

ECONOFLAME R2000
OPERATING AND MAINTENANCE
INSTRUCTIONS

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GENERAL DESCRIPTION

1. GENERAL DESCRIPTION

The Econoflame R-2000 series boilers are atmospheric open flued, low thermal capacity gas fired boilers.

These high efficiency boilers are designed to provide heating and hot water services for a wide variety of industrial and commercial premises.

R-2000 series boilers are tested and certified to BS 5978: parts 1 & 2 by British Gas plc for use on natural gas and open vented systems up to 4.5 bar working pressure.

The boilers can also be used with sealed systems as detailed in this manual.

The R-2000 series boilers have a range of heat outputs from 63kW (215,000 BTU/hr) to 400 kW (1,365,000 BTU/hr) and are available in the following models:

2017, 2022, 2028, 2034, 2041, 2048, 2056, 2077, 2090, 2105 and 2122.

The last three digits of the model number indicate the number of burner bars in the burner assembly.

All boilers have full sequence automatic control with over-heat cut off, differential pressure operated water flow switch, modulating turn down on gas and combustion air, for improved efficiency at varying heat loads, and fault indicators.

Temperature regulation can be either:

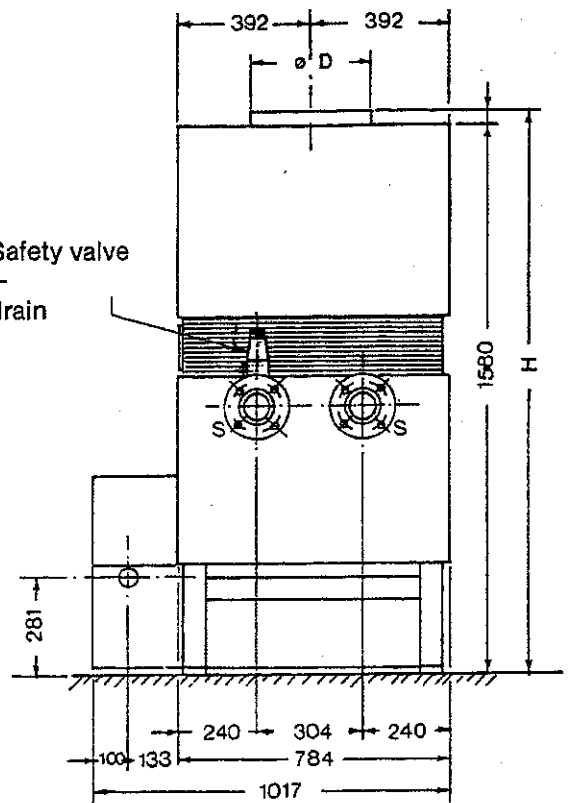
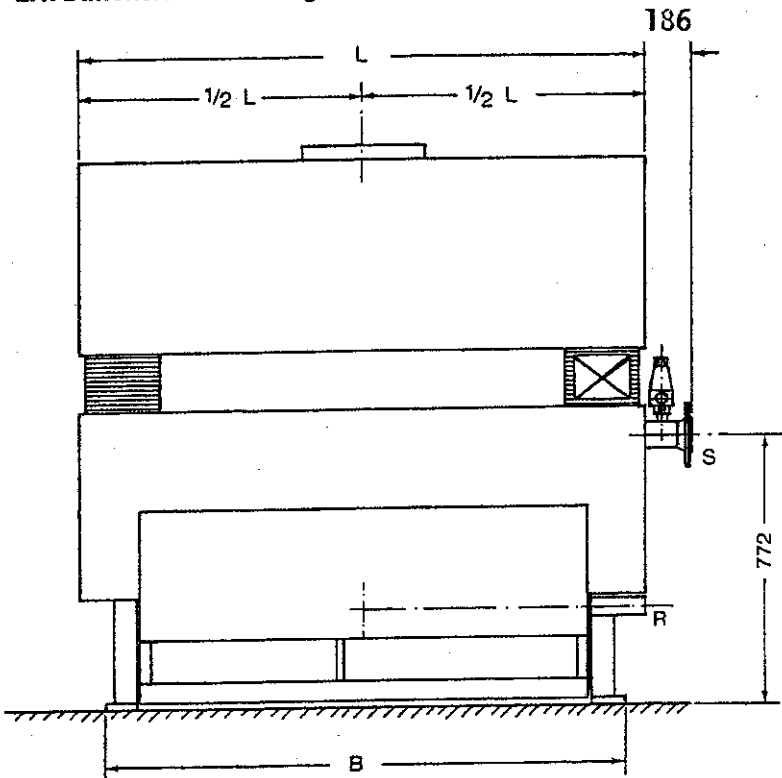
1. Type ET thermostatic 3 step regulation with constant flow temperature
- or
2. Type EM electronically modulating regulation with a constant flow temperature.

The boilers have a low water content, high efficiency copper finned tubing double pass heat exchanger and have an insulated combustion chamber to reduce radiation losses. Upon receipt of any boiler it is important to check for any external damage and report this to the carrier and Stokvis Energy Division immediately. Ensure that the number of packages received is correct.

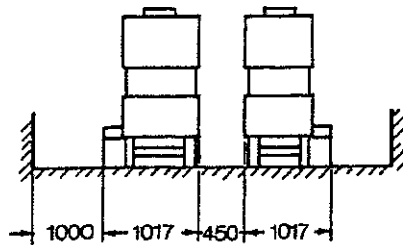
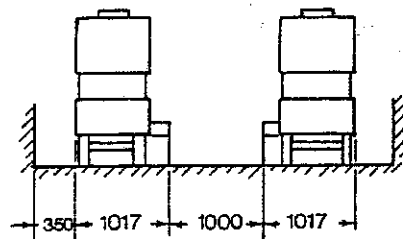
TECHNICAL DATA

2. TECHNICAL DATA

2.1. Dimensions and weights



Safety valve:
 Type 17- 56 1 1/4"
 Type 66-105 1 1/4"
 Type 122 1 1/4"



Top and side clearances are 600 mm MINIMUM.

STANDARD					ALTERNATIVE				
Model	L	ϕD	B	R	K	H	Weight (kg)	S	
17	820	200	704	3/4"	32	1612	195	R2"	
22	898	225	783		32	1612	210		
28	994	250	879		32	1612	225		
34	1090	250	974		32	1612	240		
41	1200	300	1085	1"	32	1612	260		
48	1312	300	1196		32	1612	280		
56	1438	350	1323		32	1612	305		
66	1598	350	1482	1 1/2"	32	1612	330	BS4504 PTI TABLE IG/2 DN65 PN 16	
77	1772	400	1657		52	1632	365		
90	1978	400	1883		52	1632	400		
105	2216	450	2201		72	1652	440		
122	2486	450	2371		72	1652	490		

2.2. Data table

Model	Max heat input		Max heat output		Max gas consumption natural gas		Main burner pressure mbar		Pilot burner pressure mbar	Water capacity	
	kW	BTU/hr x 1000	kW	BTU/hr x 1000	m ³ /h	ft ³ /h	max	min		litres	gals
2017	79	270	63	215	7.4	261				5.6	1.2
2022	102	348	81	277	9.5	337				5.9	1.3
2028	130	444	104	355	12.2	430	10.4	0.9	3.5	6.2	1.4
2034	155	529	124	423	14.5	512				6.5	1.4
2041	188	642	150	512	17.6	621				6.9	1.5
2048	221	755	177	604	20.7	731				7.3	1.6
2056	260	888	208	710	24.3	859				7.7	1.7
2066	293	1001	234	799	27.4	969	9.5			8.3	1.8
2077	340	1161	272	929	31.8	1123				8.9	2.0
2090	368	1258	294	1005	34.4	1217		0.8	3.0	9.6	2.1
2105	430	1467	344	1175	40.2	1420	8.5			10.5	2.3
2122	500	1706	400	1365	46.8	1651				11.4	2.5

Table 1

Maximum operating pressure - 10.6 bar (350 ft w.g.)

Minimum operating pressure - 0.7 bar (23 ft w.g.)

Main burner injectore - 1.8 mm dia

Main burner flame detection current (max rate). At least 5 microamps (µA)

Number of injectors = number of burner bars = last three digits of model number (ie 2105 is 105)

Electrical supply fuse rating - 5A

NB. British Gas certification is limited to 4.5 bar with a maximum safety valve rating of 5.2 bar.

