



High Efficiency Variable Speed Ground Source Heat Pumps

Models covered by this manual:

G-Series

Ground Source

GS08

GS16



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.

Warmflow Customer Care Centre

Warmflow Engineering
Lissue Industrial Estate
Moir Road
Lisburn
BT28 2RF
Northern Ireland

Telephone

United Kingdom:	028 9262 1515
Republic of Ireland:	048 9262 1515

Facsimile

United Kingdom:	028 9262 0869
Republic of Ireland:	048 9262 0869

Email

technical@warmflow.co.uk

Website

www.warmflow.co.uk

CONTENTS

Contents	1
1 USER INSTRUCTIONS.....	3
1.1 Intended Use.....	3
1.2 Compliances	3
1.3 Basic Operation.....	3
1.4 Product Data	4
1.4.1 Starting Current.....	6
1.5 Construction	6
1.6 Supplied Components	7
1.7 Storage / Transport	7
2 USER INTERFACE	8
2.1 Home Screen Icons.....	8
2.2 Using the Main Menu	9
2.3 Selecting the Home Menu	10
2.4 Selecting the Alarms Menu	10
2.5 Selecting the Functions Menu	10
2.6 Selecting the Settings Menu.....	11
2.6.1 Date / Time:	12
2.6.2 Scheduler:	12
2.6.3 Temperature:	13
2.6.4 Information:	15
2.7 Selecting the Engineer Menu	17
2.7.1 Parameters:	18
2.7.2 Commissioning:	20
2.7.3 Servicing:	21
2.7.4 Service Now:	25
2.7.5 History:	25
2.7.6 In/Out:	25
2.8 Selecting the Help Menu	27
3 GROUND SOURCE HEAT PUMP INSTALLATION	28
3.1 General	28
3.2 Unpacking	30
3.3 Ground Collector Installation	30
3.3.1 Brine.....	30
3.3.2 Brine Connections to the Heat Pump	30
3.3.3 Ground Loop Sizing & Integrated Circulator	30
3.3.4 Borehole Sizing.....	31
3.3.5 Brine Pump Overrun	32
3.3.6 Brine Circuit Line Components	32
3.3.7 Brine Circuit Expansion Vessel.....	33
3.3.8 Filling the Brine Circuit.....	33
3.4 Heating Circuit Connection.....	33
3.4.1 Heating Medium.....	33
3.4.2 Heating Connections to the Heat Pump	34
3.4.3 Heating Circuit and Integrated Circulator.....	34

3.4.4	Heating Pump Overrun	34
3.4.5	Bypass / Open Zones	34
3.4.6	Freeze Protection.....	34
3.4.7	Heating Circuit Line Components	34
3.4.8	3-port Motorised Valve Installation	36
3.4.9	Heating Expansion Vessel (Integral)	37
3.5	Drain Pipe & Pressure Relief Valve.....	37
3.6	Electrical Installation.....	38
3.6.1	Incoming Supply	41
3.6.2	Fuses	41
3.6.3	Power Out	41
3.6.4	Digital Outputs	41
3.6.5	Temperature Sensors	45
3.6.6	Digital Inputs	45
3.6.7	pLAN	46
3.7	Commissioning.....	48
3.7.1	Recorded Details	48
3.7.2	Testing Flow Rates	48
3.7.3	Probe Adjustment	49
3.7.4	Unit Control	50
3.7.5	Weather Compensation Mode	50
3.7.6	DHW Cylinder Heat Up Test.....	51
3.7.7	Digital Outputs	51
3.7.8	Sign Off	51
3.8	System Hand Over.....	51
3.9	Servicing	52
3.9.1	Servicing Schedule	52
3.10	Alarms and Troubleshooting	54
3.11	Alarms	54
3.12	Troubleshooting.....	60
4	YOUR GUARANTEES, TERMS & CONDITIONS	61
4.1	Period of Guarantee	61
4.2	Warmflow's Obligations.....	61
4.3	Your Obligations.....	61
4.4	Exclusions of Guarantee	62
4.4.1	Repairs.....	62
4.4.2	Other property	62
4.4.3	General	62
5	APPLIANCE INSTALLATION/COMMISSIONING CERTIFICATE & REGISTRATION.	66
6	APPLIANCE SERVICE RECORDS.	69

1 USER INSTRUCTIONS

1.1 Intended Use

The Warmflow Ground 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 ground using a horizontal ground collector or a vertical borehole collector. For connection to a water source please contact Warmflow for further details.

1.2 Compliances

The Warmflow GS08 and GS16 ground source heat pump units are Microgeneration Certification Scheme (MCS) approved and CE marked. 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.
- EN 14511 - Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling.
- 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 378 - Refrigerating systems and heat pumps. Safety and environmental requirements.

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 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).

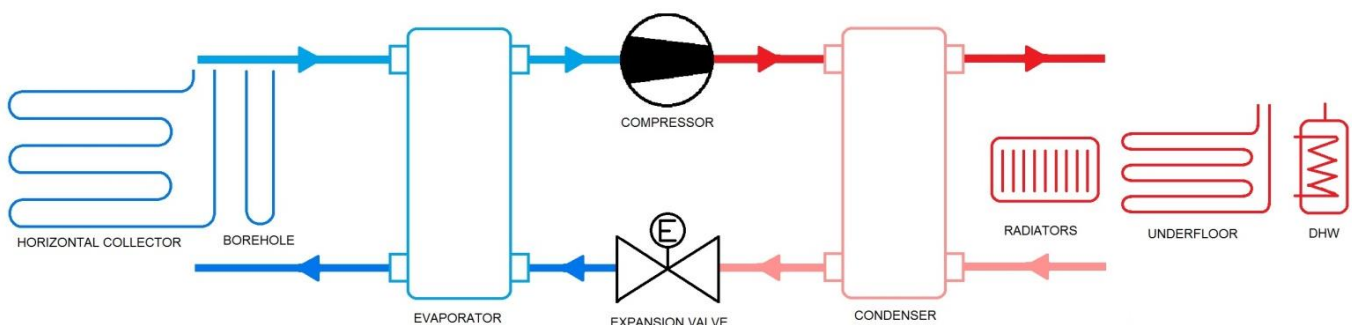


Figure 1 Basic Operating Principles of a Heat-pump

Heat is extracted from the ground by pumping brine around a horizontal surface collector or vertical borehole collector. Brine is a mixture of water and anti-freeze (mono ethylene glycol), to allow operation in sub-zero temperatures. This collected heat is then transferred into the heat pump's refrigerant via a heat exchanger known as 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		GS08	GS16
Dimensions (mm)	Width	590	590
	Depth	660	660
	Height	890	890
Weight (kg)		125	130
Electrical Supply		230V Single Phase @50Hz	230V Single Phase @50Hz
Maximum Current (Amps)		30	40
Nominal Sound Level (dBA)*		58	55
Performance	COP @ B0W35^	4.41 @ 7.59kW	5.08 @ 11.63kW
	COP @ B5W35^	4.95 @ 8.44kW	5.64 @ 12.82kW
	COP @ B0W45^	3.63 @ 7.72kW	4.10 @ 12.00kW
	COP @ B0W55^	3.00 @ 7.91kW	3.34 @ 12.32kW
	COP @ B0W65^	2.29 @ 8.13kW	2.72 @ 12.59kW
	Heat Output Range	2.5-8kW	4.5-18kW
	ErP Efficiency Class (35°C / 55°C)^	A++ / A++	A++ / A++
Flow Temp. (°C)	Brine, min/max	-5/15	-5/15
	Heating, min/max	30/65	30/65
Flow Rates (l/m)	Brine, min/max	10/45	10/75
	Heating, min/max	8/34	8/60
Refrigerant	Type	R410A	R410A
	Charge (kg)	2.60	3.10
Compressor Oil	Type	RL32 3MAF	RL32 3MAF
	Quantity (l)	1.5	1.5
Connections	Brine	1 ½" female BSP	1 ½" female BSP
	Heating	1 ¼" female BSP	1 ¼" female BSP

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

^COP and Heat Power ratings have been independently tested in accordance with EN 14511.

Table 2 Product information

Model		GS08	GS16	
Air-to-water heat pump	No			
Water-to-water heat pump	No			
Brine-to-water heat pump	Yes			
Low-temperature heat pump	No			
Equipped with a supplementary heater	No			
Heat pump combination heater	No			
	Symbol	Value		Unit
Rated heat output	P_{rated}	8	12	kW
Declared Capacity for heating for part load at indoor temperature 20°C and outdoor temperature T_j				
$T_j = -7^{\circ}\text{C}$	P_{dh}	7.3	9.1	kW
$T_j = 2^{\circ}\text{C}$	P_{dh}	4.4	6.1	kW
$T_j = 7^{\circ}\text{C}$	P_{dh}	2.7	11.4	kW
$T_j = 12^{\circ}\text{C}$	P_{dh}	8.2	11.4	kW
$T_j = \text{bivalent temperature}$	P_{dh}	2.7	6.1	kW
$T_j = \text{operation limit temperature}$	P_{dh}	8.2	11.6	kW
Bivalent temperature	T_{biv}	7.0	2.0	°C
Cycling interval capacity for heating	P_{cyc}	-	-	kW
Degradation coefficient	C_{dh}	-	-	
Seasonal Space Heating Energy Efficiency	η_s	146	155	%
$T_j = -7^{\circ}\text{C}$	COP_d	4.09	4.26	
$T_j = 2^{\circ}\text{C}$	COP_d	4.56	4.83	
$T_j = 7^{\circ}\text{C}$	COP_d	4.75	4.34	
$T_j = 12^{\circ}\text{C}$	COP_d	3.48	3.45	
$T_j = \text{bivalent temperature}$	COP_d	4.75	4.83	
$T_j = \text{operation limit temperature}$	COP_d	3.85	4.06	
Operation limit temperature	TOL	-15	-15	°C
Cycling interval capacity for heating	COP_{cyc}	-	-	
Heating water operating limit temperature	$WTOL$	60	60	°C
Power consumption in modes other than active				
Off mode	P_{OFF}	0.008	0.008	kW
Thermostat-off mode	P_{TO}	0.024	0.019	kW
Standby mode	P_{SB}	0.016	0.020	kW
Crankcase heater mode	P_{CK}	0.016	0.016	kW
Other items				
Capacity control	Variable			
Sound power level indoors	LWA	58	55	dB
Annual energy consumption	QHE	4514	5991	kWh
Rated brine flow rate	QHE	3	5	m³/h

Table 3 Product Fiche

Supplier	Warmflow	Warmflow
Model	GS08	GS16
Energy Efficiency Class	A++	A++
Rated Heat Output (kW)	8	12
Seasonal Space Heating Energy Efficiency	176	192
Annual Energy Consumption, GCV (kWh)	3706	4777
Sound Power Level, LWA (dB)	58	58
Rated Heat Output in Colder Climate (kW)	8	12
Seasonal Space Heating Energy Efficiency in Colder Climate	176	192
Annual Energy Consumption in Colder Climate, GCV (kWh)	4422	5700
Rated Heat Output in Warmer Climate (kW)	8	12
Seasonal Space Heating Energy Efficiency in Warmer Climate	176	192
Annual Energy Consumption in Warmer Climate, GCV (kWh)	2397	3089

1.4.1 Starting Current

The GS08 and GS16 ground source heat pump units are both inverter driven. This means they ramp up slowly and therefore do not require a large starting current which is required in fixed speed units. In the majority of situations the starting current will be less than 5Amps. The starting current will also be below the rated current of the unit.

1.5 Construction

The Warmflow ground source heat pumps are housed in a pre-coated metal casing complete with plastic dresser upon which the user interface is mounted. Both models are supplied in the same size of outer casing although internal components differ significantly.

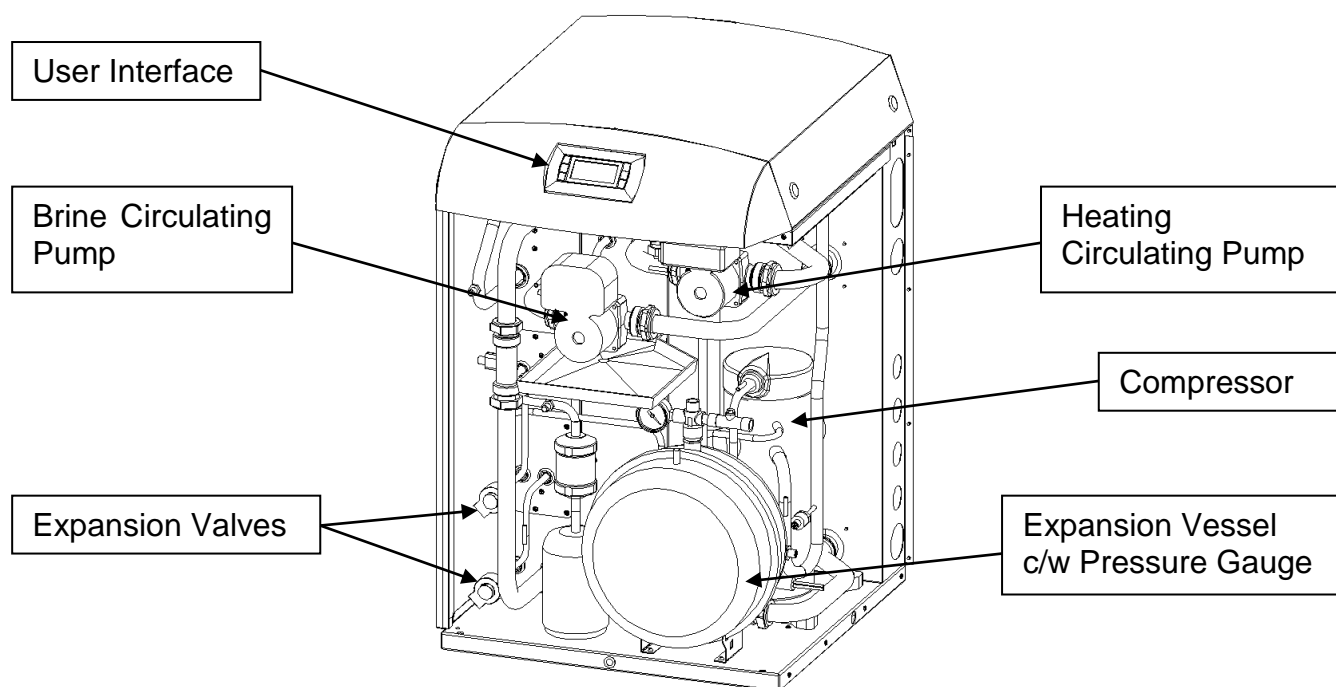


Figure 2 Main Components

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.

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:

- Low restriction 3-port motorised valve
- 1¼" BSP Y-strainer complete with 700µm filter gauze
- 1½" BSP Y-strainer complete with 700µm filter gauze
- 2no. 1¼" BSP flexible hoses
- 2no. 1½" BSP flexible hoses
- External temperature sensor complete with weather protected enclosure
- DHW cylinder temperature sensor

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 small pallet measuring 800mm by 670mm 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.

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.

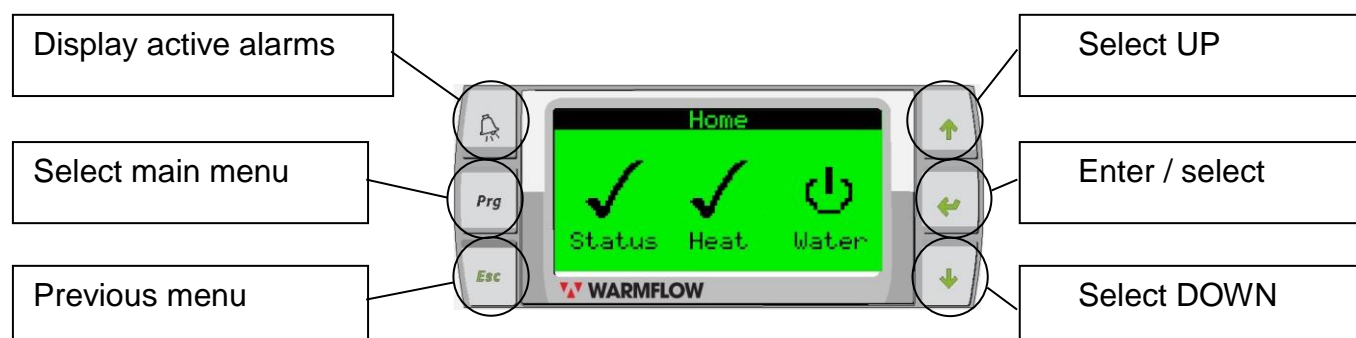


Figure 3 User Interface Display and Function Keys

2.1 Home Screen Icons

All interactions with the heat pump are via the control panel located on the front of the heat pump. 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.

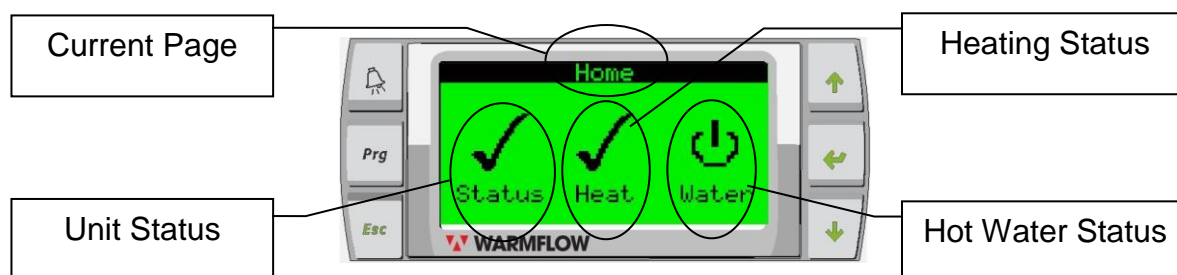





Figure 4 Icon Descriptions


Unit Status

Icon	Status	Meaning
✓	Unit OK	The appliance is functioning normally. There are no faults or alerts. Servicing is not due.
⚠	Unit Alert	The appliance has reached alert condition but will continue to operate as normal. This alert means that servicing is now due. The servicing time limit can be seen by pressing the  'Display active alarms' key. You should arrange servicing as soon as possible and before servicing is overdue otherwise the appliance will shut down.
✗	Unit Fault	The appliance has shut down due to a fault or alarm. This may be a fault with the appliance or an overdue service. The fault or alarm can be viewed by pressing the  'Display active alarms' key.

Heating Status

Icon	Status	Meaning
✓	Heating ON	The unit is in heating mode. Heating mode has been enabled by a signal from the internal timeclock, from a remote digital input or by the frost protection function.
	Heating OFF	The unit is not in heating mode. A signal has not been received to enable heating mode.

Hot Water Status

Icon	Status	Meaning
✓	Hot Water ON	The unit is in hot water mode. Heating mode has been enabled by a signal from the internal timeclock or from a remote digital input.
	Hot Water OFF	The unit is not in hot water mode. A signal has not been received to enable hot water mode.

2.2 Using the Main Menu





The main menu can be accessed by pressing once on the  'Program key'. This displays the main menu as shown in Figure 5 and Figure 6 below.



