

# **Broxley BX**

## **Cast Iron Boiler**

### **Design Installation and User Guide**



March 2001

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## Brief Boiler Specification

The BX is a cast iron sectional boiler for pressure jet oil firing or forced draught gas firing and is supplied complete with combustion and control equipment. The boiler is supplied in separate sections for assembly on site.

The boiler is CE Marked on PIN 87AT59 to:-

Gas Appliance Directive  
Boiler Efficiency Directive  
Low Voltage Directive  
Electromagnetic Compatibility Directive

and conforms to the requirements of :-

EN 303/297 Parts 1 and 3 For Boilers  
BSEN676 Gas Burners  
BSEN267 Oil Burners

The boiler is suitable for central heating and indirect hot water supply at working pressures not exceeding 6.0 bar. The boiler must not be used for direct hot water supply.

The boiler is provided with a comprehensive control panel containing high/low fire and limit thermostats, thermometers, altitude gauge, On/Off switch, "high/low fire" indication lamps, and control box/high limit lock out lamps. Output signals are available for remote indication via optional volt free contacts. An optional pump over-run timer is available for inclusion in the boiler control panel to time shunt pumps etc..

All models are available with Nu-Way or Riello oil or gas burners and the gas combinations are CE Marked and other combinations can be supplied.

## Location

The boiler should be located on a level foundation of brick or a concrete plinth, capable of supporting the weight of the boiler when filled and 100 mm high. The front edge of the plinth should not extend forward of the front of the boiler case as this may interfere with the burner.

The boiler is cleaned from the front and back, and should be positioned so that adequate access is provided. It is recommended that at least 500 mm (20") clearance be allowed between the boiler and the walls of the boiler house. The clearance at the front should be equivalent to the length of the boiler and 1000mm at the rear and top of the appliance.

Where more than one boiler is installed, the distance between them may be reduced to a minimum of 500 mm. The above dimensions and clearances given are intended to indicate the minimum requirements of the boiler and do not take into account the clearances required for pipe work, flues and other associated equipment (see fig 3 page 6).

## Shipping Contents

This boiler is supplied in separate sections shrunk wrapped onto pallets for site assembly and burners are supplied in a carton or shrink wrapped onto a pallet or pallets and small burners are supplied in a single carton and larger gas burners have the gas train supplied on a small separate pallet.

## NOx

Typical NOx figures depending on the boiler size and burner combinations are as follows :

Gas : 43 ppm at 9% CO2 wet - equivalent to 65 ppm Dry Air Free (DAF) or 114 mg/kWh on net boiler input.

Oil : 80 ppm at 12% CO2 wet - equivalent to 115 ppm Dry Air Free or 206 mg/kWh net boiler input.

## General Design Considerations

The installation of the boiler must be in accordance with the following regulations :

National Building Regulations  
Local Building Regulations  
The Building Standards (Scotland) (Consolidation) Regulations  
I.E.E. Regulations ( BS7671 )  
Local Water Byelaws  
Local Gas Service Area Recommendations  
Local Authority Recommendations  
BS 5440 Pt1 1978 Flues  
BS 5440 Pt2 1976 Air Supply .....  
BS 6644 1991 Specification for the installation of gas fired hot water boilers of rated input between 60 kW and 2 MW  
CP 342 Pt2 1974 Code of practice for centralised hot water supply buildings other than individual dwellings

British Gas Publications :  
IM/2 Purging procedures .....  
IM/5 Soundness testing .....  
IM/16 Installation of gas pipe work and boosters .....  
IM/11 Flues for commercial boilers .....  
Health and Safety Executive Guidance Note PM5 :-  
Automatically controlled steam and hot water boilers  
C.I.B.S.E I.H.V.E Guide Parts A, B and C.

## Installation

It is the Law that this appliance is installed and serviced only by a competent person e.g. a C.O.R.G.I registered / ACOP assessed installer or British Gas (BG plc).

**THIS APPLIANCE MUST BE EARTHED**

## Boiler Outputs

Table 1

MODEL	A *	NUMBER OF SECTIONS	OUTPUTS		WEIGHT EMPTY* Kg	WATER CONTENT L	WEIGHT FULL Kg
			kW	x1000 Btu/h			
BX320	1380	9	320	1093	1669	246	1915
BX380	1510	10	380	1298	1832	274	2106
BX440	1640	11	440	1503	1991	302	2293
BX500	1770	12	500	1708	2153	330	2483
BX560	1900	13	560	1912	2315	358	2673
BX630	2030	14	630	2151	2476	386	2886
BX700	2160	15	700	2390	2638	413	3081
BX780	2290	16	780	2664	2799	449	3248
BX860	2420	17	860	2937	2965	469	3434

\* Does not include allowance for burner  
(refer to Fig 1 for overall dimensions, Tables 7 to 10 for burner weights)

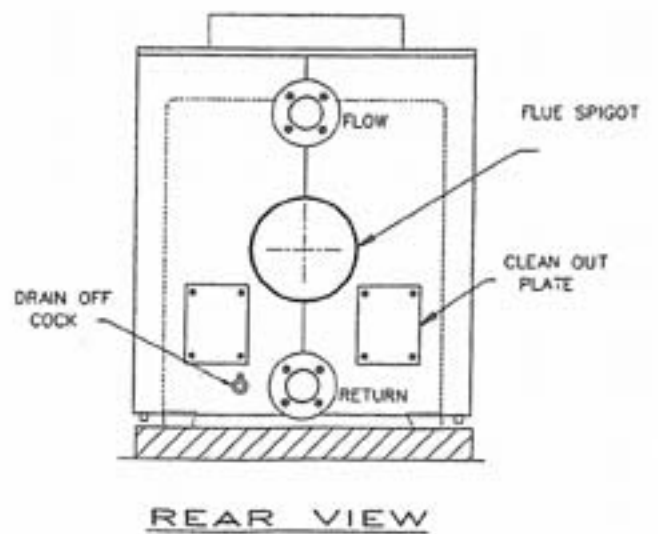
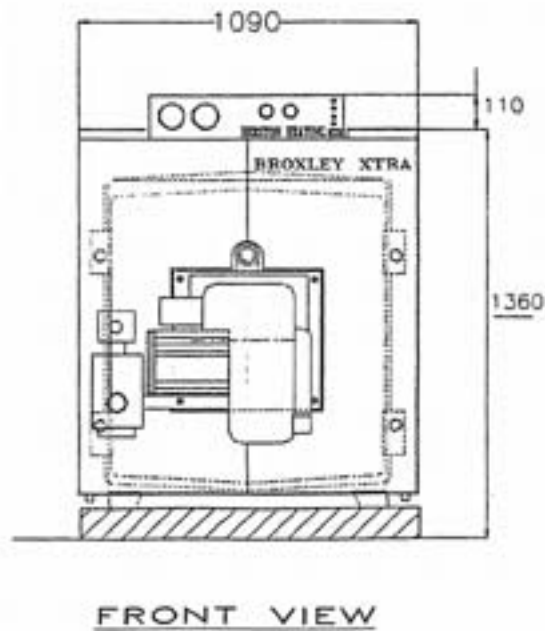
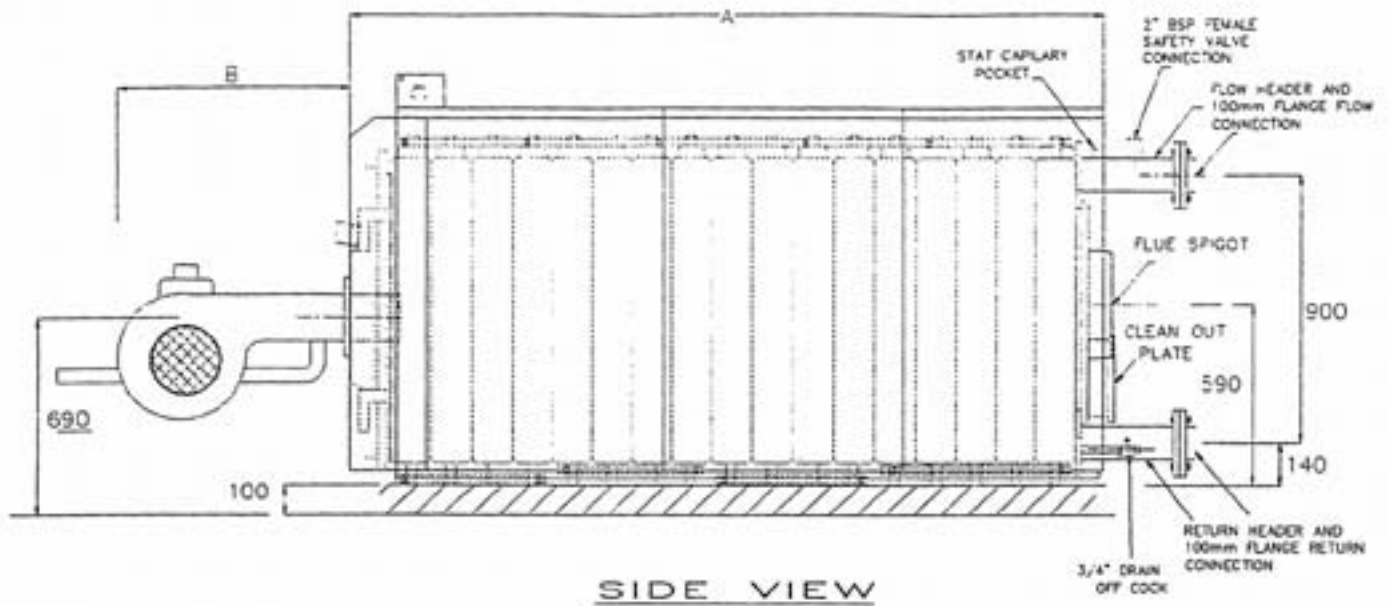
## Dimensions

Table 2

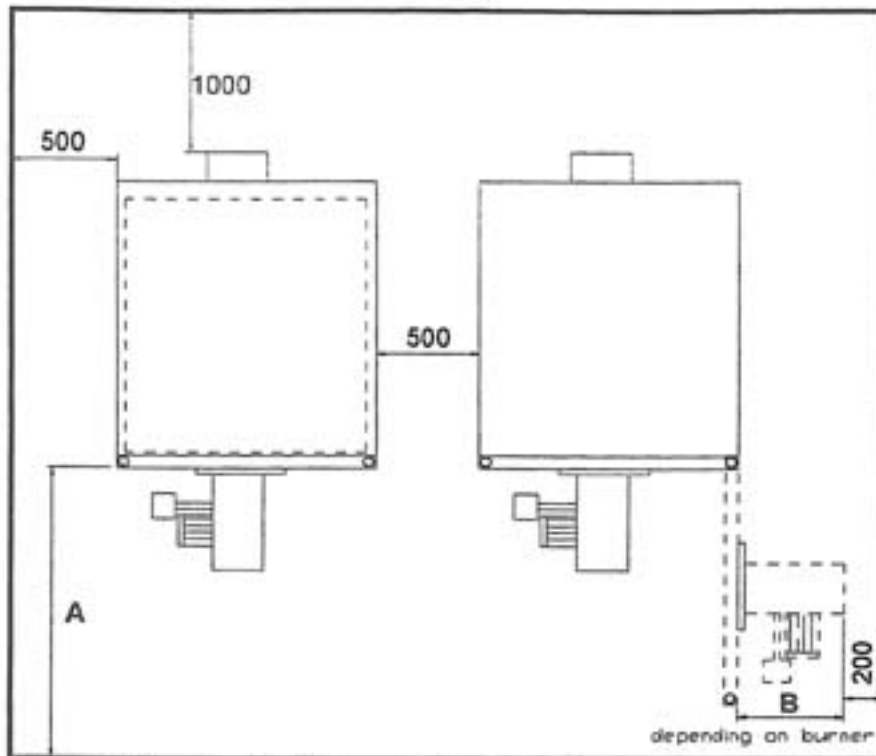
MODEL	BURNER PROJECTION B				FLUE SPIGOT SIZE * mm	COMBUSTION CHAMBER RESISTANCE m.bar	COMBUSTION CHAMBER	
	NUWAY		RIELLO				DIAMETER mm	LENGTH mm
	OIL	GAS	OIL	GAS				
BX320	580	783	468	510	300	0.6	570	1079
BX380	580	783	468	510	300	1.2	570	1207
BX440	580	783	468	510	300	1.7	570	1335
BX500	580	970	468	910	300	1.9	570	1463
BX560	542	970	680	910	300	2.3	570	1591
BX630	542	970	680	910	300	2.5	570	1719
BX700	542	970	680	910	300	2.9	570	1847
BX780	542	970	680	910	350	3.1	570	1975
BX860	686	970	680	910	350	3.3	570	2103

\* This is the nominal o.d. flue spigot size only and larger flue sizes may be needed depending on site conditions.

