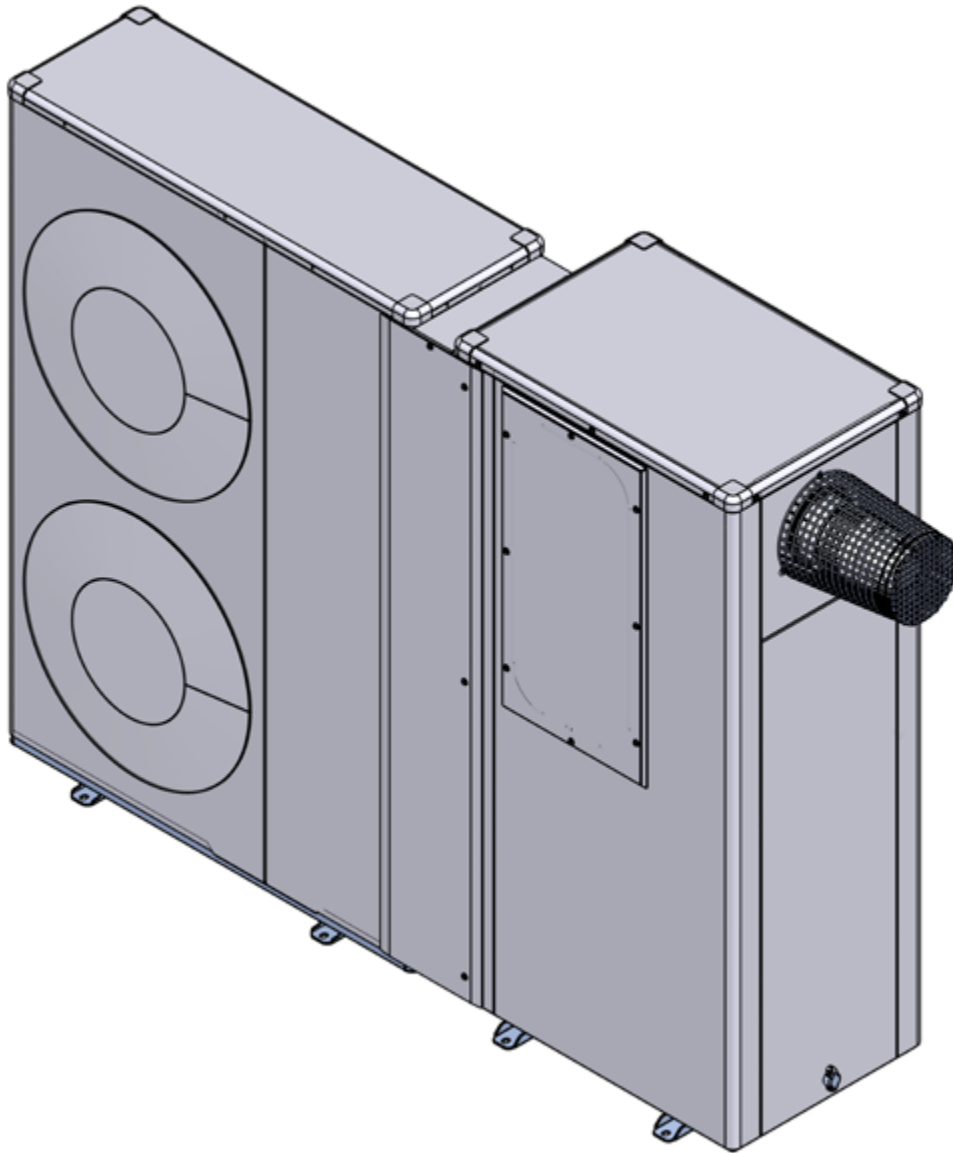


Grant VortexAir

VortexBlue Oil Boiler and Aeronas³ Air Source Heat Pump Hybrid

Installation and Servicing Instructions



THESE INSTRUCTIONS SHOULD BE READ IN CONJUNCTION WITH THE INSTALLATION AND SERVICING INSTRUCTIONS SUPPLIED WITH THE HEAT PUMP

Special Text Formats

The following special text formats are used in this manual for the purposes listed below:



WARNING

Warning of possible human injury as a consequence of not following the instructions in the warning.



CAUTION

Caution concerning likely damage to equipment or tools as a consequence of not following the instructions in the caution.



NOTE

Used for emphasis or information not directly concerned with the surrounding text but of importance to the reader.



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Contents

1	Introduction	4	11	Domestic Hot Water	38
1.1	General	4	11.1	Temperature Control	38
1.2	Outputs	4	11.2	Legionella	39
1.3	Planning Permission	4	11.3	Grant Automatic DHW Boost Kit 2	39
1.4	DNO Application	4	11.4	Grant Digital 2-Stage Cylinder Thermostat	39
1.5	Servicing	4			
1.6	Important Advice	5	12	Electrical	40
1.7	Product Contents	5	12.1	General	40
1.8	Installation Accessories	5	12.2	Hybrid (Boiler) Electrical Supply Connection	40
1.9	Hybrid Components	6	12.3	Heating System Controls Connection	41
			12.4	Heat Pump Electrical Supply Connection	42
			12.5	Heat Pump Controls Connection	42
2	Technical Data	8	13	Flue System and Air Supply	54
2.1	Boiler Technical Data	8	13.1	Flue System	54
2.2	Heat Pump Technical Data	8	13.2	Air Supply	55
2.3	Sealed System Data	9	13.3	Balanced Flue Terminal Positions	56
2.4	Burner Settings	9	13.4	Prepare the Wall - Indoor Installation only	58
2.5	Flue Gas Analysis	9	13.5	Prepare the Flue - Low Level	58
2.6	Hybrid Dimensions	10			
2.7	Clearances	12	14	Control Panel	60
3	Oil Storage and Supply System	13	14.1	General	60
3.1	Fuel Supply	13	14.2	Hybrid Controls	60
3.2	Burner Oil Connection	15	14.3	Heat and Electricity Meters	60
3.3	Burner Components	15	15	Operation	62
4	Installation Information	16	15.1	General	62
4.1	Introduction	16	15.2	External Heating System Controls	62
4.2	VortexAir Location	16	15.3	Oil/Hybrid Switch	62
4.3	Preparation for Installation	16	15.4	Hybrid Operation	62
4.4	Regulations and Standards	16	15.5	Boiler Only Operation	63
4.5	Completion	17			
4.6	Before you Commission	17	16	Commissioning	64
4.7	Heating System Design Considerations	17	16.1	General	64
4.8	Underfloor Heating Systems	17	16.2	Oil Boiler	64
4.9	Pipework Materials	17	16.3	Before Switching On	64
4.10	Underfloor Pipework	17	16.4	Setting the Hybrid Temperature Controls	64
5	Installation of the Oil Boiler	18	16.5	Digital Temperature Controllers	65
5.1	Preparation for Installation	18	16.6	Switching On	67
5.2	Installing the Oil Boiler - External Location	18	16.8	Air Adjuster Disc - 15/21kW only	67
5.3	Installing the Oil Boiler - Internal Location	18	16.9	Running the Boiler	67
5.4	Boiler Only Operation	18	16.10	Balancing the System	68
6	Installation of the Heat Pump	20	16.11	Completion	68
6.1	Preparation for Installation	20	16.12	Heat Pump	68
6.2	Installing the Heat Pump - Next to Oil Boiler	20			
6.3	Installing the Heat Pump - Separate from Oil Boiler	21	17	Servicing	69
6.4	Heat Pump Parameter Settings	21	17.1	Checking before Servicing	69
7	Installation of Heat and Electricity Meters	22	17.2	Dismantling prior to Servicing	69
7.1	General	22	17.3	Cleaning the Boiler	69
7.2	Heat Meter	22	17.4	Cleaning the Burner	70
7.3	Electricity Meter	28	18	Fault Finding	72
7.4	Setting up the Heat Meter	28	18.1	Burner Fault Indication	72
8	Internal Pipework	30	18.2	Burner Fault Diagnostics	72
8.1	General	30	18.3	Riello RDB BLU Fault Finding Chart	73
8.2	Meter Ready	30	19	Spare Parts	74
9	Condensate Disposal	32	19.1	Riello RDB BLU Burner Parts List	74
9.1	Heat Pump Condensate Disposal	32	19.2	Exploded View of Riello RDB BLU Burner	75
9.2	General Requirements	32	19.3	Boiler Parts List	76
9.3	Connections	32	20	EC Declaration of Conformity	78
9.4	Pipework	32	21	ErP	79
9.5	External Pipework	32	22	Health and Safety	80
9.6	Condensate Soakaway	32	23	Recycling and Decommissioning	81
9.7	Condensate Trap	33	24	Guarantee	82
9.8	Condensate Disposal Pipework	33	Appendix A	84	
9.9	Inspection and Cleaning of Trap	34			
10	Sealed Systems	36			
10.1	Sealed System Requirements	36			
10.2	Filling the Sealed System	37			
10.3	Pressure Relief (Safety) Valve Operation	37			

1 Introduction

1.1 General

The Grant VortexAir Hybrid is a unique combination of a Grant VortexBlue oil-fired boiler and a Grant Aeronas³ inverter driven heat pump.

It is available in two models – HPIDAIR (15/21kW) and HPIDAIR2 (21/26kW). The outputs indicate the size of the range-rated blue flame boiler used, either 15/21kW or 21/26kW. A 16kW Grant Aeronas³ heat pump is used in both models.

The Grant VortexAir is supplied in two parts, the oil boiler and the heat pump (each on their own pallets), for connection together by the installer on site.

It also possible to purchase the boiler only. This can be installed as an immediate replacement for an existing boiler, with the Aeronas³ HPID16 heat pump being purchased and added at a later date. Alternatively, the boiler can simply be installed and used as a 'stand-alone' boiler with no heat pump fitted, if required.

Both parts of the Grant VortexAir Hybrid have are housed in a powder coated galvanised steel weatherproof enclosure.

The Aeronas³ heat pump is designed to be installed externally in a suitable position, either against a wall or some distance away from the property as required. Refer to Section 2.7 for guidance.

The boiler unit can be installed either:

- Externally – located next to the heat pump
OR
- Internally – connected through the wall to the heat pump

The Grant low level balanced flue system (Yellow system) must be used with the VortexAir. This is supplied with the unit.

The Grant VortexAir is only suitable for use on sealed central heating systems. Refer to Section 10.

Both models are supplied with the control panel, burner and hybrid system pipework/valves factory fitted.

1.1.1 How it Works

The Grant VortexAir Hybrid combines the Grant Aeronas³ air-to-water inverter driven air source heat pump and the innovative VortexBlue high-efficiency oil boiler.

The VortexAir Hybrid control system allows the Aeronas³ heat pump to operate as the primary heat source for the majority of the heating season, thus achieving the fuel efficient and cost effective provision of space heating.

The oil boiler will only be operated when the ambient air temperature falls to a level where the heat pump cannot either sustain the required flow temperature for the system, or when the heat demand cannot be met by the heat pump at the set flow temperature.

The ambient air temperature is monitored by the air thermostat incorporated in the control system. The two-stage air thermostat operation allows either partial use of the boiler (to back up the heat pump) or full operation of the boiler, under control of the boiler thermostat controller, under the most extreme low temperature conditions.

The air thermostat settings will vary from one installation to another. These are critical for the correct and efficient operation of the Hybrid unit and must be determined by using the Grant Hybrid Calculator (available as a download at www.grantuk.com). The resulting values for both the Air thermostat controller and Boiler thermostat controller are set during commissioning. Refer to Section 12.

For further details on the operation of the Grant VortexAir Hybrid refer to Section 15 (Operation).

1.2 Outputs

There are two models in the VortexAir range as follows:

Table 1-1: Hybrid product codes

Product code	Components	Output
HPIDAIR	Boiler: Flue: Heat Pump:	15/21kW (factory setting 21kW) EZ90 (included) 16kW*
HPIDAIR2	Boiler: Flue: Heat Pump:	21/26kW (factory setting 26kW) EZ90 (included) 16kW*

* 7°C air and 35°C flow temperature

Two models of oil boiler only are also available as follows:

Table 1-2: Oil boiler product codes

Product code	Components	Output
VTXBFAIR	Boiler: Flue:	15/21kW (factory setting 21kW) EZ90 (included)
VTXBFAIR2	Boiler: Flue:	21/26kW (factory setting 26kW) EZ90 (included)

1.3 Planning Permission

Oil Boiler

Boiler installation is considered to be permitted development and therefore, you do not need to apply for planning permission. However, there are limitations:

- External flues must not exceed the highest point of a roof by one metre or more.
- Listed buildings and property located in conservation areas may be subject to listed building consent and planning permission.
- Any external flue installed on to a property located in a conservation area must not be on the front of a property or any part of the property that fronts a highway.
- Any outside building that will form part of your boiler and heating system will have to follow the planning permission limitations of outbuildings and extensions.

Heat Pump

The installation of a heat pump on domestic premises may be considered to be permitted development, not needing an application for planning permission, provided ALL the limits and conditions listed on the Planning Portal website are met.

For further information, visit www.planningportal.gov.uk.

1.4 DNO Application

An application must be made to the Distribution Network Operator (DNO) before connecting the heat pump to the mains electrical supply. There are six DNOs operating the electrical distribution network throughout England, Scotland and Wales and the application must be made to the DNO covering the area concerned.

The necessary information required to make this application (J-forms) can be downloaded from the Grant UK website (www.grantuk.com), completed and then submitted to the correct DNO for the area in question.

1.5 Servicing

It is recommended (and a requirement of the product guarantee) that the hybrid should be regularly serviced, at least once a year and the details entered in the Service Log by the service engineer.

Refer to Section 16 (Commissioning).

1.6 Important Advice

1. It is essential that the full layout of the system is understood before the installation of any component is undertaken. If you are in any doubt, please stop and seek advice from a qualified heating engineer or from Grant UK. Please note that Grant UK will not be able to offer specific advice about your system. In this case, we will always refer you to seek the advice of a qualified system designer.
2. The hybrid must be installed and commissioned in accordance with these installation and servicing instructions. Deviations of any kind will invalidate the guarantee and may cause an unsafe situation to occur. Please seek advice from Grant UK if any of these user, installation and servicing instructions cannot be followed for whatever reason.
3. The heat pump contains high pressures and high temperatures during normal working conditions. Care must be taken when accessing the internal workings of the heat pump.
4. The heat pump contains an electrically driven fan which rotates at high speed. Disconnect the heat pump from the electrical supply before removing the top cover.

1.7 Product Contents

The VortexAir comes supplied on two pallets. The following items are included:

Table 1-3: Product contents

Quantity	Item
1	Aerona³ 16kW heat pump (product code: HPID16)
1	Heat pump remote controller
1	Heat pump remote controller cable (length: 8 metres)
1	Heat pump condensate drain elbow
2	Flexible braided hose (1" BSP / 28 mm compression)*
2	1" x 1 1/4" BSP elbow
2	1" BSPM x 28mm brass tail
1	VortexBlue oil boiler (product codes: VTXBFAIR or VTXBFAIR2)
1	Joiner front cover plate
1	Joiner top cover plate
1	Lockshield valve adjustment key
1	Air adjuster disc**
1	Flexible oil hose (600 mm)
1	Oil line adaptor (3/8" x 1/4")
1	Oil isolator
4	4-core heat pump controls cable - numbered 1 to 4 Length: 1400 mm (refer to Section 12.5)
1	Low level standard flue kit (product code: EZ90)
1	Vertical flue extension section
1	Flue clamp bolt and nut
1	Flue bubble seal
1	Hybrid Installation and Servicing Instructions
1	Aerona ³ Installation and Servicing Instructions
1	User Guide
1	Commissioning form
1	Energy label

* If flexible braided hoses are supplied with the heat pump, they must be discarded.

** For downrating the 15/21kW boiler to 15 or 16kW output.

1.8 Installation Accessories

The following are available from Grant UK:

Table 1-4: Installation accessories

Product code	Description
HPIDFOOT/KIT*	Anti-vibration mounts with fixings (2 x 600mm)
HPIDINSU/KIT	Through wall insulation kit (22 - 28mm flexible hoses)
HPIDHEATMETER	Heat meter (Refer to Section 7-2)
HPIDKW/HMETER	Electricity meter (Refer to Section 7-3)
HPIDBUFFER50	50 litre buffer vessel
GCS2	Digital two-stage cylinder thermostat
HPDHWBK2	Automatic domestic hot water boost kit (timed)
HPAWSSK18	Aerona ³ 18 litre sealed system kit
HPAWSSK50	Aerona ³ 50 litre sealed system kit
RBS35	Adaptor oil line - 3/8 x 1/4
RBS36	Flexible oil hose (900mm) - 3/8 x 1/4

* Two sets required (one for the oil boiler and one for the heat pump)

1.9 Hybrid Components

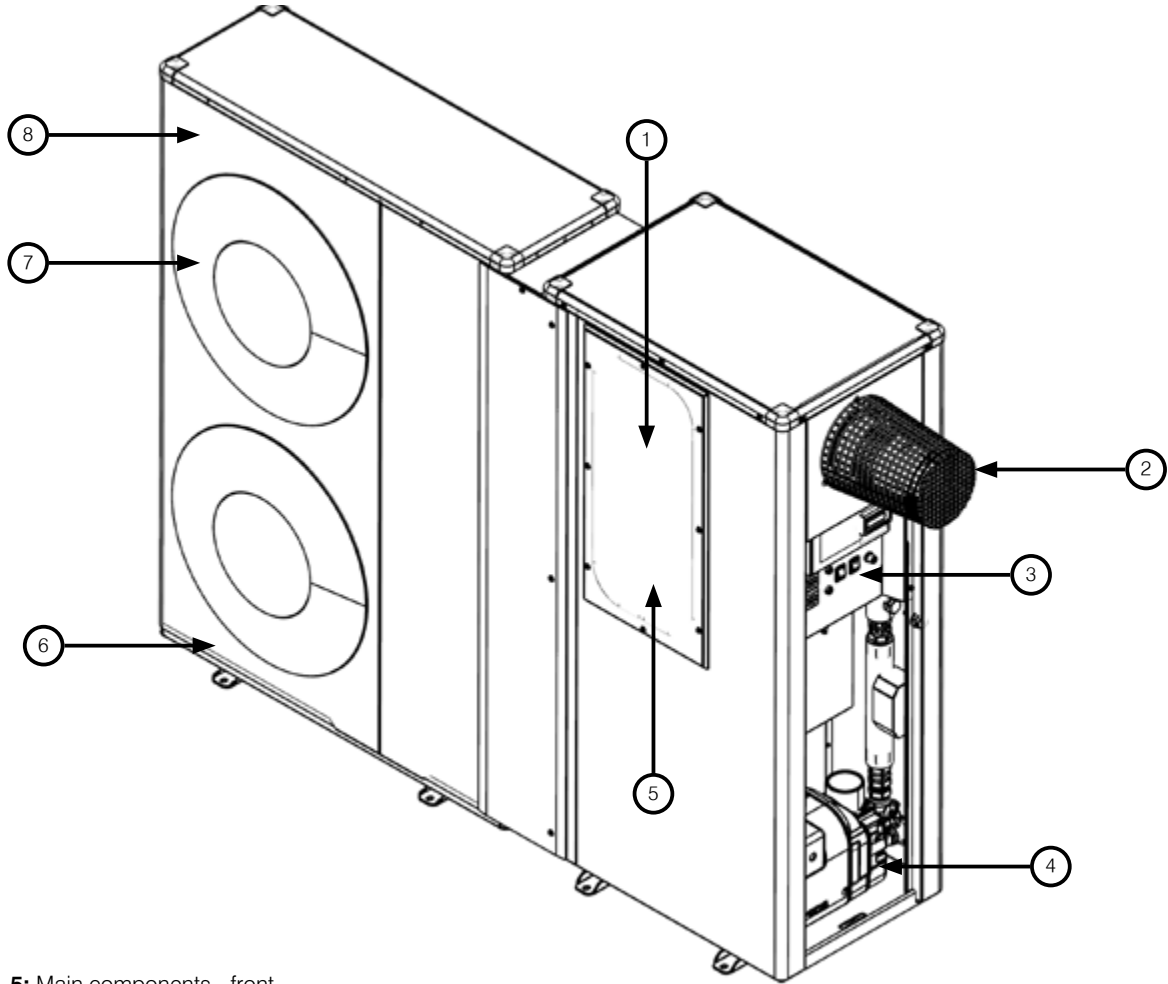


Figure 1-5: Main components - front

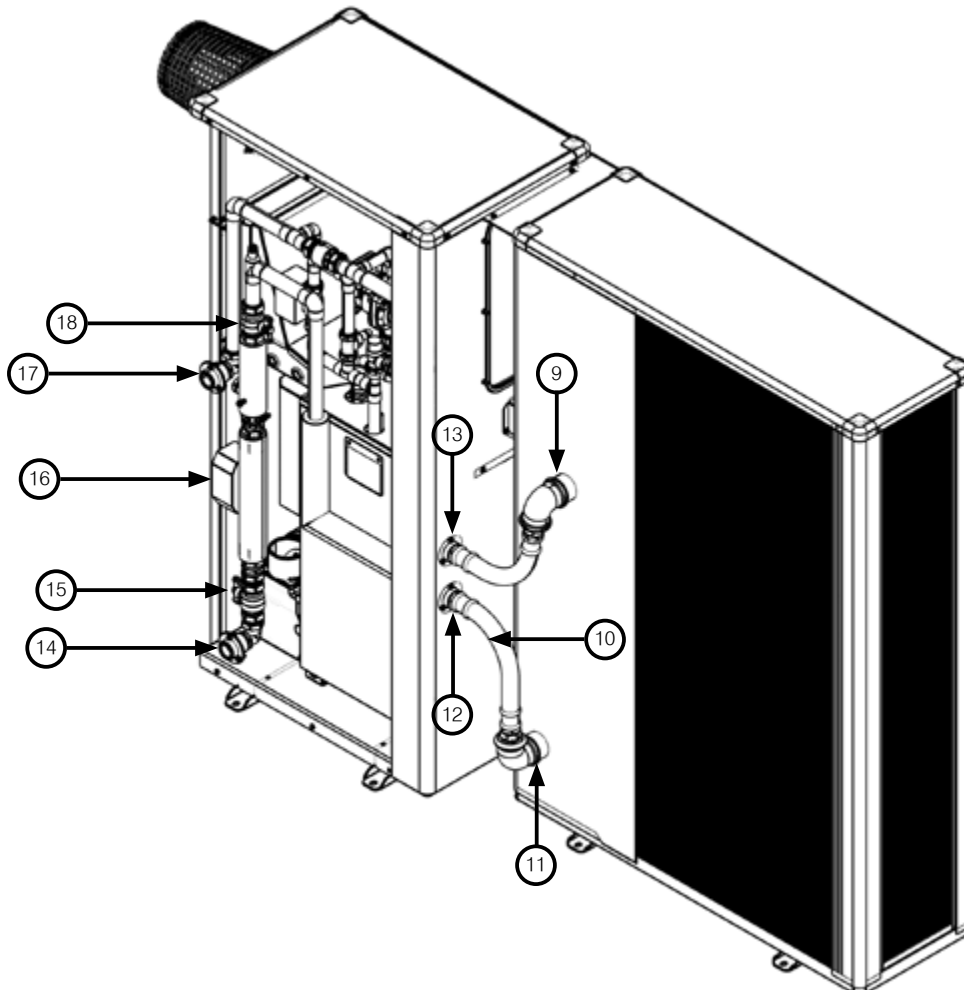


Figure 1-6: Main components - rear (oil boiler casing removed)

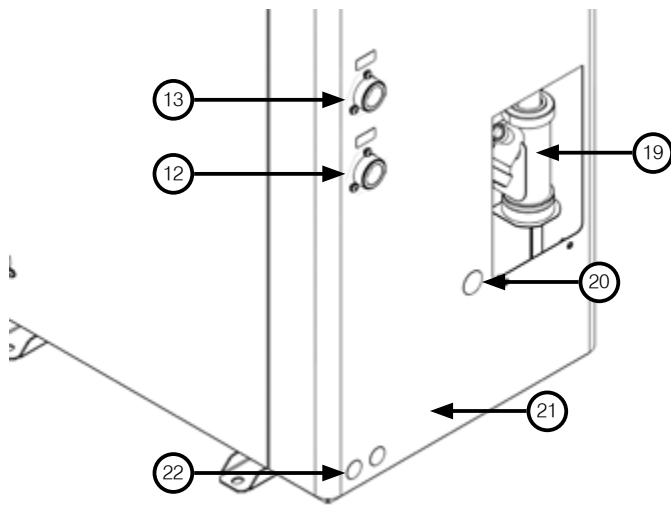


Figure 1-7: Knockouts for oil lines and condensate disposal

Table 1-8: Key to main components - front

Key	Item	
1	Front (removable) access cover	To access the heat pump wiring centre
2	Flue (external applications)	Refer to Section 13
3	Control panel	Refer to Section 10
4	Blue flame burner	A Riello high-efficiency, low NOx blue flame burner with plug and socket connection
5	Pump	High efficiency circulating pump
6	Anti-freezing heater	Factory fitted electric heater prevents condensate in the base of the heat pump from freezing
7	Fan	A high-efficiency DC fan motor is used for smooth and quiet operation. Two fans (3 blade) are fitted to the 16kW unit.
8	Air inlet	Located in the left and back of the heat pump
9	Flow	Refer to Section 5
10	Flexible hose	
11	Return	Refer to Section 5
12	Heat pump return	Refer to Section 5
13	Heat pump flow	Refer to Section 5
14	System return	Refer to Section 5
15	Isolation valve	Refer to Section 4 (if heat meter is fitted)
16	Heat meter	Refer to Section 4 (if heat meter is fitted)
17	System flow	Refer to Section 5
18	Isolation valve	Refer to Section 4 (if heat meter is fitted)
19	Condensate trap	
20	Condensate knockout	Refer to Section 9
21	Condensate knockout (base - not shown)	
22	Oil line knockouts	Refer to Section 3
Not shown	Heat exchanger	Award winning condensing heat exchanger
	DC Inverter	This responds rapidly to changing conditions to provide the necessary output to meet heating demands by varying the speed and output of the compressor, fan and circulating pump. This reduces the on/off times of the compressor, keeping the water temperature constant during operation reducing the electricity consumption.
	Compressor	A high-efficiency DC twin-rotary compressor to provide smooth performance and quiet operation.
	Plate Heat Exchanger (Condenser)	The high-efficiency plate heat exchanger is used to transfer heat to the heating system primary circuit.
	Circulating Pump	High-efficiency DC pump speed controlled from the ASHP control PCB.
	Pressure Relief Valve	A 3 bar pressure relief valve is factory fitted.
	Air Purge Valve (Automatic Air Vent)	Factory fitted to assist in the removal of air from the heating primary circuit of the heat pump.

2 Technical Data

2.1 Boiler Technical Data

Table 2-1: Boiler technical data

	Unit	HPIDAIR - 15/21kW	HPIDAIR2 - 21/26kW
Water content - oil boiler / heat pump (total)	litre	16.5 / 2.0 (18.5)	10.5 / 2.0 (12.5)
	gallon	3.6 / 0.44 (4.04)	2.3 / 0.44 (2.74)
Weight - oil boiler and heat pump (empty)*	kg	270	272
	lb	595	600
Weight - oil boiler and heat pump (full)*	kg	290.2	286.5
	lb	639.8	631.6
Maximum heat output (Kerosene)**	kW	21	26
	Btu/h	71 694	88 764
Heating system flow connection		1" BSP female	
Heating system return connection		1" BSP female	
Minimum flow rate ($\Delta T=8^{\circ}\text{C}$)	litres/min.	15	
Condensate connection		22 mm (only connect plastic pipe)	
Waterside resistance ($\Delta T=10^{\circ}\text{C}$)	mbar	26	
Waterside resistance ($\Delta T=20^{\circ}\text{C}$)	mbar	9.5	
Maximum static head	metre	28	
Minimum circulating head	metre	1	
Boiler thermostat range	$^{\circ}\text{C}$	65 to 78	
Limit (safety) shut off temperature	$^{\circ}\text{C}$	111 \pm 3	
Maximum hearth temperature	$^{\circ}\text{C}$	Less than 50	
Electricity supply		230/240V 1ph 50Hz fused at 5A	
Burner motor power	Watts	90	
Absorbed motor power	Watts	0.15	
Starting current	Amps	2.0	
Running current	Amps	0.85	
Oil connection		1/4" BSP male (on end of flexible tube)	
Maximum operating pressure - sealed system	bar	2.5	
Maximum operating pressure - pressure relief valve	bar	2.0	

* Weight includes burner but excludes flue.

** Factory setting (maximum output). Refer to Section 2.4 for other boiler outputs.

2.2 Heat Pump Technical Data

For technical data relating to the heat pump, please refer to the Aerona³ installation and servicing instructions supplied with the heat pump.

2.3 Sealed System Data

Table 2-2: Sealed system data

	15/21 and 21/26kW
Heating system pressure (cold)	Maximum 1.0 Minimum 0.5 bar
Operating pressure of pressure relief valve	2.5 bar
Expansion vessel size (pre-charged at 1 bar)	To be selected based on the water content of the system
Cold water mains connection *	15 mm copper pipe
Pressure relief valve discharge connection *	15 mm copper pipe

* Provided that a Grant UK sealed system kit (listed in Table 1-4) has been used

2.4 Burner Settings

Table 2-3: Burner settings

Hybrid model (burner type)	Heat output		Nozzle	Oil pressure (bar)	Smoke No.	Burner head type	Burner head/disc setting	Fuel flow rate (kg/h)	Flue gas temp. (°C)	CO ₂ (%)
	(kW)	(Btu/h)								
HPIDAIR 15/21kW (RDB2.2 BG1 BLU)	* 21 *	71 650	0.60/80°ES	8.5	0 - 1	BG1	N/A	1.78	55 - 85	12.0
	15	51 200	0.40/80°ES	9.0	0 - 1	BG1	Disc setting B	1.28	45 - 75	12.0
	16	54 600	0.40/80°ES	10.5	0 - 1	BG1	Disc setting B	1.36	45 - 75	12.0
	18	61 400	0.55/80°ES	8	0 - 1	BG1	N/A	1.53	50 - 80	12.0
HPIDAIR2 21/26kW (RDB2.2 BG3 BLU)	* 26 *	88 700	0.65/80°ES	10	0 - 1	BG2	N/A	2.19	55 - 75	12.0
	21	71 650	0.60/80°ES	8.5	0 - 1	BG2	N/A	1.78	45 - 65	12.0
	23	78 475	0.65/80°ES	8.5	0 - 1	BG2	N/A	1.94	50 - 70	12.0

Notes:

- The data given above is approximate only.
- The above settings may have to be adjusted on site for the correct operation of the burner.
- Gas Oil and Bio Kerosene are NOT suitable for use with the Grant HybridAir
- The flue gas temperatures given above are $\pm 10\%$.
- When commissioning, the air damper **must be** adjusted to obtain the correct CO₂ level.
- * Factory settings: 15/21 - 21kW, 21/26 - 26kW
- The installer must amend the boiler data label if the output is changed.

2.5 Flue Gas Analysis

To allow the boiler to be commissioned and serviced, the boiler is supplied with a combustion test point on the front cleaning door. When this test point is used please note the following:

- The test point is for CO₂ and smoke readings only.
- The boiler efficiency and temperature must be taken from the flue test point on high level, vertical and conventional flue adaptors.
- Concentric low level flues do not contain a test point. The temperature and efficiency readings must be taken from the flue terminal.

2.6 Hybrid Dimensions

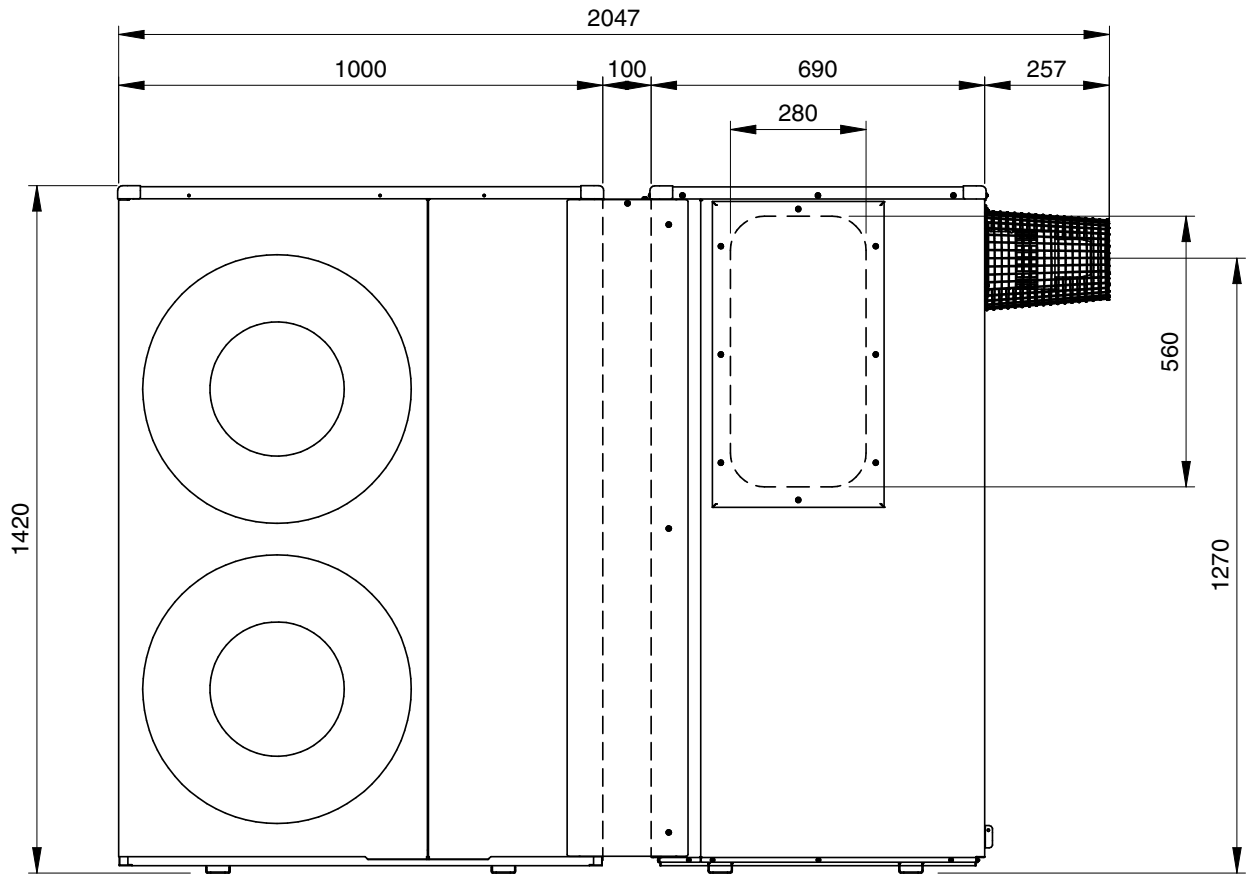


Figure 2-4: Hybrid front view

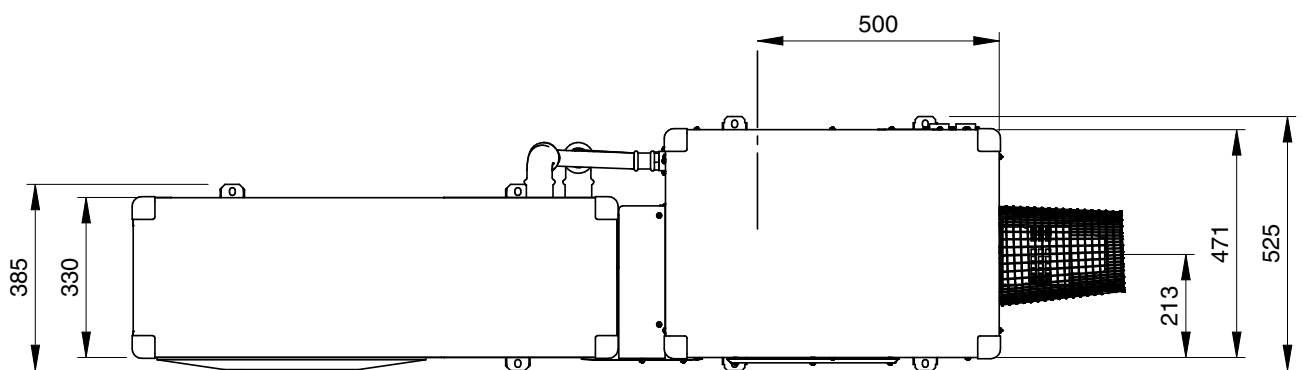


Figure 2-5: Hybrid top view

All dimensions in the diagrams are in millimetres.

Please note: all dimensions are excluding the feet (refer to Section 1.8).

For details of the heat pump only - refer to Aeraon³ Installation Instructions supplied with the heat pump.

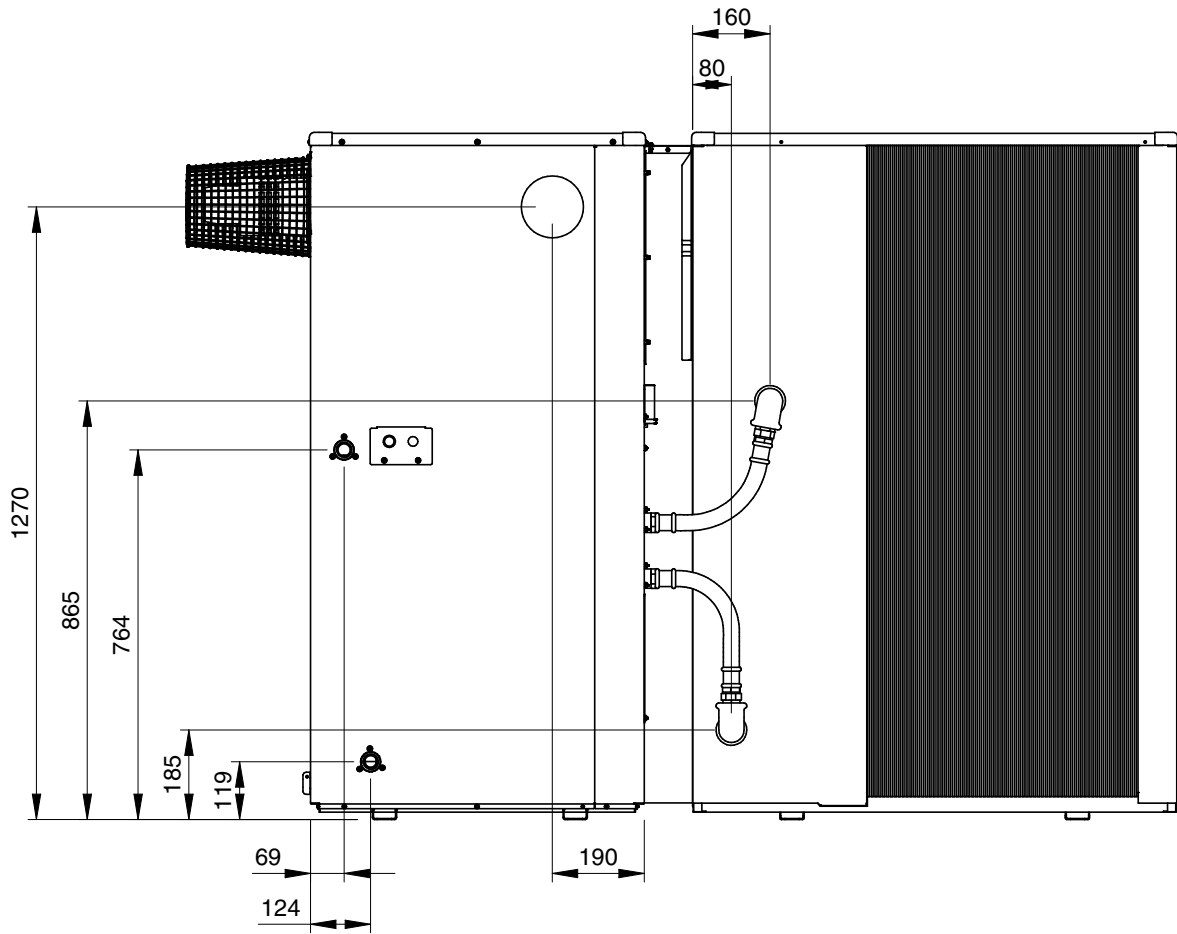


Figure 2-6: Hybrid rear view

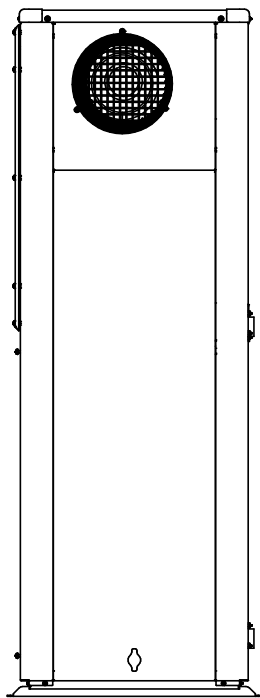


Figure 2-7: Oil boiler right hand view

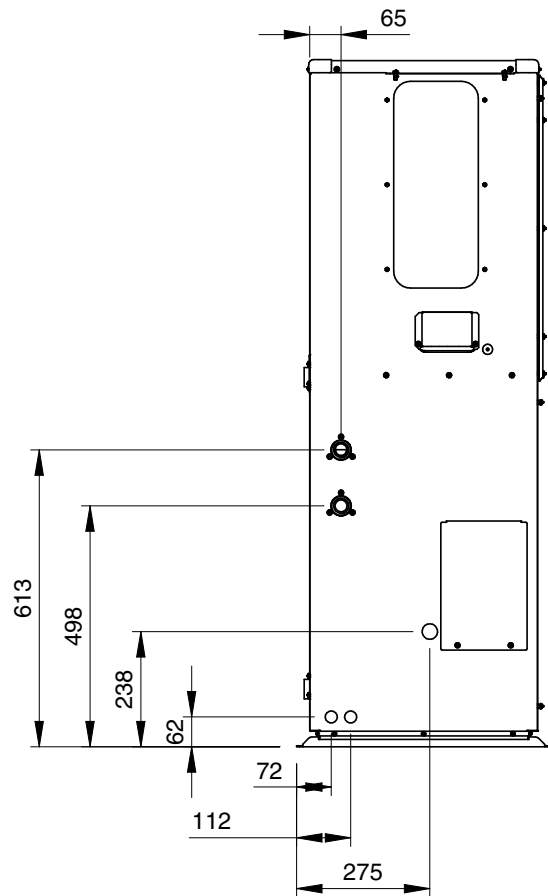


Figure 2-8: Oil boiler left hand view

2.7 Clearances

The following minimum clearances must be used to enable the unit to be easily commissioned, serviced and maintained. In the case of the heat pump, these will allow for adequate air flow in and out of the unit.

