

Grant Aeronair Air Source Heat Pump

Air to Water Heat Pump Range

Installation & User Instructions



Tested to BS EN 14511

Part No. DOC.87 Rev.00 January 2010



STOP!

Before continuing with the installation of your new Aerona Heat pump, please spend a few minutes confirming the suitability of the Heat Pump to your system. Failure to do so may result in poor performance and wasted time.

- Has a heat loss calculation been carried out? kW
- Is this system designed for Mono or Bivalent
.....
- If Mono, total heating capacity? kW
- If Bivalent, what is the load capacity of Heat Pump? kW
- If Bivalent, what is/are additional heat source(s)?
 - i) kW
 - ii) kW
 - iii) kW
- Type of system design?
 - i) S-plan
 - ii) Y-plan
 - iii) Other
- Will a buffer be used? Yes/No
- If yes, what is the capacity of Buffer? litres
- Has cavity wall insulation been installed? Yes/No
- Has loft insulation of 270mm been installed? Yes/No
- Have all system pipes been lagged correctly? Yes/No
- Are the existing controls being upgraded? Yes/No

If any of the above questions cannot be answered accurately, please do **NOT** proceed with the installation. While any errors made now may be able to be compensated for after the installation is completed, you will incur unnecessary delays and additional costs.

Legislation

All work that is required regarding the refrigerant circuit must be carried out by an F-gas registered (or equivalent) refrigeration Engineer. On no account should maintenance or repair be carried out on the refrigerant circuit by unqualified personnel.

Information regarding the refrigerant used in this Heat Pump. R407c

R407C is a mixture of three refrigerants, each of which boil at different temperatures. R407C has a range or glide of approximately 5°C. The lubricating oils used in this heat pump are known as Polyolester or POE oils. They are considered to be superior oils, less liable to breakdown however they are more hygroscopic – they must therefore be kept from contact with air as far as is practical.

Information regarding the charging / recharging of the unit.

Always add R407C as a liquid to ensure that the correct mix is added.

Charge the heat pump with the correct weight of refrigerant. See data plate for this information.

Never 'top-up' refrigerant. Always recover the remaining refrigerant first for recycling.

Information regarding a refrigerant leak or if the circuit is opened accidentally.

Recover the remaining refrigerant as quickly as possible for recycling.

Avoid entry of air into the heat pump as much as possible.

Replace or install a drier if necessary.

LEGISLATION

The installation of the Grant Aerona Heat Pump requires a power supply cable from the customer's consumer unit to an external isolation switch and from this switch to the heat pump. It will require a final connection to an individual MCB or RHBO within the existing consumer unit or from a newly installed consumer unit.

This work MUST be carried out by a qualified electrician or by a Part-P competent installer who has passed an examination proving their competency in these works.

Failure to follow this legislation will invalidate all warranties.

Please seek advice from a competent person before commencing any electrical work.

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1 Introduction & General Information

1.1 General Information

The Grant Aerona Heat Pump is a low water content – low temperature heat source, designed to be highly efficient when installed and used in line with these installation and user instructions.

It is important that these installation instructions are understood and followed to ensure reliable operation in all weather conditions. Failure to do so will result in erratic temperature swings, poor efficiency and an unhappy customer.

It is not within the scope of this manual to design the heating system or provide any advice regarding the layout of the system or any of the controls required for any individual heating system.

These instructions do not replace the installation or users manuals for any additional components used in the design of your system e.g. cylinders, motorised valves, programmers, solar thermal devices, buffers, etc.

Grant Engineering UK Ltd offer a design service for an additional fee – please contact info@grantuk.com for more information or visit our website at www.grantuk.com Note: this service is subject to the terms and conditions in force at the time of the design.

These instructions must be left with the householder for their reference.

1.2 Warranty

This appliance is guaranteed for two years, covering parts and labour. When making a claim against this warranty, the following information must be provided at the initial point of contact.

- Appliance model number
- Appliance Serial number
- Date of Installation
- Date of Commissioning (if different)
- Evidence of Heat Loss calculation

- Description of fault together with any relevant fault codes

Please ensure that the caller is on site to assist us in providing a fast response.

The warranty will begin only when a completed registration card is returned to Grant, or when the registration is completed online at www.grantuk.com. Failure to complete the registration at the time of installation will result in the warranty being suspended. This does not affect the consumer's statutory rights.

If a Grant Engineer is required to visit the site and no fault is found with the heat pump, a charge will be made for this visit. The original caller will be responsible for this charge.

Refer to Section 17 for full details of the Grant Heat Pump warranty.

1.3 Important Advice

1. It is essential that the full layout of the system is understood before the installation of any component is undertaken. If you are in any doubt, please stop and seek advice from a qualified heating engineer or from Grant Engineering UK Ltd. Please note that Grant Engineering will not be able to offer specific advice about your system unless we designed it. In this case, we will always refer you to seek the advice of a qualified system designer.
2. The Heat Pump must be installed and commissioned in accordance with these installation instructions. Deviations of any kind will invalidate the warranty and may cause an unsafe situation to occur. Please seek advice from Grant Engineering UK Ltd if any of these installation instructions cannot be followed for whatever reason.

3. The heat pump contains high pressures and high temperatures during normal working conditions. Care must be taken when accessing the internal workings of the heat pump.
4. The heat pump contains an electrically driven fan which rotates at high speed. Disconnect the heat pump from the electrical supply before removing the top cover.

1.4 Immersion Heater

All Grant Aerona Heat pumps are supplied with a factory fitted 3kW immersion element. This is designed to operate at low ambient air temperatures to increase the output of the unit to meet the design heat load. Refer to Section 11 of these instructions for details of the automatic operation of the immersion element.

If required, all Grant Aerona Heat pumps are available with a 6kW back-up immersion element (in place of the standard 3kW unit).

This is a factory fitted option ONLY and must be specified when ordering the heat pump.

For the starting and running current, along with the required MCB rating/type for units with either the 3kW or 6kW immersion elements refer to Section 8 (page 21) of these instructions.

IMPORTANT

Grant Aerona heat pumps should be stored and transported in an upright position. If not, the heat pump MUST be positioned in an upright position for at least 4 hours before being operated.

2 Specifications and Controls

2.1 Specifications

Model		HPAW65	HPAW85	HPAW110	HPAW130	HPAW155
Heating Capacity	kW	6.78	8.73	11.32	12.58	15.5
Input Power	kW	1.62	2.20	2.61	2.59	2.77
Running Current	A	7.36	10.0	11.7	11.8	12.6
Power supply	V	230	230	230	230	230
Phase		Single	Single	Single	Single	Single
Frequency	Hz	50	50	50	50	50
Mechanical Protection		IP X4	IP X4	IP X4	IP X4	IP X4
Refrigerant		R407c	R407c	R407c	R407c	R407c
Mass of R407c	g	1300	1750	1900	2200	2300
Built In Immersion	kW	3	3	3	3	3
Circulating Pump	m head	6	6	6	6	15
Flow Rate	litres/sec	0.311	0.422	0.54	0.61	0.724
Sound Level at 1m	dB(A)	52	52	52	52	58
Water Connections	BSPF	3/4"	3/4"	1"	1"	1"
COP @ Air 7°C/Water 35°C		4.1	3.9	4.3	4.8	5.8
Weight (empty)	kg	94	115	138	152	172
Weight (full)	kg	111	134	156	170	191

2.2 Dimensions

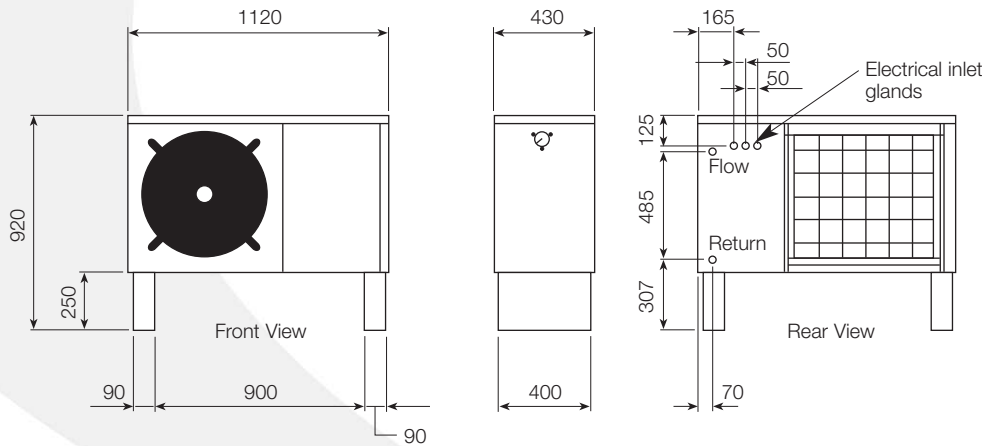


Figure 2-1: HPAW65 model

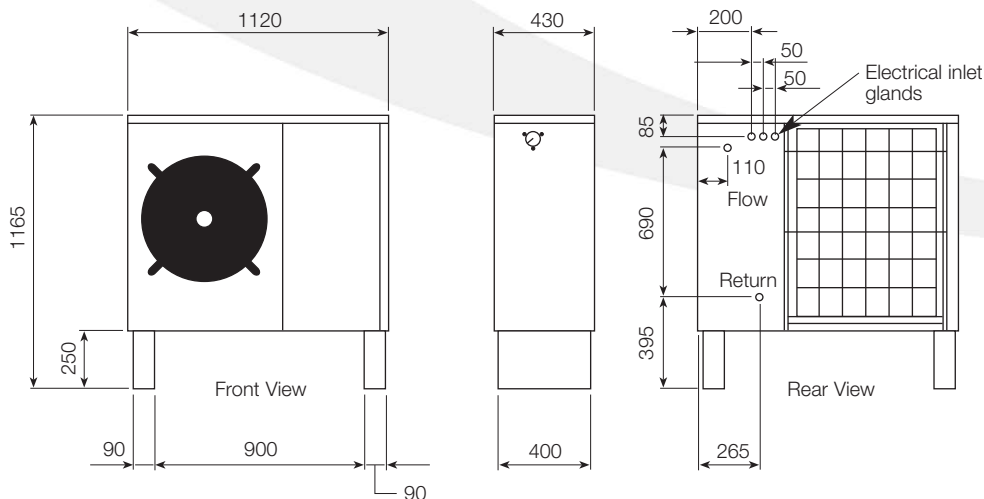


Figure 2-2: HPAW85, HPAW110 & HPAW130 models

2.2 Dimensions

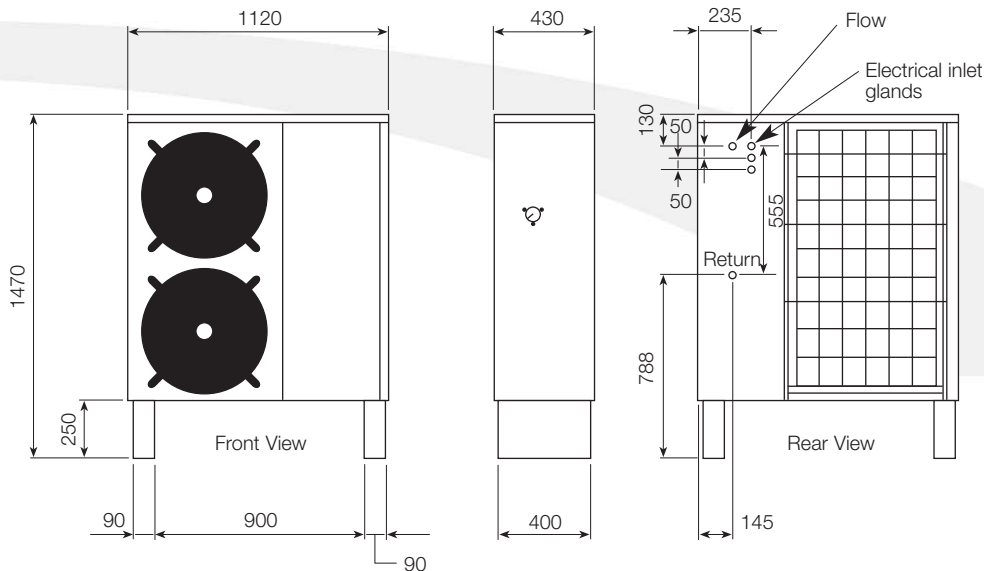


Figure 2-3: HPAW155 model

2.3 Main Components

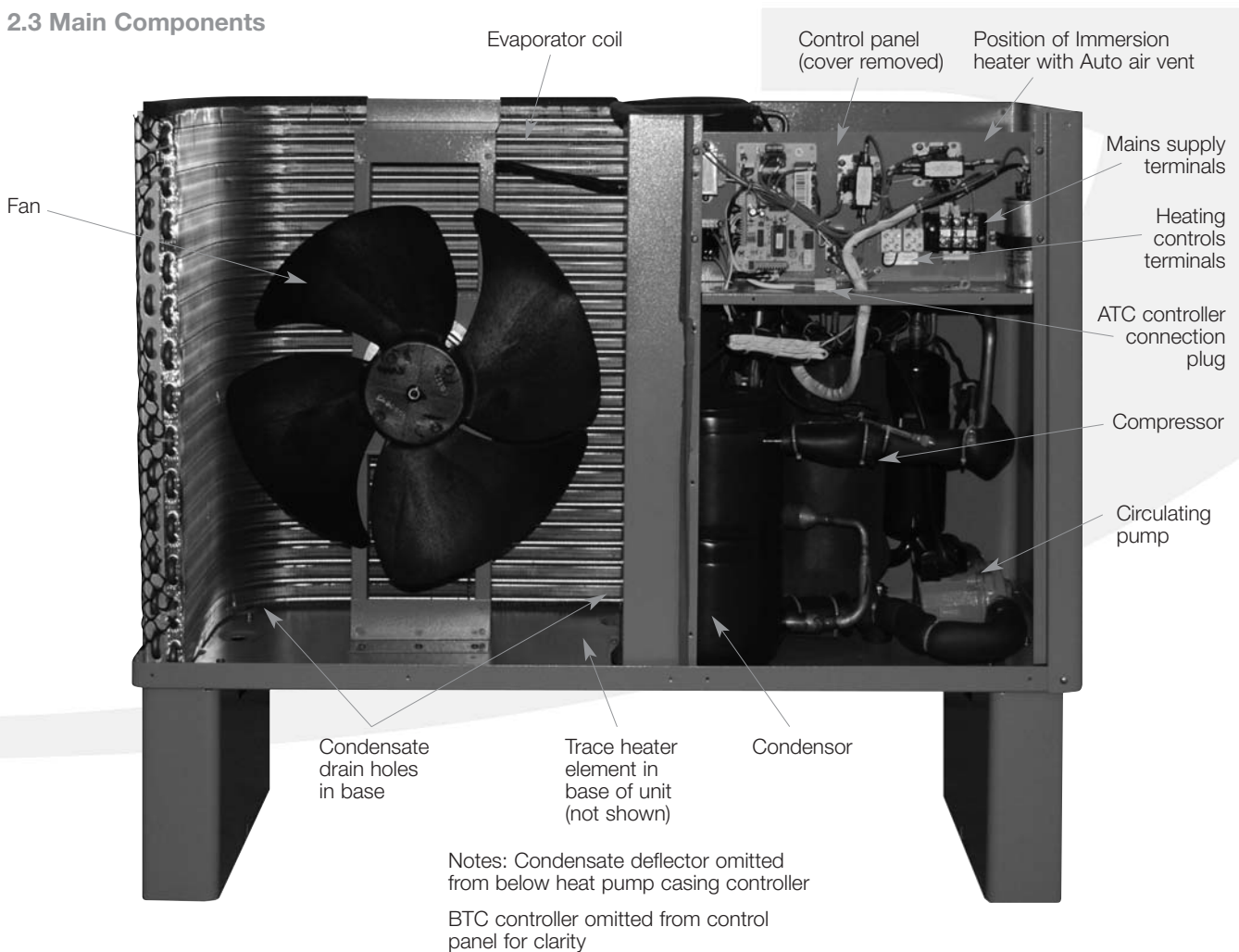


Figure 2-4: Main internal components

2 Specifications and Controls

2.4 Heat Pump Curves

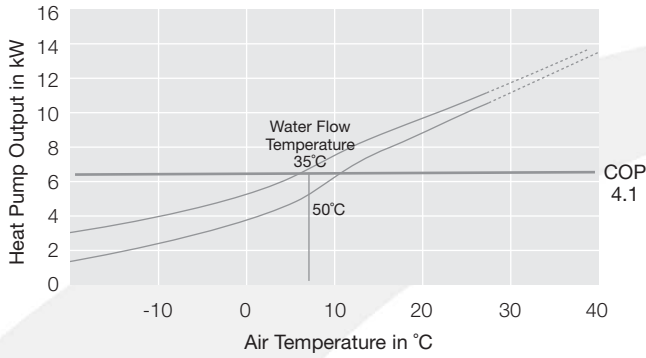


Figure 2-5: Grant HPAW65

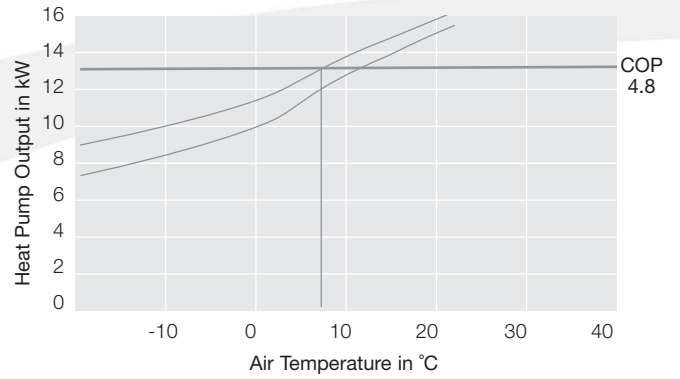


Figure 2-8: Grant HPAW130

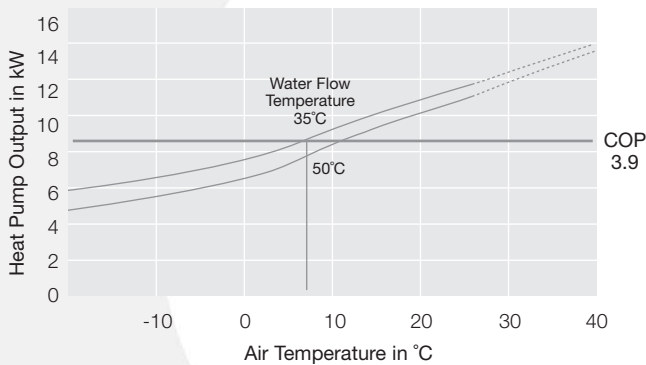


Figure 2-6: Grant HPAW85

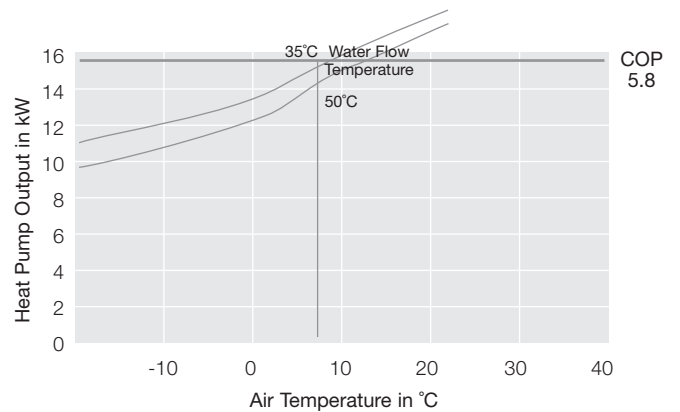


Figure 2-9: Grant HPAW155

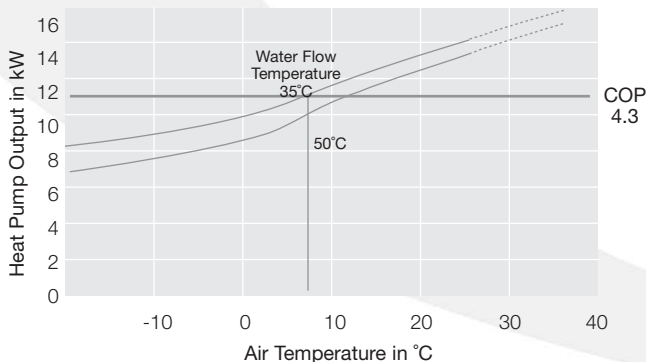


Figure 2-7: Grant HPAW110

! NOTE

All Grant Aerona heat pumps have been independently third party tested to BS EN 14511. The COP data given above is based on 7°C ambient air and 35°C water temperature. This information should be used as guidance only and **not** to estimate the COP at other temperatures.