Figure 5 Main Menu Page 1



Figure 6 Main Menu Page 2

The  'Down Arrow' or the  'Up Arrow' key can then be used to scroll through the menu. Confirm selection with the  'Enter key' when the required item is highlighted in black. There are six options in the main menu including 'Home', 'Alarms', 'Functions', 'Settings', 'Engineer' and 'Help'.

2.3 Selecting the Home Menu

Home:

Selecting the home menu returns the display to the home screen. This display is as shown in Figure 7 and detailed in section 2.1.

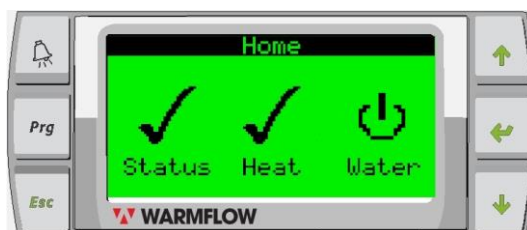


Figure 7 Home Screen

2.4 Selecting the Alarms Menu

Alarms:





Selecting the alarms menu enters the alarms display. This can also be entered at any time by pressing the  'Display active alarms' key. The screen shown in Figure 8 will be displayed when no alarms are present.



Figure 8 Alarms Screen

When an alarm is present, the  'Display active alarms' key will flash red. Pressing the flashing key or entering the alarm menu will then display one or more active alarms or faults. The  'Down Arrow' or the  'Up Arrow' key can then be used to scroll through the alarms.

Refer to Section 3.11 for more information on the alarm messages that can be displayed and the appropriate action to take in each case.

2.5 Selecting the Functions Menu

Functions:





Selecting the functions menu enters the main unit control page. This page is used to control how the unit is operated for both heating and hot water modes. Pressing the  'Enter key' repeatedly will cycle through the menu options, at each option its status can be changed by using the  'Down Arrow' or the  'Up Arrow' key and confirmed with the  'Enter key'.



Figure 9 Functions Screen

Press the ⬅ 'Enter key' to select the master ON / OFF control use the ⬇ 'Down Arrow' or the ⬆ 'Up Arrow' key to change its status to ON and confirm with the ⬅ 'Enter key'.

The control for both the heating and hot water can be manually controlled here. There are four options to choose from in each field including OFF, ON, TIMER and ECO. If the unit is to be controlled by remote digital inputs, the control for both heating and hot water should be set to OFF with the master control set to ON as is shown in Figure 9. When the remote digital inputs are activated, this will automatically change to ON and revert to OFF when the remote digital inputs are deactivated.

In the default control mode, the unit is controlled by the internal time clocks built into the controller. To enable this, both the heating and hot water should be set to TIMER with the master control set to ON as shown in Figure 10 below.



Figure 10 Functions Screen with Timers Enabled

The ON and ECO setting will run the unit manually at the normal operating temperature and the economy operating temperature respectfully. These will stay enabled until these setting are changed.

The 'Boost' functionality enables the user to switch on either heating or hot water for a period of 1 hour, 2 hours or 3 hours. This turns the selected function on and triggers the heat pump to target the current set points for the relevant function. Once the boost period has elapsed, the unit will automatically revert to standby mode.

Press the ⬅ 'Enter key' to select the Boost control, use the ⬇ 'Down Arrow' or the ⬆ 'Up Arrow' key to change its status from OFF to 1 hour, 2 hours or 3 hours and confirm with the ⬅ 'Enter key'.

2.6 Selecting the Settings Menu

⚙ Settings:

Selecting the settings menu enters a sub-menu which has a number of information and setting screens. These can be viewed and adjusted by the user. The information and setting screens are displayed in the same format as the main menu screen and may be accessed in the same way. The sub-menus include Date/Time, Scheduler, Temperature and Information as shown in Figure 11 and Figure 12 below.

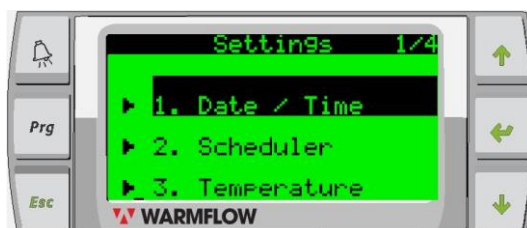


Figure 11 Settings Menu Page 1

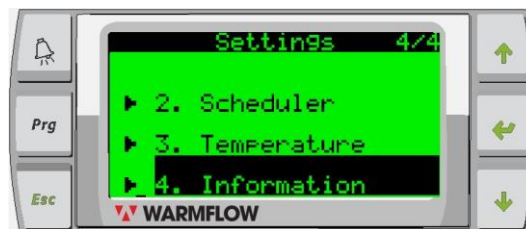






Figure 12 Settings Menu Page 2

2.6.1 Date / Time:

Selecting the date/time sub-menu enters the appliance clock and date management system. It is very important that the date and time are set correctly as shown in Figure 13.







Figure 13 Date / Time Screen

Press the  'Enter key' to select the required menu item. The date and time can then be adjusted using the  'Down Arrow' or the  'Up Arrow' keys. Confirm with the  'Enter key'. The day will automatically update when the date is altered.

2.6.2 Scheduler:

Selecting the scheduler sub-menu enters the appliance's internal timeclocks. This allows the on and off times for the heating, hot water and thermal disinfection (if required) to be set. The scheduler sub-menu also has a screen for enabling/disabling and adjusting the daylight saving time function.

The first screen is for setting the heating timeclock. The timeclock can have unique programs for each day or you can use the 'copy to:' function to use the same settings for each day. Up to four time settings can be used per day and for each of these time settings, the appliance can be set to ON, Energy save or OFF.

Press the  'Enter key' to select the parameter you wish to modify and then use the  'Down Arrow' or the  'Up Arrow' key to change its status. Confirm with the  'Enter key'.

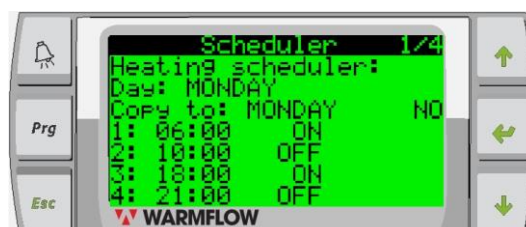


Figure 14 Heating Scheduler Screen

The second screen is for setting the hot water timeclock. The timeclock can have unique programs for each day or you can use the 'copy to:' function to use the same settings for a number of days. Up to four time settings can be used per day and each of these time settings the appliance can be set to ON, Energy save or OFF.

Press the ⬅ 'Enter key' to select the parameter you wish to modify and then use the ⬇ 'Down Arrow' or the ⬆ 'Up Arrow' key to change its status. Confirm with the ⬅ 'Enter key'.



Figure 15 Hot Water Scheduler Screen

The third screen is for setting the thermal disinfection timeclock. The commissioning engineer will decide if thermal disinfection is required based on the heat up performance of the hot water cylinder. The timeclock can have unique programs for each day or you can use the 'copy to:' function to use the same settings for each day. It is recommended to carry out thermal disinfection at least once per week. Up to four time settings can be used per day and each of these time settings the appliance can be set to ON or OFF.

Press the ⬅ 'Enter key' to select the parameter you wish to modify and then use the ⬇ 'Down Arrow' or the ⬆ 'Up Arrow' key to change its status. Confirm with the ⬅ 'Enter key'.

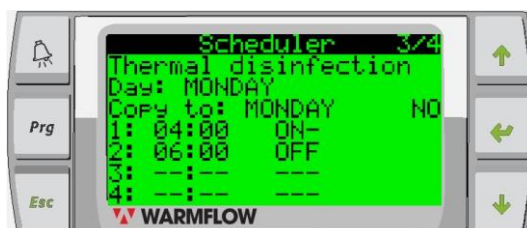


Figure 16 Thermal Disinfection Scheduler Screen

The fourth screen is for enabling/disabling and adjusting the daylight saving time function. The default setting is for daylight saving time to be enabled based on the GMT time zone. However, it is possible to disable or modify this functionality.

Press the ⬅ 'Enter key' to select the parameter you wish to modify and then use the ⬇ 'Down Arrow' or the ⬆ 'Up Arrow' key to change its status. Confirm with the ⬅ 'Enter key'.



Figure 17 Daylight Saving Time Screen

2.6.3 Temperature:

Selecting the temperature sub-menu enters two screens from which the appliances heating flow temperature and hot water storage temperature may be adjusted. There are two setting for each and these include 'Normal' and 'Energy Save'. These allow the temperatures to be set independently for varying times in the day. This feature can be used to run the unit at higher

temperatures when electricity is available from a renewable source such as photovoltaic solar panels or a wind turbine and also when electricity is cheaper from the grid such as using an Economy 7 tariff.

The first page contains the heating flow temperature setpoints.

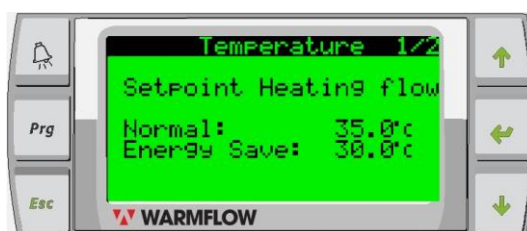


Figure 18 Heating Flow Temperature Setpoints Screen

The heating flow temperature is the temperature at which the heating system water leaves the appliance and enters the central heating circuit. This can be adjusted between 25°C and 60°C.

Press the ↵ 'Enter key' to select the required setpoint and then press the ↓ 'Down Arrow' or the ↑ 'Up Arrow' key to decrease or increase the temperature. Confirm your selection with the ↵ 'Enter key'.

The second page contains the hot water storage temperature setpoints.

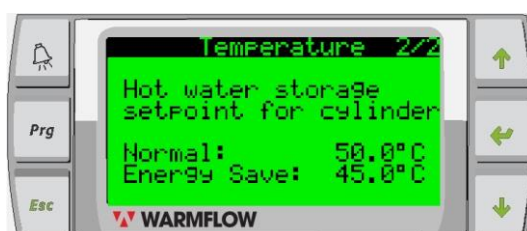


Figure 19 Hot Water Storage Temperature Setpoints Screen

The hot water storage temperature is the temperature at which the water in the hot water cylinder is stored at. This can be adjusted between 40°C and 60°C*.

Press the ↵ 'Enter key' to select the required setpoint and then press the ↓ 'Down Arrow' or the ↑ 'Up Arrow' key to decrease or increase the temperature. Confirm your selection with the ↵ 'Enter key'.

*The maximum storage temperature achievable will depend on the performance of the DHW cylinder. Cylinders designed especially for heat pumps have very large heat exchanger coils (3.0m² or greater) or a plate heat exchanger. These cylinders can achieve a hot water storage temperature of 60°C. Standard cylinders may only achieve a hot water storage temperature of between 50°C and 55°C. These cylinders will need an additional heat source such as an immersion heater to raise the hot water storage temperature above 60°C to prevent legionella. During commissioning, an engineer will determine the maximum achievable hot water storage temperature and will decide if an additional heat source is required. This heat source, usually an immersion heater, is then controlled via the thermal disinfection functionality in the heat pump. It is good practice to perform a thermal disinfection of the DHW cylinder at least once per week.

2.6.4 Information:

Selecting the information sub-menu allows 5 information screens to be viewed. The first information screen displays an overview of the refrigeration system including parameters such as expansion valve opening value, superheat, evaporating temperature, compressor speed and heat capacity.

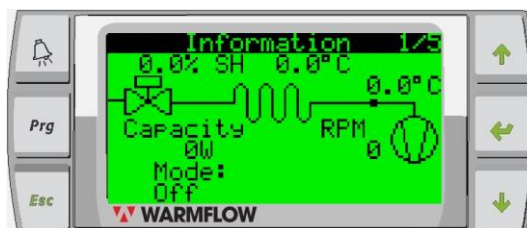


Figure 20 Information Screen 1

This screen also displays the current mode of the unit. This can take a number of values including:

- Off – The master control has been switched off. The internal timeclocks or remote digital inputs will not cause the unit to start.
- Standby – The unit is in standby mode and is waiting for a signal from the internal timeclocks or from a remote digital input to start up.
- Heating – The unit is in heating mode meaning it is either heating the heating water or the hot water storage cylinder.
- Stopping – The unit is shutting down after having been in heating mode. This could be due to having reached the setpoint, no longer receiving a signal from the internal timeclock or remote digital input.
- Anti-cycle – The unit is waiting for the anti-cycle timer to elapse. This anti-cycle timer function prevents the unit from starting and stopping too frequently. The timer can be adjusted and disabled by the commissioning engineer, however, it is not recommended to modify this from the default settings.
- Alarm – The unit is in alarm mode due to a fault being detected. The unit will not start up until the alarm is reset. An engineer is required to investigate.
- Waiting – The unit is waiting for an internal timer to be reset. This may have been triggered by a minor alarm which has reset itself. The unit will return to normal after the waiting time has elapsed.

The second, third and fourth information screens in the menu display a list of values relating to the operational performance of the appliance. These values are for monitoring purposes only and cannot be altered. A description of the information displayed along with expected values that are considered normal are shown in the following images and accompanying tables.

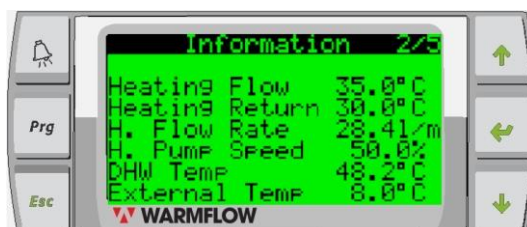


Figure 21 Information Screen 2

Text	Description	Expected Value(s)
Heating Flow	This is the temperature at which the heating water travelling to either the heating circuit or to the hot water storage cylinder is leaving the heat pump displayed in degrees Celsius.	Ambient temperature if the appliance is off. No greater than 65.0 degrees Celsius in normal operation.
Heating Return	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 displayed in degrees Celsius.	Ambient temperature if the appliance is off. The value should be approximately 5.0 degrees Celsius below the heating flow temperature in normal operation. It may vary when the unit first starts up, is shutting down or is transitioning between flow temperatures.
H. Flow Rate	The flow rate of the heating water leaving the appliance, displayed in litres per minute.	This should read 0.0 litres per minute when the unit is off and between 10.0 and 80.0 litres per minute in normal operation.
H. Pump Speed	The speed of the heating pump motor expressed in a percentage of the maximum possible speed.	This should read 0.0 percent when the unit is off and between 25.0 and 100.0 percent in normal operation.
DHW Temp	This is the temperature of the water in the storage tank displayed in degrees Celsius.	This should read between 10 and 70 degrees Celsius.
External Temp	This is the temperature of the outside air displayed in degrees Celsius.	This should read between -20 and 40 degrees Celsius.

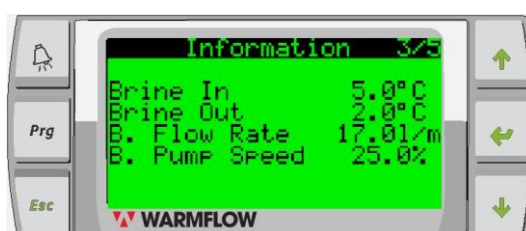


Figure 22 Information Screen 3

Text	Description	Expected Value(s)
Brine In	This is the temperature at which the brine enters the heat pump flowing from the ground collector displayed in degrees Celsius.	Ambient temperature if the appliance is off. No greater than 25.0 degrees Celsius and no less than -10 degrees Celsius in normal operation.
Brine Out	This is the temperature at which the brine leaves the heat pump flowing to the ground collector displayed in degrees Celsius.	The value should be approximately 3.0 degrees Celsius below the heating flow temperature. It may vary when the unit first starts up, is shutting down or varying output.
B. Flow Rate	The flow rate of the brine leaving the appliance, displayed in litres per minute.	This should read 0.0 litres per minute when the unit is off and between 10.0 and 90.0 litres per minute in normal operation.
B. Pump Speed	The speed of the brine pump motor expressed in a percentage of the maximum possible speed.	This should read 0.0 percent when the unit is off and between 25.0 and 100.0 percent in normal operation.

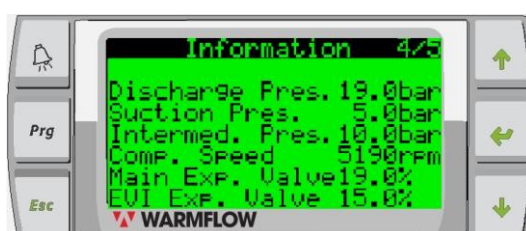


Figure 23 Information Screen 4

Text	Description	Expected Value(s)
Discharge Pres.	This is the pressure of the discharge line (the gas leaving the compressor travelling to the condenser), displayed in bar.	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.
Suction Pres.	This is the pressure of the suction line (the gas entering the compressor from the evaporator), displayed in bar.	This should read between 7.0 and 20.0 bar if the appliance is off and between 15.0 and 45.0 bar in normal operation.
Intermed. Pres.	This is the pressure of the intermediate line (the gas entering the compressor from the economiser), displayed in bar.	This should read between 7.0 and 20.0 bar if the appliance is off and between 10.0 and 35.0 bar in normal operation.
Comp. Speed	The speed of the compressor expressed in revolutions per minute (rpm).	This should read 0 rpm when the unit is off and between 1800 and 7200 rpm in normal operation.
Main Exp. Valve	The opening value of the main expansion valve expressed in a percentage of the maximum possible opening value.	This should read 0.0 percent when the unit is off and between 5.0 and 95.0 percent in normal operation.
EVI Exp. Valve	The opening value of the EVI expansion valve expressed in a percentage of the maximum possible opening value.	This should read 0.0 percent when the unit is off and between 5.0 and 95.0 percent in normal operation.

Information screen 5 displays a list of values relating to the software used in the appliance as shown in Figure 24. The most important of these values is the Software Ver. (meaning software version). The example in Figure 24 displays the Software Ver. as 1.01a. It is beneficial to be aware of the software version used on the appliance prior to seeking technical support.

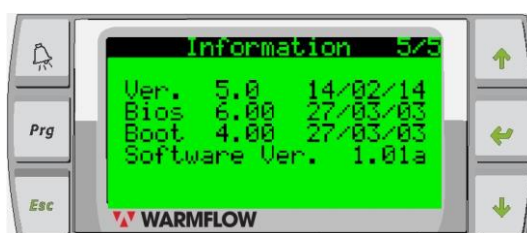


Figure 24 Information Screen 5

2.7 Selecting the Engineer Menu

Engineer:

Selecting the engineer menu enters a sub-menu which has a number of information and setting screens intended for an approved engineer only. For this reason the Engineer utility is password protected. The password should be entered as shown in Figure 25.



Figure 25 Engineer Password Protection Screen

As an authorised Engineer and having entered the password the following sub-menus become accessible: Parameters, Commissioning, Servicing, History, and In/Out.