2.7.1 Oil Boiler and Heat Pump Installed Externally

Table 2-9: Minimum clearances required for oil boiler and heat pump installed externally

Aspect	Minimum clearance required (mm)	Notes
Top (above)	300	
Bottom (below)	100	This is the height of anti-vibration mounts. Refer to Table 1-4.
In front of unit	600	Ensure that there is adequate clearance to remove the front access panel and that the air discharged from the heat pump will not cause a nuisance.
Rear of unit	300 (from rear of heat pump) 150 (from rear of oil boiler)	
Left-hand side	100	
Right-hand side (burner end)	600	Ensure that there is adequate clearance to remove the access panel, the burner and to work upon the control panel. IMPORTANT: This distance may have to be increased in order to comply with the flue terminal clearances. Refer to Section 13.3.

2.7.2 Oil Boiler Installed Internally

Table 2-10: Minimum clearances required for oil boiler installed internally

Aspect	Minimum clearance required (mm)	Notes
Top (above)	300	
Bottom (below)	N/A	
In front of unit	600	Ensure that there is adequate clearance to remove the front access panel.
Rear of unit	150	
Left-hand side	600	Ensure that there is adequate clearance to remove the condensate trap access panel and condensate trap.
Right-hand side (burner end)	600	Ensure that there is adequate clearance to remove the access panel, the burner and to work upon the control panel.

2.7.3 Heat Pump Installed Externally

For clearances for the heat pump (only) installed externally, refer to Section 3.5.2 and Figure 3-2 of the Installation and Servicing Instructions supplied with the Aerona³ unit.

3 Oil Storage and Supply System

3.1 Fuel Supply

Fuel Storage

The tank should be positioned in accordance with the recommendations given in BS 5410-1:2014, which gives details of filling, maintenance and protection from fire.

A steel tank may be used and must be constructed to BS 799-5:2010 and OFS T200.



CAUTION

A galvanised tank must NOT be used.

A plastic tank may be used and must comply with OFS T100.



NOTE

Plastic tanks should be adequately and uniformly supported on a smooth level surface, across their entire base area, that is, the area in contact with the ground.

Fuel Pipes

Fuel supply pipes should be of copper tubing with an external diameter of at least 10 mm.

Galvanised pipe must not be used.

All pipe connections should preferably use flared fittings. Soldered connections must not be used on oil pipes.



CAUTION

Flexible hoses must NOT be used outside the boiler casing.

A remote sensing fire valve must be installed in the fuel supply line, with the sensing head located above the burner.

Recommendations are given in BS 5410-1:2014.

A suitable oil filter with a minimum 15µ filtration must be installed in the oil supply line. A shut-off valve should be fitted before the filter, to allow the filter to be serviced.

A flexible fuel line, adaptor and 1/4" BSP isolation valve are supplied loose with the boiler for the final connection to the burner. If a two pipe system or 'Tiger Loop' type de-aerator is used, an additional flexible fuel hose (900 mm) and 3/8" to 1/4" BSP male adaptor are available to purchase from Grant UK (product codes: RBS35 and RBS36).

Metal braided flexible hoses should be replaced annually when the boiler is serviced. Long life flexible hoses should be inspected annually and replaced at least every 60 months.

Single pipe system - (refer to Figure 3-2 and Table 3-5)

With the storage tank outlet above the burner a single pipe system should be used. The height of the tank above the burner limits the length of pipe run from the tank to the burner.

As supplied the burner is suitable for a single pipe system.

Two pipe system - (refer to Figure 3-3 and Table 3-6)

With the storage tank outlet below the burner, a two pipe system should be used. The pipe runs should be as shown in Figure 3-2. The return pipe should be the same level in the tank as the supply pipe, both being 75 to 100 mm above the base of the tank. The pipe ends should be a sufficient distance apart so as to prevent any sediment disturbed by the return entering the supply pipe. Avoid the bottom of the tank being more than 3.5 m below the burner.

A non-return valve should be fitted in the supply pipe together with the filter and fire valve. A non-return valve should be fitted in the return pipe if the top of the tank is above the burner.

To be used with a two-pipe system, the burner must be fitted with an additional flexible fuel hose - a flexible fuel hose (900 mm) and 3/8" to 1/4" BSP male adaptor are available to purchase from Grant UK (product codes: RBS35 and RBS36).

The pump vacuum should not exceed 0.4 bar. Beyond this limit gas is released from the oil.

For guidance on installation of top outlet fuel tanks and suction oil supply sizing, see OFTEC Technical Book 3. Available from OFTEC.

Tiger Loop system - (refer to Figure 3-1 and 3-4)

When The storage tank outlet is below the burner, an alternative to a two pipe system can be achieved using a 'Tiger Loop' type oil de-aerator. This effectively removes the air from the oil supply on a single pipe lift.

The de-aerator is connected close to the boiler as a two pipe system (omitting the non-return valve) as shown in Figure 3-3.

Refer to the manufacturers instructions supplied with the de-aerator.

The de-aerator must be mounted vertically. See Figure 3-3 and 3-4.

To be used with a de-aerator, the burner must be fitted with an additional flexible fuel hose - a flexible fuel hose (900 mm) and 3/8" to 1/4" BSP male adaptor are available to purchase from Grant UK (product codes: RBS35 and RBS36).

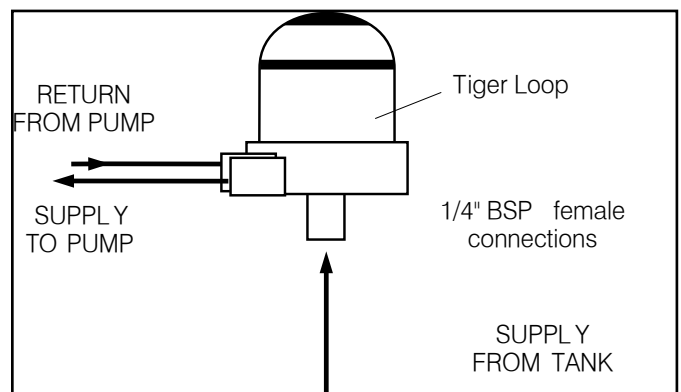


Figure 3-1: Tiger loop de-aeration device

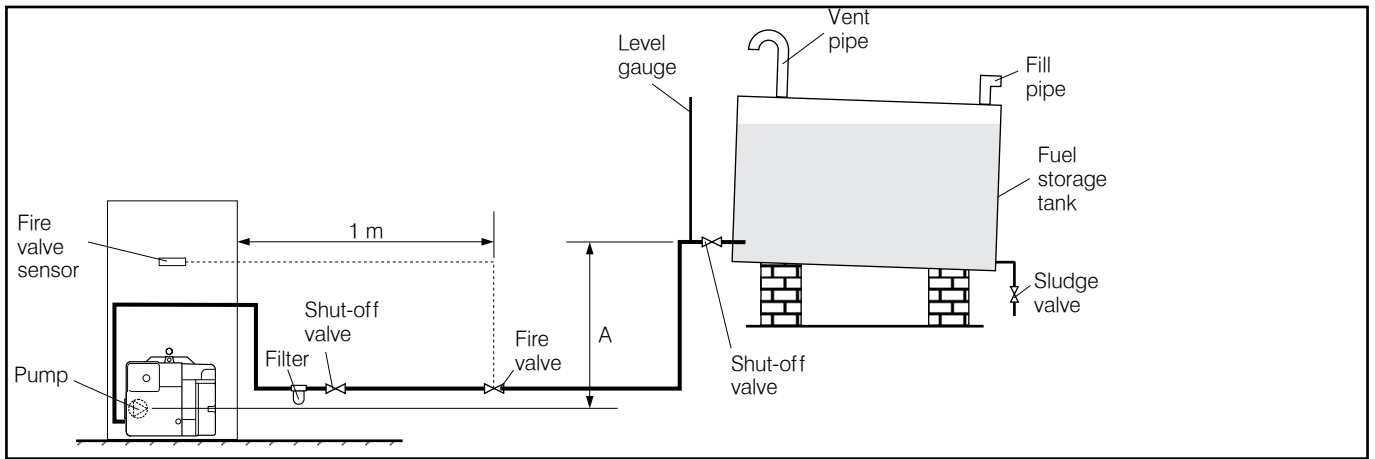


Figure 3-2: Single pipe system

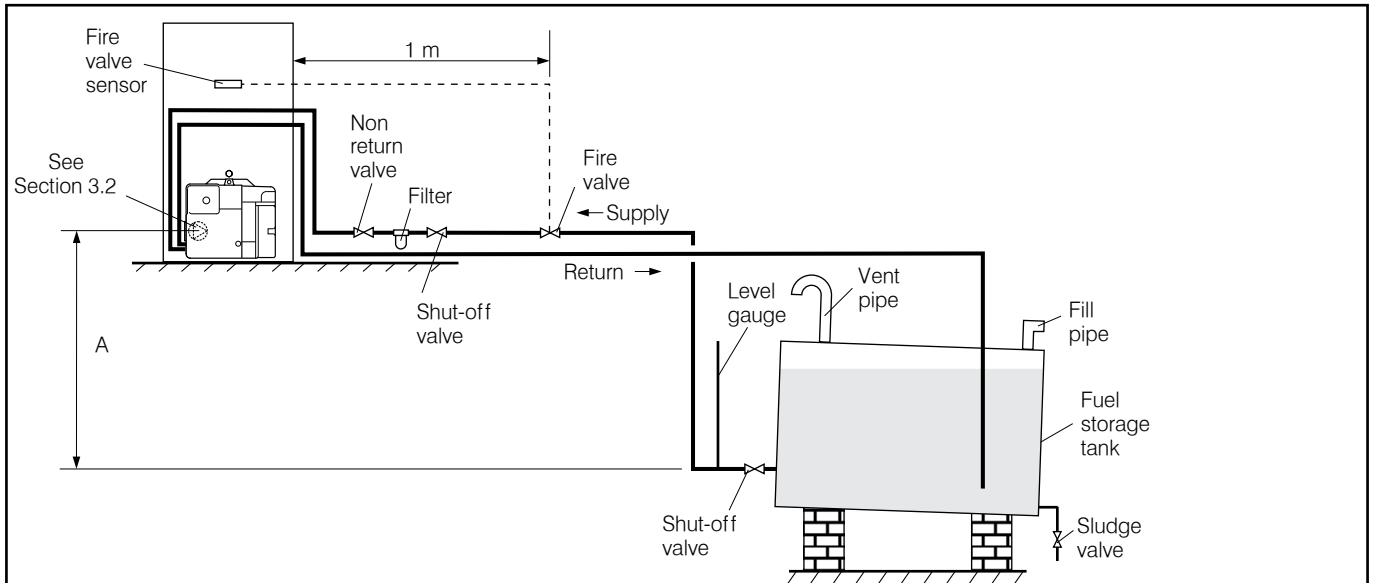


Figure 3-3: Two pipe system

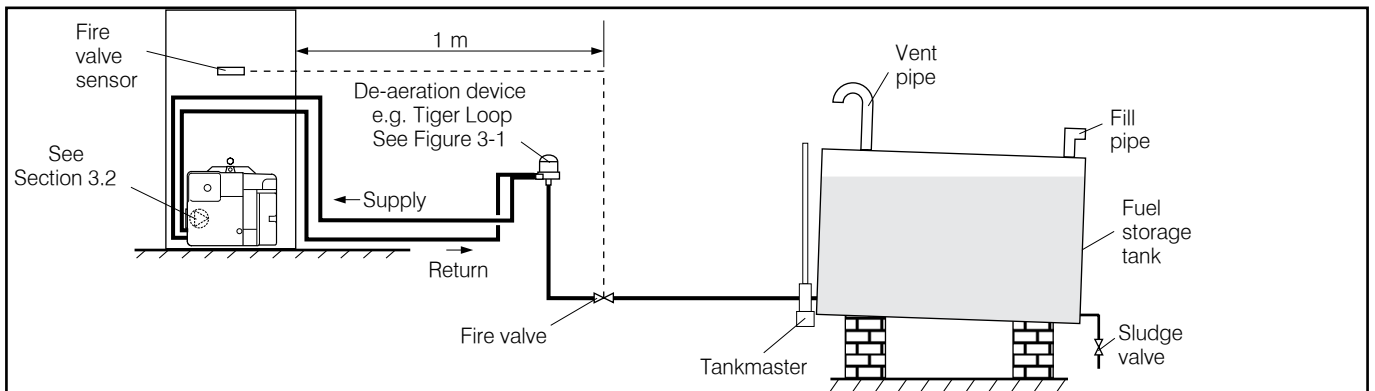


Figure 3-4: De-aeration device system

Table 3-5: Single pipe system maximum pipe runs

Head A (m)	Maximum pipe run (metres)	
	10 mm OD pipe	12 mm OD pipe
0.5	10	20
1.0	20	40
1.5	40	80
2.0	60	100

Table 3-6: Two pipe system maximum pipe runs

Head A (m)	Maximum pipe run (metres)	
	10 mm OD pipe	12 mm OD pipe
0	35	100
0.5	30	100
1.0	25	100
1.5	20	90
2.0	15	70
3.0	8	30
3.5	6	20

3.2 Burner Oil Connection

The burner fuel pump is supplied for use with a single pipe fuel supply system. For use on a two pipe system, it is necessary to fit the by-pass screw, as shown in Figure 3-7, into the tapping in the return port.

The by-pass screw is supplied in the boiler accessory pack.

1. Remove the plastic burner cover (secured by one screw).
For ease of access to the fuel pump, to fit the by-pass screw and connect the oil lines, the burner can be removed from the boiler. To do this, unscrew the single nut at the top of the burner (using a 13 mm spanner) and withdraw the burner from the boiler.
2. Remove and discard the blanking plug from the return connection of the pump and fit the by-pass screw using an hexagonal key.

! WARNING

The blanking plug supplied in the inlet (suction) port may now be plastic and will not provide an oil tight seal when the pump is running. Ensure that the supply from the tank is connected to this port and that the plastic plug is discarded.

3. Connect the return oil flexible fuel hose to the pump.
4. Connect the 3/8" to 1/4" BSP adaptor to the flexible fuel hose.

Flexible fuel hoses and adaptors are available to purchase from Grant UK. Refer to Section 1.8.

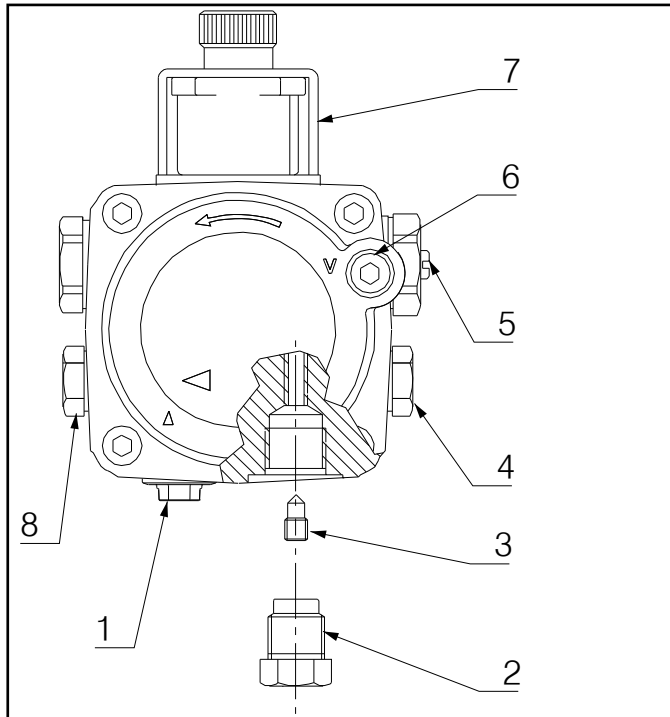


Figure 3-7: Riello RDB pump

Table 3-8: Riello RDB pump key

Item	Description
1	Inlet (suction) port
2	Return port
3	By-pass screw
4	Pressure gauge port
5	Pressure adjustment
6	Vacuum gauge port
7	Solenoid
8	Auxiliary pressure test point

3.3 Burner Components

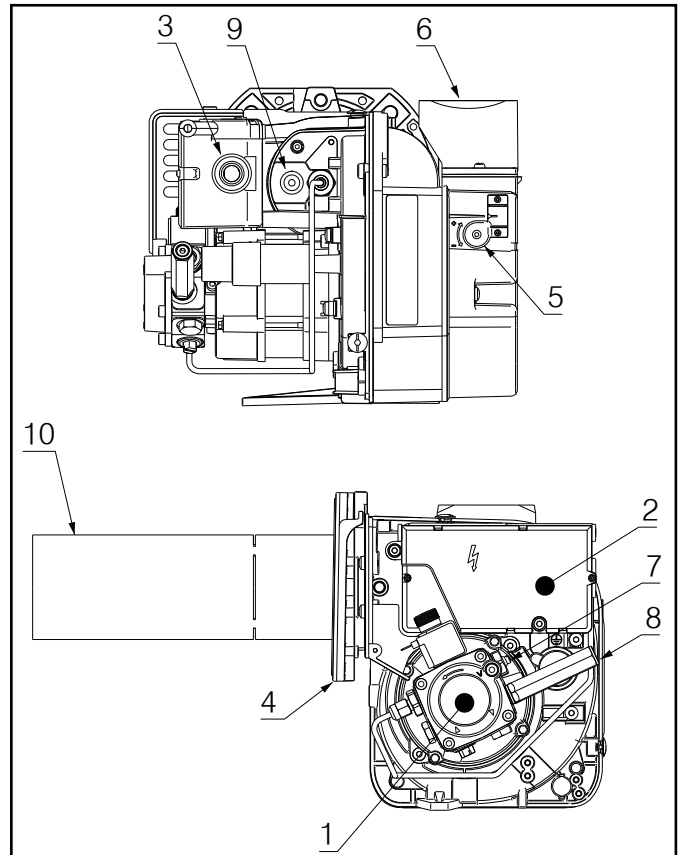


Figure 3-9: Riello RDB burner components

Table 3-10: Riello RDB burner components key

Key	Description
1	Oil pump
2	Digital control box
3	Reset push-button with lockout lamp
4	Flange with insulating gasket
5	Air damper adjustment screw
6	Snorkel (balanced flue) connection
7	Pump pressure adjustment screw
8	Pressure gauge port
9	UV sensor
10	Combustion head

4 Installation Information

4.1 Introduction



WARNING

Before starting any work on the boiler or fuel supply, please read the Health and Safety information given in Section 18 of these instructions.

Before starting any work on the heat pump, please read the Health and Safety information given in Section 14 of the Aeron³ installation instructions.

This section gives a general overview of the installation process with detailed installation information given in the following sections:

- Section 5 - Installing the Oil Boiler - pages 18 to 19
- Section 6 - Installing the Heat Pump - pages 20 to 21
- Section 7 - Installing the Heat Meters (where required) - pages 22 to 29



NOTE

It is recommended, where possible, to fit the heat meter during the installation of the oil boiler to avoid the need to drain the system at a later date.

4.2 VortexAir location

4.2.1 Selection of position

- Consider a place where the noise, air and flue discharge will not affect neighbours.
- Consider a position protected from the wind.
- Consider an area that reflects the minimum spaces recommended.
- Consider a place that does not obstruct the access to doors or paths.
- The surfaces of the floor must be solid enough to support the weight of the VortexAir and minimise the transmission of noise and vibration.
- Take preventive measures so that children cannot reach the unit.
- Install the VortexAir in a place where it will not be inclined more than 5°.
- When installing the VortexAir where it may be exposed to strong wind, brace it securely.

Decide the mounting position as follows:

- Install the VortexAir in a level location which can withstand the weight of the heat pump and vibration.
- Provide the indicated space to ensure good airflow.
- Do not install the VortexAir near a source of heat, steam, or flammable gas.
- During heating operation, condensate water flows from the heat pump. Therefore, install the heat pump in a place where the condensate water flow will not be obstructed.
- Do not install the heat pump where strong wind blows directly onto the heat pump or where it is very dusty.
- Do not install the VortexAir where people pass frequently.
- Install the VortexAir in a place where it will be free from adverse weather conditions as much as possible.
-

4.2.2 Noise Level (heat pump)

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

4.2.3 Orientation (heat pump)

The North face of the building will usually have colder ambient air than any other side. To ensure maximum efficiency from the Grant UK Aeron³ heat pump, position the heat pump on a warmer side. In order of preference, site the heat pump on a South face followed by either South East or South West, then by East or West. Only install on a North face if there is no other alternative.

4.3 Preparation for Installation

4.3.1 Base (boiler and heat pump installed externally)

The heat pump and boiler should be installed on a flat trowelled finished concrete base 150 mm thick. This base should extend at least 150 mm beyond the heat pump and boiler on three sides.

To avoid bridging the DPC, leave a gap of at approximately 150 mm between the concrete base and the wall of the house.

The VortexAir unit must be raised up from the base by approximately 100mm on suitable anti vibration mounts or blocks - two each for the boiler and the heat pump (refer to Table 1-4).

The VortexAir can be installed either against the building or 'free standing' some distance away from the building.

4.3.2 Base (boiler installed internally)

The boiler must stand on a firm and level surface. The boiler base temperature is less than 50°C so no special hearth is required.

4.3.3 Clearances

The **minimum** clearances given in Section 2.7 must be used to enable both the boiler and heat pump of the VortexAir to be easily commissioned, serviced and maintained and allow adequate air flow in and out of the heat pump.

4.4 Regulations and Standards

Installation of a Grant VortexAir must be in accordance with the following recommendations:

- Building Regulations for England and Wales, and the Building Standards for Scotland issued by the Department of the Environment and any local Byelaws which you must check with the local authority for the area.
- Model and local Water Undertaking Byelaws.
- Applicable Control of Pollution Regulations.

The following OFTEC requirements:

- OFS T100 Polythene oil storage tanks for distillate fuels.
- OFS T200 Fuel oil storage tanks and tank bunds for use with distillate fuels, lubrication oils and waste oils.

Further information may be obtained from the OFTEC Technical Book 3 (Installation requirements for oil storage tanks) and OFTEC Technical Book 4 (Installation requirements for oil fired boilers).

The installation should also be in accordance with the latest edition of the following British Standard Codes of Practice:

- BS 715 Metal flue pipes, fittings, terminals and accessories.
- BS 799:5 Oil storage tanks.
- BS 1181 Clay flue linings and flue terminals.

- BS 4543:3 Factory made insulated chimneys for oil fired appliances.
- BS 4876 Performance requirements for oil burning appliances
- BS 5410:1 Code of Practice for oil firing appliances.
- BS 5449 Forced circulation hot water systems.
- BS 7593 Code of Practice for treatment of water in heating systems.
- BS 7671 Requirements for electrical installations, IET Wiring Regulations.

For a list of recommendations and regulations to the heat pump, refer to the Installation and Servicing Instructions supplied with the heat pump.

4.5 Completion

Please ensure that the OFTEC CD/10 installation completion report (provided with the boiler) is completed in full.

Leave the top copy with the User.

Retain the carbon copy.

Ensure that:

- The User Information pack (supplied with the boiler) is handed over to the Householder.
- The householder is aware of how to use the product.
- The householder is aware of the need to refer to the online calculator and change the stat.
- The product is registered for the Grant product guarantee.

4.6 Before you Commission

4.6.1 Flushing and Corrosion Protection

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

This is especially important where the VortexAir is installed as a replacement for a boiler on an existing system.

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

For optimum performance after installation, this VortexAir and the central heating system must be flushed in accordance with the guidelines given in BS 7593:2006 'Treatment of water in domestic hot water central heating systems'.

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

After flushing, a suitable thermal fluid should be used (such as Sentinel R600) specifically designed for use in air source heat pump installations. This provides long term protection against corrosion and scale as well as the risk of the freezing in the external section of the heating system (i.e. the flexible hoses, condenser and circulating pump within the heat pump casing) in the event of power failure during winter months.

In order to avoid bacterial growth, due to the lower system operating temperatures, a suitable Biocide (such as Sentinel R700) should also be used in conjunction with the thermal fluid.

Both the thermal fluid and biocide should be added to the system water when finally filling the heating system.

Alternatively, Fernox HP5C can be used (or HP15C for greater frost protection).

This is a suitable thermal fluid that already contains a suitable biocide.

Full instructions on the correct use of thermal fluids and biocides are supplied with the products, but further information can be obtained from either www.sentinel-solutions.net or www.fernox.com.

Failure to implement the above guidelines by fully flushing the system and using a suitable thermal fluid and biocide corrosion inhibitor will invalidate the heat pump product guarantee.

Grant Engineering (UK) Limited strongly recommends that a Grant MagOne in-line magnetic filter/s (or equivalent*) is fitted in the heating system pipework. This should be installed and regularly serviced in accordance with the filter manufacturer's instructions.

** As measured by gauss. The MagOne magnetic filter has a gauss measurement of 12000.*



NOTE

We recommend that both antifreeze and corrosion inhibitor be used in the primary water system.

4.7 Heating System Design Considerations

To achieve the maximum efficiency possible from the Grant VortexAir, the heating system should be designed to the following parameters:

Radiators:

- Flow temperature 70°C, return temperature 50°C, differential 20°C

Underfloor:

- Flow temperature 50°C, return temperature 40°C, differential 10°C

Size radiators with a mean water temperature of 60°C.

Design system controls with programmable room thermostats or use weather compensating controls to maintain return temperatures below 55°C.



NOTE

The boiler should not be allowed to operate with return temperatures of less than 40°C when the system is up to operating temperature.

The use of a pipe thermostat is recommended to control the return temperature when using weather compensating controls.

4.8 Underfloor Heating Systems

In underfloor systems it is essential that the return temperature must be maintained above 40°C to prevent internal corrosion of the boiler water jacket.

4.9 Pipework Materials

Grant VortexAir units are compatible with both copper and plastic pipe. Where plastic pipe is used it must be of the oxygen barrier type and be of the correct class (to BS 7291-1:2010) for the application concerned.



WARNING

The first metre of pipework connected to both the heating flow and return connections of the boiler must be made in copper.

4.10 Underfloor Pipework

Plastic pipe may be used on underfloor systems where the plastic pipe is fitted after the thermostatic mixing valve.

Copper tube must be used for at least the first metre of flow and return primary pipework between the boiler and the underfloor mixing/blending valves.

5 Installation of the Oil Boiler

5.1 Preparation for Installation

1. Carefully remove the packaging from the boiler and remove it from the transit pallet.
2. The oil supply line should be installed up to the position of the boiler. Refer to Section 3 for details.
3. The final connection into the boiler enclosure can be made when the boiler is in position. Using 10 mm soft copper, route the oil line(s) into the boiler casing through the hole(s) provided in the lower left corner of the left-hand casing panel. Refer to Figure 1-7. Run it along the base of the enclosure (between rear casing panel and the boiler) up to the burner located at the right hand end of the enclosure. Refer to Section 3.2 for details of the connection to the burner.
4. Position the boiler in the final location required, raised up from the base by approximately 100 mm on suitable anti-vibration mounts. This location may be either inside or outside the building, as required.
 - If the boiler is to be installed externally (next to the heat pump), refer to Section 5.2.
 - If the boiler is to be installed internally (with the heat pump outside), refer to Section 5.3.

5.2 Installing the Oil Boiler – External location (next to the heat pump)

1. With the boiler in the required position, ensure that the flue terminal position complies with the necessary clearances. Refer to Section 2.8.
2. Mark the wall and drill holes for the system flow and return pipes. Refer to Figures 2-6 and 5-2 for the positions of the pipework connections in the boiler rear panel.
3. Make the water connections as described in Section 8.4. If access will be restricted, make any connections to the boiler (and heat pump) before placing it in its final position.
4. Pipework should be insulated where it passes through the wall.
5. The boiler must be fitted to a sealed heating system. Refer to Section 10 for details.
6. Ensure the requirements for the disposal of condensate as described in Section 9 are met.
7. Connect the power supply to the hybrid control panel (in the boiler) as described in Section 12.
8. Connect the flue system as described in Section 13.

5.3 Installing the Oil Boiler – Internal Location (with heat pump outside)

1. With the boiler in required position, ensure that the flue terminal position will comply with the necessary clearances. Refer to Section 2.7.
2. Prepare the wall for the pipework and flue system. Mark the wall and drill holes for the system flow and return pipes between the boiler and the heat pump. Refer to Figures 2-6 and 5-2 for the positions of the pipework connections in the boiler rear panel.
3. Mark the wall and make a hole for the flue system to pass through. Refer to Section 13-4 for the correct hole position.
4. Fit the flue system to the boiler as detailed in Section 12.5. Ensure that there is an adequate air supply to the boiler if required. Refer to Section 12.2.
5. Make the water connections as described in Section 8.4. If access will be restricted, make any connections to the boiler (and heat pump) before placing it in its final position.
6. The boiler must be fitted to a sealed heating system. Refer to Section 10 for details.
7. Ensure the requirements for the disposal of condensate as described in Section 9 are met.
8. Connect the power supply to the hybrid control panel (in the boiler) as described in Section 12.

5.4 Boiler Only Operation (inside or outside location)

5.4.1 Heat pump flow and return connections

If the boiler and heat pump are not to be installed at the same time, but the boiler is required to operate immediately, e.g. following an emergency boiler replacement, the boiler can be operated as a 'stand-alone' unit.

To do this the heat pump flow and return connections on the boiler, located at the rear of the left side casing panel, must be connected together.

This can be done by using 1" BSP x 28mm compression connectors, as follows:

1. Using a suitable thread sealant or PTFE tape, screw one of the connectors into the 1" BSP 'Heat Pump Flow' connection on the boiler.
2. Repeat the above process to fit the second connector to the 1" BSP 'Heat Pump Return' connection on the boiler.
3. Make a 'U' section of 28mm Copper pipe (using either two compression or capillary elbows). Fit this into the two compression connections on the boiler to complete the loop and tighten both compression fittings.
4. Insulate the connection between the heat pump flow and return connections. Even though this loop may only be a temporary measure, until the heat pump is installed, it MUST be insulated using a suitable external insulation material.
5. Fill the sealed heating system as described in Section 10 of these instructions.
6. Vent the system to remove trapped air using the manual air vents located inside the boiler enclosure (refer to Figures 8-2 and 8-3).



WARNING

If the boiler is to be used without the heat pump fitted, the heat pump flow and return connections on the boiler **MUST** be connected together, as described above, **BEFORE** the system and boiler are filled with water.

5.4.2 'Boiler only' controls

If the boiler is to be used as a 'stand-alone' unit, without the heat pump connected, the 'Oil/Hybrid' switch on the Hybrid control panel (in the boiler) **MUST** be set to 'Oil' for the boiler to operate.

Depending on the hot water controls option fitted, it may be necessary to alter either the connections to the heating system controls terminal block (in the hybrid control panel) in the boiler or change the control settings for the boiler to operate to heat a hot water cylinder. Refer to Section 11 for details of the hot water control options and Section 12 for details of the electrical connections.



WARNING

Any such changes to connections or settings **MUST** be reversed when the heat pump is connected to the boiler and operation of both together as a hybrid unit is required.

Table 5-1: Flow and return key

Item	Description	Item	Description
1	System return (1" BSP female)	4	Return (1¼" BSP male)
2	System flow (1" BSP female)	5	Heat pump return (1" BSP female)
3	Flow (1¼" BSP male)	6	Heat pump flow (1" BSP female)

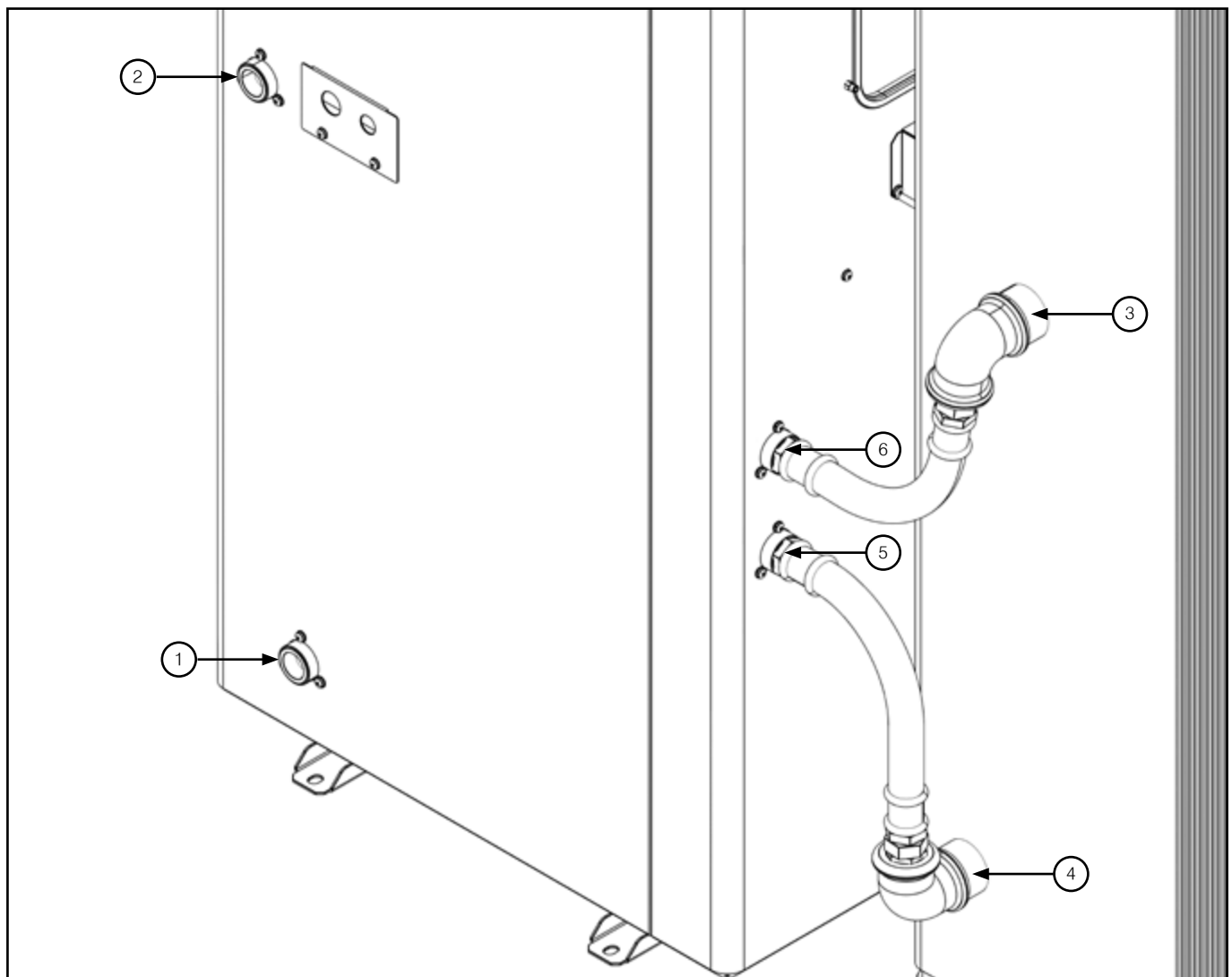


Figure 5-2: Flow and return connections

6 Installation of the Heat Pump



WARNING

Ensure that the electrical supply to the boiler has been isolated at the lockable isolator BEFORE commencing the installation and connection of the heat pump.

6.1 Preparation for Installation

- Carefully remove the packaging from the heat pump and remove it from the transit pallet.
- Position the heat pump in the final location required, raised up from the base by approximately 100 mm on suitable anti-vibration mounts.

This location may be either:

- Next to the boiler, if the boiler is installed externally. Refer to Section 6.2
- OR
- Freestanding outside, if the boiler is installed internally. Refer to Section 6.3



NOTE

If the boiler has been operated as a 'stand-alone' unit prior to the installation of the heat pump, the loop between the heat pump flow and return connections on the boiler (as described in Section 5.4.1) will now have to be removed to connect the heat pump.

To avoid draining the heating system it is possible to close valves in both the flow and return pipework within the boiler enclosure. Referring to Figures 8-2 and 8-3, the isolation valves for the heat meter flow sensor (13) and heat meter in the return (3) should be closed before removing the loop between the heat pump flow and return connections on the boiler.

6.2 Installing the Heat Pump – Next to Oil Boiler (External oil boiler)

6.2.1 Electrical connections

1. Before moving heat pump into final position, remove the wiring cover from the right hand end of the heat pump. Refer to Section 6 of the Installation Instructions supplied with the Aerona³ heat pump for details.
2. Remove the access panel from the front of the boiler casing. Unscrew and remove the eight screws that secure the access panel to the casing. Refer to Figure 12-1.
3. Working from inside the boiler enclosure, remove the internal access cover in the left casing panel of the boiler. Slacken off all six retaining screws. Lift the panel upwards and off the retaining screws using the keyhole slots.
4. Remove the two screws from the top left edge of the boiler enclosure and fit the top spacer plate provided with the boiler. Re-fit and tighten the screws to secure it in position on the boiler enclosure.
5. Manoeuvre the heat pump into position such that the top spacer plate butts against the heat pump enclosure across the full depth of the heat pump, giving a gap between the boiler and heat pump of 100mm.
6. Make the heat pump electrical supply connection between the heat pump electrical supply terminal block in the hybrid control panel (in the boiler) and the electrical supply terminal block in the Aerona³ heat pump.
Refer to Section 12 for electrical connection details. Figure 12-10 shows the location of this terminal block and Figure 12-11 is the connection diagram.
7. Make the heat pump controls connection between the heat pump controls terminal block in the hybrid control panel (in the boiler) and the Terminal PCB in the Aerona³ heat pump.
Refer to Section 12 for electrical connection details. Figure 12-12 shows the location of this terminal block and Figure 12-13 is the connection diagram.
8. Working from both outside and through the access opening in the left casing panel of the boiler, as required, replace the wiring cover on the right hand end of the heat pump and secure in place with the three fixing screws.
9. Replace the internal access cover in the left casing panel of the boiler. Fit the keyhole slots onto the six retaining screws. Pull it down and tighten the screws to secure it in position.
10. When all wiring connections have been made, re-fit the upper cover panel at the rear of the control panel and secure it using the two screws at the top of the cover. Refer to Figure 12-3.
11. Then replace the lower cover panel at the rear of the control panel and secure it using the two screws. Refer to Figure 12-3.
12. Replace the access panel on the front of the boiler casing. Re-fit and tighten the eight screws to secure the access panel to the casing. Refer to Figure 12-1.

6.2.2 Pipework connections

Make the flow and return connections between the boiler and heat pump, using the fittings provided with the boiler, as follows:

1. Using a suitable thread sealant or PTFE tape, screw one of the two flexible hoses into the 1" BSPF 'Heat Pump Flow' connection on the boiler.
2. Repeat the above process to fit the second flexible hose to the 1" BSPF 'Heat Pump Return' connection on the boiler.
3. Using a suitable thread sealant or PTFE tape screw the 1" BSPM x 28mm tail into the 1" x 1/4" elbow. Then fit the elbow to the flow connection (the higher of the two connections) on the rear of the heat pump.
4. Fit the 28mm compression connection on the end of the flexible hose from the heat pump flow connection (on to the boiler) on to the tail fitted to the heat pump flow connection. Tighten the compression connection.
5. It may be necessary to adjust the angle of the elbow/tail on the flow connection to align it with the compression connection on the end of the flexible hose.
6. Repeat steps 4 and 5 above to connect the heat pump return on the boiler with the flow connection on the heat pump.
7. Fill the sealed heating system as described in Section 10 of these instructions.
8. Vent the system to remove trapped air using the manual air vents located inside the boiler enclosure (refer to Figures 8-2 and 8-3) and also the automatic air vent in the heat pump (refer to Section 1 of the Installation Instructions supplied with the Aerona³ heat pump).

6.3 Installing the Heat Pump – Separate from Oil Boiler (Internal oil boiler)

6.3.1 Electrical connections

1. Move the heat pump into the required final position. Ensure that it does not obstruct the flue terminal and that the flue terminal position complies with the necessary clearances. Refer to Section 2.8.
2. Remove the wiring cover from the right hand end of the heat pump. Refer to Section 6 of the Installation Instructions supplied with the Aerona³ heat pump for details.
3. Remove the access panel from the front of the boiler casing. Unscrew and remove the eight screws that secure the access panel to the casing. Refer to Figure 12-1.
4. Make the heat pump electrical supply connection between the heat pump electrical supply terminal block in the hybrid control panel (in the boiler) and the electrical supply terminal block in the Aerona³ heat pump.
Refer to Section 12 for electrical connection details. Figure 12-10 shows the location of this terminal block and Figure 12-11 is the connection diagram.
5. Make the heat pump controls connection between the heat pump controls terminal block in the hybrid control panel (in the boiler) and the Terminal PCB in the Aerona³ heat pump.
Refer to Section 12 for electrical connection details. Figure 12-12 shows the location of this terminal block and Figure 12-13 is the connection diagram.
6. Replace the wiring cover on the right hand end of the heat pump and secure in place with the three fixing screws.
7. When all wiring connections have been made, re-fit the upper cover panel at the rear of the control panel and secure it using the two screws at the top of the cover. Refer to Figure 12-3.
8. Then replace the lower cover panel at the rear of the control panel and secure it using the two screws. Refer to Figure 12-3.
9. Replace the access panel on the front of the boiler casing. Re-fit and tighten the eight screws to secure the access panel to the casing. Refer to Figure 12-1.