2.5 Pump Curves

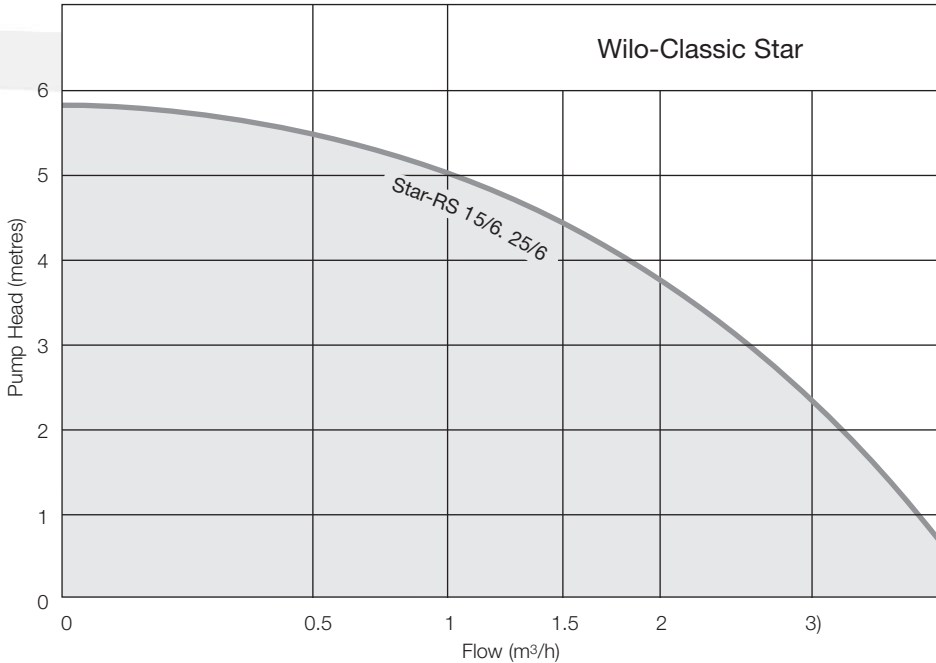


Figure 2-10: Pump curve for HPAW65, HPAW85, HPAW110 & HPAW130

15.5kW Pump Curve

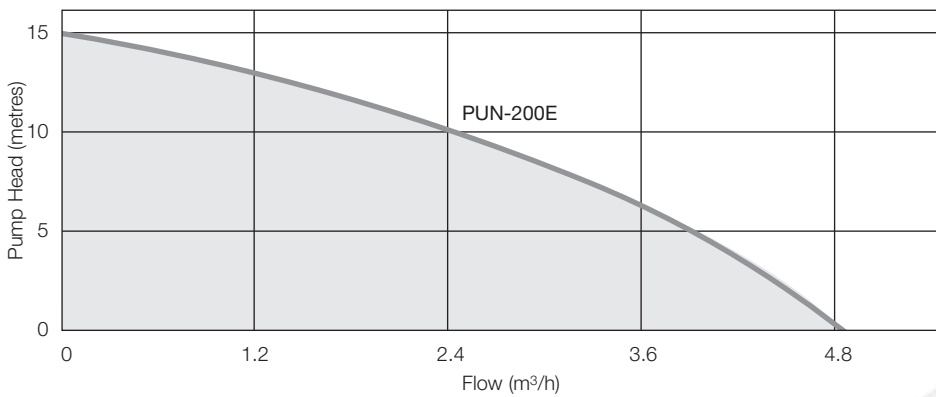


Figure 2-11: Pump curve for HPAW155

2.6 Heat Pump Operating Sequences

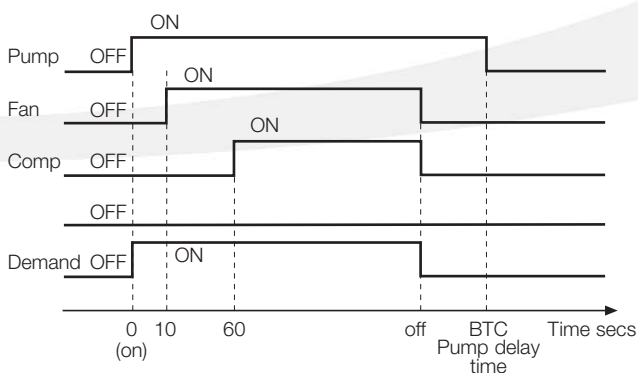


Figure 2-12: Normal operating sequence

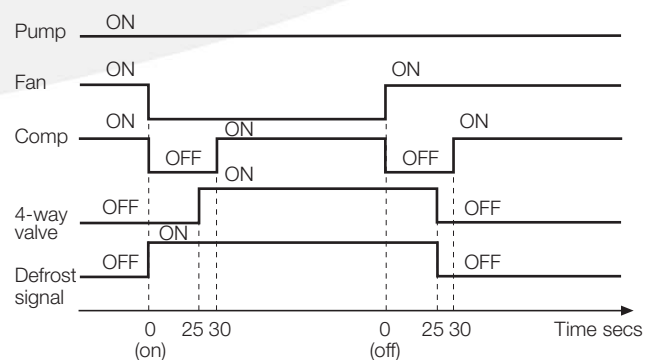


Figure 2-13: Defrost cycle

2 Specifications and Controls

2.7 Controls

All Grant Aeron Heat Pumps are supplied with 2 controllers. 1 x heat pump controller (ATC) and 1 x temperature controller (BTC).

The ATC is positioned inside the house/building and is normally used in an automatic condition. There are a few parameters that can be adjusted including time and maximum water temperature. The details of these settings can be found in Section 11 of this manual.

The BTC is a split temperature controller located inside the heat pump. For many installations, the DHW temperature and the CH temperature will be different. The BTC allows for 2 different design temperatures to be entered, maximising the efficiency of the Grant Aeron heat pump. The details of these settings can be found in Section 11 of this manual.

All other controls (programmers, motorised valves, thermostats, etc) are not supplied but their use is covered in Sections 4 and 8 of this installation manual.

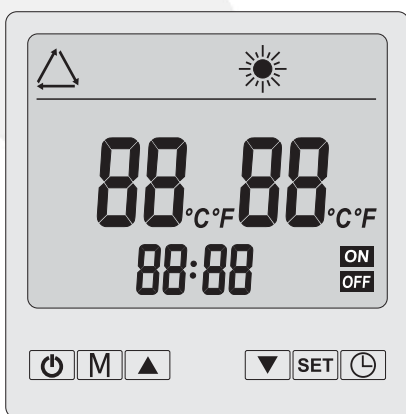


Figure 2-11: ATC Controller

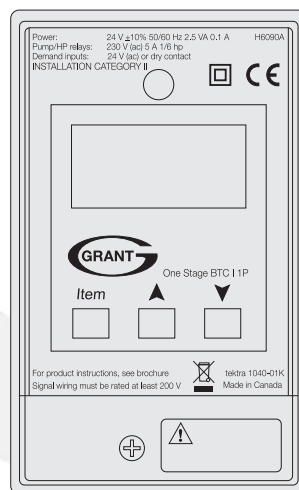


Figure 2-12: BTC Controller

3 Siting the Heat Pump

3.1 Position

1. Base

The heat pump should be installed on a flat trowelled finished concrete base 150mm thick. This base should extend at least 100mm beyond the unit on three sides. The edge of the concrete base on the side closest to the building should be flush with that face of the heat pump. Refer to Figure 3-1.

To avoid bridging the DPC, leave a gap of at least 300mm between the concrete base and the wall of the house.

The Underside of the heat pump is fitted with a condensate deflector that directs the condensate to the rear of the unit. To allow this condensate to safely drain away, there should be a shallow trench at least 150mm wide, filled with stone chippings, along the rear edge of the concrete base. This trench can extend across the gap between the concrete base and the house (minimum distance 300mm) but the chippings must be below the building DPC level.

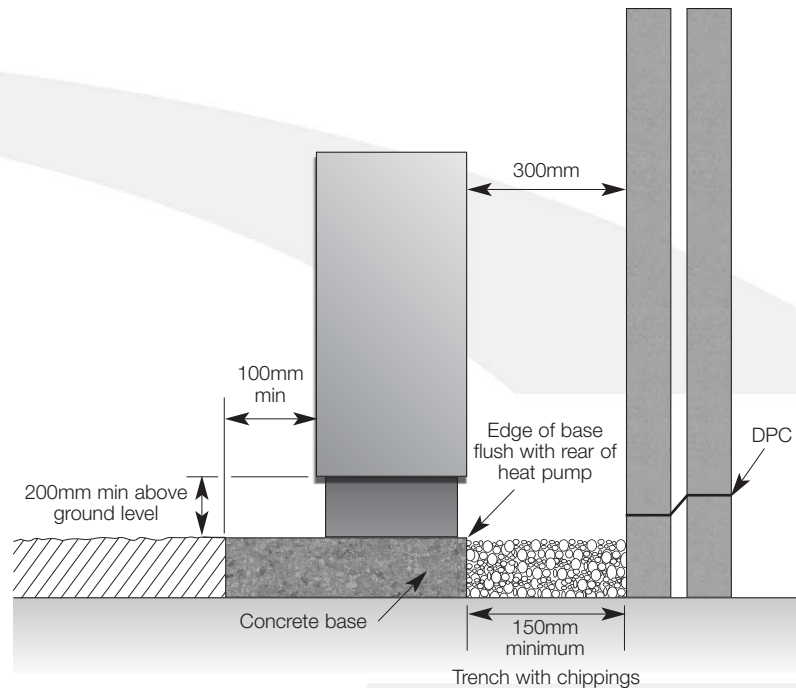


Figure 3-1: Installation details

IMPORTANT

It is essential that the condensate is able to drain away and not allowed to run onto any adjacent paths or driveways where, in winter, this will result in icing and a potential hazard for anyone walking near the heat pump.

The top of the concrete base must be either level with, or above, the surrounding ground level. Always ensure at least 200mm vertical clearance between the surrounding ground level and the underside of the heat pump to allow for adequate air movement. Refer to Figure 3-1 for details.

2. Clearances

The Heat pump should have a minimum of 300mm from the rear of the unit to any wall and not have any obstruction within 1000mm from the front or either side of the unit. Do not rest objects on top or against any part of the heat pump under any circumstances. Do not insert **objects into the fan guard**.

3. Noise Level

All heat pumps make a noise. Discuss the potential nuisance factor with the end-user when considering the final position of the heat pump. Take opening windows and doors into account. It is not essential for the heat pump to be positioned next to a wall of the house. Behind an out-building may be more suitable so discuss the options with the end-user.

4. Insulation

Remember, all pipe work, irrespective of length, must be well insulated to prevent heat loss. The use of barrier plastic pipe together with double thick insulation is strongly recommended, particularly when considering longer pipe runs.

3 Siting the Heat Pump

3.2 Orientation

The North face of a building will usually have colder ambient air than any other side. To ensure maximum efficiency from the Grant Aeron heat pump, position the unit on a warmer side. In order of preference, site the unit on a South face followed by either South East or South West, then by East or West. Only install on a North face if there is no other alternative.

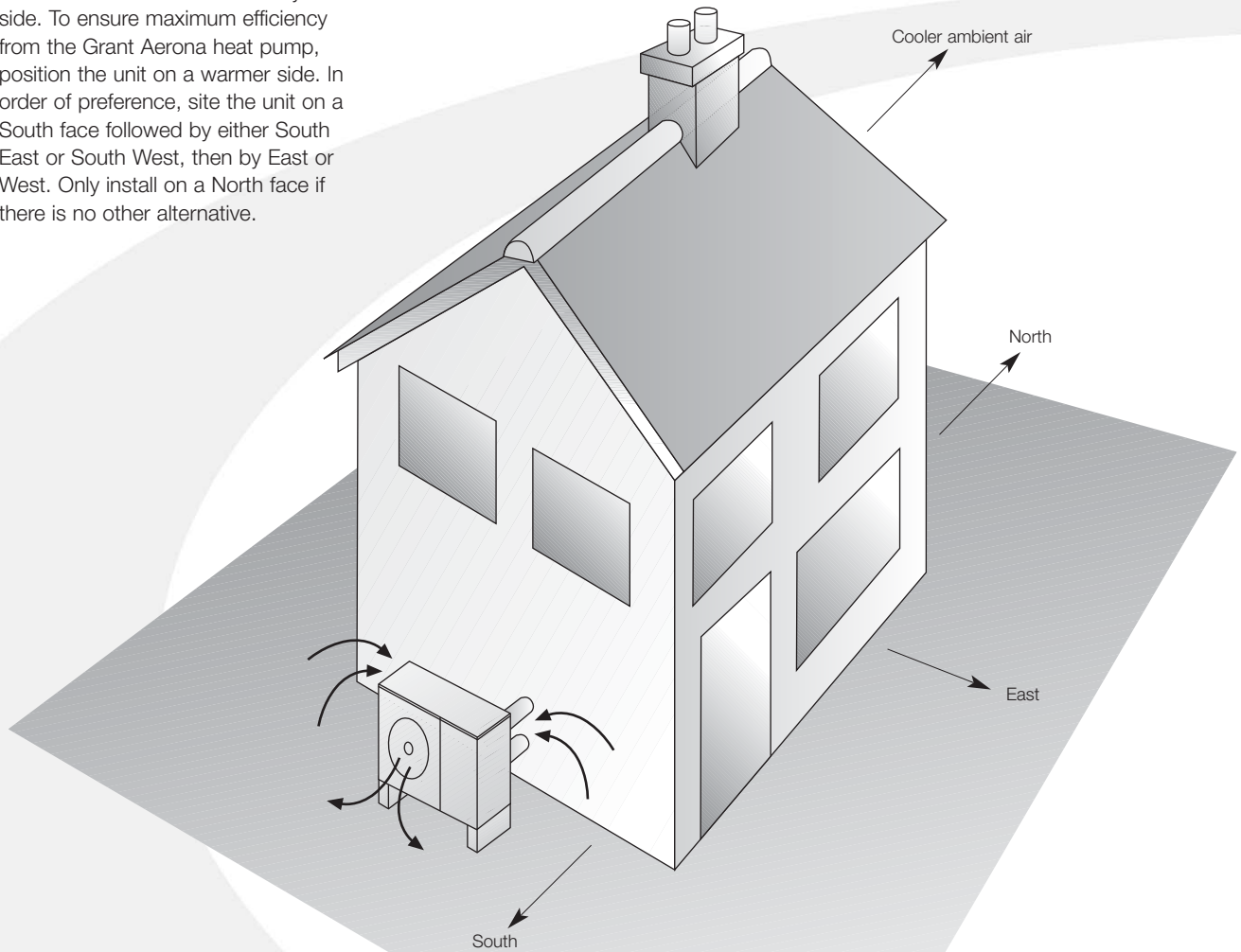


Figure 3-2: Location of air source heat pump

4 Hydraulic Diagrams

IMPORTANT

The following system diagrams are only concept drawings and not detailed engineering drawings. They are not intended to describe complete systems, nor any particular system.

It is the responsibility of the system designer, not Grant Engineering UK Ltd., to determine the necessary components for and configuration of the particular system being designed including any additional equipment and safety devices to ensure compliance with building and safety code requirements.

The following are examples of suitable systems

4.1 S-Plan Type - Monovalent

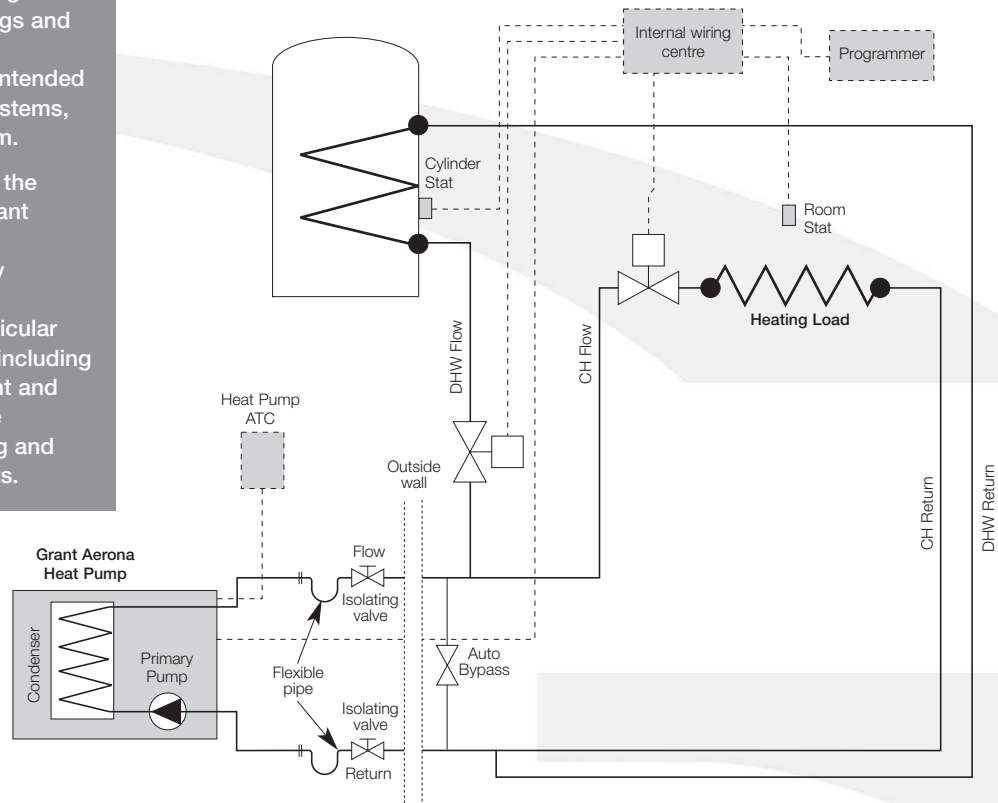


Figure 4-1: Monovalent system - with S-Plan type controls

4.2 Extended S-Plan Type - Monovalent

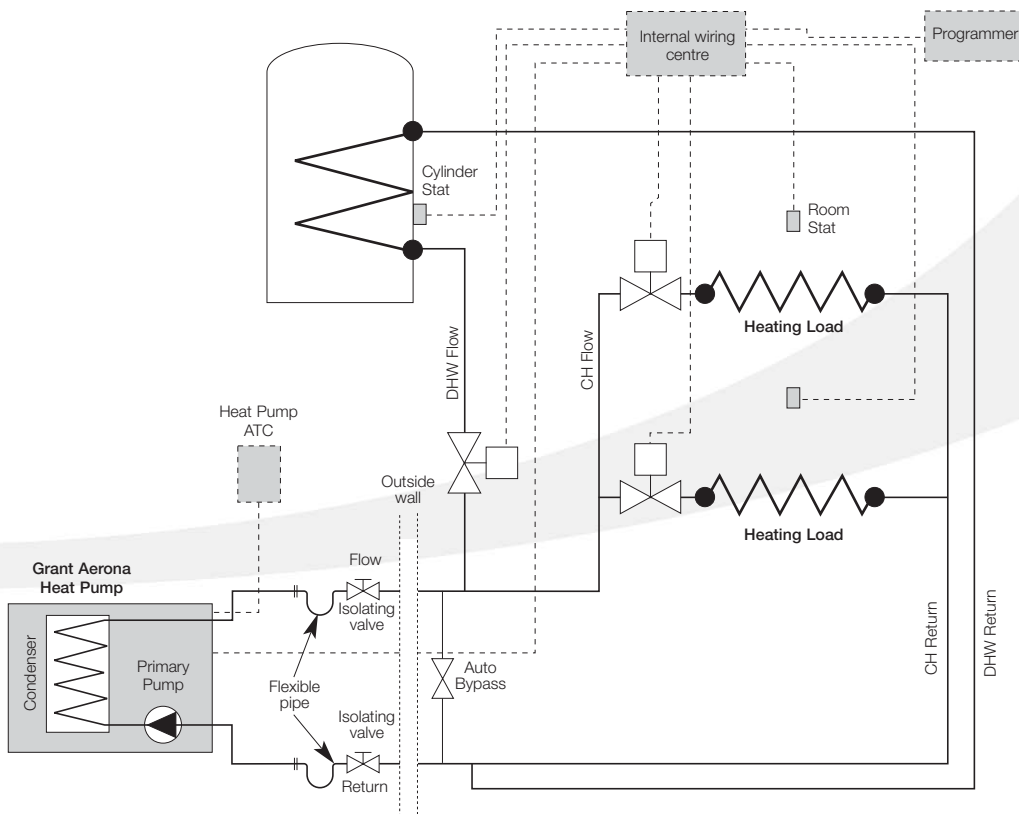


Figure 4-2: Monovalent system - with extended S-Plan type controls

4 Hydraulic Diagrams

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The following are examples of suitable systems

