Wimborne MS Boilers

Gas/Oil Fired Cast Iron Sectional Boilers
495kW to 1160kW

Installation, Commissioning and Servicing Instructions

NATURAL GAS I_{2H}
CLASS D (35 sec fuel oil)
Dual Fuel

IMPORTANT NOTE

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

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THE WIMBORNE MS BOILER IS INTENDED FOR USE AS A COMMERCIAL APPLIANCE.

THE GAS FIRED VARIANTS ARE FOR USE ON GROUP H NATURAL GAS (2ND FAMILY) I_{2H} . THE OIL FIRED VARIANTS ARE FOR USE ON CLASS D (35 sec FUEL OIL). PLEASE ENSURE RELEVANT INFORMATION REQUIRED WITHIN DOCUMENT IS FOUND RELATING TO SPECIFIC FUEL TO BE FIRED BEFORE OPERATING THE BOILER.

THIS BOILER COMPLIES WITH ALL RELEVANT EUROPEAN DIRECTIVES.
EC TYPE CERTIFICATE No. EC-87/07/039
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CONTENTS **PAGE**

FIGURES **PAGE**

1.0 INTRODUCTION

1.1 Boiler Range

The Wimborne MS boiler range consists of 8 gas or oil fired cast iron sectional boilers with outputs ranging from 495kW to 1160kW. Refer to Section 2.0 for details on Natural Gas and Oil firing.

The assembled sections form a heat exchanger with three flue gas passes ensuring low flue gas temperatures and high efficiency.

Wimborne MS 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.

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

1.2 Sectional Boilers

Wimborne MS sectional boilers are supplied ready for on-site assembly.

The heat exchanger consists of:

a. A front section.
b. Plain intermediate sections.
c. A rear section

These sections are connected to each other using tapered nipples and are held together by tie rods.

The section to section flue gas seal is made by a mastic strip located in a groove around the inner and outer perimeter of each section.

The insulation around the assembled boiler block is 100mm thick and the mild steel casing is finished in two-tone enamel. The casing, insulation, boiler control panel and burner are packed separately for fitting on site.

The heat exchanger assembly is completed by a cast iron exhaust gas collector with corner access plates for the cleaning and inspection of the heat exchanger flue ways at the rear and a boiler door at the front. The burner mounts onto the door which is hinged, suitable for left or right hand opening.

The flow and return water connections are located at the rear of the boiler.

The Wimborne MS boiler is available with high/low or modulating burners for operation on Class D (35 second) fuel oil, Natural Gas I_{2H} (Second Family) or dual fuel with 2 stage control.

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

a. A fuse
b. An illuminated mains on/off switch
c. Boiler control thermostats (On/Off) & (High/Low)
d. Boiler run, high/low lamps and hours run meters.
e. A temperature limiter (overheat thermostat) to shut down the boiler should the water temperature in the heat exchanger approach 110°C - with manual reset.
f. An overheat lamp
g. A water temperature thermometer (temp. gauge)
h. Flying leads and plugs to connect to the burner.
i. Volt free relay contacts for normal run, overheat and lockout.

1.3 Hydraulic Testing

All Wimborne MS boiler sections are hydraulically tested, ensuring the Wimborne MS boiler is suitable for use on systems with maximum working pressures of up to 8 bar.

1.4 Boiler Set

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

a. Cast iron sections complete with boiler door and exhaust gas collector on pallets enclosing flue gas baffles and flow and return connectors.
b. Casing panels, insulation blankets and tie rods within a large crate.
c. Push nipples, mastic and accessories within a small crate.
d. Boiler control panel.
e. Burner mounting plate, complete with studs and cut out ready to accept specified burner.
f. Matched burner for fuel oil, gas or dual fuel.
g. Oil burner nozzle(s) where applicable.

1.5 COSHH Information

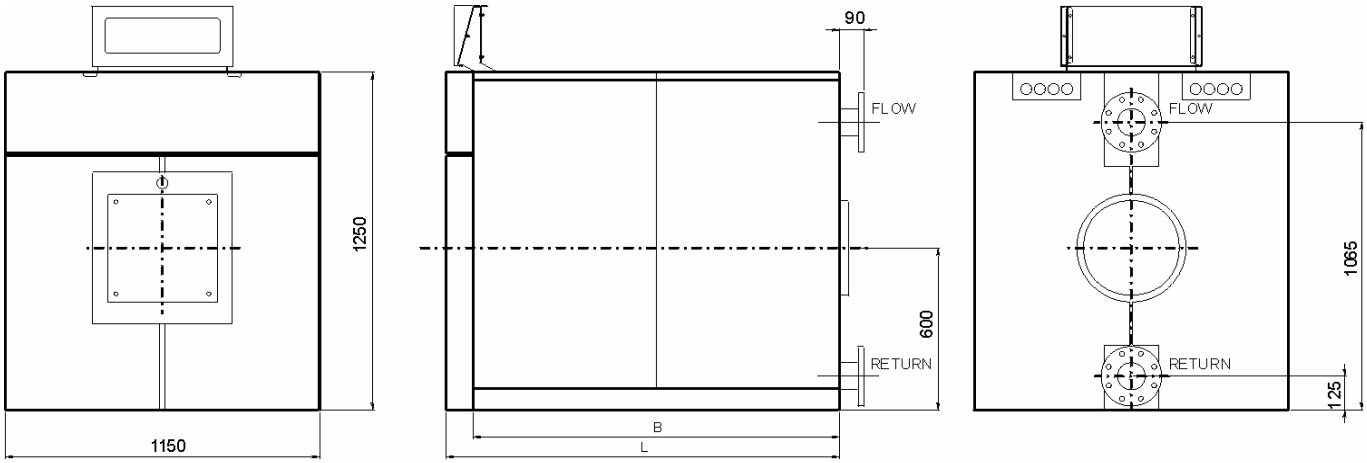
The boiler insulation blankets are non-carcinogenic, mineral wool fibre, and may cause inflammation and irritation on immediate or repeated or prolonged contact with the skin or if inhaled. The use of suitable protective clothing is highly recommended. Avoid contact with skin and direct inhalation

1.5.1 In case of contact with the eyes, rinse immediately with plenty of water and seek medical advice.

1.5.2 In case of contact with skin, wash immediately with plenty of water.

1.5.3 In case of inhalation, move immediately to a clean environment.

2.0 DIMENSIONS AND TECHNICAL DATA



WIMBORNE MS		MS 7	MS 8	MS 9	MS 10	MS 11	MS 12	MS 13	MS 14
No. OF SECTIONS		7	8	9	10	11	12	13	14
BOILER OUTPUT Gas and Oil - max.	kW	495	600	690	780	870	960	1060	1160
NOMINAL HEAT INPUT (net)	kW	561	667	765	864	961	1060	1169	1279
INPUT RATE - Natural Gas (G20)**	m^3/h	59.4	70.6	81.0	91.4	101.7	112.2	123.7	135.3
INPUT RATE - Oil (35 R No1 sec)	kg/h	47.2	56.1	64.3	72.7	80.8	89.2	98.3	107.6
FLUE DATA									
NOMINAL FLUE DIA.	mm	350				400			
FLUE DRAUGHT REQUIRED	mbar	0.04 - 0.25 suction							
AT BOILER OUTLET	in.wg	0.02 - 0.1 suction							
GAS SIDE RESISTANCE	mbar	1.5	2.0	2.9	3.2	4.1	5.0	5.9	6.8
	in.wg	0.59	0.79	1.18	1.30	1.65	2.00	2.36	2.72
APPROX. FLUE GAS TEMP (net)	°C	185 (Gas) ~ 205 (Oil)							
APPROX. FLUE GAS VOLUME	Gas	769	915	1049	1184	1318	1453	1603	1753
@ NTP (wet) - (m^3/h)	Oil	713	848	972	1099	1221	1348	1486	1626
GAS DATA		consult burner manufacturers manual							
WATER DATA									
CONNECTIONS - FLOW and RETURN*		Flanged DN100 (PN16)							
HYDRAULIC RESISTANCE @ 11°C	mbar	12.9	19.5	25.8	32.4	42.3	48.6	61.5	71.4
HYDRAULIC RESISTANCE @ 20°C	mbar	3.9	5.9	7.8	9.8	12.8	14.7	18.6	21.6
DESIGN FLOW RATE @ 11°C	l/s	10.86	13.03	14.98	16.94	18.89	20.84	23.02	25.19
MINIMUM FLOW RATE @ 20°C	l/s	5.97	7.17	8.24	9.31	10.39	11.46	12.66	13.85
MAXIMUM WATER PRESSURE	bar g.	8							
MAXIMUM FLOW TEMPERATURE	°C	90							
MINIMUM RETURN TEMPERATURE	°C	50							
WATER CONTENT	l	305	350	395	440	485	530	575	620
WEIGHT (FULL) WITHOUT BURNER	kg.	1985	2245	2505	2760	3025	3285	3545	3805
OVERALL CASING LENGTH - Dim L	mm	1440	1620	1800	1980	2160	2340	2520	2700
COMBUSTION CHAMBER LENGTH - Dim B	mm	1160	1340	1520	1700	1880	2060	2240	2420
ELECTRICAL SUPPLY		400 V 3 ph 50 Hz (Burner) - 230 V 1 ph 50 Hz (Boiler Panel)							

* Supplied with mating flanges suitable for welding

** Net Calorific Value of 34.02 MJ/m³ at 15°C and 1013.25mbar

Approximate Burner Depth Dimension 'A' in Figure 3.1 - Clearances

Burner Manufacturer	Fuel	MS 7 mm	MS 8 mm	MS 9 mm	MS 10 mm	MS 11 mm	MS 12 mm	MS 13 mm	MS 14 mm
Riello	Nat Gas	810	1170	1170	1170	1170	1170	1200	1200
	Oil	680	960	960	960	960	960	960	960
	Dual Fuel	1170	1170	1170	1170	1170	1170	1200	1200
Nuway	Nat Gas	980	1050	1050	1200	1200	1200	1200	1200
	Oil	820	790	790	930	930	930	930	930
	Dual Fuel	1035	1130	1130	1310	1310	1310	1310	1310

Note: For burner model selection see Figures B1, B2 and B3

3.0 GENERAL REQUIREMENTS

3.1 Delivery. The boiler is delivered unassembled in a series of package crates and pallets. Before beginning to assemble the boiler it is advisable to check these packing crates to ensure that all delivered items are present using the charts on pages 13 & 19 of this manual. Any shortages should be reported to Hamworthy Heating.

3.2 Location

3.2.1 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 and the opening of the door complete with burner 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 3.1 over the page 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.

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 6.0 for details.

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.

3.2.2 Boilers should be installed on a plinth which is at least 50mm high and is smooth and level, 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. Mild steel inserts to support the boiler should be positioned in the partially set concrete, made level and the concrete allowed to set, see Figure 3.2 for dimensions. These allow the boiler to expand and contract freely whilst remaining fully in contact with the plinth.

Note: For some burners with acoustic shrouds the plinth may need to be higher, refer to Hamworthy Heating Technical Department if in doubt.

3.3 Adequate Water Flow

The flow water temperature from the boiler must reach 60°C (gas firing) or 50°C (oil firing) as soon as possible after the boiler being brought into operation. Thereafter, water circulation should be maintained through the boiler such that the return water temperature is always above 40°C (gas firing) or 30°C (oil firing).

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 8.0: Electrical Supply for details. See Figure 8.1 for wiring details.

For multi-boiler systems a reverse-return pipework configuration ensures equal distribution of water flow throughout the boilers.

If the type and/or control of the system could possibly lead to the boiler being subject to repeated thermal shock, some form of boiler protection should be considered. There are several ways of providing boiler protection, eg shunt pumps, primary loops, etc. Shunt pumps should be sized at minimum flow rate for the boiler model (See Fig. 2.1)

Typical piping arrangements are shown in Figure 3.3 and a typical shunt pump arrangement is shown in Figure 3.4.

3.4 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 7.10.1 for details.

3) Multiple 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) Multiple boiler installation running at 82°C flow temperature and 20°C rise across system. Minimum head required = 9.4 metres or 0.92 bar. See Section 7.11 for Pressurised Water Systems.