6.3.2 Pipework connections

Make the flow and return connections between the boiler and heat pump, using the fittings provided with the boiler, as follows:

1. Using a suitable thread sealant or PTFE tape screw one of the 1" x 1/4" elbows (supplied with the boiler) on to the flow connection (the higher of the two connections) on the rear of the heat pump.
2. Repeat the same process for the return connection (the lower of the two connections) on the rear of the heat pump.
3. Using a suitable thread sealant or PTFE tape, screw the 1" BSPM thread on one of the two flexible hoses (supplied with the boiler) into the elbow on the heat pump flow connection.
4. Connect the other end of this flexible hose to the flow pipe from the boiler using the 28mm compression connection.
5. Repeat the above process to fit the second flexible hose between the elbow on the heat pump return connection and the return pipe to the boiler.
6. It may be necessary to adjust the angle of the elbows on the heat pump flow and return connections to align it with the end of the flexible hoses.
7. Fill the sealed heating system as described in Section 10 of these instructions.
8. Vent the system to remove trapped air using the manual air vents located inside the boiler enclosure (refer to Figures 8-2 and 8-3) and also the automatic air vent in the heat pump (refer to Section 1 of the Installation Instructions supplied with the Aerona³ heat pump).

6.4 Heat Pump Parameter Settings

When connected to the boiler as part of the VortexAir Hybrid unit, some of the Control Parameter factory default settings must be changed. Refer to Section 15.11 of these Installation Instructions for details of the Control Parameters to be re-set.

Also, refer to Section 9 of the Installation Instructions supplied with the Aerona³ heat pump for guidance on how to access and change the Control Parameters.

7 Installation of Heat and Electricity Meters

7.1 General

As not all installations will require a heat meter and electricity meter, the Grant VortexAir Hybrid is supplied without any meters fitted. Usually only installations receiving a Renewable Heat Incentive (RHI) payment will require both these meters to be fitted.

Both meters are available as accessories from Grant UK for on-site fitting by the installer:

- Heat meter (Grant product code: HPIDMETER)
- Electricity meter (Grant product code: HPIDKW/HMETER)



NOTE

When required, only the meters supplied by Grant UK (as listed above) must be used with the Grant VortexAir hybrid.

In accordance with MCS metering requirements, the Grant VortexAir Hybrid is supplied 'meter ready' to allow both the heat meter and electricity meter to be easily fitted when required, as follows:

- The necessary temperature sensor points and valved sections are incorporated in the pipework (inside the boiler casing) for installation of the flow meter and temperature sensors of the heat meter.
- A purpose made (DIN rail) mounting and housing is provided for both the heat meter integrator unit and the electricity meter.
- A 1A fused power supply for the heat meter is provided within the meter housing.
- The incoming power to the heat pump is located inside the meter housing for connection to the electricity meter.

7.2 Heat Meter

When correctly installed, this heat meter will measure and record the heat produced by the heat pump only.

7.2.1 Description

The Sontex Superstatic 440 heat meter, supplied by Grant for use with the Grant VortexAir Hybrid, consists of the following components:

a) Integrator unit (Supercal 531)

This calculates the heat produced by the heat pump from the information provided by the flow meter and the two temperature sensors (see below). The heat produced by the heat pump, along with the flow and return water temperatures, can be displayed on the integrator screen if required.

Refer to Section 7.4 (or the Instructions supplied with the heat meter kit) for guidance on how to access the information available on the integrator screen.

When fitted, the integrator unit is located in a purpose made housing immediately above the control panel. Refer to Figure 7-1.

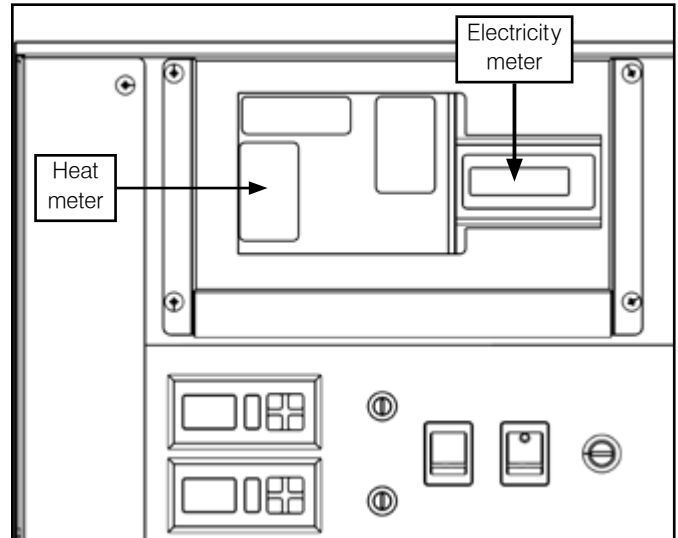


Figure 7-1: Location of integrator meter when fitted

b) Flow meter (fluid oscillator flow sensor)

This measures the flow of water in the primary circuit when the heat pump is operating. This flow rate can be displayed, if required, on the integrator screen.

The flow meter is installed in the heating return pipe to the heat pump. Refer to Figure 7-2. For details of how to install the flow meter refer to Section 7.2.1.

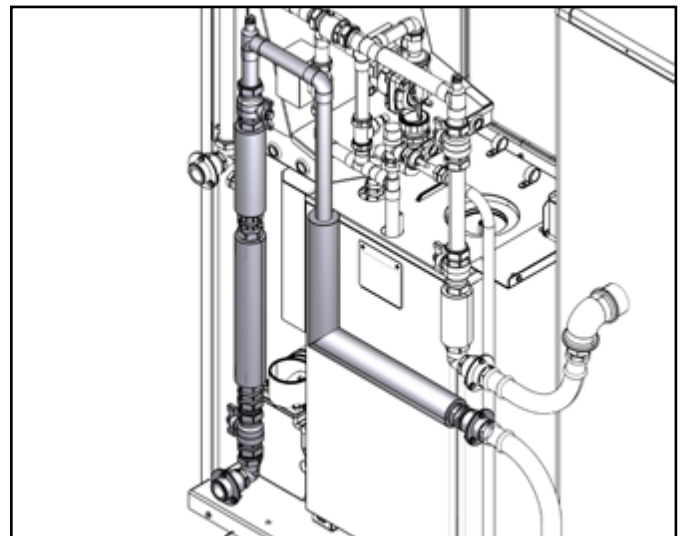


Figure 7-2: Heating return pipework

c) Return temperature sensor

This measures the return water temperature. This temperature can be displayed, if required, on the integrator screen.

The sensor is fitted in a 'dry pocket' (supplied with the heat meter kit) that is installed in a tapping located in the return pipe to the heat pump (just above the flow meter). Refer to Figure 7-2.

For details of how to install the return temperature sensor refer to Section 7.2.5.

d) Flow temperature sensor

This measures the flow water temperature. This temperature can be displayed, if required, on the integrator screen.

The sensor is fitted in a 'dry pocket' (supplied with the heat

meter kit) which is installed in a tapping located in the flow pipe from the heat pump. Refer to Figure 7-3.

For details of how to install the flow temperature sensor refer to Section 7.2.6.

WARNING

The two temperature sensors supplied with the heat meter are a matched pair. They must both be used together, and not replaced by any other sensor(s), as the sensors supplied have been calibrated with the heat meter. The sensor cables MUST NOT be either shortened or extended as this will affect the measuring accuracy of the heat meter. They should run independently of power cables to limit interference.



Figure 7-5: Kit contents (flow and return sensor coiled together)

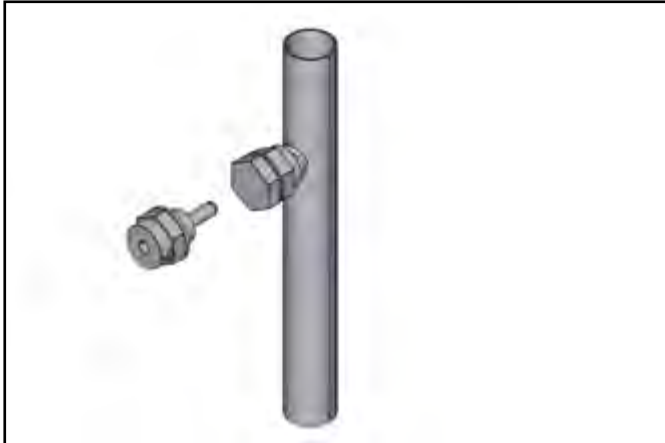


Figure 7-3: Sensor and pocket

7.2.2 Kit Contents

Before fitting the heat meter, check that you have all the necessary components, as follows (refer to Figure 7-4):

Table 7-4: Kit contents

Quantity	Item
1	Sontex Superstatic flow meter DN25 G1¼" (qp 3.5m³/hr)
1	Sontex Supercal 531 integrator
2	1¼" Union nut
2	1" BSP Union tail
2	Fibre washers
2 (not shown)	1" BSPM x 28mm compression connector
1	Pt500 flow temperature sensor (red tag)
1	Pt500 return temperature sensor (blue tag)
3 (not shown)	Sticker seals (refer to Section 7.2.8)
1 (not shown)	Calibration report (to be left with the end user following installation)
1 (not shown)	Sontex installation instructions (to be left with the end user following installation)

7.2.3 Fitting the Integrator unit

To fit the flow meter integrator unit, use the following procedure:

1. Remove the top panel of the VortexAir boiler. To do so, unscrew and remove the 10 screws around the four sides of the top casing panel. Lift the top panel up and off the boiler casing.
2. To access the control panel remove the boiler/burner access panel on the right hand side of the boiler casing. Turn the handle at the bottom clockwise to release the catch. Pull the panel forwards at the bottom and remove it from the boiler. Refer to Figure 7-6.

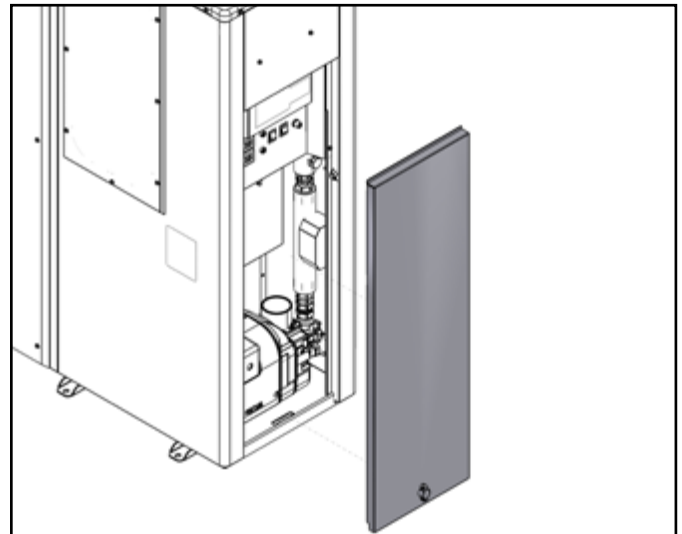


Figure 7-6: Removal of boiler access panel

3. Remove the upper panel on the right hand side of the boiler casing. Unscrew and remove the two panel retaining screws (accessed from inside casing), lift the panel straight up to disengage the two tags from their slots and remove the panel from the boiler casing. Refer to Figure 7-7.

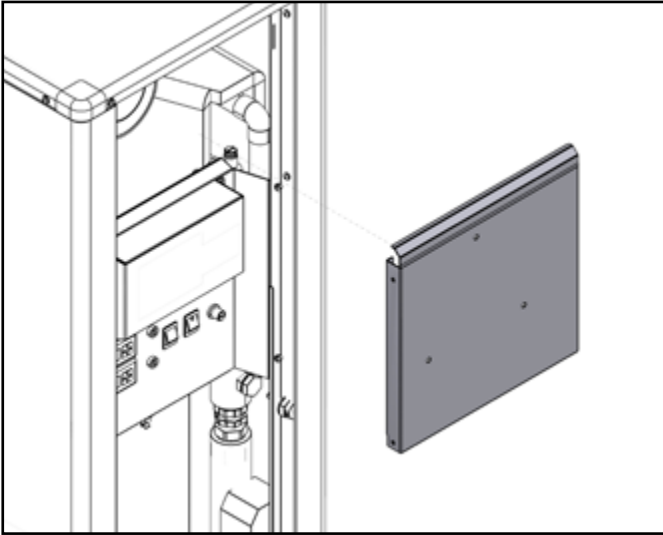


Figure 7-7: Removal of upper side casing panel

- Remove both the meter housing and cover (located immediately above the control panel) from the boiler. Unscrew the four screws (two on either side of the cover). The meter housing and cover will come away together from the boiler. Refer to Figure 7-8. Keep the four screws as they will be required to re-fit the retaining bracket.

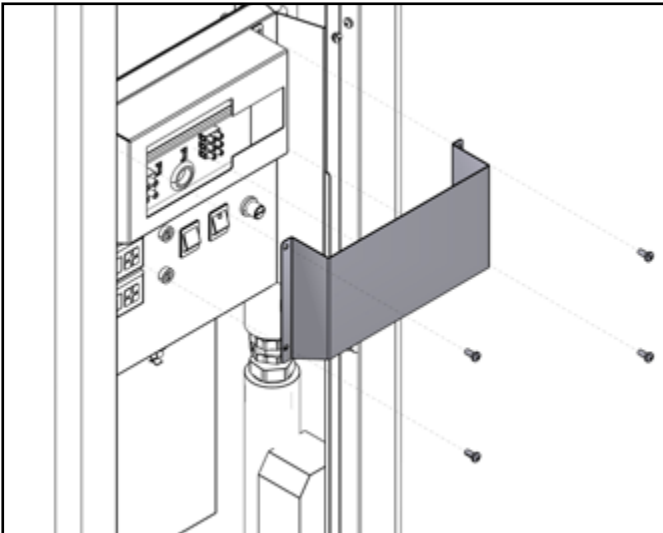


Figure 7-8: Removal of meter retaining bracket and cover

- Cut the retaining cable ties and move the heat meter and heat pump power supply cables to one side to gain access to the DIN rail located behind the meter housing. Refer to Figure 7-9.

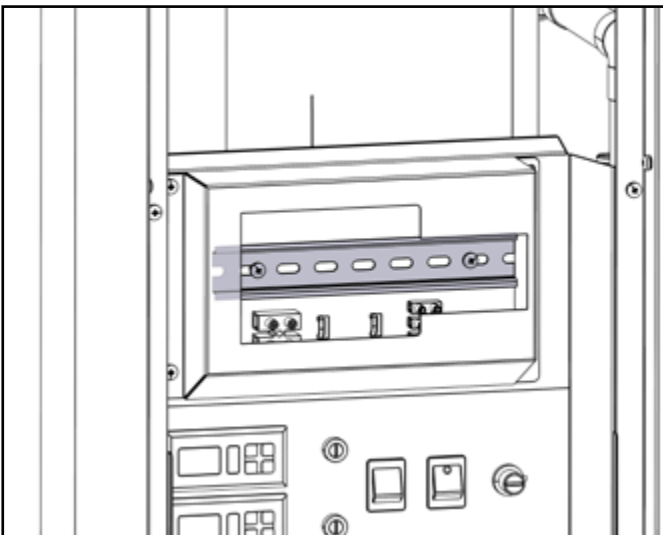


Figure 7-9: Meter housing and DIN rail (with cover removed)

- Take the integrator unit and press in the four clips (two on each side of the integrator unit) to release the front and carefully pull it forwards to remove it from the rear section of the unit.
- Pull out the tab on the rear of the LCD display to start the clock. Refer to Figure 7-14.
- Push back and pull up the white plastic tab visible above the top edge of the integrator (rear section) to open the DIN rail clip on the back. Locate the rear section of the integrator unit onto the DIN rail (at the left hand end of the rail) with the row of cable grommets at the bottom.
- Fully push the tab back down and check that the rear section of the integrator unit is securely attached to the DIN rail.

7.2.4 Fitting the flow meter



NOTE

Whilst the flow meter and temperature sensors are best fitted before the heating system is filled with water, they can be fitted after filling if necessary.

To fit the flow meter use the following procedure:

- Locate the removable section of pipe in the return to the heat pump. Refer to Figure 7-9.



CAUTION

If the heating system has already been filled with water ensure that the valves located both above and below this section of pipe are CLOSED before removing the pipe.

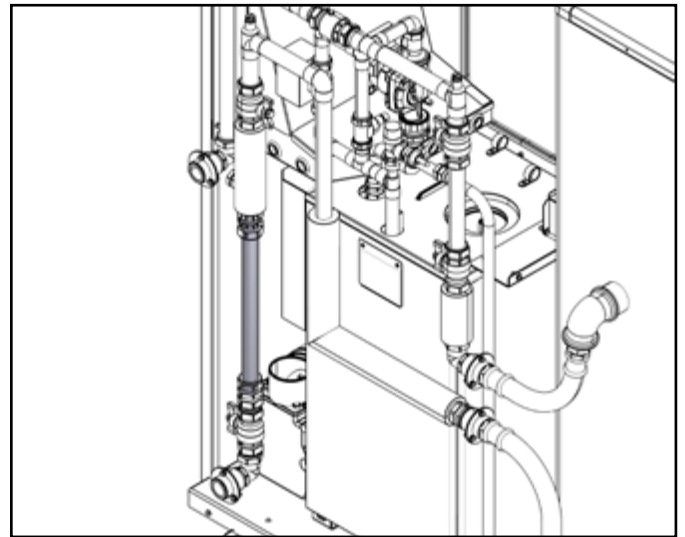


Figure 7-10: Location of removable pipe section

- Unscrew the compression nuts at both the upper and lower ends of the removable pipe section. Refer to Figure 7-10. Carefully lift the upper section of pipe just enough to remove the pipe with the fittings attached at each end.
- Remove the compression nut and olive from the 28mm compression x 1" BSPF fitting (supplied with the heat meter) and connect the fitting to the compression nut (just above the lower isolating valve). Refer to Figure 7-10.
- Using a suitable sealant or PTFE tape, fit one of the 1" BSP threaded tails (provided with the flow meter) into the 1" BSP socket. Ensure that the union nut is fitted on the tail BEFORE it is screwed into the socket.
- Repeat steps 3 and 4 above to fit the other 1" BSP threaded tail and union nut (provided with the flow meter) into the vacant upper 1" BSP socket. Refer to Figure 7-10.

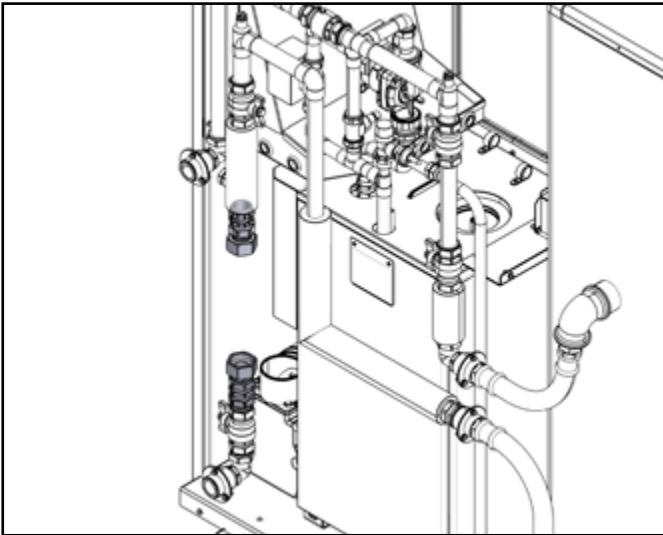


Figure 7-11: Fitting of flow meter connections

- Using the two fibre washers (provided with the flow meter), fit the flowmeter between the joint faces of the upper and lower tails and tighten the union nuts. Refer to Figure 7-12.



Ensure that the flow meter is installed such that the arrows on the body of the unit are pointing UPWARDS.

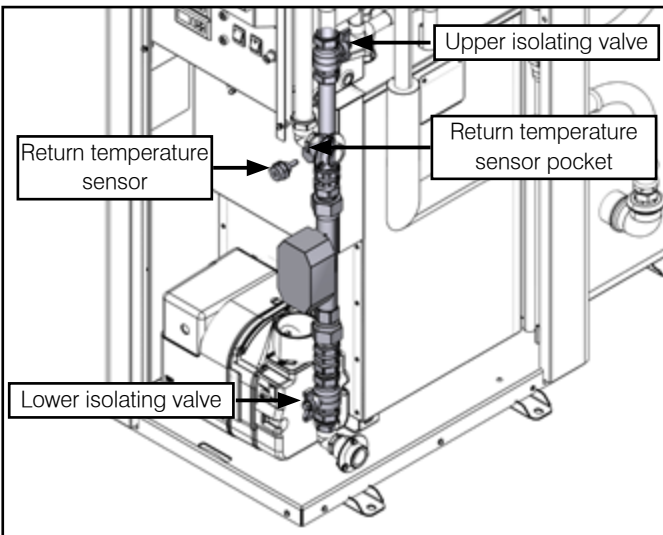


Figure 7-12: Flow meter fitted

- Carefully route the cable from the flow meter through one of the grommets in the side of the lower part of the control panel and up to the integrator unit, installed immediately above the control panel fascia.
- The connection terminals are located towards the bottom of the rear section of the integrator unit. Pierce the cable grommet located in the lower face of the integrator unit (below terminals 9, 10 and 11) and pass the flow meter cable through.
- The flow meter must be connected to terminals 10, 11 and 9 on the terminal block inside the Integrator unit, as follows:
 - White wire – terminal 10
 - Green wire – terminal 11
 - Brown wire – terminal 9



Ensure that the metal ferrule (at the end of the flow meter cable) is securely trapped under the metal cable clamp to ground the flow meter cable. Refer to Figure 7-13 (integrator connection diagram).



In order to comply with the Measuring Instruments Directive (MID) 2004/22/EU the flow meter cable MUST NOT be shortened. Any excess cable should be gathered up (coiled up) in a suitable location, i.e. where it will not restrict access to any component (valve, pump, etc.) within the boiler casing. They should run independently of power cables to limit interference.

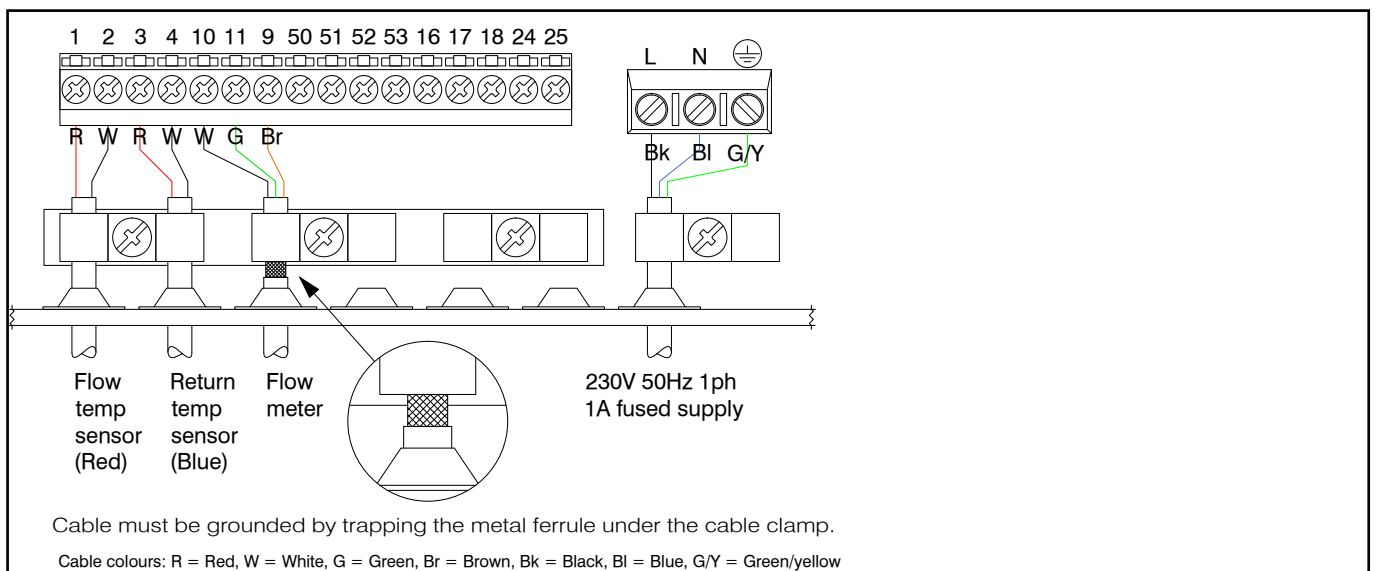


Figure 7-13: Integrator connection diagram

7.2.5 Fitting the return temperature sensor



CAUTION

The return temperature sensor MUST be fitted in return sensor pocket, as described below, and not fitted to (or on) the return pipe in any other way.

To fit the return temperature sensor, use the following procedure:

1. Locate the return temperature sensor point on the return pipe above the flow meter. Refer to Figure 7-12.



NOTE

If the heating system has already been filled with water ensure that the valves located both above and below this section of pipe are CLOSED before removing the plug from the sensor point.

2. Unscrew the plug from the temperature sensor point.
3. Using a suitable sealant or PTFE tape, fit one of the two temperature sensor pockets provided into the sensor point and tighten, but only enough to achieve a seal.
4. Slacken off the small clamp screw on the sensor pocket and fit the stainless steel sensor fully into the sensor pocket. To ensure the best operation of the temperature sensor (and heat meter), first inject some heat conducting grease (not provided) into the sensor pocket before inserting the sensor.

The sensor MUST be fitted fully into the pocket as far as it will go. Then tighten the small clamp screw to secure the sensor into the pocket. **DO NOT OVERTIGHTEN!**

5. Carefully route the cable from the return temperature sensor through the same grommet as the flow meter cable (in the side of the lower part of the control panel) and up to the integrator unit, installed immediately above the control panel fascia.
6. Pierce the cable grommet located in the lower face of the integrator unit (below terminals 3 and 4) and pass the flow meter cable through.
7. The return temperature sensor must be connected to terminals 3 and 4 on the terminal block inside the Integrator unit, as follows:
 - Red wire – terminal 3
 - White wire – terminal 4

Refer to Figure 7-13 Integrator connection diagram.

Ensure that the cable is securely held under the metal cable clamp.



NOTE

In order to comply with the Measuring Instruments Directive (MID) 2004/22/EU the flow meter cable MUST NOT be shortened. Any excess cable should be gathered up (coiled up) in a suitable location, i.e. where it will not restrict access to any component (valve, pump, etc.) within the boiler casing.

7.2.6 Fitting the flow temperature sensor



CAUTION

The flow temperature sensor MUST be fitted in flow sensor pocket, as described below, and not fitted to (or on) the return pipe in any other way.

To fit the flow temperature sensor, use the following procedure:

1. Locate the flow temperature sensor point. This is in the flow pipe just above the insulated boiler jacket return pipe above the flow meter. Refer to Figure 7-3.



NOTE

If the heating system has already been filled with water ensure that the valves located both above and below the flow temperature sensor point are CLOSED before removing the plug.

2. Unscrew the plug from the temperature sensor point.
3. Using a suitable sealant or PTFE tape, fit one of the two temperature sensor pockets provided into the sensor point and tighten, but only enough to achieve a seal.
4. Slacken off the small clamp screw on the sensor pocket and fit the stainless steel sensor fully into the sensor pocket. To ensure the best operation of the temperature sensor (and heat meter), first inject some heat conducting grease into the sensor pocket before inserting the sensor.

The sensor MUST be fitted fully into the pocket as far as it will go. Then tighten the small clamp screw to secure the sensor into the pocket. **DO NOT OVERTIGHTEN!**

5. Carefully route the cable from the flow temperature sensor through the same grommet as the flow meter cable (in the side of the lower part of the control panel) and up to the integrator unit, installed immediately above the control panel fascia.
6. Pierce the cable grommet located in the lower face of the integrator unit (below terminals 1 and 2) and pass the flow meter cable through.
7. The flow temperature sensor must be connected to terminals 1 and 2 on the terminal block inside the Integrator unit, as follows:
 - Red wire – terminal 1
 - White wire – terminal 2

Refer to Figure 7-12 Integrator connection diagram.

Ensure that the cable is securely held under the metal cable clamp.



NOTE

In order to comply with the Measuring Instruments Directive (MID) 2004/22/EU the flow meter cable MUST NOT be shortened. Any excess cable should be gathered up (coiled up) in a suitable location, i.e. where it will not restrict access to any component (valve, pump, etc.) within the boiler casing. They should run independently of power cables to limit interference.

7.2.7 Connection of mains power supply

The required power supply for the heat meter is factory fitted and terminated in a 3-way terminal block, located behind the meter housing when the cover plate is removed. Refer to Figure 7-9. This power supply is protected by a 1A fuse, located on the control panel. Refer to Section 14 (Control Panel).

To connect the mains power supply to the integrator unit, use the following procedure:

1. Unscrew the three terminals; remove the terminal block from the three wires and discard it.
2. Pierce the cable grommet located in the lower face of the integrator unit (below terminals L, N and) and pass the three wires through.
3. Connect them to the mains power terminals in the lower right hand corner of the integrator unit, as follows:
 - Black wire – terminal L (Live)
 - Blue wire – terminal N (Neutral)
 - Green/Yellow wire – terminal (Earth)

Refer to Figure 7-12 Integrator connection diagram.

Ensure that the wires are securely held under the metal cable clamp.

4. Finally, re-fit the front of the integrator unit to the rear section. Locate the four clips (two on each side of the front section) into the corresponding openings on the two sides of the rear section.
5. Carefully push the front onto the to rear section until it clips into place.

7.2.8 Security seals

Both the integrator and flow meter are supplied with factory-fitted calibration seals. These are to protect against unauthorised tampering, manipulation or dismantling of these items that will invalidate the product guarantee.

These seals are located as follows:

- Integrator unit - two stickers seals are located on the inner (rear) face of the front section of the integrator unit. Refer to Figure 7-14. These calibration seals must not be tampered with or removed.
- Flow meter - two seals (one a sticker and the other a wire seal) are located on the front face of the flow meter. Refer to Figure 7-15.

Following installation of the heat meter, three further user sticker seals (supplied with the heat meter) should be applied to the integrator unit, as follows:

- One user sticker seal must be stuck over the terminal screws on the flow meter connections (terminals 9, 10 and 11) on the integrator terminal block. Refer to Figure 7-16.
- Once the front section of the integrator unit is finally fitted to the rear section, two user sticker seals must be stuck over the joint between the front and rear sections. These two stickers should be located on the small flat area, on either side of the integrator unit, intended for this purpose. Refer to Figure 7-17.

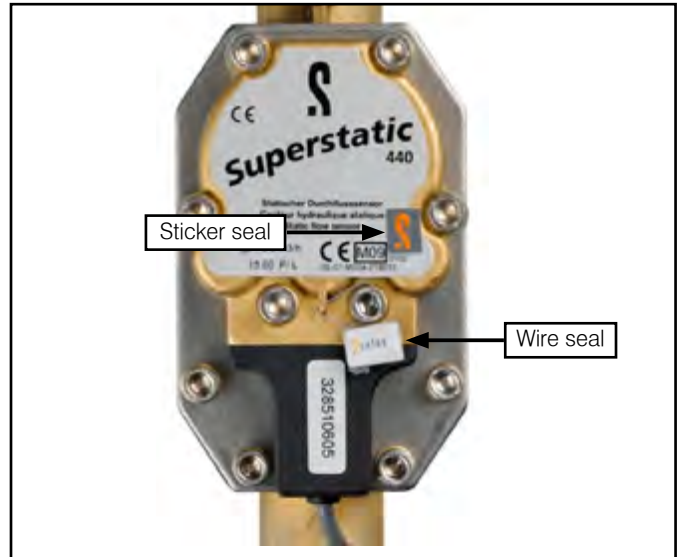


Figure 7-15: Calibration seals on flow meter



Figure 7-16: User sticker seal over flow meter connections



Figure 7-17: User sticker seal on assembled integrator unit

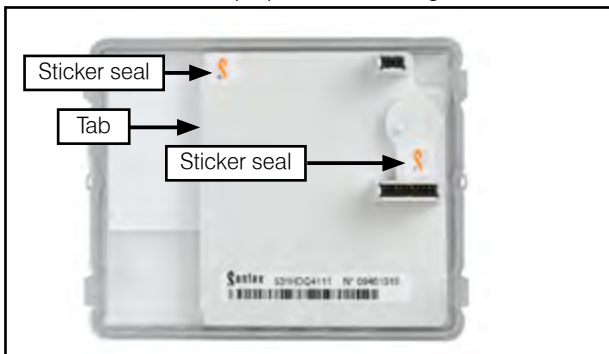


Figure 7-14: Calibration seals on rear of integrator front section

7.3 Electricity Meter

In accordance with MCS metering requirements, if a heat meter is required (e.g. in order to meet the requirements for an RHI tariff) an electricity meter will also have to be fitted.

This meter will record the electrical input to the heat pump only. This is necessary as the amount energy eligible for an RHI payment will be that produced by the heat pump MINUS the electrical energy supplied.

7.3.1 Description

The electricity meter supplied by Grant UK for use with the VortexAir Hybrid is a Rayleigh Instruments 230V 50Hz single phase meter, Type RI-76-100-P, rated at 100A.

For full details refer to either Section 2 of these Installation Instructions or the Information supplied with the meter.

7.3.2 Kit Contents

Before fitting the electricity meter, check that you have the following:

Table 7-18: Kit contents

Quantity	Item
1	Rayleigh Instruments Type RI-76-100-P electricity meter
1	Rayleigh Instruments installation instructions (to be left with the end user following installation)

7.3.3 Fitting the electricity meter

To fit the electricity meter, use the following procedure:

1. With the meter housing removed and the power supply cables moved to one side to gain access to the DIN rail located behind the meter housing. See Section 7.2.3 – Fitting the integrator unit.
2. Pull down the black plastic tab visible below the bottom edge of the meter to open the DIN rail clip and locate the rear of the meter onto the DIN rail (at the right hand end of the rail) with the meter display screen the correct way up.
3. Fully push the tab back up and check that the meter is securely attached to the DIN rail.
4. Unscrew the single retaining screw and remove the terminal cover at the bottom of the meter.
5. Remove the terminal block from the power supply wires and discard it.
6. Connect the four wires to the terminals on the electricity meter as follows:
 - Brown wire – terminal 1 (Supply Live)
 - Blue wire – terminal 3 (Supply Neutral)
 - Red wire – terminal 2 (Load Live)
 - Black wire – terminal 4 (Load Neutral)

There is no earth connection on the electricity meter.

Refer to Figure 7-19 (energy meter connection diagram).

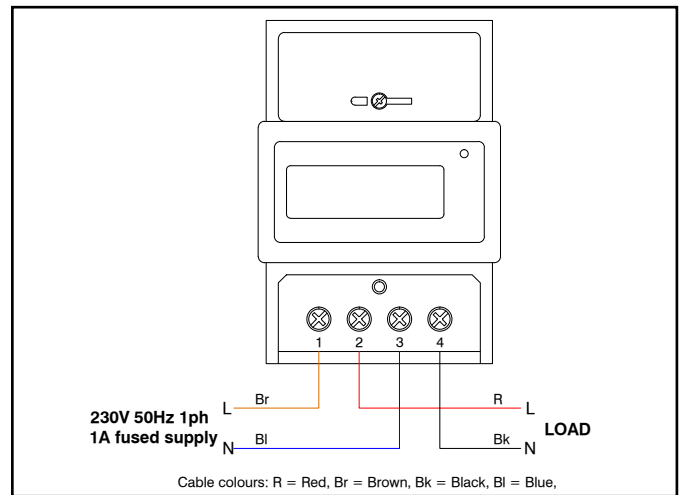


Figure 7-19: Electricity meter connection diagram

7. Re-fit the terminal cover to the electricity meter and secure with the retaining screw.
8. Re-fit the meter housing and secure in place with the four screws previously removed.

Ensure that:

- The electricity meter display screen protrudes through the opening in the front of the housing, and
- The display screen of the integrator unit is visible through the opening in the front of the housing and the two operating buttons are accessible.

7.4 Setting up the heat meter

7.4.1 Heat meter display

The heat meter integrator unit has an LCD screen to display a wide range of information. Refer to Figure 7-20.

The integrator has the following display sequence – see list printed on integrator fascia (below display screen):

- Favorite menu (if activated)
- Main menu (Billing relevant data)
- Set days
- Monthly values
- Average values
- Maximal values
- Configuration
- Service

The display levels can be customised; in number and in order of the display sequence.

7.4.2 LCD control concept



With the arrow key you can address the different menus or the positions within a menu. In the verification mode you can also increment with the arrow key the digits from 0...9.




By pressing the enter key you can confirm the menu or the position. When you keep pressing the enter key, you can by pressing the arrow key (at any Pos. and/or menu) get back to the different levels or by simultaneously pressing the enter key and the arrow key you can get back to the previous menu position.

After 3 minutes the display of the integrator switches automatically back to the main menu.

7.4.3 Error messages

If a fault should occur with the heat meter, an error message will be displayed on the intergrator LCD screen. This will be Err-sign together with a numbered code. If several errors occur at the same time, the numbers of the error codes are added.

The possible error messages are as follows:

- Err1 The supply sensor is short circuited or disconnected
- Err2 The return sensor is short circuited or disconnected
-  The temperature sensors are switched; the temperature sensor in the return (cooler) pipe is higher than the temperature sensor in the (flow) warmer pipe
- Err4 The flow rate too high for the flow meter
- Err8 EEPROM error in the integrator base (only active after the second incident)
- Err16 EEPROM error in the measurement and calibration part (only active after the second incident)
- Err32 Configuration error into the measurement and calibration part
- Err64 Configuration error into the integrator base
- Err128 Internal electronic failure, return to manufacturer
- Err256 Voltage drop (by mains supply or bus supply)
- Err512 Defective communication module connection place 1
- Err1024 Defective communication module connection place 2
- Err2048 Error pulse inputs additional meter A1
- Err4096 Error pulse inputs additional meter A2
- Err8192 Internal electronic failure, return to manufacturer

If an error lasts longer than an hour, the error will be registered in the error register with its date and time (beginning) and duration (in minutes).

When an error lasts less than 60 minutes the error will be automatically deleted without being memorized.

The two temperature sensor indicators are displayed on the cumulated energy by the main menu when:

- Temperature sensors are switched - this installation error mode happen with most installations during the summer time
- Temperature in the cooler line is higher than the one in the warmer line.

These error messages are automatically deleted from the LCD display 60 seconds after the error has been removed.

7.4.4 Battery back-up

The integrator unit is fitted with a back-up battery. This is supplied factory fitted with a jumper that permits activation or de-activation of the back-up battery.

For the back-up battery function to be activated, the jumper MUST be fitted. Refer to Figure 7-21. DO NOT remove this jumper as this will result in the battery back-up function being de-activated.



Figure 7-21: Back-up battery with jumper fitted

7.4.5 Menus

For details of the menu screens, refer to the instructions supplied with the electricity meter.

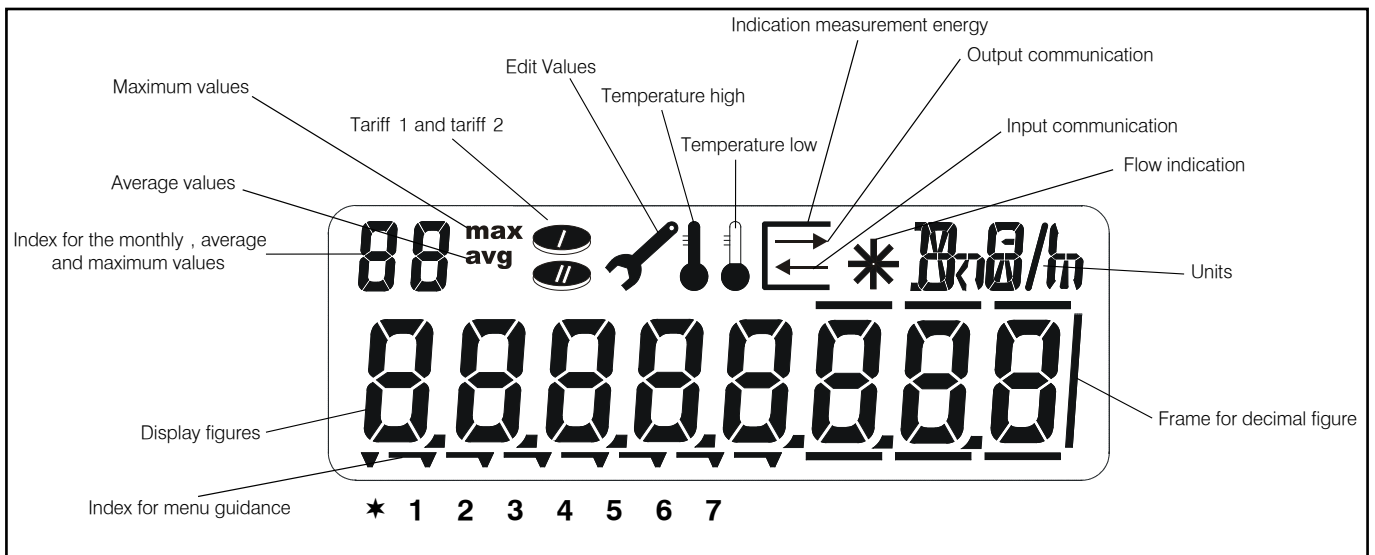


Figure 7-20: Integrator unit LCD screen

8 Internal Pipework

8.1 General

All the pipework and controls for the Grant VortexAir Hybrid are factory fitted within the boiler casing.

This includes the boiler circulating pump, boiler motorised valve, lockshield valve, isolating valves, etc. Refer to Figure 5-1.

8.2 Meter Ready

As not all applications will require a heat meter to be fitted, the Grant VortexAir Hybrid is supplied with the pipework 'meter ready'. It incorporates the necessary temperature sensor points and a valved pipework to allow the heat meter kit to be easily fitted, in accordance with MCS metering requirements, if required (e.g. in order to meet requirements for an RHI tariff). Refer to Section 7 on how to fit the heat meter and the electricity meter.