4.3 S-Plan Type - Bivalent

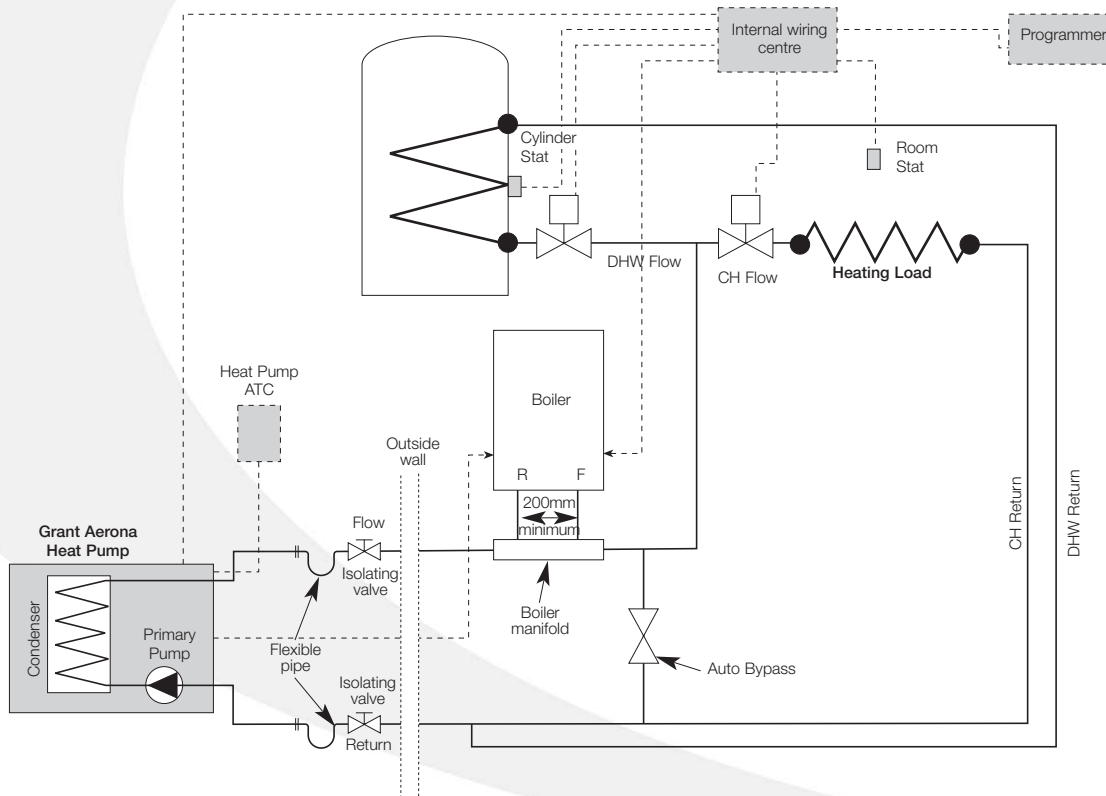


Figure 4-4: Bivalent system - with boiler manifold and S-Plan type controls

4.4 Extended S-Plan Type - Bivalent

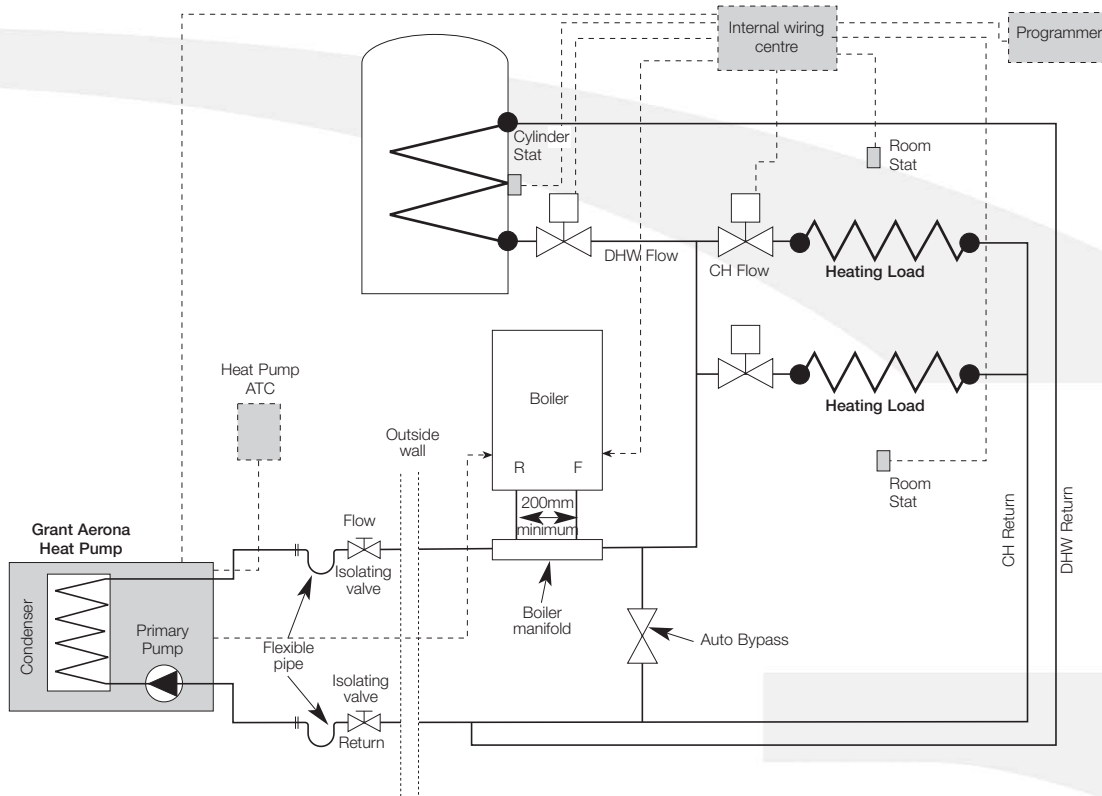


Figure 4-6: Bivalent system - with boiler manifold and extended S-Plan type controls

4 Hydraulic Diagrams

IMPORTANT

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4.5 Buffers Tanks

The use of a buffer with the current Aerona heat pump is not necessary in the majority of installations. However, it is possible to utilise a buffer if the end-user wishes to store hot water when there is no other demand placed on the system. There are two main considerations when deciding when and where a buffer tank should be used.

1. It may act as an initial boost when a heating demand is placed on the system from cold.
2. Storing water for this function will result in heat losses from the buffer over time, reducing the overall COP and therefore the overall efficiency of the heat pump and the system.

When considering the use of a buffer, also consider the space the buffer will take up – it may not be possible to house both a cylinder and a buffer tank.

The following diagrams show both an S-plan and an extended S-Plan for use with a buffer tank.

4.6 S-Plan with Buffer - Monovalent

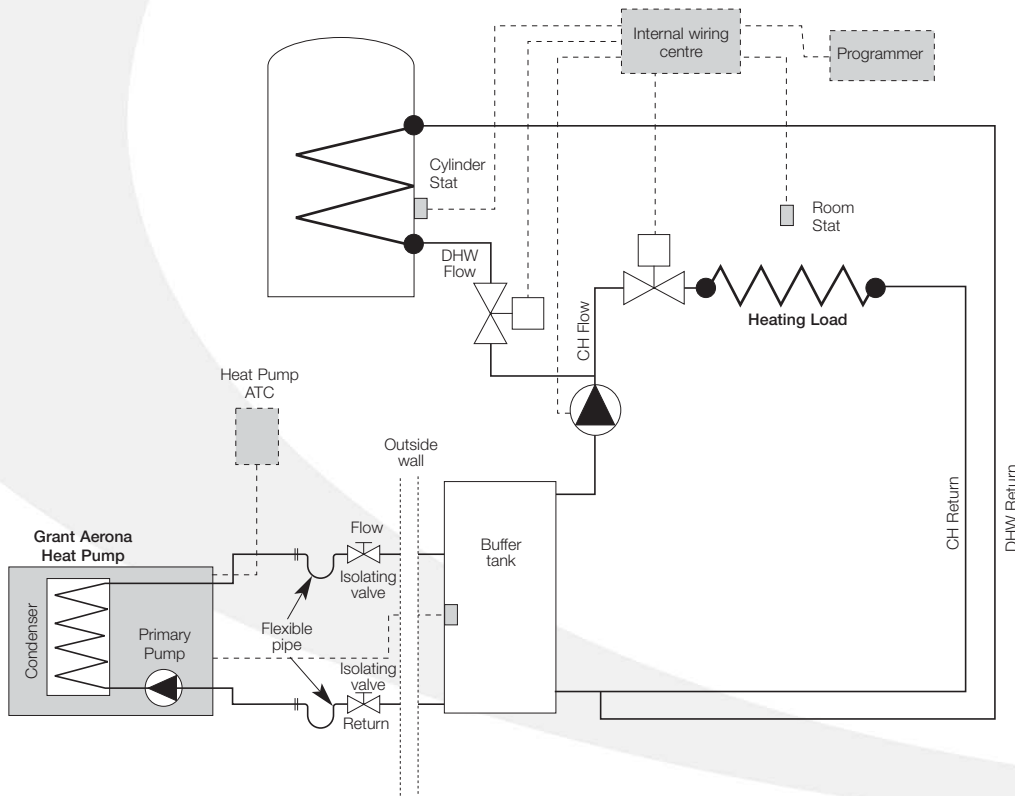


Figure 4-7: Monovalent system - with Buffer and S-Plan type controls

4.7 Extended S-Plan with Buffer - Monovalent

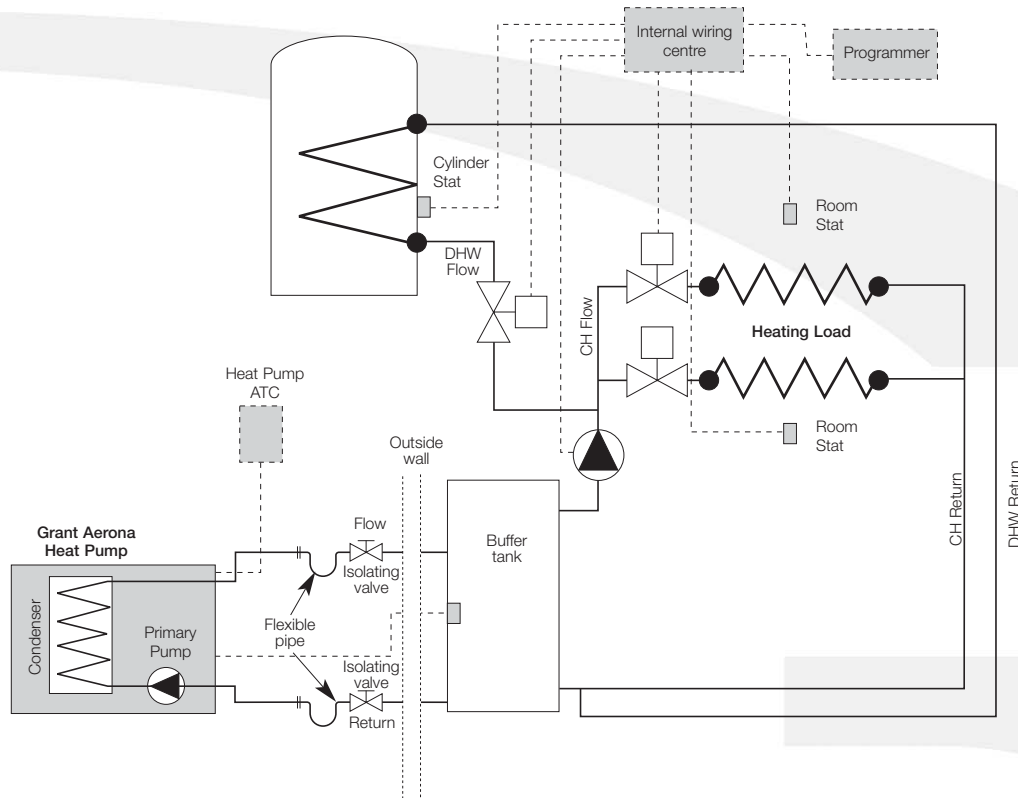


Figure 4-8: Monovalent system - with Buffer and extended S-Plan type controls

! NOTE

The hydraulic diagrams do not show the isolation valves, any expansion vessels, pressure relief valves or filling loops. More information on these components can be found in section 7.

5 System Design Criteria

Unlike a typical condensing oil or gas fired boiler that operates at a flow of 70°C and a return of 50°C, a heat pump operates with a flow of between 30°C and 60°C. The return temperature will depend on the load of the system at a given point in time.

The design of any system in the UK is typically based on 2 parameters.

1. That the outside air temperature can fall to as low as -3°C and that the house comfort temperature will be 21°C.

The BTC incorporated in the heat pump will adjust the output according to the external ambient air temperature but the system must be designed in the first place to meet this maximum demand.

2. The second factor to consider is achieving this maximum demand using much lower water temperatures than with oil or gas fired appliances.

Designing a new system for use with a low-grade heat source is straight forward, and assuming the insulation properties of the dwelling meets or exceeds current building regulations, there should be no issue with achieving the heat demand.

It must be understood that your final design working temperature will have an effect on the overall system efficiency, the COP of the heat pump and the complete system. Put simply, the lower your design working temperature, the better the COP. If you are in any doubt about the suitability of the heating system, stop and seek the advice of a qualified heating engineer or experienced system designer.

The use of a heat pump in an existing system can be straightforward if the following rules are followed.

1. The loft has insulation to a depth of 270mm
2. Cavity wall insulation has been installed
3. The radiators have been changed or upgraded to match the new water temperature
4. An accurate heat loss calculation for each room of the house has been carried out
5. All primary and secondary pipes have been well insulated to prevent heat loss

While underfloor heating is the preferred heat emitter, a combination of underfloor heating and radiators, or radiators only, works just as efficiently. It is necessary, however, to calculate the size of radiator required accurately – if this is not done, the house will fail to reach the target temperature and will be costly to rectify after the installation is complete.

Refer to Section 6 to determine the size of radiators required for your installation.

6 Calculating Radiator Sizes

Existing systems

Most existing wet heating systems will use radiators as emitters. When the original system was installed, the radiators would have been sized according to the manufacturer's specifications. Typically, this would have been 82°C flow and 71°C return with the connections being flow at the top and return at the opposite bottom corner.

With the advent of condensing boilers, most installations were found to have oversized radiators and as such, little or no adverse effects were found when the system temperatures fell to 70°C flow and 50°C return.

However, as heat pumps work at temperatures lower than even this, it is important that each radiator is checked again for its suitability and replaced with one of the correct size/output if necessary.

Below is a typical radiator conversion factor table and a worked example of sizing radiators for use with a heat pump*

°C	Correction Factor
5	0.050
10	0.123
15	0.209
20	0.304
25	0.406
30	0.515
35	0.629
40	0.748
45	0.872
50	1.000
55	1.132
60	1.267
65	1.406
70	1.549
75	1.694

As can be seen, the size of radiator required will be larger than conventional systems. This can be controlled to an extent by choosing a suitable design water temperature. The trade off will be a slightly lower COP. As we have already discussed, the higher the running temperature, the harder the heat pump has to work to reach the desired temperature.

Please advise the customer that, in any case, the radiator will not get 'hot'. The perception may well be that the system is not working correctly because the radiators are only 'warm'.

A typical heat pump operating to feed radiators will run at a flow temperature of **50°C** and a return temperature of **40°C** – giving a mean water temperature of **45°C**.

In the case of a system using both radiators and Underfloor heating (UFH) a flow of **40°C** and a return of **30°C** – giving a mean water temperature of **35°C** – would usually be preferred.

For a living room with a design temperature of **21°C** and heat loss of 1.8kW.

The $\Delta T = 45^\circ\text{C} - 21^\circ\text{C} = \mathbf{24^\circ\text{C}}$.

From the radiator manufacturers correction factor table: for $\Delta T = 24^\circ\text{C}$ factor ≈ 0.406 .

For a design heat loss of 1.8 kW: the required corrected output is $1.8 / 0.406 = \mathbf{4.43kW}$.

Select a radiator from manufacturer's information that would give 4.43kW output (at 75°C mean water temperature) – this will give the required 1.8 kW output at 45°C mean water temperature produced by the heat pump.

Similarly, for a bedroom with the same design heat loss but design temperature of **18°C**.

The $\Delta T = 45^\circ\text{C} - 18^\circ\text{C} = \mathbf{27^\circ\text{C}}$.

From the radiator manufacturers correction factor table: for $\Delta T = 27^\circ\text{C}$ factor ≈ 0.46 .

For a design heat loss of 1.8 kW: the required corrected output is $1.8 / 0.46 = \mathbf{3.48kW}$.

Thus, select a radiator from manufacturer's information that would give 3.48kW output to give the required 1.8 kW output at 45°C mean water temperature.

For an UFH system with a mean water temperature of **35°C**.

For a design heat loss of 1.8kW and a design room temperature of **18°C**.

The $\Delta T = 35^\circ\text{C} - 18^\circ\text{C} = \mathbf{17^\circ\text{C}}$.

From the radiator manufacturers correction factor table: for $\Delta T = 17^\circ\text{C}$ factor ≈ 0.26 .

For a design heat loss of 1.8 kW: the required corrected output is $1.8 / 0.26 = \mathbf{6.92kW}$.

Thus, select a radiator from manufacturer's information that would give 6.92 kW output to give the required 1.8 kW output at 35°C mean water temperature.

*** Where possible reference should be made to radiator manufacturers own information for the correction factors for different types of radiator.**

7 Sealed Systems

The following components are required to use the Grant Aerona heat pump as part of a sealed heating system. Due to the lack of space these components are not located within the heat pump, but have to be fitted external to the unit.

- expansion vessel (of the correct size to suit the volume of the system)
- Pressure relief valve – 3 bar
- Pressure gauge
- Filling loop
- Tundish

These items may already be installed on the existing system. If so, they should be checked to ensure the integrity and suitability of the components before proceeding to re-use them.

Refer to Section 14 for details of the Grant sealed system kits designed for use with the Grant Aerona heat pump range.

The expansion vessel can be fitted to either the flow or return pipes but ensure that there is no automatic or manual valve in line that may prevent the heat pump utilising the expansion vessel.

The filling loop can be sited anywhere in the system, but it must always be sited within visual distance of the pressure gauge. The nominal filling pressure for the system when cold is 1 bar.

Before filling the system check the expansion vessel charge pressure. This should be 0.2 – 0.3 bar higher than the cold fill pressure for the system.

It is good practice to have automatic air vents at all high points of the system, particularly where pipes fall vertically – e.g. drop feed systems. The immersion unit within the heat pump has a factory fitted manual air vent.

