

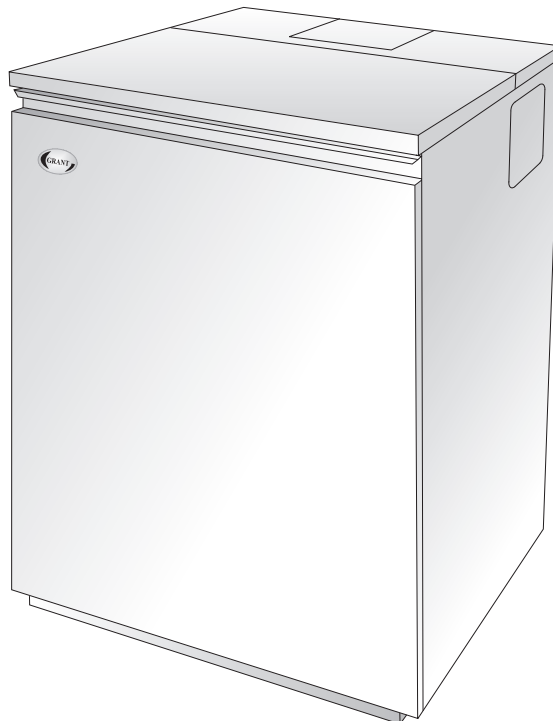
Part No. DOC 56 Rev. 02 August 2005

**USER, INSTALLATION
and
SERVICING INSTRUCTIONS**

**Combi 70 V3, Combi 90 V3
Combi Max
Vortex Combi 26 and Vortex Combi 36**

**For Combi 90 V3 and Combi Max Outdoor Modules installation
and wiring please refer to the separate supplement**

For use with Kerosene or Gas Oil (Vortex Combi Kerosene only)



Combi 90 V3

After installing the boiler leave these instructions with the User

This appliance is deemed a controlled service and specific regional statutory requirements
may be applicable



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SERVICE LOG

It is recommended that the boiler should be regularly serviced, at least once a year, and the details entered in the Boiler Handbook by the Service Engineer.

COMMISSIONING REPORT

Date:

Commissioning engineer: Tel. No:

Boiler model/output: Btu/h Fuel type: Kerosene or Gas oil

Nozzle size: Pump pressure: Air setting:

Flue gas % CO₂: Net flue gas temp: Smoke No:



1.1 About your Combi V3 or Combi Max boiler

Your Grant Combi boiler is fully automatic when the Boiler On/Off switch is set to ON, and will provide domestic hot water at mains pressure on demand and central heating when the boiler and heating system controls call for it.

Your boiler may be fitted with either an internal electronic 7-day timer or mechanical 24-hour timer. Alternatively, your installer may have fitted a separate timer, in a convenient position remote from the boiler.

Whichever type of timer is connected to your boiler, it will allow you to set the operating times of the central heating. Domestic hot water is available continuously, provided the boiler is switched on, irrespective of the settings on the timer.

1.2 Boiler controls (see Fig. A)

To access the controls, pull off the front door from the boiler.

1 Heating switch - When set to TIMED the boiler will only provide central heating during the 'on' periods set on the timer. When set to the HOT WATER ONLY position the boiler will not provide central heating. When set to the CONSTANT position the boiler provides central heating continuously, overriding all of the timer settings.

2 Boiler On/Off - This switches the boiler on and off.

Note: The timer (if fitted) will still operate with this switch set to OFF, providing the electricity supply to the boiler is still switched on, but the boiler will not operate to provide domestic hot water.

3 Boiler thermostat - This control allows adjustment of the temperature of the water leaving the boiler to heat either the radiators or the hot water, via the hot water heat exchanger.

The boiler thermostat has an operating range of 75°C to 85°C. **For optimum hot water operation, ensure this is set to maximum.**

1.3 Useful tips

To ensure that the hot water performance is not reduced first thing in the morning, or in the evening if the heating is off through the day, set the heating timer to switch the heating on *at least 30 minutes* before hot water will normally be required in the morning (or evening).

When setting the times for the 'on' periods it is useful to remember that it might take up to an hour for the house to become warm, especially in colder weather. Also the effect of the central heating will remain for a time when the central heating is turned off.

Do not forget that if you require central heating during an 'off' period, simply set the Heating switch to CONSTANT, remember the switch must be reset to TIMED at a later time for the timer to return to your pre-set periods.

1.4 About your fuel

The boiler will operate on either Class C2 Kerosene or Class D Gas Oil to BS 2869:1998. Your Installer will have informed you of the type of fuel your boiler has been set to use and he will have marked this on the boiler data label. You should always quote the type of fuel you require when ordering from your supplier.

Note: Low level balanced flue installations (flue terminal through the wall) must only be used with Kerosene, unless the flue terminal is higher than 2.0 m above outside ground level.

Do not wait until the fuel runs out before you order some more. Sludge in the bottom of the tank may be drawn into the fuel lines. If it is possible, switch off the boiler when the new supply is delivered and leave the fuel to settle for an hour before restarting the boiler.



2 - VORTEX COMBI USER INSTRUCTIONS

2.1 About your Vortex Combi boiler

Your Vortex Combi boiler is fully automatic once switched on, and will provide domestic hot water at mains pressure on demand and central heating when the boiler and heating system controls call for it. The boiler On/Off switch incorporates a 'mains on' neon, see Fig. B, which lights when the boiler is switched on, but does not necessarily indicate the burner is firing.

Your boiler may be fitted with either an internal electronic 7-day timer or mechanical 24-hour timer. Alternatively, your installer may have fitted a separate timer, in a convenient position remote from the boiler.

Whichever type of timer is connected to your boiler, it will allow you to set the operating times of the central heating. Domestic hot water is available continuously, provided the boiler is switched on, irrespective of the settings on the timer.

2.2 Boiler controls (see Fig. B)

To access the controls, pull off the front door from the boiler.

- 1 Store switch** - Allows the primary store to be manually switched off if hot water is not required. With the switch set to OFF, the burner will not fire to maintain the water temperature in the store and the hot water (store) pump will not operate.

IMPORTANT: The boiler will **not** produce hot water when the Store switch is set to OFF.

- 2 Heating switch** - When set to TIMED, the boiler will only provide central heating during the 'on' periods set on the timer. When set to OFF, the boiler will not provide central heating. When set to CONSTANT, the boiler provides central heating continuously, overriding all of the timer settings.

Note: Provided the Store switch is set to ON, the boiler will provide hot water on demand irrespective of the setting on the Heating switch and will override the heating as required to maintain the temperature of the store.

- 3 Boiler On/Off** - This switches the boiler on and off.
Note: The internal timer (if fitted) will still operate with this switch set to OFF, provided that the electricity supply to the boiler is still switched on, but the boiler will not operate to provide domestic hot water.
- 4 Boiler heating thermostat** - Controls the temperature of the water leaving the boiler to the central heating system. Operation of this control does not affect the temperature of the hot water flowing to the taps.

2.3 About your fuel

Grant Vortex Combi boilers only operate on Class C2 Kerosene to BS 2869:1998.

You should always quote the type of fuel you require when ordering from your supplier.

Do not wait until the fuel runs out before you order some more. Sludge in the bottom of the tank may be drawn into the fuel lines. If it is possible, switch off the boiler when the new supply is delivered and leave the fuel to settle for an hour before restarting the boiler.

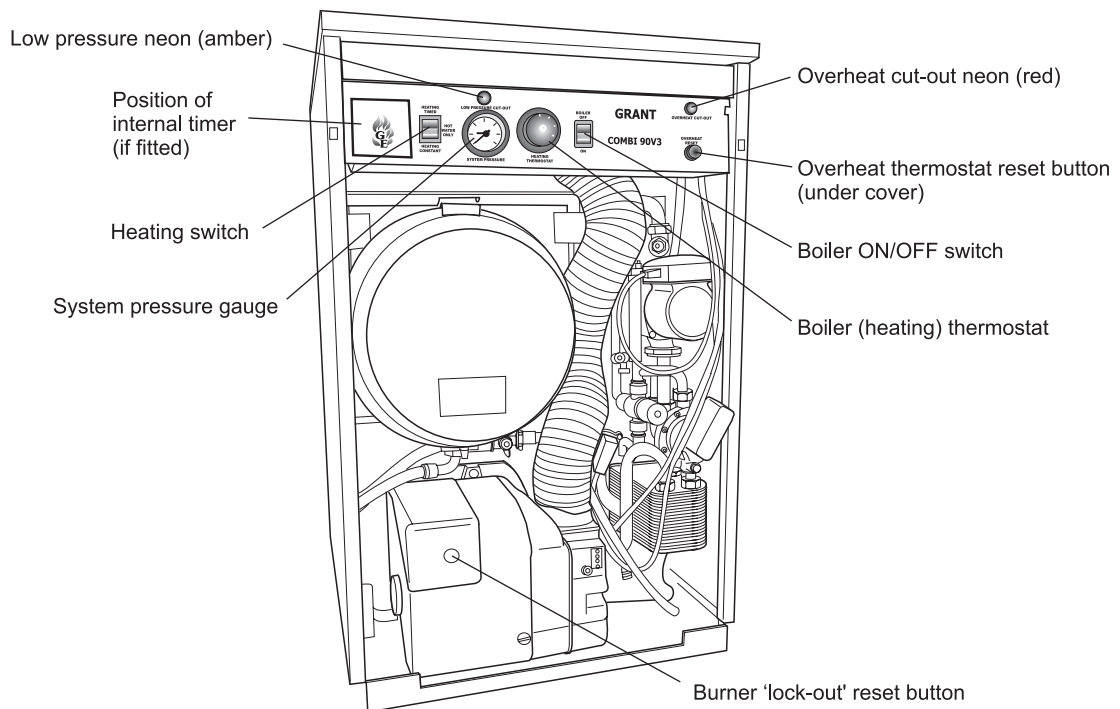


Fig. A - Combi V3 and Combi Max boiler Controls

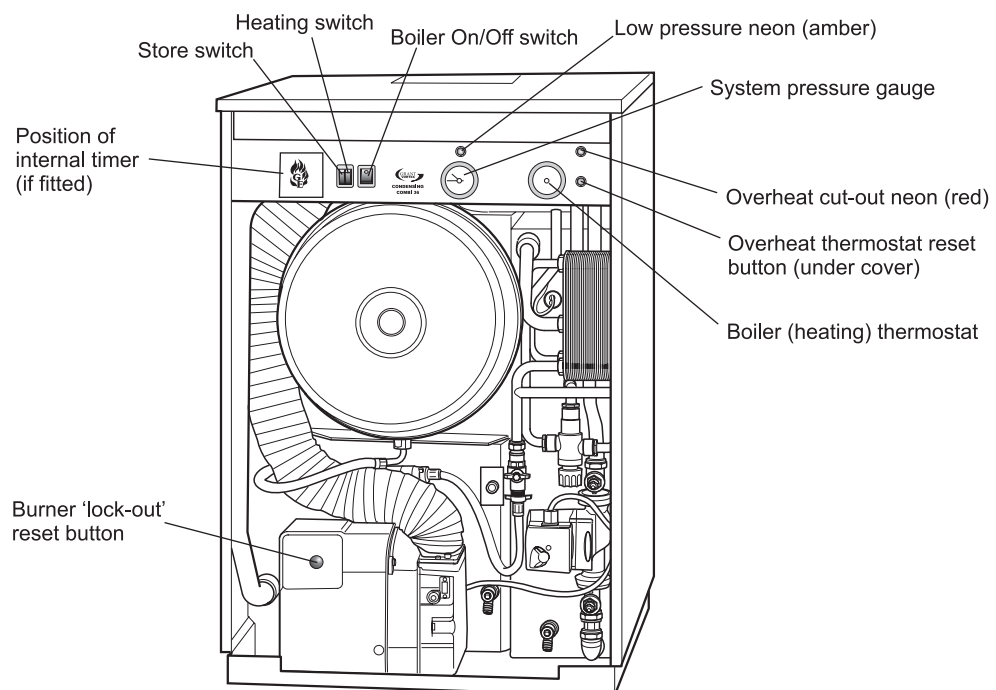


Fig. B - Boiler controls (Vortex Combi 36 shown)



3.1 Lighting your boiler (see Fig. A or B)

- 1 **Ensure that** - There is sufficient fuel in the supply tank and all fuel supply valves are open, the water supply is on, the electricity supply to the boiler is off, the Boiler On/Off switch is set to OFF, the Heating switch is set to TIMED, the black pointer on the pressure gauge is not below the red pointer, the room thermostat (if fitted) is at the desired setting and the timer is correctly set.
- 2 Switch on the electricity supply to the boiler.
- 3 Set the On/Off switch to ON.
- 4 The boiler will light automatically to heat the water stored in the boiler.
If the timer is set to an 'on' period the boiler will continue to run to provide central heating. If a hot tap is opened the boiler will supply hot water.

3.2 Turning off your boiler (see Fig. A or B)

For short periods - Set the On/Off switch to OFF. To restart, simply set the switch to ON.

For long periods: Set the On/Off switch to OFF and switch off the electricity supply to the boiler. If required, the fuel supply valve may be closed and the water and electricity supplies turned off at the mains. To restart, refer to the full lighting instructions above.

3.3 Points to check if burner fails to light

- 1 Check that the boiler On/Off switch is set to ON.
- 2 Check that the timer is working and is in an 'on' period.
- 3 Check that all thermostats are set to the desired setting and are calling for heat.
- 4 Check if the burner 'Lock-out' reset button is lit. If it is, press it to start the burner. If the burner fails to light and goes to 'Lock-out' again, check that you have sufficient fuel in the storage tank and that the fuel supply valve is open.
- 5 Ensure that a fuse has not blown or that the electricity supply has not failed.
- 6 Check to see if the overheat thermostat has operated (see note 4 in Section 3.6).
- 7 Check that the black pointer on the pressure gauge is not below the red pointer.
- 8 If the heating system water pressure falls below 0.2 bar the boiler low pressure cut-out switch will activate and an amber neon on the control panel (see Fig. A or B) will light. The system must be recharged to between 0.5 and 1 bar. If the heating system loses pressure on a regular basis then contact your Installer to investigate the cause.

If the burner still fails to light after carrying out these checks then a fault exists. Switch off the electricity supply to the boiler and contact your Service engineer.

3.4 Domestic hot water system

The boiler will supply domestic hot water whenever a hot tap is opened, providing the Boiler On/Off switch is set to ON.

Note: The Vortex Combi Store switch must also be set to 'ON' for hot water to be supplied.

The flow of water from the taps (hot or cold) depends upon the mains water pressure, and in some homes it may not be possible to use more than one tap at the same time.

3.5 Sealed central heating system

The boiler operates on a sealed central heating system which will have been pressurised by your Installer. He will have set the red pointer on the pressure gauge (see Fig. A or B), to indicate the system pressure (when cold) usually between 0.5 and 1.0 bar. **Do not** adjust this pointer. The black pointer indicates the actual system pressure which will increase slightly when the boiler is operating. If the black pointer falls below the red pointer (when the boiler is switched off and cold), you should contact your Service Engineer to re-pressurise the system. If the system requires frequent re-pressurising, ask your Service Engineer to check the heating system for leaks.

If the heating system water pressure falls below 0.2 bar the boiler low pressure cut-out switch will activate and an amber neon on the control panel (see Fig. A or B) will light. The system must be recharged to between 0.5 and 1 bar. If the heating system loses pressure on a regular basis then contact your Installer to investigate the cause.

The boiler is fitted with an automatic air vent which removes air trapped in the boiler. Any air trapped in the radiators needs removing by venting the radiators using the vent screw at the top of the radiators. Only vent a radiator if the top is cool and the bottom is hot. Excessive venting will reduce the system pressure, so only vent when necessary and check the system pressure as mentioned above.

Note: Your sealed system may incorporate a 'Top-Up' vessel, advice on how to use it should be obtained from your Installer.

The boiler is fitted with a safety valve to release excess pressure from the system. If water or steam is emitted from the end of the safety valve discharge pipe, switch off the boiler and contact your Installer or Service engineer.



The expansion vessel air charge must be checked annually. Failure to maintain an adequate air charge in the vessel may invalidate the warranty.

To re-pressurise the system by adding water:

- 1 Only add water to the system when it is cold and the boiler is off. **Do not overfill.**
- 2 Ensure the flexible filling loop is connected and that the shut off valve connecting it to the boiler is open and the double check valve at the front 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.
- 3 Gradually open the double check valve on the front of the filling loop until water is heard to flow.
- 4 Vent each radiator in turn, starting with the lowest one in the system, to remove air.
- 7 Continue to fill the system until the pressure gauge indicates the required pressure between 0.5 and 1.0 bar. Close the fill point valve.
- 9 Close the valves either side of the filling loop and disconnect the loop.

The temperature of the water leaving the boiler to the radiators can be increased by turning the boiler (heating) thermostat (see Fig. A or B) clockwise.

With the Heating switch set to TIMED, the boiler will provide central heating whenever the timer is in an 'on' period and the room thermostat (if fitted) is calling for heat. For summer time operation, when central heating is not required, set the Heating switch (see Fig. A) to HOT WATER ONLY, or OFF for Vortex Combi (see Fig. B).

3.6 General notes and care of your system

- 1 **Boiler controls** - Refer to Section 2.2 or 3.2.
- 2 **Pressure switch** - If the heating system water pressure falls below 0.2 bar the boiler low pressure cut-out switch will activate and an amber light will illuminate. The system must be recharged to between 0.5 and 1 bar. If the heating system loses pressure on a regular basis then contact your Installer to investigate the cause.
- 3 **Burner Lock-out reset button** - If there is a burner malfunction, a built-in safety circuit switches the burner off and the Lock-out reset button will light. Usually such malfunctions are short lived and pressing the reset button will restore normal operation. If the burner continually goes to 'Lock-out' a fault exists **or** the fuel supply is low. If you have sufficient fuel, you will need to call your Service engineer.
- 4 **Overheat thermostat** - Your boiler is fitted with a safety overheat thermostat which will automatically switch off the boiler in the case of a control malfunction causing overheating. A red neon (see Fig. A or B) will light indicating the thermostat has operated.

If your boiler goes off and you try to light it but nothing happens and the 'Lock-out' reset button on the burner is not lit, the overheat thermostat has probably operated. The boiler will not light until the thermostat is reset. To reset, unscrew the small plastic cap (see Fig. A or B), press the button then replace the cap. **Note:** You may have to wait for the boiler to cool down before the button will reset. If this condition continually repeats, contact your Service engineer.

- 5 **Ventilation** - Always ensure that the boiler has adequate ventilation. Any ventilation openings provided by the Installer **must not** be obstructed. Periodically check that they are clear. **Do not** attempt to 'box in' the boiler or build a compartment around it before consulting your Installer. **Do not** place any combustible material around or on the boiler or flue pipe.
- 6 **Flue terminal** - The flue terminal on the outside wall **must not** be obstructed or damaged. In severe conditions check that the terminal does not become blocked by snow.
- 7 **Frost protection** - Your Installer may have fitted a frost thermostat. If not, and you are likely to be away for a short time, leave the boiler on with the boiler thermostat set at a low setting. For longer periods the boiler and system should be drained. Contact your Service engineer for draining and filling the system.
- 8 **Cleaning and servicing** - Lightly wipe over the case with a damp cloth and a little detergent. **Do not** use abrasive pads or cleaners. You should have your boiler serviced at least once a year to ensure safe and efficient operation. Contact your Service engineer for further details.
- 9 **Failure of electricity supply** - If the electricity supply fails, the boiler will not operate. It should relight automatically when the supply is restored. **Note:** The time on the internal 7-day or 24-hour timer may need to be reset after a power failure.

3.7 Electricity supply

The boiler requires a 230/240 V ~ 50 Hz supply. It must be protected by a 5 Amp fuse.

Warning: This appliance must be earthed.

3.8 Important

The section of any worktop (if fitted) above the boiler must be removable to provide access for servicing for the Combi 70 V3 and Vortex Combi 36.

The Combi 90 V3, Combi Max and Vortex Combi 26 boilers can be serviced from the front, but it is preferable for any worktop above the boiler to be removable to provide the best access for servicing.



4 - BOILER TECHNICAL INFORMATION

4.1 Boiler technical data - Combi V3 and Combi Max boilers

Model		Combi 70 V3	Combi 90 V3	Combi Max
Boiler water content	litre	80	40	40
	gal	17.6	8.8	8.8
* Weight (dry)	kg	158	158	159
	lb	348	348	350
Max. heat input (Kerosene)	kW	22.0	27.6	36.8
	Btu/h	75 000	94 200	125 500
Connections:	Heating flow and return	22 mm copper pipe		
	Cold water mains inlet	15 mm copper pipe		
	Domestic hot water outlet	15 mm copper pipe **		
	Pressure relief valve discharge	15 mm copper pipe		
Flue size (conventional)		100 mm (4 in) diameter		
Waterside resistance Flow/Return temp. diff. of 10°C		26.5 mbar		
Waterside resistance Flow/Return temp. diff. of 20°C		9.5 mbar		
Boiler thermostat range		75 to 85°C		
Limit (safety) thermostat switch off temp.		111°C ± 3°C		
Maximum heating system pressure (cold)		1.0 bar		
Minimum heating system pressure (cold)		0.5 bar		
Pressure relief valve		2.5 bar		
Expansion vessel		12 litres (pre-charged at 1.0 bar)		
Maximum heating system volume ***		128 litres		
Maximum operating pressure		2.5 bar		
Minimum domestic hot water flow rate		3.0 litres/min (0.66 gal/min)		
Maximum domestic hot water temperature		65°C (factory set)		
Maximum mains water inlet pressure		8.0 bar		
Minimum recommended mains water inlet pressure		2.5 bar		
Max. hearth temperature		Less than 50°C		
Electricity supply		230/240 V ~ 50 Hz Fused at 5 Amp		
Motor power		90 W max.		
Starting current		2.60 Amp		
Running current		0.85 Amp		
Oil connection		¼" BSP Male (on end of flexible fuel line)		
Conventional flue		Minimum flue draught - 8.7 N/m ² (0.035 in wg)		
		Maximum flue draught - 37 N/m ² (0.15 in wg)		

* Weight includes burner but excludes flue

** 22 mm hot water pipe can be connected to the Combi Max if required.

*** Based on expansion vessel charge and initial cold system pressure of 0.5 bar.



4.2 Boiler technical data - Vortex Combi boilers

Model		Vortex Combi 26	Vortex Combi 36
Boiler water content (including 32.5 litre primary store)	litre	48.5	53.5
	gal	10.7	11.8
* Weight (dry)	kg	188	218
	lb	415	481
Max. heat input (Kerosene)	kW	26	36
	Btu/h	88 700	123 000
Connections:	Heating flow and return	22 mm copper pipe	28 mm copper pipe
	Cold water mains inlet	15 mm copper pipe	22 mm copper pipe
	Domestic hot water outlet	15 mm copper pipe	22 mm copper pipe
	Pressure relief valve discharge	15 mm copper pipe	
	Condensate connection	22 mm plastic pipe	
Flue size (conventional)		100 mm (4 in) diameter	
Waterside resistance Flow/Return temp. diff. of 10°C		28.5 mbar	26.0 mbar
Waterside resistance Flow/Return temp. diff. of 20°C		10.0 mbar	9.5 mbar
Boiler thermostat range		65 to 80°C	
Limit (safety) thermostat switch off temp.		111°C +0 -3°C	
Maximum heating system pressure (cold)		1.0 bar	
Minimum heating system pressure (cold)		0.5 bar	
Pressure relief valve		2.5 bar	
Expansion vessel (pre-charged at 1 bar)		12 litres	14 litres
Maximum heating system volume**		128 litres	148 litres
Maximum operating pressure		2.5 bar	
Minimum domestic hot water flow rate		3.0 litres/min (0.66 gal/min)	
Maximum domestic hot water temperature		65°C (factory set)	
Maximum mains water inlet pressure		8.0 bar	
Minimum recommended mains water inlet pressure		2.5 bar	
Max. hearth temperature		Less than 50°C	
Electricity supply		230/240 V ~ 50 Hz Fused at 5 Amp	
Motor power		90 W max.	
Starting current		2.60 Amp	
Running current		0.85 Amp	
Oil connection		¼" BSP Male (on end of flexible fuel line)	
Conventional flue		Minimum flue draught - 8.7 N/m ² (0.035 in wg)	
		Maximum flue draught - 37 N/m ² (0.15 in wg)	

* Weight includes burner but excludes flue

** Based on expansion vessel charge and initial cold system pressure of 0.5 bar



4 - BOILER TECHNICAL INFORMATION

4.3 Combi V3 and Combi Max oil boilers using class C2 kerosene

Note: All boilers are despatched for use with kerosene.

