



High Efficiency Variable Speed Air Source Heat Pumps

Models covered by this manual:

A-Series

Air Source

AS01-R32

AS02-R32

AS03-R32



Incorporating:

User Instructions
Installation Instructions
Service Instructions
Guarantee Terms & Conditions



INSTALLATION, COMMISSIONING & SERVICING

This appliance must be installed as described herein and the installation commissioned by competent persons as instructed. The Installation/Commissioning Certificate supplied with the product must be completed and returned to the manufacturer with proof of purchase (e.g. receipts / invoices).

This appliance must be serviced annually by competent persons, the Service Record completed on each occasion and proof of servicing (e.g. receipts / invoices) retained.

The complete guarantee policy statement is included in Section 4.

FAILURE TO COMMISSION, REGISTER AND ANNUALLY SERVICE THIS PRODUCT WILL INVALIDATE ALL GUARANTEES

TECHNICAL, SPARES & GUARANTEE CLAIMS

For technical advice about the installation, commissioning, servicing or use of this appliance, please contact the Warmflow Customer Care Centre by post, phone, fax or email at the addresses below. Please also refer to our website.

In the unlikely event that replacement components might be required within the guarantee period, please notify the Customer Care Centre in writing, by post, fax or email, stating the nature of the fault and the part number of the replacement components required.

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1 USER INSTRUCTIONS

1.1 Intended Use

The Warmflow Air Source Heat Pump units are intended for the production of hot water for space heating and sanitary water. The units can be used to provide heating and domestic hot water (DHW) via underfloor heating circuits, radiators and approved hot water cylinders. The units are designed to extract heat from the air.

1.2 Compliances

The Warmflow AS01-R32, AS02-R32 and AS03-R32 air source heat pump units are Microgeneration Certification Scheme (MCS) approved and hold both UKCA and CE markings. They are approved on the Renewable Heat Incentive Eligibility list and can be found on both the Product Characteristics Database (PCDB) as well as the Home-heating Appliance Register of Performance (HARP) database. As such the units comply with the following directives and are tested to the following standards:

- MCS 007 Issue 3.0 - Product Certification Scheme Requirements: Heat Pumps.
- 2006/95/EC - Low Voltage Directive.
- 2004/108/EC - Electromagnetic Compatibility Directive.
- 97/23/EC - Pressure Equipment Directive.
- EN14511 - Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.
- EN14825 - Air conditioners, liquid chilling packages and heat pumps, with electrically driven compressors, for space heating and cooling. Testing and rating at part load conditions and calculation of seasonal performance.
- EN 60335-1 - Household and similar electrical appliances. Safety. General requirements.
- EN 60335-2-40 - Household and similar electrical appliances. Safety. Particular requirements for electrical heat pumps, air-conditioners and dehumidifiers.
- EN 61000 - Electromagnetic compatibility (EMC). Limits.
- EN 378 - Refrigerating systems and heat pumps. Safety and environmental requirements.
- ENV 12102 - Air conditioners, liquid chilling packages, heat pumps and dehumidifiers with electrically driven compressors for space heating and cooling. Measurement of airborne noise. Determination of the sound power level.

1.3 Basic Operation

Heat flows from an area of higher temperature to an area of lower temperature. In much the same way that a water pump, pumps water from a low level to a higher level, a heat pump pumps heat from a source at a low temperature to a source at a higher temperature. The benefit of this is that natural sources such as the air and ground, which are at relatively low temperatures, can be used to heat buildings at a higher temperature. In order to do this the heat pump uses a relatively small amount of electrical energy. The proportion of electrical energy used to do this is much smaller than the heat power delivered to the building. The ratio of the heat power delivered to the electrical energy used determines the efficiency of the heat pump and is commonly known as the coefficient of performance (COP).

Heat is extracted from the air by blowing air through a finned radiator, known as the evaporator, with a fan. The extracted energy from the air is transferred into the refrigerant which circulates around the evaporator. The heat pump then converts this low grade heat to a high grade by compressing the refrigerant using the compressor. The compression of the refrigerant increases the pressure and the temperature. This high grade heat is then transferred to the heating system via another heat exchanger known as the condenser. The heat can now be used to provide space heating and DHW. The pressure of the refrigerant is then released through a throttling valve known as the expansion valve which also causes the temperature to drop and allows the cycle to start over again.

1.4 Product Data

Table 1 Product data

Product Data		AS01-R32	AS02-R32	AS03-R32
Dimensions (mm)	Width	1002	953	997
	Depth	490	460	437
	Height	805	915	1315
Weight (kg)		90	108	140
Electrical Supply		230V Single Phase @50Hz	230V Single Phase @50Hz	230V Single Phase @50Hz
Maximum Current (Amps)		13	22	33
Nominal Sound Level (dBA)*		37 - 54	42 - 55	44 - 58
Performance	COP @ A7W35	4.58	4.35	4.67
	COP @ A2W30	4.18	3.46	3.74
	COP @ A7W27	6.10	5.76	5.37
	COP @ A12W24	8.58	8.39	7.37
	COP @ A-7W34	3.11	2.95	2.71
	COP @ A7W55	2.68	2.67	2.51
	COP @ A-10W55	1.90	1.69	1.94
	Heat Output Range	2 - 8kW	5 - 12kW	7 - 20kW
	ErP Efficiency Class (35°C / 55°C)^	A+++ / A++	A++ / A++	A++ / A++
Operating Temp. (°C)	Ambient Air, min/max	-25/43	-25/52	-25/52
	Heating Flow, min/max	20/65	20/65	20/65
Flow Rates (l/m)	Heating, min/max	10/20	16/30	28/60
Fluid Content (l)		1.0	1.53	2.51
Refrigerant	Type	R32	R32	R32
	Charge (kg)	1.30	1.70	2.00
Connections	Heating Flow & Return	1" female BSP	1" female BSP	1 ¼" female BSP

*Nominal Sound Levels have been independently tested in accordance with EN 12102.

^ ErP ratings have been independently tested in accordance with EN 14825.

Table 2 Product information

Model		AS01- R32	AS02- R32	AS03- R32	
Air-to-water heat pump	Yes				
Water-to-water heat pump	No				
Brine-to-water heat pump	No				
Low-temperature heat pump	No				
Equipped with a supplementary heater	No				
Heat pump combination heater	No				
	Symbol	Value			Unit
Rated heat output	<i>Prated</i>	8	12	20	kW
Declared Capacity of heating for part load at indoor temp. 20°C and outdoor temp., T_j (~ 55°C)					
$T_j = -7^\circ\text{C}$	<i>Pdh</i>	3.8	7.1	9.0	kW
$T_j = 2^\circ\text{C}$	<i>Pdh</i>	2.4	4.5	5.5	kW
$T_j = 7^\circ\text{C}$	<i>Pdh</i>	2.2	4.7	7.3	kW
$T_j = 12^\circ\text{C}$	<i>Pdh</i>	2.9	5.2	7.7	kW
$T_j =$ bivalent temperature	<i>Pdh</i>	3.8	7.1	9.0	kW
$T_j =$ operation limit temperature	<i>Pdh</i>	4.4	6.3	9.3	kW
Bivalent temperature	<i>Tbiv</i>	-7	-7	-7	°C
Cycling interval capacity for heating	<i>Pcyc</i>	-	-	-	kW
Degradation coefficient	<i>Cdh</i>	-	-	-	
Seasonal Space Heating Energy Efficiency	η_s	125	126	126	%
$T_j = -7^\circ\text{C}$	<i>COPd</i>	2.12	2.20	2.23	
$T_j = 2^\circ\text{C}$	<i>COPd</i>	3.01	2.98	2.90	
$T_j = 7^\circ\text{C}$	<i>COPd</i>	4.04	4.34	4.54	
$T_j = 12^\circ\text{C}$	<i>COPd</i>	6.70	6.42	6.39	
$T_j =$ bivalent temperature	<i>COPd</i>	2.12	2.20	2.23	
$T_j =$ operation limit temperature	<i>COPd</i>	1.90	1.69	1.94	
Operation limit temperature	<i>TOL</i>	-10	-10	-10	°C
Cycling interval capacity for heating	<i>COPcyc</i>	-	-	-	
Heating water operating limit temperature	<i>WTOL</i>	60	60	60	°C
Power consumption in modes other than active					
Off mode	<i>P_{OFF}</i>	0.013	0.060	0.020	kW
Thermostat-off mode	<i>P_{TO}</i>	0.013	0.060	0.020	kW
Standby mode	<i>P_{SB}</i>	0.013	0.060	0.020	kW
Crankcase heater mode	<i>P_{CK}</i>	0.043	0.069	0.106	kW
Other items					
Capacity control	Variable				
Sound power level indoors	<i>LWA</i>	50	51	55	dB
Annual energy consumption	<i>QHE</i>	2739	5163	6504	kWh
Rated air flow rate	-	4050	5620	8740	m³/h

Table 3 Product Fiche

Supplier	Warmflow	Warmflow	Warmflow
Model	AS01	AS02	AS03
Energy Efficiency Class	A+++	A++	A++
Rated Heat Output (kW)	8	12	20
Seasonal Space Heating Energy Efficiency	179	158	159
Annual Energy Consumption, GCV (kWh)	1838	2750	5355
Sound Power Level, LWA (dB)	50	51	55
Rated Heat Output in Colder Climate (kW)	8	12	20
Seasonal Space Heating Energy Efficiency in Colder Climate	179	158	159
Annual Energy Consumption in Colder Climate, GCV (kWh)	2193	3159	6389
Rated Heat Output in Warmer Climate (kW)	8	12	20
Seasonal Space Heating Energy Efficiency in Warmer Climate	179	158	159
Annual Energy Consumption in Warmer Climate, GCV (kWh)	1189	1778	3463

1.4.1 Starting Current

The AS01-R32, AS02-R32 and AS03-R32 air source heat pump units are all inverter driven. This means they ramp up slowly and therefore do not require a large starting current which is required with fixed speed units. In the majority of situations the starting current will be less than 1Amp. The starting current will also always be below the rated current of the unit. Below is the typical starting profile showing the compressor frequency (left side scale) and current draw (right side scale) from off to typical running speed.

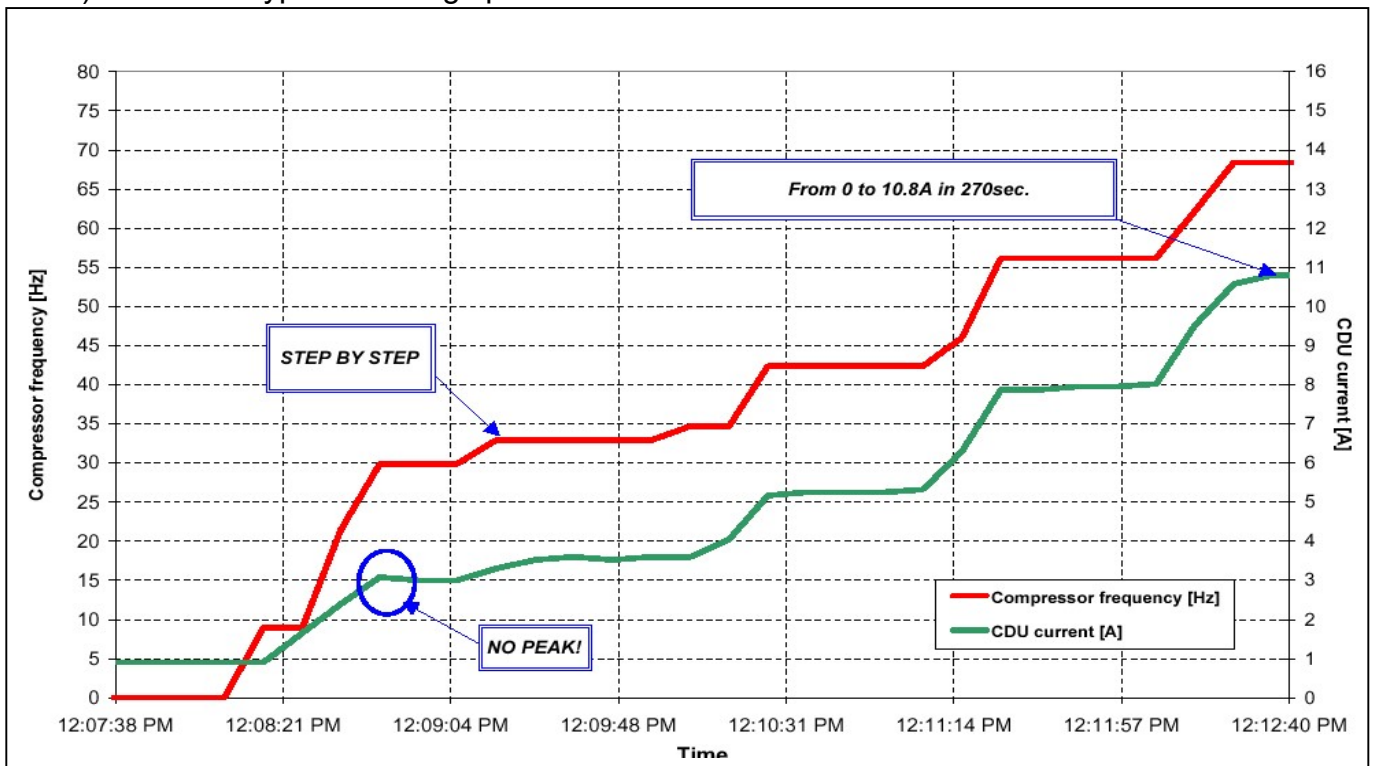


Figure 1 Starting Current

1.5 Construction

The Warmflow air source heat pumps are housed in a powder-coated galvanised metal casing complete with enclosure box in which a cable entry terminal is mounted.

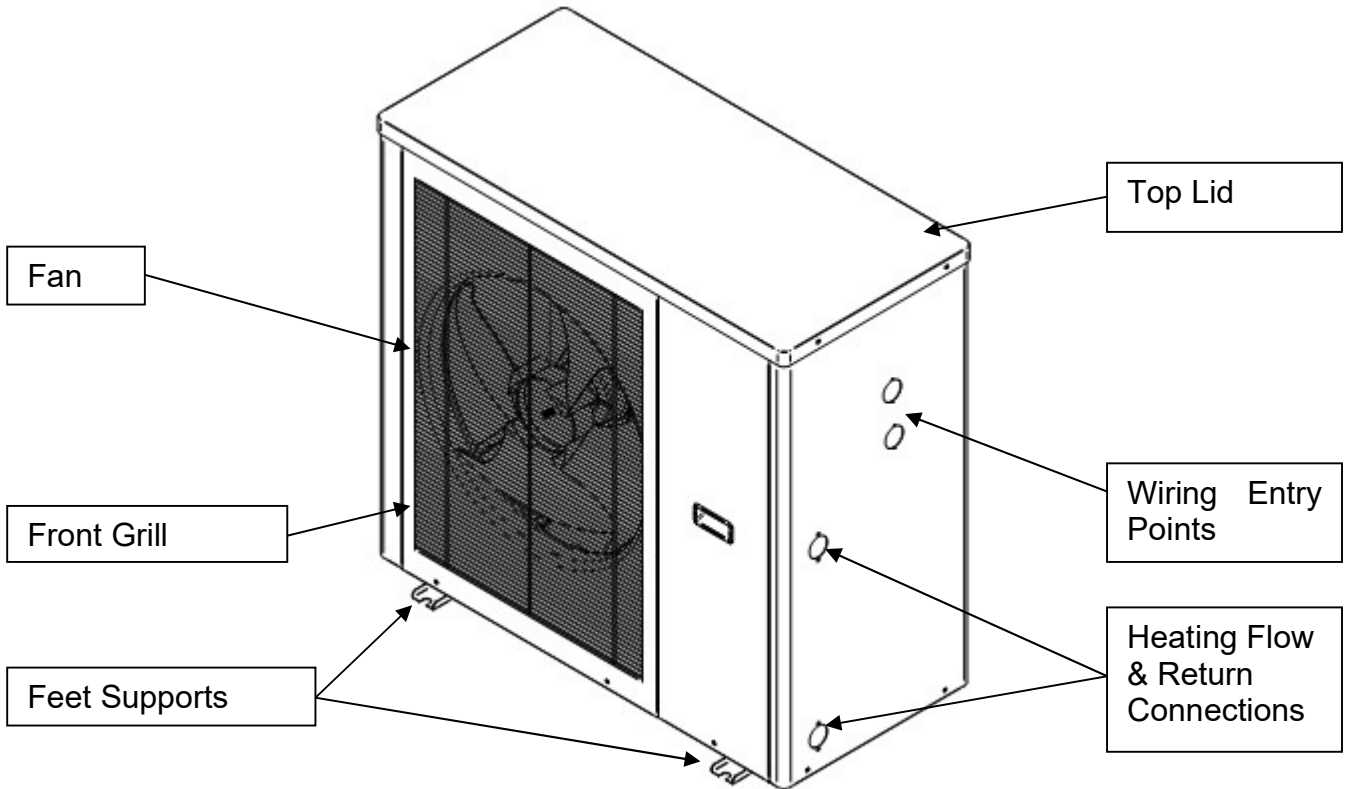


Figure 2 Typical Construction

Upon delivery, it is important that the unit is unpacked carefully and checked for any sign of damage. If something is missing or damaged please report it to Warmflow immediately. The units are secured to the shipping pallet using screws which must be removed.

NOTE: For coastal areas or other areas subjected to higher levels of corrosion, units can be supplied with a Blygold coating applied to the evaporator to help protect it. Please contact Warmflow for more details.

1.6 Supplied Components

Together with the unit, a number of additional components are supplied to aid installation. The following items are supplied with each unit:

- 1no. Y-strainer complete with 700µm Filter Gauze
- 2no. 1" flexible hoses (1¼" to 1" adapter supplied with AS03)
- 2no. 1" Male to Female Brass Elbows
- 2no. 1" Isolating Ball Valves
- 1no. DHW Cylinder Temperature Sensor
- 4no. Anti-Vibration Mounts
- 1no. Touchscreen Controller complete with wiring and wall mount

Upon delivery, it is important to check that all components are included. If something is missing or damaged please report it to Warmflow immediately.

1.7 Storage / Transport

The units come on a pallet (Dimensions of shipping sizes are shown below) and are secured to the pallet using screws. If the units are to be stored prior to installation, they must be kept indoors in storage conditions at a temperature of between 5°C and 60°C with a humidity level between 10%RH and 80%RH in order to provide a non-condensing environment. The units must not be stacked in storage or during transport. During transport the units must be kept in an upright position and should never be allowed to tilt more than 45° during loading or unloading.

Table 4 Shipping Details

Product Data		AS01-R32	AS02-R32	AS03-R32
Shipping Dimensions (mm)	Width	1120	1090	1120
	Depth	510	500	435
	Height	825	920	1340
Shipping Weight (kg)		110	120	160

2 USER INTERFACE

The appliance's user control interface (see Figure 3) has been designed to maximise the ease of use and efficiency of the heating system. The interface is a touchscreen with all interactions being performed on the screen itself.

On powering the unit up, the following start up screen will be displayed. The screen displays the firmware and software version which are installed on the controller. If the version number is not shown, this means there is a communication fault and the screen will turn off after 15 seconds. Check the wiring connections between the controller and the unit if this occurs. On first start up, the controller will give out a long beep indicating that it has been successfully set up.

