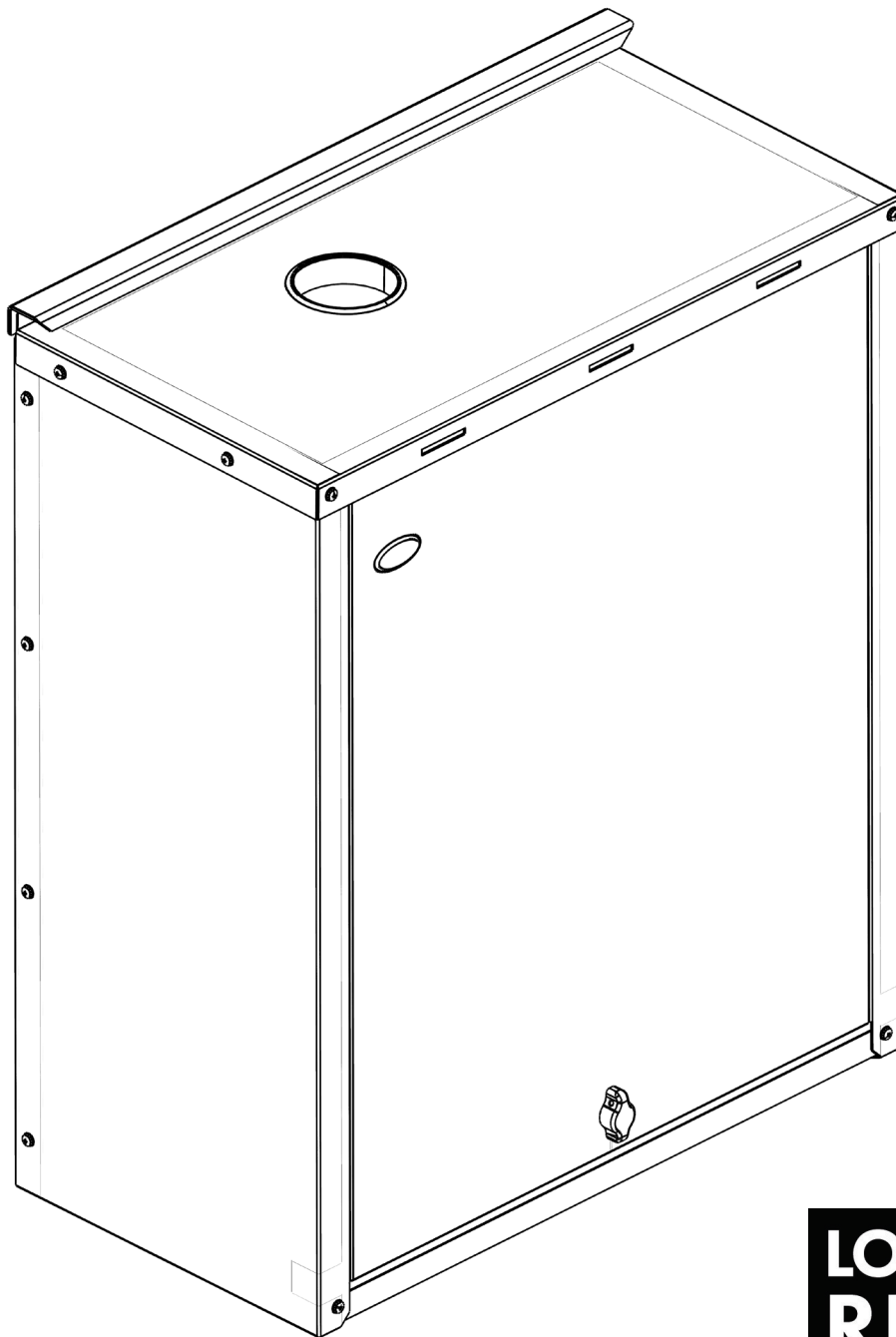


Grant Vortex Eco

Wall Hung External and Wall Hung External System Condensing Oil Boiler Range

Installation and Servicing Instructions



IMPORTANT NOTE FOR INSTALLERS

These instructions are intended to guide installers on the installation, commissioning and servicing of the Grant Vortex oil boiler. After installing the boiler, leave these instructions with the user.

A user handbook is available to guide users in the operation of the oil boiler.

SPECIAL TEXT FORMATS

The following special text formats are used in these instructions 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.

PRODUCT CODES AND SERIAL NUMBERS COVERED

The serial numbers used on Grant oil boilers consist of a fifteen digit numerical code with the final three digits being the product identifier.

For example:

100000200218764

These instructions cover the following product codes and serial numbers:

Product code	Serial number identifier
VTXOMWH16/21	764
VTXSOMWH16/21	766

SERVICING

The boiler should be serviced at least every twelve months and the details entered in the Service Log in the user handbook.

FUEL TYPE

All Grant Vortex boilers are suitable for use with Class C2 Kerosene.

The use of Class D Gas Oil on all Grant Vortex Low NOx and Blue Flame boilers DOES NOT comply with ErP requirements or EU regulations, and as a result Grant UK does not condone its use.

To use Bio-Kerosene (B30K), refer to the information below:

OPERATION ON BIO-FUEL

All Grant Vortex condensing boilers manufactured since May 2011 are suitable for operation on both standard Kerosene (Class C2 to BS 2869) and also bio-kerosene - up to a 30% blend (B30K).

All burner settings and nozzle sizes (as detailed in Section 2.3 of these instructions) are correct for both standard kerosene and bio-kerosene (B30K).

In order to operate this boiler on bio-kerosene, it will be necessary to take the following actions:

- Use a bio-kerosene (B30K) compatible flexible oil line in place of the oil line supplied with the boiler.
- Have the oil storage tank and oil supply line (including all pipework, sight gauges, filters, isolating valves, fire valves, de-aeration devices, etc.) checked for their compatibility with bio-kerosene (B30K).

Where necessary, some or all of these items may have to be replaced with a bio-kerosene compatible alternative.

- Check the suitability of the flue system with Grant UK.
- Use only bio-kerosene (B30K) that conforms to OPS24.

IMPORTANT:

Under no circumstances, should the boiler be used with bio-kerosene without the above actions being taken first.

! NOTE !

This appliance can be used by children aged from 8 years and above and persons with reduced physical, sensory or mental capabilities or lack of experience and knowledge if they have been given supervision or instruction concerning use of the appliance in a safe way and understand the hazards involved.

Children shall not play with the appliance.

Cleaning and user maintenance shall not be made by children without supervision.



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1 INTRODUCTION

1.1 HOW A CONDENSING BOILER OPERATES

During the combustion process, hydrogen and oxygen combine to produce heat and water vapour. The water vapour produced is in the form of superheated steam in the heat exchanger. This superheated steam contains sensible heat (available heat) and latent heat (heat locked up in the flue gas). A conventional boiler cannot recover any of the latent heat and this energy is lost to the atmosphere through the flue.

The Grant Vortex condensing boiler contains an extra heat exchanger which is designed to recover the latent heat normally lost by a conventional boiler. It does this by cooling the flue gases to below 90°C, thus extracting more sensible heat and some of the latent heat. This is achieved by cooling the flue gases to their dew point (approximately 55°C).

To ensure maximum efficiency, the boiler return temperature should be 55°C or less, this will enable the latent heat to be condensed out of the flue gases.

- The boiler will achieve net thermal efficiencies of 100%.

To achieve maximum performance from the Grant Vortex boiler, it is recommended that the heating system is designed so that a temperature differential of 20°C between the flow and return is maintained.

The Grant Vortex boiler will however still operate at extremely high efficiencies even when it is not in condensing mode and therefore is suitable for fitting to an existing heating system without alteration to the radiator sizes. The boiler is capable of a maximum flow temperature of 75°C.

1.2 BOILER DESCRIPTION

The Grant Vortex Eco external modules have an insulated waterproof enclosure made of galvanised steel with a powder coated finish and are designed for external installation, mounted on a suitable external wall.

The Grant Vortex Eco Wall Hung range of automatic pressure jet oil boilers have been designed for use with a fully pumped central heating system with indirect domestic hot water cylinder.

They are not suitable for use with either a direct cylinder or a 'primatic' cylinder or gravity hot water.

The boilers are suitable for use on open vented or sealed central heating systems. System models are supplied with the necessary components factory fitted. Refer to Section 7.

All boilers are supplied with the control panel and burner factory fitted.

The boilers are supplied with a flue terminal but can be connected to a conventional flue system.

All the models in the current Grant Vortex Eco range of boilers are designed to comply with the maximum NOx emissions* under the Energy-related Products Directive (ErP).

* From the 26th September 2018, the maximum NOx emissions for all new oil fired boilers (up to and including 400kW for both new build and replacement boiler installations) is 120mg/kWh.

1.3 FLUE OPTIONS

Grant Vortex Eco External Wall Hung boilers are supplied with a 45° conventional flue terminal (see Figure 1-1). There is one flue outlet position on these boilers, directly on top of the module (see Figure 2-1). The terminal can be rotated to direct the plume in the desired direction.

It is possible to discharge the products of combustion at a higher level by using the following components from the Grant 'Green' flue system:

- External module starter (available as a straight section only on the External Wall Hung boilers)
- Fixed extensions 150mm, 250mm, 450mm and 950mm
- Adjustable extension 195 to 270mm
- 45° elbow
- High level 90° or vertical terminal

It is possible to extend the flue system by 19m vertically (from the boiler outlet) using this system.

Please note, the flue may only be brought up vertically from Grant Vortex Eco External Wall Hung boilers.

Please refer to Sections 4.9 and 9 for more detailed instructions on how to install the flue system.

Conventional flues only may be fitted to Grant Vortex Eco External boilers.

! NOTE !

The flue system materials and construction MUST be suitable for use with oil-fired condensing boilers. Failure to fit a suitable conventional flue may invalidate the guarantee on the boiler.

1.4 BOILER COMPONENTS

All burners are pre-set for use with kerosene and are supplied ready to connect to a two pipe fuel supply system with a two flexible fuel lines and 3/8" to 1/4" BSP male adaptor supplied with the boiler. Please refer to Section 3 for further details.

The temperature of the water leaving the boiler to heat the radiators and hot water cylinder is user adjustable.

The boiler is fitted with an overheat thermostat (which allows it to be used on a sealed central heating system) which will automatically switch off the boiler if the heat exchanger exceeds a pre-set temperature of $110^{\circ}\text{C} \pm 3^{\circ}\text{C}$.

The control panel is fitted with an ON/OFF switch, boiler thermostat control knob and the manual reset button for the overheat thermostat.

To access the controls, remove the front door from the boiler.

Turn the knob at the bottom of the front door anticlockwise and pull the door outwards at the bottom. Carefully release the top of the front door panel from under the top casing panel flange and remove it from the boiler to reveal the boiler as shown in Figure 1-1.

Figure 1-2 shows the details of the control panel.

1.4.1 BOILER CONTROLS

To access the control panel, remove the front door panel from the boiler. The controls on the panel are as follows:

Boiler On/Off switch

This switches the boiler on and off. The boiler ON/OFF switch incorporates a 'mains on' neon which lights when the boiler is switched on. Please note that the 'mains on' neon does not necessarily indicate that the burner is firing.



Figure 1-1: Boiler with front panel removed

! NOTE !

If the ON/OFF switch is set to off the boiler will NOT supply central heating or heat domestic hot water (if a hot water cylinder is connected to the boiler). The built-in frost thermostat will also not operate.

Service/Test Switch (External Modules only)

A Service switch is fitted to the control panel to allow the Service Engineer to test-fire the boiler.

Heating Thermostat

This control allows the temperature of the water leaving the boiler to heat the radiators (and domestic hot water) to be adjusted. This will be set by the installer to the optimum temperature for efficient operation of the boiler. It should be left set in this position.

Overheat Thermostat (Overheat Reset)

The boiler is fitted with a safety overheat thermostat which will automatically switch off the boiler in the case of a control malfunction causing overheating.

System Pressure Gauge (System models only)

This is to indicate the water pressure in the sealed heating system.



Figure 1-2: Boiler controls

2 TECHNICAL DATA

2.1 BOILER TECHNICAL DATA

Table 2-1: Boiler technical data

	Units	Wall Hung External	Wall Hung External System
		16-21	16-21
Water content	litre	11	11
	gal	2.4	2.4
Weight - complete boiler (dry)	kg	92.1	96.1
	lb	203	211.9
Weight - boiler shell only (dry)*	kg	56.5	56.5
	lb	124.6	124.6
Maximum heat output (Kerosene)	kW	21.0	21.0
	Btu/h	71,700	71,700
Minimum flow rate ($\Delta T=10^{\circ}\text{C}$)	l/h	1,800	1,800
Minimum flow rate ($\Delta T=20^{\circ}\text{C}$)	l/h	900	900
Condensate connection		Accepts 21.5 mm Ø polypropylene overflow pipe	
Flue diameter (conventional)	mm	100	
Waterside resistance $\Delta T=10^{\circ}\text{C}$	mbar	28.5	
Waterside resistance $\Delta T=20^{\circ}\text{C}$	mbar	10.0	
Maximum static head	m	28	
Minimum circulating head	m	1	
Boiler thermostat range	$^{\circ}\text{C}$	50 to 75	
Limit (safety) thermostat shut off temperature	$^{\circ}\text{C}$	110 $\pm$ 3	
Maximum casing temperature	$^{\circ}\text{C}$	Less than 50	
Electricity supply		~230 1ph 50Hz 5A fused	
Burner motor power	Watts	75	
Absorbed motor power	kW	0.155	0.143
Starting current	Amps	2.7	
Running current	Amps	0.67	
Oil connection		1/4" BSP male (on end of flexible fuel hose)	
Conventional flue draught	mbar	Minimum: 0.087 - Maximum: 0.37	
	in wg	Minimum: 0.035 - Maximum: 0.15	
Maximum operating pressure - sealed/open system	bar	2.5	
Maximum operating pressure - pressure relief valve	bar	3.0	
Boiler type		ON/OFF	

* Weight of shell - without baffles and clean out door: 45.5kg

2.2 SEALED SYSTEM DATA

Table 2-2: Sealed System Data

	External System 16-21
Heating system pressure (cold)	Minimum 0.5 bar Maximum 1.0 bar
Operating pressure of pressure relief valve	3.0 bar
Expansion vessel size (pre-charged at 1 bar)	8 litres
Maximum heating system volume (including boiler)*	85 litres**
Cold water mains connection	15 mm compression (supplied)
Pressure relief valve discharge connection	15 mm compression (supplied)

* Based on vessel charge of 0.3 bar and system cold fill pressure of 0.5 bar. These values are the remaining system volume available after deducting the boiler water content.

** Approximately

2.3 BURNER SETTINGS

Table 2-3: Burner settings

Boiler models (burner type)	Heat output		Nozzle	Oil pressure (bar)	Smoke No.	Burner head type	Distance between nozzle and burner head	Fuel flow rate (kg/h)	Flue gas temp. (°C)	CO ₂ (%)	Flue gas VFR ‡ (m³/hr)
	(kW)	(Btu/h)									
External and External System 16-21 (Ecoflam Max 1 LN Vortex WM 16-21 ERP)	16.5	56,300	0.50/80°EH	7	0 - 1	EK 16-21	29.5	1.38	65 - 69	12.5	17.0
	18.7 *	63,800	0.50/80°EH	10	0 - 1	EK 16-21	31.0	1.56	70 - 75	12.5	20.0
	21.0	71,700	0.60/80°EH	8	0 - 1	EK 16 - 21	31.0	1.76	75 - 79	12.5	23.0

Notes:

‡ Flue gas VFR: Flue gas volumetric flow rate

1. The data given above is approximate only and is based on the boiler being used with a low level balanced flue.

2. The above settings may have to be adjusted on site for the correct operation of the burner.

3. Gas Oil is NOT suitable for use with Grant Vortex boiler range

4. The flue gas temperatures given above are ± 10%.

5. When commissioning, the air damper **must be** adjusted to obtain the correct CO₂ level.

6. * Factory settings: 16-21 - 18.7kW.

7. The combustion door test point may be used for CO₂ and smoke readings only. Do not use this test point for temperature or efficiency readings.

8. The installer must amend the boiler data label if the output is changed.

2.4 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.

2.5 WATER CONNECTIONS

Table 2-4: Water connections

Boiler model	Flow connection			Return connection		
	Size	Fitting	Supplied	Size	Fitting	Supplied
All models	22 mm	Push-fit Tectite	Fitted	22 mm	Push-fit Tectite	Fitted

2.6 BOILER DIMENSIONS

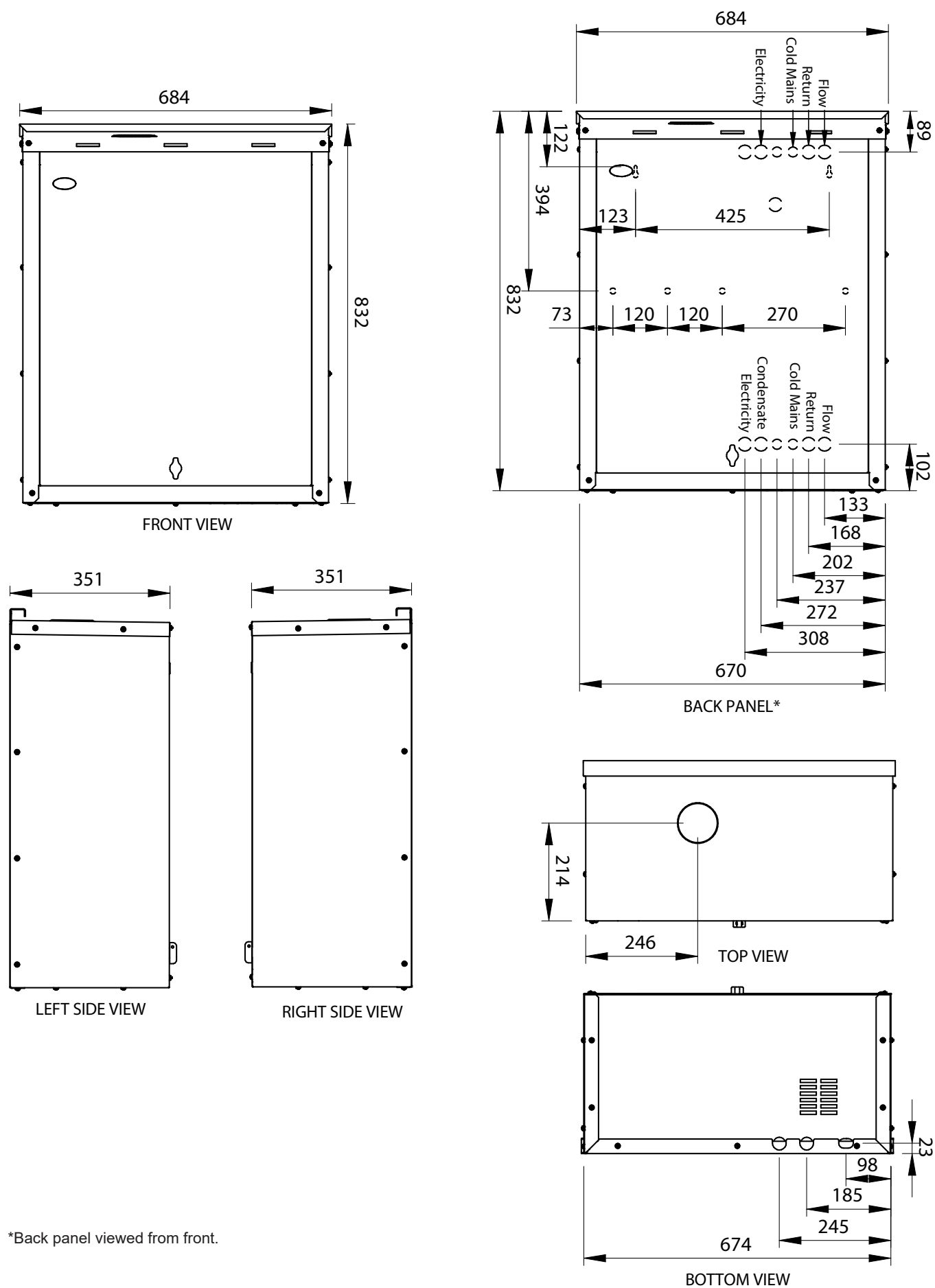


Figure 2-1: Vortex Eco Wall Hung External and External System 16-21

3 OIL STORAGE AND SUPPLY SYSTEM

3.1 FUEL SUPPLY

3.1.1 FUEL STORAGE

The tank should be positioned in accordance with the recommendations given in BS 5410-1 (Code of practice for liquid fuel firing. Installations for space heating and hot water supply purposes for domestic buildings). This gives details of the requirements for suitable oil tank construction, tank installation, tank bases, fire protection and secondary containment.

For installations of greater than 70kW output capacity, the tank should be installed accordance with BS 5410-2.

Oil storage tanks should comply with the following standards:

- Plastic tanks OFT T100
- Steel tanks OFT T200

! CAUTION !

A galvanised tank must not be used.

! NOTE !

Plastic tanks should be stood on a firm non-combustible base that adequately and uniformly supports the weight of the tank over its entire base area.

The tank capacity should be selected to suit the appliance rated output. Refer to BS5410-1 for guidance.

3.1.2 FUEL PIPES

Fuel supply pipes should be either copper or steel. Galvanised pipes or fittings should not be used.

Plastic oil supply pipe conforming to BS EN 14125 can be used for underground pipe runs, but must not be used above ground.

All soft copper pipe connections should preferably be made using flared fittings. If compression fittings are to be used, a suitable pipe insert must be fitted into the pipe end.

Soft soldered connections must NOT be used on oil supply pipework.

Fuel supply pipework should be of a suitable diameter, depending on the type of oil supply system being used. Refer to information given in sections 3.1.3, 3.1.4 or 3.1.5.

Run pipes as level as possible to prevent air being trapped. Take the most direct route possible from tank to burner whilst locating the pipe where it will be protected from damage.

Pipes should be supported to prevent sagging and sleeved where they pass through a wall.

A metal body fuel filter with a filtration size of no more than 50 µm (micron) must be fitted in the oil supply pipe close to the tank. This should be fitted with sufficient clearance around and below it to allow easy access for maintenance.

An isolating valve should also be fitted at the tank, before the filter, to allow the oil supply to be shut off for the filter to be serviced.

A second filter (15 µm for Kerosene) must be located closer to the burner to protect the burner pump and nozzle from contamination. Refer to Figures 3-1 to 3-3.

