

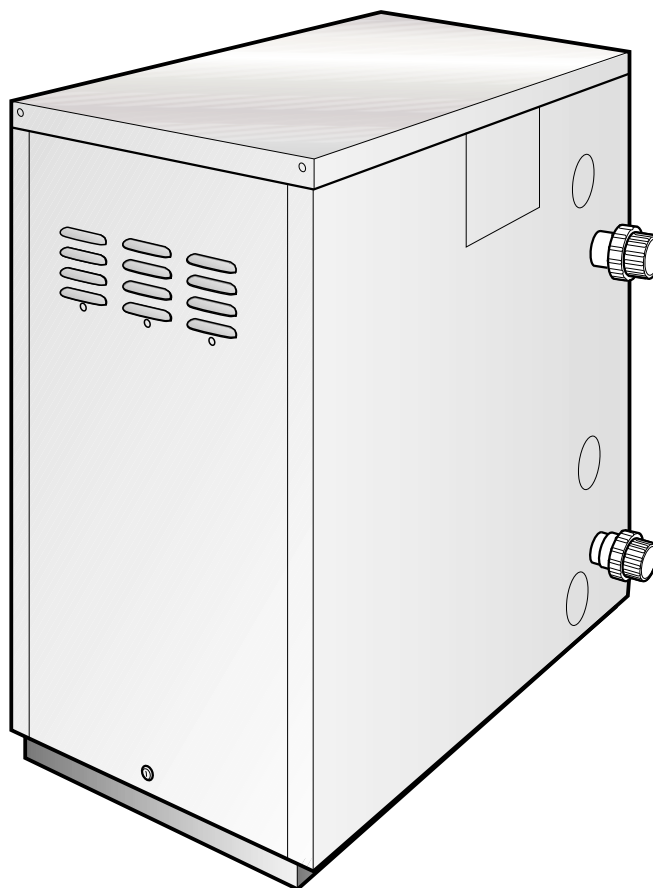
# OIL



Part No. DOC 35 Rev. 00 February 2002

USER, INSTALLATION  
and  
SERVICING INSTRUCTIONS

**UNIVERSAL**  
**SWIMMING POOL BOILER**  
**Models 100 and 150**



**For Swimming Pool and Space Heating**

After installing the boiler leave these instructions with the User

**It is recommended that the appliance is installed, commissioned and maintained  
by an OFTEC Registered or Grant Approved Technician**



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## COMMISSIONING REPORT

Date: .....

Commissioning engineer: ..... Tel. No: .....

Boiler model/output: ..... Btu/h Fuel type: Kerosine (28sec) or Gas oil (35 sec)

Nozzle size: ..... Pump pressure: ..... Air setting: .....

Flue gas % CO<sub>2</sub>: ..... Net flue gas temp: ..... Smoke No: .....

## SERVICE LOG

It is recommended that the boiler should be regularly serviced, at least once a year, and the details entered below by the service engineer.

Date	% CO <sub>2</sub>	Net flue gas temp.	Smoke No.	Service engineer/Tel. No.



## 1.1 About your boiler

The boiler will provide swimming pool or spa heating. It may also be used for space heating and domestic hot water and is fully automatic once switched on.

## 1.2 Boiler controls (see Fig. A)

Universal boilers are supplied with a factory fitted control panel incorporating a burner isolation switch, primary circulating pump isolation switch, diagnostic warning lights, boiler control thermostat, overheat thermostat, a frost thermostat set to 5°C and the pool thermostat

- 1 Pool thermostat** - A pool thermostat is fitted to the control panel allowing the pool water temperature to be adjusted to the required setting. The recommended temperature setting for the pool water is normally between 26° and 30°C. The recommended temperature for spas is 40°C. The pool thermostat should be set to the desired setting.

### 2 Diagnostic warning lamp indicators -

**Mains on neon** - indicates that the boiler is receiving a live supply.

**Heating on neon** - indicates that any external heating system connected to the boiler is calling for heat.

**Pressure switch neon** - indicates that the pressure switch has operated. The pressure switch indicator will light when the pool pump is not running or could indicate low pressure in the pool return pipework due to dirty or blocked pool filters.

**Note: If the boiler is in pool only mode and the pressure switch has activated, the boiler will automatically shut down.**

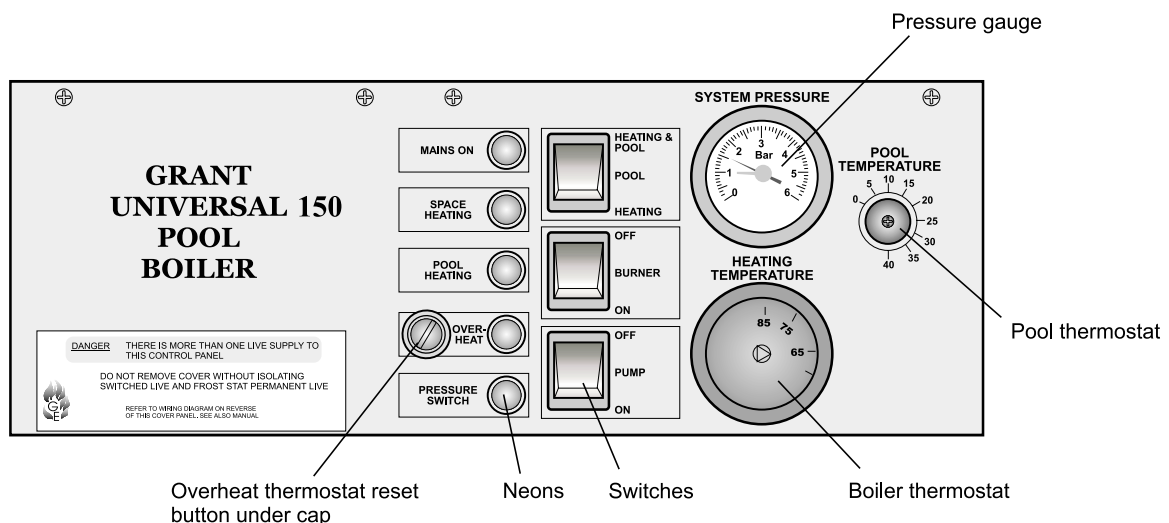
**Overheat thermostat neon** - the boiler is fitted with a safety high limit thermostat set to operate at 110°C. Should the neon illuminate, it indicates that the boiler has shut down due to overheating. **Wait for the boiler to cool down before attempting to reset the thermostat.** If the problem persists, contact your Service engineer.

## 1.3 Lighting your boiler (see Fig. A)

To access the boiler controls, unlock the front panel, withdraw the bottom slightly and remove the panel.

- 1 Ensure that** - There is sufficient fuel, of the correct type, 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 pump and burner switches are set to OFF (the neons in the switches are not alight). The pool and room thermostat (if fitted) are at the desired setting. The boiler thermostat is set to the required setting.
- Switch on the electricity supply to the boiler.
- Set the 3-position switch on the boiler control panel to HEATING & POOL position.
- Start the swimming pool pump.
- Set the burner and pump switches to ON. A neon in the switch lights when it is in the ON position.

The boiler will now light automatically.



Controls - Fig. A



## 1 - USER INSTRUCTIONS

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

**For short periods** - Set both burner and pump switches to OFF.

To restart, set both switches to ON.

**For long periods** - Set both burner and pump switches to OFF. If required, the fuel supply valve may be closed and the water and electricity supplies turned off at the mains.

**Note:** If the electricity, fuel and water supplies are turned off, the built-in frost thermostat will **not** operate.

### 1.5 Points to check if burner fails to light

- 1 Check that the burner and pump switches are ON.
- 2 Check that any remote programmer (if fitted) 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 section 1.7).
- 7 Check to see if the pool pump pressure switch has activated.

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.

### 1.6 About your fuel

Universal boilers are suitable for use with Class C 28 second Kerosine and Class D 35 second Gas oil. 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.

### 1.7 General notes and care of your system

- 1 **Boiler thermostat** - This control allows the temperature of the water leaving the boiler to heat the pool heat exchanger, the radiators and domestic hot water to be adjusted.

**Note:** If you have a cylinder thermostat on your hot water cylinder, this will control the temperature of your domestic hot water. The boiler thermostat setting must be equal to or above the cylinder thermostat setting to enable the cylinder thermostat to control the domestic hot water system.

The boiler thermostat has an operating range of 65 to 85°C. The following settings are recommended:-

- a Pool and Spa heating 85°C
- b Heating and hot water in Winter 85°C
- c Hot water only in Summer 65°C

- 2 **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.

- 3 **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 warning light on the control panel will indicate this.

The boiler will not light until the thermostat is reset. To reset, unscrew the small plastic cap (see Fig. A), press the button then replace the cap.

If this condition continually repeats, contact your Service engineer.

- 4 **Ventilation** - Always ensure that the boiler has adequate ventilation. Any ventilation openings **must not** be obstructed. Periodically check that they are clear.

**Do not** attempt to 'box in' the boiler or build a compartment around.

**Do not** place any combustible material around or on the boiler or flue pipe.

**Do not** place anything against the door of the boiler that might obstruct the ventilation openings.

**Do not** store pool chemicals in the same room as the boiler.



- 5 Flue terminal** - The flue terminal **must not** be obstructed or damaged.

In severe conditions check that the terminal does not become blocked by snow.

- 6 Frost protection** - The control panel of the Universal boiler includes a built-in frost thermostat factory set to 5°C.

If 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.

**Note:** For Outdoor use we recommend that a combined antifreeze and corrosion inhibitor be used in the primary water system.

- 7 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.

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

- 8 Failure of electricity supply** - If the electricity supply fails, the boiler will not operate. It should relight automatically when the supply is restored.

### 1.8 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.

### 1.9 Sealed central heating system

The boiler incorporates a sealed heating system, the installer will have pressurised the system and should have told you (or set it on the pressure gauge) the system pressure when cold (this is normally between 0.8 and 1.0 bar, which will increase slightly when hot). If the pressure (when cold) is below the set pressure mentioned above, you should contact your Installer or Service engineer to re-pressurise the system. If the system requires frequent re-pressuring, ask your Installer or Service engineer to check the heating system for leaks.

The boiler is fitted with an automatic air vent to remove air from the system. Any air trapped in the radiators should be removed by venting the radiators using the vent screw at the top of each radiator. 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. Re-pressurise the system if necessary.

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.**

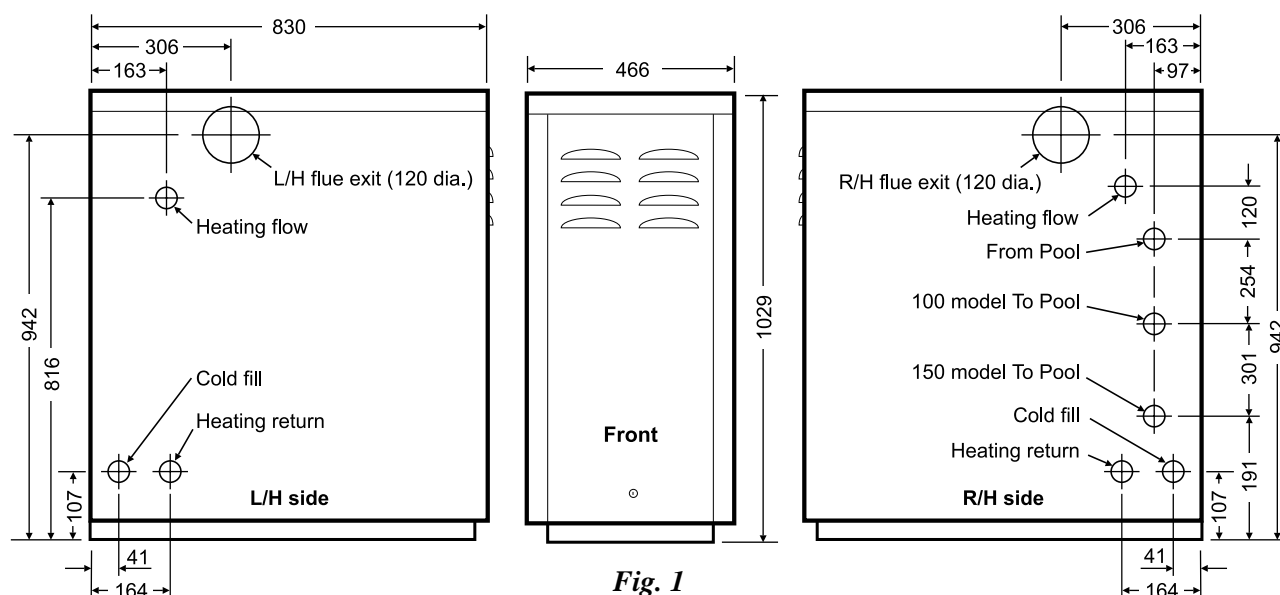


## 2 - BOILER TECHNICAL INFORMATION

### 2.1 Boiler technical data

Model		100	150
Water content	litre	26	26
	gal	5.7	5.7
Weight (dry)	kg	181	184
	lb	398	405
Max. heat input (Kerosine)	kW	30.7	43.7
	Btu/h	104 750	149 140
Flow and return connections (space heating)		2 x 28 mm	2 x 28 mm
Conventional flue		127 mm (5" internal diameter)	
Waterside resistance (space heating)		37.5 mbar	
Flow/Return temp. difference of 10°C		6.1 mbar	
Flow/Return temp. difference of 20°C		28 m	
Maximum static head		1m	
Minimum circulating head		65 to 85°C	
Boiler thermostat range		111°C ± 3°C	
Limit (safety) thermostat switch off temp.		Less than 50°C	
Max. hearth temperature		230/240 V ~ 50 Hz Fused at 5 Amp	
Electricity supply		90 W max.	
Motor power		2.6 Amp	
Starting current		0.85 Amp	
Running current		1/4" BSP Male (on end of flexible fuel line)	
Oil connection		2.5 bar	
Max. sealed system operating press.		12 litre - pre charged at 1.0 bar	
Expansion vessel size		157 litres	
Maximum heating system volume		2.5 bar	
Pressure relief valve		1.0 bar	
Maximum heating system pressure (cold)		0.5 bar	
Minimum heating system pressure (cold)			

### 2.2 Boiler dimensions





### 2.3 Universal Boilers using Class C 28 second kerosine

**Note:** All boilers are despatched for use with kerosine

Model	Heat Output		Net eff ** (%)	Net Heat Input		Nozzle	Oil press. (bar)	Smoke No.	Burner head	Fuel flow rate (kg/h)	Flue gas temp. (°C)	CO <sub>2</sub> (%)	Flue gas mass flow rate (kg/h)
	(kW)	(Btu/h)		(kW)	(Btu/h)								
100	29.3	100 000	96.6	30.6	104 750	0.85/80°EH	9.50	0 - 1	T3	2.55	180	12.0	43.3
150	41.0	140 000	93.8	43.7	149 140	1.25/60°S	8.25	0 - 1	LD3A	3.80	184	12.0	60.5

#### Kerosine Notes:

- 1 The data given above is approximate only and is based on the boiler being used with a low level discharge 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 low level discharge flue models.
- 4 The installer **must** amend the boiler data label if the type of fuel or nozzle used is changed.
- 5 \* Indicates the factory set output.
- 6 \*\* Net thermal efficiency (BSRIA).
- 7 The net flue gas temperatures given above are  $\pm 10\%$ .
- 8 When commissioning, or when the output or fuel is changed, the air damper **must** be adjusted to obtain the correct CO<sub>2</sub> level and the installer **must** amend the data label.

To obtain the correct CO<sub>2</sub> level, the final flue gas reading must be taken with all casing and door panels fitted.