Combi 70 V3 and Combi 90 V3 (Riello RDB1 burner)

Heat Output (kW) (Btu/h)		Net Heat Input (kW) (Btu/h)		Net eff. ** (%)	Head type	Nozzle size	Oil press. (bar)	Smoke No.	Fuel flow rate (kg/h)	Net flue gas temp. (°C)	Flue gas mass flow rate (kg/h)	CO ₂ (%)
20.5	70 000	22.5	76 900	93.0	LD2SX short	0.60/60°EH	8.5	0 - 1	1.87	211	34.8	11.5
26.4	90 000	27.6	94 200	95.8	LD3	0.75/60°EH	9.5	0 - 1	2.40	180	38.7	12.0

Combi Max (Riello RDB2.2 burner)

Heat Output (kW) (Btu/h)		Net Heat Input (kW) (Btu/h)		Net eff. ** (%)	Head type	Nozzle size	Oil press. (bar)	Smoke No.	Fuel flow rate (kg/h)	Net flue gas temp. (°C)	Flue gas mass flow rate (kg/h)	CO ₂ (%)
33.3	113 600	36.8	125 500	91.5	T5	1.00/80°EH	9.0	0 - 1	3.10	190	51.5	12.0

4.4 Combi V3 and Combi Max oil boilers using class D gas oil

Combi 70 V3 and Combi 90 V3 (Riello RDB1 burner)

Heat Output (kW) (Btu/h)		Net Heat Input (kW) (Btu/h)		Net eff. ** (%)	Head type	Nozzle size	Oil press. (bar)	Smoke No.	Fuel flow rate (kg/h)	Net flue gas temp. (°C)	Flue gas mass flow rate (kg/h)	CO ₂ (%)
20.5	70 000	22.5	76 900	92.0	LD2SX short	0.40/60°S	12.0	0 - 1	1.60	200	34.8	11.5
26.4	90 000	27.9	95 250	94.6	LD3	0.60/60°S	12.0	0 - 1	1.97	200	38.7	12.0

Combi Max (Riello RDB2.2 burner)

Heat Output (kW) (Btu/h)		Net Heat Input (kW) (Btu/h)		Net eff. ** (%)	Head type	Nozzle size	Oil press. (bar)	Smoke No.	Fuel flow rate (kg/h)	Net flue gas temp. (°C)	Flue gas mass flow rate (kg/h)	CO ₂ (%)
32.9	112 463	36.0	122 910	91.5	T5	0.75/80°S	11.0	0 - 1	3.02	200	51.5	12.0

Notes:

- 1 The data given above is approximate only. The Kerosene table 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 a low level balanced flue, unless the flue terminal is higher than 2.0 m above outside ground level.
- 4 The installer **must** amend the boiler data label if the type of fuel and nozzle used are changed.
- 5 Net flue gas temperatures given are $\pm 10\%$.
- 6 ** Net thermal efficiency (BSRIA).
- 7 Flue gas temperatures taken at combustion door test point will be approximately 25°C higher for the Combi 90 V3 and Combi Max.
- 8 Flue gas temperature taken at the top of the boiler will be 20°C higher for the Combi 70 V3.

4.5 Approximate air damper settings

Note: Burners are supplied factory set at the outputs shown.

When commissioning, or when the type of fuel is changed, the air damper **must** be adjusted to obtain the correct CO₂ level and the Installer **must** amend the data label.



4.6 Vortex Combi oil boilers using Class C2 kerosene

Note: Vortex Combi boilers are only for use with kerosene.

Model	Burner type	Heat Output		Net eff * (%)	Nozzle	Oil press. (bar)	Smoke No.	Burner head	Fuel flow rate (kg/h)	Flue gas temp. (°C)	CO ₂ (%)
		(kW)	(Btu/h)								
26	Riello RDB1	26.0	88 700	101.0	0.75/80°EH	8.0	0 - 1	T2	2.16	75 - 80	12.0
36	Riello RDB2	36.0	123 000	101.5	1.00/80°EH	9.1	0 - 1	T3	3.01	78	12.0

Notes:

- 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 a Grant Vortex Combi boiler.**
- 4 * Net thermal efficiency.
- 5 The net flue gas temperatures given above are $\pm 10\%$.
- 6 When commissioning the air damper **must** be adjusted to obtain the correct CO₂ level.
- 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.

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:

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



4 - BOILER TECHNICAL INFORMATION

4.7 Boiler dimensions - Combi V3 and Combi Max

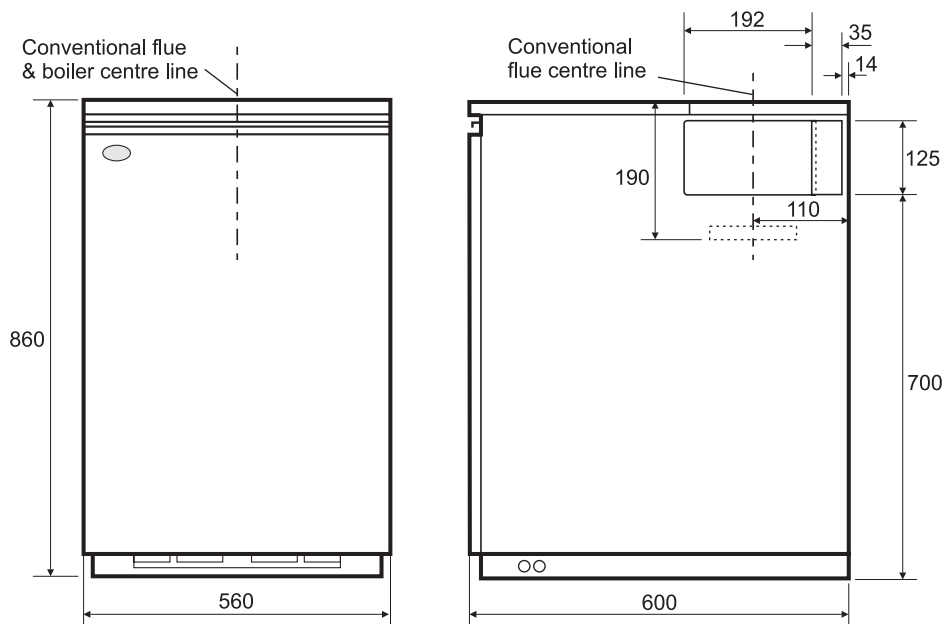


Fig. 1

Note: Water connections may be from the rear, left or right hand side. If using side exit flue, it **must be** on the opposite side to the water connections.

4.8 Water schematic of boiler - Combi V3 and Combi Max

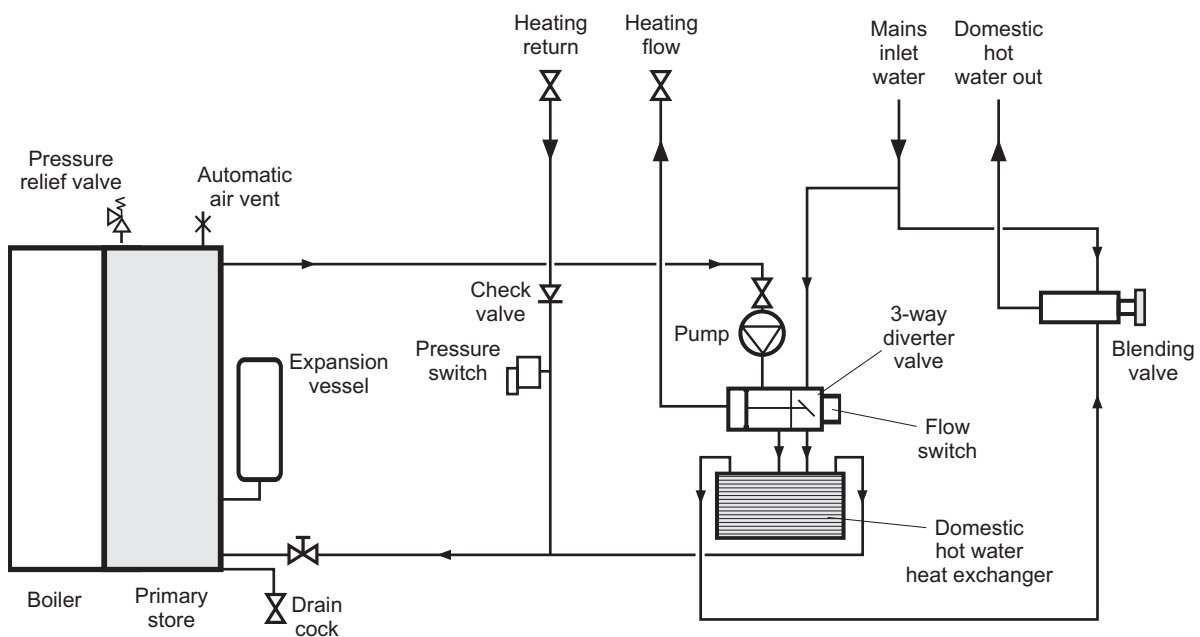


Fig. 2



4.9 Boiler dimensions - Vortex Combi

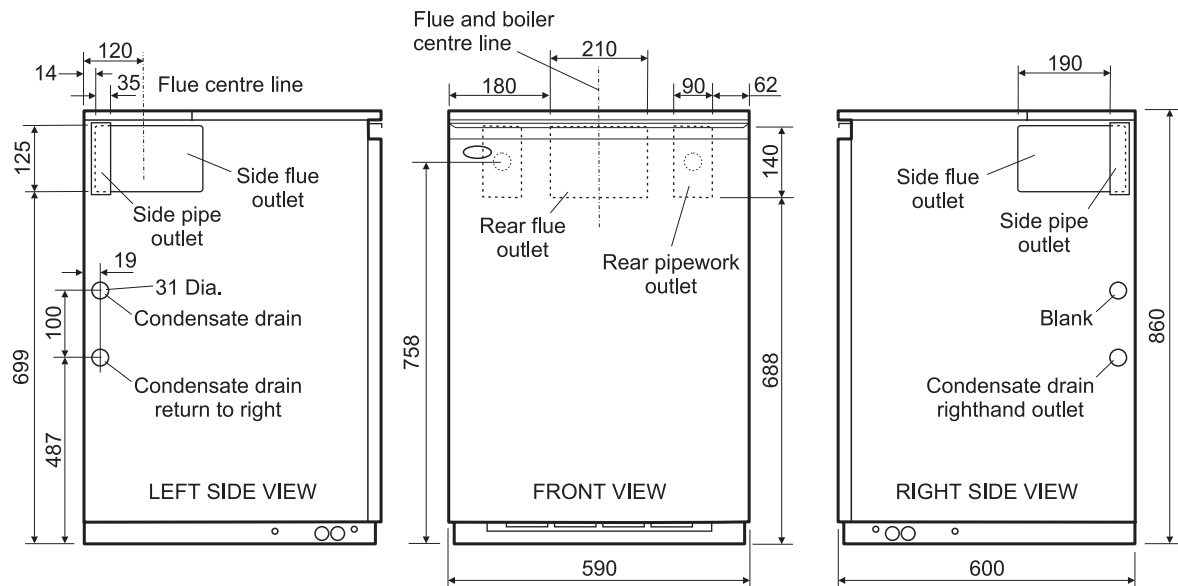


Fig. 3 - Vortex Combi 26 dimensions

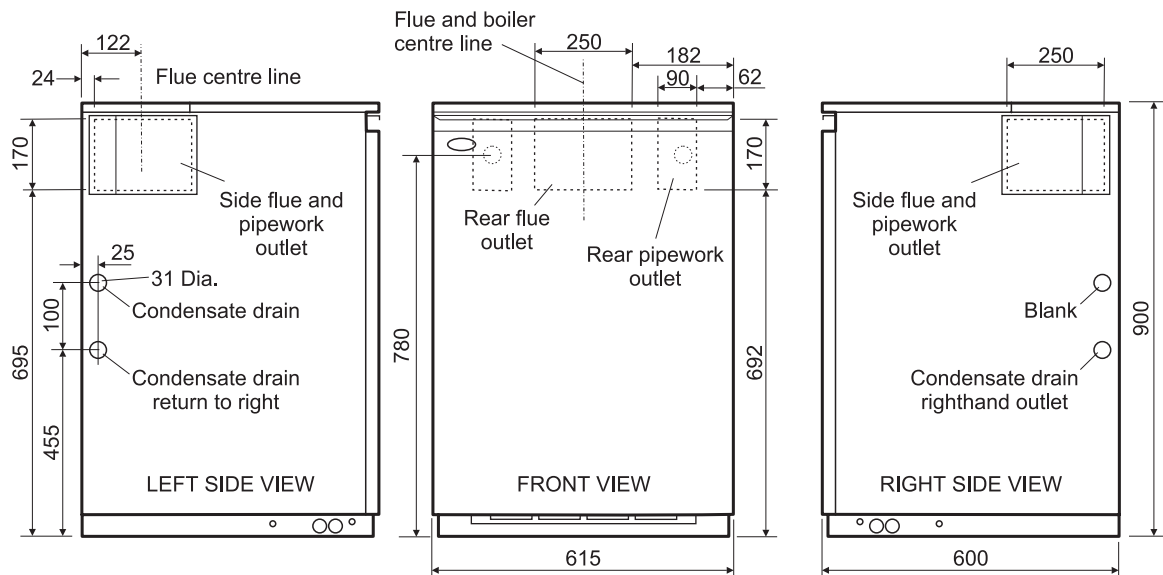


Fig. 3a - Vortex Combi 36 dimensions



4 - BOILER TECHNICAL INFORMATION

4.10 Water schematic of boiler - Vortex Combi

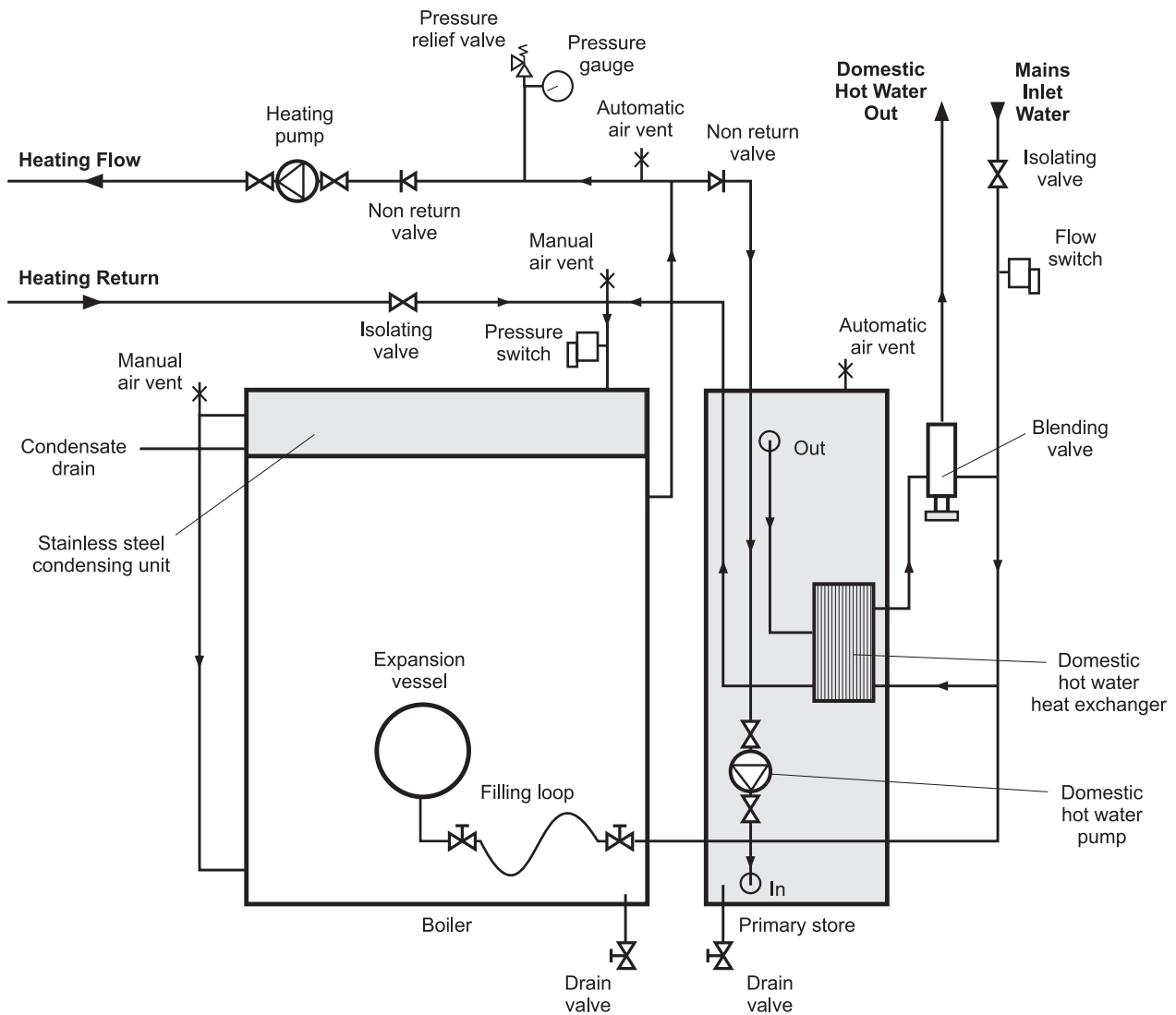


Fig. 4



5.1 Boiler description

The Combi and Vortex Combi boilers are automatic pressure jet oil boilers designed for use with a sealed central heating system and will provide domestic hot water at mains pressure.

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

All boilers can be connected to either a conventional flue system or a balanced flue system, as required.

The Combi V3 and Combi Max boilers are supplied ready to connect to a conventional flue. If the boiler is to be used with a balanced flue, a Balanced Flue Kit is required.

The Vortex Combi boilers are not supplied with a flue adaptor. If a conventional flue is to be used, a Grant conventional flue adaptor (Ref. CFCA1546) must be ordered.

For conventional flue applications, Grant recommends the use of the Grant 'Orange' flue system, specifically designed for the Vortex condensing boiler. Refer to Section 5.8 for further details.

Fitting instructions for the Low level concentric, High level and Vertical balanced flue kits are supplied with the kits.

Where a balanced flue system is required, the following flue kits are available from Grant UK.

Refer to Section 5.8 for further details.

Yellow system Standard low level concentric balanced flue - components available:

Low level concentric balanced flue short
Extensions 225 mm, 450 mm and 675 mm
90° extension elbow
45° extension elbow
45° elbow

Green system Standard external high level/vertical flue starter kit (room sealed) - components available:

External high level/vertical flue starter kit short (room sealed)
Extensions 150 mm, 250 mm, 450 mm, 950 mm and adjustable 195 to 270 mm
45° elbow
High level terminal
Vertical terminal

White system High level concentric balanced flue kit - components available:

Extensions 225 mm, 450 mm, 950 mm and adjustable 275 to 450 mm
45° elbow
Vertical concentric balanced flue kit
Extensions 225 mm, 450 mm, 950 mm and adjustable 275 to 450 mm
45° elbow

The Combi V3 and Combi Max boilers are supplied ready for use with Class C2 kerosene. If required, they can easily be adapted for use with Class D gas oil.

Note: Only Kerosene may be used with a low level balanced flue, unless the flue terminal is higher than 2.0 m above outside ground level.

If the fuel to be used is Gas Oil, it will be necessary to change the burner nozzle. Refer to the Technical Information in Section 4.3. To change the nozzle, remove the burner from the boiler then remove the nozzle as described in Section 10.4. The installer **must** amend the boiler data label accordingly.

The Vortex Combi boilers are only suitable for use with Kerosene.

All burners are ready to connect to a single pipe system with a loose flexible fuel line (600 mm) and $\frac{3}{8}$ " to $\frac{1}{4}$ " BSP male adaptor supplied with the boiler. If required, an additional flexible fuel line (600 mm) and $\frac{3}{8}$ " to $\frac{1}{4}$ " BSP male adaptor are available to purchase from Grant Engineering (UK) Limited, for two-pipe oil supply system, Part No. RBS104.

The temperature of the water leaving the boiler to heat the radiators is User adjustable.

To achieve the optimum hot water performance from the Combi V3 and Combi Max, the boiler thermostat should be set to maximum.

The setting of the boiler thermostat on the Vortex Combi has no effect on the hot water performance.

The control panel is fitted with an ON/OFF switch, boiler thermostat control knob and the manual reset button for the overheat thermostat. An optional plug-in programmer is available which allows the User to set the operating times for central heating and hot water. Alternatively, an external timer, located remotely from the boiler in a convenient position for the user, may be connected to the boiler for this purpose - the Grant TCR kit, Part No. TCRKIT is ideal. Refer to Section 12 - Wiring diagrams.

A programmable electronic room thermostat, Part No. RSKIT is also available to purchase from Grant UK.

Domestic hot water is available at all times, provided the boiler is switched on.



5.2 Regulations to comply with

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

- a Building Regulations for England and Wales, and the Building Standards for Scotland issued by the Department of the Environment and any local Byelaws etc.
- b Model and local Water Undertaking Byelaws.
- c Applicable Control of Pollution Regulations.
- d 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 Information Book 3 (Installation requirements for oil fired boilers and oil storage tanks).

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

- | | |
|-----------|--|
| BS 715 | Metal flue pipes, fittings, terminals and accessories. |
| BS 799:5 | Oil storage tanks. |
| BS 1181 | Clay flue linings and flue terminals. |
| BS 4543:3 | Factory made insulated chimneys for oil fired appliances. |
| BS 4876 | Performance requirements for oil burning appliances. |
| BS 5410:1 | Code of Practice for oil firing appliances. |
| BS 5449 | Forced circulation hot water systems. |
| BS 7593 | Code of Practice for treatment of water in heating systems. |
| BS 7671 | Requirements for electrical installations, IEE Wiring Regulations. |

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

IMPORTANT

Before starting any work on the boiler, or fuel supply please read the health and safety information given in Section 15 on page 61.

Regional statutory requirements may deem this appliance to be a 'controlled service'. Where this is the case, it is a legal requirement that the appliance is installed and commissioned either under the remit of building control or by a 'Competent person' such as a suitably qualified Oftec registered technician.

5.3 Fuel supply

5.3.1 Fuel storage

The tank should be positioned in accordance with the recommendations given in BS 5410:1:1997, which gives details of filling, maintenance and protection from fire.

A galvanised tank must not be used.

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

Note: Plastic tanks should be adequately and uniformly supported on a smooth level surface, across their entire base area.

5.3.2 Fuel pipes

- 1 Fuel supply pipes should be of copper tubing with an internal diameter of at least 8 mm. Galvanised pipe must not be used.
- 2 Flexible pipes must not be used outside the boiler case.
- 3 A remote sensing fire valve must be installed in the fuel supply line (outside) where it enters the building. Recommendations are given in BS 5410:1:1997.
- 4 A metal bowl type filter with a replaceable micronic filter must be fitted in the fuel supply line. A shut-off valve should be fitted before the filter, to allow the filter to be serviced.
- 5 A flexible fuel line, adaptor and $\frac{1}{4}$ " BSP isolation valve are supplied loose with the boiler for the final connection to the burner. If a two pipe system or Tiger Loop system is used, an additional flexible fuel line (600 mm) and $\frac{3}{8}$ " to $\frac{1}{4}$ " BSP male adaptor are available from Grant Engineering (UK) Limited (Part No. RBS104).



- The flexible fuel lines supplied should be inspected annually when the boiler is serviced and replaced at least every two years.

5.3.3 Single pipe system - (See Fig. 5)

- Where the storage tank outlet is above the burner the single pipe system should be used. The height of the tank above the burner limits the length of pipe run from the tank to the burner.
- As supplied the burner is suitable for a single pipe system.

5.3.4 Two pipe system - (See Fig. 6)

- When the storage tank outlet is below the burner, the two pipe system should be used. The pipe runs should be as shown in Fig. 5. The return pipe should be at the same level in the tank as the supply pipe, both being 75 to 100 mm above the base of the tank. The pipe ends should be a sufficient distance apart so as to prevent any sediment disturbed by the return entering the supply pipe.

- Avoid the bottom of the tank being more than 3 m below the burner.
- A non-return valve should be fitted in the supply pipe together with the filter and fire valve. A non-return valve should be fitted in the return pipe if the top of the tank is above the burner.

4 To be used with a two-pipe system, the burner **must** be fitted with an additional flexible fuel line (a flexible fuel line (600 mm) and $\frac{3}{8}$ " to $\frac{1}{4}$ " BSP male adaptor are available from Grant Engineering (UK) Limited - Part No. RBS104). See Section 5.3.6.