2.3. View of the Econoflame 2000 series

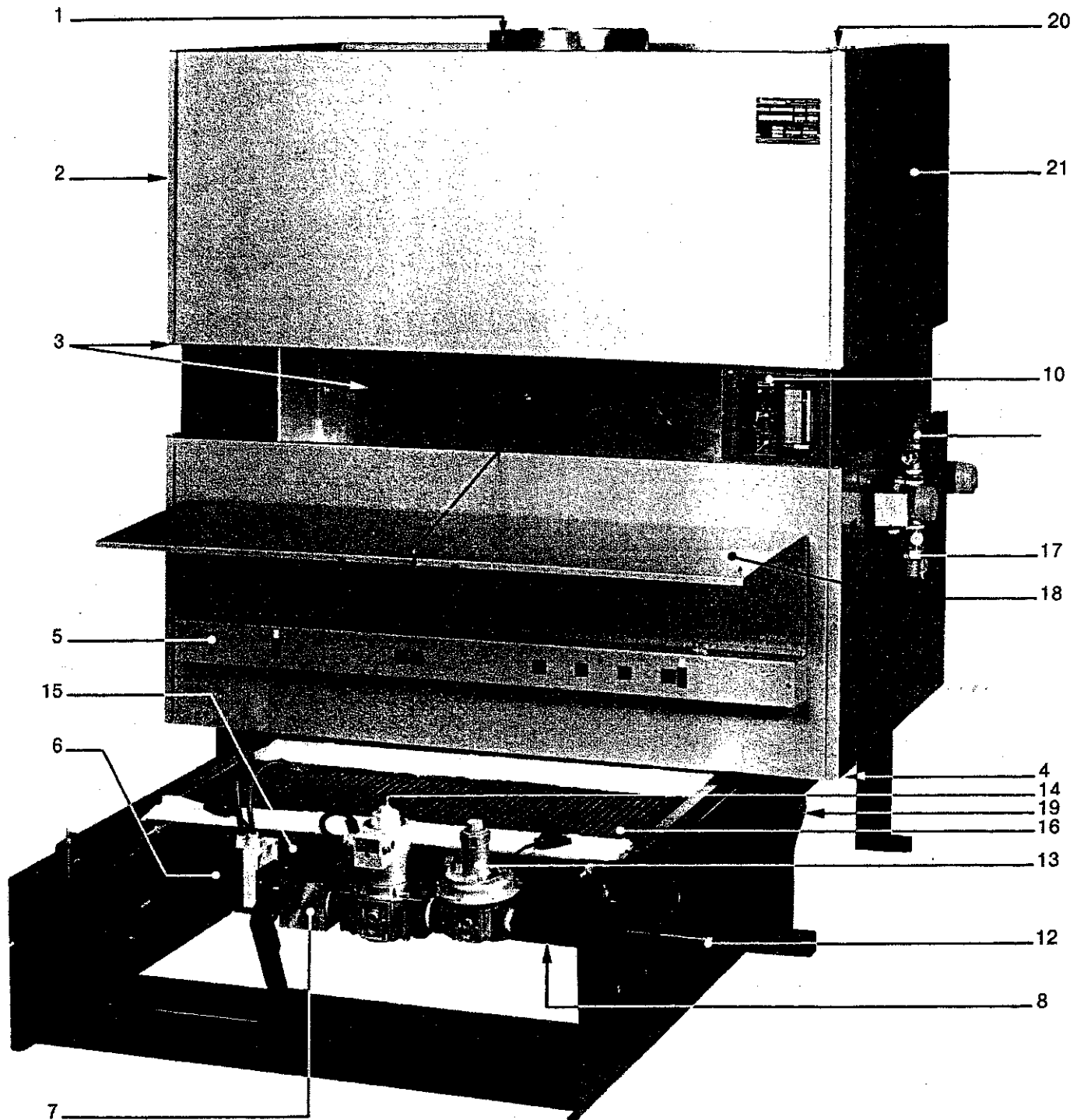


Fig. 1

- 1. Flue outlet socket
- 2. Draught diverter
- 3. Air supply opening of the draught diverter
- 4. Pilot viewing port (rh)
- 5. Connector conduit box
- 6. Servomotor (air damper/gas input)
- 7. Gas modulating valve
- 8. Air damper
- 9. Water connection
- 10. Instrumentation panel
- 12. Gas connection

- 13. Main burner gas governor
- 14. Main gas valves
- 15. Main burner pressure test point
- 16. Burner Bars
- 17. Filling and drain valve
- 18. Hinged gas train cover
- 19. Quick clamp (securing burner trolley) - not visible
- 20. Cable clamps
- 21. Inspection panel (Electrical wiring & controls)
- 22. Air damper adjustment screw
- 23. Burner trolley

2.4. Layout of data badge (Fitted to front of boiler)


		ECONOFLAME		Natural Gas		CAT. 1N	
TYPE		CODE		SER NO		YEAR	
②		③		④		19 ⑤	
	Input	Burner press.	Gas rate	Output			
Max.	⑥ kW Btu/h × 1000	⑦ mbar ins.wg	⑧ m ³ /h ft ³ /h	⑨ kW Btu/h × 1000			
Min.	⑩ kW Btu/h × 1000	⑪ mbar ins.wg	⑫ m ³ /h ft ³ /h	⑬ kW Btu/h × 1000			
Hydraulic test pressure		10 bar	Tested on: ⑭				
Burner injector size		⑮ mm	inch				
Max. working head		⑯ 6.6 bar	220 feet				
Max. flow temperature		⑰ 85°C					
240 V ~ 50 Hz ⑱		British Gas Tested					
Fuse rating 5 A		G.C.No.		⑲			
RENDAMAX BV-KERKRADE-THE NETHERLANDS ⑲							
STOKVIS ⑲							
R.S. STOKVIS & SONS LIMITED							
POOL ROAD EAST MOLESEY SURREY KT8 OHN							
TEL: 01-941-1212 TELEX: 917116 STOKVS G							

Fig. 2

- 1a. Manufacturer name
- 1b. UK distributor
2. Type - identification of the boiler indicates number of burner bars fitted (ie 2066 - 66 burner bars)
3. Code - for electrical and gasline schematics
4. Serial number - prefixed by country reference
5. Year of production
6. Input max - heat input gross value in kW
7. Main burner pressure - based on max heat input
8. Gas consumption - based on max heat input
9. Output max - heat output gross value in kW
10. Input min - heat input gross value in kW
11. Main burner pressure min - based on min heat input
12. Gas consumption - based on min heat input
13. Output min - heat output
14. Hydraulic test pressure of the heat exchanger, test date
15. Burner injection diameter size in mm
16. Max operating pressure (waterside) open vented systems
17. Max flow temperature for open vented systems
18. Electrical rating
19. British Gas plc, G.C. number

STATUTORY REQUIREMENTS

3. STATUTORY REQUIREMENTS

Notwithstanding their scope these appliances must be installed in accordance with the relevant provisions of the Gas Safety (Installation and Use) Regulations 1984. Due account should also be taken of any obligations arising from the Health and Safety at Work etc Act 1974.

It is the law that all gas appliances are installed by competent persons, failure to install appliances correctly could lead to prosecution. It is in your own interest and that of safety to ensure that the law is complied with.

The installation must be carried out in accordance with:
The requirements of these Installation Instructions
National and Local Building Regulations
IEE Regulations
Requirements of the local gas undertaking
Insurance company regulations
Local fire authority regulations
Model water byelaws

and the following documents:

BS6644

Installation of gas fired hot water boilers 60 kW-2 mW

CP342 Part 2

Centralised hot water supply (building other than individual dwellings)

CP310

Water supply.

CP341.300-307

Central heating by low pressure hot water

IM/11

British Gas publication, Flues for commercial and industrial gas installations.

For pipe installations up to R1 (1" BSP):

BS6891

Installation of low pressure gas pipework

For larger pipe installations the following British Gas publications:

IM/2

Purging procedures of non domestic gas installations

IM/5

Soundness testing procedures for industrial and commercial gas installations

IM/16

Guidance notes on the installation of gas pipework boosters and compressors in customers premises 25 mm (non domestic).

These boilers are tested and certified to BS 5978: Part 1 and 2 by British Gas plc for use on natural gas and open vented systems up to 4.5 bar working pressure.

In case of queries contact R.S. Stokvis Energy Division 01-941-1212.

INSTALLATION

4. INSTALLATION

4.1. Delivery

Normally the boilers are delivered completely assembled wired, tested and mounted on a pallet with a protective cover. After removing the cover check for any damage to the boiler. The boiler can be moved using a pallet truck, fork lift or by slinging at the points provided at the base of the pallet.

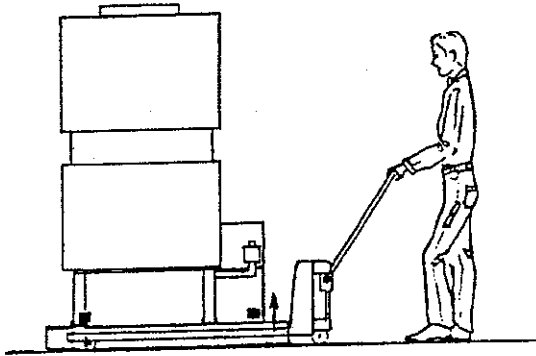


Fig. 3

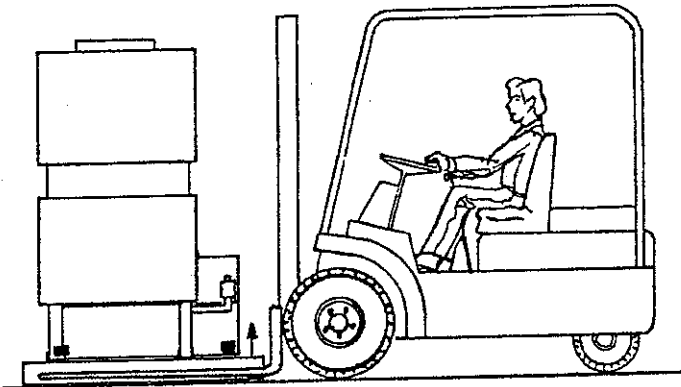


Fig. 4

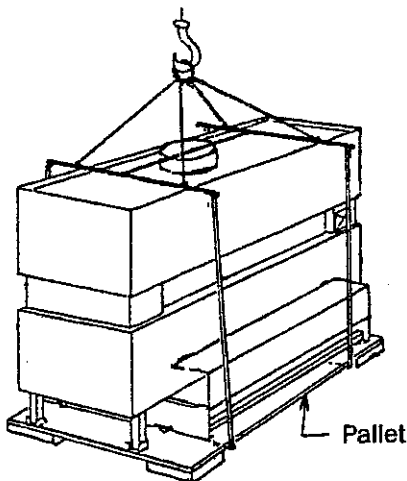


Fig. 5

Position the boiler as close to its final position as possible and remove the burner trolley by releasing the clips at the side of the boiler at the bottom and pulling the trolley out. (It is necessary to first hinge up the gas train cover which is

secured to its bottom front edge by two screws and remove all the plug in connections from the conduit box.) (Lift the boiler to remove the pallet and position. Check the burner trolley components before replacing the trolley (see figs. 6, 8, 9 and 10).

4.2. Siting

The location chosen for the boiler must permit the provision of a satisfactory flue system and air circulation around the boiler, see section 2.1. for dimensions, page 2. The boiler must be installed on a level non-combustible surface capable of supporting its weight and any necessary equipment. If the boiler is to be installed on a raised plinth, the plinth must carry forward by at least 1100 mm in front of the boiler to allow removal of the burner trolley. It is important that the boiler is sited so that extraneous material cannot be stored next to it. Further details regarding boiler siting, boiler rooms and bases are given in BS 6644.

4.3. Air supply and ventilation

It is important that there is an adequate supply of air for combustion, dilution of combustion products and ventilation of the boilerhouse.

4.3.1. Natural ventilation

Where natural ventilation is required, permanent openings at low and high level, communicating directly with the outside air, shall be provided. The openings shall be fitted with grilles of negligible resistance and shall be sited so that they cannot be easily blocked or flooded. The grilles shall have a total minimum free area as follows, taking account of all fuel burning appliances.

Low level inlet

540 sq.cm plus 4,5 sq.cm per kilowatt in excess of 60 kW total rated input.

High level outlet

270 sq.cm plus 2.25 sq.cm per kilowatt in excess of 60 kW total rated input.

4.3.2. Mechanical ventilation

The supply of air by mechanical means shall be by mechanical inlet with natural or mechanical extractions, mechanical extract with natural inlet must not be used. The minimum flow rates with mechanical ventilation are as follows: Inlet Air (Combustion ventilation) - 1.1 cubic metres per second per 1000 kW total rated heat input. Extract air (Ventilation) - 0.45 cubic metres per second per 1000 kW total rated heat input. Further details regarding air supply are given in BS 6644.