A remote sensing fire valve must be installed in the fuel supply line in accordance with BS5410-1.

A fusible wheelhead type combined isolating/fire valve MUST NOT be used in place of a remote sensing fire valve.

The fire valve must be located externally to the appliance casing, with the fire valve sensor located above the burner.

A spring clip for mounting the sensor is supplied fitted to the boiler, on the rear of the control panel.

The fire valve should be located after the second (15 micron) filter, i.e. between the filter and the point at which the oil line enters the appliance casing. Refer to Figures 3-1 to 3-3.

The fire valve must have an operating temperature of between 90 and 95°C to avoid unnecessary nuisance shut-offs to the oil supply.

Two flexible fuel hoses, adaptors and ¼" isolating valves are supplied loose with the boiler, to make the final connection to the burner with a two pipe or 'Tiger Loop' type de-aerator.

Metal braided flexible fuel hoses should be replaced ANNUALLY when the boiler is serviced.

Long life flexible fuel hoses should be inspected annually and replaced, if necessary, or after a maximum five years service life.

Flexible fuel hoses MUST NOT be used outside of the appliance casing.

3.1.3 SINGLE PIPE (GRAVITY) SYSTEM - (REFER TO FIGURE 3-1)

Head (metres)	Maximum pipe run (m)		
	Ø 6 mm	Ø 8 mm	Ø 10 mm
0.5	19	60	100
1	21	66	100
1.5	23	72	100
2	25	79	100
2.5	27	85	100
3	29	91	100
3.5	31	98	100

If the storage tank outlet is at least 300 mm above the level of the burner oil pump, a single pipe (gravity) system should be used.

The maximum height of the oil level above the burner oil pump when the tank is full, must not exceed four metres. If this height is exceeded, a pressure reducing valve must be fitted in the oil supply pipe between the tank and the burner oil pump.

The maximum length of pipe run from the tank to the burner is limited by the minimum head of oil (the height of the tank outlet above the burner oil pump).

3.1.4 TWO PIPE SYSTEM - (REFER TO FIGURE 3-2)

Head (metres)	Maximum pipe run (m)		
	Ø 6 mm	Ø 8 mm	Ø 10 mm
0.5	15	47	100
1	13	41	99
1.5	11	34	84
2	9	28	68
2.5	7	22	53
3	5	15	37
3.5	-	9	22

If the storage tank outlet is below the level of the burner oil pump, a two pipe (sub gravity) system can be used.

The return pipe should be at the same level as the tank outlet, between 75 to 100 mm above the base of the tank. The return pipe should be a sufficient distance from the tank outlet so as to prevent any sediment disturbed by the return entering the supply pipe from the tank.

A non-return valve should be fitted in the supply pipe, along with a fire valve and filters (refer to section 3.1.2 - fuel pipes). A non-return valve should also be fitted in the return pipe if the top of the tank is above the burner oil pump.

The maximum suction height (from the tank outlet to the level of the burner oil pump), must not exceed 3.5 metres.

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

For guidance on the installation of top outlet fuel tanks and suction oil supply pipe sizing, refer to OFTEC Technical Book 3: Storage and Supply, available for purchase from OFTEC.

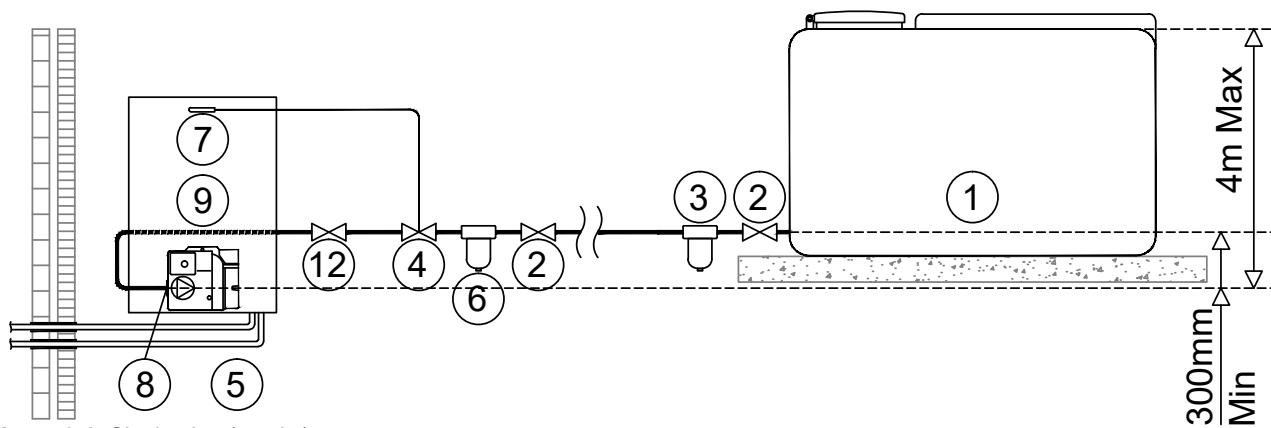


Figure 3-1: Single pipe (gravity) system

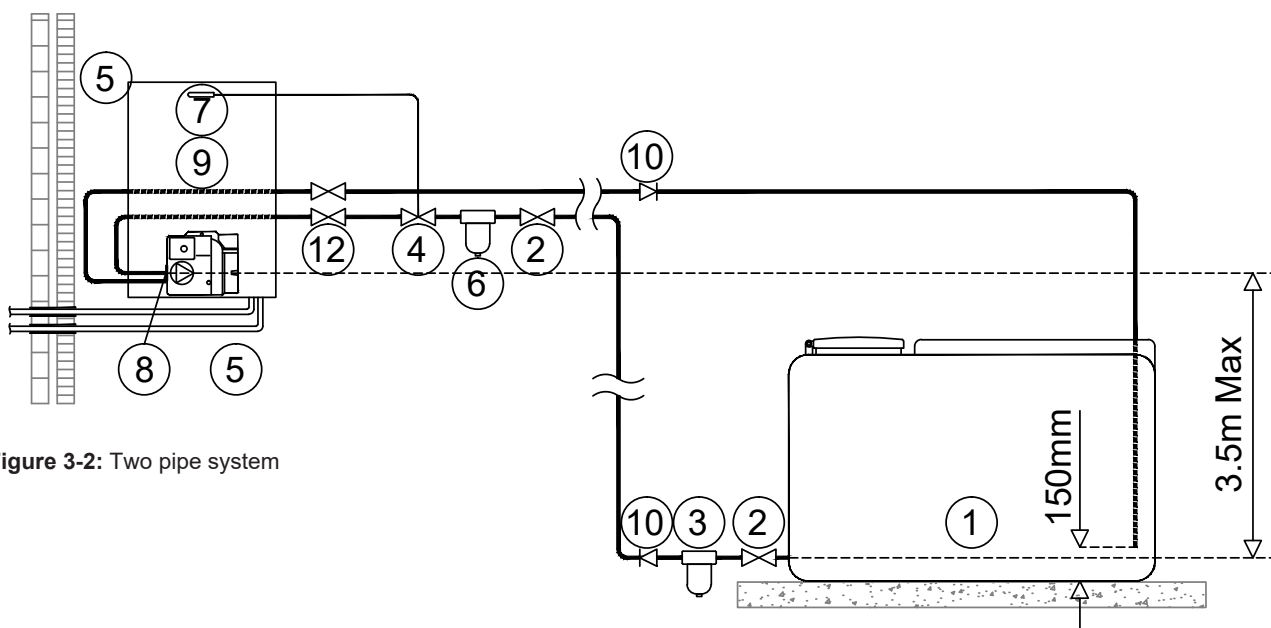


Figure 3-2: Two pipe system

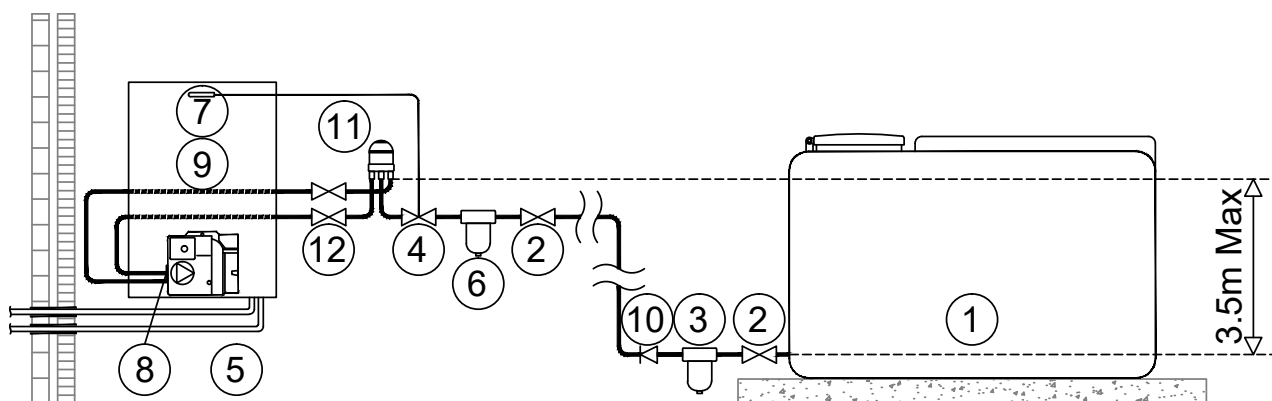


Figure 3-3: De-aeration device system

Key to oil supply diagrams

1	Oil tank	5	Heating flow and return	9	Burner
2	Isolating valve	6	Oil filter (15µm max. filtration size)	10	Non-return valve
3	Oil strainer	7	Fire valve sensor	11	De-aerator*
4	Fire valve to BS 5410-1	8	Oil pump	12	Appliance isolation valves

* Position of de-aeration device must be level with or above the oil pump

3.1.5 SINGLE PIPE (SUCTION) SYSTEM WITH DEAERATOR - (REFER TO FIGURE 3-3)

If the storage tank outlet is below the level of the burner oil pump, an alternative to the two pipe (sub gravity) system is the single pipe (suction) system using a deaerator, e.g. a 'Tiger Loop' device.

The deaerator creates a loop with the burner oil pump, with the oil being circulated through the pump out to the deaerator and back to the pump. Any air in the single pipe lift from the tank is removed from the oil, collected in the deaerator and then discharged to outside.

! WARNING !

To prevent any fuel vapour being discharged within the building, the deaerator must be fitted outside, in accordance with BS 5410-1, unless it is specifically designed to be installed inside.

The de-aerator must be mounted vertically at the same level as (or above) the burner oil pump. Refer to Figure 3-3.

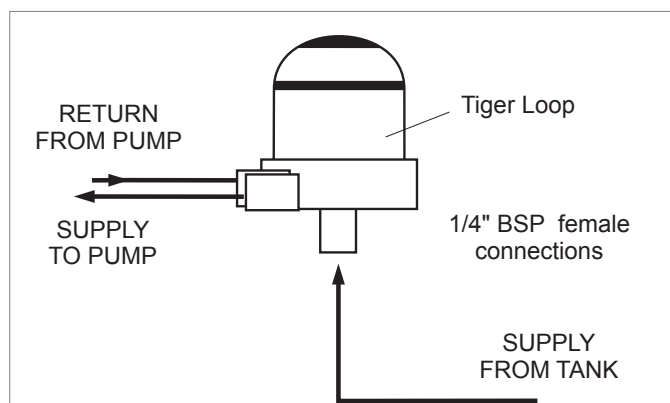


Figure 3-4: Tiger loop de-aeration device

An external deaerator must not be fitted within 500 mm of a flue terminal.

Always follow the manufacturers installation instructions supplied with the deaerator.

3.2 BURNER OIL CONNECTION

The burner fuel pump is supplied factory set for use with a two pipe oil supply system.

For ease of access to the burner oil pump connections, the burner should be removed from the boiler as follows:

1. Unscrew and remove the single burner fixing nut from the stud on the burner flange (at the top of the burner) using a 13 mm spanner. Retain the fixing nut for re-fitting the burner.
2. Rotate the burner clockwise and carefully withdraw the burner from the boiler. Refer to Figure 3-5.

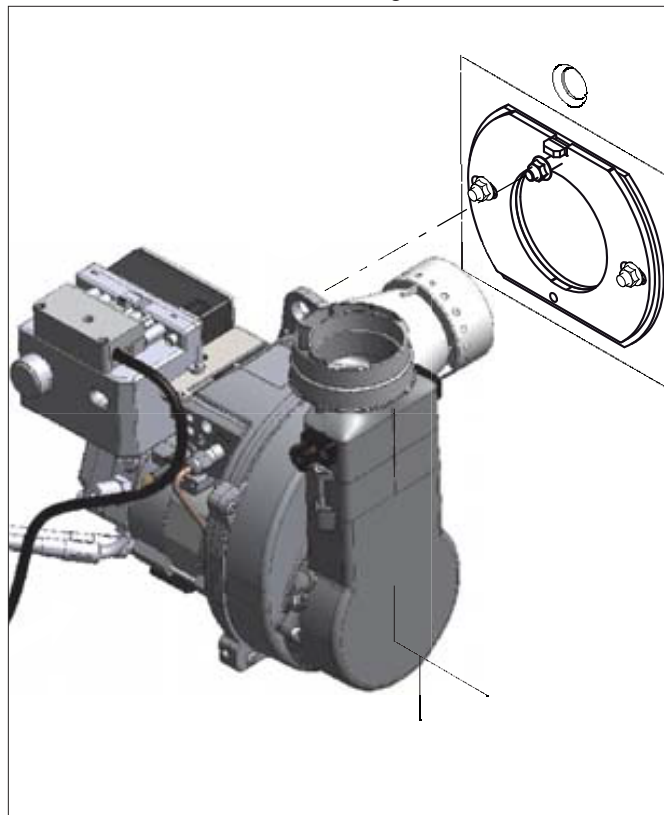


Figure 3-5: Burner removal

SINGLE PIPE (GRAVITY) SYSTEM

For use on a single pipe system, it is necessary to fit the 'horseshoe' washer into the tapping in the pump. Refer to Figure 3-6.

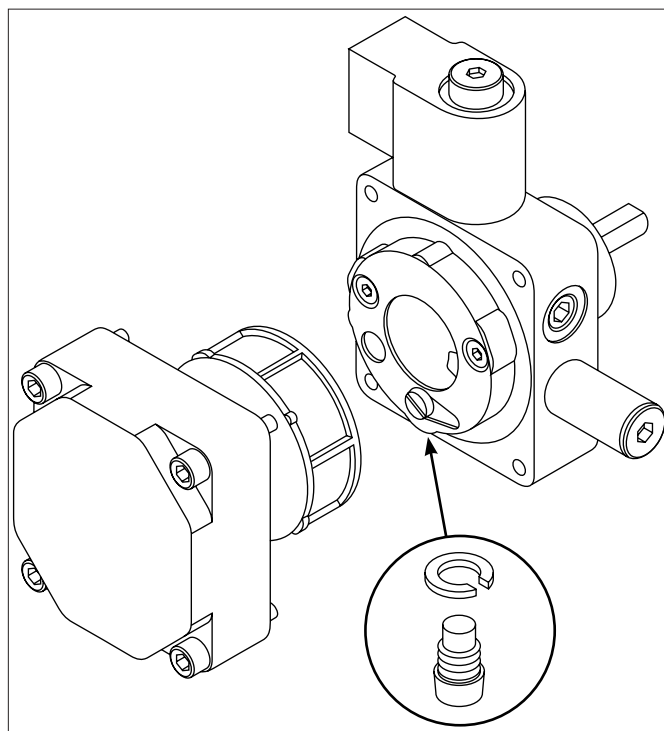


Figure 3-6: Fitting/location of 'horseshoe' washer

4 INSTALLATION

4.1 INTRODUCTION

The boiler is supplied already fully assembled in a carton which is carefully packed with packing materials. As the boiler is wall mounted all of the content of the boiler casing must be removed with the packaging before installation can begin, to give access to the rear fixing panel.

The installation procedure therefore begins with unpacking and dismantling of the packed boiler.

4.2 BOILER LOCATION

The module should be installed externally, fixed to a wall that is firm, flat, vertical and capable of supporting the boiler when full of water. Refer to Section 2.1 for weights.

It does not require any special mounting provisions as the temperature of the boiler casing is less than 50°C.

The module must be positioned such that the required clearances from the low level flue outlet as shown in Figure 9-2 are achieved.

The module must be installed with the flue terminal terminating at least two metres above ground level (refer to BS 5410-1). No terminal guard can be fitted if termination is less than two metres above ground level. In this situation, use the Green flue system to achieve the minimum height. Refer to Section 9.

The flue terminal must be a minimum distance of 1.8 metres from an oil storage tank.

The flue terminal should be positioned so as to avoid products of combustion accumulating in stagnant pockets around the building or entering into buildings.

Sufficient clearance must be allowed at the front of and below the boiler to remove the burner and baffles for servicing.

4.3 REGULATIONS COMPLIANCE

! NOTE !

Failure to install and commission appliances correctly may invalidate the boiler guarantee.

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

- Building Regulations for England and Wales, or the Building Standards for Scotland, as appropriate.
- Any relevant local Byelaws which you must check with the local authority for the area concerned.
- The Water Supply (Water Fittings) Regulations 1999 or the Water Supply (Fittings) (Scotland) Byelaws 2014, as appropriate.
- 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 (and any relevant amendments):

- BS 5410-1: 2019 (Code of practice for liquid fuel firing. Installations for space heating and hot water supply purposes for domestic buildings)
 - This standard covers domestic installations up to 70kW.
- BS 5410-2: 2018 (Code of practice for liquid fuel firing. Non-domestic installations)
 - This standard should be followed with regard to installations with an output capacity in excess of 70kW.
 - Where the combined outputs of multiple appliances located together at a domestic dwelling exceed 70kW then then a dedicated plant room as specified in BS 5410-2 is recommended.

- BS EN 12828 (Heating systems in buildings. Design for water-based heating systems)
- BS EN 12831-1 (Energy performance of buildings. Method for calculation of the design heat load)
- BS EN 14336 (Heating systems in buildings. Installation and commissioning of water-based heating systems)
- BS 7593 (Code of Practice for treatment of water in domestic hot water central heating systems)
- BS 7671 (Requirements for Electrical installations, IET Wiring Regulations)
- BS 7291 (Thermoplastics pipe and fitting systems for hot and cold water for domestic purposes and heating installations in buildings. General requirements)
- BS 7074-1 (Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. Code of practice for domestic heating and hot water supply)
- BS 2869 (Fuel oils for agricultural, domestic and industrial engines and boilers. Specification)

! WARNING !

BS5410-1: 2019 requires that appliances located in a building or structure or within a restricted area externally should have a CO detector conforming to BS EN 50291-1 installed in the same room/space.

4.4 HEATING SYSTEM DESIGN CONSIDERATIONS

! WARNING !

Before starting any work on the boiler or fuel supply, please read the Health and Safety information given in Section 15.

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

RADIATORS:

- Flow temperature 70°C
- Return temperature 50°C
- Differential 20°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 temperature.

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

UNDERFLOOR:

- Flow temperature 50°C
- Return temperature 40°C
- Differential 10°C

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

Refer to Section 2.5 for the size and type of the connections and Section 5 for the position of the connections.

OPEN VENTED SYSTEMS:

! NOTE !

The presence of 'pumping over' in an open vented heating system connected to the Grant Vortex boiler will invalidate the product guarantee.

Open vented systems must be correctly designed and installed. The open safety vent pipe must be positioned to prevent 'pumping over' (i.e. the discharge of water from the open safety vent pipe into the feed and expansion cistern under the pressure created by the circulator). For detailed information on the correct design of open vented heating systems, and the correct location of the open safety vent pipe, refer to the CIBSE Domestic Heating Design Guide and OFTEC Technical Book 4 (Installation).

4.5 PIPEWORK MATERIALS

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

On either sealed or open-vented systems; where plastic pipe is used a minimum of ONE metre of copper pipe (or as per pipe manufacturers instructions) MUST be connected between both the boiler flow and return connections and the plastic pipe.

! NOTE !

Do not connect plastic pipe directly to the boiler.

Grant UK does not accept any responsibility for any damage, however caused, to plastic piping or fittings.

SEALED SYSTEMS

If plastic pipe is to be used, the installer must check with the plastic pipe manufacturer that the pipe to be used is suitable for the temperature and pressures concerned.

Plastic pipe must be Class S to BS 7291-1.

! WARNING !

When plastic pipe is used, the system MUST incorporate a low pressure switch to shut off power to the boiler if the system pressure drops below 0.2 bar. A suitable low pressure switch kit is available to purchase from Grant UK (product code: MPCBS62).

UNDERFLOOR PIPEWORK

Plastic pipe may be used on underfloor floor 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.

4.6 CONNECTIONS

4.6.1 FLOW AND RETURN CONNECTIONS

Refer to Sections 4.9 & 5.

4.6.2 CONDENSATE CONNECTION

Grant Vortex Eco boilers are supplied with a factory-fitted condensate trap to provide the required 75 mm water seal in the condensate discharge pipe from the boiler.

Refer to Section 6 for details of the condensate disposal pipework.

4.6.3 DRAIN COCK

A drain cock is fitted at the bottom on the front of the boiler to allow the heating system to be drained.

4.7 PREPARATION FOR INSTALLATION

The following procedure must be performed before you can begin dismantling the boiler for installation:

1. With the boiler on the pallet, open the carton and remove all packing materials and the carton from the boiler.
2. To access the controls, remove the front door from the boiler. Turn the knob at the bottom of the front door anticlockwise and pull the door outwards at the bottom. Carefully release the top of the front door panel from under the top casing panel flange and remove it from the boiler to reveal the boiler as shown in Figure 1-1.
3. Remove internal packaging from within boiler casing.
4. Remove flue terminal, filling loop and flexible oil hose packs from within boiler.

