

Shaftesbury HE Series Boilers

**Gas/Oil Fired Cast Iron Sectional Boilers
110kW to 400kW**

Installation, Commissioning and Servicing Instructions

*NATURAL GAS I_{2H}
LPG-PROPANE I_{3P}
CLASS D (35 sec fuel oil)*

IMPORTANT NOTE

**THESE INSTRUCTIONS MUST BE READ
AND UNDERSTOOD BEFORE INSTALLING,
COMMISSIONING, OPERATING OR
SERVICING EQUIPMENT**

Customer Services

Technical Enquiries



01202 662527/662528

To supplement the detailed technical brochures, technical advice on the application and use of products in the Hamworthy Heating range is available from our technical team in Poole and our accredited agents.

Site Assembly



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Hamworthy offer a service of site assembly for many of our products in instances where plant room area is restricted. Using our trained staff we offer a higher quality of build and assurance of a boiler built and tested by the manufacturer.

Commissioning



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Commissioning of equipment by our own engineers, accredited agents or specialist sub – contractors will ensure the equipment is operating safely and efficiently.

Maintenance Agreements



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Regular routine servicing of equipment by Hamworthy service engineers inspects the safety and integrity of the plant, reducing the risk of failure and improving performance and efficiency. Maintenance agreements enable our customers to plan and budget more efficiently.

Breakdown service, repair, replacement



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Hamworthy provide a rapid response breakdown, repair or replacement service through head office at Poole and accredited agents throughout the UK.

Spare Parts



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A comprehensive spare parts service is operated from our factory in Poole, providing replacement parts for both current and discontinued products. Delivery of parts and components is normally from stock within seven days. However, a next day delivery service is available for breakdowns and emergencies.

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NOTE: THESE INSTRUCTIONS SHOULD BE READ AND UNDERSTOOD BEFORE ATTEMPTING TO INSTALL, COMMISSION OR OPERATE THIS UNIT

THE SHAFTESBURY HE BOILER IS INTENDED FOR USE AS A COMMERCIAL APPLIANCE

THE GASED FIRED VARIANTS OF THIS BOILER ARE FOR USE ON GROUP H NATURAL GAS (2ND FAMILY) I_{2H} OR LPG-PROPANE (3RD FAMILY) I_{3P}. THE OIL FIRED VARIANTS ARE FOR USE ON CLASS D (35sec FUEL OIL). PLEASE ENSURE RELEVANT INFORMATION REQUIRED WITHIN DOCUMENT IS FOUND RELATING TO SPECIFIC FUEL TO BE FIRED BEFORE FIRING BOILER.

THIS BOILER COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.
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1.0 INTRODUCTION

1.1 The Shaftesbury HE boiler range consists of 10 gas or oil fired cast iron sectional boilers with outputs ranging from 110kW to 400kW. Refer to Technical Data in Section 16.0 for details on Natural gas, Appendix A for Propane and Appendix B for Oil firing.

Shaftesbury HE boilers can be used individually, or in a multi-boiler configuration, and are suitable for use on either open-vented or sealed low temperature hot water heating systems. For hot water production they can be used in conjunction with calorifiers or indirect hot water cylinders.

Stacking kits are available for pairs of Shaftesbury HE boilers and are assembled on site to HHL instructions 500005091 in combination with this manual.

Portland and Weymouth pressurisation units are available from Hamworthy Heating Ltd for sealed systems.

1.2 Shaftesbury HE sectional boilers are supplied unassembled ready for on-site assembly.

The heat exchanger consists of:

- a. A front section
- b. Plain intermediate sections which can be adapted to form the 3 types of intermediate sections.
- c. A rear section

These sections are connected to each other using guide rings and 'O' ring gaskets and are held together by short lacing bolts. The complete assembly is held together by four M14 threaded tie rods running the length of the heat exchanger.

The section to section flue gas seal is made by:

- d. A mastic strip around the outer perimeter of each section.
- e. A mastic strip around the perimeter of the combustion chamber of each section.

The sections are cast with extended surface fins to increase the heat exchange area and thus enhance thermal efficiency in use.

Shaftesbury HE boilers have an operating efficiency of over 80% based on gross CV.

The heat exchanger assembly is completed by cast iron front and rear combustion chamber plates and access plates for the cleaning and inspection of the heat exchanger flue ways (on front and rear), all of which are internally lined with a ceramic fibre insulation board. The smoke box/flue connector is bolted to the upper part of the rear section and sealed with a ceramic fibre gasket.

The heat exchanger is mounted on a steel cradle which in turn stands on legs, leaving access for cleaning beneath the heat exchanger. The flow and return water connections are located at the rear of the boiler. Refer to Section 8 for details.

The Shaftesbury HE boiler can be fitted with either an on/off, high/low or modulating burner for operation on Natural Gas I_{2H} (Second Family) or Propane I_{3p} (Third Family) or an on/off or high/low burner for operation on Class D (35 second) fuel oil.

The boiler is supplied with a pre-wired control panel which contains:

- a. A fuse
- b. An illuminated mains on/off switch
- c. A boiler thermostat
- d. A boiler run lamp
- e. A temperature limiter (overheat thermostat) to shut down the boiler should the water temperature in the heat exchanger exceed 110°C - with manual reset.
- f. An overheat lamp
- g. An hours run meter
- h. A water temperature thermometer (temperature gauge)
- i. A flying lead and plug to connect to the burner
- j. An additional thermostat, boiler run lamp, hours run meter and flying lead/plug for high/low burners (optional).
- k. A volt free relay kit for normal run, overheat and lockout can be supplied as an optional extra.

The boiler is housed in a powder coated sheet steel casing which is supplied flat-packed for on-site assembly. Refer to Section 10 for casing assembly procedure.

1.3 All Shaftesbury HE boiler sections are hydraulically tested to 10 bar (145 psi), ensuring the Shaftesbury HE boiler is suitable for use on systems with maximum working pressures of up to 5 bar (73 psi).

2.0 UNPACKAGING

2.1 The boiler is normally supplied as a set of equipment comprising the following:

- a. Cast Iron Sections mounted on pallets
- b. Accessory kit and tie rods
- c. Casing panels and insulation blankets
- d. Control panel
- e. Matched burner: fuel oil or gas
- f. Flue collector box
- g. Burner mounting plate, drilled ready to accept burner

- h. Steel cradle
- i. Oil burner nozzle(s) - where applicable

Remove all packing material and inspect the equipment to ensure that all parts are present and undamaged.

If in any doubt, DO NOT USE THE EQUIPMENT. Instead, contact the supplier.

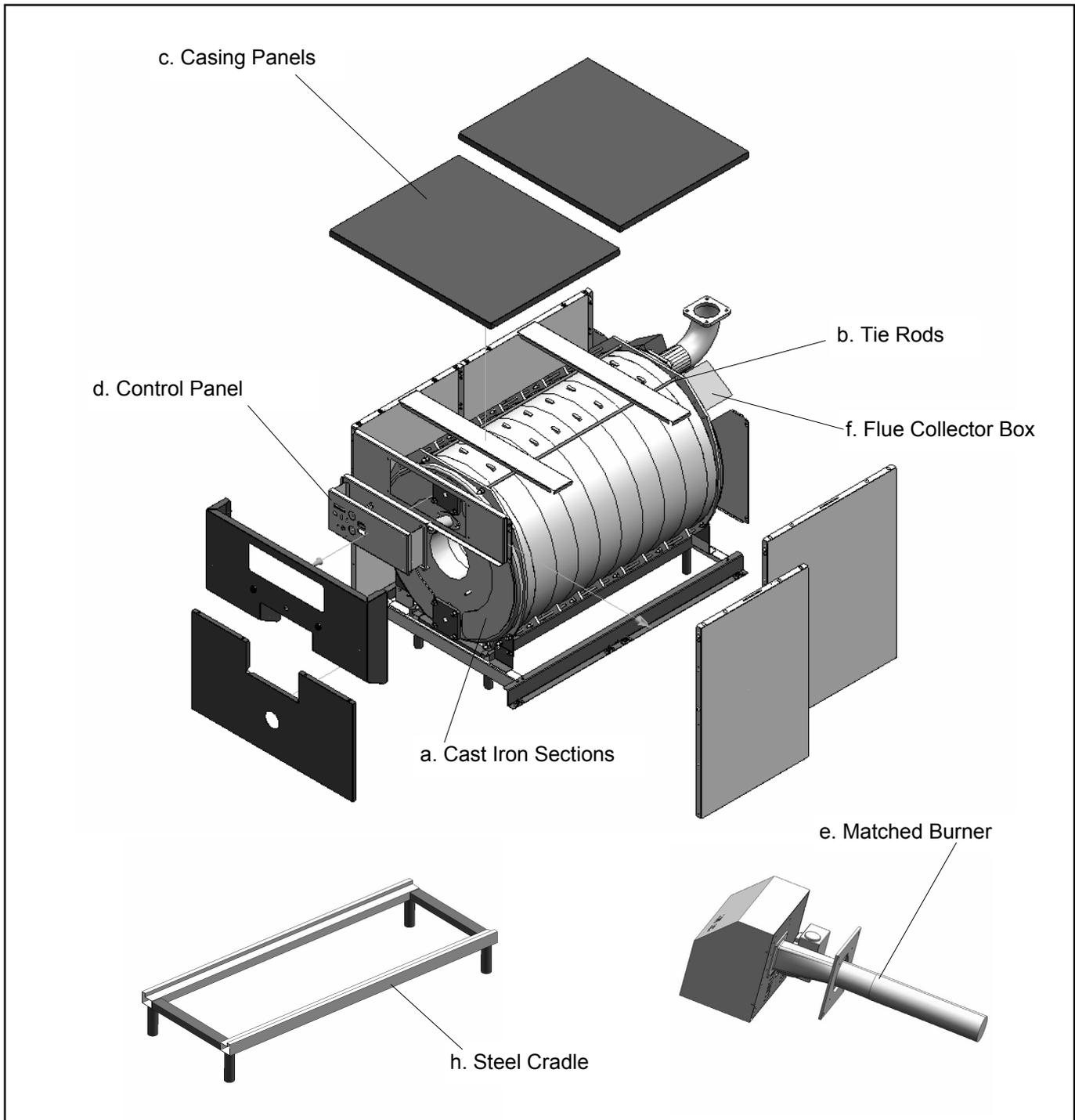


Figure 2.1 General Overview

3.0 GENERAL REQUIREMENTS

3.1 Related Documents.

Gas Safety (Installation and Use) Regulations 1994 – (As amended). It is the law that all gas appliances are installed by competent persons, in accordance with the above regulations. Failure to install appliances correctly could lead to prosecution.

It is in your own interest, and that of safety, to ensure that this law is complied with.

The installation of the boiler **MUST** be in accordance with the relevant requirements of the Gas Safety Regulations, Building Regulations, I.E.E. Regulations and the bylaws of the local water undertaking.

The installation should also be in accordance with any relevant requirements of the local gas region and local authority and the relevant recommendations of the following documents :-

British Standards

BS.5410 - Code of practice for oil firing. **Part 2:** Installations of 44 kW and above capacity for space heating, hot water and steam supply purposes.

BS.5854 - Code of practice for flues and flue structures in buildings. See para 5 (3.6).

BS.6644 - Specification for installation of gas fired hot water boilers of rated inputs between 60kW and 2MW.

BS.6700 - Design, Installation, testing and maintenance of services supplying water for domestic use.

BS.6880 - Code of practice for low temperature hot water heating systems of output greater than 45kW.

Part 1: Fundamentals & design considerations.

Part 2: Selection of equipment.

Part 3: Installation, commissioning & Maintenance.

BS 7074: Application, selection and installation of expansion vessels and ancillary equipment for sealed water systems. **Part 2:** Code of practice for low and medium temperature hot water systems.

BS.CP342 - Code of practice for centralised hot water supply. **Part 2:** Buildings other than individual dwellings.

I. Gas E. Publications

IGE/UP/1 Soundness testing and purging of industrial and commercial gas installations.

IGE/UP/1A Soundness testing and direct purging of small low pressure industrial and commercial natural gas installations.

IGE/UP/2 Gas installation pipework, boosters and compressors in industrial and commercial premises.

IGE/UP/10 Installation of gas appliances in industrial and commercial premises.

Health and Safety Executive :-

Guidance note PM5 - Automatically controlled steam

and hot water boilers.

CIBSE Publications:- "CIBSE Guide"

It is impractical in this document to specify all relevant information, but the following extracts from the above references are emphasised since failure to comply with these requirements will almost certainly result in an unsatisfactory installation.

3.2 Feed Water Quality

If the boiler feed water has a high degree of hardness, it is recommended that the water be treated to prevent precipitation of scale or sludge in the boiler water passageways. Details of additives can be obtained from any reliable manufacturer of water treatment products or the local water authority.

It should be noted however, that even if the boiler water is of average hardness, not requiring treatment, subsequent draining of the system for repair or constant make-up water due to an undetected leak will cause additional deposits and gradual build-up of scale. It is essential therefore, that leaks are attended to promptly and draining is kept to an absolute minimum.

It is recommended that the system be flushed out at least twice before any water treatment is added. If any doubt exists regarding the internal cleanliness of an old system, consideration should be given to the fitting of a coarse filter in the return pipework to the boiler(s).

3.3 Adequate Water Flow

Care should be taken in the initial design and layout having due regard for adequate water flow through the boilers and the influence of the system controls.

It is recommended that the system design should ensure a minimum return temperature of 50 °C.

If the temperature/flow rates of the application cannot meet those given in Figure 3.1 it may be necessary to incorporate mixing valves and shunt pumps to ensure that the boiler will operate satisfactorily. Figure 3.1 shows recommended and minimum water flows required with the associated pressure losses. The control system and valves, where fitted, should be regulated to avoid lower flows occurring.

3.4 Time Clock Control

In order to avoid local overheating and progressive calcium deposition at zero flow conditions where boilers are operated from time clocks, provision should be made for a 5 minute circulating pump over-run after the last boiler has ceased firing.

NOTE! Time clocks should not interrupt live, neutral or earth connections, see **Section 9.0: ELECTRICAL SUPPLY** for details. See Figures 9.1 and 9.2 for wiring details.

3.5 Minimum System Water Pressure

To comply with guidance note **PM5 (Health and Safety Executive)**, the minimum pressure requirements at the boiler are given below as examples :-

- 1) Single installed boiler running at 82°C flow temperature. Minimum head required is not less than 2 metres or 0.2 bar.
- 2) Single installed boiler running at 95°C flow temperature. Minimum head required = 5.1 metres or 0.5 bar. **See Section 8.9.1**
- 3) Modular boiler installation running at 82°C flow temperature and 11°C rise across system. Minimum head required = 4.3 metres or 0.42 bar.
- 4) Modular boiler installation running at 82°C flow temperature and 15°C rise across system. Minimum head required = 9.4 metres or 0.92 bar. **See Section 8.10** for Pressurised Water Systems.

4.0 LOCATION

4.1 The boiler location must permit the provision of a satisfactory flue system, and provide adequate space around the boiler for servicing and air circulation.

Sufficient space must be provided at the front of the boiler to allow the removal of the burner assembly for servicing/replacement, and at the rear for installation of pipes, valves and flue.

Sufficient clearance around the boiler must also be provided to allow access for servicing. Refer to **Figure 16.2** for recommended clearances.

The boiler room, or compartment, housing the boiler (s) - whether specifically constructed for the purpose, or a modification of an existing space - should be in accordance with the requirements of either BS.6644, or BS.5410 Part 2, as appropriate.

Where a separate purpose built boiler room is not available, measures should be taken to protect the boiler or boilers from damage, and the boiler should be sited such that extraneous material cannot be stored next to, or against it.

The boiler stands on a steel cradle and therefore it requires installing on a suitable level non-combustible surface, capable of withstanding temperatures of 65°C and able to support the weight of the boiler (including pipework and ancillary equipment) when filled with water. A steel sheet can be placed beneath the boiler cradle to facilitate movement of the boiler during assembly. If a plinth is required, it should be level, non-combustible, 50mm nominal height, and must be equal in width to the boiler casing dimensions.

The compartment housing the boiler must have permanent air vents communicating directly with the outside air at both high and low level. Refer to **Section 7** for details.

5.0 GAS / OIL SUPPLY

5.1 Gas Service Pipes

The local gas region should be consulted at the installation planning stage to either determine the feasibility of providing a gas supply or, where there is an existing supply, to ensure that the meter capacity is adequate for the rated input of the proposed new boiler. An existing gas service pipe must not be used without prior consultation with the local gas region.

5.2 Gas Meters

A new gas meter will be connected to the service pipe by the local gas region, or a local gas region contractor. An existing meter should be checked, preferably by the gas region, to ensure that it is adequate to deal with the rate of gas supply required.

5.3 Gas Supply Pipes

Supply pipes must be fitted in accordance with **BS 6891 or IGE/UP/2**. Pipework from the meter to the boiler must be of adequate size. Do not use pipes of a smaller size than the boiler gas connection. The complete installation must be purged and tested for soundness as described in **BS 6891 or IGE/UP/1** and **IGE/UP/1A** as appropriate.

A manual shut off valve must be fitted on the incoming gas supply pipe, adjacent to each boiler, in an easily accessible position.

5.4 Boosted Gas Supplies

Where it is necessary to employ a gas pressure booster, the controls must include a low pressure cut-off switch at the booster inlet. The local gas region must be consulted before a gas pressure booster is fitted.

5.5 Boiler House Gas Control Valve

A manual valve for boiler house isolation shall be fitted in the gas supply line. It shall be clearly identified and readily accessible for operation, preferably by an exit.

5.6 Oil Supply

The oil storage and supply system should be designed and installed in accordance with BS.5410 Part 2, as appropriate. The following notes are given as guidance:-

5.6.1 Oil Storage Tank - The oil storage tank should be of sufficient capacity to permit economic deliveries of oil to be taken. Reference should be made to oil distributor for advice. The tank should be installed such that:

- a. The oil outlet should be higher than the top of the oil burner pump. If site conditions prevent this, then a suction lift (or 'two-pipe') fuel supply system must be used.
- b. The maximum head on the suction side of the oil pump should not exceed 4 metres (14 feet).
- c. The base should be sloped away from the outlet and towards a drain cock to allow draining of any water or sediment from the tank.
- d. It is sited outside, if possible, and complies fully with the requirements of the relevant British Standards and Local Authority Regulations.

5.6.2 Oil Supply Lines - The oil supply line(s) between storage tank and burner should be run in copper, steel or aluminium pipe. Galvanised pipes and fittings should not be used. All pipework and fittings must be oil-tight, with any screwed joints made good with an oil resistant compound. The supply line should terminate adjacent to the burner with an isolating valve and metal bowl filter (with replaceable filter element). All burners are supplied with flexible oil pipes to make the final connection between the oil supply pipe and the burner.

5.6.3 Gravity Feed Supply - Where the delivery connection of the storage tank is above the level of the pump inlet on the burner a 'single pipe' gravity feed system can be used. At no point in this system should the supply pipework be higher than the lowest level of fuel in the tank.

5.6.4 Suction Lift Supply - where the delivery connection of the tank is below the level of the pump inlet on the burner a 'two-pipe' fuel supply system **MUST** be used. This system uses the burner pump to provide a circulation of oil to and from the tank.

N.B. Burner pumps can be supplied ready for use on a 'single-pipe' system. For use on a 'two-pipe' system it may be necessary to fit the pump with a by-pass plug. Refer to technical information supplied with burner.

The return line should terminate within the oil tank at the same level as the suction line, in which case a non-return valve is not required. If the return line terminates above the fuel level, a non-return valve **MUST** be fitted.

6.0 FLUE SYSTEM

6.1 General Requirements

Detailed recommendations for flue systems are given in **BS 6644, IGE/UP/10**, "Flues for Commercial and Industrial Gas-Fired Boilers and Air Heaters."

The following notes are intended to give general guidance only.

The flue passages within the Shaftesbury HE operate under pressurised conditions and in order to eliminate any additional resistance, it is recommended that the flue system shall be adapted to its design diameter as soon as possible, after leaving the boiler.

The boiler should be connected to a single flue system in the case of a single boiler, or a common flue header in the case of a multiple boiler installation. Flue systems must be self supporting, contain access for cleaning and contain a maintenance joint near the boiler outlet to allow for removal of the flue box during servicing.