4.4. Flues

The boiler has its own integral draught diverter and does not require any other draught diverter in the flue. The flue socket at the top of the boiler is sized for the direct attachment of single wall metal flue pipe. Optional adaptors can be obtained for twin wall metal pipe and BS 835 type flue pipe.

It is recommended that the boiler be connected to its own individual open flue systems, although some open flue systems can be used for multiple installations of the same type of boiler.

Recommendations for flueing are given in BS 6644 and IM/11, see section 3 page 6 and these should be adhered to. The following notes are given for information:

The flue should be constructed of non combustible materials and should not be affected by heat, the corrosive effects of condensation and the products of combustion. The flue should be no nearer than 50 mm to any combustible material except when passing through a roof, floor, ceiling or wall where it must not be enclosed in a sleeve of non combustible material and separated from the sleeve by an air space of not less than 25 mm.

The flue should terminate in a freely exposed position and must be so situated as to prevent the products of combustion entering a building.

Provision should be made for disconnecting the flue from the boiler for maintenance purposes eg split flue socket. IM/11 gives details for sizing flues.

4.5. Gas supply

The gas inlet at the bottom front RHS of the appliance terminates with a union connection. The gas service cock (not supplied with the boiler) must be fitted as close as possible to the gas inlet and be easily accessible for operation.

Appliances are factory set for natural gas to the maximum settings as given in section 2.2, data table. The inlet gas supply must be positioned so it will not interfere with access for removing the burner trolley or for gaining access to the control panel at the right hand side of the boiler.

Where there is an existing gas meter the gas supply undertaking shall be consulted to ensure that the supply capacity is adequate.

IM/16 must be consulted if it is necessary to employ a gas pressure booster and the local gas undertaking must be informed.

4.6. Electrical supply

The boilers require a 240 V 50 Hz single phase electrical supply and must be earthed. The supply to each boiler must be protected by a 5A fuse and include an accessible two pole isolator having a contact separation of at least 3 mm on all poles.

It is important to observe correct polarity of the supply to avoid problems with the flame detection circuit.

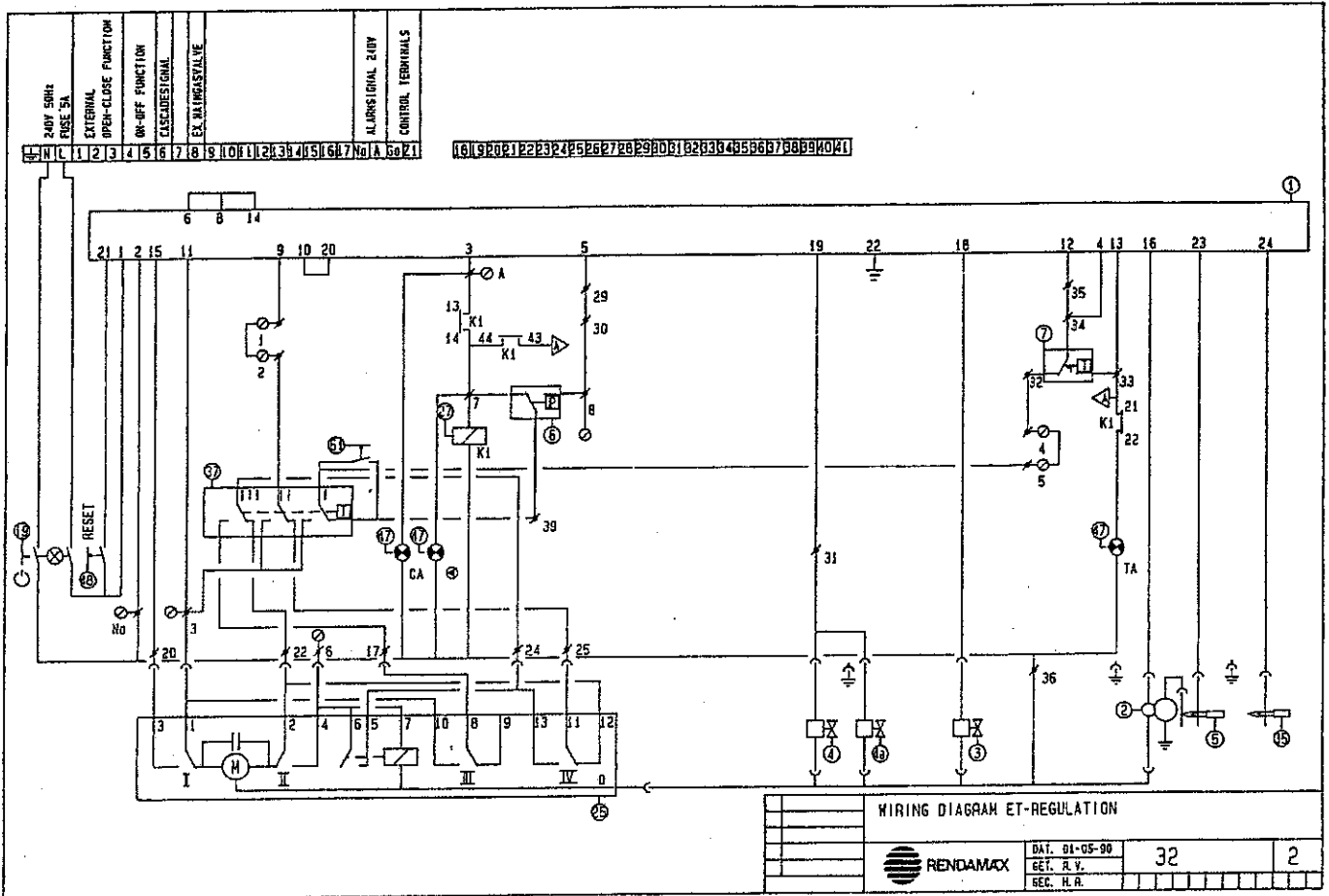
Any electrical work carried out during installation of the appliance shall be in accordance with the IEE regulations.

The electrical connections are within the right hand upper control panel which is accessed by removing the screw at the bottom of the cover and then lifting the cover to remove. The connection is 0.75 sq.mm three core heat resistant cable is made via the cable gland on the right hand side of the boiler top panel.

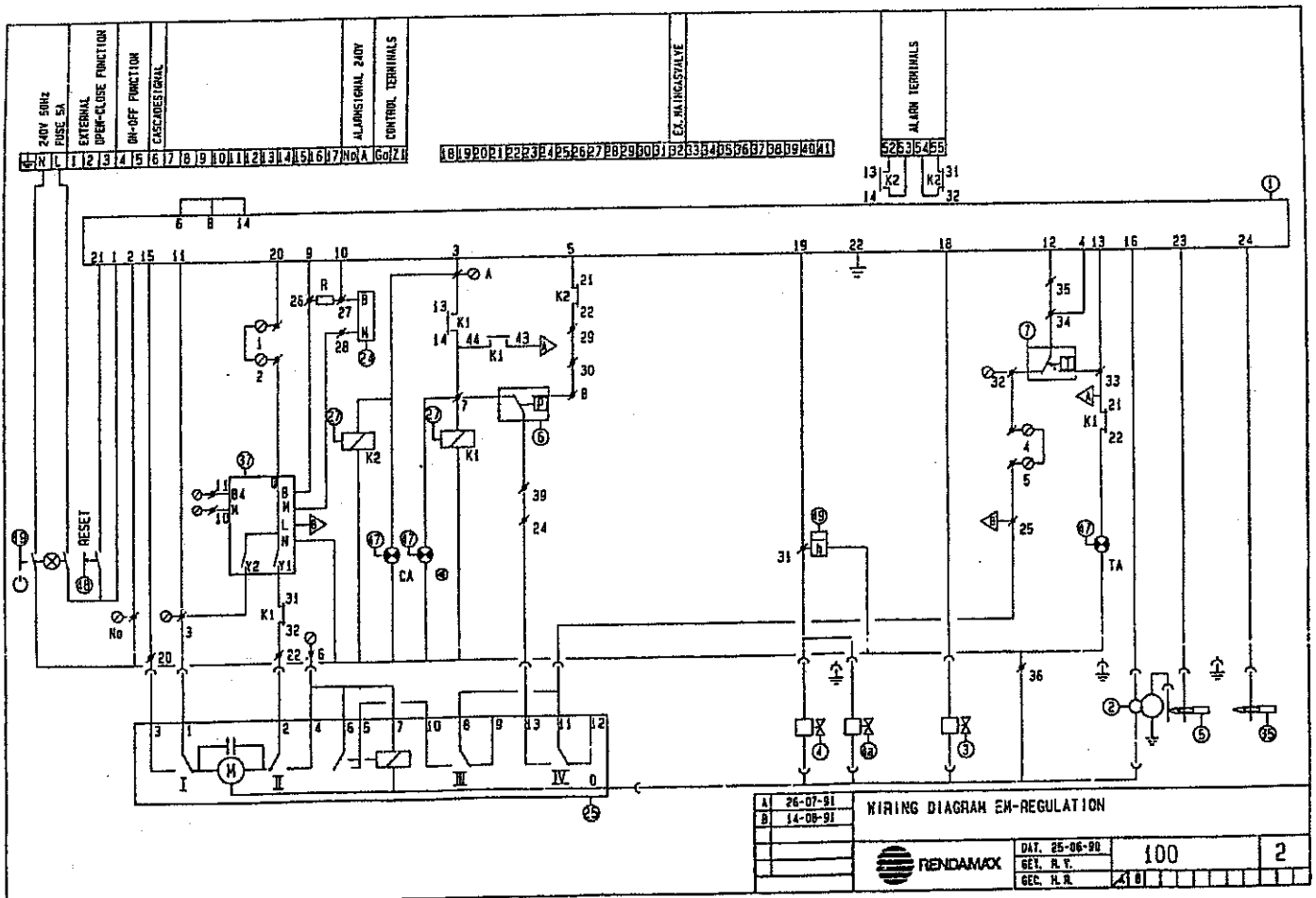
The live, neutral and earth connections, are made to the terminal block at the top left of the control box, see wiring diagram and Fig. 5, ensure that cord anchorage is secure and current carrying conductors become taut before the earth conductor.

It is essential that an overrun switch is re-wired into the pump(s) electrical supply to allow them to operate for at least 5 minutes after the burners have turned off.