4.8 DISMANTLING THE BOILER

Dismantle the boiler as follows, keeping all components, screws and washers for re-assembly:

1. Slacken off hose clip on burner air inlet and remove snorkel tube from boiler.
2. Unscrew earth wire from underside of top casing panel.
3. Remove screws securing top casing panel and remove casing panel from boiler.
4. Remove silver cover from burner control box and disconnect plug from burner control box.
5. System model only – Disconnect plug from pump.
6. Unscrew inlet connection to condensate trap and remove trap from boiler.
7. Remove retaining clip and thermostat phials from their pocket in the right side of heat exchanger – below the return connection. (See Figure 4-1)

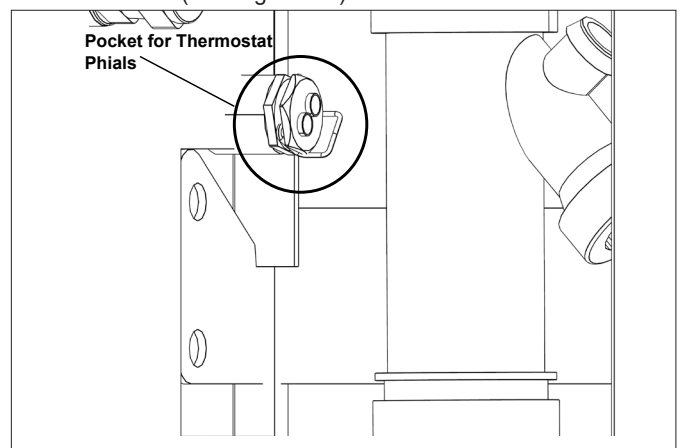


Figure 4-1: Removing thermostat phials

8. System model only - Unscrew and disconnect pressure gauge pipe from PRV body.
9. System model only - unscrew expansion vessel hose from connection on boiler shell and remove expansion vessel from boiler. (See Figure 4-2)
10. Remove screws securing right hand side panel and remove side panel, complete with control panel, pulling it forward and away from boiler.
11. Repeat procedure to remove left hand side panel from boiler.
12. Remove screws securing bottom casing panel and remove bottom panel from boiler.
13. System model only - Unscrew upper pump union and remove pump, complete with flow pipe, from boiler. (See Figure 4-3)



Figure 4-2: Expansion vessel, Expansion vessel bracket and hose connection - System model only

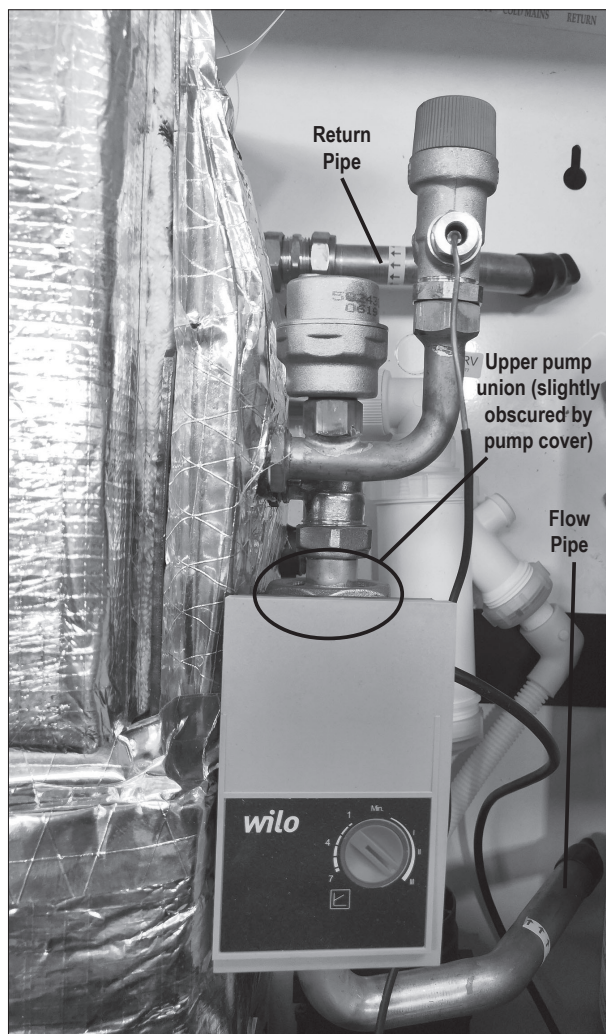


Figure 4-3: Removing flow and return pipe - System model only

14. Non-system model – Unscrew compression connection on boiler shell and remove flow pipe from boiler.
15. Unscrew top right compression connection and remove return pipe from boiler.
16. Using a 13mm socket, slacken burner retaining nut (on top of burner). Rotate burner clockwise (towards rear of boiler), pull burner to the right until burner head is clear of mounting flange and remove burner from boiler.
17. Using 13mm spanner, unscrew the two clean-out door retaining nuts and remove door from front of boiler shell. (See Figure 4-4).

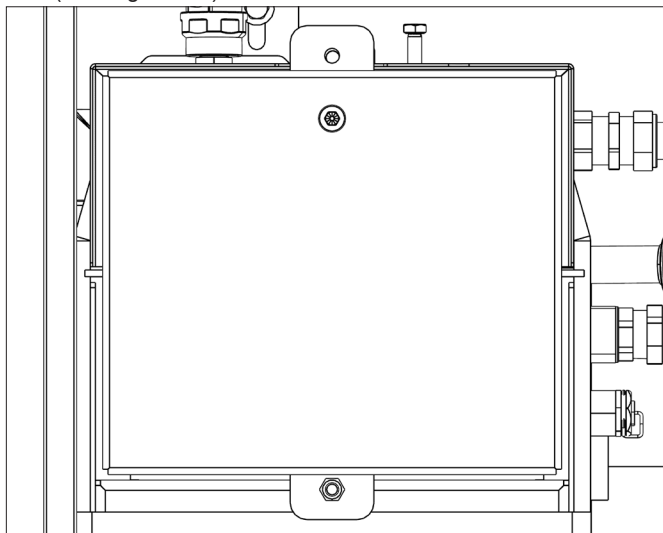


Figure 4-4: Removing clean-out door

18. Remove baffles from boiler shell. (See Figure 4-5).

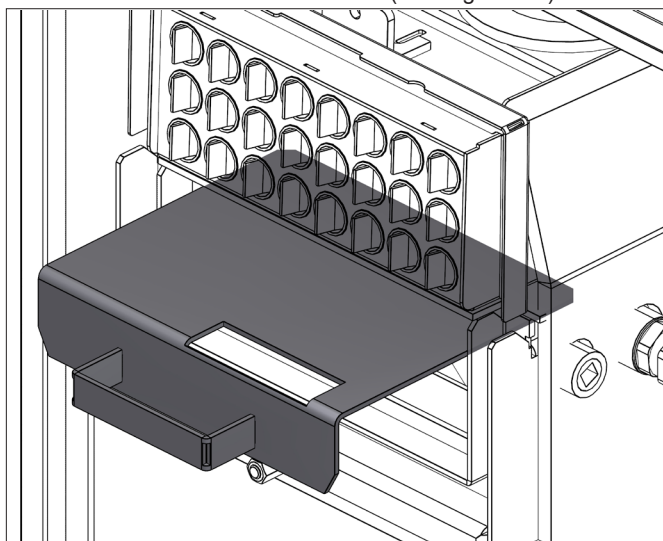


Figure 4-5: Removing baffles from boiler shell

19. Undo retaining screw and nut and remove transit bracket from top of boiler shell.
20. Push boiler shell upwards to disengage it from mounting bracket on back panel of boiler taking care not to damage the insulation on the side of shell.
21. Lift boiler shell away from back panel and stand it upright on the four feet.

! WARNING !

The boiler shell is HEAVY and requires more than one person to lift. Refer to Section 2.1 for boiler weights.

22. Carefully remove the foil-faced insulation from the back panel.
23. Unscrew and remove the two transit screws securing mounting bracket and back panel to pallet.

4.9 INSTALLING THE BOILER

You are now ready to install the boiler.

! NOTE !

The boiler must be mounted such that the boiler flue terminal (supplied with the boiler) terminates at or above 2 metres above ground level.

If the distance is to be less than this, Grant UK suggest using the Green system to achieve a termination point of at least 2 metres above ground level.

The procedure is as follows:

Figure 4-6 shows the mounting bracket in position on the back casing panel, with the holes in the bracket in-line with the corresponding holes in the back casing panel.

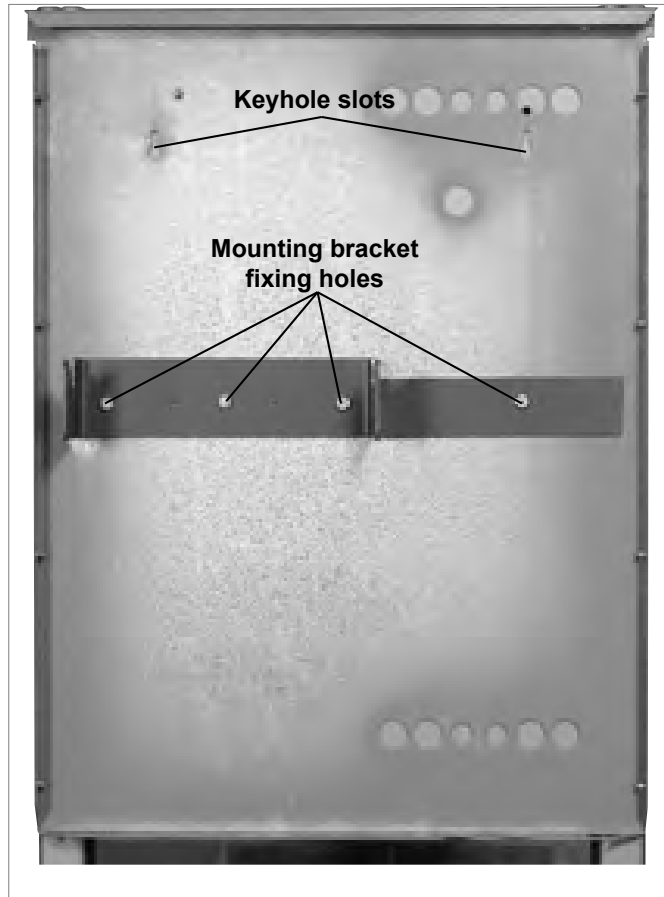


Figure 4-6: Mounting bracket and fixing holes in position on back panel

1. Remove any required knockouts from the back and bottom panels of the boiler casing for the heating system pipework, cold mains supply, oil supply, condensate discharge, electricity supply and PRV discharge (it is recommended that one of the knockouts in the bottom panel is used for the PRV discharge).
2. Locate and hold the back panel in the required position on the wall. Check it is level using a spirit level on the top flange. Mark position of the holes for the two keyhole slots (See Figure 4-6). Remove the back panel from the wall.
3. Drill and fit wall fixing plugs (not supplied) in the two holes. Fit the two screws (supplied) and mount the back panel on the wall using the two keyhole slots. Check again that the back panel is level before proceeding.
4. Mark the position of the four mounting bracket fixings on to the wall from the back panel. Also mark the positions of the flow and return pipes, the cold mains (for filling loop), the electrical power supply, and the condensate discharge pipe.
5. Remove the back panel from the wall. Drill the holes for the mounting bracket fixing holes. Drill all other necessary holes. Re-mount the back panel on the two keyholes slots.

6. Locate the mounting bracket on to the back panel, aligning the four holes in the bracket with those in the back panel. Ensure that the mounting 'hooks' are pointing upwards and secure using the fixings supplied with the boiler.
7. Check the mounting bracket is level.
8. Carefully refit insulation into back panel, passing mounting 'hooks' through the two slits in the insulation.
9. Lift the boiler shell and hang it on the mounting bracket – ensuring that the mounting plates on either side of the shell are fully located in the vertical slot of both mounting hooks.

! WARNING !

The boiler shell is HEAVY and requires more than one person to lift. Refer to Section 2.1 for boiler weights.

10. Re-fit the return pipe to top right hand connection on boiler shell. Pass return pipe from system through hole in wall and connect to boiler return pipe.
11. System model only - Re-fit pump complete with flow pipe to upper pump union on boiler shell. Ensure that rubber pump union washer is fitted. Pass flow pipe from system through hole in wall and connect to boiler flow pipe.
12. Non-system model – Re-fit flow pipe to compression connection on boiler shell. Pass flow pipe from system through hole in wall and connect to boiler flow pipe.

! NOTE !

It is recommended that the system flow and return pipes are connected to the boiler at this point in the installation. Two 22mm isolating valves are supplied for use with sealed system models only. These must not be used on an open vented system. These boiler isolating valves should be located adjacent to the boiler in a convenient position.

13. System model only - connect a 15 mm discharge pipe, of metal construction, to the outlet of the PRV and run vertically down through the relevant knockout in the bottom panel of the boiler casing. Refer to Sections 5.2 and 7 for further guidance
14. Re-fit burner. First remove burner securing nut, locate burner head into hole in burner flange/boiler shell and locate mounting screw through hole on top of burner. Re-fit nut and tighten to secure burner in place. Connect flexible oil lines from oil supply pipework to burner. It is recommended that the copper oil lines are installed at this stage while the side panels are not in place.
15. Refit baffles into boiler shell – ensuring they are in the correct order (check marking on each baffle) as shown in Figure 4-7.

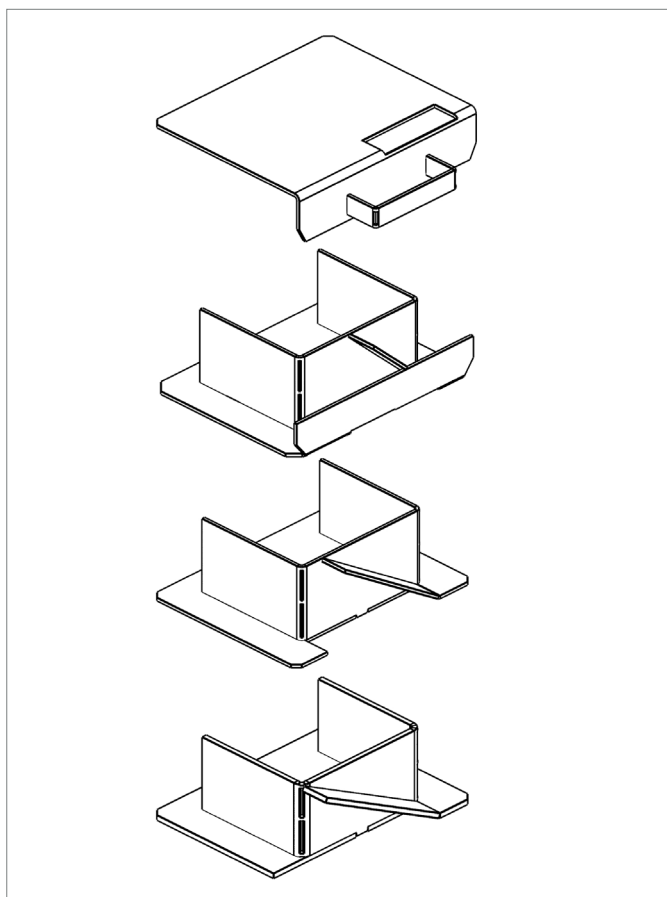


Figure 4-7: Re-fitting baffles into boiler shell

16. Locate clean-out door onto the two studs, re-fit nuts and tighten to secure door in place.
17. Refit left hand casing panel and secure in place with screws (with washers).
18. Refit bottom casing panel and secure in place with screws (with washers).
19. Refit right hand casing panel complete with control panel fitted.
20. Relocate thermostat bulbs in pocket at rear right hand side of boiler shell.
21. System model only - Reconnect pressure gauge to PRV and tighten.
22. Re-connect burner plug to burner control box and refit the silver cover onto the control box.
23. System model only - Reconnect pump plug.
24. Refit condensate trap. Connect condensate discharge pipe to outlet of trap. Refer to Section 6 for further details.
25. System model only - Refit expansion vessel onto bracket inside right hand side panel and reconnect expansion vessel hose to connection on front right hand side of boiler shell. Ensure rubber sealing washer is fitted.
26. Refit top casing panel and secure in place with screws (with washers).
27. If the flue terminal supplied is to be fitted, carefully push it through the seal in the hole in top casing panel.
Ensure that the seal is fitted to the terminal and that it is pushed fully home into the flue connector on the boiler shell. Position the outlet to point to the left and at an angle of 45° away from the wall.
28. Re-fit casing front door - locate top edge up under front flange of top panel. Push bottom of front panel into opening until flush with edge of side panels before rotating handle clockwise to secure.
29. Fit the wall flashing strip. Position the strip with the bottom edge of the wider flange 20 mm above the enclosure top panel, with the narrow flange (with the three fixing holes) flat against the wall. The strip should overhang the top panel by an equal amount at each end.

4.10 FILLING THE HEATING SYSTEM

Refer to Section 7.2 (Filling the Sealed System)

4.11 BEFORE YOU COMMISSION

To avoid the danger of dirt and foreign matter entering the boiler the complete heating system should be thoroughly flushed out – both before the boiler is connected and then again after the system has been heated and is still hot. This is especially important where the boiler is to be installed on an older system.

For optimum performance after installation, the boiler and the associated heating system must be flushed in accordance with the guidelines given in BS 7593 (Treatment of water in domestic hot water central heating systems). This must involve the use of a proprietary cleaner, such as Sentinel X300 (new systems), Sentinel X400 (existing systems), or Fernox Restorer.

After cleaning, it is vitally important that all traces of the cleaner are thoroughly flushed from the system.

For long term protection against corrosion and scale, after cleaning/flushing a suitable inhibitor should be added to the system water, such as Sentinel X100 or Fernox MB-1, in accordance with the manufacturers' instructions.

Failure to follow the above will invalidate the guarantee.

If the boiler is installed in a garage, out house or outside, in order to provide further protection should there be a power failure in cold weather, a combined anti-freeze and corrosion inhibitor can be used such as Sentinel X500 or Fernox Alpha-11. Follow the manufacturers' instructions supplied to achieve the level of anti-freeze protection required.

For details of the Sentinel Products visit www.sentinel-solutions.net and for Fernox products visit www.fernox.com.

Grant UK strongly recommends that a Grant Mag One 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 value of 12000.

4.12 COMPLETION

Following installation of the boiler, instruct the user in the operation of the boiler, the boiler controls, the heating controls and the safety devices.

Please ensure that the OFTEC CD/10 installation completion report (provided with the boiler) is completed in full, leaving the top copy with the user and retain the carbon copy for your own records.

Ensure that the User Handbook (supplied with the boiler) is handed over to the user.

5 PIPE CONNECTIONS

5.1 WATER CONNECTIONS FLOW AND RETURN CONNECTIONS - ALL MODELS

On all models a 22mm push-fit connection is provided for both the heating flow and return connections.

Holes are provided in the back plate at high and low levels to route the pipework back into the property as required. See Section 2.6.

! CAUTION !

All pipes to be fitted into the push-fit connectors provided should be cut using a pipe slicer or pipe cutter - to leave the pipe ends with a slight radius and free from any burrs or sharp edges. Pipes to be used with these fittings should not be cut square using a hacksaw.

PIPE ENTRY/EXIT HOLES IN CASE

All models have holes to enable the pipework to exit the boiler casing.

On all models these holes are pre-cut knock-outs located in both the back and bottom panels.

Push out the 'knock-out' from the required holes, taking care not to distort the panel.

5.2 WATER CONNECTIONS - SYSTEM MODELS

A 15 mm discharge pipe must be connected to the safety valve outlet connection. The pipework between the safety valve and the boiler must be unrestricted, that is, no valves. The discharge pipe should be run to the outside of the building and terminate so that it cannot cause injury to persons or property.

A 15 mm double check valve ballofix type valve is provided on the flexible filling loop hose for connection of the cold mains supply to the heating system.

The cold mains supply should terminate inside the boiler casing.

A drain cock is fitted at the bottom on the front of the boiler to allow the heating system to be drained.

The expansion vessel is connected via a flexible hose to allow it to be moved to gain access to the burner and condensate trap for servicing.

When replacing the vessel, care should be taken to ensure that the flexible connecting hose is not twisted.

! NOTE !

For guidance on the connection of the heating system pipework, please refer to Section 4.9.



Figure 5-1: Non system boiler flow and return connections

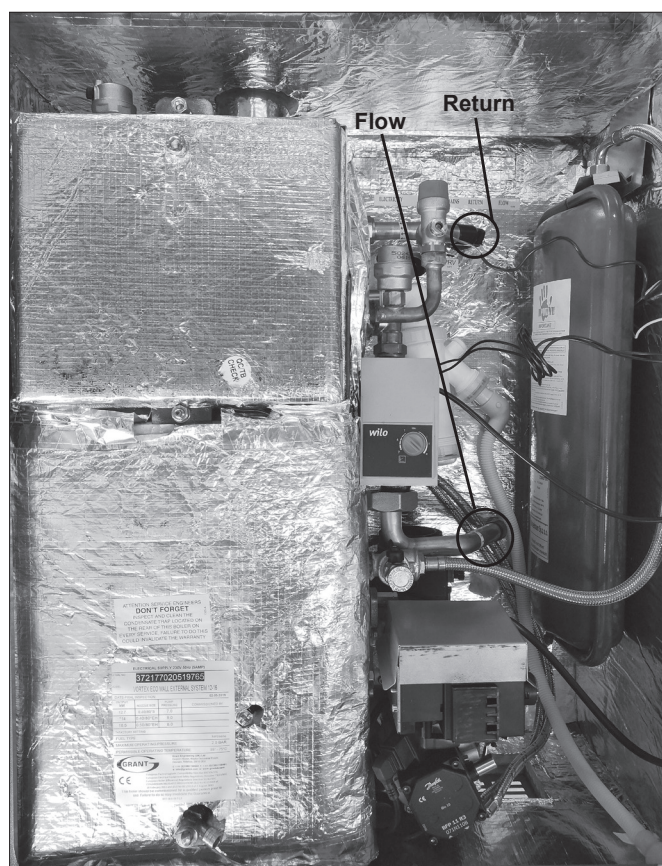


Figure 5-2: System boiler flow and return connections

6 CONDENSATE DISPOSAL

6.1 GENERAL REQUIREMENTS

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

This condensate is moderately acidic with a pH value of around 3.27 (similar to orange juice).

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 gulley
- 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.

6.2 CONNECTIONS

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

! CAUTION !

Condensate disposal pipes must 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.

6.3 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 ($\frac{3}{4}$ ") - 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 gulley (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.

6.4 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 boilers installed in an unheated area such as a loft, basement, outhouse or garage, all condensate pipework should be as 'external'.

The pipework should be insulated using suitable waterproof and weather resistant insulation.