### 2.4 Universal Boilers using Class D 35 second gas oil

**Note:** Conventional flue only

Model	Heat Output		Net eff ** (%)	Net Heat Input		Nozzle	Oil press. (bar)	Smoke No.	Burner head	Fuel flow rate (kg/h)	Flue gas temp. (°C)	CO <sub>2</sub> (%)	Flue gas mass flow rate (kg/h)
	(kW)	(Btu/h)		(kW)	(Btu/h)								
100	29.3	100 000	94.2	32.8	111 750	0.60/60°S	13.50	0 - 1	T3	2.76	184	11.5	43.3
150	41.0	140 000	94.3	43.5	148 470	1.00/60°S	9.80	0 - 1	LD3A	2.97	184	12.0	60.5

#### Gas Oil Notes:

- 1 The data given above is approximate only.
- 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 the low level discharge flue models.
- 4 The installer **must** amend the boiler data label if the nozzle is changed.
- 5 Net flue gas temperatures given are  $\pm 10\%$ .
- 6 \*\* Net thermal efficiency (BSRIA).

To obtain the correct CO<sub>2</sub> level, the final flue gas reading must be taken with all casing and door panels fitted.



## 2 - BOILER TECHNICAL INFORMATION

### 2.5 Swimming pool heat loss calculations

To calculate the heat loss of a given pool the following factors must be taken into consideration:-

- 1 Volume, depth and surface area of the pool.
- 2 The pool water temperature required.
- 3 The average air temperature during the coldest month of use.
- 4 The total hours per day that the pool will be in operation (dependant on the hours that the pool plant is in operation).
- 5 The heat up time required to heat the pool during the coldest month of use.
- 6 Whether the pool is covered and for how long.
- 7 Whether the pool is in the ground or above the ground.
- 8 Any effect caused by the water table (static or moving).
- 9 The degree of exposure (i.e. prevailing wind direction).

The boiler should be sized to heat the pool from cold to the design temperature within 60 hours (assuming no losses).

#### Typical unheated pool water temperature by month

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
°C	3.8	3.8	5.7	7.9	11.2	14.1	16.1	15.8	13.6	10.6	6.5	4.6
°F	38.8	38.8	42.3	46.2	52.2	57.4	61.0	60.4	56.5	51.1	43.7	40.3

#### Calculations

Metric

$$\text{Boiler output required (kW)} = \frac{M2 \times 1000 \times (T2C - T1C)}{H \times 860}$$

- T2C = Required swimming pool temperature °C  
T1C = Initial water temperature from table  
M2 = Volume of the pool  
1000 = Weight of 1 m<sup>3</sup> of water in kg  
860 = Kilocalories per Kwh  
H = Required heat up time in hours

Imperial

$$\text{Boiler output required (kW)} = \frac{\text{Gallons} \times 10 \times (T2F - T1F)}{H \times 3142}$$

- T2F = Required swimming pool temperature °F  
T1F = Initial water temperature from table  
10 = Weight of 1 gallon of water in pounds  
H = Required heat up time in hours  
3412 = Btu in 1 kWh

Calculations assume that the pool is covered during the heat up period. For uncovered pools or pools sited in a water table, the boiler output must be multiplied by 1.4.





#### 3.1 Boiler description

The Universal boilers have an insulated weatherproof enclosure made of galvanised steel with a powder coated finish, and are designed for either internal or external installation, either against a wall or free standing some distance away from the property, as required.

The Universal boilers are part of the Grant range of automatic pressure jet oil boilers designed for use with swimming pools, spas and fully pumped central heating system or providing hot water via an indirect hot water cylinder. They are not suitable for use with either a direct cylinder or 'primatic' cylinder.

The boilers are only suitable for use on a sealed heating system. A separate circulating pump must be fitted for space heating if required.

Two models are available, with maximum inputs of 30.7 kW (104 750 Btu/h) and 43.7 kW (149 140 Btu/h). Both models are despatched pre-set to operate at maximum output on kerosine.

Boilers are supplied with the burner, control panel and sealed system factory fitted.

The control panel incorporates a control thermostat, overheat thermostat (with manual reset button), frost thermostat (factory set to 5°C) and isolating switches for the burner and circulating pump. The burner is pre-wired to the control panel. A separate circulating pump may also be wired into the control panel, if space heating is required.

The temperature of the water leaving the boiler to the pool heat exchanger, radiators or hot water cylinder is User adjustable from 65° to 85°C by means of the control thermostat.

The overheat thermostat (which allows the boiler to be used on a sealed central heating system) will automatically switch off the boiler if the temperature in the heat exchanger exceeds a pre-set temperature of 111°C ± 3°C.

Burners are supplied ready to connect to a single pipe fuel supply system with a loose flexible fuel line (900 mm) and  $\frac{3}{8}$ " to  $\frac{1}{4}$ " BSP male adaptor supplied with the boiler. If required, a two pipe kit is available from Grant Engineering (UK) Limited, to convert the burner for use with a two pipe or Tiger Loop fuel supply.

The low level discharge flue system can be adjusted on site for either left hand, right hand or rear flue outlet position, as required.

#### 3.2 Regulations to comply with

Installation of Universal boilers must be in accordance with the following recommendations:-

- a Building Regulations Parts J, F and L issued by the Department of the Environment and any local Byelaws etc.
- b Model and local Water Undertaking Byelaws.
- c The Control of Pollution (Oil) Regulations.
- d The following OFTEC requirements:-
 

OFST 100	Polythene oil storage tanks for distillate fuels.
OFST 200	Fuel oil storage tanks and tank bunds for use with distillate fuels, lubrication oils and waste oils.
- e SPATA Standards.

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 following British Standard Codes of Practice:-

- |                |  |
|----------------|--|
| BS 799:5:1987  | Oil storage tanks.   |
| BS 5410:1:1997 | Code of Practice for oil firing appliances.                        |
| BS 5449:1990   | Forced circulation hot water systems.                              |
| BS 7593:1992   | Code of Practice for treatment of water in heating systems.        |
| BS 7671:2002   | 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 12 on page 40.

**It is recommended that the appliance is installed, commissioned and maintained by an OFTEC registered or Grant approved technician.**



### 3.3 Delivery

The Universal boiler is supplied in one pack, with the burner, control panel and indirect pool heat exchanger factory fitted. A flue must be ordered separately.

### 3.4 Fuel supply

#### 3.4.1 Fuel storage

A painted (outside only) storage tank must be constructed to BS 799:5:1987 and OFST 200 and should include the following:-

- A fuel level gauge (not a glass type).
- A vent pipe incorporating a weatherproof termination (bend or cap) of a diameter not less than the filling pipe.
- A sludge valve.
- An outlet valve at the opposite end of the tank to the sludge valve.

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.

The tank should be suitably supported so as to obtain a slope of 20 mm per metre towards the sludge valve.

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.

#### 3.4.2 Fuel pipes

- Fuel supply pipes should be of copper tubing with an internal diameter of at least 8 mm. Galvanised pipe must not be used.
- Flexible pipes must not be used outside the boiler case.
- A remote sensing fire valve must be installed in the fuel supply line 1 metre from the point of entry to the boiler, with the sensing head located above the burner using the clip mounted on the underside of the control panel. Recommendations are given in BS 5410:1:1997.
- A metal bowl type filter with a replaceable micronic filter must be fitted in the fuel supply line adjacent to the boiler. A shut-off valve should be fitted before the filter, to allow the filter to be serviced.

- 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 (900 mm) and  $\frac{3}{8}$ " to  $\frac{1}{4}$ " BSP male adaptor are available from Grant Engineering (UK) Limited.
- Flexible fuel lines should be inspected annually when the boiler is serviced and replaced every two years.
- The use of a 'Tankmaster' and Tiger Loop is an ideal way of delivering an oil supply to the boiler. The Tankmaster unit, fitted to the storage tank, includes a filter, sight tube, shut-off valve and fire valve.

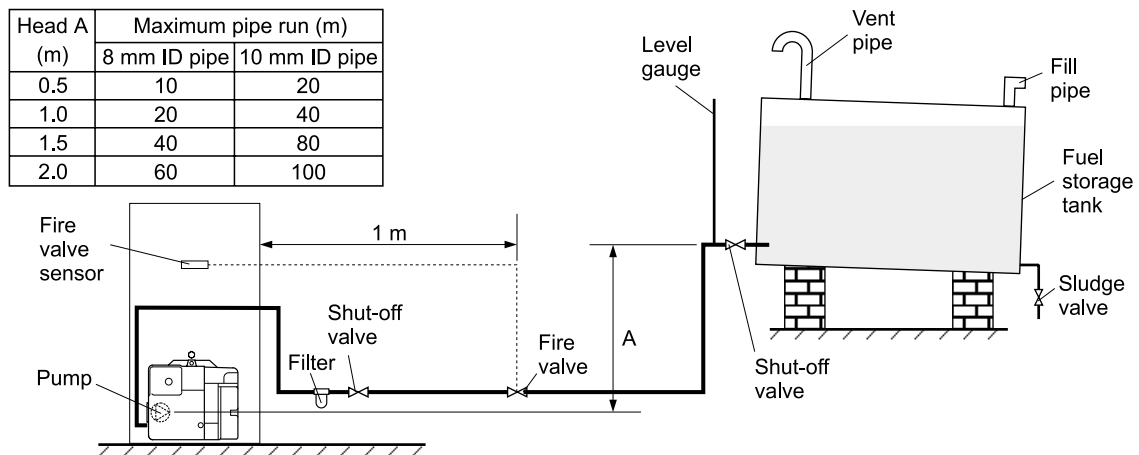
#### 3.4.3 Single pipe system - (See Fig. 2)

- 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.

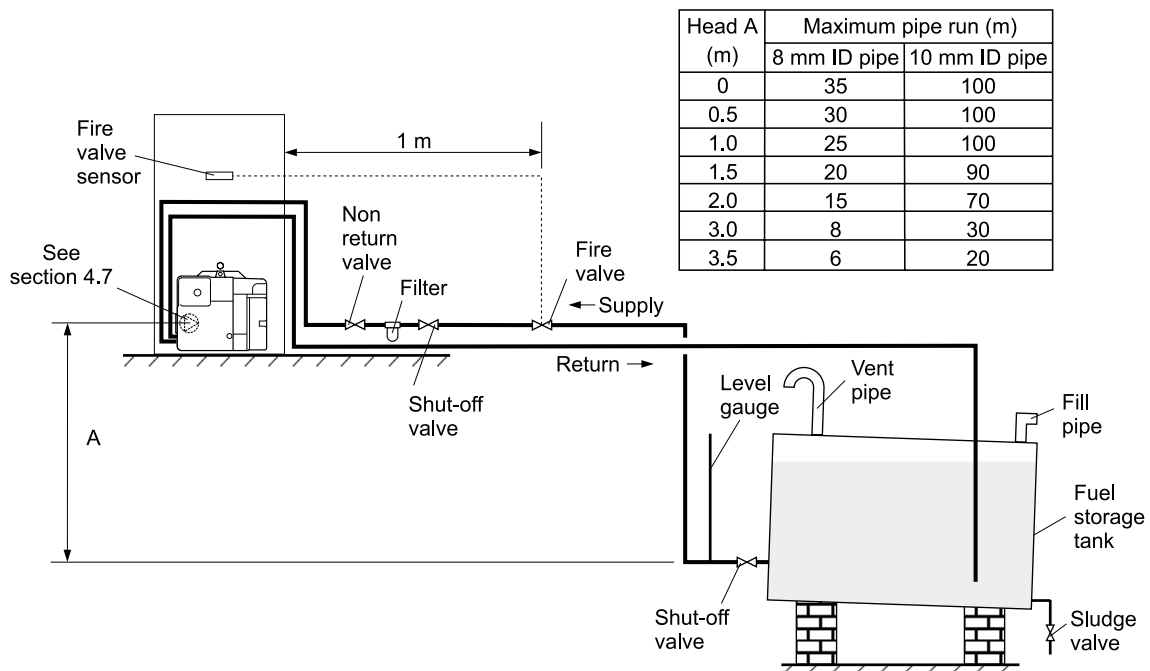
#### 3.4.4 Two pipe system - (See Fig. 3)

- 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. 3. 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. The return pipe must be unrestricted.
- To be used with a two-pipe system, the burner **must** be fitted with an additional flexible fuel line (a flexible fuel line (900 mm) and  $\frac{3}{8}$ " to  $\frac{1}{4}$ " BSP male adaptor are available from Grant Engineering (UK) Limited). See section 4.6.
- The pump vacuum should not exceed 0.4 bar. Beyond this limit gas is released from the oil.

A by-pass plug is supplied with the boiler and must be fitted for two-pipe operation. See section 4.6.



**Fig. 2 - Single pipe system**



**Fig. 3 - Two pipe system**

#### 3.4.5 Tiger Loop system (See Figs. 4, 5)

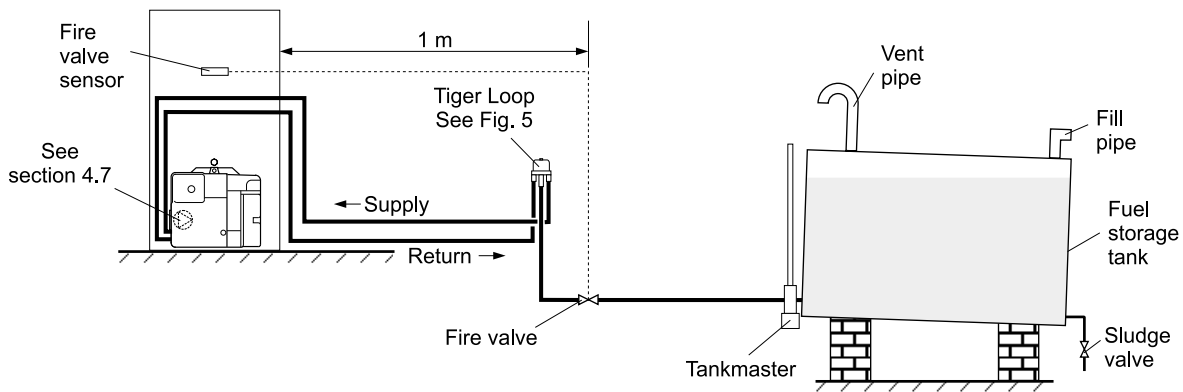
- 1 When The storage tank is below the burner, an alternative to a two pipe system can be achieved using the Tiger Loop oil deaerator. This effectively removes the air from the oil supply on a single pipe lift.
- 2 The Tiger Loop is connected close to the boiler as a two pipe system (omitting the non-return valve) as shown in Fig. 4.  
Refer to the manufacturers instructions supplied with the Tiger Loop. The Tiger Loop **must** be mounted vertically.

- 3 To be used with a Tiger Loop system, the burner **must** be fitted with an additional flexible fuel line (a flexible fuel line (900 mm) and  $\frac{3}{8}$ " to  $\frac{1}{4}$ " BSP male adaptor are available from Grant Engineering (UK) Limited). See section 4.5.

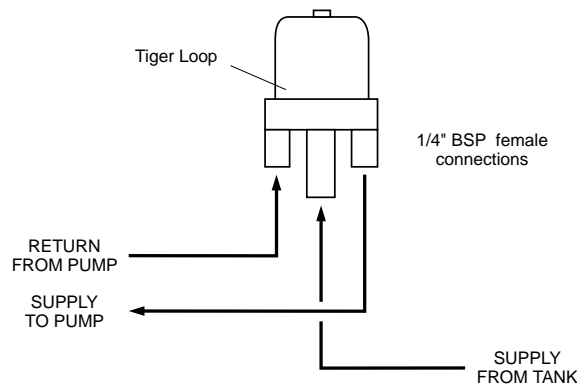
A by-pass plug is supplied with the boiler and must be fitted for two-pipe operation. See section 4.5.



