

LULWORTH HE

**GAS/OIL FIRED
STEEL BOILER
470kW TO 1170kW**

**INSTALLATION, COMMISSIONING AND
MAINTENANCE INSTRUCTIONS**

IMPORTANT NOTE

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

Customer Services

Technical Enquiries



01202 662527/662528

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

Site Assembly



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

Commissioning



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

Maintenance Agreements



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

Breakdown service, repair, replacement



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

Spare Parts



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

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INSTALLATION, COMMISSIONING AND MAINTENANCE INSTRUCTIONS

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

**THE LULWORTH BOILER IS INTENDED FOR USE AS A COMMERCIAL
APPLIANCE AND IS NOT CERTIFIED FOR USE IN DOMESTIC APPLICATIONS**

**GAS FIRED VARIANTS OF THE LILLIPUT BOILER RANGE ARE FOR USE
ON NATURAL GAS (2ND FAMILY) I_{2H} ONLY.**

**THE LULWORTH BOILER RANGE HAS BEEN TESTED TO COMPLY WITH
THE REQUIREMENTS OF THE GAS APPLIANCE DIRECTIVE (90/396/EEC)**

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LULWORTH HE BOILER. INSTALLATION AND SERVICING INSTRUCTIONS.

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1. GENERAL INFORMATION

1.1 Description

The Lulworth HE boiler range consists of 7 gas or oil fired steel boilers with outputs ranging from 470 kW (1,604,000Btu/h) to 1,170 kW (3,992,000 Btu/h). Refer to Section 2.1 for details.

Lulworth HE boilers can be used individually, or in a multi-boiler configuration, and are suitable for use on either open-vented or sealed low temperature hot water heating systems.

For hot water production they can be used in conjunction with calorifiers or indirect hot water cylinders.

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

1.2 Constructions

Lulworth HE steel boilers are supplied assembled ready for final on-site assembly of the turbulators, casing, control panel and burner.

The heat exchanger is of all welded circular construction containing a series of fire tubes between the combustion chamber and outer shell. Spiral turbulators are inserted in each of the fire tubes to increase the heat transfer and thus enhance the thermal efficiency in use.

Lulworth HE boilers have an operating efficiency of over 90% based on net CV.

The heat exchanger assembly is completed by a well insulated burner door which can be hinged either left or right and a flue connector box complete with inspection door bolted to the rear of the boiler. These give complete access to the combustion chamber and fire tubes for cleaning.

The heat exchanger is welded to a steel frame which contains four lifting eyes for ease of transportation and installation.

The flow, return and safety valve water connections are located on top of the boiler. Refer to Section 5 for details.

The Lulworth HE boiler can be fitted with a high/low burner for operation on Class D (35 second) fuel oil or natural gas.

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

- a. A fuse
- b. An illuminated mains on/off switch

- c. Two boiler thermostats
- d. Two boiler run lamps
- e. A temperature limiter (overheat thermostat) to shut down the boiler should the water temperature in the heat exchanger exceed 110°C - with manual reset.
- f. An overheat lamp
- g. Two hours run meters
- h. A water temperature thermometer (temperature gauge).
- i. Flying leads and plugs to connect to the burner.
- j. A power on lamp
- k. A volt free relay kit for normal run, overheat and lockout can be supplied as an optional extra.

An insulation blanket is supplied for wrapping around the body of the heat exchanger and the boiler is housed in a coated sheet steel casing which is supplied flat packed for on-site assembly. To prevent damage in transit or during assembly, these panels may be protected by a plastic film on all coated surfaces. This film MUST be removed before first-firing the boiler. Refer to Section 7 for casing assembly procedure.

1.3 Testing

All Lulworth HE heat exchangers are hydraulically tested to 7.5 bar (109 psi) ensuring the Lulworth HE boiler is suitable for use on systems with maximum working pressures of up to 5 bar (73 psi).

1.4 Delivery/Extent of Supply

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

- a. Heat exchanger complete with framework with insulation and turbulators packed in combustion chamber.
- b. Casing panels
- c. Control panel
- d. Matched burner fuel oil or gas
- e. Burner mounting plate, drilled ready to accept burner.

2. TECHNICAL DATA

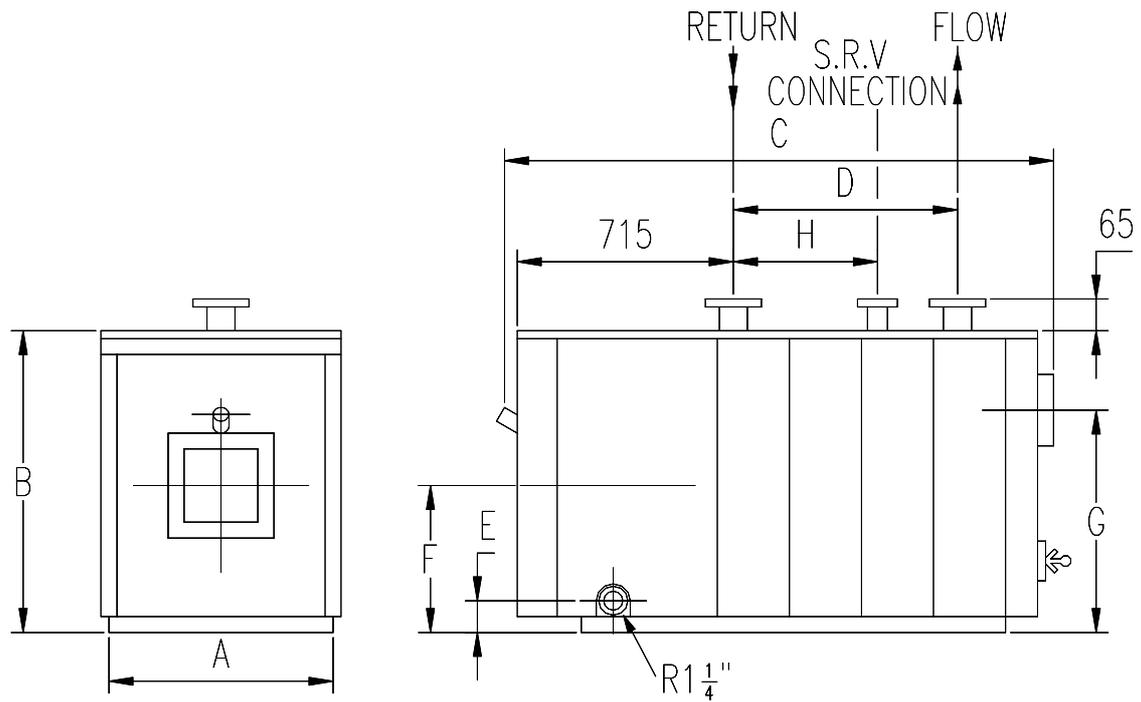
2.1 General

TABLE 1. Technical Data.