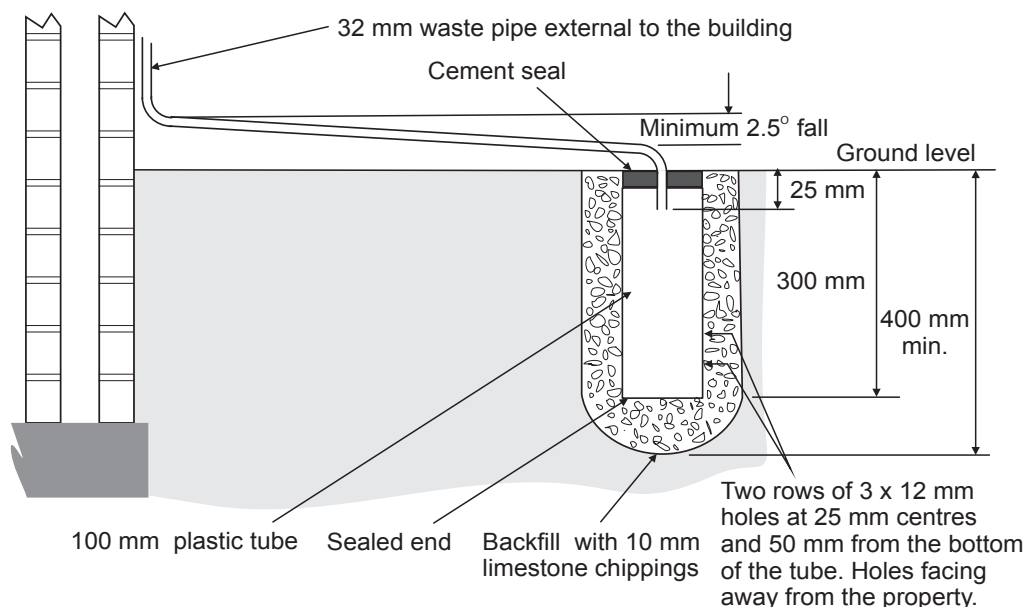


Figure 6-1: Purpose made condensate soakaway

6.5 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 6-1.

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.

6.6 CONDENSATE TRAP

Grant Vortex boilers are supplied with a condensate trap to provide the required 75 mm water seal in the condensate discharge pipe from the boiler.

The condensate trap is factory fitted inside the boiler casing - mounted on the outlet of the condensing heat exchanger - in an accessible position to allow for routine maintenance.

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 Figures 6-2 and 6-3.



Figure 6-2: Condensate trap

A 'push-fit' elbow connects the outlet of the condensing heat exchanger to the trap inlet. Ensure the elbow connector 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 the trap is re-located outside the boiler then the following applies:

- 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.

! WARNING !

Care should be taken when siting the trap such that the overflow outlet is readily visible and that any condensate overflowing from the outlet cannot cause either a hazard to persons or damage to surrounding property or equipment.

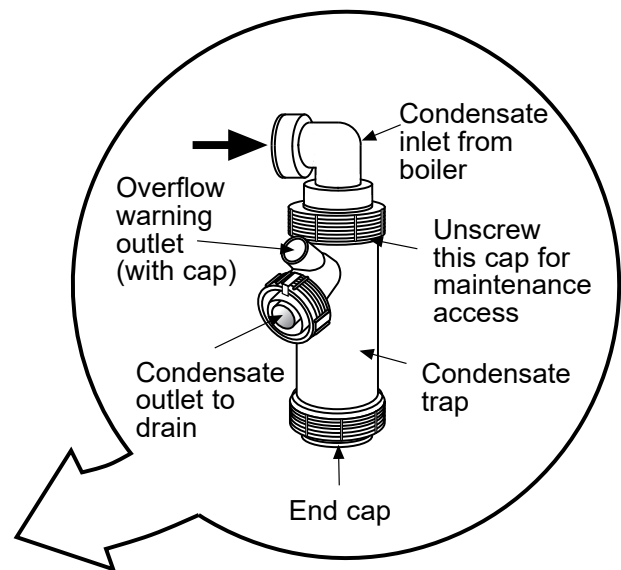


Figure 6-3: Condensate trap

6.7 CONDENSATE DISPOSAL PIPEWORK

The condense trap outlet is at an angle of 48° below the horizontal. This is to automatically give a 3° fall on any 'horizontal' runs of condense disposal pipe. Refer to Figure 6-3 and see trap outlet/pipe.

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

This discharge pipe can exit through the rear or bottom of the boiler through one of two pre-cut 'knock-outs' in either the back or bottom casing panels. Push out the 'knock-out' from the required hole taking care not to distort the side panel.

! NOTE !

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

6.8 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.

The bottom bowl can be unscrewed from the trap body for inspection and cleaning.

To inspect and clean the trap:

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

! 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.

7 SEALED SYSTEMS

7.1 SEALED SYSTEM REQUIREMENTS

All Grant Vortex Eco Wall Hung models are suitable for use with sealed systems complying with the requirements of BS EN 12828, BS EN 12831 and BS EN 14336.

The system must be provided with the following items:

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

7.1.1 EXPANSION VESSEL

The expansion vessel should be fitted in the return pipework as shown in Figures 7-1 and 7-2. 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 in diameter. If the expansion vessel is connected via a flexible hose, care must be taken to ensure that the hose is not twisted or kinked.

! NOTE !

Ensure that the expansion vessel used is of sufficient size for the system volume.

Refer to BS 7074-1 or The Domestic Heating Design Guide for sizing the required vessel.

7.1.2 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.

7.1.3 PRESSURE RELIEF (SAFETY) VALVE

The pressure relief (safety) valve should be fitted in the flow pipework near to the boiler.

The pipework between the pressure relief (safety) valve and boiler must be unrestricted, i.e. no valves. The pressure relief (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.

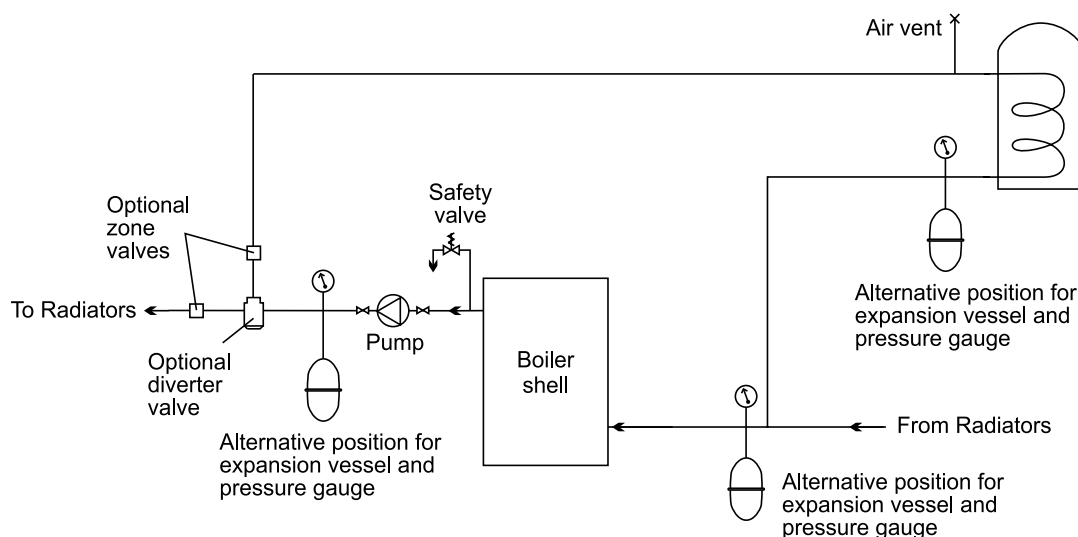


Figure 7-1: Sealed system

If thermostatic radiator valves are fitted, the system **must** incorporate an adequate by-pass.

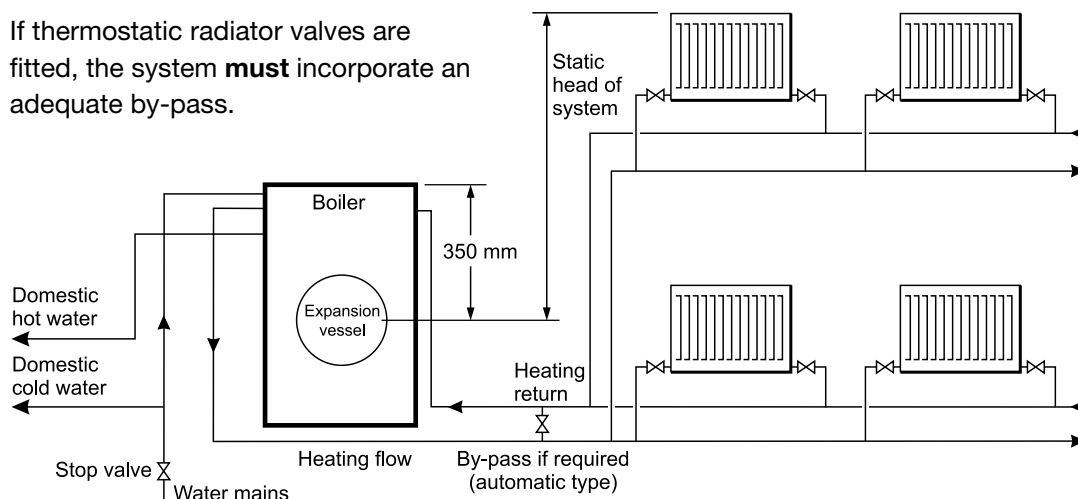


Figure 7-2: Sealed system boilers

7.1.4 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.

7.1.5 HEATING SYSTEM

The maximum 'setpoint' temperature for the central heating water is 75°C. Refer to Section 1.1.

An air vent should be fitted in the flow and return pipes of the highest point of the system.

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.

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

7.2 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 boiler 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 slightly greater than the maximum static head of the system, in bar, at the level of the vessel (1 bar = 10.2 metres of water). Refer to Figure 7-2.
The charge pressure must not be less than the actual static head at the point of connection.

! 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.

2. Check that the small cap (or screw) on all air vents is open at least one turn. The cap (or screw) remains in this position from now on.
3. 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.
4. Open the fill point valve.
5. Gradually open the double check valve from the water supply until water is heard to flow.
6. When the needle of the pressure gauge is between 0.5 and 1.0 bar, close the valve.
7. Vent each radiator in turn, starting with the lowest one in the system, to remove air.
8. 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.

9. Repeat steps 5 to 7 as required until system is full of water at the correct pressure and vented.
10. Water may be released from the system by manually operating the safety valve until the system design pressure is obtained.
11. Close the fill point and double check valves either side of the filling loop and disconnect the loop.
12. Check the system for water soundness, rectifying where necessary.

7.3 VENTING THE PUMP

For those heating circulating pumps fitted with a vent plug, it is important that the pump is properly vented to avoid an air lock and also prevent it running dry and damaging the bearings.

Unscrew and remove the plug from the centre of the pump motor. Using a suitable screwdriver, rotate the pump spindle about one turn. Replace the plug in the motor. Do not over tighten.

! NOTE !

Some heating circulating pumps are not fitted with a vent plug so it is not possible to vent these pumps in the manner described above. Refer to pump manufacturers own instructions for further details.

If a Wilo Para pump is used, please refer to Appendix A1 at the back of this installation and servicing manual for guidance on venting the pump.

7.4 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.

7.5 SYSTEM MODELS

All System models have the following sealed system components factory fitted (refer to Figure 7-3):

- A diaphragm expansion vessel complying with BS 4814, pre-charged at 1.0 bar. Refer to Section 2.2.
- System pressure gauge, with an operating range of 1 to 4 bar.
- Pressure relief safety valve complying with BS 6759 and set to operate at 3.0 bar.
- Air vent, fitted to the flow pipe of the boiler, ensures the boiler is vented.
- Filling loop. This must be isolated and disconnected after filling the system.

Refer to Section 2.2 for system volumes and BS 7074: for further guidance and for further details of the expansion vessel.

For information on the circulating pump fitted to sealed system models, please refer to Appendix A1 at the back of this installation and servicing manual.

The expansion vessel fitted, is supplied with a charge pressure of 1.0 bar (equivalent to a maximum static head of 10.2 metres). The charge pressure must not be less than the actual static head at the point of connection.

! CAUTION !

Do not pressurise the vessel above 1.5 bar.

! NOTE !

The air pressure in the vessel must be checked annually.

The central heating system volume, using the expansion vessel as supplied, must not exceed the recommended value. Refer to Section 2.2. If the system volume is greater, an extra expansion vessel (complying with BS 4841) must be fitted as close as possible to the central heating return connection on the boiler. The charge pressure of the extra vessel must be the same as the vessel fitted in the boiler.

Refer to either BS 7074:1:1989 or The Domestic Heating Design Guide for the required total expansion vessel volume for the system concerned.

! 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 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.

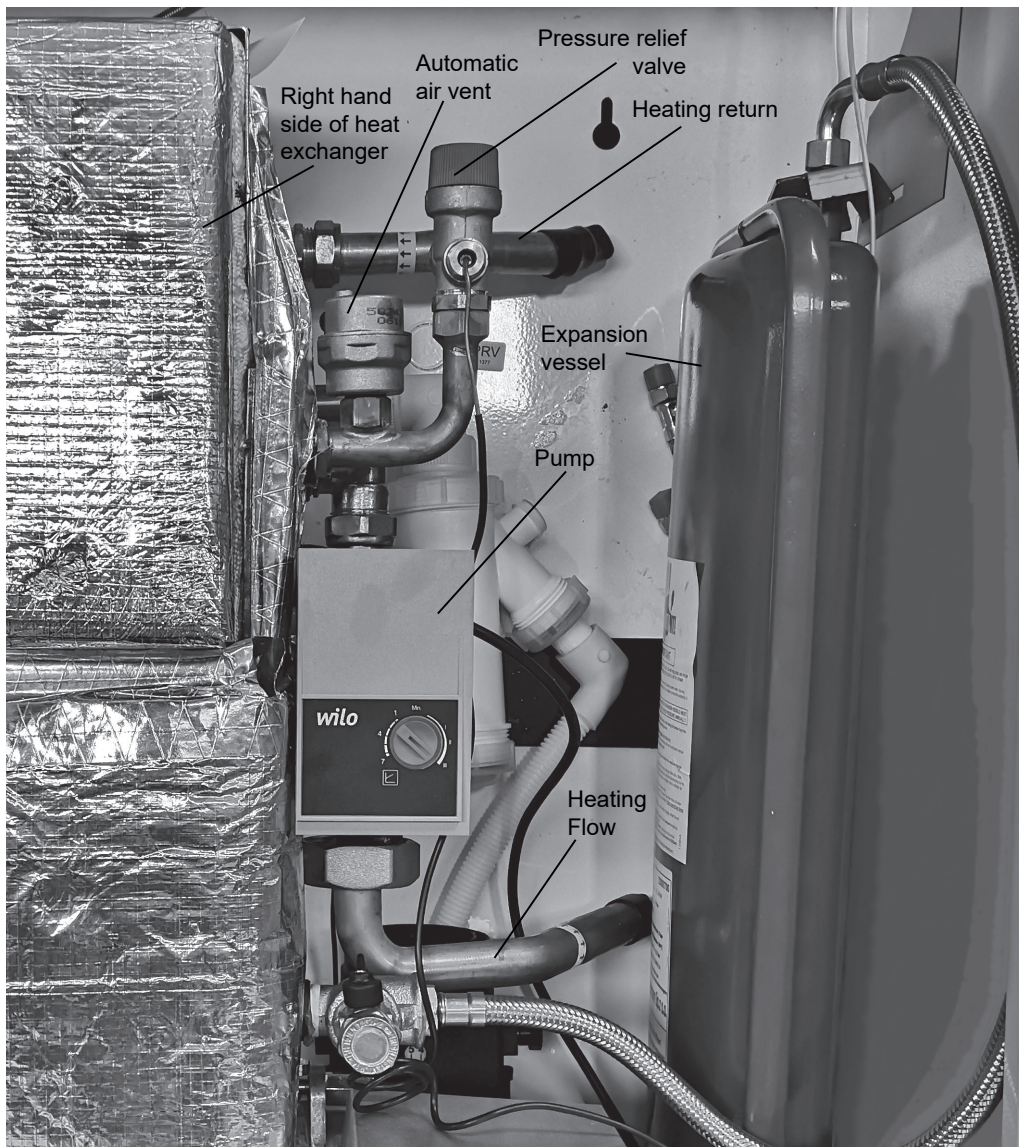


Figure 7-3: Sealed system components

8 ELECTRICAL

! WARNING !

Ensure that the electrical supply has been isolated before making any connections to the boiler.

8.1 GENERAL

Grant Vortex Wall Hung External models require a ~230V 1ph 50Hz supply. It must be protected by a 5 Amp fuse.

Refer to Figures 8-1 to 8-4 for typical control system wiring diagrams for all models.

Refer to Figures 8-5 and 8-6 for control panel wiring diagrams for all models.

! WARNING !

The Vortex boiler contains electrical switching equipment and must be earthed.

The supply must be fused at 5 Amp and there must only be one common isolator for the boiler and control system, providing complete electrical isolation.

A fused double pole switch or a fused three pin plug and shuttered outlet socket should be used for the connection.

The power supply cable should be at least 0.75 mm² PVC as specified in BS 6500, Table 16.

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

! NOTE !

If the supply cord is damaged, it must be replaced by the manufacturer, its service agent or similarly qualified persons in order to avoid a hazard.

8.2 CONNECTING THE POWER SUPPLY

It is recommended that the boiler should be connected to a switched mains power supply from a programmer or control system.

A three core cable is required to connect the boiler terminal block to the live supply.

Refer to Figures 8-1 to 8-4 for typical control system wiring diagrams.

! NOTE !

Ensure that the route and length of the supply cable is such that the boiler front cover plate can be easily removed without disconnecting the supply cable from the terminal block.

The procedure is as follows:

1. Remove the casing door on the front of the external module.
2. Loosen the two screws securing the control panel to the right hand boiler casing panel, lift upwards and remove the control panel from the right hand boiler casing panel.
3. Remove the two screws securing the back cover to the control panel (there is one screw on each side of the control panel), slide the panel downwards to disengage the locating tabs at the top of this panel and remove the panel to gain access to the boiler terminal block.
4. Loosen/remove the screws securing the cable clamp on the top of the control panel and open the clamp.
5. Route the supply and pump cables into the enclosure through one of the designated entry points in the rear casing panel. (If a system model is being installed, the pump cable comes pre-wired into the boiler terminal block).
6. Pass the mains power supply cable through the cable clamp, through the cable grommet in the top of the control panel and connect to the boiler control panel terminals as follows:
 - Brown to mains live (terminal 2)
 - Blue to mains neutral (terminal 3)
 - Green/Yellow to mains earth (terminal 4)
7. If the circulating pump is to be fitted inside the boiler enclosure, pass the 3-core cable from the pump through the cable grommet and through the clamp and connect to the boiler control panels as follows:
 - Brown to pump live (terminal 7)
 - Blue to pump neutral (terminal 8)
 - Green/Yellow to pump earth (terminal 9)

! NOTE !

Connecting the pump in this manner allows the pump to be isolated using the isolated switch inside the boiler control panel, for servicing and maintenance work.

8. Make the remaining required connections to the control panel, as detailed in Figures 8-1 to 8-4.
9. Tighten the cable clamp and refit the back of the control panel, taking care not to trap any wires.
10. Refit the control panel to the right hand boiler casing panel.

! WARNING !

After completing electrical connections and before reconnecting the electrical supply to the boiler, replace the back cover on the control panel and secure it using the screws provided. Take care not to trap any wires.

11. Re-connect the electrical supply and check operation of heating system controls (programmer, room thermostats, etc.).
12. Refer to Instructions provided with the programmer for operation and setting.
13. Leave the Programmer and Thermostat Instructions with the user after installation for their future reference.

BURNER LEAD PLUG/SOCKET CONNECTOR

On all models, the electrical cable between the boiler control panel and burner is now fitted with an in-line 3-way plug and socket connector. This enables the burner to be easily disconnected from the boiler control panel for ease of removal and servicing.

! NOTE !

A Service switch is fitted to the control panel to allow the Service Engineer to test-fire the boiler.

When set to 'ON' the switch temporarily by-passes the external control system to operate the boiler.

This is a 'momentary' or non-latching switch that cannot be left set to ON. The boiler will automatically revert to normal operation when 15 minutes have elapsed since it was last operated. If required, this 15 minute override period can be stopped by switching the boiler On / Off switch OFF and then back to ON.

The boiler will then operate as normal under control of the external heating/hot water controls (timer, room thermostat or programmer).

8.3 FROST PROTECTION

The boiler is fitted with a pre-set internal frost protection thermostat. If the air temperature around the boiler falls below 2°C, then this thermostat will be activated to protect the boiler from freezing.

Also, to protect any exposed heating system pipework, it is recommended that an 'external' frost thermostat is also installed. This frost thermostat will operate in parallel with the internal frost protection of the boiler.

It should be sited within the house in such a place that it can detect any rise and fall in the ambient air temperature, i.e. in a room with a radiator.

Where the frost thermostat is installed outside the house (to protect a boiler installed in an external boiler room or garage) or in an attic, it is recommended that it be used in conjunction with a pipe thermostat to avoid unnecessary and wasteful overheating of the property. The pipe thermostat should be located on the boiler return pipe, and set to operate at 25°C.

For connection details please refer to Figures 8-1 and 8-2.

! NOTE !

For total system protection against freezing, particularly during extended periods without electrical power, Grant recommend the use of a combined heating system antifreeze and corrosion inhibitor, used in accordance with the manufacturer's instructions.