Table 8-1: Pipework key

Item	Description
1	Manual air vent - flow
2	Pressure relief valve
3	Isolation valve for heat meter - return
4	Heat meter
5	Isolation valve for heat meter - return
6	Non-return valve
7	Manual air vent - return
8	Motorised valve
9	Heat meter sensor pocket - return
10	Lockshield valve
11	Sensor pockets - high limit and boiler stat
12	Pump union c/w non-return valve
13	Isolation valve for heat meter sensor - flow
14	Circulating pump
15	Pump union c/w valve
16	Heat meter sensor pocket - flow
17	Isolation valve for heat meter sensor - flow

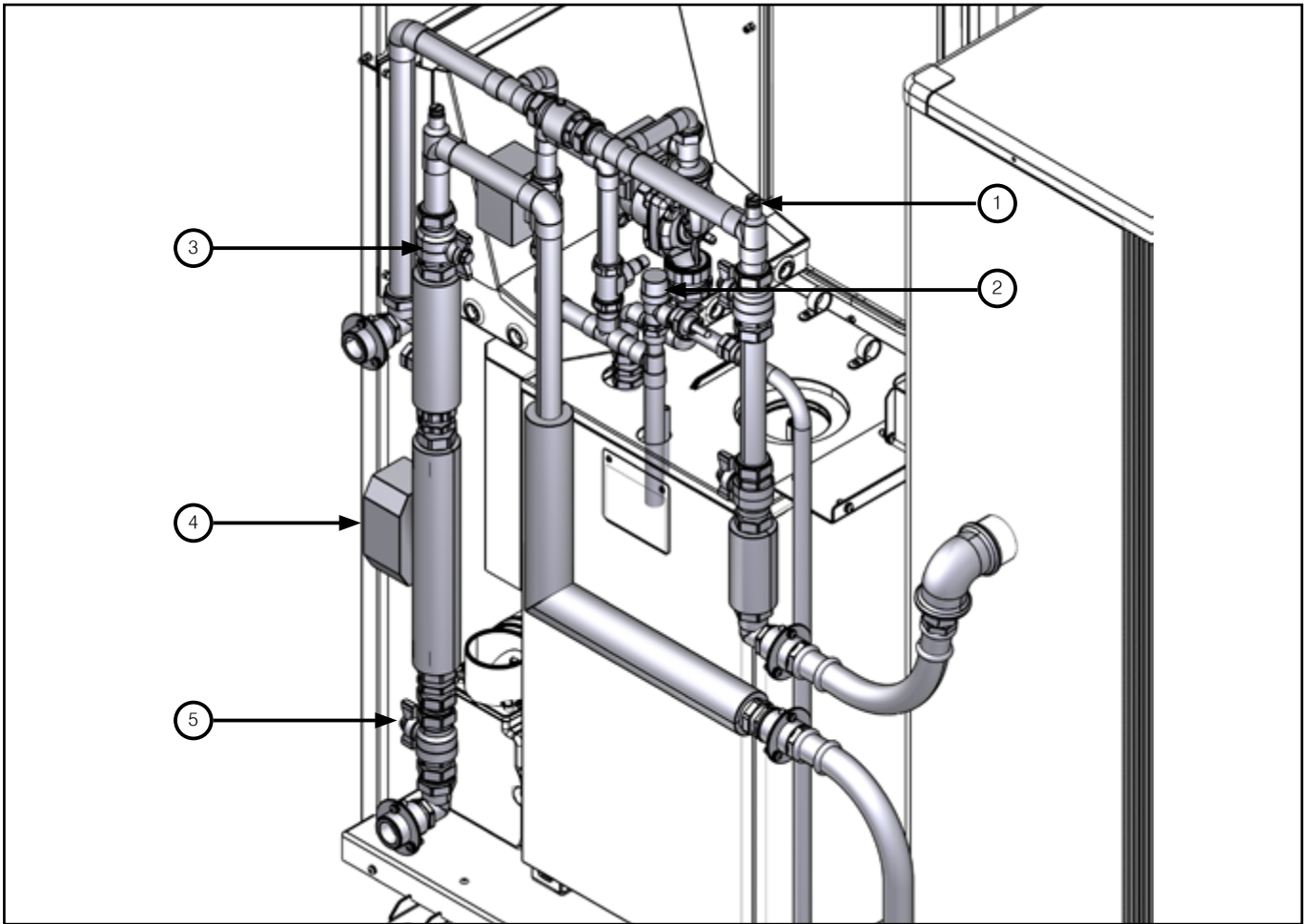


Figure 8-2: Hybrid pipework - rear view (rear, side and top panels removed)

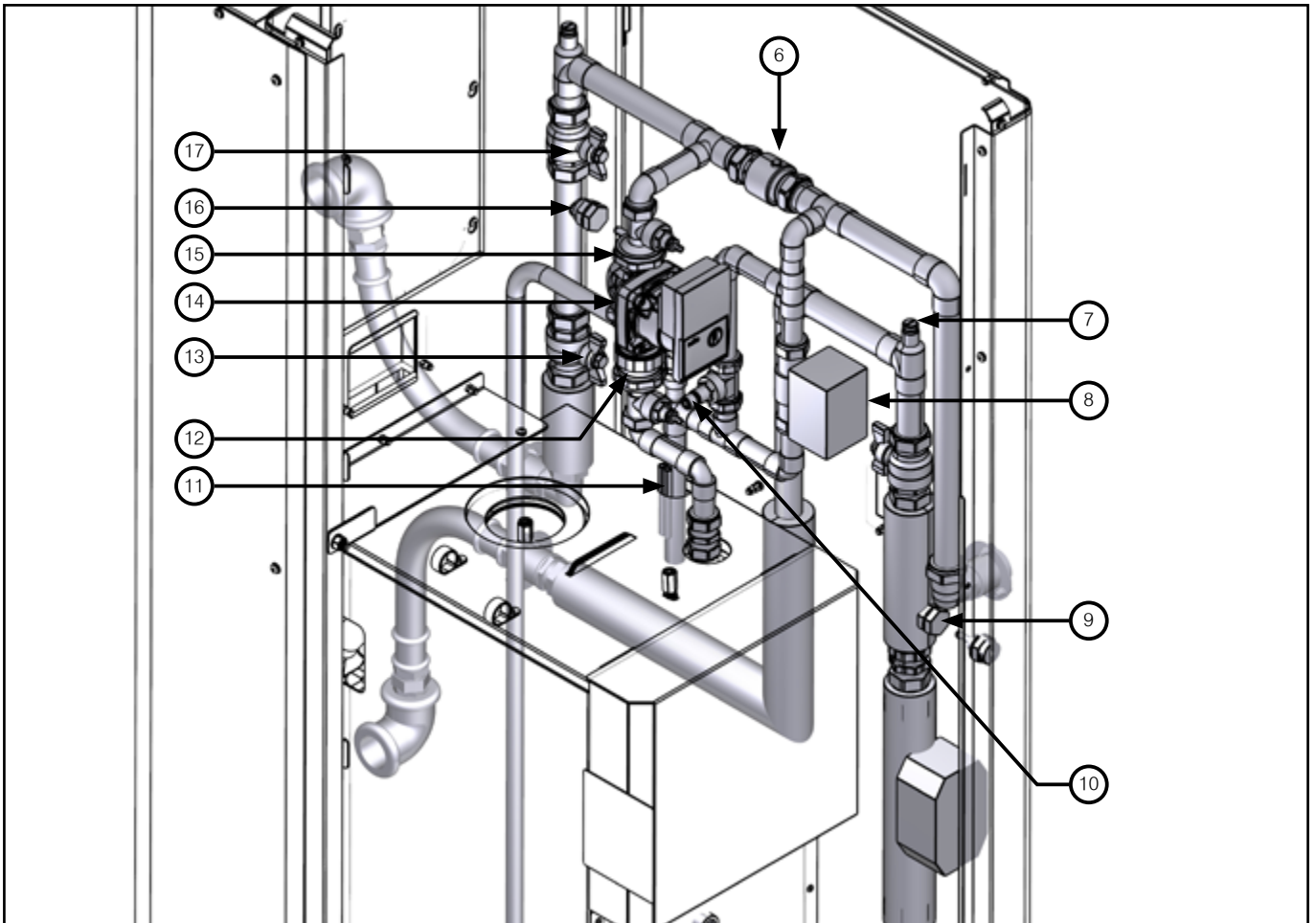


Figure 8-3: Hybrid pipework - front view (front, side and top panels removed)

9 Condensate Disposal

9.1 Heat Pump Condensate Disposal

The information below relates to the oil boiler only.

For condensate disposal information relating to the heat pump, please refer to Section 3.5.3 of the Aeron³ installation and servicing instructions supplied with the heat pump.

9.2 General Requirements

When in condensing mode the Grant VortexAir boilers produce condensate from the water vapour in the flue gases.

This condensate is slightly acidic with a pH value of around 3 (similar to vinegar).

Provision must be made for the safe and effective disposal of this condensate.

Condensate can be disposed of using one of the following methods of connection:

Internal connection (preferred option):

- into an internal domestic waste system (from kitchen sink, washing machine, etc.)
- directly into the soil stack

External connection:

- into an external soil stack
- into an external drain or gully
- into a rainwater hopper (that is part of a combined system where sewer carries both rainwater and foul water)
- purpose made soakaway

All condensate disposal pipes must be fitted with a trap - whether they are connected internally or externally to a domestic waste system/soil stack or run externally to a gully, hopper or soakaway.

9.3 Connections

Connections into a rainwater hopper, external drain or gully should be terminated inside the hopper/drain/gully below the grid level but above the water level.

Condensate disposal pipes should not be connected directly into rainwater downpipes or to waste/soil systems connected to septic tanks.

Condensate should not be discharged into 'grey water' systems that re-use water used in the home (not including water from toilets).

It should be noted that connection of a condensate pipe to the drain may be subject to local Building Control requirements.

9.4 Pipework

Condensate disposal pipework must be plastic (plastic waste or overflow pipe is suitable).



NOTE

Copper or steel pipe is NOT suitable and MUST NOT be used.

Condensate disposal pipes should have a minimum 'nominal' diameter of 22 mm (¾") - e.g. use 21.5 mm OD polypropylene overflow pipe.

Condensate disposal pipes must be fitted with a fall (away from the boiler) of at least 2.5° (~45 mm fall per metre run).



NOTE

Where it is not possible for the pipe to fall towards the point of discharge - either internally into a waste system or externally to a gully (e.g. for boilers installed in a basement), it will be necessary to use a condensate pump.

Condensate disposal pipes should be kept as short as possible and the number of bends kept to a minimum.

Pipes should be adequately fixed to prevent sagging, i.e. at no more than 0.5 metre intervals.

9.5 External Pipework

Ideally, external pipework, or pipework in unheated areas, should be avoided. If unavoidable, external pipework should be kept as short as possible (less than 3 metres) and 32 mm waste pipe used to minimise the risk of ice blocking the pipe in freezing conditions.

The number of bends, fittings and joints on external pipes should be kept to a minimum to reduce the risk of trapping condensate.



NOTE

For a boiler installed in an unheated area such as an outhouse or garage, all condensate pipework should be considered as an 'external'.

9.6 Condensate Soakaway

To keep external pipework to a minimum, locate the soakaway as close as possible to the boiler but ensure it is at least 500 mm from building foundations and away from other services, e.g. gas, electricity, etc.

The condensate pipe may be run above or below ground level and can enter either the top or side of the soakaway tube. Refer to Figure 9-1.

Ensure that the drainage holes in the soakaway tube face away from the building.

Backfill both the soakaway tube, and the hole around it, with 10 mm limestone chippings.

Only use a soakaway where the soil is porous and drains easily. Do not use in clay soils or where the soil is poorly drained.



CAUTION

Any damage due to condensate backing up into the boiler due to a high water table, in the case of a soakaway, or flooded drains when the condensate disposal is via a gully or soil stack, is not covered by the Grant product guarantee.

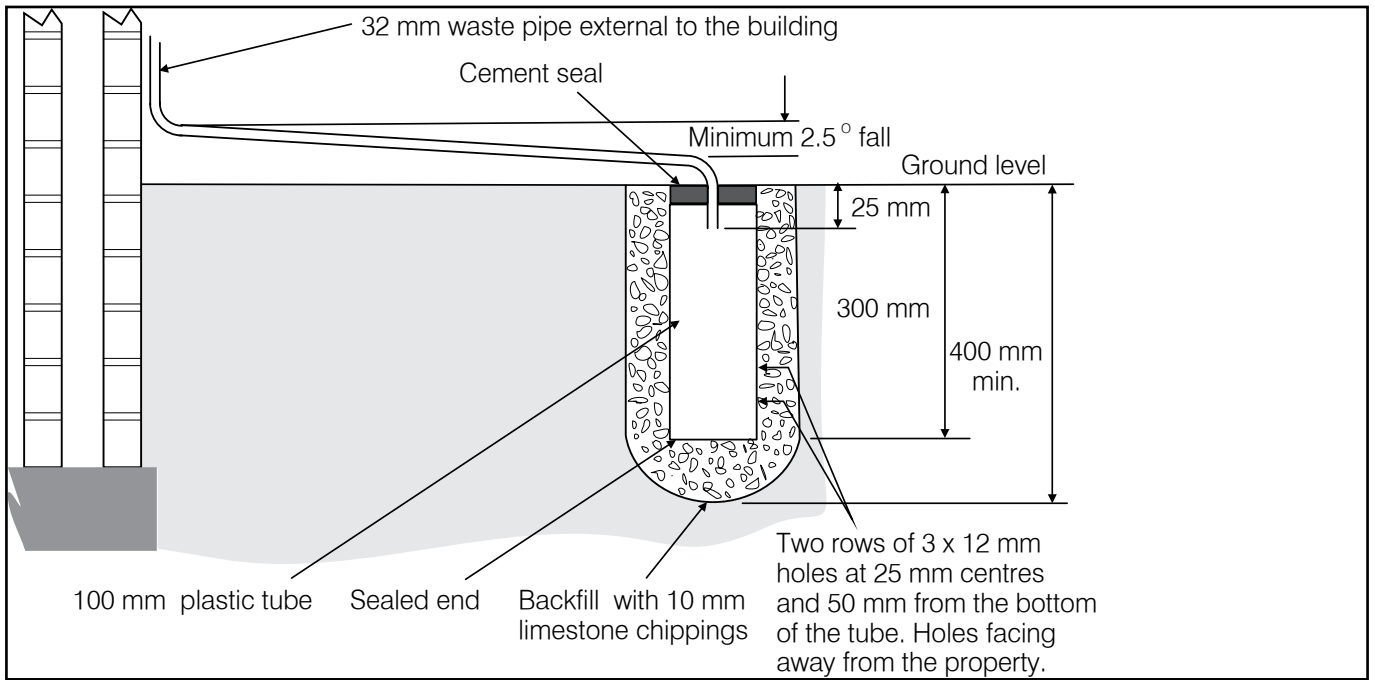


Figure 9-1: Purpose made condensate soakaway

9.7 Condensate Trap

The boiler of the Grant VortexAir hybrid is supplied with a factory-fitted condensate trap to provide the required 75 mm water seal in the condensate discharge pipe from the boiler.

This trap incorporates a float (which will create a seal when the trap is empty) and an overflow warning outlet (fitted with a plastic sealing cap), see Figure 9-2.

The trap is factory-fitted inside the boiler casing. It is located behind a removable panel in the lower front corner on the left side boiler casing panel. The outlet connection to the trap is directed towards the rear of the boiler. Refer to Figure 9-3.

The condensate discharge pipe should be run from the trap outlet and out of the casing through one of the holes provided; either in the case of the enclosure or next to the access panel of the trap. Refer to Figure 9-4.



NOTE

Access must be available to allow for routine maintenance.

A flexible hose connects the outlet of the condensing heat exchanger to the trap inlet. Ensure the straight connector on the hose is fully pushed onto the 'top hat' inlet connector of the trap.

With the trap fitted inside the boiler casing, the sealing cap must be fitted.

If connecting the condensate discharge (either internally or externally) into a waste system or soil stack - the sealing cap must be fitted in the trap outlet.

On external discharge systems to a hopper, gully or soakaway, the sealing cap should be removed from the trap outlet.

If there is any discharge of condensate from the overflow outlet, this could indicate a blockage (possibly due to freezing). Turn off the boiler and investigate the cause. If necessary contact your service engineer for assistance.

The condensate trap outlet is at an angle of 48° below the horizontal. This is to automatically give a 3° fall on any 'horizontal' runs of condensate disposal pipe. Refer to Figure 9-2.

9.8 Condensate Disposal Pipework

The outlet of the trap will accept 21.5 mm to 23 mm OD Polypropylene overflow pipe for the condensate discharge pipe.

Possible routes for disposal pipework

The boiler enclosure has several 30 mm diameter opening in the left side panel (next to the trap access panel). There is also a second opening in the base of the boiler unit. Refer to Figure 9-4. Either of these openings can be used to allow the condensate disposal pipe to exit the enclosure in one of the following ways:

Side outlet:

The opening on the left side of the enclosure can allow the condensate disposal pipe to be installed as follows:

- Connection to an internal stack – passing back through the wall of the house.
- Connection to an external soil stack adjacent to the boiler.
- Discharge into an adjacent (external) drain or gully.
- Discharge into a soakaway – with pipe either above or below ground level.

Bottom outlet:

The opening in the base that can allow the condensate disposal pipe to be installed as follows:

- Discharge into a drain or gully beneath the boiler (e.g. drain built in to the concrete base for the boiler).
- Discharge into a soakaway – with pipe below ground level.

When connecting plastic discharge pipe, ensure that the pipe is fully pushed into the outlet end on the flexible pipe to prevent the possibility of leakage.

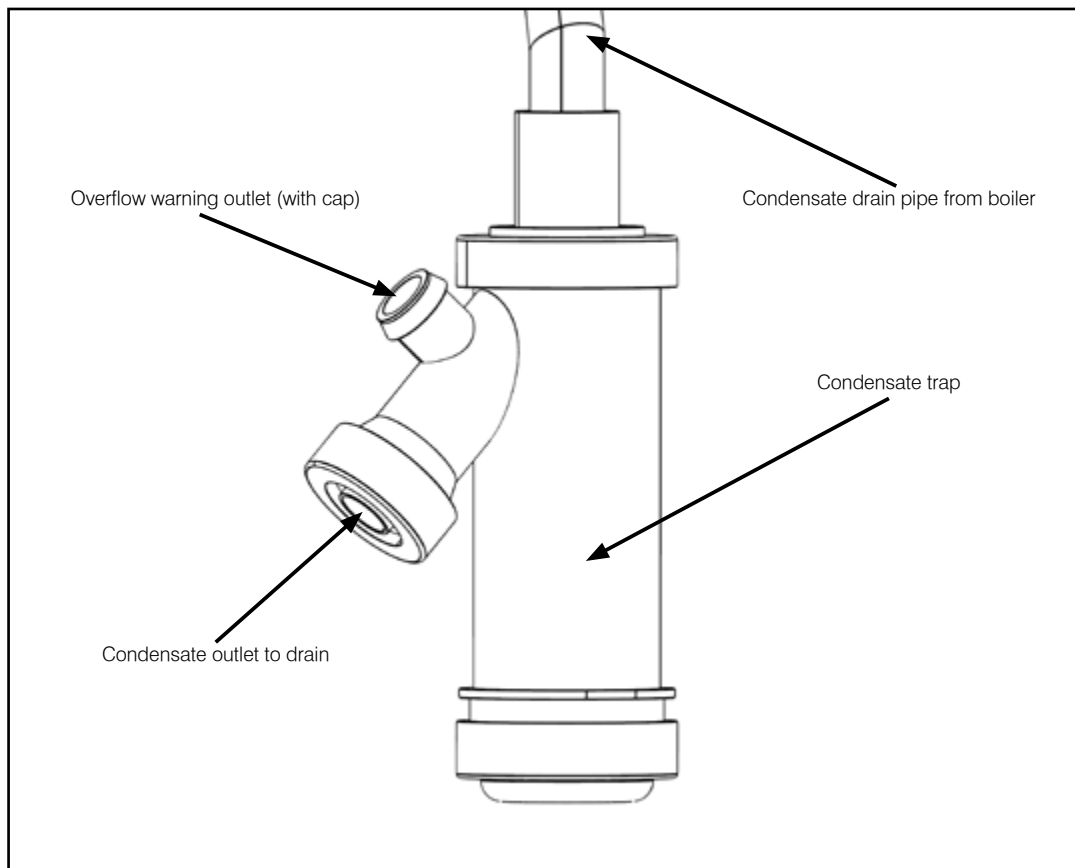


Figure 9-2: Condensate trap

9.9 Inspection and Cleaning of Trap

The trap must be checked at regular intervals (e.g. on every annual service) and cleaned as necessary to ensure that it is clear and able to operate.

To inspect and clean the trap:

1. Disconnect flexible condensate hose from inlet connector.
2. Unscrew the inlet connection nut.
3. Remove the inlet connector and nut from trap.
4. Remove trap from bracket.
5. Remove float from trap – clean if necessary.
6. Inspect inside of trap and clean as necessary.
7. Re-assemble trap, re-fit to boiler and re-connect flexible hose. Ensure that hose is fully pushed onto the trap inlet connector.

4. Push out pre-cut 'knock-out' from the condensate outlet hole in the rear of left side casing panel.
5. Remove the right angle end of the flexible condensate discharge hose from the outlet connection on the condensing heat exchanger.
6. From the front of boiler, remove the straight connector end of the flexible hose from the top of the condensate trap.
7. Reverse the flexible hose and pass the straight connector end through the new hole in the left hand casing panel. Push the straight connector firmly onto the condensate outlet connection of the condensing heat exchanger - push on at least 20 mm.
8. Refit the left hand casing panel to the rear panel using the reverse procedure, ensuring all fixing screws are used.
9. Remove the trap from the mounting bracket.
10. Unscrew and remove the trap mounting bracket from the left side panel.
11. Fix the trap mounting bracket to the wall adjacent to the boiler in the required position.



CAUTION

Failure to regularly check and clean the condensate trap may result in damage to the boiler and will not be covered by the product guarantee.

9.10 Relocate the Trap

To re-locate the factory-fitted trap outside the boiler casing, use the following procedure:



NOTE

This procedure must be carried out before the boiler is installed.

1. Remove the top casing panel(s) from the boiler.
2. Unscrew and remove the screws fastening the left side panel to the rear casing panel of the boiler.
3. Carefully separate the left side and rear panels just enough to gain access to the condensate outlet on the left rear of the



NOTE

The top of the trap must be below the condensate connection on the boiler.

12. Re-fit the trap to the mounting bracket. The mounting bracket supplied with the trap must be used - the trap should not be supported by the condensate pipework only.
13. Connect the flexible condensate hose to the trap, pushing the right angle hose connector onto the trap inlet connection.



CAUTION

The flexible hose must fall continuously from the outlet to the top of the trap.

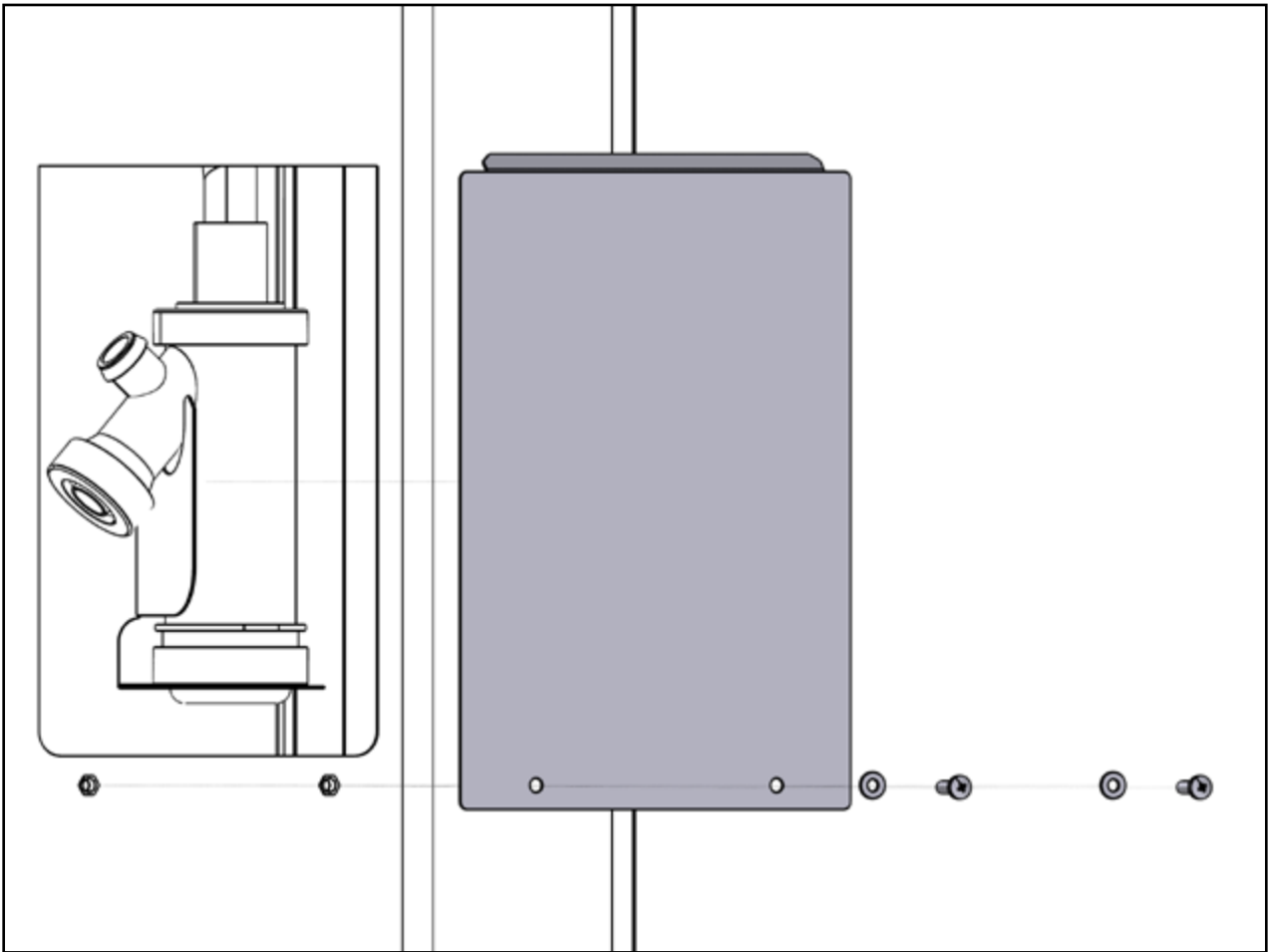


Figure 9-3: Location of trap (access cover removed)

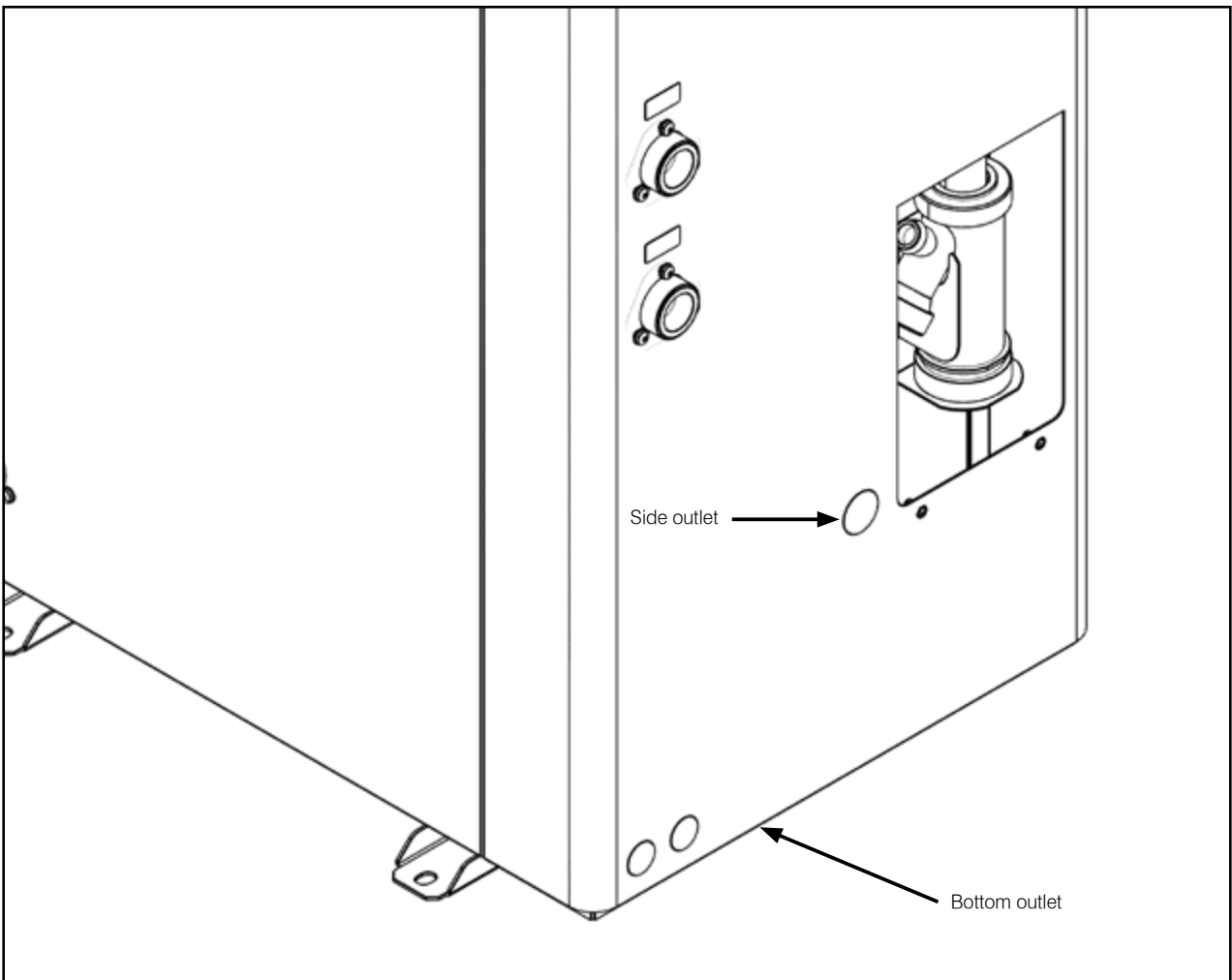


Figure 9-4: Location of openings for condensate disposal pipework

10 Sealed Systems

10.1 Sealed System Requirements

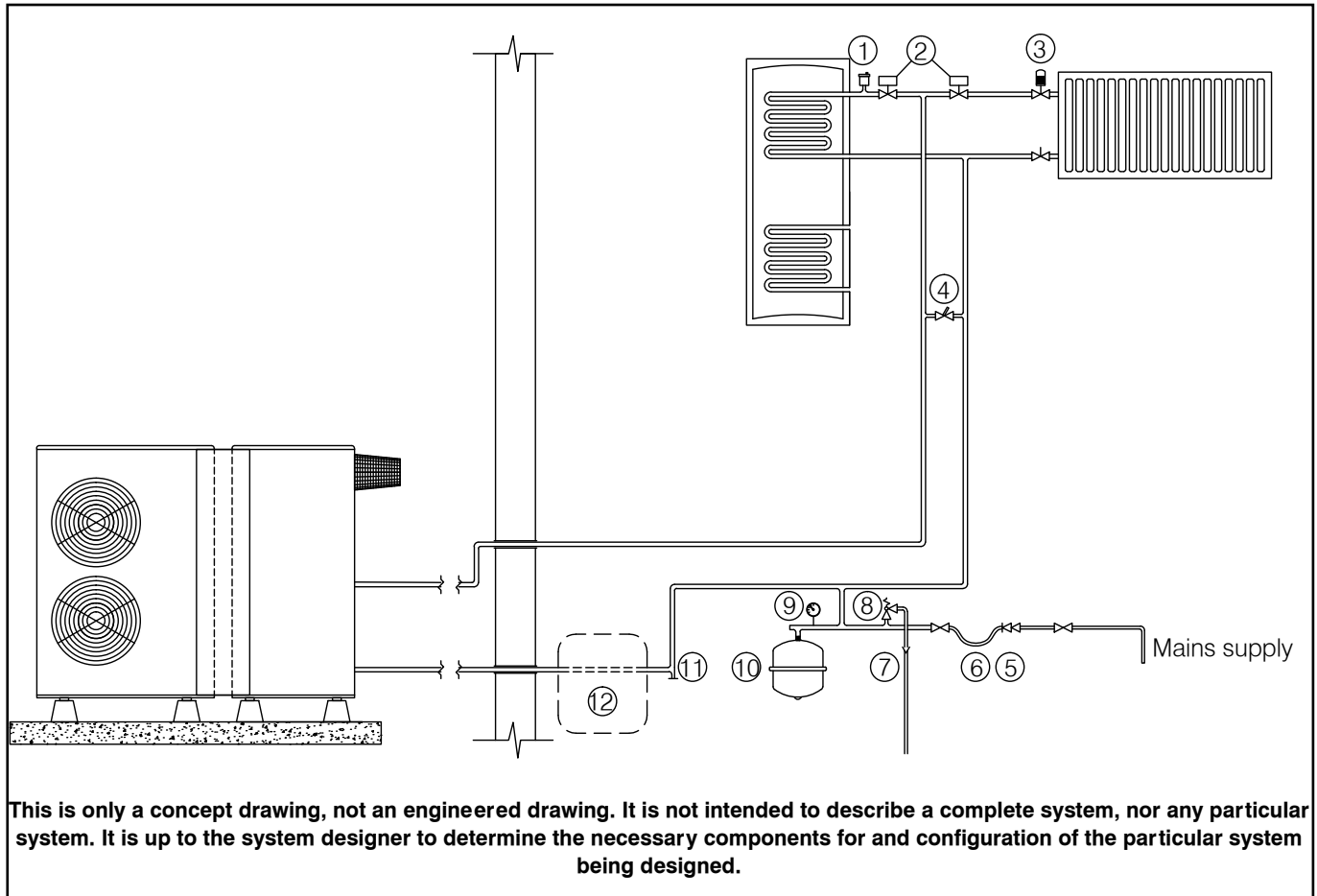


Figure 10-1: Sealed System heating components

Table 10-2: Sealed System heating components key

Key	Description
1	Automatic air vent
2	HW/HTG zone valves
3	Thermostatic radiator valve
4	Automatic bypass
5	Double check valve
6	Removable filling loop
7	Tundish
8	Pressure relief valve
9	Pressure gauge
10	Expansion vessel
11	Drain point
12	Extra system volume

All Grant Aerona³ heat pumps must be used with sealed systems complying with the requirements of BS EN 12828:2003, BS EN 12831:2003 and BS EN 14336:2004.

The system must be provided with the following items:

- Diaphragm expansion vessel complying with BS EN 13831:2007
- Pressure gauge
- Pressure relief (safety) valve
- Approved method for filling the system

Expansion vessel

The expansion vessel should be fitted in the return pipework as shown in Figure 4-1. To reduce the operating temperature of the expansion vessel, position it below the pipe to which it is connected.

The expansion vessel may be positioned away from the system, providing the connecting pipe is not less than 13 mm diameter. If the expansion vessel is connected via a flexible hose, care must be taken to ensure that the hose is not twisted.



NOTE

Ensure that the expansion vessel used is of sufficient size for the system volume. Refer to BS 7074:1:1989 or The Domestic Heating Design Guide for sizing the required vessel.

Pressure Gauge

The pressure gauge must have an operating range of 0 to 4 bar. It must be located in an accessible place next to the filling loop for the system.

Safety Valve

The safety valve (provided with the heat pump) is set to operate at 3 bar. It should be fitted in the flow pipework near to the heat pump.

The pipework between the safety valve and heat pump must be unrestricted, i.e. no valves. The safety valve should be connected to a discharge pipe which will allow the discharge to be seen, but cannot cause injury to persons or damage to property.

Filling Loop

Provision should be made to replace water lost from the system. This can be done manually (where allowed by the local water undertaking) using an approved filling loop arrangement incorporating a double check valve assembly.

The filling loop must be isolated and disconnected after filling the system.

Heating System

The maximum 'setpoint' temperature for the central heating water is 55°C.

An automatic air vent should be fitted to the highest point of the system.

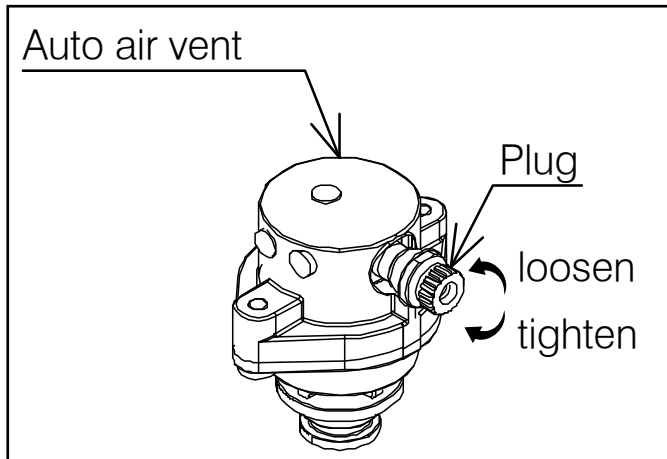


Figure 10-3: Auto Air Vent

If thermostatic radiator valves are fitted to all radiators, a system by-pass must be fitted. The by-pass must be an automatic type.

All fittings used in the system must be able to withstand pressures up to 3 bar. Radiator valves must comply with the requirements of BS 2767:1991.

One or more drain taps (to BS 2879) must be used to allow the system to be completely drained.

10.2 Filling the Sealed System

Filling of the system must be carried out in a manner approved by the local Water Undertaking.



WARNING

Only ever fill or add water to the system when it is cold and the heat pump is off. Do not overfill.

The procedure for filling the sealed system is as follows:

1. Check the air charge pressure in the expansion vessel BEFORE filling the system.

The expansion vessel charge pressure should always be approximately 0.2 bar lower than the maximum static head of the system, at the level of the vessel (1 bar = 10.2 metres of water).

Refer to Figure 10-1.

The charge pressure must not be less than the actual static head at the point of connection.

2. Check that the small cap (or screw) on all automatic air vents is open at least one turn. The cap (or screw) remains in this position until filling is completed and then it is closed.
3. Remove the front casing and loosen the plug on the automatic air vent located inside the heat pump. Refer to Figure 10-3.
4. Ensure that the flexible filling loop is connected and that the double check shut off valve connecting it to the water supply is closed. A valve is open when the operating lever is in line with the valve, and closed when it is at right angles to it.
5. Open the fill point valve.
6. Gradually open the double check valve from the water supply until water is heard to flow.
7. When the needle of the pressure gauge is between 0.5 and 1.0 bar, close the valve.
8. Vent each radiator in turn, starting with the lowest one in the system, to remove air.
9. Continue to fill the system until the pressure gauge indicates between 0.5 and 1.0 bar. Close the fill point valve. The system fill pressure (cold) should be 0.2 - 0.3 bar greater than the vessel charge pressure – giving typical system fill pressures of approx 0.5 bar for a bungalow and 1.0 bar for a two storey house.
Refer to the Domestic Heating Design Guide for further information if required.
10. Repeat steps 8 and 9 as required until system is full of water at the correct pressure and vented.
11. Water may be released from the system by manually operating the safety valve until the system design pressure is obtained.
12. Close the fill point and double check valves either side of the filling loop and disconnect the loop.
13. Check the system for water soundness, rectifying where necessary.



NOTE

The air charge pressure may be checked using a tyre pressure gauge on the expansion vessel Schraeder valve. The vessel may be re-pressurised, when necessary, using a suitable pump. When checking the air pressure, the water in the heating system must be cold and the system pressure reduced to zero.

10.3 Pressure Relief (Safety) Valve Operation

Check the operation of the pressure relief (safety) valve as follows:

1. Turning the head of the valve anticlockwise until it clicks. The click is the safety valve head lifting off its seat allowing water to escape from the system.
2. Check that the water is escaping from the system.
3. Top-up the system pressure, as necessary.



NOTE

The expansion vessel air pressure, system pressure and operation of the pressure relief valve must be checked on each service. Refer to Section 17.

11 Domestic Hot Water

11.1 Temperature Control



WARNING

There must only be ONE demand, for either heating (CH) or hot water (HW), on the VortexAir hybrid at a time. In all cases, the DHW demand MUST not clash with the CH demand, i.e. set the programmer such that the HW ON period(s) are different from the CH ON period(s) and do not overlap each other.

There are three options for the control of domestic hot water production using the Grant VortexAir hybrid.

These are as follows:

11.1.1 S-Plan type system (with standard cylinder)

With this system, the hot water can be heated to 60°C (in either the existing cylinder or a new cylinder) using the oil boiler only. The heat pump is not used to heat the hot water.

A heat pump cylinder, with a larger primary coil, is NOT required when using this hot water control option.

The system uses a standard 'S-Plan' type wiring arrangement with a two channel programmer, room thermostat, heating zone valve, hot water zone valve, cylinder dual thermostat and wiring centre. Refer to Section 12, Figure 12-7.



NOTE

With this hot water control system, the boiler of the VortexAir hybrid unit will operate to heat the hot water cylinder irrespective of whether the Oil/Hybrid switch is set to 'Oil' or 'Hybrid'. However, the Oil/Hybrid switch MUST be set to 'Oil' for the boiler of the VortexAir hybrid unit to provide heating in response to a CH demand.



NOTE

The first stage temperature (R1) on the Boiler Control Thermostat must be set to 0°C when commissioning the VortexAir hybrid. Refer to Section 17.6 of these Installation Instructions for details of setting procedure.

Boiler only installations (heat pump not yet installed)

This hot water control system will still operate to heat the hot water cylinder, even when only the boiler is installed (i.e. with no heat pump either installed or connected); provided the Oil/Hybrid switch on the hybrid control panel is set to 'Oil'. Refer to Section 14 for control panel details.

11.1.2 S-Plan type system with Grant Automatic DHW Boost Kit 2 (with heat pump cylinder)

With this system, the hot water can be heated to 50 - 55°C (in a heat pump cylinder) using the heat pump only.

A Grant heat pump cylinder, with a larger primary coil, MUST be fitted when using this hot water control option.

This system uses the standard 'S-Plan' type wiring arrangement with a two channel programmer, room thermostat, heating zone valve, hot water zone valve, cylinder dual thermostat, wiring centre and a

Grant Automatic DHW Boost Kit 2. Refer to Section 12, Figure 12-8 for wiring details.

The Automatic DHW Boost Kit 2 allows the cylinder immersion element to be used to raise the temperature to 60°C to sterilise the cylinder against Legionella. Refer to Section 11.2 – Legionella.

For further details of the Grant Automatic DHW Boost Kit 2 (Grant product code: HPDHWBK2) refer to Section 11.3.



