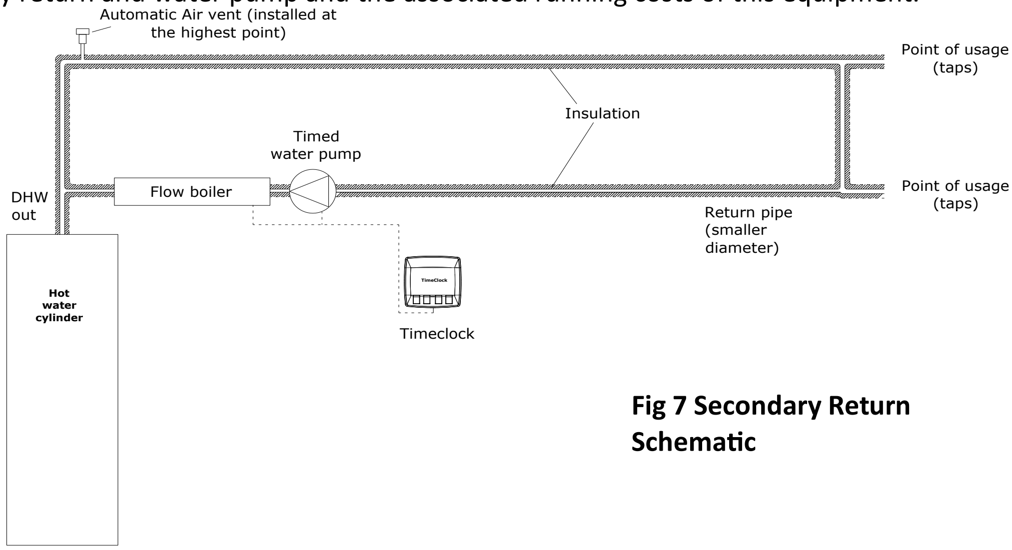


Fig 7 Secondary Return Schematic

Meter Ready Requirements.
Isolation values to reserve space for flow meter and temperature sensor in the return line and space for a temperature sensor in the flow line. See section 4.6.6.1

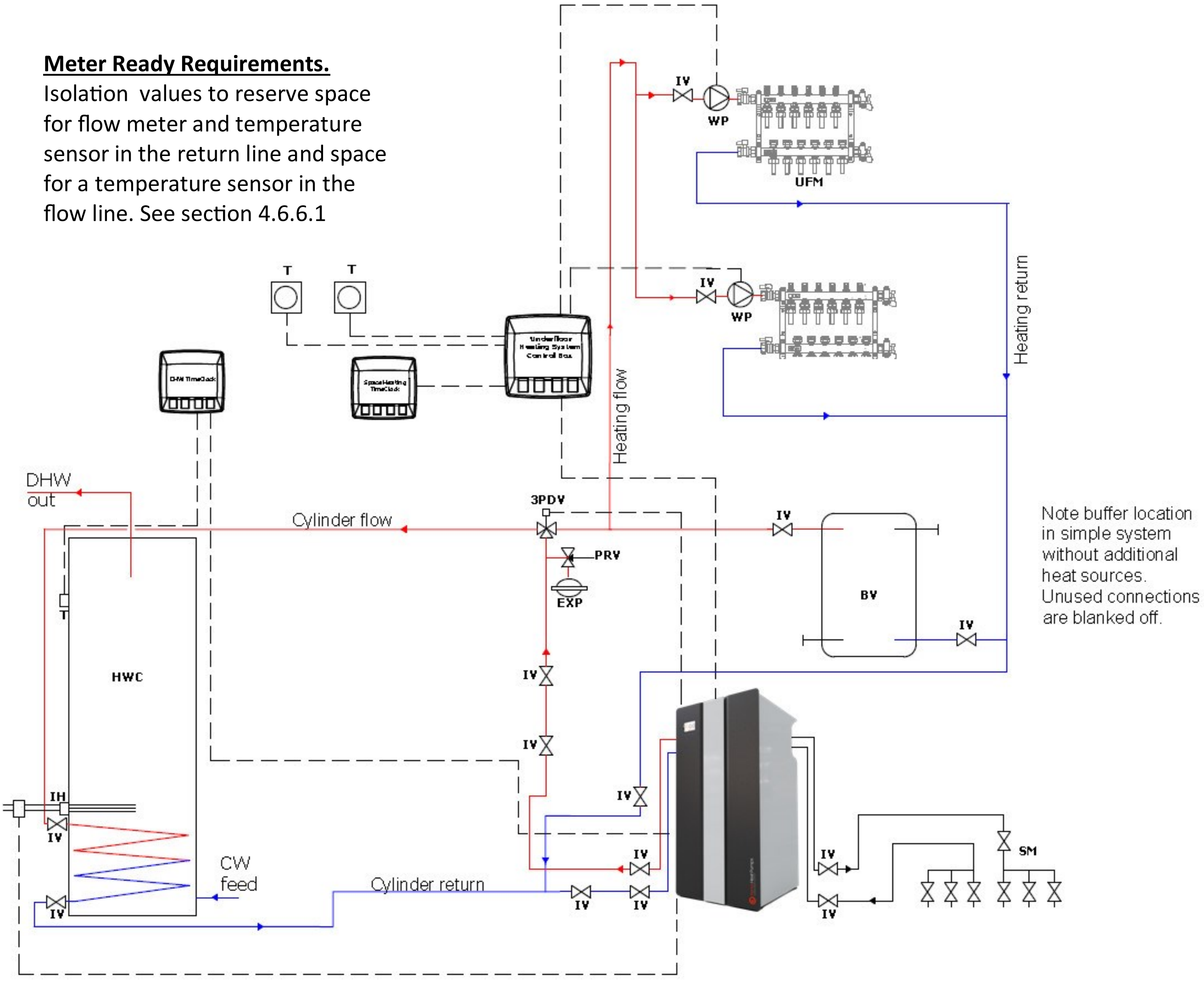


Fig 8 Underfloor with multiple manifolds and DHW Schematic

Please note:-

- The 3 port diverter valve should be installed with the motor at any angle vertical to 30° above the horizontal plane .
- Additional circulation pumps with multiple manifolds maybe required depending on the system design.
- The above drawing is a schematic only and additional valves and fittings maybe required.
- The 17kW is designed for space heating only.

4.5.8 Towel Rails

Any towel rails installed in the system must be installed on the space heating distribution side. Ideally the towel rails should be of the dual fuel type, i.e. they have an electric element within them. This enables the towel rail to operate during periods when space heating is not required, i.e. the summer.

Kensa would recommend that any towel rails should either be installed as a separate dedicated primary circuit with a separate zone valve and timer or can be used as an extension of the UFH circuit.
As the towel rails are now on a primary circuit, ferrous towel rails can be used which are considerably lower cost.

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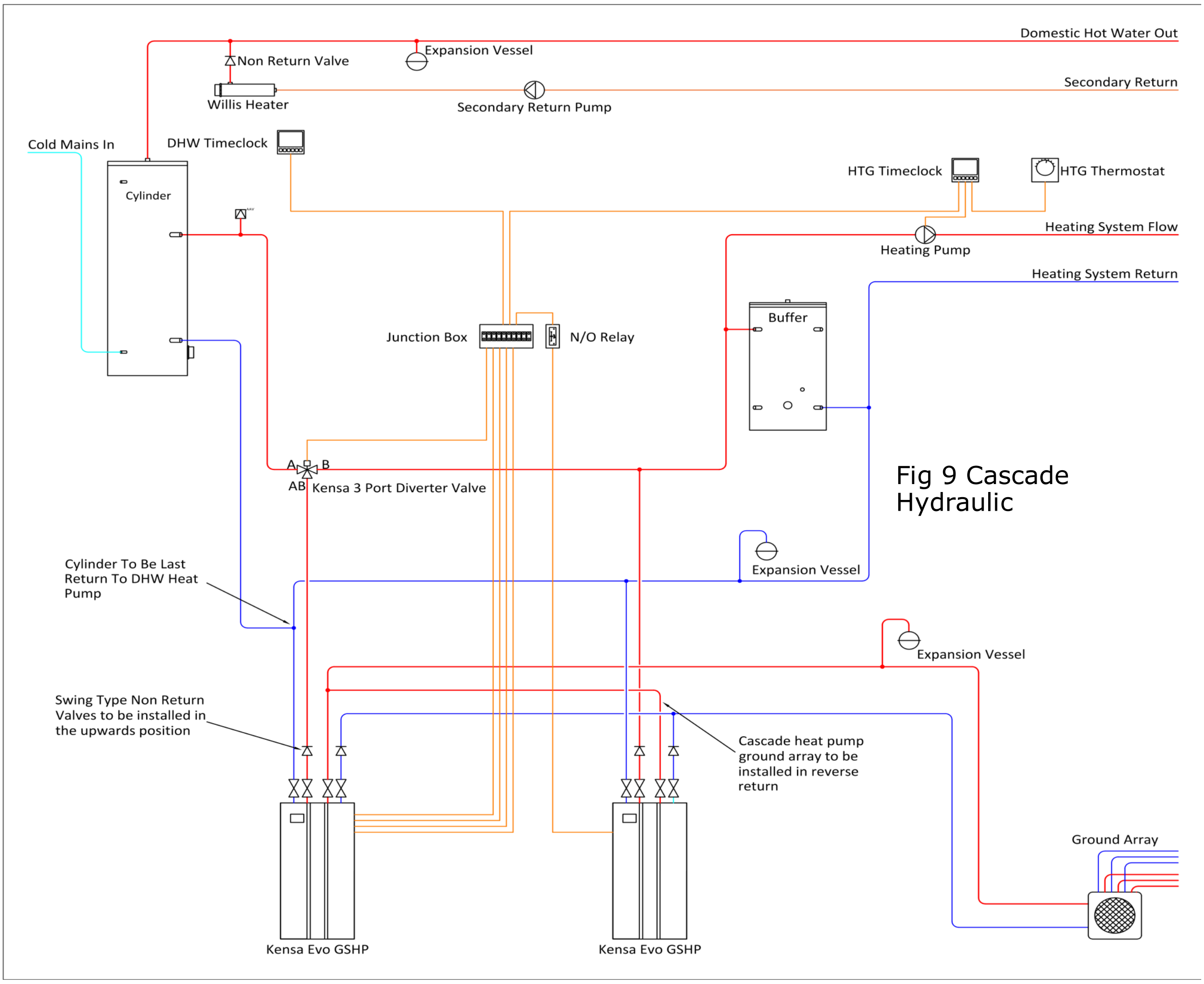


Fig 9 Cascade Hydraulic

4.5.9 Cascade systems

Due to the variance in heating loads from summer to winter Cascade systems are becoming more popular. Cascade systems utilize more than one heat pump to meet the full load of the property. For example, in winter the property might need 18kW of heat to satisfy the heat load, however in summer the property might require less than 10kW. Traditionally in order to meet all the current standards such as MCS (Microgeneration Certification Scheme) a 20kW unit would be fitted even though for half the year only 9kW of heat was required. For fixed speed units this would generally mean that the unit would be over sized for half the year leading to inefficiencies. A cascade system if installed in the previous example might comprise of two 9kW units. Only one will operate in the summer, with both units operating to satisfy loads greater than 9kW. This leads to a more efficient system. The ground array system will be the similar if 2 x 9kW units or 1 x 20kW units are installed as the ground arrays are sized on the building heat load not the heat pump size.

Cascade systems also offer a degree of redundancy as if one unit fails; the second unit is still operational. Although the full load cannot be met a degree of heat can be maintained within the building until the faulty unit can be repaired. A second type of cascade system is one which comprises of multiple units; however one or more units are dedicated to the production of domestic hot water only (DHW) with the remaining units dedicated to the space heating load. This has the advantage that DHW and space heating loads can be satisfied at the same time and specialised high temperature heat pumps which can reach above 60°C can be used for the DHW removing the reliance on immersion heaters. It is possible to have these types of cascade systems comprising of three, four or even more heat pumps where the DHW and space heating loads are split again.

4.6 Mechanical Installation

4.6.1 Locating the Heat Pump

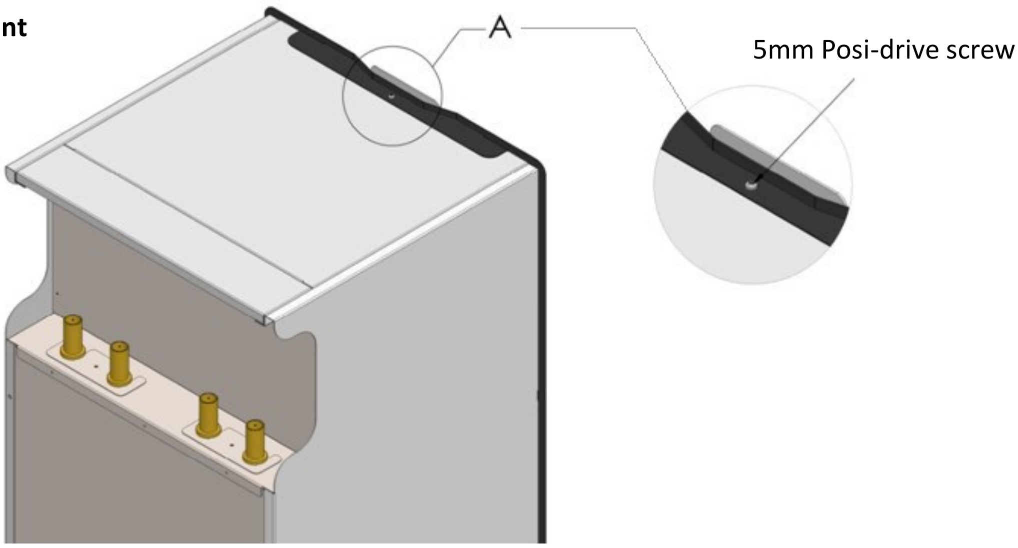
Decide on a suitable location for the Heat Pump. This should ideally be in the back of a domestic garage, or a utility room. It should not be placed in any inhabited space or near any noise sensitive areas. The Evo emits limited noise and vibration, and should not be placed adjacent to, or below bedrooms or occupied spaces. Take into account the "Recommended Clearances" when finalising the location.

Check the appliance for transport damage. Under no circumstances should a damaged appliance be operated or installed. Do not store or transport the Evo on it's side. Remove the 4 transit bolts before fitting the unit into its final position.

Warning:- The Evo is approximately 200kg and safe handling procedures should be followed.

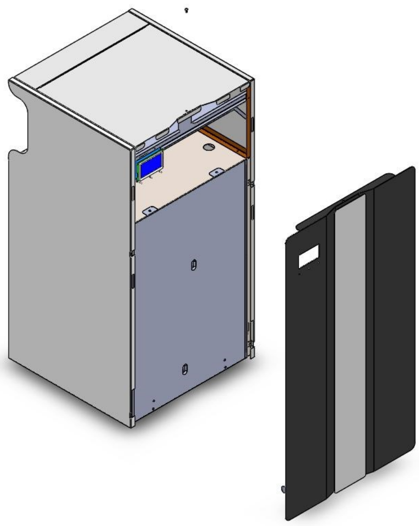
4.6.2 Removing the transit bolts

Fig 10 Location of front cover screw



i. Remove the single 5mm posi-drive screw as shown above.

ii. Pull the top of the front cover forward and pull up to disengage the bottom hooks.



Warning :- Care must be taken in removing the front cover as the item is heavy. Do not place feet under the front cover.

Fig 11 Front cover removal

ii. Place the front cover in a safe position away from the unit.
iii. Remove the two transit bolts (M5) positioned as shown below from the front of the unit.
iii. Remove the two transit bolts (M5) positioned as shown below from the rear of the unit.