BOILER MODEL	LULWORTH	L5	L6	L7	L8	L9	L10	L11
HEAT INPUT (NETT)	kW	517	650	770	900	1020	1149	1279
	Btu/h x1000	1764	2218	2627	3071	3480	3920	4364
HEAT OUTPUT	kW	470	590	700	820	930	1050	1170
	Btu/h x1000	1604	2013	2388	2798	3173	3583	3992
INPUT RATE NATURAL GAS	m ³ /h	54.2	68.1	80.7	94.3	106.9	120.4	134.0
	ft ³ /h	1914	2406	2849	3330	3774	4252	4733
INPUT RATE CLASS 'D' OIL 35 sec	l/h	52.2	65.7	77.8	91.0	103.0	116.0	129.0
	UKgal/h	11.5	14.5	17.1	20.0	22.7	25.5	28.4
COMBUSTION RESISTANCE (Gas & Oil)	mbar	5.1	5.8	6.6	7.0	7.5	8.0	8.2
	in wg	2.1	2.3	2.7	2.8	3.0	3.2	3.3
FLUE GAS VOLUME AT NTP (Oil)	m ³ /h	712	895	1061	1239	1405	1583	1762
	ft ³ /h	25145	31628	37463	43755	49604	55886	62218
APPROX. FLUE GAS	Deg.C	215						
FLUE GAS VOLUME AT NTP (Nat Gas)	m ³ /h	694	872	1033	1207	1368	1541	1715
	ft ³ /h	24491	30795	36474	42627	48312	54429	60582
APPROX. FLUE GAS	Deg.C	190						
FLUE DRAUGHT REQUIRED AT BOILER OUTLET	mbar	(-) 0-0.1						
	in wg	(-) 0-0.04						
WEIGHT (Full) WITHOUT	kg	1705	1835	2265	2460	2490	2975	3240
	l UKgal	630 138	650 143	800 176	890 195	920 202	1030 226	1140 250
WATER CONNECTIONS FLOW & RETURN FLANGED TO BS4504 PT 1 TABLE 6/3	mm	100	100	100	100	125	125	125
	in NB	4	4	4	4	5	5	5
MINIMUM WATER PRESSURE	Bar g	5						
	Psi g	73						
FLUE CONNECTION OD	mm	300	300	350	350	450	450	450
GAS CONNECTION (Typical)	in	2	2	2½	2½	2	2	2
	Nominal bore					(Boosted	supply	required)
ELECTRICAL SUPPLY		415v 3ph 50Hz (Burner) 240v 1ph 50Hz (Boiler panel)						

NOTE! Gas input rate based on NGA (G20) gas with a Nett CV of 34.06 MJ/m³

2.2 Dimensions and Clearances - Fig. 1 Overall Dimensions



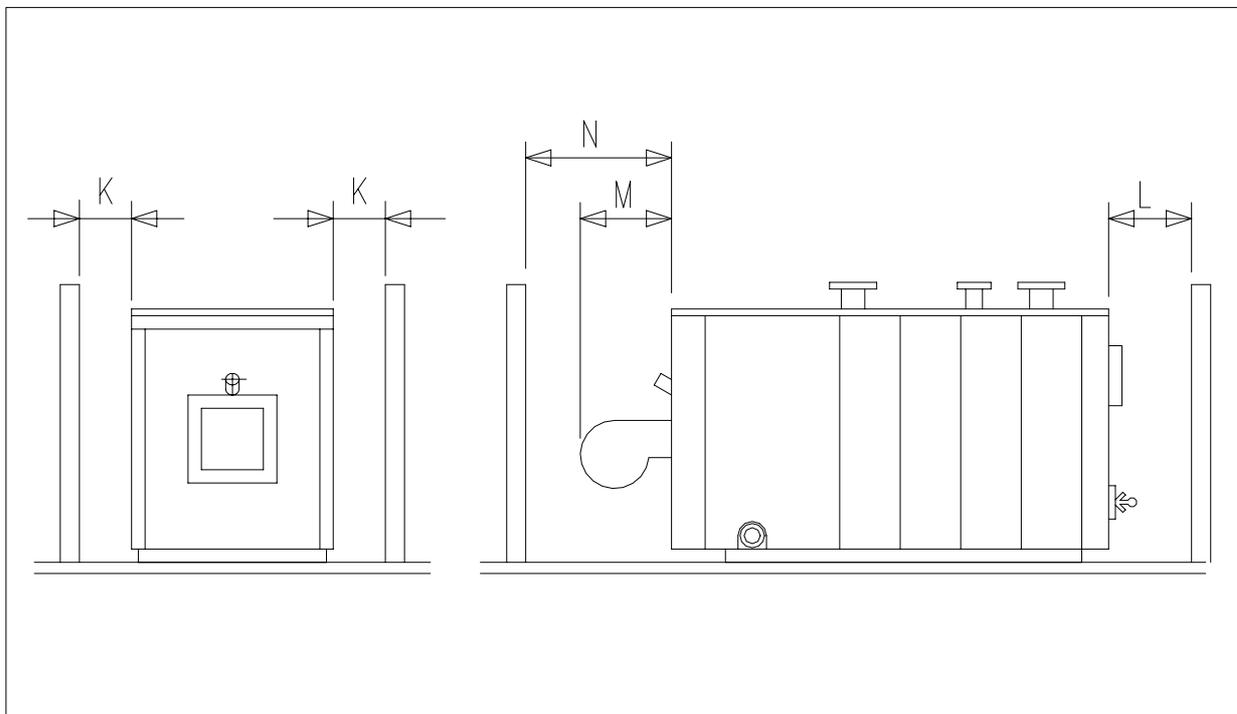
MODEL LULWORTH HE	A*	B	C	D	E	F	G	H	Flow/** Return Con- nection	S.R.V.** Connection
L5	1100	1300	2190	970	130	680	930	650	100	65
L6	1100	1300	2270	1050	130	680	930	730	100	65
L7	1200	1455	2290	1070	140	760	1020	750	100	65
L8	1200	1455	2370	1150	140	760	1020	830	100	65
L9	1300	1555	2370	1150	145	800	1110	830	125	80
L10	1300	1555	2620	1400	145	800	1110	1080	125	80
L11	1300	1555	2880	1660	145	800	1110	1340	125	80

Dimensions in mm.

*Add 70 mm to account for casings

** Flanges to BS4504 Pt 1 Table 6/3

2.2 Dimensions and Clearances - Figure 2 Clearances



MODEL LULWORTH HE	Kmm	Lmm*	Mmm**		Nmm***
			Oil Firing	Gas Firing	
L5	350	500	506	840	1295
L6	350	500	570	840	1295
L7	350	500	570	920	1300
L8	350	500	720	920	1400
L9	350	500	720	920	1400
L10	350	500	720	920	1600
L11	350	500	720	920	1900

* This dimension is a minimum recommendation permitting access to the rear of the boiler for maintenance. It may not however be adequate for the installation of flue bends within the boiler-house. Where necessary, dimension L must be increased accordingly.

** Typical dimensions only based on Riello burners.

*** Clearance required for maintenance of boiler. This dimension may require increasing to allow for servicing of particular burners.

3. INSTALLATION REQUIREMENTS

3.1 Gas Safety

It is the law that all gas appliances are installed by a competent person, ie a CORGI registered gas installer, in accordance with the requirements of all relevant current legislation and codes of practice - see below.

3.2 Legislation and Codes of Practice

Lulworth HE boilers should be installed in accordance with all relevant legislation, codes of practice and British Standards, including the following:-

a. Legislation & Regulations

- The Gas Safety (Installation and Use) Regulations 1984.
- The Gas Safety (Installation and Use) (Amendment) Regulations 1990.
- The Health and Safety at Work Act.
- Health and Safety Executive Guidance Note PM5.
- The Building Regulations.
- The IEE Wiring Regulations for Electrical Installations.
- The Byelaws of the Local Water Undertaking.
- Local Authority Regulations.
- Local Gas Region Regulations.
- Local Fire Authority Regulations.
- Insurance Company Requirements.

b. British Standards Codes of Practice

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

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

BS.6891 - Installation of low pressure gas pipework of up to 28 mm in Domestic Premises.

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 and design considerations. **Part 2:** Selection of equipment. **Part 3:** Installation, commissioning and maintenance.

c. British Gas Publications

IM/2 Purging procedures for non-domestic gas installations.

IM/5 Soundness testing procedures for industrial and commercial gas installations.

IM/11 Flues for commercial and industrial gas fired boilers and air heaters.

IM/16 Guidance notes on the installation of gas pipework, boosters and compressors in customers premises (excluding domestic installations of 25mm and below).

3.3 Boiler Location

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

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

Sufficient clearance above the boiler must also be provided to allow access for installation/servicing of valves and pipework. Refer to Section 2.2 for recommended clearances.

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

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

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

The compartment housing the boiler must have permanent air vents communicating directly with the outside air at both high and low level. Refer to Section 3.7 for details.

3.4 Gas Supply

The Gas Safety (Installation and Use) Regulations require that only competent persons, ie CORGI Registered gas installers, should install gas appliances. **Failure to install gas appliances correctly may lead to prosecution. It is in your own interest, and that of safety, to comply with**

the law.