4.7. Wiring diagram ET regulation



4.8. Wiring diagram EM regulation



4.9. Electrical partlist ET regulation

PARTLIST
32-2

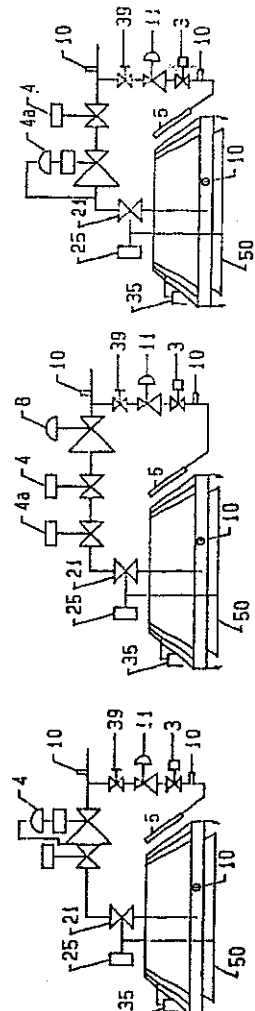
PST	MAG_NR	NAAM_EN	LEVER	TYPE	AA
1	RBA004	FLAME SAFEGUARD	L&G	LFL 1.148	1
2	ETH010	IGNITION TRANSFORMER	L&G	TQGL1A27	1
3		PILOT FLAME VALVE			1
4		MAIN GAS VALVE			1
4a		PILOT FLAME	RENDAMAX		1
5		DIFF. PRESSURE SWITCH			1
6		HIGH LIMIT THERMOSTAT			1
7		POWER SWITCH	MARQUARDT	1855	1
19	ELS020	SERVOMOTOR	L&G	SON41.94LA2700	1
25	RMS001	AUXILIARY RELAYS	SPRECHER&SCHUH	CS4-222	1
27	ERH001	SECOND IONISATION	RENDAMAX		1
35		TEMPERATURE CONTROL UNIT	JUMO	EMF133	1
37	RTR052	FAILURE INDICATION LAMP	MARQUARDT	1807	1
47	ELL011	FAILURE INDICATION LAMP	MARQUARDT	1807	1
47	ELL011	FAILURE INDICATION LAMP	MARQUARDT	1807	1
47	ELH011	FAILURE INDICATION LAMP	MARQUARDT	1807	1
48	ELS011	RESET BUTTON	MARQUARDT	1803	1
51	ELS011	BUTTON	MARQUARDT	1803	1

PARTLIST	32-2	Dat. 01-05-90	Get. RV
		Tek.no. 32-2	Get. HR

4.10. Gastrain partlist ET regulation

PARTLIST
32-02G

PST	MAG_NR	NAAM_EN	LEVER	TYPE	TYPE
3	RKS020	PILOT FLAME VALVE	DUNGS	MV502	17-122
4	RKS200	MAIN GAS VALVE	ALBION	F1"/S/VR-GM(A2) /V1(A2)/F1"END	17-22
4	RKS100	MAIN GAS VALVE	KROMSCH.	VG25R02ND31	28-34
4a	RKS101	MAIN GAS VALVE	KROMSCH.	VG25R02ND31	28-34
4	RKS101	MAIN GAS VALVE	KROMSCH.	VG40/32	41-77
4a	RKS101	MAIN GAS VALVE	KROMSCH.	VG40/32	41-77
4	RKS001	MAIN GAS VALVE	DUNGS	MVD210/5	28-34
4	RKS002	MAIN GAS VALVE	DUNGS	MVD210/5	28-34
4a	RKS002	MAIN GAS VALVE	DUNGS	MVD215/5	41-77
4	RKM001	MAIN GAS VALVE	DUNGS	MVD215/5	41-77
4	RKM001	MOTOR	L&G	VG610.14020	90-122
4a	RKM001	MOTOR	L&G	SKP10.110B27	90-122
6	RSV001	DIFF. PRESSURE SWITCH	L&G	VG610.14020	90-122
6	RSV002	DIFF. PRESSURE SWITCH	L&G	SKP20.110B27	90-122
7	RFR005	HIGH LIMIT THERMOSTAT	HUBA	630.99004	17-41
8	RDG050	PRESSURE REGULATOR	L&G	630.99005	48-122
8	RDG051	PRESSURE REGULATOR	KROMSCH.	RAK674371	17-122
8	RDG100	PRESSURE REGULATOR	KROMSCH.	GBF25R02	28-48
8	RDG101	PRESSURE REGULATOR	DUNGS	FRS210/1	56-77
11	RDG200	PRESSURE REGULATOR	DUNGS	FRS215/1	56-77
21		BUTTERFLY MOD. VALVE	JEAVONS	60DJ6	17-122
21		BUTTERFLY MOD. VALVE	RENDAMAX	D18	17-28
21		BUTTERFLY MOD. VALVE	RENDAMAX	D22	34-48
21		BUTTERFLY MOD. VALVE	RENDAMAX	D28	56-77
39	RAK010	MANUAL GAS VALVE	RENDAMAX	D38,5	90-122
50		AIRDAMPER	RENDAMAX		17-122



Type: 17-22	Type: 28-77	Type: 90-122
PARTLIST	32-02G	Dat. 01-05-90
		Tek.no. 32-2
		Get. RV
		Get. HR

4.11. Electrical partlist EM regulation

PARTLIST
100-2

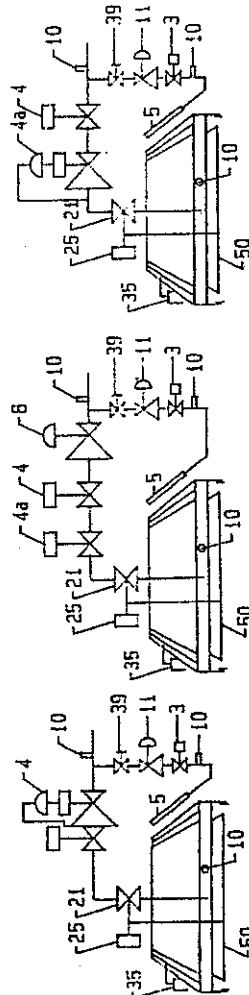
PST	MAG_NR	NAAM_EN	LEVER	TYPE	AA
1	RBA004	FLAME SAFEGUARD	L&G	LFL 1.148	1
2	ETH010	IGNITION TRANSFORMER	L&G	TQGL1A27	1
3		PILOT FLAME VALVE			1
4		MAIN GAS VALVE			1
4a		MAIN GAS VALVE	RENDAMAX		1
5		PILOT FLAME			1
6		DIFF. PRESSURE SWITCH			1
7		HIGH LIMIT THERMOSTAT			1
19	ELS020	POWER SWITCH	MARQUARDT	1855	1
24	RTV002	TEMPERATURE SENSOR	L&G	QAD21	1
25	RMS001	SERVOMOTOR	L&G	SN41.941A2700	1
27	ERH001	AUXILIARY RELAYS	SPRECHER&SCHUH	CS4-22Z	1
35		SECOND IONISATION	RENDAMAX		1
37	RRW005	TEMPERATURE CONTROL UNIT	L&G	RWF32	1
47	ELL011	FAILURE INDICATION LAMP	MARQUARDT	1807	1
47	ELL011	FAILURE INDICATION LAMP	MARQUARDT	1807	1
47	ELL011	FAILURE INDICATION LAMP	MARQUARDT	1807	1
48	ELS011	RESET BUTTON	MARQUARDT	1803	1
49	RUB001	HOUR RUN METER			1

PARTLIST	100-2	Dat. 25-06-90	Get. RV
		Tek.no. 100-2	Get. HR
RENDAMAX			

4.12. Gastrain partlist EM regulation

PARTLIST
100-02G

PST	MAG_NR	NAAM_EN	LEVER	TYPE	TYPE
3	RKS020	PILOT FLAME VALVE	DUNGS	MV502	17-122
4	RKS200	MAIN GAS VALVE	ALBION	FI"/S/VR-GM(A2) /V1(A2)/F1VEND	17-22
4	RKS100	MAIN GAS VALVE	KROMSCH.	VG25R02ND31	28-34
4a	RKS100	MAIN GAS VALVE	KROMSCH.	VG25R02ND31	28-34
4	RKS101	MAIN GAS VALVE	KROMSCH.	VG40/32	41-77
4a	RKS101	MAIN GAS VALVE	KROMSCH.	VG40/32	41-77
4	RKS001	MAIN GAS VALVE	DUNGS	MVD210/5	28-34
4a	RKS001	MAIN GAS VALVE	DUNGS	MVD210/5	28-34
4	RKS002	MAIN GAS VALVE	DUNGS	MVD215/5	41-77
4a	RKS002	MAIN GAS VALVE	DUNGS	MVD215/5	41-77
4	RKH001	MAIN GAS VALVE	L&G	VGS10.14020	90-122
4a	RKH001	MOTOR	L&G	SKP10.110B27	90-122
4a	RKH001	MAIN GAS VALVE	L&G	VGP10.14020	90-122
6	RMK010	MOTOR	L&G	SKP20.110B27	90-122
6	RSV002	DIFF. PRESSURE SWITCH	HUBA	630.99004	17-41
6	RSV002	DIFF. PRESSURE SWITCH	HUBA	630.99005	48-122
7	KTR005	HIGH LIMIT THERMOSTAT	L&G	RAK674371	17-122
8	RDG050	PRESSURE REGULATOR	KROMSCH.	GBP25R02	28-48
8	RDG051	PRESSURE REGULATOR	KROMSCH.	GBP40R02	56-77
8	RDG100	PRESSURE REGULATOR	DUNGS	FRS210/1	28-48
8	RDG101	PRESSURE REGULATOR	DUNGS	FRS215/1	56-77
11	RDG200	PRESSURE REGULATOR	JEAVONS	60DJ6	17-122
21		BUTTERFLY MOD. VALVE	RENDAMAX	D18	17-28
21		BUTTERFLY MOD. VALVE	RENDAMAX	D22	34-48
21		BUTTERFLY MOD. VALVE	RENDAMAX	D28	56-77
21		BUTTERFLY MOD. VALVE	RENDAMAX	D38,5	90-122
39	RAK010	MANUAL GAS VALVE			17-122
50		AIRDAMPER	RENDAMAX		17-122



Type: 17-22	Type: 28-77	Type: 90-122
PARTLIST		
100-02G		
RENDAMAX		
Dat. 25-06-90	Get. RV	
Tek.no. 100-2	Get. HR	

4.13. Water system

In view of the small bore of the copper heat exchanger tubes, and what they are parallel-banked, a filter should be specified to be fixed in the return pipework preferably of a design which prevents particles above a given size and removes magnetite by magnetic means.