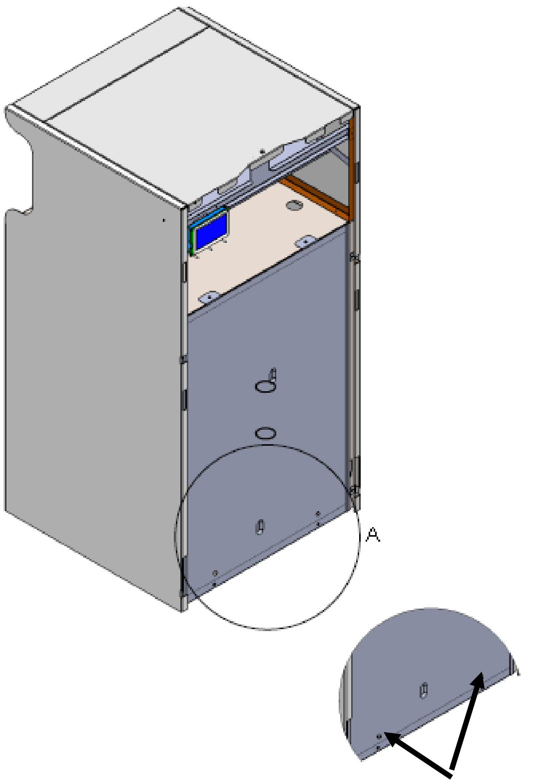


Fig 12 Position of front transit bolts

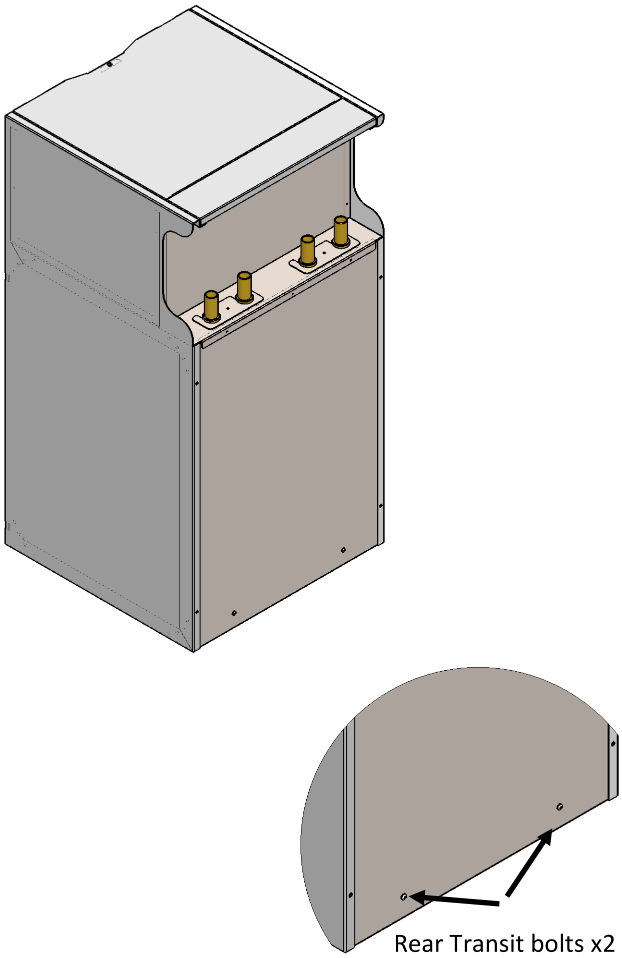


Fig 13 Position of rear transit bolts

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4.6.3 Positioning the unit.

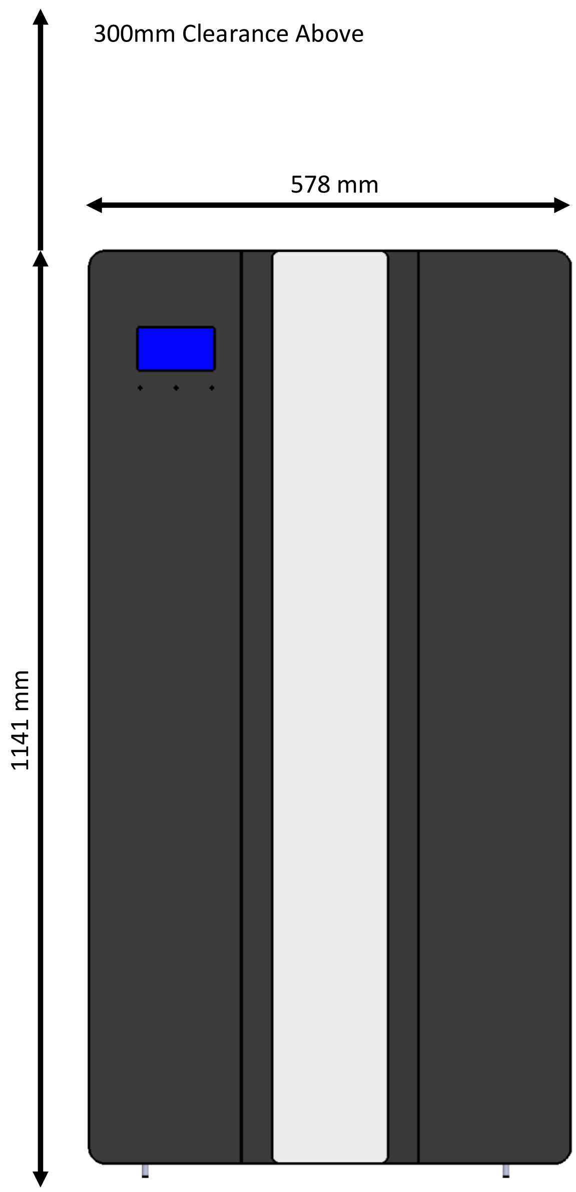
Position the appliance on a firm, level and substantial concrete base that will absorb vibration well away from any occupied rooms. Ensure that the appliance does not stand on the electrical supply cable. If the supply cable is damaged, it must be replaced. Ensure all pipes and wires are adequately supported 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.

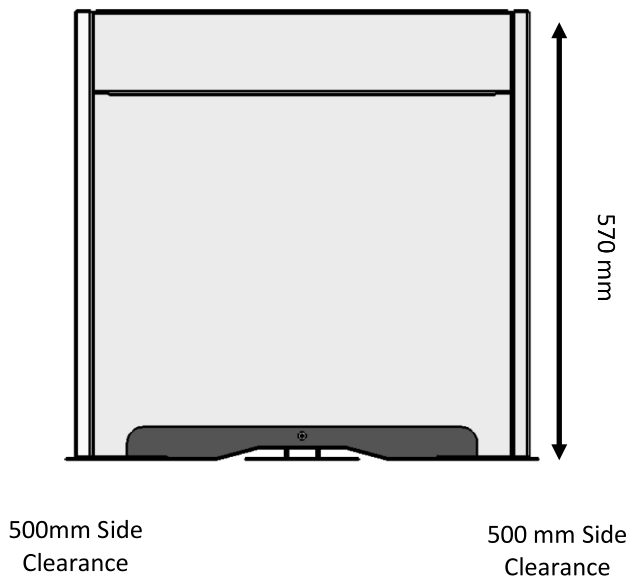
If the heat pump is being located in a damp environment, the ground array water pump should be insulated with a vapour barrier insulation such as Armaflex to avoid excessive condensation.

Do not stand or store objects on top of the unit.

4.6.4 Recommend clearances and dimensions



- 500 mm each side in an ideal install if this can't be achieved a min of 100mm and full bore isolation valves must be fitted .
- The rear of the unit must not touch a wall but it can be as close as necessary.
- The top of the unit must have clearance enough to remove all panels and have access to the internals .
- The floor must be as flat as possible and it is possible to adjust the feet to achieve this if necessary.
- The front of the unit must have at least 700mm clearance to allow removal and works .
- Clearance must be allowed for the unit to be removed from the building. If this is not possible then the client / installer must be liable for the cost and works to allow the unit to be removed .



4.6.5 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 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.

Manifolds are available in either above ground or underground versions. Both should be installed external to the building.

The expansion vessel on the ground side is optional in most cases. It maintains the pressure within the ground loop as the pipe relaxes. A suitably sized vessel would be 4l (225 x 195mm) and is available from plumber suppliers or Kensa. If one is not fitted it maybe necessary to top the pressure up at a future site visit.
If an open loop or pond mat system is being used Kensa would always recommend fitting an expansion vessel.

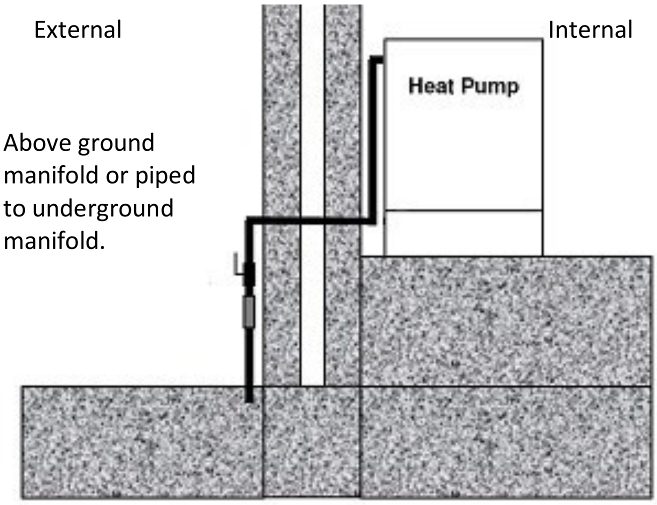


Fig 14 Positioning of Heat Pump and Manifold

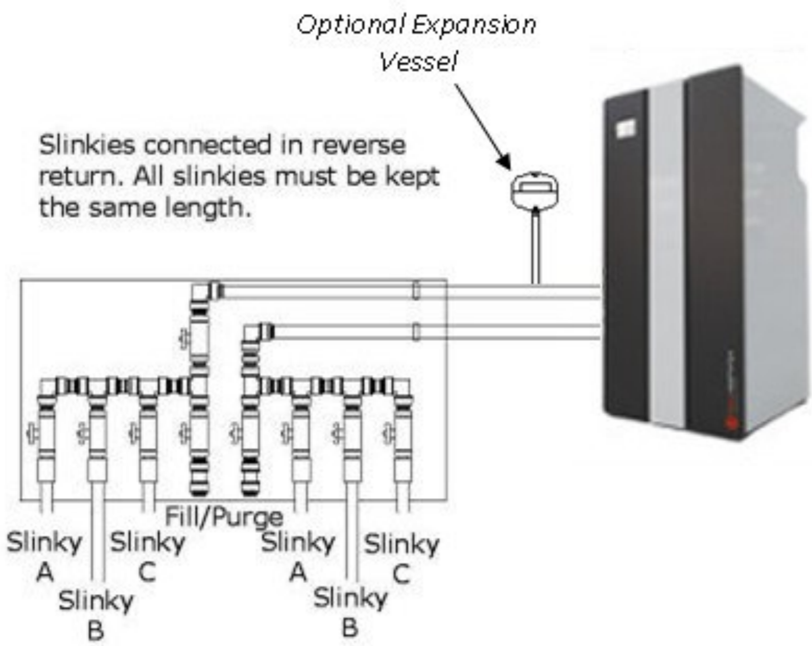


Fig 15 Manifold Slinky connections

i. Position the appliance on a firm, level and substantial concrete base that will absorb vibration and ensure the unit is well away from any occupied rooms.
ii. Using the adjustable feet, level the unit and tighten the M10 locking nuts on the feet when level.
iii. Ensure the heating distribution system has been thoroughly purged of any debris.
iv. Connect the ground feed & return pipes from the Slinky manifold as per the illustration below. Suit able connections include 'Speedfit'or compression fittings. Do not use any 'Hot' work methods.
v. The Evo can accept pipes from the left, right or top. If the pipe direction is from the top remove the rear top panel to allow access for the pipes. Remember to allow enough space to allow the electrical cables access into the Evo.

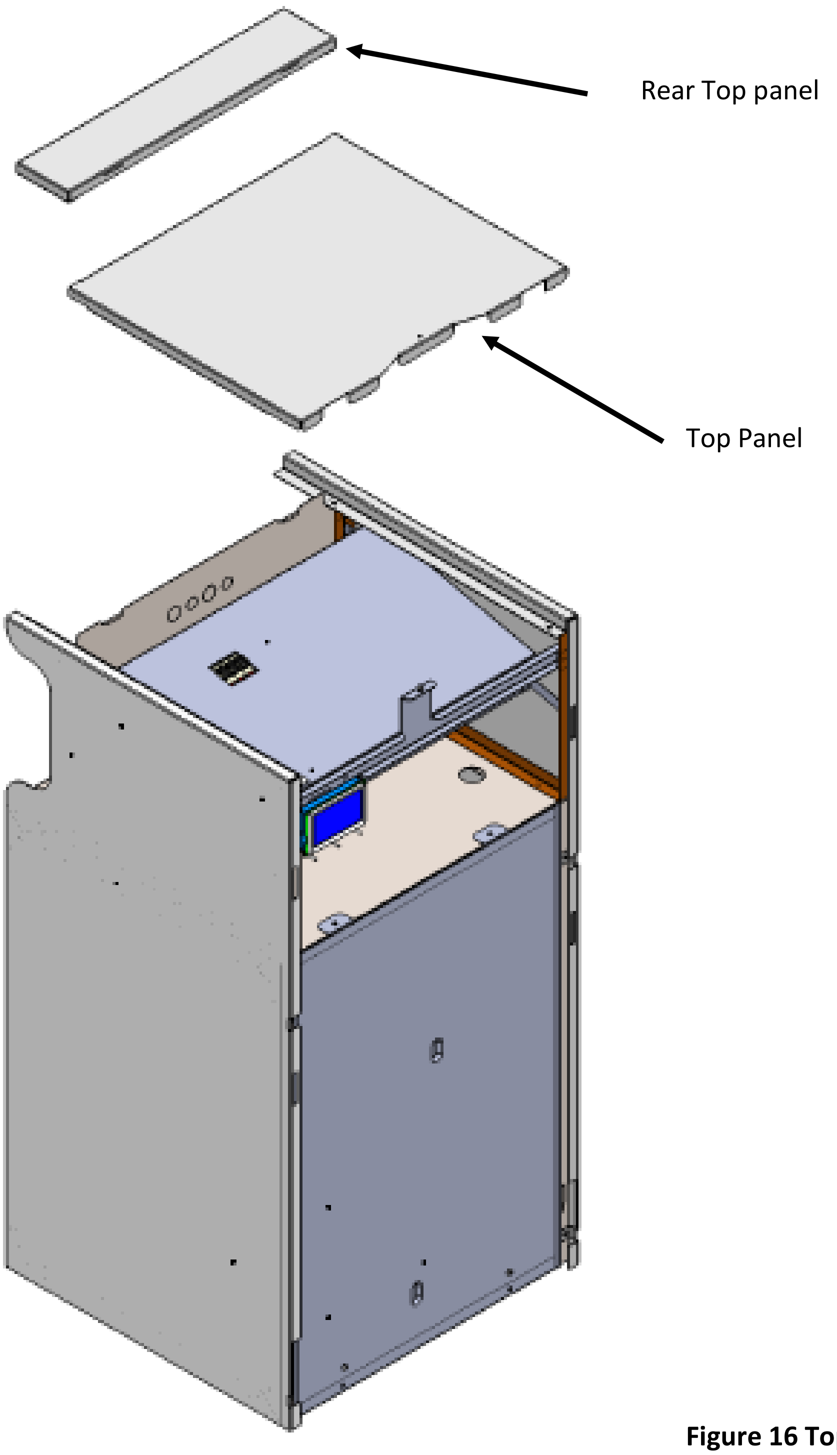
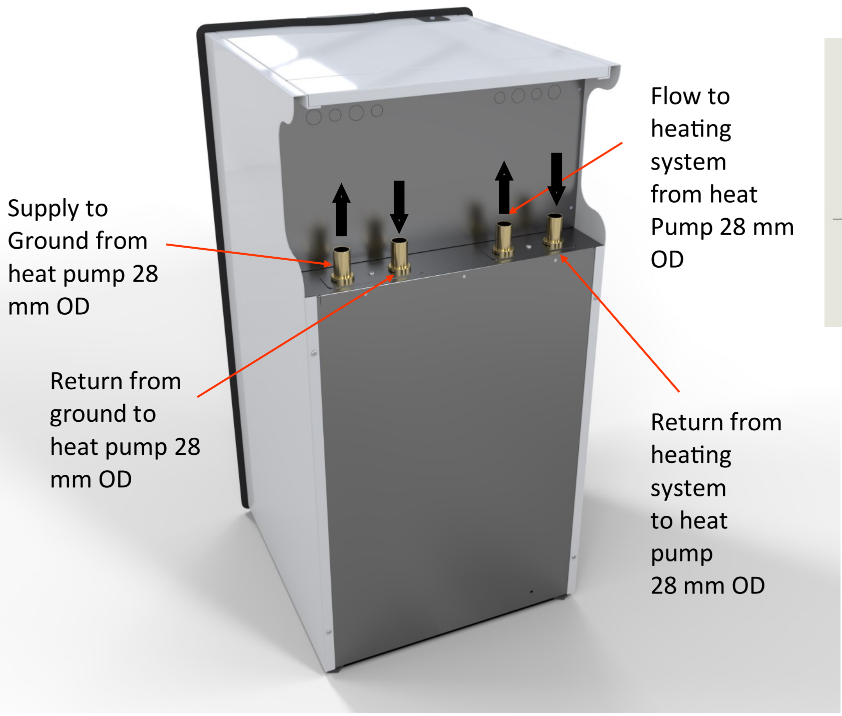
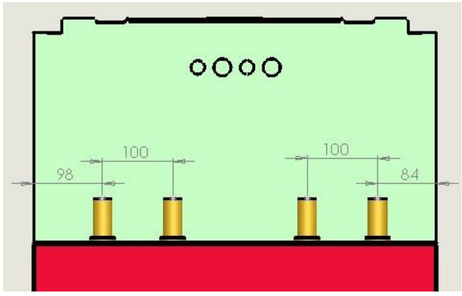