### 3 - GENERAL BOILER INFORMATION



**Fig. 4 - Tiger loop system**



**Fig. 5 - Tiger loop**

#### 3.5 Electricity supply

- 1 A 230/240 V ~ 50 Hz mains supply is required.  
**The boiler must be earthed.**
- 2 The electrical supply to the boiler **and** control system should be fed from a single separate 5 Amp circuit breaker with earth leakage protection, providing 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 mm<sup>2</sup> 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.

#### 3.6 Frost protection

- 1 Universal boilers are supplied with a factory fitted frost protection thermostat, located inside the boiler control panel. This is pre-wired to the boiler electrical system and factory set to 5°C.
- 2 For total system protection against freezing, particularly during extended periods without electrical power, Grant recommend the use of a combined heating system antifreeze and corrosion inhibitor, used in accordance with the manufacturer's instructions.
- 3 **Winterisation** - If the boiler is used only for pool heating, the boiler and system can be drained down during the winter period.

**Ensure that the boiler electricity supply is isolated to prevent the frost thermostat from starting the burner if the boiler has been drained.**



#### 3.7 Air supply - Internal installation only

See Fig. 6

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

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

- The figures given in Fig. 6 indicate the free areas of grilles in mm<sup>2</sup> required **for each kW** of boiler output.
- For a boiler fitted in a compartment, which is ventilated as shown, no additional allowance is necessary.
- Open flue - If the flue is fitted with a draught stabiliser (see section 3.9, paragraph 1), an extra 550 mm<sup>2</sup>/kW of free area should be added to the combustion air inlet.
- Open flue - Extract fans, where needed, should be in accordance with section 4.4.7 in BS 5410 Part 1 1997.

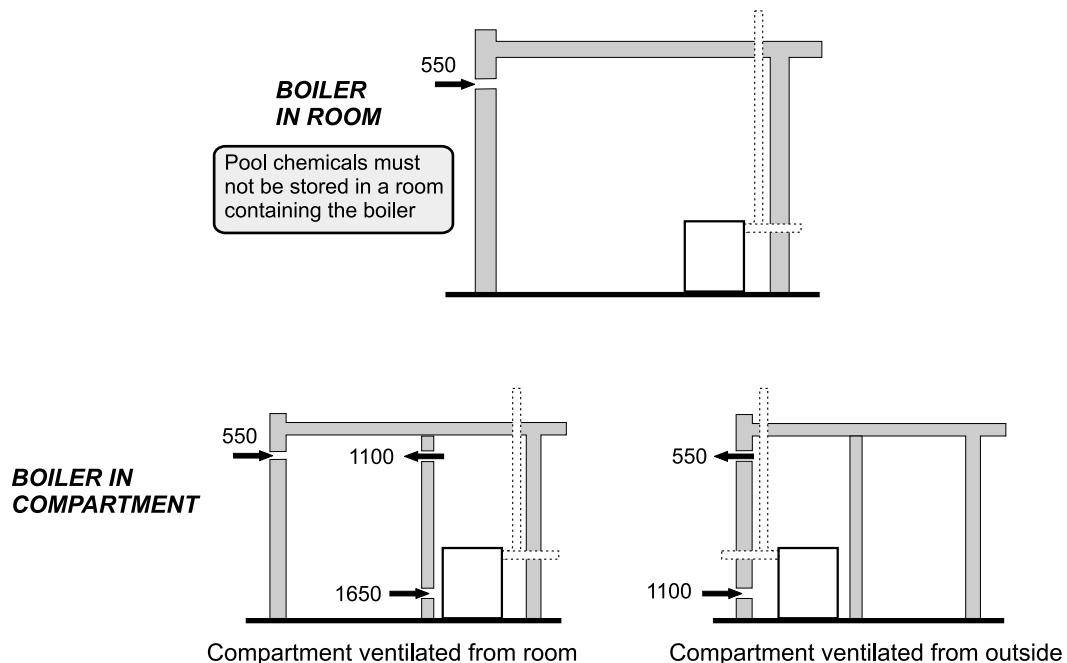


Fig. 6 - Combustion and ventilation air supply

Combustion air required for Conventional flue and Low Level Discharge flues - minimum effective area of air vent required.

	100	150
Each vent to outside	161 cm <sup>2</sup> (25 in <sup>2</sup> )	226 cm <sup>2</sup> (35 in <sup>2</sup> )

Ventilation air required for Conventional and Low Level Discharge flue models.

	100	150
Each vent to outside	161 cm <sup>2</sup> (25 in <sup>2</sup> )	226 cm <sup>2</sup> (35 in <sup>2</sup> )
Each vent to a room	322 cm <sup>2</sup> (50 in <sup>2</sup> )	452 cm <sup>2</sup> (70 in <sup>2</sup> )

**Note:** If the boiler is in a compartment, this **must** be added to the areas required for combustion.



### 3 - GENERAL BOILER INFORMATION

#### 3.8 Low level flue options

The Universal boiler may be fitted with any one of the following flue options for internal and externally sited boilers.

##### Externally sited boilers

A push-fit low level discharge flue terminal can be fitted, projecting from the rear of the boiler casing.

##### Flue kit Part No. UEF150 (rear exit only).

Ensure that the flue outlet and the flue deflector plate are on the same side of the terminal that will face away from the wall. If necessary, the deflector plate and the flue blanking plate may have to be removed and their positions reversed on the terminal.

Ensure that the deflector opening is pointing downwards.

##### Internally sited boilers

Four telescopically adjustable low-level discharge kits are available. All kits are suitable for left and right hand side exit.

**When a rear flue is required, the extra long kit must be used.**

This will ensure that a 600 mm service space is left between the rear of the boiler and the wall. See Fig. 7

Kit Part No.	Description	Wall thickness (mm)
ULF150SRT	Short flue kit	75 - 275
ULF150STD	Standard flue kit	175 - 400
ULF150LNG	Long flue kit	400 - 620
ULF150XL	Extra long flue kit	820 - 1040*

\* Rear exit 220 - 440

When the flue exits from the left hand side panel (when viewed from the front) it is recommended that the boiler is spaced 100 mm off the wall to allow access to the pool unions. This should be deducted from the wall thickness dimensions given in the table above. No gap is required when the flue exits from the right hand side.

A self-spacing wall sleeve is supplied with the flue kit for use where the flue passes through a wall constructed of combustible material. When the sleeve is used, a hole of 120 mm diameter must be cut in the wall.

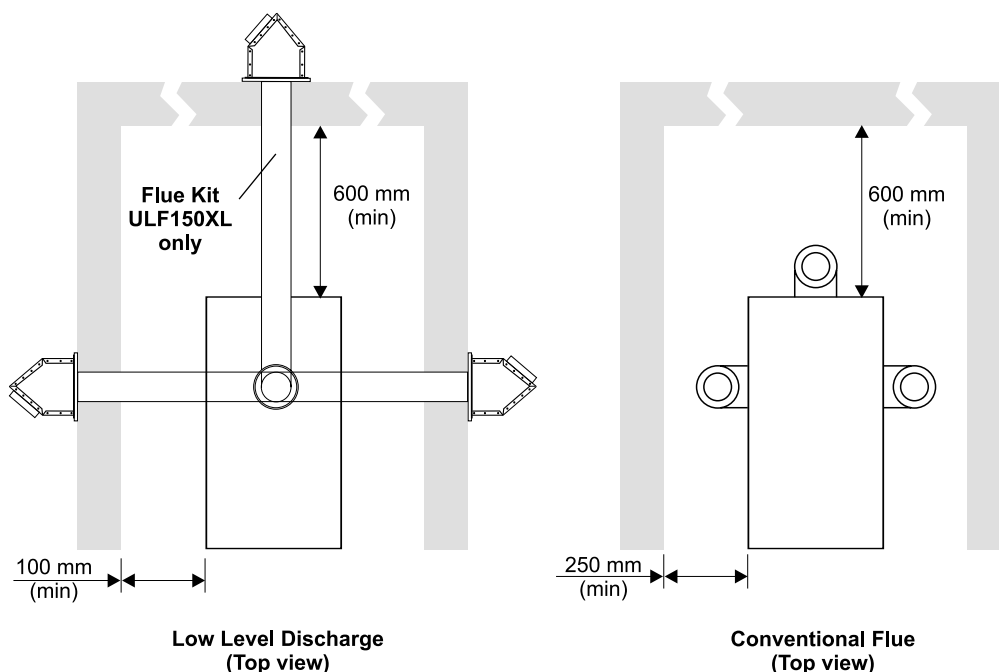


Fig. 7 - Internal sited boiler clearances



#### 3.9 Conventional flue system

##### Internally and externally sited boilers

A push-fit conventional flue elbow can be fitted to the flue pipe projecting from the rear or side of the boiler casing. A conventional flue system, suitable for oil firing pressure jet boilers can be connected to the elbow.

When using a twin wall metal flue system a 100 to 127 mm (4 to 5") boiler increaser is an ideal way to connect to the push-fit conventional flue elbow.

The flue system must be adequately supported.

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 600 mm above the point of exit through the roof or preferably above the ridge level, will normally provide the necessary draught of at least  $8.7 \text{ N/m}^2$  (0.035 in wg) as measured close to the boiler connection. If a draught of  $37 \text{ N/m}^2$  (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. See Fig. 9.
- 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 flue diameter must be 127 mm (5") internal diameter.**
- 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  $45^\circ$  from the vertical. There should be at least 600 mm of vertical flue above the boiler before the first bend.
- 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.
- 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 conventional flue pipe elbow.

In accordance with Spata Standards Vol. 2, pool chemicals must not be stored in the same space as the boiler. Due consideration must be given to the corrosive and toxic nature of chemicals such that controls, heaters and associated components are not affected by chemical vapours.

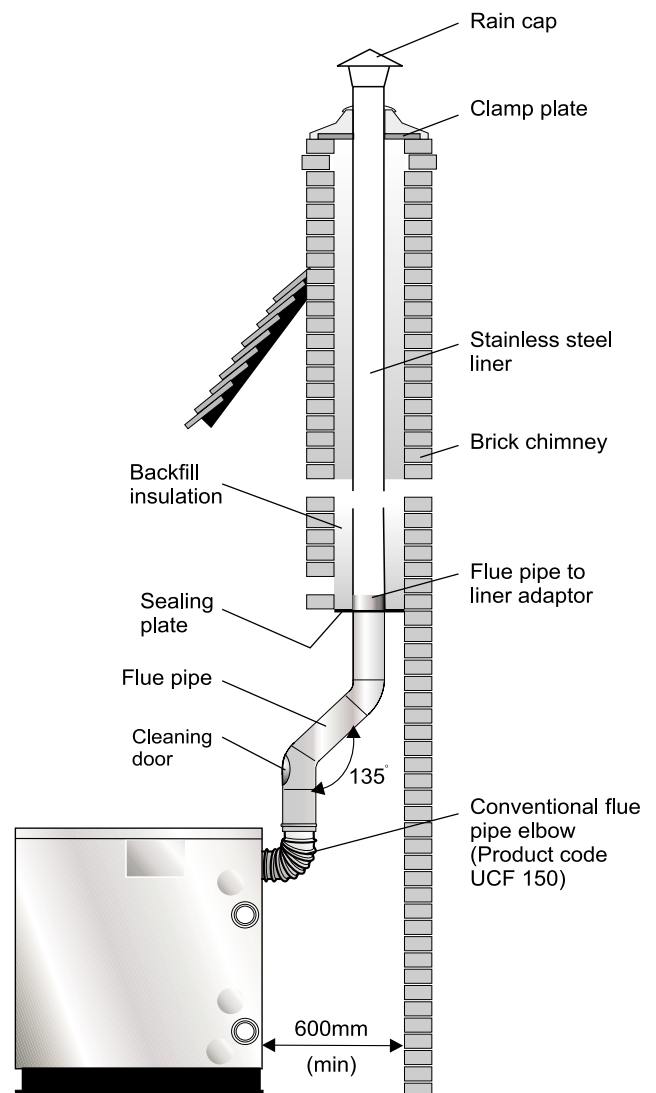


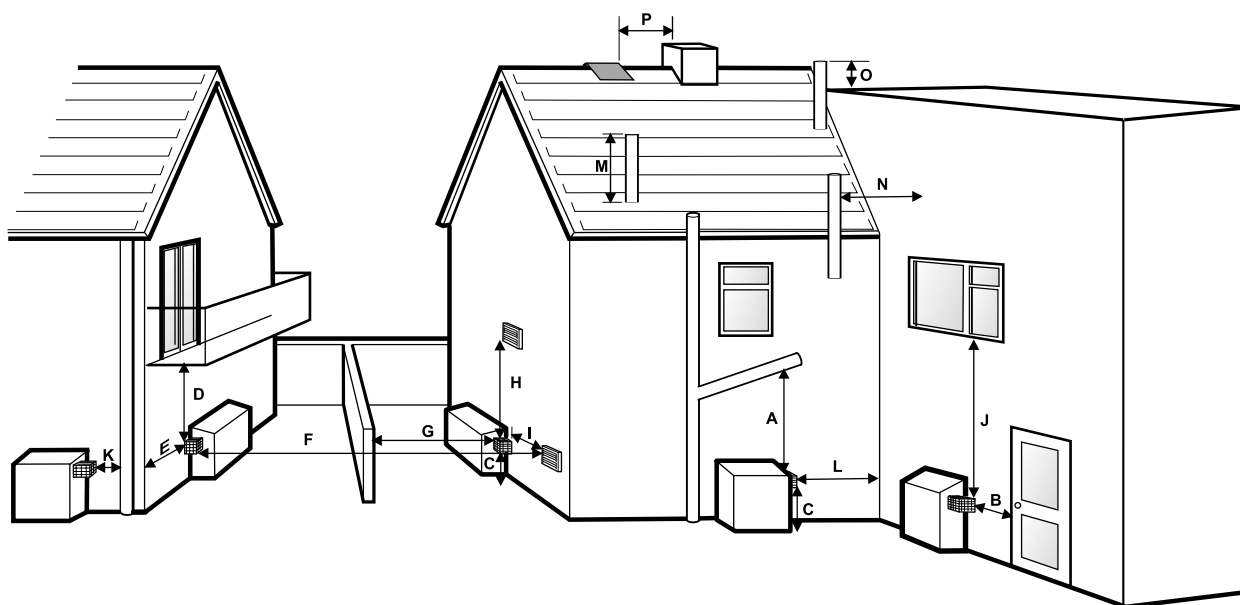
Fig. 8 - Typical conventional flue with brick chimney





### 3 - GENERAL BOILER INFORMATION

#### 3.10 Flue terminal locations



**Fig. 9 - Flue terminal locations**

Terminal position	Min. distance
A Below gutters, eaves or balconies (with protection)	75
B Horizontally from a door, window or air vent	600
C Above ground, flat roof or balcony level	300
D Below gutters, eaves or balconies (without protection)	600
E From an external corner	300
F From a terminal facing the terminal	1200
G From a surface facing the terminal	600
H Vertically from a terminal on the same wall	1500
I Horizontally from a terminal on the same wall	750
J Directly below an opening, air brick, window, etc.	600
K From a vertical drain pipe or soil pipe	300
L From an internal corner	600
M Above the highest point of an intersection with the roof	600
N From a vertical structure on the side of the terminal	750
O Above a vertical structure less than 750 mm from the side of the terminal	600
P From a ridge terminal to a vertical structure on the roof	1500

**Note:** Boiler shown externally sited.  
Clearances also apply to internally sited boilers with through the wall flue kit terminal.





#### 3.11 Boiler location

- 1 The Universal boiler must stand on a solid, level surface capable of supporting the weight of the boiler when full of water, e.g. a prepared concrete standing, paving slabs bedded down on sand/cement, or similar.
- 2 The boiler can be installed either inside a building or externally, either against the building or 'free standing' some distance away from the building.
- 3 The boiler must be positioned such that the required clearances from the low level flue outlet, as shown in Fig. 9, are achieved.
- 4 Adequate clearance must be left around the boiler for servicing. In particular, a minimum clearance of 600 mm above the boiler for removal of the top panel and 600 mm at the opposite end to the flue outlet for access to the burner and 600 mm at the flue outlet end for maintenance.