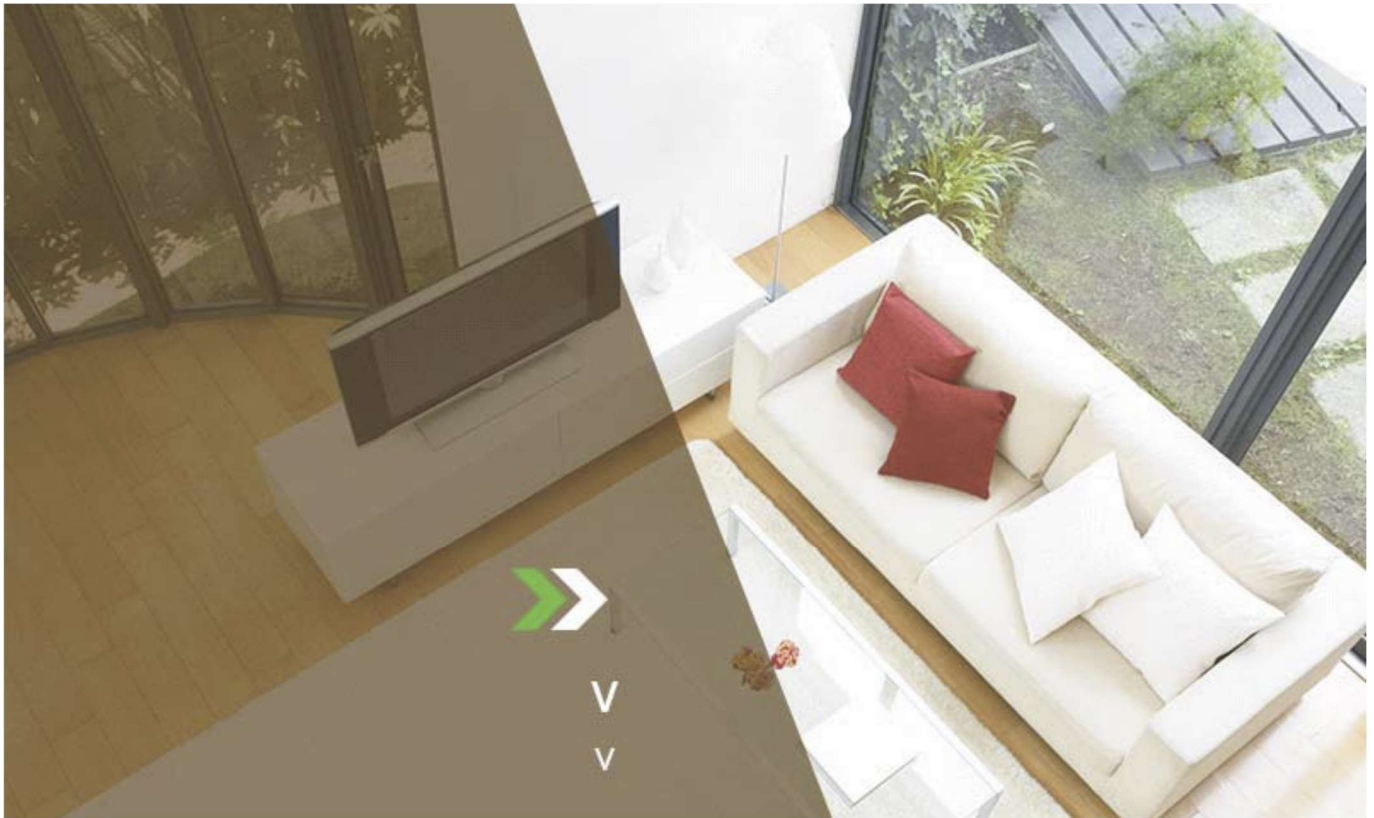


Figure 3 User Interface Start-Up Screen

2.1 Home Screen Icons

All interactions with the heat pump are via this user interface which should be located in a suitable location in the property. The interface allows the modification of parameters such as time clocks, temperature set points, heating & DHW functions, together with commissioning and service settings. The home screen appears as shown in Figure 4.



Figure 4 Screen Icons

There are a number of icons/buttons on the home screen as shown above. The meaning and features of these are explained in the points below:

- 1 ON/OFF Button - Press this button to switch the unit from OFF to ON or vice versa. When the unit is switched ON, the symbol on the button will be red and the screen will appear in full colour as shown above. When the unit is switched OFF, the symbol on the button will be grey and the screen will be greyed out as shown in the image below.



Figure 5 Unit OFF Screen Display

2

LOCK Button - Press this button to lock the display. This function prevents unwanted adjustments of parameters or changing of functions and timeclock on/off periods. When the lock function is activated, the display will ignore all key presses. To unlock the device, press the Lock Button again and then enter the password. The password is '0022'. Once entered, all functionality will be restored. The button will turn green to show that the LOCK function is enabled. The button will appear white when the function is not enabled.

3

MODE Button - Press this button to switch between operating MODES. Pressing the button will bring up the following menu screen where the required MODE can then be selected.

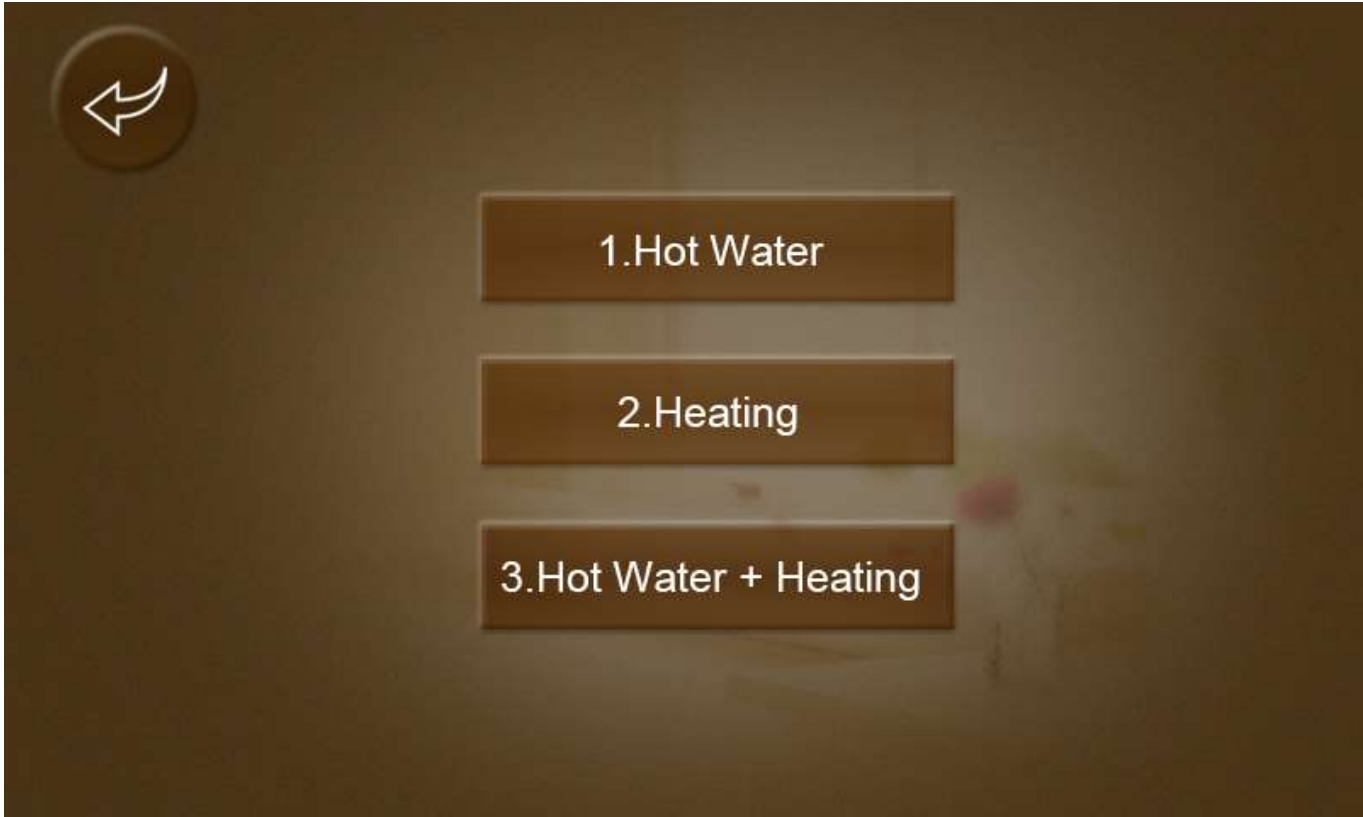


Figure 6 MODE Menu Screen

The required MODE can be selected by pressing one of the five MODE buttons. Details of each MODE are below. After selection, the display will return to the Home Screen with the appropriate symbols for the selected MODE enabled.

Modes

No.	Mode	Description
1	Hot Water	This enables Hot Water only.
2	Heating	This enables Heating only.
3	Hot Water & Heating	This enables both Heating & Hot Water with Hot Water taking priority.

- 4 Temperature Setting Button - Press this button to set the desired temperatures. Pressing the button will bring up the following menu screen where the required temperature can then be set.

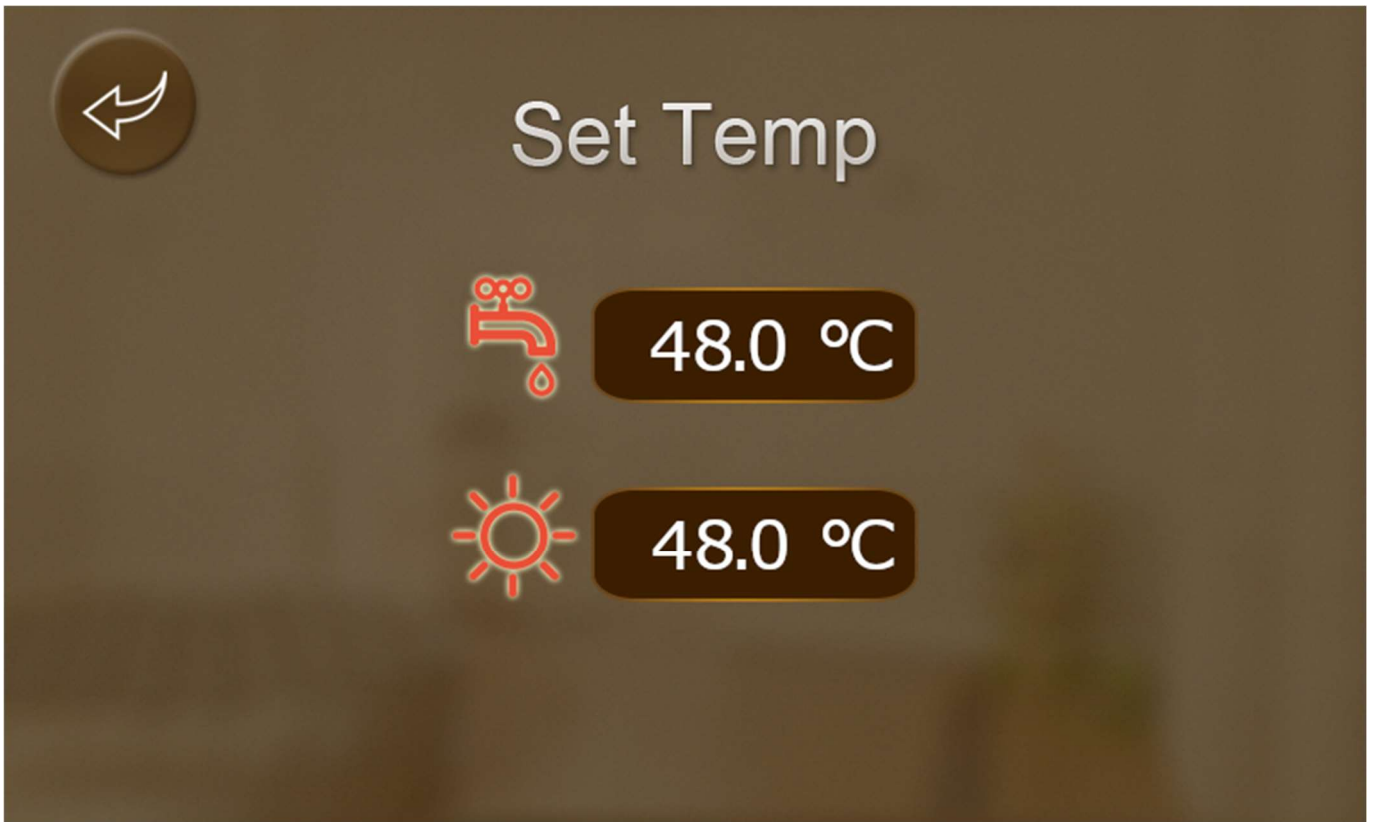


Figure 7 Temperature Setting Menu Screen

Depending on the current mode of the unit, the Temperature Setting Menu Screen will display the relevant temperatures available to be modified. For example, the image of the display above means that Hot Water & Cooling Mode is enabled so the 'Tap' symbol and the 'Snow Flake' symbol are displayed representing Hot Water and Cooling Temperature settings respectfully. The Temperature to be adjusted can be selected by pressing the required temperature button. This will then bring up a keypad as shown below.



Figure 8 Temperature Setting Menu Screen

The required setting should be entered using the keypad and then confirmed with the 'Enter' button. To return to the setting screen, press the 'Return' button. To modify another setting, repeat the above procedure. To return to the Home Screen press the 'Return' button located at the top left of the Temperature Setting Menu Screen.

5

Timeclock Button - Press this button to set the internal timeclock. When the button is green, it indicates that the timeclock function is active. If the timeclock function is not active, the button will be white. Pressing the button will bring up the following setup screen where the required timeclock can then be set.



Figure 9 Timeclock Setup Screen

The Timeclock Setup Screen allows the on and off times for the current MODE to be set. The functionality can be enabled or disabled by pressing the desired hourly sector on the clock as shown above. Pressing the hourly sector will turn it green, indicating it is active and the right hand side of the display will show that this has been set. Set the desired on-periods for the AM times and then do the same for the PM times as required. Repeat this process for the other days of the week.

6

Settings Button - Press this button to enter the Setting Menu. Pressing the button will bring up the following menu screen where five further Settings Menus can be found.

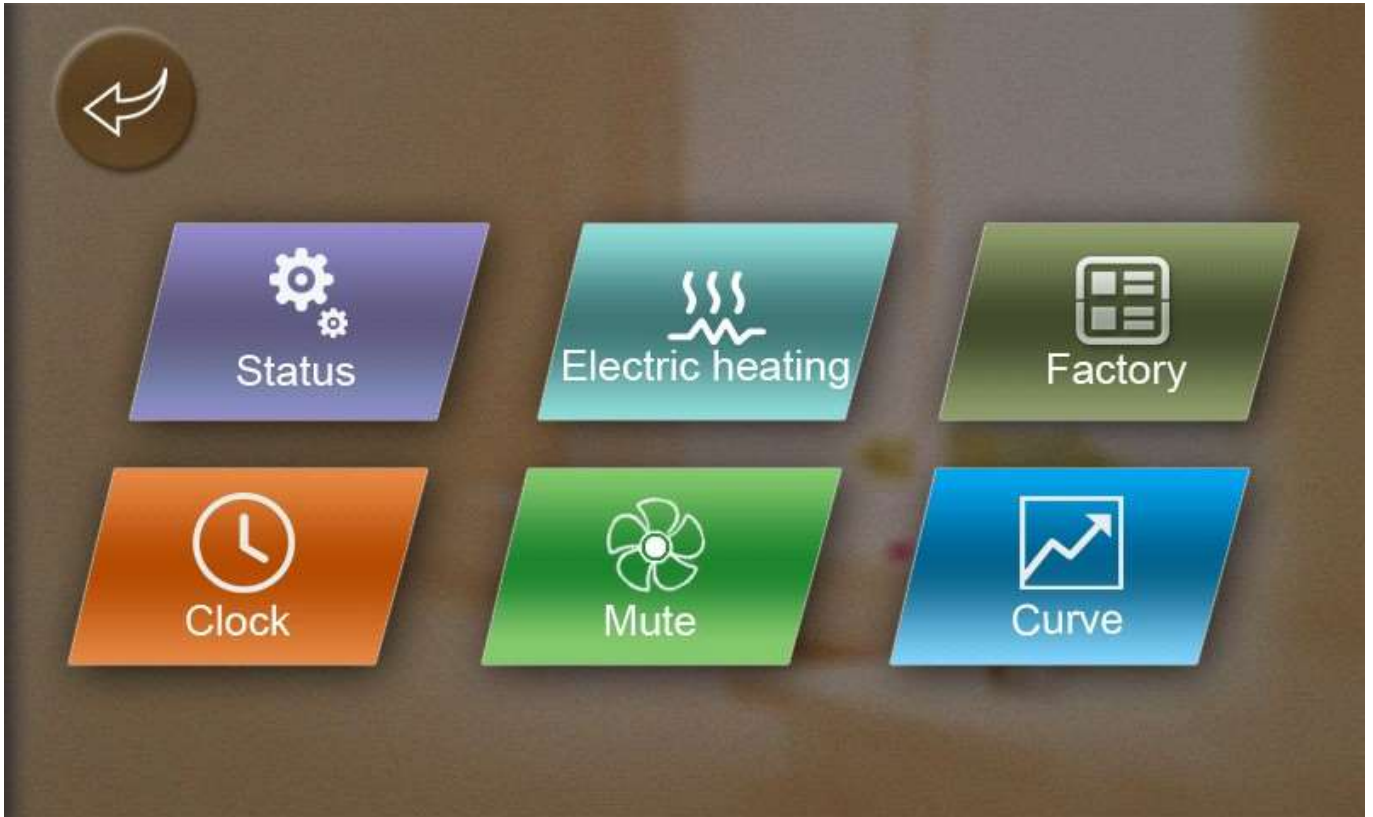


Figure 10 Settings Menu Screen

The Settings Menu Screen features six further Setting Sub-Menus. These include Status, Clock, Electric heating, Mute, Factory & Curve as shown above and detailed below. These Sub-Menus are detailed in the following pages.

Status – Press this button to enter the Status Sub-Menu. Pressing the button brings up the following display screen which displays the current status of the unit, the current mode the unit is running in and live data for a number of parameters. These parameters include Inlet Water (Heating Return) Temperature, Outlet Water (Heating Flow) Temperature, Water Tank (DHW Cylinder) Temperature and the Ambient Outdoor Temperature.

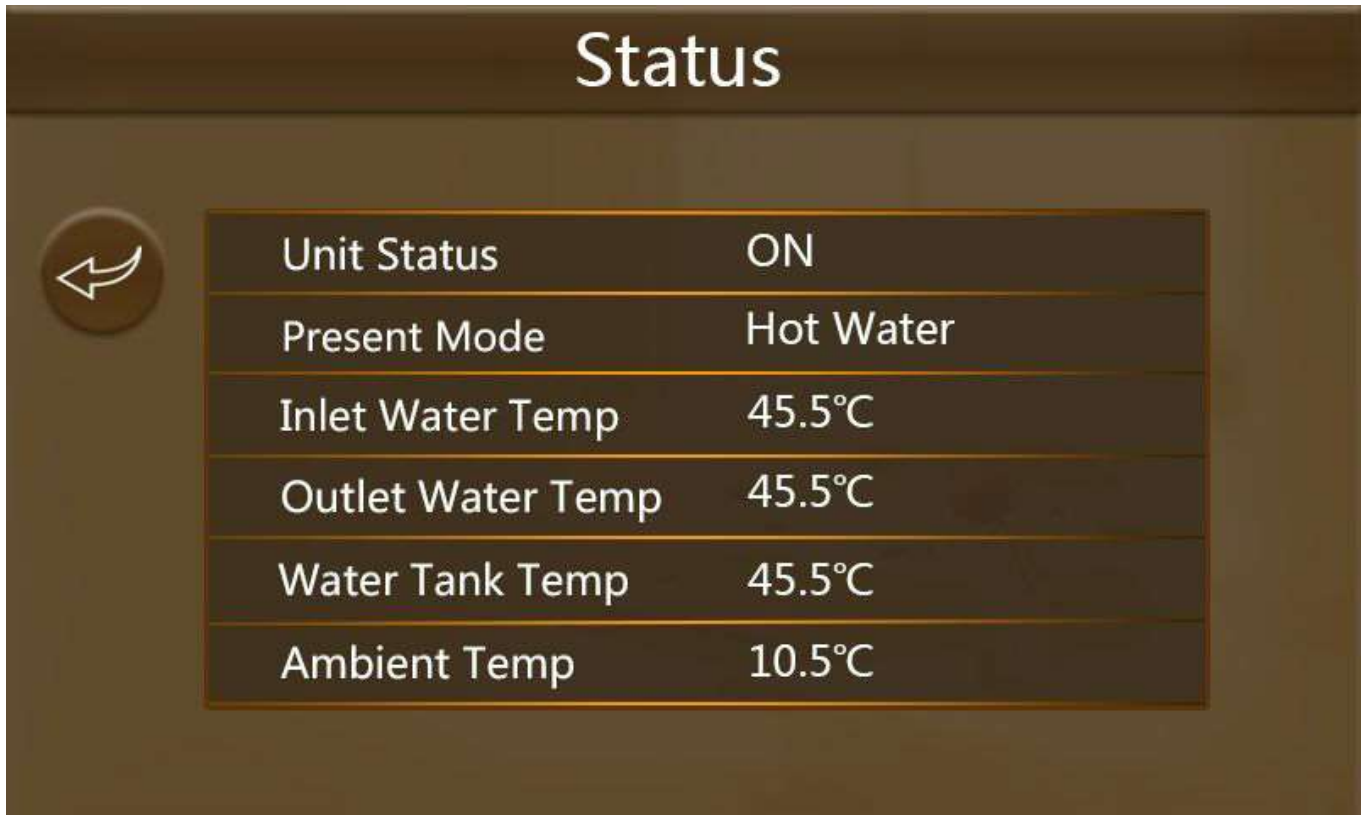


Figure 11 Status Display Screen

Clock – Press this button to enter the Clock Sub-Menu. This sub-menu allows the clock to be set to the current time and date. This must be accurately set to enable the timeclock functionality and monitoring system to operate correctly. The clock sub-menu is shown below.