Fig 1 Dimensions



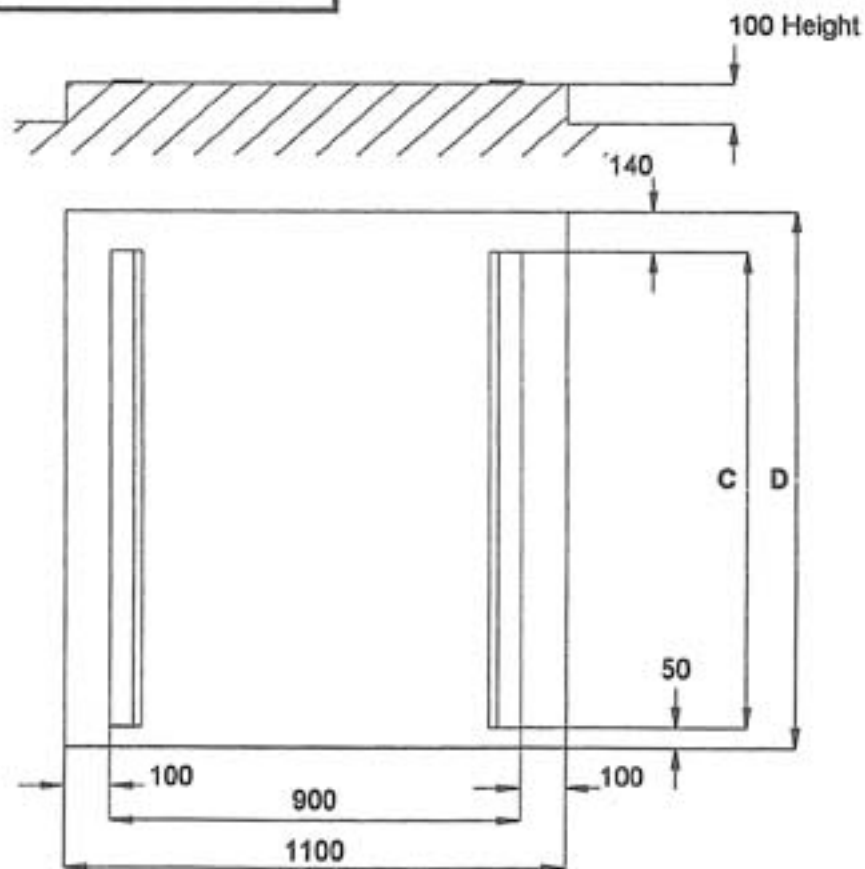
**Fig 2. Minimum Boiler and Door Clearances.**



Dimension A is the length of boiler, (see Table 1, page 4)

Dimension B is the length of burner from boiler door, (see Table 2, page 4)

**Fig 3. Foundations and Base.**



MODEL	9/320	10/380	11/440	12/500	13/560	14/630	15/700	16/780	17/860
DIM C (mm)	1140	1265	1390	1515	1640	1765	1890	2015	2140
DIM D (mm)	1330	1455	1580	1705	1830	1955	2080	2205	2330



## Water Circulation System

The installation must be in accordance with the regulations given under General Design Considerations and the water circulation system should be installed in accordance with the requirements of BS 6880.

The flow and return connections are on the rear face of the back section.

A time delay of approximately 10 minutes should be incorporated between the burner switching off and the cessation of water flow in order to dissipate residual heat and prevent high temperature "lock out". A pump over run relay is available as an optional extra. If three-way mixing or diverting valves are installed in the system, they should not be of such a type that flow through the boiler is totally interrupted. If fully closing valves are used, a bypass should be fitted. It is recommended that the minimum flow rate through the boiler is equivalent to a temperature difference between flow and return of 25°K at rated output (see table 5).

For satisfactory operation, the pressure including any effect of the circulating pump imposed on the boiler should not be less than 5.0 m (16'6") head of water. It is essential when applying the boiler to a system to avoid, by design, a return water temperature of below 45°C (112°F) as this can lead to condensation.

The boiler is supplied with altitude gauge of range 0 - 6 bar.

Boiler water systems should be thoroughly flushed and cleaned before a new boiler is installed and system water should be treated by a reputable specialist and best practice observed. Consideration should be given to the fitting of sludge traps and strainers if site conditions warrant them.

The boiler does not contain aluminium. Suitable water treatment products are:

Sentinel X100 manufactured by Grace Dearborn Ltd and Copal manufactured by Femox Ltd.

The boiler is supplied with thermostats suitable for a maximum flow temperature of 90°C. The maximum operating temperature is 120°C and it must be remembered that the boiler flow temperature must be at least 17°C (30°F) below the saturated steam temperature equivalent to the pressure at the highest point of the system.

NB: Connection for the boiler safety valve is provided on the flow header.

## Gas Supply

The local gas supply authority should always be contacted at the design stage to ensure an adequate supply is available.

An existing service pipe must not be used without prior consultation with the local gas supply authority and the supply must be made through a suitable meter. The boilers require a minimum inlet gas pressure at the boiler gas inlet of 17.5 mbar (7.0 in.wg) with all burners and appliances firing.

A gas isolating valve and union should be provided, NB: Some larger models may require gas booster to be installed for correct operation.

NB. The firing rates are based on thermal efficiency of :-

Oil : 83.8% on the gross calorific value of the fuel (93.0% net).

Gas : 82.0% on the gross calorific value of the fuel (91.0% net).

## Oil Supply

The boiler is suitable for firing with either 28 Second Kerosene or 35 Second Gas Oil and this should be specified when ordering .

A single pipe oil supply with the oil available at a slight positive pressure is generally required though the burners own oil pumps can provide some lift of the oil depending on the volume flow and the lift required.

For dual fuel burners a two pipe oil supply system is generally recommended unless the burner is fitted with an oil pump clutch. An oil filter and isolating valve should be provided and the burner connected to the oil supply with a flexible oil hose. The hose and filter are generally supplied with the burner.

**Table 4 Heat Input and Firing Rate (High Fire)**

MODEL	HEAT OUTPUT		HEAT OIL		INPUT GAS		FIRING RATE OIL		RATE GAS	
	kW	1000 Btu/h	kW	1000 Btu/h	kW	1000 Btu/h	L/h	Gal/h	cu.M/h	cu.ft/h
320	320	1092	382	1303	390	1332	35.4	7.8	36.7	1295
380	380	1297	453	1547	465	1585	42.2	9.3	43.7	1541
440	440	1501	525	1792	538	1835	48.9	10.7	50.6	1785
500	500	1706	597	2036	610	2080	55.4	12.2	57.3	2023
560	560	1911	668	2280	685	2336	62.2	13.7	64.3	2272
630	630	2150	752	2565	768	2621	69.8	15.3	72.2	2549
700	700	2388	835	2850	856	2920	77.7	17.1	80.4	2839
780	780	2661	931	3176	954	3253	86.6	19.0	89.6	3164
860	860	2934	1026	3502	1049	3578	95.3	20.9	98.6	3480

**Table 4a Heat Input and Firing Rate (Low Fire)**

MODEL	LOW FIRE HEAT OUTPUT		LOW FIRE HEAT OIL		HEAT INPUT GAS		LOW FIRE HEAT OIL		FIRING RATE GAS	
	kW	1000 Btu/h	kW	1000 Btu/h	kW	1000 Btu/h	L/h	Gal/h	cu.M/h	cu.ft/h
320	192	655	229	782	231	801	21.0	4.6	21.7	768
380	228	778	272	928	275	951	25.0	5.5	25.8	911
440	264	901	315	1075	318	1101	28.9	6.4	29.9	1055
500	300	1024	358	1221	361	1251	32.8	7.2	34.0	1199
560	336	1146	401	1368	405	1402	36.8	8.1	38.1	1343
630	378	1290	451	1539	455	1577	41.4	9.1	42.8	1511
700	420	1433	501	1710	506	1752	46.0	10.1	47.6	1679
780	468	1597	558	1906	564	1952	51.2	11.3	53.0	1871
860	516	1761	616	2101	622	2152	56.5	12.4	58.4	2063

**Table 5 Hydraulic Information**

MODEL	MINIMUM RECOMMENDED FLOW RATES AT :-					
	EQUIVALENT TO DIFFERENTIAL TEMP OF 25degC across flow/return		EQUIVALENT TO DIFFERENTIAL TEMP OF 20degC across flow/return		EQUIVALENT TO DIFFERENTIAL TEMP OF 11degC across flow/return	
	m3/hr	mbar	m3/hr	mbar	m3/hr	mbar
<b>BX320</b>	11.00	8.20	13.78	12.00	25.00	25.00
<b>BX380</b>	13.07	10.10	16.34	14.50	29.71	31.50
<b>BX440</b>	15.13	13.50	18.92	18.00	34.40	37.00
<b>BX500</b>	17.20	15.10	21.50	20.50	39.10	44.50
<b>BX560</b>	19.26	18.00	24.10	24.50	43.77	51.50
<b>BX630</b>	21.67	20.00	27.10	27.00	49.25	59.50
<b>BX700</b>	24.10	24.00	30.19	32.00	54.72	68.00
<b>BX780</b>	26.83	27.00	33.53	37.00	60.97	77.50
<b>BX860</b>	29.59	30.10	36.97	40.00	67.23	87.00



## Flue

The installation must be in accordance with the regulations given under General Design Considerations.

The nominal flue size should not be less than the figure listed in table 6 flues and ventilation. The flue must be self supporting as the flue socket is non load bearing.

The flue gas volumes given in Table 6 are quoted at S.T.P. (Standard Temperature and Pressure of 15°C and 1013.5 m.bar) but may vary slightly with site conditions.