Shaftesbury HE boilers are suitable for installation in a balanced compartment in accordance with the requirements of **BS 6644**. Consult Hamworthy Heating Technical Department for help or assistance if in doubt.

6.2 Design Waste Gas Volume and Temperature

It is recommended that the volume and temperature of the waste gases used for design of the flue system are as shown in Figure 16.4

6.3 Materials

Materials used for the flue system must be mechanically robust, resistant to internal and external corrosion, non-combustible and durable under the conditions to which they are likely to be subjected.

Consideration should be given to possible freezing of condense water traps and pipework. This must be avoided at all times. Insulate condense pipes if freezing temperatures are likely to be encountered.

Chimneys should be lined with a non-porous acid-resistant material in accordance with BS.5854, e.g. a flexible flue liner or similar British Gas Approved material. The internal diameter of the liner must not be less than the recommended flue size and the number of joints should be kept to a minimum.

Any joint between the flexible liner and the flue pipe from the boiler should be made using a purpose made connector. Existing chimneys should be thoroughly swept before use and any register plates, dampers, or restrictions removed.

If the boiler(s) is not connected to a chimney system, but is connected directly to outside by a standard stainless steel flue (either single or twin wall) it is particularly important to ensure that the point at which it exits the building is fully weatherproofed.

6.4 Suction

The flue system should be designed to maintain atmospheric pressure or a slight suction at the boiler flue connection at all times (0.1 - 0.3mbar).

It is recommended that a draught stabiliser is fitted to the flue system where the suction is likely to exceed 0.3mbar.

6.5 Disconnection

Provisions should be made for disconnection of the flue pipe for servicing. It is advisable that bends are fitted with removable covers for inspection and cleaning as appropriate. **NOTE!** The flue system must be self supporting and not present a risk to people in or around the building.

See **Section 13: SERVICING** for further information.

6.6 Flue Discharge

The flue system must ensure safe and efficient operation of the boiler to which it is attached, protect the combustion process from wind effects and disperse the products of combustion to the external air.

The flue must terminate in a freely exposed position and be situated so as to prevent the products of combustion entering any opening in a building. Consideration should be given to the fitting of a flue discharge terminal or grille to stop the ingress of birds etc.

The flue system should be designed such that the flue terminates at least 1 metre above the roof surface, or above the level of any nearby structure which is within 2.5 metres of the flue.

6.7 Surface Temperatures

Combustible materials in the vicinity of the boiler and flue shall not exceed 65 °C during boiler operation. The flue shall not be closer than 50mm to any combustible material, except where it passes through such material with a non-combustible sleeve when the air gap may not be less than 25mm.

6.8 Flue System Location

The flue system must not be placed or fitted where there is undue risk of accidental damage to the flue pipe or undue danger to persons in the vicinity. **NOTE!** The flue **MUST** be self supporting. Check that the flue and chimney are clear from any obstruction.

6.9 Condensate Discharge

When designing the flue system, care must be taken to ensure that any condensate which may form within the system, can be safely drained to a suitable waste point and, that the flue material used is resistant to the corrosive effects of that condensate.

7.0 AIR SUPPLY

Detailed recommendations for air supply are given in **BS 6644**. The following notes are intended to give general guidance. In all cases there must be provision for an adequate supply of air for both combustion and general ventilation, in addition to that required for any other appliance.

7.1 Air Supply By Natural Ventilation

The boiler room must have, or be provided with, permanent air vents directly to the outside air, at high level and at low level. For an exposed boiler house, air vents should be fitted preferably on all four sides, but at least on two sides. Air vents should have negligible resistance and must not be sited in any position where they are likely to be easily blocked or flooded or in any position adjacent to an extraction system which is carrying flammable vapour. Grilles or louvres must be so designed that high velocity air streams do not occur within the space housing the boiler.

The air supplied for boiler house ventilation shall be such that the maximum temperatures within the boiler house shall be as follows:

- 1) At floor level (or 100 mm above floor level) = 25 °C.
- 2) At mid-level (1.5 m above floor level) = 32 °C.
- 3) At ceiling level (or 100 mm below ceiling level) = 40 °C.

Where both low and high level openings are used, the grilles shall have a total minimum free area of :-

Low Level (inlet) 540cm² plus 4.5cm² per kW in excess of 60 kW total rated input (gross).

High Level (outlet) 270cm² plus 2.25cm² per kW in excess of 60kW total rated input (gross).

7.2 Air Supply By Mechanical Ventilation

Air supplied to the boiler room by mechanical means should be as follows :-

- 1) Mechanical inlet and mechanical extract can be utilized providing design extraction rates comply with Figure 7.1.
- 2) Mechanical extract ventilation with natural inlet ventilation **MUST NOT** be used.

NOTE: For mechanical ventilation systems an automatic control should be provided to cut off the gas supply to the boiler, in the event of failure of air flow in either inlet or extract fans.

Forced Draught Boilers	Flow Rate per 1000 kW total rated heat input (gross)	
	Inlet air (Combustion Ventilation)	Extract air (Ventilation)
	m ³ /s	m ³ /s
Volume	0.9	0.6

Figure 7.1 Mechanical Ventilation Flow Rates

8.0 WATER CIRCULATION SYSTEM

8.1 General

Recommendations for the water circulation system are given in **BS 6644** and **CP 342**. The following notes are of particular importance:-

- 1) In a combined central heating and hot water system, the hot water storage vessel must be of the indirect cylinder or calorifier type. The hot water storage vessel should be insulated preferably with not less than 75mm (3 in) thick mineral fibre, or its thermal equivalent.
- 2) Circulating pipework not forming part of the useful heating surface should be insulated to help prevent heat loss and possible freezing, particularly where pipes are run through roof spaces and ventilated cavities. Cisterns situated in areas, which may be exposed to freezing conditions, should also be insulated. Insulation exposed to the weather should be rendered waterproof.
- 3) Drain valves must be located in accessible positions which permit the draining of the whole system, including the boiler and hot water storage vessel.
- 4) Each boiler has 4" N.B. Flanged flow and return connections located on the rear section of the boiler. Mating flanges are supplied suitable for welding to 4" NB pipe.
- 5) Multiple boilers should be connected by flow and return headers. Headers should be connected to the system in a "reverse return" arrangement (the water flow in each header is in the same direction) to ensure equal flow in each module.

8.2 Pressure Relief Valve (Safety Valve)

The most important single safety device fitted to a boiler is its safety valve and each boiler, or in the case of a modular installation, each bank of boilers, must be fitted with a pressure relief valve to **BS 759** or **BS 6759** Part 1 (**ISO 4126**) and sized as shown in **BS 6644**.

BS 6644 provides comprehensive information for the selection and location of safety valves and attention is drawn to the higher capacity requirements of safety valves for pressurised hot water systems.

8.3 Open Vent and Cold Feed Pipe

(See **BS 6644** for further information.)

Every boiler or group of boilers should have an open vent pipe and cold feed pipe installed between the boiler and the first water isolating valve. The minimum bore (mm) of these pipes per installation are detailed in Figure 8.3.

The vent pipe must rise continually, must not be valved except by a design which when closed for maintenance the boiler is open to atmosphere. The pipe shall be protected against freezing where this might occur.

8.4 Altitude Gauge (Water Pressure Gauge)

Every boiler or group of boilers should be provided with a gauge complete with isolating valve. See Figure 16.1 for typical position.

Boiler Output	Feed	Vent
60kW - 150kW	25	32
150kW – 300kW	32	38
300kW – 600kW	38	50

Figure 8.3. Cold Feed and Vent Pipe Sizes (mm)

8.5 Thermometer

See Figure 16.1 for typical position.

A thermometer complete with pocket should be fitted in the pipework to indicate water flow temperature.

8.6 Drain Valves

Each boiler should have ¾" NB drain valve fitted (not HHL supply), to drain the boiler only. A plugged Rc ¾" connection is provided for a drain valve at the bottom of the front boiler section. The heating system in total should have drain valves as recommended by **BS 6644**. See Figure 16.1 for recommended positions.

8.7 Circulating Pump

One or more circulating pumps will be required to circulate water around the boilers and heating system. The pump should be sited to facilitate servicing. It is also important that the existing system be flushed through twice to remove any loose matter, which may have accumulated. If in any doubt regarding the cleanliness of the system, a coarse filter should be fitted in the return pipework to the boilers.

NOTE: If boilers are run off time clock control, a pump overrun (not HHL supply) should be fitted which must run for a minimum of 5 minutes on shut-down of the last boiler.

8.8 Minimum Water Flow Rates

Minimum water flow rates are shown in Figure 3.1. These flow rates should be maintained through the boiler at all times whilst the boiler is firing. If the water flow rate is allowed to fall below the minimum, the boiler heat exchanger could fail due to the resultant scale formation. Particular attention should be paid to the restriction of external flow circuits during periods of low heat demand.

8.9 Control Schemes

8.9.1 Temperature Controls

An adjustable control thermostat is supplied with each boiler and should be set to operate within the range 65-90°C for standard applications. A temperature limiter, (hand reset limit thermostat) is also fitted to the boiler and must be set at 100°C.

NOTE! The minimum difference between control thermostat and temperature limiter **must never** be less than 10°C.

Where the system is operating on a DT of 20°C, care should be taken to ensure that the return temperature does not fall below 50°C.

8.9.2 Water Flow Controls

Any external mixing valve/shunt pump or similar controls should **ALWAYS ENSURE** that the minimum water flow rate as shown in Figure 3.1. is maintained.

8.9.3 Frost Protection

Consideration should be given to fitting a frost thermostat set at approximately 4°C.

8.10 Unvented Systems

See Figure 16.1 for typical layout of a Unvented (Pressurised) Hot Water System. For system design refer to **BS 7074 Part 2**.

In order to correctly size a pressurisation unit for any heating system certain parameters are required. These are:-

- 1) Static height of highest component in system (metres).
- 2) System volume - if it is not known a general rule of thumb of 10 litres/kW of installed boiler power can be used.
- 3) Maximum flow temperature (°C).
- 4) Maximum system hot working pressure, generally given in bar g.

From the above information Hamworthy Heating can size the pressurization unit and also the expansion vessel required. Care must be taken in sizing expansion vessels to ensure maximum acceptance factors are not exceeded. Normally manufacturers of vessels impose a limit of 0.5. This value must not be exceeded at any time during the operation of the boiler: this includes the over pressure condition should a safety valve lift.

Consideration should also be given to sizing of the safety valve(s) in the system. See **BS 6759: Part 1**, for information. See also **BS 6880: Part 1** for design considerations.

8.11 Modular Boiler Control Schemes

For modular boiler installations, Hamworthy Heating can supply a unique boiler management control system called the 'Marshall HE'. This system comprises: a wall mounted master control unit, which houses the main interface processor and will control upto 8 stages. For further information, contact Hamworthy Heating for details.

9.0 ELECTRICAL SUPPLY

WARNING: THIS APPLIANCE MUST BE EARTHED

9.1 Site Wiring

Wiring external to the boiler must be installed in accordance with the I.E.E Regulations and any local regulations which apply. Wiring must be completed in heat resistant cable. (For size, refer to the Technical Instructions supplied by the burner manufacturer). The boiler control panel requires a 230V, single phase 50 Hz supply.

The burner requires either a single or 3 phase supply dependant upon model type and size, and should be wired in accordance with the instructions provided by the burner manufacturer.

Fuse ratings for individual boilers are marked on the appliance data plate. The control panel is supplied with flying lead and plugs for direct connection to corresponding sockets supplied with the burner. Should non-standard connecting wiring be necessary due to particular burners or contract conditions, space is provided in Appendix C of these instructions for a wiring diagram to be included.

The method of connection to the mains electricity supply must facilitate complete electrical isolation of the single boiler/battery with a contact separation of at least 3 mm in all poles.

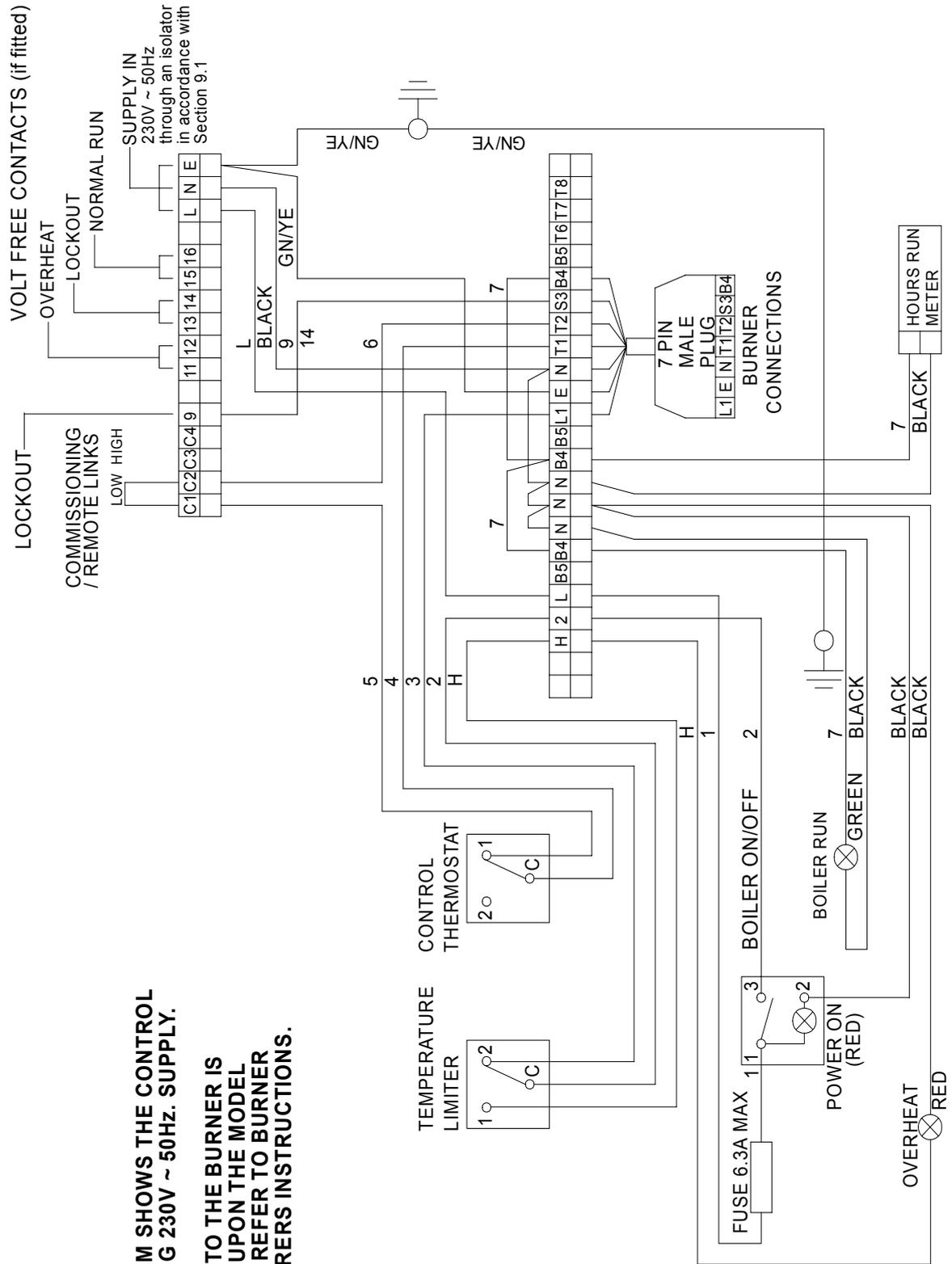
The appliance must be isolated from the mains electricity supply in the event of electric arc welding being carried out on any connecting pipework.

A mains isolator must be provided adjacent to the boiler in a readily accessible position. The supply should only serve the boiler. **NOTE!** Volt free contact electrical supplies must also be isolatable where fitted (see note in control panel). Further details regarding connection to the electricity supply are given in **BS EN 60335, Part 1** or **BS 3456, Part 201**.

9.2 Indication Signals and Volt Free Contacts

Optional control panels are available with v.f.c. contacts to enable external indicator lights or alarms to derive signals for normal run, overheat and lockout.

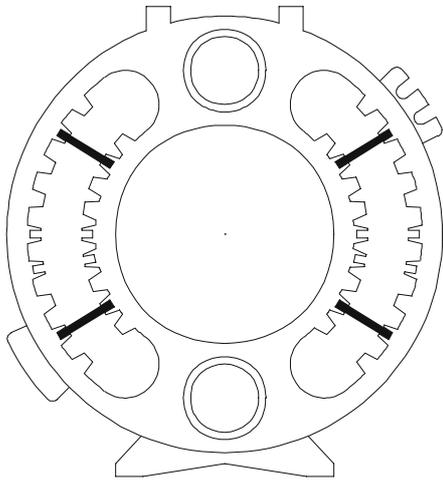
Note:- These external circuits **MUST** be isolated before any service or maintenance procedures are carried out.



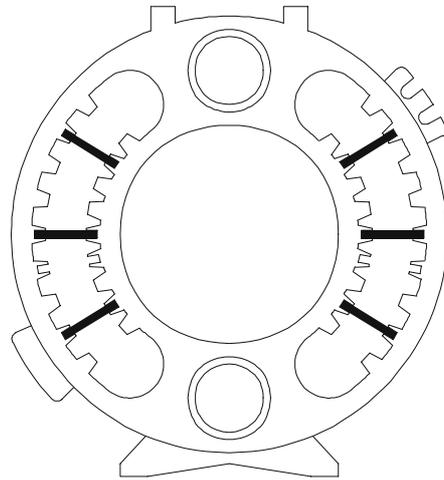
NOTE:
THIS DIAGRAM SHOWS THE CONTROL
PANEL WIRING 230V ~ 50Hz. SUPPLY.
THE SUPPLY TO THE BURNER IS
DEPENDANT UPON THE MODEL
SELECTED; - REFER TO BURNER
MANUFACTURERS INSTRUCTIONS.

Figure 9.1 – Boiler Control Panel Wiring Diagram – On/off and Modulating Burner Control

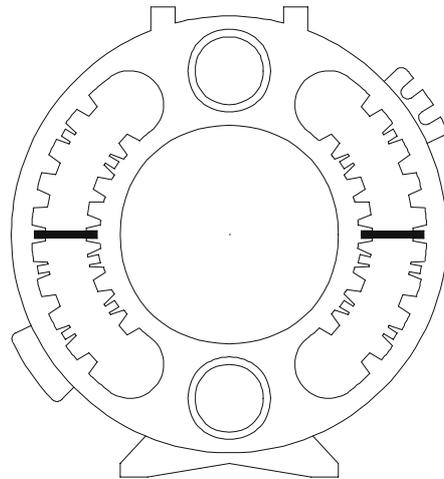
Figure 10.2 – Boiler Section Identification



A Rear Intermediate section (RI)
Fitted with 4 flue plates



B Intermediate section (I)
Fitted with 6 flue plates



C Front Intermediate section (FI)
Fitted with 2 flue plates

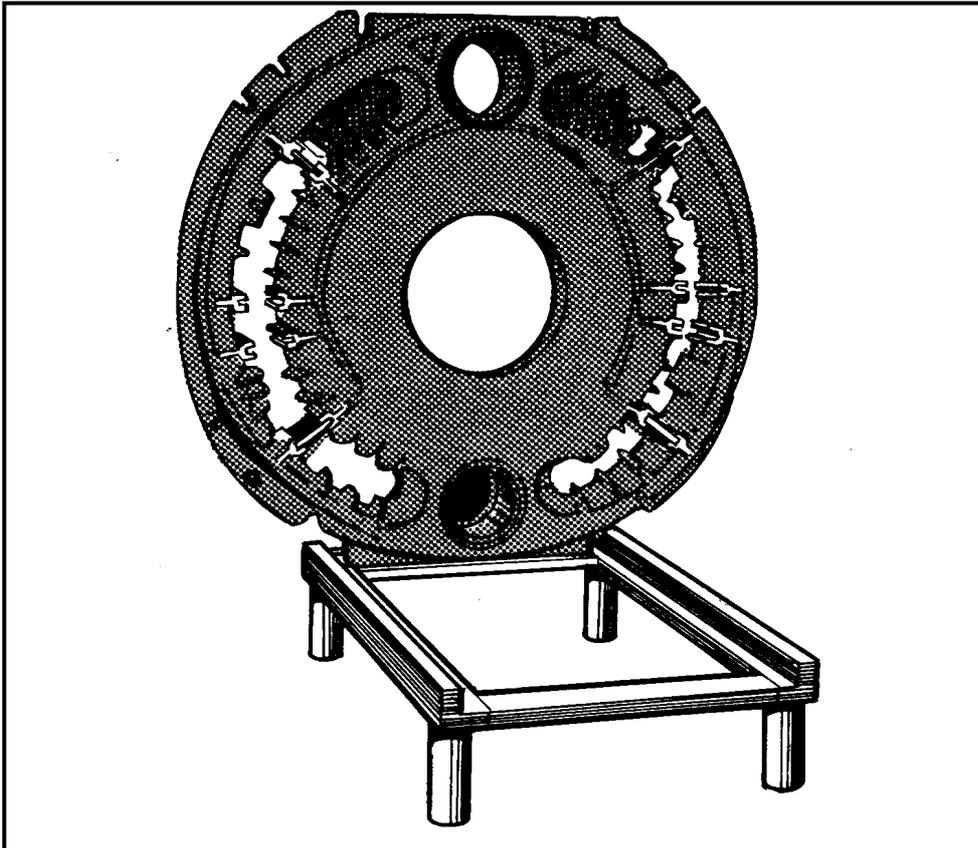


Figure 10.3 – Rear Section and Cradle

a. Position rear section (Item 4) onto end of cradle (Item 1) (Fig. 10.3) ensuring that it is safely supported. Sections can be lifted by utilising suitably tested and protected straps through the ports or flueways.