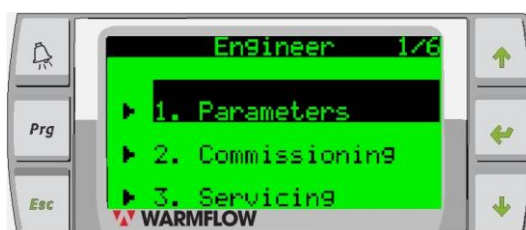


Figure 26 Engineer Menu Page 1



Figure 27 Engineer Menu Page 2

2.7.1 Parameters:

Selecting the parameters sub-menu allows 9 settings screens to be viewed. The first settings screen displays the overall unit control strategy. The screen allows the engineer to select if the unit is controlled by its internal time clocks (Internal timer) or is to be controlled by remote digital inputs. This control applies for both heating and hot water functionality and cannot be controlled independent (i.e. heating cannot be controlled by a remote digital input if hot water is controlled by the internal time clock). The screen also allows tandem mode to be enabled. Tandem mode allows two or more units to run together to provide a higher heat output and provided a larger range of heat outputs. For further information on running units in tandem mode please see section 3.6.4.

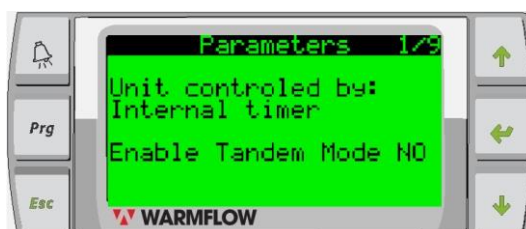


Figure 28 Parameters Screen 1

The second settings screen displays the flow temperature regulation settings. The screen allows the engineer to select if the heating flow temperature is to be controlled by a fixed set point or if it is to be assisted by the built-in weather compensation function. The screen also allows the user to set the flow temperature setpoint when the unit is in hot water mode.

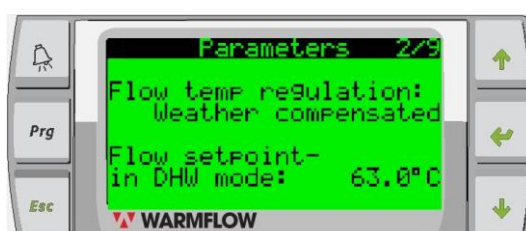


Figure 29 Parameters Screen 2

The third settings screen displays the settings for the auxiliary pump digital output. The digital output can be set to enable with a number of modes including: heating on, DHW on, heating or DHW on and compressor on. The screen also allows the engineer to set the delay off time of the digital output. This is the time period after which the mode is disabled, that the digital output remains active.



Figure 30 Parameters Screen 3

The fourth settings screen displays the settings for the auxiliary digital output. The digital output can be set to enable with a number of modes including: heating on, DHW on, heating or DHW on and compressor on. The screen also allows the engineer to set the delay off time of the digital output. This is the time period after which the mode is disabled, that the digital output remains active.

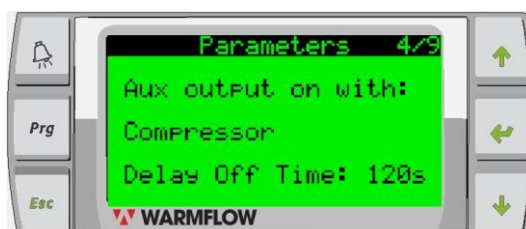


Figure 31 Parameters Screen 4

The fifth settings screen displays the settings for the DHW (hot water) and heating digital outputs. The screen allows the engineer to set the delay off time for each of the digital outputs. This is the time period after which the mode is disabled, that the digital output remains active.

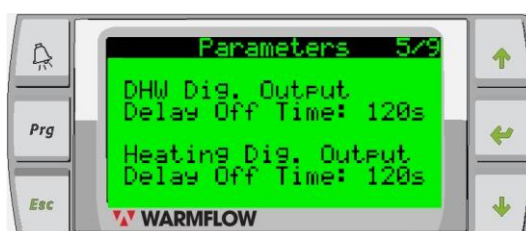


Figure 32 Parameters Screen 5

The sixth settings screen displays the settings for the thermal disinfection program. The settings include enabling or disabling the function and the external heat source to be used, an immersion heater or a backup boiler. The screen also allows the engineer to set the storage water setpoint, the difference below the setpoint before the program will be enabled and also the temperature to be achieved by the heat pump before the external heat source is to be used. For more details please see section 3.7.6.

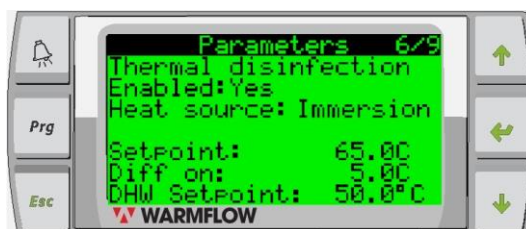


Figure 33 Parameters Screen 6

The seventh and eighth settings screen displays the probe adjustment for the range of sensors used on the unit. The probe adjustment settings are calibrated in the factory and should not be changed unless a new sensor is fitted. The setting should be recorded in the commissioning sheet as any future software upgrades will reset the values and they must then be re-entered.

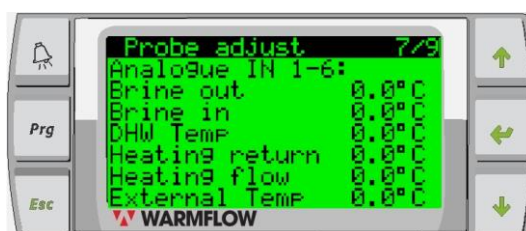


Figure 34 Parameters Screen 7

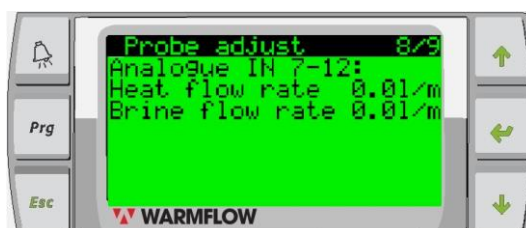


Figure 35 Parameters Screen 8

The ninth settings screen displays the settings for the heating and brine flow rate alarms. These can be disabled to get rid of nuisance alarms. However, it is strongly recommended that these are not disabled unless the engineer can guarantee that both the brine and heating flow rates are adequate to prevent freezing and overheating at all times.



Figure 36 Parameters Screen 9

2.7.2 Commissioning:

Selecting the commissioning sub-menu enters the manual management functionality. The first screen displays the option to enable or disable manual management. Enabling management unlocks three further manual management screens. For more details on commissioning please see section 3.7.

After commissioning, it is essential that manual management is disabled to restore the unit to normal operation.

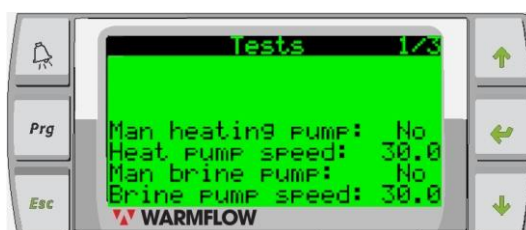


Figure 37 Manual Management Screen 1

The second screen allows the engineer to enable the brine and heating pump as well as control their speed.

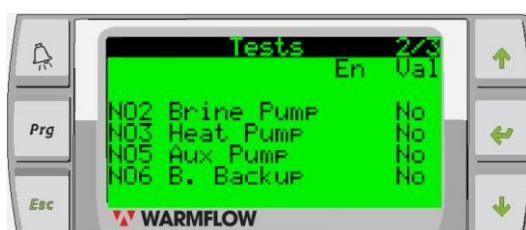


Figure 38 Manual Management Screen 2

The third screen allows the engineer to enable or disable the brine pump, heating pump, auxiliary pump and backup boiler.



Figure 39 Manual Management Screen 3

The third screen allows the engineer to enable or disable the immersion heater, heating on, DHW (hot water) on and auxiliary digital outputs.

2.7.3 Servicing:

Selecting the servicing sub- menu enters a further sub-menu which has a number of information and setting screens intended for an approved service engineer. The following sub-menus are available: Information, Working Hours, Thermoregulation and Service Now.

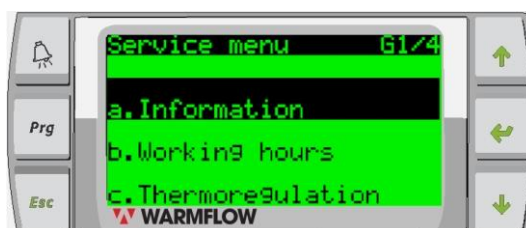


Figure 40 Service Menu Page 1

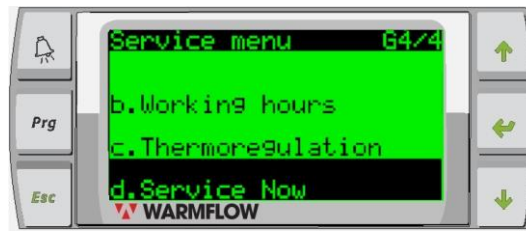


Figure 41 Service Menu Page 2

2.7.3.1 Information:

Selecting the information sub-menu allows 3 information screens relating to the software on the appliance to be viewed. The three information screens are for reference only but may be requested when in communication with Warmflow regarding the appliance.

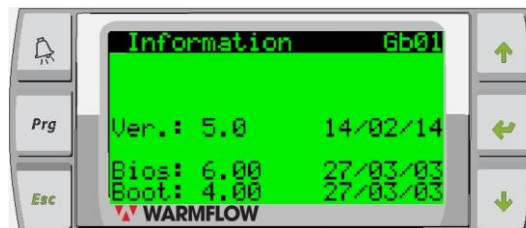


Figure 42 Service Information Screen 1

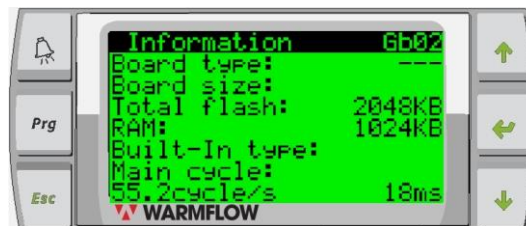


Figure 43 Service Information Screen 2

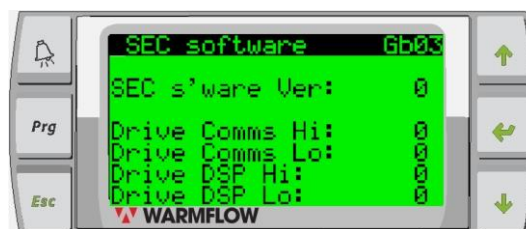


Figure 44 Service Information Screen 3

2.7.3.2 Working Hours:

Selecting the working hour's sub-menu displays two counter screens. The first screen counts the number of compressor start-ups per hour, the total number of compressor start-ups and the number of alarms recorded.



Figure 45 Working Hours Screen 1

The second screen counts the total number of running hours; this is the actual time the compressor is running for.



2.7.3.3 Thermoregulation:

Selecting the thermoregulation sub-menu allows 6 settings screens relating to the thermoregulation parameters to be viewed. These screens allow the engineer to adjust setting with regards to hot water control, weather compensation functions, compressor control as well as heating and brine pump settings. The first screen adjusts the hysteresis of the hot water setpoint. This is the difference between the setpoint temperature and the actual temperature of the storage cylinder required before the unit will switch on. For example, if the hot water setpoint is 60°C and the hysteresis setting is 10°C, the appliance will not start up if the actual storage water temperature is above 50°C when hot water heating is enabled. Once the storage water temperature drops below the hysteresis setting, the appliance will start up and heat the storage water to the setpoint.

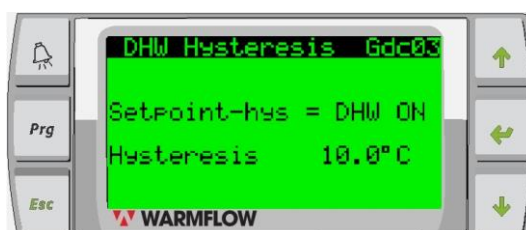


Figure 46 Service Information Screen 1

The second screen displays the weather compensation curve parameters. These parameters should only be adjusted using guidance from Warmflow.

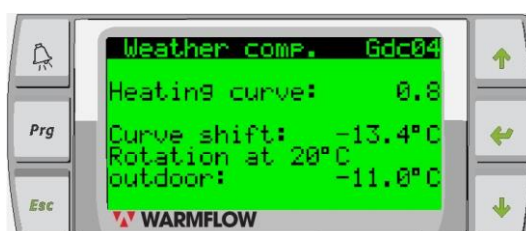


Figure 47 Service Information Screen 2

The third screen displays the weather compensation curve minimum and maximum setpoint limits. These limits can be changed to reduce the range of setpoints available to the weather compensation curve.

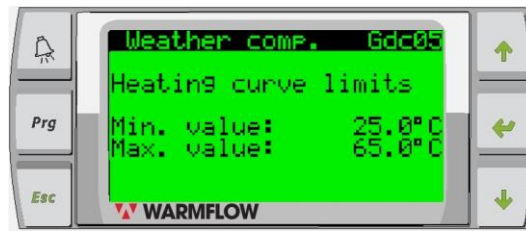


Figure 48 Service Information Screen 3

The fourth screen displays the compressor starting and running time setting. In order to limit switching the compressor on and off too frequently, a time delay between compressor starts is used. The minimum time that the compressor is running also has a timer built-in. These timers are intended to protect the inner workings of the compressor and prolong its lifespan. As such these setting should only be adjusted under guidance from Warmflow.

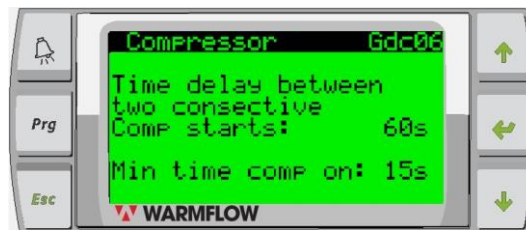


Figure 49 Service Information Screen 4

The fifth screen displays the heating pump parameters including the speed at start-up, the duration of the speed at start-up, the standby speed and the delay off (overrun) time. It is unlikely that these parameters will ever need adjusted. Care should be taken if adjustment is necessary to ensure an adequate heating flow rate at all times.

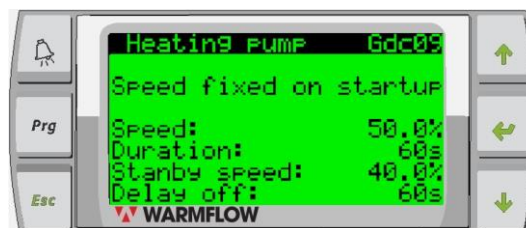


Figure 50 Service Information Screen 5

The fifth screen displays the brine pump parameters including the speed at start-up, the duration of the speed at start-up and the delay off (overrun) time. It is unlikely that these parameters will ever need adjusted. Care should be taken if adjustment is necessary to ensure an adequate brine flow rate at all times.

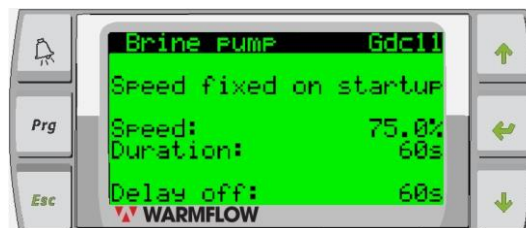


Figure 51 Service Information Screen 6

2.7.4 Service Now:

Selecting the service now sub-menu displays whether servicing is due or not and also allows an engineer to reset the servicing counter after a service has been performed. A password is required in order to reset the service counter. For more details on servicing, please see section 3.9.



Figure 52 Service Now Screen

2.7.5 History:

Selecting the history sub-menu displays a data logger which records a number of sensor readings in the event of an alarm or fault condition. This can be very useful for both the engineer and Warmflow when trying to diagnose a fault. The data logger records the alarm record number, the time and the date of the alarm trigger together with the following sensor reading: heating flow temperature (HF), heating return temperature (HR), hot water storage temperature (DHW), external temperature (Ext.), brine in temperature (BI), brine out temperature (BO), discharge pressure, suction pressure, intermediate pressure and the alarm name.

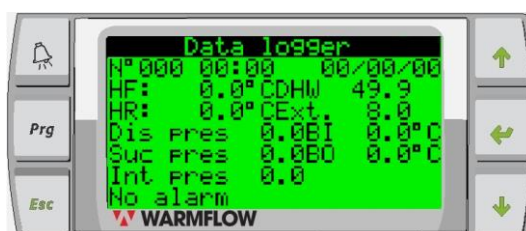


Figure 53 History Screen

2.7.6 In/Out:

Selecting the in/out sub-menu allows 6 information screens to be viewed. These screens display a number of temperature reading together with the status of digital inputs and outputs as well as the status of both the brine and heating pumps. The first screen displays the brine out temperature, brine in temperature, hot water storage temperature, heating return temperature and heating flow temperature.

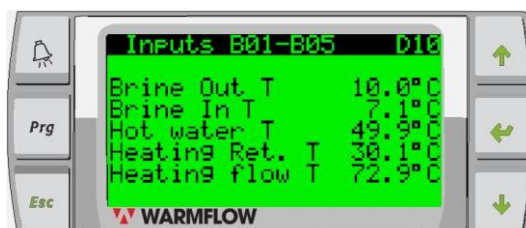


Figure 54 In/Out Screen 1

The second screen displays the brine flow rate, heating flow rate and the external temperature.

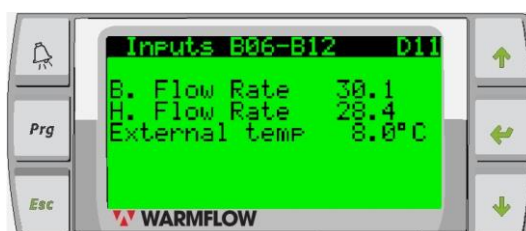


Figure 55 In/Out Screen 2

The third screen displays the status of the heating and brine pumps in terms of how fast they are running.



Figure 56 In/Out Screen 3

The fourth screen displays the status of the heating and hot water (DHW) digital inputs. Yes means they are receiving a signal and no means they aren't receiving a signal.

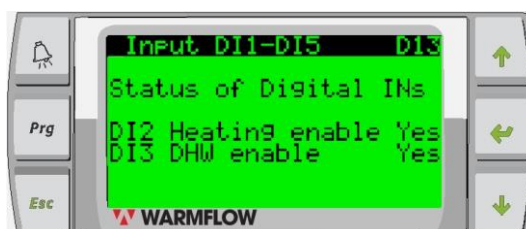


Figure 57 In/Out Screen 4

The fifth screen displays the status of four of the digital outputs. These include the brine pump, heating pump, auxiliary pump and backup boiler outputs. Yes means they are receiving power and no means they aren't receiving power.

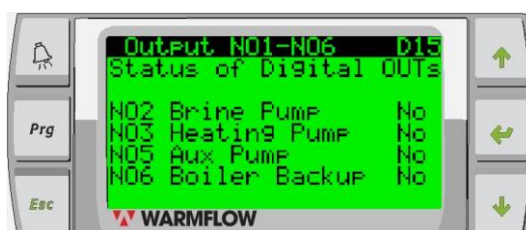


Figure 58 In/Out Screen 5

The sixth screen displays the status of the other five digital outputs. These include the inverter disable, immersion heater on, heating on, hot water (DHW) on and auxiliary outputs. Yes means they are receiving power and no means they aren't receiving power.