The flue should be designed to give a balanced draught (zero) at the boiler flue socket as the burners are designed to overcome all of the combustion chamber resistance.

NB. The flue spigot connection is nominally 300mm for models 320 to 700 and 350mm for all larger sizes. Depending on boiler size and site conditions a larger flue size may be needed and the flue system should be designed for each particular site.

\* The boiler flue spigot is 348mm O.D. (see figure 1).

## Ventilation

The installation must be in accordance with the regulations given under General Design Considerations.

**Table 6 Flue and Ventilation**

MODEL	FLUE GAS VOLUME AT S.T.P				NOMINAL FLUE SPIGOT SIZE * mm	VENTILATION					
	OIL		GAS			NATURAL		MECHANICAL			
	L/s	cu.ft/m	L/s	cu.ft/m		LOW LEVEL sq.cm	HIGH LEVEL sq.cm	INLET L/s	AIR cu.ft/m	EXTRACT L/s	AIR cu.ft/m
320	130	276	136	288	300	2037	1018	353	748	236	499
380	154	328	161	342	300	2368	1184	420	889	280	593
440	178	379	187	396	300	2699	1350	486	1029	324	686
500	202	431	212	450	300	3031	1515	552	1169	368	780
560	227	483	238	504	300	3362	1681	618	1310	412	873
630	255	543	268	567	300	3749	1874	696	1474	464	982
700	283	603	297	630	300	4135	2068	773	1637	515	1091
780	316	672	331	702	350	4577	2288	861	1824	574	1216
860	348	741	365	774	350	5018	2509	950	2011	633	1341

S.T.P Is standard conditions of 1 bar and 15 °C , typical gross flue gas temperatures are 180 to 200°C .

\*This is the nominal socket size only. Larger boilers may require larger flues, e.g. Model 860 may require a 400 mm flue system depending on site conditions.

For natural ventilation - grilles with the minimum free areas as given in Table 6 (which are based on BS6644) for a single boiler should be provided at low and high level.

For exposed boiler houses - grilles should be provided on two or more external walls.

Care should be taken in siting boilers so that they are not affected by adverse draughts or situated next to powerful fans or other such equipment.

For underground boiler houses or those where communication with the outside is not possible then mechanical ventilation may be used. Volumes of air for mechanical ventilation are given in Table 6 for single boiler and are based on BS 6644.

For mechanically ventilated boiler houses it is possible to have mechanical inlet air at low level and natural extract air at high level and all volumes and grilles should be designed on the values given in Table 6. It is not permissible to have natural inlet air and mechanical extract. In all cases of mechanical ventilation the fans should be interlocked so that the boiler cannot run unless the fans are proved to be running. Air volumes and grilles should be designed using the values given in Table 6.

The figures quoted in the Tables are based on BS 6644 for single boilers and are generally suitable for oil as well as gas fired boilers.

**Table 7 Nuway Gas Burners**

BOILER MODEL	BURNER MODEL	HEAD PRESSURE (mbar)	START CURRENT (A)		RUN CURRENT (A)		FUSE RATING (A)		NOISE LEVEL (dBA)	GAS TRAIN SIZE	BURNER WEIGHT (kg)
			3/415V	1/240V	3/415V	1/240V	3/415V	1/240V			
			BX320	NGN15T1/3S240	6.6	11	22	1.7			
BX380	NGN25T1/3S240	8.4	11	22	1.7	4.8	10	10	88	2"	70
BX440	NGN25T1/3S240	11.2	11	22	1.7	4.8	10	10	88	2"	70
BX500	NGN35T3S240	7.9	15	n/a	2.5	n/a	HRC10	n/a	86	2"	75
BX560	NGN35T3S240	9.5	15	n/a	2.5	n/a	HRC10	n/a	86	2"	75
BX630	NGN35T3S240	11.5	15	n/a	2.5	n/a	HRC10	n/a	86	2"	75
BX700	NGN35T3S240	14.2	15	n/a	2.5	n/a	HRC10	n/a	86	2"	75
BX780	NGN45T3S240	14.6	25	n/a	4.6	n/a	HRC10	n/a	86	2"	101
BX860	NGN45T3S240	16.8	25	n/a	4.6	n/a	HRC10	n/a	85	2"	101

NB:  
NGN45 will require gas booster.

**Table 8 Nuway Oil Burners**

BOILER MODEL	BURNER MODEL	OIL PRESSURE (psi)	START CURRENT (A)		RUN CURRENT (A)		FUSE RATING (A)		NOISE LEVEL (dBA)	BURNER WEIGHT (kg)	NOZZLE SIZE (gal) all 60 PLP	
			1/240V	3/415V	1/240V	3/415V	1/240V	3/415V			HIGH	LOW
			BX320	NOL20T3S240	180	n/a	9	n/a			1.7	n/a
BX380	NOL20T3S240	180	n/a	9	n/a	1.7	n/a	HRC10	72	36	4.5	4
BX440	NOL25T3S240	180	n/a	9	n/a	1.7	n/a	HRC10	72	36	5.5	4
BX500	NOL25T3S240	180	n/a	9	n/a	1.7	n/a	HRC10	72	36	6	5.5
BX560	NOL30T3S240	300	n/a	15	n/a	2.5	n/a	HRC10	80	53	6	4
BX630	NOL30T3S240	300	n/a	15	n/a	2.5	n/a	HRC10	80	53	6	5
BX700	NOL30T3S240	300	n/a	15	n/a	2.5	n/a	HRC10	80	53	6.5	6
BX780	NOL35-25T3S240	300	n/a	15	n/a	4.6	n/a	HRC10	80	53	7.5	6.5
BX860	NOL50-28T3S240	300	n/a	25	n/a	4.6	n/a	HRC15	80	94.5	8.5	7

**Table 9 Riello Gas Burners**

BOILER MODEL	BURNER MODEL	HEAD PRESSURE mbar	START CURRENT (A)		RUN CURRENT (A)		FUSE RATING (A)		NOISE LEVEL dBA	GAS TRAIN SIZE	BURNER WEIGHT kg
			1/240V	3/415V	1/240V	3/415V	1/240V	3/415V			
			BX320	RS38	6	11	5.5	2.9			
BX380	RS38	7.7	11	5.5	2.9	2	15	10	70	1.5"	40
BX440	RS50	6.95	n/a	8	n/a	3	15	HRC10	72	2"	41
BX600	RS50	7.65	n/a	8	n/a	3	n/a	HRC10	72	2"	41
BX660	RS70	9.1	n/a	25	n/a	4.8	n/a	HRC10	75	2"	70
BX630	RS70	11.4	n/a	25	n/a	4.8	n/a	HRC10	75	2.5"	70
BX700	RS70	12.8	n/a	25	n/a	4.8	n/a	HRC10	75	2.5"	70
BX780	RS100	9.2	n/a	28	n/a	8.8	n/a	HRC10	77	2.5"	73
BX860	RS100	10.6	n/a	28	n/a	8.8	n/a	HRC10	77	2.5"	73

NB:

RS100 will require gas booster.

**Table 10 Riello Oil Burners**

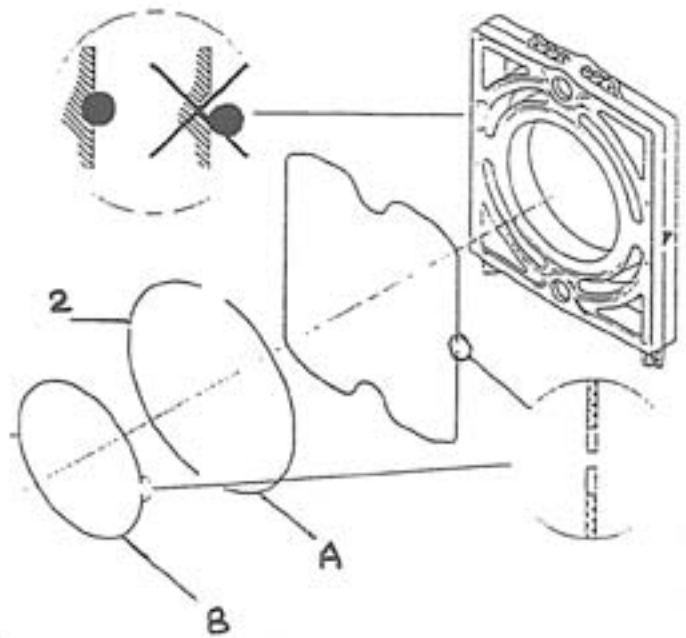
BOILER MODEL	BURNER MODEL	OIL PRESSURE psi	START CURRENT (A)		RUN CURRENT (A)		FUSE RATING (A)		NOISE LEVEL dBA	BURNER WEIGHT kg	NOZZLE SIZE(gal)	
			ALL 45 S		HIGH	LOW						
			1/240V	3/415V			1/240V	3/415V			1/240V	3/415V
BX320	RL38	180	n/a	5.5	n/a	2	n/a	HRC10	72	43	4.5	3
BX380	RL38	180	n/a	5.5	n/a	2	n/a	HRC10	72	43	5	3.5
BX440	RL50	180	n/a	25	n/a	3	n/a	HRC10	75	43	6	4
BX600	RL50	180	n/a	25	n/a	3	n/a	HRC10	75	43	6.5	4.5
BX660	RL70	180	n/a	25	n/a	4.8	n/a	HRC10	75	66	7.5	5
BX630	RL70	180	n/a	25	n/a	4.8	n/a	HRC10	75	66	8.5	5.5
BX700	RL70	180	n/a	25	n/a	4.8	n/a	HRC10	75	66	9.5	6
BX780	RL100	180	n/a	28	n/a	5.9	n/a	HRC10	80	66	10	7.5
BX860	RL100	180	n/a	28	n/a	5.9	n/a	HRC15	80	70	11.5	7.5

## General Assembly Of Boiler

Boilers are sent out in separate sections to be assembled on site. Accompanying the sections are the following packages:-

1. Instrument panel.
2. Jacket box.
3. Insulation (Insulation prefitted into the side and rear panels ).
4. Nipples, flow & return manifolds, etc.
5. Tie rods and casing frame.
6. Burner.

The boiler consists of one front, one back and several middle sections which are identical.



**Fig 4. Fitting The Sealing Rope.**  
**A - Not required for end section.**  
**B - Not required for front section.**

## Foundation

The boiler should be erected on a level foundation of brick or concrete typically 100 mm high capable of supporting the full weight of the boiler (see Table 1.). On an existing base it may be necessary to provide steel shims to provide a level footing.