3.5 Water Treatment

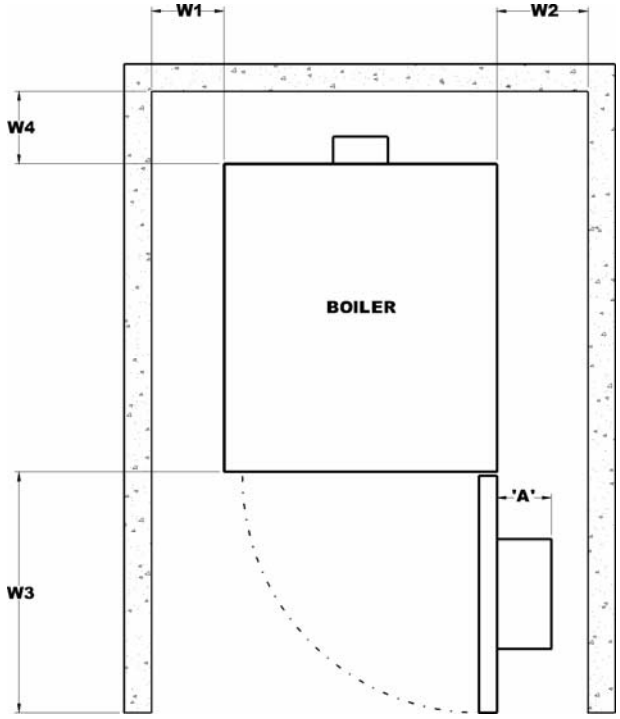
If the boiler feed water has a high degree of hardness, it is recommended that the water be treated to prevent precipitation of scale or sludge in

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 a permanent means of filtration (not HHL supply) should be fitted into the return pipework, such as a sludge trap hydrocyclone or full flow duplex filters. The boiler guarantee will be invalid if waterways are blocked by debris or carbonate deposits.

HHL can supply a range of air and dirt separators to assist with the conditioning of the water.

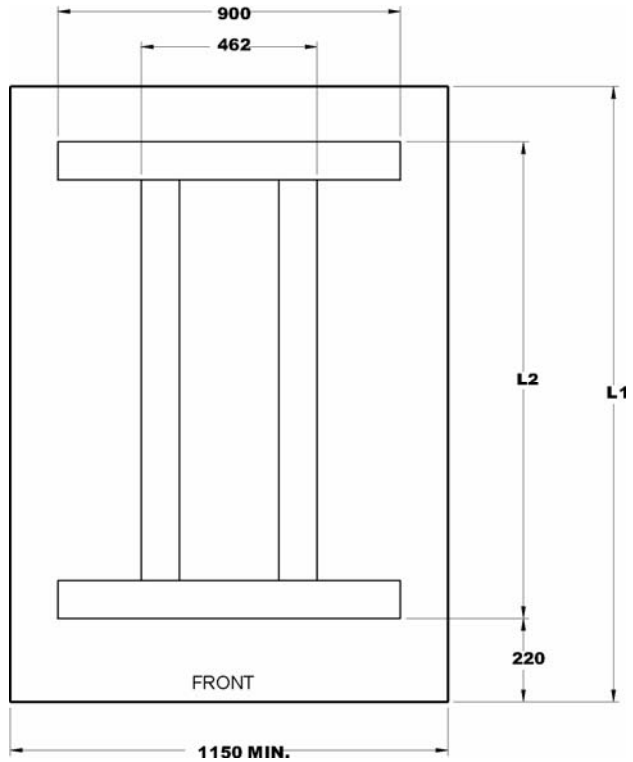


W1 - 400mm MIN.
W2 - BURNER DEPTH (dim 'A') + 100mm
W3 - 1500mm MIN.
W4 - 750mm MIN.

A ceiling height of 2.3m is recommended.

NOTE: Door may be hinged on left or right.

Figure 3.1 - Clearances.



Plinth height; 50mm min. smooth and level.
Steel inserts; 100x5 steel flat or 100x50x5 steel angle.

Blr	MS 7	MS 8	MS 9	MS 10	MS 11	MS 12	MS 13	MS 14
L1	1140	1620	1800	1980	2160	2340	2520	2700
L2	775	1255	1435	1615	1795	1975	2155	2335

Figure 3.2 - Plinth Dimensions.

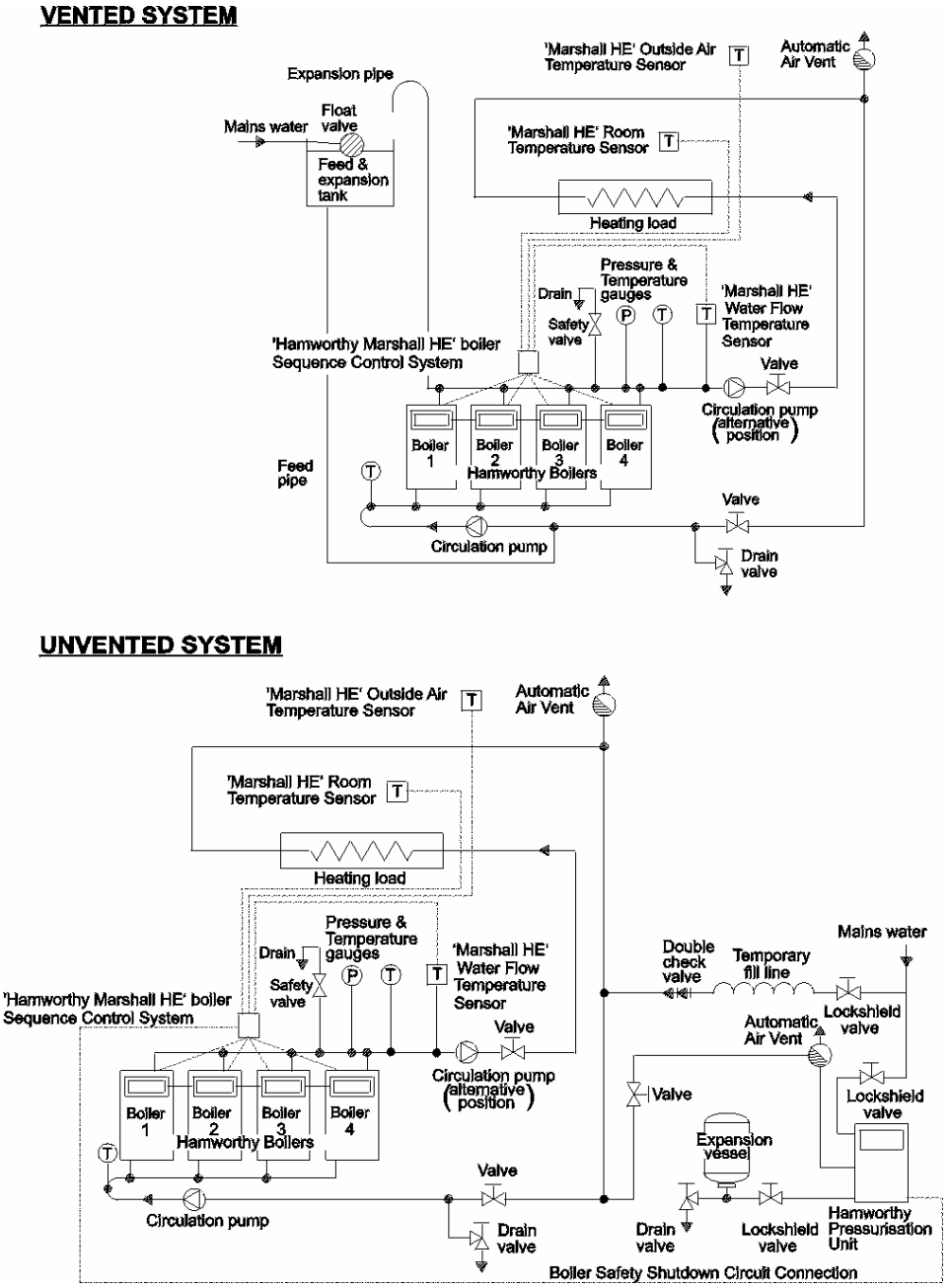


Figure 3.3 - Typical schematic boiler installation layout

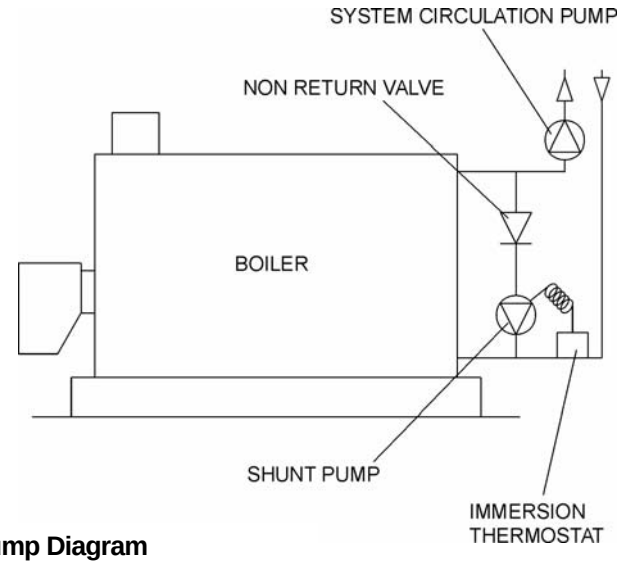


Figure 3.4 - Typical Shunt Pump Diagram

4.0 GAS / OIL SUPPLY

4.1 Gas Service Pipes

The gas transporter 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 supplier.

4.2 Gas Meters

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

4.3 Gas Installation Pipework

Installation pipes must be fitted in accordance with **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 **IGE/UP/1** or **1a** by a suitably qualified person.

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

4.4 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 gas transporter must be consulted before a gas pressure booster is fitted and it should be installed in accordance with **IGE/UP/2**.

4.5 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.

4.6 Oil Supply

The oil storage & supply system should be designed and installed in accordance with **BS5410-2**, as appropriate.

The following notes are given as guidance :-

4.6.1 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.

4.6.2 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

4.6.3 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.

4.6.4 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.

NOTE:- 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.

5.0 FLUE SYSTEM

5.1 General Requirements

Detailed recommendations for flue systems are given in **BS 5410-2**, **BS 6644**, & **IGE UP/10**. The following notes are intended to give general guidance only.

Each boiler should be connected to an individual flue system, 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.

5.2 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 2.1, Technical Data.

5.3 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 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.

It is particularly important to ensure that the point at which the flue exits the building is fully weatherproofed.

5.4 Suction

The flue system should be designed to maintain atmospheric pressure or a slight suction at the boiler flue connection at all times (0.04 - 0.25 mbar).

It is recommended that a draught stabiliser is fitted to the flue system where the suction is likely to exceed 0.25 mbar.

5.5 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 13.0: Servicing for further information**.**

5.6 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.

5.7 Surface Temperature

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.

5.8 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.

5.9 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.

6.0 AIR SUPPLY

Detailed recommendations for air supply are given in **BS 6644** and **IGE/UP/10** specifically for boilers fired by gas but the same figures can be used to approximate for fuel oil.

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.

6.1 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 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) 4cm^2 per kW
of total rated input (net).

High Level (outlet) 2cm^2 per kW
of total rated input (net).

Where a boiler installation is to operate in summer months, e.g. domestic hot water heating, the above allowance should be sufficient provided that it does not operate for more than 50% of the time. If the boiler installation is to operate at a higher percent of the time, increased ventilation will be required, e.g. at 75% an additional 1cm^2 and at 100% an additional 2cm^2 of free area per kW will be required at high end at low level.

6.2 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 utilised provided that the minimum inlet flow rate of air is in accordance with Fig. 6.1. A fan installed for extraction purposes shall be selected such as not to cause a negative pressure (relative to the outside atmosphere) to develop in the boiler house and to maintain the difference between inlet and extract flow rates shown in Fig. 6.1.

2) Mechanical extract ventilation with natural inlet ventilation **MUST NOT** be used.

NOTE:- For mechanical ventilation systems an automatic control must be provided that causes safety shut down or lockout of the boiler(s) in the event of inlet or extract air flow failing.

Boiler Type	Flow Rate per kW total rated heat input (net)	
	Minimum Inlet air (Combustion Ventilation)	Difference between inlet and extract air (inlet minus extract ventilation)
	m^3/h	m^3/h
Forced draught (no draught diverter)	2.6	1.35±0.18

Figure 6.1 - Mechanical ventilation Flow Rates

7.0 WATER CIRCULATION SYSTEM

7.1 General

Recommendations for the water circulation system are given in **BS 6644** for gas fired boilers but the same principals can be used for those using fuel oil. The following notes are of particular importance:-

7.1.1) 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.

7.1.2) 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.

7.1.3) Each boiler has DN100 flanged flow and return connections located on the rear section of the boiler, mating flanges suitable for welding are also supplied.

7.1.4) 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 boiler.

7.2 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 multiple installation, each bank of boilers, must be fitted with a pressure relief valve to **BS EN ISO 4126-1** 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.

7.3 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 is shown in figure 7.1.

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.

Boiler Output	Feed	Vent
301kW to 600kW	38	50
601kW to 1000kW	50	65
1001kW to 1500kW	50	80

Figure 7.1 - Cold Feed and Vent Pipe Sizes (mm)

7.4 Altitude Gauge (Water Pressure Gauge)

Every boiler or group of boilers should be provided with a gauge complete with isolating valve. See Figure 3.3 for typical position.

7.5 Thermometer

A thermometer complete with pocket should be fitted in the pipework to indicate water flow temperature. See Figure 3.3 for typical position.

Note: An unplugged Rc½ connection is provided on the flanged flow connection which may be suitable for the above instruments.