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

Installation pipes should be fitted in accordance with British Gas publication **IM/16**. Pipework from the meter to the boiler must be of an adequate size to pass the maximum required gas rate without excessive pressure loss. Pipe of a smaller diameter than the burner gas connection should not be used. The complete installation must be tested as described in **IM/16**.

Where it is necessary to use a gas booster, the controls must include a low pressure cut-off switch fitted upstream of the booster. The cut-off pressure will be decided by the local gas region, who should be consulted before a gas booster is installed.

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

3.5 Oil Supply

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

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.

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).

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.

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. **NB.** 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.

3.6 Flue System

The flue system should be designed and installed in accordance with the requirements of **BS.5854**, **BS.6644** and British Gas publication **IM/11**. The following notes are given for your guidance.

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

The size of the flue must be such as to guarantee the efficient discharge of combustion products from the building and should not be less than the diameter of the flue outlet.

When designing the flue system, care must be taken to ensure that any condensate that 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.

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.

The flue should not terminate adjacent to any

openings which would allow combustion products to enter a building, eg openable windows, fresh air inlets or soil pipe terminations.

The flue should not be closer than 50mm to any combustible material, except when it passes through the roof, wall, floor, ceiling or partition when it should be enclosed in a non-combustible sleeve with an air gap of not less than 25mm between the sleeve and the flue pipe.

The flue pipe should be located and, if necessary, shielded to ensure that there is no undue risk of either damage to the flue or danger to persons in or around the building.

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

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

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

3.7 Ventilation and Air Supply

The boiler house, or space, in which the boiler(s) is situated must have provision for an adequate supply of air for both combustion and ventilation. Detailed recommendations for natural or mechanical ventilation of such areas are given in:

BS.6644 - for gas boilers of input between 60kW and 2MW.

BS.5410 Part 2 - for oil boilers of 44kW output and above.

The following notes are given as general guidance:

3.7.1 Air Supply by Natural Ventilation

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

or louvres must be so designed that high velocity air streams do not occur within the space housing the boiler.

For boilers installed below ground level, high and low level ventilation should not be provided by a single duct.

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

- a. At floor level (or 100mm above floor level) = 25°C.
- b. At mid-level (1.5m above floor level) = 32°C.
- c. At ceiling level (or 100mm below ceiling level) = 40°C.

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

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

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

3.7.2 Air Supply by Mechanical Ventilation

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

Mechanical Inlet with natural or mechanical extraction - Mechanical inlet and mechanical extract can be utilised provided that the minimum flow rates of air supplied and extracted are in accordance with Table 2.

Mechanical extract ventilation with natural inlet ventilation must not be used.

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

Table 2. Mechanical Ventilation Flow Rates

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

4. WATER SYSTEM

Reference should be made to **BS.6644**, **BS.6880** and **CP.342** for detailed recommendations on heating water circulation systems. The following notes are given as guidance:

4.1 Pipework

The heating system should be thoroughly cleaned prior to the installation of the boiler(s). If there is any doubt regarding the cleanliness of an existing system, the inclusion of a coarse filter in the return pipe to the boiler(s) should be considered.

In the case of multiple boiler installations, irrespective of the type of system, it is important that the system design provides an even flow of water (of not less than the minimum rate specified) through

each of the boilers in question. This can be achieved by connecting the boilers using the 'reverse return' method, providing an even flow through each boiler, and ensuring that the pressure drop across any number of boilers is never greater than that for a single boiler plus losses for the adjacent pipework and fittings.

The system should be designed to operate with a temperature rise across the boiler of between 11°C and 22°C.

The design and minimum water flow rates, with the corresponding waterside pressure drop values, are given in Table 3: It is also important that the system control allows for a minimum return temperature to be maintained at the boiler. For oil fired boilers the minimum return temperature must be 60°C and for gas fired 55°C.

BOILER MODEL LULWORTH HE	FLOW RATE (11 deg C temp rise)				FLOW RATE (15 deg C temp rise)				MINIMUM FLOW RATE (22 deg C temp rise)			
	FLOW RATE		PRESS. DROP		FLOW RATE		PRESS. DROP		FLOW RATE		PRESS. DROP	
	l/m	UKgal /m	mbar	in wg	l/m	UKgal /m	mbar	in wg	l/m	UKgal /m	mbar	in wg
L5	607.2	133.6	51.2	20.6	443.7	97.6	27.4	11.0	303.6	66.8	12.8	5.2
L6	759.2	167.0	76.0	30.5	556.8	122.5	40.9	16.4	379.6	83.5	19.0	7.6
L7	911.2	200.4	65.2	26.2	668.2	147.0	35.0	14.1	455.6	100.2	16.3	6.5
L8	1062.6	233.7	70.8	28.4	779.3	171.4	38.0	15.3	531.3	116.9	17.7	7.1
L9	1214.6	267.2	86.8	34.8	890.7	195.9	46.7	18.8	607.3	133.6	21.7	8.7
L10	1366.2	300.5	101.2	40.6	1001.8	220.4	54.5	22.0	683.1	150.3	25.3	10.2
L11	1518.0	333.9	108.8	43.7	1113.2	244.9	58.4	23.5	759.0	167.0	27.2	10.9

TABLE 3. Water Flow Rates and Pressure Drops.

4.2 Pumps

The pressure drop through both the boiler and the heating installation should be taken into account when selecting the circulating pump for the system. In the case of open vented systems, it is essential that the pump does not 'pump over' (ie push water out of the open vent pipe) during normal operation.

Some installations may require the use of a shunt pump to maintain the temperature rise between boiler flow and return within the recommended range, and to provide an 'overrun' facility to dissipate residual heat and avoid nuisance shut down of the boiler(s) by the overheat thermostat. Under no circumstances should the boiler fire with a flow rate lower than the minimum.

Circulating pumps should be located in an accessi-

ble position and be fitted with two isolating valves to allow removal replacement.

4.3 Open Vent Pipe

An open-vented system must have an open vent pipe, sized in accordance with **BS.6644**, running directly from the flow pipe adjacent to the boiler(s), rising continuously by the shortest route, to discharge into the feed and expansion tank above the overflow level.

No valve should be fitted in the open vent pipe, except on multiple boiler installations where any isolating valve fitted between the boiler and the open vent pipe should be a 3-way valve - venting the boiler to atmosphere through the third port when isolating the open vent pipe from the boiler.

4.4 Safety Valve

A pressure relief (safety) valve, of approved manufacture and sized to match the boiler(s) rating in accordance with **BS.6644** should be installed on the flanged connection provided (refer to Fig. 1). The safety valve discharge pipe should be self draining and terminate in a visible position where any discharge will not be a danger to personnel.

4.5 Pressure Gauge

The boiler(s)/heating system should be fitted with a water pressure gauge to indicate the pressure in the system in either metres of water or bars.

4.6 Thermometer (temperature gauge)

Each boiler control panel incorporates a temperature gauge, indicating the temperature of the boiler flow water in degrees Celsius.

4.7 Drain Valves

A drain valve (not supplied) should be fitted to allow complete draining of the boiler when necessary. Any parts of the system which are below the boiler should have a drain valve installed at the lowest point to allow the system to be totally drained when necessary. A R1¼" connection is provided for a drain valve at the bottom of the right hand side, near the front of the boiler.

4.8 Feed Water Quality

The boiler feed water must be of good quality with a hardness less than 150 ppm and a pH of between 7 and 8. If the water has a higher degree of hardness, it should 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 a 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 when hot before any water treatment is added.

4.9 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:-

a. Single installed boiler running at 82°C flow temperature. Minimum head required is not less than 2 metres or 0.2 bar.

b. Single installed boiler running at 95°C flow temperature. Minimum head required = 5.1 metres or 0.5 bar.

c. Multi boiler installation running at 82°C flow temperature and 11°C rise across system. Minimum head required - 4.3 metres or 0.42 bar.

d. Multi boiler installation running at 82°C flow temperature and 20°C rise across system. Minimum head required = 9.3 metres 0.92 bar.

5. CONNECTIONS

5.1 Fuel

GAS - For burner gas train inlet connection sizes, refer to Section 2.1.

A manual shut-off valve must be fitted on the incoming gas supply pipe.