IT IS MOST IMPORTANT THAT THE BACK EDGES OF THE FEET ON THE CASTING ARE FLUSH WITH THE REAR OF THE CRADLE TO ALLOW FOR CORRECT FITTING OF THE CASING.

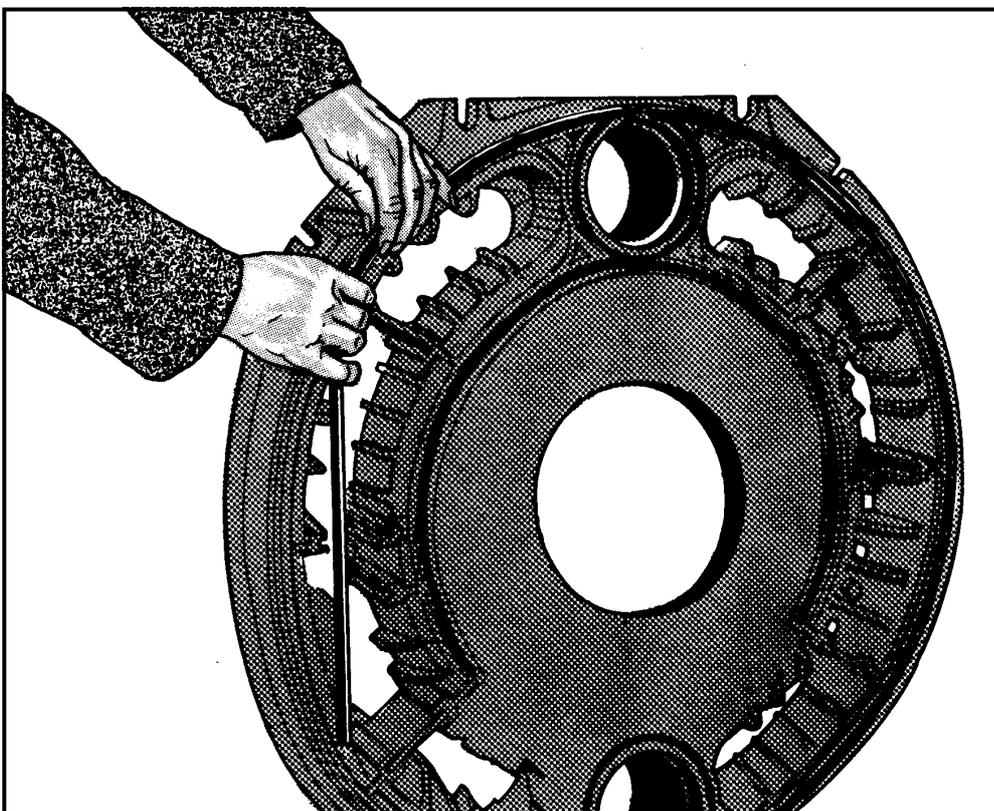
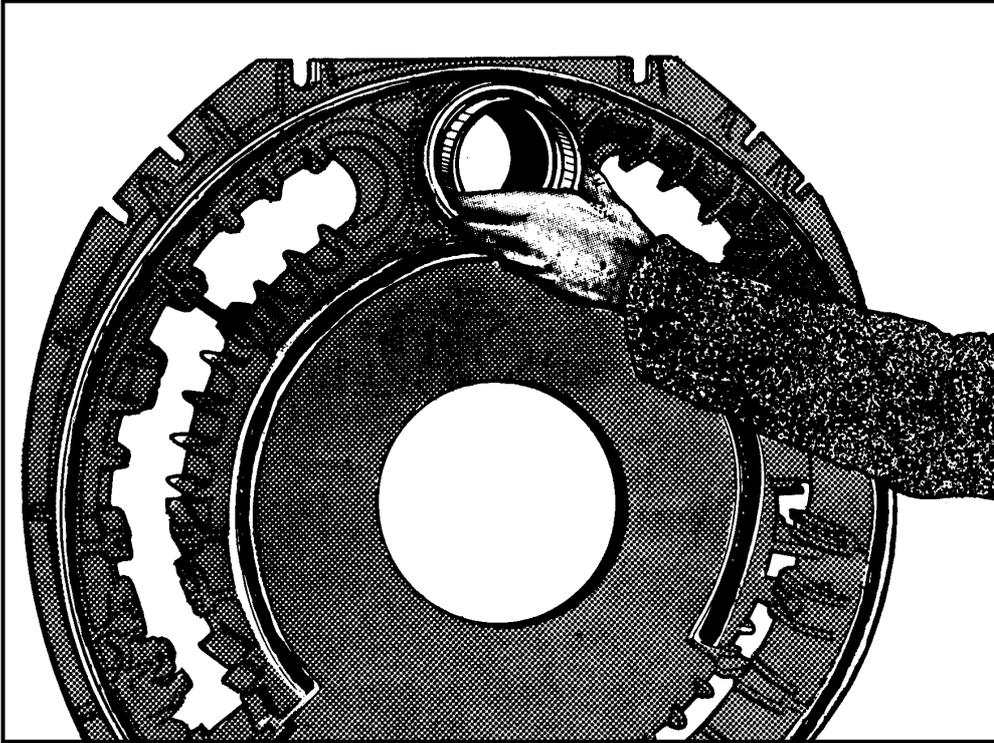


Figure 10.4 – Fitting Mastic Seal

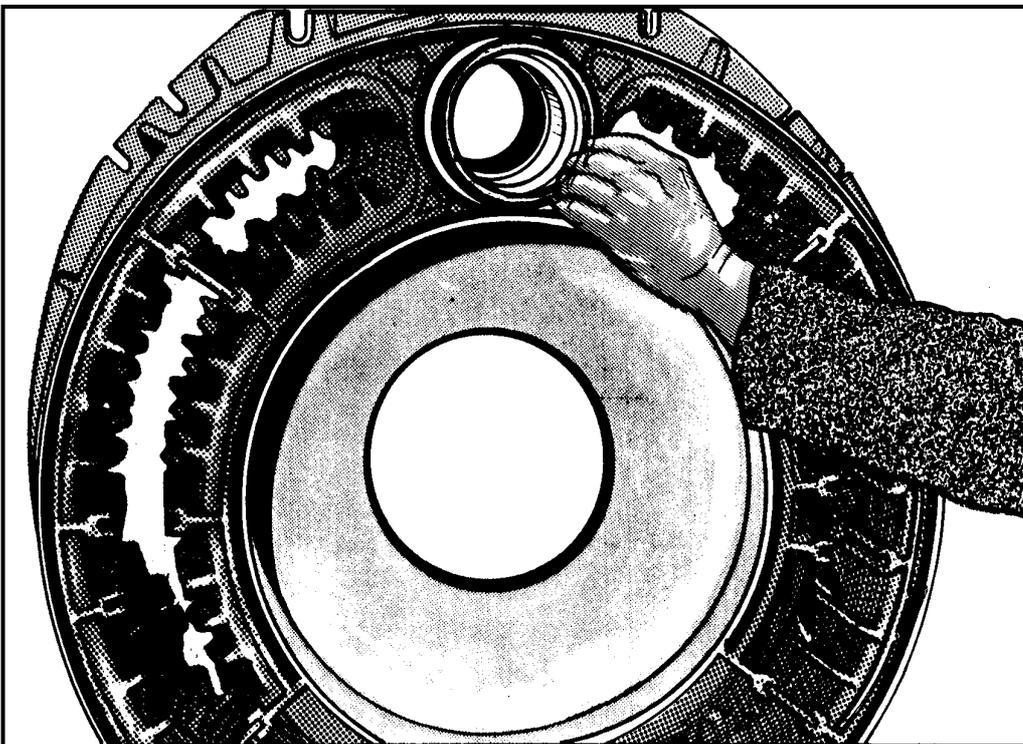
b. Fit sealing mastic to grooves around both perimeter of section and combustion chamber (Fig. 10.4). Should mastic rope break during this operation, the two ends **MUST** be overlapped to avoid any leakage.

N.B. Particular care should be taken in placing a mastic seal around both ports to protect the 'O'-ring gaskets.



c. Insert guide rings (6) into both upper and lower ports and fix in place using a small piece of the mastic sealing material (Fig. 10.5).

Figure 10.5 – Fitting Guide Ring



d. Carefully fit 'O'-ring gaskets (5) over guide rings to locate into machined recess around perimeter of port (Fig. 10.6).

Figure 10.6 – Fitting 'O'-Ring Seal

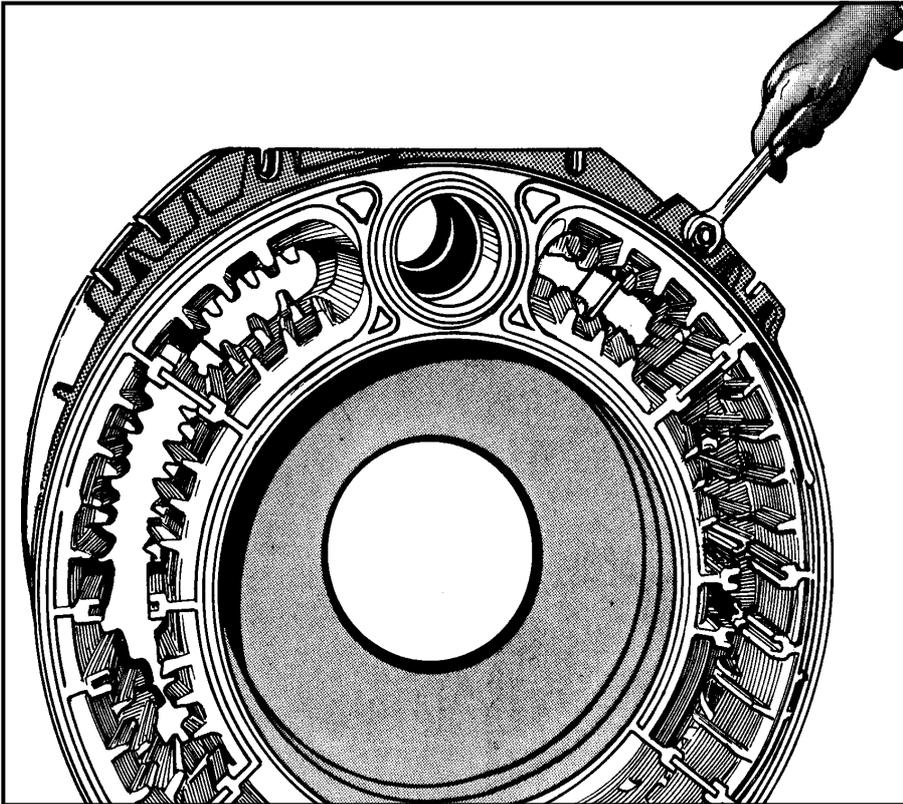


Figure 10.7 – Fitting Lacing Bolts

e. Place the next correct section (Item 3) onto the cradle and fit to rear section, carefully locating guide rings into ports and ensuring that 'O'-ring seals are correctly located between the machined faces and are not pinched or damaged.

f. Fit one of the lacing bolts (29) provided through each of the UPPER RIGHT and LOWER LEFT pairs of bolt flanges on the sections (Fig 10.7). Tighten the bolts EVENLY to a torque of 25Nm (18 lbf.ft.)

N.B. These bolts are intended only to keep the sections together during assembly. To avoid undue stress during expansion of boiler they should NOT be overtightened.

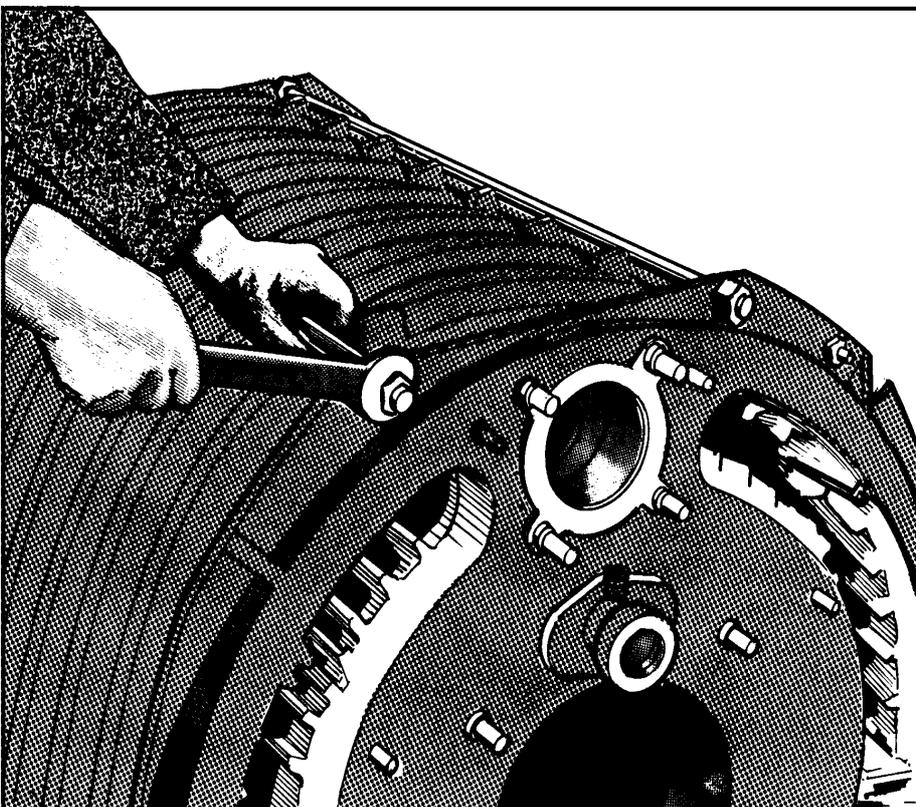


Figure 10.8 – Fitting Upper Tie Rods

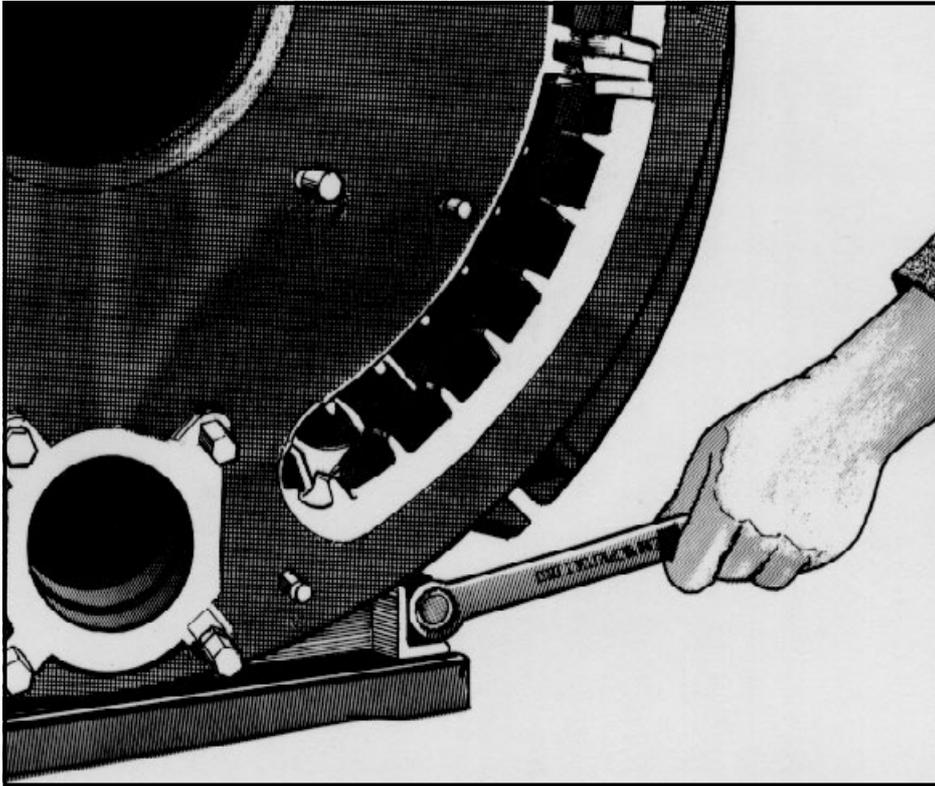
g. Repeat the above procedure for the remaining sections in the correct order ensuring that:

- * Mastic sealer is fitted into groove around perimeters of every section and port.

- * Guide rings and 'O'-ring seals are correctly fitted.

- * Lacing bolts are fitted and not overtightened.

- * Flue plates (19) are correctly positioned.



h. After fitting front section (2), fit the four tie rods (30) through the lugs on top and bottom of front and rear sections (Figs 10.8 & 10.9). Tighten tie rod nuts to a torque of 45 Nm (34 lbf.ft)

Figure 10.9 – Fitting Lower Tie Rods

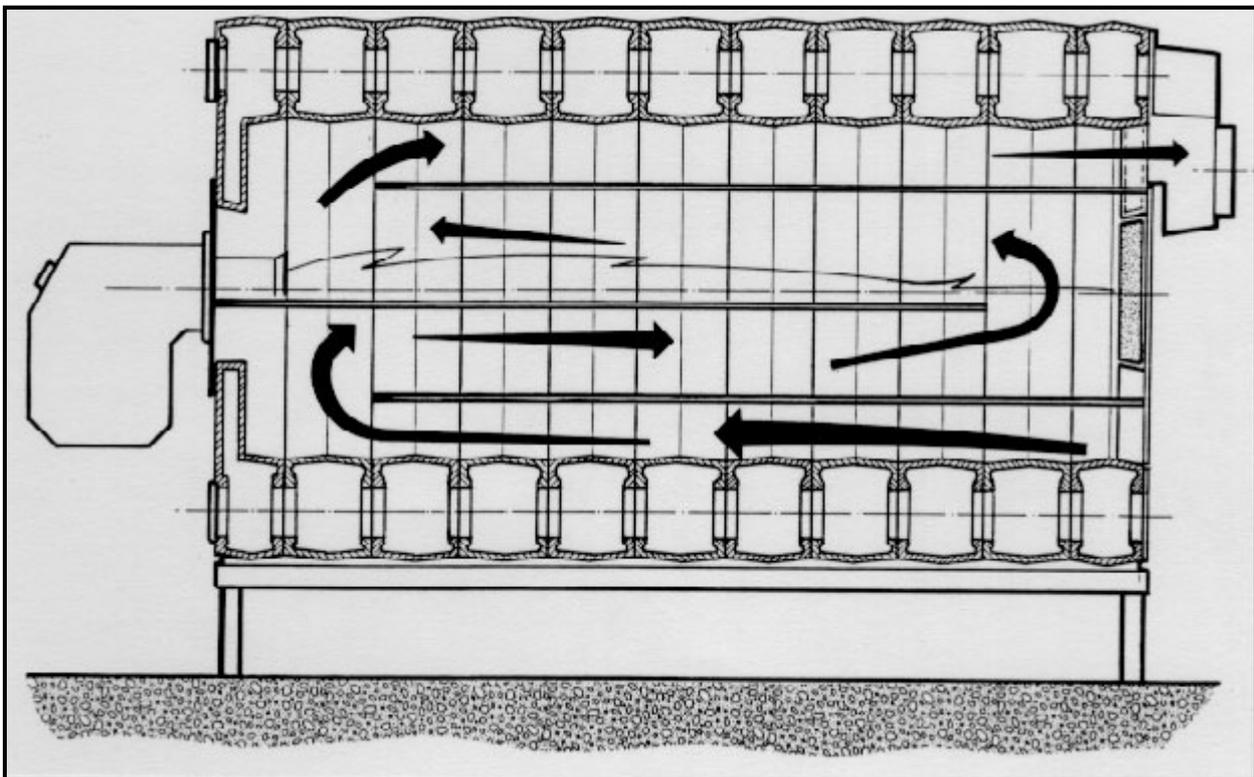


Figure 10.10 – Flue Gas Flow Path

- i. Fit thermostat pocket (18) in top of front section, and 3/4" BSP drain plug or cock (not supplied) to bottom of front section.
- j. Fit heating flow pipe elbow (28) to top of rear section, note correct orientation.