## Water Connections

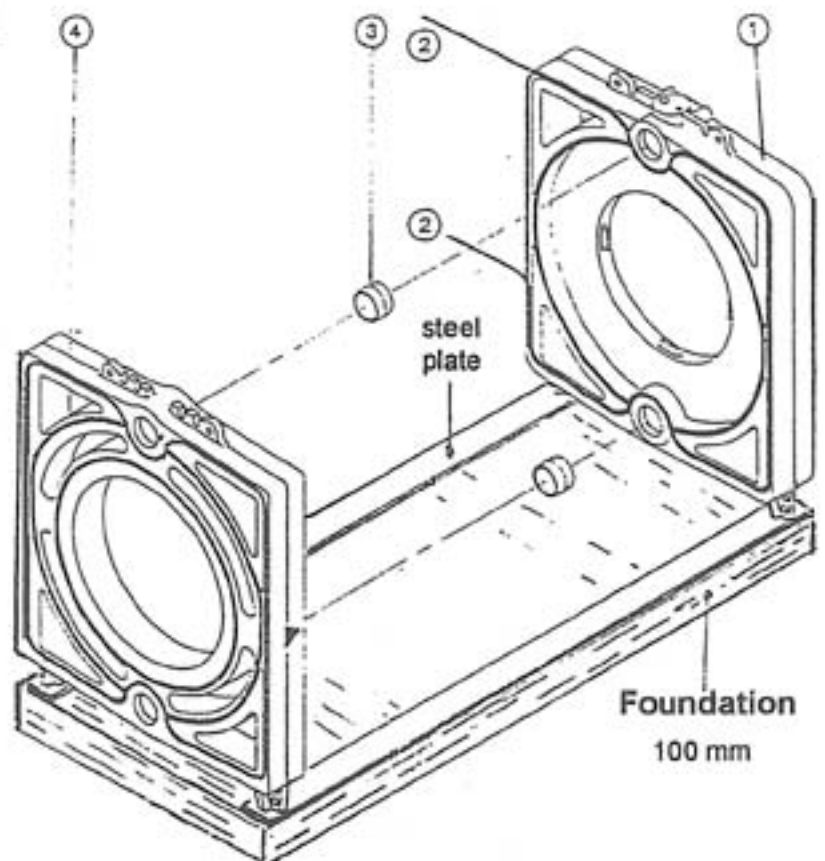
The flow and return connections are 4" 'slip on' flanges supplied. 4" flow connection should be made to the top rear of the boiler and the return connection to the bottom rear of the boiler.

The safety valve connection is made to the 2" BSP connection in the flow header, open vent connection is made to the system.

It is important that only one flow and return connection are made to the boilers as described above.

## Section Assembly

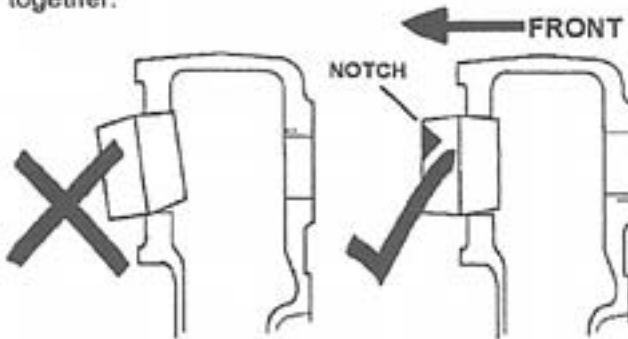
1. Remove slip on flanges from the rear section (1).
2. Remove any burrs present in the section nipple ports and clean the ports with solvent.
3. Position the rear section (1) on the steel floor plates mounted on the foundation. Align the rear section and make sure it is secure to prevent it slipping/falling forward.
4. Clean the section sealing grooves and apply the silicon sealant provided, into the grooves.



**Fig 5.**

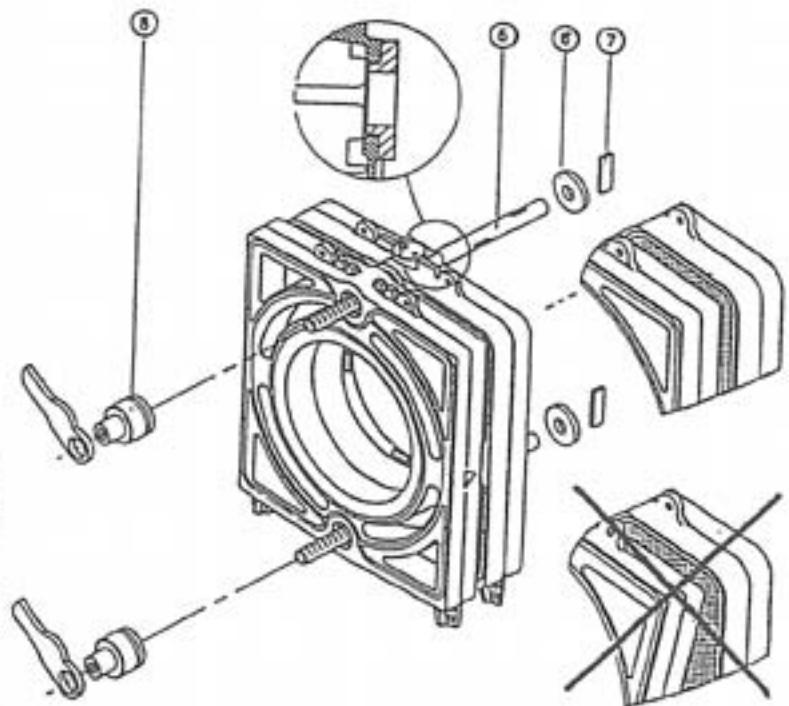


5. Press the fibre sealing rope (2), provided and cut to size, into the section sealing grooves as shown in Fig (4/5), making sure the ends of the rope butt closely together.



6. Clean the nipples (3) with solvent and apply a suitable lubricating medium such as oil to the nipple surface, ensure this coating is free of grit or other solid particles.

7. Insert the nipples (3) into the section nipple ports and knock these home with gentle blows using a soft mallet or rubber hammer, working diagonally making sure not to knock the nipples out of alignment.  
NB. the nipple can fit **ONE WAY ONLY**, the notched edge should **ALWAYS** be facing forwards i.e. toward the operator when inserted into the nipple port.



8. Prepare the middle section (4) and sealing grooves as described in steps 1 and 2. See fig (5).

9. Line up the middle section nipple ports with the rear section nipples (observing the direction of the arrow cast into the side of each section as shown in Fig (5).

10. Using a wooden mallet, gently knock the sections together.

11. Pull up the sections together by means of a suitable pulling up tools as shown in Fig (6). Tighten the sections uniformly together at the top and bottom one at a time otherwise leaks may occur, NB: a distance of 3 to 4mm between the sections is acceptable, and the minimum distance should not be less than 3mm. These sections are not designed to be pulled up metal to metal contact.

12. To assemble further middle sections, prepare the assembled sections as described in steps 2, 4 and 5.

13. Clean two nipples and follow steps 6 and 7.

14. When the number of sections required has been assembled according to table 1 (see page 4) Then fit the boiler tie rods (9) using the M16 nuts and washers provided according to the order given Fig 8, Page 14. NB: Do not slacken off the compression clamps of the pulling up tools when fitting the tie rods, under no circumstances must these boiler tie rods be used for pulling up the boiler. Fit these boiler tie rods at the top right and left and also at the bottom right and left of the sections, this is shown in Fig 8, page 14. (Do not use excessive force to tighten the nuts up on the tie rods 35-40 lbf/ft (48-54 Nm) torque recommended).

Fig 6.

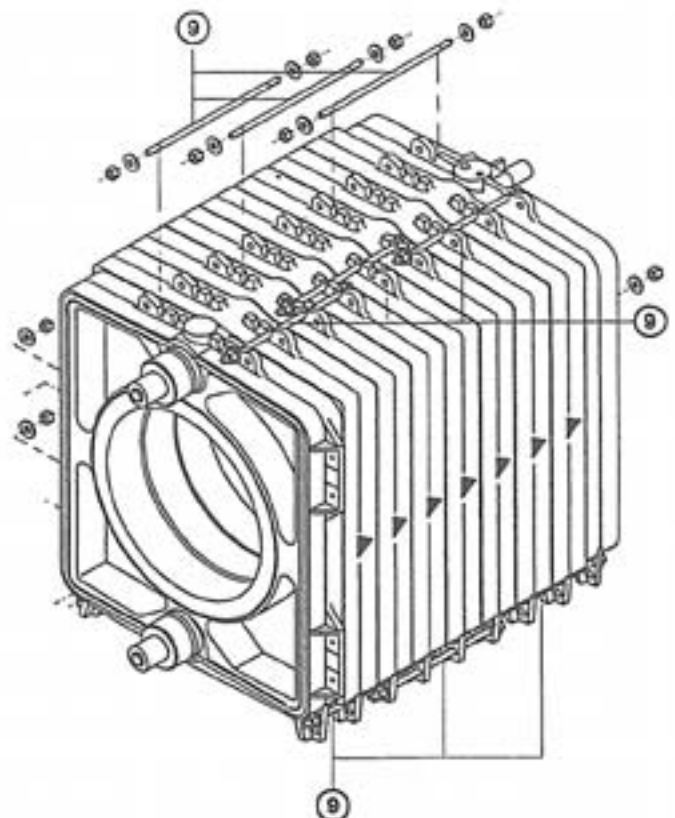


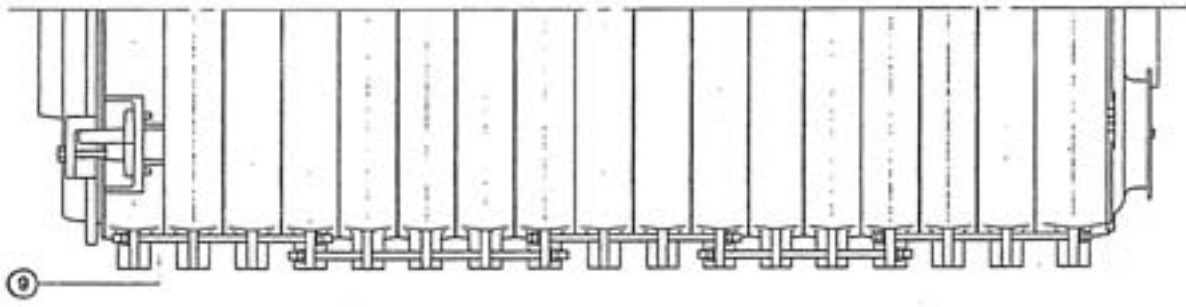
Fig 7.

**Fig 8. Boiler Tie Rods Configuration**

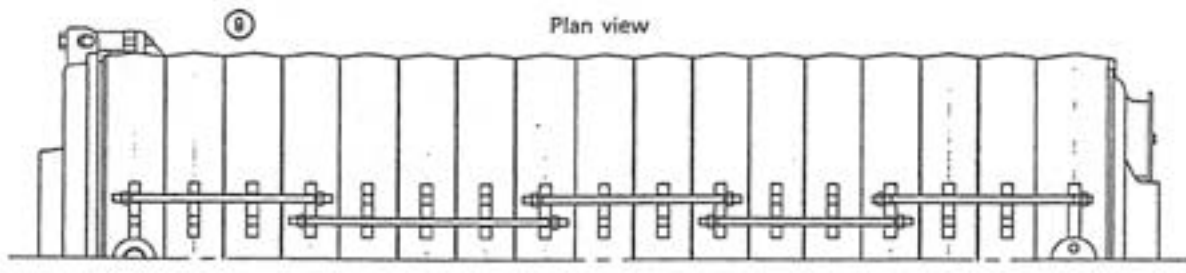
Number of Boiler Sections

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
320		480				480		480										
380		480				480		480										
440		480				510			480									
500		480				510			510									
560		480				480		480			480							
630		480				480		480			610							
700		480				510			510			480						
780		510				610			480			510						
860		480				510			480			480			480			

**Fig 8a. Boiler Side View**



**Fig 8b. Boiler Top View**





### Fitting of the Water Distributor and Drain Off Cock.

1. Push the end piece (10) with the closed end together into the middle piece (11) with the open ends, secure these together with the two No8 self tapping screws provided.