8.4 CONTROL SYSTEM WIRING DIAGRAMS

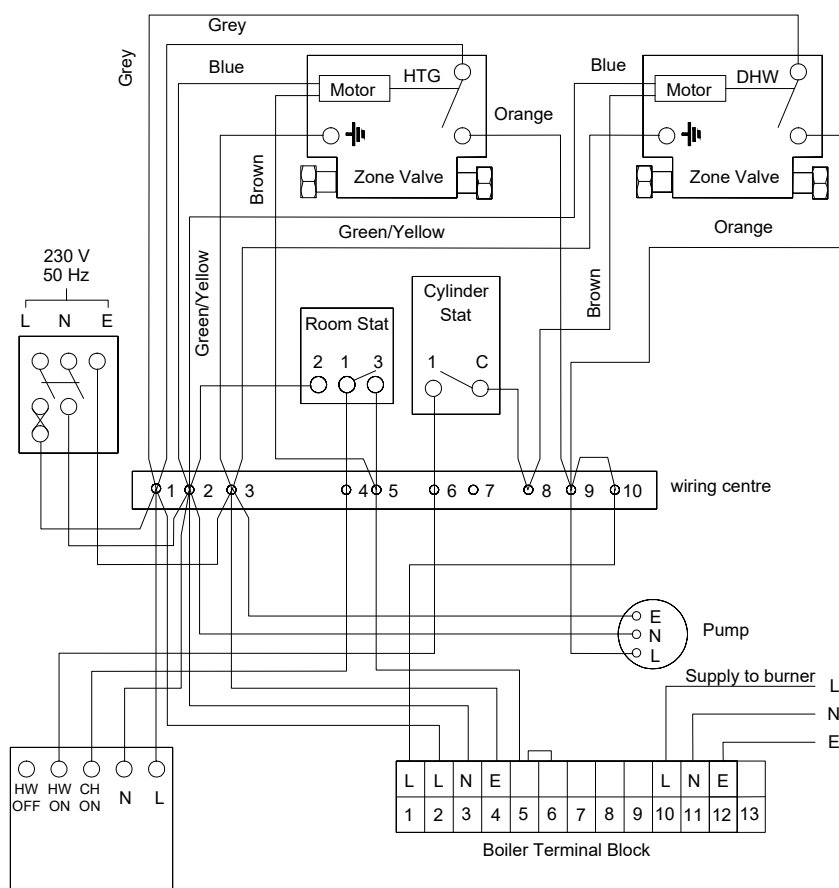


Figure 8-1: External wall hung - 2 X 2-port valve control system

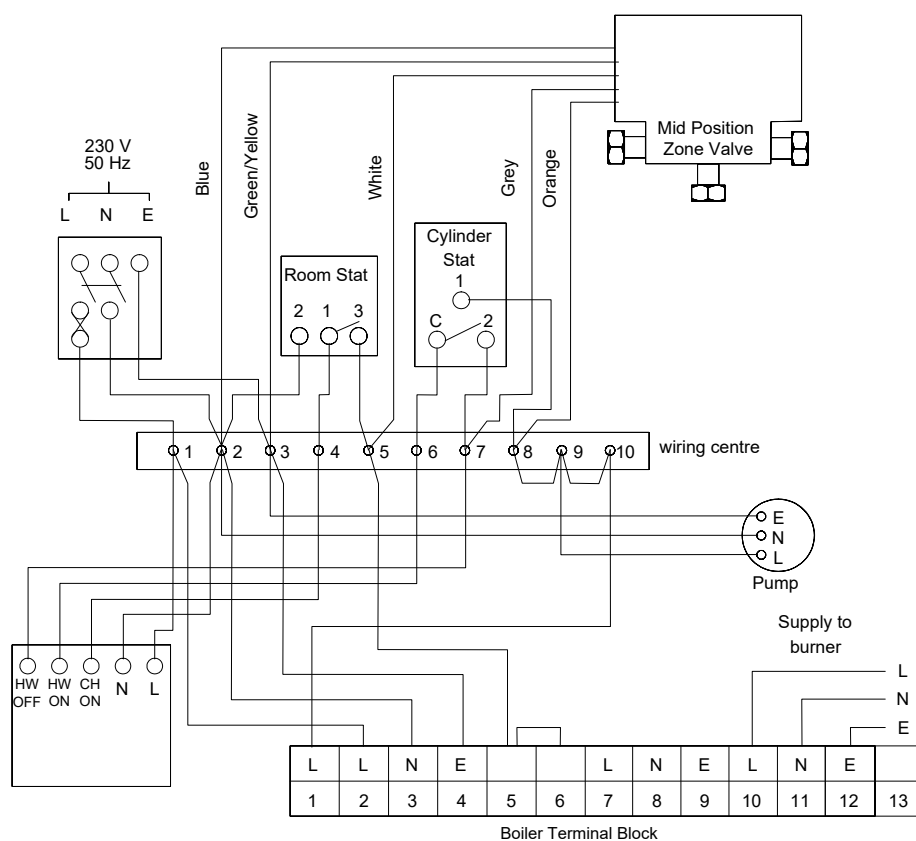


Figure 8-2: External wall hung - 3-port valve control system

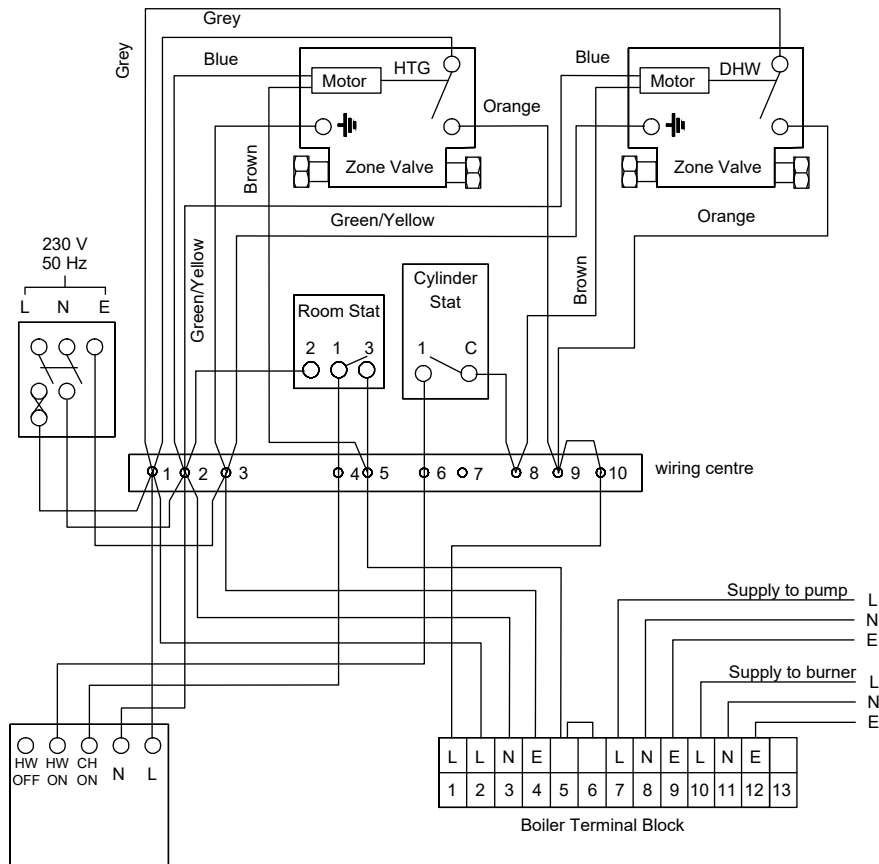


Figure 8-3: External system wall hung - 2 X 2-port valve control system

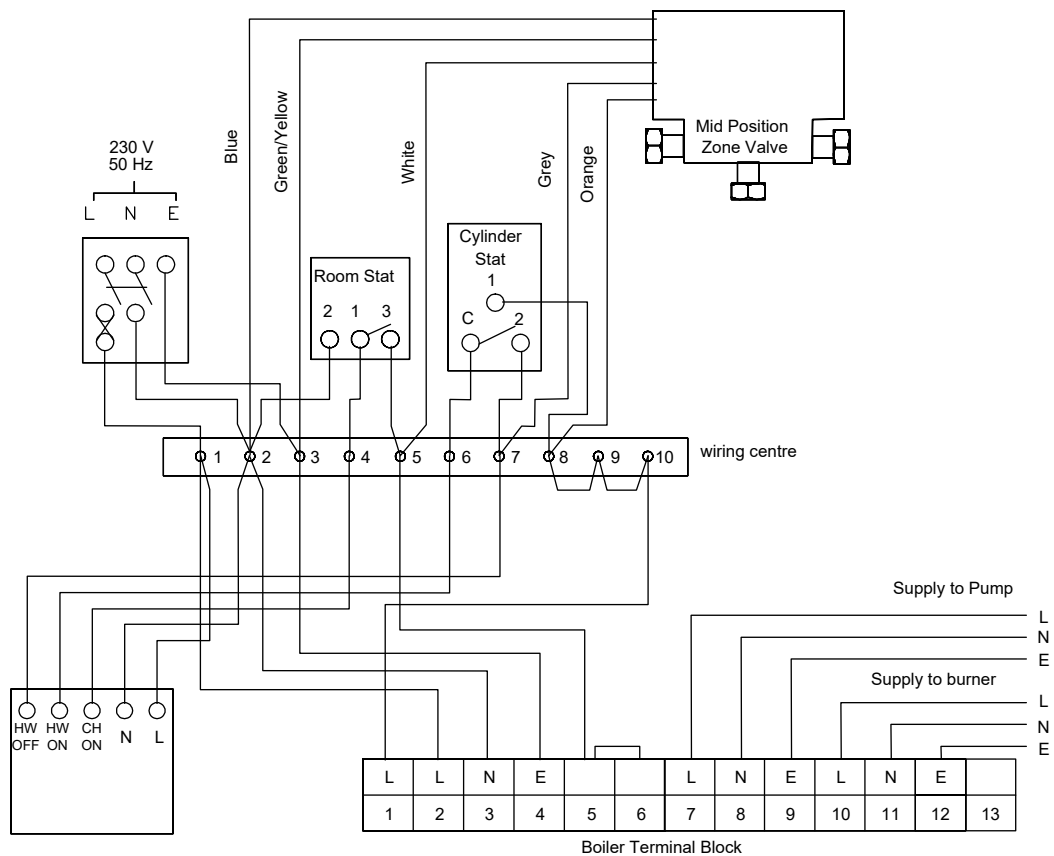


Figure 8-4: External system wall hung - 3-port valve control system

8.5 BOILER CONTROL PANEL WIRING DIAGRAMS

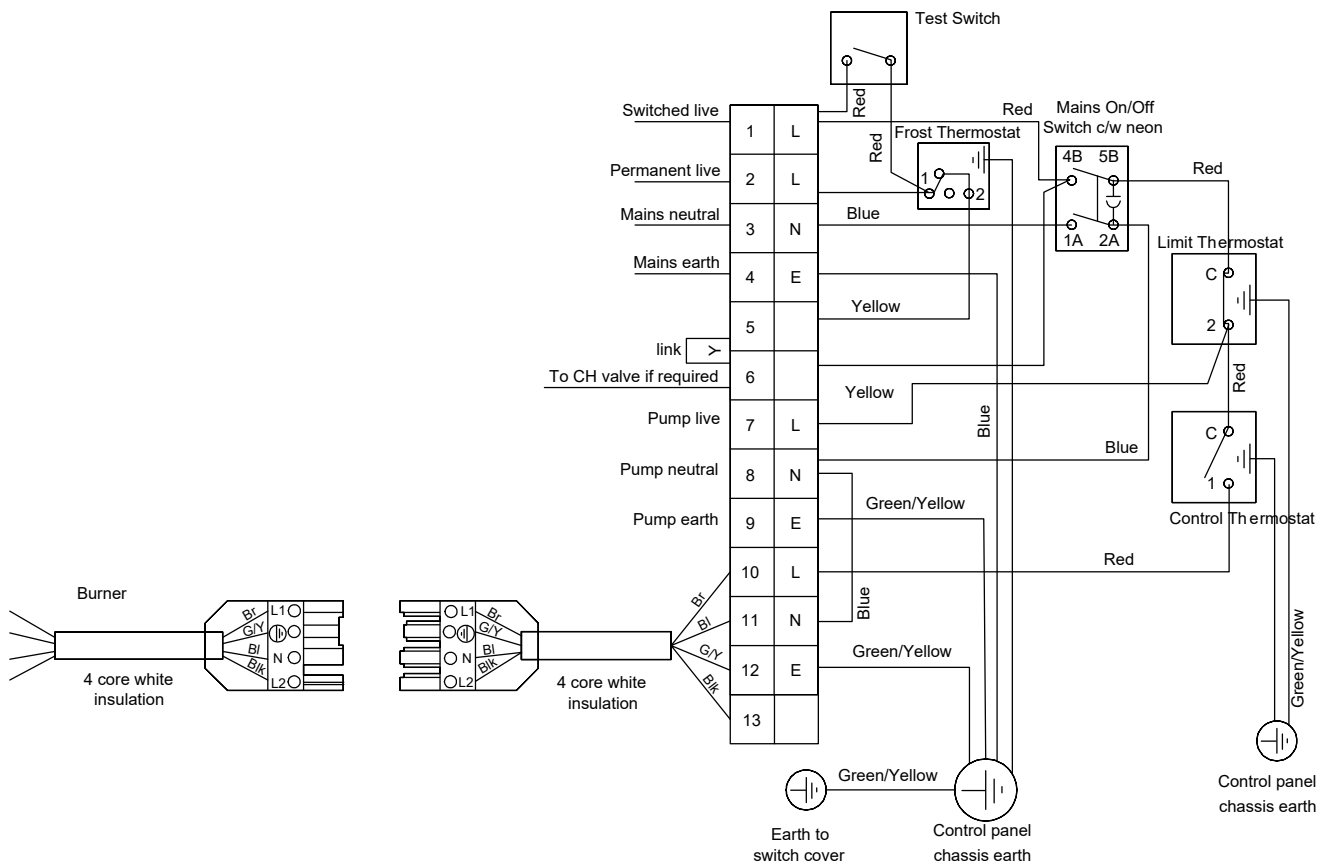


Figure 8-5: External wall hung - wiring diagram

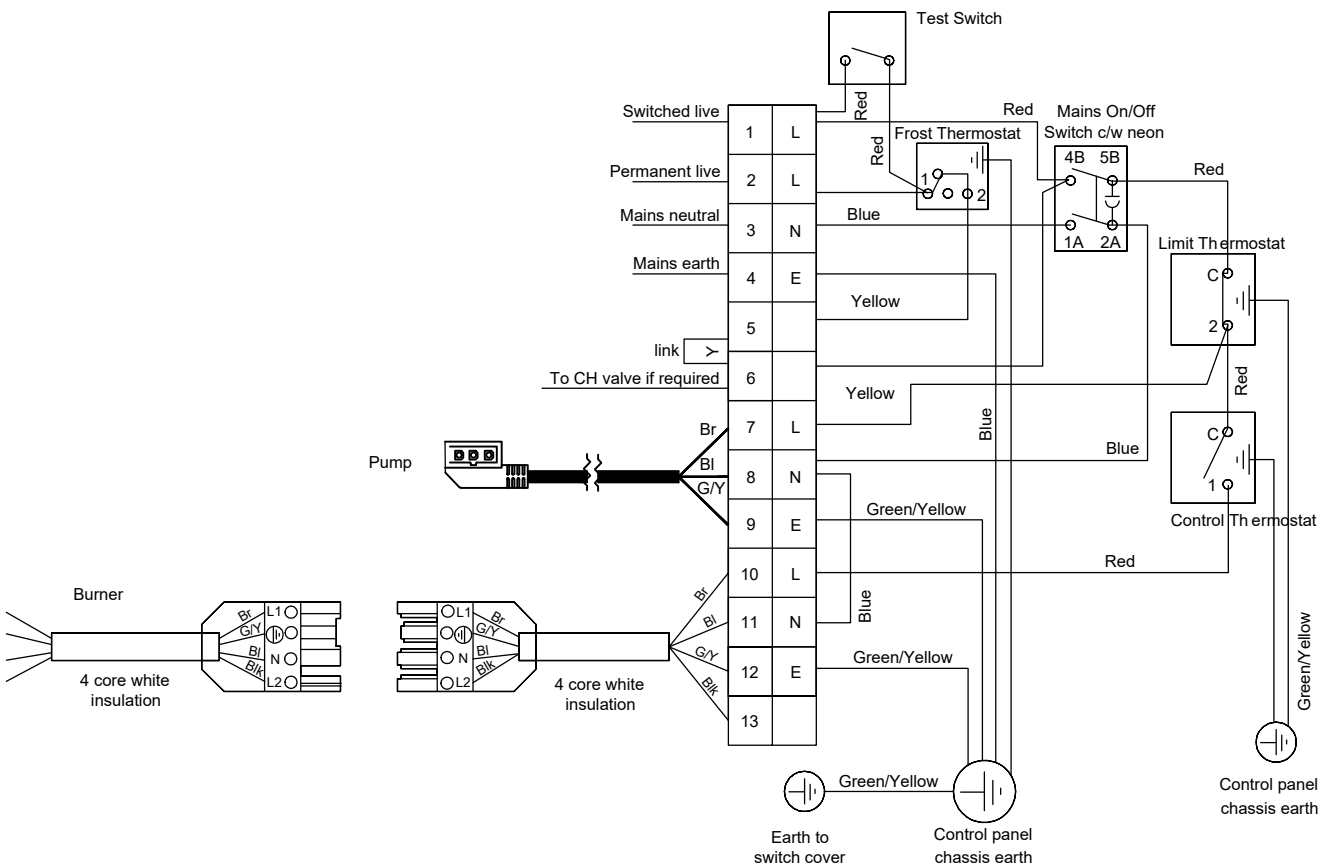


Figure 8-6: External system wall hung - wiring diagram

9 FLUE SYSTEM AND AIR SUPPLY

The boiler is supplied with a flue terminal. Refer to Section 4.9 for fitting details.

As an alternative to the terminal supplied, there is one other external flue systems that can be used with the Vortex Eco External Wall Hung boiler available from Grant UK; as follows:

GRANT VERTICAL GREEN SYSTEM

This vertical twin wall stainless steel insulated system replaces the low level terminal supplied with the boiler, and may terminate at high level or vertically as required.

This flue system is described in this section.

9.1 AIR SUPPLY

A sufficient permanent air supply to the boiler should be provided for the following reasons:

- For proper combustion of fuel and effective discharge of combustion products to the open air.
- For the ventilation of any confined space in which the boiler is installed to prevent overheating of the boiler and any equipment in and near the boiler.

Grant external boilers draw their air supply via the ventilation holes in recessed top edge of the front door of the boiler casing. These ventilation holes must not be obstructed.

Further details may be obtained from BS 5410-1.

9.2 CONVENTIONAL FLUE SYSTEMS

! NOTE !

Under no circumstances can Grant Vortex boilers be installed with existing flue systems. Only flue systems and components suitable for wet flues should be used.

Failure to install the correct type of flue system will invalidate the guarantee.

Grant condensing boilers have high operating efficiencies and low flue gas temperatures. Care must be taken to ensure the flue system is suitable for the very low flue gas temperatures and condensate in the flue gases.

Suitable conventional flue systems are available from Grant UK.

The flue must terminate in a down draught free area, i.e. at least 600 mm above the point of exit through the roof or preferably above the ridge level.

The condensate may be allowed to run back into the boiler. A condensate drain at the base of the flue system is not required.

The high level flue terminal must be at least 600 mm from any opening into the building, and 600 mm above any vertical structure or wall less than a horizontal distance of 750 mm from the terminal.

The internal flue diameter for all models must be 100 mm (4 in).

Twin wall flues are recommended for externally run flues to reduce the possibility of the condensate freezing in the flue.

No part of any flue system should be made of an asbestos material; aluminium must not be used in any part of the flue. Only stainless steel flue components should be used.

If the draught conditions are satisfactory, the flue should terminate with a standard cowl.

Refer to the locally applicable Building Regulations, BS 5410-1 and OFTEC Installation Requirements (OFTEC Books 2 and 3) for further guidance on conventional flue systems.

! CAUTION !

It is important to ensure that the flue system is sealed and that condensate cannot escape. Up to 1.5 l/h of condensate can be produced in a conventional flue system.

Do not use fire cement. The use of high temperature silicone sealants is recommended.

! NOTE !

To comply with the requirements of the Building Regulations Approved Document J - conventional flue systems must have a flue data plate.

9.3 EXTERNAL CONVENTIONAL FLUE (GREEN SYSTEM)

The external system can terminate at either high level (with a 90° terminal) or vertically (above roof level, with a vertical terminal) as required. The vertical or high level terminal must terminate in accordance with BS 5410-1. The minimum dimensions for locating the high level terminal from building features (windows, doors, etc.) are shown in Figure 9-2 and given in Table 9-2.

The Green system comprises of five insulated extension lengths, 45° elbows, a vertical terminal and a high level horizontal terminal.

Locking bands are provided with all vertical extensions and terminals. Ensure that the locking bands are fitted.

Two types of wall bracket are also available (standard and adjustable) to support the vertical flue components.

The maximum vertical height (from the top of the boiler to the terminal) for the 100mm diameter 'Green' system twin wall flue is 19 metres. Only three 45° elbows may be used in the complete system.

If the flue terminal is fitted less than 2 metres above a surface to which people have access, the terminal must be protected by a guard. The guard must be manufactured from stainless steel and should be fitted centrally over the flue terminal and securely fixed to the wall.

CONNECTION OF GREEN FLUE SYSTEM

1. Connect Grant Green system (100mm twin wall flue) to the boiler flue outlet using the Grant External Module starter (product code: GKM90C).
2. Fit the starter piece into the boiler connector after first ensuring that the seal is in place in the connector.

! NOTE !

Lubricate the seal on the boiler connector using the lubricant provided before attempting to fit the starter piece. Ensure that seals in all flue sections are lubricated before installing.

3. Assemble the remainder of the flue system as required, lubricating the seal on each component before fitting and securing every joint with the locking band provided.

The external vertical flue (Green system) components are available from Grant UK and can be found in Figure 9-1 and Table 9-1.