Figure 12 Clock Sub-Menu Screen

The date and time can be set using the up and down arrows shown in the display above (hold the buttons down to speed up the adjustment). Confirm with the enter key to save the new time. Return to the Setting Menu Screen with the return button at the top left side of the screen.

Electric (Fast) Heating - Press this button to enable or disable Fast Heating (when available). Fast Heating is only available when an auxiliary electric heater such as an immersion heater in the hot water cylinder has been fitted. Pressing the button will bring up the following menu screen, where the fast heating function can be enabled or disabled.



Figure 13 Fast Heating Pop Up Screen

The Fast Heating Pop Up Screen has two options, ON or OFF. Select the required setting by pressing the appropriate button. To return to the previous screen press any other place on the display.

NOTE: The Fast Heating function is not available when the unit is in cooling mode. When in cooling mode, the Fast Heating Button will be grey and will not be selectable.

Mute – Press this button to enter the Mute Sub-Menu. This sub-menu allows the unit to be switched into or out of Quiet Mode and also for Quiet Mode to be scheduled at certain times of the day/night. In Quiet Mode, the unit will run at a slower speed with the fan speed also reduced to provide quiet operation. As such the maximum heat output available will be reduced when Quiet Mode is enabled. When Mute mode is active, the fan symbol will show 3 blades, when it is inactive (Normal Operating Mode) the fan symbol will show 5 blades. The Mute Sub-Menu Screen is shown below.

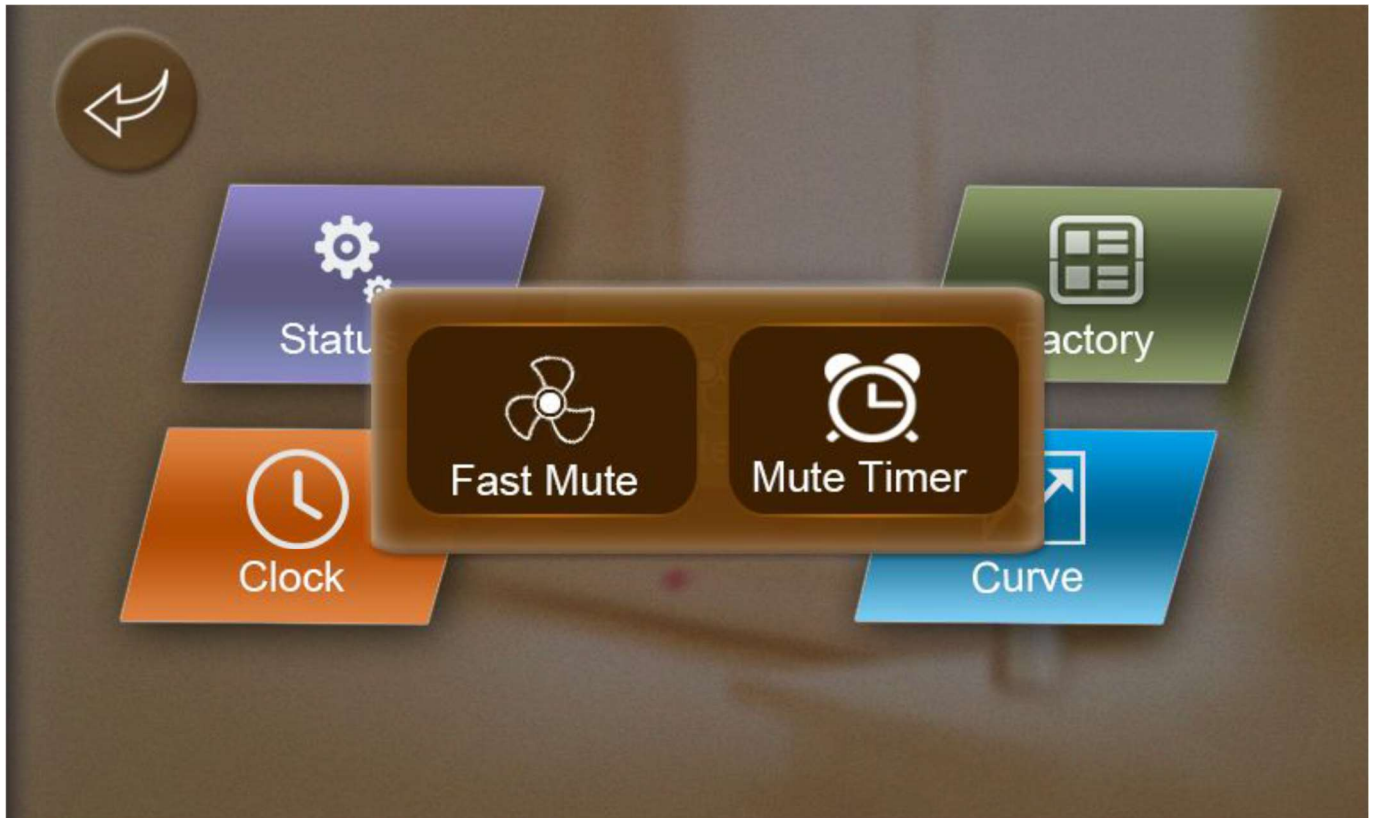


Figure 14 Mute Sub-Menu Screen

Mute Timer – Press this button to enter the Mute Timer Sub-Menu. This sub-menu is for setting the time when Mute Mode is active. The Mute Timer Sub-Menu Screen is shown below.



Figure 15 Mute Timer Sub-Menu Screen

The functionality can be enabled or disabled by pressing the ON button on the left as shown above. Pressing the ON button will turn it green, indicating it is active and the ON time is set using the Hour and Minute settings above. The OFF time is set using the right side Hour and Minute settings. The OFF button on the right side should be grey as shown above.

Factory – Press this button to enter the Factory Settings Password Screen. The Password Screen is shown below.



Figure 16 Factory Password Entry Screen

Enter Password '0022' to enter the Engineer Parameter Sub-Menu.

NOTE: This Sub-Menu should only be accessed by a suitably trained engineer. Modifying parameters can cause operating errors and malfunction of the unit. The Factory Sub-Menu Screen is shown below and contains 6 further Sub-Menus.



Figure 17 Factory Password Entry Screen

Parameters – Press this button to enter the Parameters Sub-Menu. Pressing the button brings up the following configurable display screen which features a large number of editable parameters spread across a number of pages. These parameters are detailed in section 3.11.

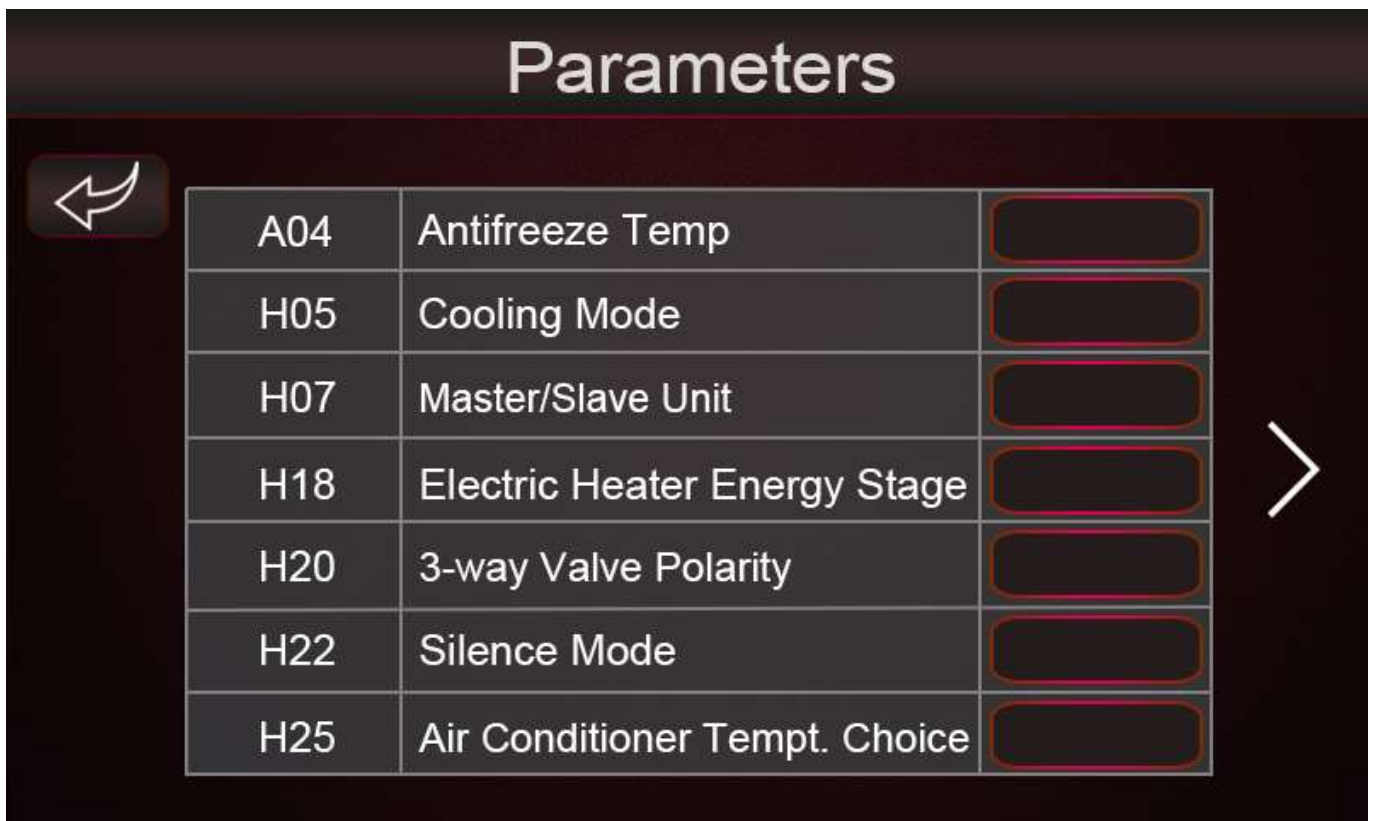


Figure 18 Parameters Sub-Menu Screen

Defrost – Press this button to enter the Defrost Sub-Menu. This sub-menu allows the unit to be switched into or out of manual Defrost mode. Switching the Defrost Button to 'On' will switch the unit into Defrost mode which will continue until a full defrost cycle has occurred. Manual defrost mode can be exited at any time by switching the Defrost Button to 'Off'. The Defrost Sub-Menu Screen is shown below.



Unit State – Press this button to enter the Unit Status Sub-Menu. Pressing the button brings up the following display screen which displays the current status of a number of outputs spread across a number of tabs. These outputs and their functionality are detailed in Table 5 at the end of this chapter:

The screenshot shows a dark-themed interface with three tabs at the top: 'Load Status' (highlighted), 'Switch Status', and 'Temp Status'. Below the tabs is a table with three columns. The first column contains output IDs (O01 to O05), the second column contains output names, and the third column is empty. Navigation arrows are visible on the left and right sides of the table area.

Output ID	Output Name	Status
O01	System1:Compressor	
O02	System2:Compressor	
O03	Fan Motor:High Speed	
O03	Fan Motor1	
O04	Fan Motor:Low Speed	
O04	Fan Motor2	
O05	Main Circulation Pump	

Figure 19 Unit Status Sub-Menu Screen

Failure – Press this button to enter the Failure Logging Sub-Menu. Pressing the button brings up the following display screen which displays the stored fault codes (most recent first). The date and time are displayed as follows: DAY-MONTH HOUR:MINUTE:SECOND in order to record the exact time when the fault occurred. A total of 42 codes can be stored together with the time and date when the code occurred. Once an error code has been resolved, the error code can be cleared by pressing the Clear button together with the reset password. A list of error codes, a description and possible resolution can be found in section 3.14 of this manual.

NOTE: It is essential that these error codes are not cleared in order to allow an engineer to fully diagnose the problem and prevent further failures.

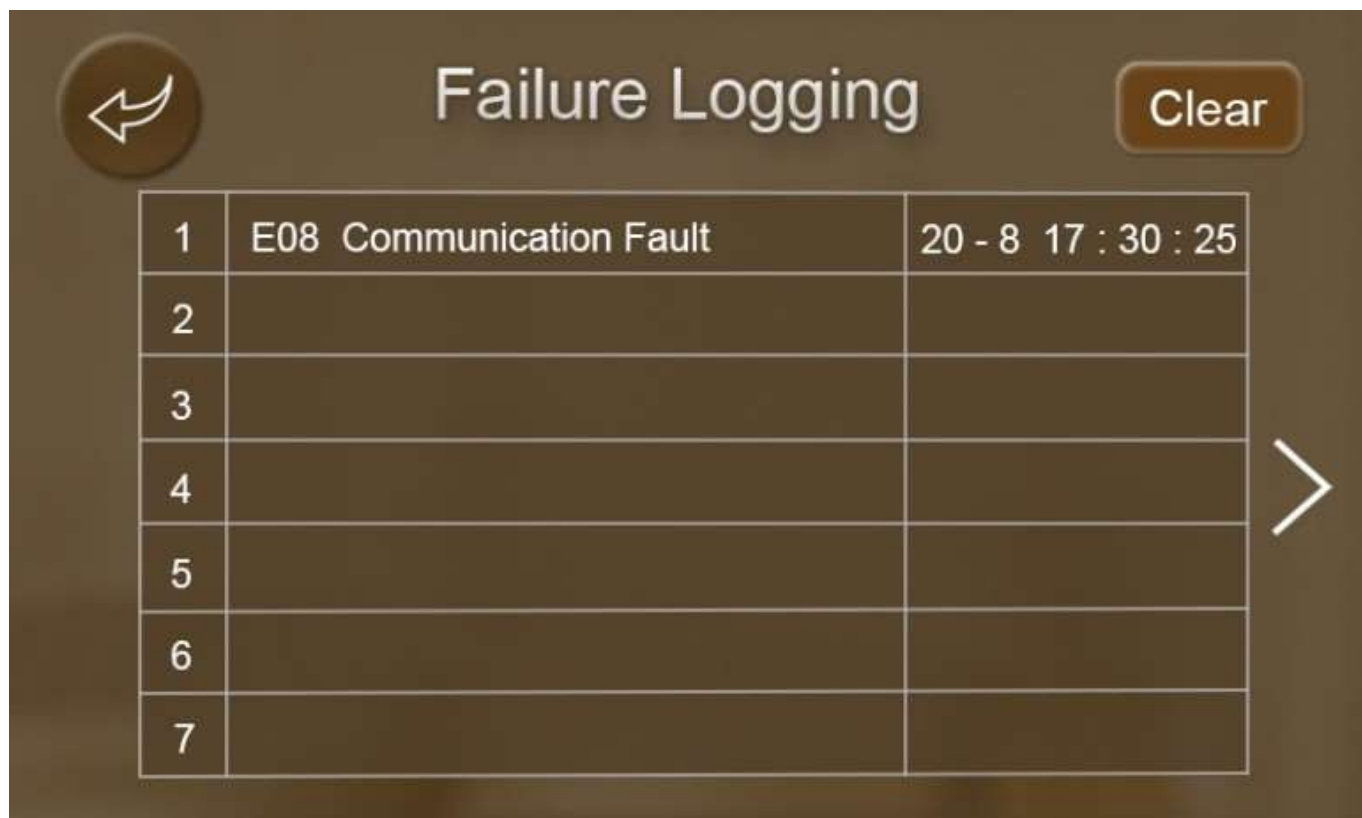
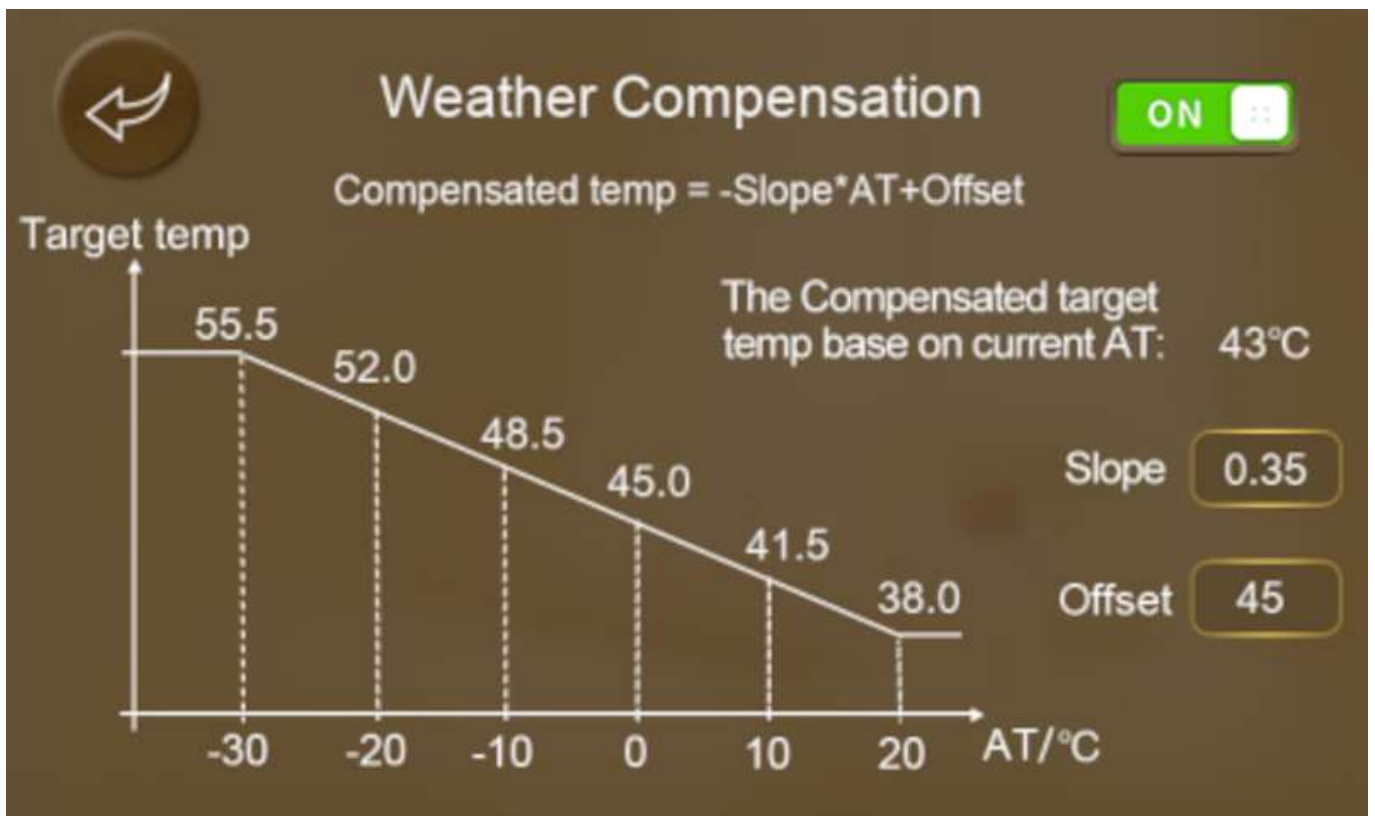


Figure 20 Failure Logging Sub-Menu Screen

Ambient Temp. Compensation / Weather Compensation – Press this button to enter the Ambient Temperature Compensation (otherwise known as Weather Compensation) Sub-Menu. Pressing the button brings up the following display screen. Ambient Temp / Weather Compensation can be enabled/disabled using the On/Off button at the top right of the screen. The compensated target is displayed at the bottom right of the screen which is calculated based on the adjustable parameters, Slope and Offset. A simulated Ambient Temperature can be entered into the Input AT parameter to display the Compensated Target at that Ambient Temperature. The slope and offset parameters can be changed to modify the weather compensation curves to suit the property. Disabling weather compensation will invalidate the SAP assessment (EPC). A commissioning certificate and label must be provided that confirm this disablement.