- The pump vacuum should not exceed 0.4 bar. Beyond this limit gas is released from the oil. A vacuum gauge must be fitted to the fuel pump to check the vacuum reading.

For guidance on installation of top outlet fuel tanks and suction oil supply sizing, see OFTEC booklet T1/139. Available at www.oftec.org.uk

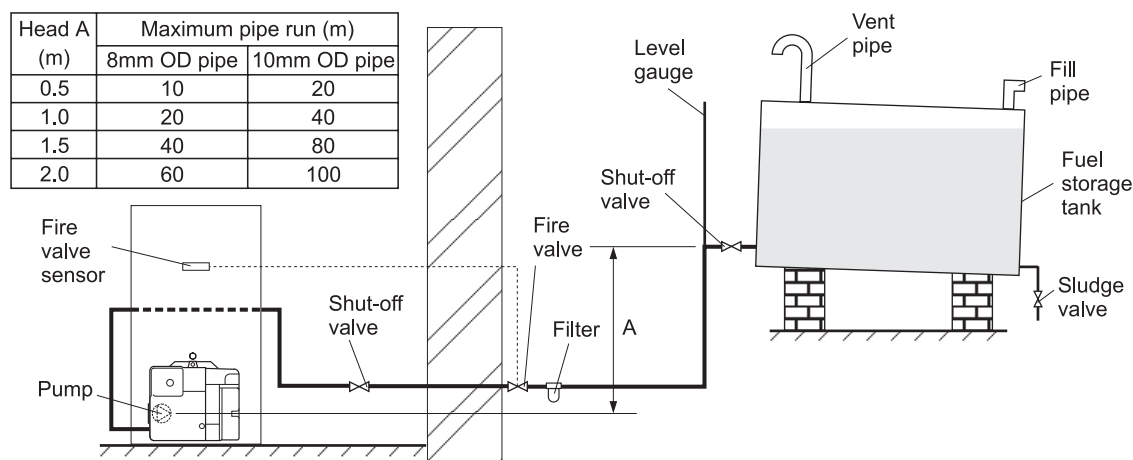


Fig. 5 - Single pipe system

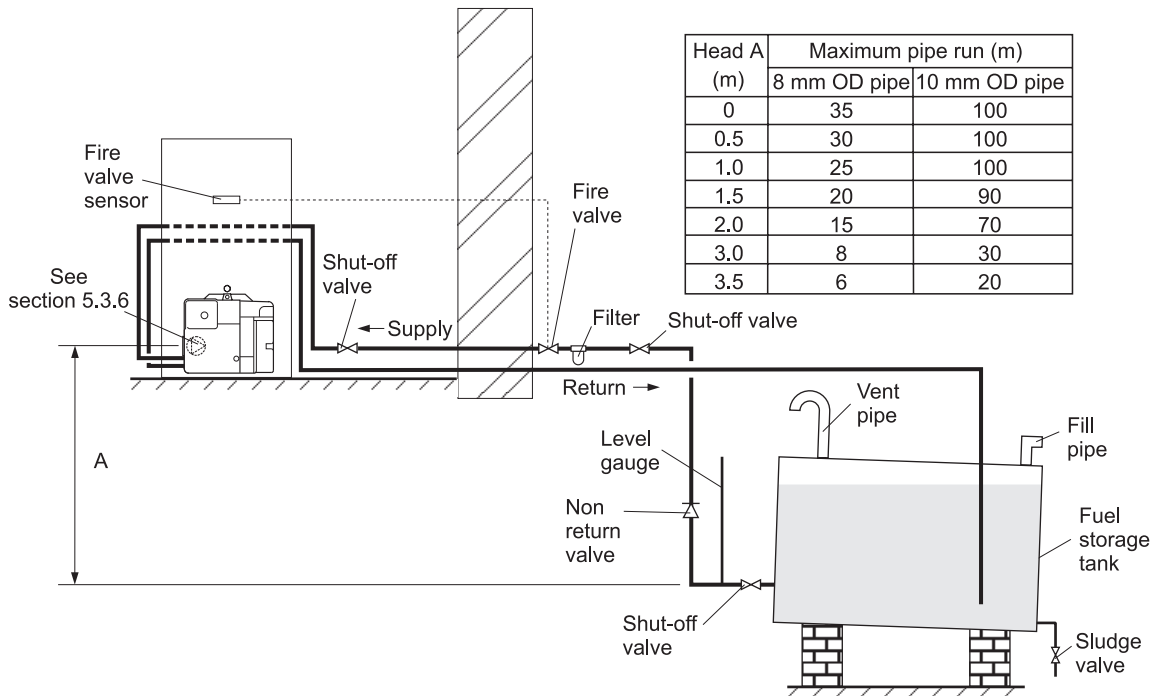


Fig. 6 - Two pipe system

5.3.5 Tiger Loop system - (See Figs. 7 and 8)

- 1 When the storage tank is below the burner, an alternative to a two pipe system can be achieved using the Tiger Loop oil deaerator. This effectively removes the air from the oil supply on a single pipe lift.
- 2 The Tiger Loop is connected close to the boiler as a two pipe system (omitting the non-return valve) as shown in Fig. 7. Refer to the manufacturers instructions supplied with the Tiger Loop. The Tiger Loop **must** be mounted vertically.

Note: To prevent any possibility of fuel fumes entering the building, the Tiger Loop **must** be fitted outside.

- 3 To be used with a Tiger Loop system, the burner **must** be fitted with an additional flexible fuel line (a flexible fuel line (600 mm) and $\frac{3}{8}$ " to $\frac{1}{4}$ " BSP male adaptor are available to purchase from Grant Engineering (UK) Limited - Part No. RBS104). See Section 5.3.6.

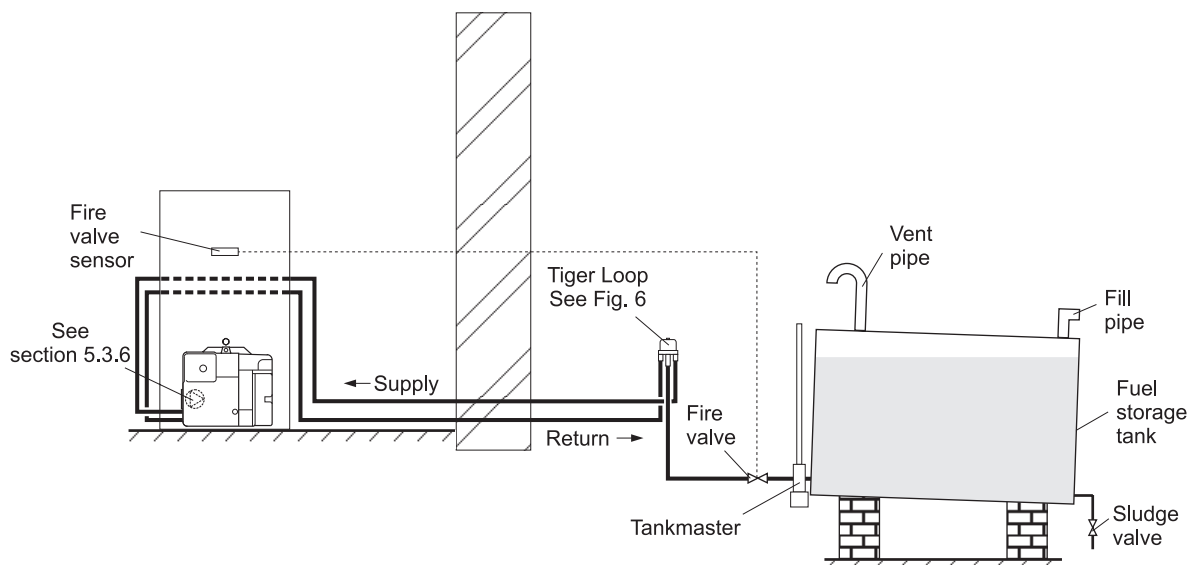


Fig. 7 - Tiger loop system

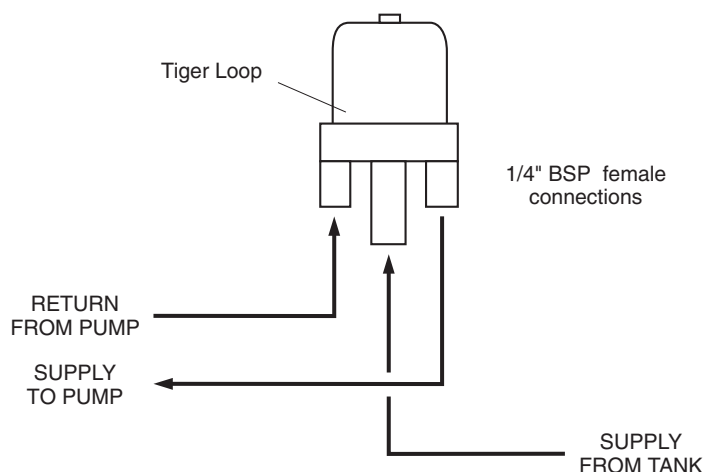


Fig. 8 - Tiger loop

5.3.6 Two pipe oil supplies

See Fig. 9

- 1 The fuel pump is supplied for use with a single pipe fuel supply system. For use on a two pipe system, it is necessary to fit the By-pass screw (see Fig. 9) into the tapping in the return port.
- 2 The By-pass screw is supplied in the boiler accessory pack.
- 3 Remove the plastic burner cover (two screws).
- 4 Remove and discard the blanking plug from the return connection of the pump and fit the By-pass screw using an hexagonal key.
- 5 Connect the return oil flexible fuel line to the pump.
- 6 Connect the $\frac{3}{8}$ " to $\frac{1}{4}$ " BSP adaptor to the flexible fuel line.
- 7 Flexible fuel lines and adaptors are available to purchase from Grant Engineering (UK) Ltd.
- 8 The burner cover may be left off until the boiler is commissioned.

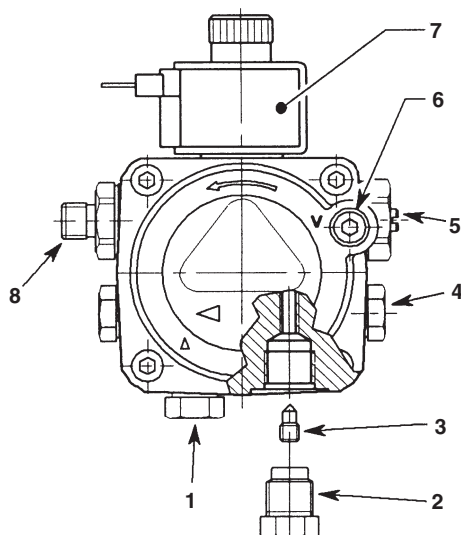


Fig. 9 - RDB pump

- | | |
|-----------------------------|---------------------------|
| 1 Oil inlet connection | 5 Pressure adjuster |
| 2 Return connection | 6 Vacuum gauge connection |
| 3 By-pass screw | 7 Solenoid |
| 4 Pressure gauge connection | 8 Supply to nozzle |



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5.4 Electricity supply

- 1 A 230/240 V ~ 50 Hz mains supply is required.

The boiler must be earthed.

- 2 The supply must be fused at 5 Amp and there must only be one common isolator for the boiler and control system, and it must provide complete electrical isolation.
- 3 A fused double pole switch or a fused three pin plug and shuttered outlet socket should be used for the connection.
- 4 The power supply cable should be at least 0.75 mm² PVC as specified in BS 6500, Table 16.
- 5 All the wiring external to the boiler must be in accordance with the current I.E.E. Wiring Regulations.
- 6 Any room thermostat or frost thermostat used must be suitable for use on mains voltage.
- 7 The boiler requires a permanent mains supply, do not interrupt it with any external time control.
- 8 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 and Resistance to earth.

5.5 Air supply

See Figs. 10 and 11

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

- a For proper combustion of fuel and effective discharge of combustion products to the open air.
- b For the ventilation of any confined space in which the boiler is installed to prevent overheating of the boiler any equipment in and near the boiler.
- c For the satisfactory operation of any draught stabiliser which may be fitted.

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

Further details may be obtained from BS 5410:1:1997.

Notes:

For a boiler fitted in a compartment, which is ventilated as shown, no additional allowance is necessary.

Open flue - Extract fans, where needed, should be in accordance with Section 4.4.7 in BS 5410 Part 1 1997.

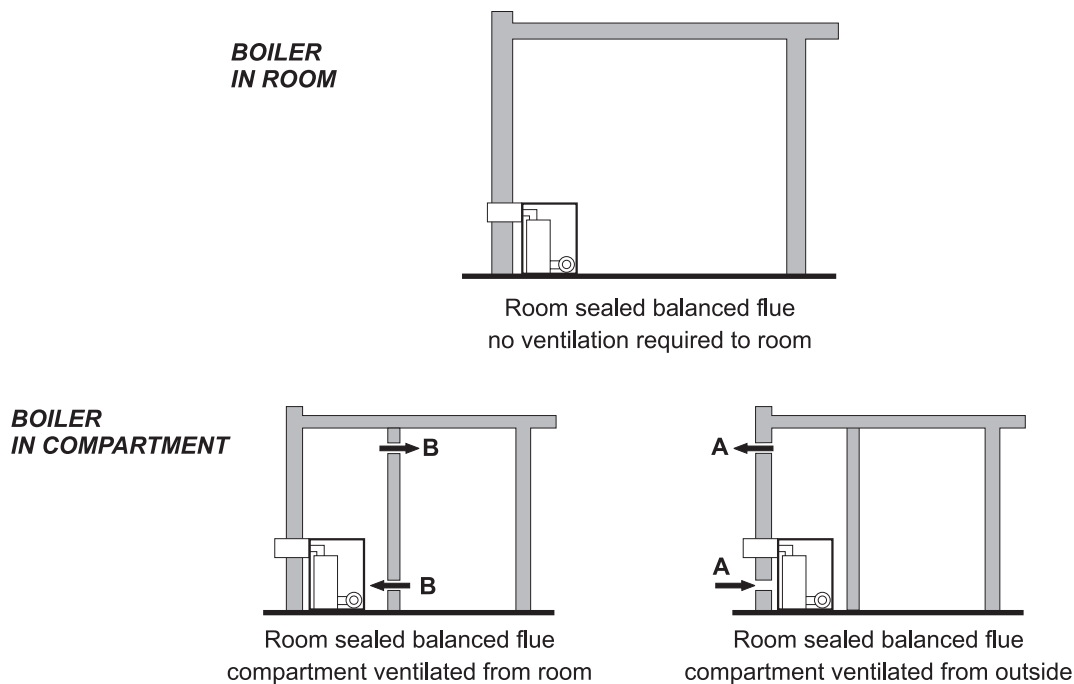


Fig. 10 - Air supply for room sealed balanced flue boilers

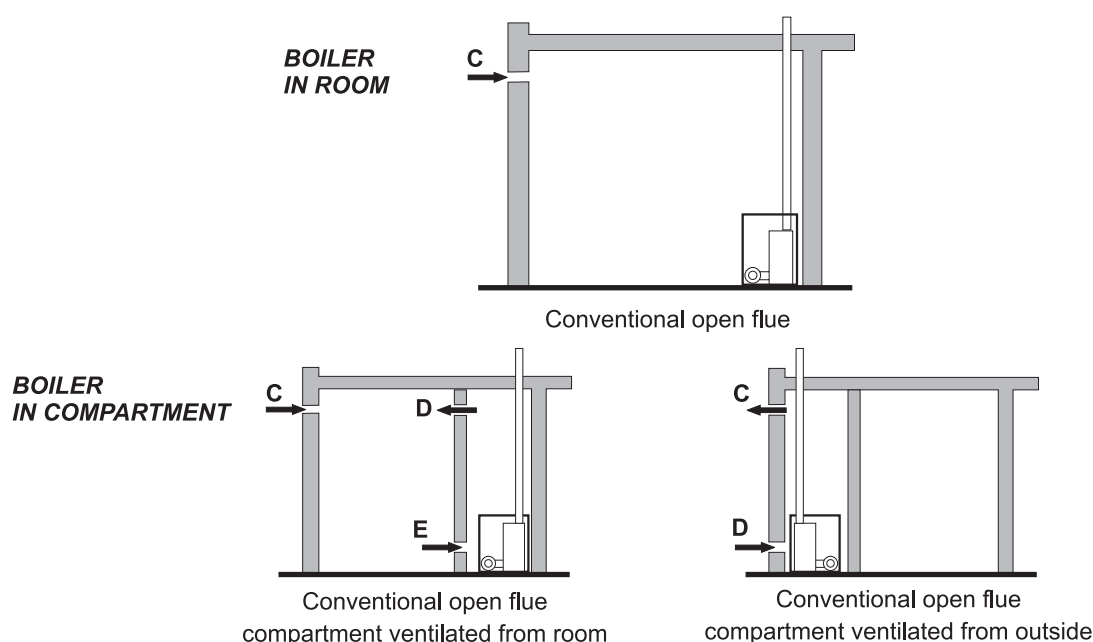


Fig. 11 - Combustion and ventilation air supply for conventional flue boilers

Minimum size of air vents required - see Figs. 10 and 11

	Combi 70 V3	Combi 90 V3	Combi Max	Vortex Combi 26	Vortex Combi 36
Vent A	85 cm ² (13 in ²)	118 cm ² (18 in ²)	156 cm ² (24 in ²)	116 cm ² (18 in ²)	171 cm ² (27 in ²)
Vent B	171 cm ² (26 in ²)	235 cm ² (36 in ²)	311 cm ² (48 in ²)	231 cm ² (36 in ²)	341 cm ² (53 in ²)
Vent C	85 cm ² (13 in ²)	118 cm ² (18 in ²)	156 cm ² (24 in ²)	116 cm ² (18 in ²)	171 cm ² (27 in ²)
Vent D	171 cm ² (26 in ²)	235 cm ² (36 in ²)	311 cm ² (48 in ²)	231 cm ² (36 in ²)	341 cm ² (53 in ²)
Vent E	256 cm ² (40 in ²)	353 cm ² (55 in ²)	467 cm ² (72 in ²)	347 cm ² (54 in ²)	512 cm ² (80 in ²)

5.6 Conventional flue system - Combi V3 and Combi Max

See Figs. 12 and 14

Grant boilers have high operating efficiencies. Care must be taken to ensure the flue system is suitable for the low flue gas temperatures.

- 1 An insulated flue terminating in a down draught free area, i.e. at least 1 m above the point of exit through the roof or preferably above the ridge level, will normally provide the necessary draught of at least 8.7 N/m² (0.035 in wg) as measured close to the boiler connection. If a draught of 37 N/m² (0.15 in wg) or more is measured, then a draught stabiliser should be fitted in the flue.
- 2 The 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.
- 3 If an existing chimney is used, it must be lined with a stainless steel liner for use with fuel oil. The top and bottom of the annular space must be sealed and the void filled with a suitable insulating material to reduce cooling of the flue gases.
- 4 If a rigid flue is used either internally or externally, it must be of the twin wall type with a stainless steel inner skin suitably insulated and weather proofed.
- 5 **The internal flue diameter for all models must be 100 mm (4 in).**
- 6 The flue must be run upwards following as near a vertical route as possible. Horizontal runs must be avoided and no bends should have an angle of more than 45° from the vertical. There should be at least 600 mm of vertical flue above the boiler before the first bend.



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- 7 A sealed cleaning door must be provided near the base of the flue.
- 8 The exposed flue pipe between the boiler and the chimney must not be of an asbestos material and aluminium must not be used in any part of the flue.
- 9 If the draught conditions are satisfactory, the flue should terminate with a standard cowl. Where the flue cannot terminate above the ridge of the roof, use an 'OH' or similar type cowl where downdraughting occurs.
Ridge vent terminals **must not** be used.
- 10 Refer to the locally applicable Building Regulations, BS 5410:1 and OFTEC Installation Requirements (Books 2 and 3) for further guidance on conventional flue systems.
- 11 To allow for flue gas analysis and combustion testing, a test point is provided in the boiler cleaning door - Combi 90 V3 and Combi Max - and on top of the Combi 70 V3 boiler.

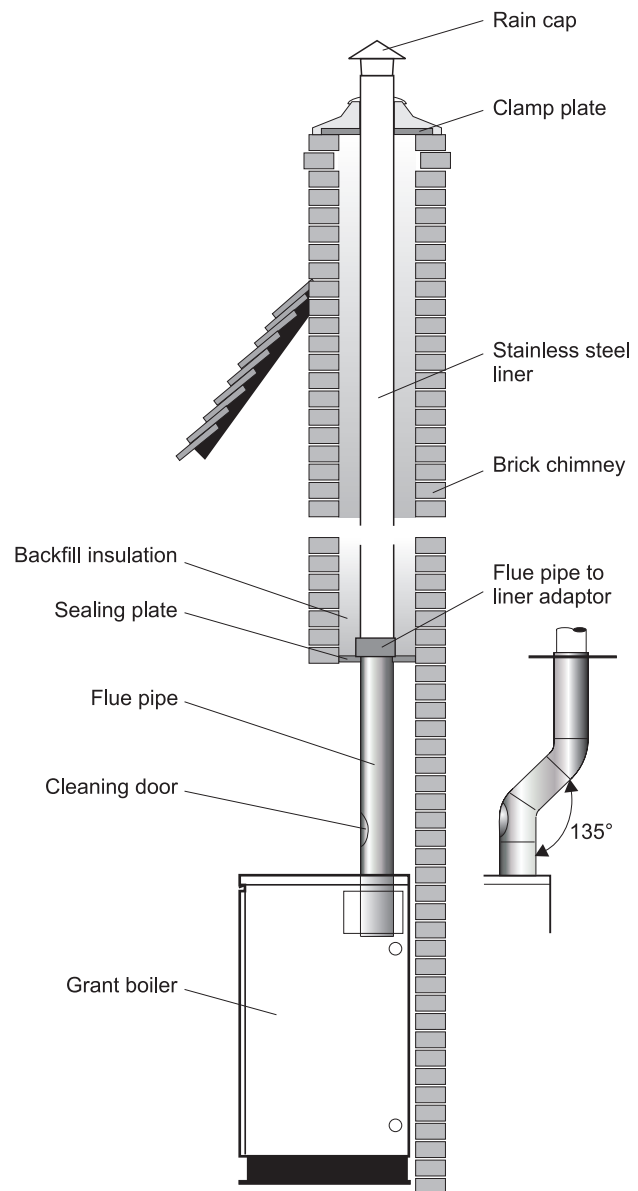


Fig. 12 - Typical conventional flue with brick chimney

5.7 Conventional flue system - Vortex Combi

Under no circumstances can Grant Vortex Combi 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 warranty.

See Figs. 13 and 14

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 (Orange system) are available from Grant UK - see Fig. 13 and page 24.

- 1 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.
- 2 The condensate may be allowed to run back into the boiler. A condensate drain at the base of the flue system is not required.

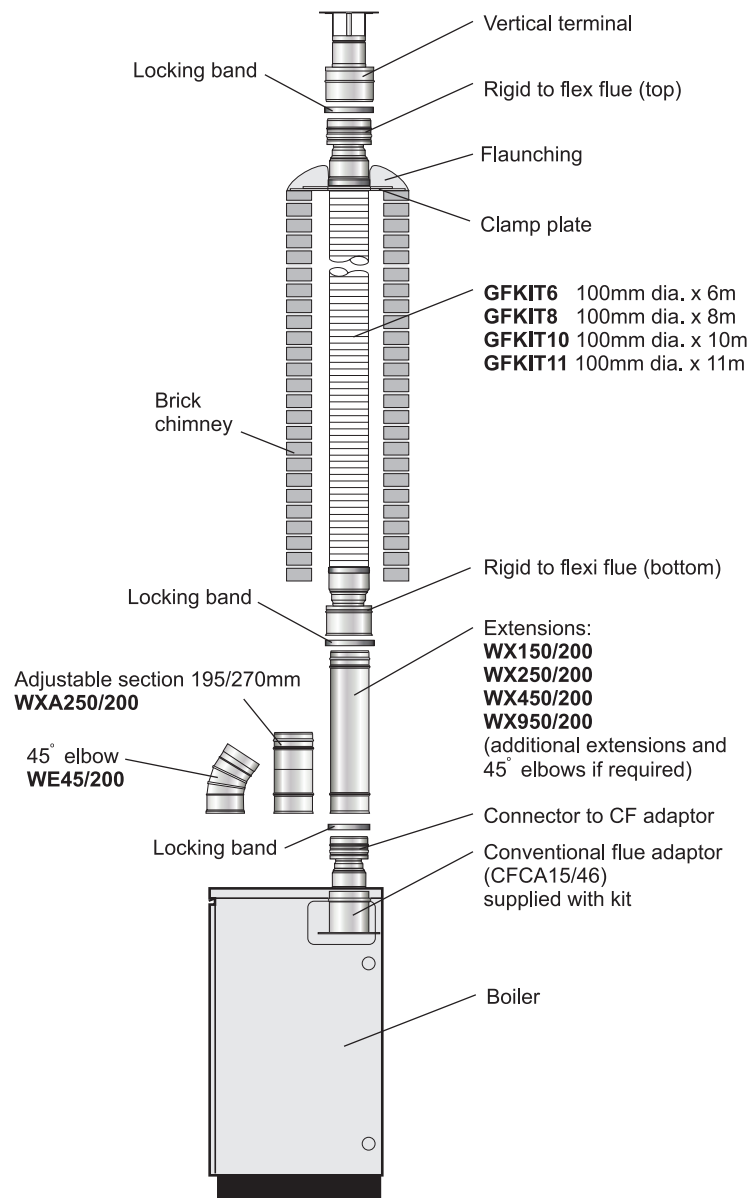


Fig. 13 - Vortex Combi typical conventional flue with brick chimney

- 3 The 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. See Fig. 13.
- 4 If an existing chimney is used, it must be lined with a smooth bore stainless steel liner for use with oil fired condensing boilers. The top and bottom of the annular space must be sealed.
- 5 If a rigid flue is used externally, it must be of the twin wall type incorporating seals, must have a stainless steel inner skin and be suitably insulated and weather proofed.
- 6 **The internal flue diameter for all models must be 100 mm (4 in).**
- 7 Twin wall flues are recommended for externally run flues to reduce the possibility of the condensate freezing in the flue.
- 8 The exposed flue pipe between the boiler and the chimney must not be of an asbestos material and aluminium must not be used in any part of the flue. Only stainless steel should be used.
- 9 If the draught conditions are satisfactory, the flue should terminate with a standard cowl.