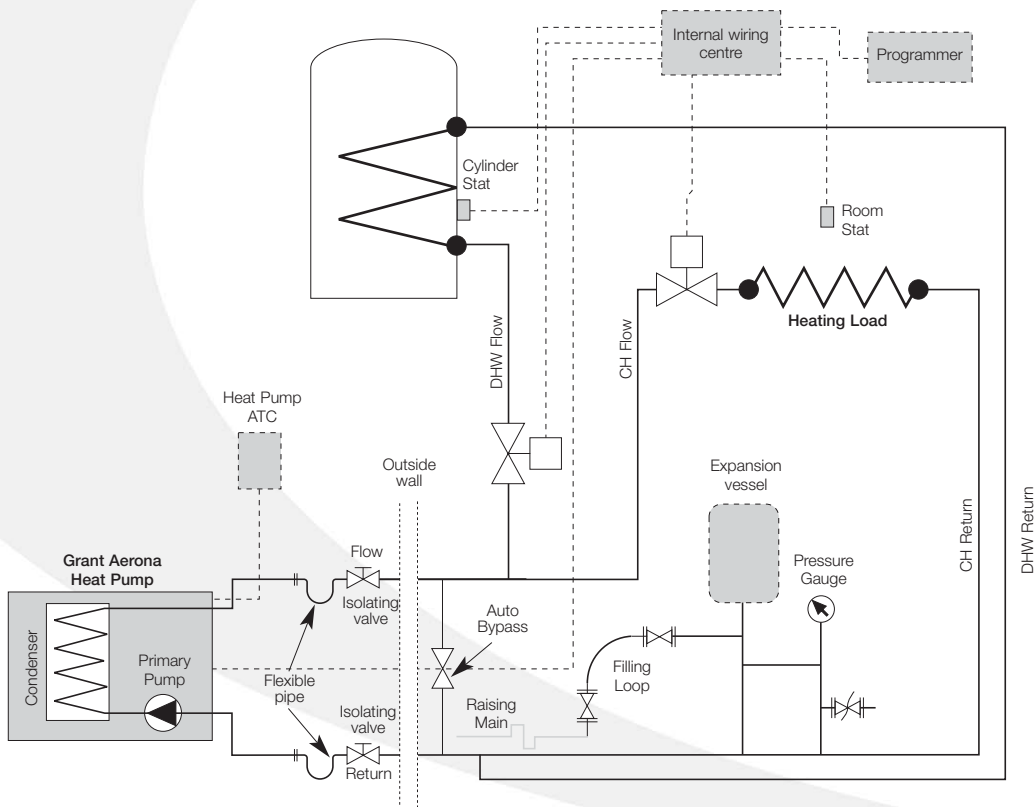


Figure 7-1: Sealed system layout

8 Electrical

IMPORTANT

All electrical work must be undertaken by a competent person. Failure to observe this legislation could result in an unsafe installation and will invalidate all warranties.

8.1 General

The Grant Aerona Heat Pump is very simple to install and to wire. The units are designed to meet the need for simplicity – both in installation and in servicing. As a result, the wiring involved is both minimal and simple compared to other heat pumps available.

For Monovalent systems, the following cables are required.

- 1 x twin and earth cable suitable for the current and length of run from the consumer board to the external isolator.
- 1 x 3-core SWA suitable for the current from the external isolator to the heat pump.
- 1 x 3-core 0.75mm² from the systems wiring centre to the heat pump
- 1 x 3-core umbilical cable from the heat pump to the ATC (heat pump controller) mounted inside the house. A 5m length of this cable, complete with fitted plugs is supplied with the heat pump.

For Bivalent systems, an additional 2-core 0.75mm² cable is required from the heat pump to the boiler.

8.2 Basic Circuits – Making the Connection

The diagram below is of a typical S-Plan type control system as used with a gas or oil fired boiler.

FOR INFORMATION ONLY – DO NOT FOLLOW THIS DIAGRAM AS IT WILL CAUSE IRREPARABLE DAMAGE TO THE HEAT PUMP.

NOTE

It is possible for some components to have 2 power supplies feeding them. It is also possible for mistaking an internal circuit to be dead when it is receiving power from another source. Please label all controls and devices if this is possible, advising to check and isolate in one or more locations as required.

To help remove as much of this risk as possible, take all heating system, heat pump and immersion element circuits from a single supply at the consumer unit.

NOTE

Note that the two wires that feed both motorised valves to Gr (grey) terminate at L, giving them a permanent supply of 230Vac. The two wires leaving the motorised valves at O (orange) are the switched output and will also be at mains potential. The switches inside the motorised valves make the connection between L (permanent Live) and 10 (switch live) to feed the boiler and the pump.

In contrast, the heat pump switches at 0V and therefore a simple re-wiring (for existing systems) must take place at the wiring centre before it is safe to connect to the heat pump.

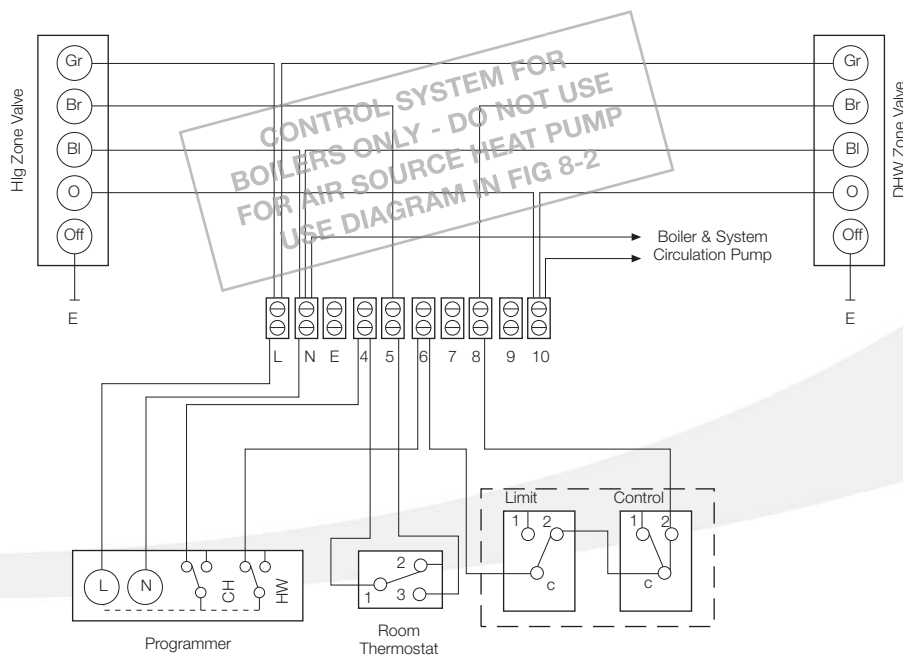


Figure 8-1: S-Plan type system for normal boiler connection

8 Electrical

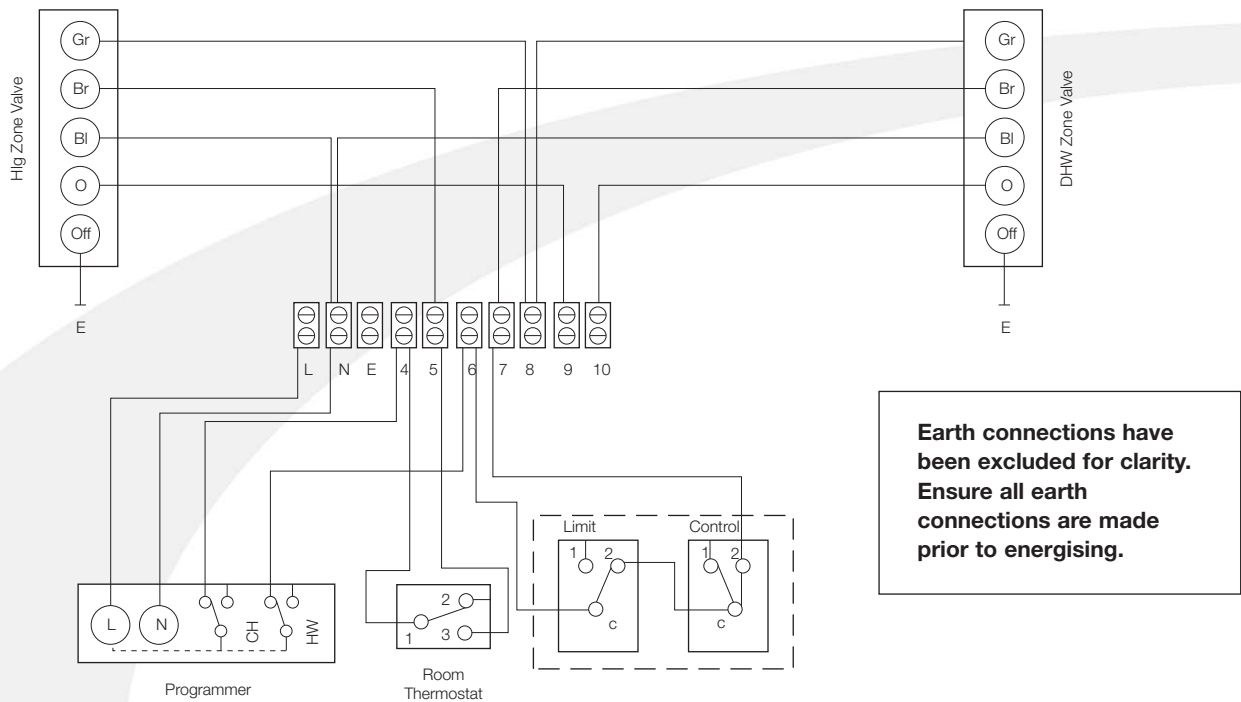


Figure 8-2: S-Plan type system for connection to Aerona heat pump

NOTE

Note that both wires from Gr (grey) now terminate on their own at position 8. The wires from O (orange) from each valve now terminate on their own at positions 9 and 10. The feed from the cylinder thermostat and the feed to Br (brown) on the DHW motorised valve, now terminates at position 7. When that is completed, the 3-core 0.75mm² cable can now connect at positions 8, 9 and 10.

Within the heat pump control panel, connect the wires as follows:

Wiring Centre	Heat Pump
8	1 – Common
9	2 – Heating
10	3 – DHW

For multiple heating zone valves, follow the above and join all oranges from the heating motorised valves into 9 in the wiring centre, and all greys to terminal 8.

8.3 Controller



Figure 8-3: ATC connection



Figure 8-4: Umbilical cable



Figure 8-5: ATC control unit

Using the 5m of umbilical cable, connect the controller (right) to the heat pump (left). The controller fits all standard single patresses (surface and flush). Use one of the cable glands at the rear of the heat pump to protect this cable. To extend (if required) simply splice a new section into the middle, ensuring all connections are sound and water proof. The size of cable is 0.5mm², and operates at ultra low voltage (<50Vdc).

8.4 Mains Supply Cable

All Grant Aerona Heat Pumps contain a 3kW immersion element as a boost heat source. This element will energise under either one or two conditions :

1. When the external ambient air temperature drops between -5°C and +5°C. This figure is variable and adjustable at the ATC.
2. When the heat pump has not seen a temperature rise of 1°C or more in the Return water from the heating system, in a 20 minute period.

The cable sizing to the heat pump must include for this additional 3kW load.

For Bivalent systems where a Gas, Oil or Wood Pellet boiler is switched from the heat pump the immersion heater is disconnected. Refer to section 8.8.

If the boiler is to be used with the 3kW immersion heater still connected, the additional load must be taken into account and the maximum demand must be determined for each heat pump.

Model	Input Power kW	Immersion Element kW	Boiler Load kW	Total Load kW	Total Current A
HPAW65	1.62	3	1	5.62	24.50
HPAW85	2.20	3	1	6.20	27.00
HPAW110	2.61	3	1	6.61	28.70
HPAW130	2.59	3	1	6.59	28.70
HPAW155	2.77	3	1	6.77	29.50

Always assume maximum possible load when considering cable sizing.

The cable supplying power from the consumer unit to the heat pump must be connected via an external 2 pole isolator. This allows the service engineer to isolate the power supply before working on the heat pump in safety.

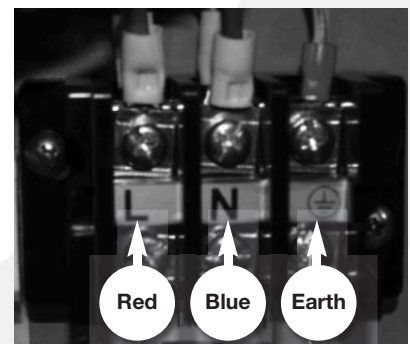


Figure 8-6: Mains supply cable connections

8 Electrical

8.5 Heat Pump Wiring Diagram

The Main Connections you have to make

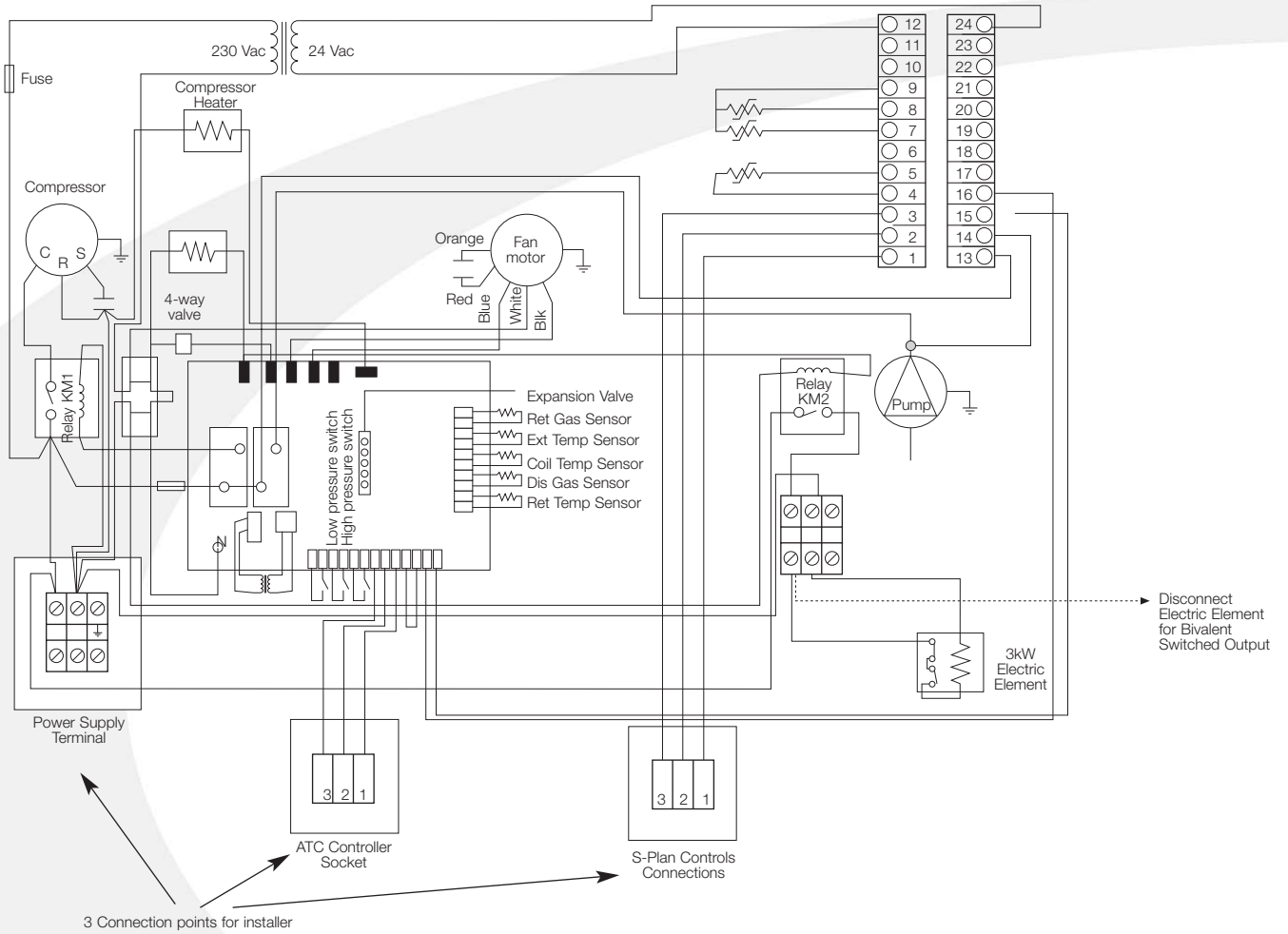


Figure 8-7: Heat pump connection diagram for 3kW electrical element

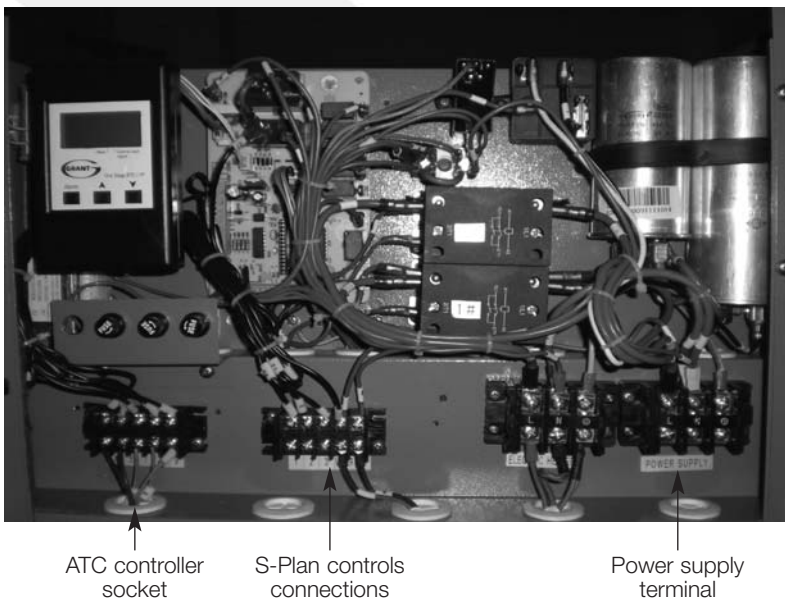


Figure 8-8: Location of connections in control panel

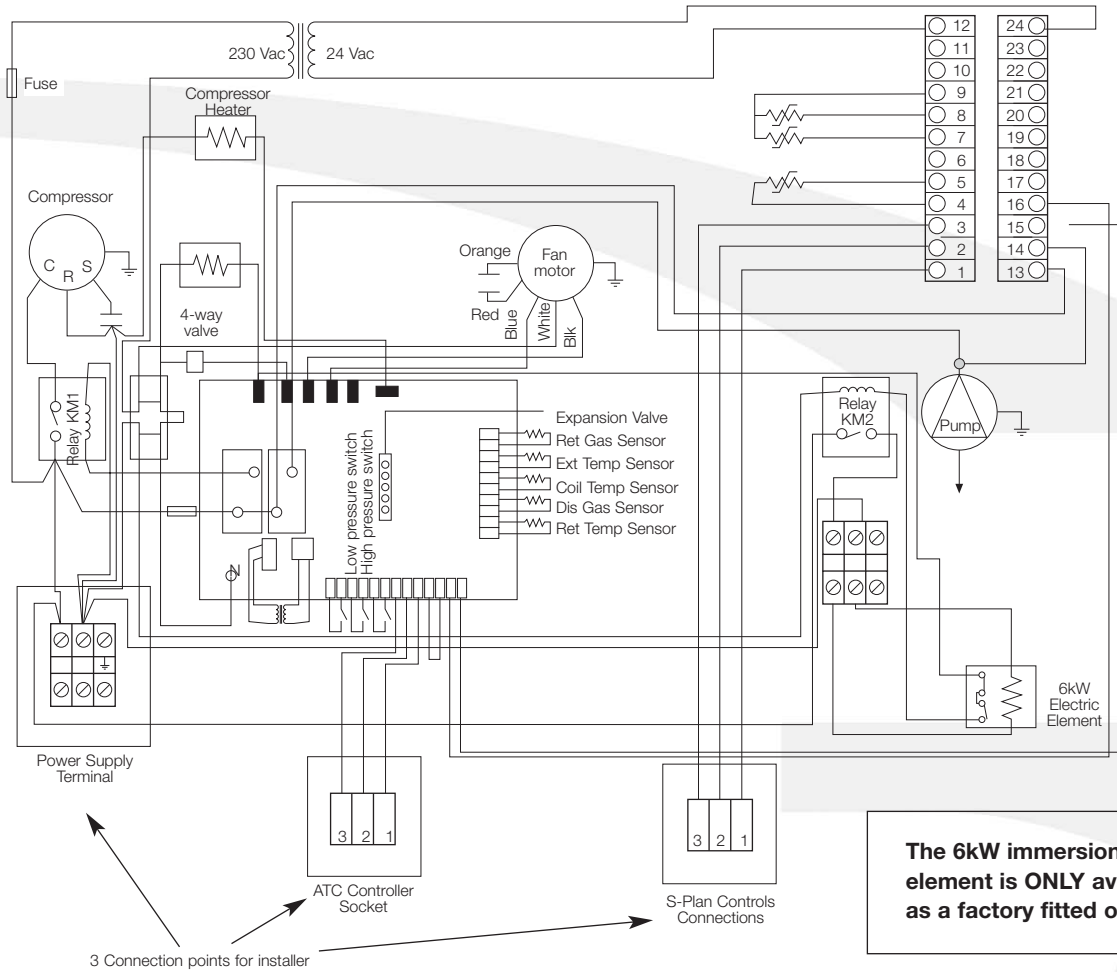


Figure 8-9: Heat pump connection diagram for 6kW electrical element

Model						3kW Immersion Heater				6kW Immersion Heater			
	P_{in} (W)	I_{start} (A)	I_{run} (A)	V	Hz	I_{start}	I_{run}	MCB (A)	MCB Type	I_{start}	I_{run}	MCB (A)	MCB Type
HPAW65	1620	22.09	7.36	220	50	35.09	20.36	32	D	49.09	34.36	40	D
HPAW85	2200	30.00	10.00	220	50	43.00	23.00	32	D	57.00	37.00	40	D
HPAW110	2610	35.59	11.86	220	50	48.59	24.86	32	D	62.59	38.86	40 or 50	D
HPAW130	2590	35.32	11.77	220	50	48.32	24.77	32	D	62.32	38.77	40 or 50	D
HPAW155	2770	37.77	12.59	220	50	50.77	25.59	32	D	64.77	39.59	50	D