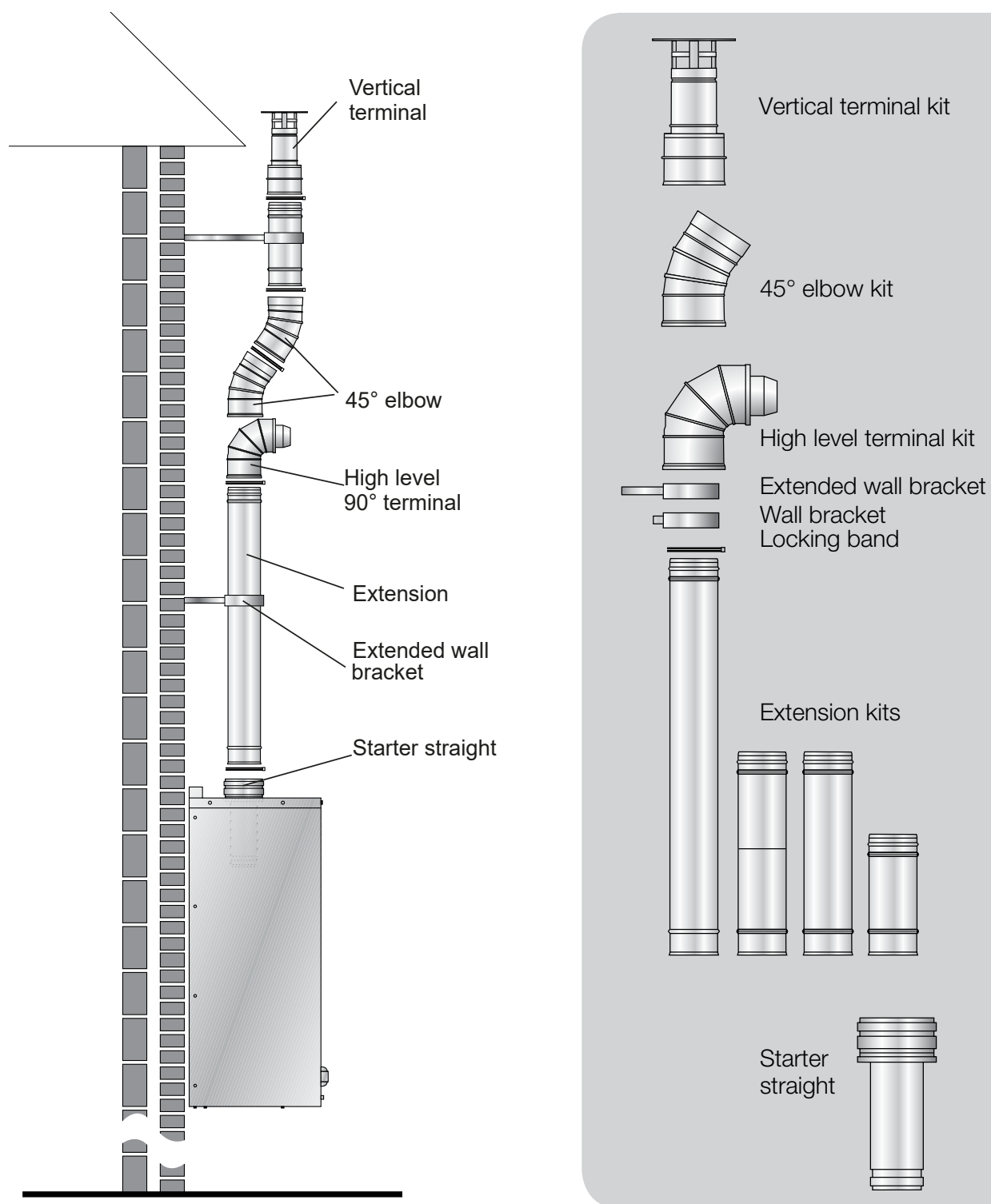


Figure 9-1: Green system

Table 9-1: Green system components - product codes

Item	Product code
150 mm extension	GX150/90
250 mm extension	GX250/90
450 mm extension	GX450/90
950 mm extension	GX950/90
195-270 mm adjustable extension	GXA250/90
45° elbow	GE45/90
High level terminal	GTH90
Vertical terminal	GTV90
Wall bracket - standard	GWB90
Wall bracket - extended	GEB90
External module starter straight	GKM90C

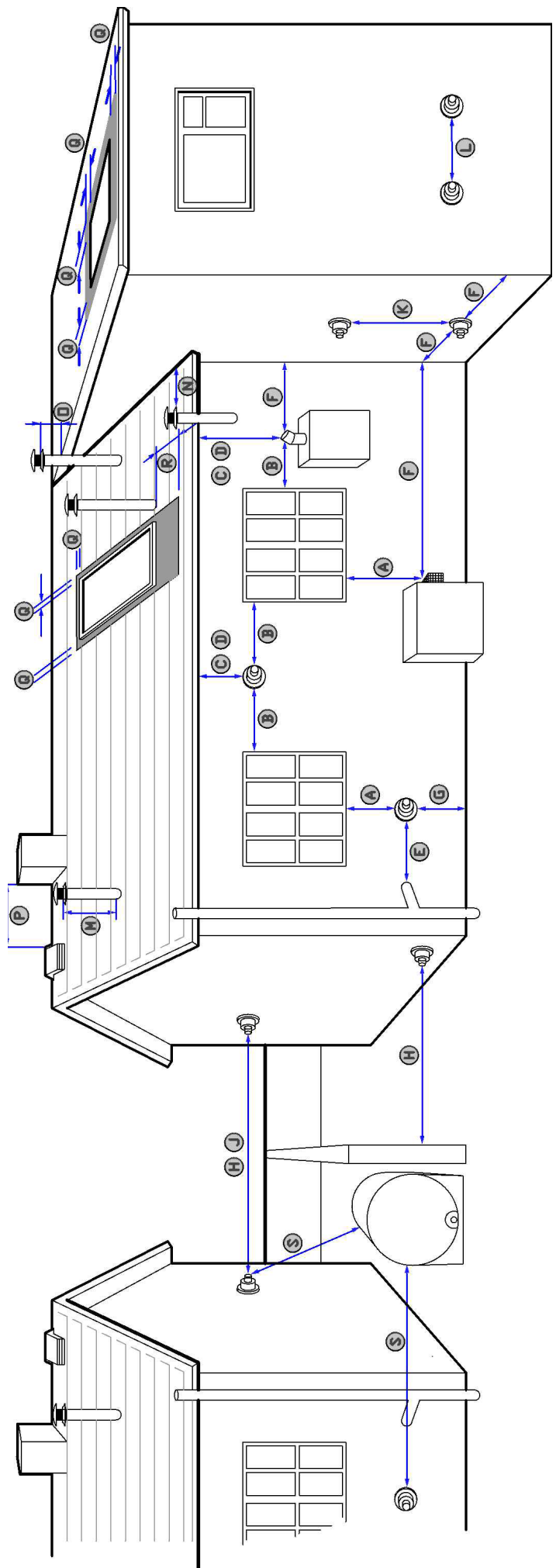


Figure 9-2: Flue clearances

Table 9-2: Flue clearances

Ref	Location of outlet	Minimum distance (mm)	
		Pressure jet	Condensing
A	Directly below an opening, air brick opening, opening window, etc.	600	1,000 **
B	Horizontally to an opening, air brick opening, opening window, etc.	600	1,000 **
C	Below a gutter, eaves or balcony with protection	75 *	1,000 **
D	Below a gutter, eaves or balcony without protection	600	1,000 **
E	From vertical sanitary pipework	300	
F	From an internal or external corner	300	
G	Above ground or balcony level	300	
H	From a surface or boundary facing the terminal	600	2,500 **
J	From a terminal facing the terminal	1,200	
K	Vertically from a terminal on the same wall	1,500	
L	Horizontally from a terminal on the same wall	750	
M	Above the highest point of an intersection with the roof	600	
N	From a vertical structure to the side of the terminal	750	
O	Above a vertical structure less than 750 mm from the side of the terminal	600	
P	From a ridge terminal to a vertical structure on the roof	1,500	
Q	Above or to the side of any opening on a flat or sloping roof	300	
R	Below any opening on a sloping roof	1,000	
S	From oil storage tank (Class 1)	1,800 ***	

* A heat shield at least 750 mm wide must be fitted to provide protection of combustible material.

** Clearances required by BS 5410-1:2019 to alleviate the effect of plume nuisance. If a risk assessment shows that there will be no impact from pluming, then the 'pressure jet' figure could apply - seek confirmation from Local Authority Building Control.

*** Seek guidance from OFTEC Book 3 (Oil Storage and Supply).

NOTES

- Appliances burning class D fuel have additional restrictions. Refer to BS 5410-1:2019.
- Vertical structure in N, O and P includes tank or lift rooms, parapets, dormers, etc.
- Terminating positions A to L are only permitted for appliances that have been approved for low level flue discharge when tested in accordance with BS EN 303-1, OFS A100 or OFS A101.
- Terminating positions should be at least 1.8 metres from an oil storage tank (Class 1) unless a wall with at least 30 minutes fire resistance and extending 300 mm higher and wider than the tank is provided between the tank and the terminating position.
- Where a flue is terminated less than 600 mm away from a projection above it and the projection consists of plastics or has a combustible or painted surface, then a heat shield of at least 750 mm wide should be fitted to protect these surfaces.
- If the lowest part of the terminal is less than 2 metres above the ground, balcony, flat roof or other place to which any person has access, the terminal should be protected by a guard.
- Notwithstanding the dimensions given above, a terminal should not be sited closer than 300 mm to combustible material. In the case of a thatched roof, double this separation distance should be provided. It is also advisable to treat the thatch with a fire retardant material and close wire in the immediate vicinity of the flue.
- A flue or chimney should not pass through the roof within the shaded area delineated by dimensions Q and R.
- Where protection is provided for plastics components, such as guttering, this should be to the standard specified by the manufacturer of the plastics components.
- Terminals must not be sited under car ports.
- Terminals at low levels (terminals under 2.1 metres) have more restrictive recommendations and should not be positioned near public footways, frequently used access routes, car parking spaces less than 2.5 metres from the terminal or patio's (hard surface area).

Further guidance can be obtained from BS 5410-1:2019, OFTEC Book 4 (Installation) and Approved Document J.

Grant UK flue products are fully compliant with the CE (Communauté Européenne/European Community) standards having undergone rigorous product testing.

10 COMMISSIONING

To ensure safe and efficient operation, it is essential that a Grant Eco Wall Hung boiler is commissioned as detailed in the following procedure.

To access the controls, remove the front door from the boiler.

Turn the knob at the bottom of the front door anticlockwise and pull the door outwards at the bottom. Carefully release the top of the front door panel from under the top casing panel flange and remove it from the boiler to reveal the boiler as shown in Figure 10-1.

The controls are shown in Figure 10-2.



Figure 10-1: Boiler with front panel removed



Figure 10-2: Boiler controls

10.1 BEFORE SWITCHING ON

1. Ensure the boiler is isolated from the electrical supply and the boiler ON/OFF switch is set to OFF.
2. Check that the high limit thermostat bulb and boiler thermostat bulb are correctly located in their respective pockets. See Figure 4-1. Check condition of both thermostat capillaries. Ensure they are not damaged, broken, kinked or crushed.
3. Remove the nuts and washers securing the front cleaning door. Withdraw the door – take care as it is heavy!
4. Check that the turbulators are in position and that the ends are vertical. Refer to Figure 11-2.
5. Check that the baffles are in position. Refer to Figure 11-1.
6. Refit cleaning door and check that it is fitted correctly and that a good seal is made.
7. Unscrew the burner fixing nut (located at the top of the mounting flange), rotate the burner clockwise and remove the burner from the boiler.

The burner has a slotted lug on the underside of the fan housing. This allows the burner, when removed from the boiler, to be hung on the bolt on the front of the combustion door for checking/servicing.

! NOTE !

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

8. Check/adjust the burner settings as described in Section 10.2.
9. Re-fit the burner to the boiler and tighten the fixing nut. DO NOT OVERTIGHTEN!
10. Check that sealed system has been vented and pressurised and that there are no leaks.
11. Ensure the air vent on the condensing heat exchanger is open. Refer to Section 7.
12. Check that all fuel line valves are open.
13. Connect a combined vent manifold and pressure gauge to the pressure gauge connection port on the oil pump (item 6, Section 11.7). Open the vent screw on the vent manifold to vent the supply while the pump is running.
14. Check that all system controls are calling for heat and turn the boiler thermostat to maximum.

10.2 BURNER SETTINGS

With the burner removed from the boiler:

1. Remove the burner head. Refer to Figure 10-3. Loosen the two fixing screws (1) and remove head (2) from the burner.

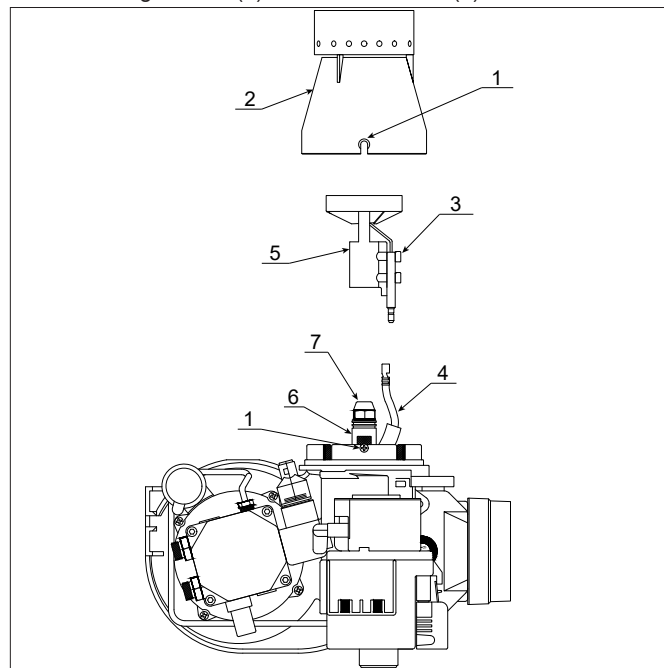


Figure 10-3: Burner head, diffuser and nozzle holder

2. Check the nozzle (7) is correct for the required boiler output. Refer to Table 2-3 for the correct nozzle size and type for the required boiler output.
3. If the nozzle needs to be replaced – remove the diffuser/electrode assembly. Refer to Figure 10-3.
 - Using a 3 mm Allen key, loosen the diffuser fixing screw (3) on the electrode assembly.
 - Lift the diffuser/electrode assembly (5) up and off the nozzle holder.
 - Disconnect both ignition leads (4) from the electrodes.
4. Use a 16mm spanner to remove /re-fit the nozzle, whilst holding the nozzle holder (6) using another 16mm spanner.

! CAUTION !

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

! NOTE !

Ensure that the nozzle is securely tightened so it does not leak but DO NOT OVERTIGHTEN!

5. Re-fit the diffuser/electrode assembly. Refer to Figure 10-3.
 - Re-connect ignition leads (4) to electrodes.
 - Re-fit the diffuser/electrode assembly (5) onto the nozzle holder (6) lining up the fixing screw (3) with the with the recess in the nozzle holder.
 - Ensure diffuser assembly is fitted down hard onto the shoulder on the nozzle holder.
 - Tighten the fixing screw (3) to secure the diffuser/electrode assembly (5) in place on the nozzle holder (6).

! NOTE !

Do not overtighten the fixing screw as this may damage the electrode insulator.

6. Check/adjust the electrode setting. Refer to Figure 10-4. Always check the electrode settings after replacing the nozzle.

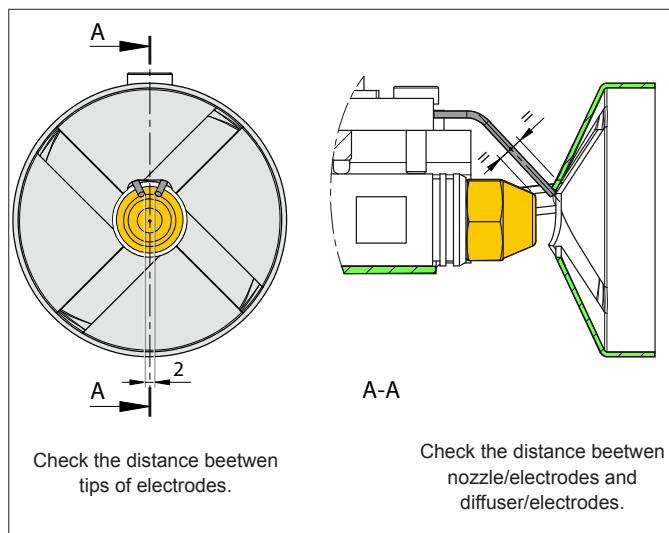


Figure 10-4: Ignition electrode settings

7. Re-fit the burner head. Refer to Figure 10-3.
 - Locate the head fixing screws in the countersunk slots in the burner collar (1).
 - Check/adjust the electrode setting. Refer to Figure 10-4.
 - As the head will only fit one way, rotate the head until the two screws align with the slots.
 - Tighten the two screws to secure the head (2) in position on the burner.
8. Check/adjust the diffuser position. Refer to Figure 10-5.

! NOTE !

The distance between the end of the burner head and the front face of the diffuser (D) MUST be correctly set for the burner to operate correctly.

- Refer to Table 2-3 for the required distance (diffuser setting) for the boiler output required. This is the distance from the front face of the nozzle to the internal shoulder of the burner head. Refer to Figure 10-5.
- Check the distance using the gauge supplied with the burner.

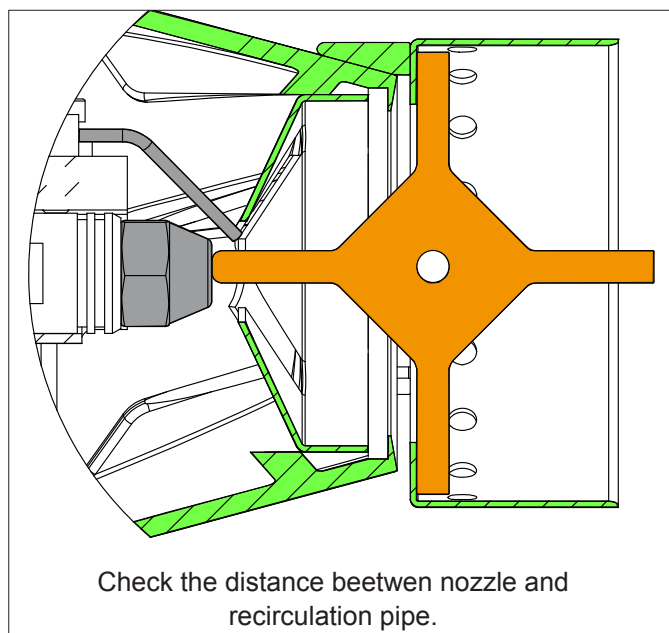


Figure 10-5: Checking the diffuser position using the gauge provided

- The three possible boiler output settings are stamped on three of the legs of the gauge.
- To use the gauge:
 - Identify the correct leg of the gauge that matches the required boiler output.

- Position the gauge on the internal shoulder of the burner head so the leg for the required output is pointing towards the nozzle.
- Check that the gauge is at 90° to the internal shoulder of the burner head and across the full diameter.
- If the diffuser setting is correct, the tip of the gauge leg will just touch the front face of the nozzle, with the gauge still in contact with the internal shoulder of the burner head on BOTH sides. Refer to Figure 10-5.
- If the gauge leg is in contact with the nozzle face but the gauge is NOT in contact with the internal shoulder of the burner head on BOTH sides, the diffuser must be 'opened' (see below).
- If the gauge leg does not reach the nozzle with the gauge is in contact with the internal shoulder of the burner head on BOTH sides, the diffuser must be 'closed' (see below).
- To adjust the diffuser position:
 - If necessary, adjust the diffuser position by rotating the adjustment screw, located on the front of the burner, using a 4mm Allen key. Refer to Section 11.7. Re-check the diffuser setting using the gauge, as described above.
 - To increase the distance between the nozzle face and internal shoulder of the burner head (to open the diffuser): rotate the adjusting screw clockwise.
 - To decrease the distance between the nozzle face and internal shoulder of the burner head (to close the diffuser): rotate the adjusting screw anti-clockwise.

! NOTE !

One full rotation of the adjuster screw is approximately 1mm of diffuser (and nozzle) movement.

! NOTE !

It is essential that the final position of the diffuser is checked, using the gauge provided with the boiler, and the diffuser adjusted as necessary to achieve the required position.

10.3 SWITCHING ON

1. Check that all system controls are calling for heat and turn the boiler thermostat to maximum.
2. Switch on the electricity supply to the boiler.
3. Set the boiler On/Off switch to ON. A Neon on 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 that the burner is firing.
The burner should then fire. Open the vent screw on the vent manifold to vent the supply while the oil pump is running.
4. The burner fan should start and the burner should light within about 12 seconds. If the burner does not light and the 'Lock-out' reset button on the burner lights, wait about 45 seconds and press the reset button to restart the ignition process.
This procedure may have to be repeated several times during first lighting.
5. With the burner alight, check the fuel pressure. Refer to Section 2.3 (burner settings).
6. Adjust the pressure if necessary.

! NOTE !

It is important that the oil pressure is correctly set.

7. Operate the boiler until it reaches normal operating temperature. Check oil supply/return pipe for leaks, rectifying where necessary.
8. Check the operation of the boiler thermostat. Ensure that by turning it anticlockwise it switches the burner off.
9. 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.
10. Ensure that there are no oil leaks.
11. On balanced flue installations – ensure the flexible air inlet tube and the flexible air tube is connected to both the burner air inlet and the flue system.

10.4 RUNNING THE BOILER

1. Relight the boiler and allow it to run for at least 20 minutes.
2. Check the smoke number, if it is 0-1 then it is satisfactory.
3. Using a calibrated electronic flue gas analyser, set to the correct fuel, check the %CO₂ in the flue gases.

! NOTE !

To allow the boiler to be commissioned and serviced correctly a combustion test point is provided on the front cleaning door. Both the %CO₂ and smoke test may all be carried out using this test point.

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

4. 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 section when used).
5. For high level and vertical balanced flues, the reading may be taken from the flue test point provided on the flue system.
6. For conventional flues, a test point is provided in the conventional flue adaptor for flue draught and flue gas temperature measurement.
7. Set the %CO₂, as indicated on the flue gas analyser, to the required value as given in Section 2.3 for the boiler concerned.
8. Adjust the burner air damper, using the hexagonal key supplied, to achieve the required %CO₂. Refer to Section 11.7.
9. To increase the %CO₂:
 - Turn the screw anti-clockwise. This will close down the burner air damper and decrease the combustion air entering the burner.
 To decrease the %CO₂:
 - Turn the screw clockwise. This will open up the burner air damper and increase the combustion air entering the burner.
10. When the %CO₂ is set to the correct level, re-check the smoke number if the burner air damper has been moved. Under no circumstances must the smoke number be above 1.

! NOTE !

For safe and efficient operation of the boiler it is essential that the air damper is correctly set to give the required %CO₂ in the flue gases.

10.5 BALANCING THE SYSTEM

1. 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.
2. Switch off the boiler.

10.6 COMPLETION

1. With the system hot, check again for leaks, rectifying where necessary. Drain the system while it is hot to complete the flushing process. Refill and vent the sealed system.
2. A suitable central heating system inhibitor must be added to protect the system against the effects of corrosion.
3. A suitable antifreeze should be used to prevent damage to the boiler in areas where electrical power failure can occur in winter months.
4. Replace the front door in the boiler casing.

! NOTE !

After commissioning the boiler complete 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, remote programmer and room thermostat 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 heating system antifreeze should be used.