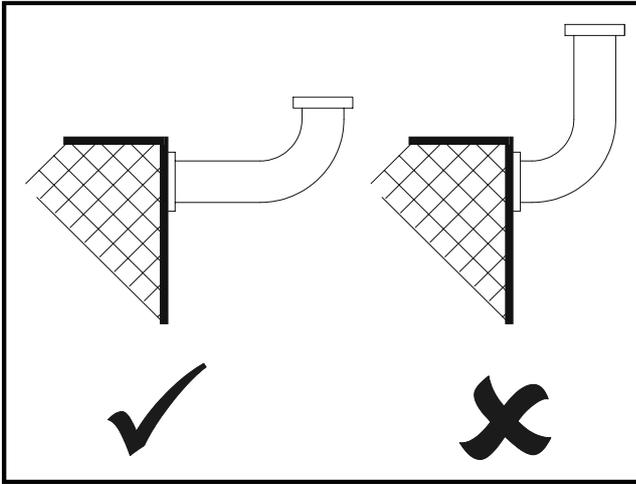


Figure 10.11 – Outflow Pipework Orientation

- k. Fit water distribution tube (11), holes uppermost, into the return connection at bottom of rear section (Note: Not required on HE110 to HE220).
- l. On completion of assembly, the heat exchanger should be hydraulically pressure tested to 1.5 times the maximum system pressure for 30 minutes (BS779 - 1989, Amendment 1 - 1993).

10.4 Assembly of Boiler

Installers must ensure compatibility between boiler body and burner by referring to Figures 11.1, 11.2 & 11.3. If in any doubt, contact Hamworthy Heating for assistance.

Further to assembly of the sections, proceed as follows (refer to Fig. 15.1):

- a. Locate and fit the flue collector box (23) to the upper part of the rear casting using the studs, nuts and gaskets (22) provided. The rear access doors (25,26) will need to be loosened to allow correct fitting of gaskets.
- b. Locate and fit the burner mounting plate (13) ensuring that the pads of insulation are packed into the burner aperture and that the fibre board gasket (12) is in position. Carefully cut a hole through both the fibre pads and board, large enough to accept the burner blast tube.
- c. Locate the foil covered insulation wrap which comprises a front blanket, a rear blanket and lengths of straight wrap. Position the front and rear blankets on the boiler so that the cut outs align with the appropriate items, i.e. burner mounting plate, thermostat pocket, flue collector and return connection. Mould the excess wrap backwards around the edges of the boiler sections and tape to secure. Position the straight wraps over the boiler body. Where more than one wrap is used, they should be overlapped so that the front and rear edges fall flush

with the front and rear of the boiler. Secure wraps in position by using tape or strapping and buckles. For further details, see instruction sheet packed with insulation.

Note! The front and rear insulation pieces will need to be removed for maintenance of the boiler.

- d. Using a combination of M10 x 35 hex head bolts, nuts & washers and existing tie rods fit 4 off casing support brackets as shown below.

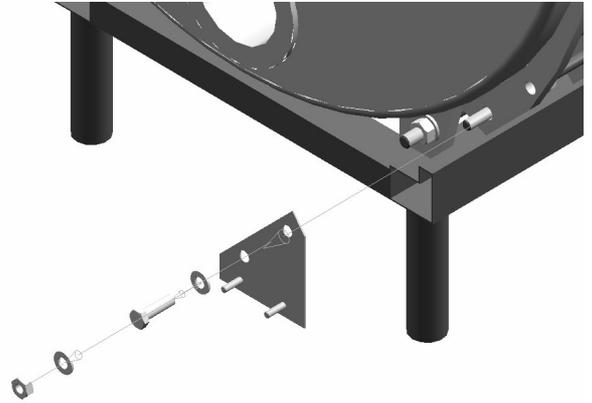


Figure 10.12 - Fitting Casing Support Brackets

- e. Locate burner onto mounting plate through lower front casing panel.
- f. Complete all pipework connections and fuel lines.
- g. Complete installation by fitting casing and control panel - refer to Section 10.5 and 10.6.

10.5 Casing Assembly

Figure 10.13

1. Using M6 nuts and washers fit front and rear cross members to M6 studs protruding from body of boiler.

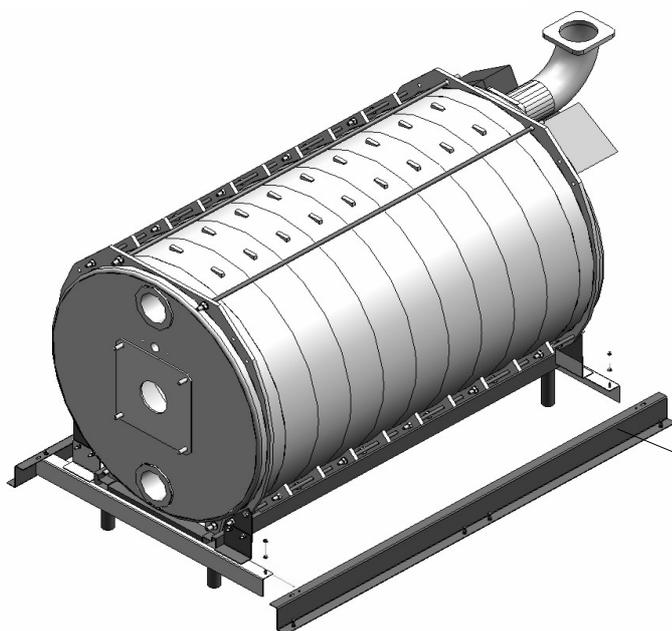
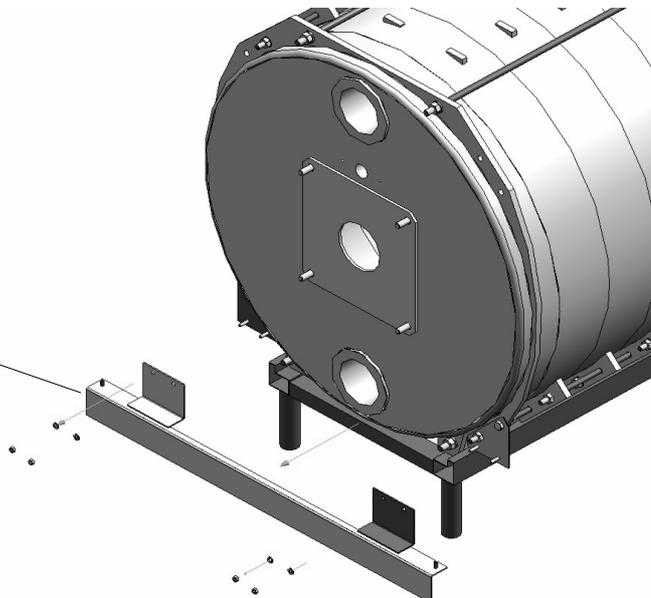


Figure 10.14

2. Using M6 nuts and washers fit casing support rails to M6 studs on front and rear cross members.

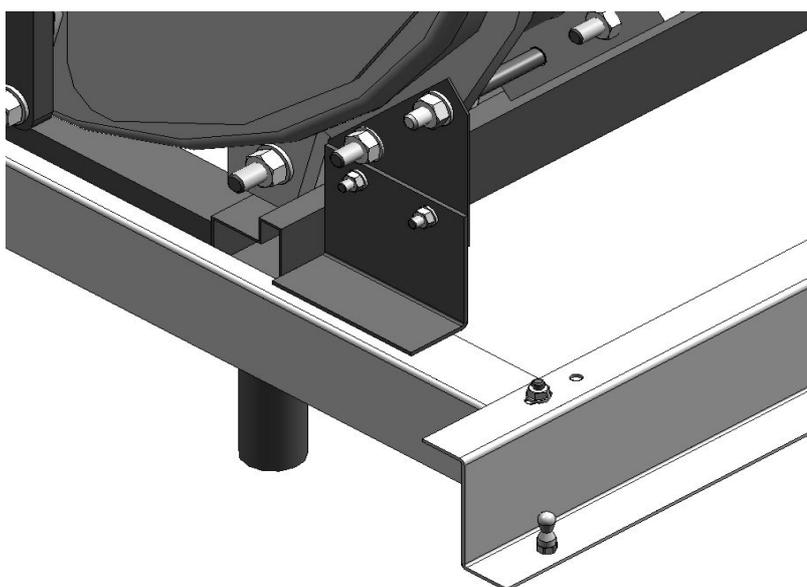


Figure 10.15

Note position of slot as viewed from front of boiler.

Figure 10.16

3. Snap side panels into position on side rails locating ball stud fasteners on base of side panels into mating latches on side rails.

4. Snap cross struts into position to anchor side panels in position.

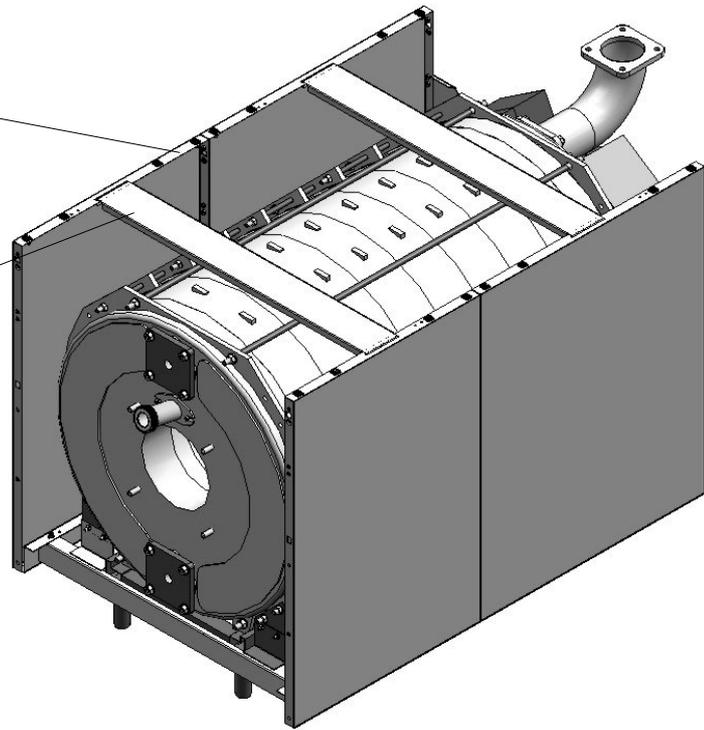


Figure 10.17

Note: On assemblies with two side panels, secure panels together with M8 x 16 hex head screw, nut and washer utilising the 9mm diameter hole towards the top of the side panel.

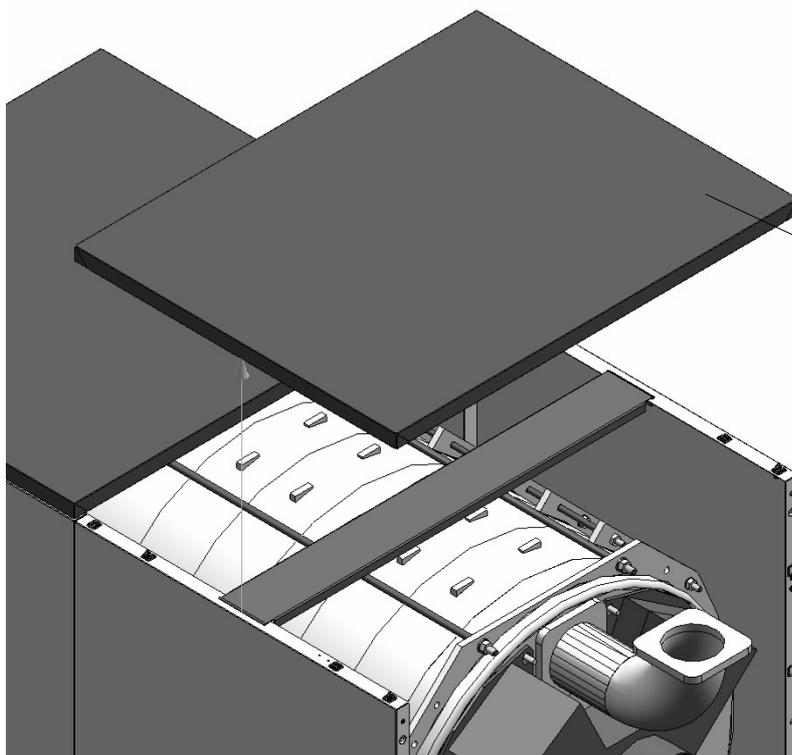
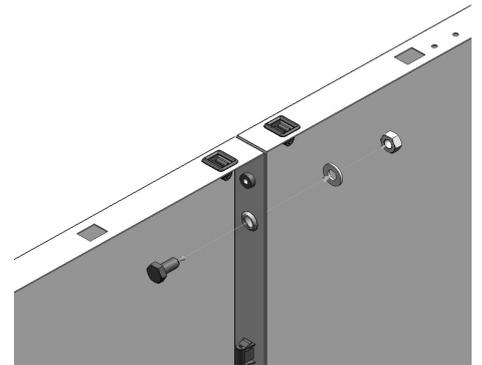


Figure 10.18

5. Snap top panel(s) into position, locating on pre-fitted latch and strikers. Note that the top panel should overlap to the front.

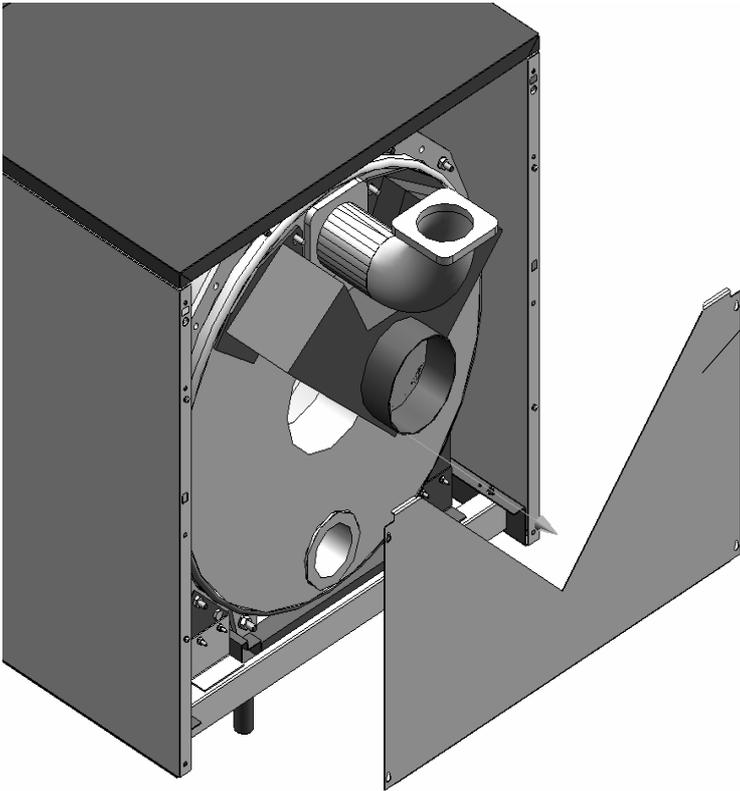


Figure 10.19

6. Position and fit rear cover to rear of casing using M5 x 10 posi screws and washers.

Figure 10.20

Note: Ensure that rear cover is located in correct position as indicated below.

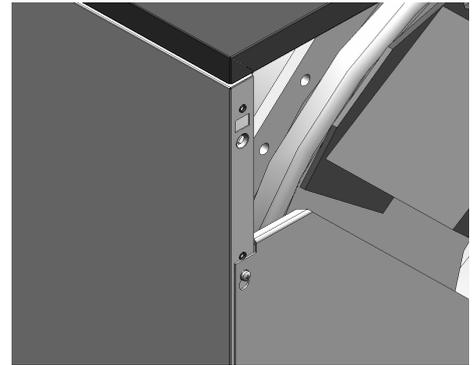
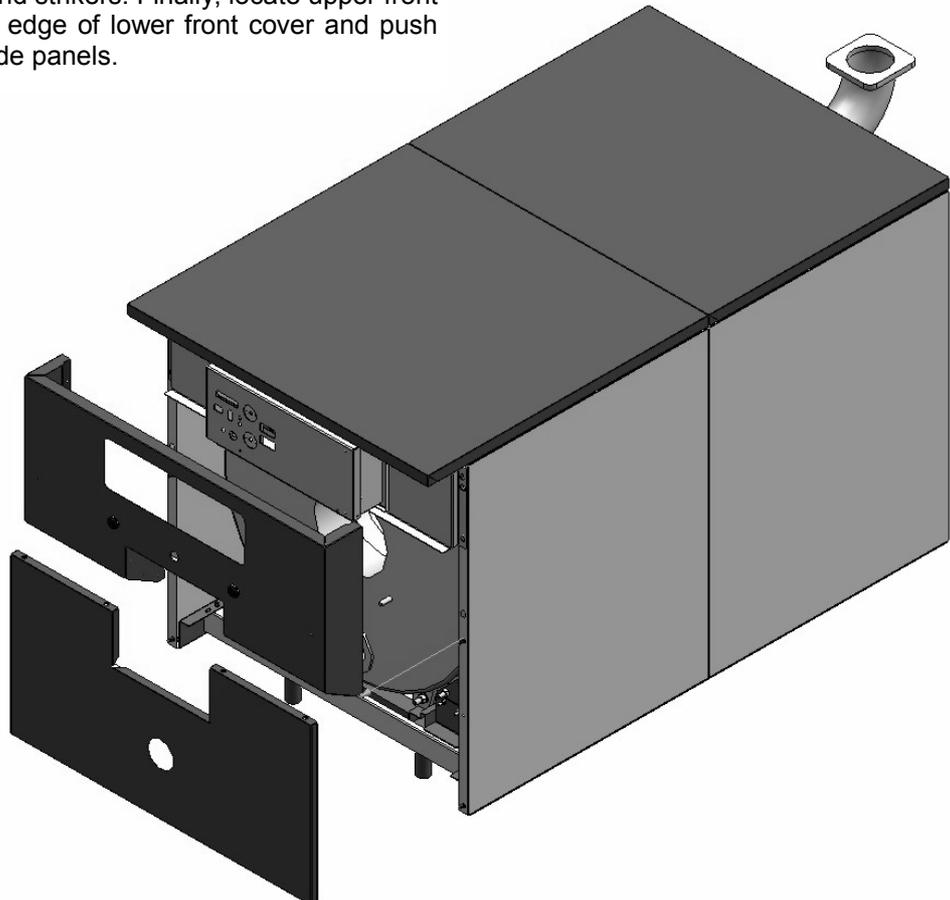


Figure 10.21

7. After fitting control panel, snap lower front cover into place, locating pre-fitted latches and strikers. Finally, locate upper front cover on locators in upper edge of lower front cover and push into place on locators on side panels.



10.6 Control Panel (Refer to Figs. 9.1 & 9.2)

When fully assembled, access to the control panel for wiring purposes is gained by firstly removing the upper front casing panel. Turn the two latches a quarter turn using a screwdriver or coin and lift off. The fascia can then be hinged downwards by unlatching the catch on the top right hand using a screwdriver. **NOTE:** before attempting to hinge the fascia down, the thermostat knobs must be pulled off and the temperature limiter (high limit) cover knob unscrewed and removed.

With the fascia hinged down, the terminals are exposed and the power supply can be connected to the appropriate terminals via the glands in a removable plate at the bottom right hand side. The upper front casing panel has a cut out appropriately positioned beneath the gland plate to allow the power supply cables to enter the casing and to allow the flying leads to the burner to exit.