7.6 Drain Valves

Each boiler should have a drain valve fitted (not H.H.L. supply), to drain the boiler only. An plugged Rc½ connection is provided for a drain valve on the flanged return connection.

The heating system in total should have drain valves as recommended by **BS 6644** which permit the draining of the whole system, including the boiler and any hot water storage vessel. See Figure 3.3 for recommended positions.

7.7 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.

7.8 Minimum Water Flow Rates

Minimum water flow rates are shown in Figure 2.1. 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.

7.9 Waterside Pressure Drop

The waterside hydraulic resistance (Pressure drop) is shown in Figure 2.1.

7.10 Control Schemes

7.10.1 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. For high / low applications a second control thermostat is supplied that should be set around 5°C lower than the main control thermostat. This will enable the burner to switch to a lower firing rate as the water temperature approaches the set point.

A temperature limiter, (hand reset limit thermostat) is also fitted to the boiler and must be set at 100°C.

If a modulating burner is fitted, an additional temperature sensor must be fitted in the flow pipework adjacent to the boiler and wired back to the modulating control on the burner, following the manufacturer's instructions. In this case, the high / low thermostat becomes superfluous and the appropriate 4 pin plug and flying lead can be disconnected from the boiler control panel. The 7 pin plug must remain connected in an unmodified condition in order to ensure that the temperature limiter remains in circuit. The boiler temperature control is carried out directly by the modulating controller on the burner to the temperature set point adjusted within the controller.

NOTE:- The minimum difference between control thermostat and temperature limiter **MUST NEVER** be less than 10°C.

Where the system is operating on a ΔT of 20°C, care should be taken to ensure that the return temperature does not fall below 40°C for gas or 30°C for oil.

7.10.2 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 2.1 is maintained.

7.10.3 Frost Protection

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

7.11 Unvented Systems

See Figure 3.3 for typical layout of a Unvented (Pressurised) Hot Water System.

For system design refer to **BS 7074-2**.

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

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 pressurisation 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 EN ISO 4126-1**, for information.

See also **BS 6880-1**, for design considerations.

7.12 Multiple Boiler Control Schemes

For multiple 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 that will control up to 8 stages from a flow temperature sensor. Outside and room temperature sensors are optional. For further information, contact Hamworthy Heating for details.

8.0 ELECTRICAL SUPPLY

WARNING: THIS APPLIANCE MUST BE EARTHED

8.1 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 control panel is supplied with flying leads 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.

Note a 3 phase 4 wire (including neutral) supply is required from which the 3 phase should be wired direct to the burner with a single phase and neutral spurred off to the boiler control panel. For fuse ratings of the main 3 phase supply, refer to the technical instructions supplied by the burner manufacturer. The fuse rating for the control panel of individual boilers is shown on the data plate.

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.

Further details regarding connection to the electricity supply are given in BS EN 60335-1.

8.2 Indication Signals and Volt Free Contacts

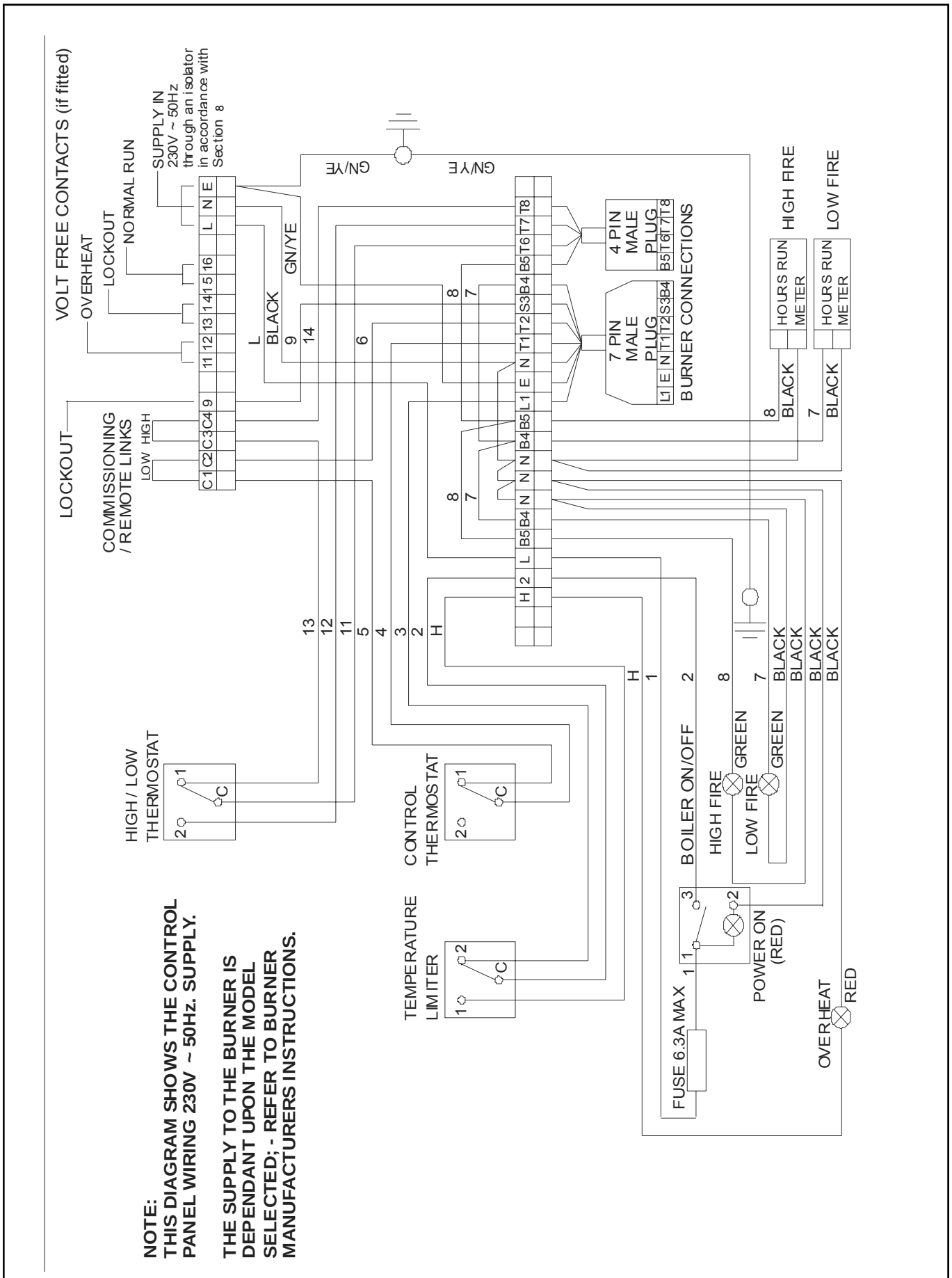
Control panels are fitted with v.f.c.'s (volt free contacts) to enable external indicator lights or alarms to derive signals for normal run, overheat and lockout.

NOTE:- These external circuits **MUST** be isolated before any service or maintenance procedures are carried out (see note in control panel).

8.3 Remote Control

The operation of the burner should be controlled through the use of the low / off (terminals C1 & C2) and high / low (terminals C3 & C4) links situated in the control panel. Remove the links and attach to the terminals to the appropriate volt free control cables.

Figure 8.1 - High / Low Burner Control Panel Wiring Diagram



Note: For modulating burner operation the 4 pin burner plug must be disconnected from terminals B5, T6, T7 and T8 and discarded.

9.0 BOILER ASSEMBLY

Front Section Assembly (located on top of pallet of intermediate sections), comprising;

HHL Part No	Description	MS7	MS8	MS9	MS10	MS11	MS12	MS13	MS14
573411068	Front Section Casting	1	1	1	1	1	1	1	1
573411095	Boiler Door	1	1	1	1	1	1	1	1
573411025	Sight Glass Assy	1	1	1	1	1	1	1	1
573411071	Hinge Pin	2	2	2	2	2	2	2	2
573411096	Hinge	2	2	2	2	2	2	2	2
573411103	M16 x 80 Bolt	4	4	4	4	4	4	4	4
573411179	M12 x 30 Bolt	4	4	4	4	4	4	4	4
573411102	M12 x 25 Bolt	8	8	8	8	8	8	8	8
573411175	M12 Plain Washer	4	4	4	4	4	4	4	4
573411176	M12 Spring Washer	8	8	8	8	8	8	8	8
573411111	M16 Plain Washer	4	4	4	4	4	4	4	4
573411117	Sealing Rope 8mm dia.	1m	1m	1m	1m	1m	1m	1m	1m
573411116	Sealing Rope 14mm dia.	3.2m	3.2m	3.2m	3.2m	3.2m	3.2m	3.2m	3.2m
573411070	Ceramic Fibre Door Sealing	1	1	1	1	1	1	1	1
573411178	Door Sealing Plate	1	1	1	1	1	1	1	1

Rear Section Assembly c/w Gas Collector (located on top of pallet of intermediate sections), comprising;

573411075	Rear Section Casting	1	1	1	1	1	1	1	1
573411093	Right Cleaning Port	2	2	2	2	2	2	2	2
573411094	Left Cleaning Port	2	2	2	2	2	2	2	2
573411091	Exhaust Gas Collector 350mm	1	1	1	1	-	-	-	-
573411092	Exhaust Gas Collector 400mm	-	-	-	-	1	1	1	1
573411107	M10 Plain Washer	8	8	8	8	8	8	8	8
573411117	Sealing Rope 8mm dia.	7m	7m	7m	7m	7m	7m	7m	7m
573411109	M10 Nut	16	16	16	16	16	16	16	16
573411108	Washer 10 dia x 30	8	8	8	8	8	8	8	8
573411105	M10 x 35 Stud	8	8	8	8	8	8	8	8

2 or more Pallets Containing Intermediate Sections, comprising;

573411073	Intermediate Section	5	6	7	8	9	10	11	12
573411077	Flow & Return Connectors	2	2	2	2	2	2	2	2
573411079	Flanges DN100 (PN16)	2	2	2	2	2	2	2	2
573411080	Flange Gasket	2	2	2	2	2	2	2	2
573411098	Front Baffles	24	24	24	24	24	24	24	24
573411099	Inner Baffles	24	48	48	24	24	24	24	24

Accessory Package (small packing crate), comprising;

573411109	M10 Nut	8	8	8	8	8	8	8	8
573411112	M16 Nut	8	8	8	8	8	8	8	8
573411111	M16 Plain Washer	8	8	8	8	8	8	8	8
573411072	Plug Rc 1½	2	2	2	2	2	2	2	2
573411107	M10 Plain Washer	8	8	8	8	8	8	8	8
573411012	Sensor Pocket	2	2	2	2	2	2	2	2
573411110	M16 x 32 x 2 Spring Washer	24	24	24	24	24	24	24	24
573411118	Sealing Rope 12mm	48m	56m	64m	72m	80m	88m	96m	104m
573411078	Gasket 135 x 135 x 90	3	3	3	3	3	3	3	3
573411076	Water Distribution Pipe 3"	1	1	1	1	1	1	1	1
573411104	M10 x 60 Stud	8	8	8	8	8	8	8	8
573411199	Permatex Sealant 320g	1	1	1	1	1	1	1	1
573411119	CM-43 Adhesive	1	1	1	1	1	1	1	1
573411074	Nipples	12	14	16	18	20	22	24	26

Accessory Package (large packing crate) - see figure 10.1 for contents.

Figure 9.1 - Boiler Block Delivery Checklist

9.1 General

The boiler will normally be delivered with at least two pallets of horizontally stacked castings. One pallet stack will be topped by the front section to which the boiler door will be mounted. Loosen the bolts and remove the door prior to moving the castings, taking particular care not to damage the insulation.

A second pallet stack will be topped by the rear section to which the exhaust gas collector will be mounted. Loosen the nuts and remove the collector prior to moving the rear section. Removal of these top sections will expose the intermediate sections in the centre of which (i.e. the combustion chamber) will be packed the flow and return castings / flanges and the boiler baffles. Remove all of these items and store carefully for future use.

The remaining parts of the boiler will be packed in one large and one small crate. The small crate contains all the items necessary to build the boiler block, apart from the tie rods which are in the larger crate together with the insulation and the outer casing. It is recommended that the insulation and casing panels are stored in the crate until the boiler house is in a sufficiently completed state that damage to the outer casing once fitted will not occur.