Figure 16 Top panels

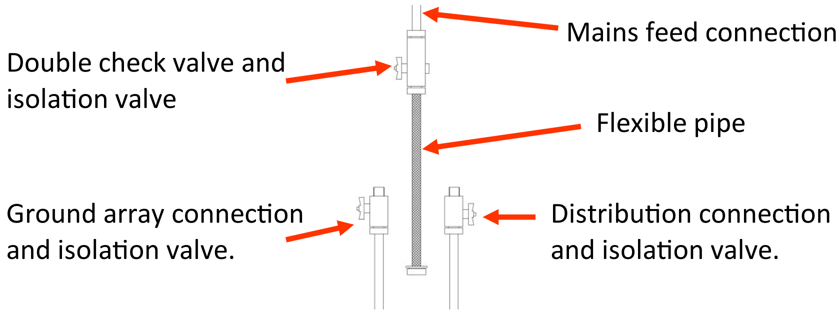
Fig 17 Evo Single Compressor heat pump connections





vi. It is advisable that a cold feed connection is connected on the ground and distribution side. This connection must follow WRAS regulations and disconnected when not in use. A cold fill connection kit is available as an extra from Kensa and can be used if plumbed (as below) to top up the ground or distribution systems.

Fig 18 Suggested Fill loop



A ground side expansion vessel can also be fitted if required.It maintains the pressure within the ground loop as the pipe relaxes. A suitably sized vessel would be 4l (225 x 195mm) and is available from plumber suppliers or Kensa. If one is not fitted it maybe necessary to top the pressure up at a future site visit. If an open loop or pond mat system is being used Kensa would always recommend fitting an expansion vessel.

vii. Using the stickers provided ensure the flow and return connections are indicated on the manifold.

viii. Connect the feed & return pipes from the underfloor heating manifold according to the Illustration above.

ix. The heating distribution side should also have an appropriate sized expansion vessel and WRAS approved make up kit installed in an accessible position and disconnected when not in use. (As per the drawing above)

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 re-frigerant to settle.

xii. The area where the heat pump is installed must be dry and rodent free.

4.6.6 Meter Installations

The government has introduced the various grant schemes 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 bio-mass boilers or stoves with back boilers for use in the domestic sector.

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

4.6.6.1 Meter Ready Installations

Some installations 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 compliant renewable heating installations should be made meter-ready. 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 pipework between the circulation pump and the distribution system. The required length of straight pipework between isolation valves is 20 times the pipe diameter to enable BEIS's chosen metering to be installed on the return pipework. The table below 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 pipework. 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 pipework accessible, i.e. not boxed in or under floor boards, to enable meters to be fitted;

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

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.

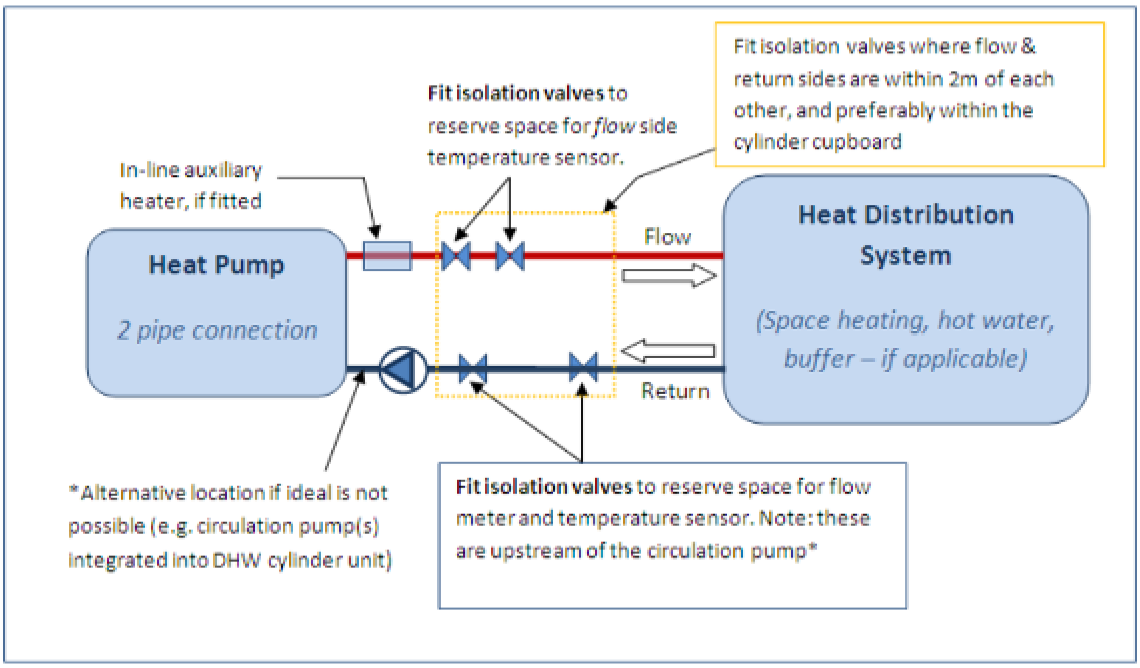
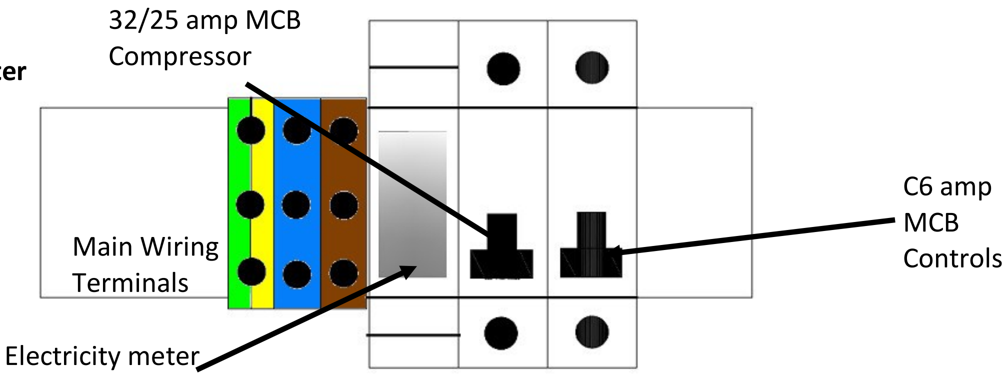


Fig 19 A meter ready installation

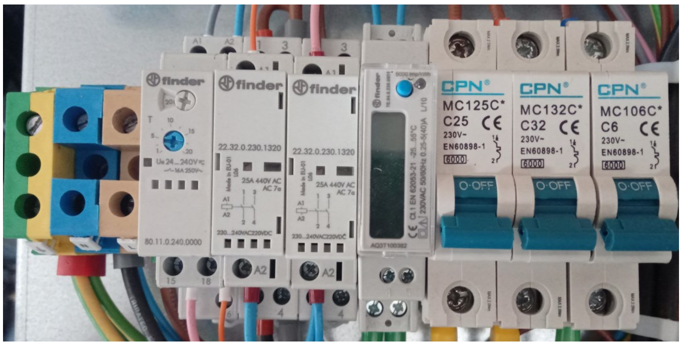
4.6.6.2 Electrical Metering

Electrical metering of the heat pump maybe required by the grant schemes. The electrical meter is to be used for indicative electricity consumption of the unit and to help resolve any instances of high electricity bills. The Evo has a built in electrical meter which measures the electrical consumption of the compressor. Access to this meter and readings are only accessible by removing the top panel of the Evo.

Figure 20
Evo Electrical Meter Position



Single phase power supplies consist of a live power supply neutral and a green and yellow earth cable. Three phase power supply is 3 Live wires, one neutral and one green and yellow Earth



Please note: the 17kW has three MCBs. A 25 amp, 32 amp and 6 amp.

4.7 Electrical Installation

The Kensa Evo heat pump range is available in single phase power supply versions.

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. If not already removed, remove the heat pump front cover by unscrewing the 1 x 5mm posidrive screw on the top of the heat pump. See section 4.6

ii. Remove the top panel and the rear top panel. (See below).

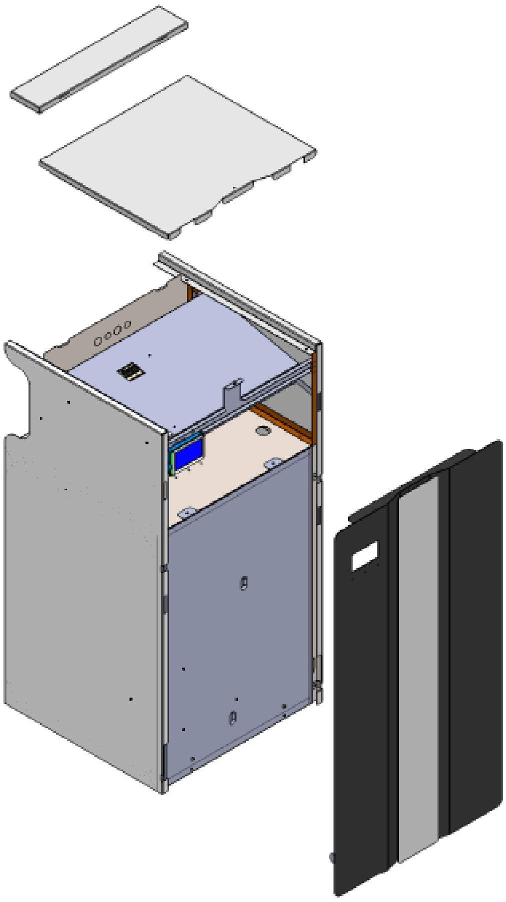
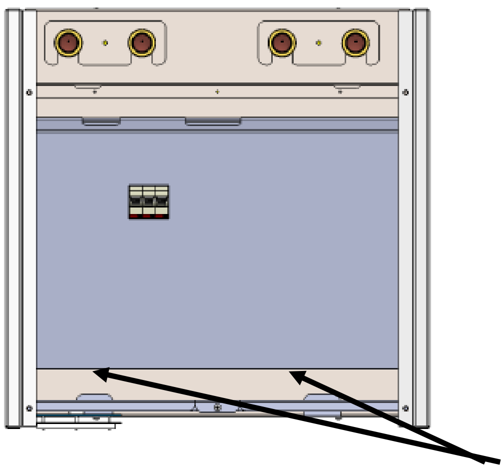


Figure 21
Evo with front and top panels removed.

iii. remove the electronics cover plate by unscrewing the two M5 pozi-drive head screws on the front cover plate.

Fig 22 Plan view with the top panels removed



Two x M5 pozidrive screws

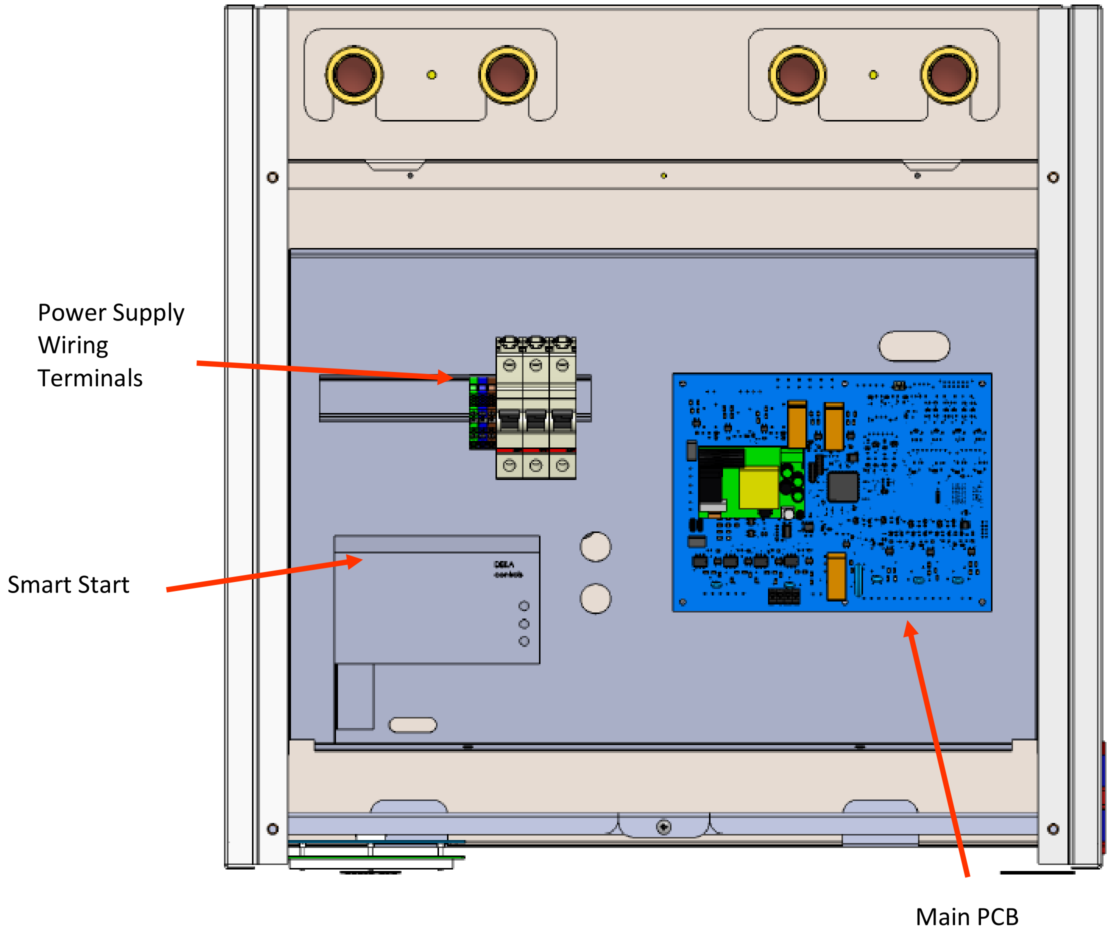
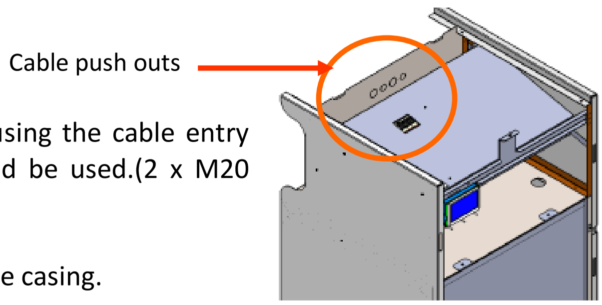


Fig 23 Electrics box with the electrics cover removed

4.7.1 Cable entry points

Push out cable entry points are positioned at the rear of the electrics tray. These can be pushed out using a screw driver or similar tool. Do not use fingers otherwise injury may result.

Fig 24 Cable push outs



Cables should enter the unit from behind using the cable entry ports provided. Suitable cable glands should be used.(2 x M20 and 2 x M25 are provided).