A powered lock-out terminal and a remote control link C1-C2 are also provided together with an optional volt free contact kit (see Figs. 9.1,9.2 & 15.3) the terminals being adjacent to the power supply, and cables for these functions should be run in a similar manner. For remote control remove the wire link between C1-C2 and replace with control cables. If the panel is for High/Low burners an additional link C3-C4 is also supplied, removal of which holds the burner on low fire. This link can also be replaced by control cables if remote high/low operation is required. For ease of disconnection, the terminals used are of the plug and socket type and hence all external wiring can be easily removed by pulling the top half of the terminal rail upwards and threading cables through the gland plate once removed.

Depending on the type of burner fitted, the panel will provide a single flying lead terminating in a seven pin plug for connection to an on/off burner, or an additional flying lead terminating in a four pin plug for connection to a high/low burner. The panel for a high/low burner will also have an additional thermostat, hours run meter and run lamp.

Two fuses are provided for the fuse holder on the panel rated at 5A and 6.3A. The correct fuse must be selected for the burner supplied -refer to burner instructions supplied separately.

When wiring is complete, raise hinged fascia and click into position by pushing on latch screw. Replace thermostat knobs and front casing panel allowing cabling to exit from the cut out.

It should be noted that if a 3 phase burner be supplied, the 3 phase supply should be wired direct to the burner and a separate 230V single phase supply wired to the panel.

NOTE: - All cables must exit the boiler casing via

the cutout in the bottom right hand edge of the upper front door and must not be routed adjacent to the burner mounting plate. **THE CABLES MUST NOT BE ROUTED ACROSS THE BURNER OR ITS MOUNTING PLATE.**

10.7 Bracket kit for use on modulating burner

A bracket kit, HHL Part No. 563605242, for repositioning the regulator box RWF40 on Riello modulating burner R40G20D, is provided with fitting instructions. The fitting of this bracket ensures that the regulator box does not foul the boiler front panel when the modulating burner is fitted.

11.0 COMMISSIONING AND TESTING

11.1 Electrical Installation

Wiring **MUST** be checked by a suitably competent person. An isolator correctly fused should be sited close to the boiler. Refer to the burner instructions.

It should be noted that if a 3 phase supply is required, it should be wired direct to the burner and a separate 230V single phase supply wired to the panel.

The boiler is supplied with a remote stop/start circuit for time clock operation. **Any other interlocks, i.e. Pressurisation unit, BEM System should be wired in series with the remote stop/start loop.**

11.2 Gas Installation

For design see **Section 5: GAS SUPPLY.**

The whole of the gas installation including the meter must be inspected and tested for soundness and purged in accordance with the recommendations of **IGE/UP/1** or **IGE/UP/1A** as appropriate.

11.3 Water Circulation System

For design see **Section 8: WATER SYSTEM.**

The system should be thoroughly flushed out with cold water without the pump in position. Ensure all the valves are open.

With the pump fitted the system should be filled and air locks cleared. Vent the radiators and check for leaks.

If the system is unvented the pressurisation unit should not be utilised for the initial filling. This should be carried out using a WRC approved double check valve and temporary filling loop. In order to comply with local Water Authority Regulations, this loop must be disconnected when filling is complete. Water treatments should not be fed through the pressurisation unit unless permitted by the manufacturer. Check the expansion vessel cushion pressure as detailed by the manufacturer's Installer's Guide.

11.4 Commissioning The Boiler

Only competent persons registered for working on non domestic gas appliances should attempt the

following: Before attempting to commission any boiler, ensure that personnel involved are aware of what action is about to be taken and begin by making the following checks:-

- 1) Flueway passages to chimney are clear.
- 2) Adequate ventilation as per **Section 7: AIR SUPPLY** exists in the boilerhouse.
- 3) The system is fully charged with water, ready to receive heat. All necessary valves are open and the pump is circulating water.
- 4) The pipework and valve arrangement is installed to Hamworthy Heating recommendations in such a way that water flow rates will be in accordance with Figure 3.1.
- 5) The gas supply pipework is clear of any loose matter, tested for soundness and purged to **IGE/UP/1** or **IGE/UP/1A** as appropriate.

11.4.1 Boiler Checks Prior To Lighting

BEFORE starting the boiler, check the following:

- a. Check that fuel supply is turned off.
 - b. Check that electrical supply is isolated.
 - c. Check that electrical installation conforms to the requirements of these Instructions, the IEE Wiring Regulations for electrical installations, and any other local Regulations which apply.
 - d. Check boiler castings are undamaged. Remove access plates to check flue plates are correctly located in sections, then replace and reseal.
 - e. Check all thermostat bulbs are correctly inserted in the appropriate pocket.
 - f. Check for water leaks and ensure that both boiler and heating system is full of water and properly vented. Check distribution tube is fitted.
 - g. Check that all drain cocks are closed, and that all isolating valves in flow and return pipework are open.
 - h. **For OIL**; check that tank(s) have been filled and oil supply pipework between tank and burner has been primed.
 - j. **For GAS**; check soundness of gas installation and that pipework is purged of air, as detailed in I. Gas. E. Publications IGE/UP/1 or IGE/UP/1A respectively.
- Check that gas meter is operational and has been checked by the local region of British Gas.
- Check that gas meter and supply pipework is of sufficient size to meet the input rating of the burner/boiler. Refer to Section 16.2.
- k. Check that burner output is correct for size of boiler in question, referring to Figures 11.1, 11.2 & 11.3, and the manufacturer's technical information supplied with the burner.

Note: - ALL FUELS.

Refer to the commissioning procedure in the burner manufacturers literature, before firing the boiler.

Always adjust the fuel supply upwards from a low position to ensure that a fuel rich mixture is not achieved.

11.4.2 Oil fired Boilers

- a. Check flexible oil lines are tightly jointed and are not twisted or kinked to form an obstruction.
- b. Check correct nozzle(s) is fitted to burner, (Figure 11.4) and that it is tight. **Note:** Some burners are despatched with a test nozzle(s) fitted. In these cases, the correct nozzle(s) is despatched in a separate package with the boiler and **MUST** be fitted to the burner before attempting to fire the boiler.
- c. Check electrodes and ensure porcelain insulation is not cracked.
- d. Check electrodes are correctly positioned, and gap is correctly set, as specified in the manufacturer's technical information supplied with the burner.
- e. Check blast tube is correctly located, and securely fastened in place and firebrick at rear of combustion chamber is sound and correctly located.
- f. Check burner seats correctly onto burner mounting plate and is securely fastened in place.
- g. Set burner for the required fuel and air throughputs, as specified in the manufacturer's technical information supplied with the burner.
- h. Fit a pressure gauge on burner oil pump to check pump pressure is correctly set.
- i. Check that overheat thermostat manual reset is set, and that boiler control thermostat and control system are set to call for heat.
Switch the boiler on and start the burner.
- j. The burner control will first operate the fan to pre-purge the boiler, then produce an ignition spark and finally open the oil solenoid valve and the flame should ignite.
- k. Purge air from oil pump through pressure gauge port.

IF BURNER LOCKS OUT WAIT 45 SECONDS BEFORE PRESSING RESET BUTTON ON BURNER CONTROL BOX.

- l. With burner firing, check the atomising pressure on gauge and adjust as necessary using the pressure regulator on burner oil pump. Refer to technical information supplied with burner.
- m. After allowing burner to reach stable firing conditions for approximately 15 minutes, carry out combustion gas check.
Measure CO₂, CO, smoke number, flue gas temperature and circulating water temperature rise across the boiler. The readings obtained should be as indicated in figure 11.4, target appliance readings.

Readings should be taken at both High and Low settings. A link C3-C4 is provided in the control panel terminals, the removal of which, by pulling out the terminals, will hold the burner on low fire.

- n. Switch off boiler. Remove oil pressure gauge and replace sealing plug complete with gasket.
- o. Restart boiler and cycle it on and off several times to ensure reliable burner ignition and boiler operation.

Check for oil, water and flue gas leakage. Tighten all access flue box and burner mounting bolts and nuts.

p. Set boiler control thermostat to required setting, and check operation of heating control system.

q. Fully familiarise the user with the boiler operating controls, the main component functions and the safety features.

THESE INSTALLATION AND SERVICING INSTRUCTIONS SHOULD BE LEFT WITH THE USERS OF THE BOILER FOR THEIR FUTURE REFERENCE.

11.4.3 Gas fired Boilers

a. Check that ignition electrode and rectification probe are correctly positioned. Refer to manufacturer's technical information supplied with the burner.

b. Check that ignition electrode and rectification probe leads are connected.

c. Check blast tube is correctly located, and securely fastened in place, and firebrick at rear of combustion chamber is sound and correctly located.

d. Check burner seats correctly onto burner mounting plate and is securely fastened in place.

e. With firing head separate from burner adjust air and gas settings, as specified in the manufacturer's technical information supplied with the burner.

f. Determine minimum burner gas pressure which corresponds to required burner output (boiler input), as follows:

From the manufacturer's technical information (supplied with the burner) take burner pressure corresponding to required burner output.

Add combustion resistance (in mbar), given in Figure 16.4 for the boiler in question, to obtain gas pressure value to be measured at burner test point.

g. Open main isolating valve in gas supply to boiler. Check for leaks throughout gas train and pipework to burner.

h. Adjust gas supply governor to achieve at least 17.5 mbar (7.0 in wg) at inlet to boiler gas train. Ensure that maximum pressure of gas train governor is not exceeded. If a gas booster is to be fitted, commission in accordance with the manufacturer's instructions.

i. Adjust start and main output gas rates as detailed in the manufacturer's technical information supplied with the gas burner.

j. Check that overheat thermostat manual reset is set, and that boiler control thermostat and control system are set to call for heat.

k. Close main isolating valve in gas supply, switch the boiler on and start the burner. The burner control will first operate the fan to pre-purge the boiler, then produce an ignition spark and attempt to ignite the burner. The flame should fail to ignite and the burner should go to lockout.

l. Open main isolating valve in gas supply. If gas train has separate pilot gas line, open pilot gas isolating valve and close main gas isolating valve. Restart boiler/burner. The burner control will pre-purge, produce an ignition spark and ignite pilot

flame. The main flame should fail to light, and burner will continue running on ignition flame only. The pilot gas rate can be checked and adjusted as detailed in the manufacturer's technical information supplied with the gas burner.

IF BURNER FAILS TO LIGHT, BOILER MUST BE PRE-PURGED BEFORE ATTEMPTING TO RESTART BURNER. IF BURNER REPEATEDLY FAILS TO LIGHT, A FULL INVESTIGATION TO FIND CAUSE SHOULD BE MADE.

m. Stop boiler/burner. Open main gas isolating valve and restart burner. The burner will pre-purge, ignite pilot flame and, after a short delay of several seconds, the main flame will light. Adjust the main gas rate as detailed in the manufacturer's technical information supplied with the gas burner.

n. After allowing burner to reach stable firing conditions for approximately 15 minutes, carry out combustion gas check.

Measure CO₂, CO, flue gas temperature, and circulating water temperature rise across the boiler. The readings obtained for the appropriate gas should be as indicated in figure 11.4, target appliance readings.

Readings should be taken at both High and Low settings. A link C3-C4 is provided in the control panel terminals, the removal of which, by pulling out the terminals, will hold the burner on low fire.

o. After all other adjustments have been made, set burner air pressure switch as instructed in manufacturer's technical information supplied with burner.

p. Check gas pressure at burner head corresponds with value determined from burner manufacturer's technical information - as detailed in (f) above.

q. Check gas flow rate at meter. Ensure that all other appliances served by the meter are isolated whilst flow rate is checked.

r. Cycle boiler on and off several times to ensure reliable burner ignition and boiler operation. Check for gas, water and flue gas leakage. Tighten all access, flue box and burner mounting bolts and nuts.

s. Set boiler control thermostat to required setting, and check operation of heating control system.

t. Fully familiarise the user with the boiler operating controls, the main component functions and the safety features.

THESE INSTALLATION AND SERVICING INSTRUCTIONS SHOULD BE LEFT WITH THE USER OF THE BOILER FOR FUTURE REFERENCE.

11.5 External Controls

The external controls used in typical boiler installations, for both vented and unvented systems, are shown in Figure 16.1. If different systems or controls are to be used and there are any doubts as to the suitability, contact Hamworthy Heating Technical Department for advice.

11.6 Installation Noise

In order to avoid the possibility of noise from the installation, care should be taken to follow the manufacturer's instructions. Particular attention should be paid to minimum water flow rates. If acoustic insulation is added to the boiler, care must be taken not to impede combustion or ventilation air flow. If in doubt contact the manufacturer.

11.7 User Instructions

When the above is complete, the boiler owner or their representative should be made aware of the lighting and operating instructions. A practical demonstration should be given describing each functional step. This Installer's Guide and burner Operating Instructions should then be handed over and kept in a safe place for easy reference.

12.0 FAULT FINDING

12.1 Fault Finding

Fault finding on the burner control system is detailed in the burner manufacturers instructions. If the boiler still cannot be operated satisfactorily after following these instructions, consult Hamworthy Heating for assistance.

13.0 SERVICING

A qualified engineer registered for working on non domestic gas or oil appliances should check and ensure that the flue, its support and terminal, the ventilation to the boiler house, safety valve, drain, water filter if fitted, pressure gauge, etc.; are in a serviceable and working condition and still comply with the relevant standards and codes of practice - see **Section 3.1**

The boiler should be serviced at regular intervals, not exceeding SIX months for oil fired boilers, or TWELVE months for gas fired boilers.

When carrying out boiler servicing always consider both your own safety and that of others. The use of protective equipment (e.g. eye protection, face mask, protective gloves, etc.) is recommended where necessary.

13.1 Initial Inspection

a. Operate boiler and check for any signs of unsatisfactory operation, water leaks, gas leaks, oil leaks or unusual noise from burner oil pump or motor.

b. After allowing burner to reach stable firing conditions for approximately 15 minutes, carry out combustion gas check.

Measure CO₂, CO, flue gas temperature, smoke number (for oil) and water temperature rise across the boiler. The readings obtained should be noted for reference upon completion of the servicing procedure.

c. Measure either gas pressure at burner head, or

oil pressure at burner pump, as applicable, and check value is correct for size of boiler in question.

d. Check operation of both boiler and heating system controls, then set boiler control thermostat to OFF.

Allow the boiler/burner to cool.

13.2 Burner Service Procedure.

SWITCH OFF ELECTRICAL SUPPLY TO BOILER AT ISOLATOR AND SHUT OFF FUEL SUPPLY TO BOILER.

Clean and service the burner in accordance with the burner manufacturers instructions.

a. Disconnect electrical and fuel connections to burner, as necessary.

b. Disconnect burner from mounting flange and remove from front of boiler.

13.3 Boiler Service Procedure

a. After removing burner, remove boiler casing, control panel (taking care to remove thermostat bulbs) and front insulation to gain access to front section of boiler. The power supply to the control panel and additional control cables, if used, can be disconnected by removing upper front panel, lowering fascia after removing thermostat knobs, pulling out the top half of the terminal block and removing the gland plate.

b. Remove heat exchanger access plates (11,12 and 15 referring to Fig. 15.1), and corresponding insulation panels, from boiler front section.

Boiler combustion chamber and heat exchanger flueways are now accessible for cleaning with suitable brushes and a vacuum cleaner.

c. Access to rear of heat exchanger flueways and combustion chamber can be obtained by removing rear insulation wrap, flue box (31), cover plate (32), insulation and fire brick (28) from rear of boiler.

The refractory fire brick (28), located at the rear of the boiler, should be checked at least once every two years and replaced if necessary.

N.B. Removal of flue box requires disconnection of flue.

d. Replace all access/cover plates, ensuring that all gaskets and insulation panels are correctly fitted.

Refit securing studs/nuts and tighten evenly.

e. Refit boiler insulation, casing and control panel (ensure thermostat bulbs are correctly located in pocket). For guidance, refer to **Section 10**.

f. Refit burner. Reconnect fuel and electrical supplies.

g. Turn on fuel supply and check soundness of fuel supply pipework.

h. Check all flue joints for integrity.

i. Check ventilation ducts/grilles to boiler room and ensure they are clear.

j. Re-commission boiler as detailed in relevant parts of **Section 11.0: COMMISSIONING & TESTING**

BOILER MODEL	BURNER DETAILS			BOILER DETAILS						COMBUSTION CHAMBER DETAILS			
	MAKE	MODEL	MODE	NOMINAL HEAT INPUTS/OUTPUTS						DIAMETER (mm)	LENGTH – REFER DIM. A FIG 11.6 (mm)	BLAST TUBE PENETRATION REFER TO DIM. B FIGURE 11.6 (mm)	MOUNTING PLATE DEPTH REFER DIM. C FIG 11.6 (mm)
				HEAT OUTPUT (kW)	HIGH FIRE HEAT INPUT (NETT)		MINIMUM HEAT INPUT BELOW WHICH A BURNER MUST NOT OPERATE (NETT)		GAS RATE m ³ /hr				
					(kW)	(kW)	(kW)	(kW)					
HE110	RIELLO RIELLO	R40GS20D R40GS20/M	HI/LO MODULATING	110	125.5	13.3	77	77	8.1	440	455	120 125	70 70
HE150	RIELLO RIELLO	RS28 RS28/M	HI/LO MODULATING	150	171.2	18.2	81	52	8.6	440	575	216 155	130 70
HE190	RIELLO RIELLO	RS28 RS28/M	HI/LO MODULATING	190	216.3	22.9	81	52	8.6	440	695	216 216	130 130
HE220	RIELLO RIELLO	RS38 RS38/M	HI/LO MODULATING	220	250.5	26.5	105	70	12.2	440	815	216 216	130 130
HE250	RIELLO RIELLO	RS38 RS38/M	HI/LO MODULATING	250	284.7	30.1	105	70	12.2	440	935	216 216	130 130
HE280	REILLO REILLO	RS50/M RS38	MODULATING HI/LO	280	309.9	32.75	85	105	11.8	440	1055	216 216	130 130
HE310	RIELLO REILLO	RS50/M RS38	MODULATING HI/LO	310	343.2	36.26	85	105	11.8	440	1175	216 216	130 130
HE340	RIELLO REILLO	RS50/M RS38	MODULATING HI/LO	340	377.9	39.94	85	105	11.8	440	1295	216 216	130 130
HE370	RIELLO RIELLO	RS50/M RS50	MODULATING HI/LO	370	404.2	42.7	85	116	11.8	440	1415	216 216	130 130
HE400	RIELLO	RS50	HI/LO	400	430.0	45.5	116	116	11.8	440	1535	216	130

Note To comply with the requirements of the Gas Appliance Directive, only the combinations listed below may be utilised for natural gas applications. Heat input values quoted above are based on Natural Gas (G20) with a net CV of 34.06 MJ/m³ @ 1013mbar and 15°C.

Figure 11.1 – Matched Burner Boiler Combinations (Natural Gas)

BOILER MODEL	BURNER DETAILS		BOILER DETAILS						COMBUSTION CHAMBER DETAILS			
	MAKE	MODEL	MODE	NOMINAL HEAT INPUTS/OUTPUTS			DIMENSIONS					
				HEAT OUTPUT (kW)	HIGH FIRE HEAT INPUT (NETT) (kW)	GAS RATE m ³ /hr	MINIMUM HEAT INPUT BELOW WHICH A BURNER MUST NOT OPERATE (NETT) (kW)	GAS RATE m ³ /hr	DIAMETER (mm)	LENGTH – REFER DIM. A FIG 11.6 (mm)	BLAST TUBE PENETRATION REFER TO DIM. B FIGURE 11.6 (mm)	MOUNTING PLATE DEPTH REFER DIM. C FIG 11.6 (mm)
HE110	RIELLO RIELLO	R40GS20D R40GS20/M	HI/LO MODULATING	110	125.5	5.7	77	3.3	440	455	120	70
HE150	RIELLO RIELLO	RS28 RS28/M	HI/LO MODULATING	150	171.2	7.8	81 45	3.3	440	575	216	130
HE190	RIELLO RIELLO	RS28 RS28/M	HI/LO MODULATING	190	216.3	8.9	81 52	3.3	440	695	216	130
HE220	RIELLO RIELLO	RS38 RS38/M	HI/LO MODULATING	220	250.5	10.2	105 70	4.75	440	815	216	130
HE250	RIELLO RIELLO	RS38 RS38/M	HI/LO MODULATING	250	284.7	11.6	105 70	4.75	440	935	216	130
HE280	RIELLO RIELLO	RS50/M RS50	MODULATING HI/LO	280	309.9	12.9	85 116	4.6	440	1055	216	130
HE310	RIELLO RIELLO	RS50/M RS50	MODULATING HI/LO	310	343.2	14.3	85 116	4.6	440	1175	216	130
HE340	RIELLO RIELLO	RS50/M RS50	MODULATING HI/LO	340	377.9	15.7	85 116	4.6	440	1295	216	130
HE370	RIELLO RIELLO	RS50/M RS50	MODULATING HI/LO	370	404.2	16.8	85 116	4.6	440	1415	216	130
HE400	NONE	-	-	400	430.0	17.9	-	-	440	1535	-	-

NOTE! To comply with the requirements of the Gas Appliance Directive, only the combinations listed below may be utilised for LPG applications. Heat input values quoted above are based on Propane (G31) with a net CV of 88 MJ/m³ @ 1013mbar and 15°C.