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

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.

Only use flue systems suitable for oil fired condensing boilers.

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

Grant EZ-Fit Flexi Pack conventional flue system (Orange System) - See Fig. 13

A range of Flexi pack conventional flue lining kits are available from Grant UK. The packs have been specifically produced for Grant Vortex Combi condensing boilers.

Contents of Grant EZ-Fit Flexi Pack

The pack includes a smooth bore flexible stainless steel 100 mm diameter flue liner with chimney top clamping plate, a rigid to flexi adaptor for the top of the liner, a rigid to flexi adaptor for the bottom of the liner, a terminal, a boiler connector (CFCA15/46) suitable for all Grant Vortex condensing boilers and a connector from the boiler adaptor to rigid flue system.

Part No.	Description - Flexi Pack
GFKIT6	Flexi pack with 6 m liner, terminal and adaptors
GFKIT8	Flexi pack with 8 m liner, terminal and adaptors
GFKIT10	Flexi pack with 10 m liner, terminal and adaptors
GFKIT11	Flexi pack with 11 m liner, terminal and adaptors

Part No.	Description - Extensions
WX150/200	150 mm extension with locking band
WX250/200	250 mm extension with locking band
WX450/200	450 mm extension with locking band
WX950/200	950 mm extension with locking band
WXA250/200	195-270 mm adjustable extension with locking band
WE45/200	45° elbow with locking band

Extensions

A range of white powder coated twin wall extensions are available to connect the boiler to the flexible liner. The external diameter of the extensions is 150 mm. Extensions are supplied with locking bands.

Flue extensions cannot be cut.

An adjustable extension is available. 45° elbows are also available.

The rigid flue between the boiler and flexible flue liner should incorporate an adjustable section to allow inspection and cleaning of the flue system.

5.8 Balanced flue options

Apart from a conventional flue, several balanced flue options are available for use with Grant Combi boilers. All are suitable for use with Class C2 kerosene and Class D Gas oil (kerosene only for the Vortex Combi).

When using Gas oil, the flue must terminate a minimum of 2 metres above outside ground level.

Note: None of the flue sections in the following system can be cut.

1 Low level horizontal balanced flue (Yellow system)

Available in Short (for single thickness brick walls) and Standard kits.

Extensions are available which extend the flue by 225 mm, 450 mm or 675 mm. 90° and 45° elbows are also available.

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

IMPORTANT: For Vortex Combi boilers with the flue to the left hand side - leave a minimum gap of 150 mm between the side of the boiler and the wall to accommodate the condensate trap.

2 High level (horizontal) balanced flue (White system)

Allows the flue to rise vertically within the building before exiting through the wall horizontally.

The maximum flue length - from the top of the boiler flue outlet to the outer face of the wall - is 4 metres for the Combi V3 and Combi Max and 6 metres for the Vortex Combi.

Extensions are available which extend the flue by 225 mm, 450 mm or 950 mm. An adjustable extension of 275 to 450 mm is also available.

A 45° elbow is also available. No more than 2 x 45° elbows should be fitted per system. Each elbow reduces the overall maximum length of the system by 1 metre.

3 Vertical balanced flue (White system)

Allows the flue to rise vertically from the boiler to exit through the roof.

The maximum flue length - from the top of the boiler flue outlet to the terminal - is 6 metres for the Combi V3 and Combi Max and 8 metres for the Vortex Combi.



Extensions are available which extend the flue by 225 mm, 450 mm or 950 mm. An adjustable extension of 275 to 450 mm is also available.

A 45° elbow is also available. No more than 2 x 45° elbows should be fitted per system. Each elbow reduces the overall maximum length of the system by 1 metre.

4 External balanced flue (Green system)

Where it is not practical to use a low level (Yellow system) or internal high level/vertical (White system) balanced flue, the boiler can be fitted with an external vertical/high level flue (Green system). See Fig. 14.

The Starter kit fits to the boiler in the same way as a low level balanced flue (Yellow system) and the external Tee allows the connection of a twin wall insulated flue pipe and a combustion air inlet - providing a room sealed flue system. The external system can terminate at either high level or vertically (above roof level) as required. See Fig. 14.

The minimum dimensions for locating the terminal from building features (windows, doors, etc.) are shown in Fig. 15.

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 fitted centrally over the flue terminal and securely fixed to the wall.

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

The terminal must be positioned so as to avoid products of combustion accumulating in stagnant pockets around the buildings or entering into buildings. Care should be taken that the plume from condensed flue gases does not cause a nuisance.

The following external flue (Green system) components are available from Grant UK

All models upto 26 kW	
Item	Part No.
Starter kit - standard	GK90
Starter kit - short	GK90S
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

All models over 26 kW	
Item	Part No.
Starter kit - standard	GK200
Starter kit - short	GK200S
150 mm extension	GX150/200
250 mm extension	GX250/200
450 mm extension	GX450/200
950 mm extension	GX950/200
195-270 mm adjustable extension	GXA250/200
45° elbow	GE45/200
High level terminal	GTH200
Vertical terminal	GTV200
Wall bracket - standard	GWB200
Wall bracket - extended	GEB200



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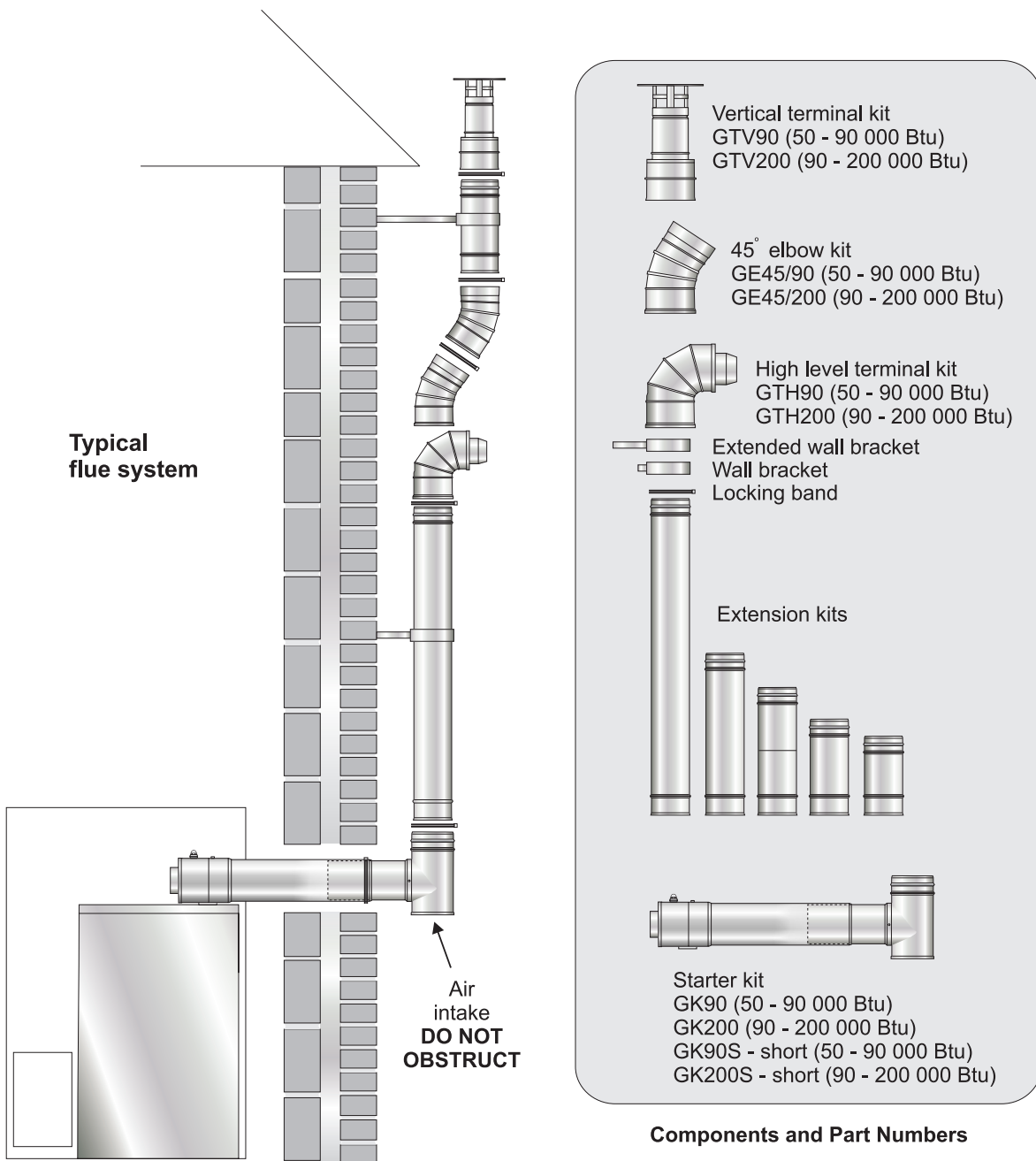


Fig. 14 - External flue (Green system)

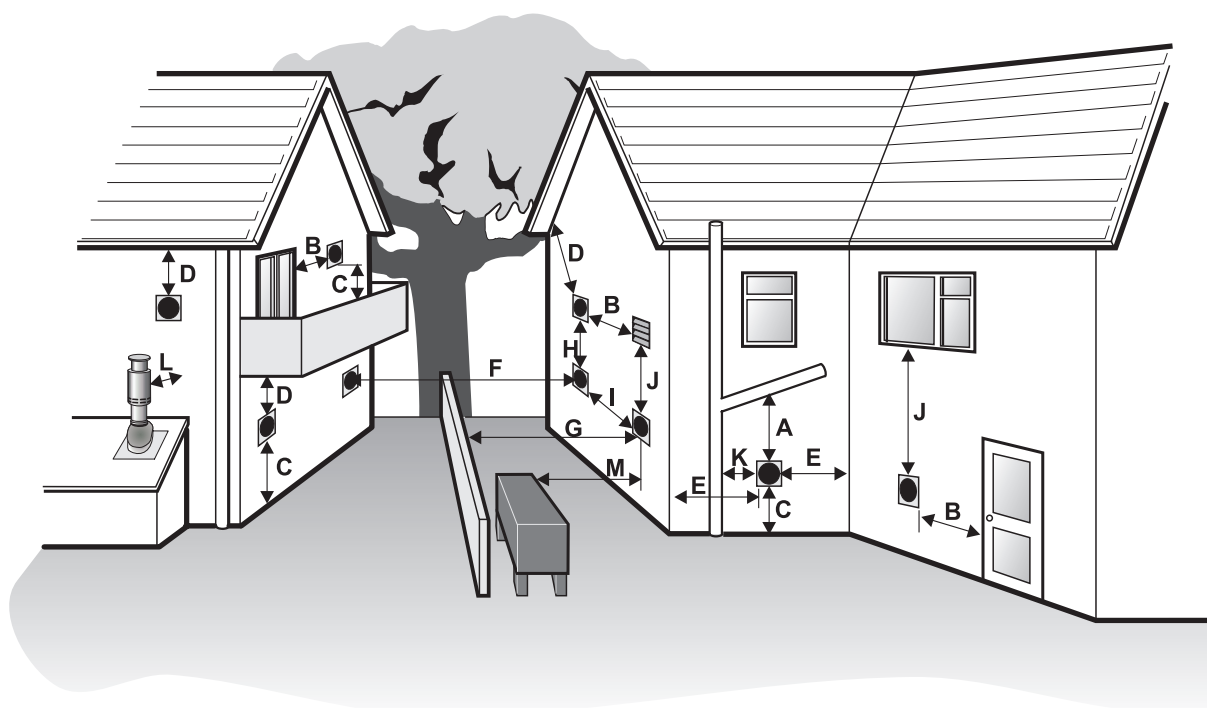


Fig. 15 - Clearances for Balanced flues

Terminal position	Min. distance (mm)
A Below a gutter or sanitary pipework	* 600
B Horizontal from an opening, air brick or window	600
C Above ground or balcony level	**300
D Below eaves or balcony	*600
E From an internal or external corner	**300
F From a terminal facing the terminal	1200
G From a surface facing the terminal	600
H Vertical from terminals on the same wall	1500
I Horizontal from terminals on the same wall	750
J Below an opening, air brick, window etc.	600
K From vertical sanitary pipework	300
L Vertical flue from a wall	600
M From an oil storage tank	1800

Notes: * 75 mm with protection.
** 300 mm British Standards

Distances measured to rim of terminal.

Clearances recommended by Grant Engineering (UK) Limited in accordance with British Standards and Building Regulations.

- Notes:**
- 1 An opening means an openable element, such as an openable window, or a permanent opening such as a permanently open air vent.
 - 2 Notwithstanding the dimensions given, a terminal should be at least 300 mm from combustible material, e.g. a window frame.
 - 3 A way of providing protection of combustible material would be to fit a heat shield at least 750 mm wide.

5.9 Frost protection

For additional protection of either the entire heating system, or the boiler and localised pipework, it is recommended that a frost thermostat be installed. Refer to Section 6.7 for connection details.

To protect the heating system the frost thermostat 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. Refer to Section 12 for connection details.



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5.10 Boiler location

- 1 The boiler must stand on a surface that is firm and level. It does not require a special hearth as the temperature of the boiler base is less than 50°C.
- 2 Sufficient clearance **must be** allowed at the front of the boiler to remove the burner and baffles for servicing.
- 3 The Combi 70 V3 and Vortex Combi 36 require a removable section of worktop (if fitted) above the boiler to provide access to components on top of the boiler and for servicing.
The Combi 90 V3, Combi Max and Vortex Combi 26 boilers can be serviced from the front, but it is preferable for any worktop above the boiler to be removable.
- 4 **Vortex Combi** - Care should be taken when siting the condensate trap. See Section 5.17.

5.11 Water connections

Note: Water connections may be from the rear, left or right hand side. If using low level side exit flue, connections must be on the opposite side to the flue.

Combi V3 and Combi Max:

Four push-fit elbows are supplied with the boiler for connection of the heating flow and return pipes (22 mm), cold water mains inlet pipe (15 mm) and domestic hot water outlet pipe (15 mm) to the four open pipe ends in the boiler. See Fig. 22.

The heating flow and return connections have been fitted with isolation valves for maintenance.

Vortex Combi:

Flow and return connections - All models are supplied with a push-fit elbow connection for the heating flow and return - 22 mm (Vortex Combi 26) or 28 mm (Vortex Combi 36).

Hot water connections - All models are supplied with push-fit elbow connections for the cold water mains inlet pipe and hot water outlet pipe. These are 15 mm for the Vortex Combi 26 and 22 mm for the Vortex Combi 36.

IMPORTANT: 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.

All models:

- 1 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, i.e. 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.
- 2 A drain tap is provided at the bottom on the front of the boiler (and also on the hot water store on the Vortex Combi).

To avoid the danger of dirt and foreign matter entering the boiler the complete heating system should be thoroughly flushed out - 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 used on an old system.

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

This must involve the use of a proprietary cleaner, such as BetzDearborn's Sentinel X300 or X400, or Fernox Restorer. Full instructions are supplied with the products, but for immediate information, please contact BetzDearborn on 0151 4209563 or Fernox on 0179 9550811.

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

Failure to implement the guidelines will invalidate the warranty.



5.12 Sealed central heating system

See Fig. 16

- 1 The boilers are only suitable for use with a sealed system complying with the requirements of BS 5449. The maximum temperature of the central heating water is 85°C for the Combi V3 and Combi Max and 80°C for the Vortex Combi models.
Design notes - when designing the system, the pump head, expansion vessel size, radiator mean temperature, etc. must all be taken into account.
- 2 The boilers are supplied with the following items factory fitted:-
 - a 12 litre diaphragm expansion vessel complying with BS 4814, pre-charged at 1.0 bar. A 14 litre vessel is fitted in the Vortex Combi 36 model.
 - b System pressure gauge, with an operating range of 1 to 4 bar.
 - c Pressure relief safety valve complying with BS 6759 and set to operate at 2.5 bar. The discharge pipe must be routed clear of the boiler to a drain, in such a manner that it can be seen, but cannot cause injury to persons or property.
 - d Automatic air vent, fitted to the top of the boiler, ensures the boiler is vented.
 - e Filling loop. This **must be** isolated and disconnected after filling the system.
- 3 Refer to Sections 4.1 or 4.2 for system volume and BS 7074: for further guidance. Refer to Section 6.8 for further details of the expansion vessel.
- 4 The system design pressure (cold) should be between 0.5 and 1.0 bar. This pressure is equivalent to the maximum static head (see Fig. 17) in bar + 0.3 (1 bar = 10.2 metres of water).
- 5 If thermostatic radiator valves are fitted to all radiators, a system by-pass must be fitted. The by-pass must be an automatic type.
- 6 Provision should be made to replace water lost from the system. This may be done manually (where allowed by the local Water Undertaking) using the filling loop arrangement supplied with the boiler.
- 7 Filling of the system must be carried out in a manner approved by the local Water Undertaking. Where allowed, the system may be filled via the filling loop supplied (the loop arrangement includes a double check valve assembly).
- 8 All fittings used in the system must be able to withstand pressures up to 3 bar.
- 9 Radiator valves must comply with the requirements of BS 2767(10):1972.
- 10 One or more drain taps (to BS 2879) must be used to allow the system to be completely drained.
- 11 The expansion vessel is connected via a flexible hose to allow it to be moved to gain access to the baffle cleaning cover. When replacing the vessel, care should be taken to ensure that the flexible connecting hose is not twisted.

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

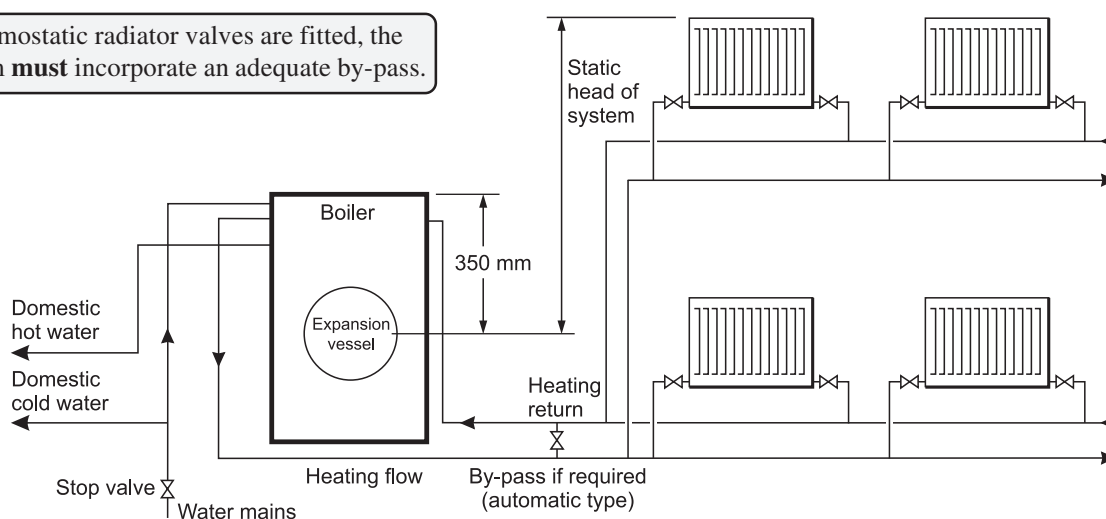


Fig. 16 - Sealed system



5 - GENERAL BOILER INFORMATION

5.13 Domestic hot water system

- 1 To maintain a longer and more consistent hot water temperature, a flow restrictor is factory fitted to all models except the Combi Max and Vortex Combi 36, to limit the flow rate to approximately 15 litres/min. The flow restrictor is located in the outlet side of the cold water inlet isolating valve.

- 2 The incoming mains water pressure should be between 1 and 8 bar to ensure efficient operation. If the pressure is above 8 bar a pressure reducing valve must be fitted.

The boiler may still operate down to a pressure of 1.0 bar but with a reduced flow rate. The minimum flow rate needed for the flow switch to operate is 3 litres/min.

- 3 To ensure economic use, the pipe runs between the boiler and hot taps should be as short as possible and in 15 mm copper pipe or 22 mm for the Combi Max and Vortex Combi 36 only. Where possible the pipework should be insulated to reduce heat loss.
- 4 All taps and mixing valves used in the domestic hot water system must be suitable for operating at a mains pressure of up to 8 bar.
- 5 If required, a shower may be fitted in the domestic hot water system. It is recommended that thermostatically controlled shower valves are used to protect against a flow of water at too high a temperature. If a fixed head type shower is used, no anti-siphonage devices are required. If a loose or flexible head type shower is used, it must be arranged so that the head cannot fall closer than 25 mm above the top of the bath, thereby preventing immersion in the bath water. If this is not practicable, an anti-siphonage device must be fitted at the point of the flexible hose connection.
- 6 The supply of hot and cold mains water direct to a bidet is allowed (subject to local Water Undertaking requirements) provided that the bidet is of the over-rim flushing type. The outlets should be shrouded and unable to have a temporary hand held spray attached. Arrangements for anti-siphonage are not necessary.
- 7 Before the mains water supply pipe is connected to the boiler, it should be thoroughly flushed out to avoid the danger of dirt or foreign matter entering the boiler.
- 8 The mains water connection to the boiler must be the first connection from the mains supply.

Note: Hard Water

A water hardness test kit is supplied with the boiler. Should the total hardness of the water supply exceed 125 ppm, an in-line scale inhibitor should be fitted in the cold water supply to the boiler. Consult the local Water Undertaking if in doubt.

5.14 To use the water hardness kit

Important: Do not immerse the test strip in running water and avoid contact.

Fill a clean container with a sample of water from the mains cold water supply to the boiler.

Immerse the test strip in the water for approximately one second, ensuring that all the test zones are fully wetted.

Shake off the surplus water and wait for one minute.

Assess the colouration of the test zones using the following chart.

Green areas	Violet areas	Hardness	Total hardness mg/l (ppm)
4	0	very soft	<50 mg/l calcium carbonate
3	1	soft	>70 mg/l calcium carbonate
2	2	medium	>125 mg/l calcium carbonate
1	3	hard	>250 mg/l calcium carbonate
0	4	very hard	>370 mg/l calcium carbonate

Note: (1 mg/l = 1 ppm (part per million))

If the hardness reading is found to be in the medium to very hard range (the shaded area), it is essential that some form of water conditioner or softener is fitted to reduce scale formation within the combination boiler. Failure to do so may invalidate both the manufacturers warranty and any extended warranty covering the appliance.

The water conditioner or softener should be fitted to the cold water supply serving the appliance and in accordance with the manufacturers instructions. Grant Engineering (UK) Ltd. cannot be held responsible for any damage or misuse caused by the fitting of any water conditioning device.

Please protect the domestic hot water system from harmful effects of scale.
Problems caused by the build-up of limescale are not covered under the terms of the warranty.