The contents of the delivery can be checked against Figures 9.1 and 10.1

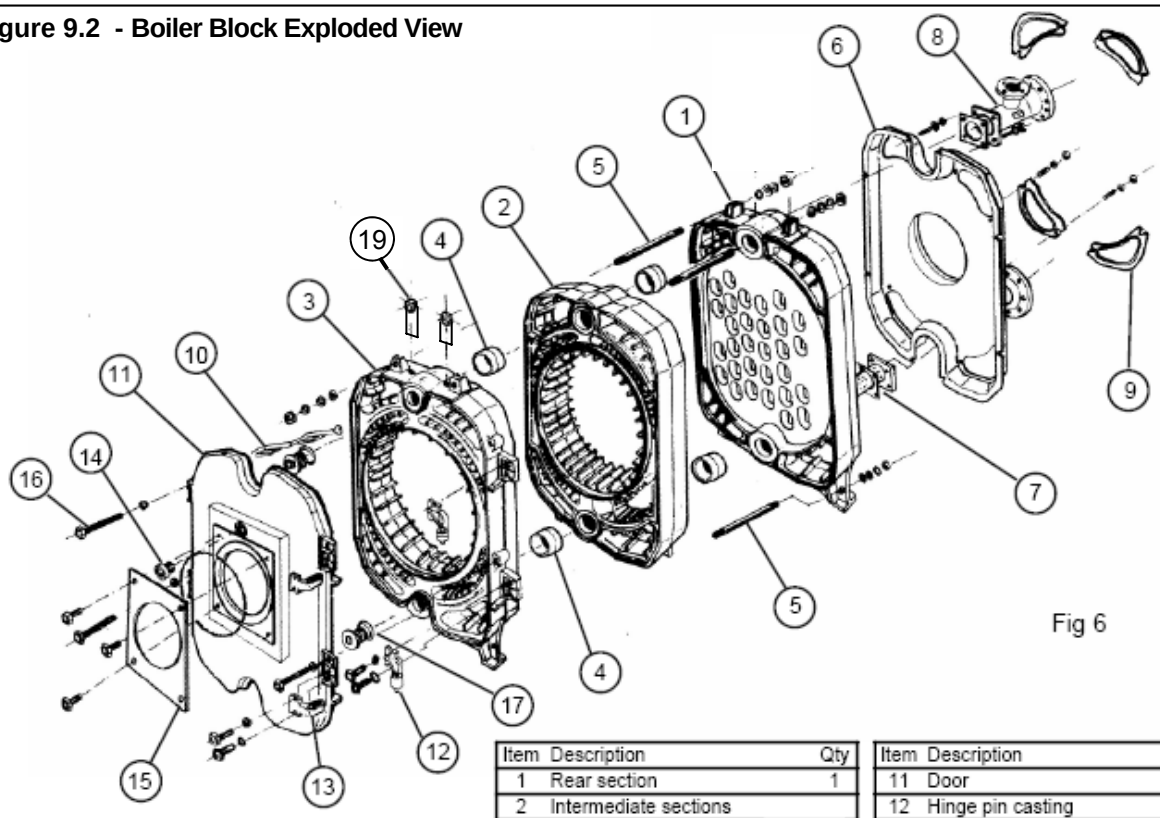
The sections should be moved into or adjacent to the boiler house in a stored arrangement that enables them to be selected in the correct order for assembly beginning with the rear section.

9.2 Tools Required:

The following tools should be available to enable the assembly to procede smoothly;

- 1 set of assembly tools
- 600mm x 50mm x 50mm timber prop
- Open ended spanners - M10, M12, M16
- Cross head and flat blade screwdrivers
- 10mm Mole or pipe grips
- 40mm pipe grips
- Wire brush, fine emery cloth
- Fine, small half-round file
- 10mm short haired brush (seal adhesive)
- Leather or rubber mallet.

Figure 9.2 - Boiler Block Exploded View



Item	Description	Qty
1	Rear section	1
2	Intermediate sections	
3	Front section	1
4	Nipples (according to boiler size)	
5	Tie rods	4
6	Exhaust gas collector	1
7	RW inlet pipe	1
8	F & R manifolds	2
9	Rear cleaning covers	4
10	Baffles (according to boiler size)	

Item	Description	Qty
11	Door	1
12	Hinge pin casting	2
13	Hinge casting	2
14	Sight glass	1
15	Front plate	1
16	Door bolts	4
17	Plugs, R1½	2
19	Sensor pockets	2

9.3 Site Preparation

Ensure that the working space is clear and clean with no debris or clutter on the floor. The plinth should be correctly sized and level ready to accept the boiler sections, as detailed in Section 3.2 and Figures 3.1 and 3.2

9.4 Boiler Section Preparation

Thoroughly wire brush the sealing grooves around the perimeters of the combustion chamber and the section to remove any casting sand and debris. The intermediate sections will require both sides to be brushed. Using the fine emery cloth, clean any protective surface from the nipple ports and the nipples. It is important that the mating surfaces of the nipples and ports are perfectly clean, smooth and free from blemishes.

9.5 Boiler Section Assembly

Note: Build the boiler from back to front.

9.5.1 Select the rear section, position on the plinth and wedge near upright using the timber prop.

WARNING:- the sections are not self supporting until several sections have been assembled together. Precautions should be taken to adequately support the sections to prevent injury or damage.

9.5.2 Apply a smooth coating of 'Permatex' sealant to the machined bore of the nipple ports and to the whole of the outside of the nipple. Engage the nipple into the top (flow) nipple port and, with a soft mallet, tap into the port to a depth of approximately 10mm. Repeat for the bottom (return) nipple port.

WARNING: Nipples and nipple ports must not be damaged during assembly. Never use a steel hammer, only rubber or leather mallets should be used. Strike the nipple on its inside edge so as not to damage the outside edge which is the sealing face for the next section.

9.5.3 Tear off strips of the sealing mastic and apply to the appropriate grooves in the rear casting as follows;

- One continuous strip around the outer perimeter of the section.
- Additional strips around the four 3rd pass gas passages. (see fig 9.3)

All joints between the strips must be continuous. Particular attention must be paid to around the nipple ports. Should the mastic not adhere satisfactorily to the casting, an adhesive is supplied that can be brushed into the grooves prior to squeezing in the mastic.

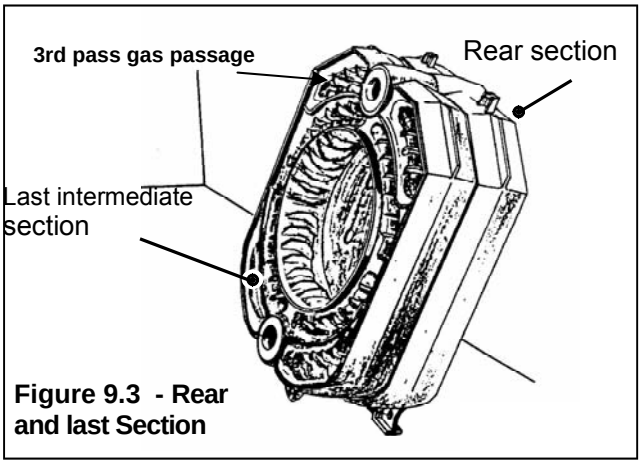


Figure 9.3 - Rear and last Section

9.5.4 Select one intermediate section and identify the side with tongues instead of grooves for the gas passage seals. Apply a smooth even coating of 'Permatex' sealant to the nipple ports on this side.

9.5.5 Offer the intermediate section up to the rear section and engage the nipples into their respective ports. Using the soft mallet, hammer the intermediate section onto the nipples until the sections are secured to each other.

9.5.6 Select the two off assembling tool pulling-up bars and thread through the top and bottom nipple ports. Fit flanges and nuts and tighten evenly top and bottom until the two sections are pulled as tightly as possible together.

9.5.7 Remove the excess sealing mastic that will have squeezed out from the joint. Leaving the assembly tools in place, manhandle the sections into their final position on the plinth and then remove.

9.5.8 Repeat steps 9.5.2 and 9.5.3 on the intermediate section with the <u>important addition</u> of a further continuous strip of sealing mastic around the circumference of the combustion chamber (see Fig. 9.4)

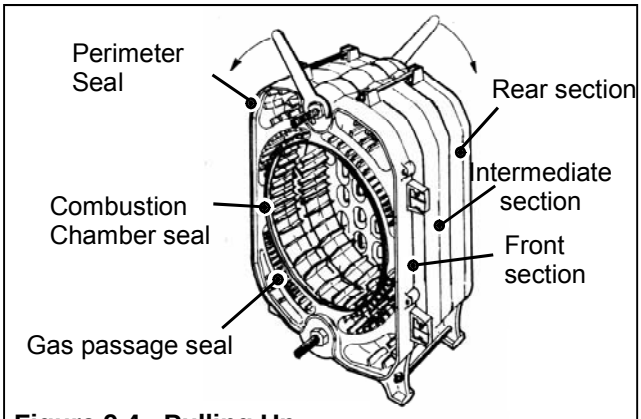


Figure 9.4 - Pulling Up

9.5.9 Select the next intermediate section and following steps 9.5.4 to 9.5.8 assemble it to the rear/

last intermediate sections (see Fig. 9.4).

9.5.10 Continue to prepare, select and fit the remaining intermediate sections, pulling up each additional section individually as tight as possible and remembering to wipe away excess mastic. Complete the boiler block by finally pulling up the front section in the same manner (see Fig. 9.5)

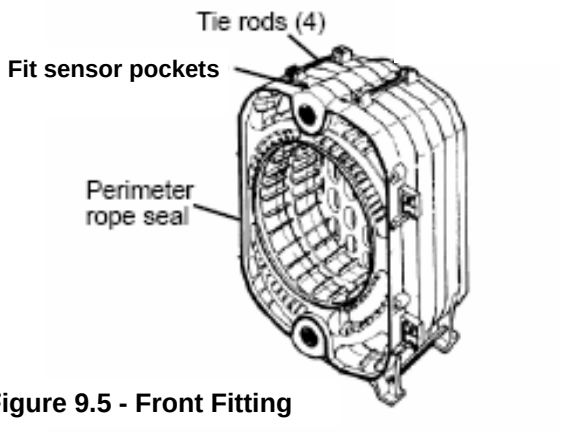


Figure 9.5 - Front Fitting

9.5.11 Prior to finally releasing and withdrawing the pulling-up bars, select the four tie rods and slide them into position, two at the top of the sections and two through the feet. Add 3 off spring washers, 1 off plain washer and 1 off nut (all M16) to each of the eight thread ends and secure but do not overtighten. Compress the spring washers by approximately 50%.

9.5.12 On the rear section, fit the four studs around the flow and return openings. At the return (bottom) opening, fit a square gasket and then slide the tubular water distributor into the opening and over the studs. Select two square gaskets and the two cast iron flanged connections, fit to the flow and return openings and secure with washers and nuts.

Note: The cast flow and return connections are identical and have a Rc½ tapped hole in their body. Consideration should be given to the required orientation of the tapped hole and its use, before fitting and securing. For example, the return connector could be fitted with its tapped hole pointing downwards if a drain valve is to be fitted and the flow connector could be fitted with its tapped hole upwards if a sensor is to be fitted.

9.5.13 On the front section, use thread tape or equivalent to fit and secure the R1½ plugs to the top and bottom openings and the two R½ thermostat pockets to the openings on top.

9.5.14 The heat exchanger is now complete and can be made ready for pressure testing. The flow and return connection flanges must be blanked off with appropriate plates with suitable test connections (Not HHL supply). The hydraulic pressure test should be 1.5 times the maximum system pressure for 30 minutes **(BS779-1981 Amendment 1-1993).**

9.5.15 To complete the boiler block assembly requires the mounting of the exhaust gas collector, the boiler door and the insertion of the appropriate baffles.

9.6 Exhaust Gas Collector Assembly

Note: Some of the following items may have already been positioned and assembled loosely prior to delivery but all should be checked for location and tightness.

9.6.1 Select the eight long studs and fit to the rear casting. Select 8mm fibre rope and fit to the perimeter groove in the rear casting to give a continuous seal. Use the adhesive supplied to ensure the rope remains in position. Select the exhaust gas collector, manoeuvre into position carefully around the flow and return flanges, locate on the studs and secure in position with the large washers and nuts provided.

Note: If more than one boiler of differing sizes are being assembled ensure that the exhaust gas collector with the correct diameter flue opening is fitted to the boiler. Refer to Fig. 2.1.

9.6.2 Select the eight shorter studs and fit to the four corners of the exhaust gas collector. Using the remaining 8mm diameter fibre rope fit a continuous seal to the groove of each of the four cleaning port covers. Use the adhesive supplied to maintain the position of the seals. Fit the covers over the cleaning ports and secure with the M10 nuts and washers.

9.7 Fitting the Baffles

9.7.1 Each baffle assembly comprises a front baffle and either one or two inner baffles, according to the boiler size, see Figure 9.6.

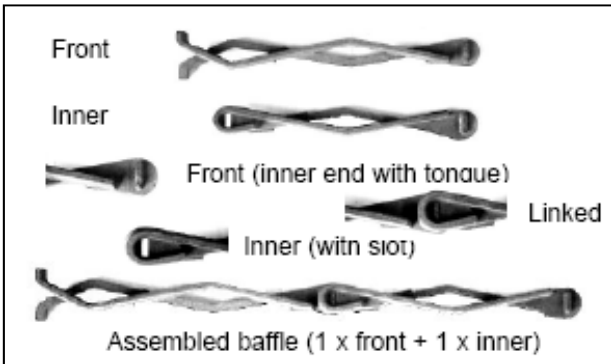


Figure 9.6 - Baffle Types

MS7	- 1 x front	2 x inner
MS8	- 1 x front	2 x inner
MS9	- 1 x front	2 x inner
MS10	- 1 x front	1 x inner
MS11	- 1 x front	1 x inner
MS12	- 1 x front	1 x inner
MS13	- 1 x front	1 x inner
MS14	- 1 x front	1 x inner

9.7.2 The front baffle has 'wings' that prevent it entering the gas passage too far. At the inner end of the front baffle there is a tongue that engages with a slot in the inner baffle. Similarly, a tongue engages with a slot to join 2 inner baffles.