Figure 11.2 – Matched Burner Boiler Combinations (LPG Propane)

BOILER MODEL	BURNER DETAILS		BOILER DETAILS				COMBUSTION CHAMBER DETAILS					
	MAKE	MODEL	MODE	NOMINAL HEAT INPUTS/OUTPUTS		MINIMUM HEAT INPUT BELOW WHICH A BURNER MUST NOT OPERATE (NETT)	DIAMETER	LENGTH – REFER DIM. A FIG 11.6	BLAST TUBE PENETRATION REFER TO DIM. B FIGURE 11.6	MOUNTING PLATE DEPTH REFER DIM. C FIG 11.6		
				HEAT OUTPUT (kW)	HIGH FIRE HEAT INPUT (NETT)						OIL FLOW RATE l/h	(kW)
HE110	RIELLO	R40G20D	HI/LO	110	122.4	12.7	77	7.8	440	455	260	200
HE150	RIELLO	RL28	HI/LO	150	168.5	17.4	81	8.2	440	575	216	130
HE190	RIELLO	RL28	HI/LO	190	211.8	21.9	81	8.2	440	695	216	130
HE220	RIELLO	RL38	HI/LO	220	246.6	25.4	116	11.8	440	815	216	130
HE250	RIELLO	RL38	HI/LO	250	281.2	28.9	116	11.8	440	935	216	130
HE280	RIELLO	RL38	HI/LO	280	309.9	31.4	118	12	440	1055	216	130
HE310	RIELLO	RL38	HI/LO	310	343.2	34.8	118	12	440	1175	216	130
HE340	RIELLO	RL38	HI/LO	340	377.9	38.4	118	12	440	1295	216	130
HE370	RIELLO	RL50	HI/LO	370	404.2	41	148	15	440	1415	216	130
HE400	RIELLO	RL50	HI/LO	400	430.0	43.6	148	15	440	1535	216	130

NOTE! Heat input values quoted above are based on class D Fuel Oil with a net CV of 35.47 MJ/litre @ 15°C.

Figure 11.3 – Matched Burner Boiler Combinations (Class D Oil)

MAKE (type)	MODEL	MODE	QUANTITY	PART No.	DESCRIPTION
RIELLO (Danfoss/ Delavan)	HE110	HI/LO	1	532904005	2.5 x 60° - (High)
	HE150	HI/LO	1	532904004	2.0 x 60° - (Low)
			1	532904014	1.5 x 60° - (High)
	HE190	HI/LO	1	532904005	2.5 x 60° - (Low)
			1	532904056	1.75 x 60° - (High)
	HE220	HI/LO	1	532904006	3.0 x 60° - (Low)
			1	532904004	2.0 x 60° - (High)
	HE250	HI/LO	1	532904057	3.0 x 45° - (Low)
			1	532904065	2.75 x 45° - (High)
	HE280	HI/LO	1	532904060	3.5 x 45° - (Low)
			1	532904058	2.5 x 45° - (High)
	HE310	HI/LO	1	532904063	4.0 x 45° - (Low)
			1	532904065	2.75 x 45° - (High)
	HE340	HI/LO	1	532904064	4.5 x 45° - (Low)
			1	532904057	3.0 x 45° - (High)
	HE370	HI/LO	1	532904069	5.0 x 45° - (Low)
			1	532904057	3.0 x 45° - (High)
	HE400	HI/LO	1	532904069	5.0 x 45° - (Low)
1			532904063	4.0 x 45° - (High)	

Figure 11.4 – Oil Nozzle Selection

Fuel Type	BOILER MODEL	HE 110	HE 150	HE 190	HE 220	HE 250	HE 280	HE 310	HE 340	HE 370	HE 400	
Natural Gas G20	CO ₂ (DRY)	9 - 10%										
	CO	Less than 100 ppm (air free)										
	Flue Gas Temp Rise °C	225 °C										
	Temp Rise Across Boiler	Less than 20 °C										
LPG Propane G31	CO ₂ (DRY)	11 - 12%										
	CO	Less than 100 ppm (air free)										
	Flue Gas Temp Rise °C	200 - 225 °C										
	Temp Rise Across Boiler	Less than 20 °C										
Class D Fuel Oil	CO ₂ (DRY)	11 - 12%										
	CO	Less than 100 ppm (air free)										
	Flue Gas Temp Rise °C	240 °C										
	Temp Rise Across Boiler	Less than 20 °C										
	Smoke No	Less than 1										

Figure 11.5 – Target Appliance Readings.

Note ! The above target values provide an approximate guide with which to attain nominal operation of the appliance so as to satisfy the requirements of the Boiler Efficiency Directive

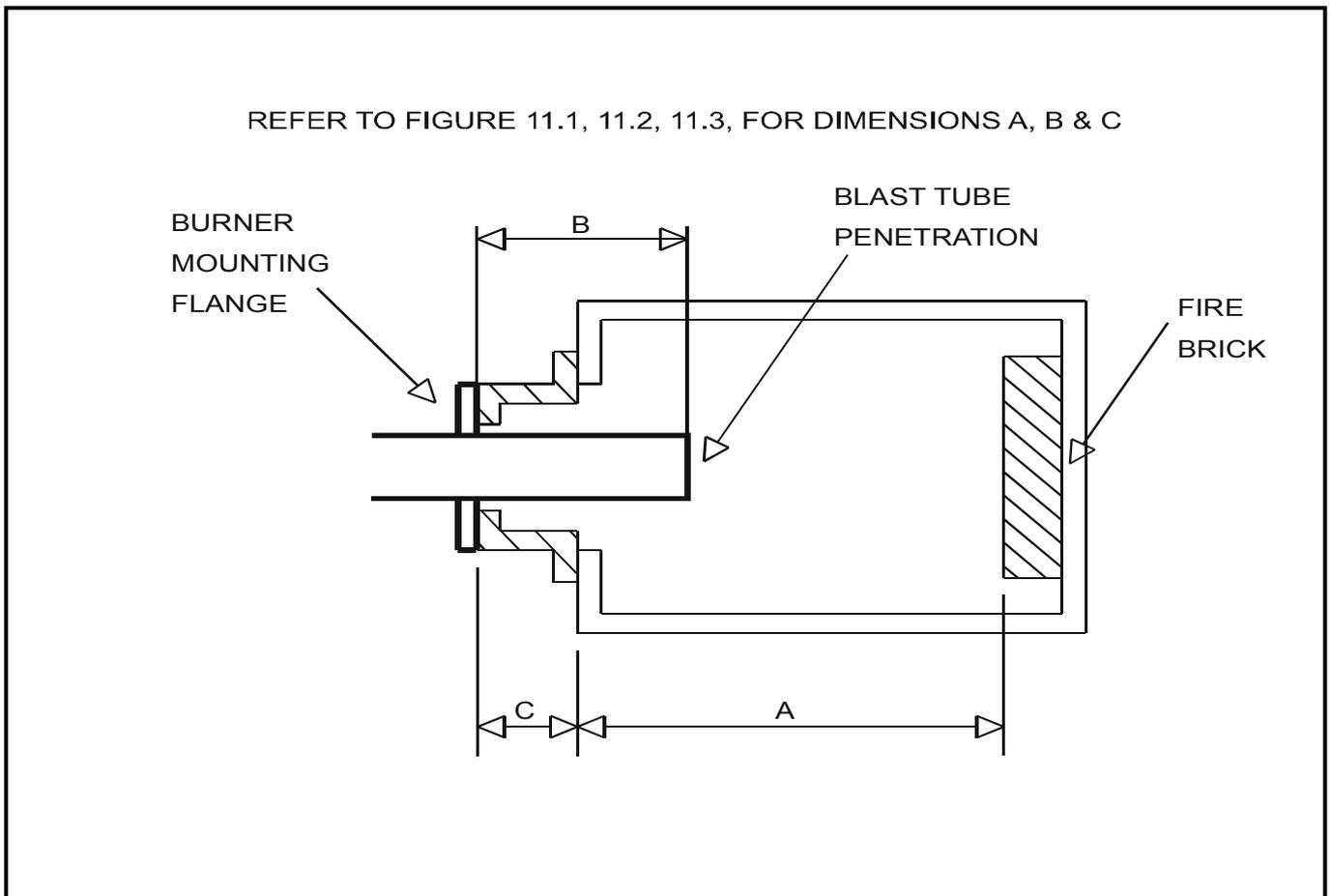


Figure 11.6 – Combustion Chamber and Burner Data

14.0 REPLACEMENT OF PARTS

There are a number of components listed below which can be replaced simply and quickly by following the given procedure. In each case the operation of each replaced component must be checked by carrying out the appropriate part of the commissioning procedure. See **Section 11.0: COMMISSIONING & TESTING**.

NOTE: Isolate all electrical supplies to the boiler and turn off the gas supply before removing controls cover and commencing any servicing or component exchange procedure.

Note : -For replacement of burner components refer to the burner manufacturers instructions.

14.1 Control and High/Low Thermostat(s)

Record the existing temperature setting of the thermostat for reference before removal.

NOTE: before attempting to hinge the fascia down, the thermostat knobs must be pulled off and the temperature limiter (high limit) cover knob unscrewed and removed.

Remove the upper front casing panel. Turn the two latches a quarter turn using a screwdriver or coin and lift off. The fascia can then be hinged downwards by unlatching the catch on the top right hand using a screwdriver.

Withdraw the appropriate thermostat bulb from the thermostat pocket and disconnect the electrical connections noting the terminal identifications.

Remove the two screws securing the thermostat to its mounting bracket and withdraw the thermostat body whilst feeding the capillary through the hole in the control panel mounting plate.

Fit the new thermostat and ensure the capillary is correctly located within the thermostat pocket. Close the fascia and run the boiler to check for correct operation. Set the thermostat to the previously noted setting.

14.2 Temperature Limiter (Limit Thermostat)

The temperature limiter replacement procedure follows that of the control thermostat with some minor differences as detailed below:

With the plastic cover removed, unscrew the holding nut and carefully withdraw the thermostat body

Prior to fitting the replacement thermostat, set to 100°C and check the operation of the device by carefully applying a heat source to the bulb.

15. SPARE PARTS LIST

15.1 Boiler Spares (refer to Fig. 15.1)

ITEM	DESCRIPTION	PART NO.
1	Boiler Cradle	
	Shaftesbury HE 110	573405511
	Shaftesbury HE 150	573405512
	Shaftesbury HE 190	573405513
	Shaftesbury HE 220	573405514
	Shaftesbury HE 250	573405515
	Shaftesbury HE 280	573405165
	Shaftesbury HE 310	573405166
	Shaftesbury HE 340	573405167
	Shaftesbury HE 370	573405168
	Shaftesbury HE 400	573405169
2	Front Section	573405170
3	Intermediate Section	573405172
4	Rear Section.....	573405174
5	'O-Ring' Seal	573405175
6	Guide Ring	573405176
7	Front Access Plate Insulation Panel.....	573405177
8	Front Access Plate - Right Hand	573405179
9	Front Access Plate - Left hand	573405178
10	Cast Iron Hand Nut.....	573405180
11	Water Distribution Tube.....	573405181
	(Not Req'd on HE 110, 150, 190 or 220 models)	
12	Burner Plate Insulation Panel.....	573405182
13	Burner Plate (Blank).....	573405216
14	Sight Glass Insulation Gasket	573405184
15	Sight Glass Assembly	573405185
16	Gasket 135 Dia X 100 X 4	573405186
17	Cast Iron Plate ¾" BSP	573405187
18	Thermostat Pocket ¾" BSP.....	573405049
19	Intermediate Section Flueway Plate.....	573405188
19A	Front Section Flueway Plate	573405189
20	Fire Brick	573405190
21	Combustion Chamber Rear Cover Plate.....	573405191
22	Flue Box Gasket.....	573405192
23	Flue Box	573405193
24	Rear Access Plate Insulation Panel	573405194
25	Rear Access Plate - Left Hand	573405195
26	Rear Access Plate - Right Hand.....	573405196
27	Return Pipe Flange	573405197
28	Flow Pipe Elbow	573405198
29	Lacing Bolt M10 X 150	573405199
30	Tie Rod Set (M14)	
	Shaftesbury HE 110	573405521
	Shaftesbury HE 150	573405522
	Shaftesbury HE 190	573405523
	Shaftesbury HE 220	573405524
	Shaftesbury HE 250	573405525
	Shaftesbury HE 280	573405200
	Shaftesbury HE 310	573405201
	Shaftesbury HE 340	573405202
	Shaftesbury HE 370	573405203
	Shaftesbury HE 400.....	573405204