NOTE

For this system to operate, the existing immersion switch must be left set permanently to ON. To totally prevent operation of the immersion element, the existing immersion switch must be set to OFF



NOTE

There must be a demand from the HW channel of the heating/hot water programmer for the Automatic DHW Boost Kit 2 to operate when required. When setting the ON period(s) on the Auto Boost Kit 2 timeswitch, ensure that they are within a HW ON period on the programmer.



NOTE

With this hot water control system, the heat pump of the VortexAir hybrid unit will NOT operate to heat the hot water cylinder, in response to a DHW demand, unless the Oil/Hybrid switch is set to 'Hybrid'.

Boiler only installations (heat pump not yet installed)

This hot water control system will NOT operate to heat the hot water cylinder, in response to a DHW demand, when only the boiler is installed (i.e. with no heat pump installed and connected).

A temporary change MUST be made to the control system connections at the Heating system controls terminal block (in the hybrid control panel) in order for the hot water heating function to operate. Refer to Section 12.3.2 for details.

As the boiler will be able to heat the cylinder to 60°C it will not be necessary for the Automatic DHW Boost Kit 2 to operate the immersion element whilst the DHW controls are temporarily connected in this way. Thus, the immersion switch MUST be set to OFF



CAUTION

As soon as the heat pump is installed and connected to the boiler, this temporary change to the control system connections MUST be reversed. Refer to Section 12.3.2 for details.

11.1.3 S-Plan type System with Grant digital two-stage cylinder thermostat (with heat pump cylinder)

With this system, the hot water temperature can be switched between two pre-set temperatures, as follows:

- 50°C for normal hot water heating
 - 60°C for one hour either daily or weekly to sterilise the cylinder against Legionella
- Refer to Section 11.2.1 for details of how to assess the Legionella sanitisation regime required for the installation concerned.

A Grant heat pump cylinder, with a larger primary coil, **MUST** be fitted when using this hot water control option.

Refer to Section 12, Figure 12-9 for wiring details.

For further details of the Grant Digital two-stage Cylinder thermostat (Grant UK product code: GCSD2), refer to Section 11.4.

NOTE

There must be a demand from the HW channel of the heating/hot water programmer for the automatic anti-legionella function of the Digital two-stage cylinder thermostat to operate. When setting the ON period(s) on the two-stage cylinder thermostat timeswitch, ensure that they are within a HW ON period on the programmer.

NOTE

With this hot water control system, the heat pump of the VortexAir hybrid unit will NOT operate to heat the hot water cylinder, in response to a DHW demand, unless the Oil/Hybrid switch is set to 'Hybrid'.

Boiler only installations (heat pump not yet installed)

This hot water control system will NOT operate to heat the hot water cylinder, in response to a DHW demand, when only the boiler is installed (i.e. with no heat pump installed or connected).

A **temporary** change **MUST** be made to the control system connections at the Heating system controls terminal block (in the hybrid control panel) in order for the hot water heating function to operate. Refer to Section 12.3.3 for details.

CAUTION

As soon as the heat pump is installed and connected to the boiler, this temporary change to the control system connections **MUST be reversed. Refer to Section 12.3.2 for details.**

11.2 Legionella

It is possible to use the heat pump of the VortexAir hybrid to raise the HW cylinder to around 50 to 55°C.

For protection against Legionella the temperature should be periodically raised to 60°C.

This can be achieved by either:

- Using the Grant Automatic DHW Boost Kit 2, available from Grant UK (product code: HPDHWBK2), as mentioned in section 11.1.2 above.
- OR
- Using the Grant digital two-stage cylinder thermostat with built-in timer function, also available from Grant UK (Grant UK product code: GCSD2), as mentioned in Section 11.1.3.

11.2.1 Legionella Sanitisation Regime

Care must be given to vulnerable people who may be exposed to potentially life-threatening legionella. This group of people include the elderly, pregnant women, young children and those with breathing difficulties.

Care must also be given to households who do not use a lot of water on a daily basis. While this chart is not exhaustive, it is important that you discuss any potential issues with the occupants before deciding on the appropriate regime.

It is important that this decision is based on the welfare of the occupants and not on energy saving measures.

Table 11-1: Legionella group sanitisation regime

	Uses less than 50 litres of hot water per day	Uses more than 50 litres of hot water per day
Vulnerable Group	Store at 50°C and raise hot water cylinder to 60°C for 1 hour every day	Store at 50°C and raise hot water cylinder to 60°C for 1 hour every 3 days
Non-Vulnerable Group	Store at 50°C and raise hot water cylinder to 60°C for 1 hour every week	Store at 50°C and raise hot water cylinder to 60°C for 1 hour every 2 weeks

WARNING

If the hot water stored in the cylinder has not been used for a prolonged period of time (e.g. a few days) and has not been stored at 60°C, then it is important that the temperature is raised to at least 60°C for a period of one hour before using the hot water.

11.3 Grant Automatic DHW Boost Kit 2

This system uses both the existing cylinder immersion heater and cylinder thermostat. This is switched via a contactor operated by a small digital timeswitch, both enclosed in a separate unit to be mounted next to the cylinder. Thus the immersion element can be programmed to operate for the required period on either a daily or weekly basis.

Once set, this system is fully automatic but can be overridden by the user if required. Also, the user can still switch the immersion element off, via the immersion heater switch, irrespective of the programmer or cylinder thermostat setting or whether the heat pump is operating.

11.4 Grant Digital 2-Stage Cylinder Thermostat

This consists of a digital two-stage thermostat, a single channel digital timeswitch and relay fitted in an electrical enclosure.

The digital temperature controller (on the front panel of the thermostat enclosure) allows the setting of two temperatures in the HW cylinder:

- Normal hot water heating using the heat (factory default: 50°C)
- High temperature to sterilise the cylinder against Legionella using the boiler (factory default: 60°C)

Refer to the Installation Instructions supplied with the Grant digital two-stage Cylinder Thermostat for details on how to set the digital temperature controller, if required.

The frequency and length of the high temperature anti-legionella operation is controlled by a digital timeswitch located inside the two-stage cylinder thermostat enclosure.

Refer to the Installation Instructions supplied with the Grant digital two-stage Cylinder Thermostat for details on how to set the digital timeswitch.

WARNING

There must only be ONE demand, for either heating (CH) or hot water (HW), on the VortexAir hybrid at a time. In all cases, the DHW demand **MUST not clash with the CH demand, i.e. set the programmer such that the HW ON period(s) are different from the CH ON period(s) and do not overlap each other.**

12 Electrical



WARNING

Electric shock may cause serious personal injury or death. All electrical work must be undertaken by a competent person. Failure to observe this legislation could result in an unsafe installation and will invalidate all guarantees. All electrical connections made on-site are solely the responsibility of the installer.

12.1 General

The Grant VortexAir hybrid requires a 230V 50Hz single phase electrical supply from a 32A circuit breaker.

All the controls for the operation of the VortexAir Hybrid are contained within the boiler casing, with all the electrical wiring housed inside the hybrid control panel. Refer to Figure 12-11 for the hybrid internal wiring diagram.

The electrical supply and external heating system controls are connected directly to the control panel in the boiler part of the hybrid.

- Refer to Section 12.2 for the hybrid electrical supply connection details.
- Refer to Section 12.3 for the heating system control connection details.
The heat pump electrical supply and external system control connections are provided directly from the control panel in the boiler part of the hybrid.
- Refer to Section 12.4 for the heat pump electrical supply connection details.
- Refer to Section 12.5 for the external system control connections between the boiler and the heat pump.



NOTE

For the heat pump internal wiring diagram and heat pump controller connections please refer to the Installation and Servicing Instructions supplied with the Grant Aeron³ heat pump.

The wiring connection terminal blocks for the electrical supply, heating system controls, heat pump electrical connections are located within the control panel enclosure.

To access the control panel enclosure, and the electrical connection terminal blocks within it, proceed as follows:

1. Remove the access panel from the front of the boiler casing. Unscrew and remove the eight screws that secure the access panel to the casing. Refer to Figure 12-1.
2. Remove the lower cover panel from the rear of the control panel. Unscrew the two screws that secure the cover panel in place and remove it from the boiler. Refer to Figure 12-2.
3. Remove the upper cover panel from the rear of the control panel. Unscrew the two screws at the top of the cover and remove it from the boiler. Refer to Figure 12-3.
4. The electrical wiring connection terminal blocks are located on the inner base of the control panel. Refer to Figures 12-4, 12-6, 12-6 and 12-7.

12.2 Hybrid (Boiler) Electrical Supply Connection

The Grant VortexAir Hybrid requires a permanent mains supply. Do not interrupt it with any external control, e.g. programmer, timer or room thermostat.

Use a dedicated power supply from a 32 A Type C circuit breaker in the consumer unit.

If both the heat pump and boiler are located outdoors, the final power supply connection to the boiler of the VortexAir Hybrid must be made from a weatherproof lockable isolator located outside the building.

The cable should be either armoured or run in a flexible conduit between the lockable isolator and the boiler.

If the boiler is located indoors (with the heat pump located outdoors), the final power supply connection to the boiler must be made from a lockable isolator located inside and next to the boiler.



NOTE

In the case of long cable runs, selection of correct cable must be done in accordance with IET Wiring Regulations (17th edition).

Refer to Figure 12-4 for the location of the hybrid electrical supply terminal block.

The electrical supply cable must be connected to the terminal block as follows:

- Live – terminal 1 (L)
- Neutral – terminal 2 (N)
- Earth – terminal 3 (≡)

Refer to Figure 12-5 for the electrical supply connection diagram.

12.3 Heating System Controls Connection

The 230V 50Hz electrical supply for the external heating system controls is provided from the heating controls terminal block in the hybrid control panel in the boiler. Refer to Figure 12-4 for the location of this terminal block. This supply is fused at 5 A via a fuse located on the control panel fascia.

The lockable isolator (see Section 12.2 above) acts as a common isolator for the boiler, control system and heat pump (when fitted), providing complete electrical isolation.

The cable between the hybrid (boiler) and the external heating controls should be at least 0.75 mm² PVC.

All the wiring and supplementary earth bonding external to the boiler must be in accordance with the current IET Wiring Regulations.

Any room thermostat or frost thermostat used must be suitable for use on mains voltage.

In the event of an electrical fault after installation of the boiler, the following electrical system checks must be carried out:

- Short circuit
- Polarity
- Earth continuity
- Resistance to earth

The boiler requires both a switched mains power supply, from an external programmer or control system, in addition to a permanent live supply. There is no facility in the boiler of the Grant VortexAir hybrid for the fitting of a plug-in timer or programmer.

The external controls are connected to the heating system controls terminal block in the hybrid control panel. Refer to Figure 12-6 for the location of this terminal block.

A 6-core cable (5-core and earth) is required to connect the boiler to the heating controls. This may be reduced to a 5-core cable (4-core and earth) depending on the type of hot water control is used.

For typical control system wiring diagrams please refer to Figures 12-7, 12-8 and 12-10.

12.3.1 S-Plan type system (with standard cylinder)

With this system, the hot water can be heated to 65°C (in either the existing cylinder or a new cylinder) using the oil boiler only. The heat pump is not used to heat the hot water. Refer to Section 11.1.1.

The system uses a standard 'S-Plan' type wiring arrangement with a two channel programmer, room thermostat, heating zone valve, hot water zone valve, cylinder dual thermostat and wiring centre. Refer to Figure 12-7

Note that the switched output from the hot water zone valve is connected to terminal 8 on the heating system controls terminal block in the hybrid control panel. Only the oil boiler will operate in response to a hot water demand from the system controls.



NOTE

Set the first stage temperature (R1) on the Boiler Control Thermostat to 0°C when commissioning the VortexAir hybrid. Refer to Section 17.6 of these Installation Instructions for details of setting procedure.

12.3.2 S-Plan type system with Grant Automatic DHW Boost Kit (with heat pump cylinder)

With this system, the hot water can be heated to 50 - 55°C (in a heat pump cylinder) using the heat pump only. Refer to Section 11.1.2.

This system uses the standard 'S-Plan' type wiring arrangement with a two channel programmer, room thermostat, heating zone valve, hot water zone valve, cylinder dual thermostat and wiring centre.

In addition a Grant Automatic DHW Boost Kit 2 is fitted to provide legionella protection. Refer to Figure 12-8.

The Automatic DHW Boost Kit 2 comes pre-wired within its enclosure, ready for installation. The connections to the Immersion heater switch, Immersion heater and cylinder thermostat must be made after it is installed on site.

When installed, this kit interrupts the electrical supply between the existing immersion heater switch and immersion heater. Refer to the electrical connection details in the Installation and User Instructions supplied with the kit.

In order to connect and use this kit, the existing cylinder thermostat must have two output terminals; one 'make on rise' (normally open) contact and the other 'break on rise' (normally closed) contact. Refer to Figure 12-8. If not, then the cylinder thermostat MUST be replaced with one that does have two output terminals.

The use of any other type of cylinder thermostat, or any modification to an existing thermostat, will invalidate the product guarantee and may result in a potentially dangerous installation.



NOTE

Do not alter the pre-wired connections within the Boost Kit enclosure and only make the external connections as shown in the wiring diagram. See Figure 12-8.



NOTE

For this system to operate, the existing immersion switch must be left set permanently to ON. To totally prevent operation of the immersion element, the existing immersion switch must be set to OFF

Boiler only installations (heat pump not yet installed)

This hot water control system will NOT operate to heat the hot water cylinder, in response to a DHW demand, when only the boiler is installed (i.e. with no heat pump installed and connected).

A **temporary** change MUST be made to the control system connections on the Heating system controls terminal block (in the hybrid control panel) in order for the hot water heating function to operate. Refer to Section

To make this temporary change:

1. Isolate the electrical supply to the boiler.
2. Disconnect the DHW demand connection from terminal 7 on the Heating system controls terminal block (in the hybrid control panel) and connect it to terminal 8 instead. Refer to Figure 12-8.

As the boiler will be able to heat the cylinder to 60°C it will not be necessary for the Automatic DHW Boost Kit 2 to operate the immersion element whilst the DHW controls are temporarily connected in this way. Thus, the immersion switch MUST be temporarily set to OFF

As soon as the heat pump is installed and connected the temporary change MUST be reversed, before the electrical supply is re-connected, as follows:

1. The DHW demand connection MUST be disconnected from terminal 8 on the Heating system control terminal block and reconnected to terminal 7
2. The immersion element switch set to ON
3. The Automatic DHW Boost Kit 2 set to operate (as described in Section 11.3 and the Installation and User Instructions supplied with the kit).

12.3.3 S-Plan type System with Grant Digital two-stage cylinder thermostat

With this system, the hot water temperature can be switched between two pre-set temperatures, as follows:

- For normal hot water heating (factory default: 50°C)
- For anti-legionella sanitisation (factory default: 60°C)

Refer to the Installation and User Instructions supplied with the Grant digital two-stage cylinder thermostat for wiring connection details and also on how to set the digital temperature controller and digital timer. Refer to Section 11.4 for further details.

Refer to Figures 12-10 and 12-11 for the electrical connection diagram for the digital two-stage cylinder thermostat.

Boiler only installations (heat pump not yet installed)

This hot water control system will NOT operate to heat the hot water cylinder, in response to a DHW demand, when only the boiler is installed (i.e. with no heat pump installed and connected).

A **temporary** change MUST be made to the control system connections on the Heating system controls terminal block (in the hybrid control panel) in order for the hot water heating function to operate. Refer to Section

To make this temporary change:

1. Isolate the electrical supply to the boiler.
2. Disconnect the DHW demand connection from terminal 7 on the Heating system controls terminal block (in the hybrid control panel) and connect it to terminal 8 instead. Refer to Figure 12-10.

As soon as the heat pump is installed and connected the temporary change MUST be reversed, before the electrical supply is re-connected, as follows:

1. Disconnect the DHW demand connection from terminal 8 on the heating controls terminal block
2. Reconnect it to terminal 7 on the Heating system control terminal block

12.4 Heat Pump Electrical Supply Connection

The Aeronas³ HPID16 heat pump, used in the Grant VortexAir hybrid, requires a 230V 50Hz single phase electrical supply from a 32A circuit breaker. This is supplied directly from the heat pump electrical supply terminal block in the hybrid control panel (in the boiler part of the hybrid). Refer to Figure 12-4 for the location of this terminal block.

The cable used between the boiler and the heat pump should be armoured.

If boiler is installed indoors, with the heat pump located outdoors, the power supply between the control panel (in the boiler) and the heat pump must be made via a weatherproof lockable isolator located outside the building.

The electrical supply cable to the heat pump must be connected to the terminal block in the control panel as follows:

- Earth – terminal 20 (≡)
- Neutral – terminal 21 (Neutral)
- Live – terminal 22 (Live)

The other end of the heat pump electrical supply must be connected to the terminal block in the heat pump as follows:

- Earth – terminal (≡)
- Neutral – terminal N
- Live – terminal L

Refer to Figure 12-13 for the heat pump electrical supply connection diagram and also Section 6 of the Installation and Servicing Instructions supplied with the Aeronas³ heat pump.

12.5 Heat Pump Controls Connection

The heat pump control connection for the Aeronas³ HPID16 heat pump are connected to the heat pump controls terminal block in the hybrid control panel (in the boiler part of the hybrid). Refer to Figure 12-12 for the location of this terminal block.

The 4-core heat pump controls cable (provided with the boiler) must be connected to the heat pump controls terminal block in the hybrid control panel as follows:

- Cable No. 1 - terminal 23
- Cable No. 2 - terminal 24
- Cable No. 3 - terminal 25
- Cable No. 4 - terminal 26

The other end of this heat pump controls cable must be connected to the following terminals on the Terminal PCB in the heat pump:

- Cable No. 1 - terminal 18
- Cable No. 2 - terminal 19
- Cable No. 3 - terminal 20
- Cable No. 4 - terminal 46

Refer to Figure 12-13 for the heat pump controls wiring diagram.

If the boiler is installed indoors, with the heat pump located externally, the controls cable supplied with the boiler will not be long enough to connect the heat pump to the hybrid control panel in the boiler and must be replaced with a longer cable (to be supplied by the installer).

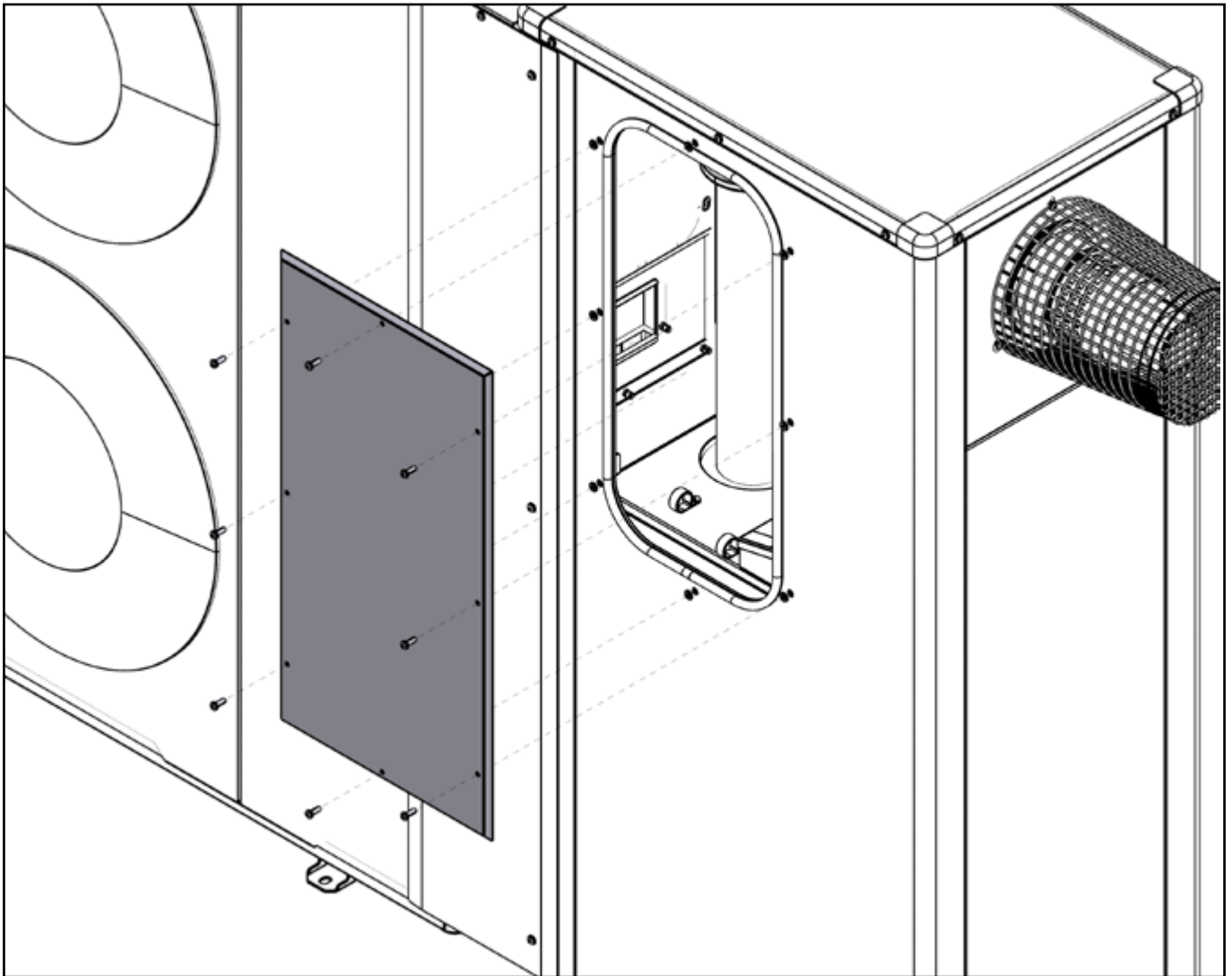


Figure 12-1: Removal of access panel

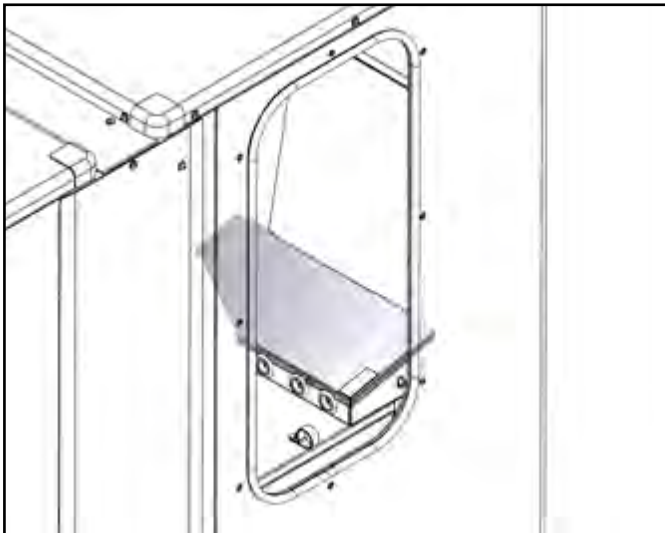


Figure 12-2: Lower control panel cover

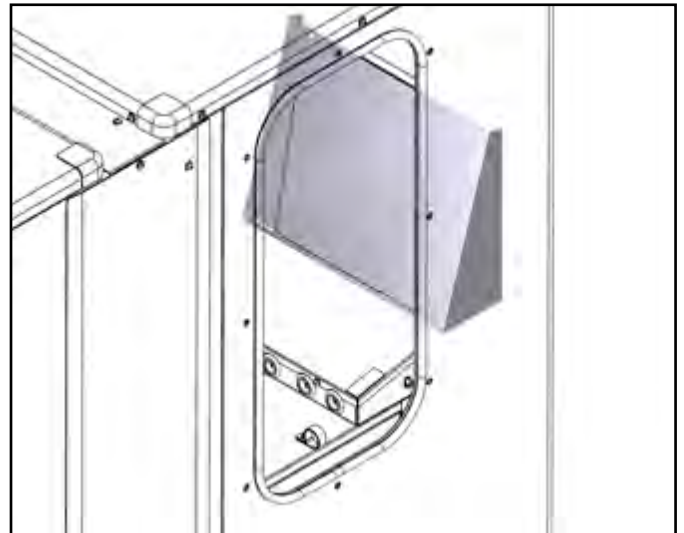


Figure 12-3: Upper control panel cover

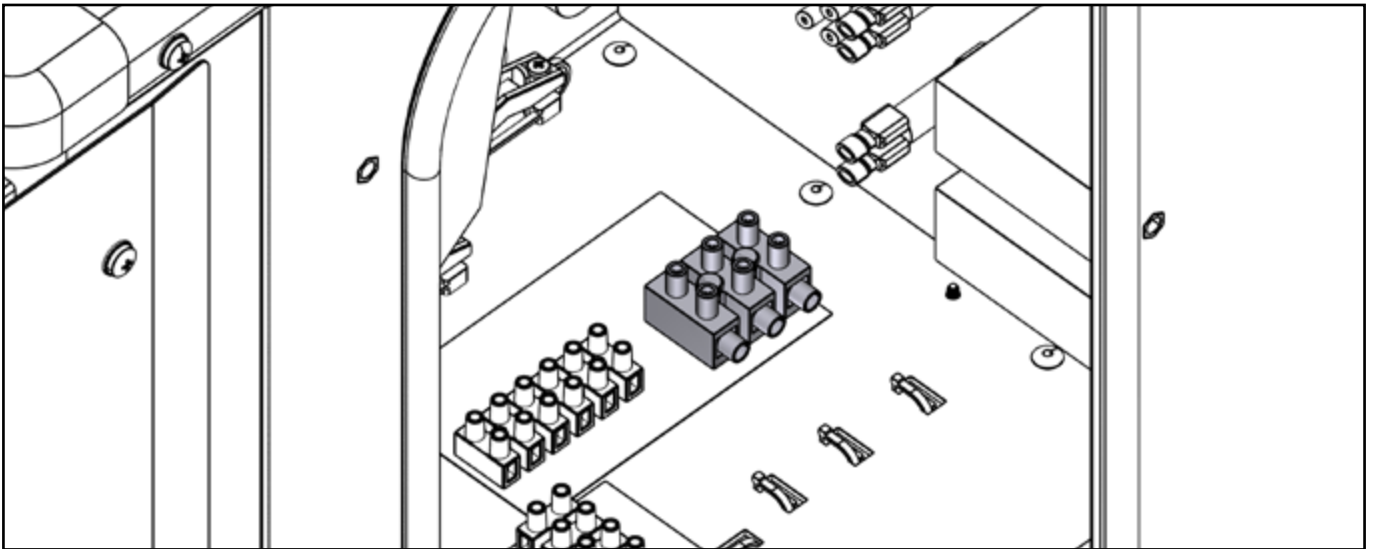


Figure 12-4: Hybrid electricity supply terminal block location

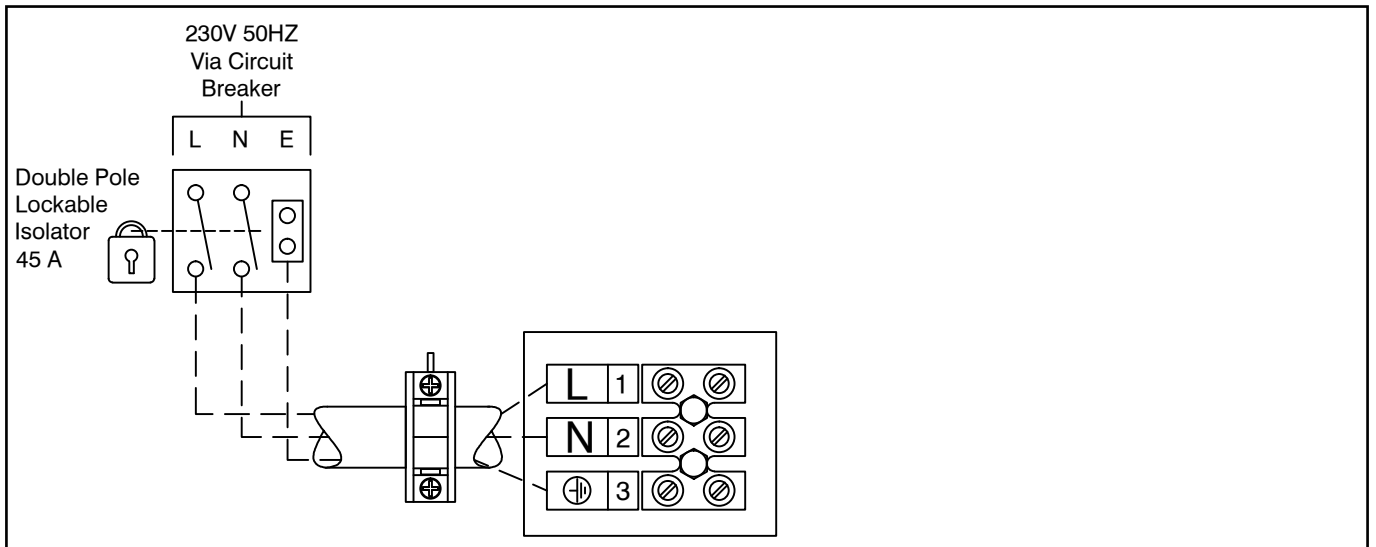


Figure 12-5: Hybrid electricity supply connection diagram

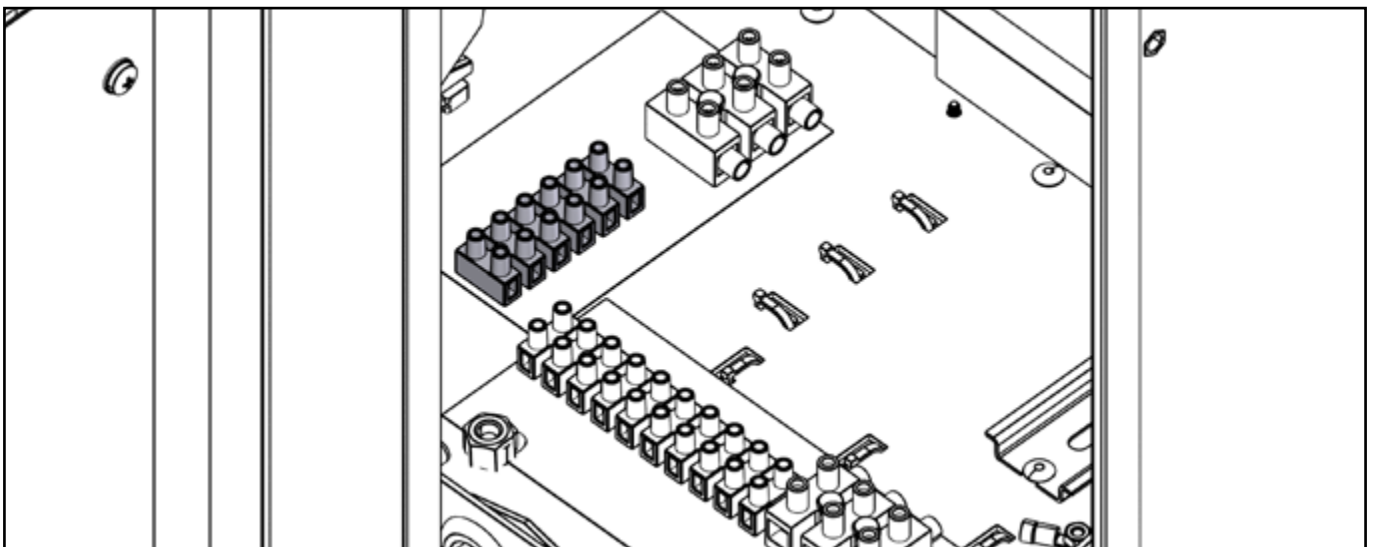


Figure 12-6: Heating system controls terminal block location

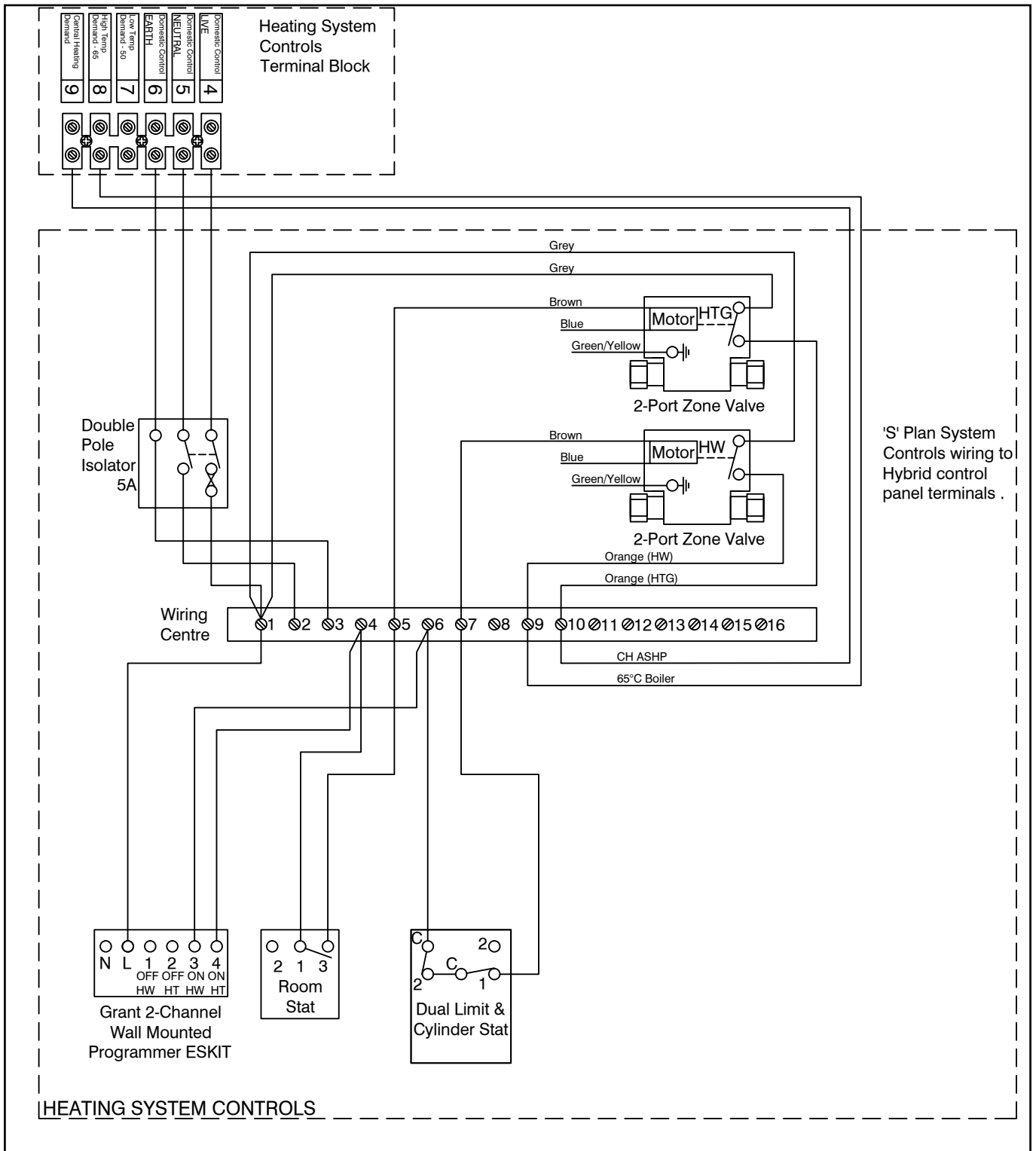


Figure 12-7: Heating controls - S-plan with cylinder stat (HW provided by boiler)

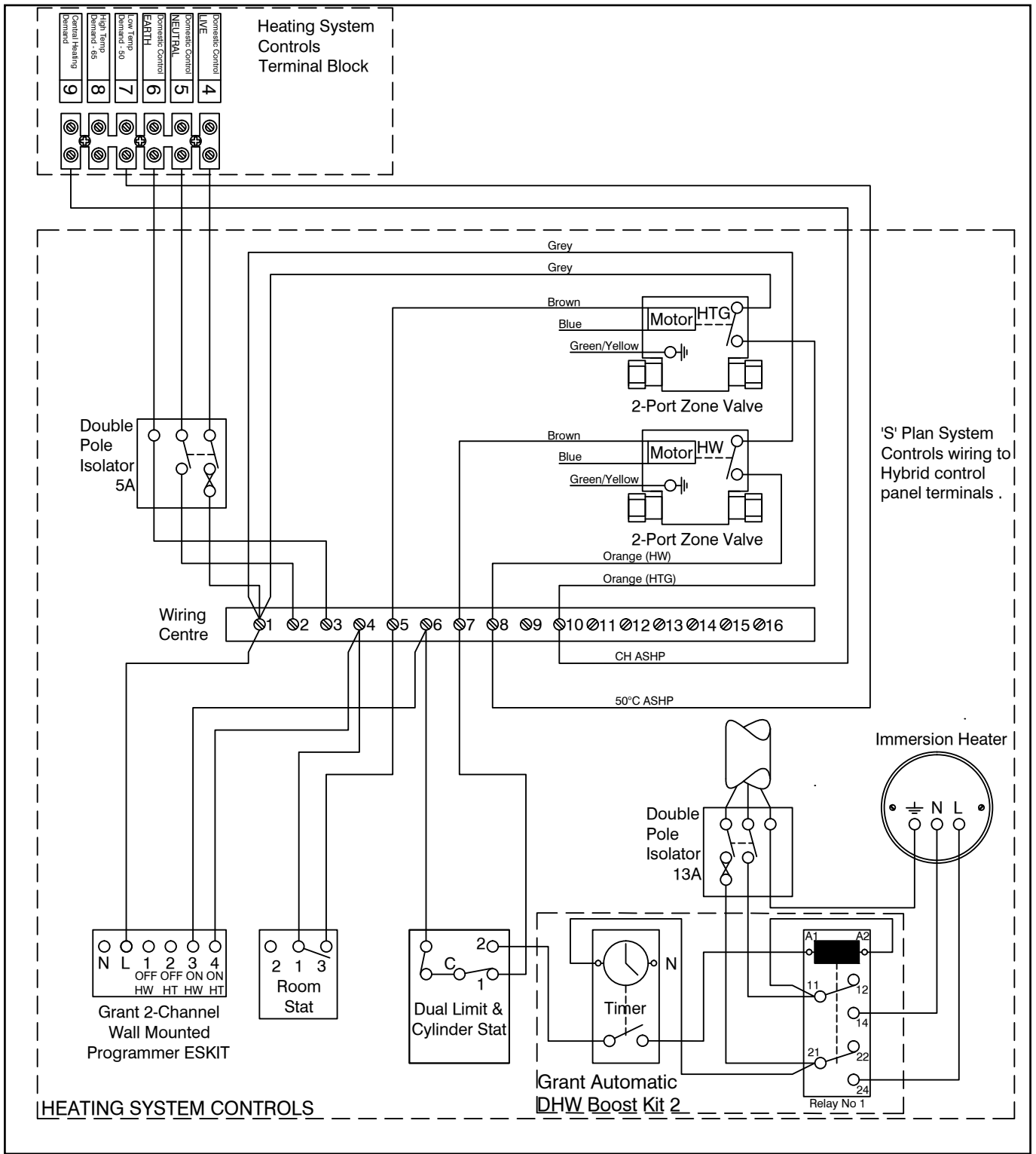


Figure 12-8: Heating controls - S-plan with cylinder stat and boost kit (HW provided by heat pump and immersion heater)