Cables/Isolator should not be mounted on the casing.

i. Thread the power supply and timeclock/room thermostat wires through the cable push outs into the electrics tray and connect them to the terminals required, (see wiring diagram section).

ii. If required fit the optional weather compensation sensor to a North facing wall, and connect with two-core minimum 0.5mm sq cable. .

iii. For applications where Domestic Hot Water has been specified a 3 port diverting valve ('W' plan) is provided by Kensa and when the timeclock 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 4.5). The diverting valve should be first connection in the heat pumps flow line, before any underfloor heating mani folds. The valve's electrical connections are connected to the heat pump's internal wiring. (See

4.7.3)

4.7.2 Electrical Isolation

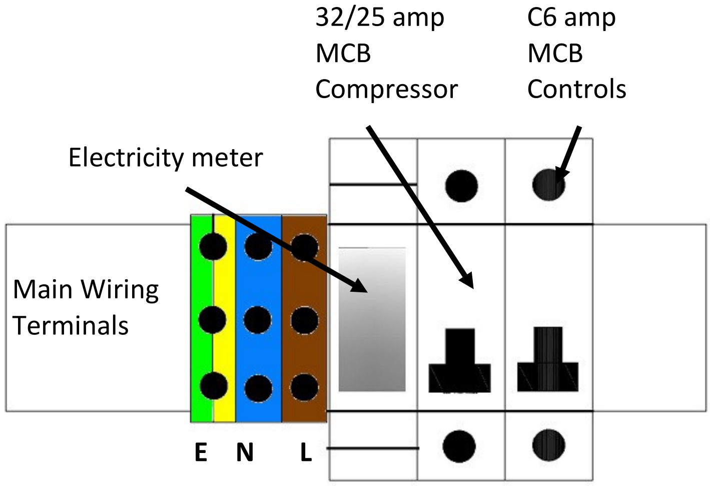
All installations should be fitted with a local isolation switch immediately adjacent to the heat pump. Wiring for the connection between the heat pump and local isolator will be a maximum of $10mm^2$.
Wiring sizes between the consumer unit (fuse box) and local isolator will depend on the length of cable run and how the cable is installed. As this is site dependant, the site electrician should and is responsible for calculating this.

The isolator should not be mounted on the casing and the pole disconnection should be 3mm minimum.

4.7.3 Wiring Diagrams

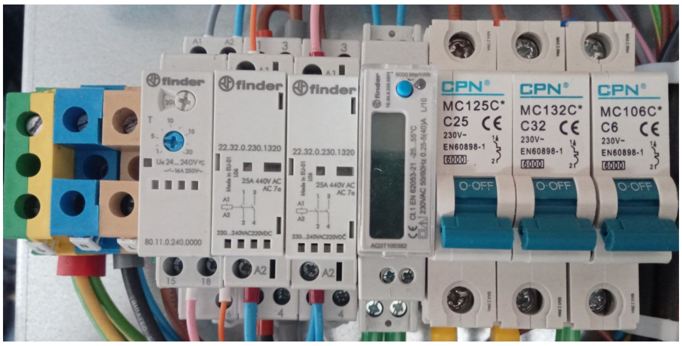
4.7.3.1 Main Power Supply Terminals

Figure 25
Mains Power Supply terminals



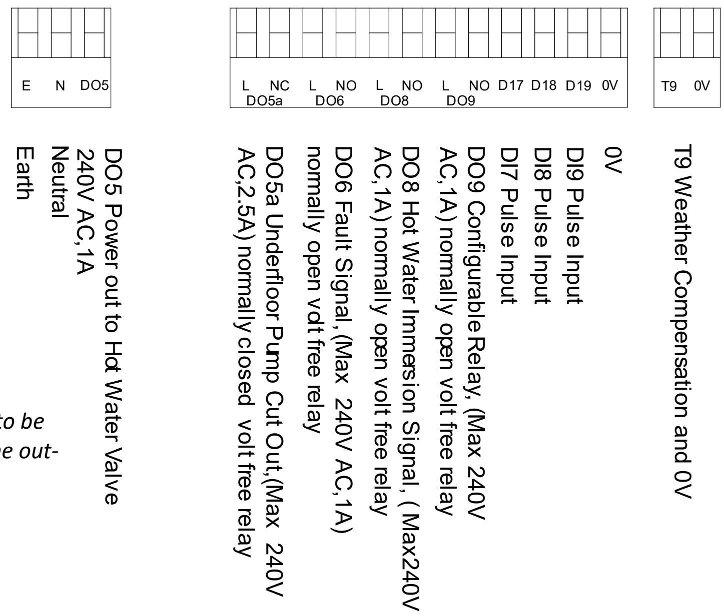
230 Vac 50Hz power supply via a Type C MCB in the buildings distribution Board

15kW Three phase unit will have three live terminals L1, L2 and L3 and voltage 380 - 420V 50Hz



Please note: the 17kW has three MCBs. A 25 amp, 32 amp and 6 amp.

4.7.3.2 Main PCB Terminals



** if the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the out-put side of the 6A MCB instead*

Figure 26
Main PCB terminals

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

Enable Signal connection is supplied with a temporary link across it . This should be removed after commissioning and connection to the heating control system. (Terminals DI1 and L)

DO8 and DO9 must use an external power supply and relay.

Kensa Heat Pumps
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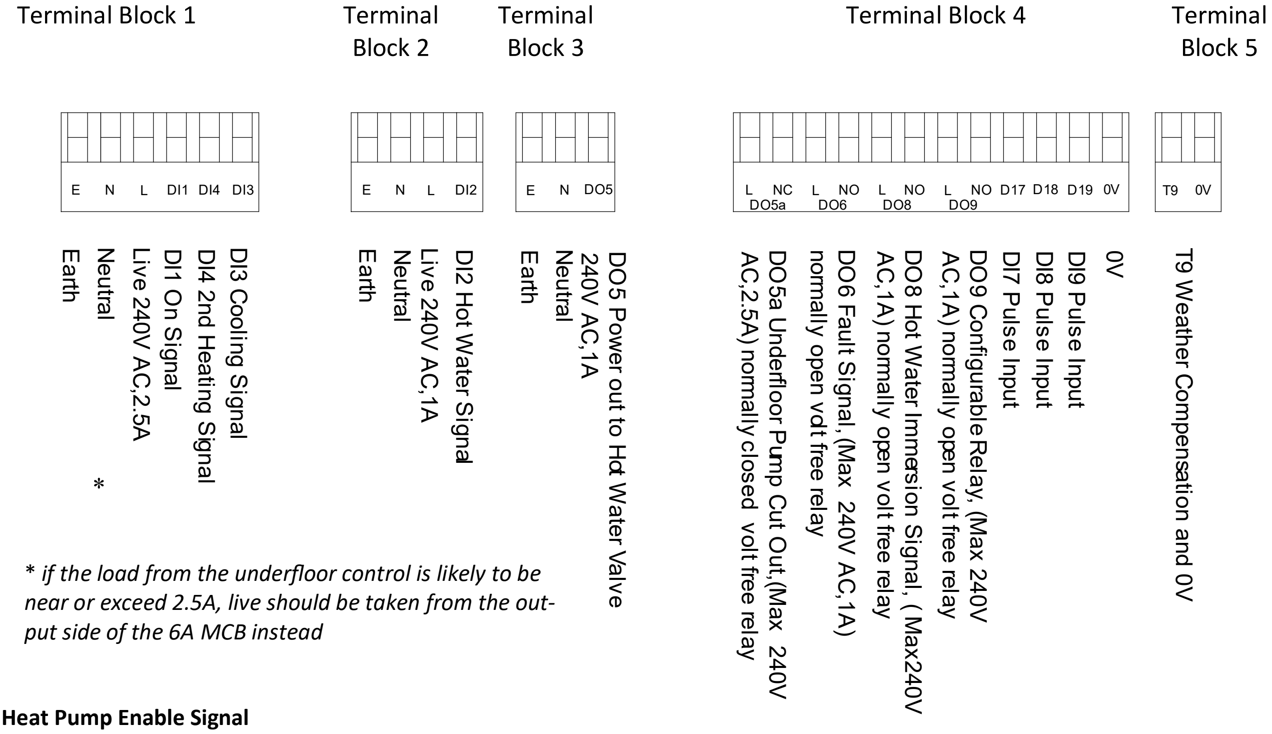
4.7.3.3 Main PCB terminals description



** if the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the output side of the 6A MCB instead*

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

Enable Signal connection is supplied with a temporary link across it . This should be removed after commissioning and connection to the heating control system. (Terminals DI1 and L)

DO8 and DO9 must use an external power supply and relay.

Terminal Block 1—Space heating/Cooling

Earth—Earth connection for space heating timeclocks/ control devices connected and powered by the Heat Pump such as underfloor control units, heating timeclocks and thermostats.
Neutral—Neutral connection for space heating timeclocks/ control devices connected and powered by the Heat Pump such as underfloor control units, heating timeclocks and thermostats.
Live- 240V AC, 1A Live connection for space heating timeclocks/ control devices connected and powered by the Heat Pump such as underfloor control units, heating timeclocks and thermostats. If the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the output side of the 6A MCB instead.
DI1—Live return 240V AC, 1A (On signal) call for heating returned from space heating timeclocks/ control devices connected to the Heat Pump.
DI4– 2nd Heating Signal—Live return 240V AC, 1A (On signal) call for a second heating set point returned from space heating timeclocks/ control devices connected to the Evo. This allows a heating zone to be controlled which requires a higher temperature than other zones. For example a zone of underfloor which requires a lower flow temperature can be controlled by a timeclock connected to DI1 and DI4 can be used to control a zone of radiators requiring a higher flow temperature by a second timeclock. If both call signals occur simultaneously the higher temperature will have priority. In this type of system architecture the underfloor manifolds must be fitted with thermostatic mixing valves.
DI3—Cooling call signal 240V AC, 1A. This is the enable signal to the heat to provide cooling. The heat pump and heating distribution system needs to be configured / specified for cooling applications. Simultaneous calls for heating and cooling will result in the unit returning an error code. Cooling applications can also affect eligibility for grant schemes.

Terminal Block 2—DHW

Earth—Earth connection for domestic hot water timeclock, powered by the Heat Pump.
Neutral—Neutral connection for domestic hot water timeclock, powered by the Heat Pump.
Live- 240V AC, 1A Live connection for domestic hot water timeclock, powered by the Heat Pump.
DI2—Live return 240V AC, 1A (On signal) call for domestic hot water heating returned from the domestic hot water heating timeclock connected to the Heat Pump.

Terminal Block 3 - DHW 3 Port valve connection

Earth—Earth connection for domestic hot water valve, powered by the Heat Pump.
Neutral—Neutral connection for domestic hot water valve, powered by the Heat Pump.
DO5- Live out to domestic hot water valve 240V AC 1A rated.

Terminal Block 4— Additional Inputs and Outputs

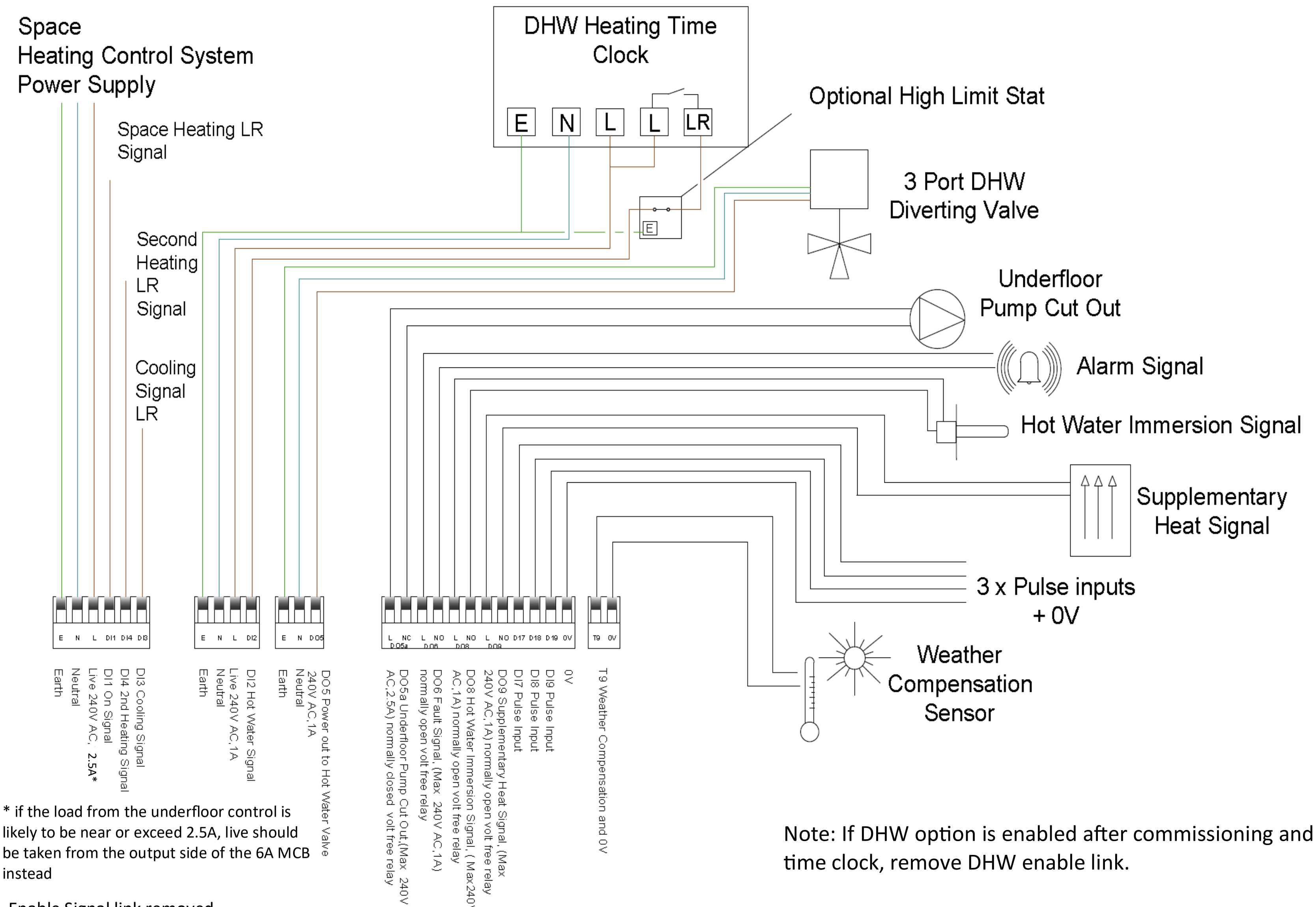
DO5a—Underfloor Pump Cut Out. Normally closed volt free relay (240V, 2.5A) which opens when the DHW valve operates. The relay can be wired directly to the supplementary underfloor manifold water pumps (up to a maximum of 2.5A). When the heat pump is producing domestic hot water if wired this relay will turn all the supplementary underfloor water pumps off increasing the systems efficiency. If the current is greater than 2.5A an external relay must be used.
DO6– Fault Signal. Normally open volt free relay (240V, 1A). Can be used as a general fault indication.
DO8– Hot water immersion heater signal. Volt free relay (240V, 1A). Can be used in conjunction with an external relay to operate the immersion heater (settable via the controller). The immersion heater must be powered by a separate external power supply.
DO9– Supplementary Heat Signal. Normally open volt free relay (240v, 1A). This relay can be used to signal to an external supplementary heat source to operate when the controller detects that the heat pump cannot maintain temperature. Configuration of this is via the controller. The supplementary heater must be powered by a separate external power supply.
DI7, DI8, DI9 and 0V– Digital inputs from devices such as electricity meters, heat meters, etc. The controller only shows the number of pulses detected, for example if a single pulse was an indication of 100 units, it would only register 1 pulse and to get the true reading the number of pulses needs to be multiplied by 100 (or whatever the single pulse is meant to represent).

Terminal Block 5—Weather Compensation T9

The Weather Compensation sensor (supplied with the heat pump) needs to be fixed to a North-facing wall, and connected with 2 core 0.5 mm cable, unshielded, to the heat pump. The cable should be routed inside the heat pump case and connected to the main pcb terminals (Terminal Block 5). If weather compensation is required this should then be enabled within the controller.