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

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

- 2 The flow and return pipework can exit the boiler enclosure either through the openings provided in both sides (under the movable cover plates) and through the wall when installed against the building, or down and through the openings provided in the base of the enclosure for 'free standing' installations.
- 3 All water connections have been temporarily sealed with plastic caps to prevent any residual water (from factory pressure testing) leaking from the boiler during storage and transit. **All** the caps must be removed before connecting any fittings. **Plug all unused connections.**
- 4 Fit drain cocks in the central heating and domestic hot water systems to allow the complete system to be fully drained.
- 5 Thoroughly flush the system before fitting the circulating pump.

#### 3.12 Water connections

**The Grant Universal swimming pool boiler is supplied with the pool heat exchanger, pool thermostat, primary circulating pump and by-pass factory fitted.**

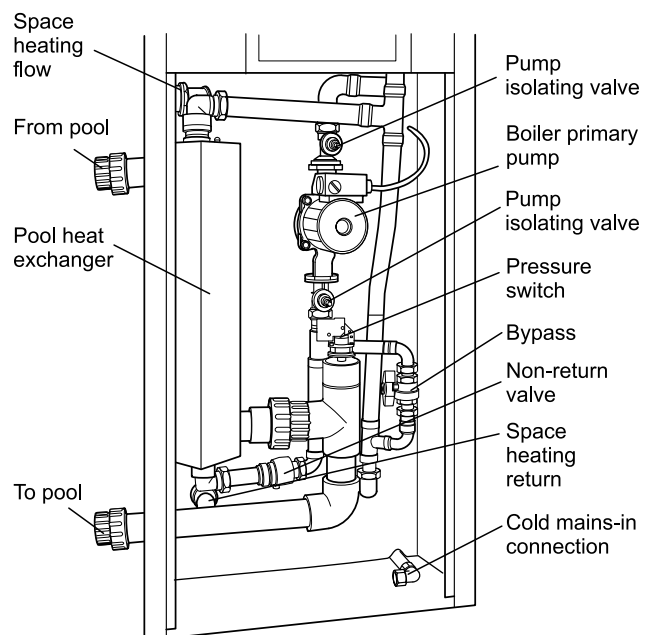
The boiler incorporates two 28 mm fittings to allow the connection of either a space heater, central heating system or an indirect hot water cylinder. The control panel is fitted with a three position switch to enable pool heating only, heating system only or pool and heating system to be selected.

When the combined pool and heating position is selected, the heating system will automatically take priority via the internal boiler relay and no pool heating will be available until the heating system is satisfied.

##### 1 Space heating

Space heating connections are provided in the rear of the boiler (i.e. inside the enclosure on the opposite side of the boiler to the burner). These connections are accessed by removing the back panel of the enclosure.

One high level flow and one low level return 28 mm compression connections are provided. See Fig. 10.



**Fig. 10 - Water connections (rear view of boiler)**



#### 3.13 Typical system layout

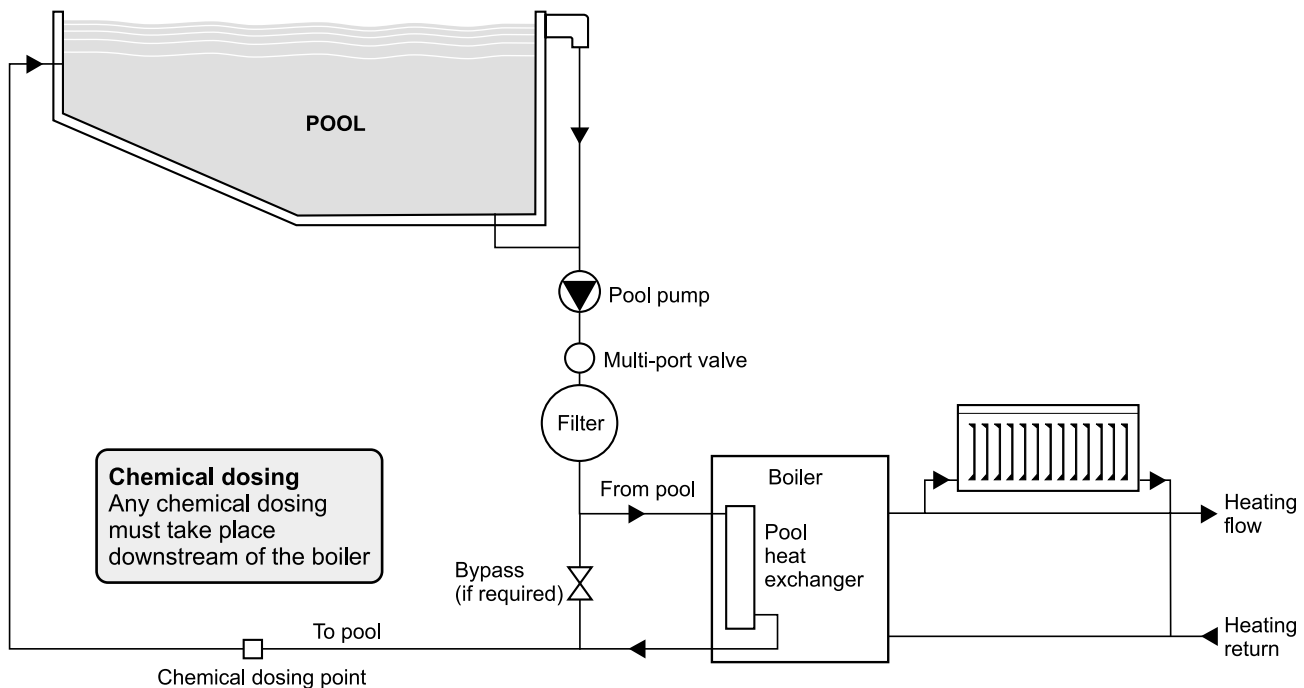


Fig. 11

**Pool By-pass** - The pool heat exchanger recommended flow rate on the pool side is 11 m<sup>3</sup>/h (41 gpm) for the 150 model and 7 m<sup>3</sup>/h (24 gpm) for the 100 model. Where the pool pump flow rate will exceed the recommended flow rate, it is recommended that a by-pass be fitted to the pool pipe work as shown in Fig. 10. The by-pass must incorporate a valve to adjust the flow rate accordingly until a temperature drop of approximately 20°C is achieved across the boiler primaries passing through the pool heat exchanger.

**Boiler primary by-pass** - The boiler has been factory fitted with a 22 mm primary by-pass. The by-pass has been factory set, but may be adjusted if necessary. To adjust the by-pass, run the boiler for 20 minutes and adjust the screw on the by-pass valve until the temperature of the return pipe after the by-pass is approximately 55°C.

**Pool heat exchanger** - The boiler is fitted with an indirect stainless steel (grade 316) pool heat exchanger sited in the rear compartment of the boiler enclosure. A 1½" composite union is supplied for connecting the pipework from the pool (top connection). A 1½" ABS union is supplied for connecting the pipework to the pool (lower connection). See Fig. 1.

#### 3.14 Sealed central heating system

See Fig. 12

- 1 The boiler is 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.  
**Design notes** - when designing the system, the pump head, expansion vessel size, radiator mean temperature, etc. must all be taken into account.
- 2 The boiler is supplied with the following items factory fitted:-
  - a 12 litre diaphragm expansion vessel complying with BS 4814, pre-charged at 1.0 bar.
  - b System pressure gauge, with an operating range of 1 to 6 bar.
  - c Pressure relief safety valve complying with BS 6759 and set to operate at 2.5 bar. The discharge pipe is factory fitted and must be sited 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 Using the expansion vessel as supplied and an initial system pressure (cold) of 0.8 bar, a heating system volume of approximately 157 litres can be used. For further guidance refer to BS 7074:1. Refer to section 5.1 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. 12) 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.
- 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.

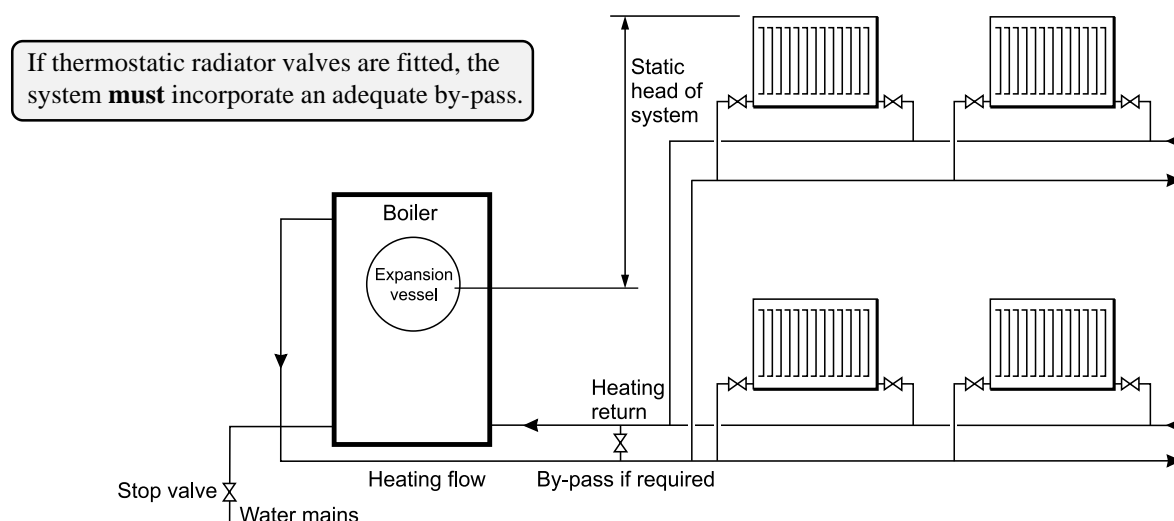
To avoid the danger of dirt and foreign matter entering the boiler the complete heating system should be thoroughly flushed out - before the boiler is connected and then again after the system has been heated and is still hot. This is especially important where the boiler is used on an old system.

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 Superfloc. 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 MB01 or Copal is dosed in accordance with the guidelines given in BS 7593:1992.

Failure to implement the guidelines may invalidate the warranty.



**Fig. 12 - Sealed system**



## 4 - BOILER INSTALLATION

### 4.1 Unpack the boiler

- 1 Carefully remove the packaging from the boiler and lift it off the pallet.
- 2 The two keys (for the lockable access doors) are taped to the top panel of the boiler.
- 3 **For external siting:** The top panel of the casing has been designed so that it may be fitted to create a slight slope away from the side positioned against the wall. To tilt the top panel, loosen the four top panel casing screws, one at each corner and push down on the side furthest from the wall. Tighten the screws. See Fig. 13.

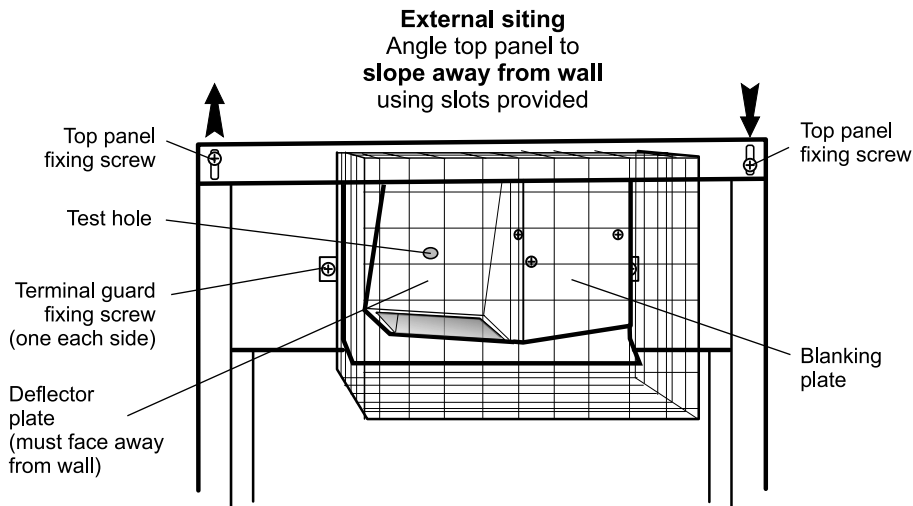


Fig. 13

### 4.2 Preparations for installation

- 1 If the boiler is to be fitted externally against the wall, prepare the wall to accept the heating system pipework. To mark the wall for drilling, refer to Fig. 1 for the positions of the pipework openings in the enclosure sides.

**Note:** Pipework should be insulated where it passes through the wall into the boiler enclosure.

If the boiler is to be installed 'free standing' (i.e. away from a wall) and the space heating pipework run underground, slide away the covers to open the two pipe openings in the base of the boiler enclosure. Using a sharp knife, cut through the polystyrene in the base, around the edge of the holes, to allow the flow and return pipes to enter the enclosure.

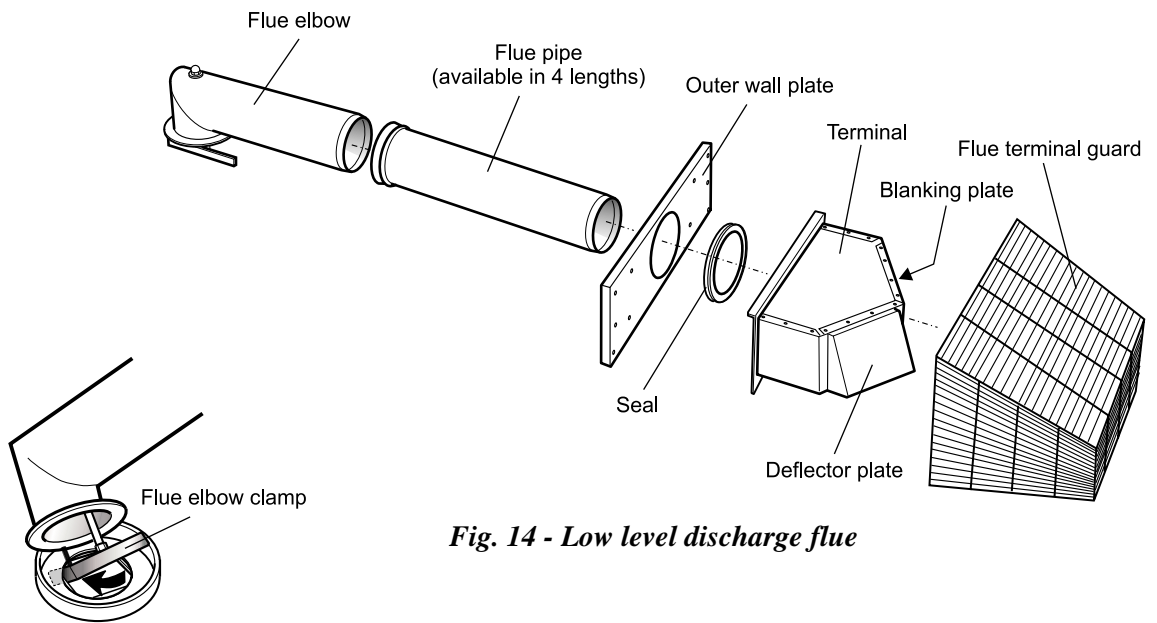
- 2 The electrical supply to the boiler should be routed through the wall in a suitable conduit, such that it enters the boiler enclosure via one of the unused pipework openings. The cable can be routed to the front of the boiler, for connection to the boiler control panel, either over the top or beneath the boiler heat exchanger. Heat resistant PVC cable, of at least 1.0 mm<sup>2</sup> cross section should be used within the boiler enclosure.