9.7.3 Twenty four baffle assemblies of the correct make-up for the boiler size (see above) are required to be placed in the second pass gas passages in four groups of six as indicated in Figure 9.7.

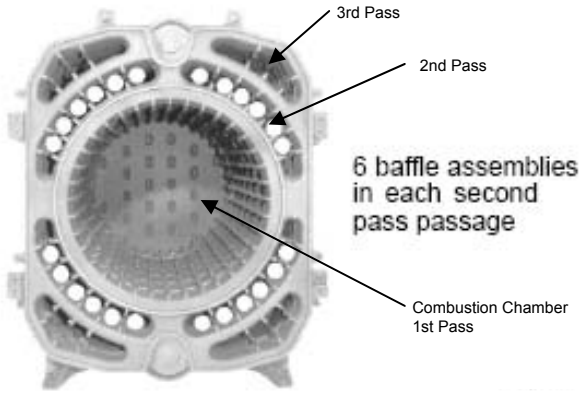


Figure 9.7 - Second Pass Baffle Assemblies

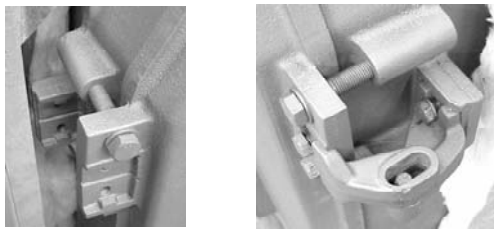
9.8 Fitting the Boiler Door

Note: Some of the following items may have already been positioned and assembled loosely prior to delivery but all should be checked for location and tightness.

9.8.1 The boiler door will normally be delivered assembled in that the main door casting will be filled with soft insulation covered with a rigid fitted insulation cover secured to the casting by means of studs, nuts and washers. If not already in place, select the 14mm fibre rope and form a continuous seal in the perimeter lip of the door casting. Use the supplied adhesive to ensure the rope remains in position.

9.8.2 Position the boiler door adjacent to the boiler and identify its correct orientation. The sight glass opening must always be uppermost above the burner mounting plate.

Note: As the door can hinge either to the right or left, site conditions should be assessed to decide which. Relevant conditions could be; proximity of walls, proximity of other equipment, the handing of the burner gas train, the position of the fuel supply etc. Select and fit the two hinge pin brackets to the appropriate lugs on the front casting using the short M12 bolts and spring washers. Select and fit the two hinge brackets to the appropriate side of the door using the short M12 bolts and spring washers supplied.



Door bolt (Door opens to the right)

Assembled hinge (Door opens to the right)

Figure 9.8 - Door Hinges

9.8.3 Lift the door in the open position and locate the hinges over the hinge pins. Carefully close the door and check that when the 4xM16 door locking bolts and washers are tightened the tongue on the front section closes firmly on the rope seal around the door. Open the door and check that there is an indentation in the rigid door insulation from the tongue on the front section around the combustion chamber hence illustrating a satisfactory seal.

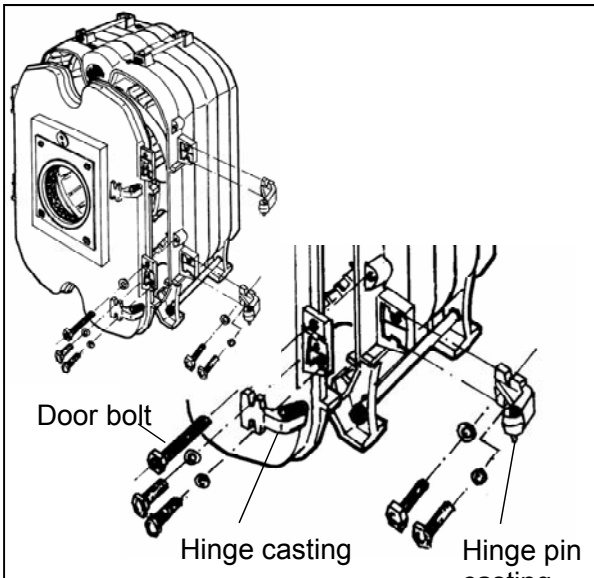


Figure 9.9 - Hinge Assembly

9.8.4 Using a suitable thread sealant, screw the sight glass assembly in the threaded hole above the burner mounting hole.

9.8.5 If not already in place, select the 8mm dia. Fibre rope and fit to the circular groove on the front of the boiler door around the burner mounting hole to form a continuous seal. Utilise the adhesive supplied to ensure the rope remains in position.

9.9 Burner Mounting Plate

9.9.1 Each boiler is supplied with a burner mounting plate specific to the burner being supplied, see Fig. 9.10.

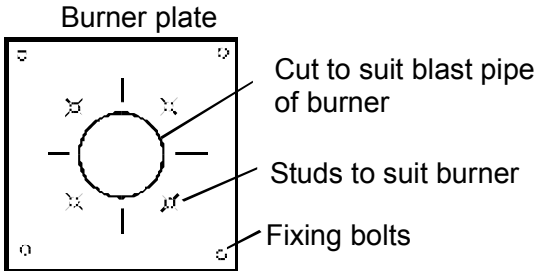


Figure 9.10 - Burner Mounting Plate

Fit the plate to the boiler door using the four longer M12 bolts and washers ensuring that the rope seal is in position and in good condition on the boiler door. Tighten the bolts sufficiently to effectively seal between the plate and the door.

9.10 Mounting the Burner

Before attempting to mount the burner, firstly ensure that the hole in the mounting plate is a clearance size for the burner blast tube diameter, and that the mounting stud pattern is correct for the burner flange. The hole in the mounting plate acts as a template for the boiler door insulation.

Using a sharp knife, hacksaw blade or padsaw and suitable personal protection equipment (mask, overalls etc.), carefully cut a hole of the same diameter as the mounting plate through the boiler door insulation. **Do not under any circumstances force the burner blast tube through the door insulation as this will destroy the insulation boards.**

When a suitably sized hole has been cut and the insulation off-cuts cleaned up and disposed of, place the burner gasket over the studs and carefully mount the burner. Secure with the washers and nuts provided and tighten to form an effective seal on the gasket.

Open the boiler door and check that the burner blast tube is sitting correctly through the insulation, it is clean internally and the insulation is undamaged. There should be a small gap between the blast tube and the insulation which should be sealed with fibre rope or similar in order to prevent hot gases from travelling backwards and onto the casting of the boiler door.

9.11 Boiler Build Completion

To avoid damage, it is advisable to complete the connection of the boiler to the heating system and the chimney before proceding with the insulation and casing assembly. The boiler is supplied with mating flanges suitable for welding to enable connection to the DN100 (PN16) flow and return flanges.

9.12 Disassembly

Should the boiler block require dismantling at any time, the reverse procedure to assembly should be followed. Gaskets should be replaced, mastic seals cleaned off and fresh mastic applied and rope seals closely inspected for condition and replaced if any doubts exist. Sections should be eased apart with fine wedges until the nipple seals free.

Always replace used nipples with new. Take particular care when removing old nipples not to damage the bore of the section if it is to be re-used.

Note: Always pay particular attention to the weight and stability of items being removed in order to ensure that adequate support is available when required.

10.0 CASING ASSEMBLY

HHL Ref.	Model	MS7	MS8	MS9	MS10	MS11	MS12	MS13	MS14
573411121	RH/LH Side Panel 'A'	4	4	4	4	4	4	4	4
573411122	RH/LH Side Panel 'B'	-	2	-	-	-	2	-	-
573411123	RH/LH Side Panel 'C'	-	-	2	-	-	-	2	-
573411124	RH/LH Side Panel 'D'	-	-	-	2	-	-	-	2
573411125	RH/LH Side Panel 'E'	-	-	-	-	2	2	2	2
573411126	Top Panel 'A'	2	2	2	2	2	2	2	2
573411127	Top Panel 'B'	-	1	-	-	-	1	-	-
573411128	Top Panel 'C'	-	-	1	-	-	-	1	-
573411129	Top Panel 'D'	-	-	-	1	-	-	-	1
573411130	Top Panel 'E'	-	-	-	-	1	1	1	1
573411131	Front Top Panel	1	1	1	1	1	1	1	1
573411132	Front RH Panel	1	1	1	1	1	1	1	1
573411133	Front LH Panel	1	1	1	1	1	1	1	1
573411134	Rear RH Panel	1	1	1	1	1	1	1	1
573411135	Rear LH Panel	1	1	1	1	1	1	1	1
573411136	Front RH Vertical Support	1	1	1	1	1	1	1	1
573411137	Front LH Vertical Support	1	1	1	1	1	1	1	1
573411138	Rear RH Vertical Support	1	1	1	1	1	1	1	1
573411139	Rear LH Vertical Support	1	1	1	1	1	1	1	1
573411167	Upper RH/LH Side Rail - 7 Section	2	-	-	-	-	-	-	-
573411140	Upper RH/LH Side Rail - 8 Section	-	2						
573411141	Upper RH/LH Side Rail - 9 Section	-	-	2	-	-	-	-	-
573411142	Upper RH/LH Side Rail - 10 Section	-	-	-	2	-	-	-	-
573411143	Upper RH/LH Side Rail - 11 Section	-	-	-	-	2	-	-	-
573411144	Upper RH/LH Side Rail - 12 Section	-	-	-	-	-	2	-	-
573411145	Upper RH/LH Side Rail - 13 Section	-	-	-	-	-	-	2	-
573411146	Upper RH/LH Side Rail - 14 Section	-	-	-	-	-	-	-	2
573411169	Upper RH/LH Side Rail - 15 Section	-	-	-	-	-	-	-	-
573411170	Upper RH/LH Side Rail - 16 Section	-	-	-	-	-	-	-	-
573411168	Lower RH/LH Side Rail - 7 Section	2	-	-	-	-	-	-	-
573411147	Lower RH/LH Side Rail - 8 Section	-	2						
573411148	Lower RH/LH Side Rail - 9 Section	-	-	2	-	-	-	-	-
573411149	Lower RH/LH Side Rail - 10 Section	-	-	-	2	-	-	-	-
573411150	Lower RH/LH Side Rail - 11 Section	-	-	-	-	2	-	-	-
573411151	Lower RH/LH Side Rail - 12 Section	-	-	-	-	-	2	-	-
573411152	Lower RH/LH Side Rail - 13 Section	-	-	-	-	-	-	2	-
573411153	Lower RH/LH Side Rail - 14 Section	-	-	-	-	-	-	-	2
573411171	Lower RH/LH Side Rail - 15 Section	-	-	-	-	-	-	-	-
573411172	Lower RH/LH Side Rail - 16 Section	-	-	-	-	-	-	-	-
573411154	Cross Beam (Front and Rear)	2	2	2	2	2	2	2	2
573411083	Tie Rods M16 x 1170mm	4	-	-	-	-	-	-	-
573411084	Tie Rods M16 x 1350mm	-	4	-	-	-	-	-	-
573411085	Tie Rods M16 x 1530mm	-	-	4	-	-	-	-	-
573411086	Tie Rods M16 x 1710mm	-	-	-	4	-	-	-	-
573411087	Tie Rods M16 x 1890mm	-	-	-	-	4	-	-	-
573411088	Tie Rods M16 x 2070mm	-	-	-	-	-	4	-	-
573411089	Tie Rods M16 x 2250mm	-	-	-	-	-	-	4	-
573411090	Tie Rods M16 x 2430mm	-	-	-	-	-	-	-	4
573411120	Insulation Blanket (cut to suit boiler size)	1	1	1	1	1	1	1	1

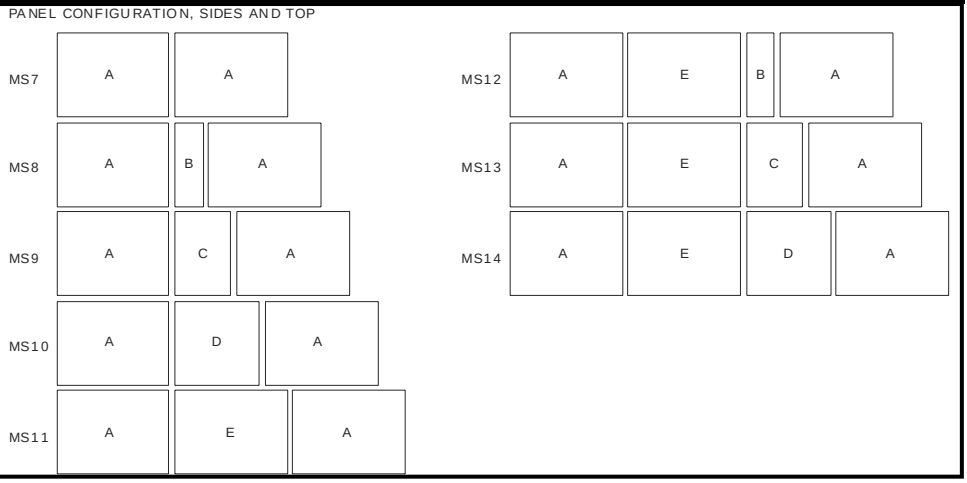


Figure 10.1 - Accessory Pack (large packing crate) Check List including casing parts.