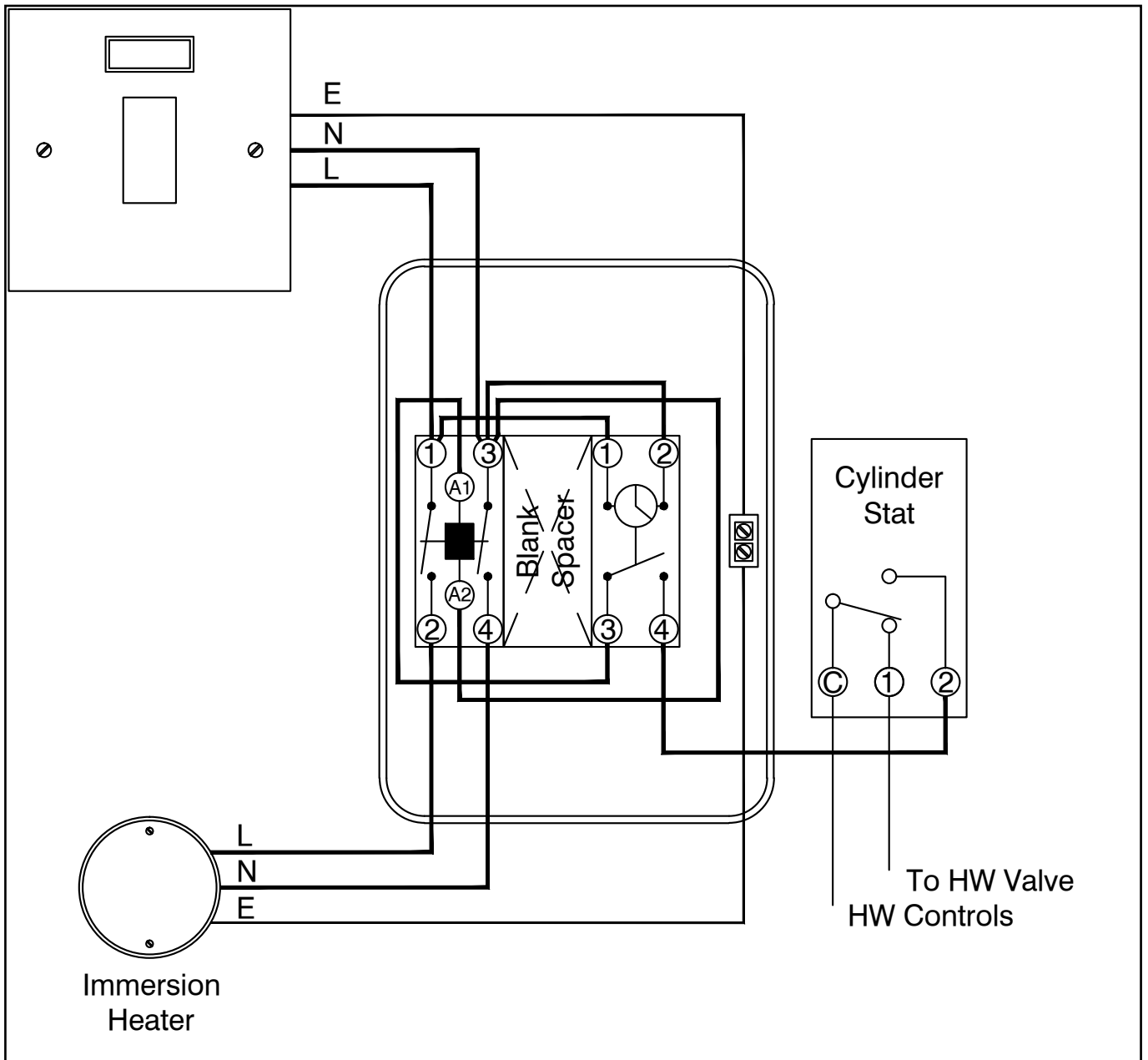


Figure 12-9: Boost kit

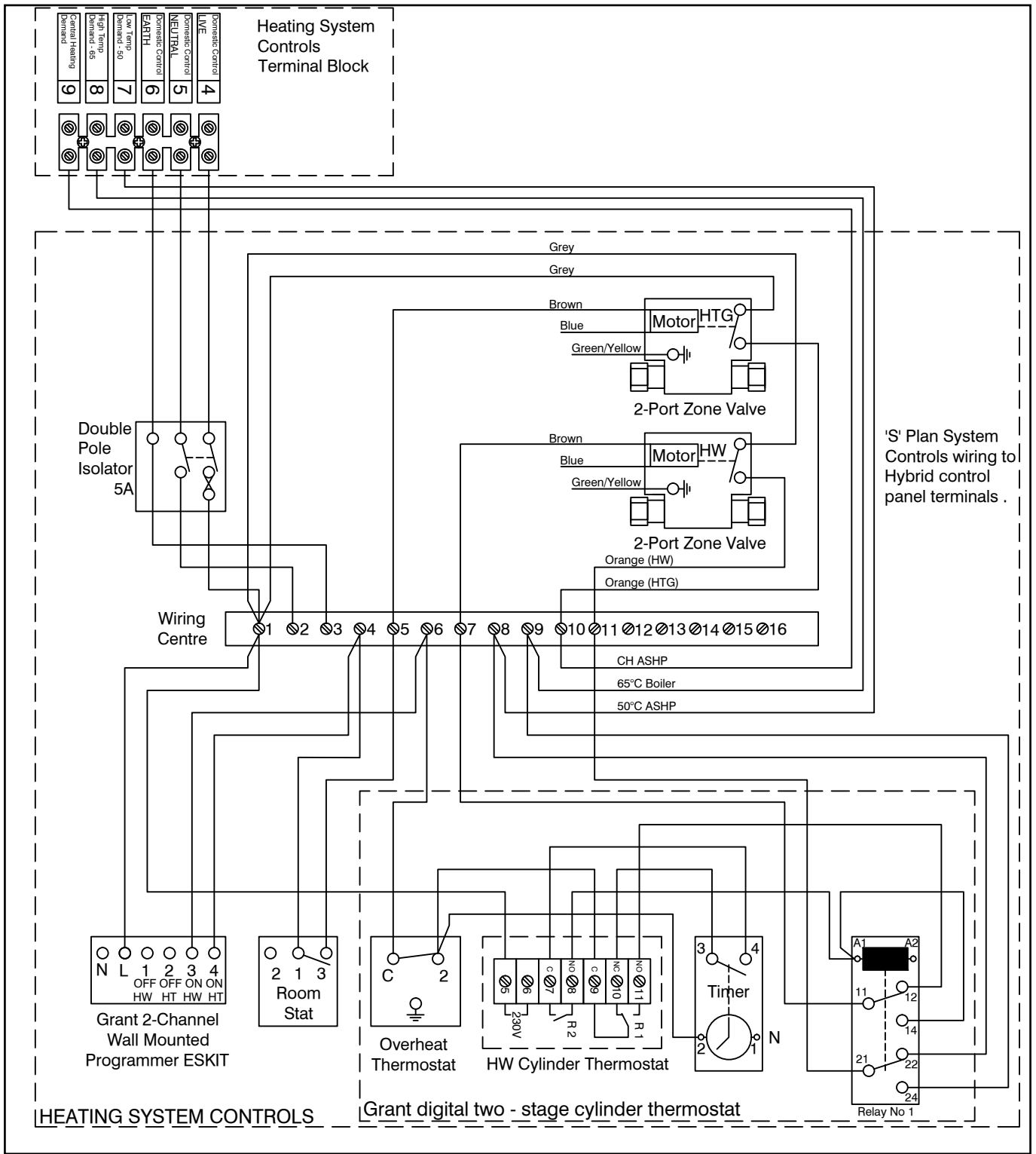


Figure 12-10: Heating controls - S-plan with Grant digital two-stage stat (HW provided by heat pump, boiler and two-stage cylinder stat)

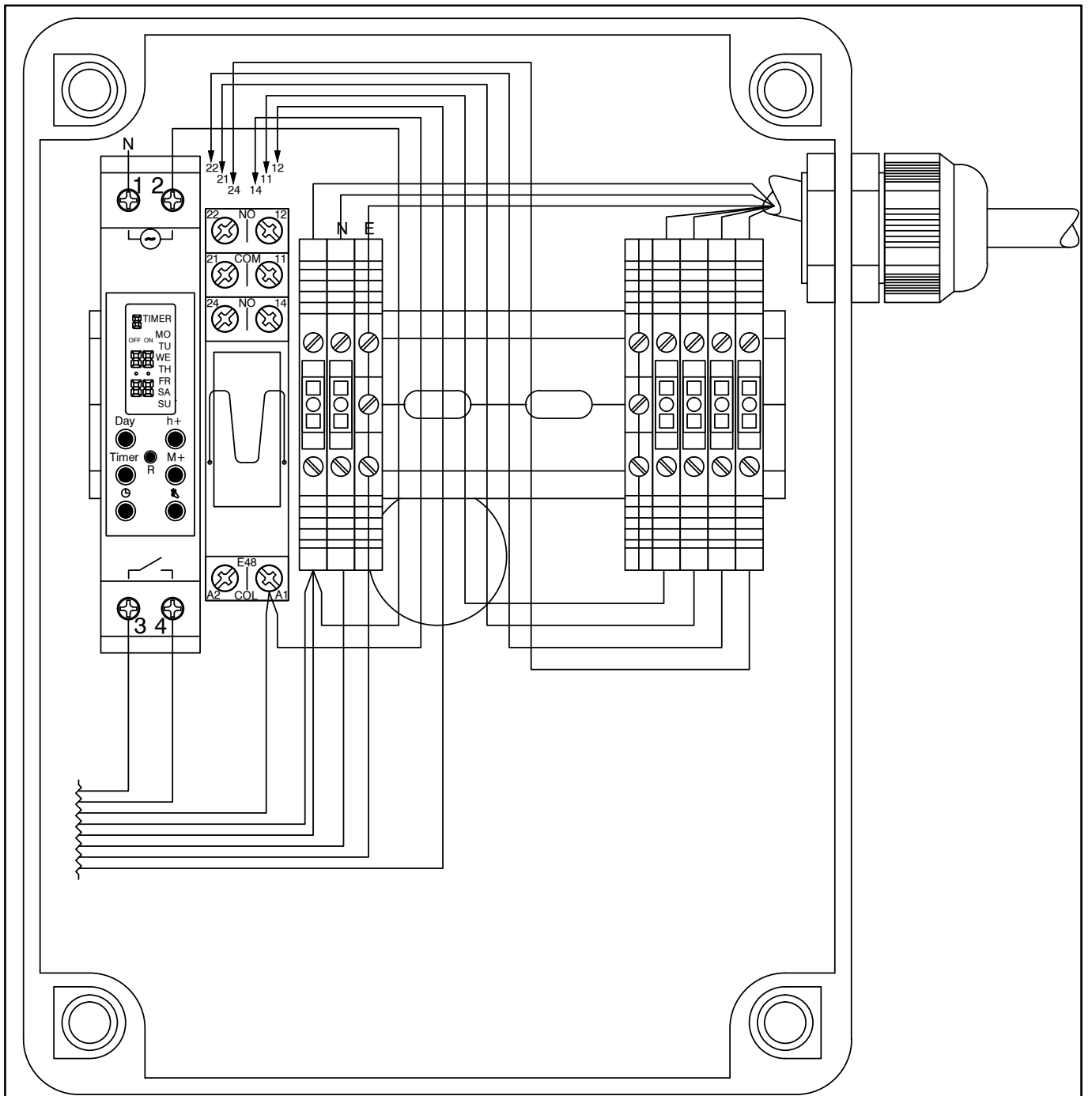


Figure 12-11: Grant digital two-stage stat

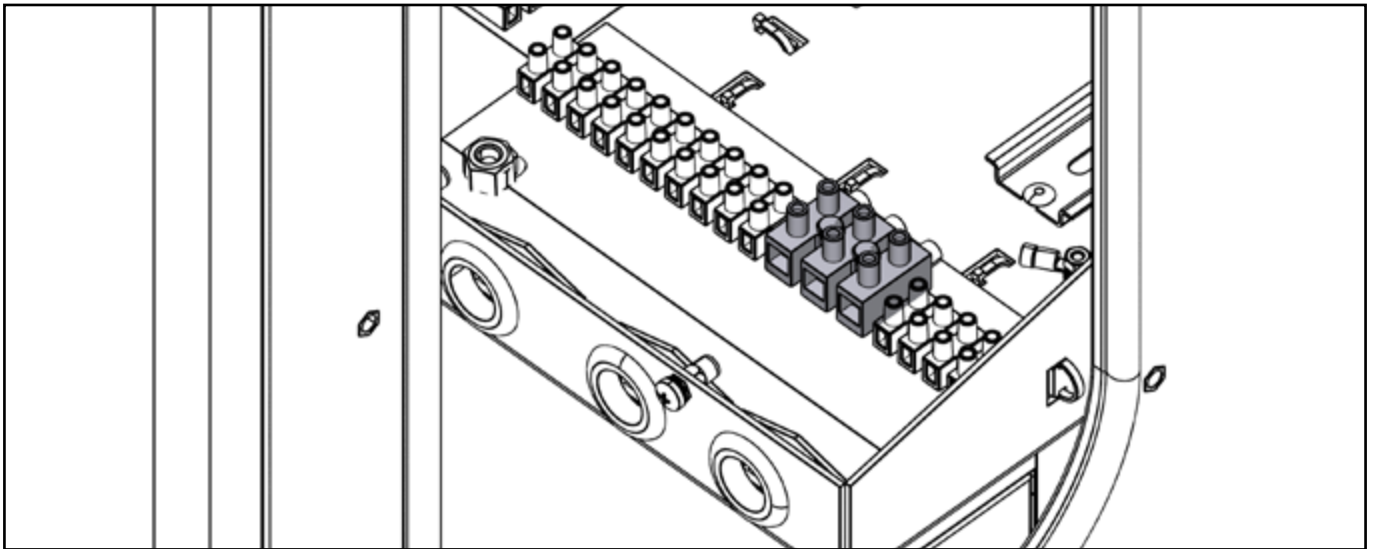


Figure 12-12: Heat pump electricity supply terminal block location

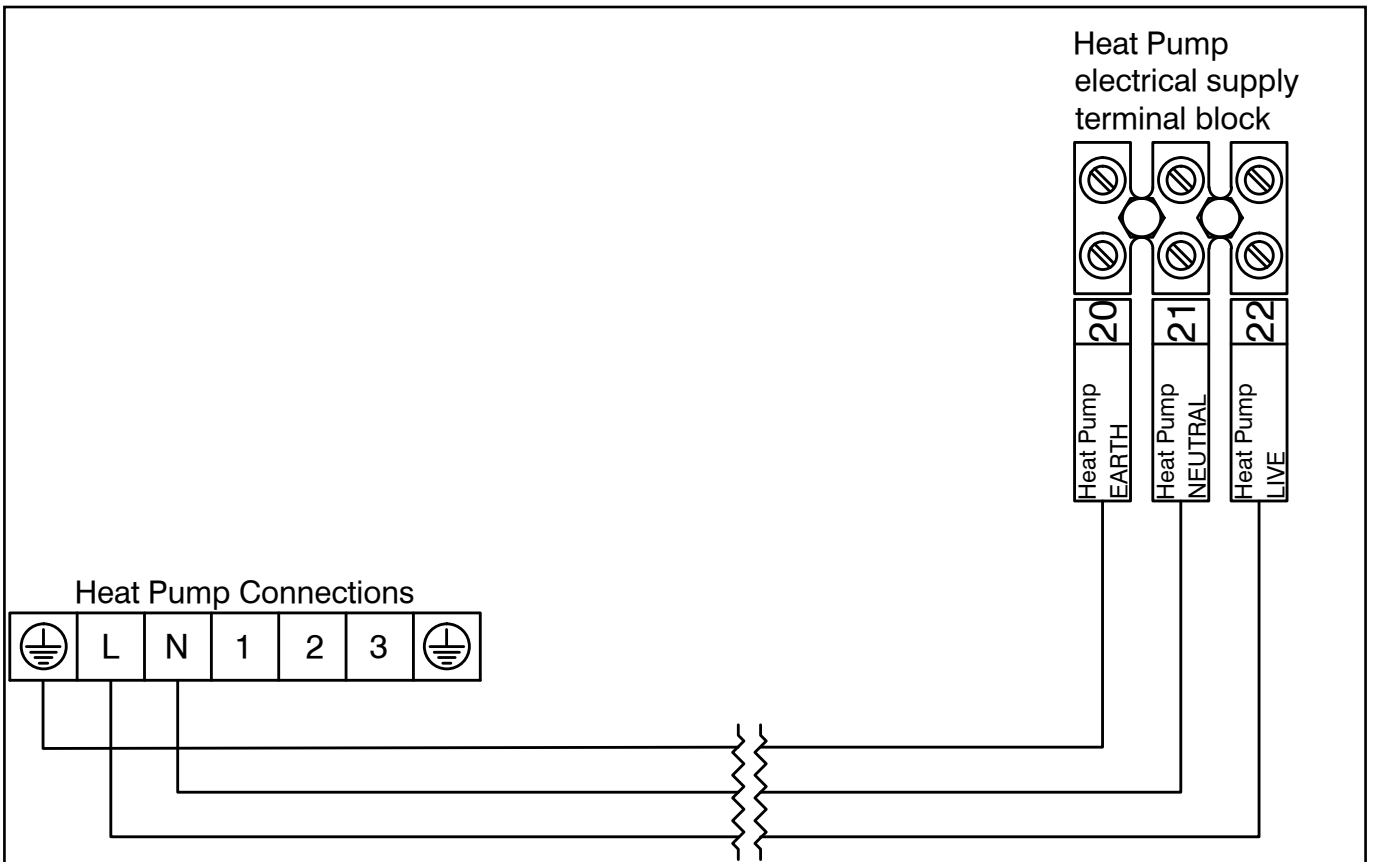


Figure 12-13: Heat pump electricity supply connection diagram

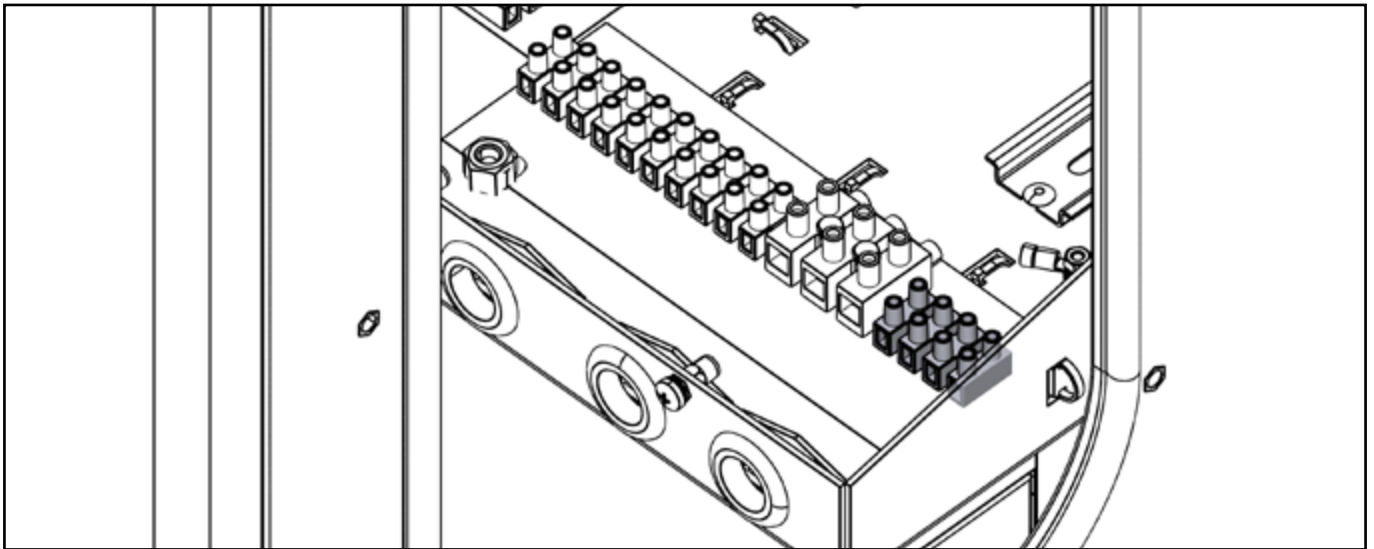


Figure 12-14: Heat pump controls terminal block location

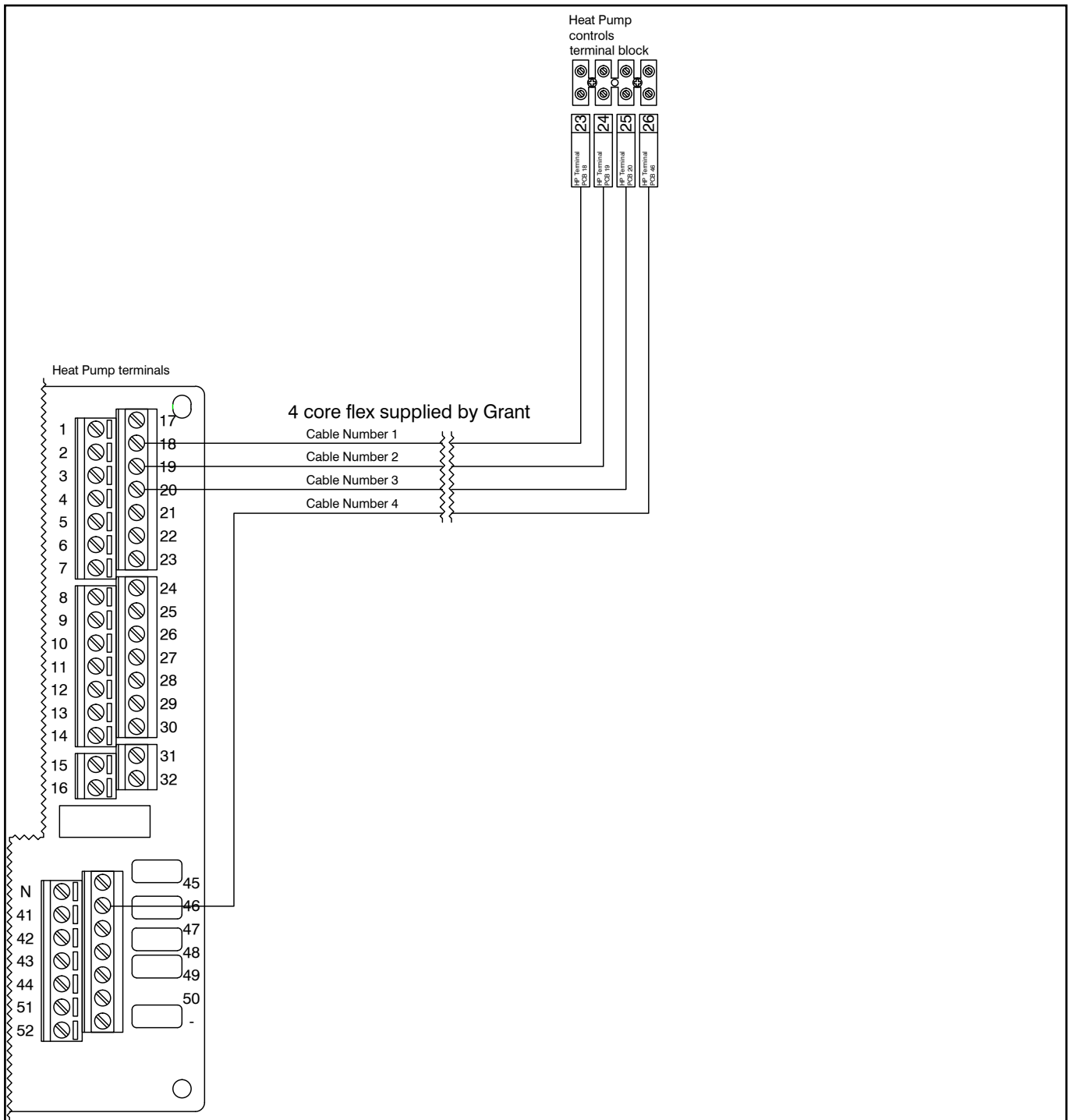


Figure 12-15: Heat pump controls connection diagram

Hybrid Wiring Center

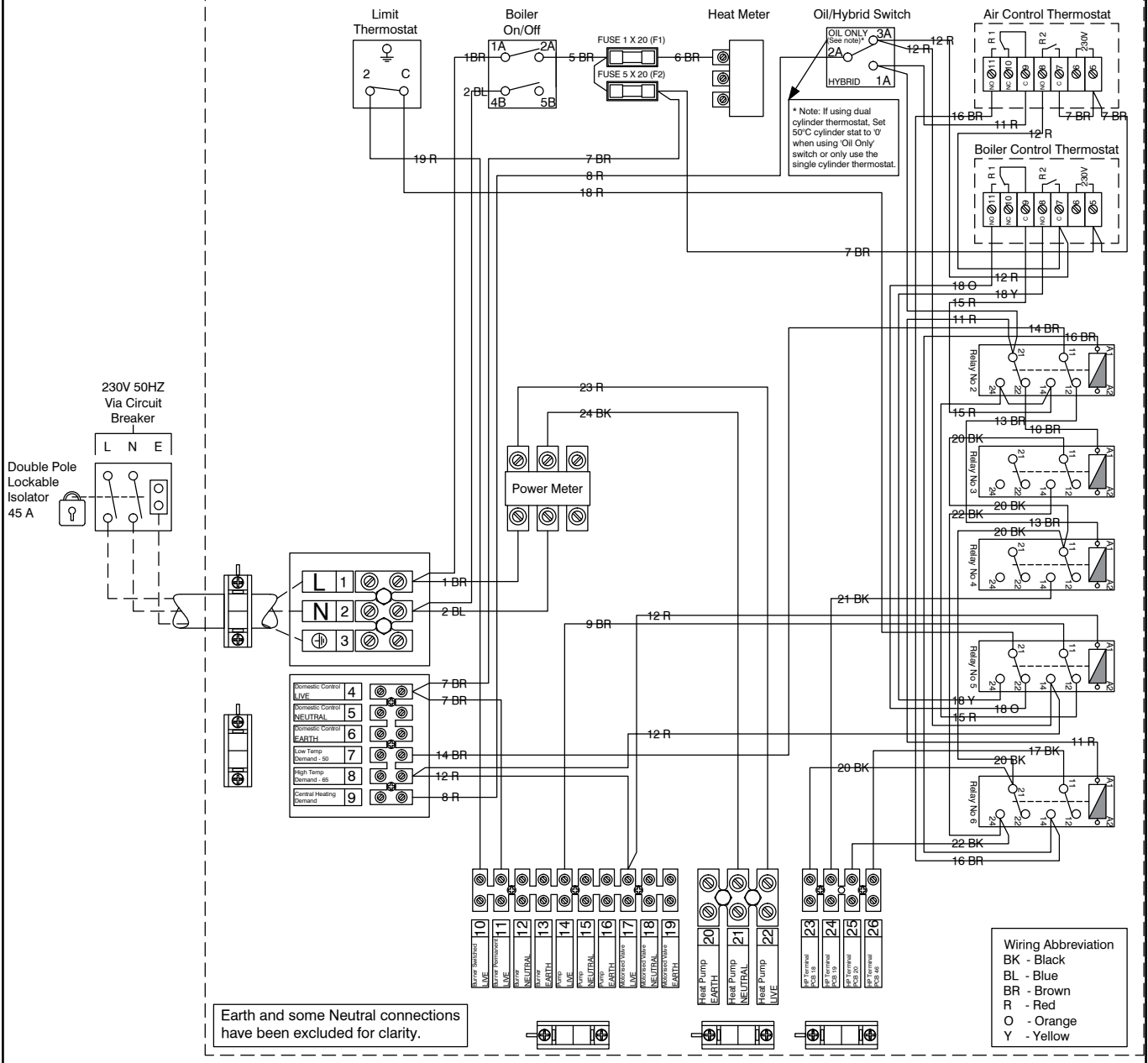


Figure 12-16: Hybrid control panel wiring diagram

Table 12-17: Terminal block key

Terminal	Description
1	LIVE
2	NEUTRAL
3	EARTH
4	Domestic control - LIVE
5	Domestic control - NEUTRAL
6	Domestic control - EARTH
7	Low temperature demand - 50°C
8	High temperature demand - 65°C
9	Central heating demand
10	Burner switched LIVE
11	Burner permanent LIVE
12	Burner NEUTRAL
13	Burner EARTH
14	Pump LIVE
15	Pump NEUTRAL
16	Pump EARTH
17	Motorised valve LIVE
18	Motorised valve NEUTRAL
19	Motorised valve EARTH
20	Heat pump EARTH
21	Heat pump NEUTRAL
22	Heat pump LIVE
23	Heat pump terminal PCB 18
24	Heat pump terminal PCB 19
25	Heat pump terminal PCB 20
26	Heat pump terminal PCB 46

13 Flue System and Air Supply

13.1 Flue system

The oil boiler unit of the Grant VortexAir Hybrid must only be fitted with the Grant low level balanced flue system (the Grant 'Yellow' System), whether installed inside or outside the building.

Low Level Horizontal Balanced Flue (Grant Yellow system)

The Grant 'Yellow' low level balanced flue system is telescopic and is available in both short (for single thickness brick walls) and standard lengths.

The maximum flue length - from the centre of the boiler flue outlet to the outer face of the wall - is 4 metres (with or without elbows included). No more than 2 x 45° or 1 x 90° elbow should be fitted per system.

The 'Yellow' system low level balanced flue is supplied with a black painted stainless steel guard. This must be fitted in all circumstances to prevent objects from entering the flue outlet.

The guard must be fitted centrally over the flue terminal and securely fixed to the wall.

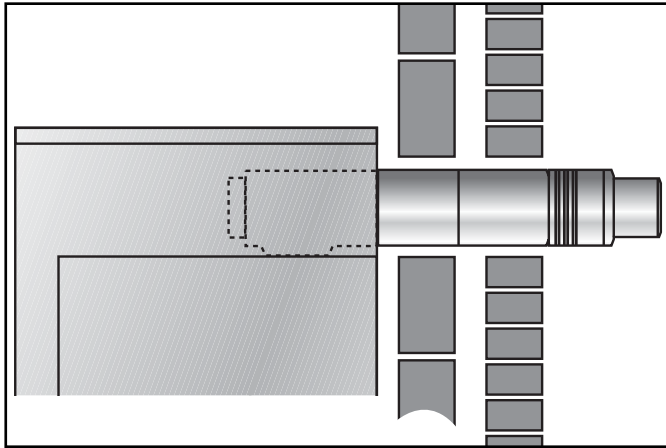


Figure 13-1: Low level balanced flue (yellow system)

Three extensions are available which extend the flue by 225mm, 450mm or 675mm.

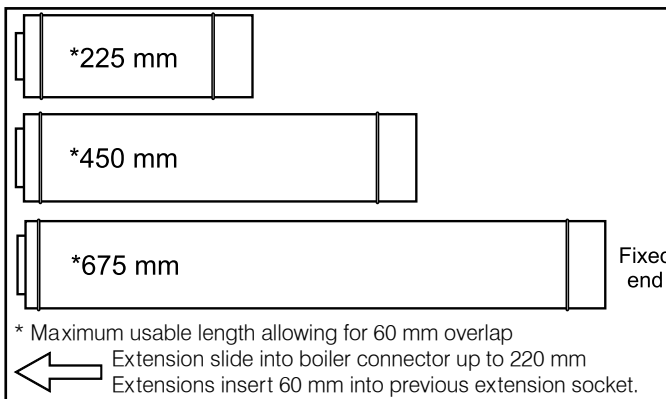


Figure 13-2: Low level flue extensions

90° and 45° elbows are also available.

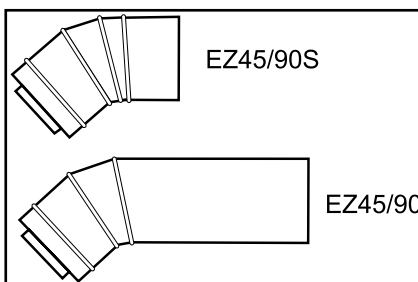


Figure 13-3: Elbows

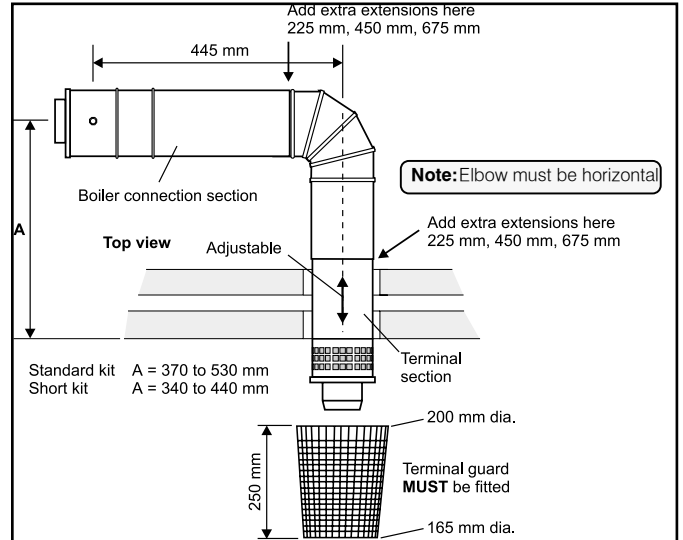


Figure 13-4: Low level balanced flue and EZELB90



NOTE

The maximum horizontal run allowed is 4 metres, including one 90° or two 45° elbows.

13.2 Air Supply

A sufficient permanent air supply to the boiler should be provided at all times for the proper combustion of fuel and effective discharge of combustion products to the open air.

If the oil boiler unit of the VortexAir Hybrid is to be installed indoors a permanent air supply must be provided for the ventilation of any confined space in which the boiler is installed to prevent overheating of the boiler any equipment in and near the boiler. Refer to Figure 13-5 below.

It should be both the designer's and installer's concern that the air required for the above is introduced so as to cause as little discomfort as possible to the building occupants and thus to offer them the least temptation to obstruct the ventilators.

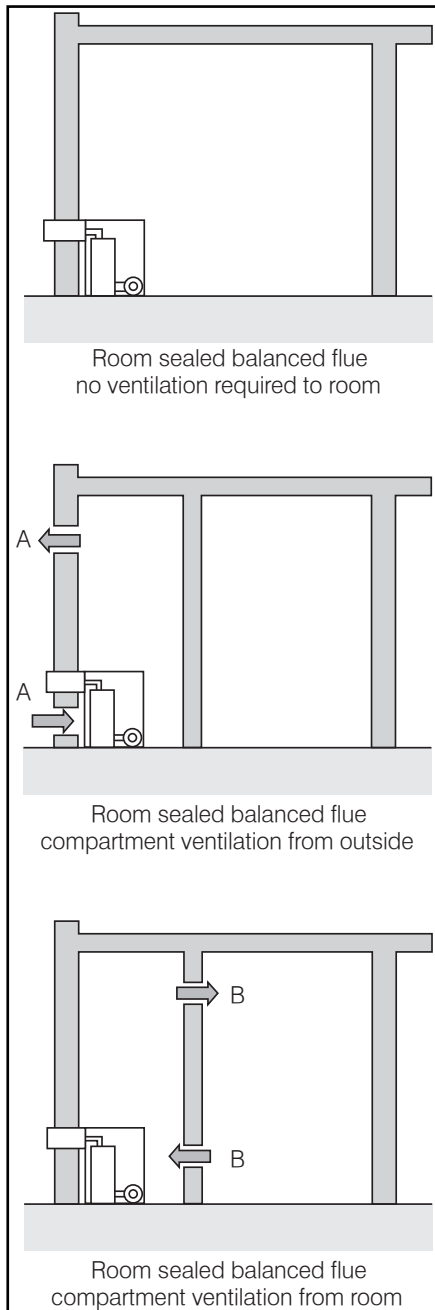


Figure 13-5: Air supply for room sealed balanced flue boilers

Minimum Size of Air Vents Required

Table 13-5 shows the minimum size of air vents required as illustrated in Figure 13-4.

Table 13-6: Minimum size of air vents required

Vent	VortexAir - 15/21kW		VortexAir - 21/26kW	
	cm ²	in ²	cm ²	in ²
Vent A	116	18	143	23
Vent B	231	36	286	45

Notes

In compliance with Approved Document J (2010 edition incorporating 2010 and 2013 amendments), the above ventilation areas are based on the total appliance output without deducting the 5 kW allowance for adventitious ventilation.



NOTE

In compliance with Approved Document J (2010 edition incorporating 2010 and 2013 amendments), the above ventilation areas are based on the total appliance output without deducting the 5 kW allowance for adventitious ventilation.



NOTE

For a boiler fitted in a compartment, which is ventilated as shown, no additional allowance is necessary. Further details may be obtained from BS 5410:1:2014.

All ventilation is given for domestic applications. For all other cases refer to BS 5410-2:2013.

13.3 Balanced Flue Terminal Positions

The minimum dimensions for locating the terminal from building features (windows, doors, etc.) are shown in Figure 9-6.

Table 13-7: Flue clearances

Ref	Location of outlet	Pressure jet	Condensing
A			
B			
C			
D			
E			
F			
G			
H			
J			
K			
L			
M			
N			
O			
P			
Q			
R			
S			

NOTES



AWAITING
IMAGE



Figure 13-8: Flue clearances

13.4 Prepare the Wall – Indoor installation only

If the oil boiler unit of the VortexAir Hybrid is to be installed indoors, make the hole in the wall for the low level balanced flue system to pass through, in the correct position as shown in Figure 9-10.



NOTE

Dimension B given in Figure X-XX includes an extra 10mm over the size of the terminal to provide clearance

Table 13-9: Flue hole dimensions

Model	Dimensions		
	A*	B**	C
VortexAir 15/21kW	1370	790	127
VortexAir 21/26kW	1370	790	127

* Includes an additional 100 mm for the anti-vibration mount/feet.
 ** Includes 600 mm clearance

Table 13-10: Suitable wall thickness

	To suit wall thickness	
	Minimum	Maximum*
EZ90 (no extension)	N/A	162
EZ90 + 225mm	197	387
EZ90 + 450mm	422	612
EZ90 + 950mm	922	1 112

* Includes 150 mm (rear) clearance between inner wall and rear of casing. Refer to Section 2.7.2.

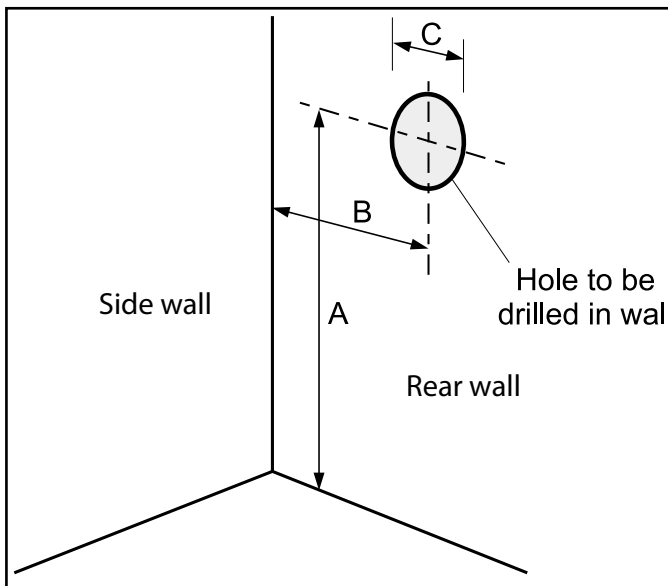


Figure 13-11: Flue hole dimensions & position for low level system

13.5 Fitting the Flue – Low Level (Yellow) balanced flue system

Remove both the burner access door, the upper access panel (above the door) and also the access panel on the front face of the oil boiler casing.

Fit the vertical flue extension section (supplied with the VortexAir Hybrid).

To do so, locate the threaded stud (at the bottom of the extension section) into the threaded socket in the centre of the flue outlet (on the top of the boiler heat exchanger). See Figure 9-11.

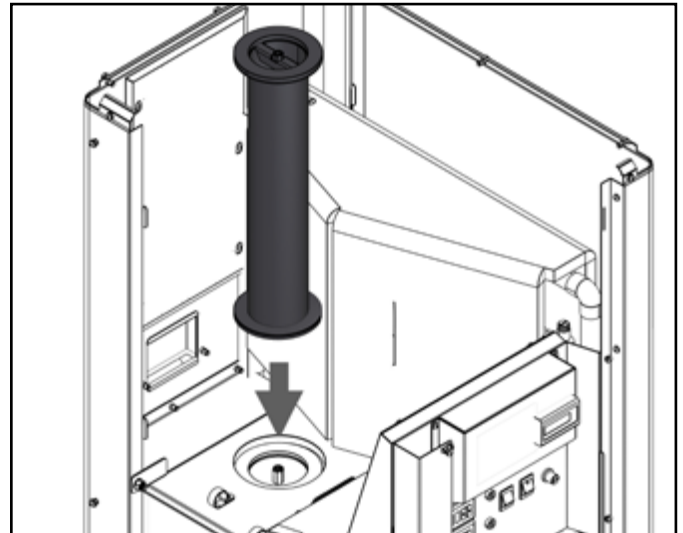


Figure 13-12: Fitting the vertical flue extension section

Rotate the extension section to screw the stud into the socket until the flange (at the bottom of the extension section) is firmly compressing the circular neoprene gasket on the top of the heat exchanger.

Depending on the location selected for the Hybrid boiler unit, either inside or outside the building, remove and discard the circular 'knock out' section, as required.

- For outdoor installation: Remove the 'knock out' from the end face of the Hybrid boiler casing.
- For indoor installation: Remove the 'knock out' from the rear face of the Hybrid boiler casing.

Fit the boiler connection section

Unpack the flue kit and check the contents.

Take the boiler connector section and remove the self-tapping screw holding the outer pipe and remove the outer pipe. See Figure 13-13.

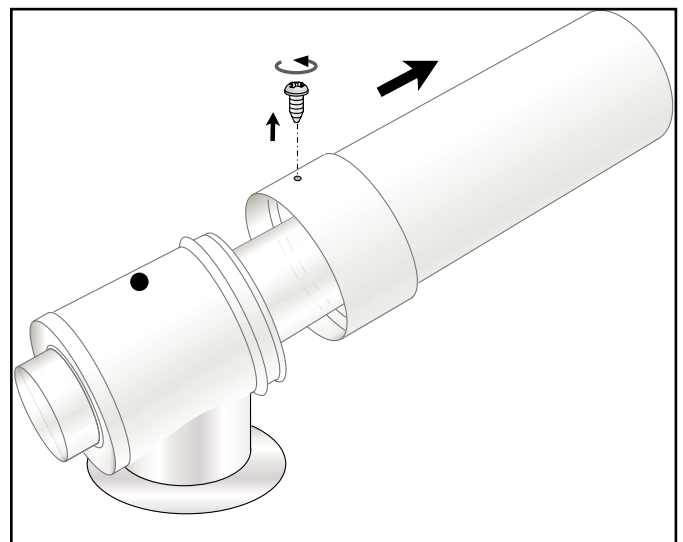


Figure 13-13: Removing the self-tapping screw

Fit steel washer and sealing washer onto the 150 mm long clamp bolt (supplied in the boiler accessory pack). Insert clamp bolt into hole in top of the boiler connector section.

Position the flange of the connector section onto the black neoprene flue outlet gasket (on the top end of the vertical flue extension). Engage the clamp bolt into the threaded socket (in centre of flue outlet).

Position the open end of the connector section to face towards the opening in the Hybrid boiler unit casing. Hand tighten clamp bolt at this stage.

Hybrid boiler unit outside building – Refit the outer pipe to the connector section in through the opening in the end of the Hybrid boiler unit (above the burner). Align the pre-drilled hole in adjustable sleeve with the hole in the top of the connector section. Secure using the self-tapping screw previously removed. See Figure 13-13.

Hybrid boiler unit inside building – Refit the outer pipe to the connector section in through the hole previously made in the wall and the opening in the rear face of the Hybrid boiler casing. Align the pre-drilled hole in adjustable sleeve with the hole in the top of the connector section. Secure using the self-tapping screw previously removed. See Figure 13-13.