- 3 The oil supply line should be installed up to the position of the boiler. Refer to section 3.4.2 for details. The final connection into the boiler enclosure can be made with 10 mm soft copper, routed along the base of the enclosure (either between the enclosure and wall or in front of the enclosure) to enter through one of the holes located in the bottom edge side panel, at the front (burner) end.

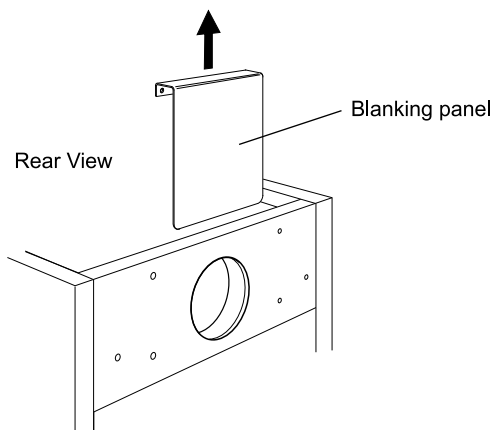
### 4.3 Fit a low level flue (internal siting)

See Fig. 14

- 1 If the boiler is to be positioned internally and fitted with a low level discharge kit. Unpack the kit and remove the top panel of the boiler.
- 2 Remove the push-fit blanking plate from the required flue hole in the boiler casing. See Fig. 15.
- 3 Fit the blanking plate to the spare un-blanked hole in the boiler casing.
- 4 Mark the position of the flue hole on the wall (see Fig. 16) and cut a clearance hole of 120 mm diameter.

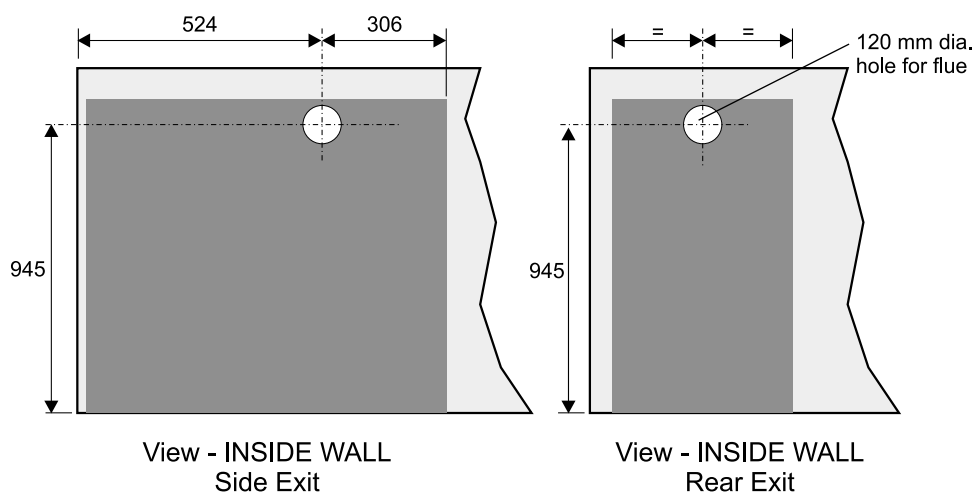


**Fig. 14 - Low level discharge flue**



**Fig. 15 - Flue opening blanking panel**

- 5 Carefully manoeuvre the boiler into position.
- 6 Place the circular white fibre gasket into the boiler flue spigot.
- 7 Take the flue elbow assembly and pass it through the hole in the casing panel.
- 8 Fit the flue elbow flange onto the boiler flue spigot ensuring that the clamp passes through the hole in the top of the boiler. See Fig. 14a.
- 9 Turn the domed nut of the flue elbow clamp clockwise to pull the elbow down onto the boiler spigot, but do not fully tighten it at this stage.
- 10 Fit the flue pipe extension to the flue elbow using a twisting motion. The flue extension seal is pre-lubricated. The end of the extension should project 50 mm from the face of the outside wall.



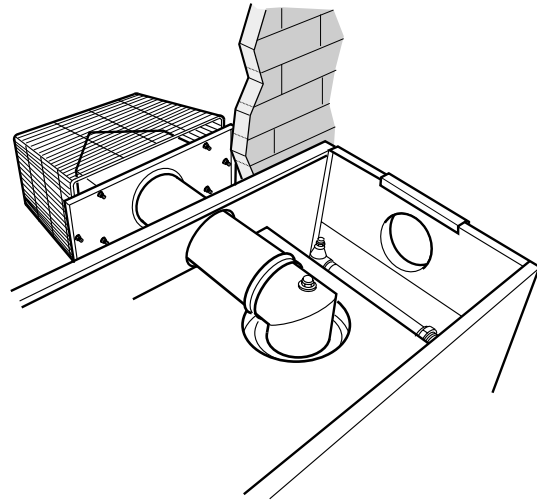
**Note:** Cut a hole 120 mm diameter when used in timber framed buildings or through combustible surfaces.

**Fig. 16 - Prepare the wall**



## 4 - BOILER INSTALLATION

- 11 Take the galvanised outer wall plate and fit the red seal in the hole in the centre of the plate. Apply a smear of the lubricant supplied to the inner lip of the seal.
- 12 Position the wall plate over the flue pipe and mark the four fixing holes on the outer wall.
- 13 Drill four holes and fit the wall plugs supplied. Fix the wall plate to the wall using the woodscrews supplied. A bead of mastic may be applied around the outer edges of the plate for weatherproofing.
- 14 Fit the flue terminal to the wall plate using the pan head screws supplied.
- 15 If required, the flue terminal blanking plate and deflector plate (see Fig. 14) positions may be reversed to suit site conditions, i.e. if the terminal is adjacent to a wall, the blanking plate must be on the side facing the wall.
- 16 Fit the flue terminal guard to the wall plate using the two remaining pan head screws.
- 17 Tighten the flue elbow clamp ensuring a gas tight seal is made. Do not over-tighten the clamp.
- 18 Refit the top panel of the boiler casing using the screws previously removed.



**Fig. 17 - Side flue connection**

- 6 Take the flue terminal and fit it to the rear of the boiler using the pan head screws supplied.
- 7 Ensure that the flue terminal outlet deflector plate is fitted on the side of the terminal facing away from the wall and that the blanking plate is located on the side of the terminal facing the wall. See Fig. 18.
- 8 Fit the terminal guard using the two remaining pan head screws.
- 9 Tighten the flue elbow clamp ensuring a gas tight seal is made. Do not over-tighten the clamp.
- 10 Refit the top panel of the boiler casing using the screws previously removed.

For conventional flue system, refer to section 3.9.

### 4.3a Fit a low level flue (external siting)

#### Flue kit Part No. UEF150

The kit comprises of a flue elbow assembly and gasket, a high temperature 'O' ring seal, stainless steel terminal and a galvanised flue guard.

#### The flue kit is for rear exit only

- 1 Unpack the kit and remove the top panel of the boiler.
- 2 Place the circular white fibre gasket into the boiler flue spigot.
- 3 Take the red seal and fit it in the hole in the rear panel. Lubricate the inner lip of the seal with the lubricant supplied.
- 4 Take the flue elbow and pass it through the seal in the rear panel, taking care not to dislodge the seal. Fit the flue elbow flange onto the boiler flue spigot ensuring that the clamp passes through the hole in the top of the boiler. See Fig. 14a.
- 5 Turn the domed nut of the flue elbow clamp clockwise to pull the elbow down into the boiler spigot. Do not fully tighten at this stage.

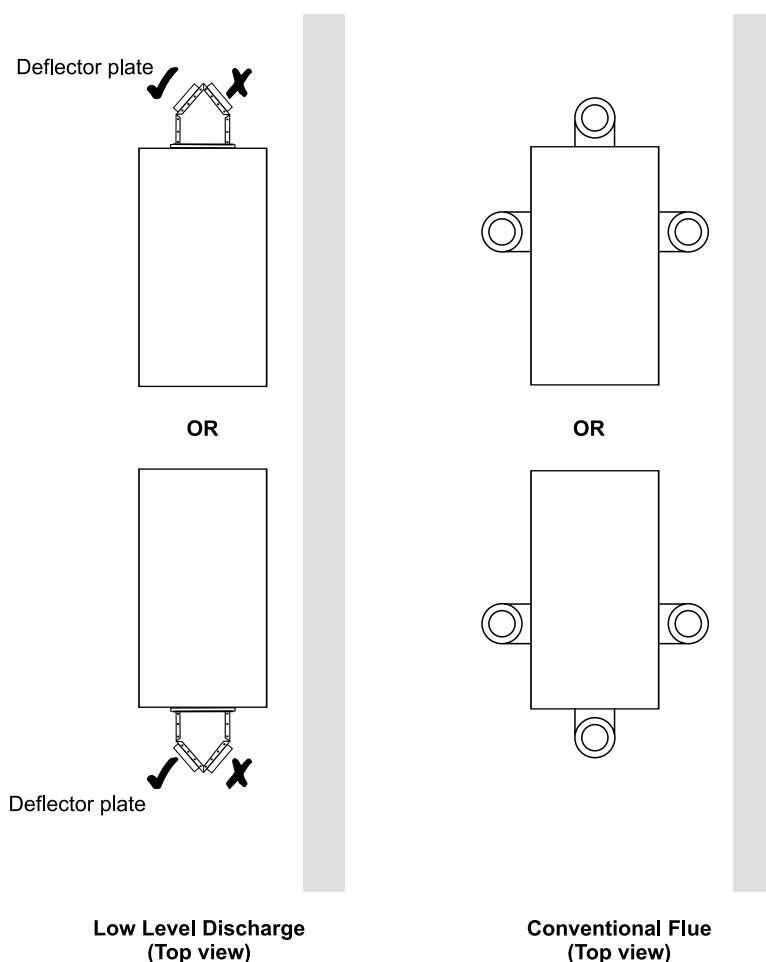
### 4.4 Make the water connections

#### See Fig. 10

- 1 To gain access to the water connections, unlock the back panel and remove it by withdrawing it forwards at the bottom.

Two 28 mm connections (capped) are supplied for space heating. The Pool flow and return connections are 1½" ABS fittings. Two unions are supplied. The brass/ABS composite union should be fitted to the top (flow) connection of the pool heat exchanger using a suitable thread sealant. Remove the protective cap from the top connection and discard.

- 2 To gain access to the burner, unlock and remove the front panel.



**Fig. 18 - External siting deflector plate positions**

### External siting

- 1 Carefully manoeuvre the boiler in position to line up with pipework and complete the water connections.

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

- 2 Fill and vent the water system (see section 4.7) and check for leaks, rectifying where necessary.

### 4.5 Connect the power supply

#### See wiring diagrams in section 7

- 1 Undo the four screws and remove the cover from the control panel to gain access to the two boiler terminal blocks.
- 2 Pass the mains power supply cable through the cable grommet in the control panel, through the cable clamp and connect to the 12-way terminal block as follows:-

#### Terminal 1 - Space heating switched live -

The supply to terminal 1 must be made via a suitable control, such as a room thermostat, that will switch off the supply on space temperature rise to enable pool heating to be resumed once the space heating is satisfied. Do not connect a timer directly to terminal 1, as pool heating will not be resumed until the space heating timer switches off. The space heating control system must incorporate a double pole isolating switch to isolate the supply to terminal 1 for servicing.

#### Terminal 2 - Boiler live supply -

The boiler live supply connection must be made via a double pole isolator to isolate the boiler for servicing. The boiler requires power on terminal 2 to operate both pool and space heating. Do not connect a timer to terminal 2.





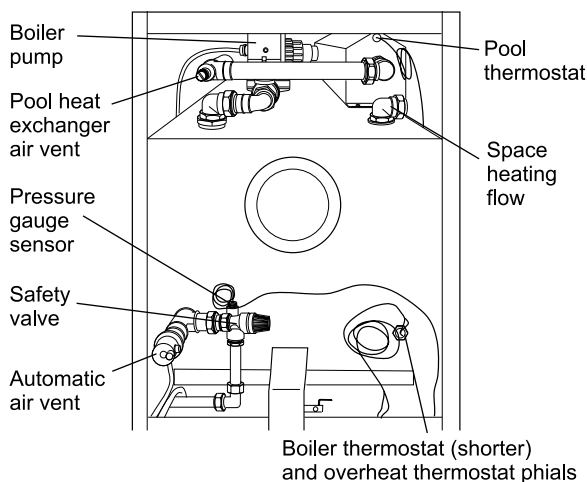
## 4 - BOILER INSTALLATION

**Terminal 3 - Frost thermostat live** - The Universal boiler incorporates a factory fitted frost thermostat set to 5°C. A permanent live supply is required for the built in frost protection thermostat to operate. The live supply for the frost thermostat may be connected via a separate double pole isolating switch or can be connected to the live supply on terminal 2 of the boiler by linking terminal 2 and 3 on the 12-way boiler terminal strip. If space heating frost protection is also required, a separate frost thermostat must be fitted in the space requiring protection. The space heating frost thermostat must be connected via the space heating control system to terminal 1 of the boiler and the boiler supply to terminal 2 must be live to allow the boiler to fire and the space heating pump to operate.

### Terminal 4 - Mains Neutral

### Terminal 5 - Mains Earth

- 3 If an external control system is to be connected to the boiler (e.g. a Y-plan system with programmer, room thermostat, cylinder thermostat, motorised valves, etc.), connect the 'switched live' from the control system to terminal 1. For an example of connecting a typical control system, see Fig. 28 or 29.



**Fig. 19 - Top view of boiler**

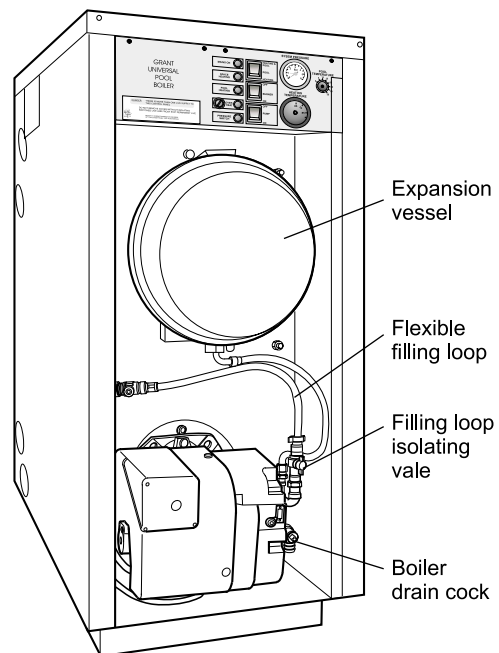
- 4 If the space heating circulating pump is to be fitted, it can be connected to the terminals provided on the 9-way terminal block in the boiler control panel.

Pass the pump power supply cable through the cable grommet in the control panel, through the cable clamp and connect to the terminal block as follows:-

Earth (green/yellow) to terminal 1 - marked E  
Neutral (blue) to terminal 2 - marked N  
Live (brown) to terminal 3 - marked L

- 5 Ensure that the cable clamp is tightened and that all cables are secure.
- 6 Replace the cover on the control panel, with the yellow warning label facing outwards and secure with the four screws.
- 7 Carry out electrical system checks - Short circuit, Polarity, Earth continuity and Resistance to earth with a suitable multimeter.

**Do not switch on the electrical power to the boiler at this stage.**



**Fig. 20 - Front view of boiler**





### 4.6 Expansion vessel pressure

#### Expansion vessel pressure

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, i.e. the height of the highest point of the heating system above the connection on the expansion vessel. Do not pressurise the vessel above 1.5 bar.

The air pressure in the vessel must be checked annually.

The maximum central heating system volume, using the 12 litre expansion vessel as supplied with the Universal boiler is approximately 157 litres. If the system volume is greater, an extra expansion vessel (complying with BS 4841) must be fitted to the system. The charge pressure of the extra vessel must be the same as the vessel fitted on 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.