Brightness – Press this button to enter the Brightness Setting Sub-Menu. Pressing the button brings up the following display screen which allows the display brightness to be increased or decreased using the slider. The Brightness Setting Screen is shown below:

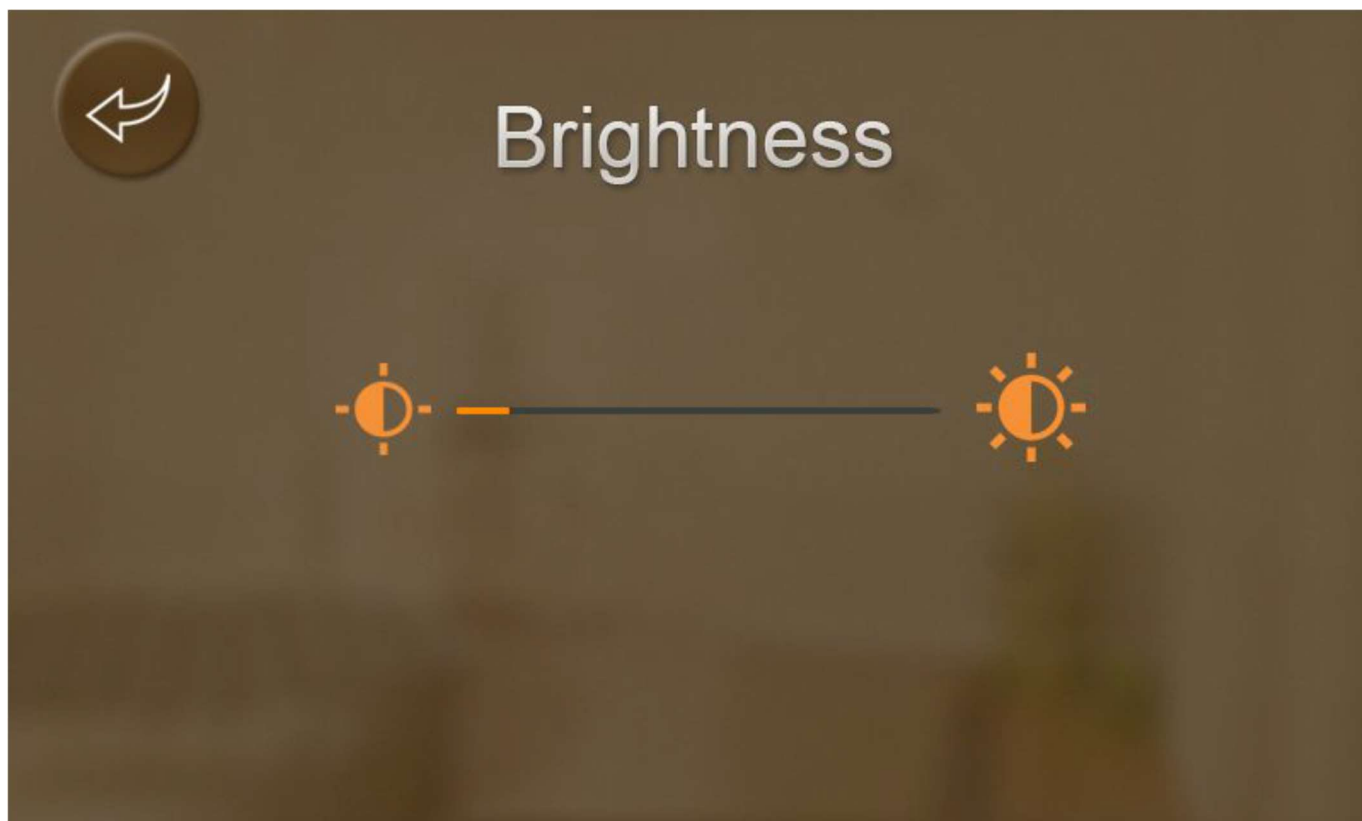


Figure 21 Brightness Setting Screen

Temperature Curve – Press this button to enter the Curve Sub-Menu. This sub-menu displays a graph showing the Heating Flow, Heating Return and Ambient temperatures when the unit is running (data will not be recorded if the unit is not running). The data is recorded every 5 minutes and displayed in either °C or °F dependent on the user setting (parameter H03). The most recent recording is shown on the left side of the graph. The graph can be cleared by pressing the Clear button although this is not recommended. A typical graph is shown below:

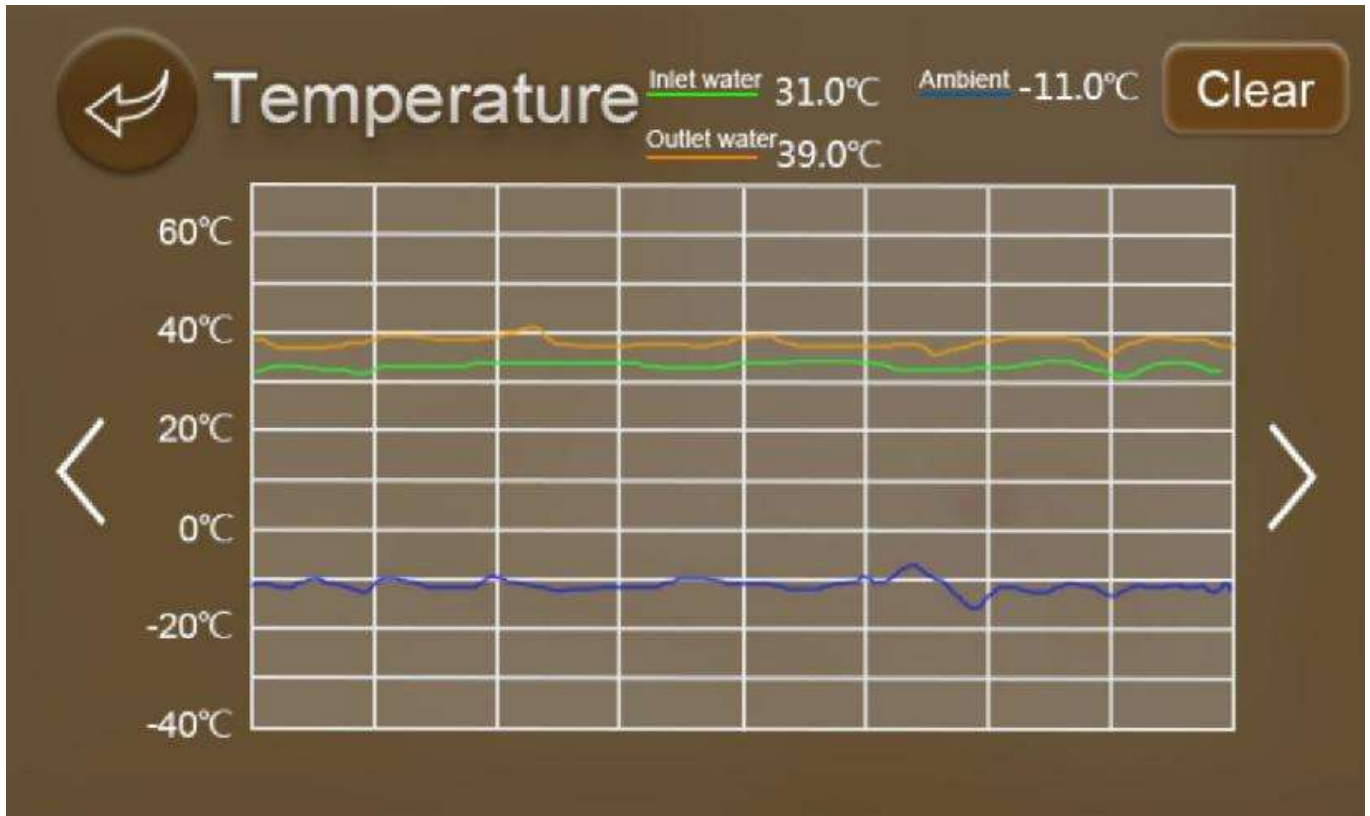


Figure 22 Heating Flow & Return Temperature Graph Screen

- 7 Tap Icon – This icon indicates that DHW Mode is active.
- 8 Sun Icon – This icon indicates that either Heating or Cooling Mode is active. A 'Sun' icon will appear when the unit is in Heating Mode and a 'Snowflake' icon will appear when the unit is in Cooling Mode.
- 9 Time And Date – This line of text indicates the current Time and Date.
- 10 Ambient Temperature – This value displays the current Ambient Temperature.
- 11 Electric (Fast) Heating – This icon indicates that the electric heating function is active.

12

Defrosting Icon – The Defrosting Icon (melting Snowflake) indicates that the unit is currently in Defrost Mode. The defrosting icon will continue to show until defrosting is complete.

13

Alarm/Fault Icon – This icon will flash when a fault or alarm is active. Pressing the icon will bring up the Fault History Sub-Menu.

Table 5 Monitored Parameters

Ref.	Text	Description	Expected Value(s)
T01	Inlet Water (Return) Temp.	This is the temperature at which the heating water returning from either the heating circuit or to the hot water storage cylinder is entering the heat pump.	Ambient temperature if the appliance has been off for a time. No greater than 65°C in normal operation.
T02	Outlet Water (Flow) Temp.	This is the temperature at which the heating water leaving to either the heating circuit or to the hot water storage cylinder is returning to the heat pump.	Ambient temperature if the appliance has been off for a time. The value should be approximately 5.0 degrees Celsius below the heating flow temperature in heating mode.
T03	Coil (Evaporator) Temp.	This is the temperature of the evaporator coil.	Ambient temperature if the appliance has been off for a time. Varies between negative and positive temperature depending on the mode.
T04	Ambient Temp.	This is the temperature of the outside air.	Dependent on local climate condition, typically between -10°C and 30°C.
T05	Suction Temp.	This is the temperature of the suction line (the gas entering the compressor from the evaporator).	Ambient temperature if the appliance has been off for a time. Varies between negative and positive temperature depending on the mode.
T08	Water Tank Temp.	This is the temperature of the water in the hot water storage tank.	Not greater than 65°C in normal operation.
T09	Room Temp.	This is the temperature at the room temperature sensor location (if fitted)	Dependent on local climate condition, typically between 10°C and 30°C.
T10	Inlet Temp. (EVI)	This is the temperature of the EVI inlet (the gas entering the EVI heat exchanger).	Ambient temperature if the appliance has been off for a time. Varies between negative and positive temperature depending on the mode.
T11	Outlet Temp. (EVI)	This is the temperature of the EVI outlet (the gas exiting the EVI heat exchanger).	Ambient temperature if the appliance has been off for a time. Varies between negative and positive temperature depending on the mode.
T12	Exhaust (Discharge) Temp.	This is the temperature of the discharge line (the gas leaving the compressor travelling to the condenser).	Ambient temperature if the appliance has been off for a time. Not greater than 130°C in normal operation.
T13	Compressor Current	This is the compressor current measurement.	Typically between 1Amp and 33Amps.
T15	Pressure	This is the pressure of the suction line (the gas entering the compressor from the evaporator).	This should read between 7.0 and 20.0 bar if the appliance is off and between 2.0 and 12.0 bar in normal operation.
T27	Speed of Fan1 Motor	This is the current speed of the fan motor.	Between 0r and 2000r.
T28	Speed of Fan2 Motor	This is the current speed of the second fan motor (only applies to AS03 models).	Between 0r and 2000r.
T29	Target Speed of Fan Motor	This is the requested speed of the fan motor/s.	Between 0r and 2000r.
T30	Actual Frequency	This is the requested speed of the compressor.	Between 20Hz and 120Hz when the unit is running, 0Hz when the unit is off.
T31	Operation Freq. of Compressor	This is the current speed of the compressor.	Between 20Hz and 120Hz when the unit is running, 0Hz when the unit is off.

Ref.	Text	Description	Expected Value(s)
T32	Max Frequency Allowed for Driver	This is the maximum allowed speed of the compressor.	120Hz
T33	IPM Shutdown Protection Temp.	This is the temperature on board the IPM module above which the unit will shut down.	Calculated value based on current conditions.
T34	AC Input Voltage	This is the current incoming AC voltage measurement.	Typically between 210Vac and 240Vac.
T35	AC Input Current	This is the current incoming AC current measurement.	Typically between 1Amp and 33Amps.
T36	Phase Current of Compressor	This is the compressor current measurement.	Typically between 1Amp and 33Amps.
T37	DC Bus Voltage	This is the current voltage measurement for the communication bus.	Up to 5V.
T38	IPM Temp.	This is the temperature on board the IPM module.	Ambient temperature if the appliance has been off for a time.
T39	Water Flow	This is the flow rate of water through the unit from the system.	This should read 0.0m ³ /hr when the unit is off and between 0.3 m ³ /hr and 5.0 m ³ /hr when the unit is running.

This appliance must be serviced annually or as indicated by the user interface controller. Contact Warmflow for further details.

In the event of a breakdown please refer to section 3.14 - Alarms and Troubleshooting. Alternatively, contact your commissioning engineer who should then contact our service department whilst at your home, to report the fault.

3 AIR SOURCE HEAT PUMP INSTALLATION

The Warmflow air source heat pumps require installation by a Warmflow or MCS approved installer. The unit can be installed as part of a new system or retrofitted into an existing system, however it is important that the system design is capable of facilitating the required flow rates and can dissipate heat efficiently.

3.1 General

The appliance is to be located outdoors only. The unit should be installed on a suitable mounting in order to ensure the evaporator sits at least 150mm above the ground. Flexible feet are available separately from Warmflow in order to provide this gain in height. This should then be installed on a smooth horizontal surface capable of supporting the weight of the unit together with any accessories and other plant. The area in which the unit is installed must have good ventilation and not be susceptible to strong gusts of wind. There should be no other heat sources close to the installation area. The unit needs to have a drain or soakaway beneath or close by the unit to get rid of the condensing water which accumulates beneath the evaporator.

In order to keep noise and vibration to a minimum, it is important that the unit's anti-vibrations mountings are secured and in full contact with the base surface. The units are supplied with a set of flexible hoses for the flow and return of the heating circuit. These should be installed to further reduce the transmission of noise and vibration into the building structure.