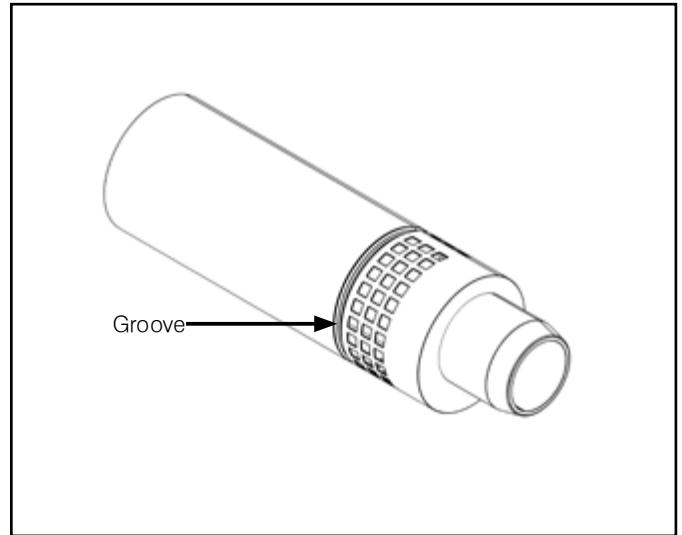


Figure 13-15: Terminal section groove

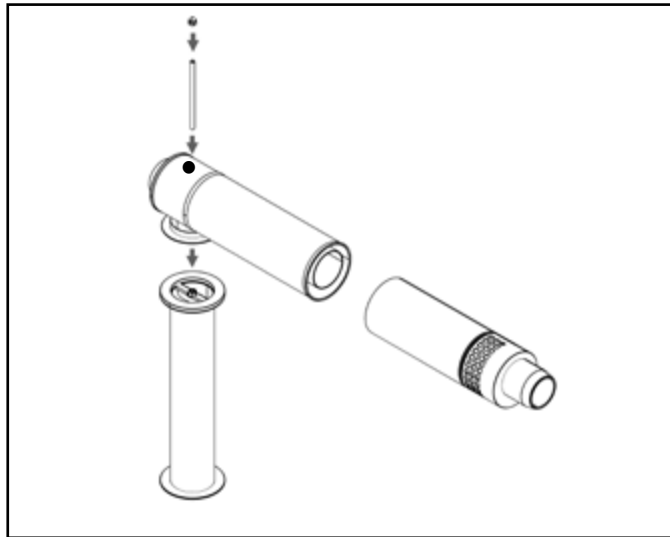


Figure 13-14: Flue (exploded)

CAUTION

Ensure that air inlet holes around outer surface of terminal are not obstructed.

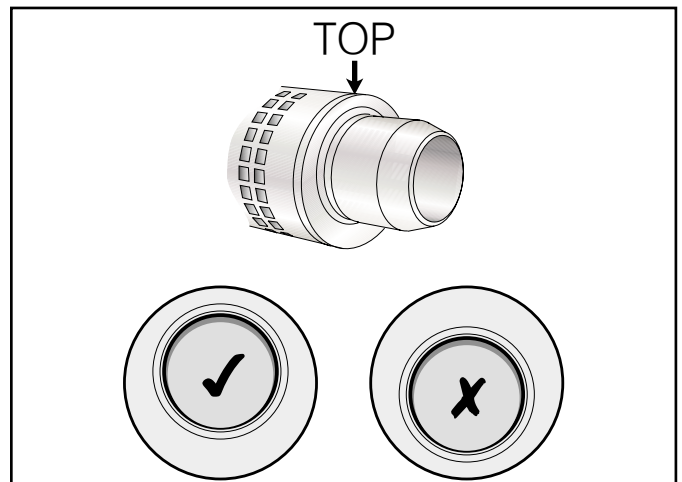


Figure 13-16: Correct position of flue terminal

NOTE

Lubricate all the seals in both the inner and outer sections with the lubricant supplied and assemble with a twisting motion.

Fit the Terminal section

Hybrid boiler unit outside building – Fit the terminal section in through the opening in the end of the Hybrid boiler unit (above the burner). Engage onto boiler connector section. See Figure 13-12. From outside Hybrid boiler unit, rotate terminal section to position 'TOP' label uppermost. See Figure 13-16.

Hybrid boiler unit inside building – Fit the terminal section in through the hole previously made in the wall and the opening in the rear face of the Hybrid boiler casing. Engage onto boiler connector section. See Figure 13-12.

From outside building, rotate terminal section to position 'TOP' label uppermost. See Figure 13-16.

Pull out the terminal as required such that groove around the terminal is aligned with the outer surface of the casing or wall.

CAUTION

The flue guard must always be fitted to protect persons from hot flue parts and to prevent entry of objects into the flue pipe.

Connect the flexible air snorkel tube to the air inlet spigot on the boiler connection section of the flue system. Secure using the hose clip provided.

Connect the other end of the flexible air snorkel tube to the burner air inlet spigot and secure using the hose clip provided.

14 Control Panel

14.1 General

The control panel for the Grant VortexAir hybrid is located inside the boiler casing, immediately above the burner.

To access the control panel fascia, remove the boiler/burner access panel on the right hand side of the boiler casing.

Turn the handle at the bottom clockwise to release the catch. Pull the panel forwards at the bottom and remove it from the boiler. Refer to Figure 14-1.

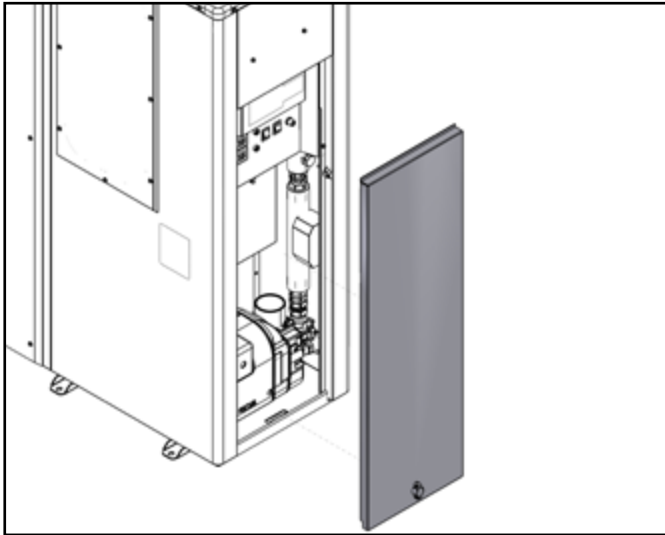


Figure 14-1: Removal of boiler access panel

14.2 Hybrid Controls

Refer to Figure 14-3 for the controls located on the control panel fascia:

14.3 Heat and Electricity Meters

Not all installations will require a Heat meter and Electricity meter. Usually only installations receiving a Renewable Heat Incentive (RHI) payment will require both the heat meter and electricity meter to be fitted. Refer to Section 7 for further information.

When fitted, the integrator unit of the heat meter and the electricity meter will be located in a purpose made housing immediately above the control panel. The display screens of both meters are clearly visible in order for meter readings to be periodically taken, as required, to determine the amount of RHI to be paid. Refer to Figure 14-3.

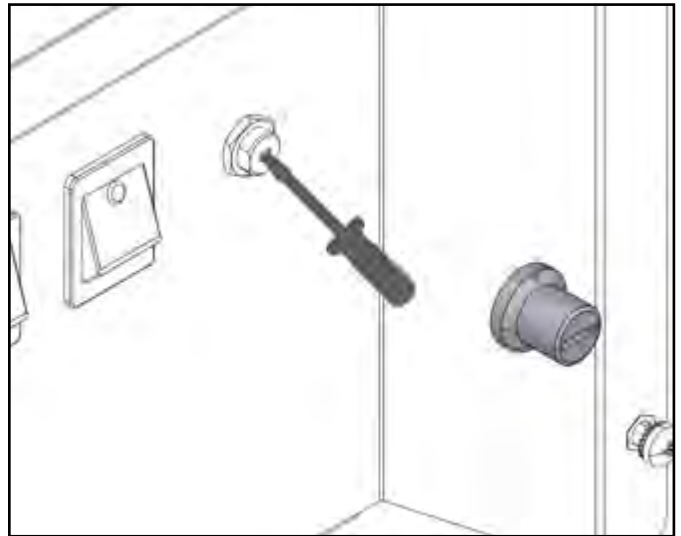


Figure 14-2: Resetting the overheat thermostat

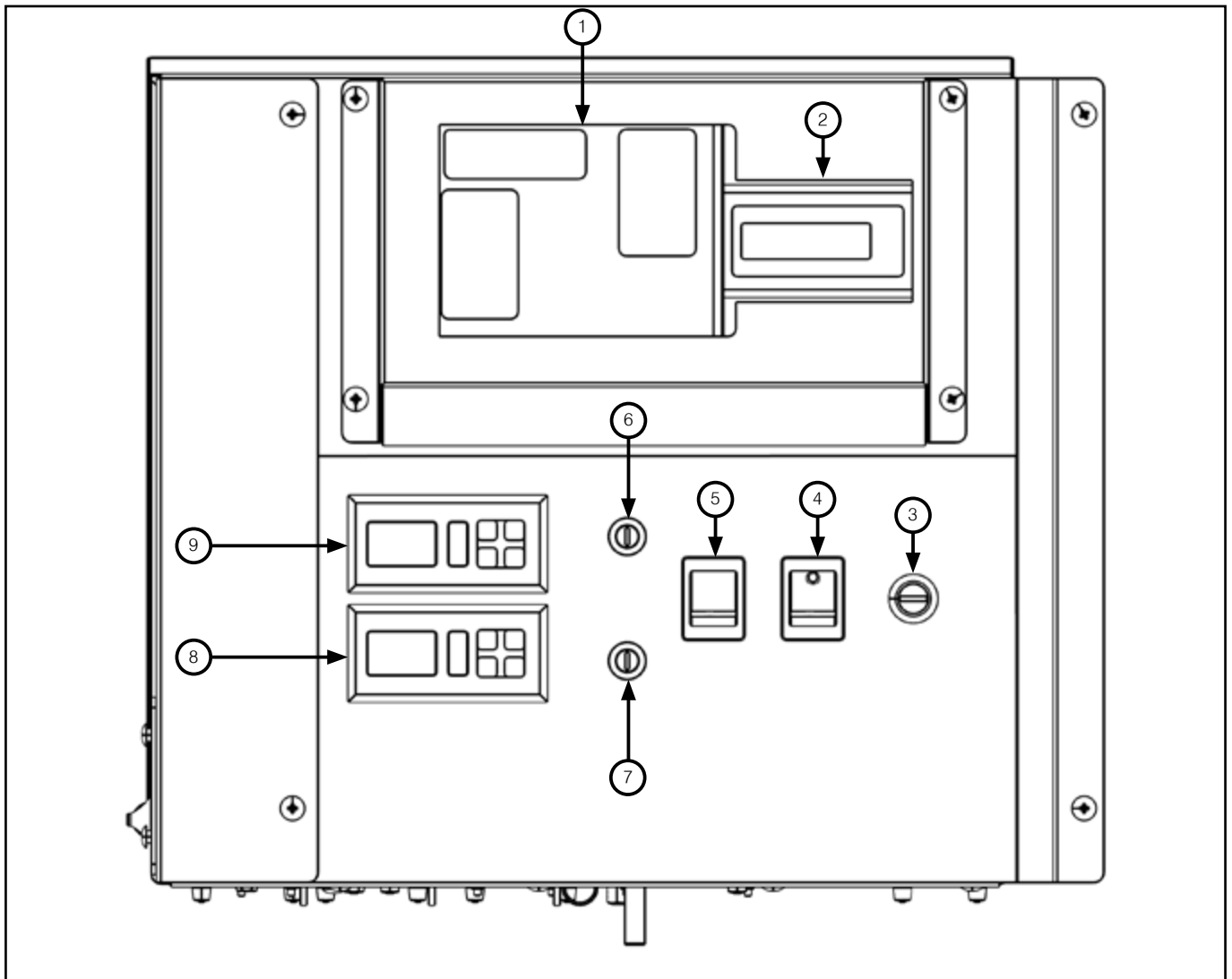


Figure 14-3: Control panel

Table 14-4: Control panel key

Key	Item	Description
1	Heat meter	Refer to Section 7.2 for further information
2	Electricity meter	Refer to Section 7.3 for further information
3	Overheat thermostat	The safety overheat thermostat will automatically switch off the boiler in the case of a control malfunction causing overheating. If this occurs, the boiler will not light until the thermostat is reset. To reset: <ul style="list-style-type: none"> • Unscrew the small plastic cap (refer to Figure 13-2) • Insert a small pointed implement into the hole and press the reset button • Replace the cap If this condition continually repeats, contact your Service Engineer.
4	On / Off switch	This switch allows the hybrid unit to be switched off and back on as and when required. With this switch set to OFF, neither the heat pump or the oil boiler will operate. This will override all heating demands from the control system for the unit to start. IMPORTANT: Setting this switch to OFF DOES NOT isolate the electrical supply to the heat pump or the oil boiler. To fully isolate both heat pump and oil boiler unit, use the lockable external isolator installed to provide power to the hybrid. Refer to Section 12 (electrical) for details of electrical wiring.
5	Oil / Hybrid switch	This switch allows selection of either the 'hybrid' or 'oil' modes of operation, as follows: <ul style="list-style-type: none"> • Hybrid - when the switch is set to this, the heat pump either operates alone or in conjunction with the oil boiler, depending on air control thermostat setting. • Oil - when the switch is set to this, only the oil boiler can operate. Set the switch to this option if the oil boiler is to operate in a 'stand-alone' situation, i.e. if the heat pump has not yet been installed, or it has been shut down for maintenance.
6	Fuse - heat meter (1 amp)	This fuse protects the electrical supply to the heat meter.
7	Fuse - heating controls (5 amps)	This fuse protects the electrical supply to the external heating system controls and the oil boiler.
8	Boiler control thermostat	This controls the boiler flow temperature level. It has two temperature settings (R1 and R2). Refer to Section 15.6.1 (commissioning) for details on how to set the boiler control thermostat.
9	Air control thermostat	This monitors the ambient (outdoor) air temperature. It has two temperature settings (R1 and R2). Refer to Section 15.6.2 (commissioning) for details on how to set the air control thermostat.

15 Operation

15.1 General

The Grant VortexAir Hybrid consists of a Grant Aeronas³ 16kW air source heat pump and a Grant high efficiency condensing oil boiler (fitted with a low NOx blue flame burner).

The principal objective of the hybrid is to use the heat pump as much as possible to provide space heating, either with or without any assistance from the oil boiler, throughout the major part of the year. The oil boiler is intended only to support the heat pump when it cannot provide sufficient heat output to meet the demand and/or where the heat emitters (eg: radiators) cannot meet the heat demand at the lower flow temperature under the coldest conditions.

In warmer periods, the heat loss from the building will be substantially less than that under 'design conditions', i.e. the lowest temperature at which the heat loss of the building was calculated. Under these warmer conditions the heat pump will be able to produce the heat output required to meet this reduced heat loss at a flow temperature sufficient to achieve the necessary heat output from the heat emitters (radiators).

As conditions get colder the heat loss from the building will increase, requiring a greater output from the heat pump and a greater flow temperature to ensure the necessary heat output from the heating system radiators.

Under the coldest conditions, the heat pump will not be able to meet the heat loss of the building and, even if it could, the lower flow temperature will be insufficient to ensure that the radiators can produce the required heat output. It is under these coldest conditions that the oil boiler will be required as a back-up. If correctly sized, the boiler output will meet the heat losses and maintain the indoor design temperature when the outside (ambient) temperature is at its lowest, i.e. at the outdoor design temperature used for the heat loss calculation.

15.2 External heating system controls

The Grant VortexAir will operate in response to a 230V switched live demand from the heating and hot water control system, e.g. an S-plan type system. Refer to Section 12 for electrical control wiring details.

This switched live will be connected to one of three terminals on the Heating System Controls terminal block, located in the hybrid control panel, as follows:

- Terminal 7 – Hot water demand (low temperature when using the Grant Digital two-stage Cylinder thermostat)
- Terminal 8 – Hot water demand (high temperature when using a standard cylinder thermostat or the Grant Digital two-stage Cylinder thermostat)
- Terminal 9 – Central heating demand



NOTE

There must only be ONE switched live on terminals 7, 8 or 9 at any one time. Thus, hot water demands must be set (on the programmer) to occur at a different time to the central heating demand.

15.3 Oil/Hybrid Switch

The Grant VortexAir Hybrid has two basic operating modes:

- Hybrid – where both the heat pump and oil boiler can operate together, depending on the prevailing ambient conditions. See Section 15.4.
- Oil – where only the oil boiler can operate. The heat pump (if installed and connected) is effectively switched off when the VortexAir Hybrid is in this operating mode. See Section 15.5.

The operating mode is selected by the setting of the Oil/Hybrid switch to either 'Oil' or 'Hybrid' as required. This switch is located on the hybrid control panel fascia (inside the boiler casing). See Section 14.

15.4 Hybrid Operation

As each application of the VortexAir Hybrid will be different, in order to achieve the most efficient operation of the Grant VortexAir Hybrid, using the Heat Pump to the maximum, it is essential that the Boiler Control and Air Control Thermostats (located on the hybrid control panel) are correctly set during commissioning. Refer to Section 16.6 for details on how to set these two thermostats.

The temperature settings for these two thermostats must be determined for the building in question using the Grant VortexAir Hybrid calculator. This is available as a download from the Grant UK website www.grantuk.com. Refer to Section 16.5 for further details.

In the hybrid operating mode (i.e. with the Oil/Hybrid switch set to 'Hybrid') the Grant VortexAir hybrid can operate in one of three ways:

- Heat pump only – under warm/mild conditions
- Heat pump with a small input from the oil boiler – under colder conditions
- Oil boiler with a small input from the heat pump – under the coldest conditions

This operation is basically controlled by the ambient air temperature. The first and second stage air temperatures, set on the Air Control Thermostat, will govern when the hybrid switches between these three forms of operation or where the heat pump automatically request assistance from the oil boiler.

The first and second stage temperatures, set on the boiler control thermostat, will govern the flow temperatures when the boiler is in operation.

15.4.1 Heat pump only

When the ambient air temperature is warmer, the heat loss from the property will be significantly lower than that at the design conditions, i.e. when the ambient air is at its coldest for the area concerned.

Thus the heat demand will be significantly less than the maximum and will be within the capacity of the heat pump.

Also, with this lower heat demand the heating system emitters (e.g. radiators) will be able to deliver the required heat output at the lower flow temperature from the heat pump, e.g. 45°C.

This will be the situation when the ambient air temperature is above the first stage (Relay R1) temperature setting of the Air Control thermostat. Refer to Section 16.6.2.

Thus, at temperatures above this value only the heat pump will be operating to meet the heat demand of the system.

The default value of this first stage (Relay R1) setting for the Air Control thermostat

=A1 (parameter SP) default 9°C + A2 (parameter C1) default 3°C = 12°C

The actual values for A1 (parameter SP) and A2 (parameter C1) must be determined using the Grant Hybrid calculator.

15.4.2 Heat pump with boiler back up

When the ambient air temperature is a little colder, the heat loss (and thus the heat demand) will increase, although it will still be less than the maximum heat demand at the design conditions.

Under these conditions the increased heat demand can either no longer be met by the heat pump alone, or the heating system emitters (e.g. radiators) will be unable to deliver the required heat output at the lower flow temperature from the heat pump, or both.

This will be the situation when the ambient air temperature falls below the first stage (Relay R1) temperature setting, but is still above the second stage (Relay R2) temperature setting, of the Air Control thermostat. Refer to Section 16.6.2.

The default value of the second stage (Relay R2) setting for the Air Control thermostat

= A3 (parameter SP2) default 1°C + A4 (parameter C51) default 3°C = 4°C

Actual values for A3 (parameter SP2) and A4 (parameter C51) must be determined using the Grant Hybrid calculator.

In this situation, the heat pump will still be operating but is backed up by the boiler, operating at a restricted output, to provide a greater combined heat output and a higher flow temperature (e.g. 55°C) to allow the heat emitters to deliver the required heat output.

This flow temperature is controlled by the first stage (Relay R1) setting of the Boiler Control thermostat. Refer to Section 16.6.1.

The default value of this first stage (Relay R1) setting for the Boiler Control thermostat

=B1 (parameter SP) default 52°C + B2 (parameter C1) default 3°C = 55°C

Actual values for B1 (parameter SP) and B2 (parameter C1) must be determined using the Grant Hybrid calculator.

15.4.3 Boiler with heat pump

When the ambient air temperature is at or near the design conditions, the heat loss (and heat demand) will be at or near maximum.

Under these conditions the heat demand can only be met by the boiler, with some contribution from the heat pump.

Also, the heating system emitters (e.g. radiators) must operate at a higher flow temperature in order to deliver the required heat output.

This will be the situation when the ambient air temperature falls below the second stage (Relay R2) temperature setting of the Air Control thermostat.

In this situation, the boiler will be operating at maximum output (either 21kW or 26kW or as set on commissioning) to meet the heat demand with a higher flow temperature (e.g. 70°C) to allow the heat emitters to deliver the required heat output.

This flow temperature is controlled by the second stage (Relay R2) setting of the Boiler Control thermostat. Refer to Section 16.6.1.

The default value of this second stage (Relay R2) setting for the Boiler Control thermostat

=B3 (parameter SP2) default 67°C + B4 (parameter C51) default 3°C = 70°C

Actual values for B3 (parameter SP2) and B4 (parameter C51) must be determined using the Grant Hybrid calculator.

The heat pump is operational and can also operate with the boiler when the return temperature is low enough, e.g. during initial start-up when the system is cold. After that the boiler will be providing the majority of the heat output to meet the system demand.

15.5 Boiler Only Operation

When the Oil/Hybrid switch is set to 'Oil', only the boiler will operate to meet any heating (or hot water) demand.

The heat pump is effectively switched off and will not respond to any heating (or hot water) demand.

If only the boiler is installed and it is to operate as a 'stand-alone' unit (until the heat pump is installed and connected), the Oil/Hybrid switch MUST be set to 'Oil'.



NOTE

In all conditions, the Boiler Control Thermostat will almost always show an R1 and R2 demand as the water stored in the boiler will be below the desired flow temperature of the heat pump. The burner will only fire when there is a demand from either the Air Control Thermostat or the heat pump is switched.

16 Commissioning



WARNING

After the heat pump has been installed and connected to the oil boiler, the control parameters shown in Section 16.11 MUST be re-set before the Hybrid system can be operated.

16.1 General

The Grant VortexAir Hybrid unit can be installed in either of the two following ways:

- The oil boiler and heat pump installed at the same time, to operate together as a hybrid unit, or
- The boiler installed to initially operate as a 'stand-alone' unit with the heat pump installed at a later date.

In either case the oil boiler should be commissioned first using the procedure detailed in this section.

16.2 Oil Boiler

It is important that the following commissioning procedure is carried out to ensure safe and efficient operation of the boiler.

To access the boiler/hybrid control panel, remove the lower panel (turn the handle and pull it forwards at the bottom and remove from casing). The control panel is shown in Figure 7-6.

16.3 Before Switching On

1. Ensure the boiler On/Off switch and the test switch are set to OFF.
2. Check that the high limit thermostat and boiler control thermostat sensors are correctly located in their respective pockets. Refer to Figures 5-1, 5-2 or 5-3. Check condition of thermostat capillaries, not damaged, broken, kinked or crushed.
3. Remove the nuts and washers securing the front cleaning door. Withdraw the door - take care it is HEAVY!
4. Check that the turbulators are in position and that the ends are vertical.
5. Check that the baffles are in position. Refer to Figures 11-1, 11-2, 11-3 or 11-4 as required.
6. Re-fit the cleaning door and check it is fitted correctly and that a good seal is made.
7. Remove and check the burner. Check that the burner head is correct. Refer to Section 2.3 and Figure 11-9. Check the electrodes are set correctly. Refer to Figure 11-6 or 11-8 as required. Check the nozzle is correct for the output rating required. Refer to Section 2.3.
8. Check that the water system has been vented, pressurised and there are no leaks.
9. Ensure the automatic air vent on the condensing heat exchanger is open.
10. Check that all fuel line valves are open.
11. Remove the plastic burner cover if it was not previously removed.
12. Connect a combined vent manifold and pressure gauge to the pressure gauge connection port on the oil pump. See Figure 3-6. Open the vent screw on the vent manifold to vent the supply while the pump is running.
13. Check that all system controls are calling for heat and turn the boiler thermostat to maximum.

16.4 Setting the Hybrid Temperature Controls

In order to achieve the most efficient operation of the Grant VortexAir Hybrid, using the Heat Pump to the maximum, it is essential that the temperature controls are correctly set before first using the unit.

The required temperature settings are determined by using the Grant VortexAir Hybrid Calculator, available as a download from the Grant UK website www.grantuk.com.

This calculator must be used to determine the correct setting temperatures for the two-stage Boiler Control and Air Control thermostats.

Refer to the user instructions provided with the Grant VortexAir Hybrid Calculator for guidance.

Enter the following information:

- Calculated heat loss for the building concerned
- Ambient design temperature
- Flow temperature
- Radiator design temperature
- Type of heat emitters

The following nine hybrid settings will be calculated and displayed by the calculator.

These must be set on the Heat Pump controller, the Boiler Control Thermostat and the Air Control Thermostat, as detailed below:

• H1 - Heat Pump Flow Temperature

Set the Heat Pump controller to this temperature using Parameter 21 02.

Refer to Section 3.7 of the Installation Instructions supplied with the Grant Aeron³ heat pump for guidance on accessing and setting heat pump parameters.

The factory default value for parameter 21 02 is 45°C. This must be checked and re-set, if required, to give the required value (H1) as indicated by the calculator.

Note: this can only be done after the Heat Pump has been installed.

• B1 - Oil Boiler Flow Temperature – 1st Stage (relay R1)

Set this as parameter SP for the 1st stage on the Oil Boiler Control Thermostat.

The factory default value for parameter SP is 52°C. This must be checked and re-set, if required, to give the required parameter SP value (B1) as indicated by the calculator.

Refer to Section 16.5.1 for guidance on setting parameter SP (B1) on the Oil Boiler Control Thermostat.

• B2 - Oil Boiler Hysteresis – 1st Stage (relay R1)

Set this as parameter C1 for the 1st stage on the Oil Boiler Control Thermostat.

The factory default value for parameter C1 is +3°C. This must be checked and re-set, if required, to give the required parameter C1 value (B2) as indicated by the calculator.

Refer to Section 16.5.1 for guidance on setting parameter C1 on the Oil Boiler Control Thermostat.

• B3 - Oil Boiler Flow Temperature – 2nd Stage (relay R2)

Set this as parameter SP2 for the 2nd stage on the Oil Boiler Control Thermostat.

The factory default value for parameter SP2 is 63°C. This must be checked and re-set, if required, to give the required parameter SP2 value (B3) as indicated by the calculator.

Refer to Section 16.5.1 for guidance on setting parameter SP2 Oil Boiler Control Thermostat.

- **B4 - Oil Boiler Hysteresis – 2nd Stage (relay R2)**

Set this as parameter C51 for the 2nd stage on the Oil Boiler Control Thermostat.

The factory default value for parameter C51 is +3°C. This must be checked and re-set, if required, to give the required parameter C51 value (B4) as indicated by the calculator.

Refer to Section 16.5.1 for guidance on setting parameter C51 on the Oil Boiler Control Thermostat.

- **A1 - Air Thermostat Temperature – 1st Stage (relay R1)**

Set this as parameter SP for the 1st stage on the Air Control Thermostat.

The factory default value for parameter SP is 9°C. This must be checked and re-set, if required, to give the required parameter SP value (A1) as indicated by the calculator.

Refer to Section 16.5.2 for guidance on setting parameter SP on the Air Control Thermostat.

- **A2 - Air Thermostat Hysteresis – 1st Stage (relay R1)**

Set this as parameter C1 for the 1st stage on the Air Control Thermostat.

The factory default value for parameter C1 is +3°C. This must be checked and re-set, if required, to give the required parameter C1 value (A2) as indicated by the calculator.

Refer to Section 16.5.2 for guidance on setting parameter C1 on the Air Control Thermostat.

- **A3 - Air Thermostat Temperature – 2nd Stage (relay R2)**

Set this as parameter SP2 for the 2nd stage on the Air Control Thermostat.

The factory default value for SP2 is 1°C. This must be checked and re-set, if required, to give the required parameter SP2 value (A3) as indicated by the calculator.

Refer to Section 16.5.2 for guidance on setting parameter SP2 on the Air Control Thermostat.

- **A4 - Air Thermostat Hysteresis – 2nd Stage (relay R2)**

Set this as parameter C53 for the 2nd stage (R2) on the Air Control Thermostat.

The factory default value for parameter C53 is +3°C. This must be checked and re-set, if required, to give the required parameter C53 value (A4) as indicated by the calculator.

Refer to Section 16.5.2 for guidance on setting parameter C53 on the Air Control Thermostat.

16.5 Digital Temperature controllers

There are two digital temperature controllers on the Hybrid unit control panel:

- The Boiler Control Thermostat
- The Air Control Thermostat

Refer to Figure 14-3 – control panel to locate the two digital temperature controllers.

Whilst the procedure for setting each digital controller is the same, the temperature values set on each controller are different. It is essential that the correct values are set on each controller.

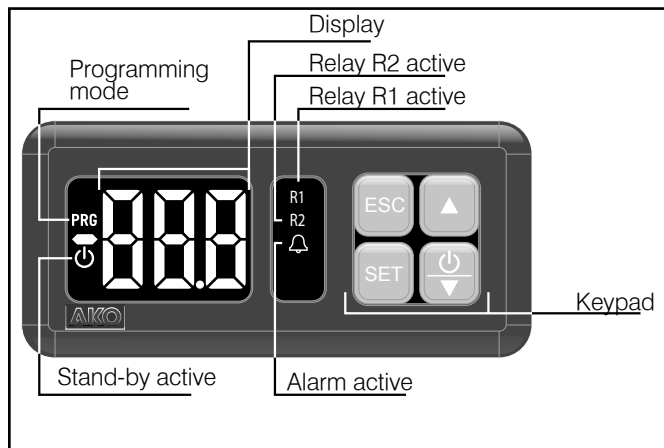


Figure 16-1: Digital temperature controller

There are FOUR buttons on the controller keypad. Their functions are as follows:

- **ESC**
Deactivates alarms but they remain signalled (According to parameter A16).
The save without changes, return to previous level or exit programming parameter appears on the programming menu.
- **SET**
Pressing it for 5 seconds allows changing the SP set point of relay 1.
Pressing it for 10 seconds accesses the programming menu. In the programming menu, it accesses the level shown on the display or, during the setting of a parameter accepts the new value.
- **Up**
Pressing it for 5 seconds allows changing the SP2 set point of relay 2.
In the programming menu it allows scrolling around the different levels, or during the setting of a parameter, changing its value.
- **Down**
Pressing it for 5 seconds activates the Stand-by mode and pressing it for 2 seconds returns the device to the normal mode. In the Stand-by mode, the unit does not carry out any action and the display only shows the m indicator.
In the programming menu it allows scrolling around the different levels, or during the setting of a parameter,

The setting procedure for the two digital controllers is as follows:

16.5.1 Setting the Boiler Control Thermostat



NOTE

If no button is pressed for ten seconds, the display will revert to normal display (temperature).

1. Set the heating system controls to OFF, e.g. set the programmer to OFF
2. Set the 'Oil/Hybrid' switch on the control panel to 'Oil'.
3. Switch on the electricity supply.
4. Set the ON/OFF switch on the control panel to ON.

To set the 1st Stage (relay R1) parameter values B1 & B2:

1. Press and hold SET button for 10 seconds until 'PrG' is displayed.
2. Release button – 'rE' is then displayed (1st stage settings).
3. Press SET – 'SP' is displayed.
4. Press SET again – the value of parameter SP is displayed. Default value 52°C.
5. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter SP to value B1 as indicated by the calculator.
6. Press SET to confirm value – 'SP' is then displayed again.
7. Press UP arrow button twice – 'C1' is displayed
8. Press SET - the value of parameter C1 is displayed. Default value +3°C.
9. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter C1 to value B2 as indicated by the calculator.
10. Press SET to confirm value – 'C1' is then displayed again.
11. Press ESC to go back to 'rE' display.
12. Press ESC again to go back to normal display (temperature).

To set the 2nd Stage (relay R2) parameter values B3 & B4:

1. Press and hold SET button for 10 seconds until 'PrG' is displayed.
2. Release button – 'rE' is then displayed (1st stage settings).
3. Press UP arrow button – 'rE2' is displayed.
4. Press SET – 'SP2' is displayed.
5. Press SET again – the value of parameter SP2 is displayed. Default value 67°C.
6. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter SP2 to value B3 as indicated by the calculator.
7. Press SET to confirm value – 'SP2' is then displayed again.
8. Press UP button once – 'C51' is displayed.
9. Press SET - the value of parameter C51 is displayed. Default value +3°C.
10. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter C51 to value B4 as indicated by the calculator.
11. Press SET to confirm value – 'C51' is then displayed again.
12. Press ESC to go back to 'rE2' display.
13. Press ESC again to go back to normal display (temperature).

16.5.2 Setting the Air Control Thermostat

To set the 1st stage (relay R1) parameter values A1 & A2:

1. Press and hold SET button for 10 seconds until 'PrG' is displayed.
2. Release button – 'rE' is then displayed (1st stage settings).
3. Press SET – 'SP' is displayed.
4. Press SET again – the value of parameter SP is displayed. Default value 9°C.
5. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter SP to value A1 as indicated by the calculator.
6. Press SET to confirm value – 'SP' is then displayed again.
7. Press UP arrow button twice – 'C1' is displayed
8. Press SET - the value of parameter C1 is displayed. Default value +3°C.
9. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter C1 to value A2 as indicated by the calculator.
10. Press SET to confirm value – 'C1' is then displayed again.
11. Press ESC to go back to 'rE' display.
12. Press ESC again to go back to normal display (temperature).

To set the 2nd Stage (relay R2) parameter values A3 & A4:

1. Press and hold SET button for 10 seconds until 'PrG' is displayed.
2. Release button – 'rE' is then displayed (1st stage settings).
3. Press UP arrow button – 'rE2' is displayed.
4. Press SET – 'SP2' is displayed.
5. Press SET again – the value of parameter SP2 is displayed. Default value 1°C.
6. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter SP2 to value A3 as indicated by the calculator.
7. Press SET to confirm value – 'SP2' is then displayed again.
8. Press UP button once – 'C51' is displayed.
9. Press SET - the value of parameter C51 is displayed. Default value +3°C.
10. Alter the value, if required, using the UP or DOWN arrow buttons.
Set parameter C51 to value A4 as indicated by the calculator.
11. Press SET to confirm value – 'C51' is then displayed again.
12. Press ESC to go back to 'rE2' display.
13. Press ESC again to go back to normal display (temperature).

Set the ON/OFF switch on the control panel to OFF.

16.6 Switching On

If the boiler is installed as a 'stand-alone' unit, i.e. the heat pump is not yet installed

Check the 'Oil/Hybrid' switch on the control panel is set to 'Oil'.

Set all system controls as required and set the ON/OFF switch on the control panel to ON.

1. Switch on the electricity supply.
2. Set the Boiler On/Off switch to ON. A neon in the switch lights when it is in the ON position. The boiler will now light automatically. Note that the neon lights when the boiler is switched on, but does not necessarily indicate the burner is firing.
3. The burner fan will start and the burner will light within about 12 seconds. If the burner does not light and the 'Lock-out' reset button lights, wait for about 45 seconds then press the reset button to restart the ignition process. This procedure may have to be repeated several times during first lighting.
4. With the burner alight, check the fuel pressure.
5. Refer to the Technical Information, Section 2.3.
6. Adjust the pressure if necessary - see Figure 3-6.



NOTE

It is important that the oil pressure is correctly set.

14. Operate the boiler until it reaches normal operating temperature. Check oil supply/return pipe for leaks, rectifying where necessary.
15. Check the operation of the boiler thermostat. Ensure that by turning it anticlockwise it switches the burner off.
16. With the burner alight, re-check the fuel pressure and re-adjust if necessary. Turn the boiler off, remove the pressure gauge and replace the plug in the pump.
17. Ensure that there are no oil leaks, replace the burner cover.

6.7 Air Damper Adjustment

Use a 3 mm Allen key to adjust the air damper. Refer to Figure 16-2.

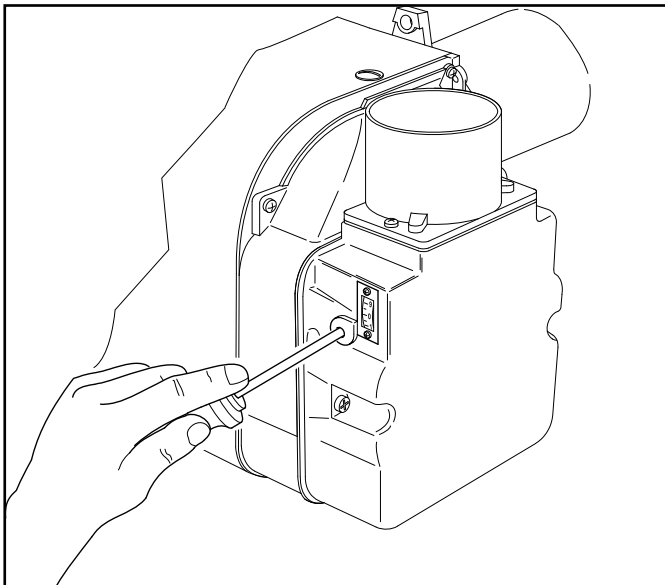


Figure 16-2: Air damper adjustment

16.8 Air Adjuster Disc – 15/21kW only

The boiler is supplied with an air adjuster disc loose in the accessories bag.

To fit and position the air adjuster disc when downrating the 15/21kW boiler to 15 or 16kW output:

1. Ensure the boiler is isolated from the electrical supply.
2. Remove the burner from the boiler.
3. Undo the two screws (1) and remove the air damper assembly from the side of the burner.
4. Remove the screw (2) from the centre of where the air adjuster disc will be fitted.
5. Position the disc such that the disc setting 'B' (corresponding to 15 or 16kW output setting – refer to Section 2.4) is located against the cast boss on the fan housing.
6. Replace the screw in the centre of the air adjuster disc and tighten.
7. Re-fit the air damper assembly to the side of the burner and reassemble in reverse order.

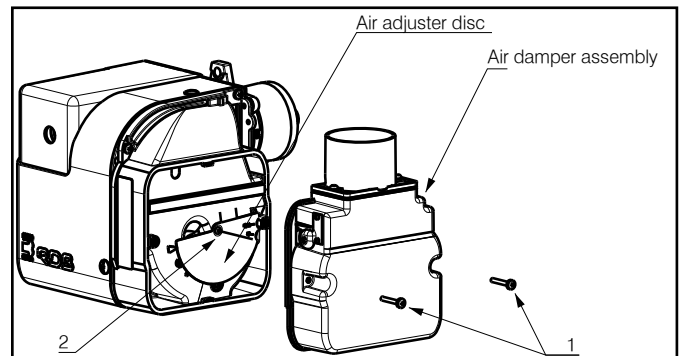


Figure 16-3: Fitting the air adjuster disc

16.9 Running the Boiler

1. Relight the boiler and allow it to run for at least 20 minutes.
2. Check the smoke number, if satisfactory check the CO₂. Set the CO₂ to the value given in Section 2.4 for the boiler concerned.



NOTE

Final combustion readings can only be measured outside through the low level flue terminal (or the test point on the conventional flue starter elbow when used) with all the casing panels fitted.

3. Use the hexagonal key supplied to adjust the burner air damper (refer to Figure 16-2) as required. Turning the screw anti-clockwise closes the damper and increases CO₂ level, turning the screw clockwise opens the damper and reduces CO₂ level.
4. Re-check the smoke number if the damper has been moved. Under no circumstances must the smoke number be above 1.



NOTE

It is important that the air damper is correctly set.

5. Check the flue gas temperature by placing the combustion analyser in the low level flue terminal (or into the test point on the starter elbow if either the Green system or Hybrid system is used).

16.10 Balancing the System

- When the boiler has been adjusted and is running satisfactorily, balance the central heating system by adjusting the radiator lock shield valves. Start with the radiator nearest the boiler and adjust the valves to achieve the required temperature drop across each radiator. If thermostatic radiator valves have been installed, check the system by-pass.
- Switch off the boiler.

16.11 Completion

- With the system hot, check again for leaks, rectifying where necessary. Drain the system while it is hot to complete the flushing process. Refill, vent and pressurise.
- A suitable central heating system inhibitor must be added to protect the system against the effect of corrosion.
- A suitable antifreeze should be used to prevent damage to the boiler in areas where electrical power failure can occur in winter months.
- Replace the top, front and rear panels as necessary.



NOTE

After commissioning the boiler complete the Commissioning Form and the OFTEC CD/11 commissioning report.

Leave the top copy with the User and retain the carbon copy.

If the boiler is to be left in service with the User, set the controls and room thermostat (if fitted) to the User's requirements.

If the boiler is not to be handed over immediately, close the boiler fuel supply valve and switch off the electricity supply.



CAUTION

If there is any possibility of the boiler being left during frost conditions, then the boiler and system should be drained. Alternatively, a suitable antifreeze should be used.

To allow the boiler to be commissioned and serviced correctly a combustion test point is provided on the front cleaning door.

The CO₂ and smoke test may all be carried out using this test point.



NOTE

The test point is not suitable for measuring boiler efficiency or conventional flue draught.

When using the test point on the cleaning cover note that the flue gas temperature reading will be higher than that measured in the flue thus resulting in an inaccurate efficiency reading. To obtain an accurate flue gas temperature and efficiency, the reading can only be measured outside through the low level flue terminal or the test point on the conventional flue starter elbow when fitted - with all the casing panels fitted.

16.12 Heat Pump

16.12.1 Heat Pump Control Parameter Settings

After the heat pump has been installed and connected to the oil boiler, the control parameters given in Table 16-4 MUST be updated before the hybrid system can be operated.

These are accessed via the Installer Menu on the Heat Pump Remote Controller.

Refer to Section 9.5 of the Aerona³ Installation and Servicing Instructions for details of how to access the Installer Menu.

16.12.2 Setting the Heat Pump flow temperature

Set the Heat Pump controller to this temperature using Parameter 21 02.

Refer to Section 3.7 of the Installation Instructions supplied with the Grant Aerona³ heat pump for guidance on accessing and setting heat pump parameters.

The factory default value for parameter 21 02 is 45°C. This must be checked and re-set, if required, to give the required value (H1) as indicated by the calculator.

Note: this can only be done after the Heat Pump has been installed.