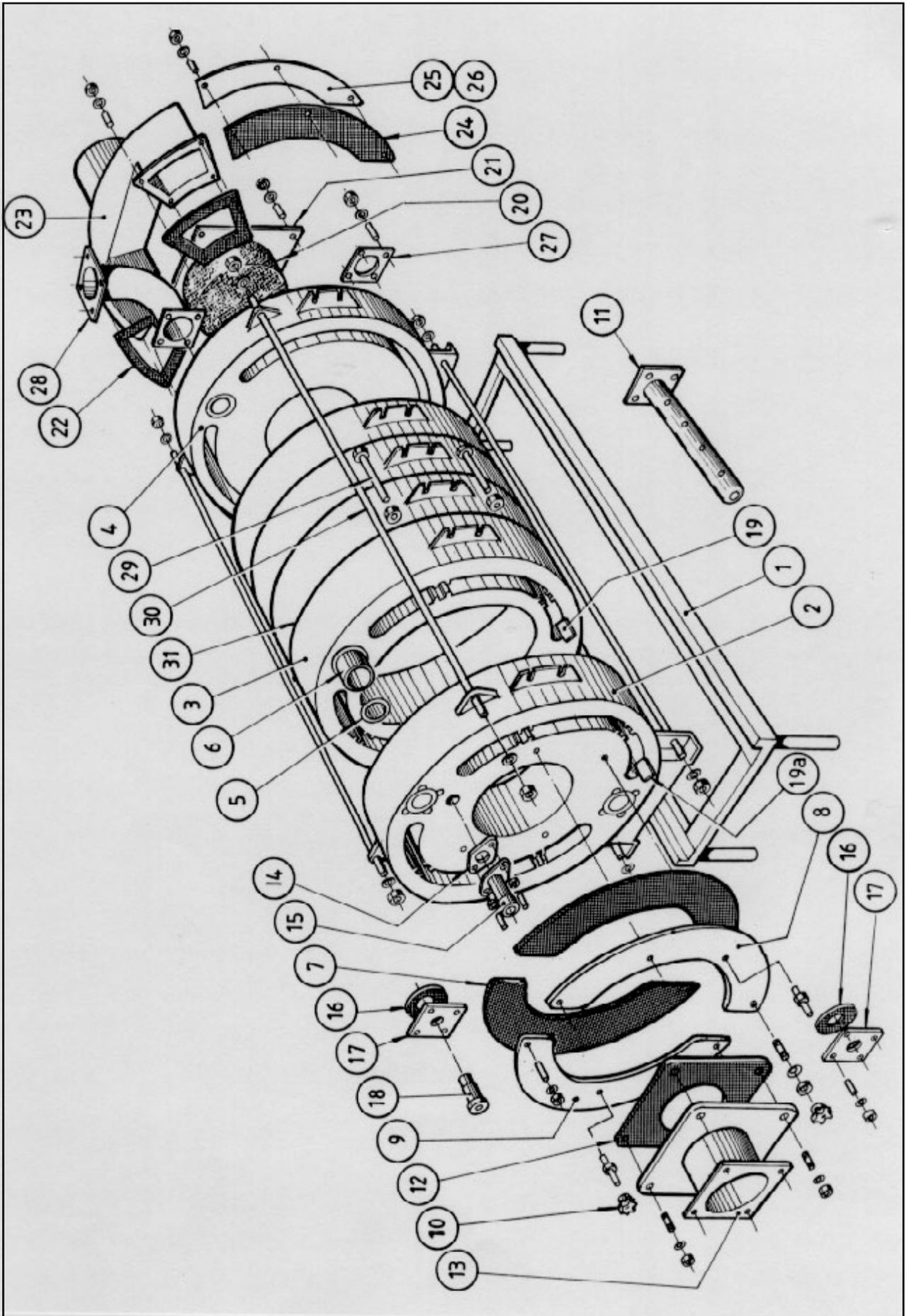


Figure 15.1 – Exploded View of Boiler

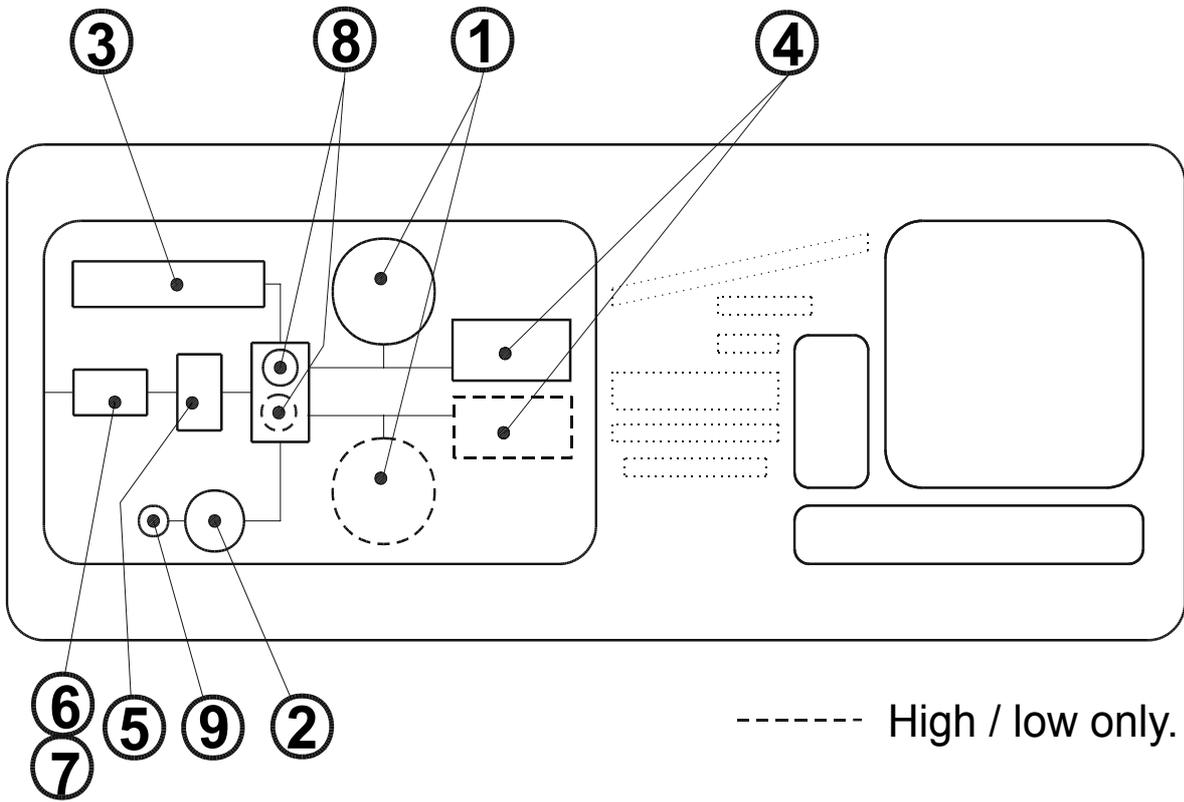


Figure 15.2 – Control Panel Fascia

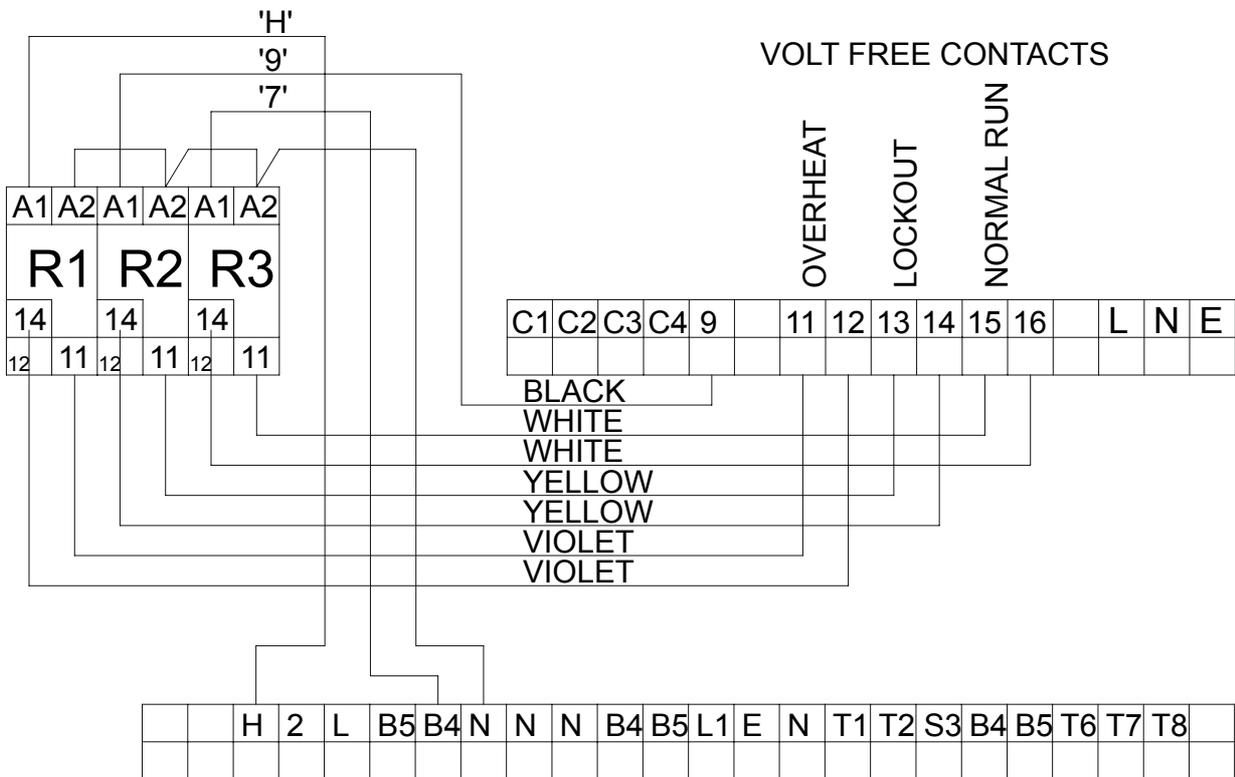
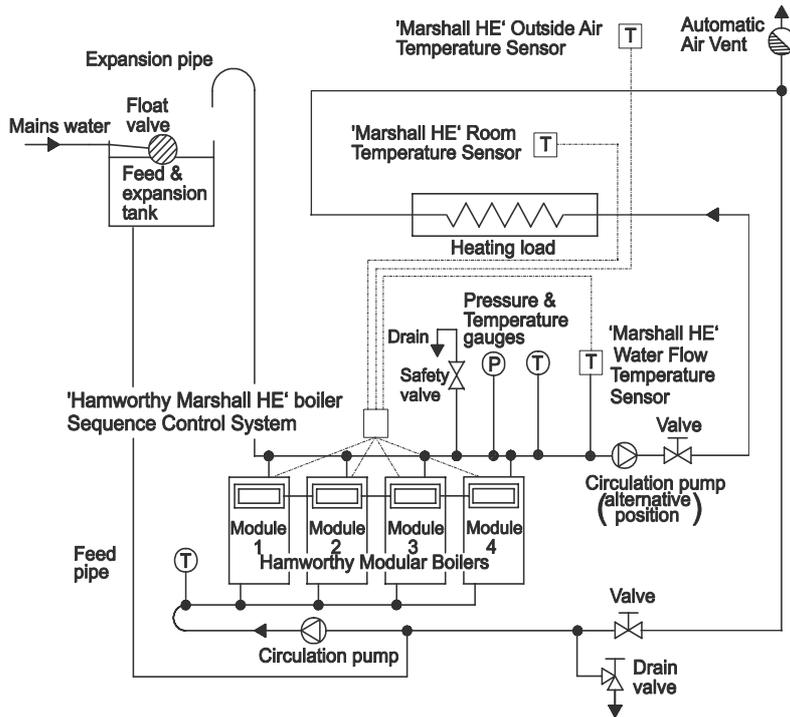


Figure 15.3 – Volt Free Contact Kit and Wiring (Optional)

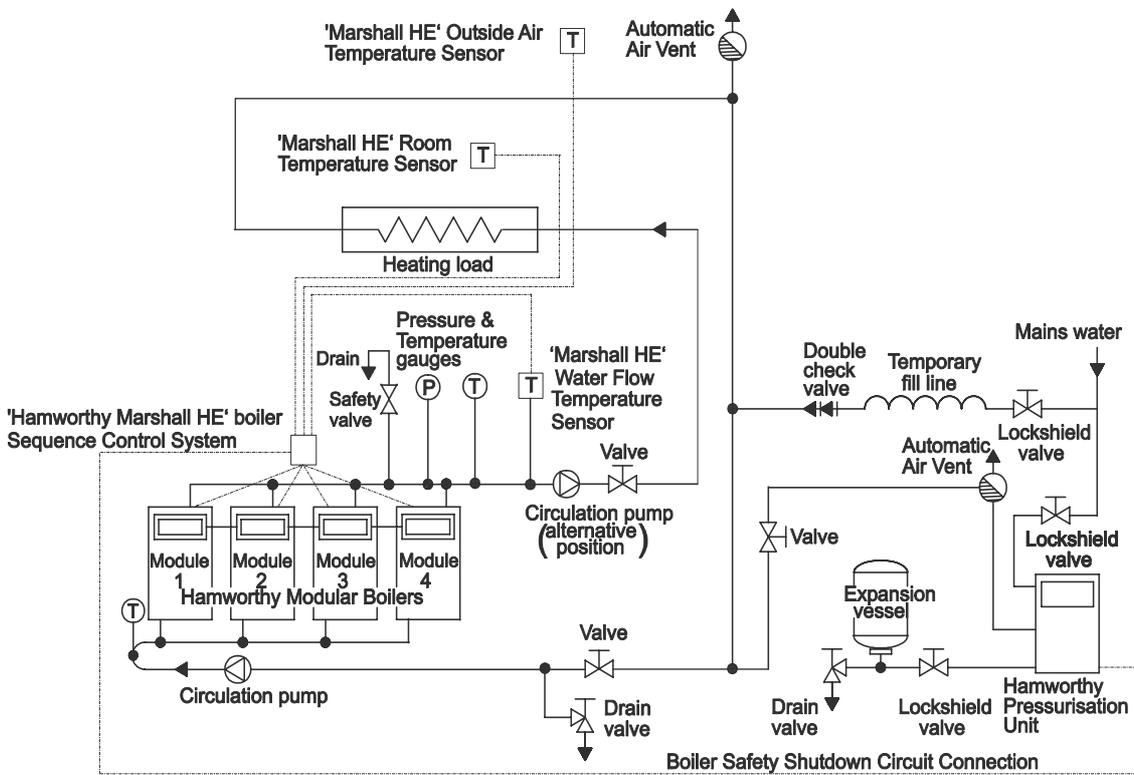
15.2 Control Panel Spares (refer to Fig. 15.2)

ITEM	DESCRIPTION	PART NO.
1	Control Thermostat.....	533901178
2	Temperature Limiter (High Limit).....	533901179
3.	Temperature Gauge.....	557002005
4.	Hours Run Meter.....	533901067
5.	On/off Switch (illuminated).....	533901212
6.	Fuse Holder.....	747224779
7.	Fuse 5A (20 mm).....	533901218
	Fuse 6.3A (20 mm).....	533901221
8	Green Neon.....	533901031
9	Red Neon.....	533901029

16.0 TECHNICAL DATA



VENTED SYSTEM



UNVENTED SYSTEM

Figure 16.1 Boiler Installation Typical

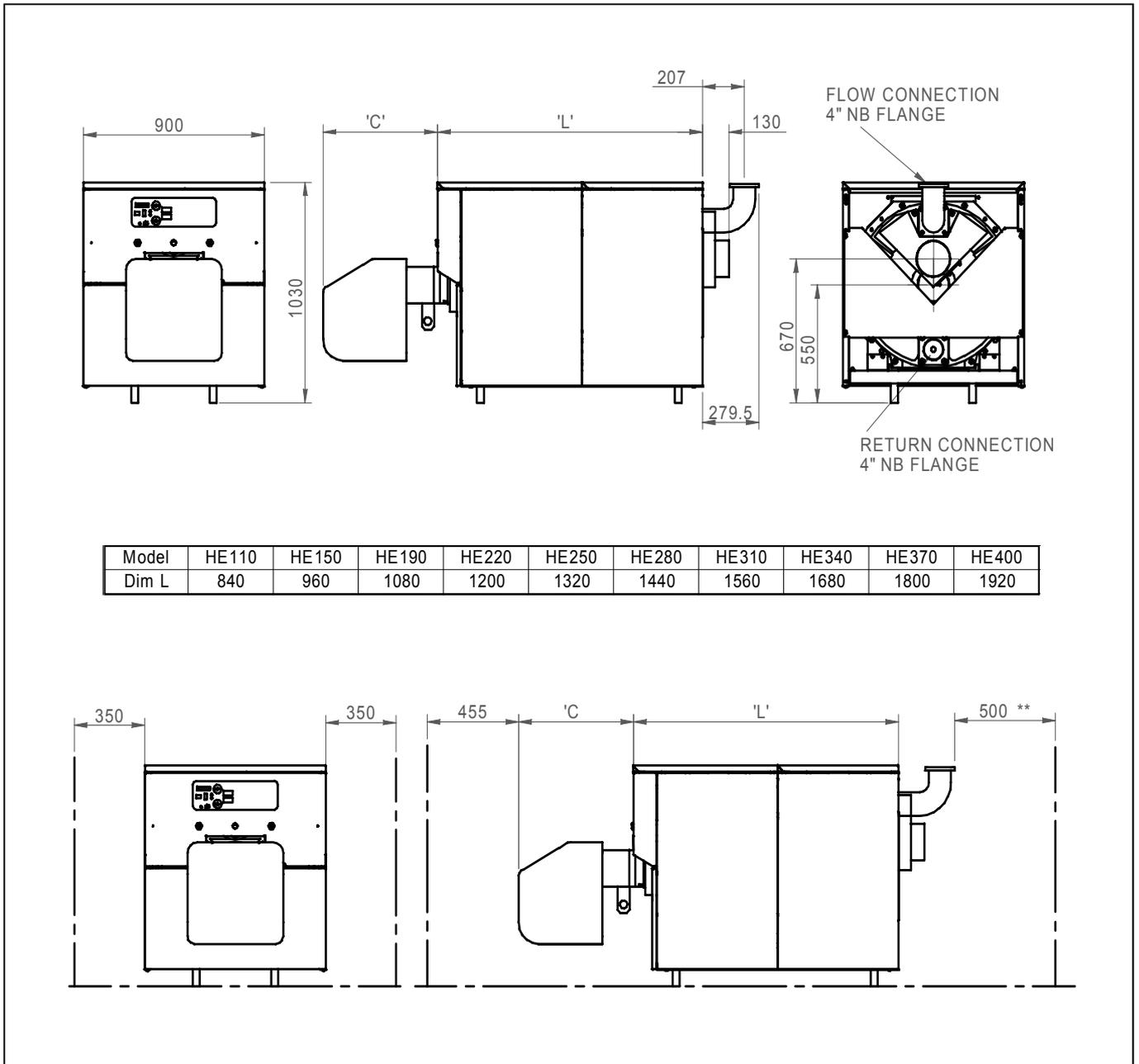


Figure 16.2 Dimensions and Clearances

Note ** - this dimension is a minimum recommendation permitting access to the rear of the boiler for maintenance (800mm for stacked boilers). It may not however be adequate for the installation of flue bends within the boiler house. Where necessary, the dimension must be increased accordingly.

Figure 16.3 Burner Clearances

MODEL	C mm					
	Gas Firing		Oil Firing		Dual Fuel	
	RIELLO	NUWAY	RIELLO	NUWAY	RIELLO	NUWAY
110	356	N/A	261	N/A	N/A	N/A
150	356	N/A	434	N/A	N/A	N/A
190	546	N/A	434	N/A	N/A	N/A
220	546	N/A	434	N/A	N/A	N/A
250	546	N/A	434	N/A	N/A	N/A
280	546	699	434	546	611	716
310	546	699	434	546	611	N/A
340	546	699	434	546	611	N/A
370	546	699	434	652	N/A	N/A
400	546	699	434	652	N/A	N/A

BOILER MODEL - SHAFTESBURY HE		110	150	190	220	250	280	310	340	370	400
GENERAL DATA											
No. OF SECTIONS		5	6	7	8	9	10	11	12	13	14
BOILER INPUT - maximum (nett) 34.06 MJ/m ³	kW	125.5	171.2	216.3	250.5	284.7	309.9	343.2	377.9	404.2	430
	Btu/hr x 1000	428.2	584.1	738	854.7	971.4	1057	1171	1289	1379	1467
BOILER INPUT - maximum (gross) 37.8 MJ/m ³	kW	139.37	190.1	240.2	278.2	316.7	344.0	380.9	419.4	448.6	477.2
	Btu/hr x 1000	475.5	648.6	819.5	949.2	1080.6	1174	1300	1431	1531	1628
BOILER OUTPUT - maximum	kW	110	150	190	220	250	280	310	340	370	400
	Btu/hr x 1000	375	511	648	751	853	955	1058	1160	1262	1365
FLUE DATA											
NOMINAL FLUE DIA.	mm	180									
	in	7									
FLUE DRAUGHT REQUIRED AT BOILER OUTLET	mbar	0.1 - 0.3									
	in.wg.	0.04 - 0.12									
COMBUSTION CHAMBER RESISTANCE (maximum)	mbar	2.8	5.0	4.4	5.9	5.9	3.9	4.6	5.5	6.5	7.4
	in.wg.	1.1	1.96	1.73	2.32	2.32	1.54	1.81	2.17	2.56	2.91
APPROX. FLUE GAS TEMP(gross)	°C	225									
APPROX. FLUE GAS VOLUME @ NTP (wet)	m ³ /h	174	236	254	294	335	383	424	467	500	532
	ft ³ /h	6144	8333	8938	10381	11828	13532	14986	16501	17650	18776
GAS DATA											
NOMINAL GAS INLET PRESSURE	mbar	20									
MAXIMUM GAS INLET PRESSURE	mbar	25									
GAS FLOW RATE	m ³ /h	13.3	18.2	22.9	26.5	30.1	32.8	36.3	39.9	42.7	45.4
	ft ³ /h	469.5	642.5	808.4	935.5	1062	1157	1281	1410	1509	1605
GAS INLET CONNECTION		Rc 1 ½									
WATER DATA											
WATER CONNECTIONS - FLOW & RETURN		4 in N.B.									
MAXIMUM WATER PRESSURE	bar g.	5.0									
	psi g	73.0									
WATER CONTENT	litres	78	92	106	120	134	148	162	176	190	204
	UK gal.	17.2	20.3	23.3	26.4	29.5	32.6	35.7	38.8	41.9	44.9
WEIGHT (FULL)	kg	508	592	676	755	834	923	1012	1106	1200	1274
WITHOUT BURNER	lb	1118	1302	1487	1661	1835	2031	2226	2433	2640	2803
ELECTRICAL SUPPLY		230V 1ph ~ 50Hz									

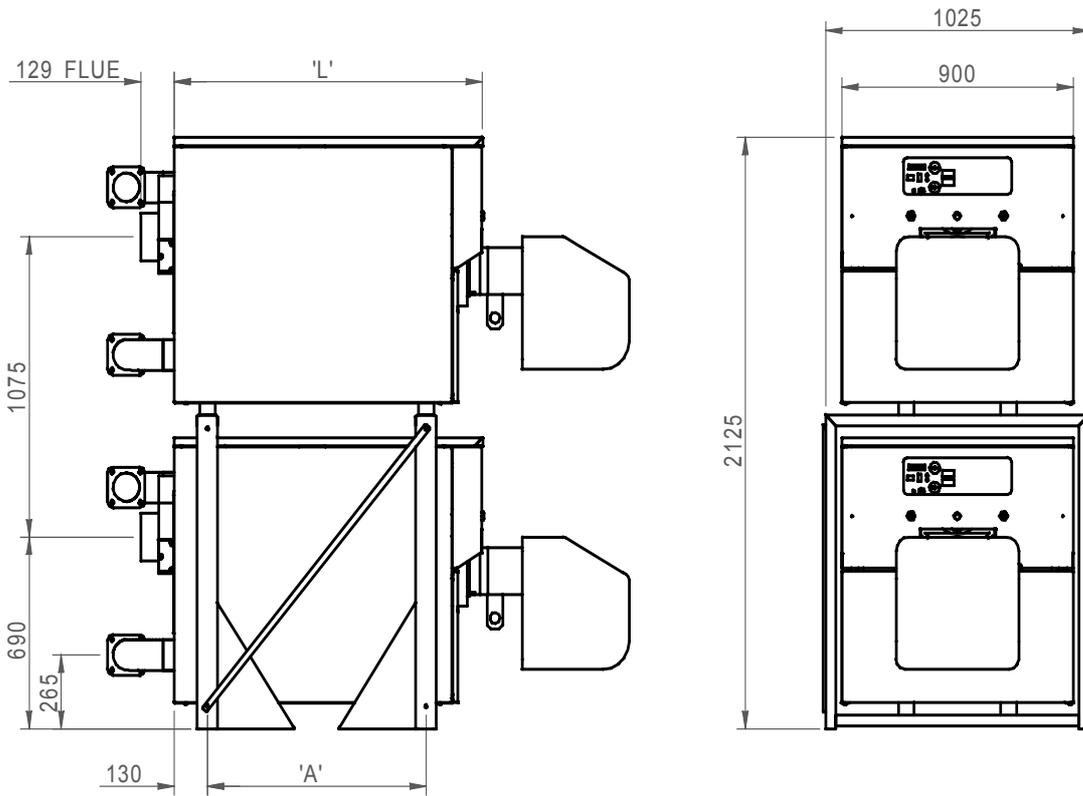
Figure 16.4 – Performance and General Data Information (Natural Gas)

Note: For matched burner/boiler combinations, refer to Figures 11.1, 11.2 & 11.3
For combustion target figures, refer to Figure 11.5
For data relating to Propane and Oil refer to Appendices A & B.