10.1 Insulation Jacket

10.1.1 The boiler block insulation comprises of two layers of 50mm mineral wool wrapped around the boiler block.

10.1.2 Lay the first blanket across the boiler, allowing it to hang down each side and tuck it between the lower tie rods and the boiler casting. Similarly, lay the second wrap in similar fashion to form a 100mm thick insulation blanket.

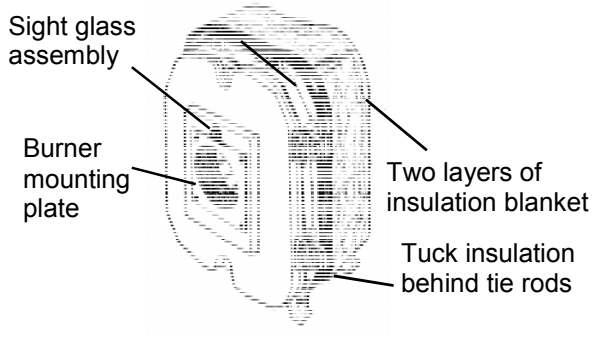


Figure 10.2 - Insulation Jacket

10.2 Casing Assembly Details

10.2.1 The boiler casing assembly comprises a frame screwed securely to the boiler block with panels supported on the frame. The casings comprise of front and rear panels plus 6 side and top panels which are common to all boilers in the range and four sizes of infill top and side panel to extend the casing assembly to suit boiler model. See Figure 10.1 on previous page for a full casing assembly check list.

10.2.2 Generally, the casing assembly is supplied as follows;

Frames

- 4 x vertical supports
- 2 x upper side rails
- 2 x lower side rails (painted)
- 2 x cross beams (3 for larger sizes)

Standard Panels

- Front top, front RH and front LH panels
- Rear RH and rear LH panels (unpainted)
- 4 x side panels x 720mm wide (Ref. A)
- 2 x top panels 720mm wide (Ref. A)

Variable Panels

- Side and top panels 180mm wide (Ref. B)
- Side and top panels 360mm wide (Ref. C)
- Side and top panels 540mm wide (Ref. D)
- Side and top panels 720mm wide (Ref. E)

10.3 Casing Frame Assembly

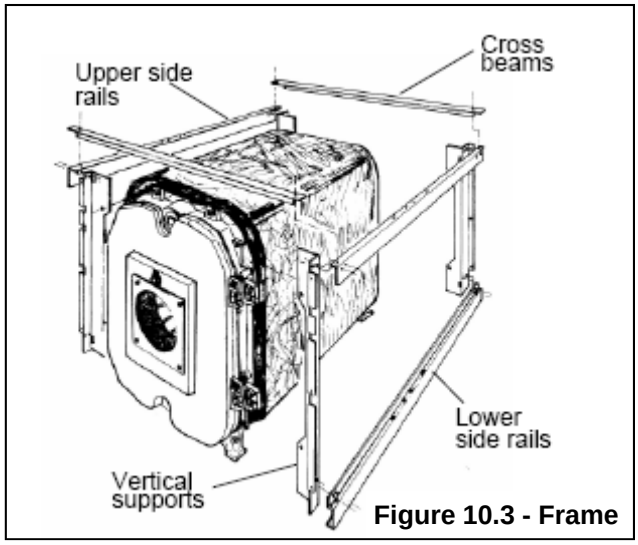


Figure 10.3 - Frame

10.3.1 Assemble the four vertical supports to the corners of the boiler block using the screws, nuts and washers supplied. The supports with the deeper offset and shallower cut-out are the rear supports (See Fig. 10.3). **Both the front and rear vertical supports bolt to the front of the cast lugs on the front and rear sections.**

10.3.2 Fit the upper and lower side rails to the vertical supports followed by the cross beam rails at the front and rear. The frame is now complete and should form a rigid structure on which to assemble the casing panels.

10.4 Casing Panel Assembly (sides, top & rear)

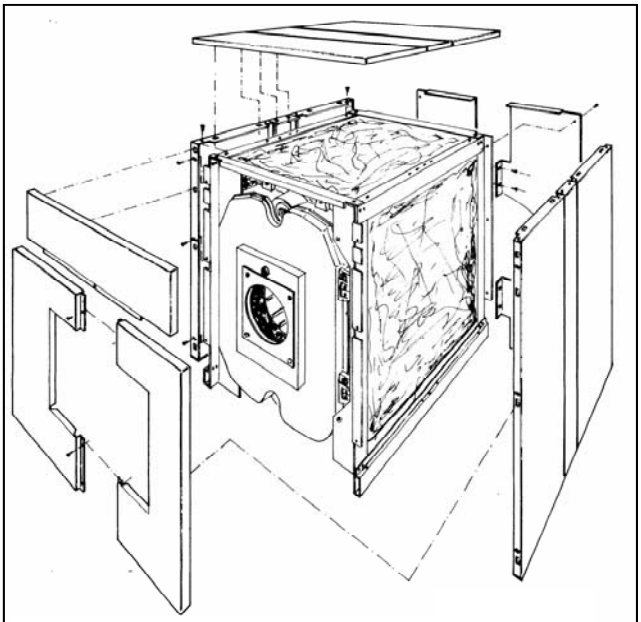


Figure 10.4 - Casing Panels

10.4.1 Begin by assembling the rear side panels;

a) Select 2 of the Type A side panels from the casing pack and screw 2 x M4 studs into the bottom edge of each.
b) Offer the panels to the lower side rails and locate the studs into the appropriate holes in the side rails.
c) Close the panels against the top side rail and secure with 2 screws, washers and nuts.

10.4.2 Assembly of the front side panels is similar;

a) Begin by fitting 4 off spring clips into the front flanges of the side panels.
b) As previously, locate the studs projecting from the side panels into the holes in the side rails.
c) Close the panels against the top side rail and secure with 2 screws, washers and nuts, together with 2 off No 8 x ½" self-tapping screws in the front flange.

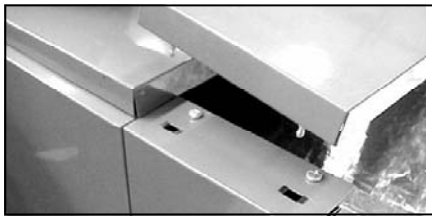
10.4.3 Complete the fitting of the side panels by inserting the appropriate infill panels (see Fig. 10.1 if in doubt).

a) Locate the M4 studs projecting from the infill panels into the holes in the side rail as before.
b) Close the panels against the top side rail and secure with 2 screws, nuts and washers as before.

10.4.4 Complete the assembly of the side panels by fitting spring clips along the top flanges of all the side panels.

10.4.5 Assemble the top panels.

a) Start with the front top panel Type A, see Fig 10.1 if in doubt.
b) Fit 4 studs in the holes provided in the underside of the top panel.
c) Ensuring that the 2 off 45mm square knock-outs (do not remove knockouts at this time) are at the front of the boiler, locate the studs in the top panel into the spring clips in the side panels and snap into place. See Fig 10.5.



Securing top panels

Figure 10.5

d) Complete the assembly of the top panels by fitting the rear panel in a similar fashion to front panel. Do not remove the 2 x 45mm access hole knock outs as they will not be used, they can be positioned at the front or rear of the panel.
e) In a similar manner add the central infill panel (no knock-outs) if applicable.

10.4.6 Assemble the rear panels.

a) Begin by fitting the profiled insulation blanket around the water and flue connections at the back of the boiler.
b) Screw the rear RH and rear LH panels to the rear vertical supports using No 8 x ½" self-tapping screws supplied
c) Complete rear panels by bolting them together using the four screws and self locking nuts supplied. See Figure 10.6.

Figure 10.6 - Rear Panels Fitted.

10.4.7 Assemble the front panels.

Note: Before assembling the front casing ensure that the control panel and wiring is completed (See Section 10.5)

a) Fit 4 studs, 2 at each side, in the back of the top front panel, securing it to the spring studs in the vertical supports.
b) Fit 2 studs in the back of each lower front panel, securing it to the spring studs in the vertical supports.
c) Use 2 screws and washers to secure the lower panels to the door casting below the burner hole and one screw to secure the lower panels to the retained nut in the front top panel. See Fig 10.7.

Figure 10.7

10.5 Control Panel Fitting Procedure.

Figure 10.8 - Control Panel Fitted

Note: Before fitting the control panel ensure that at least the top panel of the front casing has been removed.

a) The control panel is generally supplied fully assembled complete with outer casing, mounting brackets and a small bag of fixings. The brackets are secured to the panel by 4 off M5 x 12 pozi head screws, nuts and washers and the front cover c/w captive studs is secured at the sloping sides with 2 x M5 nuts and washers.

With the brackets secured to the panel, position it on the front edge of the top casing. The panel can be positioned on the right, left or centre of the front edge depending on the ease of assessibility, the position of the door hinges, the position of gas train etc. Decide on the best position, mark the four fixing hole locations, remove the panel and drill four holes 5.5mm diameter in the top casing. In addition, remove one of the 45mm square knock-outs from the front edge of the top casing which is between the fixing holes. Place the control panel in position and secure with 4 off M5 x 12 screws, nuts and washers supplied, or alternatively drill smaller holes, 3mm diameter, and secure with self-tapping screws (Not HHL supply).

b) If fitted, remove the front cover of the control panel by unscrewing the 2 x M5 nuts and lifting off. Remove the two thermostat control knobs by pulling directly off and unscrew the black plastic cover over the temperature limiter (high limit) reset button. The front fascia can now be hinged down by unlatching the catch at the top right hand with a screwdriver. With the fascia hinged down, the thermostat capilliaries and the electrical terminals are exposed.

Note: The fascia will catch on the thermostat knobs if they are not removed.

c) Locate the gland plate on the rear of the control panel, release the 2 securing screws and remove to expose the oval hole. Locate and select one at a time, the four coiled capillaries (3 x thermostats and 1 x thermometer). Uncoil carefully, from the panel end, sufficient capillary to take the sensing bulbs and remaining coils through the oval hole in the back of the panel, the square knock-out in the top casing finishing with the sensing bulbs inserted fully into one of the 2 thermostat pockets located in the top of the front section, 2 sensing bulbs in each pocket. From the accessory pack, select the 2 zig-zag springs and insert one in each pocket between the sensing bulbs then select the 2 spring clips which fit over capillaries but round the pocket top to retain the sensing bulbs in position. Replace the gland plate ensuring that the 4 capillaries are grouped together and exit the plate through the slotted opening at the bottom as shown in Fig. 10.9. Ensure that the capillaries are free to move and are not trapped beneath the gland plate.

d) Select the two flying leads that exit from the bottom of the panel and run them to the left or right of the casing ensuring that they pass behind the panel mounting brackets and not in front. The decision to run the cables right or left will depend on the position of the panel, the boiler door hinges and the location of the sockets for the flying leads on the burner. Utilise the self adhesive cable grips supplied and secure the leads down the appropriate side casing. See Fig. 10.7.

Warning: On no account must the route of the cables allow them to contact any unprotected or uninsulated surface. For example; the burner mounting plate.

e) The gland plate on the rear of the control panel contains 2 plugged holes to accept 2 x 12mm diameter cable glands. This should be used for the electrical connections to the boiler, comprising;

- 230V single phase live, neutral and earth supply to the panel.
- Volt-free control cabling to terminals C1 and C2 for remote on-off operation (remove link if used).
- Volt-free control cabling to terminals C3-C4 for remote high-low operation (remove link if used).
- Volt-free terminals 11 to 16 for remote signalling of normal run, lockout and overheat.

If required, an alternative gland plate is supplied adjacent to the exit of the flying leads.

For ease of disconnection, the terminal blocks used within the panel are of the plug and socket type and hence all external wiring can be easily removed by pulling the top of the terminal rail upwards and threading it complete with cables through the gland plate once removed.

Note: All wiring and electrical connections must be completed by a competent person in accordance with current IEE regulations.

Refer to the wiring diagram Figure 8.1 when connecting control panel to boiler.