NB. The number and length of the distributor pieces vary according to the size of boiler supplied. Make sure that the pieces are securely fastened together with the self tapping screws provided.

2. Place the gasket (12) on the flanged piece (13). Push this piece into the middle piece (11) and secure these with the No8 self tapping screws provided.

3. Push the water distributor assembly through the bottom hole on the rear section of the boiler, align the four holes on the gasket and the distributor flange with the studs on the section and fit the distributor assembly over these. **Important**, ensure that the holes on the distributor assembly are pointing upwards, as shown in Fig 9. Now fit another gasket over these four studs and fit the return water header and fasten with M16 nuts/washers provided to make a water tight seal. Fit a gasket over the four M16 studs provided around the flow connection. Place the flow header now over these studs, making sure that the 1/2" connection for the thermostat phial pocket is pointing vertically upwards and secure this with M16 nuts and washers provided, tighten to make a water tight seal.

4. Fit the 3/4" nipple (14) provided into the 3/4" tapping on the rear section adjacent to the return connection with a suitable sealing compound, then fit the 3/4" socket and drain cock provided to the nipple.

5. Plug off the holes in the front section with the 2"BSP recessed plugs provided.

6. On models BX320 to BX700 a 350mm to 300mm diameter adapter is fitted to the spigot on the back section. This adapter is fitted by sliding over spigot and using a propriety sealing compound to produce a gas tight seal.

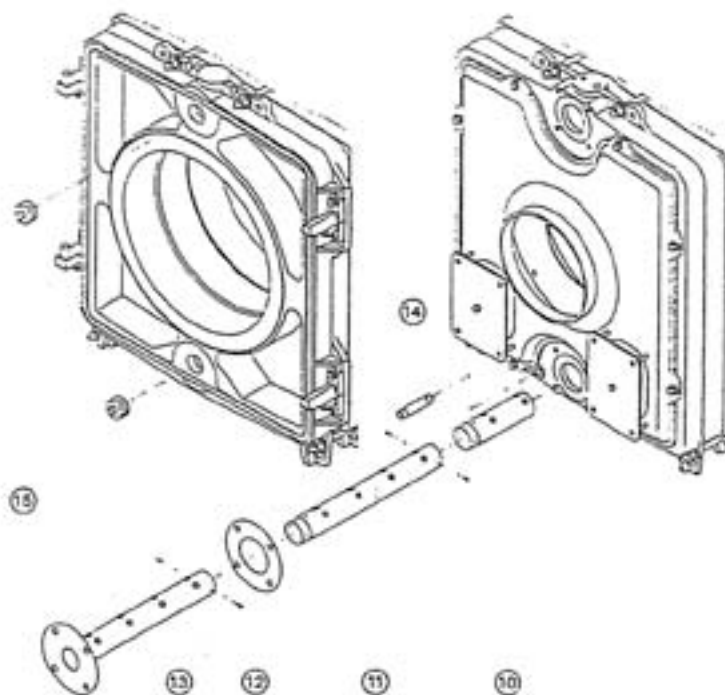


Fig 9.

### Fitting the Flue Gas Turbulators and Boiler Door.

1. For boiler sizes BX320 to BX700 only. Push in the flue gas turbulators (18), 4 off provided into the third pass of the boiler as shown in Fig 10.

2. Mount the boiler door (19) by positioning the slotted lugs on the hinge pins as delivered. The boiler door opens to the right hand side as standard, but this can be changed to the left if specified on order.

3. Secure the door with M20 Hex head bolts to the front section.

4. Fit the sight glass assembly provided, as shown in Fig10.

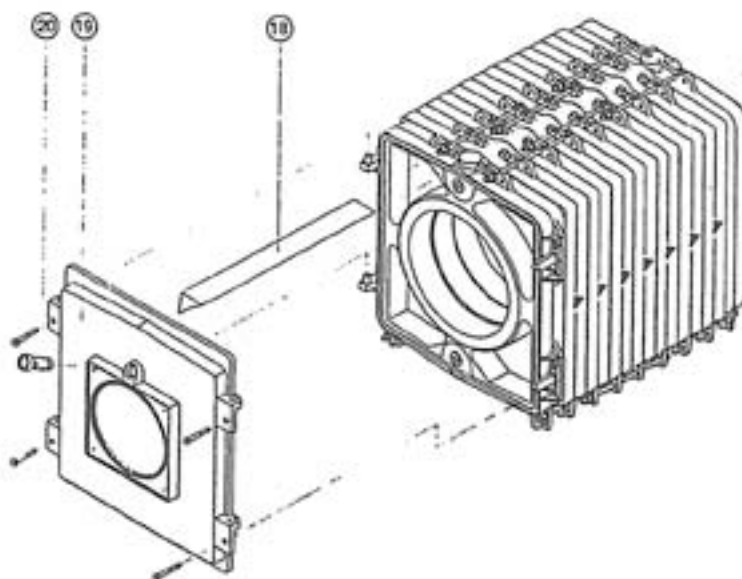


Fig 10.

### Jacket Assembly.

1. Fit the front brackets L.H. (1) and R.H. (2) to the front section with the M12 nuts provided.
2. Fit the rear bracket R.H. (4) and L.H. (3) to the back section flue box with the M12 nuts used on the flue box.
3. Fit the control panel support bracket (5) to the front brackets (1,2) with 4 off M6 screws.
4. Fit the top jacket frame box section (6).  
\* At the front, fit the frame inside the front brackets and secure with M6 nuts/screws.  
\* At the rear, fit the frame on top of the bracket and secure with an M6 screw from underneath into the hank bush fitted within the box section..
5. Fit the bottom jacket frame box section (7) under both front and rear brackets and secure with M6 screws noting that the pins should always be pointing upwards Fig 12.
6. Fitting the side panels - Before proceeding fit the ball studs, 2 per panel with the M5 screws provided. Locate the side panels to the pins on the bottom frame and then lift the panel return over the top frame member. Fix the side panels to the top frame with M6 screws and nuts provided.
7. Insulation: Fit the piece of insulation provided (9) under the control panel support bracket. Then fit the remaining insulation (10) on top of the boiler. Noting that the aluminium face of the insulation must be facing upwards.

#### Note:

(The side insulation pieces are factory pre-fitted to the innerside of the side panels).

8. Control Panel - Fit the control panel (11) to the support bracket with 4 off M6 screws provided. Run the temperature, pressure and thermostat capillaries through the square hole in the control panel support bracket (5) and pass over the top insulation. Remove the temperature and pressure gauge fittings from the capillaries and fit these into the rear section via the tappings provided (if the boiler body has been successfully pressure tested, otherwise refer to 'Pressure Testing the Boiler Body'), using the 3/4" to 1/2" reducer, provided, for the temperature gauge and for the pressure gauge use the 1/2" to 1/4" reducer provided. Refit the pressure gauge sensor and temperature sensor and secure making sure that the white sealing washer is fitted to the pressure sensor prior to reassembly. Remove the thermostat phials from the phial pocket by prising off the securing clip. Fit this phial pocket to the 1/2" connection on the boiler flow header. Replace the thermostat phials in to this pocket and secure with the clip previously removed.
9. Fit front top panel by location onto ball studs of side panels. Fit further two top panels using the same method as described above.
10. Fit the rear panels (14), (these come factory pre-fitted with insulation), to the side and top panel with 8 off No8 self tapping screws provided and then join the two half together, again with No8 self tapping screws.

### Pressure Testing the Boiler Body.

1. To pressure test the boiler body, first fit the 2" BSP recessed plugs ONLY provided to the front section, to seal off the holes used for pulling up. Blank off the flow and return connections of the boiler with the two blank plate flanges provided. Also fit a plug to one of the instrument holes (3/4" BSP or 1/2" BSP) on the top of the back section.
2. Fill the boiler by means of the drain cock until water is seen escaping from the unblanked instrument hole, this means the boiler is now full or alternatively use an auto air vent, refer to Fig 11.
3. Turn off the water supply to the boiler and fit the blanking plug to the open hole, the boiler is now ready for pressure testing.
4. Once pressure testing has been successfully completed using suitable equipment/method depressurise, drain the boiler body, remove plate flanges and remove plugs from instrument hole on rear section and refer to paragraph 8, Jacket Assembly. DO NOT remove the 2" BSP recessed plugs from the front section as the holes used for pulling up the boiler sections are no longer required and should be left sealed off.