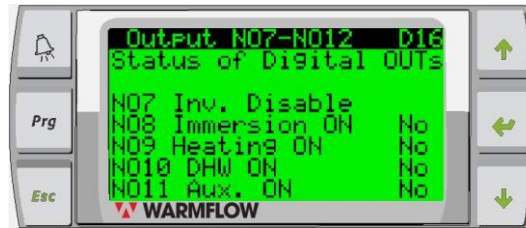


Figure 59 In/Out Screen 6

2.8 Selecting the Help Menu

📞 Help:

Selecting the help menu, as shown in Figure 60 below, displays the contact details for Warmflow who should be contacted if you require further assistance or if you encounter a problem with your appliance.



Figure 60 Help Screen

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 3.10 - Alarms and Troubleshooting. Alternatively, contact your commissioning engineer who should then contact our service department whilst at your home, to report the fault.

3 GROUND SOURCE HEAT PUMP INSTALLATION

The Warmflow ground 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 **MUST** be located indoors in a frost free environment. The unit should be installed in an unoccupied space such as a garage or plant room. If the unit has to be installed in an occupied space such as a utility room, the minimum room volume must be at least 8m³. This means a room which measures more than 2m wide by 2m long by 2m high. The unit shall be installed on a smooth horizontal surface capable of supporting the weight of the unit together with any accessories and other plant. In order to keep noise and vibration to a minimum, it is important that the unit's base is in full contact with the floor surface. On some floor types an anti-vibration mat may be required to reduce vibration and noise transmitting to the floor. The units are supplied with a set of flexible hoses for the flow and return of the brine and heating circuits. These should be installed to further reduce the transmission of noise and vibration into the building structure. The unit should not be located in a room which experiences extreme conditions including the following: high temperatures (>40°C), low temperatures (<5°C) or high humidity (>80%). In the event of an electricity supply outage or other event which interrupts the operation of the unit, provisions should be made to ensure the unit does not freeze. This may be achieved by providing supplementary heating to the room the unit is installed in or ensuring both the brine and heating circuits are filled with a glycol mixture to provide freeze protection to at least -10°C.

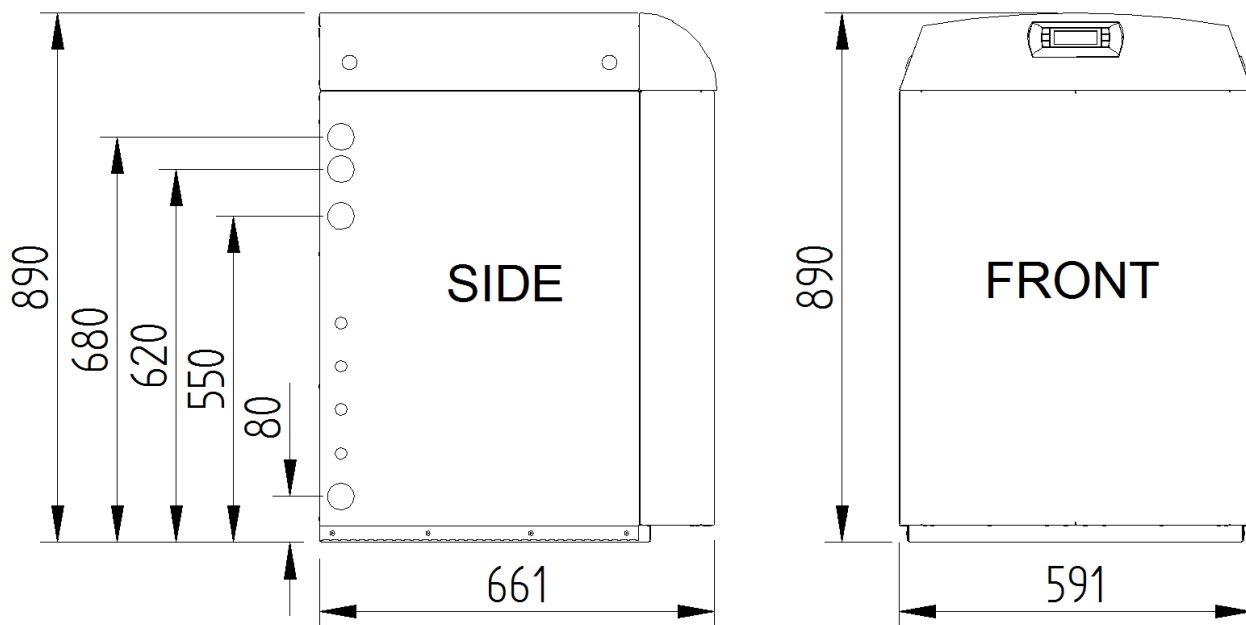


Figure 61 Casing dimensions

The heating and brine connections are located in the recessed back panel of the appliance as shown in Figure 62.

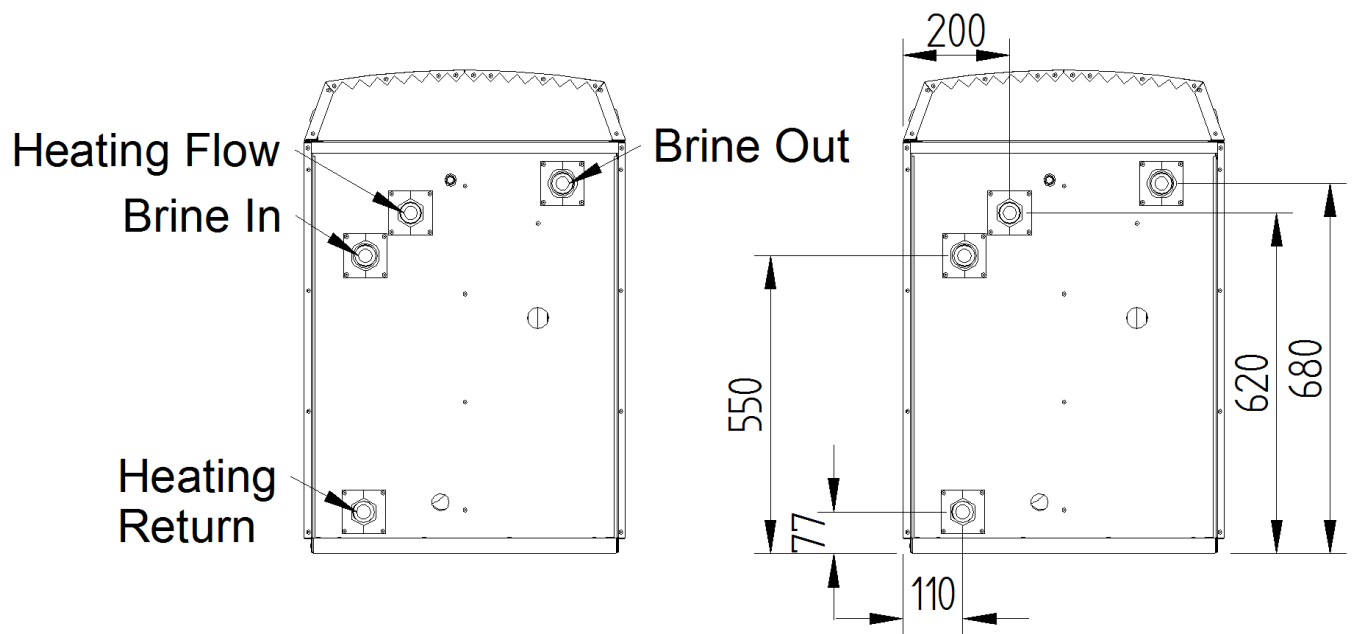


Figure 62 Heating & brine connections

In order to provide access for maintenance, a minimum space of depth 1m must be provided to the front and above the unit as shown in Figure 63.

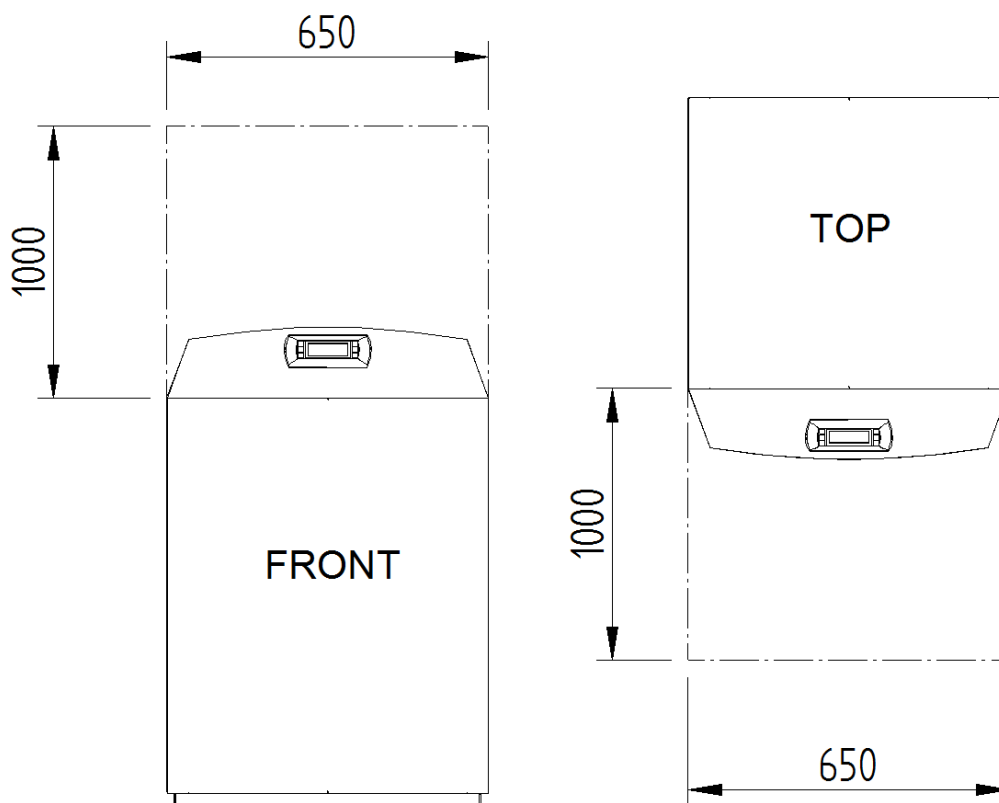


Figure 63 Access requirements

3.2 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 located in the recessed back panel. The unit is supplied 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 in 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.

The outer coloured metalwork of the unit is wrapped in a protective plastic covering. This should be removed after installation.

A set of wheels together with a lifting strap which attach to the unit are available from Warmflow to ease moving the unit around once it is off the pallet. Please contact Warmflow for further details.

3.3 Ground Collector Installation

3.3.1 Brine

The brine should be pre-mixed before filling the system. The brine will be a mixture of water and mono ethylene glycol (MEG). The concentration of mono ethylene glycol should be 25%, providing a freeze protection down to -10°C. Warmflow supply mono ethylene glycol which is treated with additives and inhibitors to make it non-toxic and to also prevent corrosion, scale and bacteria growth within the system. Please contact Warmflow for more details. The concentration should be as accurate as possible. If the concentration is too low, the freeze protection will be reduced and there will be significant risk of freezing the brine solution which in turn could cause damage to pipework, pumps and the heat pump unit itself. If the concentration is too high, the brine's heat transfer coefficient will be reduced which will cause the unit to work harder and have a significant detrimental effect on the efficiency of the overall system. The concentration of the brine should be checked by taking a sample of the brine when the system is filled and testing it in a refractometer. The refractometer should display a refractive index of 1.36 (25% mono ethylene glycol providing freeze protection to -10°C). If necessary, the concentration should then be adjusted accordingly by adding mono ethylene glycol or water if the concentration is found to be incorrect.

3.3.2 Brine Connections to the Heat Pump

The unit comes with female union fittings on the recessed back panel. The pipework can be connected straight off the back or taken out the sides via knock-outs provided in the casing. 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 and to the building structure.

3.3.3 Ground Loop Sizing & Integrated Circulator

The area required for the ground loop is determined by the specific heat extraction rate from the soil and the total heat extracted by the heat pump. The typical soil type encountered is damp cohesive soil with a specific heat extraction rate of 20W/m² (based on an operating time of 1800 hours per year). As such the required area of each unit is shown in the table below.

A variable speed high efficiency circulator for the brine circuit is provided within the heat pump enclosure. The table below shows the recommended pipework sizes and lengths possible using the circulator supplied. The circulator is more than capable of providing the required flow rates. However, should the ground collector design be outside these limits, the ground collector design should be verified and a decision made on the suitability of the supplied circulator. An

upgraded circulating pump or an additional boost pump may be required which can be supplied by Warmflow.

Heat Pump Model	Required Flow Rate (l/min)	Collector Area Required (m ²)	No. of Collector Coils	Collector Coil Pipe	Heat Pump to Manifold Pipe
GS08	45	400	5	100m of 32mm SDR17 HDPE	20m of 40mm SDR17 HDPE
GS16	81	700	9	100m of 32mm SDR17 HDPE	20m of 50mm SDR17 HDPE
GS16 & GS08 in tandem	126	1100	14	100m of 40mm SDR17 HDPE	20m of 63mm SDR17 HDPE

Table 4 Recommended number of horizontal collector coils based on 20W/m² extraction rate

*The above table is based on typical damp cohesive soil with a minimum specific extraction output of 20W/m² with an operating time of 1800 hours per year. Should the intended collector location have soil with a lower specific extraction output such as dry non-cohesive soil or if the unit will have a longer operating time, the collector area and associated pipework will need to be increased accordingly. Ground collectors should be laid according to MIS 3005: Requirements for contractors undertaking the supply, design, installation, set to work commissioning and handover of Microgeneration heat pump systems and to MCS 022: Ground heat exchanger sizing tables.

3.3.4 Borehole Sizing

The design of borehole installations is more complex than horizontal ground collectors. The reason for this is the varying specific heat extraction rates in varying ground conditions. It is therefore vital that the location is assessed in terms of the depth of borehole possible and the ground conditions to be encountered. It is likely that more than one type of ground condition is encountered. The borehole sizing will need to take this into account. This may require the drilling of assessment test holes. The following information in Table 5 acts as guidance for common types of ground conditions. A full ground survey and heat extraction calculation should be carried out to ensure the borehole design can achieve the requirements of the appliance.

Heat Pump Model	Ground Condition	Specific Heat Extraction (W/m)	No. of 100m Boreholes Required	Size of Collector Pipe Required
GS08	Dry Sediment	25	4	40mm of SDR17 HDPE
	Normal, Water Saturated Sediment	60	2	40mm of SDR17 HDPE
	Consolidated Rock	84	1	50mm of SDR17 HDPE
GS16	Dry Sediment	25	6	40mm of SDR17 HDPE
	Normal, Water Saturated Sediment	60	3	50mm of SDR17 HDPE
	Consolidated Rock	84	2	50mm of SDR17 HDPE
GS16 & GS08 in tandem	Dry Sediment	25	10	50mm of SDR17 HDPE
	Normal, Water Saturated Sediment	60	5	63mm of SDR17 HDPE
	Consolidated Rock	84	3	63mm of SDR17 HDPE

Table 5 Borehole data

*The above table is based on an operating time of 1800 hours per year. Should the unit have a longer intended operating time, please consult Warmflow. Boreholes should be constructed according to MIS 3005: Requirements for contractors undertaking the supply, design, installation, set to work commissioning and handover of Microgeneration heat pump systems and to MCS 022: Ground heat exchanger look-up tables.

3.3.5 Brine Pump Overrun

In order to prevent freezing within the heat pump when heating mode is disabled a pump overrun feature is included. Once the temperature has risen in the heat pump and the pump overrun timer has elapsed, the brine circulator will stop.

3.3.6 Brine Circuit Line Components

Together with the brine collector, associated pipework and manifold, the brine circuit will also require the following items, expansion vessel, strainer/filter, filling group, drain valve, pressure gauge and isolation valves. The strainer/filter comes supplied with the unit.

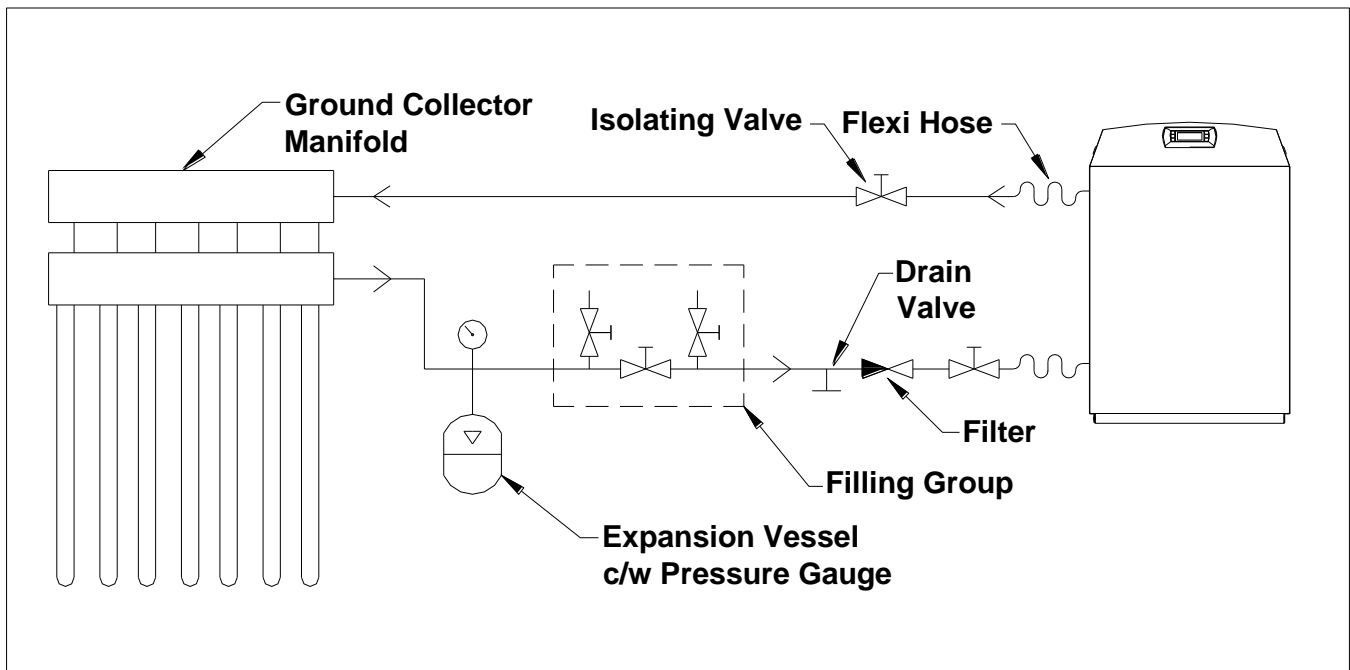


Figure 64 Brine circuit line components

3.3.7 Brine Circuit Expansion Vessel

Expansion vessels should be sized according to the pipework layout and expected temperature differences.

An expansion vessel is required for each unit. Therefore if more than one unit is running together such as in a tandem situation, a separate expansion vessel is required for each. If a single large expansion vessel must be fitted, a pressure equalising valve must be fitted to ensure the circuits of both units are linked and therefore of the same pressure.