Recommendations for the water circulation system are given in BS 6644, CP341,300-307 and CP 342 Part 2. The following notes are of particular importance to these boilers. A drain tap is fitted to the water header at the connection end of the boiler to drain the contents of the boiler.

Isolation valves need to be fitted to allow disconnection of the boiler from the water circulation system. The water connections are normally on the right hand side of the boiler but can be supplied on the left hand side by special order. Secondary mixing valves should be of the slow closing type to prevent unstable boiler operation.

The boiler is suitable for a maximum operating pressure of 10.6 bar (350 ft wg) although certification by British Gas is limited to 4.5 bar.

It is important that pumps are fitted in the return to the boiler and that if the boiler is at the highest point in the system the flow and return connections are taken upwards from the boiler before descending to ensure the heat exchanger is filled with water.

An overrun is required to ensure that the pumps continue for at least 5 minutes after the boiler has switched off.

Frost protection should be employed if there is a likelihood of the boiler being out of service for some time or the heat exchanger should be drained.

It is important that the heating system incorporates a bypass to prevent overheating of the heat exchanger and to give the minimum water flow rate. Minimum flow rates and maximum flow rates are shown in the diagram which indicates water flow rates against pressure loss in the heat exchanger.

Water treatment and suitable filtration is recommended for these boilers and advice should be obtained from a reputable source. For multiple installation, BS 6644 should be referred to for connection and mountings.

Table - Flow rate VS pressure drop across boiler

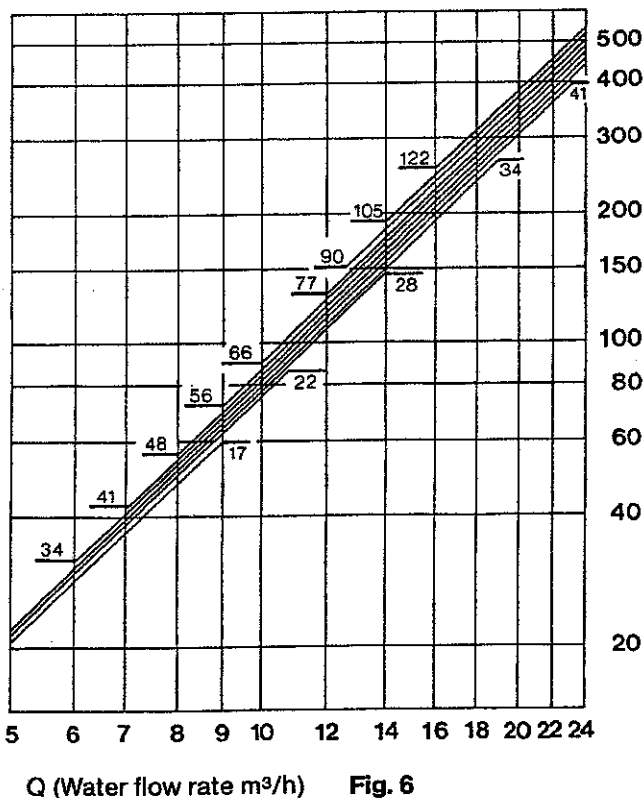
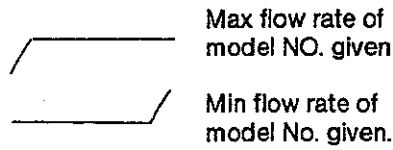


Fig. 6

Minimum boiler operating pressure : - 0.7 bar.

Maximum operating temperature (open vent) : -85.deg. C.



Flow rate range versus pressure drop				
Type	Minimum		Maximum	
	Waterflow rate in ³ /h	Pressure drop meter W.G.	Waterflow rate in m ³ /h	Pressure drop meter W.G.
2017	5	0,22	9	0,60
2022	5	0,24	11	0,88
2028	5	0,26	14	1,45
2034	6	0,36	19	2,70
2041	7	0,44	23	4,00
2048	8	0,58	24	4,40
2056	9	0,66	24	4,60
2066	10	0,92	24	4,80
2077	12	1,35	24	4,90
2090	13	1,50	24	5,00
2105	14	1,90	24	5,20
2122	16	2,70	24	5,40

Table 2

Typical heating installation

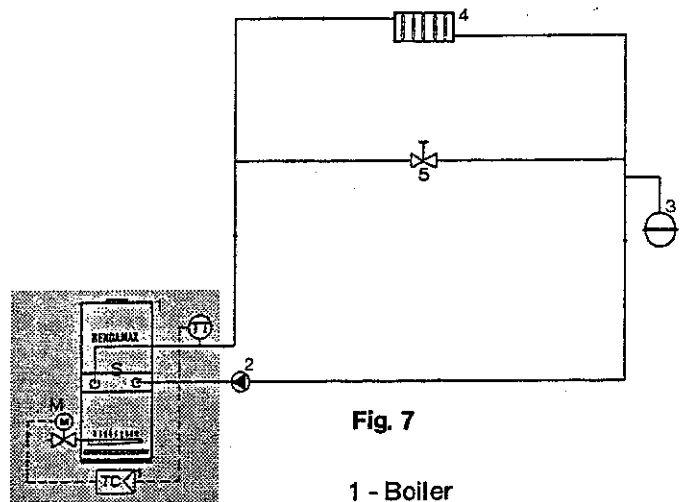


Fig. 7

- 1 - Boiler
- 2 - Pump
- 3 - Expansion vessel
- 4 - Radiator
- 5 Isolating valve
- T - Temp. sensor
- TC - Temp. controller
- M - Modulating Servo Motor

NB Integral water flow switch "S" will send boiler to lock out if water flow is too low.

R.S. Stokvis & Sons Ltd should be contacted for advice on the many kinds of installation designs that can be incorporated.

BY PASS SIZE	BOILER MODEL
1"	20 17 - 2022
1½"	2028 - 2041
2"	2041 - 2090
2½"	2105 - 2122

The return water temperature should not be allowed to fall below 40 Deg C in order to avoid the risk of condensation.

4.14. Open vent and cold feed

An open vent pipe must be fitted in open systems not more than one meter along the flow pipe and must rise continuously by the shortest route to the venting point without valving and with frost protection where necessary. BS 6644 gives details concerning vent pipes and cold feed pipes.

Vent pipes and cold feed pipes should be sized as follows.

Rated output (kW)	Open vent	Cold feed
Below 60	25 mm (1")	19 mm (¾)
60 - 150	32 mm (1¼")	25 mm (1")
150 - 300	38 mm (1½")	32 mm (1¼")
300 - 600	50 mm (2")	38 mm (1½")
Above 600	63 mm (2½")	50 mm (2")

Table 3

See data table section 2.2 for individual boiler outputs.

4.15. Safety valve

Safety valves must be selected and fitted in accordance with BS 6644 and be fitted to the R 1¼ inch connection, located between the flow and return connections.

Safety valve setting (bar) = 0.7 bar + operating pressure (bar) sizes should be:

2017 - 2056	32 mm (1¼") on all
2066 - 2105	models
2122	

The maximum rating of the safety valve is 5.2 bar for British Gas plc certification and in no case shall be more than 10.6 bar.

4.16. Sealed systems

BS 6644 details various automatic controls that all required with sealed systems and further information and guidance is given in Guidance Note PM5 automatically controlled steam and hot water boilers published by the Health and Safety executive.

Normal set pressure would be 1,5 bar for sealed system.

COMMISSIONING

5. COMMISSIONING

5.1. Pre-lighting checks and dry run

The following is a list of appliance checks to be carried out.

5.1.1. With the boiler gas inlet service cock closed and electricity supply switched off

- i) Ascertain from the gas supplier or the customer that the meter installation is operational.
- ii) Ensure that the gas installation pipework up to and including the gas inlet service cock has been tested for soundness in accordance with IM/5 or BS 6891 as appropriate.
- iii) Ensure that the gas installation pipework up to the gas inlet service cock has been purged in accordance with IM/2 or BS 6891 as appropriate.
- iv) Check that all electrical supplies are isolated.
- v) Check electrical earth continuity between the boiler gas pipework and the mains supply.
- vi) Check the electrical components are of the correct voltage range, particularly low voltage ancillary controls.
- vii) Check the pump motor current and adjust the starter overload settings.
- viii) Fill and vent the water system and check for leaks.

5.1.2. With the boiler gas inlet service cock closed, electrical supply switched on but on/off switch on boiler control panel switched off

- i) Check that the direction of rotation of the pump(s) is correct.
- ii) Check the operation of the water flow pressure differential switch in the control box as the pumps are turned on and off.

Components within the control box

(Cover panel removed by removing screw at top of panel and lifting panel off locating pegs).

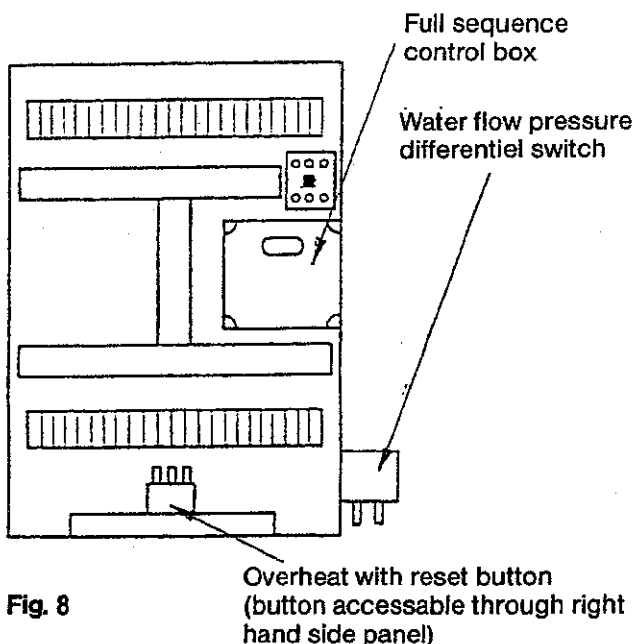


Fig. 8

- iii) Check the setting of the modulating combustion air damper situated underneath the burners, there should be a gap of 4 mm with the damper in the fully closed position against the stops.