Note :- DI4, DO6, DO8, DO9, DI7,DI9 and T9 are all optional.
DI3 is only for use with cooling models
DI2, DO5 and DO5a only for use with DHW enabled models.

4.7.3.4 Fig 27 Generic Heat Pump Wiring Diagram

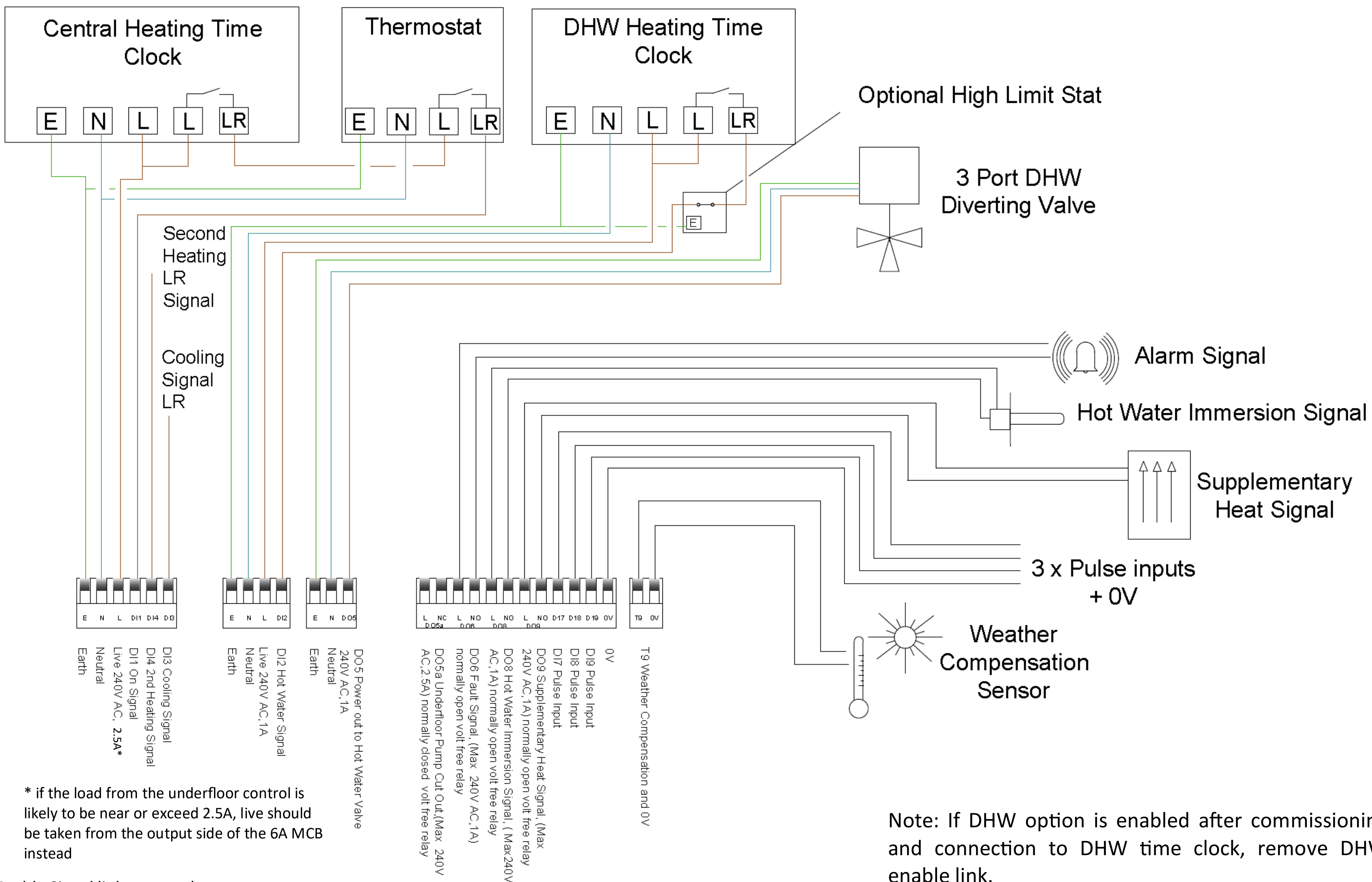


* if the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the output side of the 6A MCB instead

Enable Signal link removed

Note: If DHW option is enabled after commissioning and connection to DHW time clock, remove DHW enable link.

4.7.3.5 Fig 28 Central Heating Time Clock and Thermostat Heat pump wiring diagram

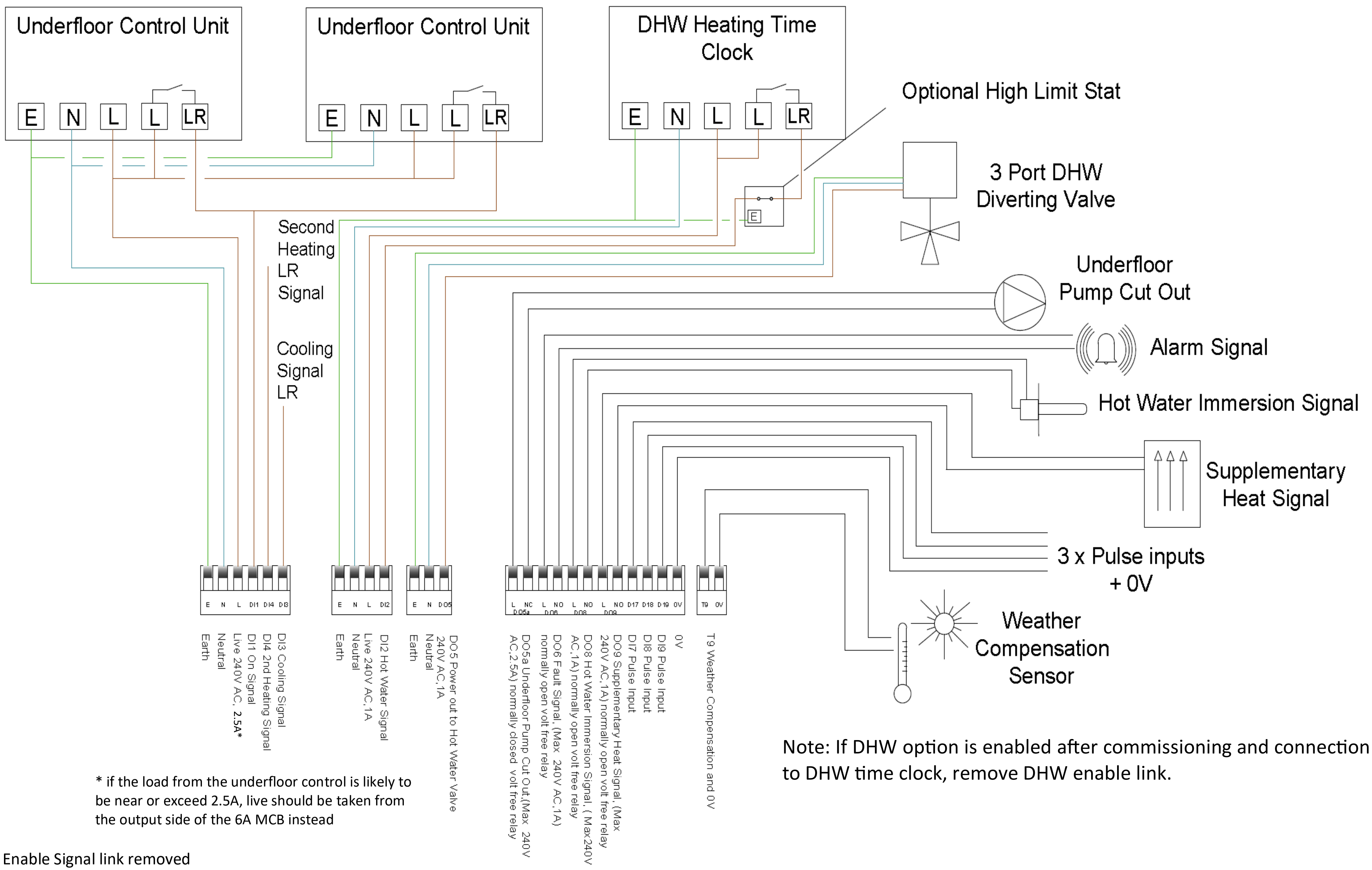


* if the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the output side of the 6A MCB instead

Enable Signal link removed

Note: If DHW option is enabled after commissioning and connection to DHW time clock, remove DHW enable link.

4.7.3.6 Fig 29 Multiple Underfloor Control Units Heat Pump Wiring Diagram

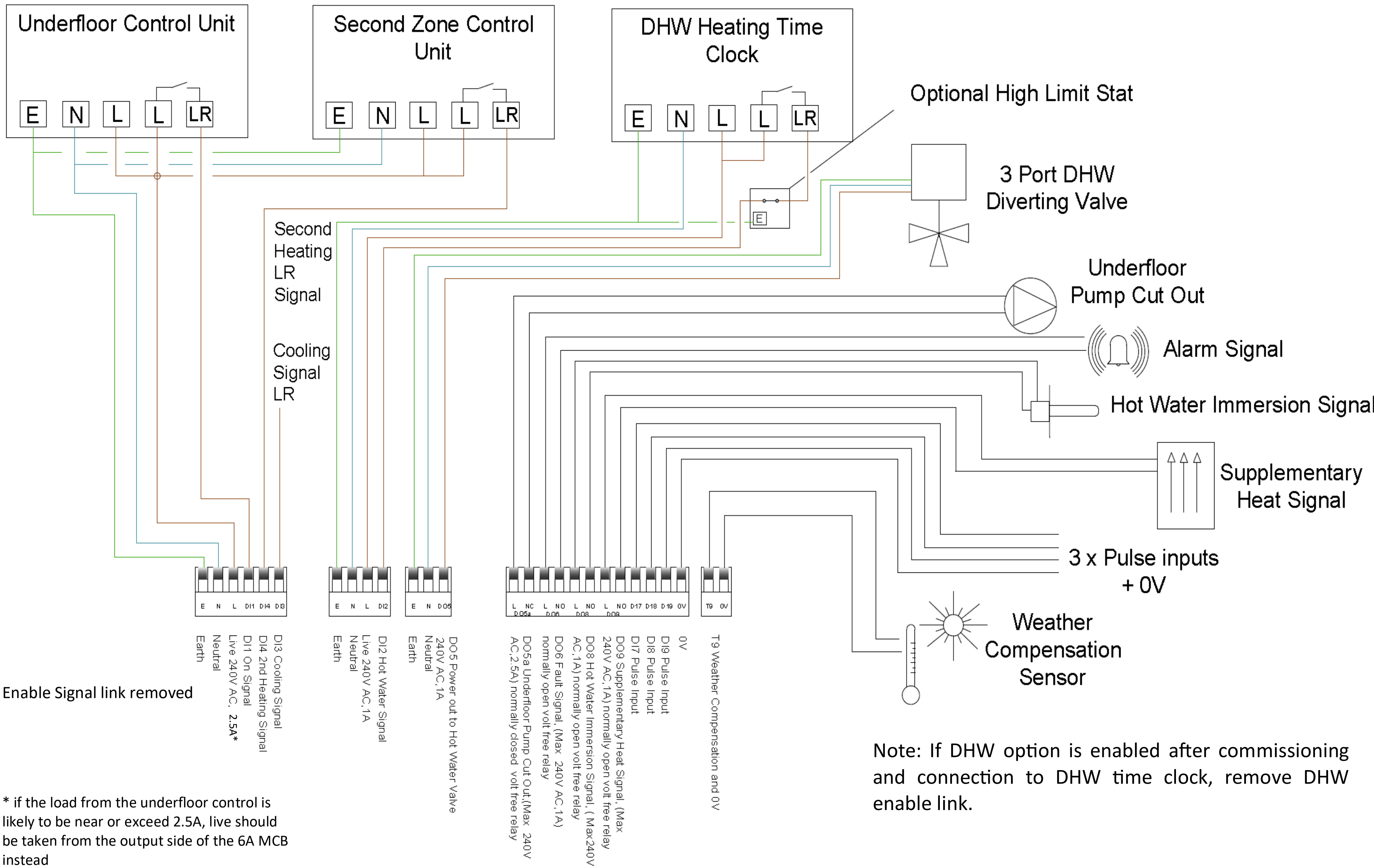


* if the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the output side of the 6A MCB instead

Note: If DHW option is enabled after commissioning and connection to DHW time clock, remove DHW enable link.

Enable Signal link removed

4.7.3.7 Fig 30 Heat pump wiring diagram utilising the second set point function (underfloor and radiators)



Enable Signal link removed

Note: If DHW option is enabled after commissioning and connection to DHW time clock, remove DHW enable link.

* if the load from the underfloor control is likely to be near or exceed 2.5A, live should be taken from the output side of the 6A MCB instead