It shall be adjacent to the boiler, clearly identified and readily accessible.

OIL - All burners are supplied with flexible oil pipes to make the final connection between the oil supply pipe and burner. The oil supply line should terminate adjacent to the burner with an isolating valve and metal bowl filter.

5.2 Water

The flow and return water connections are located on the top of each boiler and terminate in flanges. Refer to Fig.1.

5.3 Electrical

WARNING: THIS APPLIANCE MUST BE EARTHED.

IMPORTANT: All wiring must be installed in accordance with the IEE Wiring Regulations for electrical installations, and any other local electrical regulations which apply.

A 240 volt 50 Hz single phase neutral and earth supply is required for the panel. Entry points for the electrical cable are located in the right hand side panel above the drain connection and enter the control panel through the top casing.

To allow electrical isolation of the boiler when necessary, the electrical supply should come from a double pole fused isolator (located in the boiler room), having a minimum contact separation of 3mm on both poles.

The earth connection must never be omitted. All wiring should be in heat resistant PVC insulated cable, with the minimum cross section as specified in the technical information supplied with the burner.

The boiler control panel includes a terminal block for all electrical connections to the boiler. Refer to Fig.3.

The panel is supplied with flying lead and plugs for direct connection to corresponding sockets supplied with the burner. Should non-standard connecting wiring be necessary due to particular burners or contract conditions, space is provided in Appendix A of these instructions for a wiring diagram to be included.

A suitable 415 volt 50 Hz 3 phase neutral and earth supply is required for the burner. This should be wired direct to the burner via a suitable adjacent isolator.

6. BOILER ASSEMBLY

6.1 Boiler Shell

The boiler shell is delivered complete with the hinged burner door and the rear flue connector box attached. For transport purposes some items are packed within the combustion chamber and will require fitting on site.

- a.** Position the boiler shell on the level surface prepared for the boiler. Refer to Section 3.3- Boiler Location. The boiler can be lifted by utilising the 4 lifting eyes welded to the bulkhead plate and the shell.
- b.** Remove the right or left hand pair of burner door securing nuts and hinge the door open.
- c.** Remove the contents of the combustion chamber ensuring that it is completely empty and clean. The major items to be removed are the turbulators and insulation.

6.2 Turbulators

Locate the spirally wound turbulators. These are supplied in two lengths of different materials for insertion into the fire tubes. These must be sufficient in number for a long and short section to be inserted in each tube. From the front of the boiler insert a long section of turbulator into each fire tube. Then hook on the short section of turbulator to the long section already inserted and push into each tube to finish flush with front of tube. It is important that the short section of turbulator is at the front (hottest) of each tube.

6.3 Insulation

Locate the insulation wrap. It is recommended that

suitable protection be worn when fitting the isolation. Wrap the insulation around the shell of the boiler between the bulkheads and secure in place, utilising the straps and buckles provided.

6.4 General

- a.** Locate and fit the burner mounting plate ensuring that the fibre board gasket is in position first and the central hole is carefully cut out to match the mounting plate.
- b.** Select the front door casing panel (Item 1 Fig. 5) from the casing kit and mount on front door using the clip-in nuts on the slots in the door mounting brackets and the bolts provided. Leave bolts loose to enable correct positioning when remainder of casing is fitted.
- c.** Locate burner and fit to mounting plate using studs and nuts. On some burners it may only be necessary to fit the detachable head. Open burner door and pack any gap between the burner head and the moulded door insulation with suitable material, for example ceramic fibre rope, to ensure a good seal.
- d.** Close burner door and tighten nuts to give a good seal with the boiler shell.
- e.** Mount the remaining section of the burner to the burner head, if required.
- f.** Ensure the flue connector box at the rear is correctly positioned and held tightly to give a good seal with the boiler shell. Ensure that the clean out door at the bottom of the flue collector box is secured in position and sealed.
- g.** Complete all pipework connections and fuel lines.
- h.** Complete installation by fitting casing and control panel - refer to Section 7.

7. CONTROL AND CONTROL PANEL ASSEMBLY

7.1 Control Assembly (Refer to Fig.5)

- a.** Locate and select the casing side panels (2). These consist of a left and right hand panel with a hinged section and an additional left and right extension panel, except for the Lulworth HE L11, which has 2 extension panels each side.
- b.** Fit the front side casings with hinged section by clipping over the square top and bottom side rails welded between the bulkheads. Ensure that the welded brackets (4) on the bottom rail are open sufficiently to receive the panels and that the hinged section protrudes forward at the front bulkhead. These hinged sections are provided to allow the burner door to hinge open without removing the casing.
- c.** Complete the side casing by clipping on the extension panels (3) in a similar manner.
- d.** Select the front top casing panel (5) which contains the mounting and access holes for the control panel. Mount the spring catches into the appropriate holes in the panel and push panel into position.
- e.** Select the control panel (6) and remove the top half. Carefully unwind the four capillaries, for the thermostats and thermometer, and the flying leads for connection to the burner ensuring they are all fed through the access hole in the bottom of the panel.
- f.** Feed the capillaries and cables through the hole in the top front casing panel and secure panel to casing top using screws provided.
- g.** Run the capillaries backwards along the top of the boiler and insert the bulbs in the pocket provided, which is located below the flange on the flow connection of the boiler.
- h.** Run the burner cables backwards and round the right hand side of the boiler and feed the plugs through the hole provided in the side casing above the drain connection.
- i.** Locate the remaining top casing panels (7), mount the spring catches into the appropriate holes and fit to side panels to complete the top casing.
- j.** Adjust the position of the front door casing panel (1) to centralise between side panels and tighten bolts.

7.2 Control Panel (Refer to Fig. 3)

All site wiring must be run to the control panel via the access hole at the bottom and the cables restrained utilising the clamps and screws provided. To complete the control panel, position the moulded top half over the panel and lower, ensuring that the front and rear metal panels fit inside the grooves provided. Screw the halves together using the black screws provided.

To gain access to the panel, use the reverse procedure.

A powered lock-out, terminal 10 and a powered overheat, terminal 4, are provided together with an optional volt free contact kit (see Fig. 7). Site fitting of this kit requires holes to be drilled in the panel back plate for mounting the relays. A remote control link is not supplied, but terminals 17 and 18 are spare and can be used in conjunction with minor wiring alterations.

The panel is supplied with two flying leads terminating in a flat seven pin plug for on/off control and a flat four pin plug for additional high/low control and these should be coupled firmly to the corresponding sockets supplied with the burner.

It should be noted that with a single phase 240 volt supply connected to the panel, a three phase 415 volt supply connected to the burner and the possibility of additional live cables for volt free connections. It is important that all supply sources are isolated before commencing work on the panel or boiler.