A simple test to check if the expansion vessel size is adequate, is to fully heat the system and if the pressure rises to no more than 2.3 bar the vessel is adequate. A higher figure indicates that an extra vessel is required.

### 4.6 Fill and vent the sealed system

- 1 An automatic air vent is fitted to the top of the boiler (see Fig. 19). Check that the small cap on the top of the air vent is screwed on fully, then unscrew it one complete turn - the cap remains in this position from now on.
- 2 Ensure that any valves in the heating system pipework are open.
- 3 Ensure that the flexible filling loop is fitted between the shut off valve on the mains water supply and the double check valve on the heating system.
- 4 Open the mains shut off valve and then gradually open the valve on the double check valve until water is heard to flow. The valves are fully open when the operating lever is in line with the valve body and closed when it is at right angles to it.
- 5 Fill the system until the pressure gauge indicates a pressure of approximately 1.5 bar. Close both the filling loop valves and check the system for water soundness, rectifying where necessary.
- 6 If a heating system is connected, vent each radiator in turn, starting with the lowest in the system, to remove the air.
- 7 It is important that the boiler pump (and any external heating pump) is properly vented to avoid it running dry and damaging its bearings. Unscrew and remove the vent plug. Insert a suitable screwdriver into the end of the pump shaft and rotate it at least one complete turn. Replace the plug.
- 8 Check the operation of the pressure relief valve (see Fig. 19) by turning the head anticlockwise until it clicks. The click is the valve lifting off its seat allowing water to escape from the system. Check that this is actually happening, and water flows unobstructed from the relief discharge pipe.
- 9 Continue to fill the system until the pressure gauge indicates 1.0 bar. Close the filling valve and cold water inlet valve and check the boiler and 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.
- 10 The system design pressure (cold) should be between 0.8 and 1.0 bar. This pressure is equivalent to the maximum static head in bar + 0.3 (1 bar = 10.2 metres of water). Set the adjustable pointer on the pressure gauge to the system design pressure.
- 11 On completion of filling, ensure that both filling loop valves are closed and disconnect the flexible hose.

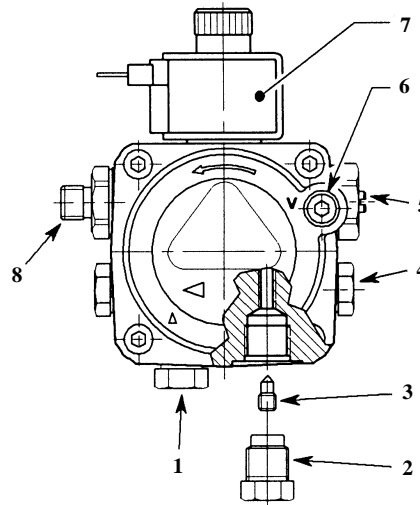


## 4 - BOILER INSTALLATION

### 4.7 Two pipe oil supplies

See Fig. 21

- 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. 21) 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 from Grant Engineering (UK) Ltd.



**Fig. 21 - RDB pump**

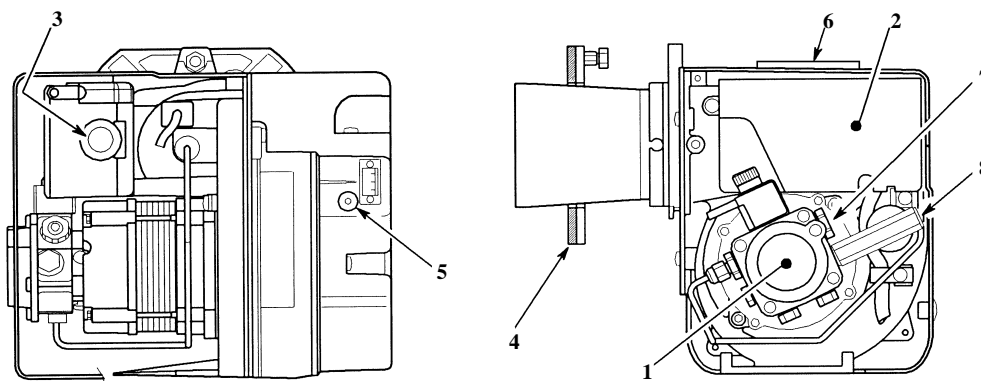
- 1 Oil inlet connection
- 2 Return connection
- 3 By-pass screw
- 4 Pressure gauge connection
- 5 Pressure adjuster
- 6 Vacuum gauge connection
- 7 Solenoid
- 8 Supply to nozzle

### 4.8 Connect the fuel supply

See Fig. 21

If a two pipe system is to be used refer to section 4.7.

- 1 Remove the plug from the fuel pump oil inlet adaptor 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 the enclosure through one of the holes in the bottom of the side panels.



**Fig. 22 - RDB burner components**

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



Refer to Fig. 23 for boiler controls

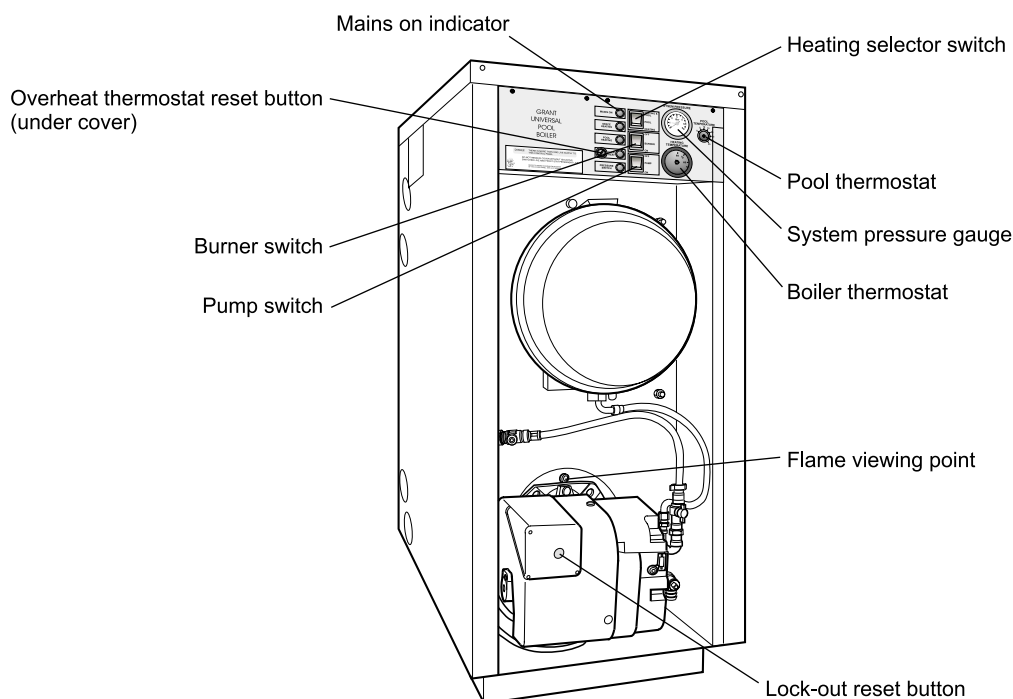


Fig. 23

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

**If the boiler output is to be adjusted from that which is factory, set refer to section 2.3 or 2.4 for the required settings, section 7.4 for burner head/nozzle change instructions and Fig. 23 for baffle plate adjustment as appropriate.**

**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 if sealed system) 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.
- 4 Connect a combined vent manifold and pressure gauge to the pressure gauge connection port on the oil pump. See Fig. 22. Open the vent screw on your vent manifold to vent the supply while the pump is running.
- 5 Check that all system controls are calling for heat and turn the boiler thermostat to maximum. Switch on the electricity supply. Start the swimming pool pump.

**Note:** The boiler will start as soon as the electricity supply to it is switched on.

- 6 The burner fan should start and the burner should light within about 20 seconds. If the burner does not light and the 'Lock-out' reset button lights, wait for about 45 seconds then press the reset button to restart the ignition process. This procedure may have to be repeated several times during first lighting.
- 7 With the burner alight, check the fuel pressure. Refer to the Technical Information, section 2.3 or 2.4. Adjust the pressure if necessary - see Fig. 22.
- 8 Operate the boiler until it reaches normal operating temperature. Check oil pipes for leaks, rectifying where necessary.
- 9 With the burner alight, re-check the fuel pressure and re-adjust if necessary. Turn the boiler off, remove the pressure gauge and replace the plug in the pump.
- 10 Having ensured that there are no oil leaks, replace the burner cover.



## 5 - COMMISSIONING

- 11 Relight the boiler and allow it to run for 20 minutes then check the following:-  
CO<sub>2</sub> level, Flue gas temperature and Smoke Number. Refer to the Technical Information in section 2.3 or 2.4.

Use the hole in the flue deflector plate for flue gas analysis.

A flame viewing point is provided just above the burner (see Fig. 17). Use this to view the flame **not** as a test point.

Insert combustion probe into the end of the flue terminal to measure the CO<sub>2</sub> level.

- 12 Check the smoke number, if satisfactory check the CO<sub>2</sub>. Use the hexagonal key supplied to adjust the burner air damper (see Fig. 22) as required. Turning the screw clockwise closes the damper and increases CO<sub>2</sub> level, turning the screw anticlockwise opens the damper and reduces CO<sub>2</sub> level.

Re-check the smoke number if the air damper has been moved.

Under no circumstances must the smoke number be above 1.

A suitable position for the air damper is one which gives 1% less CO<sub>2</sub> than that which has a smoke number of 1.

**Note: To obtain the correct CO<sub>2</sub> level, the final flue gas reading must be taken with all casing panels fitted.**

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

- 13 Check the flue gas temperature.
- 14 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.
- 15 Switch off the boiler.
- 16 With the hot water system hot, check again for leaks, rectifying where necessary. Drain the system while it is hot to complete the flushing process. Refill and vent (and pressurise if a sealed system) the system.

- 17 A suitable central heating system inhibitor must be added to protect the system against the effect of corrosion.

- 18 Replace the top, front and rear panels, locking the front panel with one of the keys provided.

- 19 Ensure the deflector plate is in position on the end of the flue assembly, then fit the flue terminal guard using the two screws provided.

**Note: After commissioning the boiler you should complete the Commissioning Report on the Guarantee Registration Card. Also complete the Commissioning Report on page 2 of these instructions.**

If the boiler is to be left in service with the User, set the controls and room thermostat (if fitted) to the User's requirements then refer to section 6.

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 and pressure gauge.
- 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.**

**Note:** Do not forget to give the two keys for the door panels to the User.

## 7 - 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 for Kerosine burning appliances. Boilers burning Gas oil should be serviced twice a year.

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

**Important:** Details of every service should be entered in the Service Log, on page 2 of these instructions. This information may be required to validate the Grant extended warranty.

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

### IMPORTANT

Before starting any work on the boiler, or fuel supply please read the health and safety information given in section 12 on page 40.

### 7.1 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 system pressure. Refill, vent and re-pressurise the system as necessary.
- 4 Check that the louvres in the front panel are clear.
- 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, isolate the electricity supply to the burner and pump (if fitted inside the boiler enclosure) and close the fuel supply valve. Allow the boiler to cool.

**Important:** Do not remove the cover from the control panel without isolating the electrical supply at the fused isolator.

The data label on the inside of the enclosure side panel will indicate the nozzle fitted.



## 7 - BOILER SERVICING

### 7.2 Dismantling prior to servicing

- 1 It will be necessary to obtain the key from the User for the front and rear panels. Unlock the panels and remove by withdrawing forwards at the bottom.
- 2 Remove the burner fixing nut (top of the mounting flange) and withdraw the burner. If required, disconnect the flexible oil pipe(s), use a suitable container to prevent any oil spillage.

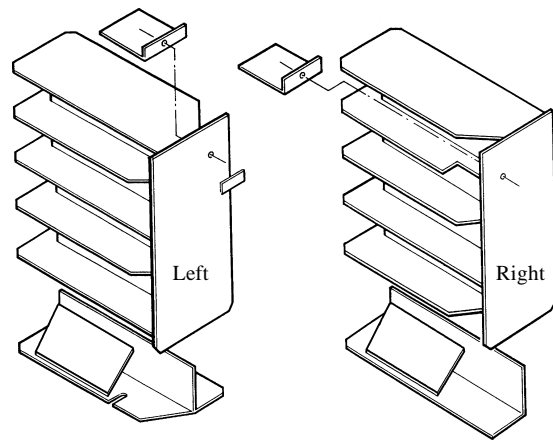
**Note:** If two flexible pipes are connected to the burner, identify (mark if necessary) which is the inlet and return if they are to be disconnected.

### 7.3 Cleaning the boiler

See Fig. 23 or 24

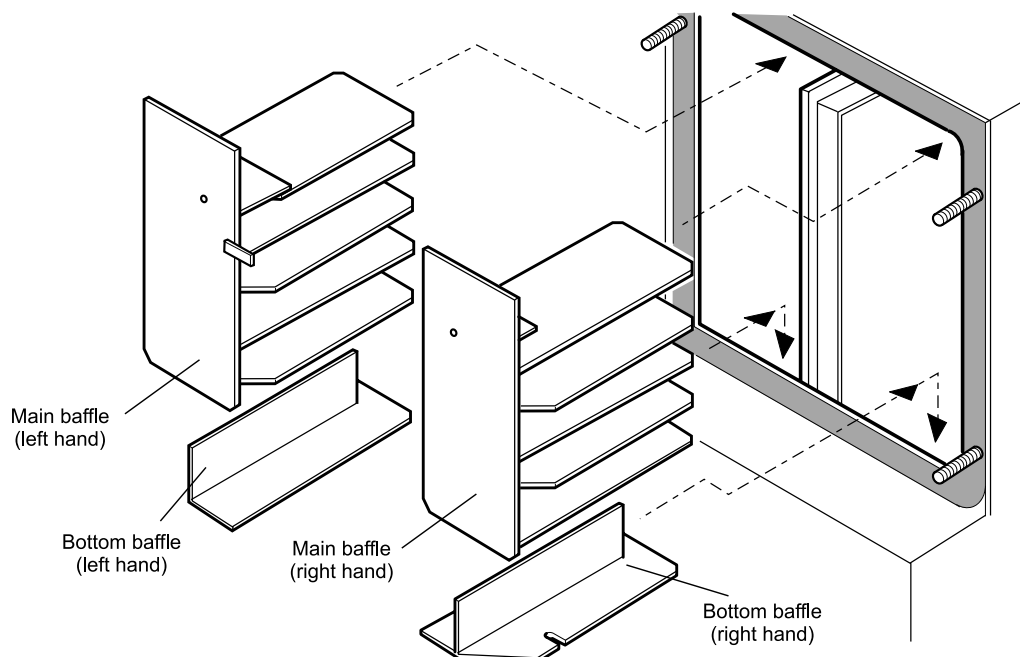
- 1 Lift the expansion vessel off the boiler and carefully place it in front of the boiler.
- 2 Remove the four nuts and washers securing the cleaning cover on the front of the boiler and remove the cover. Take care not to damage the seal.
- 3 Remove the baffles, noting their position (see Fig. 23 or 24).
- 4 Remove all deposits from the baffle plates and all the boiler internal surfaces using a stiff brush and scraper if necessary.

- 5 Check the condition of the flue, clean as necessary.
- 6 Check the condition of the cleaning cover seal, replace if necessary.
- 7 Replace the baffles, ensuring they are correctly fitted. See Fig. 23 or 24.
- 8 Replace the cleaning cover, securing it in position with the nuts and washers previously removed.
- 9 Replace the expansion vessel on to the boiler.



**Note:** Secure plate in position as shown for 150 000 Btu/h input

**Fig. 23 - 150 baffle arrangement**



**Fig. 24 Baffle positioning - 150 baffles shown**



### 7.4 Cleaning the burner

See section 11.1

- 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 3 to 3.5 mm in front of the nozzle, see Fig 25.