4.7.3.8 Cascade System Wiring

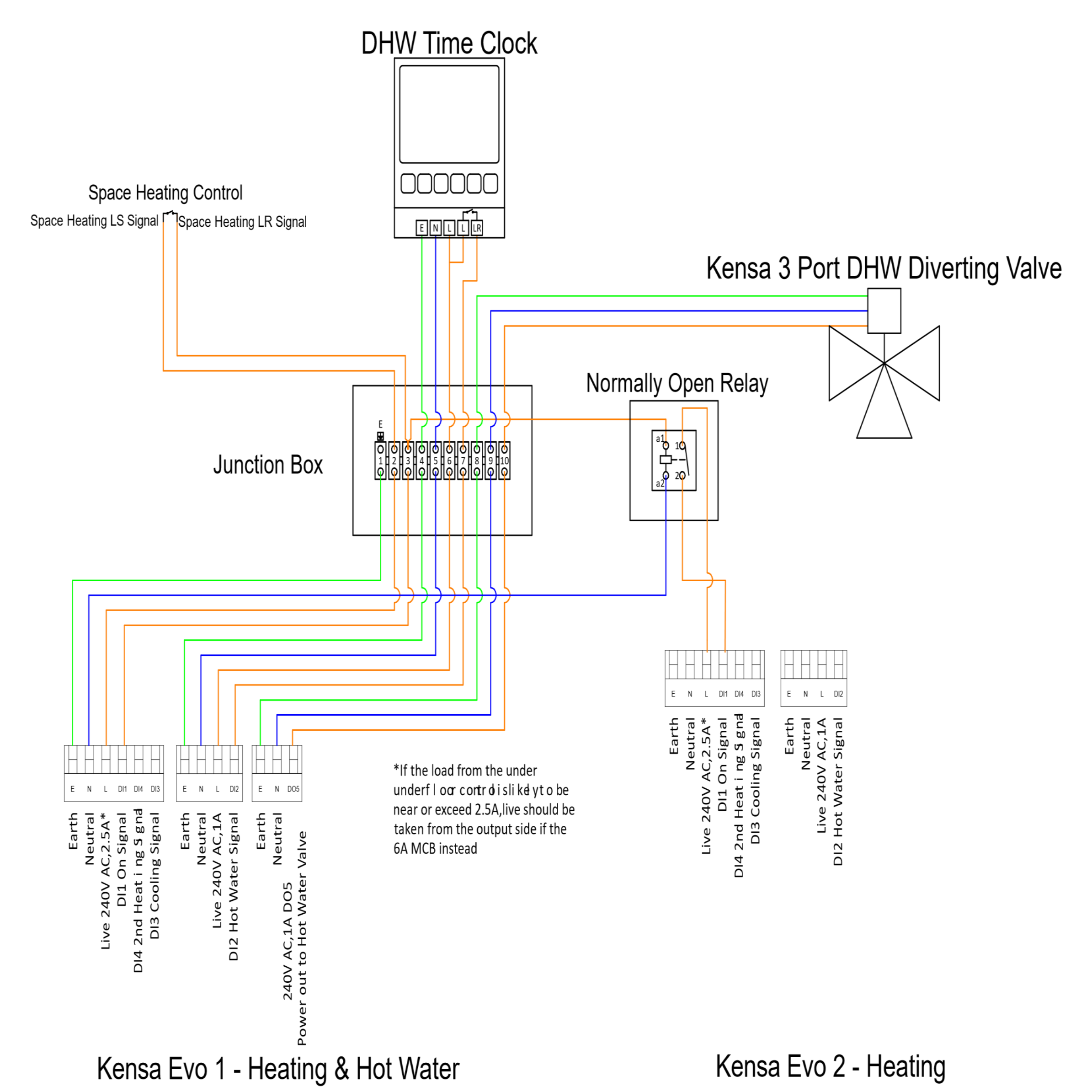


Fig 31 Cascade Heat Pump System using two Evos

Kensa Heat Pumps
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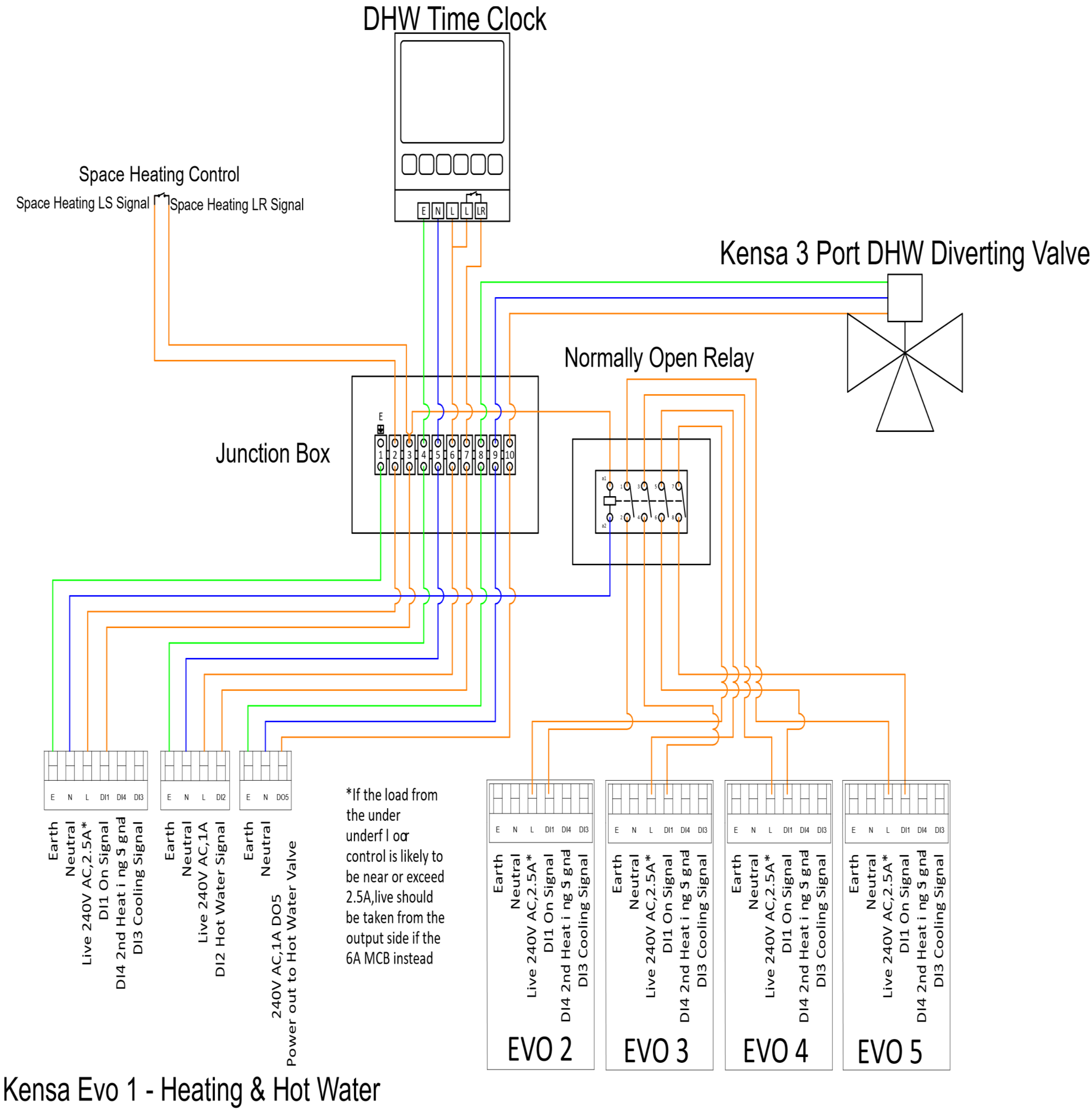


Fig 32 Cascade Heat Pump System using multiple Evos

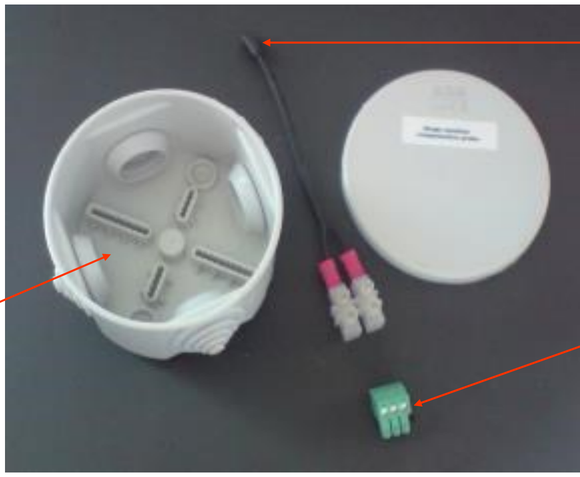
4.7.4 Weather Compensation.

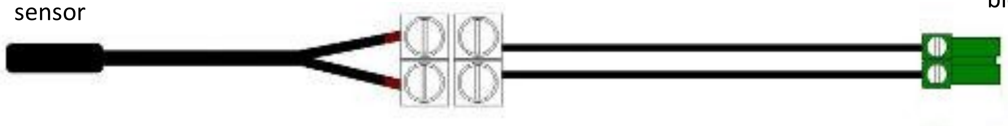
All Kensa Evo Heat Pumps are supplied with Weather Compensation as standard. This facility will reduce the return water set-point against a schedule of external ambient temperatures. In more simple terms, the temperature of water flowing into the building's radiators or underfloor heating is reduced in mild weather, which allows the heat pump to run more efficiently. This is particularly important with radiators, as much higher temperatures are required. In cold weather, many people already turn up the temperature of water flowing from their boiler by hand and are therefore weather compensating their heating system manually.

To enable weather compensation (if required) on your heat pump the sensor should be installed and weather compensation enabled within the controller .

The weather compensation sensor is supplied in a small waterproof enclosure.

Fig 33 Weather compensation sensor





Kensa strongly suggest that the heatpump should be run for at least one week after commissioning, before the weather compensation is activated, to enable the client to become use with living with a heat pump and understand the buildings heating profile.

This sensor needs to be fixed to a North-facing wall, and connected with 2 core 0.5 mm cable, unshielded, to the heat pump. The cable should be routed inside the heat pump case and connected to the main pcb terminals. The weather compensation should then be left disabled. If weather compensation is required this should then be enabled within the controller.

4.7.5 External Immersion Contactor Assembly

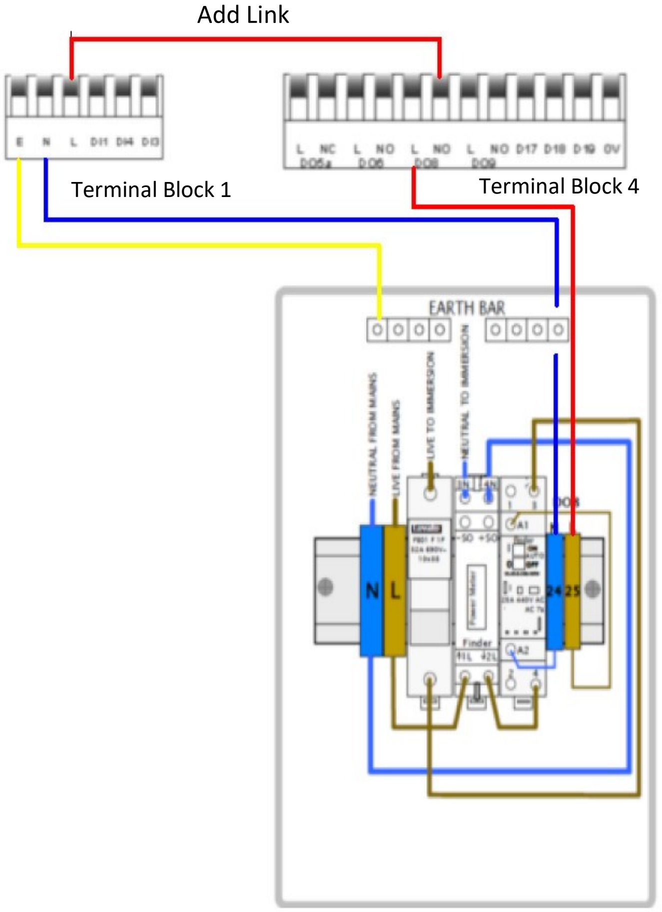
The External Immersion Contactor Assembly with Power Meter has been developed to aid connection of the Kensa Evo heat pump and a Domestic Hot Water Immersion heater. It is available as an optional extra for the 7, 9 , 13, and 15kW Evo's . The 17kW is designed for space heating only and is not used for Domestic Hot Water production. The Evo heat pump can ensure that the immersion heater only operates for a set time after a heat pump DHW cycle has finished or that a Pasteurisation cycle is enabled.
The unit also measures the amount of power that the immersion heater uses.

The unit comes with:-
1 x Main Housing Assembly
3 x 20mm hole sealed cable gland

20mm hole sealed cable gland.

The external faces of the housing are left intact so that the correct cable gland can be fitted in the preferred location. It is important that the mains power supply is secured using the correct sized cable glands and appropriately tightened.

Wiring



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

Isolate the electricity supply prior to any wiring being carried out.

Important :- Ensure the power supply to both the Evo and the external immersion contactor with power meter is isolated if any work to the Evo is being carried out.

The relay has a three way function switch.
I—Relay/Immersion heater on. (this can be used to bypass the Evo control logic and continually provide power to the immersion heater.)
Auto—Control is automatic via the Evo control logic. The relay should be left in this position for normal operation.
O– No power is supplied to the immersion heater.

Wiring should be as shown on the drawing. Wires shown within the immersion box are pre-wired internal wires.
A neutral should be taken from the Evo and wired into 24.

5. Mechanical Set to Run

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 (ie. 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 34 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 5.1.3)

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 can be connected either way round.

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.

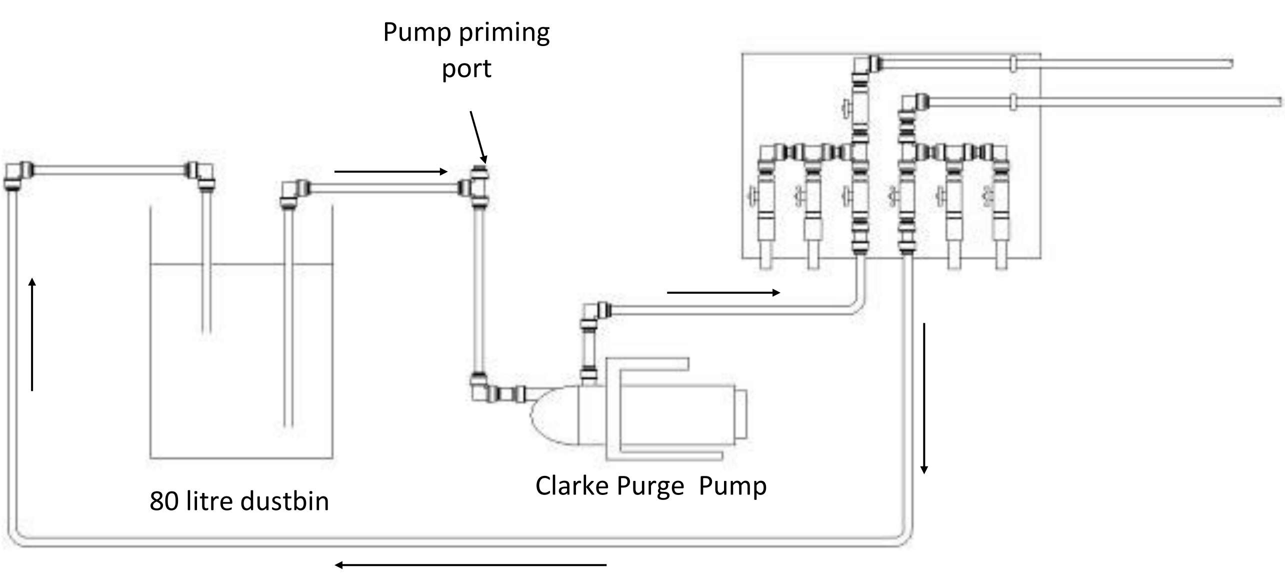
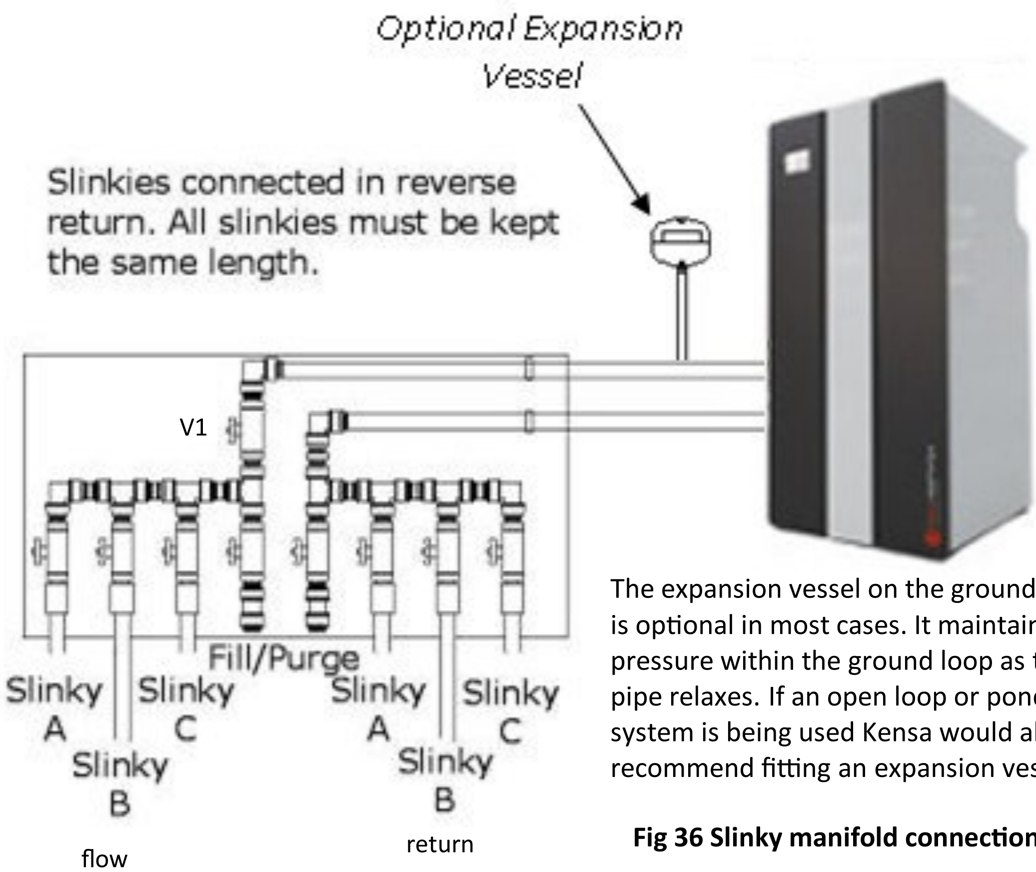


Fig 35 Slinky purging kit connected to a manifold



The expansion vessel on the ground side is optional in most cases. It maintains the pressure within the ground loop as the pipe relaxes. If an open loop or pond mat system is being used Kensa would always recommend fitting an expansion vessel

Fig 36 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 34) :-

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 37 Purging the Slinkies of Air

Fig 38 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 36). 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 36)

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.

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. 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.

If in doubt please watch the online video at the Kensa Heat Pumps Channel on Youtube or the website www.kensaheatpumps.com

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. If the level of water drops significantly 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 C6 MCB on the heat pump. (Note DO NOT TURN THE COMPRESSOR 32 or 25 amp 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.