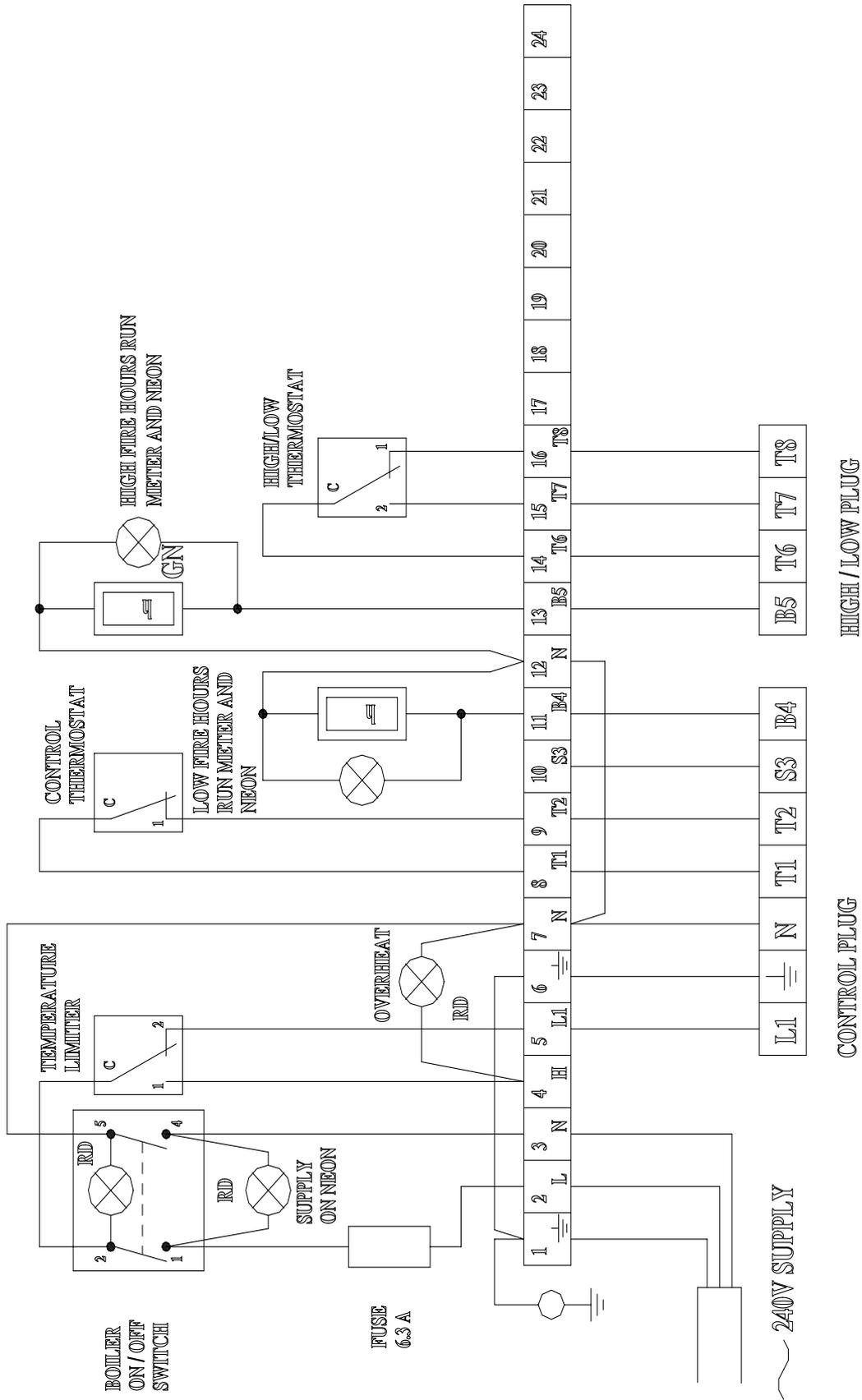


Figure 3 - Boiler Control Panel Wiring Diagram

8. COMMISSIONING

The boiler should be commissioned by a competent person. The Gas Safety (Installation and Use) Regulations require that only Registered (ie CORGI Registered) gas personnel should install, commission and service gas fired equipment such as these boilers. **Failure to comply with these regulations may lead to prosecution.**

Before commencing the commissioning of the boiler, ensure that any personnel involved are aware of the action about to be taken.

The following burner commissioning procedures are given as a guide only and reference must be made to the instructions supplied with the burner. Gas regulating devices must always be set to their minimum initially and only adjusted between light-up attempts until satisfactory ignition and start rates have been achieved.

8.1 Preliminary Checks

BEFORE starting the boiler, check the following:-

- a. Check that the 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 that the electrical connections are correctly made, eg no loose strands at terminals.
- e. Check that supply is correctly fused for the current rating of the installation.
- f. Check that electrical installation is correctly earthed (earth continuity between boiler, gas pipework and mains electrical supply).
- g. Check that installation is complete.
- h. Check boiler is standing level on an adequate base.
- i. Hinge open the boiler door and check turbulators are in position and combustion chamber is clear. Re-seal door following burner checks 8.2 and 8.3.
- j. Check all thermostat bulbs are correctly inserted in the appropriate pocket.
- k. Check for water leaks and ensure that both boiler and heating system is full of water and properly vented.
- l. Check that all drain cocks are closed, and that all isolating valves in flow and return pipework are open.
- m. Check that flue is unobstructed and conforms to the relevant Regulations, Code of Practice or British Standards. Refer to Section 3.6.
- n. Check boiler house is adequately ventilated (refer to Section 3.7) and that ventilation grilles are unobstructed.
- o. **For OIL**; check that tank(s) have been filled

and oil supply pipework between tank and burner has been primed.

p. For GAS; check soundness of gas installation and that pipework is purged of air, as detailed in British Gas Publications **IM/5** and **IM/2** respectively.

Check that the gas meter and supply pipework is of sufficient size to meet the input rating of the burner/boiler. Refer to Section 3.1.

q. Check that burner output is correct for size of boiler in question, referring to Section 2.1 and the manufacturer's technical information supplied with the burner.

8.2 Oil Fired Boilers

a. Check flexible oil lines are tightly jointed and are not twisted or kinked to form an obstruction.

b. Check correct nozzle(s) is fitted to burner, and that it is tight.

c. Check electrodes and ensure porcelain insulation is not cracked.

d. Check electrodes are correctly positioned, and gap is correctly set, as specified in the manufacturer's technical information supplied with the burner.

e. Check blast tube is correctly located, and securely fastened in place and any surrounding gap is filled with insulation.

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

g. Set burner for the required fuel and air throughputs, as specified in the manufacturer's technical information supplied with the burner.

h. Fit a pressure gauge on burner oil pump to check pump pressure is correctly set.

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

j. Follow commissioning procedure for burner specified in the manufacturer's literature supplied.

k. Purge air from oil pump through pressure gauge port.

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

l. With burner firing, check the atomising pressure on gauge and adjust as necessary using the pressure regulator on burner oil pump. Refer to technical information supplied with burner.

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

Measure CO₂, CO, smoke number, flue gas temperature rise across the boiler. The readings obtained should be as follows:-

CO ₂	11-12%
CO	less than 100 ppm
Smoke Number	less than 2
Temp. rise across boiler	less than 22°C

If burner is High/Low model, readings should be taken at both settings.

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

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

- p. Set boiler control thermostat to required setting, and check operation of heating control system.
- q. Fully familiarise the user with the boiler operating controls, the main component functions and the safety features.

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

8.3 Gas Fired Boilers

- a. Check that ignition electrode and ionization probe are correctly positioned. Refer to manufacturer's technical information supplied with the burner.
- b. Check that ignition electrode and ionization probe leads are connected.
- c. Check blast tube is correctly located, and securely fastened in place, and any surrounding gap is filled with insulation.
- 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 Section 2.1 for 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.
- i. Adjust start and main output gas rates to minimum as detailed in the manufacturer's technical information supplied with the gas train.
- j. Check that overheat thermostat manual reset is set, and that boiler control thermostat and control system are set to call for heat. Follow commissioning procedure supplied with burner which should include the following:
- 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.

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.

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

Measure CO₂, CO, flue gas temperature, and circulating water temperature rise across the boiler. The readings obtained should be as follows:

CO ₂	9-10%
CO	Less than 100 ppm
Flue gas exit temp.	190°C
Temp. rise across boiler	Less than 22°C

If burner is High/Low model, readings should be taken at both settings.

- o. After all other adjustments have been made, set burner air pressure switch as instructed in manufacturer's technical information supplied with burner.
- p. Check gas pressure at burner head corresponds with value determined from burner manufacturer's technical information - as detailed in (f) above.
- q. Check gas flow rate at meter. Ensure that all other appliances served by the meter are isolated whilst flow rate is checked.
- r. Cycle boiler on and off several times to ensure reliable burner ignition and boiler operation. Check for gas, water and flue gas leakage. Tighten all access, flue box and burner mounting bolts and nuts.
- s. Set boiler control thermostat to required setting, and check operation of heating control system.
- t. Fully familiarise the user with the boiler operating controls, the main component functions and the safety features.

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

9. SERVICING

The boiler should be serviced by a competent person. The Gas Safety (Installation and Use) Regulations require that only Registered (ie CORGI Registered) gas personnel should install, commission and service gas fired equipment such as these boilers. **Failure to comply with these Regulations may lead to prosecution.**

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 (eg eye protection, face mask, protective gloves, etc) is recommended where necessary.