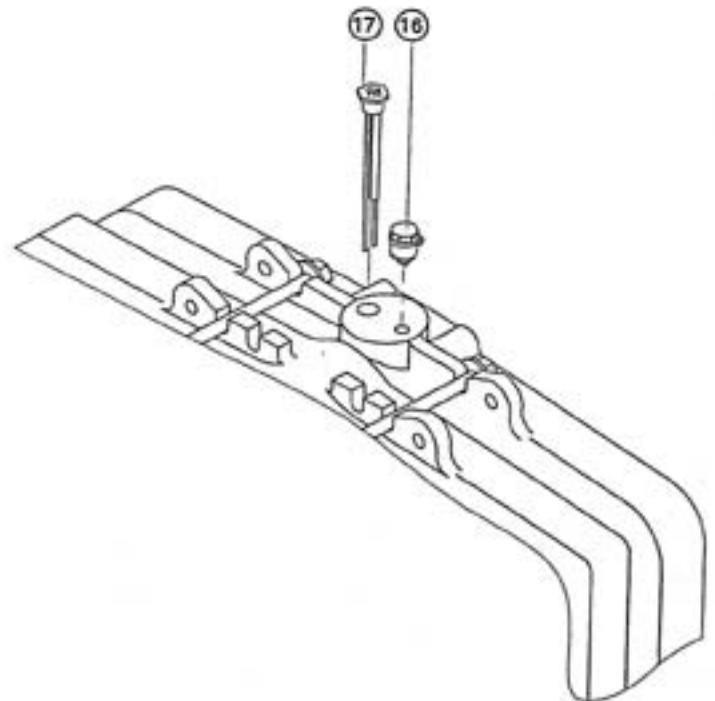
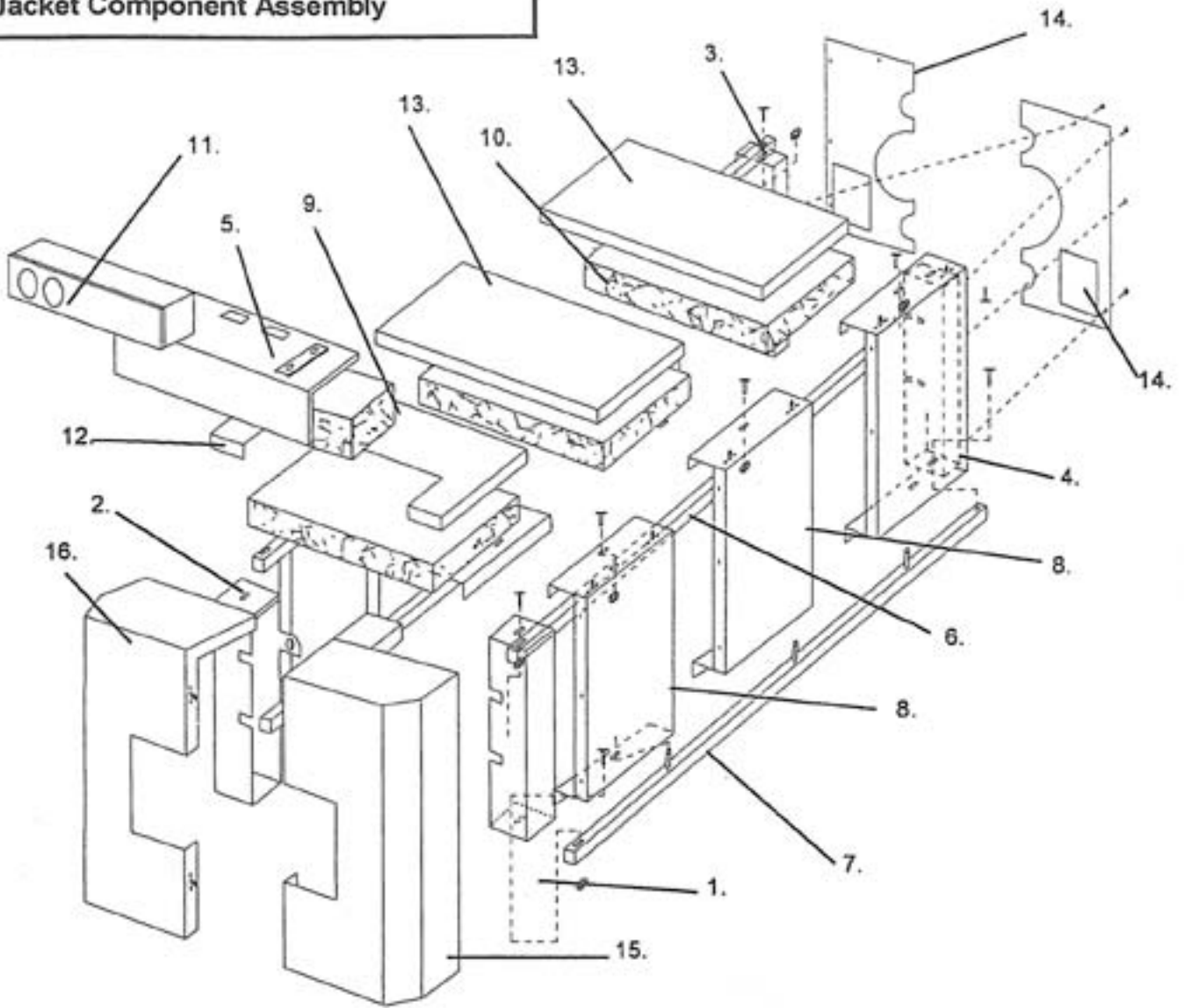


Fig 11.

Jacket Component Assembly



1	FRONT BRACKET RIGHT HAND SIDE
2	FRONT BRACKET LEFT HAND SIDE
3	REAR BRACKET LEFT HAND SIDE
4	REAR BRACKET RIGHT HAND SIDE
5	CONTROL PANEL SUPPORT BRACKET
6	TOP JACKET FRAME BOX SECTION
7	BOTTOM JACKET FRAME BOX SECTION
8	SIDE PANEL
9	CONTROL PANEL SUPPORT INSULATION
10	TOP INSULATION
11	CONTROL PANEL
12	FRONT TOP PANEL
13	TOP PANEL
14	REAR PANEL
15	FRONT PANEL RIGHT HAND SIDE
16	FRONT PANEL LEFT HAND SIDE

## Fitting Flue Pipe

For models 320 to 700 the flue outlet is designed to accept a 300mm diameter nominal bore flue pipe.

For 780 to 860 models the flue outlet is designed to accept 350mm nominal bore flue pipe.

Smaller diameter flue pipe should not be used. On the larger models the actual flue may well be larger than 350mm depending on actual flue runs and the position of bends etc.

## Fitting Pressure Jet Burners

1. To allow for easy maintenance the boilers burner mounting door is hinged and the hinge is normally fitted on the right hand side( looking from the front ) but should be changed on site before fitting the burner if necessary.

2. The burner, and gas train if applicable, should be fitted after the casing to ensure that the route for the fuel supply pipes does not interfere with the casing or boiler front.

3. Fit the burner to the burner mounting plate studs using the burner mounting gasket supplied with the burner.

4. The tip of the burner draught tube should project through the ceramic lining of the boiler door and into the combustion chamber proper by a sufficient distance.

5. On gas fired burners the gas train should be fitted in accordance with the burner manufacturers instructions using a suitable gas jointing compound if necessary and the soundness of the installation should be checked. A union and service gas cock should be fitted by the installer to allow removal of the burner for servicing.

## Electrical Connection

1. The main electrical supply should be taken from a fused isolator having a minimum contact separation between the poles of 3 mm and taken through 20 mm electrical conduit to the live (1), neutral (2) and earth connection in the boiler control panel or burner terminal block as appropriate..

For single phase burners with low run current ( less than 6 Amp ) the power to the burner is supplied from the boiler control panel as shown in Fig 12b. All Nuway and Riello burners supplied by Beeston come under this category.

For single phase burners supplied by others with higher run currents the main power supply should be made into the burner as shown in Fig 12a and wired accordingly.

All three phase burners should be wired in accordance with Fig125b.

The flexible conduit from the boiler control panel should have been routed through the inner front panel and behind the front bracket and through the hole at the bottom, this then shall pass under the front jacket panels to the burner.

The interconnections between the boiler control panel and the burner are simply made by plugging together the 7 and 4 way plugs and sockets.

2. All wire should be suitable for a service temperature of 70°C and a load of 10 Amp and have a minimum cross sectional area of 1.0 mm<sup>2</sup>

All electrical installations should be in accordance with I.E.E Regulations (BS 7671).

## THIS APPLIANCE MUST BE EARTHED

### Electrical Safety Checks

Carry out the following electrical safety checks using a multimeter. (Do not use a PAT Tester on the pressure jet burners control pack as you could damage the electronics and they give false readings).

#### Earth Continuity Check

1. Appliance must be electrically disconnected from the mains.
2. Set the meter to Ohms x1 scale and zero if necessary.
3. Measure resistance between the earth connection point in the boiler control panel and the earth contact point in the supply junction box or the earth pin on the 3 way plug if this is being used.
4. If the resistance is greater than 0.1 Ohm check all earth wires and connections for continuity and that they are clean and tight and rectify as necessary.

#### Short Circuit Check

1. Appliance must be electrically disconnected from the mains and all appliance switches set to "ON" including the thermostats.
2. Set the meter to the Ohms scale x1 and measure the resistance between the live (1) and neutral (2) terminals in the boiler control panel. If the meter reads zero then there is a direct short circuit and a fault that should be rectified.
3. Set the meter to the Ohms x100 scale and measure the resistance between the live terminal (1) and the earth block in the boiler control panel. If the meter reads less than infinity then there is a fault that requires rectifying.



### Polarity Check

Connect the appliance to the mains supply and set the meter to AC volts by 300V scale.

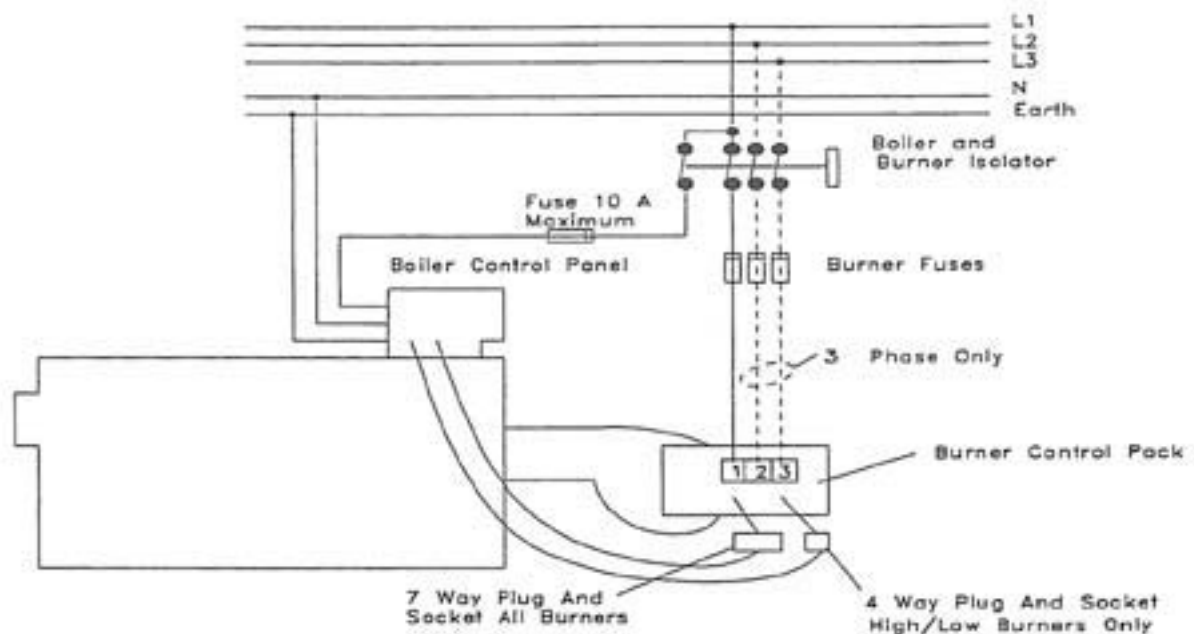
1. Measure the voltage between the live (1) and neutral (2) terminals and check that the voltage measures approximately 230V.
2. Measure the voltage between the live (1) and earth block and check that the voltage measures approximately 230V. When doing this if earth fault detection equipment is installed in the distribution board you may well trip it on some types of multimeter.
3. Measure the voltage between earth and neutral (2) and check that the voltage measures less than 15V.

### Resistance to Earth Check

The appliance must be disconnected from the mains supply and all switches including the thermostats set to "ON".

1. Set the meter to the Ohms x100 scale.
2. Measure the resistance between the live (1) and the earth block. The reading should be infinity and if there is any other reading then there is a fault which should be isolated and rectified.