BOILER MODEL Shaftesbury	DESIGN FLOW RATE (11 ° C. ΔT)				MINIMUM FLOW RATE (20 ° C. ΔT)			
	FLOW RATE		PRESS. DROP		FLOW RATE		PRESS. DROP	
	l/min	UK gal/min	mbar	in. wg	l/min	UK gal/min	mbar	in. wg
HE110	158.5	34.8	3.5	1.4	80	17.6	1.0	0.4
HE150	206.7	45.4	6.5	2.6	108	23.8	1.8	0.7
HE190	247.6	54.5	8.5	3.3	136.2	30.0	2.9	1.1
HE220	286.7	63.1	11.5	4.5	157.7	34.7	3.7	1.5
HE250	325.7	71.7	13.0	5.1	179.1	39.5	4.2	1.6
HE280	357.5	78.6	16.5	6.6	196.3	43.2	5.0	2.0
HE310	397.0	87.3	18.5	7.4	218.3	48.0	5.6	2.3
HE340	435.0	95.7	21.0	8.4	240.0	52.8	6.4	2.6
HE370	475.6	104.6	23.5	9.5	262.0	57.7	7.1	2.9
HE400	514.9	113.3	26.0	10.5	283.3	62.4	7.9	3.2

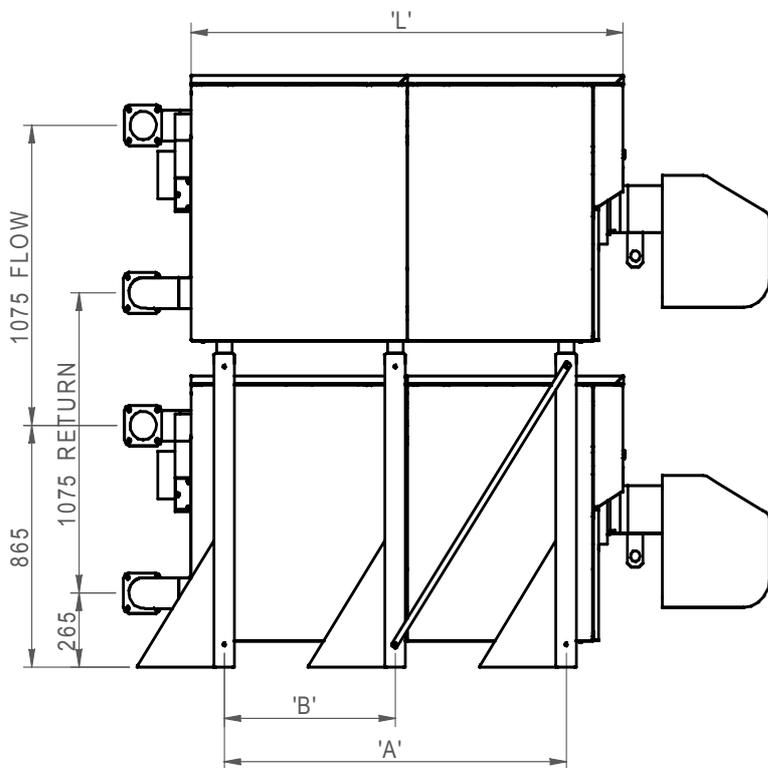
Figure 3.1 - Water Flow Rates and Pressure Drops

STACKED BOILER DIMENSIONS



SIDE VIEW (HE110-HE250)

FRONT VIEW (ALL MODELS)



SIDE VIEW (HE280-HE400)

Model	Dim A	Dim B	Dim L
HE 110	490	n/a	840
HE150	610	n/a	960
HE190	730	n/a	1080
HE220	850	n/a	1200
HE250	970	n/a	1320
HE280	1090	545	1440
HE310	1210	605	1560
HE340	1330	665	1680
HE370	1450	725	1800
HE400	1570	785	1920

Figure 16.5 - Stacked Boiler Dimensions

APPENDIX A INFORMATION RELATING TO PROPANE FIRING

Figure 16.6 – Performance and General Data Information (LPG Propane)

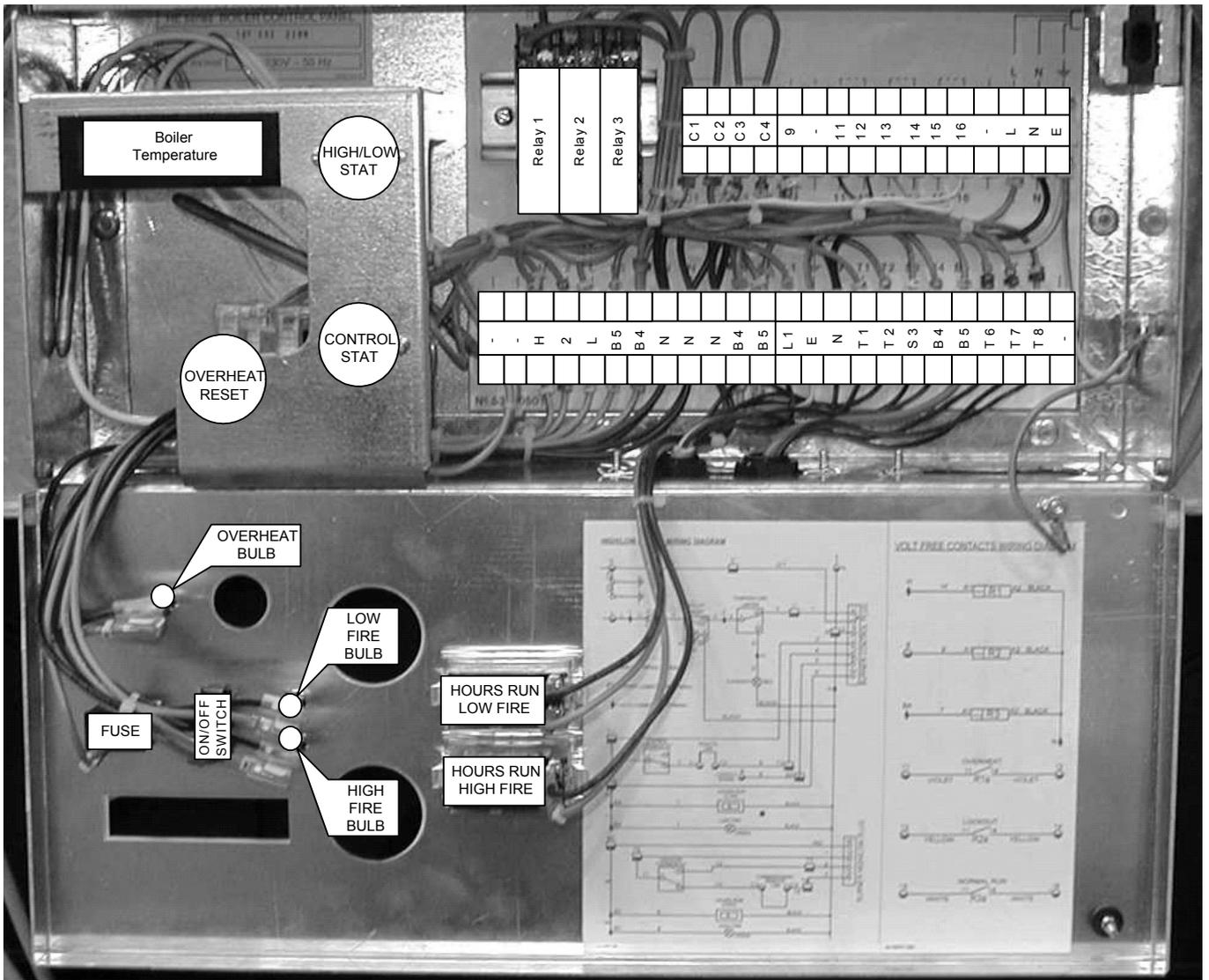
BOILER MODEL Shaftesbury HE		110	150	190	220	250	280	310	340	370	400
GENERAL DATA											
No. Of Sections		5	6	7	8	9	10	11	12	13	14
Boiler Input Max. (Nett) (Nett) 88.0 MJ/m ³	kW	125.2	171.2	216.3	250.5	284.7	309.9	343.2	377.9	404.2	430
	Btu/hr x 1000	428.2	584.1	738	854.7	971.4	1057	1171	1289	1379	1467
Boiler Input Max. (Gross) (Gross) 95.65 MJ/m ³	kW	139.37	190.1	240.2	278.2	316.7	337	373	410	439	467
	Btu/hr x 1000	475.5	648.6	819.5	949.2	1080.6	1147	1270	1398	1496	1591
Boiler Output Max.	kW	110	150	190	220	250	280	310	340	370	400
	Btu/hr x 1000	375	511	648	751	853	956	1058	1160	1263	1365
FLUE DATA											
Approx. Flue Gas Temp. (Gross)	°C	225	225	225	225	225	225	225	225	225	225
Approx. Flue Gas Volume @ NTP (Wet)	m ³ /hr	173	236	261	303	344	388	429	473	506	538
	ft ³ /hr	6110	8333	9239	10689	12147	13699	15171	16705	17868	19008
GAS DATA											
Nom. Gas Inlet Pressure	mBar	37	37	37	37	37	37	37	37	37	37
Max. Gas Inlet Pressure	mBar	45	45	45	45	45	45	45	45	45	45
Gas Flow Rate	m ³ /hr	5.7	7.8	8.9	10.2	11.6	12.9	14.3	15.7	16.8	17.9
	ft ³ /hr	201	275	314	360	410	455	504	555	594	632

APPENDIX B INFORMATION RELATING TO OIL FIRING

Figure 16.6 – Performance and General Data Information (Class D fuel oil)

BOILER MODEL Shaftesbury HE		110	150	190	220	250	280	310	340	370	400
GENERAL DATA											
No. Of Sections		5	6	7	8	9	10	11	12	13	14
Boiler Input Max. (Nett)	kW	125.5	171.2	216.3	250.5	284.7	309.9	343.2	377.9	404.2	430
	Btu/hr x 1000	428.2	584.1	738	854.7	971.4	1057	1171	1289	1379	1467
Boiler Input Max. (Gross)	kW	139.37	190.1	240.2	278.8	316.7	329	365	402	430	457
	Btu/hr x 1000	475.5	648.6	819.5	949.2	1080.6	1125	1247	1372	1468	1562
Boiler Output Max.	kW	110	150	190	220	250	280	310	340	370	400
	Btu/hr x 1000	375	511	648	751	853	956	1058	1160	1263	1365
FLUE DATA											
Approx. Flue Gas Temp. (Gross)	°C	225	225	225	225	225	225	225	225	225	225
Approx. Flue Gas Volume @ NTP (Wet)	m ³ /hr	206	252	300	347	394	445	492	542	580	617
	ft ³ /hr	7295	8907	10595	12258	13931	15710	17399	19158	20491	21799
OIL DATA											
Oil Flow Rate	l/hr	12.7	17.4	21.9	25.4	28.9	32.8	36.3	40.0	42.8	45.5
	UK gal/hr	2.8	3.8	4.8	5.6	6.4	7.2	8.0	8.8	9.4	10

SHAFTESBURY CONTROL PANEL



NOTES:-

THIS DIAGRAM SHOWS THE CONTROL PANEL WIRING 230V ~ 50Hz SUPPLY.

THE ELECTRICAL SUPPLY TO THE BURNER IS DEPENDANT UPON THE MODEL SELECTED, REFER TO BURNER MANUFACTURERS INSTRUCTIONS.

TWO FUSES ARE SUPPLIED (5 AMP OR 6.3 AMP), THE CORRECT FUSE MUST BE SELECTED FOR THE BURNER SUPPLIED, REFER TO BURNER MANUFACTURERS INSTRUCTIONS.

DEPENDENT ON BURNER TYPE EITHER A 230V ~ 50Hz AC SINGLE PHASE SUPPLY OR A 415V 3-PHASE 4-WIRE SUPPLY WILL BE REQUIRED. 3-PHASE SUPPLIES SHOULD BE CONNECTED DIRECTLY TO THE BURNER WITH A SINGLE PHASE & NEUTRAL SPURRED OFF TO THE CONTROL PANEL.

Figure 16.7 – Shaftesbury Control Panel - Pictorial View

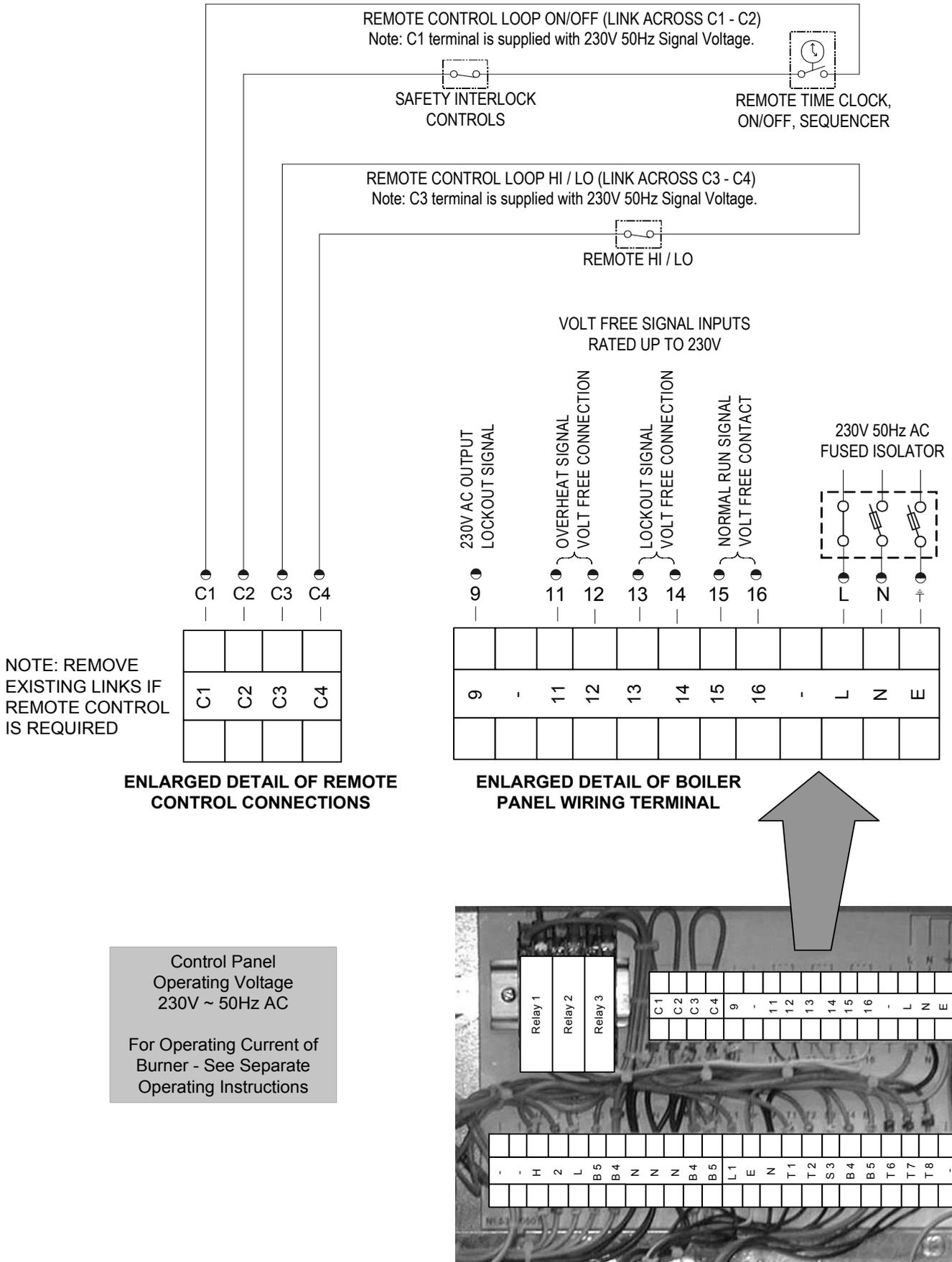
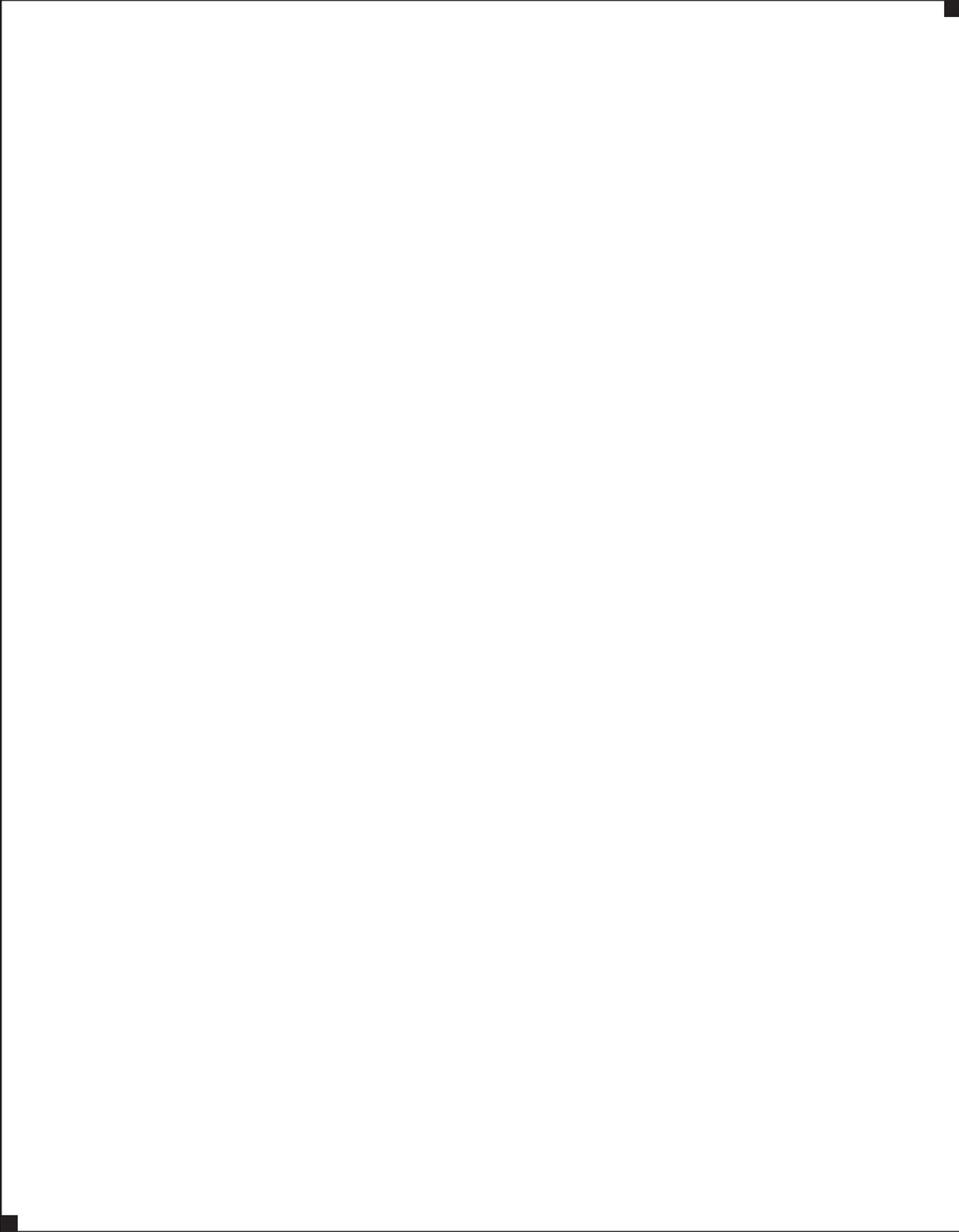


Figure 16.8 – Shaftesbury Termination Details

Notes



Connect direct

Direct Dial Telephone and Fax Numbers



- boilers
- controllers
- water heaters
- pressurisation sets

Poole Office

Hamworthy Heating Limited
Fleets Corner, Poole, Dorset BH17 0HH England
Main switchboard tel: **01202 662500**

Technical enquiries	 01202 662527/662528	 01202 665111
Spare parts	 01202 662525	 01202 665111
Service department	 01202 662555	 01202 662522



- flue components
- packaged fan dilution systems
- bespoke flue components
- bespoke flue systems
- design and installation

Birmingham Office

Hamworthy Heating Limited
Shady Lane, Great Barr, Birmingham B44 9ER
Main switchboard tel: **0121 360 7000** fax: **0121 325 2309**

General enquiries  **0121 360 7000**

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technical@hamworthy-heating.com
sales.flues@hamworthy-heating.com

Hamworthy Heating Accredited Agents

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tel: **0151 666 1030** fax: **0151 647 8101**

Southern Ireland

HEVAC Limited
Naas Road, Dublin 12, Ireland
tel: **00 3531 141 91919** fax: **00 3531 145 84806**

Northern Ireland

HVAC Supplies Limited
Unit 2, Antrim Line Business Park, Sentry Lane, Newtownabbey BT36 8XX
tel: **02890 849826** fax: **02890 847443**

Scotland

McDowall Modular Services
14-46 Lomond Street, Glasgow, Scotland G22 6JD
tel: **0141 336 8795** fax: **0141 336 8954**

North East England

Allison Heating Products
17 Beech Road, South Shields, Tyne & Wear NE33 2QH
tel: **0191 455 7898** fax: **0191 455 7899**

Website

www.hamworthy-heating.com

Associate Companies, Offices and Agents throughout the World.

Hamworthy reserves the right to make changes and improvements which may necessitate alteration to the specification without prior notice.