9.1 Initial Inspection

- a.** Operate boiler and check for any signs of unsatisfactory operation, water leaks, gas leaks, oil leaks or unusual noise from burner oil pump or motor.
- b.** After allowing burner to reach stable firing conditions for approximately 15 minutes, carry out combustion gas check.
Measure CO₂, CO, flue gas temperature, smoke number (for oil) and water temperature rise across the boiler. The readings obtained should be as given in Section 8 - Commissioning.
- 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.

9.2 Burner Service Procedure

SWITCH OFF ALL ELECTRICAL SUPPLIES TO BOILER AT ISOLATORS AND SHUT OFF FUEL SUPPLY TO BOILER.

- a. For oil installations:** Desludge oil storage tank and examine for leaks and signs of deterioration.

Examine contents gauge for visibility and clean or recommend replacement as necessary.

- b.** Disconnect electrical and fuel connections to burner, as necessary.

Examine flexible oil line(s) for any signs of deterioration, leakage, damage, or hardening of inner tube.

- c.** Disconnect burner from mounting flange or

hinge open the burner door by removing either the left or right pair of nuts.

- d. For oil burners:** Remove control box, check photocell is clean, check electrode rod contacts, check wires in base of control box and condition of electrical spring connectors. Wipe nozzle clean and inspect for spark erosion.

- e.** Remove burner blast tube and clean thoroughly. Check combustion head settings are correct, as specified in the manufacturer's technical information supplied with the burner. Check diffuser disc slots are clean.

- f.** Remove, clean and check electrodes inspecting for any signs of deterioration or crazing in porcelain.

Check electrode gaps are as specified in the manufacturer's technical information supplied with the burner.

9.3 Boiler Service Procedure

- a.** With the burner door hinged open the combustion chamber and fire tubes are accessible. Carefully remove all turbulators from the fire tubes.

- b.** Using a suitably sized brush, clean each fire tube straight through to the flue connector box.

- c.** Remove the cleaning door at the bottom of the flue connector box and clean out deposits with brush and vacuum cleaner.

- d.** Brush and vacuum combustion chamber.

- e.** Replace cleaning door ensuring it is correctly sealed.

- f.** Replace all turbulators in fire tubes, long sections first followed by short sections at front of boiler.

- g.** Close door and tighten. Replace seal if necessary.

- h.** Refit burner if necessary. Reconnect fuel and electrical supplies.

- i.** Turn on fuel supply and check soundness of fuel supply pipework.

- j.** Check all flue joints for integrity.

- k.** Check ventilation ducts/grilles to boiler room and ensure they are clear.

- l.** Re-commission boiler as detailed in relevant parts of Section 8 - Commissioning.

10. SPARE PARTS LIST

10.1 Boiler Spares (Refer to Fig.4)

ITEM	DESCRIPTION	PART NO.
1	Hinge bracket	573405459
2	Hinge Tie Rod	573405460
3	Hinge Pin	573405461
4	Hinge Pin Retaining Ring	573405462
5	Thermostat Pocket	573405463
6	Burner Mounting Plate Gasket (L5 & 6)	573405464
	Burner Mounting Plate Gasket (L7 - 11)	573405466
7	Burner Mounting Plate (Blank) (L5 & 6)	573405465
	Burner Mounting Plate (Blank) (L7 -11)	573405467
8	Turbulator Set L5	573405468
	Turbulator Set L6	573405469
	Turbulator Set L7	573405470
	Turbulator Set L8	573405471
	Turbulator Set L9	573405472
	Turbulator Set L10	573405473
	Turbulator Set L11	573405474
9	Flue Collector Gasket 3.5m	573405476
10	Burner Door Gasket 3.5m	573405477

10.2 Control Panel Spares (Refer to Fig. 6)

ITEM	DESCRIPTION	PART NO.
1	Control Thermostat.....	573405428
2	Temperature Limiter (High Limit Thermostat)	573405427
3	Temperature Gauge	573405430
4	Hours Run Meter	573405431
5	On/off Switch (Illuminated)	573405251
6	Fuse Holder	573405255
7	Fuse 6.3A	573405256
8	Green Neon Lens	573405432
9	Red Neon Lens	573405433
8/9	Neon Lamp.....	573405434