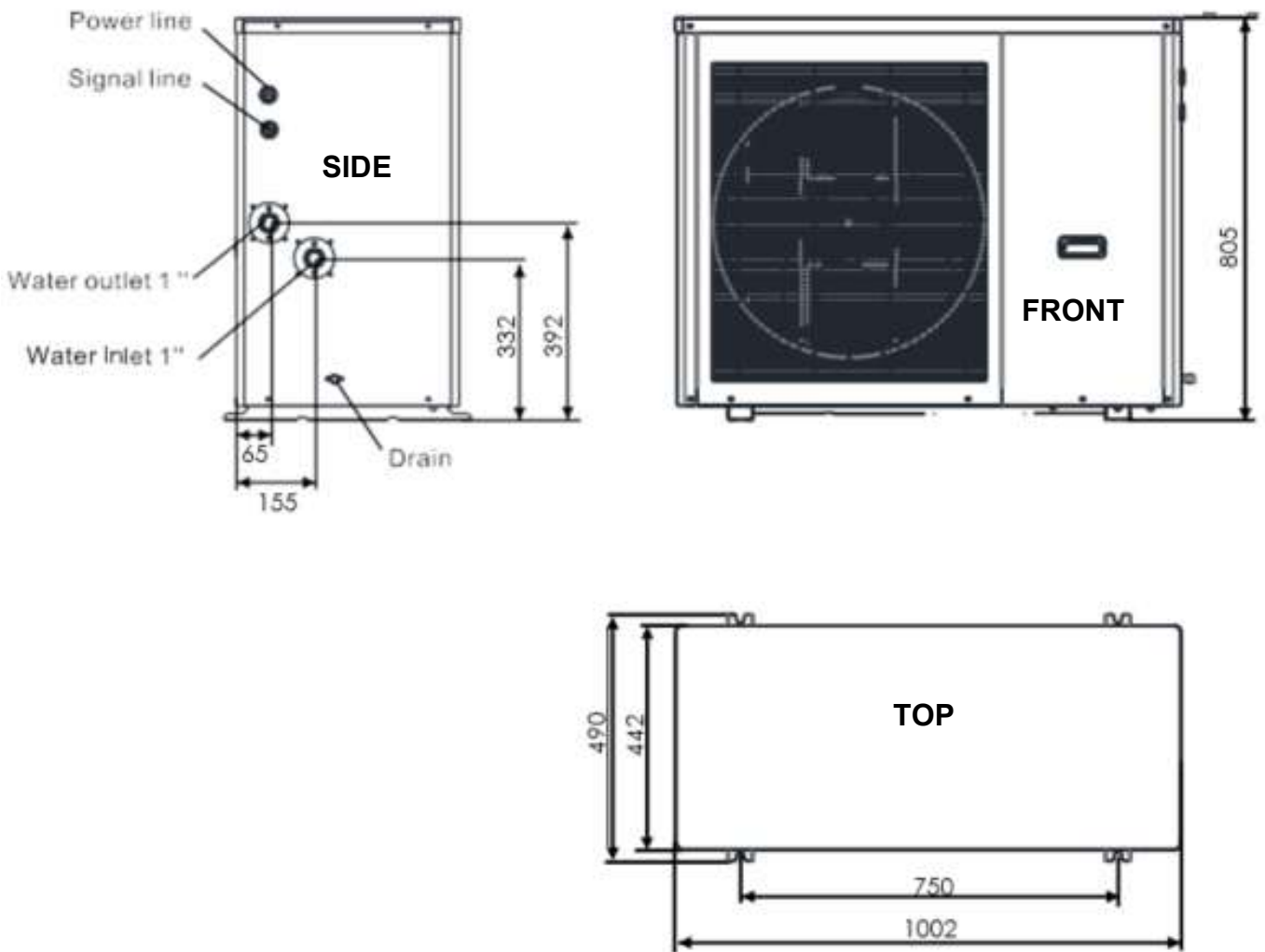


Figure 23 AS01-R32 Casing Dimensions & Heating Connection Locations

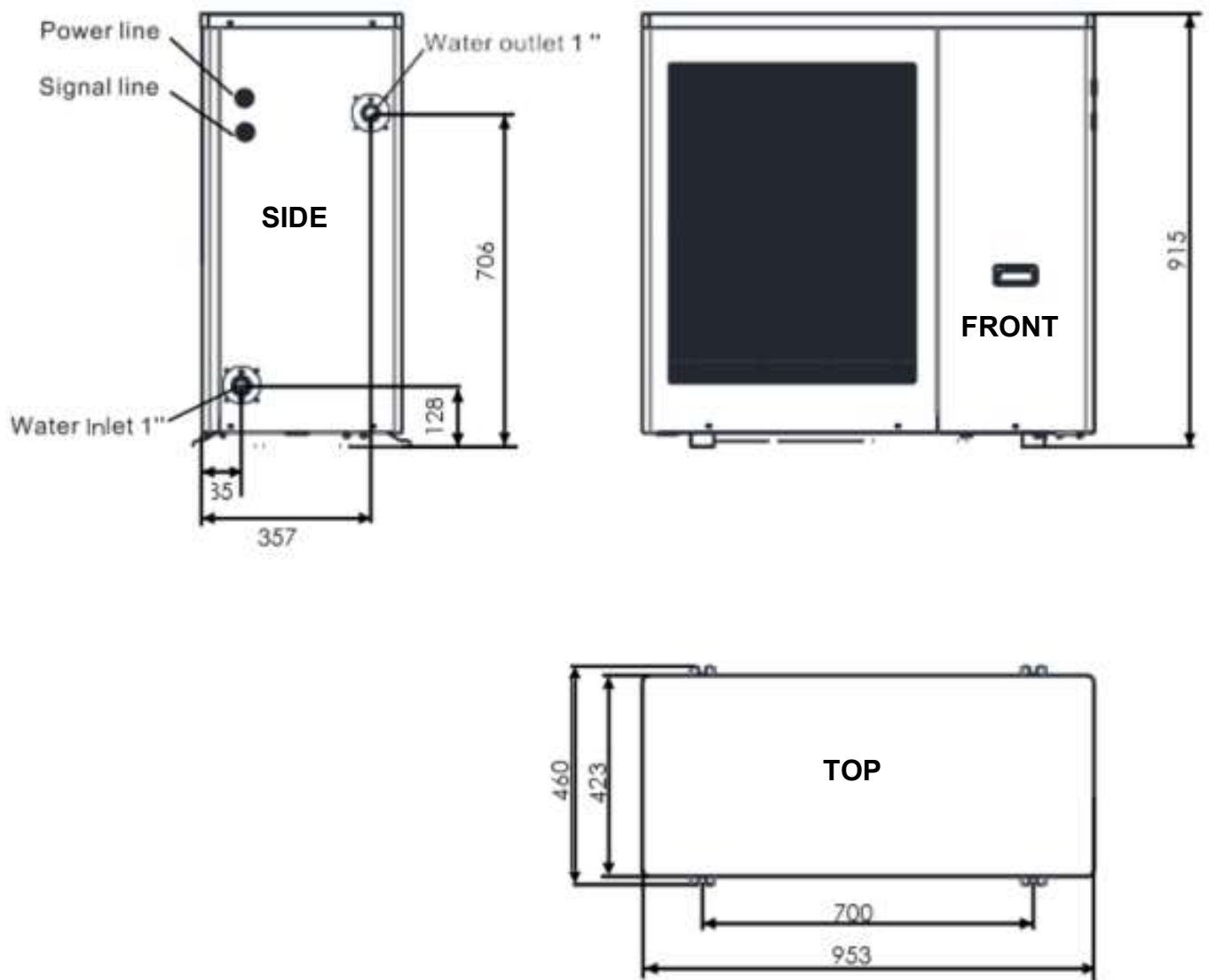


Figure 24 AS02-R32 Casing Dimensions & Heating Connection Locations

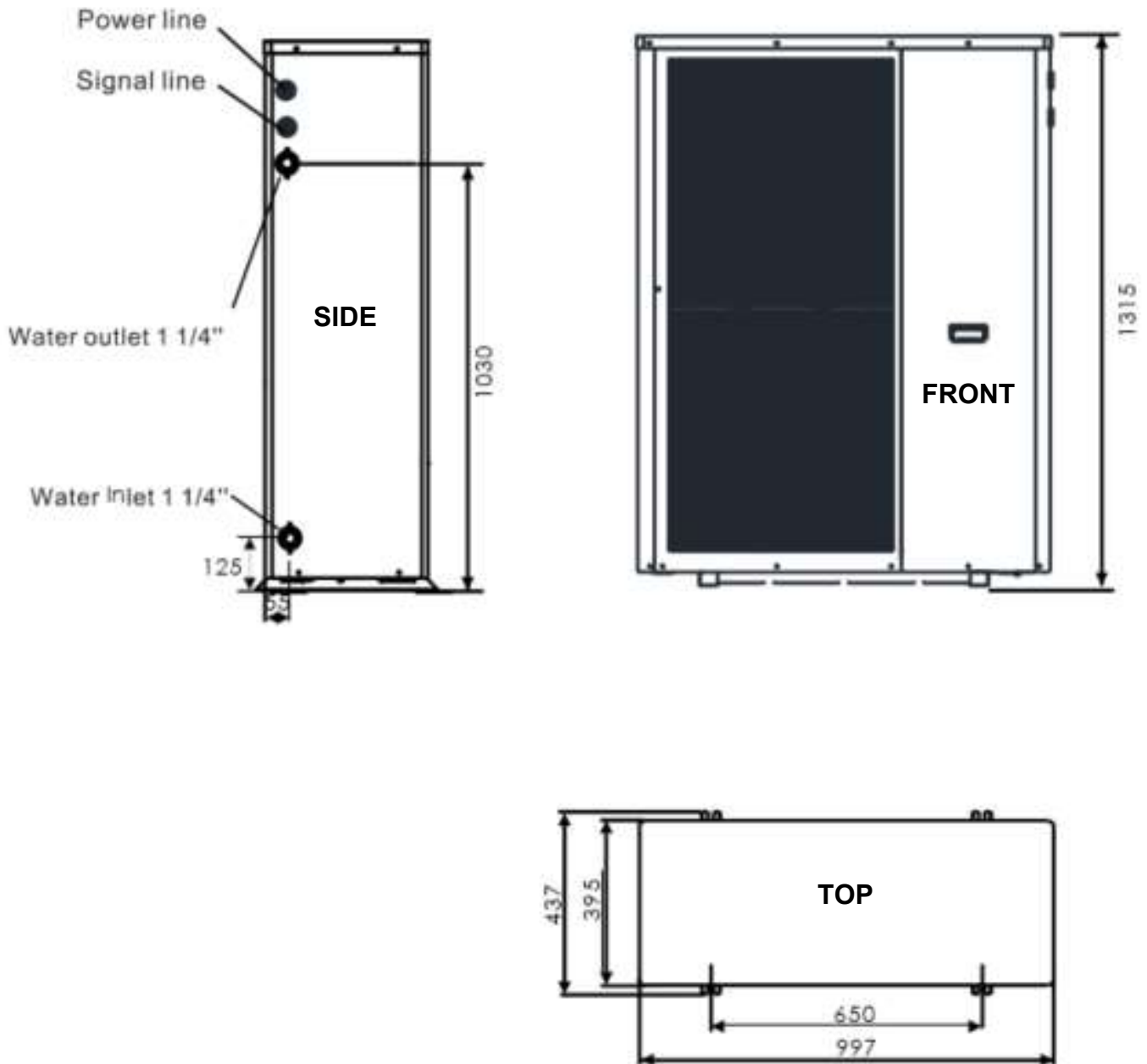


Figure 25 AS03-R32 Casing Dimensions & Heating Connection Locations

The heating flow and return connections are located on the right side panel of the AS01-R32, AS02-R32 and AS03-R32 units as shown in the images above. The heating flow (Water Outlet) is the top connection with the heating return (Water Inlet) at the bottom.

3.2 Access

In order to provide access for maintenance, a minimum space of depth 0.5m must be provided to each side, 1.5m provided to the front and 0.4m provided to the rear of the unit. There should also be a minimum space of depth 1m above the unit.

3.3 Unpacking

The unit is supplied on a small pallet and is covered with a cardboard box. The cardboard box should be removed to reveal the unit with the supplied components. The unit is attached to the

pallet using screws. These must be removed before trying to remove the unit from the pallet. The unit can then be slid off the pallet and located into position. Care should be taken to ensure that the unit does not tilt more than 45° when being moved around as this can cause internal damage.

3.4 Heating Circuit Connection

3.4.1 Heating Medium

The heating system should be completely flushed to remove impurities and deposits from sealants and fluxes. The heating circuit should be flushed, purged and pressure tested according to MCS guide MIS3005 and to the relevant Building Regulations. An inhibitor should be added to the water to prevent corrosion, scale and bacteria growth. This should be added according to the inhibitor manufacturer’s guidelines. Glycol should be added to the system in areas where the ambient temperature drops below freezing. The amount of Glycol to be added should be determined according to the manufacturer’s instruction. Warmflow provide a non-toxic glycol solution complete with corrosion, scale and biological inhibitor.

3.4.2 Heating Connections to the Heat Pump

The unit comes with female union fittings for the heating flow and return connections. Two flexible hoses with connections to attach to the female unions are included with the unit. These should be used to reduce any vibration or noise which may be transferred to rigid pipe or the building structure.

3.4.3 Heating Circuit and Integrated Circulator

A variable speed high efficiency circulator for the heating circuit is provided within the casing of each unit. The circulators have been sized to accommodate the majority of heating systems based on the heat output of each unit. However, due to the variation in each system, checking that the minimum required flow rate is achievable is essential. The table below shows the minimum and maximum required flow rates for each unit at minimum and maximum heat outputs respectfully.

Table 6 Heating flow rate requirements

Heat Pump	Heat Output (kW)		Required Flow Rate (l/min)		Min circuit volume (L)
	Minimum	Maximum	@ Min. Output	@ Max. Output	
AS01-R32	2	8	10	20	18
AS02-R32	5	12	16	30	30
AS03-R32	7	20	28	60	50

3.4.4 Bypass / Open Zones

It is essential that the heating circuit can always achieve a minimum flow rate of at least 10 litres per minute even when no zones are calling for heat. This can be achieved by fitting a bypass between the flow and return or by leaving a number of zones/radiators permanently on. This will significantly reduce short cycling and nuisance alarms such as low flow rate. It is also essential to provide freeze protection as detailed in section 3.4.5.

3.4.5 Freeze Protection

Freeze protection works in a number of ways depending on the current operation and conditions at the unit. When the unit is running, freeze protection is enabled if the outlet water temperature is more than 2°C below the inlet water temperature and is also less than 5°C. This may be the case if the unit is trying to defrost but there is not enough energy in the heating system to utilise. When these conditions are met, the unit will stop the compressor but continue to run the circulating pump. The unit will exit this freeze protection mode when the outlet water temperature rises above 7°C and the suction pressure in the refrigeration circuit is above 0bar.

NOTE: If this type of Freeze Protection is triggered 3 times within 30 minutes, the unit will not start up. Power to the unit needs to be turned OFF and then back ON in order to perform a reset and confirm that everything is OK with the system. The unit will start up and operate as normal after this reset.

When the unit is not running or in standby mode, there are two stages of freeze protection built into the unit. In the first stage, if the temperature of the heating medium falls below 4°C within the unit and the ambient temperature is less than 0°C, the unit will automatically start up the circulating pump to increase the medium temperature and prevent it from freezing. Therefore the unit needs to have a permanent electricity supply and be connected to a heating system which can always provide a complete circuit in order to achieve the minimum heating flow rate. The unit will exit freeze protection mode when the heating medium temperature rises above 8°C or the ambient temperature rises above 1°C.

In the second stage, if the temperature of the heating medium falls below 2°C within the unit and the ambient temperature is less than 0°C, the unit will automatically start up the compressor and run in heating mode to increase the medium temperature and prevent it from freezing. Again, the unit needs to have a permanent electricity supply and be connected to a heating system which can always provide a complete circuit in order to achieve the minimum heating flow rate. The unit will exit freeze protection mode when the heating medium temperature rises above 15°C or the ambient temperature rises above 1°C.

3.4.6 Heating Circuit Line Components

Together with the heating system, associated pipework and manifolds, the heating circuit will also require the following items, expansion vessel, strainer/filter, filling loop, drain valve, pressure gauge, pressure relief valve and isolation valves. A full flow 3-port motorised valve may also be required for some systems; this can be ordered separately, please contact Warmflow for details. Please see section 3.9 for more details of installing and wiring the 3-port motorised valve. These air source heat pump units come with the following items included integrally, a high flow circulating pump, a manual air vent, flow switch and temperature sensors. A strainer/filter, isolating valves, elbows and a set of flexible hoses are also supplied with the units as standard.

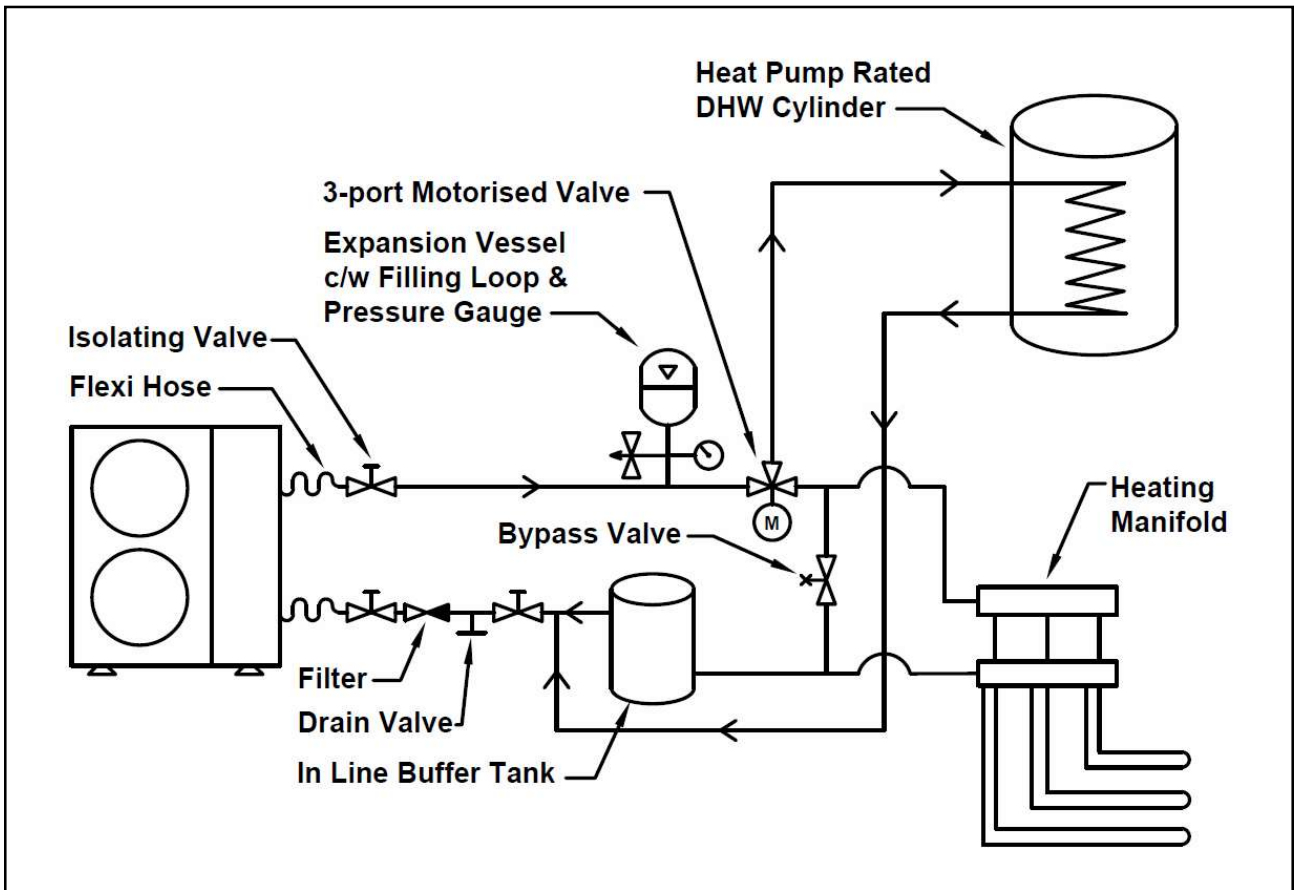


Figure 26 Heating & DHW Schematic

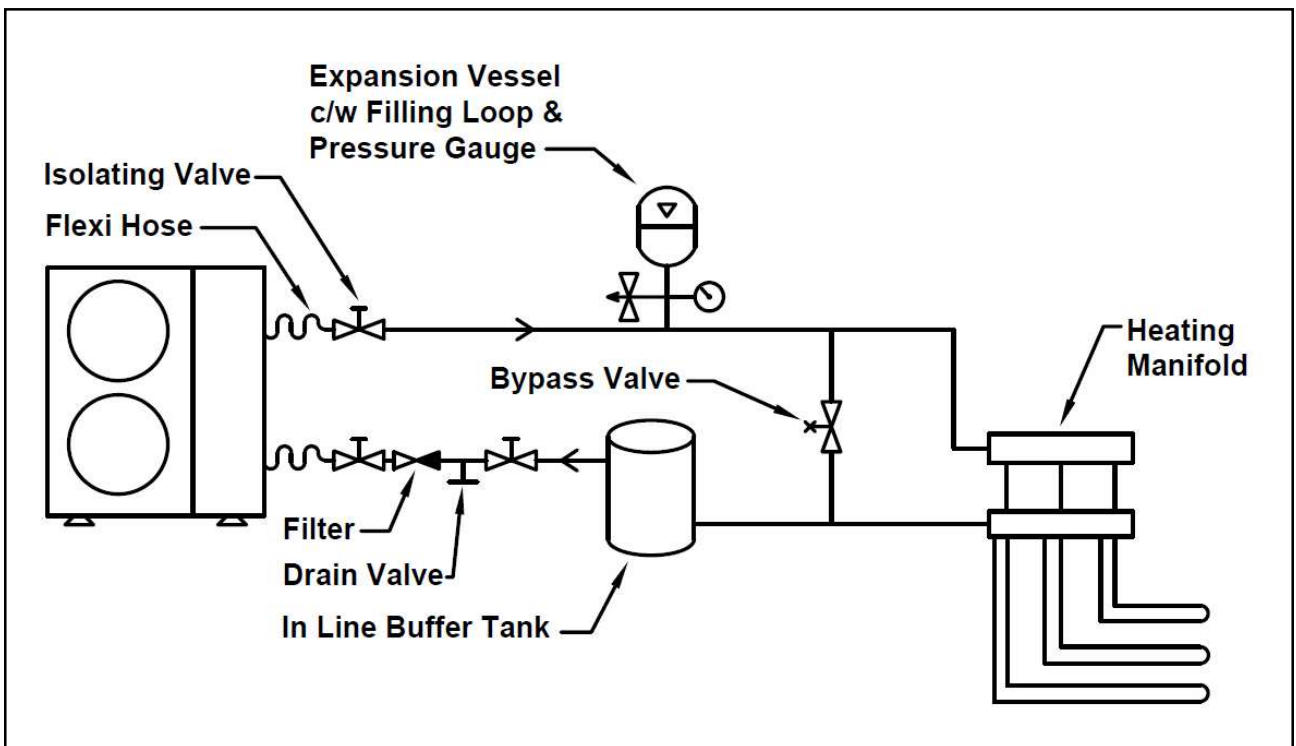


Figure 27 Heating Only Schematic

3.5 Defrosting

Due to the nature of the heat pump operating cycle, frost and ice may build-up on the evaporator. The unit senses this build-up and then performs a defrost cycle to get rid of this ice. As a result, the ice is melted and collects in the drip tray. The drip tray is heated to prevent this water from refreezing. Holes in the bottom of the drip tray allow the water to exit the heat pump.

Adequate provision should be made to prevent condensate from collecting around the units. A soak away underneath the unit or drip tray should be used as deemed appropriate to the site.

3.6 Air Vent

Each unit features a manual air vent located at the top of the unit (internal on some models, external on others). This is to allow air to be removed from the unit when it is filling.

NOTE: For models with an internal manual air vent, a piece of piping must be fitted to the air vent before opening it to ensure no water is sprayed onto any electrical components in the casing.

3.7 Buffer tank

In order to perform the defrost cycle, the air source heat pump runs in reverse mode. The defrost cycle takes a small amount of heat from the heating system and uses it to melt any frost or ice which may have formed on the appliance's evaporator. Frost or ice which has formed on the evaporator will interfere with the operation of heat pump and it is therefore vital that it is thawed to remove it. The appliance will defrost regularly in order to maintain its performance. To ensure the availability of sufficient heat for the purposes of defrosting, it is recommended that an in-line buffer tank of appropriate size is incorporated on the return heating pipework to the appliance. An in-line buffer tank accessory is available separately from Warmflow (AS01 – 18l capacity, AS02 – 30l capacity, AS03 – 50l capacity).

If an in-line buffer tank is not incorporated into the installation, a calculation must be performed to determine the circulating volume of water which is available to the appliance for the purposes of defrosting. The minimum circulating volume required for each appliance model is given in Table 6. The calculation below must be used to calculate the actual circulating volume. This actual volume must always be equal to or greater than the minimum circulating volume indicated for the appliance in Table 6 and must also be recorded in the Installation & Commissioning Certificate, see Page 70.

In all cases an open circuit must always be maintained to allow defrosting to occur.

Model Volume		Total Pipe Volume		Total Emitter Volume *		Actual Circulating Volume
(l)	+	(l)	+	(l)	=	(l)
See Table 1 for Model Fluid Content		See Appendix A for guidance		See Appendix A for guidance		

* = Radiators without TRVs, open UFH loops, etc.

3.8 Bypass Valve

In order to provide sufficient flow rates and to facilitate defrosting, it is essential that the heating circuit can always achieve a minimum flow rate of at least 10 litres per minute even when no zones are calling for heat. This can be achieved by fitting a bypass between the flow and return or by leaving a number of zones/radiators permanently on. This will significantly reduce short

cycling and nuisance alarms such as low flow rate. It is also essential to provide freeze protection as detailed in section 3.4.5. An open circuit must always be maintained to allow defrosting to occur.

3.9 3-Port Motorised Valve

A full flow 3-port motorised valve is available separately. This 3-port motorised valve has a number of operating positions and comes in two parts, the valve body and the actuator. It is essential that the valve body position and actuator are positioned correctly to ensure appropriate functionality. The valve body position is adjusted by a 'T' on top of the valve. The default position of the 'T' is shown on the left in Figure 28 below. The default position is for heating with flow from A to B.

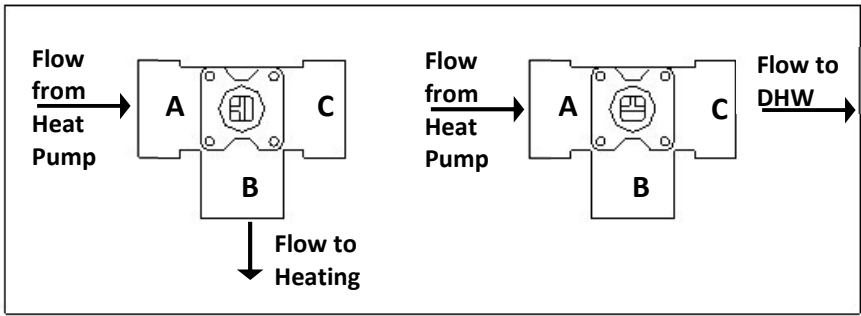


Figure 28 3-port Motorised Valve Body Positions

The valve turns clockwise when DHW is enabled as shown on the right in Figure 28 above with flow from A to C. With the valve body in the default position, the actuator should then be set to the default position as shown on the left in Figure 29 below. This can be achieved by holding down the clutch release button (located on the right side of the actuator) and rotating the lever into the correct position. The actuator should then be clipped onto the valve body. A rotation switch can be found on the right side of the actuator and must be in the 'CW' (clockwise) position.