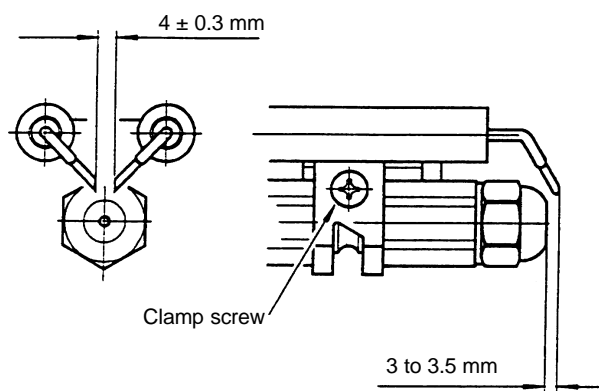


Fig. 25

**IMPORTANT: The electrode settings given above MUST be observed**

- 3 **Nozzle** - Check that the nozzle size and type are correct, refer to table in section 2.3 or 2.4 and boiler data label. Clean the nozzle with kerosine if necessary. Do **not** use a pin or piece of wire to clean the nozzle.  
 Replace the nozzle if a build up of carbon is present. With the combustion head removed, loosen the electrode assembly clamp screw and slide the electrodes away from the nozzle. Remove the nozzle using a good fitting spanner (16 mm). The use of an ill-fitting spanner will damage the nozzle and could lead to an incorrect flame pattern. Always check the electrode settings after replacing the nozzle, see Fig. 25.
- 4 **Photocell** - The photocell is a push-fit in the burner body, see Fig. 26. Carefully pull out the photocell to clean.

- 5 **Fan** - With the air intake grille 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 kerosine. Replace the filter and end cover, ensure the 'O' ring is in position.

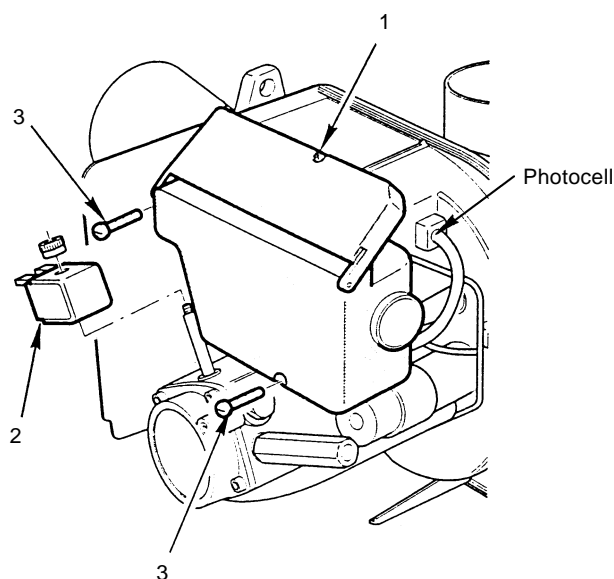


Fig. 26

- 7 **Control box (see Fig. 26)** - With the plastic burner cover removed, loosen the screw (1) securing the cover. Open the cover and remove all components. Remove the oil pump solenoid (2) and loosen the two screws (3). Move the control box slightly and disconnect the high voltage leads.

Re-assemble in reverse order.

**To ensure safe and efficient operation of the boiler it is important that re-commissioning is carried out, especially combustion checks (CO<sub>2</sub> level, flue gas temperature and smoke number) after the boiler has been serviced.**

Refer to the Commissioning instructions starting on page 27.