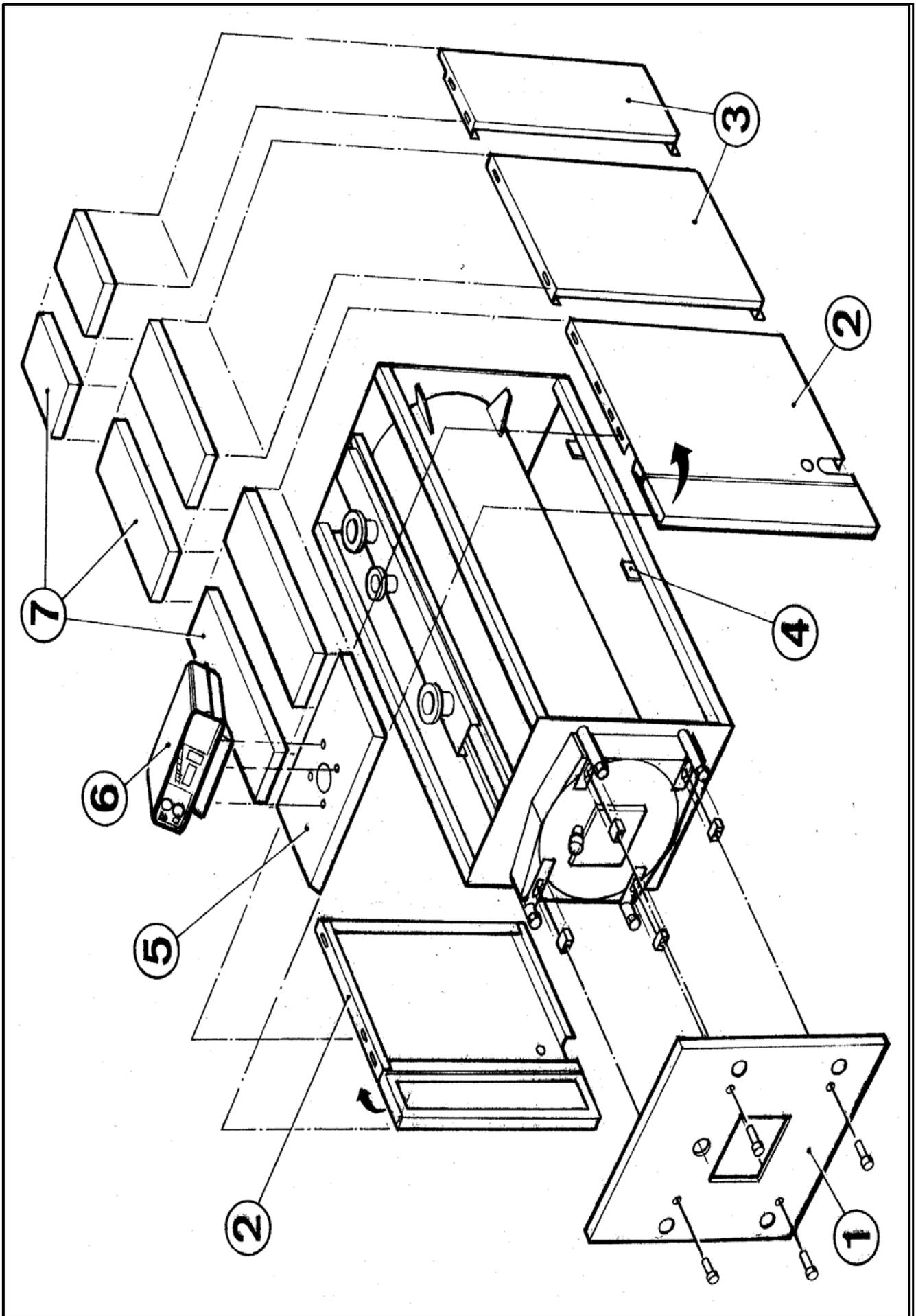


Fig. 5. Boiler Casing Assembly

Fig. 6 - Control Panel Fascia

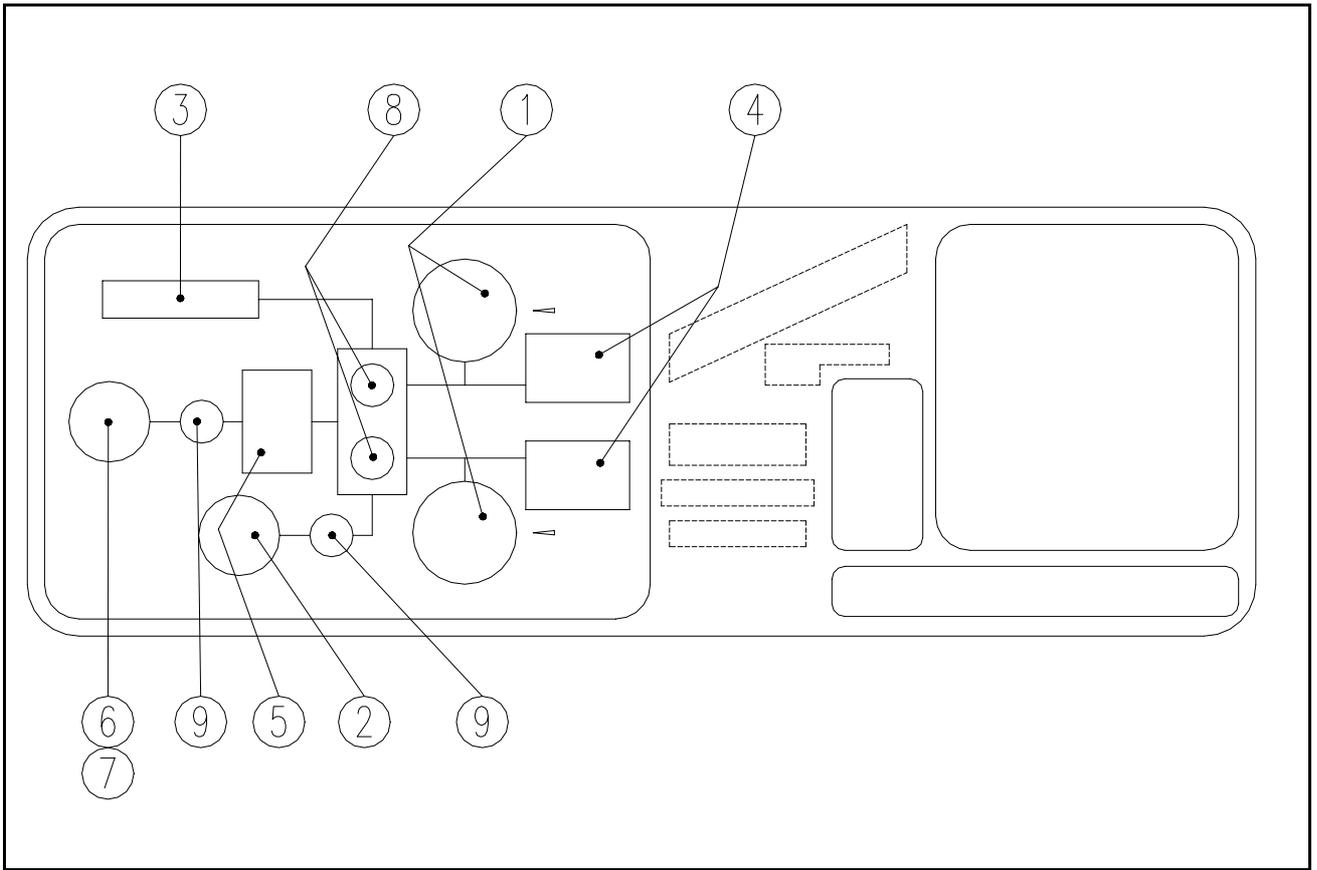
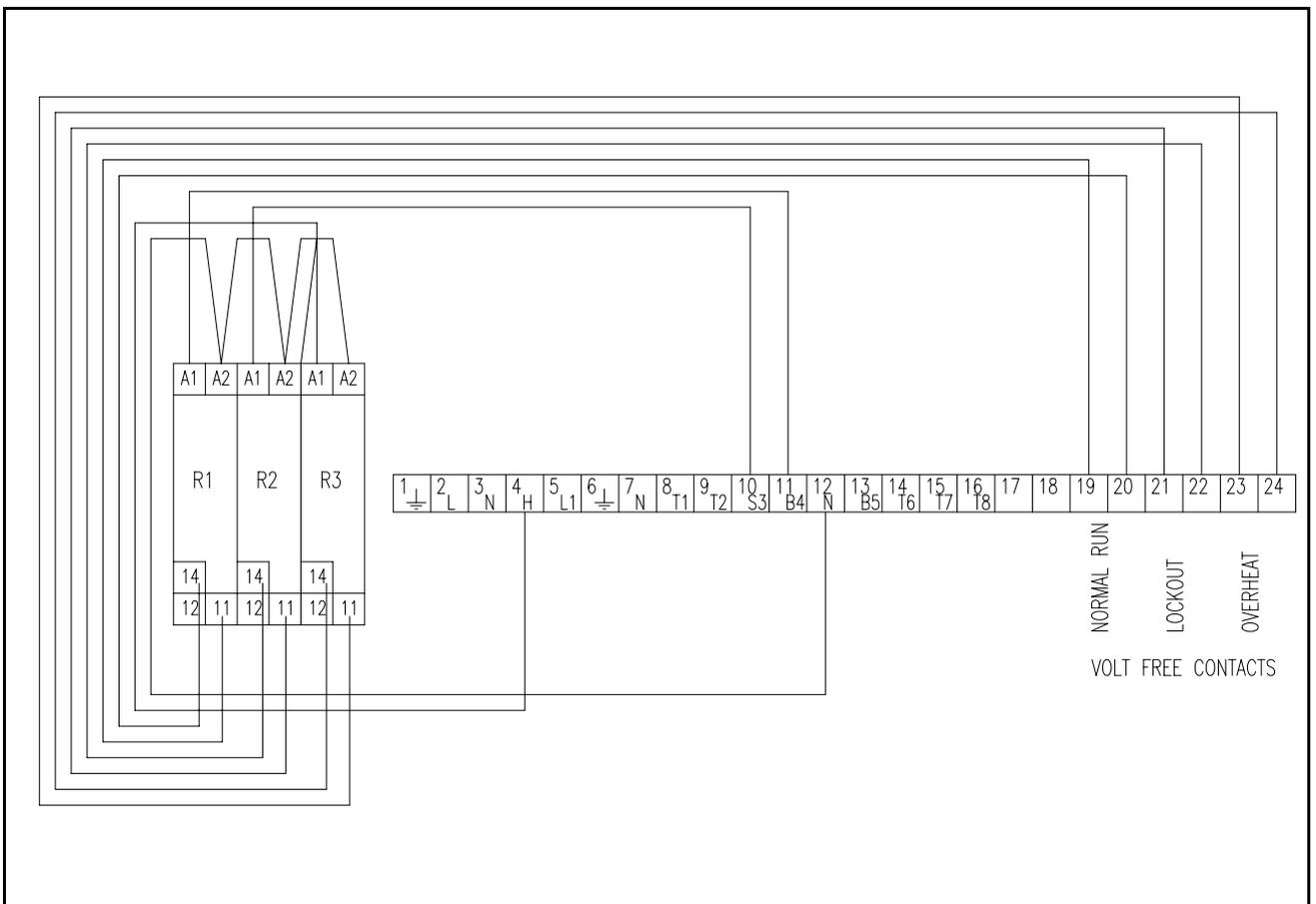
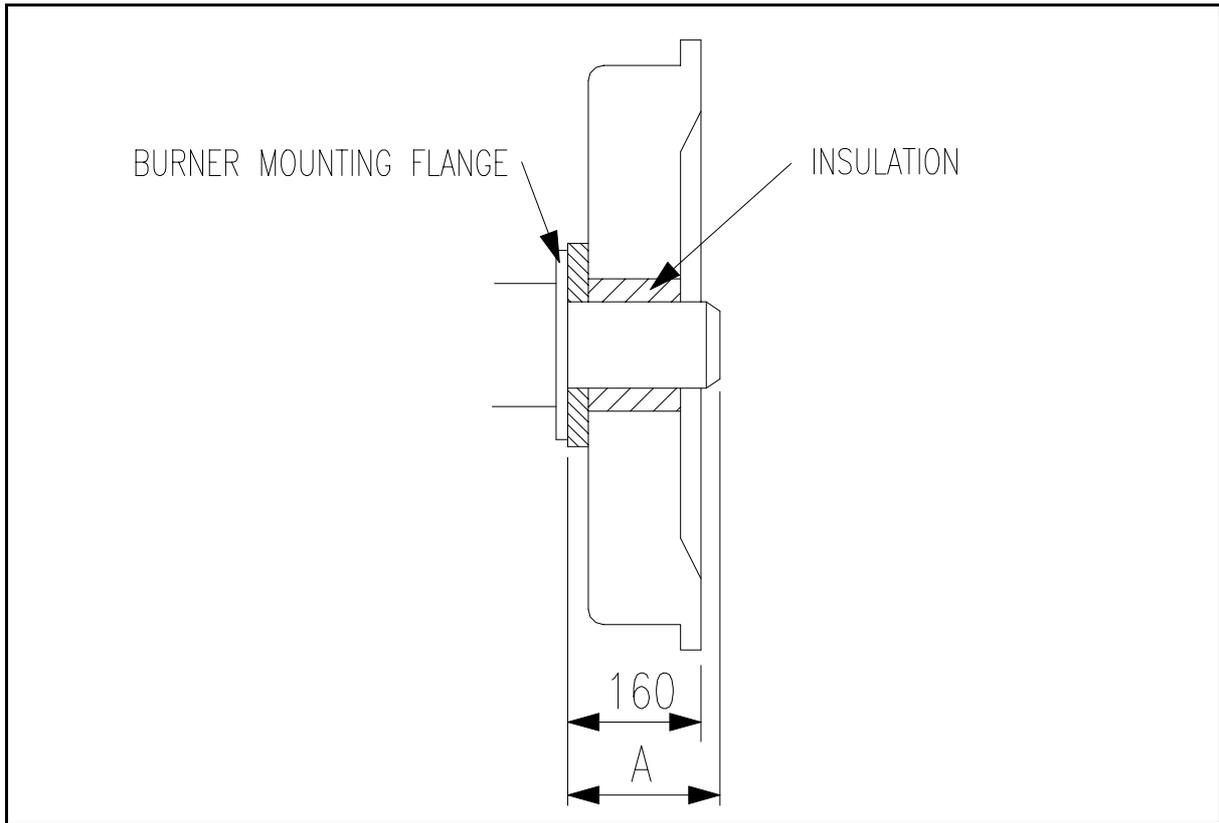