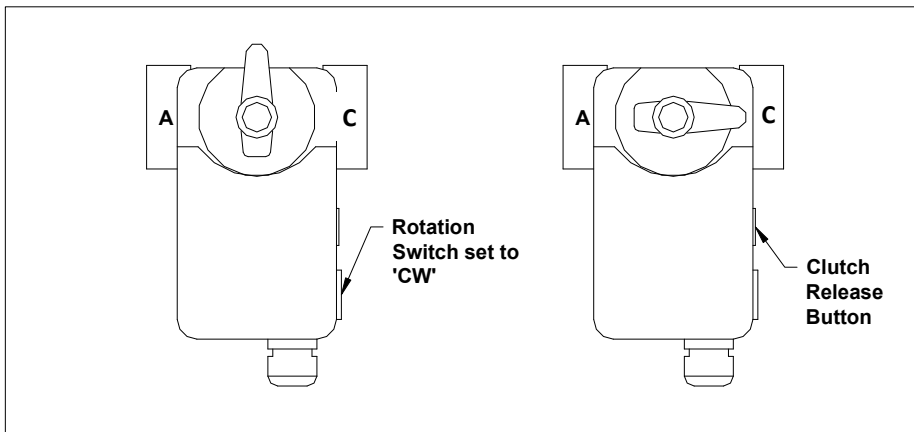


Figure 29 3-port Motorised Valve Actuator Positions

The valve turns clockwise when DHW is enabled as shown on the right in the figure above.

The valve actuator is 230V ac and has 3 wires, a brown, a blue and a white wire. The brown wire is the permanent live to the valve to power it in order to return to the default position and should be wired into the permanent live connection in the installers wiring enclosure. The white wire is the switched power which powers the valve to the DHW position when DHW mode is active. The blue wire is the neutral. See figures 32 & 33 for terminal connections in the installers wiring enclosure.

3.10 Electrical Installation

Together with the connection to the mains, there are a number of sensors and input/output connections which must be made with the heat pump. These connections are to be made in the installers wiring enclosure. The installers wiring enclosure can be found under the removable plastic cover panel of the heat pump casing.

The installer's wiring enclosure contains the entire necessary connection terminals for installation.

Electrical installation including cable sizing and protection should only be undertaken by a qualified electrician in accordance with the latest Institute of Electrical Engineers (IEE) regulations.

3.10.1 Incoming Supply

The AS01-R32, AS02-R32 & AS03-R32 units all require a single phase 230V_{ac} 50Hz electricity supply compliant with EN50160, 230V -6% +10% (i.e. 216.2 V – 253.0 V). Note: Fluctuations in the voltage characteristics of the electricity supply may adversely affect the operation of the appliance as well as its warranty.

The AS01-R32 is rated at 13Amps whilst the AS02-R32 is rated at 22Amps and the AS03-R32 is rated at 33Amps. As these units are variable speed, during starting the compressor speed is ramped up slowly meaning there is not a high starting current commonly associated with fixed speed units and as such there is no need for a very large power supply or the use of starting capacitors.

The units must be protected by a Type C MCB and RCD according to the table below.

Table 7 Electrical Installation Specification

Unit	Minimum Wire Gauge	MCB Rating (Type C)	RCD Rating (Type F)
AS01-R32	2.5mm ²	20A	30mA ≤0.1 seconds
AS02-R32	4.0mm ²	32A	30mA ≤0.1 seconds
AS03-R32	6.0mm ²	40A	30mA ≤0.1 seconds

NOTE: The incoming power supply must be connected via an isolating switch with a minimum breaking gap of 3mm. Cable cross sectional areas should be calculated according to the current at full load together with the on-site conditions and the cable length between the heat pump and the consumer unit, the above table lists minimum recommendations only.

3.10.2 Digital Inputs

The unit can also be controlled remotely from an external controller such as a timeclock or room thermostat instead of the internal timeclock. To enable remote control, parameter H07 must be changed from 'Master' to 'Slave'. This will activate the digital input connections in the installers wiring enclosure. These connections are all 'volt free' and therefore no voltage should be connected into any of them, they are enabled by connecting the relevant terminals together.

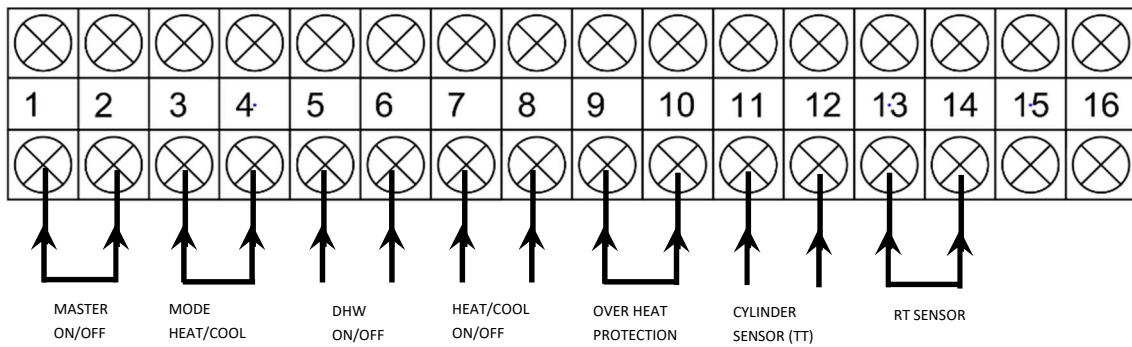


Figure 30 Installer's Digital Input Connections (AS01 & AS02)

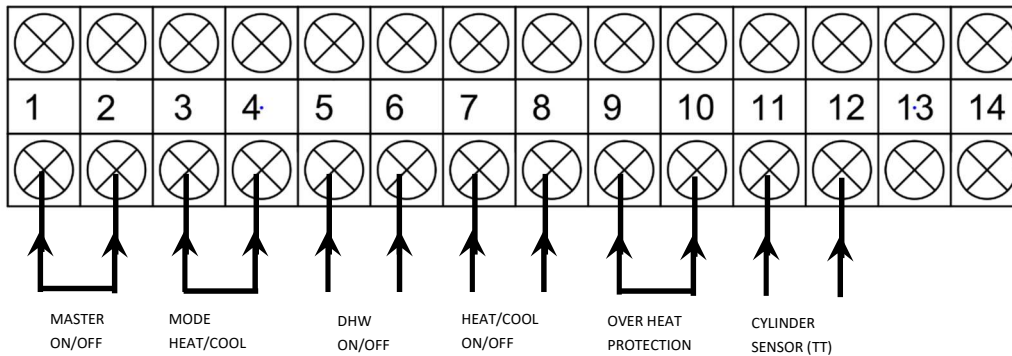


Figure 31 Installer's Digital Input Connections (AS03)

A link wire should be placed between the terminals for the 'Master On/Off' and also between terminals for the 'Mode Heat/Cool' function and 'Over heat Protection'. This will ensure the unit is on and set in heating mode. Volt-free connections can then be made to the 'DHW On/Off' and 'Heat/Cool On/Off' from a remote source such as a timeclock, programmer or room stat. Connecting the terminals for 'DHW On/Off' (5 & 6) will set the unit into DHW mode. Connecting the terminals for 'Heat/Cool On/Off' (7 & 8) will set the unit into heating mode (provided the link wire is connected between the 'Mode Heat/Cool' terminals).

NOTE: Connections are volt-free, no voltage should be connected into any of them. Connecting any kind of voltage to the terminals will damage the control board inside the unit.

3.10.3 Temperature Sensors

There is one additional temperature sensor which needs to be connected to the unit in order to achieve full functionality. This sensor is a DHW storage temperature sensor. The sensor is supplied with the unit but the wiring to it may need to be extended. The wires should be ran separately to any power transmission cables, however, if they need to run close to or in the same conduit as power transmission cables, then shielded cable should be used. The type of temperature sensor to be used is NTC 10kΩ.

The DHW storage temperature sensor is used to control the DHW heating requirements. It must be connected or this will cause a fault and trigger an alarm. The unit will arrive with a link wire complete with a built-in resistor in order to give a reading and enable the unit to operate. The link wire which is wired into the 'TT' (11 & 12) terminals of the installer's wiring enclosure needs to be removed and replaced with the supplied DHW storage temperature sensor. The sensor should be located in a stat pocket on the DHW storage cylinder to give an accurate indication of the cylinder's temperature. If the unit is only to be used for space heating, the link wire complete with resistor should not be removed from the 'TT' terminals.

The link wire complete with a built-in resistor which is wired into the 'RT' (13 & 14) terminals on the AS01 & AS02 is required in order to give a reading and enable the unit to operate. This link wire should not be removed.

3.10.4 Digital Outputs

The digital outputs section allows the connection of ancillaries which are turned on or off via the units controller. **The total rated current of all the outputs together must be less than 3.0 Amps. Items such as immersion heaters and high powered pumps can still be controlled by the outputs but they MUST be connected via a relay with an external power supply.** The following outputs can be controlled by connecting into the appropriate connection blocks.

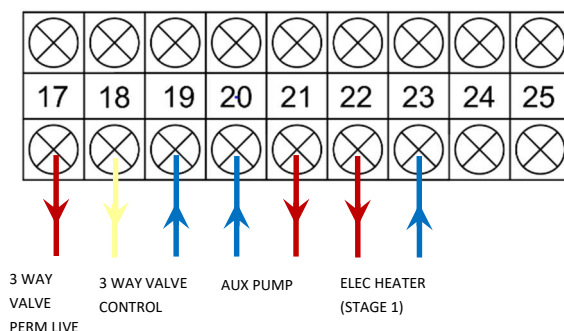


Figure 32 Installer's Digital Output Connections (AS01 & AS02)

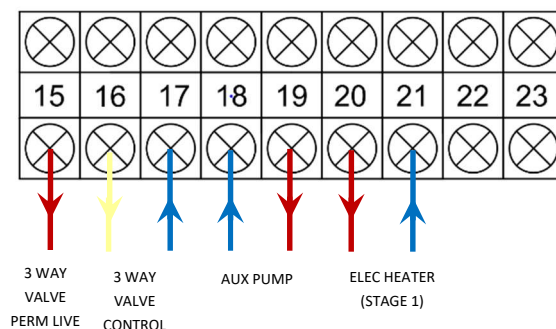


Figure 33 Installer's Digital Output Connections (AS03)

3 Port Motorised Valve – The 3 Port Motorised valve is detailed in section 3.9. The valve actuator is 230V ac and has 3 wires, a brown, a blue and a white wire. The brown wire is the permanent live to the valve and should be wired into the permanent live terminal (17 - AS01 & AS02, 15 - AS03). The white wire is the switched power which powers the valve to the DHW position and should be wired into the 3 Way Valve control terminal (18 - AS01 & AS02, 16 - AS03). The blue wire is the neutral and should be wired into the neutral terminal (19 - AS01 & AS02, 17 - AS03).

Auxiliary Pump – This output is for controlling an auxiliary pump which may be used to activate an auxiliary DHW pump. The pump live should be wired into the Aux pump live terminal (21 - AS01 & AS02, 19 - AS03). The pump neutral and should be wired into the Aux pump neutral terminal (20 - AS01 & AS02, 18 - AS03). This output is protected with a 3 Amp fuse.

Electric Heater Stage 1 (Immersion) – This output (230Vac) is for controlling an immersion heater in the DHW storage cylinder or an in-line heater fitted in the heating pipework. **As the immersion heater will have a high electrical load, it must be wired via a relay or contactor (240V) with an external power supply.** The live output terminal (22 - AS01 & AS02, 20 - AS03) and neutral terminal (23 - AS01 & AS02, 21 - AS03) should be wired to the coil of the relay which then will switch the external power supply to the immersion heater. Cable cross sectional areas

should be calculated according to the current at full load together with the on-site conditions and the cable length between the relay, the immersion heater and the consumer unit.

A DHW storage cylinder immersion may be called to switch on to provide thermal disinfection of the DHW cylinder. This may be the case if a DHW storage temperature of 60°C cannot be achieved by the heat pump alone. To enable this functionality, parameter R35 should be changed to '2' (Water Tank) and parameter H18 set to 'Stage1'. Thermal disinfection times can then be set in the engineer's menu using parameters G01 to G05. The control settings of the immersion should be set during commissioning.

An in-line immersion heater may be called to switch on to aid with defrosting and to provide a boost when the ambient temperature is low. If an in-line immersion is to be used, parameter R35 should be set to 1 (Water Line). This immersion will then become active when all of the following conditions are met:

- The Ambient Temperature is less than 4°C.
- The Inlet Water Temperature is 7°C less than the Target Temperature.
- The compressor has been at maximum output (> 80Hz) for more than 30 minutes.
- The water pump has been running for at least 1 minute and flow is detected.

This immersion will then switch off when any of the following conditions are met:

- The Ambient Temperature rises to more than 2°C.
- The Inlet Water Temperature rises to 2°C less than the Target Temperature.
- The compressor outputs drops below the medium output (< 50Hz).
- Flow is no longer detected.

If neither an in-line immersion nor a DHW cylinder immersion are to be used, parameter R35 should be set to 0 (Not Used).

RO 12 Alarm – This output (230Vac) is not available in the installers wiring enclosure and so must be connected directly into the main control board. It can be used to trigger a light or buzzer to indicate that there is an error/alarm situation. This is useful if the controller is not in an occupied space or to alert a Building Management System (BMS).

3.10.5 User Interface (Controller)

The user interface (controller) needs to be connected by plugging it into the corresponding plug which can be found in the installer's wiring terminal. The interface can be plugged directly into the unit or further away in the property by using the supplied extension cable. This extension cable is 10m long and this can be further extended up to a maximum length of 200m. The extension cable can be extended by joining with a 5-core cable with wire gauge of 0.5mm². The cable should be joined in such a way so that the connectors are located at each end for joining to the unit or the interface as appropriate.

3.10.6 DTU Module

The Data Transfer Unit (DTU) is a communication module which when connected to the air source heat pump, provides remote control and diagnostics through a Cloud server. The DTU module connects to the cloud server via the 4G Telephone Network. The module consist of a control box with display LEDs, an antenna and wiring to connect it to the air source heat pump's control board.

The DTU module wiring is connected to the 485_A3, 485_B3 and GND terminals on the main control board. This is shown more clearly on the wiring diagram located inside the electrical control panel.

The DTU module is located inside the electrical control panel on the air source heat pump as it is not waterproof. The antenna, which is waterproof is also located inside the unit. The signal strength is shown by the display LEDs on the DTU module.

Once installed, the unit can be set up using the Warmlink App together with the QR Code on the side of the unit. For more details and help with registration, please see the Warmlink App or visit www.warmflow.co.uk.

3.11 Parameter List

Table 8 Protection Parameters

Parameter	Name	Range	Default	Description
A03	Shutdown Ambient Temp.	*	-25°C	The outside temperature below which the unit will shut down.
A04	Antifreeze Temperature	*	4°C	Temperature below which Antifreeze Protection is enabled
A05	Antifreeze Temp. Difference	*	3°C	The temperature rise above A04 at which Antifreeze Protection is disabled
A06	Exhaust Protection Temp.	*	120°C	The refrigerant discharge temperature above at which the unit will shut down.
A11	Low Voltage Pressure Sensor	0/1	1	To enable or disable the Low Pressure Switch. 0 is disable, 1 is enable
A21	Ambient Temp. Sensor Type	*	0	Type of Ambient Temp. Sensor fitted. 0 is 5K, 1 is 2K.
A22	Minimum Antifreeze Temp.	*	4°C	Minimum Outside Temp. at which Antifreeze Protection is enabled.

* Indicates that this parameter is not adjustable

Table 9 Defrosting Parameters

Parameter	Name	Range	Default	Description
D01	Start Defrosting Setpoint	*	-7°C	Evaporator temperature below which Defrosting is enabled
D02	Exit Defrosting Setpoint	*	13°C	Evaporator temperature below which Defrosting is complete
D03	Defrosting Cycle	*	45mins	Time between complete defrosting cycles
D04	Max. Defrosting Time	*	8mins	Maximum time allowed to complete defrosting
D07	Electric Heater Control	*	1	Enable electric heater (0 for No, 1 for Yes) to assist Defrosting
D08	Sliding Defrost AT Start	*	2°C	Ambient Temperature below which Sliding Defrosting is enabled
D09	Sliding Defrost AT Difference	*	17°C	Ambient Temperature difference after Sliding Defrosting is enabled
D10	Sliding Defrost Coil Difference	*	15°C	Coil Temperature difference after Sliding Defrosting is enabled
D11	Min. Sliding Defr. Coil Temp	*	-25°C	Minimum Sliding Defrost Coil Temp
D12	Defrosting Frequency	*	70	Time between defrosting cycles

Table 10 Pump Parameters

Parameter	Name	Range	Default	Description
P01	Running Mode	0/1/2	2	Selects the operating mode of the pump, 0 for normal, 1 for special, 2 for interval
P02	Running Interval Time	0~120min	30min	Time between pump operating cycle when the compressor is off
P03	Running Duration	0~30min	3min	Pump operating cycle time when the compressor is off
P05	Auxiliary Pump Mode	0/1/2	2	Selects the operating mode of the pump, 0 for normal, 1 for special, 2 for interval

* Indicates that this parameter is not adjustable

Table 11 Fan Parameters

Parameter	Name	Range	Default	Description
F01	Fan Motor Type	0/1/3	3	Type of fan motor (0 for High, 1 for Double, 3 for DC)
F02	Max Cool Coil Temp.	*	45°C	Temperature of the Coil at which the Fan will run at Low Speed in Cooling Mode
F03	Min Cool Coil Temp.	*	20°C	Temperature of the Coil at which the Fan will run at Low Speed in Cooling Mode
F05	Max Heat Coil Temp.	*	1°C	Temperature of the Coil at which the Fan will run at Low Speed in Heating Mode
F06	Min Heat Coil Temp.	*	15°C	Temperature of the Coil at which the Fan will run at Low Speed in Heating Mode
F10	Quantity	0/1	0/1	Number of fans (0 for 1no, 1 for 2no. – AS03-R32 only)
F18	Min Speed in Cooling	*	300r	Minimum fan speed in Cooling Mode
F19	Min Speed in Heating	*	300r	Minimum fan speed in Heating Mode
F20	Mute Mode Speed	300-1300r	600r	Set fan speed in Mute (Reduced Fan Speed) Mode
F21	Timer Mute	0/1	0	Enable reduced fan speed (0 for No, 1 for Yes)
F22	Manual-control Fan Speed	0/1	0	To enabled and disabled manual running of the fan (0 for Disabled, 1 for Enabled)
F23	DC/EC Fan Rated Speed	*	600r	Rated Speed of DC Fans
F25	Max Speed in Cooling	*	800r	Maximum fan speed in Cooling Mode
F26	Max Speed in Heating	*	800r	Maximum fan speed in Heating Mode

* Indicates that this parameter is not adjustable

Table 12 System Parameters

Parameter	Name	Range	Default	Description
H01	Auto Start	*	1	After a power cut, the unit will remain off (0) or return to the last mode (1)
H05	Cooling Mode Enabling	0/1	1	Enables or Disables Cooling Mode (0 for Disabled, 1 for Enabled)
H07	Master/Slave Unit	0/1	0	Sets the unit as the master (0) or slave (1) if more than 1 unit is installed
H10	Unit Address	*	1	Software Address of the Unit
H18	Electric Heater Mode	1/2/3	3	Sets the Electric Heating Mode (1 for Stage 1, 2 for Stage2, 3 for Stage 3)
H20	3-Way Valve Polarity	0/1	0	0 for Activated with DHW, 1 for Activated with Heating
H21	Temperature Units	0/1	0	0 for °C, 1 for °F
H25	Silent Mode Enable	0/1	1	Enables or Disables Silent Mode (0 for Disabled, 1 for Enabled)
H27	Temperature Control Mode Select	0/1	1	Temperature Setpoint Target (0 for Water Flow Temp., 1 for Room Temp.)
H28	DHW Enable	0/1	1	Enables or Disables DHW Mode (0 for Disabled, 1 for Enabled)
H29	Model Parameter Code	0-20	0	Parameter List Used

Table 13 Compressor Parameters

Parameter	Name	Range	Default	Description
C01	Manual Frequency	*	0Hz	If set (greater than 0) the compressor will run constantly at this speed when on
C02	Min Frequency	*	30Hz	The minimum frequency which the compressor will operate
C03	Max Frequency	*	90Hz	The maximum frequency which the compressor will operate
C04	Model Selection	*	0	Sets the operation of the 3-way valve, 0 for on with DHW, 1 for on with heating
C05	Min Freq. for Low Ambient Temp.	*	50Hz	Minimum Frequency for operating at a Low Ambient Temperature in Cooling
C06	Frequency Control Mode	*	1	Mode for Frequency Control

Table 14 Thermal Disinfection Parameters

Parameter	Name	Range	Default	Description
G01	Setpoint	60~70°C	63°C	Hot water thermal disinfection target temperature
G02	Time of Duration	0~60min	0min	Duration of thermal disinfection cycle (0 is off)
G03	Start Time	0~23h	1h	Time when thermal disinfection is on
G04	Work cycle	1~30days	30days	Thermal disinfection cycle schedule (default is once every 7 days)
G05	Thermal Disinfect. Enable	0-1	1	Thermal disinfection enabling or disabling (0 is disabled, 1 is enabled)