3.3.8 Filling the Brine Circuit

The brine circuit should be flushed, purged and pressure tested according to MCS guide MIS3005 and European standard EN 805. The brine solution should be pre-mixed as described in section 3.3.1. In order to fill the brine circuit and expel any air, a pump which is capable of achieving a flow rate of 60 litres per minute at a back pressure of at least 1bar. This pump should be connected between a container holding the mixed brine solution and the filling port on the brine circuit. Each loop must be flushed and purged separately in order to prevent short circuiting when other loops are open. The brine circuit should be charged to a pressure of approximately 1bar ensuring each loop has been filled with brine. A number of samples should be taken and measured with a refractometer to verify the concentration throughout the system. This should be recorded in the commissioning document.

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.

3.4.2 Heating Connections to the Heat Pump

The unit comes with female union fittings on the recessed back panel. The pipework can be connected straight off the back or taken out the sides via knock-outs provided in the casing. 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 and to the building structure.

3.4.3 Heating Circuit and Integrated Circulator

Main runs of pipe should be ran in 28mm or larger with the smaller branches of the circuit ran in 22mm as a minimum. 15mm pipework should be avoided where possible. A variable speed high efficiency circulator for the heating circuit is provided within the heat pump enclosure. The circulators for both the GS08 and GS16 have been sized to accommodate the majority of heating systems. 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.

Heat Pump	Heat Output (kW)		Required Flow Rate (l/min)	
	Minimum	Maximum	@ Min. Output	@ Max. Output
GS08	2.5	10	10	30
GS16	4.5	18	20	60

Table 6 Heating flow rate requirements

3.4.4 Heating Pump Overrun

In order to dissipate heat from the heat pump when heating mode is disabled a pump overrun feature is included. Once the temperature has fallen in the heat pump and the pump overrun timer has elapsed, the heating circulator will stop.

3.4.5 Bypass / Open Zones

It is essential that the heating circuit can always achieve a minimum flow rate of at least 8 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 3.4.6.

3.4.6 Freeze Protection

If the temperature of the heating medium falls below 3°C within the unit, the unit will automatically start up 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.

3.4.7 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 3-port motorised valve may also be required for some systems. These ground source heat pump units come with the following items included integrally; a 12 litre expansion, pressure gauge, pressure relief valve and a filling loop. A strainer /filter and high flow 3-port motorised valve are also supplied with the units.

NOTE: AUTOMATIC FILLING / TOPPING UP DEVICES MUST NOT BE USED

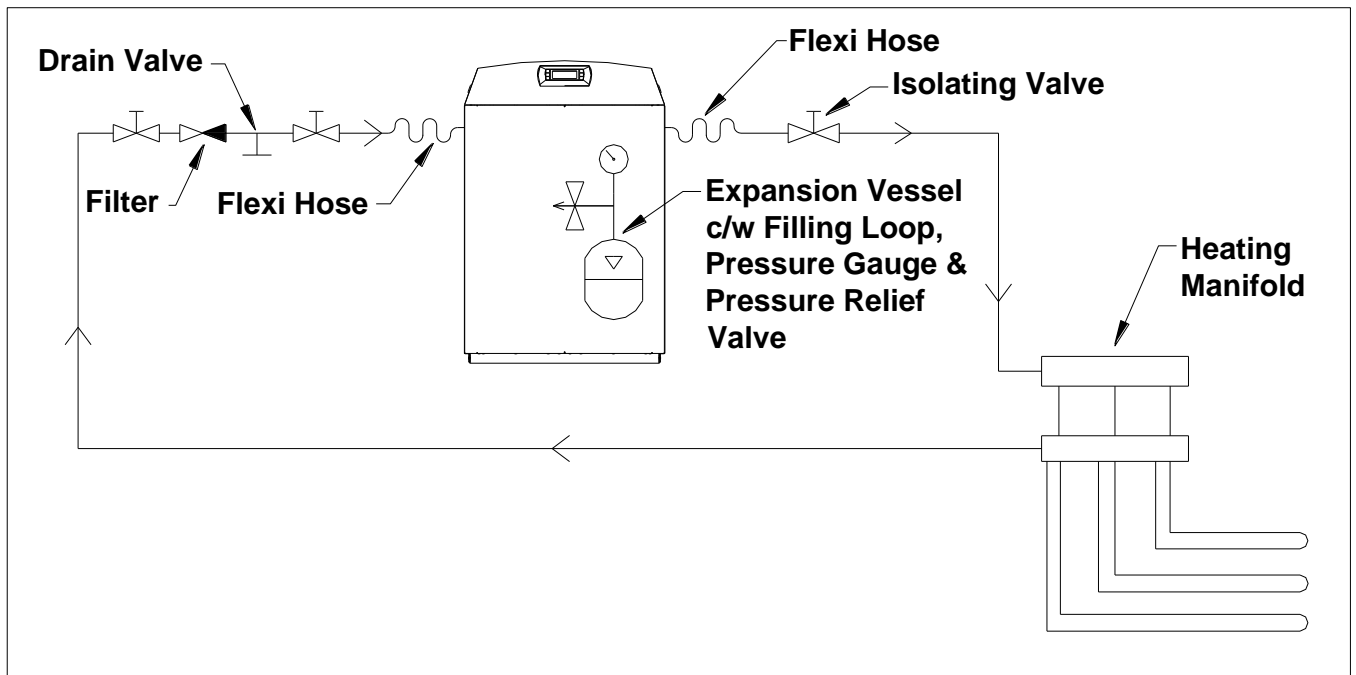


Figure 65 Heating Only Schematic

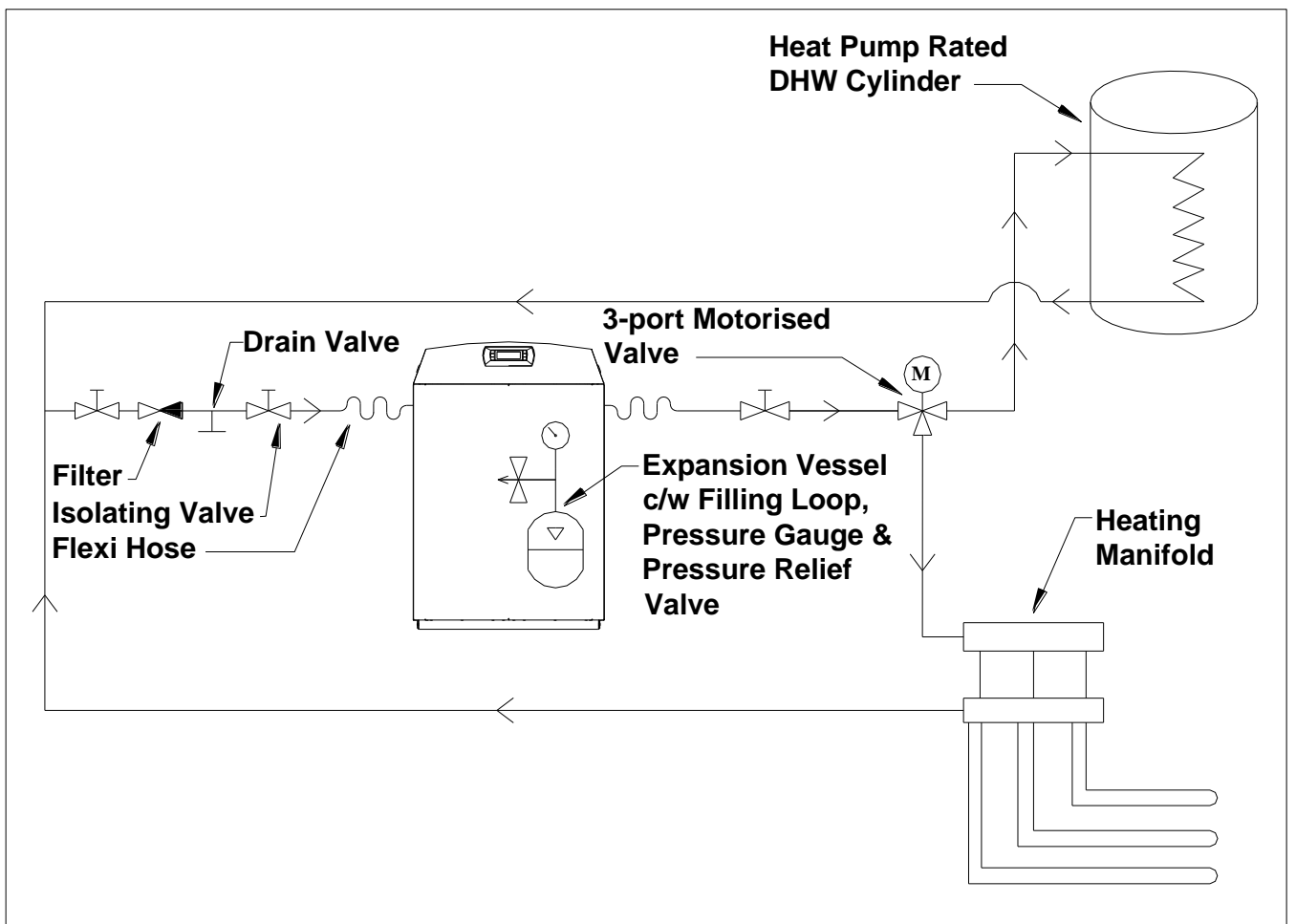


Figure 66 Heating & DHW Schematic

3.4.8 3-port Motorised Valve Installation

The 3-port motorised valves supplied with the units have a number of operating positions and come 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 67 below. The default position is for heating with flow from A to AB.

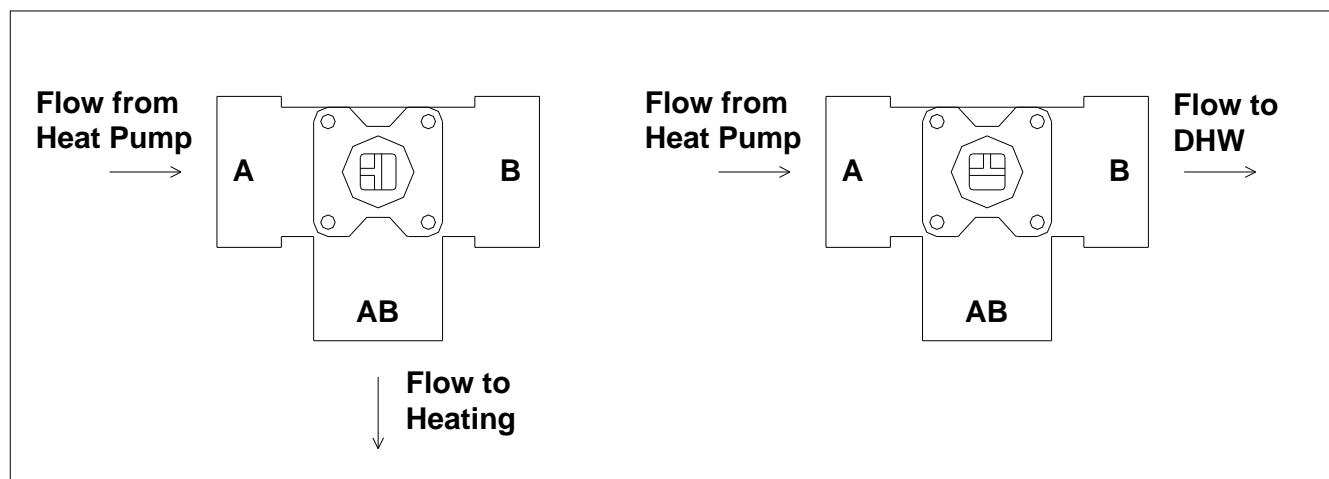


Figure 67 3-port Motorised Valve Body Positions

The valve turns clockwise when DHW is enabled as shown on the right in Figure 77 above with flow from A to B. 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 68 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 this must be in the 'CW' (clockwise) position.

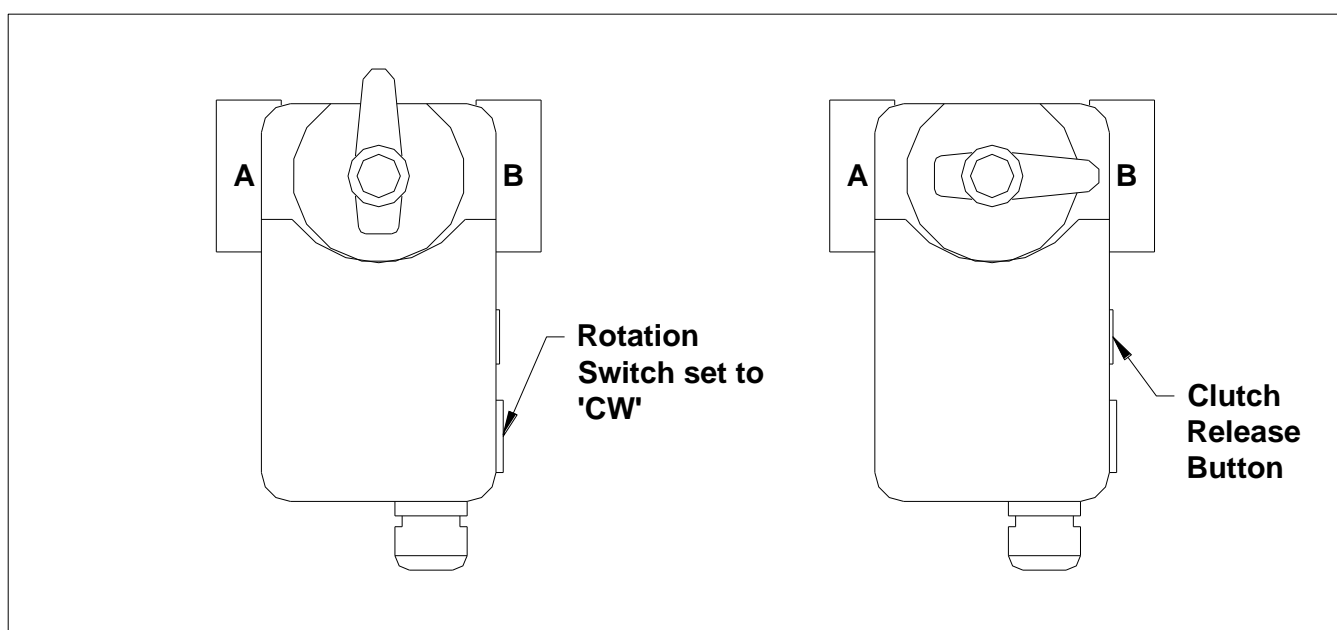


Figure 68 3-port Motorised Valve Actuator Positions

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

3.4.9 Heating Expansion Vessel (Integral)

Expansion vessels for the heating circuit are supplied integral to the heat pump casing. Both units are fitted with a 12 litre expansion vessel with a maximum working pressure of 3 bar. This expansion vessel should accommodate the majority of heating systems. However, due to the variation in each system, checking that the supplied expansion vessel volume is adequate is required.

3.5 Drain Pipe & Pressure Relief Valve

Due to the nature of the heat pump operating cycle, a condensing environment may be created within the heat pump casing. In order to prevent damage by corrosion to internal parts, a drip tray linked to a drain pipe is provided.

The drainage pipe within the unit is a flexible plastic hose which can be trimmed to length. 3/4" or 22mm pipe should be connected to the flexible hose. The drainage pipe may run into an internal soil stack or waste pipe, an external gulley, hopper or soakaway.

The heat pump will produce a maximum of 0.05 litres per hour of condensate. It is recommended that the drainage pipe should have a minimum fall of 1:20. This pipe must be protected from freezing either by insulating or using large diameter pipework in exposed locations. The figure below shows the terminal location on the recessed back panel of the heat pump casing.

The heating side of the unit includes a pressure relief valve connected to copper tubing which terminates past the recessed panel at the back of the unit. The copper tube is Ø15mm and should be continued into an internal soil stack or waste pipe, an external gulley, hopper or soakaway.

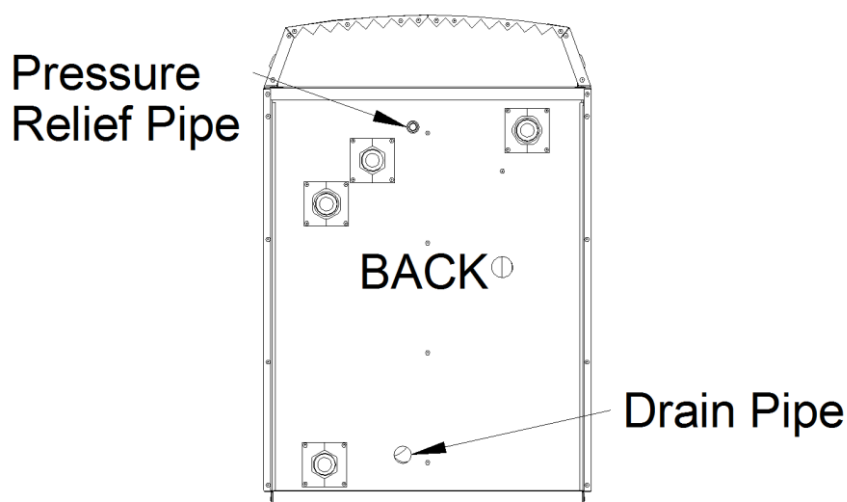


Figure 69 Drain & pressure relief pipes

3.6 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 top panel of the heat pump casing.

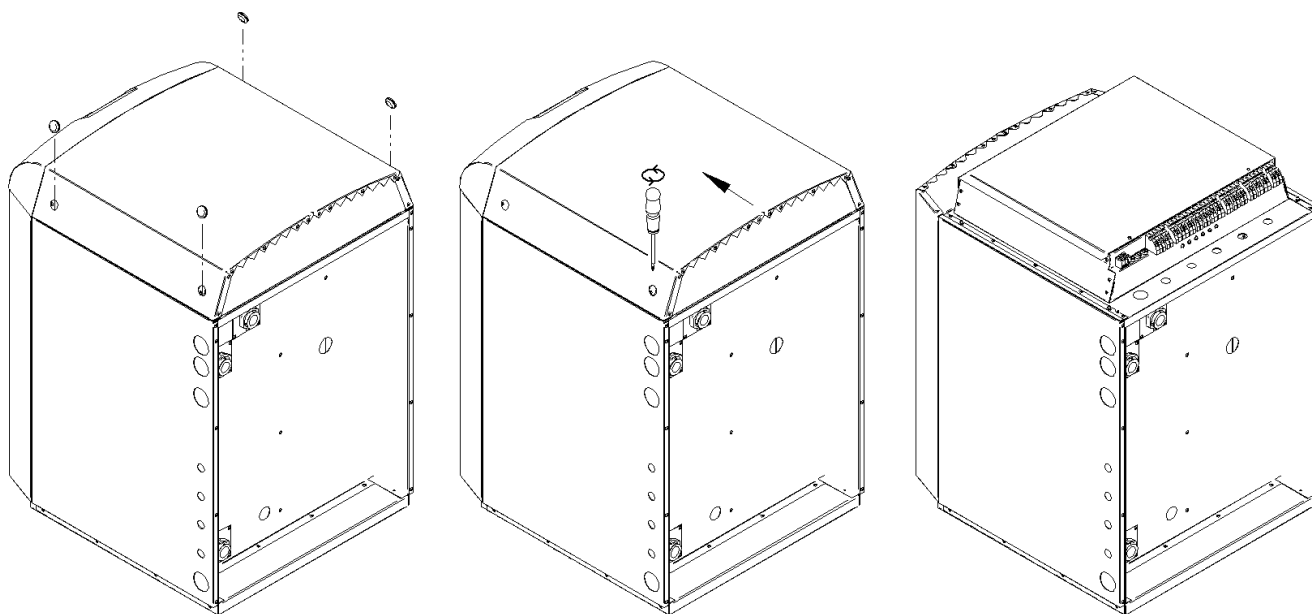


Figure 70 Top panel removal

The top panel is removed by first taking out the four black closed grommets. This allows a Phillips® head screwdriver to be inserted to access four screws. These screws are then unscrewed by a few turns which will free the top panel. The top panel can now be slid forward and then lifted off the unit. Care should be taken when removing the top panel as the user interface will still be connected by a wire. This must be unclipped from the user terminal to allow the top panel to be removed fully.