## 8 - WIRING DIAGRAMS

### 8.1 Universal boiler wiring diagram

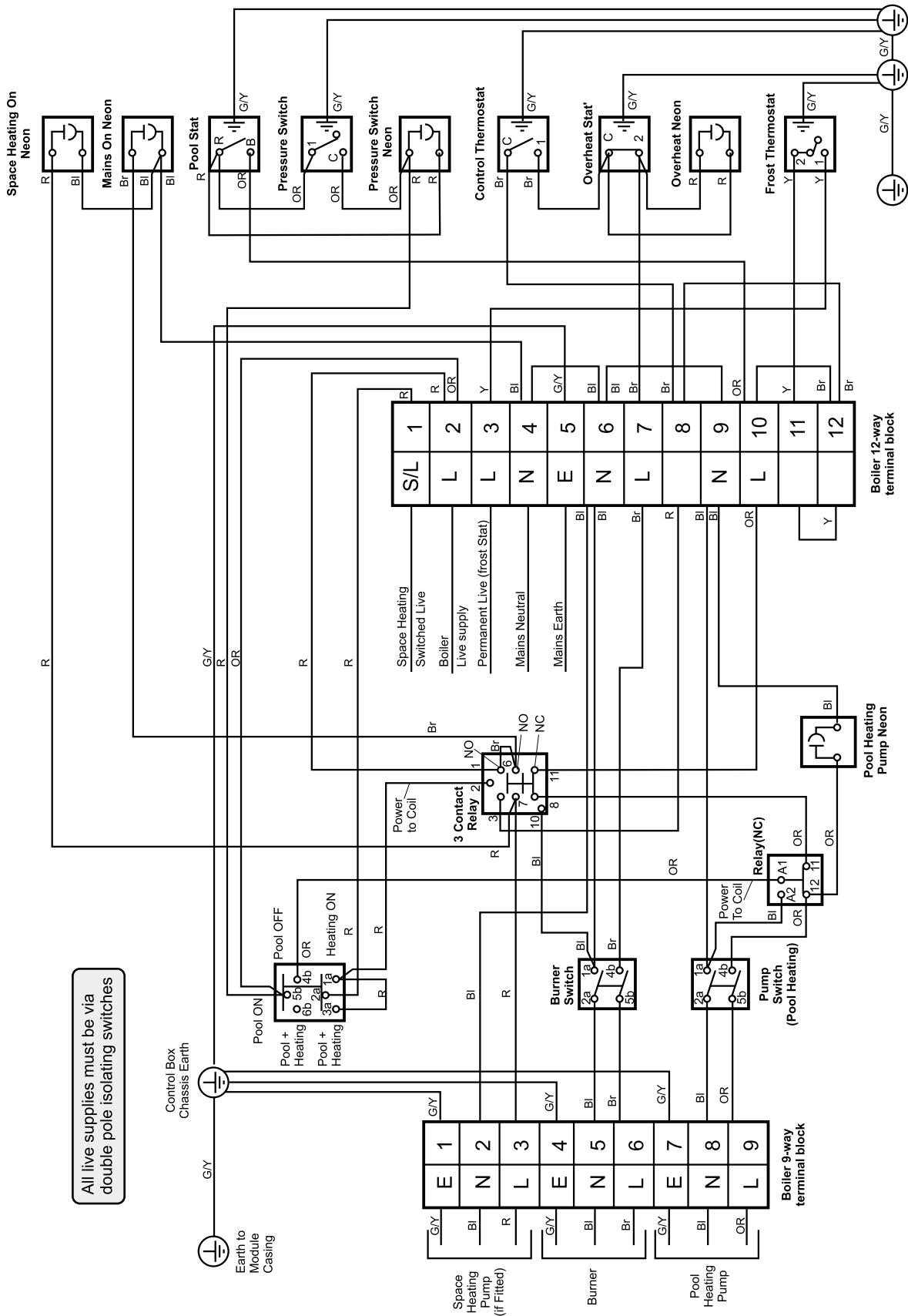


Fig. 27





## 8.2 Typical space heating control system wiring diagrams

### a Honeywell Y Plan - Hot water controlled by mid position valve

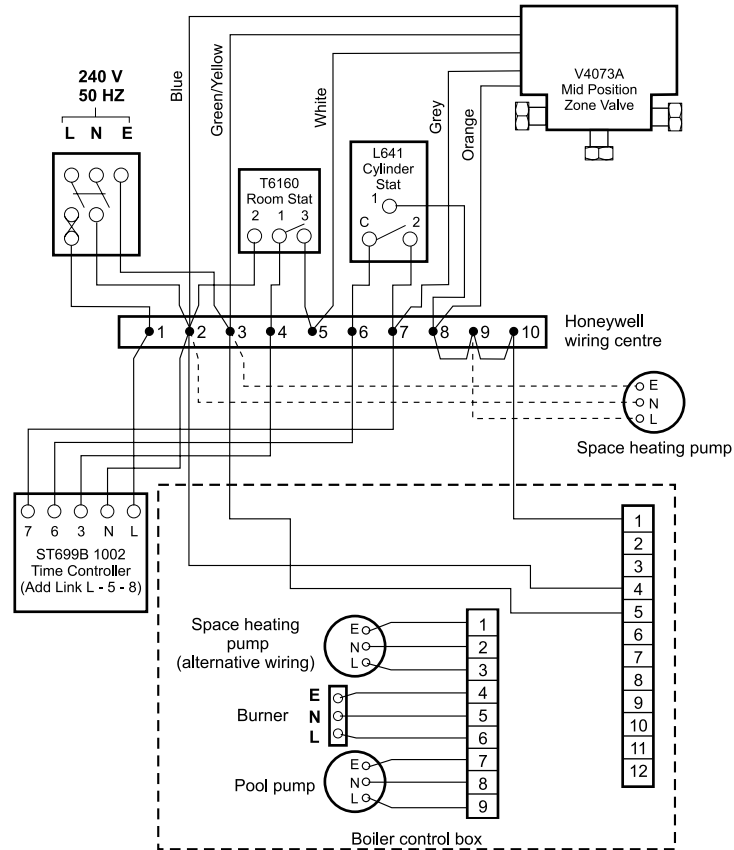


Fig. 28



## 8 - WIRING DIAGRAMS

### b Honeywell S Plan - Hot water and Central heating controlled by two valves

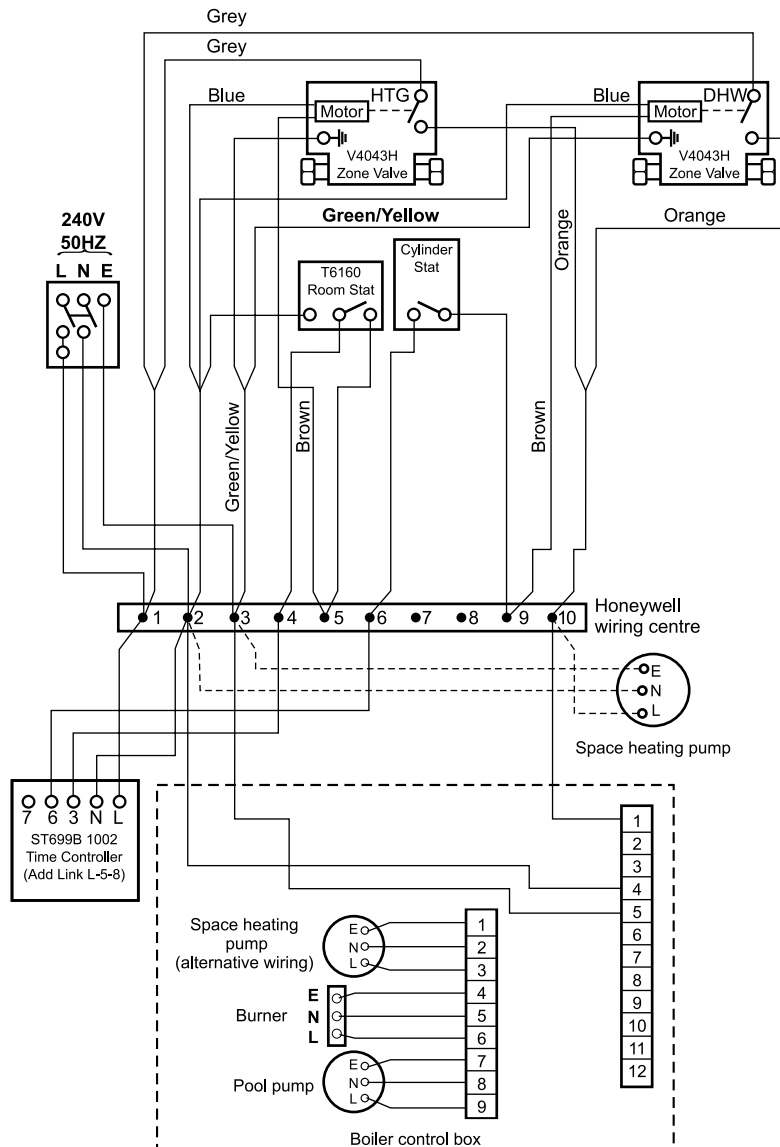


Fig. 29



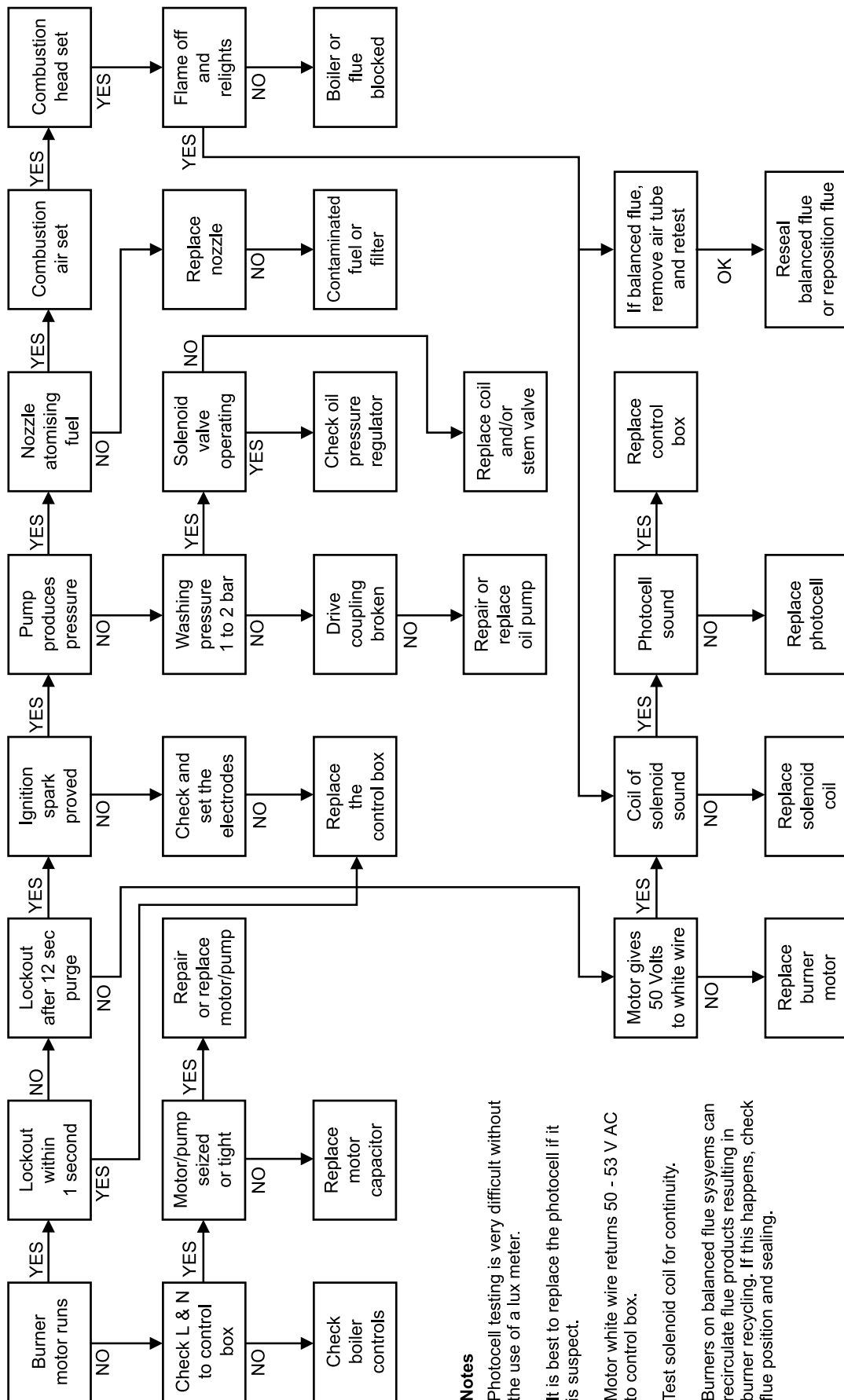
### 9.1 Boiler fault finding

**Warning:** Always isolate the electricity supply to the boiler before working on the boiler.

<b>Faults</b>	<b>Remedies</b>
<b>Boiler will not start</b>	
1 Pressure switch activated.	Pool pump not running. Pool filter blocked.
2 Primary pump not running.	Pool thermostat satisfied. Pool thermostat faulty. Pressure switch activated.
3 No fuel supply.	Ensure that an adequate supply of fuel is available and that the fuel supply valve is open. Check the condition of the fuel filter, clean if necessary. Ensure fuel supply is reaching burner and vent pump.
4 No electricity supply.	Ensure electricity supply to the boiler is switched on and that <b>all</b> controls are calling for heat. Ensure that the overheat thermostat has not tripped, reset if necessary. Check that a mains supply is present at the burner terminal block. If not, check the boiler and overheat thermostat.
5 Burner not starting - fuel and electricity supplies present.	Press the reset button on the burner control box if it is lit. Refer to burner fault finding flow diagram.
6 Burner lights but goes to 'lock-out'.	If the flame is unstable, check the combustion settings. Refer to burner fault finding flow diagram.
<b>Boiler works but:-</b>	
7 Visible smoke from flue or high smoke number.	Insufficient air supply - check the air damper setting and the condition of the fan. Check the nozzle size and type. Fuel pressure may be too high - check and adjust.
8 Burner pulsates.	Insufficient air supply - check the air damper setting and the condition of the fan. Check the nozzle size and type.
9 Flame slow to stabilise during start up.	Insufficient air supply - check the air damper setting and the condition of the fan. Check the nozzle size and type. Fuel pressure may be too low - check and adjust. Insufficient draught - clean boiler heat exchanger and check condition of flue.
10 Water temperature low.	Undersize nozzle and/or low fuel pressure. Check condition of boiler heat exchanger and clean if necessary. Check the boiler thermostat. Check the combustion settings. Check the condition of the fuel filter.
11 Boiler operating on overheat thermostat.	Faulty boiler thermostat.
12 Oil odours.	Check all fuel line connections, remake as necessary.
13 Combustion fumes smell.	Check boiler cleaning cover and seal are correctly fitted. Check burner is correctly fitted onto flange. Check flue is correctly sealed into flue outlet of boiler.

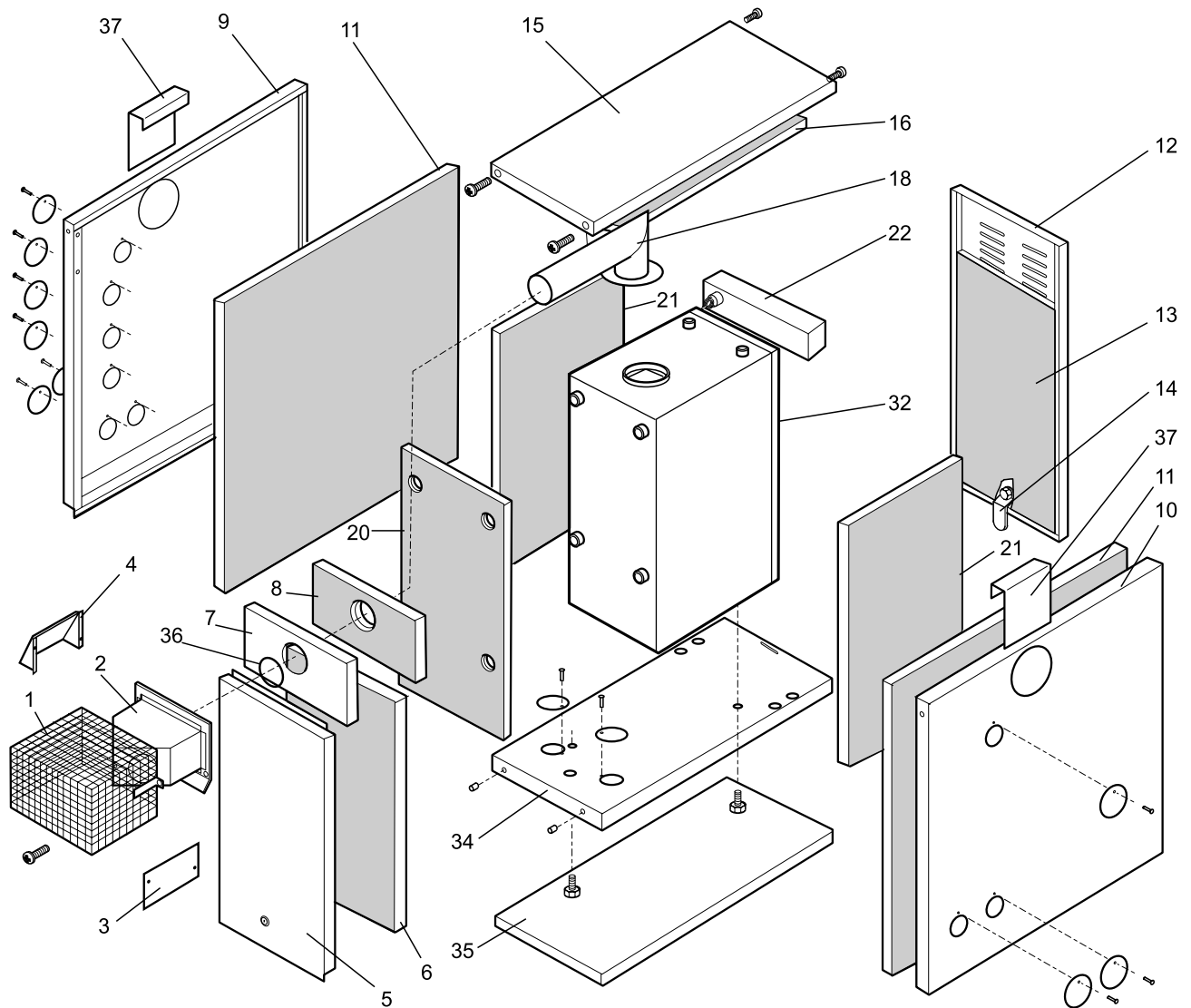


### 9.2 Riello RDB burner fault finding





## 10.1 Universal boiler - exploded view



### Key No. Description

1	Flue terminal guard
2	Flue terminal
3	Flue blanking plate
4	Wind deflector plate
5	Rear panel (lower)
6	Rear panel (lower) insulation
7	Rear panel (upper)
8	Rear panel (upper) insulation
9	Right side panel
10	Left side panel
11	Side panel insulation (L/R)
12	Front panel

### Key No. Description

13	Front panel insulation
14	Front panel lock
15	Top panel
16	Top panel insulation
17	Not applicable
18	Flue elbow
19 *	Boiler insulation (front)
20	Boiler insulation (rear)
21	Boiler insulation (side L/R)
22	Control panel assembly
23 *	Boiler thermostat
24 *	Overheat thermostat

### Key No. Description

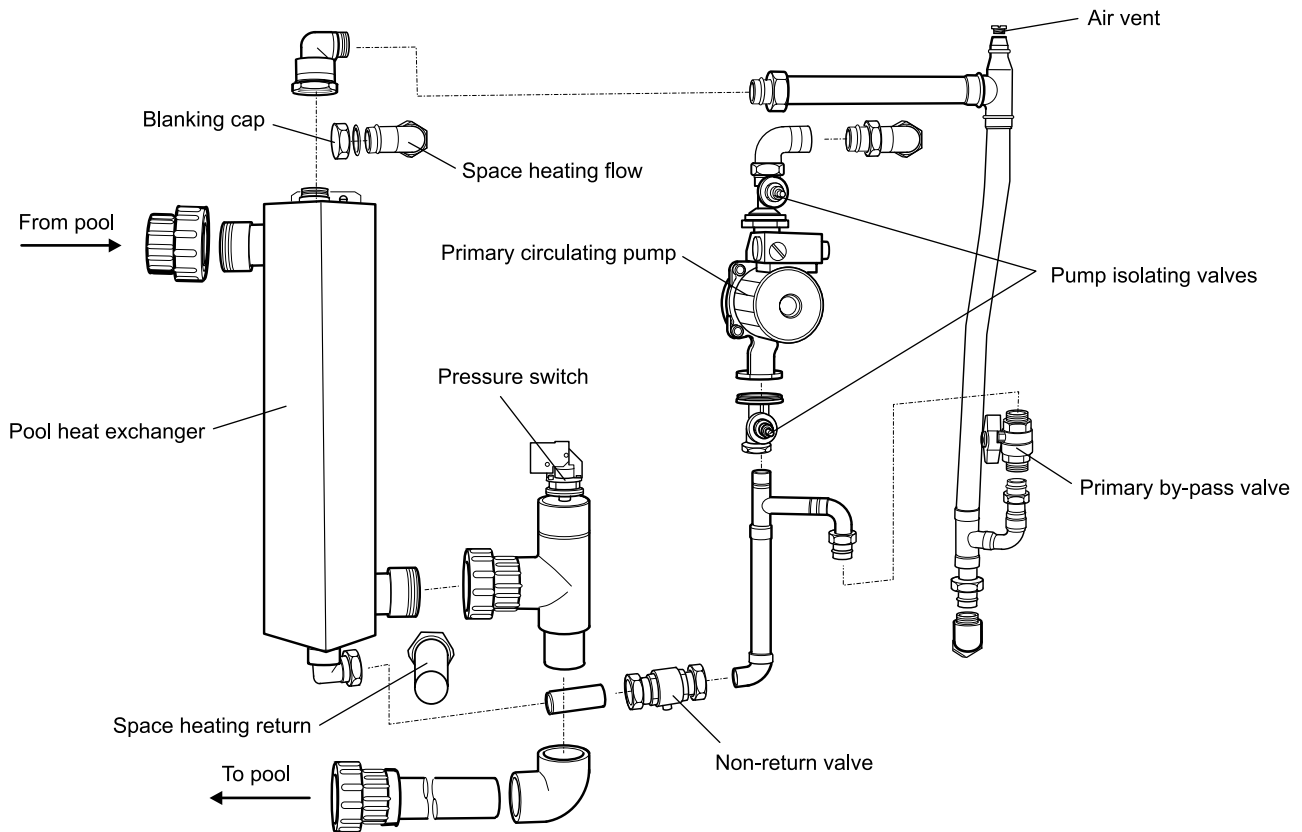
25 *	Frost thermostat
26 *	On/Off switch
27 *	Baffle (Bottom LH)
28 *	Baffle (Bottom RH)
29 *	Baffle (Top LH)
30 *	Baffle (Top RH)
31 *	Thermostat pocket
32 *	Cleaning cover
33 *	Cleaning cover seal
34	Base panel insulation
35	Base panel
36	'O' ring - exhaust seal
37	Flue blanking plate

\* Item not shown in exploded view.

**IMPORTANT: You MUST specify the boiler model when ordering spare parts.**

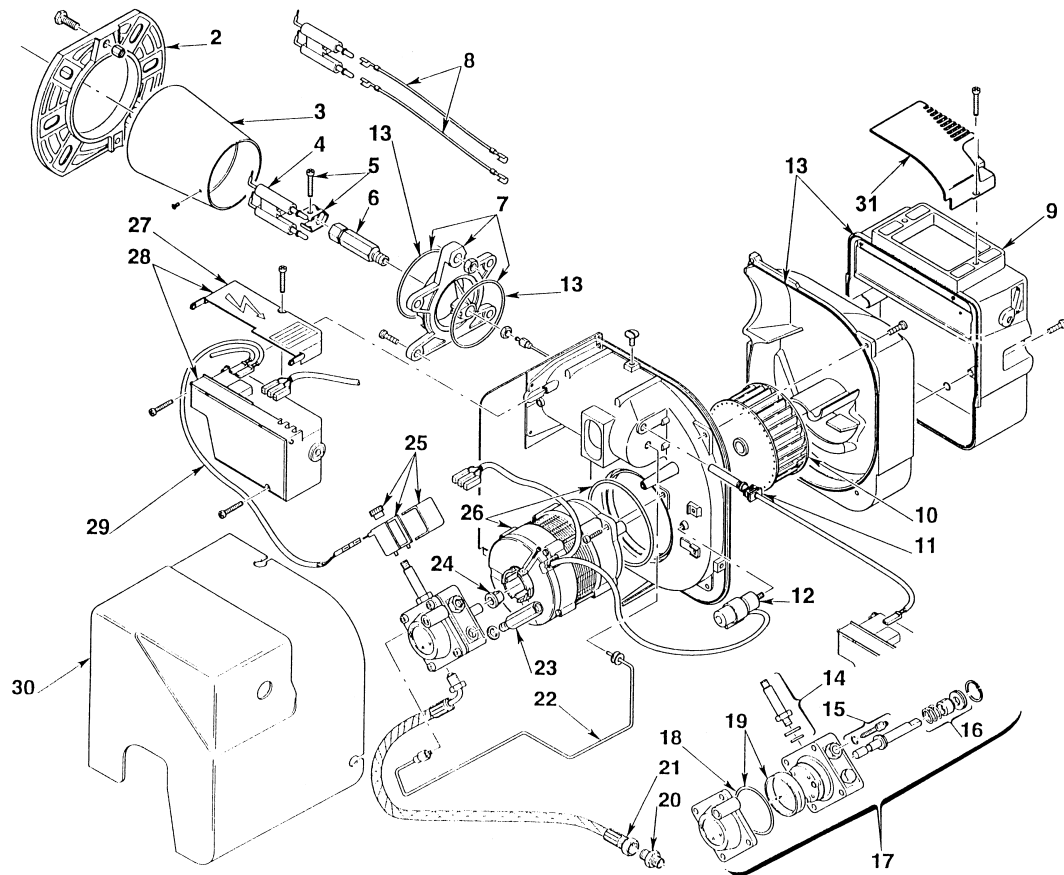


### 10.2 Pipework components - exploded view





## 11.1 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	-	-	16	Pump seal	3000439	RBS14
2	Flange	3005786	RBS28	17	Pump	3008654	RBS101
3	Combustion head (100) T3	3002447	RBS144	18	'O' ring	3007162	RBS08
3	Combustion head (150) LD3A	3008769	RBS128	19	Filter - 'O' ring	3008653	RBS122
4	Electrodes	3007513	RBS108	20	Connector	3003602	RBS35
5	Electrode bracket	3006552	RBS29	21	Flexible pipe	3007672	RBS36
6	Nozzle holder	3008642	RBS111	22	Tube	3008644	RBS113
7	Collar	3008643	RBS112	23	Pressure gauge connector	3008876	RBS138
8	High voltage lead	3008794	RBS129	24	Drive coupling	3000443	RBS16
9	Air damper assembly	3008647	RBS116	25	Solenoid	3008648	RBS117
10	Fan	3005708	RBS39	26	Motor	3008650	RBS102
11	Photocell	3008646	RBS115	27	Cover	3008649	RBS118
12	Capacitor 4 µF	3007479	RBS107	28	Control box assembly	3008652	RBS103
13	Seal kit	3008878	RBS140	29	Solenoid lead	3008851	RBS139
14	Needle valve	3007582	RBS109	30	Cover	3008879	RBS141
15	Regulator	3008651	RBS120	31	Air intake cover		RBS142



## 12 - HEALTH AND SAFETY INFORMATION

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

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

The following other materials are present in the product:

### *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.

### *Kerosine 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.





We declare that the Universal range of 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)





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



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



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