Table 15 Temperature Parameters

Parameter	Name	Range	Default	Description
R01	Hot Water Setpoint	R06~R07	55°C	Hot water target setpoint
R02	Heating Setpoint	R08~R09	45°C	Heating target setpoint
R03	Cooling Setpoint	R08~R09	7°C	Cooling target setpoint
R04	H. On Return Temp. Difference	0.5~10°C	2°C	Hysteresis differential for Heating to reactivate Heating Mode
R05	H. Off. Return Temp Difference	*	2°C	Temperature difference above the setpoint to return to standby mode
R06	C. On Return Temp. Difference	0.5~10°C	1°C	Hysteresis differential for Cooling to reactivate Cooling Mode
R07	C. Off. Return Temp Difference	*	1°C	Temperature difference below the setpoint to return to standby mode
R08	Min Cooling Setpoint	*	5°C	Minimum cooling setpoint allowed
R09	Max Cooling Setpoint	*	28°C	Maximum cooling setpoint allowed
R10	Min Heating Setpoint	*	15°C	Minimum heating setpoint allowed
R11	Max Heating Setpoint	*	60°C	Maximum heating setpoint allowed
R15	DHW Overheat Temp Difference	*	2°C	Temperature difference above the setpoint to return to standby mode
R16	DHW On Return Temp. Difference	0.5~10°C	5°C	Hysteresis differential for DHW to reactivate DHW Mode
R17	DHW Overheat Temp Difference	*	2°C	Temperature difference above the setpoint to return to standby mode
R29	Low Ambient H. Start-up Temp	*	-15°C	Low Ambient Starting Temperature During Heating

R30	Low Ambient H. Shut Down Temp	*	-25°C	Low Ambient Shut Down Temperature During Heating
R31	Low Ambient Max. Heat. Temp	*	45°C	The Maximum Heating Setpoint when the Ambient Temp. is low
R32	High Amb. DHW Start-up Temp	*	43°C	Low Ambient Starting Temperature During DHW
R33	High Amb. DHW Shut Down Temp	*	43°C	Low Ambient Shut Down Temperature During DHW
R34	Low Ambient Max. DHW Temp	*	60°C	The Maximum DHW Setpoint when the Ambient Temp. is low
R35	Electric Heating	0/1/2	2	Electric Heating Function, 0 for not used, 1 for in-line heater, 2 for tank immersion
R36	Min. DHW Setpoint	*	15°C	Minimum DHW Setpoint Temperature
R37	Max. DHW Setpoint	*	58°C	Maximum DHW Setpoint Temperature
R39	Heating Restart Amb. Temp	*	10°C	Ambient Temperature at which Heating Mode will be re-enabled
R40	Pump Auto Start-Up Temp.	*	2°C	Ambient Temperature at which the Circulating Pump will Run Automatically
R41	Heat Pump Running Ambient Temp.	*	2°C	Ambient Temperature at which the Compressor will Run Automatically
R42	Max. Heating Temp on Change	*	55°C	Maximum Heating Temperature when the Unit is Adjusting
R43	Max. Water Heating Temp. (Low Temp.)	*	45°C	Maximum Heating Temperature when the Ambient Temp. is Low
R44	Max. Water Heating Temp. (High Temp.)	*	35°C	Maximum Heating Temperature when the Ambient Temp. is High
R45	Electric Heater Start at Once AT	*	-10°C	Outside temperature below which the electric heater starts without delay
R46	Electric Heater Start AT	*	2°C	Outside temperature below which the electric heater is enabled

Commissioning

The following tasks must be completed in order to commission the ground source heat pump:

3.11.1 Recorded Details

The following details must be recorded in the commissioning certificate.

- Householder's Name and Address
- Installation Date
- Installing Engineer
- Commissioning Date
- Commissioning Engineer (Name and registered company)
- Unit Type (AS01-R32, AS02-R32 or AS03-R32)
- Serial Number
- Heating System Details (no. of zones, underfloor heating pipe spacing, radiators etc.)
- Inhibitor Type (brand of inhibitor and dosing)
- DHW Cylinder Details (brand and model number, capacity, heat exchanger details)

The time and date must be set.

3.11.2 Testing Flow Rate

The heating circuit must be fully installed, filled, purged and pressure tested. The pressure should be set at around 1 bar. It is essential that all air has been expelled from the circuit and that adequate flowrates are achievable.

3.11.3 Weather Compensation Mode

Weather compensation works by adjusting the heat output of the heat pump to match the current heat loss of the building. This is achieved by adjusting the heating flow temperature according to the outdoor temperature. As the outdoor temperature drops, the heating flow temperature is increased and vice versa. The outdoor temperature is monitored by an external temperature sensor installed on the back of the unit.

To activate weather compensation turn on the switch as shown in Fig 34 below. If a fixed flow temperature is required, the weather compensation can be turned off. If weather compensation is disabled, the SAP assessment (EPC) is invalid. A commissioning certificate and label must be provided that confirm this disablement.

Sample setting for weather compensation curves for underfloor heating and radiators are shown below. The flow temperature setpoint should be adjusted to match the calculated flow temperature requirement at the design day temperature. The default flow temperature setting is 50°C.

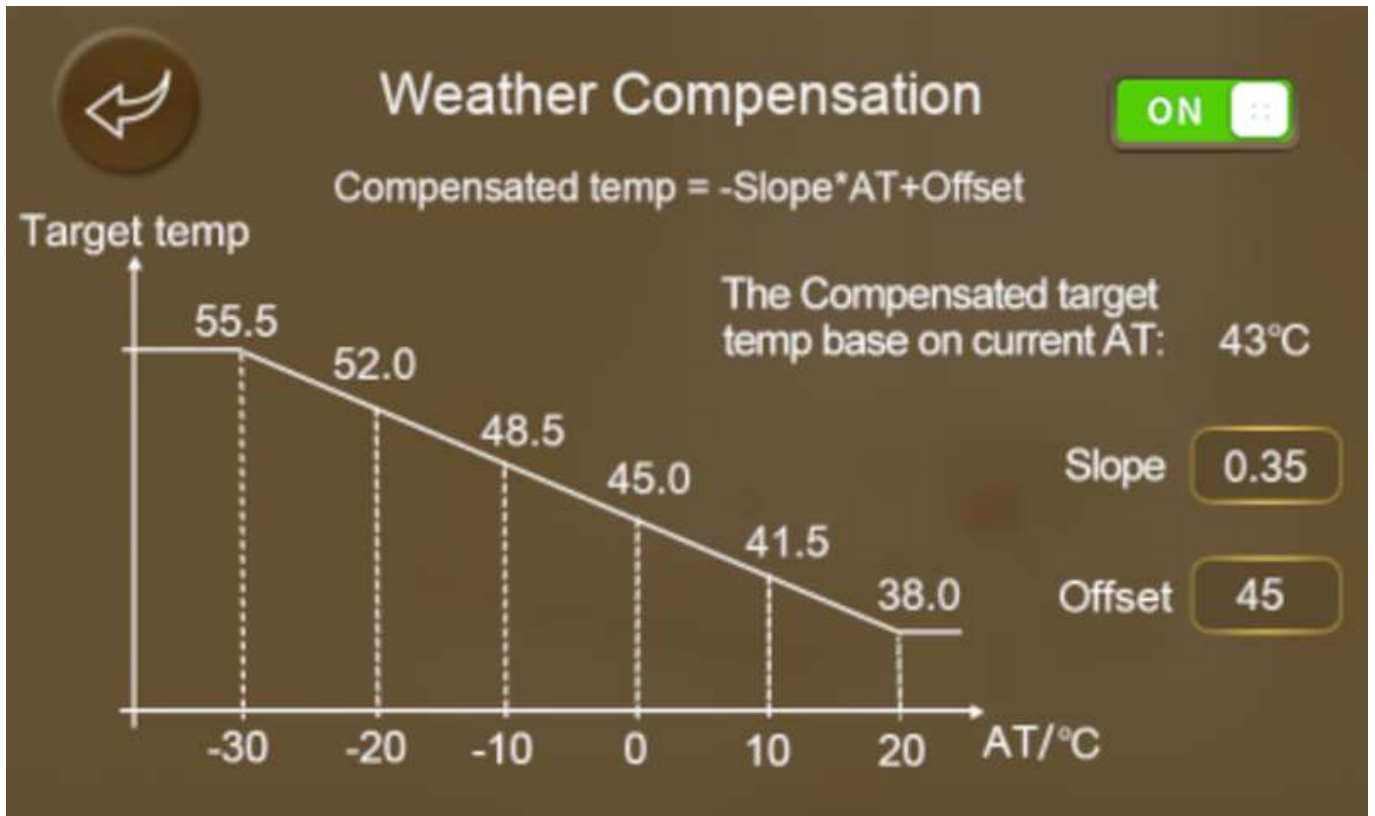


Figure 34 Weather Compensation Activation & Setting

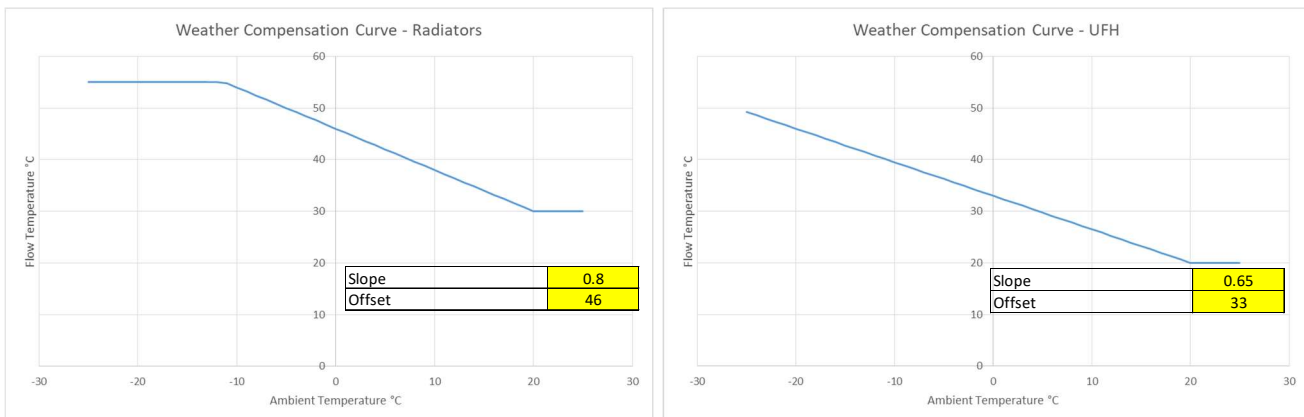


Figure 35 Sample Weather Compensation settings for Radiators & UFH

3.11.4 DHW Cylinder Heat Up Test

A DHW cylinder heat up test must be completed for units in a system providing both heating and DHW. The cylinder storage temperature should be set to maximum and the unit switched to DHW 'ON'. The unit will now start up and begin heating the DHW cylinder. The unit will continue heating the tank until it reached the setpoint or it can no longer get rid of the heat it is producing. If the unit shuts down before the DHW storage cylinder reaches the desired setpoint, the heat exchanger area in the DHW cylinder is too small or the flow rate is not high enough. The maximum temperature that the DHW storage cylinder reaches should be recorded in the commissioning certificate and the DHW cylinder setpoint should be set to 3 degrees below this value. The thermal disinfection program will then need to be enabled to boost the DHW cylinder temperature above 60°C on a weekly basis.

3.11.5 Sign Off

The commissioning certificate must be signed by the commissioning engineer, with a copy sent to Warmflow and a copy to remain with the appliance.

All product warranties will be invalidated if the appliance is not commissioned by a Warmflow engineer or other trained and competent engineer and the combined installation/commissioning certificate (See Section 0 of this manual) returned to Warmflow within 30 days from the date of installation and 90 days from the date code stamped on the appliance.

3.12 System Hand Over

After installation and commissioning has been completed, a handover package should be completed by the installer and delivered to the house holder. This handover package will include the following:

- Instructions explaining the operation of the complete system (this user manual).
- Final plans of the system layout to include; heating circuit design together with all equipment and piping used.
- Electrical Schematic of sensor and input/output connections outside of the heat pump unit.
- The results of commissioning tests.
- Contact details of the installer.

The installer should explain the components of the handover package to the householder.

3.13 Servicing

3.13.1 Servicing Schedule

The appliance must be serviced at least annually or as indicated by the user interface controller (whichever occurs sooner) by a Warmflow Engineer or other competent Engineer. This is necessary in order to optimise performance of the appliance and to ensure its efficiency and safety for the user.

The below table is a typical list of service operations, however it is not exhaustive.

Item	Inspect	Clean	Test
Electrical Connections	✓		
Heating Circuit Filter	✓	✓	
Inhibitor Concentration of Heating Solution	✓		✓
Glycol Concentration of Heating System*	✓		✓
Heating Circuit Pressure	✓		
Heating Manifold	✓		
Heating Pipework & Sealing	✓		
Heating Circuit Safety Devices	✓		✓
Heating Flow Rate	✓		✓
Insulation Inside Unit	✓		

Replace any defective components if necessary.

Electrical Connections – Inspection of the electrical connections should only be undertaken with power isolated to the unit. The condition of wiring together with the security of electrical connections should be inspected and repaired as required.

Heating Circuit Filter – The heating filter/strainer should be inspected and cleaned to remove any debris and ensure optimal flow rates. The filter should first be isolated on both sides using the isolating valves. The strainer element can then be removed for cleaning.

Inhibitor Concentration of Heating Solution – The system corrosion inhibitor level must be checked (instant on-site test kits are available from inhibitor manufacturers) and additional inhibitor must be added if the system is found to be under-dosed. Refer to the inhibitor manufacturer for further guidance. If the inhibitor concentration has dropped significantly since the last service/commissioning, this may suggest someone has been topping up the heating system with water. Further investigation for a leak may be necessary.

Glycol (Antifreeze) Concentration of Heating Solution – The system Glycol level must be checked (if applicable). This can be checked with a refractometer in accordance with the Glycol manufacturer's instructions. Additional Glycol must be added if the system is found to be under-dosed. Refer to the Glycol manufacturer for further guidance. If the Glycol concentration has dropped significantly since the last service/commissioning, this may suggest someone has been topping up the heating system with water. Further investigation for a leak may be necessary.

Heating Circuit Pressure – The system pressure of the heating circuit should be inspected on the installed pressure gauge. The pressure should be between 1 and 2 bar. The pressure should be adjusted accordingly. If the pressure has dropped significantly since the last service/commissioning, this may suggest a leak somewhere in the system.

Heating Manifold - The condition of the manifold, together with the operating of any motorised valves and the flow rates in each circuit should be inspected.

Heating Pipework & Sealing - The condition of the heating pipework including joints and insulation should be inspected and repaired as necessary.

Heating Circuit Safety Devices – Safety devices such as pressure and temperature relief valves should be manually activated to confirm their operation. A pressure relief device is located inside the unit. Defective devices should be replaced immediately.

Heating Flow Rate – The maximum heating flow rate achievable should be checked. The heating flow rate should be checked against the maximum flow rate recorded on the commissioning certificate. If the flow rate is found to have dropped significantly, this may indicate a blockage in the system or a problem with the pump. Further investigation is required.

Insulation Inside Unit – The condition of pipe insulation and sound proofing in the appliance casing should be inspected for damage. If either is found to be damaged or defective, it should be replaced. Insulation kits are available from Warmflow.

Note: All product warranties will be invalidated if the appliance is not serviced at least annually or as indicated by the user interface controller (whichever occurs sooner) by a Warmflow engineer or other trained and competent engineer and details recorded in the service record section of this manual.

In the event of a breakdown please contact your commissioning engineer who should then contact our service department whilst at your home, to report the fault.

3.14 Alarms and Troubleshooting

3.15 Alarms

The control system built into the appliance includes an alarm utility. The alarm utility shuts the appliance down and activates alarms if a fault or abnormality develops in the appliance.

The alarms situations in the following pages suggest possible causes for the activation of each alarm. Suggested actions for each alarm condition are also included. The suggested actions are attributed to the user (typically the homeowner) or a Warmflow engineer or other trained and competent engineer, and should be conducted in the order suggested. The possible causes and suggested actions are not exhaustive.

Alarm Code	Fault	Possible Cause(s)	Suggested Action(s)	Action By	
				User	Engineer
P01	Heating Return Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the heating return temperature sensor and re-connect/replace if necessary.		✓
P02	Heating Flow Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the heating flow temperature sensor and re-connect/replace if necessary.		✓
P03	DHW Cylinder Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the DHW cylinder temperature sensor and re-connect/replace if necessary.		✓
P04	Ambient Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the ambient temperature sensor and re-connect/replace if necessary.		✓
P17	Suction Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the refrigerant suction line temperature sensor and re-connect/replace if necessary.		✓
P42	Room Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the room temperature sensor (if fitted) and re-connect/replace if necessary.		✓
P101	EVI Inlet Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the EVI inlet line temperature sensor and re-connect/replace if necessary.		✓
P102	EVI Outlet Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the EVI outlet line temperature sensor and re-connect/replace if necessary.		✓
P153	Evaporator Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the evap. temperature sensor and re-connect/replace if necessary.		✓
P181	Discharge Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the refrigerant discharge line temperature sensor and re-connect/replace if necessary.		✓
P182	Discharge Overheat Temperature Sensor Error	The temperature sensor is faulty or disconnected.	Test the operation of the discharge line overheat temperature sensor and re-connect/replace if necessary.		✓
PP2	Suction Pressure Sensor Error	The pressure sensor is faulty or disconnected.	Test the operation of the suction line pressure sensor and re-connect/replace if necessary.		✓

Alarm Code	Fault	Possible Cause(s)	Suggested Action(s)	Action By	
				User	Engineer
TP	Low Ambient Temperature Warning	The ambient temperature is too low.	Test the operation of the ambient temperature sensor and re-connect/replace if necessary.		✓
E003	Driver Board Self Test	There is a fault affecting the Fan Motor	Check the operation of the fan and check the connections.		✓
E04	Electric Overheat Protection	The compressor is overloaded.	Check the operation of the refrigeration circuit in terms of gas pressure and charge.		✓
E08	Communication Error	There is a communication error between the controller and the unit.	Check the wiring and connections between the controller and the unit.		✓
E11	High Pressure Protection	The high pressure switch in the refrigeration circuit has been tripped.	Check the operation of the high pressure switch and refrigeration circuit in terms of gas pressure.		✓
E12	Low Pressure Protection	The low pressure switch in the refrigeration circuit has been tripped.	Check the operation of the low pressure switch and refrigeration circuit in terms of gas pressure.		✓
E19	Primary Anti-freezing Protection	The ambient temperature is low.	Test the operation of the ambient temperature sensor and re-connect/replace if necessary.		✓
E29	Secondary Anti-freezing Protection	The ambient temperature is low.	Test the operation of the ambient temperature sensor and re-connect/replace if necessary.		✓
E032	Low Flow Error	There is not enough flow in the heating circuit.	Check the plumbing circuit for blockages or air, valves are open and the operation of the circulating pump.		✓
E051	Compressor Overload	The compressor is overloaded.	Check the operation of the refrigeration circuit in terms of gas pressure and charge.		✓
E065	Outlet Water Temp. Overtemp.	The temperature of the outlet water is too high.	Check there is enough water in the system and there are no air locks/lack of flow.		✓

Alarm Code	Fault	Possible Cause(s)	Suggested Action(s)	Action By	
				User	Engineer
E071	Outlet Water Temp. Lowtemp.	The temperature of the outlet water is too low.	Check there is enough water in the system and there are no air locks/lack of flow.		✓
E081	DC Fan Motor Communication Error	There is a communication error between the fan speed control module and the main board.	Check the wiring and connection between the fan speed control module and the main board.		✓
E082	DC Fan Motor 2 Communication Error	There is a communication error between the fan speed control module and the main board.	Check the wiring and connection between the fan speed control module and the main board.		✓
E084	Display and Main Controller Not Compatible	The software on the Display is not compatible with the main control board.	Replace the Display with a compatible version.		✓
E101	Compressor Overcurrent	The compressor is overloaded.	Check the operation of the refrigeration circuit in terms of gas pressure and charge.		✓
E103	Fan Motor 1 Overload	The Fan Motor 1 is overloaded.	Check the operation of the fan.		✓
E203	Fan Motor 2 Overload	The Fan Motor 2 is overloaded.	Check the operation of the fan.		✓
E171	Anti-freezing Protection	There is not enough flow in the heating circuit.	Check the plumbing circuit, valves and operation of the circulating pump.		✓