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)

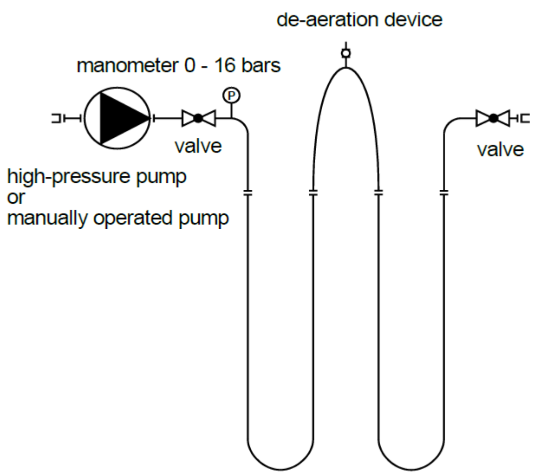


Fig 39 Leak Tightness Configuration

Test procedure in detail (Fig. 38):

- 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

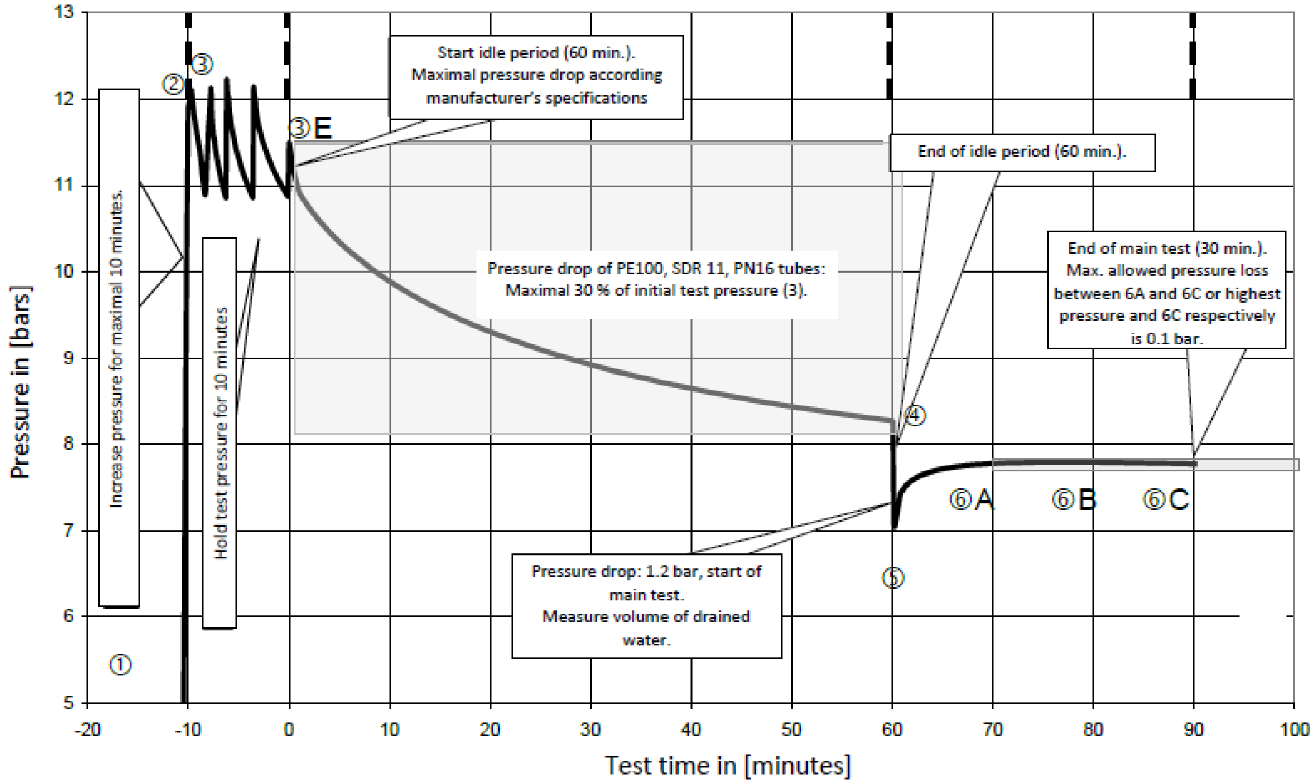


Fig 40 Graphical Test Procedure

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.

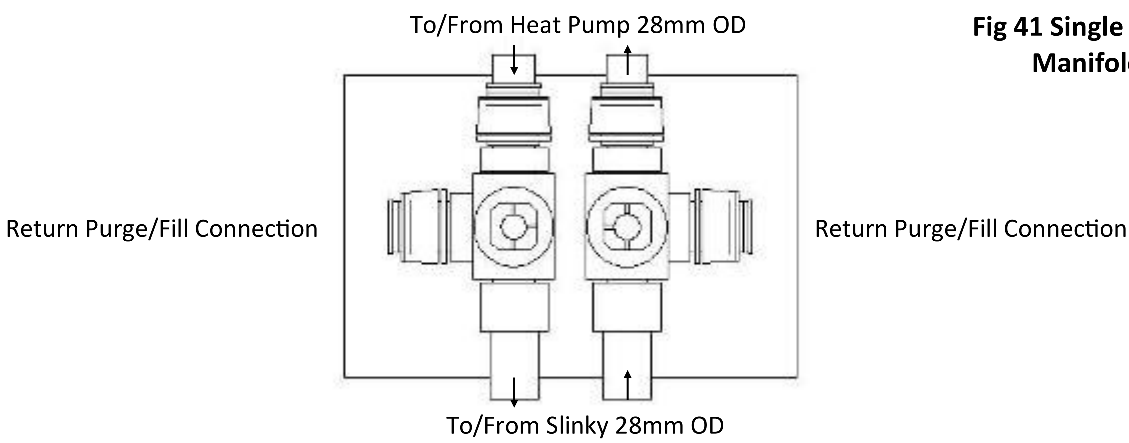


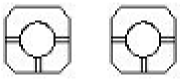
Fig 41 Single Slinky Manifold

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 39) 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 39 above. The purge ports can be connected either way round.

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.

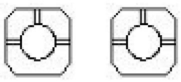
Fig 41 Purging the Slinky of Air

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 42 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.



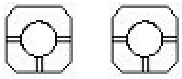
Both slinky connections are now closed. Purge ports open to heat pumps.

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

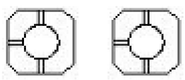
x. When the return pipe to the dustbin runs with clean water (after a few seconds) discharge this water to waste until the level in the dustbin is approx 200-250mm. **Do not uncover the suction pipe.**

xi. Place the return pipe back into the bin.

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

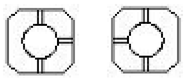
viii. With the purge pump running move the return valve to the position below to close off the return purge connection and pressurize the heat pump using the purge pump.

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 6 amp MCB on the heat pump. (Note DO NOT TURN THE COMPRESSOR 25 amp 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°C (minimum 22% by volume, Refractive Index 1.356). Concentrations below this could cause an 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.

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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 heat pump.
ii. Follow the manufacturer's procedures for purging the heating system.
iii. For any systems that involves cooling, antifreeze (minimum 22% by volume, Refractive Index 1.356) must be added to the distribution load side.

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

5.2 Reassembling and turning the Heat Pump on for the first time.

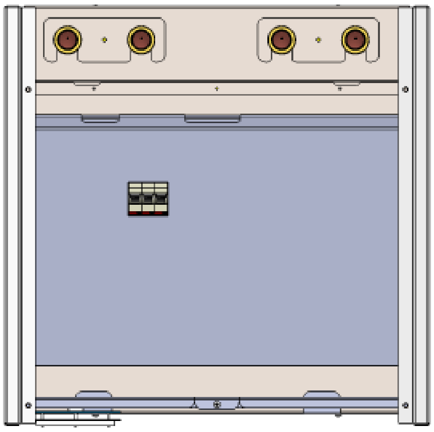
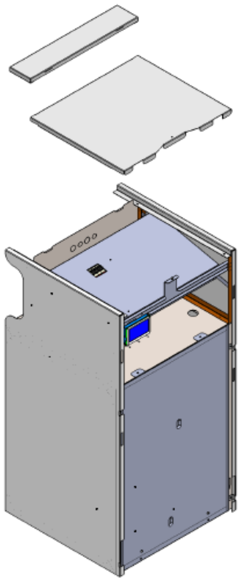


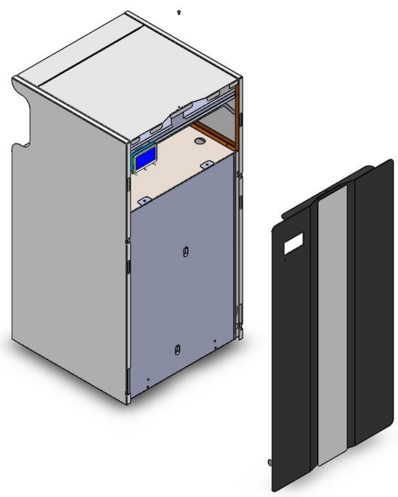
Fig 43 Evo with top panels removed and electronic cover fitted.

i. Ensure all tools and materials are removed from the inside of the unit.
ii. Reassembling is the reverse of disassembling the heat pump.
iii. Replace the electronics cover plate and secure by using the two M5 pozi-drive head screws on the front cover plate.
iv. Turn on the local power isolation switch.
v. Turn the C6 Amp MCB on to enable the controls and water pumps to operate. Operating this MCB should result in a change in pressure on the underfloor pressure gauge and indicates that the pump is operational. Shortly after operating this MCB, the ground pump contactor should engage. This will result in a change of pressure indicated on the ground array pressure and this indicates that the ground array water pump is operational. **DO NOT operate the compressor 32/25 amp MCB until Kensa Heat Pumps has been contacted and flow has been confirmed around the system.** Failure to do this will cause the unit to freeze and may invalidate the warranty.
vi. Using the controller check that the ground pressure reads at least 0.5 bar. If the pressure is lower than this, open the mains cold water supply valve (fitted outside the case) fully until the gauge reads at least 2 bar. Close the mains cold water supply valve fully.
vii. Check that the heating distribution system pressure reads at least 0.5 bar. If the pressure is lower than this, find the mains cold water supply valve and pressurize the system until the gauge reads at least 1.5 bar. Close the mains cold water supply valve fully.
viii. The controller display will read the temperature of the water returning from the heating system. If a low pressure error is displayed, then the heat pump will not run until both heating distribution and ground circuits are above 1.5 bar pressure.
ix. Once the pressures and flow has been confirmed by Kensa operate the 32/25 amp compressor MCB



x. Reposition the top panel(s)

Fig 44 Reassembling the top panels.



xi. Offer up the front panel and engage the bottom hooks into the main case. Pull up and magnetically attached the front panel.

Warning :- Care must be taken in replacing the front cover as the item is heavy. Do not place feet under the front cover.

Fig 45 Reassembling the front panel.

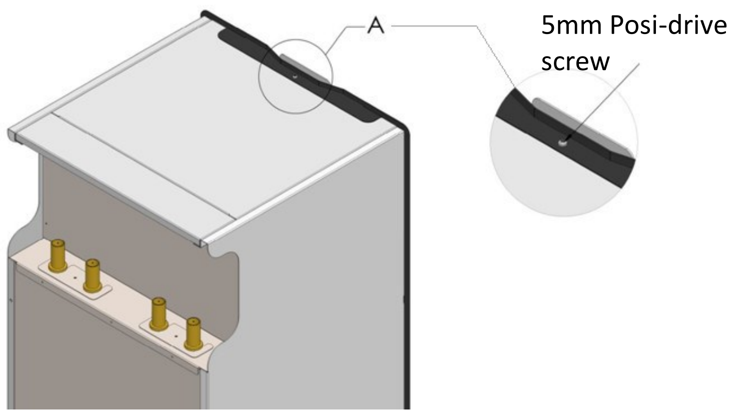


Fig 46 Reassembling the front cover screw

xii. Replace the single 5mm posi-drive screw as shown.

xiii. Program the heat pump controller and heating system control system ie. external timeclock / thermostat or underfloor control system.

xiv. 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.

6. Controller

The heat pump controller fitted to the heat pump has been especially designed for the application. It uses clear and concise language to indicate faults and uses a logical and intuitive menu structure providing trouble free commissioning. For the Evo heat pump the controller and heat pump settings are accessed via the display on the Evo.

For directions on how to commission the controller please refer to the Genesis Commissioning manual which is available using the QR code below or direct from Kensa.

QR Code for Genesis Commissioning Manual

QR Code for Evo Operational Manual

Before attempting Commissioning please refer to the Genesis Commissioning Manual.

7. Fault Finding

Error Code	Error Level	Error Message	Action
Blank display on software controller	No Error	No power supply	Check wall mounted electrical isolator switch or call electrician
		Controls MCB tripped	Call electrician to investigate cause
		There is no call from the time-clock or thermostat for heat pump operation	Programme time-clock according to manufacturer's instructions
		Dimmed display - No error	Display will wake up on touch
Compressor not running but display reading temperature near setpoint	No Error	Heat pump is up to temperature. T1 displayed is close to set point.	No fault
A1	Fault or Warning	Ground return temperature T5 is below the Heating Mode Anti-freeze Limit . For single or left hand compressors.	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. Compressor 1 will not operate until T5 rises above the lower limit and the fault has cleared to prevent heat exchanger damage.
A2	Fault or Warning	Ground return temperature T6 is below the Heating Mode Anti-freeze Limit For twin right hand compressors only.	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. Compressor 2 will not operate until T6 rises above the lower limit and the fault has cleared to prevent heat exchanger damage.
TPL:	Fault or Warning	Pressure in distribution side is below the low pressure load side limit. (P1)	Top up the load water pressure to clear error. Check water pressure setup, load side. The fault should clear by raising the pressure above 1.5 bar based on default values.
TPG	Fault or Warning	Pressure in ground side is below the low pressure ground side limit. (P2)	Top up the ground pressure to clear error. Check water pressure setup, ground side. The fault should clear by raising the pressure above 2 bar based on default values.
HP1	Fault	High refrigeration pressure in discharge gas pipe. (P5)	Check for flow restriction on load side - usually accompanied with FLH1 (FLC1 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1
HP2	Fault	High refrigeration pressure in discharge gas pipe. (P6) Twin compressor only	Check for flow restriction on load side - usually accompanied with FLH2 (FLC2 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1
DI5	Fault	High pressure Switch is open circuit.	Check for flow restriction on load side - usually accompanied with FLH1 (FLC1 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1
DI6	Fault	High pressure Switch is open circuit. (Twin Compressor Only)	Check for flow restriction on load side - usually accompanied with FLH2 (FLC2 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1
FLH1	Warning	Temperature differential T2-T1 (load temperature leaving the heat pump—low temperature entering the heat pump) is greater than low flow differential.	Check load pump speed Check load flow Check for flow restrictions in distribution system Check set low flow differentials
FLH2	Warning	Temperature differential T3-T1 (load temperature leaving the heat pump - load temperature entering the heat pump) is greater than low flow differential. (For twin compressors only)	Check load pump speed Check load flow Check for flow restrictions in distribution system Check set low flow differentials
FGH1	Warning	Temperature differential T4-T5 (Temperature of the thermal transfer fluid returning to the heat pump from the ground—Temperature of the thermal transfer fluid leaving the heat pump to the ground.) is greater than set point.	Check ground pump speed Check ground flow Check for flow restrictions on ground side Check set low flow differentials