Model						3kW Immersion Heater				6kW Immersion Heater			
	P_{in} (W)	I_{start} (A)	I_{run} (A)	V	Hz	I_{start}	I_{run}	MCB (A)	MCB Type	I_{start}	I_{run}	MCB (A)	MCB Type
HPAW65	1770	23.09	7.70	230	50	36.09	20.70	32	D	50.09	34.70	40	D
HPAW85	2404	31.36	10.45	230	50	44.36	23.45	32	D	58.36	37.45	40	D
HPAW110	2852	37.20	12.40	230	50	50.20	25.40	32	D	64.20	39.40	50	D
HPAW130	2830	36.91	12.30	230	50	49.91	25.30	32	D	63.91	39.30	50	D
HPAW155	3028	39.50	13.17	230	50	52.50	26.17	32	D	66.50	40.17	50	D

- Assumptions:
- 30m run from consumer box to heat pump
 - Cable not run in thermally insulated environment: Method A and C only (17th edition)
 - Starting current assumes 3x running current
 - Earth Loop Impedance value does not exceed 0.36Ω for a D type MCB

IMPORTANT: ENSURE INCOMING SUPPLY CABLE AND SUPPLY FUSE ARE OF SUITABLE SIZE

8 Electrical

8.6 System Control Wiring Diagrams

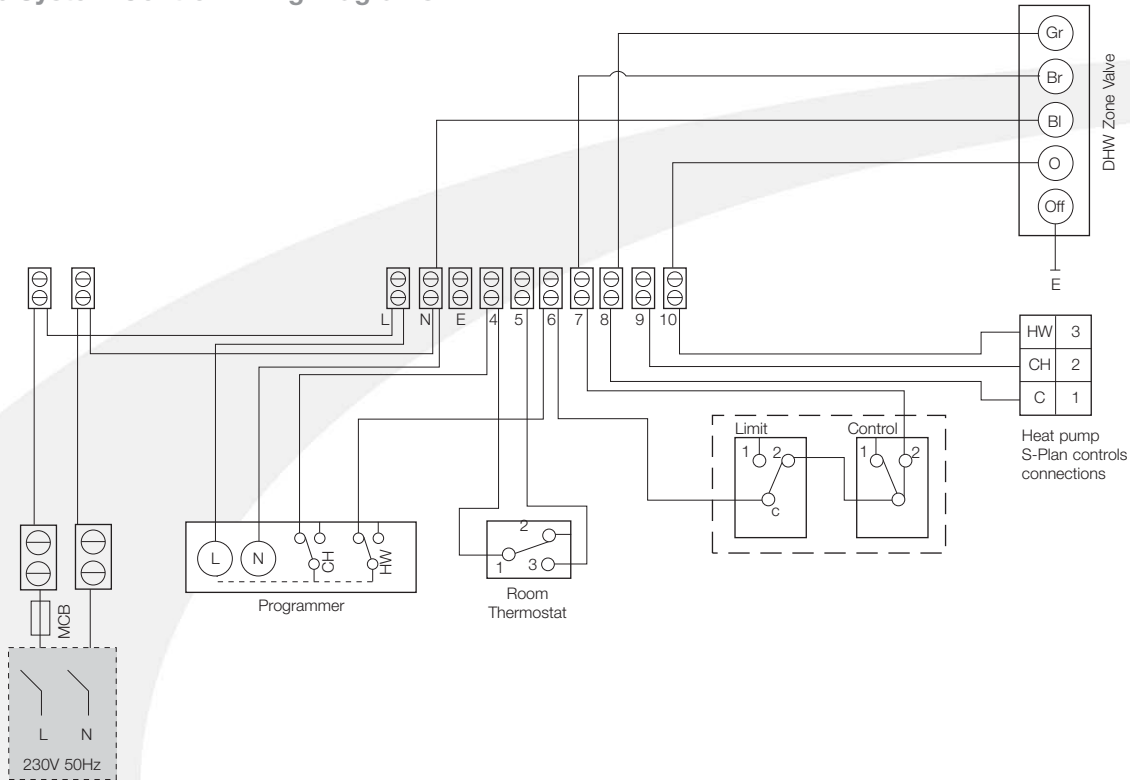


Figure 8-10: Domestic hot water connection diagram

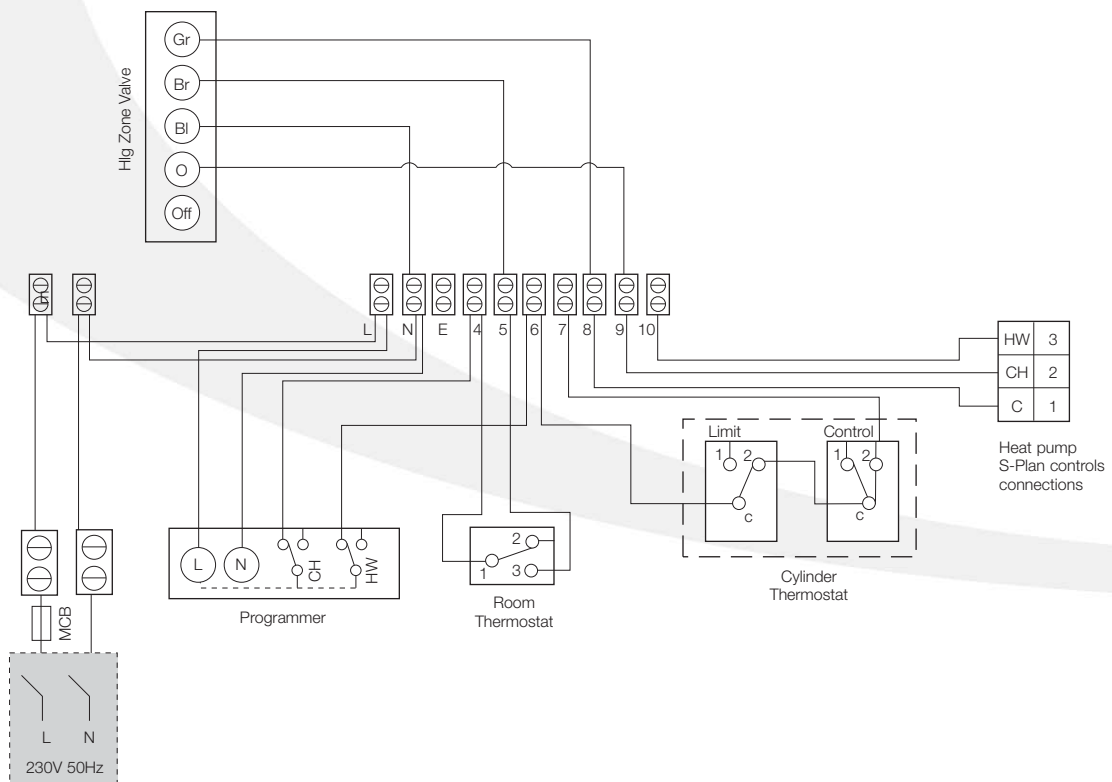


Figure 8-11: Central Heating connection diagram

8.7 Wiring Diagrams

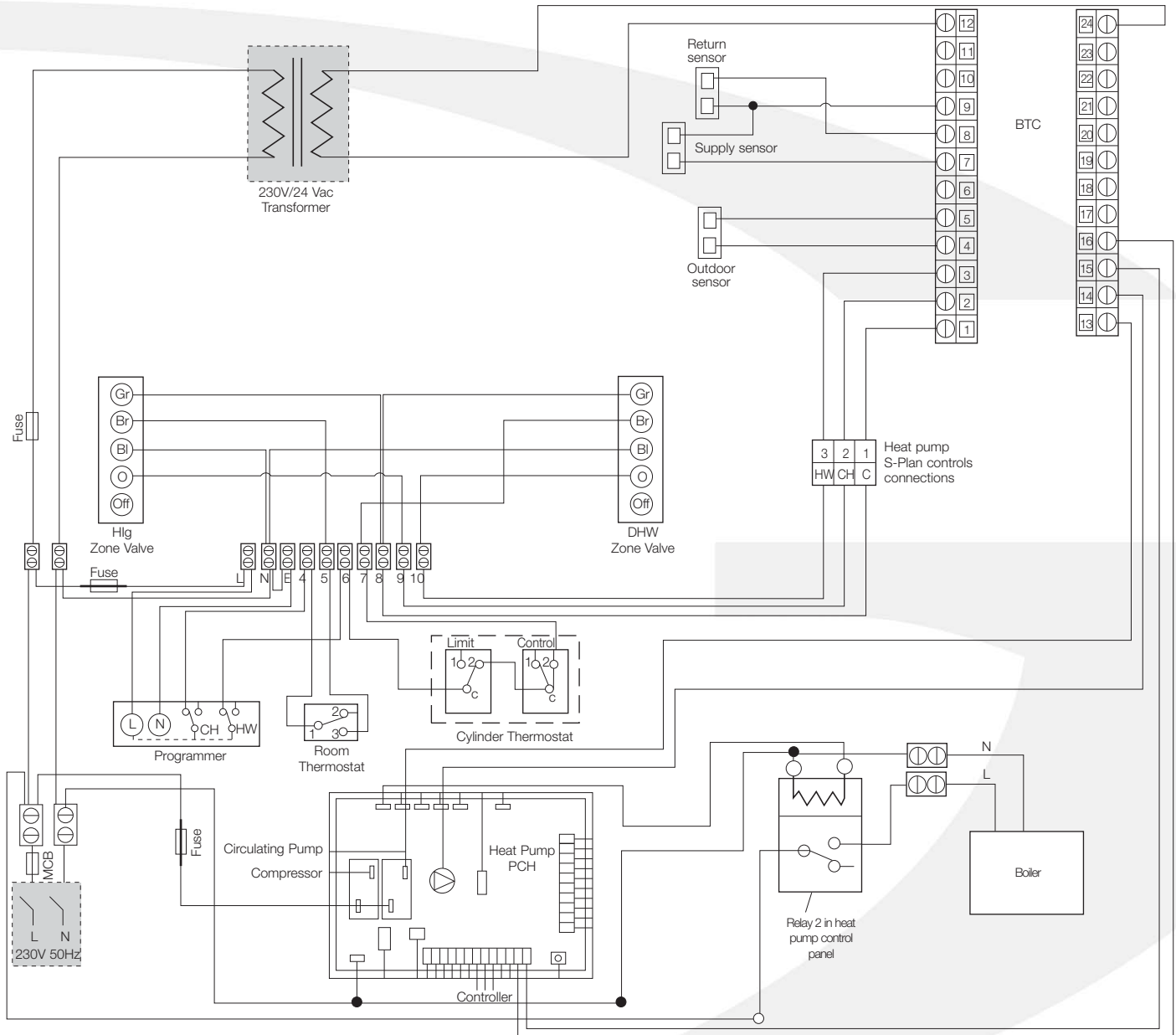


Figure 8-12: Bivalent system connection diagram

8 Electrical

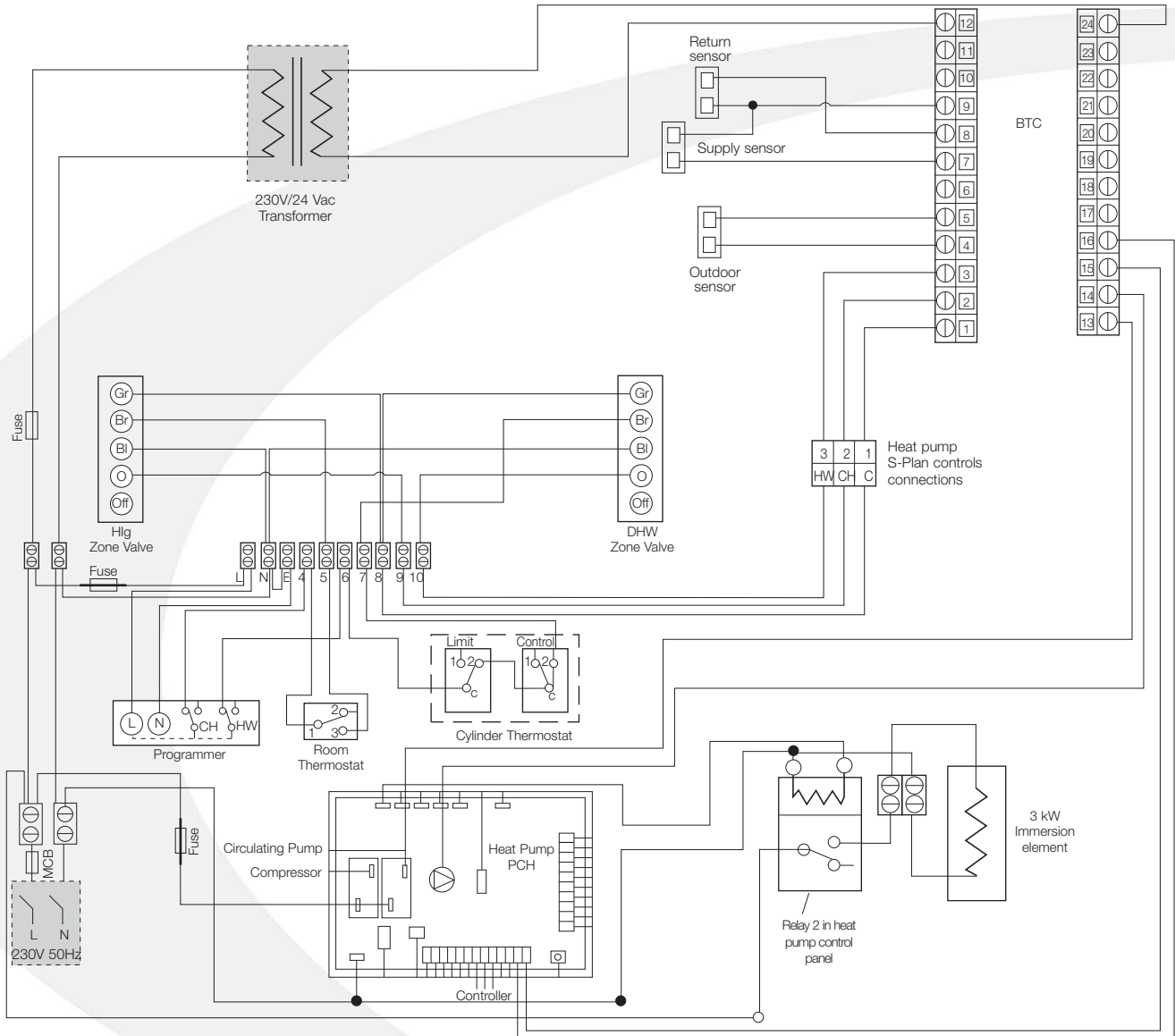


Figure 8-13: Monovalent system connection diagram

8.8 Bivalent Systems

For bivalent systems, it is necessary to disconnect the internal immersion element from the relay inside the heat pump control panel. Taking the live and neutral outputs from this relay extend this wire to the boiler. Isolate this cable through a fused double pole spur switch and mark on the switch that the supply comes from the heat pump.

8.9 Extending the Electrics

It may be part of the system design to incorporate Solar Thermal into the design.

This is easily done with the use of an additional two-pole relay. Following the diagram in Figure 8-13 below will give the solar thermal system a priority over the heat pump when there is a demand for DHW only.

This can, of course be added to both monovalent and bivalent systems. It is much easier to carry out all these types of systems based on S-plan type controls only.

Y and W type plans can be used, but the need for additional relays is not practical. It is much easier to convert Y and W type plans to S types from the start.

IMPORTANT

Do not take the Neutral from the heat pump to feed the boiler circuit. This will create an imbalance at the MCB and cause nuisance tripping. Always take the neutral supply from the existing S-Plan wiring centre.

Follow the wiring diagram as shown in Figure 8-11 for a bivalent system.

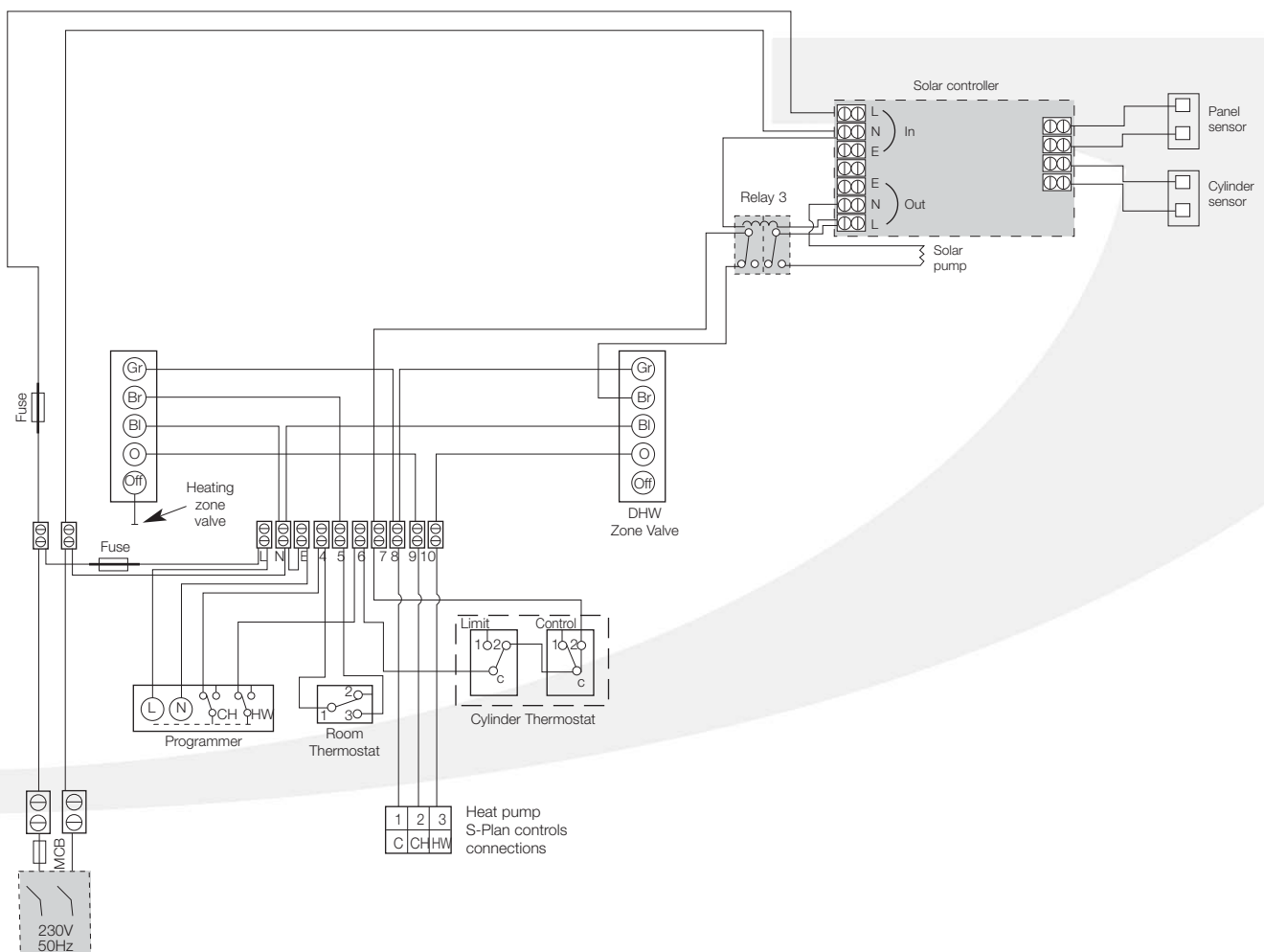


Figure 8-14: Connection diagram for Grant solar thermal system

9 Domestic Hot Water

9.1 Temperature Control

The desired hot water temperature stored in the cylinder can be adjusted on the BTC controller. As already mentioned, the heat pump works most efficiently at lower temperatures but these temperatures are not suitable for domestic hot water which should always be stored at about 60°C.