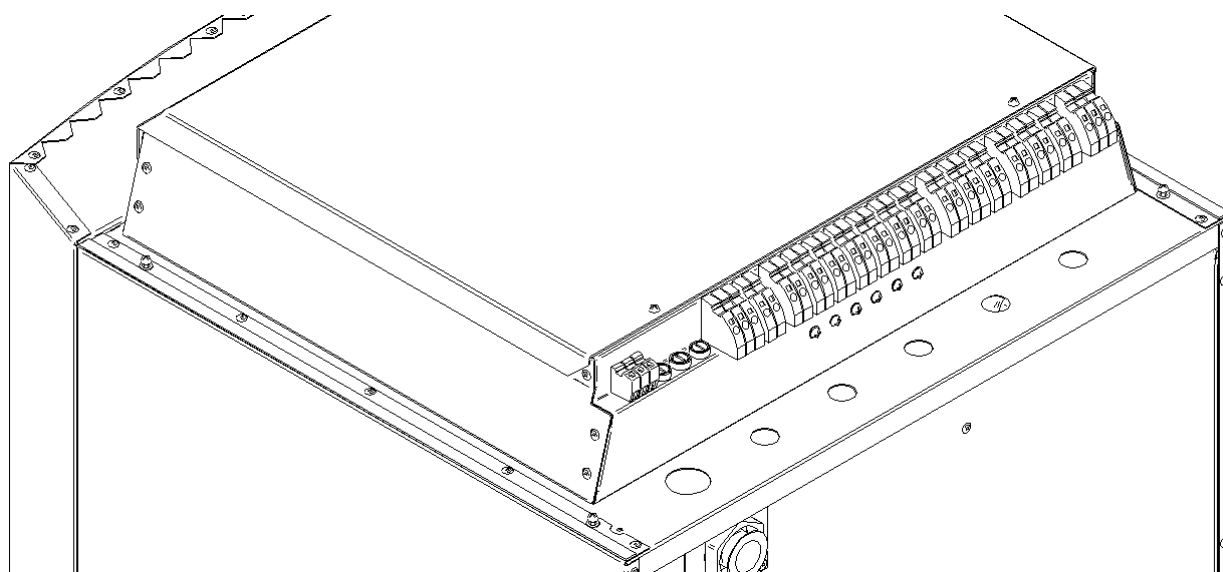


Figure 71 Installers Wiring Enclosure

The installer's wiring enclosure contains the entire necessary connection terminals for installation. Cable should be routed through holes to the recessed panel and protected using suitably sized grommets. The larger hole is for connection of the incoming power cable to include live, neutral and earth. Connections are clearly identified on the wiring label located above the terminals. Electrical installation including cable sizing should be undertaken by a qualified electrician in accordance with the latest Institute of Electrical Engineers (IEE) regulations.

The three connections for the incoming supply cables are screw type connection blocks, the rest are push-in and release quick type connector blocks. Wires should be stripped back and an appropriate sized ferrule crimped on to the end before attaching to the connector blocks. A number of earth posts can be found underneath the connector blocks. These are of M5 size and should therefore be connected to using 5.5mm ring tongue crimps.

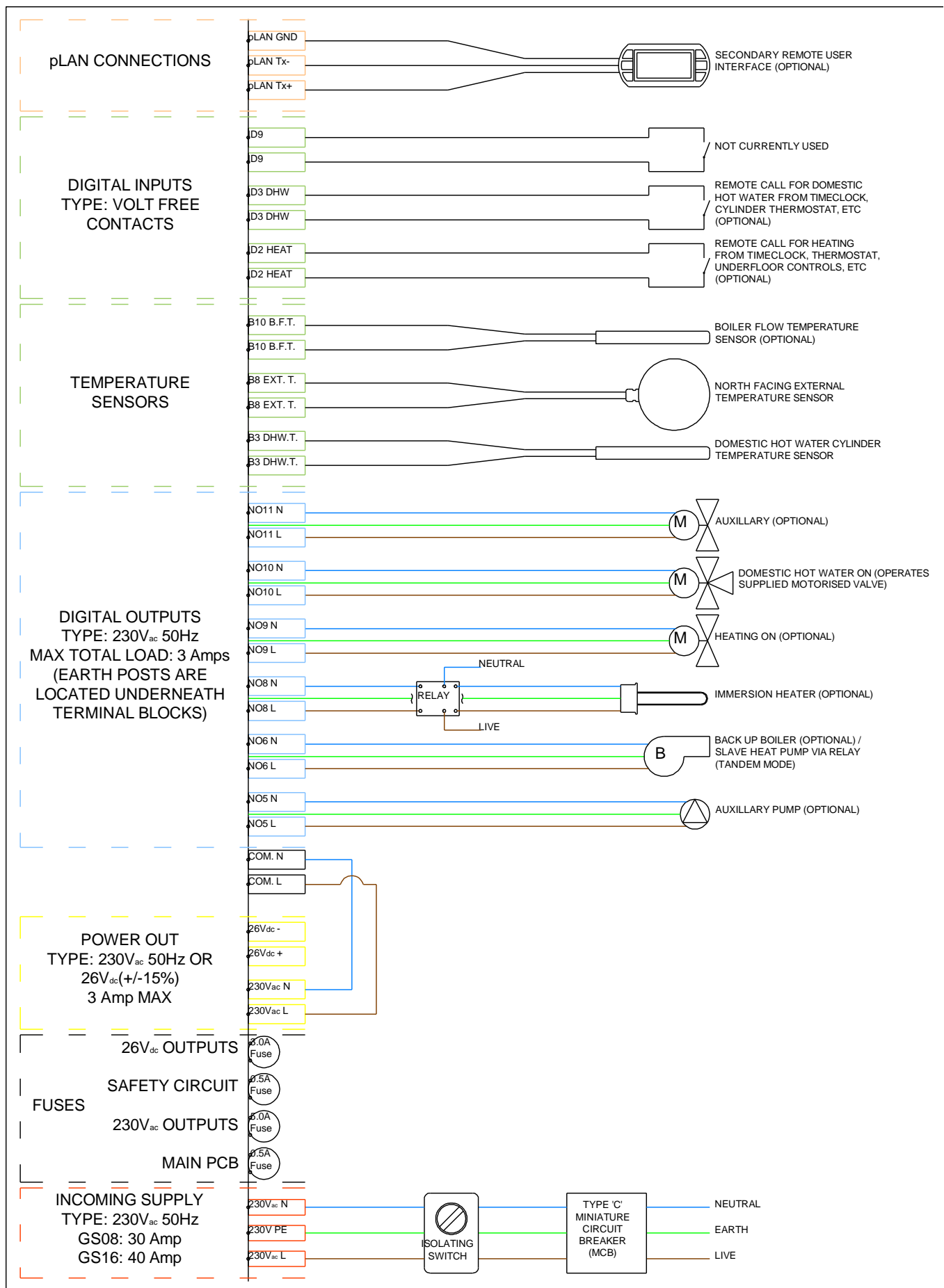


Figure 72 Installers Wiring Diagram

3.6.1 Incoming Supply

Both the GS08 and GS16 units require a single phase 230V_{ac} 50Hz electricity supply. The GS08 is rated at 30Amps whilst the GS16 is rated at 40Amps. 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.

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.

3.6.2 Fuses

There are a number of fuses incorporated in the electrical panel to protect both internal and external electrical components. A 0.5Amp fuse is used to protect the main PCB and user interface. A 5.0Amp fuse is used to protect the 230V_{ac} outputs together with the internal brine and heating pumps and the secondary PCB. A 0.5Amp fuse is used to protect the safety circuit and a 3.0Amp fuse is used to protect the 26V_{dc} outputs.

3.6.3 Power Out

The power out section contains both 230V_{ac} and 26V_{dc} fused outputs. These are permanent live and can be used directly to power an ancillary. Their main purpose is to provide power to the switched outputs in the next section. This is achieved by connecting the live 230V_{ac} or the positive 26V_{dc} into the common (COM.L) of the output group. The neutral or the negative should be then connected accordingly into the other common (COM.N). This now makes all the switchable outputs of the selected power output. 230V_{ac} is the most commonly used. 26V_{dc} has a tolerance of +/-15% so care should be taken when combining this with ancillaries. Both power outputs have a limit of 3.0Amps.

3.6.4 Digital Outputs

The digital outputs section allows the connection of ancillaries which are turned on or off via the units controller. As mentioned in section 3.6.3 the outputs can either be all 230Vac or all 26Vdc by connecting the power out connection blocks into the common connection blocks. As previously mentioned, the total rated current of all the outputs together must be less than 3.0Amps. Items such as immersion heaters and high powered pumps can still be controlled by the outputs but they should be connected via a relay with an external power supply. The following outputs can be controlled by connecting into the appropriate connection blocks (please see Figure 72 for wiring details):

NO5 Auxiliary Pump – This output is for controlling an auxiliary pump which may be used to boost either the heating or brine flow rates if the system has high pumping losses. The output can be programmed to switch on with 'Heating Enabled', 'DHW Enabled', 'Heating or DHW Enabled' or with 'Compressor On'. A delay off (overrun) timer is also built-in which allows the output to run for a determined time after the control signal is turned off. The control setting and delay off timer can be changed in the parameters sub-menu of the engineer menu as detailed in section 2.7.1 and as shown in Figure 73 below.



Figure 73 NO5 Auxiliary Pump Output Setting Screen

NO6 Backup Boiler/Slave Heat Pump – This output is for controlling an external boiler or secondary heat pump. The backup boiler 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 and an immersion heater is not being used. Thermal disinfection must be enabled and the default setting changed to bring on a back-up boiler instead of the default Immersion heater. This can be adjusted in the parameters sub-menu of the engineer menu as detailed in section 2.7.1 and as shown in Figure 74 below.

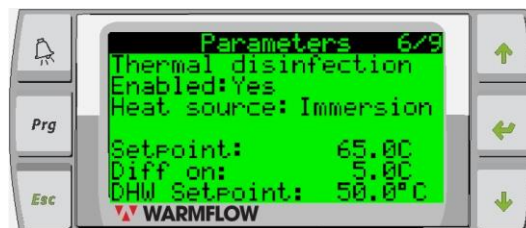


Figure 74 Thermal Disinfection Settings Screen

The backup boiler may also be called to switch on if the ground conditions are struggling to keep up with the properties demands. For example, the default setting is for the backup boiler to be called for when the incoming brine flow temperature falls below -9.0°C.

If a secondary heat pump is to be used in tandem with the unit, NO6 provides the call to turn the secondary (slave) unit on. This output should be connected via a relay to give a volt-free contact into the 'Heating On' input (ID2) of the slave unit. Enabling tandem mode and adjusting the trigger point for the slave unit can be done in the parameters sub-menu of the engineer menu as detailed in section 2.7.1 and as shown in Figure 75 below. The default for the trigger point is for the master unit to have a heating demand of more than 80% for more than 6 minutes. At this point the slave unit will be called for. When the heating demand of the master unit drops below 80%, the slave unit will lose its call for heating and will shut down.

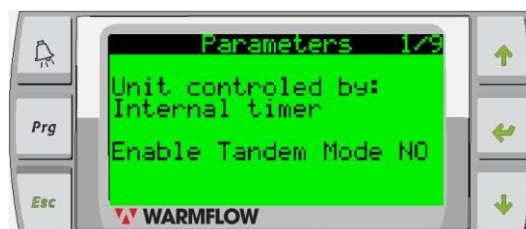


Figure 75 Tandem Mode Enabling Screen

NO8 Immersion – This output is for controlling an immersion heater in the DHW storage cylinder. The 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. As the immersion heater will have a high electrical load, it must be wired via a relay with an external power supply. The outputs from NO8 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. The control settings of the immersion should be set during commissioning. Please see section 3.7.6 for more details.

NO9 Heating On – This output is for controlling ancillaries such as opening motorised valves when heating mode is enabled. This output will become active when the unit is in heating mode and will remain active until the unit returns to standby mode or DHW mode is activated. A delay off (overrun) timer is also built-in which allows the output to run for a determined time after the control signal is turned off. The delay off timer setting can be in the parameters sub-menu of the engineer menu as detailed in section 2.7.1 and as shown in Figure 76 below.

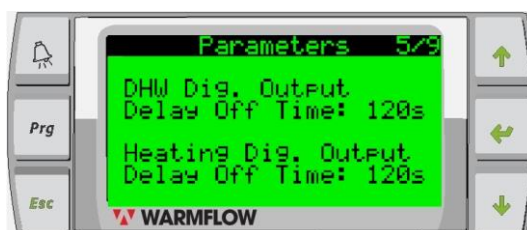


Figure 76 DHW & Heating Digital Output Settings Screen

NO10 DHW On – This output is for controlling the supplied 3-port motorised valve. This output will become active when the unit is in DHW mode and will remain active until the unit returns to standby mode. The output will activate the 3-port motorised valve diverting flow from the heating circuit to the DHW cylinder. A delay off (overrun) timer is also built-in which allows the output to run for a determined time after the control signal is turned off. The delay off timer setting can be changed in the parameters sub-menu of the engineer menu as detailed in section 2.7.1 and as shown in Figure 76 above.

The 3-port motorised valve should be wired as shown in Figure 77 below. The NO10 output can also be used for other ancillaries such as another motorised valve or pump which are required when DHW mode is enabled.

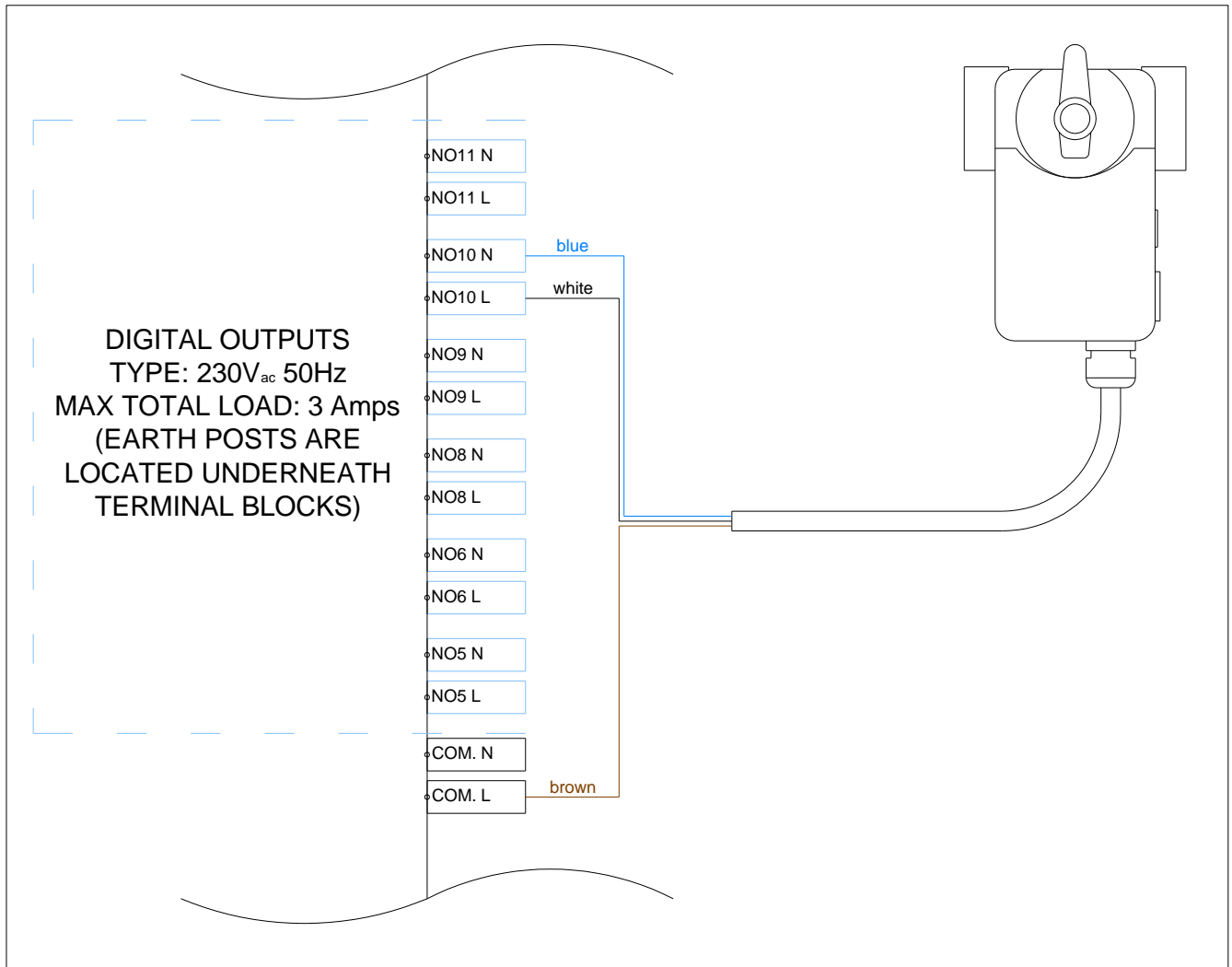


Figure 77 3-port Motorised Valve Wiring Diagram

*Note: other connections and wiring have been removed for clarity.

NO11 Auxiliary – This output is for controlling an auxiliary ancillary such as a motorised valve or auxiliary pump. The output can be programmed to switch on with ‘Heating Enabled’, ‘DHW Enabled’, ‘Heating or DHW Enabled’ or with ‘Compressor On’. A delay off (overrun) timer is also built-in which allows the output to run for a determined time after the control signal is turned off. The control setting and delay off timer can be changed in the parameters sub-menu of the engineer menu as shown in Figure 78 below.

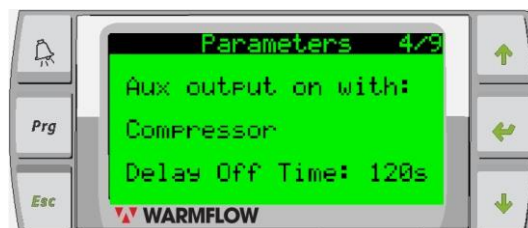


Figure 78 NO11 Auxiliary Output Setting Screen

3.6.5 Temperature Sensors

There are a number of temperature sensors which need to be connected to the unit in order to achieve full functionality. These sensors include a DHW storage temperature sensor, an external air temperature sensor and a boiler flow temperature sensor. The three sensors are supplied with the unit but the wiring to them 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, which are supplied with the unit. There are two 'tadpole' type sensors with stainless steel end caps which are to be used for the DHW storage temperature and the boiler flow temperature. There is also a temperature sensor enclosed in a weather proof enclosure which is to be used for the external air temperature.