5.15 Underfloor heating systems

See Fig. 17

On underfloor systems it is essential that the return is pre-heated by mixing flow water into the return before it enters the boiler. To prevent internal corrosion of the boiler water jacket, the return water temperature must be maintained above 55°C for the Combi V3 and Combi Max and 40°C for the Vortex Combi

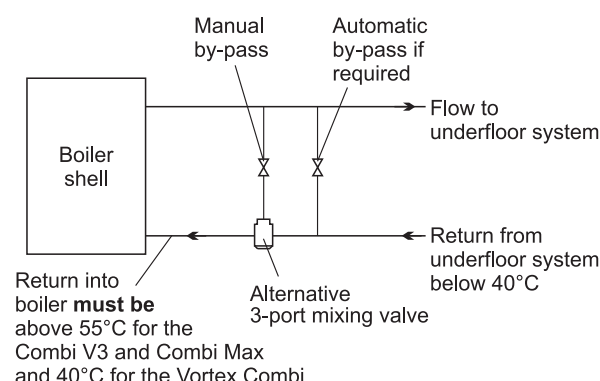


Fig. 17 - Underfloor system

5.16 Pipework materials

General - Grant boilers are compatible with both copper and plastic pipe. Where plastic pipe is used it **must** be of the oxygen barrier type and be of the correct class (to BS 7291:Part 1:1990) for the application concerned.

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

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. Pipe must be Class S to BS 7291: Part 1:1990.

The boiler is fitted with a low-pressure switch to shut off power to the boiler if the system pressure drops below 0.2 bar.

Underfloor systems (see Section 5.15) - Plastic pipe may be used on Underfloor systems where the plastic pipe is fitted **after** the thermostatic mixing valve. Copper tube **must** be used for at least the first metre of flow and return primary pipework between the boiler and the underfloor mixing/blending valves.

5.17 Condensate disposal - Vortex Combi

When in condensing mode the Vortex Combi boiler produces condensate from the water vapour in the flue gases. Provision must be made for the safe and effective removal of the condensate.

Condensate can be disposed either internally - into an internal domestic waste system or directly into the soil stack, or externally - to an external soil stack, gully, hopper or soakaway.

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

Pipework

Condensate disposal pipework must be plastic (plastic waste pipe is suitable). Copper or steel pipe is **NOT** suitable and should **NOT** be used.

The internal diameter of condensate disposal pipes should not be less than 20 mm - e.g. 22 mm plastic plumbing pipe or 19 mm (¾") plastic overflow pipe.

Condensate disposal pipes must be fitted with a fall of 2.5° (1:20).

For boilers installed where it is not possible for the pipe to fall towards the point of discharge - either internally into a waste system or externally to a gully - e.g. 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.

Ideally, external pipework, or pipework in unheated areas such as garages, 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 freezing.

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

Condensate trap

Condensate disposal pipes **MUST** be fitted with a trap - whether they are connected internally or externally.

Vortex Combi boilers are supplied with a condensate trap to provide the required 75 mm water seal in the condensate discharge pipe from the boiler. This trap incorporates a float (which will create a seal when the trap is empty) and an overflow warning outlet (fitted with a rubber bung), See Fig. 18.



5 - GENERAL BOILER INFORMATION

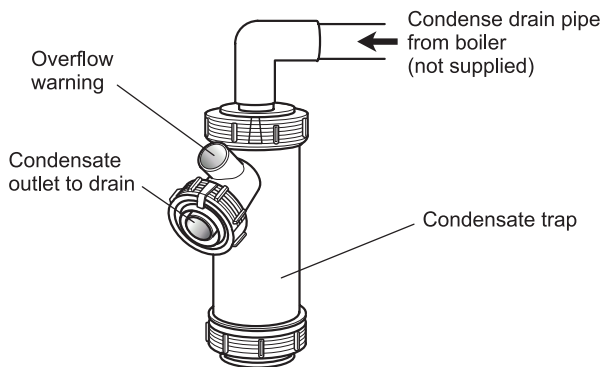


Fig. 18 - Condensate trap

The trap must be located internally in an accessible position to allow for routine maintenance. The mounting bracket supplied with the trap **MUST** be used - the trap should **NOT** be supported by the condensate pipework only.

A 22 mm push-fit plastic plumbing connector is supplied with the boiler to connect the plastic pipe to the stainless steel condensate outlet pipe - on the left hand side of the boiler.

Use 22 mm plastic plumbing pipe between the boiler and the inlet of the trap. Either 22 mm plastic plumbing pipe or 19 mm (3/4") overflow pipe can be used from the outlet of the trap.

Note: Due to the wall thickness of plastic plumbing pipe, it may be necessary to chamfer the internal edge of the pipe before fitting it onto the spigot in the outlet of the trap.

If connecting the condensate discharge internally - into a waste system or soil stack - the bung must be fitted in the overflow outlet of the trap.

On external discharge systems to a gully or soakaway, the bung should be removed from the overflow outlet. If connected to an external soil stack, the bung must be fitted on the trap.

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 contact your service engineer.

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.

IMPORTANT: 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.

It is recommended that, if there is access to the left hand side of the boiler, the condensate pipe be connected to the boiler using a 'tee-piece' and cap to form a 'rodding eye' - to allow cleaning inside the back of the condensing heat exchanger via the boiler condensate outlet.

5.18 Method of operation

Once the boiler is switched on it will always provide domestic hot water upon demand. The timer only controls the operating times of the central heating. When central heating is not required, the timer switch should be set to OFF.

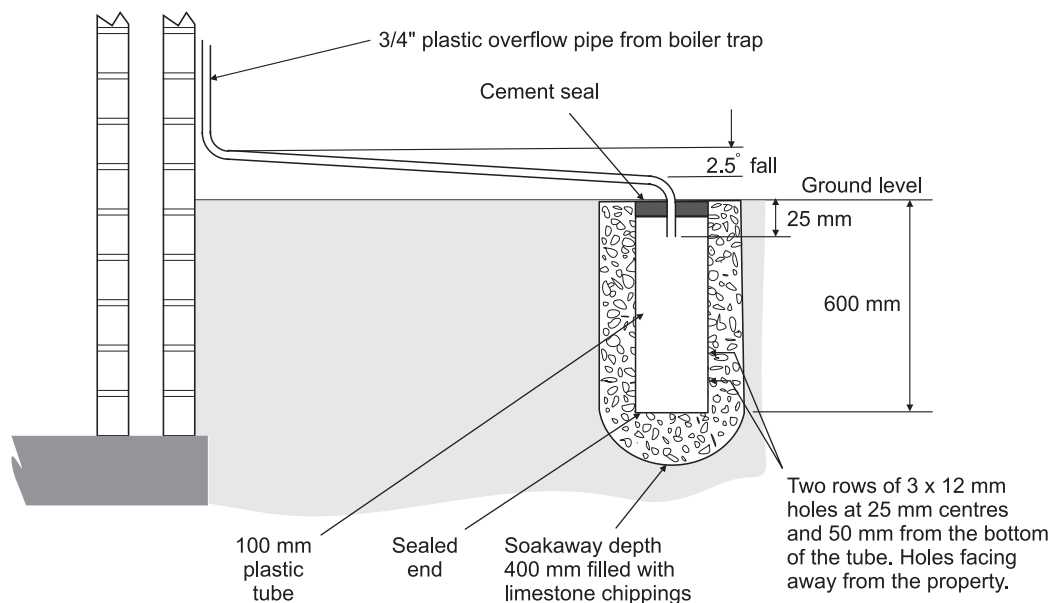


Fig. 19 - Purpose made condensate soakaway



Domestic hot water supply always takes priority over central heating. If a demand for hot water occurs during a period of central heating, the boiler mode will automatically change to provide hot water until the demand ceases. This interruption in the central heating only lasts for as long as hot water is required and should not be noticed by the User.

Central Heating Mode - If there is a call for heat, i.e. the timer and room thermostat (if fitted) are calling for heat, the pump will start to circulate the central heating water and the burner will light. When the temperature in the boiler reaches that set on the boiler thermostat, the burner is turned off. The pump continues to run, circulating water around the system, for as long as both the timer and room thermostat (if fitted) are calling for heat. As the heating system water cools, the temperature drop is detected by the boiler thermostat and the burner is automatically restarted for the cycle to continue until either the timer or room thermostat stops calling for heat. The burner and pump are then turned off.

Domestic Hot Water Mode (Combi V3 and Combi Max) - When a demand for hot water (by opening a hot tap, etc.) is sensed by the diverter valve flow switches, the pump starts and the water in the boiler is diverted through the domestic hot water plate heat exchanger, heating the incoming mains water. The hot water produced is mixed in the thermostatic blending valve with incoming mains water to automatically ensure that the temperature does not exceed 65°C.

When the hot tap is closed and the diverter valve flow switches sense that hot water is no longer required, if the timer switch is set to either TIMED or CONSTANT, the boiler will return to the central heating mode, with the pump and burner running. If the switch is set to HOT WATER ONLY, the pump is turned off but the burner will continue to run for a short period until the water in the boiler reaches the required temperature ready for another hot water operation.

Domestic Hot Water Mode (Vortex Combi) - When a demand for hot water (by opening a hot tap, etc.) is sensed by the flow switch, the Hot Water pump starts and circulates water from the store through the hot water plate heat exchanger heating the incoming mains water.

The hot water produced is mixed in the thermostatic blending valve with incoming mains water to automatically ensure the water temperature does not exceed 65°C.

When the hot tap is closed and the flow switch senses that hot water is no longer required, the Hot Water pump will continue to run and the burner continues to fire until the primary store temperature control is satisfied.

If the Heating switch is set to either TIMED or CONSTANT, the boiler will return to the central heating mode, with the Heating pump and burner running. **Note** - As the temperature of the boiler is now higher than the boiler thermostat setting the burner may not fire immediately, but only after the flow temperature has fallen to below the thermostat setting.

If the Heating switch is set to OFF, or the timer is in an OFF setting, the Heating pump will not operate.

For optimum performance the thermostatic blending valve has been factory set to provide a hot water temperature of approximately 50°C.

If the water in the boiler is already up to temperature when a hot tap is opened, there will be a delay before the burner fires to maintain the hot water temperature in the boiler (to heat the hot water).

5.19 How Vortex condensing boilers work

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 Vortex Combi condensing boilers contain an extra heat exchanger which is designed to recover the latent heat normally lost by conventional boilers. This is done by cooling the flue gases to below 55°C, thus extracting more sensible heat and some of the latent heat.

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 nett thermal efficiencies of 100%.

To achieve maximum performance from a Vortex Combi 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 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 80°C.

5.20 Vortex heating system design considerations

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



5 - GENERAL BOILER INFORMATION

Radiators:-

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

Underfloor:-

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

- 1 Size radiators with a mean water temperature of 60°C.
- 2 Design system controls with programmable room thermostats or use weather compensating controls to maintain return temperatures below 55°C.

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

6 - BOILER INSTALLATION

6.1 Unpack the boiler

- 1 Carefully remove the packaging from the boiler and remove it from the transit pallet.
- 2 Pull off the boiler front panel and remove the literature pack.
- 3 Lift off the two parts of the case top and remove the water connecting fittings.

6.2 Low level balanced flue

See Fig. 20 and 20a

If the boiler is to be used with a low level balanced flue (Yellow system) make the hole in the wall for the flue as shown in Fig. 20a.

Note: Dimension B given in Fig. 20a includes an extra 10 mm over the size of the terminal to provide clearance for fitting.

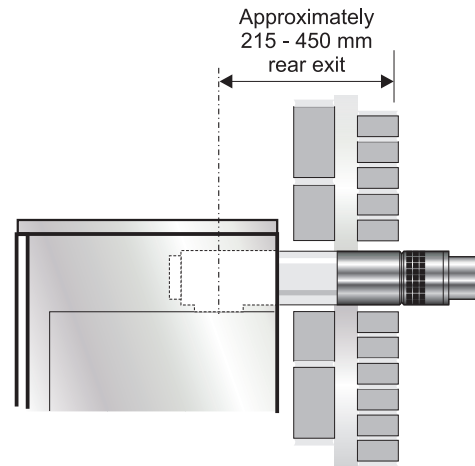
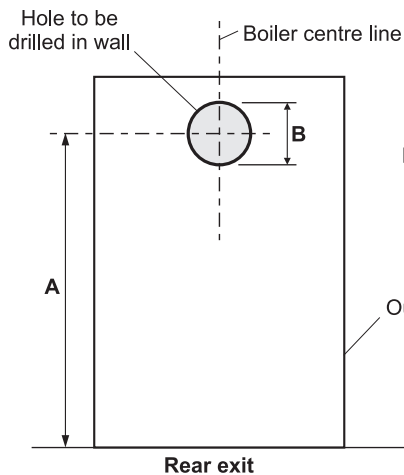


Fig. 20 - Low level balanced flue



Note: This dimension is given with the boiler pushed back against the rear wall. Any clearances must be added to it.

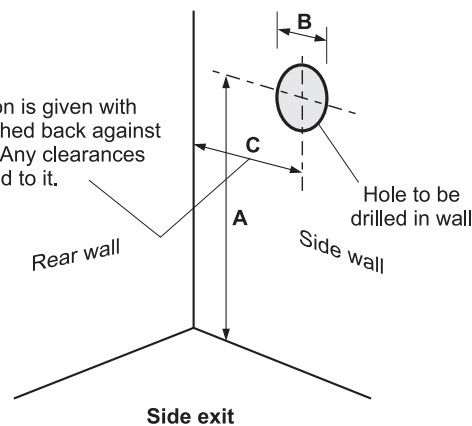


Fig. 20a - Low level balanced flue (Yellow system) and Starter kit (Green system)

Model	Dimension (mm)		
	A	B dia	C
Combi V3 and Combi Max	756	127	110
Vortex Combi 26	768	127	120
Vortex Combi 36	780	162	127

6.3 High level and vertical balanced flue

See Fig. 21 and 21a

If the boiler is to be used with the high level balanced flue (White system) make the hole in the wall as shown in Fig. 21a.

Note: Dimension B given in Fig. 21a includes an extra 10 mm over the size of the terminal to provide clearance for fitting.

Fitting instructions for the high level balanced flue and vertical balanced flue are supplied with the flue kits.

Adjustable sections: The adjustable extensions are telescopic. The wall terminal section is adjustable and is suitable for a wall thickness of 215 mm to 450 mm. Simply adjust to the required length using a twisting motion. The outer pipes **must** overlap by a minimum of 25 mm.

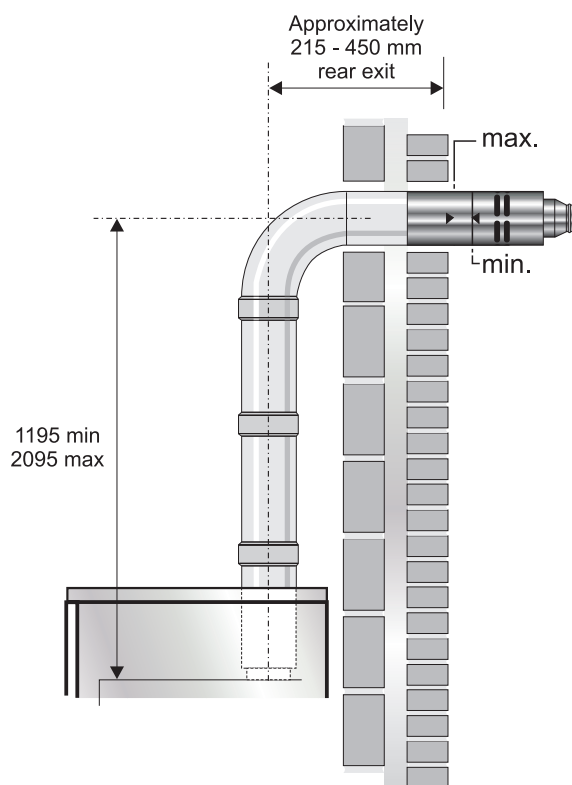


Fig. 21 - High level balanced flue

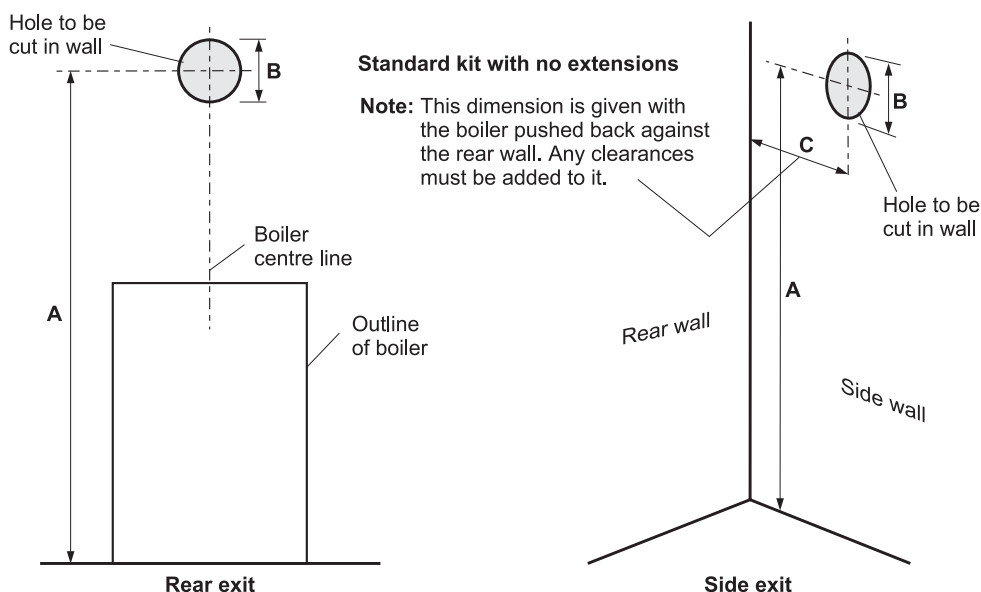


Fig. 21a - High level balanced flue (White system)

Model	Dimension (mm)			
	A	B dia	C	
Combi V3 and Combi Max	1200*	1700 - 2100	175	110
Vortex Combi 26	1215*	1715 - 2115	175	120
Vortex Combi 36	1280*	1700 2020	200	127

*Dimension A for Starter section and elbow/terminal only



6 - BOILER INSTALLATION

6.4 Make the water connections

Combi V3 and Combi Max water connections

Note: Water connections may be from the rear, left or right hand side. If using low level side exit flue, the flue must be on the opposite side to the water connections.

- 1 If required, for easier access, the case bracing bracket may be temporarily removed. Remove the four screws securing the bracing bracket and lift it out.
- 2 Removable plates are provided on both side panels for pipe entry.
- 3 Fit the four push-fit elbow connectors onto the open pipe ends. See Fig. 22. Connect the pipework (not supplied with the boiler) to the elbows.
- 4 **Balanced flue models** - proceed with the flue installation as described in the separate fitting instructions.
- 5 **Conventional flue models** - proceed with the flue connection as described in Section 6.6.
- 6 The safety valve discharge pipe must be routed clear of the boiler to outside, to discharge in such a manner that it can be seen but cannot cause injury or damage to persons or property.
- 7 Do not turn on the mains water supply at this stage.

Vortex Combi water connections

Flow and return pipework can be routed to either side of the boiler, dependant on the flue system used, from the push-fit elbows (supplied) on the flow and return connection. Refer to Section 5.11 - Water connections.

Holes are provided in the rear of the casing side panels to allow the condensate pipe to be run through the back of the boiler. It will be necessary to remove the back panel from the boiler casing to fit this pipework, and to refit the panel before placing the boiler in its final position.

If access will be restricted, make any connections to the boiler before placing it in its final position.

If using a balanced flue system - Install the balanced flue system before connecting the heating system pipework to the boiler.

* Pipe can be increased to 22 mm on Combi 90 V3MAX

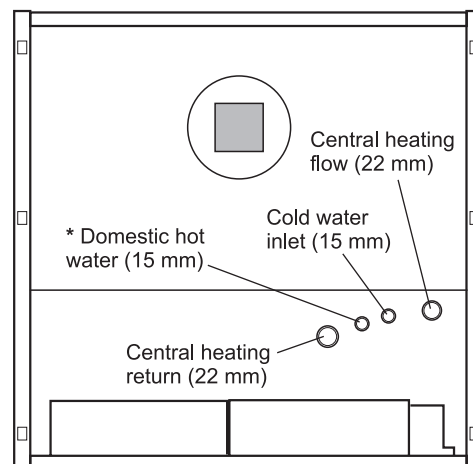


Fig. 22 - Combi V3 and Combi Max pipe positions

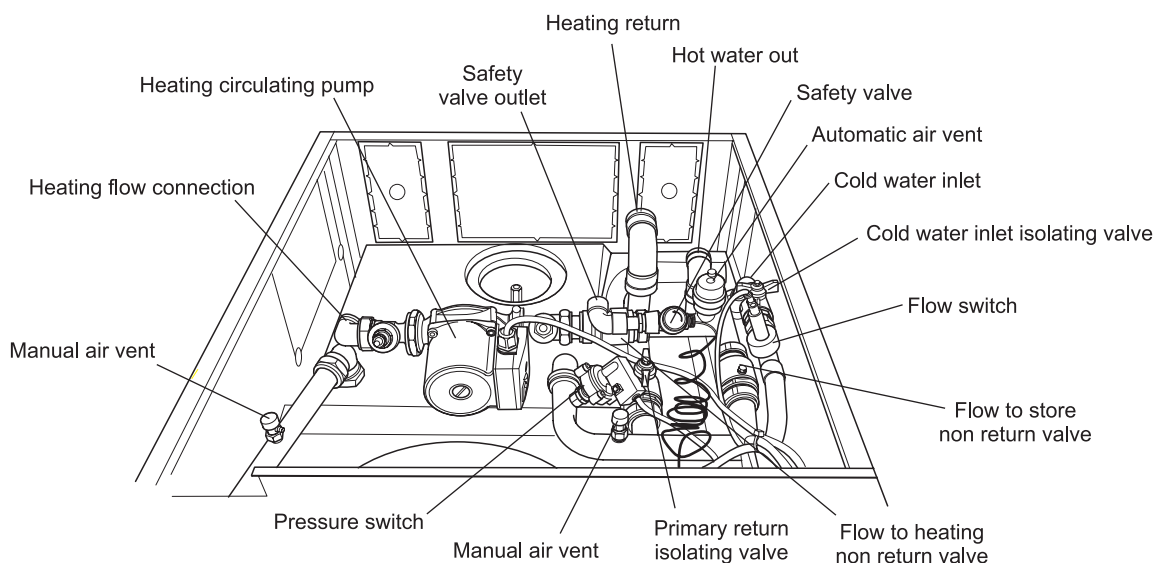


Fig. 22a Vortex Combi pipe positions



6.5 Connect a conventional flue

- 1 Lift off the rear part of the case top.
- 2 Remove the insulation from the rear top panel (do not discard it) and remove the blanking panel. Discard the panel, retaining the nuts and washers.
- 3 Unscrew the protective covers from the studs on the flue dress panel, supplied in the literature pack. Place the panel in position in the rear case top panel and secure in place using the washers and nuts previously removed.
Note: The first section of **Vortex Combi** flue must be in single wall rigid stainless steel flue pipe suitable for condensing boilers.
- 4 **Combi V3 and Combi Max** - Fit the flue dress plate to the hole in the rear section of the case top.
- 4a **Vortex Combi** - Cut the insulation into three equal pieces and replace two - either side of the flue opening in the case top panel.
Fit the conventional flue adaptor (Part No. CFCA15/46 not supplied with boiler) on to the neoprene gasket around the flue outlet on top of the boiler. Secure in position using the 40 mm stainless steel bolt supplied with the boiler as shown in Fig. 23.

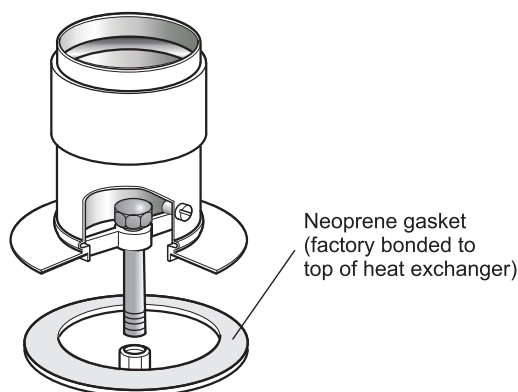


Fig. 23 - Vortex Combi conventional flue adaptor

- 5 Position the flue pipe into socket.
Combi V3 and Combi Max - Make good the connection using a suitable flexible high temperature sealant (e.g. Silastic or similar) and rope seal.
- 6 Position the rear section of the previously prepared case top over the first section of the flue.
- 7 Replace the rear section of the case top.

6.6 Expansion vessel

The expansion vessel fitted is supplied with a charge pressure of 1.0 bar (equivalent to a max. static head of 10.2 metres). The charge pressure must not be less than the actual static head at the point of connection. Do not pressurise the vessel above 1.5 bar.