It is recommended that all wiring to the control panel should be in heat resistant cable and kept external, away from the unprotected or uninsulated hot surfaces but sufficiently flexible to allow for future maintenance. If it is required to bring the wiring in from the rear of the boiler, holes are available in the rear and front casing cross frames to accept cable glands and allow the cables to run under the top casing. In this case, the wiring must be heat resistant, be on top of the insulation, be protected against touching hot surfaces and be protected as it exits the top casing via the knock-out.

Note: If a modulating burner is fitted to the boiler, some alterations to the wiring will be necessary. The burner manufacturer's instructions must be followed. It is likely that the second stage wiring (flying lead with four pin plug, hi/lo thermostat etc.) will become redundant and additional temperature sensor (s) will need to be added.

g) When the wiring is complete, raise the hinged fascia and click into position by pushing on the latch screw. Replace the two thermostat knobs on to the appropriate shafts and screw the temperature limiter reset button cover into position. Finally, locate control panel cover over the fascia with fixed studs through the holes in the brackets and secure with the 2 x M5 nuts and shakeproof washers.

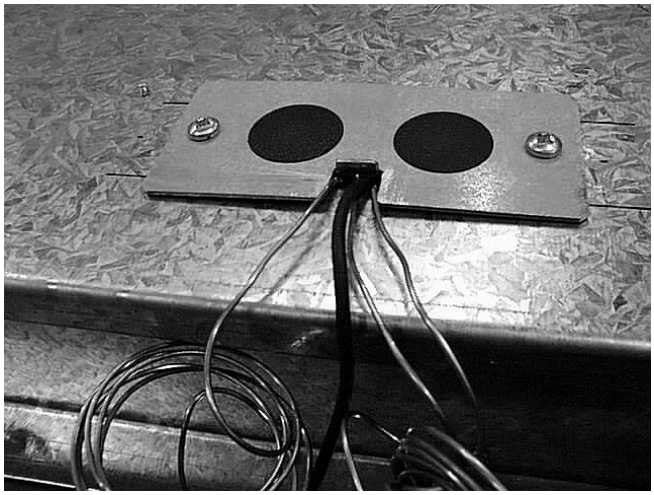


Figure 10.9 – Thermostat Capillaries exiting the Gland Plate

HHL Ref.	Description	No off per Panel
563902253	Control Panel Complete (inc. instruments)	1
530101024	Control Panel Support Bracket (LH)	1
530101025	Control Panel Support Bracket (RH)	1
533902031	Control Panel Cover	1
533901178	Control Thermostat	2
533901179	Temperature Limiter	1
557002005	Temperature Gauge	1
533901067	Hours Run Meter	2
533901212	On / Off Switch (Illuminated)	1
747224779	Fuse Holder	1
500005033	Anti Surge Fuses (5A & 6.3A, 20mm)	1
533901031	Green Neon	2
533901029	Red Neon	1
533901204	Volt Free Relay	3

Figure 10.10 - Control Panel Spares List

11.0 COMMISSIONING AND TESTING

11.1 Electrical Installation

Wiring **MUST** be checked by a suitably competent person. Power supply required is 400V 50 Hz three phase, 4 wire. An isolator correctly fused should be sited close to the boiler. Refer to the burner instructions.

It should be noted the 3 phase supply should be wired direct to the burner and a separate 240V single phase supply derived from the burner should be 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 4: 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 7: 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 WRAS approved double check valve and temporary filling loop. In order to comply with Water Supply 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 and oil 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) Flue way passages to chimney are clear.

2) Adequate ventilation as per Section 6: Air Supply exists in the boiler house.

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 2.1.

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 Open boiler door to check 2nd pass flue baffles are fitted.

e. Check all thermostat bulbs are correctly inserted in the appropriate pockets.

f. Check for water leaks and ensure that both boiler and heating system is full of water and properly vented.

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 that gas meter is operational and has been checked by the local gas supplier.

Check that gas meter and supply pipework is of sufficient size to meet the input rating of the burner/ boiler. Refer to Figure 2.1.

k. Check that burner output is correct for size of boiler in question, referring to Figure B.1, 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 nozzles are fitted to burner (See Fig. B.4, B.5 & B.6) and that they are 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.

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 temperature limiter manual reset button is pushed in, 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 CO_2, CO, smoke number, flue gas temperature and circulating water temperature rise across the boiler. The readings obtained should be as indicated in Figure B.7, target appliance readings.

Readings should be taken at both High and Low settings. A link is provided in the control panel terminals, the removal of which, 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 thermostats 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.

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 2.1 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 temperature limiter manual reset button is pushed in, 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 CO_2, 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 B.7, target appliance readings.
Readings should be taken at both High and Low settings. A link is provided in the control panel terminals, the removal of which, 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 thermostats 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 3.3. 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

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 Appendix A.

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 CO_2, CO, flue gas temperature, smoke number (for oil) and water temperature rise across the boiler. The readings obtained should be noted for reference against those taken 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. If the boiler has been in use wait for it to cool down before opening the boiler door. It may be necessary to shut heating circuit service valve(s) to prevent the continuing circulation of hot water through the boiler.

c. Remove the screws securing the three front casing panels and pull them free of the stud clips in the vertical supports at each side.

d. When the boiler is cool enough unscrew the four bolts that secure the door and carefully open the hinged door, with the burner attached.

13.3 Boiler Service Procedure

a. Remove all the baffles from the gas passages. Wire brush all deposits from the baffles and lay them aside for refitting.

b. Remove the rear casing panels by unscrewing the securing bolts and self-tapping screws.

c. Remove the insulation blanket.

d. Remove the nuts and washers that secure each of the cleaning access covers in the back of the boiler. Remove access covers.

e. Using a wire brush, clean all soot and loose debris from the surfaces of the cast iron sections taking care to brush between the fins of each section.

f. With a vacuum cleaner remove the debris as the surfaces are brushed.

g. Inspect the insulation around the burner head and make good as necessary.

h. Check the flue and chimney, brush and remove dirt if necessary.

i. Inspect the rope seal around the perimeter of the door and around the rear access covers. If there is any evidence of damage or leakage through the seals they should be removed and replaced with new sealing ropes.

j. Replace the baffles in each of the 2nd pass gas passages

k. Refit and secure the four rear access port covers.

l. Refit the rear insulation blanket and casing panels. Close the boiler door and secure with the four bolts then refit front boiler casing panels.

m. Re-commission boiler as detailed in relevant parts of Section 11.0: Commissioning & Testing.

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 Thermostats

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

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.

15.0 SPARE PARTS

Boiler parts are listed in Figure 9.1, casing parts in Figure 10.1 and control panel parts in Figure 10.9. Always quote the Hamworthy Heating Ltd (HHL) part number when ordering spare parts.

For burner spare parts refer to the burner manufacturer's literature.

APPENDIX A - RECOMMENDED PUBLICATIONS

Related Documents.

Gas Safety (Installation and Use) Regulations 1998 – (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, Fire 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 practise for flues and flue structures in buildings.
See paragraph 5 (3.6).

BS 6644 Specification for installation of gas fired hot water boilers of rated inputs between 70kW & 1.8MW.

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 and 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 I 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 Pt 1 flued appliances.

Health and Safety Executive

Guidance note PM5 Automatically controlled steam and hot water boilers.

CIBSE Publications

"CIBSE Guide"

Boiler model	Burner Details: Make	Burner Details: Model	Burner Details: Mode	Gas Supply Details: Gas Inlet Connection Size (")	Gas Supply Details: Min. Gas Pressure (mbar)	Gas Supply Details: Booster Required	Boiler Details: Max.Heat Output (kW)	Boiler Details: Nom. Heat Input Full Load (net) (kW)	Boiler Details: Nom. Heat Input Gas Rate (G20) m³/h	Combustion chamber diameter dim (B) mm	Combustion chamber length dim (A) mm	Blast Tube Projection (mm) dim (C) mm
MS7	Riello	RS50	Hi / Lo	2.0	17.5		495	561	59.4	600	1160	216
MS7	Riello	RS50 / M	Modul'n	2.0	17.5							216
MS7	Nu Way	XGN 650 T3S	Hi / Lo	2.0	17.5							240
MS7	Nu Way	XGN 650 M3D	Modul'n	2.0	17.5							240
MS8	Riello	RS70	Hi / Lo	2.0	18.7		600	667	70.6	600	1340	250
MS8	Riello	RS70	Hi / Lo	2.0	17.5							250
MS8	Riello	RS70 / M	Modul'n	2.0	18.7							250
MS8	Riello	RS70 / M	Modul'n	2.0	17.5							250
MS8	Nu Way	XGN 1000 T3S	Hi / Lo	2.0	17.5							240
MS8	Nu Way	XGN 1000 M3D	Modul'n	2.0	17.5							240
MS9	Riello	RS70	Hi / Lo	2.0	18.2		690	765	81.0	600	1520	250
MS9	Riello	RS70	Hi / Lo	2.0	24.2	Yes						250
MS9	Riello	RS70 / M	Modul'n	2.0	18.2							250
MS9	Riello	RS70 / M	Modul'n	2.0	24.2	Yes						250
MS9	Nu Way	XGN 1000 T3S	Hi / Lo	2.0	17.5							240
MS9	Nu Way	XGN 1000 M3D	Modul'n	2.0	17.5							240
MS10	Riello	RS100	Hi / Lo	2.0	17.5		780	864	91.4	600	1700	250
MS10	Riello	RS100 / M	Modul'n	2.0	17.5							250
MS10	Nu Way	XGN 2100 T3S	Hi / Lo	2.0	17.5							240
MS10	Nu Way	XGN 2100 M3D	Modul'n	2.0	17.5							240
MS11	Riello	RS100	Hi / Lo	2.0	18.0		870	961	101.7	600	1880	250
MS11	Riello	RS100 / M	Modul'n	2.0	18.0							250
MS11	Nu Way	XGN 2100 T3S	Hi / Lo	3.0	17.5							240
MS11	Nu Way	XGN 2100 M3D	Modul'n	3.0	17.5							240
MS12	Riello	RS100	Hi / Lo	2.5	19.7		960	1060	112.2	600	2060	250
MS12	Riello	RS100	Hi / Lo	2.0	33.0	Yes						250
MS12	Riello	RS100 / M	Modul'n	2.5	19.7							250
MS12	Riello	RS100 / M	Modul'n	2.0	33.0	Yes						250
MS12	Nu Way	XGN 1250 T3S	Hi / Lo	2.0	33.7	Yes						240
MS12	Nu Way	BG 700 T3S	Hi / Lo	3.0	17.5							328
MS12	Nu Way	XGN1250 M3D	Modul'n	2.0	33.7	Yes						240
MS12	Nu Way	BG 700 T3S	Modul'n	3.0	17.5							328
MS13	Riello	RS130	Hi / Lo	2.5	19.8		1060	1169	123.7	600	2240	280
MS13	Riello	RS130	Hi / Lo	2.0	35.3	Yes						280
MS13	Riello	RS130 / M	Modul'n	2.5	19.8							280
MS13	Riello	RS130 / M	Modul'n	2.0	35.3	Yes						280
MS13	Nu Way	XGN 2100 T3S	Hi / Lo	2.0	31.2	Yes						240
MS13	Nu Way	BG 800 T3S	Hi / Lo	3.0	17.5							361
MS13	Nu Way	XGN 2100 M3D	Modul'n	2.0	31.2	Yes						240
MS13	Nu Way	BG 800 T3S	Modul'n	3.0	17.5							361
MS14	Riello	RS130	Hi / Lo	3.0	20.2		1160	1279	135.3	600	2420	280
MS14	Riello	RS130	Hi / Lo	2.0	41.1	Yes						280
MS14	Riello	RS130 / M	Modul'n	3.0	20.2							280
MS14	Riello	RS130 / M	Modul'n	2.0	41.1	Yes						280
MS14	Nu Way	XGN 2100 T3S	Hi / Lo	2.0	36.2	Yes						240
MS14	Nu Way	BG 800 VP T3S	Hi / Lo	3.0	17.5							361
MS14	Nu Way	XGN 2100 M3D	Modul'n	2.0	36.2	Yes						240
MS14	Nu Way	BG 800 VP T3S	Modul'n	3.0	17.5							361