**Fig 12a. Electrical Installation General: All 3 Phase Burners And 1 Phase With Run Current Above 6 Amp**



**Fig 12b. Electrical Installation General: All 1 Phase Burners With Run Current Below 6 Amp**

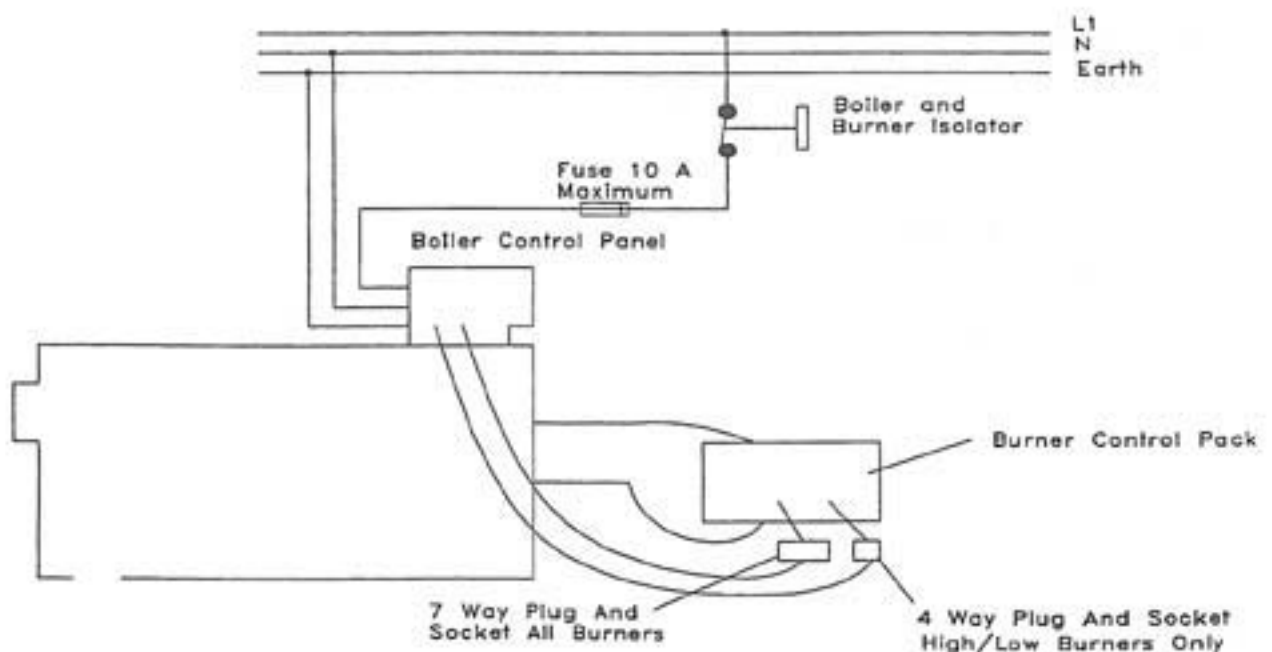


Fig.13 High/Low Control Panel DN 7400C

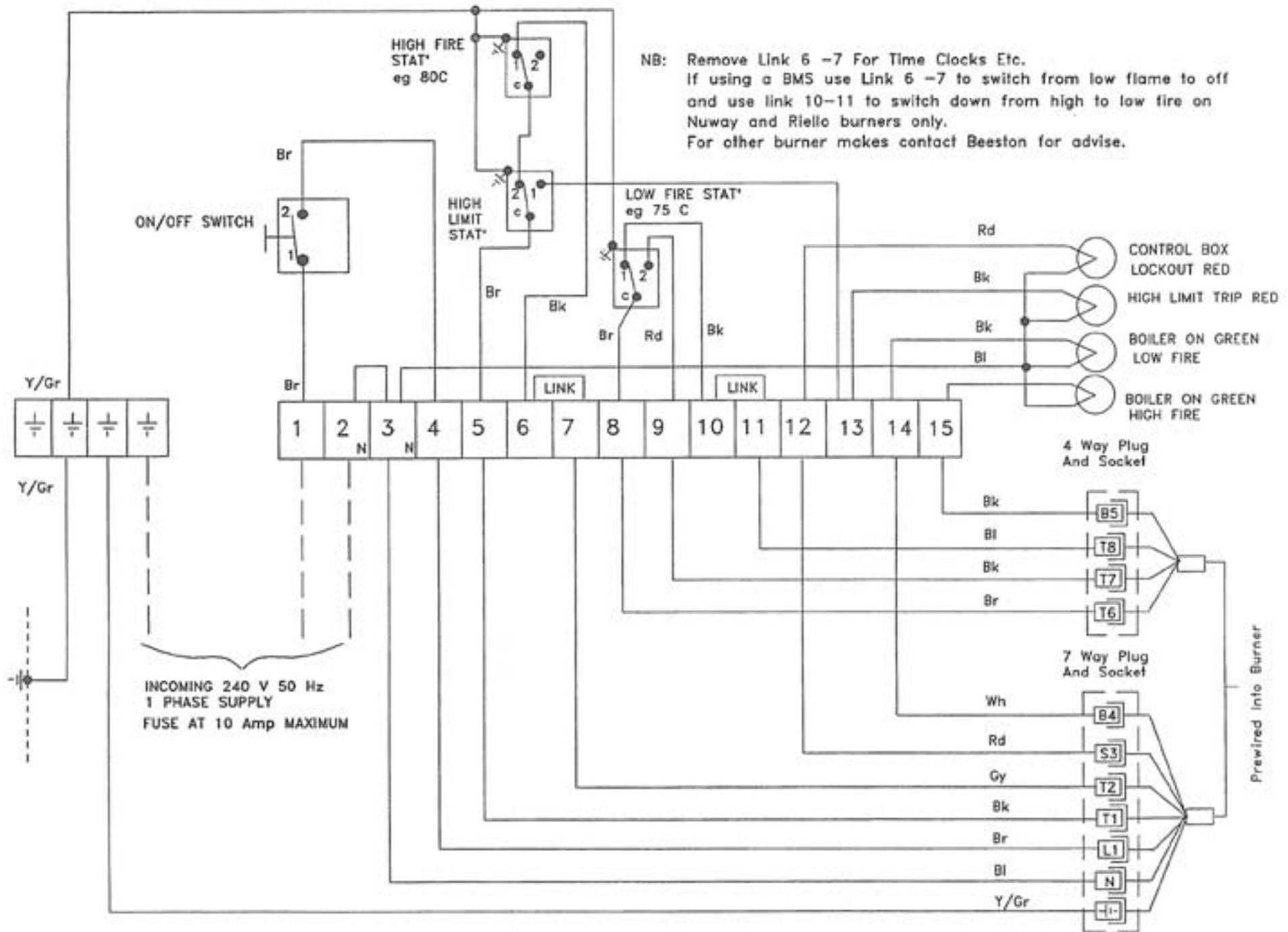


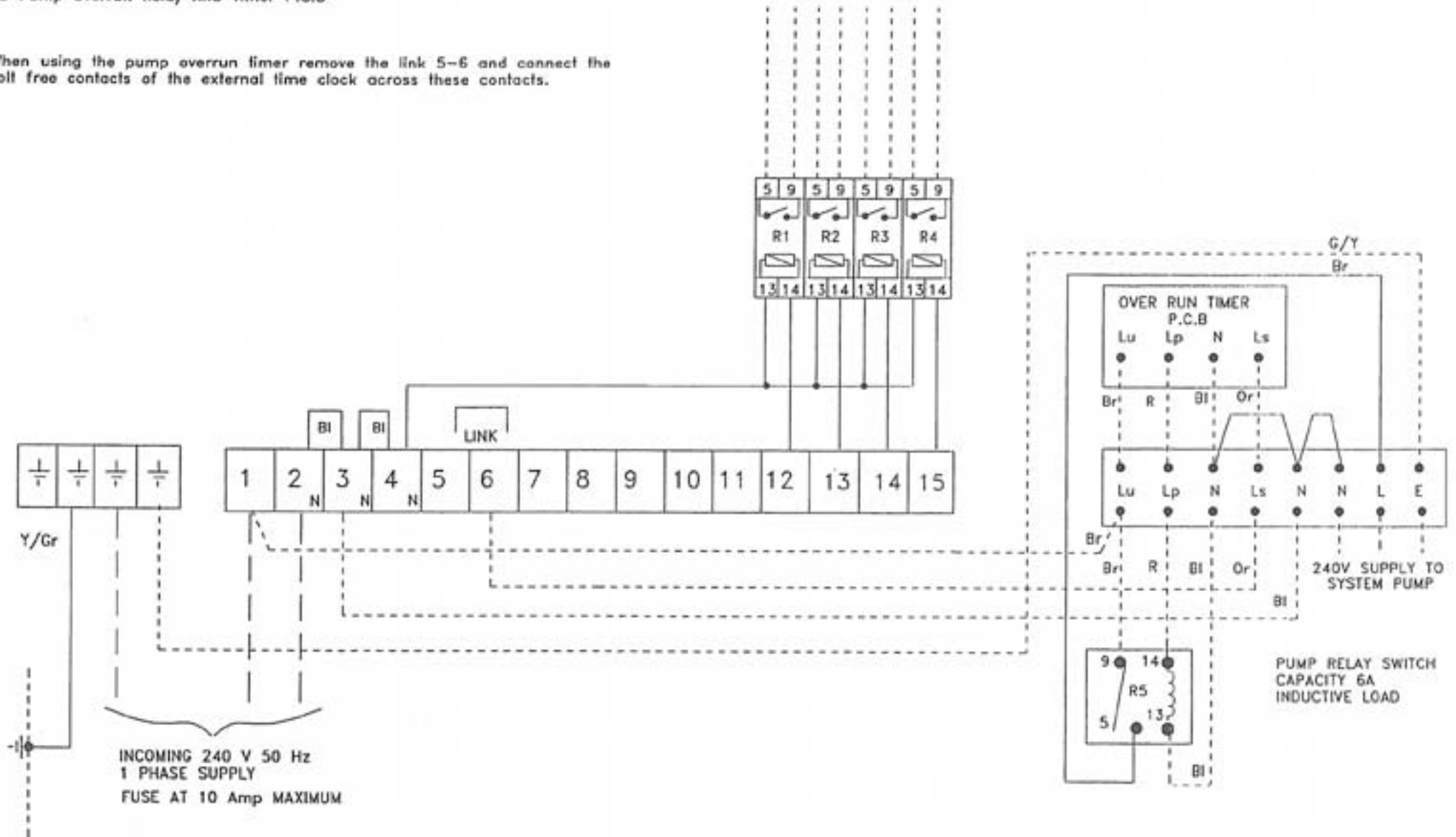


Fig.14 Control Panel Optional Extras DN 7402A

- R1 Burner Control Box Lockout
- R' High Limit Stat' Trip
- R3 Boiler On 1st Stage ( Low or Main )
- R4 Boiler On 2nd Stage ( High Fire )
- R5 Pump Overrun Relay And Timer P.C.B

When using the pump overrun timer remove the link 5-6 and connect the volt free contacts of the external time clock across these contacts.

Volt Free Contacts For Building Energy Management Systems, Alarms Etc.



## Commissioning Boilers

It is the Law that this appliance is installed and serviced only by a competent person e.g. a C.O.R.G.I registered installer or British Gas.

**THIS APPLIANCE MUST BE EARTHED.**

### Electrical:

Before commencing ensure that the electrical supply is turned off and that all electrical connections are correctly made and that the appliance is earthed.

### Gas Supply:

Before commencing check that the gas supply is purged of air and that the gas connections are sound and that the boiler gas cock is off. Ensure that the gas supply is turned on at the meter.

### Oil Supply:

Before commissioning check that oil is available and that the oil supply has been made through an isolating valve and a suitable filter.

### Water:

Before commencing ensure that primary system has been filled and that pumps are operating and that the system pressure is at least 0.2 bar and that any isolating or any other valves on the system are open.