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 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 DHW storage temperature sensor should be connected and placed in free air. It should be wired into the two connection blocks of input B3.

The external air temperature sensor is used to control weather compensation when weather compensation mode has been enabled. It must be connected or this will cause a fault and trigger an alarm. The sensor comes in a weatherproof enclosure which should be attached to a North facing wall out of direct sunlight and away from any vents, doors or opening windows. Wall plugs and fixing screws are included within the sensor enclosure. The enclosure should be attached to a wall with the grommet pointing towards the ground to prevent any moisture from entering the enclosure. It should then be wired into the two connection blocks of input B8.

The boiler flow temperature sensor is used to control a backup boiler. This temperature sensor only needs to be connected if a backup boiler is to be used. The sensor should be strapped to the heating flow pipe of the boiler and then covered with insulation. It should then be wired into the two connection blocks of input B10.

3.6.6 Digital Inputs

These units can also be controlled remotely from an external controller such as a timeclock and room thermostats instead of their internal timeclocks. To enable remote control, the 'Unit Controlled By' setting must be changed in the parameters sub-menu of the engineer menu as detailed in section 2.7.1 and as shown in Figure 79 below. The default setting is control by 'Internal Timer' which must be changed to 'Remote Digital Input'. Also if two units are to be used in tandem, the slave unit must be controlled by 'Remote Digital Input'.

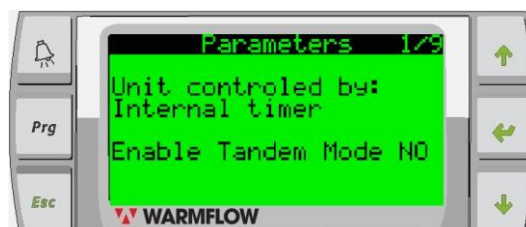


Figure 79 Unit Controlled By Settings Screen

There are two digital inputs which can be used, one to switch the unit into heating mode (ID2) and one to switch the unit into DHW mode (ID3). DHW mode takes priority as it does when the unit is controlled by 'Internal Timer'. The digital inputs are volt free contacts meaning that when

a circuit is made between the two connection blocks of that input, the input will become active. No voltage should be applied to any of the digital input connection blocks.

3.6.7 pLAN

These ground source heat pumps may be linked to a remote user interface terminal (available separately). The controller allows the same range of access and functionality as the user interface located on the unit. If using a remote terminal, the user interface on the unit must be disconnected, however it should not be removed as it is required for servicing and maintenance. The remote user interface supplied by Warmflow includes a wall mounting box and a 20m CAT5e cable complete with RJ12 connector plug. The RJ12 connector plug clips into the back of the remote user interface whilst the other end of the cable can be cut to length and connected into the unit as shown in Figure 80 below. Please contact Warmflow for further details on purchasing a remote user interface terminal.

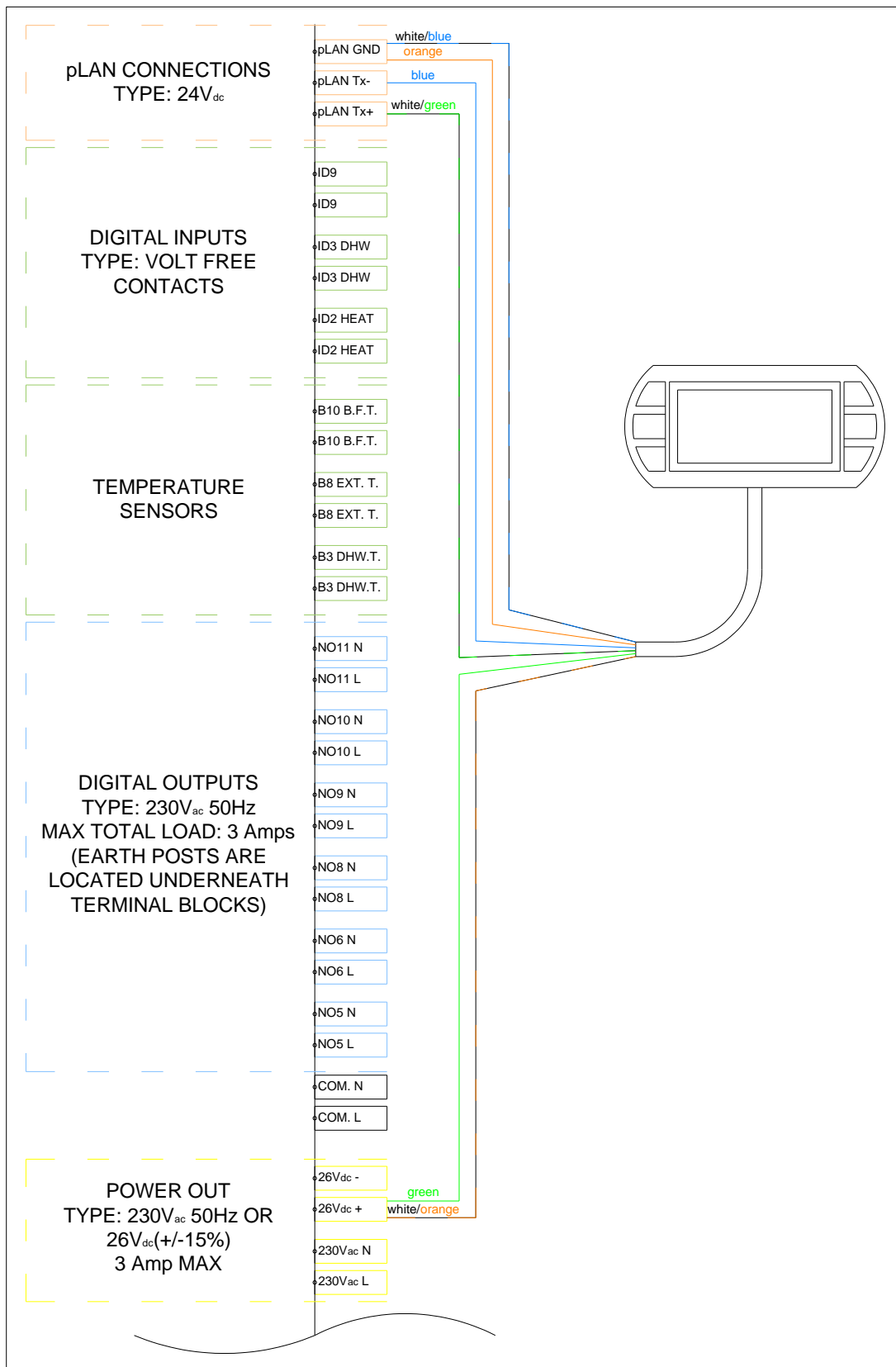


Figure 80 Remote User Interface Terminal Wiring Diagram

3.7 Commissioning

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

3.7.1 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 (GS08 or GS16)
- Serial Number
- Ground Collector Details (no. of loops, length of loops, pipe sizes etc.)
- Brine Mixture (Concentration checked with refractometer, brand of glycol used etc.)
- 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 as detailed in section 2.6.1.

3.7.2 Testing Flow Rates

The brine and heating circuits must be fully installed, filled, purged and pressure tested. The pressure should be set between 1 and 2 bar for both circuits. It is essential that all air has been expelled from both circuits and that adequate flowrates are achievable. In order to test the flow rates, the internal pumps should be operated manually. The function for manually controlling the pumps is found in the commissioning sub-menu of the engineer menu as shown in Figure 81 below.



Figure 81 Manual Management Screen for Internal Circulating Pumps

The brine pump should be turned to 'ON' and the speed set to 25%. The flow rate for the brine circuit can then be found in the in/out sub-menu of the engineer menu as shown in Figure 82 below.

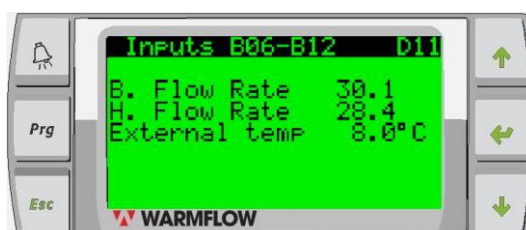


Figure 82 Brine & Heating Circuit Flow Rate Information Screen

This value should be recorded in the commissioning certificate. The brine pump should then be set to 100% and the flow rate value again recorded in the commissioning certificate.

The heating pump should then be turned to 'ON' and the speed set to 25%. The flow rate for the heating circuit can then be found in the in/out sub-menu of the engineer menu as shown in Figure 82 above. This value should be recorded in the commissioning certificate. The heating pump should then be set to 100% and the flow rate value again recorded in the commissioning certificate.

For systems using the DHW functionality, flow should be diverted to the DHW circuit and the tests detailed above repeated with the heating pump at 25% and 100% with the values also recorded in the commissioning certificate. The 3-port motorised valve can be actuated manually by switching 'DHW on' to ON in the commissioning sub-menu of the engineer menu as shown in Figure 83 below.

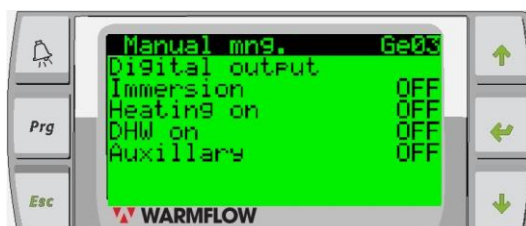


Figure 83 Manual Management Screen for Digital Outputs

The brine circuits and heating circuits must also be balanced to produce uniform flow throughout the circuits. Manually controlling the pumps as detailed in the flow tests above should be used for balancing both the heating and brine circuits as well as bleeding the circuits. It is essential that both pumps are turned 'OFF' after the flow tests or balancing and that manual management mode is disabled or the unit will not function correctly.

3.7.3 Probe Adjustment

The probe adjustments must be recorded in the commissioning certificate. These are calibrated and set in the factory but the values need to be recorded so they can be re-entered following a software update. The probe adjustment values are found in the parameters sub-menu of the engineer menu as shown in Figure 84 and Figure 85 below.



Figure 84 Probe Adjustment Settings Screen 1

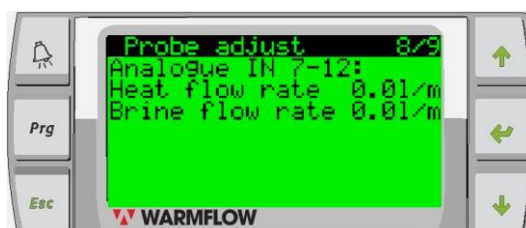


Figure 85 Probe Adjustment Settings Screen 2

3.7.4 Unit Control

The way in which the unit is to be controlled (Internal Timer / Remote Digital Inputs) should be set as detailed in section 3.6.6 and the option recorded in the commissioning certificate.

The heating flow temperature can be a fixed setpoint or can be self-adjusting through the weather compensation function as detailed in section 3.7.5 below. The chosen option should be recorded in the commissioning certificate.

3.7.5 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 (supplied by Warmflow), which should be located on a north facing wall of the property.

The default setting of the heat pump has weather compensation enabled. If a fixed flow temperature is required, the weather compensation can be disabled by the commissioning engineer. However, this is not recommended and should only be undertaken in consultation with Warmflow. If weather compensation is disabled, the SAP assessment (EPC) is invalid. A commissioning certificate and label must be provided that confirm this disablement.

The weather compensation curves for flow temperature set points of 35°C, 45°C and 55°C are shown in the chart 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 35°C.

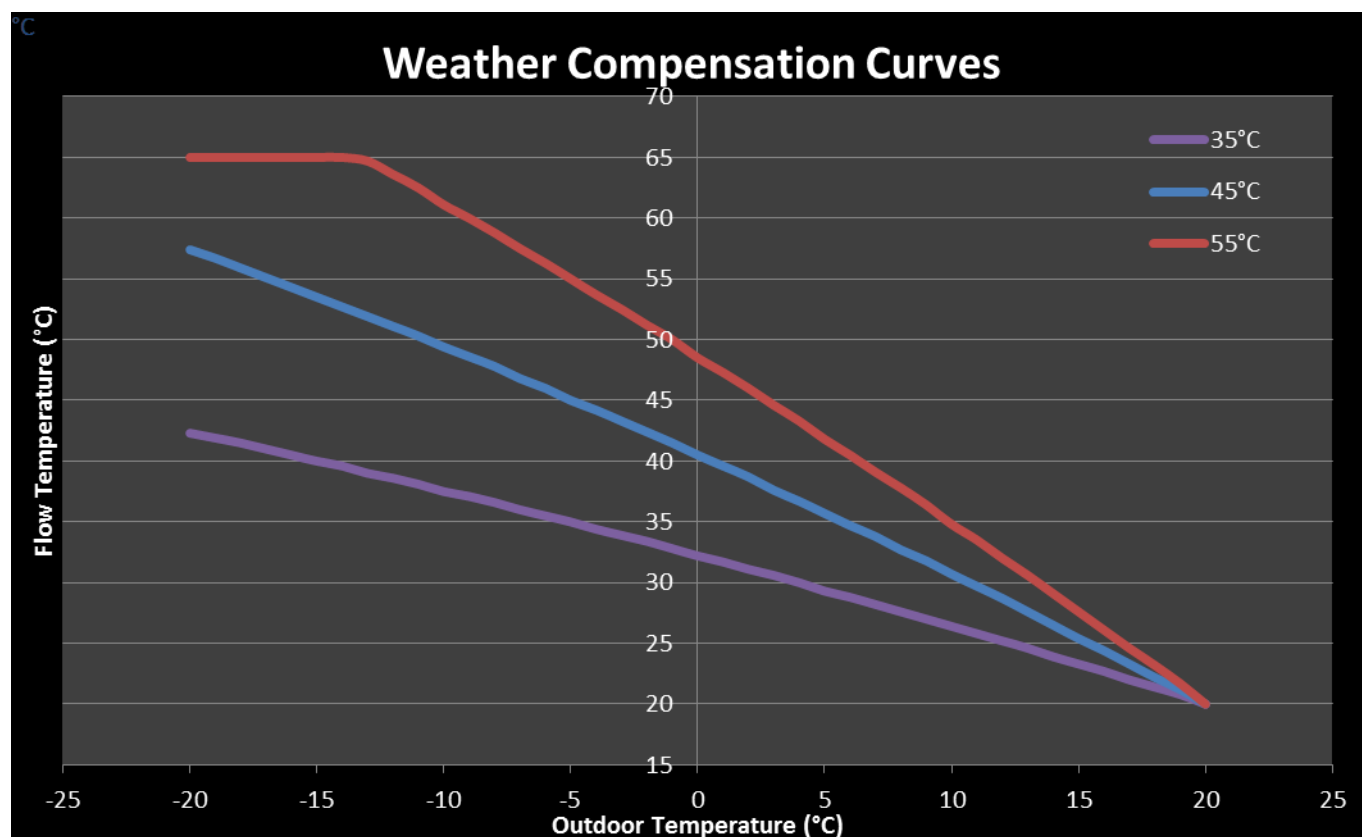


Figure 86 Weather Compensation Curves for 35°C, 45°C and 55°C Setpoints

3.7.6 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 60°C as detailed in section 2.6.3 and the unit switched to DHW 'ON' as detailed 2.5. 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 60°C, 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 2 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. This is detailed in section 2.7.1 and section 2.6.2. The 'Thermal Disinfection by HP Setpoint' should be set to the same as the 'DHW Storage Temperature Setpoint'. After the test the unit should be switched back to its normal operation.

3.7.7 Digital Outputs

The operation of the digital outputs including the 'On With' selection and the 'Time Delay' should be recorded in the commissioning certificate.

3.7.8 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 6 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.

3.8 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; ground collector map, 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.

3.9 Servicing

3.9.1 Servicing Schedule

The control system built into the appliance includes a servicing scheduler that continually records the operating hours of the appliance. When a pre-defined number of operating hours has elapsed, an alert is triggered to indicate that a scheduled service is required.



The  'Display Active Alarms' key will flash red. When the  'Display Active Alarms' key is pressed, a servicing alert screen will be displayed to indicate the remaining time for a clean to be completed. A typical example of a servicing alert message is shown in Figure 87.



Figure 87 Servicing Alert Screen

When all steps of the servicing procedure have been completed in full, the engineer can then reset the servicing scheduler and the appliance will return to normal operation.

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
Brine Circuit Filter	✓	✓	
Glycol Concentration of Brine Solution	✓		✓
Brine Circuit Pressure	✓		
Brine Manifold	✓		
Brine Pipework & Sealing	✓		
Brine Circuit Safety Devices	✓		✓
Brine Flow Rate	✓		✓
Electrical Connections	✓		
Heating Circuit Filter	✓	✓	
Inhibitor Concentration of Heating Solution	✓		✓
Heating Circuit Pressure	✓		
Heating Manifold	✓		
Heating Pipework & Sealing	✓		
Heating Circuit Safety Devices	✓		✓
Heating Flow Rate	✓		✓
Insulation Inside Unit	✓		

Replace any defective components if necessary.

Brine Circuit Filter – The brine 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.

Glycol Concentration of Brine Solution – The glycol concentration of the brine solution should be checked and amended as necessary. A sample should be taken and tested using a refractometer. The refractometer should display a refractive index of 1.36 (25% mono ethylene glycol providing freeze protection to -10°C). If the concentration has dropped significantly since the last service/commissioning, this may suggest someone has been topping it up. Further investigation for a leak may be necessary.

Brine Circuit Pressure – The system pressure of the brine 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.

Brine Manifold - The condition of the manifold and the flow rates in each loop should be inspected. Flow rates should be equal throughout the loops.

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

Brine Circuit Safety Devices – Safety devices on the brine circuit such as pressure relief valves should be manually activated to confirm their operation. Defective devices should be replaced immediately.

Brine Flow Rate – The maximum brine flow rate achievable should be checked. This can be done by manually setting the brine pump at 100% as documented in section 3.7.2. The brine 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.

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 it the heating system up 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 on the brine circuit 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. This can be done by manually setting the heating pump at 100% as documented in section 3.7.2. 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.

3.10 Alarms and Troubleshooting

3.11 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  'Display active alarms' key will flash red when an alarm is active. The **✗** symbol above the status text on the home screen of the user control interface also indicates an alarm is active.





Figure 64 shows a typical example of a home screen with active alarms present. In this case the alarm condition is associated with the boiler and cleaning functions of the appliance.