Alarm Code	Fault	Possible Cause(s)	Suggested Action(s)	Action By	
				User	Engineer
F00	Inverter IPM Overcurrent Shutdown	Inverter IPM input current is too high.	Check the current measurement and adjust/replace if necessary.		✓
F01	Compressor Start-up Failure	Voltage too low. Damage to inverter.	Check the voltage measurement. Check the inverter for damage.		✓
F03	Power Factor Correction (PFC) Error	There is an error with the power factor correction circuit.	Check the power correction wiring for a break or short circuit.		✓
F05	DC Bus Overload	The DC bus voltage is higher than the overload protection limit.	Check the input voltage measurement.		✓
F06	DC Bus Underload	The DC bus voltage is lower than the underload protection limit.	Check the input voltage measurement.		✓
F07	AC Input Underload	The AC input voltage is low causing the input current to be low.	Check the input voltage measurement.		✓
F08	AC Input Overload	The AC input voltage is high causing the input current to be high.	Check the input voltage measurement.		✓
F09	Input Voltage Read Error	The input voltage reading is incorrect/out of range.	Check the input voltage measurement.		✓
F10	DSP and PFC Communication Error	There is a communication error between the DSP and the PFC.	Check the wiring and connection between the DSP and the PFC.		✓
F11	DSP Communication Error	There is a communication error between the DSP and the inverter.	Check the wiring and connection between the DSP and the inverter.		✓
F12	Inverter Communication Error	There is a communication error between the inverter and the main board.	Check the wiring and connection between the inverter and the main board.		✓
F13	IPM Over Temperature Protection	There IPM module temperature is too high.	Check the current measurement and adjust/replace if necessary.		✓
F15	Input Voltage Lacking Phase	The input voltage has lost a phase.	Check the input voltage measurement.		✓
F16	Weak Magnetism Error	The magnetic force of the compressor motor is too low.	Check the operation of the refrigeration circuit in terms of gas pressure and charge.		✓
F17	Module/Radiator Sensor Error	A transducer has overheated.	Check the current measurement.		✓
F18	IPM Current Read Error	The IPM current reading is incorrect/out of range.	Check the IPM current measurement.		✓

Alarm Code	Fault	Possible Cause(s)	Suggested Action(s)	Action By	
				User	Engineer
F20	IGBT Power Device Error	A transducer has overheated.	Check the current measurement.		✓
F21	Overload Error	The compressor input current is too high.	Check the operation of the refrigeration circuit in terms of gas pressure and charge.		✓
F22	AC Input Over Current Error	The AC input current is too high.	Check the current measurement and adjust/replace if necessary.		✓
F23	EEPROM Alarm	MCU Error	Replace board.		✓
F24	EEPROM Alarm	MCU Error	Replace board.		✓
F25	LP 15V Error	THE V15V is out of range.	Check the V15V input voltage is between 12.5V and 16.5V.		✓
F26	IGBT Power Device Over Temperature	The IGBT transducer temperature is too high.	Check the current measurement and adjust/replace if necessary.		✓
F031	DC Fan Motor 1 Error	There is no connection between the fan module and motor. The fan motor is in locked rotor state.	Check the connection between the fan module and motor. Replace the fan motor.		✓
F032	DC Fan Motor 2 Error (AS03 models only)	There is no connection between the fan module and motor. The fan motor is in locked rotor state.	Check the connection between the fan module and motor. Replace the fan motor.		✓
F33	Compressor Current Frequency Reduction Error	The Compressor current reading is incorrect/out of range.	Check the Compressor current measurement.		✓

3.16 Troubleshooting

Other faults or problems with the appliance that may not trigger an alarm are listed below

Symptom	Possible Cause(s)	Suggested Action(s)	Action By	
			User	Engineer
No heat supplied to the property or hot water storage cylinder.	<p>Timer mode not enabled.</p> <p>Time clocks not set.</p> <p>No demand signal from remote digital inputs.</p>	<p>Ensure timer mode is enabled in 'Timer' menu.</p> <p>Ensure time clocks are set correctly in 'Timer' menu.</p> <p>Check feeds from room thermostats, underfloor manifolds and remote time clocks are functioning correctly.</p>	<p>✓</p> <p>✓</p>	<p>✓</p>
Timeclock and controls are switched on, and appliance is in standby.	Heat demand for the property has been satisfied	If the property temperature is too low, increase the flow temperature in the 'Temperature' sub-menu.	✓	
The appliance has been producing heat for some time, but the property heat demand has still not been satisfied.	<p>Flow temperature set too low.</p> <p>Airlocks in heating system.</p> <p>3-port diverting valve fault.</p> <p>Heating circulating pump fault.</p>	<p>Increase flow temperature in the 'Temperature' sub-menu.</p> <p>Bleed heating system to remove airlocks.</p> <p>Ensure valve is operating correctly.</p> <p>Ensure pump is operating correctly.</p>	✓	<p>✓</p> <p>✓</p> <p>✓</p>
Appliance is cycling on and off very frequently.	<p>Poor quality room thermostats, or location close to draughts from opening doors etc.</p> <p>Hysteresis temperature is too low.</p> <p>External temperature located in position where temperature is changing rapidly.</p>	<p>Consider upgrading controls and utilise alternative locations.</p> <p>Increase hysteresis parameter.</p> <p>Ensure external temperature sensor is on a north facing wall out of direct sunlight and away from opening such as vents, doors and windows.</p>		<p>✓</p> <p>✓</p> <p>✓</p>

4 YOUR GUARANTEES, TERMS & CONDITIONS

4.1 Period of Guarantee

Your Air Source Heat Pump is guaranteed against defective parts and workmanship for a period of five (5) years or nine thousand (9000) working hours (whichever is soonest) from the date of registration, provided that your Appliance is installed and commissioned in accordance with any instructions and recommendations of the manufacturer in force at the time of installation, and any other conditions of this warranty are met.

Please note that this period of guarantee will not be extended under any circumstances.

4.2 Warmflow's Obligations

Where components are found to be defective in materials or workmanship within the periods set out above, Warmflow will arrange for repair or replacement as required.

In the event that components are not capable of repair, Warmflow will provide replacement parts for any such components.

Warmflow reserves the right to repair or replace components within the period of guarantee at a time and location that is most convenient to the company.

All removed parts and components of your Appliance shall become the property of Warmflow. All replaced and/or repaired parts shall assume the status of the original part for the purposes of this warranty and this warranty shall not be extended by the replacement of such parts.

This guarantee applies to Warmflow appliances installed in GB (including Scottish Isles), Isle of Man, Channel Islands, Northern Ireland and Republic of Ireland only. Provision of warranty cover elsewhere is subject to the agreement in writing of Warmflow.

4.3 Your Obligations

Your Appliance must be installed, commissioned and serviced in accordance with any instructions and recommendations of the manufacturer from time to time in force as may be communicated to you.

In addition:

- Your Appliance must be registered with Warmflow within thirty (30) days of installation. Please note if your Appliance has not been installed within three (3) months of the date of dispatch from Warmflow, then this guarantee will be deemed to have commenced upon such date of dispatch. Please also note that failure to complete and return the commissioning certificate at the time of installation will invalidate all guarantees.
- Your Appliance must be installed and commissioned by an appropriately qualified person with suitable training* and experience, with commissioning completed immediately following installation.

- Your Appliance must be serviced by an appropriately qualified person with suitable training* and experience twelve (12) months after the date of installation and thereafter at twelve (12) monthly intervals in accordance with the manufacturer's instructions and all regulations and codes of practice in force at the time. Warmflow reserves the right to determine at its absolute discretion whether an engineer has suitable experience.
- Each service record must be completed with proof of servicing retained and made available to Warmflow in respect of any claim.
- If you choose to have someone other than an appropriately qualified person with suitable training* and experience carry out works to your Appliance, this warranty will automatically become null and void.

* I.e. Warmflow product training course

In the event of a breakdown please contact your commissioning engineer who should then contact our Customer care Department whilst at your home to report the fault.

PLEASE NOTE THAT FAILURE TO REGISTER AND ANNUALLY SERVICE THIS PRODUCT WILL INVALIDATE ALL GUARANTEES IN THEIR ENTIRETY

4.4 Exclusions of Guarantee

The guarantee is not transferable.

4.4.1 Repairs

All repairs and/or replacements must be authorised in writing by Warmflow prior to any works being carried out. Warmflow will have no responsibility or liability for repairs or works performed by a person who has not been authorised by Warmflow.

Warmflow will accept no liability for the cost of repairs resulting from incorrect installation, inadequate commissioning, lack of annual servicing, misuse, tampering or repair by persons who have not been authorised by Warmflow. Invoices for call out and/or repair by any third party or parts supplied by a third party will not be accepted unless previously authorised by Warmflow in writing. If you choose to have someone other than an authorised service provider carry out works to your appliance, this warranty will automatically become null and void.

4.4.2 Other property

In no event shall Warmflow have any liability or responsibility whatsoever for damage to surrounding property and other structures or objects around your Appliance.

4.4.3 General

This warranty excludes all defects or damage that are not the direct fault of Warmflow, including without limitation, loss or damage caused by any one or more of the following:

- (a) use of the Appliance in anything other than its normal and intended use;
- (b) Any repair that is needed as a result of anything other than a fault in the appliance or failure of the appliance itself;
- (c) Any damage, whether accidental, negligent, malicious or otherwise;
- (d) Any fault or failure in the heating system to which the appliance is connected;
- (e) Any other costs or expenses caused by, or arising as a result of, a repair;

- (f) any fault or failure in the appliance caused by a fault, failure or defect in the heating system to which the appliance is connected
- (g) any party's wilful misconduct, negligence, misuse, abuse, accidents, improper operation, failure to maintain, improper or negligent installation, tampering, failure to follow operating instructions, mishandling, unauthorized service;
- (h) adjustment, alteration or modification of the Appliance of any kind;
- (i) ordinary wear and tear; and
- (j) any external forces and factors, including without limitation, lightning strikes, fire, floods, rain, freezing, excessive moisture or extended exposure to humidity, power surges, and acts of God.
- (k) Any defects that appear after the customer makes any modification or alteration to the appliance;
- (l) Defects caused by the improper use or storage of the appliance and in particular (but without limitation) Warmflow shall not be liable in the case of defects arising from normal deterioration or improper or faulty handling or processing of the appliance by the customer;
- (m) Any problems caused by inadequate supply of services such as electricity or water to the property;

Claims for consequential loss or damage however caused are not covered by this guarantee.

Please note that your statutory rights are not affected by this guarantee.

5 END-OF-LIFE INFORMATION

Warmflow High Efficiency Ground Source Heat Pumps must be disposed of according to local regulations by using a public or private waste collection service.

5.1 Safety Risks

Prior to disassembly, the appliance should be electrically isolated and disconnected. Refrigeration gas (R410A) should be recovered and disposed of by an F-Gas registered engineer. Any fluids within the appliance must be drained, and disposed of in-line with local regulations. Care should be taken when handling the appliance due to weight, use appropriate PPE and lifting aids.

5.2 Disassembly of the Product

The main materials of the components are:

- Mild Steel
- Stainless Steel
- Copper
- Brass
- Neoprene Foam
- Plastic Components
- Electronic Components

These may be recycled – depending on the local recycling facilities available.

The appliance is assembled by using mechanical fasteners and can be disassembled with standard tools.

APPLIANCE INSTALLATION/COMMISSIONING CERTIFICATE & REGISTRATION.

Instructions.

- **Complete the Installation/Commissioning Certificate.**
 - Complete the Installation/Commissioning Certificate overleaf.
 - Fill out all relevant sections of the Installation/Commissioning Certificate using BLOCK CAPITALS. Please write legibly.
 - Ensure that the certificate is signed by both the Competent Person and the Customer.

- **Register the Appliance.**
 - Remove the white copy of the Installation/Commissioning Certificate.
 - Send the certificate to Warmflow
 - By post to:

Warmflow Engineering Co. Ltd.
Lissue Industrial Estate
Moira Road
Lisburn
Co. Antrim
Northern Ireland
BT28 2RF

OR
 - By fax to: 02892620869

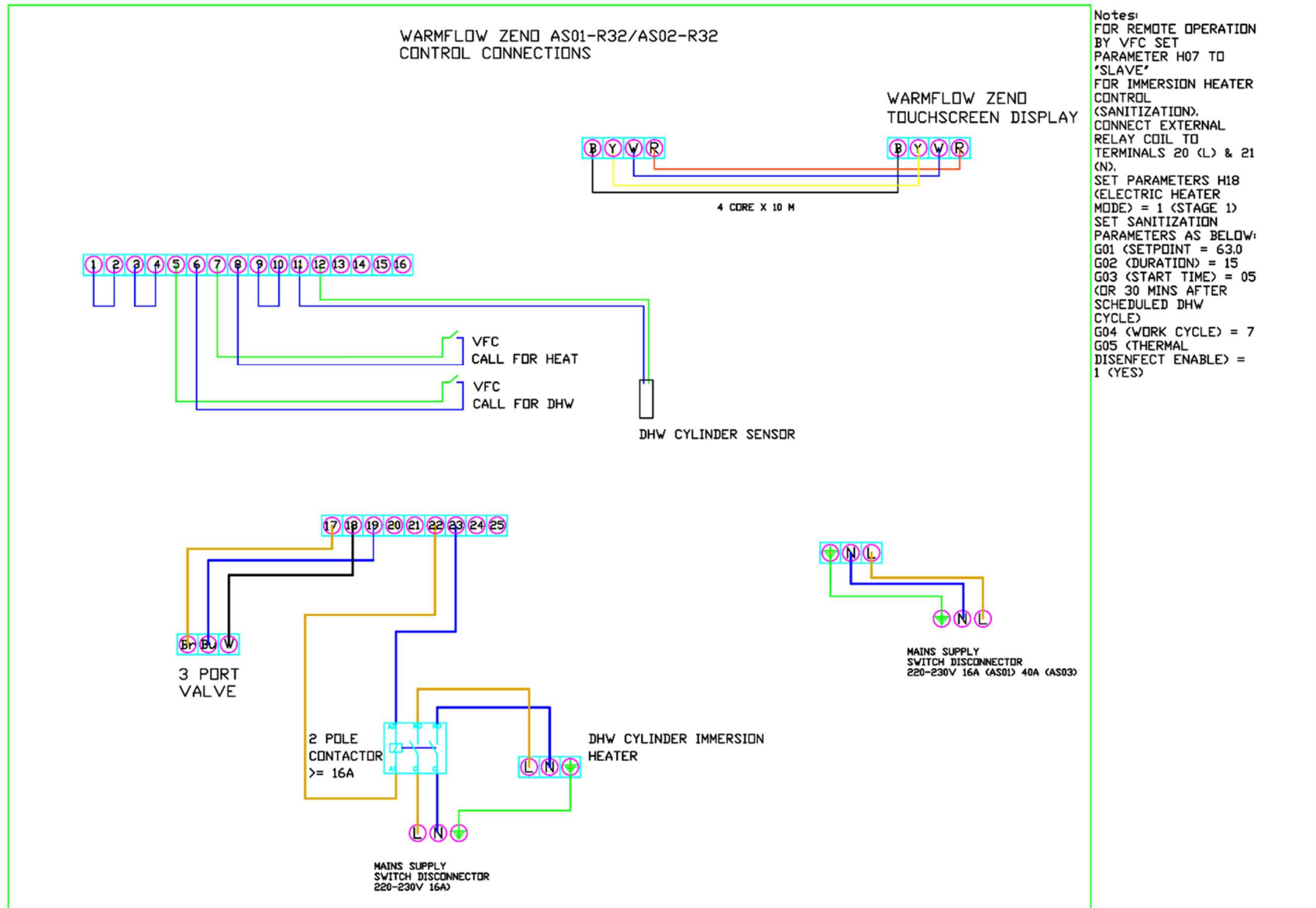
If the appliance is not registered, warranty may be invalidated.

6 APPENDIX A: TABLES FOR MINIMUM CIRCULATING VOLUME CALCULATION.

Typical Pipe Volumes			
Pipe Type	O.D. (mm)	I.D. (mm)	Volume per metre (l)
Copper (Table X)	15	13.6	0.145
	22	20.2	0.320
	28	26.2	0.539
	35	32.6	0.835
PEX	10	7.4	0.043
	12	8	0.050
	16	12	0.113
Plastic (Push Fit)	15	12	0.113
	22	18	0.254
	28	22.8	0.408

Typical Radiator (Emitter) Volumes			
Radiator Height (mm)	Volume per metre (l)		
	Single Panel	Double Panel	Triple Panel
300	1.89	3.70	5.40
450	2.57	5.15	-
500	-	-	8.33
600	3.25	6.60	9.80
700	3.77	7.63	11.37

7 APPENDIX B: WIRING DIAGRAMS



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PLEASE COMPLETE IN BLOCK CAPITALS

Installation & Commissioning Certificate

Date of Installation:

Date of Commissioning:

1. Installation Engineer Details

MCS/SEAI Registration No.

Installation Company Name

Installation Company Address

Contact Telephone No.

Installer's Name

Installer's E-Mail

5. Commissioning Engineer Details

MCS/SEAI Registration No.

Commissioning Company Name

Commissioning Company Address

Contact Telephone No.

Commissioning Engineer's Name

Commissioning Engineer's E-Mail

2. Appliance Details

Appliance Model No.

Appliance Serial No.

6. Commissioning Performance

DHW Cylinder Heat Up Test Max. DHW Temp Achieved °C Thermal Disinfection

Maximum Heating Flow Rate Achievable l/min

3. Householder & Installation Address Details

Householder's Name

Householder's Address

Installation Company Address

Post Code

Contact Telephone No.

Householder's Email Address

7. Statement of Conformity

Does the installation conform to IEE Regulations, relevant British & European standards, codes of practice, Building Regulations & Local Authority Bylaws? Has the customer been explained the correct operation of the appliance according to the manufacturer's instructions?

Does the installation comply with the Manufacturer's instructions? Has the manufacturer's maintenance instructions & schedules been explained to the customer?

Does the installation conform to the requirements of MCS Microgeneration Installation Standard MIS 3005? Has the appliance warranty documentation been provided to the customer?

Has the appliance operating manual been explained & provided to the customer?

4. System Details

Approximate Age of Dwelling years Floor Area m²

Heating System Overview Replacement New

Heating System Type Open Vented (Gravity) Sealed (Pressurised)

Heat Emitters Radiators Underfloor

Total Heating System Volume Total Expansion Capacity

Has the system been flushed? What cleaner was used

Corrosion Inhibitor Added Brand Quantity Added

Buffer tank volume (L) If no buffer min circulating vol (L)

DHW Cylinder Details Brand Model Volume litres

Notes:

8. Commissioning Completion

Competent Person's Signature Print Name

Customer's Signature* Print Name

*To confirm demonstrations of the appliance and receipt of related appliance instructions

Notes:

1. An estimate of system performance should be detailed in a separate document within the Installer's Handover Pack.
2. The system requires regular maintenance as detailed in the Installer's Handover Pack & manufacturer's instructions.
3. A certificate confirming registration on the MCS Installation Database should be found in the Installer's Handover Pack.

Further Details of Heating System (no. of zones, underfloor pipe spacing, pip sizes etc.)

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8 APPLIANCE SERVICE RECORDS.

Instructions.

- The appliance must be serviced in accordance with the service schedule and instructions laid out in this manual.
- Details of the service conducted must be fully recorded on the following service record sheets by the Warmflow or other competent engineer conducting the service.
- Service records must be retained for inspection upon request by the manufacturer.
- All product warranties will be invalidated if the appliance is not serviced at least annually or as indicated by the user interface controller (whichever occurs sooner) by a Warmflow engineer or other trained and competent Engineer and details recorded in the service record section of this manual.

PLEASE COMPLETE IN BLOCK CAPITALS

Service Record No.

Service Date

Service Engineer Details

MCS/SEAI Registration No.

Service Company Name

Service Company Address

Contact Telephone No.

Service Engineer's Name

Service Engineer's E-Mail

Appliance Servicing Checklist

Inspect Electrical Connections

Clean Heating Circuit Filter

Check Inhibitor Concentration

Check Heating Flow Rate

Inspect Condition of Insulation inside Unit

Details of Additional Service Items included:

System Modification since Last Service

Have there been any modifications made to the heating system since the last service? For example; additional radiators, additional domestic hot water needs, additional of auxiliary heat sources.

Yes

No

If Yes, please specify below

Details of Modifications:

After Service Performance

Heating Flow Temp.

 °C

Heating Return Temp.

 °C

Heating Flow Rate

 l/min

Compressor Speed

 rpm

Heating Power Output

 kW

Suction Pressure

 bar

Intermediate Pressure

 bar

Discharge Pressure

 bar

Notes:

Service Completion

Competent Person's Signature

Print Name

Customer's Signature

Print Name

*To confirm demonstration of appliance servicing and receipt of this service record.

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This manual is accurate at the date of printing (E&OE) but will be superseded and should be disregarded if specifications and/or appearances are changed in the interests of continued product improvement.

ASHP MAN 7723 ISSUE A FEB 2022