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 volumes. 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 BS 7074:1 for further guidance.

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.

6.7 Connect the power supply

Important: Ensure that the electrical supply has been isolated before commencing.

If a Grant plug-in timer is used, a permanent 230 V mains supply (fused at 5 Amp) must be taken to the boiler. A three core cable is required to connect the boiler terminal block to the live supply. Refer to Section 12 for typical control system wiring diagrams.

- 1 **Loosen (do not remove) the four screws securing the control panel to the side panels,** hinge the panel forward and allow it to drop down to gain access to the rear of the panel.
- 2 Remove the two screws securing the terminal block cover and lift off the cover.
- 3 Remove the screws securing the cable clamp and open the clamp.
- 4 Connect the power supply cable to the left hand terminal block as follows:
Brown to mains Live - terminal 3
Blue to mains Neutral - terminal 2
Green/Yellow to mains Earth - terminal 1



6 - BOILER INSTALLATION

- 5 Connect a room thermostat as follows:
Remove the room thermostat link wire (6 and 7 on Combi V3 and Combi Max or 4 and 5 on Vortex Combi) from the left hand terminal block and connect the room thermostat to the terminal block in accordance with the room thermostat manufacturers instructions.
- 6 Connect a frost thermostat as follows:
Connect the frost thermostat to the left hand terminal block using terminals 4 and 5 on the Combi V3 and Combi Max or 6 and 7 on the Vortex Combi in accordance with the thermostat manufacturers instructions.
- 7 Replace the rear cover of the control panel.
- 8 Replace the terminal block cover and secure with two screws previously removed.

6.8 Connection of external remote timeswitch

See Section 12

Important: Any remote timer must be of a single channel 230 V type with voltage free output contacts.

Important: Ensure electrical supply to boiler has been isolated before fitting the timer.

- 1 Remove the screws securing the terminal block cover and lift off the cover.
- 2 Pass a 4-core cable (or 4-core and earth if the timer to be used has an earth connection) through the cable clamp in the panel. Connect the two switch wires from the timer to terminals 8 and 9. Connect the live, neutral (and earth if required) from the timer to terminals 3, 2 & 1 respectively on the boiler terminal block.
See Section 12 for a typical wiring diagram.
- 3 Remove the link from terminals 8 and 9 on the boiler terminal block.
- 4 Secure the cable in the cable clamp, replace the wiring cover in position over the terminal block, taking care not to trap any wires, and secure in position with the screws previously removed.
- 5 Ensure that all external wiring is adequately supported.
- 6 Do not switch on the electricity supply at this stage.

6.9 Optional Grant internal timer

Important: Ensure electrical supply to boiler has been isolated before fitting the timer.

- 1 From underneath the control panel, remove the screw securing the bracket behind the timer aperture.
- 2 Remove the blanking piece from the timer aperture in the control panel fascia by firmly pressing on the Grant logo (in the centre of the black square) until it is detached from the rear of the fascia. Remove the blanking piece from the panel and the bracket inside the aperture and discard both items.
- 3 **Loosen (do not remove) the four screws securing the control panel to the side panels,** hinge the panel forward and allow it to drop down to gain access to the rear of the panel.
- 4 Remove the two screws securing the terminal block cover and lift off the cover.
- 5 **Remove the factory fitted link from terminals 8 and 9.**
- 6 Remove the two top screws from the rear of the control panel and loosen the two lower screws. Remove the rear access cover.
- 7 Fit the 6-way plug on the timer wiring harness firmly into the 6-way socket to connect the timer to the boiler.
- 8 **ET and MT kits -** Carefully fit the timer into the aperture.
- 9 **MT kit only -** From the rear of the control panel fit the two fixing clamps, supplied, into the slots on each side of the timer housing with the two 'legs' towards the front of the timer. With the front of the timer held against the fascia, push both clamps towards the front of the timer as far as possible to secure the timer firmly in position.
- 10 Replace the rear cover of the control panel.
- 11 Replace the terminal block cover and secure with the two screws previously removed.
- 12 Do not switch on the electricity supply at this stage. Refer to the User Instructions provided for operating and setting the timer.

6.10 Connect the fuel supply

See Fig. 9

If a two pipe system is to be used refer to Section 5.4.6.

- 1 Remove the oil inlet plug from the fuel pump and connect the elbow of the flexible fuel line supplied with the boiler.
- 2 Connect the flexible fuel line to the rigid supply using the adaptor supplied. The supply enters through one of the holes at the bottom of the case sides.

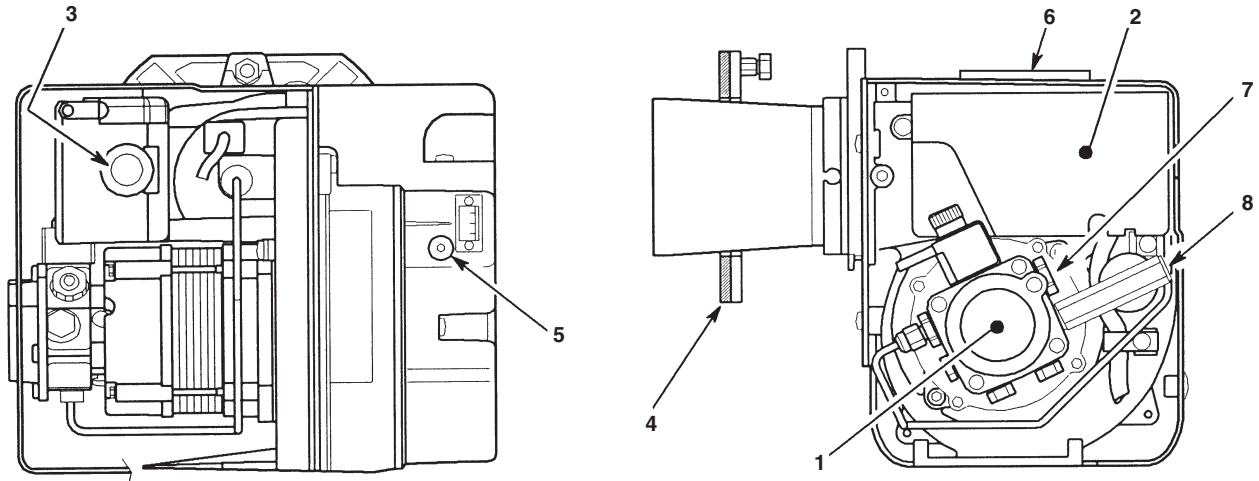


Fig. 24 - RDB burner components

- | | |
|--|--|
| 1 Pump | 5 Air damper adjustment screw |
| 2 Control box | 6 Air supply tube connection (balanced flue) |
| 3 Reset button with lock-out lamp | 7 Pump pressure adjustment screw |
| 4 Flange with gasket (do not remove from boiler) | 8 Pressure gauge connection |



7 - FILL AND VENT THE SYSTEM

7.1 Fill the system

- 1 Automatic air vent(s) are fitted to the top of the boiler. Check that the small cap on the top of each air vent is screwed on fully, then unscrew it one complete turn - the cap remains in this position from now on.
- 2 If the flexible filling loop is used to fill the system, ensure it is connected and that the valve connecting it to the boiler is open and the valve at the front 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.
- 3 Ensure that the mains cold water supply valve is open (operating lever in line with the valve), then turn on the mains cold water supply and gradually open the front valve on the filling loop until water is heard to flow.
- 4 Vent each radiator in turn, starting with the lowest one in the system, to remove air.
- 5 It is important the circulating pumps are properly vented to avoid them running dry and the bearings being damaged.

To gain access to the pump in the Combi V3 and Combi Max, and the Heating pump in the Vortex Combi, it is necessary to lower the control panel. Loosen (but do not remove) the four fixing screws securing the control panel to the side panels, hinge the panel forward to gain access to the pump. Unscrew and remove the plug from the centre of the pump. Using a suitable screwdriver rotate the exposed spindle about one turn. When water starts to trickle out, replace the plug.

On the Vortex Combi the Hot water pump must also be vented as described above.
- 6 Check the operation of the safety valve by turning the head anticlockwise until it clicks. The click is the safety valve head lifting off its seat allowing water to escape from the system. Check that this is actually happening.
- 7 Continue to fill the system until the pressure gauge indicates between 0.5 and 1.0 bar. Close the fill point valve and check the system for water soundness, rectifying where necessary. Water may be released from the system by manually operating the safety valve until the system design pressure is obtained.
- 8 The system design pressure (cold) should be between 0.5 bar and 1.0 bar. The pressure is equivalent to the maximum static head in bar + 0.3 (1 bar = 10.2 metres of water), where the static head is the vertical height from the centre of the expansion vessel to the highest point of the system.
- 9 Close the valves either side of the filling loop and disconnect the loop.

7.2 Completion

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

Leave the top copy with the User. Retain the two carbon copies.

Ensure that the User Information pack (supplied with the boiler) is handed over to the Householder.

Refer to Fig. 25 or 25a for boiler controls

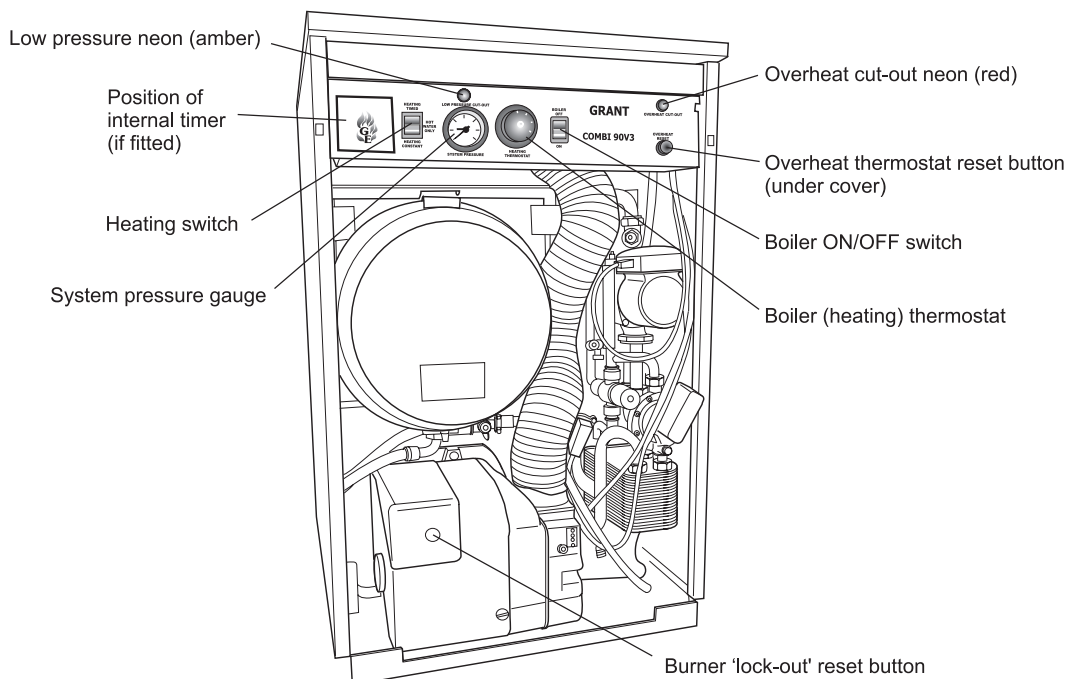


Fig. 25 - Combi V3 and Combi Max boiler Controls

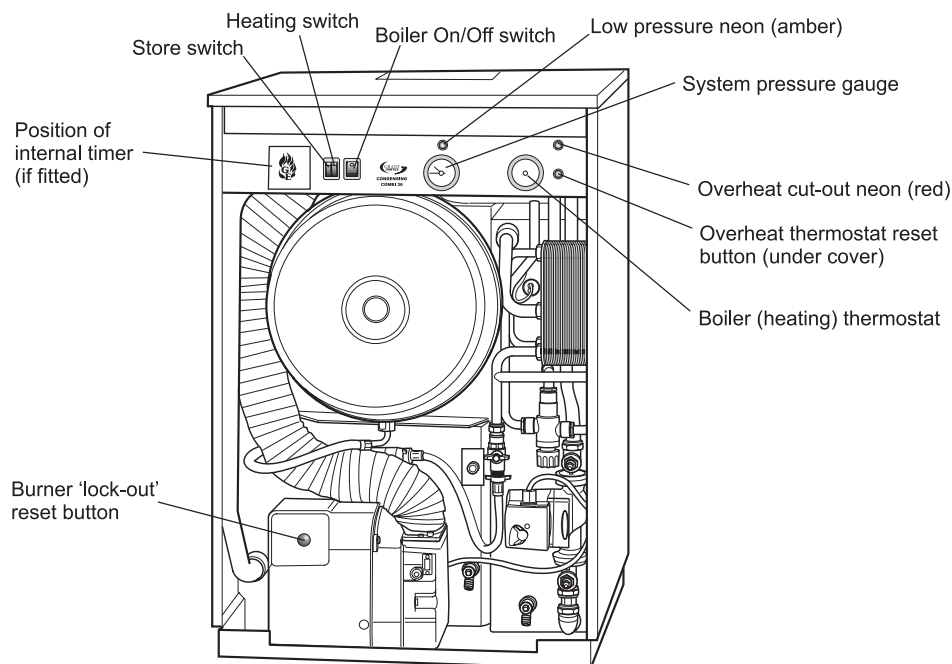


Fig. 25a Boiler controls (Vortex Combi 36 shown)

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

Note: Check that the baffles are in position and that the cleaning cover is correctly fitted and a good seal made.

- 1 Check that the water system has been vented and pressurised, and there are no leaks.
- 2 Check that all fuel line valves are open.
- 3 Remove the plastic burner cover (two screws) if it was not previously removed.



8 - COMMISSIONING

- 4 Connect a combined vent manifold and pressure gauge to the pressure gauge connection port on the oil pump. See Fig. 24. Open the vent screw on your vent manifold to vent the supply while the pump is running.
- 5 Set the Heating switch to 'Hot Water Only' (Combi V3 and Combi Max) or to 'OFF' (Vortex Combi). Check that all system controls are calling for heat and turn the boiler thermostat to maximum. Switch on the electricity supply to the boiler.
- 6 Set the boiler On/Off switch to 'ON' and the Store switch to 'ON' (Vortex Combi). Fully open a hot tap and allow it to run for a few moments to vent the internal primary circuit. The boiler pump in the Combi V3 and Combi Max or the Hot Water pump in the Vortex Combi will operate and the burner should light within about 15 seconds. If the burner does not light and the 'Lock-out' reset button lights, wait for about 45 seconds then press the reset button to restart the ignition process. This procedure may have to be repeated during first lighting.
Close the hot tap. The burner will continue to fire to heat the primary water in the boiler or primary store (Vortex Combi) until the required temperature is reached.
Note: On the Vortex Combi the Hot Water pump will continue to run for a short period after the burner has stopped.
- 7 Set the Heating switch to 'CONSTANT'. The boiler will now be operating in the central heating mode.
Note: The burner may not fire immediately.
- 8 With the burner alight, check the fuel pressure. Refer to the Technical Information, Section 4.3, 4.4 or 4.6. Adjust the pressure if necessary - see Fig. 24.
- 9 Operate the boiler until it reaches normal operating temperature. Check oil supply/return pipe for leaks, rectifying where necessary.
- 10 Switch the boiler off, remove the pressure gauge and replace the plug in the pump.
- 11 Having ensured that there are no oil leaks, replace the burner cover. Tighten the two fixing screws. Ensure the flexible air tube is connected to the burner.

12 A flue gas sampling test point is provided. This is located in the cleaning door on the front of the Combi 90 V3, Combi Max and Vortex Combi, and on the top of the Combi 70 V3.

- 13 After allowing the burner to run for 20 minutes - Check the smoke number, if satisfactory check the CO₂ level. Set the CO₂ to the value given in Section 4.3, 4.4 or 4.6. for the boiler and fuel used. Adjust the burner air regulator, see Fig. 24, turning the screw anti-clockwise closes the damper and increases CO₂ level, turning the screw clockwise opens the damper and reduces CO₂ level.
Re-check the smoke number if the air damper has been moved.
Under no circumstances must the smoke number be above 1.

Note: It is important that the air damper is correctly set.

- 14 Check the flue gas temperature.
- 15 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.
- 16 Switch off the boiler.
- 17 With the system hot, check again for leaks, rectifying where necessary. Drain the heating system while it is hot to complete the flushing process.
- 18 Refill, vent and pressurise the system as described in Section 7.2, adding a suitable inhibitor. For further information concerning inhibitors contact Grant Engineering (UK) Limited.
- 19 Replace the case bracing bracket and top panel, if not already fitted.

Note: After commissioning the boiler, complete the Commissioning Report on page 2 of these instructions and the OFTEC CD/11 commissioning report. Leave the top copy with the User and return the two carbon copies.

If the boiler is to be left in service with the User, set the controls, timer (see Section 1) and room thermostat (if fitted) to the User's requirements then refer to Section 9.

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

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



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

- 1 How to light and turn off the boiler and how to operate the system controls.
- 2 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.
- 3 The importance of servicing the boiler to ensure safe and efficient operation. This should normally only be required once a year.
- 4 The type of fuel used.
- 5 That any servicing or replacement of parts must only be carried out by a suitably qualified engineer.
- 6 Ensure that the boiler controls and room thermostat (if fitted) are set to the User's requirements.
- 7 Tell the User the system pressure and show them the position of the safety valve discharge pipe.
- 8 Show the User how to reset the overheat thermostat and how to restart the boiler if it goes to 'Lock-out'.

Leave this Instruction manual with the User.

Ensure the User information pack has been given to the Householder.

10 - BOILER SERVICING

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

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

Important: Details of every service should be recorded in the Service Log in the Boiler Handbook. This information may be required to validate the Grant extended warranty.

IMPORTANT

Before starting any work on the boiler, or fuel supply please read the health and safety information given in Section 15 on page 61.

10.1 Important notes prior to servicing

- 1 Check the flue terminal and ensure it is not blocked or damaged.
- 2 Run the boiler and check the operation of its controls.

- 3 Ensure that all water/fuel system connections and fittings are sound. Remake any joints and check the tightness of any fittings that may be leaking. Check the expansion vessel air charge. See Section 6.6. Check the system pressure. Refill, vent and re-pressurise the system as necessary. See Section 7.1.
- 4 Check that any ventilation openings are adequate and are clear. See Section 5.6.
- 5 Remove any sludge/water from the fuel tank by opening the sludge valve at the lower end of the tank.
- 6 With the fuel supply valve closed, clean/replace the filter element and clean the filter bowl.
- 7 Flexible fuel supply pipes should be inspected annually when the boiler is serviced and replaced every two years. If in doubt replace the pipes.

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

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



10.2 Dismantling prior to servicing

- 1 Pull off the front panel.
- 2 Carefully lift up the expansion vessel and remove it from the front of the boiler. Place it on the floor, taking care not to strain the flexible pipe.
- 3 Disconnect the flexible air tube from the burner.
- 4 Remove the burner fixing nut (top of mounting flange) and withdraw the burner. If required, disconnect the flexible oil line(s), use a suitable container to prevent any oil spillage.
- 4 Check the condition of the flue, clean as necessary.
- 5 Check the condition of the front cleaning door seal on the Combi 90 V3, Combi Max and Vortex Combi, or the cleaning cover gasket on the Combi 70 V3, Replace if necessary.
- 6 Replace the baffles, ensuring they are correctly fitted. See Fig. 26, 27, 28, 29 or 30.

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

10.3 Cleaning the boiler

See Fig. 26, 27, 28, 29 or 30

1 Combi 90 V3, Combi Max and Vortex Combi

Remove the four nuts and washers securing the front cleaning door and withdraw the door. Take care - it is heavy.

1 Combi 70 V3

Remove the two nuts and washers securing the top cleaning cover and lift it off the boiler.

- 2 Remove the baffles as shown in Fig. 26, 27, 28, 29 or 30.
- 3 Remove all deposits from the baffle plates and all the boiler internal surfaces using a stiff brush and scraper if necessary.

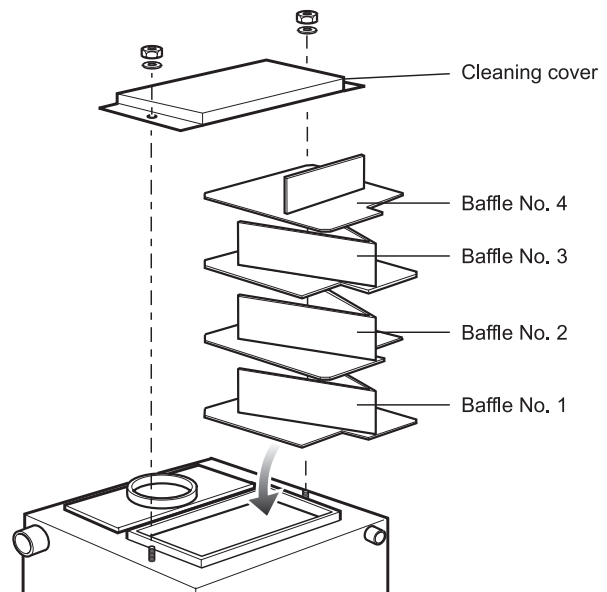


Fig. 26 - Combi 70 V3 baffle positions

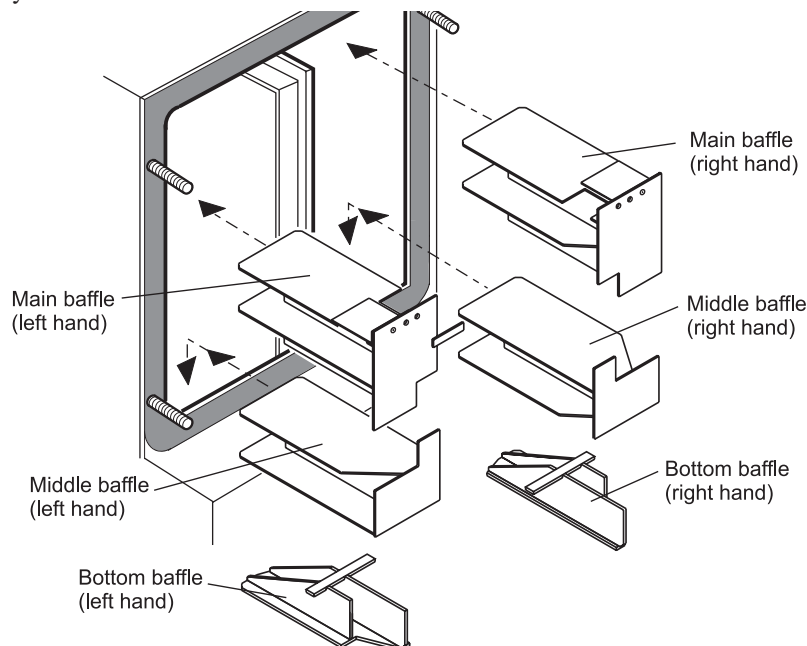


Fig. 27 - Combi 90 V3 baffle positions

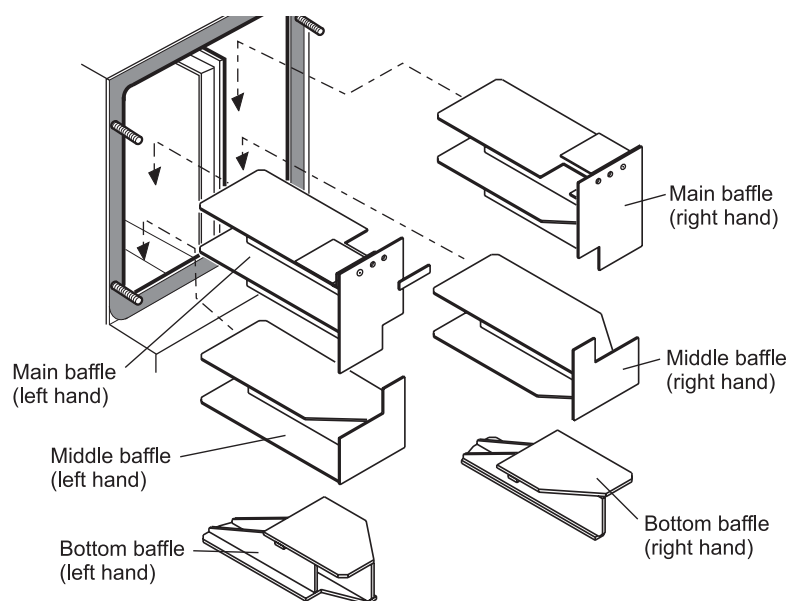


Fig. 28 - Combi Max baffle positions

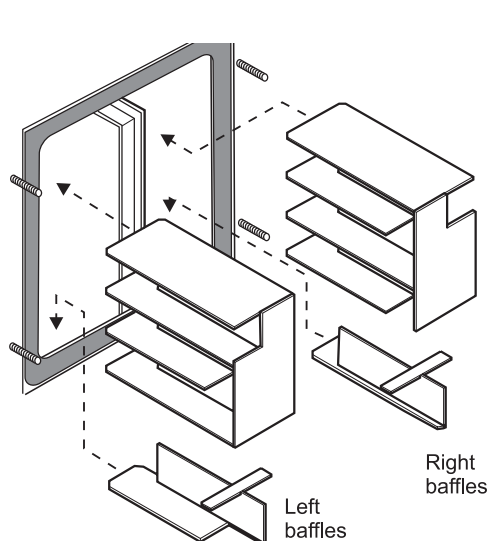


Fig. 29 - Vortex Combi 26

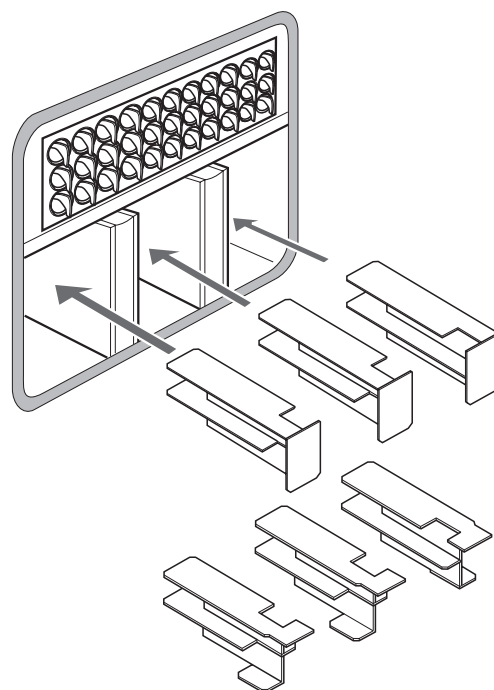


Fig. 30 - Vortex Combi 36

- 7 **Vortex Combi** - Pull out the spiral turbulators from the heat exchanger tubes. See Fig. 31. Clean the turbulators using a stiff brush. Test the heat exchanger condensate drain by pouring water into one of the lower tubes and observe whether the water discharges from the 22 mm condensate outlet. Replace the turbulators.
- 8 **All boilers** - Replace the cleaning door or cover, securing it in position with the nuts and washers previously removed.