Fig. 7 - Volt-Free Contact Kit and Wiring (Optional)



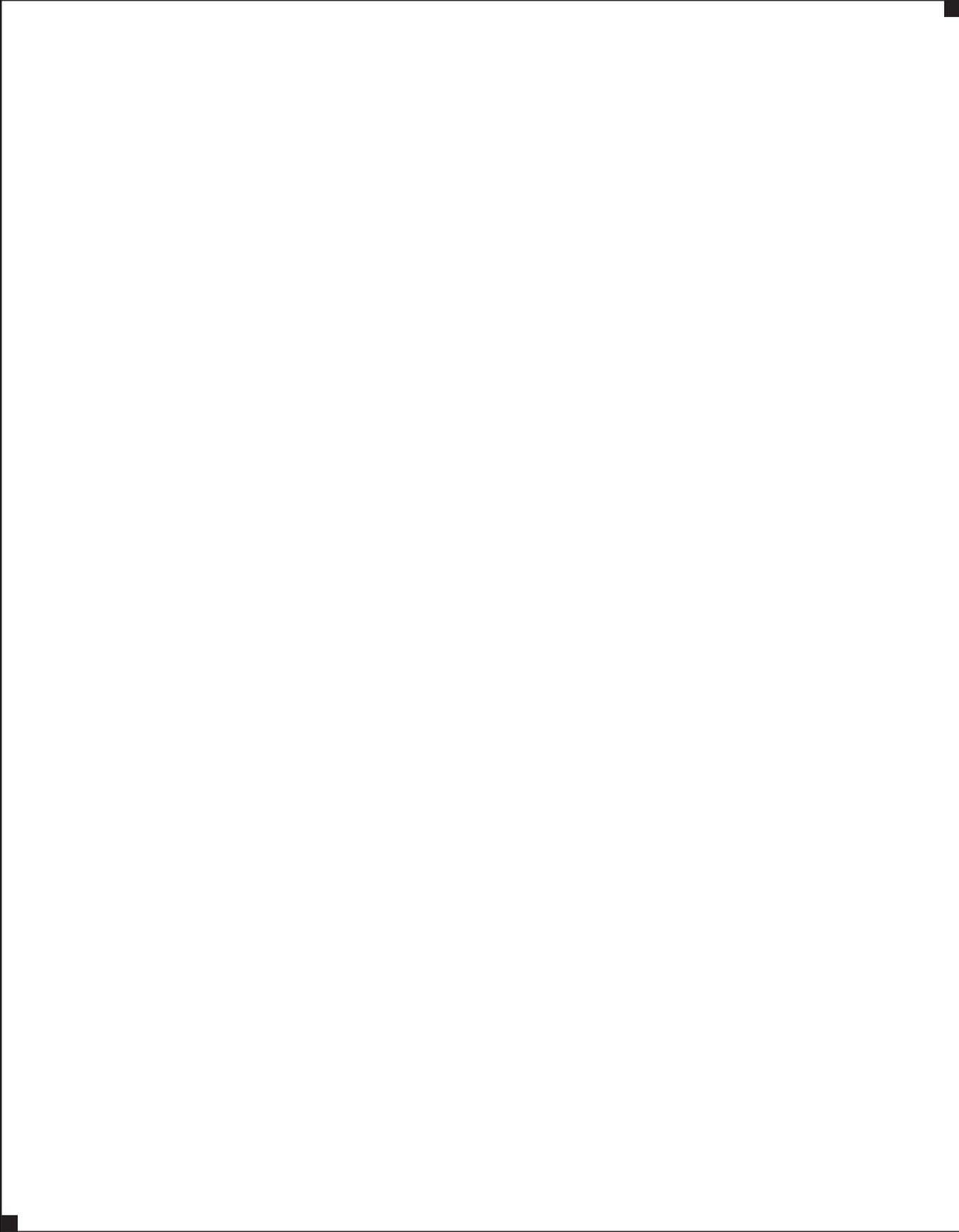


DESCRIPTION	LULWORTH						
	L5	L6	L7	L8	L9	L10	L11
Combustion Chamber Diameter (mm)	620	620	700	700	770	770	770
Combustion Chamber Length (mm)	1530	1610	1610	1690	1690	1940	2200
Combustion Chamber Type	Reversed						
BURNER FOR GAS TYPE INSTALLATIONS							
Burner Manufacturer	MODEL						
RIELLO	RS70	RS70	RS100	RS100	RS130	RS130	GA58/PM
Blast Tube Length Dim A (mm)	250	250	250	250	280	280	391
Burner Manufacturer	MODEL						
NU-WAY	NGN35	NGN35	NGN45	NGN45	NGN55	NGN55	NGN55
Blast Tube Length Dim A (mm)	340	340	340	340	340	340	340

Fig. 8 - Combustion Chamber and Burner Data

APPENDIX A. BOILER/BURNER WIRING DIAGRAMS

Notes



Connect direct

Direct Dial Telephone and Fax Numbers



- boilers
- controllers
- water heaters
- pressurisation sets

Poole Office

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

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



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

Birmingham Office

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

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tel: **02890 849826** fax: **02890 847443**

Scotland

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

Website

www.hamworthy-heating.com

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