Table 16-4: Control parameters updates

Level	Parameter		Function description	Display and input value				Settings
	Group	Code		Default	Min.	Max.	Unit	
I	21	02	Maximum outgoing water temperature in Heating mode (Tm1)	45.0	23.0	60.0	0.5°C	Change to 'heat pump flow temperature' (value of H1) given in the hybrid calculator to maximum of 55°C.
I	21	04	Minimum outdoor air temperature corresponding to maximum outgoing water temperature (Te1)	-4	-20.0	50.0	0.5°C	Change to 'ambient design temperature' (cell C11) given in the hybrid calculator.
I	46	00	Backup heater type of function 0=disable 1=Replacement mode 2=Emergency mode 3=Supplementary mode	0	0	3	-	Change to 3 (supplementary mode)*
I	46	01	Manual water set point	50.0	40.0	60.0	0.5°C	Change to parameter 2102 value
I	46	04	Heater activation delay time	5	0	900	1min	Change to 45.0
I	46	05	Integration time for starting heaters	600	0	900	°C×sec	Change to 0
I	46	10	Conditions to be available backup heaters 0=always enabled 1=depends on outdoor air temperature	1	0	1	-	Change to 0
I	51	46	Terminal 46: DHW electric heater or backup heater 0=DHW Electric heater 1=Backup heater	0	0	1	-	Change to 1

* When parameter 4600 is changed to 3, parameter 4700 (EHS type of function) becomes disabled.

17 Servicing

This section covers the servicing procedure for the oil boiler.

For servicing information on the heat pump, refer to the Installation Instructions supplied.

To ensure efficient operation of the boiler it is recommended that it is checked and serviced as necessary at regular intervals. The frequency of servicing will depend upon the particular installation conditions and usage, but in general once per year should be adequate.

Servicing and replacement of parts must only be carried out by a suitably qualified engineer.



WARNING

Before starting any work on the boiler, or fuel supply please read the health and safety information given in Section X.

External equipment operated at 230 volts should not be serviced or repaired under adverse weather conditions.

17.1 Checking Before Servicing

The following sequential checks should be made before any servicing:

1. Check the flue terminal and ensure it is not blocked or damaged.
2. Run the boiler and check the operation of its controls.
3. Ensure that all water/fuel system connections and fittings are sound. Remake any joints and check the tightness of any fittings that may be leaking.
4. If the boiler is used on a sealed central heating system, check the system pressure, check the operation of the pressure relief valve and check the expansion vessel air charge. See Section 7.2.
5. Refill, vent and re-pressurise the system as necessary. See Section 7.3.
6. Check that the louvres in the front panel are clear.
7. Remove any sludge/water from the fuel tank by opening the sludge valve at the lower end of the tank.
8. With the fuel supply valve closed, clean/replace the filter element and clean the filter bowl.
9. Braided flexible fuel supply hoses (as supplied with the boiler) should be replaced annually. If long-life hoses have been installed, these should be inspected annually. If in doubt replace the hoses. In any event, these hoses must be replaced every five years.



WARNING

Before servicing, set the boiler On/ Off switch to Off, isolate the electricity supply and close the fuel supply valve.

Allow the boiler to cool.

The data label on the inside of the case side panel will indicate the fuel used and the nozzle fitted.

17.2 Dismantling Prior to Servicing

The procedure for dismantling the boiler is as follows:

1. Remove the front panel by turning the handle and withdrawing it forwards at the bottom.
2. Remove the four screws securing the top panel and carefully lift it off, taking care not to damage the insulation.
3. Remove the burner fixing nut (top of mounting flange) and withdraw the burner. If required, disconnect the flexible oil hose(s), use a suitable container to prevent any oil spillage.



NOTE

If two flexible hoses are connected to the burner, identify (mark if necessary) which is the inlet and return if they are to be disconnected.

17.3 Cleaning the Boiler

The procedure for cleaning the boiler is as follows:

1. Remove the nuts and washers securing the front cleaning door and withdraw the door. Take care - it is heavy.
2. Remove the baffles.
3. Remove all deposits from the baffle plates and all the boiler internal surfaces using a stiff brush and scraper if necessary.
4. Check the condition of the flue, clean as necessary.
5. Check the condition of the front cleaning door seal, replace if necessary.
6. Replace the baffles, ensuring they are correctly fitted.
7. Pull out the spiral turbulators from the heat exchanger tubes.
8. Clean the turbulators using a stiff brush.
9. Test the heat exchanger condensate drain by pouring water into one of the lower tubes and observe whether the water discharges from the 22 mm condensate outlet. Replace the turbulators.
10. Replace the front cleaning door, ensuring the seal is in good condition and secure it in position with the nuts and washers previously removed. Tighten to form a seal.
11. Remove the condensate trap and check that it is not blocked and is operating correctly, i.e. the float is free to move. Clean the trap and float as required. Refer to Section 6.8.
12. Check that the boiler condensate outlet is unobstructed. Clean if necessary.



NOTE

The condensate trap and condensate outlet must be checked on every service and cleaned as necessary.

17.4 Cleaning the Burner

The procedure is as follows:

1. Combustion head: Loosen the two screws securing the combustion head and withdraw the head.
2. Clean the combustion head.
3. Inspect the ignition electrodes: Loosen the electrode clamp screw and withdraw the electrode assembly. Wipe clean and check for any cracks in the ceramic insulation. Replace if necessary.
4. Check the electrode setting and diffuser setting.
5. To adjust the electrodes: Loosen the electrode clamp screw and move the electrode unit to achieve the gap 'in Figure 16-7, tighten the screw.
6. To adjust the air damper, refer to Section 6.7.
7. Nozzle: The nozzle should be replaced on an annual service. Check that the nozzle size and type are correct, refer to table in Section 2.4 and boiler data label.
8. With the combustion head removed, loosen the electrode assembly clamp screw and slide the electrodes away from the nozzle.
9. Do not attempt to clean the nozzle.
10. Remove the nozzle using a good fitting spanner (16 mm).



The use of an ill-fitting spanner will damage the nozzle and could lead to an incorrect flame pattern.

11. Always check the electrode settings after replacing the nozzle, see Figure 16-7.

All models

UV sensor:

The photocell is a push-fit in the burner body. Carefully pull it out to clean.

Burner fan:

With the air intake grille or spigot removed, remove the screws securing the fan housing cover (R/H side of burner) and remove the cover.

Inspect the fan and housing and clean as necessary. Replace the cover.

Pump filter:

With the burner cover removed, remove the four screws securing the pump end cover. Remove the filter and wash in kerosene. Replace the filter and end cover, ensure the 'O' ring is in position.

Re-assemble in reverse order.



To ensure safe and efficient operation of the boiler it is important that recommissioning is carried out, especially combustion checks (CO₂ level, flue gas temperature and smoke number) after the boiler has been serviced.

Refer to the Commissioning instructions in Section 16.

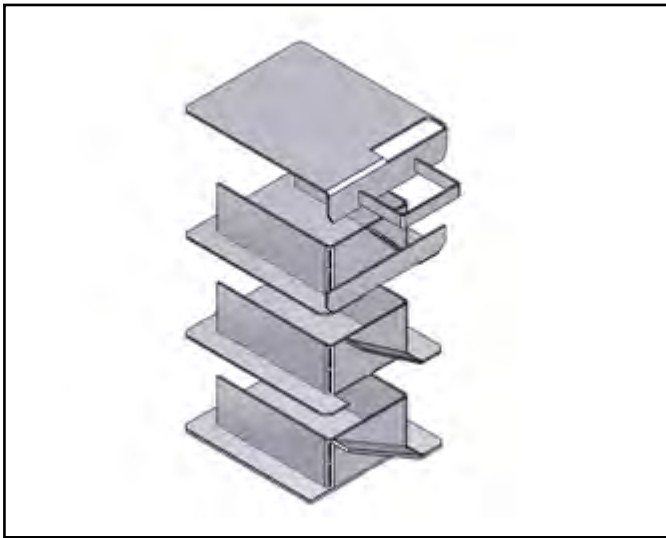


Figure 16-5: 15/21kW baffles

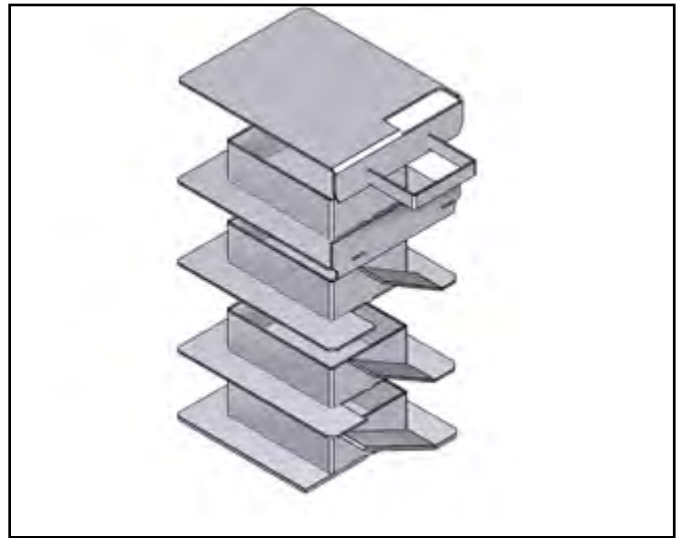


Figure 16-6: 21/26kW baffles

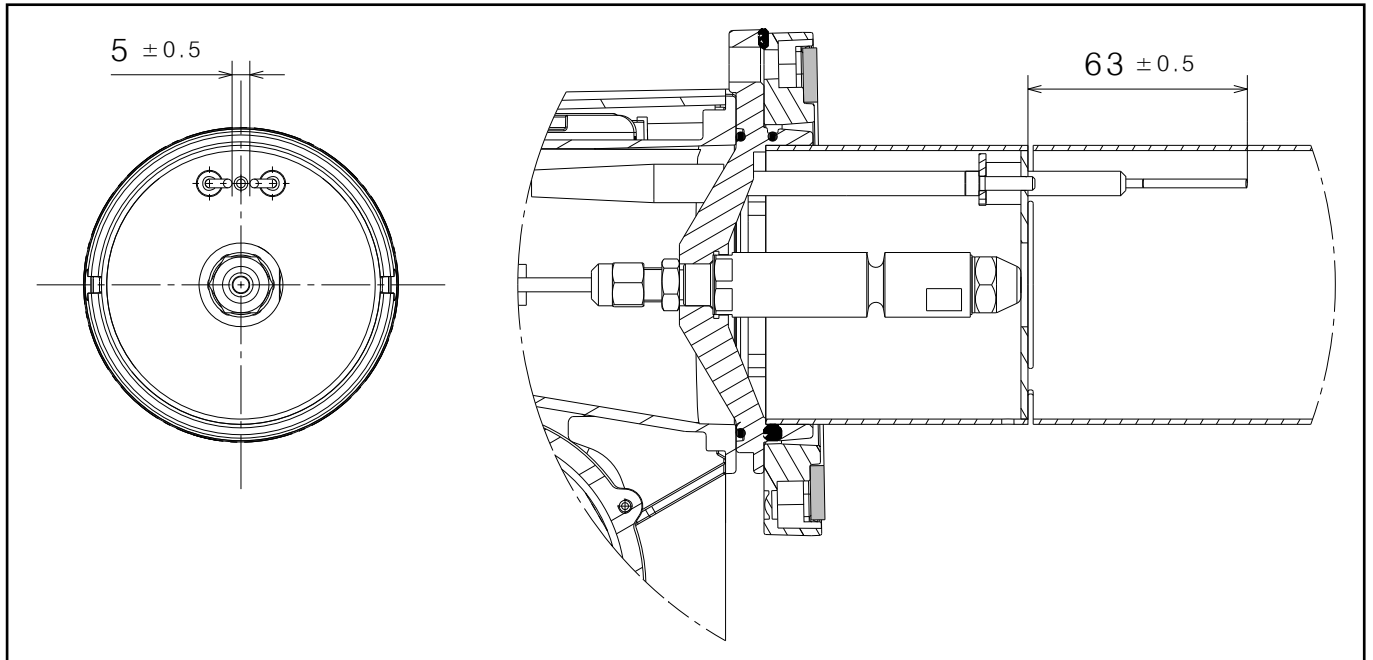


Figure 16-7: Ignition electrodes

18 Fault Finding

18.1 Burner Fault Indication

Whenever a burner lockout occurs the cause is displayed via the reset push button indicator LED on the control box. The colour, sequence and speed of the indicator LED flashes identify the specific lockout type and the possible causes are listed in Table X-1.

Table 18-1: Burner fault indication

Lockout description	Lockout time	LED colour	Probable cause
Presence of extraneous light during standby	After 25 seconds	RED blinking	<ul style="list-style-type: none"> • Presence of a false flame signal before the heat request
Presence of extraneous light detected during pre-purging	After 25 seconds	RED blinking	<ul style="list-style-type: none"> • Presence of false flame signal during pre-purging
Extraneous light detected during post-purging	After 25 seconds	RED blinking	<ul style="list-style-type: none"> • Presence of false flame signal during post-purging (or pre-heating if the short-circuit socket is not connected)
The flame is not detected after the safety time	After 5 seconds from oil-valve starts	RED steady ON	<ul style="list-style-type: none"> • UV sensor defective or dirty • Oil valve defective or dirty • Faulty ignition transformer • Badly regulated burner • Oil fuel not present
Flame failure during operation	After 3 recycles	RED blinking	<ul style="list-style-type: none"> • Badly adjusted burner • Oil valve defective or dirty • UV sensor defective or dirty
Fan motor error	Immediate (during pre-purge)	RED, ORANGE blinking inverted	<ul style="list-style-type: none"> • Faulty fan motor • Fan motor not connected
Malfunction in the internal control circuit that drives the oil valve	Immediate (during pre-purge)	RED, GREEN blinking inverted	<ul style="list-style-type: none"> • Faulty oil valve • Internal control circuit that drives the oil valve faulty
Eeprom error	Immediate (during pre-purge)	ORANGE, GREEN blinking inverted	<ul style="list-style-type: none"> • Faulty internal memory

18.2 Burner Fault Diagnostics

Table 18-2: Burner faults

Faults	Possible cause	Fault diagnostics	Solutions
The burner does not start when there is heat demand	Lack of electrical supply	OFF	Check presence of voltage in the L - N the pin plug
			Check the conditions of the fuses.
			Check that safety thermostat is not in lockout
The burner goes into lockout mode before or during the pre-purging	The UV sensor sees an extraneous light	GREEN, RED blinking	Eliminate the extraneous light.
	The connections in the control box are wrongly inserted	OFF	Check and connect all the plugs and sockets properly.
The burner goes into lockout mode before or during the pre-purging	The UV sensor sees extraneous light	RED blinking	Eliminate the extraneous light.
	The UV sensor is dirty	RED steady ON	Clear it
	The UV sensor is faulty		Replace it
	Flame moves away or fails		Check pressure and output of the fuel
			Check air output
Change nozzle			
	Check the coil of solenoid valve		
Burner starts with an ignition delay	The ignition electrodes are wrongly positioned	GREEN blinking	Adjust them according to the instructions of this manual
	Air output is too high		Set the air output according to the instructions of this manual
	Nozzle dirty or worn		Replace it

18.3 Riello RDB BLU Fault Finding Chart

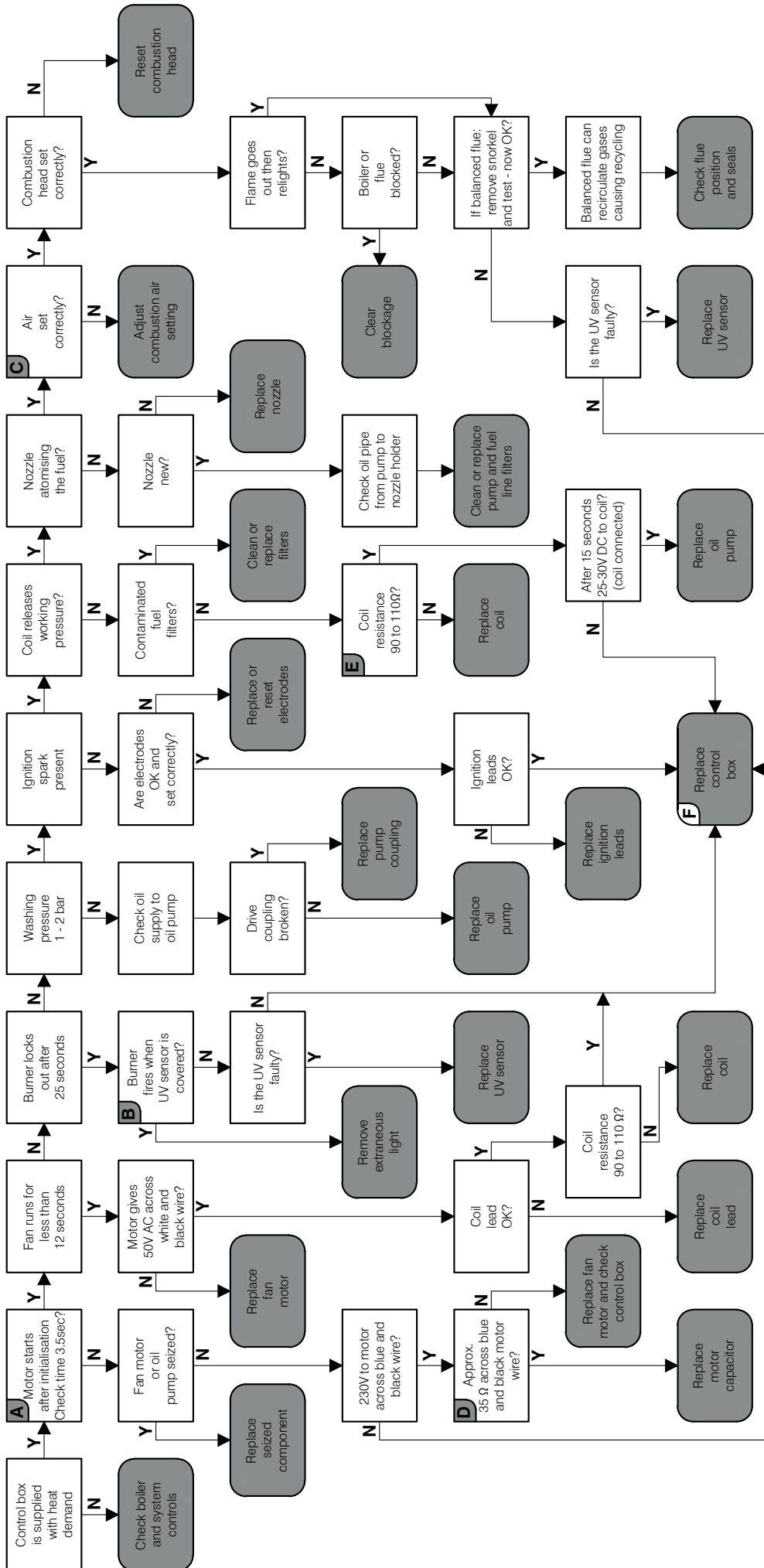


Figure 18-3: Riello RDB BLU Fault Finding

19 Spare Parts

19.1 Riello RDB BLU Burner Parts List

Table 19-1: Riello RDB BLU burner parts list

Key	Description	15-21kW	21-26kW	Riello product code	Grant UK product code
1	Gasket	✓		3005787	RBS27
2	4-pin connector			20117417	RBS201
3	Combustion head			20117435	RBS203
4	Ignition electrodes			20117455	RBS205
5	Pre-heater jumper			20045862	RBS206
6	Nozzle holder			20117459	RBS207
7	Collar (including o-rings)			20117472	RBS209
8	Ignition HT lead			20105111	RBS211
9	Air damper assembly			3008647	RBS116
10	Fan			3005788	RBS151
11	UV sensor			20095126	RBS212
12	Capacitor 4.5 μ F			20071576	RBS149A
13	Solenoid valve			3007871	RBS213
14	Pump pressure regulator			20032135	RBS214
15	Air damper			20094349	RBS215
16	Oil pump			20030953	RBS101
17	O-ring (pump filter) - 10 pack			3007175	RBS216
18	Pump filter and o-ring			3020436	RBS217
19	Oil hose connector - 3/8 x 1/4			3009068	RBS218
20	Flexible oil hose			3007621	RBS219
21	Oil pipe			20117488	RBS220
22	Pressure gauge connector			3008876	RBS138
23	Oil pump drive coupling - 10 pack			3000443	RBS16
24	Solenoid coil			3008648	RBS117
25	Motor and capacitor 4.5 μ F			20071577	RBS102A
26	Control box cover			20094351	RBS221
27	Control box			20117694	RBS222
28	Solenoid coil lead			3008682	RBS223
29	Cover			20117497	RBS224
30	O-ring kit			3008878	RBS140
31	Front shield			3020306	RBS225
32	Air intake - balanced flue			3020281	RBS226
33	Air baffle			20117504	RBS227
34	Flange			3006384	RBS119
35	Air intake - conventional flue			20012046	RBS230

19.2 Exploded View of Riello RDB BLU Burner

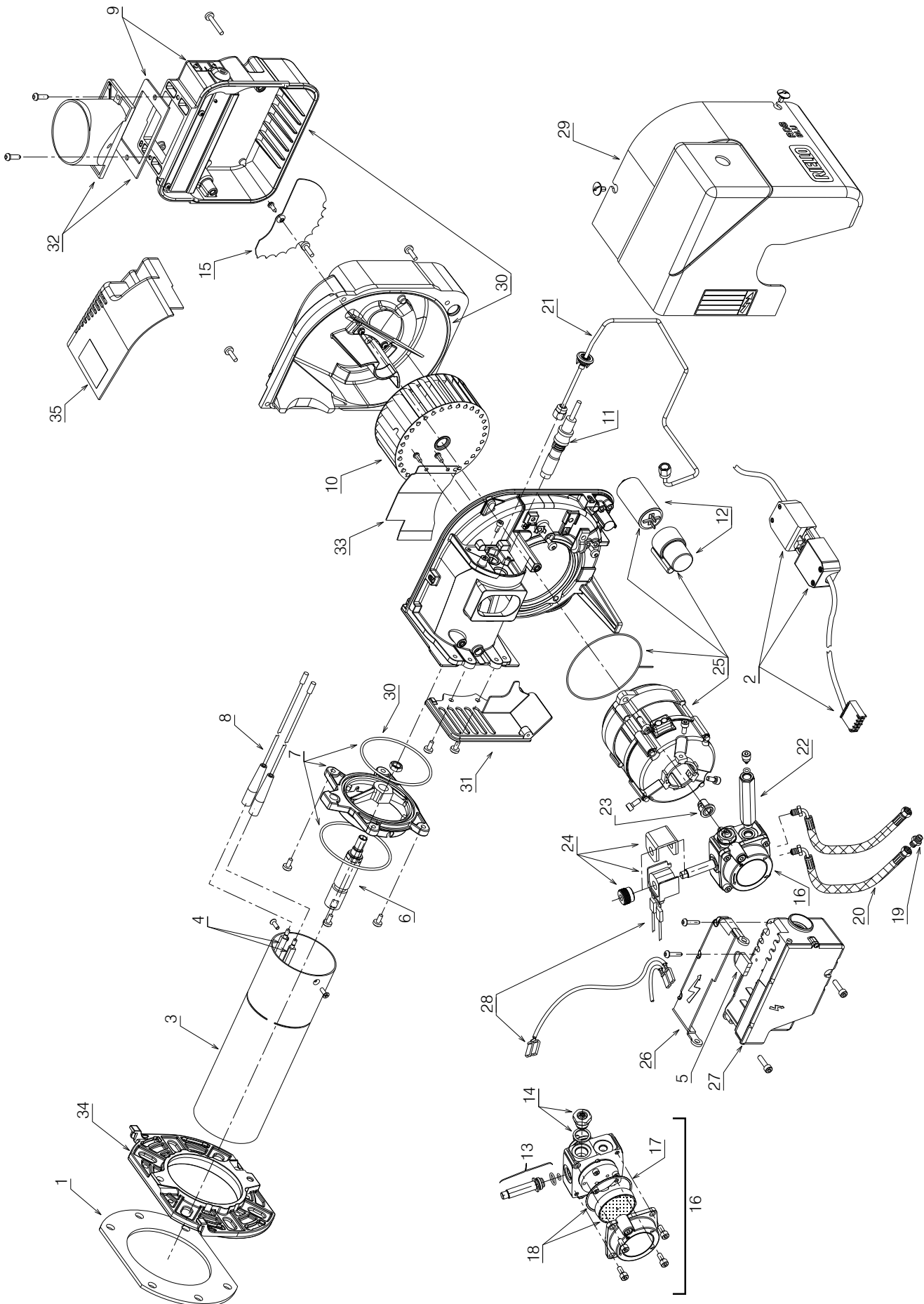


Figure 19-2: Exploded view of Riello RDB BLU burner

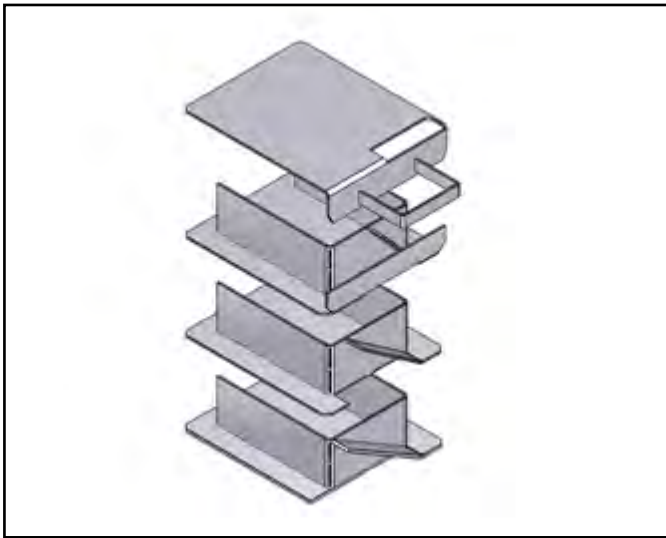


Figure 19-4: 15/21kW baffles

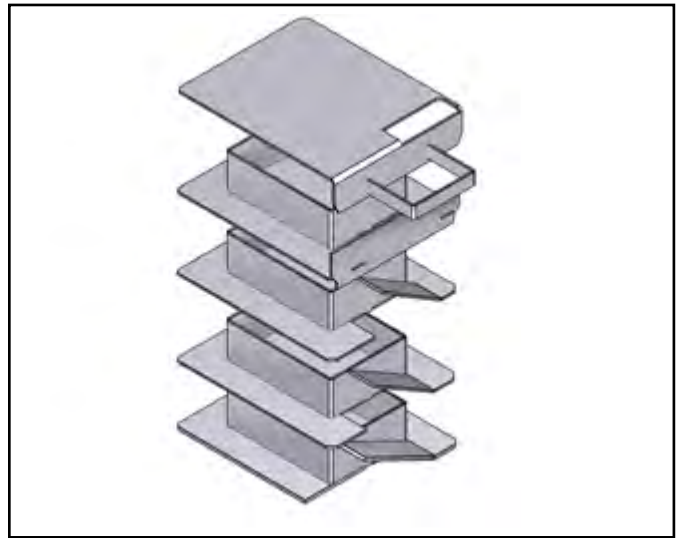


Figure 19-5: 21/26kW baffles

20 EC Declaration of Conformity

In accordance with BS EN ISO/IEC 17050-1:2004

We: GRANT ENGINEERING (UK) Limited
Hopton House
Hopton Industrial Estate
Devizes
SN10 2EU
Telephone: 01380 736920
Fax: 01380 736991
Email: info@grantuk.com
Website: www.grantuk.com

Declare that:

Equipment: **Domestic Oil boilers**
Model name/number: **Grant Vortex (Hybrid) 15-21, & 21-26**

In accordance with the following Directives:

Low Voltage Directive	:2006/95/EEC	
EMC Directive	:2004/108/EEC	
Boiler Efficiency Directive	:92/42/EEC	
Energy Labelling Directive	:2010/30/EU	Conforms with EU (no) 811/2013
Ecodesign Directive	:2009/125/EC	Conforms with EU (no) 813/2013

I hereby declare that the equipment named above has been tested and found to comply with the relevant sections of the above referenced specifications. The unit complies with all essential requirements of the Directives.

Responsible Person: Neil Sawers
Position: Technical Manager
Signature:



Date: 15th July 2016

The EC Declaration of Conformity given in this section relates to the oil boiler only. For details of the EC Declaration of Conformity for the heat pump, refer to Section 13 of the Aeron³ installation and servicing instructions supplied.

21 ErP

21.1 Energy and Package Labels

Figure 21-1: Energy and package labels

System	Heat pump	Boiler	Package
Hybrid only	Energy label	Energy label	No package label required
Hybrid + HW cylinder	Hot water combination energy label*	Space heating energy label	No package label required
Hybrid + HW cylinder + Solar thermal	Space heating and hot water combination energy label*	Space heating energy label	Package label required with heat pump as primary heat source and boiler as supplementary heater

* Not supplied with hybrid/heat pump - download from Grant UK website

21.2 Product Fiches

The product fiches for the 15/21 and 21/26 oil boilers are included in this manual. Refer to Appendix A .

The product fiche for the Aeron³ is supplied with the heat pump.

21.3 ErP Ratings

ErP ratings are available from our website www.grantuk.com.

22 Health and Safety Information

22.1 General

The Health and Safety information given in this section relates to the oil boiler only. For details of the Health and Safety Information for the heat pump, refer to Section 14 of the AERONA³ installation and servicing instructions supplied.

Under the Consumer Protection Act 1987 and Section 6 of the Health & Safety at Work Act 1974, we are required to provide information on substances hazardous to health (COSHH Regulations 1988).

Adhesives, sealants and paints used in the manufacture of the product are cured and present no known hazards when used in the manner for which they are intended.

The following other materials are present in the product:

22.2 Insulation Materials

Material Types:

Ceramic fibre board, mineral wool.

Description:

Rigid board, slabs, sleeves, gaskets, ropes.

Known Hazards:

May cause temporary irritation or rash to skin. High dust levels may irritate eyes and upper respiratory system.

Precautions:

Avoid unnecessary or rough handling, or harsh abrasion of boards. Normal handling and use of material should not produce high dust levels.

Avoid inhalation, and contact with skin and eyes.

After handling always follow normal good hygiene practices.

Protection:

Use disposable gloves, face mask and eye protection.

First Aid:

Eyes:	If irritation occurs, wash eyes with copious amounts of water. If symptoms persist, seek immediate medical advice.
Skin:	If irritation occurs, wash under running water before washing with soap and water.
Inhalation:	Remove to fresh air, drink water to clear throat and blow nose to remove dust/fibres.
Ingestion:	Drink plenty of water.

22.3 Sealant and Adhesive

Material Types:

Silicone elastomer.

Description:

Sealant and adhesive.

Known Hazards:

Irritation to eyes.

Precautions:

Avoid inhalation of vapour, contact with eyes and prolonged or repeated contact with skin.

After handling always follow normal good hygiene practices.

Protection:

Use eye protection. Rubber or plastic gloves should be worn where repeated contact occurs and a face mask worn when working in confined spaces.

First Aid:

Eyes:	Flush eyes with water for 15 minutes. Seek immediate medical attention.
Skin:	Wipe off and wash with soap and water.
Inhalation:	Remove to fresh air.

22.4 Kerosene and Gas Oil Fuels (mineral oils)

Known Hazards:

The effect of mineral oils on the skin vary according to the duration of exposure and the type of oil. The lighter fractions remove the protective grease naturally present on the skin, leaving it dry, liable to crack and more prone to damage by cuts, abrasions and irritant chemicals.

Skin rashes (Oil acne) most often on arms, but also on any part of the body in contact with oil or oily clothing.

Contact with fuel oils can cause dermatitis.

Precautions:

Avoid as far as possible any skin contact with mineral oil or with clothing contaminated with mineral oil.

The use of a lanolin-based barrier cream is recommended, in conjunction with regular washing with soap and rinsing with water to ensure all oil is removed from the skin.

Take care to prevent clothing, especially underwear, from becoming contaminated with oil.

Do not put oily rags or tools in pockets, especially trouser pockets.

Have first-aid treatment at once for an injury, however slight.

Do not inhale any vapours from mineral oils.

23 Recycling and Decommissioning

23.1 End of Life Information

The information below relates to the oil boiler only. For recycling and decommissioning for the heat pump, refer to the Installation and Servicing Instructions provided.

General

Grant oil boilers incorporate components manufactured from a variety of different materials. The majority of these materials can be recycled whilst the smaller remainder cannot.

Materials that cannot be recycled must be disposed of according to local regulations using appropriate waste collection and/or disposal services.

Disassembly

There is little risk to those involved in the disassembly of this product. Please refer to and follow the Health and Safety Information given in the Installation & Servicing Instructions provided with the boiler.

For guidance on the disassembly of the boiler refer to the information given in the Servicing section of the Installation & Servicing Instructions provided with the boiler.

Recycling

Many of the materials used in Grant oil boilers can be recycled, these are listed in the table below:

Component	Material
Outer casing panels	Galavanised steel
Inner casing panels	Zintec
Primary heat exchanger and baffles	Mild steel
Secondary heat exchanger	Stainless steel
Secondary heat exchanger spirals	Aluminium alloy
Pipework	Copper
Burner body/flange	Aluminium alloy
Burner oil pump	Aluminium alloy/steel
Riello oil burner cover	Plastic
Electrical wiring	Copper/plastic
Thermostats	Copper/plastic
Printed Circuit boards	Copper/plastic

Disposal

All materials other than those listed above must be disposed of responsibly as general waste.

24 Guarantee

You are now the proud owner of a Grant Vortex condensing boiler from Grant Engineering (UK) Limited which has been designed to give years of reliable, trouble free, operation.

Grant Engineering (UK) Limited guarantees the manufacture of the boiler including all electrical and mechanical components for a period of **twelve months from the date of installation**⁴, provided that the boiler has been installed in full accordance with the installation and servicing instructions issued.

This will be extended to a total period of **two years** if the boiler is registered with Grant Engineering (UK) Limited **within thirty days of installation**⁴ and serviced at twelve monthly intervals³. See main Terms and Conditions below.

Registering the product with Grant Engineering (UK) Limited

Please register your Grant Vortex condensing boiler with Grant Engineering UK Limited **within thirty days of installation**. To do so visit www.grantuk.com and follow the links to the 'Homeowners Zone', where you can register your boiler for a further **twelve months** guarantee (giving **two years** from the date of installation⁴). This does not affect your statutory rights¹.

If a fault or defect occurs within the manufacturer's guarantee period

If your boiler should fail within the guarantee period, you must contact Grant Engineering (UK) Limited who will arrange for the repair under the terms of the guarantee, providing that the boiler has been correctly installed, commissioned and serviced (if the appliance has been installed for more than twelve months) by a competent person and the fault is not due to tampering, running out of oil, oil contamination, debris, system water contamination, misuse, trapped air or the failure of any external components not supplied by Grant Engineering (UK) Limited, e.g. fire valve, motorised valve, etc.

This two year guarantee only applies if the boiler is registered with Grant Engineering (UK) Limited within thirty days of installation⁴ and is serviced after twelve months³.

In the first instance

Contact your installer or commissioning engineer to ensure that the fault does not lie with the system components or any incorrect setting of the system controls that falls outside of the manufacturer's guarantee otherwise a service charge could result. Grant Engineering (UK) Limited will not be liable for any charges arising from this process.

If a fault covered by the manufacturer's guarantee is found

Ask your installer to contact Grant Engineering (UK) Limited Service Department on +44 (0)1380 736920 who will arrange for a competent service engineer to rectify the fault.

Remember - before you contact Grant Engineering (UK) Limited:

- Ensure the boiler has been installed, commissioned and serviced by a competent person in accordance with the installation and servicing instructions.
- Ensure there is oil to supply the burner.
- Ensure the problem is not being caused by the heating system or its controls. Consult the boiler handbook for guidance.

Free of charge repairs

During the **two year** guarantee period no charge for parts or labour will be made, provided that the boiler has been installed and commissioned correctly in accordance with the manufacturer's installation and servicing instructions, it was registered with Grant Engineering (UK) Limited within thirty days of installation⁴ and, for boilers over twelve months old, details of annual service is available³.

The following documents must be made available to Grant Engineering (UK) Limited on request:

- Proof of purchase
- CD10 Installation Completion Form (or equivalent document)
- CD11 Commissioning Report Form (or equivalent document)
- Service documents (CD11 or equivalent document)

Chargeable repairs

A charge may be made (if necessary following testing of parts) if the breakdown is due to any fault(s) caused by the plumbing or heating system, e.g. contamination of parts due to system contamination, sludge, scale, debris or trapped air. See 'Extent of manufacturer's guarantee'.

Extent of manufacturer's guarantee:

The manufacturer's guarantee does not cover the following:

- If the boiler has been installed for over **two years**.
- If the boiler has not been installed, commissioned, or serviced by a competent person in accordance with the installation and servicing instructions.
- The serial number has been removed or made illegible.
- Fault(s) due to accidental damage, tampering, unauthorised adjustment, neglect, misuse or operating the boiler contrary to the manufacturer's installation and servicing instructions.
- Damage due to external causes such as bad weather conditions (flood, storms, lightning, frost, snow, or ice), fire, explosion, accident or theft.
- Fault(s) due to incorrectly sized expansion vessel(s), incorrect vessel charge pressure or inadequate expansion on the system.
- Fault(s) caused by external electrics and external components not supplied by Grant Engineering (UK) Limited.
- Problems caused by lack of oil or faults with the oil storage and supply system.
- Fault(s) due to contamination of the oil storage and supply system, e.g. water or debris.
- Bleeding or removing oil storage tank contamination or blockages from oil lines.
- Problems due to the flue system being incorrectly fitted or not installed to meet installation requirements.
- Boiler servicing, de-scaling or flushing.
- Cleaning out condensate traps/discharge pipes or thawing out frozen condensate pipework.
- Checking and replenishing system pressure.
- Oil supply pipelines, electrical cables and plugs, external controls not supplied by Grant Engineering (UK) Limited.
- Heating system components, such as radiators, pipes, fittings, pumps and valves not supplied by Grant Engineering (UK) Limited.
- Instances where the oil boiler has been un-installed and re-installed in another location.
- Use of spare parts not authorised by Grant Engineering (UK) Limited.
- Consumable items including, but not limited to, oil nozzles, oil hoses, gaskets.

IMPORTANT

The nozzle and braided oil hose supplied with the boiler are only covered for the period up to the time of the first service (twelve months). Both **must** be changed on the first service and on every annual service thereafter.

IMPORTANT

Do not wait until the fuel supply runs out before you re-order. Sludge in the bottom of the tank may be drawn into the fuel lines. It is recommended that the boiler is switched off when the new oil supply is delivered and that the fuel is allowed to settle for an hour before restarting the boiler.

Terms of manufacturer's guarantee:

- The Company shall mean Grant Engineering (UK) Limited.
- The boiler must be installed by a competent installer and in full accordance with the relevant Codes of Practice, Regulations and Legislation in force at the time of installation.
- The boiler is guaranteed for **two years** from the date of installation⁴, providing that after twelve months the annual service has been completed³ and the boiler registered with the Company within thirty days of installation. Any work undertaken must be authorised by the Company and carried out by a competent service engineer.
- The shell (heat exchanger) of the oil boiler is also covered by a **five year parts only** guarantee from the date of installation⁴. This is subject to the following:
 - The boiler is operated correctly, in accordance with the installation and servicing instructions.
 - Proof is provided that the system has been flushed or chemically cleaned where appropriate (refer to BS 7593) and that the required quantity of a suitable corrosion inhibitor added.
 - Proof of annual servicing (including the checking of any expansion vessels and pressure relief valves) must be provided if and when requested by the Company.

IMPORTANT

*Grant Engineering (UK) Limited **strongly recommends** that a Grant Mag-One in-line magnetic filter/s (or equivalent⁶) is fitted in the heating system pipework. This should be installed and regularly serviced in accordance with the filter manufacturer's instructions.*

- This guarantee does not cover breakdowns caused by incorrect installation, neglect, misuse, accident or failure to operate the boiler in accordance with the manufacturer's installation and servicing instructions.
- The boiler is registered with the Company within thirty days of installation. Failure to do so does not affect your statutory rights¹.
- The balance of the guarantee is transferable providing the installation is serviced prior to the dwelling's new owners taking up residence. Grant Engineering (UK) Limited must be informed of the new owner's details.
- The Company will endeavour to provide prompt service in the unlikely event of a problem occurring, but cannot be held responsible for any consequences of delay however caused.
- This guarantee applies to Grant Engineering (UK) Limited boilers purchased and installed on the UK mainland, Isle of Wight, Channel Islands and Scottish Isles only². Provision of in-guarantee cover elsewhere in the UK is subject to agreement with the Company.
- All claims under this guarantee must be made to the Company prior to any work being undertaken. Invoices for call out/repair work by any third party will not be accepted unless previously authorised by the Company.
- Proof of purchase and date of installation, commissioning and service documents must be provided on request.
- If a replacement boiler is supplied under the guarantee (due to a manufacturing fault) the product guarantee continues from the installation date of the original boiler, and **not** from the installation date of the replacement⁴.
- The oil boiler must be connected to a mains water supply (installations utilising a private water supply are not covered by this guarantee).
- Breakdown/failure due to lime scale will not be covered by this guarantee.
- The replacement of a boiler under this guarantee does not

include any consequential costs, such as the removal or replacement of worktops, kitchen units, etc.

- The boiler (excluding external modules) must not be sited in a location where it may be subjected to frost.

Hard water advice (for Combi boilers only)

If you live in a hard water area, protection against scaling must be given to the domestic hot water heat exchanger of your combination boiler.

You should fit an appropriate scale inhibitor or water softener as any breakdown caused by water scaling is not covered by the manufacturer's guarantee. Ask your installer for advice.

Foot notes:

1. Your statutory rights entitle you to a one year guarantee period only.
2. The UK mainland consists of England, Scotland and Wales only. Please note that for the purposes of this definition, Northern Ireland, Isle of Man and Scilly Isles are **not** considered part of the UK mainland.
3. Your boiler must be regularly serviced as per the installation and servicing instructions, (even when the guarantee has expired) to prolong the lifespan and ensure it is operating safely and efficiently.
4. The guarantee period will commence from the date of installation, unless the installation date is more than six months from the date of purchase, in which case the guarantee period will commence six months from the date of purchase.
5. As measured by gauss. The Mag-One magnetic filter has a gauss measurement of 12000.

Version 1.0

Appendix A



GRANT ENGINEERING (UK) LIMITED

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