9.2 Heat Pump Cylinders

As the water temperature from the heat pump is lower than traditional systems, a much larger coil is required inside the cylinder to transfer the heat efficiently.

Grant Engineering has a range of 7 stainless steel cylinders from 90 litres to 300 litres with coil areas of up to 3.5m². Visit www.grantuk.com for more

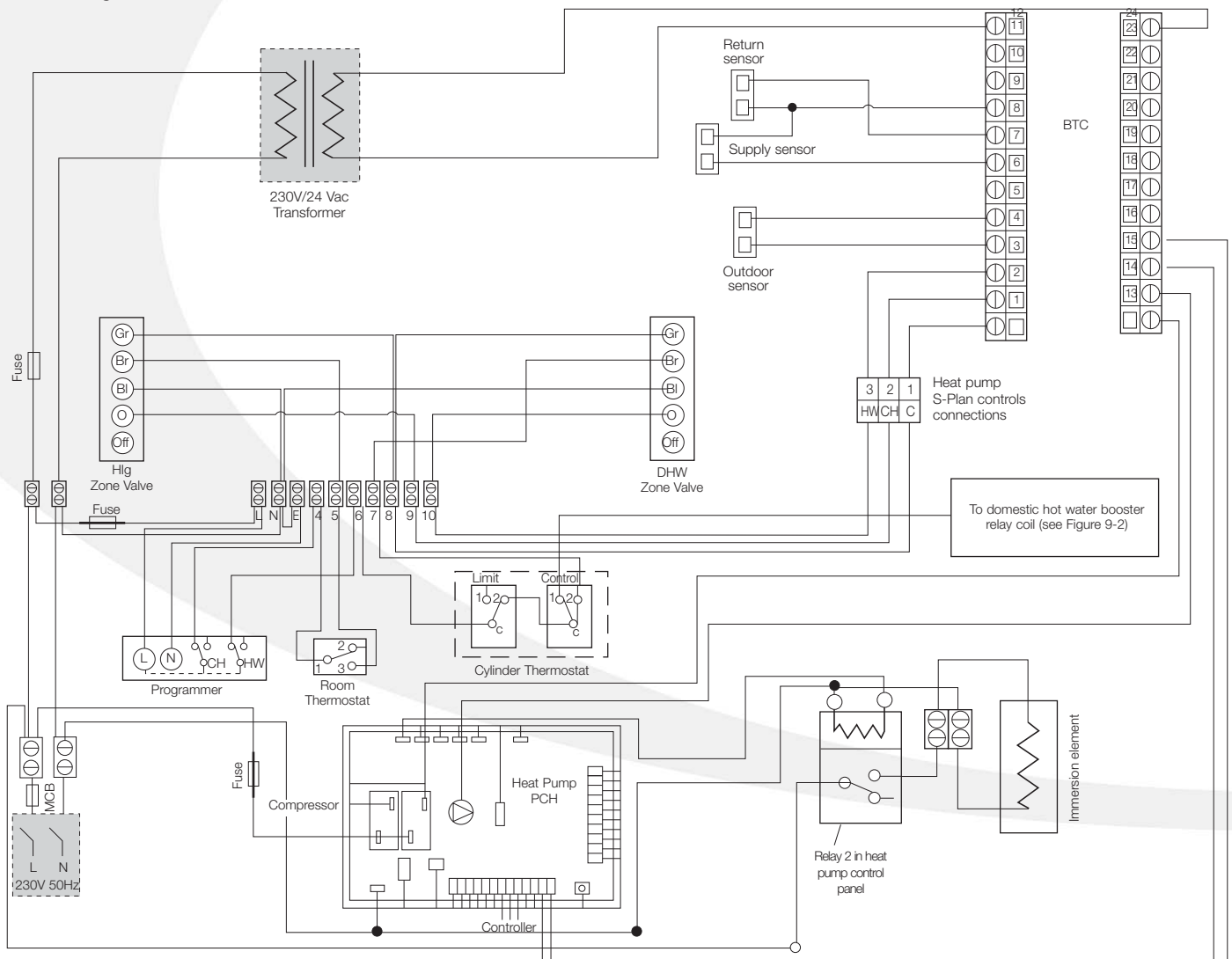
information. These cylinder have been designed to match the output from the Grant Aerona heat pumps for maximum efficiency and faster re-heat times when compared to standard type indirect cylinders.

9.3 Temperature Boost

It is possible to use the heat pump to raise the DHW temperature to 60°C. During the summer, this may be preferable, when the external ambient air temperature is high. However, during the winter, it would not be economical for any heat pump to try to raise the water temperature to this level.

As a result, Grant has developed a control system that will take the temperature of the existing cylinder from 45°C to 60°C, after the cylinder thermostat has switched off the hot water operation of the heat pump.

This system uses both the existing cylinder immersion element and cylinder thermostat, but operated via an 'add-on' relay and override switch enclosed in a separate unit to be mounted next to the cylinder. This system is fully automatic but can be overridden by the user if required, i.e. the user can switch on the immersion element using the override switch to manually boost the hot water cylinder temperature.



The DHW boost pack contains a power relay and an additional 2-pole isolator.

Figure 9-1: Connection diagram for DHW booster system

NB. Setting this override switch to OFF does not stop the automatic operation of the immersion element.

The required relay, manual override switch and enclosure are available from Grant Engineering UK Ltd as a kit. For details of this Automatic Domestic Hot Water Boost Kit (Grant Ref. HPDHWBK1) refer to Section 15 of these instructions.

When fitted, this kit interrupts the electrical supply between the existing immersion heater and the fused immersion switch. Refer to Figures 9-1 and 9-2 for electrical connection details.

With the cylinder thermostat set to 45°C, when the heat pump raises the DHW cylinder to this temperature, the cylinder thermostat switches to the 'satisfied' position. The resulting switched live from the auxiliary (normally open) contact of the cylinder thermostat

operates the relay in the booster kit and energises the existing immersion element in the cylinder, controller and protected by its internal thermostat and limit thermostat.

The immersion heater thermostat should be set to 60°C

When hot water is drawn off, if the temperature falls below 45°C the cylinder thermostat will detect the drop in cylinder temperature, creating a demand for the heat pump to operate to re-heat the cylinder. The switched live to the boost kit relay will cease and the immersion element is de-energised.

If the temperature detected by the cylinder thermostat does not fall to 45°C the immersion element will continue to operate, via the relay, to re-heat the cylinder.

IMPORTANT

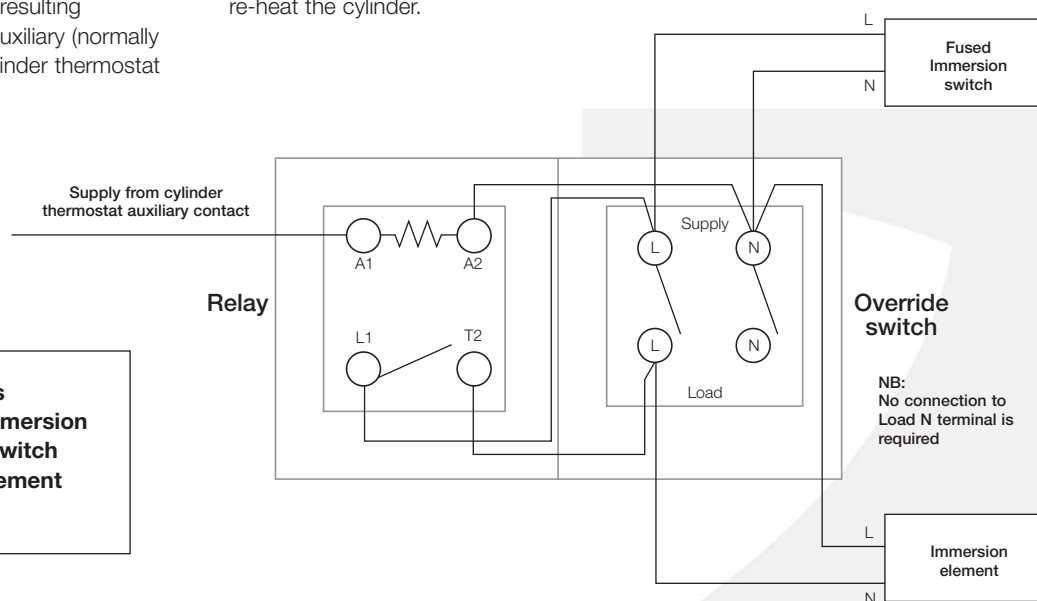
For this system to operate the existing immersion switch must be left set permanently to ON.

To totally prevent operation of the immersion element the existing immersion switch must be set to OFF.



WARNING

Two separate power supplies are connected to the DHW boost kit. Do not install or work on this kit, or remove the switch or cover, without ensuring that BOTH supplies are isolated.



Earth connections between fused immersion switch, override switch and immersion element not shown.

Figure 9-2: Connection of immersion element using DHW booster kit

IMPORTANT

This domestic hot water booster pack is optional and is only used if the customer wants the most efficient form of heating their hot water. If not, then the BTC can be programmed to deliver hot water up to 60°C with no additional wiring.

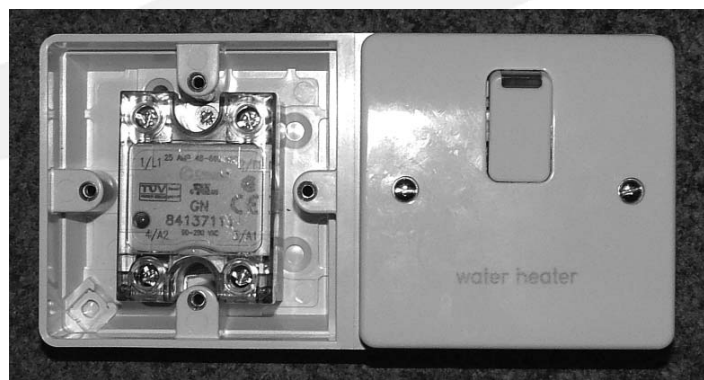


Figure 9-3: DHW booster kit with cover removed to show relay

10 Filling the System

10.1 Filling and Venting - Sealed Systems

NOTE

For technical details and requirements for Sealed Systems, refer to Section 7 of these instructions.

For details of the Grant Sealed System kits for use with the Grant Aerona heat pump range refer to Section 15.

IMPORTANT

As with all wet heating systems, it is the responsibility of the installer to remove all the air from the heating system after filling.

1. To vent the heat pump – All Grant Aerona heat pumps are fitted with a single automatic air vent on the top of the electric immersion element housing.

Check that the small cap on the automatic air vent is screwed on fully, then unscrew it one complete turn - leave the cap in this position. Note. Cap is supplied loose in bag attached to air vent.

2. Before filling the system check charge pressure in the expansion vessel (as supplied in the Sealed System kit).

This should be 0.2 – 0.3 bar higher than the cold fill pressure for the system.

The nominal filling pressure for the system when cold is 0.5 -1 bar.

3. If a flexible filling loop is to be used to fill the system (as supplied in the Sealed System kit), ensure it is connected between the two filling valves and that both valves are closed.

A valve is open when the operating lever is in line with the valve and closed when at right angles to it.

4. To fill the system, ensure that the mains cold water supply valve (stop cock) is open, then open the filling valve on the cold water supply.

Gradually open the filling valve on the heating circuit (at the other end of the filling loop) until water is heard to flow into the system.

Fill the system until the required system pressure is indicated on the sealed system pressure gauge (as supplied in the Sealed System kit). Then close both filling valves.

5. Vent each UFH circuit and then each radiator in turn, starting with the lowest one in the system, to remove air.
6. It is important the circulating pump(s) are properly vented to avoid them running dry and the bearings being damaged.
7. Check the operation of the safety valve (as supplied in the Sealed System kit) by turning the head anticlockwise until it clicks. The click is the safety valve head lifting off its seat allowing water to escape from the system. Check that this is actually happening.
8. After venting, check system pressure and top-up using the filling loop, as required.

10.2 Flushing and Corrosion Protection

To avoid the danger of dirt and foreign matter entering the Heat pump the complete heating system should be thoroughly flushed out – both before the heat pump is operated and then again after the system has been heated and is still hot.

This is especially important where the heat pump is installed as a replacement for a boiler on an old system.

In this case the system should be first flushed hot, before the old boiler is removed and replaced by the heat pump.

For optimum performance after installation, this heat pump and the central heating system must be flushed in accordance with the guidelines given in BS 7593:1992 'Treatment of water in domestic hot water central heating systems'.

This must involve the use of a proprietary cleaner, such as Betz Dearborn Sentinel X300 or X400, or Fernox Restorer.

For long term protection against corrosion and scale, after flushing, it is recommended that an inhibitor such as Betz Dearborn Sentinel X100 or Fernox MB-1 is used in accordance with the guidelines given in BS 7593:1992.

Full instructions on the correct use of system cleaners and corrosion inhibitors are supplied with the products, but further information can be obtained from www.betzdearborn.com and www.fernox.com

Failure to implement the above guidelines by fully flushing the system and using a suitable corrosion Inhibitor will invalidate the Heat Pump product warranty.

10.3 Antifreeze

To avoid the risk of the freezing in the external section of the heating system (i.e. the flexible hoses, condenser and circulating pump within the heat pump casing) in the event of power failure during winter months, a suitable domestic heating system antifreeze should be used. This is added to the system water when finally filling the heating system.

Full instructions are supplied with the system antifreeze, but immediate information can be obtained from www.betzdearborn.com and www.fernox.com

11 Commissioning

11.1 Switching on First Time

When switching on for the first time carry out the following procedures in the order they appear.

1. Ensure the external mains power isolation switch is set to the 'OFF' position.
2. Energise the heating system inside the house.
3. Create a CH demand using the timer/programmer.
4. Confirm the CH motorised valve has opened. (You may need to adjust the room thermostat to achieve this).
5. At the heat pump control panel, confirm there is no voltage present between terminal 1 and 2 on the S-Plan connections in the Heat Pump control panel – check there is continuity. If voltage is present (230Vac), check the wiring as shown on page 20 and correct as necessary.
6. Remove CH demand.
7. Create a DHW demand (if applicable) using the timer/programmer.
8. Confirm the DHW motorised valve has opened. (You may need to adjust the cylinder thermostat to achieve this).
9. At the heat pump control panel, confirm there is no voltage present between terminal 1 and 3 on the S-Plan connections in the Heat Pump control panel – check there is continuity. If voltage is present (230Vac), check the wiring as shown on page 20 and correct as necessary.
10. Create a CH and DHW demand using the timer/programmer.
11. Confirm the CH and DHW motorised valves have opened.
12. Switch the external isolator to 'ON'.
13. Check power is established – the ATC and BTC should now show display default settings.
14. Set the ATC to automatic using the 'M' button, and the display will show the return temperature.
15. Within 30 seconds, the circulating pump will start.
16. Within 30 seconds the fan will start.
17. Within 60 seconds the compressor will start.
18. Once the compressor has started, pay attention to the pressure gauge on the side of the heat pump. If the pointer starts to rise quickly, (enters the yellow or red zone within 30 seconds) switch off at the external isolator and remove all air from the system.
19. When satisfied that all air has been expelled, start this process again from step 12.
20. Remove demand for CH and DHW.
21. Compressor and fan will stop.
22. Circulating pump will continue to run for a period of time (default setting in BTC.).
23. Set the ATC and BTC - details in sections 11.2 and 11.3 respectively.

IMPORTANT

When putting the heat pump into use for the first time, watch the refrigerant pressure gauge on the side of the heat pump. The needle will rise over time when the temperature of the refrigerant increases. However, if this happens very quickly (e.g. rises into the yellow or red zone within 1 minute) then an air lock is present. Switch off power to the heat pump immediately, and purge any remaining air from the system.

IMPORTANT

Grant Aerona heat pumps should be stored and transported in an upright position. If not, the heat pump **MUST** be positioned in an upright position for at least 4 hours before being operated.

11 Commissioning

11.2 Setting the ATC Controller

The main purpose of the ATC controller is to give an overall maximum temperature control over the heat pump. In contrast, the BTC controller will give accurate control over both CH and DHW temperatures, even if they each have different target temperatures.

There are 3 main conditions the ATC can be set in:

1. OFF – no signal to the heat pump, irrespective of other heating controls. THE HEAT PUMP WILL NOT OPERATE IN THIS CONDITION.
2. Automatic (Sun Symbol) – The heat pump is in a fully automatic condition. Conditions such as running, defrosting, frost protection are all operative.
3. Stand-by (Triangle Symbol) - Only basic functions are possible. Frost protection and back up heater will not operate.

Press the 'M' button to switch between 'Automatic' and 'Standby' settings.

The ATC also has a series of fault codes which will help in any fault diagnosis, should an internal fault occur. Refer to Section 13.3 for details.

Set the time function on the ATC using the following procedure.

1. Press the 'SET' button twice. The hour segments will flash. Using the ▲▼ buttons to alter the hour setting.
2. Press the 'SET' button again to set the minutes Using the ▲▼ buttons.
3. Press the 'SET' button to confirm your entry.
4. The clock is now set.

Setting the ATC parameters:

The table shown on page 31 gives a list of the parameters applicable to the ATC. Please note that there are parameters that MUST NOT be altered.

Changing these parameters will adversely affect the efficiency of the heat pump and will invalidate all warranties.

To alter a parameter, first press ▲▼ until you have reached the appropriate function. To alter the setting, press the 'SET' button once, then use the ▲▼ buttons to alter the value. Once set, press the 'SET' button to exit back to the function menu.

! NOTE

If no button is pressed for a period of 20 seconds, the ATC will automatically default back to normal status.