10.7 INFORMATION FOR THE USER

The User must be advised (and demonstrated if necessary) of the following important points:-

- How to start and switch off the boiler and how to operate the system controls.
- The precautions necessary to prevent damage to the central heating system and to the building, in the event of the boiler not being in operation during frost conditions.
- The importance of servicing the boiler to ensure safe and efficient operation. This should normally be required only once a year.
- The type of fuel used.
- That any servicing or replacement of parts must only be carried out by a suitably qualified engineer.
- Ensure that the boiler controls and room thermostat (if fitted) are set to the User's requirements.
- Tell the User the system pressure and show them the position of the safety valve discharge pipe.
- Show the User how to reset the overheat thermostat and how to restart the boiler if it goes to 'Lockout'.

11 SERVICING

To ensure efficient operation of the boiler it is essential that a Grant Vortex Eco Wall Hung boiler is serviced at regular intervals of no longer than 12 months.

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

! CAUTION !

Details of every service should be entered in the Service Log, in the Boiler Handbook.

This information may be required to validate the Grant extended guarantee.

! WARNING !

Before starting any work on the boiler, or fuel supply please read the Health and Safety information given in Section 15 of these instructions.

11.1 CHECKS BEFORE SERVICING

The following sequence of checks should be made before starting any servicing work:

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 system connections and fittings are sound. Remake any joints and check the tightness of any fittings that may be leaking.
4. Allow the boiler and system to cool down.
5. 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. Refer to Section 7.
6. Refill, vent and re-pressurise the system as necessary. Refer to Section 7.
7. Check that any ventilation openings are of adequate free area and are clear. Refer to Section 9.1.
8. Remove any sludge/water from the fuel tank by opening the sludge valve at the lower end of the tank (if fitted).
9. Ensure that all fuel system connections and fittings are sound. Remake any joints and check the tightness of any fittings that may be leaking.
10. With the fuel supply valve (at the oil tank) closed, clean/replace the filter element and clean the filter bowl.

! WARNING !

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

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

11.2 DISMANTLING PRIOR TO SERVICING

The procedure for dismantling the boiler is as follows:

1. Remove the front door from the boiler.
Turn the knob at the bottom of the front door anticlockwise and pull the door outwards at the bottom. Carefully release the top of the front door panel from under the top casing panel flange and remove it from the boiler casing to reveal the boiler as shown in Figure 10-1.
2. On System models, carefully lift up and remove the expansion vessel from the boiler. Place the vessel on the front of the boiler. A clip is fitted to clip it on to the top front edge of the casing.
3. Unscrew the burner fixing nut (top of mounting flange) and rotate the burner clockwise and withdraw the burner from the boiler.
The burner has a slotted lug on the underside of the fan housing. This allows the burner, when removed from the boiler, to be hung on the bolt on the front of the combustion door for checking/servicing.
4. If required, disconnect the flexible oil line(s), using a suitable container to prevent any oil spillage.
5. Check or replace the flexible fuel supply hose(s), as follows:
 - Braided flexible fuel supply hoses (as supplied with the boiler) should be replaced annually i.e. when the boiler is serviced.
 - Long-life hoses should be inspected annually. If in doubt replaces the hose(s). In any event, these hoses must be replaced every five years.

! NOTE !

With a two-pipe oil supply there will be two flexible hoses connected to the burner. Identify (mark if necessary) which is the inlet and return if they are to be disconnected.

11.3 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 as shown in Figure 11-1.

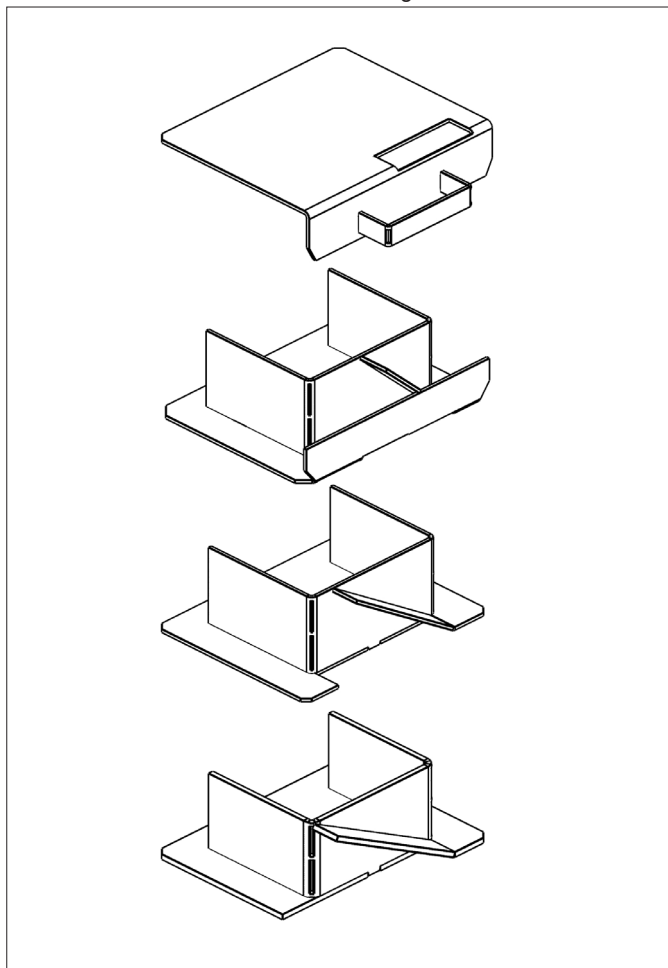


Figure 11-1: Removing the baffles

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 and replace if necessary.
6. Replace the baffles, ensuring they are correctly fitted. Refer to Figure 11-1.
7. Pull out the spiral turbulators from the heat exchanger tubes. (Refer to Figure 11-2).

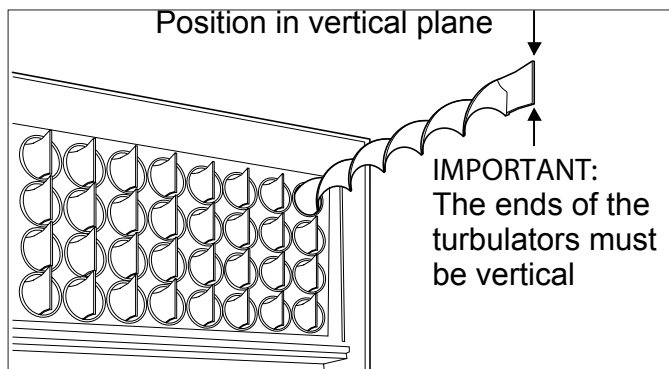


Figure 11-2: Turbulators

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 22mm 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.

11.4 CLEANING THE BURNER

With the burner removed from the boiler:

1. Remove the burner head. Refer to Figure 10-3. Loosen the two fixing screws (1) and remove head (2) from burner.
2. Clean the burner head.
3. Remove the diffuser/electrode assembly. Refer to Figure 10-3.
 - Using a 3mm Allen key, loosen the diffuser fixing screw (3) on the diffuser/electrode assembly (5).
 - Lift the diffuser/electrode assembly up and off the nozzle holder (6).
 - Disconnect both ignition leads (4) from the electrodes.
4. Refer to figure 10-3. Replace the nozzle (7). The nozzle should always be replaced on an annual service. Refer to Table 2-3 for the correct nozzle size and type for the required boiler output. Do NOT attempt to clean the nozzle.

Use a 16 mm spanner to remove/re-fit the nozzle, whilst holding the nozzle holder using another 16 mm spanner.

! CAUTION !

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

! NOTE !

Ensure that the nozzle is securely tightened so that it does not leak but DO NOT OVER TIGHTEN!

5. Inspect the ignition electrodes – remove the electrode fixing screw and withdraw the electrode assembly. Wipe clean and check for any cracks on the insulation. Replace if necessary.
6. Re-fit the diffuser/electrode assembly. Refer to Figure 10-3.
 - Re-connect ignition leads (4) to electrodes.
 - Re-fit the diffuser/electrode assembly (5) onto the nozzle holder (6) lining up the fixing screw (3) with the recess in the nozzle holder.
 - Ensure diffuser/electrode assembly is fitted down hard onto the shoulder on the nozzle holder.
 - Tighten the fixing screw (3) to secure the diffuser/electrode assembly (5) in place on the nozzle holder (6).

! NOTE !

Do not overtighten the fixing screw as this may damage the electrode insulator.

7. Check/adjust the electrode setting. Refer to Figure 10-4. Always check the electrode settings after replacing the nozzle.
8. Re-fit the burner head. Refer to Figure 10-3.
 - Locate the head fixing screws in the countersunk slots in the burner collar (1).
 - Check/adjust the electrode setting. Refer to Figure 10-4.
 - As the head will only fit one way, rotate the head until the two screws align with the slots.
 - Tighten the two screws to secure the head (2) in position on the burner.
9. Adjust the diffuser position. Refer to Figure 10-5.

! NOTE !

The distance between the end of the burner head and the front face of the diffuser (D) MUST be correctly set for the burner to operate correctly.

- Refer to Table 2-3 for the required distance (diffuser setting) for the boiler output required. This is the distance from the front face of the nozzle to the internal shoulder of the burner head. Refer to Figure 10-5.
- Check the distance using the gauge supplied with the burner.
- The three possible boiler output settings are stamped on three of the legs of the gauge.
- To use the gauge:
 - Identify the correct leg of the gauge that matches the required boiler output.
 - Position the gauge on the internal shoulder of the burner head so the leg for the required output is pointing towards the nozzle.
 - Check that the gauge is at 90° to the internal shoulder of the burner head and across the full diameter.
 - If the diffuser setting is correct, the tip of the gauge leg will just touch the front face of the nozzle, with the gauge still in contact with the internal shoulder of the burner head on BOTH sides. Refer to Figure 10-5.
 - If the gauge leg is in contact with the nozzle face but the gauge is NOT in contact with the internal shoulder of the burner head on BOTH sides, the diffuser must be 'opened' (see below).
 - If the gauge leg does not reach the nozzle with the gauge in contact with the internal shoulder of the burner head on BOTH sides, the diffuser must be 'closed' (see below).
- To adjust the diffuser position:
 - If necessary, adjust the diffuser position by rotating the adjustment screw, located on the front of the burner, using a 4mm Allen key. Refer to Section 11.7. Re-check the diffuser setting using the gauge, as described above.
 - To increase the distance between the nozzle face and internal shoulder of the burner head (to open the diffuser): rotate the adjusting screw clockwise.
 - To decrease the distance between the nozzle face and internal shoulder of the burner head (to close the diffuser): rotate the adjusting screw anti-clockwise.

! NOTE !

One full rotation of the adjuster screw is approximately 1mm of diffuser (and nozzle) movement.

! NOTE !

It is essential that the final position of the diffuser is checked, using the gauge provided with the boiler, and the diffuser adjusted as necessary to achieve the required position.

10. Continue cleaning the other burner components as detailed in Section 11.5

11.5 CLEANING THE BURNER: OTHER COMPONENTS

Photocell

The photocell is a push-fit in the front of the burner body.

1. Holding the body of the photocell and NOT the cable, carefully pull the photocell out of the burner.
2. Clean the sensor end of the photocell.
3. Replace photocell back in the burner and check that it is fully pushed in.

Burner air inlet

This is located on the right hand side of the burner. Refer to Section 11.7.

1. Using a 4mm Allen key, unscrew and remove the two screws and remove the air inlet from the burner.
2. Check inside and remove any debris, leaves, hair, fluff, etc. from the air inlet housing and air damper.

Burner fan housing

This is located over the fan impeller. Refer to Section 11.7.

With the burner air inlet already removed:

1. Using a 4mm Allen key, unscrew and remove the four screws and remove the fan housing from the burner.
2. Check and clean the fan impeller and remove any debris, leaves, hair, fluff, etc.
3. Check the fan housing is clean and clean as required.
4. Check the rubber seal around the fan housing. Replace if damaged or missing.
5. Re-fit the fan housing to the burner and secure with the four screws.
6. Re-fit the burner air inlet to the burner and secure with the two screws.

Oil pump filter

This is located under the end cover on the oil pump. Refer to Section 11.7.

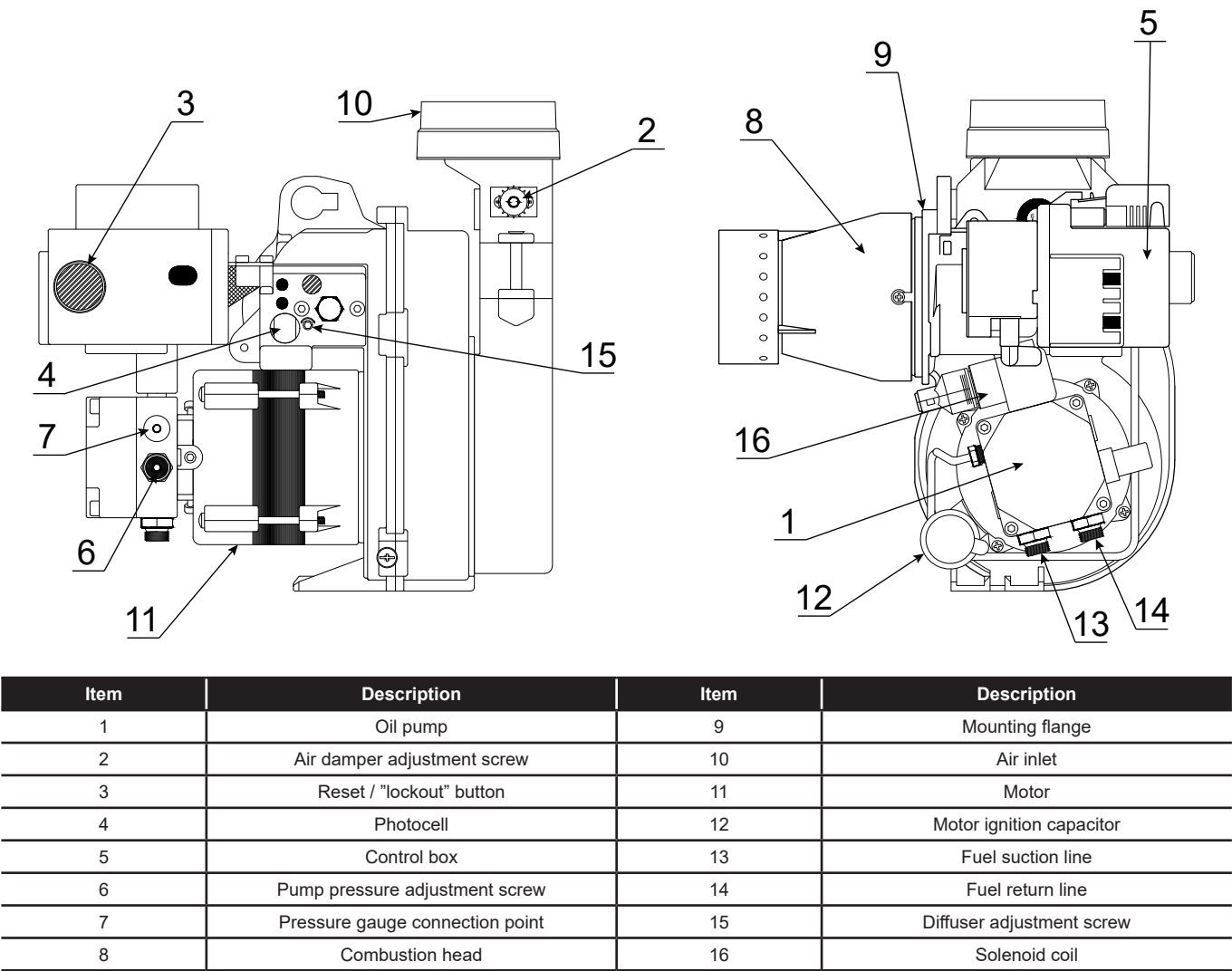
1. Using a 4mm Allen key, unscrew and remove the four cap screws securing the pump end cover. Remove end cover from pump.
2. Remove the filter and wash in kerosene.
3. Check the O-ring seal around the end cover. Replace if damaged.
4. Refit the filter and end cover.
5. Re-fit the four cap screws, tighten evenly, to secure the end cover.

11.6 RECOMMISSIONING

! WARNING !

To ensure safe and efficient operation of the boiler it is important that re-commissioning 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 10.

11.7 BURNER COMPONENTS
(ECOFLAM MAX 1 LN)



12 FAULT FINDING

12.1 BOILER FAULT FINDING

Always isolate the electricity supply to the boiler before working on the boiler.

Table 12-1: Boiler fault finding

Fault	Remedies
Boiler will not start:	
No fuel supply.	Ensure that an adequate supply of fuel is available and that the fuel supply valve is open. Check the condition of the fuel filter, clean if necessary. Ensure fuel supply is reaching burner and vent pump. Check that the fire valve has not operated to shut off the oil supply.
No electricity supply.	Ensure electricity supply to the boiler is switched on and that all controls are calling for heat. Ensure that the overheat thermostat has not tripped, reset if necessary. Check that a mains supply is present at the burner terminal block. If not, check the boiler and overheat thermostat.
Burner not starting - fuel and electricity supplies present.	Press the reset button on the burner control box if it is lit. Refer to burner fault finding charts.
Burner lights but goes to lock-out.	If the flame is unstable, check the combustion settings. Refer to burner fault finding charts.
Boiler works but:	
1. Visible smoke from flue or high smoke number.	Insufficient air supply - check the air damper setting and the condition of the fan. Check room ventilation is adequate, see Section 9.1. Check the nozzle size and type. Fuel pressure may be too high - check and adjust.
2. Burner pulses.	Insufficient air supply - check the air damper setting and the condition of the fan. Check room ventilation is adequate, see Section 9.1. Check the nozzle size and type.
3. Flame slow to stabilise during start up.	Insufficient air supply - check the air damper setting and the condition of the fan. Check room ventilation is adequate, see Section 9.1. Check the nozzle size and type. Fuel pressure may be too low - check and adjust. Insufficient draught - clean boiler heat exchanger and check condition of flue.
4. Water temperature low.	Undersized nozzle and/or low fuel pressure. Check condition of boiler heat exchanger and clean if necessary. Check the boiler thermostat. Check the combustion settings. Check the condition of the fuel filter.
5. Boiler operating on overheat thermostat.	Faulty boiler thermostat. No circulation, check circulating pump. Check for air lock.
6. Fumes and puffing during starting (conventional flue)	Check the condition of the chimney, ensure it is not blocked and is high enough to produce the required draught. Check that there is an adequate air supply near the burner and that a kitchen fan is not drawing products out of the burner.
7. Oil odours.	Check all fuel line connections, remake as necessary.
8. Combustion fumes smell.	Check boiler cleaning cover and seal are correctly fitted. Check burner is correctly fitted onto flange. Check flue is correctly sealed into flue outlet of boiler. Check the condensate pipe and trap are operating correctly.

! NOTE !

For an overview of the fault diagnostic capabilities built into the circulating pump that comes installed in the sealed system boiler models, please refer to Appendix A1 at the back of this installation and servicing manual.

12.2 BURNER FAULT FINDING CHARTS

12.2.1 BURNER FAILS TO START, NO FLAME, NO LOCK OUT

Symptoms	Possible causes	Actions
Motor fails to run	No electrical supply to boiler	▶ Check ON/OFF switch is ON - mains neon is lit
▼	▼	▼
Lock-out light not lit	Fuse has blown	▶ Check or replace fuse
		▼
		If fuse has blown - check reason for failure
	Boiler thermostat not calling	▶ Adjust boiler thermostat to call for heat
	Heating controls are not calling	▶ Adjust programmer and room thermostat to call
	Overheat thermostat has operated	▶ Check and reset overheat thermostat if required
		▼
		If operated - check reason for operation
	No power to burner	▶ Check for 230 volts at control box mains terminals
	Control box faulty	▶ Replace faulty control box

12.2.2 BURNER FAILS TO START, NO FLAME, GOES TO LOCKOUT

Symptoms	Possible causes	Actions
Motor fails to run	No power to burner motor	▶ Check for 230 volts at motor plug terminals
▼		
Burner lockout	Burner motor capacitor faulty	▶ Check and replace if necessary
	Burner motor faulty	▶ Replace burner motor
	Burner motor stalled	
	▼	
	Seized oil pump	▶ Check and replace faulty oil pump

12.2.3 BURNER STARTS, NO FLAME, GOES TO LOCKOUT

Symptoms	Possible causes	Actions
Motor runs	Flame instability	
▼	▼	
Burner pre-purges	Carbon / soot on combustion head	► Clean blast tube
▼	▼	
Burner does not fire	No oil pressure	► Check pump drive coupling - replace if failed
▼		
Burner lock-out	Low oil pressure	► Check oil pump pressure is correct
	▼	
	Excessive combustion air	► Adjust air damper setting
	▼	
	Excessive flue draught (CF only)	► Rectify condition
	False light	► Check photocell is not sensing ambient light
	No ignition spark	► Check HT lead connections are sound
		Check ignition electrode gap is correct
		Check for 230 volts at ignition transformer
		Check transformer - replace if faulty
	No oil at nozzle	► Check for sufficient fuel in tank
		Check fire valve has not tripped
		Check all oil supply valves are open
		Check oil line and pump is not air-locked
		Check operation of solenoid valve
		Check pump drive coupling - replace if failed
		Check fuel pump - replace if seized
	Restriction in oil supply	► Check filters, valves and oil lines and rectify
	Fuel contamination (water in tank)	► Check tank, filters and oil line for water

12.2.4 BURNER FIRES, GOES TO LOCKOUT

Symptoms	Possible causes	Actions
Motor runs	Flame instability	
▼	▼	
Burner pre-purges	Carbon / soot on combustion head	► Clean combustion head
▼	▼	
Burner fires	Fuel contamination (water in tank)	► Check tank, filters and oil line for water
▼		
Burner lockout	Low oil pressure	► Check oil pump pressure and adjust if necessary
	▼	
	Excessive combustion air	► Adjust air damper setting
	▼	
	Excessive flue draught (CF only)	► Rectify condition
	Photocell not sensing light	► Check photocell is clean and unobstructed
	Photocell failed	► Replace faulty photocell
	Defective nozzle	► Replace nozzle

12.2.5 DELAYED IGNITION, BURNER STARTS VIOLENTLY

Symptoms	Possible causes	Actions
Burner pulsates on start up	Excessive combustion air	▶ Recommission burner - adjust air setting
	Low oil pressure	▶ Check and recommission burner
	Partially blocked nozzle	▶ Replace nozzle
	Fuel contamination (water in tank)	▶ Check tank, filters and oil line for water
	Fan slipping on shaft	▶ Check and re-tighten
	Pump coupling loose or worn	▶ Check and replace
Burner starts violently	Delayed ignition	▶ Check electrode settings
		Check electrodes for damage
		Check HT lead connections are sound
		Check HT leads for damage or arcing

12.2.6 BURNER CYCLES ON AND OFF

Symptoms	Possible causes	Actions
Burner firing	Restriction in oil supply	▶ Check filters, valves and oil lines and rectify
▼		
Burner stops firing	Fuel contamination (water in tank)	▶ Check tank, filters and oil line for water
▼		
Pre-purge starts	Partially blocked nozzle	▶ Replace nozzle
▼		
Burner fires	Vitiated combustion air (balanced flue only)	▶ Disconnect snorkel tube and check operation
▼		
Burner stops firing		▶ Check flue terminal for obstructions and rectify
		▶ Check flue system for leaks and rectify
		▶ Replace faulty thermostat
	Boiler thermostat hunting	▶ Replace faulty thermostat

13 SPARE PARTS

13.1 BOILER PARTS LIST

Table 13-1: Boiler parts list

Description	Grant UK product code
Cleaning door nut and washer set	EFBS14
Double pole switch	EFBS19
Baffle set (complete) - all Wall Hung models	WBS03
Turbulator baffle - all Wall Hung models	WBS01
Combustion Door - all Wall Hung models	WBS04
Cleaning door rope seal - all Wall Hung models	WBS05
Limit thermostat (110°C) c/w Earth wire	VBS147
Control thermostat (50 - 75°C) c/w Earth wire	VBS146
Wilo Yonos Para RKS HE circulating pump (7 m head) - all models between April 2015 and November 2019	VBS126
Wilo Para SC HE circulating pump (7m head) - all models from November 2019	VBS159
Automatic Air Vent	MPCBS29
Low Pressure Switch Upgrade Kit (Wall Hung External models)	MPCBS63/A

13.2 SEALED SYSTEM PARTS LIST

Table 13-2: Sealed system parts list

Description	Grant UK product code
Expansion vessel (8 litre) - all Wall Hung models	WBS07
Water pressure gauge	VBS08
Pressure relief valve (3.0 bar)	MPCBS123
Pressure relief valve with pressure gauge port (3.0 bar)	MPCBS124
Expansion vessel flexible hose	WBS08
Filling Loop Kit	VBS35

13.3 ECOFLAM MAX 1 LN BURNER

This section gives exploded views of the Ecoflam Max 1 low NOx yellow flame burners in the Grant Vortex Eco Wall Hung boilers, and parts lists associated with them.