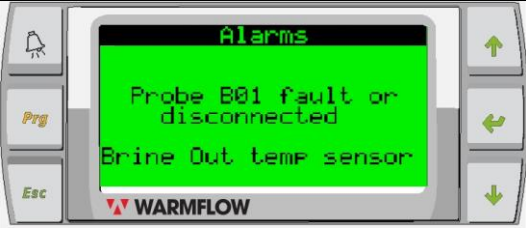
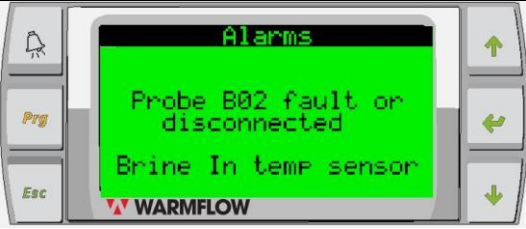
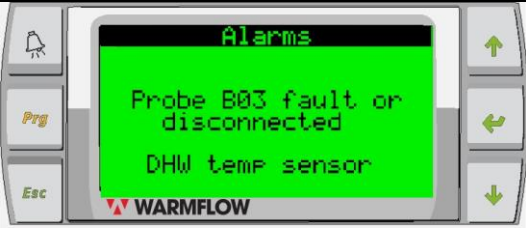
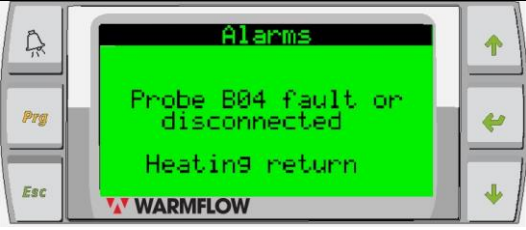


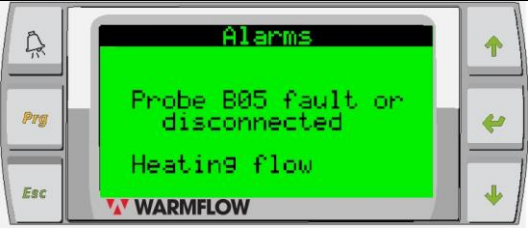
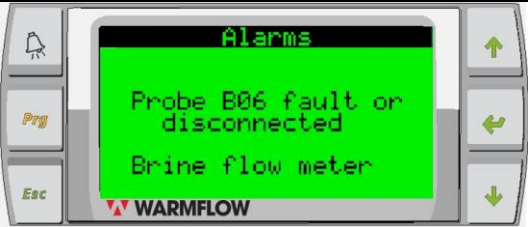
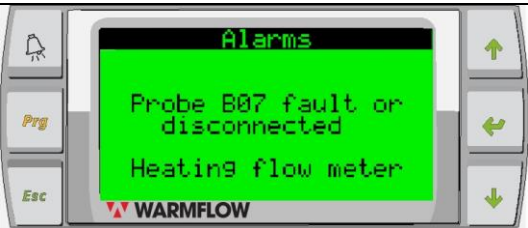
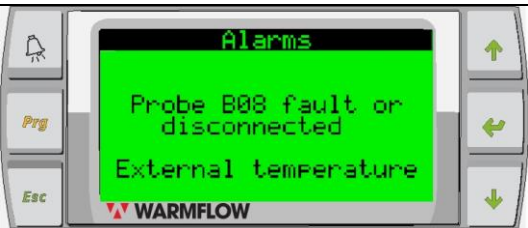
Figure 88 Home Screen showing Alarm Status





Pressing the flashing  'Display active alarms' key or entering the alarm option from the main menu will then display one or more active alarms or faults. The  'Down Arrow' or the  'Up Arrow' key can then be used to scroll through the alarms.

The alarms schedules 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 Screen	Possible Cause(s)	Suggested Action(s)	Action By	
			User	Engineer
 <p>The image shows a Warmflow control panel with a green LCD screen. The screen displays 'Alert' at the top, followed by 'Commission mode enabled'. The panel has buttons for 'Prg', 'Esc', and directional arrows (up, down, left, right). The Warmflow logo is at the bottom of the screen.</p>	Manual management mode has been enabled.	Disable manual management mode in the engineer's menu to return the unit to normal operation.		✓
 <p>The image shows a Warmflow control panel with a green LCD screen. The screen displays 'Alert' at the top, followed by 'Service is due in...' and '30 day(s)'. The panel has buttons for 'Prg', 'Esc', and directional arrows (up, down, left, right). The Warmflow logo is at the bottom of the screen.</p>	The appliance requires a service within the time displayed.	Service the appliance. Servicing must be conducted by a Warmflow engineer or other competent engineer who has received appropriate training.		✓
 <p>The image shows a Warmflow control panel with a green LCD screen. The screen displays 'Alarm' at the top, followed by 'Brine circuit freeze risk'. Below this, it shows 'Brine out -11.0°C' and 'Brine in -8.0°C'. The panel has buttons for 'Prg', 'Esc', and directional arrows (up, down, left, right). The Warmflow logo is at the bottom of the screen.</p>	The brine temperature has dropped too low.	<p>Check for blockages in the ground collector pipework.</p> <p>Check the flow rate of each circuit in the ground collector is balanced.</p> <p>Check the brine pump is functioning correctly.</p>		✓ ✓ ✓
 <p>The image shows a Warmflow control panel with a green LCD screen. The screen displays 'Alarm' at the top, followed by 'Heating circuit freeze risk'. Below this, it shows 'Heating flow 1.0°C' and 'Heating return 1.0°C'. The panel has buttons for 'Prg', 'Esc', and directional arrows (up, down, left, right). The Warmflow logo is at the bottom of the screen.</p>	The temperature of the unit has dropped too low.	<p>Ensure the unit can start up and run in freeze protection mode, see section 3.4.6.</p> <p>Check for blockages in the heating pipework.</p> <p>Check the heating pump is functioning correctly.</p>		✓ ✓ ✓

Alarm Screen	Possible Cause(s)	Suggested Action(s)	Action By	
			User	Engineer
	The brine out temperature sensor is faulty or disconnected.	Test the operation of the brine out temperature sensor and re-connect/replace if necessary.		✓
	The brine in temperature sensor is faulty or disconnected.	Test the operation of the brine in temperature sensor and re-connect/replace if necessary.		✓
	The DHW temperature sensor is faulty or disconnected.	Test the operation of the DHW temperature sensor and re-connect/replace if necessary.		✓
	The heating return temperature sensor is faulty or disconnected.	Test the operation of the heating return temperature sensor and re-connect/replace if necessary.		✓

Alarm Screen	Possible Cause(s)	Suggested Action(s)	Action By	
			User	Engineer
	The heating flow temperature sensor is faulty or disconnected.	Test the operation of the heating flow temperature sensor and re-connect/replace if necessary.		✓
	The brine flow meter is faulty or disconnected.	Test the operation of the brine flow meter and re-connect/replace if necessary.		✓
	The heating flow meter is faulty or disconnected.	Test the operation of the heating flow meter and re-connect/replace if necessary.		✓
	The external temperature sensor is faulty or disconnected.	Test the operation of the external temperature sensor and re-connect/replace if necessary.		✓

Alarm Screen	Possible Cause(s)	Suggested Action(s)	Action By	
			User	Engineer
 <p>The image shows a handheld device screen with a green background. At the top, it says 'Alarm'. Below that, it reads 'Brine flow rate too low or blocked'. The 'WARMFLOW' logo is at the bottom. The device has buttons for 'Prg', 'Esc', and directional arrows.</p>	The brine flow rate has dropped below the minimum threshold.	<p>Fully purge the system of air (common in new installations).</p> <p>Check for blockages in filters, valves etc.</p> <p>Check the system pressure hasn't dropped.</p> <p>Ensure brine pump is functioning correctly.</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>
 <p>The image shows a handheld device screen with a green background. At the top, it says 'Alarm'. Below that, it reads 'Heating flow rate too low or blocked'. The 'WARMFLOW' logo is at the bottom. The device has buttons for 'Prg', 'Esc', and directional arrows.</p>	The heating flow rate has dropped below the minimum threshold.	<p>Fully purge the system of air (common in new installations).</p> <p>Check for blockages in filters, valves etc.</p> <p>Check the system pressure hasn't dropped.</p> <p>Ensure heating pump is functioning correctly.</p>		<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>
 <p>The image shows a handheld device screen with a green background. At the top, it says 'Hardware Alarm'. The 'WARMFLOW' logo is at the bottom. The device has buttons for 'Prg', 'Esc', and directional arrows.</p>	The hardware of the refrigeration circuit controller has developed a problem.	Please consult Warmflow.		✓
 <p>The image shows a handheld device screen with a green background. At the top, it says 'Software Alarm'. The 'WARMFLOW' logo is at the bottom. The device has buttons for 'Prg', 'Esc', and directional arrows.</p>	The software of the refrigeration circuit controller has developed a problem.	Please consult Warmflow.		✓

3.12 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.	Timer mode not enabled.	Ensure timer mode is enabled in 'Functions' menu.	✓	
	Time clocks not set.	Ensure time clocks are set correctly in 'Scheduler' menu.	✓	
	'Unit controlled by' mode set incorrectly.	Set unit controlled by to correct mode in the 'Parameters' sub-menu of the 'Engineer' menu.		✓
	No demand signal from remote digital inputs.	Check feeds from room thermostats, underfloor manifolds and remote time clocks are functioning correctly.		✓
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 of the 'Settings' menu.	✓	
The appliance has been producing heat for some time, but the property heat demand has still not been satisfied.	Flow temperature set too low.	Increase flow temperature in the 'Temperature' sub-menu of the 'Settings' menu.	✓	
	Airlocks in heating system.	Bleed heating system to remove airlocks.		✓
	3-port diverting valve fault.	Ensure valve is operating correctly.		✓
	3-port diverting valve actuator set to CCW rotation.	Ensure actuator is set to CW rotation.		✓
	Heating circulating pump fault.	Ensure pump is operating correctly.		✓
Appliance is cycling on and off very frequently.	Poor quality room thermostats, or location close to draughts from opening doors etc.	Consider upgrading controls and utilise alternative locations.		✓
	Hysteresis temperature is too low.	Increase hysteresis parameter.		✓
	External temperature located in position where temperature is changing rapidly.	Ensure external temperature sensor is on a north facing wall out of direct sunlight and away from opening such as vents, doors and windows.		✓

4 YOUR GUARANTEES, TERMS & CONDITIONS

4.1 Period of Guarantee

Your Ground 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
- Polyisocyanurate Foam
- Neoprene Foam
- Polyurethane 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.

5.3 Casing and key components

The components of a typical appliance are shown below (not all components may be fitted, depending on appliance specification)

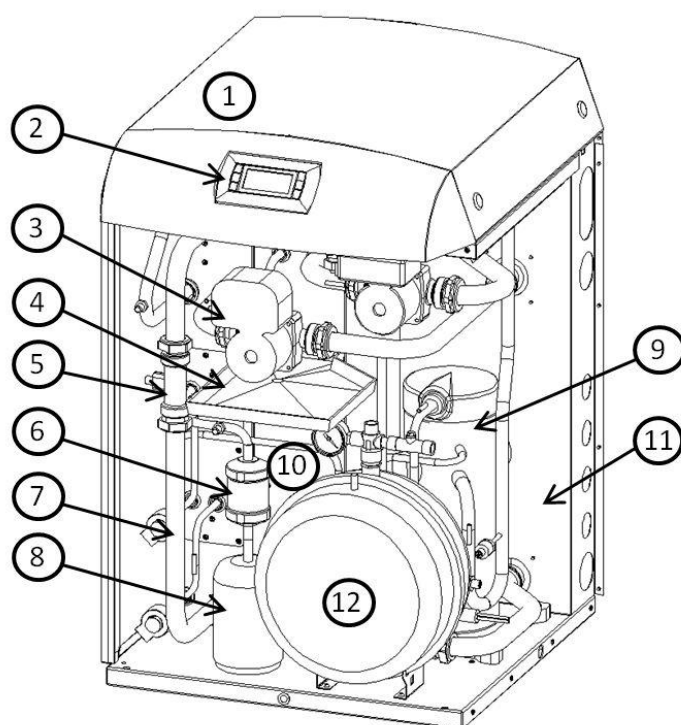


Figure 89: Key Component Diagram

Item	Description	Main Materials	Special Notes
1	Casing	Coated Galvanised Steel	
2	User Interface	Plastic, Electronic Components	
3	Circulating Pumps	Steel, Stainless Steel, Plastic	Consult Component Manufacturer
4	Drip Tray	Plastic	
5	Flow Sensors	Plastic	
6	Filter	Steel, Ceramic	
7	Pipework Assembly	Copper, Brass, Neoprene Foam	
8	Receiver	Steel, Copper	
9	Compressor	Steel, Copper, Rubber	Consult Component Manufacturer
10	HE Box	Stainless Steel, Galvanised Steel, Polyisocyanurate Foam,	Wear Appropriate PPE
11	Casing Foam	Polyurethane Foam	
12	Expansion Vessel	Steel, Rubber, Brass	Consult Component Manufacturer
Others	Electronic Devices	Plastic, Electronic Components	Consult Component Manufacturer

Various other brackets, fasteners and components may be used, with up to 5% of appliance weight

6 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.
 - Carbon copies of the certificate are produced automatically.

- **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
Moir Road
Lisburn
Co. Antrim
Northern Ireland
BT28 2RF

OR
 - By fax to: 02892620869

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



Installation & Commissioning Certificate

Date of Installation:

1. Installing Engineer Details.

MCS/SEAI Registration No.

Installation Company Name:

Installation Company Address:

Contact Telephone No.: (LandLine) (Mobile)

Installer's Name:

Installer's E-Mail Address:

2. Appliance Details.

Appliance Model No.: Output:

Appliance Serial No.: Date Code:

MCS Approval No.: GS08: BSI KM 612798/1 GS16: BSI KM 612798/2

3. Householder & Installation Address Details.

Householder's Name:

Householder's Address:

Post Code:

Contact Telephone No.: (LandLine) (Mobile)

Householder's E-Mail Address:

4. System Details.

Approx. Age of Dwelling: years

Dwelling Floor Area: m²

Replacement Heating System? ☐ New Heating System: ☐ Open Vented: ☐ Sealed System: ☐

Heating Emitters: Radiators: ☐ Underfloor: ☐ Designed Heating Flow Temp: °C

Is the system for: Space Heating Only: ☐ Space Heating & Hot Water: ☐

Total Heating System Volume: litres Total Expansion Capacity: litres

Has the system been flushed: Yes: ☐ No: ☐ What Cleanser Was Used?

Has Corrosion Inhibitor been added? Brand: Litres Used:

DHW Cylinder Details Brand: Model: Volume: litres Heat Exchanger Area: m²

Ground Collector: Horizontal: ☐ Borehole: ☐

Brine Solution Details Brand of Glycol Used: Concentration of Glycol in Brine: %

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

Further Details of Ground Collector (no. of circuits, length of circuits, pipe sizes etc):

5. Commissioning Engineer Details.

☐ Tick here if commissioned by Installer and proceed directly to 6. Date of Commissioning:

MCS/SEAI Registration No.

Commission Company Name:

Commission Company Address:

Contact Telephone No.: (LandLine) (Mobile)

Commissioning Eng. E-Mail:

6. Commissioning Performance.

Brine Flow Rate Tests: Pump @ 25%: l/min Pump @ 100%: l/min

Heating Flow Rate Tests: Pump @ 25%: l/min Pump @ 100%: l/min

DHW Flow Rate Tests: Pump @ 25%: l/min Pump @ 100%: l/min

DHW Cylinder Heat Up Test Max DHW Storage Temp Achieved: °C Thermal Disinfection Enabled: ☐

Unit Controlled By: Internal Timer ☐ Remote Digital Inputs ☐

Flow Temp. Regulation By: Fixed Setpoint ☐ Weather Compensated ☐

Digital Outputs

Auxiliary Pump Output On With: Auxiliary Pump Output Delay Off: s

Auxiliary Output On With: Auxiliary Output Delay Off: s

Heating Output Delay Off: s DHW Output Delay Off: s

Probe Adjustment Settings

Brine In Temp. Offset: °C DHW Storage Temp. Offset: °C

Brine Out Temp. Offset: °C External Temp. Offset: °C

Heating Flow Temp. Offset: °C Brine Flow Rate Offset: l/min

Heating Return Temp. Offset: °C Heating Flow Rate Offset: l/min

7. Statement of Conformity.

	Yes ✓	Yes ✓
Does the installation conform to IEE Regulations, relevant British & European standards, codes of practice, Building Regulations and Local Authority Byelaws?	<input type="checkbox"/>	Has the customer manufacturer's instructions on the correct operation of the appliance been explained to the customer?
Does the installation comply with the Manufacturer's instructions?	<input type="checkbox"/>	Has the manufacturer's maintenance instructions and schedules been explained to the customer?
Does the installation conform to the requirements of MCS Microgeneration Installation Standard MIS 3005?	<input type="checkbox"/>	Has the appliance warranty documentation been provided to the customer?
Has the appliance operating manual been provided to the customer?	<input type="checkbox"/>	

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 is detailed in a separate document within the Installer's Handover Pack.
2. The system requires regular maintenance, details of which can be found within the Installer's Handover Pack and manufacturer's instructions.
3. A certificate confirming registration on the MCS Installation Database can be found within the Installer's Handover Pack.

7 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 USING BLOCK CAPITALS.

Service Record 1.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 2.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 3.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 4.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 5.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 6.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 7.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 8.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 9.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

PLEASE COMPLETE USING BLOCK CAPITALS.

Service Record 10.

Date of Servicing:

1. Service Engineer Details.

MCS/SEAI Registration No.	<input type="text"/>	
Service Company Name:	<input type="text"/>	
Service Company Address:	<input type="text"/>	
Contact Telephone No.:	<input type="text" value="(LandLine)"/>	<input type="text" value="(Mobile)"/>
Service Engineer's Name:	<input type="text"/>	
Service Engineer's E-Mail:	<input type="text"/>	

2. Appliance Servicing Checklist.

Clean Brine Circuit Filter	<input type="checkbox"/>	Clean Heating Circuit Filter	<input type="checkbox"/>
Check Glycol Concentration of Brine	<input type="checkbox"/>	Check Inhibitor Concentration in Heating Water	<input type="checkbox"/>
Check Brine Circuit System Pressure	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Brine Manifold	<input type="checkbox"/>	Inspect Heating Manifolds	<input type="checkbox"/>
Inspect Brine Pipework and Sealing	<input type="checkbox"/>	Inspect Heating Pipework and Sealing	<input type="checkbox"/>
Actuate Brine Circuit Safety Devices	<input type="checkbox"/>	Actuate Heating Circuit Safety Devices	<input type="checkbox"/>
Check Brine Flow Rate	<input type="checkbox"/>	Check Heating Flow Rate	<input type="checkbox"/>
Inspect Electrical Connection	<input type="checkbox"/>	Inspect Condition of Insulation Inside Unit	<input type="checkbox"/>

Details of additional service items included:

3. System Modifications 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, addition of auxiliary heat sources.

Yes: ☐ No: ☐

If Yes, please specify below

Details of Modifications:

4. After Service Performance.

Heating Flow Temp:	<input type="text"/>	°C
Heating Return Temp:	<input type="text"/>	°C
Heating Flow Rate:	<input type="text"/>	l/min
Brine In Temp:	<input type="text"/>	°C
Brine Out Temp:	<input type="text"/>	°C
Brine Flow Rate:	<input type="text"/>	l/min
Compressor Speed:	<input type="text"/>	rpm
Heating Output:	<input type="text"/>	W
Suction Pressure	<input type="text"/>	bar
Intermediate Pressure	<input type="text"/>	bar
Discharge Pressure	<input type="text"/>	bar

Notes:

5. Service Completion.

Competent Person's Signature:	<input type="text"/>
Customer's Signature*:	<input type="text"/>

Print Name:	<input type="text"/>
Print Name:	<input type="text"/>

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

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.

CODE 4392 ISSUE 6 JAN 2021