Error Code	Error Level	Error Message	Action
FGH2	Warning	Temperature differential T4-T6 (Temperature of the thermal transfer fluid returning to the heat pump from the ground—Temperature of the thermal transfer fluid leaving the heat pump to the ground.(2nd compressor)) is greater than set point. (For twin compressors only)	Check ground pump speed Check ground flow Check for flow restrictions on ground side Check set low flow differentials
LP1	Fault	Low refrigeration pressure in suction gas pipe P3.	Check for flow restriction on ground side - usually accompanied with FGH1 (FGC1 if in cooling). Check Ground Anti-freeze limit, if T5 reading bellow the setpoint, unit might be frozen - allow heat pump to defrost - add correct anti-freeze quantity. This fault could briefly trigger LPS1 fault. Fault may occur on first run or unit has not run for a long time. Fault maybe caused by ground pump failure.
LP2	Fault	Low refrigeration pressure in suction gas pipe P4. (For twin compressors only)	Check for flow restriction on ground side - usually accompanied with FGH2 (FGC2 if in cooling). Check Ground Anti-freeze limit, if T6 reading bellow the setpoint, unit might be frozen - allow heat pump to defrost - add correct anti-freeze quantity. This fault could briefly trigger LPS2 fault. Fault may occur on first run or unit has not run for a long time. Fault maybe caused by ground pump failure.
LPS1	Fault	Refrigeration pressure is too low. P3	Fault may occur on units stored in a cold environment before installation and first run. If accompanied with LP1 follow action in LP1 section. Potential loss of refrigerant, refer to Kensa Technical Support Department.
LPS2	Fault	Refrigeration pressure is too low. (For twin compressors only) P4	Fault may occur on units stored in a cold environment before installation and first run. If accompanied with LP2 follow action in LP2 section. Potential loss of refrigerant, refer to Kensa Technical Support Department.
HTPL	Fault	Pressure in distribution side exceeds the high pressure load side limit. P1	Release pressure to clear error– check Water Pressures in commissioning mode. (Load side)
HTPG	Fault	Pressure in ground side exceeds the high pressure ground side limit. P2	Release pressure to clear error– check Water Pressures in commissioning mode. (Ground side)
DHT1	Fault or Warning	Refrigerant temperature T7 in discharge gas pipe exceeds the allowable high limit (set at the factory)	Error may occur if compressor is over heating - accompanied with HP1. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.
DHT2	Fault or Warning	Gas temperature T8 in discharge gas pipe exceeds the allowable high limit (set at the factory)	Error may occur if compressor is over heating - accompanied with HP2. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.
HGT1	Fault or Warning	Ground return temperature T5 is higher than Cooling Mode Upper Limit.	Check Ground Cooling Mode Upper Limit settings. Ensure adequate flow in ground side. Error maybe caused by ground pump failure. Compressor 1 will not run until T5 falls below the upper limit and the fault has cleared.
HGT2	Fault or Warning	Ground return temperature T6 is higher than Cooling Mode Upper Limit. (Twin Compressor only)	Check Ground Cooling Mode Upper Limit settings. Ensure adequate flow in ground side. Error maybe caused by ground pump failure. Compressor 2 will not run until T6 falls below the upper limit and the fault has cleared.
FLC1	Warning	Temperature differential T1-T2 (load temperature entering the heat pump—load temperature leaving the heat pump) is greater than low flow differential. (Cooling applications only)	Check load pump speed Check load flow Check for flow restrictions in distribution system Check set low flow differentials (Cooling)
FLC2	Warning	Temperature differential T1-T3 (load temperature entering the heat pump—load temperature leaving the heat pump (2nd compressor)) is greater than low flow differential. (Cooling applications and twin compressors only)	Check load pump speed Check load flow Check for flow restrictions in distribution system Check set low flow differentials (Cooling)

Error Code	Error Level	Error Message	Action
FGC1	Warning	Temperature differential T5-T4 (Temperature of the thermal transfer fluid leaving the heat pump to the ground—Temperature of the thermal transfer fluid returning to the heat pump from the ground.) is greater than set point. (Cooling applications only)	Check ground pump speed Check ground flow Check for flow restrictions on ground side Check set low flow differentials (Cooling)
FGC2	Warning	Temperature differential T6-T4 (Temperature of the thermal transfer fluid leaving the heat pump to the ground—Temperature of the thermal transfer fluid returning to the heat pump from the ground.(2nd compressor) is greater than set point.(Cooling applications only)	Check ground pump speed Check ground flow Check for flow restrictions on ground side Check set low flow differentials
HV	Fault	Supplied voltage is greater than high voltage limit.	Call electrician to investigate cause
LV	Fault	Supplied voltage is less than low voltage limit.	Call electrician to investigate cause
DHWER	Warning	Heat pump has been operating in DHW mode for longer than designated time.	Hot water demand might be too high Check DHW Excessive running time setting in commissioning.
HCE	Fault	Simultaneous call for Heating and Cooling.	Check time clock operation on both cooling and heating systems. Refer to Kensa Technical department
SSFC	Fault	Soft Start Fault	Check soft start fault code list. Refer to Kensa Technical department
E1	Fault	T1 Temperature Probe Error	T1 (load return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E2	Fault	T2 Temperature Probe Error	T2 (flow return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E3	Fault	T3 Temperature Probe Error	T3 (flow twin return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E4	Fault	T4 Temperature Probe Error	T4 (ground flow) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E5	Fault	T5 Temperature Probe Error	T5 (ground return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E6	Fault	T6 Temperature Probe Error	T6 (ground twin return) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E7	Fault	T7 Temperature Probe Error	T7 (discharge pipe) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E8	Fault	T8 Temperature Probe Error	T8 (discharge twin pipe) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
E9	Fault	T9 Temperature Probe Error	T9 (weather compensation) temperature probe is faulty or disconnected. Refer to Kensa Technical Department.
S1	Fault	P1 Pressure Sensor Error.	P1 (load side) pressure sensor is faulty or disconnected. Refer to Kensa Technical Department.
S2	Fault	P2 Pressure Sensor Error.	P2 (ground side) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.
S3	Fault	P3 Pressure Sensor Error.	P3 (suction pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.
S4	Fault	P4 Pressure Sensor Error. (Twin Compressor Only)	P4 (suction twin pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.
S5	Fault	P5 Pressure Sensor Error.	P5 (discharge pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.
S6	Fault	P6 Pressure Sensor Error. (Twin Compressor Only)	P6 (discharge twin pipe) pressure sensor is faulty or disconnected. Refer to Kensa Technical Support Department.

7.1. Flashing Lights Code

Position of light (left to right)	Colour	Status	Description
1	Green	Solid	Heat pump controls are powered
2	Yellow	Solid	Space heating—zone 1
2	Yellow	Flashing	Space heating—zone 2
3	White	Solid	Domestic hot water mode
3	Blue	Flashing	Access Point connection is open
3	White & Blue	Both Flashing	Function test mode
4	Red	Number of flashes represent error code	Number of flashes represent error code below.

LED flashes	Error	Action
0	Clear	None
1	A1: Antifreeze limit (Heating)	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. Compressor 1 will not operate until T5 rises above the lower limit and the fault has cleared to prevent heat exchanger damage.
2	A2: Antifreeze limit (Heating)	Check Ground Temperature settings - ensure adequate flow in ground side. Error maybe caused by ground pump failure. Check Antifreeze concentration. Compressor 2 will not operate until T6 rises above the lower limit and the fault has cleared to prevent heat exchanger damage.
3	TPG: Low Ground Pressure	Top up the ground pressure to clear error. Check water pressure setup, ground side. The fault should clear by raising the pressure above 2 bar based on default values.
4	TPL: Low Load Pressure	Top up the load water pressure to clear error. Check water pressure setup, load side. The fault should clear by raising the pressure above 1.5 bar based on default values.
5	HP1: High Gas Pressure	Check for flow restriction on load side - usually accompanied with FLH1 (FLC1 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1
6	HP2: High Gas Pressure	Check for flow restriction on load side - usually accompanied with FLH2 (FLC2 if in cooling). Fault maybe caused by load pump failure. Check for temperature probe failure E1
7	LP1: Low Gas Pressure	Check for flow restriction on ground side - usually accompanied with FGH1 (FGC1 if in cooling). Check Ground Anti-freeze limit, if T5 reading bellow the setpoint, unit might be frozen - allow heat pump to defrost - add correct anti-freeze quantity. This fault could briefly trigger LPS1 fault. Fault may occur on first run or unit has not run for a long time. Fault maybe caused by ground pump failure.
8	LP2: Low Gas Pressure	Check for flow restriction on ground side - usually accompanied with FGH2 (FGC2 if in cooling). Check Ground Anti-freeze limit, if T6 reading bellow the setpoint, unit might be frozen - allow heat pump to defrost - add correct anti-freeze quantity. This fault could briefly trigger LPS2 fault. Fault may occur on first run or unit has not run for a long time. Fault maybe caused by ground pump failure.
9	DHT1: High Discharge Temp	Error may occur if compressor is over heating - accompanied with HP1. Evaporating temperature might be too high. Refer to Kensa Technical Support Department.
10	DHT2: High Discharge Temp	Error may occur if compressor is over heating - accompanied with HP2. Evaporating tempera-

Note—The errors will be repeated on the display for the Evos

8. Warranty

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

8.1 Terms and Conditions.

8.1.1 Persons covered by the Warranty

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

8.1.2 Validity period of the Warranty

The warrantee 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.

8.1.3 Scope

Kensa Heat Pumps Ltd warrants to the original purchaser ("Buyer") that all parts ("Parts") of the Kensa Evo 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 Evo 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.

8.1.4 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

8.1.5 Care of Duty

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

8.1.6 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.

8.1.7 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.

9. Heat Pump Settings Sheet

General Installation		
Serial Number		
Visual Inspection		
Feet level on floor		
Visual check of site wiring		
Software operating		
Software errors		
Heating Status		
Type of heating		
No of Manifolds		
Any UFH water pumps		
Control philosophy		
Ground Array		
Type of ground arrays		
Number and length		
Depth and width of trenches		
Array Separation		
Ground Arrays purged and flushed	Yes / No	
Ground Arrays Clear of debris	Yes / No	
Ground arrays leak tested according to BS805 Section 11.3.3.4	Yes / No	
Type of Purge Pump Used		
Antifreeze quantity		
Antifreeze concentration	Sample 1	Sample 2
Heat Pump Settings		
Temperatures		
T1 Load Return Temperature		
T2 / T3 Load Flow Temperature	/	
T4 Ground Return Temperature		
T5 / T6 Ground Flow Temperature	/	
T7 / T8 Discharge Pipe Temperature	/	
T9 Weather Compensation Set point		
Weather Compensation Multiplier		
Weather Compensation Maxi Variation		

Water Temperature Set Points	
Heating / Cooling Set Point	
2nd Heating Set Point	
Anti Freeze Temperature Limit	
Ground Upper Limit (Cooling)	
Heat Pump Pressures	
P2 Current Ground Water Pressure	
P1 Current Load Water Pressure	
P3 / P4 Suction Pressure	/
P5 / P6 Discharge Pressure	/
Internal Water Pumps	
Operational Speed % (Load/Ground)	/
Set Back Speed % (Load/Ground)	/
Exercise Mode	Enabled / Disabled
Real Time Pump Performance (Load/ Ground)	/
Compressor Performance	
Compressor COP	
Run Hours (Comp 1 / Comp 2)	/
Input Voltage	
Input Voltage	
Domestic Hot Water	
Lock Out (Minimum Stopping Time)	
Excessive Running Time	
Cut Out (Comp 1 / Comp 2)	/
External Immersion DHW Heater	Enabled / Disabled
Duration / Run Time After DHW	
Pasteurisation	Enabled / Disabled
Duration	
Frequency	
Supplementary Heat	
Supplementary Heat	Enabled / Disabled
Cut in Frequency	
Cut in Differential	
Cut Out Differential	

Introduction
Safety information
General product information
Installation
Mechanical installation
Electrical installation
Mechanical set to run
Controller
Fault Finding
Warranty
Heat Pump settings sheet

Low Flow Differentials	
Load Side ΔT (Heating / Cooling)	/
Ground Side ΔT (Heating and Cooling)	/
Pressure Fault Settings	
Ground Side	
Load Side	
Passive Cooling	
Passive Cooling	Enabled / Disabled
Active Cooling	
Active Cooling	Enabled / Disabled
Antifreeze Concentration Load Side	

Heat Pump Left In Good Working Order	

Demonstration and Handover of Heat Pump Completed	

Client Sign Off	
Date :-	

Comments:

Installed by:-

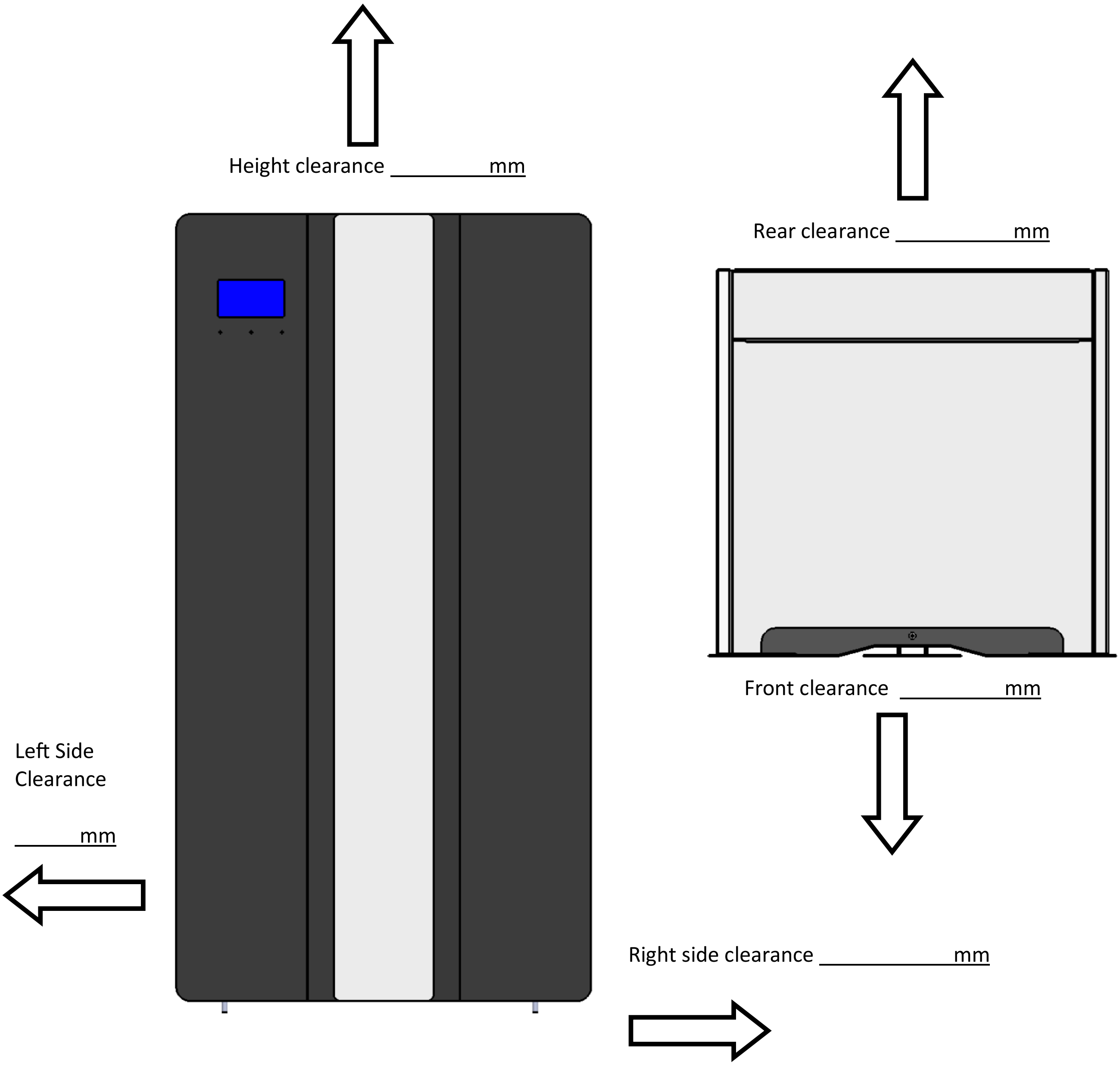
Date:-

Tel:-

Kensa Heat Pumps
A KENSA GROUP COMPANY

10. Pre-Site Visit Assessment Form

In the unlikely event that a site visit is required for warranty work and is agreed with Kensa Technical Department, the following sheet should be completed and returned to Kensa prior to the site visit.



Site Details

Name:
Address:

KR Number:

Contact Number:

Parking?	Yes / No
Power Supply available?	Yes / No
Electrical Isolation Present?	Yes / No
Fluid Isolation (Ground)?	Yes / No
Fluid Isolation (Load)?	Yes / No

Please note any other access or site constraints in detail or provide a diagram ____________
____
____
____

Kensa Heat Pumps
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