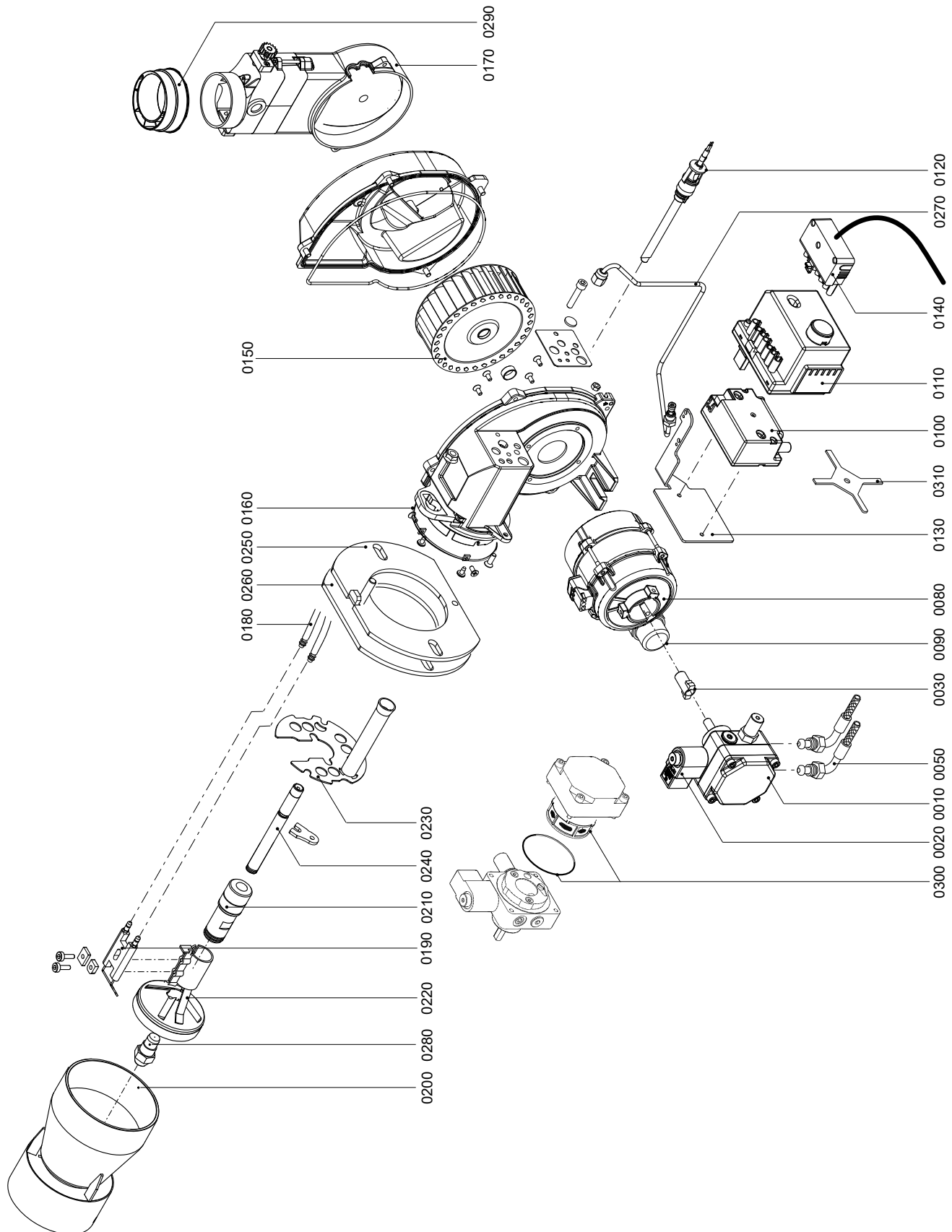


Figure 13-1: Ecoflam Max 1 low NOx yellow flame burner exploded diagram

Table 13-3: Ecoflam Max 1 low NOx burner parts list

Key No.	Description	Ecoflam product code	Grant product code
0010	Oil pump (Danfoss BFP11 R3)	65322968	EBS65322968
0020	Coil (Danfoss BFP T85)	65327293	EBS65327293
0030	Coupling	65322920	EBS65322920
0050	Hoses	65327402	EBS65327402
0080	Motor	65326747	EBS65326747
0090	Capacitor (4 µF)	13011117	EBS13011117
0100	Ignition transformer	65323257	EBS65323257
0110	Control box with cables	65327403	EBS65327403
0120	Photoresistor	65327404	EBS65327404
0130	Support	65327405	EBS65327405
0140	Plug and cable	65327406	EBS65327406
0150	Fan	65323826	EBS65323826
0160	O-ring	65321066	EBS65321066
0170	Cover air inlet	65327407	EBS65327407
0180	Cables	65320934	EBS65320934
0190	Electrodes	65327306	EBS65327306
0200	Combustion head (16-21)	65327409	EBS65327409
0210	Nozzle holder	65327410	EBS65327410
0220	Diffuser (16-21)	65327412	EBS65327412
0230	Conveyor	65327413	EBS65327413
0240	Rod	65327414	EBS65327414
0250	Flange	65320975	EBS65320975
0260	Gasket	65321089	EBS65321089
0270	Oil pipe	65327415	EBS65327415
0280	Nozzle - 0.50/80°EH	-	M1BS27/46
	Nozzle - 0.60/80°EH	-	M1BS27/31
0290	Ring	65320513	EBS65320513
0300	Set filter and seal	65325684	EBS65325684
0310	Gauge	65327489	EBS 65327489

14 DECLARATION OF CONFORMITY

EC DECLARATION OF CONFORMITY

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

We: Grant Engineering (UK) Limited

Of: Frankland Road
Blagrove Industrial Estate
Swindon
SN5 8YG

Telephone: +44 (0)1380 736920

Fax: +44 (0)1380 736991

Email: info@grantuk.com

Website: www.grantuk.com

Declare that:

Equipment: Domestic oil boilers

Model Name/Number: Grant Vortex Eco Wall Hung External 16-21
Grant Vortex Eco Wall Hung External System 16-21

Note: All Grant system variants are supplied with glandless high efficiency integrated circulators

In accordance with the following Directives:

2006/95/EEC	Conforms with the safety objectives of the Low Voltage Directive and its amending directives.
2004/108/EC	Conforms with the essential protection requirements of the Electromagnetic Compatibility Directive and its amending directives.
92/42/EC	Conforms with the requirements of the Boiler Efficiency Directive.
2010/30/EU	Conforms with the Labeling of Energy related products to EU (no) 811/2013
2009/125/EC	Conforms with the Ecodesign of Energy related products to 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: April 2022

15 HEALTH AND SAFETY INFORMATION

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:

15.1 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.

15.2 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.

15.3 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.

16 END OF LIFE INFORMATION

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	Mild steel (polyester powder coated)
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.



Neil Sawers
Technical Manager

17 PRODUCT FICHE

Product fiche concerning the
COMMISSION DELEGATED REGULATIONS
(EU) No 811/2013 of 18 February 2013
(EU) No 813/2013 of 2 August 2013

Vortex Eco Wall Hung External	Symbols	Unit	16-21	System 16-21
Condensing boiler			Yes	Yes
Low temperature boiler			No	No
B1 boiler			No	No
Combination heater			No	No
Rated heat output	Prated	kW	21	21
Useful heat output				
At rated heat output and high temperature regime	P_4	kW	21	21
At 30% of rated heat output and low temperature regime	P_1	kW	6.3	6.3
Auxiliary electricity consumption				
At full load	elmax	kW	0.150	0.150
At part load	elmin	kW	0.07	0.07
In standby mode	P_{SB}	kW	0	0
Useful efficiency				
Seasonal space heating energy efficiency	η_s	%	90.52	90.52
At rated heat output and high temperature regime	η_4	%	90.8	90.8
At 30% of rated heat output and low temperature regime	η_1	%	96.9	96.9
Other items				
Standby heat loss	P_{stby}	kW	0.236	0.236
Ignition burner power consumption	P_{ign}	kW	0	0
Annual energy consumption	Q_{HE}	kWh	-	-
Sound power level indoors	L_{WA}	dB	52	52
Emissions of nitrogen oxides	NO_x	mg/ kWh	<120	<120
Emission class			2	2
Daily fuel consumption	Q_{fuel}	kWh	-	-
Annual fuel consumption	AFC	GJ	-	-

18 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 installation⁴**, 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** and it is serviced at twelve month 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/support/product-registration

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. Refer to '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.
- Instances where 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 and seals.

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

A suitable oil filter with a minimum 15µ filtration **must** be installed in the oil supply line.

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 person 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 every 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.
- This guarantee will be invalid if the boiler does not have an annual (every twelve month) service and will then be limited to twelve months from the date of installation⁴.
- The shell (heat exchanger) of the oil boiler is 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.
 - Grant Engineering (UK) Limited **strongly recommends** that a Grant Mag-One in-line magnetic filter/s (or equivalent⁵) is fitted in the heating system pipework. This should be installed and regularly serviced in accordance with the filter manufacturer's instructions. We reserve the right to ask for proof of installation – failure to provide this may result in the guarantee becoming invalid.
 - 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.
- 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, Isle of Man 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 and Scilly Isles are **not** considered part of the UK mainland.
3. We recommend that your oil boiler is serviced every twelve months (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 MagOne magnetic filter has a gauss measurement of 12,000.

Version 1.2 – February 2017

APPENDIX A1 WILO-PARA 25-130/7-50/SC-6#GRA CIRCULATING PUMP

A1.1 WILO-PARA 25-130/7-50/SC-6#GRA CIRCULATING PUMP

A1.1.1 PUMP SPECIFICATION

Table A1-1: Pump specification

Make and model	Wilo - PARA 25-130/7- 50/SC-6#GRA
Construction	
Pump housing	Cast iron (with cataphoresis treatment)
Impellar	PP composite with GF 40%
Pump shaft	Stainless Steel
Bearing	Carbon, metal impregnated
Motor Data	
Speed	2580 - 4700rpm
Power consumption @ 1 - 230V	8.2 - 50W
Current @ 1 - 230V	0.07 - 0.43A
Minimum starting voltage	170V
Minimum running voltage	160V
Peak inrush current	>3A
Starting torque	>25N.cm
Electrical	
Mains connection	1ph 230V AC +10%/-15% 50/60Hz
Protection Class	IPx4D
Insulation Class	F
Motor Protection	Integrated
Performance	
Max. delivery head	7.7m @ Q = 0 m³/h
Max. volume flow	3.5 m³ /h
Minimum suction head @ 50/95°C	0.5/4.5m
Energy Efficiency Index (EEI)	≤ 0.20
Settings	ΔP-variable (1-7m head) ΔP-constant (1-7m head) Constant Speed (I, II and III)
Application	
Maximum Static Pressure	PN10
Fluid Temperature range @ maximum ambient temperatures (See Section A1.1.2)	Maximum ambient temperature 58°C: 0 to 100°C Maximum ambient temperature 62°C: 0 to 90°C Maximum ambient temperature 66°C: 0 to 80°C Maximum ambient temperature 71°C: 0 to 70°C
Approved Fluids	Heating Water Water/Glycol - Max 1:1 (above 20% check pumping data)

A1.1.2 THERMAL PROTECTION FUNCTION

The pump is equipped with a thermal self-protection mode.

If the fluid temperature exceeds the maximum value at a specific ambient temperature, e.g. 90°C at an ambient of 62°C, the pump will automatically reduce the power consumption, reducing the speed and performance of the pump.

In this condition the Run/Fault signal LED will be blinking RED. When normal temperature conditions return the pump will automatically revert to normal operation.

If the fluid temperature increases further, the thermal protection function may stop the pump temporarily.

In this condition the Run/Fault signal LED on the pump will be constant RED until normal temperature conditions return.

A1.1.3 PUMP COMPONENTS

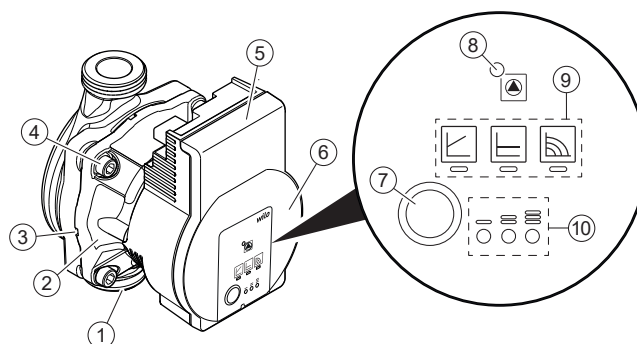


Figure A1-1: Pump components and control panel

1. Pump housing	6. Rating plate
2. Glandless motor	7. Operating button for pump adjustment
3. Condensate drain openings (4 around motor)	8. Run/Fault signal LED
4. Housing screws	9. Display of selected control mode
5. Control module	10. Display of selected pump curve (I, II, III)

A1.1.4 CONTROL PANEL

Indicator LEDs

- Run/Fault signal LED (item 8, Figure A1-1)
 - LED is GREEN when pump is running in normal pump operation.
 - LED lights up red/flashes when there is a fault (refer to Section A1.2).
- Control mode display LEDs (item 9, Figure A1-1)
- Pump curve display LEDs (item 10, Figure A1-1)
- LED combinations are used to indicate when the following functions are in operation:
 - Pump venting (refer to Sections A1.1.5 and A1.1.6 for information on how to activate this function).
 - Manual restart (refer to Sections A1.1.5 and A1.1.2 for information on how to activate this function).
 - Key lock (refer to Sections A1.1.5 and A1.1.6 for information on how to activate this function).

Operating button - Green (item 7, Figure A1-1)

- Press to select:
 - Control mode
 - Pump curve (within the control mode)
- Press and hold to:
 - Activate the pump venting function (press for 3 seconds)
 - Activate manual restart (press for 5 seconds)
 - Lock/unlock control mode and pump curve (press for 8 seconds)

A1.1.5 OPERATING MODES

Wilo-Para 25-130/7-50/SC-6#GRA circulating pumps have three possible operating modes:

- Variable differential pressure ($\Delta p-v$) with three pre-defined pump curves (I, II and III)
- Constant differential pressure ($\Delta p-c$) with three pre-defined pump curves (I, II and III)
- Constant speed with three pump speed settings (I, II and III)

Variable Differential Pressure Mode ($\Delta p-v$)

Recommended for two-pipe heating systems with radiators to reduce the flow noise at thermostatic valves.

In this mode the electronic control reduces the delivery head of the pump to half in the case of decreasing volume flow in the pipework. There are three pre-defined pump curves (I, II and III) to choose from.

Constant Differential Pressure Mode ($\Delta p-c$)

Recommended for underfloor heating systems.

In this mode the electronic control maintains the set delivery head irrespective of the volume flow from the pump. There are three pre-defined pump curves (I, II and III) to choose from.

Constant Speed Mode

Recommended for systems with fixed system resistance requiring a constant volume flow from the pump.

This is the default setting of the pump and as such is recommended by Grant for heating systems.

In this mode the pump speed is not automatically regulated (as with the Variable or Constant differential pressure modes) but operates constantly at one of the three available speeds (I, II or III)

! NOTE !

Factory default setting is Constant speed mode - pump curve III.

Pump Venting Function

Activated by pressing and holding the green operating button for 3 seconds.

Automatically vents the pump. **This function DOES NOT vent air from the heating system.**

Manual Restart (Unblocking) Function

Activated by pressing and holding the green operating button for 5 seconds.

Unblocks the pump when required, e.g. after a long idle period in the summer.

Key Lock Function

Activated by pressing and holding the green operating button for 8 seconds.

Locks/unlocks the current pump settings set by the operating button, preventing unwanted adjustment of the current pump settings.

Factory Setting Function

Activated by pressing and holding the green operating button whilst switching the pump off, and continuing to hold the button down until all lights on the pump control panel are off.

When the pump is switched back on, it will operate at the original factory settings.

Factory default setting is Constant speed mode - pump curve III.

A1.1.6 COMMISSIONING

After installation of the boiler, commission the pump by using the following procedure:

Venting:

- Fill and vent system correctly. (Refer to Section 7)
- If the pump does not vent automatically use the pump vent function.
- Press and hold the green operating button for 3 seconds and release to start.
- The pump venting function will operate for 10 minutes, during which the pump alternated between off and on to vent air from the pump.
- Pump mode and pump curve LED rows flash in turn at 1 second intervals to indicate when this function is operating.
- To cancel, press and hold green operating button for 3 seconds.
- After 10 minutes the pump automatically reverts to the previously set operating mode, e.g. constant speed -curve III.

! NOTE !

After venting the LED display shows the previous pump settings.

Set Control Mode

- Switch on power to the pump.
- The factory setting is Constant speed mode - pump curve III.
- This will be indicated by the control mode LED and pump curve LED.
- Press the green operating button briefly (approx. 1 second) to change the pump setting.
- Continue to repeat pressing the button, using the following sequence, until the required pump mode and pump curve are set:

Table A1-2: Setting pump control mode

	LED display	Control mode	Pump curve
1		Constant speed	II
2		Constant speed	I
3		Variable differential pressure $\Delta p-v$	III
4		Variable differential pressure $\Delta p-v$	II
5		Variable differential pressure $\Delta p-v$	I
6		Constant differential pressure $\Delta p-c$	III
7		Constant differential pressure $\Delta p-c$	II
8		Constant differential pressure $\Delta p-c$	I
9		Constant speed	III

- Pressing the button for the 9th time returns to the basic setting (constant speed / characteristic curve III).

Lock Operating Button

- To activate the key lock function press and hold the green operating button for 8 seconds until the LEDs for the selected pump settings briefly flash, then release.
- LEDs flash constantly at 1 second intervals to show that key lock is activated.
- The pump settings can no longer be changed unless the key lock function is deactivated.
- To deactivate the key lock function press and hold the green operating button for 8 seconds, as above.

! NOTE !

All settings and displays are retained if the power supply is interrupted.

A1.2 CIRCULATING PUMP FAULT DIAGNOSIS - WILO-PARA 25-130/7-50/SC-6#GRA

The Run/Fault signal LED (item 8, Figure A1-1) will indicate if there is a fault with the pump and can assist in diagnosing and rectifying that fault as detailed in Table A1-3 below:

Table A1-3: Pump fault diagnosis

Run/Fault LED condition	Diagnostic	Cause	Remedy
Green	Normal Operation	Pump runs according to the pump settings	N/A
Red	Pump is stopped	Pump rotor blocked	Activate pump manual restart function
	Winding	Winding defective	
Flashes red	Under/Over voltage	Undervoltage: Voltage < 160V OR Overvoltage: Voltage > 253V	Check mains voltage and operating conditions (water and ambient temperature)
	Excessive motor temperature	Overheating: Temperature inside motor too high	
	Short circuit	Motor current too high	
Flashes red/green	Pump stopped (blocked)	Water flowing through pump but no mains voltage to motor	Check mains voltage, water quantity and pressure and ambient conditions.
	Dry running	Air in pump	
	Overload	Sluggish motor with slower speed than normal operation. Pump is operating outside temperature limits.	
LED off	No power to pump control electrics	Pump is not connected to power supply	Check cable connection
		LED is damaged	Check if pump is running
		Electronics are damaged	Replace pump

Manual Restart (Unblocking) Function:

The pump will attempt an automatic restart if a blackage is detected. If this is not successful, the Run/Fault LED will be constant RED.

To activate the manual restart (unblocking) function:

- Press and hold the green operating button for 5 seconds to activate the manual restart function.
- The restart function will run for up to 10 minutes.
- The pump automatically alternates between forward and reverse operation to unblock the pump.
- Pump mode and pump curve LEDs flash in succession in a clockwise direction to indicate when this function is operating.
- To cancel, press and hold the green operating button for 5 seconds.

NOTES

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