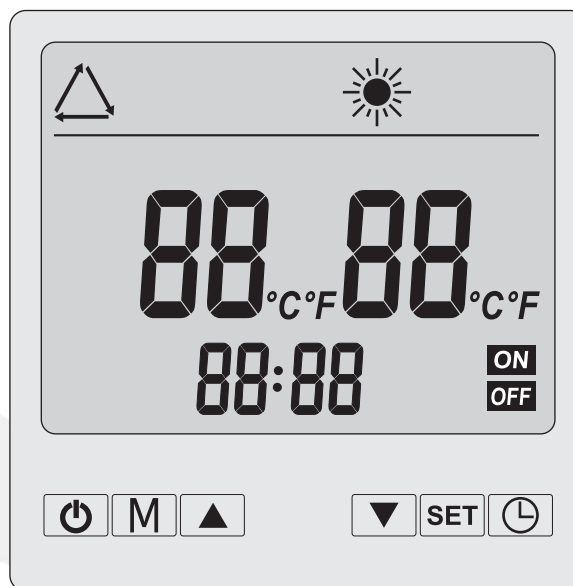


Figure 11-1: ATC display and buttons

ATC Parameters

Parameter	Description	Range	Default	Comments
0	Return water temperature to start electrical heater	0°C – 30°C	2°C	Factory Set
1	Desired Return water temperature setting	10°C – 60°C	55°C	SET TO 60°C
2	Defrost cycle	30 Min – 90Min	40Min	Factory Set
3	Coil temperature point to start defrosting	-30°C – 0°C	-3°C	Factory Set
4	Coil temperature point to stop defrosting	2°C – 30°C	18°C	Factory Set
5	Max time for defrosting	1 Min – 12Min	8Min	Factory Set
6	Reserved			Reserved
7	Restart after power failure	0/1 0=NO, 1=Yes	1	Factory Set
8	EEV manual / auto control	0/1	1	Reserved
9	Water pump working mode, 0= Continuous, 1=Normal	0/1	1	Factory Set
A	Fan motor working mode 0= daytime working mode, 1=night time working mode	0/1	1	Adjustable
b	Target superheat	-F – F	3	Factory Set
C	Manual control paces of EEV	0 – 50	35	Factory Set
d	Temperature point to start electrical element (ambient)	-5°C to +5°C	3°C	Adjustable
F	Coil temp.			Reading
10	Return gas temp.	-9 – 99°C		Reading
11	Ambient temp.	-9 – 99°C		Reading
12	Tank water temp.	-9 – 99°C		Reading
13	EEV actual open paces	-9 – 99°C		Reading

Take a note of these settings and write them in the Commissioning sheet in section 16.

IMPORTANT - Do not adjust Factory Set parameters unless instructed by Grant UK to do so.

Additional Operating Information about the ATC

Fan Motor Operation

- Normal (night time) working mode - when Parameter A set to 1. Refer to Table of ATC Parameters above
- When in heating mode (CH or DHW), fan motor starts up to 60 seconds before compressor starts.
- When ambient temperature is higher than 25°C, fan motor switches to low fan. When ambient temperature is lower than 23°C, fan motor switches to high fan.
- During period 20:00 to 8:00 (next morning), fan motor switches to low speed (time according to the ATC clock).
- During all other periods, fan motor works at full speed according to ambient temperature
- During defrosting, fan motor works according to defrost mode parameters.
- Normal (daytime) working mode - when Parameter A set to 0

Fan operates as described above for 'night time' operation but with NO Low speed fan operation during period 20:00 to 8:00 (next morning).

Electric Immersion Heater and Trace Heater Operation

Started by ambient temperature - Parameter d Setting

Refer to Table of ATC Parameters above

Regardless of whether the ATC is in 'Standby' or 'Auto' mode, when either:

- Return water temperature is 2°C lower than the parameter d temperature setting (adjustable between -10°C to +5°C with default setting 3°C), OR
- Ambient temperature is at parameter d temperature setting

BOTH the Electric immersion backup heater and Trace Heater (in the base tray) will be energised.

Both will remain energised until either:

- the Return water temperature has reached set temperature (55°C) OR
- the ambient temperature is higher than the parameter d temperature setting If the Return water temperature rise is less than 1°C in a 20 minute period when the heat pump is operating – parameter 0 set to 1°C (adjustable between 0°C and 30°C with default setting of 2°C) the Electric Immersion backup heater (and trace heater) will be energised to increase the heat output of the heat pump.

The Electric Immersion heater (and Trace heater) will be switched off when the Return water temperature reaches 55°C.

Bivalent Systems

In a Bivalent system the electric immersion element is disconnected and the switched live for the backup boiler is taken from the immersion element live terminal – refer to Figures 8-7 and 8-11.

Thus the backup boiler will be energised under the same parameters as given above for the electric immersion element and trace heater.

Circulating Pump

In all conditions, the circulating pump will operate when the ambient temperature falls below 5°C. This is part of the frost protection and cannot be adjusted by the user.

Frost Protection

- When ambient air temperature is less than 5°C, the circulating pump will start. The pump will stop when air temperature is above 6°C.
- When ambient air temperature is less than 0°C AND the return water temperature is less than 5°C, the heat pump will start. The Heat pump will stop when return water temperature is above 8°C.

11 Commissioning

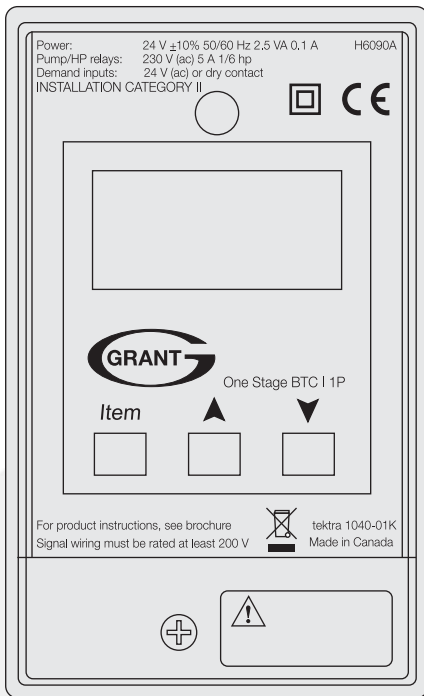


Figure 11-2: BTC display and buttons

11.3 Setting the BTC Controller

To set the BTC controller.

1. Press all 3 buttons for 1 second to enter the mode setting.
2. If 'Mode1' is shown, press the ▲ button until 'Mode 3' is displayed then press 'Item' again. 'OUTDR START' should now be displayed.
3. Scroll through the menu using the ▲ button, the 'Item' button to access the desired function. Use the ▲ or ▼ button to alter the setting.
4. Press the 'Item' button once more to go back to the menu.

The BTC incorporates 2 digital temperature controls – one for the CH and one for the DHW.

The purpose is to give far greater control over the heating system than conventional controls allow.

If UFH (Under Floor Heating) and Radiators are on the same system you may want the system to work around a flow temperature of 50°C. If UFH alone, then the flow temperature could be a 35°C flow. When a DHW demand is present, you may want to use the heat pump to take the water to 60°C, or alternatively you may wish to preserve the COP and therefore the efficiency and only raise the cylinder to 50°C.

This control allows you to be in control.

When operating in DHW mode, the ambient air temperature is ignored. However, in CH mode (without DHW demand) the ambient outside temperature is used to determine how much input power is required to achieve the desired target temperature.

This provides a very efficient way to weather compensate the heating system which will add to the heat pump and the system efficiency.

! NOTE

This increase in efficiency has NOT been taken into account in the COP's quoted on the technical specifications table.

BTC Settings Menu

Item	Access	Active	Mode	Default	Range
OUTDR Start	1	Always	All	21°C	1 to 29°C
OUTDR DSGN	1	Always	All	-3°C	-50 to 0°C
BOIL START	1	Always	All	21°C	1 to 65°C
BOIL DSGN	1	Always	All	48°C	21 to 104°C
BOIL MAX	0	Always	All	55°C	48 to 107°C, OFF
BOIL MIN	0	Always	All	OFF	OFF, 26 to 82°C
MASS	0	Always	All	1 (lo)	1(lo)<>2(med)<>3(Hi)
DIFF	0	Always	All	AU	AU, 1 to 23°C
DHW BOIL TARGET	0	Always	All	48°C	OFF, 21 to 104°C
'pump' DLY	0	Always	All	20 secs	OFF, 20 secs to 9:55 mins
WWSD (Warm Weather Shut Down)	1	Always	All	24°C	1 to 38°C, OFF

Notes:

- a) Access = 1 is available at all times. To access settings menu with access = 0, remove the front control panel cover then remove the screw at the base of the BTC. Select the DIP switch 1 to 'ON'. When the parameters have been set, switch the DIP switch back to OFF and replace the cover.
- b) OUTDR START and BOIL START must always be the same figure.
- c) These settings are suitable for a system design of -3°C to 21°C. If any other design criteria is used, alter these settings to match the design.
- d) If a buffer or thermal store is being used, change MASS to a suitable setting.
 - e.g. MASS = 1 (lo) for Monovalent system (no buffer or thermal store)
 - MASS = 2 (med) for Bivalent system (no buffer or thermal store)
 - MASS = 3 (Hi) for Bivalent system (with buffer or thermal store)
- e) DHW BOIL TARGET of 48°C assumes the cylinder thermostat setting of 45°C and thereafter, heated by an auxiliary source – e.g. immersion element, boiler etc.
- f) Pump Delay should be set for about 2 minutes.
- g) WWSD should always be set 3°C higher than the BOIL START setting.

Take a note of these settings and write them in the Commissioning sheet in section 11.4.

11 Commissioning

11.4 Record of ATC and BTC Settings

Please complete the following settings:

ATC

Parameter	Description	Range	Set Value	Comments
0	Return water temperature to start electrical heater	0°C – 30°C	°C	Do not Adjust
1	Desired Return water temperature setting	10°C – 60°C	°C	SET TO 60°C
2	Defrost cycle	30 Min – 90Min	Min	Do not Adjust
3	Coil temperature point to start defrosting	-30°C – 0°C	°C	Do not Adjust
4	Coil temperature point to stop defrosting	2°C – 30°C	°C	Do not Adjust
5	Max time for defrosting	1 Min – 12Min	Min	Do not Adjust
7	Restart after power failure	0/1 0=NO, 1=Yes	1	Do not Adjust
9	Water pump working mode 0 = Cont, 1 = Normal	0/1	1	Do not Adjust
A	Fan motor working mode 0 = daytime working mode 1 = night time working mode	0/1	1	Adjustable
B	Target superheat	-F – F	3	Do not Adjust
C	Manual control paces of EEV	0 – 50	35	Do not Adjust

BTC

Item	Access	Active	Mode	Set Value	Range
OUTDR Start	1	Always	all	°C	1 to 29°C
OUTDR DSGN	1	Always	All	°C	-50 to 0°C
BOIL START	1	Always	All	°C	1 to 65°C
BOIL DSGN	1	Always	All	°C	21 to 104°C
BOIL MAX	0	Always	All	°C	48 to 107°C, OFF
BOIL MIN	0	Always	All	°C	OFF, 26 to 82°C
DIFF	0	Always	All	AU	AU, 1 to 23°C
DHW BOIL TARGET	0	Always	All	°C	OFF, 21 to 104°C
'pump' DLY	0	Always	All	secs	OFF, 20 secs to 9:55 mins
WWSD (Warm Weather Shut Down)	1	Always	All	°C	1 to 38°C, OFF

12 Servicing & Maintenance

12.1 General

Grant Aeron Heat Pumps require only the minimum of routine servicing and maintenance. This basically consists of a visual check of the unit and should be regularly carried out (e.g. annually) to ensure that the heat pump continues to operate in a safe and efficient manner.

12.2 Air Inlet and Outlet

The air inlet grille and evaporator must be checked and leaves or any other debris removed from the space between the grille and the evaporator fins.

IMPORTANT

Take care not to damage or distort the Aluminium fins of the evaporator when removing any debris.

Ensure that both the air inlet to the evaporator and the discharge from the fan outlet are unobstructed. Any foliage, plants, etc. near the heat pump must not be allowed to grow over the unit.

Under no circumstances should anything be stacked on or against the unit.

Refer to Section 3.1 for the required clearances around the unit.

12.3 Condensate Disposal

Check that condensate drain holes in the bottom of the unit are not blocked.

12.4 Heating System Connections

Check the condition of the flexible hoses. Replace if damaged or leaking.

12.5 Heat Pump Controls

Check that settings on both the ATC and BTC controllers are as set when commissioned. Refer to table of recorded settings on Page 34 of these Instructions. Reset to commissioned settings as necessary.

12.6 Refrigerant

Under no circumstances should the refrigerant be vented from the charging points on the refrigerant circuit of the Heat Pump.

If any work is required to be carried out on the refrigerant circuit, it MUST be undertaken by an F-gas registered refrigeration Engineer (or equivalent).

On no account should any such work be carried out by unqualified personnel.

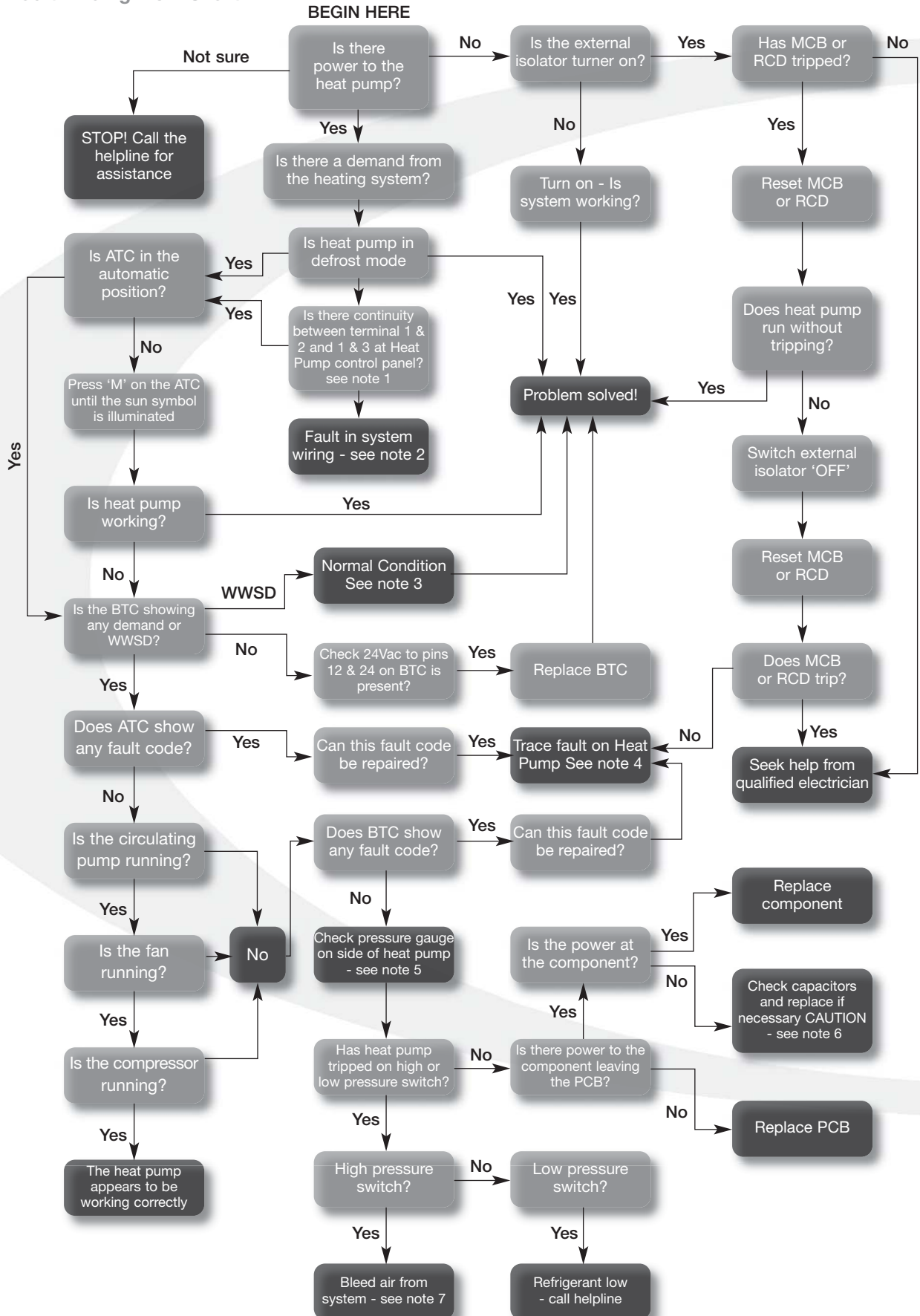


WARNING

If it is necessary to carry out any remedial work on the Heat Pump, e.g. replacement of the flexible hoses, switch the heat pump to off (set the on/off switch on the ATC controller to OFF) and isolate the electrical supply at the external isolator (and at consumer unit/MCB) **BEFORE** starting any work on the heat pump or system.

13 Fault Finding

13.1 Fault Finding Flow Chart



13.2 General Notes

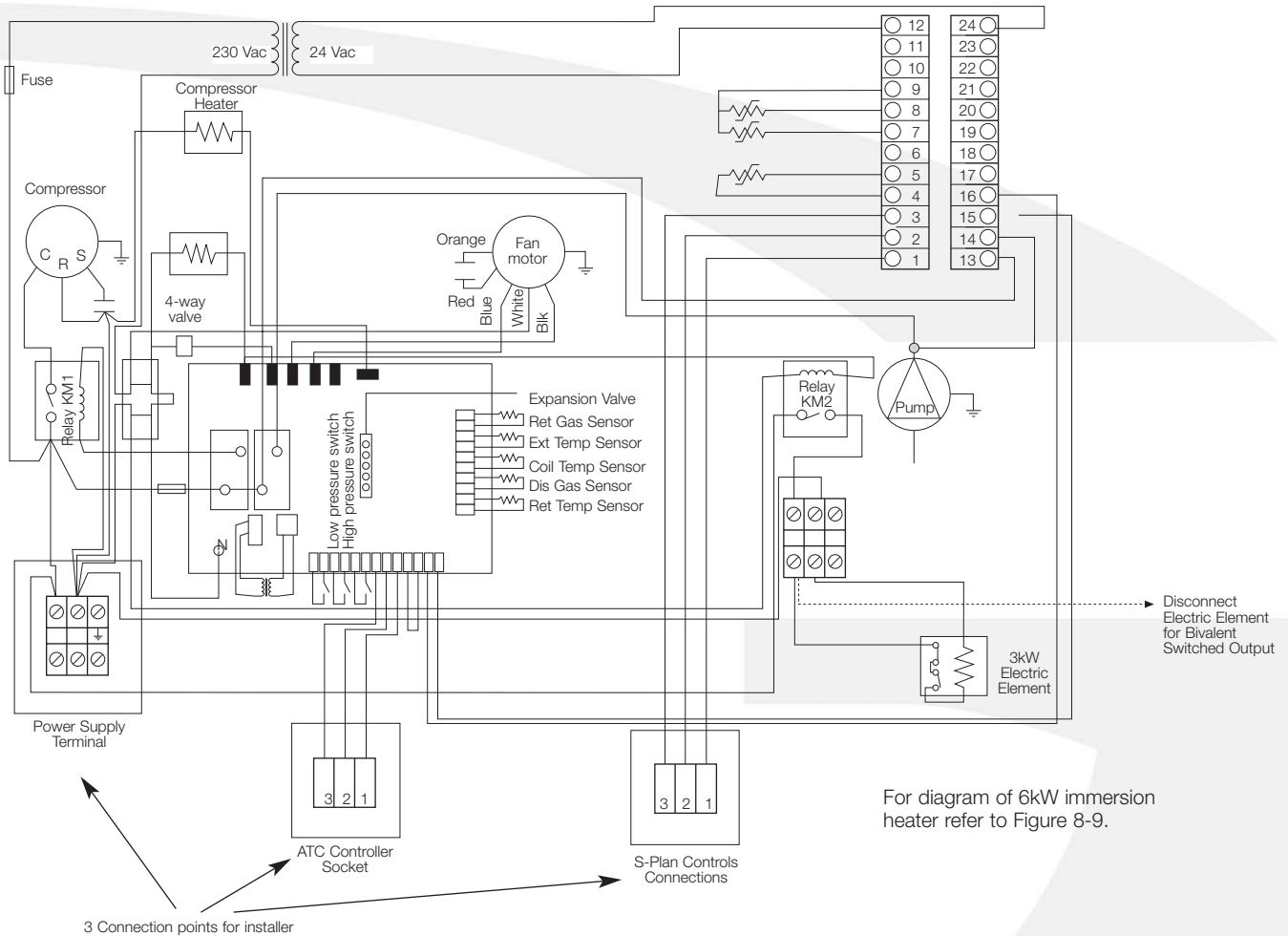


Figure 13-1: Heat pump wiring diagram

1. If no continuity can be found between terminals 1 & 2 and/or 1 & 3 there will be a fault within the heating s-plan system. (see diagram for location of the terminals.)
2. Please go back to your design of the S-plan wiring and check it against the installation manual. In detail, trace the demand for CH and DHW in isolation, covering the programmer, room or cylinder thermostats, motorised valves and end switches. Make sure that when the end switches of the motorised valves make, that there is no voltage present. Voltage on these wires will do irreparable damage to the heat pump and will not be covered by the warranty.
3. WWSD (warm weather shut down) happens only under 2 conditions.
 - 1 – when the ambient air temperature is at 24°C or equal to the indoor temperature and 2 – when the CH is the only demand on the heat pump. WWSD is active when WWSD appears on the display of the BTC.
4. MCB's and RCD can trip for a variety of reasons. Here are some common explanations but remember only qualified electricians can work on power installations. If you are in any doubt, call an electrician – not our helpline – we will only direct you to call an electrician.
 - a) Incorrect rating or type of MCB/RCD
 - b) A component leaking to earth
 - c) A component with a dead short
 - d) Incorrect polarity
 - e) Incorrect cable size
 - f) Damaged cable or component

13 Fault Finding

5. When tracing a fault code, use the table of fault codes on page 32 to help you. As often as not, it will be a wire that has become loose or disconnected. Check all wires for security before calling our helpline for assistance. There are 6 sensors in total. The ATC have black tails and the BTC have blue tails. The resistance/temperature tables for the ATC and BTC sensors are given in Figures 13-2 and 13-3.