- 9 **Vortex Combi** - 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. Check that the boiler condensate outlet is unobstructed. Clean if necessary.

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

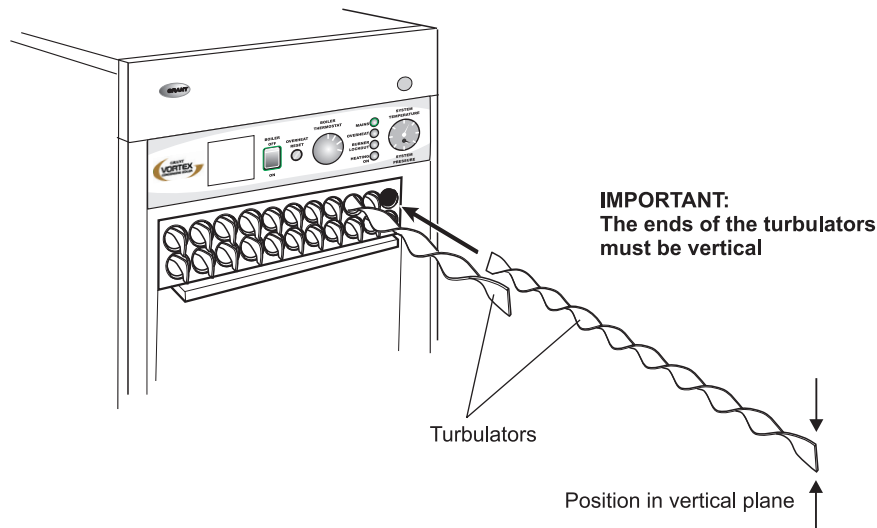


Fig. 31 Vortex Combi turbulators

10.4 Cleaning the burner

See Section 14.1

- 1 **Combustion head** - Loosen the two screws securing the combustion head to the burner flange and withdraw the head. Clean and replace the combustion head.
- 2 **Inspect the ignition electrodes** - With the combustion head removed, loosen the electrode clamp screw and withdraw the electrode assembly. Wipe clean and check for any cracks in the ceramic insulation. Replace if necessary.
Check the electrode settings - Electrode tips approximately 4 mm apart and 2 to 2.5 mm (Combi 70 V3) or 3 to 3.5 mm (Combi 90 V3, Combi Max, Vortex Combi) in front of the nozzle, see Fig. 32.
- 3 **Nozzle** - The nozzle should be replaced on an annual service.
Check that the nozzle fitted is the correct size and type, refer to tables in Section 4.3, 4.4 or 4.6 and boiler data label.

Do **NOT** attempt to clean the nozzle.

Remove and replace the nozzle using a good fitting spanner (16 mm). The use of an ill-fitting spanner will damage the nozzle and could lead to an incorrect flame pattern. Always check the electrode settings after replacing the nozzle, see Fig. 32.

- 4 **Photocell** - The photocell is a push-fit in the burner body. Carefully pull out the photocell to clean.
- 5 **Fan** - With the air intake spigot removed, remove the screws securing the fan housing cover (R/H side of burner) and remove the cover. Inspect the fan and housing and clean as necessary. Replace the cover.

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

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 starting on page 41.

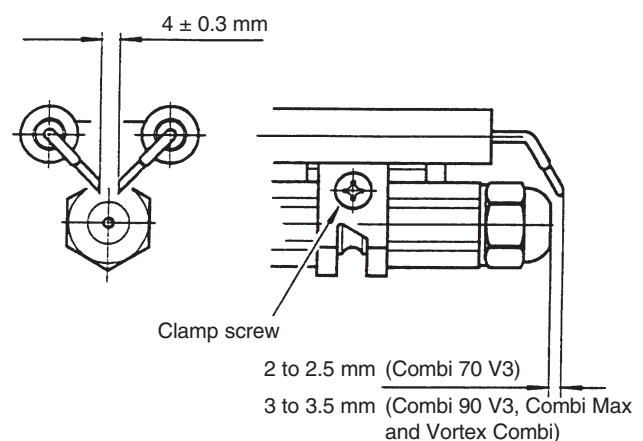


Fig. 32

IMPORTANT: The electrode settings given above MUST be observed

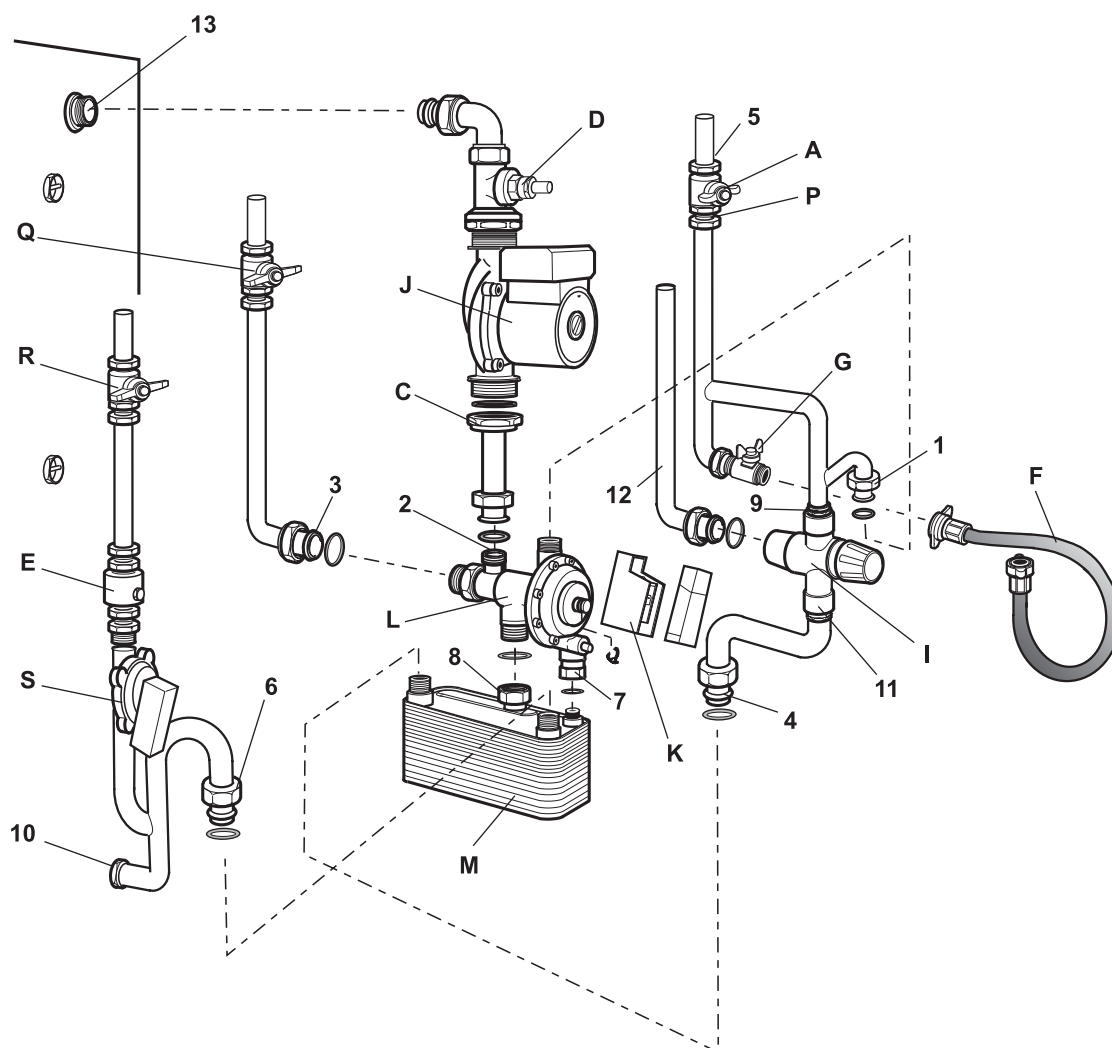


Fig. 33 - Combi V3 and Combi Max components/connections

Main Components

A	Cold water inlet isolating valve
C	Lower pump union
D	Upper pump union - isolating valve
E	Heating check valve
F	Filling hose
G	Filling loop - cold inlet isolating valve
I	Thermostatic mixing valve
J	Circulating pump
K	Microswitch assembly
L	Diverter valve
M	Plate heat exchanger
P	Flow restrictor
Q	Heating flow isolating valve
R	Heating return isolating valve
S	Pressure switch

Connections

1	Diverter valve - cold water inlet
2	Diverter valve - primary inlet
3	Diverter valve - primary outlet
4	Plate heat exchanger - hot water outlet
5	Cold water Inlet isolating valve - outlet
6	Plate heat exchanger - primary outlet
7	Plate heat exchanger - cold water inlet
8	Plate heat exchanger - primary inlet
9	Mixing valve - cold water inlet
10	Primary return isolating valve - inlet
11	Mixing valve - hot water inlet
12	Mixing valve - blended water outlet
13	Primary flow from boiler

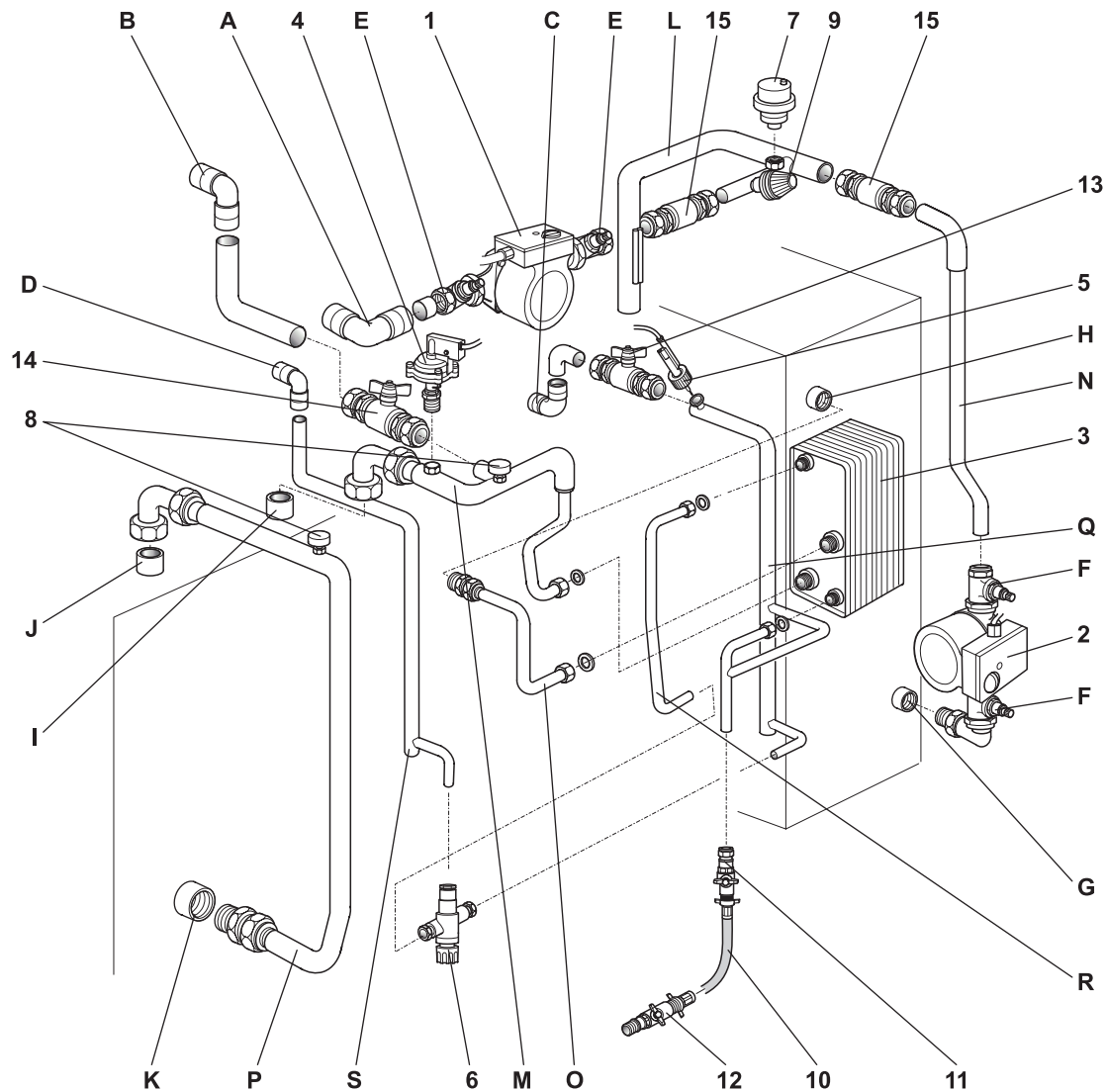


Fig. 33a - Vortex Combi components/connections

Main Components

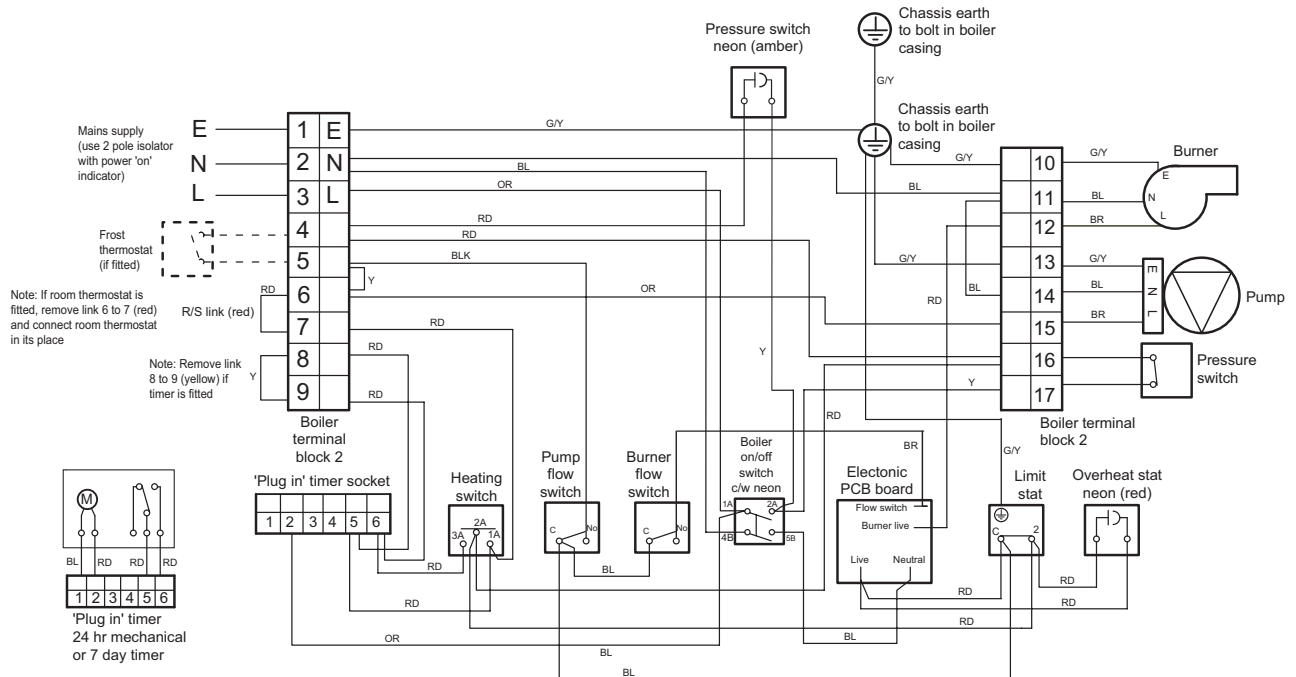
- 1 Circulating pump - heating
- 2 Circulating pump - hot water (primary store)
- 3 Plate heat exchanger
- 4 Pressure switch
- 5 Flow switch
- 6 Thermostatic mixing valve
- 7 Automatic air vent
- 8 Manual air vent (x 2)
- 9 Pressure relief valve
- 10 Filling hose
- 11 Filling loop - cold inler isolating valve
- 12 Filling loop - heating system isolating valve
- 13 Isolating valve - cold inlet
- 14 Isolating valve - heating return
- 15 Non return valve (x 2)

Connections/pipe

- A Heating system flow - push-fit elbow
- B Heating system return - push-fit elbow
- C Cold water inlet - push-fit elbow
- D Hot water outlet - push-fit elbow
- E Pump isolating valves - heating pump
- F Pump isolating valves - hot water (store) pump
- G Primary inlet to store
- H Primary outlet from store
- I Primary inlet to condensing heat exchanger
- J Primary outlet from condensing heat exchanger
- K Primary return to main heat exchanger
- L Primary flow manifold
- M Primary return manifold
- N Primary flow to heating (store) pump
- O Primary flow to plate heat exchanger
- P Primary return to boiler
- Q Cold water inlet manifold
- R Hot water flow to blending valve
- S Hot water outlet from blending valve

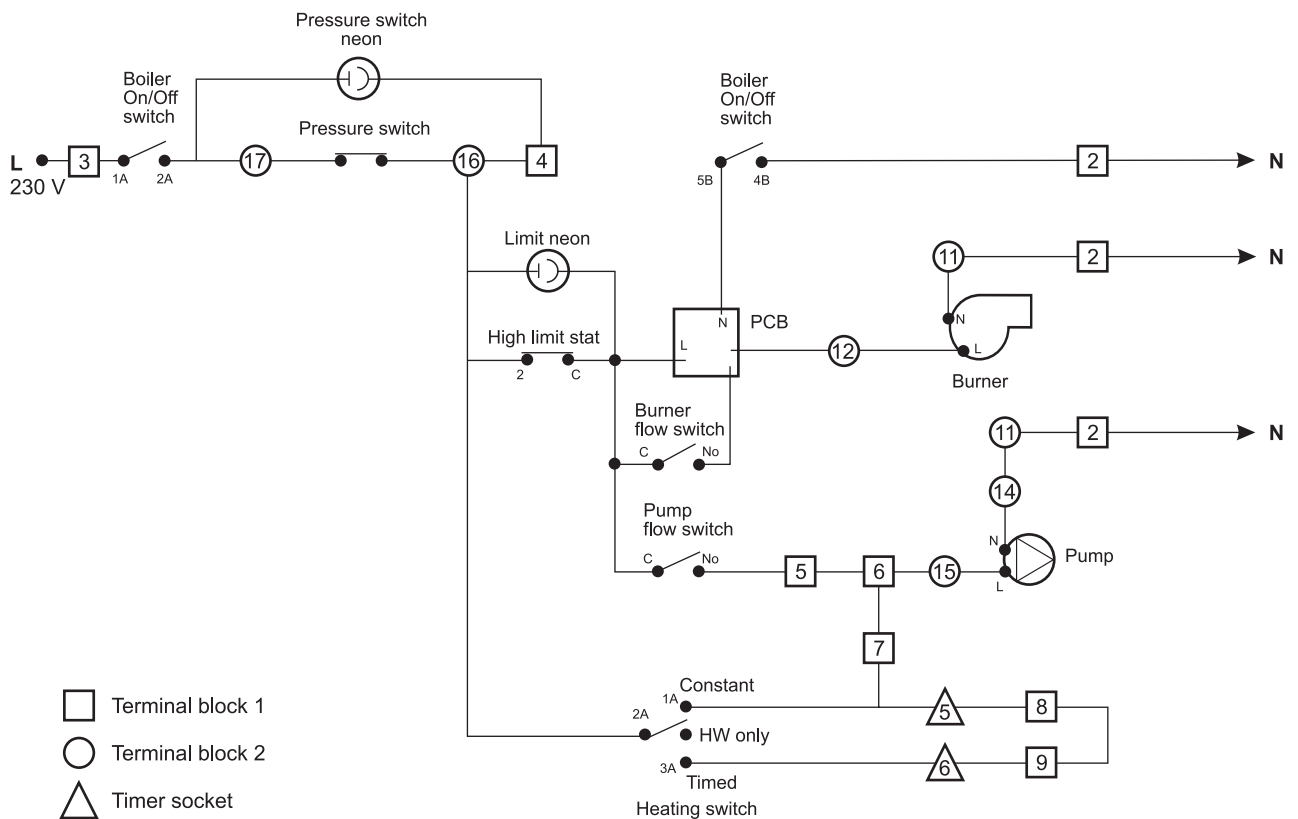


12.1 Control panel wiring diagram - Combi V3 and Combi Max



Colour code: BLK Black, BL Blue, BR Brown, RD Red, Y Yellow G/Y Green/Yellow, OR Orange

12.2 Functional flow wiring diagram - Combi V3 and Combi Max





If room thermostat is fitted
remove link 4 to 5 and connect
room thermostat in its place

Mains supply
use 2 pole isolator
with power 'on' indicator

Remove link 8 to 9
(yellow) if timer is fitted

Frost thermostat
if fitted

Flow switch

Pressure switch

Chassis earth
to bolt in boiler
casing

Chassis earth
to bolt in panel

Boiler
terminal block

Plug-in timer
socket

Heating
switch

Heating pump

DHW pump

Burner

Hot water store

Relay No.1 (bottom)

Relay No.2 (top)

Boiler On/Off
switch with neon

CH (adjustable)
PCB board

Flow switch
Burner live

Flow switch
Burner live

DHW (fixed)
PCB board on bracket

Overheat thermostat
neon (red)

Limit thermostat

Colour code:
BLK Black
BL Blue
BR Brown
RD Red
Y Yellow
G/Y Green/Yellow
OR Orange

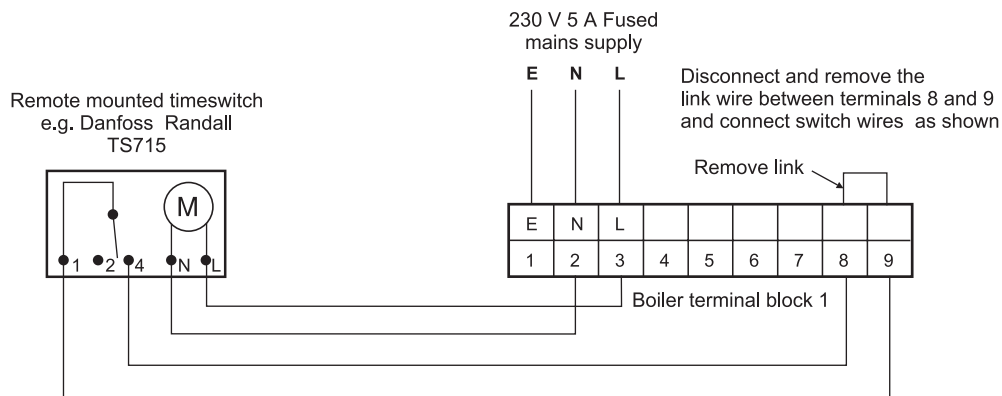
The diagram illustrates the electrical wiring for a boiler system. It shows the connections between various components, including switches, relays, pumps, and control units. The components are labeled as follows:

- Boiler On/Off switch
- Pressure switch
- Limit thermostat
- Switched Live Heating
- Timer (if fitted)
- Pressure switch neon (amber)
- Overheat neon (red)
- Room thermostat (remove link if fitted)
- Heating switch
- Frost thermostat
- Relay 1
- Relay 2
- CH pump
- Burner
- DHW pump
- Boiler On/Off switch
- Burner live
- Flow switch
- Live
- Neutral
- CH control PCB
- DHW control PCB
- Store switch

The diagram is numbered 1 through 21, indicating specific terminals and components. A legend indicates that a triangle symbol represents a timer socket terminal.