Burner trolley assembly

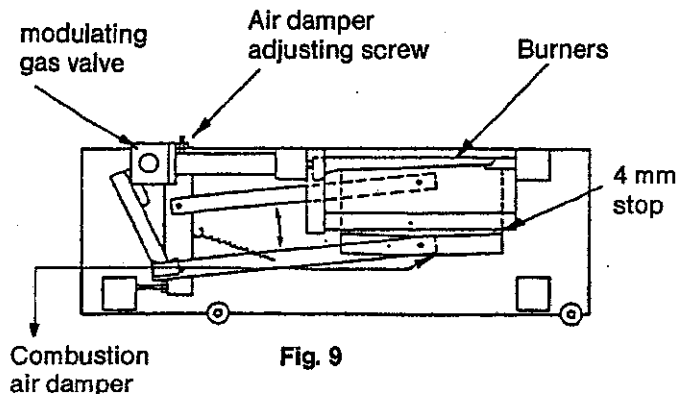


Fig. 9

- iv) Check the operation and interlocking of any air inlet and extract fans.
- v) Check the correct connection and operation of any external controls
- vi) With the control thermostat on a high setting turn on the on/off switch at the boiler control panel, check that the combustion air inlet damper cycles open and then closes, that there is a spark at the ignition electrode, that the pilot safety shut off valve is heard to open and that the boiler goes to lock out approximately 5 secs later as there is no gas.

5.1.3. With the electricity supply switched off check the gas train downstream of the gas inlet service cock as follows:

Refer to Block Diagrams, page 34 for particular boiler model.

1. Ensure that Gas Inlet Cock and Pilot Manual Cock are turned off.
2. Unseal and connect a pressure gauge to Test Point 1 and unseal Test Point 2.
3. Open and then close the Gas Inlet Cock to pressurise up to the 1st safety shut off valve and the pilot manual cock.
4. Allow 1 min. for temperature stabilisation and then check for any loss of pressure during the next 2 mins.
5. If there is a pressure loss the pipework upstream of the 1st safety shut off valve should be checked with a suitable leak detection fluid with the gas inlet cock open.
6. If no leak is found, this indicates that the 1st safety shut off valve is letting by and should be replaced (whole multi block on models 2017 and 2022).
7. With test points 1 and 2 unsealed connect them together with a short piece of flexible tubing which incorporates a tee connection to the pressure gauge.
8. Open and close the gas inlet cock to pressurise up to the 2nd safety shut off valve.
9. Allow 1 min. for temperature stabilisation and then check for any loss of pressure at the gauge during the next 2 mins.

10. If there is a pressure loss the pipework between the 1st and 2nd safety shut off valves should be checked with a suitable Safety shut off valves should be checked with a suitable leak detection fluid with the gas inlet cock open. (Not applicable to models 2017 and 2022).
11. If no leak is found this indicates that the 2nd safety shut off valve is letting by and should be replaced (whole multi block on models 2017 and 2022).
12. Seal test point 2, replace pressure gauge on unsealed test point 1 and open pilot manual cock.
13. Open and close the gas inlet cock to pressurise up to the pilot safety shut off valve.
14. Allow 1 minute for temperature stabilisation and then check for any loss of pressure at the gauge during the next 2 minutes.
15. If there is a pressure loss the pipework upstream of the pilot safety shut off valve should be checked with a suitable leak detection fluid with the gas inlet cock open.
16. If no leak is found this indicates that the pilot safety shut off valve is letting by and should be replaced.

5.2. Live run check

- a Disconnect the electrical connections to the 1st and 2nd safety shut off valves by removing the plug in connections on the connector conduit box. Open the gas inlet cock and pilot manual cock and with the control thermostat on a high setting turn on the electrical supply and the on/off switch on the front control panel. Check that the combustion air inlet damper cycles to the fully open position and back before ignition of the pilot burner commences. Using the viewing port at the lower right hand side of the boiler check that the ignition electrode ignites the pilot burner and that the pilot burner is stable in operation. Check that the boiler goes to lockout approximately 5 secs later and that the pilot burner is extinguished. (It may be necessary to purge the ignition system if there is air in the gas supply; although seven minutes must be allowed between each attempt to ensure that any gas has been dispersed from the combustion chamber).

Press reset button to override boiler lockout.
- b Carry out (a) above but turn off the pilot manual cock once the pilot burner has ignited. Check that the boiler proceeds to lock out.
- c Connect a pressure gauge to pressure test point 3 (see block diagrams page 34) and carry out (a) above. Check that pilot burner pressure is indicated in the data table page 3, with the pilot burner on test the pilot pipe and connections from the pilot manual cock to the burner connection.
- d Connect a pressure gauge to the main burner manifold, test point 4 and re-connect the electrical connections from the main safety shut off valves into the connector conduit box. Switch the on/off switch to on and the boiler will ignite in the sequence described in (a) above with the main burners igniting from the pilot burner at minimum rate.

Check ignition of the main burners is smooth. Observe that the modulating air damper opens and the gas rate increases to maximum. Check the main burner pressure on maximum is as indicated in the data table and adjust if necessary.

Check all pipework and connections downstream of the safety shut off valves for gas leaks with a suitable leak detection fluid.

Switch off the boiler, remove pressure gauge and re-seal test point.

- e Remove the RH upper side panel and within the control panel remove the test link for the RH flame detection (see wiring diagram) and connect a microammeter in series with the flame detection circuit. With the boiler operating on maximum check that the microammeter reads at least 5 microamps. Repeat this test for the LH flame detection circuit. Switch off boiler and replace microammeter with the link.
- f With the hinged gas train cover closed turn on the boiler. Check for spillage of products of combustion from the draught diverter opening with a smoke detector or other suitable apparatus, ensuring that any openable windows, doors etc., fitted in the boiler space are shut and any extract fans are operating. Spillage checks should be done with the boiler cold and when the system has heated up, both on maximum and minimum rates.
- g With the system heated up, check the flue system for any leaks and by changing the control thermostat setting check that the burner and combustion air modulating valve cycle correctly between high and low fire. Check this several times for reliable operation.
- h Re-check the main burner pressure at maximum and by modulating the damper down also check the main burner pressure at minimum against that indicated in the data table, adjust if necessary at the main burner governor. Check this against a gas rate reading at the installation gas meter.
- i Check the operation of the water flow switch by gradually closing down one of the boiler isolating valves. The boiler should go to lock out.
- j Check that the pump overrun is operating correctly when the boiler is switched off and that any time controls are operational.

5.3. Instructions to user

Upon satisfactory completion of commissioning hand the Users Instructions to the person responsible for the plant and explain the method of safe operation.

Ensure that he/she is fully conversant with the starting, shut down, general operation and emergency shut down procedures.

Explain the operation of the over heat control, by pressing button in right hand upper side panel, but stress that in case of repeated overheating of the boiler that the fault should be corrected by a competent person.

Stress the importance of regular servicing for safe and efficient operation and that if a gas leak is detected to turn off the boiler at the gas inlet cock and to call the local gas undertaking.

SERVICING

6. SERVICING

WARNING: ONLY COMPETENT PERSONS SHOULD CARRY OUT SERVICING ON THIS BOILER IN ACCORDANCE WITH THE GAS SAFETY (INSTALLATION AND USE) REGULATIONS 1984.

Ensure that both gas and electrical supplies are switched off before carrying out any service operation.

After carrying out any service operation it is important to check for gas soundness and re-commission the boiler as described in Section 5 - Commissioning.

Ensure that any panels covering live connections are replaced securely upon completing any service operation. Wiring diagrams are shown on pages 11 to 17 of this booklet.

6.1. Routine maintenance

The frequency of routine maintenance depends on the use and environment in which the boiler is used although it must be carried out at least annually.

The scope of routine maintenance includes the following:

- i) Cleaning the heat exchanger.
- ii) Cleaning the burner assembly and checking the condition of the burner and ignition components.
- iii) Checking the gas train for soundness.
- iv) Inspecting the adjustment of the air damper and operation of the modulating gas valve.
- v) Checking the effectiveness of natural or mechanical ventilation.
- vi) Inspecting the flue system including terminal, for damage and ensure it is evacuating the products of combustion without any leakage.
- vii) Checking gas pressure settings, safety shut down systems and water flow switch.

6.1.1. Procedure

Referring to Fig. 1 (Page 4) release the fixings securing the bottom edge of the hinged gas train cover at the front of the boiler, secure in the open position with strut supplied. Disconnect all the plug in electrical connections from the connector conduit box, release the gas union at the inlet to the gas train and release the quick clamps at either side of the burner trolley. The burner trolley can now be withdrawn from underneath the boiler.

Release the fixing screw at the bottom of the right hand upper side panel covering the electrical controls. Both the right hand and left hand upper side panels can now be removed by lifting upwards and off their locating pegs. The front and rear upper panel are also now removed by lifting upwards off the locating pegs exposing the down draught diverter and the top of the heat exchanger, see Fig. 8.

6.1.2. Boiler with burner trolley-removed

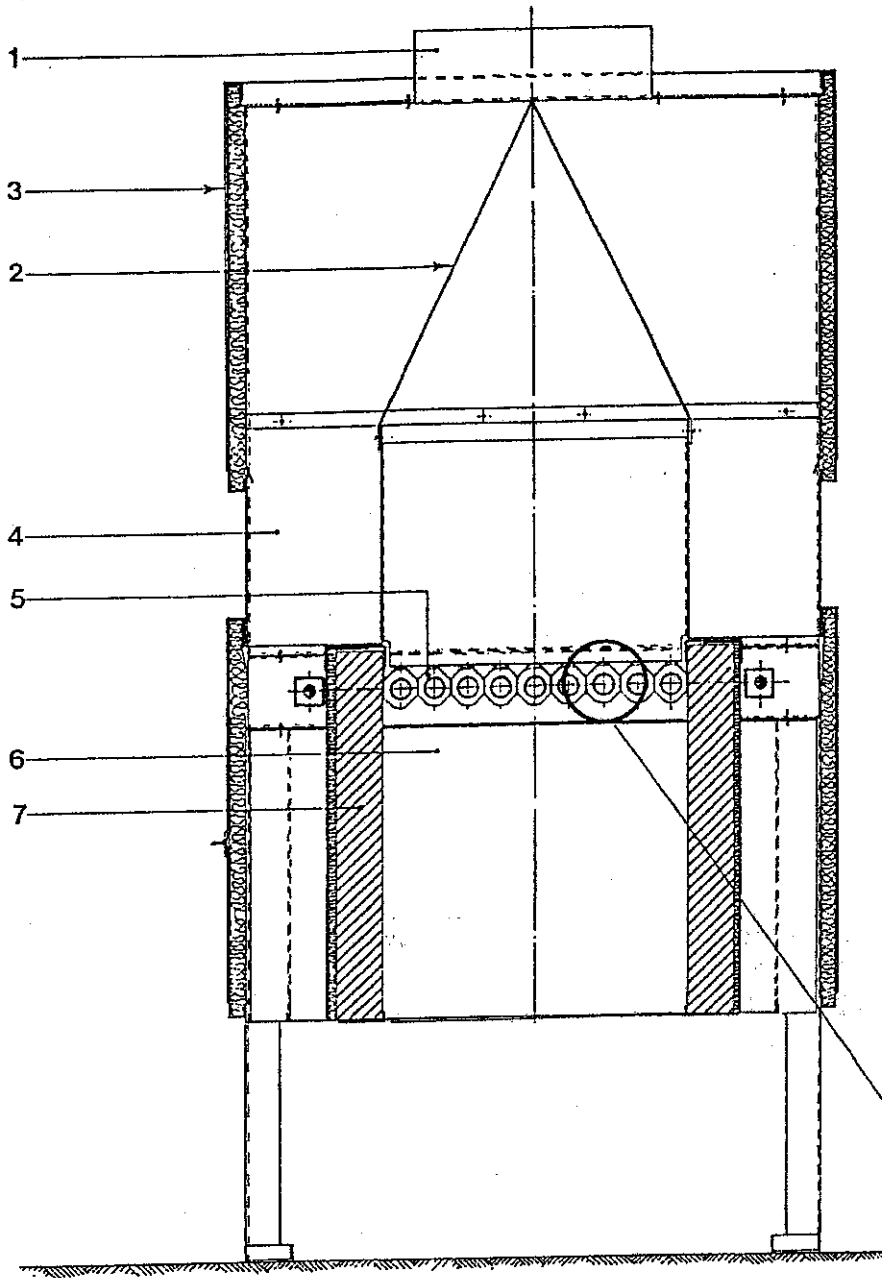
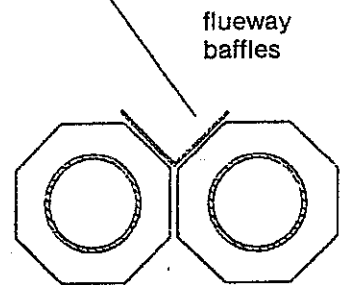