Figure B.1 - Matched Burner Boiler Combinations for Natural Gas

Boiler model	Burner Details			Boiler Details			Burner Nozzles			Combustion chamber	Combustion chamber	Blast Tube Projection (mm)
	Make	Model	Mode	Max. Heat Output (kW)	Nom. Heat Input		1st Nozzle 60° US gal	2nd Nozzle 60° US gal	3rd Nozzle 60° US gal	diameter dim (B) mm	length dim (A) mm	dim (C) mm
					Full Load (net) (kW)	Oil Rate Kg/h						
MS7	Riello	RL 50	Hi / Lo				6.5	5.0	N/A			216
MS7	Riello	RL 50/M	Modul'n	495	561	47.2	50 kg/h Bergonzo A3 45°			600	1160	241
MS7	Nu Way	NOL 25 T3S	Hi /Lo				5.5	5.5	N/A			240
MS7	Nu Way	XOL 750-23 SM3D	3 Stage				2.0	2.25	4.5			240
MS8	Riello	RL 70	Hi / Lo				8.0	5.5	N/A			250
MS8	Riello	RL 70/M	Modul'n	600	667	56.1	60 kg/h Bergonzo A3 45°			600	1340	272
MS8	Nu Way	NOL 30-25 T3S	Hi / Lo				5.0	5.5	N/A			240
MS8	Nu Way	XOL 950-25 SM3D	3 Stage				2.75	2.75	5.0			240
MS9	Riello	RL 70	Hi / Lo				9.5	6.0	N/A			250
MS9	Riello	RL 70/M	Modul'n	690	765	64.3	70 kg/h Bergonzo A3 45°			600	1520	272
MS9	Nu Way	NOL 30-25 T3S	Hi / Lo				6.0	6.0	N/A			240
MS9	Nu Way	XOL 950-25 SM3D	3 Stage				3.0	3.0	6.0			240
MS10	Riello	RL 100	Hi / Lo				10.0	7.5	N/A			250
MS10	Riello	RL 100/M	Modul'n	780	864	72.7	80 kg/h Bergonzo A3 45°			600	1700	272
MS10	Nu Way	NOL 50-28 T3S	Hi / Lo				7.0	7.0	N/A			240
MS10	Nu Way	XOL 1550-28 SM3D	3 Stage				3.5	3.5	7.0			240
MS11	Riello	RL 100	Hi / Lo				12.0	7.5	N/A			250
MS11	Riello	RL 100/M	Modul'n	870	961	80.8	90 kg/h Bergonzo A3 45°			600	1880	272
MS11	Nu Way	NOL 50-28 T3S	Hi / Lo				7.5	7.5	N/A			240
MS11	Nu Way	XOL 1550-28 SM3D	3 Stage				4.0	4.0	7.5			240
MS12	Riello	RL 100	Hi / Lo				13.0	8.5	N/A			250
MS12	Riello	RL 100/M	Modul'n	960	1060	89.2	90 kg/h Bergonzo A3 45°			600	2060	272
MS12	Nu Way	NOL 50-28 T3S	Hi / Lo				8.5	8.5	N/A			240
MS12	Nu Way	XOL 1550-28 SM3D	3 Stage				4.0	4.5	8.5			240
MS13	Riello	RL 100	Hi / Lo				14.0	10.0	N/A			250
MS13	Riello	RL 100/M	Modul'n	1060	1169	98.3	100 kg/h Bergonzo A3 45°			600	2240	272
MS13	Nu Way	NOL 50-34 T3S	Hi / Lo				9.5	9.5	N/A			240
MS13	Nu Way	XOL 1550-34 SM3D	3 Stage				4.5	4.5	8.5			240
MS14	Riello	RL 130	Hi / Lo				15.5	10.5	N/A			250
MS14	Riello	RL 130/M	Modul'n	1160	1279	107.6	110 kg/h Bergonzo A3 45°			600	2420	272
MS14	Nu Way	NOL 50-34 T3S	Hi / Lo				9.5	10.5	N/A			240
MS14	Nu Way	XOL 1550-34 SM3D	3 Stage				5.0	5.0	10.5			240

Figure B.2 - Matched Burner Boiler Combinations for Class D Oil

Figure B.3 - Matched Burner Boiler Combinations for Dual Fuel

Boiler model	Burner Details			Gas Supply Details			Boiler Details				Burner Nozzle		Combustion chamber	Combustion chamber	Blast Tube Projection
	Make	Model	Mode	Gas Inlet Connection Size (“)	Min. Gas Pressure (mbar)	Booster Required	Max. Heat Output (kW)	Nom. Heat Input Full Load (net) (kW)	Gas Rate (G20) m³/h	Oil Rate Kg/h	1st Nozzle 60˚ US gal	2nd Nozzle 60˚ US gal	diameter dim (B) mm	length dim (A) mm	(mm) dim (C) mm
MS7	Riello	RLS 70	Hi / Lo	1.5	17.5		495	561	59.4	47.2	5.5	5.0	600	1160	250
MS7	Nu Way	NDFL 25 T3S	Hi / Lo	2.0	17.5						8.5	N/A			240
MS8	Riello	RLS 70	Hi / Lo	2.0	17.5		600	667	70.6	56.1	6.5	6.0	600	1340	250
MS8	Nu Way	NDFL 35-25 T3S	Hi / Lo	2.0	33.9	Yes					5.0	5.5			240
MS9	Riello	RLS 70	Hi / Lo	2.5	17.5		690	765	81.0	64.3	7.5	7.0	600	1520	250
MS9	Nu Way	NDFL 35-25 T3S	Hi / Lo	2.0	43.8	Yes					6.0	6.0			240
MS10	Riello	RLS 100	Hi / Lo	2.5	17.5		780	864	91.4	72.7	8.0	8.0	600	1700	250
MS10	Nu Way	NDFL 35-34 T3S	Hi / Lo	2.0	54.0	Yes					7.0	7.0			240
MS11	Riello	RLS 100	Hi / Lo	2.5	20.2						9.0	9.0			250
MS11	Riello	RLS 100	Hi / Lo	2.0	29.4	Yes	870	961	101.7	80.8	9.0	9.0	600	1880	250
MS11	Nu Way	NDFL 50-28 T3S	Hi / Lo	2.0	35.6	Yes					7.5	7.5			240
MS12	Riello	RLS 100	Hi / Lo	3.0	19.1						10.0	10.0			250
MS12	Riello	RLS 100	Hi / Lo	2.0	34.1	Yes	960	1060	112.2	89.2	10.0	10.0	600	2060	250
MS12	Nu Way	NDFL 50-34 T3S	Hi / Lo	2.0	42.4	Yes					8.5	8.5			240
MS13	Riello	RLS 130	Hi / Lo	3.0	22.0	Yes					11.0	11.0			250
MS13	Riello	RLS 130	Hi / Lo	2.0	38.0	Yes	1060	1169	123.7	98.3	11.0	11.0	600	2240	250
MS13	Nu Way	NDFL 50-34 T3S	Hi / Lo	2.0	50.2	Yes					9.5	9.5			240
MS14	Riello	RLS 130	Hi / Lo	3.0	23.4	Yes					12.0	12.0			250
MS14	Riello	RLS 130	Hi / Lo	2.0	44.9	Yes	1160	1279	135.3	107.6	12.0	12.0	600	2420	250
MS14	Nu Way	NDFL 50-34 LDU11 T3S	Hi / Lo	2.0	58.7	Yes					9.5	10.5			240

Figure B.4 - OIL Burner Nozzles - Part Numbers for multistage burners

Nozzle Size US gal - 60˚ spray angle Solid cone	**HHL Part No.**	**Nozzle Size** US gal - 60˚ spray angle Solid cone	**HHL Part No.**
2.0	532904004	7.5	532904022
2.25	532904011	8.0	532904049
2.75	532904012	8.5	532904050
3.0	532904006	9.0	532904023
3.5	532904007	9.5	532904053
4.0	532904008	10.0	532904024
4.5	532904009	10.5	532904025
5.0	532904015	11.0	532904026
5.5	532904016	12.0	532904027
6.0	532904017	13.0	532904066
6.5	532904018	14.0	532904051
7.0	532904020	15.5	532904052

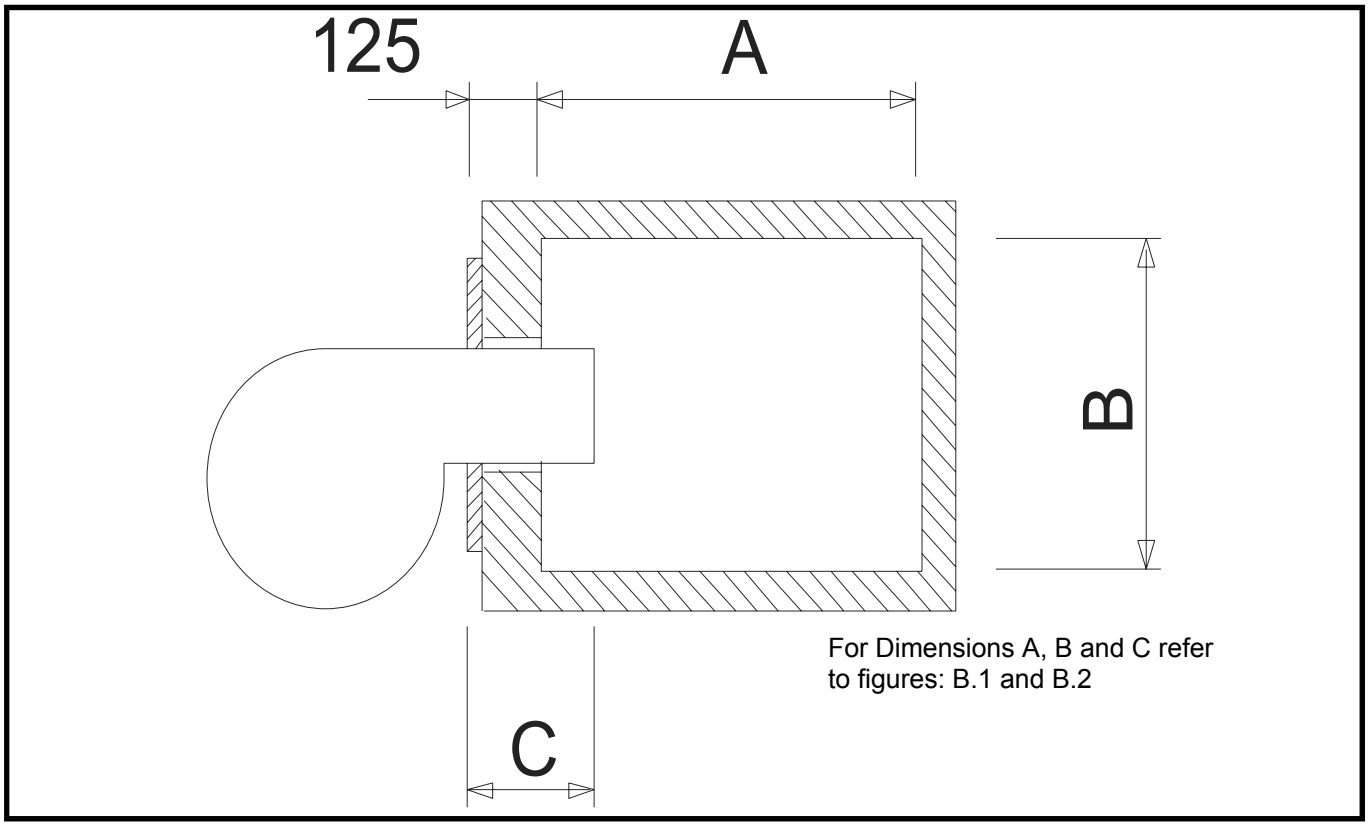
Figure B.5 - Oil Burner Nozzles - Part Numbers for modulating burners

Nozzle Size Bergonzo Type A3, 45˚ kg/h	**HHL Part No.**
50	532904103
60	532904104
70	532904105
80	532904106
90	532904107
100	532904108
110	532904109

Figure B.6 - Combustion target figures

BOILER MODEL		MS7	MS8	MS9	MS10	MS11	MS12	MS13	MS14
FUEL TYPE									
NATURAL GAS G20	CO2 (DRY)	9.5 - 10.0%							
	CO	Less than 100 ppm (air free)							
	FLUE GAS TEMP. °C gross	200 - 210							
	TEMP RISE ACROSS BOILER ^{0}C	Less than 20							
CLASS D FUEL OIL	CO2 (DRY)	11.5 – 12.0%							
	CO	Less than 85 ppm (air free)							
	FLUE GAS TEMP. °C gross	220 - 230							
	TEMP RISE ACROSS BOILER ^{0}C	Less than 20							
	SMOKE No.	0 - 1							

Figure B.7 - Combustion chamber data



APPENDIX C - BOILER / BURNER WIRING DIAGRAMS

NOTES

USEFUL USER INFORMATION

INSTALLER	SITE ADDRESS

BOILER TYPE	BOILER SIZE(S)	UNIT NO(S).	SERIAL NO(S).	FLUE

Notes

Hamworthy Heating Accredited Agents

North West England
Gillies Modular Services
210-218 New Chester Road, Birkenhead, Merseyside L41 9BG
tel: **0151 666 1030** fax: **0151 647 8101**

Southern Ireland
HEVAC Limited
Naas Road, Dublin 12, Ireland
tel: **00 353 141 91919** fax: **00 353 145 84806**

Northern Ireland
HVAC Supplies Limited
Unit 12 forty 8 north, 48 Duncrue Street, Belfast BT3 9BJ
tel: **02890 747737** fax: **02890 741233**

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
12 Sunnyside Lane, Cleadon Village, Sunderland SR6 7XB
tel: **0191 536 8833** fax: **0191 536 9933**

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