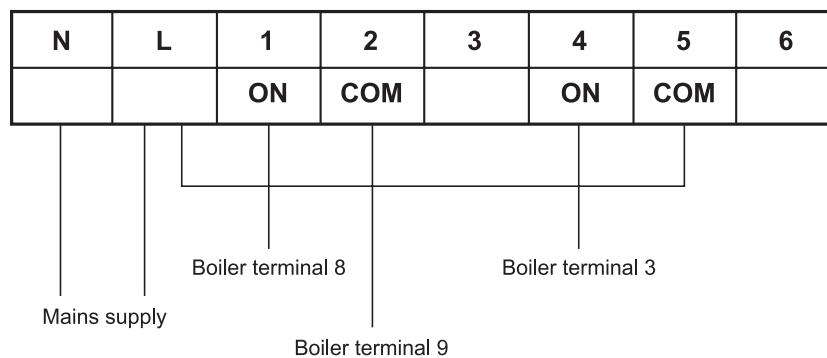


12.5 Typical connection of external timer



Important: If a remote timer is used, it must be a single channel 230V unit incorporating voltage free output contacts.

12.6 Connection of Grant remote wall mounted mini programmer

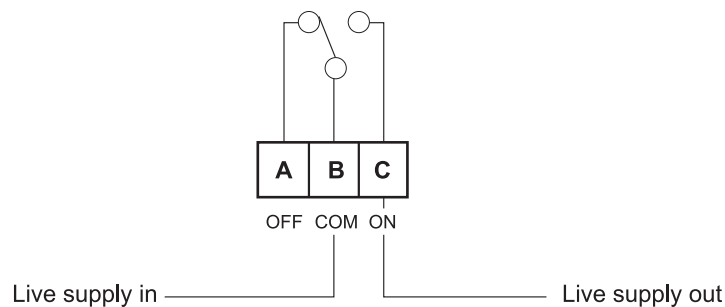


Ensure a link is fitted between Live and 5

Remove the link between terminals 8 and 9 on the boiler terminal block

12.7 Grant programmable room thermostat

A programmable room thermostat - Part No. RSKIT is available from Grant UK. The thermostat has a 5/2 day operation and enables six time and temperature changes each day. The thermostat incorporates frost protection and an On/Off facility.





13.1 Combi V3, Combi Max and Vortex Combi - Boiler faults on central heating and hot water

FAULT	POSSIBLE CAUSE	ACTION
Boiler will not start	<p>Low pressure cut-out activated (amber neon on panel lit).</p> <p>No electrical supply to burner. No electrical supply to boiler. Check controls are switched on and calling for heat. Overheat thermostat has operated (red neon on panel lit). Boiler thermostat and/or overheat thermostat faulty.</p>	<p>Refill system to 0.5 - 1.0 bar.</p> <p>Check for 230 V at boiler terminal block. Check boiler On/Off switch is set to 'ON'. Set boiler thermostat to maximum. Set 3-position Heating switch to 'Constant'. Check and reset thermostat as necessary. Check for 230 V output from BURNER LIVE terminal of PCB. Check continuity of overheat thermostat - replace as necessary.</p>
Burner lights but goes to lock-out	<p>Fault with burner.</p>	<p>Press reset button - no more than twice. If burner does not operate refer to burner fault finding chart.</p>
Burner not lighting Oil & electricity present at burner	<p>No fuel supply Oil tank empty. Isolating valve(s) in fuel supply line closed. Fire valve closed. Fuel line filter is blocked. Oil supply line is air locked. Excessive combustion air. Fault with burner.</p>	<p>Check tank and refill as necessary. Check and open valves as necessary. Check and reset as necessary. Check and clean as necessary. Vent oil supply line at pump. Reset burner air damper and check combustion. Refer to burner fault finding chart.</p>
Burner fires but smoke visible from flue or high smoke number	<p>Insufficient combustion air supply to burner.</p> <p>Incorrect or faulty nozzle fitted. Fuel pressure too high.</p>	<p>Check flue terminal is clear (balanced flue). Check room ventilation is adequate (conventional flue). Check condition of burner fan. Check air damper setting on burner. Check nozzle size and type and replace if necessary. Check fuel pressure and adjust as necessary.</p>
Burner pulsates	<p>Insufficient combustion air supply to burner.</p>	<p>Check as for high smoke number (above).</p>
Burner cycles On and Off	<p>Contaminated combustion air (balanced flue). Insufficient oil flow to burner due to restriction in supply line. Excessive combustion air.</p>	<p>Check the flue terminal is unobstructed Connect vacuum gauge to pump and check pump vacuum. Check for blockage in filter, fire valve, valves or pipe and rectify. Reset burner air damper and check combustion.</p>



13.2 Combi V3, Combi Max and Vortex Combi - Boiler faults on central heating and hot water - continued

FAULT	POSSIBLE CAUSE	ACTION
Fumes and puffing on starting (Conventional flue)	Flue is blocked. Insufficient flue draught. Flue pipe or liner is too large or existing stack is unlined. Insufficient combustion air supply to burner.	Check flue is clean and unobstructed - rectify as necessary. Check flue draught and improve flue as necessary. Check flue condition/size and alter as necessary. Check as for high smoke number (above). Check that an extract fan is not pulling combustion gases from burner.
Flame slow to stabilise on starting	Insufficient combustion air supply to burner. Incorrect or faulty nozzle fitted. Fuel pressure too low.	Check as for high smoke number (above). Check nozzle size and type and replace if necessary. Check fuel pressure and adjust as necessary.
Oil smells	Oil leak in supply line or burner.	Check all joints and flexible hose for leaks and rectify as necessary.
Combustion fume smells	Leak around boiler cleaning door. Burner not correctly fitted on mounting flange. Burner seal 'O' ring damaged or missing. Leakage around flue connection.	Check gasket, re-tighten nuts or replace gasket as necessary. Remove and re-fit burner ensuring correct fitting. Check and replace 'O' ring as necessary. Check and re-seal flue as necessary.
Overheat thermostat operating	Faulty boiler thermostat. Thermostat sensor not connected to PCB (Vortex Combi only). Faulty overheat thermostat.	Check and replace as necessary. Check and rectify as necessary. Check and replace as necessary.



FAULT	POSSIBLE CAUSE	ACTION
No water flowing from hot tap	Mains water supply is not connected to cold water inlet of boiler. One or more isolating valves, stop cocks, etc. in the pipework are closed. The cold water isolating valve in the boiler is closed. There is a blockage (or blockages) in the pipework.	Check and rectify as necessary. Open all valves in pipework to and from boiler. Open valve (situated above pump in front of boiler). Check and rectify as necessary.
No hot water operation	Hot tap is not connected to hot water outlet of boiler. Insufficient flow of water through boiler. Boiler cold water and hot water connections reversed. Thermostatic mixing valve incorrectly fitted. Pump is not operating in hot water mode. Diverter valve microswitch(es) faulty. Diverter valve microswitches not operated. Diverter valve seized. Diverter valve diaphragm failed.	Check and rectify as necessary. Check flow is at least 3 litres/min - rectify as necessary. Check and rectify as necessary. Check hot and cold inlets are connected correctly. Check operation of diverter valve. Check pump is free to rotate and is vented. Check for 230V supply to pump. Check electrical continuity of pump microswitch. Check wiring continuity from pump to microswitch. Check switch continuity, replace if faulty. Check diverter valve diaphragm. Remove, dismantle and clean. Replace diaphragm or complete diverter valve.
Low water temperature at tap	Flow of water through boiler too high. Boiler thermostat incorrectly set Thermostatic mixing valve incorrectly set. Faulty boiler thermostat. Pump speed setting too low. Pump is incorrectly fitted.	Reduce flow and check water temperature. Set boiler thermostat to maximum. Set mixing valve to setting '4.5'. Check continuity and replace if necessary. Set pump speed switch to maximum (top position). Check and rectify as necessary.
Hot water for short period only	Burner not firing for hot water (after a short time). Burner oil pressure set too low at oil pump. Incorrect oil nozzle fitted to burner.	Check operation of burner on central heating. If burner faulty, refer to burner fault finding chart. Check electrical continuity of burner microswitch. Check electrical continuity of thermostat. Check operation of diverter valve. Check wiring continuity from burner to microswitch. Check and set oil pressure to correct value (see Section 4.3, 4.4, 4.6). Check and fit correct nozzle (see Section 4.3, 4.4, 4.6).



13.4 Combi V3 and Combi Max only - Domestic hot water OK - poor or no central heating

FAULT	POSSIBLE CAUSE	ACTION
No operation on heating	<p>Timeswitch either not set, or not in an 'ON' period.</p> <p>Timeswitch not operating.</p> <p>Faulty timeswitch.</p> <p>Faulty timeswitch switch contacts.</p> <p>Timeswitch OK but not switching boiler on.</p> <p>Heating switch set to 'HOT WATER ONLY'.</p> <p>Room thermostat not calling for heat.</p> <p>Faulty room thermostat.</p> <p>No room thermostat or external timeswitch connected to boiler.</p>	<p>Check setting and set to 'Constant' to test.</p> <p>Check power supply to timeswitch.</p> <p>Check and replace if necessary.</p> <p>Check continuity of switch, replace if necessary.</p> <p>Check continuity of wiring to timeswitch.</p> <p>Check and set switch to 'Constant' to test.</p> <p>Set thermostat to call and check boiler operates.</p> <p>Check continuity of thermostat, replace if necessary.</p> <p>Check link fitted between 8 & 9 on boiler terminal block.</p>
Flow temperature low	<p>Boiler thermostat is set too low.</p> <p>Boiler thermostat faulty.</p> <p>Boiler is underfired.</p> <p>Combustion setting of burner incorrect.</p> <p>Boiler heat exchanger is sooted up.</p>	<p>Check and reset as necessary.</p> <p>Check and replace if necessary.</p> <p>Check nozzle size & fuel pressure, correct as necessary.</p> <p>Check settings and correct as necessary.</p> <p>Check boiler & baffles and clean as necessary.</p>

**FAULT****POSSIBLE CAUSE****ACTION****No water flowing from hot tap**

Mains water supply is not connected to cold water inlet of boiler.
One or more isolating valves, stop cocks, etc. in the pipework are closed.
The cold water isolating valve in the boiler is closed.
There is a blockage (or blockages) in the pipework.

Check and rectify as necessary.
Open all valves in pipework to and from boiler.
Open valve fully (located in the top right of boiler).
Check and rectify as necessary.

No hot water operation

Store switch is set to OFF.
Insufficient flow of water through boiler.
Hot tap is not connected to hot water outlet of boiler.
Boiler cold water and hot water connections reversed.
Flow switch is not operating.

Primary store is not up to temperature.
Primary store (hot water) pump is not operating.
Faulty Hot Water PCB sensor.
Faulty Hot Water PCB.

Check store switch is set to ON (on boiler control panel).
Check flow is at least 3 litres/min - rectify as necessary.
Check and rectify as necessary.
Check and rectify as necessary.
Check flow switch is correctly fitted - in line with flow.
Check continuity across flow switch between terminals 10 and 11.
Set store switch to ON - burner and hot water pump should start.
Check for 230 V supply to pump with water on.
Replace sensor and check operation.
Check for 230 V output from 'Burner' terminal on PCB.
If no output - replace Hot Water PCB and check operation.

Low water temperature at tap

Flow of water through boiler too high.
Thermostatic mixing valve incorrectly set.
Primary store (hot water) pump speed too low.
Faulty Hot Water PCB sensor.
Faulty Hot Water PCB.

Reduce flow and check water temperature.
Set mixing valve to setting '4.5'.
Check pump speed is set to maximum - setting 3.
Replace sensor and check operation.
Check for 230 V output from 'Burner' terminal on PCB.
If no output - replace Hot Water PCB and check operation.

Hot water for short period only

Burner not firing for hot water (after a short time).
Note: Burner will not necessarily fire as soon as tap is opened.
Burner oil pressure set too low on oil pump.
Incorrect nozzle fitted to burner.

Check operation of boiler on heating - set switch to 'Constant'.
If burner faulty, refer to burner fault finding chart.
Check and set oil pressure to correct value (see Section 4.3, 4.4, 4.6).
Check and fit correct nozzle (see Section 4.3, 4.4, 4.6).

13.6 Vortex Combi only - Domestic hot water OK - poor or no central heating

FAULT

No operation of boiler on heating

POSSIBLE CAUSE

Boiler switch is set to OFF.
 Heating switch is set to OFF.
 Room thermostat (if fitted) not calling for heat.
 Timeswitch either not set or not in an ON period.
 Timeswitch not operating.
 Faulty timeswitch.
 Faulty timeswitch contacts.
 Faulty room thermostat.
 No room thermostat or external timeswitch fitted.
 Faulty Heating PCB sensor.
 Faulty Heating PCB.
 Faulty relay No. 2.

ACTION

Check boiler On/Off switch is set to ON (on boiler control panel).
 Check heating switch is set to TIMED.
 Set thermostat to call for heat and check boiler operates.
 Check setting and set to CONSTANT to check boiler operates.
 Check power supply to timeswitch.
 Check and replace as necessary.
 Check continuity of switch and replace as necessary.
 Check continuity of thermostat and replace if necessary.
 Check links are fitted between terminals 4 & 5 and 8 & 9.
 Replace sensor and check operation.
 Check for 230 V output from BURNER LIVE terminal.
 If no 230 V output - replace PCB.
 Check for 230 V supply to burner - between terminals 20 & 21.
 Check for 230 V supply to heating pump - between terminals 14 & 15.

Flow temperature low

Boiler temperature control set too low.

Little or no heating flow

Heating pump speed too low.

Heating pump not operating.

Primary store sensor not operating correctly.

Faulty relay No. 1.

Check and set as necessary.

Check pump speed and set as required.

Check for 230 V supply to pump.

Check sensor is correctly located in pocket on front of store.

Check sensor lead is correctly connected to Hot Water PCB.

Check for 230 V supply to Hot water pump.

ATTENTION

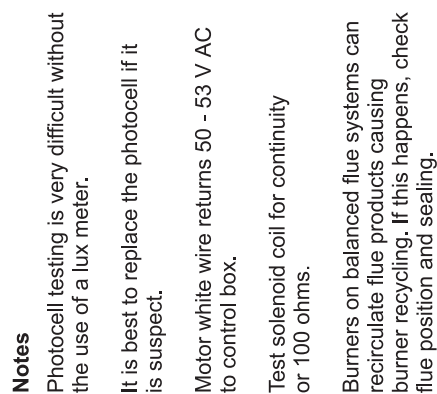
If either sensor is disconnected from it's respective PCB, then that PCB will operate as if a demand was present and supply 230 V from the BURNER LIVE terminal producing the following conditions:

Heating PCB sensor disconnected - Burner and heating pump will run continuously until the limit thermostat operates to shut down the boiler.

Store (hot water) PCB sensor disconnected - Burner and store pump will run until Heating PCB stops burner (via sensor on flow pipe). Store pump continues to run. **Note:** - The boiler cannot provide flow to heating system in this condition - but will continue to provide hot water (and re-heat the primary store) as required.

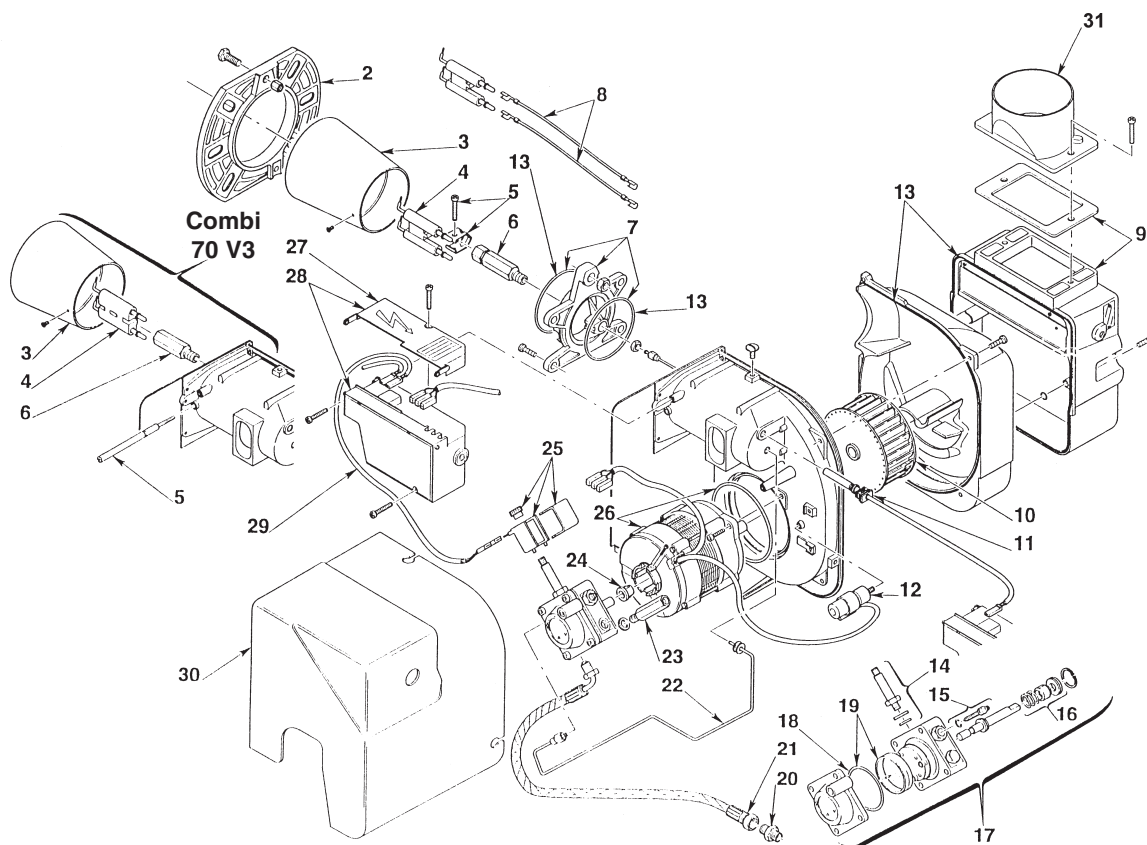


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14.1 Riello RDB burner - exploded view

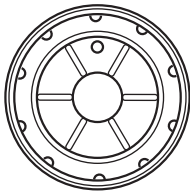
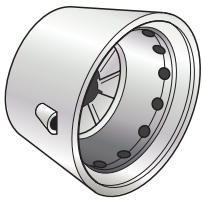


Key No.	Description	Riello Part No.	Grant Part No.	Key No.	Description	Riello Part No.	Grant Part No.
1	Not applicable	-	-	12	Capacitor 4.5 μ F	3002837	RBS149
2	Flange	3005786	RBS28	13	Seal kit	3008878	RBS140
3	Combustion head LD2SX (70V3)	3008859	RBS132	14	Needle valve	3007582	RBS109
3	Combustion head LD3 (90V3)	3008768	RBS127	15	Regulator	3008651	RBS120
3	Combustion head T2 (Vortex 26)	3002423	RBS147	16	Pump seal	3000439	RBS14
3	Combustion head T3 (Vortex 36)	3002447	RBS144	17	Pump	3008654	RBS101
3	Combustion head T5 (Max)	3002533	RBS150	18	'O' ring	3007162	RBS08
4	Electrode assembly (70V3 only)	3008860	RBS133	19	Filter - 'O' ring	3008653	RBS122
4	Electrode assembly	3007513	RBS108	20	Connector	3003602	RBS35
5	Screw (70V3 only)	3008875	RBS137	21	Flexible pipe	3007672	RBS36
5	Electrode bracket	3006552	RBS29	22	Tube	3008644	RBS113
6	Nozzle holder (70V3 only)	3008861	RBS134	23	Pressure gauge connector	3008876	RBS138
6	Nozzle holder	3008642	RBS111	24	Drive coupling	3000443	RBS16
7	Collar	3008643	RBS112	25	Solenoid	3008648	RBS117
8	High voltage lead	3008794	RBS129	26	Motor	3002836	RBS102
9	Air damper assembly	3008647	RBS116	27	Cover	3008649	RBS118
10	Fan (70V3, 90V3 and Vortex 26)	3005708	RBS39	28	Control box assembly	3008652	RBS103
10	Fan (Vortex 36)	3008645	RBS142	29	Solenoid lead	3008851	RBS139
10	Fan (Max)	3005788	RBS151	30	Cover	3008879	RBS141
11	Photocell	3008646	RBS115	31	Air tube spigot	3062774	RBS143

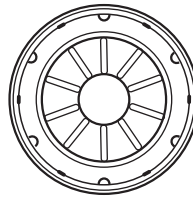
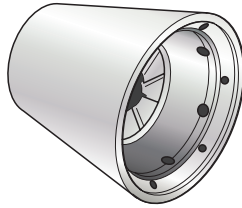


14 - BURNER SPARE PARTS

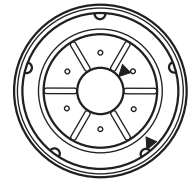
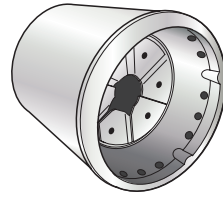
Burner Heads



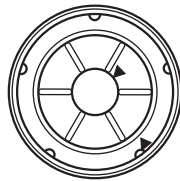
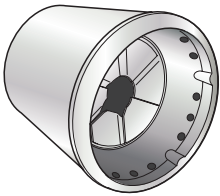
LD2SX (short) Combustion head
Combi 70 V3



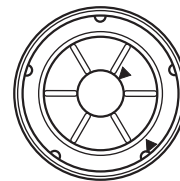
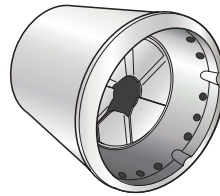
LD3 Combustion head
Combi 90 V3



T5 Combustion head
Combi MAX



T2 Combustion head
Vortex Combi 26



T3 Combustion head
Vortex Combi 36



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:

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.

Sealants

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.

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 - EC DECLARATION OF CONFORMITY

We declare that the Combi 70 V3, Combi 90 V3, Combi Max, Vortex Combi 26 and Vortex Combi 36 Oil Boilers equipped with Riello RDB burner approved to EN 267: 1991 satisfy the requirements of the following European Directives:-

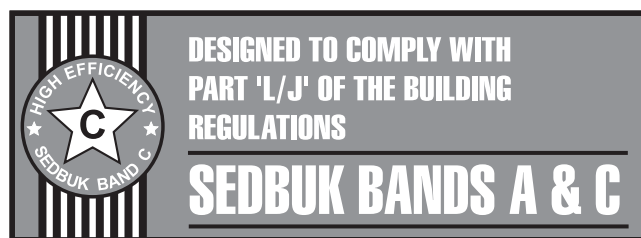
1. 89/336/EEC - Electromagnetic Compatibility Directive
Referred to the generic standards EN 55014: 1993, EN 50082: 1: 1992
2. 73/23/EEC - Electrical Equipment Safety Regulations Directive
Referred to the generic standard NO: 3260: The Electrical Equipment (Safety) Regulations: 1994
3. 92/42/EEC - Hot Water Boiler Efficiency Directive
Referred to the generic standard The Boiler (Efficiency) (Amendment) Regulations 1994
(SI 1994/3083)





89/336/EEC
73/23/EEC
92/42/EEC

Complies with the EC Low voltage,
Electromagnetic compatibility and
Boiler efficiency Directives



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

All goods sold are subject to our official Conditions of Sale, a copy of which may be obtained on application.

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