Fig. 10

- 1. Flue outlet socket
- 2. Down draught diverter
- 3. Front and rear upper panels
- 4. Draught diverter air supply opening
- 5. Boiler heat exchanger
- 6. Combustion chamber
- 7. Combustion chamber insulation



flueway baffles

Remove the down draught diverter by releasing two screws in either side and remove the flueway baffles from the top of the heat exchanger. Inspect the heat exchanger for deposits and clean if necessary, check condition of tubes and fins and replace flueway baffles.

Check the condition of the boiler for any possible corrosion damage. Also check the condition of the combustion chamber insulation panels, replacing if necessary.

With the burner trolley removed each individual burner bar can be removed and cleaned. This is done by first removing the insulation covered stainless steel channels, located at the front and rear of the burner assembly, and then removing each burner bar by first lifting the end of the burner out of its locating notch and then withdrawing the burner from its injector (avoid damaging the single sensing electrode at the left hand end).

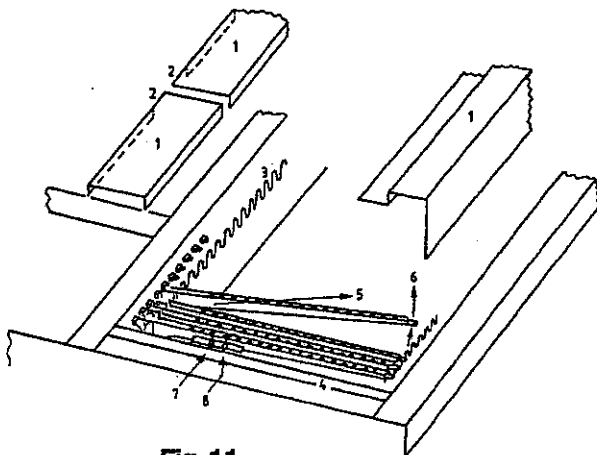


Fig. 11

LEGEND

1. Insulation covered stainless steel channels.
2. Notches to go over gas inlet pipe.
3. Burner location tabs.
4. Burner assembly frame.
5. Withdrawal direction from holder & injector.
6. Lift burner out of notch at end.
7. Ignition Electrode.
8. Sensing Electrode (see also Fig. 12 for secondary ionisation electrode).

The right hand end pilot burner is secured. To avoid damaging the electrodes, each burner bar can be withdrawn from its injector. With the burners removed check the injectors for any blockage and if necessary clean in spirit. Remove the air guides located beneath the burners and clean. Check the setting of the modulating combustion air damper. See Fig. 9 there should be a gap of 4 mm with the damper in the fully closed position against the stops.

Check the condition of the ignition electrode at the right hand end of the burner assembly and the sensing electrodes at each end. There should be no burning of the metal tip and the ceramic should not be cracked.

Replace the burners starting with the two right hand burners and the left hand burner. Ensure that the shaped venturi end at each burner locates properly over the injector and that the tab at the end of the burner bar locates fully in its notch. The two right hand burners have handed tabs to ensure that they are fitted in the correct position as they have cross lighting parts.

Ensure the insulation covered stainless steel channels are correctly positioned as they guarantee the correct location of the burners. The front tip of the from channels locate over the burner location tabs, see Fig. 11.

Ensure that the ignition and sensing electrodes are cor-

rectly positioned as shown in Figs. 12 and 13. If the position or gaps are not correct the electrodes must not be bent, but exchanged for replacement parts.

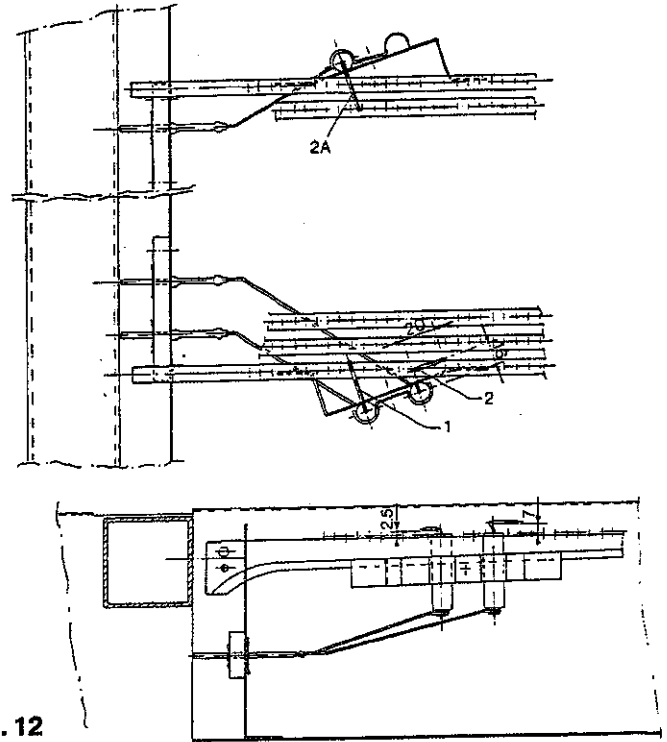


Fig. 12

Check that the modulating combustion air/gas control linkages are in good working order and that there is no play in the gas control spindle.

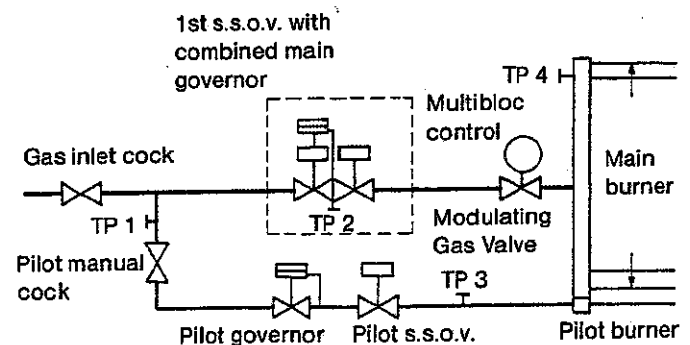
Replace the various panels on the top of the boiler including the down draught diverter, see Fig.10 replace the burner trolley and clamp into position. Re-connect the electrical connectors to the connector conduit box.

Re-commission the boiler as described in Section 5 commissioning.

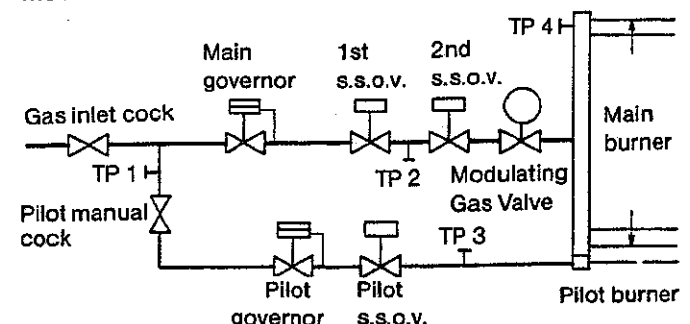
Gas train block diagrams

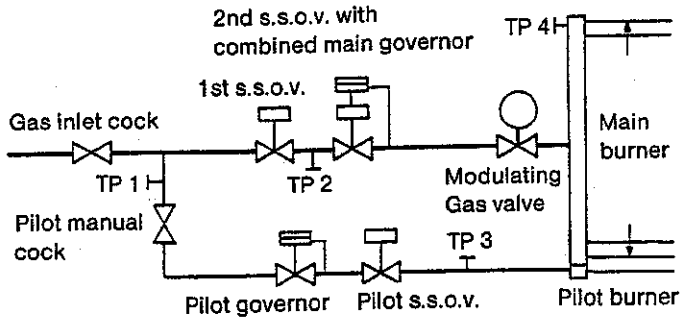
Models 2017 to 2022

s.s.o.v. safety shut off valve



Models 2028 to 2077





Note: - Gas cock supplied by others.

6.2. Component replacement

6.2.1. Electrodes

Remove the burner trolley as described in section 6.1.1. page 17. Remove the insulation covered channels and each burner bar as described in section 6.1.2. page 19. See Figs. 1 & 11. Remove the air guide assembly(s) which are located under the burner bars and ensure the spark electrode is disconnected from the ignition generator. Remove the burner assembly frame complete from its location in the burner trolley.

The ignition and sensing electrodes can now be replaced by removing two security screws and nuts which attach each electrode to the burner assembly frame.

When re-assembling ensure that the electrodes are correctly replaced with the burner bars in position. See Figs 11 & 12 and that the insulation covered channels are correctly located.

Replace components in the reverse order of removal. Check operation of electrodes by carrying out the relevant parts of section 5, commissioning.

6.2.2. Burner bars

Remove the burner trolley as described in section 6.1.1. page 17 remove the insulation covered stainless steel channels, see Fig. 11 page 19.