1. Check that the on/off switch on the boiler control panel is off and that the gas or oil service cocks are turned on.
2. Check that the correct oil nozzle is fitted and fit an oil pressure gauge to the oil pump or a manometer to the burner head for gas burners.
3. Commission the burner as described in the Burner Manufacturers Manual. The burner settings given in Tables 7 to 10 are for initial guidance only and a full commissioning must be completed.
4. Switch OFF the electricity and check that the burner closes down.
5. Test for gas soundness around joints as described in BS 6644 and British Gas Publication IM 5. These documents give the correct procedure which is to pressurise the gas pipework system and look for a loss of pressure with a suitable manometer. Soap solution or ultrasonic leak detectors are not suitable to prove that pipework is sound, only to find the point of the leak when a pressure test shows one.
6. The high limit thermostat is typically set to 95°C. Set the left hand HIGH FIRE thermostat to typically 80°C and the right hand LOW FIRE thermostat to typically 75°C and this will bring the burner down from high to low fire when the water temperature reaches 75°C and switch the burner off when the water temperature reaches 80°C. The high limit thermostat should again be typically set to 95°C.

## Maintenance of Boiler

### Safety:

Before servicing the boiler switch off electrical supply and close oil and gas valves.

### Maintenance:

To maintain optimum efficiency the boiler flueways must be cleaned at regular intervals. The period between cleaning will depend on the hours of use, type of fuel and site conditions, but should not be less than once yearly, at the end of the heating season.

The boiler flueways, combustion chamber and chimney system should be kept free from soot and scale. When the boiler is shut down for long periods the front cleaning plate should be removed to allow air to circulate through the boiler.

To avoid the risk of fireside corrosion the minimum return water temperature should be 40°C .

**WARNING:** Before commencing any form of maintenance and cleaning make certain that the electricity supply to the burner is switched off.

### To Clean Boiler

1. Switch off electricity, disconnect 4 and 7 way weiland plugs and sockets. Isolate gas and/or oil supply to burner.
2. Break the gas or oil connection to the burner making sure that the boiler house is well ventilated.
3. Lift off the front panels of the jacket.
4. Loosen the four M16 bolts holding the front combustion chamber door to the front section and remove these and swing open taking care not to strain any leads or cables attached.
5. Loosen and remove the four nuts holding each of the two rear combustion chamber clean out covers and remove these.
6. With a 3" round wire brush, clean horizontally from the front and back, removing all deposits.
7. Thoroughly clean the boiler deposits from the combustion chamber. (This can most conveniently be done with a vacuum cleaner).
8. Check sealing gaskets/rope, and renew where necessary.
9. Refit all platework and the close the boilers burner door making sure that a gas tight seal has been remade.
10. Refit all flueway covers, ensuring that the covers bed down on the gaskets and tighten the nuts.
10. Refit jacket panels.

## Component Replacement

### CAUTION:

Never open the boiler door unless the burner electrical and fuel systems have been isolated.

### Burner and Gas Line

Components should be replaced with reference to the Burner Manufacturers Installation Manual

### Control Panel Component Replacement

Remove the two screws in the sides of the control panel and hinge it open.

#### 1. High or Low Thermostat:

Remove the electrical connections noting their positions. Remove the thermostat bulb from the thermostat pocket (after removing the top jacket panels) and thread it back out through the control panel. Remove the knob and the two screws holding the thermostat body and release it from the control panel facia. Replace as the reverse of the above taking care to replace the spring clip that retains the bulb in the thermostat pocket and to remake the earth connection.

## Spare Parts

### Boiler Functional Spares :-

PART NO:	DESCRIPTION
BXSGA	Sight glass assembly
BXN	Steel nipple
BXFDA	Front door assembly (inc. door insulation)
BXF	Front section
BXB	Back section assembly, complete
BXM	Middle section
1634	Fibreglass rope set 3.
1635	Fibreglass rope set 4.
1636	Fibreglass rope set 5.
1708	Thermostat. Imit TR2 0-90 C 2.5m capillary.
1709	Thermostat. Imit TR2 0-120 C.2.5m capillary.
1710	High limit thermostat. Imit LS1/3.2.5m 90-110 C.
1711	High limit thermostat. Imit LS1/3 .2.5m 100-130 C.
1712	Boiler thermometer 100mm-3m 0-120 C.
1713	Boiler altitude gauge 100mm - 3m.
0835	On/off switch Arco Electric.
LAMPG	Green lamp. Arco Electric.
LAMPR	Red lamp. Arco Electric.
OO72	Websil 3B sealant-black (for F.G. rope fixing)

Replace as the reverse of the above ensuring that the new thermostat is set to the same temperature as the faulty one. Ensure that the earth connection is remade and that the spring clip retains the bulb in the thermostat pocket.

#### 2. High Limit Thermostat:

Remove the electrical connections noting their positions. Remove the thermostat bulb from the thermostat pocket and thread it back through the control panel. Remove the 'HIGH LIMIT' label and remove the two pozidriv countersunk screws. Now remove the stat from inside the panel.

#### 3. Temperature and Pressure Gauge:

Remove jacket top panels and remove the temp sensor from its pocket by loosening the alien grub screw for the temperature gauge and remove the fitting from the self isolating fitting on the boiler for the pressure gauge and thread back out through the control panel. Remove the two brass knurled nuts and retaining brackets from the back of either gauge and push it out through the panel. Replace as the reverse of the above.

#### 4. Main On/Off Switch and Lamp:

Remove the electrical connections, noting their positions, and the back nut on the lamp and push it out through the panel. Replace as the reverse of the above.

#### 5. Pump Overrun Kit

Remove the electrical connections noting where they go and release the circuit board from the 4 push on plastic pillars.

# Bx Boiler Users Guide

## To Shut Down the Boiler

1. Switch off the electricity supply and the on/off switch on the boiler control panel.
2. If switching off for an extended period e.g. holidays turn off the gas or oil supplies at the service and isolating gas or oil cock on the burner.

## Care of the Boiler

1. Do not shut down the boiler if freezing conditions are expected unless a frost protection thermostat has been incorporated in the boiler house control system.
2. Do not obstruct the airvents, grilles or other air openings in the boiler room and ensure a clear path of combustion and ventilation air to the boiler.
3. Do not store objects on or near the boiler or the flue.
4. Do not use propellant sprays or chemicals particularly chlorine based chemicals in the vicinity of the boiler.
5. The boiler should be serviced once a year by a C.O.R.G.I registered engineer.
6. If at any time a gas leak is suspected DO NOT use a naked flame to locate the leak or turn on or off any electrical switches.
7. Turn off the gas supply to the boiler at the gas meter and contact the Local Gas Region Office immediately.
8. The number is in the phone book under GAS, write the number here....

GAS TELEPHONE No:

## To Light the Boiler

1. Turn OFF the on/off switch on the boiler control panel.
2. Check that the gas cock or the oil isolating valve is on.
3. Switch on the electricity supply, time clocks etc. and the on/off switch on the boiler control panel. The green lamp in the on/off switch should light .
4. Turn the Control Thermostat on the control panel to  
LOW FIRE thermostat to 75°C. The LOW FIRE thermostat will switch the boiler down from high into low fire at 75°C and the HIGH FIRE thermostat will switch the boiler off at 80°C.
5. The burner should now light.

## Boiler Fails to Light

If the High Limit Thermostat has tripped then the burner will not attempt to start. The red High Limit Thermostat Trip Lamp on the boiler control panel will be ON and the thermostat can be reset by removing the black plastic dust cap on the side of the control panel and pressing the small button beneath it.

2. If the burner itself has detected an internal fault it will Lock Out and will not attempt to light. The red Burner Lockout Lamp on the boiler control panel will be ON and this Lock Out can be reset by pressing the reset button on the burner control pack which may be glowing red.

3. If the burner starts and runs and then locks out check that there is fuel reaching the burner.

If you still cannot light the boiler contact your installer.



**HEALTH AND SAFETY INFORMATION**

**CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH**

For the type of material and where used in Beeston Heating products refer to the chart opposite.

Specific data sheets are available on request from Beeston Heating for those materials but the following Material Handling and First Aid procedures should in all cases be observed.

**PAINTS SEALANTS AND HEATING FUEL OIL.**

These materials contain organic solvents and should be used in a well ventilated area away from naked flames.

Do not allow to come into contact with the skin, eyes, inhale or swallow.

Use barrier cream or gloves to protect the skin and goggles to protect the eyes from accidental contact.

Small quantities can be removed from clothes or skin with a proprietary paint remover or hand cleaning product.

If inhaled remove sufferer into fresh air, if swallowed clean mouth with and drink fresh water but do not induce vomiting.

If in the eye irrigate the eye with clean water and seek medical attention.

**SHARP EDGES**

Care should be taken when handling sheet metal panels that do not have safety or folded edges.

**LIFTING OF CAST IRON SECTIONS AND BUILDING OF BOILERS**

Care should be taken when lifting cast iron sections as they can weigh up to a few hundred kilograms and

Beeston Heating can confirm the weight of each individual section if required. When building the boiler the section should always be built on a level base capable of supporting the full weight of the boiler and the sections should always be supported on blocks of wood or props when positioning before final bolting up. An unsupported section should never be left unattended.

**NATURAL GAS**

By law only a competent qualified person e.g. C.O.R.G.I. registered and A.C.O.P.S. certified can install, commission or service this gas appliance.

**THERMAL INSULATION**

Avoid contact with skin, eyes or inhaling dust.

If cutting insulation then do so in a well ventilated area using gloves to protect the hands, goggles to protect the eyes and a disposable dust mask.

If a skin reaction or eye irritation is experienced then discontinue working with the material and seek medical advice.

**CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH**

PAINTS	
General purpose black undercoat Johnsons Paints.	n/a
High temperature black Guard Coatings HT Black Primer	1 Flue hood 2 Burner plate 3 Burner Assembly
Green and Grey jackets Trimoco Paints.	1 All jacket parts. 2 Control panel

INSULATION AND SEALS	
Rockwool foil faced slabs	1 Boiler body 2 Burner Door
Fibre glass rope and tape	1 Burner Door 2 Section Joints
Ceramic Fibre Board	1 Burner Door
C.F.C Free Polyurethane spray on foam.	n/a
Refractory Brick	n/a
Asbestos products	Not Used

SEALENTS	
Nipple jointing compound. Haw k Red	n/a
Websil 38 silicone sealant.	1 Inter section joints.
Rust inhibitor Rocol Rustshield.	1 Boiler nipples 2 Machined ports
Fire Cement In cartridges Pankit of Fortafix.	n/a
Water Jointing Compound P.T.F.E Tape / Boss White / Hemp	Cast iron plugs Gauges/pockets Drain cocks
Gas Jointing Compound Plasticol PX10	n/a



## Our Promise

### Customers will find that:

- They get value for money
- They can communicate with us easily
- We are reliable and do what we say we will do
- Our products are reliable and do what we claim for them
- We deliver the right product on time, every time
- We aim to have zero defects in our products, services, systems, information and advice
- It is easy to be our customer

Quality for Beeston means that we aim to meet and exceed our customers' expectations of both product and service all the time, every time and in every way - at a competitive price.

Beeston Heating maintain a policy of continuous research and development, and reserve the right to alter specifications when necessary.

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● HEATING ● STORING ● MOVING ● CONTROLLING WATER ●