6. The pressure gauge on the side of the heat pump measures refrigerant pressure not water pressure and is a useful tool to help fault finding.

If the heat pump goes out on high pressure, it will almost certainly be as a result of an air-lock. An air-lock that cannot be cleared by the pump will have the same effect as that of an ordinary boiler. It will overheat as

it cannot get rid of the heat it is producing. This will be evident if, when switched on from cold or warm, the gauge rises quickly towards the yellow or red zones. If this happens, switch off, and purge the system. (Remember to check the circulating pump is working.)

In normal working conditions, the pointer on the gauge will remain in the green zone.

7. Capacitors store an electrical charge. Small capacitors are found in all domestic electronics and cause no danger. However, the capacitors in a heat pump are power capacitors and will give a large electric shock if care is not taken. DO NOT try to test the functionality of a capacitor using a screwdriver or multi-meter and NEVER try to short out the

connections – even with the mains voltage removed. Seek the help of a qualified electrician or a qualified heating engineer who has been trained by Grant Engineering.

8. This is a repeat of note 5. If the heat pump goes out on high pressure, it will almost certainly be as a result of an air-lock. An air-lock that cannot be cleared by the pump will have the same effect as that of an ordinary boiler. It will overheat as it cannot get rid of the heat it is producing. This will be evident if, when switched on from cold or warm, the gauge rises quickly towards the yellow or red zones. If this happens, switch off, and purge the system. (Remember to check the circulating pump is working.)

ATC

Temperature °C	Resistance kΩ	Temperature °C	Resistance kΩ	Temperature °C	Resistance kΩ	Temperature °C	Resistance kΩ
-20	37.4111	2	13.0055	24	5.1978	46	2.3276
-19	35.5384	3	12.4391	25	5.0000	47	2.2493
-18	33.7705	4	11.9008	26	4.8109	48	2.1740
-17	31.1009	5	11.3890	27	4.6300	49	2.1017
-16	30.5237	6	10.9023	28	4.4569	50	2.0320
-15	29.0333	7	10.4393	29	4.2912	51	1.9651
-14	27.6246	8	9.9987	30	4.1327	52	1.9007
-13	26.2927	9	9.5794	31	3.9808	53	1.8387
-12	25.0330	10	9.1801	32	3.8354	54	1.7790
-11	23.8412	11	8.7999	33	3.6961	55	1.7216
-10	22.7133	12	8.4377	34	3.5626	56	1.6663
-9	21.6456	13	8.0925	35	3.4346	57	1.6131
-8	20.6345	14	7.7635	36	3.3120	58	1.5618
-7	19.6768	15	7.4498	37	3.1943	59	1.5123
-6	18.7693	16	7.1506	38	3.0815	60	1.4647
-5	17.9092	17	6.8652	39	2.9733	61	1.4188
-4	17.0937	18	6.5928	40	2.8694	62	1.3746
-3	16.3203	19	6.3328	41	2.7697	63	1.3319
-2	15.5866	20	6.0846	42	2.6740	64	1.2908
-1	14.8903	21	5.8475	43	2.5821	65	1.2511
0	14.2293	22	5.6210	44	2.4939	66	1.2128
1	13.6017	23	5.4046	45	2.4091		

Figure 13-2: ATC sensor resistance table

BTC

Temperature °C	Resistance kΩ	Temperature °C	Resistance kΩ	Temperature °C	Resistance kΩ	Temperature °C	Resistance Ω
-46	490.813	-7	46.218	32	7.334	71	1,689
-43	405.710	-4	39.913	35	6.532	74	1,538
-40	336.606	-1	34.558	38	5.828	77	1,403
-37	280.279	2	29.996	41	5.210	79	1,281
-34	234.196	4	26.099	43	4.665	82	1,172
-32	196.358	7	22.763	46	4.184	85	1,073
-29	165.180	10	19.900	49	3.760	88	983
-26	139.402	13	17.436	52	3.383	91	903
-23	118.018	16	15.311	54	3.050	93	829
-21	100.221	18	13.474	57	2.754	96	763
-18	85.362	21	11.883	60	2.490	99	703
-15	72.918	24	10.501	63	2.255	102	648
-12	62.465	27	9.299	66	2.045	104	598
-9	53.658	29	8.250	68	1.857	107	553

Figure 13-3: BTC sensor resistance table

Protection/failure	Display
Inlet water temperature sensor failure	PP 1
Coil temperature sensor failure	PP 3
Ambient temperature sensor failure	PP 5
Winter anti-freeze protection	PP 7
High pressure	EE 1
Low pressure	EE 2
Flow switch	EE 3
Wrong/ miss phase	EE 4
Electrical shock protection	EE 5
Defrosting	Defrosting indicator
communication failure	EE 8

Figure 13-4: ATC fault codes

Item Field	Num Field	Display
E01	Err	EEprom read error
BOIL OUT	SHr	HP Flow sensor short
BOIL OUT	OPn	HP Flow sensor open
BOIL IN	SHr	HP return sensor short
BOIL IN	OPn	HP return sensor open
SUP	SHr	Supply sensor short
SUP	OPn	EE 3Supply sensor open
OUTDR	SHr	Outdoor sensor short
OUTDR	OPn	Outdoor supply sensor open

Figure 13-5: BTC fault codes

14 Spare Parts List

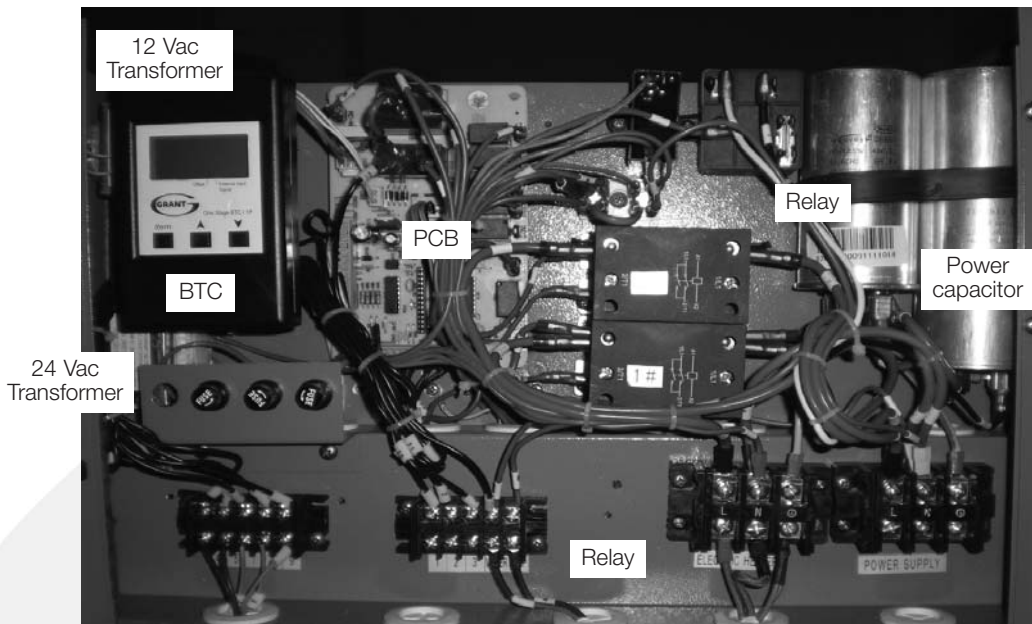


Figure 14-1: Heat pump control panel components

Part Number	Description	HPAW65	HPAW85	HPAW110	HPAW130	HPAW155
HPAS10	Power capacitor 50 μ F	1	1	0	0	0
HPAS11	Power Capacitor 60 μ F	0	0	1	1	0
HPAS12	Power Capacitor 70 μ F	0	0	0	0	1
HPAS13	Power capacitor 100 μ F	0	0	1	1	1
HPAS14	Fan Capacitor 4 μ F	1	0	0	0	0
HPAS15	Fan Capacitor 6 μ F	0	1	1	1	2
HPAS16	Fan Motor A	1	0	0	0	0
HPAS17	Fan Motor B	0	1	1	1	2
HPAS18	PCB	1	1	1	1	1
HPAS19	12Vac Transformer	1	1	1	1	1
HPAS20	24Vac Transformer	1	1	1	1	1
HPAS21	Controller ATC	1	1	1	1	1
HPAS22	Compressor A	1	0	0	0	0
HPAS23	Compressor B	0	1	0	0	0
HPAS24	Compressor C	0	0	1	0	0
HPAS25	Compressor D	0	0	0	1	0
HPAS26	Compressor E	0	0	0	0	1
HPAS27	Controller BTC	1	1	1	1	1
HPAS28	Relay 1	2	2	2	2	2
HPAS29	Circulating Pump A	1	1	1	1	0
HPAS30	Circulating Pump B	0	0	0	0	1
HPAS31	Immersion element 3kW	1	1	1	1	1
HPAS32	Flexible Hoses 3/4"	2	2	0	0	0
HPAS33	Flexible Hoses 1"	0	0	2	2	2
HPAS34	Isolation Valves 22mm	2	2	0	0	0

15 Accessories



Figure 15-1: Sealed system kit



Figure 15-2: Automatic hot water boost kit

15.1 Sealed System Kits

These are required when the Grant Aerona Heat Pump is used as part of sealed heating system – refer to Section 7 for further details.

Kit 1 (Grant Ref. HPAW55K12) 12 litre expansion vessel kit

For use on heating systems with a volume of up to 110 litres*

Kit contents:

12 litre expansion vessel
Wall bracket and fixing band
3 bar pressure relief valve
Manifold
Pressure gauge
Filling loop kit (isolation valve, non-return/isolation valve and filling hose)

Kit 2 (Grant Ref. HPAW55K18) 18 litre expansion vessel kit

For use on heating systems with a volume of up to 165 litres*

Kit contents:

18 litre expansion vessel
Wall bracket and fixing band
3 bar pressure relief valve
Manifold
Pressure gauge
Filling loop kit (isolation valve, non-return/isolation valve and filling hose)

Kit 3 (Grant Ref. HPAW55K50) 50 litre expansion vessel kit

For use on heating systems with a volume of up to 460 litres*

Kit contents:

50 litre expansion vessel
Wall bracket and fixing band
3 bar pressure relief valve
Manifold
Pressure gauge
Filling loop kit (isolation valve, non-return/isolation valve and filling hose)

*maximum system volumes shown for all sealed system kits are based on a vessel charge and initial (cold) system pressure of 1 bar.

15.2 Immersion Heater Kits

Kit 4 (Grant Ref. HPDHWBK1) Automatic domestic hot water boost kit - with manual override

This kit, installed next to the hot water cylinder, allows the stored hot water temperature to be automatically boosted in winter periods using the existing cylinder immersion element and thermostat. Refer to Section 9 for further details.

Kit contents:

Double patress c/w relay
Blanking plate
Water heater switch

16 Glossary of Terms

Efficiency

The word “efficiency” is defined as the ratio of useful heat output to energy input. For example, if we use 1 kW of energy to produce 500W of heat it is deemed to be 50% efficient.

Entropy

Loosely speaking, when a system’s energy is divided into its “useful” energy (energy that can be used, for example, to push a piston), and its “useless energy” (that energy which cannot be used to do external work), then entropy can be used to estimate the “useless”, “stray”, or “lost” energy, which depends on the entropy of the system and the absolute temperature of the surroundings.

COP

The COP or ‘Coefficient of Performance’ is found by dividing the useful heat output by the energy input. For example; a heat pump that produces 4 kW of heat for 1 kW of input power has a COP of 4.

SPF

Seasonal Performance Factor is similar to COP, but is an average figure taken over the year. It is usually lower than quoted COP figures due to the need in some cases for additional heat input during very cold periods.

Source

This is wherever the heat is being extracted from e.g. the outside air or ground.

Emitters

A term used to describe radiators or underfloor heating. This is the component that ‘emits’ the heat into the building.

Refrigerant

The working fluid within the heat pump. It evaporates in one part and condenses in another. By doing so, heat is transferred from cold to hot. This fluid is sealed in and will not degrade within the life of the heat pump. Refrigerant handling should only be carried out by persons qualified to do so.

Heat Exchanger

A component that allows the transference of heat from one circuit to another without the two circuits mixing. Two heat exchangers are housed within the heat pump, one for the hot side (the condenser which transfers the heat to the heating circuit) and one for the cold side (the evaporator).

Geothermal

Geothermal is often mistakenly used to describe a ground source heat pump; proper geothermal energy is where the energy from the earth’s core is able to make its way near to the surface, usually using hot water. In the UK there are only a couple of sites where this type of energy extraction is feasible as it requires holes in excess of 2km deep.

Buffer Tank

This is simply a large water cylinder that is used, so we are told, to improve the efficiency and durability of a system. In fact, it reduces the number of stop/starts the compressor makes.

Heat Pump Rating

A heat pump is given a kW heat output rating. This value will vary depending on the working temperatures. The electrical power input will be typically between a half and a quarter of the heat output.

Monovalent

A monovalent system is one where all of the energy required for the heat load of the building is available from the heat pump.

Bivalent

Bivalent systems are those which require an additional source to meet the buildings heat load.

17 Warranty

17.1 The Grant Heat Pump Warranty

Dear Customer

You are now the proud owner of a Grant Aerona Air Source Heat Pump from Grant Engineering (UK) Limited, that has been designed to give years of reliable, trouble free operation.

Grant Engineering (UK) Ltd. guarantees the manufacture of the heat pump including all electrical and mechanical components for a period of two years from the date of purchase. Provided that the card is completed and returned to Grant UK, the heat pump is installed in full accordance with the installation instructions provided and it is serviced after 12 months operation. (See Terms and Conditions).

Important

Please complete the guarantee registration section, then detach the card and return it within 30 days of the installation of your Grant Air Source Heat Pump.

Breakdown during the Manufacturer's Warranty

If your Grant Heat Pump should fail during the first 2 years, you must contact Grant Engineering (UK) Limited, who will arrange for the repair under the terms of their Warranty, providing that the system has been correctly installed and commissioned, serviced (if older than 12 months) and the fault is not due to misuse, or the failure of any external components not supplied by Grant UK (e.g. pipework, etc.).

In the first Instance:

Contact your installer or commissioning engineer to ensure that the fault does not lie with the system or any other components.

If a Fault is Found:

Ask your installer to contact Grant Engineering (UK) Limited, Service Department on 01380 736920 who will arrange for a qualified service engineer to attend to the fault.

Free of Charge Repairs:

During the first 2 years no charge for parts or labour will be made providing that the Heat Pump has been installed and commissioned correctly in accordance with the manufacturer's instructions. Proof of 'purchase' date must be provided upon request.

Chargeable Repairs:

A charge will be made if the cause of the breakdown is due to any of the following:

- **Faults caused by the plumbing or heating system, external electrics and external components.**
- **The Grant Heat Pump has not been commissioned, or serviced in accordance with the installation and servicing manual.**
- **The system has been installed for over 2 years.**

Remember before you contact Grant:

Please complete the guarantee registration section, then detach the card and return it within 30 days of the installation of your Grant Heat Pump.

Terms of Manufacturer's Guarantee

1. The Grant Heat Pump guarantee starts from the date of purchase.
2. All electrical and mechanical components supplied with the Grant Heat Pump are guaranteed for a period of two years.
3. The registration card must be completed and returned within 30 days of installation. Failure to do so does not affect your statutory rights.

4. The Grant Heat Pump must be installed by a competent installer and in accordance with the Codes of Practice and Regulations in force at the time of the installation.

5. The Grant Heat Pump and its components must not have been modified or tampered with.

6. The installation must be serviced every 12 months as per the installation instructions. (Receipts should be kept as proof.)

7. All claims under this guarantee must be made to Grant Engineering (UK) Ltd prior to any work being undertaken. Proof of purchase and date of installation must be provided on request. Invoices for call out/repair work by any third party will not be accepted unless previously authorised by Grant Engineering (UK) Ltd.

8. This guarantee is transferable providing the installation is serviced prior to the dwelling's new owners taking up residence. Grant Engineering (UK) Ltd must be informed of the new owner's details.

9. Grant Engineering (UK) Ltd will endeavour to provide prompt service in the unlikely event of a problem occurring, but cannot be held responsible for any consequence of delay however caused.

10. This guarantee applies to Grant Heat Pumps installed on the UK mainland, Isle of Man and Channel Islands only. Provision of in-warranty cover elsewhere in the UK is subject to agreement with Grant Engineering (UK) Ltd.



EFFICIENT HEATING SOLUTIONS

GRANT ENGINEERING (UK) LTD

Hopton House, Hopton Industrial Estate, Devizes, Wiltshire. SN10 2EU

Telephone: 01380 736920 Fax: 01380 736991

Email: info@grantuk.com Website: www.grantuk.com

To be Completed by the Householder

Title Initials Surname

Address

Town County Post code

Tel: Home Work Mobile

Heat Pump Model Serial Number

System Type: Monovalent Bivalent

If Bivalent System - other heat source(s):

Gas Boiler Oil Boiler Biomass Boiler Other (specify)

Heating System (tick all that apply):

Radiators only Underfloor only Radiators & Underfloor

Hot Water Cylinder Swimming Pool Heater Thermal Store

Installer Date installed

Address

Town County Post code

Commissioning Engineer (if different) Date Commissioned

Address

Town County Post code

Do you own a:

Grant Oil Boiler? Yes No Grant Solar Thermal System? Yes No

Grant Pellet Boiler? Yes No Grant Solar PV System? Yes No

Grant Hot Water Cylinder? Yes No Grant Thermal Store? Yes No



EFFICIENT HEATING SOLUTIONS

GRANT ENGINEERING (UK) LTD

Hopton House, Hopton Industrial Estate, Devizes, Wiltshire. SN10 2EU

Telephone: 01380 736920 Fax: 01380 736991

Email: info@grantuk.com Website: www.grantuk.com

Guarantee Registration Card



Grant Air Source Heat Pump Guarantee

Air to Water Heat Pump Range

- 2 years parts and labour cover on all electrical and mechanical components
- Extended warranty available. Contact Grant for details.

Important - Don't Delay!

Please complete the attached reply-paid guarantee registration card and return it to:

GRANT ENGINEERING (UK) LIMITED

Hopton House, Hopton Industrial Estate, Devizes, Wiltshire SN10 2EU

Tel: 01380 736920 Fax: 01380 736991

Email: sales@grantuk.com www.grantuk.com



EFFICIENT HEATING SOLUTIONS

BUSINESS REPLY SERVICE
Licence No. SCE15739



**Guarantee Registration
Grant Engineering (UK) Limited
Hopton House
Hopton Industrial Estate
Devizes
Wiltshire
SN10 2EU**