With the exception of the right hand burner bar, the burner bars are removed by first lifting the end of the burner out of its locating notch and then withdrawing the burner from its injector. To remove only the left hand burner it is necessary to first remove the burner to its right so that the left hand burner can be removed without damaging the left hand sensing electrode.

The two right hand burners are fixed at their ends by handed fixing brackets and screws. To remove either of these burners it is necessary to first remove the third bar from the right so that the two left hand burners can be moved to the left during removal to avoid damaging the ignition and right hand sensing electrodes.

Replacement of the burner bars is described in Section 6.1.2. page 19. Check operation of the burners.

6.2.3. Injectors

Remove the burner trolley and burner bars, as described in section 6.1.1. page 17,19.

With the burner bars removed the injectors can be unscrewed from the gas manifold.

Ensure that injectors are unblocked and are the correct size - 1.8 mm diameter (natural gas).

Use an approved pipe sealant on the injector thread to ensure a gas sound seal.

Replace components in the reverse order of removal.

6.2.4. Gas train (including gas train components).

Release the fixings securing the bottom edge of the hinged gas train cover at the front of the boiler and secure the cover in the open position with the strut supplied, see Fig. 1, page 5.

Ensure that the gas inletcock is closed, release the gas union, disconnect the plug in electrical connections from the connections conduit box, release the quick clamps at either side of the burner trolley and withdraw the burner trolley.

Solenoid valve heads can be replaced with valve in situ by releating the, appropriate fixing on the valve head, ensure new valve head is wired in accordance with the wiring diagrams see section 4,6.

The main gas train is removed as follows:

Loosen the grub screw securing the keyed shaft of the modulating valve servomotor to its coupling and remove the motor by unscrewing two fixing screws. It is not necessary to remove the gas train if only replacing this component. Remove the pin connecting the modulating air damper to its actuating arm at the modulating valve by releasing the clip. Remove the copper pilot supply pipe by releasing the union nut at each end. Unscrew the four screws that secure the modulating valve to its flange connection on the gas manifold being careful not to loose the O'ring, and withdraw the gas train to the left out from its locating slot in the burner trolley, the various controls in the main gas train can now be replaced by unscrewing from the gas train. The pilot solenoid valve can also be unscrewed at its outlet connection and replaced.

An approved thread sealant should be used when re-connecting any pipe threads. Ensure that any controls replaced are fitted squarely on the gas train, the O'ring seal on the outlet of the modulating valve is in good condition and correctly located, and the modulating valve shaft drive and linkages are correctly assembled.

Upon replacement if components carry out the relevant portions of section 5 commissioning.

6.2.5. Ignition generator

Release the fixings securing the bottom edge of the hinged gas train cover at the front of the boiler and secure the cover in the open position with the strut supplied, see Fig. 1 page 5.

Disconnect all of the plug in electrical connections from the connections conduit box and remove the cover of the conduit box by releasing two screws at each end.

Release the fixing screw at the bottom of the right hand upper side panel and remove the panel by lifting upwards off its locating pegs.

Disconnect the ignition generator electrical connection from within the control panel and release the ignition electrode lead from the generator.

Replace the generator by releasing its screw fitting and re-connect the electrical connections in accordance with the wiring diagrams Section 4,6.

6.2.6. Control panel components

Release the fixing screw at the bottom of the right hand upper side panel and remove the panel by lifting upwards and off its locating pegs.

Refer to Fig. 8 page 15 for the locations of the various controls.

Replace components by removing electrical connections and screw fixings. It is necessary to drain the boiler when replacing the water flow switch as it incorporates water connections.

The temperature sensing phials for both the control thermostat and the overheat control are contained within a thermostat pocket in the flow header immediately beneath the control panel. The phials are released by first removing the securing clip.

The control thermostat is fixed to the front right hand side panel of the boiler and its fixing screws can be accessed via the control panel.

Re-connect any electrical connections in accordance with the wiring diagrams Sect. 4,5.

FAULT FINDING

7. FAULT FINDING

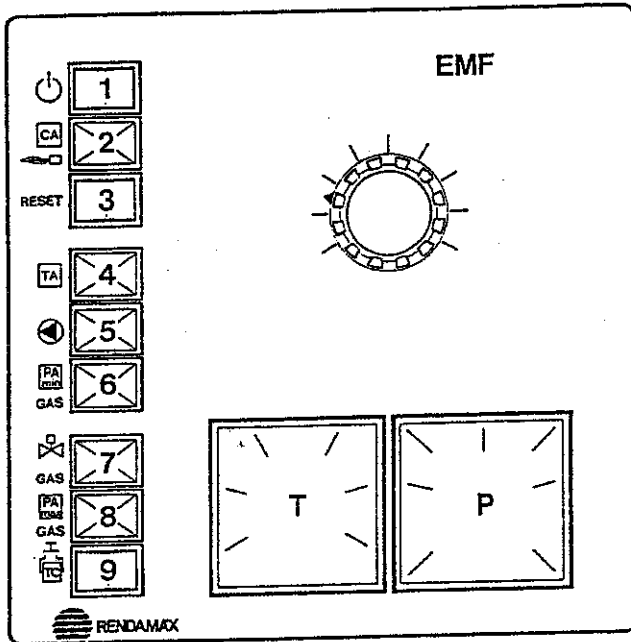


Fig. 14

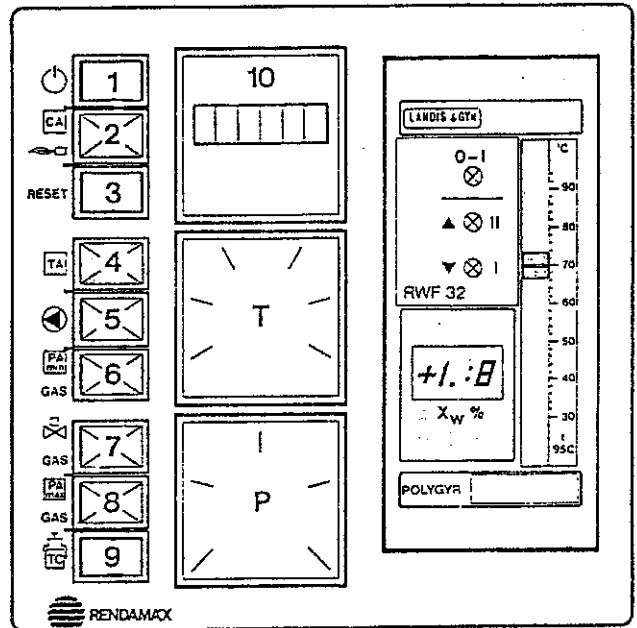


Fig. 15

T - Temperature Gauge
 P - Pressure Gauge
 TC - Temp. Control Knob.
 Control panel layout type ET
 Control panel layout type EM

To assist with fault the control panels incorporate a number of warning indicators and switches.

1. Power on/off switched indicator
2. Boiler lock out indicator
3. Reset switch
4. Overheat temperature indicator
(off when boiler overheated)
5. Insufficient water flow indicator
6. Low gas pressure indicator (optional)
7. Gas leak indicator (optional)
8. High gas pressure indicator (optional)
9. By pass switch for high limit rest
10. Hours run indicator (EM only)

Boiler does not attempt to light	<ol style="list-style-type: none"> 1. No electrical supply to boiler, check whether switched indicator (1) is alight 2. Check time clock 3. No heat demand. Check control thermostat is set high enough. 4. Overheat control has operated. Check whether indicator (4) is alight if not reset by button through hole in upper RH side panel 5. Insufficient water flow indicator (5) alight, check water system 6. Control panel fuse blown, check fuse 7. Faulty control box, change box
Air modulating damper cycles, no ignition spark and boiler then goes to lockout, indicator (2) alight	<ol style="list-style-type: none"> 1. HT lead disconnected or faulty, correct 2. Ignition electrode incorrectly set or faulty, check setting or replace 3. Faulty ignition generator, change 4. Faulty control box, change box
Ignition sparks, pilot burner does not light and boiler then goes to lock out indicator (2) alight	<ol style="list-style-type: none"> 1. Gas supply turned off, turn on 2. Pilot manual cock turned off, turn on 3. Air in gas line, purge air 4. Check ionisation probe, if damaged, replace 5. Faulty pilot safety shut off valve or Connections, rectify 6. Pilot injector blocked, clean 7. Pilot governor set too low, adjust
Pilot burner ignites but boiler then goes to lock out indicator (2) alight. Main burners do not light	<ol style="list-style-type: none"> 1. Check flame probe, if damaged, replace. 2. Flame probe lead(s) not connected or faulty, rectify 3. Faulty connections to main safety shut off valve(s), rectify 4. Faulty main safety shut off valves change valves 5. Faulty control box, replace 6. Check ionisation current, as per instructions
Pilot burner & main burners light but water temp stays low	<ol style="list-style-type: none"> 1. Control thermostat set too low re-adjust 2. Modulating valve/air damper will not open to increase gas rate, faulty modulating valve, servo motor, replace motor 3. Main burner pressure set too low reset.
Boiler operates but then goes to overheat indicator (4) alight	<ol style="list-style-type: none"> 1. Fault in water system, rectify 2. Main burner pressure set too high reset 3. Pump overrun inoperative, rectify 4. Boiler does not shut down, min fire - reset servomotor.

LIST OF SERVICEABLE PARTS

8. LIST OF SERVICEABLE PARTS

When ordering parts it is important to specify the model and serial number of the boiler. When ordering under warranty it is also necessary to specify the date of installation and commissioning.

COMPONENT	PART NUMBER
Main gas valve (multibloc) model 2017 & 2022	Inter Albion 1"
1st Main gas valve Model 2028 - 2034 Model 2041 - 2077 Model 2090 - 2122	Kromschroder 1" Kromschroder 1½" L & G
2nd Main gas valve Model 2028 - 2034 Model 2041 - 2077 Model 2090 - 2122	Kromschroder 1" Kromschroder 1½" L & G
Modulating gas valve Model 2017 - 2028 Model 2034 - 2043 Model 2056 - 2077 Model 2090 - 2122	D 18 D 22 D 28 D 385
Modulating valve servomotor	L & G
O ring for modulating gas valve	
Pilot gas valve	Dungs
Ignition transformer	Danfoss
Full sequence control box	
Control thermostat Type ET Type EM	Jumo EMF 133 L & G RWF 31
Overheat control	L & G
Ignition electrode	
Flame sensing electrode RH end LH end	
Burner bar Standard RH End.	
2nd from RH end	
Water flow switch	
Temperature gauge	
Pressure gauge	